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**THE HIMALAYAN PLANTS**  
**VOLUME 4**

Edited by  
Hideaki Ohba



2006 TOKYO

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**THE HIMALAYAN PLANTS**  
**Volume 4**

Results of the co-operative research on the Himalayan plants  
between the University of Tokyo and Department of Plant  
Resources, Nepal

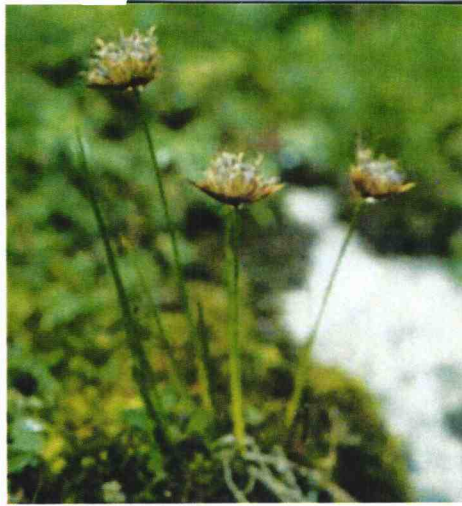
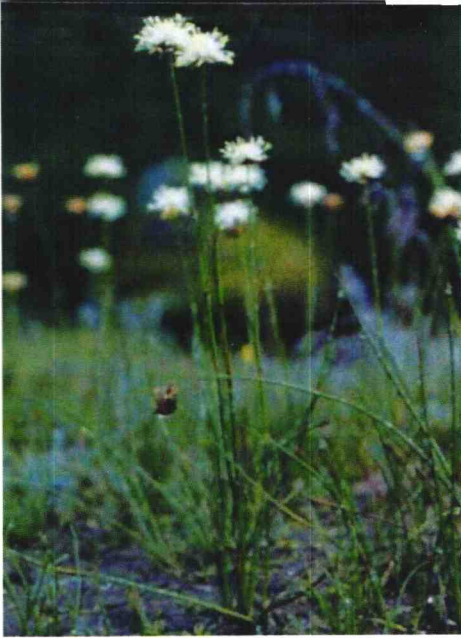
Edited by  
**Hideaki Ohba**

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**Plate 1**

- a & b. *Juncus allioides* Franch.
- c & d. *Juncus rostratus* Miyam.
- e. *Juncus articulatus* L.
- f. *Juncus benghalensis* Kunth
- g & h. *Juncus biglumoides* H. Hara

c

d

f



g



h







a



b



c

**Plate 2**

- a. *Juncus brachystigma* Sam.
- b. *Juncus chrysocarpus* Buchenau
- c. *Juncus clarkei* Buchenau
- d. *Juncus bryophilus* Noltie
- e. *Juncus bufonius* L.
- f. *Juncus cephalostigma* Sam.

d



e



f







a



b



c

**Plate 3**

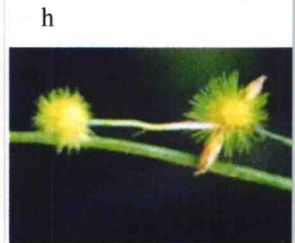
- a. *Juncus concinnus* D. Don
- b. *Juncus concolor* Sm.
- c. *Juncus ganeshii* Miyam. & H. Ohba
- d. *Juncus crassistylus* A. Camus
- e. *Juncus duthiei* (C. B. Clarke) Noltie
- f. *Juncus fimbristylodes* Noltie
- g & h. *Juncus dongchuanensis* K. F. Wu



d



e



h



f



g





a



b



c

**Plate 4**

- a. *Juncus glaucoturgidus* Noltie
- b. *Juncus gonggae* Miyam. & H. Ohba
- c. *Juncus grisebachii* Buchenau
- d. *Juncus gracilicaulis* A. Camus
- e. *Juncus harae* Miyam. & H. Ohba
- f. *Juncus effusus* L.
- g. *Juncus himalensis* Klotzsch

d



e



f



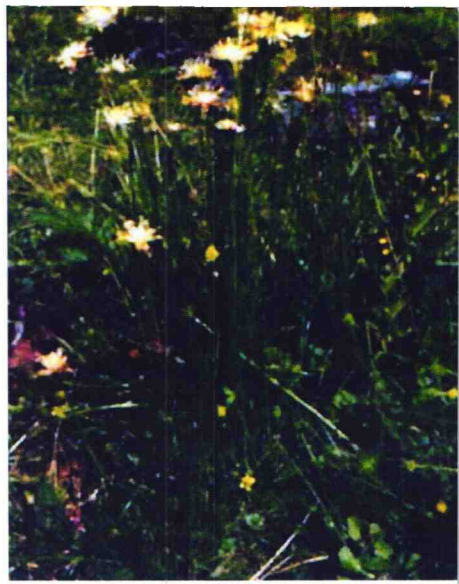
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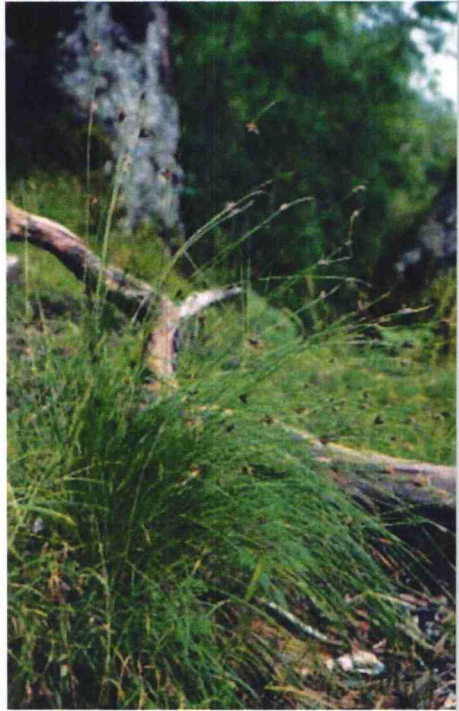
a



b



d



c

**Plate 5**

- a. *Juncus leptospermus* Buchenau
- b. *Juncus leucanthus* Royle ex D. Don
- c & d. *Juncus longiflorus* (A. Camus) Noltie
- e. *Juncus kingii* Rendle
- f. *Juncus inflexus* L.
- g. *Juncus khasiensis* Buchenau



e

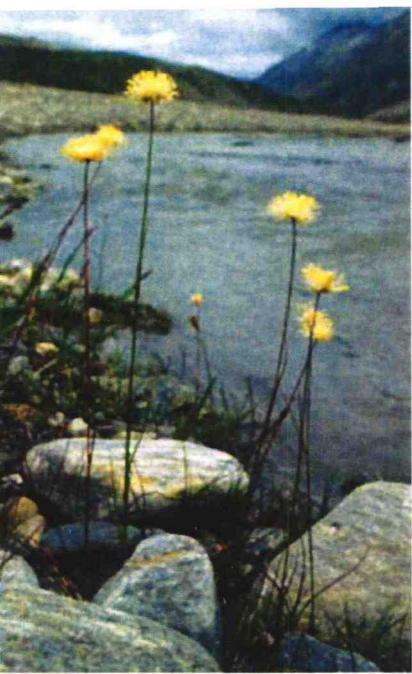


f



g





a



b



c

**Plate 6**

- a. *Juncus membranaceus* Royle ex D. Don
- b. *Juncus milashanensis* A. M. Lu & Z. Y. Zhang
- c. *Juncus nepalicus* Miyam. & H. Ohba
- d. *Juncus minimaus* Buchenau
- e. *Juncus modicus* N. E. Br.
- f. *Juncus ochraceus* Buchenau



d



e

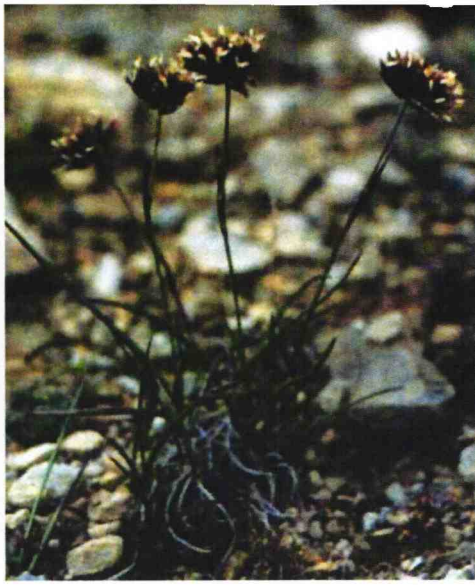


f





a



b



c

**Plate 7**

- a. *Juncus perpusillus* Sam.
- b. *Juncus przewarskii* Buchenau
- c. *Juncus petrophilus* Miyam.
- d. *Juncus rohtangensis* Goel. & Aswal.
- e. *Juncus pseudocastaneus* (Lingelsh.) Sam.
- f. *Juncus prismatocarpus* R.Br.
- g. *Juncus potaninii* Buchenau



d



e



f



g





a

b

c

### Plate 8

- a. *Juncus amplifolius* A. Camus
- b. *Juncus sherei* Miyam & H. Ohba
- c. *Juncus sphacelatus* Decne.
- d & e. *Juncus spumosus* Noltie
- f. *Juncus sikkimensis* Hook. f.



e



d



f





a



b



c

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- a. *Juncus thomsonii* Buchenau
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- c. *Juncus trachyphyllus* Miyam. & H. Ohba
- d. *Juncus triglumis* L.
- e. *Juncus uniflorus* W. W. Sm.
- f. *Juncus wallichianus* Laharpe

d



e

f





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- b. *Juncus allioides* Franch.  
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- c & d. *Juncus rostratus* Miyam.  
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- e. *Juncus articulatus* L.  
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- f. *Juncus benghalensis* Kunth.  
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- c. *Juncus clarkei* Buchenau.  
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- d. *Juncus bryophilus* Noltie.  
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- f. *Juncus fimbriatylodes* Noltie.  
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- g & h. *Juncus dongchuanensis* K. F. Wu.  
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- c. *Juncus grisebachii* Buchenau.

- Sankhuwasawa, Thasing Dingma–Chhatarwa, 3900 m, Nepal (28 Aug. 1995).
- d. *Juncus gracilicaulis* A. Camus.  
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- e. *Juncus harae* Miyam. & H. Ohba.  
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- f. *Juncus effusus* L.  
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- e. *Juncus kingii* Rendle.  
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- f. *Juncus inflexus* L.  
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- c. *Juncus nepalicus* Miyam. & H. Ohba.  
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- b. *Juncus przewarskii* Buchenau.  
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- c. *Juncus petrophilus* Miyam.  
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- d. *Juncus rohtangensis* Goel & Aswal.  
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- e. *Juncus pseudocastaneus* (Lingelsh.) Sam.  
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- f. *Juncus prismatocarpus* R. Br.  
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- g. *Juncus potaninii* Buchenau.  
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- Plate 8. a. *Juncus amplifolius* A. Camus.  
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c. *Juncus sphacelatus* Decne.  
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d & e. *Juncus spumosus* Noltie.  
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- Plate 9. a. *Juncus thomsonii* Buchenau.  
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e. *Juncus uniflorus* W. W. Sm.  
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f. *Juncus wallichianus* J. Gay ex Laharpe.  
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The fourth volume of *Himalayan Plants* contains three articles. The first and second articles are results of systematic studies of *Juncus* and Euphorbiaceae, and the third one is the fourth series of papers of wood structure of 35 Himalayan wood species. For the first two we expect their works to become a consensus for further researches of the diversity of *Juncus* and Euphorbiaceae in the Himalaya and adjacent regions. Description of wood structures not only becomes an addition to the atlas of the Himalayan woods, totally attaining 193 species, and also reveals their phylogenetic and ecological diversity in the Himalayan region.

All four volumes were dedicated to publish the results of botanical researches in the Himalaya and adjacent regions, i.e. Pakistan, India, and China including Tibet since 1983. The main purpose of the researches is to resolve the regional diversity of extremely diversified taxonomic groups in the Himalaya and adjacent regions, such as *Saxifraga*, *Pedicularis*, and *Impatiens*. Revisional papers of these and also some other groups were included. Our research activities have spread out to meteorology of the Himalaya alpine region, geobotany particularly relations between the occurrence of plants and the microscale landform, and cytology. Some articles in these subjects were also included in this series.

The researches were financially supported by a Grants-in-Aid for Scientific Research (A) from the Japan Society for the Promotion of Science and the Ministry of Education, Culture, Sports, Science, and Technology, Japan since 1983 (recent ones: nos. 08041137, 11691178, 14255005, 18255004 to HO).

March 2006

Hideaki Ohba



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# A SYSTEMATIC REVISION OF *JUNCUS* (JUNCACEAE) IN THE SINO-HIMALAYAN REGION

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The genus *Juncus* consists of about 310 species (Mabberley 2008) and have a very wide geographical range, extending through out the globe from the equator to the polar regions, and providing examples of the occurrence in both hemispheres of the same species (Don 1840). In the tropics the genus is absent in the lowland but present at higher elevations, usually above 2000 m (Balslev 1996). It occupies many habitats from coastal to mountain marshy places or bogs.

In the Sino-Himalaya, the species of *Juncus* are found widely in the alpine and subalpine regions and are sometimes dominant. Economically it is also an important pasture plant where grazing animals feed. *Juncus* is one of the genera much diversified in the alpine and subalpine of the Sino-Himalaya.

*Juncus* in this region has been studied by several taxonomists and more than 100 species have been reported (Don 1825, 1840, Buchenau 1867, 1885, 1890, 1906, Franchet 1887, Hooker 1894, Brown 1903, Rendle 1906, Camus 1910, Smith 1914, Samuelsson 1927, 1936, Satake 1968, 1971, Hara 1978, Lu & Zhang 1979, Miyamoto & Ohba 1993, 1995, 1997a, 1997b, Noltie 1994a, 1998, Wu 1994). A considerable number of the species have been described based on one or a few specimens. In spite of former taxonomic studies, some species of *Juncus* have not yet been successfully circumscribed for the lack of reliable diagnostic characters.

This paper provides a revision of the species of *Juncus* found in the Sino-Himalayan region.

## Materials and Methods

This study was mainly based on several thousands of the herbarium specimens including types of the Sino-Himalayan species. Field trips were carried out in the Sino-Himalayan region throughout Pakistan, Nepal, Darjeeling, Bhutan, and China (Yunnan, Sichuan, and Xizang) from 1990 to 2002 and examined variation among and within populations.

Specimens of the following herbaria were examined: Harvard University Herbaria (A), Botanischer Garten und Botanisches Museum Berlin-Dahlem (B), Department of Botany, London Natural History Museum (BM), Central National Herbarium, Botanical Survey of India (CAL), Botany Department, Chengdu Institute of Biology, Chendgu (CDBI), Royal Botanic Garden, Edinburgh (E), East China Normal University, Shanghai (HSNU), Royal Botanic Gardens, Kew (K), National Herbarium and Plant Laboratories, Department of Plant Resources, Kathmandu (KATH), Kunming Institute of Botany, Chinese Academy of Sciences, Kunming (KUN), Herbarium, Department of Botany, Faculty of Science, Kyoto University (KYO), National Herbarium Netherlands, Leiden (L), V. L. Komarov Botanical Institute, Saint Petersburg (LE), Muséum National d'Histoire Naturelle, Paris



(P), Institute of Botany, Chinese Academy of Sciences, Beijing (PE), Herbarium, Botany Department, Swedish Museum of Natural History (S), Herbarium, Department of Botany, University Museum, University of Tokyo (TI), Botanical Museum, Uppsala University (UPS), Herbarium, Department of Botany, Naturhistorisches Museum, Wien (W), and Herbarium, Institute für Botanik, Universität Wien (WU).

### Taxonomical History

Taxonomical study of *Juncus* in the Sino-Himalaya was begun in the early nineteenth century when Don (1825) described *Juncus concinnus* based on a specimen collected from Gossain Than (actually Gosainkund, north of Kathmandu) in Nepal by Wallich in 1818. Later he (1840) described four new species, *J. indicus*, *J. leucanthus*, *J. leucomelus*, and *J. membranaceus*, based on specimens collected in northern India by Royle. Buchenau (1867) described two new species, *J. thomsoni* and *J. minimus*, and he (1885) was the first botanist who summarized Himalayan *Juncus* based on specimens collected in Northwest Himalaya, Sikkim, and Assam by J. D. Hooker, J. Thomson, and C. B. Clarke. He recognized 25 species of *Juncus*, together with description of five new species, *J. bracteus*, *J. chrysocarpus*, *J. clarkei*, *J. leptospermus*, and *J. sphenostemon*. In 1890 Buchenau published a worldwide monograph of Juncaceae, in which several new species of the Sino-Himalayan *Juncus* were described. Hooker (1892) recognized 26 species of *Juncus* from the Himalayan region in his 'Flora of British India,' and later he (1894) described two new species, *J. nematocaulon* and *J. sikkimensis*. Professor Hiroshi Hara made expeditions to Nepal, Sikkim, and Bhutan in 1960s and 1970s. Collections of these expeditions were enumerated and published in three parts in 1966, 1971, and 1975. Satake studied the *Juncus*, and he described two new species, *J. albescens* and *J. tratangensis*, in the reports, and in another report (Satake 1968) described more two new species, *J. bhutanensis* and *J. leuteocarpus*. Hara published 20 papers from 1961 to 1978 entitled 'New or noteworthy flowering plants from Eastern Himalaya,' and in the one of the papers, he (1974) described a new species of *Juncus biglumoides* based on a specimen collected from Lamjung Himal in Nepal by J. D. A. Stainton and others. After Hara (1978) the number of species increased to 30 in 'An Enumeration of the Flowering Plants of Nepal' (Hara et al. 1978). Ohba and his associates inquired succeeding Himalayan plant research, and Miyamoto and Ohba (1993, 1995, 1997) described four new species, *J. ganeshii*, *J. harae*, *J. nepalicus*, and *J. sherei*, based on the specimens collected from Nepal. Noltie (1994a) made a detailed study on *Juncus* and described four new species, *J. bryophytes*, *J. glaucoturgidus*, *J. hydrophilus*, and *J. spumosus*, from Bhutan and adjacent regions, which were included in a contribution to the elucidation of the Flora of Bhutan (Noltie 1994b). After he also described two new species from the Himalayan region, *J. deosaicus* from Pakistan and *J. tobdeniorum* from Sikkim (Noltie 1998). Most recently Press et al. (2000) reported 38 species of *Juncus* from Nepal in 'Annotated Checklist of the Flowering Plants of Nepal.'

A great number of specimens of *Juncus* were collected from SW China, mainly Yunnan and Sichuan by French missionaries, such as David, Delavay, and Soulié, in the middle of nineteenth century. Succeedingly *Juncus* was collected from SW China by Forrest, Rock, Smith, Kingdon-Word, and Handel-Mazzetti. Franchet (1887) described *J. allioides* and *J. luzuliformis* based on David's collections. Camus (1910) treated Asian *Juncus*,

and he described five new species and three varieties, *J. amplifolius*, *J. amplifolius* var. *pumilus*, *J. clarkei* var. *marginatus*, *J. crassistylus*, *J. gracilicaulis*, *J. longistamineus*, *J. sikkimensis* var. *longiflorus*, and *J. yunnanensis* based on Delavay's and Soulié collections. Samuelsson (1927, 1936) described several new species based on their collections. Wu (1994) revised Chinese *Juncus*, and he described several new species based on specimens collected in Yunnan and Sichuan. Recently Miyamoto and Ohba (1997) described two new species, *J. gonggae* and *J. trachyphyllus*, from Mt. Gongga shan in Sichuan. Noltie (1998) described *J. fimbriatylodes*, an endemic species from Yunnan, China.

Recently *Juncus* was treated only in regional floras of Sino-Himalaya, for example, Jafri (1981), Lu and Zhang (1987), Noltie (1994b), Zhang and Lu (1994), Wu (1997), Akiyama et al. (1999, 2000), Miyamoto and Ohba (1999, 2002, 2008), Li (2000), Press et al. (2000), Wu and Clemants (2000), and Bao (2003).

### Morphological Characters

The following morphological characters are used to distinguish the Sino-Himalayan species.

#### Rhizomes

Five types of rhizomes for branching pattern are found in *Juncus*. Their appearance is usually quite characteristic to a given species or group of species (Balslev 1996).

1. Branching-ascending rhizomes: rhizomes branch loosely with conspicuous internodes.  
*J. bufonius*, *J. prismatocarpus*, and *J. wallichianus*.
2. Stoloniferous rhizomes: rhizomes creep horizontally with long internodes.  
*J. amplifolius*, *J. benghalensis*, *J. chryosocarpus*, *J. concolor*, *J. crassistylus*, *J. ganeshii*, *J. grisebachii*, *J. himalensis*, *J. kingii*, *J. longistamineus*, *J. membranaceus*, *J. milashanensis*, *J. minimus*, *J. pseudocastaneus*, *J. rohtangensis*, and *J. sphacelatus*.
3. Densely branching rhizomes: rhizomes irregularly branch with short internodes.  
*J. longiflorus*, *J. nepalicus*, *J. ochraceus*, *J. rostocarpus*, and *J. spumosus*.
4. Short creeping rhizomes: rhizomes creep horizontally, and culms arise in dense rows from the upper side of the rhizome.  
*J. articulatus*, *J. biglumoides*, *J. brachystigma*, *J. bryophilus*, *J. cephalostigma*, *J. clarkei*, *J. concinnus*, *J. dongchauanensis*, *J. duthiei*, *J. effusus*, *J. fimbriatylodes*, *J. giganteus*, *J. glaucoturgidus*, *J. gonggae*, *J. gracilicaulis*, *J. harae*, *J. inflexus*, *J. khasiensis*, *J. leptospermus*, *J. luzuliformis*, *J. mustangensis*, *J. perpusillus*, *J. petrophilus*, *J. potaninii*, *J. przewalskii*, *J. setchuensis*, *J. sherei*, *J. sikkimensis*, *J. spectabilis*, *J. thomsonii*, *J. tobdeniorum*, *J. trachyphyllus*, *J. trichophyllus*, *J. triglumis*, and *J. uniflorus*.
5. Long creeping rhizomes: rhizomes differ from short creeping ones only in having conspicuous internodes.  
*J. allioides*, *J. leucanthus*, and *J. modicus*.

#### Culms

The flowering stem is the culm. The culms are ascending and erect.

They are terete and the cross sections are rounded in *J. allioides* (Fig. 1-1), oval in *J. himalensis* (Fig. 1-2), pentaquetrous in *J. brachystigma* (Fig. 1-3), or laterally compressed in *J. prismatocarpus* (Fig. 1-4). The surface of culms is smooth as in *J. allioides* (Fig.



1-5), or with longitudinal striae as in *J. himalensis* (Fig. 1-6), or longitudinal ridges as in *J. brachystigma* (Fig. 1-7).

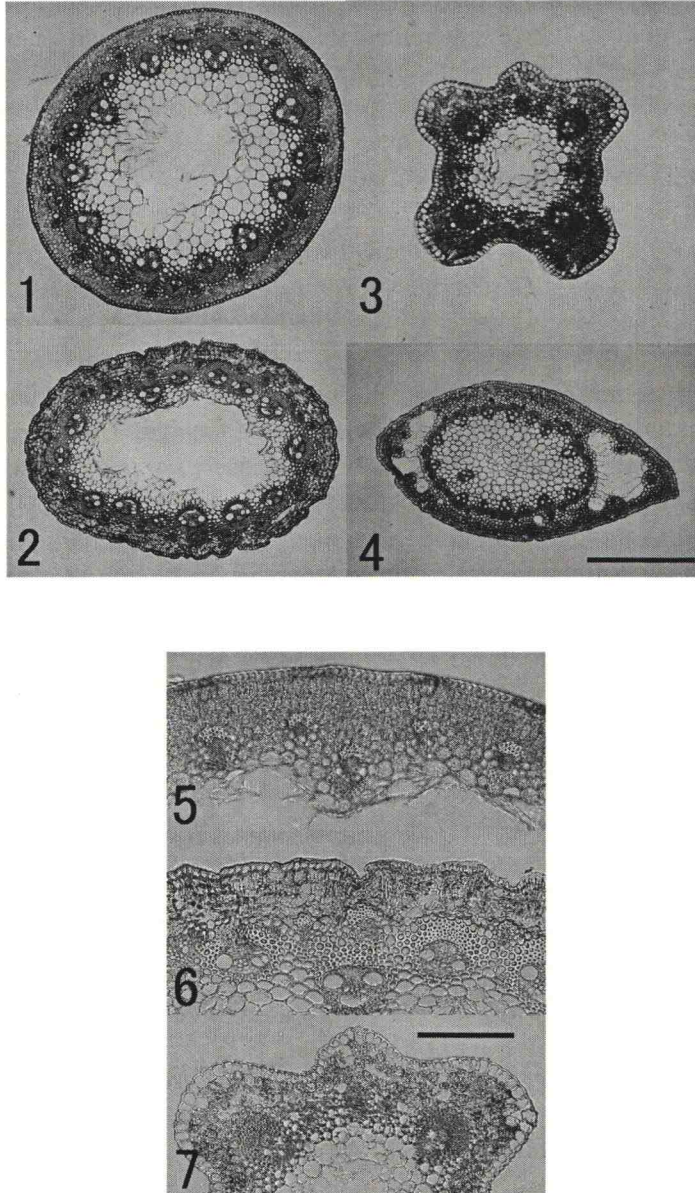


Fig. 1. Cross sections of middle part of culms. 1: *J. allioides*, 2: *J. himalensis*, 3: *J. brachystigma*, 4: *J. prismatocarpus*, 5: *J. allioides*, 6: *J. himalensis*, 7: *J. brachystigma*. Scale: upper 0.5 mm, lower 0.2 mm.

## Blade

Four types of leaves are found in the cross section of the blades in Sino-Himalayan *Juncus*. The adaxial side of leaves or terete leaves, when present, have epidermis with large hyaline, so-called bulli-form cells (Fig. 2) (Duval-Jouve 1871).

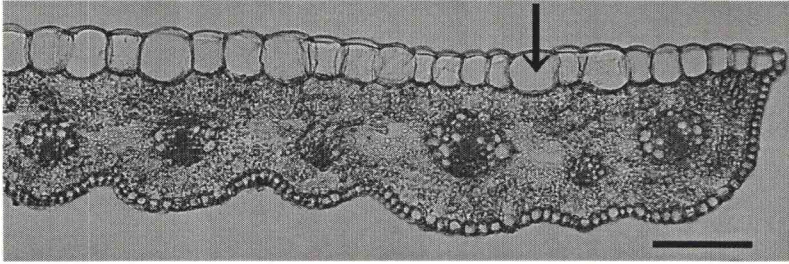


Fig. 2. Cross section of the leaf of *J. rostratus*. Arrow indicates bulliform cell. Scale: 0.1 mm.

1. Flat blades: the cross section of the blades is flattened. The vascular bundles lie in a row under both surfaces respectively (Fig. 3-1).

*J. amplifolius*, *J. giganteus*, *J. gracilicaulis*, *J. hydrophilus*, *J. milashanensis*, and *J. minimus*; the bulliform cells absent.

*J. clarkei*, *J. crassistylus*, *J. nepalicus*, *J. petrophilus*, *J. rostratus*, and *J. spumosus*; the bulliform cells present on adaxial side.

2. Bifacial blades: the cross section of the blades is U-shaped. The vascular bundles lie in U-shaped (Fig. 3-2).

*J. benghalensis*, *J. biglumoides*, *J. brachystigma*, *J. bryophilus*, *J. bufonius*, *J. ganeshii*, *J. grisebachii*, *J. harae*, *J. himalensis*, *J. membranaceus*, *J. modicus*, *J. mustangensis*, *J. potaninii*, *J. sphacelatus*, and *J. triglumis*; the bulliform cells absent on both side.

*J. gonggae*, *J. ochraceus*, and *J. trachyphyllus*; the bulliform cells present on adaxial side.

*J. chrysocarpus*, *J. concinnus*, and *J. fimbriatylodes*; the bulliform cells present on both sides.

3. Terete blades: the cross section of the blades is rounded or oval. The vascular bundles lie in a circle (Fig. 3-3–6).

*J. allioides*, *J. articulatus*, *J. cephalostigma*, *J. concolor*, *J. dongchuanensis*, *J. duthiei*, *J. glaucoturgidus*, *J. khasiensis*, *J. kingii*, *J. leptospermus*, *J. leucanthus*, *J. longiflorus*, *J. longistamineus*, *J. luzuliformis*, *J. perpusillus*, *J. przewalskii*, *J. pseudocastaneus*, *J. rohtangensis*, *J. sherei*, *J. sikkimensis*, *J. thomsonii*, *J. trichophyllus*, *J. uniflorus*, and *J. wallichianus*; the bulliform cells absent. The surface of leaves is smooth (Fig. 3-3), or with longitudinal striae (Fig. 3-4) or longitudinal ridges (Fig. 3-5–6).

*Juncus sherei* has leaves with a single groove both on adaxial and abaxial sides, respectively (Fig. 3-4), *J. brachystigma* with conspicuous longitudinal ridges (Fig. 3-5), and *J. khasiensis* X-shaped (Fig. 3-6).

4. Compressed blades: the cross section of the blades is oblong to linear-oblong with compressedly sharp edges. The vascular bundles lie in oval-shaped (Fig. 3-7).

*J. prismatocarpus*; the bulliform cells absent.



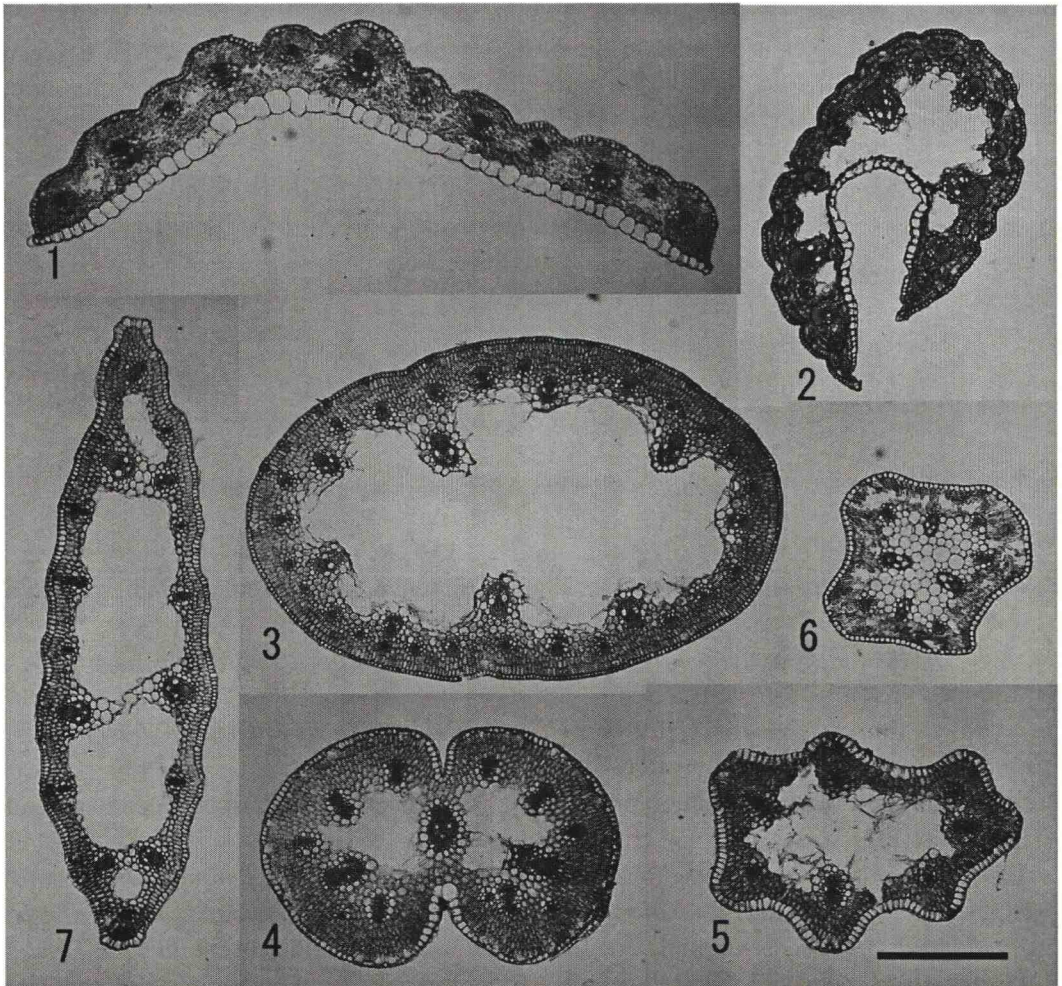


Fig. 3. Cross sections of basal leaves. 1: Flat blade of *J. rostricarpus*, 2: Bifacial blade of *J. benghalensis*, 3: Terete blade of *J. allioides*, 4: Terete blade of *J. sherei* with a single groove each on adaxial and abaxial side. 5: Terete blade of *J. brachystigma* with longitudinal conspicuous ridges. 6: Terete blade of (X-shape) *J. khasiensis*. 7: Compressed blade of *J. prismatocarpus*. Scale: 0.2 mm.

### Cataphylls

*Juncus* has sheathing leaves at base of culms which blade is degenerated. Such sheathing leaves are called cataphylls by Buchenau (1875, 1890, 1906).

*Juncus effusus*, *J. inflexus*, *J. setchuensis*, and *J. tobdeniorum* have only cataphylls.

### Inflorescences

The inflorescences of *Juncus* are terminal on the culm and generally many-flowered. But *J. bryophilus*, *J. harae*, *J. longistamineus*, *J. potaninii*, *J. rohtangensis*, and *J. uniflorus* of the Sino-Himalayan *Juncus* have 1 or 2 flowers in the inflorescences.

*Juncus* has two types of the inflorescences. One is cymose and occurs in *J. bufonius*, *J. effusus*, *J. inflexus*, *J. luzuliformis*, *J. setchuensis*, and *J. tobdeniorum*. Another is racemose and occurs in other species.

### Lowest bract

In *Juncus* there is considerable and taxonomically important variation in the lowest bract (Balslev 1996). The lowest bract is longer or shorter than, or as long as the inflorescence. *Juncus amplifolius*, *J. articulatus*, *J. benghalensis*, *J. brachystigma*, *J. bryophilus*, *J. bufonius*, *J. clarkei*, *J. concinnus*, *J. crassistylus*, *J. dongchuanensis*, *J. duthiei*, *J. fimbriatylodes*, *J. ganeshii*, *J. giganteus*, *J. gracilicaulis*, *J. grisebachii*, *J. harae*, *J. himalensis*, *J. hydrophilus*, *J. khasiensis*, *J. kingii*, *J. leptospermus*, *J. longiflorus*, *J. milashanensis*, *J. minimus*, *J. mustangensis*, *J. nepalicus*, *J. ochraceus*, *J. petrophilus*, *J. prismatocarpus*, *J. pseudocastaneus*, *J. rohtangensis*, *J. rostocarpus*, *J. sherei*, *J. sikkimensis*, *J. spacelatus*, *J. spumosus*, and *J. wallichianus* have the lowest bract similar to basal leaves or cauline leaves. *Juncus biglumoides*, *J. effusus*, *J. harae*, *J. inflexus*, *J. luzuliformis*, *J. setchuensis*, and *J. tobdeniorum* have the lowest bract like a culm. *Juncus benghalensis*, *J. brachystigma*, and other species of the Sino-Himalayan species have the scarious lowest bract like other floral bract.

### Floral bract

The floral bract is broadly ovate, lanceolate to linear or filiform. *Juncus amplifolius*, *J. articulatus*, *J. bufonius*, *J. clarkei*, *J. concinnus*, *J. crassistylus*, *J. dongchuanensis*, *J. effusus*, *J. fimbriatylodes*, *J. ganeshii*, *J. giganteus*, *J. gracilicaulis*, *J. grisebachii*, *J. himalensis*, *J. inflexus*, *J. leptospermus*, *J. milashanensis*, *J. ochraceus*, *J. potaninii*, *J. prismatocarpus*, *J. pseudocastaneus*, *J. rostocarpus*, *J. setchuensis*, *J. sikkimensis*, *J. spacelatus*, *J. spumosus*, *J. trachyphyllus*, and *J. wallichianus* have sheathing bracts on peduncle.

### Bracteoles

Bracteoles are foliar structures, inserted on the pedicel just below the flower. In the Sino-Himalayan *Juncus* the bracteoles present in *J. bufonius*, *J. effusus*, *J. inflexus*, *J. setchuensis*, and *J. tobdeniorum* with the cymose inflorescence.

### Perianth

The perianth is composed of six free tepals in two whorls. They are scarious and ovate, lanceolate to oblong.

### Stamens

Usually six stamens occur in two whorls and alternate to tepals. The inner stamens are absent in six species, *J. effusus*, *J. leptospermus*, *J. prismatocarpus*, *J. setchuensis*, *J. tobdeniorum*, and *J. wallichianus*. The length of stamens is shorter or longer than, or as long as tepals. The filaments are free and filiform or linear. The anthers are linear to oblong and attached the filaments at base. The relative length of the filament and the anther is one of taxonomically significant characters. Because the length of stamens in young flower are variable, it is necessary to measure mature flowers for comparison.



**Pistil**

The pistil consists of three distinct stigmas, one style, and one ovary consisting of three united carpels. The ovary is oblong-trigonous and 1- or 3-locular, or 3-septate. The length of stigma and style is one of taxonomically significant characters.

**Capsule**

The capsule is obovoid or ovoid, and obtuse, acute, mucronate, cuspidate or aristate at apical part. The cross section of the capsule is rounded, trigonous or three-keeled.

**Seeds**

The seeds are ovoid, obovoid, or ellipsoid; appendage of hyaline outer seed coat on both sides are absent or present.

**Taxonomic Treatment of Sino-Himalayan *Juncus***

Genus ***Juncus*** L., Sp. Pl. 325 (1753). Kunth, Enum. Pl. 3: 315–362 (1841). Buchenau, Monogr. Junca. in Bot. Jahrb. Syst. 12: 167–461 (1890); Juncaceae. In: Engler, A. (ed.), Das Pflanzenreich (iv. 36) 25: 98–226 (1906).

**Key to Species of Sino-Himalayan *Juncus***

1. A pair of bracteoles present on pedicel just below flower
  2. Inflorescence terminal; lowest bract similar to basal or cauline leaf; basal and cauline leaves with blade; annual ..... 8. *J. bufonius*
  2. Inflorescences lateral; lowest bract like culm; only cataphylls on basal culms, without leaves with blade; perennial
    3. Stamens 6 ..... 29. *J. inflexus*
    3. Stamens 3
      4. Pith spongy, interrupted ..... 58. *J. tobdeniorum*
      4. Pith spongy, continuous
        5. Culms striations 20–50; capsule perfectly 3-locular ..... 18. *J. effusus*
        5. Culms striations 15–30; capsule imperfectly 3-locular ..... 52. *J. setchuensis*
1. A pair of bracteoles absent
  2. Sheathing floral bract present on peduncle; inflorescence usually with several flower heads (except for *J. khasiensis* and *J. potaninii* with one or two flower heads)
  3. Cross section of capsule 3-keeled; style very short, 0.1–0.5 mm long
    4. Leaves strongly compressed ..... 47. *J. prismatocarpus*
    4. Leaves terete
      5. Stamens 6 ..... 3. *J. articulatus*
      5. Stamens 3
        6. Tepals 3–4 mm long ..... 63. *J. wallichianus*
        6. Tepals 2.5–3.5 mm long ..... 32. *J. leptospermus*
  3. Cross section of capsule rounded to trigonous; style 1–4 mm long (except for *J. potaninii* 0.2–0.4 mm long)
    4. Stamens longer than tepals
      5. Leaves grass leaf-like; cross section of blade flattened
        6. Anthers not exerted; stamens slightly longer than tepals ..... 11. *J. clarkei*
        6. Anthers distinctly exerted; stamens longer than tepals
          7. Filaments 3 times as long as anthers ..... 28. *J. hydrophilus*
          7. Filaments 4–5 times as long as anthers
            8. Outer tepals slightly longer than inner ones; style as long as stigmas ..... 56. *J. spumosus*
            8. Outer tepals shorter than inner ones; style twice as long as stigmas ..... 24. *J. gracilicaulis*
    5. Leaves terete; cross section of blade rounded, oval, U-shaped, or X-shaped
      6. Basal leaf absent; proliferous ..... 16. *J. dongchuanensis*
      6. Basal leaf present; non-proliferous
        7. Filaments twice as long as anthers; rhizome stoloniferous ..... 25. *J. grisebachii*
        7. Filaments 3–6 times as long as anthers; rhizome short creeping



- 8. Cross section of blade X-shaped ..... 30. *J. khasiensis*
  - 8. Cross section of blade U-shaped
    - 9. Outer tepals longer than inner ones; flower head with 7–12 flowers ..... 12. *J. concinnus*
    - 9. Outer tepals as long as inner ones; flower head with 1 or 2 flowers ..... 46. *J. potaninii*
  - 4. Stamens shorter than tepals
  - 5. Leaves grass leaf-like; cross section of leaf blade flattened
    - 6. Leaf blade with denticulate margin ..... 14. *J. crassistylus*
    - 6. Leaf blade with entire margin
      - 7. Style longer than stigmas; culm with several longitudinal striae; cross section oval ..... 51. *J. rostocarpus*
      - 7. Style shorter than stigmas; culm without longitudinal striae; cross section rounded
        - 8. Outer tepals longer than inner ones ..... 21. *J. giganteus*
        - 8. Outer tepals as long as inner ones ..... 2. *J. amplifolius*
  - 5. Leaves terete; cross section of leaf blade rounded, oval, U-shaped
    - 6. Flower heads with sterile flowers ..... 16. *J. dongchuanensis*
    - 7. Basal leaves present; surface of culms with several longitudinal striae ..... 43. *J. ochraceus*
    - 7. Basal leaves absent; surface of culms smooth ..... 19. *J. fimbriatylodes*
  - 6. Flower heads without sterile flowers
    - 7. Anthers shorter than filaments
      - 8. Filaments 1.5–2 times as long as anthers ..... 20. *J. ganeshii*
      - 8. Filaments 3 times as long as anthers
        - 9. Stamens almost as long as tepals; auricles rounded ..... 27. *J. himalensis*
        - 9. Stamens shorter than tepals; auricles elongated ..... 55. *J. sphacelatus*
    - 7. Anthers longer than filaments
      - 8. Rhizomes creeping with stolons ..... 49. *J. pseudocastaneus*
      - 8. Rhizomes densely branched or short creeping without stolons
        - 9. Cross section of culms U-shaped ..... 15. *J. deosaicus*
        - 9. Cross section of culms rounded ..... 54. *J. sikkimensis*
2. Sheathing floral bract absent on peduncle; inflorescence with 1 or 2 flower heads except for *J. luzuliformis*
3. Stamens shorter than tepals or slightly exerted
  - 4. Leaves grass leaf-like; cross section of leaf blade flattened
    - 5. Anthers longer than filaments ..... 38. *J. milashanensis*
    - 5. Anthers shorter than filaments
      - 6. Filaments 5 times as long as anthers; style very short, 0.5–0.7 mm long; apex of capsule obtuse ..... 39. *J. minimus*
      - 6. Filaments 3 times as long as anthers; style 1.5–2 mm long; apex of capsule acute ..... 42. *J. nepalicus*
  - 4. Leaves terete; cross section of leaf blade rounded, oval, U-shaped, or X-shaped

5. Anthers shorter than filaments
6. Stamens as long as or slightly longer than tepals; surface of culms with longitudinal ridges or striae
7. Inflorescences lateral; lowest bract culm-like ..... 5. *J. biglumoides*
7. Inflorescence terminal; lowest bract similar to cauline leaf  
..... 36. *J. luzuliformis*
6. Stamens shorter than tepals; surface of culms with a single groove or without groove
7. Filaments 3 times longer than anthers; tepals chestnut-brown, shining  
..... 17. *J. duthiei*
7. Filaments 2–2.5 times as long as anthers; tepals brown ... 7. *J. bryophilus*
5. Anthers longer than filaments
6. Basal leaves 2 or 3; lowest bract as long as or just exceeding inflorescence, lanceolate ..... 62. *J. uniflorus*
6. Basal leaf 1 (rarely 2); lowest bract longer than inflorescence, linear-lanceolate or filiform
7. Inflorescence proliferous ..... 26. *J. harae*
7. Inflorescence non-proliferous
8. Anthers twice as long as filaments ..... 26. *J. harae*
8. Anthers 4 times as long as filaments
9. Rhizomes stoloniferous or short creeping ..... 50. *J. rohtangensis*
9. Rhizomes densely branched, plants caespitose .... 34. *J. longiflorus*
3. Stamens longer than tepals, distinctly exerted
4. Cross section of leaf blade U-shaped or flattened
5. Cross section of culm with several longitudinal striae or ridges
6. Filaments slightly shorter than anthers ..... 10. *J. chrysocarpus*
6. Filaments 3–4 times as long as anthers
7. Stigmas very short, 0.1–0.2 mm long ..... 6. *J. brachystigma*
7. Stigmas distinct, 0.4–0.5 mm long ..... 23. *J. gonggae*
5. Cross section of culm without striae or ridges
6. Rhizomes stoloniferous
7. Filaments 1.5–2 times as long as anthers ..... 4. *J. benghalensis*
7. Filaments 3 times as long as anthers ..... 37. *J. membranaceus*
6. Rhizomes not stoloniferous
7. Cross section of leaf blade U-shaped ..... 59. *J. trachyphyllus*
7. Cross section of leaf blade flattened ..... 45. *J. petrophilus*
4. Cross section of leaf blade rounded or oval
5. Leaves and culms glaucous, surface scabrid ..... 22. *J. glaucoturgidus*
5. Leaves and culms not glaucous, surface smooth
6. Culm surface with several longitudinal striae or ridge
7. Flower heads with 1 or 2 flowers ..... 35. *J. longistamineus*
7. Flower heads with more than 5 flowers
8. Basal leaf absent; stigmas 0.5–0.7 mm long ..... 40. *J. modicus*
8. Basal leaf present; stigmas 0.1–0.2 mm long, capitate  
..... 9. *J. cephalostigma*



6. Culm surface without longitudinal striae
  7. Basal leaf absent
    8. Rhizomes stoloniferous, cataphylls straw colored ..... 13. *J. concolor*
    8. Rhizomes very short, cataphylls shining, chestnut-brown ..... 33. *J. leucanthus*
  7. Basal leaves present
    8. Cauline leaves usually present
      9. Bulbils present at sheath of cauline leaves ..... 60. *J. trichophyllus*
      9. Bulbils absent
        10. Lowest bract similar to cauline leaf or basal leaf, terete, longer than inflorescence ..... 53. *J. sherei*
        10. Lowest bract scarious, flattened, slightly longer than or as long as inflorescence
          11. Auricles of cauline leaf truncate or absent ..... 48. *J. przewalskii*
      8. Cauline leaf always absent
        9. Lowest bract similar to basal leaf, terete, longer than inflorescence
          10. Rhizomes stoloniferous ..... 31. *J. kingii*
          10. Rhizomes not stoloniferous
            11. Basal leaves with a single groove on adaxial and abaxial surfaces ..... 53. *J. sherei*
            11. Basal leaves with a single groove on adaxial surface ..... 41. *J. mustangensis*
        9. Lowest bract scarious, flattened, slightly longer than inflorescence
          10. Others 4 times as long as filaments ..... 61. *J. triglumis*
          10. Others 2–3 times as long as filaments
            11. Seed appendage less than 0.1 mm long ..... 44. *J. perpusillus*
            11. Seed appendage 0.6–0.7 mm long ..... 1. *J. allioides*
            11. Seed appendage 0.8–1.1 mm long ..... 57. *J. thomsonii*

**1. *Juncus allioides*** Franch. in Nouv. Arch. Mus. Hist. Nat., ser. 2, **10**: 99 (1887). Buchenau in Bot. Jahrb. Syst. **12**: 399 (1890); in Bot. Jahrb. Syst. **29**: 238 (1900); in Bot. Jahrb. Syst. **36** (Bibl. 82): 19 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 229, f. 106 (1906). Brown in J. Linn. Soc., Bot. **36**: 162 (1903). Camus in Notul. Syst. (Paris) **1**(10): 278 (1910). Samuelsson in Acta Horti. Gothob. **3**: 69 (1927). Egorova in Akad. Nauk. SSSR Bot. Inst. Komarov, Rast. Tsentral. Azii, Fasc. **3**: 95, t. 8, f. 8 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2081 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 515, f. 287 (1987). Noltie, Fl. Bhutan **3**(1): 262, f. 25a–d (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2421 (1994). Wu in Acta Phytotax. Sin. **32**: 452 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 177, f. 41, 1–3 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 180 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 102 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 236 (2000); in J. Jap. Bot. **78**: 153 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 51 (2000). Li et al., Fl. Gaoligong Mts.: 1119 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 148 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 89, f. 65 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 539, f. 111, 1–4 (2003).

[Colour plate 1a, b; Plate 1; Fig. 4]

Types: China; Tibet oriental, Provice de Moupin (M. l'Abbé David s. n., Jun. 1869, P-holotype, W-isotype).

*Juncus macranthus* Buchenau in Bot. Jahrb. Syst. **12**: 398 (1890); in Bot. Jahrb. Syst. **29**: 238 (1900). Types: China; Prov. Kansu [Gansu] orientali (G. N. Potanin s. n., 11 Jul. 1885, LE, W-syntypes); loc. cit., Tschagola (G. N. Potanin s. n., 11 Jul. 1885, W-syntype); loc. cit., Trajectu 8890 ped alt inter vicos Mör-pin et U-pin (G. N. Potanin s. n., 4 Jul. 1885, W-syntype).

*Juncus spectabilis* Rendle in J. Bot. Lond. **44**: 46 (1906). Buchenau in Engler, Pflanzenr. (iv. 36) **25**: 265 (1906). Noltie in Edinburgh J. Bot. **51**: 131 (1994). Types: Tibet; Gyangtse (H. J. Walton 69, Jul.–Sept. 1904, BM-holotype, CAL, K-isotypes).

*Juncus yunnanensis* A. Camus in Notul. Syst. (Paris) **1**(10): 275, f. 19, 13–16 (1910). Wu in Acta Phytotax. Sin. **32**: 459 (1994); Fl. Reipubl. Popul. Sin. **13**: 199, f. 47, 7–10 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 56 (2000). Type: China; Yunnan, marais au pied du Tsang-chan, au-dessus de Tali, 2200 m (P. J. M. Delavay 2046, 20 Apr. 1886, P-lectotype, designated here).

*Juncus membranaceus* auct. non Royle ex D. Don: Bao in Wu and Wu, Fl. Yunnanica **15**: 549 (2003).

Perennial, loosely caespitose, 8–50 cm tall. Rhizomes horizontally long creeping or short creeping, 0.8–1.5 mm in diam. Culms erect, grass-green, terete, 0.6–2.2 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 1–3 to each culm, light brown to stramineous, 1–5 cm long. Leaves grass-green, terete, cross section of blade oval, auricles rounded; basal leaves 1 or 2 to each culm, 4–30 cm long including sheath, 0.5–1.8 mm in diam., sheath 2–5 cm long; cauline leaves 1 or 2 to each culm or rarely absent, terete, shorter than culm, 4–21 cm long including sheath, 0.2–1.5 mm in diam., sheath 3–6 cm long. Inflorescence terminal; flower head single, cream-white, subglobose to hemispherical, 1.5–2 cm in diam., flowers 10–20. Lowest bract scarious, brown to light brown, lanceolate to ovate-lanceolate, 0.8–1.8 cm long, 3–5 mm wide, as long as inflorescence; floral bract lanceolate, 2–8 mm long, 1.5–3.5 mm wide, scarious; sheathing bract absent. Flowers 0.8–1 cm long, 2–3 mm wide, pedicel 1.5–4 mm long. Tepals cream-white, oblong-lanceolate to oblong, outer ones and inner ones equal in length, 5–6.5 mm long, 1.2–1.8 mm wide. Stamens 6, longer than tepals, 7.5–9 mm long; filaments 5.7–6 mm long, 2–3 times as long as anthers; anthers yellow, linear-elliptic, 1.8–3 mm long. Pistil 5–8 mm long, 1–1.5 mm wide; stigmas 1–1.3 mm long; style 1.8–2.2 mm long. Capsule brown, oblong, longer than tepals, 5–6 mm long, 2.0–2.2 mm wide, mucronate, cross section trigonous. Seeds ellipsoid, 0.6–0.7 mm long, appendage 0.5–0.6 mm long.

Distr. India (Punjab, Kumaon), Nepal, Sikkim, Bhutan, China (Xizang, Qinghai, Yunnan, Sichuan, Shaanxi, Hubei).

*Juncus allioides* is a widespread and common species in the Sino-Himalaya. Its altitudinal range is wider than those of most other Sino-Himalayan *Juncus* species. It grows on marshy places along bogs or streams as high up as 4800 m in Nepal and as low as 2000 m in China. The cauline leaf of *J. allioides* is present or sometimes absent. The character of present or absent of cauline leaf was used as a diagnostic character in several species of *Juncus*. However, in *J. allioides*, this character shows wide range of variation



among populations. *Juncus spectabilis* Rendle and *J. yunnanensis* A. Camus, which are characterized by the lack of cauline leaf, described from Southwest China, are also conspecific with *J. allioides*.

**2. *Juncus amplifolius*** A. Camus in Notul. Syst. (Paris) **1**(10): 281, f. 19, 7–12 (1910). Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1230 (1936). Wu et al., Index Fl. Yunnan. **2**: 2081 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 523, f. 293 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2423 (1994). Wu in Acta Phytotax. Sin. **32**: 465 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 224, f. 52, 1–4 (1997). Noltie in Edinburgh J. Bot. **51**: 139 (1994); Fl. Bhutan **3**(1): 261 (1994). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 180 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 102 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 62 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 115 (2002).

[Colour plate 8a; Plate 2; Fig. 5]

Type: China; Tibet oriental, Yunnan, Tsé-kou, montagne de Patong et mont de Tsen-tchrou (J. A. Soulié 1105, 20 Sept. 1895, P-holotype).

*Juncus crassistylus* auct. non A. Camus: Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 180 (1999).

Perennial, 10–50 cm tall. Rhizomes stoloniferous, horizontally long creeping, 0.9–2.1 mm in diam. Culms erect, grass-green, terete, 0.6–2.2 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 2 or 3 to each culm, brown to stramineous, 1–5 cm long. Leaves grass-green, grass leaf-like, blade margin entire, multi-grooved on abaxial side, cross section of blade flattened, auricles absent; basal and subbasal leaves 1 or 2 to each culm, 3–18 cm long including sheath, 3–8 mm wide, sheath 1–8 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 3–16 cm long including sheath, 1.5–7 mm wide, sheath 1–5 cm long. Inflorescence terminal, branched; flower heads 2–5, brown, 0.8–2.5 cm in diam., flowers 2–20, peduncle 0.3–5 cm long. Lowest bract grass leaf-like, linear, 1.5–10 cm long including sheath, 0.8–3.0 mm wide, as long as inflorescence, with several ridges on abaxial side, cross section flattened, sheath 0.3–1.5 cm; floral bract lanceolate to ovate-lanceolate, 3–6 mm long, 1–2 mm wide, scarious; sheathing bract on peduncle membranaceous, lanceolate, 0.5–1.5 cm long. Flowers 0.8–1.4 cm long, 2–3 mm wide, pedicel 1–2 mm long. Tepals brown, lanceolate, outer ones slightly longer than inner ones, 5–7 mm long, 1.3–1.8 mm wide, inner ones 4.7–6.8 mm long, 1.3–1.8 mm wide, with a hooked appendage at apex. Stamens 6, longer than tepals, 4.5–4.9 mm long; filaments 2.0–2.2 mm long; anthers linear-elliptic, slightly longer than filaments, 2.5–2.7 mm long. Pistil 0.8–1.3 mm long, 1.5–1.8 mm wide; stigmas 4–7 mm long. Capsule brown, oblong, longer than tepals, 6–8 mm long, 2.5–3 mm wide, mucronate, cross section rounded. Seeds ovoid, 0.6–0.8 mm long, appendage 1.5–1.6 mm long.

Distr. China (Gansu, Yunnan, Sichuan, Shaanxi).

*Juncus amplifolius* is characterized in having a hooked appendage at apex of the outer tepals but this character was not noted by Camus (1910). This species is similar to *J. crassistylus* A. Camus and *J. milashanensis* A. M. Lu & Z. Y. Zhang but *J. amplifolius* has multi-grooved and flattened leaves; *J. crassistylus* has short stigma lobes (0.5–0.7 mm

long) and *J. milashanensis* has anthers twice as long as the filaments.

*Juncus amplifolius* grows on exposed screes or streamsides from elevations of 3500 m in *Abies* forests zone to 4500 m in alpine zone.

**3. *Juncus articulatus* L.**, Sp. Pl.: 327 (1753). Egorova in Akad. Nauk. SSSR Bot. Inst. Komarov, Rast. Tsentral. Azii, Fasc. **3**: 100 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Jafri in Fl. Pakistan **138**: 15, f. 3 a–e (1981). Lu and Zhang in Wu, Fl. Xizang. **5**: 508, f. 281 (1987). Noltie, Fl. Bhutan **3**(1): 255 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2418 (1994). Wu in Acta Phytotax. Sin. **32**: 452 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 184, f. 42, 8–10 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 180 (1999); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 53 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 247, f. 109 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 542 (2003).

[Colour plate 1e; Plate 3; Fig. 6]

*Juncus lampocarpus* Buchenau in Bot. Jahrb. Syst. **6**: 200 (1885), pro part.

Perennial, ascending, 2–40 cm tall. Rhizomes horizontally short creeping, 1.6–3 mm in diam. Culms erect or ascending, grass-green, 0.5–1.8 mm in diam., smooth, cross section oval. Leaves grass-green, terete, cross section of blade oval, auricles rounded; basal and subbasal leaves 1 or 2 to each culm, 4–10 cm long including sheath, 0.4–0.8 mm in diam., sheath 1–4 cm long; cauline leaves 1–3 to each culm, shorter than culm, 6–11 cm long including sheath, 0.6–1 mm in diam., sheath 1.5–4.5 cm long. Inflorescence terminal, loosely branched; flower heads many, grass-green, 2–3.5 mm in diam., flowers 2–6, sheath 0.5–1.5 cm. Lowest bract grass-green, linear, shorter than inflorescence, 1.5–5 cm long; floral bract ovate to ovate-lanceolate, shorter than inflorescence, 2–3 mm long, 0.8–1.2 mm wide, scarious; sheathing bract on peduncle lanceolate to obovate, 0.8–1.5 cm long, membranaceous. Flowers 3–4 mm long, 1.0–1.3 mm wide. Tepals grass-green to light brown, lanceolate to ovate-lanceolate, outer ones slightly longer than inner ones, 2.0–2.8 mm long, 0.5–0.8 mm wide. Stamens 6, shorter than tepals, 1.2–1.4 mm long; filaments 0.6–0.7 mm long; anthers yellow, linear-elliptic, 0.6–0.7 mm long, as long as filaments. Pistil 1.8–2.0 mm long; stigmas 0.8–1.0 mm long; style 0.1–0.15 mm long. Capsule light brown, oblong, slightly longer than tepals, 3.8–4 mm long, 1.0–1.2 mm wide, acute, cross section 3-keeled. Seeds obovoid, 0.4–0.5 mm long, appendage absent.

Distr. Afghanistan, Pakistan, Kashmir, India (Punjab), Nepal, Bhutan, China (Xizang, Gansu, Yunnan, Sichuan, Shaanxi, Hubei).

*Juncus articulatus* is similar to *J. leptospermus* Buchenau and *J. wallichianus* Laharpe but differs in having six stamens. This species grows in exposed marshy places or streamsides from elevations of 1200 to 3200 m.

**4. *Juncus benghalensis* Kunth**, Enum. Pl. **3**: 360 (1841). Buchenau in Bot. Jahrb. Syst. **6**: 222 (1885); in Bot. Jahrb. Syst. **12**: 400 (1890). Samuelsson in Hand. Mazz., Symb. Sin. **7**: 1235 (1936). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2081 (1984). Jafri in Fl. Pakistan **138**: 5, f. 2 e–g (1981). Noltie, Fl. Bhutan **3**(1): 267, f. 25g–h (1994). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 208, f. 49, 7–8 (1997). Miyamoto in Ohba and Ikeda, Fl. Ganesh Him.: 66



(1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 180 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 102 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 236 (2000); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 58 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 101, f. 65 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 549 (2003).

[Colour plate 1f; Plate 4; Fig. 7]

Types: Bengalia inferior (Wallich 3480a, K-holotype, W-isotype).

*Juncus leucomelus* Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 319 (1840). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 211 (1885); in Bot. Jahrb. Syst. **12**: 319 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 225 (1906). Hook. f., Fl. Brit. Ind. **6**: 397 (1892). Camus in Notul. Syst. (Paris) **1**(10): 275 (1910). Samuelsson in Acta Horti Gothob. **3**: 69 (1927). Satake in Hara, Fl. E. Himal. **1**: 403 (1966); Fl. E. Himal. **2**: 163 (1971); in J. Jap. Bot. **43**: 382 (1968). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 95, t. 8, f. 5 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Jafri in Fl. Pakistan **138**: 7, f. 1d (1981). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 510, f. 283 (1987). Noltie in Edinburgh J. Bot. **51**: 130 (1994); Fl. Bhutan **3**(1): 266 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2419 (1994). Wu in Acta Phytotax. Sin. **32**: 459 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 199, f. 47, 7–10 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 56 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 99 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 547 (2003). Types: N. W. India; Kunawar ad Soongnum (Royle s. n., LIV-holo, not seen, K, W-isotypes).

*Juncus bracteatus* Buchenau in Bot. Jahrb. Syst. **6**: 220 (1885); in Bot. Jahrb. Syst. **12**: 397 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 228 (1906). Hook. f., Fl. Brit. Ind. **6**: 397 (1892). Lu and Zhang in Wu, Fl. Xizang. **5**: 514 (1987). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 208, f. 49, 1–2 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 58 (2000). Bao in Wu and Wu, Fl. Yunnanica **15**: 549 (2003). Types: Sikkim, 12000 ft. (J. D. Hooker s. n., BM, S, UPS, W-syntypes).

*Juncus sphenostemon* Buchenau in Bot. Jahrb. Syst. **6**: 223, t. 3, f. 1–6 (1885); in Bot. Jahrb. Syst. **12**: 401 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 230, f. 107 (1906). Camus in Notul. Syst. (Paris) **1**(10): 278 (1910). Satake in Hara, Fl. E. Himal. **1**: 403 (1966); Fl. E. Himal. **2**: 164 (1971); in Ohashi, Fl. E. Himal. **3**: 131 (1975). Types: North West Himalaya; Laka, Dhurmsala, 11000 ft. (C. B. Clarke 23983, 24617, 17 Oct. 1874, K, W-syntypes). Kashmir; Palgam, 13000 ft. (C. B. Clarke 31059, 4 Sept. 1875, K, W-syntypes).

*Juncus bhutanensis* Satake in J. Jap. Bot. **43**: 382, f. 1–2 (1968); in Ohashi, Fl. E. Himal. **3**: 130 (1975). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Type: Bhutan; Barshong–Nala, 3100–3500 m (H. Kanai et al. 6021, 25 May 1967, TI-holotype).

*Juncus upendrii* Goel in Himalayan Research and Development **7**: 68, f. 1 (1988). Types: India; Uttar Pradesh (Kumaon), Pithoragarh district, Rungling forest (C. M. Arora 56823A, 8 Oct. 1975, CAL-holotype, BSD-isotype, not seen).

Perennial, loosely caespitose, 5.5–25 cm tall. Rhizomes stoloniferous, horizontally

short creeping, 0.2–0.3 mm in diam. Culms erect, grass-green, terete, 0.2–0.4 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 1 or 2, or absent, grass green, stramineous, 1–1.5 cm long. Leaves terete, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded; basal and subbasal leaves 1 or 2 to each culm, 2.5–12 cm long including sheath, 0.3–0.6 mm in diam., sheath 0.8–3 cm long; cauline leaves 1 or 2 to each culm or absent, 2–11 cm long including sheath, 0.3–0.5 mm in diam., sheath shorter or longer than culm, 0.8–2.5 cm long. Inflorescence with a single flower head, cream-white, hemispherical, 0.8–1.5 cm in diam., flowers 2–13. Lowest bract grass-green to brown, terete to scarious, linear to linear-lanceolate, 0.5–6 cm long; floral bract lanceolate, 2–6 mm long, 0.6–1.2 mm wide, scarious; sheathing bract absent. Flowers 7–8 mm long, 3–4 mm wide, pedicel 0.6–1.2 mm long. Tepals cream-white, oblong-lanceolate to lanceolate, outer ones and inner ones equal in length, 4–6 mm long, 0.8–1.5 mm wide. Stamens 6, longer than tepals, 6.5–9 mm long; filaments 4.8–6.5 mm long, 2.5–2.8 times as long as anthers; anthers yellow, linear-elliptic, 1.7–2.5 mm long. Pistil 6–7.5 mm long, 0.8–1 mm wide; stigmas 0.6–1.0 mm long; style 1.8–2.2 mm long. Capsule chestnut-brown, obovoid, longer than tepals, 4–6 mm long, 1.8–2.0 mm wide, cuspidate, cross section rounded. Seeds ellipsoid, 0.6–0.7 mm long, appendage 0.1 mm long.

Distr. Pakistan, Kashmir, India (Himachal Pradesh, Uttar Pradesh), Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan).

Present or absent of the cauline leaf of *Juncus benghalensis* is variable. The form in having the cauline leaf was found on mossy banks in *Abies* forests in subalpine region around 3000 m, while the form in lacking the cauline leaf was found on grassland slopes in Alpine region above ca. 3500 m. *Juncus leucomelus*, described on a specimen collected by D. Don in 1840 from NW India, was characterized in lacking the cauline leaf, however, it is difficult to separate it from *J. benghalensis*.

**5. *Juncus biglumoides*** H. Hara in J. Jap. Bot. **49**: 201 (1974). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 102 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Miyamoto and Ohba in J. Jap. Bot. **77**: 25, f. 1 (2002). Kirschner et al., Juncaceae 2, Fl. World **7**: 109 (2002).

[Colour plate 1g, h; Plate 5; Fig. 8]

Types: Nepal; Lamjung Himal, Rambrong, 12000 ft. (Stainton, Sykes & Williams 6029, 29 Jun. 1954, BM-holotype, A, TI-isotypes).

*Juncus kangpuensis* K. F. Wu in Acta Phytotax. Sin. **32**: 443, f. 1, 1–5 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 163, f. 36, 1–5 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 49 (2000). Types: China; Yunnan, Weixi, Kangpu, 3500 m (C. W. Wang 64511, 22 Jul. 1935, PE-holotype, A, KUN, HSNU-isotypes).

*Juncus biglumis* non L.: Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1238 (1936).

Perennial, loosely caespitose, 10–20 cm tall. Rhizomes horizontally short creeping, 0.7–1 mm in diam. Culms erect, grass-green, terete, 0.3–0.7 mm in diam., with several longitudinal ridges, cross section compressed oval. Cataphylls 1 or 2 to each culm, light brown to brown, 0.5–1.2 mm long. Leaves terete, with ridges, cross section of blade oval, auricles rounded, sheath light brown to stramineous at base; basal leaves 1–3 to each culm, 3–9 cm long including sheath, 0.7–1.2 mm in diam., sheath 2–3 cm long; cauline



leaves absent. Inflorescences pseudolateral, flower head single, brown to chestnut-brown, 0.5–1.1 mm in diam., flowers 1–3, peduncle absent. Lowest bract culm-like, appearing as a continuation of culm, grass-green, 1–3 cm long, 0.8–1.1 mm in diam. cross section oval, with several striae; floral bract lanceolate to ovate, 2–3 mm long, 0.5–0.8 mm wide, scarious; sheathing bract absent. Flowers 3–7 mm long, 2–3 mm wide, flower sessile if solitary, pedicel 0.3–0.4 mm long. Tepals chestnut-brown, shining, lanceolate, outer ones shorter than inner ones, 2.5–2.8 mm long, 0.75–0.85 mm wide, inner ones 3.0–3.5 mm long, 0.9–1.1 mm wide. Stamens 6, as long as inner tepals and slightly longer than outer tepals, 3.2–3.5 mm long; filaments 1.7–2.2 mm long, 2.5 times as long as anthers; anthers leather-yellow, ellipsoid, 0.8–1.0 mm long. Pistil 4–5 mm long, 0.8–1 mm wide; stigmas white, 1.2–1.4 mm long; style 1.8–2 mm long. Capsule chestnut-brown, ovoid, longer than tepals, 3.5–5 mm long, 1.5–2 mm wide, mucronate, cross section trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendage absent.

Distr. Nepal, China (Yunnan).

*Juncus biglumoides* is similar to *J. bryophilus* Noltie and *J. harae* Miyam. & H. Ohba but differs in having the stamens as long as or slightly longer than the tepals. This species is grown on exposed grassland slopes and damp places by streams from elevations of 3500 to 4200 m. Very few specimens are found in the herbaria and probably this species is rare. *Juncus kangpuensis* K. F. Wu, described on two specimens collected in Weixi in Yunnan, China, is conspecific with *J. biglumoides*.

**6. *Juncus brachystigma*** Sam. in Hand.-Mazz., Symb. Sin. 7: 1236 (1936). Hara et al., Enum. Flow. Pl. Nepal 1: 84 (1978). Wu et al., Index Fl. Yunnan. 2: 2081 (1984). Lu and Zhang in Wu, Fl. Xizang.: 509 (1987). Noltie, Fl. Bhutan 3(1): 268, f. 25i–j (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2419 (1994). Wu in Acta Phytotax. Sin. 32: 460 (1994); Fl. Reipubl. Popul. Sin. 13(3): 202, f. 47, 3–6 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 66 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 180 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 26: 103 (2000); in J. Jap. Bot. 78: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China 24: 56 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 95, f. 65 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 548 (2003). [Colour plate 2a; Plate 6; Fig. 9]

Types: China; Yunnan, in montis Yülung-schan prope urbem Lidjiang pratis pinguibus lapidosis regionis frigide temperatae Ndwolo, 3600 m (H. F. Handel-Mazzetti, 4259, 20 Jul. 1914, WU-lectotype, designated by J. Kirschner in 2002, S, K, TI, W-isolectotypes).

*Juncus biglumis* non L.: Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2418 (1994). Bao in Wu, Fl. Yunnanica 15: 551, f. 114, 8–12 (2003).

Perennial, caespitose, 3–16 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.3–0.7 mm in diam., with several longitudinal ridges, cross section rounded. Cataphylls inconspicuous or 1 or 2 to each culm, chestnut-brown, 0.3–1.5 cm long, fibrillose. Leaves terete to flattened, with a groove on adaxial side, cross section of blade U-shaped with longitudinal ridges, auricles grass-green, very short; basal leaves 1 or 2 to each culm, 1.2–7 cm long including sheath, 0.3–0.7 mm in diam., sheath 0.5–1.5 cm long; cauline leaves absent. Inflorescence with a single flower head, cream-white, hemispherical, 0.8–1.3 cm in diam., flowers 6–12. Lowest bract usually grass-green,

sometimes light brown, linear to lanceolate, 0.4–4 cm long, terete to scarious; floral bract grass-green to light brown, lanceolate to ovate-lanceolate, 2.5–6 mm long, 1.0–2.5 mm wide, scarious; sheathing bract absent. Flowers 4–6 mm long, 1.5–2.5 mm wide, pedicel 0.5–1.2 mm long. Tepals cream-white, oblong to lanceolate, outer ones and inner ones equal in length or outer ones slightly shorter than inner ones, 3–5 mm long, 0.7–1.0 mm wide. Stamens 6, longer than tepals, 4–6 mm long; filaments 3.2–4.8 mm long, 4 times as long as anthers; anthers yellow, linear-elliptic, 0.8–1.2 mm long. Pistil 4–5 mm long, 0.8–1.3 mm wide; stigmas 0.2–0.3 mm long; style 1.3–1.5 mm long. Capsule chestnut-brown, ovoid, 4–5 mm long, 1.5–1.8 mm wide, cuspidate, cross section trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendage 0.2–0.3 mm long.

Distr. India (Kumaon), Nepal, Sikkim, Bhutan, China (Xizang, Gansu, Yunnan, Sichuan).

*Juncus brachystigma* grows on mossy rocks or screes between shrubs from elevations of 2900 to 4600 m. This species is similar to *J. benghalensis* Kunth and *J. sherei* Miyam. & H. Ohba. These species have been confused but this species differs in having very short stigma (0.2–0.3 mm long) and longitudinal conspicuous ridges on the culms and the leaves.

**7. *Juncus bryophilus*** Noltie in *Edinburgh J. Bot.* **51**: 137, f. 1F–K (1994); *Fl. Bhutan* **3**(1): 271 (1994). Miyamoto and Ohba in *J. Jap. Bot.* **77**: 25, f. 2 (2002). Kirschner et al., *Juncaceae* 2, *Fl. World* **7**: 112, f. 66 (2002). [Colour plate 2d; Plate 7; Fig. 10]

Type: Bhutan; Upper Mo Chu District, ridge above Laya, 28°07'N 89°44'E, 4450 m (I. W. J. Sinclari & D. G. Long 5217b, 21 Sept. 1984, E-holotype, photo).

Perennial, caespitose, 2–9 cm tall. Rhizomes horizontally short creeping. Culms grass-green, 0.3–0.5 mm in diam., terete, with a longitudinal groove, cross section rounded. Cataphyll 1 to each culm, light brown to stramineous, 2–5 mm long, fibrillose. Leaves grass-green, terete, cross section of blade oval, auricles grass-green, rounded; basal leaf 1 or sometimes absent, 0.5–4.0 cm long including sheath, 0.4–0.5 mm in diam., sheath 2–3 mm long; cauline leaves absent. Inflorescences pseudolateral, flower head solitary, brown, flowers 1 or 2(or 3). Lowest bract grass-green, culm-like, appearing as a continuation of culm, terete, 0.6–0.8 mm in diam.; floral bract lanceolate, 2–3 mm long, 0.6–0.8 mm wide, scarious; sheathing bract absent. Flowers 5–6 mm long, 2–2.5 mm wide, sessile if solitary, pedicel 0.4–0.5 mm long. Tepals brown, lanceolate, outer ones slightly longer than inner ones, 3.2–3.7 mm long, 0.9–1.0 mm wide, inner tepals 3.0–3.5 mm long, 0.7–1.0 mm wide. Stamens 6, shorter than tepals, 2.2–2.5 mm long; filaments 1.4–1.6 mm long, 2.3 times as long as anthers; anthers leather-yellow, ellipsoid, 0.6–0.7 mm long. Pistil 4–5 mm long, 1.2–1.4 mm wide; stigmas 1.2–1.4 mm long; style 0.3–0.4 mm long. Capsule brown, ovoid, slightly longer than tepals, 3.5–4.0 mm long, 1.2–1.6 mm wide, mucronate, cross section trigonous. Seeds oblong, 0.8–1.0 mm long, appendage absent.

Distr. Nepal, Sikkim, Bhutan.

*Juncus bryophilus* grows on mossy rocks from elevations of 3650 to 4050 m and is similar to *J. harae* Miyam. & H. Ohba and *J. uniflorus* W. W. Sm. but differs in having the filaments longer than the anthers. This species is distributed disjunctively in central Nepal, Sikkim, and Bhutan.



**8. *Juncus bufonius* L.**, Sp. Pl.: 328 (1753). Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 324 (1840). Buchenau in Bot. Jahrb. Syst. **1**: 106 (1880); in Bot. Jahrb. Syst. **6**: 198 (1885); in Bot. Jahrb. Syst. **12**: 174 (1890); in Bot. Jahrb. Syst. **36** (Beibl. 82): 17 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 105 (1906). Hook. f., Fl. Brit. Ind. **6**: 392 (1892). Brown in J. Linn. Soc., Bot. **36**: 162 (1903). Samuelsson in Acta Horti Gothob. **3**: 66 (1927); in Hand. Mazz., Symb. Sin. **7**: 1229 (1936). Krecetovicz and Goncarpv in Komarov, Fl. URSS. **3**: 517 (1935). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral Azii, Fasc. **3**: 93 (1967). Satake in Hara, Fl. E. Himal **2**: 163 (1971). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Jafri in Fl. Pakistan **138**: 4, f. 1a–c (1981). Wu et al., Index Fl. Yunnan. **2**: 2081 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 503, f. 277 (1987). Noltie, Fl. Bhutan **3**(1): 252, f. 24o (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2417 (1994). Wu in Acta Phytotax. Sin. **32**: 451 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 172, f. 39, 8–11 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 181 (1999); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 51 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 3, Fl. World **8**: 9, f. 119 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 537, f. 109, 1–7 (2003).

[Colour plate 2e; Plate 8; Fig. 11]

Type: In Europae (Van Royen, L904145-433, not seen).

*Juncus alutaiensis* K. F. Wu in Acta Phytotax. Sin. **32**: 450, f. 3, 5–8 (1994). Wu and Clemants in Wu and Raven, Fl. China **24**: 50 (2000). Type: China; Xinjian, Altay, 600 m (XJAA-72-2302, 19 Sept. 1972, HSNU-holotype).

Annual, caespitose, 5–22 cm tall. Rhizomes very short creeping. Culms ascending, grass-green, terete, 0.2–0.8 mm thick, with several longitudinal striae, cross section rounded. Cataphyll 1 or absent to each culm, loosely embracing at base of culm, stramineous or brown, 0.5–1 cm long. Leaves terete to somewhat flattened, cross section of blade oval, auricles very short, sheath light brown at base; basal leaves 1 or 2 to each culm or absent, 2–5 cm long including sheath, 0.2–1.5 mm wide, sheath 0.5–1.5 cm long; cauline leaf solitary to each culm or absent, 2–10 cm long including sheath, 0.2–0.8 mm wide, sheath shorter or longer than culm, 0.5–1.5 cm long. Inflorescence terminal, loosely branched, flower heads many, grass-green, 3–7 mm in diam., flowers 2–4, peduncle 0.5–4 cm long. Lowest bract grass-green, linear, 2.5–9 cm long, cross section U-shaped. Bracteoles 2, pale brown, broadly ovate, 0.5–0.8 mm long, membranaceous; sheathing bract on peduncle pale brown, lanceolate, 0.4–1.0 cm long, membranaceous. Flowers 3.5–5 mm long, 1–1.7 mm wide, pedicel 0.3–0.5 mm long. Tepals light brown, linear-lanceolate, outer ones longer than inner ones, 3.5–4.5 mm long, 0.6–0.8 mm wide. Stamens 6, shorter than tepals, 1.2–1.5 mm long; filaments 0.6–0.9 mm long, 1.5–2 times as long as anthers; anthers yellow, linear-elliptic, 0.4–0.6 mm long. Pistil 2.8–3 mm long, 1.0–1.2 mm wide; stigmas 0.4–0.5 mm long; style 0.1–0.15 mm long. Capsule light brown, obovoid, as long as tepals, 3.5–4 mm long, 1.5–2.0 mm wide. Seeds ellipsoid, 0.3–0.4 mm long, appendage absent.

Distr. Afghanistan, Pakistan, Kashmir, India (Punjab, Himachal Pradesh, UttarPradesh), Nepal, Sikkim, Bhutan, Assam, China (Xizang, Gansu, Yunnan, Sichuan, Shaanxi, Shanxi).

*Juncus bufonius* grows in exposed marshy places from elevations of 1500 to 4500 m.

This species is cosmopolitan, however, occurs rarely in the Sino-Himalayan region.

**9. *Juncus cephalostigma*** Sam. in Hand.-Mazz., Symb. Sin. 7: 1233 (1936). Hara et al., Enum. Flow. Pl. Nepal 1: 84 (1978). Wu et al., Index Fl. Yunnan. 2: 2082 (1984). Lu and Zhang in Wu, Fl. Xizang. 5: 517 (1987). Noltie, Fl. Bhutan 3(1): 265 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2420 (1994). Wu in Acta Phytotax. Sin. 32: 460 (1994); Fl. Reipubl. Popul. Sin. 13(3): 209, f. 50, 4–5 (1997). Wu and Clemants in Wu and Raven, Fl. China 24: 58 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Miyamoto in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 236 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 94 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 550 (2003).

[Colour plate 2f; Plate 9; Fig. 12]

Types: Tibet; Tseku am Mekong (Monbeig 43, S-holotype, K-isotype).

*Juncus cephalostigma* Sam. var. *dingjieensis* K. F. Wu in Acta Phytotax. Sin. 32: 460 (1994); Fl. Reipubl. Popul. Sin. 13(3): 209 (1997). Wu and Clemants in Wu and Raven, Fl. China 24: 58 (2000). Types: Xizang [Tibet]; Dinggye, 3650 m (Qing-Xin expedition team 5484, PE-holotype, HSNU, KUN-isotypes).

Perennial, caespitose, 4.5–15 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.2–0.4 mm in diam., with several longitudinal ridges, cross section oval to rounded. Cataphylls 1 or 2 to each culm, brown, shining. Leaves terete, with a groove on adaxial side, cross section of blade oval to somewhat U-shaped, auricles grass-green, rounded on basal leaves; basal leaves 1 or 2 to each culm, 2–8 cm long including sheath, 0.3–0.4 mm in diam., sheath 0.8–2.5 cm long; cauline leaf solitary to each culm, shorter than culm, blade 0.8–2 cm long, 0.1–0.15 mm in diam., bristle, sheathing part absent. Inflorescence with a single flower head, cream-white, 0.4–1.5 cm in diam., flowers 2–10. Lowest bract chestnut-brown, lanceolate to ovate-lanceolate, 2.5–6 mm long, scarious; floral bract light brown to chestnut-brown, lanceolate, 2–5 mm long, 0.5–1 mm wide, scarious; sheathing bract absent. Flowers 5–8 mm long, 2–2.5 mm wide, pedicel 0.5–1 mm long. Tepals cream-white, oblong-lanceolate, outer ones and inner ones equal in length, 2.5–3.5 mm long, 0.5–1 mm wide. Stamens 6, shorter than tepals, 1.2–1.5 mm long; filaments 2.5–5 mm long, 2.5–3 times as long as anthers; anthers yellow, linear-elliptic, 0.8–2 mm long. Pistil cream-white, 3.5–5 mm long, 0.8–1 mm wide; stigmas 0.1–0.2 mm long; style cream-white, 1–2 mm long. Capsule brown, oblong, as long as tepals, 3–4.5 mm long, 1.4–1.6 mm wide. Seeds ellipsoid, 0.5–0.6 mm long, appendage very short.

Distr. Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan).

*Juncus cephalostigma* grows on grassland slopes in alpine region from elevations of 3500 to 4400 m. This species is similar to *J. leucanthus* Royle ex D. Don and *J. przewalskii* Buchenau but differs in having very short stigma lobes and culms with several longitudinal striae on surface.

**10. *Juncus chrysocarpus*** Buchenau in Bot. Jahrb. Syst. 6: 201 (1885); in Bot. Jahrb. Syst. 12: 266 (1890); in Bot. Jahrb. Syst. 12: 237 (1890). Hook. f., Fl. Brit. Ind. 6: 394 (1892). Hara et al., Enum. Flow. Pl. Nepal 1: 84 (1978). Lu and Zhang in Wu, Fl. Xizang. 5: 518 (1987). Noltie, Fl. Bhutan 3(1): 258 (1994). Zhang and Lu in Wang et al., Vasc. Pl.



Hengduan Mts. **2**: 2421 (1994). Wu in Acta Phytotax. Sin. **32**: 452 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 179 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 67 (1999). Wu and Clemants in Wu and Raven, Fl. China **24**: 52 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 82 (2002).

[Colour plate 2b; Plate 10; Fig. 13]

Types: Sikkim; Isumbo, 11000 ft. (C. B. Clarke 25552, 24 Oct. 1875, W-syntype); loc. cit., Yakla, 10000 ft. (C. B. Clarke 10259, 20 Oct. 1869, W-syntype); loc. cit., Jongri, 12000 ft. (C. B. Clarke 25963, 15 Oct. 1885, W, UPS-syntypes).

Perennial, loosely caespitose, 12–30 cm tall. Rhizomes stoloniferous, horizontally short creeping, 0.3–0.5 mm in diam. Culms erect, grass-green, terete, 0.3–1.3 mm thick, with several longitudinal inconspicuous striae, cross section rounded. Cataphyll solitary or inconspicuous, light brown to stramineous, 0.5–2 cm long. Leaves terete, with a groove on adaxial side, cross section of blade U-shaped, bulli-form cells on both sides, auricles grass-green, rounded, septa conspicuous when dried; basal and subbasal leaves 1 or 2 to each culm, 8–20 cm long including sheath, 0.3–0.7 mm in diam., sheath 1–5 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 4–20 cm long including sheath, 0.3–0.8 mm in diam., sheath 1.5–4 cm long. Inflorescence with a single or rarely 2 flower heads, cream-white, hemispherical, 0.3–1.6 cm in diam., flowers 2–16. Lowest bract grass-green or pale brown, lanceolate to linear, 0.5–5 cm long, terete or scarious; floral bract lanceolate to linear-lanceolate, 0.4–1 cm long, 0.8–2.0 mm wide, scarious; sheathing bract absent. Flowers 7–8 mm long, 2–3 mm wide, pedicel 0.5–2.0 mm long. Tepals cream-white, oblong-lanceolate, outer ones slightly shorter than inner ones, inner ones 4–7 mm long, 1.0–1.3 mm wide. Stamens 6, longer than tepals, 5–8 mm long; filaments 3.2–4.5 mm long, 1.2–1.7 times as long as anthers; anthers yellow, linear-elliptic, 1.8–3.5 mm long. Pistil 4–6 mm long, 0.7–1.7 mm wide; stigmas 0.7–1.3 mm long; style 1.5–3 mm long. Capsule yellow-brown, oblong, slightly shorter than tepals, 5–6 mm long, 2.0–2.5 mm wide, cross section rounded. Seeds ellipsoid, 0.5–0.6 mm long, appendage 0.8–1.0 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Xizang).

*Juncus chrysocarpus* grows on mossy banks and tree trunks from elevations of 2700 to 4000 m. This species is similar to *J. benghalensis* Kunth but differs in having septate leaves and culms with several longitudinal striae on surface.

**11. *Juncus clarkei*** Buchenau in Bot. Jahrb. Syst. **6**: 210 (1885); in Bot. Jahrb. Syst. **12**: 413 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 236 (1906). Hook. f., Fl. Brit. Ind. **6**: 400 (1892). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 524 (1987). Noltie, Fl. Bhutan **3**(1): 260 (1994). Wu in Acta Phytotax. Sin. **32**: 463 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 222, f. 52, 12–14 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 67 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 181 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 103 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 236 (2000); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 61 (2000). Li et al., Fl. Gaoligong Mts.: 1120 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 83 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 556 (2003). [Colour plate 2c; Plate 11; Fig. 14]

Types: Sikkim; 11000–14000 ft. (J. D. Hooker, s. n., K, W-syntypes); loc. cit., Singale

la, 11000 ft. (C. B. Clarke 12711, 8 Oct. 1870, W-syntype); loc. cit., Jongri, 12000 ft. (C. B. Clarke 25959, 15 Oct. 1875, K, W-syntypes); loc. cit. Jonglo, Darjeeling, 10000 ft. (C. B. Clarke 27604, 12 Sept. 1875, W-syntype); loc. cit., Yakla, 10000 ft. (C. B. Clarke 9854, 15 Oct. 1869, W-syntype); loc. cit., 13000 ft. (C. B. Clarke 9621, 16 Oct. 1896, W-syntype); loc. cit., 12000 ft. (C. B. Clarke 9994bis, 17 Oct. 1869, W-syntype); loc. cit., 10000 ft. (C. B. Clarke 10222, 20 Oct. 1869, W-syntype); loc. cit., Isumbo, 12000 ft. (C. B. Clarke 25565, 24 Oct. 1875, K, W-syntypes).

*Juncus clarkei* Buchenau var. *marginatus* A. Camus in Notul. Syst. (Paris) **1**(10): 278 (1910). Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1230 (1936). Wu in Acta Phytotax. Sin. **32**: 463 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 223 (1997). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Wu and Clemants in Wu and Raven, Fl. China **24**: 62 (2000). Type: China; Yunnan, Tsang-chan, 3500 m (P. J. M. Delavay 2656, 20 Aug. 1887, P-holotype).

*Juncus albescens* Satake in Hara, Fl. E. Himal. **2**: 161, f. 13 (1971), nom. illegit., non (Lange) Fernald in Rhodora **26**: 202 (1925). Press et al., Ann. Check. Fl. Pl. Nepal: 148 (2000). Bao in Wu and Wu, Fl. Yunnanica **15**: 539, f. 112, 6–11 (2003). Type: Bhutan; Laya-Laum Thang, 3850–4100 m (H. Kanai et al. 11847, 18 May 1967, TI-holotype).

*Juncus yoshisukei* Goel in J. Econ. Taxon. Bot. **7**: 208 (1985), nom. nov. Type: Bhutan; Laya-Laum Thang, 3850–4100 m (H. Kanai et al. 11847, 18 May 1967, TI-holotype).

*Juncus yuii* S. Y. Bao in Wu and Wu, Fl. Yunnanica **15**: 804, f. 115, 1–5 (2003). Type: China; Gongshan Xian, Sewalongba, 3400 m (T. T. Yü 22533, 27 Aug. 1938, KUN-holotype).

Perennial, loosely caespitose, 13–50 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.3–1.3 mm thick, with several longitudinal striae, cross section oval to rounded. Cataphylls 1(or 2) to each culm or absent, loosely embracing at base of culm, stramineous, 0.5–1 cm long. Leaves grass leaf-like, blade margin entire, cross section of blade flattened, auricles absent, sheath stramineous at base; basal and subbasal leaves 1–3 to each culm, 7–25 cm long including sheath, 1.5–6 mm wide, sheath 2–10 cm long; cauline leaves 1 or 2 to each culm, 5–30 cm long including sheath, 1.3–5 mm wide, sheath 1–6 cm long, usually longer than culm. Inflorescence terminal, branched, flower heads 2–5, pale stramineous, hemispherical, 0.4–2 cm in diam., flowers 2–15, peduncle 0.5–4 cm long. Lowest bract grass leaf-like, linear, longer than inflorescence, 3–20 cm long, apical part grass-green, basal reddish brown; floral bract lanceolate to ovate-lanceolate, 2.5–8 cm long, 1–2.8 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 0.3–2 cm long, membranaceous. Flowers 5–8 mm long, 2.5–3 mm wide, pedicel 0.5–3 mm long. Tepals pale stramineous, linear-lanceolate, outer ones and inner ones equal in length, 4–5 mm long, 0.9–1.1 mm wide. Stamens 6, longer than tepals, 4.5–9 mm long; filaments 2.9–7 mm long, 2–3 times as long as anthers; anthers yellow, linear-ellipsoid, 1.6–2 mm long. Pistil 5–9 mm long, 1.0–1.2 mm wide; stigmas 0.3–1 mm long; style 1–2 mm long.

Capsule light brown, oblong, longer than tepals, 6–8 mm long, 1.3–1.5 mm wide, acute, cross section rounded. Seeds ellipsoid, 0.8–1 mm long, appendage 0.5–0.8 mm long.

Distr. Nepal, Sikkim, Bhutan, Assam, Myanmar, China (Xizang, Yunnan, Sichuan).

*Juncus clarkei* grows on mossy or damp rocks from elevations of 2900 to 4000 m. This species is similar to *J. crassistylus* A. Camus but differs in having the stamens longer than



the tepals.

**12. *Juncus concinnus*** D. Don, Prodr. Fl. Nepal.: 44 (1825); in Trans. Linn. Soc. London **18**(3): 321 (1840); Hook. f., Fl. Brit. Ind. **6**: 399 (1892). Buchenau in Bot. Jahrb. Syst. **1**: 112 (1880); in Bot. Jahrb. Syst. **6**: 215 (1885); in Bot. Jahrb. Syst. **12**: 406 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 235 (1906). Samuelsson in Had.-Mazz., Symb. Sin. **7**: 1235 (1936). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Jafri in Fl. Pakistan **138**: 11, f. 6, c–g (1981). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 525, f. 294 (1987). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 72 (1992). Noltie, Fl. Bhutan **3**(1): 258 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2424 (1994). Wu in Acta Phytotax. Sin. **32**: 462 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 219, f. 52, 5–7 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 67 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 181 (1999); Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 103 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 237 (2000); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 61 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 80 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 554, f. 115, 6–11 (2003).

[Colour plate 3a; Plate 12; Fig. 15]

Type: Nepal; Gosaing Stan [Gosainkund] (Wallich s. n., Jul. 1818, BM-lectotype, designated by J. Kirschner in 2002).

*Juncus elegans* Royle ex Sam. in Hand.-Mazz., Symb. Sin. **7**: 1232 (1936). Type: India; Uttar Pradesh (Mussoorie s. n., LIV-lectotype, designated by J. Kirschner in 2002).

*Juncus leuteocarpus* Satake in J. Jap. Bot. **43**: 384, f. 3–4 (1968). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Type: Bhutan; Charikhachor–Chendebi–Rukubi–Longtepanang, 2250–2950 m (H. Kanai et al. 8478, 21 Apr. 1967, TI-holotype).

*Juncus glomeratus* K. F. Wu in Acta Phytotax. Sin. **32**: 462, f. 6, 1–5 (1994), nom. Illegit., non Thunb., Fl. Jap.: 145 (1784).

*Juncus meiguensis* K. F. Wu in Acta Phytotax. Sin. **32**: 463, f. 6, 6–7 (1994); Fl. Reipubl. Popul. Sin. **1**: 222, f. 53, 6–7 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 61 (2000). Types: China; Sichuan, Meigu (Sichuan expedition team 1954, 23 Aug. 1959, CDBI-holotype, not seen, KUN, PE-isotypes).

*Juncus lanpinguensis* V. Novikov in Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. **103**(4): 71 (1997). Types: China; Yunnan, Lanping, 3000 m (H. T. Tsai 53760, 17 Aug. 1933, PE-holotype, A, HSNU, KUN-isotypes).

*Juncus khasiensis* auct. non Buchenau: Zhang & Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2424 (1994).

Perennial, caespitose, 10–35 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, 0.5–0.8 mm in diam., with several longitudinal ridges. Cataphylls 1 or 2 to each culm or absent, 0.5–2 cm long, stramineous. Leaves terete to somewhat flattened, with a groove on adaxial side, cross section of blade U-shaped with bulliform cells, auricles grass-green, acute; basal leaves 1 or 2 to each culm, 6–20 cm long including sheath, 0.4–0.8 mm in diam., sheath 1–4 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 4–15 cm long including sheath, 0.3–0.6 mm in diam., sheath 1–4 cm long. Inflorescence terminal, branched; flower heads 2–8, cream-white, hemispherical,

5–8 mm in diam., flowers 4–10, peduncle 0.5–3 cm long. Lowest bract grass-green, linear, longer than inflorescence, sometimes as long as inflorescence, 2–15 cm long, cross section U-shaped to flattened with bulli-form cells; floral bract pale stramineous or light brown, lanceolate, 3–6 mm long, 1–1.2 mm wide; sheathing bract on peduncle pale stramineous, lanceolate, 0.25–1.9 cm long, membranaceous. Flowers 4–6 mm long, 2–2.5 mm wide, pedicel 0.3–0.8 mm long. Tepals cream-white, lanceolate, outer ones slightly shorter than inner ones, inner ones 2.5–3.2 mm long, 0.6–0.8 mm wide. Stamens 6, longer than tepals, 5–7 mm long; filaments 4.2–6.0 mm long, 6 times as long as anthers; anthers yellow, linear-ellipsoid, 0.8–1 mm long. Pistil cream-white, 4–5 mm long, 0.5–0.7 mm wide; stigmas 0.6–0.8 mm long; style 1.0–1.5 mm long. Capsule brown, oblong, slightly longer than tepals, 4–4.2 mm long, 1.3–1.5 mm wide, cuspidate, cross section rounded. Seeds ellipsoid, 0.5–0.7 mm long, appendage 0.2 mm long.

Distr. India (Punjab, Himachal Pradesh, Uttar Pradesh, Kumaon), Nepal, Sikkim, Bhutan, Assam, Myanmar, China (Xizang, Yunnan, Sichuan).

*Juncus concinnus* was first described as a species based on a specimen collected from Nepal by Don (1825). This species is morphologically variable, and it has been treated as a single species in Bhutan (Satake 1968), as two species in China (Wu 1994). I have not find any reason to divide it into either microspecies or varieties but further work is required. It is similar to *J. gracilicaulis* A. Camus and *J. petrophilus* Miyam. but differs in having the U-shaped cross section of the leaf blade with bulli-form cells on both sides. It grows on mossy banks and tree trunks, sometimes grassland slopes from elevations of 1000 to 3750 m.

**13. *Juncus concolor*** Sam. in Had.-Mazz., Symb. Sin. 7: 1232 (1936). Wu et al., Index Fl. Yunnan. 2: 2082 (1984). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2421 (1994). Wu in Acta Phytotax. Sin. 32: 461 (1994); Fl. Reipubl. Popul. Sin. 13: 211 (1997). Miyamoto in J. Jap. Bot. 74: 72, f. 1 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 181 (1999). Wu and Clemants in Wu and Raven, Fl. China 24: 59 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 102, f. 68 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 550 (2003). [Colour plate 3b; Plate 13; Fig. 16]

Types: China; Yunnan, Prope urbem Yungbei, in regionis calide temperate et Semperatae pinebis inter vic. Dschaoping et Boloti, 2600–3000 m (J. F. Handel-Mazzetti 3359, 30 Jun. 1914, S-holotype, W-isotype).

Perennial, loosely caespitose, 10–38 cm tall. Rhizomes horizontally short creeping, 0.3–0.7 mm in diam. Culms erect, grass-green, terete, without longitudinal striae, cross section rounded. Cataphylls 3–6 to each culm, stramineous. 1.6–4.0 cm long, apex acuminate. Leaves grass-green, terete, cross section of blade rounded, auricles grass-green, very short; basal leaf absent or sometimes solitary; cauline leaf solitary, linear, longer than or sometimes as long as inflorescence, 10–24 cm long including sheath, 1.0–1.5 mm in diam., sheath 1.0–3.0 cm long. Inflorescence with a single flower head, cream-white, hemispherical, 1.0–2.0 cm in diam., flowers 5–20. Lowest bract light brown, lanceolate, shorter than inflorescence, 7–9 mm long, 3.4–4.3 mm wide; floral bract pale brown, lanceolate, 3.0–9.0 mm long, 0.7–4.3 mm wide, scarious; sheathing bract absent. Flowers 6.5–9.5 mm long, 2.0–2.5 mm wide, pedicel 0.8–2.4 mm long. Tepals ivory-



white, lanceolate, outer ones and inner ones equal in length, 4.8–5.5 mm long, 1.2–1.5 mm wide. Stamens 6, ivory-white, longer than tepals, 7.3–8.7 mm long; filaments 4.8–6.0 mm long, 2–3 times as long as anthers; anthers linear-elliptic, 2.5–2.8 mm long. Pistil ivory-white, 2.9–3.4 mm long, 1.2–1.8 mm wide; stigmas 0.6–0.9 mm long; style 2.3–3.5 mm long. Capsule obovoid, 2.5–4.0 mm long, 1.0–1.4 mm wide, cross section trigonous. Seeds unknown.

Distr. Myanmar, China (Yunnan).

*Juncus concolor* was known from only the type specimen collected in the west side of Mt. Cangshan, Yunnan Province by Handel-Mazzetti in 1914. We collected this species on grassy slope at 3800–3820 m near the type locality.

*Juncus concolor* is similar to *J. allioides* Franch., *J. cephalostigma* Sm., *J. glaucoturgidus* Noltie, *J. leucanthus* Royle ex D. Don, and *J. trachyphyllus* Miyam. & H. Ohba but differs apparently in having stoloniferous rhizomes, straw-colored basal sheath and the lack of basal leaf.

**14. *Juncus crassistylus*** A. Camus in Notul. Syst. (Paris) **1**(10): 278, f. 19, 1–6 (1910). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2423 (1994). Wu in Acta Phytotax. Sin. **32**: 465 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 227, f. 55, 1–4 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 103 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 63 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 148 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 84 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 558 (2003). [Colour plate 3d; Plate 14; Fig. 17]

Type: China; Yunnan, Tsang-chan, parmiles bambous, 3500 m (P. J. M. Delavay 2656, 20 Aug. 1887, P-lectotype, designated here).

*Juncus megalophyllus* S. Y. Bao in Wu and Wu, Fl. Yunnanica **15**: 558, f. 116, 1–8 (2003). Type: China; Yunnan, Lushi Xian, Pianma, 3100–3500 m (Jujiang Expedition 1832, 4 Aug. 1978, KUN-holotype).

Perennial, loosely caespitose, 30–60 cm tall. Rhizomes stoloniferous, horizontally creeping, robust, 2–3 mm in diam. Culms erect, grass-green, terete, 2–5 mm in diam., with several longitudinal striae, cross section oval. Cataphylls 1 or 2 to each culm, loosely embracing at base of culm, light brown to stramineous. Leaves grass leaf-like, blade margin denticulate, with several ridges on abaxial side, cross section of blade flattened, auricles absent; basal and subbasal leaves 2 or 3 to each culm, 3–10 cm long including sheath, 1–1.5 cm wide, sheath 2–5 cm long; cauline leaves 1 or 2 to each culm, 10–30 cm long including sheath, 1–2 cm wide, sheath longer than culm, 2–5 cm long. Inflorescence terminal, branched, flower heads 3–8, yellowish white, hemispherical, 1–2 cm in diam., flowers 5–20, peduncle 1–6 cm long. Lowest bract longer than inflorescence, grass-green, grass leaf-like, linear-lanceolate, 10–15 cm long, 3–6 mm wide, with several ridges on abaxial side, cross section flattened; flora bracts lanceolate to ovate-lanceolate, 3–15 mm long, 1.5–4 mm wide, scarious; sheathing bract on peduncle lanceolate, 5–8 mm long, membranaceous. Flowers 6–8 mm long, 2–3 mm wide, pedicel 1.5–6.0 mm long. Tepals yellowish white, lanceolate, outer ones slightly shorter than inner ones, 3.0–4.0 mm long, 0.8–2.4 mm wide, inner ones 3.5–5.0 mm long, 0.8–2.5 mm wide. Stamens 6, shorter than tepals, 2.6–3.3 mm long; filaments 1.2–1.5 mm long; anthers linear-elliptic, slightly

longer than filaments, 1.4–1.8 mm long. Pistil 4.2–5.0 mm long, 0.8–1.0 mm wide; stigmas 0.5–0.7 mm long; style ovoid-trigonal, 1.3–1.5 mm long. Capsule brown to light brown, ovoid, slightly longer than tepals, 6–8 mm long, 2–2.5 mm wide, cuspidate, cross section rounded. Seeds ovoid, 0.6–0.8 mm long, appendage 1 mm long.

Distr. Myanmar, China (Yunnan, Sichuan).

*Juncus crassistylus* is similar to *J. clarkei* Buchenau and *J. amplifolius* A. Camus in having grass leaf-like leaves but it differs from the latter two species in having the leaf blade with denticulate margin. It grows in exposed places along streams and roads from elevations of 2100 to 4000 m, and is distributed disjunctively in Myanmar and China. The specimens of this species are found very scarcely in the herbaria and this species is probably rare.

**15. *Juncus deosaicus*** Noltie in *Edinburgh J. Bot.* **55**: 41, f. 1C, 2K–M (1998). Kirschner et al., *Juncaceae 2, Fl. World 7*: 123, f. 63, 64 (2002). [Fig. 18]

Types: Pakistan (Northern Area); Deosai Plains, 0–9 Km beyond top of Satpara Valley, 35°06'N, 75°33'E, 3900 m (S. Z. Hussain, Lowe, Muqarrad & Springate 940659, 19 Aug. 1994, E-holotype, photo, CAL-isotype).

Perennial, loosely caespitose, 15–22 cm tall. Rhizomes short creeping, c. 1.2 mm in diam. Culms erect, grass-green, terete. Cataphylls reddish brown, short. Leaves grass-green, as long as culms, 0.7 mm wide, apex acute; cauline leaves 1 or 2, upper cauline leaf with conspicuous reddish brown sheath, blade sometimes exceeding inflorescences; auricles scarcely produced. Inflorescence with a single flower head, flowers 3–5. Lower bract erect, leaf-like, longer than inflorescence, 2–9 cm long, slender, base reddish brown, membranaceous; floral bract brown, lanceolate, scarious. Tepals dark reddish brown, greenish white at base, extreme apex hyaline; outer ones narrowly lanceolate, 5.3–5.5 mm long, 0.7–1.1 mm wide, apex acuminate, concave, keeled; inner ones oblong-lanceolate, 4.5–5 mm long, 1–1.2 mm wide, apex acuminate. Stamens 6, filaments shorter than anthers, 1.2–1.5 mm long; anthers cream, 2.5–2.9 mm. Pistil narrowly ovoid, 2–2.5 mm long, gradually tapering into style; stigmas erect, pale brown, 4–4.3 mm long; style 2 mm long.

Distr. Pakistan.

This species is closest to *J. himalensis* Klotzsch. It also superficially resembles *J. amplifolius* A. Camus, from which it differs greatly in its leaf morphology (Noltie 1998).

**16. *Juncus dongchuanensis*** K. F. Wu in *Acta Phytotax. Sin.* **32**: 457, f. 5, 4–5 (1994); *Fl. Reipubl. Popul. Sin.* **13**: 195, f. 40, 6–7 (1997). Miyamoto in *J. Jap. Bot.* **74**: 74, f. 2 (1999); in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **25**: 181 (1999); in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **26**: 103 (2000). Wu and Clemants in Wu and Raven, *Fl. China* **24**: 55 (2000). Kirschner et al., *Juncaceae 2, Fl. World 7*: 134, f. 78 (2002). Bao in Wu and Wu, *Fl. Yunnanica* **15**: 545 (2003). [Colour plate 3g, h; Plate 15; Fig. 19]

Type: China; Yunnan, Dongchuan, 2500–2700 m (Exped. Boreali-orientali-Yunnan team 500, 12 Aug. 1964, KUN-holotype).

*Juncus miyiensis* K. Y. Wu in *Acta Phytotax. Sin.* **32**: 456, f. 5, 1–3 (1994); *Fl. Reipubl. Popul. Sin.* **13**(3): 195 (1997). Wu and Clemants in Wu and Raven, *Fl. China* **24**: 55 (2000). Types: China; Sichuan, Miyi, 3200 m (S. Y. Chen, Z. He & M. F. Zhong 10914,



26 Jul. 1958., NAS-holotype, not seen, HSNU-isotype).

Perennial, caespitose, 10–30 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.6–0.8 mm in diam., with several longitudinal ridges, cross section rounded. Cataphylls 3–6 to each culm, yellowish brown to stramineous, shining, 0.3–3 cm long. Leaves terete, cross section of blade oval, with several longitudinal striae, auricles grass-green, rounded; basal leaf absent; cauline leaf solitary, linear, shorter than culm, 10–28 cm long including sheath, 0.7–2.0 mm wide, sheath 1–4 cm long. Inflorescence terminal, branched, flower heads 2–4, grass-green, globose, 5–10 mm in diam. flowers several, peduncle 0.5–5.0 cm long. Lowest bract linear-lanceolate, shorter than inflorescence, 1.0–3.0 cm long, 1.5–2.0 mm wide; floral bract linear-lanceolate, 0.2–3.0 cm long, 0.6–2.0 mm wide; sheathing bract on peduncle lanceolate, 1.5–2.0 mm long, membranaceous. Flowers normal or viviparous, mixed with in the same inflorescence. Ordinal flowers 6–8 mm long, 2.2–2.5 mm wide, pedicel 0.5–1.2 mm long. Tepals grass-green, ovate-lanceolate to lanceolate, outer ones slightly shorter than inner ones, 4.3–4.6 mm long, 0.8–1.4 mm wide, inner one 5.5–6.8 mm long, 0.9–1.3 mm wide. Stamens 6, longer than tepals, outer ones longer than inner ones, 11–12 mm long, inner ones, 8–10 mm long; filaments 5.6–8.0 mm long, 2.5 times as long as anthers; anthers linear-elliptic, 5.6–8.0 mm long. Pistil. 2.4–2.8 mm long, 1.5–1.9 mm wide; stigmas 0.7–0.8 mm long; styles 1.8–2.0 mm long. Capsule ovoid, acuminate, cross section trigonous, 5.0–6.0 mm long, 2–2.5 mm wide. Seeds unknown. Viviparous flowers grass-green, 3.5–6.0 mm long, 0.7–1.5 mm wide, stamens and pistils absent.

Distr. China (Yunnan).

*Juncus dongchuanensis* is similar to *J. concinnus* D. Don but differs in having shining yellowish brown basal sheath and the filaments 2.5 times as long as the anthers, and lack of basal leaf. It grows on banks and rocks along paths from elevations of 2600 to 3460 m and is ecologically similar to *J. fimbristyloides* Noltie. This species is distributed only in Yunnan Province.

**17. *Juncus duthiei*** (C. B. Clarke) Noltie in *Edinburgh J. Bot.* **51**: 134 (1994); *Fl. Bhutan* **3**(1): 269, f. 25k (1994). Press et al., *Ann. Check Fl. Pl. Nepal*: 149 (2000). Miyamoto and Ohba in *J. Jap. Bot.* **77**: 27, f. 3 (2002). Kirschner et al., *Juncaceae 2, Fl. World* **7**: 110, f. 65 (2002). [Colour plate 3e; Plate 16; Fig. 20]

Type: India; Uttar Pradesh, Rhudughera, Tihri Garhwal, 15000–16000 ft. (J. F. Duthie 132, 20 Jul. 1882, K-holotype).

*Microschoenus duthiei* C. B. Clarke in Hooker, *Fl. Brit. Ind.* **6**: 675 (1894).

Perennial, caespitose, 0.7–5 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.5–0.7 mm in diam., cross section rounded. Cataphylls 1 or 2 to each culm, brown to light brown, 3–8 mm long. Leaves grass-green, terete, auricles very short, basal leaf solitary to each culm, grass-green, 1–6 cm long including sheath, 0.4–0.7 mm in diam.; sheath 3–5 mm long; cauline leaves absent. Inflorescences pseudolateral, flower head solitary, 0.3–2.3 cm long, 0.5–0.8 mm wide, flowers 1–3. Lowest bract longer than inflorescence, grass-green, 0.8–2.3 cm long, 0.6–0.8 mm wide; floral bract lanceolate, 3–8 mm long, 0.8–2 mm wide, scarious; sheathing bract absent. Flowers 5–7 mm long, 1.5–2.0 mm wide; pedicel 0.6–3.5 mm long. Tepals ovate-lanceolate, outer ones chestnut-brown, slightly longer than inner ones, 2.8–3.0 mm long, 0.9–1.3 mm wide, cuspidate.

Stamens 6, shorter than tepals, 2.0–2.3 mm long; filaments 1.5–1.7 mm long, 3.5 times as long as anthers; anthers leather-yellow, ellipsoid, 0.4–0.5 mm long. Pistil 3.8–4.2 mm long, 1.2–1.3 mm wide; stigmas 1.2–1.4 mm long; style 0.2–0.3 mm long. Capsule obovoid, 3.5–4 mm long, mucronate, cross section rounded. Seeds oblong, 0.77–0.83 mm long, appendages very short, 0.1 mm long.

Distr. India (Uttar Pradesh), Nepal.

*Juncus duthiei* was originally described in the monotypic genus *Microschoenus*, Cyperaceae (Clarke 1894), and moved to *Juncus* by Noltie (1994a). Noltie (1994a) noted that this species has the anthers longer than the filaments, a long style (1.5–4.0 mm long), and the red stigma. However, I checked the type specimen and samples collected in central Nepal and found the anthers to be shorter than the filaments, the style very short (0.2–0.3 mm long), and the stigma pale yellow. I examined the specimens cited by Noltie (1994a) as *J. duthiei* and found that he identified them as *J. rohtangensis* Goel & Aswal.

This species is most similar to *J. bryophilus* Noltie but differs in having the filaments three times longer than the anthers and the chestnut-brown perianth. It was collected on scree slopes at 4920 m in Nepal.

**18. *Juncus effusus* L.**, Sp. Pl.: 326 (1753). Buchenau in Bot. Jahrb. Syst. **1**: 107 (1880); in Bot. Jahrb. Syst. **6**: 199 (1885); in Bot. Jahrb. Syst. **29**: 238 (1900); in Engler, Pflanzenr. (iv. 36) **25**: 135 (1906). Brown in J. Linn. Soc. Bot. **36**: 163 (1903). Samuelsson in Had.-Mazz., Symb. Sin. **7**: 1229 (1936); in Acta Horti Gothob. **3**: 67 (1927). Krecetovicz and Goncarpv in Komarov, Fl. URSS. **3**: 548, pl. 29, f. 8 (1935). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Noltie, Fl. Bhutan **3**(1): 253 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2417 (1994). Wu in Acta Phytotax. Sin. **32**: 443 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 160, f. 35, 5–8 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 48 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae **3**, Fl. World **8**: 88, f. 137 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 534, f. 109, 8–14 (2003). [Colour plate 4f; Plate 17; Fig. 21]

Type: Herb. Linn. (LINN449.6, not seen).

Perennial, densely caespitose, 50–100 cm tall. Rhizomes horizontally short creeping, internodes very short, 2.5–4 mm in diam., covered with brown scales, culms arising in densely crowded rows. Culms erect, grass-green, terete, 1–2.5 mm in diam., with several longitudinal striae, pith continuous, spongy, aerenchymatous with asteriform cells. Cataphylls 2 or 3 to each culm, closely embracing at base of culm, brown at base, stramineous upward, 1–13 cm long. Leaves only cataphylls sheathing culm. Inflorescences pseudolateral, loosely branched, flowers many. Lowest bract appearing as a continuation of culm, 7–15 cm long. Bracteoles 2, ovate to ovate-lanceolate, 0.4–0.5 mm long. Flowers 1.5–2 mm long, 1–1.5 mm wide. Tepals light brown, lanceolate, outer ones longer than inner ones, 1.8–2 mm long, 0.5–0.7 mm wide. Stamens 3, opposite to outer tepals, shorter than tepals, 1.2–1.5 mm long; filaments 0.8–1 mm long, 3 times as long as anthers; anthers yellow, linear-elliptic, 0.4–0.5 mm long. Pistil 1.8–2 mm long, 1–1.2 mm wide; stigmas 0.4–0.5 mm long; style very short, 0.05–0.1 mm long. Capsule ellipsoid, brown, obtuse, longer than tepals, 2.3–2.5 mm long, 1.8–2.0 mm wide, mucronate,



3-loculed, cross section trigonous. Seeds brown, ovoid, 0.4–0.5 mm long, appendages very short.

Distr. Nepal, Bhutan, Assam, Myanmar, China (Xizang, Yunnan, Sichuan).

*Juncus effusus* is a cosmopolitan species and very little common in Sino-Himalaya. This species is similar to *J. setchuensis* Buchenau but differs in having aerenchymatous pith with asteriform cells. It grows in exposed wet places along roads or ditches from elevations of 1350 to 2600 m.

**19. *Juncus fimbristyloides*** Noltie in *Edinburgh J. Bot.* **55**: 39, f. 1B, 2E–J (1998). Miyamoto in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **26**: 104 (2000). Kirschner et al., *Juncaceae 3, Fl. World 7*: 86, f. 63–64 (2002). [Colour plate 3f; Plate 18; Fig. 22]

Types: China; Yunnan, Lijiang Prefecture, Yulong Shan ridge, N of Camellia Temple, 3400 m (CLD 1122, 11 Oct. 1990, E-holotype, not seen, PE, TI-isotypes).

Perennial, caespitose, 15–30 cm tall. Rhizomes horizontally short creeping. Culms ascending, grass-green, terete, 0.3–0.6 mm in diam., cross section rounded. Cataphyll 1 to each culm, brown, 0.8–5 cm long, mucronate. Leaves terete, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded to obtuse; basal leaf absent; cauline leaf 1 to each culm, linear, shorter than culm, 7–13 cm long including sheath, 0.3–0.4 mm in diam., sheath 1.5–2.5 cm long. Inflorescence terminal, loosely branched, flower heads many, flowers many, almost sterile, sterile flowers composed of several sterile bracts, peduncle 0.5–5 cm long; sterile bracts golden-brown, ovate, 2–3 mm long, 1–1.4 mm wide. Lowest bract grass-green, filiform, terete, shorter than inflorescence, 1.5–3 cm long; floral bract brown, lanceolate, 1.5–2 mm long, 0.6–0.8 mm wide, scarious; sheathing bracts on peduncle pale brown, lanceolate, 5–8 mm long, membranaceous. Normal flower absent as far as examined. Sterile flowers composed of narrowly lanceolate scales, apical part with bristles.

Distr. China (Yunnan).

*Juncus fimbristyloides* is similar to *J. ochraceous* Buchenau but differs in having bristle scales in sterile flowers, bulliform cells on the surface of the leaf, and no basal leaf. It was collected from only two localities in Yunnan Province and grows on damped mossy rocks at 3400 m and 2900 m.

**20. *Juncus ganeshii*** Miyam. & H. Ohba in *J. Jap. Bot.* **69**: 245, f. 1 (1995); in Ohba and Ikeda, *Contr. Fl. Ganesh Him.*: 67 (1999). Press et al., *Ann. Check. Fl. Pl. Nepal*: 149 (2000). Kirschner et al., *Juncaceae 2, Fl. World 7*: 125, f. 75 (2002).

[Colour plate 4f; Plate 19; Fig. 23]

Type: Nepal; Bagmati Zone, Rasuwa Distr., Jaisuli Kund–Paldol Base Camp, 4440 m (F. Miyamoto, K. R. Rajbhandari, S. Akiyama, M. Amano, H. Ikeda & H. Tsukaya 9410148, 2 Aug. 1994, TI-holotype).

Perennial, loosely caespitose, 6–20 cm tall. Rhizomes stoloniferous, horizontally short creeping, 0.4–0.8 mm in diam. Culms erect, grass-green, basal part yellowish green, terete, 0.5–0.8 mm in diam., smooth, cross section rounded. Cataphylls 1 or 2 to each culm, light brown, 1–4 cm long. Leaves grass-green, terete, sheathing at base, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded; basal leaves 1 or 2 to each culm, 3–8 cm long including sheath, 0.4–0.6 mm wide, sheath 1.5–4 cm

long; cauline leaf solitary to each culm, linear, shorter than culm, 3.5–7 cm long including sheath, 0.3–0.5 mm wide, sheath 1.5–3.5 cm long. Inflorescence with 1 or 2(or 3) flower heads, chestnut-brown, 0.5–1 cm wide, flowers 2–8, peduncle 0.3–3 cm long. Lowest bract longer than or sometimes as long as inflorescence, grass-green, linear-lanceolate, terete, 1–4 cm long, 1.5–3.0 mm wide, margin reddish brown; floral bract lanceolate, 4–6 mm long, 1.5–2 mm wide, scarious; sheathing bract on peduncle lanceolate, 4–7 mm long, membranaceous. Flowers 5–6 mm long, 1.0–1.5 mm wide, pedicel 1–3 mm long. Tepals chestnut-brown, lanceolate, outer ones slightly longer than inner ones, 5–6 mm long, 1.0–1.6 mm wide, inner ones 4.5–6.0 mm long, 0.9–1.2 mm wide. Stamens 6, shorter than tepals, outer ones 3.3–5.0 mm long, inner ones 3.0–5.0 mm long; filaments 1.9–2.8 mm long, 1.3 times as long as anthers; anthers yellow, linear-ellipsoid, 1.4–2.2 mm long. Pistil 0.6–1 cm long, 2.5–3 mm wide; stigmas 2–2.5 mm long; style 1.8–2 mm long. Capsule ovoid, 3–4 mm long, 1–1.5 mm wide, cross section rounded. Seeds not seen.

Distr. Pakistan, Kashmir, Nepal.

*Juncus ganeshii* is most similar to *J. himalensis* Klotzsch but differs in having the filaments 1.3 times as long as the anthers and the stamens shorter than the tepals. *Juncus himalensis* has the filaments twice to three times as long as the anthers and the stamens slightly shorter than or as long as the tepals. *Juncus ganeshii* is similar to the small plants of *J. sphacelatus* Decne. but the latter has elongated leaf auricles. *Juncus ganeshii* grows in marshy places of bogs from elevations of 2700 to 4440 m.

**21. *Juncus giganteus*** Sam. in Acta Horti Gothob. **3**: 70 (1927). Wu in Acta Phytotax. Sin. **32**: 465 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 225, f. 54, 1–3 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 63 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 119 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 539, f. 111, 1–4 (2003).

[Plate 20; Fig. 24]

Types: China; Szech'uan [Sichuan], Huang-chen-kuan, ca. 3200 m (H. Smith 4002, 19 Aug. 1922, UPS-holotype, S-isotype).

*Juncus exploratorum* Walker in Contr. U. S. Natn. Herb. **28**: 600, f. 144 (1941). Types: China, Kansu [Gansu], Garagannar, south of old Taochow, 3600–4200 m (R. C. Ching 912, 26–31 Aug. 1923, US-holotype, not seen, A-isotype).

*Juncus tibeticus* E. M. Egorova in Akad. Nauk. SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 96, t. 8, f. 3 (1967). Wu in Acta Phytotax. Sin. **32**: 465 (1994); Fl. Reipubl. Popul. Sin. **13**: 229 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 63 (2000). Type: China; Kansu [Gansu], fl. Tetung (Przewalski 352, 28 Jun.–9 Jul. 1872, LE-holotype).

Perennial, loosely caespitose, 40–60 cm tall. Rhizomes stoloniferous, horizontally short creeping, 0.9–1.2 mm in diam. Culms erect, grass-green, terete, 5–6 mm in diam., cross section rounded. Cataphylls inconspicuous. Leaves grass leaf-like, blade margin entire, cross section of blade flattened, auricles absent; basal leaves 2–4 to each culm, 10–25 cm long including sheath, 5–8 mm wide, sheath 3–5 cm long; cauline leaves 2 or 3 to each culm, 20–30 cm long including sheath, 4–6 mm wide, sheath 4–6 cm long. Inflorescence terminal, branched, flower heads 3–5, brown, 0.8–1.3 mm in diam., flowers 5–10, peduncle 1–6 cm long. Lowest bract grass-green, grass leaf-like, linear-lanceolate,



longer than inflorescence, 5–7 cm long, 3–5 mm wide, flattened; floral bract lanceolate to ovate-lanceolate, 3–7 mm long, 1–1.5 mm wide; sheathing bract on peduncle lanceolate, 0.6–0.8 cm long, membranaceous. Flowers 6–8 mm long, 1.5–2.0 mm wide, pedicel 0.5–1.0 mm long. Tepals brown, lanceolate, outer ones slightly longer than inner ones, 5–7 mm long, 1.0–1.4 mm wide, inner ones 4.8–5.2 mm long, 0.9–1.2 mm wide. Stamens 6, shorter than tepals, 4–5 mm long; filaments 2.3–3.0 mm long, 1–1.5 times as long as anthers; anthers linear ellipsoid, 1.7–2.0 mm long. Pistil 7–8 mm long, 1.5–2.0 mm wide; stigmas 1.6–1.8 mm long; style 0.5–0.8 mm long. Capsule dark brown, oblong, longer than tepals, 6–8 mm long, 2–3 mm wide, acuminate. Seeds ellipsoid, 3 mm long, cross section rounded, appendages 1.1 mm long.

Distr. China (Qinghai, Gansu, Sichuan).

*Juncus giganteus* is similar to *J. ganeshii* Miyam. & H. Ohba, *J. himalensis* Klotzsch, and *J. sphacelatus* Decne. but differs in having grass leaf-like leaves. Also this species is similar to *J. amplifolius* A. Camus but differs in having the shorter stigmas (1.6–1.8 mm long) and style (0.5–0.8 mm long) than those of *J. amplifolius* (stigmas 4–7 mm long and style 1.5–2 mm long). It grows on grassland slopes from elevations of 3800 to 4300 m.

**22. *Juncus glaucoturgidus*** Noltie in Edinburgh J. Bot. **51**: 132, f. 1A–E (1994); Fl. Bhutan **3**(1): 264 (1994). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 67 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 90, f. 66 (2002). [Colour plate 4a; Plate 21; Fig. 25]

Types: Sikkim; Samiti Lake (Bungmoteng Chho), 27°33'33"N, 88°11'25"E, 4300 m (D. G. Long, R. J. D. McBeath, H. J. Noltie, & M. F. Watson ESİK 572, 21 Jul. 1992, E-holotype, photo, K-isotype).

Perennial, caespitose, 10–25 cm tall. Rhizomes horizontally short creeping. Culms erect, glaucescent green, terete, 0.7–1.2 mm in diam. Cataphylls 3–6 to each culm, stramineous to light brown, 0.5–5 cm long. Leaves glaucescent green, terete, cross section of blade rounded to oval, auricles rounded; basal leaf 1 to each culm, 7–12 cm long including sheath, 0.8–1.2 mm wide, sheath 3–5 cm long; cauline leaves 1 or 2 to each culm, 2–5 cm including sheath, 0.15–0.4 mm wide, sheath 1.5–4 cm long, auricles rounded, shorter than culm. Inflorescence with a single flower head, hemispherical, 1–2.5 cm in diam., flowers 10–15, cream-white. Lowest bract light brown to chestnut-brown, lanceolate to ovate-lanceolate, slightly longer than inflorescence, 0.8–1.5 cm long, scarious; floral bract lanceolate, 0.7–1.4 cm long, 2.5–4.0 mm wide, scarious; sheathing bract absent. Flowers 0.7–1.3 cm long, 2.5–3.5 mm wide, pedicel 1–5 mm long. Tepals cream-white, lanceolate to linear-lanceolate, outer ones and inner ones equal in length, 4–6.5 mm long, 1–1.8 mm wide. Stamens 6, longer than tepals, 4.5–7.5 mm long; filaments 3–5 mm long, twice as long as anthers; anthers yellow, linear-ellipsoid, 1.5–2.5 mm long. Stigmas 0.8–1 mm long; style 1.5–2.5 mm long. Capsule brown, oblong, as long as tepals, 5–6 mm long, 2.5–2.7 mm wide, cross section trigonous. Seeds ellipsoid, 0.6–0.7 mm long, appendages very short, 0.05 mm long.

Distr. Nepal, Bhutan, China (Sichuan).

*Juncus glaucoturgidus* is similar to *J. allioides* Franch. and *J. trachyphyllus* Miyam. & H. Ohba but differs from the former in having glaucous leaves, scabrid culms, and

glaucous green leaf blade, and from the latter in having the rounded to oval cross section of leaf blade. *Juncus trachyphyllus* has the U-shaped cross section of leaf blade. *Juncus glaucoturgidus* grows on scree slopes among *Rhododendron* shrubs from elevations of 3750 to 4800 m.

**23. *Juncus gonggae*** Miyam. & H. Ohba in J. Jap. Bot. **72**: 162, f. 1 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999). Kirschner et al., Juncaceae 2, Fl. World **7**: 106, f. 70 (2002). [Colour plate 4b; Plate 22; Fig. 26]

Types: China; Sichuan, Daocheng District, Mt. Gonggashan, 4300 m (S. Wu et al. 1551, 25 Aug. 1996, KUN-holotype, TI-isotype).

Perennial, caespitose, 4–20 cm tall. Rhizomes horizontally short creeping. Culms ascending or erect, terete, 0.35–0.5 mm in diam., with several longitudinal striae. Cataphylls 2 or 3 to each culm, stramineous, 0.5–2 cm long. Leaves grass-green, terete, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded; basal leaves 1 or 2 to each culm, 1.5–10 cm long including sheath, 0.3–0.5 mm wide, sheath 0.5–2 cm long; cauline leaf almost absent, if present solitary, linear, 3–5 cm long including sheath, 0.25–0.35 mm wide, sheath 5–8 mm long. Inflorescence with a single flower head, hemispherical, 0.5–1.2 cm in diam., flowers 3–8, cream-white. Lowest bract light brown, linear-lanceolate, longer than or sometimes as long as inflorescence, 0.4–1.0 cm long, 0.5–1.0 mm wide; floral bract light brown, lanceolate, 1.5–2.0 mm long, 0.5–0.8 mm wide, scarious. Flowers viviparous or normal, sometimes both mixed in an inflorescence. Normal flowers 5–7 mm long, 5–8 mm wide, pedicel 0.4–0.6 mm long. Tepals white, lanceolate, outer ones slightly longer than inner ones, 3.0–3.5 mm long, 0.8–1.1 mm wide. Stamens 6, longer than tepals, 4.5–5.5 mm long; filaments 3.5–4.2 mm long, 3 times as long as anthers; anthers white, linear, 1–1.3 mm long. Pistil 3.8–4.5 mm long, 1.1–1.3 mm wide; stigmas 0.5–0.7 mm long; style 0.4–0.8 mm long. Capsule ovoid, 2.9–3.0 mm long, 1.0–1.2 mm wide, cuspidate, cross section trigonous. Viviparous flowers 3–5 mm long, 3.5–5.0 mm wide; stamens and pistil usually reduced, inner tepals changed into propagules, 3.0–4.5 mm long. Seeds ellipsoid, 0.5–0.6 mm long, appendages very short, 0.05 mm long.

Distr. China (Yunnan, Sichuan).

*Juncus gonggae* is similar to *J. modicus* N. E. Brown but differs in having the short anthers and the grooved leaves. This species is often proliferous. In subgenus *Alpini*, proliferation has been known in *J. trichophyllus* W. W. Sm., *J. harae* Miyam. & H. Ohba, and *J. dongchuanensis* K. F. Wu. *Juncus trichophyllus* differs from *J. gonggae* in having axillary bulbils on cauline leaves. The normal flowered form of *J. gonggae* was found on mossy rocks with *J. concinnus* D. Don in *Abies* and *Larix* forests from elevations of 3600 to 4300 m. The proliferous form of *J. gonggae* was found only in exposed screes with *J. trachyphyllus* at the margin of *Rhododendron* shrubs.

**24. *Juncus gracilicaulis*** A. Camus in Notul. Syst. (Paris) **1**(10): 279, f. 19, 17–22 (1910). Noltie, Fl. Bhutan **3**(1): 259 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2424 (1994). Wu in Acta Phytotax. Sin. **32**: 463 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 223, f. 54, 4–5 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 181 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000). Wu



and Clemants in Wu and Raven, Fl. China **24**: 62 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 81 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 556 (2003).

[Colour plate 4d; Plate 23; Fig. 27]

Type: China; Yunnan, rochers humides dans les bois de San-tcha-ho (P. J. M. Delavay 3943, 4 Sept. 1889, P-lectotype, designated here).

Perennial, caespitose, 12–20 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.4–0.8 mm in diam., with several longitudinal ridges. Cataphylls 1 or 2 to each culm, stramineous, 1–2 cm long. Leaves grass leaf-like, with several ridges on both sides, cross section of blade flattened, auricles absent; basal and subbasal leaves 1 or 2 to each culm, 5–10 cm long including sheath, 4–6 mm wide, sheath 2–4 cm long; cauline leaf 1 to each culm, 5–12 cm long including sheath, 3–5 mm wide, sheath 2–3 cm long, shorter or longer than culm. Inflorescence terminal, branched, flower heads 2–4, hemispherical, 0.8–1.3 cm in diam., flowers 3–8, ivory-white, peduncle 0.4–4 cm long. Lowest bract grass leaf-like, grass-green, linear-lanceolate, longer than inflorescence, 3–5 cm long, 2–4 mm wide, with several ridges on both sides, cross section flattened; floral bract lanceolate to ovate-lanceolate, 3–6 mm long, 1–3 mm wide; sheathing bract on peduncle lanceolate, 0.2–0.3 mm long, membranaceous. Flowers ivory-white, 6–8 mm long, 1.2–1.5 mm wide, pedicel 0.5–1.0 mm long. Tepals white, lanceolate, outer ones slightly shorter than inner ones, 1.8–2.3 mm long, 0.6–0.8 mm wide; inner ones 2.0–2.8 mm long, 0.6–0.8 mm wide. Stamens 6, longer than tepals, 7–9 mm long; filaments 5.2–6.9 mm long, 6 times as long as anthers; anthers ellipsoid, 0.8–1.1 mm long. Pistil ivory-white, 3–3.5 mm long, 0.6–0.8 mm wide; stigmas 0.5–0.6 mm long; style 1.0–1.3 mm long. Capsule brown, ovoid, 4–6 mm long, 1.5–2 mm wide, rostrate, cross section rounded. Seeds ellipsoid, 0.6–0.8 mm long, appendages 0.4–0.5 mm long.

Distr. India (Punjab), Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan).

*Juncus gracilicaulis* is characterized by having the grass leaf-like leaves and most similar to *J. concinnus* D. Don, but *J. gracilicaulis* has the U-shaped cross section of blades with the bulli-form cells on both surfaces. It grows on mossy rocks from elevations of 2700 to 4500 m.

**25. *Juncus grisebachii*** Buchenau in Bot. Jahrb. Syst. **1**: 109 (1880); in Bot. Jahrb. Syst. **6**: 202 (1885); in Bot. Jahrb. Syst. **12**: 265 (1890); in Bot. Jahrb. Syst. **29**: 236, t. 111 (1900). Hook. f., Fl. Brit. Ind. **6**: 394 (1892). Satake in Hara, Fl. E. Himal.: 402 (1966). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Lu and Zhang in Wu, Fl. Xizang. **5**: 525 (1987). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 72 (1992). Noltie, Fl. Bhutan **3**(1): 257 (1994). Wu in Acta Phytotax. Sin. **32**: 452 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 180 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 52 (2000). Miyamoto in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 237 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 82 (2002). [Colour plate 4c; Plate 24; Fig. 28]

Types: Sikkim; 10000–14000 ft. (J. D. Hooker s. n., K, S, W-syntypes).

*Juncus phaeocarpus* A. M. Lu & Z. Y. Zhang in Acta Phytotax. Sin. **17**: 126, f. 2-1, 5 (1979); in Wu, Fl. Xizang. **5**: 522, f. 290 (1987). Wu in Acta Phytotax. Sin. **32**: 451 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 181, f. 41, 7–10 (1997). Types: Tibet; NeLaMu,

Chang Mu, 3550 m (Y. T. Chang & K. Y. Ling 3285, 11 May 1966, PE-holotype, HSNU-isotype).

Perennial, loosely caespitose, 30–100 cm tall. Rhizomes stoloniferous, horizontally short creeping, 0.5–0.8 mm in diam. Culms erect, grass-green, terete, 1–3 mm in diam., with several longitudinal ridges, cross section rounded. Cataphylls 1 or 2 to each culm, light brown to brown, 1–6 cm long. Leaves light brown to brown, terete, sheathing at base, cross section of blade U-shaped, auricles acute; basal leaves 1 or 2 to each culm or absent, 5–30 cm long including sheath, 0.6–1.6 mm in diam., sheath 2–10 cm long; cauline leaves 2 or 3 to each culm, 10–30 cm long, 0.8–1.3 mm in diam., sheath 3–10 cm long, shorter than culm. Inflorescence terminal, branched, flower heads 1–5, hemispherical, 0.7–1.8 cm in diam., flowers 5–20, cream-white, peduncle 1–4 cm long. Lowest bract grass-green, linear-lanceolate, longer than or sometimes as long as inflorescence, terete, 5–20 cm long; floral bract light brown, lanceolate to ovate-lanceolate, 5–9 mm long, 1.5–2 mm wide, scarious; sheathing bract on peduncle light brown, lanceolate, 0.5–1.5 cm long, membranaceous. Flowers 8–11 mm long, 2–2.5 mm wide, pedicel 1–1.5 mm long. Tepals cream-white, lanceolate, outer ones slightly shorter than inner ones, 4.5–6 mm long, 1.2–1.5 mm wide. Stamens 6, longer than tepals, 6–7.5 mm long; filaments 3.6–4.9 mm long, 1.5 times as long as anthers; anthers yellow, linear-ellipsoid, 2.4–2.6 mm long. Pistil 5.5–7 mm long, 1–1.2 mm wide; stigmas 1–1.5 mm long; style 2–3 mm long. Capsule brown, oblong, as long as tepals, 5–6 mm long, 1.5–1.8 mm wide, mucronate, cross section rounded to trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendages 1.5–1.8 mm long.

Distr. India, Nepal, Sikkim, Bhutan, Assam, China (Xizang, Yunnan).

*Juncus grisebachii* is characterized by having the lowest bract three times as long as the inflorescence and the stoloniferous rhizomes, and similar to *J. concinnus* D. Don and *J. chrysocarpus* Buchenau, but differs in having the filaments 1.5 times as long as the anthers and no bulli-form cells on the leaves. It grows on grassland slopes from elevations of 2400 to 4000 m.

**26. *Juncus harae*** Miyam. & H. Ohba in J. Jap. Bot. **68**: 27, f. 1 (1993). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 67 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 237 (2000). Miyamoto and Ohba in J. Jap. Bot. **77**: 29, f. 4 (2002). Kirschner et al., Juncaceae 2, Fl. World **7**: 110 (2002). [Colour plate 4e; Plates 25 & 26; Fig. 29]

Type: Nepal; Koshi Zone, Sankhuwa Sabha Distr., Sano Pokhari–Khongma, 3850 m (M. Minaki et al. 9020853, 12 Aug. 1990, TI-holotype).

Perennial, caespitose, 3–25 cm tall. Rhizomes horizontally short creeping. Culms ascending, slender, compressed terete, 0.3–0.5 mm in diam., with several longitudinal ridges, cross section compressed oval. Cataphyll 1 to each culm, stramineous, 1.0–1.5 mm long. Leaves grass-green, with several grooves, cross section of blade compressed oval, auricles rounded; basal leaf absent on culm with viviparous flowers, or 1 to each culm with normal flowers, 3–10 cm long including sheath, 0.2–0.4 mm wide, sheath 1.5–4 cm long; cauline leaves absent. Inflorescences with normal flowers pseudolateral, flowers 1 or 2, brown, or inflorescences with 3–7 viviparous flowers. Lowest bract grass-green, longer than inflorescence, 0.5–3.0 cm long, 0.2–0.3 mm wide; floral bract brown,



ovate, 1.5–2 mm long, 1–1.5 mm wide. Flowers normal or viviparous, sometimes mixed. Normal flowers 5–8 mm long, 1.2–1.5 mm wide; pedicel 0.3–0.5 mm long. Tepals brown, ovate-lanceolate, outer ones and inner ones equal in length, 2.8–4 mm long, 1.0–1.3 mm wide. Stamens 6, shorter than tepals, 2.5–2.8 mm long; filaments shorter than anthers, 0.8–0.9 mm long; anthers leather-yellow, linear-ellipsoid, 1.6–1.8 mm long. Pistil 5–8 mm long, 1–1.5 mm wide; stigmas pale yellow, 2.8–3.0 mm long; style 1.5–2.0 mm long. Capsule ovoid, 2.8–3.0 mm long, 1.8–2.2 mm wide, cross section trigonous. Seeds 0.3–0.32 mm long, appendages very short, 0.05 mm long. Viviparous flowers 2.5–3.8 mm long, one inner tepal part transformed into a propagule, inner tepals lanceolate, 1.8–2.5 mm long, 0.5–0.6 mm wide, aristate; stamens and pistil reduced.

Distr. Nepal, Bhutan, China (Yunnan).

*Juncus harae* has both flower forms, normal and viviparous, and the former form is similar to *J. biglumoides* H. Hara and *J. rohtangensis* Goel & Aswal, but it is clearly distinguished from *J. biglumoides* by the equal length tepals and the anthers longer than the filaments, and from *J. rohtangensis* by the filaments twice as long as the anthers and a pale yellow stigma. This species is found on mossy rock cliffs from elevations of 3700 to 4100 m.

**27. *Juncus himalensis*** Klotzsch and Garcke, Bot. Reise Pr. Waldemar: 60, t. 97 (1862). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 227 (1885); in Bot. Jahrb. Syst. **12**: 405 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 234 (1906). Hook. f., Fl. Brit. Ind. **6**: 398 (1892). Brown in J. Linn. Soc., Bot. **36**: 164 (1903). Camus in Notul. Syst. (Paris) **1**(10): 283 (1910). Krecetovicz and Goncarpv in Komarov, Fl. URSS. **3**: 525 (1935). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 522, f. 291 (1987). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 72 (1992). Noltie, Fl. Bhutan **3**(1): 255 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2423 (1994). Wu in Acta Phytotax. Sin. **32**: 465 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 229, f. 56, 1–4 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 238 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 63 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 123 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 560 (2003). [Colour plate 4g; Plate 27; Fig. 30]

Types: Himalayas (Hoffmeister s. n., B, destroyed, W-syntype).

*Juncus schlagintweitii* Buchenau in Nachr. Königl. Ges. Wiss. Göttingen Geschäftl. Mitt. **13**: 255 (1869); in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 229 (1885). Types: Tibet; Prov. Dras, Matai up to the Tsoji Pass (A. & H. Schlagintweit 6668, 14 Oct. 1868, W-syntype). India; Garhwal (A. & H. Schlagintweit 9708, 6 Oct. 1855, W-syntype, not seen).

*Juncus himalensis* Klotzsch var. *schlagintweitii* Buchenau in Bot. Jahrb. Syst. **12**: 406 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 235 (1906). Samuelsson in Acta Horti Gothob. **3**: 71 (1927); in Hand.-Mazz., Symb. Sin. **7**: 1230 (1936). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 522 (1987).

*Juncus sphacelatus* Decne. var. *himalensis* (Klotzsch) Jafri in Fl. Pakistan **138**: 12, f. 2, A–D (1981).

Perennial, loosely caespitose, 15–70 cm tall. Rhizomes stoloniferous, horizontally, short creeping, 0.6–1.8 mm in diam. Culms erect, grass-green, terete, 1.2–2.0 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 2 or 3 to each culm, loosely embracing at base of culm, light brown to stramineous, 0.5–3 cm long. Leaves light brown to grass-green, terete to somewhat flattened, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded, sheathing at base; basal and subbasal leaves 1–3 to each culm, 8–45 cm long including sheath, 0.4–0.8 mm in diam., sheath 1–10 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 4–25 cm long including sheath, 0.4–0.8 mm in diam., sheath 2–5 cm long. Inflorescence terminal, branched, flower heads 2–10, 4–15 mm in diam., flowers 2–10, chestnut-brown, peduncle 0.5–5 cm long. Lowest bract grass-green, linear, longer than or sometimes as long as inflorescence, 5–20 cm long, margin reddish brown to grass-green, cross section U-shaped; floral bract lanceolate, 0.5–1.1 cm long, 1.3–2.5 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 0.5–1.5 cm long, membranaceous. Flowers 6–11 mm long, 2–4.5 mm wide, pedicel 1–5 mm long. Tepals chestnut-brown to light brown, lanceolate, outer ones slightly longer than inner ones or equal in length, 4–8 mm long, 1–2 mm wide. Stamens 6, shorter than tepals, 3.5–8.0 mm long; filaments 2.8–6.0 mm long, 2–3 times as long as anthers; anthers yellow, linear-ellipsoid, 0.7–2 mm long. Pistil 4–5 mm long, 1.2–1.6 mm wide; stigmas 1.4–2.5 mm long; style 1.0–1.5 mm long. Capsule chestnut-brown to brown, oblong, longer than tepals, 6–8 mm long, 2–3 mm wide, mucronate, cross section trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendages 1.5–1.8 mm long.

Distr. Pakistan, Kashmir, India (Punjab, Himachal Pradesh, Uttar Pradesh, Kumaon), Nepal, Sikkim, Bhutan, China (Xizang, Gansu, Yunnan, Sichuan, Shanxi).

*Juncus himalensis* is similar to *J. ganeshii* Miyam. & H. Ohba, *J. pseudocastaneus* Sam., *J. sikkimensis* Hook. f., and *J. sphacelatus* Decne. These species are characterized by having the composite flower heads, cylindrical leaves, chestnut-colored flowers, and stamens shorter than tepals. *Juncus himalensis* has filaments three times as long as anthers and the tepals lanceolate and grows in exposed marshy places from subalpine to alpine with other species, such as *J. sphacelatus* Decne., and *J. thomsonii* Buchenau. This species is widely distributed in the Sino-Himalaya from Pakistan in West Himalaya to Shanxi in SW China through Tibet from elevations of 1750–4000 m.

**28. *Juncus hydrophilus*** Noltie in Edinburgh J. Bot. **51**: 138, f. 2I–O (1994); Fl. Bhutan **3**(1): 260 (1994). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 84, f. 62 (2002). [Fig. 31]

Types: Sikkim; West District, Prek Chhu Bridge below Bakhim, 27°25'N, 88°11'E, 2300 m (D. G. Long, R. J. D. McBeath, H. J. Noltie, & M. F. Watson 771, 27 Jul. 1992, E-holotype, photo, K-isotype).

Perennial, loosely caespitose, 32–40 cm tall. Rhizomes stoloniferous, horizontally short creeping, 1 mm in diam. Culms erect, terete, grass-green. Cataphyll 1 to each culm, 0.7–4 cm long. Leaves grass-green; basal leaves lacking; cauline leaves 3 or 4, grass leaf-like, flattened, longest one 14–17 cm long, 2–3 mm wide; sheath reddish brown, 2.5–



4.0 cm long, without auricle. Inflorescence terminal, branched, flower heads 1–5, 1.5 cm in diam., flowers 4–9, cream-white. Lower bract shorter than inflorescence, bristle-like; floral bract lanceolate, scarious. Tepals unequal, cream, outer ones narrowly lanceolate, 3.5–5.0 mm long, 0.8–1.4 mm wide, acute at apex, keeled, inner ones 4.0–5.3 mm long, 0.9–1.0 mm wide. Stamens 6, longer than tepals; anthers pale yellow, narrowly oblong, 1.4–2.5 mm long. Pistil 5.0–6.5 mm long including style, 1.0–1.5 mm wide; stigmas 0.5–1.0 mm; style 1.5 mm long. Capsule stramineous, shining, very narrowly ovoid, 5–6 mm long, 1.8–2 mm wide. Seeds unknown.

Distr. Nepal, Sikkim, Bhutan.

**29. *Juncus inflexus* L., Sp. Pl.: 326 (1753).** Krecetovicz and Goncarpv in Komarov, Fl. URSS. **3**: 546, t. 29, f. 10 (1935). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Jafri in Fl. Pakistan **138**: 22, f. 22, f. 5f–i (1981). Wu et al., Index Fl. Yunnan. **2**: 2082 (1984). Noltie, Fl. Bhutan **3**(1): 252, f. 24p–q (1994). Wu in Acta Phytotax. Sin. **32**: 442 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 157, f. 35, 1–4 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 238 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 48 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 3, Fl. World **8**: 103, f. 139 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 535 (2003).

[Colour plate 5f; Plate 28; Fig. 32]

Types: Europa australi (UPS, not seen).

*Juncus glaucus* Ehrh. [Beitr. **6**: 83 (1791), nom. nud.] ex Sibth, Fl. Oxon: 113 (1794). Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 324 (1840). Buchenau in Bot. Jahrb. Syst. **1**: 107 (1880); in Bot. Jahrb. Syst. **6**: 199 (1885); in Bot. Jahrb. Syst. **12**: 243 (1890); in Bot. Jahrb. Syst. **36** (Beibl. 82): 18 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 132 (1906). Hook. f., Fl. Brit. Ind. **6**: 393 (1892). Brown in J. Linn. Soc., Bot. **36**: 164 (1903). Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1229 (1936). Satake in Hara, Fl. E. Himal. **2**: 162 (1971). Type: Germany; Hannoverae (F. Ehrhart, LINN-SMITH, not seen).

*Juncus glaucus* Ehrh. var. *leptocarpus* Buchenau in Bot. Jahrb. Syst. **6**: 20 (1885); in Bot. Jahrb. Syst. **12**: 244 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 134 (1906). Samuelsson in Acta Horti Gothob. **3**: 67 (1927). Type: Nepal (Hügel 475, W-holotype).

*Juncus inflexus* var. *leptocarpus* (Buchenau) Z. Y. Zhang in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2417 (1994).

*Juncus inflexus* L. subsp. *austro-occidentalis* K. F. Wu in Fl. Reipubl. Popul. Sin. **13**(3): 261 (1997). Types: China; Sichuan, Shimian (C. C. Hsieh 42386, SZ-holotype, not seen, HSNU, PE-isotypes).

*Juncus jinpingensis* S. Y. Bao in Wu and Wu, Fl. Yunnanica **15**: 804, f. 110, 1–6 (2003). Type: China; Yunnan, Jinping Xian, 1800 m (Sino-Russian Expeditio 1258, 11 May 1956, KUN-holotype).

Perennial, densely caespitose, 50–120 cm tall. Rhizomes horizontally short creeping, 4–7 mm in diam., covered with castaneus scales, internodes very short, culms arising in densely crowded rows. Culms erect, grass-green, terete, 1–3 mm thick, with several longitudinal ridges, pith interrupted spongy, cross section rounded. Cataphylls 2 or 3 to each culm, closely embracing at base of culm, stramineous or light brown apically,

chestnut-brown at base, 1–18 cm long. Leaves cataphylls only, sheathing to culm. Inflorescences pseudolateral, loosely branched, flowers many. Lowest bract appearing as a continuation of culm, 8–30 cm long. Bracteoles 2, ovate to ovate-lanceolate, 0.5–0.8 mm long. Flowers 1.5–2 mm long, 1–1.5 mm wide. Tepals light brown, lanceolate, outer ones longer than inner ones, 1.5–2 mm long, 0.5–0.7 mm wide. Stamens 6, shorter than tepals, 0.5–0.8 mm long; filaments 0.25–0.4 mm long; anthers yellow, linear-ellipsoid, equaling filaments, 0.25–0.4 mm long. Pistil 2–3 mm long, 0.8–1.1 mm wide; stigmas 0.2–0.3 mm long; style 0.1–0.12 mm long. Capsule brown, ellipsoid, longer than tepals, 2–3 mm long, 1.2–1.5 mm wide, acute, mucronate, cross section rounded to trigonous, 3-septate. Seeds brown, ovoid, 0.4–0.5 mm long, appendages very short.

Distr. Pakistan, India (Punjab, Kumaon), Nepal, Sikkim. Bhutan, Assam, Myanmar, China (Yunnan, Sichuan, Shanxi).

*Juncus inflexus* is distributed widely in North Africa, Europe, West Asia, and Sino-Himalaya. This species is characterized by having six stamens and interrupted spongy pith. It grows on wet banks along streams or roads and in flood plains from elevations of 1400 to 3000 m. I have not found *J. inflexus* sympatrically with *J. effusus* L. and *J. setchuensis* Buchenau.

**30. *Juncus khasiensis*** Buchenau in Bot. Jahrb. Syst. **12**: 407 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 235 (1906). Hook. f., Fl. Brit. Ind. **6**: 399 (1892). Brown in J. Linn. Soc., Bot. **36**: 164 (1903). Satake in J. Jap. Bot. **43**: 382 (1968). Lu and Zhang in Wu, Fl. Xizang. **5**: 526 (1987). Noltie, Fl. Bhutan **3**(1): 260 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2424 (1994). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 238 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 89, f. 65 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 539, f. 111, 1–4 (2003).

[Colour plate 5g; Plate 29; Fig. 33]

Types: India; Assam, Khasia, 5000 ft. (C. B. Clarke 45453, Sept. 1885, 1886, W-syntype); loc. cit., Maokadokadok, 5000 ft. (C. B. Clarke 40457, 12 Sept. 1885, K-syntype); loc. cit., Sailankote, 5000 ft. (C. B. Clarke s. n., 22 Oct. 1886, W-syntype); loc. cit., 5500 ft. (C. B. Clarke 45656A, 25 Sept. 1886, K-syntype); loc. cit., 5000–6000 ft. (J. D. Hooker & T. Thomson s. n., K, W-syntypes).

*Juncus nematocaulon* Hook. f., [Fl. Brit. Ind. **6**: 400 (1892), nom. nud.] Icon. Pl. **23**: t. 2234 (1894). Buchenau in Engler, Pflanzenr. (iv. 36) **25**: 236 (1906). Types: India; Assam, Naga Hill, 9900 ft. (C. B. Clarke 41274, 25 Oct. 1885, K-holotype, W-isotype).

Perennial, loosely caespitose, 7–20 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.4–0.5 mm in diam., with longitudinal striae, cross section tetragonous to oval. Cataphylls 1 or 2 to each culm, embracing at base of culm, brown to stramineous, 0.5–2 cm long. Leaves terete, cross section of blade X-shaped, auricles very short; basal or subbasal leaf one to each culm, longer than or sometimes shorter than culm, 4–25 cm long including sheath, sheath 1–4 cm long, 0.3–0.4 mm in diam.; cauline leaves absent. Inflorescence with 1 or 2 flower heads, hemispherical, 4–12 mm in diam., flowers 2–10, cream-white, peduncle 0.5–1.5 cm long. Lowest bract shorter than inflorescence, linear-lanceolate, 0.5–1.5 cm long, scarious; floral bracts lanceolate,



3–5 mm long, 1.3–2 mm wide; sheathing bract on peduncle brown, lanceolate, 3–5 mm long, membranaceous. Flowers 6–8 mm long, 2.5–3 mm wide, pedicel 0.5–0.8 mm long. Tepals cream-white, lanceolate, outer ones and inner ones equal in length, 3.5–5 mm long, 1–1.2 mm wide. Stamens 6, longer than tepals, 5.5–6 mm long; filaments 4.2–4.5 mm long, 3 times as long as anthers; anthers yellow, linear-ellipsoid, 1.3–1.5 mm long. Pistil 3–4 mm long, 0.5–0.9 mm wide; stigmas 0.6–0.7 mm long; style 1.2–1.5 mm long. Capsule light brown to stramineous, oblong, longer than tepals, 6–7 mm long, 2–2.2 mm wide, cross section rounded to trigonous. Seeds ellipsoid, 0.5–0.6 mm long, appendages 0.4–0.5 mm long.

Distr. Nepal, Sikkim, Bhutan, Assam, China (Yunnan), Thailand.

*Juncus khasiensis* is characterized by having the X-shaped cross section of leaf blade and culm, and similar to *J. concinnus* D. Don but differs in having the cauline leaves and bulliform cells. It grows on mossy banks or tree trunks from elevations of 1500 to 4500 m. This species was recorded for the first time from Thailand (J. F. Maxwell 94-1016, 10 Sept. 1994, A).

**31. *Juncus kingii*** Rendle in J. Bot. **44**: 45 (1906). Buchenau in Engler, Pflanzenr. (iv. 36) **25**: 265 (1906). Camus in Notul. Syst. (Paris) **1**(10): 275 (1910). Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1237 (1936). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 511 (1987). Noltie, Fl. Bhutan **3**(1): 266 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2419 (1994). Wu in Acta Phytotax. Sin. **32**: 459 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 200, f. 47, 1–2 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 238 (2000); in J. Jap. Bot. **78**: 154 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 56 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 95 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 547 (2003). [Colour plate 5e; Plate 30; Fig. 34]

Types: Tibet; Kang-me, two days north of Phari (King's Coll. s. n., 3 Aug. 1882, BM-lectotype, designated by Kirschner in 2002, K-isolectotype).

*Juncus longibracteatus* A. M. Lu & Z. Y. Zhang in Acta Phytotax. Sin. **17**: 126, f. 5–8 (1979); in Wu, Fl. Xizang. **5**: 513, f. 284 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2419 (1994). Type: Tibet; Gyi-Lung, 4150 m (Qing-Zang Exped., Veget. Group Q113-1, PE-holotype).

Perennial, loosely caespitose, 10–40 cm tall. Rhizomes stoloniferous, horizontally short creeping, 0.5–0.8 mm in diam. Culms erect, grass-green, terete, 0.6–1.3 mm in diam., smooth, cross section rounded. Cataphylls inconspicuous, 1–6 to each culm, stramineous, 0.5–4 cm long. Leaves grass-green, terete, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded; basal leaf one to each culm, 6–25 cm long including sheath, 0.7–1.5 mm in diam., sheath 1.5–8 cm long; cauline leaves absent. Inflorescence with a single flower head, subglobose, 1.3–2.3 cm in diam., flowers 10–35, cream-white. Lowest bract grass-green, terete, linear, longer than inflorescence, 1.5–5(–10) cm long, cross section rounded; floral bract lanceolate to linear-lanceolate, 0.5–1.5 cm long, 1–2.0 mm wide, scarious; sheathing bract absent. Flowers 7–10 mm long, 2–3 mm wide, pedicel

0.5–1 mm long. Tepals cream-white, lanceolate to linear-lanceolate, outer ones and inner ones equal in length, 4–6 mm long, 1–1.2 mm wide. Stamens 6, longer than tepals, 7–9 mm long; filaments 5–6.5 mm long, 2.5 times as long as anthers; anthers yellow, linear-ellipsoid, 2–2.5 mm long. Pistil 6–8 mm long, 1–1.5 mm wide; stigmas 1.5–1.8 mm long; style 2.3–2.5 mm long. Capsule chestnut-brown, oblong, as long as tepals, 4.8–5 mm long, cuspidate, cross section trigonous. Seeds ellipsoid, 0.6–0.7 mm long, appendages 0.1 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan).

*Juncus kingii* is characterized by the lowest bract longer than the inflorescence and the lack of the cauline leaf. Absence or presence of the cauline leaf is variable in *J. allioides* Franch. and *J. benghalensis* Kunth, however, this character in *J. kingii* is stable. *Juncus kingii* is similar to *J. allioides* but differs in having the stoloniferous rhizomes and the cylindrical lowest bract. It grows on grassland slopes from elevations of 2545 to 5000 m.

**32. *Juncus leptospermus*** Buchenau in Bot. Jahrb. Syst. **6**: 203 (1885); in Bot. Jahrb. Syst. **12**: 339 (1890); in Bot. Jahrb. Syst. **36** (Beibl. 82): 19 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 197, f. 95 (1906). Hook. f., Fl. Brit. Ind. **6**: 396 (1892). Camus in Notul. Syst. (Paris) **1**(10): 275 (1910). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Noltie, Fl. Bhutan **3**(1): 255 (1994). Wu in Acta Phytotax. Sin. **32**: 453 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 186, f. 43, 3–4 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 238 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 53 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 227 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 543, f. 117, 1–5 (2003).

[Colour plate 5a; Plate 31; Fig. 35]

Types: India; Assam, Khasia, 4000–6000 ft. (J. D. Hooker & T. Thomson s. n., K-syntype); East Bengal (Griffith 5459, W, L, P-syntypes).

Perennial, ascending, 20–40 cm tall. Rhizomes horizontally short creeping. Culms erect or ascending, 0.7–1.5 mm in diam. Leaves grass-green, terete, cross section of blade rounded to oval, auricles rounded; basal leaves 1 or 2 to each culm, sometimes absent, 4–8 cm long including sheath, 0.4–0.75 mm wide, sheath 1–3 cm long; cauline leaves 1–4 to each culm, shorter than culm, 5–13 cm long including sheath, sheath 2–4 cm long, 0.5–0.65 mm wide. Inflorescence terminal, loosely branched, flower heads many, 3–5 mm in diam., flowers 2–6, grass-green. Lowest bract grass-green, linear, shorter than inflorescence, 2–5 cm long; floral bract ovate to lanceolate, 1–2 mm long, 0.4–0.8 mm wide, scarious; sheathing bract on peduncle lanceolate to obovate, 5–10 mm long, membranaceous. Flowers 3–4 mm long, 1.0–1.5 mm wide. Tepals grass-green to brown, lanceolate to linear-lanceolate, outer ones sometimes slightly longer than inner ones or equal in length, 2.5–3.5 mm long, 0.6–0.8 mm wide. Stamens 3, shorter than tepals, 2.0–2.5 mm long; filaments longer than anthers, 1.6–2 mm long; anthers yellow, linear-ellipsoid, 0.4–0.5 mm long. Stigmas 0.2–0.3 mm long; style 0.1–0.15 mm long. Capsule brown, oblong, slightly longer than tepals, 2.8–3 mm long, 0.8–1 mm wide, cross section 3-keeled, appendages very short.

Distr. India (Himachal Pradesh), Nepal, Bhutan, Assam, China (Xizang, Yunnan).

*Juncus leptospermus* is similar to *J. articulatus* L. and *J. wallichianus* Laharpe but



differs from *J. articulatus* in having three stamens and from *J. wallichianus* in having the shorter tepals (2.5–3.5 mm long) than those of *J. wallichianus* (3–4 mm long). It grows in marshy places in the upper elevation of 2100 m.

**33. *Juncus leucanthus*** Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 318 (1840). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 218 (1885); in Bot. Jahrb. Syst. **12**: 395 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 228 (1906). Hook. f., Fl. Brit. Ind. **6**: 397 (1892). Camus in Notul. Syst. (Paris) **1**(10): 278 (1910). Satake in Hara, Fl. E. Himal.: 403 (1966); in Fl. E. Himal. **2**: 163 (1971); in Ohashi, Fl. E. Himal. **3**: 130 (1975); in J. Jap. Bot. **43**: 382 (1968). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Lu and Zhang in Wu, Fl. Xizang. **5**: 514, f. 286 (1987). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 72 (1992). Noltie, Fl. Bhutan **3**(1): 264, f. 25e (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2420 (1994). Wu in Acta Phytotax. Sin. **32**: 461 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 212, f. 50, 1–3 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 182 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 239 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 59 (2000). Li et al., Fl. Gaoligong Mts.: 1121 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 92, f. 65E (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 551 (2003). [Colour plate 5b; Plate 32; Fig. 36]

Types: N. W. India (J. F. Royle s. n., LIV-lectotype, designated by J. Kirschner in 2002, not seen, K, LE, W-isolectotypes).

*Juncus leucanthus* Royle ex D. Don var. *alpinus* Buchenau in Bot. Jahrb. Syst. **12**: 396 (1890). Types: Sikkim; Jongri, 13000 ft. (C. B. Clarke 2617, 15 Oct. 1875, K-holotype, W-isotype).

*Juncus tanguticus* Sam. in Hand.-Mazz., Symb. Sin. **7**: 1233 (1936). Wu in Acta Phytotax. Sin. **32**: 461 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 213, f. 50, 8–11 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 59 (2000). Types: China; Shenxi [Shaanxi], Hwan-tsn-shan (G. Gairaldi 7242, 10 Jul. 1900, B-holotype, destroyed, S-isotype).

*Juncus leucomelus* auct. non Royle ex D. Don: Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 72 (1992).

*Juncus membranaceus* auct. non Royle ex D. Don: Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992).

Perennial, caespitose, 10–30 cm tall. Rhizomes horizontally short or long creeping. Culms erect, grass-green, terete, 0.4–0.7 mm in diam., smooth, cross section rounded. Cataphylls 2 or 3 to each culm, chestnut-brown, shining, 1–4 cm long, aristate. Leaves grass-green, terete, cross section of blade rounded to oval; basal leaf usually absent; cauline leaves usually 2 to each culm, shorter than culm; lower cauline leaves 4–10 cm long including sheath, 0.5–0.8 mm wide, sheath 1–4 cm long, auricles rounded, upper ones 3–5 cm long including sheath, 0.3–0.4 mm wide, sheath 1–2 cm long, auricles very short. Inflorescence with a single flower head, hemispherical, 0.5–2 cm in diam., flowers 5–15, cream-white. Lowest bract chestnut-brown, lanceolate to ovate-lanceolate, as long as inflorescence, 0.4–1.0 cm long, scarious; floral bract chestnut-brown, lanceolate, 3–8 mm long, 2–3 mm wide, scarious; sheathing bract absent. Flowers 6–10 mm long, 2–2.5 mm wide, pedicel 0.8–1.5 mm long. Tepals cream-white, lanceolate to oblong-lanceolate,

outer ones and inner ones equal in length, 3–4.5 mm long, 0.8–1.2 mm wide. Stamens 6, longer than tepals, 6–9 mm long; filaments chestnut-brown, 4–6 mm long, twice as long as anthers: anthers yellow, linear-ellipsoid, 2–3 mm long. Pistil 3–4 mm long, 0.8–1 mm wide; stigmas 0.5–1 mm long; style 1.5–3 mm long. Capsule chestnut-brown, oblong, as long as tepals, 4.5–5 mm long, 1.3–1.5 mm wide, cross section trigonous. Seeds ellipsoid, 0.7–0.8 mm long, appendages very short, 0.1 mm long.

Distr.: India (Punjab), Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan, Shaanxi).

*Juncus leucanthus* is similar to *J. allioides* Franch. and *J. cephalostigma* Sam. but differs from *J. allioides* in having chestnut-brown, shiny cataphylls and from *J. cephalostigma* in having the auricles on the cauline leaf. *Juncus cephalostigma* has no auricle on the cauline leaf. It grows on grassland or scree slopes from elevations of 2000 to 4500 m.

**34. *Juncus longiflorus*** (A. Camus) Noltie in Edinburgh J. Bot. **51**: 134 (1994). Miyamoto and Ohba in J. Jap. Bot. **74**: 76, f. 3 (1999); in J. Jap. Bot. **77**: 34 (2001). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 183 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 104 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 60 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 126, f. 76 (2002).

[Colour plate 5c, d; Plate 33; Fig. 37]

*Juncus sikkimensis* Hook. f. var. *longiflorus* A. Camus in Notul. Syst. (Paris) **1**(10): 283, f. 19, 23 (1910). Bao in Wu and Wu, Fl. Yunnanica **15**: 557 (2003).

Type: China; Yunnan, lieux humides oupeu ombragés du Tsang-chan (Cang shan), 4000 m (P. J. M. Delavay 2806, 27 Jul. 1887, P-lectotype, designated by H. Noltie in 1994a).

*Juncus sikkimensis* Sam. in Hand.-Mazz., Symb. Sin. **7**: 1232 (1936), pro parte.

*Juncus sikkimensis* Hook. f. var. *helvolus* K. F. Wu in Acta Phytotax. Sin. **32**: 461 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 217 (1997). Bao in Wu and Wu, Fl. Yunnanica **15**: 558 (2003). Types: China; Yunnan, Deqin, 3800 m (K. M. Feng 6594, 13 Aug. 1940, PE-holotype, KUN-isotype).

*Juncus fugongensis* S. Y. Bao in Wu and Wu, Fl. Yunnanica **15**: 805, f. 112, 1–5 (2003). Type: China; Yunnan, Bijiang, Biluoxueshan, 3500–3700 m (Nujiandiaochoadui 0882, 18 Jun. 1978, KUN-holotype).

Perennial, densely caespitose, 20–50 cm tall. Rhizomes densely short branched and clustered. Culms ascending, densely tufted, grass-green, terete, 0.5–0.8 mm in diam., smooth, cross section rounded. Cataphylls 3–6 to each culm, shining yellowish brown, 3.0–4.0 cm long, acute. Leaves grass-green, terete, cross section of blade oval, auricles rounded; basal or subbasal leaf one to each culm, shorter than culm, 10–30 cm long including sheath, 0.4–0.7 mm in diam., sheath 3–4 cm long; leaves on sterile shoots with a blade, 25–70 cm long, 0.3–0.6 mm in diam., sheath same as long as basal one. Inflorescence terminal, flower head solitary, flowers 3–5, chestnut-brown. Lowest bract chestnut-brown, linear-lanceolate, longer than inflorescence, 2.5–3.7 cm long, 5.0–9.0 mm wide; flora bract lanceolate to linear-lanceolate, 1.3–2.0 cm long, 4–6 mm wide, scarious; sheathing bract absent. Flowers 8–15 mm long, 2.2–3.5 mm wide, pedicel 0.5–5.0 mm long. Tepals chestnut-brown, lanceolate, outer ones longer than inner ones, 5.5–



9.4 mm long, 1.5–1.8 mm wide, inner ones 5.0–8.0 mm long, 1.1–1.6 mm wide. Stamens 6, shorter than tepals, outer ones 2.8–3.2 mm long, inner ones 2.6–3.0 mm long; filaments 0.8–1.0 mm long, shorter than anthers; anthers leather-yellow, linear-ellipsoid, 1.6–2.0 mm long. Pistil 6.0–8.5 mm long, 1–1.4 mm wide; stigmas 3.3–4.5 mm long; styles 3.0–4.0 mm long. Capsule brown, obovoid, slightly shorter than tepals, 7–8 mm long, 2.0–2.5 mm wide, cross section trigonous. Seeds ellipsoid, 0.7–0.8 mm long, appendages 0.3–0.4 mm long.

Distr. China (Xizang, Yunnan).

*Juncus longiflorus*, characterized by the culms densely tufted, is similar to *J. rohtangensis* Goel & Aswal and *J. sikkimensis* Hook. f. but differs in having the leaves on sterile shoots which are longer than or sometimes same as long as the inflorescence, the shining yellowish brown basal sheaths, and no sheath-like bract. This is often misidentified as most similar *J. sikkimensis*, especially for fragmental or incomplete specimens. *Juncus sikkimensis* var. *helvolus* K. F. Wu was described based on a specimen collected in Deqin, but it is identical with *J. longiflorus*.

*Juncus longiflorus* grows in grassland on exposed slopes near ridges from elevations of 3400 to 4400 m, while *J. pseudocastaneus* (Lingelsh.) Sam. and *J. sikkimensis* grow in bogs or humid places by creeks.

**35. *Juncus longistamineus*** A. Camus in Notul. Syst. (Paris) 1(10): 277, f. 19, 24–26 (1910). Samuelsson in Hand.-Mazz., Symb. Sin. 7: 1235 (1936). Wu et al., Index Fl. Yunnan. 2: 2083 (1984). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2420 (1994). Wu in Acta Phytotax. Sin. 32: 460 (1994); Fl. Reipubl. Popul. Sin. 13(3): 204, f. 48, 1–3 (1997). Wu and Clemants in Wu and Raven, Fl. China 24: 57 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 133 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 548 (2003). [Plate 34; Fig. 38]

Type: China; Tibet oriental [Yunnan], Tsékou, mont de Tsen-tchrou, sur les rochers (J. A. Soulié 1113, 20 Sept. 1895, P-lectotype, designated by F. Miyamoto in Kirschner et al., Juncaceae 2, Fl. World 7: 133, 2002).

Perennial, caespitose, 10–13 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.3–0.5 mm in diam., with several longitudinal striae, cross section compressed oval. Cataphylls 1 or 2 to each culm, light brown to stramineous, 3–5 mm long. Leaves grass-green, compranately terete, with several longitudinal striae, cross section of blade oval, auricles rounded; basal leaves 1 or 2 to each culm, 5–10 cm long including sheath, 0.6–0.7 mm wide, sheath 1–4 cm long; cauline leaves absent. Inflorescence with a single flower head, 4–7 mm in diam., flowers 1 or 2, ivory-white. Lowest bract linear-lanceolate, shorter than inflorescence, 5–7 mm long; floral bract pale brown, lanceolate, 3–6 mm long, 0.7–1 mm wide; sheathing bract absent. Flowers 8–12 mm long, 3–5 mm wide, pedicel 0.5–0.8 mm long. Tepals ivory-white, linear-lanceolate, outer ones slightly shorter than inner ones or equal in length, 4–5 mm long, 0.7–0.8 mm wide. Stamens 6, longer than tepals, 6–7 mm long; filaments 4–4.5 mm long, twice as long as anthers; anthers white, linear-ellipsoid, 2–2.5 mm long. Pistil ivory-white, 4–5.5 mm long, 1.2–1.5 mm wide; stigmas 0.8–1 mm long; style 1–1.2 mm long. Capsule light brown, oblong, 5–5.5 mm long, 1.5–2 mm wide, mucronate, cross section trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendages 0.4 mm long.

Distr. China (Yunnan).

*Juncus longistamineus* is similar to *J. potaninii* Buchenau but differs in having the long style (1–1.2 mm long) and the filaments twice as long as the anthers. *Juncus potaninii* has the short style (0.2–0.4 mm long) and the filaments 3 to 4 times as long as the anthers. This species is restricted in Yunnan Province in China from elevations of 3600 to 3900 m.

**36. *Juncus luzuliformis*** Franch., Nouv. Arch. Mus. Hist. Nat., ser. 2, **10**: 99 (1887). Buchenau in Bot. Jahrb. Syst. **12**: 204 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 227 (1906). Brown in J. Linn. Soc., Bot. **36**: 164 (1903). Camus in Notul. Syst. (Paris) **1**(10): 277 (1910). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 183 (1999). Wu and Clemants in Wu and Raven, Fl. China **24**: 57 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 133, f. 69 (2002). [Plate 35; Fig. 39]

Types: Tibet oriental; Provce de Moupine (M. l'Abbé David s. n., Aug. 1869, P-holotype, W-isotype).

Perennial, caespitose, 5–20 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.2–0.3 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 1 to 2 to each culm, light brown to stramineous, shining, 1.5–2 cm long. Leaves grass-green, compressedly terete, cross section oval to rounded, auricles rounded; basal leaves 1 or 2 to each culm, sometimes longer than culm, 10–25 cm long including sheath, 0.6–0.85 mm wide; sheath 1–1.5 cm long; cauline leaf one to each culm, shorter than culm, 1.5–3 cm long including sheath, 0.5–0.6 mm wide, sheath 1–1.5 mm long. Inflorescence cymose, lateral branches 1–3, flower solitary to each branch, yellowish white. Lowest bract shorter than inflorescence, 1–1.5 mm long, bristle; floral bract ovate-lanceolate to ovate, 1–2 mm long, 0.6–1.3 mm wide; sheathing bract absent. Flowers yellowish white, 6–7.5 mm long, 2–2.5 mm wide, sessile. Tepals yellowish white, narrowly lanceolate to lanceolate, outer ones and inner ones equal in length, 3.5–5 mm long, 0.8–1 mm wide. Stamens 6, slightly longer than or as long as tepals, 4–5 mm long; filaments 2.6–3.2 mm long, 1.5–1.8 times as long as anthers: anthers white, linear-ellipsoid, 1.4–1.8 mm long. Pistil yellowish white, 4.5–5.5 mm long, 1–1.3 mm wide; stigmas 0.5–0.7 mm long; style 2–2.5 mm long. Capsule brown, ovoid, slightly longer than tepals, 4.5–5 mm long, 1.5–1.8 mm wide, rostrate, cross section trigonous. Seeds ellipsoid, 0.5–0.6 mm long, appendages 0.2 mm long.

Distr. China (Xizang, Yunnan, Sichuan, Shaanxi, Hubei).

*Juncus luzuliformis* is similar to *J. potaninii* Buchenau but differs in having the cymose and the stamens same as long as tepals. It grows on mossy rocks afrom elevations of 1750 to 3450 m. *Juncus potaninii* has the terminal inflorescence sometimes branched and the stamens longer than the tepals.

**37. *Juncus membranaceus*** Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 320 (1840). Buchenau in Bot. Jahrb. Syst. **6**: 220 (1885); in Bot. Jahrb. Syst. **12**: 397 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 229 (1906). Hook. f., Fl. Brit. Ind. **6**: 397 (1892). Satake in Hara, Fl. E. Himal.: 403 (1966). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 95 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 85 (1978). Jafri in Fl. Pakistan **138**: 10, f. 6a–b2 (1981). Lu and Zhang in Wu, Fl. Xizang. **5**: 514



(1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2422 (1994). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 206 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 58 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 89 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 549 (2003). [Colour plate 6a; Plate 36; Fig. 40]

Types: N. W. India (Royle s. n., LIV-holotype, not seen, W-isotype).

*Juncus hoffmeisteri* Klotzsch in Klotzsch and Garcke, Bot. Ergebn. Reise Waldemar: 60 (1862). Type: Himalaya (Hoffmeister, B, destroyed); Klotzsch and Garcke, Bot. Ergebn. Reise Waldemar: Plate 98 (1862).

*Juncus concinnus* Royle ex D. Don var. *turbidus* Buchenau in Nachr. Königl. Ges. Wiss. Göttingen Geschäftl. Mitt. **13**: 252 (1869); in Bot. Jahrb. Syst. **12**: 407 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 235 (1906). Types: Tibet, Prov. Tsans Kar, Sulle to Padum (Schlaginweit 6700, 22–24 Jun. 1856, B, destroyed, W-syntype).

Perennial, loosely caespitose, 15–35 cm tall. Rhizomes stoloniferous, horizontally, 0.4–0.5 mm in diam. Culms erect, grass-green, terete, 0.8–1.2 mm in diam., with several longitudinal striae, cross section rounded to oval. Cataphyll inconspicuous, one or absent, light brown to stramineous, 1–2 cm long. Leaves grass-green, terete, with a groove on adaxial side, cross section of blade U-shaped, auricles rounded; basal and subbasal leaves 1 or 2 to each culm, 3–12 cm long including sheath, 0.4–0.7 mm in diam., sheath 1–5 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 4–9 cm long including sheath, 0.3–0.5 mm in diam., sheath 1.5–4 cm long. Inflorescence with a single flower head, hemispherical, 1–2 cm in diam., flowers 6–12, cream-white. Lowest bract light brown, lanceolate to ovate-lanceolate, as long as inflorescence, 0.8–1.2 cm long, scarious; floral bract lanceolate, 5–8 mm long, 1.5–2.0 mm wide, scarious; sheathing bract absent. Flowers 8–10 mm long, 2–2.5 mm wide, pedicel 2–2.5 mm long. Tepals cream-white, oblong-lanceolate, outer ones slightly shorter than inner ones or equal in length, 4–5 mm long, 1.2–1.5 mm wide. Stamens 6, longer than tepals, 6–7 mm long; filaments 4.5–5.3 mm long, 3 times as long as anthers: anthers yellow, linear-ellipsoid, 1.5–1.7 mm long. Pistil 4–5 mm long, 0.8–1 mm wide; stigmas 1.3–1.5 mm long; style 0.1–0.2 mm long. Capsule chestnut-brown to brown, oblong, longer than tepals, 5.5–6.5 mm long, 2.5–2.7 mm wide, mucronate, cross section rounded. Seeds ellipsoid, 0.5–0.6 mm long, appendages 1.4–1.6 mm long.

Distr. Afghanistan, Pakistan, Karakoram, Kashmir, India (Punjab, Uttar Pradesh, Kumaon), Nepal, China (Xizang).

*Juncus membranaceus* is similar to *J. allioides* Franch. but differs in having the stoloniferous rhizomes and the short style 0.1–0.2 mm long. It grows in glasslands along streams from elevations of 2400 to 4000 m. This species is distributed mainly in West Himalaya.

**38. *Juncus milashanensis*** A. M. Lu & Z. Y. Zhang in Acta Phytotax. Sin. **17**: 127, f. 2, 6–10 (1979); in Wu, Fl. Xizang **5**: 520, f. 290 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2422 (1994). Wu in Acta Phytotax. Sin. **32**: 462 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 217 (1997). Miyamoto in J. Jap. Bot. **74**: 78, f. 4 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 183 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 61

(2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 115, f. 73 (2002). [Colour plate 6b; Plate 37; Fig. 41]

Type: Tibet; Mi-La Shan, 5200 m (Y. T. Chang & K. Y. Long 2734, 16 Sept. 1965, PE-holotype).

Perennial, loosely caespitose, 5–25 cm tall. Rhizomes long creeping with scale-like leaves, sometimes densely branched and clustered, 1.0–2.0 mm in diam. Culms erect or oblique, terete, 1–3 mm in diam., with several longitudinal ridges, cross section rounded. Cataphylls 3 or 4 to each culm, loosely embracing at base of culm, brown, 1–3 cm long, sometimes with fimbriate old leaves at base. Leaves grass leaf-like, blade margin entire, cross section of blade flattened, with several longitudinal striae on abaxial side, auricles absent; basal leaves 2 or 3 to each culm, 1.0–6.0 cm long including sheath, 0.8–3.0 mm wide, sheath 0.5–3.0 cm long; cauline leaves absent or one to each culm, shorter than culm, 1.0–4.0 cm long including sheath, 2.0–3.0 mm wide, sheath 0.5–1 cm long. Inflorescence with 1 or 2 (or 3) flower heads, 0.8–2.0 cm in diam., flowers 4–10, chestnut-brown, peduncle 0.5–1.5 cm long. Lowest bract grass leaf-like, grass-green with chestnut-brown base, linear-lanceolate, longer than or sometimes same as long as inflorescence, 1.0–4.5 cm long, 2.3–4.0 mm wide, flattened, with many grooves on abaxial side; floral bract linear-lanceolate to lanceolate, 0.5–4.5 cm long, 2.0–4.0 mm wide; sheathing bract on peduncle lanceolate, 0.5–1.0 cm long, membranaceous. Flowers 10–15 mm long, 2.5–3.5 mm wide, pedicel 0.6–4.5 mm long. Tepals chestnut-brown, ovate-lanceolate, outer ones slightly shorter than inner ones, 4.5–7.7 mm long, 0.8–1.3 mm wide, inner ones 5.0–8.0 mm long, 0.9–1.4 mm wide. Stamens 6, shorter than tepals, 2.7–4.5 mm long; filaments 0.9–1.5 mm long; anthers leather-yellow, linear-ellipsoid, 1.8–3.0 mm long, twice longer than filaments. Pistil 4.5–6.2 mm long, 0.8–1.2 mm wide; stigmas red, 3.0–4.0 mm long; style 1.5–2.2 mm long. Capsule ovoid, slightly longer than tepals, 6–7 mm long, 2–2.5 mm wide, cuspidate, cross section trigonous. Seeds ellipsoid, 0.5–0.6 mm long, appendages 0.2–0.3 mm long.

Distr. China (Xizang, Yunnan, Sichuan).

*Juncus milashanensis* is similar to *J. amplifolius* A. Camus, *J. nepalicus* Miyam. & H. Ohba, and *J. pseudocastaneus* (Lingelsh.) Sam., and these species have often been confused. *Juncus milashanensis* differs from those in having the flattened, abaxially multi-grooved, grass leaf-like leaves, the anthers longer than the filaments, and the red-coloured stigmas. *Juncus milashanensis* grows on open scree slopes from elevations of 4550 to 4800 m. Lu and Zhang (1979) described this species having erect rhizomes, but actually the rhizomes are creeping.

Although this species has been reported only from Tibet, I found it around Wuming Shan and Gongga Shan in Sichuan province. Zhang and Lu (1994) listed *J. milashanensis* in Yunnan province with reference to a specimen collected in Yangbi (Zhang & Lu 1206), but this specimen is identical with *J. concinnus* D. Don.

**39. *Juncus minimus*** Buchenau in Bot. Zeitung (Berlin) **25**: 145 (1867); in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 209 (1885); in Bot. Jahrb. Syst. **12**: 412 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 232, f. 109 (1906). Hook. f., Fl. Brit. Ind. **6**: 400 (1892). Samuelsson in Hand.-Mazz., Symb. Sin. **7**: 1230 (1936). Hara et al., Enum. Flow. Pl. Nepal **1**: 85 (1978). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Lu and Zhang in Wu, Fl.



Xizang. **5**: 517, f. 288 (1987). Miyamoto and Ohba in Ohba and Akiyama, *Alp. Fl. Jaljale Him.*: 73 (1992). Noltie, *Fl. Bhutan* **3**(1): 261 (1994). Zhang and Lu in Wang et al., *Vasc. Pl. Hengduan Mts.* **2**: 2419 (1994). Wu in *Acta Phytotax. Sin.* **32**: 461 (1994); *Fl. Reipubl. Popul. Sin.* **13**(3): 216, f. 51, 5–7 (1997). Miyamoto in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **25**: 183 (1999); in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **26**: 105 (2000). Wu and Clemants in Wu and Raven, *Fl. China* **24**: 60 (2000). Li et al., *Fl. Gaoligong Mts.*: 1122 (2000). Press et al., *Ann. Check. Fl. Pl. Nepal*: 150 (2000). Kirschner et al., *Juncaceae 2, Fl. World* **7**: 116, f. 69E–F (2002). Bao in Wu and Wu, *Fl. Yunnanica* **15**: 553 (2003). [Colour plate 6d; Plate 38; Fig. 42]

Types: Sikkim; 16000–18000 ft. (J. D. Hooker s. n., K, W-syntypes).

*Juncus unifolius* A. M. Lu & Z. Y. Zhang in *Acta Phytotax. Sin.* **17**: 125, f. 1–4 (1979). Wu in *Acta Phytotax. Sin.* **32**: 461 (1994); *Fl. Reipubl. Popul. Sin.* **13**(3): 215, f. 51, 8–10 (1997). Wu and Clemants in Wu and Raven, *Fl. China* **24**: 60 (2000). Type: Tibet; Za-Yul, 4250 m (F. W. Chang & D. Cheng 1525, 13 Aug. 1973, PE-holotype).

Perennial, densely caespitose, 2–8 cm tall. Rhizomes densely short branched and clustered. Culms erect, grass-green, terete, 0.2–0.6 mm in diam., with several longitudinal deep striae, cross section compressedly oval. Cataphylls inconspicuous. Leaves grass leaf-like, blade margin entire, cross section of blade flattened, auricle absent; basal and subbasal leaves 1–3 to each culm, 1–5 cm long including sheath, 1.5–5.5 mm wide; sheath 0.5–2 cm long; cauline leaf one to each culm or absent, 2.5–4 cm long including sheath, 2–3 mm wide, sheath 0.8–1 cm long. Inflorescence with a single flower head, hemispherical, 0.4–1.2 cm in diam., flowers 1–7, brown. Lowest bract grass leaf-like, grass-green, linear-lanceolate, longer than or sometimes as long as inflorescence, 0.5–1.5 cm long; floral bract linear-lanceolate to lanceolate, 4–8 mm long, 1.2–1.8 mm wide, scarious; sheathing bract absent. Flowers 4–8 mm long, 3–4 mm wide, pedicel 0.5–2.5 mm long. Tepals brown to light brown, lanceolate, outer ones slightly shorter than inner ones or equal in length, 4–6 mm long, 0.6–0.8 mm wide. Stamens 6, as long as tepals, 3–3.5 mm long; filaments 2.5–3.0 mm long, 5 times as long as anthers; anthers cream-white, ellipsoid, 0.4–0.6 mm long. Pistil 3–4 mm long, 1–1.5 mm wide; stigmas 1.2–1.5 mm long; style 0.5–0.7 mm long. Capsule chestnut-brown, obovoid, as long as tepals, 4–5 mm long, 1.8–2 mm wide, mucronate, cross section trigonous. Seeds ellipsoid, 0.4–0.5 mm long, appendages 0.3–0.5 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Xizang, Yunnan).

*Juncus minimus* is similar to *J. nepalicus* Miyam. & H. Ohba but differs in having the filaments five times as long as the anthers, short style (0.5–0.7 mm long), and mucronate capsule. *Juncus nepalicus* has the filaments three times as long as the anthers, the 1.5–2 mm long style, and the cuspidate capsule. It grows on exposed scree slopes from elevations of 4200 to 5090 m.

**40. *Juncus modicus*** N. E. Br. in *J. Linn. Soc., Bot.* **34**: 165 (1903). Buchenau in *Bot. Jahrb. Syst.* **36** (Beibl. 82): 19 (1905); in Engler, *Pflanzenr.* (iv. 36) **25**: 231 (1906). Camus in *Notul. Syst. (Paris)* **1**(10): 278 (1910). Zhang and Lu in Wang et al., *Vasc. Pl. Hengduan Mts.* **2**: 2421 (1994). Wu in *Acta Phytotax. Sin.* **32**: 460 (1994); *Fl. Reipubl. Popul. Sin.* **13**(3): 209, f. 50, 6–7 (1997). Miyamoto in Akiyama et al., *Bull. Natn. Sci. Mus., Tokyo, B*, **25**: 183 (1999). Wu and Clemants in Wu and Raven, *Fl. China* **24**: 59

(2000). Press et al., *Ann. Check. Fl. Pl. Nepal*: 150 (2000). Kirschner et al., *Juncaceae* 2, *Fl. World* 7: 109 (2002). Bao in Wu and Wu, *Fl. Yunnanica* 15: 550 (2003).

[Colour plate 6e; Plate 39; Fig. 43]

Types: China; Hupeh [Hubei], Fang, 8000–9000 ft. (A. Henry 6854, K, P-syntypes); loc. cit. (A. Henry 6868A, K, W-syntypes).

Perennial, caespitose, 10–40 cm tall. Rhizomes horizontally short or long creeping. Culms erect, grass-green, terete, 0.3–0.6 mm in diam., with several longitudinal ridges, cross section of blade oval. Cataphylls 1 or 2 to each culm, chestnut-brown, shining, 1–3 cm long. Leaves terete, with several longitudinal ridges, cross section compressedly oval, auricles rounded, elongated; basal leaf absent; lower cauline leaf one to each culm, 5–10 cm long including sheath, 0.4–0.7 mm wide, sheath 1–3 cm long; upper cauline leaf one to each culm, shorter than culm, 1.5–5 cm long including sheath, 0.3–0.5 mm wide, sheath 1–2 cm long. Leaves in sterile shoots longer than or as long as culm, 10–40 cm long. Inflorescence with a single flower head, hemispherical, 0.8–1.4 mm in diam., flowers 4–10, ivory-white. Lowest bract pale brown, lanceolate to ovate-lanceolate, as long as inflorescence, 0.5–0.8 mm long, scarious; floral bract lanceolate to ovate, 0.4–0.6 mm long, 0.1–0.2 mm wide, scarious; sheathing bract absent. Flowers 6–10 mm long, 0.8–1.5 mm wide, pedicel 2–3 mm long. Tepals yellowish white, lanceolate, outer ones slightly shorter than inner ones, 3–4 mm long, 0.8–1.1 mm wide. Stamens 6, longer than tepals, 6–8 mm long; filaments 4–5.7 mm long, twice as long as anthers: anthers white, linear-ellipsoid, 2–2.3 mm long. Pistil 4–5 mm long, 1.2–1.5 mm wide; stigmas 0.5–0.7 mm long; style 1.1–1.5 mm long. Capsule obovoid, slightly longer than tepals, 4.5–5.5 mm long, 1.6–1.8 mm wide, cuspidate, cross section trigonous. Seeds oblong, 0.7–0.8 mm long, appendages very short, 0.05–0.1 mm long.

Distr. China (Gansu, Yunnan, Sichuan, Guizhou, Hubei).

*Juncus modicus* is similar to *J. leucanthus* Royle ex D. Don but differs in having the cross section of culm with several longitudinal striae, the leaves in sterile shoots longer than or as long as the culm, and the elongated auricles. It grows on mossy banks on edges of *Picea* and *Abies* from elevations of 2100 to 3800 m.

#### 41. *Juncus mustangensis* Miyam. & H. Ohba in *J. Jap. Bot.* 78: 154, f. 1 (2003).

[Plate 40; Fig. 44]

Types: Nepal; Dhaulagiri Zone, Mustang District, between Sangda Pass and Phalyak, 28°51' 40"N, 83°44'41"E, 3870 m (F. Miyamoto, N. Kurosaki, S. Akiyama, H. Ikeda, M. Tsusaka & M. N. Subedi 20210100, 13 Aug. 2002, TI-holotype, KATH-isotype).

Perennial, caespitose, 7–20 cm tall. Rhizomes horizontally very short creeping, 0.4–0.7 mm in diam. Culms erect, grass-green, terete, 0.3–0.8 mm in diam., smooth, cross section rounded. Cataphylls inconspicuous. Leaves grass-green, terete, with an adaxial groove, cross section of blade U-shaped, auricles absent; basal leaves 1 or 2 (or 3) per culm, 4–8 cm long including sheath, 0.7–1.5 mm in diam., sheath 0.5–3 cm long; cauline leaves absent. Inflorescence with a single flower head, subglobose, 1–1.8 cm in diam., flowers 7–14, creamy white. Lowest bract grass-green, terete, linear, longer than inflorescence, 1–1.8 cm long, cross section rounded; floral bracts lanceolate to linear-lanceolate, 2–5 mm long, 1–1.5 mm wide, scarious; sheathing bract absent. Flowers 0.6–0.9 cm long, pedicellate, 1.5–2 mm wide, pedicel 0.5–1 mm long. Tepals cream-white, lanceolate to



linear-lanceolate, outer ones slightly longer than inner ones, 3.5–5 mm long, 0.8–1 mm wide. Stamens 6, longer than tepals, 5–8 mm long; filaments 3–5 mm long, twice as long as anthers; anthers yellow, linear-elliptic, 1.5–2.5 mm long. Pistil 5.5–7 mm long, 1–1.5 mm wide; stigma 0.8–1 mm long; style 1.5–2 mm long. Capsule chestnut-brown, oblong, as long as tepals, 4–5 mm long, 2–2.5 mm wide, cuspidate, cross section trigonous. Seeds unknown.

Distr. Nepal.

*Juncus mustangensis* is characterized by the short creeping rhizomes, the absence of auricles and cauline leaves, and basal leaves with a single adaxial groove. It is similar to *J. benghalensis* Kunth and *J. sherei* Miyam. & H. Ohba, but *J. benghalensis* has stoloniferous rhizomes and leaves with rounded auricles, and *J. sherei* has the basal leaves with a single groove on both adaxial and abaxial surfaces. *Juncus mustangensis* is also similar to *J. kingii* Rendle, which has the stoloniferous rhizomes and the basal leaves without groove.

*Juncus mustangensis* was collected in moist cliffs along the gorge between Sangda Pass and Phalyak on the west side of Kali Gandaki River.

**42. *Juncus nepalicus*** Miyam. & H. Ohba in J. Jap. Bot. **68**: 28, f. 2 (1993). Noltie in Edinburgh J. Bot. **51**: 139 (1994); Fl. Bhutan **3**(1): 262 (1994). Wu and Clemants in Wu and Raven, Fl. China **24**: 62 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 116 (2002).

[Colour plate 6c; Plate 41; Fig. 45]

Type: Nepal; Koshi Zone, Sankhuwa Sabha Distr., around Cha Ding Kharka, 4400 m (M. Minaki et al. 9020690, 7 Aug. 1990, TI-holotype).

Perennial, densely caespitose, 5–20 cm tall. Rhizomes densely short branched and clustered. Culms ascending, grass-green, compressed terete, 0.4–0.7 mm in diam., with several longitudinal ridges, cross section oval. Cataphylls 1 or 2 to each culm, loosely embracing at base of culm, brown, 3–5 mm long. Leaves grass leaf-like, blade margin entire, with several ridges on abaxial side, cross section of blade flattened, auricles absent; basal and subbasal leaves 2–4 to each culm, 2–12 cm long including sheath, 1.5–3 mm wide, sheath 0.5–1 cm long; cauline leaf absent or one to each culm, linear-lanceolate, shorter than culm, 3–6 cm long including sheath, 0.8–1.5 mm wide, sheath 1.5–3 cm long. Inflorescence with 1 or 2 flower heads, 0.5–1 cm in diam., flowers 3–6, chestnut-brown, peduncle 0.1–1 cm long. Lowest bract brown, lanceolate, as long as or sometimes slightly longer than inflorescence, 0.5–1.5 mm long, 1–2 mm wide; floral bract lanceolate to ovate, 2–6 mm long, 0.8–1.3 mm wide, scarious; sheathing bract absent. Flowers 6–8 mm long, 1.8–2.2 mm wide, pedicel 1–2 mm long. Tepals chestnut-brown, ovate-lanceolate, outer ones slightly shorter than inner ones, 2.8–3.8 mm long, 0.8–1.0 mm long, inner ones 3.5–4.5 mm long, 1.0–1.2 mm wide. Stamens 6, shorter than tepals, 2.5–3.5 mm long; filaments brown, 2.0–2.2 mm long, twice as long as anthers: anthers ivory-yellow, linear-ellipsoid, 1.0–1.2 mm long. Pistil 7–8 mm long, 1.6–1.8 mm wide; stigmas reddish, 2.5–4 mm long; style 1.5–2 mm long. Capsule brown, oblong, mucronate, cross section trigonous. Seeds ellipsoid, 0.5–0.6 mm long, appendages 0.6 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Yunnan).

*Juncus nepalicus* is similar to *J. milashanensis* A. M. Lu & Z. Y. Zhang and *J. minimus*

Buchenau but differs from *J. milashanensis* in having the tepals unequal in length and the anthers with half-length of the filaments, and from *J. minimus* in having the bulliform cells on the adaxial side of leaves and the cuspidate capsule. It grows on exposed slopes among *Rhododendron* shrubs from elevations of 3300 to 4400 m.

**43. *Juncus ochraceus*** Buchenau in Abh. Naturwiss. Vereine Bremen **3**: 292 (1872); in Bot. Jahrb. Syst. **1**: 112 (1880); in Bot. Jahrb. Syst. **6**: 207 (1885); in Bot. Jahrb. Syst. **12**: 415 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 240 (1906). Hook. f., Fl. Brit. Ind. **6**: 394 (1892). Camus in Notul. Syst. (Paris) **1**(10): 283 (1910). Satake in Hara, Fl. E. Himal.: 403: (1966); Fl. E. Himal. **2**: 163 (1971). Hara et al., Enum. Flow. Nepal **1**: 85 (1978). Noltie in Edinburgh J. Bot. **51**: 141 (1994); Fl. Bhutan **3**(1): 253, f. 24r–t (1994). Wu in Acta Phytotax. Sin. **32**: 452 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 176, f. 56, 5–7 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 51 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 86 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 545 (2003).

[Colour plate 6f; Plate 42; Fig. 46]

Types: Sikkim; 12000 ft. (J. D. Hooker s. n., K-holotype, W, P-isotypes).

*Juncus tratangensis* Satake in Hara, Fl. E. Himal.: **2**: 164, f. 14 (1971). Type: Bhutan; Tongsa–Tratang–Uto La Road, 2200–2950 m (H. Kanai et al. 5952, 17 Apr. 1967, TI-holotype).

Perennial, caespitose, 15–45 cm tall. Rhizomes densely branched. Culms erect, grass-green, terete, 0.6–1.3 mm in diam., with several longitudinal striae, cross section rounded. Cataphyll one to each culm, loosely embracing at base of culm, grass-green at apex, light brown at base, 0.5–4 cm long. Leaves terete, with a groove on adaxial side, cross section of blade U-shaped with several striae, auricles rounded to obtuse; basal leaves 1 or 2 to each culm, 5–15 cm long including sheath, 0.4–0.7 mm wide, sheath 2–7 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 5–15 cm long including sheath, 0.4–0.6 mm wide, sheath 2–4 cm long. Inflorescence terminal, loosely branching, flower heads many, flowers many; almost inflorescences with sterile flowers and normal flower heads with 1 or 2 flowers, peduncle 0.5–8 cm long. Lowest bract grass-green, filiform, terete, shorter than inflorescence, 3–8 cm long; floral bract lanceolate, 3–4 mm long, 0.6–0.8 mm wide, scarious; sheathing bract on peduncle pale brown, lanceolate, 0.3–1.4 cm long, membranaceous. Flowers normal or viviparous, mixed in an inflorescence. Normal flowers 6–8 mm long, 3–4 mm wide, pedicel 0.5–0.8 mm long. Tepals gold-brown, lanceolate, outer ones and inner ones equal in length, 3.5–4 mm long, 0.8–1 mm wide. Stamens 6, shorter than or sometimes as long as tepals, 2.6–3.8 mm long; filaments 1.2–1.5 mm long; anthers yellow, linear-elliptic, slightly longer than filaments, 1.4–2.8 mm long. Pistil 4–6 mm long, 1–1.5 mm wide; stigmas 2.0–2.3 mm long; style 1.3–1.5 mm long. Capsule pale brown, obovoid, as long as tepals, 3.5–4 mm long, 2–2.2 mm wide, obtuse, mucronate, cross section 3-keeled. Seeds unknown. Viviparous flowers composed of several sterile bracts, 4–5 mm long, 0.5–0.6 mm wide; stamens and pistil reduced; sterile bracts golden-brown, linear-lanceolate.

Distr. Kashmir, Nepal, Sikkim, Bhutan, Assam, Arunachal Pradesh, China (Xizang, Yunnan, Sichuan).



*Juncus ochraceus* is similar to *J. fimbristylodes* Noltie but differs in having the culms with several longitudinal striae and no bulli-form cells on leaf surface. It grows on exposed road sides or bare soil slopes from elevations of 1500 to 3000 m.

**44. *Juncus perpusillus*** Sam. in Hand-Mazz., Symb. Sin. 7: 1237 (1936). Noltie in Edinburgh J. Bot. **51**: 130 (1994); Fl. Bhutan **3**(1): 268 (1994). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 202, f. 46, 12–14 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 68 (1992); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 239 (2000); in J. Jap. Bot. **78**: 156 (2003). Wu and Clemants in Wu and Raven, Fl. China **24**: 57 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 101 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 551 (2003).

[Colour plate 7a; Plate 43; Fig. 47]

Types: China; Sichuan, Taofu (Dawo) Distr., Haitzeshan, 4400–4600 m (H. Smith 11684, 31 Aug. 1934, S-holotype, BM, S-isotypes).

Perennial, caespitose, 1–15 cm tall. Rhizomes horizontally short creeping, culms arising in dense rows. Culms erect, terete, 0.25–0.6 mm in diam., cross section compressed oval. Cataphyll one or inconspicuous, loosely embracing at base of culm, light brown, 0.3–1 cm long. Leaves filiform, terete, cross section of blade rounded, auricles rounded; basal leaves 1 or 2 to each culm, 0.8–4.5 cm long including sheath, sheath 0.3–2.5 cm long; cauline leaves absent. Inflorescence with a single flower head, hemispherical, 0.4–1 cm diam., flowers 2–12, chestnut-brown. Lowest bract brown to chestnut-brown, ovate-lanceolate, shorter than inflorescence, scarious; floral bract lanceolate to ovate, 2–4 mm long, 0.7–2 mm wide, scarious. Flowers 4–6 mm long, 1–1.5 mm wide, pedicel 0.3–0.5 mm long. Tepals brown to chestnut-brown, lanceolate, outer ones and inner ones equal in length, 3–4 mm long, 0.7–1.0 mm wide. Stamens 6, longer than tepals, 4–8 mm long; filaments chestnut-brown, 3 times as long as anthers, 3–4.5 mm long; anthers cream-yellow, linear-ellipsoid, 1–1.4 mm long. Pistil 3–4 mm long, 0.8–1 mm wide; stigmas brown to chestnut-brown, 0.3–1.3 mm long; style brown to chestnut-brown, 1–1.2 mm long. Capsule chestnut-brown, oblong, slightly longer than tepals, 4–6 mm long, 1.2–1.5 mm wide, mucronate, cross section trigonous. Seeds oblong, 0.5–0.6 mm long, appendages very short, 0.05 mm long.

Distr. Kashmir, India (Uttar Pradesh, Kumaon), Nepal, Sikkim, China (Gansu, Yunnan, Sichuan).

*Juncus perpusillus* is similar to *J. thomsonii* Buchenau but differs in having the filaments three times as long as the anthers. It grows on wet grass land slopes along streams or bogs, sometimes with *J. thomsonii*, from elevations of 3400 to 4660 m. This species is one of the smallest plants (1 cm tall) of the Sino-Himalayan *Juncus*.

**45. *Juncus petrophilus*** Miyam., sp. nov. [Colour plate 7c; Plate 44; Fig. 48]

Types: China; Yunnan province, Dali, Mt. Dancang Shan, 3600 m (F. Miyamoto 10520, 11 Jul. 2000, KUN-holotype, TI-isotype).

*Juncus benghalensis* Kunth, *J. concinno* D. Don, et *J. sherei* Miyam. & H. Ohba, sed foliis complanato et filamentis 1.3–1.5-plo longiores quam antheris differt.

Perennial, caespitose, 5–15 cm tall. Rhizomes horizontally short creeping. Culms erect,

grass-green, terete, smooth, cross section rounded. Cataphyll one to each culm, sedge-green, 0.3–1.5 cm long. Leaves grass leaf-like, grass-green, margin entire, cross section of blade flattened, auricles very short; basal leaves 1 or 2 to each culm, 2–8 cm long including sheath, 1–1.7 mm wide, sheath 0.5–2 cm long; cauline leaf one to each culm, linear, shorter than culm, 1–6 cm long including sheath, 0.8–1.6 mm wide, sheath 0.3–1.5 cm long. Inflorescence with a single flower head, hemispherical 5–9 mm in diam., flowers 3–7, ivory-white. Lowest bract linear-lanceolate to lanceolate, shorter than or slightly longer than inflorescence, 2.5–8(–10) mm long; floral bract white, sometimes partly brown, lanceolate to ovate-lanceolate, 2–6 mm long, 0.8–2 mm wide, scarious. Flowers 4.5–5 mm long, 1–1.6 mm wide, pedicel 0.3–0.5 mm long. Tepals white, oblong-lanceolate, outer ones slightly longer than inner ones or equal in length, 2–3.2 mm long, 0.6–0.8 mm wide; inner ones 2.5–3.3 mm long, 0.7–1 mm wide. Stamens 6, slightly longer than tepals, 3.6–4.5 mm long; filaments 2–2.6 mm long, 1.3–1.5 times as long as anthers; anthers cream-yellow, narrowly oblong, 1.6–1.9 mm long. Pistil white, 4–4.5 mm long, 0.8–1 mm wide; stigmas 0.4–0.5 mm long; style 1.6–1.8 mm long. Capsule white, ovoid, 2–2.2 mm long, 0.9–1.1 mm wide, cross section trigonous. Seeds unknown.

Distr. China (Yunnan).

*Juncus petrophilus* is similar to *J. benghalensis* Kunth, *J. concinnus* D. Don, and *J. sherei* Miyam. & H. Ohba but differs in having the flattened basal leaves with bulliform cells on abaxial side and the filaments 1.3–1.5 times as long as the anthers. *Juncus concinnus* has sometimes flattened basal leaves but differ from *J. petrophilus* by the filaments 3–4 times as long as the anthers and the inner tepals longer than the outer ones. *Juncus petrophilus* grows on mossy rocks along paths in *Abies* forests with *J. benghalensis* and *J. concinnus* in Mt. Dancang Shan in Yunnan province, China at 3600 m.

**46. *Juncus potaninii*** Buchenau in Bot. Jahrb. Syst. **12**: 394 (1890); in Bot. Jahrb. Syst. **29**: 238 (1896). Brown in J. Linn. Soc., Bot. **36**: 165 (1903). Samuelsson in Acta Horti Gothob. **3**: 69 (1927). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 95 (1967). Lu and Zhang in Wu, Fl. Xizang. **5**: 514, f. 285 (1987). Zang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2420 (1994). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 206, f. 49, 9–11 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **25**: 183 (1999). Wu and Clemants in Wu and Raven, Fl. China **24**: 57 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 130 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 548, f. 111, 5–9 (2003).

[Colour plate 7g; Plate 45; Fig. 49]

Types: China; Prov. Szechuan [Sichuan], Kseruzo (G. N. Potanin s. n., 6 Aug. 1885, W-syntype); Prov. Kansu [Gansu], Dshoubunon (G. N. Potanin s. n., 10 Aug. 1885, W-syntype).

*Juncus modestus* Buchenau in Bot. Jahrb. Syst. **12**: 203 (1890). Brown in J. Linn. Soc., Bot. **36**: 164 (1903). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2420 (1994). Wu in Acta Phytotax. Sin. **32**: 460 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 204, f. 48, 4–5 (1997). Types: China; Prov. Szetschuan [Sichuan], septentrionali, Valle flum. Heiho supra vicum Hunneiku (G. N. Potanin s. n., 2 Jul. 1885, LE-holotype, W-isotype).

*Juncus luzuliformis* Franch. var. *modestus* (Buchenau) Buchenau in Bot. Jahrb. Syst.



**36** (Beibl. 82): 15 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 228, f. 105 (1906). Camus in Notul. Syst. (Paris) **1**(10): 277 (1910).

*Juncus luzuliformis* Franch. var. *potaninii* (Buchenau) Buchenau in Bot. Jahrb. Syst. **36** (Beibl. 82): 15 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 228, f. 106 (1906).

*Juncus perparvus* K. F. Wu in Acta Phytotax. Sin. **32**: 448, f. 3, 1–4 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 170, f. 38, 1–4 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 50 (2000). Bao in Wu and Wu, Fl. Yunnanica **15**: 537 (2003). Types: China; Qinghai, Huangyuan, Fengjie Shan (P. C. Tsoog 8847, 10 Jul. 1958, PE-holotype, HSNU, KUN-isotypes).

Perennial, slender, caespitose, 5–12 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.2–0.3 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls inconspicuous or 1 or 2 to each culm, stramineous to light brown, 0.5–1 cm long. Leaves grass-green, filiform, terete, cross section of blade U-shaped, auricles very short; basal and subbasal leaves 1 or 2 to each culm, 2–9 cm long including sheath; sheath 0.5–2 cm long, 0.1–0.2 mm wide; cauline leaf one to each culm, filiform, shorter than culm, 1–3 cm long including sheath, sheath 0.5–1.2 mm long. Inflorescence terminal, flower heads 1 or 2, 1.5–5 mm in diam., flowers 1 or 2, yellowish white, peduncle of lateral head 0.5–1 cm long. Lowest bract pale brown, shorter than or as long as inflorescence, 2.5–4 mm long, 0.4–1 mm wide; floral bract lanceolate, 1.5–2.5 mm long, 0.6–1.2 mm wide, scarious; sheathing bract on peduncle lanceolate, 1.5–2 mm long, membranaceous. Flowers 3.5–4 mm long, 2–2.5 mm wide, sessile. Tepals yellowish white, narrowly lanceolate, outer ones and inner ones equal in length, 2.5–3.2 mm long, 0.5–0.9 mm wide. Stamens 6, longer than tepals, 3.5–3.8 mm long; filaments 2.7–3.0 mm long, 3–4 times as long as anthers; anthers white, linear-ellipsoid, 0.6–0.8 mm long. Pistil 4–5 mm long, 1–1.5 mm wide; stigmas 0.3–0.5 mm long; style 0.2–0.4 mm long. Capsule brown, oblong, as long as tepals, 3.5–4 mm long, 1.5–1.7 mm wide, cross section rounded. Seed ellipsoid, 0.4–0.5 mm long, 0.15–0.2 mm wide, appendages very short, 0.1–0.2 mm long.

Distr. China (Xizang, Qinghai, Gansu, Yunnan, Sichuan, Shaanxi, Hubei).

*Juncus potaninii* is similar to *J. longistamineus* A. Camus but differs in having the filaments three to four times as long as the anthers and the short style (0.2–0.4 mm long). It grows on mossy rocks in *Abies* forests from elevations of 2300 to 4400 m.

**47. *Juncus prismatocarpus*** T. Br., Prod.: 259 (1810). Buchenau in Bot. Jahrb. Syst. **6**: 204 (1885). in Bot. Jahrb. Syst. **12**: 310 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 180 (1906). Hook. f., Fl. Brit. Ind. **6**: 395 (1892). Brown in J. Linn. Soc., Bot. **36**: 165 (1903). Samuelsson in Hand-Mazz., Symb. Sin. **7**: 1229 (1936). Jafri in Fl. Pakistan **138**: 18 (1981). Noltie, Fl. Bhutan **3**(1): 254, f. 24u–v (1994). Wu in Acta Phytotax. Sin. **32**: 455 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 192, f. 45, 7–10 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 239 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 54 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 148, f. 82A–C (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 544 (2003).

[Colour plate 7f; Plate 46; Fig. 50]

Type: Australia; [NSW, Port Jackson area] (R. Brown 5784, BM-holotype).

*Juncus leschenaultia* J. Gay in Laharpe, Mém. Soc. Hist. Nat. Paris. **3**: 137 (1827). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880). Krecetovicz and Goncarpv in Komarov, Fl. URSS **3**: 540, t. 30, f. 2 (1935). Satake in Hara, Fl. E. Himal.: 403 (1966); Fl. E. Himal. **2**: 162 (1971). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 101 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 84 (1978). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Lu and Zhang in Wu, Fl. Xizang. **5**: 508, f. 280 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2417 (1994). Press et al., Ann. Check. Fl. Pl. Nepal: 149 (2000). Type: India; Mountitus Nelly Gerry (*Leschenaultia* s. n., K-holotype).

*Juncus sinensis* J. Gay in Laharpe, Mém. Soc. Hist. Nat. Paris **3**: 137 (1827). Buchenau in Bot. Jahrb. Syst. **1**: 108 (1880); in Bot. Jahrb. Syst. **6**: 203 (1885). Types: China (G. Staunton s. n., P, W-syntypes). Japon (C. P. Thunberg s. n., G-DEL-syntype, not seen).

*Juncus prismatocarpus* R. Br. var. *leschenaultia* (J. Gay) Buchenau in Bot. Jahrb. Syst. **6**: 311 (1885); in Bot. Jahrb. Syst. **12**: 311 (1890); in Bot. Jahrb. Syst. **29**: 238 (1900); in Engler, Pflanzenr. (iv. 36) **25**: 180 (1906).

Perennial, ascending, 10–30 cm tall. Rhizomes branched-ascending. Culms erect or ascending, compranate, 0.7–1.5 mm in diam., margin narrowly two-winged. Leaves grass-green, terete, cross section of blade compressedly oval, margin narrowly two-winged, auricles rounded; basal leaves 1 or 2, sometimes absent, 3–10 cm long including sheath, 2–3 mm wide, sheath 1–4 cm long; cauline leaves 1–3, shorter than culm, 3–15 cm long including sheath, 1–2 mm wide, sheath 1–4 cm long, auricles obtuse. Inflorescence terminal, loosely branched, flower heads many, 5–10 mm in diam., flowers 2–15, grass-green. Lowest bract grass-green, linear, shorter than inflorescence, 2–10 cm long; floral bract ovate to ovate-lanceolate, 0.5–2.5 mm long, 0.4–2.0 mm wide, scarious; sheathing bract on peduncle lanceolate to obovate, 3–7 mm long, membranaceous. Flowers 3–5 mm long, 0.8–1.0 mm wide. Tepals grass-green, lanceolate to linear-lanceolate, outer ones slightly longer than inner ones or equal in length, 2.3–4.5 mm long, 0.4–0.8 mm wide. Stamens 3, shorter than tepals, 1–2.5 mm long; filaments 0.7–1.8 mm long, longer than anthers; anthers yellow, linear-elliptic, 0.3–0.7 mm long. Pistil 1.5–3 mm long, 1–1.2 mm wide; stigmas 0.2–1 mm long; style 0.1–0.3 mm long. Capsule brown, oblong, slightly longer than or as long as tepals, 3–4 mm long, 1–1.2 mm wide, cross section 3-keeled. Seeds obovoid, 0.4–0.5 mm long, appendages absent.

Distr. India, Nepal, Sikkim, Bhutan, Assam, China (Yunnan & Sichuan).

Although *Juncus prismatocarpus* is similar to *J. wallichianus* Laharpe, *J. prismatocarpus* is characterized by laterally compressed culms and leaves. This species is distributed widely in Asia and grows in marshy places or near paddy fields at lower altitudes of below 2800 m.

**48. *Juncus przewalskii*** Buchenau in Bot. Jahrb. Syst. **12**: 401 (1890); in Bot. Jahrb. Syst. **36** (Beibl. 82): 19 (1905); in Engler, Pflanzenr. (iv. 36) **25**: 231, f. 108 (1906). Brown in J. Linn. Soc., Bot. **36**: 166 (1903). Samuelsson in Acta Horti Gothob. **3**: 69 (1927). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 96, t. 8, f. 4 (1967). Wu et al., Index Fl. Yunnan. **2**: 2083 (1984). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2421 (1994). Wu in Acta Phytotax. Sin. **32**: 461 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 213, f. 51, 1–2 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci.



Mus., Tokyo, B, **25**: 183 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 59 (2000). Li et al., Fl. Gaoligong Mts.: 1122 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 102, f. 69C–D (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 553 (2003).

[Colour plate 7b; Plate 47; Fig. 51]

Types: China; Kansu [Gansu], Terra Tangutorum, regio alpina secus fl. Tetung (N. M. Przewalskii s.n., Jul. 1872, LE-holotype, W, S-syntypes).

*Juncus przewalskii* Buchenau var. *discolor* Sam. in Hand.-Mazz., Symb. Sin. **7**: 1234 (1936). Wu et al., Index Fl. Yunnan. **2**: 2084 (1984). Wu in Acta Phytotax. Sin. **32**: 461 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 215 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 60 (2000). Types: China; Yunnan, Yangtze watershed, Prefectural District of Likiang, eastern slopes of Likiang Snow Range (J. F. Rock 4953, May–Oct. 1922, S-holotype, not seen, B-isotype).

*Juncus kandingensis* K. F. Wu in Acta Phytotax. Sin. **32**: 460, f. 4, 9–10 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 211, f. 44, 9–10 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 59 (2000). Types: China; Sichuan, Kangdin, 3400 m (Z. S. Liu 964, PE-holotype, HSNU-isotype).

*Juncus przewalskii* Buchenau var. *multiflorus* S. Y. Bao in Wu, Fl. Yunnanica **15**: 804 (2003). Type: China; Yunnan, Haba shan, 4500 m (Zhongdian research team 2062, 16 Sept. 1962, KUN-holotype).

Perennial, caespitose, 3–25 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.2–0.5 mm in diam., with smooth, cross section rounded. Cataphylls 2 or 3 to each culm, light brown to brown, 1–3 cm long. Leaves grass-green, terete, cross section of blade rounded; basal leaves 1–3 to each culm, 3–9 cm long including sheath, 0.4–1 mm in diam., sheath 1.5–4 cm long, auricles absent or truncate; cauline leaf solitary, dark brown, linear, shorter than culm, 2–5 cm long, sheath part absent, auricles absent. Inflorescence with a single flower head, hemispherical, 0.5–2 cm in diam., flowers 8–20, chestnut-brown or rarely cream-white. Lowest bract brown to dark brown, ovate-lanceolate to ovate, shorter than or as long as inflorescence, 0.7–1 cm long, 3–6 mm wide, scarious; floral bract 3–8 mm long, 2–3 mm wide, scarious; sheathing bract absent. Flowers 5–10 mm long, 2–4 mm wide, pedicel 0.5–2 mm long. Tepals shining brown or ivory-white, lanceolate, outer ones slightly longer than inner ones, 3–6.5 mm long, 1–1.8 mm wide. Stamens 6, longer than tepals, 5–7 mm long; filaments 3.7–6 mm long, 2.3–2.6 times as long as anthers: anthers white, linear-ellipsoid, 1.3–2.6 mm long. Pistil brown or ivory-white, 6–7 mm long, 1.2–1.5 mm wide; stigmas 0.5–0.8 mm long; style 2–3 mm long. Capsule brown, obovoid, shorter than tepals, 3–4.5 mm long, 1.5–2 mm wide, mucronate, cross section rounded. Seeds ellipsoid, 0.4–0.7 mm long, appendages 0.2–0.3 mm long.

Distr. China (Xizang, Gansu, Yunnan, Sichuan, Shaanxi).

*Juncus przewalskii* is similar to *J. allioides* Franch., *J. cephalostigma* Sam., and *J. leucanthus* Royle & D. Don but differs from *J. allioides* and *J. leucanthus* in having the truncate auricles or no auricle, and the cauline leaf without sheathing part, and from *J. cephalostigma* in having the stigmas (0.5–0.8 mm long) longer than those of *J. cephalostigma* (0.1–0.2 mm long). This species is characterized by dark brown cauline leaf. It grows in grassland or on scree slopes from elevations of 2800 to 4870 m. *Juncus*

*kandingensis* K. F. Wu, which was described based on a specimen collected in Kangdin, Sichuan (Z. S. Liu 964, PE-holotype) by K. F. Wu, is dwarf form of *J. przewalskii*.

**49. *Juncus pseudocastaneus*** (Lingelsh.) Sam. in Hand.-Mazz., Symb. Sin. 7: 1230 (1936). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Wu et al., Index Fl. Yunnan. 2: 2084 (1984). Lu and Zhang in Fl. Xizang. 5: 518 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2422 (1994). Wu in Acta Phytotax. Sin. 32: 452 (1994); Fl. Reipubl. Popul. Sin. 13(3): 180, f. 41, 4–6 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 183 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 239 (2000). Bao in Wu and Wu, Fl. Yunnanica 15: 539 (2003).

[Colour plate 7e; Plate 48; Fig. 52]

*Juncus sikkimensis* Hook. f. var. *pseudocastaneus* Lingelsh. in Limpricht, Repert. Spec. Nov. Regnii Veg. Beih. 12: 316 (1922). Samuelsson in Acta Hort. Gothob. 3: 71 (1927).

Types: Tibet; Tatsienlu, Dawo, Gata, auf der Pasalm Hai tse schan am Dshara, 4360 m (Limpricht 1869, 2 Jul. 1914, WRS�-holotype, K. WU-isotypes).

Perennial, loosely caespitose, 9–47 cm tall. Rhizomes stoloniferous, horizontally creeping, 0.4–0.6 mm thick. Culms erect, grass-green, terete, 0.6–1.3 mm thick, smooth, cross section rounded. Cataphylls 1 or 2 to each culm, loosely embracing at base of culm, brown, shining, 1–5 cm long. Leaves terete, cross section of blade rounded, auricles rounded, sheathing at base light brown to stramineous; basal leaves 2–4 to each culm, 7–21 cm long including sheath, 1–1.5 mm wide, sheath 2.5–8 cm long; cauline leaves absent. Inflorescence terminal, pseudolateral, flower heads 1 or 2, 0.6–1.7 cm in diam., flowers 2–5, chestnut-brown, peduncle 0.3–3 cm long. Lowest bract grass-green, linear, apical part terete, basal part flattened, longer than inflorescence, 2–4 cm long, margin chestnut-brown; floral bract lanceolate to ovate-lanceolate, 5–8 mm long, 2–2.5 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 1–1.5 cm long, membranaceous. Flowers chestnut-brown, 12–17 mm long, 2.8–4 mm wide, pedicel 1–3.5 mm long. Tepals chestnut-brown, linear-lanceolate, outer ones slightly longer than inner ones, 5.5–7 mm long, 1.2–2.2 mm wide. Stamens 6, shorter than tepals, 3.6–5 mm long; filaments 1.3–1.5 mm long, shorter than anthers; anthers orange-yellow, linear-ellipsoid, 2.3–3.5 mm long. Pistil 0.9–1.4 cm long, 1–1.2 mm wide; stigmas 4–8 mm long; style 3–4 mm long. Capsule chestnut-brown, oblong, slightly longer than tepals, 7–9 mm long, 2–2. mm wide, cuspidate, cross section rounded. Seeds ellipsoid, 0.6–0.7 mm long, appendages 0.6–0.8 mm long.

Distr. Nepal, Sikkim, Bhutan, Assam, China (Xizang, Qinghai, Yunnan, Sichuan).

*Juncus pseudocastaneus* was described as *J. sikkimensis* var. *pseudocastaneus* Lingelsh. and in a recent taxonomical treatment (Wu & Clemants 2000) it is regarded as a synonym of *J. sikkimensis* Hook. f. However, I considered it to be an independent species because *J. pseudocastaneus* is characterized by stoloniferous creeping rhizomes, 2–4 basal leaves to each culm, and the rounded auricles. It grows in marshy places by streams or bogs from elevations of 3500 to 4920 m.

**50. *Juncus rohtangensis*** Goel & Aswal in Indian J. Forest. 10: 262, f. 1–8 (1987). Miyamoto in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 239 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 111, f. 69C–D (2002). Miyamoto and Ohba in J. Jap. Bot.



77: 31, f. 5 (2002); in J. Jap. Bot. 78: 156 (2003). [Colour plate 7d; Plate 49; Fig. 53]

Types: India; Himachal Pradesh, Lahaul Spiti Distr., Lahaul Valley, Rohtang Pass, 4000 m (B. S. Aswal 10554E, 27 Jul. 1979, CDRI-holotype, not seen, CAL-isotype).

*Juncus sikkimensis* var. *monocephalus* Hook. f., [Fl. Brit. Ind. 6: 399 (1892), nom. nud.] Icon. Pl. 23: t. 2235 (1894). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Wu et al., Index Fl. Yunnan. 2: 2084 (1984). Types: Sikkim; Lachen, 11000–12000 ft. (Hooker s. n., 20 Jun. 1849, K-holotype, A, B-isotypes).

*Juncus duthiei* (C. B. Clarke) Noltie in Edinburgh J. Bot. 51: 134 (1994), pro part.

*Juncus nigroviolaceus* K. F. Wu in Acta Phytotax. Sin. 32: 448, f. 2, 10–12 (1994). Wu, Fl. Reipubl. Popul. Sin. 13(3): 169 (1879). Wu and Clemants in Wu and Raven, Fl. China 24: 50 (2000). Types: China; Xizang, Cona, 4300 m (C. Y. Wu & C. K. Chen 75-612, 18 Jul. 1975, HNWP-holotype, not seen, KUN-isotype).

*Juncus uniflorus* auct. non W. W. Sm.: Miyamoto and H. Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992), pro part. Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999).

Perennial, loosely caespitose, 1–28 cm tall. Rhizomes stoloniferous, horizontally creeping, 0.6–1.8 mm thick. Culms erect, grass-green, terete, 0.3–0.8 mm in diam., with several longitudinal striae. Cataphylls 1 or 2 to each culm, embracing at base of culm, pale brown to stramineous, 0.5–2 cm long. Leaves grass-green, terete, cross section of blade oval, auricles rounded; basal leaf usually one to each culm, 0.8–9 cm long including sheath, 0.4–0.75 mm wide, sheath 2–10 mm long; leaves on sterile shoots 1–18 cm long including sheath, 0.25–0.70 mm wide, sheath 2–10 mm long; cauline leaves absent. Inflorescence solitary, pseudolateral, 0.2–2.8 cm long, 0.4–0.8 mm wide, flowers 1–3. Lowest bract grass-green, longer than inflorescence, 0.4–2.8 cm long, 1–2 mm wide; floral bract lanceolate, 0.1–1 cm long, 0.5–1.2 mm wide; sheathing bract absent. Flowers 0.3–1.4 cm long, 1.2–2.5 mm wide, sessile if solitary, pedicel 0.6–2.5 mm long. Tepals chestnut-brown, ovate-lanceolate, outer ones and inner ones equal in length, 1.8–3.9 mm long, 0.5–1.2 mm wide. Stamens 6, shorter than tepals, 1.0–3.1 mm long; filaments 0.17–0.5 mm long, shorter than anthers; anthers leather-yellow, linear-ellipsoid, 0.83–2.6 mm long. Pistil 0.5–1.5 cm long, 0.4–0.7 mm wide; stigmas red, 0.9–4.0 mm; style 0.8–4.0 mm long. Capsule ovoid, 3–4.5 mm long, 1.5–2.0 mm wide, mucronate, cross section rounded. Seeds ellipsoid, 0.5–0.9 mm long, appendages very short, 0.05–0.1 mm long.

Distr. India (Himachal Pradesh), Nepal, Sikkim, Bhutan, China (Xizang).

*Juncus rohtangensis* is very variable in the size. Dwarf individuals are similar to *J. uniflorus* W. W. Sm. but differ in having the anthers five times longer than the filaments, the lowest grass-green bract exceeding the flowers, and the chestnut-brown tepals. Larger ones are similar to *J. sikkimensis* Hook. f. and *J. pseudocastaneus* Sam. but differ in lacking the sheath-like bracts on the peduncle. *Juncus sikkimensis* var. *monocephalus* Hook. f. described from Sikkim is conspecific with *J. rohtangensis*. It grows on alpine scree slopes and along streams above 3500 m.

**51. *Juncus rostocarpus*** Miyam., nom. nov. [Colour plate 1c, d; Plate 50, Fig. 54]

*Juncus amplifolius* A. Camus var. *pumilus* A. Camus in Notul. Syst. (Paris) 1(10): 282 (1910). Samuelsson in Acta Horti Gothob. 3: 70 (1927). Wu in Acta Phytotax. Sin. 32: 465 (1994); Fl. Reipubl. Popul. Sin. 13(3): 225 (1997).

Types: China; Yunnan, ravins sur le Tsang-chan, 3500 m (P. J. M. Delavay 2412, 26 Jun. 1886, P-lectotype, designated here). Tibet, Tatsien-lou (J. A. Soulié 1154, Jul. 1894, P-syntype).

Perennial, densely caespitose, 20–40 cm tall. Rhizomes densely short branched and clustered. Culms ascending, grass-green, terete, 0.7–1.2 mm thick, with several longitudinal ridges, cross section compressed oval. Cataphylls 2 or 3 to each culm or absent, loosely embracing at base of culm, light brown to stramineous, 2–3 cm long. Leaves grass leaf-like, blade margin entire, sheathing at base light brown to reddish, cross section of blade flattened, with several ridges on abaxial side, auricles absent; basal and subbasal leaves 2 or 3 to each culm, 8–14 cm long including sheath, 2–3 mm wide, sheath 2–5 cm long; cauline leaves 1 or 2 to each culm, shorter than culm, 5–10 cm long including sheath, 2–3 mm wide, sheath 2.5–5 cm long. Inflorescence terminal, branched, flower heads 3–6, 0.5–1.5 cm in diam., flowers 2–8, chestnut-brown, peduncle 0.4–5 cm long. Lowest bract grass-green, leaf-like, linear, slightly longer than or as long as inflorescence, 2–5 cm long, with several ridges on abaxial side, cross section flattened; floral bract lanceolate to ovate, 1.5–4 mm long, 1–1.5 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 0.5–1 cm long, membranaceous. Flowers 11–15 mm long, 2–2.5 mm wide, pedicel 1–1.5 mm long. Tepals chestnut-brown, lanceolate to linear-lanceolate, outer ones slightly shorter than inner ones, 4–6 mm long, 0.8–1.2 mm wide. Stamens 6, slightly shorter than tepals, 3–5.5 mm long; filaments 1.4–2.6 mm long, slightly shorter than or as long as anthers; anthers yellow, linear-ellipsoid, 1.5–2.8 mm long. Pistil 0.8–1 cm long, 1–1.2 mm wide; stigmas 2.5–4 mm long; style 2.5–4 mm long. Capsule chestnut-brown to brown, oblong, longer than tepals, 6–7 mm long, 2.5–3 mm wide, cuspidate, cross section rounded. Seeds ellipsoid, 0.5–0.6 mm long, appendages 1.5–1.8 mm long.

Distr. Nepal, Sikkim, Bhutan, Myanmar, China (Xizang, Yunnan).

*Juncus rostratus* is a new name for *J. amplifolius* A. Camus var. *pumilus* A. Camus. Camus (1910) described this based on two specimens collected from Kanding in Sichuan and Tali in Yunnan as a variety of *J. amplifolius*. *Juncus rostratus* is most similar to *J. amplifolius* and *J. nepalicus* Miyam. & H. Ohba but differs from *J. amplifolius* in having the densely branched, nonstoloniferous rhizomes, the long style as long as the stigmas, and the red stigmas in flowering, and from *J. nepalicus* in having the filaments same as long as the anthers. It grows on exposed slopes on edges of *Abies* forests from elevations of 3100 to 3850 m.

**52. *Juncus setchuensis*** Buchenau in Bot. Jahrb. Syst. **29**: 238 (1900); in Bot. Jahrb. Syst. **36** (Beibl. 82): 17 (1905). Brown in J. Linn. Soc., Bot. **36**: 166 (1903). Samuelsson in Acta Horti Gothob. **3**: 68 (1927); in Hand.-Mazz., Symb. Sin. **7**: 1229 (1936). Wu et al., Index Fl. Yunnan. **2**: 2084 (1984). Lu and Zhang in Fl. Xizang. **5**: 506, f. 279 (1987). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. **2**: 2417 (1994). Wu in Acta Phytotax. Sin. **32**: 443 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 160, f. 35, 9–12 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000). Wu and Clemants in Wu and Raven, Fl. China **24**: 48 (2000). Li et al., Fl. Gaoligong Mts.: 1123 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 100 (2002). Bao in Wu and Wu, Fl. Yunnanica **15**: 535, f. 110, 7–13 (2003).

[Plate 51; Fig. 55]



Type: China; Setchuen [Sichuan], Nanchuan, Shihtru Kon, Chinfu Shan (C. Bock & A. von Rosthorn 78, 7 Jul. 1891, O-holotype, photo).

*Juncus dulongjiangensis* V. Novikov in Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. **103**(4): 69 (1998). Type: China; Yunnan, Gonshan, Dulongjian, 2800 m (Dulongjian expedition team 753, 22 Nov. 1990, KUN-holotype).

Perennial, densely caespitose, 30–60 cm tall. Rhizomes horizontally short creeping, culms arising in densely crowded rows. Culms erect, grass-green, terete, 0.8–1.5 mm in diam., with several longitudinal ridges, pith continuous. Cataphylls 2 or 3 to each culm, closely embracing at base of culm, brown at base, stramineous upward, 1–8 cm long. Leaves only cataphylls sheathing culm. Inflorescence pseudolateral, loosely branched, flowers many. Lowest bract appearing as a continuation of culm, 6–16 cm long. Bracteoles 2, ovate to ovate-lanceolate, 0.5–0.8 mm long. Flowers 3–3.5 mm long, 1.2–1.5 mm wide. Tepals light brown, lanceolate, outer ones longer than inner ones, 2.5–3 mm long, 0.8–1.2 mm wide. Stamens 3, shorter than tepals, 2.2–2.5 mm long; filaments 1.6–1.7 mm long, twice as long as anthers; anthers yellow, linear-ellipsoid, 0.6–0.8 mm long. Pistil 2–3 mm long, 1–1.2 mm wide; stigmas 0.6–0.8 mm long; style 0.2–0.3 mm long. Capsule brown, obovoid, as long as tepals, 2.7–3 mm long, 2.2–2.5 mm wide, obtuse, mucronate, cross section rounded-trigonous, 3-septate. Seeds brown, ovoid, 0.4–0.5 mm long, appendages absent.

Distr. Sikkim, China (Xizang, Yunnan, Sichuan, Ghuizhou, Hubei).

*Juncus setchuensis* is widely distributed in East Asia from Sikkim to Japan. It grows in exposed wet places along roads or ditches from elevations of 400 to 2950 m in the Sino-Himalaya. This species is similar to *J. effuses* L. but differs in having the culms with several longitudinal ridges and the obovoid capsule.

**53. *Juncus sherei*** Miyam. & H. Ohba in J. Jap. Bot. **72**: 293, f. 1 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 105 (2000); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 240 (2000). Press et al., Ann. Check Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 104 (2002). [Colour plate 8b; Plate 52; Fig. 56]

Type: Nepal; Sagarmatha Zone, Solukhumbu Distr., Gnaula–Pike, 3300 m (F. Miyamoto et al. 9580049, 22 Jul. 1995, TI-holotype).

Perennial, caespitose, 6–19 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green terete, 0.3–0.5 mm thick, smooth, cross section rounded. Cataphylls 1 or 2 to each culm, stramineous, 5–25 mm long. Leaves terete, grooved on both sides, cross section oval, auricles rounded; basal leaves 1 or 2 to each culm, 2–15 cm long including sheath, 0.15–0.4 mm wide, sheath 2–4 cm long; cauline leaves absent, sometimes present, solitary linear, shorter than inflorescence, 1.5–3.0 cm long. Inflorescence with a single flower head, hemispherical, 0.7–1.5 cm in diam., flowers 5–15, cream-white. Lowest bract brownish green, acicular-lanceolate, longer than inflorescence, 0.5–1.5 cm long, 1–2 mm wide; floral bract brown, lanceolate, 2–4 mm long, 0.5–2 mm wide, scarious; sheathing bract absent. Flowers 4–8 mm long, 6–12 mm wide, pedicel 0.3–0.5 mm long. Tepals ivory-white, lanceolate, outer ones and inner ones equal in length, 3–6 mm long, 1–1.7 mm wide. Stamens 6, longer than tepals, 5.8–8.8 mm long; filaments 4–6.1 mm long, twice as long as anthers; anthers white, linear-ellipsoid, 1.8–2.5 mm long. Pistil 3–

5 mm long, 0.8–1 mm wide; stigmas 0.6–0.8 mm long; style 1.3–1.8 mm long. Capsule obovoid, 3–4 mm long, 1–1.5 mm wide, cuspidate, cross section trigonous. Seeds ellipsoid, 0.5–0.7 mm long, appendages very short, 0.05 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Yunnan).

*Juncus sherei* is similar to *J. benghalensis* Kunth but differs in having the leaves with a single groove on both sides, the shorter anthers (1.8–2.5 mm long), and no stolons. The leaves of *J. benghalensis* has a single groove on the adaxial side only. *Juncus gonggae* Miyam. & H. Ohba and *J. brachystigma* Sam. differ from *J. sherei* in having the many-grooved culms and leaves. The presence and absence, and the number of grooves on culms and leaves are considered to be constant and stable in *Juncus*. *Juncus sherei* was found on mossy rocks in *Rhododendron* forests with *J. benghalensis* or sometimes on exposed grassland slopes from elevations of 3000 to 4500 m.

**54. *Juncus sikkimensis*** Hook. f., [Fl. Brit. Ind. 6: 399 (1892), nom. nud.] Icon. Pl. 23: t. 2235 (1894). Buchenau in Engler, Pflanzenr. (iv. 36) 25: 234 (1906). Camus in Notul. Syst. (Paris) 1(10): 283 (1910). Samuelsson in Acta Horti Gothob. 3: 71 (1927); in Hand.-Mazz., Symb. Sin. 7: 1232 (1936). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Wu et al., Index Fl. Yunnan. 2: 2084 (1984). Lu and Zhang in Fl. Xizang. 5: 522, f. 292 (1987). Noltie in Edinburgh J. Bot. 51: 134 (1994); Fl. Bhutan 3(1): 256 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2422 (1994). Wu in Acta Phytotax. Sin. 32: 461 (1994); Fl. Reipubl. Popul. Sin. 13(3): 217, f. 52, 8–11(1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999). Wu and Clemants in Wu and Raven, Fl. China 24: 60 (2000). Li et al., Fl. Gaoligong Mts.: 1123 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 126 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 557 (2003). [Colour plate 8f; Plate 53; Fig. 57]

Types: Sikkim; 12000–14000 ft. (J. D. Hooker s. n., K-holotype, W-isotype).

Perennial, loosely caespitose, 20–35 cm tall. Rhizomes horizontally short creeping, 2–3 mm in diam. Culms erect, grass-green, terete, 0.6–1 mm in diam., smooth, cross section rounded. Cataphylls 3–5 to each culm, embracing at base of culm, reddish brown, shining, 1–4 cm long. Leaves terete, with a groove on both sides, cross section of blade oval, auricles very short, sheathing at base light brown; basal leaves absent, subbasal leaf one to each culm, 11–17 cm long including sheath, 0.5–0.9 mm wide, sheath 2.5–7 cm long; cauline leaves absent. Inflorescence terminal, pseudolateral, flower heads 1 or 2, 0.8–1.3 cm in diam., flowers 3–7, blackish brown, shining, peduncle 0.3–3 cm long. Lowest bract chestnut-brown, linear, apical part terete, basal part flattened, as long as inflorescence, 2.5–4 cm long; floral bract linear-lanceolate to oblong-lanceolate, 5–15 mm long, 1–2 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 5–7 mm long, membranaceous. Flowers blackish brown, 8–9 mm long, 2–3 mm wide, pedicel 0.5–2 mm long. Tepals blackish brown, linear-lanceolate, outer ones slightly longer than inner ones, 4.5–5 mm long, 1–1.2 mm wide. Stamens 6, shorter than tepals, 2.3–3 mm long; filaments 0.8–1 mm long; anthers orange-yellow, linear-ellipsoid, 1.5–2 mm long, twice longer than filaments. Pistil 6–7 mm long, 1–1.2 mm wide; stigmas 2–3 mm long; style 2–2.5 mm long. Capsule chestnut-brown, oblong, slightly shorter than tepals, 5.5–6 mm long, 1.5–1.8 mm wide, cuspidate, cross section trigonous. Seeds unknown.

Distr. Nepal, Sikkim, Bhutan, China (Xizang, Yunnan).



*Juncus sikkimensis* is similar to *J. pseudocastaneus* (Lingelsh.) Sam. but differs in having the short creeping rhizomes, the leaves with a groove on both sides, and the truncate auricles. It grows in marshy places along streams or bogs from elevations of 3000 to 4500 m.

**55. *Juncus sphacelatus*** Decne. in Jacquem., Voy. Inde 4: 172, t. 172 (1835). Buchenau in Bot. Jahrb. Syst. 1: 111 (1880); in Bot. Jahrb. Syst. 6: 225 (1885); in Bot. Jahrb. Syst. 12: 404 (1890); in Engler, Pflanzenr. (iv. 36) 25: 233, f. 110 (1906). Hook. f., Fl. Brit. Ind. 6: 398 (1892). Samuelsson in Acta Horti Gothob. 3: 71 (1927); in Hand.-Mazz., Symb. Sin. 7: 1230 (1936). Satake in Hara, Fl. E. Himal.: 403 (1966); in Ohashi, Fl. E. Himal. 3: 131 (1975). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. 3: 96 (1967). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Jafri in Fl. Pakistan 138: 12 (1981). Wu et al., Index Fl. Yunnan. 2: 2084 (1984). Lu and Zhang in Fl. Xizang. 5: 519, f. 289 (1987). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992). Noltie, Fl. Bhutan 3(1): 255, f. 24w-x (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2423 (1994). Wu in Acta Phytotax. Sin. 32: 466 (1994); Fl. Reipubl. Popul. Sin. 13(3): 231, f. 56, 8-11 (1997). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 183 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 240 (2000); in J. Jap. Bot. 78: 156 (2003). Wu and Clemants in Wu and Raven, Fl. China 24: 64 (2000). Li et al., Fl. Gaoligong Mts.: 1123 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 124 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 561 (2003). [Colour plate 8c; Plate 54; Fig. 58]

Types: India (V. Jacquemont s. n., P, K-syntypes).

Perennial, loosely caespitose, 6-62 cm tall. Rhizomes stoloniferous, horizontally creeping. Culms erect, grass-green, terete, 0.6-2.5 mm thick, with several longitudinal striae, cross section oval. Cataphylls 1 or 2 to each culm, loosely embracing at base of culm, stramineous, 0.8-5 cm long. Leaves terete, with a groove on adaxial side, cross section of blade U-shaped, sheathing at base light brown to stramineous, auricles rounded, elongate; basal and subbasal leaves 1 or 2 to each culm, 2-32 cm long including sheath, 0.6-0.8 mm wide, sheath 0.5-20 cm long; cauline leaves absent. Inflorescence terminal, branched, flower heads 1-3(-4), 0.15-1.5 cm in diam., flowers 1-8, chestnut-brown to brown, peduncle 0.1-6.5 cm long. Lowest bract grass-green, linear, apical part terete, basal part flattened, longer than inflorescence, 1.3-14 cm long, margin chestnut-brown; floral bract lanceolate to ovate, 5-8 mm long, 0.9-1.2 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 1-1.5 cm long, membranaceous. Flowers chestnut-brown, 12-16 mm long, 2-2.5 mm wide, pedicel 2.5-5 mm long. Tepals chestnut-brown, linear-lanceolate, outer ones longer than inner ones, 6.5-9 mm long, 0.8-1.3 mm wide. Stamens 6, shorter than tepals, 3.5-5 mm long; filaments 2.7-3.8 mm long, 3 times as long as anthers; anthers yellow, linear-ellipsoid, 0.8-1.2 mm long. Pistil 6-9 mm long, 1-1.3 mm wide; stigmas 2-3 mm long; style 0.5-1 mm long. Capsule chestnut-brown, obovoid, longer than tepals, 0.8-1 cm long, 1.9-2.5 mm wide, mucronate, cross section rounded. Seeds ellipsoid, 0.6-0.8 mm long, appendages 1-1.5 mm long.

Distr. India (Punjab, Himachal Pradesh, Uttar Pradesh, Kumaon), Nepal, Sikkim, Bhutan, China (Xizang, Yunnan, Sichuan, Shaanxi).

*Juncus spacelatus* is similar to *J. himalensis* Klotzsch but differs in having the elongate auricles and the linear-lanceolate tepals much longer than the stamens. It grows in marshy places along streams or bogs from elevations of 3700 to 4600 m.

**56. *Juncus spumosus*** Noltie in Edinburgh J. Bot. **51**: 139, f. 2A–H (1994); Fl. Bhutan **3**(1): 261 (1994). Wu and Clemants in Wu and Raven, Fl. China **24**: 62 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 126, f. 62A–H (2002).

[Colour plate 8d, e; Plate 55; Fig. 59]

Types: Bhutan; Tongsa Distr. west side of Yuto La, 3350 m (H. J. Noltie 122, 8 Aug. 1991, E-holotype, photo, K-isotype).

*Juncus biluoshanensis* K. F. Wu in Acta Phytotax. Sin. **32**: 463, f. 6, 8–11 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 223, f. 53, 8–11 (1997). Miyamoto in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, **26**: 102 (2000). Bao in Wu and Wu, Fl. Yunnanica **15**: 557 (2003). Type: China; Yunnan, Bijiang, Biluo snowy mountain, 3900 m (S. K. Wu 8703, 10 Sept. 1964, KUN-holotype).

Perennial, densely caespitose, 20–90 cm tall. Rhizomes densely short branched and clustered. Culms ascending, grass-green, terete, 2–2.8 mm in diam., with several longitudinal striae, cross section rounded. Cataphylls 1 or 2 to each culm, loosely embracing at base of culm, brown to reddish brown, 2–3 cm long. Leaves grass leaf-like, blade margin entire, sheathing at base light brown to reddish, cross section of blade flattened, with several ridges on abaxial side, auricles absent; basal and subbasal leaves 2 or 3 to each culm, 5–27 cm long including sheath, 5–8 mm wide, sheath 2–5 cm long; cauline leaves 1–3 to each culm, shorter than culm, 5–20 cm long including sheath, 3–5 mm wide, sheath 2–5 cm long. Inflorescence terminal, branched, hemispherical, flower heads 10–30, 0.5–1 cm in diam., flowers 2–8, chestnut-brown, peduncle 0.5–6 cm long. Lowest bract grass leaf-like, grass-green, linear, slightly longer than or as long as inflorescence, 5–14 cm long, with several ridges on abaxial side, cross section flattened; floral bract lanceolate to ovate, 1.8–2 mm long, 0.6–0.8 mm wide, scarious; sheathing bract on peduncle brown, lanceolate, 1–2 cm long, membranaceous. Flowers cream-white, 5–6 mm long, 1.8–2 mm wide, pedicel 0.8–1 mm long. Tepals light brown, ovate to oblong, outer ones slightly longer than inner ones, 3–3.5 mm long, 0.8–1.3 mm wide. Stamens 6, longer than tepals, 4.5–5 mm long; filaments 3.8–4.1 mm long, 5 times as long as anthers; anthers yellow, linear-ellipsoid, 0.7–0.9 mm long. Pistil 4.5–5.5 mm long, 1.2–1.8 mm wide; stigmas 0.5–0.8 mm long; style 0.3–0.5 mm long. Capsule brown, ovoid, longer than tepals, 5–6 mm long, 2.0–2.2 mm wide, acute, cross section rounded. Seeds ellipsoid, 0.5–0.6 mm long, appendages 1–1.4 mm long.

Distr. Bhutan, China (Yunnan).

*Juncus spumosus* is similar to *J. amplifolius* A. Camus and *J. rostratus* Miyam. but differs in having the bulliform cells on the abaxial side of leaves, the filaments five times as long as the anthers, the shorter stigmas (0.5–0.8 mm long), and the shorter style (0.3–0.5 mm long); *J. amplifolius* (stigmas 4–7 mm long, style 1.5–2 mm long) and *J. rostratus* (stigmas 2.5–4 mm long, style 2.5–4 mm long). It grows on exposed scree slopes along road sides from elevations of 2600 to 3900 m.

**57. *Juncus thomsonii*** Buchenau in Bot. Zeitung (Berlin) **25**: 148 (1867); in Bot. Jahrb.



Syst. 6: 214 (1885); in Bot. Jahrb. Syst. 12: 390 (1890); in Engler, Pflanzenr. (iv. 36) 25: 224 (1906). Brown in J. Linn. Soc., Bot. 36: 166 (1903). Samuelsson in Acta Horti Gothob. 3: 69 (1927); in Hand.-Mazz., Symb. Sin. 7: 1237 (1936). Krecetovicz and Goncarpv in Komarov, Fl. USSR 3: 523, t. 30, f. 7 (1935). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. 3: 96, t. 8, f. 6 (1967). Satake in J. Jap. Bot. 43: 382 (1968); in Ohashi, Fl. E. Himal. 3: 131 (1975). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Jafri in Fl. Pakistan 138: 8, f. 1e–g (1981). Wu et al., Index Fl. Yunnan. 2: 2084 (1984). Lu and Zhang in Fl. Xizang. 5: 508, f. 282 (1987). Noltie, Fl. Bhutan 3(1): 268 (1994). Wu in Acta Phytotax. Sin. 32: 459 (1994); Fl. Reipubl. Popul. Sin. 13(3): 198, f. 46, 5–7 (1997). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2418 (1994). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 183 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 240 (2000); in J. Jap. Bot. 78: 156 (2003). Wu and Clemants in Wu and Raven, Fl. China 24: 56 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 96 (2002). Bao in Wu and Wu, Fl. Yunnanica 15: 545 (2003). [Colour plate 9a; Plate 56; Fig. 60]

*Juncus leucomelus* Royle var. *thomsonii* (Buchenau) Buchenau in Nachr. Königl. Ges. Wiss. Göttingen Geschäftl. Mitt. 13: 250 (1869).

Type: Himalaya Bor. Occ.; 10000–15000 ft. (T. Thomson s. n., W-syntype).

*Juncus thomsonii* var. *fulvus* K. F. Wu in Acta Phytotax. Sin. 32: 459 (1994); Fl. Reipubl. Popul. Sin. 13(3): 199 (1997). Type: Tibet; Tumengela coal mine, 5000 m (J. X. Yang 1917, 8 Jul. 1963, KUN-holotype).

Perennial, caespitose, 5–30 cm tall. Rhizomes short creeping. Culms erect, terete, 0.3–0.9 mm in diam., with several shallow grooves, cross section rounded. Cataphylls 1 or 2 to each culm or absent, light brown to brown, 5–8 mm long. Leaves terete, cross section of blade rounded, auricles rounded; basal leaves 2 or 3 to each culm, 2–8 cm long including sheath, 0.2–0.4 mm wide, sheath 1–6 cm long; cauline leaves absent. Inflorescence with a single flower head, hemispherical, 0.5–1.2 mm in diam., flowers cream-white, 3–10. Lowest bract brown to chestnut-brown, lanceolate to ovate-lanceolate, shorter than inflorescence, 3–8 mm long, 2–5 mm wide, scarious; floral bract lanceolate to ovate, 2–7 mm long, 1.5–4 mm wide, scarious; sheathing bract absent. Flowers 5–8 mm long, 0.5–1.5 mm wide, pedicel 0.5–2 mm long. Tepals ivory-white, elliptic-lanceolate, outer ones slightly longer than inner ones, 2–3 mm long, 0.7–0.9 mm wide. Stamens 6, longer than tepals, 4–6 mm long; filaments 3–4.2 mm long, 2–2.3 times as long as anthers; anthers white, linear-ellipsoid, 1.5–1.8 mm long. Pistil 3–5 mm long, 0.7–1 mm wide; stigmas 1–1.5 mm long; style white, 0.5–0.8 mm long. Capsule chestnut-brown, obovoid, 5–7 mm long, 2–2.5 mm wide, mucronate, cross section trigonous. Seeds 0.6–0.8 mm long, 0.2–0.3 mm wide, appendages 0.8–1.1 mm long.

Distr. Pakistan, Kashmir, India (Punjab, Himachal Pradesh, Kumaon), Nepal, Sikkim, Bhutan, China (Xizang, Qinghai, Gansu, Yunnan, Sichuan, Shaanxi).

*Juncus thomsonii* is similar to *J. perpusillus* Sam. but differs in having the anthers (1.5–1.8 mm long) half of the filaments in length; *J. perpusillus* (the anthers 1–1.4 mm long). It grows in marshy places of bogs or along rivers from elevations of 3000 to 4920 m.

**58. *Juncus tobdeniorum*** Noltie in Edinburgh J. Bot. 55: 42, f. 1A, 2A–D (1998).

Kirschner et al., Juncaceae 3, Fl. World 8: 102 (2002).

[Plate 57; Fig. 61]

Types: Sikkim; North District, Yakche, N. of Lachung, 27°43'17"N, 88°45'02"E, 3105 m (D. G. Long & H. J. Noltie 209, 14 Jul. 1996, E-holotype, photo, CAL, PE, TI-isotypes).

Perennial, densely caespitose, 16–23 cm tall. Rhizomes horizontally short creeping, culms arising in densely crowded rows. Culms erect, grass-green, terete, 0.5–0.8 mm in diam., with several longitudinal ridges, pith interrupted spongy. Cataphylls 2 or 3 to each culm, closely embracing at base of culm, stramineous apically, brown at base, 0.3–4 cm long. Leaves only cataphylls sheathing culm. Inflorescence pseudolateral, loosely branched, flowers 3–25. Lowest bract appearing as a continuation of culm, 3–7 cm long. Bracteoles 2, ovate to ovate-lanceolate, 0.4–1 mm long. Flowers 2–2.8 mm long, 1–1.3 mm wide. Tepals light brown, lanceolate to linear-lanceolate, outer ones as long as inner ones, 2–2.3 mm long, 0.5–0.7 mm wide. Stamens 3, shorter than tepals, 1–1.2 mm long; filaments 0.7–0.8 mm long, twice as long as anthers; anthers yellow, linear-ellipsoid, 0.3–0.4 mm long. Pistil 1.2–1.5 mm long, 0.5–0.8 mm wide; stigmas 0.2–0.3 mm long; style 0.1–0.2 mm long. Capsule brown, obovoid, shorter than tepals, 1.2–1.5 mm long, 0.7–0.8 mm wide, cross section trigonous, 3-septate. Seeds brown, ovoid, 0.4–0.5 mm long, appendages absent.

Distr. Sikkim.

*Juncus tobdeniorum* is most similar to *J. setchuensis* Buchenau but differs in having the culms with the interrupted spongy pith and the short stigma (0.2–0.3 mm long).

**59. *Juncus trachyphyllus*** Miyam. & H. Ohba in J. Jap. Bot. 72: 164, f. 2 (1999); in Akiyama et al., Bull. Natn. Sci. Mus., Tokyo, B, 25: 183 (1999); in J. Jap. Bot. 78: 154 (2003). Kirschner et al., Juncaceae 2, Fl. World 7: 106, f. 71A–M (2002).

[Colour plate 9c; Plate 58; Fig. 62]

Types: China; Sichuan, Docheng District, Mt. Gonggashan, 4300 m (S. Wu et al. 1540, 21 Aug. 1996, KUN-holotype, TI-isotype).

Perennial, caespitose, 7–20 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.4–0.8 mm in diam., scabrous, cross section oval. Cataphylls 2–4 to each culm, stramineous, 1.0–3.5 cm long. Leaves grass leaf-like, cross section of blade U-shaped, auricles very short; basal leaves 1 or 2 to each culm, 4–10 cm long including sheath, 0.4–1 mm wide, sheath grass-green, 1.5–4 cm long; cauline leaf one to each culm, terete, linear, shorter than inflorescence, 1.5–7.0 cm long, with several grooves. Inflorescence with a single flower head, rarely 2, hemispherical, 0.8–1.8 cm in diam., flowers 5–15, ivory-white, peduncle of lateral head 1.0–1.5 cm long. Lowest bract linear-lanceolate, longer than or as long as inflorescence, 0.8–1.2 cm long, 2.0–3.5 mm wide; floral bract light brown, lanceolate-ovate, 4–7 mm long, 1.5–3.0 mm wide, scarious; sheathing bract on peduncle lanceolate, 3–4 mm long, membranaceous. Flowers 7–10 mm long, 0.8–1.5 mm wide, pedicel 0.8–1.0 mm long. Tepals white, lanceolate, outer ones slightly shorter than inner ones, 4–5 mm long, 0.9–1.0 mm wide, inner ones 4.5–5.5 mm long, 1.0–1.4 mm wide. Stamens 6, longer than tepals, 9–10 mm long; filaments 6.5–7.2 mm long, 2.6 times as long as anthers; anthers white, linear, 2.5–2.8 mm long. Pistil 7–8 mm long, 1.5–2 mm wide; stigmas 0.6–0.8 mm long; style 2.0–2.5 mm long. Capsule ovoid, 4.4–4.8 mm long, 1.2–1.5 mm wide, mucronate, cross section trigonous. Seeds



ellipsoid, 1.5–1.8 mm long, appendages very short, 0.05 mm long.

Distr. China (Sichuan).

*Juncus trachyphyllus* is similar to *J. allioides* Franch. and *J. glaucoturgidus* Noltie but differs in having the grooved basal leaves, the U-shaped cross section of the leaf blade, the scabrid leaves, and the scabrid culms. It grows on exposed scree slopes with *J. kingii* Rendle and *J. gonggae* Miyam. & H. Ohba from elevations of 3900 to 4300 m. *Juncus trachyphyllus* is found only at the foot of the Mt. Gongga shan in Sichuan, China.

**60. *Juncus trichophyllus*** W. W. Sm. in Rec. Bot. Surv. India **6**: 103 (1914). Noltie in Edinburgh J. Bot. **51**: 131 (1994); Fl. Bhutan **3**(1): 266, f. 25f (1994). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 241 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 96 (2002). [Colour plate 9b; Plate 59; Fig. 63]

Types: Sikkim, Changu, 13000 ft. (W. W. Smith 3502, 16 Jul. 1910, CAL, K-syntypes); without precise locality (King's Coll. s. n., in 1889, CAL, K-syntypes).

Perennial, caespitose, 3–11 cm tall. Rhizomes horizontally short creeping. Culms erect, terete, 0.25–0.35 mm in diam., smooth, cross section rounded. Cataphylls 1 or 2 to each culm, brown, 3–6 mm long. Leaves grass-green, terete, cross section of blade rounded, auricles rounded; basal leaf absent or one to each culm, 0.5–1 cm long; cauline leaves 2 or 3 to each culm, linear, 2–5 mm long, with bulbils, auricles oblique-truncate, shorter than culm. Inflorescence with a single flower head, hemispherical, 0.6–1 cm in diam., flowers 3–8, yellowish white. Lowest bract brown, ovate-lanceolate, shorter than inflorescence, 3–5 mm long, 1–1.5 mm wide, scarious; floral bract pale brown, lanceolate, 3–4 mm long, 0.8–1 mm wide, scarious; sheathing bract absent. Flowers 4–6 mm long, 0.7–0.9 mm wide, pedicel 0.8–1.3 mm long. Tepals ivory-white, ovate-lanceolate to ovate, outer ones and inner ones equal in length, 2–2.5 mm long, 0.7–0.9 mm wide. Stamens 6, longer than tepals, 2.1–3.2 mm long; filaments 1.7–2.2 mm long, twice as long as anthers: anthers white, linear-ellipsoid, 0.8–1 mm long. Pistil white, 2–3 mm long, 0.7–1 mm wide; stigmas 0.2–0.3 mm long; style 0.6–0.8 mm long. Capsule brown, obovoid, 2.5–3 mm long, 1.3–1.5 mm wide, cuspidate, cross section trigonous. Seeds unknown.

Distr. Nepal, Sikkim, Bhutan.

*Juncus trichophyllus* is characterized by the axillary bulbils on the cauline leaves and similar to *J. brachystigma* Sam. in the floral morphology, but *J. brachystigma* has the culm and leaf surface with several longitudinal ridges and no cauline leaf. *Juncus trichophyllus* is restricted in Nepal, Sikkim, and Bhutan. It grows on mossy rocks from elevations of 3650 to 4300 m.

**61. *Juncus triglumis*** L., Sp. Pl.: 328 (1753). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880); in Bot. Jahrb. Syst. **6**: 213 (1885); in Bot. Jahrb. Syst. **12**: 388 (1890); in Engler, Pflanzenr. (iv. 36) **25**: 224 (1906). Hook. f., Fl. Brit. Ind. **6**: 396 (1892). Samuelsson in Acta Horti Gothob. **3**: 69 (1927). Krecetovicz and Goncarpv in Komarov, Fl. USSR **3**: 522, t. 30, f. 13 (1935). Satake in Hara, Fl. E. Himal.: 404 (1966); in Hara, Fl. E. Himal. **2**: 164 (1970). Egorova in Akad. Nauk SSSR Bot. Inst. Komarova, Rast. Tsentral. Azii, Fasc. **3**: 97, t. 8, f. 7 (1967). Hara et al., Enum. Flow. Pl. Nepal **1**: 85 (1978). Jafri in Fl. Pakistan **138**: 6 (1981). Lu and Zhang in Fl. Xizang. **5**: 508 (1987). Miyamoto and Ohba

in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992). Noltie, Fl. Bhutan 3(1): 269 (1994). Zhang and Lu in Wang et al., Vasc. Pl. Hengduan Mts. 2: 2418 (1994). Wu in Acta Phytotax. Sin. 32: 459 (1994); Fl. Reipubl. Popul. Sin. 13(3): 196, f. 46, 1–4 (1997). Wu and Clemants in Wu and Raven, Fl. China 24: 55 (2000). Miyamoto in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 241 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World 7: 97, f. 67 (2002).

[Colour plate 9d; Plate 60; Fig. 64]

Types: In alpinis Lapponiensis [Sweden; Lappland] (LINN-LAPP-syntype); Tauro Rastadiensis [Austria; Dadstadter Tauern] (LINN-LAPP-syntype).

*Juncus hancockii* Hance in J. Bot. 16: 111 (1878). Type: China; Shanxi, Siao Wu-tai-shan (W. Hancock 20118, BM-holotype).

*Juncus potaninii* Buchenau: Miyamoto & Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992).

Perennial, caespitose, 4–7 cm tall. Rhizomes horizontally short creeping, culms arising in dense rows. Culms erect, grass-green, terete, 0.4–0.6 mm in diam., smooth, cross section rounded. Cataphyll one to each culm or inconspicuous, loosely embracing at base of culm, light brown to brown, 0.5–1.5 cm long. Leaves terete, filiform, with a groove on adaxial side, cross section of blade compressed U-shaped, auricles rounded; basal and subbasal leaves 1 or 2 to each culm, 3–8 cm long including sheath, sheath 1–4 cm long; cauline leaves absent. Inflorescence with a single flower head, hemispherical, 3.5–8 mm in diam., flowers 2–6, chestnut-brown. Lowest bract brown, ovate-lanceolate, as long as inflorescence, 3–5 mm long, 1.5–1.8 mm wide, scarious; floral bract lanceolate to ovate, 2.5–4 mm long, 1.3–1.5 mm wide, scarious. Flowers 5.5–6.5 mm long, 1.8–2.0 mm wide, pedicel 0.8–1 mm long. Tepals brown to chestnut-brown, lanceolate, outer ones and inner ones equal in length, 3–4 mm long, 0.8–1.4 mm wide. Stamens 6, longer than tepals, 3.5–5.5 mm long; filaments chestnut-brown, 3–4.4 mm long, 4–5 times as long as anthers; anthers cream-yellow, linear-ellipsoid, 0.5–1.1 mm long. Pistil brown to chestnut-brown, 5–7 mm long, 1–1.3 mm wide; stigmas 0.5–0.8 mm long; style 0.5–0.8 mm long. Capsule chestnut-brown, oblong, 4–5 mm long, 1.8–2 mm wide, mucronate, cross section trigonous. Seeds oblong, 0.7–0.8 mm long, appendages 0.5–0.8 mm long.

Distr. Nepal, Sikkim, Bhutan, China (Xizang, Hubei).

*Juncus triglumis* is similar to *J. thomsonii* Buchenau but differs in having the compressedly oval leaves, the U-shaped cross section of the leaf blade, and the shorter stigmas (0.5–0.8 mm long); *J. thomsonii* (stigmas 1–1.5 mm long). It grows in marshy places of bogs or along streams from elevations of 2400 to 4660 m. *Juncus triglumis* is widely distributed in the northern hemisphere and one of the common species in the alpine region of Nepal. However, in eastern Sino-Himalaya it is rather rare.

**62. *Juncus uniflorus*** W. W. Sm. in Rec. Bot. Surv. India 6: 104 (1914). Hara et al., Enum. Flow. Pl. Nepal 1: 85 (1978). Noltie in Edinburgh J. Bot. 51: 136 (1994); Fl. Bhutan 3(1): 270, f. 251 (1994). Miyamoto in Ohba and Ikeda, Contr. Fl. Ganesh Him.: 69 (1999); in Ohba and Ikeda, Fl. Hinku and Hunku, E. Nepal: 241 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Miyamoto and Ohba in J. Jap. Bot. 77: 33, f. 6 (2002). Kirschner et al., Juncaceae 2, Fl. World 7: 111, f. 65 (2002). [Colour plate 9e; Plate 61; Fig. 65]

Types: Sikkim; Se-moo-do-ne, about 2500 ft. below the Jelep La (i. e., about 12000ft.)



(G. King's Coll. s. n., 22 Jun. 1882, K-lectotype, designate by H. Noltie in 1994a, CAL-isolectotype); Chakung Chu, 13000 ft. (W. W. Smith 3854, 26 Jul. 1910, K-syntype).

Perennial, caespitose, 1–3 cm tall. Rhizomes horizontally short creeping. Culms erect, grass-green, terete, 0.2–0.3 mm in diam., smooth, cross section rounded. Cataphylls 1 or 2 to each culm, light brown, 2–5 mm long. Leaves terete, grass-green, auricles very short; basal leaves 2 or 3 to each culm, 0.8–2.5 cm long including sheath, 0.25–0.32 mm wide, sheath 2–5 mm; cauline leaves absent; leaves on sterile shoots 1–4 cm long, 0.25–0.35 mm wide. Inflorescence solitary, pseudolateral, 3.0–5.5 mm long, 1.3–2.2 mm wide, flower solitary or sometimes 2, bracts 2, as long as or just exceeding flower; sheathing bract absent; lowest bract brown, slightly longer than inflorescence, 2.5–4.5 mm long, 0.4–0.8 mm wide. Flowers 3–5.5 mm long, 1.0–1.5 mm wide, sessile. Tepals brown, lanceolate, outer ones shorter than inner ones, 1.8–3.0 mm long, 0.4–0.6 mm wide. Stamens 6, shorter than tepals, 1.0–1.7 mm long; filaments 0.24–0.70 mm long; anthers leather-yellow, linear-ellipsoid, 0.36–1.0 mm long, 1.5 times as long as filaments. Pistil 2.8–5.2 mm long, 0.8–1.5 mm wide; stigmas 0.8–1.2 mm long; style 0.8–1.0 mm long. Seeds ellipsoid, 0.5–0.6 mm long, appendages very short.

Distr. Nepal, Sikkim, China (Xizang).

*Juncus uniflorus* is one of the smallest species of *Juncus* in the Sino-Himalayan region. It is similar to *J. rohtangensis* Goel & Aswal but differs in having two or three basal leaves, the brown tepals, and the anthers 1.5 to 2 times as long as the filaments. It grows in marshy places from elevations of 4150 to 4600 m.

**63. *Juncus wallichianus*** Laharpe in Mém. Soc. Hist. Nat. Paris. **3**: 139 (1827). Buchenau in Bot. Jahrb. Syst. **1**: 111 (1880). Satake in Hara, Fl. E. Himal.: 404 (1966); in Hara, Fl. E. Himal. **2**: 169 (1970). Hara et al., Enum. Flow. Pl. Nepal **1**: 85 (1978). Miyamoto and Ohba in Ohba and Akiyama, Alp. Fl. Jaljale Him.: 73 (1992). Noltie, Fl. Bhutan **3**(1): 254 (1994). Wu in Acta Phytotax. Sin. **32**: 453 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 188, f. 43, 5–6 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 54 (2000). Li et al., F. Gaoligong Mts.: 1123 (2000). Press et al., Ann. Check. Fl. Pl. Nepal: 150 (2000). Kirschner et al., Juncaceae 2, Fl. World **7**: 225, f. 90D–E (2002).

[Colour plate 9f; Plate 62; Fig. 66]

Types: Nepal (Wallich s. n., K-holotype, G, W-isotypes).

*Juncus indicus* Royle ex D. Don in Trans. Linn. Soc. London **18**(3): 323 (1840). Types: Nepal; Katmandu [Kathmandu] (Wallich 8999, in 1821, K-holotype, W-isotype).

*Juncus monticola* Steud. in Syn. Pl. Glumac. **2**: 301 (1855). Satake in Hara, Fl. E. Himal.: 403 (1966); in Hara, Fl. E. Himal. **2**: 163 (1971); in Ohashi, Fl. E. Himal. **3**: 130 (1975). Types: India; M. Nilagiri (R. F. Hohenacker 951, P-lectotype, designated by Wilson & Johnson in 2001, BM, S, UPS-isolectotypes).

*Juncus auritus* F. K. Wu in Acta Phytotax. Sin. **32**: 453, f. 4, 5–8 (1994); Fl. Reipubl. Popul. Sin. **13**(3): 189, f. 44, 5–8 (1997). Wu and Clemants in Wu and Raven, Fl. China **24**: 54 (2000). Types: China; Yunnan (C. W. Wang 63454, in 1935, HSNU-holotype, KUN-isotype).

*Juncus sphaerocephalus* K. F. Wu in Acta Phytotax. Sin. **32**: 453, f. 4, 1–4 (1994). Bao in Wu and Wu, Fl. Yunnanica **15**: 542 (2003). Types: China; Yunnan, Shithze Shan, 1200 m (C. W. Wang & Y. Liu 84257, 9 Oct. 1939, PE-holotype, KUN-isotype).

*Juncus yanshanuensis* Novikov in Obshch. Isp. Prir., Otd. Biol. **103**(4): 70 (1998).

Perennial, ascending, 10–30 cm tall. Rhizomes branched-ascending, erect or ascending, 0.6–1.2 mm in diam., cross section rounded. Leaves grass-green, terete, cross section of blade rounded to oval, auricles rounded; basal leaves 1 or 2 to each culm, sometimes absent, 2–6 cm long including sheath, sheath 1–3 cm long, 0.4–0.8 mm wide; cauline leaves 1–3 to each culm, shorter than culm, 5–10 cm long including sheath, sheath 1–2.5 cm long, 0.5–0.8 mm wide. Inflorescence terminal, loosely branched, flower heads many, 4–8 mm in diam., flowers 2–20, grass-green. Lowest bract grass-green, linear, shorter than inflorescence, 2–6 cm long; floral bract ovate to lanceolate, 1.5–2.0 mm long, 0.6–0.8 mm wide, scarious; sheathing bract on peduncle lanceolate to obovate, 5–10 mm long, membranaceous. Flowers 3–4 mm long, 0.8–1.0 mm wide. Tepals grass-green to light brown, lanceolate to linear-lanceolate, outer ones slightly longer than inner ones or equal in length, 3–4 mm long, 0.7–0.8 mm wide. Stamens 3, shorter than tepals, 2–2.5 mm long; filaments 1.6–2 mm long, longer than anthers; anthers yellow, linear-ellipsoid, 0.4–0.5 mm long. Stigmas 0.2–0.3 mm long; style 0.1–0.2 mm long. Capsule brown, oblong, slightly longer than tepals, 3.5–4.5 mm long, 1–1.2 mm wide, cross section 3-keeled. Seeds obovoid, 0.4–0.5 mm long, appendages very short.

Distr. Nepal, Sikkim, Bhutan, Assam, Myanmar, China (Xizang, Yunnan).

*Juncus wallichianus* is found only at low altitude, below 2000 m in marshy places in the Sino-Himalaya. This species is similar to *J. leptospermus* Buchenau but differs in having the slightly compressed oblong cross section of the leaf blade and the longer tepals.

### Summary

The species of *Juncus* (Juncaceae) in the Sino-Himalayan region are revised. Sixty-three species are recognized. One new species, *Juncus petrophilus* Miyam., is described. *Juncus rostocarpus* Miyam. is a new name for *J. amplifolius* var. *pumilus* A. Camus.

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## Appendix: Specimens Examined

### I. *Juncus allioides* Franch.

**PUNJAB:** Kulu-Lahaul, above Manali, 11000 ft. (J. R. Drummond 23168, 16 Jul. 1888, K); Mussoorii, Kidar Kantha, 15000 ft. (J. R. Drummond 22794, 10 Jun. 1904, K); Kunawar (J. R. Drummond 22433, 22434, 1885, K).

**KUMAON:** Palang, 11000 ft. (J. F. Duthie 6053a, 20 Jul. 1886, K); without precise locality (Wallich 9002B, 1872, K).

**NORTH WEST INDIA:** Tihri-Garhwal, Rudugaira Gad, 15000 ft. (P. P. Huggins 237, Sept. 1950, BM); loc. cit., Rhudughara, 10000-11000 ft. (J. F. Duthie 152, Jul. 1888, CAL).

**NEPAL:** Bhurchula Leke, near Jumla, 12500 ft. (O. Polunin et al. 4505a, 10 Jul. 1952, BM); Central Nepal, Thorong La, E. of Muktinath, 14500 ft. (G. Mische 645, 9 Sept. 1977, BM); Taglung, S. of Tukucha, Kali Gandaki, 12000 ft. (J. D. A. Stainton et al. 1750, 7 Nov. 1954, A); Namdo, N. of Mustang, 16500 ft. (J. D. A. Stainton et al. 2335, 9 Aug. 1954, A, BM, CL); Gandaki Zone, Manang distr., Bimtang, 28°38'04"N, 84°28'20"E, 4325 m (M. Suzuki et al. 9460279, 10 Aug. 1994, TI); Jargeng Khola, 15000-16000 ft. (D. G. Lowndes 1349, 7 Aug. 1950, BM); Taglung, Kali Gandaki, 12000 ft. (J. D. A. Stainton & L. H. J. Williams 1750, 11 Jul. 1954, BM); Tukucha, Kaki Gandaki, 10500 ft. (J. D. A. Stainton & L. H. J. Williams 1880a, 18 Jul. 1954, BM); Pangsing, 14000 ft. (C. L. Dhwoj 113, 1929, BM); Rasuwa, around Tinbu Kharka, 3800 m (F. Miyamoto et al. 9410078, 27 Jul. 1994, TI); loc. cit., Gosain Kund - Bhairab Kund, 4200 m (M. Sato 9534046, 27 Jul. 1995, TI); near mining camp Lari, 28°14'N, 85°12'E, 4300 m (J. H. Haas 2502, 23 Aug. 1974, BM); Lamche Danda, 27°26'N, 86°27'E, 3100 m (J. F. Dobremez 248, 25 Jun. 1970, BM); Near Lapsang, Simula Khola, 4250 m (C. G. Wilson et al. 758, 19 Sept. 1989, KATH); loc. cit., 27°34'N, 87°59'E, 4330 m (C. G. Wilson et al. 762, 19 Sept. 1989, KATH); Kosi zone, Sankhuwa Sabha district, Younglay, Barun Khola (24 km N. W. Num), 27°44'N, 87°12'E, 3660 m (H. B. Emery CH37, 9 Jul. 1974, K); loc. cit., Ribuk, Barun Khola (24 km N. W. Num), 27°45'N, 87°11'E, 3812 m (H. B. Emery CH8B, 9 Jul. 1974, K); Ghunsa to Kambachen, 27°02'N, 87°58'E (S. Crawford et al. KEKE473, 9 Sept. 1989, K); near Lapsang, Simbua Khola, 27°04'N, 87°59'E, 4250 m (S. Crawford et al. KEKE758, 19 Sept. 1989, K); loc. cit., 4330 m (S. Crawford et al. KEKE762, 19 Sept. 1989, K); Chairam, 27°33'N, 87°58'E, 12500 ft. (L. H. J. Williams 862, 23 Jun. 1969, BM, KATH, TI); Ghunsa to Kambachen, 3720 m (C. G. Wilson et al. 473, 9 Sept. 1989, KATH); Solukhumbu, Khare - Tangna, 4100 m (F. Miyamoto et al. 9580361, 20 Aug. 1995, KATH, TI); loc. cit., Saure Kharka - Tangna, 3900 m (F. Miyamoto et al. 9580212, 5 Aug. 1995, KATH, TI); loc. cit., Saure Kharka - Tangna, 4000 m (F. Miyamoto et al. 9580202, 5 Aug. 1995, KATH, TI); loc. cit., Tangna - Sabsitsho - Dik Kharka, 4200 m (F. Miyamoto et al. 9580221, 6 Aug. 1995, KATH, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalangi Base Camp, 4660 m (F. Miyamoto et al. 9580265, 11 Aug. 1995, KATH, TI); loc. cit., Dik Kharka - Khare, 4200 m (F. Miyamoto et al. 9592223, 17 Aug. 1995, TI); loc. cit., Tangna - Sabsitsho - Dik Kharka, 4280 m (F. Miyamoto et al. 9596233, 6 Aug. 1995, TI); loc. cit., Jar Kharka - Panch Pokari - Mojong Khola - Thasing Dingma, 4200 m (F. Miyamoto et al. 9580172, 3 Aug. 1995, TI); Changyam Khola, 13500 ft. (P. C. Gardner 759/759A, 14 Jun. 1953, BM); Michet, 13500-15000 ft. (C. Wigram 23, 3 Feb. 1924, K); Nimasey, 12000-13000 ft. (C. L. Dhwoj 312, 1930, BM); N. Phgune Dhuri, 13000 ft. (J. D. A. Stainton et al. 3412a, 7 Jul. 1954, BM); Tak Tor, 12000-13000 ft. (C. L. Dhwoj 048A, 1930, BM).

**SIKKIM:** Lachen, 14000 ft. (J. D. Hooker s.n., 15 Jul. 1849, K); loc. cit., 13000 ft. (G. King's collector, s.n., Jul. 1888, CAL); Dzongri, 27°28'31"N, 88°09'38"E, 4000 m (ESIK 428, 433, 16 Jul. 1992, E, TI); West district, Below Lam Pokhri, 27°29'N, 88°12'E, 4090 m, (ESIK 525, 19 Jul. 1992, E, TI); Jongri (H. Hara et al. s.n., 23 May 1960 TI); East district, Tsomgo Chho, 27°22'14"N, 88°45'52"E, 3720 m (D. G. Long & H. J. Noltie 60, 8 Jul. 1996, E, TI); North district, N. W. slopes above Seku chho, Moraine ridge, 27°55'08"N,

88°40'40"E, 4830 m (D. G. Long & H. J. Noltie 417, 23 Jul. 1996, E, TI); By Rathong river en route from Dharrahli pass to Bilibari camp site, 4000 m (B. N. Starling et al. AGSES 223, 30 Jun. 1983, K); Darjeeling, Sandakphu, West, 3633 m (B. Safui 1684, 16 Sept. 1962, CAL); Chamnago, 12000 ft. (W. W. Smith 3642, 22 Jul. 1910, CAL); Chang, 14000 ft. (Ribu & Rhomoo 5703, 25 Nov. 1911, B); Tsomgo Lake, 12000ft. (Cutting & Vernay 22, 3 Aug. 1935, K); without precise locality, 11000–14000 ft. (J. D. Hooker s.n., 30 Aug. 1849, K).

**BHUTAN:** Upper Mo Chu district, E. bank of Tharizam Chu, 28°01'N, 89°35'E, 4080 m (I. W. J. Sinclair & D. G. Long 5319, 25 Sept. 1984, K); Dotena Limpa, 10000 ft. (R. E. Cooper et al. 2481, 30 Jul. 1914, BM); Jiutang, upper Trongsa Cew valley, 12500 ft. (F. Ludow et al. 19445, 17 Jul. 1949, BM); Waitang, Tsampa, 13500 ft. (F. Ludlow et al. 19236, 24 Jun. 1949, BM); Wangdi Phodrang district, Maorothang - Tintatso, 27°39'N, 90°31'E, 3900 m (F. Miyamoto 9361567, 20 Sept. 1993, TI); loc. cit., 3800 m (F. Miyamoto 9361570, 20 Sept. 1993, TI); loc. cit., Tintatso, 27°42'N, 90°31'E, 3900 m (F. Miyamoto 9361575, 20 Sept. 1993, TI); loc. cit., Tsonsothang, 27°49'N, 90°24'E, 4100 m (F. Miyamoto 9361635, 22 Sept. 1993, TI); Tamp La, 27°43'N, 90°31'E, 4400 m (F. Miyamoto 9361693, 25 Sept. 1993, TI); loc. cit., Tintatso, 27°42'N, 90°31'E, 4150 m (F. Miyamoto 9361745, 27 Sept. 1993, TI).

**XIZANG (TIBET):** Nyalam, 3100 m (Qing-Zang expedition team 5903, 25 Jun. 1975, KUN); loc. cit., 3850 m (S. K. Wu et al. 75-443, 22 Jun. 1975, KUN); Yatung, 27°51'N, 88°35'E (H. E. Hobson 2, 1897, K); Chumbi & Phari (Dungboo s.n., Jul. 1879, CAL); Lhasa district (collector unknown 20264, Jun.–Jul. 1947, K); Nyingchi, 4500 m (Qing-Zang expedition team 74-5358, 26 Sept. 1974, KUN); Mainling (Qing-Zang expedition team 74-5326, 21 Sept. 1974, KUN); Baxoi Xian, Rawu - Baxoi, 4180 m (S. Akiyama et al. 105181, 4 Aug. 2000, KUN, TI); Zogang, 4000 m (Qing-Zang expedition team 12139, KUN); Lusha, Tsangpo valley, 29°27'N, 94°35'E, 9500 ft. (F. Ludlow et al. 4852, 17 Jun. 1938, A, CAL); Karwa valley, 12000 ft. (collector unknown 211, K); Ronaphar valley, 1300 ft. (M. R. W. G. Hingston 35, 1 Jul. 1924, K); Tongolo [Tungo la] (R. P. Soulié 720, 1893, CAL, K, P); loc. cit. (R. P. Soulié 931, 1893, K, P); loc. cit. (R. P. Soulié 961, 1893, A, K); above Yangu, Yersta valley, 13500 ft. (F. E. Younghusband T20, 7 Jul. 1903, K, CAL); without precise locality (N. M. Przewalski s.n., 1884, S).

**QINGHAI:** Yushu 3850 m (Tibet expedition team 1245, 1 Aug. 1972, PE).

**GANSU:** Gargannar, S. of Old Taochow, 3600–4200 m (R. C. Ching 917, 28–31 Aug. 1923, A); Lingan Hsien, 3000 m (P. Wang 55110, 20 Jul. 1936, KUN, PE); without precise locality (N. M. Przewalski s.n., 17–29 Jun. 1980, S); without precise locality, 3800 m (K. T. Fu 1353, 22 Jul. 1937, PE).

**YUNNAN:** Wei-si Hsien, 3500 m (C. W. Wang 63865, Jun. 1935, A, PE); loc. cit., 3000 m (C. W. Wang 67676, Aug.–Sept. 1935, A, PE); loc. cit., 3000 m (C. W. Wang 67820, Aug.–Sept. 1935, A, PE); loc. cit., Yeh-Chih, 3600 m (C. W. Wang 68409, Aug. 1935, A, PE); loc. cit., Kang-pu, 3500 m (C. W. Wang 64640, Jul. 1935, A, KUN, PE); loc. cit., 2000 m (C. W. Wang 64689, Jul. 1935, A, PE); Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68753, Aug. 1935, A); A-tun-tze, 3000 m (C. W. Wang 64806, Jul.–Aug. 1935, A); loc. cit., 3000 m (C. W. Wang 64801, Jul.–Aug. 1935, PE); Atuntze, Paimashan, Mune, 4020 m (T. T. Yü 9233, 27 Jul. 1937, PE); Deqe, Sanchan He, 3040 m (H. Ohba et al., 1404, 3 Aug. 1996, KUN, TI); loc. cit., Sibao, 2800 m (H. Ohba et al., 1425, 4 Aug. 1996, KUN, TI); loc. cit., Dacao Chang, 3200 m (H. Ohba et al., 1437, 6 Aug. 1996, KUN, TI); Zhongdian Xian, Hong Shan, 4160 m (S. K. Wu et al. 103042, 31 Jul.–4 Aug. 1999, KUN, TI); loc. cit., Tianchi, 27°39'N, 99°38'E, 3900 m (S. Akiyama et al. 420, 8 Jul. 2000, KUN, TI); loc. cit., Shudu Hu, a lake near Zhongdian, 27°55'N, 99°56'E, 3400 m (S. Akiyama et al. 424, 9 Jul. 2000, KUN, TI); Yanbi Xian, W. side of Diancang Shan, 25°50'N, 99°59'E, 3000 m (B. Bartholomew & D. E. Boufford 637, 30 Jun. 1984, A); Chungtien, Kongsinshu, 3300 m (T. T. Yü 11830, 28 Jun. 1937, PE); loc. cit., Tehgoh, 3200 m (T. T. Yü 12364, 24 Jul. 1937, A, PE); Shunning, Holungtan, 3000 m (T. T. Yü 16206, 10 Jun. 1937, PE); Dali Xian, Diancang Shan, 25°53'N, 100°01'E, 2900–3200 m (B. Bartholomew & D. E. Boufford 1173, 19 Jul. 1984, A); Tali range, 8000–10000 ft. (G. Forrest 4899, Jun.–Jul. 1909, CAL); Gue-sai-gue, Tsa-wa-rung, 3200 m (C. W.



Wang 65777, Aug. 1935, A, PE); Lijiang, Lijiang - Ganhaizi, 2750-2800 m (H. Ohba et al. 380, 15 Sept. 1987); Lijiang Xian, Laojun Shan, Longqun Lodge - Jiushijiu Longtan, 4000 m (S. K. Wu et al. 103159, 8 Sept. 1999, KUN, TI); Li-kiang Hsien, 2900 m (C. W. Wang 70811, Jul. 1935, PE); loc. cit., 3000 m (C. W. Wang 71026, Jul. 1935, A, PE); loc. cit., 2300 m (C. W. Wang 70524, Jun. 1935, A, PE); Prope urbem Lidjiang, imprimis in monte Yulung-schan (F. Handel-Mazzetti 4074, 1914-1918, S); Bangtze watershed, Prefectural district of Likiang (J. F. Rock 4765, May-Oct. 1922, A, S); Eastern slopes Likiang (J. F. Rock 11496, 10 Sept. 1923, KUN); Upper Kiukiang valley, Lungtsahmuru, 3800 m (T. T. Yü 19836, 9 Aug. 1938, A, PE); Konkaling, Konkatien, 3900 m (T. T. Yü 13053, 30 Aug. 1937, A, PE); Kulung, Metikonga, Lamashi, 3600 m (T. T. Yü 6863, 6 Jul. 1937 A, PE); Pin-chuan, 3000 m (C. W. Wang 52963, 18 Jul. 1933, PE); Taucheng Hsien, Mowu, 3950 m (T. T. Yü 12874, 23 Aug. 1937, A, PE); without precise locality (G. Forrest 14722, 1917-1919, K); without precise locality, 10000 ft. (G. Forrest 2364, Jun. 1904, K); without precise locality (Monati & Maire 3427, A).

**SICHUAN:** Taofu district, Haitzeshan, in ripa glareosa rivuli., 3800 m (H. Smith 11728, 28 Aug. 1934, KYO, PE); Kangding (Huang et al. 914 12, Jul. 1930, PE); Tachienlu, 9000-13500 ft. (A. E. Pratt 398, 1890, CAL); Ta Tsien lou (R. P. Soulié 887, 1893, CAL); Bao-Hsien (Moupin), Liang-ho-kuo, 11900 ft. (S. Y. Hu 395, Jul.-Aug. 1939, A, K); Mountains between the Litang and Shou-Chu rivers, between Wa-Erh-Dje and Garu, 4450 m (J. F. Rock 16770, Jul.-Aug. 1928, A); Xiangcheng - Daocheng, around Wuming Shan, 3600 m (S. K. Wu et al., 425, 29 Jul. 1997, KUN, TI); around Wuming shan 4600 m (S. K. Wu et al. 1038, 28 Jul. 1997, KUN, TI); Daocheng, Haizi, 4400 m (S. K. Wu et al., 1520, 17 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, Beiyu, 4650 m (S. K. Wu et al., 1547, 22 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, 4450 m (S. K. Wu et al., 446, 4 Aug. 1997, KUN, TI); loc. cit., 4020 m (S. K. Wu et al., 462, 7 Aug. 1997, KUN, TI); Yanyuan, 3900-4000 m (Qing-Zang expedition team 12264, 22 Jul. 1983, KUN); Tatsienlu (McLaren AC65, Jun. 1938, KYO); Muli, 3300 m (Qing-Zang expedition team 13012, 19 Aug. 1983, KUN); Mu-li, Wa-chin, 3300 m (T. T. Yü 6153, 12 Jun. 1937, A, PE); Sungpan, Gebirgeum (H. Wrigold s.n., Jun.-Aug. 1914, S); Sungpan Hsien, (W. P. Fang 4056, 8 Aug. 1928, A, K); Qinglongzui near the side of Longwangmiao, along the Longxi river, 1750 m (D. E. Boufford & B. Bartholomew 24622, 5 Sept. 1988, A); Xiaojin, Rilong - a pass of Balang Shan - Rilong, 3600 m (H. Ikeda et al., 100806, 29 Aug. 1998, KUN, TI); loc. cit., Ganhaizi - Dashuiba - Ganhaizi, 3530 m (H. Ikeda et al., 100826, 31 Aug. 1998, KUN, TI); loc. cit., Ganhaizi - southwestern slope of Mt. Siguniang - Ganhaizi, 3800 m (H. Ikeda et al., 100847, 1 Sept. 1998, KUN, TI); Mt. Omei (E. H. Wilson 5302, A, K); loc. cit., 3100 m (W. P. Fang 12983, 5 Aug. 1938, A, PE); loc. cit., 2150 m (T. C. Peng 121, 1 Aug. 1938, A); loc. cit., 10000-11000 ft. (W. P. Fang 2946, 14 Aug. 1928, A, PE); Omei shan (T. N. Liou 10302, 18 Oct. 1938, PE); loc. cit. (T. N. Liou & C. Wang 1230, 4 Oct. 1939, PE); Dongrergo, rufra Thrangbung-ssu, 4000 m (H. Smith 3114, 23, Jul. 1922, S); Lieng ho kou, 12000 ft. (T. K. Wang & T. S. Wen 615, Aug. 1936, A); Pao-hsin Hsein, Mupin, Tzu-pu Soong (collector unknown 2, 1954, PE); without precise locality (A. Henry 8916, Feb. 1890, K); without precise locality (R. P. Soulié 827, 1893, K); without precise locality, 3200 m (C. Y. Chiao & C. S. Fan 748, 12 Aug. 1938, A); without precise locality, 3000 m (C. Y. Chiao & C. S. Fan 839, 23 Aug. 1938, A).

**SHAANXI:** Mt. Thae-pei-san (G. Giraldi 2055, 1897, B); Taipai shan, Vicinity of Pinganszu (T. N. Liou & P. C. Tsoong 2466, 19 Jul. 1938, PE); Taibai Shan (Ren et al. 142, 30 Sept. 1955, PE);

**HUBEI:** without precise locality (E. H. Wilson 2347, K); Hsignshan (A. Henry 6927, Mar. 1889, A, K).

**WESTERN CHINA:** without precise locality (E. H. Wilson 4545, Jul. 1903, A, K).

## 2. *Juncus amplifolius* A. Camus

**GANSU:** Minshan, 4100 m (T. P. Wang 7572, 23 Aug. 1937, PE).

**YUNNAN:** Tse-kou (R. P. Soulié 1105, S); Soo-roo-la, Cham-pu-tung, 3000 m (C. W. Wang 66704, Sept.

1935, A, PE).

**SICHUAN:** Taofu (Dawo) district, Taining (Ngata), montes orientales, 4500 m (H. Smith 11929, 7 Sept. 1934, S, UPS); Kangting (Tachienlu) district, West range, 4200–4400 m (H. Smith 11365, 20 Aug. 1934, BM, S, UPS); loc. cit., Tapaoshan, in prato alpino, 4400 m (H. Smith 11485, 20 Aug. 1934, BM, KYO, PE, S, UPS); loc. cit., Chungo valley, Mt. Yara, N. E. slopes, 4100 m (H. Smith 11112, 18 Aug. 1934, KYO, S, UPS); Tachenlu, 9000–13500 ft. (A. E. Pratt 844, BM, CAL); Li-fan Hsien, Mt. Hung-ch'iao, 3800 m (F. T. Wang 21547, 29 Jun. 1930, S); Xiaojin, Rilong - a pass of Balang Shan - Rilong, 4000 m (H. Ikeda et al., 100803, 29 Aug. 1998, KUN, TI); loc. cit., Ganhaizi - Dashuiba - Ganhaizi, 3530 m (H. Ikeda et al., 100823, 31 Aug. 1998, KUN, TI); loc. cit., Ganhaizi - southwestern slope of Mt. Siguniang - Ganhaizi, 4450 m (H. Ikeda et al., 100838, 100840, 1 Sept. 1998, KUN, TI); Sungpan (F. Hander-Mazzetii s.n., Jun.–Aug. 1914, S); Hsioeh-Shan, San-cha-tsu, 4400 m (H. Smith 3400, 10 Aug. 1922, S, UPS); loc. cit., 4300 m (H. Smith 3841, 19 Jul. 1922, S, UPS); Tahsiangling, 2700–2900 m (H. Smith 10171, 26 Jun. 1934, BM, S, UPS); Win-Chuan, Tsao-puh, 10000 ft. (S. Y. Hu 2597, Aug. 1942, A); without precise locality (J. W. & C. J. Gregory s.n., 1922, BM).

**SHAANXI:** Ta-pei-shan, 3000–3200 m (G. Fenzel 803, 28 Aug.–5 Sept. 1934, S); Taipaishan, On way from Fangyangszu to Eryaihai, 3200–3800 m (T. N. Liou & P. C. Tsoong 894, 14 Sept. 1937, PE); loc. cit., Pashientai, 3900 m (T. N. Liou & P. C. Tsoong 972, 15 Sept. 1937, PE); loc. cit., Paomaliang (T. N. Liou & P. C. Tsoong 2908, 29 Jul. 1938, PE); Taibai Shan, 3750 m (Fu 8508, 8 Aug. 1956, KUN).

**NORTH CENTRAL CHINA:** Mt. Miao-Wang-shan (R. F. Hugh s.n., Jul. 1899, BM); Mt. Ngo-shan (Sas-y-san), (R. F. Hugh s.n., Sept. 1899, BM).

### 3. *Juncus articulatus* L.

**AFGHANISTAN:** Kandahar Algandof (S. Kitamura s.n., 7 Jun. 1955, KYO); Nuristan Voma to Chatrass (S. Kitamura s.n., 1 Aug. 1955, KYO); Nuristan, Chatrass-Kushmaicot (S. Kitamura s.n., 2 Aug. 1955, KYO); Tshkashim, Wakhan (R. Yosii 876, 876, 880, 884, 885, 887, 893, 29–31 Aug. 1960, KYO); Borak, Badakhshan (R. Yosii 983, 1001, 1002, 4 Sept. 1960, KYO); loc. cit. (R. Yosii 300, 7 Jul. 1960, KYO); Mt. Noshang, Qasideh village (R. Yosii 414, 16–17 Jul. 1960, KYO); Pugman, near Kobur (S. Kitamura s.n., 15 Jul. 1955, KYO); Pulikhumri (S. Kitamura s.n., 3 Jul. 1955, KYO); Taiwora (S. Kitamura s.n., 8 Sept. 1955, KYO); loc. cit. (T. Umesao s.n., 8 Sept. 1955, KYO).

**PAKISTAN:** Hindukushi, Pingal to Pahimal, 2500 m (K. Honda 242, 31 Jul. 1957, KYO); loc. cit., Hilter, 2300 m (K. Ogino 518, 7 Aug. 1957, KYO); between 35°55'N, 71°18'E and 36°06'N, 71°48'E, 7100 ft. (S. A. B. Lyoon 806, 6 Jun. 1958, A); Harchin (S. M. Toppin 652, Sept. 1908, K); Siran, Hazara (R. R. Stewart s.n., 13 Apr. 1959, K); Hazara district (H. Deane s.n., K); Gabral, 7500 ft. (M. Shah et al. 392, 4 Sept. 1975, A); Kshkoman valley, Pakor to Imit (K. Honda s.n., 16 Sept. 1956, KYO); near Madian. Swat State (R. J. Rodin 5527, 15 Aug. 1952, K); Urrak to Hanna, 6000 ft. (Dar & Arif 575, A).

**KASHMIR:** near Rawalpindi, 1700 ft. (R. R. Stewart 13815, Apr. 1934, A); Riwayat near Rawalpindi, 1800 ft. (R. R. Stewart 17277A, 25 Apr. 1939, A); Uri Cashm, 4000 ft. (A. Meebold 210, Jun. 1905, CAL); Tangmarg, 6000 m (O. Polunin 56/339, 16 Aug. 1956, B); Barsil, 10500 ft. (C. B. Clarke 29618, 26 Jul. 1876, K); Llos, Auckar Lake near Srinagar (R. R. Stewart 8100, 29 Jul. 1925, K); Sciud valley, near Srinagar, 9000 ft. (R. R. Stewart 9912, 20 Aug. 1928, K); Dras, Ladak, 10000 ft. (R. R. Stewart 10027, Aug. 1928, K); Mulbekh, Kadakh (W. N. Koelz 6181, 28–29 Jul. 1933, A); Leh, Ladak, 10500 ft. (W. N. Koelz 2595b, 12 Aug. 1931, S); loc. cit., 10500 ft. (W. N. Koelz 2595, 12 Aug. 1931, K); Gilgit, 4770 ft. (O. Polunin 6023, 13 Jul. 1960, BM); loc. cit., 4900 ft. (R. R. Stewart 26296, 28 Jul. 1954, K); Gurus, 8000 ft. (C. B. Clarke 29497, 22 Jul. 1876, CAL); Qurais, 8700 ft. (B. B. Osmaston 3S, 29 Jul. 1928, K); Ramoo 6000 ft. (C. B. Clarke 28491, 10 Jul. 1876, CAL); Sind valley (C. B. Clarke 24189, Sept. 1874, CAL); Shrigar, 7000 ft. (C. B. Clarke 300071, 5 Aug. 1876, K); Sumlal Cashm, 5000 ft. (A. Meebold 208, Jun. 1905, CAL); without precise locality, 9500 ft. (R. R.



Stewart 18873, 19 Aug. 1939, A).

**PUNJAB:** Dilasini - Bajaura (J. R. Drummond 23162, 26 May 1888, K); Bucuber Raoevi below Kasauli (J. R. Drummond 5001, K); Bassahir, Kunawar (J. R. Drummond 26521, 1885, K); Ghora Gob, Murree Hills, 6000 ft. (R. R. Stewart 12847, 1928, S); Murree, 7000 ft. (R. R. Stewart 9592, 31 May 1928, K, S) loc. cit., 8000 ft. (Jafri & Ali 3032, 15 Jun. 1959, K); near Manikaru (J. R. Drummond 23161, 20 May 1888, K).

**NORTH WEST HIMALAYA:** Billu, 6000 ft. (Brandis 3339, Sept. 1964, CAL); Sanawarg, 9000 ft. (R. R. Stewart 9912, 20 Aug. 1928, S).

**NEPAL:** Sialgarhi, 9500 ft. (O. Polunin et al. 104, 11 Jul. 1952, A); Kunri, Jumla district (H. Tabata et al. 3254, 6 Sept. 1976, KATH); Pura, Muktinath, 12000 ft. (J. D. A. Stainton et al. 2031, 27 Jul. 1954, A); Dhaulagiri zone, Mustang district, Phalyak - Sangda Pass - Pongio Kharka (a kharka between Sangda Pass and Sangda village), 28°49'0.7"N, 83°44'28.1"E, 3340 m (F. Miyamoto et al. 20210008, 9 Aug. 2002, TI); Dhaulagiri zone, Mustang district, Ghami - Ghar Gompa, 29°04'34"N, 83°52'53.8"E, 3690 m (F. Miyamoto et al. 20210123, 18 Aug. 2002, TI); Gandaki Zone, Gorkha distr., Lhogaon, 28°34'25"N, 84°42'05"E-28°33'09"N, 84°39'19"E, 3175 m (M. Suzuki et al. 9460217, 5 Aug. 1994, TI).

**BHUTAN:** Paro, 2286 m (R. Bedi 698, 18 Aug. 1971, K).

**ASSAM:** Khasia (Griffith s.n., K); loc. cit., 4000-6000 ft. (J. D. Hooker & T. Thomson s.n., 14 Sept. 1850, K, KYO); loc. cit., Soyung, 5000 ft. (C. B. Clarke 45402A, 16 Sept. 1886, K).

**XIZANG (TIBET):** Zhigung, 2350 m (S. K. Wu 5268, 30 Aug. 1976, KUN).

**GANSU:** Min Hsien, 2500 m (T. P. Wang 4958, 9 Jul. 1936, KUN, PE); Tienshui Hsien, 1300 m (T. P. Wang W4324, 14 Jun. 1936, A, PE).

**YUNNAN:** Deqen, 2651 m (Qing-Aang expedition team 2912, 19 Jul. 1981, KUN); A-tun-tze, 3400 m (C. W. Wang 69208, Sept. 1935, A, KUN, PE); Wei-si Hsien, 2800 m (H. T. Tsai 59861, 18 Oct. 1934, PE).

**SICHUAN:** Taofu (Dawo) district, Taofu, 2900 m (H. Smith 12182, 17 Sept. 1934, S); loc. cit., Lhamo Mondeh La, 3700 m (H. Smith 12418, 23 Sept. 1934, PE, S); Djer-mai, Tsa-wa-rung, 3200 m (C. W. Wang 65695, Aug. 1935, A, PE); Dzer-nar, Tsa-wa-rung, 3000 m (C. W. Wang 66300, Sept. 1935, A, PE); Kangting (Tachienlu) district, Chungo valley, 3000 m (H. Smith 11152, 17 Aug. 1934, PE, S); Muli (Qing-Zang expedition team 1347, 20 Aug. 1983, KUN).

**SHANXI:** Yun-cheng, 500 m (H. Smith 6009, 1 Jul. 1924, PE).

#### 4. *Juncus benghalensis* Kunth

**PAKISTAN:** Kagan valley, Hazara, 12400 ft. (Inayat 20240, 20 Jul. 1896, CAL); Richwori, Shuikiyari, Hazara (Inayat s.n., 10 Jun. 1899, CAL); Suran valley, Hazara (Inayat 20239a, 27 Jun. 1896, CAL); Hazara (Inayat 22630, 24. Jul. 1897, CAL).

**KASHMIR:** Gulmarg Rakh, 10000 ft. (R. R. Stewart 8667, 26 Jul. 1926, K, S); Pir Panjal (J. F. Duthie 25771, 10 Aug. 1901, K); Masjid Gali, Gurais region, 13000 ft. (R. R. Stewart 18360, 12 Aug. 1936, A); Pohlgam, 12000 ft. (R. R. Stewart 9035, 10 Aug. 1927, S); Sekiwas, 12000 ft. (R. R. Stewart 12435, 19 Sept. 1931, K); Sonamarg, 10000 ft. (R. R. Stewart 9842, 3 Aug. 1928, S); Sorus above Pahlagane, 10000-12000 ft. (R. R. Stewart 21594, 6 Aug. 1945, K).

**HIMACHAL PRADESH:** Lahul Khokhsar, 10500 ft. (N. L. Bor. 16612, 3 Aug. 1941, K).

**NORTH WEST INDA:** without precise locality (K. Biswas 3550, A); without precise locality (Royle s.n., CAL).

**NEPAL:** Lara, 11000 ft. (C. B. Clarke 24598, 7 Oct. 1874, BM); Jumla, Bajari Binu - Visht Dah, Giri Khora, 4460 m (M. Minaki et al. 9109121, 23 Sep. 1991, TI); Larjung, S. of Tukucha, Kali Gandaki, 11500 ft. (J. D. A. Stainton et al. 1942, 13 Jul. 1954, A, CAL); Mustang, around Ommang (T. Hoshino et al. 9662106, 1 Aug. 1996, TI); Dhaulagiri zone, Mustang district, Around Sangda Pass, 28°52'29.5"N, 83°43'9.4"E, 4700 m (F.

Miyamoto et al. 20210077, 12 Aug. 2002, TI); Rasuwa, around Base Camp, 4990 m (H. Takayama et al. 9220323, 21 Jul. 1992, TI); loc. cit., a Kharka - Pati Kharka, 3700 m (F. Miyamoto et al. 9410185, 4 Aug. 1994, TI); loc. cit., Yure Kharka - Tinbu Kharka, 3430 m (F. Miyamoto et al. 9410042, 26 Jul. 1994, TI); loc. cit., around Tinbu Kharka, 3800 m (F. Miyamoto et al. 9410084, 27 Jul. 1994, TI); loc. cit., Tulo Bhera Kharka - Jaisuli Kund, 4200 m (F. Miyamoto et al. 9410120, 30 Jul. 1994, TI); Ramechhap around Neju, 3500 m (H. Ohba et al. 8530623, 31 Jul. 1985, TI); Kalinchok, 11000 ft. (Banerjee et al. 2819a, 15 Sept. 1964, KATH); Solukhumbu, Gnaula - Pike, 3400 m (F. Miyamoto et al. 9580050, 22 Jul. 1995, KATH, TI); loc. cit., Pike - Tasman Bhangjang - Pike Khop, 3700 m (F. Miyamoto et al. 9580071, 9580072, 24 Jul. 1995, KATH, TI); loc. cit., Chhatarwa - a pass - Kurke, 3900 m (F. Miyamoto et al. 9580473, 29 Aug. 1995, KATH, TI); loc. cit., Thasing Dingma - Chhatarwa, 3600 m (F. Miyamoto et al. 9580468, 28 Aug. 1995, KATH, TI); loc. cit., Chalem Kharka - Jar Kharka, 4000 m (F. Miyamoto et al. 9580152, 1 Aug. 1995, KATH, TI); loc. cit., Chalem Kharka - Jar Kharka, 4200 m (F. Miyamoto et al. 9580157, 1 Aug. 1995, KATH, TI); loc. cit., Samakang Kharka - Dudh Kund, 3700 m (F. Miyamoto et al. 9580416, 24 Aug. 1995, KATH, TI); loc. cit., Thasing Dingma - Sanu Khola - Saure Kharka, 3700 m (F. Miyamoto et al. 9580501, 4 Aug. 1995, KATH, TI); loc. cit., around Khare, 4800 m (F. Miyamoto et al. 9580256, 8 Aug. 1995, KATH, TI); loc. cit., Chhomalung Base Camp - Rato Odara, 4800 m (F. Miyamoto et al. 9580345, 18 Aug. 1995, KATH, TI); Sankhuwasawa, around Cha Ding Kharka and Shipton Pass, 4430 m (M. Minaki et al. 9020682, 9 Aug. 1990, TI); loc. cit., 3700 m (M. Minaki et al. 9020804, 9020805, 10 Aug. 1990, TI); loc. cit., Bhainsi Charka - Danda Kharka - Unshisa Kharka - Khongma, 3300 m (M. Minaki et al. 9020560, 9020563, 4 Aug. 1990, TI); loc. cit., 3000 m (M. Minaki et al. 9020624, 4 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3900 m (M. Minaki et al. 9020642, 9020654, 5 Aug. 1990, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 4000 m (M. Minaki et al. 9020870, 12 Aug. 1990, TI); loc. cit., Ta Dasa - Ne Kharka (Nehe Kharka) - Yangri Kharka - Phemathang Kharka (Tematan Kharka), 3380 m (M. Suzuki et al. 8850688, 28 Jul. 1988, TI); loc. cit., Hati Sar - Mangalbare - Lam Pokhari - Minchin Dhap (H. Hara et al. s.n., 28 Oct. 1963, TI); loc. cit., Chhippon (Chhippon Pokhari) - Gidde (Gidde Kharka) (H. Ohba et al. 9153156, 19 Jul. 1991, TI); Kosi zone, Sankhuwa Sabha district, Younglay, Barun Khola (23 km N. W. Num), 27°44'N, 87°12'E, 3721 m (H. B. Emery CH26, 9 Jul. 1974, K); loc. cit., Younglay, Barun Khola (23 km N. W. Num), 27°45'N, 87°11'E, 3812 m (H. B. Emery CH38A, 9 Jul. 1974, K); Nehe Kharka, S side of Barun Khola, 27°45'N, 87°10'E, 3730 m (D. G. Long et al. 431, 30 Sept. 1991, KATH); Environs of Ghunsa, 27°40'N, 87°57' (C. G. Wilson et al. 430a, 8 Sept. 1989, KATH); Below Tamo La, 27°35'N, 87°57'E, 4050 m (C. G. Wilson et al. 717, 16 Sept. 1989, KATH); E Dhankuta, Bilbatay Bhanjang - Tutay - Tinjuray - Hati Sar (H. Hara et al. 6300867, 27 Oct. 1963, TI); loc. cit., Taplejung, Baroya Khimty - Thakma Khola (H. Hara et al. s.n., 12 Nov. 1963, TI); loc. cit., Bilbatay, Bhanjang - Tinjuray - Hati Sar (H. Hara et al. 6300867, 27 Oct. 1963, KYO); loc. cit., Taplejung, Walunchung Gola - Zongi (H. Kanai et al. 6300986, 11 Nov. 1963, TI); Sindhupalchok, Thale - Thale Bisauna, 2200 m (H. Kanai & T. B. Shrestha 672794, 10 Sept. 1970, TI); loc. cit., Lukthang - Kalingchok - Kuri, 3400 m (H. Kanai et al. s.n., 12 Nov. 1963, TI); Environs of Ghunsa, 27°40'N, 87°57'E, 3430 m (S. Crawford et al. KEKE435, 3 Sept. 1989, K); near Dojam Khola, Suli Gola, 14000 ft. (O. Polunin et al. 2276, 21 Jun. 1952, CAL).

**SIKKIM:** Jongri, 13000 ft. (C. B. Clarke 25748, 15 Oct. 1875, BM); Ling-tir, Dcujo (collector unknown s.n., 25 Aug. 1878, K); Singalila, Phalut, 3600 m (H. Hara et al. s.n., 17 Jul. 1967, TI); Singalila, Sandakphu, 3800–3970 m (H. Hara et al. s.n., 14 & 15 Jul. 1969, TI); Tsomgo Lake, 12000 ft. (Cutting & Vernay 22, 3 Aug. 1935, K); Tsomgo Lake, 12000 ft. (Cutting & Vernay 23, 3 Aug. 1935, K); Zewu valley, 10000 ft. (Smith & Cave 1065, 9 Jul. 1909, CAL); loc. cit., 10800 ft. (Smith & Cave 1162, 10 Jul. 1909, CAL); North district, Yumthang, Lachung Chhu, 27°48'08"N, 88°42'22"E, 3600 m (D. G. Long & H. J. Noltie 161, 13 Jul. 1996, E, TI); without precise locality (G. King 4918, 8 Jul. 1877, K); without precise locality, 12000–15000 ft. (J. D.



Hooker s.n., Sept. 1849, K); without precise locality, 12000 ft. (J. D. Hooker s.n., 20 Jun. 1849, K); without precise locality, 12000 ft. (J. D. Hooker s.n., Aug. 1936, CAL, K, L, S, UPS); without precise locality (Prain 291, 12 Aug. 1903, CAL).

**BHUTAN:** Wandu Phodrang district, Tsonsothang, 27°49'N, 90°24'E, 3900 m (F. Miyamoto 9361644, 22 Sept. 1993, TI); loc. cit., Marrothang - Tintatso, 27°39'N, 90°31'E, 4000 m (F. Miyamoto 9361569, 20 Sept. 1993, TI); E. slope of Thrumse La, W. of Sengor, 27°24'N, 91°00'E (A. J. C. Grierson & D. G. Long 2571, 7 Jul. 1979, E, TI); Chi la pass, 12500ft. (G. S. Gupta 613, 20 Aug. 1964, CAL).

**HIMALAYA:** Himal. Bor. Occ., without precise locality, 4000–10000 ft. (T. Thomson s.n., L); without precise locality (Falconer 1184, L).

**XIZANG (TIBET):** Nyalam Xian, Nyalam - Zhangmu, 28°05'N, 85°59'E, 3470 m (S. Akiyama et al. 106302, 21 Aug. 2001, KUN, TI); Nage, 3250 m (Tibet expedition team 74-3804, 31 Jul. 1974, KUN); Natu La to Champitang, 14000–12000 ft. (F. S. Chapman 706, 1 Aug. 1936, K); Northern foot of Tari Pass via Mud to southern foot of Parang (collector unknown s.n., 12–17 Jun. 1856, L); Nyingchi Xian, Sezhaishan, 4500 m (S. Akiyama et al. 105212, 17 Aug. 2000, KUN, TI); Deyan La, Kongbo, 13000 ft. (F. Ludlow et al. 14325, 11 Aug. 1947, BM, CAL, UPS); Champang, 12000ft. (F. S. Chapman 453, 1, Aug. 1936, K); without precise locality (Stoices s.n., CAL); without precise locality (Stoliczka s.n., CAL).

**YUNNAN:** Gongshan Xian, S. W. of Gongshan, 2600 m (S. K. Wu et al. 103190, 103192, 20 Sept. 1999, KUN, TI); Che-tse-lo, 4000 m (H. T. Tsai 58209, 27 Aug. 1934, PE, KUN); Tsekou (R. P. Soulié s.n., 18 Jul. 1895, K); Deqe, around Daxue Shan, 4300 (S. K. Wu et al. 1593, 27 Aug. 1996, KUN, TI); Eokerla, A-tun-tze, 3000 m (C. W. Wang 64899, 3-5 Aug. 1935, A); Wei-si Hsien, Yeh-chih, 3600 m (C. W. Wang 68552, Aug. 1935, PE, KUN); Chengkang, 3500 m (T. T. Yü 16932, 24 Jul. 1938, KUN); Chungtien (K. M. Feng 1555, 7 Jul. 1939, PE); Ta-li Hsien, 4000 m (H. T. Tsai 53986, 31 Jul. 1933, PE); Yangbi, around Cangshan, 3760 m (S. K. Wu et al. 471, 17 Aug. 1997, KUN, TI); Zhongdian Xian, Hong Shan, 4300 m (S. K. Wu et al. 103028, 31 Jul.-4 Aug. 1999, KUN, TI); loc. cit., Tianchi, near Zhongdian, 3900 m (S. Akiyama et al. 418, 8 Jul. 2000, KUN, TI); loc. cit., Ha ba Xueshan, Haba Hai, 4400 m (S. K. Wu et al. 103081, 8–11 Aug. 1999, KUN, TI); Dali Shi, Diancang Shan, Zhonghe Peak, 3800 m (S. K. Wu et al. 103148, 6 Sept. 1999, KUN, TI); Eastern slopes of Likiang Snow range, Yangtze watershed (J. F. Rock 10701, 10 Sept. 1923, B); Chi-na-tung, Tsa-wa-rung, 2800 m (C. W. Wang 65372, Aug. 1935, A, PE); Chi-na-tung, Tsa-wa-rung, 2800 m (C. W. Wang 65723, Aug. 1935, PE); Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68764, Aug. 1935, A); Shi-gi-tung, Champu-tung (C. W. Wang 67230, Oct. 1935, KUN, PE); loc. cit., 3000 m (C. W. Wang 67193, Oct. 1935, PE); Boggy, stony pasture on the eastern flank of the Tali Range, 25°40'N, 8000–10000 ft. (G. Forrest 4906, Jun. 1906, B); Tsekou, Sila (R. P. Soulié 1152, 18 Jul. 1895, S).

**SICHUAN:** Kangting (Tachienlu) district, Tapaoshan, 4200 m (H. Smith 11312, 20 Aug. 1934, PE, S, UPS); Kangting (Tachienlu) district, Chung valley, Mt. Yara, N. E. slopes, 3900 m (H. Smith 11162, 18 Aug. 1934, KYO, S, UPS); Hi-ma-la, Tsa-wa-rung, 3700 m (C. W. Wang 65620, Aug. 1935, A, PE); Daocheng, around Gongga Shan, Beiyu, 4400 m (S. K. Wu et al. 1553, 22 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, 4370 m (S. K. Wu et al. 466, 8 Aug. 1997, KUN, TI); Xiaojin, Ganhaizi - Dashuiba - Ganhaizi, 3600 m (H. Ikeda et al. 100819, Aug. 31 1998, KUN, TI); loc. cit., 3500 m (H. Ikeda et al. 100821, 31 Aug. 1998, KUN, TI); loc. cit., around Gongga Shan, 4600 m (S. K. Wu et al. 1142, 4 Aug. 1997, KUN, TI).

##### 5. *Juncus biglumoides* H. Hara

**YUNNAN:** Weixi, Kangpu, 3500 m (C. W. Wang 64538, 22 Jul. 1935, KUN-paratype of *J. kangpuensis*); Zhongdian, Around Mt. Hongshan, 4200 m (S. K. Wu et al. 103044, 2 Aug. 1999, KUN, TI); loc. cit., Tianchi, 27°39'N, 99°38'E, 3900 m (S. Akiyama et al. 414, 8 Jul. 2000, KUN, TI); In tergi inter vicus Haba et Dugwan-twun ad austro-orient., pagi Dschungdien regione, 3850 m (F. Handel-Mazzetti 6902, 22 Jun. 1915, S).

**6. *Juncus brachistigma* Sam.**

**KUMAON:** Palang, 11000 ft. (J. F. Duthie 6050, 20 Jul. 1886, BM).

**NEPAL:** near Dojam Khola, Suli Gola, 14000 ft. (O. Polunin et al. 2276, 21 Jun. 1952, A, BM); Tukucha, Kali Gandaki, 12000 ft. (J. D. A. Stainton et al. 1170a, 15 Jun. 1954, BM); Lamjung, 13500 ft. (J. D. A. Stainton et al. 6160, 5 Jul. 1954, BM); Sabze Khola, 13500 ft. (D. G. Lowndes 1208, 19 Jul. 1950, BM); on route Chilime Khola, 15000 ft. (O. Polunin 1327, 26–28 Jul. 1949, BM); Rasuwa, Yure Kharka - Tinbu Kharka, 3700 m (F. Miyamoto et al. 9410053, 26 Jul. 1994, TI); loc. cit., Tulo Bhera Kharka - Jaisuli Kund, 4200 m (F. Miyamoto et al. 9410121, 9410810, 30 Jul. 1994, TI); loc. cit., Paldol Base Camp - a Kharka, 4400 m (F. Miyamoto et al. 9410165, 3 Aug. 1994, TI); near Gunsu, 3800 m (K. Nishioka 283, 12 Jun. 1962, KYO).

**SIKKIM:** North district, S. E. side of Lasha Chhu, Velow Sebu La, Dampmoraine slope, 27°56'13"N, 88°38'30"E, 4700 m (D. G. Long & H. J. Noltie 380, 21 Jul. 1996, E, TI); Na-tut a mountain, (G. King's collector, s.n., 28 Aug. 1882, CAL, K); Rookah, 10000 ft. (G. King's collector, s.n. 1885, K); Chwnago, 12000–13000 ft. (W. W. Smith 3808, 26 Jul. 1910, CAL); Dikuchu, 13000 ft. (W. W. Smith 3752, 23 Jul. 1910, CAL); Kangpnpehuthang, 16000 ft. (Ribu & Rhomoo 5229, 6 Sept. 1911, K); without precise locality (J. D. Hooker s.n., K); without precise locality (G. King's collector, s.n., 1882, CAL).

**BHUTAN:** Shingbe, Me la, 11000 ft. (F. Ludlow et al. 20325a, 6 Jun. 1949, BM); loc. cit., 12000 ft. (F. Ludlow et al. 20695, 4 Jun. 1949, BM).

**EAST HIMALAYA:** Chulong, 15000 ft. (R. Lepcha 216, 12 Sept. 1912, A, E).

**XIZANG (TIBET):** Nyalam, 3350 m (Zhang & Lang 3593, 20 May 1966, KUN); Phile la, 14000 ft. (R. E. Cooper 1784, 23 Jul. 1914, BM); Kongbo Province, Molom Nepar, 4000 m (F. Ludlow et al. 62666, BM).

**GANSU:** Lien hoa shan in swanmpy meadow between Taochow and Titao, 11500 ft. (J. F. Rock 12715, 20 Jul. 1925, A).

**YUNNAN:** Chungtien Plateau (K. M. Feng 1555, 7 Jul. 1939, A); Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68858, Aug. 1935, KUN, PE); Weihsi, Tungchuling, Sungyenka, 4000 m (T. T. Yü 8943, 12 Jul. 1937, A, PE); Wei-si Hsien, Yeh-Chih, 3600 m (C. W. Wang 68346, Aug. 1935, A, PE); In montis Yülung-schan prope urbem Lidjiang (Likiang) regione alpina, in glarea, und unter dem kleinen Gletscher ober der Schlucht Loku, 3625 m (F. Handel-Mazzetti 6815, 18 Jun. 1915, S); In regionis temperatae supra vicum Nguluko ad urbem Lidjiang, 3100–3400 m (F. Handel-Mazzetti 6695, 10 Jun. 1915, S); Li-kiang Hsien, 2900 m (C. W. Wang 70811a, Jul. 1935, A); loc. cit., 3000 m (C. W. Wang 71677, Jul. 1935, PE); Likiang Snow Range (R. C. Ching 30332, 7 Jul. 1939, A); Gongshan (Qing-Zang expedition team 7789, 30 Jun. 1982, KUN); Zhongdian, Chungtien, Lichiashica, 3600 m (T. T. Yü 11661, 17 Jun. 1937, A, KUN, PE); Zhongdian, 4000 m (Qing-Zang expedition team 1301, 21 Jun. 1981, KUN); Zhongdian Xian, Hong Shan, 3700 m (S. K. Wu et al. 103027, 31 Jul.–4 Aug. 1999, KUN, TI); loc. cit., Haba Xueshan, Haba Hai, 4000 m (S. K. Wu et al. 103087, 11 Aug. 1999, KUN, TI); Yangbi, around Cangshan, 3750 m (S. K. Wu et al. 479, 18 Aug. 1997, KUN, TI).

**SICHUAN:** Daocheng, around Gongga Shan, Beiyu, 4600 m (S. K. Wu et al. 1548, 22 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, 4600m (S. K. Wu et al. 455, 5 Aug. 1997, KUN, TI); without precise locality, 27°30'N, 11000 ft. (G. Forrest 6298, Aug. 1910, BM, K); Muli, Sao-siang-liang-tze, 3600 m (T. T. Yü 7771, 17 Aug. 1937, KUN).

**7. *Juncus bryophilus* Noltie**

**NEPAL:** Bagmati zone, Rasuwa district, a Kharka - Pati Kharka, 28°15'N, 85°10'E, 3650 m (F. Miyamoto et al. 9410195, 4 Aug. 1994, TI).

**SIKKIM:** Dzongri, 4000 m (ESIK 698, 25 Jul. 1992, E, TI-paratype of *J. bryophilus*).

**BHUTAN:** Wangdi Phodrang district, Maorothang - Tintatso, 27°39'N, 90°31'E, 3700 m (F. Miyamoto 9361571, 20 Sept. 1993, TI).



**8. *Juncus bufonius* L.**

**AFGHANISTAN:** Hindukush, Gupis, 2170 m (K. Ogino 586, 1 Aug. 1957, KYO).

**PAKISTAN:** Borit Jil, Hunza valley, Mourirars, 2500 m (F. A. Perrott 15, 31 Aug. 1980, K); Karakoram, Oltali Chish, 2400 m (S. Nakao s.n., 10 Jun. 1955, KYO).

**KASHMIR:** Gilgit (G. M. Giles s.n., 1885, CAL); Srinagar, 5000 ft. (Meebold 206, Jun. 1905, CAL); loc. cit., 7700 ft. (C. B. Clarke 30075, 5 Aug. 1876, CAL); Skard, 7650 ft. (C. B. Clarke 30034, 4 Apr. 1876 CAL); Dehara Sun, Kailong-Ka-Gor, Lahaul (N. L. Boris 22, 3 Jul. 1938, K); Kadak, 3700 m (U. C. Bhattacharyya 41062, 8 Sept. 1970, CAL); Taugwarg, 7200 ft. (R. R. Stewart 8822A, 26 Jul., K); Tilail (J. F. Duthie 13940, 31 Aug. 1893, CAL).

**PUNJAB:** Karnal Jungle (J. R. Drummond 26525, 27 May 1886, K); Maisi (O. P. Misra 47008, 16 Apr. 1972, CAL); Nasrela (O. P. Misra 47053, 17 Apr. 1972, CAL); without precise locality, 1000–3000 ft. (T. Thomson s.n., Mar. 1846, K); without precise locality (J. R. Drummond 1748, Mar. 1885, K); without precise locality (J. R. Drummond 2339, 10 Feb. 1886, K); without precise locality (J. R. Drummond 26523, 24024, 26530, 26536, 26552, 1886, K).

**HIMACHAL PRADESH:** Gilgit (G. M. Giles 270, Mar. 1886, CAL); Lahul, Sissn (N. L. Bor 16503, 28 Jul. 1941, K); Lahul, Chola dara, 3900 m (U. C. Bhattacharyya 48779, 21 Jul. 1972, CAL).

**UTTAR PRADESH:** Spiti, Gette, 4300 m (U. C. Bhattacharyya 49266, 3 Aug. 1972, CAL); Garhwal, Trijuginarayan, 2000 m (B. D. Naithani 48012, 26 May 1972, CAL); near Chour, Kumaon (J. E. Winterbottom 8, CAL); Sarjoo river (O. P. Misra 7795, 2 Sept. 1965, CAL).

**NORTH WEST HIMALAYA:** Daspa valley, 2000 ft. (Brandis 3341, Sept. 1864, CAL); Langha, 8500 ft. (Brandis 3340, 25 Sept. 1864, CAL).

**NEPAL:** Between Chahar and Muktinath, 11000 ft. (H. Tabata et al. 6272, 11 Oct. 1976, KATH); Dhaulagiri zone, Mustang district, Ghami - Ghar Gumpa, 29°04'34"N, 83°52'53.8"E, 3690 m (F. Miyamoto et al. 20210118, 18 Aug. 2002, TI); Kambachen, 27°44'N, 87°59'E, 4100 m (S. Crawford et al. KEKE602, 12 Sept. 1989, K, KATH).

**SIKKIM:** North district, E. bank of Lachung Chhu, just above Lachung, 27°41'37"N, 88°45'10"E, 2730 m (D. G. Long & H. J. Noltie s.n., 15 Jul. 1996, E, TI); Gingong, 15000 ft. (Ribu & Rhomoo 2876, Sept.–Oct. 1909, CAL); Grangong, 15000 ft. (R. Lepcha 2876, 2 Nov. 1909, CAL); without precise locality, 9000 ft. (J. D. Hook s.n., CAL, K).

**BHUTAN:** Thimphu - Wangdu Phodrang, 1450–3200 m (H. Kanai et al. 4493, 9 Apr. 1967, TI); without precise locality (Griffith 2659, Aug. 1837, K).

**ASSAM:** Talap (G. A. Gummie 189, 23 Mar. 1894, CAL); Pobomkh (I. H. Brukill 38234, 11 Mar. 1912, CAL).

**HIMALAYA:** Range (S. Kurz s.n., CAL); Himal Bor Occ., without precise locality, 6000–13000 ft. (T. Thomson s.n., CAL, K); without precise locality, 1000–3000ft. (T. Thomson s.n., CAL).

**XIZANG (TIBET):** Gyangtse (C. H. J. Walton 99, Jul.–Sept. 1904, B, CAL, K); Gongbo'gyamda Xian, Basum Lake, 3550 m (S. Akiyama et al. 105199, 15 Aug. 2000, KUN, TI); Mainling, 3070 m (Qing-Zhang expedition team 750908, 28 Jul. 1975, KUN); Kongbo Province, near Puchu, 29°27'N, 94°15'E, 9800 ft. (F. Ludlow et al. 6116, 11 Aug. 1938, BM); loc. cit., near Lamdo, Tsangpo valley, 29°23'N, 94°22'E, 9800 ft. (F. Ludlow et al. 4567, 30 May 1938, BM); Markam (S. K. Wu 4477, 11 Aug. 1976, KUN); Ladak, Gia to Upshi (collector unknown 1428, 27 Jun. 1856, A).

**GANSU:** In via Min-Schemo-Weitseba-Li-Tienschui (G. Fenzel 2728, 20–29 Aug. 1935, A); near Pingfan, 2350–2800 m (R. C. Ching 467, 12–20 Jul. 1923, A).

**YUNNAN:** Atuntze, 2700 m (C. W. Wang 70227, Sept. 1935, A, KUN); Lijiang, Heilongtan (Hen et al. 618, 28 May 1986, KUN).

**SICHUAN:** Chiefly near Tachienlu, 9000–13500 ft. (A. E. Pratt 390, BM); Daocheng, 3000 m (Qing-Zhang expedition team 4318, 25 Aug. 1981, KUN); Tachienlu, 9000–13500 ft. (A. E. Pratt 390, Dec. 1890, CAL); Xiaojin, Rilong - a pass of Balang Shan - Rilong, 2880 m (H. Ikeda et al. 100802, 29 Aug. 1998, KUN, TI); Chengtu (C. W. Wang 12309, 4 May 1938, A); loc. cit. (W. P. Fang 13326, 11 Apr. 1939, A); Feng-ab-Hsien, 500 m (K. S. Hao 160, 11 May 1930, S); Shunching, 320 m (K. S. Hao 164, 10 May 1930, S); Mt. Uo-mi-san (R. F. Hugh s.n., Sept. 1899, BM).

**SHAANXI:** Hsia-Hsien, Pei-shui-ho (H. Smith s.n., 9 Jul. 1924, S).

**SHANXI:** Kolan Hsien, 4300 m (T. Tang 471, 31 Apr. 1929, S); Makiapou (N. E. Licent 491, 25 Jul. 1914, BM); Puhaiian, Kohchengeien (T. P. Wang 3778, 30 Sept. 1935, S); Siao-y Hsien, Shengtingshen (T. P. Wang 3268, 25 Aug. 1935, S).

### 9. *Juncus cephalostigma* Sam.

**NEPAL:** Sankhuwasawa, Pike - Pike Peak - Pike, 3820 m (F. Miyamoto et al. 9580061, 23 Jul. 1995, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4500 m (F. Miyamoto et al. 9580275, 11 Aug. 1995, TI); Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 4620 m (M. Minaki et al. 9020686, 12 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3670 m (M. Minaki et al. 9020655, 5 Aug. 1990, TI); loc. cit., 3870 m (M. Minaki et al. 9020638, 5 Aug. 1990, TI); loc. cit., 3750 m (M. Minaki et al. 9020652, 5 Aug. 1990, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 4100 m (M. Minaki et al. 9020882, 12 Aug. 1990, TI); loc. cit., 3900 m (M. Minaki et al. 9020860, 12 Aug. 1990, TI); loc. cit., around Cha Ding Kharka and Shipton Pass, 4400 m (M. Minaki et al. 9020683, 10 Aug. 1990, TI); loc. cit., Kongma - Sano Pokhari - Siptong Pass - Thulo Pokhari - Cha Ding Kharka, 3570m (M. Minaki et al. 9020653, 5 Aug. 1990, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass - Sano Pokhari - Khongma, 3900 m (M. Minaki et al. 9020862, 12 Aug. 1990, TI); Kosi zone, Sankhuwa sabha district, Dap, Kasua Kholā (18 km N. Num), 27°43'N, 87°16'E, 3812 m (H. B. Emery CH06, 28 Jun. 1974, K).

**SIKKIM:** East district, Tsomgo Chho, 27°22'14"N, 88°45'52"E, 3720 m (D. G. Long & H. J. Noltie 62, 8 Jul. 1996, E, TI); Chaugu [Tsomgo] (Chatterjee 231, 14 Jul. 1906, CAL); Jelap Ia, 14500 ft. (collector unknown 54, 20 Sept. 1926, CAL); Maglatha W Imgi (G. King s.n., Jun. 1887, K); Rshinangi, 13000 ft. (Ribu & Rhomoo 4516, 26 Oct. 1910, CAL); Laghep, 11000 ft. (P. E. Cooper 14, 26 Jun. 1913, KATH); without precise locality, 12000–15000 ft. (J. D. Hooker s.n., 1849, K); without precise locality, 12000 ft. (J. D. Hooker s.n., 20, Jun. 1849, K with *J. benghalensis*); without precise locality, 12000 ft. (J. D. Hooker s.n., S).

**BHUTAN:** E. slope of Thrumse La, W. of Sengor, 27°24'N, 91°00'E, 3640 m (A. J. C. Grierson & D. G. Long 2572, 7 Jul. 1979, A, K).

**EAST HIMALAYA:** [Sikkim] Gnathong, 13000 ft. (C. H. Cave s.n., 20 Sept. 1916, A, E); [Nepal] Sherbathang, 11000 ft. (C. H. Cave s.n., 24 Oct. 1916, A, E).

**XIZANG (TIBET):** Tsekou, (R. P. Soulié s.n., 18 Jul. 1895, BM); Baxoi Xian, Demu La, 4870 m (S. Akiyama et al. 105089-bis, 26 Jul. 2000, KUN, TI).

**YUNNAN:** Mekong-Salwin Divide, Sila, 3700 m (T. T. Yü 22229, 8 Aug. 1938, A, KUN, PE); Gongshan, 3600–3500 m (Qing-Zang expedition team 8489, 14 Jul. 1982, KUN); loc. cit., 3500 m (Qing-Zang expedition team 8536, 24 Jul. 1982, KUN); Fugong (Lin 791986, 1 Aug. 1979, KUN); Weihsi, Tungchuling, Nankukung, 3900 m (T. T. Yü 8842, 11 Jul. 1937, PE).

**SICHUAN:** Tatsienlu (MacLaren AC 134, Jul. 1938, KYO).

### 10. *Juncus chrysocarpus* Buchenau



**NEPAL:** Rasuwa, Sunchet Kharka - Kangait Kharka - Gopchet Kharka - a pass - Lipchet Kharka, 2800 m (F. Miyamoto et al. 9410309, 15 Aug. 1994, TI); loc. cit., Lipchet Kharka - Makgan Kharka - Guinsi (near Balche), 3320m (F. Miyamoto et al. 9410324, 16 Aug. 1994, TI); Rorested ridge between Basantpur (N. of Chitre) and Door Pani, 27°07'N, 87°24'E, 2720 m (S. Crawford et al. KEKE51, 28 Aug. 1989, K); Ghunsa Khola, Amjilassa to KYapra, 27°37'N, 87°53'E, 2700 m (S. Crawford et al. KEKE300, 6 Sept. 1989, K); Between Ghunsa and Tamo La. 27°38'N, 87°57'E, 3730 m (S. Crawford et al. KEKE675, 15, Sept. 1989, K); Forested ridge between Basantapur and Door Pani, 27°07'N, 87°24'E, 2720 m (C. G. Wilson et al. 51, 28 Aug. 1989, KATH); above Door Pani, 27°10'N, 87°26'E, 2900 m (C. G. Wilson 1248, 5 Oct. 1989, KATH); Taplejung district, Forested ridge at Manebhanjang, N end of Milke Danda Ridge, 27°27'N, 87°28'E, 3350 m (D. G. Long et al. 960, 22 Oct. 1991, KATH); Environs of Ghunsa, 27°40'N, 87°57'E, 3570 m (C. G. Wilson 433, 8 Sept. 1989, KATH); Ghunsa and Tamo La, 27°37'N, 87°57'E, 3730 m (C. G. Wilson et al. 675, 15 Sept. 1989, KATH).

**SIKKIM:** Jongri, 12000 ft. (C. B. Clarke 25891, 25893, 25976, 15 Oct. 1875, K); loc. cit., 13000 ft. (C. B. Clarke 26149, Oct. 1875, K); Guantong, 11000 ft. (G. A. Gammie 993, 23 Aug. 1892, CAL); Darjeeling, Phallut to Singla, 11000-12000 ft. (I. H. Burkill 25291, 20 Oct. 1904, CAL); Islumbo, 12000 ft. (C. B. Clarke 25572, 24 Oct. 1875, K); loc. cit., 11000 ft. (C. B. Clarke 25592, 24 Oct. 1875, CAL); Phallaling, 12000 ft. (C. B. Clarke 25699, 25 Oct. 1875, CAL); without precise locality, 12000 ft. (C. B. Clarke 25562, 24 Oct. 1875, K); without precise locality, 10000-12000 ft. (J. D. Hooker s.n., A, K); without precise locality (S. Kurz s.n., 17 Oct. 1868, CAL).

**BHUTAN:** Wangdi Phodrang district, Lipchet Kharka - Makgan Kharka, 28°03'N, 85°07'E, 3320 m (F. Miyamoto 9410324, 16 Aug. 1994, TI); loc. cit., Tsonsothang - Tampetso, 27°37'N, 90°31'E, 4000 m (F. Miyamoto 9361678, 24 Sept. 1993, TI); loc. cit., Marothang, 27°39'N, 90°31'E, 3500 m (F. Miyamoto 9361755, 28 Sept. 1993, TI); loc. cit., Nika chuu - Bhaja, 27°37'N, 90°32'E, 3200 m (F. Miyamoto 9361527, 18 Sept. 1993, TI); without precise locality (Griffith s.n., K).

**EAST HIMALAYA:** without precise locality (Griffith 5454/1, CAL).

**XIZANG (TIBET):** Cona, 3250 m (Qing-Zang expedition team 74-3804, 31 Jul. 1974, KUN); without precise locality (collector unknown 1176, 1882, K).

### 11. *Juncus clarkei* Buchenau

**NEPAL:** Tukucha, Kali Gandaki, 10500 ft. (J. D. A. Stainton et al. 1114, 14 Jun. 1954, CAL); Rasuwa, Gopte - Thale Patil, 3400 m (H. Hara et al. 721968, 26 Aug. 1972, TI); loc. cit., Pabil Kharka - a pass - a Kharka, 3800 m (F. Miyamoto et al. 9410229, 7 Aug. 1994, KATH, TI); loc. cit., Chyauche Kharka - a bridge - Lingju, 3400 m (F. Miyamoto et al. 9410269, 12 Aug. 1994, KATH, TI); loc. cit., Lipchet Kharka - Makgan Kharka - Guinsi (near Balche), 3400 m (F. Miyamoto et al. 9410318, 16 Aug. 1994, KATH, TI); Solukhumbu, Thasing Dingma - Chhatarwa, 3600 m (F. Miyamoto et al. 9580470, 28 Aug. 1995, KATH, TI); loc. cit., Junbesi - Tagtor - a pass - Lanjura Pass - Goyom - Dakchu - Sete - Kensa, 3400 m (F. Miyamoto et al. 9580496, 2 Sept. 1995, KATH, TI); loc. cit., Najing Ding - Chalem Kharka, 3000 m (F. Miyamoto et al. 9580137, 31 Jul. 1995, KATH, TI); Sankuwa Shaba district, Bhinsi Kharka - Danda Kharka - Unshisa Kharka - Khongma, 3000 m (M. Minaki et al. 9020559, 4 Aug. 1990, TI); loc. cit., Singoa Kharka - Pahakhola (H. Ohba et al. 9153450, 11 Aug. 1991, TI); loc. cit., Lamo Pokhari, 2900 m (H. Kanai et al. 720281, 9 Jun. 1972, TI); loc. cit., Pemathang kharka, S side of Barun Khola, 27°44', 87°12', 3505 m (D. G. Long et al. 395, 28 Sept. 1991, KATH); Ridge N. E. of Gupha Pokhali, 27°18', 87°33', 2800 m (C. G. Wilson et al. 108, 30 Aug. 1989, KATH); Ghunsa Khola, Amjilassa to Kyapra, 27°37', 87°53', 2700 m (C. G. Wilson et al. 300, 6 Sept. 1989, KATH); Simbua Khalka, below Tseram, 27°31', 87°56', 3400 m (C. G. Wilson et al. 820, 21 Sept. 1989, KATH); J. F. Rock Shelter I - J. F. Rock Shelter II, 3250 m (H. Kanai & S. B. Malla 674774, 24 Aug. 1969, TI).

**SIKKIM:** Lachen, 11000 ft. (J. D. Hooker s.n., 12 Jun. 1849, K); Jongri, 12000 ft. (C. B. Clarke 25959, 15 Oct. 1875, K); Darjeeling, 10000 ft. (C. B. Clarke 27604, 12 Sept. 1875, K, CAL-paratype of *J. clakeii*); Singalela, 11000 ft. (collector unknown, 1603 a, b, c, 4 Sept. 1876, K); Cheugtang, 6000 ft. (Smith & Cave 895, 7 Jul. 1909, CAL); Chooabanja (G. King s.n., Aug-Sept. 1887, CAL); Glumbo, 12000 ft. (C. B. Clarke 25565, 24 Oct. 1887, S, K); Phadouchen, 11000 ft. (W. W. Smith 4419, 20 Aug. 1910, CAL); Tongloo, 10000ft. (S. Kurz s.n., CAL); Tonglos, (T. Anderson 1335, 1862, CAL); Yakla, 13000 ft. (C. B. Clarke 9621, 16 Oct. 1869, CAL); Waya (Ribu 317, Oct. 1908, CAL, K); without precise locality 12000 ft. (G. King s.n., Aug. 1888, CAL); without precise locality 11000–14000 ft. (J. D. Hooker s.n., 6 Jun. 1849, A, K, L, CAL); without precise locality (S. Kurz s.n., 15 Oct. 1868, CAL).

**BHUTAN:** Wangdi Phodrang district, Bhaja - Nika chhu, 27°35'N, 90°30'E, 3200 m (F. Miyamoto 9361757, 28 Sept. 1993, TI).

**ASSAM:** Jakpho, Naga Hill, 9900 ft. (C. B. Clarke 41352, 25 Oct. 1885, K, CAL); loc. cit., 9800 ft. (N. L. Bor 6403, 27 Sept. 1935, K).

**MYANMAR:** North Triangle, Tama Bun, 9000 ft. (F. Kingdon-Ward 21441, 11 Oct. 1953, A, BM); loc. cit., 10300 ft. (F. Kingdon-Ward 21455, 12 Oct. 1953, A); N. E. Upper Burma, 11000 ft. (G. Yorrest 24877, Aug. 1924, K).

**XIZANG (TIBET):** Chumbi, Knug boo (G. King 150, 7 Jul. 1884, CAL, K).

**YUNNAN:** Tsekou (P. T. Manberg s.n., Jun. 1905, K); Pi-lo-shan, Che-tse-lo, 4000 m (H. T. Tsai 58605, 14 Sept. 1934, A, PE); Che-tse-lo, 3000–4000m (H. T. Tsai 54128, 4 Sept. 1933, A, KUN, PE); loc. cit., 4000 m (H. T. Tsai 58161, 24 Aug. 1934, A, PE); A-tun-tze, 3000 m (C. W. Wang 64863, Jul.–Aug. 1935, KUN); loc. cit. (C. W. Wang 64888, Jul-Aug. 1935, A, PE, KUN); Atuntze, Kangtsatung, 3900 m (T. T. Yü 9817, 24 Aug. 1937, PE); Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68817, 68834, Aug. 1935, A, PE, KUN); In montium, inter fluvios Landsang-djiang (Mekong) et Lu-djiang (Salween), 28°09'N, 3800–3950 m (F. Handel-Mazzetti 9705, 6 Aug. 1916, S, W, WU); Mekong-Salwin Divide, Sewalongba, 3000 m (T. T. Yü 22533, 27 Aug. 1938, KUN, PE); Wei-si Hsien, Yeh-Chih, 3600 m (C. W. Wang 68420, Aug. 1935, PE); loc. cit., 3600 m (C. W. Wang 68548, Aug. 1935, A, PE, KUN); Inter pagum Dschungdien (Chungtien) et vicum Djitsung, 3900–4100 m (F. Handel-Mazzetti 7821, 25 Aug. 1915, S, W, WU); Lushui Xian, Pianma - Pianma Pass - Lushui, 3000 m (S. K. Wu et al. 103169, 13 Sept. 1999, KUN, TI); Gongshan, 3000 m (Qing-Zang expedition team 8592, 25 Jul. 1982, KUN); Gongshan Xian, Dulongjiang - Gongshan, 3000 m (S. K. Wu et al. 103187, 18 & 19 Sept. 1999, KUN, TI); loc. cit., S. W. of Gongshan, Gaoligong Shan, 2615 m (S. K. Wu et al. 103189, 20 Sept. 1999, KUN, TI); Wen-shan Hsien, Loa-jiun-shan (K. M. Feng 11181, 13 Aug. 1947, KUN); Tali Range (G. Forrest 28156, Jul. 1929, S); Tsangshan Range, W. of Talifu, 13000 ft. (J. F. Rock 6342, Aug. 1922, A, KUN); Dali, Cangshan, 3440 m (S. K. Wu et al. 1608, 1 Sept. 1996, KUN, TI); Yangbi, a Fruit Garden-Cangshan, 3800 m (S. K. Wu et al. 468, 16 Aug. 1997, KUN, TI); Dali Shi, Diancang Shan, Zhonghe Temple - Ximatang, 3400 m (S. K. Wu et al. 103134, 5 Sept. 1999, KUN, TI); loc. cit., Zhonghe Peak, 3500 m (S. K. Wu et al. 103146, 6 Sept. 1999, KUN, TI); Lijiang Xian, Laojun Shan, Longqun Lodge - Jiushijiu Longtan, 3900 m (S. K. Wu et al. 103160, 8 Sept. 1999, KUN, TI); Lung-pan-la Champu-tung, 3120 m (C. W. Wang 67273, Oct. 1935, A, KUN, PE); Upper Kiukiang valley, Lungtsahmuru, 3800 m (T. T. Yü 19838, 9 Aug. 1938, A, PE, KUN); Sooroo, Cham-pu-tung, 3000 m (C. W. Wang 66703, Sept. 1935, A, PE); Taron-Taru Divide, Tangtehwang, 2100 m (T. T. Yü 20005, 27 Aug. 1938, A); loc. cit. (T. T. Yü s.n., 27 Aug 1938, KUN); without precise locality (G. Forrest 29817, 1930-1931, S).

**SICHUAN:** Yanyuan, 3800 m (Qing-Zang expedition team 12755, 9 Aug. 1983, KUN).

## 12. *Juncus concinnus* D. Don

**INDIA:** N. Bihar, near Nepal Border (B. B. Mundkur 45, Sept. 1942, A).



**PUNJAB:** Kulu valley between Kothi and Rahla, 2700 m (R. A. M. Geesteranus 14071, 22 Aug. 1964, L); Kumawar (J. R. Drummond 22252, K).

**HIMACHAL PRADESH:** Dalhousie, 6000 ft. (C. B. Clarke 22493, 15 Sept. 1874, CAL); Dhurmsala, 10000 ft. (C. B. Clarke 22596, 17 Oct. 1874, CAL); loc. cit. (C. B. Clarke s.n., 17 Oct. 1874, L); Mdia, Simla, 2200 m (R. A. Maas Geesteranus 14056, 15 Aug. 1964, L); Narkavoa (Stoliczka s.n., CAL).

**UTTAR PRADESH:** Jaunsar. United Provinces, Deoban at 8500 ft. (C. E. Parkinson 7141, 25 Jun. 1936, S); Nainital, 6000 ft. (Meebold 215, Oct. 1905, CAL).

**KUMAON:** Bhaichan, 2000 m (C. M. Arora 49622, 6 Aug. 1972, CAL); Dafia - Dhoora, 2600 m (C. M. Arora 50067, 28 Aug. 1973, CAL); Nasini Tal, 6500 ft. (R. Strachey & J. E. Winterbottom 10, CAL); Nawi Lal, 7000 ft. (R. Strachey & J. E. Winterbottom 10, A); near Sasa, 8000–9000 ft. (J. F. Duthie 6054, 12 Jul. 1886, K); Jagesar, 7000 ft. (R. Strachey & J. E. Winterbottom 10, K).

**NORTH WEST HIMALAYA:** Kulel, 3000 ft. (G. A. Gammie 18174, 22 Aug. 1896, K); Landow, Mussoorie, 7000 ft. (R. R. Stewart 12846, 21 Aug. 1936, S); Jableukhet ridges, 7000 ft. (R. R. Stewart 14367, 16 Aug. 1934, A).

**NEPAL:** Thogwmdanda, 3200 m (collector unknown 712, 27 Aug. 1972, KATH); Jumla, 2300 m (M. P. Nanandher & B. P. Joshi 6817, 6 Aug. 1981, KATH); Surkhet, Katukuwa - Sidhapaila - Ranimatta, 1925 m (M. Suzuki et al. 9193018, 30 Jul. 1991, TI); near Phagune Dhuri, 13000 ft. (J. D. A. Stainton et al. 3421, 7 Jul. 1954, A, BM); Myagdi, Chitre (T. Hoshino et al. 9662041, 27 Jul. 1996, TI); Tukcha, Kali Gandaki, 10000 ft. (J. D. A. Stainton et al. 7482, 26 Aug. 1954, A, BM); Kali Gandaki, N. Dhumpu, 7800 ft. (G. Miede 82, 12 Jul. 1977, BM); near Lumsum, 7500 ft. (J. D. A. Stainton et al. 3516, 17 Jul. 1954, A, BM); Samargaon, N. of Tukucha, 15500 ft. (J. D. A. Stainton et al. 7295, 15 Aug. 1954, CAL); S. of Annapurna, above Siklis, 28°07'N, 84°06'E, 2650 m (G. Troth 940, 28 Aug. 1976, BM); Gandaki Zone, Manang distr., around Bimtang, 28°38'04"N, 84°28'20"E, 3520 m (M. Suzuki et al. 9470370, 9470374, 11 Aug. 1994, TI); loc. cit. 3535 m (M. Suzuki et al. 9060280, 11 Aug. 1994, TI); Bimtang, 3350 m (M. Suzuki et al. 9485391, 12 Aug. 1994, TI); Gandaki Zone, Gorkha distr., Lungdang Gompa, 28°28'10"N, 85°03'07"E, 2840 m (M. Suzuki et al. 9460113, 28 Jul. 1994, TI); loc. cit., Lokpa, 28°24'35"N, 84°53'40"E - 28°26'49"N, 84°55'56"E, 1940 m (M. Suzuki et al. 9485153, 25 Jul. 1994, TI); near Lumsum, 7500 ft. (J. D. A. Stainton et al. 3516, 17 Jul. 1954, CAL); Shiar Khola, W. of Chumje, 9500 ft. (P. C. Gardner 924, 27 Jun. 1953, BM); Langtang, 11500–12500 ft. (O. Polunin 481, 21 Jun. 1949, BM); Syarpagoan - Langtang, 9500 ft. (O. Polunin 1360, 31 Jul. 1949, BM); Langtang village area, 11500 ft. (O. Polunin 1548, 1 Aug. 1949, BM); Kyangijin, 11500–12000 ft. (A. Richards 58, 8 Aug. 1969, BM); Bagmati zone, Rasuwa district, just east of village of Bharku, 1828 m (H. van T. & S. N. Irene 150, 3 Aug. 1985, A); Bagmati zone, Lalitpur district, top of Mt. Pulchoki, 10 miles S. E. of Kathmandu, 2700 m (D. H. Nicolson 2255, 3 Sept. 1966, BM, KATH); Rasuwa, Bhorlang - Pati Bhanjyang - Tanguni - Chipling - Latsu - Ingyur (H. Kanai & S. B. Malla 674587, 21 Aug. 1969, TI); loc. cit., Gram - Thale - Dunche, 1900 m (H. Hara et al. 721733, 21 Aug. 1972, TI); loc. cit., Yure Kharka - Tinbu Kharka, 3750 m (F. Miyamoto et al. 9410056, 26 Jul. 1994, TI); loc. cit., Pati Kharka - cross a river - a Kharka (near Pabil Kharka), 3000 m (F. Miyamoto et al. 9410217, 5 Aug. 1994, TI); loc. cit., a Kharka - Pabil Kharka, 2920 m (F. Miyamoto et al. 9410219, 6 Aug. 1994, TI); loc. cit., Chyauche Kharka - a bridge - Lingju, 3400 m (F. Miyamoto et al. 9410284, 12 Aug. 1994, TI); loc. cit., Sunchet Kharka - Kangait Kharka - Gopchet Kharka - a pass - Lipchet Kharka, 2800 m (F. Miyamoto et al. 9410308, 15 Aug. 1994, TI); loc. cit., Lama Lodge - Chumna Lodge - Ghora Tabela - Thangshab - Langtang, 3300 m (H. Takayama et al. 9220115, 12 Jul. 1992, TI); Daman, 7620 ft. (Rajbhandari & Upadhyay 2230, 16 Aug. 1964, KATH); Daman, 27°45', 85°05', 2400 m (J. F. Dobremez 809, 14 Aug. 1971, KATH); Sherpagaon, 7000–8000 ft. (A. Richards 53, 5 Aug. 1969, BM); Rolwaling, 27°41', 86°15', 11500 ft. (D. McCosh 159, 31 May 1964, BM, KATH); Numbur, Rolwaling Himal., 2800 m (K. Yoda s.n., 3 Jun. 1963, KYO); loc. cit., 2900 m (K. Yoda s.n., 3 Jun. 1963, KYO); Ramechhap, Shivalaya -

Khasrubus - Deorali (H. Ohba et al. 8570099, 5 Jul. 1985, TI); loc. cit., Thare Og - Gyajo La - Neju (Njashung Dingma) (H. Ohba et al. 8570910, 30, Jul. 1985, TI); loc. cit., Bhandar - Deorali - Khasrubus - Shivalaya (H. Ohba et al. 8530786, 6 Aug. 1985, TI); loc. cit., Deorali - Thodung - Serdingma (H. Ohba et al. 8570190, 6 Jul. 1985, TI); loc. cit., Sibalaya - Manidara - Merudara - Sanmadara - Kösurobas - Mohobill - Gatekhora - Deorali - Bandar, 1900 m (F. Miyamoto et al. 9592036, 19 Jul. 1995, TI); loc. cit., 1870 m (F. Miyamoto et al. 9596028, 19 Jul. 1995, TI); loc. cit., Takisindu - Junbesi, 2500 m (F. Miyamoto et al. 9580493, 1 Sept. 1995, TI); Dorzhong to Chhumdung, 3400 m (S. Nakao s.n., 12 Jun. 1953, KYO); Taplejung, Topke Gola - Shewaden (H. Kanai et al. s.n., 28 Jun. 1972, TI); Taplejung district, from Chini to Nup, 3000 m (H. Tabata et al. 11713, 19 Jul. 1978, KYO); Solukhumbu, Pike Khop - Leding - Tama Khani - Beni - Fera, 2600 m (F. Miyamoto et al. 9580074, 25 Jul. 1995, TI); Chauki, 27°11'N, 87°29'E, 2500 m (J. F. Dobremea 1515, 17 Aug. 1972, BM); Sankhuwasawa, Thudam, 3400 m (H. Kanai et al. 720740, 25 Jun. 1972, TI); Milke Danda, 27°15'N, 87°30'E, 8500 ft. (L. H. J. Willams & J. D. A. Stainton 8433, 10 Sept. 1967, K); Kaski, Tirkhedhunga - Ulleri - Banthanti - Ghorepani, 2480 m (M. Mikage et al. 9552183, 16 Sept. 1995, TI); Dhankuta, Tute - Tinjure Phedi (H. Ohba et al. 9153067, 14 Jul. 1991, TI); near Ghunsa, 3500 m (K. Nishioka 36, 16 Jun. 1962, KYO); near Wallun, 3400 m (K. Nishioka 124, 16 Jul. 1962, KYO); Jangla Banjang, 1000 m (S. Elnarsson et al. 771, 16 Jun. 1973, BM); Phagune Dhuri, 13000 ft. (J. D. A. Stainto et al. 3421, 7 Jul. 1954, BM); Mahani gaon (O. Polunin et al. 311, 26 Jul. 1952, BM); Mupong, 9000–10000 ft. (C. L. Dhwoj 396, 1930, BM); On path from Chomro to Gandrung, 7000 ft. (C. Barclay 2411, 30 May 1971, K); Sindnuwa, Dhankuta district, 2100 m (N. P. Manandhar 129, 2 Aug. 1976, KATH); Environs of Ghunsa, 27°40', 87°57', 3430 m (C. G. Wilosn et al. 435, 8 Sept. 1989, KATH); Kyapra to Pheri, Ghunsa, 27°38', 87°55', 3380 m (C. G. Wilosn et al. 1246, 5 Oct. 1989, KATH); Shidna N of Dhankuta, 27°03', 87°24', 2650 m (C. B. Wilosn et al. 347a, 7 Sept. 1989, KATH); above Door Pani, 27°10', 87°26', 2900 m (C. G. Wilosn et al. 435, 8 Sept. 1989, KATH); Rikheswone, 8000 ft. (S. B. Malla & K. R. Rajbhandari 62, 27 Aug. 1960, CAL, KATH); without precise locality (J. Scully 122, CAL); Near Kutungchhang, 7500 ft. (T. B. Shrestha & P. R. Shakya 3715, 7 Sept. 1965, KATH); without precise locality, 4050–4100 m (O. Namikawa 569, 2 Sept. 1958, KYO).

**SIKKIM:** Lachen, 14000 ft. (J. D. Hooker s.n., 15 Jul. 1849, K); North district, Lasha Chhu valley, N. E. of Thanggu, 27°53'39"N, 88°32'44"E, 3980 m (D. G. Long & H. J. Noltie 317, 18 Jul. 1996, E, TI); Chawuago, 12000–13000 ft. (W. W. Smith 3810, 26 Jul. 1910, CAL); Zewu valley, 13000 ft. (Smith & Cave 2807, 20 Jul. 909, CAL); without precise locality, 8000–10000 ft. (J. D. Hooker s.n., L).

**BHUTAN:** Laya, Upper Mo Chu, 12000 ft. (F. Ludlow et al. 16434, 6 Jun. 1949, A, BM, CAL); Denchung, Khoma Chu, 7000 ft. (F. Ludlow et al. 20875, 13 Jul. 1949, A, BM); Dochula, 3100 m (G. S. Gupta 1747, 28 Aug. 1965, CAL); Thimphu district, Dotena, Thimphu Chu, 27°35'N, 89°38'E, 2550 m (I. W. J. Sinclair & D. G. Long, 5023, 15 Sept. 1984, K); Thimpu, 9500 ft. (S. B. Lyon 5096, 17 Sept. 1967, BM); Upper MO Chu district, Gasa Dzong, 27°57'N, 89°46'E, 2800 m (I. W. J. Sinclair & D. G. Long 5023, 15 Sept. 1984, K); Sengor, N. W. of Mongar, 27°22'N, 91°01'E, 3000 m (A. J. C. Grierson & D. G. Long 2519, 6 Jul. 1979, K); Ura ha, 11000 ft. (S. B. Lyon 15106A, 28 Jun. 1969, BM); Chi la, 4000–4300 m (G. S. Gupta 613, 20 Aug. 1963, CAL).

**ASSAM:** Khasia, 5000–6000 ft. (J. D. Hooker & T. Thomson s.n., L); Tha Chu (F. Kingdon-Ward 19653, 16 Jul. 1950, BM); Jakpho, Naga Hill, 9900 ft. (C. B. Clarke 41276, 25 Oct. 1885, CAL).

**HIMALAYA:** Him. Bor. Occ., 10000–14000 ft. (T. Thomson s.n., L); without precise locality, 6000–10000 ft. (T. Thomson s.n., L, CAL); without precise locality, 4000–10000 ft. (T. Thomson s.n., L); without precise locality (Falconer 1184, L).

**MYANMAR:** West central Myanmar, Mt. Victoria, 7000 ft. (F. Kingdon-ward 22617, 2 Sept. 1956, BM).

**XIZANG (TIBET):** Nyalam Xian, Zhangmu, 27°59'N, 85°58'E, 2700 m (S. Akiyama et al. 106261, 16 Aug. 2001, KUN, TI); Chumbi, Rwdung (Dungboo s.n., 28 Jun. 1878, B, CAL); Chumbi & Phari (Meebold



4919, Oct. 1907, CAL); Rung-me, N. of Phari (G. King s.n., Aug. 1882, CAL); Mainling, 3150 m (Qing-Zang expedition team 74-5336, 21 Sept. 1974, KUN); Gongbo'gyamda Xian, Basum Lake, 3550 m (S. Akiyama et al. 105203, 15 Aug. 2000, KUN, TI); Nyingch, 2800 m (Yang 2349, 18 Sept. 1963, KUN); Mira La, Nyang Chu, 29°28'N, 94°12'E, 11000–12000 ft. (F. Ludlow et al. 6031, 12 Aug. 1938, A); Zayu, 3500 m (Qing-Zang expedition team 10520, 18 Sept. 1981, KUN); loc. cit., 3700 m (Tibet expedition team 10811, 27 Sept. 1982, KUN); Lang (G. King 1808, 5 Aug. 1882, K); Rookah, 10000 ft. (G. King s.n., 1885, K); San-duan-tung from Chumbi (G. King s.n., 5 Aug. 1882, CAL).

**YUNNAN:** In pluviisilvis mixtis temperatis supra vicum Bahan (Pehalo) ad fluvium Lu-djiang (Salween), Tong-Tchouan, 27°58'N, 2700 m (F. Handel-Mazzetti 9054, 24 Jun. 1916, S, W); Boggy pasture on the western flank of the Shewli Salwin divide, 25°20'N, 9000–10000 ft. (G. Forrest 8934, Aug. 1912, K); loc. cit., 9000 ft. (G. Forrest 8951, Aug. 1912, K); Yangtze watershed, in the Prefectural district of Likiang, eastern slopes of Likiang Snow Range, 12000–13000 ft. (J. F. Rock 4873, 12-29 May 1922, A); Mt. Wuaha, Yung-ning Territory, 11000 ft. (J. F. Rock 24212, May 1922, A, K-paratype of *J. glomeratus*); Zhongdian (S. Y. Hu & Y. C. Kong Y167, 8 Jul. 1999, A); Chengkang, Snow Range, 3100 m (T. T. Yü 17214, 6 Aug. 1938, A, KUN, PE); Haba Xueshan, 2900 m (Zhongdian expedition team 2101, 17 Sept. 1962, KUN); Chi-na-tung, Tsa-wa-rung, 2800 m (C. W. Wang 65226, Aug. 1935, A, KUN, PE); Wei-si Hsien, 3500 m (C. W. Wang 63806, Jun. 1935, A); loc. cit., 3500 m (C. W. Wang 63885, Jun. 1935, A, PE); loc. cit., 2800 m (H. T. Tsai 57990, 21 Sept. 1934, A, PE); loc. cit., Yeh-Chih, 3600 m (C. W. Wang 68339, Aug. 1935, PE); loc. cit., 3200 m (C. W. Wang 68067, Aug. 1935, A); loc. cit., 3600 m (C. W. Wang 68326, Aug. 1935, A); Chih-tse-lo, 2500 m (H. T. Tsai 54162, 7 Sept. 1933, A, PE); Chu-hsiung, To-Tsu, 1980 m (M. K. Li 143, 23 Sept. 1939, PE); Chi-na-tung, Tsa-wa-rung, 3000 m (C. W. Wang 65358, Aug. 1935, A, PE); Pin-chuan Hsien, 3000 m (H. T. Tsai 52963, 18 Jul. 1933, A, PE); Atuntze, Kangtsatung, Chienlungna, 3250 m (T. T. Yü 9963, 29 Aug. 1937, PE); Atuntze, Paimashan, Kuchianung, 3400 m (T. T. Yü 9460, 9 Aug. 1937, PE); Atun-tze, 3000 m (C. W. Wang 64799, Jul.-Aug. 1935, A); loc. cit., 2700 m (C. W. Wang 69938, Sept. 1935, PE); loc. cit., 2700 m (C. W. Wang 69933, Sept. 1935, A); Deqen (Qing-Zang expedition team 2653, 11 Jul. 1981, KUN); Zhongdian, Biutahai, 3440 m (Qing-Zang expedition team 1619, 23 Jun. 1951, KUN); Zhongdian, Haba Shan, 3600 m (Zhongdian expedition team 1309, 25 Aug. 1962, PE-paratype of *J. glomeratus*); Zhongdian Xian, Tianchi, 27°39'N, 99°38'E, 3900 m (S. Akiyama et al. 419, 8 Jul. 2000, KUN, TI); loc. cit., Shudu Hu, a lake near Zhongdian, 27°55'N, 99°56'E, 3400 m (S. Akiyama et al. 426, 9 Jul. 2000, KUN, TI); Y. Chungtien, Pica, 3100 m (T. T. Yü 12010, 7 Jul. 1937, PE); Kiukiang valley, Narktai to Bleeton, 2350 m (T. T. Yü 19597, 3 Aug. 1937, PE); Song-Ming, Ta-Po-chiao, 2300 m (Y. P. Chang 151, 14 Oct. 1940, PE); Yangbi Xian, W. side of Diancang Shan mountain range, En route from Xueshanhe to Dapingzi, 25°43'N, 100°02'E, 2600-3000 m (B. Bartholomew & D. E. Boufford 216, 17 Jun. 1984, A); loc. cit., Vicinity of Dajiping, 25°50'N, 99°59'E, 2600-3100 m (B. Bartholomew & D. E. Boufford 670, 1 Jul. 1984, A); Yangbi county, Zhongsan, 2500 m (K. Iwatsuki et al. 480, 23 Aug. 1984, KUN, TI); loc. cit., 2400 m (K. Iwatsuki et al. 232, 23 Aug. 1984, KUN, TI); Yangbi county, Sanchaho on the western slope of Dianchang Shan, 2350-2600 m (M. Kato et al. 303, 21 Jul. 1988, KUN, TI); Tai-li Hsien, Tien-ts'ang Shan (K. K. Tsoong 2282, 3 Sept. 1908, S); Tali range (G. Forrest 28162, Jul. 1929, S); loc. cit., 9000-10000 ft. (G. Forrest 4911, 1909, CAL); Ta-li Hsien, 2800 m (H. T. Tsai 53821, 26 Jul. 1933, A, PE); Dali Xian, E. side of Diancang Shan mountain range, Vicinity of Yinglofeng, 25°42'N, 100°07'E, 2900–3050 m (B. Bartholomew & D. E. Boufford 940, 10 Jul. 1984, A); Dali Xian, Diancang Shan mountain range, Xiaohuadianba in the vicinity of Huadianba medicinal herb farm, 25°53'N, 100°01'E, 3200 m (B. Bartholomew & D. E. Boufford 1183, 19 Jul. 1984, A); Dali, Cangshan, 3410 m (S. K. Wu et al. 1611bis, 1 Sept. 1996, KUN, TI); loc. cit., 3300 m (S. K. Wu et al. 1613, 1 Sept. 1996, KUN, TI); Dali Bizu Zizhizhou, Huandianba, 2900–3100 m (K. Iwatsuki et al. 1482, 29 Aug. 1984, KUN, TI); Dali Shi, Diancang Shan, 3300 m (S. Akiyama et al. 403, 5 Jul. 2001, KUN, TI); Lichiang, 3600 m (C. Schneider 2069,

30 Jul. 1914, K); Li-kiang Hsian, 2500 m (C. W. Wang 70862, Jul. 1935, A, PE); loc. cit., 2500 m (C. W. Wang 70893, Jul. 1935, A, PE); loc. cit., 2800 m (C. W. Wang 71379, Jul. 1935, PE); loc. cit., 2800 m (C. W. Wang 71679, Jul. 1935, A, PE); loc. cit., 2300 m (C. W. Wang 70951, Jul. 1935, PE); Likiang snow range (R. C. Ching 30293, 28 Jun. 1939, A); Lijiang, Ganhaizi, 3080 m (S. K. Wu et al. 1439, 9 Aug. 1996, KUN, TI); loc. cit., Baishui, 3000–3150 m (K. Iwatsuki et al. 1161, 2 Oct. 1987); loc. cit., Longpan, 1950–2250 m (H. Ohba et al. 142, 10 Sept. 1987, KUN, TI); loc. cit., Nguluko, 2800 m (T. T. Yü 15263, 5 Jul. 1937, PE); N.W. Likiang Snow range on Yangtze (R. C. Ching 20746, 9 Jun. 1939, A); Upper Kiukiang valley, Narktai, 2350 m (T. T. Yü 19597, 3 Aug. 1938, A); Septentrional central (Maire 6865, 1909-1911, S); Tong-Tchouan (Maire s.n., 1909-1911, S).

**SICHUAN:** Taofu (Dawo) district, montes orientales, Lhamo Mondeh La, 3500 m (H. Smith 12306, 21 Sept. 1934, KYO, PE, S); Sacred Mt. Kar-war-kar-boo, Tsa-wa-rung, 3400 m (C. W. Wang 66263, Sept. 1335, A, PE); Litang, 3900 m (Sichuan expedition team 3677, 3 Aug. 1973, KUN); Mu-li, Lea-lang-kang-din, 2400 m (T. T. Yü 7471, 30 Jul. 1937, A, PE); Muli, 3200 m (Tibet expedition team 14004, 13 Sept. 1983, KUN); loc. cit., 2500-3350 m (S. K. Wu 3235, 25 Sept. 1959, KUN); Xiangcheng - Daocheng, around Wuming Shan, 4000 m (S. K. Wu et al. 428, 29 Jul. 1997, KUN, TI); Daocheng, 3250 m (Qing-Zang expedition team 4298, 25 Aug. 1981, KUN); loc. cit., 4200 m (Qing-Zang expedition team 5894, 31 Aug. 1981, KUN); loc. cit., Daocheng - Gongling, 3740 m (S. K. Wu et al. 1531, 19 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, Beiyu, 4200 m (S. K. Wu et al. 1554, 22 Aug. 1996, KUN, TI); loc. cit., Gongga Zhonggu - Riwa Xiang - Gongling - Daocheng, 3700 m (S. K. Wu et al. 1577, 25 Aug. 1996, KUN, TI); loc. cit., around Gongga Zhonggu, 3880 m (S. K. Wu et al. 435, 3 Aug. 1997, KUN, TI); Tahsiangling, W. side, 2600 m (H. Smith 10207, 26 Jun. 1934, KYO, S); Xiaojin, Ganhaizi - southwestern slope of Mt. Siguniang - Ganhaizi, 3800 m (H. Ikeda et al. 100839, 1 Sept. 1998, KUN, TI); loc. cit., 3700 m (H. Ikeda et al. 100841, 1 Sept. 1998, KUN, TI); Yanyuan, 3200 m (Qing-Zang expedition team 12036, 12175, 12872, 20 Jul. 1983, KUN).

### 13. *Juncus concolor* Sam.

**INDIA AND BURMA:** Sirhoi, 8000–8500 ft. (F. Kingdon-Ward 17839, 21 Jul. 1948, A).

**YUNNAN:** Chengkang, Snow Range, 3400 m (T. T. Yü 16961, 24 Jul. 1938, A, PE); loc. cit., 3420 m (T. T. Yü 17194, 4 Aug. 1938, A, PE); Yangbi, around Cangshan, Yangbi side, 3800 m (S. K. Wu et al. 475, 17 Aug. 1997, KUN, TI); loc. cit., 3820 m (S. K. Wu et al. 476, 17 Aug. 1997, KUN, TI).

### 14. *Juncus crassistylus* A. Camus

**MYANMAR:** Open moist pasture on the summit of the Sansi gorge, Upper Burmah, 25°25'N, 9500 ft. (G. Forrest 9116, Sept. 1912, K); N. E. upper Buruma (G. Forrest 25042, Sept. 1924, K); Nmai Hka-Salwin divide (G. Forrest 25072, Sept. 1924, BM).

**YUNNAN:** Western flank of the Shweli-Salwin divide, 10000–11000 ft. (G. Forrest 9026, Aug. 1912, K, PE, S); Che-tse-lo, 4000 m (H. T. Tsai 58016, 18 Aug. 1934, A, K, KUN, PE); loc. cit., 4000 m (H. T. Tsai 58063, 18 Aug. 1934, A, PE); loc. cit., 4000 m (H. T. Tsai 58253, 27 Aug. 1934, A, PE); loc. cit., 4000 m (H. T. Tsai 58639, 15 Aug. 1934, A, PE); Lushui Xian, Pianma - Pianma Pass - Lushui, 3200 m (S. K. Wu et al. 103173, 13 Sept. 1999, KUN, TI); Tali range, 25°40'N, 100°05'E, 7000 ft. (G. Forrest 28009, Aug. 1929, BM, S); Dali Xian, E. side of Diancang Shan mountain range, Vicinity of Yinglofeng, 3000 m, (B. Bartholomew et al. 859, 8 Jul. 1984, A); Dali Shi, Diancang Shan, Zhonghe Peak, 3700 m (S. K. Wu et al. 103153, 6 Sept. 1999, KUN, TI); loc. cit., 3300 m (S. K. Wu et al. 103144, 6 Sept. 1999, KUN, TI); loc. cit., Zhonghe Temple - Ximatang, 3200 m (S. K. Wu et al. 103138, 5 Sept. 1999, KUN, TI); Parmi les bambous, Tsang Chang, 3500 m (P. J. M. Delavey 2641, 20 Aug. 1887, BM, CAL, K, P); without precise locality (G. Forrest 12882, 1917-1919, BM); without precise locality (G. Forrest 15882, K).



**SICHUAN:** Between Taining (Ngata) and Taofu (Dawo), 3800 m (H. Smith 12074, 12 Sept. 1934, BM).

**16. *Juncus dongchuanensis* K. F. Wu**

**YUNNAN:** Tali fu, 3000–3400 m (Schneider 2498, Aug. 1914, A, K); Huize, Dahihenshan, 3350m (Dongchuandui 63-122, 27 Sep. 1963, KUN); Dongchuan, 2700 m (S. B. Lan 585, 20 Sept. 1985, PE); Ta-li Hsien, 2600 m (H. T. Tsai 53917, 29 Jul. 1933, A, KUN); Dali, Cangshan, 25°40'N, 100°07'E, 3410 m (S. K. Wu et al. 1611, 1 Sep. 1996, KUN, TI); Dali Shi, Diancang Shan, Zhonghe Temple, 3200 m (S. K. Wu et al. 103136, 5 Sept. 1999, KUN, TI); loc. cit., Zhonghe Peak, 3300 m (S. K. Wu et al. 103151, 6 Sept. 1999, KUN, TI); Tsang shan, 3460 m (collector unknown CLD-90 1246, 15 Oct. 1990, K); Binchuan Xian, Jizu Shan, Jinding Temple - Zhusheng Temple, 2900 m (S. K. Wu et al. 103198, 25 Sept. 1999, KUN, TI); without precise locality (P. J. M. Delavey 6660, 6556, Aug. 1895, P); without precise locality (P. J. M. Delavey 3165, 20 Aug. 1887, P).

**17. *Juncus duthiei* (C. B. Clarke) Noltie**

**NEPAL:** Bagmati zone, Rasuwa district, around base camp, 28°13'09"N, 85°37'17"E, 4920 m (H. Takayama et al. 9220322, 21 Jul. 1992, TI).

**XIZANG (TIBET):** without precise, 15000 ft. (collector unknown, K).

**18. *Juncus effuses* L.**

**NEPAL:** Jumbesi, 2700 m (K. Yoda s.n., 5 May 1963, KYO).

**BHUTAN:** Timphu (2250 m) - Dochu La (3050 m) (H. Kanai et al. 658, 30 May 1967, KYO).

**ASSAM:** Tsera Rin, Khasiyas, 4500 ft. (C. B. Clarke 7321, 1 Jun. 1868, K); Laitlynkot, Khasi Hills, 6000 ft. (W. N. Koelz 23243, 16 Jul. 1949, L); Cherrapunjee, Khasi Hills, 4000 ft. (T. R. Chand 5500, 28 Apr. 1952, L); Shillong, Khasi Hills, 5500 ft. (T. R. Chand 7547, 15 Apr. 1954, L); Khasia, 5000 ft. (J. D. Hooker s.n., K); East Bengal (Griffith 5456, K).

**MYANMAR:** Kambaiti (73 km E. of Myitkyina), 2100 m (R. Malaise 45, 1 May 1934, S); loc. cit., 2100 m (R. Malaise 18, 7 Jun. 1934, S); loc. cit., 2100 m (R. Malaise 121, 1934, S).

**XIZANG (TIBET):** Long (M. F. E. Younghusband s.n., 29 Jun. 1903, B).

**YUNNAN:** Lushui Xian, Pianma - Pianma Pass - Lushui, 2600 m (S. K. Wu et al. 103176, 103178, 13 Sept. 1999, KUN, TI); Wei-se Hsien, 2300 m (H. T. Tsai 63081, 8 Nov. 1934, A); Shunning, 1950 m (T. T. Yü 16049, A); Dali Xian, E. side of Diancang Shan, vicinity of Butterfly Springs. 25°55'N, 100°05'E, 2050 m (B. Bartholomew & D. E. Boufford 744, 6 Jul. 1984, A); loc. cit., 25°38'N, 100°10'E, 2200–2350 m (B. Bartholomew & D. E. Boufford 805, 7 Jul. 1984, A); Dali Shi, Diancang Shan, Zhonghe Temple - Ximatang, 2900 m (S. K. Wu et al. 103129, 5 Sept. 1999, KUN, TI); Tali-Hsien, 2600 m (C. W. Wang 63124, May 1935, KUN); Fo-Hai, 1520 m (C. W. Wang 74032, May 1936, A); Jinghong Xian, 1700 m (T. Zhanhuo 92-291, 5 Jun. 1992, A); Kun-Ming, 2200 m (C. W. Wang 63059, Apr. 1935, A); Kien-shuei Hsien, 1900 m (H. T. Tsai 53109, 11 Apr. 1933, A); Lan-Tsang Hsien, 1500 m (C. W. Wang 76598, May 1936, A); O-shan Hsien, 1650 m (H. T. Tsai 55784, 9 Jun. 1933, A); O-pien Hsien, 1700 m (T. T. Yü 728, A); Shung-Kiang Hsien, 1480 m (C. W. Wang 73066, Apr. 1936, A); Tsang-Yuan, 1600 m (C. W. Wang 73253, Apr. 1936, A).

**SICHUAN:** Mt. Omei (H. C. Chow 12124, 13 Apr. 1940, A); loc. cit. (W. P. Fang s.n., A); Ping-wu Hsien, Mo-tien Ling, 2500 m (F. T. Wang 22503, S); Juxta urbem Ningyuen secus rivus regionis subtropicae, 1650 m (F. Handel-Mazzetti 1284, 13 Jun. 1914, S); Nin-ijuan-fer, 1650 m (H. Smith 1735, 15 May 1922, S); Opien Hsien (C. L. Sun 950, 10 Aug. 1939, A).

**19. *Juncus fimbristylodes* Noltie**

**YUNNAN:** Binchuan Xian, Jizu Shan, Jinding Temple - Zhusheng Temple, 2900 m (S. K. Wu et al. 103196,

25 Sept. 1999, KUN, TI).

**20. *Juncus ganeshii*** Miyam. & H. Ohba

**PAKISTAN:** Chitral, Lohigal An, N. E. of Drosh, 13000 ft. (J. D. A. Stainton 3131, 14 Aug. 1958, A, BM); Chitral, Lutko, between 35°55'N, 71°18'E and 36°06'N, 71°48'E, 9000 ft. (S. A. B. Lyon 787, 3 Jun. 1958, A, BM).

**KASHMIR:** above Rattu, Astor valley, 9500 ft. (R. R. Stewart & I. D. Stewart 18775, 19 Aug. 1939, A); Buzil, 10000 ft. (W. N. Koelz 9423, 5 Aug. 1936, A); To Gadsar, beyond Gangabal, 11000–12000 ft. (R. R. Stewart 18302, 11 Aug. 1939, A); Bwji La, Deosai side, 14000–15000 ft. (R. R. Stewart 20109, 31 Jul. 1940, A); Char, Zanskar (W. N. Koelz 5690, 5693, 16–17 Jul. 1933, A); Pense La, Zanskar district, 13700 ft. (M. Grace et al. s.n. 29 Jul. 1981, K).

**21. *Juncus giganteus*** Sam.

**QINGHAI:** Dari Xian, Huleanma, Jianshe Xiang, S. side of the Huang He and S. W. of confluence with the Sari He (Dar Qu), 33°45'42"N, 99°23'32"E, 4000 m (T. N. Ho et al. 1102, 11 Aug. 1993, A).

**GANSU:** Tao River basin: Alpine meadows of Mt. Kwang Kei, W. Tebbu land, Minshan range (J. F. Rock 13742, Oct. 1925, A, K); Gargannar, S. of Old Taochow, 3600–4200 m (R. C. Ching 912, Oct. 1925, K); without precise locality (P. Licsut 4510, 28 Jul. 1918, S).

**SICHUAN:** Between Taining (Ngata) and Taofu (Dawo), S. W. of Sunglingku, 3800 m (H. Smith 12074, 12 Sept. 1934, S, UPS); Taofu (Dawo) district, Mt. Yara, N. W. valley, 4100 m (H. Smith 11609, 29 Aug. 1934, S, KYO, UPS); Hsioeh-shan, 4300 m (H. Smith 3878, 19 Jul. 1922, UPS); loc. cit., 4200–4300 m (H. Smith 3737, 24 Jul. 1922, S, UPS).

**22. *Juncus glaucoturgidus*** Noltie

**NEPAL:** Kyangin Kharka areas, 12000–14000 ft. (S. B. Malla s.n., 18 Jul. 1967, BM-paratype of *J. glaucoturgidus*); Rasuwa, Yure Kharka - Tinbu Kharka, 3750 m (F. Miyamoto et al. 9410055, 26 Jul. 1994, TI); loc. cit., around Tinbu Kharka, 3820 m (F. Miyamoto et al. 9410079, 27 Jul. 1994, TI); loc. cit., Base Camp - Yala Kharka - Yathang - Langtang Khola, 4800 m (H. Takayama et al. 9220279, 19 Jul. 1992, TI); loc. cit., 4300 m (H. Takayama et al. 9220280, 19 Jul. 1992, TI); loc. cit., Kyangjin Kharka - Tarche Pisa - Tashigang - Yala Kharka, 4000 m (H. Takayama et al. 9220171, 14 Jul. 1992, TI); loc. cit., Kyangjin Kharka - Tarche Pisa - Tashigang - Yala Kharka, 4230 m (H. Takayama et al. 9220172, 14 Jul. 1992, TI); Solukhumbu, Beni Kharka (Dambuk) - Dikitscho - below DudhKund, 4300 m (H. Ohba et al. 8572028, 26 Aug. 1985, TI).

**BHUTAN:** Kantanang, Tsampa, 13000 ft. (F. Ludlow & G. Serriff 19042, 3 Jun. 1949, BM-paratype of *J. glaucoturgidus*).

**SICHUAN:** Daocheng, around Gongga Zhonggu, 3790 m (S. K. Wu et al. 443, 3 Aug. 1997, KUN, TI); loc. cit., around Gongga Shan, 4400 m (S. K. Wu et al. 445, 4 Aug. 1997, KUN, TI).

**23. *Juncus gonggae*** Miyam. & H. Ohba

**YUNNAN:** Dali shi, Diancang Shan, 3500 m (S. Akiyama et al. 409, 5 Jul. 2001, KUN, TI).

**24. *Juncus gracilicaulis*** A. Camus

**PUNJAB:** Rohtang Pass, 4000 m (N. P. Suigh 22949, 30 Jul. 1962, CAL).

**NEPAL:** Lamo Pokhari, 2900 m (H. Kanai et al. 720281, 9 Jun. 1972, TI); Kyapra to Pheri, Ghunsa Khola, 27°38'N, 87°55'E, 3370 m (C. G. Wilson et al. 346, 7 Sept. 1989, KATH).

**SIKKIM:** without precise locality (G. King 4505, 1879, K).

**BHUTAN:** Gasa - Pari La - Chamsa (H. Hara et al. 12682, 14 May 1967, TI); Lachen (J. D. Hooker s.n., 9



Jun. 1849, K); without precise locality, 8000–10000 ft. (J. D. Hooker s.n., S).

**CHINA. XIZANG (TIBET):** Zayu (Qing-Zang expedition team 10330, 11 Sept. 1982, KUN); loc.cit., 3700 m (Qing-Zang expedition team 10811, 27 Sept. 1982, KUN).

**YUNNAN:** Deqin Xian, Meili Xueshan, Suola, 3700 m (S. K. Wu et al. 193125, 20–23 Aug. 1999, KUN, TI); Lijiang Xian, Laojun Shan, Longqun Lodge - Jiushijiu Longtan, 3700 m (S. K. Wu et al. 193162, 8 Sept. 1999, KUN, TI); Dali (H. C. Wang 859, Jun. 1941, PE); Mt. Wuaha, Yung-ning Territory, 11000 ft. (J. F. Rock 24212, May 1932, B); Zhongdian, Haba shan, 27°22'28"N, 100°05'50"E, 3717 m (Alpine Garden Society expedition ACE 329, 16 Jun. 1994, K).

**SICHUAN:** Daocheng, Haizi, 4050 m (S. K. Wu et al. 1512, 17 Aug. 1996, KUN, TI); Xiangcheng - Daocheng, around Wuming Shan, 4520 m (S. K. Wu et al. 431, 29 Jul. 1997, KUN, TI); Tahsiangling, W. side, 2700 m (H. Smith 10208, 26 Jun. 1934, UPS).

## 25. *Juncus grisebachii* Buchenau

**INDIA:** without precise locality (K. Biswas 3601, A); West Bengal, Sandakphu, 12300 ft. (K. Biswas 5741, 8 Oct. 1941, CAL).

**NEPAL:** Rasuwa, Gopte - Thale Patil, 3400 m (H. Hara et al. 721967, 26 Aug. 1972, TI); Rasuwa, Gopte - Thale Patil (H. Hara et al. s.n., 26 Aug. 1972, TI); Dawan, 27°41'N, 85°05'E, 2490 m (J. F. Dobremez 809, 14 Aug. 1971, BM); Langtang valley, 13000 ft. (A. D. Schilling 465, 2 Aug. 1965, K); E. Tharke - Chyang, towards Ganja la, 28°00'N, 85°33'E, 3300 m (J. H. Hass 2700, 8 Sept. 1974, BM); Yangyr - Danda, 28°02'N, 85°34'E, 3800 m (J. H. Hass 2753, 15 Sept. 1974, BM); Sindhupalchok, Tingoang - Khosori Khabre, 3000 m (H. Kanai & T. B. Shrestha 676106, 12 Sept. 1970, TI); Dobate - Hile Dhap - Mane - Thale Patil - J. F. Rock Shelter I - J. F. Rock Shelter II, 3450 m (H. Kanai & S. B. Malla 674757, 24 Aug. 1969, TI); Kalinchok, 11000 ft. (Banerjee et al. 2819b, 15 Sept. 1964, KATH); Khokim, 27°23'N, 87°29'E, 3100 m (J. F. Dobremez 1583, 19 Aug. 1972, BM); Sankhuwasabha district, E bank of Upper Saldim Khola, below bridge NW of Hatiya, 27°44'N, 87°18'E, 2785 m (D. G. Long et al. 717, 12 Oct. 1991, KATH); loc. cit., N bank of Barun Khola, below Pemathang Kharka, 27°44'N, 87°12'E, 3360 m (D. G. Long et al. 589, 8 Oct. 1991, KATH); Sankhuwasawa, Banduke - Jomle (H. Ohba et al. 9153310, 4 Aug. 1991, TI); loc. cit., Banduke - Jomle, 4000 m (H. Ohba et al. 9110284, 4 Aug. 1991, TI); loc. cit., Singoa Kharka - Pahakhola, 3800 m (H. Ohba et al. 9110458, 11 Aug. 1991, TI); loc. cit., around Cha Ding Kharka and Shipton Pass, 3800 m (M. Minaki et al. 9020787, 10 Aug. 1990, TI); loc. cit., Beni Kharka - Sarkari Pati, 3600 m (H. Ohba et al. 8572141, 2 Sept. 1985, TI); loc. cit., Loding - Pikebuk - Pike Bhanjyang, 3500 m (H. Ohba et al. 8572335, 5 Sept. 1985, TI); loc. cit., Singoa Kharka - Pahakhola, 3900 m (H. Ohba et al. 9120379, 11 Aug. 1991, TI); loc. cit., Samakang Kharka - Dudh Kund, 3500 m (F. Miyamoto et al. 9580419, 24 Aug. 1995, TI); loc. cit., Tangna - Samakang Kharka, 3600 m (F. Miyamoto et al. 9580400, 23 Aug. 1995, TI); loc. cit., Thasing Dingma - Chhatarwa, 3900 m (F. Miyamoto et al. 9580467, 28 Aug. 1995, TI); loc. cit., Chalem Kharka - Jar Kharka, 3500 m (F. Miyamoto et al. 9580156, 1 Aug. 1995, TI); Guide Himal., 27°24'N, 87°06'E, 3700 m (J. F. Dobremez 1742, 29 Aug. 1972, BM); Arun valley, Wabak Khola, E. of Num, 13000 ft. (J. D. A. Stainton 1339, 12 Aug. 1956, A, BM); Arun valley, Num, 10000 ft. (J. D. A. Stainton 1680, 19 Sept. 1956, BM, L); Pangsing, 14000 ft. (C. L. Dhwoj 113a, 1929, BM); Bhararate Himal, Barun valley, 3500 m (T. Wraber 376, 4 Oct. 1972, BM); Lamjoora, 17000ft. (C. L. Dhwoj 251, 1930, A, BM); Simigaon, 2850 m (A. Zimmermann 1323, 15 Sept. 1954, BM); Amjilassa to Kyapra, 27°37'N, 87°53'E, 2450 m (C. G. Wilson et al. 299, 6 Sept. 1989, KATH); Kyapana to Pheri, Ghunsa Khola, 27°38'N, 87°55'E, 3370 m (C. G. Wilson et al. 346, 7 Sept. 1989, KATH).

**SIKKIM:** Lachen, 8000 ft. (K. Biswas s.n., 22 May 1945, A); loc. cit. (C. H. Cave 81, 31 Aug. 1947, K); loc. cit., 8000–9000 ft. (N. C. Mjumdar 468, 12 Sept. 1968, CAL); above Changu, 13000 ft. (J. Pradhan s.n., 8

Aug. 1943, K); Darjeeling, 12000 ft. (J. S. Gamble 9514, Jul. 1881, K); loc. cit., 11000–12000 ft. (I. H. Burkill 25244, 19 Oct. 1904, CAL); loc. cit., 11000 ft. (I. H. Burkill 25368, 22 Oct. 1904, CAL); Jongri, 13000 ft. (C. B. Clarke 26008, 26119, 26223, 26228, 15 Oct. 1875, K); Chamnago, 13000 ft. (R. E. Cooper et al. 870, 11 Sept. 1913, BM); loc. cit. (W. W. Smith 3704, 23 Jul. 1910, CAL); Domang (J. Pradhan s.n. 10 Aug. 1943, K); Guatong, 13000 ft. (W. W. Smith 4356, 17 Aug. 1910, CAL); Islumbo, 11000 ft. (C. B. Clarke 25628, 24 Oct. 1875, CAL); Kali (G. King s.n., Aug.–Sept. 1887, BM); Tongloo, 10000 ft. (S. Kurz s.n., CAL); loc. cit. (T. Anderson 1336, 3 Aug. 1862, CAL); Phedang campsite, 11300 ft. (B. N. Stirling et al. A.G.S.E.S.386, 1983, K); Rechi La, 10000 ft. (H. H. Haines 2024, Sept. 1904, K); above Changu, 13000 ft. (Ribu & Rhomoo 4591, 26 Oct. 1910, CAL); Tongri (T. Anderson 1336, 8 Oct. 1962, A); Tongla, Darjeeling, 10000 ft. (J. S. Gamble 8427, Sept. 1880, CAL, K); loc. cit., 10000 ft. (C. B. Clarke 27586, 12 Sept. 1875, K, CAL); Yanjma, 13000 ft. (J. D. Hooker s.n., K); Youmtong, 11000 ft. (G. A. Gammie 990, 23 Aug. 1899, CAL); loc. cit., 12000 ft. (G. A. Gammie 1004, 24 Aug. 1892, CAL); Chamnago, 13000 ft. (R. E. Cooper 870, 11 Sept. 1913, KATH); without precise locality, 12000 ft. (J. D. Hooker s.n., Sept. 1849, K); without precise locality (S. Kurz s.n., 14 Oct. 1868, CAL); without precise locality, 14000 ft. (G. King 1004, Sept. 1888, CAL); without precise locality (G. King s.n., Sept. 1888, CAL); without precise locality, 13000 ft. (W. W. Smith 4163, 11 Aug. 1910, CAL); without precise locality, 10000–14000 ft. (J. D. Hooker s.n., A); without precise locality, 10000–14000 ft. (J. D. Hooker s.n., K, L).

**BHUTAN:** Upper Mo Chu district, near Chusom, N. of Kohina, 28°02'N, 89°47'E (I. W. J. Sinclair & D. G. Long 5087, 17 Sept. 1984, K); loc. cit., S. side of Pari La, between Gasa and Kohina, 27°58'N, 89°48'E (I. W. J. Sinclair & D. G. Long 5057, 16 Sept. 1984, K); Paro valley, 2400 m (N. P. Balakrishnan 1337, 24 Aug. 1963, CAL); Tongsa district, summit of Pele La, E. side, 27°32'N, 90°11'E (I. W. J. Sinclair & D. G. Long 5679, 12 Oct. 1984, K); Wangdi Phodrang district, Nika chhu - Bhaja, 27°31'N, 90°25'E, 2630 m (F. Miyamoto 9361514, 18 Sept. 1993, TI); loc. cit., Bhaja - Nika chhu, 27°36'N, 90°24'E, 2800 m (F. Miyamoto 9361759, 28 Sept. 1993, TI); valley above Gyetsa, W. of Bumtang, 27°31'N, 90°37'E (A. J. C. Grierson & D. G. Long 2606, 9 Jul. 1979, K); E. slope below Yuto La, E. of Tongsa, 27°31'N, 90°37'E (A. J. C. Grierson & D. G. Long 1734, 8 Jun. 1979, K); Chi la, on way to pass, 11000 ft. (G. S. Gupta 733, 24 Aug. 1963, CAL); Ehra Punthang, 10000 ft (R. E. Cooper et al. 4750, 31 Aug. 1915, BM); Ohra, 10000 ft. (R. E. Cooper et al. 4150, 31 Aug. 1915, B); Yakla, 13000 ft. (C. B. Clarke 9615, 16 Oct. 1886, CAL).

**ASSAM:** near Orban La, 8000–9000 ft. (F. Kingdon-Ward 14274, 24 Sept. 1938, BM).

**EAST HIMALAYA:** Kanglasa, 10000 ft. (C. H. Cave s.n., 24 Oct. 1916 A, E); Gowsar, 12000 ft. (C. H. Cave s.n., 20 Sept. 1916, A, E); without precise locality (Griffith 54457, CAL).

**HIMALAYA:** Yakla, 10000 ft. (C. B. Clarke 10053, 17 Oct. 1869, CAL); loc. cit., 10000 ft. (C. B. Clarke 10265, 20 Oct. 1869, CAL); loc. cit., 10000 ft. (C. B. Clarke s.n., 15 Oct. 1869, L); Himal Bor. Occ., 10000–14000 ft. (T. Thomson s. n., BM).

**XIZANG (TIBET):** Chumbi & Phari (Dungboo s.n., Aug. 1879, B, CAL, K); Yadong, 2900 m (Qing-Zang expedition team 74-2163, 10 Sept. 1974, KUN); Cona, 2700 m (Qing-Zang expedition team 74-2295, 11 Sept. 1974, KUN); Shoka, Tsangpo valley, 29°14'N, 94°09'E, 9800 ft. (F. Ludlow et al. 7151, 28 Sept. 1938, BM).

**YUNNAN:** without precise locality (R. P. Maire 3964, Aug. 1910, B).

## 26. *Juncus harae* Miyam. & H. Ohba

**NEPAL:** Bagmati zone, Rasuwa district, Yure Kharka - Tinbu Kharka, 28°10'N, 85°13'E, 3700 m (F. Miyamoto et al. 9410057, 26 Jul. 1994, TI); Koshi zone, Sankhuwa Sabha district, Khongma - ChaDing Kharka, 87°10'E, 27°40'N, 3570 m (M. Minaki et al. 9020629, 5 Aug. 1990, TI); Sagarmatha zone, Solukhumbu district, Gnaula - Pike, 27°33'N, 86°27'E, 3600 m (F. Miyamoto et al. 9580051, 22 Jul. 1995 TI).

**BHUTAN:** Wangdi Phodrang district, Tampetso - Tsonsothang, 27°48'N, 90°29'E, 3900 m (F. Miyamoto



9361642, 22 Sept. 1993, TI); loc. cit., Tsonsothang - Tampetso, 27°46'N, 90°31'E, 4000 m (F. Miyamoto 9361680, 24 Sept. 1993, TI).

**YUNNAN:** Zhongdian, Around Beihai (Mt. Haba Xueshan), 4100 m (S. K. Wu et al. 103082, 9 Aug. 1999, KUN, TI).

**27. *Juncus himalensis* Klotzsch**

**PAKISTAN:** Ziarat, 9000 ft. (S. L. Harriss 16723, 14 Jun. 1895, CAL); Lohigal An. N. E. of Drosh, 13000 ft. (J. D. A. Stainton 3131, 14 Aug. 1958, CAL); Lutko, Chitral, 9000 ft. (A. A. B. Lyan 787, 3 Jun. 1958, CAL); Chitral, Barum Gol, Between Och Anzog and Camp 2 by south Barum Glacier, 3800 m (P. Wendelbo s.n., 12 Jul. 1950, K, S); Chitral, Barum Gol, Och Anzog, 3600 m (P. Wendelbo s.n., 19 Jul. 1950, K, S); Chitral, 1000 ft. (S. L. Harriss 16722, 15 Jun. 1895, CAL); Bibiyali, vila, Kagn, Hzara (Inayat s.n., 22 Jul. 1899, CAL); Bhapran, Kagan (Inayat s.n., 26 Jul. 1899, CAL); Kagan valley, 9500 ft. (Inayat 20242a, 22 Jul. 1896, CAL); Gilgit (G. M. Giles s.n., 1885, CAL); Raji bhogi, Nila Kagan (Inayat 22631, 24 Jul. 1897, CAL); Swat Himalaya, Diwanganr to Pichar, 3600 m (K. Ogino 169, 23 Jul. 1957, KYO); Titri, Saranranqe (Inayat s.n., 23 Aug. 1899, CAL); (C4) Dishei to (C5) N. slope of Tikatoki, 3100 m (K. Honda 118, 22 Jul. 1957, KYO).

**KASHMIR:** Gulmarg Rakh, 10000 ft. (R. R. Stewart 8673, 26 Jul. 1926, K); Naltau valley, Gilgit, 12000-13000 ft. (R. R. Stewart 26297, 19 Jul. 1954, K); Khillanmarg, above Gulmarg, 10500 ft. (R. R. Stewart 10522, 21 Aug. 1929, S); Gilgit district, Nallar valley, 10000-11000 ft. (J. F. Duthie 12382, 4 Aug. 1892, K); Buzil, 10000 ft. (W. N. Koelz 9423, 5 Aug. 1936, K); Liddarwat, 11000 ft. (O. Polunin 56/500, 25 Aug. 1956, B); Sonamang, 10000-12000 ft. (R. R. Stewart 9771, 23 Jul. 1928, S); Pahlgam, 10000 ft. (R. R. Stewart 7915, 18 Jul. 1925, K); loc. cit., 9000 ft. (R. R. Stewart 5965, 6 Sept. 1920, S); loc. cit., 10000 ft. (R. R. Stewart 7942, 13-14 Jul. 1925, S); loc. cit., 9000 ft. (R. R. Stewart 8018, 22 Jul. 1925, S); Shigar valley, 10000 ft. (B. B. Osmaston 8S, 18 Jul. 1928, K); Karakorum, 13500 ft. (C. B. Clarke 30341, 10 Aug. 1876, K); Braryer Wardnan, 8000 ft. (A. Meebold 214, Jun. 1905, CAL); Kunrlwan, 8000 ft. (C. B. Clarke 29347, 21 Jul. 1876, K); Laka, 11000 ft. (C. B. Clarke 23850, 17 Oct. 1874, CAL); Lidder valley, 1100 m (R. R. Stewart 21808a, 28 Aug. 1945, K); Nittar valley, 10000-11000 ft. (J. F. Duthie 12382, 4 Aug. 1892, K); Pahapgam Talinlake, 3800 m (T. A. Rao 9663, 24 Jun. 1959, CAL); Pir Pinjul, 11000 ft. (C. B. Clarke 28766, 6 Jul. 1876, K); Prljam, 9000 ft. (C. B. Clarke, 31091, 5 Sept. 1876, K); Sauamarg, Scuid valley, 10000 ft. (R. R. Stewart 9851A, 3 Aug. 1928, K); without precise locality, 8000 ft. (C. B. Clarke 29347, 21 Jul. 1876, CAL); without precise locality, 12000-13000 ft. (J. F. Duthie 13399, 1 Aug. 1893, CAL); without precise locality (J. F. Duthie 13465, 3 Aug. 1893, CAL); without precise locality (T. A. Rao 257, CAL); without precise locality (T. A. Rao 726, CAL); without precise locality (W. N. Koelz 3002, 19 Sept. 1931, S).

**INDIA:** Between Alwas and Sach Pass, 12000-14000 ft. (G. A. Gammie 18371, 30 Aug. 1896, K).

**PUNJAB:** Laosar, Spiti, Kangra (W. N. Koelz 7033, 2-3 Sept. 1933, A); Lahul (collector unknown s.n., Mar. 1865, K); Kulu-Lahaul, Marsh above Manali, 9000-10000 ft. (J. R. Drummond 23164, 16 Jul. 1788, K); Kulu-Lahaul, Duhar, (J. R. Drummond 23171, 7 Jul. 1888, K); Boiling Nullah, Lahul, 14000 ft. (W. N. Koelz 1263, 29 Aug. 1930, S); Kado La, 11000 ft. (R. E. Cooper 5472, 21 Aug. 1916, B); Kunawar (J. R. Drummond 26520, 1886, K).

**KUMAON:** Below Udyar, 2900 m (C. M. Arora 49747, 8 Aug. 1972, CAL); Chipla, 4500 m (C. M. Arora 49887, Aug. 1972, CAL); Mulapa Gdh, Darma, 12000-13000 ft. (J. F. Duthie 6052, 5 Aug. 1886, CAL); Tola, 11500 ft. (R. Strachey & J. E. Winterbottom 5, K); without precise locality, 12000-13000 ft. (J. F. Duthie 6052, 1887, K); without precise locality (collector unknown 1849, K); without precise locality (collector unknown s.n., K).

**HIMACHAL PRADESH:** Lahaul, Bara-lacha (N. L. Bor 158, 18 Aug. 1938, K); loc. cit., Pofaus, 11000 ft. (N. L. Bor 9485, 16 Jul. 1938, K); loc. cit., Rotang, 13000 ft. (N. L. Bor. 12142, 2 Jul. 1938, K); loc. cit., 13800

ft. (N. L. Bor. 16895, 21 Jul. 1938, K); loc. cit., Biling Lumpa, 11000 ft. (N. L. Bor. 12678-12680, 12 Jun. 1941, K); Rohtang Pass, 13140 ft. (M. Nath s.n., 8 Sept. 1935, CAL); Bara Shizin Glacier, Lahul & Spiti district, 13500 ft. (J. M. Hoghes 42, Jul. 1981, K); Sonapani Glacier, Lahul & Spiti district, 13200 ft. (J. M. Hoghes 80, 29 Jul. 1981, K).

**UTTRA PRADESH:** Tihri-Garhwal, 10000–11000 ft. (J. F. Duthie 150, 19 Jul. 1883, CAL); Garhwal, Kedamath Glacier valley (M. A. Rau 8704, 27 Sept. 1958, CAL).

**NEPAL:** Rara, 2900 m (M. P. Manandhar & D. P. Joshi 8014, 10 Aug. 1981, KATH); Chakhure Lekh (N. P. Manandhar & D. P. Joshi 6587, 3 Aug. 1981, KATH); Maharigaon, 3 miles N. E. (O. Plounin et al. 130, 13 Jul. 1952, CAL); loc. cit., 11000 ft. (O. Plounin et al. 178, 15 Jul. 1952, CAL); Thakurji Lekh, S. of Jumla, 12000 ft. (O. Plounin et al. 4737, 17 Jul. 1952, CAL); near Balangra Pass, 12000 ft. (O. Plounin et al. 2626, 28 Jul. 1952, S, CAL); near Tarakot, Bheri river, 10500 ft. (O. Plounin et al. 2385, 6 Jul. 1952, CAL); Rambrong, Lamjung Himal., 14000 ft. (J. D. A. Stainton & L. H. J. Williams 6157, 5 Jul. 1954, L); Central Nepal, P29 East Peak, 4500 m (T. Namba 1022003, 22 Oct. 1963, KYO); Gandaki Zone, Gorkha distr., Thangmanang Kharka, 28°34'25"N, 84°42'05"E–28°33'09"N, 84°39'19"E, 3750m (M. Suzuki et al. 9460234, 5 Aug. 1994, TI); Gandaki Zone, Gorkha distr., Thangmanang Kharka, 28°33'09"N, 84°39'19"E, 4160m (M. Suzuki et al. 9470345a, 6 Aug. 1994, TI); Rasuwa, Parbati Kund (near Gatlang) - Yure Kharka, 3000 m (F. Miyamoto et al. 9410034, 25 Jul. 1994, TI); loc. cit., Tinbu Kharka - Sano Bhera Kharka - Tulo Bhera Kharka, 3850 m (F. Miyamoto et al. 9410086, 28 Jul. 1994, TI); loc. cit., Paldol Base Camp - a Kharka, 4100 m (F. Miyamoto et al. 9410173, 3 Aug. 1994, TI); loc. cit., Ganesh Base Camp - a pass - cross a river - a Kharka, 4180 m (F. Miyamoto et al. 9410253, 10 Aug. 1994, TI); loc. cit., Base Camp - Yala Kharka - Kyangjin Kharka - Langtang, 3700 m (H. Takayama et al. 9220348, 22 Jul. 1992, TI); loc. cit., Langtang Khola - Pirgona - Pyung - a pass - Base Camp, 4020 m (H. Takayama et al. 9220292, 9220307, 20 Jul. 1992, TI); loc. cit., Base Camp - Yala Kharka - Kyangjin Kharka - Langtang, 4290 m (H. Takayama et al. 9220349, 22 Jul. 1992, TI); loc. cit., Bhairabkund (M. Sato 9534024, 27 Jul. 1995, TI); Langtang valley, 13000 ft. (Schilling et al. 465, 27 Jun. 1965, KATH); Ganesh Himal, Shiari Khola, 13000 ft. (P. C. Gardner 1303, 15 Jul. 1953, KATH); Thami, Khumbu, 14250 ft. (A. D. Schilling 992, 31 Jul. 1966, K); Sankhuwasawa, Lama Chungbu - Samdan - Slesa - Lama Chungbu - Thudam (H. Kanai et al. s.n., 24 Jun. 1972, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 3950 m (M. Minaki et al. 9020886, 12 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3570 m (M. Minaki et al. 9020630, 5 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3820 m (M. Minaki et al. 9020628, 5 Aug. 1990, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 4000 m (M. Minaki et al. 9020856, 12 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3900 m (M. Minaki et al. 9020651, 5 Aug. 1990, TI); loc. cit., around Cha Ding Kharka and Sipton Pass, 4100 m (M. Minaki et al. 9020711, 8 Aug. 1990, TI); loc. cit., Khokling (Khokling Kharka) - Jaljale (Jaljale Himal) (H. Ohba et al. 9153196, 21 Jul. 1991, TI); loc. cit., Jaljale (Jaljale Himal) - Tin Pokhari (H. Ohba et al. 9120149, 22 Jul. 1991, TI); loc. cit., Thasing Dingma - Sanu Khola - Saure Kharka, 3700 m (F. Miyamoto et al. 9580195, 4 Aug. 1995, TI); loc. cit. Samakang Kharka - Dudh Kund, 3700 m (F. Miyamoto et al. 9580409, 24 Aug. 1995, TI); loc. cit. Tangna - Samakang Kharka, 3850 m (F. Miyamoto et al. 9580387, 23 Aug. 1995, TI); Sankhuwasabha district, Upper valley of tributary of Barun Khola, NE of Pemathang Kharka, 27°45'N, 87°13'E, 4100 m (D. G. Long et al. 618, 9 Oct. 1991, KATH); loc. cit., Ridge between Kauma and Sipton La, 27°39'N, 87°13'E, 3790 m (D. G. Long et al. 305, 26 Sept. 1991, KATH); Arun valley, Barun Khola, N. of Num, 11000 ft. (J. D. A. Stainton 567, 8 Jun. 1956, A, BM, CAL); Tamur valley, Mewa Khola, Topke Gola, 12500 ft. (J. D. A. Stainton 929, 11 Jul. 1956, A, BM); loc. cit., from Jongbuk to Thudam pass, 3505 m (H. Tabata et al. 11405, 11 Jul. 1978, KYO); Taplejung district,



From Walungchunggola to Chini, 2650–2800 m (H. Tabata et al. 11668, 18 Jul. 1978, KYO); loc. cit., from Nup to Yangma, 3880–4010 m (H. Tabata et al. 11750, 20 Jul. 1978, KYO); Environs of Ghunsa, 27°40'N, 87°57'E, 3425 m (C. G. Wilson et al. 436, 8 Sept. 1989, KATH); Yangma, 4500 m (S. Nakao 74, 6 Jul. 1962, KYO); Yamatari glacier, 3900 m (S. Nakao & K. Nishioka s.n., 16 Jun. 1962, KYO); In the forest of *Pinus griffitti*, 3600 m (O. Namikawa 305, 322, 334, 30 Sept. 1958, KYO).

**SIKKIM:** Lachen, 10000–12000 ft. (J. D. Hooker s.n., 30 Aug. 1849, K); Gamothang (H. Hara et al. 512, 27 May 1960, KYO); By Rathong river en route from Dharahli pass to Biklbari campsite, 4000 m (B. N. Starling et al. A.G.S.E.S.225, 30 Jun. 1983, K); W. Jongri (G. King s.n., Aug. 1887, CAL); Zewu valley, 12800 ft. (Smith & Cave 1397, 14 Jul. 1909, CAL); loc. cit., 11000 ft. (W. W. Smith 1180, 11 Jul. 1910, CAL); loc. cit., 12800 ft. (W. W. Smith 1397, 14 Jul. 1910, CAL); loc. cit., 10000 ft. (W. W. Smith 1148, 10 Aug. 1910, CAL); Chola valley, 12000 ft. (W. W. Smith 3606, 21 Jul. 1910, CAL); Chakung Chu, 14000 ft. (W. W. Smith 3857, 26 Jul. 1910, CAL); Changa, 11000 ft. (W. W. Smith 3057, 5 Jul. 1910, CAL); loc. cit., 13000 ft. (W. W. Smith 3581, 16 Jul. 1910, CAL); Chawuago, 12000–13000 ft. (W. W. Smith 3623, 23 Jul. 1910, CAL); loc. cit., 11000 ft. (W. W. Smith 3703, 23 Jul. 1910, CAL); Llonak, 12000 ft. (Smith & Cave 1758, 26 Jul. 1909, CAL); without precise locality, 10000–14000 ft. (J. D. Hooker 29, L); without precise locality, 10000–14000 ft. (J. D. Hooker s.n., A, CAL); without precise locality, 10000–12000 ft. (J. D. Hooker s.n., K); without precise locality, 11500 ft. (J. D. Hooker s.n., 7 Jul. 1849, K); without precise locality, 12000 ft. (J. D. Hooker s.n., 5 Sept. 1849, K); without precise locality, 9000–10000 ft. (J. D. Hooker s.n., 6 Jul. 1849, K); without precise locality (Prain 324, 12 Aug. 1903, CAL); without precise locality, 11000 ft. (Smith & Cave 1180, 11 Jul. 1909, B); without precise locality, 12000 ft. (Smith & Cave 1758, 26 Jul. 1909, B).

**BHUTAN:** Upper Mo Chu district, E. bank of Thrizam Chu, 28°01'N, 89°35'E, 4080 m (I. W. J. Sinclair & D. G. Long 5320, 25 Sept. 1984, K); Wangdi Phodrang district, Tampetso - Tsonsothang, 27°49'N, 90°24'E, 3900 m (F. Miyamoto 9361629-9361631, 22 Sept. 1993, TI); loc. cit., Tsonsothang, 27°49'N, 90°24'E, 4100 m (F. Miyamoto 9361647, 22 Sept. 1993, TI).

**HIMALAYA:** Himal. Bor. Occ. (Falconer 1185, L); without precise locality, 10000–14000 ft. (T. Thomson s.n., A, CAL); without precise locality, 10000-14000 ft. (T. Thomson s.n., 5 Aug. 1849, K); above Pauji, Kunawar, 10000–14000 ft. (T. Thomson s.n., 18 Aug. 1849, K); without precise locality, 9500 ft. (J. F. Duthie 20242a, 22 Jul. 1896, K); without precise locality (J. F. Duthie s.n., 23 Aug. 1899, K); without precise locality, 10000 ft. (J. F. Duthie s.n., 31 Aug. 1899, K); without precise locality, 13000 ft. (J. S. Gamble 24266, 3 Jun. 1893, K); without precise locality (G. King s.n., Aug. 1889, K); without precise locality, 10000–14000 ft. (Wallich 9001B, K).

**XIZANG (TIBET):** Nyalam, 3850 m (Qing-Zang expedition team 5814, 23 Jun. 1975, KUN); loc. cit., 3850 m (S. K. Wu et al. 75-444, 22 Jun. 1975, KUN); Dengqen, 4000 m (S. K. Wu 4910, 21 Aug. 1976, KUN); Yadong, 2900 m (Qing-Zang expedition team 74-2445, 13 Sept. 1974, KUN); Province Dras, Dras to Matai (collector unknown 6472, 12 and 13 1856, S); Chumbi (G. King s.n., 5 Aug. 1882, K); Chumbi & Phari (Dungboo s.n., 2 Jul. 1878, B, CAL, K); Thieppa, 13000 ft. (G. King s.n., Aug. 1885, K); Ga-Ling between Chumlei and Pahari (G. King s.n., 7 Jul. 1882, B); Deyang La, Kongbo, 14000 ft. (F. Ludlow et al. 14322, 11 Aug. 1947, A); Kongbo Province, Shoka, Tsangpo valley, 29°14'N, 94°09'E, 9800 ft. (collector unknown 4548, 29 May 1938, BM); Mainling, 3250 m (Qing-Zang expedition team 74-5325, 21 Sept. 1974, KUN); Tang, 13500–14500 ft. (M. F. F. Younghusband T18, 14 Jul. 1903, K, CAL); Gongbo'gyamda Xian, Basum Lake, 3550 m (S. Akiyama et al. 105199, 15 Aug. 2000, KUN, TI); Zagon, 4000 m (Qing-Zang expedition team 12138, 1 Jul. 1976, KUN); Dras (collector unknown 6453, 12–13 Oct. 1856, A); Nangaske, Gam Dok Cho, 15000 ft. (C. H. J. Walton T19, Jul. 1904, CAL); Ga-ling, (G. King s.n., 7 Jul. 1882, CAL); Sang-dang-tung (G. King s.n., 5 Aug. 1882, CAL); without precise locality (Stoliczka s.n., CAL).

**GANSU:** Kintan Hsien, 2990 m (T. P. Wang W5109, 20 Jul. 1936, KUN).

**YUNNAN:** A-tun-tze, 3500 m (C. W. Wang 64848, Jul.–Aug. 1935, A, KUN, PE); loc. cit., 2700 m (C. W. Wang 69938, Sept. 1935, KUN); loc. cit., Huann-fu-ping, 3700 m (C. W. Wang 68752, Aug. 1935, A, PE, KUN); Atuntze, Yangtsatung, 3900 m (T. T. Yü 9824, 24 Aug. 1937, PE); loc. cit., Kungpu, Piyenla, 3200 m (T. T. Yü 10024, 31 Aug. 1937, A, PE); Wei-si Hsien, Yeh-Chih, 3600 m (C. W. Wang 68446, Aug. 1935, PE); loc. cit. (C. W. Wang 68515, Aug. 1935, A, KUN, PE); loc. cit., 3000 m (C. W. Wang 64090, Jun. 1935, A, KUN, PE); Deqen, 3700 m (Qing-Zang expedition team 1192, 11 Jul. 1981, KUN); In regione frigide temperata jugi Si-la inter fluvios Landsang-djiang (Mekong) et Lu-djiang (Salween), 3600 m (F. Handel-Mazzetti 8439, 29 Sept. 1915, S); Yangtze watershed, in the Prefectural district of Likiang, eastern slopes of Likiang snow range, 16000 ft. (J. F. Rock 5299, 12–29 May 1922, A); Prope urbem Lidjiang, imprimis in monte Yulung-schan. (F. Handel-Mazzetti 4073, Jun.–Sept. 1914–1916, S); Lijiang Xian, Laojun Shan, Longqun Lodge - Jiushijiu Longtan, 3700 m (S. K. Wu et al. 103157, 8 Sept. 1999, KUN, TI); Muli, Wachin, Jin-chang, 4000 m (T. T. Yü 14598, 22 Oct. 1937, A); Chi-na-tung, Tsa-wa-rung, 3500 m (C. W. Wang 65378, Aug. 1935, A, PE); Shi-gi-tung, Champu-tung, 2170 m (C. W. Wang 67180, Oct. 1935, A, PE, KUN); loc. cit., 3000 m (C. W. Wang 67290, Oct. 1935, A, PE).

**SICHUAN:** Taofu (Dawo) district, valley W. of Mt. Yara, 3700 m (H. Smith 11726, 1 Sept. 1934, S, UPS); Kangting (Tachienlu), 2700 m (H. Smith 10518, 17 Jul. 1934, KYO, S); Liang-ho-kuo, 11900 ft. (S. Y. Hu 1403A, Jul.–Aug. 1939, A); loc. cit., 12000 ft. (C. W. Wang & T. S. Wen 630, Aug. 1938, A); Litang (Sichuan vegetation expedition team 3713, 5 Aug. 1973, KUN); Daocheng, Haizi, 4350 m (S. K. Wu et al. 1524, 18 Aug. 1996, KUN, TI); loc. cit., Daocheng - Daxue Shan Yakou, 3610 m (S. K. Wu et al. 405, 26 Jul. 1997, KUN, TI); Muli, Wachin, Jin-chang, 4000 m (T. T. Yü 14598, 22 Oct. 1937, BM); Muli, 3300–3400 m (Qing-Zang expedition team 13013, 19 Aug. 1983, KUN); Kangting (Tachienlu), 2700 m (H. Smith 10518, 17 Jul. 1934, PE); Tachienlu, 9000–13500 ft. (A. E. Pratt 96, CAL); Chiefly near Tachienlu, 9000–13500 ft. (A. E. Pratt 86, A); Omei Hsien, Mt. Omei (W. P. Fago 17336, 14 Jul. 1941, PE); loc. cit. (L. Y. Tai, T297, 14 Aug. 1940, A); loc. cit., 8500–9000 ft. (W. P. Fang 2854, 1928, A); loc. cit., 3135 m (W. P. Fang 17736, 14 Jul. 1941, A); Omeishan (T. N. Liou 10312, 18 Oct. 1938, PE); loc. cit. (T. N. Liou & C. Wang 1229, 4 Oct. 1939, PE); Dujiangyan Municipality, Qinglongzui near the side of Longwangmiao, along the Longxi River, 1750 m (D. E. Boufford & B. Bartholomew 24632, 5 Sept. 1988, A); Mou Hsien (Mou-chow), Kuanyin Shan, 2600 m (F. T. Wang 22038, 31 Jul. 1930, S); inter Baorst Tha (H. Smith 4898, 20 Oct. 1922, S); without precise locality, 3100 m (C. Y. Chiao & C. S. Fan 819, 22 Aug. 1938, A); without precise locality, 11000 ft. (S. Y. Hu 2569, Aug. 1942, A).

**SHANXI:** Hsiaowutai shan, 3000 m (C. W. Wang 62104, 6 Aug. 1934, PE).

**WESTERN CHINA:** without precise locality (E. H. Wilson 4544, Jul. 1903, A, K).

## 28. *Juncus hydrophilus* Noltie

**NEPAL:** N. W. of Salties, along trail to Pangsing Bhanjyang, 2760 m (D. Haas 2547, 25 Aug. 1974, BM-paratype of *J. hydrophilus*).

**BHUTAN:** Dotena, 2730 m (H. J. Noltie 13, 20 Jul. 1991, E, TI-paratype of *J. hydrophilus*).

## 29. *Juncus inflexus* L.

**PAKISTAN:** Kurram, Inter Amal Kot et Sadda, 33°43'N, 70°25'E, 1400 m (K. H. Rechinger 30978, 8–11 Oct. 1856, B); Muzaffwabad, Axodkashnice, Rawalpindi (J. Mohd. 8013, 12 Sept. 1967, K); Chashma shahi (V. N. Kaul 60, 22 Jul. 1964, CAL); Shoghot, N. of Chitral, 6000 ft. (J. D. A. Stainton 2750, 25 Jun. 1958, CAL); Chitral (S. L. Harriss 16727, 6 Jun. 1895, CAL); loc. cit., Mastut, 7500 ft. (J. D. A. Stainton 2480, 19 May 1958, BM); Swat Himalaya, Kalam to Paloza, 2390 m (K. Honda 44 18 Jul. 1957, KYO); loc. cit., Lutko valley, N. W. of Chitral, 7000 ft. (J. D. A. Stainton 3253, 14 Sept. 1958, BM) Bhouja, Kagan, Hazara (Inayat



s.n., 1 Aug. 1899, CAL); Gilgit (G. M. Giles s.n., 1885, CAL); Wna, 4000–5000ft. Waziristan (Harsukh 15668, 5 May 1895, CAL).

**INDIA. PUNJAB:** Simla (J. R. Drummond 22253, 1886, K); loc. cit. (J. R. Drummond 20928–20930, 1887, K); without precise locality (J. R. Drummond 26524, K).

**UTTAR PRADESH:** Mukba road, Tihri-Garhwal (J. F. Duthie 155, CAL).

**KUMAON:** near Ranikhet, 5000–6000 ft. (J. F. Duthie 6057, 3 Jun. 1886, CAL); on the southern slopes of the Tari Pass (collector unknown 9931, 9 Jun. 1856, S); Monali, 6600 ft. (N. L. Bor 11814, 28 Jun. 1938, K); loc. cit., 7400 ft. (R. Strachey & J. E. Winterbottom 6, K); loc. cit. (T. Thomson 1030, May 1845, K); loc. cit., near Chour, 8700 ft. (J. E. Winterbottom 6, 9 May 1840, CAL); loc. cit., Inucus (T. Thomson 1030, May 1843, BM); Konain, Jaunsar, United Province, 7500 ft. (G. E. Parkinson 7136, 23 Jun. 1936, S).

**NORTH WEST HIMALAYA:** Beyond Theog (or Iheog) (J. S. Gamble 6580A, 8 Sept. 1878, K).

**NEPAL:** Rara, Mugu district, 2900 m (N. P. Manandhar 7058, 7066, 10 Aug. 1981, KATH); Maharigaon, 10500 ft. (O. Polunin et al. 324, 27 Jul. 1952, CAL); Between Yangzo and Ghunsa, 2850 m (K. Nishioka 1051, 24 Sept. 1962, KYO); above Chepuwa, 10000 ft. (Banerjee et al. 3450, 12 May 1965, K, KATH); Rasuwa, Syabru Bensi - Parbati Kund (near Gatlang), 2200 m (F. Miyamoto et al. 9410018, 24 Jul. 1994, TI); loc. cit., Syabru - a river - Langtang Khola - Lama Lodge, 2180 m (H. Takayama et al. 9220081, 11 Jul. 1992, TI); loc. cit., Lama Lodge - Langtang Khola - a river - Syabru, 2500 m (H. Takayama et al. 9220402, 24 Jul. 1992, TI); Dolakha, Jiri - Bkal - Ratmate - Maligaon - Shivalaya (H. Ohba et al. 8571659, 16 Aug. 1985, TI); Sankhuwasawa, Hatia Gola - Digedanra - Taram Bhanjyang - Honkon (H. Ohashi et al. 770449, 5 Aug. 1977, TI); loc. cit., Takisindu - Junbesi, 2800 m (F. Miyamoto et al. 9580502, 1 Sept. 1995, TI); loc. cit., from Chamtang to Ritak, 2015 m (H. Tabata et al. 11285, 9 Jul. 1978, KYO); Tamur valley, Mewa Khola, S. E. of Topke Gola, 8000 ft. (J. D. A. Stainton 333, 17 May 1956, CAL).

**SIKKIM:** Lachen to Chungthang, 8000 ft. (K. Biswas 6903, 22 May 1845, CAL); Lachung, 9000 ft. (G. A. Gammie 671, 7 Aug. 1892, CAL); Tiger Hill, 8900 ft. (D. Chatterjee 263, 20 Jul. 1856, CAL); Yoksam, 1700 m (H. Hara et al. 328, 16 May 1960, KYO); Chungthang to Lechen, 5000–6000 ft. (K. Biswas 6689, 16 May 1845, CAL); Chang thang, 5000 ft. (G. King s.n., May 1885, CAL); Dikchu valley, 9000–10000 ft. (W. W. Smith 3822, 26 Jul. 1910, CAL); Dubdi forest, Yuksum, 6200 ft. (S. N. Mitra 9519, 27 May 1954, CAL); Legek Panthing (C. B. Clarke 46438, May 1885, BM); Loo-li-la (G. King 607, 28 May 1884, CAL); Lunlang, 6000 ft. (R. Lepcha 2385, 20 Jun. 1909, CAL); Panthng (C. B. Clarke 46438B, May 1885, CAL); Zemu valley, 9000 ft. (Smith & Cave 2809, 20 Jul. 1909, CAL); Yong, 5000 ft. (M. F. E. Younghusband s.n., 29 Jun. 1903, CAL); without precise locality, 6000–10000 ft. (J. D. Hooker s.n., 3 Aug. 1849, BM, CAL, K, L, S); without precise locality, 9000–10000 m (J. D. Hooker s.n., 4 Jul. 1849, K).

**BHUTAN:** Tashiling (2100 m) - Neylong (2200 m) - Charikhachor (2250 m) (H. Hara et al. 8277, 20 Apr. 1967, KYO, TI); Tongsa, 27°30'N, 90°30'E (A. J. C. Grierson & D. G. Long 1287, 24 May 1979, K); loc. cit., 8500 ft. (F. Ludlow et al. 17010, 4 Aug. 1949, BM); Sherpang, 7000 ft. (F. Ludlow et al. 20211, 30 Apr. 1949, BM).

**ASSAM:** Khasia, Lailanhote, 5500 ft. (C. B. Clarke 45656, 25 Sept. 1886, B); loc. cit., 5000 ft. (J. D. Hooker & T. Thomson s.n., L); loc. cit., 5000 ft. (J. D. Hooker s.n., BM, CAL); Eastern Circle, Shillong, Nyukmadong, 2600 m, (R. S. Rao 7606, 19 May 1957, CAL); Shillong, 5000 ft. (C. B. Clarke 38227, 1 Jun. 1885, CAL).

**HIMALAYA:** Himal Bor. Occ., without precise locality, 6000–9000 ft. (T. Thomson s.n., 6 Jun. 1849, BM, CAL, K, L); Himal Bor. Occ., without precise locality (T. Thomson s.n., K).

**MYANMAR:** Haka, 6000 ft. (F. G. Dickason 7531, Apr. 1938, A); N. Triangle (Hkinlum), 4000 ft. (F. Kingdon-Ward 20811, 12 May 1953, A).

**XIZANG (TIBET):** Chumbi, Loo-li-la (G. King 607, 28 May 1884, B); Kongbo Province, Tse to Chamna, Tsangpo valley, 29°25'N, 94°26'E, 9000 ft. (F. Ludlow et al. 4656, 5 Jun. 1938, BM); Kadrang on the northern

foot of the Laotse Pass (collector unknown catalogue no. 2176, 10–17 Aug. 1886, B); Milbe to Dras (collector unknown catalogue no. 4984, 8–11 Oct. 1856, B); near the spring between Pullakand, Chongil Dane Astse (collector unknown catalogue no. 6773, 6 Aug. 1856, B); Yugu to Leh, right side of the Indus valley, Ladak (collector unknown catalogue no. 1973, 1–31 Aug. 1856, L).

**YUNNAN:** Gongshan, 2600–3500 m (Lin 790937, 16 Jul. 1979, KUN); Prope urbem Lidjiang, imprimis in monte Yulung-schan. (F. Handel-Mazzetti 4075, Jun.–Sept. 1914–1916, S); Chengkang, 2580 m (T. T. Yü 16991, 26 Jul. 1938, KUN); Tali Hsien, 1500 m (C. W. Wang 63370, May 1935, PE, KUN); loc. cit., 2400 m (H. T. Tsai 53892, 28 Jul. 1933, PE); loc. cit., 2400 m (H. T. Tsai 53904, 29 Jul. 1933, PE); Dali Shi, Diancang Shan, 2300 m (S. Akiyama et al. 402, 5 Jul. 2001, KUN, TI); Likiang Hsien, 2800 m (C. W. Wang 71439, Jul. 1935, KUN, PE); loc. cit., 2000 m (C. W. Wang 65046, Jun. 1935 KUN); Kun Ming, 2300 m (C. W. Wang 62962, Apr. 1935, KUN); Prope fines Tibeto-Birmanicas inter fluvios Lu-djiang (Salween) et Djiou-djiang (Irrawadi orient. super.), in pluviisilivis mixtis temperatis vallis Tjiontson-lumba infra Tschamutong, 2950 m (F. Handel-Mazzetti 9174, 29 Jun. 1916, S); Y. Si-chou Hsien (C. W. Wang 85505, 9 Dec. 1939, KUN).

**SICHUAN:** Mou Hsien, road leading to the city, 1750 m (F. T. Wang 21808, 25 Jul. 1930, S); Nin-yuan-sun, 1650 m (H. Smith 1736, 15 May 1922, S); without precise locality (J. W. & C. J. Gregory s.n., 19 Aug. 1922, BM).

**SHANXI:** austr. inter Kao-lo-ghan et Ch-wo-Hsien, 1000 m (H. Smith 6628, 30 Jul. 1924, S).

### 30. *Juncus khasiensis* Buchenau

**NEPAL:** near Balangra Pass, 12800 ft. (O. Polunin et al. 2542, 22 Jul. 1952, L, UPS); Rasuwa, Chyauche Kharka - a bridge - Lingju, 3100 m (F. Miyamoto et al. 9410268, 12 Aug. 1994, TI); loc. cit., 3400 m (F. Miyamoto et al. 9410283, 12 Aug. 1994, TI); loc. cit., Lingju - Tibling, 2100 m (F. Miyamoto et al. 9410289, 13 Aug. 1994, TI); loc. cit., Sunchet Kharka - Kangait Kharka - Gopchet Kharka - a pass - Lipchet Kharka, 3000 m (F. Miyamoto et al. 9410317, 15 Aug. 1994, TI); loc. cit., Lipchet Kharka - Makgan Kharka - Guinsi (near Balche), 3400 m (F. Miyamoto et al. 9410319, 16 Aug. 1994, TI); loc. cit., 2800 m (F. Miyamoto et al. 9410322, 16 Aug. 1994, TI); E. of Dobato, 3200 m (J. H. Haas, 2148, 9 Aug. 1974, BM); Khokim, 27°23'N, 87°29'E, 3100 m (J. F. Dobremez, 1584, 19 Aug. 1972, BM); Sankhuwasawa, Chhippon (Chhippon Pokhari) - Gidde (Gidde Kharka) (H. Ohba et al. 9120110, 19 Jul. 1991, TI); loc. cit., Junbesi - Tagtor - a pass - Lanjura Pass - Goyom - Dakchu - Sete - Kensa, 3200 m (F. Miyamoto et al. 9592569, 2 Sept. 1995, TI); loc. cit., Najing Ding - Chalem Kharka, 3100 m (F. Miyamoto et al. 9580138, 31 Jul. 1995, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4500 m (F. Miyamoto et al. 9580494, 11 Aug. 1995, TI); Sankhuwasabha district, Pemathang Kharka, S side of Barun Khola, 27°44'N, 87°12'E, 3410 m (D. G. Long et al. 391, 29 Sept. 1991, KATH); Ridge N. E. of Gupha Pokhari, 27°18'N, 87°33'E, 2870 m (C. G. Wilson et al. 109, 30 Aug. 1989, KATH); above Door Pani, 27°10'N, 87°26'E, 2870 m (C. G. Wilson et al. 11247, 10 Oct. 1989, KATH); Tinjure Danda ridge above Door Pani, 27°10'N, 87°25'E, 2960 m (C. G. Wilson et al. 68, 29 Aug. 1989, KATH).

**SIKKIM:** East district, Between Gangtok and Phusum (Karponang), 27°21'N, 88°39'E, 2680 m (D. G. Long & H. J. Noltie 80, 8 Jul. 1996, E, TI); East district, Below Kyangosla, 27°22'N, 88°42'E, 3120 m (D. G. Long & H. J. Noltie 77, 8 Jul. 1996, E, TI); Karponong, 7500 ft. (D. Catterjee 150, 12 Jul. 1856, CAL); without precise locality (S. Kurz s.n., 17–16 Oct. 1868, CAL).

**BHUTAN:** Wangdi Phodrang district, Bhaja-Nika chhu, 27°35'N, 90°24'E, 3200 m (F. Miyamoto 9361758, 28 Sept. 1993, TI).

**ASSAM:** Khasia, Maokadokadik 5000 ft. (C. B. Clarke 40457, 12 Sept. 1885, CAL, K); loc. cit., Lailankote, 5500 ft. (C. B. Clarke 45656A, 25 Sept. 1886, BM, K, S); loc. cit., 5000–6000 ft. (J. D. Hooker & T. Thomson s.n., K, S).



**YUNNAN:** Fugong, 3500 m (Lin 792041, 1 Aug. 1979, KUN); Yangbi, a Fruit Garden - Cangshan, 3550 m (S. K. Wu et al. 469, 16 Aug. 1997, KUN, TI).

**THAILAND:** Doi intanon National Park, Giwe Mae Ban meadow, 2275 m (J. F. Maxwell 94-1016, 10 Sept. 1994, A).

### 31. *Juncus kingii* Rendle

**NÉPAL:** Bajura district, Porakya pass, 2545 m (H. Tabata et al. 2620, 19 Aug. 1976, KYO); near Balangra Pass, 12800 ft. (O. Polunin et al. 2542, 22 Jul. 1952, A, BM, CAL); Dolpo, W. side Khung Khola, 5000 m (Aney-Nilson & Phillips 674, 19 Aug. 1973, K); Jargeng Khola, 15000–16000 ft. (D. G. Lowndes 1349a, 7 Aug. 1950, BM); Jumla, Hanka - pass - the 2nd highest peak - digging point - Bajari Binu, 4690 m (M. Minaki et al. 9106051, 20 Sept. 1991, TI); Tukucha, Kari Gandaki, 10500 ft. (J. D. A. Stainton & L. H. J. Williams 1880, 18 Jul. 1954, BM); Kyangin, 11500–12000 ft. (A. Richards 63, 8 Aug. 1969, BM); Gandaki Zone, Manang distr., Yak Kharka - Chri Lattar-Thorong Phedi, 28°43'24"N, 83°58'20"E–28°46'46"N, 83°58'16"E, 4020 m (M. Suzuki et al. 9460391, 18 Aug. 1994, TI); Langsisa Kharka (O. Polunin 1924, Sept. 1924, BM); Rasuwa, a Kharka - Pati Kharka, 3700 m (F. Miyamoto et al. 9410184, 4 Aug. 1994, TI); loc. cit., Bhairab Kund 4200m (M. Sato 9534063, 27 Jul. 1995, TI); loc. cit. (M. Sato 9534130, 9534144, 9534164, 9534169, 9534171, 28 Jul. 1995, TI); loc. cit., Gosain Kund - Bhairab Kund (M. Sato 9534195, 28 Jul. 1995, TI); loc. cit., Yure Kharka - Tinbu Kharka 3750 m (F. Miyamoto et al. 9410054, 26 Jul. 1994, TI); loc. cit., Base Camp - Yala Kharka - Yathang - Langtang Khola, 4800 m (H. Takayama et al. 9220282, 19 Jul. 1992, TI); Solukhumbu, Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4600 m (F. Miyamoto et al. 9580289, 11 Aug. 1995, TI); loc. cit., Pike - Tasman Bhangjang - Pike Khop, 3660 m (F. Miyamoto et al. 9580069, 24 Jul. 1995, TI); loc. cit., Samakang Kharka - Dudh Kund, 3700 m (F. Miyamoto et al. 9580420, 24 Aug. 1995, TI); loc. cit., Saure Kharka - Tangna, 4000 m (F. Miyamoto et al. 9580213, 5 Aug. 1995, TI); Khumbakarna Himal., Lower Barun valley, 4850 m (T. Wraber 34588, 25 Sept. 1972, BM); Taplejung district, from Nupo to Yangma, 3880–4010 m (H. Tabata et al. 11783, 20 Jul. 1978, KYO); Nea Lapsang, Simbua Khola, 27°34'N, 87°59'E, 4330 m (S. Crawford et al. KEKE764, 19 Sept. 1989, K); Kambchen, 27°44'N, 87°59'E, 4100 m (C. G. Wilson et al. 603, 12 Sept. 1989, KATH); Dojam Khola, 16000 ft. (O. Polunin et al. 1485, 5 Jul. 1952, BM); Tchaftang, Clugu, 15000 ft. (O. Polunin et al. 5385, 22 Aug. 1952, BM).

**SIKKIM:** Lachen, 14000 ft. (J. D. Hooker s.n., 15 Jul. 1849, K); North district, Softhanggu, Degraded slope (formerly fin forest) with *Spiraea/Rosa* scrub, 27°52'28"N, 88°32'31"E, 3760 m (D. G. Long & H. J. Noltie 283, E, TI); without precise locality, 11000–14000 ft. (J. D. Hooker s.n., B).

**BHUTAN:** Upper Mo Chu district, E. bank of Tharizam Chu, 28°01'N, 89°35'E, 4120 m (I. W. J. Sinclair & D. G. Long 5294, 24 Sept. 1984, K).

**XIZANG (TIBET):** Nyingchi, 4300 m (Qing-Zang expedition team 751049, 2 Aug. 1975, KUN-paratype of *J. longibracteatus*); Batang (R. P. Soulié 3474, 1903, P).

**YUNNAN:** Deqen, Baimashue Shan, 4500 m (Qing-Zang expedition team 2393, 13 Jul. 1981, KUN); loc. cit., Tianchi, 3600 m (S. K. Wu et al. 1479, 12 Aug. 1996, KUN, TI); loc. cit., around Daxue Shan, 4300 m (S. K. Wu et al. 1592, 27 Aug. 1996, KUN, TI); Wei-si Hsien, Yeh-Chih, 3600 m (C. W. Wang 68323, Aug. 1935, PE); E. slopes of Mount Dyinaloko, N. peak of the Likiang Snow Range, 13000 ft. (J. F. Rock 10381, Aug. 1923, A); without precise locality (C. Schneider 3750, 1914, A); without precise locality (C. Schneider 3771, 1914, A).

**SICHUAN:** Gue-sai-gue, Tsa-wa-rung, 3200 m (C. W. Wang 65777, Aug. 1935, KUN); Daocheng, Bowa Shan, 4360 m (S. K. Wu et al., 1505, 16 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, Beiyu, 4300 m (S. K. Wu et al., 1555, 22 Aug. 1996, KUN, TI); loc. cit., Gongga Zhonggu - Riwa Xiang - Gongling -

Daocheng, 4000 m (S. K. Wu et al., 1580 25 Aug. 1996, KUN, TI); loc. cit., around Gongga Zhonggu, 3880 m (S. K. Wu et al. 444, 3 Aug. 1997, KUN, TI); loc. cit., around Gongga Shan, 4300 m (S. K. Wu et al. 457 6 Aug. 1997, KUN, TI); Tachienlu, 9000–13500 ft. (A. E. Pratt 398, K); Xiaojin, Ganhaizi - S. W. slope of Mt. Siguniang - Ganhaizi, 3800 m (H. Ikeda et al. 100846, 1 Sept. 1998, KUN, TI).

### 32. *Juncus leptospermus* Buchenau

**INDIA. HIMACHAL PRADESH:** Siarun, Lahul (N. L. Bor 10300, 8 Jul. 1941, CAL).

**NEPAL:** near Gurjakhani, 8500 ft. (J. D. A. Satinton et al. 3681, 30 Jul. 1954, A, BM, CAL); Rasuwa, Syabru Bensi - Parbati Kund (near Gatlang), 2300 m (F. Miyamoto et al. 9410012, 24 Jul. 1994, TI); loc. cit., 2200 m (F. Miyamoto et al. 9410019, 24 Jul. 1994, TI); loc. cit., Lingju - Tibling, 2100 m (F. Miyamoto et al. 9410298, 13 Aug. 1994, TI); loc. cit., Lipchet Kharka - Makgan Kharka - Guinsi (near Balche), 2400 m (F. Miyamoto et al. 9410323, 16 Aug. 1994, TI); loc. cit., Lama Lodge - Chumna Lodge - Ghora Tabela - Thangshab - Langtang, 3000 m (H. Takayama et al. 9220106, 12 Jul. 1992, TI); Ramechhap, Patkare - Bhandar (H. Ohba et al. 8571333, 5 Aug. 1985, TI); Solukhumbu, Pike Khop - Leding - Tama Khani - Beni - Fera, 2440 m (F. Miyamoto et al. 9592104, 25 Jul. 1995, TI).

**BHUTAN:** Paro district, Takshang, 27°28'N, 89°21'E, 2500 m (F. Miyamoto 9361505, 16 Sept. 1993, TI); Wangdi Phodrang district, Nika chhu-Bhaja, 27°31'N, 90°25'E, 2630 m (F. Miyamoto 9361517, 18 Sept. 1993, TI).

**ASSAM:** Khasia Hills, Umjao river, 5000 ft. (Burkill & Banerjee 35209, 4 Jun. 1911, CAL); Cherrapunji, Eastern Circle, Shillong (G. K. Deka 19210, 20 Sept. 1959, CAL).

**XIZANG (TIBET):** Yadong, 2940 m (Tibet expedition team 74-2442, 13 Sept. 1974, KUN).

**YUNNAN:** Wei-se Hsien, 2800 m (H. T. Tsai 59861, 18 Oct. 1934, A); Dali Shi, Diancang Shan, Zhonghe Temple - Ximatang, 2600 m (S. K. Wu et al. 103130, 5 Sept. 1999, KUN, TI); without precise locality, 3600 m (C. Schneider 2363, 4 Sept. 1914, A).

### 33. *Juncus leucanthus* Royle ex D. Don

**PUNJAB:** Mussoorie, Kidar Kantha, 12000 ft. (J. R. Drummond 22795, Jun. 1904, K).

**NEPAL:** Rambrong, Lumjung Himal., 13000 ft. (J. D. A. Stainton et al. 6124, 4 Jul. 1955, A, BM, CAL); Rasuwa, around Jaisuli Kund, 4250 m (F. Miyamoto et al. 9410133, 31 Jul. 1994, TI); loc. cit., Paldol Base Camp - a Kharka, 4300 m (F. Miyamoto et al. 9410162, 3 Aug. 1994, TI); loc. cit., Tulo Bhera Kharka - Jaisuli Kund, 4200 m (F. Miyamoto et al. 9410800, 30 Jul. 1994, TI); loc. cit., Gosainkund - Surjakund - Gopte, 4200 m (H. Hara et al. 721921, 25 Aug. 1972, TI); loc. cit., Mul Kharka, 3880 m (H. Kanai & P. R. Shakya 672245, 3 Jul. 1970, TI); Gosainkund (4200 m) - Surjakund (4400 m) - Gopte (3500 m) (H. Kanai et al. s.n., 25 Aug. 1972, TI); loc. cit., Gadje (3920 m) - Surja Kund (4450m) - Gosainkund (4260 m) (S. B. Malla & H. Kanai 674893, 26 Aug. 1969, TI); loc. cit., Lama Chungbu - Samdan - Slesa - Lama Chungbu - Thudam, 4500 m (H. Kanai et al. 720724, 24 Jun. 1972, TI); loc. cit., Langtang Khola - Pirgona - Pyung - a pass - Base Camp (H. Takayama et al. 9220293, 20 Jul. 1992, TI); loc. cit., Base Camp - Yala Kharka - Kyangjin Kharka - Langtang (H. Takayama et al. 9220356, 22 Jul. 1992, TI); loc. cit., Kyangjin Kharka - Tarche Pisa - Tashigang - Yala Kharka (H. Takayama et al. 9220176, 14 Jul. 1992, TI); loc. cit., around Base Camp (H. Takayama et al. 9220320, 21 Jul. 1992, TI); loc. cit., Base Camp - Yala Kharka - Yathang - Langtang Khola (H. Takayama et al. 9220285, 19 Jul. 1992, TI); loc. cit., Langtang Khola - Pirgona - Pyung - a pass - Base Camp (H. Takayama et al. 9220313, 20 Jul. 1992, TI); Mul Kharka, Chilime Khola, 3800–4100 m (H. Kanai & P. R. Shakya 672245, 3 Jul. 1970, TI); Sankhuwasawa, Suke - Kokim Pokhari - Hati Surde - Hile Chok (H. Kanai et al. s.n., 11 Jun. 1972, TI); Ramechhap, Serdingma - Dubikharka (H. Ohba et al. 8570302, 8530148, 7 Jul. 1985, TI); loc. cit., around Neju (H. Ohba et al. 8530648, Aug. 1985, TI); loc. cit., around Thare Og (H. Ohba et al. 8570853, 26



Jul. 1985, TI); Solu Khumbu district, from Gohim to Junbesi, 3090-3410 m (H. Tabata et al. 10351, 4 Jun. 1978, KYO); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 3800 m (F. Miyamoto et al. 9580274, 11 Aug. 1995, KATH, TI); loc. cit., Pike - Tasman Bhangjang - Pike Khop, 3800 m (F. Miyamoto et al. 9580070, 24 Jul. 1995, KATH, TI); loc. cit., Samakang Kharka - Dudh Kund, 3700 m (F. Miyamoto et al. 9580421, 24 Aug. 1995, TI); loc. cit., Tangna - Samakang Kharka, 3900 m (F. Miyamoto et al. 9580388, 23 Aug. 1995, KATH, TI); loc. cit., Chalem Kharka - Jar Kharka, 4200 m (F. Miyamoto et al. 9580149, 1 Aug. 1995, KATH, TI); loc. cit., Jar Kharka - a pass - Panch Pokhari - Jar Kharka, 4400 m (F. Miyamoto et al. 9580166, 2 Aug. 1995, KATH, TI); Sankhuwasawa, Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka (M. Minaki et al. 9020635, 5 Aug. 1990, TI); loc. cit., Taplejung, Saju Pokhari - 4400m - Topke Gola (H. Kanai et al. s.n., 16 Jun. 1972, TI); loc. cit., Jomle - Goja (Goja Kharka) (H. Ohba et al. 9120228, 5 Aug. 1991, TI); loc. cit., Singoa Kharka - Pahakhola (H. Ohba et al. 9120396, 11 Aug. 1991, TI); loc. cit., around Cha Ding Kharka and Shipton Pass (M. Minaki et al. 9020680, 9020714, 9020720, 9020738, 9020747, 9020751, 8 Aug. 1990, TI); loc. cit. (M. Minaki et al. 9020678, 7 Aug. 1990, TI); loc. cit. (M. Minaki et al. 9020684, 11 Aug. 1990, TI); loc. cit. (M. Minaki et al. 9020748, 9 Aug. 1990, TI); loc. cit. (M. Minaki et al. 9020795, 10 Aug. 1990, TI); loc. cit., Khongma - Unshisa Kharka - Danda Kharka - Bhainsi Kharka - Uttise Kharka - Tashi Gaun (M. Minaki et al. 9020687, 13 Aug. 1990, TI); loc. cit., Sedua - Vedghari - Arun Khola - Dhadkhet - Num (M. Minaki et al. 9020694, 15 Aug. 1990, TI); loc. cit., Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma (M. Minaki et al. 9020861, 9020863, 12 Aug. 1990, TI); loc. cit., Jaljale (Jaljale Himal), Khongma - Tin Pokhari (H. Ohba et al. 9120146, 22 Jul. 1991, TI); Tamo La - Simion La, 27°37'N, 87°57'E, 4025 m (C. G. Wilson et al. 677, 15 Sept. 1989, KATH); Near Lapsang, Simbua Khola, 27°34'N, 87°59'E, 4330 m (C. G. Wilson et al. 763, 19 Sept. 1989, KATH).

**SIKKIM:** Aluthang to Jongri, 13900 ft. (S. N. Mitra 9502, 4 Jun. 1954, CAL); Jongri, 13000 ft. (C. B. Clarke 26146, 26149, 15 Oct. 1875, K); North district, S. E. side of Lasha Chhu, below Sebu La, 27°56'13"N, 88°38'30"E, 4560 m (D. G. Long & H. J. Noltie 376, 21 Jul. 1996, E, TI); East district, Tsomgo Chho, 27°22'14"N, 88°45'52"E, 3720 m (D. G. Long & H. J. Noltie 58, 8 Jul. 1996, E, TI); Chuga, 12000-13000 ft. (W. W. Smith 3155, 7 Jul. 1910, CAL); Maglatha W Imgi (G. King s.n., Jun. 1887, K); Phedang to Dzongri, 4000 m (B. N. Starling et al. A.G.S.E.S.39, 21 Jun. 1983, K); Se-mo-go-ne, 2500 ft. (G. King s.n., 23 Jun. 1882, B); Sindukphoo, 12000 ft. (C. B. Clarke 3498, 5 Jun. 1884, CAL); Tosar Chakung Chu, 14000 ft. (Ribu & Rhomoo 4489, 26 Oct. 1910, CAL); without precise locality (G. King 4918, 8 Jul. 1877, K); without precise locality, 12000-15000 ft. (J. D. Hooker 11 Sept. 1849, K, S); without precise locality, 12000 ft. (J. D. Hooker s.n., 20 Jun. 1849, K); without precise locality (Prain 113, 12 Aug. 1903, CAL); without precise locality 12000 ft. (J. D. Hooker s.n., L, S).

**BHUTAN:** Laya (3650 m) - Laum Thang (3900 m) (H. Hara et al. 11981, 18 May 1967, KYO); Sele La, 2900 m (S. Nakao 759, 26 Jul. 1958, KYO); Upper Mo Chu district, Moraine above Timuzam, W. of Laya, 28°05'N, 89°40'E, 4150 m (I. W. J. Sinclair & D. G. Long 5254, 23 Sept. 1984, K); Barshong 3500 m - Nala 3100 m (H. Kanai et al. 6201, 25 May 1967, TI).

**HIMALAYA:** Himal. Bor. Occ., without precise locality, 4000-10000 ft. (T. Thomson s.n., L).

**XIZANG (TIBET):** N. of Pagri, Kang Me (G. King's collector s.n., 8 Aug. 1882, BM).

**YUNNAN:** Dokerla, A-tun-tze, 3000 m (C. W. Wang 64899, 3-5 Aug. 1935, PE); Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68736, 68742, 68753, Aug. 1935, PE); Atuntze, Chitoyangou, 4200 m (T. T. Yü 9743, 9749, 22 Aug. 1937, PE); Dokeria, A-tun-tze, 3000 m (C. W. Wang 64899, 3-5 Aug. 1935, PE); Che-tse-lo, 4000 m (H. T. Tsai 58228, 27 Aug. 1934, PE); loc. cit. (T. T. Yü 58226, 27 Aug. 1934, PE); Deqe, around Daxue Shan, 4470 m (S. K. Wu et al. 1583, 27 Aug. 1996, KUN, TI); Kang-pu, Wei-si Hsien, 2000 m (C. W. Wang 64689, Jul. 1935, PE); Chengkang, Snow lange, 3400 m (T. T. Yü 16961, 24 Jul. 1938, PE); Tsang-

chan, au-dessus de Tali, 3500 m (P. J. M. Delavey 369, 4 Jul. 1882, P); Mu-li, Lu-lu, 3500 m (T. T. Yü 7130, 9 Jul. 1937, PE); Yangbi, around Cangshan, 3750 m (S. K. Wu et al. 482, 18 Aug. 1997, KUN, TI); Zhongdian Xian, Hong Shan, 28°06'N, 99°54'E, 4300 m (S. K. Wu et al. 103026, 31 Jul. – 4 Aug. 1999, KUN, TI); Dali shi, Diancang Shan, Zhonghe Peak, 25°42'N, 100°10'E, 3900m (S. K. Wu et al. 103152, 6 Sept. 1999, KUN, TI);

**SICHUAN:** Kangting (Tachienlu) district, Yulingkong, Gomba La, 3700 m (H. Smith 10724, 22 Jul. 1934, KYO, S); Daocheng, Bowa Shan, 4400 m (S. K. Wu et al. 1510 16 Aug. 1996, KUN, TI); Ping-wu Hsien, Mo-t'ien Ling, 2300 m (Salween), 28°04'N, 3600–3450 m (F. T. Wang 22492, 1 Sept. 1930, S).

**SHAANXI:** Taipei-schan (G. Giraldi 2054, Aug. 1894, B); loc. cit. (G. Giraldi 2026, Sept. 1897, B); loc. cit. (G. Giraldi 6725, 6726, 6746, 1 Oct. 1901, B); Miaowang-schan bei Paotji (G. Giraldi 6727, 1 Oct. 1901, B); Hwangtou-schan (G. Giraldi 6743, 1 Oct. 1901, B); loc. cit. (G. Giraldi 7242, 1 Oct. 1901, B).

### 34. *Juncus longiflorus* (A. Camus) Noltie

**XIZANG (TIBET):** Tsekou (R. P. Soulié 2754, 18 Jul. 1895, P); without precise locality (R. P. Soulié 1154, 17 Jul. 1895, S).

**YUNNAN:** Gongshan Xian, Kongmu, Dadui, 3500–3880 m (Lin & Den 791033, 17 Jul. 1979, KUN); loc. cit., Yako, Dulonjian (Lin & Den 790550, 1979, KUN); loc. cit., Changputong, 3700–3800 m (Feng 7878, 20 Sep. 1940, KUN); Gong Shan, 3800 m (T. T. Yü 22807, 17 Oct. 1938, PE); In regione alpina jugi Sila inter fluvios Landsang-djiang (Mekong) et Lu-djiang (Salween), 4400 m (F. Handel-Mazzetti 8433, 29 Sept. 1915, P, S, W); Mekong-Salwin Divide Sila, 3800 m (T. T. Yü 22257, 9 Aug. 1938, A, PE); Gong Shan, 3800 m (T. T. Yü 22807, 17 Oct. 1938, PE); coteaux prs de l'arête du Tsang-chan, 4000 m (P. J. M. Delavey 4065, 30 Aug. 1889, S); Deqin, 3400 m (H. T. Tsai 53953, 30 Jul. 1933, PE); Che-tse-lo, 4000 m (H. T. Tsai 58054, 18 Aug. 1934, A, PE); loc. cit. (H. T. Tsai 58222, 27 Aug. 1934, A, PE); loc. cit., Pi-lo-shan, 4000 m (H. T. Tsai 58621, 15 Sept. 1934, A, PE); Tali Hsien, 4000 m (H. T. Tsai, 53987, 31 Jul. 1933, KUN, PE); Dali Xian, alpine meadow near the summit of Diancang Shan mountain range in the vicinity of Yinglofeng Peak, directly W. of Dali city, 3900 m (B. Bartholomew et al. 1035, 11–12 Jul. 1984, KUN); Boggy pasture on the eastern flank of the Tali Range, 25°40'N, 9000–10000 ft. (G. Forrest 4894, Jun. 1906, B, P); Dali, 3400 m (C. W. Wang 63260, May 1935, KUN); loc. cit., Cangshan, Zhonghefen (Zhongdian expedition team 63–3801, 2 Aug. 1963, KUN); loc. cit., 25°40'N, 100°07'E, 3680 m (S. K. Wu et al. 1604, 1 Sep. 1996, KUN, TI); loc. cit., 3800 m (S. K. Wu et al. 1605, KUN, TI); loc. cit., 3900 m (S. K. Wu et al. 1607, KUN, TI); loc. cit., Zhonghe Peak, 3600 m (S. K. Wu et al. 103145, 6 Sept. 1999, KUN, TI); loc. cit., 3700 m (S. K. Wu et al. 103147, 6 Sept. 1999, KUN, TI); Dali shi, Diancang Shan, 3400 m (S. Akiyama et al. 411, 5 Jul. 2001, KUN, TI); Dali, Cangshan Mt. 25°40'N, 100°45'E, 3290 m (Alpine Garden Society expedition ACE 926, 5 Jul. 1994, K); Dali Xian, alpine meadow near the summit of Diancang Shan mountain range in the vicinity of Yinglofeng Peak, directly W. of Dali city, 3900 m (B. Bartholomew et al. 1035, 11–12 Jul. 1984, PE); Yangbi, around Cangshan, 3850 m (S. K. Wu et al. 477, 17 Aug. 1997, KUN, TI); Yanbgi Xian, W. side of Diancang Shan mountain range. Vicinity of Baiyungeng Peak above Malutang, 3500–3600 m (B. Bartholomew et al. 585, 26 Jun. 1984, KUN, PE).

### 35. *Juncus longistamineus* A. Camus

**YUNNAN:** Wei-si Hsien, Yeh-Chih, 3600 m (C. W. Wang 68459, Aug. 1935, KUN, PE); Atuntze, Yangtsatung, 3900 m (T. T. Yü 9815, 24 Aug. 1937, KUN, PE); without precise locality (G. Forrest 18302, 1917–1919, BM).

### 36. *Juncus luzuliformis* Franch.

**YUNNAN:** Fugong (Lin 792041, 1 Aug. 1979, KUN).



**SICHUAN:** Kangting (Tachienlu) district, Cheto La, 3400 m (Salween), 28°04'N, 3600-3450 m (H. Smith 11075, 2 Aug. 1934, PE, S, UPS); Hua Niu Ping, Han Yuen Hsien, 2800 m (C. Y. Chiao 1857, 19 Aug. 1939, A); Bao-Hsien, Tu-pa-kou-Ta-chong-pun, 8850 ft. (S. Y. Hu 1281, Jul.-Aug. 1939, A, K); near Yu Ya Ling, 2600 m (C. Y. Chiao 1762, 10 Aug. 1939, A); Tachienlu, 9000-13500 ft. (A. E. Pratt 162, Dec. 1890, CAL); Ta-tsien-Lou, Principauté Kia La (R. P. Soulié 119, 1 Aug. 1893, P); Xiaojin, Rilong-a pass of Balang Shan - Wenchuan: Wolong, 2500 m (H. Ikeda et al. 100856, 6 Sept. 1998, KUN, TI); Dujiangyan Municipality, Qinglongzui near the side of Longwangmiao, along the Longxi River, 1750 m (D. E. Boufford & B. Bartholomew 24615, 5 Sept. 1988, A); Sungpan Hsien (W. P. Fang 4170, 11 Aug. 1928, PE, A); Mt. Omi (E. H. Wilson 5201, Sept. 1904, BM); loc. cit., 1800 m (T. C. Lee 3787, 10 Oct. 1940, PE); loc. cit., (H. C. Chow 12487, 23 Jul. 1940, A); loc. cit., 1800 m (H. C. Chow 8328, 9 Sept. 1938, A); loc. cit., 1800 m (L. Y. Tai 77, 3 Aug. 1940, A); loc. cit. (L. Y. Tai T236, 15 Aug. 1940, A); loc. cit. (L. Y. Tai T319, 17 Aug. 1940, A); loc. cit. (S. C. Sun & K. Chang 1146, 16 Aug. 1939, A); loc. cit. (S. C. Sun and K. Chang 1117, 7 Aug. 1939, A); loc. cit. (T. C. Lee 3498, 10 Sept. 1940, A); loc. cit., 3000 m (C. Y. Chiao & C. S. Fan 749, 12 Aug. 1938, A); loc. cit., 3000 m (C. Y. Chiao & C. S. Fan 834, 23 Aug. 1938, A); loc. cit., 1900 m (C. Y. Chiao & C. S. Fan 544, 29 Aug. 1938, A); loc. cit., 1770 m (Y. S. Liu 1159, Aug. 1937, A); Omei shan (T. N. Liou 1095, 30 Sept. 1939, PE); loc. cit. (T. N. Liou 10246, 18 Oct. 1938, PE); loc. cit. (T. N. Liou 10448, 20 Oct. 1938, PE); Tchen-keou-tin district (R. P. Farges 28, K, P); without precise locality (T. N. Liou 12626, 24 Oct. 1938, PE).

**SHAANXI:** Taipaishan, Ravine to the S. of Fangyangszu, 3000 m (T. N. Liou & P. C. Tsoong 1181, 23 Sept. 1937, PE); loc. cit. (T. N. Liou & P. C. Tsoong 1322, 28 Sept. 1937, PE).

**HUBEI:** Shennongjia Forest district, 31°30'N, 110°30'E, 2760 m (B. Bartholomew et al. 42, 26 Aug. 1980, A).

**HUPEH:** without precise locality (A. Henry 6846, 1885-1888, K); without precise locality (A. Henry 6868, 1885-1888, BM, CAL, K).

**WESTERN CHINA:** without precise locality, 11000 ft. (E. H. Wilson 4546, A, K); without precise locality (E. H. Wilson 5301, K).

### 37. *Juncus membranceus* Royle ex D. Don

**AFGHANISTAN:** Hindukush, between Dalti and Nazbardel, 2600 m (K. Ogino 452, 9 Aug. 1957, KYO); loc. cit., 2650 m (K. Ogino 453, 9 Aug. 1957, KYO).

**PAKISTAN:** Chitral, Gangailat Gol, Kafiristan, 9000 ft. (J. D. A. Stainton 2710, 18 Jun. 1958, BM); loc. cit., Madaklasht, N. E. of Drosh, 12000 ft. (J. D. A. Stainton 3116, 14 Aug. 1958, BM); loc. cit., Luger, 8400 ft. (Harriss 16721, 18 Jun. 1895, BM); loc. cit., Gangalwat Gol (Kafiristan) S. W. of Chitral, 9000 ft. (J. D. A. Stainton 2710, 18 Jun. 1958, A, UPS); loc. cit., Laspur (Harchin), 36°02' N, 72°27' E, 9000 ft. (S. A. B. Lyon 30, 15 Jul. 1957 A, BM, UPS); loc. cit., Madaklasht, N. E. of Drosh, 12000 ft. (J. D. A. Stainton 3116, 14 Aug. 1958, UPS); Kagan valley between Dalakot (34°35'N, 73°20'E) and Babusar Pass (35°10'N, 74°2'E) (J. Abel 181, Jul.-Sept. 1954, BM); Darkot, 10200 ft. (S. A. B. Lyon 8088, 18 Jun. 1976, K); near Burawai, Kagan valley, 33°70'N, 73°80'E, 10000 ft. (C. Wright 65, 16 Aug. 1975, BM); Kagan valley, 12000 ft. (Inayat 20237, 21 Jul. 1896, CAL); loc. cit., Hazara, 9000 ft. (Inayat 20238, 22 Jul. 1896, CAL); Saiful Hable, Kaghan valley, 10500 ft. (Muqarrabshab & Jamghed 150, 5 Aug. 1987, BM); Kan Koli, Kagan, Hazara (Inayat s.n., 27 Jul. 1899, CAL); Dara Kullu, Shuikujari, Hazara, 10400 ft., (Inayat s.n., 11 Jun. 1899, CAL); Dhafran, Kagan, Hazara (Inayat s.n., 26 Jul. 1899, CAL); Suger, 8400 ft. Hazara (S. L. Harriss 16721, 18 Jun. 1895, CAL); Narau, Kagu, 8400 ft., Hazara (Inayat s.n., 20 Jun. 1899, CAL); Baltistan, Katzarah, 2420 m (S. Takatsuki et al. 9360001, 30 Jun. 1993, TI); near Kalam, 25 miels above Bahrein, 6000-7000 ft. (R. J. Rodin s.n., 19 Aug. 1952, K); Barum Gol, Zapotili, 3500 m (P. Wendelbo s.n., 20 Jul. 1950, BM, K); Diamar, Northern areas (M. A. Khan & M. Afzal 937, 26 Jun. 1977, W); Sat Himalaya, Mahidan(C3) - Dishei(C4), 2800 m (K. Honda 96,

21 Jul. 1957, KYO); Sat Himalaya, Mahidan(C3) - Dishei(C4), 2950 m (K. Honda 105, 21 Jul. 1957, KYO); Swat State, Ushu, 9000 ft. (R. R. Stewart & A. Rahman 25316, 27 Jul. 1953, BM).

**KARAKORAM:** Upper end of Hushe valley, Ghondakoro Glacier basin at the foot of the Mt. Masherbrum, 11000 ft. (G. L. Webster & E. Nasir 6261, 23 Jul. 1955, A, K, S, W); Upper end of Field, S. of the village of Hushe, 10000 ft. (G. L. Webster & E. Nasir 5942, 3 Jul. 1955, A); Hispar Village area, Nagar State, 10600 ft. (O. Polunin 6352, 20 Aug. 1960, B, BM); Hispar valley, 9000–10000 ft. (R. S. Russell 1165, 15 Jul. 1939, BM); Nagar state, Minadin glacier, 11500 ft. (Meqan 93, 21 Aug. 1961, BM); Oltali Chish, 2400 m (S. Nakao s.n., 10 Jun. 1955, KYO); near Asiolo, 3200 m (S. Nakao s.n., 29 Jun. 1955, KYO); Kero Lugma Glacier, left bank, Oblation valley, 12000–13000 ft. (R. S. Russell 1303, Jul. 1939, BM); Solu Glacier, R. Bank, Oblation valley, 11500 ft. (R. S. Russell 1721, 26 Aug. 1939, BM).

**KASHMIR:** Hunza und Nagar-Gebiet, Boladas, Tumpel im Gletschervorland, 2700 m (H. K. Paffen 168, W); Shardi, Kishenganga valley, 6000 ft. (R. R. Stewart 17758, 20–21 Jul. 1939, A); Gilgit, Mang Gah, 10000 ft. (J. W. Thornley 10, 21 Jul. 1950, BM); Gilgit, Gstor valley (G. M. Giles 655, K); Gilgit, Naltar, 113000 ft. (R. R. Stewart 26298, 19 Jul. 1954, K); Sonamang, 10000 ft. (R. R. Stewart 9861A, 9 Aug. 1928, CAL); Burzil Pass, Gilgit road, 13000 ft. (R. R. Stewart 19030, 27 Aug. 1939, A); Mahalish, S. of Haramukh (F. Ludlow & G. Sherriff 7839, 28 Jul. 1940, BM); Rana valley, 36°20'N, 75°50'E, 12000 ft. (Laijets & Deadoh TEL1258, 30 Jul. 1967, BM); Baltistan, Koghani, 8000 ft. (F. Ludlow 349, BM); Baltistan, Turmih Nallah, 9000 ft. (F. Ludlow 305, BM); Baltistan, 10000–11000 ft. (J. F. Duthie 12110, 18 Jul. 1892, BM); above Pahlgam, 10000 ft. mutong, 2950 m (R. R. Stewart 7945a, 13–14 Jul. 1925, S); Sonawary, 9000 ft. (H. H. Rich 1284, 15 Jul. 1919, K); Dras, W. Lcber, 10000 ft. (G. A. Gammie s.n., 1 Aug. 1891, K); Kutti valley, 14000 ft. (J. F. Duthie 3441, 7 Sept. 1884, CAL); Margan, 8000–9000 ft. (A. Meebold 212, Jun. 1905, CAL); Rotang Pass, 13140 ft. (M. Nath s.n., 28 Jul. 1935, CAL); Shish Nag, 12000 ft. (R. R. Stewart 12844, 1 Sept. 1925, UPS); Snon valley, 11500 ft. (B. B. Osmaston 183, 4 Jul. 1928, K); Bang La, 9000 ft. (C. B. Clarke 24 Jul. 1876, L); Knzlodan, 7500 ft. (C. B. Clarke 29390, 21 Jul. 1875, W); Masjid Gali, 11000–12000 ft. (R. R. Stewart & I. D. Stewart 18447, 12 Aug. 1939, A); Thajiwias, 10000 ft. (N. K. B. Robson 2030, 7 Jun. 1971, BM); without precise locality (Stoliczka s.n., W); without precise locality, 9000–10000 ft. (R. R. Stewart 9764, 23 Jul. 1928, UPS); without precise locality, 12000–13000 ft. (J. F. Duthie 13230, 25 Jul. 1893, CAL); without precise locality, 13000–14000 ft. (J. F. Duthie 13281, 27 Jul. 1893, CAL); without precise locality, 7500 ft. (C. B. Clarke 29390, 21 Jul. 1876, CAL); without precise locality, 9000 ft. (C. B. Clarke 29552, 24 Jul. 1876, CAL); without precise locality, 10000 ft. (C. B. Clarke 28687, 9 Jul. 1876, W); without precise locality, 11000 ft. (C. B. Clarke 28371, 6 Jul. 1876, W).

**PUNJAB:** Kulu-Lahaul (J. R. Drummond 23190, 8 Jul. 1888, K); Lahul, Sisu, 10000 ft. (W. N. Koelz 670, 25 Jul. 1930, S); Lahul, Kyelang, 10500 ft. (W. N. Koelz 8539, 27 Jun. 1936, A); Lahul, Sisu, Kangra, 10000 ft. (W. N. Koelz 5101, 1–2 Jul. 1933, A); Lahul, Yramphoo, 3400 m (U. C. Battacharyya 48757, 19 Jul. 1972, CAL); Pin valley, Spiti, Kangra (W. N. Koelz 7198, 18–21 Sept. 1933, A); Spiti, Losar, 4100 m (U. C. Battacharyya 48900, 26 Jul. 1972, CAL).

**UTTAR PRADESH:** Tehri-Garhwal (J. F. Duthie 151, 19 Jun. 1883, K); loc. cit., Domdor valley, 11000–12000 ft. (J. F. Duthie 151, 26 Jun. 1883, BM); loc. cit., Rudugaira Gad, 130000 ft. (P. P. Huggins 255, 28 Sept. 1952, BM).

**KUMAON:** Tolu, 11500 ft. (R. Strachey & J. E. Winterbottom 12, A, BM, K); Kutti valley in Byoins, 14000 ft. (J. F. Duthie 3441, 7 Sept. 8994, K, BM).

**WESTERN HIMALAYA:** without precise locality (J. F. Duthie s.n., 17 Jul. 1899, K).

**NEPAL:** Opposte Budhi, Village, 10000–11000 ft. (J. F. Duthie 6053, 18 Jul. 1886, BM, CAL); Kali Gandaki, 13100 ft. (G. Miehe 284, 21 Jul. 1977, BM); Cha Lungpa (G. Miehe 385, 29 Jul. 1977, BM)

**HIMALAYA:** Himal Bor. Occ., without precise locality, 10000–14000 ft. (T. Thomson s.n., A, CAL, K);



without precise locality, 6000–10000 ft. (T. Thomson s.n., BM, K, L, UPS); without precise locality, 10000–15000 ft. (T. Thomson s.n., BM).

**XIZANG (TIBET):** E. of Suroo in Zanskar (Stoliczka s.n., CAL); Between Chokutenz and Gandar Chish, 9000–13000 ft. (W. M. Conway 185, 1892, CAL); Spiti (collector unknown s.n., 12–17 Jun. 1856, BM); Balti (collector unknown s.n., 13–15 Jul. 1856, BM).

**38. *Juncus milashanensis*** A. M. Lu & Z. Y. Zhang

**XIZANG (TIBET):** Lhasa, 4800–5000 m (Y. T. Chang & K. Y. Long 2413, 1 Sept. 1965, KUN-paratype of *J. milashanensis*).

**YUNNAN:** Deqin Xian, Meili Xueshan, Suola, 4600 m (S. K. Wu et al. 103115, 20–23 Aug. 1999, KUN, TI).

**SICHUAN:** Daocheng, around Wuming Shan, 4680 m (S. K. Wu et al. 410, 27 Jul. 1997, KUN, TI); loc. cit., around Gongga Shan, alt. 4550 m (S. K. Wu et al. 450, 4 Aug. 1997, KUN, TI).

**39. *Juncus minimus*** Buchenau

**NEPAL:** Ganga La Pass, 13500 ft. (O. Polunin 237, 9–10 Jun. 1949, BM); Taplejung, Bomrang (Bomrang Kharka) - Pamphule Deurali - Singoa Kharka, 4500 m (H. Ohba et al. 9120351, 10 Aug. 1991, TI).

**SIKKIM:** North district, E. side of Selu La, Fine, 27°55'N, 88°39'E, 5090 m (D. G. Long & H. J. Noltie 395, 22 Jul. 1996, E, TI); Zemu valley, 12800 ft. (Smith & Cave 1396, 14 Jul. 1909, K, CAL); Gumtso 15000 ft. (Smith & Cave 1441, 14 Jul. 1909, CAL); without precise locality, 16000–18000 ft. (J. D. Hooker s.n., A, BM, CAL, K).

**BHUTAN:** Wangdi Phodrang district, Tintaso-Tampe La, 27°43'N, 90°31'E, 4400 m (F. Miyamoto 9361616, 21 Sept. 1993, TI); loc. cit. (F. Miyamoto 9361617, 22 Sept. 1993, TI).

**ASSAM:** Jakpho, 3100 m (C. B. Clarke, K).

**XIZANG (TIBET):** Mira La, 29°30'N, 94°10'E, 14000 ft. (F. Ludlow et al. 6138, 13 Aug. 1938, BM); Doshong La, 29°29'N, 94°59'E, 13000 ft. (F. Ludlow et al. 5252, 14 Jul. 1938, BM); Nyingchi Xian, Sezhaishan Shan, 4500 m (S. Akiyama et al. 105214, 17 Aug. 2000, KUN, TI); Zayu, 4200 m (Tibet research team 10714, 26 Sept. 1982, KUN).

**YUNNAN:** In montium inter fluvios Landsang-djiang (Mekong) et Lu-djiang (Salween) 28°09'N, 4450 m (F. Handel-Mazzetti 9744, 7 Aug. 1916, S); Deqe, around Daxue Shan, 4550 m (S. K. Wu et al. 1595, 28 Aug. 1996, KUN, TI); Deqin Xian, Meili Xueshan, Suola, 4500 m (S. K. Wu et al. 103112, 20–23 Aug. 1999, KUN, TI); Zhongdian Xian, Hong Shan, 4600 m (S. K. Wu et al. 103031, 31 Jul.–4 Aug. 1999, KUN, TI).

**SICHUAN:** Kangting (Tachienlu) district, Chungo valley, Mt. Yara, N. E. slopes, 3900 m (H. Smith 11158, 18 Aug. 1934, S); loc. cit., Tapaoshan, N. side, 4600 m (H. Smith 11426, 22 Aug. 1934, PE, PE, S).

**40. *Juncus modicus*** N. E. Br.

**GANSU:** without precise locality (W. Y. Hsia 7092, PE)

**YUNNAN:** Yangtze watershed, Prefectural district of Likiang, eastern slopes of Likiang Snow Range, 10000–11000 ft. (J. F. Rock 5977, 1922, S, W); Dali, Cangshan, 3700 m (S. K. Wu et al. 1610, 2 Sept. 1996, KUN, TI); Dali shi, Diancang Shan, Zhonghe Peak, 25°42'N, 100°10'E, 3700m (S. K. Wu et al. 103150, 6 Sept. 1999, KUN, TI); Dali shi, Diancang Shan, Zhonghe Temple-Ximatang, 25°41'N, 100°09'E, 3800m (S. K. Wu et al. 103137, 103139, 5 Sept. 1999, KUN, TI); Dali shi, Diancang Shan, 3600 m (S. Akiyama et al. 410, 5 Jul. 2001, KUN, TI); Yangbi, around Cangshan, 3800 m (S. K. Wu et al. 472, 17 Aug. 1997, KUN, TI).

**SICHUAN:** Tchen-Keou-Tin district (R. P. Fargens s.n., BM); Xiaojin, Ganhaizi-Dashuiba-Ganhaizi, 3530 m (H. Ikeda et al. 100834, 31 Aug. 1998, KUN, TI); Dujiangyan Municipality, L Qinglongzui near the side of Longwangmiao, along the Ongxi river, 2020 m (D. E. Boufford & B. Bartholomew 24790, 10 Sept. 1988, A).

**SHAANXI:** septentr., Gipfel du Thai-pei-shan (G. Giraldi 6413, 6414, 10–20 Aug. 1901, B); septentr., Kuan-Aou-San (G. Giraldi 2025, Jul. 1894, B); septentr., Tar-pa-shan (G. Giraldi 2028a, Aug. 1893, B); septentr., Thoce-Pei-San (G. Giraldi 2055, Jul. 1897, B); Taipaishan, On way from Pinganszu to Fangyangszu (T. N. Liou & P. C. Tsoong 806, 11 Sept. 1937, PE); loc. cit., 3580-3700 m (T. N. Liou & P. C. Tsoong 932, 11 Sept. 1937, PE); Taipaishan, Vicinity of Pinganszu (T. N. Liou & P. C. Tsoong 732, 8 Sept. 1937, PE).

**GUIZHOU:** Hsing Shan, 2100 m (N. Steward et al. 650, 10 May 1931, S).

**HUBEI:** Shennongjia Forest district, 31°30'N, 110°30'E, 2780 m (B. Bartholomew et al. 118b, 26 Aug. 1980, A); without precise locality (E. H. Wilson 2347a, Aug. 1901, K, S).

**WESTERN CHINA:** without precise locality (E. H. Wilson 4542, Jul. 1903, A, BM, K).

#### 42. *Juncus nepalicus* Miyam. & H. Ohba

**NEPAL:** Sankhuwasawa, around Cha Ding Kharka and Shipton Pass 4400 m (M. Minaki et al. 9020690, 7 Aug. 1990, TI); loc. cit., 4100 m (M. Minaki et al. 9020753, 9 Aug. 1990, TI).

**SIKKIM:** North district, Glacial valley above Yakche, N of Lachung, 27°43'09"N, 88°44'47"E, 3180 m (D. G. Long & H. J. Noltie 222, 15 Jul. 1996, E, TI); Lachen valley, 10000 ft. (J. D. Hooker s.n., 6 Jun. 1849, K); Eumtso 15000 ft. (Smith & Cave 1441, 14 Jul. 1909, K); without precise locality, 10000–12000 ft. (J. D. Hooker s.n., K).

**BHUTAN:** Thimphu (2250 m) - Dochu La (3050 m) (H. Kanai et al. 696, 30 May 1967, KYO); Wangdi Phodrang district, Tintaso-Tampe La, 27°43'N, 90°31'E, 4400 m (F. Miyamoto 9361618, 21 Sept. 1993, TI).

**YUNNAN:** Tehching (Atuntze), Miyetzium, 3350 m (T. T. Yü 8634, 18 Jun. 1937, A, KUN); Dokeria, A-tuntze, 3300 m (C. W. Wang 64942, 3–5 Aug. 1935, PE); Weihsi, Tungchuling, Mankukung, 4000 m (T. T. Yü 8934, 12 Jul. 1937, KUN, PE); loc. cit., 3900 m (T. T. Yü 8834, 11 Jul. 1937, A, KUN, PE).

#### 43. *Juncus ochraceus* Buchenau

**KASHMIR:** Srinagar, 5000 ft. (A. Meebold 211, Jun. 1905, CAL).

**NEPAL:** Balangra Pass, 12000 ft. (O. Polunin et al. 1030, 28 May 1952, UPS); Dhawalagiri zone, Myagdi, Ghorepani - Chitre - Sikha - Ghara - Tatopani, 2190 m (M. Mikage et al. 9552228, 17 Sept. 1995, TI); Dhankuta, Murhay - Sinduwa - Chitray - Bilbatay Bhanjang (H. Hara et al. 6300885, 24 Oct. 1963, TI); Between Yangzo and Ghunsa, 2850 m (K. Nishioka 1052, 24 Sept. 1962, KYO); Sankhuwasawa, Minchin Dhap - Mul Pokhari (H. Hara et al. 6300862, 29 Oct. 1963, TI); Arun valley, Chyamtang, 8000 ft. (J. D. A. Stainton 1754, 20 Sept. 1956, A, BM, CAL); Thudam, 11500 ft. (L. W. Beer 10681, 2 Nov. 1971, BM); Taplejung, Baroya Khimty - Thakma Khola (H. Hara et al. 6300981, 12 Nov. 1963, TI); loc. cit., (H. Hara et al. 6300984, 12 Nov. 1963, TI); loc. cit. (H. Kanai et al. 6300965, 16 Nov. 1963, TI); below Siling Tzokupa - Siling Tzokpa (H. Hara et al. 6300970, 21 Nov. 1963, TI); Sankhuwasabha district, N Bank of Barun Khola, above Pemathang Kharka, 27°45'N, 87°11'E, 3490 m (D. G. Long et al. 586, 8 Oct. 1991, KATH); loc. cit., E bank of Upper Saldim Khola, below bridge, NW of Hatiya, 27°44'N, 87°18'E, 2785 m (D. G. Long 716, 12 Oct. 1991, KATH); Ghunsa Khola, Amjilassa to Kyapra, 27°37'N, 87°53'E, 2700 m (S. Crawford et al. KEKE298, 6 Sept. 1989, K, KATH); Kyapra to Pheri, Ghunsa Khola, 27°38'N, 87°55'E, 3330 m (S. Crawford et al. KEKE351, 7 Sept. 1989, K); without precise locality (M. L. Banerjee 2240, CAL).

**SIKKIM:** Darjieling 7000 ft. (C. B. Clarke 8889, 29 Aug. 1869, K, CAL); loc. cit., 8000 ft. (C. B. Clarke 13610, 8 Nov. 1870, K, CAL); loc. cit., 7000 ft. (C. B. Clarke 26277, 4 Nov. 1875, K, S, UPS); loc. cit., 7500 ft. (collector unknown s.n., 29 Sept. 1879, K); loc. cit., 7000 ft. (T. Anderson 1338, 27 Aug. 1862, A); On way up Tiger hill, 8000 ft. (K. Biswas 8641, 13 Nov. 1945, CAL); Lachung, 8500 ft. (G. A. Gammie 1064, 30 Aug. 1892, CAL); Lachen, 8000-9000 ft. (N. C. Majumdar & R. N. Banerjee 464, 12 Sept. 1968, CAL); Bansoi (on way to Lachen), 7500 ft. (R. N. Banerjee 432, 12 Sept. 1968, CAL); Amilal, 8000 ft. (G. King 4088, 2 Sept.



1877, CAL); Cinchal lake area, 8000 ft. (K. Biswas 8645, 13 Nov. 1945, CAL); Kwseueg, 5000 ft. (G. King's collector, 4035, 1887, CAL); Ruwahi Jhora, 6500 ft. (W. W. Smith 337, 1 Oct. 1808, CAL); Siuohal, 8000 ft. (T. Anderson 1338, Aug. 1862, CAL); Sureil, 6000 ft. (W. G. Craib 47, 13 Nov. 1908, CAL); loc. cit. (J. D. Drummond 20984, 1904, K); loc. cit., 8000 ft. (M. B. Raizada 19031, 15 Nov. 1944, A); loc. cit., 8000 ft. (J. S. Gamble 8449, Sept. 1880, K); loc. cit., 7000 ft. (J. S. Gamble 10534, Sept. 1882, CAL); loc. cit., 6500 ft. (J. S. Gamble s.n., Aug. 1872, K); loc. cit., 7000 ft. (J. S. Gamble 3174A, Oct. 1872, K); loc. cit., 7000 ft. (J. S. Gamble 3173A, Sept. 1872, K); loc. cit., 7000 ft. (J. S. Gamble s.n., K); Yoksun, 6000 ft. (J. S. Gamble 25237, 11 Oct. 1875, CAL, K); without precise locality, 6500 ft. (G. King's collector, s.n., 14 Sept. 1872, CAL, S); without precise locality, 6800 ft. (G. King's collector, s.n., 14 Sept. 1872, CAL); without precise locality (G. King's collector, s.n., 1878, CAL); without precise locality, 6000–9000 ft. (J. D. Hooker s.n., K, CAL); without precise locality (J. D. Hooker s.n., K); without precise locality (collector unknown 323, CAL); without precise locality (Griffith 5462, Aug. 1837, K, L, S, CAL); without precise locality (S. Kurz s.n., 7 Oct. 1868, CAL); without precise locality (S. Kurz s.n., 3 Oct. 1868, CAL); without precise locality (J. S. Gamble 3175A, 1873, K).

**BHUTAN:** Streamside above Taba, Thimphu, 27°30'N, 89°39'E (A. J. C. Grierson & D. G. Long 947, 11 May 1979, K); Thimphu Chu above Dotena (I. W. J. Sinclair & D. G. Long 4881, 5 Sept. 1984, K); Mishina - Dochu La - Thimphu (H. Hara et al. 10369, 28 Apr. 1967, BM, TI); Thimphu - Dochu La (H. Kanai et al. 696, 30 May 1967, BM, TI); 1 km S of Tongsa 27°30'N, 90°30'E (A. J. C. Grierson & D. G. Long 1097, 17 May 1979, K); Chimakushi, 7200 ft. (P. K. Hajra 500, 27 Sept. 1964, CAL); Putlibhir, 7300 ft. (G. D. Gupta 2109, 16 Sept. 1965, CAL).

**ASSAM:** Dichu valley between Lohit valley and Diphu pass into Bwuma (F. Kingdon Ward 19466, 14 May 1950, K); Charduar (Masters s.n., 1857, CAL); without precise locality (Simons s.n., L).

**ARUNACHAL PRADESH:** Camp C12, Eastern Circle, Shilong (J. Joseph 48800, 4 Jan. 1970, CAL); Sissini Camp, Kameng (G. Panigrahi 6065, 26 Mar. 1956, CAL); Takepokong to Sirang, 1900–2400 m (R. S. Rao 17856, 19 Nov. 1958, CAL).

**XIZANG (TIBET):** Medog, Hanmi, 2300 m (H. Sun et al. 836, 27 Oct. 1992, KUN); Bomi (S. K. Wu 5784, 11 Sept. 1976, KUN); Di Chu Gorge, 2600 m (F. Kindgon-Ward 19644, BM).

**YUNNAN:** Yunlong Xian, Ziben Shan, 2700 m (S. K. Wu et al. 103165, 10–11 Sept. 1999, KUN, TI); Lushui Xian, Pianma - Pianma Pass - Lushui, 2600 m (S. K. Wu et al. 103175, 13 Sept. 1999, KUN, TI); Gongshan Xian, Dulongjiang, 1700 m (S. K. Wu et al. 103180, 17 Sept. 1999, KUN, TI); loc. cit., S. W. of Gongshan, Gaoligong Shan, 2500 m (S. K. Wu et al. 103191, 20 Sept. 1999, KUN, TI); Tali Hsien, 1300 m (C. W. Wang 63448, 35 May 1935 A, KUN); Dzung-duei, Cham-pu-tung, 3000 m (C. W. Wang 67025, Oct. 1935, A, KUN); Shi-gi-tung, Champu-tung, 2500 m (C. W. Wang 67128, Oct. 1935, A, KUN); Chiu-Kiang, W. of Champutung, 2800 m (C. W. Wang 67331, Oct. 1935, A, KUN); Shang-pa Hsien, 2000 m (H. T. Tsai 56573, 21 Sept. 1933, A, KUN); loc. cit., 2000 m (H. T. Tsai 59071, 29 Oct. 1934, KUN).

**SICHUAN:** near Chang-lou-ping, 2200 m (C. W. Wang, 2070, 28 Aug. 1939, A); Tianjin, 2550 m (C. W. Wang 1932, 26 Aug. 1963, PE).

#### 44. *Juncus perpusillus* Sam.

**KASHMIR:** Snsal Nala, Lidlar valley, 12000–13000 ft. (J. F. Duthie 13344, 30 Jul. 1893, CAL).

**UTTARA PRADESH:** Tihei-Garhwal, Bandarpuneh, 13000–4000 ft. (J. F. Duthie 478, 25 Aug. 1883, CAL).

**KUMAON:** without precise locality, 14500 ft. (R. Strachey & J. E. Winterbottom 13, A).

**NEPAL:** Rara Daha, 9800 ft. (O. Polunin et al. 4091, 15 May 1952, UPS); Tukucha, Kali Gandaki, 12000 ft. (J. D. A. Stainton & L. H. J. Williams 1170, 15 Jun. 1954, UPS); Nea Chlike Pahar, 13500 ft. (J. D. A. Stainton & L. H. J. Williams 3134, 15 Jun. 1954, UPS); Rasuwa, Tulo Bhera Kharka - Jaisuli Kund, 4200 m (F.

Miyamoto et al. 9410830, 30 Jul. 1994, TI); loc. cit., Paldol Base Camp - a Kharka, 4400 m (F. Miyamoto et al. 9410164, 3 Aug. 1994, TI); Sankhuwasawa, around Cha Ding Kharka and Shipton Pass, 4150 m (M. Minaki et al. 9020825, 9 Aug. 1990, TI); Solukhumbu, around Khare, 4800 m (F. Miyamoto et al. 9580257, 9 Aug. 1995, TI); loc. cit., Chhomalang Base Camp - Seto Pokhari, 4400 m (F. Miyamoto et al. 9580305, 12 Aug. 1995, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4660 m (F. Miyamoto et al. 9580264, 11 Aug. 1995, TI); loc. cit., around Tangna, 4000 m (F. Miyamoto et al. 9580401, 22 Aug. 1995, TI); Gokyo, 27°59'N, 86°41'E, 4600 m (J. F. Dobremez 409, 8 Jul. 1970, KATH).

**SIKKIM:** North district, S. E. side of Lasa Chhu, below Sebu La, Damp moraine slopes, 27°56'13"N, 88°38'30"E, 4700 m (D. G. Long & H. J. Noltie, 383, 21 Jul. 1996, E, TI).

**CHINA. GANSU:** without precise locality (E. Licent 4317, 13 Jul. 1918, UPS).

**YUNNAN:** Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 68858, Aug. 1935, A); Zhongdian Xian, Hong Shan, 4600 m (S. K. Wu et al. 103030, 31 Jul. -4 Aug. 1999, KUN, TI).

**SICHUAN:** Hi-ma-la, Tsa-wa-rung, 3400 m (C. W. Wang 65598, Aug. 1936, A); S. Mu-li, Shao-siang-liang-tze, 3600 m (T. T. Yü 7771, 17 Aug. 1937, PE).

#### 46. *Juncus potaninii* Buchenau

**XIZANG (TIBET):** without precise locality (S. K. Wu 4947, 22 Aug. 1976, KUN).

**QINGHAI:** Yushu Xian: Xia-Baitang, 32°40'30"N, 97°17'40"E, 4200-4400 m (D. E. Boufford & T. S. Ying 27043, 5 Jul. 1995, A); Maqin Xian, along the Xihalong He, between Jungong and Maqin, 3450-3550 m (T. N. Ho et al. 360, 26 Jul. 1993, A).

**GANSU:** near Chuoni, 2700 m (T. P. Wang 5323, 24 Jul. 1936, PE); Lin long chan et Ma ho chan (P. Licent 4317, 13 Jul. 1918, S).

**YUNNAN:** Deqe, around Daxue Shan, 3800 m (S. K. Wu et al. 1600, 29 Aug. 1996, KUN, TI); Zhongdian, Haba Shan, Dishuiyan, 4100 m (Zhongdian expedition team 1739, 31 Aug. 1962, KUN-paratype of *J. parvulus*).

**SICHUAN:** Kangting (Tachienlu) district, Tapaoshan, 3900 m (H. Smith 11554, 26 Aug. 1934, UPS); loc. cit., Cheto valley, 3110 m (H. Smith 11078, 2 Aug. 1932, BM, P, PE, S); Tachenlu, 9000-13500 ft. (A. E. Pratt 162, BM); Dongrergo (Hsioeh-pao-ting), 4200 m (H. Smith 3795, 20 Jul. 1922, BM, PE, S, UPS); Tsipula, 4400 m (H. Smith 4216, 26 Aug. 1922, S, UPS); Xiajin, Rilong - Ganhaizi, 3300 m (H. Ikeda et al. 100812, 30 Aug. 1998, KUN, TI); loc. cit., Rilong - a pass of Balang Shan - Rilong, 4100 m (H. Ikeda et al. 100811, 29 Aug. 1998, KUN, TI).

**SHAANXI:** Taipai Shan, 2100-2300 m (T. N. Liou & P. C. Tsoong 517, 1 Sept. 1937, PE).

**HUBEI:** without precise locality (A. Henry 6868, 1885-1888, BM).

**WESTERN CHINA:** Mt. Omi (E. H. Wilson 5201, Sept. 1904, BM).

#### 47. *Juncus prismatocarpus* R. Br.

**PUNJAB:** Bhadwar, Kangra, 2000 ft. (W. N. Koelz 4382, 3 May 1933, A).

**HIMACAL PRADESH:** Chamba, Khajjar, 6500 ft. (W. N. Koelz 8819, 11 Jul. 1936, A).

**UTTAR PRADESH:** Ganges Balley between Dhunda and Barabit, 4000-5000 ft. Tihri-Garhwal (J. F. Duthie 154, 13 Jul. 1883, CAL); Kheri (Inayat 22831, 28 Apr. 1898, CAL); Yons valley, Jaunsar, 3000 ft. (G. A. Gamble s.n., May 1891, CAL).

**NEPAL:** Between Barigad and Galsera (H. Tabata 151, 27 Jun. 1976, KATH); Katmandu, 1400 m (S. Nakao s.n., 27 Aug. 1953, KYO); Gokarna, 4400 ft. (Pradhan & Thapa 4402, 27 Apr. 1966, CAL); loc. cit., 4500 ft. (Pradhan & Ramola 7702, K); Baglung, 3000 ft. (J. D. A. Stainton et al. 58, 20 Apr. 1952, A, BM, CAL); above Suikhet village, 6 miles N. W. Pokhara (C. Barclay & P. M. Synge 2201, 22 May 1971, K); Dolakha, Jiri



- Kune - Kattike - Those - Shivalaya, 1780 m (M. Suzuki et al. 8571663, 16 Aug. 1985, TI); Rolwaling Himal, Banepa, 1400 m (K. Yoda s.n., 19 Apr. 1963, KYO); Ramechhap, Shivalaya - Those - Kattike - Kune - Jiri, 1900 m (H. Ohba et al. 8572612, 12 Sept. 1985, TI); Dhankuta, Hile - Pakhribas - Gholi Kharka, 1480 m (M. Minaki et al. 9020011, 23 Jul. 1990, TI); Solukhumbu, Takisindu - Junbesi, 2800 m (F. Miyamoto et al. 9580491, 1 Sept. 1995, TI); loc. cit., Pike - Tasman Bhangiang - Pike Khop, 2630 m (F. Miyamoto et al. 9580063, 24 Jul. 1995, TI); loc. cit., Manebanjang - Danda Pangma - Sekaha - Chipe Gaun - Bhotebas - Gogane - Chichila, 1300 m (M. Minaki et al. 9020244, 28 Jul. 1990, TI); loc. cit., Hurhure - Mude - Num, 2020 m (M. Minaki et al. 9020342, 31 Jul. 1990, TI); Tamur River between Chirwa and Hellok, 27°29'N, 87°46'E, 1560 m (S. Crawford et al. KEKE206, 4 Sept. 1989, K); Between Barigad and Galsera, 1480 m (H. Tabata et al. 151, 27 Jun. 1976, KYO); Marma Ghabung Khola, near Qpokhara, 3000 ft. (J. D. A. Stainton et al. 2489, 16 Apr. 1954, A); Tamur River between Chhiruwa and Hellok, 27°29'N, 87°46'E, 1560 m (C. G. Wilson et al. 206, 4 Sept. 1989, KATH); without precise locality, 2000–5000 ft (T. Thomson s.n., 18 Apr. 1844, K).

**SIKKIM:** Mungher 4000 ft. (W. W. Smith s.n., 12 Apr. 1908, CAL); Tista, 1000 ft. (C. H. Cave s.n., 9 Jun. 1917, CAL); without precise locality, 8000–10000 ft. (J. D. Hooker s.n., K).

**BHUTAN:** Taba, Thimphu, 27°30'N, 89°38'E, 2350 m (A. J. C. Grierson & D. G. Long 917, 9 May 1979, K); Punakha district, 1 km below Chuzomsa, Tang Chu, 27°30'N, 89°58'E, 1420 m (A. J. C. Grierson & D. G. Long 4529, 20 Apr. 1982, A, K); Tongsa district, near Pertimi, 27°13'N, 90°41'E, 1400 m (A. J. C. Grierson & D. G. Long 4286, 3 Apr. 1982, K); without precise locality (Griffith 5459, K).

**ASSAM:** Khasya Hills (Griffith s.n., L); loc. cit. (H. G. Carter 773, Mar. 1918, CAL); Khasia, 4000–6000 ft. (J. D. Hooker & T. Thomson s.n., K); Khasia, Surarim to Cherrapunji, 4000–6000 ft. (S. C. Banerji 136, 31 May 1911, CAL); Mokochung, 4600 ft. (N. L. Bor 16677, 20 Sept. 1942, L); Naga Hills, 9900 ft. (C. B. Clarke 41274, 25 Oct. 1885, K, S); Agalhatti Mysane (A. Meebold 8343, 1908, K); Delrvghur, 3000 ft. (C. B. Clarke 37723, 4 Apr. 1885, CAL); Gabru (A. C. Chattejee s.n., May 1902, A); Gabru (A. C. Chattejee s.n., May 1902, A).

**ARUNACHAL PRADISH:** on way Hapoh to Zino (G. V. SubbaRao 24691, 2 Jun. 1961, CAL); Chardwar (R. S. Rao 5876, 23 Mar. 1957, CAL).

**EAST BENGAL:** without precise locality (Griffith 5459, L)

**MYANMAR:** North Triangle (Hkinlum), 3000–4000 ft. (F. Kingdon-Ward 20776, 4 May 1953, A).

**XIZANG (TIBET):** Champitang, 12000 ft. (F. S. Chapman 453, 1 Aug. 1936, K); Kham, Pass Chun-tschoa (G. N. Potanin s.n., 10 Aug. 1893, S).

**YUNNAN:** Shun-Ning Hsien, 2800 m (C. W. Wang, 71890, Feb. 1936, A, PE); Weixi, 1920 m (Tibet expedition team 850, 10 Jun. 1981, KUN); Ta-li Hsien, 2540 m (C. W. Wang 63523, May 1935, A); Fo-Hai, 1540 m (C. W. Wang 72949, May 1936, A); Fo-Hai, 1900 m (C. W. Wang 77354, Jul. 1936, A); Wen-shan Hsien, 1600 m (H. T. Tsai 51777, 12 Feb. 1933, A); Meng-soong, Dah-meng-lung, Che-li Hsien, 1850 m (C. W. Wang 78495, Sept. 1936, A); Ping-pien Hsien, 1400 m (H. T. Tsai 60224, 15 Jun. 1934, A); Tsang Yuan, 1200 m (C. W. Wang 73161, Apr. 1936, A).

**SICHUAN:** Kiating (H. C. Chow 9560, 10 Apr. 1939, A); Ta-tien-pa, Kiating (L. Y. Tai T865, 3 Jun. 1941, A); Mt. Omei (S. C. Sun & K. Chang 363, 22 Jun. 1939, A); Mt. Omei (S. C. Sun & K. Chang 548, 27 Jun. 1939, A); loc. cit., 2300 m (S. C. Sun & K. Chang 1217, 26 Aug. 1939, A); loc. cit. (W. P. Fang 12900, Jul.-Aug. 1938, A); loc. cit., 630 m (W. P. Fang 14493, 7 Jun. 1940, A); Ma-pin Hsien 1300 m (F. T. Wang 22714, 10 May 1931, PE).

**HUBEI:** without precise locality (A. Henry 2471, 1885–1888, BM); without precise locality (collector unknown s.n., BM).

#### 48. *Juncus przewalskii* Buchenau

**XIZANG (TIBET):** Baxoi Xian, Demu La, 4870 m (S. Akiyama et al. 105089, 26 Jul. 2000, KUN, TI); Kham, Pass Chuntschao (G. N. Potanii s.n., 10 Aug. 1893, S).

**GANSU:** Dschoni (G. N. Potanii s.n., 1885, S-paratype of *J. tanguticus*); Lapuleng, 3800 m (C. W. Wang 5844, 20 Aug. 1936, KUN); Vicinity of Lapuleng, 3500 m (K. T. Fu 1464, 17 Aug. 1937, PE).

**YUNNAN:** Atun-tze, Huann-fu-ping, 3700 m (C. W. Wang 68742, Aug. 1935, A); loc. cit., 3600 m (C. W. Wang 68994, Aug. 1935, A, KUN, PE); loc. cit., 3700 m (C. W. Wang 68764, Aug. 1935, KUN, PE); loc. cit., Bai-mar-shan, 3400 m (C. W. Wang 69642, Sept. 1935, A, KUN, PE); loc. cit., 3000 m (C. W. Wang 69622, Sept. 1935, A, PE); loc. cit., Paimashan, Shelong, 4100 m (T. T. Yü 9165, 24, Jul. 1937, PE); loc. cit., Chitoyangou, 4200 m (T. T. Yü 9743, 22 Aug. 1937, KUN); Deqin, around Daxue Shan, 4300 m (S. K. Wu et al. 1601, 29 Aug. 1996, KUN, TI); Deqin Xian, Meili Xueshan, Suola, 4500 m (S. K. Wu et al. 103113, 20–23 Aug. 1999, KUN, TI); Che-tse-lo, 4000 m (H. T. Tsai 58226, 58228, 27 Aug. 1934, A); Chungtien Plateau (K. M. Feng 1559, 7 Jul. 1939, PE); loc. cit., Sianrentung, 3600 m (T. T. Yü 12199, 17 Jul. 1937, A, PE); loc. cit., Juatze, 3400 m (T. T. Yü 12740, 8 Aug. 1937, PE); Zhongdian Xian, Hong Shan, 4360 m (S. K. Wu et al. 103029, 31 Jul.–4 Aug. 1999, KUN, TI); loc. cit., 4600 m (S. K. Wu et al. 103032, 31 Jul.–4 Aug. 1999, KUN, TI); Haba shan, 3950 m (Zhongdian research team 1792, 31 Aug. 1962, KUN); loc. cit., 4250 m (Zhongdian research team 1754, 31 Aug. 1962, KUN); Lichiang range, 11000–12000 ft. (G. Forrest 2917, Sept. 1909, B, CAL); Eastern slopes of Mount Dyaloko, northern peak of the Likiang Snow Range, 14500 ft. (J. F. Rock 10376, Aug. 1923, BM, S); Li-kiang Hsien, 2900 m (C. W. Wang 70811, Jul. 1935, A, PE); Yangtze watershed, Prefectural district of Likiang, eastern slopes of Likiang snow range, 15000 ft. (J. F. Rock 5265, 3 Jul. 1926, A, B); loc. cit. (J. F. Rock 4953, 3 Jul. 1926, B, PE); without precise locality, 3600 m (C. Schneider 3582, 19 Aug. 1914, A).

**SICHUAN:** Kangting (Tachienlu) dist., Tapaoshan, West range, Tsipula, 4200 m (H. Smith 3051, 5 Aug. 1922 S, UPS); loc. cit., Tapaoshan, West range, 4400–4600 m (H. Smith 11204, 22 Aug. 1934, BM, S, UPS); loc. cit., 4200–4400 m (H. Smith 11198, 22 Aug. 1934, PE, S, UPS); Chi-na-tung, Tsa-wa-rung, 2800 m (C. W. Wang 65237, Aug. 1935, A); Hi-ma-la, Tsa-wa-rung, 3400 m (C. W. Wang 65598, Aug. 1935, PE); Kangdin, 3400 m (Zhen-shu Liu 964, 1934, PE); Daocheng, around Gongga Shan, Beiyu, 4200–4580 m (S. K. Wu et al. 1546, 22 Aug. 1996, KUN, TI); loc. cit., 4700 m (S. K. Wu et al. 451, 5 Aug. 1997, KUN, TI).

**SHAANXI:** Ta-pai-shan (G. Giraldi 6746, 10–20 Aug. 1895, S-paratype of *J. tanguticus*); loc. cit., (G. Giraldi 6726, Aug. 1899, S-paratype of *J. tanguticus*); Taipaishan, Pesiantai (T. N. Liou & P. C. Tsoong 975, 15 Sept. 1937, PE); Than-tsn-shan (G. Giraldi 7242, 10 Jul. 1900, S).

**WEST CHINA:** without precise locality (E. H. Wilson 4540, Jul. 1904, BM).

#### 49. *Juncus pseudocastaneus* (Lingelsh.) Sam.

**NEPAL:** Maharigaon, 3 miles N. E., 14500 ft. (O. Polunin et al. 125, 13 Jul. 1952, A, BM, CAL, UPS); Lamjung Himal, 15000 ft. (J. D. A. Stainton et al. 6335, 13 Jul. 1954, A); Rasuwa, around Base Camp, 4920 m (H. Takayama et al. 9220316, 9220317, 21 Jul. 1992, TI); loc. cit., Yala Kharka, 4750 m (H. Takayama et al. 9220204, 15 Jul. 1992, TI); loc. cit., Yala Kharka - Base Camp, 4800 m (H. Takayama et al. 9220220, 16 Jul. 1992, TI); Solukhumbu, Panch Pokhari - Seto Pokhari, 4780 m (F. Miyamoto et al. 9580325, 16 Aug. 1995, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4600 m (F. Miyamoto et al. 9580284, 9580503, 11 Aug. 1995, KATH, TI); loc. cit., Dik Kharka - Khare, 4300 m (F. Miyamoto et al. 9580243, 7 Aug. 1995, TI); Sankhuwasawa, Slesa, 4500 m (H. Kanai et al. 720723, 24 Jun. 1972, TI).

**SIKKIM:** North district, S. E. side of Lasha Chhu, below Sebu La, stony stream sides and flushes, 27°56'13"N, 88°38'30"E, 4600 m (D. G. Long & H. J. Noltie 379, 21 Jul. 1996, E, TI); without precise locality (R. S. Rao 974, CAL); without precise locality, 12000–16000 ft. (J. D. Hooker s.n. K).

**BHUTAN:** Yakuna, 4224 m (Ramesh Bedi 69, 6 Aug. 1971, K); Wangdi Phodrang district, Chukarpo,



27°49'N, 90°23'E, 4300 m (F. Miyamoto 9361650, 23 Sept. 1993, TI); loc. cit., Tsonsothang, 27°49'N, 90°24'E, 4300 m (F. Miyamoto 9361684, 24 Sept. 1993, TI); loc. cit., Maorothang - Tintatso, 27°39'N, 90°31'E, 4000 m (F. Miyamoto 9361568, 20 Sept. 1993, TI).

**ASSAM:** without precise locality (R. S. Rao 974, CAL).

**EAST HIMALAYA:** Chumolari, 16000 ft. (R. Lepcha 493, 12 Sept. 1912, A).

**XIZANG (TIBET):** Yatung, 27°51'N, 88°35'E (H. E. Hobson, s.n., 1897, K); Zhongba, 5000 m (Qing-Zang expedition team 6733, 12 Aug. 1975, KUN); Hills S. of Lhasa, 15500 ft. (F. Ludlow & G. Sheriff 8796, 6 Jul. 1942, A, UPS); Maizhokunggar Xian, Mt. Milha Shan, 29°49'N, 92°20'E, 4910 m (S. Akiyama et al. 106202, 6 Aug. 2001, KUN, TI); Budi Tsepo La, Kongbo, 13000 ft. (F. Ludlow et al. 14429, 21 Aug. 1947, A); Sang La, 29°35'N, 94°43'E, 13500 ft. (F. Ludlow et al. 5049, 29 Jun. 1938, A, UPS); Gongbo gyamda, 4920 m (Qing-Zang expedition team 74-2024, 30 Aug. 1974, KUN); Markam Xian, Lawu Shan, 4400 m (S. Akiyama et al. 105023, 14 Jul. 2000, KUN, TI).

**QINGHAI:** Gande Xian, Gande shan, Shanggongma Xiang, on road from Dari to Gande, 4400 m (T. N. Ho et al. 910, 9 Aug. 1993, A).

**YUNNAN:** Dokerla, A-tun-tze, 3500 m (C. W. Wang 64922, 3-5 Aug. 1935, A, PE); Hi-ma-la, Tsa-wa-rung, 3700 m (C. W. Wang 65672, Aug. 1935, A, PE); without precise locality, 3600 m (C. Schneider 3033, 1914, A).

**SICHUAN:** Taofu (Dawo) district, Mt. Yara, N. W. valley, 4100 m (H. Smith 11600, 29 Aug. 1934, PE, S, UPS); Kangting (Tachienlu) district, Cheto 4300 ft. (H. Smith 11008, 3 Aug. 1934, PE, S, UPS); Daocheng, Gongga shan (Qing-Zang expedition team 5531, 29 Aug. 1981, KUN); loc. cit., around Gongga Shan, 4500 m (S. K. Wu et al. 449, 4 Aug. 1997, KUN, TI); Xiaojin, Rilong - a pass of Balang Shan - Rilong, 4100 m (H. Ikeda et al. 100804, 29 Aug. 1998, KUN, TI); Kangting (Tachienlu) dist., Tapaoshan, West range, Tsipula, 4200 m (H. Smith 3052, 5 Aug. 1922, UPS).

**WESTERN CHINA:** Bogs, 13000 ft. (S. H. Wilson 4540, Jul. 1904, A, S).

#### 50. *Juncus rohtangensis* Goel & Aswal

**NEPAL:** above Sauwala Khola, 13000 ft. (J. D. A. Stainton et al. 3582, 22 Jul. 1954, A, BM, CAL, UPS); Mukutinath, 3962 m (J. D. A. Stainton & L. H. J. Williams 1451, 26 Jun. 1954, BM, UPS); Shiar Khola, W. of Chumje, 12500 ft. (Gardner 1016, 29 Jun. 1953, BM); 5 miles E. Timure, 13500 ft. (O. Polunin 801, 3 Jul. 1949, BM); Langtang valley, 15000 ft. (O. Polunin 626, Jun. 1949, BM); J. F. Rock shelter II- Gadge, 3220-3950 m (H. Kanai & S. B. Malla 674837, 25 Aug. 1969, KATH, TI); Mul Kharka, Chilime Khola, 3800-4100 m (H. Kanai & P. R. Shakya 676208, 672225, 3 Jul. 1970, KATH, TI); Lari, 28°14'N, 85°11'E, 4650 m (Yon 107, 7 Jul. 1974, BM); Bagmati zone, Rasuwa district, Ganesh Base Camp - a Kharka, 28°15'N, 85°06'E, 3860 m (F. Miyamoto et al. 9410250, 10 Aug. 1994 TI); loc. cit., around Jaisuli Kund, 28°11'N, 85°11'E, 4500 m (F. Miyamoto et al. 9410129, 31 Jul. 1994, TI); loc. cit., Tulo Bhera Kharka - Jaisuli Kund, 85°13'E, 28°12'N, 4300 m (F. Miyamoto et al. 9410118, 9410119, 30 Jul. 1994, TI); loc. cit., around Tinbu Kharka, 28°11'N, 85°13'E, 3750 m (F. Miyamoto et al. 9410080, 27 Jul. 1994, TI); loc. cit., Tinbu Kharka - Tulo Bhera Kharka, 28°12'N, 85°14'E, 4100 m (F. Miyamoto et al. 9410098, 28 Jul. 1994, TI); loc. cit., Kyangjin Kharka - Yala Kharka, 4580 m (H. Takayama et al. 9220175, 14 Jul. 1992, TI); loc. cit., Around Base Camp, 28°13'09"N, 85°37'17"E, 4920 m (H. Takayama et al. 9220319, 21 Jul. 1992, TI); loc. cit., Yala Kharka - Langtrang, 4700 m (H. Takayama et al. 9220359, 22 Jul. 1992, TI); Tharepati, N. of Kathmandu, 3200 m (Phillips 163, 27 Jun. 1973, K); Between Tomo La and Sinion La, 27°37'N, 85°57'E, 4000 m (S. Crawford et al. KEKE678, 15 Sept. 1989, K); Janakpur zone, Ramechhap district, Dubikharka - Baula Pokhari, 3720-4000 m (H. Ohba et al. 8570328, 9 Jul. 1985, TI); loc. cit., Chhu-Ningma - Jata Pokhari, 4040-4220 m (H. Ohba et al. 8570426, 12 Jul. 1985, TI); loc. cit., Jata Pokhari - a peak - a peak on northwest of Panch Pokhari - Jata Pokhari, 27°43'N,

86°25'E, 4220–4893 m (M. Suzuki et al. 8580308, 16 Jul. 1985, TI); loc. cit., Koshing Kharka - Thare Og, 4000–4150 m (H. Ohba et al. 8570732, 22 Jul. 1985, TI); Hong Khola, 27°30'N, 86°45'E, 14000 ft. (D. McCosh 353, 2 Jul. 1964, BM, TI); Koshi zone, Sankhuwa Sabha district, Khongma - Cha Ding Kharka, 27°40'N, 87°10'E, 4100 m (M. Minaki et al. 9020636, 5 Aug. 1990, TI); loc. cit., Around Cha Ding Kharka, 27°40'N, 87°10'E, 3400 m (M. Minaki et al. 9020746, 9020822, 9 Aug. 1990, TI); loc. cit., 4150 m (M. Minaki et al. 9020824, 9 Aug. 1990, TI); loc. cit., Jaljale Himal, around Banduke, 27°30'N, 87°30'E, 4150 m (H. Ohba et al. 9110215, 9110232, 9120193, 25 Jul.-3 Aug. 1991, TI); loc. cit., Makalu Base Camp, 27°48'N, 87°06'N, 4728 m (H. B. Emery CH25, 8 Jul. 1974, K); Bhalukhop, 13400 ft. (T. B. Shrestha et Joshi 292, 24 Jul. 1971, BM); Dhdkund, 6 miles E. of Timure, 15500 ft. (O. Polunin 810, 5 Jul. 1949, BM); Near Lapsang, Simua Khola, 27°34'N, 87°59'E, 4270 m (C. G. Wilson et al. 760, 19 Sept. 1989, KATH); Tomo La - Sinion La, 27°37'N, 87°57'E, 4000 m (C. G. Wilson et al. 678, 15 Sept. 1989, KATH); Bhlalukhop to Jumley, 12400 ft. (T. B. Shrestha & D. P. Joshi 292, 24 Jul. 1971, KATH).

**SIKKIM:** Chokisn nera Jongri (G. King s.n., Jun. 1887, CAL); East district, Tsomgo Chho, 27°22' 14"N, 88°45' 52"E, 3720 m (D. G. Long & H. J. Noltie 63, 8 Jul. 1996, E, TI); Choktse (G. King s.n., Jun. 1887, CAL, K); Dzongri, 4000 m (B. N. Starling et al. AGSES268, 2 Jul. 1983, K); Zumu valley (Smith & Cave 2808, 20 Jul. 1909, CAL); without precise locality (G. King s.n., B); without precise locality, 10000–12000 ft. (J. D. Hooker s.n., A).

**BHUTAN:** Kempfu, 14000 ft. (B. J. Gould 463, 14 Jun 1938 K); Chesha La, 14000 ft. (F. Ludlow et al. 16647, 27 Jun. 1949, BM); Wangdi Phodrang district, Maorothang - Tintatso, 27°39'N, 90°31'E, 4000 m (F. Miyamoto 9361566, 20 Sept. 1993, TI); loc. cit., Tintatso - Tampe La, 27°43'N, 90°31'N, 4200 m (F. Miyamoto 9361592, 21 Sept. 1993, TI); loc. cit., Tampe La, 27°44'N, 90°31'E, 4500 m (F. Miyamoto 9361607, 9361611, 9361612, 21 Sept. 1993, TI).

**XIZANG (TIBET):** N. Chumbi, 13000 ft. (L. A. Waddell 73, K); Chumbi, N. W. Chumbi, 14000 ft. (L. A. Waddell s.n. K); Dotha, 13000 ft. (Bor & Ram 20510, 20 Jun. 1945, K); Cona, 4300 m (Wu & Chen 75-949, 18 Jul. 1975, KUN).

### 51. *Juncus rostrocarpus* Miyam.

**NEPAL:** Sankhuwasawa, Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3570 m (M. Minaki et al. 9020646, 13 Aug. 1990, TI); loc. cit., around Cha Ding Kharka and Shipton Pass, 3850 m (M. Minaki et al. 9020798, 10 Aug. 1990, TI); loc. cit., Khongma - Unshisa Kharka - Danda Kharka - Bhainsi Kharka - Uttise Kharka - Tashi Gaun, 3500 m (M. Minaki et al. 9020922, 5 Aug. 1990, TI); Arun valley, Chhoyang Khola, W. of Num, 12500 ft. (J. D. A. Stainton 727, 21 Jun. 1956, BM, UPS); 18 km N. of Num, Khogma La, 3965 m (H. B. Emery CH48, 10 Jul. 1974, K); Khongma La (18 Km N. Num), Sankhuwa Sabha District, Kosi zone, 27°43'N, 87°15'E, 3965 m (H. B. Emery CH47, 10 Jul. 1974 A, K)..

**SIKKIM:** North district, Glacial valley above Yakche, N. of Lachung, 27°43'09"N, 88°04'47"E, 3180 m (D. G. Long & H. J. Noltie 223, 15 Jul. 1996, E, TI).

**BHUTAN:** Tongsa district, Yuto La, 10700 ft (B. Lyon 3304, 3 Jun. 1966 BM).

**MYANMAR:** N. Triangle (Tama Bum), 10000 ft. (F. Kingdon-Ward 21017, 20 Jun. 1953, BM), Hpimaw Pass, 11000 ft. (C. E. Parkinson 10056, 7 Jun. 1929, K); Htoma Bum Range, Dist. Myitkyina, 10400 ft. (Tha Hen d Chitkoko 4123, 21 Jun. 1953, K).

**XIZANG (TIBET):** Tsanang La, near Paka, 29°13'N, 94° 24'E, 13000-14000 ft. (F. Ludlow et al. 5854, 17 Jul. 1938, BM, UPS); Kongbo Province, Lusha Chu, 29°20'N, 94°35'E, 12500 ft. (F. Ludlow et al. 4760, 10 Jun. 1938, BM, CAL, UPS); Doshong La, Kongbo, 13000 ft. (F. Ludlow et al. 14384, 17 Aug. 1947, CAL, UPS); Trulung, Po Tsangpo, Pome, 8000 ft. (F. Ludlow et al. 13050, 28 May 1947, BM, UPS); Lisum, Nunkhu



Phu Chu valley, near Tongkyuk. Pome, 11000 ft. (F. Ludlow et al. 13769, 26 May 1947, UPS); Tse Ga, Tsari, Capt. (F. Kingdon-Ward 11935, 1935, BM); E. Tibet and S.W. China (G. Forrest 4909, BM).

**YUNNAN:** Prope fines Tibeto-Birmanicas inter fluvios Lu-djiang (Salween) et Djiou-djiang (Irrawadi orient. super.), in pluviisilvis mixtis temperatis vallis Tjiontson-lumba infra Tschamutong, 3150 m (F. Handel-Mazzetti 9200, 1914-1918, S); Gongshan (Lin & Jiao 790491, 1979, KUN); Fugong (Qing-Zang expedition team 7014, 28 May 1982 KUN); Lushui Xian, Pianma - Pianma Pass - Lushui, 3200 m (S. K. Wu et al. 103171, 13 Sept. 1999, KUN, TI); Lushui, 3300-3400 m (Bijiang expedition team 1725, 3 Aug. 1978, KUN); Che-tse-lo, 4000 m (H. T. Tsai 58225, 27 Aug. 1934, PE); Ta-li Hsien, 3400 m (H. T. Tsai 53859, 27 Jul. 1933, A, PE); Dali Xian, E. side of Diancang Shan mountain range, 3100 m (B. Bartholomew et al. 854, 11 Jul. 1984, BM, KUN); Dali, Cangshan, 3410 m (S. K. Wu et al. 1603, 1 Sept. 1996, KUN, TI); loc. cit., 3770m (S. K. Wu et al. 1606, 1 Sept. 1996, KUN, TI); Dali Shi, Diancang Shan, Zhonghe Peak, 3200 m (S. K. Wu et al. 103143, 6 Sept. 1999, KUN, TI); loc. cit., 3300 m (S. Akiyama et al. 406, 5 Jul. 2001, KUN, TI); loc. cit., 3500 m (S. Akiyama et al. 412, 5 Jul. 2001, KUN, TI); Dali Xian, E. side of Diancang Shan, 3100 m, 25°42'N, 100°97'E (B. Bartholomew et al. 854, A); Ta-li Hsien (C. W. Wang 63236, May 1935, A, PE); Tehching, Miyetziium, 3350 m (T. T. Yü 8634, 18 Jun. 1937, PE); W of Huadianba Rarm. N end of Cangshan, 2900 m (Sino-British expedition 826, 19 May 1981, K); Longquan to Dali road, 3100 m (Sino-British expedition 619, 15 May 1981, K); Dali, Cangshan Mt., 25°40'N, 100°45'E, 3290 m (Alpine Garden Society expedition ACE 922, 5 Jul. 1994, K); loc. cit., 3521 m (Alpine Garden Society expedition ACE 930, 5 Jul. 1994, K).

## 52. *Juncus setchuensis* Buchenau

**SIKKIM:** without precise locality, 6000-10000ft. (J. D. Hooker s.n., K).

**XIZANG (TIBET):** Chumbi & Phari (Dungbo s.n., Jul. 1879, K, CAL).

**YUNNAN:** Prope fines Tibeto-Birmanicas inter fluvios Lu-djiang (Salween) et Djiou-djiang (Irrawadi orient. super.), in pluviisilvis mixtis temperatis vallis Tjiontson-lumba infra Tschamutong, 2950 m (F. Handel-Mazzetti 9147, 29 Jun. 1916, S); Kang-pu, Wei-si Hsien (C. W. Wang 64540, Jul. 1935, A); Wei-si-Hsien, 2300 m (C. W. Wang 63563, Jun. 1935, A); Fugong, 1900 m (Qing-Zang expedition team 6880, 29 May 1982, KUN); Gongshan Xian, S. W. of Gongshan, Gaoligong Shan, 2615 m (S. K. Wu et al. 103188, 20 Sept. 1999, KUN, TI).

**SICHUAN:** Bao Hsin, Lung-tung, 4000 ft. (S. H. Hu 1507, Jul.-Aug. 1939, A); 5 miles from Ya-an, 600 m (C. Y. Chiao 1169, 27 Jul. 1939, A); Moon Ting Shan, 15 km from city, 1100 m (C. Y. Chiao 1244, 30 Jul. 1939, A); Kuan Hsien, Ts'ing-cheng Shan (F. T. Wang 21781a, 20 Jul. 1930, S); Yin-hsiu-wan, 1800 m (H. Smith 2391, 22 Jun. 1926, BM); Shunching Hsien (K. S. Hao 166, 10 May 1930, S); Guan Xian, Logxi, 1100 m (Wang Zhong-tao et al. 870192, 28 Jul. 1987, BM); Guan Xian, Qishuping, 1350 m (Z. T. Wang et al. 870222, 29 Jul. 1987, KYO); without precise locality, 1000 m (C. Y. Chiao & C. S. Fan 186, 4 Aug. 1938, A); Dujiangyan Amunicipality, just E. of the town of Longxi along the flowing tributary of the Longxi River, 820 m (D. E. Boufford & B. Bartholomew 24673, 6 Sept. 1988, A); Ma-pien Hsien, 1300 m (F. T. Wang 22843, 10 May 1931, A); Yin-hsin-wan, 1800 m (H. Smith 2391 22 Jun. 1926, PE); Lifan, Mung-twin-ke, 7000 ft. (S. H. Hu 1879 Aug. 1931, A); Mt. Ormei (T. C. Peng 69, 26 Aug. 1938, A); loc. cit., 400 m (W. P. Fang 14327, 10 May 1940, A); loc. cit. (W. W. Ma 2284, 12 Jun. 1940, A).

**GUIZHOU:** Yinjiang Xian, Huguoshi, in the valley above Zhangjiaba on the W. side of the Fajing Shan mountain range, 850-1300 m (B. Bartholomew et al. 1554, 3 Sept. 1986, BM).

**HUBEI:** Shenlungkai (K. S. Chow 76025, BM).

## 53. *Juncus sherei* Miyam. & H. Ohba

**NEPAL:** near Phagune Dhuri, 13000 ft. (J. D. A. Stainton et al. 3412, 7 Jul. 1954, BM, CAL); Chilime and

Langtang valley, Oo Kharka - Nul Kharka, 3400–3800 m (H. Kanai & P. R. Shakya 676206, 1 Jul. 1970, KATH, TI); Bagmati zone, Rasuwa district, NW of Dobate, 3400 m (J. H. Hass 2162A, 10 Aug. 1974, BM); loc. cit., Paldol Base Camp - a kharka, 4300 m (F. Miyamoto et al. 9410163, 3 Aug. 1994, TI); loc. cit., Yure Kharka - Tinbu Kharka, 3700 m (F. Miyamoto et al. 9410053a, 26 Jul. 1994, TI); Solukhumbu, Gnaula - Pike, 3300 m (F. Miyamoto et al. 9580049, 22 Jul. 1995, TI); loc. cit., Thasing Dingma - Sanu Khola - Saure Kharka, 3700 m (F. Miyamoto et al. 9580194, 4 Aug. 1995, TI); loc. cit., Najing Ding - Chalem Kharka, 3100 m (F. Miyamoto et al. 9580140, 31 Jul. 1995, TI); loc. cit., Chalem Kharka - Jar Kharka, 4050 m (F. Miyamoto et al. 9580148, 1 Aug. 1995, TI); loc. cit., Chhatarwa - a pass - Kurke, 4100 m (F. Miyamoto et al. 9580472, 29 Aug. 1995, TI); loc. cit., Beni Kharka - Sarkari Pati, (H. Ohba et al. 8581282, 2 Sept. 1985, TI); Koshi zone, Sankhuwa Sabha district, Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka, 3800 m (M. Minaki et al. 9020641, 5 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari, 3800 m (M. Minaki et al. 9020686b, 7 Aug. 1990, TI); loc. cit., 4100 m (M. Minaki et al. 9020752b, 9 Aug. 1990, TI); Singum Gompa, 3000 m (H. Kanai s.n., 4 Jun. 1969, TI).

**SIKKIM:** Chamnag, 12000–13000 ft. (W. W. Smith 3809, 26 Jul. 1910, CAL); without precise locality, 10000–12000 ft. (W. W. Smith 3063, 5 Jul. 1910, CAL); without precise locality (G. King 4198, 8 Jul. 1877 CAL).

**BHUTAN:** Phajudin Limper (R. E. Cooper 3513, 4 Nov. 1914, BM).

**YUNNAN:** Gongshan Xian, S. W. of Gongshan, Gaoligong Shan, 2600 m (S. K. Wu et al. 103193, 20 Sept. 1999, KUN, TI); Zhongdian Xian, Haba Xueshan, Haba Hai, 4500 m (S. K. Wu et al. 103080, 8–11 Aug. 1999, KUN, TI).

#### 54. *Juncus sikkimensis* Hook. f.

**NEPAL:** Dap, Kasua Khola (18 km N. Num): Lamjung Himal, 15000 ft. (J. D. A. Stainton et al. 6335, 13 Jul. 1954, UPS, CAL); Jumla, Bajari Binu - Visht Dah, Giri Khora, 4280 m (M. Minaki et al. 9106056, 21 Sept. 1991, TI); Gandaki Zone, Gorkha distr., Thangmanang Kharka, 28°33'09"N, 84°39'19"E, 4160m (M. Suzuki et al. 9470345b, 6 Aug. 1994, TI); Rasuwa, Paldol Base Camp - a Kharka, 4350 m (F. Miyamoto et al. 9410169, 3 Aug. 1994, TI); loc. cit., Ganesh Base Camp - a pass - cross a river - a Kharka, 4200 m (F. Miyamoto et al. 9410254, 10 Aug. 1994, TI); loc. cit., Mul Kharka, 4000 m (H. Kanai & P. R. Shakya 672319, 6 Jul. 1970, TI); loc. cit., 3900 m (H. Kanai & P. R. Shakya s.n., 3 Jul. 1970, TI); Kosi zone, Sankhuwasawa, around Cha Ding Kharka and Shipton Pass, 4500 m (M. Minaki et al. 9020774, 9 Aug. 1990, TI); loc. cit., 4200 m (M. Minaki et al. 9020758, 9 Aug. 1990, TI); loc. cit., 27°43'N, 87°16'E (H. B. Emery CH05, 28 Jun. 1974, K); Khongma La (18 Km N. Num), Sankhuwa Sabha District, Kosi zone, 27°43'N, 87°15'E, 3965 m (H. B. Emery CH47, 10 Jul. 1974 A, K).

**SIKKIM:** Zemu valley (Smith & Cave 1239, 11 Jul. 1909, CAL); loc. cit., 16000 ft. (Smith & Cave 1428, 14 Jul. 1909, CAL); Chola valley, 13000 ft. (W. W. Smith 3615, 20 Jul. 1910, CAL); Chakung Chu, 13000 ft. (W. W. Smith 3851, 26 Jul. 1910, CAL); Kapoop, 13000 ft. (W. W. Smith 3425, 13 Jul. 1910, CAL); Lumtso, 15000 ft. (Smith & Cave 1442, 14 Jul. 1909, CAL); Thanka, 16000 ft. (Ribu & Rhomoo 5802, 25 Nov. 1911, B); Tosa, 14000 ft. (W. W. Smith 4034, 2 Aug. 1910, CAL).

**BHUTAN:** Yakuna, 4224 m (R. Bedi 69, 8 Jun. 1971, K).

**XIZANG (TIBET):** Yatung, 27°51'N, 88°35'E (H. E. Hobson 1897, K); Chumbi & Phari (Dungboo s.n., Jul. 1879, B, K); Budi Tsepo Kongbo, 13000 ft. (F. Ludlow et al. 14429, 21 Aug. 1947, UPS); Medog, 4000–4400 m (Li & Cheng 1161, 8 Oct. 1982, PE); Zayu, 4100 m (Qing-Zang expedition team 10243, Sept. 1982, KUN).

**YUNNAN:** Dokeria, Atuntze, 3500 m (C. W. Wang 64922, 3–5 Aug. 1935, KUN); loc. cit., 3700–4000 m (Feng 6208, 1 Aug. 1940, KUN); without precise locality (C. Schneider 3033, Aug. 1914, K).



**55. *Juncus sphacelatus* Decne.**

**PUNJAB:** Spiti, Losar, 13000 ft. (Gill 1976, 8 Aug. 1933, K); Dibibokri Nal, Kulu district, 12700 ft. (T. Sicelpe 3398, 27 Jun. 1952, BM).

**HIMACHAL PRADESH:** Spiti, Losar, 4100 m (U.C. Bhattacharyya 49004, 26 Jul. 1972, CAL).

**UTTRA PRADESH:** Tehri-Garhwal, 8000-9000 ft. (J. F. Duthie 479, Jul 1883, K); loc. cit., Rudugaira Gad, 13200 ft. (P. P. Huggins 181, Sept. 1952, BM).

**KUMAON:** United Provinces (Wallich 9001b, BM, K); without precise locality (R. Strachey & J. E. Winterbottom 4, BM, K).

**INDIA ORIENTALIS:** without precise locality (Griffith 9820, BM).

**NEPAL:** Thakurji Lekh, S. of Jumla, 12000 ft. (O. Polnin et al. 4737, 17 Jul. 1952, UPS); Maharigaon, 3 miles N. E., 14500 ft. (O. Polunin et al. 125a, 13 Jul. 1952, BM); near Jangla Bhanjyang, 13500 ft. (O. Plounin et al. 2367, 3 Jul. 1952, A, BM, CAL, UPS); near Seng Khola, 14000 ft. (J. D. A. Stainton & L. H. J. Williams 3815, 10 Aug. 1954, A, BM, UPS); Khangsar, 16500 ft. (D. G. Lowndes 1264, 28 Jul. 1950, BM); above Dogadi Khola, 13500 ft. (J. D. A. Stainton & L. H. J. Williams 3214, 21 Jun. 1954, A, BM, CAL, UPS); Namdo, N. of Mustang, 17000 ft. (J. D. A. Stainton & L. H. J. Williams 2291, 8 Aug. 1954, A, CAL, UPS); loc. cit., 16500 ft. (J. D. A. Stainton & L. H. J. Williams 2313, 9 Aug. 1954, BM, UPS); Gandaki Zone, Gorkha distr., Thangmanang Kharka, 28°33'09"N, 84°39'19"E, 4160m (M. Suzuki et al. 9470345c, 6 Aug. 1994, TI); Kyangin Ghyang, 13500 ft. (O. Polunin 250, 9-10 Jun. 1949, BM); Upper Mailung Khola, 28°N14'E, 85°N13'E, 4300 m (J. H. Hass 2485, 22 Aug. 1974, BM); Rasuwa, Jaisuli Kund - Paldol Base Camp, 4320 m (F. Miyamoto et al. 9410147, 2 Aug. 1994, TI); loc. cit., Gadje - Surjakund - Gosainkund, 4450 m (H. Kanai & S. B. Malla 674892, 26 Aug. 1969, TI); S. of Gosainkund, 3900 m (J. H. Hass 2201, 11 Aug. 1974, BM); N. E. of Gosainkund, 4550 m (J. H. Hass 2281, 16 Aug. 1974, BM); Langtang Jang Glacier, 15000-15500 ft. (A. Richards 71, 9 Aug. 1969, BM); Rasuwa, Base Camp - Yala Kharka - Kyangjin Kharka - Langtang, 4800 m (H. Takayama et al. 9220347, 22 Jul. 1992, TI); loc. cit., Base Camp - Yala Kharka - Yathang - Langtang Khola, 4000 m (H. Takayama et al. 9220283, 19 Jul. 1992, TI); loc. cit., Kyangjin Kharka - Tarche Pisa - Tashigang - Yala kharka, 4580 m (H. Takayama et al. 9220163, 14 Jul. 1992, TI); Solukhumbu, Chhomalung Base Camp - Seto Pokhari, 4400 m (F. Miyamoto et al. 9580306, 12 Aug. 1995, KATH, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalung Base Camp, 4600 m (F. Miyamoto et al. 9580285, 11 Aug. 1995, KATH, TI); loc. cit., Tangna - Sabsitsho - Dik Kharka, 4300 m (F. Miyamoto et al. 9580234, 6 Aug. 1995, KATH, TI); loc. cit., around Dudh Kund, 4300 m (F. Miyamoto et al. 9580440, 26 Aug. 1995, KATH, TI); loc. cit., Dik Kharka - Khare, 4300 m (F. Miyamoto et al. 9580242, 7 Aug. 1995, KATH, TI); loc. cit., Panch Pokhari - Seto Pokhari, 4780 m (F. Miyamoto et al. 9580326, 16 Aug. 1995, KATH, TI); Ramechhap, Baula Pokhari - a peak - Chhu - Ningma, 4100 m (H. Ohba et al. 8570389, 11 Jul. 1985, TI); loc. cit., Botase kharka - a stream - Koshing Kharka, 4150 m (H. Ohba et al. 8570642, 21 Jul. 1985, TI); loc. cit., 4300 m (H. Ohba et al. 8580365, 21 Jul. 1985, TI); loc. cit., Jata Pokhari - Panch Pokhari - the ridge between Khimti Khola East and West - Jata Pokhari, 4220 m (H. Ohba et al. 8530326, 17 Jul. 1985, TI); loc. cit., Ramechhap, Jata Pokhari - Panch Pokhari - Botase Kharka, 4270 m (H. Ohba et al. 8541107, 20 Jul. 1985, TI); Khumbakarana Himal, Makalu, Upper Barun valley, 4900 m (T. Wraber 193, 15 Sept. 1972, BM); Kosi zone, Sankhuwa Sabha district, Ribuk, Barun Khola, 25 km N. W. Num, 27°45'N, 87°11'E, 3843 m (H. B. Emery CH20, 30 Jun. 1974, K); loc. cit., Lower Barun Glacier, near Mera, 27°48'N, 87°07'E, 4420 m (D. G. Long et al. 515, 3 Oct. 1991, KATH); Jaljale Pokhari, 27°28'N, 87°27'E, 4000 m (J. F. Dobremez 1667, 22 Aug. 1972, BM); Tamo La - Sinion La, 27°37'N, 87°57'E, 4060 m (C. G. Wilson et al. 673, 15 Sept. 1989, KATH); Sankhuwasabha district, Upper valley of tributary of Barun Khola, NE of Pemathang Kharka, 27°45'N, 87°13'E, 3970 m (D. G. Long et al. 609, 9 Oct. 1991, KATH); loc. cit., Jaljale Himal, ridge near Panch Pokhari lakes at head of Panch Pokhari Khola, 27°32'N, 87°28'E, 3880 m (D. G. Long et al. 907, 19 Oct. 1991, KATH);

Sankhuwasawa, Jomle - Goja (Goja Kharka), 4000 m (H. Ohba et al. 9120224, 5 Aug. 1991, TI); Sankhuwasabha district, Jaljale Himal, ridge near Panch Pokhari lakes at head of Panch Pokhari Khola, 27°32'N, 87°28'E, 3880 m (D. G. Long et al. 907, 19 Oct. 1991, KATH); Kambachen to Lhonak, 27°44'N, 88°01'E, 4690 m (C. G. Wilson et al. 532, 10 Sept. 1989, KATH); Yañgune Khola valley above Pholle, 4500 m (Curzon 35, 22 Sept. 1985, K); Maccherma, 27°54'N, 86°43'E, 4500 m (J. F. Dobremez 377, 7 Jul. 1970, BM); Cho Oyo (G. Miehe 1093, 25 Sept. 1982, BM); Thakurji Lekh, S. of Jumla, 12000 ft. (O. Polunin et al. 4737, 17 Jul. 1952, A, BM); without precise locality (Wallich 9001a, 1821, BM).

**SIKKIM:** Chouga, 12000–13000 ft. (W. W. Smith 4280, 13 Aug. 1910, CAL); Ghalloot, 13000 ft. (S. Kurz s.n., CAL); Jarigla, 8000–9000 ft. (J. F. Duthei 479, 27 Jul. 1883, CAL); Llouok, 14000 ft. (Smith & Cave 2071, 30 Jul. 1909, CAL); Darjeeling, Gamatang, 3800 m (H. Hara et al. s.n., 27 May 1960, KYO); without precise locality, 13000–15000 ft. (T. Anderson 1337, 9 Oct. 1862, CAL); without precise locality, 12000–16000 ft. (J. D. Hook s.n., A, BM, CAL, K, S).

**BHUTAN:** Upper Mo Chu district, N. side of shingche La, 28°04'N, 89°37'E, 4640 m (I. W. J. Sinclair & D. G. Long 5270, 23 Sept. 1984, K); Wangdi Phodrang district, Tampetso - Tsonsohang, 27°48'N, 90°24'E, 3900 m (F. Miyamoto 9361628, 22 Sept. 1993, TI); loc. cit., S. of Rinchenzo, 27°58'N, 90°21'E, 4920 m (F. Miyamoto 9361649, 23 Sept. 1993, TI); loc. cit., Chukarpo, 27°49'N, 90°23'E, 4300 m (F. Miyamoto 9361651, 23 Sept. 1993, TI); Waitang Tsampa, 13500 ft. (F. Ludlow et al. 19237, 24 Jun. 1949, BM, UPS).

**XIZANG (TIBET):** Chumbi & Phari (Dungboo s.n., Jul. 1879, B, CAL, K); Yadong, 4400 m (Qing-Zang expedition team 74-2734, 20 Sept. 1974, KUN); Dengqen (S. K. Wu 4910, 21 Aug. 1976, KUN); Baxoi Xian, Rawu - Vaxoi, 4180 m (S. Akiyama et al. 105180, 4 Aug. 2000, KUN, TI); Nangarke, 15000 ft. (C. H. J. Walton T19, Jul. 1904, K).

**YUNNAN:** Ad confines Tibeticas sub jugo Dokerla, 28°15'N, 4226 m (F. Handel-Mazzetti 8174, 18 Sept. 1916, S, W); Bai-ma-shan, A-tun-tze, 3400 m (C. W. Wang 69508, Sept. 1935, A, KUN, PE); loc. cit. (C. W. Wang 69572, Sept. 1935, A, PE); loc. cit., 3500 m (C. W. Wang 9573, Sept. 1935, KUN); Atuntze, Paimashan, sanyungpa, 4150 m (T. T. Yü 9273, 29 Jul. 1937, A, KUN, PE); Weihsi, Tungchuling, Tsidang, 4000 m (T. T. Yü 8982, 14 Jul. 1937, KUN, PE); Hi-ma-la, Tsa-wa-rung, 3700 m (C. W. Wang 65612, Sept. 1935, A, PE); Si Konkaling, Tsungu, 3900 m (T. T. Yü 13031, 30 Aug. 1937, A, KUN, PE).

**SICHUAN:** Kangting (Tachienlu) district, Tapaoshan, 4200 m (H. Smith 11313, 20 Aug. 1934, PE, S, USP); Daocheng, Gongga Shan (Qing-Zang expedition team 5587, 29 Aug. 1981, KUN); Daocheng: around Gongga Shan, 4500 m (S. K. Wu et al. 1562, 23 Aug. 1996, KUN, TI); In jugi Tschescha ad septentr. Pagi Yunnanensis Yunging in districtu monasterii Muli regione frigide temperata, 4101 m (F. Handel-Mazzetti 7249, 25 Jul. 1916, S, W); Muli, 4200 m (Qing-Zang expedition team 14784, 14 Sept. 1983, KUN); Hsoeh-shan, 4300 m (H. Smith 3737, 22 Jul. 1924, PE); Taofu (Dawo) district, Mt. Yara, N. W. glacier valley, 4100 m (H. Smith 11609, 29 Aug. 1934, PE); loc. cit., valley W. of Mt. Yara, 3700 m (H. Smith 11726, 1 Sept. 1934, PE); Xiaojin, Rilong - a pass of Balang Shan - Rilong, 4000 m (H. Ikeda et al. 100805, 29 Aug. 1998, KUN, TI); Fupien Hsien, 3400 m (T. T. Yü 2454, 8 Aug. 1933, PE).

**SHAANXI:** Ta-pai-shan (G. Giraldi 6746, 10–20 Aug. 1895, S).

#### 56. *Juncus spumosa* Noltie

**CHINA. YUNNAN:** Lushui Xian, Pianma - Pianma Pass - Lushui, 2600 m (S. K. Wu et al. 103174, 102179, 13 Sept. 1999, KUN, TI).

#### 57. *Juncus thomsonii* Buchenau

**PAKISTAN:** Lahul, Serchu, 14000 ft. (F. Schmid 491, 20 Jul. 1953, BM).

**KASHMIR:** Deosai Plains, 13000 ft. (C. B. Clarke 29824, 31 Jul. 1876, K, S); loc. cit., 13000 ft. (R. R.



Stewart 20060, 20096, 30 Jul. 1940, CAL); Deosai (W. N. Koelz 6465, 14 Aug. 1933, A); Upper end of Hushe valley, Ghondakoro Glacier basin at the foot of the Masherbrum, 13000 ft. (R. R. Stewart 20096, 30 Jul. 1940, A, CAL); Ladak Rangtse La, 13500 ft. (R. Meinertzhagen s.n., Jun. 1950, BM); Tsakzhun Tso, 15000 ft. (G. L. Webster & E. Nasir 6122, 14 Jul. 1955, A); Taklung La, 17000 ft. (W. N. Koelz 2480, 31 Jul. 1931, S); Tsultak, Ladak, 16000 ft. (W. N. Koelz 2396, 20 Jul. 1931, S).

**PUNJAB:** Maqin Xian, Heitu Shan, Dawu Xiang, at pass between Jungong and Maqin, 34°23'09"N, 100°23'33"E, 4220 m (W. N. Koelz 2100, 22 Jun. 1931, S).

**HIMACHAL PRADESH:** Rotang Pass (Kulu and Lahoul), 13140 ft. (U.C. Bhattacharyya 49179, 31 Jul. 1972, CAL); Spiti, Kunzum Base, 4400 m (M. Nath s.n., 9 Aug. 1935, CAL); Lahul, Sarehu, 13000 ft. (N. L. Bor 9251, 16 Jul. 1938, K); without precise locality, 10000-15000 ft. (U.C. Bhattacharyya 48973, 24 Jul. 1972, CAL).

**KUMAON:** Konkonor 10500 ft. (K. M. Liou 6265, 26 Jul. 1936, PE); Marto li, 9000 ft. (R. Strachey & J. E. Winterbottom 9, K); Shushal, 15400 ft. (T. R. Chand 711, 14 Jun. 1948, L).

**WESTERN HIMALAYA:** Lichiang valley, 27°10'N, 9000 ft. (R. Meinertzhagen s.n., 7 Jun. 1925, B)

**NEPAL:** 4 miles N. E. of Saipal, 17000 ft. (J. D. A. Stainton et al. 1170, 15 Jun. 1954, BM); Talphi, Pansae Dara, 9300 ft. (O. Polunin 259, 9-10 Jun. 1949, BM); loc. cit. (J. D. A. Stainton 372, 21 May 1956, BM, UPS); Balangra pass, 12000 ft. (O. Polunin et al. 942, 12 May 1952, A, BM, UPS, CAL); near Balangra Pass, 15500 ft. (O. Polunin et al. 1030, 28 May 1952, A, BM, UPS); near Kagbeni, 3500 m (O. Namikawa 431, 3 Oct. 1958, KYO); Muktinat, 28°49'N, 83°55'E, 3700 m (J. E. M. Arnold 278, 26 Aug. 1954, BM); Dhorpatan, 9200 ft. (S. Einarsson et al. 2887, 6 Aug. 1973, BM); Dhorpatan, 9200 ft. (P. C. Gardner 744, 745, 14 Jun. 1953, BM); Dhaulagiri zone, Mustang district, Syangboche - Ghami, 29°00'16"N, 83°50'48.8"E, 3680 m (F. Miyamoto et al. 20210112, 17 Aug. 2002, TI); S. W. on the Dhauligiri Range and E. of the main trail from Dhorpatan to Tarakot via Jangla Barjyang (J. L. Fox s.n., Mar-Jun. 1975, TI); near Chalike Pahar, 13000 ft. (J. D. A. Stainton et al. 2638, 27 Apr. 1954, A, BM); Kali Gandaki, S. E. Tini, 9000 ft. (D. McCosh 154, 29 May 1964, BM); Marsiandi valley, 11500 ft. (Bernard Yon s.n., 14 Jul. 1974, BM); Tukucha, Kaligandaki, 12000 ft. (J. D. A. Stainton 7096, 15 Jun. 1974, BM); Rasuwa, Tinbu Kharka - Sano Bhera Kharka - Tulo Bhera Kharka, 4100 m (F. Miyamoto et al. 9410096, 28 Jul. 1994, TI); loc. cit., Yala Kharka - Base Camp, 4800 m (H. Takayama et al. 9220219, 16 Jul. 1992, TI); loc. cit., Kyangjin Kharka - Tarche Pisa - Tashigang - Yala Kharka, 4230 m (H. Takayama et al. 9220177, 14 Jul. 1992, TI); loc. cit., 4220 m (H. Takayama et al. 9220174, 14 Jul. 1992, TI); loc. cit., around Base Camp, 4920 m (H. Takayama et al. 9220321, 21 Jul. 1992, TI); loc. cit., Base Camp - Yala Kharka - Kyangjin Kharka - Langtang, 4300 m (H. Takayama et al. 9220350, 22 Jul. 1992, TI); loc. cit., Langtang Khola - Pirogona - Pyung - a pass - Base Camp, 4300 m (H. Takayama et al. 9220309, 20 Jul. 1992, TI); loc. cit., 4020 m (H. Takayama et al. 9220308, 20 Jul. 1992, TI); loc. cit., 4030 m (H. Takayama et al. 9220312, 20 Jul. 1992, TI); Khanging Ghyang, 13500 ft. (L. H. J. Williams 862, 23 Jun. 1969, A, BM); Langtang valley, 13000 ft. (S. Nakao s.n., 17 May 1953, KYO); Rolwaling, 27°45'N, 86°15'E, 12000 ft. (D. G. Lowndes 1072, 27 Jun. 1950, BM); Ghunsa, 3600 m (H. Tabata et al. 11795, 20 Jul. 1978, KYO); Inukhu Khola, Naulekh, 27°38'N, 86°50'E, 13000 ft. (G. Mische 170, 15 Jul. 1977, BM); Solukhumbu, Saure Kharka - Tangna, 3900 m (F. Miyamoto et al. 9580201, 5 Aug. 1995, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalang Base Camp, 4660 m (F. Miyamoto et al. 9580263, 11 Aug. 1995, TI); loc. cit., Seto Pokhari - Chhomalang Base Camp, 5000 m (F. Miyamoto et al. 9580332, 17 Aug. 1995, TI); loc. cit., Panch Pokhari - Seto Pokhari, 4780 m (F. Miyamoto et al. 9580327, 16 Aug. 1995, TI); Sankhuwasabha district, Barun Khola between Pemathang Kharka and Nehe Kharka, 27°44'N, 87°11'E, 3520 m (D. G. Long et al. 408, 29 Sept. 1991, KATH) Arun valley, Thudam E. of Chyamtang, 12500 ft. (T. Wraber 34493, 15 Sept. 1972, BM); Khumbakarna Himal, Makalu, Upper Barun valley, 4900 m (J. D. A. Stainton et al. 3134, 16 Jun. 1954, A, BM, CAL); Taplejung district, from Nup to Yangma, 3880-4010 m (J. D. A. Stainton & L. H. J. Williams

2638, 27 Apr. 1954, BM, UPS, CAL); Near Lapsang, Simbua Khola, 27°34'N, 87°57'E, 4330 m (C. G. Wilson et al. 761, 19 Sept. 1989, KATH); Between Tamo La and Sinicn La, 27°37'N, 87°57'E, 4100 m (C. G. Wilson 674, 15 Sept. 1989, KATH); Chairam, 27°33'N, 87°58'E, 12500 ft. (J. F. Dobremez 3042, 19 May 1954, BM); Kambachen, 27°44'N, 87°59'E, 4100 m (C. G. Wilson et al. 606, 12 Sept. 1989, KATH); Kambachen to Lhonak, 27°44'N, 88°01'E, 4690 m (C. G. Wilson et al. 533, 10 Sept. 1989, KATH); near Lapsang, Simbua Khola, 27°34'N, 87°59'E, 4330 m (C. Barclay & P. M. Synge 2610, 6 Jun. 1971, K); Basia Banjang, 4500 m (O. Polunin et al. 2574, 26 Jul. 1952, A, BM); Changyam Khola, 13500 ft. (D. C. Gardner 744, 745, 14 Jun. 1953, TI); loc. cit., 13500 ft. (O. Polunin et al. 2574, 26 Jul. 1952, UPS, CAL, L); Phopa (O. Namikawa 182, 16 Aug. 1958, KYO); Prov. De La, Frontiere N. O. alpage au-dessus de Gittidas, 4300 m (S. Crawford et al. KEKE761, 19 Sept. 1989, K); Trail to Tilicho, 13400 ft. (A. D. Schilling et al. 408, 25 Jun. 1965, K); Tsarkachuglang (K. Nishioka 461, 1 Jun. 1962, KYO).

**SIKKIM:** without precise locality, 34°19'N, 82°12'E, 16500 ft (Ribu & Rhomoo 5657, 25 Nov. 1911, B);

Thamootsa, W. Jongri (J. D. Hooker 1849, K); Jongri (G. King's collector, s.n., Jun. 1887, CAL); W. Jongri (G. King's collector, s.n., CAL); Along the Choktsering Chu, north of Jongri, 4000–4500 m (H. Hara et al. s.n., 25 May 1960, TI); Jongri - Olothang, 4300 m (H. Hara et al. s.n., 23 May 1960, TI); Nakuchu, 16000 ft. (G. King's collector, s.n., 1889, K); Ghora La, 16000 ft. (J. D. Hooker s.n., S); Khambajong (W. W. Smith 3648, 22 Jul. 1910, CAL); Beeroon, 11000 ft. (G. King's collector, s.n., Jun. 1887, CAL); Beeroon, 11000 ft. (G. King's collector, s.n., Jun. 1887, BM); Chamnago, 11000–12000 ft. (W. W. Smith 3270, Jun. 1910, CAL); Llovok 14500 ft. (S. Kurz s.n., CAL); Tha moo tsa (G. King's collector, s.n., May 1885, CAL); Tongri, 13500–15000 ft. (Smith & Cave 1911, 3 Aug. 1909, CAL); W. Chaugh, 12000 ft. (T. Anderson 1332, 8 Oct. 1862, CAL); Changa, 12000 ft. (R. E. Cooper 38, 28 Un. 1913, KATH); without precise locality (Ribu & Rhomoo 2753, Sept-Oct. 1909, CAL); without precise locality (S. Kurz s.n., CAL); without precise locality (G. King's collector, s.n., May 1885, B, CAL); without precise locality, 12000–15000 ft. (C. B. Clarke 25717, 27 Oct. 1875, CAL); without precise locality, 12000–15000 ft. (M. F. E. Younghusband 148, 26 Jul. 1903, CAL).

**BHUTAN:** Chabecha - Goy - Lingshi, 3600–3900 m (H. Kanai et al. 6687, 24 May 1967, TI); Seanchu Passa - Okhu La - Chabecha, 3600 m (H. Kanai et al. 7520, 21 May 1967, TI); Wangdi Phodrang district, Thintaso, 27°02'N, 90°31'E, 4000 m (F. Miyamoto 9361583, 20 Sept. 1993, TI); loc. cit., Tamp La, 27°44'N, 90°31'E, 4500 m (F. Miyamoto 9361613, 21 Sept. 1993, TI); loc. cit. (F. Miyamoto 9361695, 25 Sept. 1993, TI); loc. cit., 4300 m (F. Miyamoto 9361699, 25 Sept. 1993, TI); Waitang, Tsampa, 13500 ft. (F. Ludlow et al. 16300, 21 May 1949, BM); Byakar, Bumtang Chu, 27°33'N, 90°43'E, 2750 m (F. Ludlow et al. 16393, 28 May 1945, A, BM, CAL, UPS); Byakar, Bumtang Chu, small valley near Dzong, 27°33'N, 90°43'E, 2750 m (A. T. C. Grierson & D. G. Long 1762, 9 Jun. 1979); Barshong, Thimbu Chu, 11500 ft. (F. Ludlow et al. 19238, 24 Jun. 1949, BM).

**EAST HIMALAYA:** Lintan, 3000 m (Townaud 505, CAL).

**HIMALAYA:** Himal Bor. Occ., Sin long Chan (T. Thomson s.n., K)

**XIZANG (TIBET):** Nyalam, 3710 m (T. Thomson s.n., CAL); Yatung, 27°51'N, 88°35'E (F. Ludlow et al. 13790, 27 May 1947, A); Chumbi (C. S. Cuthing & A. S. Vernay 116A, 10 Sept. 1935, K); Khambajong (Dungboo s.n., 1879, K); S. of Lhasa, 12500 ft. (F. Ludlow et al. 13790, 27 May 1947, UPS); Cona, 4260 m (N. M. Przewalski s.n., 1884, K); Ba valley, 9900 ft. (J. E. Winterbottom 797, 13 Jul. 1847, K); Nunkhu Phu Chu valley, near Tongkyuk, 11500 ft. (L. R. Wager 215, 6 Jul. 1933, K); loc. cit., Nunkhu Phu Chu valley, near Tongkyuk, Pome, 11500 ft. (M. F. E. Younghusband 148, 26 Jul. 1903, CAL); loc. cit. (collector unknown s.n., 1–4 Jul. 1856, K); Markam Xian, Lawu Shan, 4400 m (S. Akiyama et al. 105025, 14 Jul. 2000, KUN, TI). Cholzhong, 15000 ft. (M. R. W. G. Hingston 228, 24 Jun. 1924, K); Dochen Lake camp, 15000 ft. (A. P. Chiefly 858, 31 Jul. 1896, K); Gautsa, 13000 ft. (B. J. Gould 2190, 24 Jun. 1939, K); Gnari Khorsum (F. Ludlow & G. Sherriff 8670, 6 Jun. 1942, B, L, UPS); loc. cit., 14800–15500 ft. (Zhang & Lang 4617, 1 Jul. 1966, KUN);



Kenaoots in Ronglo (R. P. Soulié 960, 1893, K); Kiblesans, 14000–15000 ft. (Stoliczka s.n., CAL); Kuma, 14000 ft. (Bor & Ram 20546, 21 Jun. 1945, K); Laugphu Chu, 12000 ft. (J. F. Rock 14248, Jun. 1926, A, K, S); Pangkong province, Panamik on the lake Tsomognalari to Durguk (collector unknown 6611, 17–26 Jul. 1856, A); Pangkong Lake, 14000 ft. (collector unknown s.n., 5–15 Sept. 1855, L); Ronaphar valley, 1200 ft. (F. Ludlow et al. 13790, 27 May 1947, CAL); Rupehu, 15000–18000 ft. (R. Strachey & J. E. Winterbottom 11, K); Tal des Alyk-norin-holy, 12100 ft. (H. E. Hobson s.n., K); Tongolo (H. Smith s.n., 7 Jul. 1901, S); Vallup, 15000 ft. (Qing-Zang expedition team 74-2744, 2 Oct. 1974, KUN); without precise locality, 10000–15000 ft. (Stoliczka s.n., CAL); without precise locality, 14000–16000 ft. (T. Thomson s.n., 11 Sept. 1847, K); without precise locality (Mt. Everest expedition team 44, 19 Jun. 1938, K).

**QINGHAI:** Maqin Xian, Muchang, Dawu Xiang, S. E. of Maqin, 34°20'03"N, 100°30'34"E, 3980 m (T. N. Ho et al. 655, 2 Aug. 1993, A); Wu-chuan Hsien, Pa-lan Shan, 3500 m (T. N. Ho et al. 796, 5 Aug. 1993, A).

**GANSU:** Suehloshan, Min Hsien, 3000 m (T. P. Wang 4787, 1 Jul. 1936, PE); Sin long Chan (A. E. Licent 4379, 14 Jul. 1918, K); Regio Tangut (T. Anderson s.n., 4 Jun. 1837, CAL); without precise locality (T. T. Yü 14599, 22 Oct. 1937, BM); without precise locality (G. N. Potani s.n., 1883, K).

**YUNNAN:** Huann-fu-ping, A-tun-tze, 3700 m (C. W. Wang 65237, Aug. 1935, PE); Tehching (Atuntze) Miyetzimu, 3350 m (N. M. Przewalski s.n., 1880, CAL); Tehching (Atuntze), Mitzimu, 3350 m (T. T. Yü 8019, 6 Apr. 1937, PE); Litiping between Likiang and Weihsi (C. W. Wang 68742, Aug. 1935, PE); Zhongdian Xian, Tianchi, near Zhongdian, 3900 m (S. Akiyama et al. 415, 8 Jul. 2000, KUN, TI); Muli, Wachin, Jin-chang, 4000 m (T. T. Yü 8633, 19 Jun. 1937, BM); Li-chiang, Snow range, 2700 m (T. T. Yü 7052, 6 Jul. 1937, A, PE); loc. cit. (R. C. Ching 20806, 24 Jun. 1939, A); without precise locality (T. T. Yü 8019, 6 Apr. 1937, PE).

**SICHUAN:** Taofu (Dawo) district, Haitzeshan, 3700 m (H. Smith 3051a, 5 Aug. 1922, UPS); Tsipula, 4200 m (H. Smith 11311, 20 Aug. 1934, S, UPS); Daocheng, 4300 m (F. Handel-Mazzetti 3055, 15 Jun. 1914, S); loc. cit., Bowa Shan, 4300 m (S. K. Wu et al. 1518, 17 Aug. 1996, KUN, TI); Wolo-ho inter Yenyuen et Yungning, 3300 m (F. Handel-Mazzetti 2832, 4 Jun. 1914, S); Mu-li, Ku-lu-dar-s, 3400 m (T. T. Yü 14599, 22 Oct. 1937, A); Chi-na-tung, Tsa-wa-rung, 2800 m (A. K. Bulley 2148, May 1906, K); Yenyuen, 28°10'N, 3150 m (F. Handel-Mazzetti 1762, 26 Apr. 1914, S); Yenyuen, 2600 m (F. Handel-Mazzetti 2559, 25 May 1914, S); Taofu (Dawo) district, Haitzeshan, 3700 m (H. Smith 11311, 20 Aug. 1934, KYO, PE); Kangting (Tachienlu) district, Tapaoshan, 4200 m (H. Smith 4292, 4 Sept. 1922, S, UPS); loc. cit., 4400 m (S. K. Wu et al. 1501, 16 Aug. 1996, KUN, TI); loc. cit., around Gongga Shan, 4500 m (S. K. Wu et al., 448, 4 Aug. 1997, KUN, TI); Xiaojin, Ganhaizi - Dashuiba - Ganhaizi, 3600 m (H. Ikeda et al. 100820, 31 Aug. 1998, KUN, TI); Sung-pan (E. Licent 4279:01:00, 14 Jul. 1918, UPS); loc. cit., 3100 m (F. T. Wangn 21186, 5 Jun. 1930, S); Daliang schan, Ningyuen, 2725 m (H. Smith 11351, 27 Aug. 1934, PE); inter Merge et Pankar, 4500 m (H. Smith 2209, 22 Jul. 1911, S, KYO, PE); Mellan Mergeoch, 4500 m (H. Smith 2209, 11 Jul. 1922, UPS); Phulloot, 11000 ft. (Tibet expedition team 5149, 23 Aug. 1981, KUN).

**SHAANXI:** Taipei schan (H. Smith 11351, 27 Aug. 1934, S, UPS).

### 58. *Juncus tobdeniorum* Noltie

**NEPAL.** Gai Kharka, Kasua Khola (16 km, N. Num), Sankhuwa Sahba District, Koshi zone, 27°42'N, 87°16'E, 3172 m (B. H. Emery BHE86, 9 Jul. 1974, K).

### 59. *Juncus trachyphyllus* Miyam. & H. Ohba

**NEPAL.** Dhaulagiri zone, Mustang district, North-west of Lo-Manthang, 29°14'50"N, 83°54'28"E, 4530 m (F. Miyamoto et al. 20210166, 21 Aug. 2002 TI).

**CHINA. SICHUAN:** Daocheng, around Gongga Shan, Zhong Niuan, 4260 m (S. K. Wu et al. 1540, 21 Aug.

1996, KUN, TI); loc. cit., Beiyu, 4200 m (S. K. Wu et al. 1552, 22 Aug. 1996, KUN, TI); loc. cit., Gongga Zhonggu - Riwa Xiang - Gongling - Daocheng, 3900 m (S. K. Wu et al. 1579, 25 Aug. 1996, KUN, TI-paratype of *J. trachyphyllus*); loc. cit., around Gongga Zhonggu, 3880 m (S. K. Wu et al. 443, 3 Aug. 1997, KUN, TI).

#### 60. *Juncus trichophyllus* W. W. Sm.

**NEPAL:** Rasuwa, a Kharka - Pati Kharka, 3650 m (F. Miyamoto et al. 9410194, 4 Aug. 1994, TI); Solukhumbu, Chalem Kharka - Jar Kharka, 4200 m (F. Miyamoto et al. 9580155, 1 Aug. 1995, TI); loc. cit., Pike - Pike Peak - Pike, 3820 m (F. Miyamoto et al. 9580059, 23 Jul. 1995, TI); Koshi zone, Sankuwasawa district, Cha Ding Kharka - Tutu La - Thulo Pokhari - Siptong Pass (Keke La) - Sano Pokhari - Khongma, 3900 m (M. Minaki et al. 90208629, 13 Aug. 1990, TI); loc. cit., Tributary on N side of Barun Khola, opposite Shipton La, 27°45'N, 87°14'E, 4200 m (D. G. Long et al. 653, 10 Oct. 1991, KATH);

**SIKKIM:** without precise locality (G. King's collector, s.n., K).

**BHUTAN:** Wangdi Phodrang district, Tintatso, 27°42'N, 90°31'E, 4300 m (F. Miyamoto 9361739b, 27 Sept. 1993, TI).

#### 61. *Juncus triglumis* L.

**NEPAL:** Ramechhap, Koshing Kharka - Thare Og, 4000 m (H. Ohba et al. 8570735, 22 Jul. 1985, TI); loc. cit., 4100 m (H. Ohba et al. 8530421, 22 Jul. 1985, TI); Sankhuwasawa, Khokling (Khokling Kharka) - Jaljale (Jaljale Himal) (H. Ohba et al. 9153180, 21 Jul. 1991, TI); loc. cit., around Banduke (H. Ohba et al. 9153291, 31 Jul. 1991, TI); loc. cit., around Cha Ding Kharka and Shipton Pass, 4100 m (M. Minaki et al. 9020712, 9020745, 9 Aug. 1990, TI); loc. cit., Khongma - Sano Pokhari - Siptong Pass (Keke La) - Thulo Pokhari - Tutu La - Cha Ding Kharka (M. Minaki et al. 9020637, 5 Aug. 1990, TI); loc. cit., Khokling (Khokling Kharka) - Jaljale (Jaljale Himal), 4000 m (H. Ohba et al. 9110148, 21 Jul. 1991, TI); loc. cit., Rato Odara - beside a river - a pass - a pass - Chhomalung Base Camp, 4660 m (F. Miyamoto et al. 9580266, 11 Aug. 1995, TI); loc. cit., Chalem Kharka - Jar Kharka, 4250 m (F. Miyamoto et al. 9580147, 1 Aug. 1995, TI); loc. cit., Gnaula - Pike, 3550 m (F. Miyamoto et al. 9580052, 22 Jul. 1995, TI); Ding Kharka, 3870 m (M. Minaki et al. 9020637, 90206807, 5 Aug. 1990, TI); Sankhuwasabha district, Tributary valley of Barun Khola, NE of Pemathang Kharka, 27°44'N, 87°13'E, 4000 m (D. G. Long et al. 596, 8 Oct. 1991, KATH).

**SIKKIM:** Jongri (G. King's collector, s.n., K); loc. cit., 13000 ft. (C. B. Clarke 26088, 15 Oct. 1875, K); East district, Tsomgo Chho, 27°22'14"N, 88°45'52"E, 3720 m (D. G. Long & H. J. Noltie 54, 8 Jul. 1996, E, TI); Chokung chu, 13000–14000 ft. (W. W. Smith 3853, 26 Jul. 1910, CAL); Chola, 12000–13000 ft. (W. W. Smith 3922, 28 Jul. 1910, CAL); Phaloot, 13000 ft. (S. Kurz s.n., CAL); Rarakorum, 13500 ft. (C. B. Clarke 30339, 10 Aug. 1876, K); Thenga, 14000 ft. (Lepeha 2844, 2 Nov. 1909, CAL); without precise locality, 12000–15000 ft. (J. D. Hooker s.n., Sept. 1849, K).

**BHUTAN:** Pajoding, above Thimphu, 27°29'N, 89°35'E, 3750 m (A. J. C. Grierson & D. G. Long 2783, 19 Jul. 1979, E, K); Wangdi Phodrang district, Tsonsothang, 27°48'N, 90°24'E, 3900 m (F. Miyamoto 9361639, 22 Sept. 1993, TI); loc. cit., 4300 m (F. Miyamoto 9361681, 24 Sept. 1993, TI); loc. cit., Tintatso-Tampe La, 27°43'N, 90°31'E, 4400 m (F. Miyamoto 9361620, 21 Sept. 1993, TI); loc. cit., Chukarpo, 27°49'N, 90°23'E, 4300 m (F. Miyamoto 9361654, 23 Sept. 1993, TI).

**XIZANG (TIBET):** Chumbi & Phari (Dungboo s.n., Jul. 1879, B, CAL); Cona, 4260 m (Tibet expedition team 74-2744, 2 Oct. 1974, KUN); Raj hoti, 15000 ft. (R. Strachey & J. E. Winterbottom 1, K).

**HUBEI:** Chili Prov., Hsiao-wu-tai-shan, 3200 m (H. Smith 1230, 22 Sept. 1921, UPS); Hsiao-wu-tai-shan (C. T. Li 2224, 8 Jul. 1933, PE); loc. cit., 2400 m (C. T. Li 61427, 30 Jun. 1934, PE); Wuhe shan, 2700 m (Shanxi expedition team 636, 22 Aug. 1953, KUN).



**62. *Juncus uniflorus* W. W. Sm.**

**NEPAL:** Solukhumbu, Chhomalung Base Camp - Rato Odara, 4600 m (F. Miyamoto et al. 9580347, 18 Aug. 1995, TI); loc. cit., Chhomalung Base Camp - Seto Pokhari, 4400 m (F. Miyamoto et al. 9580304, 12 Aug. 1995, TI); loc. cit., around Cha Ding Kharka and Shipton Pass, 4150 m (M. Minaki et al. 9020823, 9 Aug. 1990, TI); Arun-Tamur Watershed, S. of Topke Gola, 13000 ft. (J. D. A. Stainton 872, 7 Jul. 1956, KATH).

**SIKKIM:** above Changu, 12000 ft. (W. W. Smith 3202, 8 Jul. 1910, K); Sherad Mang (R. E. Cooper 307, 18 Jul. 1913, KATH, S); Hills N. of Changu, 13500 ft. (R. E. Cooper 73, 26 Jun. 1913, KATH); without precise locality (collector unknown 972, CAL); without precise locality (collector unknown 1020, CAL); without precise locality, 6000-10000 ft. (J. D. Hooker s.n., L).

**BHUTAN:** N. E. Bhutan, Shingbe, Me La, 12000 ft. (F. Ludlow et al. 20693, 3 Jun. 1949, A, BM, UPS); Pajoding, above Thimphu, 27°29'N, 89°35'E, 3750 m (A. J. C. Grierson & D. G. Long 2783, 19 Jul. 1973, K); Wangdi Phodrang district, Tsonsohang, 27°49'N, 90°24'E, 4100 m (F. Miyamoto 9361636, 22 Sept. 1993, TI).

**XIZANG (TIBET):** Lusha Chu, Kongbo province, 29°20'N, 94°35'E, 12500 ft. (F. Ludlow et al. 4766, 10 Jun. 1938, BM).

**63. *Juncus wallichianus* Laharpe**

**NEPAL:** Ingyur - Gul Bhanjyang (H. Kanai & S. B. Malla 676151, 22 Aug. 1969, TI); Kathmandu (Wallich 8999, 1821, K); loc. cit., Nagarkot, 2000 m (H. Kanai et al. 6725239, 6725285, 24 Jun. 1967, TI); Dhankuta, Hile - Mure - Sinduwa - Bhalukhop - Chitre (H. Kanai et al. s.n., 5 Jun. 1972, TI); Sankhuwasawa, Hati Sar - Mangalbare - Lam Pokhari - Minchin Dhap (H. Hara et al. s.n., 28 Oct. 1963, TI); loc. cit., Minchin Dhap - Mul Pokhari (H. Hara et al. s.n., 29 Oct. 1968, TI); loc. cit., Hati Sar - Mangalbare - Lam Pokhari - Minchin Dhap (H. Hara et al. 6300868, 28 Oct. 1963, TI); loc. cit., Sedua - Mane Gaun - Tashi Gaun, 1600 m (M. Minaki et al. 9020463, 9020477-9020479, 2 Aug. 1990, TI); loc. cit., Bhuje - Gupha Pokhari - Lamo Pokhari - Chauke (H. Kanai et al. s.n., 4 Jul. 1972, TI); Taplejung, Nessum - Puntapla - Gorza Gaon - Bhuje (H. Kanai et al. s.n., 3 Jul. 1972, TI).

**SIKKIM:** on the way up Tiger Hill, 8000 ft. (E. Biswas 8631, 3 Nov. 1848, CAL); Gangtok, 5600 ft. (E. Biswas 7054, 19 May 1847, CAL); Gopal Dora (E. Biswas 55941, 23 Oct. 1841, CAL); Mungboo, 3600 ft. (W. W. Smith 183, 26 Sept. 1908, CAL); Descent from Buje Danda to the Tamur River, 27°20'N, 87°35'E, 2000 m (S. Crawford et al. KEKE 130, 31 Aug. 1989, K), Lachung, 8610 ft. (J. Pradham s.n., 8 Aug. 1943, K).

**BHUTAN:** Paro valley, 2550m (N. P. Balakrishnan 1241, 18 Aug. 1963, CAL).

**ASSAM:** Khasia, 4000-6000 ft. (J. D. Hooker & T. Thomson s.n., K).

**EAST HIMALAYA:** Seuchal (E. Biswas 3663, 28 Oct. 1839, CAL); without precise locality (A. B. Chowdhary s.n., 30 Jun. 1960, CAL).

**MYANMAR:** Kalaw (F. G. Dickason 5351, May 1932, A).

**XIZANG (TIBET):** Nyanlam, 2500 m (Qing-Zang expedition team 6090, 29 Jun. 1975, KUN); loc. cit. (Zhang & Lang 4458, 3 Jun. 1966, KUN).

**YUNNAN:** Gongshan, Dulong jiang, 1450 m (Dulong Jiang expedition team 1485, 30 Dec. 1990, KUN); Wei-si Hsien, 2800 m (C. W. Wang 67632, Aug.-Sept. 1935, A); Ta-li Hsien, 2800 m (H. T. Tsai 53915, 29 Jul. 1933, A); loc. cit., 2540 m (C. W. Wang 63520, May 1935, A); loc. cit. (C. W. Wang 63535, May 1935, PE); Dali Shi, Diancang Shan, 2300 m (S. Akiyama et al. 401, 5 Jul. 2001, KUN, TI); Kunming, 2300 m (C. W. Wang 62974, Apr. 1935, A); Yan shan, Shih-tze-shan, 1200 m (C. W. Wang 84259, 9 Oct. 1939, PE); near Kao-Chiao, Hsi-shan, Kunming, 1900 m (T. N. Liou 13364, 9 Jun. 1945, PE); Ping-pin Hsien, 1400 m (H. T. Tsai 60029, 1 Jun. 1934, PE); loc. cit. (H. T. Tsai 60224, 15 Jun. 1934, PE); Shung-Kiang Hsien, 1480 m (C. W. Wang 73028, Apr. 1936, A); without precise locality (T. T. Yü 12439, A).

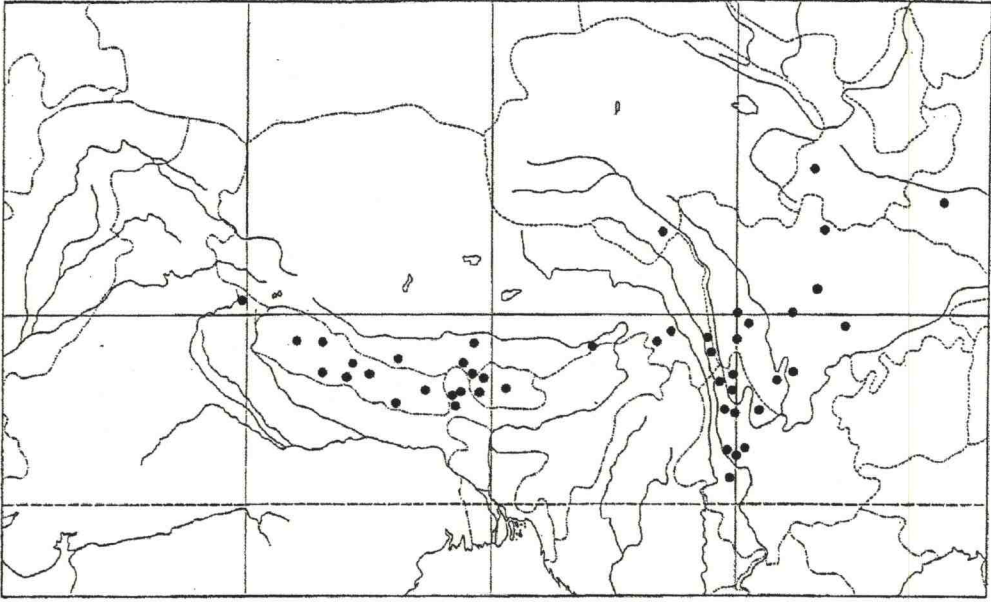


Fig. 4. Distribution map of *Juncus allioides* Franch.

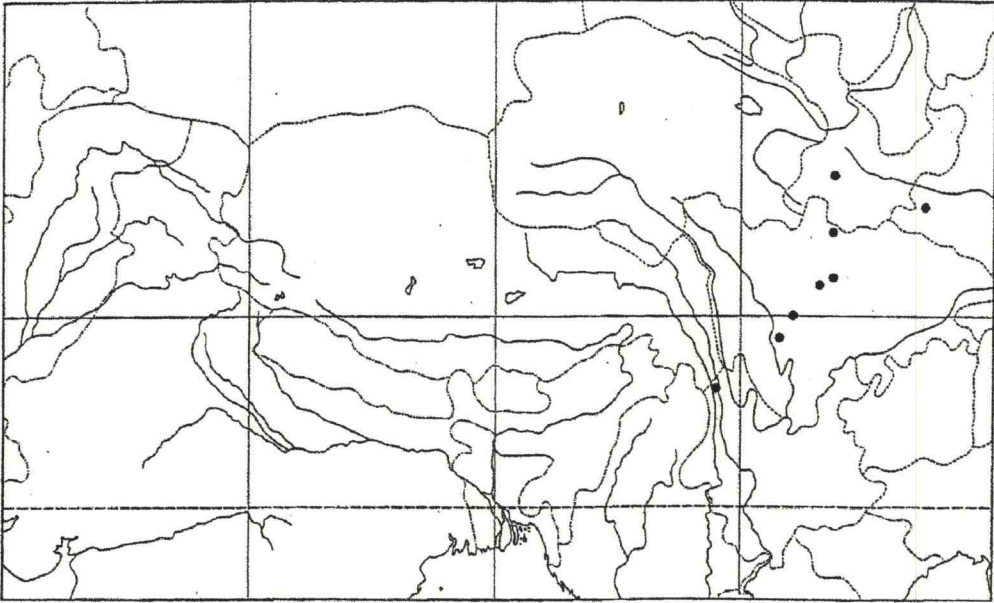


Fig. 5. Distribution map of *Juncus amplifolius* Miyam. & H. Ohba



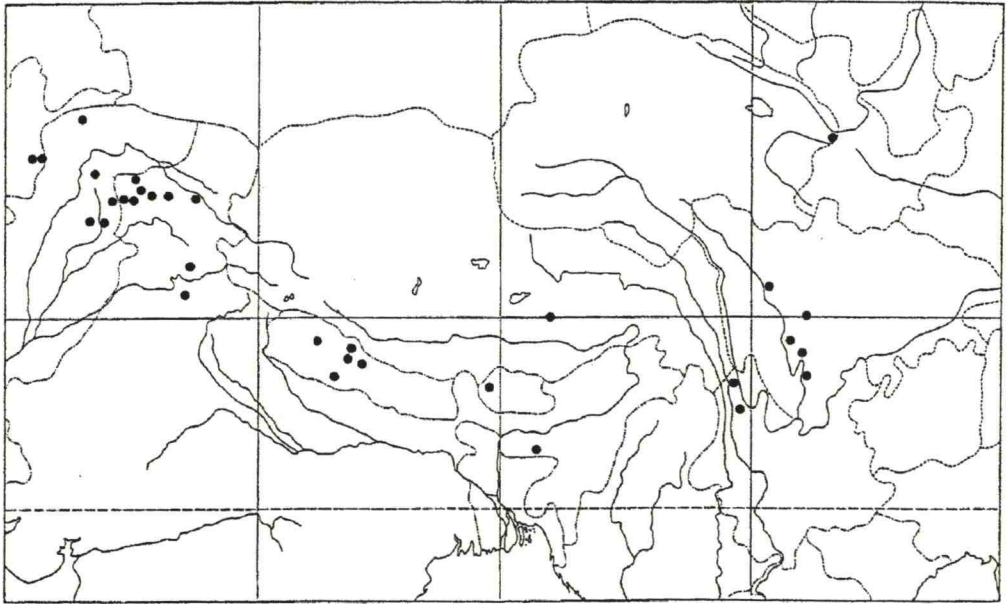


Fig. 6. Distribution map of *Juncus articulatus* L.

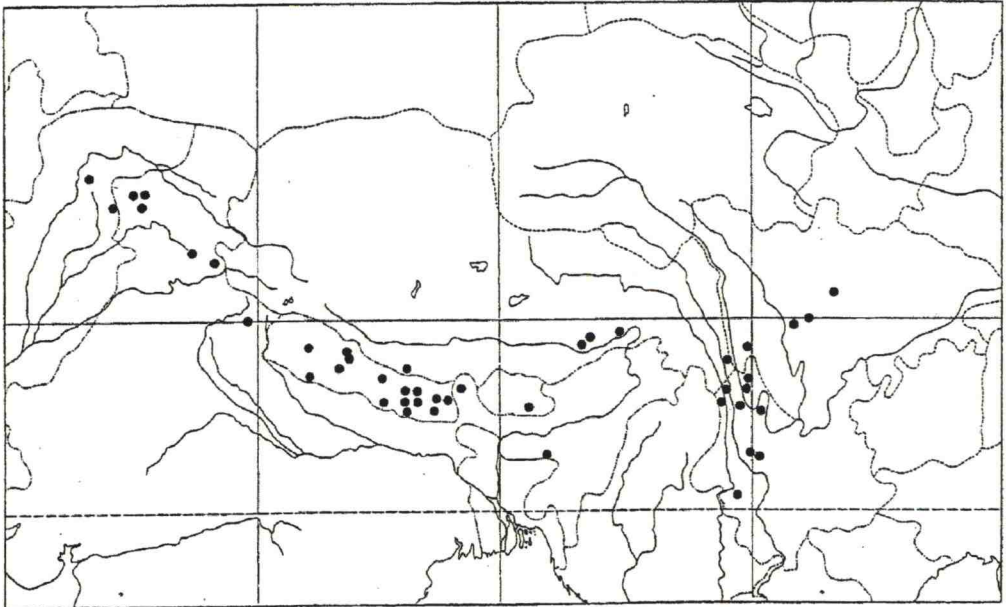


Fig. 7. Distribution map of *Juncus benghalensis* Kunth

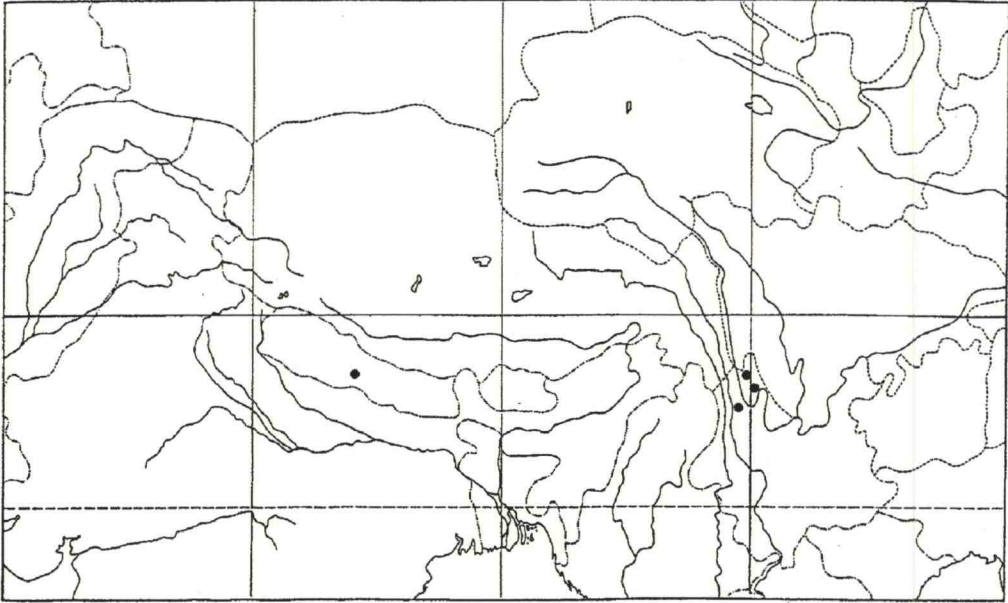


Fig. 8. Distribution map of *Juncus biglumoides* H. Hara.

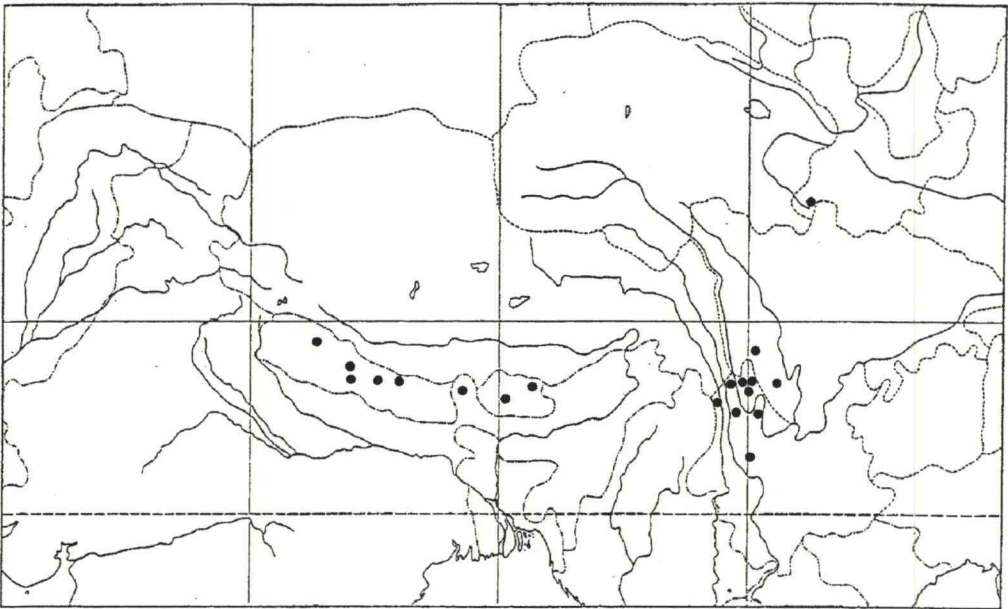


Fig. 9. Distribution map of *Juncus brachystigma* Sam.



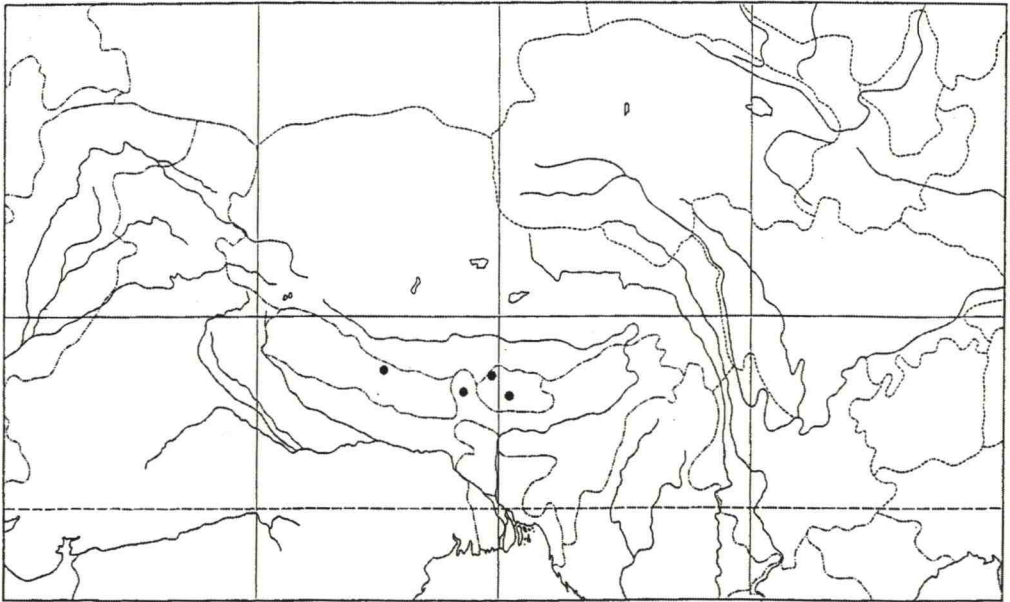


Fig. 10. Distribution map of *Juncus bryophilus* Noltie.

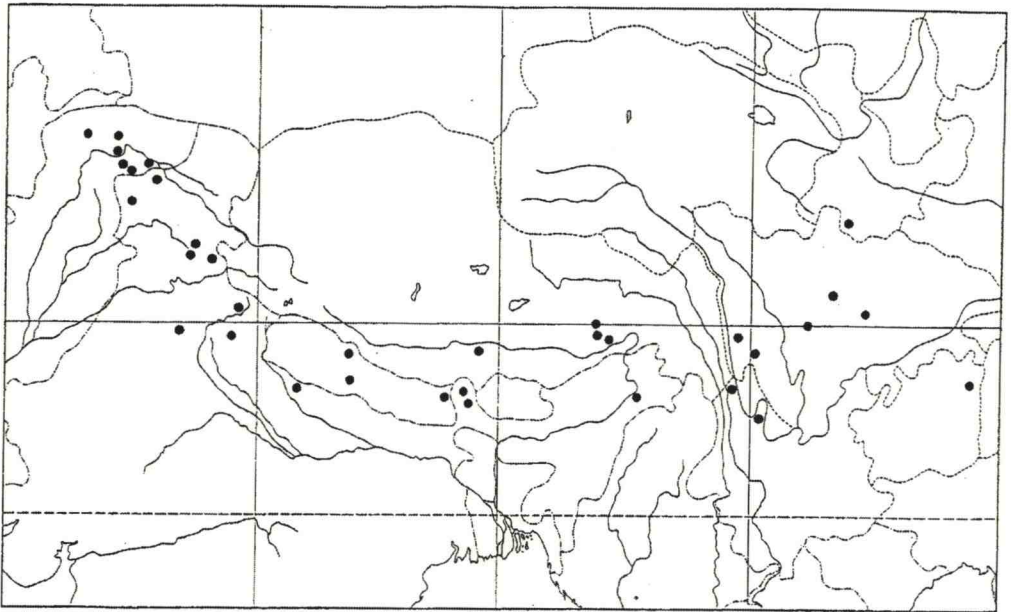


Fig. 11. Distribution map of *Juncus bufonius* L.

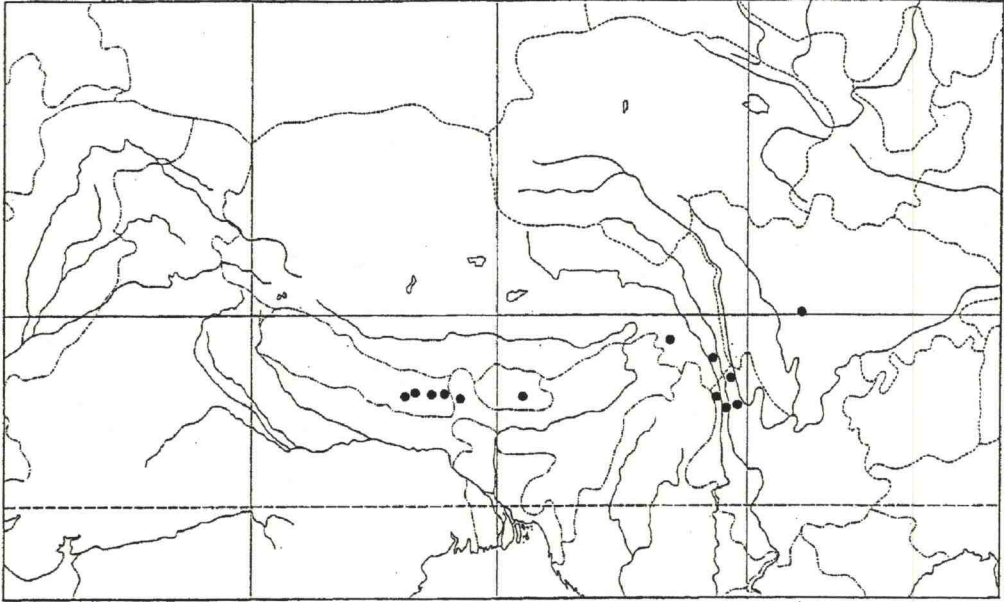


Fig. 12. Distribution map of *Juncus cephalostigma* Sam.

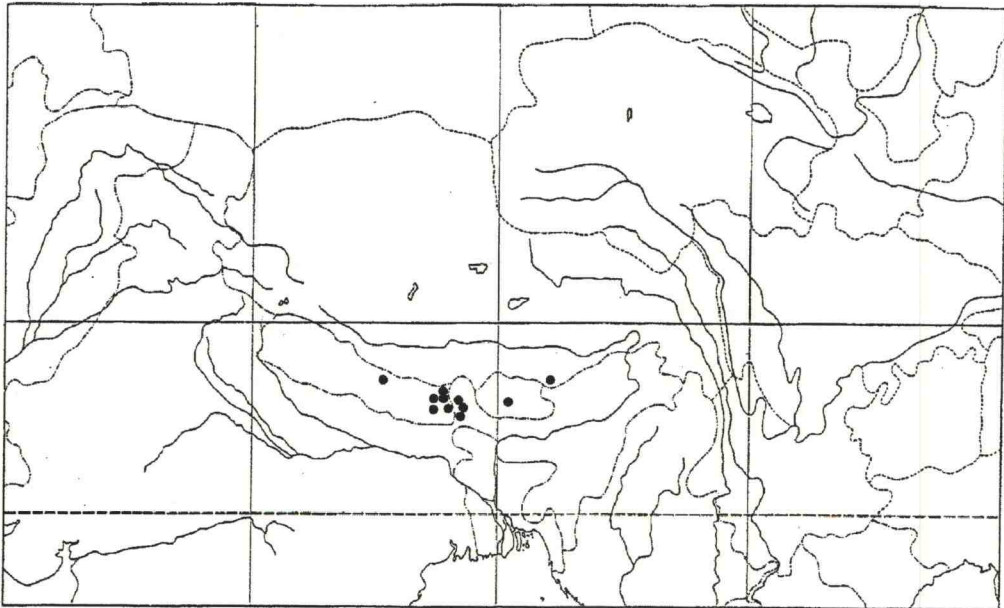


Fig. 13. Distribution map of *Juncus chrysocarpus* Buchenau



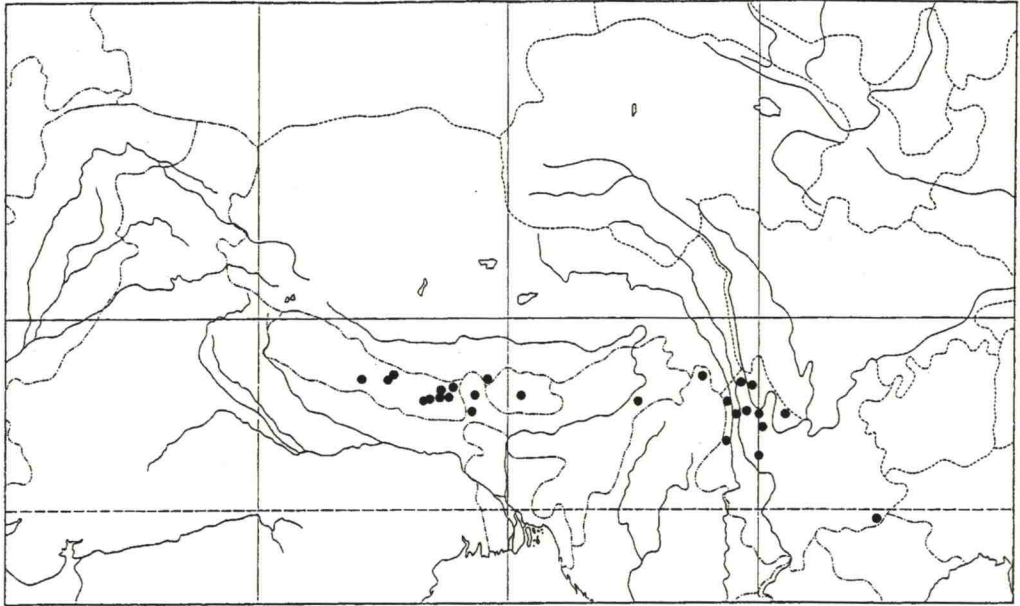


Fig. 14. Distribution map of *Juncus clarkei* Buchenau

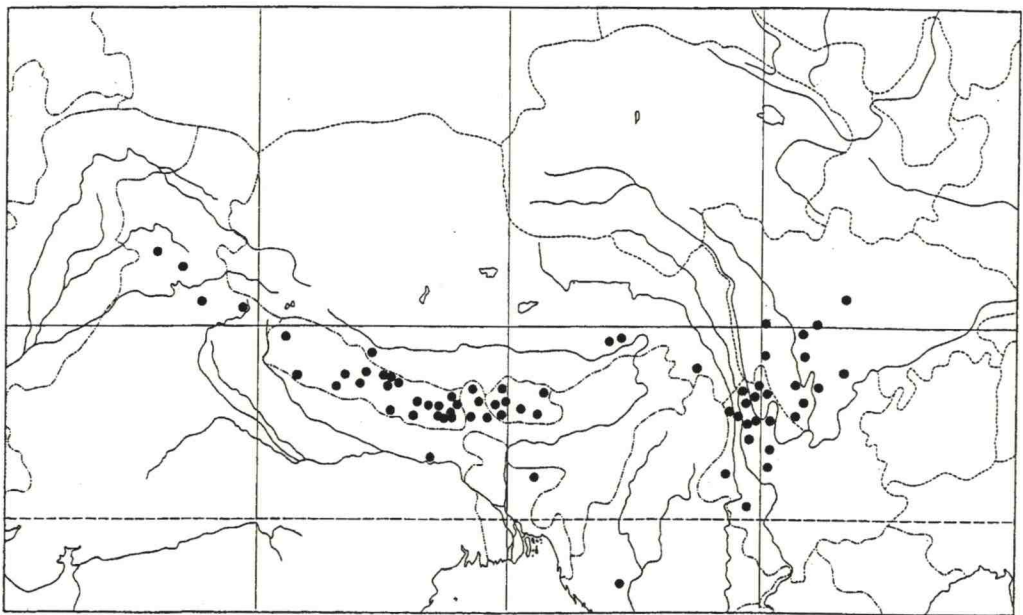


Fig. 15. Distribution map of *Juncus concinnus* D. Don

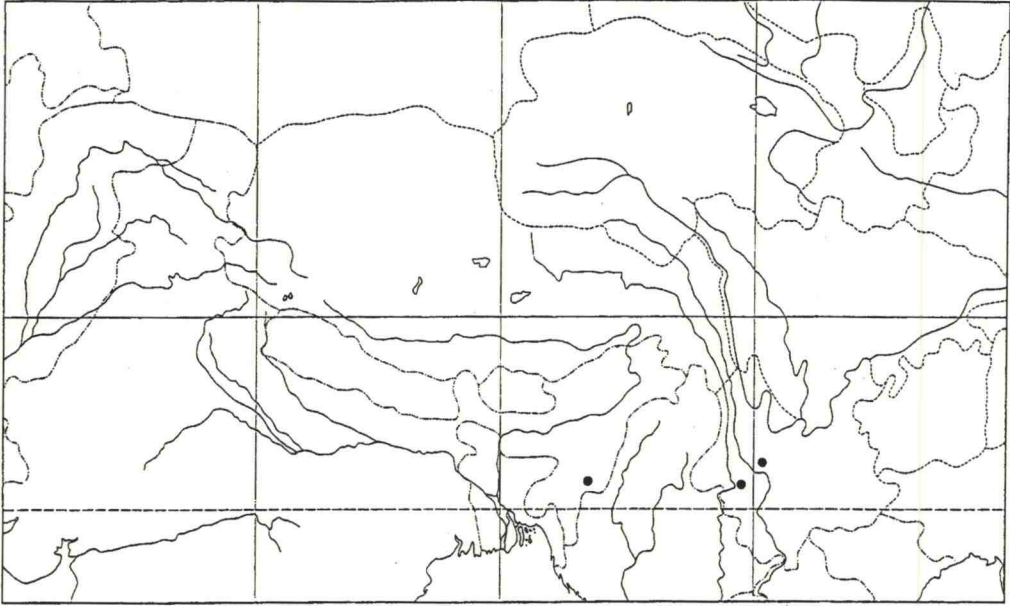


Fig. 16. Distribution map of *Juncus concolor* Sam.

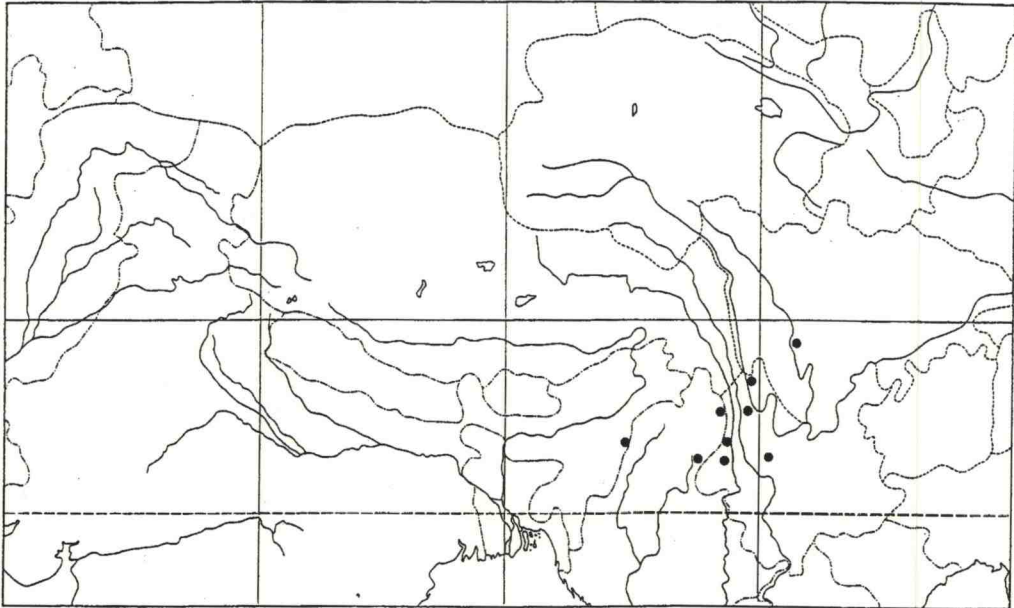


Fig. 17. Distribution map of *Juncus crassistylus* A. Camus



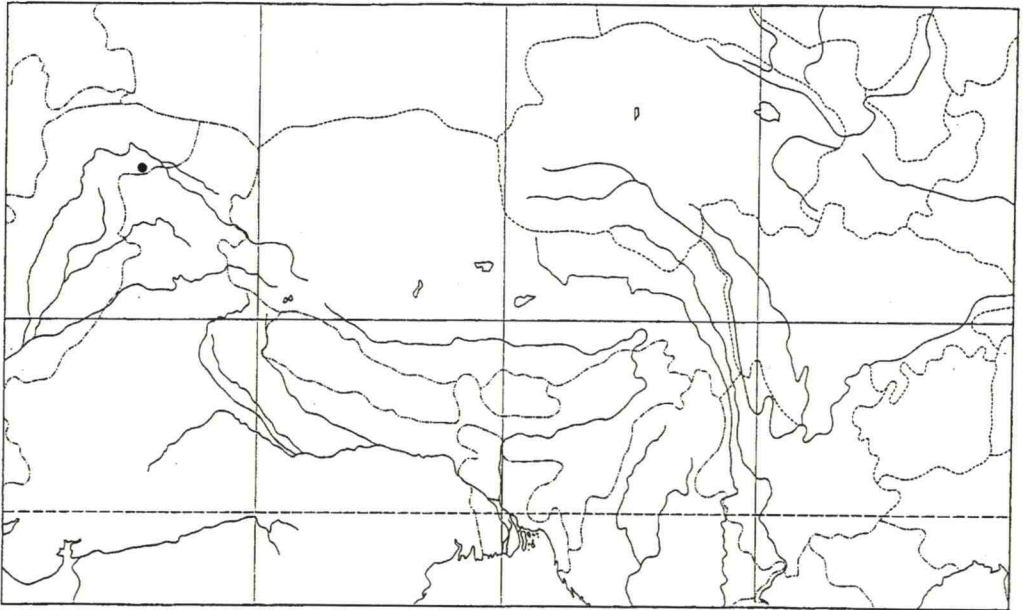


Fig. 18. Distribution map of *Juncus deosaiicus* Noltie

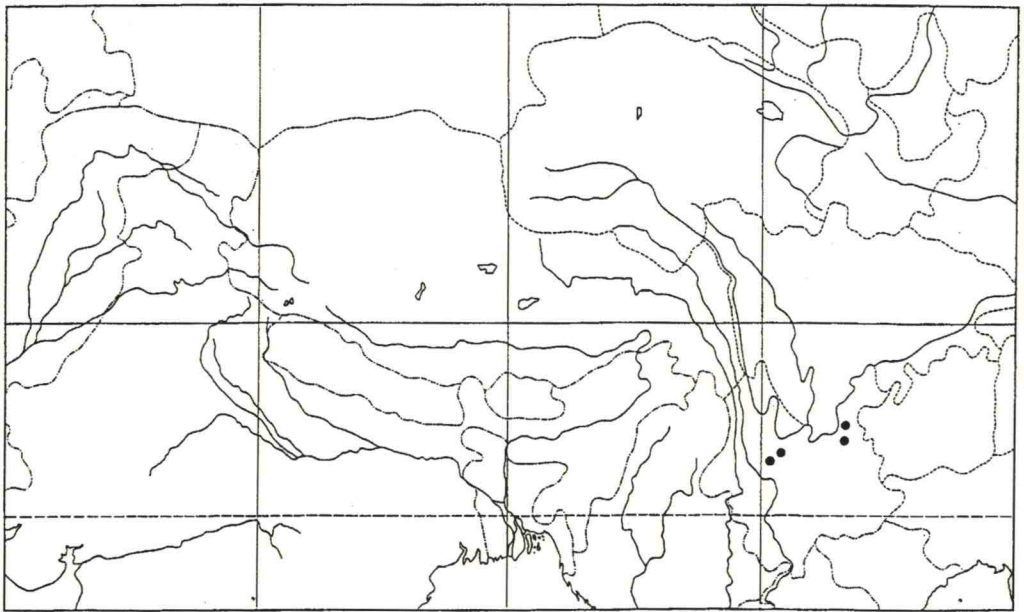


Fig. 19. Distribution map of *Juncus dongchuanensis* K. F. Wu.

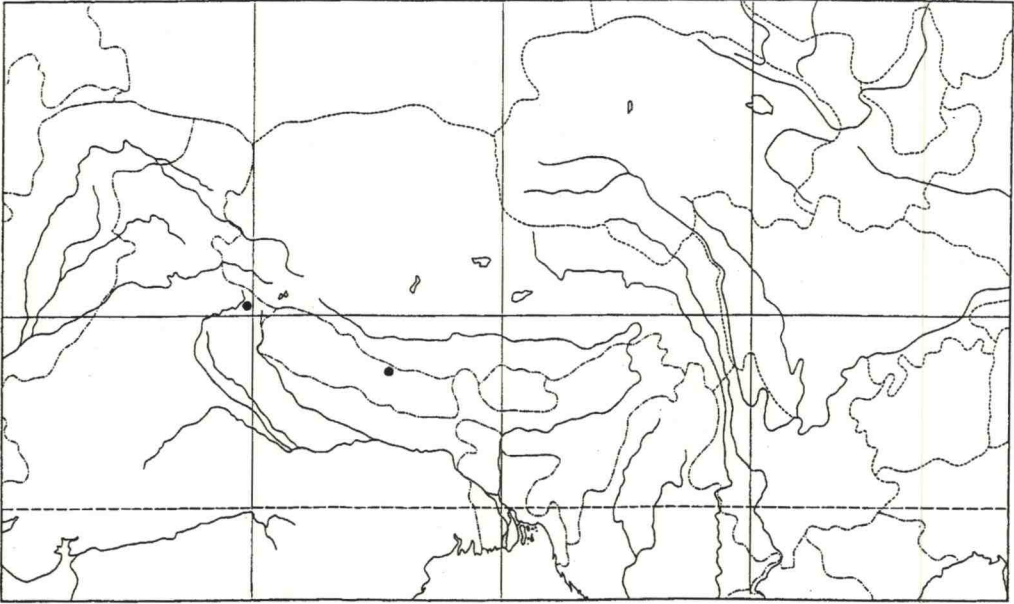


Fig. 20. Distribution map of *Juncus duthiei* (C. B. Clarke) Noltie

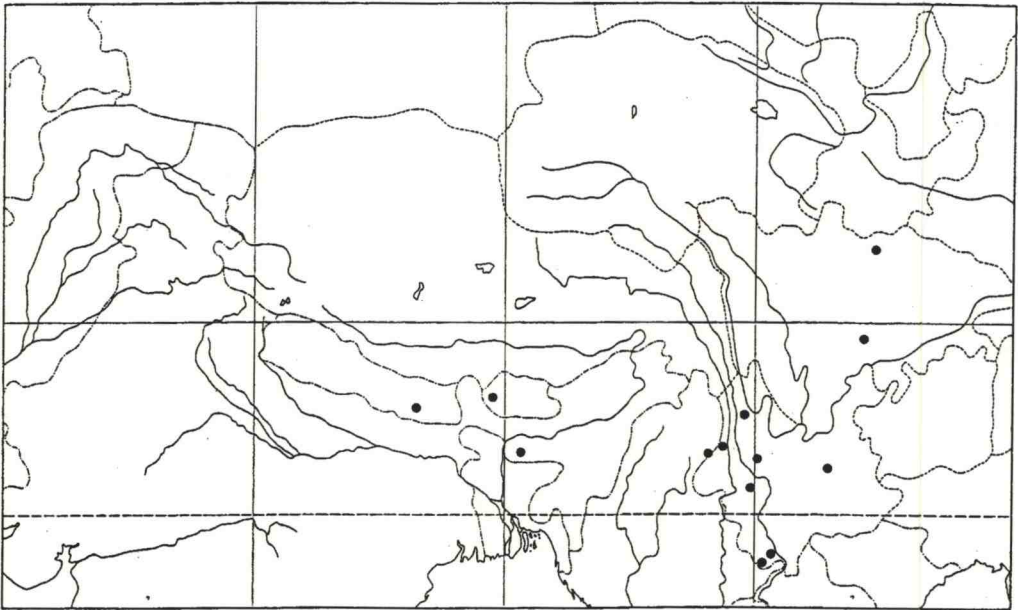


Fig. 21. Distribution map of *Juncus effuses* L.



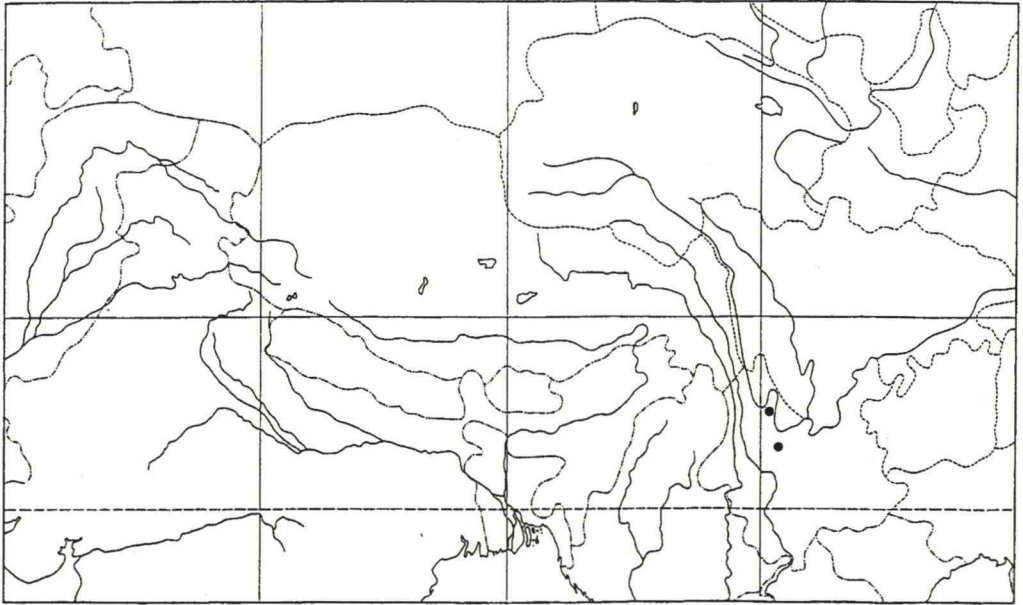


Fig. 22. Distribution map of *Juncus fimbriatylodes* Noltie

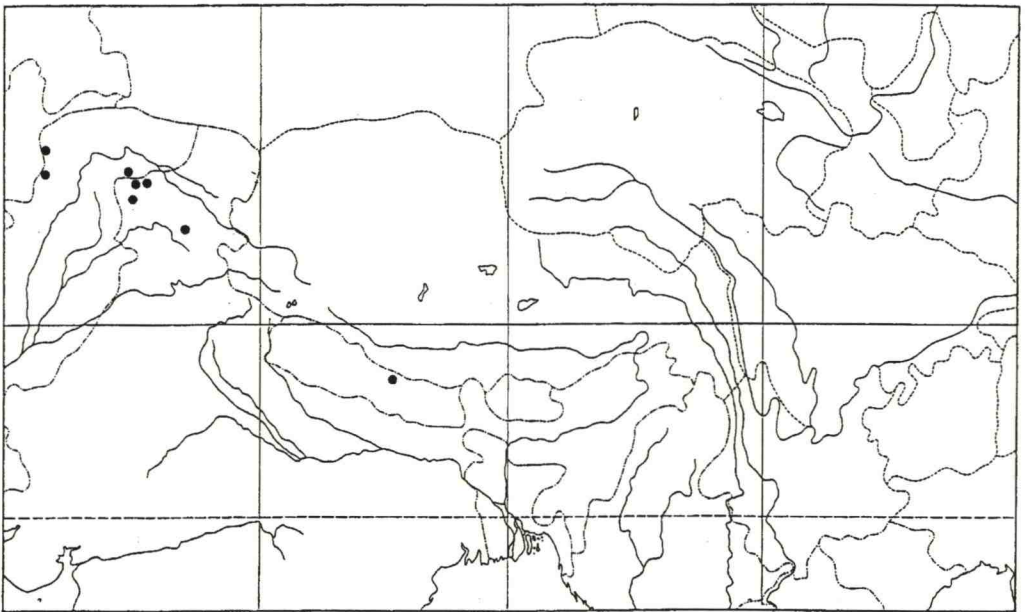


Fig. 23. Distribution map of *Juncus ganeshii* Miyam. et H. Ohba

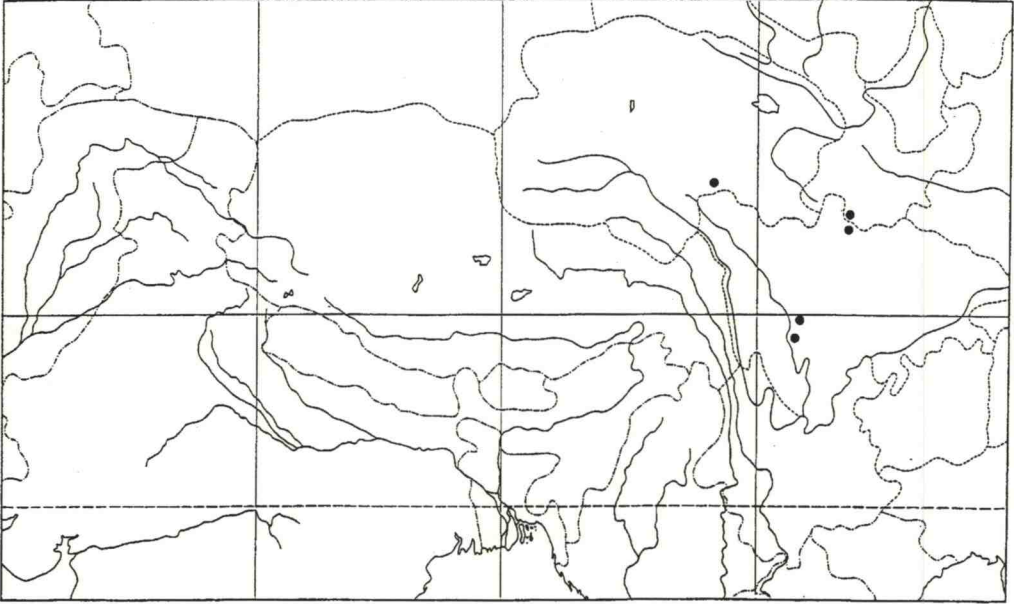


Fig. 24. Distribution map of *Juncus giganteus* Sam.

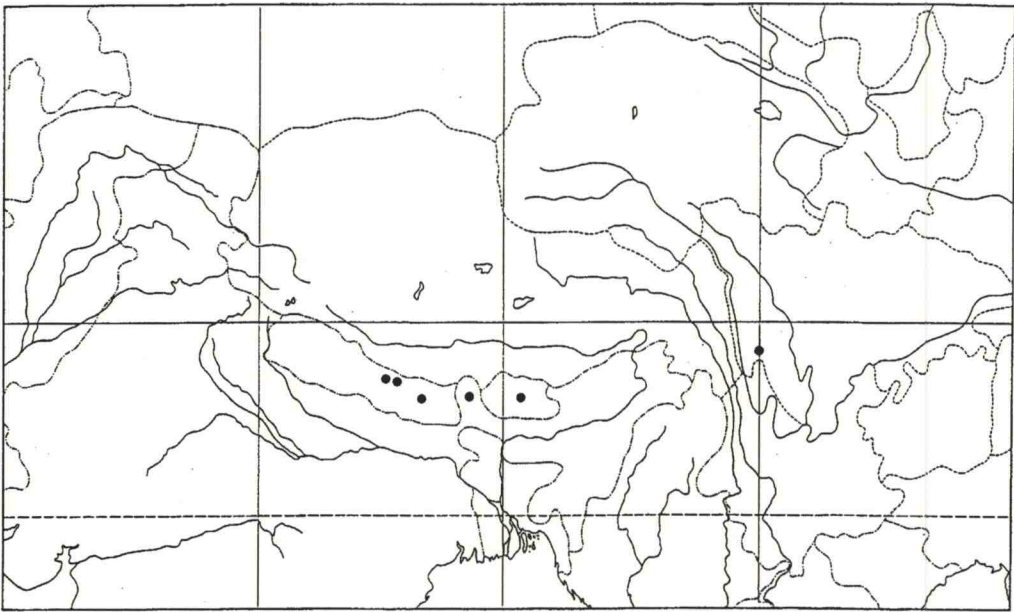


Fig. 25. Distribution map of *Juncus glaucoturgidus* Noltie



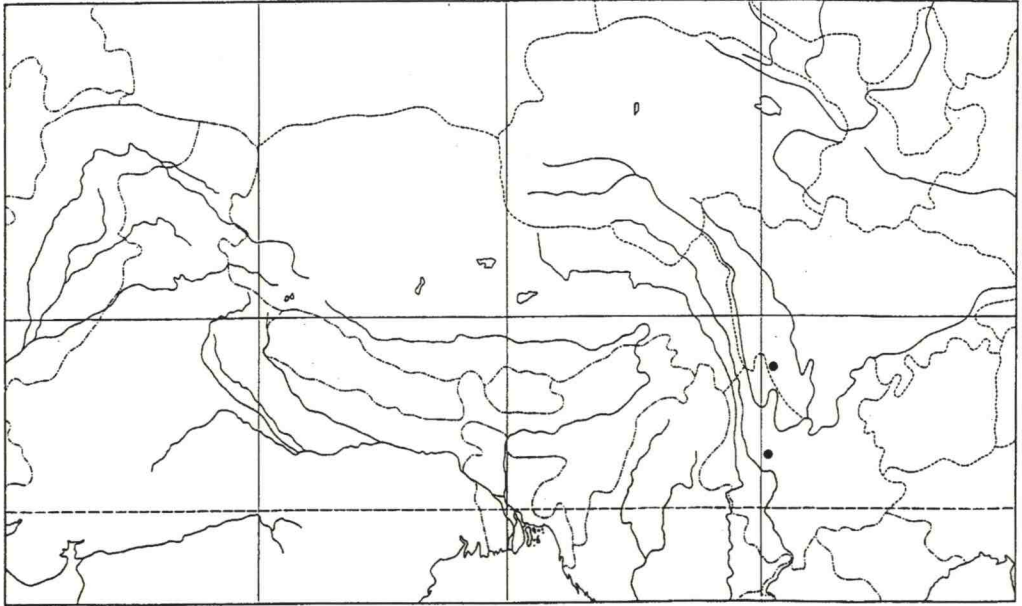


Fig. 26. Distribution map of *Juncus gonggae* Miyam. & H. Ohba

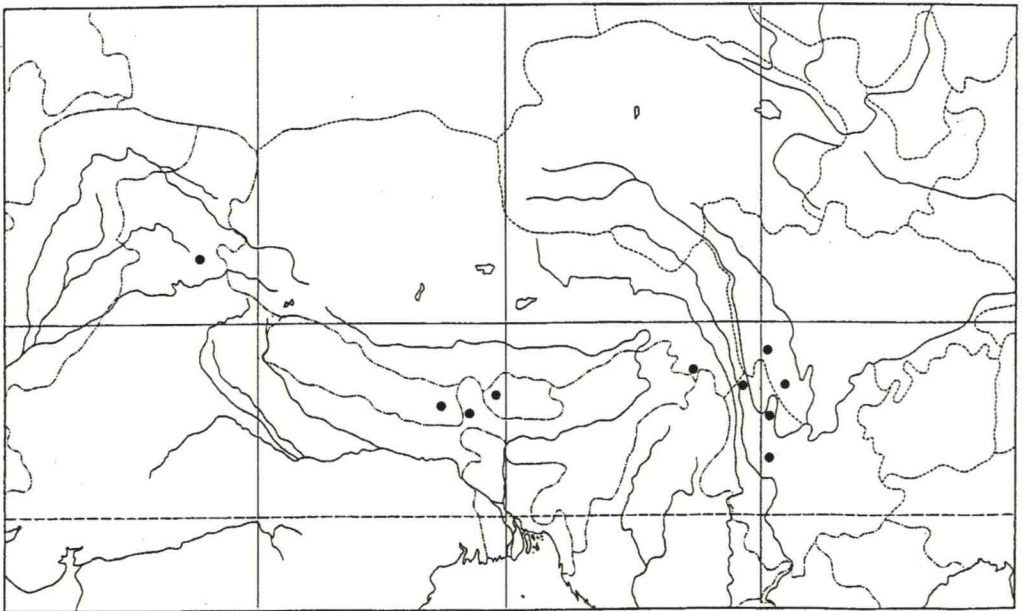


Fig. 27. Distribution map of *Juncus gracilicaulis* A. Camus

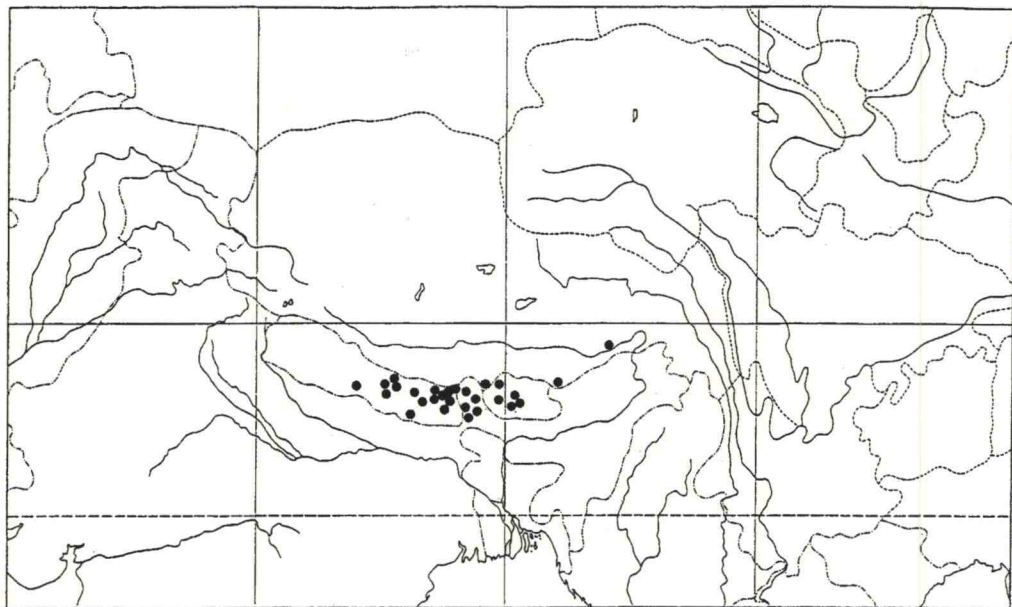


Fig. 28. Distribution map of *Juncus grisebachii* Buchenau

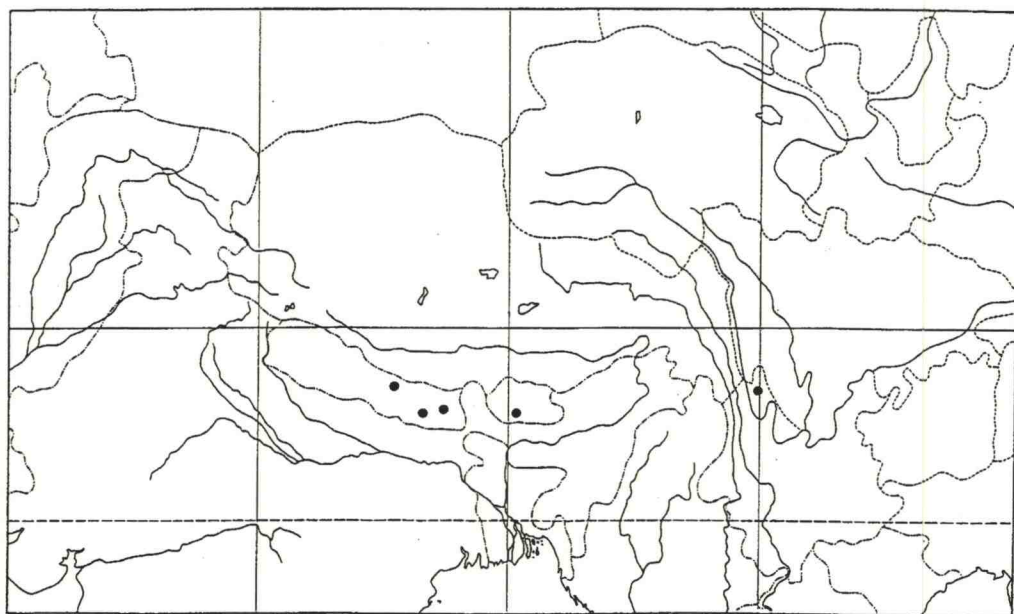


Fig. 29. Distribution map of *Juncus harae* Miyam. & H. Ohba.



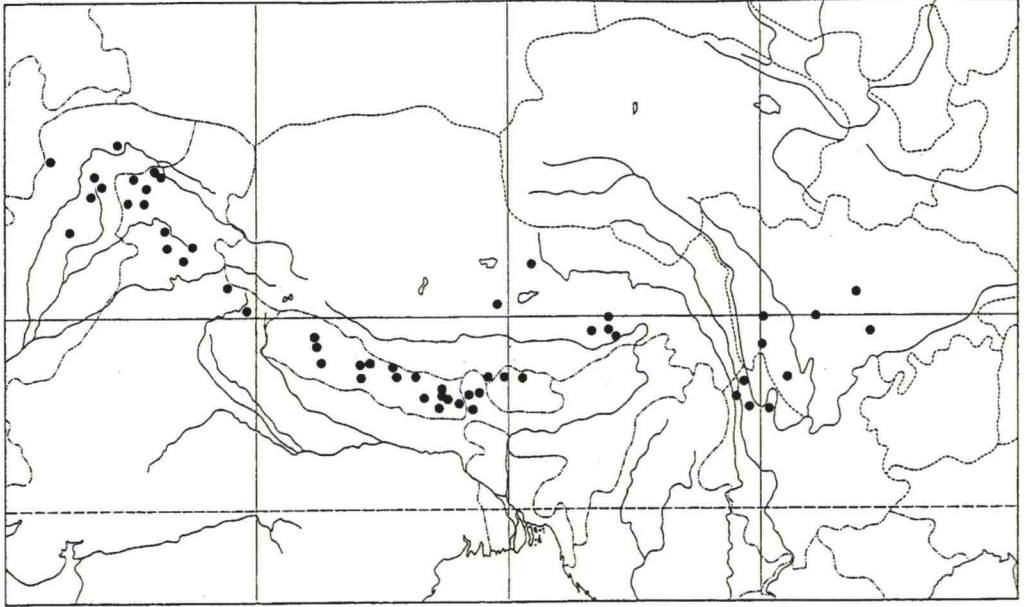


Fig. 30. Distribution map of *Juncus himalensis* Klotzsch

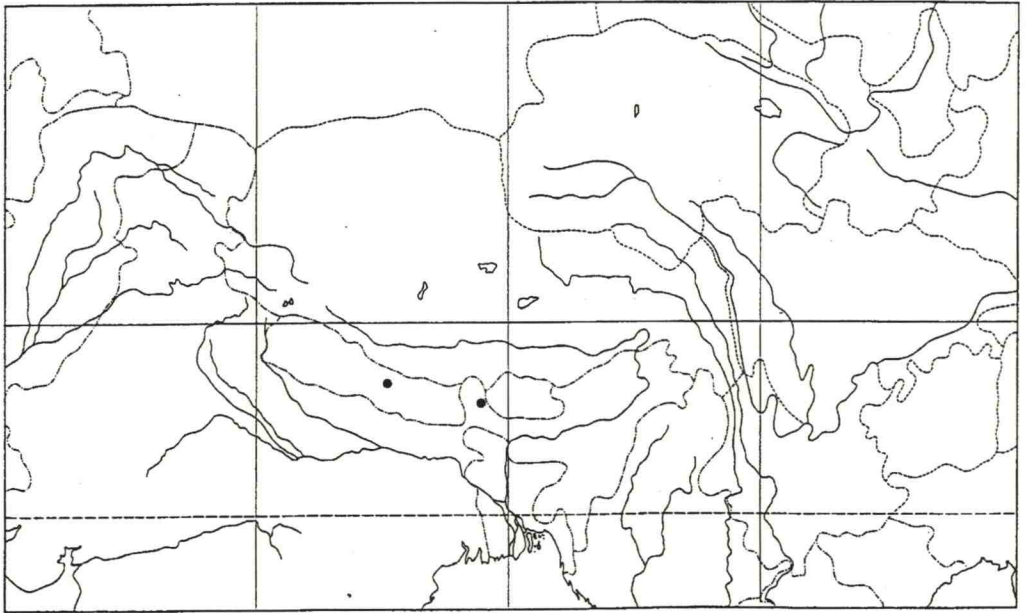


Fig. 31. Distribution map of *Juncus hydrophilus* Noltie

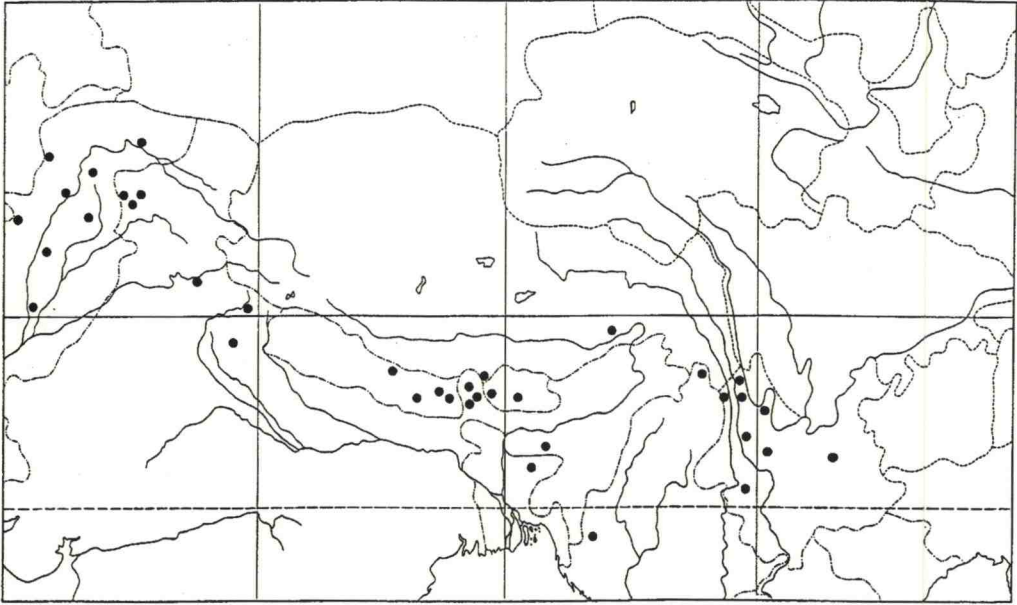


Fig. 32. Distribution map of *Juncus inflexus* L.

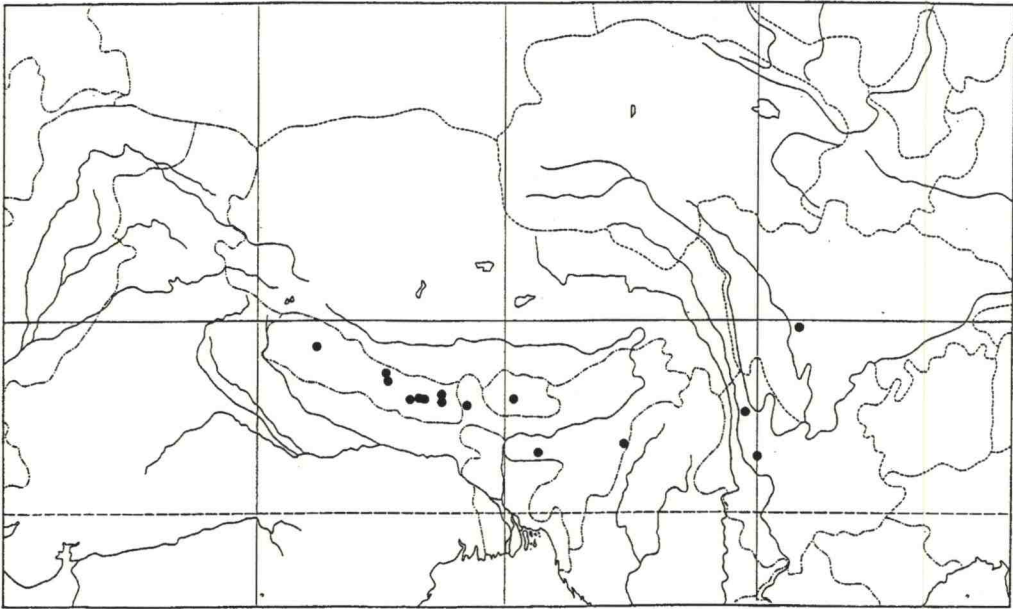


Fig. 33. Distribution map of *Juncus khasiensis* Buchenau



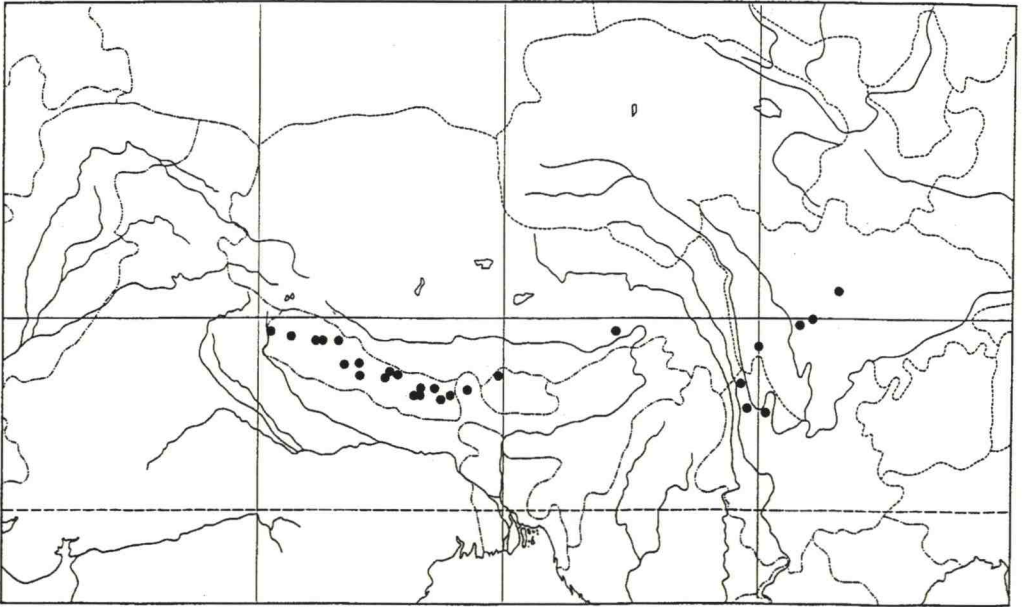


Fig. 34. Distribution map of *Juncus kingii* Rendle

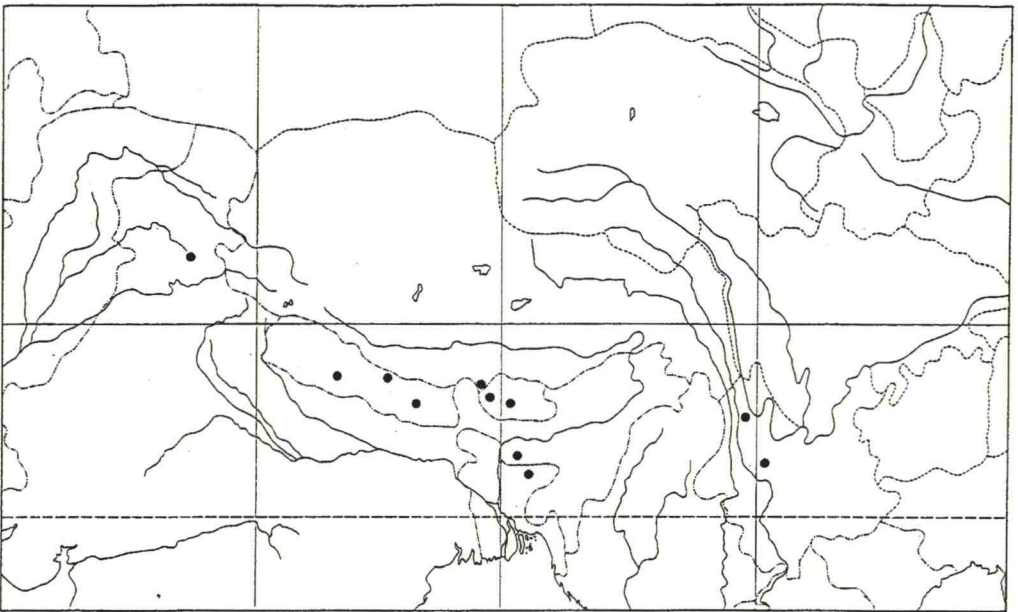


Fig. 35 Distribution map of *Juncus leptospermus* Buchenau

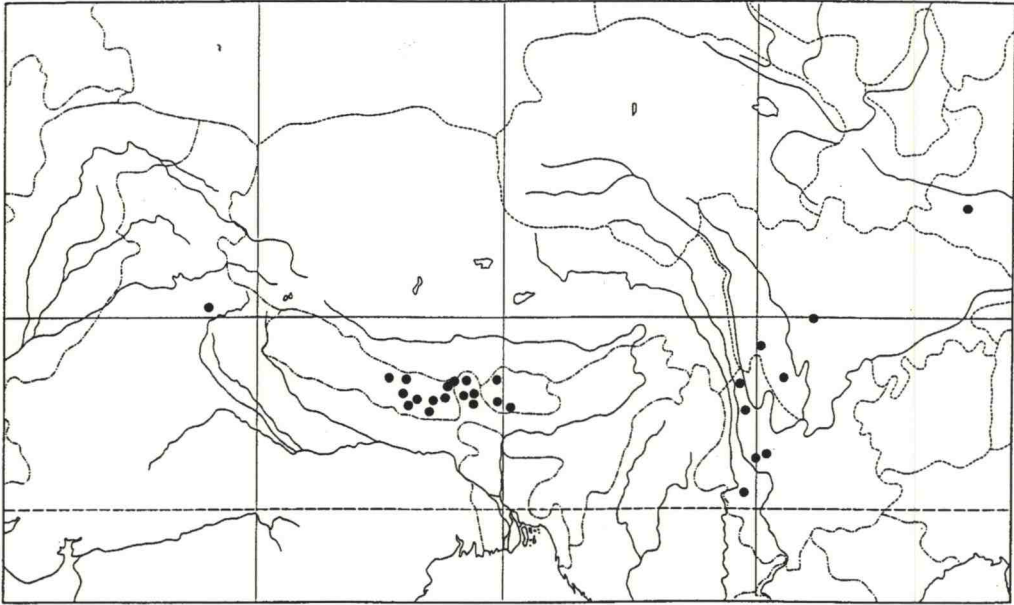


Fig. 36. Distribution map of *Juncus leucanthus* Royle ex D. Don

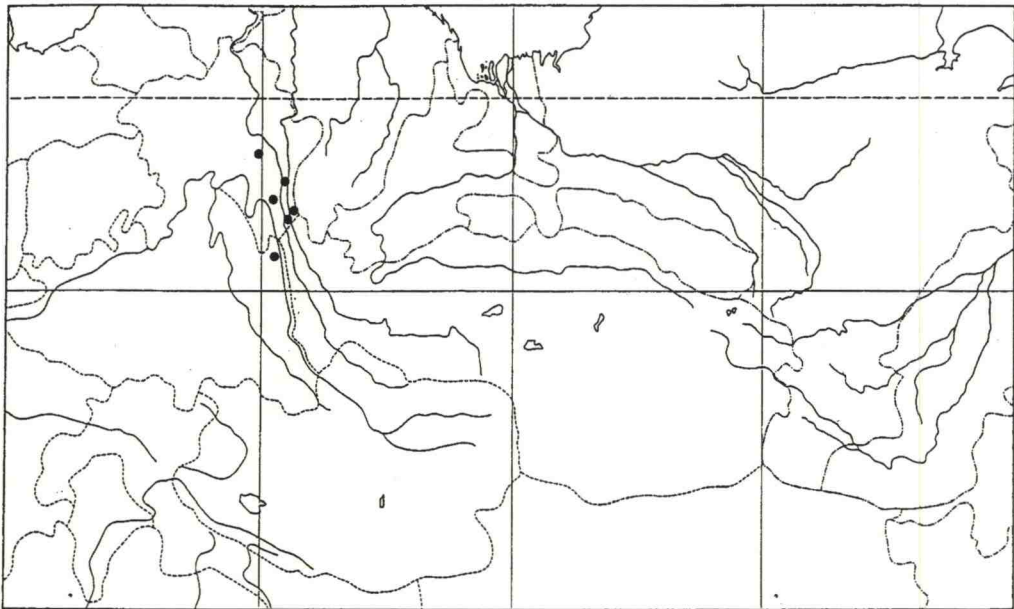


Fig. 37. Distribution map of *Juncus longiflorus* (A. Camus) Noltie



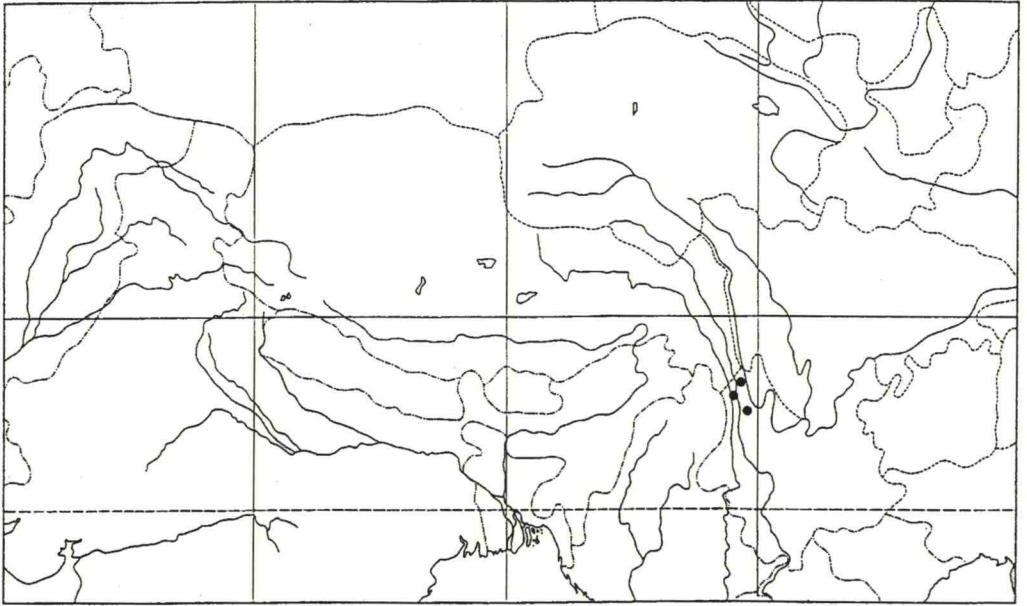


Fig. 38. Distribution map of *Juncus longistamineus* A. Camus

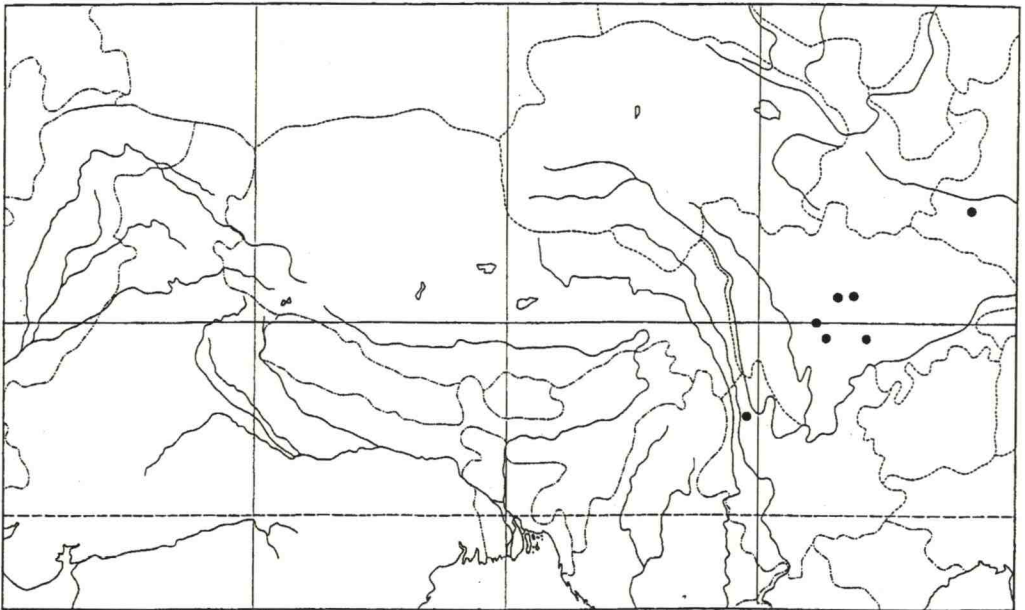


Fig. 39. Distribution map of *Juncus luzuliformis* Franch.

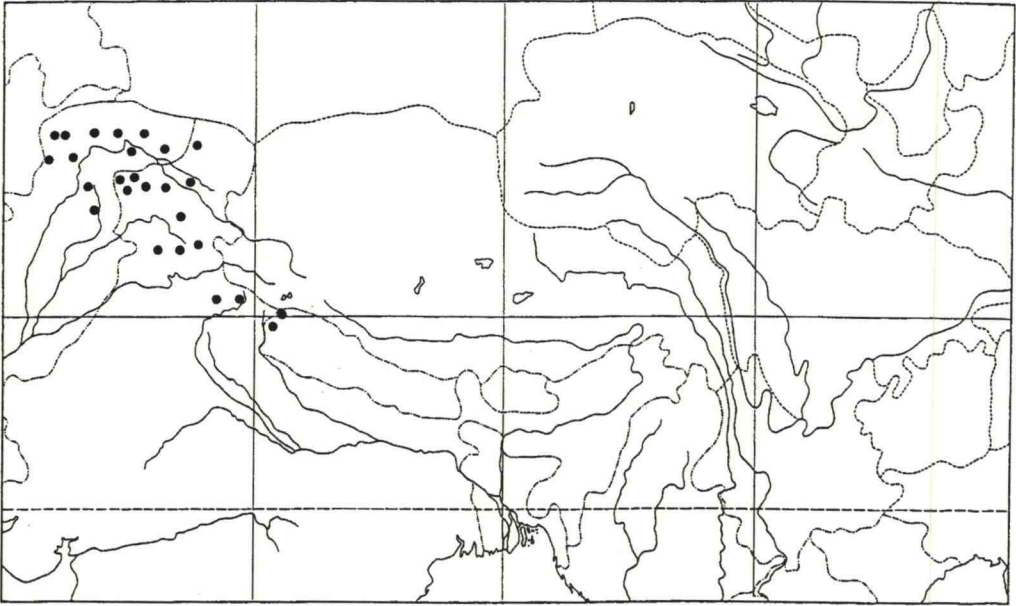


Fig. 40. Distribution map of *Juncus membranaceus* Royle ex D. Don

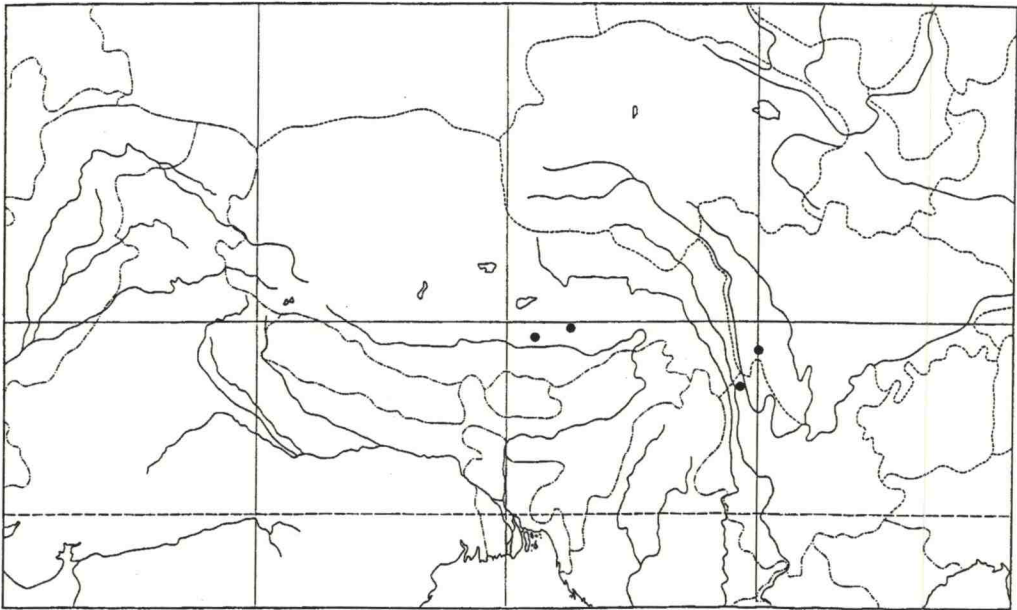


Fig. 41. Distribution map of *Juncus milashanensis* A. M. Lu & Z. Y. Zhang



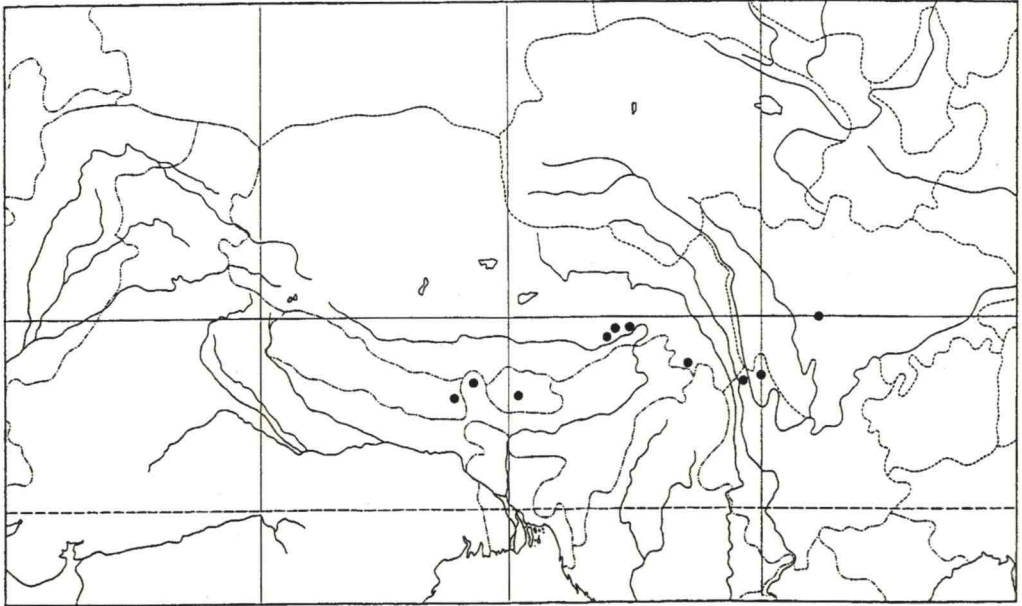


Fig. 42. Distribution map of *Juncus minimus* Buchenau

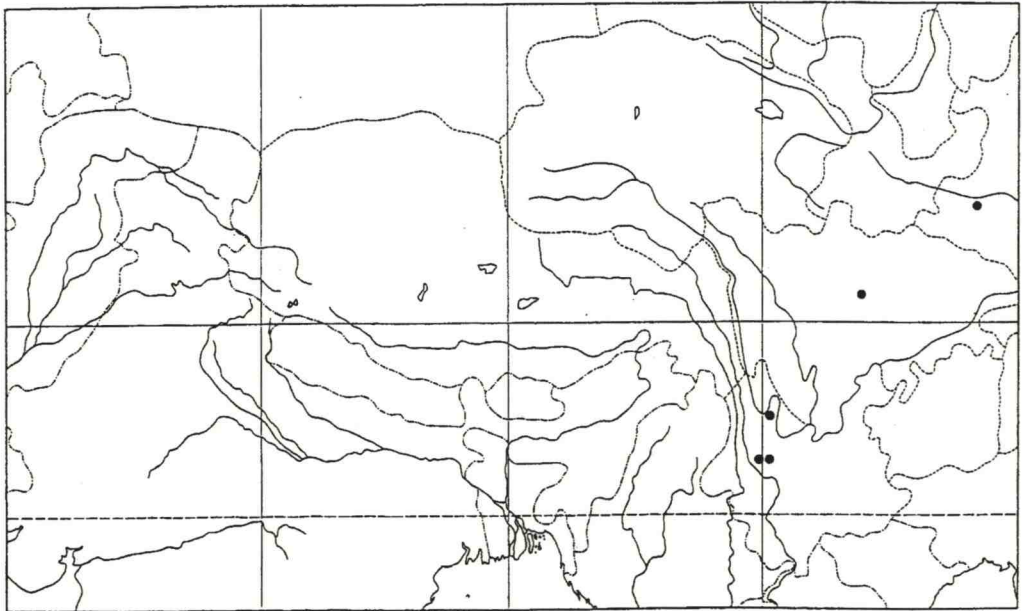


Fig. 43. Distribution map of *Juncus modicus* N. E. Br.

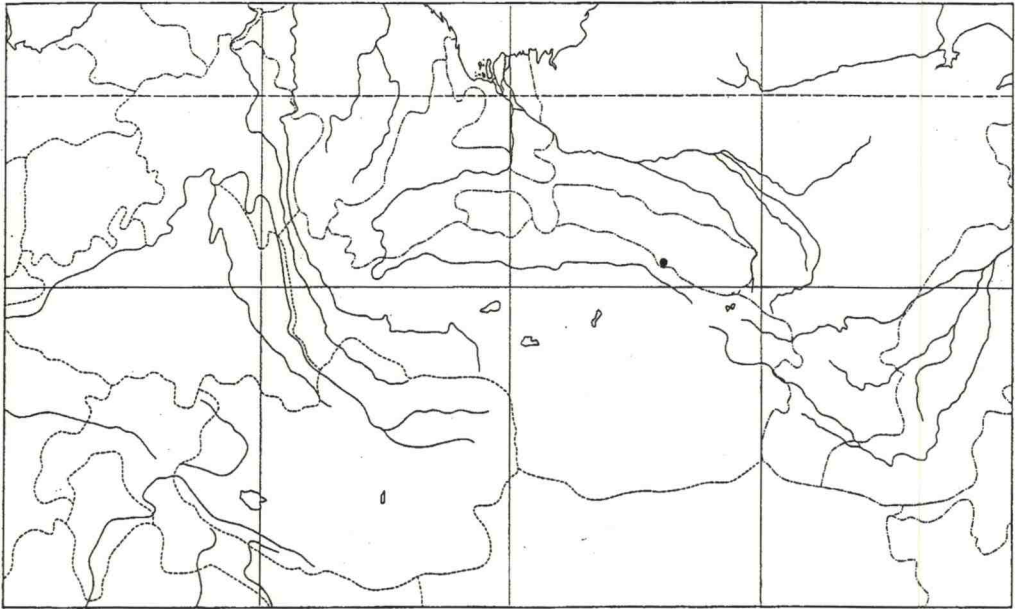


Fig. 44. Distribution map of *Juncus musatangensis* Miyam. et H. Ohba

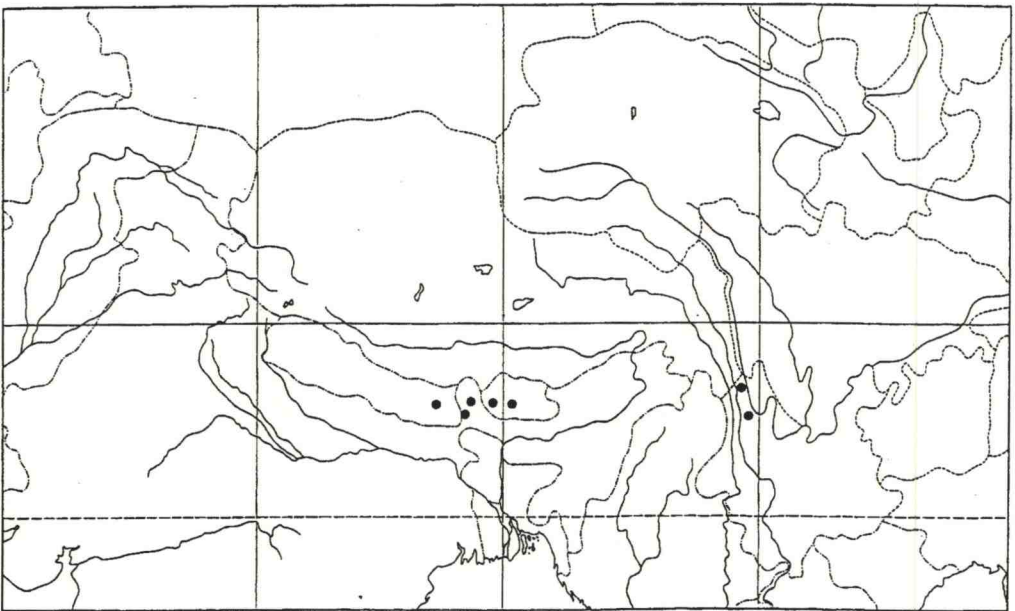


Fig. 45. Distribution map of *Juncus nepalicus* Miyam. et H. Ohba



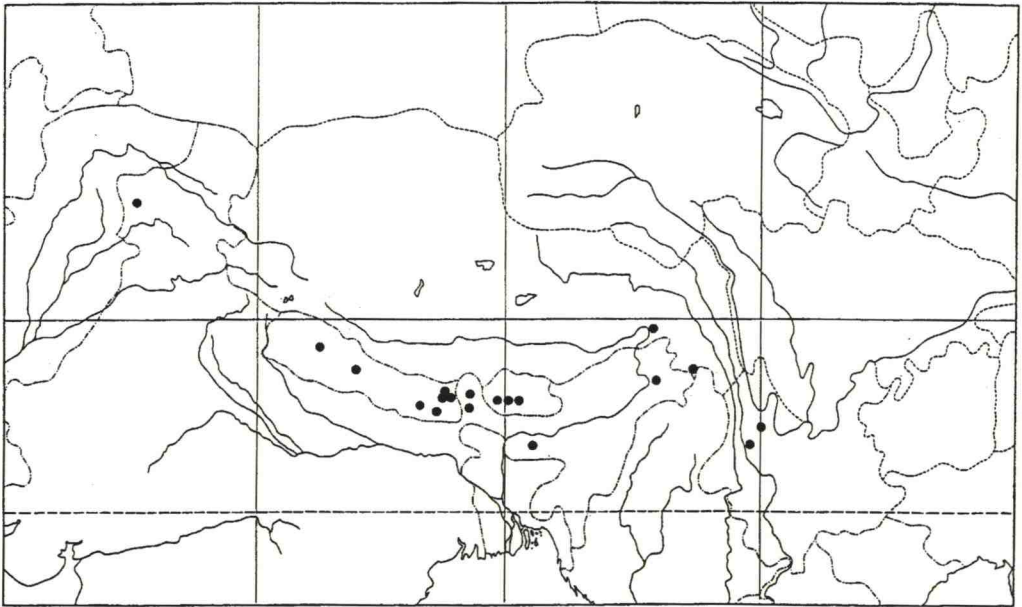


Fig. 46. Distribution map of *Juncus ochraceus* Buchenau

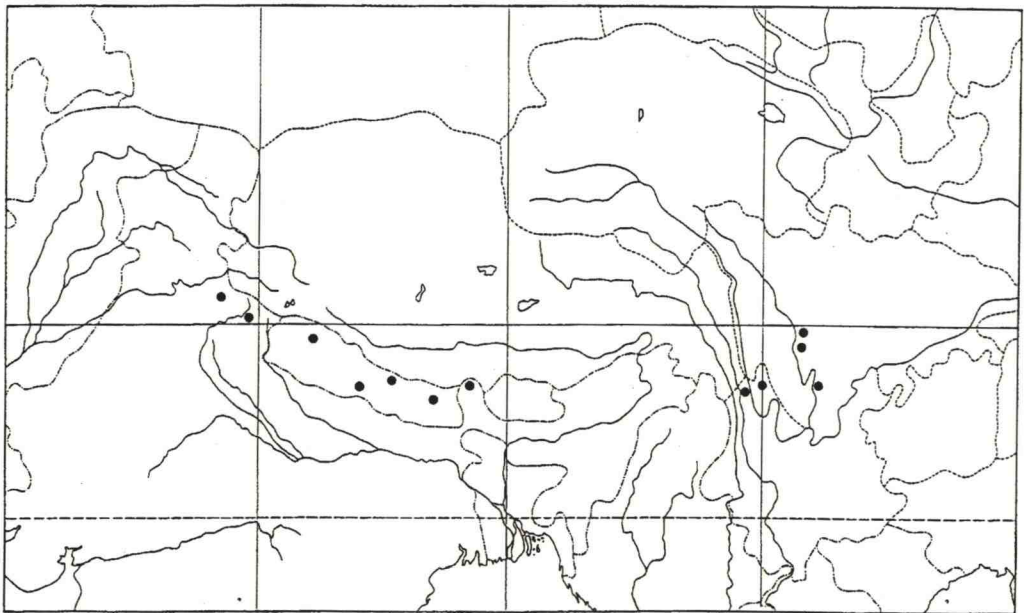


Fig. 47. Distribution map of *Juncus perpusillus* Sam.

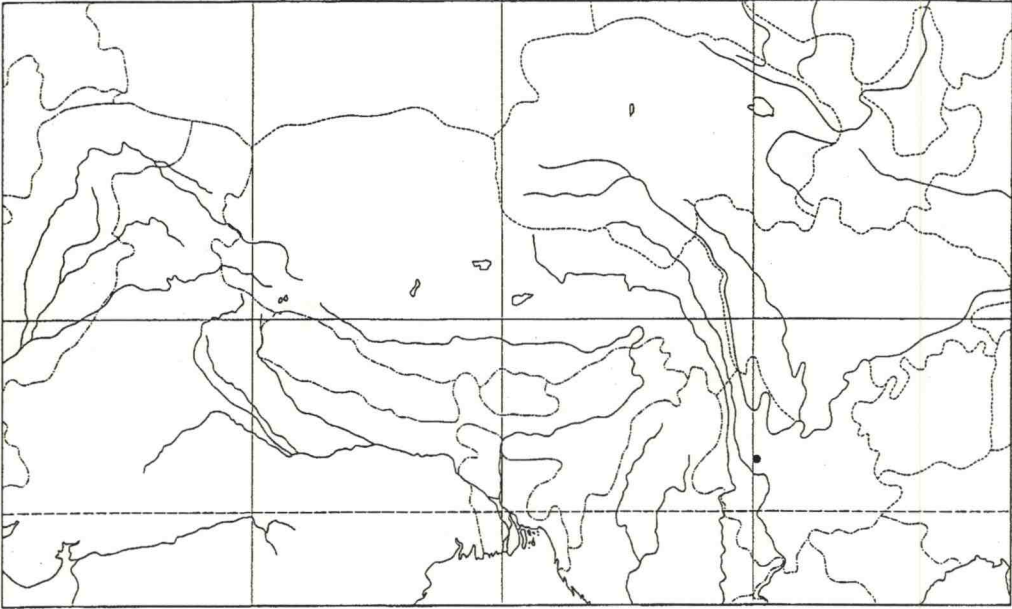


Fig. 48. Distribution map of *Juncus petrophilus* Miyam. & H. Ohba

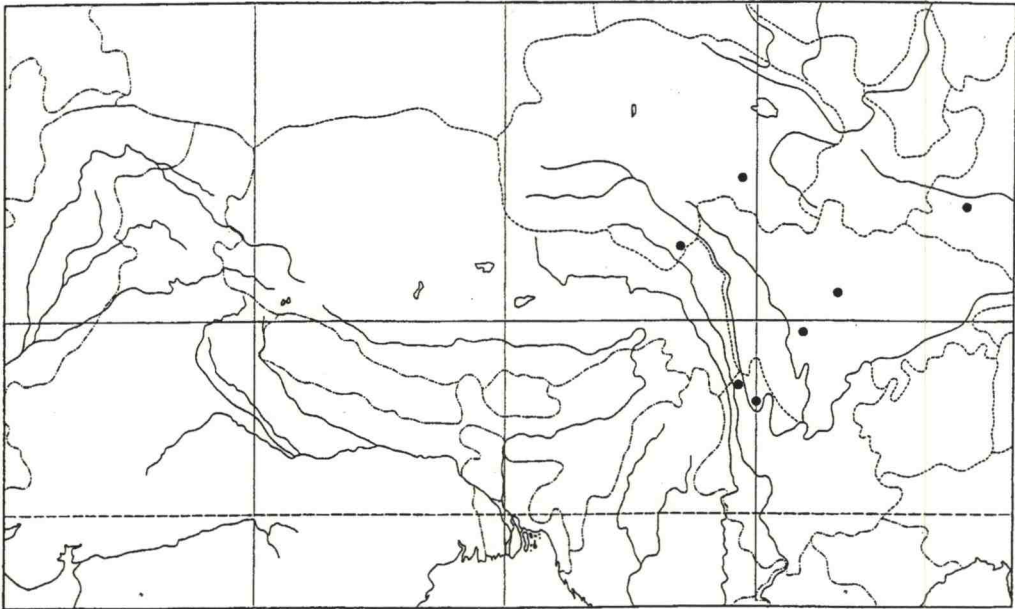


Fig. 49. Distribution map of *Juncus potanii* Buchenau



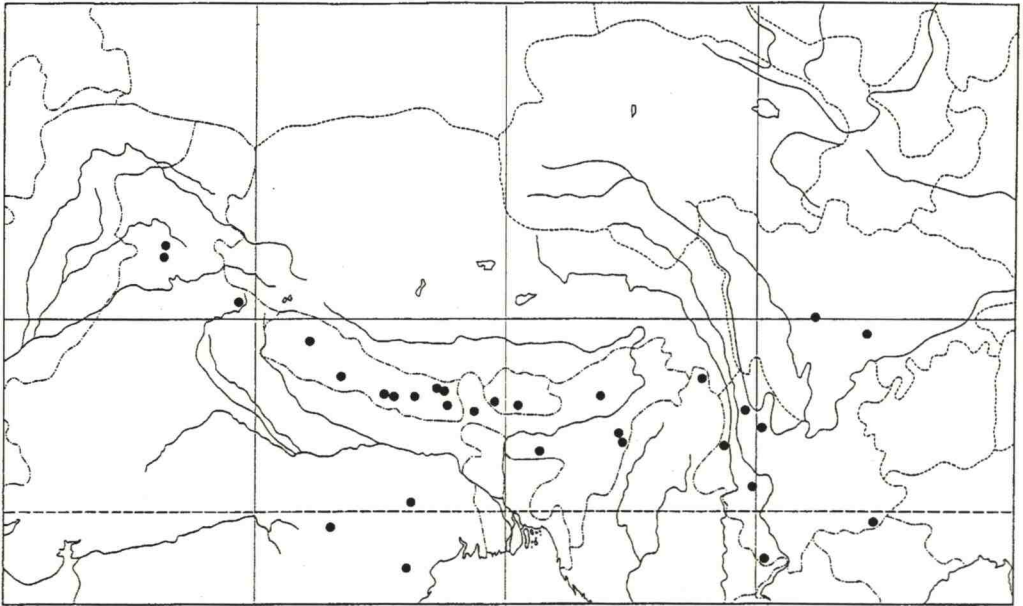


Fig. 50. Distribution map of *Juncus prismatocarpus* R. Br.

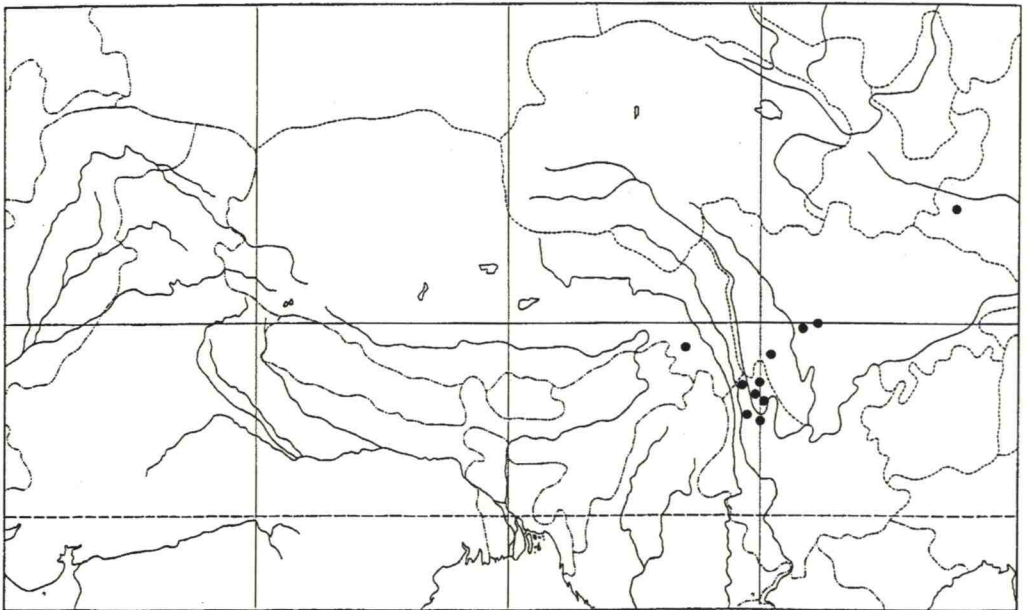


Fig. 51. Distribution map of *Juncus przewarskii* Buchenau

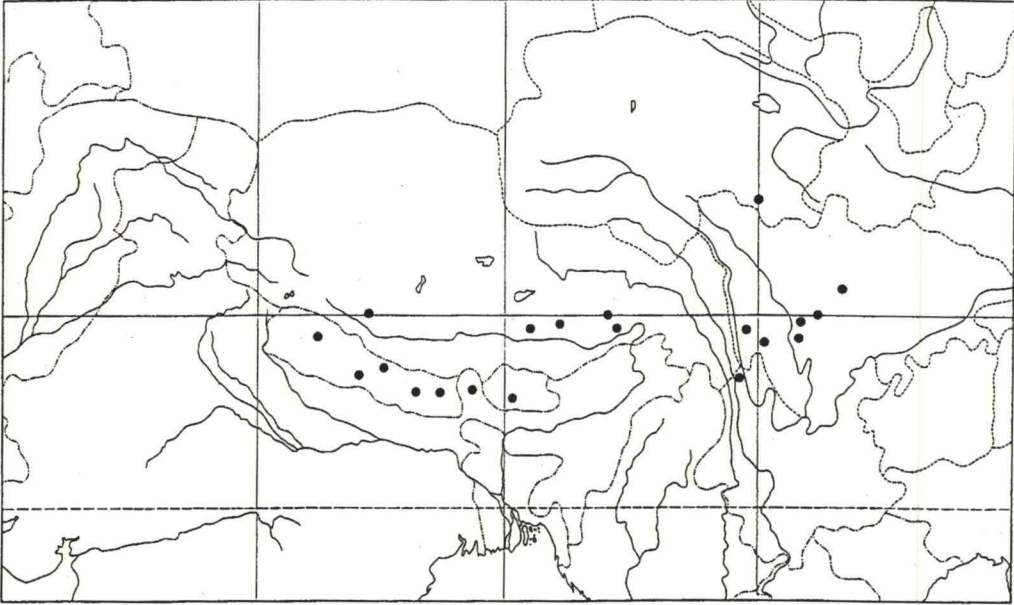


Fig. 52. Distribution map of *Juncus pseudocastaneus* Sam.

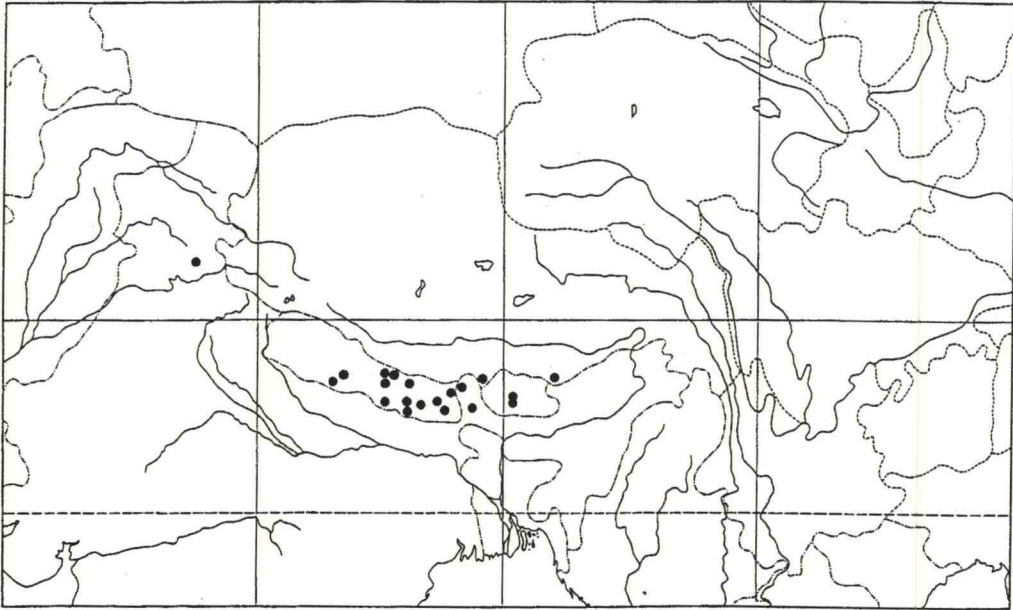


Fig. 53. Distribution map of *Juncus rohtangensis* Goel & Aswal.



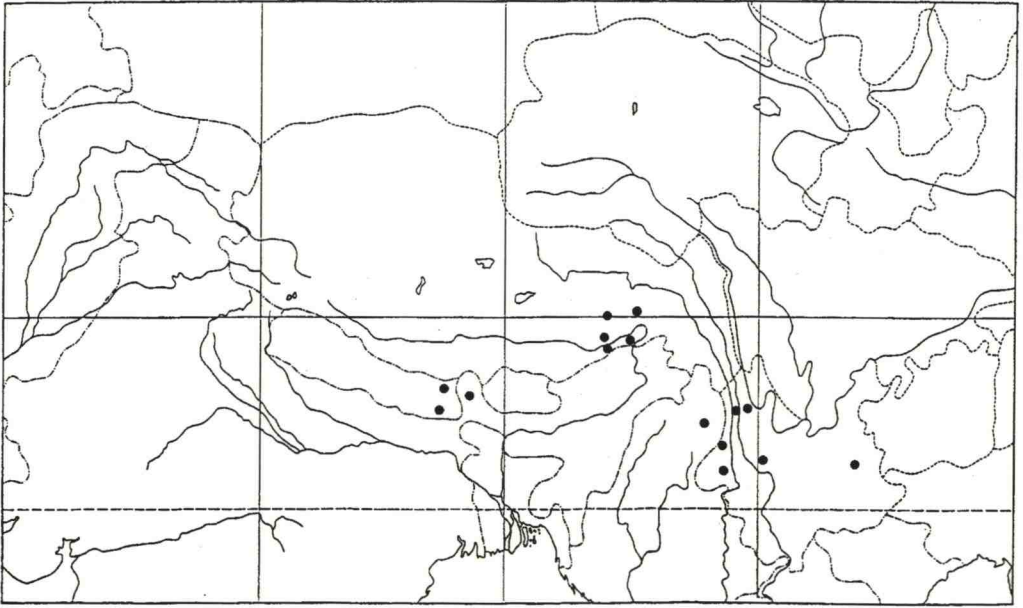


Fig. 54. Distribution map of *Juncus rostricarpus* Miyam. et H. Ohba

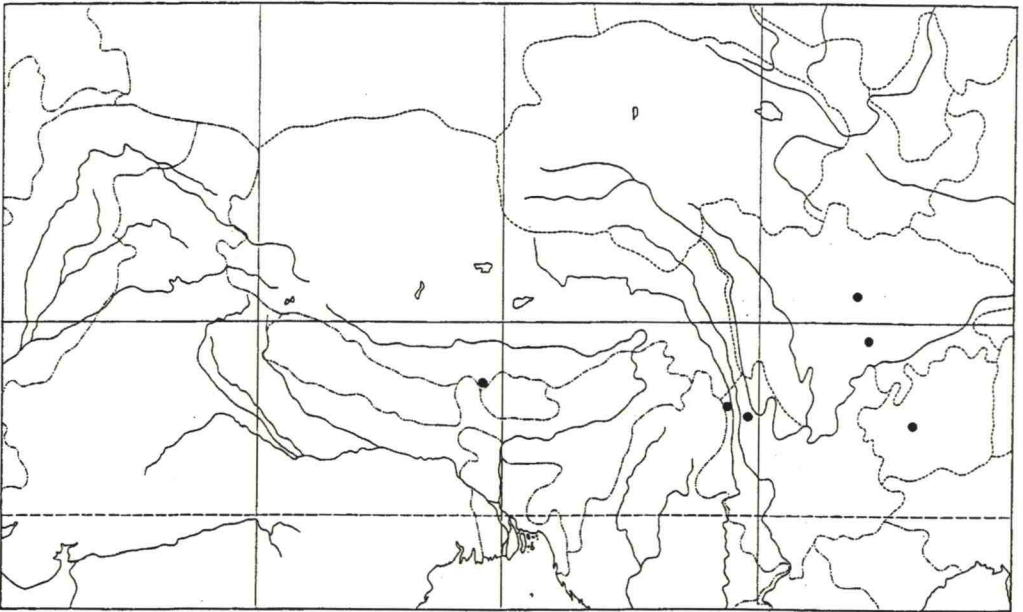


Fig. 55. Distribution map of *Juncus setchuensis* Buchenau

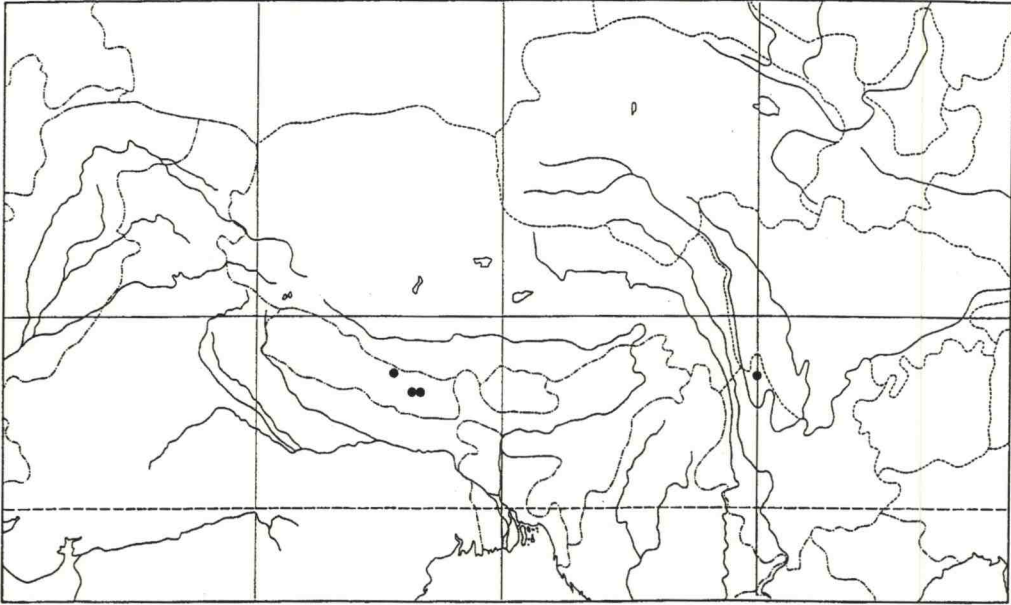


Fig. 56. Distribution map of *Juncus sherei* Miyam & H. Ohba

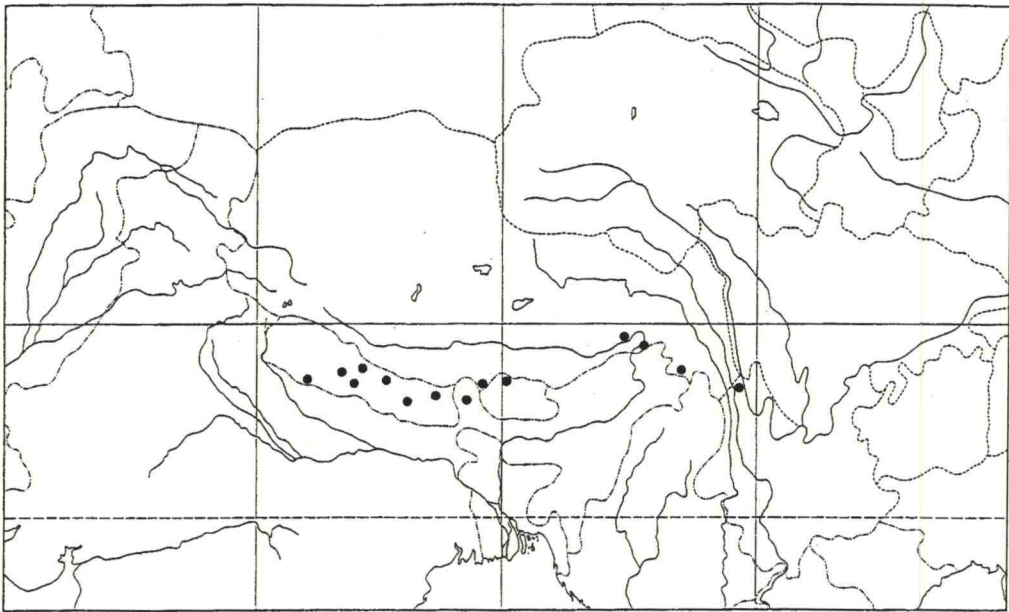


Fig. 57. Distribution map of *Juncus sikkimensis* Hook. f.



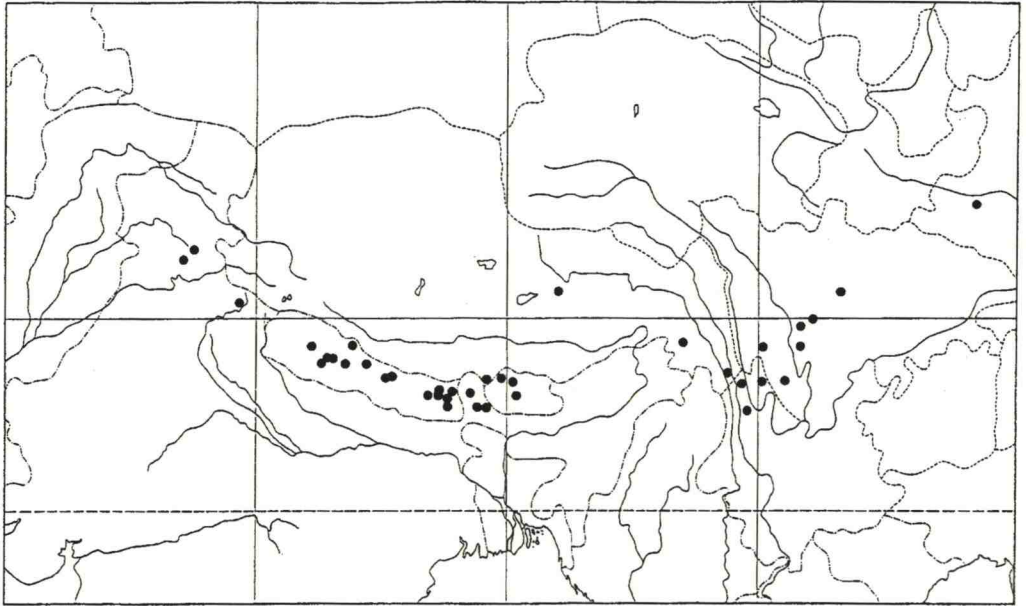


Fig. 58. Distribution map of *Juncus sphacelatus* Decne.

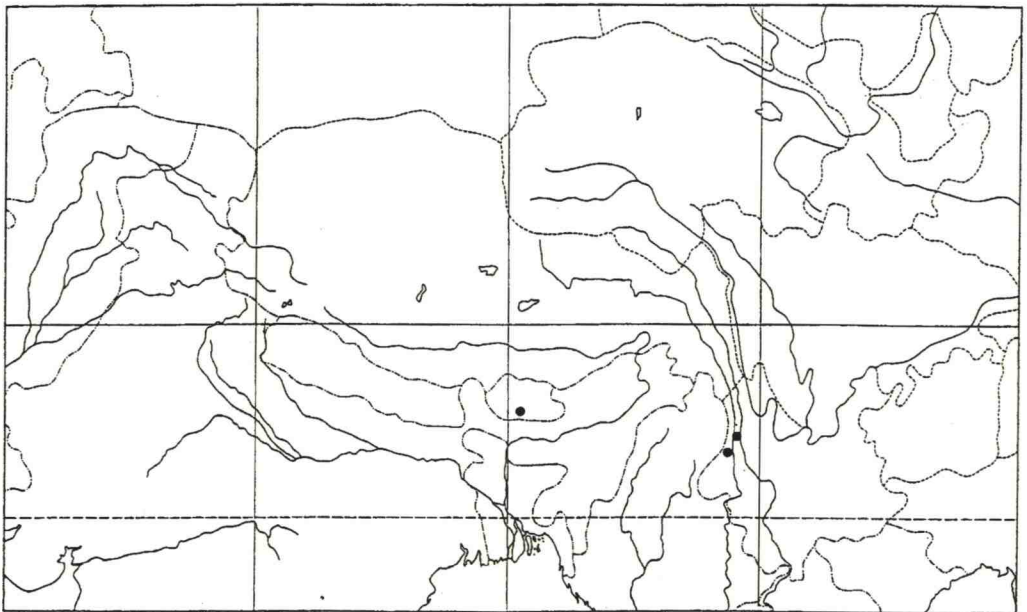


Fig. 59. Distribution map of *Juncus spumosos* Noltie

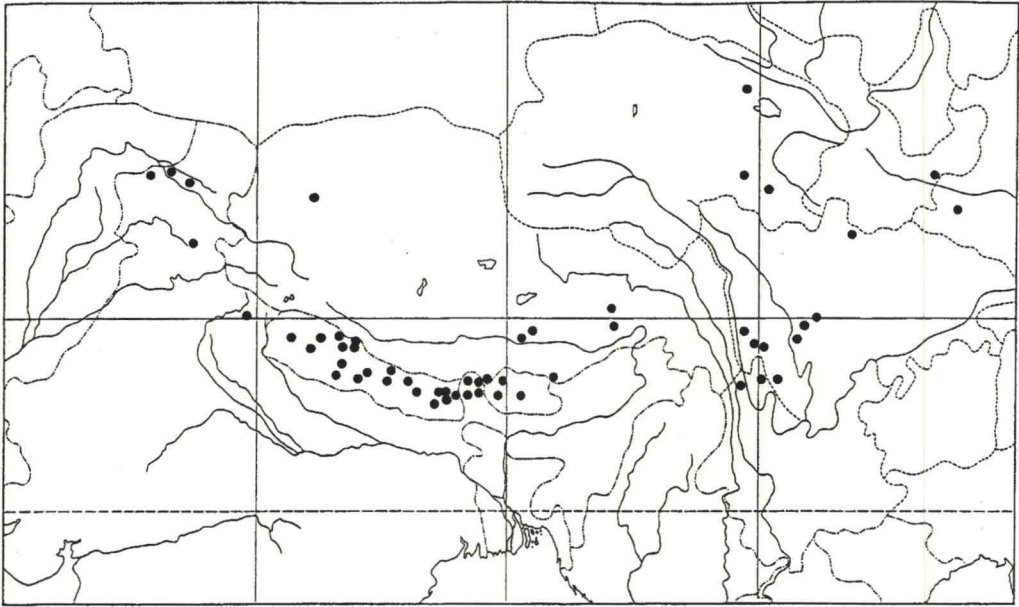


Fig. 60. Distribution map of *Juncus thomsoni* Buchenau

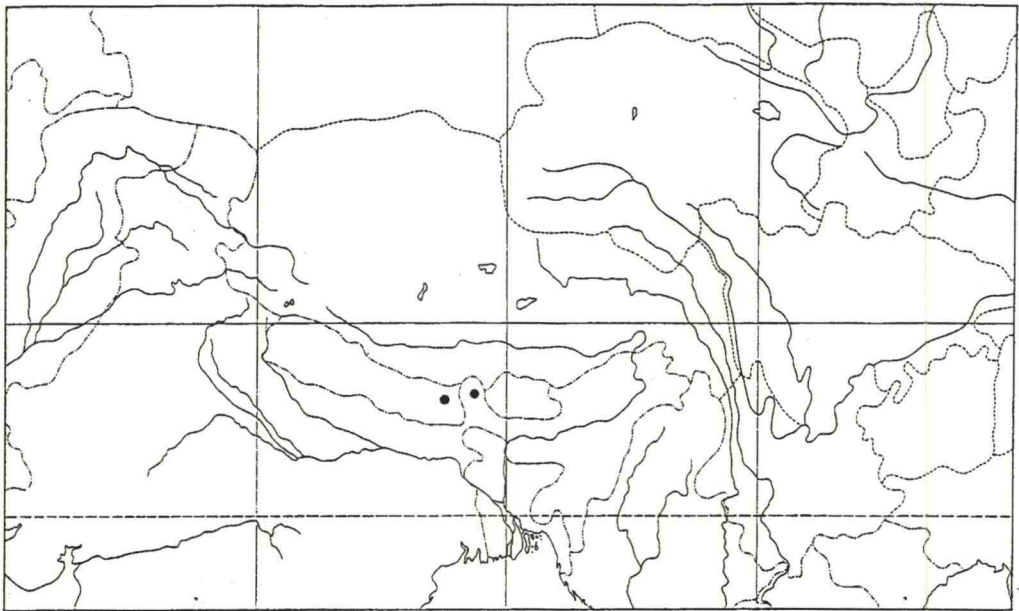


Fig. 61. Distribution map of *Juncus tobdeniorum* Noltie



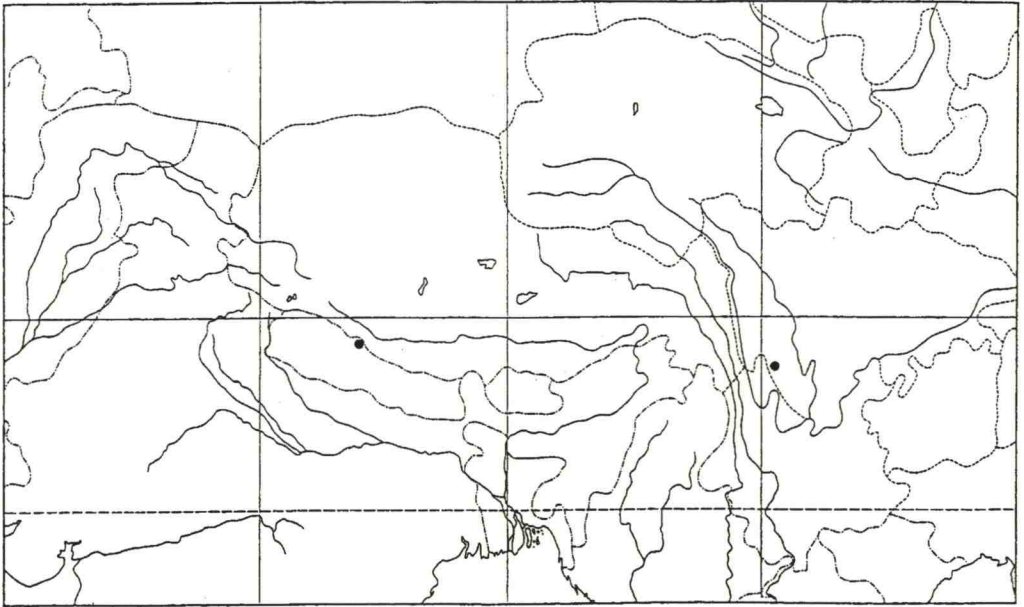


Fig. 62. Distribution map of *Juncus trachyphyllus* Miyam. & H. Ohba

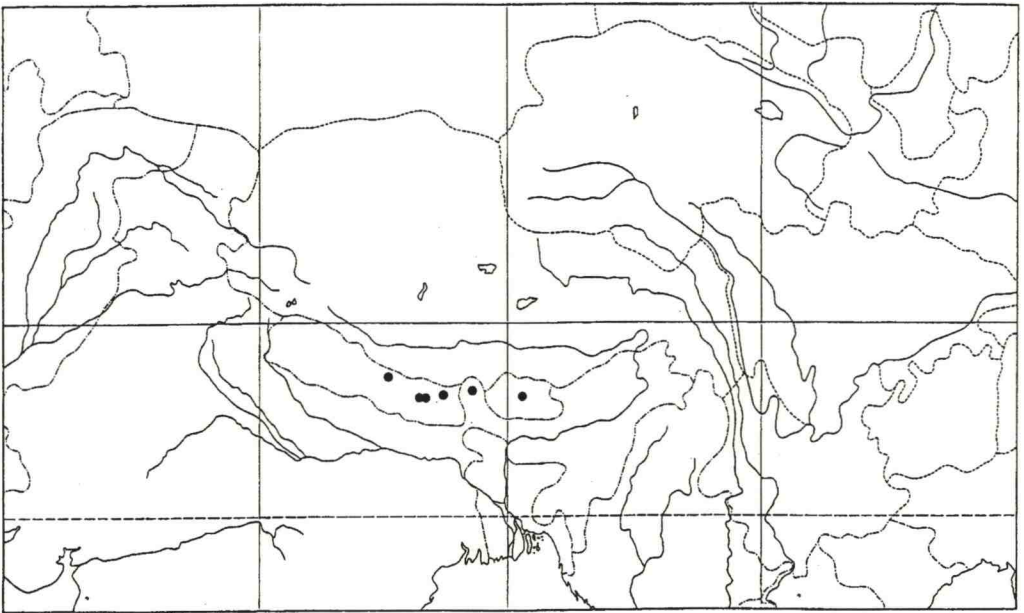


Fig. 63. Distribution map of *Juncus trichophyllus* W. W. Sm.

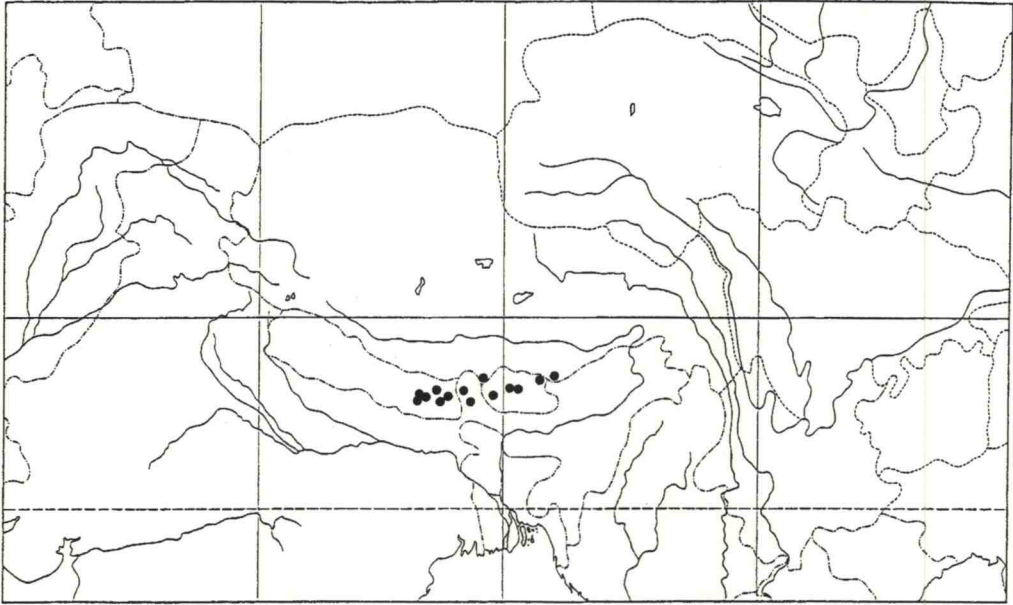


Fig. 64. Distribution map of *Juncus triglumis* L.

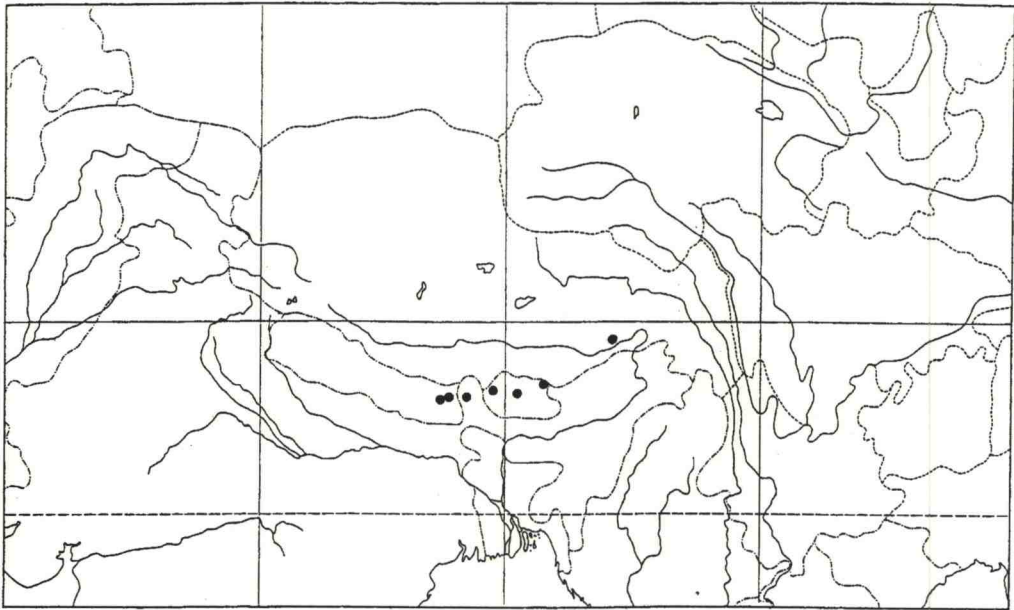


Fig. 65. Distribution map of *Juncus uniflorus* W. W. Sm.



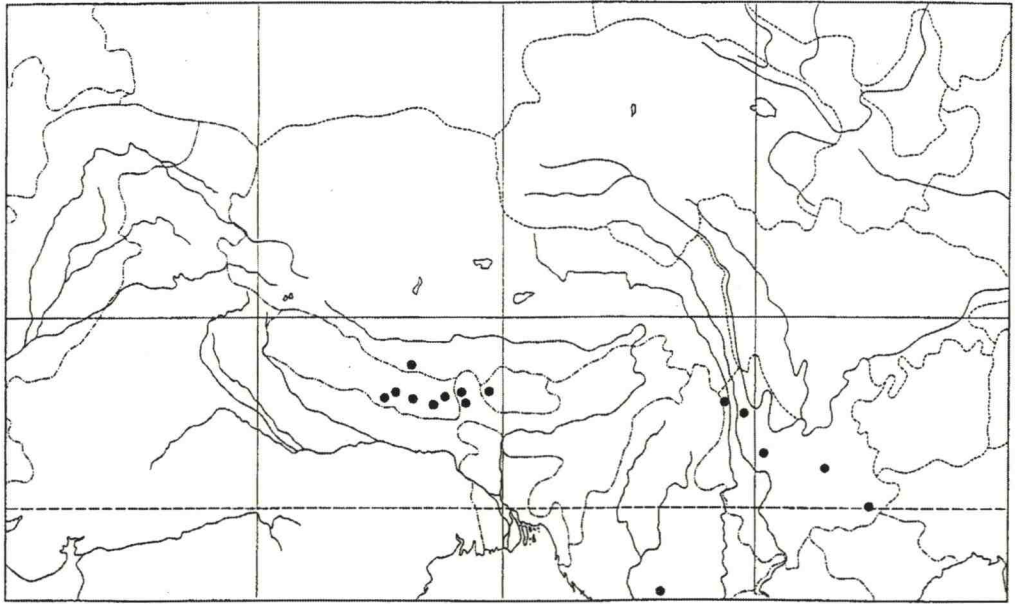


Fig. 66. Distribution map of *Juncus wallichianus* Laharpe

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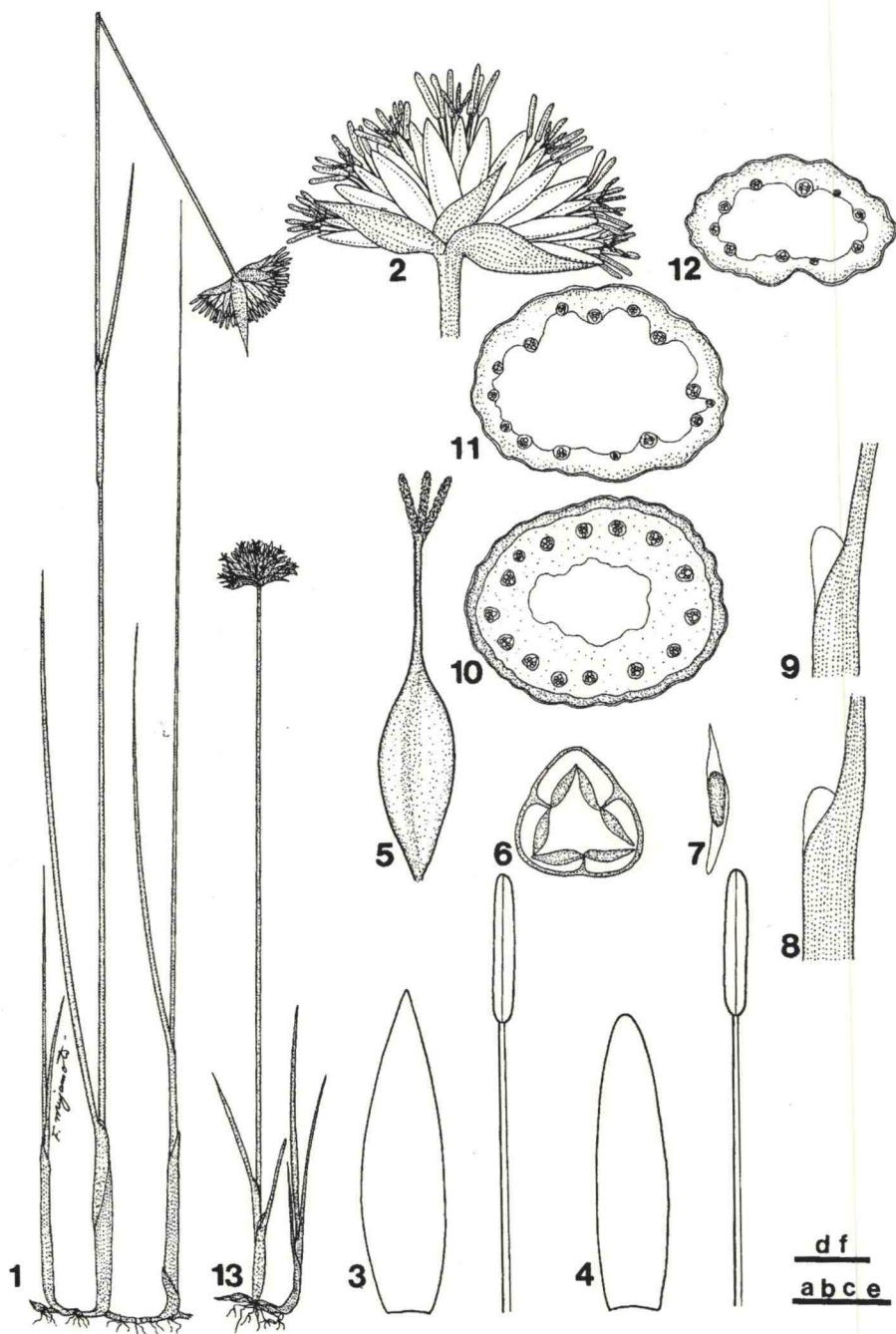
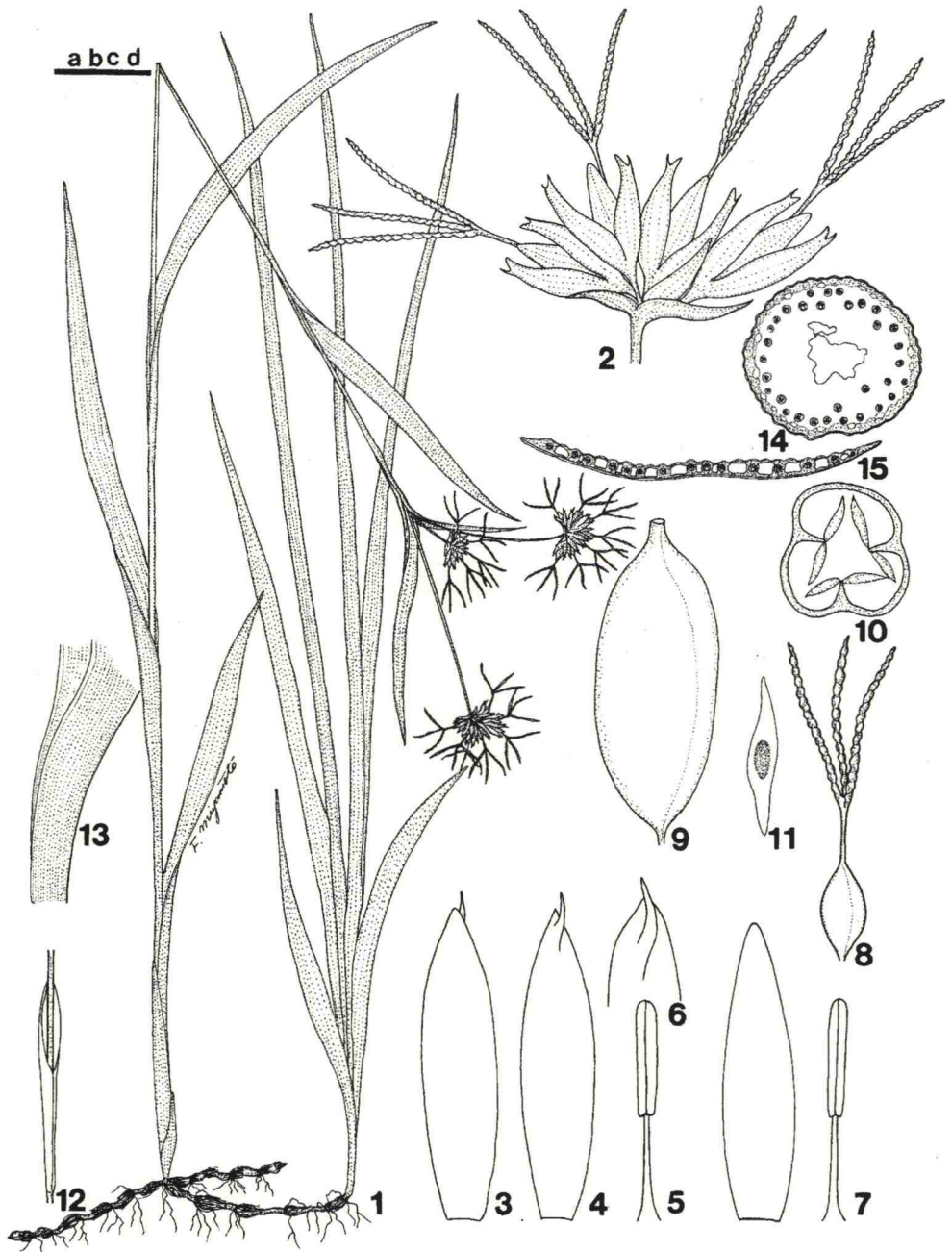


PLATE 1. *Juncus allioides* Franch.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Seed, 8. Auricle of basal leaf, 9. Auricle of cauline leaf, 10. Cross section of lower part of culm, 11. Cross section of basal leaf, 12. Cross section of cauline leaf, 13. Habit. Scales: a (2 cm) for 1 and 13; b (4 mm) for 2, 8 and 9; c (2 mm) for 3, 4 and 5; d (1 mm) for 6; e (1 mm) for 7; f (0.5 mm) for 10, 11 and 12.

Voucher specimen: 1-12, China; Sichuan, Xiaojin, Ganhaizi - Dashuiba - Ganhaizi, 3530 m (H. Ikeda et al. 100826, 31 Aug. 1998, KUN, TI). 13, Nepal; Bagmati zone, Rasuwa Distr., Langtrang Khola - Base camp (near Yala Kharka), 4030 m (F. Miyamoto 9220312, 20 Jul. 1992, TI).

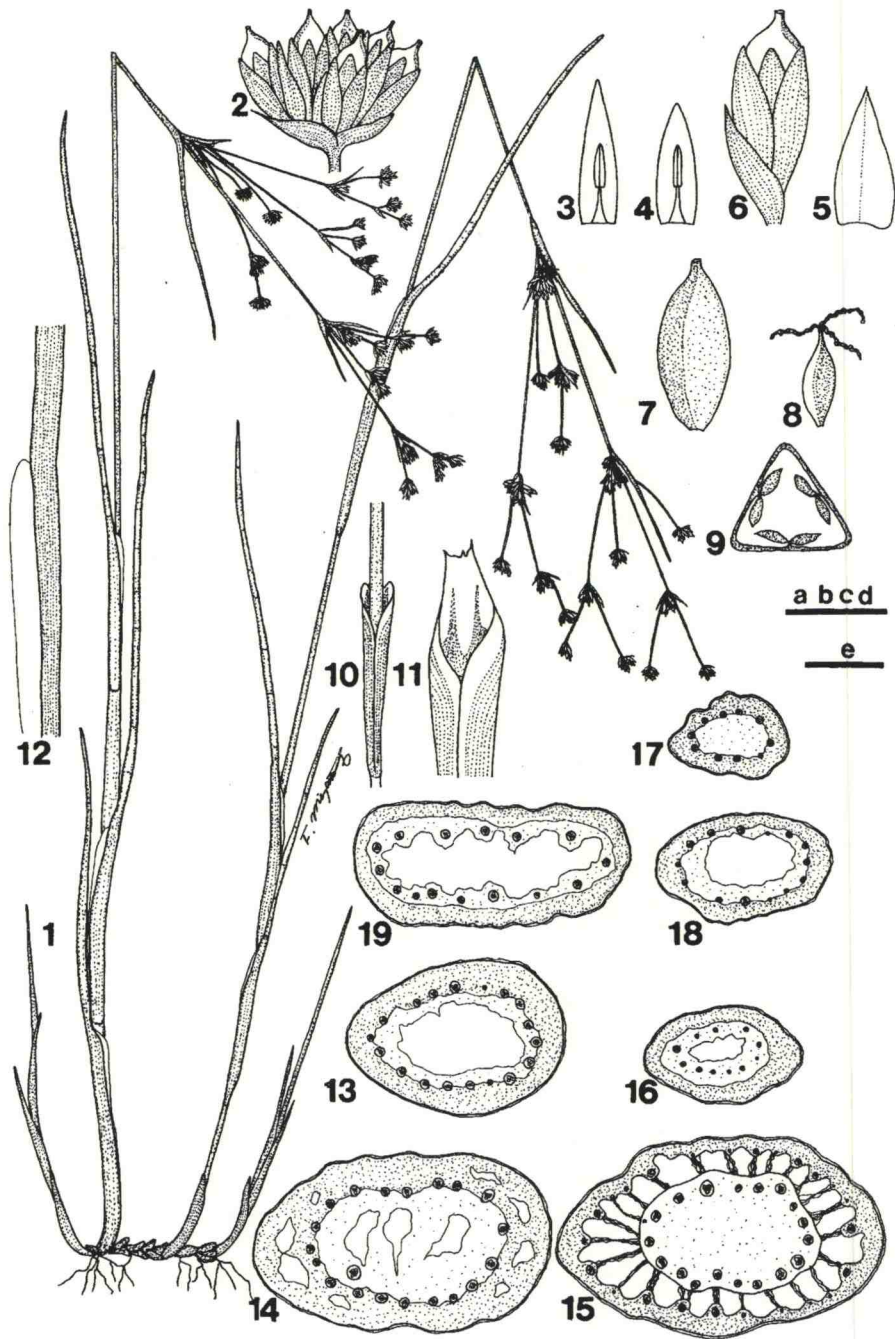




**PLATE 2.** *Juncus amplifolius* A. Camus

1. Habit, 2. Inflorescence, 3. Adaxial side of outer tepal, 4. Abaxial side of outer tepal, 5. Outer stamen, 6. A hooked appendage at apex of outer tepal, 7. Inner tepal and stamen, 8. Pistil, 9. Capsule, 10. Cross section of capsule, 11. Seed, 12. Sheathing bract on peduncle, 13. Leaf auricle of basal leaf, 14. Cross section of culm, 15. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 8, 12 and 13; c (2 mm) for 3, 4, 5, 7, 9, 10, 11 and 15; d (1 mm) for 6 and 14.

Voucher specimen: China; Sichuan, Xiaojin, Ganhaizi - southwestern slope of Mt. Siguniang - Ganhaizi, 4450 m (H. Ikeda et al. 100838, 1 Sept. 1998, TI)



**PLATE 3.** *Juncus articulatus* L.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Bract, 6. Perianth and capsule, 7. capsule, 8. Pistil, 9. Cross section of capsule, 10. Sheathing bract on peduncle, 11. Apex of sheathing bract, 12. Auricle of basal leaf, 13. Cross section of upper part of culm, 14. Cross section of middle part of culm, 15. Cross section of lower part of culm, 16. Cross section of peduncle, 17. Cross section of lowest bract, 18. Cross section of upper part of cauline leaf, 19. Cross section of lower part of cauline leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 12; c (2 mm) for 3, 4, 5, 6, 7, 8 and 10; d (1 mm) for 9 and 11; e (0.5 mm) for 13, 14, 15, 16, 17, 18 and 19.

Voucher specimen: Pakistan; Baltistan, Skardu - Katzarah, 2400 m (S. Takatsuki et al. 9360001, 26 Jul. 1993, TI).

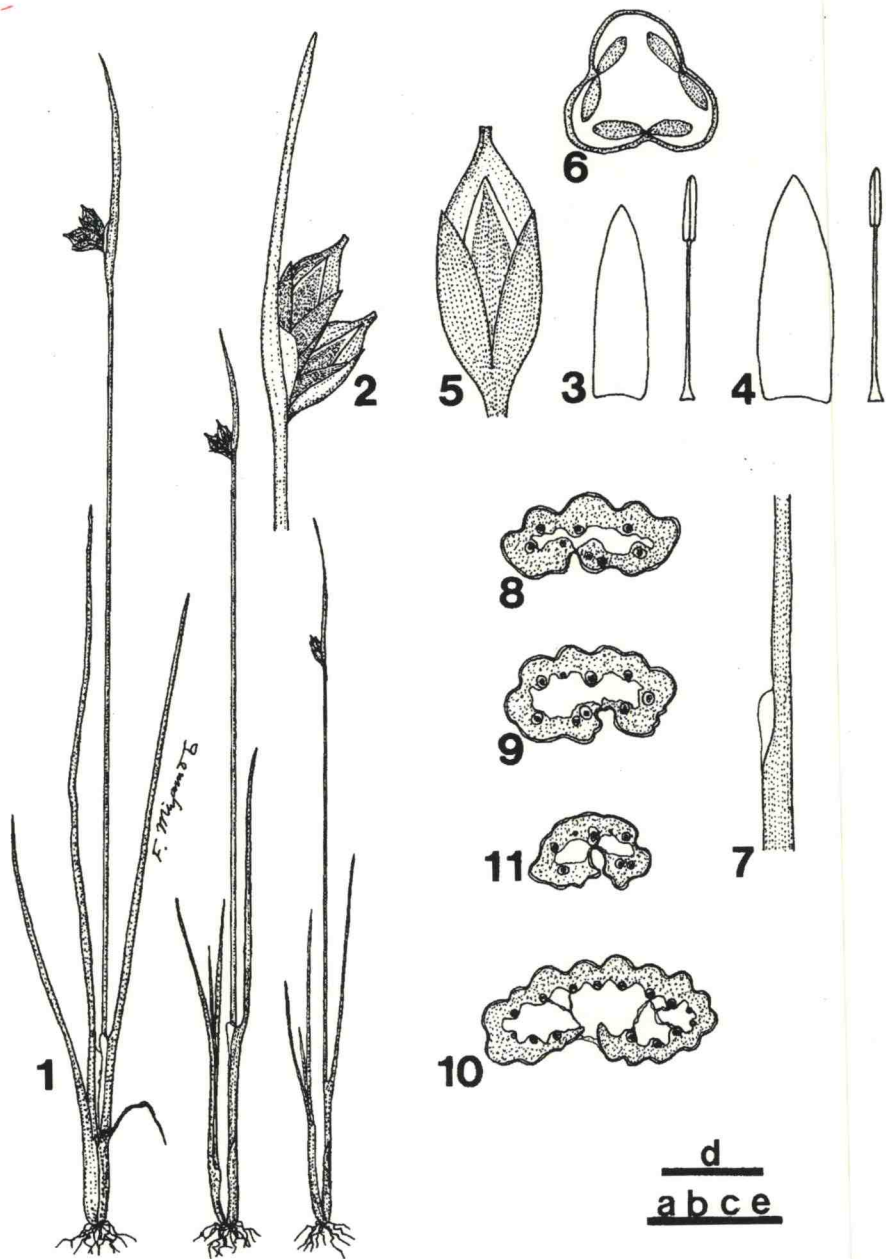




**PLATE 4. *Juncus benghalensis* Kunth**

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of cauline leaf basal leaf, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of lower part of lowest bract, 12. Cross section of upper part of lowest bract, 13. Cross section of lower part of basal leaf, 14. Cross section of upper part of basal leaf, 15. Cross section of lower part of cauline leaf, 16. Cross section of upper part of cauline leaf, 17. Habit. Scales: a (2 cm) for 1 and 17; b (4 mm) for 2 and 8; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7; e (0.5 mm) for 9, 10, 11, 12, 13, 14, 15 and 16.

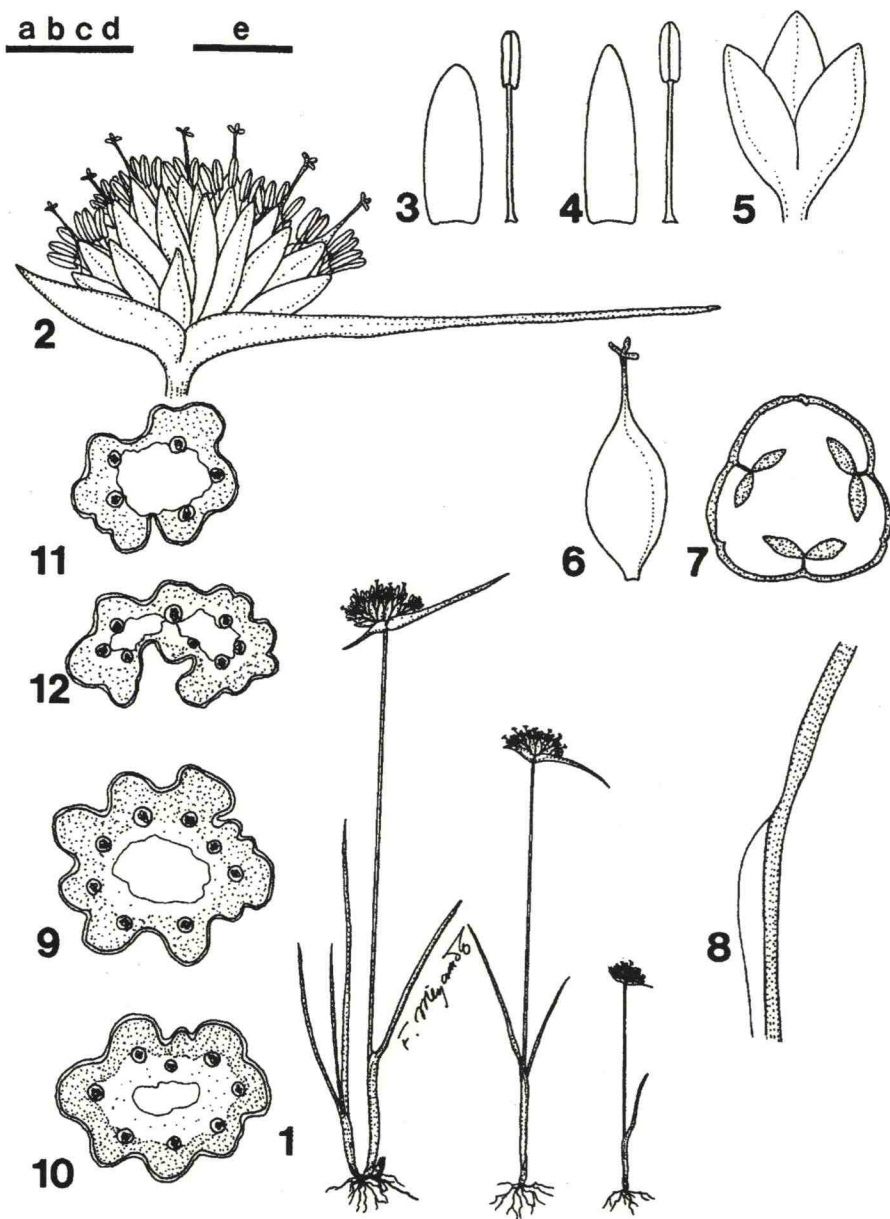
Voucher specimen: 1-16, Nepal; Koshi zone, Sankhuwa Sabha Distr., Bhainsi Karka - Khongma, 3300 m (M. Minaki et al. 920560, 4 Aug. 1990, TI). 17, Bhutan; Wangdi Phodrang distr. Tampe La, 4400 m (F. Miyamoto 9361687, 25 Sept. 1993, TI).



**PLATE 5.** *Juncus biglumoides* H. Hara

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and capsule, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of upper part of culm, 9. Cross section of lower part of culm, 10. Cross section of basal leaf, 11. Cross section of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4, 5 and 7; d (1 mm) for 6; e (0.5 mm) for 8, 9, 10 and 11. Voucher specimen: Nepal; Rambrong, Lamjung Himal, 12000 ft. (J. D. A. Stainton et al. 6029, 29 Jul. 1954, TI).

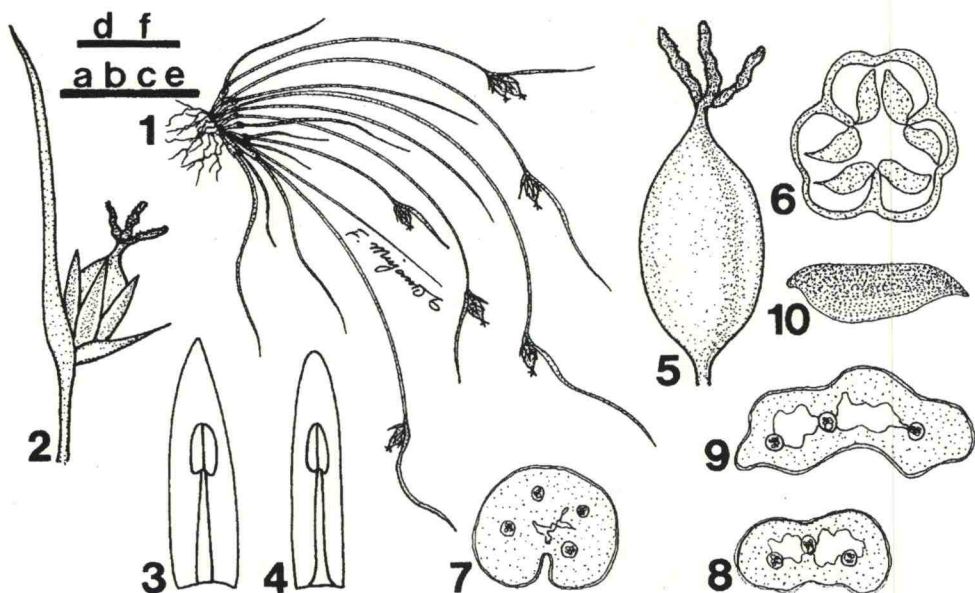




**PLATE 6.** *Juncus brachystigma* Sam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of lowest bract, 12. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 8; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7; e (0.5 mm) for 9, 10, 11 and 12.

Voucher specimen: Bhutan; Wangdi Phodrang Distr., Tampe La, 4400 m (F. Miyamoto 9361692, 25 Sept. 1993, TI).



**PLATE 7.** *Juncus bryophilus* Noltie

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Cross section of middle part of culm, 8. Cross section of basal leaf, 9. Cross section of Lowest bract, 10. Seed. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4 and 5; d (1 mm) for 6; e (0.5 mm) for 7, 8 and 9; f (0.5 mm) for 10.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., a Kharka - Pati Kharka, 3650 m (F. Miyamoto et al. 9410195, 4 Aug. 1994, TI).



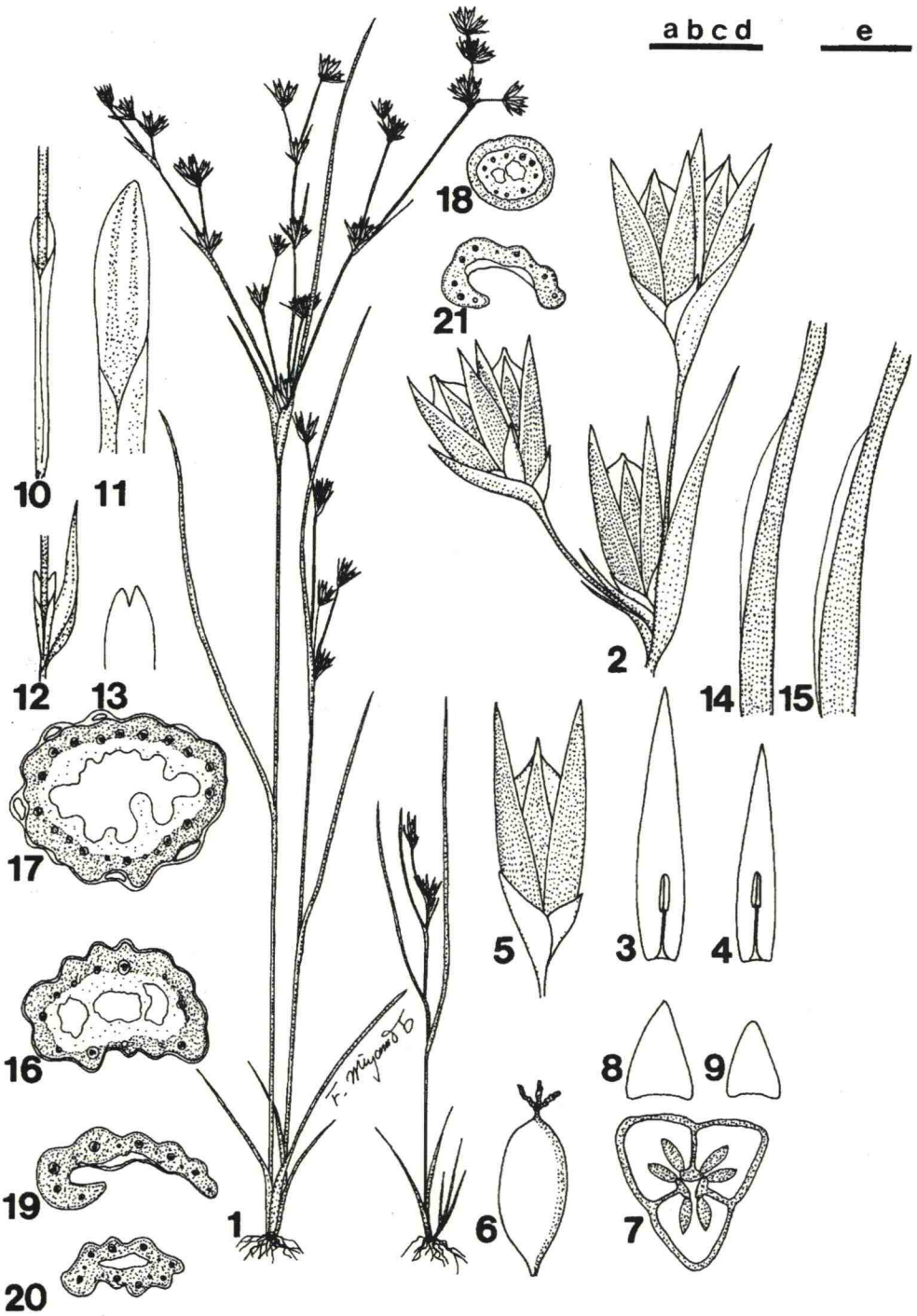


PLATE 8. *Juncus bufonius* L.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and capsule, 6. Pistil, 7. Cross section of capsule, 8. Outer bract, 9. Inner bract, 10, 12. Sheathing bract on peduncle, 11, 13. Apex of sheathing bract, 14. Auricle of cauline leaf, 15. Auricle of basal leaf, 16. Cross section of upper part of culm, 17. Cross section of lower part of culm, 18. Cross section of peduncle, 19. Cross section of cauline leaf, 20. Cross section of basal leaf, 21. Cross section of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2, 11, 13, 14 and 15; c (2 mm) for 3, 4, 5, 6, 8, 9, 10 and 11; d (1 mm) for 7; e (0.5 mm) for 16, 17, 18, 19, 20 and 21.

Voucher specimen: Bhutan; Thimphu - Wangdu Phodrang, 1450-3200 m (H. Kanai et al. 4493, 9 Apr. 1967, TI).

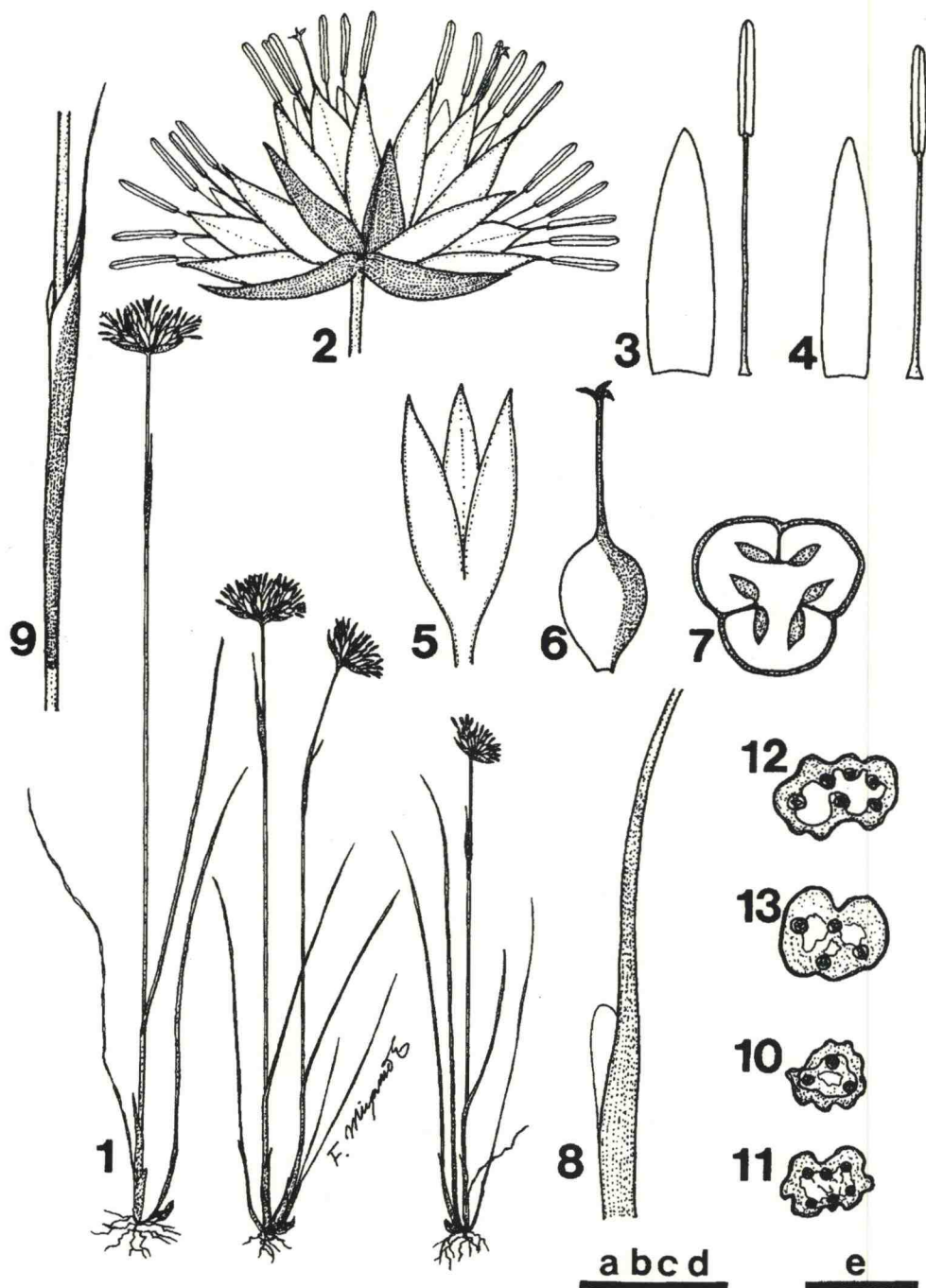
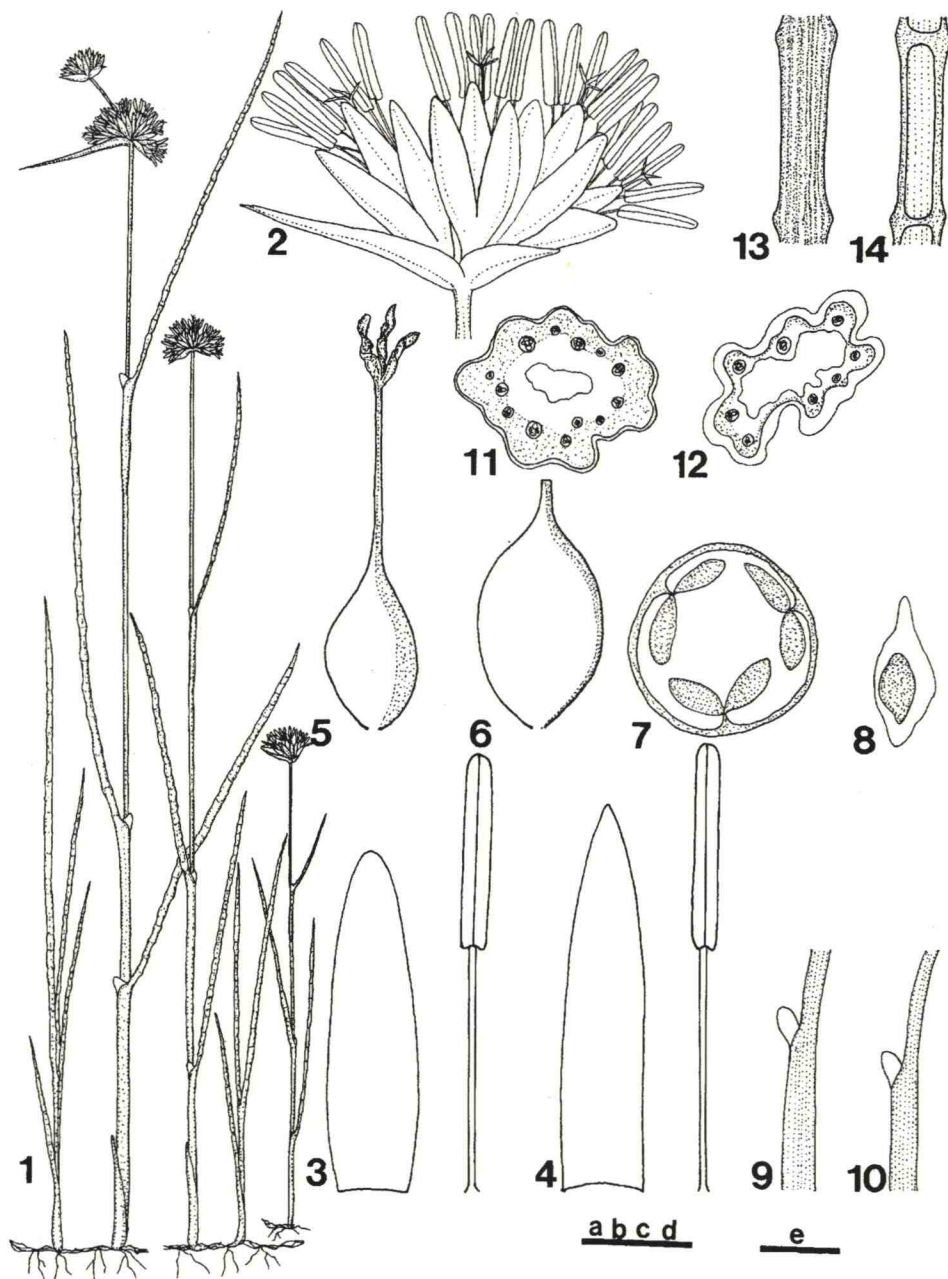


PLATE 9. *Juncus cephalostigma* Sam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cauline leaf, 10. Cross section of part of culm, 11. Cross section of lower part of culm, 12. Cross section of upper part of basal leaf, 13. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 8; c (2 mm) for 3, 4, 5, 6 and 9 d (1 mm) for 7; e (0.5 mm) for 10, 11, 12 and 13.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, Surveying the whole area around Shipton Pass, 4400 m (M. Minaki et al. 9020683, 7 Aug. 1990, TI).





**PLATE 10.** *Juncus chrysocarpus* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Capsule, 7. Cross section of capsule, 8. Seed, 9. Auricle of basal leaf, 10. Auricle of cauline leaf, 11. Cross section of culm, 12. Cross section of basal leaf, 13. transverse septa of basal leaf, 14. Longitudinal section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9 and 10; c (2 mm) for 3, 4, 5, 6, 13 and 14; d (1 mm) for 7; e (0.5 mm) for 8, 11 and 12.

Voucher specimen: Nepal; Rasuwa, Lipchet Kharka - Makgan Kharka - Guinsi (near Balche), 3320m (F. Miyamoto et al. 9410324, 16 Aug. 1994, TI).



**PLATE 11. *Juncus clarkei* Buchenau**

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Auricle of cauline basal leaf, 9. Cross section of peduncle, 10. Cross section of culm, 11. Cross section of lowest bract, 12. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 8; c (2 mm) for 3, 4, 5 and 7; d (1 mm) for 6; e (0.5 mm) for 9, 10, 11 and 12. Voucher specimen: Bhutan; Wangdi Phodrang Distr., Bhja - Maorothang, 3350 m (F. Miyamoto 9361535, 19 Sept. 1993, TT).



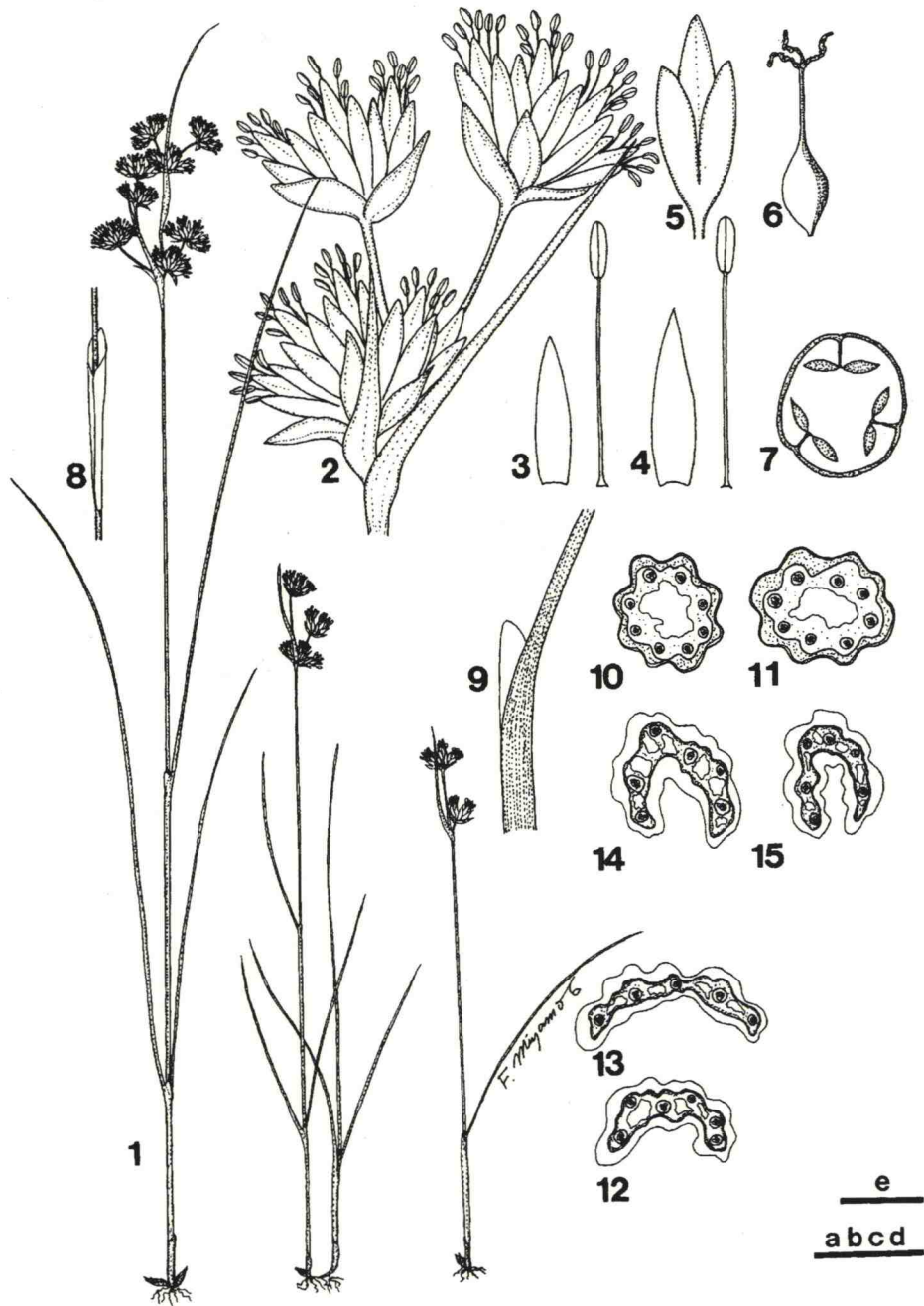


PLATE 12. *Juncus concinnus* D. Don

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. Auricle of cauline leaf, 10. Cross section of upper part of culm, 11. Cross section of lower part of culm, 12. Cross section of upper part of lowest bract, 13. Cross section of lower part of lowest bract, 14. Cross section of upper part of basal leaf, 15. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 9; c (2 mm) for 3, 4, 5, 6 and 8; d (1 mm) for 7; e (0.5 mm) for 10, 11, 12, 13, 14 and 15.

Voucher specimen: Nepal; Janakpur zone, Ramechhap Distr., Neju - Choarma, 3651-2760 m (H. Ohba et al. 8571114-bis, 2 Aug. 1985, TI).

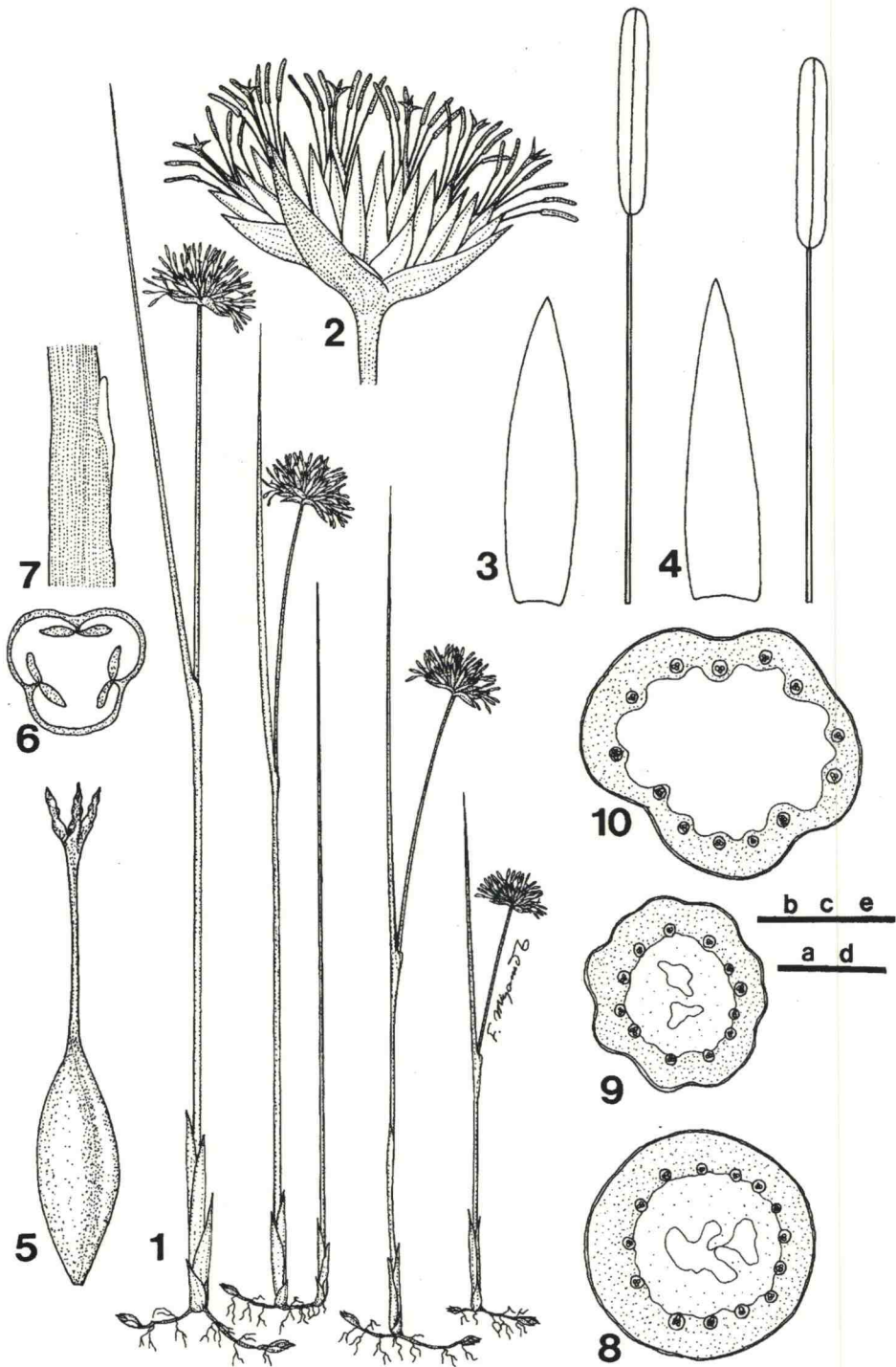


PLATE 13. *Juncus concolor* Sam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Leaf auricle, 8. Cross section of lower part of culm, 9. Cross section of upper part of culm, 10. Cross section of cauline leaf. Scales: a (2cm) for 1; b (5mm) for 2 and 7; c (2.5 mm) for 3, 4, and 5; d (1mm) for 6; e (1.5 mm) for 8, 9, and 10.

Voucher specimen: China. Yunnan, Yangbi, around Cangshan, Yangbi side, 3800 m (S. K. Wu et al. 475, 17 Aug. 1997, TI).





**PLATE 14.** *Juncus crassistylus* A. Camus

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Auricle of basal leaf, 9. Cross section of culm, 10. Cross section of peduncle, 11. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 7 and 8; c (2 mm) for 3, 4, 5; d (1 mm) for 6; e (0.5 mm) for 9, 10 and 11.

Voucher specimen: China; Yunnan, Tsang-chan, parmiles bambous, 3500 m (P. J. M. Delavey 2656, 20 Aug. 1887, TI).

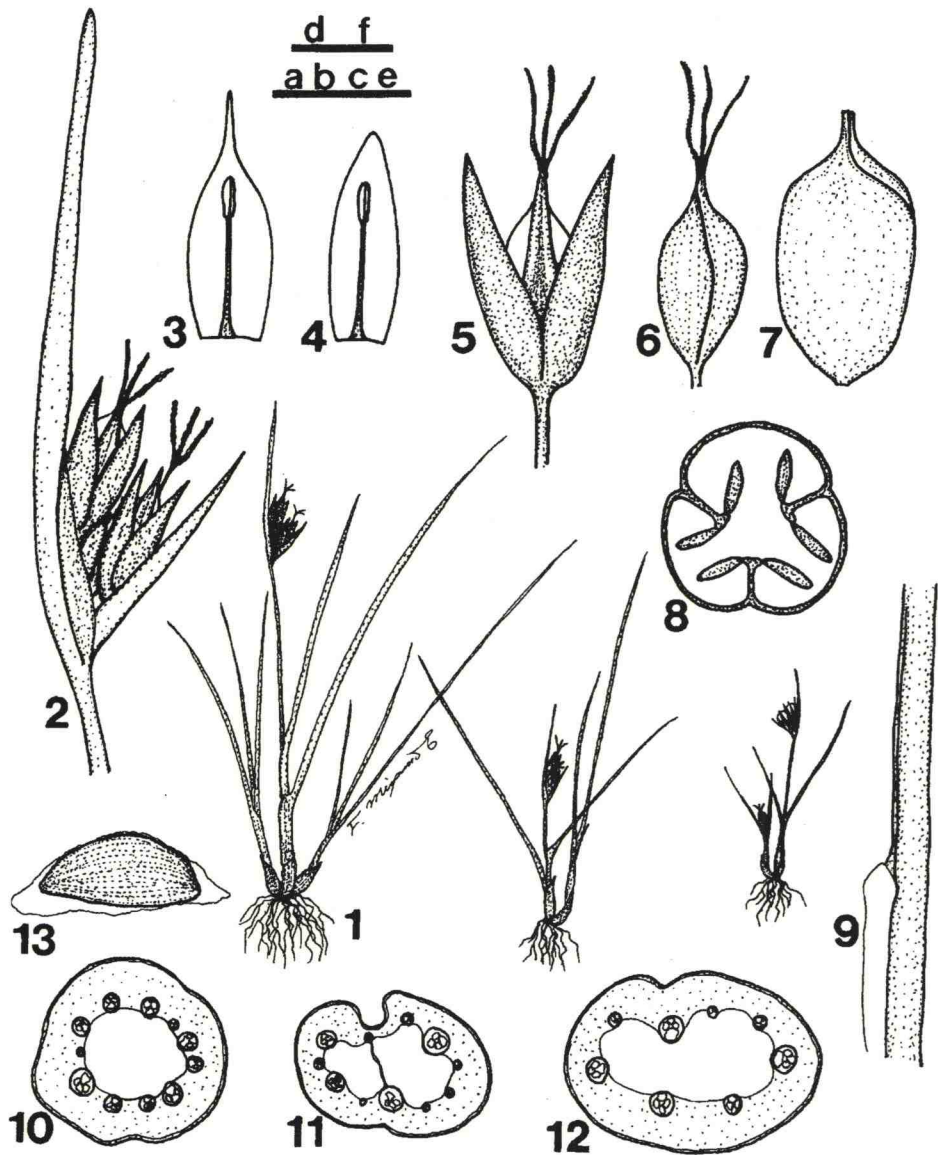


**PLATE 15.** *Juncus dongchuanensis* K. F. Wu.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Proliferous flower, 8. Leaf auricle, 9. Sheathing bract on peduncle, 10. Cross section of lower part of culm, 11. Cross section of cauline leaf. Scales: a (2cm) for 1; b (7.5 mm) for 2; c (5 mm) for 8 and 9, d: (2.5 mm) for 3, 4, 5, and 7; e (1mm) for 6, 10, and 11.

Voucher specimen: China; Yunnan, Dali, Cangshan, 3410 m (S. K. Wu et al. 1611, 1 Sep. 1996, TI).





**PLATE 16.** *Juncus duthiei* (C. B. Clarke) Noltie  
 1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Flower, 6. Pistil, 7. Capsule, 8. Cross section of capsule, 9. Auricle of basal leaf, 10. Cross section of culm, 11. Cross section of lowest bract, 12. Cross section of basal leaf, 13. Seed. Scales: a (2 cm) for 1; b (4 mm) for 2 and 9; c (2 mm) for 3, 4, 5, 6 and 7; d (1 mm) for 8; e (0.5 mm) for 10, 11 and 12; f (0.5 mm) for 13.  
 Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Around Base Camp (near Yala Kharka), 4920 m (H. Takayama et al. 9220322, 21 Jul. 1992, TI-holotype).

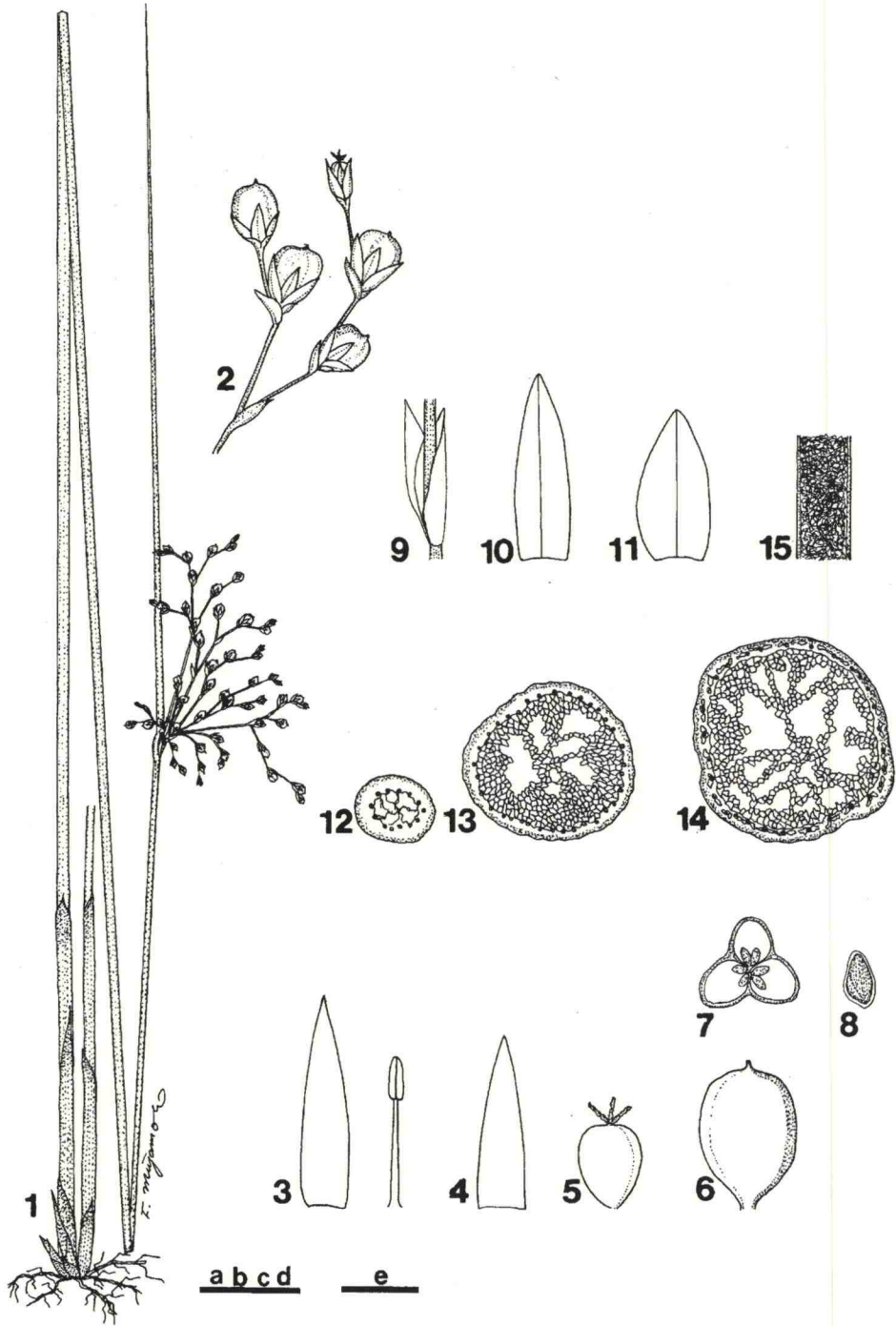
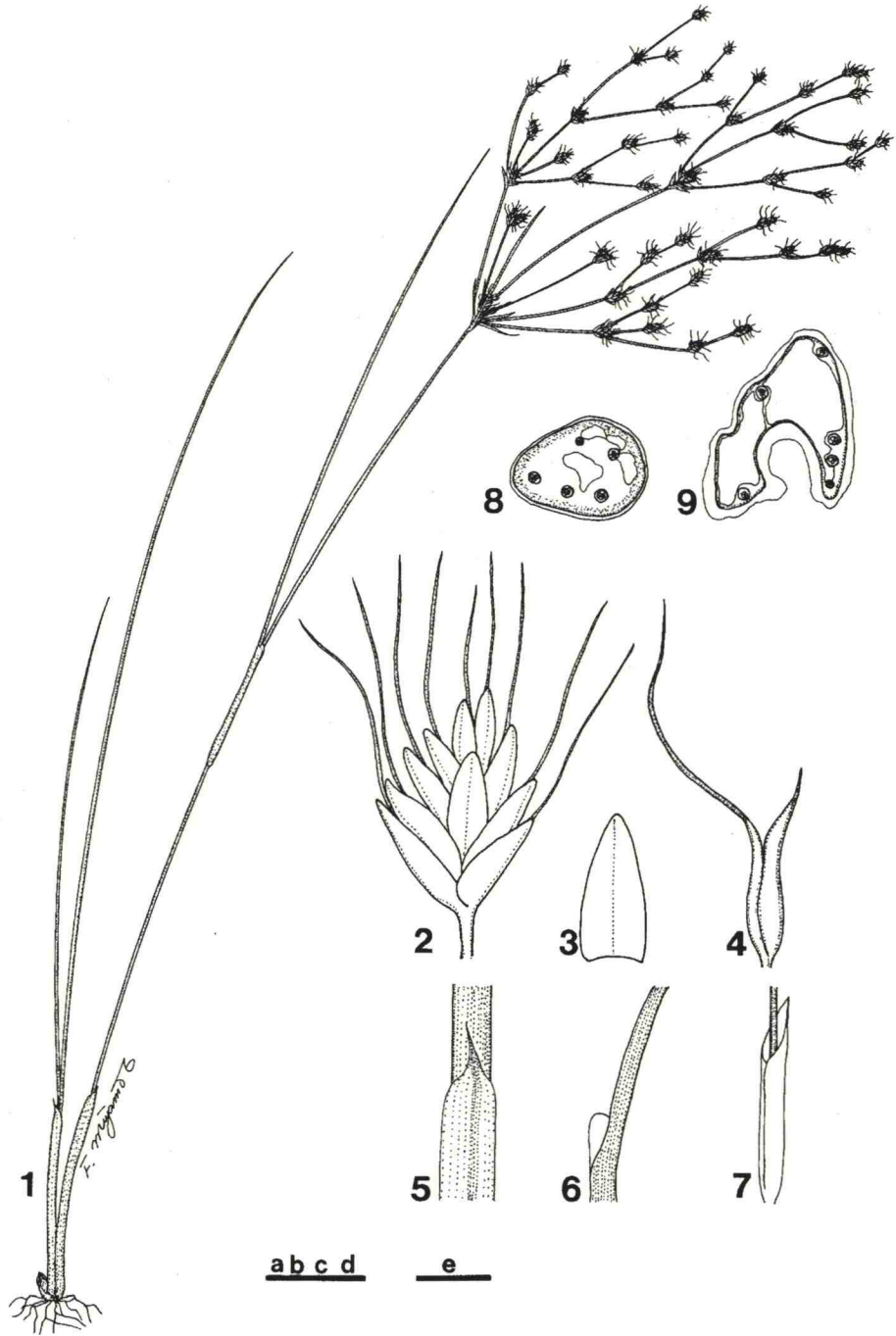


PLATE 17. *Juncus effusus* L.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal, 5. Pistil, 6. Capsule, 7. Cross section of capsule, 8. Seed, 9. Sheathing bract on peduncle, 10. Bract on peduncle, 11. Sheathing bract, 12. Cross section of peduncle, 13. Cross section of lowest bract, 14. Cross section of lower part of culm, 15. Longitudinal section of culm. Scales: a (2 cm) for 1; b (4 mm) for 2; c (1 mm) for 3, 4 and 8; d (2 mm) for 5, 6, 7 and 9; e (1 mm) for 10, 11, 12, 13, 14 and 15.

Voucher specimen: China; Yunnan, Lushui, Pianma - Pianma Pass - Lushui, 2600 m (S. K. Wu et al. 103178, 13 Sept. 1999, TI).

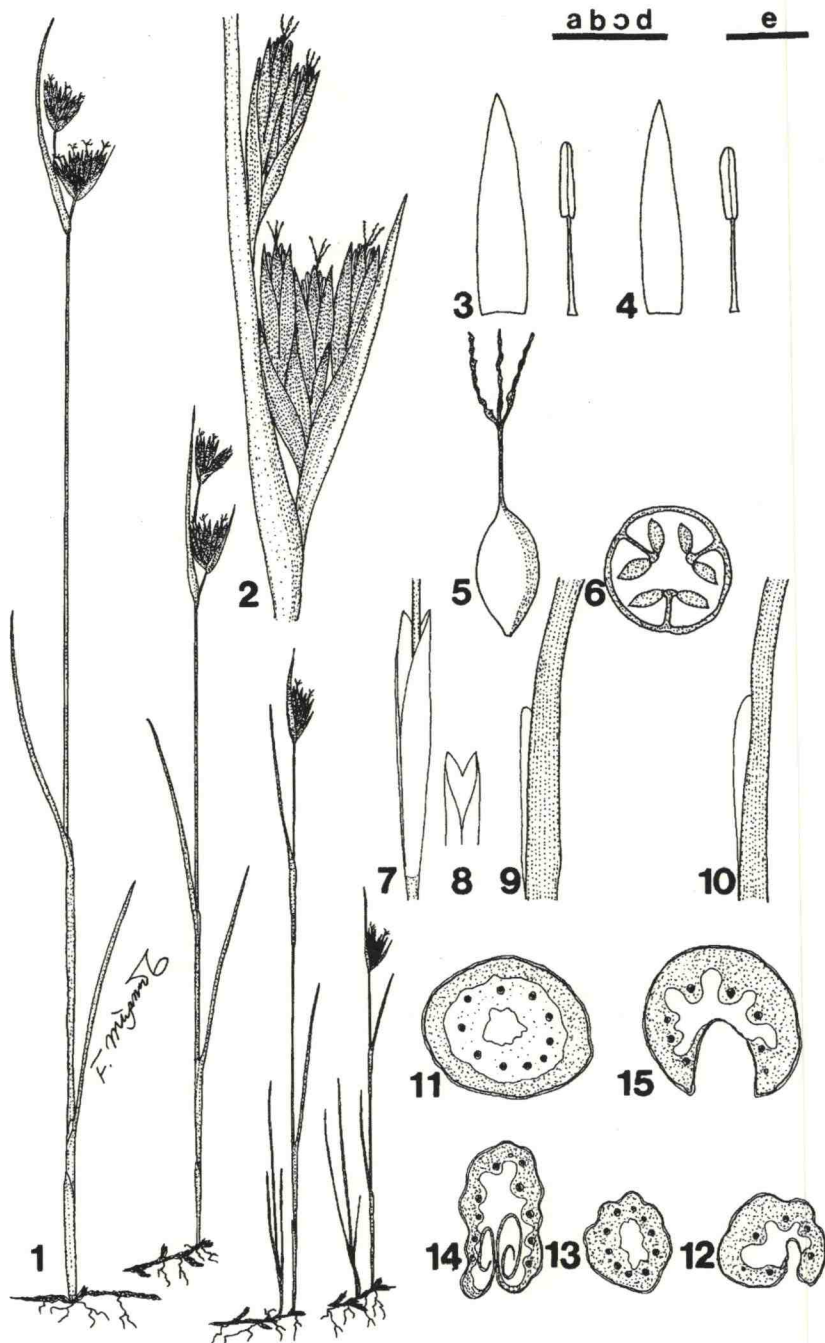




**PLATE 18. *Juncus fimbriatylodes* Noltie**

1. Habit, 2. Inflorescence, 3. Bract, 4. Sterile flower, 5. Apex part of basal sheathing leaf, 6. Auricle of cauline leaf, 7. Sheathing bract on peduncle, 8. Cross section of upper part of culm, 9. Cross section of cauline leaf. Scales: a (2 cm) for 1; b (1 mm) for 2, 3 and 4; c (2 mm) for 5; d (4 mm) for 6 and 7; e (0.5 mm) for 8 and 9.

Voucher specimen: China; Yunnan, Binchuan, Jizu Shan, Jinding Temple - Zhusheng Temple, 2900 m (S. K. Wu et al. 103196, 25 Sept. 1999, TT).



**PLATE 19.** *Juncus ganeshii* Miyam. & H. Ohba

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Apex of sheathing bract, 9. Auricle of cauline leaf, 10. Auricle of basal leaf, 11. Cross section of culm, 12. Cross section of lowest bract, 13. Cross section of upper part of cauline leaf, 14. Cross section of lower part of cauline leaf, 15. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9 and 10; c (2 mm) for 3, 4, 5, 7 and 8; d (1 mm) for 6; e (0.5 mm) for 11, 12, 13, 14 and 15.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Jaisuli Kund - Paldo Base Camp, 4440 m (F. Miyamoto et al. 9410148, 2 Aug. 1994, TI-holotype).





**PLATE 20.** *Juncus giganteus* Sam.  
 1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and capsule, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Auricle of basal leaf, 9. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 7 and 8; c (2 mm) for 3, 4, 5; d (1 mm) for 6; e (0.5 mm) for 9. Voucher specimen: China; Szechuan, Hsioeh-shan, 4300 m (H. Smith 3878, 19 Jul. 1922, TI).

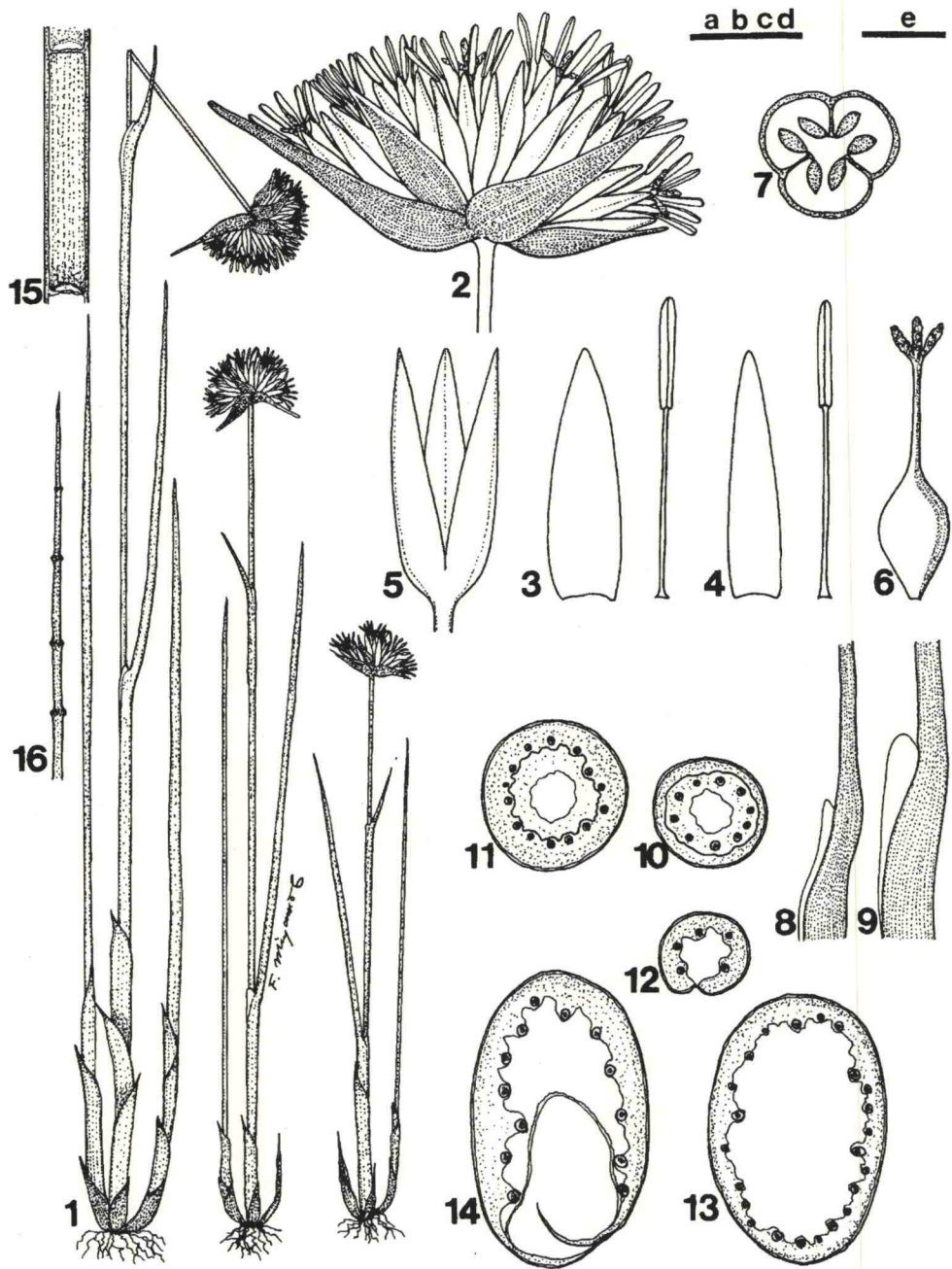


PLATE 21. *Juncus glaucoturgidus* Noltie

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricule of cauline leaf, 9. Auricule of basal leaf, 10. Cross section of upper part of culm, 11. Cross section of lower part of culm, 12. Cross section of cauline leaf, 13. Cross section of upper part of basal leaf, 14. Cross section of lower part of basal leaf, 15. Longitudinal section of basal leaf, 16. Leaf at dried. Scales: a (2 cm) for 1 and 16; b (4 mm) for 2, 8, 9 and 15; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7; e (0.5 mm) for 10, 11, 12, 13 and 14.

Voucher specimen: Nepal, Bagmati zone, Rasuwa Distr., Kyangin Kharka - Yala Kharka, 4230 m (H. Takayama et al. 92202172, 14 Jul. 1992, TI).



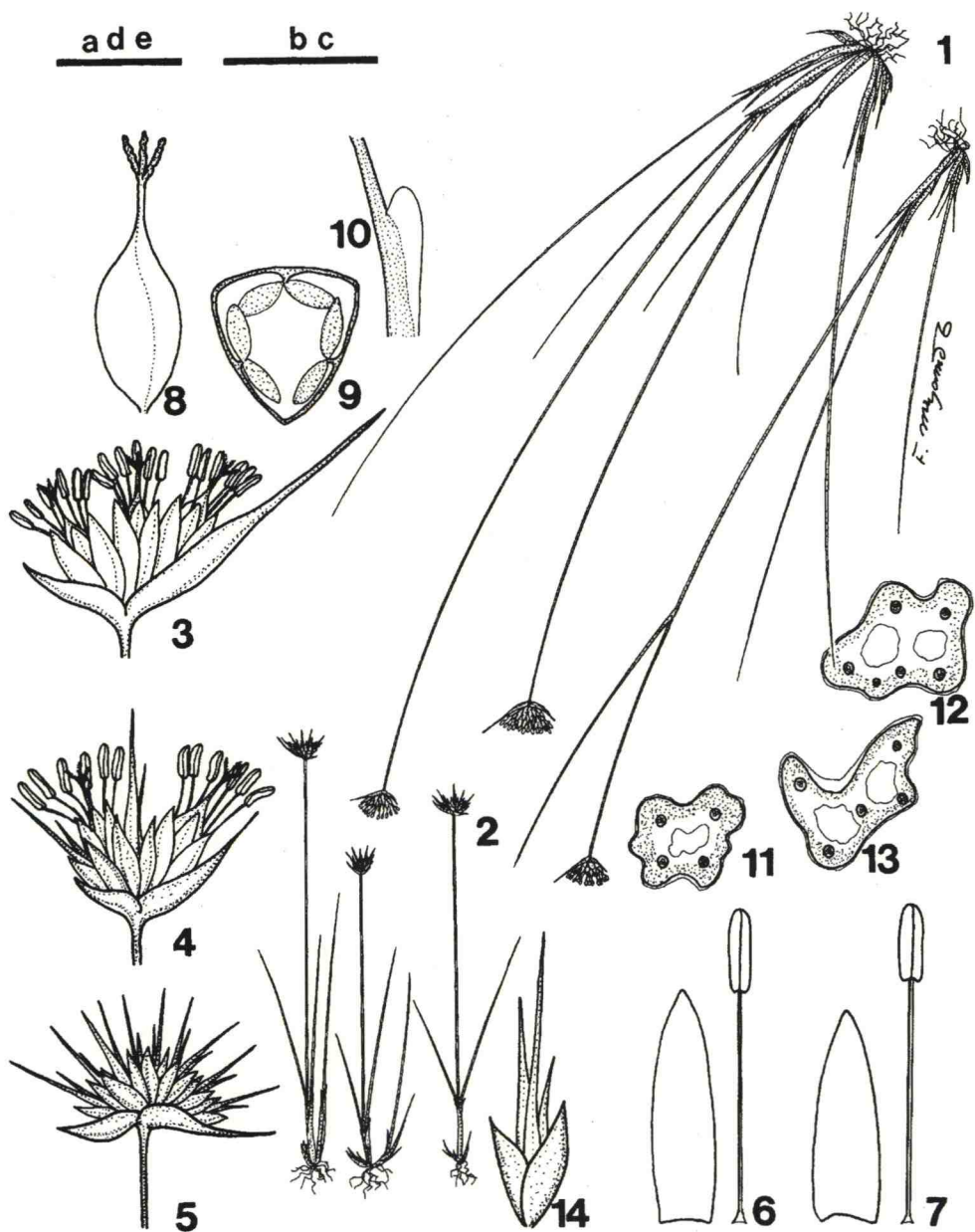
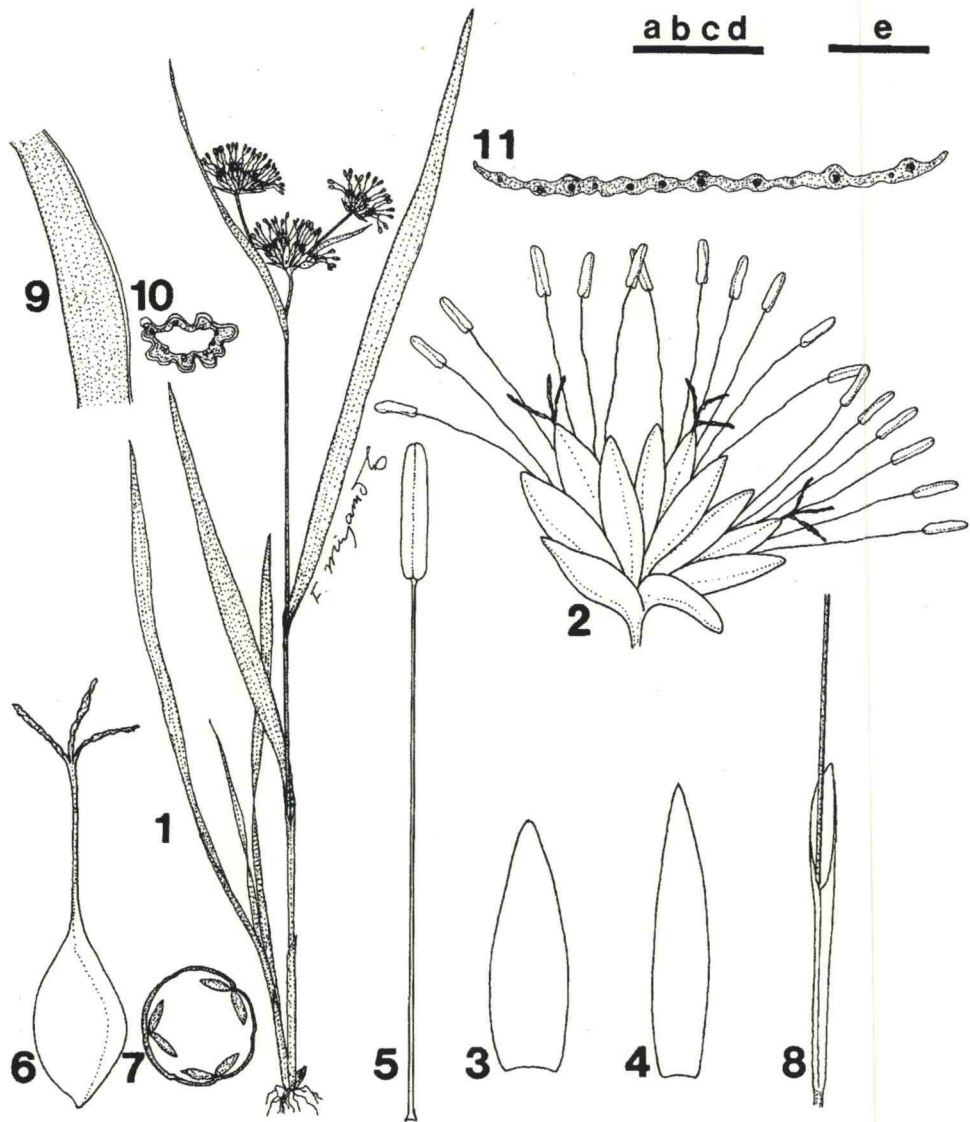


PLATE 22. *Juncus gonggae* Miyam. & H. Ohba

1. Habit, 2. Habit, 3. Normal inflorescence, 4. Normal and proliferous inflorescence, 5. Proliferous inflorescence, 6. Outer tepal and stamen, 7. Inner tepal and stamen, 8. Pistil, 9. Cross section of capsule, 10. Leaf auricle, 11. Cross section of upper part of culm, 12. Cross section of sterile leaf, 13. Cross section of basal leaf, 14. Proliferous flower. Scales: a (2 cm) for 1; b (5 mm) for 2, 3, 4 and 5; c (2.5 mm) for 6, 7, 8, 10 and 14; d (1 mm) for 9; e (0.5 mm) for 11, 12 and 13.

Voucher specimen: China; Sichuan, Daocheng, Mt. Gonggashan, 4300 m (S. K. Wu et al. 1551, 25 Aug. 1996, TI).

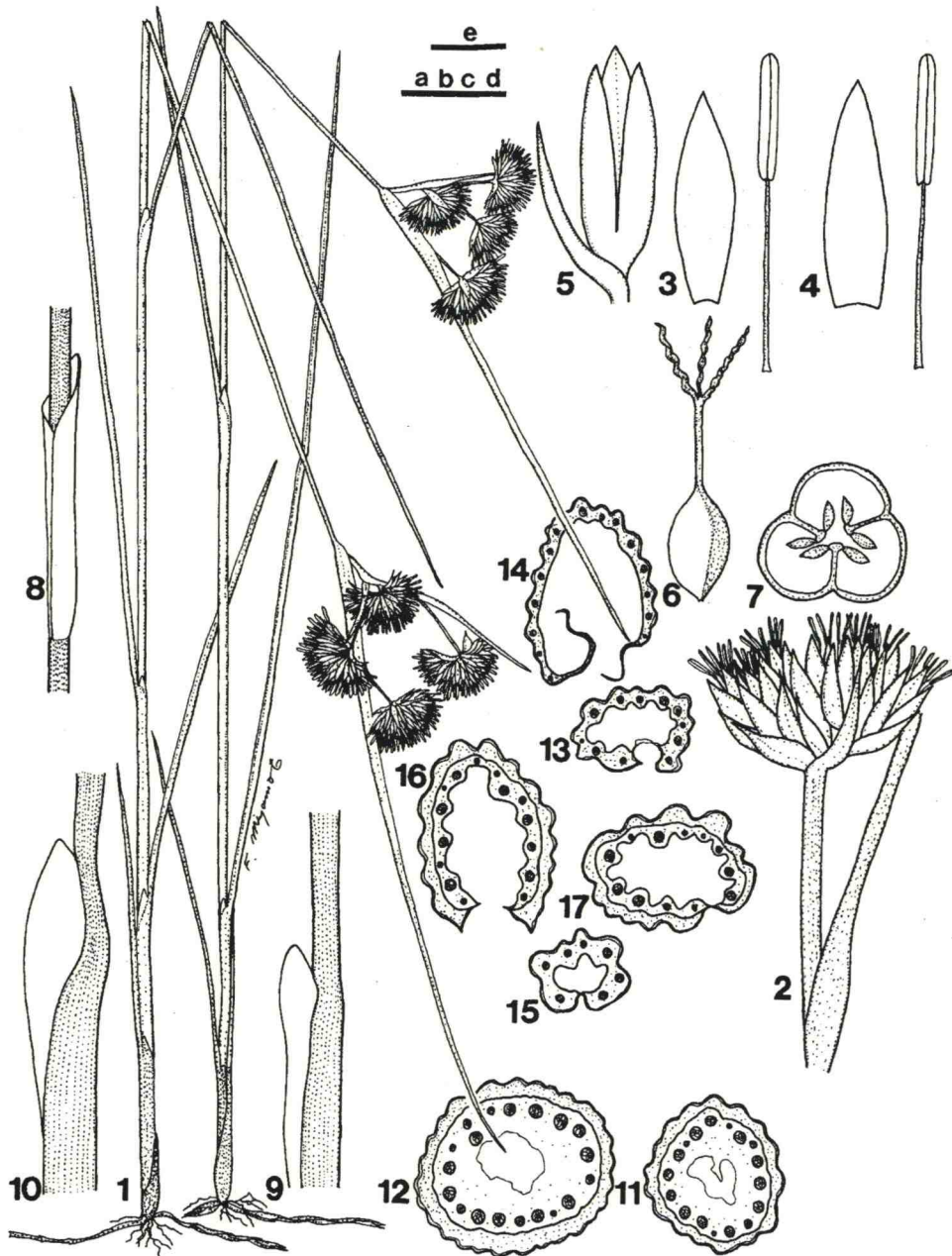


**PLATE 23.** *Juncus gracilicaulis* A. Camus

1. Habit, 2. Inflorescence, 3. Outer tepal, 4. Inner tepal, 5. Stamen, 6. Pistil, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. Auricle of basal leaf, 10. Cross section of culm, 11. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 9; c (2 mm) for 3, 4, 5 and 8; d (1 mm) for 6 and 7; e (0.5 mm) for 10 and 11.

Voucher specimen: China; San-tcha-ho (P. J. M. Delavey, s.n., 10 Aug. 1889, TI).

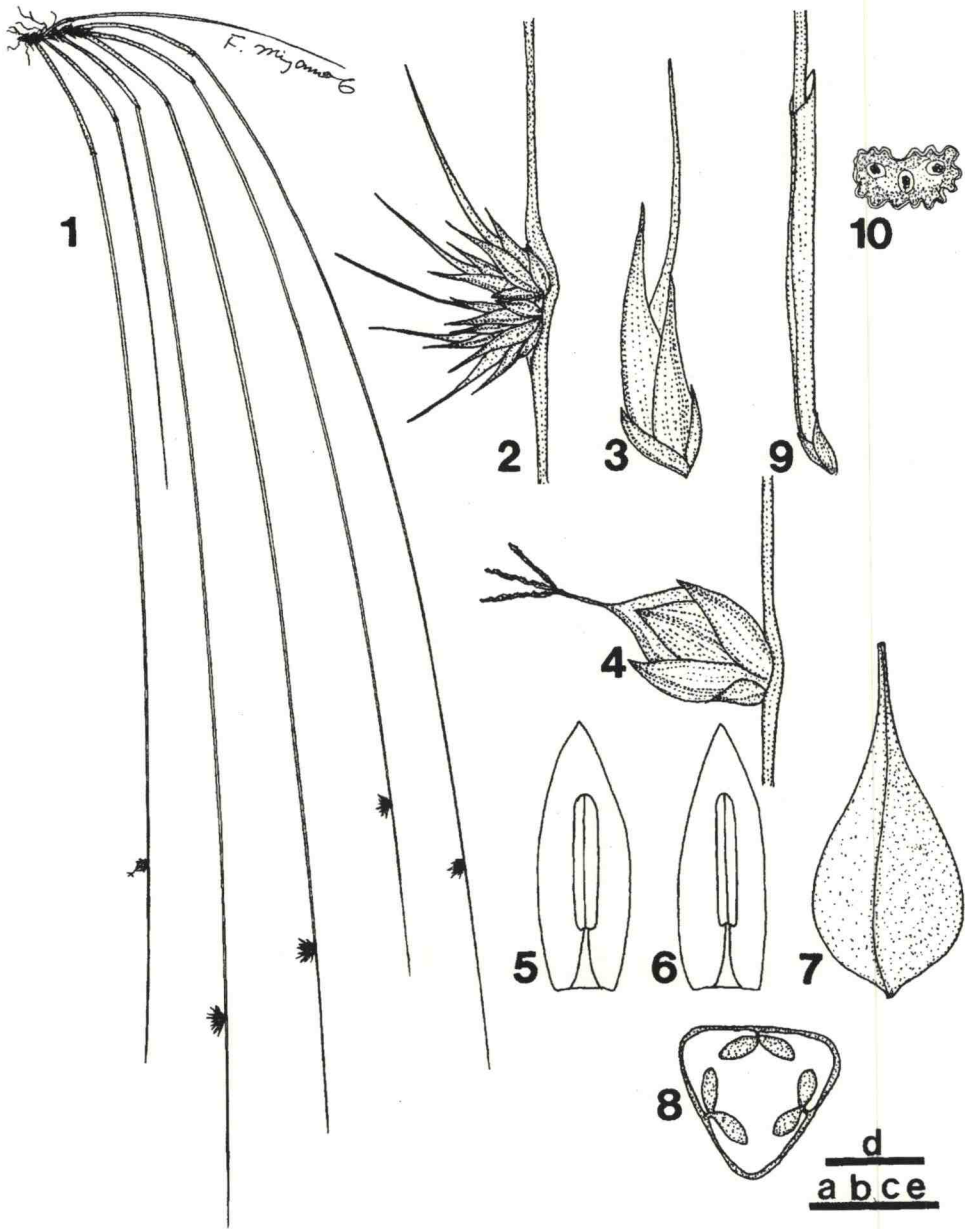




**PLATE 24.** *Juncus grisebachii* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. Auricle of cauline leaf, 10. Auricle of basal leaf, 11. Cross section of upper part of culm, 12. Cross section of lower part of culm, 13. Cross section of upper part of lowest bract, 14. Cross section of lower part of lowest bract, 15. Cross section of upper part of cauline leaf, 16. Cross section of middle part of cauline leaf, 17. Cross section of lower part of cauline leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9 and 10; c (2 mm) for 3, 4, 5, 6 and 8; d (1 mm) for 7; e (0.5 mm) for 11, 12, 13, 14, 15, 16 and 17.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Jaljale Himal, Singoa Kharka - Pakha Khola, 4140-2400 m (H. Ohba et al. 9120379, 11 Aug. 1991, TT).

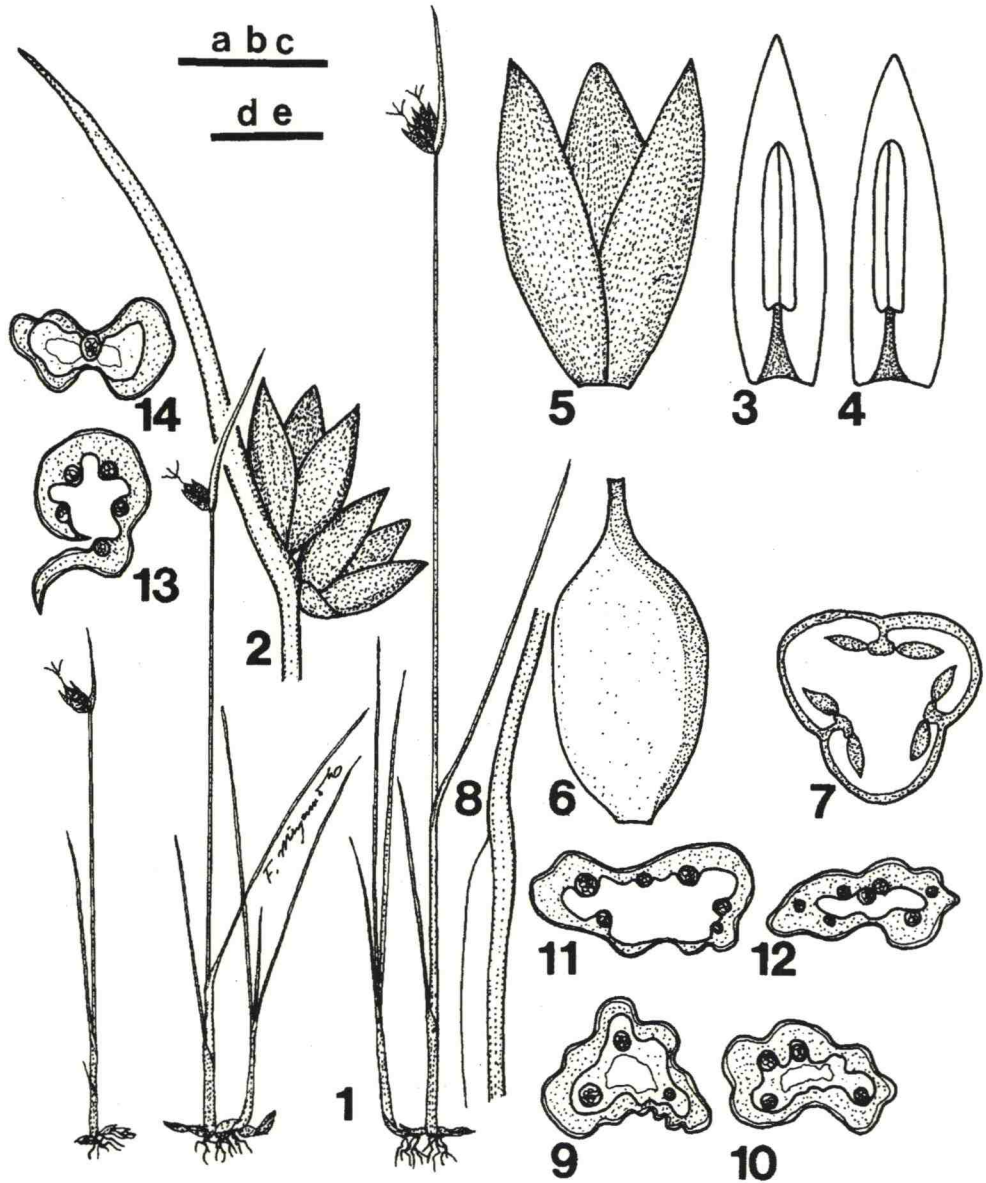


**PLATE 25.** *Juncus harae* Miyam. & H. Ohba.

1. Habit, 2. Proliferous inflorescence, 3. Proliferous flower, 4. Normal inflorescence, 5. Outer tepal and stamen, 6. Inner tepal and stamen, 7. Pistil, 8. Cross section of capsule, 9. Sheathing leaf, 10. Cross section of middle part of culm. Scales: a (2 cm) for 1; b (4 mm) for 2, 4 and 9; c (2 mm) for 3, 5, 6 and 7; d (1 mm) for 8; e (0.5 mm) for 10.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Sano Pokhari - Khongma, 3850 m (M. Minaki et al. 9020853, 12 Aug. 1990, TI).





**PLATE 26.** *Juncus harae* Miyam. & H. Ohba

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of lower part of culm, 10. Cross section of upper part of culm, 11. Cross section of lower part of basal leaf, 12. Cross section of upper part of basal leaf, 13. Cross section of lower part of lowest bract, 14. Cross section of upper part of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4, 5, 6 and 8; d (1 mm) for 7; e (0.5 mm) for 9, 10, 11, 12, 13 and 14.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, Surveying the whole area around Shipton Pass, 4150 m (M. Minaki et al. 9020824, 9 Aug. 1990, TI).

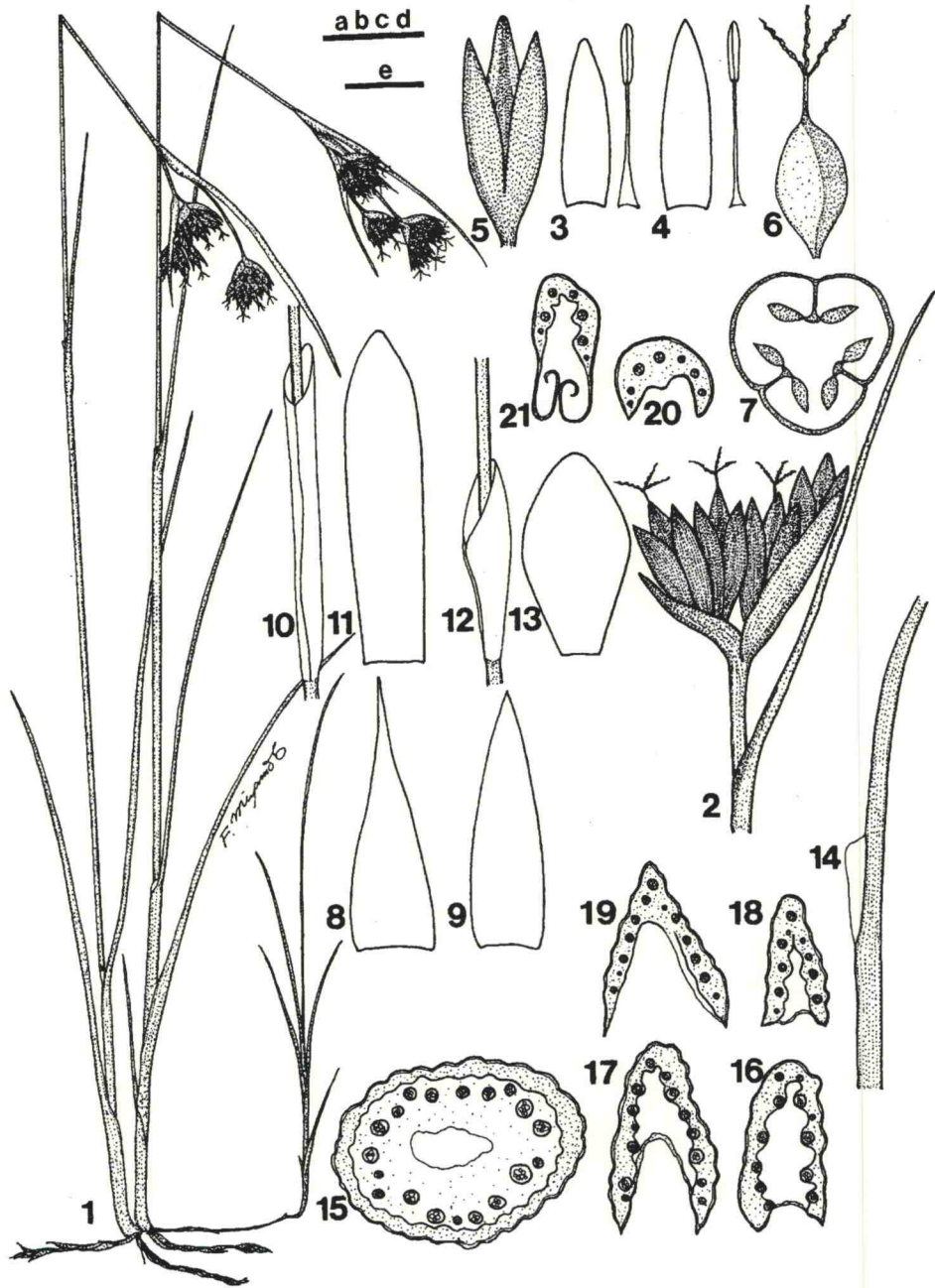


PLATE 27. *Juncus himalensis* Klotzsch

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Outer bract, 9. Inner bract, 10, 11, 12, 13. Sheathing bract on peduncle, 14. Auricle of basal leaf, 15. Cross section of culm, 16. Cross section of upper part of basal leaf, 17. Cross section of lower part of basal leaf, 18. Cross section of upper part of cauline leaf, 19. Cross section of lower part of cauline leaf, 20. Cross section of upper part of lowest bract, 21. Cross section of lower part of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2 and 14; c (2 mm) for 3, 4, 5, 6, 8, 9, 10, 11, 12 and 13; d (1 mm) for 7; e (0.5 mm) for 15, 16, 17, 18, 19, 20 and 21.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, 4100 m (M. Minaki et al. 920711, 8 Aug. 1990, TI).



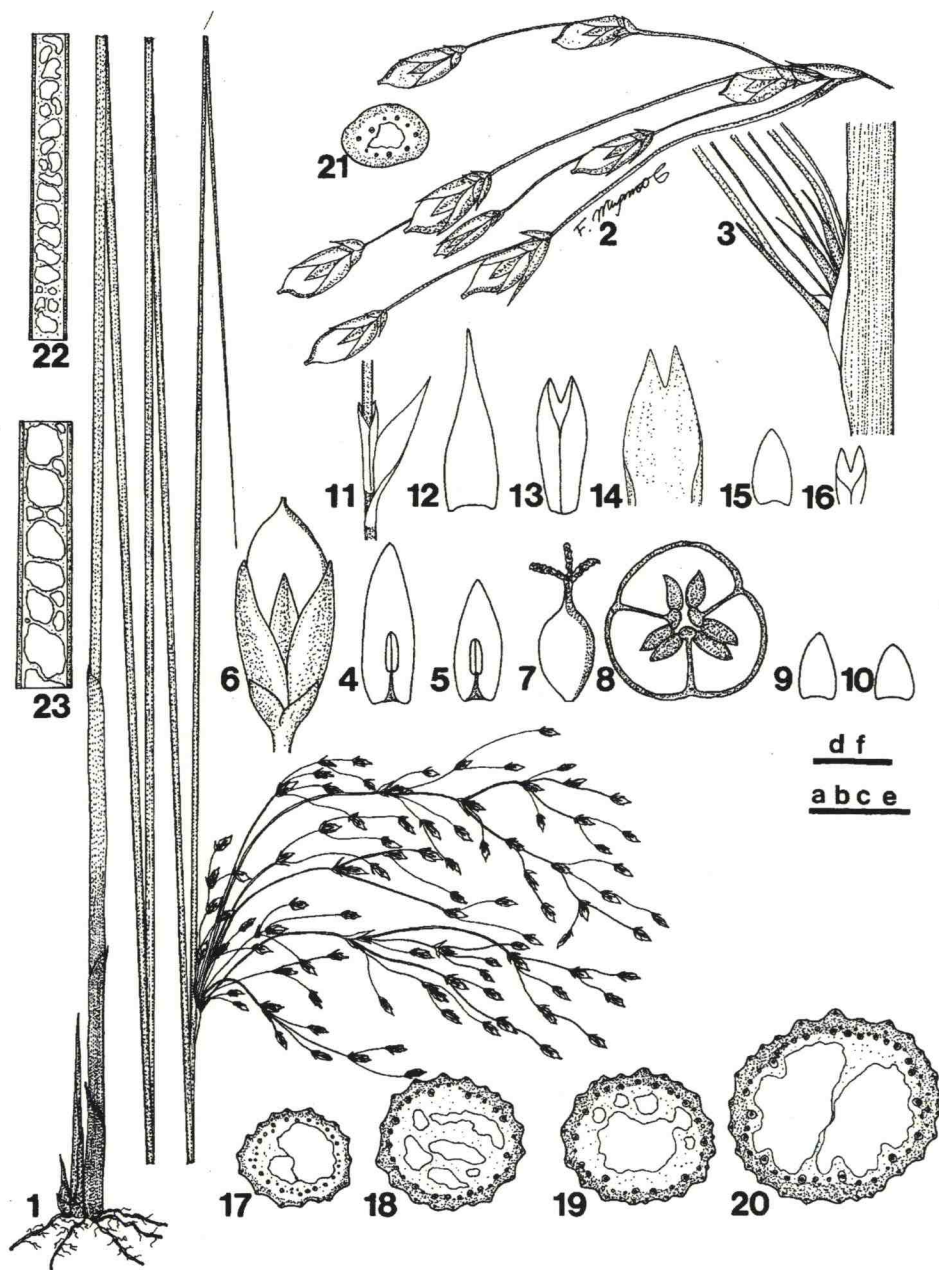


PLATE 28. *Juncus inflexus* L.

1. Habit, 2. Inflorescence, 3. Auricle of lowest bract, 4. Outer tepal and stamen, 5. Inner tepal and stamen, 6. Perianth and capsule, 7. Pistil, 8. Cross section of capsule, 9. Outer bracteole, 10. Inner bracteole, 11. Sheathing bract on peduncle, 12, 15. Bract, 13. Sheathing bract, 14, 16. Apex of sheathing bract, 17. Cross section of upper part of lowest bract, 18. Cross section of lower part of lowest bract, 19. Cross section of upper part of culm, 20. Cross section of lower part of culm, 21. Cross section of peduncle, 22. Longitudinal section of lowest bract, 23. Longitudinal section of culm. Scales: a (2 cm) for 1; b (4 mm) for 2, 3, 22 and 23; c (1 mm) for 4, 5, 6, 7, 9, 10, 12, 13, 15 and 16; d (0.5 mm) for 8, 14 and 21; e (2 mm) for 11; f (1 mm) for 17, 18, 19 and 20.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Lama Lodge - Syabru, 2500 m (H. Takayama et al. 9220402, 24 Jul. 1992, TI).

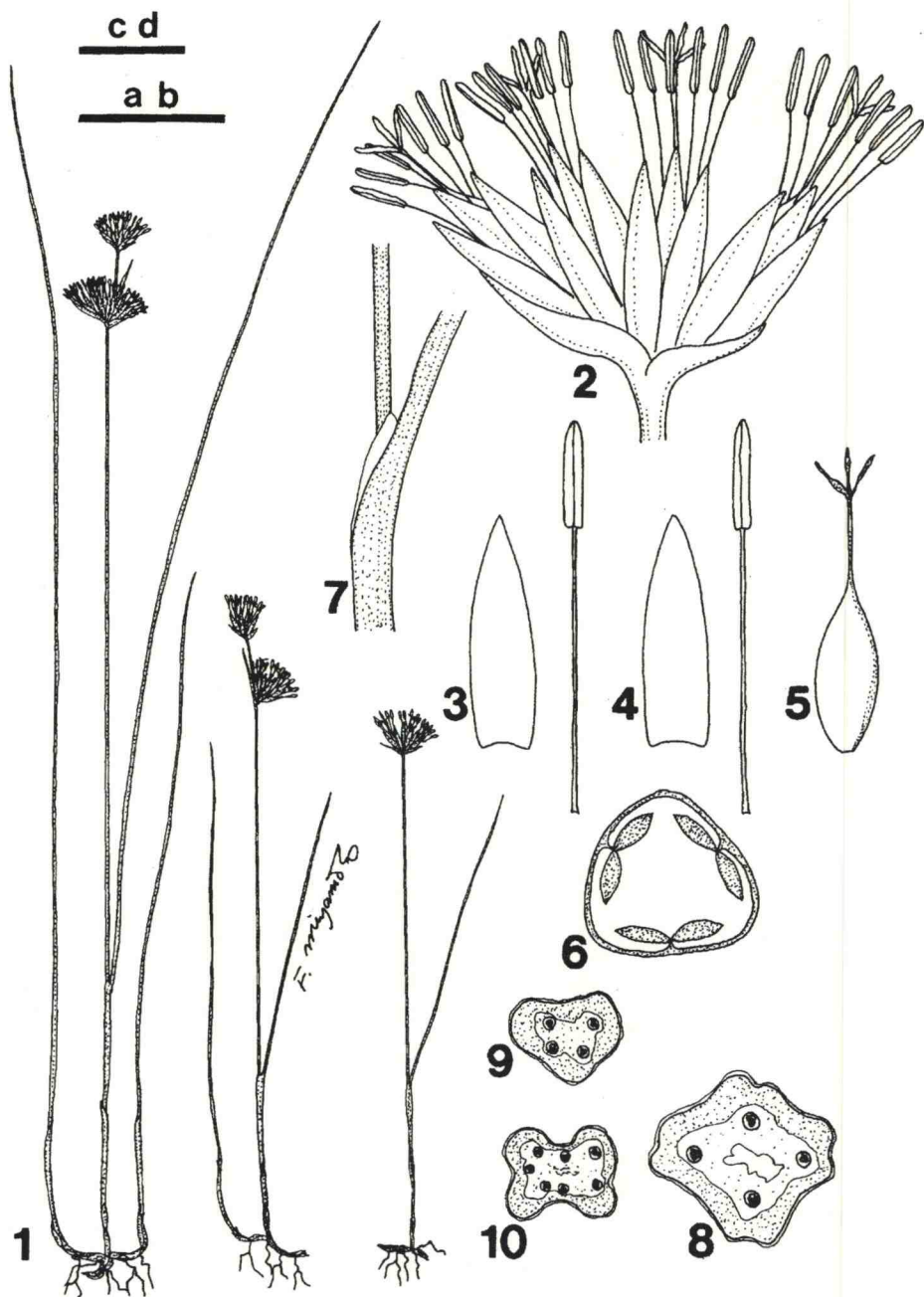


PLATE 29. *Juncus khasiensis* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of lower part of culm, 9. Cross section of upper part of culm, 10. Cross section of basal leaf. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4, 5 and 7; c (1 mm) for 6; d (0.5 mm) for 8, 9 and 10.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Lipchet Kharka - makgan Kharka - Guinsi, 2800 m (F. Miyamoto et al. 9410322, 16 Aug. 1994, TI).



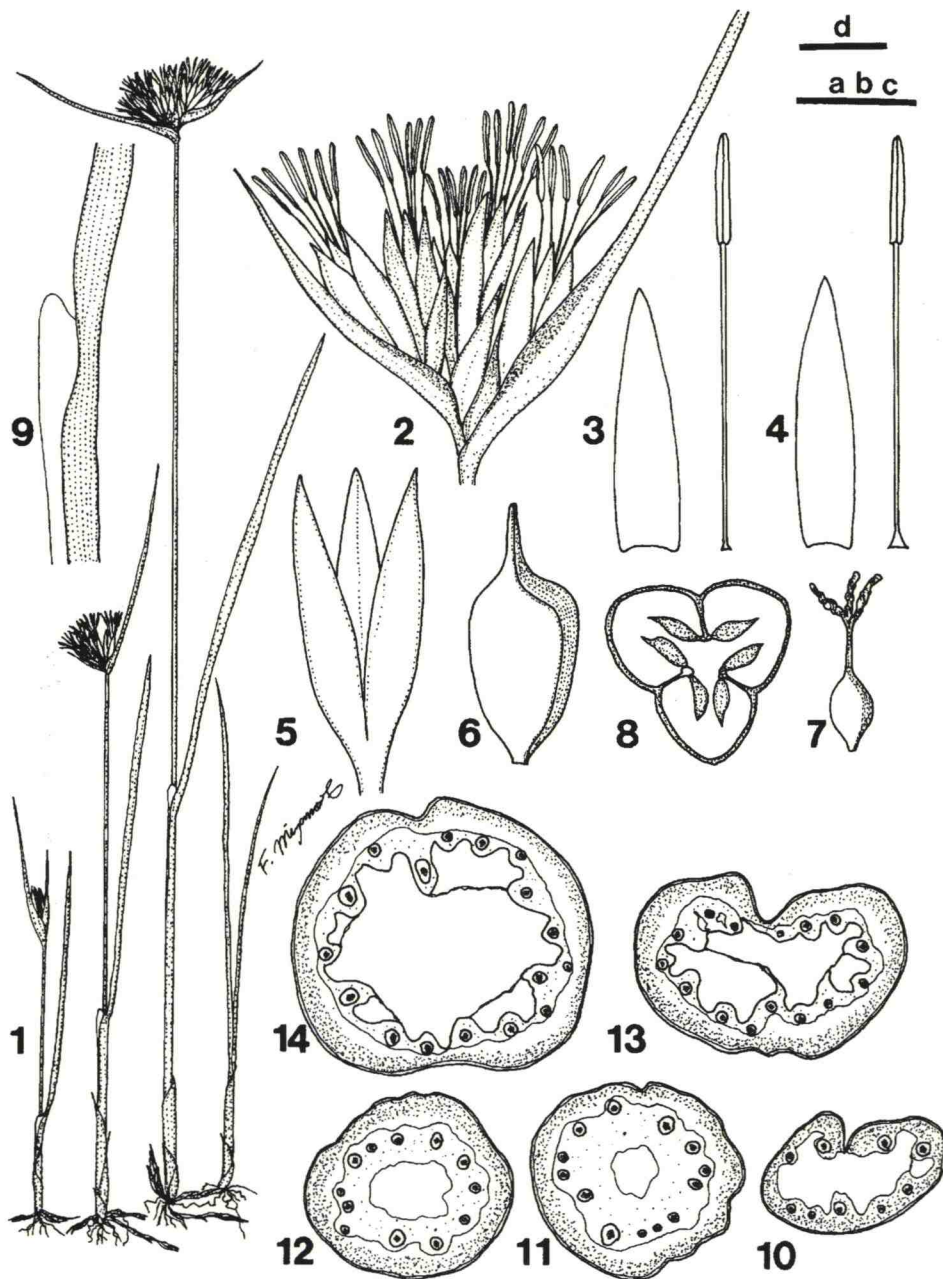
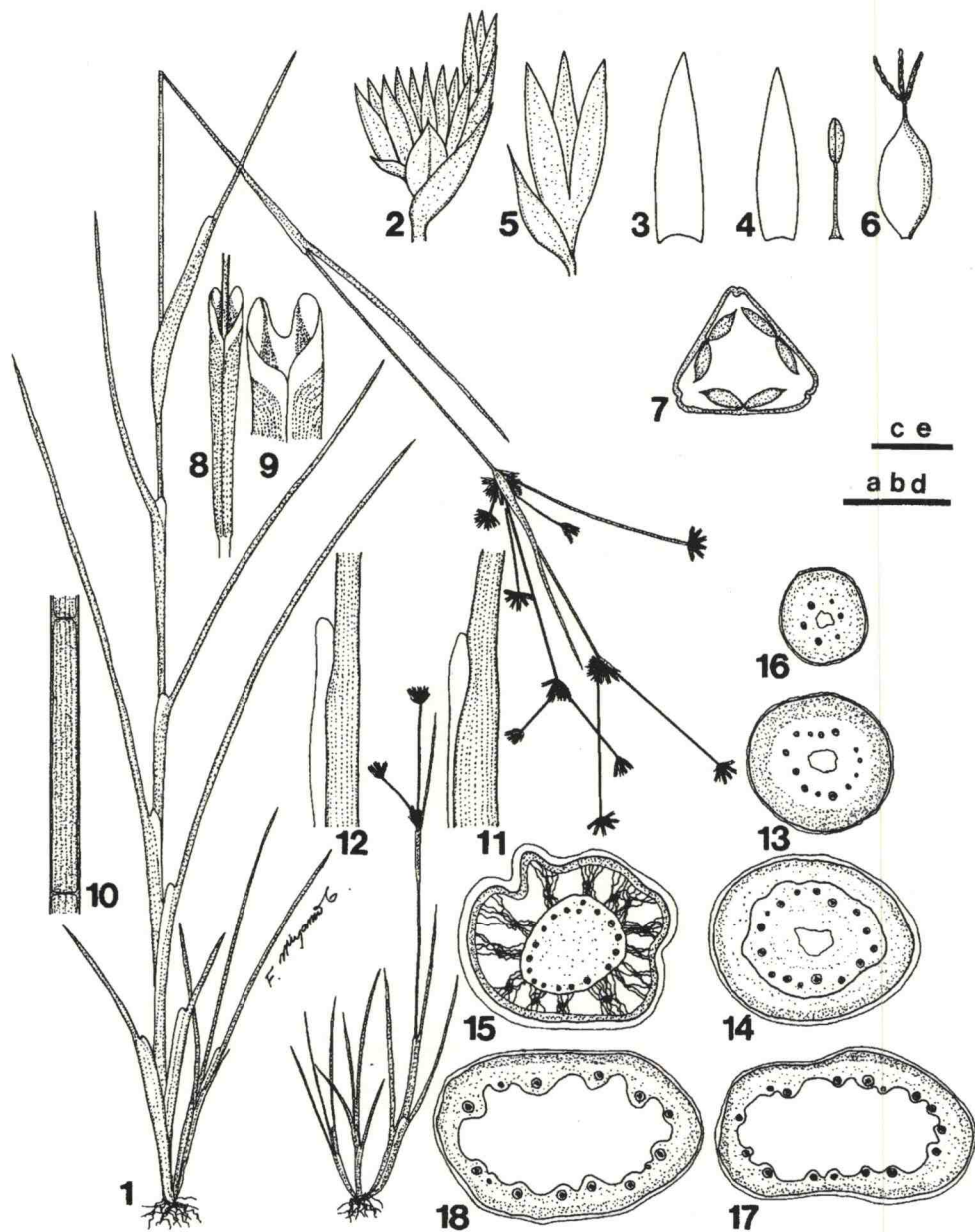


PLATE 30. *Juncus kingii* Rendle

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Capsule, 8. Cross section of capsule, 9. Auricle of basal leaf, 10. Cross section of lower part of culm, 11. Cross section of upper part of culm, 12. Cross section of lower part of basal leaf, 13. Cross section of upper part of basal leaf, 14. Cross section of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2 and 9; c (2 mm) for 3, 4, 5, 6 and 7; d (0.5 mm) for 8, 10, 11, 12, 13 and 14.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Base Camp - Yala Kharka - Langtrang Khola, 4800 m (F. Miyamoto, 9220282, 19 Jul. 1993, TI).

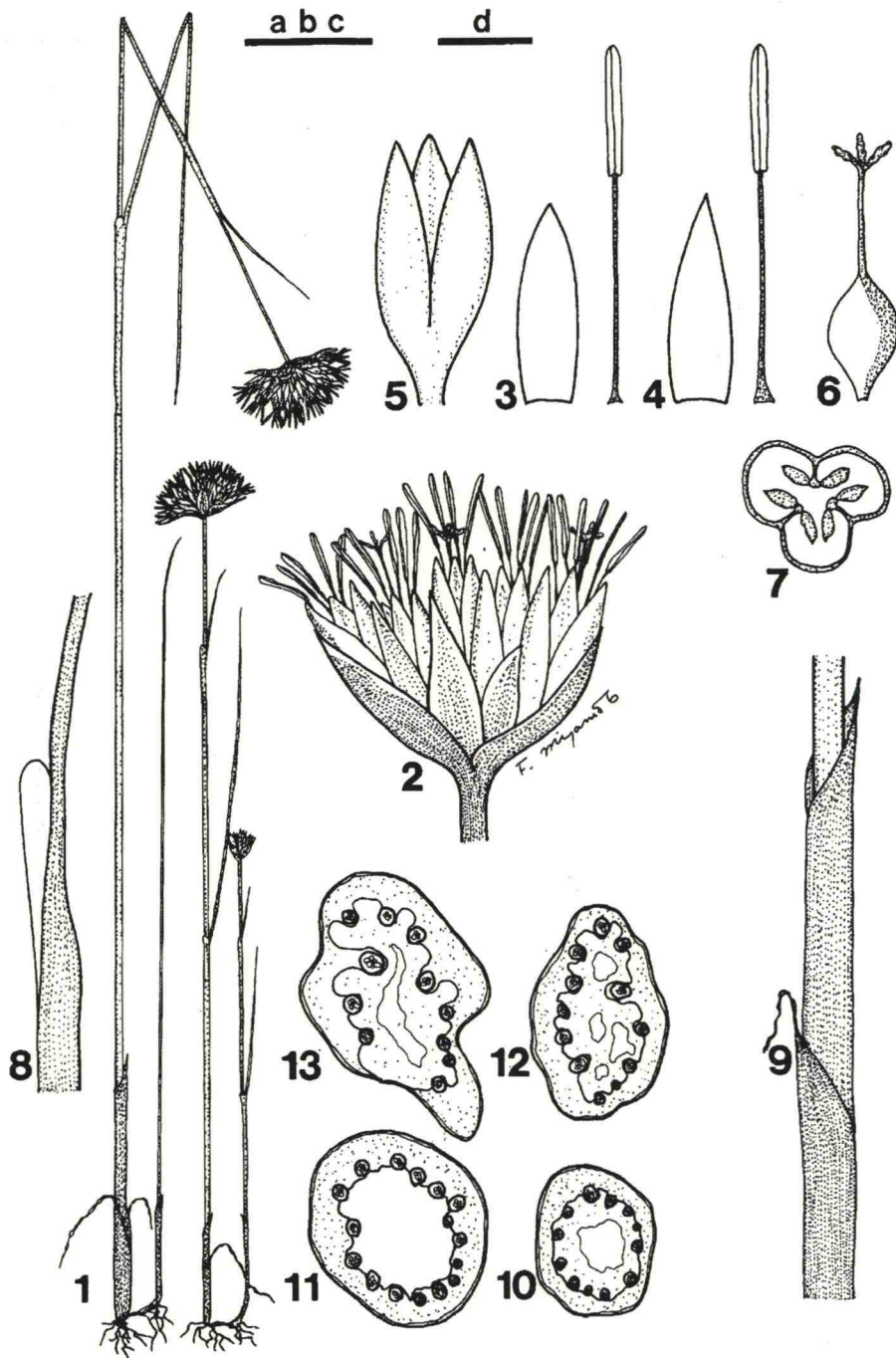


**PLATE 31.** *Juncus leptospermus* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. Apex of sheathing bract, 10. Longitudinal section of basal leaf, 11. Auricle of cauline leaf, 12. Auricle of basal leaf, 13. Cross section of peduncle, 14. Cross section of upper part of culm, 15. Cross section of lower part of culm, 16. Cross section of lowest bract, 17. Cross section of upper part of basal leaf, 18. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4, 5, 6 and 9; c (1 mm) for 7; d (4 mm) for 8 and 10; e (0.5 mm) for 11, 12, 13, 14, 15, 16, 17 and 18.

Voucher specimen: Nepal; Janakpur zone, Ramechhap Distr., Patkare - Bhandar, 2200-2300 m (H. Ohba et al. 8571333, 5 Aug. 1985, TI).

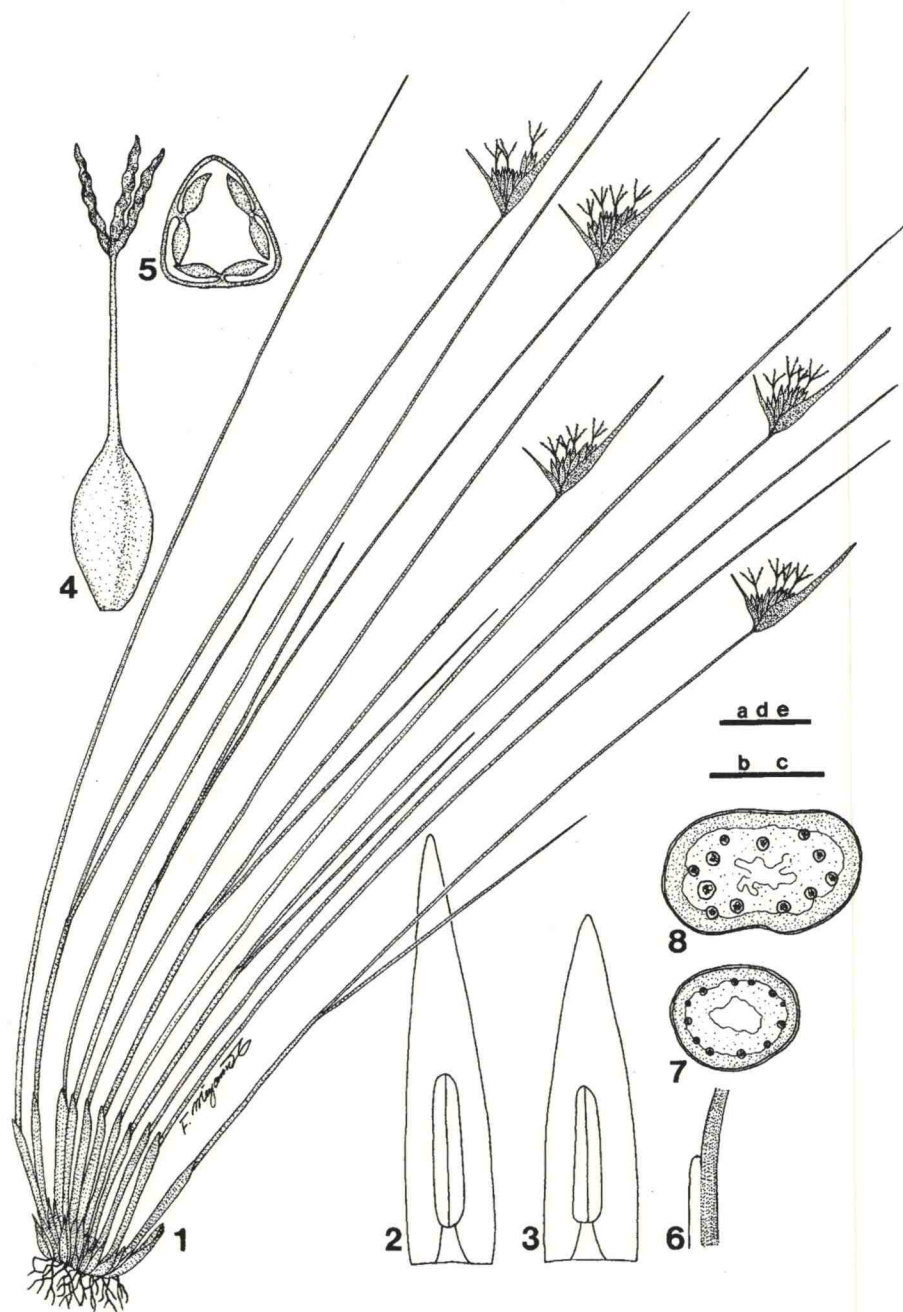




**PLATE 32.** *Juncus leucanthus* Royle ex D. Don

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Sheathing basal leaf, 10. Cross section of upper part of culm, 11. Cross section of lower part of culm, 12. Cross section of upper part of cauline leaf, 13. Cross section of lower part of cauline leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 8 and 9; c (2 mm) for 3, 4, 5 and 6; d (0.5 mm) for 7, 10, 11, 12 and 13.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, Surveying the whole area around Shipton Pass, 4430 m (M. Minaki et al. 9020680, 7 Aug. 1990, TI).

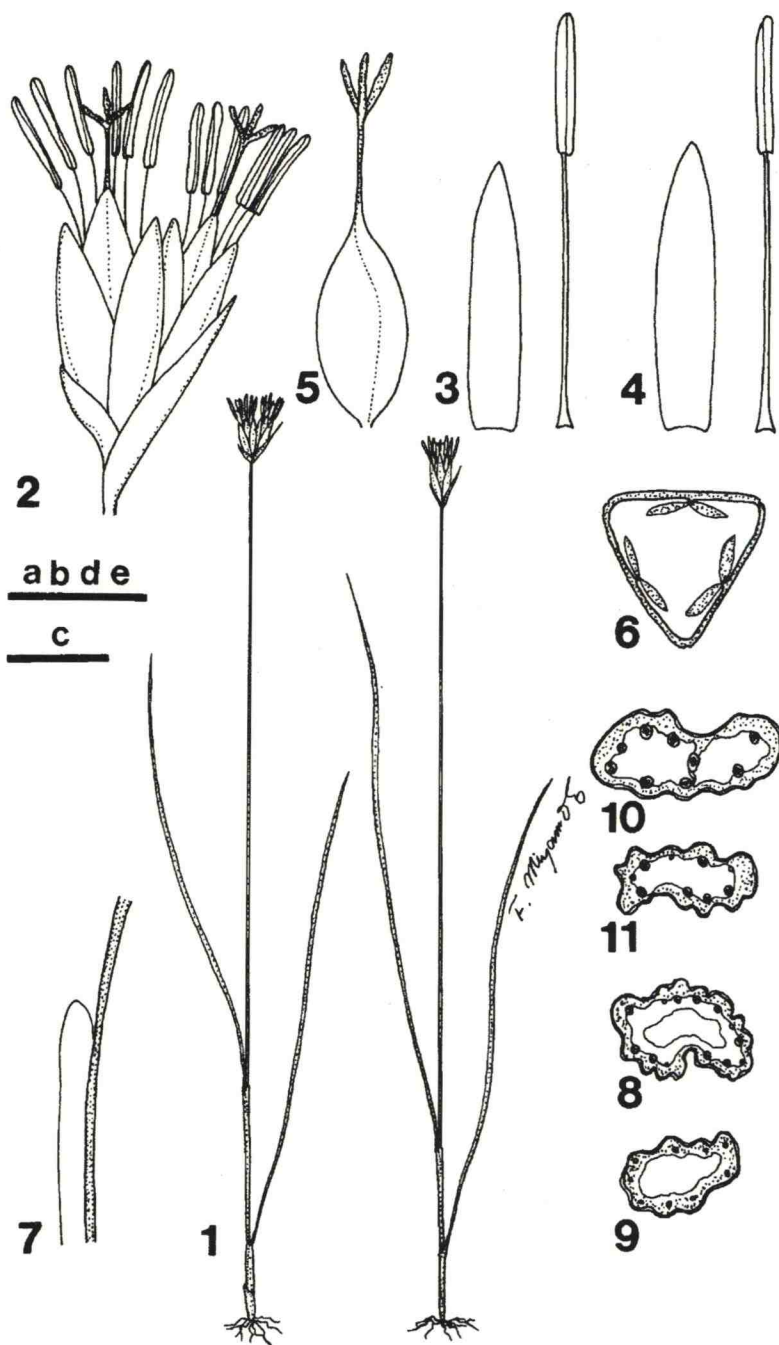


**PLATE 33.** *Juncus longiflorus* (A. Camus) Noltie

1. Habit, 2. Outer tepal and stamen, 3. Inner tepal and stamen, 4. Pistil, 5. Cross section of capsule, 6. Leaf auricle, 7. Cross section of lower part of culm, 8. Cross section of basal leaf. Scales: a (2 cm) for 1; b (2.5 mm) for 2, 3 and 4; c (1.6 mm) for 5; d (4 mm) for 6; e (0.6 mm) for 7 and 8.

Voucher specimen: China; Yunnan, Dali, Cangshan, 3630 m (S. K. Wu et al. 1604, 1 Sep. 1996, TI).

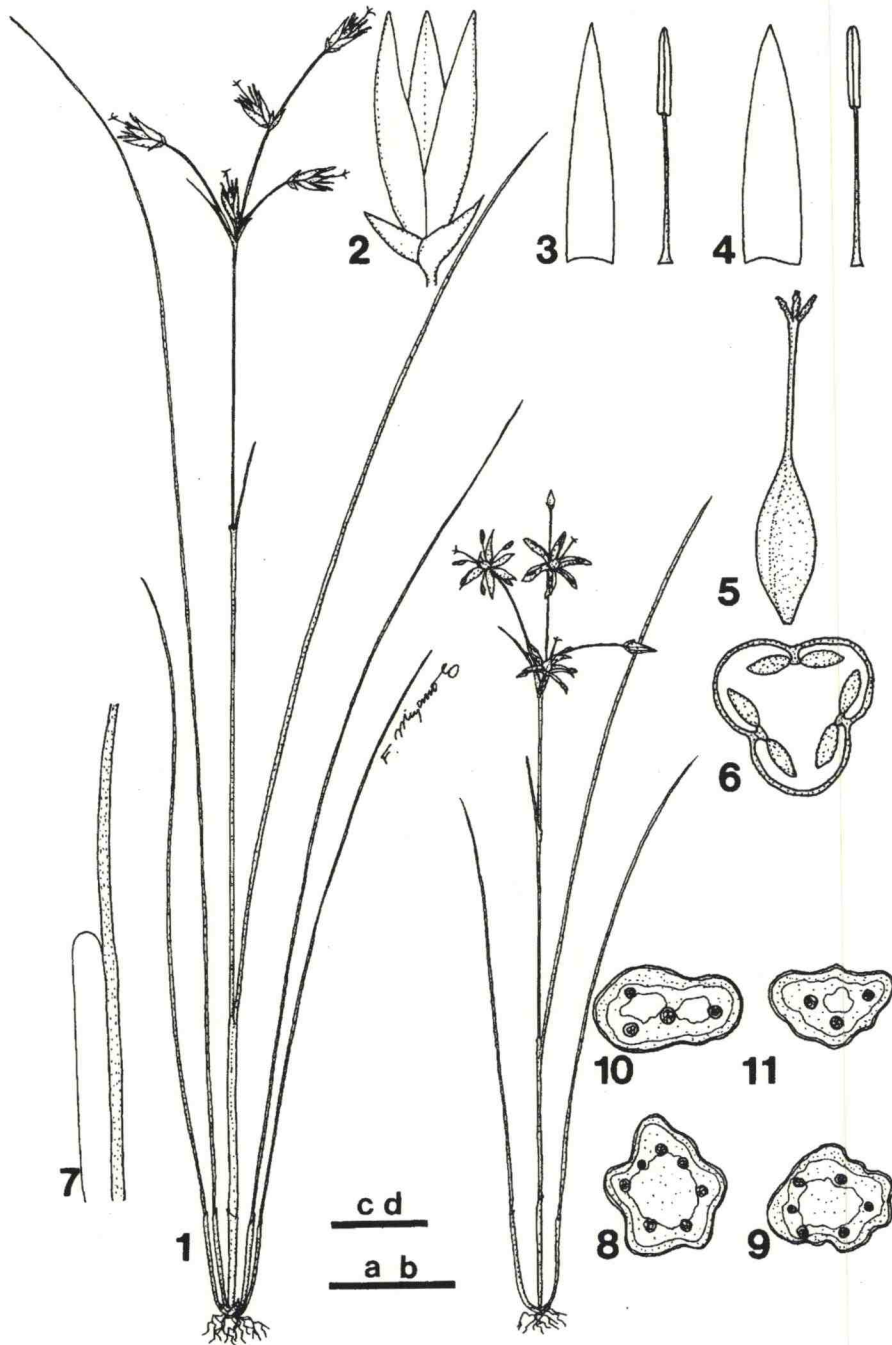




**PLATE 34.** *Juncus longistamineus* A. Camus

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of upper part of culm, 9. Cross section of lower part of culm, 10. Cross section of upper part of basal leaf, 11. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4 and 5; c (1 mm) for 6; d (1 mm) for 7; e (0.5 mm) for 8, 9, 10 and 11.

Voucher specimen: China; Yunnan, Y. Atuntze, Yangtsatung, 3900 m (T. T. Yü 9815, 24 Aug. 1937, KUN).



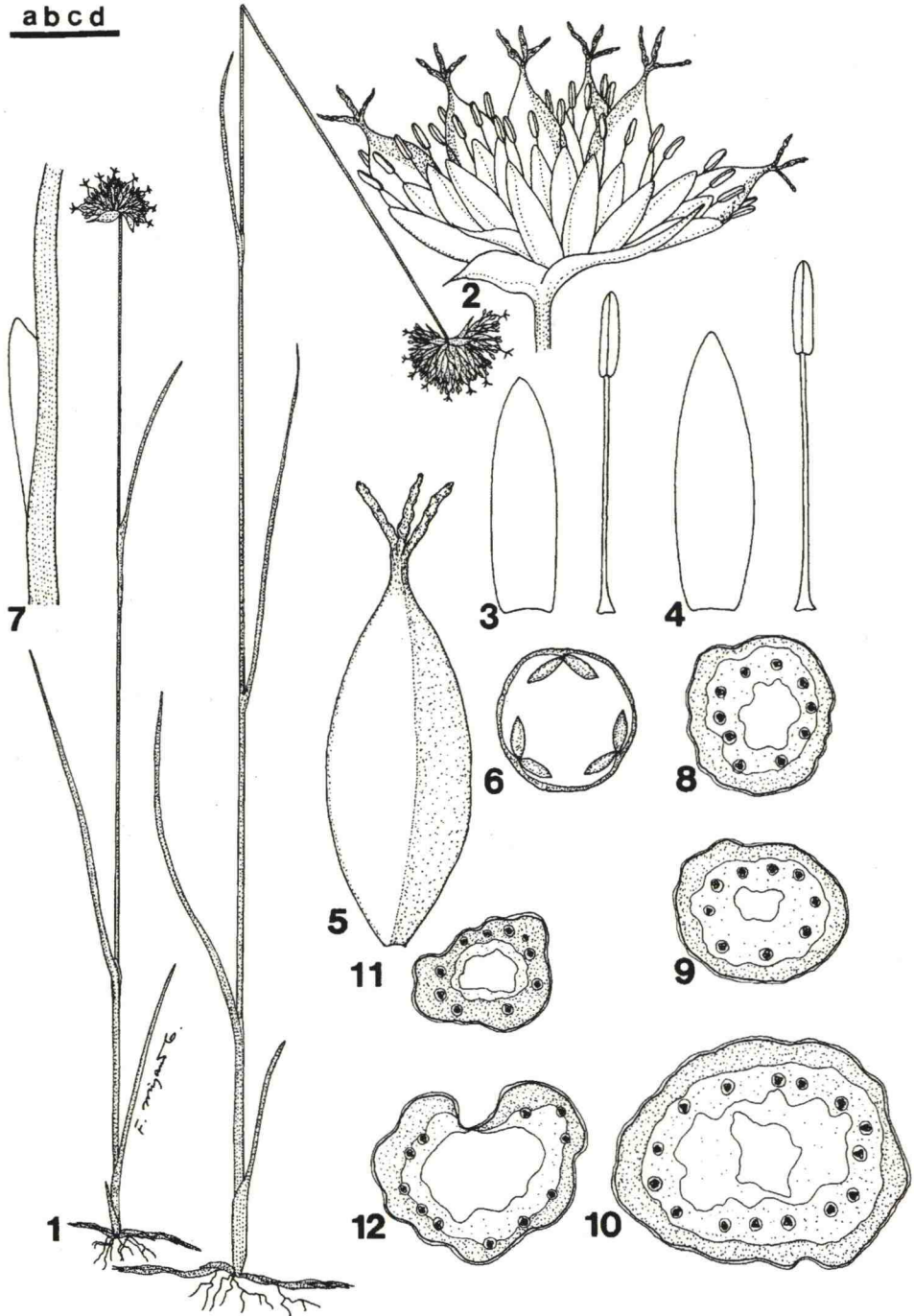
**PLATE 35.** *Juncus luzuliformis* Franch.

1. Habit, 2. Perianth, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of lower part of culm, 9. Cross section of upper part of culm, 10. Cross section of lower part of cauline leaf, 11. Cross section of upper part of cauline leaf. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4, 5 and 7; c (1 mm) for 6; d (0.5 mm) for 8, 9, 10 and 11.

Voucher specimen: China; Sichuan, Xiaojin, Rilong - a pass of Balang Shan - Wenchuan - Wolong, 2500 m (H. Ikeda et al., 100856, 6 Sept. 1998, TT).



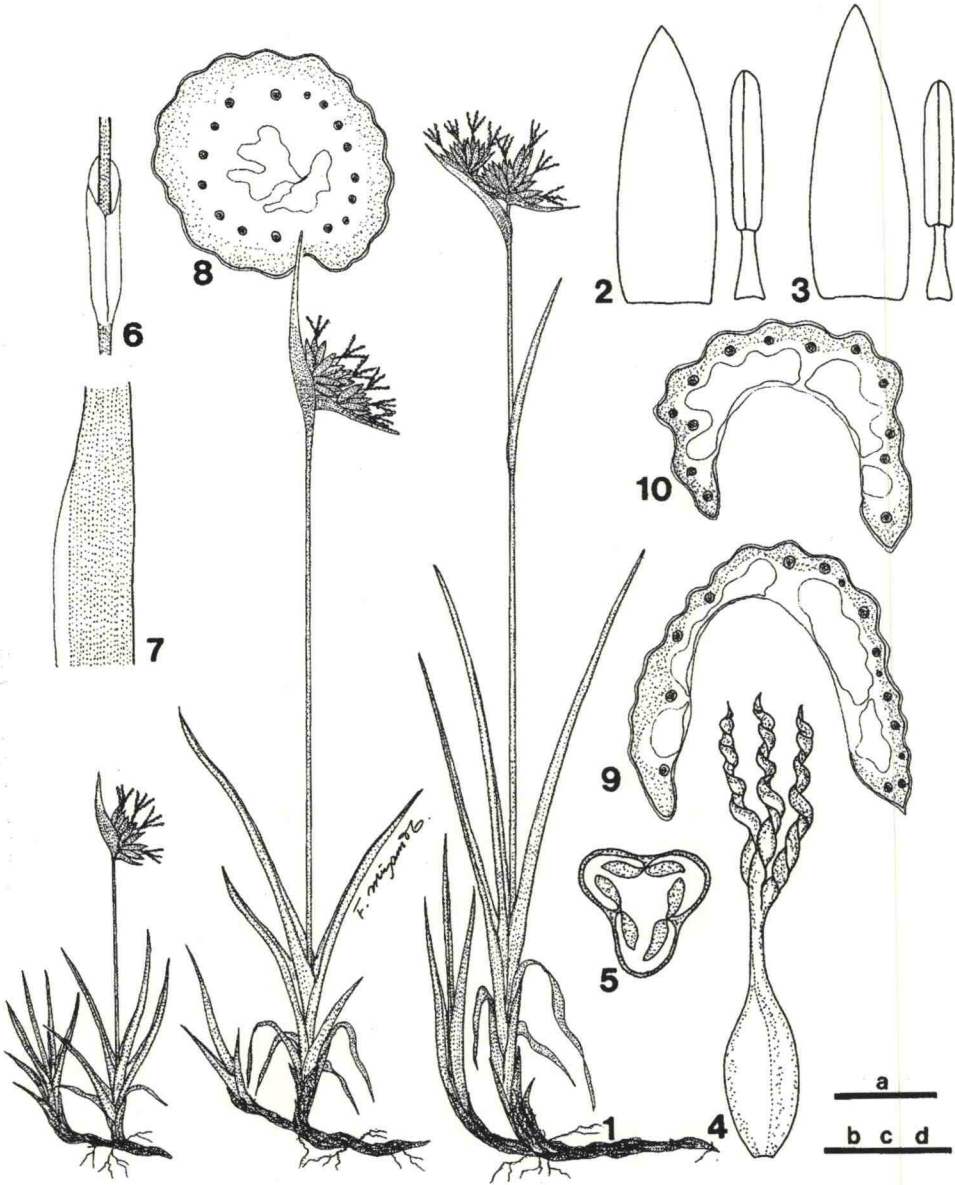
abcd



**PLATE 36.** *Juncus membranaceus* Royle ex D. Don

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of peduncle, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of lowest bract, 12. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 7; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 8, 9, 10, 11 and 12.

Voucher specimen: Pakistan; Baltistan, Skardu - Katarah, 2400 m (S. Takatsukiet al. 9360003, 26 Jul. 1993, TD).

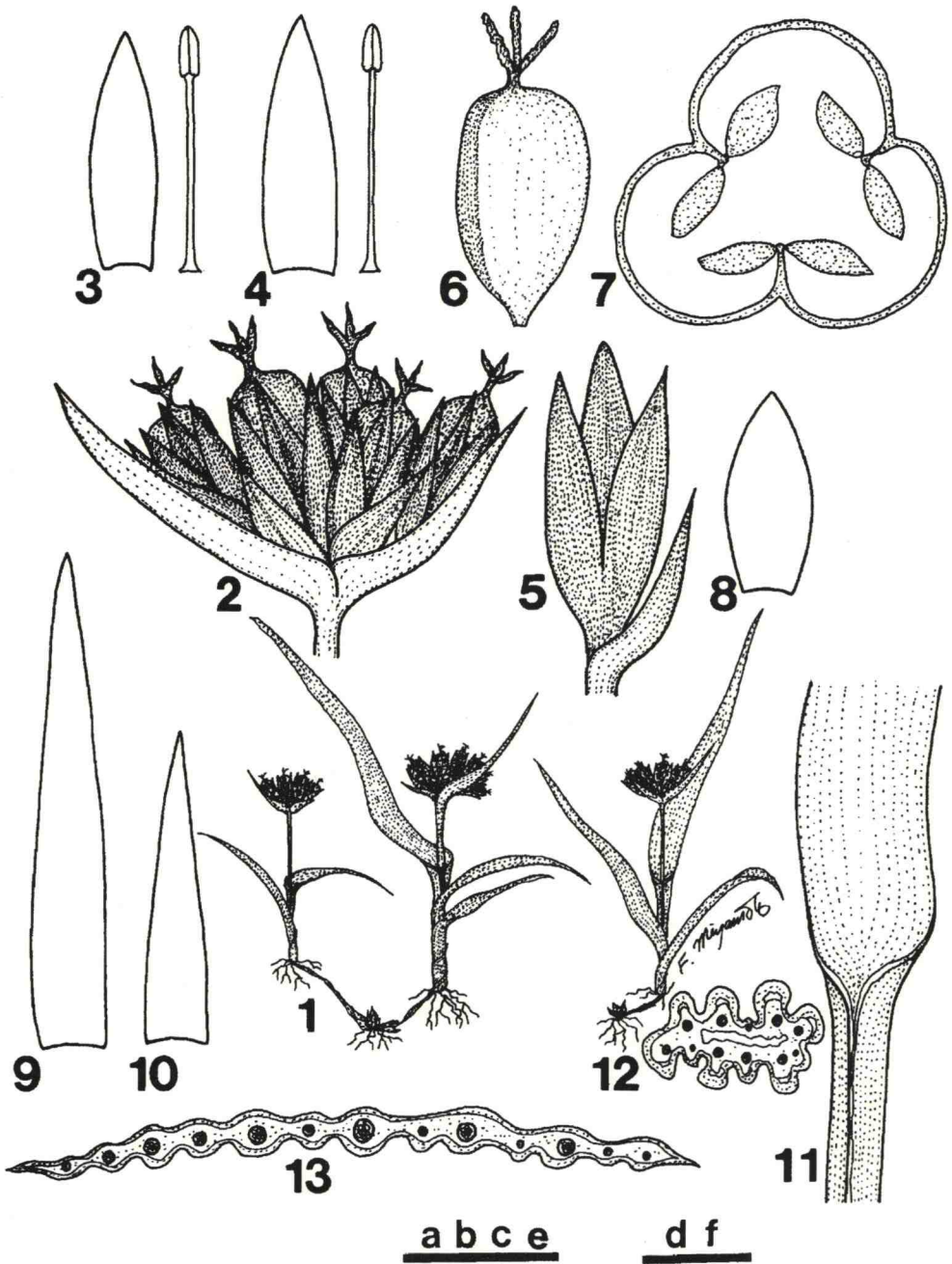


**PLATE 37.** *Juncus milashanensis* A. M. Lu & Z. Y. Zhang

1. Habit, 2. Outer tepal and stamen, 3. Inner tepal and stamen, 4. Pistil, 5. Cross section of capsule, 6. Leaf auricle, 7. Sheathing bract on peduncle, 8. Cross section of culm, 9. Cross section of basal leaf, 10. Cross section of cauline leaf. Scales: a (2cm) for 1; b (5mm) for 6 and 7; c (2.5 mm) for 2, 3, and 4; d (1.5mm) for 5, 8, 9, and 10.

Voucher specimen: China; Sichuan, Daocheng, around Wuming Shan, 4680 m (S. K. Wu et al. 410, 27 July 1997, TI).

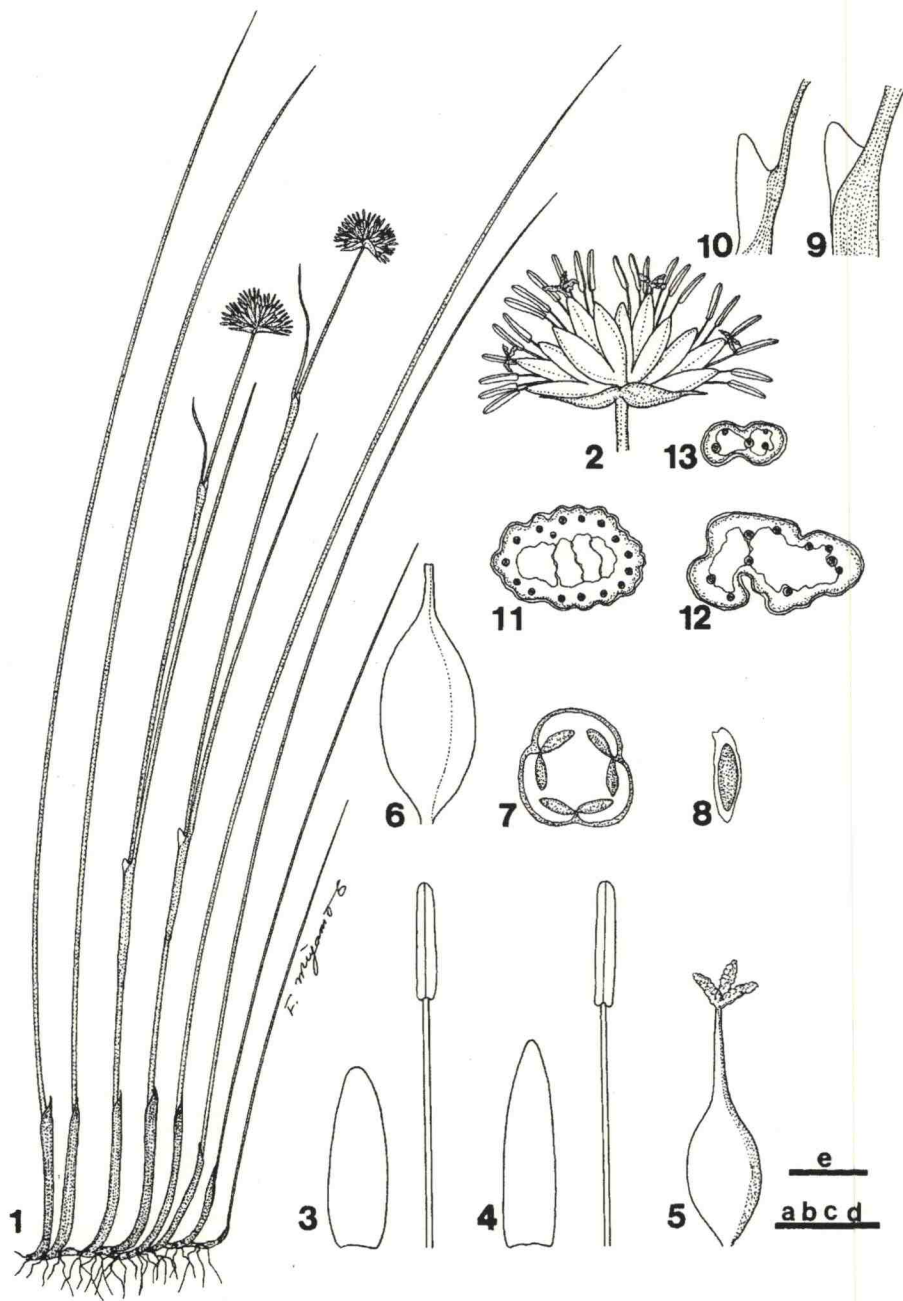




**PLATE 38.** *Juncus minimus* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8, 9, 10. Bract, 11. Auricle of basal leaf, 12. Cross section of culm 13. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9, 10 and 11; c (2 mm) for 3, 4, 5, 6 and 8; d (1 mm) for 7; e (0.5 mm) for 12; f (0.5 mm) for 13.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Jaljale Himal, Bomrang - Singoa Kharka, 4100 m (H. Ohba et al. 9120351, 10 Aug. 1991, TT).



**PLATE 39.** *Juncus modicus* N. E. Br.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. pistil, 6. Capsule, 7. Cross section of capsule, 8. Seed, 9. Auricule of basal leaf, 10. Auricule of cauline leaf, 11. Cross section of culm, 12. Cross section of lower part of cauline leaf, 13. Cross section of upper part of cauline leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9 and 10; c (2 mm) for 3, 4, 5, 6 and 7; d (1 mm) for 8; e (0.5 mm) for 11, 12 and 13.

Voucher specimen: China; Yunnan, Dali, Cangshan, 3600 m (S. K. Wu et al. 1610, 1 Sept. 1996, TI).



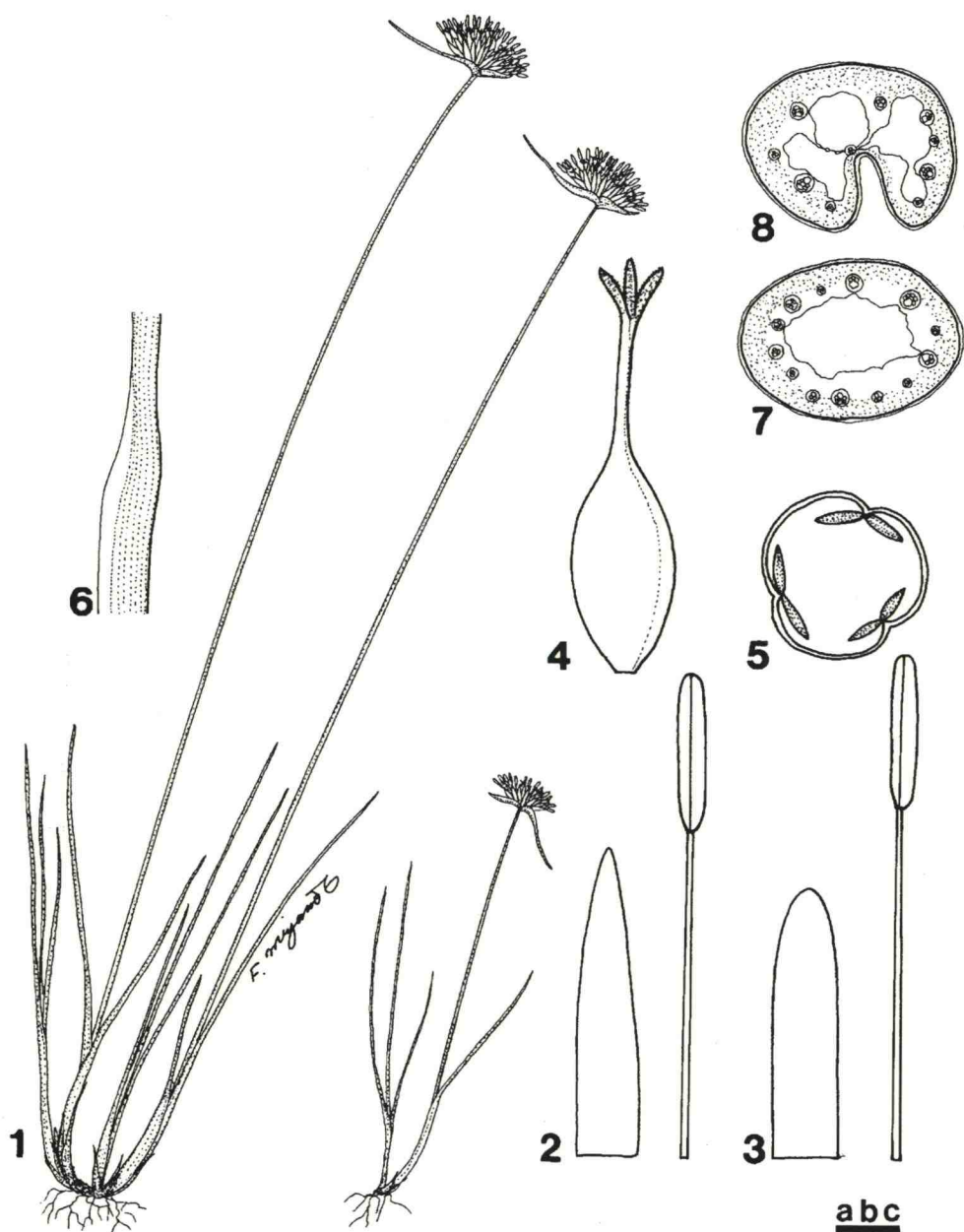
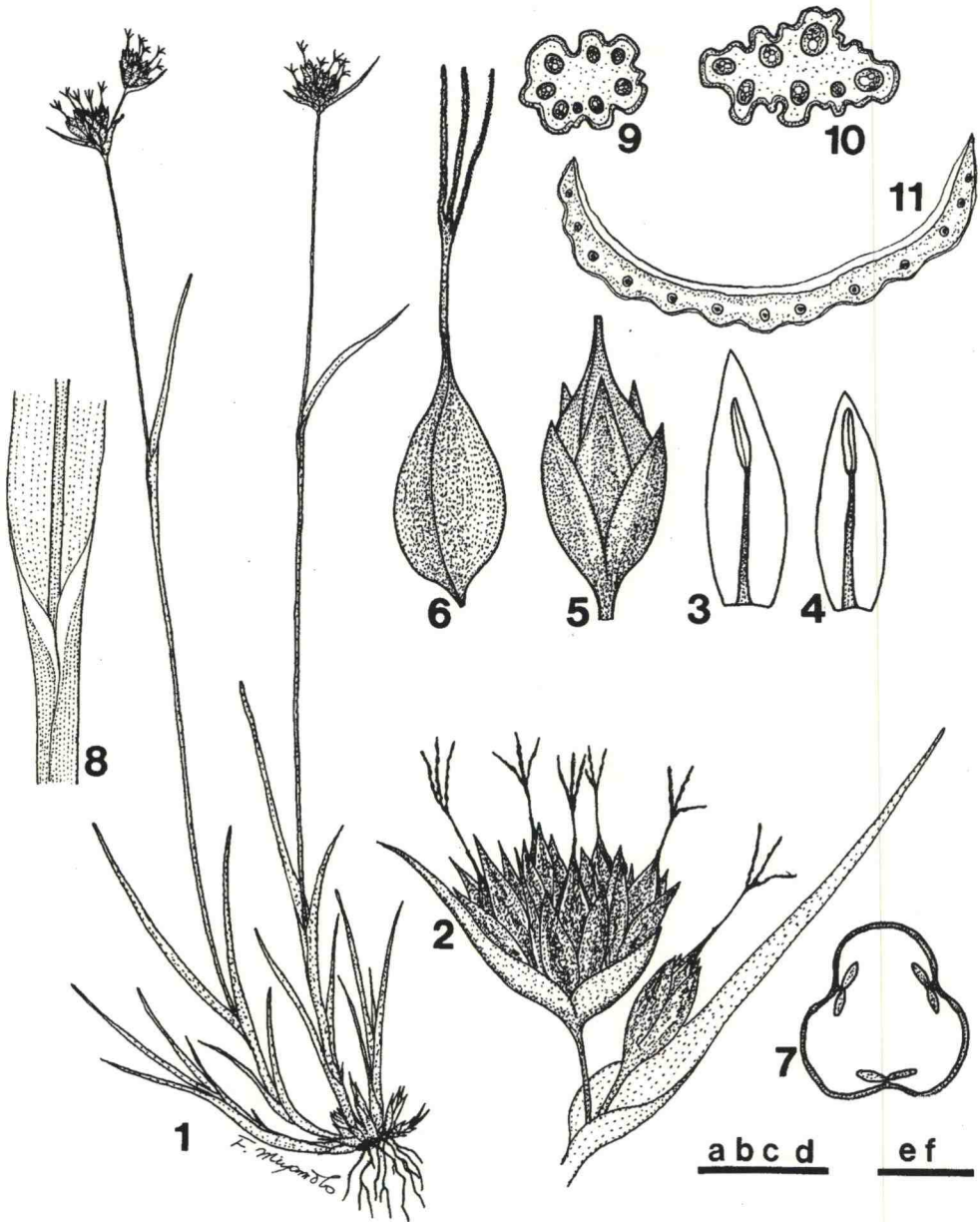


PLATE 40. *Juncus mustangensis* Miyam. & H. Ohba

1. Habit, 2. Outer tepal and stamen, 3. Inner tepal and stamen, 4. Pistil, 5. Cross section of capsule, 6. Auricle of basal leaf, 7. Cross section of flowering culm, 8. Cross section of basal leaf, Scales: a (1 cm) for 1. b (1 mm) for 2, 3, 4, 5 and 6. c (2 mm) for 7 and 8.

Voucher specimen: Nepal. Dhaulagiri zone, Mustang district, between Sangda Pass and Phalyak, 28°51'40"N, 83°44'41"E, 3870 m (F. Miyamoto, N. Kurosaki, S. Akiyama, H. Ikeda, M. Tsusaka & M. N. Subedi 20210100, 13 Aug. 2002, TI).



**PLATE 41.** *Juncus nepalicus* Miyam. & H. Ohba  
 1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and capsule, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of basal leaf. Scales: a (2 cm) for 1; b (2 mm) for 2 and 5; c (1 mm) for 3, 4 and 6; d (4 mm) for 8; e (1 mm) for 7; f (0.5 mm) for 9, 10 and 11.  
 Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, 4400 m (M. Minaki et al. 9020690, 7 Aug. 1990, TT).



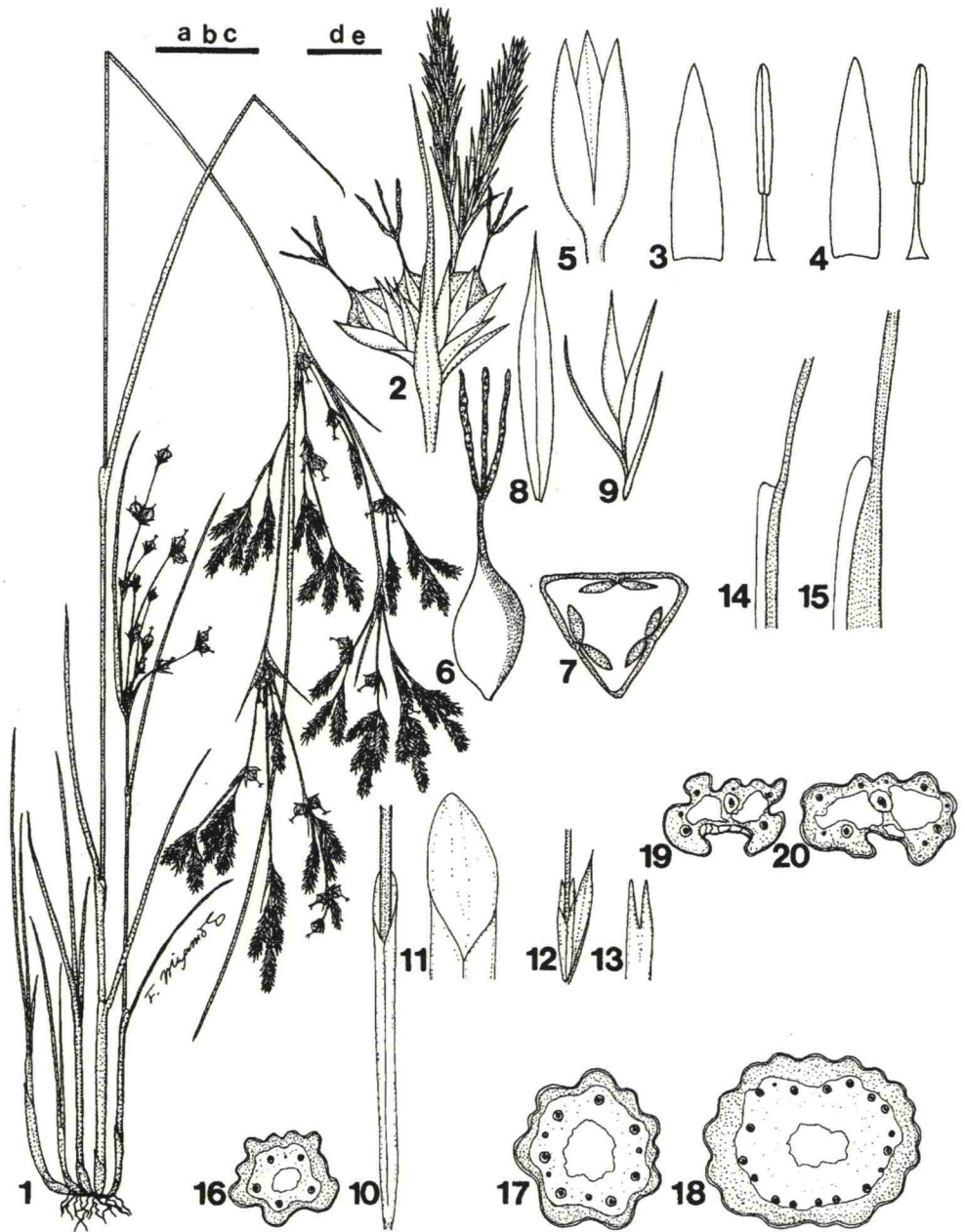
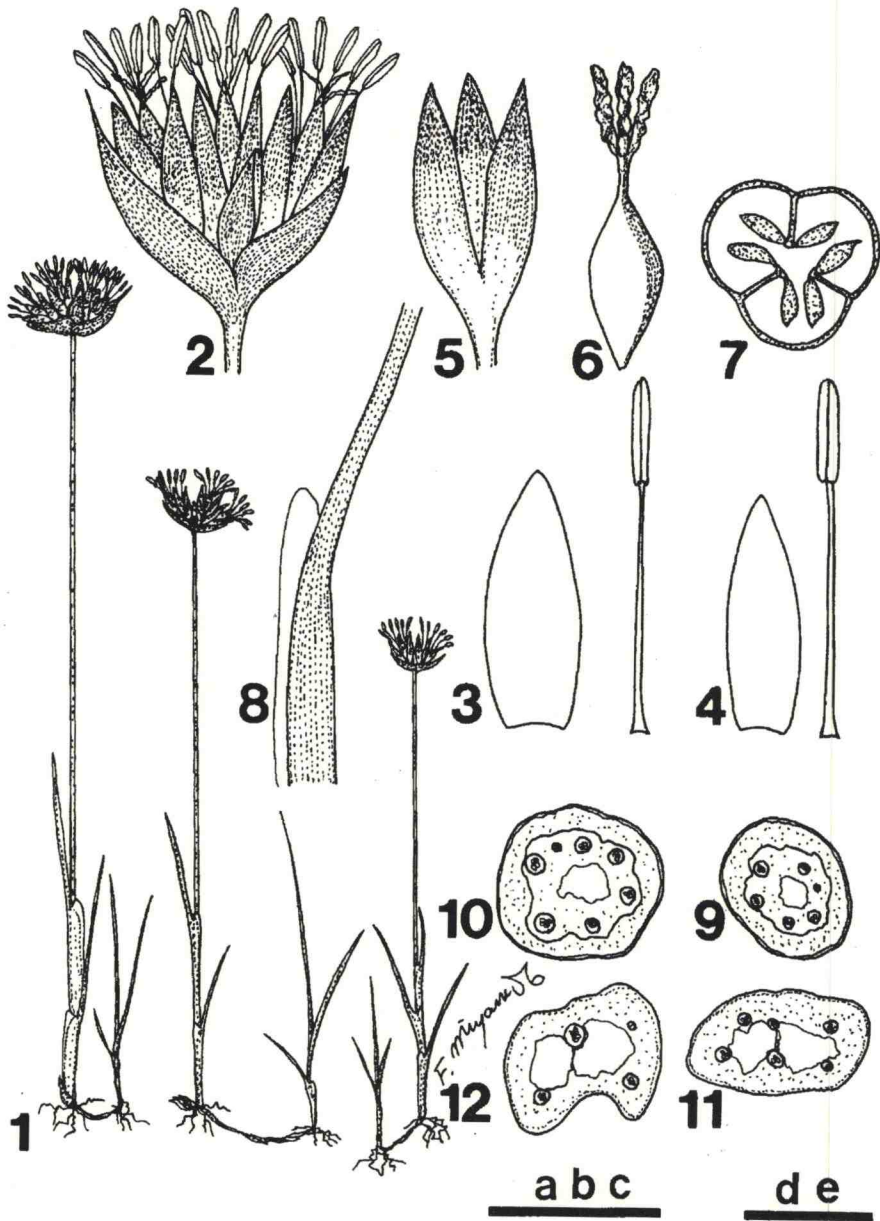


PLATE 42. *Juncus ochraceus* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Bract, 9. Sterile flower, 10, 12. Sheathing bract on peduncle, 11, 13. apex of sheathing bract, 14. Auricle of culm leaf, 15. Auricle of basal leaf, 16. Cross section of peduncle, 17. Cross section of upper part of culm, 18. Cross section of lower part of culm, 19. Cross section of lowest bract, 20. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 10; c (2 mm) for 3, 4, 5, 6 and 11; d (1 mm) for 7, 8, 9, 12, 13, 14 and 15; e (0.5 mm) for 16, 17, 18, 19 and 20.

Voucher specimen: Nepal; Taplejung, below Siling Tzokupa - Siling Tzokupa (H. Hara et al. 6300970, 29 Oct. 1963, TI).

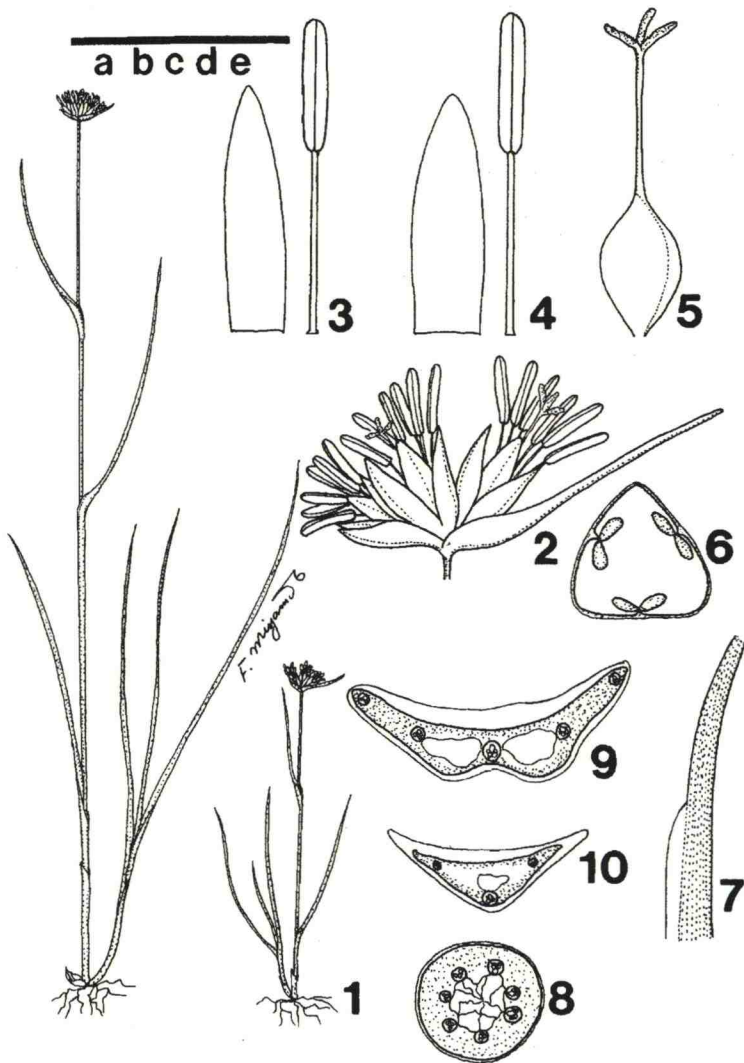


**PLATE 43.** *Juncus perpusillus* Sam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of upper part of basal leaf, 12. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 8; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7; e (0.5 mm) for 9, 10, 11 and 12.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Yala Kharka - Langtrang, 4850 m (H. Takayama et al. 9220352 b, 22 Jul. 1992, TI).

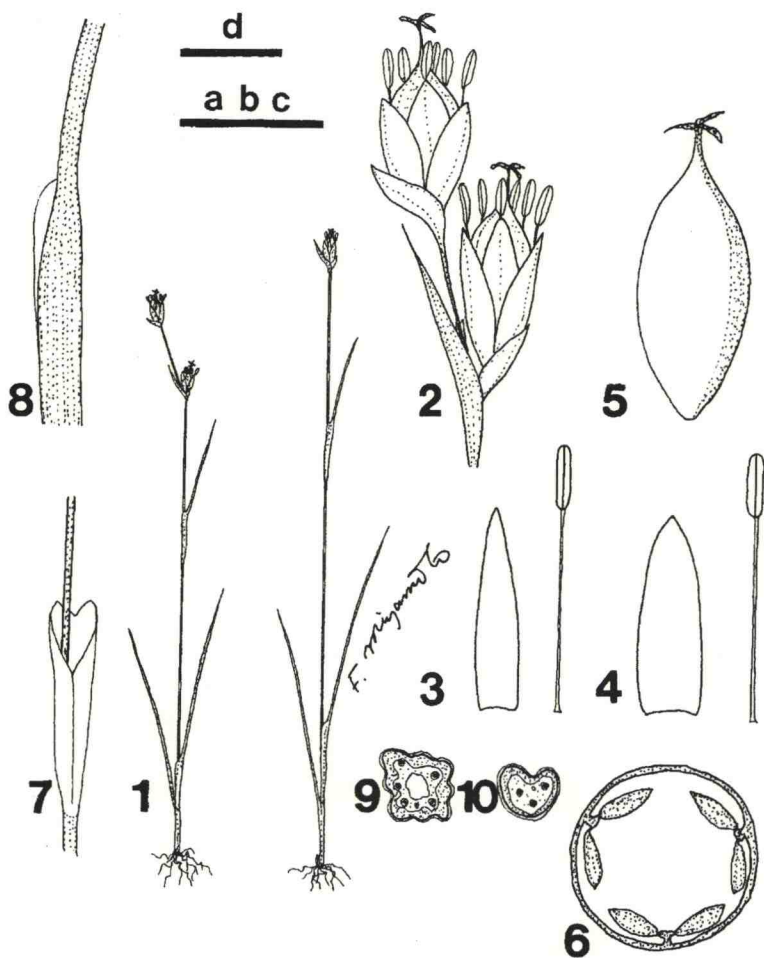




**PLATE 44.** *Juncus petrophilus* Miyam.

1. Habit of plants, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Leaf auricle of basal leaf, 8. Cross section of culm, 9. Cross section of basal leaf, 10. Cross section of cauline leaf. Scales: a (3 cm) for 1; b (6 mm) for 2 and 7; c (3 mm) for 3, 4 and 5; d (1.5 mm) for 6; e (1 mm) for 8, 9 and 10.

Voucher specimen: China; Yunnan, Dali, Mt. Dancang Shan, 3600 m (F. Miyamoto 105201, 1 Jul. 2000, TI).

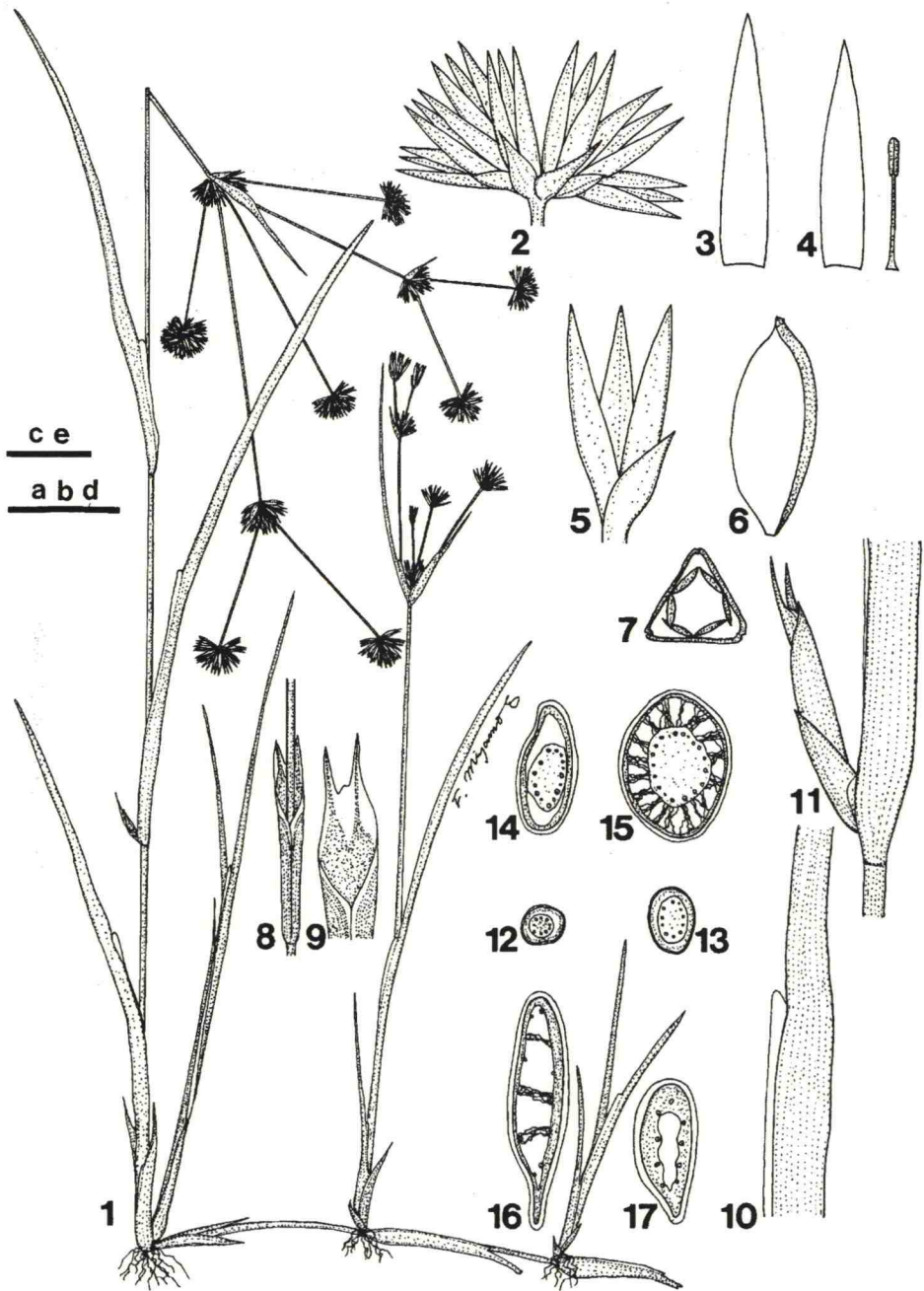


**PLATE 45.** *Juncus potaninii* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Auricle of basal leaf, 9. Cross section of culm, 10. Cross section basal leaf. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4 and 5; c (1 mm) for 6, 7 and 8; d (0.5 mm) for 9 and 10.

Voucher specimen: China; Sichuan, Xiajin, Rilong - Ganhaizi, 3300 m (H. Ikeda et al. 100812, 30 Aug. 1998, KUN, TI).

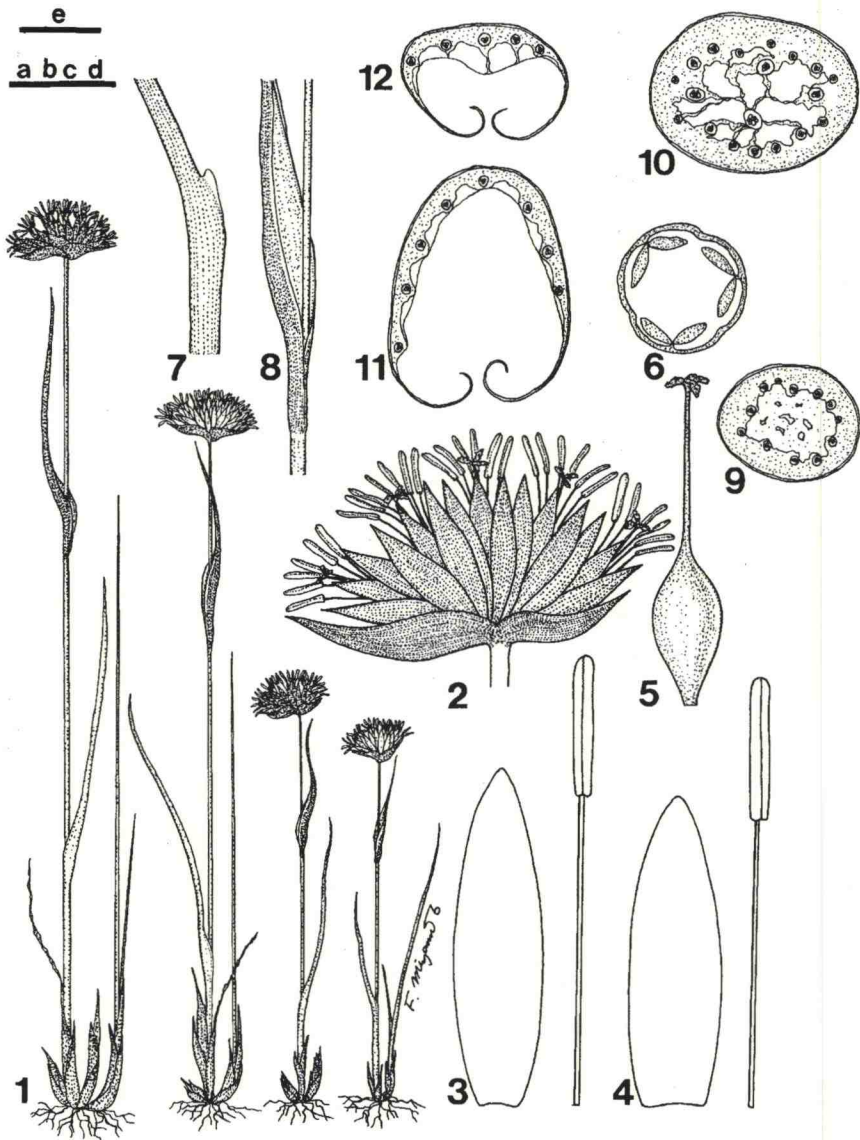




**PLATE 46.** *Juncus prismatocarpus* R. Br.

1. Habit, 2. Inflorescence, 3. Outer tepal, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. apex of sheathing bract, 10. Auricle of basal leaf, 11. Proliferous, 12. Cross section of upper part of peduncle, 13. Cross section of lower part of peduncle, 14. Cross section of upper part of culm, 15. Cross section of lower part of culm, 16. Cross section of cauline leaf, 17. Cross section of lowest bract. Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4, 5 and 9; c (1 mm) for 6, 7, 12, 13, 14 and 15; d (4 mm) for 8, 10 and 11; e (0.5 mm) for 16 and 17.

Voucher specimen: Nepal; Koshi zone, sankhuwa Sabha Distr., Manebanjang - Chichi la, 1300 m (M. Minaki et al. 9020244, 28 Jul. 1990, TI).



**PLATE 47. *Juncus przewarskii* Buchenau**

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cauline leaf, 9. Cross section of culm, 10. Cross section of basal leaf, 11. Cross section of upper part of cauline leaf, 12. Cross section of lower part of cauline leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 7 and 8; c (2 mm) for 3, 4 and 5; d (1 mm) for 6; e (1 mm) for 9, 10, 11 and 12.

Voucher specimen: China; Sichuan, Daocheng, around Gongga Shan, 4700 m (S. K. Wu et al. 451, 5 Aug. 1997, TI).



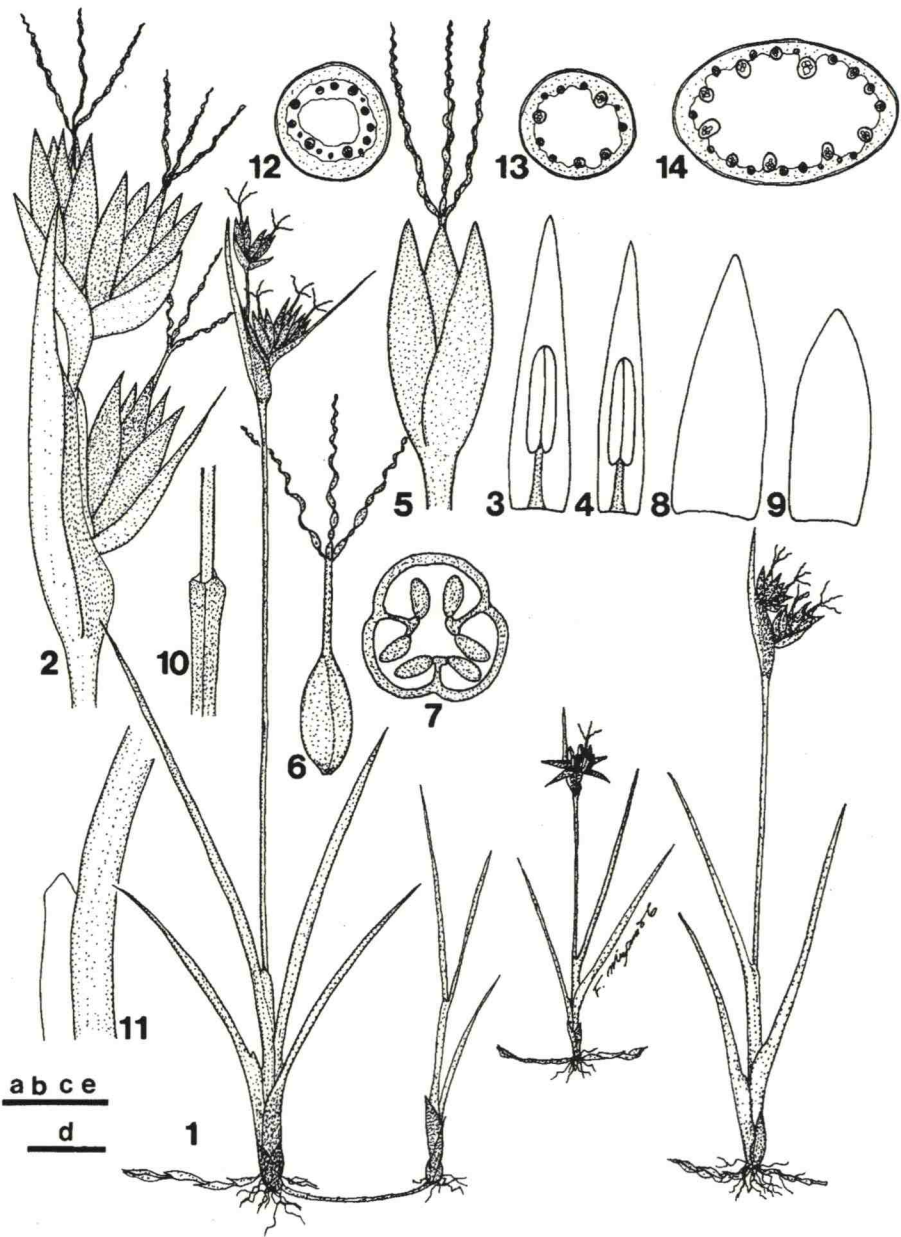
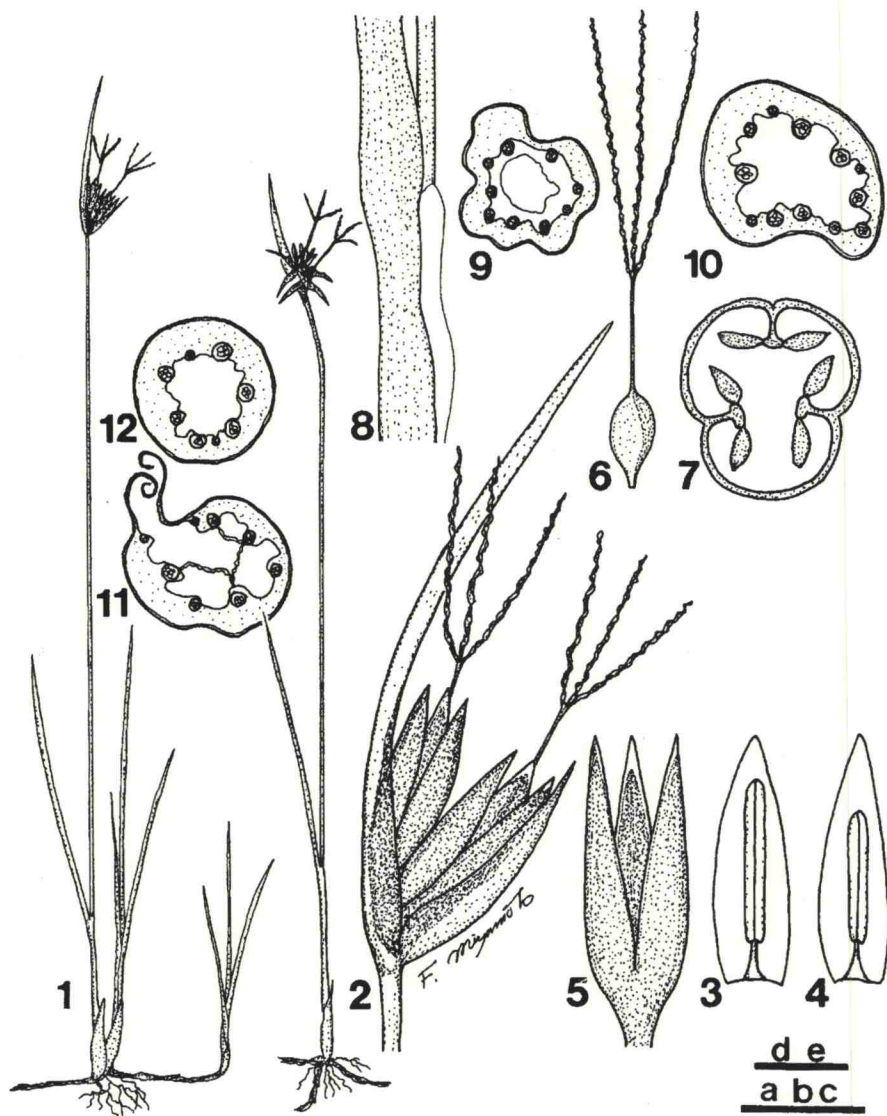


PLATE 48. *Juncus pseudocastaneus* Sam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and stigmas, 6. Pistil, 7. Cross section of capsule, 8. Outer bract, 9. Inner bract, 10. Sheathing bract on peduncle, 11. Auricle of basal leaf, 12. Cross section of culm, 13. Cross section of lowest bract, 14. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 10 and 11; c (2 mm) for 3, 4, 5, 6, 8 and 9; d (1 mm) for 7; e (1 mm) for 12, 13 and 14.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, Surveying the whole area around Shipton Pass, 4200 m (M. Minaki et al. 9020758, 9 Aug. 1990, TI).



**PLATE 49.** *Juncus rohtangensis* Goel & Aswal.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of lower part of culm, 10. Cross section of upper part of culm, 11. Cross section of lowest bract, 12. Cross section of upper part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7, 9, 10, 11, 12; e (0.5 mm) for 8. Voucher specimens: Nepal; Bagmati zone, Rasuwa Distr., Kyangjin Kharka - Yala Kharka, 4580 m (H. Takayama et al. 9220175, 14 Jul. 1992, TI).



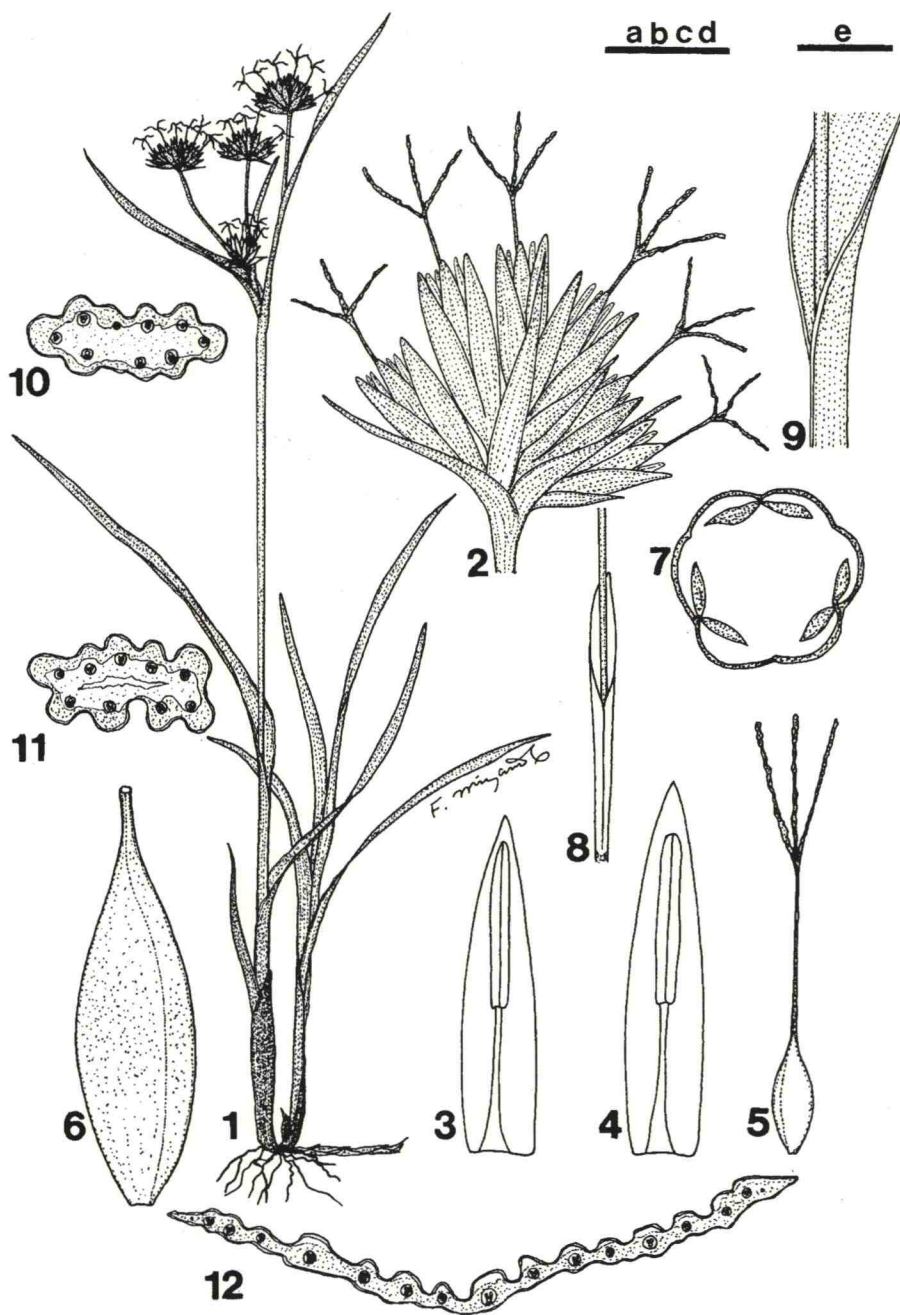


PLATE 50. *Juncus rostocarpus* Miyam.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. pistil, 6. Capsule, 7. Cross section of capsule, 8. Sheathing bract on peduncle, 9. Auricle of basal leaf, 10. Cross section of peduncle, 11. Cross section of culm, 12. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 9; c (2 mm) for 3, 4, 5, 6 and 8; d (1 mm) for 7; e (0.5 mm) for 10, 11 and 12.

Voucher specimen: Tibet; Tsekou (J. A. Soulié 1105, 20 Sept. 1895, TI).

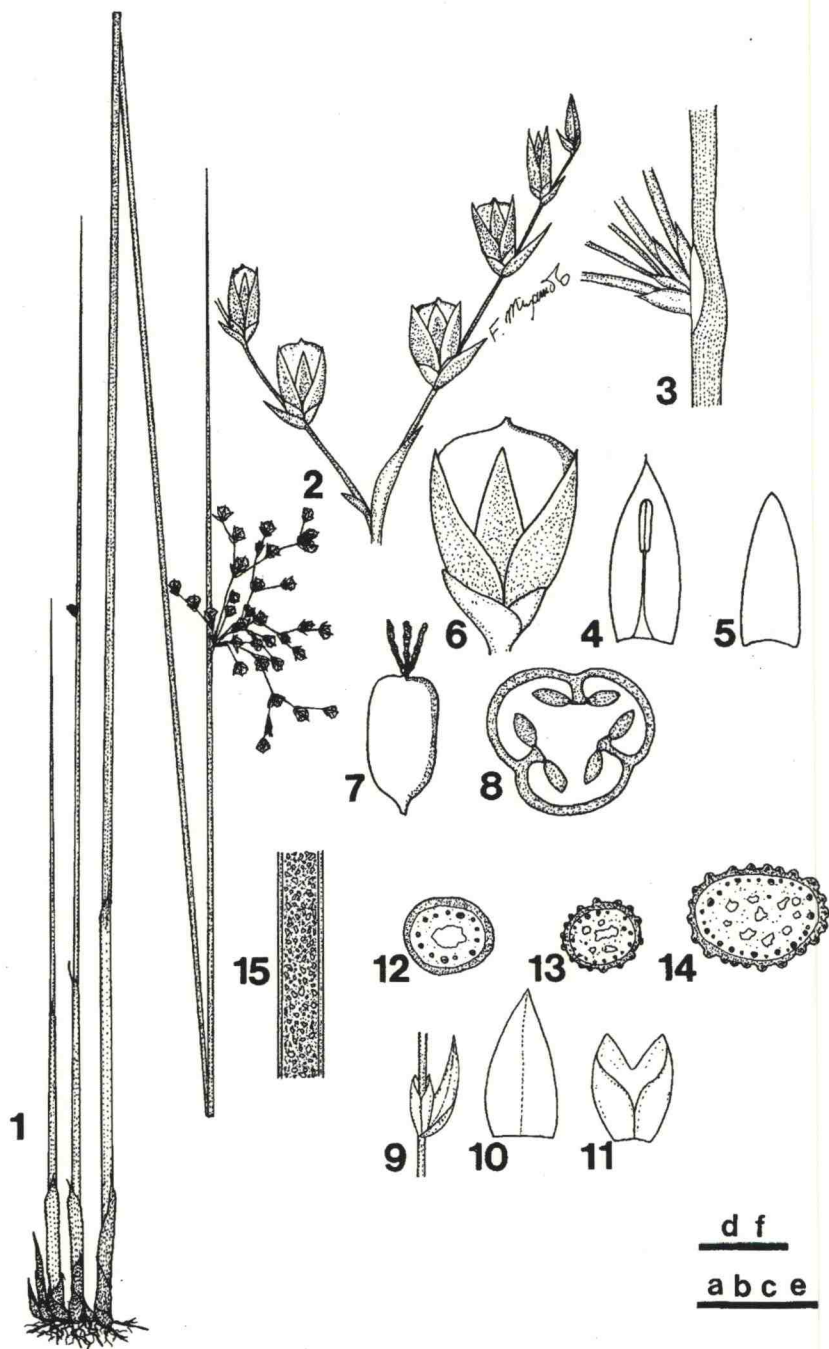


PLATE 51. *Juncus setchuensis* Buchenau

1. Habit, 2. Inflorescence, 3. Auricle of lowest bract, 4. Outer tepal and stamen, 5. Inner tepal, 6. Perianth and capsule, 7. Pistil, 8. Cross section of capsule, 9. Sheathing bract on peduncle, 10. Bract on peduncle, 11. Apex of sheathing bract, 12. Cross section of peduncle, 13. Cross section of upper part of culm, 14. Cross section of lower part of culm, 15. Longitudinal section of culm. Scales: a (2 cm) for 1; b (4 mm) for 2, 3, 9 and 15; c (2 mm) for 4, 5, 6 and 7; d (0.5 mm) for 8, 12 and 13; e (1 mm) for 10 and 11; f (1 mm) for 14. Voucher specimen: China; Yunnan, Gongshan Xian, SW of Gongshan, Gaoligong Shan, 2615 m (S. K. Wu et al. 103188, 20 Sept. 1999, TI).

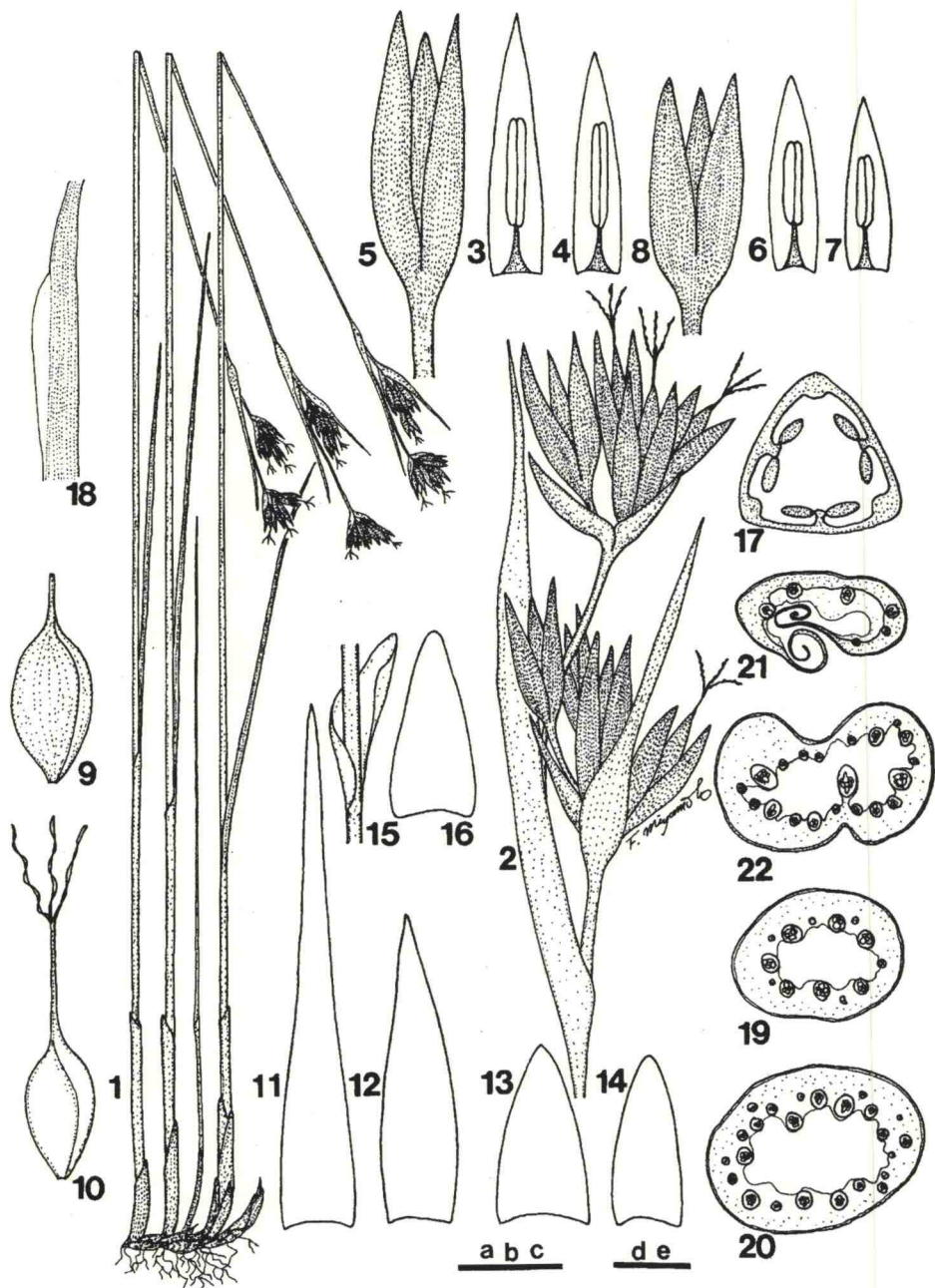




**PLATE 52.** *Juncus sherei* Miyam & H. Ohba

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Auricle of basal leaf, 8. Cross section of culm, 9. Cross section of basal leaf, 10. Cross section of lowest bract. Scales: a (2 cm) for 1; b (5 mm) for 2; c (2.5 mm) for 3, 4, 5 and 7; d (1 mm) for 6; e (0.5 mm) for 8, 9 and 10.

Voucher specimen: Nepal; Sagarmatha zone, Solukhumbu District, Fnaula - Pike, 3300 m (F. Miyamoto et al. 9580049, 22 Jul. 1995, TI).



**PLATE 53.** *Juncus sikkimensis* Hook. f.

1. Habit, 2. Inflorescence, 3 and 6. Outer tepal and stamen, 4 and 7. Inner tepal and stamen, 5 and 8. Perianth, 9. Capsule, 10. Pistil, 11, 13. Outer bract, 12, 14. Inner bract, 15. Sheathing bract on peduncle, 16. Sheathing bract, 17. Cross section of capsule, 18. Auricle of basal leaf, 19. Cross section of upper part of culm, 20. Cross section of lower part of culm, 21. Cross section of lowest bract, 22. Cross section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2 and 18; c (2 mm) for 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16; d (1 mm) for 17; e (0.5 mm) for 19, 20, 21, 22.

Voucher specimen: Nepal; Bagmati zone, Rasuw Distr., Around Base Camp (near Yala Kharka), 4920 m (H. Takayama et al. 9220316, 21 Jul. 1992, TI).



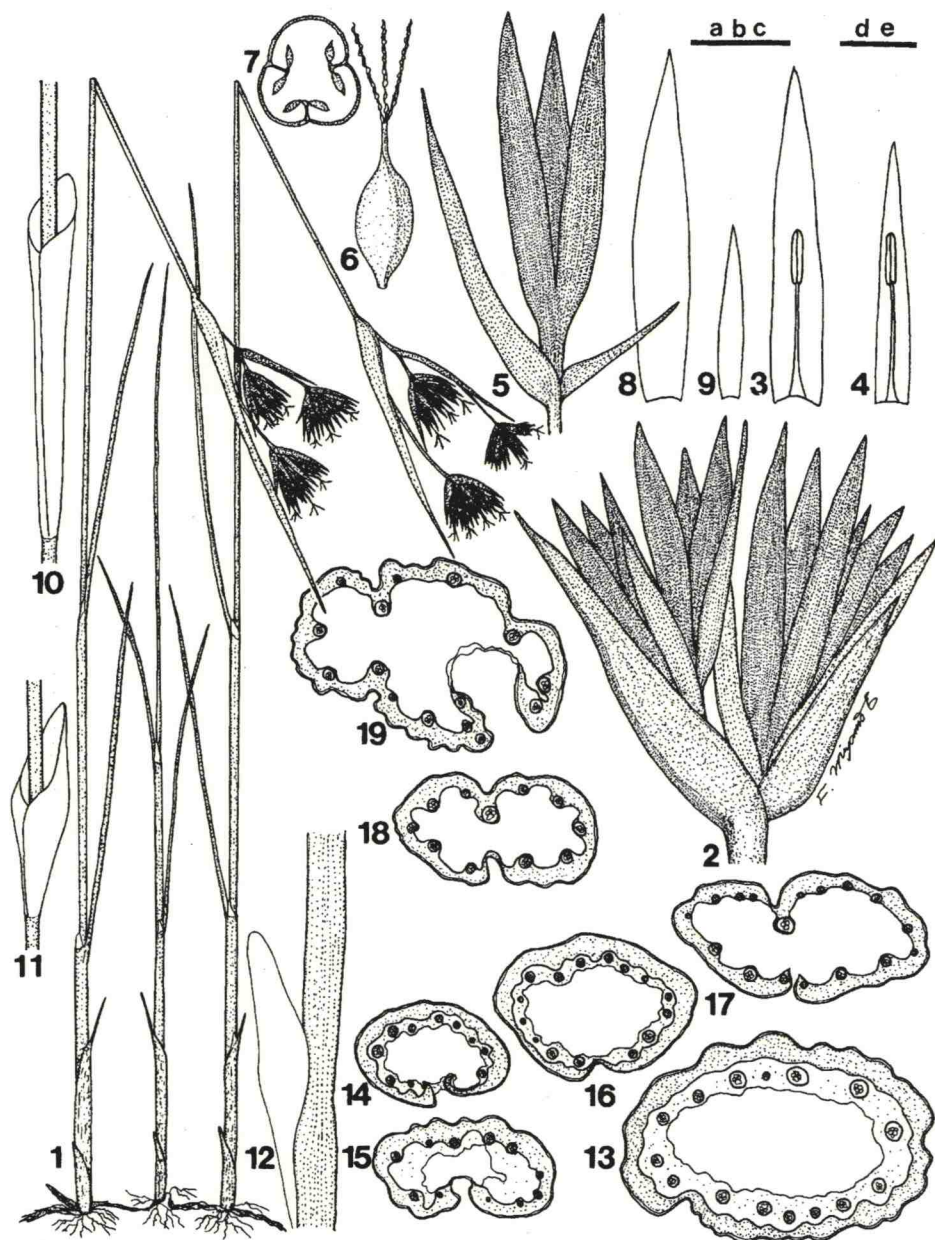


PLATE 54. *Juncus sphacelatus* Decne.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and bract, 6. Pistil, 7. Cross section of capsule, 8. Outer bract, 9. Inner bract, 10, 11. Sheathing bract on peduncle, 12. Auricle of basal leaf, 13. Cross section of culm, 14. Cross section of upper part of lowest bract, 15. Cross section of lower part of lowest bract, 16. Cross section of upper part of cauline leaf, 17. Cross section of lower part of cauline leaf, 18. Cross section of upper part of basal leaf, 19. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 10 and 11; c (2 mm) for 3, 4, 5, 6, 8, 9 and 12; d (1 mm) for 7; e (0.5 mm) for 13, 14, 15, 16, 17, 18 and 19.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Yala Kharka - Langtrang, 4800 m (H. Takayama et al. 9220347, 22 Jul. 1992, TI).

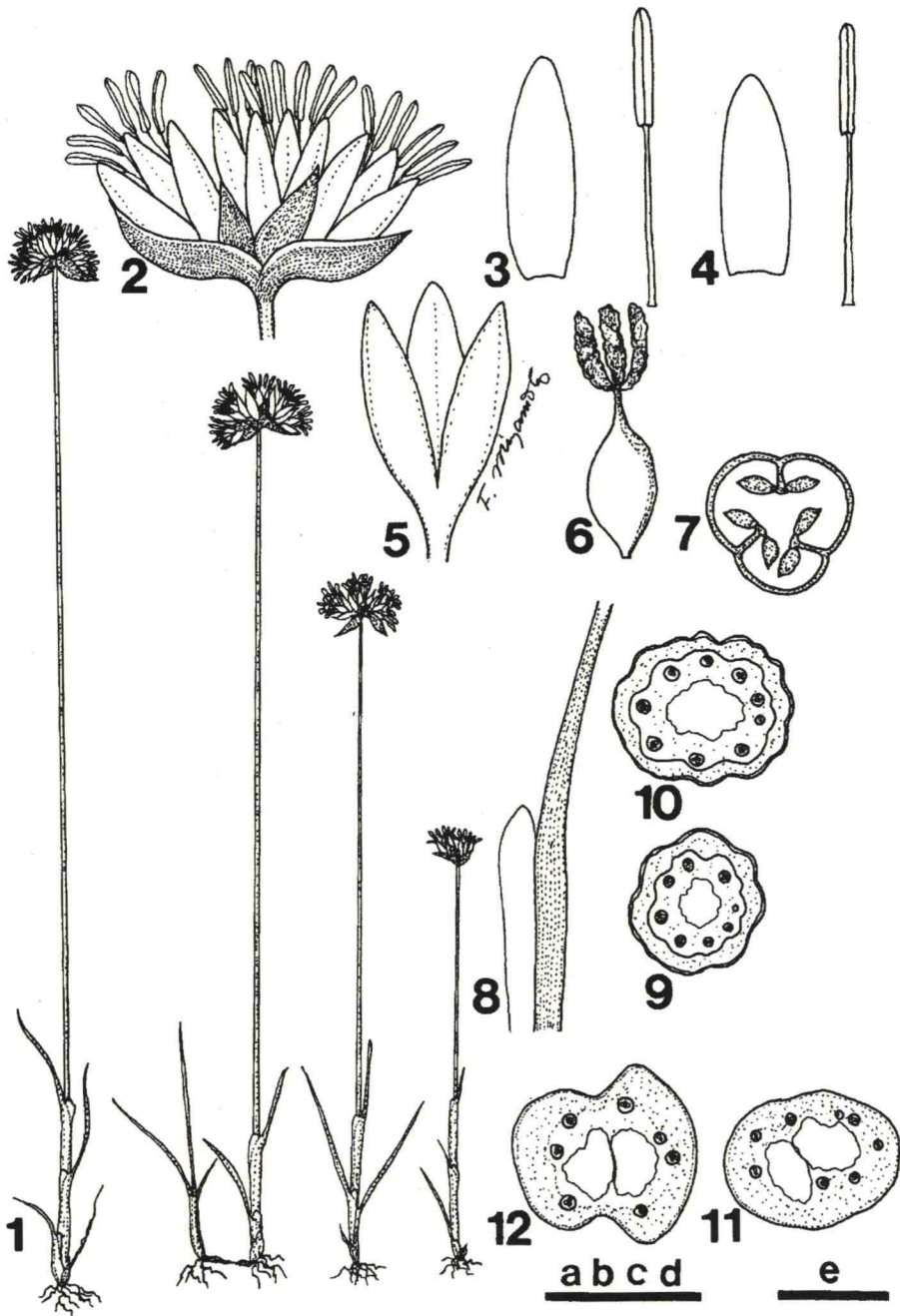


**PLATE 55. *Juncus spumosus* Noltie**

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Capsule, 7. Cross section of capsule, 8. Seed, 9. Sheathing bract on peduncle, 10. Auricle of basal leaf, 11. Cross section of culm, 12. Cross section of peduncle, 13. Cross section of basal leaf, 14. Cross section of lowest bract. Scales: a (2 cm) for 1; b (4 mm) for 2, 9 and 10; c (2 mm) for 4, 5, 6 and 8; d (1 mm) for 7; e (1 mm) for 11, 13 and 14; f (0.5 mm) for 12.

Voucher specimen: China; Yunnan, Lushui, Pianma - Pianma Pass - Lushui, 2600 m (S. K. Wu et al. 103174, 13 Sept. 1999, TI).

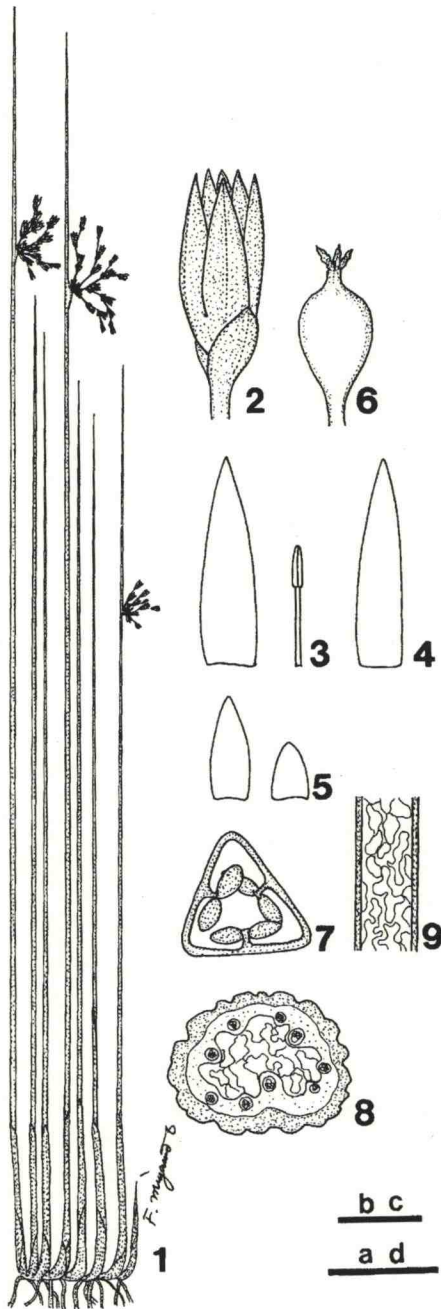




**PLATE 56.** *Juncus thomsonii* Buchenau

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9. Cross section of upper part of culm, 10. Cross section of lower part of culm, 11. Cross section of upper part of basal leaf, 12. Cross section of lower part of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 8; c (2 mm) for 3, 4, 5 and 6; d (1 mm) for 7; e (0.5 mm) for 9, 10, 11 and 12.

Voucher specimen: Nepal; Bagmati zone, Rasuwa Distr., Yala Kharka - Langtrang, 4850 m (H. Takayama et al. 9220352a, 22 Jul. 1992, TT).



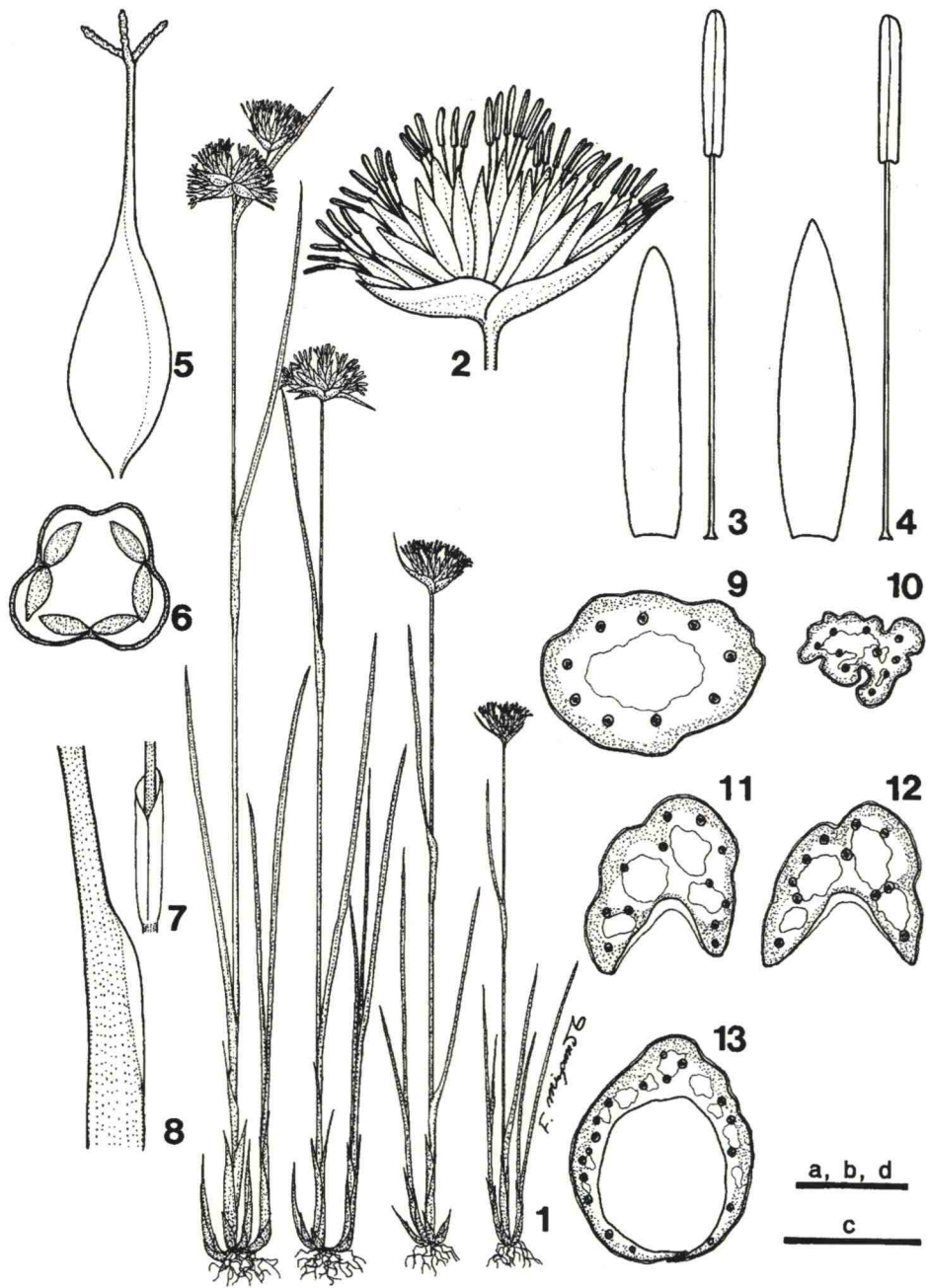
**PLATE 57. *Juncus tobdeniorum* Noltie**

1. Habit, 2. Perianth and bracteoles, 3. Outer tepal and stamen, 4. Inner tepal, 5. Bracteoles, 6. Pistil, 7. Cross section of capsule, 8. Cross section of culm, 9. Longitudinal section of culm.

Scales: a (2 cm) for 1; b (1 mm) for 2, 3, 4, 5, 6 and 9; c (0.5 mm) for 7; d (0.5 mm) for 8.

Voucher specimen: Sikkim; North District, Yakche, N. of Lachung, 3150 m (D. G. Long & H. J. Noltie 209, 14 Jul. 1996, TI).

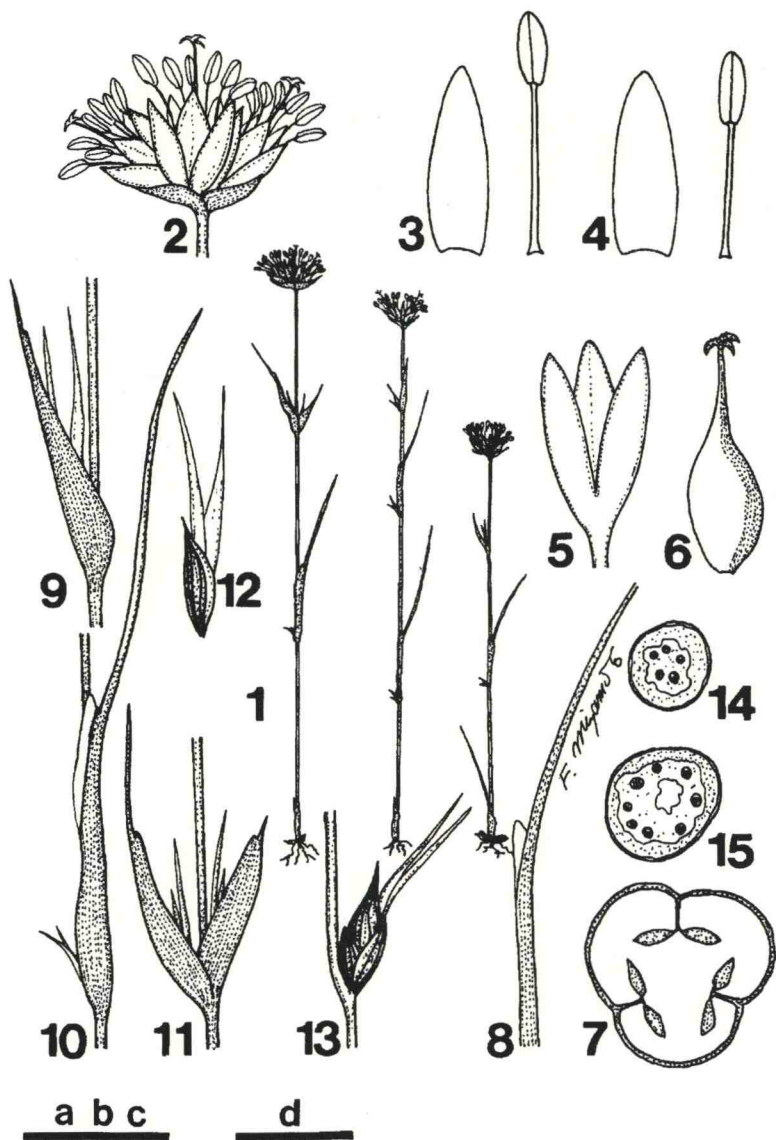




**PLATE 58.** *Juncus trachyphyllus* Miyam. & H. Ohba

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Cross section of capsule, 7. Sheathing bract on peduncle, 8. Auricle of basal leaf, 9. Cross section of lower part of culm, 10. Cross section of cauline leaf, 11. Cross section of upper part of basal leaf, 12. Cross section of lower part of basal leaf, 13. Cross section of lowest bract. Scales: a (2 cm) for 1; b (5 mm) for 2, 7 and 8; c (2.5 mm) for 3, 4 and 5; d (1 mm) for 6, 9, 10, 11, 12 and 13.

Voucher specimen: China; Sichuan, Daoching District, Mt. Gonggashan, 4300 m (Wu et al. 1540, 21 Aug. 1995, TI).

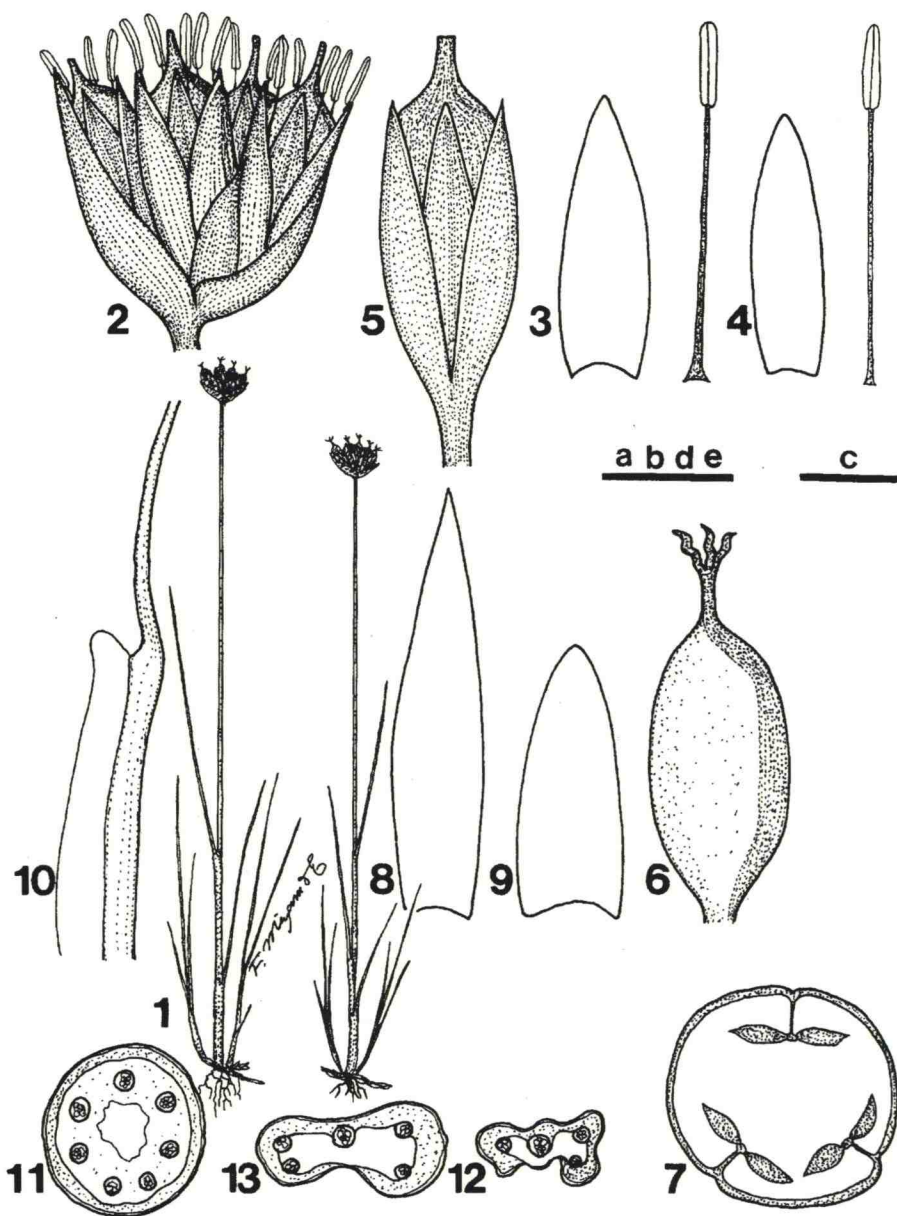


**PLATE 59.** *Juncus trichophyllus* W. W. Sm.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Auricle of basal leaf, 9, 10, 11. Cauline leaf with proliferous, 12, 13. Proliferous, 14. Cross section of upper part of culm, 15. Cross section of lower part of culm. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4, 5, 6, 8, 9, 10, 11, 12 and 13; d (1 mm) for 7, 14 and 15.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Cha Ding Kharka - Khongma, 3900 m (M. Minaki et al. 9020862a, 12 Aug. 1990, TI).

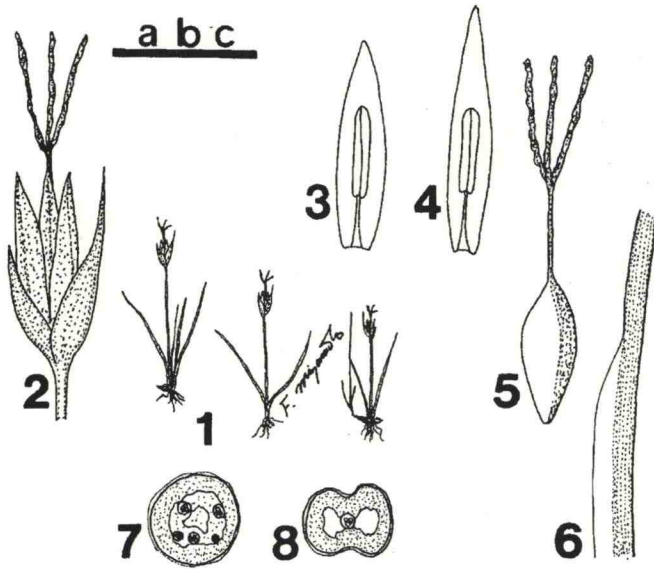




**PLATE 60.** *Juncus triglumis* L.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth and capsule, 6. Pistil, 7. Cross section of capsule, 8. Outer bract, 9. Inner bract, 10. Auricle of basal leaf, 11. Cross section of culm, 12. Cross section of upper part of basal leaf, 13. Cross section of lower part of basal leaf. ). Scales: a (2 cm) for 1; b (2 mm) for 2, 3, 4, 5, 6, 8, and 9; c (1 mm) for 7; d (1 mm) for 10; e (0.5 mm) for 11, 12 and 13.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Around Cha Ding Kharka, 4100 m (M. Minaki et al. 9020745, 9 Aug. 1990, TT).

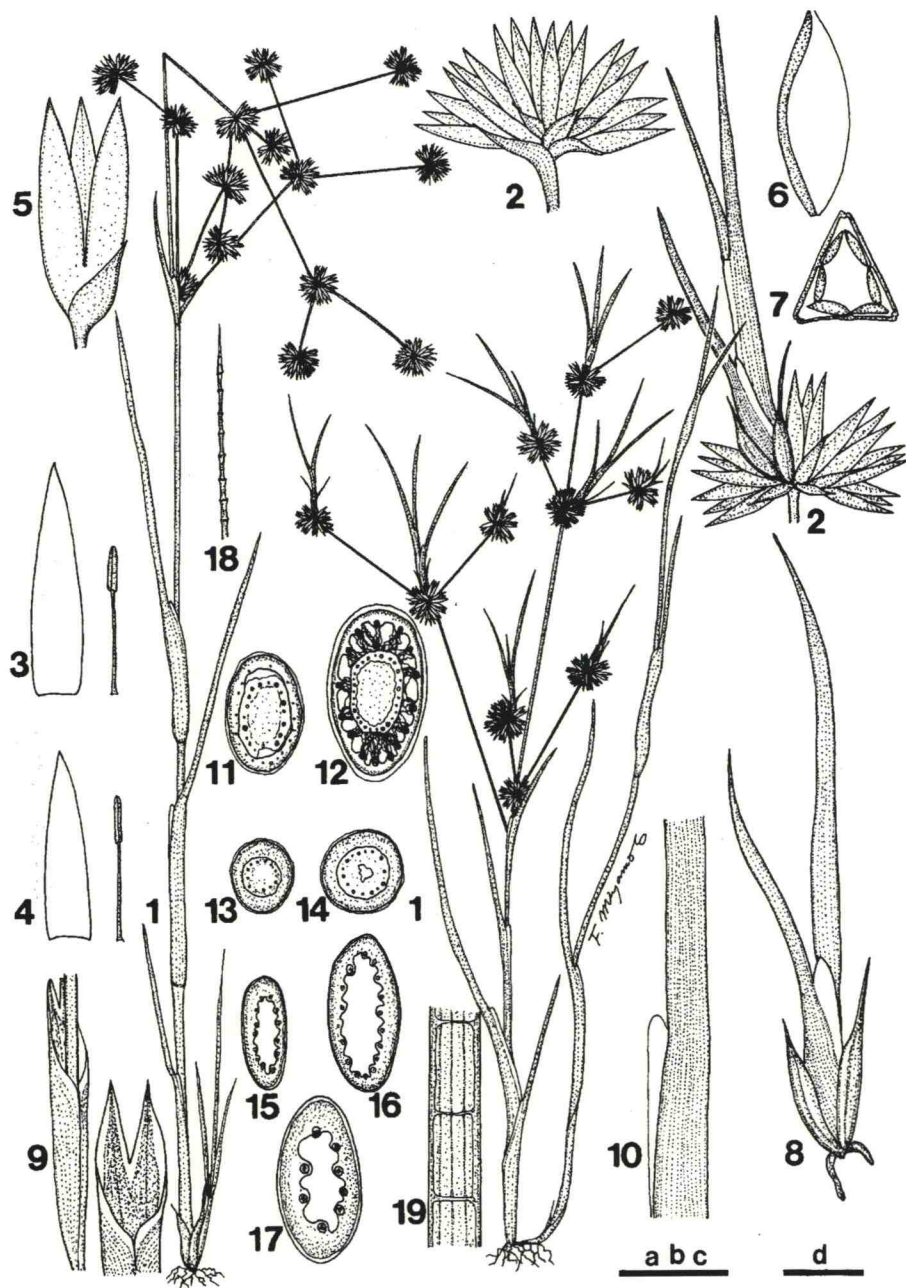


**PLATE 61.** *Juncus uniflorus* W. W. Sm.

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Pistil, 6. Auricle of basal leaf, 7. Cross section of lower part of culm, 8. Cross section of basal leaf. Scales. a (2 cm) for 1; b (4 mm) for 2, 3, 4, 5 and 6; c (2 mm) for 7 and 8.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Jaljale Himale, around Banduke, 4150 m (H. Ohba et al. 9110215, 25 Jul. - 3 Aug. 1991, TT).





**PLATE 62.** *Juncus wallichianus* Laharpe

1. Habit, 2. Inflorescence, 3. Outer tepal and stamen, 4. Inner tepal and stamen, 5. Perianth, 6. Pistil, 7. Cross section of capsule, 8. Proliferous flower, 9. Sheathing bract on peduncle and apex of sheathing bract, 10. Auricle of cauline leaf, 11. Cross section of upper part of culm, 12. Cross section of lower part of culm, 13. Cross section of upper part of peduncle, 14. Cross section of lower part of peduncle, 15. Cross section of upper part of cauline leaf, 16. Cross section of lower part of cauline leaf, 17. Cross section of basal leaf, 18. Upper part of basal leaf, 19. Longitudinal section of basal leaf. Scales: a (2 cm) for 1; b (4 mm) for 2, 9, 10 and 18; c (2 mm) for 3, 4, 5, 8 and 19; d (1 mm) for 6, 7, 11, 12, 13, 14, 15, 16 and 17.

Voucher specimen: Nepal; Koshi zone, Sankhuwa Sabha Distr., Sedua - Mane Gaun - Tashi Gaun, 1600 m (M. Minaki et al. 9020479, 2 Aug. 1990, TI).

## THE FAMILY EUPHORBIACEAE S. L. IN NEPAL A CHECKLIST AND TAXONOMICAL NOTES

Takahide KUROSAWA

Euphorbiaceae s. l. is characterized by often minute, unisexual flowers and superior ovaries with 1 or 2 ovules per cymule, and some of the members are of great economic importance (Webster 1987, 1994a, Govaerts et al. 2000, Radcliffe-Smith 2001). The family distributes nearly world wide, although predominantly in tropical and subtropical areas (Webster 1987, 1994a, Govaerts et al. 2000). According to Radcliffe-Smith (2001) this is the sixth largest family of angiosperms. Govaerts et al. (2000) recorded 322 genera and 8910 species in the family.

Webster (1975, 1994b) had outlined and extended a system of classification of the family and now most workers accept his system. However, molecular evidences (Chase et al. 1993, Tokuoka & Tobe 1999, Savolainen et al. 2000) together with some morphological evidences (e. g. Tokuoka & Tobe 1999) have suggested Euphorbiaceae s. l. are heterogeneous and polyphyletic. Angiosperm Phylogeny Group (1998) and Savolainen et al. (2000) proposed Phyllanthaceae, Pseudanthaceae, and Putranjivaceae for Phyllanthoideae (excl. Drypeteae), Oldfieldioideae, and Drypeteae in the system of Webster (1994b) respectively. Although the advanced system of Euphorbiaceae s. l. proved by phylogenetic classification will be proposed and become widely accepted in the future, in this checklist "Euphorbiaceae" is used in the broad and traditional sense in accordance with the precedent works.

### History

The first botanical collection of Nepal was made by F. Buchanan sent by the Honourable East India Company from Makwanpur to Kathmandu from March 1802 to March 1803 (Rajbhandari 1976, 2002, Stearn 1978). A set of these collections had formed the basis of Don's *Prodromus Florae Nepalensis* (1825), in which the first six species of Nepalese Euphorbiaceae, *Euphorbia dracunculoides* Lam. (as *E. angustifolia*) (Plate 78), *E. fusiformis* Buch.-Ham. ex D. Don (Plate 74), *E. prolifera* Buch.-Ham. ex D. Don (Plate 75), *Chamaesyce parviflora* (L.) Soják (as *E. tenuis*) (Plate 81), *Phyllanthus parvifolius* Buch.-Ham. ex D. Don (as '*parvifolia*') (Plate 63), and *Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery (as *Myrica octandra*, Myricaceae) (Plate 70) were recorded (Press & Shrestha 2000). The type specimens of these species are held at the Natural History Museum, London (BM) (Press & Shrestha 2000).

Wallich (1828–1849) proposed numerous new names of Nepalese Euphorbiaceae based on Buchanan's collections and his own collections in the expedition to Kathmandu valley and Trisuli valley made from December 1820 to November 1821 (Burkill 1910), but without description. Among these invalid names Müller Argoviensis (1863) validated two names, *Phyllanthus juniperinus* Wall. ex Müll. Arg. (Plate 64) and *Phyllanthus glaucus* Wall. ex Müll. Arg. (Plate 65). Müller Argoviensis (1863, 1865) and Boissier (1862)



described four new species from Nepal, *Glochidion acuminatum* Müll. Arg. (Plate 68), *Phyllanthus nepalensis* Müll. Arg. (Plate 67), *Mallotus nepalensis* Müll. Arg. (Plate 71), and *Euphorbia nepalensis* Boiss. (Plate 76), based on Wallich's collections. Hooker and his collaborators had reviewed the results of these explorations and publications, and compiled them in *Flora of British India* in which 21 species of Euphorbiaceae from Nepal were recorded (Hooker 1886–1888) (Table 1).

Burkill traced almost the same route at the same season of Wallich's expedition and recorded 13 species in 8 genera of Euphorbiaceae (Burkill 1910).

Through some major botanical expeditions organized by the British Museum (Natural History) and University of Tokyo after 1949, numerous Nepalese specimens had been provided to British, Scottish and Japanese herbaria as well as plant collecting activities by the Department of Plant Resources, Nepal (Stearn 1978, 1981, Ohba 2002, Rajbhandari 2002). Hurusawa & Tanaka's enumeration (1966) based on specimens in TI has greatly contributed to the progress of the knowledge on diversity of Euphorbiaceae in eastern Nepal, though many misidentifications and nomenclatural mistakes were pointed by various authors. A regional flora of Kathmandu valley was edited by Malla et al. (1986) with reference to the Herbarium, Department of Plant Resources, Nepal (KATH) in which 17 species in 11 genera of Euphorbiaceae were included with keys to species, synonymy, and descriptions. Short & Vickery (1982) completed the first full list of Nepalese Euphorbiaceae mostly based on the specimens kept in BM, and enumerated 28 genera with 83 species (and *Bischofia javanica* as Staphyleaceae). Kurosawa (1998) provided keys to genera and species with miscellaneous taxonomic notes based on studies in Japanese herbaria, the University Museum, University of Tokyo (TI) and Biological Institute, Faculty of Science, Tohoku University (TUS), with reference to literatures.

### Aims of the Checklist

Recent progress in understanding the taxonomy for Euphorbiaceae is remarkable. Three floristic works including many new taxonomic treatment in adjacent countries (Sikkim and Bhutan by Long 1987; China by Li 1994, Kiu et al. 1996, and Ma & Tseng 1997; Sri Lanka by Philcox 1997) and numerous regional or world revisions and checklists of genera (*Antidesma* by Hoffmann 2000; *Aporosa* by Chakrabarty & Gangopadhyay 1993, Schot 1995; *Baccaurea* by van Welzen et al. 2000, Haegens 2000; *Balakata* by Esser 1999; *Baliospermum* by Chakrabarty & Balakrishnan 1990; *Breynia* by van Welzen et al. 2000; *Bridelia* by Dressler 1996b, van Welzen et al. 2000; *Croton* by Chakrabarty & Balakrishnan 1992; *Chrozophora* by van Welzen 1999; *Excoecaria* by Chakrabarty & Gangopadhyay 1994; *Falconeria* by Esser 1999; *Flueggea* by Webster 1984; *Glochidion* by Chakrabarty & Gangopadhyay 1995, van Welzen et al. 2000; *Mallotus* by van Welzen et al. 2000; *Putranjiva* as *Drypetes* by Chakrabarty et al. 1997; *Triadica* by Esser 1999; *Vernicia* by Stuppy et al. 1999) had been published, and a checklist for the family as a whole had been completed by Govaerts et al. (2000) in a series of worldwide checklists by the Royal Botanic Gardens, Kew. Short & Vickery's enumeration (1982) requires revising to the recent progress with reference. Descriptions as well as detailed distributions and ecological data of most of Nepalese Euphorbiaceae have not be available. The checklist presented here aims at revising taxonomic treatments and showing present knowledge about the Euphorbiaceae of Nepal through studies on herbarium specimens and literatures.

TABLE 1. The records of Nepalese Euphorbiaceae in Hooker (1886–1888) and their cited specimens. Data in brackets are those available from the label of specimens

Name in Hooker (1886–1888) (page)	Treatment in present study	Cited specimens in Hooker (1886–1888)
<i>Euphorbia fusiformis</i> Ham. (257)	<i>Euphorbia fusiformis</i>	Hamilton
<i>E. wallichii</i> Hook. f. (258)	<i>E. wallichii</i>	Wallich, List no. 7696A, at Gossainthan [in 1821] (K-WALL*).
<i>E. stracheyi</i> Boiss. (259)	<i>E. stracheyi</i>	Wallich, List no. 7685, [in 1821] (K-WALL*).
<i>E. longifolia</i> Don (261)	<i>E. pseudosikkimensis</i>	Hamilton; Wallich, List no. 7694A, at Thokote [18 May 1821] (K-WALL*).
<i>E. prolifera</i> Ham. (264)	<i>E. prolifera</i>	Wallich, List no. 7698A, [in 1821] (K!, Plate 14, K-WALL*).
<i>E. angustifolia</i> Ham (265, as doubtful species)	<i>E. dracunculoides</i>	Hamilton, at Norcotera.
<i>E. tenuis</i> Ham. (266, as doubtful species)	<i>Chamaesyce parvifolia</i>	Hamilton, at Bassaria.
<i>Andrachne cordifolia</i> Muell. Arg. (283)	<i>Leptopus cordifolius</i>	Wallich, List no. 7913B (K-WALL*).
<i>Phyllanthus glaucus</i> Wall. (288)	<i>Phyllanthus glaucus</i>	Wallich, List no. 7918A p.p.[May 1821] (K-WALL!); 7927A, [April 1821 & 15 Dec. 1820] (K!, K-WALL!, Plate 65)
<i>P. parvifolius</i> Ham. (294)	<i>P. parvifolius</i>	Wallich, List no. 7901B (K-WALL!)
<i>Glochidion lanceolarium</i> Dalz. (308)	<i>Glochidion lanceolarium</i>	Wallich, List no. 7855E, [24 March 1821] (K-WALL!).
<i>G. velutinum</i> Wight (322)	<i>G. heyneanum</i>	Wallich, List no. 7852, [May 1821] (K-WALL!, Plate 67).
<i>G. acuminatum</i> Muell. Arg. (323)	<i>G. triandrum</i>	Wallich, List no. 7885 (K!, K-WALL!, Plate 68).
<i>Breynia patens</i> Benth (329)	<i>Breynia retusa</i>	Wallich, List no. 7911D [May 1821 & April 1821] (K-WALL*).
<i>Sauropus compressus</i> Müll. Arg. (336)	<i>Sauropus quadrangularis</i>	Hamilton
<i>Antidesma bunius</i> Spreng (358)	<i>Antidesma bunius</i>	?
<i>Acalypha brachystachya</i> Hornem. (416)	<i>Acalypha supera</i>	?
<i>Alchornea mollis</i> Müll. Arg. (420)	<i>Alchornea mollis</i>	Wallich, List no. 7825, [May 1821] (K-WALL!).
<i>Mallotus nepalensis</i> Müll. Arg. (428)	<i>Mallotus nepalensis</i>	Wallich, List no. 7824, [in 1821] (K!, K-WALL!, Plate 71).
<i>Baliospermum corymbiferum</i> Hook. f. (463)	<i>Baliospermum corymbiferum</i>	no cited specimens
<i>Excoecaria acerifolia</i> F. Didrichs. (473)	<i>Excoecaria acerifolia</i>	Wallich, List no. 7969, [in 1821] (K-WALL!).

\* IDC microfiches in TI were seen.



### Materials and Methods

Herbarium studies were conducted in E, KYO, TI and TUS from 2000 to 2003, although I could not examine numerous Nepalese specimens not yet mounted in TI. The specimens kept in four other herbaria, BM, K, K-WALL and KATH, were also observed in the same period, but rather partially and insufficiently. IDC microfiches in TI were seen for the type specimens in G-DC and some important specimens in K-WALL. My field observations in Chitwan, Arun-Iswa Khola, and Mustang (Suzuki & Yoda 1996, Noshiro 1998, Noshiro & Amano 2002) are also reflected for descriptions of habitat and ecology.

### Explanation of Checklist

*Classification and arrangement.* Intrafamilial classification and generic circumscription and arrangement follow Radcliffe-Smith (2001).

*Acceptance of species and infraspecific taxa.* The phylogenetic species concept (Nixon & Wheeler 1990, Luckow 1995) is employed here, i. e. species are the smallest diagnosable aggregation. Species generally taken here are as groups of individuals that consistently differ in qualitative morphological characters, or quantitative morphological characters that have no overlap in values. The rank of subspecies is applied to geographically complementary taxa that differ in reasonably reliable characters but without clear intervals as in the case of *Flueggea virosa* subsp. *himalaica*.

Taxa recorded in literatures but not examined specimens during this study, whether it is reliable or not, are listed in *Excluded Taxa* at the end of the checklist and included in keys with "excl."

*Keys.* Keys are generally made with reference to Nepalese materials cited in Appendix, except in the case of excluded taxa indicated by "excl."

*Synonym lists.* Synonyms are listed chronologically if heterotypic, with any homotypic synonyms following in a given lead. Synonyms of which I have not observed the type materials are also listed referring to Govaerts et al. (2000) or, in some case of Wallich's names, to Hooker (1986–1988), Short & Vickery (1982), and Govaerts et al. (2000). Synonyms in brackets are those of invalid, i. e. nom. nud., nom. rejic., etc., according to the International Code of Botanical Nomenclature (Greuter et al. 2000). Data of the type materials in brackets are those available from the label of specimens. Abbreviations of authors of scientific names, books, journals, and herbaria follow "Authors of Plant Names" (Brummitt & Powell 1992), "Taxonomic Literature" (Stafleu & Cowan 1976–1988), "Botanico-Periodicum-Huntianum/Supplementum" (Bridson 1991), and "Index Herbariorum. Part I. The Herbaria of the World (Regnum Veg. vol. 120)" (Holmgren et al. 1990), respectively.

*Descriptions.* All descriptions are based on herbarium collections from Nepal cited in Appendix. Descriptions of most of foreign taxa are omitted as well as the taxa treated in another papers in press or in preparation. Terminology follows generally Radford et al. (1974) and Harris & Harris (1994).

*Distributions.* World distribution of each taxon is based on assessments of literature. The names of geographical ranges in the world generally follow Hollis & Brummitt (1992), but do not follow in some cases (e. g. Sikkim is separated from Bhutan and is treated as a part of India). The categories of the elements are modified from those of Grierson & Long (1983).



1. *Himalayan-Chinese-Japanese element* (Grierson & Long 1983). This element is subdivided into following 4 categories here.

1a. Taxa distributed from Kashmir or western Nepal to eastern Nepal, Sikkim, Bhutan, Assam or southeastern Tibet. It is tentatively called as '*Pan-Himalayan element*' here.

1b. Taxa distributed from Kashmir to Nepal. It is tentatively called as '*NW Himalayan element*' here.

1c. Taxa distributed from eastern Nepal to Sikkim, Bhutan, Assam and southeastern Tibet. It is tentatively called as '*E Himalayan element*' here.

1d. *Endemic*: taxa at present known only from Nepal Himalaya.

2. *Tibetan element* (Grierson & Long 1983): taxa distributed from Nepal to Tibet.

3. *Deccan element* (Grierson & Long 1983): taxa distributed from Nepal to Peninsular India and Sri Lanka.

4. *SE Asian-Malaysian element* (Grierson & Long 1983): taxa distributed from Nepal and India to many parts of tropical or subtropical SE Asia.

5. Taxa widely distributed from Peninsular India and Sri Lanka to SE Asia. It is tentatively called as '*Deccan-Malaysian element*' here.

6. *Pan old tropic or Pan-tropic*.

These are descriptive and do not imply any migration or origin of the taxon concerned as emphasized in Grierson & Long (1983). *Distribution in Nepal* and distribution maps of each taxon are based on herbarium specimens cited in Appendix. For geographical subdivision I have adopted the administrative division in which Nepal is divided into 5 development regions, i. e. Far Western, Mid Western, Western, Central, and Eastern, subdivided into 14 zones and 75 districts.

*Habitat & ecology*. Habitat and ecology is based on labels of herbarium specimens with reference to literatures and my limited field observations in Nepal.

*Vernacular names and Uses*. Vernacular name and use of plants are based on literatures.

*Distribution map*. Horizontal and altitudinal distribution maps are presented for each taxon based on label data in herbarium specimens. In some cases, latitude, longitude, and altitude for collecting sites were decided with the help of a locality database prepared by Dr. K. Yonekura.

### Synopsis of Nepalese Euphorbiaceae

In the present checklist 96 species in 34 genera are accepted for Nepalese Euphorbiaceae (Table 2). Among them *Chamaesyce hispida* (Boiss.) V. S. Raju & P. N. Rao (Plate 80), *Euphorbia cashmeriana* Royle (Plate 79), *Glochidion daltonii* (Müll. Arg.) Kurz (Plate 69), and *Phyllanthus leschenaultii* Müll. Arg. (Plate 66) are firstly recorded from Nepal. Numerous taxa are revised in their taxonomical treatments either from the previous Nepalese enumeration (Short & Vickery 1982) or from a world checklist (Govaerts et al. 2000).

The number of native species of Euphorbiaceae is largest in Eastern development region. This situation reflects that the number of species of subfamily Phyllanthoideae (excl. Drypeteae), Acalyphoideae, and Crotonoideae tend to decrease in western regions (Table 3).

About a half of the native species are distributed from Malaysia (Deccan-Malaysian element and SE Asian-Malaysian element) (Table 4). Relatively few number of species are share with Kashmir or Tibet (Pan-Himalayan element, NW Himalayan element, and Tibetan element). Only three species are endemic to Nepal. At present, no taxon of Nepalese Euphorbiaceae falls under the Euro-Siberian element and Arctic-alpine element of Grierson & Long (1983).



TABLE 2. Number of accepted native and naturalized species in each genus of Nepalese Euphorbiaceae

Genera	Native species	Naturalized species	Genera	Native species	Naturalized species
I. Phyllanthoideae					
1. <i>Bridelia</i>	5	0	19. <i>Mallotus</i>	7	0
2. <i>Leptopus</i>	1	0	20. <i>Trewia</i>	1	0
3. <i>Flueggea</i>	1	0	21. <i>Acalypha</i>	1	0
4. <i>Phyllanthus</i>	15	2	22. <i>Tragia</i>	1	0
5. <i>Sauropus</i>	2	0	III. Crotonoideae		
6. <i>Breynia</i>	2	0	23. <i>Manihot</i>	0	1
7. <i>Glochidion</i>	7	0	24. <i>Jatropha</i>	0	2
8. <i>Putranjiva</i>	1	0	25. <i>Ostodes</i>	1	0
9. <i>Baccaurea</i>	1	0	26. <i>Baliospermum</i>	2	0
10. <i>Aporusa</i>	1	0	27. <i>Croton</i>	4	1
11. <i>Antidesma</i>	4	0	28. <i>Vernicia</i>	0	1
12. <i>Bischofia</i>	1	0	IV. Euphorbioideae		
II. Acalyphoideae			29. <i>Excoecaria</i>	1	0
13. <i>Chrozophora</i>	1	0	30. <i>Falconeria</i>	1	0
14. <i>Alchornea</i>	1	0	31. <i>Triadica</i>	1	0
15. <i>Ricinus</i>	0	1	32. <i>Balakata</i>	1	0
16. <i>Mercurialis</i>	1	0	33. <i>Euphorbia</i>	12	2
17. <i>Cleidion</i>	1	0	34. <i>Chamaesyce</i>	4	1
18. <i>Macaranga</i>	3	0			
			<b>Total</b>	<b>85</b>	<b>11</b>

TABLE 3. Number of native Euphorbiaceous species in each development region of Nepal

	Far Western	Mid Western	Western	Central	Eastern	Total
Phyllanthoideae						
excl. Drypeteae	10	13	24	28	35	40
Drypeteae ( <i>Putranjiva</i> )	1	0	0	0	0	1
Acalyphoideae	3	3	7	10	16	17
Crotonoideae	0	1	2	3	6	7
Euphorbioideae	8	14	13	14	10	20
<b>Total</b>	<b>22</b>	<b>31</b>	<b>46</b>	<b>55</b>	<b>67</b>	<b>85</b>

TABLE 4. Number of native Euphorbiaceous species in each geographical element

	Pan-Himalayan element	NW Himalayan element	E Himalayan element	Endemic	Tibetan element	Deccan element	SE Asian-Malayasian element	Deccan-Malayasian element	Pan old tropic or Pan tropic	unknown
Phyllanthoideae										
excl. Drypeteae	4	0	5	1	0	3	13	13	1	0
Drypeteae	0	0	0	0	0	0	0	1	0	0
( <i>Putranjiva</i> )										
Acalyphoideae	0	0	6	1	0	1	1	6	1	1
Crotonoideae	0	0	1	1	0	0	1	4	0	0
Euphorbioideae	4	4	3	0	2	0	2	3	2	0
<b>Total</b>	<b>8</b>	<b>4</b>	<b>15</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>17</b>	<b>27</b>	<b>4</b>	<b>1</b>



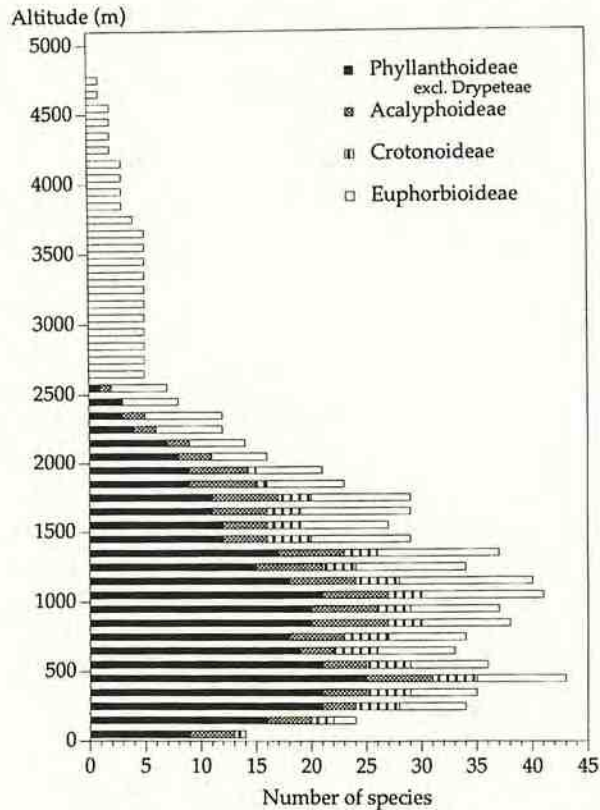


Fig. 1. Altitudinal changes in number of species in each subfamily of Nepalese Euphorbiaceae.

Subfamily Crotonoideae is restricted below ca. 2000 m, and Phyllanthoideae and Acalyphoideae are distributed up to ca. 2500 m in altitude (Fig 1). Only four species of *Euphorbia* section *Holophyllum*, *E. wallichii* Hook. f., *E. luteoviridis* D. G. Long, *E. himalayensis* (Klotzsch) Boiss., and *E. stracheyi* Boiss., have been collected above 3800 m. The last species is found up to 4700 m.

SE Asian-Malaysian element and Deccan-Malaysian element are remarkable in lower altitude, while Tibetan element and NW Himalayan element are restricted to higher altitude (Fig. 2). Most of naturalized species are found up to 2000 m altitude. In Euphorbiaceae s. s. (Acalyphoideae + Crotonoideae + Euphorbioideae) E Himalayan element are dominated in medium altitude, from 1900 m to 2600 m. Three endemic species are restricted to medium altitude of Western and Central development regions.

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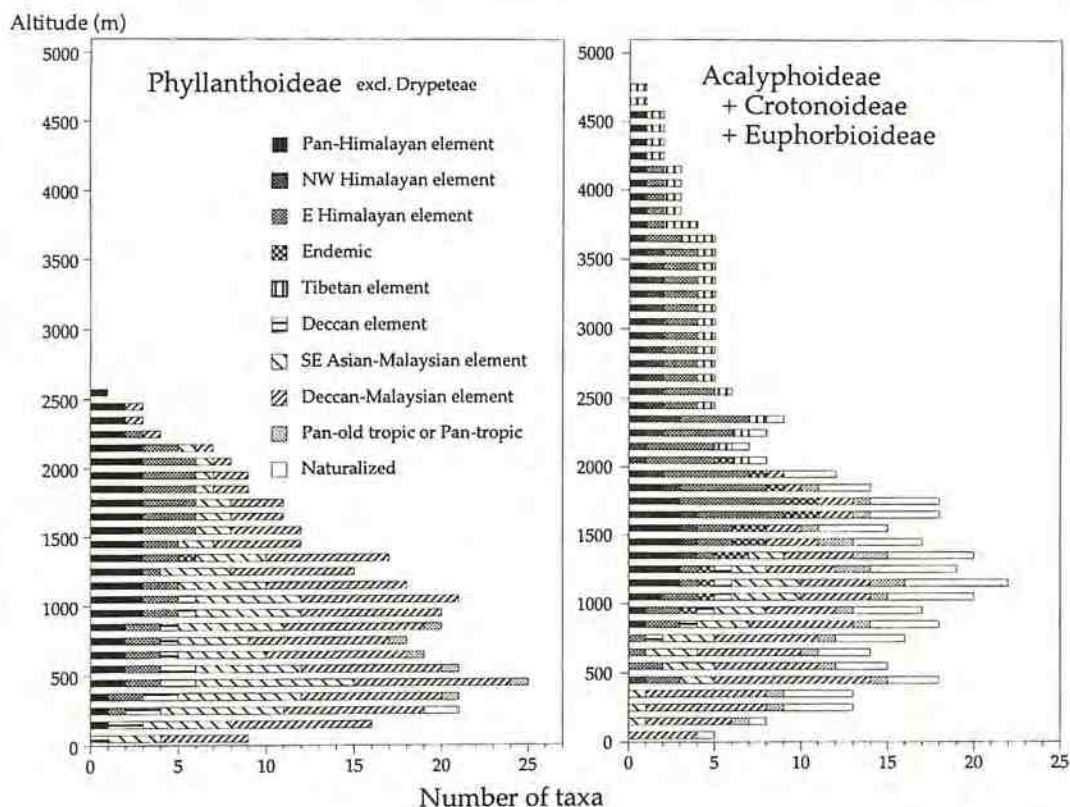


Fig. 2. Altitudinal changes in number of species of each geographical element in Phyllanthoideae excluding Drypeteae (Phyllanthaceae) and Acalyphoideae+Crotonoideae+Euphorbioideae (Euphorbiaceae s. l.) in Nepal. See text for categories of the elements.

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**EUPHORBIACEAE**Euphorbiaceae A. L. de Jussieu, Gen. Pl.: 384 (1789). — Type genus: *Euphorbia* L.**KEY TO THE SUBFAMILIES**

1. Locules of ovary each with 2 ovules; fruits with 1 or 2 seeds per locules; hairs simple; leaves and inflorescences without glands (except in *Aporosa*); milky latex absent  
.....I. PHYLLANTHOIDEAE
1. Locules of ovary each with 1 ovule; fruits with 1 seed per locule; hairs simple, stellate or lepidote; leaves or inflorescences with glands; milky latex present or absent
  2. Milky latex absent ..... II. ACALYPHOIDEAE
  2. Milky latex present
    3. Hairs simple, stellate or lepidote; leaves lobate or elobate; petals present or absent; stamens 5 or more ..... III. CROTONOIDEAE
    3. Hairs simple; leaves elobate; petals absent, stamens 1–3  
..... IV. EUPHORBIOIDEAE

**KEY TO THE GENERA OF PHYLLANTHOIDEAE**

- A. Pistillate flowers in axillary or terminal inflorescences, ovary 1–3(–5)-locular, styles 2 or 3(–5); fruits capsular, drupaceous or baccate, 1–3(–5)-locular, 1–6(–10)-seeded
- B. Leaves simple; flowers in spikes, racemes or clusters
  - C. Fruits with 2 seeds per locule; flowers in axillary clusters; peduncle less than 1 cm long
    - D. Petals present
      - E. Fruits drupaceous, sessile or shortly pedicellate; petiole less than 1 cm  
..... **1. Bridelia**
      - E. Fruits capsular, long pedicellate; petiole 1–2 cm ..... **2. Leptopus**
    - D. Petals absent
      - E. Pistillode present in staminate flowers; fruits white ..... **3. Flueggea**
      - E. Pistillode absent; fruits red, brown, black or yellowish green
        - F. Sepals free
          - G. Floral disc present; seeds dry, brown or yellowish brown  
..... **4. Phyllanthus**
          - G. Floral disc absent; seeds with fleshy seed-coat, usually vermilion  
..... **7. Glochidion**
        - F. Sepals connate at least at base, often conspicuous in fruits
          - G. Styles free; calyx of staminate flowers discoid ..... **5. Sauropus**
          - G. Styles connate into a column; calyx of staminate flowers turbinate  
..... **6. Breynia**
    - C. Fruits with 1 seed per locule; flowers in the terminal or axillary spikes or racemes; peduncle more than 1 cm at least in staminate spikes or racemes
      - D. Ovary 2- or 3-locular
        - E. Petioles 1.5–5 cm long, eglandular; spikes often cauliflorous; pistillate spikes 10–19 cm ..... **9. Baccaurea**
        - E. Petioles 1–1.5 cm long, 2-glandular at apex; spikes axillary; pistillate spikes

- less than 0.5 cm ..... 10. **Aporosa**  
 D. Ovary 1-locular; petioles 0.3–0.6 cm long ..... 11. **Antidesma**  
 B. Leaves trifoliolate; inflorescences panicles ..... 12. **Bischofia**  
 A. Pistillate flowers solitary at axil, ovary 2- or 3-locular, styles 2 or 3; fruits drupaceous,  
 1-locular and 1-seeded by abortion ..... 8. **Putranjiva**

## KEY TO THE GENERA OF ACALYPHOIDEAE

- A. Erect tree, shrub, or herb  
 B. Petals present ..... 13. **Chrozophora**  
 B. Petals absent  
 C. Leaves with stipels at the top of petiole ..... 14. **Alchornea**  
 C. Leaves without stipel  
 D. Leaves peltate, deeply 5–10-lobed; filaments connate into fascicles .....  
 ..... 15. **Ricinus**  
 D. Leaves peltate or not peltate, unlobed or shallowly 3-lobed; filaments free  
 E. Leaves opposite  
 F. Herbs; fruits capsular, dehiscent; seeds carunculate ..... 16. **Mercurialis**  
 F. Trees; fruits fleshy, indehiscent; seeds ecarunculate ..... 20. **Trewia**  
 E. Leaves alternatet  
 F. Leaves entire; pistillate flowers long-pedicellate, solitary in leaf axil  
 ..... 17. **Cleidion**  
 F. Leaves toothed; pistillate flowers pedicellate or sessile, on panicles, spikes,  
 racemes, thyrses  
 G. Dioecious; inflorescences unisexual; bracts of pistillate flowers  
 inconspicuous, scaly; seeds ecarunculate  
 H. Indumentum simple; leaves not granulose-glandular .....  
 ..... 18. **Macaranga**  
 H. Indumentum stellate or lepidote; leaves granulose-glandular .....  
 ..... 19. **Mallotus**  
 G. Monoecious; inflorescences usually bisexual; bracts of pistillate flowers  
 conspicuous, foliaceous; seeds carunculate ..... 21. **Acalypha**  
 A. Twinging herbs ..... 22. **Tragia**

## KEY TO THE GENERA OF CROTONOIDEAE

- A. Leaves palmately 3–7-lobed, lobes entire; seeds carunculate  
 B. Petals present ..... 23. **Manihot**  
 B. Petals absent ..... 24. **Jatropha**  
 A. Leaves unlobed or 3-lobed, margin serate, serrulate or crenate; seeds carunculate or  
 ecarunculate  
 B. Inflorescences cauliflorious; seeds ecarunculate ..... 25. **Ostodes**  
 B. Inflorescences terminal or axillary; seeds carunculate or ecarunculate  
 C. Leaves simple; petals absent or, if present, inconspicuous, 0–3.5 mm long; fruits  
 0.4–2 cm in diam.; seeds carunculate  
 D. Indumentum simple; petals absent ..... 26. **Baliospermum**  
 D. Indumentum stellate or lepidote; petals present at least in staminate flowers .....



- .....27. **Croton**  
 C. Leaves simple or 3-lobed; petals conspicuous, 20–35 mm long; fruits 4–6 cm in diam. (not seen in Nepalese *Vernicia*); seeds ecarunculate (not seen in Nepalese *Vernicia*) ..... 28. **Vernicia**

#### KEY TO THE GENERA OF EUPHORBIOIDEAE

- A. Inflorescences elongated thyrses  
 B. Dioecious; leaves without glands on petiole apex or blade base; stamens 3  
 ..... 29. **Excoecaria**  
 B. Monoecious; leaves with glands on petiole apex or blade base; stamens 2 or 3  
 C. Leaves serrulate; inflorescences unisexual ..... 30. **Falconeria**  
 C. Leaves entire; inflorescences bisexual  
 D. Fruits capsular, dehiscent, 3-seeded; seeds with whitish sarcotesta 31. **Triadica**  
 D. Fruits fleshy, indehiscent, 1- or 2-seeded; seeds without sarcotesta  
 ..... 32. **Balakata**  
 A. Inflorescences pseudanthia (cyathia), one ovary and several stamens in cup-like gland-fringed involucre  
 B. Involucres radially symmetrical, glands not enclosed; styles free or connate at base  
 C. Involucral glands without petal-like appendages; cauline leaves alternate, floral leaves whorled or opposite ..... 33. **Euphorbia**  
 C. Involucral glands with petal-like appendages; leaves opposite  
 ..... 34. **Chamaesyce**  
 B. Involucres bilaterally symmetrical, glands enclosed within the spur; styles connate into a column ..... excl. *Pedilanthus*

#### Subfamily I. PHYLLANTHOIDEAE Asch.

Phyllanthoideae Asch., Fl. Prov. Brandenburg 1: 59 (1864). — Phyllanthaceae Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 246 (1859). — Type: *Phyllanthus* L.

#### 1. **Bridelia** Willd.

*Bridelia* Willd., Sp. Pl. 4: 978 (1806), "*Briedelia*"; corr. Spreng., Anleit. Kenntn. Gew. ed. 2, 2: 887 (1818). — Lectotype species designated by Webster (1994b): *Bridelia scandens* (Roxb.) Willd.; See Dressler (1996a) for orthography of the name.

#### Key to the species

(See also Table 5)

- A. Leaf blades 3–10.5 by 1.3–3.5 cm, secondary veins 7–12, petiole 2–5 mm long; drupes globose, 4–6 by 4–6 mm, sessile ..... 1. **B. tomentosa** Blume  
 A. Leaf blades 6.5–20.5 by 3–11 cm, secondary veins 8–23, petiole 4–13 mm long; drupes globose, ellipsoid, or obovoid, 5–12 by 4–9 mm, pedicel 0–2.5 mm  
 B. Scrambling shrubs or small trees; pistillate sepals 4–6 by 2–3 mm; drupes 9–12 mm long, 5–9 mm in diam. .... 2. **B. stipularis** (L.) Blume  
 B. Shrubs, small trees or trees; pistillate sepals 1–2 by 0.8–1.5 mm  
 C. Leaf apex acute or acuminate; secondary veins 8–10 pairs; drupes ellipsoid, 10–12

- mm long, 6–7 mm in diam. .... 3. **B. pubescens** Blume  
 C. Leaf apex acute, obtuse or rounded; secondary veins 12–23 pairs; drupes globose or ellipsoid, 5–7 mm long, 4–7 mm in diam.  
 D. Twigs tomentose or pilose; petioles tomentose; leaf lower surfaces pubescent or tomentose throughout; pistillate pedicels 1–1.5 mm long; staminate pedicels ca. 1 mm long; drupes globose ..... 4. **B. retusa** (L.) A. Juss.  
 D. Twigs glabrous or pilose; petioles glabrous or pilose; leaf lower surfaces puberulent throughout and pubescent on veins; pistillate and staminate flowers sessile; drupes ellipsoid ..... 5. **B. sikkimensis** Gehrm.

### 1. *Bridelia tomentosa* Blume — Fig. 3.

- Bridelia tomentosa* Blume, Bijdr.: 597 (1826); Wall., Numer. List: 273, no. 7874 (1847); Baill., Étude Euphorb.: 584 (1858); Müll. Arg. in DC., Prodr. 15(2): 501 (1866); Kurz, Forest Fl. Burma 2: 367 (1877); Hook. f., Fl. Brit. India 5: 271 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966); Airy Shaw, Kew Bull. 31: 382 (1976); Airy Shaw, Kew Bull. 35: 602 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 770 (1987); P. T. Li, Acta Phytotax. Sin. 26: 64 (1988); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 30, t. 8, f. 1–4 (1994); Dressler, Blumea 41: 297, f. 2 (1996); T. Kuros., Newsl. Himal. Bot. no. 22: 16 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 292 (2000); Dressler & van Welzen, Thai Forest Bull., Bot. 28: 67 (2000). — [*Bridelia tomentosa* Blume var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 501 (1866), nom. inval.] — *Amanoa tomentosa* (Blume) Baill., Adansonia 6: (1866). — Lectotype designated by Airy Shaw (1980): [*Blume s. n.*] (BO n. v.; iso BM, BR, L, NY (fide Dressler 1996) n. v.), Buitenzorg (Java, Bogor).
- Bridelia lanceifolia* Roxb., [Hort. Bengal.: 70 (1814), "*lanceofolia*", nom. nud.] Fl. Ind. ed. 1832, 3: 737 (1832), "*lanceaefolia*"; Wall., Numer. List: 273, no. 7884 (1847), "*lancifolia*." — *Bridelia tomentosa* Blume var. *lanceifolia* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 502 (1866), "*lanceaefolia*." — Lectotype designated by Dressler (1996b): [*Roxburgh s. n.*] (BM n. v.; iso K!) [without locality].
- Bridelia loureirii* Hook. & Arn., Bot. Beechey Voy.: 211 (1837), "*loureiri*", excl. syn. Lour. — Type: *Millett* (n. v.), China.
- Bridelia tomentosa* Blume var. *glabrescens* Benth., Hooker's J. Bot. Kew Gard. Misc. 6: 8 (1854). — Type: *Champion s. n.* (K? (fide Dressler 1996b) n. v.), Hongkong, East Point, Hedges.
- Bridelia rhamnoides* Griff., Not. Pl. Asiat. 4: 480 (1854). — Type: *Griffith s. n.*, Oct. 1834 (K!; CAL (fide Dressler 1996b) n. v.), in sylvis Mergue (Burma).
- Bridelia urticoides* Griff., Not. Pl. Asiat. 4: 481 (1854). — Type: *Griffith*, Dec. 1834 (CAL? (fide Dressler 1996b) n. v.), Mergue, ad littoram Ins. Madamaca (Burma).
- Bridelia tomentosa* Blume var. *trichadenia* Müll. Arg. in DC., Prodr. 15(2): 501 (1866). — Type: *Ferd. Muell. s. n.* [in 1863] (holo G-DC (IDC microfiche in TI) n. v.), in Nova Hollandia septentr., Arnhemland.
- Bridelia tomentosa* Blume var. *chinensis* Müll. Arg. in DC., Prodr. 15(2): 501 (1866). — Type: *Park s. n.* (G-DC (IDC microfiche in TI) n. v.), China; [*J. Motley 493*, [in 1857–1858] (K!), Borneo prope Bangarmassing.
- Bridelia tomentosa* Blume var. *rhamnoides* Müll. Arg. in DC., Prodr. 15(2): 502



TABLE 5. Comparison of characters of Nepalese *Bridelia* species

	<i>B. tomentose</i>	<i>B. stipularis</i>	<i>B. pubescens</i>	<i>B. retusa</i>	<i>B. sikkimensis</i>
Habit	shrub or small tree	scrambling shrub or small tree	small tree	shrub, small tree or tree	shrub or small tree
Twig hair	tomentose or glabrous	tomentose	pubescent or tomentose	tomentose	glabrous or pilose
lenticels	scattered	scattered	scattered	scattered	densely scattered
Petiole hair	tomentose or glabrous	densely tomentose	pubescent or tomentose	tomentose	glabrous or pilose
length	2–5 mm	4–10 mm	5–8 mm	6–13 mm	5–10 mm
Leaf blade shape	elliptic or narrowly ovate	elliptic or obovate	elliptic, ovate or lanceolate	elliptic	obovate, widely obovate or elliptic
apex	bluntly acute	acute or obtuse	acute or acuminate	acute or obtuse	acute, obtuse or rounded
secondary vein	7–12 pairs	11–16 pairs	8–10 pairs	13–23 pairs	12–16 pairs
upper surface	glabrous	pilose at least on veins	glabrous or pubescent along veins	glabrous or pilose on veins	glabrous
lower surface	tomentose	densely tomentose	pubescent	pubescent or tomentose	puberulent throughout and pubescent on veins
Pistillate flower sepal	1–1.6 × 0.5–1 mm	4–6 × 2–3 mm	1.5 × 1.5 mm	1.8–2 × 1–1.3 mm	1–1.5 × 0.8–1 mm
Fruits	globose	ellipsoid or obovoid	ellipsoid	globose	ellipsoid
size	4–6 × 4–6 mm	9–12 × 5–9 mm	10–12 × 6–7 mm	6.5–7 × 6–7 mm	5–6 × 4–5 mm
seed	1- or 2-seeded	1- or 2-seeded	1-seeded	1- or 2-seeded	1-seeded
pedicel length	sessile	1–1.5 mm	1–2 mm	1.5–2.5 mm	sessile

- (1866). — Type: *Hoffmannsegg s. n.* (B†, herb. Franquev. (P?), G-DC (fragm.) (IDC microfiche in TI) n. v.), insula Java.
- Cleistanthus lanceolatus* Müll. Arg. in DC., Prodr. 15(2): 507 (1866). — Type: *Teyssm.*, [in 1765] (holo G-DC (IDC microfiche in TI) n. v.), in horto bog. cultus.
- Bridelia tomentosa* Blume var. *ovoidea* Benth., Fl. Austral. 6: 120 (1873). — Type: *Gulliver s. n.* (holo K!), Australia, Wood Island.
- Bridelia phyllanthoides* W. Fitzg., J. Roy. Soc. W. Australia 3: 163 (1918). — Type: *Fitzgerald 823* (NSW (fide Dressler 1996b) n. v.), W Australia, base of Mt. Broome.
- Bridelia monoica* sensu Merr., Philipp. J. Sci., C 13: 142 (1918), non (Lour.) Merr.
- Bridelia glabrifolia* Merr., Enum. Philipp. Fl. Pl. 2: 422 (1923). — *Bridelia tomentosa* Blume var. *glabrifolia* (Merr.) Airy Shaw, Kew Bull. 31: 383 (1976); Airy Shaw, Kew Bull. 35: 603 (1980). — Lectotype designated by Airy Shaw (1980): *Gaudichaud s. n.* (G-DC n. v.), Philippines, Manila.
- Bridelia tomentosa* Blume var. *eriantha* Airy Shaw, Kew Bull. 31: 384 (1976); Airy Shaw, Kew Bull. 35: 603 (1980). — Type: *Lozarides & Adams 145* (holo K n. v.), Northern Territory, about 6 miles N. of pine Creek Township.
- Bridelia nayarii* P. Basu, J. Econ. Taxon. Bot. 7: 634 (1985, publ. 1986). — Type: *N. G. Nair 909A*, 1 March 1974 (holo PBL n. v.; iso (909B) PBL n. v.), India, Car Nicobar Island, Malacca.

Shrub or small tree, 4.5 m high. Twigs slender, long and whiplike, tomentose or glabrous, with scattered lenticels. Leaves alternate; stipules early caducous; petiole 2–5 mm long, tomentose or glabrous; blade elliptic or narrowly ovate, 3–10.5 by 1.3–3.5 cm, thinly chartaceous, base obtuse, apex bluntly acute, margin entire, upper surface glabrous, lower surface tomentose, secondary veins prominent, 7–12 pairs. Inflorescences axillary glomerules. Staminate flowers: sepals 5, triangular, 1–1.5 by 0.7–1 mm, apex acute, margin entire, glabrous; petals 5, obovate, ca. 0.8 by 0.4 mm, apex rounded; staminal column ca. 1 mm long; free part of filaments 0.3–0.5 mm long; anthers ellipsoid, ca. 0.3 mm long. Pistillate flowers sessile; sepals 5 or 6, triangular, 1–1.6 by 0.5–1 mm, glabrous, persistent; petals 5 or 6, elliptic, ca. 0.6 by ca. 0.3 mm, base cuneate to spatulate, apex rounded, irregularly toothed; ovary globose, ca. 1 mm diam.; styles ca. 0.3 m long. Infructescence with up to 4 fruits. Fruits sessile; drupe globose, 4–6 mm diam., glabrous, smooth, 1 or 2 seeded.

Distribution — India (Bihar, Orissa, West Bengal, Sikkim, Assam, Andaman), Nepal, Bhutan, Burma, Thailand, Malaysia, Indonesia, New Guinea, N. Australia, Philippine, Cambodia, Laos, Vietnam, S. China, and Taiwan (Long 1987, Dressler 1996b, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 450 m. Flowers in September; fruits in December.

Notes — Airy Shaw (1976) and Dressler (1996b) pointed out that hairiness of this species varies and glabrous form is found all over the range of the species with intermediate forms. Some Nepalese specimens are lacking hairs on its twigs and petioles but they have more or less tomentose undersurface of leaves.

Govaerts et al. (2000) cited the author of *B. tomentosa* var. *rhamnoides* as "(Griff.) Müll. Arg." This variety is, however, considered to be published as a new variety with different type from *B. rhamnoides* Griff., because Müller Argoviensis (1866) did not cite any basionym.



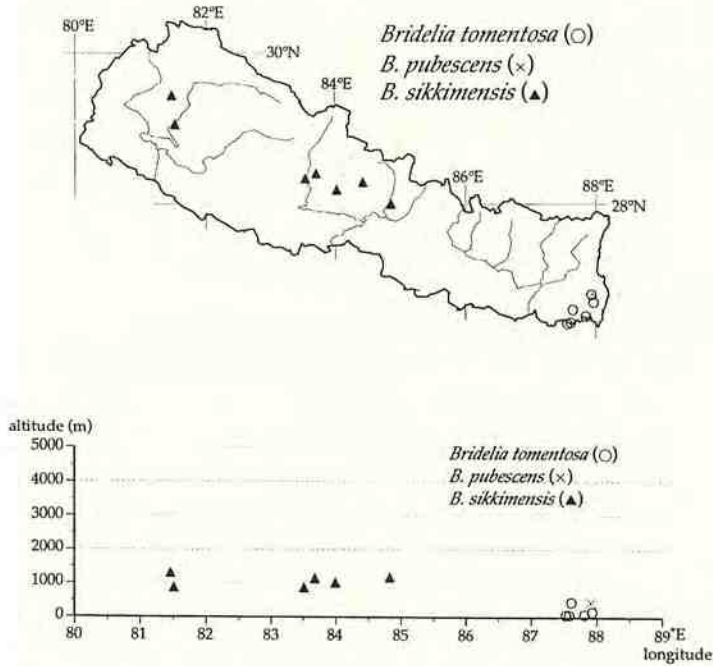


Fig. 3. Distribution of *Bridelia tomentosa* Blume, *B. pubescens* Blume, and *B. sikkimensis* Gehrm. in Nepal.

## 2. *Bridelia stipularis* (L.) Blume — Fig. 4.

*Bridelia stipularis* (L.) Blume, Bijdr.: 597 (1826); Baill., Étude Euphorb.: 584 (1858); Müll. Arg. in DC., Prodr. 15(2): 499 (1866); Kurz, Forest Fl. Burma 2: 369 (1877); Hook. f., Fl. Brit. India 5: 270 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 769 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 38, t. 8, f. 5–7 (1994); Dressler, Blumea 41: 293 (1996); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 292 (2000); Dressler & van Welzen, Thai Forest Bull., Bot. 28: 65 (2000). — *Clutia stipularis* L., Mant. Pl.: 127 (1767); Willd., Sp. Pl. 4: 883 (1806), "*Clutya*." — [*Bridelia stipularis* (L.) Blume var. *typica* Gehrm., Bot. Jahrb. Syst. 41(95): 29 (1908), nom. inval.] — Lectotype designated by Dressler (1996b): *Herb. Linnaeus*, No. 1206-13 (LINN n. v.) [India].

*Clutia scandens* Roxb., Pl. Coromandel 2: 39, t. 173 (1802); Santapau, J. Bomb. Nat. Hist. Soc. 50: 307 (1951); Siwakoti & Varma, Pl. Divers. E. Nepal: 321 (1999). — *Bridelia scandens* (Roxb.) Willd., Sp. Pl. 4: 979 (1806); Roxb., Fl. Ind. ed. 1832, 3: 736 (1832); Wall., Numer. List: 273, no. 7878, excl. E (1847); Baill., Étude Euphorb.: 584 (1858). — Lectotype designated by Dressler (1996b): *Roxburgh s. n.* (BR (fide Dressler 1996b) n. v.; iso K!, K-WALL (7878A)!, BM (fide Dressler 1996b) n. v.), [East India].

*Bridelia zollingeri* Miq., Fl. Ned. Ind. 1(2): 364 (1859). — Type: *Zollinger 878*, as "8782" (holo U (fide Dressler 1996b) n. v.; iso P (fide Dressler 1996b) n. v.), Java, in Bandung.

*Bridelia dasycalyx* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42(2): 241 (1874); Kurz, Forest Fl. Burma 2: 369 (1887); Hook. f., Fl. Brit. India 5: 271 (1887). — [*Bridelia*

*dasycalyx* var. *genuina* Kurz, nom. inval.] — Lectotype designated by Dressler (1996b): *Kurz 1605* (K!; iso K!, BO (fide Dressler 1996b) n. v.), Burma, Ava, Prome, Pegu [Yomah, Phoungyen].

*Bridelia dasycalyx* Kurz var. *aridicola* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42(2): 241 (1874); Kurz, Forest Fl. Burma 2: 370 (1887). — Lectotype designated by Dressler (1996b): *Kurz 2475* (BO n. v.), Burma, Brome, Pegu.

*Bridelia stipularis* (L.) Blume var. *ciliata* Gehrm., Bot. Jahrb. Syst. 41(95): 29 (1908). — Type: not designated.

*Bridelia stipularis* (L.) Blume subsp. *philippinensis* Jabl. in Engl., Pflanzenr., IV, 147, VIII: 57 (1915). — Lectotype designated by Dressler (1996b): *FB (Ahern) [Ahern's collector] 1884*, Oct. 1904 (US, n. v.; iso K!, BO, NY (fide Dressler 1996b) n. v.), the Philippines, Luzon, Prov. Rizal, Bosoboso.

Monoecious scrambling shrub or small tree, 6–15 m high, stem diameter ca. 20 cm. Twigs tomentose when young, with scattered lenticels. Leaves alternate; stipules triangular, 7–12 by 3–4 mm, apex acuminate, tomentose, early caducous; petiole 4–10 mm long, densely tomentose; blade elliptic or obovate, 6.5–20 by 3–11 cm, chartaceous, base obtuse, rounded or slightly emarginate, apex acute or obtuse, margin entire, secondary veins prominent, 11–16 pairs, upper surface pilose at least on veins, lower surface densely tomentose. Inflorescences glomerules, along the leafless or smaller leaved ends of twigs. Staminate flowers: pedicel ca. 1 mm long, glabrous; sepals 5, triangular, 2–3 by 1.3–2 mm, apex acuminate, margin entire, glabrous or pilose; petals 5, obovate, 1.2–1.7 by 0.8–1.8 mm, apex rounded; free part of filaments 1–1.7 mm; anthers ellipsoid, 0.5–0.9 mm long;

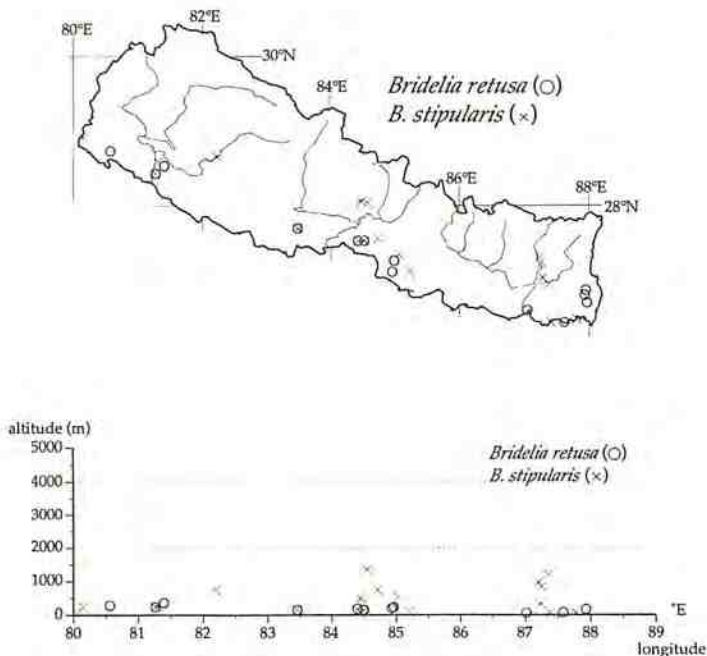


Fig. 4. Distribution of *Bridelia retusa* (L.) A. Juss. and *B. stipularis* (L.) Blume in Nepal.



staminal column 1–2.7 mm long; disc annular, ca. 3.5 mm diameter. *Pistillate flowers* subsessile; sepals 5, triangular, 4–6 by 2–3 mm, apex acute or acuminate, tomentose or pilose, persistent; petals elliptic, 2.5–3 by 1–1.5 mm, apex rounded. *Fruits*: pedicel 1–1.5 mm long; drupe ellipsoid or obovoid, 9–12 mm long, 5–9 mm in diam., glabrous, smooth, with remnants of style, 1- or 2-seeded.

Distribution — Sri Lanka, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Malaysia, Indonesia, Philippine, Cambodia, Vietnam, and S China (Dressler, 1996b). *SE Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude up to 290 m. In forests or in *Saccharum* grassland. Rare in eastern plains (Siwakoti & Varma 1999, as *B. scandens*). Flowers in October; fruits from December to June.

### 3. *Bridelia pubescens* Kurz — Fig. 3.

*Bridelia pubescens* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42(2): 241 (1874); Kurz, Forest Fl. Burma 2: 367 (1877); Hook. f., Fl. Brit. India 5: 270 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 770 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 36 (1994); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998). — Lectotype designated by Dressler (1996b): *Kurz 2474*, [10 Apr. 1871] (K!; iso K!, BM (fide Dressler 1996b) n. v.), Burma, Pegu, Yomah.

*Bridelia nooteboomii* Chakrab., J. Econ. Taxon. Bot. 5: 949 (1984). — Type: *Nooteboom 716*, Jan. 11, 1969 (holo PBL n. v.; iso L, PBL (fide Dressler 1996b) n. v.), Thailand, Northern Region, NW of Chiangmai, Doi Pui, 19°N, 98°30'E, 1300m.

*Bridelia glauca* auct. non Blume, Bijdr.: 597 (1826); Dressler, Blumea 41: 311 (1996) p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 287 (2000), p. p.; Dressler & van Welzen, Thai Forest Bull., Bot. 28: 63 (2000).

Small tree, 4.5–7.5 m high. *Twigs* pubescent or tomentose when young, with scattered lenticels. *Leaves* alternate; stipules early caducous; petiole 5–8 mm long, pubescent or tomentose; blade elliptic, ovate or lanceolate, 8.5–18 by 4–7.5 cm, chartaceous, base acute, apex acute or acuminate, margin entire, secondary veins prominent, 8–10 pairs, upper surface glabrous or pubescent along the main veins, lower surface pubescent. *Inflorescences* axillary glomerules. *Staminate flowers* not seen. *Pistillate flowers*: pedicel ca. 0.5 mm long, tomentose; sepals triangular, ca. 1.5 by ca. 1.5 mm, both surface pubescent; petals circular or widely elliptic, ca. 1 by 0.8–1 mm. *Infructescence* with 1–4 fruits. *Fruits*: pedicel 1–2 mm; drupe ellipsoid, 10–12 mm long, 6–7 mm in diam., acute or blunt at apex, glabrous, smooth, 1-seeded.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Burma, Thailand (Long 1987, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 450 m. In evergreen forests. Flowers in May; fruits in March.

Notes — Although this Asian mainland plant is recently treated as conspecific with the Javanese plant, *B. glauca* Blume (Dressler 1996b, Govaerts et al. 2000, van Welzen et al. 2000), in my limited observation the latter is distinguishable from the former in its leaves with often truncate base, large number of secondary vein pairs (11–18), and long pedicels of pistillate flowers and fruits.



**4. *Bridelia retusa* (L.) A. Juss. — Fig. 4.**

*Bridelia retusa* (L.) A. Juss., Euphorb. Gen.: 109 (1824); Spreng., Syst. Veg. 3: 48 (1826); Baill., Étude Euphorb.: 584 (1858); Müll. Arg. in DC., Prodr. 15(2): 493 (1866); Kurz, Forest Fl. Burma 2: 368 (1877); Hook. f., Fl. Brit. India 5: 268 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 769 (1987); Dressler, Blumea 41: 289 (1996); Philcox, Rev. Handb. Fl. Ceylon 13: 81 (1999); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 289 (2000); Dressler & van Welzen, Thai Forest Bull., Bot. 28: 64 (2000); Manandhar, Pl. People Nepal: 122 (2002). — *Clutia retusa* L., Sp. Pl.: 1042 (1753); Willd., Sp. Pl. 4: 883 (1806). — *Bridelia airy-shawii* P. T. Li, Acta phytotax. Sin. 20: 117 (1982), nom. superfl. — [*Bridelia retusa* (L.) A. Juss. var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 493 (1866), nom. inval.] — Lectotype designated by Dressler (1996b): *Herb. Hermann 2: fol. 71, #367* (BM n. v.).

*Clutia squamosa* Lam., Encycl. 2: 54 (1786). — *Bridelia retusa* (L.) A. Juss. var. *squamosa* (Lam.) Müll. Arg. in DC., Prodr. 15(2): 493 (1866); Hook. f., Fl. Brit. India 5: 268 (1887). — *Bridelia squamosa* (Lam.) Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908); Siwakoti & Varma, Pl. Divers. E. Nepal: 321 (1999). — [*Bridelia squamosa* (Lam.) Gehrm. var. *typica* Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908), nom. inval.] — Type: *Herb. Sonnerat* (P? (fide Dressler 1996b) n. v.); *Herb. Commerson* (P? (fide Dressler 1996b), India oriental).

*Clutia spinosa* Roxb., Pl. Coromandel 2: 38, t. 172 (1802). — *Bridelia spinosa* (Roxb.) Willd., Sp. Pl. 4: 979 (1806); Roxb., Fl. Ind. ed. 1832, 3: 735 (1832); Wall., Numer. List: 273, no. 7883 (1847). — Lectotype designated by Dressler (1996b): *Roxburgh s. n.* (*Herb. Martius*) (BR n. v.; iso BM p. p., n. v.).

*Bridelia fruticosa* Pers., Syn. Pl. 2: 591 (1807). — Type: (n. v.), India.

*Bridelia crenulata* Roxb., [Hort. Bengal.: 70 (1814), nom. nud.] Fl. Ind. ed. 1832, 3: 734 (1832). — *Bridelia retusa* (L.) A. Juss. var. *roxburghiana* Müll. Arg. in DC., Prodr. 15(2): 493 (1866); Hook. f., Fl. Brit. India 5: 268 (1887). — *Bridelia roxburghiana* (Müll. Arg.) Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908), nom. superfl. — Type: [*Wallich, List no. 7880*] (K!, K-WALL!, BM, G-DC (fide Dressler 1996b) n. v.), the Botanic garden [Calcutta], origin from the mouth of the river Megna.

[*Andrachne doonkyboisca* B. Heyne ex Wall., Numer. List: 273, no. 1819 (1847), nom. nud.]

*Bridelia amoena* Wall. ex Baill., Étude Euphorb.: 584 (1858). — Type: *Wallich in Herb. Gaudichaud* (P? (fide Dressler 1996b) n. v.), Calcutta?

*Bridelia retusa* (L.) A. Juss. var. *glauca* Hook. f., Fl. Brit. India 5: 268 (1887). — Type: (n. v.), Deccan Peninsula.

*Bridelia retusa* (L.) A. Juss. var. *glabra* Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908). — Type: not designated.

*Bridelia retusa* (L.) A. Juss. var. *pubescens* Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908). — Type: not designated.

*Bridelia retusa* (L.) A. Juss. var. *stipulata* Gehrm., Bot. Jahrb. Syst. 41(95): 30 (1908). — Type: not designated.

*Bridelia squamosa* (Lam.) Gehrm. var. *meeboldii* Gehrm., Bot. Jahrb. Syst. 41(95): 30



(1908). — Type: not designated.

*Bridelia cambodiana* Gagnep., Bull. Soc. Bot. France 70: 432 (1923). — Lectotype designated by Dressler (1996b): *Chatillon s. n.* (P n. v.; iso P n. v.), Cambodge, Prey-kdey.

*Bridelia pierrei* Gagnep., Bull. Soc. Bot. France 70: 434 (1923). — Lectotype designated by Dressler (1996b): *Pierre 6287*, Nov. 1867 (US n. v.; iso K!, BM, BO, BR, E, NY, P n. v.), Cambodia, Caudoc, Mt. Cam.

*Bridelia chinensis* Thin, J. Biol. (Vietnam) 9: 37 (1987).

*Bridelia montana* auct. non Willd., Sp. Pl. 4: 978 (1806): Wall., Numer. List: 273, no. 7879 p. p. (1847).

Monoecious shrub, small tree or tree, 3.6–15 m high, stem diameter 16–25 cm. *Twigs* tomentose when young, with scattered lenticels. *Leaves* alternate; stipules early caducous; petiole tomentose, 6–13 mm long; blade elliptic, 6.5–17.5 by 3–10.5 cm, base acute or rounded, apex acute or obtuse, margin entire, coriaceous, secondary veins prominent, 13–23 pairs, upper surface glabrous or pilose at the midrib, lower surface pubescent or tomentose. *Inflorescences* glomerules, axillary or on leafless twigs. *Staminate flowers*: pedicel ca. 1 mm long, glabrous or sparsely villous; sepals 5, triangular, 1.5–2 by 1–1.2 mm, apex acute or acuminate, margin entire, glabrous or sparsely villous; petals 5, obovate, 1–1.5 by ca. 1 mm, lacerate; staminal column 1–1.2 mm long; free part of filaments 0.7–0.9 mm long; anthers ellipsoid, 0.4–0.6 mm long; disc annular, 2–3 mm diameter. *Pistillate flowers*: pedicel 1–1.5 mm long, glabrous or pilose; sepals triangular, 1.8–2 by 1–1.3 mm, apex acuminate, sparsely pilose or glabrate; petals elliptic, obovate or narrowly elliptic, base spatulate, apex rounded, ca. 1.5 by 0.3–0.7 mm. *Infructescences* with 1–7 fruits. *Fruits*: pedicel 1.5–2.5 mm long; drupe globose, 6.5–7 mm long, 6–7 mm in diam., smooth, glabrous, 1- or 2-seeded.

**Distribution** — Sri Lanka, India, Nepal, Bhutan, Burma, Thailand, Malaysia, Cambodia, Vietnam, Philippine, S. China (Dressler 1996b). *SE Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

**Habitat & Ecology** — Altitude up to 1350 m. In riverside bushes. Rare in eastern plains (Siwakoti & Varma 1999). Flowers from July to October; fruits from October to January.

**Vernacular names** — Nepali: *gayo* (Manandhar 2002), *gudi* (Manandhar 2002), *kaja* (Manandhar 2002). Chepang: *ranbo* (Manandhar 2002), *ropsi* (Manandhar 2002). Danuwar: *gaiyo* (Manandhar 2002), *kanjhi* (Manandhar 2002). Magar: *gayo* (Manandhar 2002). Mooshar: *kanjhi* (Manandhar 2002). Rai: *hasung* (Manandhar 2002). Tamang: *gramsachhe* (Manandhar 2002).

**Uses** — Fruit is edible (Manandhar 2002). Bark yields tannin (Manandhar 2002). Lopped leaf is used as fodder (Manandhar 2002). Juice of bark is medicinally applied for peptic ulcer (Manandhar 2002).

**Notes** — Although *Bridelia fordii* Hemsl. is treated as a synonym of *B. retusa* in Dressler (1996b) and Govaerts et al. (2000), both of syntypes from Kwangtung, China (*C. Ford 249 & 254*, K!) are different from the latter in their ellipsoid drupe and glabrous leaves.

##### **5. *Bridelia sikkimensis* Gehrm. — Fig. 3.**

*Bridelia sikkimensis* Gehrm., Bot. Jahrb. Syst. 41(95): 34 (1908); D. G. Long in Fl.



Bhutan 1: 768 (1987); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 291 (2000). — Type: *King 90* (n. v.); *I. D. Hooker* (n. v.); *Hooker* (n. v.), Khasia Mts.; [*C. B. Clarke 45628*[A, 15 Oct. 1886] (K! with an annotation by D. G. Long as the lectotype), Khasia Mts., [Mamlos, 4000 ft.]; *Clarke 45839* (n. v.), Khasia Mts.

*Bridelia sikkimensis* Gehrm. var. *macrophylla* Gehrm., Bot. Jahrb. Syst. 41(95): 34 (1908).

*Bridelia sikkimensis* Gehrm. var. *minuta* Gehrm., Bot. Jahrb. Syst. 41(95): 34 (1908).

*Bridelia verrucosa* Haines, J. Bot. 59: 189, 193 (1921); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982). — Type: *Hooker [4501]* (holo K!), Parasnath.

*Bridelia montana* sensu Wall., Numer. List.: 273, no. 7879 (1847), p. p., non Willd., Sp. Pl. 4: 978 (1806); Hook. f., Fl. Brit. India 5: 269 (1887).

Shrub or small tree, 2–8 m high, stem diameter 10–20 cm. *Twigs* glabrous or pilose, with densely scattered lenticels. *Leaves* alternate; stipules narrowly triangular, ca. 3 by 1–1.2 mm, apex acuminate, villous, caducous; petiole 5–10 mm long, glabrous or pilose; blade obovate, widely obovate or elliptic, 7–20.5 by 4–10 cm, base obtuse, rounded or cuneate, apex acute, obtuse or rounded, margin entire, thinly chartaceous, secondary veins prominent, 12–16 pairs, upper surface glabrous, lower surface puberulent throughout and pubescent on veins. *Inflorescences* glomerules, axillary. *Staminate flowers* sessile; sepals triangular, ca. 1.5 by ca. 1.2 mm, glabrous; petals elliptic or obovate, ca. 1 by 0.6–0.9 mm, apex rounded; free part of filaments ca. 0.5 mm long; anthers shortly ellipsoid, ca. 0.5 mm long; staminal column ca. 0.8 mm long. *Pistillate flowers* sessile; sepals triangular, 1–1.5 by 0.8–1 mm, glabrous; petals ovate, 0.8–1 by ca. 0.5 mm, apex rounded or acute. *Fruits* sessile; drupe ellipsoid, 5–6 mm long, 4–5 in diam., glabrous, smooth, 1-seeded. *Seeds* ellipsoid, with deep lateral furrow, 4–4.5 mm by 2.5–3.2 by 1.8–2.5 mm.

Distribution — Pakistan, India (Assam, Sikkim), Nepal, Bhutan, Bangladesh (Long, 1987; Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Far Western, Mid Western, Western.

Habitat & Ecology — Altitude 130–1333 m. In dry deciduous forests. Flowers from August to October; fruits from January to April.

Notes — *Bridelia sikkimensis* was proposed with two infraspecific taxa, var. *macrophylla* and var. *minuta* (Gehrmann 1908). According to the International Code of Botanical Nomenclature (Greuter et al. 2000), one of the varietal epithet will be preempted by that of the autonym, *Bridelia sikkimensis* var. *sikkimensis*, when the valid lectotypification will be published.

## 2. *Leptopus* Decne.

*Leptopus* Decne. in Jacquem., Voy. Inde 4: 155 (1844). — Type species: *Leptopus cordifolius* Decne.

### 1. *Leptopus cordifolius* Wall. ex Decne. — Fig. 5.

*Leptopus cordifolius* Wall. ex Decne. in Jacquem., Voy. Inde 4: 155 (1844); G. L. Webster, Ann. Missouri Bot. Gard. 81: 40 (1994); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998). — [*Phyllanthus cordifolius* Wall., Numer. List.: 273, no. 7913, p. p. (1847), "*cordifolia*", nom. nud.]. — *Andrachne decaisneana* Baill., Étude Euphorb.: 577 (1858), nom. superfl. — *Andrachne cordifolia* (Wall. ex Decne.) Müll. Arg. in DC., Prodr. 15(2): 234 (1866); Hook. f., Fl. Brit. India 5: 283 (1887); Burkill, Rec. Bot.



Surv. India 4: 130 (1910); Kitam. in Fauna Fl. Nepal Himal.: 171 (1955); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 165 (2000). — *Arachne cordifolia* (Wall. ex Decne.) Hurus., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 6: 339 (1954); Hurus. & Ya. Tanaka in Fl. E. Himal.: 174 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); Malla et al., Fl. Kathmandu Valley: 622 (1986). — Type: (n. v.), Circa Nagkudah, alt. 1500 metr. circiter.

*Phyllanthus hoffmeisteri* Klotzsch, Bot. Ergebn. Reise Waldemar: 117 (1862). — Type: *Hoffmeister* (n. v.), Himalaya.

Monoecious shrub, 1–3 m high, stem diameter 1.9–2.5 cm. *Branching* non phyllanthoid (i. e. branchlets subtended by normal leaves). *Twigs* pubescent or villous. *Leaves* deciduous, alternate; stipules persistent, free, lanceolate or narrowly ovate, 1–1.5 by ca. 0.5 mm, apex acuminate, margin entire, densely pubescent; petiole 0.7–2.5 cm long, pubescent or villous; blade ovate or narrowly ovate, 2.5–6 by 1–3 cm, base cordate or rounded, apex rounded or mucronate, margin entire, midrib raised beneath, upper surface glabrous (glabrous or villous when young), lower surface pubescent or villous. *Cymules* axillary. *Staminate flowers*: pedicel 5–15 mm long; sepals 5, elliptic or obovate, 2–2.5 by 1.1–1.8 mm, apex obtuse or rounded, margin entire or ciliate, outside pilose, inside glabrous; petals 5, elliptic, ca. 1.2 by ca. 1 mm, margin entire, glabrous; stamens 5; filaments free, 1–1.5 mm long; anthers ca. 0.3 mm long. *Pistillate flowers* 0 or 1 per cymule; pedicel 1.5–2.3 cm long; sepals persistent, 5, orbicular or widely elliptic, 2.5–3.2 by 2.2–3.1 mm, apex obtuse or rounded, margin entire, outside pilose, inside glabrous; petals 5, semicircular, ca. 0.2–0.3 by 0.3–0.4 mm, margin entire, glabrous, apex rounded; disc annular, 5-lobed, lobes ca. 0.2 mm long, obcordate; ovary 3-carpellate, globose,

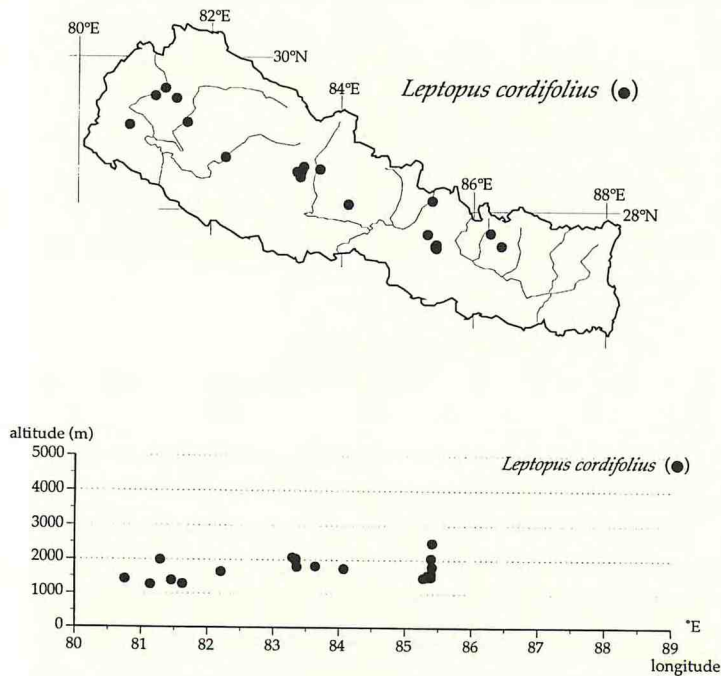


Fig. 5. Distribution of *Leptopus cordifolius* Wall. ex Decne. in Nepal.

glabrous, smooth; styles 3, bifid at base, branches 0.7–1 mm long. *Fruits*: pedicel 3.4–3.8 cm long; sepals persistent, ca. 4 by ca. 3.5 mm; capsule transversally ellipsoid, ca. 4 mm long, ca. 6 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 3 mm long. *Seeds* trigonous, ca. 3.3 mm long, ca. 2.5 mm wide, ca. 2.2 mm tangentially, smooth.

*Distribution* — Pakistan, India (Kashmir), Nepal, China (South-Central) (Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 950–2500 m. On roadsides, on open slopes, or in open forests. Flowers from April to October; fruits from April to December.

*Notes* — Govaerts et al. (2000) erroneously treated *Phyllanthus hoffmeisteri* Klotzsch as a synonym of a tropical American *Phyllanthus*, *P. stipulatus* (Raf.) G. L. Webster.

### 3. *Flueggea* Willd.

*Flueggea* Willd., Sp. Pl. 4: 637 (1806), "*Flüggea*." — Type species: *Flueggea leucopyrus* Willd. See Webster (1984) for orthography of the name.

#### 1. *Flueggea virosa* (Roxb. ex Willd.) Voigt subsp. *himalaica* D. G. Long — Fig. 6.

*Flueggea virosa* (Roxb. ex Willd.) Voigt subsp. *himalaica* D. G. Long, Notes Roy. Bot. Gard. Edinburgh 44: 167 (1986); D. G. Long in Fl. Bhutan 1: 776 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 929 (2000). — Type: *Grierson & Long 2149*, 21 June 1979 (holo E!; iso K!, TI!, A, THIMPHU n. v.), Bhutan, Deothang district, Samdrup-Jongkhar to Deothang road, 11 km above Samdrup-Jongkhar, 26°50'N, 91°28'E, 600 m.

*Securinega virosa* auct. non (Roxb. ex Willd.) Baill., Adansonia 6: 334 (1886); Hurus. & Ya. Tanaka in Fl. E. Himalaya: 177 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); Malla et al., Fl. Kathmandu Valley: 632 (1986); Siwakoti & Varma, Pl. Divers. E. Nepal: 334 (1999); Manandhar, Pl. People Nepal: 421 (2002). — *Flueggea virosa* auct. non (Roxb. ex Willd.) Voigt, Hort. Suburb. Calcutt.: 152 (1845); G. L. Webster, Allertonia 3: 288 (1984), p. p.; Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 12: 494 (1988), p. p.

*Flueggea microcarpa* auct. non Blume: Hook. f., Fl. Brit. India 5: 328 (1887), p. p.

Shrub or small tree, 1.5–6 m high, stem diameter 8.6–15 cm. *Branching* not phyllanthoid (i. e. branchlets subtended by normal leaves). *Twigs* subterete, more or less angled when young, glabrous. *Leaves* deciduous, alternate, glabrous; stipules persistent, triangular or narrowly triangular, 1–2 by 0.5–0.8 mm, margin entire; petiole 3–10 mm long, channeled adaxially; blade elliptic or ovate (basal 1 or 2 leaves often obovate), 3.5–8.5 by 1.7–4 cm, base cuneate or obtuse, decurrent to petiole, apex acuminate, acute or obtuse, margin entire, upper surface green, lower surface paler, midrib prominently raised beneath. *Cymose clusters* axillary. *Staminate flowers* many per cymule; pedicel 2–5 mm long; sepals 5, unequal, elliptic or widely elliptic, 0.7–1.2 by 0.5–1 mm, margin entire or obscurely denticulate distally; stamens 5, free; filaments becoming ca. 1.5 mm long; anthers ca. 0.4 mm long; pistillode ca. 1 mm long. *Pistillate flowers* 1–6 per cymule; pedicel 2–3.5 mm long, glabrous; sepals 5 or 6, ovate or elliptic, unequal, 0.8–1 by 0.5–0.8 mm, obscurely lacerate, glabrous; ovary globose, ca. 1.3 mm in diam., glabrous,



smooth; styles 3, ca. 1.1 mm long, lower half connate, upper half bifid. *Fruits*: pedicel 3–5 mm long, somewhat dilated distally; bacca white, not dehiscent. *Seeds* trigonous, ca. 1.8 mm long, ca. 1.3 mm radially, ca. 1.2 mm tangentially, smooth.

*Distribution* — India (Darjeeling, Sikkim, Assam), Nepal, Bhutan, Burma (Long 1986). *E Himalayan element*. In Nepal: Far Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 350–2100 m. In roadside scrubs, in secondary forests, or on sunny slopes. Occasional in eastern plains (Siwakoti & Varma 1999, as *Securinega virosa*). Flowers from May to June; fruits from June to July.

*Vernacular names* — Nepali: *nundhiki* (Manandhar 2002), *paileti* (Manandhar 2002), *sano nundhiki* (Manandhar 2002). Chepang: *wakarang* (Manandhar 2002).

*Uses* — Ripe fresh fruit is edible (Manandhar 2002). Bark is used as astringent (Manandhar 2002). Squeezed bark is used as fish poison (Manandhar 2002).

*Notes* — *Flueggea virosa* subsp. *himalaica* differs from subsp. *virosa* in larger ovate or elliptic leaves with an acute or obtuse apex as pointed by Long (1986, 1987). These differences seem to be rather clear in my limited observation, although Chakrabarty & Gangopadhyay (1988) reported innumerable transitions between them. Characters of all Nepalese specimens well agree with the description of subsp. *himalaica*, but only one collection from Chitwan District (*H. Tabata et al.* 9773, KYO) has chartaceous, obovate leaves with rounded apex.

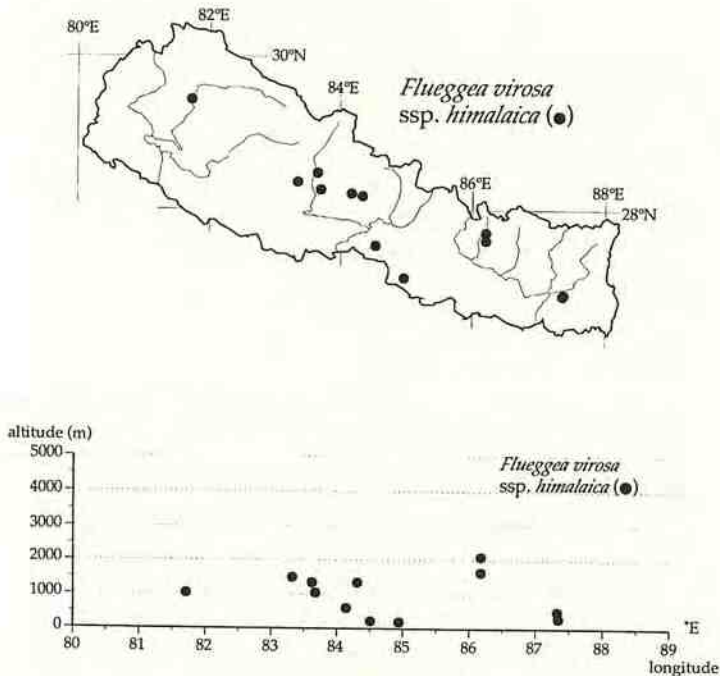


Fig. 6. Distribution of *Flueggea virosa* (Roxb. ex Willd.) Voigt subsp. *himalaica* D. G. Long in Nepal.

4. *Phyllanthus* L.

*Phyllanthus* L., Sp. Pl.: 981 (1753). — Lectotype species designated by Small in Britton & Brown, Ill. Fl. N. US. ed. 2, 2: 453 (1913): *Phyllanthus niruri* L.

## Key to the subgenera

- A. Branching not phyllanthoid (i. e. branchlets subtended by normal leaves); fruits dry capsular ..... I. Subgenus **Isocladus**
- A. Branching phyllanthoid (i. e. branchlets subtended by cataphylls on main axes); fruits dry or fleshy capsular, or baccate
- B. Sepals irregularly toothed; staminate sepals 4, stamens 2; fruits dry capsular ..... II. Subgenus **Eriococcus**
- B. Sepals entire; staminate sepals 5 or 6, stamens 3–5 (not seen in Nepalese *P. leschenaultii*); fruits dry or fleshy capsular, or baccate
- C. Stamens 4 or 5 (not seen in *P. leschenaultii*), filaments free (not seen in Nepalese *P. reticulatus* and *P. leschenaultii*); pedicels of fruits 2–11 mm long ..... III. Subgenus **Kirganelia**
- C. Stamens 3 (not seen in Nepalese *P. acidus* and *P. aff. embergeri*), filaments connate into a column; pedicels of fruits 0–3 mm long
- D. Trees or shrubs; fruits baccate or fleshy capsular, 17–22 mm in diam.; seeds smooth (not seen in *P. acidus*) ..... IV. Subgenus **Cicca**
- D. Herbs; fruits dry capsular, 1.8–3 mm in diam.; seeds more or less longitudinally or transversely rugose ..... V. Subgenus **Phyllanthus**

I. Subgenus **Isocladus** G. L. Webster

*Isocladus* G. L. Webster, J. Arnold Arbor. 37: 345 (1956). — Type species: *Phyllanthus maderaspatensis* L.

## Key to the species

- A. Shrubs; leaf blades elliptic, obovate or narrowly obovate; seeds smooth or with obscure minute tubercles
- B. Leaf blades 0.3–1 by 0.2–0.5 cm; capsules ca. 3 mm in diam.; pedicels of capsules 1–2 mm long ..... 1. ***P. parvifolius*** Buch.-Ham. ex D. Don
- B. Leaf blades 0.7–2.4 by 0.6–1.2 cm; capsules 3.2–3.8 mm in diam.; pedicels of capsules 4–13 mm long
- C. Leaves elliptic, seeds with longitudinally arranged obscure minute tubercles ..... 2. ***P. aff. clarkei*** Hook. f.
- C. Leaves obovate, seeds smooth ..... 3. ***P. clarkei*** Hook. f.
- A. Herbs; leaf blades lanceolate or narrowly elliptic; seeds granulate . 4. ***P. simplex*** Retz.

1. ***Phyllanthus parvifolius*** Buch.-Ham. ex D. Don — Plates 63, 64; Fig. 7.

*Phyllanthus parvifolius* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 63 (1825), "*parvifolia*"; Müll. Arg. in DC., Prodr. 15(2): 385 (1866); Hook. f., Fl. Brit. India 5: 294 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Murata, Acta Phytotax. Geobot. 25: 115 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982); Malla et al., Fl. Kathmandu Valley: 630 (1986); D. G. Long in Fl. Bhutan 1: 775 (1987); P. T. Li, Fl.



Reipubl. Pop. Sin. 44(1): 96, t. 27, f. 7–10 (1994); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Ohba in Contr. Fl. Ganesh Himal.: 46 (1999); T. Kuros. in Fl. Hinku & Hunku Valleys: 118 (2000); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1313 (2000); Rajbhandari, Ethnobot. Nepal: 60 (2001); Manandhar, Pl. People Nepal: 360 (2002). — Type: *Hamilton* [*s. n.*, 5 June 1802] (holo BM!), ad Suembu Nepalensium (Swayambhu, Nepal).

*Phyllanthus juniperinus* Wall. [Numer. List: 273, no. 7901 (1847), "*juniperiana*", nom. nud.] ex Müll. Arg., *Linnaea* 32: 28 (1863). — Type: *Wallich*, *List no. 7901B* (K!, K-WALL!), in *Nepalia*; *T. Thomson* (G-DC (IDC microfiche in TI) n. v.), in *Himalaya boreali-occidentali* [alt 4–5000 ped].

*Phyllanthus juniperinus* Müll. Arg. var. *obovatus* Müll. Arg., *Linnaea* 32: 28 (1863). — *Phyllanthus praetervisus* Müll. Arg., *Linnaea* 34: 73 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 385 (1866). — Type: *Hook. & Thoms.* (n. v.), in *Indiae orientalis montibus Khasia*.

Deciduous monoecious shrub, 0.5–2.5 m high, stem diameter 6 cm. *Branching* not phyllanthoid (i. e. branchlets subtended by normal leaves), sympodial. *Twigs* 1–7 cm long, glabrous or minutely granulate on ridges. *Leaves* alternate, 5–18 per twig; stipules free, lanceolate, ca. 1 by ca. 0.1 mm, apex acuminate, margin entire; petiole 0.2–0.3 mm long, glabrous; blade elliptic or obovate, 0.3–1 by 0.2–0.5 cm, base obtuse or rounded, apex obtuse or rounded, margin entire, both surfaces glabrous. *Cymules* axillary. *Staminate flowers* 0 or 1 per cymule; pedicel 0.2–0.6 mm long, glabrous; sepals 6, elliptic, 0.7–1 by 0.5–0.8 mm, entire, glabrous; stamens 3; filaments free, ca. 0.4 mm long; disc 6-segmented. *Pistillate flowers* 0 or 1 per cymule; pedicel 0.7–1 mm long; sepals 6, narrowly ovate or narrowly elliptic, 0.8–1 by 0.6–0.7 mm, apex acute or obtuse, margin entire, glabrous; disc annular or somewhat hexagonal, margin entire; ovary 3-carpellate, glabrous; styles 3, ca. 0.4 mm long, bifid. *Fruits*: pedicel 1–2 mm long; capsule depressed-globose, ca. 2 mm long, ca. 3 mm in diam., smooth; columella persistent after dehiscence, ca. 1 mm long. *Seeds* trigonous, 1.3–1.8 mm long, 1–1.2 mm radially, ca. 1 mm tangentially, smooth.

*Distribution* — N. Pakistan, India (Kashmir, Assam), Nepal, Bhutan, China (Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Western, Central, Eastern.

*Habitat & Ecology* — Altitude 500–2200 m. On sunny place in forests or bushes, or on roadsides. Flowers from April to November; fruits from July to December.

*Vernacular names* — Nepali: *khareto* (Rajbhandari 2001a, Manandhar 2002), *paitei* (Manandhar 2002), *sunpate* (Manandhar 2002). Chepang: *khareto* (Manandhar 2002). Gurung: *nabhya* (Manandhar 2002). Majhi: *khargaja* (Manandhar 2002). Tamang: *chhetrephyha* (Rajbhandari 2001a), *khagan* (Manandhar 2002), *maimanthara* (Manandhar 2002), *mirman* (Manandhar 2002), *ramhagam* (Manandhar 2002), *ramalakan* (Manandhar 2002), *rawagan* (Manandhar 2002), *wasipsip* (Manandhar 2002).

*Uses* — Dried sticks are used as broom (Rajbhandari 2001a). Leaf extract or powdered leaf is used for washing head to treat dandruff and head lice (Rajbhandari 2001a, Manandhar 2002). Paste of plant, powdered plant, powdered leaf, decoction of leaf, and leaf juice are medicinally used for various diseases (Rajbhandari 2001a, Manandhar 2002).

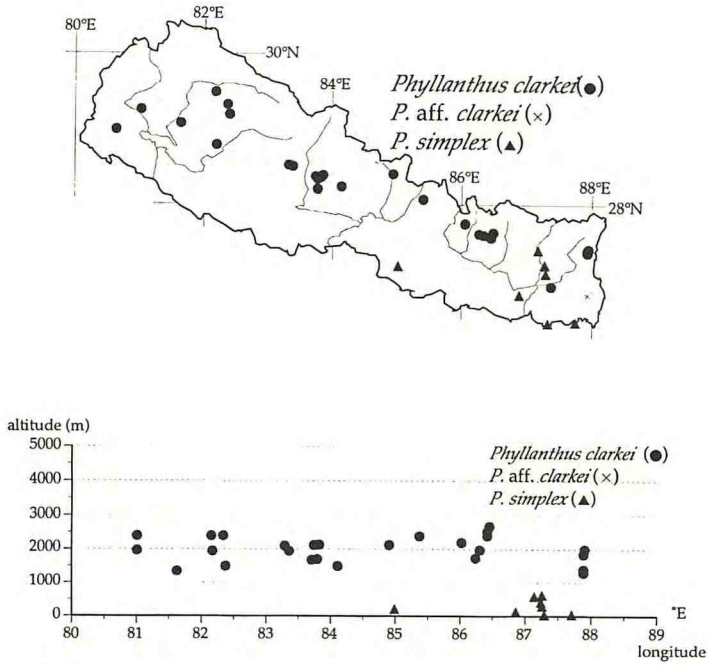


Fig. 7. Distribution of *Phyllanthus parvifolius* Buch.-Ham. ex D. Don in Nepal.

**2. *Phyllanthus* aff. *clarkei* Hook. f. — Fig. 8.**

Distribution — *E Himalayan element*. In Nepal: Eastern.

Habitat & Ecology — Flowers and fruits in December.

Notes — This species was misidentified as *P. griffithii* in my previous report (Kurosawa 2002). Identity and circumscription of this species will be discussed in another paper.

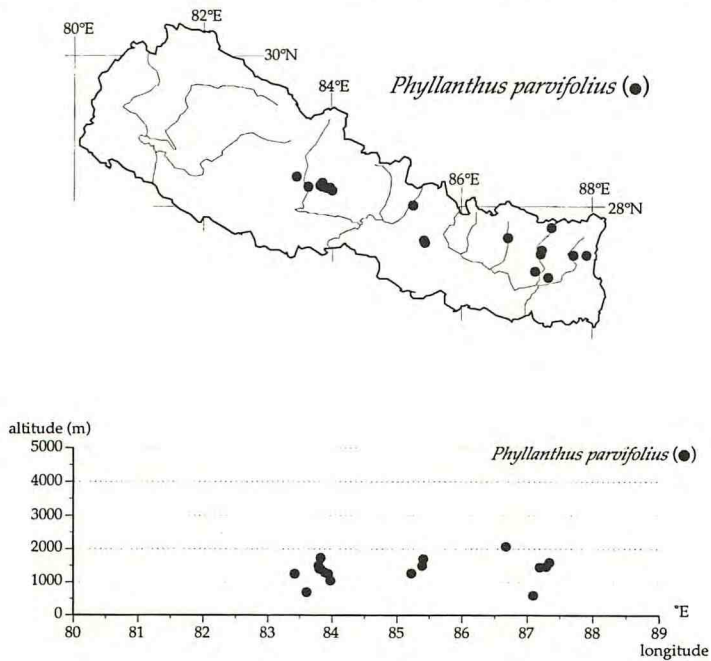


Fig. 8. Distribution of *Phyllanthus* aff. *clarkei* Hook. f., *P. clarkei* Hook. f., and *P. simplex* Retz. in Nepal.



### 3. *Phyllanthus clarkei* Hook. f. — Fig. 8.

Distribution — *Pan Himalayan element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 1500–2530 m. On roadsides, on slopes, on banks, in thicket, or in forests. Flowers from June to December; fruits from July to December.

Notes — Lectotypification and circumscription of this species in relation with the identity of "*P. aff. clarkei*" will be discussed in another paper.

### 4. *Phyllanthus simplex* Retz. — Fig. 8.

*Phyllanthus simplex* Retz., *Observ. Bot.* 5: 29 (1788); Roxb., *Fl. Ind. ed.* 1832, 3: 654 (1832); Wall., *Numer. List*: 273, no. 7898A, B, part of D (1847); Müll. Arg., *Linnaea* 32: 32 (1863); Müll. Arg. in DC. *Prodr.* 15(2): 391 (1866); Hook. f., *Fl. Brit. India* 5: 295 (1887); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 181 (1966); G. L. Webster in *Rev. Handb. Fl. Ceylon* 11: 213 (1997). — [*Phyllanthus simplex* Retz. var. *genuinus* Müll. Arg. in DC. *Prodr.* 15(2): 391 (1866), nom. inval.] — Type: *König s. n.* (C (fide Webster 1997) n. v.), E. Tranquebar.

*Phyllanthus anceps* Vahl, *Symb. Bot.* 2: 95 (1791). — *Melanthesa anceps* (Vahl) Miq., *Fl. Ned. Ind.* 1(2): 371 (1859).

[*Phyllanthus fruticosus* Heyne ex Wall., *Numer. List*: 273, no. 7899A p. p. (1847), "*fruticosa*", nom. nud.]

[*Phyllanthus marginatus* Heyne ex Wall., *Numer. List*: 273, no. 7899A p. p. (1847), nom. nud.]

*Macraea oblongifolia* Wight, *Icon. Pl. Ind. Orient.* 5(2): 27, t. 1092-1 (1852). — *Phyllanthus simplex* Retz. var. *oblongifolius* (Wight) Müll. Arg., *Linnaea* 32: 32 (1863); Müll. Arg. in DC., *Prodr.* 15(2): 391 (1866). — Type: (n. v.), Pulney Mountains?

*Macraea ovalifolia* Wight, *Icon. Pl. Ind. Orient.* 5(2): 27, t. 1092-2 (1852). — Type: (n. v.), eastern slopes of the Neilgherries.

*Melanthesa rupestris* Miq., *Fl. Ned. Ind.* 1(2): 371 (1859). — Type: *Zollinger* (n. v.).

*Phyllanthus virgatus* auct. non G. Forst., *Fl. Ins. Austr. Prodr.*: 65 (1786); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 198 (1982); D. G. Long in *Fl. Bhutan* 1: 772 (1987); P. T. Li, *Fl. Reipubl. Pop. Sin.* 44(1): 91, t. 25, f. 5–9 (1994); T. Kuros., *Newslett. Himal. Bot.* no. 22: 17 (1998); Siwakoti & Varma, *Pl. Divers. E. Nepal*: 332 (1999); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1333 (2000); Manandhar, *Pl. People Nepal*: 360 (2002).

Annual monoecious herb. *Branching* not phyllanthoid (i. e. branchlets subtended by normal leaves). *Stem* erect or ascending, branched out throughout, 18–50 cm long, glabrous, with ridges. *Leaves* alternate, many; stipules triangular, 0.7–2 by 0.7–1 mm, apex acuminate, base auriculate, margin lacerate or almost entire; petiole 0.2–0.7 mm long; blade lanceolate or narrowly elliptic, 0.9–3.7 by 0.3–0.7 cm, apex rounded, obtuse or acute, base truncate or rounded, margin entire, midrib raised beneath, both surfaces glabrous. *Cymules* axillary. *Staminate flowers* 0 or 1 per cymule; sepals 6, widely ovate, 0.3–0.4 by 0.3–0.4 mm, apex rounded, margin entire, glabrous; stamens 3; filaments ca. 0.3 mm long, connate at base; pedicel ca. 0.4 mm long; anthers dehiscing horizontally. *Pistillate flowers* 0 or 1 per cymule; sepals 6, lanceolate or narrowly ovate, 0.6–0.7

by 0.3–0.4 mm, apex obtuse, margin entire, glabrous; ovary 3-carpellate, glabrous, minutely verrucose; styles 3, ca. 0.2 mm long, bifid. *Fruits*: pedicel 4–6 mm long; capsule depressed-globose, ca. 2 mm long, ca. 3 mm in diam., verrucose or almost smooth; columella persistent after dehiscence, ca. 0.8 mm long. *Seeds* sharply trigonous, 1.6–1.8 mm long, 1–1.3 mm radially, 1–1.2 mm tangentially, granulate, brown.

*Distribution* — Sri Lanka, India, Nepal, Bhutan, Indo-China, China (South), Taiwan, Japan (Nansei-shoto (Ryukyu Isls.)) (Webster 1986, 1997, Kurosawa 2001). *S Asian-Malaysian element*. In Nepal: Western, Central, Eastern

*Habitat & Ecology* — Altitude up to 1350 m. On roadsides or in crop fields. A common weed. Flowers & fruits from July to December.

*Vernacular name* — Nepali: *amala jhar* (Manandhar 2002 as *P. virgatus*).

*Uses* — Plant is used as antiseptic agent (Siwakoti & Varma 1999 as *P. virgatus*). Juice of leaf is medicinally applied to boil and pimple (Manandhar 2002 as *P. virgatus*).

*Notes* — This species often has been treated as a synonym of *Phyllanthus virgatus*, although the latter has smaller seeds of ca. 1 mm long, 0.8 mm radially, 0.9–0 mm tangentially, and restrict to Pacific Ocean (Webster 1986, 1997).

## II. Subgenus *Eriococcus* (Hassk.) Croizat & F. P. Metcalf

Subgenus *Eriococcus* (Hassk.) Croizat & F. P. Metcalf, J. Arnold Arbor. 23: 32 (1942).

— *Eriococcus* Hassk. in Hoeven & De Vries, Tijdschr. 10: 143 (1843). — Type species: *Eriococcus gracilis* Hassk. [= *Phyllanthus gracilipes* (Miq.) Müll. Arg.]

### Key to the species

- A. Blanchlets hirsute; petioles hirsute, leaf blades 1.9–3.9 by 0.9–2.2 cm; capsules papillose-puberulous; seeds ca. 2.5 mm long, 1.5–1.7 mm radially, 1.5–1.8 mm tangentially ..... **5. *P. sikkimensis*** Müll. Arg.
- A. Blanchlets glabrous; petioles glabrous, leaf blades ca. 1.8 by ca. 1 cm; capsules glabrous; seeds 2–2.2 mm long, 1.2–1.3 mm radially, 1.2–1.4 mm tangentially ..... **6. *P. aff. sikkimensis*** Müll. Arg.

### 5. *Phyllanthus sikkimensis* Müll. Arg. — Fig. 9.

*Phyllanthus sikkimensis* Müll. Arg., Linnaea 32: 48 (1863); Müll. Arg. in DC., Prodr. 15(2): 425 (1866); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982); D. G. Long in Fl. Bhutan 1: 774 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1325 (2000). — Type: *J. D. Hook. [Reidia 6]* (G-DC (IDC microfiche in TI) n. v.), in Indiae orientalis prov. Sikkim [alt 1000 ped].

*Agynenia tetrandra* Buch.-Ham., Trans. Linn. Soc. London 15: 125 (1826); Wall., Numer. List: 274, no. 7951 (1847). — *Phyllanthus hamiltonianus* Müll. Arg., Linnaea 34: 75 (1865), nom. nov.; Müll. Arg. in DC., Prodr. 15(2): 424 (1866); Hook. f., Fl. Brit. India 5: 304 (1887). — *Reidia hamiltoniana* (Müll. Arg.) A. M. Cowan & Cowan, Trees N. Bengal: 117 (1929), nom. superfl. — *Eriococcus hamiltonianus* (Müll. Arg.) Hurus. & Ya. Tanaka in Fl. E. Himal.: 177 (1966), nom. illeg.

*Phyllanthus secundiflora* Ridl., J. Straits Branch Roy. Asiat. Soc. 59: 170 (1911). — Type: 15189 (n. v.), Lower Siam, Perlis, Telor Jambu Hill, Kanga.



*Phyllanthus perlisensis* Ridl., J. Straits Branch Roy. Asiat. Soc. 59: 171 (1911). — Type: 15188 (n. v.), Lower Siam, Perlis, near Kanga, Ginting Kabok.

Subshrub or shrub, 0.5–2 m high, stem diameter up to 3 cm. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* 14–35 cm long, hirsute. *Cataphylls* narrowly triangular, 1.5–2.5 by 0.5–1.2 mm, apex acuminate, margin entire, glabrous. *Normal leaves* alternate, 5–27 per branchlet; stipules free, narrowly triangular, 1.5–1.8 by 0.5–1 mm, apex acuminate, margin entire; petiole 1.5–1.8 mm long, hirsute; blade elliptic or ovate, 1.9–3.9 by 0.9–2.2 cm, apex acute, base obtuse or cuneate, margin entire, both surfaces glabrous or more or less hirsute on margin and on under surface midrib. *Cymules* axillary. *Staminate flowers* 5–14 per cymule; pedicel 5–8 mm long, glabrous; sepals 4, narrowly ovate or ovate, 1–1.5 by 0.5–1 mm, margin fimbriate, outside hirsute; disc 4-segmented; stamens 2; filaments connate into a short column. *Pistillate flowers* 0 or 1 per cymule; sepals 5 or 6, narrowly ovate, 1.5–1.8 by 0.7–1 mm, apex acute, glabrous, margin fimbriate; disc annular; ovary 3-carpellate, papillose-puberulous; styles 3, 0.2–0.3 mm long, deeply bifid. *Fruits*: pedicel 15–22 mm long; capsule ellipsoid, ca. 3 mm long, ca. 3.5 mm in diam., papillose-puberulous; columella persistent after dehiscence, 2–2.4 mm long. *Seeds* trigonous, ca. 2.5 mm long, 1.5–1.7 mm radially, 1.5–1.8 mm tangentially, smooth, brown.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Burma, Thailand, N. Malay Peninsula (Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Eastern.

Habitat & Ecology — Altitude 900–1400 m. On river bed, on roadsides, or in *Castanopsis* forests. Flowers from May to October; fruits from May to November.

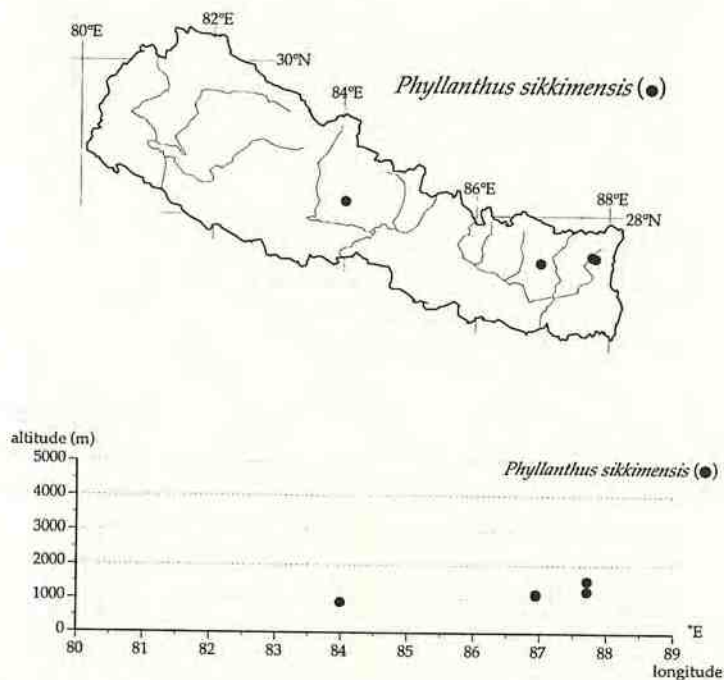


Fig. 9. Distribution of *Phyllanthus sikkimensis* Müll. Arg. in Nepal.

**6. *Phyllanthus* aff. *sikkimensis* Müll. Arg.**

Distribution — Endemic to Nepal. In Nepal: Western.

Habitat & Ecology — Altitude 1400 m. Flowers & fruits from July to October.

Notes — Identity and circumscription of this species will be discussed in another paper.

### III. Subgenus *Kirganelia* (Juss.) G. L. Webster

Subgenus *Kirganelia* (Juss.) G. L. Webster, J. Arnold Arbor. 37: 344 (1956). — *Kirganelia* Juss., Gen. Pl.: 387 (1789). — Type species: *Kirganelia phyllanthoides* Desf. [= *Phyllanthus casticum* Soy.-Willem]

#### Key to the species

- A. Pistillate flowers solitary in cymule; fruits baccate, pedicel 3–11 mm long  
 B. Pedicels of bacca 5–11 mm long; styles entire, 1–1.5 mm long; ovary 3-carpellate; stamens 4 ..... **7. *P. glaucus*** Wall. ex Müll. Arg.  
 B. Pedicels of bacca 3–5 mm long; styles bifid, 0.1–0.2 mm long; ovary 4–8-carpellate; stamens 5 ..... **8. *P. reticulatus*** Poir.  
 A. Pistillate flowers 1 or 2 per cymule; fruits dry capsular, pedicel 2–3 mm long  
 ..... **9. *P. leschenaultii*** Müll. Arg.

#### **7. *Phyllanthus glaucus*** Wall. ex Müll. Arg. — Plate 65; Fig. 10.

*Phyllanthus glaucus* Wall. [Numer. List: 274, no. 7927A (1847), "*glanca*", nom. nud.] ex Müll. Arg., Linnaea 32: 14 (1863); Hook. f., Fl. Brit. India 5: 288 (1887); Kitam. in Fauna Fl. Nepal Himal.: 278 (1955); Murata, Acta Phytotax. Geobot. 25: 115 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982); D. G. Long in Fl. Bhutan 1: 774 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 85, t. 22, f. 4–6 (1994); T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998); T. Kuros. in Fl. Hinku & Hunku Valleys: 118 (2000); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1290 (2000). — *Phyllanthus flueggeiformis* Müll. Arg. in DC., Prodr. 15(2): 349 (1866), nom. superfl. — *Fluggeopsis glauca* (Wall. ex Müll. Arg.) A. Das in Kanjilal et al., Fl. Assam 4: 158 (1940); Banerji, Rec. Bot. Surv. India 19(2): 82 (1966). — *Hemicicca glauca* (Wall. ex Müll. Arg.) Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966). — *Hemicicca glauca* (Wall. ex Müll. Arg.) Hurus. & Ya. Tanaka var. *flueggeiformis* (Müll. Arg.) Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966), nom. superfl. — Type: *Wallich*, List no. 7927[A] (holo G-DC (IDC microfiche in TI) n. v.; iso K!, K-WALL!, BM!), in India orientali [Nepaul, Nepal].

[*Phyllanthus griseus* Wall., Numer. List: 274, no. 7918 (1947), p. p., nom. nud.]

*Phyllanthus flexuosus* auct. non (Siebold & Zucc.) Müll. Arg. in DC., Prodr. 15(2): 324 (1866); Croizat, J. Jap. Bot. 16: 647 (1940).

Monoecious shrub, 1.5–4.5 m high, 3–8 cm in diameter. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 9–21 cm, glabrous. *Normal leaves* deciduous, alternate, 15–20 per branchlet, glabrous; stipules persistent or deciduous, free, lanceolate or narrowly oblong, 1.5–2 by 0.5–0.7 mm, margin entire, green; petiole 2.2–2.8 mm long; blade elliptic or ovate, 2.5–4.8 by 1.3–2.5 cm, base obtuse or cuneate, apex acute, rounded or obtuse, margin entire, midrib raised beneath. *Cymules* axillary. *Staminate flowers* 2–8 per cymule; pedicel ca. 2.7 mm



long; sepals 5 or 6, elliptic, 1–1.2 by 0.6–0.7 mm, margin entire; disc not seen; stamens 4; filaments free, ca. 0.5 mm long; anthers dehiscing vertically. *Pistillate flowers* 1 per cymule; pedicel 3–5 mm long, gradually thickened distally; sepals deciduous, 6, often unequal, narrowly ovate, 1.2–1.5 by ca. 0.8 mm, margin entire; disc not seen; ovary 3-carpellate, spheroidal, ca. 0.8 mm long, ca. 0.9 mm in diam.; styles free, 1–1.5 mm long, entire. *Fruits*: pedicel 5–11 mm long, gradually thickened distally; bacca spheroidal, ca. 8 mm in diam., ca. 7 mm long.

**Distribution** — India (Sikkim, Assam), Nepal, Bhutan, China (South-central, Hainan, Southeast, Tibet-Qinghai) (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Western, Central, Eastern.

**Habitat & Ecology** — Altitude 1560–2235 m. On slopes, in bushes, or in forests of *Pinus*, *Rhododendron*, or *Lithocarpus*. Flowers from April to June; fruits from June to October.

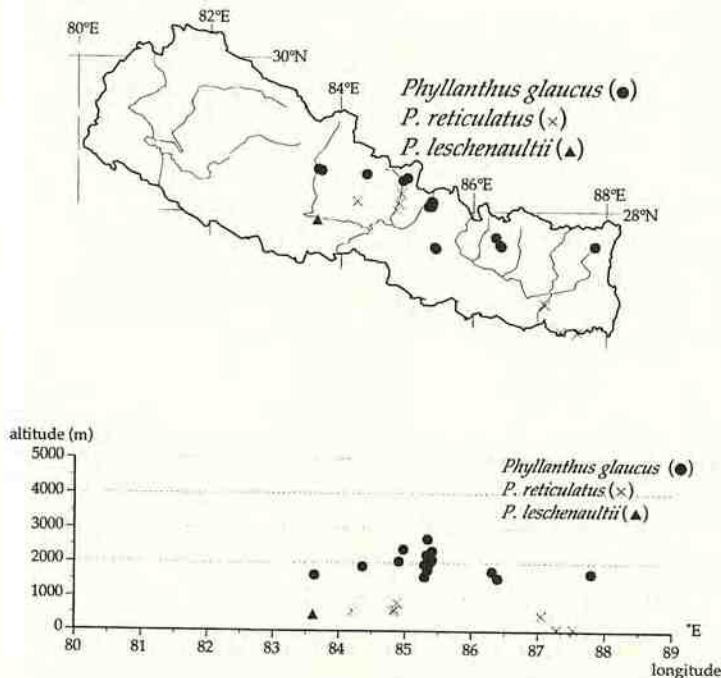


Fig. 10. Distribution of *Phyllanthus glaucus* Wall. ex Müll. Arg., *P. reticulatus* Poir., and *P. leschenaultii* Müll. Arg. in Nepal.

### 8. *Phyllanthus reticulatus* Poir. — Fig. 10.

*Phyllanthus reticulatus* Poir. in Lam., Encycl. 5: 298 (1804), "*reticulata*"; Müll. Arg., Linnaea 32: 12 (1863); Müll. Arg. in DC. Prodr. 15(2): 344 (1866); Hook. f., Fl. Brit. India 5: 288 (1887); G. L. Webster, J. Arnold Arbor. 38: 57 (1957); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982); D. G. Long in Fl. Bhutan 1: 773 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 82, t. 22, f. 1–3 (1994); G. L. Webster in Rev. Handb. Fl. Ceylon 11: 217 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1320 (2000); Manandhar, Pl. People Nepal: 360 (2002). — *Anisonema reticulatum* (Poir.) A. Juss., Euphorb. Gen.: 19 (1824).

- *Kirganelia reticulata* (Poir.) Baill., Étude Euphorb.: 613 (1858); Banerji, Rec. Bot. Surv. India 19(2): 83 (1966); Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966); Siwakoti & Varma, Pl. Divers. E. Nepal: 328 (1999). — *Cicca reticulata* (Poir.) Kurz, Forest Fl. Burma 2: 354 (1877). — Type: (holo in P-LA (fide Webster 1957) n. v.), les Indes..
- Phyllanthus multiflorus* Willd., Sp. Pl. 4: 581 (1805); Roxb., Fl. Ind. ed. 1832, 3: 664 (1832); Wall., Numer. List: 274, no. 7921 (1847). — *Kirganelia multiflora* (Willd.) Baill., Étude Euphorb.: 614 (1858). — *Anisonema multiflorum* (Willd.) Wight, Icon. Pl. Ind. Orient. 5(2): 26, t. 1899 (1852), "multiflora." — Type: *D. Klein* (n. v.), India orientali.
- Anisonema dubium* Blume, Bijdr.: 589 (1826), "dubia." — *Kirganelia dubia* (Blume) Baill., Étude Euphorb.: 614 (1858). — Type: (n. v.), in fructicetis prope Tangerang.
- Anisonema intermedium* Decne., Nuov. Ann. Mus. Hist. Nat. 4: 482 (1831). — *Kirganelia intermedia* (Decne.) Baill., Étude Euphorb.: 614 (1858).
- Cicca decandra* Blanco, Fl. Filip.: 701 (1837). — Type: not designated.
- Phyllanthus scandens* Roxb. ex Dillwyn, Rev. Hortus Malab.: 7 (1839).
- Melanthesa oblongifolia* Oken, Allig. Naturgesch. 3(3): 1602 (1841). — Type: (n. v.), Timor.
- Phyllanthus chamissonis* Klotzsch, Nova Acta Acad. Caes. Leop-Carol. German. Nat. Cur. 19, Suppl. 1: 420 (1843).
- [*Phyllanthus griseus* Wall., Numer. List: 274, no. 7918A (1847) p. p., nom. nud.]
- [*Phyllanthus spinescens* Wall., Numer. List: 274, no. 7934 (1847), p. p., nom. nud.]
- [*Kirganelia eglandulosa* Baill., Étude Euphorb.: 614 (1858), nom. nud.]
- [*Kirganelia puberula* Baill., Étude Euphorb.: 614 (1858), nom. nud.]
- [*Anisonema puberulum* Baill., Étude Euphorb.: 614 (1858), nom. nud.]
- [*Kirganelia sinensis* Baill., Étude Euphorb.: 614 (1858), nom. nud.] — [*Phyllanthus sinensis* Müll. Arg., Linnaea 32: 12 (1863), nom. nud.]
- Phyllanthus jamaicensis* Griseb., Fl. Brit. W. I.: 34 (1859). — *Anisonema jamaicense* (Griseb.) Griseb., Fl. Brit. W. I.: 716 (1864). — Type: *Macf., Wils.* (n. v.), Jamaica.
- Kirganelia prieuriana* Baill., Adansonia 1: 82 (1860). — *Phyllanthus prieurianus* (Baill.) Müll. Arg., Linnaea 32: 12 (1863).
- Phyllanthus alaternoides* Rchb. ex Baill., Adansonia 1: 83 (1860).
- Cicca microcarpa* Benth., Fl. Hongk.: 312 (1861); Kurz, Forest Fl. Burma 2: 355 (1877). — *Phyllanthus microcarpus* (Benth.) Müll. Arg., Linnaea 32: 51 (1863); Müll. Arg. in DC. Prodr. 15(2): 343 (1866). — [*Phyllanthus microcarpus* (Benth.) Müll. Arg. var. *genuinus* Müll. Arg. in DC. Prodr. 15(2): 343 (1866), nom. inval.] — *Kirganelia microcarpa* (Benth.) Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966). — Type: *Seemann* [2485, Dec. 1850] (K!), Hongkong [S. China]; *Wilford* [228, Dec. 1857] (K!), in a ravine on the south side of the island, [Hong Kong].
- Phyllanthus oblongifolius* Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 19 (1890).
- Phyllanthus microcarpus* (Benth.) Müll. Arg. var. *dalbergioides* Müll. Arg. in DC., Prodr. 15(2): 343 (1866). — *Phyllanthus dalbergioides* Wall. [Numer. List: 274, no. 7934 p. p. (1847), nom. nud.] ex J. J. Sm. in S. H. Koorders & T. Valetton, Bijdr. Boomsort. Java 12: 67, 69 (1910). — [*Phyllanthus sinensis* Müll. Arg. var. *dalbergioides* Müll. Arg. in Linnaea 32: 12 (1863), nom. nud.] — Type: *Wallich*, List no. 7934 (G-DC)



(IDC microfiche in TI) n. v.), in India orient. prope Amherst; *Wallich, List no. 7940* (K-WALL (IDC microfiche in TI) n. v.), in Silhet.

*Phyllanthus takaoensis* Hayata, *Icon. Pl. Formosan.* 9: 94 (1920). — Lectotype designated by Kurosawa & Shimizu (2000): *B. Hayata s. n.*, [22] Apr. 1917 (TI!), Formosa, Ape's Hill (Taiwan).

*Phyllanthus erythrocarpus* Ridl., *Bull. Misc. Inform. Kew* 1923: 362 (1923). — Type: *Ridley*, March 1915 (n. v.), Malay Peninsular, Selangor, Batu Caves.

*Kirganelia lineata* auct. non (Willd.) Alston: Alston in Trimen, *Handb. Fl. Ceylon* 6: 259 (1931).

Monoecious shrub, 1.2–4.5 m high, 7 cm in diameter. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 6–17 cm, glabrous or villous. *Normal leaves* deciduous, alternate, 7–16 per branchlet; stipules persistent, free, narrowly triangular, 1–3 by 0.5–0.6 mm, apex rounded or acute, margin entire; petiole 1.5–2.4 mm long, glabrous or villous; blade elliptic, 1.5–5.3 by 0.7–1.9 cm, base obtuse or cuneate, apex rounded or obtuse, margin entire, midrib raised beneath, both surfaces glabrous or villous at base. *Cymules* axillary. *Staminate flowers* 3–5 per cymule; pedicel 3–4 mm long, glabrous or vilous; sepals 5, elliptic or narrowly ovate, 1–1.8 by 0.6–1.2 mm, margin entire; stamens 5; filaments not seen; anthers not seen; disc not seen. *Pistillate flowers* 1 per cymule; sepals persistent, 5 or 6, often unequal, orbicular, narrowly ovate or ovate, 1.2–1.8 by 0.4–1 mm, apex acute or obtuse, margin entire; disc not seen; ovary 4–8-carpellate, spheroidal; styles 0.1–0.2 mm long, bifid. *Fruits*: pedicel 3–5 mm long, gradually thickened distally, glabrous or villous; bacca spheroidal.

*Distribution* — Tropical & South Africa, Pakistan, Sri Lanka, India, Nepal, Bhutan, Thailand, Cambodia, Laos, Vietnam, Borneo, Jawa, Moluccas, New Guinea, Philippines, Sulawesi, Sumatera, Australia (Northern Territory, Queensland, Western), China (South-central, Hainan, Southeast), Taiwan, Japan (Nansei Shoto [Ryukyu]) (Webster 1957, Long 1987, Govaerts et al. 2000). In Nepal: Western, Eastern.

*Habitat & Ecology* — Altitude 400–830 m. In forests, on riversides, or rocky cliffs. Common in eastern plains (Siwakoti & Varma 1999). Flowers & fruits throughout the year.

*Vernacular names* — Nepali: *nundhik* (Manandhar 2002). Mooshar: *sikat* (Manandhar 2002). Tamang: *khayal* (Manandhar 2002).

*Uses* — This species is planted as a hedge plant (Siwakoti & Varma 1999). Ripe fruit is edible (Manandhar 2002). Juice of bark and leaf are medicinally applied for various diseases (Manandhar 2002).

### 9. *Phyllanthus leschenaultii* Müll. Arg. — Plate 66; Fig. 10.

*Phyllanthus leschenaultii* Müll. Arg., *Linnaea* 32: 37 (1863); Müll. Arg. in DC. *Prodr.* 15(2): 398 (1866); Hook. f., *Fl. Brit. India* 5: 296 (1887); D. G. Long in *Fl. Bhutan* 1: 775 (1987); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1298 (2000). — Type: *Leschenault 129*, [in 1823] (G-DC (IDC microfiche in TI) n. v.), in montibus Neilgherries Indiae orientalis; *Hook. & Thoms. [Phyllanthus 22]* (G-DC (IDC microfiche in TI) n. v.), Khashia (India).

Deciduous shrub, ca. 50 cm high. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* glabrous. *Leaves* alternate; stipules free, narrowly triangular, ca. 1.5 by ca 0.6 mm, apex acuminate, margin entire; petiole 2–2.5 mm long,

glabrous; blade elliptic, 1.6–2.3 by 0.7–1.3 cm, base acute or obtuse, apex rounded, margin entire. *Cymules* axillary. *Staminate flowers* 0 or 1 per cymule; pedicel 1.5–2 mm long, glabrous; sepals 5?, orbicular or widely obovate, 0.7–0.8 by 0.6–0.8 mm, glabrous, margin entire; disc not seen; stamens not seen; filaments not seen. *Pistillate flowers* 1 or 2 per cymule; sepals 6, elliptic or widely elliptic, ca. 1.2 by ca. 1 mm, glabrous, apex acute, margin entire; disc annular, margin irregularly cleft; ovary 3-lobed, glabrous, smooth; styles 3, ca. 0.4 mm long, bifid. *Fruits*: pedicel 2–3 mm long, gradually thickened distally; capsule depressed-globose, ca. 2.5 mm in diam., ca. 1.8 mm long, glabrous, smooth; columella persistent after dehiscence, ca. 1.3 mm long. *Seeds* not seen.

Distribution — India, Nepal, Bhutan (Long 1987, Govaerts et al. 2000). *Deccan element*. In Nepal: Western.

Habitat & Ecology — Altitude 510 m. In grasslands near river. Flowers & fruits in October.

Notes — This is the first record of the species from Nepal.

#### IV. Subgenus *Cicca* (L.) G. L. Webster

Subgenus *Cicca* (L.) G. L. Webster, J. Arnold Arbor. 37: 344 (1956). — *Cicca* L., Mant. Pl.: 17 (1767). — Type species: *Phyllanthus acidus* (L.) Skeels

#### Key to the species

A. Leaves elliptic or ovate, 2.5–3.5 cm wide; fruits baccate ..... **10. *P. acidus*** (L.) Skeels

A. Leaves linear, 0.1–0.3 cm wide; fruits fleshy capsular ..... **11. *P. emblica*** L.

#### 10. *Phyllanthus acidus* (L.) Skeels — Fig. 11.

*Phyllanthus acidus* (L.) Skeels, U. S. D. A. Bur. Pl. Industr. Bull. 148: 17 (1909); G. L. Webster, J. Arnold Arbor. 38: 66 (1957); Short & Vickery in Enum. Flow. Pl. Nepal

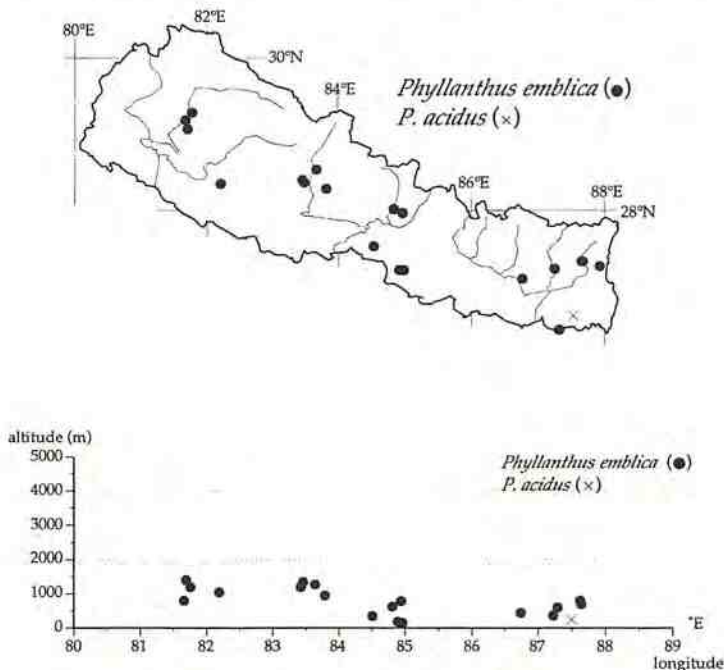


Fig. 11. Distribution of *Phyllanthus acidus* (L.) Skeels. and *P. emblica* L. in Nepal.



3: 198 (1982); D. G. Long in Fl. Bhutan 1: 773 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 330 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1264 (2000); Manandhar, Pl. People Nepal: 359 (2002). — *Averrhoa acida* L., Sp. Pl.: 428 (1753). — *Cicca acida* (L.) Merr., Interpr. Herb. Amboin.: 314 (1917). — Lectotype designated by Webster (1957): *Herb. Linnaeus*, No. 592-3 (LINN n. v.), India.

*Cicca disticha* L., Mant. Pl.: 124 (1767); Kurz, Forest Fl. Burma 2: 353 (1877). — *Phyllanthus cicca* Müll. Arg., Linnaea 32: 50 (1863), nom. illeg. — *Phyllanthus distichus* (L.) Müll. Arg. in DC. Prodr. 15(2): 413 (1866); Hook. f., Fl. Brit. India 5: 304 (1887). — *Diasperus distichus* (L.) O. Ktze., Rev. Gen. 2: 599 (1891). — Type: *Koenig in Herb. Linnaeus*, No. 1108-1 (holo LINN n. v.), India.

[*Phyllanthus tetrandrus* Wall., Numer. List: 274, no. 7930 (1847), "*tetrandra*", nom. nud.]

See Govaerts et al. (2000) for further synonyms.

Distribution — Native probably to South America (Webster 1957), widely cultivated throughout the tropics, and naturalized elsewhere (Govaerts et al. 2000). In Nepal: Eastern.

Habitat & Ecology — Altitude 260 m. Occasional along roadsides and gardens on plains (Siwakoti & Varma 1999). Flowers & fruits in September.

Vernacular names — Nepali: *amala* (Siwakoti & Varma 1999). Danuwar: *aura* (Manandhar 2002).

Uses — Cultivated. Fresh or pickled fruit are edible (Siwakoti & Varma 1999, Manandhar 2002).

### 11. *Phyllanthus emblica* L. — Fig. 11.

*Phyllanthus emblica* L., Sp. Pl.: 982 (1753); Roxb., Fl. Ind. ed. 1832, 3: 671 (1832); Wall., Numer. List: 273, no. 7903 p. p. (1847); Baill., Étude Euphorb.: 627 (1858); Müll. Arg., Linnaea 32: 15 (1863); Müll. Arg. in DC., Prodr. 15(2): 352 (1866); Hook. f., Fl. Brit. India 5: 289 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Kitam. in Fauna Fl. Nepal Himal.: 172 (1955); G. L. Webster, J. Arnold Arbor. 38: 76 (1957); Hurus. & Ya. Tanaka in Fl. E. Himal.: 180 (1966); Murata, Acta Phytotax. Geobot. 25: 115 (1973); N. P. Manandhar, Med. Pl. Nep. Himal.: 53 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 484 (1983); Malla et al., Fl. Kathmandu Valley: 629 (1986); D. G. Long in Fl. Bhutan 1: 772 (1987); Stainton, Flow. Himal. Suppl.: 55, pl. 104 (1988); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 87, t. 23, f. 1-5 (1994); G. L. Webster in Rev. Handb. Fl. Ceylon 11: 219 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 16 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 331 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1285 (2000); Rajbhandari, Ethnobot. Nepal: 60 (2001); Manandhar, Pl. People Nepal: 359 (2002). — *Emblica officinalis* Gaertn., Fruct. Sem. Pl. 2: 122, t. 108(2) (1790); Banerji, Rec. Bot. Surv. India 19: 82 (1966); C. R. Rao, Ind. For. 93: 95 (1967). — *Cicca emblica* (L.) Kurz, Forest Fl. Burma 2: 352 (1877). — *Diasperus emblica* (L.) O. Ktze., Rev. Gen. 2: 599 (1891). — Possible type fide Webster (1957, 1997): *Herb. Linnaeus*, No. 1105-11 (LINN n. v.), India.

*Phyllanthus mimosifolius* Salisb., Prodr. Stirp. Chap. Allerton: 391 (1796).

*Phyllanthus taxifolius* D. Don, Prodr. Fl. Nepal.: 63 (1825), "*taxifolia*." — Type: *Kamroop* (n. v.), Sirinagur.



*Emblica arborea* Raf., Sylva Tellur.: 91 (1838).

[*Phyllanthus glomeratus* Roxb. ex Wall., Numer. List: 273, no. 7903B (1847), nom. nud.]

*Phyllanthus mairei* H. Lév., Bull. Acad. Int. Géogr. Bot. 25: 23 (1915). — Type: *E. E.*

*Maire s. n.*, Apr. 1912 (holo E (fide Lauener 1983) n. v.), China, Yunnan, rives du fleuve à Siao-ho, 400 m.

Monoecious shrub, small tree or tree, 0.5–12 m high, stem diameter 10–15 cm. *Branching* phyllanthoid (i. e. deciduous branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 10–29 cm long, hispidulous. *Leaves* deciduous, alternate, many per branchlet, glabrous; stipules persistent or deciduous, free, triangular, ca. 1 by ca. 0.6 mm, margin entire or serrate; petiole 0.3–0.5 mm long; blade linear, 0.7–1.4 by 0.1–0.3 cm, base obtuse or rounded, apex obtuse or acute, margin entire, midrib raised beneath, upper surface green, lower surface whitish. *Cymules* axillary. *Staminate flowers* 2–7 per cymule; pedicel 1.3–2.3 mm long; sepals 5 or 6, unequal, narrowly elliptic or oblanceolate, 1.5–1.7 by 0.5–0.8 mm, margin entire or obscurely serrate; disc not seen; stamens 3; filaments connate, ca. 0.5 mm long; anthers elliptic, 0.6–0.8 mm long, dehiscing vertically. *Pistillate flowers* 0 or 1 per cymule; pedicel 0.2–0.3 mm long; sepals 6, deciduous, narrowly elliptic, 1.5–2 by ca. 0.6 mm, margin entire; disc not seen; ovary 3-carpellate; styles 3, thick, bifid, free, 2–2.8 mm long. *Fruits* sessile; fleshy capsule sphaeroidal, 1.8–2.2 mm in diam., pericarp 1–1.5 mm thick. *Seeds* trigonous, 4.8–5.8 mm long, 2.5–3.5 mm radially, 2.8–3.5 mm tangentially, smooth, brown.

*Distribution* — Sri Lanka, India (Kumaon, Assam), Nepal, Bhutan, Burma (North), Thailand, Cambodia, Laos, Borneo, Jawa, Lesser Sunda Isls., Malaya, Sumatera, China (South-central, Hainan, Southeast), Taiwan (Short & Vickery 1982, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 150–2000 m. In *Shorea robusta* forests or *Pinus* forests, on cliffs, on slopes, or on riversides. Flowers from April to June; fruits from June to January.

*Vernacular names* — Nepali: *amala(a)* (Siwakoti & Varma 1999, Rajbhandari 2001a, Manandhar 2002). Chepang: *tausī* (Manandhar 2002). Danuwar: *rikhiya* (Manandhar 2002). Gurung: *kyun* (Manandhar 2002), *tigi* or *titi* (Rajbhandari 2001a, Manandhar 2002). Khaling: *korosi* (Manandhar 2002). Limbu: *aagra* (Manandhar 2002). Magar: *aaunlesa* (Manandhar 2002), *ghwarbhet* or *ghwarmeth* (Rajbhandari 2001a, Manandhar 2002). Majhi: *amala* (Manandhar 2002). Mooshar: *rikhiya* (Manandhar 2002). Newari: *amba* (Manandhar 2002). Rai: *chimbak* (Manandhar 2002), *jurse* (Manandhar 2002), *korosi* (Rajbhandari 2001a). Raute: *aurya* (Manandhar 2002). Satar: *meral* (Rajbhandari 2001a). Tamang: *amble* (Manandhar 2002), *harimnal* (Manandhar 2002), *tebu* (Manandhar 2002). Tharu: *aonla* (Rajbhandari 2001a), *aura* (Manandhar 2002). Tibetan: *kyu-ru-ra* (Manandhar 2002).

*Uses* — Fresh fruit is acidic, edible and rich in vitamin C, and is medicinally used for various diseases (Siwakoti & Varma 1999, Manandhar 2002). Pickled fruit is also eaten (Manandhar 2002). Bark and leaf are used for tanning (Manandhar 2002). Detergent properties of dried fruit are used for washing head (Manandhar 2002). Juice of bark, juice of leaf, dried fruit, and endosperm are medicinally applied for various diseases (Rajbhandari 2001a, Manandhar 2002).



V. Subgenus **Phyllanthus**

## Key to the species

- A. Capsules verrucose or obscurely verrucose, pedicel 0.1–0.5 mm long; seeds transversely rugose or almost smooth
- B. Perennial herbs; stipules of normal leaves 1.5–3 mm long; capsules obscurely verrucose, ca. 3 mm in diam.; seeds 1.6–1.8 mm long, with transverse ridges on the back or almost smooth ..... **12. P. aff. embergeri**
- B. Annual herbs; stipules of normal leaves 0.7–1.2 mm long; capsules verrucose, ca. 2.5 mm in diam.; seeds 1.2–1.3 mm long, with transverse ridges on the back
- C. Seeds with obscure ridges on the side, with 13–17 ridges on the back; margin of female disc crenate or dentate ..... **13. P. lepidocarpus** Siebold & Zucc.
- C. Seeds with sharp ridges on the side, with 10 or 11 ridges on the back; margin of female disc crenulate ..... **14. P. embergeri** Haicour & Rossignol
- A. Capsules smooth; pedicel 1–3 mm long; seeds longitudinally rugose
- B. Sepals of pistillate flowers 5, acute or obtuse at apex, 0.8–1 mm long ..... **15. P. amarus** Schumach. & Thonn. ex D. Don
- B. Sepals of pistillate flowers 6, obtuse or rounded at apex, 1–2 mm long
- C. Sepals of pistillate flowers 0.7–1.3 mm long; seeds 0.9–1 mm long; pedicels of capsules 1–1.5 mm long ..... **16. P. fraternus** G. L. Webster
- C. Sepals of pistillate flowers ca. 2 mm long; seeds ca. 1.2 mm long; pedicels of capsules 2.5–3 mm long ..... **17. P. airy-shawii** Brunel & J. P. Roux

**12. Phyllanthus aff. embergeri** — Fig. 12.

Distribution — *S Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 1200 m. Flowers & fruits in October.

Notes — Identity and circumscription of this species will be discussed in another paper.

**13. Phyllanthus lepidocarpus** Siebold & Zucc. — Fig. 13.

*Phyllanthus lepidocarpus* Siebold & Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 143 (1845); T. Kuros., Acta Phytotax. Geobot. 52: 18 (2001). — Type: (holo L? n. v.; iso? K!), Japonia.

*Phyllanthus urinaria* auct. non L., Sp. Pl.: 982 (1753); Müll. Arg. in DC. Prodr. 15(2): 364 (1866), p. p.; Hook. f., Fl. Brit. India 5: 293 (1887), p. p.; Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966), p. p.; Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982), p. p.; D. G. Long in Fl. Bhutan 1: 772 (1987), p. p.; T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1331 (2000), p. p.; Rajbhandari, Ethnobot. Nepal: 61 (2001), p. p.; Manandhar, Pl. People Nepal: 360 (2002), p. p.

*Phyllanthus niruri* sensu Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966), p. p., non L., Sp. Pl.: 981 (1753).

Annual monoecious herb. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Stem* erect, ascending or procumbent, branched out main axes throughout, 5–69 cm long, glabrous, with ridges. *Branchlets* 2–9 cm long, hispidulous or glabrous. *Cataphylls* at the base of branchlets, lanceolate or narrowly triangular, 1.7–3

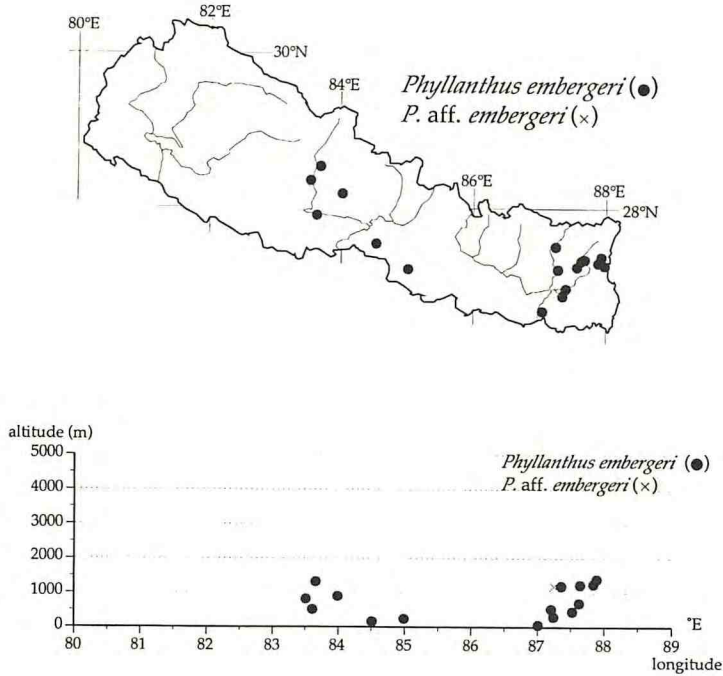


Fig. 12. Distribution of *Phyllanthus aff. embergeri* and *P. embergeri* Haicour & Rossignol in Nepal.

by ca. 0.8 mm, apex acuminate, margin entire, glabrous; stipules on nodes, lanceolate or narrowly triangular, 1.2–3 by 0.4–1 mm, base auriculate, peltate, apex acuminate. *Normal leaves* alternate, 20–34 per branchlet; stipules narrowly triangular or lanceolate, 1–1.2 by 0.4–0.5 mm, base auriculate, apex acuminate; petiole 0.3–0.5 mm long; blade oblong or elliptic, 0.6–1.6 by 0.3–0.6 cm, base obliquely obtuse, apex mucronate or obtuse, margin minutely hispidulous, midrib raised beneath. *Cymules* axillary. *Staminate flowers* 0–2 per cymule; pedicel ca. 0.2 mm long; sepals 6, elliptic, ca. 0.3 by 0.2 mm, glabrous, apex rounded, margin obscurely toothed; stamens 3; filaments connate into a column; anthers dehiscing longitudinally. *Pistillate flowers* 0 or 1 per cymule; sepals 6, lanceolate or narrowly ovate, 0.6–0.8 by ca. 0.2 mm, glabrous, apex obtuse, margin obscurely toothed or almost entire; disc annular, with crenate or dentate margin; ovary 3-carpellate, glabrous, verrucose; styles 3, ca. 0.1 mm long, bifid. *Fruits*: pedicel ca. 0.1 mm long; capsule depressed-globose, ca. 1.5 mm long, ca. 2.5 mm in diam., verrucose; columella persistent after dehiscence, ca. 0.8 mm long. *Seeds* sharply trigonous, 1.2–1.3 mm long, 0.9–1 mm radially, 0.9–1 mm tangentially, with 13–17 transverse ridges on the back, with obscure radial ridges on the side, minutely granulate on the ridges, brown.

**Distribution** — Sri Lanka, India, Nepal, Thailand, Vietnam, Malaya, Philippines, China (South-central, Southeast), Taiwan, Japan (Rossignol et al. 1987 as *P. hookeri*, Chen & Wu 1997 as *P. hookeri*, Govaerts et al. 2000 as *P. urinaria* var. *hookeri*, Kurosawa 2001). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

**Habitat & Ecology** — Altitude up to 2500 m. On roadsides, in crop fields, or in sunny forests. Flowers & fruits throughout the year.



Vernacular names — Nepali: *bhuin amala* (Manandhar 2002 as *P. urinaria*). Satar: *kanthad* (Rajbhandari 2001a as *P. urinaria*).

Uses — Paste of plant is applied to boil, wound and sore (Rajbhandari 2001a as *P. urinaria*, Manandhar 2002 as *P. urinaria*).

Notes — Based on chromosome numbers and flower and seed morphology, Rossignol et al. (1987) distinguished 4 species and 1 subspecies within annual weeds collectively treated as *P. urinaria* L. Among these *P. hookeri* sensu Rossignol et al. (1987) and *P. embergeri* were found in Nepal. The name, *P. lepidocarpus* Siebold & Zucc., is prior to *P. hookeri* (Kurosawa 2001).

One of the specimens cited as *P. niruri* L. in Hurusawa & Tanaka (1966) is referable to this species. See note under *P. amarus*.

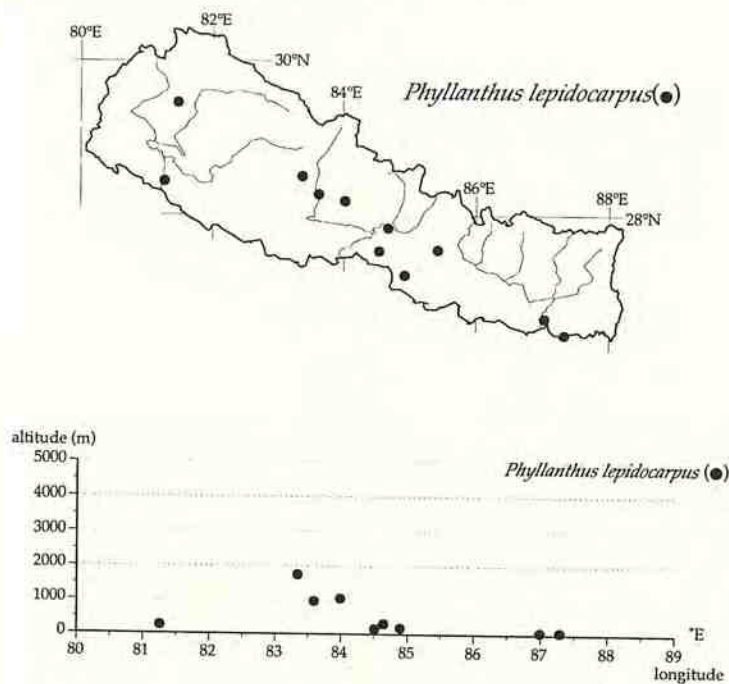


Fig. 13. Distribution of *Phyllanthus lepidocarpus* Siebold & Zucc. in Nepal.

#### 14. *Phyllanthus embergeri* Haicour & Rossignol — Fig. 12.

*Phyllanthus embergeri* Haicour & Rossignol, Amer. J. Bot. 74: 1860 (1987, publ. 1988).

— Type: *Nozeran P.3* (holo VIL n. v.; iso VIL, P n. v.), along bay, North Vietnam.

*Phyllanthus niruri* auct. non L., Sp. Pl.: 981 (1753): Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966), p. p.

*Phyllanthus amarus* auct. non Schum., Beskr. Guin. Pl.: 421 (1827): Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982), p. p.

*Phyllanthus urinaria* auct. non L., Sp. Pl.: 982 (1753): Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966), p. p.; Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982), p. p.; Long in Fl. Bhutan 1: 772 (1987), p. p.; T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998), p. p.; Rajbhandari, Ethnobot. Nepal: 61 (2001), p. p.; Manandhar, Pl. People Nepal: 360 (2002), p. p.

*Phyllanthus cochinchinensis* auct. non Spreng., Syst. Veg. 3: 21 (1826); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1280 (2000).

Annual monoecious herb. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Stem* erect, ascending or procumbent, branched out main axes throughout, 5–28 cm long, glabrous, with ridges. *Branchlets* 3.5–6.5 cm long, hispidulous. *Cataphylls* at the base of branchlets, lanceolate, 1–2.5 by 0.4–0.5 mm, apex acuminate, margin entire, glabrous; stipules on nodes, lanceolate or narrowly triangular, 2–3 by ca. 1 mm, base auriculate, peltate, apex acuminate. *Normal leaves* alternate, 8–21 per branchlet; stipules lanceolate, 0.7–1 by 0.3–0.4 mm, base auriculate, apex acuminate; petiole 0.2–0.3 mm long; blade oblong or elliptic, 0.8–1.4 by 0.3–0.6 cm, base obliquely obtuse, apex mucronate, obtuse or acute, margin hispidulous, midrib raised beneath. *Cymules* axillary. *Staminate flowers* 0–2 per cymule; pedicel ca. 0.2 mm long; sepals 6, elliptic, 0.3–0.4 mm long, glabrous, apex rounded, margin obscurely toothed; disc not seen; stamens 3; filaments connate into a column; anthers dehiscing longitudinally. *Pistillate flowers* 0 or 1 per cymule, subsessile; sepals 6, lanceolate or narrowly ovate, ca. 0.8 by 0.2–0.3 mm, glabrous, apex obtuse, margin serrate; disc annular, with crenulate margin; ovary 3-carpellate, glabrous, verrucose; styles 3, ca. 0.1 mm long, bifid. *Fruits*: pedicel ca. 0.2 mm long; capsule depressed-globose, ca. 2.5 mm in diam., ca. 1.5 mm long, verrucose; columella persistent after dehiscence, ca. 0.8 mm long. *Seeds* sharply trigonous, ca. 1.3 mm long, ca. 0.9 mm radially, ca. 1 mm tangentially, with 10 or 11 sharp transverse ridges on the back, with sharp radial ridges on the side, yellowish brown, somewhat glossy.

Distribution — India, Nepal, Vietnam, China (South-central, Southeast), Taiwan, Japan (Nansei-Shoto [Ryukyu]) (Rossignol et al. 1987, Chen & Wu 1997, Kurosawa 2001). *S Asian-Malaysian element*. In Nepal: Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude up to 1400 m. On roadsides, in grazed grasslands, on forest margin or in crop fields. Flowers & fruits from July to January.

Vernacular names — Nepali: *bhuin amala* (Manandhar 2002 as *P. urinaria*). Satar: *kanthad* (Rajbhandari 2001a as *P. urinaria*).

Uses — Paste of plant is applied to boil, wound and sore (Rajbhandari 2001a as *P. urinaria*, Manandhar 2002 as *P. urinaria*).

Notes — Recently Govaerts et al. (2000) regards *P. embergeri* as a synonym of a Vietnamese plant, *P. cochinchinensis* Spreng, although the latter has been known as a shrubby species with pedicellate pistillate flowers (Li 1994).

One of the specimens cited as *P. niruri* L. in Hurusawa & Tanaka (1966) is referable to this species. See note under *P. amarus*.

### 15. *Phyllanthus amarus* Schumach. & Thonn. — Fig. 14.

*Phyllanthus amarus* Schumach. & Thonn., Beskr. Guin. Pl.: 421 (1827); Schumach. & Thonn., Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Aft. 4: 195 (1829); G. L. Webster, J. Arnold Arbor. 38: 313 (1957); Mitra & Jain, Bull. Bot. Surv. India 27: 164 (1985); G. L. Webster, Rev. Handb. Fl. Ceylon 11: 226 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1267 (2000); Manandhar, Pl. People Nepal: 359 (2002). — *Phyllanthus niruri* L. var. *amarus* (Schumach. & Thonn.) Leandri, Fl. Madag. 111: 73 (1958). — Type: *Schumacher &*



*Thonnig* (holo C (fide Webster 1957) n. v.), Guinée (Guinea, Africa).

*Phyllanthus nanus* Hook. f., Fl. Brit. India 5: 298 (1887). — Type: Griffith [Kew distrib. no. 4803] (K!), Burma, at Tsegau.

*Phyllanthus niruri* auct. non L., Sp. Pl.: 981 (1753); Swartz, Obs. Bot.: 354 (1791); Müll. Arg., Linnaea 32: 43 (1863), p. p.; Müll. Arg. in DC. Prodr. 15(2): 406 (1866), p. p.; Hook. f., Fl. Brit. India 5: 298 (1887), p. p.; Malla et al., Fl. Kathmandu Valley: 630 (1986); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 101, t. 26, f. 1–5 (1994).

See Govaerts et al. (2000) for further synonyms.

Distribution — Probably native to tropical America, now pantropical (Webster 1957, Govaerts et al. 2000). In Nepal: Eastern.

Habitat & Ecology — Altitude 215 m. On sunny path sides. Flowers & fruits in October.

Vernacular names — Nepali: *bhui amala* (Manandhar 2002). Tharu: *chhotaki dahigola* (Manandhar 2002).

Uses — Infusion of root, decoction of plant, bark, juice of leaf are medicinally applied for various diseases (Manandhar 2002).

Notes — This is one of much misunderstood species in Nepalese Flora. The cited specimens as *P. niruri* in Hurusawa & Tanaka (1966) are not referable to *P. amarus* but *P. embergeri* (H. Hara et al. s. n., Oct. 16, 1963, TI!) and *P. lepidocarpus* (H. Kanai s. n., Sep. 20, 1963, TI!). The cited specimens of this species in Short & Vickery (1982) are *P. airy-shawii* (Wraber 488, BM!) and a mixture of *P. embergeri* and *P. fraternus* (Wraber 119, BM!).

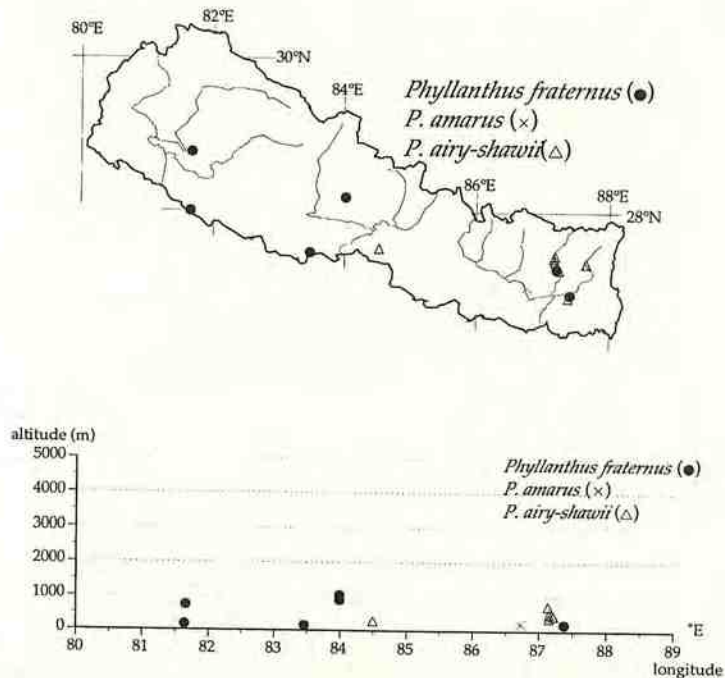


Fig. 14. Distribution of *Phyllanthus amarus* Schumach. & Thonn., *P. fraternus* G. L. Webster, and *P. airy-shawii* Brunel & J. P. Roux in Nepal.

**16. *Phyllanthus fraternus*** G. L. Webster — Fig. 14.

*Phyllanthus fraternus* G. L. Webster, Contr. Gray Herb. 176: 53 (1955); Mitra & Jain, Bull. Bot. Surv. India 27: 172 (1985); Siwakoti & Varma, Pl. Divers. E. Nepal: 331 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1288 (2000). — *Phyllanthus niruri* L. var. *scabrellus* Müll. Arg., Linnaea 32: 43 (1863); Müll. Arg. in DC., Prodr. 15(2): 406 (1866). — Type: *Thomas Thomson*, Oct. 1846 (holo K!), India, Panjab, Tummooohat, Ravee-Chenab Doeb.

[*Phyllanthus lonphali* Wall., Numer. List: 273, no. 7895C (1847), nom. nud.]

*Phyllanthus niruri* auct. non L., Sp. Pl.: 981 (1753); Hook. f., Fl. Brit. India 5: 298 (1887), p. p.

*Phyllanthus amarus* auct. non Schum., Beskr. Guin. Pl.: 421 (1827); Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982), p. p.

*Phyllanthus debilis* auct. non Klein ex Willd., Sp. Pl. 4: 582 (1805); T. Kuros., Newslett. Himal. Bot. no. 22: 17 (1998).

Annual monoecious herb. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Stem* erect, glabrous, 9–42 cm long. *Branchlets* 3–8 cm long, glabrous or serrulate on ridges. *Cataphylls* triangular, ca. 0.8 by ca. 0.6 mm. *Normal leaves* alternate, 12–24 per branchlet; stipules lanceolate, ca. 1 by ca. 0.2 mm, apex acuminate; petiole 0.3–0.4 mm long; blade narrowly elliptic or elliptic, 0.5–1 by 0.2–0.5 cm, base acute, obtuse or rounded, apex obtuse or rounded, margin entire, midrib raised beneath, both surfaces glabrous. *Cymules* axillary. *Staminate flowers* 0–3 per cymule; pedicel 0.3–0.5 mm long; sepals 6, orbicular or widely elliptic, ca. 0.5 mm long, glabrous, apex rounded, margin obscurely toothed or entire; disc not seen; stamens 3; filaments connate into a short column; anthers dehiscing horizontally. *Pistillate flowers* 0 or 1 per cymule; sepals 6, narrowly obovate, unequal, 0.7–1.3 by 0.3–0.7 mm, glabrous, apex rounded or obtuse, margin entire; disc annular, deeply lobed; ovary 3-carpellate, glabrous, smooth; styles 3, ca. 0.05 mm long, bifid. *Fruits*: pedicel 1–1.5 mm long; capsule depressed-globose, ca. 1.8 mm in diam., smooth; columella persistent after dehiscence, ca. 0.6 mm long. *Seeds* sharply trigonous, 0.9–1 mm long, 0.7–0.8 mm radially, 0.7–0.8 mm tangentially, with 6 longitudinal ridges on the back, with 4 or 5 semicircular ridges on the side, brown.

*Distribution* — Pakistan, India, Nepal (Webster 1955, Mitra & Jain 1985, Govaerts et al. 2000). Introduced into tropical Africa and America (Webster 1955, 1970, Govaerts et al. 2000). *Deccan element*. In Nepal: Mid Western, Western, Eastern.

*Habitat & Ecology* — Altitude 150–1050 m. On moist and open place or crop fields. Common in eastern plains (Siwakoti & Varma 1999). Flowers and fruits from July to December.

*Uses* — Plant is medicinally used for de-obstruent, diuretic, astringent and cooling, and in jaundice and genito-urinary infection (Siwakoti & Varma 1999).

*Notes* — This species often have been misidentified as *P. amarus* or *P. debilis* in both herbarium sheets and publications on Nepalese flora (see notes under those species).

**17. *Phyllanthus airy-shawii*** Brunel & J. P. Roux — Fig. 14.

*Phyllanthus airy-shawii* Brunel & J. P. Roux, Nordic J. Bot. 4: 470 (1984); Mitra & Nayar, Taxon 37: 470 (1988); Siwakoti & Varma, Pl. Divers. E. Nepal: 330 (1999);



Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1265 (2000). — Type: *Roux 81-36* (holo AAU n. v.; iso P, K, STR n. v.), Thailand, near Chiang Dao Caves.

*Phyllanthus debilis* Hook. f., Fl. Brit. India 5: 299 (1887), non Klein ex Willd., Sp. Pl. 4: 582 (1805); Long in Fl. Bhutan 1: 772 (1987); Siwakoti & Varma, J. Econ. Taxon. Bot. 18: 497 (1994). — Lectotype designated by Mitra & Nayar (1988): *Hamilton s. n.*, 5 July 1811, Wallich, List no. 7892A, p. p. (K-WALL! right hand top), India, Bihar, Mungger.

*Phyllanthus amarus* auct. non Schum., Beskr. Guin. Pl.: 421 (1827): Short & Vickery in Enum. Flow. Pl. Nepal 3: 198 (1982), p. p.

Annual or perennial herb or subshrub. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Stem* 19–66 cm long. *Cataphylls* lanceolate, ca. 2 by ca. 0.3 mm, apex acuminate, margin entire. *Normal leaves* alternate; stipules lanceolate, ca. 2 by ca. 0.3 mm, apex acuminate, margin entire; petiole 0.6–1 mm long; blade widely elliptic, 1–1.8 by 0.7–0.9 cm, base cuneate, apex obtuse, margin entire, both surfaces glabrous. *Staminate flowers*: pedicel ca. 1 mm; disc not seen; sepals 6, widely elliptic, 0.8–1 by 0.6–0.8 mm, apex rounded; stamens 3; filaments connate into a short column. *Pistillate flowers*: sepals 6, elliptic, ca. 2 by ca. 1.3 mm, apex rounded; disc annular, deeply lobed; styles 3, ca. 0.4 mm long, bifid. *Fruits*: pedicel 2.5–3 mm long; capsule depressed-globose, ca. 2.2 mm in diam., ca. 1.5 mm long, smooth; columella persistent after dehiscence, ca. 1 mm long. *Seeds* trigonous, ca. 1.2 mm long, ca. 0.9 mm radially, ca. 0.9 mm tangentially, longitudinally rugose.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Bangladesh, Burma, Thailand (Brunel & Roux 1984, Mitra & Nayar 1988, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 400–750 m. In *Shorea robusta* forests or on forest margin. Occasional in eastern plains (Siwakoti & Varma 1994 as *P. debilis*, 1999). Flowers & fruits from August to January.

Notes — This species also often have been misidentified in either herbarium sheets or publications on Nepalese flora as *P. amarus* or *P. debilis* (see notes under those species). I treated this species as "*Phyllanthus* (subg. *Phyllanthus*) sp." in my previous paper (Kurosawa 1998).

It is needed to compare this species with a less known species from Bengal, *P. pendulus* Roxb.

### 5. *Sauropus* Blume

*Sauropus* Blume, Bijdr.: 595 (1826). — Lectotype species designated by G. L. Webster, Ann. Missouri Bot. Gard. 81: 46 (1994): *Sauropus albicans* Blume

#### Key to the species

- A. Leaf blades 1–2.8 by 0.6–1.7 cm; staminate pedicels 1.5–3 mm long; capsules ca. 6 mm in diam., pedicel ca. 4 mm long ..... **1. *S. quadrangularis*** (Willd.) Müll. Arg.  
 A. Leaf blades 3.7–8 by 1–3.8 cm; staminate pedicels 8–9 mm long; capsules ca. 11 mm in diam., pedicel 1.8–2.1 mm long ..... **2. *S. androgynus*** (L.) Merr.

**1. *Sauropus quadrangularis* (Willd.) Müll. Arg. — Fig. 15.**

*Sauropus quadrangularis* (Willd.) Müll. Arg., *Linnaea* 32: 73 (1863); Müll. Arg. in DC. Prodr. 15(2): 242 (1866); Kurz, *Forest Fl. Burma* 2: 350 (1877); D. G. Long in *Fl. Bhutan* 1: 783 (1987); Philcox in *Rev. Handb. Fl. Ceylon* 13: 107 (1999); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1439 (2000); Manandhar, *Pl. People Nepal*: 414 (2002). — *Phyllanthus quadrangularis* Willd., *Sp. Pl.* 4: 585 (1805). — *Aalius quadrangularis* (Willd.) Kuntze, *Revis. Gen. Pl.* 2: 591 (1891). — Type: (n. v.), in India orientali.

*Phyllanthus rhamnoides* Roxb., *Fl. Ind. ed.* 1832, 3: 663 (1832). — *Ceratogynum rhamnoides* (Roxb.) Wight, *Icon. Pl. Ind. Orient.* 5(2): 26 (1852). — Type: (n. v.), on the coast of Coromandel.

[*Phyllanthus myrtillus* Wall., *Numer. List*: 273, no. 7892A p. p. (1847), nom. nud.]

*Phyllanthus leschenaultii* Müll. Arg. var. *tenellus* Müll. Arg., *Linnaea* 32: 38 (1863). — Type: *Wallich, List no. 7892B* p. p., as "7982B" (G-DC (IDC microfiche in TI) n. v.), in India orientali.

*Sauropus ceratogynum* Baill. [*Étude Euphorb.*: 635 (1858), nom. nud.] ex Müll. Arg. in DC., *Prodr.* 15(2): 243 (1866). — *Aalius ceratogynum* (Baill. ex Müll. Arg.) Kuntze, *Revis. Gen. Pl.* 2: 591 (1891). — Type: *Wight* (herb. Hook. n. v.); *Wallich, List no. 7892A* p. p. (K-WALL (IDC microfiche in TI) n. v.); *Wallich, List no. 7892B* p. p. (G-DC (IDC microfiche in TI) n. v.; K-WALL (IDC microfiche in TI) n. v.); *Wallich, List no. 7892D* p. p. (K-WALL (IDC microfiche in TI) n. v.); *Wallich, List no. 7909* p. p. (K-WALL (IDC microfiche in TI) n. v.).

*Sauropus compressus* Müll. Arg. in DC. *Prodr.* 15(2): 243 (1866); Kurz, *Forest Fl. Burma* 2: 350 (1877); Hook. f., *Fl. Brit. India* 5: 336 (1887); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 182 (1966); Murata, *Acta Phytotax. Geobot.* 25: 115 (1973); P. T. Li, *Fl. Reipubl. Pop. Sin.* 44(1): 173 (1994). — *Aalius compressa* (Müll. Arg.) Kuntze, *Revis. Gen. Pl.* 2: 591 (1891). — *Sauropus quadrangularis* (Willd.) Müll. Arg. var. *compressus* (Müll. Arg.) Airy Shaw, *Kew Bull.* 26: 337 (1972); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 199 (1982); D. G. Long in *Fl. Bhutan* 1: 783 (1987); T. Kuros., *Newslett. Himal. Bot.* no. 22: 18 (1998). — Type: *J. D. Hook. Saurop.* 8 (holo G-DC (IDC microfiche in TI) n. v.), in Indiae orient. prov. Sikkim.

*Sauropus quadrangularis* (Willd.) Müll. Arg. var. *puberulus* Kurz, *Forest Fl. Burma* 2: 350 (1877); D. G. Long in *Fl. Bhutan* 1: 783 (1987); Siwakoti & Varma, *Pl. Divers. E. Nepal*: 334 (1999), "*pubescens*." — Type: (n. v.), Burma.

*Sauropus pubescens* Hook. f., *Fl. Brit. India* 5: 335 (1887); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 182 (1966). — *Aalius pubescens* (Hook. f.) Kuntze, *Revis. Gen. Pl.* 2: 591 (1891). — Type: *Hamilton*, [17 June 1810], *Wallich, List no. 7909* (K-WALL n. v.; iso E!), *Morung*; *Clarke* [11650, 27 May 1870] (K!), Siligoree, at the foot of the Sikkim Hills.

Monoecious subshrub or shrub, 0.5–1.8 m high, stem diameter 3 cm. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes), narrowly winged. *Deciduous branchlets* 3–17.5 cm, glabrous or pubescent. *Cataphylls* alternate, triangular or narrowly triangular, 1.5–2.5 by ca. 1 mm, apex acuminate. *Normal leaves* alternate, 8–21 per branchlet; stipules persistent, free, lanceolate, 1.5–2 by ca. 0.8 mm, apex acuminate, margin entire; petiole 0.6–1.5 mm long; blade elliptic or ovate, 1–2.8 by 0.6



–1.7 cm, base obtuse or cuneate, apex rounded, obtuse or acute, margin entire, both surfaces glabrous or pubescent, midrib and secondary veins raised beneath, secondary veins 4 or 5 pairs. *Staminate flowers* 1 or 2 per cymule; pedicel 1.5–3 mm long; sepals connate into a disc with 6 lobes, disc circular, 3–4 mm in diam.; stamens 3; anthers sessile, connate into a column of ca. 0.3 mm long. *Pistillate flowers* 1 per cymule; pedicel ca. 2.5 mm long; calyx ca. 5 mm diameter; calyx lobes 6, depressed ovate or depressed obovate, 1.8–2 by ca. 2.5 mm, glabrous or pubescent, apex rounded, margin entire; ovary transversely ellipsoid, glabrous, smooth; styles 3, free, bifid, 0.8–1.2 mm long, borne on 0.3 mm from the top of ovary. *Fruits*: pedicel ca. 4 mm long; calyx persistent, 7–8 mm diam.; capsule spheroidal or tranversely ellipsoid, ca. 4 mm long, ca. 6 mm in diam., glabrous, smooth; styles persistent, borne separately. *Seeds* trigonous, 4–4.5 mm long, 2.2–2.5 mm wide, 2.5 mm tangentially, smooth.

**Distribution** — India (Assam, Sikkim), Nepal, Bhutan, Burma, Cambodia, Thailand, Vietnam, China (South-central, Southeast, Tibet-Qinghai) (Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central, Eastern.

**Habitat & Ecology** — Altitude 220–2200 m. On roadsides, riversides or rocky cliffs or *Shorea robusta* forests. Common in eastern plains (Siwakoti & Varma 1999). Flowers from May to October; fruits from June to October.

**Vernacular name** — Nepali: *pyaunli* (Manandhar 2002).

**Uses** — Smoke of dried leaf is medicinally used for tonsillitis (Manandhar 2002).

**Notes** — *Sauropus quadrangularis* is surprisingly similar to *Breynia retusa* in such vegetative characters as size and shape of leaves, and reproductive characters as size and shape of capsule and calyx (Long 1987). The latter differs from the former in obconical staminate flowers and styles borne not separately.

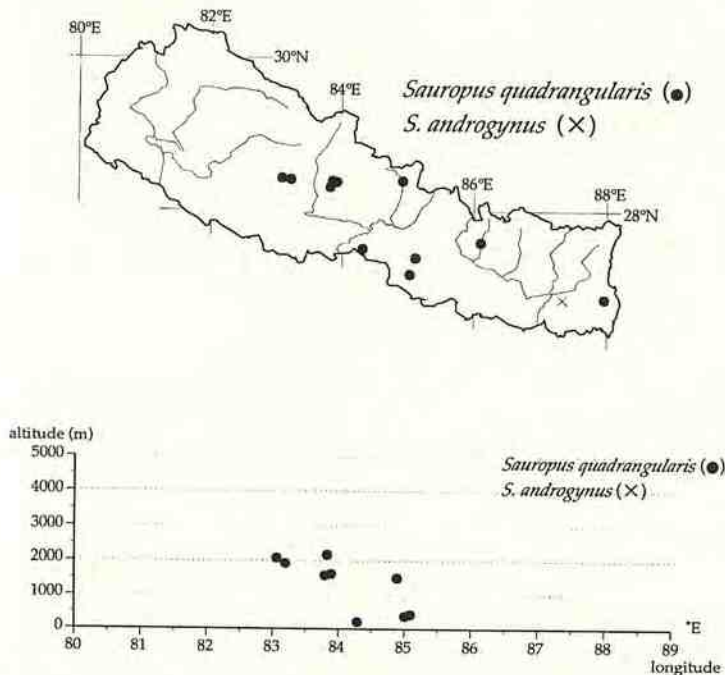


Fig. 15. Distribution of *Sauropus quadrangularis* (Willd.) Müll. Arg. and *S. androgynus* (L.) Merr. in Nepal.

**2. *Sauropus androgynus* (L.) Merr. — Fig. 15.**

*Sauropus androgynus* (L.) Merr., Bull. Bur. Forest. Philipp. Islands 1: 30 (1903); Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); D. G. Long in Fl. Bhutan 1: 783 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 175, t. 49, f. 8–11 (1994); Philcox in Rev. Handb. Fl. Ceylon 13: 102 (1999); T. Kuros., Newslett. Himal. Bot. no. 22: 18 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1434 (2000). — *Clutia androgyna* L., Mant. Pl.: 128 (1767). — *Aalius androgyna* (L.) Kuntze, Revis. Gen. Pl. 2: 591 (1891). — Type: (n. v.), India. *Phyllanthus acidissimus* Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 22 (1790). [*Phyllanthus speciosus* Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 22 (1790), nom. nud.].

*Agyneia ovata* Poir. in Lamarck, Encycl., Suppl. 1: 243 (1810).

*Sauropus albicans* Blume, Bijdr.: 596 (1826); Baill., Étude Euphorb.: 635 (1858); Kurz, Forest Fl. Burma 2: 349 (1877); Müll. Arg., Linnaea 32: 72 (1863); Müll. Arg. in DC. Prodr. 15(2): 240 (1866); Hook. f., Fl. Brit. India 5: 332 (1887). — [*Sauropus albicans* Blume var. *genuinus* Müll. Arg. in DC. Prodr. 15(2): 241 (1866), nom. inval.] — Type: (n. v.), in montains Provinciarum Buitenzorg, Bantam, Tjanjor etc. (Java).

*Phyllanthus strictus* Roxb., Fl. Ind. ed. 1832, 3: 670 (1832). — Type: [*R. Roxb. (Herb. Forsyth) s. n.*] (K!), [East India].

*Sauropus gardnerianus* Wight, Icon. Pl. Ind. Orient. 6: 6, t. 1951-2 (1853), "*gardneriana*." — *Sauropus albicans* Blume var. *gardnerianus* (Wight) Müll. Arg., Linnaea 32: 72 (1863); Müll. Arg. in DC., Prodr. 15(2): 241 (1866). — Type: *Gardner 742* (n. v.), Ceylon, Hautane.

*Sauropus indicus* Wight, Icon. Pl. Ind. Orient. 6: 6, t. 1952-2 (1853), "*indica*." — Type: (n. v.), Courtallum and Shevagherry Hills.

*Sauropus zeylanicus* Wight, Icon. Pl. Ind. Orient. 6: 6, t. 1952 (1853), "*zeylanica*." — *Sauropus albicans* Blume var. *zeylanicus* (Wight) Müll. Arg. in DC. Prodr. 15(2): 241 (1866). — Type: *Wight* (n. v.), Ceylon.

*Sauropus sumatranus* Miq., Fl. Ned. Ind., Eerste Bijv.: 179, 446 (1861). — *Aalius sumatrana* (Miq.) Kuntze, Revis. Gen. Pl. 2: 591 (1891). — Type: (n. v.), Sumatra orient, in prov. Palembang; (n. v.), in Sumatra austr. prov. Lampong, ad Pager-dewok.

*Sauropus albicans* Blume var. *intermedius* Müll. Arg., Linnaea 32: 72 (1863); Müll. Arg. in DC., Prodr. 15(2): 241 (1866). — Type: *Wallich absq. n.* [273?] (G-DC (IDC microfiche in TI) n. v.), in India orientali prope Prome.

*Sauropus macranthus* Rern.-Vill. in Blanco, Fl. Filip. ed. 3, 4(13A); 187 (1880), non Hassk., Retzia 1: 166 (1855).

*Sauropus scandens* C. B. Rob., Philipp. J. Sci., C 4: 72 (1909). — Type: *For. Bur. 1934 Borden* (n. v.), Luzon, Province of Bataan, Mount Mariveles, Lamao River.

*Sauropus parviflorus* Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, XV: 218 (1922).

Monoecious shrub. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 28–47 cm, glabrous. *Cataphylls* alternate, triangular or deltate, 1.5–2 by 1.5 mm, apex acuminate. *Normal leaves* alternate, 20–32 per branchlet, glabrous; stipules persistent, free, lanceolate, 1.8–2 by 0.6–0.9 mm, apex acuminate, margin entire; petiole 1.5–2.5 mm long; blade ovate, 3.7–8 by 1–3.8 cm, base obtuse, apex obtuse, margin entire, midrib and secondary veins raised beneath, secondary veins



6–8 pairs. *Staminate flowers*; pedicel 8–9 mm long; sepals connate into a disc, ca. 4 mm in diam.; stamens 3; anthers sessile. *Pistillate flowers* 1 per cymule; pedicel 1.2–1.5 mm long; calyx ca. 6 mm in diam.; calyx lobes 6, arranged 2 rows, outer lobes obovate, ca. 2 by ca. 2.5 mm, apex rounded, margin entire, inner lobes circular or transversely elloptic, 1–2 by 1.5–2 mm, margin entire; styles 3, bifid, ca. 1.5 mm long. *Fruits*: pedicel 1.8–2.1 mm long; calyx persistent, 8–9 mm in diam.; capsule spheroidal, ca. 9 mm long, ca. 11 mm in diam. *Seeds* not seen.

Distribution — Sri Lanka, India, Nepal, Indo-China, China (South-central, Hainan, Southeast), Cambodia, Laos, Thailand, Vietnam, Malaya, Sumatra, Borneo, Jawa, Lesser Sunda Isl., Molucca, Sulawesi, New Guinea, Philippines (Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 450–900 m (Short & Vickery 1982, as 4500–900 m). Flowers & fruits in October.

### 6. *Breynia* J. R. & G. Forst.

*Breynia* J. R. & G. Forst., Char. Gen. Pl.: 145 (1776), nom. cons. — Type species: *Breynia disticha* J. R. Forst. & G. Forst.

#### Key to the species

- A. Fruits capsular, ca. 7 mm in diameter, calyx conspicuous, 9–11 mm in diameter, pedicel 3–5 mm long; leaf blades 1.5–2.5 cm long, petioles 1.5–2.2 mm long  
..... **1. *B. retusa*** (Dennst.) Alston
- A. Fruits baccate, 5–6 mm in diameter, calyx 2.5–3 mm in diameter, pedicel 2.5–4 mm long; leaf blades 2.1–3.7 cm long, petioles 2–4 mm long  
..... **2. *B. vitis-idaea*** (Burm. f.) C.E.C. Fisch.

#### 1. *Breynia retusa* (Dennst.) Alston — Fig. 16.

*Breynia retusa* (Dennst.) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 204 (1929); Alston in Trimen, Handb. Fl. Ceylon 6: 261 (1931); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 782 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 181, t. 54, f. 1–4 (1994); Philcox in Rev. Handb. Fl. Ceylon 11: 240 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 18 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 282 (2000); van Welzen & Esser, Thai Forest Bull., Bot. 28: 76 (2000); Manandhar, Pl. People Nepal: 121 (2002). — *Phyllanthus retusus* Dennst., Schlüssel Hortus Malab.: 31 (1818). — *Melanthesa retusa* (Dennst.) Kostel., Allg. Med.-Pharm. Fl. 5: 1771 (1836). — *Melanthesopsis variabilis* Müll. Arg. var. *arborea* Müll. Arg., Linnaea 32: 75 (1863), nom. illeg.

*Phyllanthus pomaceus* Moon, Cat. Pl. Ceylon: 65 (1824). — *Melanthesopsis variabilis* Müll. Arg. var. *oblongifolius* Müll. Arg., Linnaea 32: 75 (1863), nom. illeg. — *Melanthesopsis patens* Roxb. var. *oblongifolia* Müll. Arg. in DC., Prodr. 15(2): 437 (1866).

*Phyllanthus patens* Roxb., Fl. Ind. ed. 1832, 3: 667 (1832); Wall., Numer. List: 273, no. 7911A (1847). — *Melanthesopsis variabilis* Müll. Arg. var. *patens* (Roxb.) Müll. Arg., Linnaea 32: 75 (1863), nom. illeg. — *Melanthesopsis patens* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 437 (1866); Kurz, Forest Fl. Burma 2: 348 (1877). —



[*Melanthesopsis patens* (Roxb.) Müll. Arg. var. *gemina* Müll. Arg. in DC. Prodr. 15(2): 438 (1866), nom. inval.] — *Breynia patens* (Roxb.) Rolfe, J. Bot. 20: 359 (1882); Hook. f., Fl. Brit. India 5: 329 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910). — Type: [R: Roxb. (*Herb. Forsyth*) s. n.] (K!), the Botanic garden (Calcutta), native of Chittagong [East India].

*Phyllanthus turbinatus* Roxb., Fl. Ind. ed. 1832, 3: 666 (1832), non Sims, Bot. Mag. 44: t. 1862 (1817). — *Melanthesa turbinata* (Roxb.) Oken, Allig., Naturgesch. 3(3): 1603 (1841). — *Melanthesopsis variabilis* Müll. Arg., Linnaea 32: 75 (1863), nom. illeg. — [*Melanthesopsis variabilis* Müll. Arg. var. *vulgaris* Müll. Arg., Linnaea 32: 75 (1863), nom. inval.] — *Melanthesopsis patens* Roxb. var. *turbinata* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 437 (1866). — *Melanthesopsis patens* Roxb. var. *vulgaris* Müll. Arg. in DC., Prodr. 15(2): 438 (1866), nom. illeg. — *Breynia turbinata* (Roxb.) Cordem., Fl. Réunion: 348 (1895). — Type: (n. v.), the mountains of Orissa.

[*Phyllanthus suffultus* Wall., Numer. List: 274, no. 7939A (1847), nom. nud.]

*Melanthesa obliqua* Wight, Icon. Pl. Ind. Orient. 5(2): 26, t. 1898 (1852). — Type: not designated.

*Breynia angustifolia* Hook. f., Fl. Brit. India 5: 330 (1887). — *Breynia microphylla* (Kurz ex Teijsm. & Binn.) Müll. Arg. var. *angustifolia* (Hook. f.) Airy Shaw, Kew Bull. 36: 272 (1981). — Type: *M'Lelland* [s. n.] (K!), Pegu, at Rangoon; *Griffith* [949] (K!), Tenasserim, at Mergui; *Parish* [260, in 1839] (K!), Tenasserim, Moulmein; *King's Collector* [3949, Mar. 1883] (K!, with an annotation as lectotype by Esser; K!, with an annotation as isolectotype by Esser), Perak.

Monoecious shrub, 1–1.5 m high, stem diameter ca. 2 cm. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 12–19 cm, glabrous. *Cataphylls* alternate, triangular, 1.4–2 by ca. 1 mm, apex acute or acuminate. *Normal leaves* alternate, 10–25 per branchlet, glabrous; stipules persistent, free, triangular, 1.3–2 by 0.6–1 mm, apex acuminate, margin entire; petiole 1.5–2.2 mm long; blade elliptic or ovate, 1.5–2.5 by 1–1.5 cm, base obtuse, apex acute or obtuse, margin entire, midrib and secondary veins raised beneath, secondary veins 3 or 4 pairs. *Staminate flowers* obconic, 1 or 2 per cymule, 2.5–3 mm long, 2.8–3 mm in diam., glabrous; pedicel 4–5 mm long; calyx lobes 6, semicircular, entire, 0.3–1 by 0.7–1.2 mm; stamens 3, connate into a cone of ca. 2 mm long, ca. 0.8 mm in diam.; anthers elliptic, ca. 1 mm long, sessile, with appendage on the top. *Pistillate flowers* 1 per cymule; sepals 6, glabrous, margin entire; ovary 3-carpellate, spheroidal; styles bifid, free, ca. 0.5 mm long. *Fruits*: pedicel 3–5 mm long; calyx persistent, 9–11 mm diameter, lobes circular or depressed obovate, 2–3 by 4–4.5 mm; capsule depressed globose, ca. 4.5 mm long, ca. 7 mm in diam. *Seeds* trigonous, ca. 4 mm long, ca. 2.3 mm wide, ca. 2.1 mm tangentially, smooth.

Distribution — Réunion, Sri Lanka, India, Nepal, Bhutan, Burma, Thailand, Vietnam, Malaysia (Peninsular), China (South-central, Southeast, Tibet-Qinghai) (Govaerts et al. 2000; van Welzen et al. 2000). *S Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 1000–1500 m. In roadside scrubs. Flowers from June to July; fruits from July to August.

Vernacular name — Nepali: *sano nundhiki* (Manandhar 2002).

Uses — Juice of bark is medicinally used for indigestion, and pase of leaf is



medicinally applied to cuts and wounds (Manandnar 2002).

Notes — This species has very similar leaves and fruits to *Sauropus quadrangularis* (Long 1987). See note under the latter species for the difference between them.

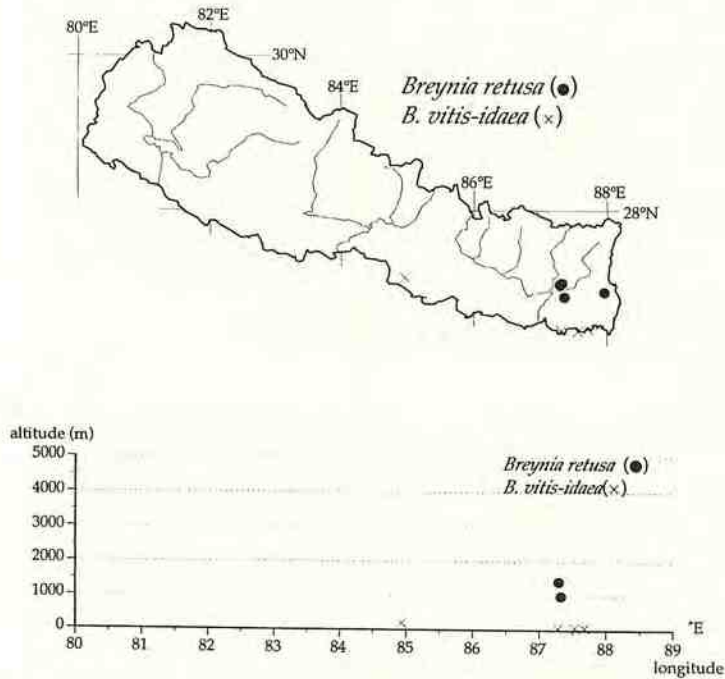


Fig. 16. Distribution of *Breynia retusa* (Dennst.) Alston and *B. vitis-idaea* (Burm. f.) C.E.C. Fisch. in Nepal.

## 2. *Breynia vitis-idaea* (Burm. f.) C.E.C. Fisch. — Fig. 16.

*Breynia vitis-idaea* (Burm. f.) C. E. C. Fisch., Bull. Misc. Inform. Kew 1932: 65 (1932); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 179 (1994); Philcox in Rev. Handb. Fl. Ceylon 11: 238 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 18 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 283 (2000); Dressler & van Welzen, Thai Forest Bull., Bot. 28: 67 (2000); van Welzen & Esser, Thai Forest Bull., Bot. 28: 77 (2000). — *Rhamnus vitis-idaea* Burm. f., Fl. Ind.: 61 (1768). — *Phyllanthus rhamnoides* Retz., Observ. Bot. 5: 30 (1788); Willd., Sp. Pl. 4: 580 (1805), nom. illeg. — *Melanthesa rhamnoides* (Retz.) Blume, Bijdr.: 591 (1826), nom. illeg.; Wight, Icon. Pl. Ind. Orient. 5(2): 26, t. 1898 (1852); Müll. Arg., Linnæa 32: 73 (1863). — *Phyllanthus vitis-idaea* (Burm. f.) D. Koenig ex Roxb., Fl. Indica ed. 1832, 3: 665 (1832). — [*Breynia rhamnoides* (Retz.) Müll. Arg. var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 440 (1866), nom. inval.] — *Breynia rhamnoides* (Retz.) Müll. Arg. in DC., Prodr. 15(2): 440 (1866); Kurz, Forest Fl. Burma 2: 350 (1877), nom. illeg.; Hook. f., Fl. Brit. India 5: 330 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 175 (1966).

*Phyllanthus tristis* A. Juss., Euphorb. Gen.: 108, t. 5, f. 16 (1824).

*Melanthesa ovalifolia* Kostel., Allg. Med.-Pharm. Fl. 5: 1772 (1836).

[*Phyllanthus calycinus* Wall., Numer. List: 274, no. 7939B (1847), "*calycina*", nom. nud.]  
 [*Phyllanthus sepiarius* Roxb. ex Wall., Numer. List: 273, no. 7914A (1847), "*sepiaria*", nom. nud.]

[*Phyllanthus tinctorius* Vahl ex Baill., Étude Euphorb.: 633 (1858), nom. nud.]

*Breynia officinalis* Hemsl., J. Linn. Soc., Bot. 26: 427 (1894).

*Breynia accrescens* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 20(3): 22 (1904). — *Breynia officinalis* var. *accrescens* (Hayata) M. J. Deng & J. C. Wang in Fl. Taiwan, ed.2, 3: 430 (1993). — Type: *K. Miyake* [*s. n.*, 20 Nov.] 1899 (TI!), Formosa, Kotôshô (Taiwan); *T. Makino* [*s. n.*, 19 Nov.] 1896 (TI!), Formosa, Tamsui (Taiwan).

*Breynia stipitata* Müll. Arg. var. *formosana* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 20(3): 22 (1904). — Type: *T. Makino s. n.* (TI!), Formosa, Shintekku (Taiwan); [*unknown collector s. n.*] in 1896[?] (TI!), Formosa, Taipea[?] (Taiwan).

*Breynia keithii* Ridl., J. Straits Branch Roy. Asiat. Soc. 59: 174 (1911). — Type: [*H. N. R. (Ridley)*] 14888, [Jul. 1891?] (K!), with an annotation as lectotype by H. J. Esser), Lower Siam, Kedah, Alor Sta; 14887 (n. v.), Setul at Bukit Bunga.

*Breynia microcalyx* Ridl., J. Fed. Malay States Mus. 10: 114 (1920). — Type: 6547 (n. v.), Peninsular Siam, Koh Pipidon off Ghirbi.

Monoecious shrub, 3 m high. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Deciduous branchlets* 11–25 cm, glabrous. *Cataphylls* alternate, triangular, 2–3 by 2–2.2 mm, apex acuminate. *Normal leaves* alternate, 12–21 per branchlet, glabrous; stipules persistent, free, triangular, 1–1.5 by 0.6–1 mm, apex acuminate, margin entire; petiole 2–4 mm long; blade widely ovate or ovate, 2.1–3.7 by 1.6–3 cm, base obtuse or rounded, apex rounded or obtuse, margin entire, midrib and secondary veins raised beneath, secondary veins 4 or 5 pairs. *Staminate flowers*: pedicel 3–4 mm long; calyx 1–1.2 mm long, 1.2–1.3 mm in diam.; sepals not seen. *Pistillate flowers* 1 per cymule; pedicel 1.5–2.5 mm long; calyx cup shape, ca. 1 mm long, ca. 1.5 mm in diam.; calyx lobes 6, unequal, depressed ovate or widely ovate, 0.3–0.6 by 0.5–0.8 mm, margin entire; ovary 3-carpellate; styles connate, crown shape. *Fruits*: pedicel 2.5–4 mm long; bacca spheroidal, 4–4.5 mm long, 5–6 mm diameter; calyx persistent, 2.5–3 mm in diam.; calyx lobes 6, elatate or triangular, 0.5–1 by 0.4–0.6 mm. *Seeds* not seen.

Distribution — Pakistan, Sri Lanka, India, Nepal, Burma, Cambodia, Thailand, Vietnam, Malaya, Sumatera, Philippines, China (South-central, Southeast), Taiwan, Japan (Nansei-Shoto [Ryukyu]) (Philcox 1997, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude up to 240 m. Flowers from May to December; fruits from October to December.

### 7. *Glochidion* J. R. & G. Forst.

*Glochidion* J. R. & G. Forst., Char. Gen. Pl. 113, t. 57 (1776), nom. cons. — Type species: *Glochidion ramiflorum* J. R. & G. Forst.

Key to the species

(See also Table 6)

A. Styles flat, very short

B. Branchlets glabrous or pilose; leaf blades narrowly elliptic, lanceolate or



- oblanceolate, lower surface glabrous or pilose; pistillate flowers solitary in cymule, pedicel 2–4 mm long; capsules ca. 15 mm in diam., shallowly 6- or 7-lobed, pedicel 4–8 mm long, glabrous ..... **1. G. multiloculare** (Roxb. ex Willd.) Voigt
- B. Branchlets Branchlets villous; leaf blades elliptic or ovate, lower surface sparsely pubescent on veins; pistillate flowers 1–5 per cymule, pedicel 0.5–1 mm long; capsules 8–10 mm in diam., deeply 8–10-lobed, pedicel 3–4.5 mm long, villous ....  
..... **2. G. nubigenum** Hook. f.
- A. Styles connate into a column, 0.6–2.5 mm long
- B. Lower surface of leaf blades glaucous; pistillate flowers 10 or more per cymule; capsule ca. 6 mm in diam. .... **3. G. triandrum** (Blanco) C. B. Rob.
- B. Lower surface of leaf blades green or pale green; pistillate flowers 1–10 per cymule; capsule 7–17 mm in diam.
- C. Lower surface of leaves pubescent at least on veins when young; styler columns 0.6–1.5 mm long; capsules 7–10 mm in diam., hairy
- D. Branchlets densely tomentose; leaf blades ovate, both surfaces pubescent especially on veins, petiole tomentose; pedicel of staminate flowers pubescent; pedicel of pistillate flowers 1–2 mm long; capsule 8–10-lobed, 9–10 mm in diam., tomentose ..... **4. G. heyneanum** (Wight & Arn.) Wight
- D. Branchlets sparsely pubescent or glabrate; leaf blades elliptic, upper surface glabrous, lower surface sparsely pubescent on veins when young, often glabrate when mature, petiole puberulous or glabrate; pedicel of staminate flowers glabrous; pistillate flowers subsessile; capsule unlobed or very shallowly 3–4-lobed, 7–8 mm in diam., puberulous ..... **5. G. ellipticum** Wight
- C. Lower surface of leaves glabrous; styler columns 2–2.5 mm long; capsules 14–17 mm in diam., glabrous
- D. Leaf blades elliptic, petiole 5–7 mm long; sepals of staminate flower 3.5–5 mm long, staminate columns ca. 1.5 mm long; pedicels of capsule 4–5 mm long, glabrous ..... **6. G. lanceolarium** (Roxb.) Voigt
- D. Leaf blades lanceolate, petiole 2–3 mm long; sepals of staminate flower 1.8–2.4 mm long; staminate columns ca. 1 mm long; pedicels of capsule 2.5–3 mm long, tomentose ..... **7. G. daltonii** (Müll. Arg.) Kurz

**1. *Glochidion multiloculare*** (Roxb. ex Willd.) Voigt — Fig. 17.

*Glochidion multiloculare* (Roxb. ex Willd.) Voigt, Hort. Suburb. Calcutt.: 152 (1845); Müll. Arg., *Linnaea* 32: 59 (1863); Kurz, *Forest Fl. Burma* 2: 343 (1877); Hook. f., *Fl. Brit. India* 5: 307 (1887); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 178 (1966); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 197 (1982); D. G. Long in *Fl. Bhutan* 1: 778 (1987); Chakrab. & M. G. Gangop., *J. Econ. Taxon. Bot.* 19: 217 (1995); T. Kuros., *Newslett. Himal. Bot.* no. 22: 19 (1998); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 957 (2000). — *Agyneia multilocularis* Roxb. ex Willd., *Ges. Naturf. Freunde Berlin Neue Schriften* 4: 206 (1803). — *Bradleia multiloculare* (Roxb. ex Willd.) Spreng., *Syst. Veg.* 3: 19 (1826); Roxb., *Fl. Ind. ed. 1832*, 3: 696 (1832); Wall., *Numer. List*: 272, no. 7864 (1847), "*multilocularis*." — *Phyllanthus multilocularis* (Roxb. ex Willd.) Müll. Arg., *Flora* 48: 370 (1865); Müll. Arg. in *DC., Prodr.* 15(2): 279 (1866). — Type: *Roxburgh s. n.* (B-WILLD (fide Chakrabarty & Gangopadhyay 1995) n. v.),

TABLE 6. Comparison of characters of Nepalese *Glochidion* species

	<i>G. multiloculare</i>	<i>G. nubigenum</i>	<i>G. triandrum</i>	<i>G. heyneanum</i>	<i>G. ellipticum</i>	<i>G. lanceolarium</i>	<i>G. daltonii</i>
Blanchlet	glabrous or pilose	villous	pubescent	densely tomentose	sparsely pubescent or glabrate	glabrous	glabrous or villous
Leaf blade shape	narrowly elliptic, lanceolate or oblanceolate	elliptic or ovate	lanceolate	ovate	elliptic	elliptic	lanceolate
size (mm)		6–12 × 3–5	8.5–13.5 × 2.5–4	6–10.5 × 3.5–5	6.5–17.5 × 3–7.2	7.5–16 × 4–7.5	6.5–12 × 2–3.5
upper surface	4.5–16 × 1.5–5 glabrous	glabrous or sparsely pubescent	sparsely strigose	pubescent especially on veins	glabrous	glabrous	glabrous
lower surface		sparsely pubescent	pubescent and glaucous	pubescent especially on veins	sparsely pubescent on veins or glabrate	glabrous	glabrous
Petiole length (mm)	glabrous or pilose	3–5	2–4	2.5–5	2–4	5–7	2–3
surface	2–3	villous or glabrous	pubescent	tomentose	puberulous or glabrate	glabrous	glabrous
Staminate flower	glabrous or pilose	2.5–3 × 0.5–1.5	1.5–2.2 × 1–1.2	ca. 2 × ca. 1	1.7–2.2 × 0.7–1	3.5–5 × 1–1.4	1.8–2.4 × 0.8–1.4
sepal size (mm)	2–2.5 × 0.4–1	glabrous	pubescent	pubescent on midrib	glabrous	glabrous	glabrous
sepal outside pedicel (mm)	glabrous	5–11	5–7	6–9	5–10	10–12	7–12
pedicel surface	6–9	glabrous	pubescent	pubescent	glabrous	glabrous	glabrous
stamens	glabrous	3	(not seen)	(not seen)	3	(not seen)	3
column (mm)	3	ca. 1	(not seen)	(not seen)	1–1.2	ca. 1.5	ca. 1
Pistillate flower	ca. 1						
flower / cymule		1–5	10 or more	2–10	1–10	1–8	2–7
sepal size (mm)	1	1–1.5 × 0.2–1	0.6–1.5 × 0.4–0.6	1.5–2 × ca. 0.4	1–1.5 × 0.5–0.8	ca. 1.5 × ca. 1	1.3–2 × 0.5–1
ovary	2–2.5 × 1–1.8	4–5-carpellate	4–5-carpellate	4–5-carpellate	3–4-carpellate	4–5-carpellate	4–5-carpellate
style	5-carpellate	flat	connate into a column	connate into a column	connate into a column	connate into a column	connate into a column
style length (mm)	flat	very short	1–1.8	1–1.5	0.6–0.7	ca. 2	2–2.5
pedicel (mm)	very short	0.5–1	0.3–0.8	1–2	subsessile	ca. 1	ca. 0.5
Capsule lobes	2–4	deeply 8–10	deeply 2–5	8–10	unlobed or very shallowly 3 or 4	shallowly 8–10	unlobed
diameter (mm)	shallowly 6 or 7	8–10	ca. 6	9–10	7–8	14–17	ca. 14
surface	ca. 15	glabrous	glabrous	tomentose	puberulous	glabrous	glabrous
pedicel length (mm)	glabrous	3–4.5	6–9	7–9	3–9	4–5	2.5–3
pedicel surface	4–8	villous	pubescent	tomentose	puberulous	glabrous	tomentose
	glabrous						



*Roxburgh in Lambert 1816* (G-DC (fide Chakrabarty & Gangopadhyay 1995) n. v.),  
*Roxburgh in herb. Rottler s. n.* (K!), Bengal.

[*Bradleia pubera* Roxb. ex Wall., Numer. List: 272, no. 7870 (1847), nom. nud.]

Deciduous subshrub or shrub, 0.3–2 m high. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* glabrous or pilose. *Cataphylls* lanceolate, ca. 1.3 by ca. 0.4 mm, apex acuminate, glabrous. *Normal leaves* alternate; stipules free, triangular, 1.5–2.5 by 0.9–1.2 mm, apex acuminate, margin entire; petiole 2–3 mm long, glabrous or pilose; blade narrowly elliptic, lanceolate or oblanceolate, 4.5–16 by 1.5–5 cm, base cuneate, apex acute, obtuse or rounded, margin entire, upper surface glabrous, lower surface glabrous or pilose. *Cymules* axillary. *Staminate flowers* 1–6 per cymule; pedicel 6–9 mm long, glabrous; sepals 6, narrowly elliptic or elliptic, 2–2.5 by 0.4–1 mm, apex obtuse, both surfaces glabrous; stamens 3, connate into a column of ca. 1 mm long. *Pistillate flowers* 1 per cymule; pedicel 2–4 mm long, glabrous; sepals 6, ovate, 2–2.5 by 1–1.8 mm, glabrous, apex acute, margin entire; ovary 5-carpellate, depressed globose, 2.5 mm long, 3.5–4 mm in diam., glabrous, smooth; styles flat, obscure. Fruits: pedicel 4–8 mm long, glabrous; capsules shallowly 6 or 7-lobed, depressed-globose, ca. 5 mm long, ca. 15 mm in diam., glabrous, smooth; styles obscure. *Seeds* with aril, widely ovate, 4–4.6 mm long, ca. 4 mm wide, ca. 2 mm thick.

Distribution — India, Nepal, Bangladesh, Burma (North) (Govaerts et al. 2000).  
*Deccan element.* In Nepal: Central, Eastern.

Habitat & Ecology — Altitude up to 450 m. On river banks, in grasslands, or on margin of *Shorea robusta* forests. Flowers from August to January; fruits from December to January.

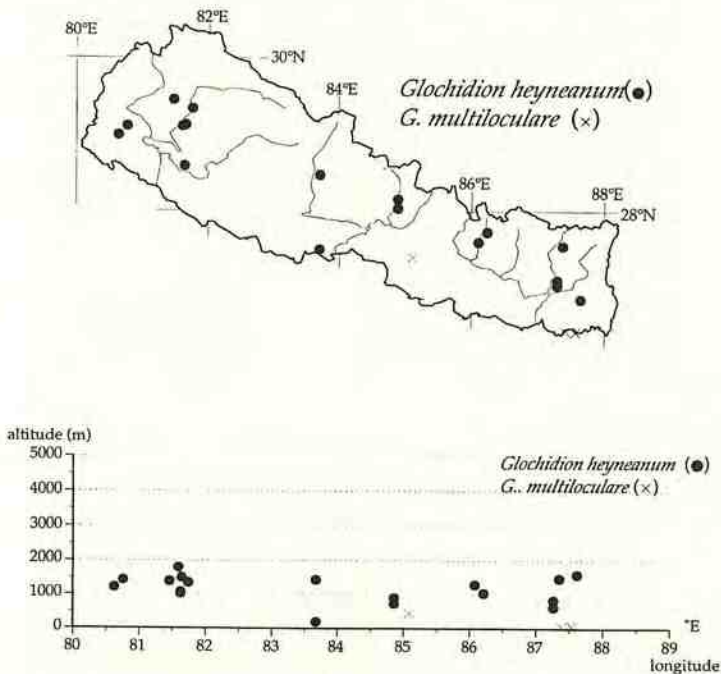


Fig. 17. Distribution of *Glochidion multiloculare* (Roxb. ex Willd.) Voigt. and *G. heyneanum* (Wight & Arn.) Wight in Nepal.

## 2. *Glochidion nubigenum* Hook. f. — Fig. 18.

*Glochidion nubigenum* Hook. f., Fl. Brit. India 5: 315 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 178 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); D. G. Long in Fl. Bhutan 1: 779 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 150 (1994); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 19: 219 (1995); T. Kuros., Newslett. Himal. Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 958 (2000); van Welzen, Thai Forest Bull., Bot. 28: 89 (2000). — *Glochidion velutinum* Wight var. *nubigenum* (Hook. f.) Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 14: 720 (1990). — Type: *J. D. Hooker* [*s. n.*] (K!), Sikkim Himalaya, [Lubong]; *Clarke* [25453A, 21 Oct. 1875] (K!), Sikkim Himalaya, [Lingcham]; *Clarke* [2730A & 2730B] (CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.), Sikkim Himalaya; [*C. B.*] *Clarke* [23087A, 12 June 1876] (K!), at Darjeeling, [7000 ft].

*Glochidion metanubigenum* Hurus. & Ya. Tanaka in Fl. E. Himal.: 177 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); T. Kuros., Newslett. Himal. Bot. no. 22: 19 (1998). — Type: [*H. Hara et al.* 6306761], 19 Nov. 1963 (holo T!), Nepal, Ghatte–Khebang, 1600–2400 m. See Kurosawa & Shimizu (2002) for a photograph of the holotype.

Deciduous monoecious shrub, 1.5 m high. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* villous. *Normal leaves* alternate; stipules free, narrowly triangular or triangular, 2–3.5 by 1–2.5 mm, hairy or glabrous, apex acuminate; petiole 3–5 mm long, villous or glabrous; blade elliptic or ovate, 6–12 by 3–5 cm, base obtuse or cuneate, apex acute or acuminate, margin entire, upper surface glabrous or sparsely pubescent, lower surface sparsely pubescent on veins. *Staminate cymules* axillary often of fallen leaves. *Staminate flowers* 1–11 per cymule; pedicel 5–11 mm long, glabrous; sepals 6, narrowly elliptic or obovate, 2.5–3 by 0.5–1.5 mm, margin entire, glabrous; disc absent; stamens 3; filaments short, connate into a column of ca. 1 mm long; anthers ca. 0.8 mm long, dehiscing vertically. *Pistillate cymules* axillary. *Pistillate flowers* 1–5 per cymule; pedicel 0.5–1 mm long, tomentose; sepals 6, unequal, ovate or widely ovate, ca. 1–1.5 by 0.2–1 mm, villous, apex acute or obtuse; ovary 4- or 5-carpellate, shallowly 4- or 5-lobed, glabrous; styles flat. *Fruits*: pedicel 3–4.5 mm long, villous; capsule depressed-globose, deeply 8–10-lobed, ca. 3 mm long, 8–10 mm in diam., glabrous, smooth; styles flat. *Seeds* with aril, widely ovate, ca. 4 mm long, ca. 3 mm wide.

Distribution — India (Assam, Sikkim), Nepal, Bhutan, Burma, Thailand (North) (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 1330–2120 m. In forests. Flowers in April or from November to December; fruits in November.

Notes — *Glochidion metanubigenum* was described from Eastern Nepal by Hurusawa & Tanaka (1966) based on its submembranaceous leaves and characters of staminate flower. Chakrabarty & Gangopadhyay (1995) and Govaerts et al. (2000), however, treated it as a synonym of *G. nubigenum*. I agree with the latter treatment because I could not distinguish them by leaf nor flower characters.



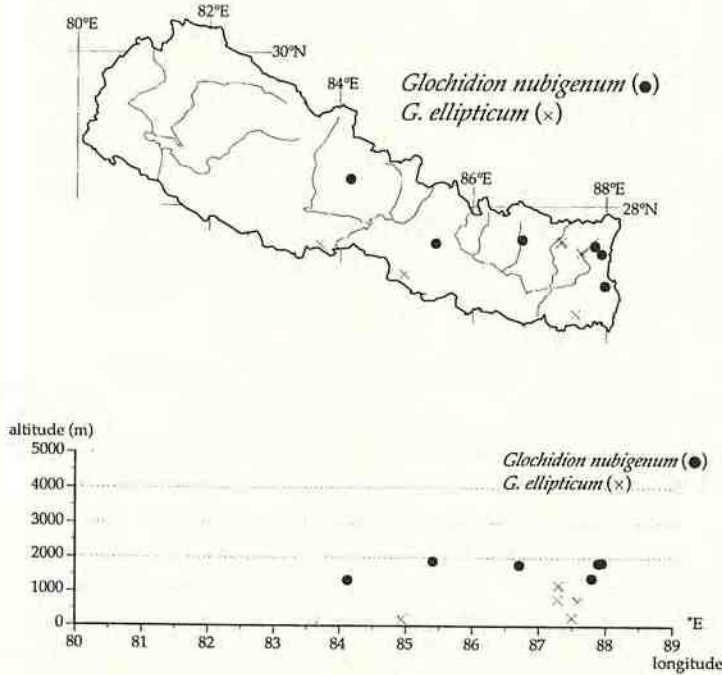


Fig. 18. Distribution of *Glochidion nubigenum* Hook. f. and *G. ellipticum* Wight in Nepal.

### 3. *Glochidion triandrum* (Blanco) C. B. Rob. — Plate 68.

*Glochidion triandrum* (Blanco) C. B. Rob., Philipp. J. Sci., C 4: 92 (1909); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 146, t. 44, f. 1–4 (1994); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 965 (2000). — *Kirganelia triandra* Blanco, Fl. Filip.: 711 (1837). — *Phyllanthus triandrus* (Blanco) Müll. Arg., Flora 48: 379 (1865); Müll. Arg. in DC., Prodr. 15(2): 299 (1866). — Type: not designated.

*Glochidion acuminatum* Müll. Arg., Linnaea 32: 68 (1863); Hook. f., Fl. Brit. India 5: 323 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982), p. p.; D. G. Long in Fl. Bhutan 1: 779 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 19 (1998); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 19: 181 (1995); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 940 (2000). — [*Bridelia acuminata* Wall., Numer. List: 273, no. 7885 (1847), nom. nud.] — *Phyllanthus bicolor* Müll. Arg., Flora 48: 389 (1865), nom. nov.; Müll. Arg. in DC. Prodr. 15(2): 311 (1866). — *Glochidion bicolor* (Müll. Arg.) Hayata, J. Coll. Sci. Imp. Univ. Tokyo 20(3): 18 (1904), nom. superfl. — Type: Wallich, List no. 7885 (G-DC (IDC microfiche in TI) n. v.; iso K!, K-WALL!, E!, BM!), in Nepalia Indiae orientalis (Nepal); J. D. Hooker (G-DC (IDC microfiche in TI) n. v.; iso K!), in Sikkim.

*Glochidion eleutherostylum* Müll. Arg., Linnaea 32: 69 (1863). — Type: *Cuming 509* (n. v.), in insulis Philippinis.

*Glochidion quinquestylum* Elmer, Leaflet Philipp. Bot. 1: 303 (1908). — Type: *A. D. E. Elmer 8916*, Mar. 1907 (holo †?; iso CAL (fide Datta et al. 1985) n. v.), Philippine, Luzon, Province of Benguet.

*Glochidion hypoleucum* Hayata, Icon. Pl. Formosan. 9: 95 (1920), non (Miq.) Boerl., Handl. Fl. Ned. Ind. 3: 275 (1900). — *Glochidion hayatae* Croizat & H. Hara, J. Jap.

Bot. 16: 316 (1940), nom. nov. — Type: *B. Hayata* s. n., [28] Apr. 1916 (holo TI!; iso TI!), Formosa, Holisha, Giochi (Taiwan).

Deciduous monoecious shrub. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* pubescent. *Normal leaves* alternate; petiole 2–4 mm long, pubescent; stipules free, narrowly triangular or lanceolate, ca. 2 by ca. 0.3 mm, pubescent, apex acuminate; blade lanceolate, 8.5–13.5 by 2.5–4 cm, base obtuse or acute, apex acuminate, margin entire, upper surface sparsely strigose, lower surface pubescent, glaucous. *Cymules* axillary. *Staminate flowers* 7–17 per cymule; sepals 6, unequal, elliptic, 1.5–2.2 by 1–1.2 mm, apex obtuse, outside pubescent; pedicel 5–7 mm long, pubescent. *Pistillate flowers* 10 or more per cymule; pedicel 0.3–0.8 mm long; sepals not seen, narrowly elliptic or lanceolate, 0.6–1.5 by 0.4–0.6 mm, apex obtuse or acute, outside tomentose; ovary 4- or 5-carpellate, tomentose; styles obscurely bifid, connate into a column of 1–1.8 mm long, 0.5–0.8 mm in diam. *Fruits*: pedicel 6–9 mm long, pubescent; capsule deeply 2–5-lobed, depressed-globose, ca. 3 mm long, ca. 6 mm in diam., glabrous; styles persistent, ca. 0.4 mm long, ca. 0.3 mm in diam. *Seeds* not seen.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Cambodia, Philippines, China (South-central, Southeast), Taiwan, S. Japan (Long 1987, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Central.

Habitat & Ecology — Altitude 910–1100 m (Short & Vickery 1982).

Notes — Numbers of capsular lobes of *Glochidion triandrum* seem to vary. Indian and Himalayan specimens have (3–)4–5(–6)-lobed capsules (Long 1987, Chakrabarty & Gangopadhyay 1995) and Japanese and Taiwanese specimens have 3(or 4)-lobed ones (Deng & Wang 1993, Ohba 1999).

#### 4. *Glochidion heyneanum* (Wight & Arn.) Wight — Plate 67; Fig. 17.

*Glochidion heyneanum* (Wight & Arn.) Wight, Icon. Pl. Ind. Orient. 5(2): 29, t. 1908 (right hand) (1852); Hook. f., Fl. Brit. India 5: 323 (1887); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 19: 205 (1995); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 950 (2000). — *Gynoon heyneanum* Wight & Arn., Edinburgh New Philos. J. 14: 300 (1833). — *Phyllanthus heyneanus* (Wight & Arn.) Müll. Arg., Flora 48: 389 (1865), non Müll. Arg., Linnaea 32: 49 (1863); Müll. Arg. in DC., Prodr. 15(2): 311 (1866). — Type: *Wight 942* (K!, E!), in provincia "Circas" dicta [Peninsular Ind. Orientalis].

*Glochidion velutinum* Wight, Icon. Pl. Ind. Orient. 5(2): 29, t. 1907-2 (1852); Hook. f., Fl. Brit. India 5: 322 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); Malla et al., Fl. Kathmandu Valley: 625 (1986); D. G. Long in Fl. Bhutan 1: 779 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 153, t. 41, f. 1–3 (1994); T. Kuros., Newsl. Himal. Bot. no. 22: 19 (1998); Rajbhandari, Ethnobot. Nepal: 59 (2001); Manandhar, Pl. People Nepal: 246 (2002). — *Phyllanthus velutinus* (Wight) Müll. Arg., Flora 48: 387 (1865); Müll. Arg. in DC., Prodr. 15(2): 309 (1866). — Type: [*Wight, Kew Distrib. no. 2575*] (CAL & K (fide Chakrabarty & Gangopadhyay 1995) n. v.), Neilgherries, Northern slopes towards Mysore.

*Eriococcus glaucescens* Zoll., Tijdschr. Ned.-Ind. 14: 173 (1857).

*Phyllanthus nepalensis* Müll. Arg., Flora 48: 375 (1865); Müll. Arg. in DC., Prodr. 15(2): 291 (1866). — [*Bradleia ovata* Wall., Numer. List: 272, no. 7852 (1847), nom. nud.; Baill., Étude Euphorb.: 638 (1858)]. — *Glochidion nepalensis* (Müll. Arg.) Kurz,



Forest Fl. Burma 2: 344 (1877), "*nepalense*." — Type: *Wallich*, *List no. 7852* (G-DC (IDC microfiche in TI) n. v.; iso E!, BM!, excl. center plant, K-WALL!), *Nepalia* (Nepal).

*Phyllanthus asperus* Müll. Arg., *Flora* 48: 377 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 297 (1866); Hook. f., *Fl. Brit. India* 5: 327 (1887). — *Glochidion asperum* (Müll. Arg.) Bedd., *Fl. Sylv. S. India*: 193 (1872). — Type: *Stocks & Law s. n.* (holo G-DC (IDC microfiche in TI) n. v.), India, Malabar, Concan.

Deciduous monoecious shrub or small tree, 1.5–10 m high, stem diameter 5–20 cm. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* densely tomentose. *Normal leaves* alternate; stipules free, narrowly triangular or triangular, 1.7–3 by 0.5–0.8 mm, apex acuminate, tomentose; petiole 2.5–5 mm long, tomentose; blade ovate, 6–10.5 by 3.5–5 cm, base obtuse or acute, apex acuminate, margin entire, both surfaces pubescent especially on veins. *Cymules* axillary. *Staminate flowers* 2–6 per cymule; pedicel 6–9 mm long, pubescent; sepals 6, narrowly elliptic, ca. 2 by ca. 1 mm, apex obtuse, outside pubescent on midrib. *Pistillate flowers* 2–10 per cymule; pedicel 1–2 mm long; sepals 6, narrowly elliptic or lanceolate, 1.5–2 by ca. 0.4 mm, apex acute, outside tomentose; ovary 4- or 5-carpellate, tomentose; styles obscurely bifid, connate into a column of 1–1.5 mm long, ca. 1 mm in diam.. *Fruits*: pedicel 7–9 mm long, tomentose; capsule 8–10-lobed, depressed-globose, ca. 5 mm, 9–10 mm in diam. long, tomentose; styles persistent, ca. 2 mm long. *Seeds* with aril, widely ovate, ca. 3 mm long, ca. 3.5 mm wide.

*Distribution* — Pakistan, India (Assam, Kashmir, Bengal), Nepal, Bhutan, Bangladesh, Burma (North), Thailand, Cambodia, Laos, Vietnam, China (South-central) (Chakrabarty & Gangopadhyay 1995, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 200–1800 m. On roadsides, on rocky cliffs, on slopes, or in forests of *Pinus* or *Shorea robusta*. Flowers from April to September; fruits from July to September.

*Vernacular names* — Nepali: *bahiro* (Manandhar 2002), *kaalikaath* (Rajbhandari 2001a), *kane bahiro* (Manandhar 2002), *kane mauwa* (Manandhar 2002), *lati kath* (Manandhar 2002), *mauwa* (Manandhar 2002), *muse deli* (Manandhar 2002). Chepang: *maisi* (Manandhar 2002). Gurung: *chaulani* (Manandhar 2002). Raute: *niniya* (Manandhar 2002). Tamang: *rabagachhi* (Manandhar 2002).

*Uses* — Juice of bark is medicinally used to heal wounds (Rajbhandari 2001a, Manandhar 2002). Paste of bark is applied externally to treat dislocated bones (Manandhar 2002). Paste of fruit is medicinally use to cure pimples (Rajbhandari 2001a, Manandhar 2002). Lopped plant is used for fodder (Manandhar 2002). Bark yields tannin (Manandhar 2002).

##### 5. *Glochidion ellipticum* Wight — Fig. 18.

*Glochidion ellipticum* Wight, *Icon. Pl. Ind. Orient.* 5(2): 29, t. 1906 (1852); Hook. f., *Fl. Brit. India* 5: 321 (1887); Chakrab. & M. G. Gangop., *J. Econ. Taxon. Bot.* 19: 199 (1995); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 947 (2000). — *Phyllanthus diversifolius* Miq. var. *longifolius* Müll. Arg., *Flora* 48: 378 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 298 (1866). — Type: [*Wight 2894, Kew distrib. 2546*] (K!), [Peninsular



Indiae Orientalis]; [*Wight s. n.*, *Kew distrib.* 2546, Apr. 1846] (K!, CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.), [Siespaury (India)].

*Phyllanthus malabaricus* Müll. Arg., *Linnaea* 34: 69 (1865); Müll. Arg., *Flora* 48: 386 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 305 (1866). — *Glochidion malabaricum* (Müll. Arg.) Bedd., *Fl. Sylv. S. India*: 194 (1872); Hook. f., *Fl. Brit. India* 5: 319 (1887). — Type: *Stocks* [ *Law et al. s. n. Bradleia* 42] (K!, hb. berol. n. v.; iso CAL, fide Chakrabarty & Gangopadhyay (1995), n. v.), [Concan] in India orientali Malabarica.

*Phyllanthus assamicus* Müll. Arg., *Flora* 48: 378 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 297 (1866). — *Glochidion assamicum* (Müll. Arg.) Hook. f., *Fl. Brit. India* 5: 319 (1887); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 196 (1982); D. G. Long in *Fl. Bhutan* 1: 780 (1987); P. T. Li, *Fl. Reipubl. Pop. Sin.* 44(1): 158, t. 46, f. 1–5 (1994); T. Kuros., *Newslett. Himal. Bot.* no. 22: 19 (1998); van Welzen, *Thai Forest Bull., Bot.* 28: 84 (2000). — Type: *Jenkins* 530 (CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.), Assam, India; *J. D. Hooker* [& Thomson], [*Glochidion* 51] (G-DC (IDC microfiche in TI) n. v., CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.), Upper Assam, India; *J. D. Hooker*, [*Bradleia* 45] (G-DC (IDC microfiche in TI) n. v., NY, CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.), Sikkim, India.

*Phyllanthus diversifolius* Miq. var. *wightiana* Müll. Arg., *Flora* 48: 378 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 298 (1866). — [*Bradleia wightiana* Wall., *Numer. List*: 272, no. 7862 (1847), nom. nud.]. — *Glochidion diversifolium* (Miq.) Merr. var. *wightianum* (Müll. Arg.) Bedd., *Fl. Sylv. S. India*: 193 (1872). — *Glochidion ellipticum* Wight var. *wightianum* (Müll. Arg.) Hook. f., *Fl. Brit. India* 5: 321 (1887), "*wightiana*." — Type: *Wallich*, *List no. 7862* (G-DC (IDC microfiche in TI) n. v.), in peninsula Indiae orient.

*Phyllanthus diversifolius* Müll. Arg. var. *longifolius* Müll. Arg., *Flora* 48: 378 (1865).

*Phyllanthus andersonii* Müll. Arg., *Flora* 55: 3 (1872), non Müll. Arg. in DC., *Prodr.* 15(2): 395 (1866).

*Glochidion assamicum* (Müll. Arg.) Hook. f. var. *brevipedicellatum* Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 177 (1966). — Type: [*H. Hara* & *M. Togashi* 3022] no. 2191, 20 Apr. 1960 (holo TI!), India, Darjeeling, Takdah, 1500 m.

Deciduous monoecious shrub or small tree, 3–7 m high, stem diameter 15 cm. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* sparsely pubescent or glabrate. *Normal leaves* alternate; stipules free; petiole 2–4 mm long, puberulous or glabrate; blade elliptic, 6.5–17.5 by 3–7.2 cm, base acute or obtuse, apex acuminate, margin entire, upper surface glabrous, lower surface sparsely pubescent on veins when young, often glabrate when mature; secondary veins 7 pairs. *Cymules* axillary. *Staminate flowers*: pedicel 5–10 mm long, glabrous; sepals 6, narrowly elliptic, 1.7–2.2 by 0.7–1 mm, apex obtuse, glabrous; stamens 3, connate into a column of 1–1.2 mm long; anthers sessile, ellipsoid, ca. 0.8 mm long. *Pistillate flowers* 1–10 per cymule, subsessile; sepals 6, unequal, narrowly ovate or lanceolate, 1–1.5 by 0.5–0.8 mm, apex acute or obtuse, margin entire, outside glabrous; ovary 3- or 4-carpellate, densely puberulous; styles connate into a column of 0.6–0.7 mm long, ca. 0.3 mm in diam. *Fruits*: pedicel 3–9 mm long, puberulous; capsule unlobed or very shallowly 3- or 4-lobed, depressed globose, ca. 4 mm long, 7–8 mm in diam., puberulous; styles persistent, ca. 0.7 mm long. *Seeds* with aril, widely ovoid, ca. 4 mm long, ca. 3 mm wide.

Distribution — India (Kumaon, Sikkim, Assam), Nepal, Bhutan, Bangladesh, Burma,



Thailand, Vietnam, China (South-central, Hainan), Taiwan (Long 1987, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 100–1200 m. In riverside forests, in moist forests, or on slopes. Flowers from April to August; fruits from March to September.

**6. *Glochidion lanceolarium* (Roxb.) Voigt — Fig. 19.**

*Phyllanthus flaxinifolius* Lodd., Bot. Cab.: t. 839 (1824), pro. syn.

*Glochidion lanceolarium* (Roxb.) Voigt, Hort. Suburb. Calcutt.: 153 (1845); Müll. Arg., *Linnaea* 32: 60 (1863); Kurz, *Forest Fl. Burma* 2: 343 (1877); Hook. f., *Fl. Brit. India* 5: 308 (1887); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 197 (1982); D. G. Long in *Fl. Bhutan* 1: 780 (1987); P. T. Li, *Fl. Reipubl. Pop. Sin.* 44(1): 144, t. 42, f. 5–8 (1994); Chakrab. & M. G. Gangop., *J. Econ. Taxon. Bot.* 19: 214 (1995); T. Kuros., *Newslett. Himal. Bot.* no. 22: 19 (1998); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 952 (2000); van Welzen, *Thai Forest Bull., Bot.* 28: 88 (2000). — *Bradleia lanceolaria* Roxb., *Fl. Ind. ed.* 1832, 3: 697 (1832); Wall., *Numer. List*: 272, no. 7855, excl. C, D, K (1847). — *Phyllanthus lanceolarius* (Roxb.) Müll. Arg., *Flora* 48: 371 (1865); Müll. Arg. in *DC., Prodr.* 15(2): 282 (1866). — Type: [*Wallich, List no. 7855F*] (K-WALL!, G-DC (IDC microfiche in TI) n. v.; iso K!), [*Hort. Calc.*]; [*Collector unknown 2523 & 2525*] (BM!).

*Glochidion macrophyllum* Benth., *London J. Bot.* 1: 491 (1842).

*Glochisandra acuminata* Wight, *Icon. Pl. Ind. Orient.* 5(2): 28, t. 1905 (1852). — Type: not designated.

*Phyllanthus benthamianus* Müll. Arg., *Flora* 48: 371 (1865), non Müll. Arg., *Linnaea* 32: 29 (1863).

*Glochidion cantoniense* Hance, *Ann. Sci. Nat., Bot., V*: 5: 241 (1866).

*Glochidion subsessile* N. P. Balakr. & Chakrab. var. *birmanicum* Chakrab. & M. G. Gangop., *J. Econ. Taxon. Bot.* 13: 716 (1989). — Type: *J. C. Prager 96*, 6 July 1894 (holo CAL n. v.; iso CAL n. v.), Burma, Kalay hills.

Deciduous monoecious small tree or tree, 4.5–12 m high. *Branching* phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). *Branchlets* glabrous. *Cataphylls* alternate, ovate, ca. 1.5 by ca. 0.8 mm, glabrous, apex acute. *Normal leaves* alternate; stipules free, triangular, ca. 2.2 by ca. 1.5 mm, glabrous, apex acuminate; petiole 5–7 mm long, glabrous; blade elliptic, 7.5–16 by 4–7.5 cm, base acute, apex caudate or acuminate, margin entire, both surfaces glabrous, secondary veins 6 or 7 pairs. *Cymules* axillary. *Staminate flowers* 2–9 per cymule; pedicel 10–12 mm long, glabrous; sepals 6, narrowly elliptic, 3.5–5 by 1–1.4 mm, glabrous, apex obtuse; filaments connate into a column of ca. 1.5 mm long. *Pistillate flowers* 1–8 per cymule; pedicel ca. 1 mm long, glabrous; sepals narrowly ovate, ca. 1.5 by ca. 1 mm, glabrous, apex acute; ovary globose, ca. 1 mm long, ca. 1 mm in diam., glabrous; styles 4 or 5, connate into a column of ca. 2 mm long, 0.8–1.2 mm in diam. *Fruits*: pedicel 4–5 mm long, glabrous; capsule shallowly 8–10-lobed, depressed-globose, ca. 7 mm long, 14–17 mm in diam., glabrous; styles persistent, ca. 1.5 mm long, ca. 0.8 mm in diam. *Seeds* with orange-red aril, widely ovate, ca. 5 mm long, ca. 4.5 mm wide, ca. 3.5 mm thick.

Distribution — India (North, Sikkim, Assam), Nepal, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, China (South-central, Hainan, Southeast) (Govaerts et al.

2000). *SE Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 150–600 m. In *Shorea robusta* forests or on open slopes. Flowers from March to May; fruits in March.

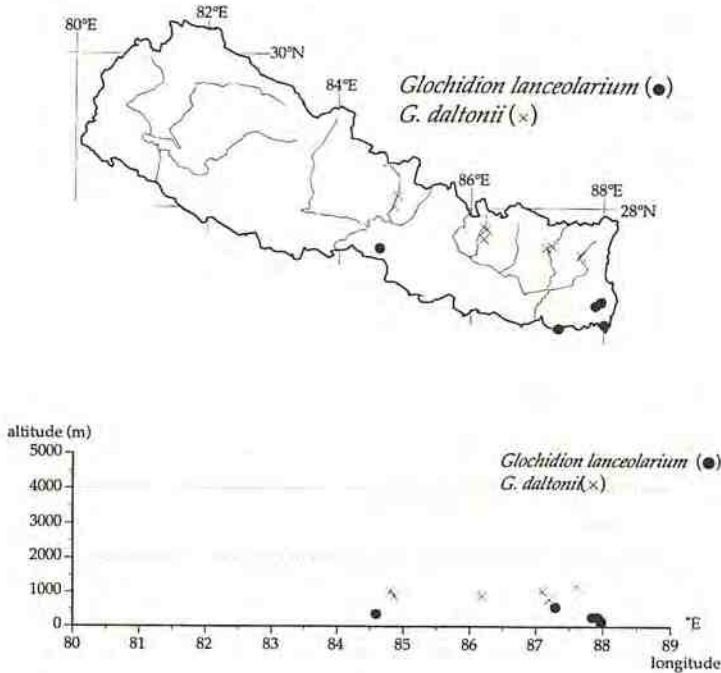


Fig. 19. Distribution of *Glochidion lanceolarium* (Roxb.) Voigt and *G. daltonii* (Müll. Arg.) Kurz in Nepal.

### 7. *Glochidion daltonii* (Müll. Arg.) Kurz — Plate 69; Fig. 19.

*Glochidion daltonii* (Müll. Arg.) Kurz, Forest Fl. Burma 2: 344 (1877); Hook. f., Fl. Brit. India 5: 320 (1887); D. G. Long in Fl. Bhutan 1: 781 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 159 (1994); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 19: 194 (1995); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 946 (2000); van Welzen, Thai Forest Bull., Bot. 28: 86 (2000). — *Phyllanthus daltonii* Müll. Arg., Flora 48: 388 (1865); Müll. Arg. in DC., Prodr. 15(2): 310 (1866). — Type: [J. D.] Hooker, [Bradleia 47] (G-DC (IDC microfiche in TI) n. v.; iso K!), Sikkim; Wallich s. n. (G-DC (fide Chakrabarty & Gangopadhyay 1995) n. v.), Martaban, near Attran (Burma).

*Glochidion gamblei* Hook. f., Fl. Brit. India 5: 310 (1887). — Type: Hooker [s. n., 47 Bradleia] (K!), Sikkim; Hooker [s. n., 47 Bradleia] (K!), Sikkim, [Kunsing]; Gamble [447, 17 Apr. 1876] (K!, CAL (fide Chakrabarty & Gangopadhyay 1995) n. v.; iso K!), Darjeeling, Terai, [Dulkaghar].

*Glochidion acuminatum* auct. non Müll. Arg., Linnaea 32: 68 (1863); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982), p. p.

Deciduous monoecious shrub, small tree, or tree 2.4–12 m high, stem diameter 25–40 cm. Branching phyllanthoid (i. e. branchlets subtended by cataphylls on main axes). Branchlets glabrous or villous. Normal leaves alternate; stipules free, triangular, 1.2–



2 by 0.8–1.2 mm, apex acuminate, margin entire; petiole 2–3 mm long, glabrous; blade lanceolate, 6.5–12 by 2–3.5 cm, base obtuse, decurrent to petiole, apex acuminate, margin entire, both surfaces glabrous. *Cymules* axillary. *Staminate flowers*: pedicel 7–12 mm long, glabrous; sepals 6, unequal, elliptic, 1.8–2.4 by 0.8–1.4 mm, glabrous, apex obtuse, margin entire; stamens 3, connate into a column of ca. 1 mm long; filaments ca. 0.2 mm long, glabrous; anthers narrowly ellipsoid, ca. 0.8 mm long. *Pistillate flowers* 2–7 per cymule; pedicel ca. 0.5 mm long, tomentose or glabrous; sepals 6, unequal, obovate or oblanceolate, 1.3–2 by 0.5–1 mm, apex acute or obtuse, margin entire, outside glabrous; ovary 4- or 5-carpellate, villous or glabrous; styles connate into a column of 2–2.5 mm long, 1.2–1.5 mm in diam.. *Fruits*: pedicel 2.5–3 mm long, tomentose; capsule depressed globose, ca. 14 mm in diam., glabrous, smooth; styler column persistent, ca. 1.5 mm long, ca. 1.5 mm in diam. *Seeds* widely ovoid, with orange aril, ca. 5 mm long, ca. 4–4.2 mm wide, 2.5–3 mm thick.

Distribution — India (Sikkim, Assam), Nepal, Burma, Thailand, Vietnam, Malaysia (Peninsular), China (South-central, Southeast) (Chakrabarty & Gangopadhyay 1995, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 810–1800 m. In open or moist forests or on slopes. Flowers from April to August; fruits in April.

Notes — This is the first record of the species from Nepal.

### 8. *Putranjiva* Wall.

*Putranjiva* Wall., Tent. Fl. Nepal.: 61 (1826). — Type species: *Putranjiva roxburghii* Wall.

#### 1. *Putranjiva roxburghii* Wall. — Fig. 20.

*Putranjiva roxburghii* Wall., Tent. Fl. Nepal.: 61 (1826); Royle, Ill. Bot. Himal. Mts.: 347, t. 83 (1836); Wight, Icon. Pl. Ind. Orient. 5(2): t. 1876 (1852); Müll. Arg. in DC., Prodr. 15(2): 443 (1866); Kurz, Forest Fl. Burma 2: 366 (1877); Hook. f., Fl. Brit. India 5: 336 (1887); Philcox in Rev. Handb. Fl. Ceylon 11: 258 (1997); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1382 (2000). — *Drypetes roxburghii* (Wall.) Hurus., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 6: 335 (1954); Chakrab. et al., J. Econ. Taxon. Bot. 21: 271 (1997); Rajbhandari, Ethnobot. Nepal: 58 (2001). — Type: not designated.

*Nageia putranjiva* Roxb., Fl. Ind. ed. 1832, 3: 766 (1832). — Type: (n. v.), mountainous countries of Coromandel and hindoosthan.

[*Cyclostemon racemosus* Zipp. ex Span., Linnæa 15: 348 (1841), nom. nud.]

*Pycnosandra timorensis* Blume, Mus. Bot. 2: 192 (1856). — *Drypetes timorensis* (Blume) Pax & K. Hoffm. in Englar, Pflanzenr., IV, 147, XV: 278 (1922). — *Drypetes roxburghii* (Wall.) Hurus. var. *timorensis* (Blume) Airy Shaw, Kew Bull., Addit. Ser. 4: 107 (1975). — Type: (n. v.), in Timor.

*Putranjiva amblyocarpa* Müll. Arg. in DC. Prodr. 15(2): 444 (1866). — Type: *Royle* (n. v.), in montibus himalayensibus Indiae orient.

*Putranjiva sphaerocarpa* Müll. Arg. in DC. Prodr. 15(2): 443 (1866). — Type: *Thwait*. 2122 (holo G-DC (IDC microfiche in TI) n. v.; iso G-DC (IDC microfiche in TI) n. v., CAL (fide Chakrabarty et al. 1997) n. v.), in insula Ceylonia (Sri Lanka).

*Twigs* pubescent. *Leaves* alternate; stipules lanceolate, 1.2–1.5 by 0.5–0.7 mm,

pubescent, apex acute or acuminate; petiole 4–5 mm long, pubescent; blade narrowly ovate or narrowly elliptic, 4.8–6 by 1.5–2.2 cm, base cuneate or obtuse, apex acute or obtuse, margin shallowly serrate, secondary veins inconspicuous, 9 or 10 pairs, upper surface glabrous, lower surface pubescent. *Staminate inflorescences* not seen. *Staminate flowers* not seen. *Pistillate racemes* pubescent. *Pistillate flowers* not seen. *Fruits*: pedicel 3–10 mm long, pubescent; drupe ellipsoid, 15–16 mm long (excl. styles), 9–10 mm in diam., apex acuminate, surface puberulent.

**Distribution** — Pakistan, Sri Lanka, India, Thailand, Laos, Malaysia (Peninsular), Borneo, Jawa, Lesser Sunda Isls, Moluccas, New Guinea (Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western.

**Habitat & Ecology** — Altitude 230–250 m. Along river. Fruits in October.

**Vernacular names** — Nepali: *putranjiva* (Rajbhandari 2001a). Tharu: *pitamaari* (Rajbhandari 2001a).

**Uses** — Seed is used for making necklaces (Rajbhandari 2001a).

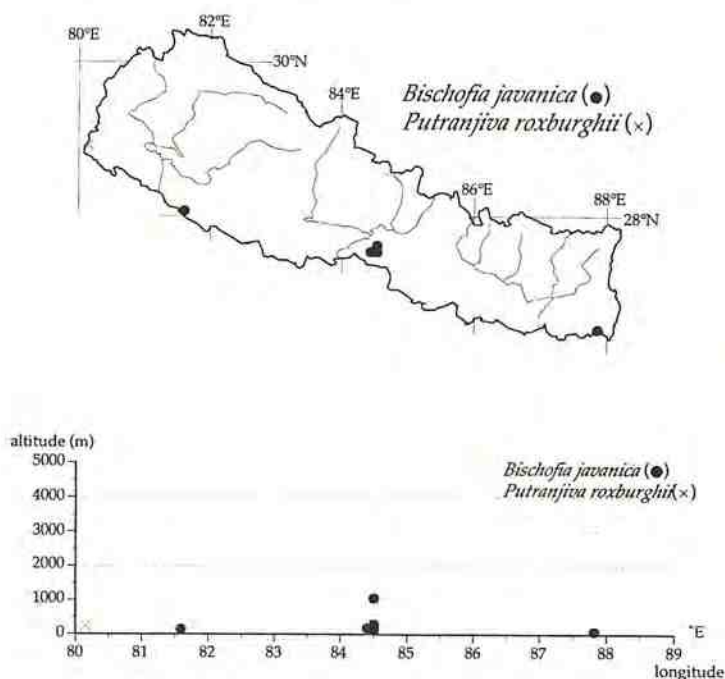


Fig. 20. Distribution of *Bischofia javanica* Blume and *Putranjiva roxburghii* Wall. in Nepal.

## 9. *Baccaurea* Lour.

*Baccaurea* Lour., Fl. Cochinch.: 661 (1790). — Lectotype species designated by Merrill, Trans. Amer. Philos. Soc. 24 (1935): *Baccaurea ramiflora* Lour.

### 1. *Baccaurea ramiflora* Lour. — Fig. 21.

*Baccaurea ramiflora* Lour., Fl. Cochinch.: 661 (1790); Müll. Arg. in DC., Prodr. 15(2): 458 (1866); Gagnep., Fl. Gén. Indo-Chine 5: 551 (1927); Airy Shaw, Kew Bull. 26: 221 (1972); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 788 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 131 (1994); T. Kuros.,



- Newslett. Himal. Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 238 (2000); Haegens & van Welzen, Thai Forest Bull., Bot. 28: 73 (2000); Haegens, Blumea, suppl. 12: 172 (2000). — Lectotype designated by Haegens (2000): *Loureiro s. n.* (BM sheet 31252 n. v.), Hortis Cochinchinae.
- Baccaurea cauliflora* Lour., Fl. Cochinch.: 661 (1790); Müll. Arg. in DC., Prodr. 15(2): 458 (1866); Gagnep., Fl. Gén. Indo-Chine 5: 551 (1927). — Neotype designated by Haegens (2000): *Fleury 32043* (P n. v.), Vietnam, Cochinchina, Bien Hoa Province, Trañg Bône Forest Reserve.
- Pierardia sapida* Roxb., Fl. Ind. ed. 1832, 2: 254 (1832); Wall., Numer. List: 277, no. 8072 (1847). — *Baccaurea sapida* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 459 (1866); Kurz, Forest Fl. Burma 2: 356 (1877); Hook. f., Fl. Brit. India 5: 371 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 174 (1966). — Lectotype designated by Haegens (2000): *Wallich, List no. 8072* (K-WALL n. v.), Burma?
- Baccaurea flaccida* Müll. Arg. in DC., Prodr. 15(2): 459 (1866); Hook. f., Fl. Brit. India 5: 370 (1887). — [*Pierardia flaccida* Wall., Numer. List: 277, no. 8074 (1847), nom. nud.] — Lectotype designated by Haegens (2000): *Wallich, List no. 8074* (K-WALL n. v.), Burma.
- Baccaurea propinqua* Müll. Arg. in DC., Prodr. 15(2): 463 (1866). — Lectotype designated by Haegens (2000): *Wallich, List no. 8071* (G-DC (IDC microfiche in TI) n. v.), in India orientali, in Silhet.
- Baccaurea wrayi* King ex Hook. f., Fl. Brit. India 5: 374 (1887). — Lectotype designated by Haegens (2000): *King's Collector s. n.* (K n. v.), Peninsular Malaysia, Perak.
- Baccaurea oxycarpa* Gagnep., Bull. Soc. Bot. France 23: 431 (1923); Gagnep., Fl. Gén. Indo-Chine 5: 549 (1927). — Lectotype designated by Haegens (2000): *Pierre 614* (K n. v.; isolecto P n. v.), Cambodge, monts de Knang-krépeuh, alt. 600–1500 m.
- Gatnaia annamica* Gagnep., Bull. Soc. Bot. France 24: 870 (1924); Gagnep., Fl. Gén. Indo-Chine 5: 540 (1927) — Lectotype designated by Haegens (2000): *Eberhardt 3042* (P n. v.; isolecto K, L n. v.), Annam, Thua-thien Prov.
- Dioecious tree, 9–15 m high. *Young twigs* tomentose. *Leaves* alternate; stipules early caducous; petiole 1–5 cm long, tomentose or glabrate; blade obovate, 7.5–17.5 by 3.5–9.5 cm, base cuneate or obtuse, apex obtuse, rounded or acute, margin entire, upper surface glabrous, lower surface pilose on veins, secondary veins conspicuous, 7–9 pairs. *Staminate panicles* 4.5–6.5 cm, tomentose; bracts ovate or lanceolate, 2–5 by 1–2 mm, pilose. *Staminate flowers*: pedicel 0.5–1 mm long, granulate; sepals 4 or 5, elliptic or circular, 1.7–2.4 by 1–1.8 mm, granulate, apex rounded or obtuse; anthers elliptic, ca. 0.3 mm long. *Pistillate racemes* not seen. *Pistillate flowers*: not seen. *Fruits* coriaceous, fleshy, indehiscent, ellipsoid, 2–2.3 cm long, 1.4–1.6 cm in diam., pubescent.
- Distribution — India (Assam, Andaman Isl.), Nepal, Bhutan, Burma, Thailand, Laos, Vietnam, Malaysia (Peninsular), China (South-central, Hainan) (Govaerts et al. 2000, Haegens 2000). *SE Asian-Malaysian element*. In Nepal: Central, Eastern.
- Habitat & Ecology — Altitude 250–450 m. In *Shorea* forests. Flowers from March to April; fruits in May.

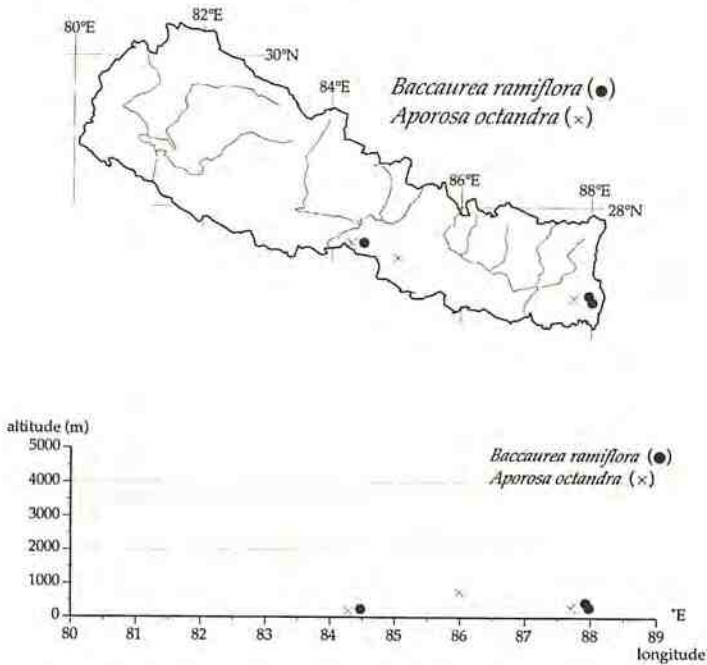


Fig. 21. Distribution of *Baccaurea ramiflora* Lour. and *Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery in Nepal.

### 10. *Aporosa* Blume

*Aporosa* Blume, Bijdr.: 514 (1826). — Type species: *Aporosa frutescens* Blume — See Schot (1995) for orthography of *Aporosa* and *Aporosa*.

#### 1. *Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery — Plate 70; Fig. 21.

*Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982), "*Aporosa*"; Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 17: 166 (1993), "*Aporosa*"; D. G. Long in Fl. Bhutan 1: 785 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 19 (1998), "*Aporosa*"; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 210 (2000), "*Aporosa*." — *Myrica octandra* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 56 (1825). — Type: *Buch.-Ham.* [s. n., 2 Apr. 1802] (holo BM!), Ettaura (Hetaunda, Nepal).

*Almus dioica* Roxb., Fl. Ind. ed. 1832, 3: 580 (1832). — *Aporosa dioica* (Roxb.) Müll. Arg. in DC. Prodr. 15(2): 472 (1866); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 126, t. 37 (1994). — Type (fide Chakrabarty & Gangopadhyay 1993): *Roxburgh*, *Icon. No. 2378* (CAL, n. v.), [native of Silhet].

*Lepidostachys roxburghii* Wall. [Numer. List: 229, no. 6816 (1832), nom. nud.] ex Lindl., Intr. Nat. Syst. Bot., ed. 2: 441 (1836); Steud., Nomencl. Bot., ed. 2, 1: 56 (1840). — *Aporosa roxburghii* (Wall. ex Lindl.) Baill, Étude Euphorb.: 645 (1858); Kurz, Forest Fl. Burma 2: 362 (1877); Hook. f., Fl. Brit. India 5: 347 (1887). — Type: *Wallich*, *List no. 6816* (n. v.; iso BM!).

*Scepa stipulacea* Lindl., Intr. Nat. Syst. Bot., ed. 2: 441 (1836). — Type: *Griffith* (n. v.), in regno Burmano.

*Leiocarpus serratus* Hassk., Hort. Bogor. Desc.: 55 (1858).



*Aporosa frutescens* auct. non Blume, Bijdr. 514 (1826); Benth., Fl. Hongk.: 317 (1861).  
*Aporosa villosula* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42(2): 23 (1873); Kurz,  
 Forest Fl. Burma 2: 362 (1877). — Type fide Chakrabarty & Gangopadhyay (1993):  
 [Kurz s. n.] (CAL n. v.), [South Andaman Is., Corbyn's Cove]; [Kurz 1616] (CAL n. v.,  
 K n. v.), [Burma, Pegu, Toukyeqhat].  
*Leiocarpus tinctorius* Blume ex Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, XV: 101  
 (1922).

*Aporosa microcalyx* (Hassk.) Hassk. var. *intermedia* Pax & K. Hoffm. in Engler,  
 Pflanzenr., IV, 147, XV: 102 (1922).

Shrub or small tree, 4.5–10 m high. *Young twigs* pilose. *Leaves* alternate; stipules early  
 caducous; petiole 1–1.5 cm long, glabrous, apex with a pair of glands; blade elliptic or  
 narrowly elliptic, 8.5–15 by 2.5–6 cm, base cuneate or obtuse, apex acuminate, margin  
 entire, both surfaces glabrous, secondary veins relatively conspicuous, 6–8 pairs.  
*Staminate racemes* not seen. *Staminate flowers* not seen. *Pistillate racemes* 1–4 mm long,  
 bracteate. *Pistillate flowers* sessile; ovary ovoid, 0.5–2 mm long, 1.2–1.7 mm in diam.,  
 pubescent, smooth; styles 2, ca. 0.5 mm long, deeply bifid; stigmas papillose. *Fruits*:  
 pedicel 0.9–1 cm long, pubescent; drupe ellipsoid, ca. 1 cm long, 0.7–0.8 cm in diam.,  
 glabrous, smooth.

Distribution — India (Sikkim, Assam, Andaman Isl.), Nepal, Bhutan, Burma, Thailand,  
 Vietnam, Malaysia (Peninsular), Borneo, Jawa, Sumatera, Philippines, China (South-  
 central, Hainan, Southeast) (Long 1987, Li 1994, Govaerts et al. 2000). *SE Asian-  
 Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 200–900 m. In *Shorea* forests. Flowers in March; fruits  
 in May.

## II. *Antidesma* L.

*Antidesma* L., Sp. Pl.: 1027 (1753). — Type species: *Antidesma alexiteria* L.

### Key to the species

(See also Table 7)

- A. Twigs tomentose; leaf blades broadly elliptic, petiole 5–8 mm long; racemes much  
 branched at base; drupes ca. 3.5 mm long ..... **1. *A. ghaesembilla*** Gaertn.
- A. Twigs pilose or pubescent; leaf blades elliptic, narrowly elliptic, lanceolate, obovate  
 or oblanceolate; petiole 3–6 mm long; racemes simple or 1- or 2-branched at base (not  
 seen in staminate raceme of Nepalese *A. bunius*); drupes 4–7 mm long
- B. Twigs pilose; drupes 6–7 mm long, pedicel 3–6 mm long  
 ..... **2. *A. bunius*** (L.) Spreng.
- B. Twigs pubescent; drupes 4–4.5 mm long, pedicel 0.7–2 mm long
- C. Leaf blades elliptic or lanceolate, 8–21 by 3.2–7 cm, secondary veins 7–12 pairs;  
 stamens 3 or 4, pedicels of staminate flowers 0.3–0.8 mm long  
 ..... **3. *A. acuminatum*** Wight
- C. Leaf blades obovate or oblanceolate, 5.5–11 by 1.5–4.5 cm, secondary veins 5–8  
 pairs; stamens 2, pedicels of staminate flowers 0.8–1.1 mm long  
 ..... **4. *A. acidum*** Retz.

**1. *Antidesma ghaesembilla* Gaertn.**

*Antidesma ghaesembilla* Gaertn., Fruct. Sem. Pl. 1: 189, t. 39 (1788); Müll. Arg. in DC., Prodr. 15(2): 251 (1866); Kurz, Forest Fl. Burma 2: 358 (1877); Hook. f., Fl. Brit. India 5: 357 (1887); Gagnep. in Lecomte, Fl. Indo-Chine 5: 505 (1927); Airy Shaw, Kew Bull. 35: 694 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982); D. G. Long in Fl. Bhutan 1: 787 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 56, t. 15, f. 1–5 (1994); Philcox in Rev. Handb. Fl. Ceylon 11: 276 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 184 (2000); Hoffmann, Thai Forest Bull., Bot. 28: 147 (2000). — [*Antidesma ghaesembilla* Gaertn. var. *genuinum* Müll. Arg. in DC., Prodr. 15(2): 251 (1866), nom. inval.] — Type: (L (fide Airy Shaw 1980) n. v.), e collect. sem. hort. lugdb.

*Antidesma pubescens* Roxb., Pl. Coromandel 2: 35, t. 167 (1802); Blume, Bijdr.: 1123 (1826–1827); Roxb., Fl. Ind. ed. 1832, 3: 770 (1832); Wight, Icon. Pl. Ind. Orient. 3(2): 2, t. 821 (1844–1845); Wall., Numer. List: 289, no. 8567 (1847).

*Antidesma frutescens* Jack, Malayan Misc. 2: 91 (1822).

*Antidesma paniculatum* Willd., Sp. Pl. 4: 764 (1806), "*paniculata*"; Blume, Bijdr.: 1126 (1826–1827); Roxb., Fl. Ind. ed. 1832, 3: 770 (1832), "*paniculata*"; Wight, Icon. Pl. Ind. Orient. 3(2): 1, t. 820 (1844–1845), "*paniculata*"; Wall., Numer. List: 245, no. 7280 (1847). — *Antidesma ghaesembilla* Gaertn. var. *paniculatum* (Willd.) Müll. Arg. in DC., Prodr. 15(2): 251 (1866). — Type: (n. v.), in India orientali.

*Antidesma rhamnoides* Brongn. ex Tul., Ann. Sci. Nat., Bot., III, 15: 217 (1851).

*Antidesma vestitum* C. Presl, Epimel. Bot.: 232 (1851). — *Antidesma ghaesembilla* Gaertn. var. *vestitum* (C. Presl) Müll. Arg. in DC., Prodr. 15(2): 251 (1866).

*Antidesma schultzi* Benth., Fl. Austral. 6: 86 (1873). — Type: *Schultz 610 & 743* (K (fide Airy Shaw 1980) n. v.), Australia, Port Darwin.

Diocious tree. *Twigs* tomentose. *Leaves* alternate; stipules early caducous, linear or lanceolate, 4–7 by 0.8–1 mm, tomentose, apex acuminate; petiole 5–8 mm long, tomentose; blade broadly elliptic, 5–6.5 by 3.5–5 cm, base subcordate or truncate, apex obtuse or rounded, margin entire, upper surface pubescent at least on veins, lower surface pubescent or tomentose, secondary veins conspicuous, 5 pairs. *Inflorescences* racemose, much branched, terminal or axillary of upper leaves, tomentose. *Staminate racemes* 4.5–5.5 cm long, 4–8-branched at the base; bracts lanceolate, ca. 1 by 0.2–0.3 mm, tomentose. *Staminate flowers* sessile; calyx lobes 4, quadrate, ca. 0.6 by 0.4–0.6 mm, apex rounded, outside densely pubescent, inside glabrate; stamens 4; filaments ca. 2 mm long; anthers V-shapes. *Pistilate racemes* not seen. *Pistilate flowers*: pedicel 0.4–0.5 mm long, pubescent; calyx lobes 5, lanceolate, 0.8–1 by 0.2–0.3 mm, pubescent, apex acuminate; ovary globose, ca. 1 mm long, ca. 1 mm in diam., pubescent, smooth; styles 2, ca. 0.3 mm long, bifid. *Fruits*: pedicel ca. 1 mm long; drupe ellipsoid, ca. 3.5 mm long (excl. styles), ca. 3 mm in diam.

Distribution — Sri Lanka, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, Malaysia (Peninsular), Sumatera, Borneo, Java, Bismarck Archipelago, Sulawesi, Lesser Sunda Is., Moluccas, New Guinea, Australia (Northern Territory, Queensland, Western), Philippines, China (South-central, Hainan, Southeast) (Long 1987, Govaerts et al. 2000, Hoffmann 2000). *S Asian-Malaysian element*. In Nepal: Central.



TABLE 7. Comparison of characters of Nepalese *Antidesma* species

	<i>A. ghaesembilla</i>	<i>A. bunius</i>	<i>A. acuminatum</i>	<i>A. acidum</i>
Twig	tomentose	pilose	pubescent	pubescent
Leaf blade shape	broadly elliptic	obovate, narrowly elliptic or oblanceolate	elliptic or lanceolate	obovate or oblanceolate
size	5–6.5 × 3.5–5 cm	8–15 × 4–7 cm	8–21 × 3.2–7 cm	5.5–11 × 1.5–4.5 cm
apex	obtuse or rounded	acute, obtuse or truncate	acute, acuminate or caudate	acuminate, acute or obtuse
lower surface	pubescent or tomentose	pilose on veins	pubescent on veins	pubescent
secondary veins	5 pairs	5 or 6 pairs	7–12 pairs	5–8 pairs
Staminate raceme	4–8-branched	(not seen)	unbranched	0–2-branched
Staminate pedicel	sessile	(not seen)	0.3–0.8 mm	0.8–1.1 mm
Stamens	4	(not seen)	3 or 4	2
Fruit length	ca. 3.5 mm	6–7 mm	4–4.5 mm	4–4.5 mm
Fruit pedicel	ca. 1 mm	3–6 mm	0.7–2 mm	1.5–1.8 mm

Habitat & Ecology — Altitude 500 m. In *Shorea robusta* forests. Flowers & fruits in June.

**2. *Antidesma bunius* (L.) Spreng. — Fig. 22.**

*Antidesma bunius* (L.) Spreng., Syst. Veg. 1: 826 (1824); Blume, Bijdr.: 1122 (1826–1827); Wall., Numer. List: 245, no. 7282, except A and part of B (1847); Müll. Arg. in DC. Prodr. 15(2): 262 (1866); Wight, Icon. Pl. Ind. Orient. 3(2): 1, t. 819 (1844–1845); Kurz, Forest Fl. Burma 2: 358 (1877), "*bunias*"; Hook. f., Fl. Brit. India 5: 358 (1887); Banerji, Rec. Bot. Surv. India 19(2): 82 (1966); Airy Shaw, Kew Bull. 35: 693 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982); D. G. Long in Fl. Bhutan 1: 787 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 64, t. 18, f. 1–6 (1994); Philcox in Rev. Handb. Fl. Ceylon 11: 277 (1997); T. Kuros., Newslett. Himalayan Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 181 (2000). — *Stilago bunius* L., Mant. Pl.: 122 (1767); Roxb., Fl. Ind. ed. 1832, 3: 758 (1832). — *Antidesma stilago* Poir. in Lam., Encycl., Suppl. 1: 403 (1811), nom. superfl. — [*Antidesma bunius* (L.) Spreng. var. *genuinum* Müll. Arg. in DC. Prodr. 15(2): 262 (1866), nom. inval.]. — Type: (n. v.), India; *Bunius sativus* Rumph, Amb. 3. p. 204, t. 131.

*Antidesma sylvestre* Lam., Encycl. 1: 207 (1783), "*sylvestris*." — *Antidesma bunius* (L.) Spreng. var. *sylvestre* (Lam.) Müll. Arg. in DC. Prodr. 15(2): 263 (1866).

*Antidesma ciliatum* C. Presl, Epimel. Bot.: 234 (1851).

*Antidesma cordifolium* C. Presl, Epimel. Bot.: 235 (1851). — *Antidesma bunius* (L.) Spreng. var. *cordifolium* (C. Presl) Müll. Arg. in DC. Prodr. 15(2): 262 (1866).

*Antidesma glabrum* Tul., Ann. Sci. Nat., Bot., III, 15: 188 (1851).

*Antidesma floribundum* Tul., Ann. Sci. Nat., Bot., III, 15: 189 (1851). — *Antidesma bunius* (L.) Spreng. var. *floribundum* (Tul.) Müll. Arg. in DC. Prodr. 15(2): 263 (1866). — Type: *Macrae s. n.* (CGE, G (fide Philcox 1997) n. v.), Ceylon, Kandy; *Walker s. n.* (CGE, G (fide Philcox 1997) n. v.), Kandy, Ceylon.

*Antidesma rumphii* Tul., Ann. Sci. Nat., Bot., III, 15: 238 (1851).

*Antidesma bunius* (L.) Spreng. var. *wallichii* Müll. Arg. in DC. Prodr. 15(2): 263 (1866). — Type: *Wallich, list no. 7282* (G-DC (IDC microfiche in TI) n. v.), in India orientali; *Hook. et Thoms.* (n. v.), in Madras.

*Antidesma dallachyanum* Baill., Adansonia 6: 337 (1866). — Type: *Dallachy s. n.* (P, MEL (fide Airy Shaw 1980) n. v.; iso K, excl. lowermost piece (fide Airy Shaw 1980) n. v.), Dalrymple Cape, Rockhampton (Queensland, Australia).

*Antidesma andamanicum* Hook. f., Fl. Brit. India 5: 364 (1887). — Type: *Kurz* (n. v.), South Andaman Islands.

*Sapium crassifolium* Elmer, Leafl. Philipp. Bot. 2: 485 (1908). — *Antidesma crassifolium* (Elmer) Merr., Philipp. J. Sci., C 7: 383 (1912 publ. 1913). — Type: *A. D. E. Elmer 10312*, June 1908 (n. v.), Philippine, Negros, Province of Negros Oriental, Cuernos Mountains, Dumaguete.

*Antidesma collettii* Craib, Bull. Misc. Inform. Kew 1911: 461 (1911).

*Antidesma thorelianum* Gagnep., Bull. Soc. Bot. France 70: 124 (1923). — Type: *Thorel 684 p. p.* (n. v.), Laos, Nong-kay, Kemmarat, Vien-thian, Stung-treng, La-khon.

Dioecious small tree or tree, 7–15 m high, stem diameter 30 cm. *Twigs* pilose. *Leaves* alternate; stipules lanceolate, 4–7 by 0.7–1.2 mm, early caducous, densely pilose, apex



acuminate; petiole 3–6 mm long, pilose; blade obovate, narrowly elliptic or oblanceolate, 8–15 by 4–7 cm, base acute or obtuse, apex acute, obtuse or truncate, margin entire, both surfaces pilose on veins, secondary veins conspicuous, 5 or 6 pairs. *Inflorescences* racemose, pilose. *Staminate racemes* not seen. *Staminate flowers* not seen. *Pistillate racemes* simple, 7–8 cm long in fruits. *Pistillate flowers* not seen. *Fruits*: pedicel 3–6 mm long, puberulous; drupe ellipsoid, 6–7 mm long (excl. styles), 4–6 mm diameter.

Distribution — Christmas Isls., Sri Lanka, India, Nepal, Burma, Thailand, Laos, Vietnam, Malaysia (Peninsular), Borneo, Sumatera, Jawa, Sulawesi, Lesser Sunda Isls., Moluccas, New Guinea, Australia (Queensland), Philippines, China (South-central, Hainan, Southeast, Tibet-Qinghai), Tahiti, Hawaiian Isls. (Govaerts et al. 2000, Hoffmann 2000). *S Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 1100 m. On roadsides. Fruits in July.

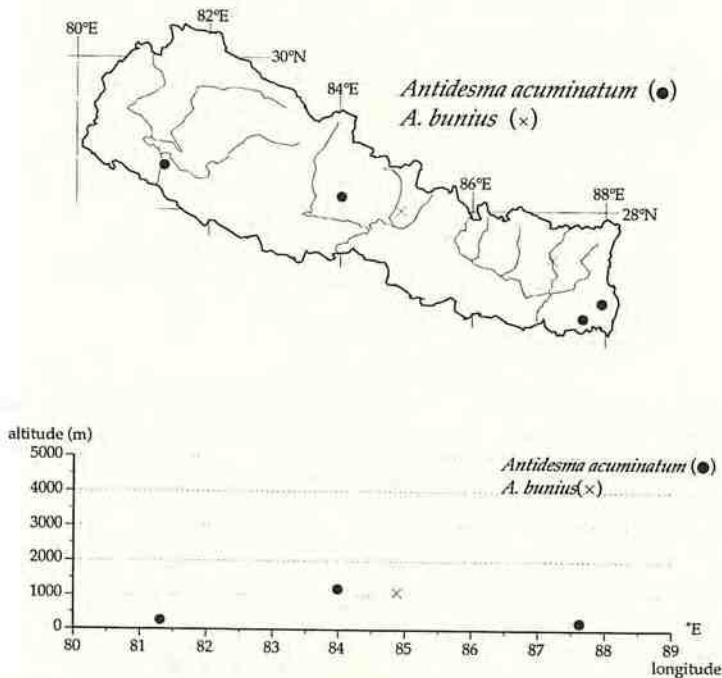


Fig. 22. Distribution of *Antidesma acuminatum* Wight and *A. bunius* (L.) Spreng. in Nepal.

### 3. *Antidesma acuminatum* Wight — Fig. 22.

*Antidesma macrophyllum* Wall. ex Voigt, Hort. Suburb. Calcutt.: 295 (1845), nom. illeg.  
*Antidesma acuminatum* Wight, Icon. Pl. Ind. Orient. 6: 12, t. 1991 (1853), "acuminata"; Müll. Arg. in DC., Prodr. 15(2): 268 (1866); Hook. f., Fl. Brit. India 5: 363 (1887), p. p.; Hurus. & Ya. Tanaka in Fl. E. Himal.: 173 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982); D. G. Long in Fl. Bhutan 1: 787 (1987); T. Kuros., Newslett. Himalayan Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 181 (2000). — Type: (n. v.; iso? E!), Malabar, Calcutta Botanic Garden.  
*Antidesma refractum* Müll. Arg. in DC., Prodr. 15(2): 257 (1866). — Type: Hook. f. (herb.

reg. berol. n. v.), in Indiae orient. prov. Sikkim alt. 2000 ped. s. m.

*Antidesma simile* Müll. Arg. in DC., Prodr. 15(2): 259 (1866). — Type: *Wallich, List no. 7282B, F* (G-DC (IDC microfiche in TI) n. v.), in Indiae orient. prov. Silhet.

Dioecious small tree or tree, 4.5–12 m high. *Twigs* pubescent. *Leaves* alternate; stipules caducous, lanceolate, 7–20 by 1.5–2 mm, pilose, apex acuminate; petiole 3–6 mm long, pubescent; blade elliptic or lanceolate, 8–21 by 3.2–7 cm, apex acute, acuminate or caudate, base acute or obtuse, margin entire, without marginal gland and basal gland, secondary veins conspicuous, 7–12 pairs, both surfaces pubescent on veins. *Inflorescences* racemose, terminal and axillary, pubescent or glabrate. *Staminate racemes* simple; bracts ca. 0.5 mm long, pubescent, without gland. *Staminate flowers*: pedicel 0.3–0.8 mm long, pubescent; sepals 0.3–0.6 mm long, glabrous; stamens 3 or 4; filaments ca. 1.5 mm long. *Pistillate racemes* simple, 7–12 cm long in fruits. *Pistillate flowers* not seen. *Fruits*: pedicel 0.7–2 mm long; drupe 1-seeded, ellipsoid, 4–4.5 mm long (excl. styles), 2–4 mm in diam.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Burma (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Mid Western, Western, Eastern.

Habitat & Ecology — Altitude 225–1200 m. Flowers in May; fruits from August to December.

Notes — Hoffmann (2000) regarded *A. simile* as a synonym of *A. montanum* Blume. Further studies are needed to clarify the delimitation of *A. montana* and *A. acuminata*.

#### 4. *Antidesma acidum* Retz. — Fig. 23.

*Antidesma acidum* Retz., Obsorb. Bot. 5: 30 (1788), "*acida*"; Müll. Arg. in DC., Prodr. 15(2): 249 (1866); C. E. C. Fischer, Kew Bull. 1932: 65 (1932); Airy Shaw, Kew Bull. 26: 352 (1972); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982); D. G. Long in Fl. Bhutan 1: 786 (1987); P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 60 (1994); T. Kuros., Newslett. Himalayan Bot. no. 22: 19 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 179 (2000); Hoffmann, Thai Forest Bull., Bot. 28: 145 (2000); Rajbhandari, Ethnobot. Nepal: 57 (2001); Manandhar, Pl. People Nepal: 92 (2002). — Type: *König* (n. v.).

*Stilago diandra* Roxb., Pl. Coromandel 2: 35, t. 166 (1802); Roxb., Fl. Ind. ed. 1832, 3: 759 (1832). — *Antidesma diandrum* (Roxb.) Roth, Nov. Pl. Sp.: 369 (1821); Müll. Arg. in DC., Prodr. 15(2): 266 (1866); Kurz, Forest Fl. Burma 2: 360 (1877); Hook. f., Fl. Brit. India 5: 361 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Banerji, Rec. Bot. Surv. India 19(2): 82 (1966); Hurus. & Ya. Tanaka in Fl. E. Himal.: 174 (1966); Murata, Acta Phytotax. Geobot. 25: 114 (1973). — [*Antidesma diandrum* (Roxb.) Roth var. *genuinum* Müll. Arg. in DC., Prodr. 15(2): 267 (1866), nom. inval.] — Type: [Collector unknown s. n.] (E!).

[*Antidesma sylvestre* Wall., Numer. List: 245, no. 7281 (1847), nom. nud.]

*Stilago lanceolaria* Roxb., Fl. Ind. ed. 1832, 3: 760 (1832). — *Antidesma lanceolarium* (Roxb.) Wall. [Numer. List: 245, no. 7284 (1847), nom. nud.] ex Wight, Icon. Pl. Ind. Orient. 3(1): 4, t. 766 (1844), "*lanceolaria*"; Thwaites, Enum. Pl. Zeyl.: 289 (1861). — Type: (n. v.), the Botanic garden (Calcutta), native of Chittagong.

*Antidesma diandrum* (Roxb.) Roth var. *ovatum* Tul., Ann. Sci. Nat., Bot., III, 15: 198 (1851); Müll. Arg. in DC., Prodr. 15(2): 266 (1866).



*Antidesma diandrum* (Roxb.) Roth var. *lanceolatum* Tul., Ann. Sci. Nat., Bot., III, 15: 199 (1851); Müll. Arg. in DC., Prodr. 15(2): 267 (1866).

*Antidesma diandrum* (Roxb.) Roth var. *parvifolium* Tul., Ann. Sci. Nat., Bot., III, 15: 199 (1851); Müll. Arg. in DC., Prodr. 15(2): 267 (1866).

*Antidesma wallichianum* C. Presl, Epimel. Bot.: 235 (1851).

*Antidesma diandrum* (Roxb.) Roth f. *javanicum* J. J. Sm. in S. H. Koorders & T. Valetton, Bijdr. Boomsoort. Java 12: 275 (1910). — *Antidesma diandrum* (Roxb.) Roth var. *javanicum* (J. J. Sm.) Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, XV: 144 (1922).

*Antidesma parviflorum* Ham. ex Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, XV: 143 (1922).

*Antidesma henryi* Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, XV: 132 (1922), non Hemsl., J. Linn. Soc., Bot. 26: 431 (1894). — *Antidesma paxii* F. P. Metcalf, Lingnan Sci. J. 10: 485 (1931), nom. nov.

Dioecious shrub, 1.2–6 m high, stem diameter 3–10 cm. Twigs pubescent. Leaves alternate; stipules lanceolate or linear, 4–7 by 0.8–1.1 mm, early caducous, tomentose, apex acuminate; petiole 3–6 mm long, pubescent; blade obovate or oblanceolate, 5.5–11 by 1.5–4.5 cm, base cuneate or obtuse, apex acuminate, acute or obtuse, margin entire, secondary veins conspicuous, 5–8 pairs, upper surface pubescent on veins, lower surface pubescent. Inflorescences racemose, terminal, glabrous or pubescent. Staminate racemes 3–6 cm, 0–2-branched at the base; bracts ovate or widely ovate, 0.6–1 by 0.3–0.7 mm, glabrous or pubescent. Staminate flowers: pedicel 0.8–1.1 mm long, pubescent or glabrous; calyx lobes ca. 0.4 mm long, glabrous; stamens 2; filaments 0.9–1.5 mm long. Pistillate racemes simple or 1-branched at base, 1.5–2.5 cm long (2.5–3.5 cm in fruits);

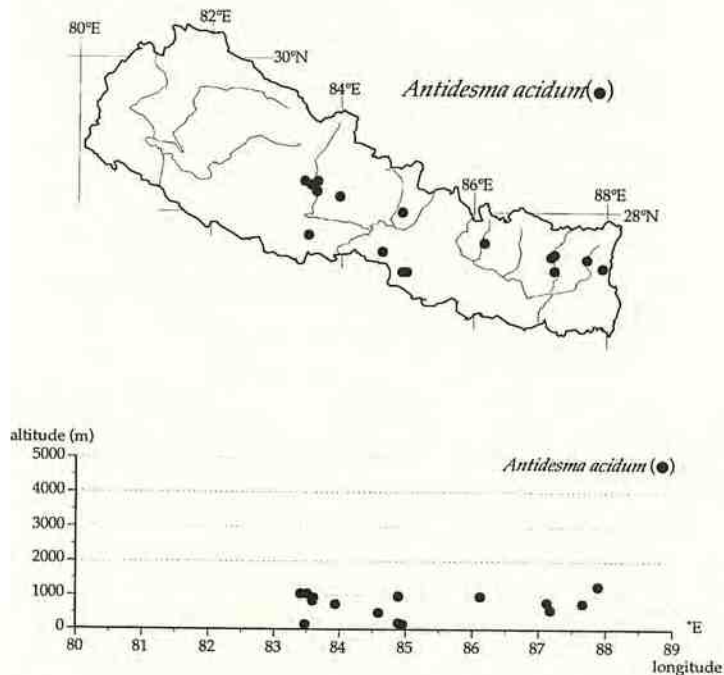


Fig. 23. Distribution of *Antidesma acidum* Retz. in Nepal.

bracts ovate or widely ovate, 0.8–0.9 by 0.5–0.7 mm, glabrous. *Pistillate flowers*: pedicel 1.5–1.6 mm long, glabrous; calyx lobes 0.4–0.6 mm long, glabrous; ovary ellipsoid, ca. 1 mm long, ca. 0.8 mm in diam., glabrous, smooth; styles 3, ca. 0.4 mm long. *Fruits*: pedicel 1.5–1.8 mm long; drupe ellipsoid, 4–4.5 mm long (excl. styles), 2.5–3 mm in diam.

*Distribution* — Pakistan, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, China (South-central), Jawa (Govaerts et al. 2000, Hoffmann 2000). *S Asian-Malaysian element*. In Nepal: Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 150–1600 m. In forests or on slopes. Flowers from May to June; fruits from July to November.

*Vernacular names* — Nepali: *amali* (Manandhar 2002), *archal* (Rajbhandari 2001a, Manandhar 2002), *himal churi* (Manandhar 2002). Tamang: *nakadansing* (Rajbhandari 2001a, Manandhar 2002). Tharu: *ban musari* (Rajbhandari 2001a)

*Uses* — Fresh or pickled ripe fruits are eaten (Manandhar 2002). Tender acidic leaves are eaten by children (Manandhar 2002). Bark paste is medicinally used to treat mumps (Rajbhandari 2001a, Manandhar 2002). Tree is used for fodder (Manandhar 2002).

## 12. *Bischofia* Blume

*Bischofia* Blume, Bijdr.: 1168 (1826–1827). — Type species: *Bischofia javanica* Blume

### 1. *Bischofia javanica* Blume — Fig. 20.

*Bischofia javanica* Blume, Bijdr.: 1168 (1826–1827); Decne. in Jacquem. Voy. Inde 4: 153 (1844); Müll. Arg. in DC., Prodr. 15(2): 478 (1866); Kurz, Forest Fl. Burma 2: 355 (1877); Hook. f., Fl. Brit. Ind. 5: 345 (1887); Hara in Fl. E. Himalaya 2: 69 (1971); Whitmore in Enum. Flow. Pl. Nepal 2: 99 (1979), as Staphyleaceae; D. G. Long in Fl. Bhutan 2: 130 (1991), as Bischofiaceae; P. T. Li, Fl. Reipubl. Pop. Sin. 44(1): 185, t. 56, f. 2–4 (1994); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 264 (2000); Manandhar, Pl. People Nepal: 112 (2002). — [*Bischofia javanica* Blume var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 478 (1866), nom. inval.]. — Type: *Blume 154* (holo L (fide Radcliffe-Smith 1987b) n. v.; iso BO (fide Radcliffe-Smith 1987b) n. v.), W. Java.

*Andrachne trifoliata* Roxb., Fl. Ind. ed. 1832, 3: 728 (1832). — *Stylodiscus trifoliatum* (Roxb.) Benn., Pl. Jav. Rar.: 133, t. 29 (1840). — *Bischofia trifoliata* (Roxb.) Hook., Hooker's Icon. Pl. 9: t. 844 (1851). — *Bischofia javanica* Blume var. *lanceolata* Müll. Arg. in DC., Prodr. 15(2): 479 (1866). — Type: not designated.

*Microelus roeperianus* Wight & Arn., Edinburgh New Philos. J. 14: 298 (1833); Wight, Icon. Pl. Ind. Orient. 5(2): 22, t. 1880 (1852). — *Bischofia roeperiana* (Wight & Arn.) Decne. in Jacquem., Voy. Inde 4: 153 (1844). — Type: *Wight, Cat. no. 941 [941, 941A, B, C]* (E!), in dumetis montium provinciae Madura; *Hamilton* (E n. v.), in Nepala inferlore; *Hamilton* (E n. v.), Bengala orientali.

*Bischofia cumingiana* Decne. in Jacquem., Voy. Inde 4: 153 (1844). — Type: *Cumming. exsiccata*, no. 1174, v. 1185 (herb. Mus. Par.), in silvis ad Manillam.

*Bischofia oblongifolia* Decne. in Jacquem., Voy. Inde 4: 152, t. 154 (1844). — *Bischofia javanica* Blume var. *oblongifolia* (Decne.) Müll. Arg. in DC., Prodr. 15(2): 479 (1866). — Type: (n. v.), in umbrosis humidis Keyri Pass, Dehra-Dhoun.



*Bischofia toui* Decne. in Jacquem., Voy. Inde 4: 153 (1844). — *Bischofia javanica* Blume var. *toui* (Decne.) Müll. Arg. in DC., Prodr. 15(2): 478 (1866). — Type: *Cl. Calléry* (herb. Mus. Par. n. v.), in silvis circa Manillam, ubi tagale Toui dicitur, secund.

[*Andrachne apetala* Roxb. ex Wall., Numer. List: 274, no. 7956 (1847), nom. nud.]

*Phyllanthus gymnanthus* Baill., Adansonia 2: 240 (1862).

*Bischofia leptopoda* Müll. Arg. in DC., Prodr. 15(2): 479 (1866). — Type: *Un. Stat. Explor. Exped. [Herb. U. S. Exploring Expedition]* (holo G-DC (IDC microfiche in TI) n. v.), in insula Tongatabu Archipelagi Samoanensis Oceani Pacifici.

Deciduous dioecious tree, 12–18 m high, stem diameter 12.5–50 cm. *Branching* not phyllanthoid (i. e. branchlets subtended by normal leaves). *Twigs* glabrous. *Leaves* alternate, trifoliolate; stipules caducous; petiole 8.5–12 cm long, glabrous; petiolules of terminal leaflets 1.8–3.5 cm long, those of lateral leaflets 0.4–1.2 cm long, glabrous; leaflets elliptic, 7–11.5 by 4–8 cm, base obtuse or acute, apex caudate or acuminate, margin serrate. *Panicles* axillary. *Staminate panicles* many-flowered, much branched, 6–16 cm long, 3–9 cm wide, glabrous. *Staminate flowers*: pedicel 1–1.5 mm long, glabrous; sepals 5, elliptic, ca. 1.5 by ca. 1 mm, glabrous, reflexed, margin entire; disc 6-segmented; stamens 5; filaments free, 0.5–0.9 mm long; anthers elliptic, ca. 0.8 mm long, ca. 0.4 mm in diam.; pistillidia ca. 0.5 mm long, ca. 0.5 mm in diam. *Pistillate panicles* 16–23 cm long, 5–8 cm wide in fruits. *Pistillate flowers* not seen. *Fruits*: pedicel 5–10 mm long; drupe globose 8–10 mm in diam., glabrous, smooth.

*Distribution* — India, Nepal, Bhutan, Burma, Thailand, Cambodia, Laos, Vietnam, Borneo, Jawa, Lesser Sunda Isls., Sulawesi, New Guinea, Australia (Queensland), New Caledonia, Samoa, Cook Isls., Philippines, China (South-central, Hainan, Southeast), Taiwan, Japan (Nansei-Shoto (Ryukyu)) (Long 1987, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Central, Eastern.

*Habitat & Ecology* — Altitude up to 1060 m. In grasslands or secondary forests. Flowers from March to April; fruits from December to January.

*Vernacular name* — Nepali: *kainjalo* (Manandhar 2002).

*Uses* — Fresh ripe fruit is eaten for sweet (Manandhar 2002). Root is used for controlling bedwetting (Manandhar 2002). Wood is used for furniture (Manandhar 2002). Bark yields red dye (Manandhar 2002).

#### Subfamily II. ACALYPHOIDEAE Asch.

Acalyphoideae Asch., Fl. Prov. Brandenburg 1: 58 (1864). — Acalyphaceae Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 246 (1859). — Type: *Acalypha* L.

#### 13. *Chrozophora* Necker ex A. Juss.

*Chrozophora* Necker ex A. Juss., Euphorb. Gen.: 27 (1824), "*Crozophora*", nom. & orth. cons. — Type species: *Chrozophora tinctoria* (L.) A. Juss.

##### 1. *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng. — Fig. 24.

*Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng., Syst. Veg. 3: 850 (1826); Prain, Bull. Misc. Inform.: 95 (1918); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); van Welzen, Blumea

44: 419 (1999); Siwakoti & Varma, Pl. Divers. E. Nepal: 322 (1999); Rajbhandari, Ethnobot. Nepal: 58 (2001); Manandhar, Pl. People Nepal: 150 (2002). — *Croton rotleri* Geiseler, Croton. Monogr.: 54 (1807). — *Chrozophora plicata* (Vahl) A. Juss. ex Spreng. var. *rotleri* (Geiseler) Müll. Arg. in DC., Prodr. 15(2): 747 (1866). — Type: *Vahl s. n.* (C (fide van Welzen 1999) n. v.).

*Chrozophora plicata* auct. non (Vahl) A. Juss. ex Spreng.; Hook. f., Fl. Brit. India 5: 409 (1887), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 337 (2000).

Herb or subshrub, 0.6 m high. *Stem* stellate-hairy. *Leaves* alternate; stipules caducous, linear triangular, ca. 3.1 by ca. 0.2 mm, stellate-hairy; petiole 2.2–3.9 cm long, densely stellate-hairy; blade ovate, shallowly 3 or 5-lobed, 4–9 by 3.5–10.5 cm, base obtuse or emarginate, apex rounded, margin entire, lower surface with 2 glands near the base, 1 mm diam., upper surface stellate-hairy, lower surface densely stellate-hairy, venation impressed at upper surface, raised at lower surface, secondary veins ca. 4 pairs. *Inflorescences* in fruit 10.5 cm long, densely stellate-hairy. *Staminate flowers* not seen. *Pistillate flowers*: sepals 5, triangular, 1.1–1.5 by ca. 0.6 mm; petals 1–1.2 by 0.3–0.4 mm. *Fruits*: pedicel 0.6–1.8 cm long, densely stellate-hairy; capsule dehiscent, ca. 7 mm long, stellate-hairy; columella persistent after dehiscence, ca. 3.5 mm long. *Seeds* broadly ellipsoid, 3.8–3.9 mm long, 2.9–3 mm wide, 2.7–2.9 mm thick.

Distribution — India, Nepal, Burma, Thailand, Andaman Isls., Jawa (introduced?) (Van Welzen, 1999). *S Asian-Malaysian element*. In Nepal: Eastern.

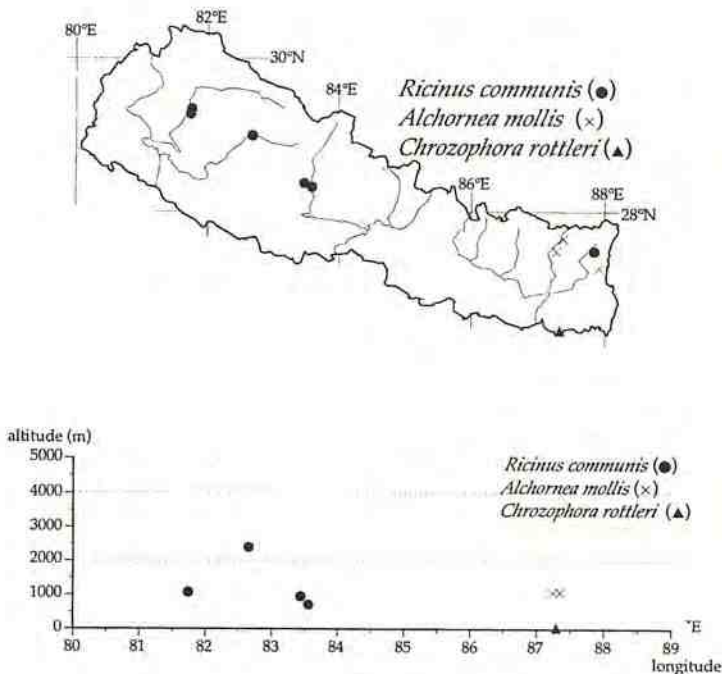


Fig. 24. Distribution of *Ricinus communis* L., *Chrozophora rotleri* (Geiseler) A. Juss. ex Spreng., and *Alchornea mollis* (Benth.) Müll. Arg. in Nepal.



Habitat & Ecology — Altitude 75 m. On waste ground. Common in eastern plains (Siwakoti & Varma 1999). Fruits in May.

Vernacular name — Tharu: *chotaki-hunkatath* (Rajbhandari 2001a, Manandhar 2002).

Uses — Juice of fruit is medicinally applied to cough and cold (Manandhar 2002). Fruit is worn around neck to relief from cold (Rajbhandari 2001a).

Notes — *Chrozophora plicata* (Vahl) A. Juss. ex Spreng. is often confused with *C. rottleri*. The former is, however, distinguishable from the latter by its 3-dimensional stellate hairs on ovaries and fruits and smaller (less than 3 cm long) leaf blades (van Welzen 1999).

#### 14. *Alchornea* Sw.

*Alchornea* Sw., Prodr. 6: 98 (1788). — Type species: *Alchornea latifolia* Sw.

##### 1. *Alchornea mollis* (Benth.) Müll. Arg. — Fig. 24.

*Alchornea mollis* (Benth.) Müll. Arg., Linnaea 34: 168 (1865); Müll. Arg. in DC., Prodr. 15(2): 902 (1866); Hook. f., Fl. Brit. India 5: 420 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 173 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982); D. G. Long in Fl. Bhutan 1: 798 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 72 (1996); T. Kuros., Newsl. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 144 (2000). — [*Rottlera mollissima* Wall., Numer. List: 272, no. 7825 (1847), nom. nud.] — *Stipellaria mollis* Benth., Hooker's J. Bot. Kew Gard. Misc. 6: 3 (1854). — Type: *Wallich, List no. 7825* (K-WALL!), Nepalia.

*Sapium cordifolium* Roxb., Fl. Ind. ed. 1832, 3: 693 (1832). — Type: not designated.

Monoecious shrub, 2–3.5 m high, 2–3 cm in diameter. *Twigs* tomentose. *Leaves* alternate; stipules lanceolate, 4–5 by 0.5–0.7 mm, early caducose, pubescent, apex acuminate; petiole 3–30 cm long, tomentose; stipels 2 or 4, at the end of petiole, linear or lanceolate, 3–6 by 0.5–0.8 mm, pubescent; blade widely ovate, 11 or 24.5 by 8–24.5 cm, base truncate or cordate, apex acuminate, caudate, acute or obtuse, margin crenate-serrate with marginal glands, upper surface pubescent, lower surface tomentose, venation palmately 3-veined at base, secondary veins pinnate, 5 or 6 pairs, 4 discoid basal glands between veins on lower surface, circular, ca. 1 by 0.7 mm. *Staminate inflorescences* racemose, 9–17 cm long, tomentose. *Staminate flowers* not seen. *Pistillate inflorescences* racemose, tomentose. *Pistillate flowers*: pedicel 2–2.5 mm, tomentose; sepals 2–3, unequal, ovate or widely ovate, 3.5–4 by 2–4 mm, apex acute or obtuse, outside pubescent; ovary spheroid, ca. 2.5 mm diam., densely tomentose; styles 3, 0.8–1.2 mm long, glabrous. *Fruits*: pedicel 3–4 mm long, tomentose; capsule dehiscent, globose, shallowly 3-lobed, 9–10 mm long, 9–11 mm in diam., tomentose; styles persistent, ca. 8 mm long; columella persistent after dehiscence, 6–8 mm long. *Seeds* widely elliptic, 7–8 mm long, 6–7 mm wide, ca. 4 mm thick, rough.

Distribution — India (Assam, Sikkim), Nepal, Bhutan, China (South-central) (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 520–1090 m. On path sides, on forest margin or on riversides. Flowers from July to November; fruits from July to August.

### 15. *Ricinus* L.

*Ricinus* L., Sp. Pl.: 1007 (1753). — Type species: *Ricinus communis* L.

#### 1. *Ricinus communis* L. — Fig. 24.

*Ricinus communis* L., Sp. Pl.: 1007 (1753); Roxb., Fl. Ind. ed. 1832, 3: 689 (1832); Müll. Arg. in DC., Prodr. 15(2): 1017 (1866); Kurz, Forest Fl. Burma 2: 400 (1877); Hook. f., Fl. Brit. India 5: 457 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966); C. R. Rao, Ind. For. 93: 55 (1967); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); Polunin & Stainton, Fl. Himal.: 362, f. 1241 (1984); Malla et al., Fl. Kathmandu Valley: 631 (1986); D. G. Long in Fl. Bhutan 1: 808 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 88 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 175 (1997); T. Kuros., Newsl. Himalayan Bot. no. 22: 20 (1998); van Welzen, Blumea 43: 152 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 333 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1403 (2000); Rajbhandari, Ethnobot. Nepal: 61 (2001); Manandhar, Pl. People Nepal: 400 (2002). — Possible type fide van Welzen (1998): *Herb. Linnaeus*, no. 1142-1, 1142-2 (LINN (fide van Welzen 1998) n. v.), 392-11, 392-13 (S (fide van Welzen 1998) n. v.).

*Croton spinosus* L., Sp. Pl.: 1005 (1753). — Type: (n. v.), India.

*Ricinus speciosus* Burm. f., Fl. Indica: 207, as "307", t. 63, f. 2 (1768). — Type: (n. v.), Java.

*Ricinus spectabilis* Blume, Bijdr.: 623 (1826). — Type: (n. v.), in montanis (Java).

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of NE Tropical Africa (Govaerts et al. 2000), widely cultivated and occasionally naturalized throughout the tropics (Webster & Burch 1968, van Welzen 1998). In Nepal: Far Western, Mid Western, Western, Eastern.

Habitat & Ecology — Altitude 720–2400 m. On roadsides, on open slopes, or on edge of cultivation. Common in eastern plains (Siwakoti & Varma 1999). Flowers from March to August; fruits from April to November.

Vernacular names — Nepali: *aaril* (Manandhar 2002), *ander* (Rajbhandari 2001a), *andi ko bot* (Siwakoti & Varma 1999), *arend* (Manandhar 2002), *arer* (Manandhar 2002). Chepang: *areth* (Manandhar 2002), *ater* (Manandhar 2002), *kukat* (Manandhar 2002), *lidis* (Manandhar 2002). Danuwar: *andi* (Rajbhandari 2001a, Manandhar 2002). Darai: *ander* (Rajbhandari 2001a). Gurung: *yanyan* (Rajbhandari 2001a, Manandhar 2002). Majhi: *madhishe aril* (Manandhar 2002). Mooshar: *andi* (Manandhar 2002). Newari: *aa ma* (Manandhar 2002). Rai: *daldo* (Manandhar 2002). Raute: *indeyo* (Manandhar 2002). Satar: *iradam* (Rajbhandari 2001a). Tamang: *dandarobi* or *dhandarobi* (Rajbhandari 2001a, Manandhar 2002), *thatur* (Manandhar 2002). Tharu: *reyar* (Manandhar 2002). Tibetan: *dan-khra* (Manandhar 2002), *dar-ta* (Manandhar 2002), *e-ra* (Manandhar 2002).

Uses — This species is cultivated for its oil of seed, castor oil. Seed is used for poisoning mad dogs or as fish poison (Siwakoti & Varma 1999, Manandhar 2002). Juice of root, paste of root, paste of bark, leaf, juice of leaf, paste of flower, juice of fruit, seed oil, paste of seed, and cotyledon are medicinally applied for various diseases (Siwakoti & Varma 1999, Rajbhandari 2001a, Manandhar 2002).



### 16. *Mercurialis* L.

*Mercurialis* L., Sp. Pl.: 1035 (1753). — Lectotype species designated by Small in Britton & Brown, Ill. Fl. N. US. ed. 2, 2: 460 (1913); *Mercurialis perennis* L.

#### 1. *Mercurialis leiocarpa* Siebold & Zucc. — Fig. 25.

*Mercurialis leiocarpa* Siebold & Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(2): 45 (1845); Müll. Arg. in DC., Prodr. 15(2): 795 (1866); Hurus. & Ya. Tanaka in Fl. E. Himal.: 180 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); Malla et al., Fl. Kathmandu Valley: 628 (1986); D. G. Long in Fl. Bhutan 1: 796 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 83 (1996); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1174 (2000). — Type: (n. v.), (Japan).

*Mercurialis transmorrisonensis* Hayata, Icon. Pl. Formosan. 5: 199 (1915). — *B. Hataya* [s. n., Apr. 1912] (holo TI!; iso TI!), Formosa, Mt. Arisan, Tôzan, ad 8000 ped alt. (Taiwan).

*Mercurialis leiocarpa* Siebold & Zucc. var. *trichocarpa* W. T. Wang, Acta Bot. Yunnan. 10: 39 (1988). — Type: *Ying Zun-sheng 4016*, 18 Aug. 1960 (holo PE n. v.), China, Sichuan, Jiulong, Sanyanlong, 2900 m.

Monoecious or dioecious perennial herb with creeping slender rhizome. *Stem* deciduous, simple, erect, 17–40 cm long, glabrous. *Leaves* deciduous, 8–20, opposite; stipules persistent, free, lanceolate or ovate, 1.5–2 mm long; petiole 1–2.5 cm long in middle leaves, shorter in upper leaves; blade membranaceous, ovate or narrowly ovate, 3–7 by 1.5–3.5 cm, base obtuse, rounded or truncate, with a pair of glands, apex acuminate

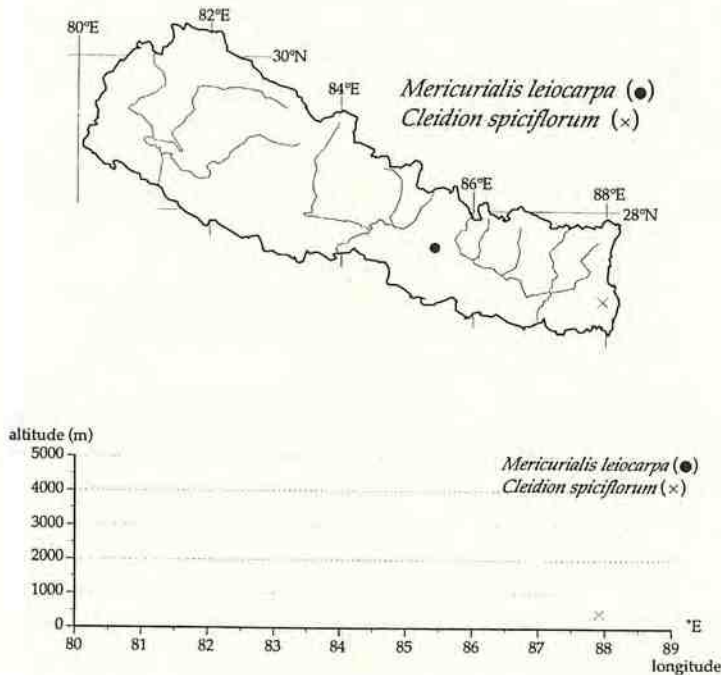


Fig. 25. Distribution of *Mercurialis leiocarpa* Siebold & Zucc. and *Cleidion spiciflorum* (Burm. f.) Merr. in Nepal.

or cuspidate, margin crenate, with a gland on each tooth, upper surface pubescent, lower surface pubescent on veins, scattered with glandular spots. *Inflorescences* unisexual or less commonly bisexual, axillary, solitary; upper inflorescences female or bisexual, lower male in monoecious shoots; upper flowers female, lower male in bisexual inflorescences; peduncle 4–6 cm long; modified thyrse 1.2–3.5 cm long; bracts ovate, glabrous, 0.8–1.2 mm long. *Staminate flowers* 1 to several per bract; pedicel ca. 0.5 mm long; sepals 3, widely ovate, 1.2–1.5 by 0.9–1.1 mm, glabrous, base connate, apex acute, margin entire; filaments ca. 1 mm. *Pistillate flowers* 1 per bract, short pedicellate; sepals 3, elliptic, ca. 1 by ca. 0.4 mm, glabrous, base connate, apex acute, margin entire; ovary 2-carpellate, reniform, glabrous; styles 0.8–1 mm long. *Fruits*: pedicel ca. 3 mm long; capsule dehiscent, 2-valved, verrucose; columella persistent after dehiscence. *Seeds* not seen.

Distribution — India (Assam), Nepal, Bhutan, Thailand (North), China (South-central, North-central), Taiwan, Korea, Japan (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 2550 m. In moist forests. Flowers from December to May; fruits in December.

### 17. *Cleidion* Blume

*Cleidion* Blume, Bijdr.: 612 (1826). — Type species: *Cleidion javanicum* Blume

#### 1. *Cleidion spiciflorum* (Burm. f.) Merr. — Fig. 25.

*Cleidion spiciflorum* (Burm. f.) Merr., Interpr. Herb. Amboin.: 322 (1917); Airy Shaw, Kew Bull. 35: 608 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); D. G. Long in Fl. Bhutan 1: 803 (1987); Philcox in Rev. Handb. Fl. Ceylon 11: 167 (1997); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 358 (2000). — *Acalypha spiciflora* Burm. f., Fl. Indica: 203, as "303" (1768). — *Claoxylon spiciflorum* (Burm. f.) A. Juss., Euphorb. Gen.: 43 (1824). — Type: (n. v.), India orientalis.

*Tragia filiformis* Poir. in Lam., Encycl. 7: 727 (1806).

*Cleidion javanicum* Blume, Bijdr.: 613 (1826); Müll. Arg. in DC., Prodr. 15(2): 987 (1866); Kurz, Forest Fl. Burma 2: 390 (1877); Hook. f., Fl. Brit. India 5: 444 (1887); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 75 (1996). — Type: [*Collector unknown s. n.*] (BO (fide Airy Shaw 1980) n. v.), in monte Bonkok Provinciae Tjanjor (Java).

*Acalypha spicigera* Klotzsch in Seemann, Bot. Voy. Herald: 101 (1853).

*Macaranga tamiana* K. Schum., Notizbl. Bot. Gart. Berlin-Dahlem 1: 52 (1895).

*Cleidion javanicum* Blume var. *longipedicellatum* Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 12: 491 (1988, publ. 1989). — Type: *Kari 1161*, 26 Apr. 1909 (holo CAL n. v.; iso CAL n. v.), India, Sikkim, Munsong.

Diocious tree, 12 m high. *Twigs* glabrous. *Leaves* alternate; stipules early caducous; petiole 3.5–11 cm long, glabrous but pilose when young; blade narrowly elliptic or oblanceolate, 13–20 by 3.5–8 cm, base cuneate, apex acuminate or bluntly apiculate, margin serrate, both surface glabrous, secondary veins pinnate, 5–8 pairs, upper surface with a pair of basal glands, glands circular, sessile, ca. 0.2 mm in diam., situated at 2–5 mm from base. *Staminate inflorescences* racemiform, 11–16 cm long, villous; bracts depressed ovate, 1.5–2 by 2.5–3 mm, apex obtuse. *Staminate flowers* 1–5 per node, ca. 3



mm diam.; pedicel 3–4 mm long, villous; sepals 3, ovate, 2.5–3 by ca. 1.2 mm, outside villous or glabrate, inside glabrous; stamens many; anthers ellipsoid, ca. 0.2 mm long. *Pistillate inflorescences* not seen. *Pistillate flowers* not seen. *Fruit* not seen. *Seeds* not seen.

Distribution — India, Nepal, Bhutan, Thailand, Malaysia (Peninsular), Bismarck Archipelago, Borneo, Jawa, Sulawesi, Sumatera, Lesser Sunda Isls., New Guinea, Australia (Queensland), Solomon Isls., Philippines, China (South-central) (Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 450 m. In *Shorea robusta* forests. Flowers in March.

### 18. *Macaranga* Thouars

*Macaranga* Thouars, Gen. Nova Madag.: 26 (1806). — Lectotype species designated by Coode, Taxon 25: 184 (1976): *Macaranga mauritiana* Bojer ex Müll. Arg.

#### Key to the species

- A. Leaves not peltate; discoid gland 2, on the base of blade  
 ..... **1. *M. pustulata*** King ex Hook. f.
- A. Leaves peltate; discoid gland 2–8, 0.5–2.5 cm from petiole attachment  
 B. Petioles inserted 3–9 cm from the base of blade, glabrous; twigs glabrous  
 ..... **2. *M. indica*** Wight
- B. Petioles inserted 0.7–2.5 cm from the base of blade, tomentose; twigs tomentose ....  
 ..... **3. *M. denticulata*** (Blume) Müll. Arg.

#### 1. *Macaranga pustulata* King ex Hook. f. — Fig. 26.

*Macaranga pustulata* King ex Hook. f., Fl. Brit. India 5: 445 (1887); Banerji, Rec. Bot. Surv. India 19(2): 83 (1966); Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); D. G. Long in Fl. Bhutan 1: 805 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 55, t. 13, f. 7–8 (1996); T. Kuros., Newsl. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1097 (2000); Manandhar, Pl. People Nepal: 302 (2002). — Type: *Duthie* (n. v.), tropical Himalaya, Kumaon, alt. 4000–5000 ft.; *King* (n. v.), Sikkim; *Clarke* (n. v.), Sikkim.

*Macaranga gmelinaefolia* King ex Hook. f., Fl. Brit. India 5: 445 (1887). — Type: *Kurz* (n. v.), Sikkim Himalaya, at Kursiong, alt. 4500 ft.

Deciduous small tree or tree, 4.5–15 m high, 21–39 cm in diameter. *Twigs* tomentose. *Leaves* alternate; petiole 4.5–13 cm long, densely villosulous or glabrate; stipules free, triangular, 1.2–1.6 by 0.7–1.2 cm, caducous, densely villosulous, apex acuminate; blade widely ovate; 9–18 by 8–20 cm, base obtuse or shallowly cordate, apex shortly acuminate, margin entire, sparsely glandular, both surface glabrous or villosulous on veins, lower surface with dense minute red glands, venation palmately 5–7-veined, secondary veins pinnate, 9 or 10 pairs; a pair of glands on upper surface of blade, situated on petiole attachment, sessile, circular or elliptic, concave, 0.7–2.5 mm by 0.5–2 mm. *Inflorescences* axillary, paniculate, erect, tomentose. *Staminate inflorescences* 5–9 cm long, branches up to 3 cm long, 1–1.5 mm diam., villosulous. *Staminate flowers* sessile, ca. 3 mm diam.; calyx lobes 2 or 3, unequal, outside villosulous or glabrate, inside

glabrate; stamens 18–21; filaments ca. 1 mm long; anthers globose, ca. 0.2 mm in diam. *Pistillate inflorescences* 4–8 cm long, 1.5–3 mm in diam. *Pistillate flowers* 1 per node; pedicel 1–3 mm long, villosulous; sepals 2 or 3, ovate or transversely elliptic, 1.5–2 by 2–2.5 mm, apex acute or obtuse, outside villosulous outside; ovary 2-locular, depressed globose, tomentose; stigmas 2, ca. 2 mm long, recurved, villosulous. *Fruits*: pedicel 1.5–3 mm long; capsule dehiscent, 2-lobed, ca. 5 mm long, ca. 8.5 mm wide, tomentose but glabrate on lobes. *Seeds* depressed obovoid, ca. 4.5 mm long, 5–5.5 mm wide, ca. 3.5 mm thick, smooth.

**Distribution** — India (Uttarakhand, Sikkim), Nepal, Bhutan (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

**Habitat & Ecology** — Altitude 900–1920 m. In secondary forests, on edge of cultivation, or on stream sides. Flowers from March to November; fruits from July to August.

**Vernacular names** — Nepali: *banare* (Manandhar 2002), *mallato* (Manandhar 2002). Chepang: *pahasingh* (Manandhar 2002). Gurung: *kala* (Manandhar 2002), *khorsani chhi* (Manandhar 2002).

**Uses** — Wood is used for fuel (Manandhar 2002). Leaf is used as plates and wrappings for food (Manandhar 2002).

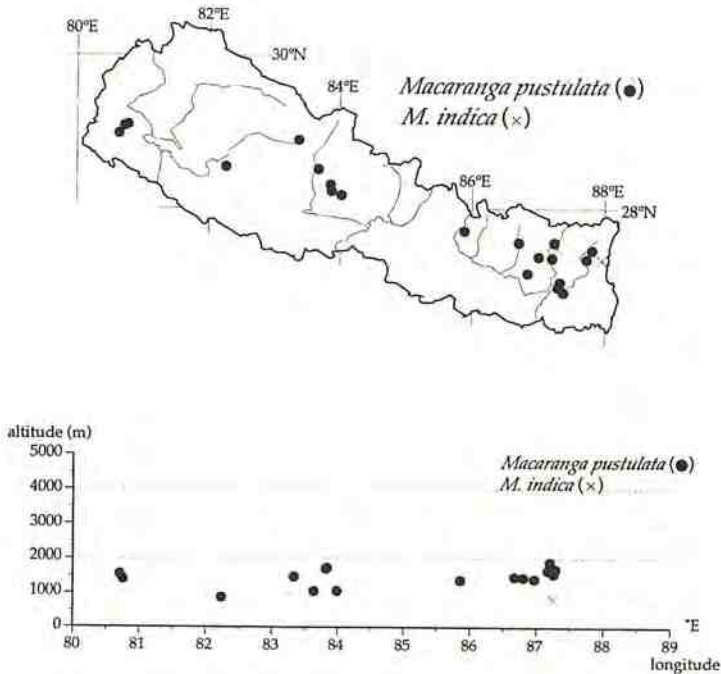


Fig. 26. Distribution of *Macaranga pustulata* King ex Hook. f. and *M. indica* Wight in Nepal.



## 2. *Macaranga indica* Wight — Fig. 26.

*Trewia hernandifolia* Roth, Nov. Pl. Sp.: 374 (1821), pro. syn.

*Macaranga indica* Wight, Icon. Pl. Ind. Orient. 5(2): 23, t. 1883 (1852), 6: 5, t. 1949-2 (1853); Müll. Arg. in DC., Prodr. 15(2): 1009 (1866); Kurz, Forest Fl. Burma 2: 387 (1877); Hook. f., Fl. Brit. India 5: 446 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal: 179 (1966); D. G. Long in Fl. Bhutan 1: 805 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 51 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 169 (1997); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1091 (2000). — Type: (n. v.), Neilgherries, Courtallum (India).

*Macaranga flexuosa* Wight, Icon. Pl. Ind. Orient. 5(2): 23 (1852), 6: 5, t. 1949-3 (1853); Müll. Arg. in DC., Prodr. 15(2): 1010 (1866). — Type: (n. v.), Courtallum (India).

*Macaranga adenantha* Gagnep., Bull. Soc. Bot. France 69: 701 (1922 publ. 1923). — Type: *Eberhardt 4960* (n. v.), Tonkin, prov. de Vinh-yen, à Tam-dao; *Cavalerie 3409* (n. v.), Chine, Koay-tcheou.

Dioecious small tree, 7 m high, stem diameter 10 cm. *Twigs* glabrous. *Leaves* alternate; petiole inserted 3–9 cm from the base of blade, 5–35 cm long, glabrous; blade ovate or widely ovate; 15–46 by 11–36 cm, base peltate, rounded, apex shortly acuminate, margin entire, sparsely glandular, upper surface sparsely villous or glabrous, lower surface villous or villosulous, with dense minute red glands, venation palmately 9–11 veined, secondary veins pinnate, 7–10 pairs, glands 2–4, on upper surface of blade, situated on veins 0.5–2.1 cm from petiole attachment, discoid, sessile. *Inflorescences* axillary, paniculate, erect, villosulous. *Staminate inflorescences* 6–10 cm long, branches up to 2.5 cm long, ca. 0.6 mm diameter, villosulous, discoid glands 1.2–1.4 mm in diam. *Staminate flowers* not seen. *Pistillate inflorescences* not seen. *Pistillate flowers* not seen. *Fruis* not seen. *Seeds* not seen.

Distribution — Sri Lanka, India, Nepal, Andaman Isls., Thailand, Malaysia (Peninsular), China (South-central) (Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 840 m. In evergreen forests. Flowers in August.

## 3. *Macaranga denticulata* (Blume) Müll. Arg. — Fig. 27.

*Macaranga denticulata* (Blume) Müll. Arg. in DC., Prodr. 15(2): 1000 (1866); Kurz, Forest Fl. Burma 2: 387 (1877); Hook. f., Fl. Brit. India 5: 446 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); D. G. Long in Fl. Bhutan 1: 804 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 53 (1996); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1086 (2000); Manandhar, Pl. People Nepal: 302 (2002). — *Mappa denticulata* Blume, Bijdr.: 625 (1826). — [*Macaranga denticulata* (Blume) Müll. Arg. var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 1000 (1866), nom. inval.] — Type: (n. v.), in sylvis montium Salak et Gede (Java).

*Mappa gummiflua* Miq., Fl. Ned. Ind., Eerste Bijv.: 458 (1861). — *Macaranga gummiflua* (Miq.) Müll. Arg. in DC., Prodr. 15(2): 1000 (1866). — Type: *D.* (n. v.), Sumatra occid. in prov. Priaman, gummy Getah fundens.

*Macaranga perakensis* Hook. f., Fl. Brit. India 5: 447 (1887). — Type: *Scortechini* (n. v.), Perak.

*Macaranga henricorum* Hemsl., J. Linn. Soc., Bot. 26: 442 (1894).

Dioecious small tree or tree, 4–12 m high, stem diameter 22 cm. *Twigs* tomentose. *Leaves* alternate, peltate; petiole inserted 0.7–2.5 cm from the base of blade, 6–16 cm long, tomentose, densely villosulous or glabrate; blade ovate, 11–24 by 10–21 cm, base rounded or truncate, apex shortly acuminate, margin entire, sparsely glandular, both surfaces glabrous (tomentose on veins when young), lower surface with dense minute red glands, venation palmately 9–11-veined at base, secondary veins pinnate, 7–13 pairs, glands 6–8, on upper surface of blade, situated on the veins, 0.5–2.5 cm from petiole attachment, discoid, sessile. *Inflorescences* axillary, paniculate, erect, villosulous. *Staminate inflorescences* 4.5–8 cm long, branches up to 3.5 cm long, ca. 1 mm diam., tomentose. *Staminate flowers* sessile, ca. 1.5 mm in diam.; calyx lobes 2 or 3, unequal, outside tomentose or glabrate, inside glabrate; stamens ca. 12; filaments ca. 0.8 mm long; anthers globose, ca. 0.2 mm diam. *Pistillate inflorescences* 1–7 cm long, 1–2 mm in diam. *Pistillate flowers* 1–3 per node; pedicel 1–3 mm long; calyx lobes 2, persistent, widely ovate, ca. 1 by ca. 1 mm, apex acute or obtuse, outside tomentose; ovary 2-locular, depressed obovoid, deeply bilobed; stigmas 2, 0.6–0.8 mm long, recurved. *Fruits*: pedicel 4–6 mm long; capsule dehiscent, obovoid, deeply bilobed, ca. 3.5 mm long, 4.5–5 mm wide, glabrate. *Seeds* globose, ca. 2.5 mm in diam., striate.

*Distribution* — India (Sikkim, Assam, Andaman Isls.), Nepal, Bhutan, Burma, Thailand, Malaysia (Peninsular), Sumatera, Jawa, China (Southeast) (Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central, Eastern.

*Habitat & Ecology* — Altitude 200–1350 m. On riversides or in *Schima* forests.

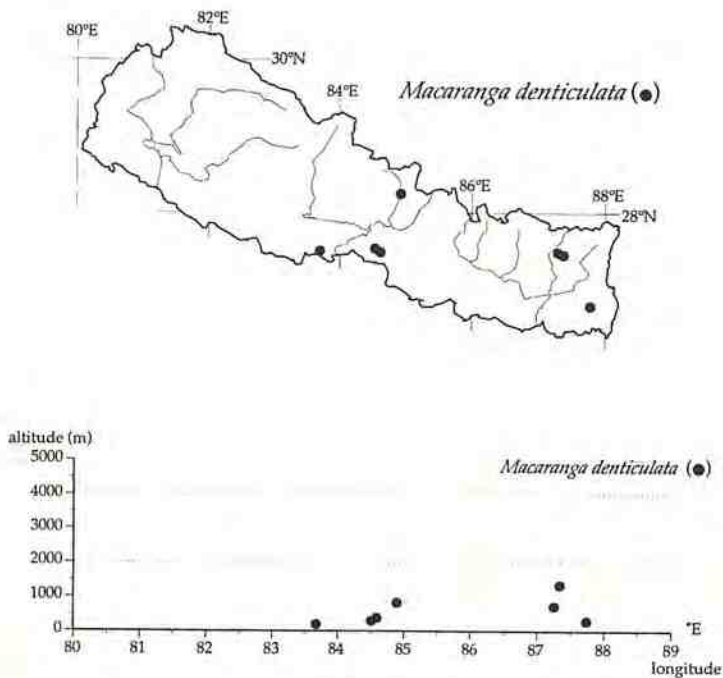


Fig. 27. Distribution of *Macaranga denticulata* (Blume) Müll. Arg. in Nepal.



Flowers from April to May; fruits from May to July.

Vernacular name — Raute: *indolya* (Manandhar 2002).

Uses — Lopped plant is used for fodder (Manandhar 2002). Paste of bark is medicinally applied for swellings and bruises (Manandhar 2002).

### 19. *Mallotus* Lour.

*Mallotus* Lour., Fl. Cochinch.: 635 (1790). — Type species: *Mallotus cochinchensis* Lour.

Key to the species

- A. Capsules without spine-like hairs or verrucae (not seen in Nepalese *M. repandus*)
  - B. Twigs and leaves with minute red glands; leaves not peltate, secondary veins 6–8 pairs; capsules densely red-glandular
    - C. Leaf blades acuminate or acute at apex, a pair of basal glands situated on petiole attachment; pistillate pedicels 0.5–1.5 mm; capsules (2–)3(–4) locular ..... **1. *M. philippensis*** (Lam.) Müll. Arg.
    - C. Leaf blades acuminate or caudate at apex, 1 or 2 pairs of basal glands situated at 0.5–3.5 mm from petiole attachment; pistillate pedicels 1.2–2 mm; capsules 2- or 3-locular ..... **2. *M. aff. philippensis*** (Lam.) Müll. Arg.
  - B. Twigs, leaves, and capsules (not seen in Nepalese plants) without red-gland; petioles attached at 1–1.5 mm from the base of blade, secondary veins 4 or 5 pairs ..... **3. *M. repandus*** (Willd.) Müll. Arg.
- A. Capsules verrucose or with spine-like hairs
  - B. Leaves truncate or rounded at base; stigmas 3, ovaries 3-locular; capsules with long spine-like hairs of 5–7 mm long and stellate hairs but not obscured
    - C. Leaf margin denticulate, petiole inserted 10–20 mm from the base of blade; capsules sparsely on racemes, pedicels 6–14 mm long ..... **4. *M. roxburghianus*** Müll. Arg.
    - C. Leaf margin entire, petiole inserted 0–2.5 mm from the base of blade; capsules densely on racemes, pedicels 1–3 mm long
      - D. Petioles attached at base, lower surfaces of blades stellate-hairy, not obscured, a pair of basal glands on upper surfaces; seeds ca. 5 mm long, ca. 4.5 mm wide ..... **5. *M. nepalensis*** Müll. Arg.
      - D. Petioles inserted 0.8–1.5 mm from the base of blade, lower surfaces of blades densely stellate-hairy, obscured, basal glands obscure; seeds 3.8–4.2 mm long, 3.6–4.2 mm wide ..... **6. *M. oreophilus*** Müll. Arg.
  - B. Leaves rounded, truncate or cordate at base; stigmas 4, ovaries 4-locular; capsules with dense verrucae of 1–4 mm long ..... **7. *M. tetracoccus*** (Roxb.) Kurz

#### 1. *Mallotus philippensis* (Lam.) Müll. Arg. — Fig. 28.

*Mallotus philippensis* (Lam.) Müll. Arg., Linnaea 34: 196 (1865), "*philippinensis*"; Müll. Arg. in DC., Prodr. 15(2): 980 (1866), "*philippinensis*"; Kurz, Forest Fl. Burma 2: 381 (1877), "*philippinensis*"; Hook. f., Fl. Brit. India 5: 442 (1887), "*philippinensis*"; Burkill, Rec. Bot. Surv. India 4: 130 (1910); Kitam. in Fauna Fl. Nepal Himal.: 172 (1955); Banerji, Rec. Bot. Surv. India 19(2): 83 (1966); Hurus. & Ya. Tanaka in Fl.

E. Himal.: 180 (1966); C. R. Rao, Ind. For. 93: 55 (1967); Airy Shaw, Kew Bull. 35: 655 (1980); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 483 (1983), "*philippinensis*"; D. G. Long in Fl. Bhutan 1: 802 (1987); Stainton, Flow. Himal. Suppl.: 55, pl. 103 (1988); S. M. Hwang, Fl. Reipubl. Pop. Sin. 44(2): 31, t. 8, f. 7 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 158 (1997); T. Kuros., Newslett. Himalayan Bot. no. 22: 20 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 328 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1122 (2000); van Welzen et al., Thai Forest Bull., Bot. 28: 105 (2000); Rajbhandari, Ethnobot. Nepal: 59 (2001); Manandhar, Pl. People Nepal: 307 (2002). — *Croton philippense* Lam., Encycl. 2: 206 (1786). — Type: *M. Sonnerat s. n.* (P (fide Airy Shaw 1980) n. v.), Philippines.

*Croton punctatus* Retz., Obserb. Bot. 5: 30 (1788), non Jacq., Collectanea 1: 166 (1787). — Type: *König* (n. v.), E. Zeylonia.

*Croton coccineus* Vahl, Symb. Bot. 2: 97 (1791), non Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 11 (1790). — Type: *König* (n. v.), in Zeylona.

*Rottlera tinctoria* Roxb., Pl. Corom. 2: 36, t. 168 (1798); Roxb., Fl. Ind. ed. 1832, 3: 827 (1832); Benth., Fl. Hongk.: 307 (1861).

*Croton montanus* Willd., Sp. Pl. 4: 547 (1805); Wall., Numer. List: 270, no. 7723A (1847). — Type: *D. Klein* (n. v.), in India orientali.

[*Croton distans* Wall., Numer. List: 270, no. 7772A p. p., B (1847), nom. nud.]

*Mappa stricta* Rechb. f. & Zoll., Acta Soc. Regiae Sci. Indo-Neerl. 1: 31 (1856). — *Macaranga stricta* (Rechb. f. & Zoll.) Müll. Arg. in DC., Prodr. 15(2): 1004 (1866).

*Mallotus reticulatus* Dunn, J. Linn. Soc., Bot. 38: 365 (1908). — *Mallotus philippensis* (Lam.) Müll. Arg. var. *reticulatus* (Dunn) F. R. Metcalf, J. Arnold Arbor. 22: 207 (1941).

*Euonymus hypoglaucus* H. Lévl., Fedde, Rep. Sp. Nov. 13: 260 (1914). — Type: *Cavalerie* 2733, 4 Apr. 1906 (holo E!), China, Kweichow, Lofou.

*Mallotus philippensis* (Lam.) Müll. Arg. var. *mengliangensis* C. Y. Wu ex S. M. Hwang, Acta Phytotax. Sin. 23: 294 (1985). — Type: *Y. H. Li* 3543 (SCBI n. v.), China, Yunnan, Xishuangbanna.

Dioecious shrub, small tree, or tree, 3–15 m high; stem diameter 15–50 cm. Twigs stellate-tomentose with minute red glands. Leaves alternate; petiole 2–10.5 cm long, stellate-tomentose with minute red glands; blade ovate or narrowly ovate, 7–23 by 3–10 cm, base acute, obtuse or rounded, apex acuminate or acute, margin entire, upper surface glabrous, lower surface obscured by stellate-tomentose, with minute red glands, secondary veins pinnate, 6–8 pairs, a pair of basal glands on upper surface, circular or elliptic, 0.4–1.8 by 0.4–1 mm, situated on petiole attachment. Inflorescences terminal or axillary, racemose or much branched at base, forming panicles, erect, stellate-tomentose. Bracts triangular, 1–1.3 by 1–1.2 mm, stellate-tomentose, apex acute. Staminate inflorescences 6–16.5 cm long, branches up to 9.5 cm long, 0.6–1.5 mm diam., stellate-tomentose. Staminate flowers 2–3 mm diam.; pedicel 1–3 mm, stellate-tomentose; calyx lobes 3 or 4, unequal, ovate, 1.5–2 by 1–1.8 mm, outside stellate-tomentose, inside glabrate; stamens 18–41; filaments 1–2.5 mm long; anthers ellipsoid, 0.5–0.8 mm long. Pistillate inflorescences 3–13 cm long, 1–2 mm diam., 1 flower per node. Pistillate flowers: pedicel 0.5–1.5 mm; calyx lobes 3–5, unequal, narrowly ovate, ovate or widely ovate, 1–1.8 by 0.8–1.8 mm, persistent, apex acute, outside stellate-tomentose; ovary spheroid, (2–)3(–4)-locular,



stellate-hairy and with minute red glands; stigmas (2–)3(–4), sessile, 2–3 mm long, 0.4–0.8 mm in diam., with papillae up to 0.6 mm long. *Fruits*: pedicel 1.5–2 mm long; capsule dehiscent, densely red glandular; column persistent after dehiscence, ca. 7.5 mm long, ca. 4 mm in diam., prominently winged. *Seeds* depressed globose, 4.5–5.3 mm long, 4–4.3 mm wide, 3.7–3.9 mm thick, smooth, black.

*Distribution* — Pakistan, Sri Lanka, India, Nepal, Bhutan, Thailand, Vietnam, Malaysia (Peninsular), Sumatra, Jawa, Borneo, Lesser Sunda Isls., Sulawesi, Moluccas, New Guinea, Bismarck Archipelago, Philippines, Australia (New South Wales, Northern Territory, Queensland), Polynesia, China (Southeast), Taiwan, Japan (Nansei-Shoto (Ryukyu Isls.)) (Long 1987, Ohba 1999, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude up to 1333 m. On roadsides, on slopes, in grasslands, in tickets, or in *Shorea robusta* forests. Flowers & fruits throughout the year.

*Vernacular names* — Nepali: *rohini* (Manandhar 2002), *roina* (Manandhar 2002), *sindure* or *singure* (Siwakoti & Varma 1999, Rajbhandari 2001a, Manandhar 2002). Chepang: *dusi* (Manandhar 2002), *paras* (Manandhar 2002), *sindurya* (Manandhar 2002). Danuwar: *sunphunari* (Manandhar 2002). Darai: *raini* (Rajbhandari 2001a). Gurung: *sindare* (Manandhar 2002). Lepcha: *puroa* (Manandhar 2002), *tukla* (Manandhar 2002). Magar: *sinduri* (Manandhar 2002). Newali: *kamila* (Manandhar 2002). Raute: *rohinya* (Manandhar 2002). Satar: *roro* (Rajbhandari 2001a). Tamang: *pyongla* (Manandhar 2002), *sililin* (Manandhar 2002), *sindri* (Manandhar 2002), Tharu: *rohini* (Rajbhandari 2001a, Manandhar 2002).

*Uses* — Lopped plant is used for fodder (Manandhar 2002). Powder of red glands of

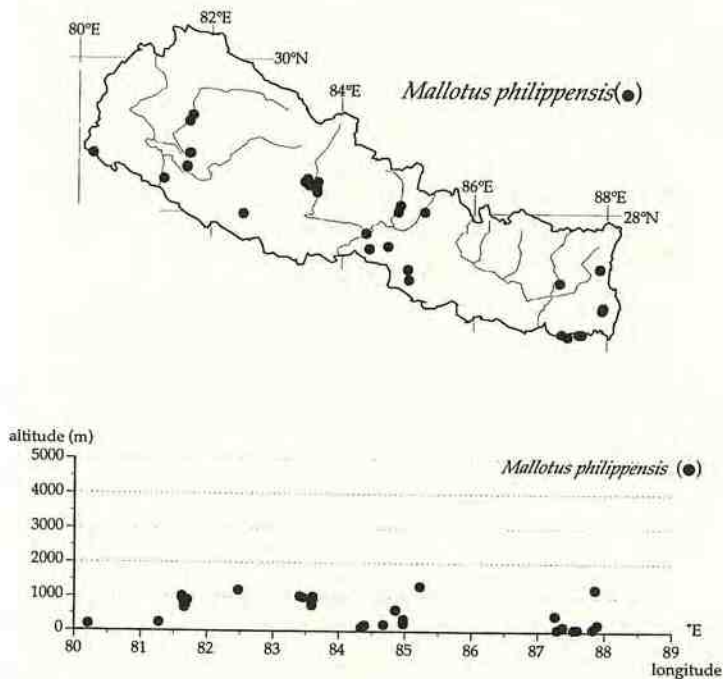


Fig. 28. Distribution of *Mallotus philippensis* (Lam.) Müll. Arg. in Nepal.

fruit is used as a dye or anthelmintic and purgative (Siwakoti & Varma 1999, Rajbhandari 2001a, Manandhar 2002). Juice of root, boiled root, decoction of bark, juice of bark, juice of leaves, and dried fruit are medicinally applied for various diseases (Rajbhandari 2001a, Manandhar 2002).

## 2. *Mallotus* aff. *philippensis* (Lam.) Müll. Arg.\*

Distribution — Endemic to Nepal. In Nepal: Western, Central.

Habitat & Ecology — Altitude 1350–2100 m. In forests. Flowers from April to August; fruits from July to October.

Notes — This species was treated as *M. philippensis* in Malla et al. (1986). Identity and circumscription of this species will be discussed in another paper\*.

## 3. *Mallotus repandus* (Willd.) Müll. Arg.

*Mallotus repandus* (Willd.) Müll. Arg., *Linnaea* 34: 197 (1865); Müll. Arg. in DC. Prodr. 15(2): 981 (1866); Hook. f., *Fl. Brit. India* 5: 442 (1887); Croizat, *J. Arnold. Arbor.* 19: 145 (1938); D. G. Long in *Fl. Bhutan* 1: 802 (1987); Siwakoti & Varma, *J. Econ. Taxon. Bot.* 18: 497 (1994); Kiu et al., *Fl. Reipubl. Pop. Sin.* 44(2): 28, t. 8, f. 5–6 (1996); Philcox in *Rev. Handb. Fl. Ceylon* 11: 165 (1997); Siwakoti & Varma, *Pl. Divers. E. Nepal*: 329 (1999); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1123 (2000); van Welzen et al., *Thai Forest Bull., Bot.* 28: 107 (2000). — *Croton repandus* Willd., *Ges. Naturf. Freunde Berlin Neue Schriften* 4: 206 (1803). — [*Mallotus repandus* (Willd.) Müll. Arg. var. *geninus* Müll. Arg., *Linnaea* 34: 197 (1865), nom. inval.] — Type: *Klein s. n.* (B† (fide Airy Shaw 1980)), S. India.

*Croton rhombifolius* Willd., *Sp. Pl.* 4: 555 (1805). — Type: (n. v.), in Zeylona.

*Rottlera scabrifolia* A. Juss., *Euphorb. Gen.*: 111 (1824). — *Mallotus repandus* (Willd.) Müll. Arg. var. *scabrifolius* (A. Juss.) Müll. Arg., *Linnaea* 34: 197 (1865); Müll. Arg. in DC. Prodr. 15(2): 982 (1866).

*Rottlera scandens* Span., *Linnaea* 15: 348 (1841). — *Mallotus scandens* (Span.) Müll. Arg. in DC. Prodr. 15(2): 982 (1866). — Type: (n. v.), circa Koepang.

[*Croton baccifera* Wall., *Numer. List*: 272, no. 7826 (1847), nom. nud.]

*Croton volubilis* Llanos, *Mem. Real. Acad. Ci. Exact. Madrid* 4: 503 (1856).

Dioecious climbing shrub. *Twigs* surface obscured by stellate tomentum. *Leaves* alternate; petiole 1–3.5 cm long, attached at 1–1.5 mm from the base of blade, surface obscured by stellate tomentum; blade ovate or widely ovate, 4–9.5 by 3–8.5 cm, base truncate, narrowly peltate, apex acuminate, margin entire, upper surface stellate-hairy on veins, lower surface stellate-hairy, not obscured, secondary veins pinnate, 4 or 5 pairs; 1 or 2 pairs of basal glands on upper surface, elliptic, 0.4–0.6 by 0.3–0.4 mm, situated at 1.5–6 mm from petiole attachment. *Inflorescences* terminal, racemose or paniculate, erect, surface obscured by stellate tomentum, bracts persistent, linear, 1–1.5 by ca. 0.2 mm, apex acute, surface obscured by stellate tomentum. *Staminate inflorescences* not seen. *Staminate flowers* not seen. *Pistillate inflorescences* not seen. *Pistillate flowers* not seen. *Fruit* not seen. *Seeds* not seen.

Distribution — Sri Lanka, India, Nepal, Bhutan, Thailand, Malaysia (Peninsular),

\* The taxon was described as *Mallotus bicarpellatus* T. Kuros. (Kurosawa in *Edinburgh J. Bot.* 61: 31 (2005)).



Siumatera, Jawa, Lesser Sunda Isls., Sulawesi, New Guinea, Australia (Queensland), New Caledonia, Philipinnes, China (Southeast, Hainan), Taiwan (Long 1987, Kiu et al. 1996, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Western.

Habitat & Ecology — Altitude up to 160 m. Occasional in eastern plains (Siwakoti & Varma 1994, 1999). Flower buds in January.

Notes — This species was firstly reported by Siwakoti & Varma (1994) from Biratnagar.

#### 4. *Mallotus roxburghianus* Müll. Arg. — Fig. 29.

*Mallotus roxburghianus* Müll. Arg., *Linnaea* 34: 186 (1865), nom. nov.; Müll. Arg. in DC., *Prodr.* 15(2): 962 (1866); Kurz, *Forest Fl. Burma* 2: 383 (1877); Hook. f., *Fl. Brit. India* 5: 428 (1887); D. G. Long in *Fl. Bhutan* 1: 802 (1987); S. M. Hwang, *Acta Phytotax. Sin.* 23: 301 (1985); S. M. Hwang, *Fl. Reipubl. Pop. Sin.* 44(2): 24, t. 6, f. 6–9 (1996); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1124 (2000). — *Rottlera peltata* Roxb., *Fl. Ind. ed.* 1832, 3: 828 (1832); Wight, *Icon. Pl. Ind. Orient.* 5(2): 21, t. 1873 (1852); Wall., *Numer. List*: 272, no. 7823 (1847). — Type: [*Collector unknown s. n.*] (BM!).

Shrub, 4 m high, stem diameter 5 cm. *Twigs* stellate-tomentose or stellate-hirsute. *Leaves* alternate; petiole 3–11 cm long, stellate-tomentose or densely stellate-hirsute, attached at 1–2 cm from the base of blade; blade simple, widely ovate, 9–22 by 5.5–21 cm, base rounded, peltate, apex acuminate or caudate, margin denticulate, glandular, venation palmately 7–10-veined, with 4–6 secondary veins, upper surface pubescent or hirsute with sparse stellate hairs, lower surface stellate-pubescent with minute glands, basal glands 1 or 2 pairs, situated from 2–12 mm from petiole attachment on upper surface, elliptic, 0.2–0.8 by 0.1–0.5 mm. *Inflorescences* terminal, racemose, erect; rachis simple, stout, angular, stellate-tomentose or densely stellate-hirsute; bracts persistent, linear or lanceolate, 2–7 by 0.2–1 mm, stellate-tomentose or stellate-hirsute, apex acuminate. *Staminate inflorescences* 11–13.5 cm long. *Staminate flowers*: pedicel 3–4 mm long, stellate-pubescent; calyx lobes 5, obovate, ca. 2 by ca. 1 mm, outside stellate-pubescent, inside glabrate; stamens many; filaments ca. 2.5 mm long; anthers subglobose, ca. 0.4 mm long. *Pistillate inflorescences* ca. 17 cm long. *Pistillate flowers*: pedicel 1–3 mm long, stellate-tomentose; calyx lobes 2–4, unequal, lanceolate, ca. 3 by ca. 1 mm, apex acuminate, outside stellate-tomentose; ovary depressed globose, ca. 1.5 mm long, ca. 2 mm in diam., with dense soft spine, densely stellate-hairy; stigmas 3, sessile, ca. 3.5 mm long, papillate. *Infructescences* 12–25 cm long. *Fruits*: pedicel 6–14 mm long; capsule dehiscent, 3-locular, subglobose, ca. 4.5 cm long, ca. 6 mm in diam., stellate with long soft spines of 7–8 mm long; columella persistent after dehiscence, ca. 4 mm long. *Seeds* compressed globose, 4.5–5 mm long, 4.2–4.5 mm wide, ca. 3.8 mm thick, shiny, smooth, dark brown, released after dehiscence.

Distribution — India (Sikkim, Assam), Nepal, China (South-central) (Hwang 1985, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 500–550 m. In *Shorea robusta* forests. Flowers in June; fruits in September.

Notes — This species was recently reported by Chalise (1995) and Wesche (1995) and treated as "*Mallotus* sp." in my previous paper (Kurosawa 1998).

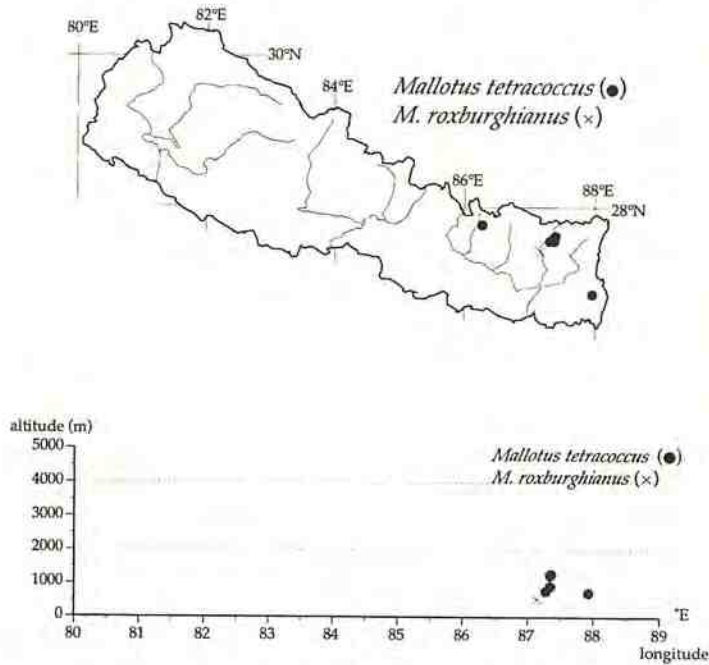


Fig. 29. Distribution of *Mallotus tetracoccus* (Roxb.) Kurz and *M. roxburghianus* Müll. Arg. (Burm. f.) Merr. in Nepal.

##### 5. *Mallotus nepalensis* Müll. Arg. — Plate 71; Fig. 30.

*Mallotus nepalensis* Müll. Arg., *Linnaea* 34: 188 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 964 (1866); Hook. f., *Fl. Brit. India* 5: 428 (1887), p. p.; Croiz., *J. Arnold Arbor.* 19: 135 (1938); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 180 (1966); Airy Shaw, *Kew Bull.* 21: 387 (1968); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 197 (1982); Malla et al., *Fl. Kathmandu Valley*: 627 (1986); D. G. Long in *Fl. Bhutan* 1: 800 (1987); T. Kuros., *Newslett. Himal. Bot.* no. 22: 20 (1998); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1120 (2000). — Type: *Wallich, List no. 7824* (herb. Soc. Linn. Londin. n. v.; iso K!, K-WALL!, BM!), in *Nepalia Indiae orientalis*.

*Mallotus oreophilus* Müll. Arg. var. *floccosus* Müll. Arg., *Linnaea* 34: 188 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 964 (1866); S. M. Hwang, *Fl. Reipubl. Pop. Sin.* 44(2): 44 (1996). — *Mallotus nepalensis* Müll. Arg. var. *floccosus* (Müll. Arg.) Pax in *Engl., Pflanzenr., IV, 147, VII*: 166 (1914). — *Mallotus tenuifolius* Pax var. *floccosus* (Müll. Arg.) Croizat, *J. Arnold Arbor.* 19: 138 (1938). — *Mallotus japonicus* (Thunb.) Müll. Arg. var. *floccosus* (Müll. Arg.) S. M. Hwang, *Acta Phytotax. Sin.* 23: 299 (1985). — Type: *Hook. & Thoms., Rottl. 5 quoad foem.* (holo G-DC (IDC microfiche in TI) n. v.; iso K!), [Mont Khasia, alt 5000 ped.].

Diococious shrub, small tree, or tree, 3.6–12 m high, stem diameter 7–25 cm. Twigs densely stellate-hairy. Leaves alternate; petiole 5–14 cm long, densely stellate-hairy; blade ovate or widely ovate, 8.5–24 by 5.5–20 cm, base rounded or truncate, not peltate, apex acuminate, margin entire, upper surface stellate-hairy or glabrate, lower surface stellate-hairy, punctate, not obscured, secondary veins pinnate, 9–11 pairs, a pair of basal glands on upper surface, elliptic, 0.8–2 by 0.4–0.9 mm, situated at 0.5–3 mm from



petiole attachment. *Inflorescences* terminal, racemose, erect; rachis simple, stout, angular, densely stellate-hairy; bracts persistent, linear, 2.5–7 by 0.3–1 mm, stellate-tomentose, apex acute. *Staminate inflorescences* 10.5–20 cm long. *Staminate flowers* 5–7 mm diam.; pedicel 4–6 mm long, densely stellate-hairy; calyx lobes 3 or 4, ovate, 3.5–4 by 2.5–3.5 mm, outside densely stellate-hairy, inside glabrate; stamens many; filaments ca. 3 mm long; anthers subglobose, 0.3–0.4 mm long. *Pistillate inflorescences* ca. 3.5 cm long, 3.5–5 mm in diam. (6–18 cm long when fruit). *Pistillate flowers* subsessile; calyx lobes narrowly triangular, 2–3 by 0.7–0.9 mm, densely stellate-hairy, apex acuminate; stigmas 3, sessile, 3.5–4 mm long, 0.6–0.8 mm in diam., papillate. *Fruits*: pedicel ca. 3 mm long; capsule dehiscent, 3-locular, subglobose, 7–8 mm long, ca. 7 mm in diam., stellate-hairy, with long soft spines of 5–6 mm long. *Seeds* compressed globose, ca. 5 mm long, ca. 4.5 mm wide, ca. 3.8 mm thick, shiny, smooth, black, not released after dehiscence.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Burma, China (South-central) (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 1650–2400 m. In forests, on forest margin, or on slopes. Flowers from May to August; fruits from June to August.

Notes — *Mallotus japonicus* (Thunb. ex L. f.) Müll. Arg. differs from *M. nepalensis* by its paniculate inflorescences and pedicellate (3–4 mm long) pistillate flowers.

See notes under *M. oreophilus* for the typification of *M. oreophilus* var. *floccosus*.

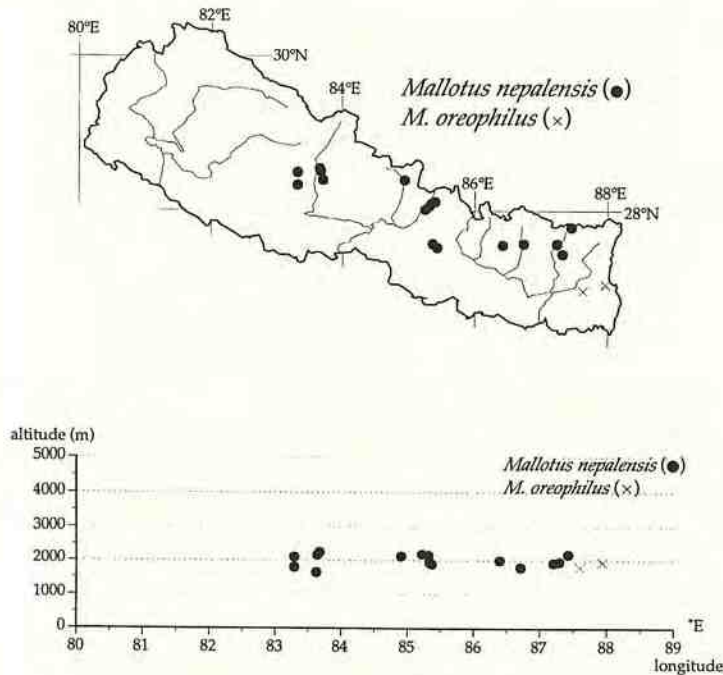


Fig. 30. Distribution of *Mallotus nepalensis* Müll. Arg. and *M. oreophilus* Müll. Arg. in Nepal.

**6. *Mallotus oreophilus* Müll. Arg.** — Plate 10; Fig. 30.

*Mallotus oreophilus* Müll. Arg., *Linnaea* 34: 188 (1865); Müll. Arg. in DC., *Prodr.* 15(2): 964 (1866); Airy Shaw, *Kew Bull.* 21: 387 (1968); D. G. Long in *Fl. Bhutan* 1: 800 (1987); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1121 (2000). — *Mallotus oreophilus* Müll. Arg. var. *ochraceo-albidus* Müll. Arg., *Linnaea* 34: 188 (1865), nom. superfl.; Müll. Arg. in DC., *Prodr.* 15(2): 964 (1866). — *Mallotus nepalensis* Müll. Arg. var. *ochraceo-albidus* (Müll. Arg.) Pax in *Engl., Pflanzenr.*, IV, 147, VII: 166 (1914), nom. illeg.; Croiz., *J. Arnold Arbor.* 19: 135 (1938); Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 180 (1966). — *Mallotus japonicus* (Thunb.) Müll. Arg. var. *ochraceo-albidus* (Müll. Arg.) S. M. Hwang, *Acta Phytotax. Sin.* 23: 298 (1985), nom. illeg. — *Mallotus japonicus* (Thunb.) Müll. Arg. var. *oreophilus* (Müll. Arg.) S. M. Hwang, *Fl. Reipubl. Pop. Sin.* 44(2): 44 (1996). — Type: *Hook. & Thoms., Rottl. 5 quoad male* (holo G-DC (IDC microfiche in TI) n. v.; iso K!, BM!), in India orientali, in Sikkim.

*Mallotus nepalensis* auct. non Müll. Arg., *Linnaea* 34: 188 (1865): *Hook. f., Fl. Brit. India* 5: 430 (1887), p. p.

*Mallotus japonicus* auct. non (L. f.) Müll. Arg., *Linnaea* 34: 189 (1865): Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 1117 (2000), p. p.

Dioecious small tree or tree, 7–12 m high, stem diameter 12 cm. *Twigs* stellate-tomentose. *Leaves* alternate; petiole 2.5–16 cm long, stellate-tomentose, attached at 0.8–1.5 mm from the base of blade; blade ovate or narrowly ovate, 12–26 by 5.5–21 cm, base rounded, narrowly peltate, apex acuminate, margin entire, upper surface stellate-hairy or glabrate, lower surface stellate-tomentose, completely obscured, secondary veins pinnate, 7–9 pairs, a pair of basal glands obscure or on upper surface, elliptic, 1.2–1.5 by 0.6–0.8 mm, situated at 1–2.5 mm from petiole attachment. *Inflorescences* terminal, racemose, erect; rachis simple, stout, angular, stellate-tomentose; bracts persistent, linear, 3.5–7 by ca. 0.5 mm, stellate-tomentose. *Staminate inflorescences* not seen. *Staminate flowers* not seen. *Pistillate inflorescences* ca. 8 cm long, ca. 5 mm in diam. (ca. 15 cm long in fruit). *Pistillate flowers* subsessile; calyx lobes 4 or 5, unequal, narrowly triangular or triangular, 1–2 by 0.7–1 mm, apex acuminate, outside stellate-tomentose, inside stellate-hairy; stigmas 3, sessile, 3–3.5 mm long, ca. 1 mm in diam., papillate. *Fruits*: pedicel 1–3 mm long; capsule dehiscent, 3-locular, subglobose, ca. 6 mm long, ca. 7 mm in diam., stellate-hairy, with soft spines of 5–7 mm long; columella persistent after dehiscence, ca. 3.5 mm long. *Seeds* compressed globose, 3.8–4.2 mm long, 3.6–4.2 mm wide, 3–3.3 mm thick, shiny, smooth, black.

Distribution — India (Sikkim), Nepal, China (South-central) (Long 1987, Kiu et al. 1996, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 1800–1950 m. In forests. Flowers from May to June; fruits in September.

Notes — *Mallotus oreophilus* was proposed with two infraspecific taxa, var. *ochraceo-albidus* based on *Hooker & Thomson, "Rottlera No. 5, quoad specim. masc."* from Sikkim and var. *floccosus* based on *Hooker & Thomson, "Rottlera No. 5, quoad specim. foem."* (Müller Argoviensis 1865). The former is interpreted as the type of the species (Croizat 1938, Airy Shaw 1968, Boufford 1990). Hence, according to the International Code of Botanical Nomenclature (Greuter et al. 2000) the name *M. nepalensis* var. *ochraceo-albidus* and *M. japonicus* var. *ochraceo-albidus* are incorrect (Boufford 1990) and the



treatment of *M. oreophilus* Müll. Arg. var. *ochraceo-albidus* Müll. Arg. as a synonym of *M. japonicus* Müll. Arg. by Govaerts et al. (2000) is inconsistent with their treatment of *M. oreophilus* as a distinct species.

*Mallotus japonicus* (Thunb. ex L. f.) Müll. Arg. differs from the *M. oreophilus* by its not peltate leaves, paniculate inflorescences and pedicellate (3–4 mm long) pistillate flowers.

### 7. *Mallotus tetracoccus* (Roxb.) Kurz — Fig. 29.

*Mallotus tetracoccus* (Roxb.) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41(2): 245 (1873); Kurz, Forest Fl. Burma 2: 382 (1877); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); D. G. Long in Fl. Bhutan 1: 802 (1987); S. M. Hwang, Fl. Reipubl. Pop. Sin. 44(2): 33, t. 9, f. 1 or 2 (1996); T. Kuros., Newslett. Himal. Bot. no. 22: 20 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1126 (2000). — *Rottlera tetracocca* Roxb., Fl. Ind. ed. 1832, 3: 826 (1832). — Type: [*Collector unknown s. n.*] (BM!).

*Rottlera ferruginea* Roxb., Fl. Ind. ed. 1832, 3: 828 (1832). — *Mallotus ferrugineus* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 982 (1866). — Type: [*Collector unknown s. n.*] (BM!).

*Rottlera alba* auct. non Roxb., Fl. Ind. ed. 1832, 3: 829 (1832): Wall., Numer. List: 271, no. 7812C, D (1847). — *Mallotus albus* auct. non (Roxb.) Müll. Arg., Linnaea 34: 188 (1865): Hook. f., Fl. Brit. India 5: 429 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 180 (1966).

Dioecious shrub or small tree, 3–9 m high, stem diameter 6–25 cm. Twigs densely stellate-hairy. Leaves alternate; petiole 5–26 cm long, attached at 1–8 mm from the base of blade, surface obscured by dense stellate tomentum; blade simple or shallowly 3-lobed, widely depressed ovate or very widely ovate, 10–24 by 12–28 cm, base rounded, truncate or cordate, narrowly peltate, apex acute, acuminate or cuspidate, margin entire, upper surface glabrous, lower surface obscured by stellate tomentum, secondary veins pinnate, 7–11 pairs; 1 or 2 pairs of basal glands on upper surface, elliptic or narrowly elliptic, 0.8–4 by 0.4–0.8 mm. Inflorescences terminal, racemose or paniculate, erect, surface obscured by stellate tomentum, bracts surface obscured by stellate tomentum. Staminate inflorescences 18–34 cm long, branches up to 23 cm long. Staminate flowers 4–5 mm diam.; pedicel 1–2 mm long, surfaces obscured by stellate tomentum; calyx lobes 4–6, ovate, ca. 2.5 by 1–1.6 mm, outside densely stellate-hairy, inside glabrate; stamens many; filaments 2–2.5 mm long; anthers subglobose, 0.2–0.3 mm long. Pistillate inflorescences 15–23 cm long in fruit, branches up to 14 cm in fruit. Pistillate flowers: pedicel 1–4 mm, surfaces obscured by stellate tomentum; calyx lobes 3 or 4, persistent, ovate, 2–3 by 1–2.5 mm, apex acute, outside obscured by stellate tomentum; ovary ovoid, 4-locular, surface obscured by stellate tomentum, densely warted; stigmas 4, sessile, ca. 2.5 mm long, papillate. Fruits: pedicel 1.5–3 mm long; capsule depressed globose, ca. 6 mm long, ca. 8 mm in diam., surface obscured by stellate tomentum, with dense verrucae of 1–4 mm long; column persistent after dehiscence. Seeds trigonous, 4.2–4.5 mm long, 3–4 mm wide, 3.2–3.5 mm thick.

Distribution — Sri Lanka, India, Nepal, Bhutan, China (South-central) (Govaerts et al. 2000). *Deccan element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 790–1300 m. On sunny slopes. Flowers from July to August; fruits from August to December.

20. *Trewia* L.

*Trewia* L., Sp. Pl.: 1193 (1753). — Type species: *Trewia nudiflora* L.

1. *Trewia nudiflora* L. — Fig. 31.

*Trewia nudiflora* L., Sp. Pl.: 1193 (1753); Roxb., Fl. Ind. ed. 1832, 3: 837 (1832); Wall., Numer. List: 271, no. 7816, 7817 (1847); Wight, Icon. Pl. Ind. Orient. 5(2): 21, t. 1870, 1871 (1852), "*nudiflorae*"; Müll. Arg. in DC., Prodr. 15(2): 953 (1866); Kurz, Forest Fl. Burma 2: 379; Hook. f., Fl. Brit. India 5: 423 (1887); C. R. Rao, Ind. For. 93: 55 (1967); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); D. G. Long in Fl. Bhutan 1: 799 (1987); Stainton, Flow. Himal. Suppl.: 56, pl. 101 (1988); S. M. Hwang, Fl. Reipubl. Pop. Sin. 44(2): 11, t. 4, f. 1–4 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 143 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 20 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 335 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1560 (2000); Manandhar, Pl. People Nepal: 463 (2002). — Type: (n. v.), in Malabariae arenosis (India).

*Trewia integrima* Stokes, Bot. Mat. Med. 4: 570 (1812).

*Trewia macrophylla* Roth, Nov. Pl. Sp.: 373 (1821).

*Trewia macrostachya* Klotzsch, Bot. Ergebn. Reise Waldemar: 117, t. 23 (1862). — Type: Hoffmeister (n. v.), im Himalaya gefunden.

*Trewia polycarpa* Benth. & Hook. f., Gen. Pl. 3: 318 (1880); Hook. f., Fl. Brit. India 5: 424 (1887). — Type: (n. v.), peninsulae Indiae.

*Mallotus cardiophyllus* Merr., Philipp. J. Sci., C 7: 398 (1912 publ. 1913). — Type:

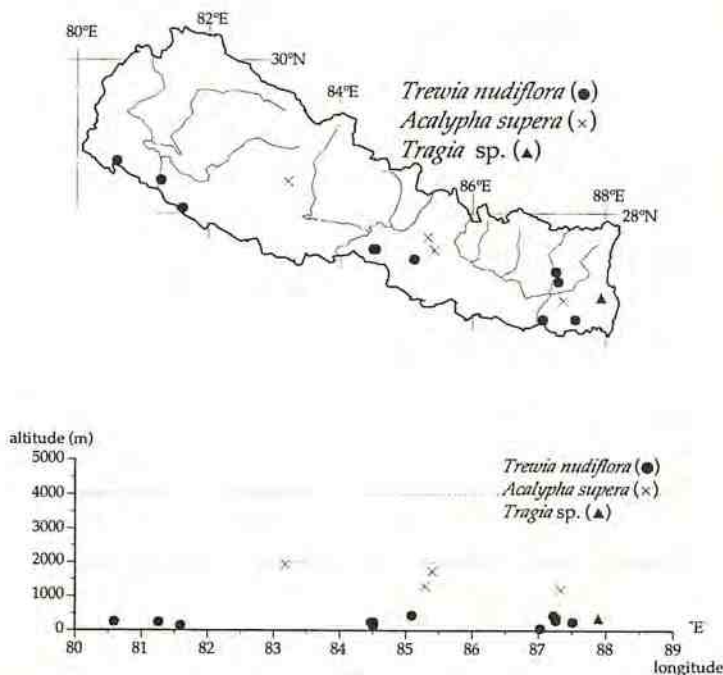


Fig. 31. Distribution of *Trewia nudiflora* L., *Acalypha supera* Forssk., and *Tragia* sp. in Nepal.



*Cuming 1267* (n. v.), Luzon, Province of Cagayan.

Small tree or tree, 9–15 m high, stem diameter 42 cm. *Twigs* stellate-tomentose or stellate-hairy. *Leaves* opposite; stipules triangular, ca. 2.5 by ca. 1 mm, apex acuminate, early caducous; petiole 3–16 cm long, stellate-hairy or stellate-tomentose; blade narrowly ovate, ovate or widely ovate, 7–17 by 9–15 cm, base cordate or obtuse, apex acuminate, margin entire, upper surface stellate-hairy or glabrate, lower surface stellate-hairy, venation palmately 5-veined at base, secondary veins pinnate, 4–7 pairs; 2–8 basal glands on upper surface, narrowly elliptic or elliptic, 1–2.5 by 0.3–0.8 mm, situated 2–8 mm from petiole attachment. *Staminate inflorescences* axillary, modified thyrse, 10–23 cm long, 1–2 mm in diam., stellate-tomentose; bracts caducous, narrowly ovate, 4–5 by 1.2–1.5 mm, apex acuminate, outside stellate-tomentose, inside glabrous. *Staminate flowers* 1–5 per node; pedicel 4–9 mm long, stellate-tomentose; sepals 2 or 3, ovate, ca. 5 by 4–5 mm, apex acute, outside stellate-tomentose, inside pilose; stamens many; filaments ca. 2 mm long; anthers ellipsoid, ca. 1 mm long. *Pistillate inflorescences* not seen. *Pistillate flowers* not seen. *Fruits*: pedicel ca. 6 cm long, stellate-hairy or stellate-tomentose; drupaceous, fleshy, indehiscent, obovoid, ca. 3.5 cm long, ca. 4 cm in diam., stellate-tomentose or glabrate. *Seeds* not seen.

Distribution — Sri Lanka, India, Nepal, Thailand (North), Vietnam, China (South-central, Hainan), Sumatera, Borneo, Jawa, Philippines (Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Central, Eastern.

Habitat & Ecology — Altitude up to 440 m. On roadsides, on river banks, or in *Shorea robusta* forests. Common in eastern plains (Siwakoti & Varma 1999). Flowers from February to March; fruits from June to August.

Vernacular names — Nepali: *belar* (Manandhar 2002), *gamari* (Manandhar 2002), *gule kapasi* (Manandhar 2002), *rambrero* (Manandhar 2002), *ramritha* (Manandhar 2002), *ranipha* (Manandhar 2002). Danuwar: *pithari* (Manandhar 2002). Mooshar: *pitho* (Manandhar 2002).

Uses — Wood is used for planking and in match and paper industries (Manandhar 2002). Lopped leaves is used for fodder (Manandhar 2002). Juice of root is medicinally applied for indigestion, diarrhea, and dysentery (Manandhar 2002).

## 21. *Acalypha* L.

*Acalypha* L., Sp. Pl.: 1003 (1753). — Lectotype species designated by Small in Britton & Brown, Ill. Fl. N. US. ed. 2, 2: 457 (1913): *Acalypha virginica* L.

Key to the species

- A. Spikes 0.3–1.5 cm long; pistillate bracts deeply 3-lobed ..... **1. A. *supera*** Forssk.  
 A. Spikes 1.5–6 cm long; pistillate bracts dentate, unlobed ..... excl. 1. **A. *indica*** L.

**1. *Acalypha supera*** Forssk. — Fig. 31.

*Acalypha supera* Forssk., Fl. Aegypt.-Arab.: 162 (1775); Hepper & Friis, Pl. P. Forssk. Fl. Aegypt.-Arab.: 153 (1994); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 90 (2000). — Type: not designated.

*Acalypha brachystachya* Hornem., Hort. Bot. Hafn.: 909 (1815); Müll. Arg. in DC., Prodr. 15(2): 870 (1866); Hook. f., Fl. Brit. India 5: 416 (1887); Short & Vickery in

Enum. Flow. Pl. Nepal 3: 193 (1982); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 475 (1983); D. G. Long in Fl. Bhutan 1: 797 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 103, t. 25, f. 1–5 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 130 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 20 (1998). — *Ricinocarpus brachystachyus* (Hornem.) Kuntze, Revis. Gen. Pl. 2: 617 (1891). — Type: (holo C (fide Radcliffe-Smith 1987b) n. v.), China, specimen cult. 1806 in Copenhagen Botanic Garden.

*Acalypha conferta* Roxb., Fl. Ind. ed. 1832, 3: 677 (1832). — Type: (n. v.), the Botanic garden (Calcutta), native of China.

[*Acalypha calyciformis* Wight ex Wall., Numer. List: 271, no. 7786 (1847), nom. nud.]

[*Acalypha fissa* Wall., Numer. List: 271, no. 7786B (1847), nom. nud.]

[*Tragia tenuis* Wall., Numer. List: 271, no. 7787 (1847), nom. nud.]

*Acalypha elegantula* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 246 (1850). — Type: Schimper 1708, 31 Aug. 1840 (holo TUB (fide Radcliffe-Smith 1987b) n. v.; iso G, K, P (fide Radcliffe-Smith 1987b) n. v.), Ethiopia, Tegra (Tigray), near Djeladjeranne.

*Nanocnide closii* H. Lév. & Vant., Bull. Soc. Bot. France 51: 144 (1904). — Type: *Cavalerie in herb. Bodinier 2732*, Sep. 1899 (holo E (fide Lauener 1983) n. v.), China, Kweichow, environs de Tou-chan.

Annual monoecious herb. *Stems* erect, branched at middle and lower nodes, 20–45 cm long, sparsely hirsute and with dense short decending hairs. *Leaves* 10–16, alternate; stipules persistent, triangular or lanceolate, 0.8–1 mm long; petiole 1.5–3 cm long, sparsely hirsute with short ascending hairs; blade ovate, 2–4.5 by 1–3 cm, base obtuse or rounded, apex caudate, margin dentate, both surfaces sparsely hirsute, venation 3-veined at base. *Inflorescences* axillary, spiciform, bisexual or unisexual, without peduncles, 0.3–1.5 cm long, hirtellous. *Staminate flowers* many, dense at upper part of inflorescence. *Pistillate flowers* sessile, 1 or 2 per bract; bracts deeply 3-lobed, 1 to several at base of inflorescence, lobes lanceolate, 2.5–5 by 1–2 mm, apex acute or acuminate, hirtellous; ovary globose, hirtellous; styles 3, fimbriate, 1–1.8 mm long, often reddish. *Fruits*: capsule very broadly ovoid, ca. 1.2 mm long, ca. 2 mm in diam., hirtellous. *Seeds* carunculate, ellipsoid, 1.2–1.5 mm long, 0.8–1 mm wide, smooth, brown or whitish.

Distribution — West-Central Tropical Africa, Northeast Tropical Africa, East Tropical Africa, South Tropical Africa, Yemen, Pakistan, Sri Lanka, India, Nepal, Bhutan, Sumatera, Jawa, Sulawesi, Lesser Sunda Isls., China (South-central) (Long 1987, Govaerts et al. 2000). *Pan old tropic*. In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 1200–1950 m. On roadsides, on stone walls, or in crop fields. Flowers & fruits from August to September.

## 22. *Tragia* L.

*Tragia* L., Sp. Pl.: 980 (1753). — Lectotype species designated by Small in Britton & Brown, Ill. Fl. N. US. ed. 2, 2: 458 (1913): *Tragia volubilis* L.

### Key to the species

- A. Leaf blades elliptic, 14–18 by 6.5–8.5 cm, base cordate ..... **1. *Tragia* sp.**  
 A. Leaf blades narrowly ovate-lanceolate, 4–7.5 by 0.5–1.5 cm, base cuneate  
 ..... excl. **2. *T. involucrata* L.**



**1. *Tragia* sp.** — Plate 11; Fig. 31.

*Tragia involucrata* sense Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982), non L., Sp. Pl.: 980 (1753); T. Kuros., Newslett. Himal. Bot. no. 22: 21 (1998).

Twinning herb. *Stems* densely pilose or tomentose. *Leaves* alternate; stipules persistent lanceolate, 5–10 by 1.5–3 mm, densely pilose, apex acuminate; petiole 2–7 cm long, tomentose; blade elliptic, 14–18 by 6.5–8.5 cm, base cordate, apex acuminate or caudate, margin dentate, venation 3-veined at base, secondary veins 4–6 pairs, upper surface pilose, lower surface densely pubescent. *Inflorescences* not seen. *Staminate flowers* not seen. *Pistillate flowers* not seen. *Fruit* not seen. *Seeds* not seen.

Distribution — Unknown. In Nepal: Eastern.

Habitat & Ecology — Altitude 390 m. Among shrubs.

Notes — I could find only one sheet of *Tragia* specimen from Nepal during the study that Short & Vickery (1982) regarded as *T. involucrata*. The specimen consists of a twinning shoot without any reproductive organs. Although I could not identify it to species level, it seems rather to resemble to *T. montana* (Twaites) Müll. Arg., *T. hispida* Willd., or *T. involucrata* L. var. *rheediana* Müll. Arg. in its large elliptic leaves with cordate base and large stipules.

*Tragia involucrata* have been recorded from East Nepal (Siwakoti & Varma 1999, Rajbhandari 2001a). See under excluded taxa.

## Subfamily III. CROTONOIDEAE Pax

*Crotonoideae* Pax, Bot. Jahrb. Syst. 5: 413 (1884). — Type: *Croton* L.

**23. *Manihot* Mill.**

*Manihot* Mill., Gard. Dict. Abr. ed. 4 (1754). — Type species: *Manihot esculenta* Crantz [*Jatropha manihot* L.].

**1. *Manihot esculenta* Crantz** — Fig. 32.

*Manihot esculenta* Crantz, Inst. Rei Herb. 1: 167 (1766); D. G. Long in Fl. Bhutan 1: 795 (1987). — *Jatropha manihot* L., Sp. Pl.: 1007 (1753). — Lectotype fide Radcliffe-Smith (1987b): *Herb. Linnaeus, No. 1141-11* (LINN n. v.)

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of Mexico and tropical America, widely cultivated in tropical region (Govaerts et al. 2000). In Nepal: Eastern.

Habitat & Ecology — Altitude 1200 m.

**24. *Jatropha* L.**

*Jatropha* L., Sp. Pl.: 1006 (1753). — Lectotype species, not traced: *Jatropha gossypifolia* L.

## Key to the species

- A. Leaves deeply 3–5-lobed, with densely glandular-hairy margin; capsules ca. 1.3 cm long, ca. 1 cm in diameter ..... **1. *J. gossypifolia* L.**  
 A. Leaves shallowly 3–5-lobed, with glabrous margin; capsules ca. 2.5 cm long, ca. 2 cm in diameter ..... **2. *J. curcas* L.**

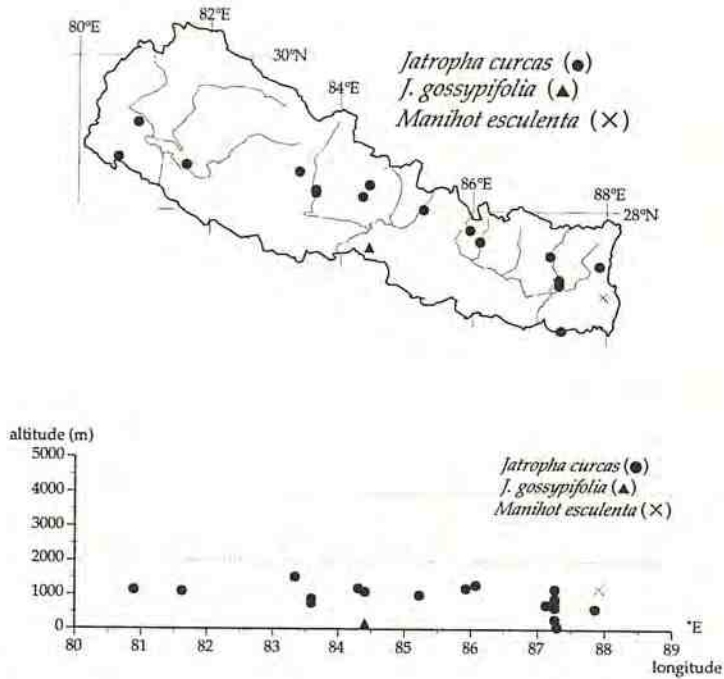


Fig. 32. Distribution of *Jatropha gossypifolia* L., *J. curcas* L. and *Manihot esculenta* Crantz in Nepal.

### 1. *Jatropha gossypifolia* L. — Fig. 32.

*Jatropha gossypifolia* L., Sp. Pl.: 1006 (1753), "*gossypifolia*"; Müll. Arg. in DC., Prodr. 15(2): 1086 (1866); Hook. f., Fl. Brit. India 5: 383 (1887); Baehni, Candollea 17: 70 (1959); C. R. Rao, Ind. For. 93: 55 (1967); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); T. Kuros., Newsl. Himal. Bot. no. 22: 21 (1998), "*gossypifolia*"; Siwakoti & Varma, Pl. Divers. E. Nepal: 327 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1025 (2000); Manandhar, Pl. People Nepal: 279 (2002). — Type fide Coode et al. (1982): *Herb. Linnaeus, No. 1141-1* (LINN (fide Radcliffe-Smith 1987b) n. v.), in America meridionali; *Royen* (L (fide Radcliffe-Smith 1987b) n. v.), in America meridionali.

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of SE. Mexico and Tropical America (Govaerts et al. 2000), cultivated in pantropical areas and introduced into the Old World (Webster & Burch 1968). In Nepal: Central.

Habitat & Ecology — Altitude 200 m. On sunny waste ground. Common in eastern plains (Siwakoti & Varma 1999). Flowers from December to February; fruits in December.

Vernacular names — Nepali: *bepane danti* (Manandhar 2002). Danuwar: *chhotaka baghandi* (Manandhar 2002). Mooshar: *lal baghandi* (Manandhar 2002).

### 2. *Jatropha curcas* L. — Fig. 32.

*Jatropha curcas* L., Sp. Pl.: 1006 (1753); Roxb., Fl. Ind. ed. 1832, 3: 686 (1832); Wall., Numer. List: 271, no. 7799A–C, D, p. p., H (1847); Müll. Arg. in DC., Prodr. 15(2):



1080 (1866); Kurz, Forest Fl. Burma 2: 403 (1877); Hook. f., Fl. Brit. India 5: 383 (1887); Burkill, Rec. Bot. Surv. India 4: 120 (1910); Bachni, Candollea 17: 70 (1959); Banerji, Rec. Bot. Surv. India 19(2): 82 (1966); Hurus. & Ya. Tanaka in Fl. E. Himal.: 179 (1966); Murata, Acta Phytotax. Geobot. 25: 114 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); Malla et al., Fl. Kathmandu Valley: 626 (1986); D. G. Long in Fl. Bhutan 1: 790 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 148 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 85 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 21 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 327 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1022 (2000); Manandhar, Pl. People Nepal: 278 (2002). — Lectotype fide Radcliffe-Smith (1987b): *Hort. Cliff.*: 445 (BM n. v.), from 'America calidiore.'

See Govaerts et al. (2000) for further synonyms.

Distribution — Native probably to Mexico and Guatemala (Webster & Burch, 1968), cultivated as a medicinal or hedge plant in pantropical areas, and often escaping (Webster & Burch 1968). In Nepal: Far Western, Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 290–2000 m. On roadsides or on edge of cultivation. Flowers from May to November; fruits from June to November.

Vernacular names — Nepali: *arin* (Manandhar 2002), *kadam* (Manandhar 2002), *nimte* (Manandhar 2002), *sajyon* (Manandhar 2002), *saruwa* (Siwakoti & Varma 1999). Chepang: *dhuching* (Manandhar 2002), *nirguri* (Manandhar 2002). Danuwar: *akakgachha* (Manandhar 2002), *arari* (Manandhar 2002). Gurung: *rajani giri* (Manandhar 2002), *sajin* (Manandhar 2002), *satiman* (Manandhar 2002). Magar: *ratyun* (Manandhar 2002). Majhi: *aren* (Manandhar 2002), *aril* (Manandhar 2002). Mooshar: *baghandi* (Manandhar 2002). Rai: *kadam* (Manandhar 2002). Raute: *dekiro* (Manandhar 2002). Tamang: *desya* (Manandhar 2002), *gara* (Manandhar 2002), *gyagar desya* (Manandhar 2002). Tharu: *ratanjot* (Manandhar 2002).

Uses — Cultivated as hedge plant or to collect seeds containing oil for lighting (Siwakoti & Varma 1999, Manandhar 2002). Tender shoots are cooked as a vegetable (Manandhar 2002). Juice, bark, leaf, cotyledon and seed oil are medicinally applied for various diseases (Siwakoti & Varma 1999, Manandhar 2002).

## 25. *Ostodes* Blume.

*Ostodes* Blume, Bijdr.: 619 (1826). — Type species: *Ostodes paniculata* Blume

### 1. *Ostodes paniculata* Blume — Fig. 33.

*Ostodes paniculata* Blume, Bijdr.: 620 (1826); Müll. Arg. in DC., Prodr. 15(2): 1115 (1866); Kurz, Forest Fl. Burma 2: 404 (1877); Hook. f., Fl. Brit. India 5: 400 (1887); Banerji, Candollea 19: 218 (1964); Banerji, Rec. Bot. Surv. India 19(2): 83 (1966); Hurus. & Ya. Tanaka in Fl. E. Himal.: 180 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 197 (1982); D. G. Long in Fl. Bhutan 1: 795 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 157 (1996); T. Kuros., Newslett. Himal. Bot. no. 22: 21 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1231 (2000); Manandhar, Pl. People Nepal: 343 (2002). — Type: (n. v.), in sylvis montium Salak, Burangrang et Tjerimai (Java).

*Ostodes corniculata* Baill., Étude Euphorb.: 391 (1858).

*Ostodes kerrii* Craib, Bull. Misc. Inform. Kew 1911: 464 (1911).

*Ostodes thyrsantha* Pax in Engler, Pflanzenr., IV, 147, II: 18 (1911). — *Ostodes paniculata* Blume var. *thyrsantha* (Pax) Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 27: 260 (1985 publ. 1987).

*Ostodes prainii* Gand., Bull. Soc. Bot. France 66: 287 (1919 publ. 1920).

Shrub or small tree, 3–10 m high, stem diameter 15–31 cm. Twigs tomentose. Leaves alternate; petiole 4–24 cm long, with appressed hairs or glabrous, paired glands at apex, ca. 0.5–1 mm broad, stalked or sessile; blade narrowly ovate or ovate, 11.5–27 by 5.5–13 cm, base subcordate or rounded, apex acuminate or caudate, margin bluntly serrate, with a gland at the top of every tooth, 3-veined, upper surface glabrous, lower surface hairy at sides and axils of veins. *Staminate inflorescences* paniculate, cauliflorous, 6–30 cm long, 1–1.5 mm in diam., glabrous; the lowest branch 0.5–4.5 cm long. *Staminate flowers*: pedicel 4–5 mm long, glabrous; sepals 3, unequal, elliptic or orbicular, 3–3.5 by 2–3 mm, glabrous or villous; petals 5, unequal, elliptic, orbicular or transversely elliptic, 4–7 by ca. 5 mm, apex rounded, margin entire, glabrous; stamens many; filaments ca. 5 mm long, lower half villous; anthers ellipsoid, ca. 0.8 mm long. *Pistillate inflorescences* racemose, cauliflorous, 15–30 cm long when fruit. *Pistillate flowers* on racemes, cauliflorous; ovary 3-carpellate. *Fruits*: capsule subglobose, 1.8–2.2 cm high, 2.3–2.5 cm in diam., tomentose; columella persistent after dehiscence, 1.7–1.9 cm long. *Seeds* broadly ellipsoid, 1.4–1.6 cm long, 1.2–1.3 cm wide, glabrous.

Distribution — India (Sikkim, Assam), Nepal, Bhutan, Burma, Thailand, Vietnam, Malaysia (Peninsular), Sumatera, Jawa, China (South-central, Hainan) (Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 600–1350 m. On rocky slopes, on roadsides, or in

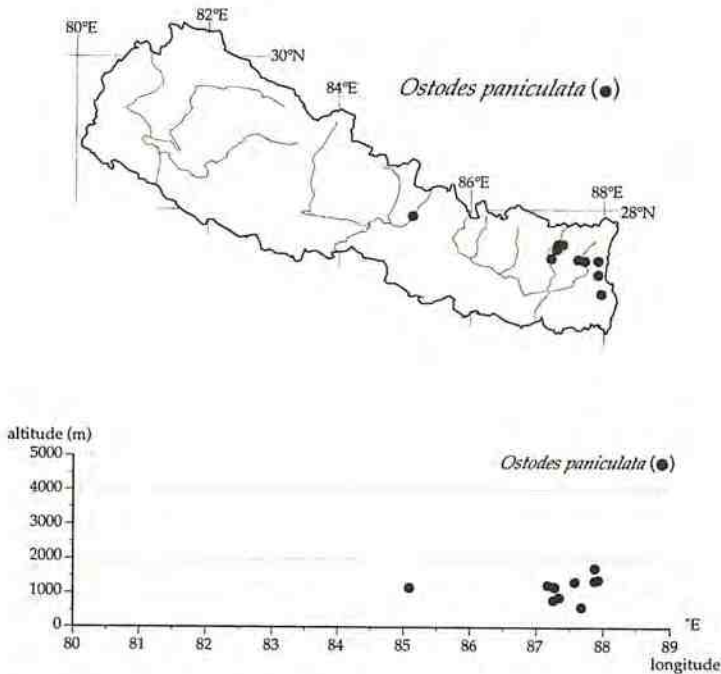


Fig. 33. Distribution of *Ostodes paniculata* Blume in Nepal.



forests. Flowers in April; fruits from July to November.

Vernacular name — Nepali: *bepari* (Manandhar 2002).

Uses — Seed oil is medicinally used for muscular swellings (Manandhar 2002).

## 26. *Baliospermum* Blume

*Baliospermum* Blume, Bijdr.: 603 (1826). — Type species: *Baliospermum axillare* Blume

Key to the species

A. Monoecious; leaf margin crenate; sepals of pistillate flowers ca. 1 by ca. 0.6 mm, pubescent, styles ca. 1.5 mm long; capsules globose, pubescent

..... **1. *B. montanum*** (Willd.) Müll. Arg.

A. Dioecious; leaf margin crenate; sepals of pistillate flowers 5–7 by 1–2.5 mm, villous or glabrate, styles ca. 3 mm long; capsules depressed ovoid, glabrous

..... **2. *B. corymbiferum*** Hook. f.

### 1. *Baliospermum montanum* (Willd.) Müll. Arg. — Fig. 34.

*Baliospermum montanum* (Willd.) Müll. Arg. in DC., Prodr. 15(2): 1125 (1866); Kurz, Forest Fl. Burma 2: 410 (1877); Hurus. & Ya. Tanaka in Fl. E. Himal.: 174 (1966); C. R. Rao, Ind. For. 93: 55 (1967); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 811 (1987); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 178, t. 47, f. 4 (1996); T. Kuros., Newslett. Himal. Bot. no. 22: 21 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 320 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 243

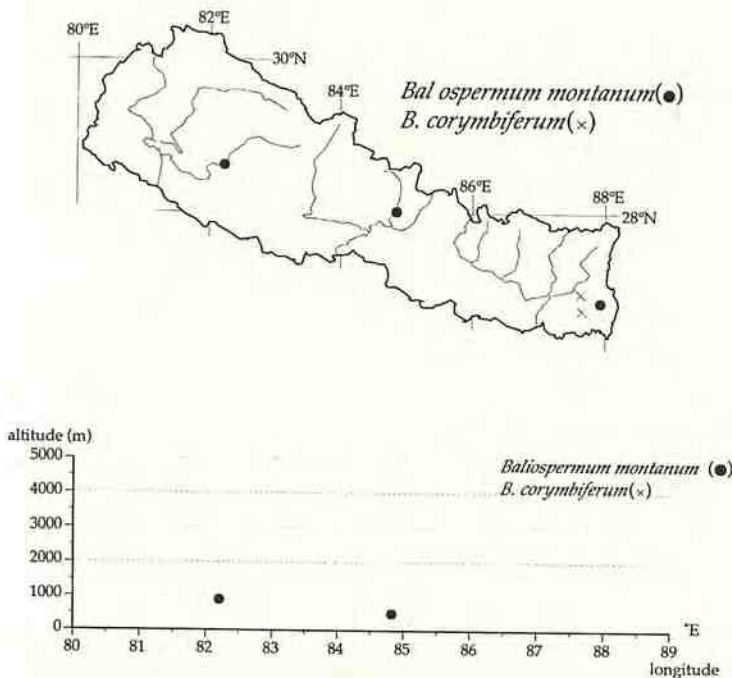


Fig. 34. Distribution of *Baliospermum montanum* (Willd.) Müll. Arg. and *B. corymbiferum* Hook. f. in Nepal.

(2000); Rajbhandari, Ethnobot. Nepal: 57 (2001). — *Jatropha montana* Willd., Sp. Pl. 4: 563 (1805). — *Croton polyandrus* Roxb., Fl. Ind. ed. 1832, 3: 682 (1832), nom. illeg. — *Ricinus montanus* (Willd.) Wall., Numer. List: 270, no. 7727 (1847) — *Baliospermum polyandrum* Wight, Icon. Pl. Ind. Orient. 5(2): 23, t. 1885 (1852), nom. superfl. — Type: [Klein s. n.] (B-WILLD (fide Chakrabarty & Balakrishnan 1990) n. v.), India orientali.

*Croton solanifolius* Geiseler, Croton. Monogr.: 74 (1807); A. Juss., Euphorb. Gen.: 31 (1824). — *Baliospermum indicum* Decne. in Jacquem., Voy. Inde 4: 154, t. 155 (1844), nom. illeg. — *Baliospermum solanifolium* (Geiseler) Suresh in Nicolson et al., Interpret. Rheede's Hort. Malab: 106 (1988). — Type: *Vahl s. n.* (C (fide Chakrabarty & Balakrishnan 1990) n. v.), India.

*Baliospermum axillare* Blume, Bijdr.: 604 (1826); Hook. f., Fl. Brit. India 5: 461 (1887).

— Type: [Blume] (L? (Chakrabarty & Balakrishnan 1990) n. v.), Java, in montosis.

[*Baliospermum moritzianum* Baill., Étude Euphorb.: 395 (1858), nom. nud.]

*Baliospermum pendulinum* Pax in Engl., Pflanzenr., IV, 147, IV: 28 (1912). — Type:

*Wawra 2495* (n. v.), Gebiet der Sandwich-Inseln, Honolulu.

*Baliospermum raziana* Keshava, Murthy & Yagan., Curr. Sci. 56: 486 (1987). — Type: K.

R. Keshava Murthy & Party 4218A (holo Herbarium of the Regional Research Centre, Bangalore n. v.; iso (4218B, C) Herbarium of the Regional Research Centre, Bangalore n. v.), India, Karnataka, Nagarhole.

Monoecious shrub, up to 1.8 m high. Twigs pubescent. Leaves alternate; petiole 2–7 cm long, pubescent; blade elliptic or narrowly elliptic, 5–20 by 2–15 cm, base subcordate or rounded, with a pair of glands, apex acuminate, margin crenate, with a gland at the top of every tooth, venation 3-veined, both surfaces pubescent. Inflorescences axillary, racemose or paniculate, 1.5–9 cm long, with many staminate flowers and 0–3 pistillate flower at base and rarely also at top. Staminate flowers: pedicel 2–5 mm long, pubescent or glabrate; sepals 5, circular or transversely elliptic, 1–2 by 0.8–2.5 mm, apex rounded, outside pubescent at lower half; petals absent; stamens many. Pistillate flowers: pedicel 1–2.5 mm long, pubescent or tomentose; sepals 5, ovate, ca. 1 by ca. 0.6 mm, apex acute, pubescent; ovary depressed globose, ca. 1.4 mm high, ca. 2 mm in diam., densely tomentose; styles 3, ca. 1.5 mm, bifid, glabrous. Fruits: pedicel 5–8 mm long, pubescent; capsule globose, ca. 8 mm high, ca. 8 mm in diam., pubescent. Seeds broadly ellipsoid, ca. 6 mm long, ca. 4 mm wide, glabrous.

Distribution — India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Vietnam, Malaysia (Peninsular), Sumatera, Jawa, Lesser Sunda Isls., China (South-central) (Govaerts et al. 2000). *S Asian-Malaysian element.* In Nepal: Mid Western, Western, Eastern.

Habitat & Ecology — Altitude 500–900 m. In open forests on riversides. Common in eastern plains (Siwakoti & Varma 1999). Flowers & fruits from December to June.

Vernacular names — Rai: *dudhe jaar* (Rajbhandari 2001a). Satar: *danti* (Rajbhandari 2001a).

Uses — Seeds are used medicinally for gastric disorders, gouts and rheumatism (Rajbhandari 2001a).

## 2. *Baliospermum corymbiferum* Hook. f. — Fig. 34.

*Baliospermum corymbiferum* Hook. f., Fl. Brit. India 5: 463 (1888); Hurus. & Ya. Tanaka in Fl. E. Himal.: 174 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982);



D. G. Long in Fl. Bhutan 1: 810 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 21 (1998). — *Baliospermum calycinum* Müll. Arg. var. *corymbiferum* (Hook. f.) Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 32: 13 (1990, publ. 1992); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 242 (2000). — Lectotype designated by Chakrabarty & Balakrishnan (1990): [*G.*] *King s. n.* (K n. v.), Sikkim.

*Baliospermum nepalense* Hurus. & Ya. Tanaka in Fl. E. Himal.: 174, f. 20, A–F (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 194 (1982); D. G. Long in Fl. Bhutan 1: 810 (1987). — *Baliospermum calycinum* Müll. Arg. var. *nepalense* (Hurus. & Ya. Tanaka) Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 32: 20 (1990, publ. 1992); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 243 (2000). — Lectotype designated by Kurosawa & Shimizu (2000): *H. Hara et al.* 6306822 (TI!), Nepal, Below Mai Majuwa–Dhara Pani, 1600–1500m. See Kurosawa & Shimizu (2002) for a photograph of the lectotype.

Dioecious shrub, 0.9–1.2 m high. *Twigs* villous. *Leaves* alternate; petiole 6–16 cm long, villous; blade elliptic, 11–22 by 5–14 cm, base shallowly cordate or rounded, apex acuminate, margin crenate, without a gland, venation 3-nerved, both surfaces pubescent. *Inflorescences* axillary paniculate. *Staminate inflorescences* 4–9 cm long, 2–4 cm wide; peduncle 12–18 cm long, villous; the lowest branch 0.2–0.9 cm long; scale-like leaves ovate, 1.5–2 by 0.5–0.8 mm, apex acuminate or acute. *Staminate flowers* many; pedicel ca. 4 mm long, glabrous or sparsely villous; sepals 5, widely elliptic, apex rounded, ca. 2 by ca. 1.8 mm, glabrous or sparsely villous; stamens many; filaments ca. 2 mm long; anthers ellipsoid, ca. 0.5 mm long. *Pistillate inflorescences* paniculate, 1–2 cm long, villous; peduncle 1–2.5 cm long; scale-like leaves lanceolate 2–5 by 0.7–1 mm, apex acuminate. *Pistillate flowers* 4 or 5 per panicle; pedicel 0.5–4 mm long, glabrous; sepals 5, lanceolate, 5–7 by 1–2.5 mm, villous or glabrate, apex acute; ovary globose, ca. 2 mm long, ca. 2.2 mm in diam., glabrous, smooth; styles 3, ca. 3 mm long, connate for ca. 0.6 mm from base, bifid at upper half, glabrous, smooth. *Fruits*: pedicel 4–5 mm long; sepals persistent, unequal, narrowly elliptic, 5–6 by 1–2 mm, apex acute or acuminate; capsule depressed ovoid, deeply 3-lobed, ca. 5 mm high, ca. 9 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 4 mm long. *Seeds* broadly ellipsoid, 4.5–5 mm long, 3.2–3.8 mm wide, glabrous.

*Distribution* — India (Sikkim), Nepal, Bhutan, Burma (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Eastern.

*Habitat & Ecology* — Altitude 1500–1800 m. Flowers from September to December; fruits in December.

*Notes* — Chakrabarty & Balakrishnan (1990) considered *Baliospermum calycinum* as an "exceedingly variable polymorphic" in its shape of leaves, and branching and bracts size of male inflorescences and *B. colymbiferum* and *B. nepalense* were treated as its varieties. I, however, treat *B. colymbiferum* as a distinct species because it is distinguishable from *B. calycinum* in leaf shape and breadth of male panicle as pointed out by Chakrabarty & Balakrishnan (1990).

Chakrabarty & Balakrishnan (1990) treated *B. colymbiferum* and *B. nepalense* as distinct varieties based on subtle difference of breadth of male inflorescences: the lowest branches of the former is up to 1 cm long and that of the latter is 2–5 cm long. Here the two taxa are not regarded as distinct varieties because the length of lowest branches seems to be



overlapped in some specimens including syntypes of *B. nepalense* (1–2.5 cm long).

## 27. *Croton* L.

*Croton* L., Sp. Pl.: 1004 (1753). — Lectotype species designated by Webster (1967):  
*Croton aromaticus* L.

### Key to the species

- A. Subshrub; leaf blades 4.5–7 by 2.5–4 cm; styles ca. 1.5 mm long  
..... **1. *C. bonplandianus*** Baill.
- A. Tree or shrub; leaf blades 9–25 by 3–10 cm; styles 3–8 mm long
- B. Leaf blades narrowly ovate or lanceolate, pinnately veined, paired glands sessile, at apex of petiole; twigs, lower surfaces of leaves, and capsules lepidote  
..... **2. *C. roxburghii*** N. P. Balakr.
- B. Leaf blades elliptic, ovate or widely ovate, palmately veined, paired glands stalked, at base of blade; twigs, lower surfaces of leaves, and capsules stellate-hairy
- C. Leaf blades base cordate, subcordate or rounded; capsule broadly ovoid, densely stellate-hairy
- D. Leaf margins serrulate, marginal gland absent; sepals of pistillate flowers 2–2.5 by 1.5–1.8 mm; styles ca. 3 mm long; capsules 8–10 mm long, 8–10 mm in diam., pericarp 0.2–0.4 mm thick; seeds ca. 6 mm long, ca. 4 mm wide .....  
..... **3. *C. aff. caudatus*** Geiseler
- D. Leaf margins serrate or duplicate-serrate, stalked marginal glands present; sepals of pistillate flowers ca. 4 by ca. 3 mm; styles 7–8 mm long; capsules 17–20 mm long, 16–18 mm in diam., pericarp 1.5–2 mm thick; seeds 12–13 mm long, ca. 9 mm wide ..... **4. *C. caudatus*** Geiseler
- C. Leaf blades base cuneate or obtuse; capsules broadly ellipsoid, stellate-hairy .....  
..... **5. *C. tigilium*** L.

### 1. *Croton bonplandianus* Baill. — Fig. 35.

*Croton bonplandianus* Baill., *Adansonia* 4: 339 (1864); Short & Vickery in *Enum. Flow. Pl. Nepal* 3: 195 (1982); Chakrab., *J. Econ. Taxon. Bot.* 4: 579 (1983); D. G. Long in *Fl. Bhutan* 1: 793 (1987); Chakrab. & N. P. Balakr., *Bull. Bot. Surv. India* 34: 31 (1992); Philcox in *Rev. Handb. Fl. Ceylon* 11: 89 (1997); T. Kuros., *Newslett. Himal. Bot.* no. 22: 22 (1998); Siwakoti & Varma, *Pl. Divers. E. Nepal*: 322 (1999); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 434 (2000). — Type: *Bonpland s. n.*, in 1833 (holo P (fide Radcliffe-Smith 1987b) n. v.; iso P (fide Radcliffe-Smith 1987b) n. v.), Argentina, Corrientes Province.

*Croton sparsiflorus* Morong, *Ann. New York Acad. Sci.* 7: 221 (1893). — Type: *Morong 43* (NY (fide Radcliffe-Smith 1975) n. v.; iso K n. v.), Paraguay, Asunción; *Morong 940* (NY (fide Radcliffe-Smith 1975) n. v.), Pilcomayo River.

*Croton spiciflorus* sensu Hurus. & Ya. Tanaka in *Fl. E. Himal.*: 177 (1966), non Thunb., *Fl. Jav.*: 23 (1825).

See Govaerts et al. (2000) for further synonyms.

Monoecious subshrub, 0.3–0.5 m high. *Twigs* stellate-hairy. *Leaves* alternate; petiole 1.5–3 cm long; a pair of sessile glands at apex of petiole, circular, 0.2–0.4 mm in



diameter, ca. 0.8 mm broad; blade narrowly ovate or ovate, 4.5–7 by 2.5–4 cm, base cuneate, apex acuminate, margin serrulate, without gland between teeth, venation palmately 3-veined, upper surface glabrous or sparsely stellate-hairy, lower surface sparsely stellate-hairy. *Inflorescences* terminal, racemose, 5–17 cm long, with many staminate flowers on upper part, 6–11 pistillate flowers on lower part. *Staminate flowers* glabrous; pedicel 1–1.5 mm long; sepals 5, elliptic, ca. 1 by ca. 0.7 mm, apex rounded, outside glabrous; petals 5, narrowly elliptic, ca. 1.2 by ca. 0.5 mm, apex rounded; stamens ca. 14; filaments ca. 1.3 mm; anthers elliptic, ca. 0.4 mm long. *Pistillate flowers*: pedicel ca. 0.5 mm long, stellate-hairy; sepals 5, ovate, ca. 1.5 by ca. 0.7 mm, stellate-hairy, apex acuminate; petals absent; ovary orbicular, ca. 1 mm in diam., densely stellate-hairy; styles 3, ca. 1.5 mm long, bifid. *Fruits*: capsule ellipsoid, ca. 5 mm high, ca. 4 mm in diam., stellate-hairy; columella persistent after dehiscence, ca. 5 mm long, trifold at the top. *Seeds* ellipsoid, ca. 4 mm long, ca. 2 mm wide, glabrous, carunculate.

**Distribution** — Native of S. Bolivia, Paraguay, SW. Brazil and N. Argentina (Radcliffe-Smith 1975), naturalized throughout tropical Asia and Africa (Radcliffe-Smith 1975, Short & Vickery 1982, Chakrabarty 1983b, Chakrabarty & Balakrishnan 1992). In Nepal: Western, Central, Eastern.

**Habitat & Ecology** — Altitude 100–390 m. On river banks or on roadsides. Common in eastern plains (Siwakoti & Varma 1999). Flowers & fruits throughout the year.

**Vernacular name** — Nepali: *khursane jhar* (Siwakoti & Varma 1999).

**Notes** — Short & Vickery (1982) and Chakrabarty (1983a) independently pointed out that the records of *Croton spiciflorus* from Nepal by Hurusawa & Tanaka (1966) is referable to *C. bonplandianus*.

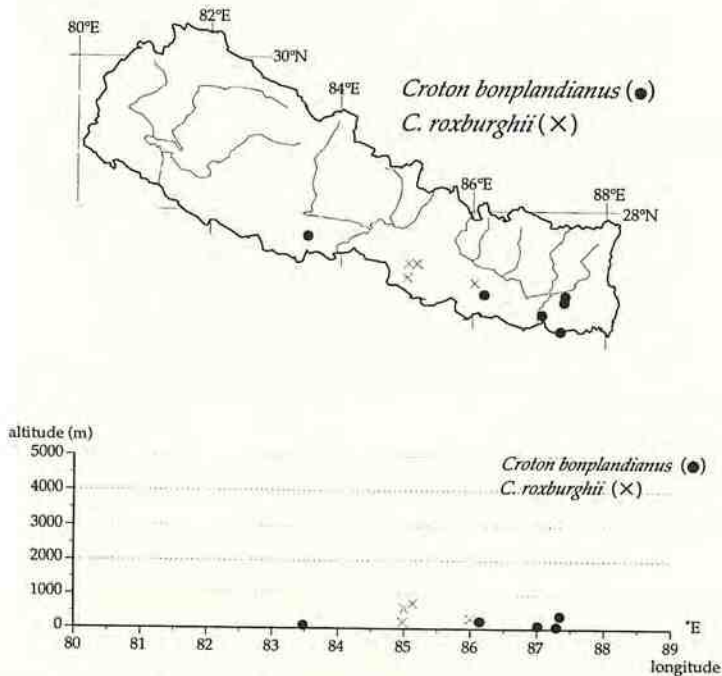


Fig. 35. Distribution of *Croton bonplandianus* Baill. and *C. roxburghii* N. P. Balakr. in Nepal.

Chakrabarty (1983b) made an attempt to trace the major migratory routes of *C. bonplandianus* in Indian Subcontinent on the basis of herbarium specimens and literature. He supposed that it spreaded from Chittagong, Bangladesh, over the subcontinent, and reached Nepal from Bihar (and Utter Pradesh?), India.

**2. *Croton roxburghii* N. P. Balakr. — Fig. 35.**

*Croton roxburghii* N. P. Balakr., Bull. Bot. Surv. India 3: 39 (1962), nom. nov.; Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); D. G. Long in Fl. Bhutan 1: 792 (1987); Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 34: 67 (1992); T. Kuros., Newslett. Himal. Bot. no. 22: 22 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 323 (1999); Rajbhandari, Ethnobot. Nepal: 58 (2001); Manandhar, Pl. People Nepal: 176 (2002). — *Croton oblongifolius* Roxb., [H. Beng.: 69 (1814), nom. nud.] Fl. Ind. ed. 1832, 3: 685 (1832), "*oblongifolium*", non Delile, Descr. Egypte, Hist. Nat.: 283 (1812), nec Sieber ex Spreng., Syst. Veg. 3: 850 (1826); Müll. Arg. in DC., Prodr. 15(2): 573 (1866); Kurz, Forest Fl. Burma 2: 373 (1877); Hook. f., Fl. Brit. India 5: 386 (1887); C. R. Rao, Ind. For. 93: 55 (1967). — Type fide Chakrabarty & Balakrishnan (1992), but without Roxburgh's identification: [*Roxburgh s. n.*] (BM!), [Bengal] (India).

[*Croton elaeocarpifolius* Wall., Numer. List: 270, no. 7734 (1847), "*elaecarpifolium*", nom. nud.]

[*Croton laevigatus* Wall., Numer. List: 270, no. 7735A, p. p. (1847), "*laevigatum*", nom. nud.]

[*Croton dubia* Wall., Numer. List: 270, no. 7735A, p. p. (1847), nom. nud.]

[*Croton boragatch* Wall., Numer. List: 270, no. 7735D (1847), nom. nud.]

*Croton laevigatus* auct. non Vahl, Symb. Bot. 2: 97 (1791); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 136 (1996), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 467 (2000).

Monoecious shrub, small tree, or tree, 3–12 m high. *Twigs* lepidote. *Leaves* alternate; petiole 1.5–2.5 cm long; a pair of sessile glands at apex of petiole, elliptic, ca. 1.3 by ca. 0.7 mm; blade narrowly ovate or lanceolate, 12–19 by 4.5–7.2 cm, base cuneate or rounded, apex acute or obtuse, margin crenate or serrate, without gland between teeth, venation pinnately veined, secondary veins 13–17 pairs, upper surface glabrous, lower surface sparsely lepidote. *Inflorescences* terminal, racemose, 9–29 cm long, with many staminate flowers on upper part and 0–7 pistillate flowers on lower part. *Staminate flowers*: pedicel 5–7 mm long, 0.2–0.3 mm in diam., stellate-hairy; sepals 5, ovate, 2.5–3 by 1.5–2 mm, apex acute, outside stellate-hairy; petals 5, elliptic, 2.5–3 by 1.2–1.4 mm, apex acute, outside pilose; stamens 11–13; filaments ca. 4 mm; anthers elliptic, ca. 1.3 mm long. *Pistillate flowers*: pedicel 4–6 mm long, densely stellate-tomentose; sepals 5, ovate, 2–2.5 by 1.2–1.8 mm, apex acute, stellate-hairy; petals absent; ovary globose, ca. 2 mm high, ca. 2 mm in diam., densely stellate-hairy; styles 3, ca. 4.5 mm, bifid. *Fruits*: pedicel 5–8 mm long; capsule ellipsoid, ca. 10 mm high, ca. 8 mm in diam., densely lepidote; columella persistent after dehiscence, ca. 7 mm long. *Seeds* broadly ellipsoid, 7–8 mm long, 5–5.5 mm wide, glabrous, carunculate.

*Distribution* — Sri Lanka, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Vietnam, China (South-central) (Chakrabarty & Balakrishnan 1992). *S Asian-Malaysian element*. In Nepal: Central, Eastern.

*Habitat & Ecology* — Altitude 200–750 m. On roadsides, in *Shorea robusta* forests, or



in deforested place. Common in eastern plains (Siwakoti & Varma 1999). Flowers from February to March; fruits in April.

Vernacular names — Nepali: *aule* (Rajbhandari 2001a, Manandhar 2002). Danuwar: *mahason* or *mahasun* (Rajbhandari 2001a, Manandhar 2002). Mooshar: *mahison* (Manandhar 2002). Satar: *guti* (Rajbhandari 2001a).

Uses — Bark juice is medicinally used to cure malarial fever (Rajbhandari 2001a, Manandhar 2002). Bark and root are used as purgative (Rajbhandari 2001a). Seed oil is medicinally used as a laxative or used as fish poison and insecticidal property (Manandhar 2002).

Notes — This species has been occasionally treated as a synonym of Hainanese species, *C. laevigatus* Vahl. (Kiu et al. 1996, Govaerts et al. 2000), but is considered to be a distinct species as Croizat (1942) asserted. *Croton laevigatus* has smaller leaves (8.5–16 by 3.5–5 cm) and clearly 3-lobed transversely ellipsoid capsule (ca. 8 mm high, ca. 10 mm in diameter).

Further studies are needed to clarify the delimitation of this species and an Assamese species, *C. joufra* Roxb.

### 3. *Croton* aff. *caudatus* Geiseler \*

Distribution — Endemic to Nepal. In Nepal: Western, Central.

Habitat & Ecology — Altitude 970–1800 m. On rocky places, on slopes, or in forsts. Flowers & fruits from July to August.

Notes — Identity and circumscription of this species will be discussed in another paper.

### 4. *Croton caudatus* Geiseler — Fig. 36.

*Croton caudatus* Geiseler, *Croton*. Monogr.: 73 (1807); Müll. Arg. in DC., Prodr. 15(2): 599 (1866); Kurz, Forest Fl. Burma 2: 375 (1877); Hook. f., Fl. Brit. India 5: 388 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 177 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); D. G. Long in Fl. Bhutan 1: 793 (1987); Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 34: 38 (1992); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 133 (1996); Philcox in Rev. Handb. Fl. Ceylon 11: 94 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 22 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 438 (2000). — [*Croton caudatus* Geiseler var. *genuinus* Müll. Arg. in DC., Prodr. 15(2): 599 (1866), nom. inval.] — Type: *Rottler s. n.* (C (fide Chakrabarty & Balakrishnan 1992) n. v.), India Orientali.

*Croton aromaticus* Gaertn., Fruct. Sem. Pl. 2: 119, t. 167(6) (1790), non L., Sp. Pl.: 1005 (1753).

*Croton denticulatus* Blume, Bijdr.: 603 (1826), "*denticulatum*." — *Croton caudatus* Geiseler var. *denticulatus* (Blume) Müll. Arg. in DC., Prodr. 15(2): 599 (1866). — Type: [Blume] (L (fide Chakrabarty & Balakrishnan 1992) n. v.), (Java).

*Croton drupaceus* Roxb., Fl. Ind. ed. 1832, 3: 683 (1832), "*drupaceum*"; Wall., Numer. List: 270, no. 7720A, C, 7721 (1847). — Type: [*Roxburgh s. n.*] (BM!), [H. B. C.]; *herb. Francis Buchanan Hamilton 2111* (E!, fragment), [Hort. Beng.].

*Croton malvifolius* Griff., Itin. Pl. Khasyah Mts. 200: 1166 (1848), nom. illeg.

\* The taxon was described as *Croton nepalensis* T. Kuros. (Kurosawa in Edinburgh J. Bot. 61: 34 (2005)).

- Tigilium klotzschianum* Wight, Icon. Pl. Ind. Orient. 5: t. 1914 (1852). — *Croton caudatus* Geiseler var. *klotzschianus* (Wight) Müll. Arg. in DC., Prodr. 15(2): 599 (1866). — Type: (n. v.), Travancore, Martabar.
- Croton caudatus* Geiseler var. *oblongifolius* Müll. Arg. in DC., Prodr. 15(2): 600 (1866). — Type: *Zolling 642* (holo G-DC (IDC microfiche in TI) n. v.; iso G-DC (IDC microfiche in TI) n. v.), in insula Java.
- Croton caudatus* Geiseler var. *minor* Kurz, Forest Fl. Burma 2: 376 (1877). — Type: (n. v.), Burma.
- Croton caudatus* Geiseler var. *hispidus* Hook. f., Fl. Brit. India 5: 389 (1887), "*hispidus*." — Type: not designated.
- Croton caudatus* Geiseler var. *ruminatus* Hook. f., Fl. Brit. India 5: 389 (1887), "*ruminata*." — Type: [*J. D. Hooker s. n.*] (K!), Sikkim, [Terai]; [*J. D. Hooker & T. Thomson 491*, 11 June 1850] (K!), Khasia Mts.; [*Griffith s. n.*, in 1865] (K!), Khasia Mts. [Khasiya, Jemann].
- Croton caudatus* Geiseler var. *globosus* Hook. f., Fl. Brit. India 5: 389 (1887), "*globosa*." — Type: not designated.
- Croton caudatus* Geiseler var. *tomentosus* Hook. f., Fl. Brit. India 5: 389 (1887), "*tomentosa*." — Type: *Wallich, List no. 7838* (K!, CAL (fide Chakrabarty & Balakrishnan 1992) n. v.; iso BM!, K-WALL!), Silhet [Sillet]; *Griffith [s. n.]* (K!), Assam.
- Croton caudatus* Geiseler var. *malaccanus* Hook. f., Fl. Brit. India 5: 389 (1887), "*malaccana*." — Type: *Griffith [s. n.]*, *Kew distrib. no. 4775* (K!, CAL (fide Chakrabarty & Balakrishnan 1992) n. v.), Malacca; [*A. C.] Maingay [1802]*, *Kew distrib. no. 1376*, in 1865-66 (K!, CAL (fide Chakrabarty & Balakrishnan 1992) n. v.),

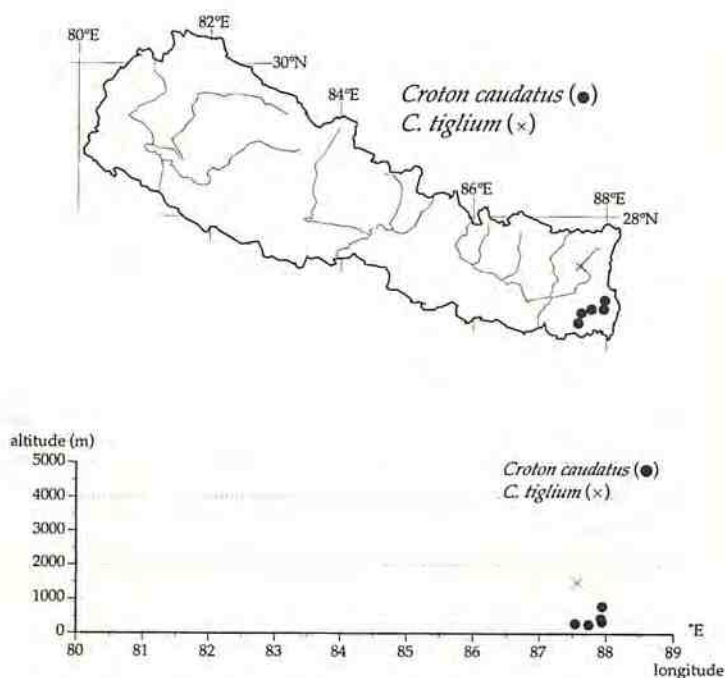


Fig. 36. Distribution of *Croton caudatus* Geiseler and *C. tigilium* L. in Nepal.



Malacca; *Griffith* [*s. n.*] (K!; iso K!), Mergui (Burma).

*Croton caudatus* Geiseler var. *harmandii* Gagnep. in Lecomte, Fl. Indo-Chine 5: 286 (1925). — Type: *P. Coudec* (n. v.), Cambodge, Wat-preas, vers Kampur; *Harmand* (n. v.), Cochinchine, delta; *Pierre* (n. v.), Cochinchine, prov. de Bien-hoa.

*Croton caudatus* Geiseler var. *obovoideus* N. P. Balakr. & Chakrab., Bull. Bot. Surv. India 25: 190 (1983, publ. 1985). — Type: *Sebastine 25343A* (CAL (fide Chakrabarty & Balakrishnan 1992) n. v.), India, Kerala, Kottayam dist., Velara.

Monoecious shrub, 1.5–2.4 m high. *Twigs* stellate-tomentose. *Leaves* alternate; petiole 2.3–9 cm long; a pair of stalked glands at apex of petiole, 1–1.3 mm high, 0.5–0.7 mm broad; blade ovate or widely ovate, 7–17 by 6–16 cm, base cordate or subcordate, apex acuminate, margin serrate or duplicate-serrate, with stalked gland of 0.2–0.5 mm high, 0.2–0.3 mm broad between teeth, venation palmately 5-veined or 3-veined with 2 additional weaker ones, upper surface sparsely stellate-hairy, lower surface stellate-hairy. *Inflorescences* terminal and uppermost nodes, racemose, 12–31 cm long, with many staminate flowers above, ca. 6 pistillate flowers below. *Staminate flowers*: pedicel 5–7 mm long, densely stellate-hairy; sepals 5, ovate, ca. 3.5 by ca. 2 mm, apex acute, outside densely stellate-tomentose, inside glabrate; petals 5, elliptic, ca. 3.5 by ca. 1.5 mm, apex rounded, outside densely tomentose, inside glabrate; stamens 29–32; filaments 3.5–5 mm; anthers elliptic, ca. 1 mm long. *Pistillate flowers*: pedicel 4–5 mm long, densely stellate-tomentose; sepals 5, ovate, ca. 4 by ca. 3 mm, apex acute, stellate-hairy; petals absent; ovary globose, ca. 4 mm in diam., densely stellate-tomentose; styles 3, 7–8 mm long, bifid. *Fruits*: capsule broadly ovoid, 17–20 mm high, 16–18 mm in diam., densely stellate-hairy; pericarp 1.5–2 mm thick, often peeled off when dry. *Seeds* broadly ellipsoid, 12–13 mm long, ca. 9 mm wide, glabrous, carunculate.

*Distribution* — Pakistan, Sri Lanka, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, Malaysia (Peninsular), Sumatera, Jawa, Borneo, Lesser Sunda Is., Sulawesi, Philippines, China (South-central) (Chakrabarty & Balakrishnan 1992, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Eastern.

*Habitat & Ecology* — Altitude 240–450 m. On stream side. Flowers in April; fruits from May to September.

### 5. *Croton tiglium* L. — Fig. 36.

*Croton tiglium* L., Sp. Pl.: 1004 (1753); Roxb., Fl. Ind. ed. 1832, 3: 682 (1832); Wall., Numer. List: 270, no. 7722C (1847); Müll. Arg. in DC., Prodr. 15(2): 600 (1866); Kurz, Forest Fl. Burma 2: 374 (1877); Hook. f., Fl. Brit. India 5: 393 (1887); Hurus. & Ya. Tanaka in Fl. E. Himal.: 177 (1966); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 476 (1983); D. G. Long in Fl. Bhutan 1: 793 (1987); Chakrab. & N. P. Balakr., J. Econ. Taxon. Bot. 12: 370 (1988); Chakrab. & N. P. Balakr., Bull. Bot. Surv. India 34: 72 (1992); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 134 (1996); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 508 (2000). — *Tiglium officinale* Klotzsch, Nov. Act. Acad. Nat. Cur. 19, Suppl. 1: 418 (1843). — *Croton officinalis* (Klotzsch) Alston in Trimen, Handb. Fl. Ceylon 6: 264 (1931), nom. superfl. — Type: *Hermann 2: fol. 5, #343* (BM (fide Chakrabarty & Balakrishnan 1988) n. v.), India [Ceylon].

*Croton acutus* Thunb. in Murray, Syst. Veg. ed. 14: 863 (1784).

*Croton jamalgota* Buch.-Ham., Trans. Linn. Soc. London 14: 258 (1825). — Type: [*F.*



*Buchanan Hamilton 2115*, 13 May 1908] (E!, K-WALL 7722B, p. p. (IDC microfiche in TI) n. v.), [Gualpara] (Assam, India).

*Croton camaza* Perr., Mém. Soc. Linn. Paris 3: 112 (1825).

*Croton pavana* Buch.-Ham., Trans. Linn. Soc. 14: 259 (1825); Müll. Arg. in DC., Prodr. 15(2): 623 (1866), "*pavanae*." — Type: [*F. Buchanan Hamilton 2116*, 10 June 1908] (E!, K-WALL 7722B, p. p. (fide Chakrabarty & Balakrishnan 1992), n. v.), [Gualpara] (Assam, India).

*Croton muricatus* Blanco, Fl. Filip., ed. 2: 518 (1845).

*Alchornea vaniotii* H. Lév., Cat. Pl. Yun-Nan: 95 (1916), "*vaniotii*"; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 147 (2000). — Type: *E. E. Maire s. n.*, in 1910 (holo E (fide Lauener 1983) n. v.), Chana, Yunnan, Tong tchouan.

*Croton himalaicus* D. G. Long, Notes Roy. Bot. Gard. Edinburgh 44: 170 (1986); D. G. Long in Fl. Bhutan 1: 792 (1987); T. Kuros., Newslett. Himal. Bot. no. 22: 22 (1998). — Type: *Haines 828*, June 1904 (holo E!), Darjeeling District, near Pedong, 1640 m [5400'].

*Croton birmanicus* auct. non Müll. Arg., Linnaea 34: 112 (1865); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 433, 525 (2000), p. p.

Shrub or small tree, 4.5–6 m high. *Twigs* stellate-pubescent. *Leaves* alternate; petiole 2.2–4 cm long; blade ovate or elliptic, 10–14.5 by 4–7 cm, base cuneate or obtuse, apex acuminate, margin serrulate, without gland between teeth, venation 3-veined or with 2 additional weaker veins, upper surface glabrous or sparsely stellate-hairy, lower surface sparsely stellate-pubescent or glabrate; a pair of stalked glands at 0–1 mm from petiole attachment, ca. 0.5 mm high, 0.5–0.6 mm in diam. *Inflorescences* terminal, racemose. *Staminate flowers* not seen. *Pistillate flowers*: pedicel ca. 4 mm long, densely stellate-tomentose; sepals 5, ovate, ca. 2.5 by 1.5–2 mm, apex acute, outside stellate-tomentose, inside glabrous; petals absent; ovary globose, densely stellate-tomentose; styles 3, ca. 4 mm, bifid. *Fruits*: capsule broadly ellipsoid, 15–20 mm long, 15–20 mm in diam., stellate-hairy; pericarp ca. 0.1 mm thick. *Seeds* not seen.

Distribution — Sri Lanka, India, Bangladesh, Burma, Thailand, Cambodia, Vietnam, Borneo, Jawa, Lesser Sunda Islands, Malaya, Philippines, Sulawesi, Sumatera, China (South-central, Hainan, Southeast), Taiwan (Chakrabarty & Balakrishnan 1992, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Eastern.

Habitat & Ecology — Altitude 1500 m. Fruits in July.

Notes — As critically shown by Chakrabarty & Balakrishnan (1988), it is difficult to distinguish *C. himalaicus* from *C. tiglium* by differences shown by Long (1986).

This description was described from a paratype of *C. himalaicus* D. G. Long from Eastern Nepal. The specimen also has both characters of *C. tiglium* as defined in Long (1986) (glabrous habit, 3-veined leaves with a pair of glands situated on leaf margin) and those of *C. himalaicus* (leaf glands stalked).

On the other hand, Govaerts et al. (2000, p. 525) treated *C. himalaicus* as a synonym of a Burmese species, *C. birmanicus* Müll. Arg. The latter has, however, leaves with marginal glands and smaller capsules.



**28. Vernicia** Lour.

*Vernicia* Lour., Fl. Cochinch.: 586 (1790). — Type species: *Vernicia montana* Lour.

**1. Vernicia fordii** (Hemsl.) Airy Shaw

*Vernicia fordii* (Hemsl.) Airy Shaw, Kew Bull. 20: 394 (1966); Radcliffe-Smith, Kew Bull. 28: 296 (1973); H. S. Kiu et al., Fl. Reipubl. Pop. Sin. 44(2): 143 (1996); Stuppy et al., Blumea 44: 91 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1585 (2000). — *Aleurites fordii* Hemsl., Hooker's Icon. Pl. 29: t. 2801 (1906); Gagnep. in Lecomte, Fl. Indo-Chine 5: 293 (1925). — Lectotype designated by Radcliffe-Smith (1973): *Henry 878* (K n. v.), China, Hupeh Province, Ichang.

*Dryandra oleifera* auct. non Lam., Encycl. 2: 329 (1786), nom. superfl.: Wall., Numer. List: 274, no. 7958 (1847). — *Aleurites cordata* auct. non (Thunb.) R. Br. ex Steud., Nomencl. Bot., ed. 2, 1: 49 (1840); Hook. f., Fl. Brit. India 5: 384 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 193 (1982). — *Vernicia cordata* auct. non (Thunb.) Airy Shaw, Kew Bull. 20: 394 (1966); T. Kuros., Newslett. Himal. Bot. no. 22: 23 (1998).

Distribution — Native of S. Burma, China (South-Central, Hainan, Southeast), Vietnam (Stuppy et al. 1999, Govaerts et al. 2000). Cultivated in subtropical regions (Stuppy et al. 1999). In Nepal: unknown.

Notes — The record of this species depends on a specimen, *Wallich, List no. 7958B* (K-WALL (IDC microfiche in TI) n. v.), which has been treated as *Aleurites cordata* or *Vernicia cordata* by authors (Hooker 1886–1888, Short & Vickery 1982, Kurosawa 1998).

## Subfamily IV. EUPHORBIOIDEAE (Boiss.) G. L. Webster

*Euphorbioideae* (Boiss.) G. L. Webster, Taxon 24: 600 (1975). — Subordo *Euphorbieae* Boiss. in DC., Prodr. 15(2): 3 (1862). — Type: *Euphorbia* L.

**29. Excoecaria** L.

*Excoecaria* L., Syst. Nat. ed. 10, 2: 1288 (1759). — Type species: *Excoecaria agallocha* L.

**1. Excoecaria acerifolia** Didr. — Fig. 37.

*Excoecaria acerifolia* Didr., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1857: 129 (1857); Müll. Arg. in DC., Prodr. 15(2): 1222 (1866); Hook. f., Fl. Brit. India 5: 473 (1888); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 18: 197 (1994); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 11, t. 2, f. 1 or 2 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 23 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 913 (2000); Manandhar, Pl. People Nepal: 231 (2002). — [*Excoecaria acerifolia* Didr. var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 1222 (1866), nom. inval.]

*Stillingia himalayensis* Klotzsch, Bot. Ergebn. Reise Waldemar: 116, t. 21 (1862).

— *Excoecaria himalayensis* (Klotzsch) Müll. Arg., Linnaea 32: 122 (1863). —

*Excoecaria acerifolia* Didr. var. *himalayensis* (Klotzsch) Pax in Engler, Pflanzenr., IV, 147, V: 168 (1912). — Type: *Hoffmeister* (n. v.), Himalaya.

*Excoecaria himalayensis* (Klotzsch) Müll. Arg. var. *cuspidata* Müll. Arg., Linnaea 32: 122 (1863). — *Excoecaria acerifolia* Didr. var. *cuspidata* (Müll. Arg.) Müll. Arg. in

DC., Prodr. 15(2): 1222 (1866). — *Excoecaria cuspidata* (Müll. Arg.) Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 14: 182 (1990). — Type: *J. D. Hook. & T. Thoms. s. n.* (G-DC (IDC microfiche in TI) n. v.), in Indiae orientalis montibus Khasia.

*Excoecaria acerifolia* Didr. var. *lanceolata* Pax & K. Hoffm. in Engler, Pflanzenr., IV, 147, V: 168 (1912). — Type: *Henry 12095D* (n. v.), Yünnan, Szemao.

Deciduous shrub with milky sap, 0.8–3 m high, stem diameter 2.5–3 cm. *Twigs* glabrous. *Leaves* alternate, glabrous; petiole 2–5 mm long; stipules caducous; blade elliptic, 6–12 by 3.5–4.5 cm, base cuneate or obtuse, apex acuminate or cuspidate, margin serrate, without foliar gland, secondary veins 9–12 pairs. *Inflorescences* terminal or axillary, spiciform, bisexual, 3–4 cm long, glabrous; bracts of staminate flowers deltate, 1–1.2 by ca. 1.3 mm, apex cuspidate; bracts of pistillate flowers triangular, ca. 2.6 by ca. 2 mm, apex acuminate. *Staminate flowers* many per spike, sessile; calyx lobes deltate, ca. 0.5 by ca. 0.7 mm, irregularly toothed, with gland of 0.6–0.8 by 0.3–0.5 mm; stamens with filaments ca. 0.7 mm long; anthers ca. 0.3 mm long. *Pistillate flowers* 1 per spike; pedicel ca. 1 mm long; calyx lobes narrowly triangular, ca. 1.8 by ca. 0.8 mm, apex acuminate; ovary glabrous; styles 3, free, ca. 3 mm long, recurved. *Fruits*: pedicel ca. 5 mm long; capsule depressed globose, 3-lobed, ca. 1.2 cm long, ca. 1.6 cm in diam., glabrous, smooth; pericarp 0.5–0.6 mm thick; columella persistent after dehiscence, ca. 7 mm long. *Seeds* ovoid, 5.5–6.5 mm long, 4.5 mm in diam., glabrous, smooth.

*Distribution* — India (Uttarkhand, Assam), Nepal, China (South-central) (Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Far Western, Mid Western, Western, Central.

*Habitat & Ecology* — Altitude 1200–1950 m. On open slopes, on roadsides, or on river banks. Flowers from April to August; fruits from August to September.

*Vernacular names* — Nepali: *gadasilo* (Manandhar 2002), *rajeli* (Manandhar 2002).

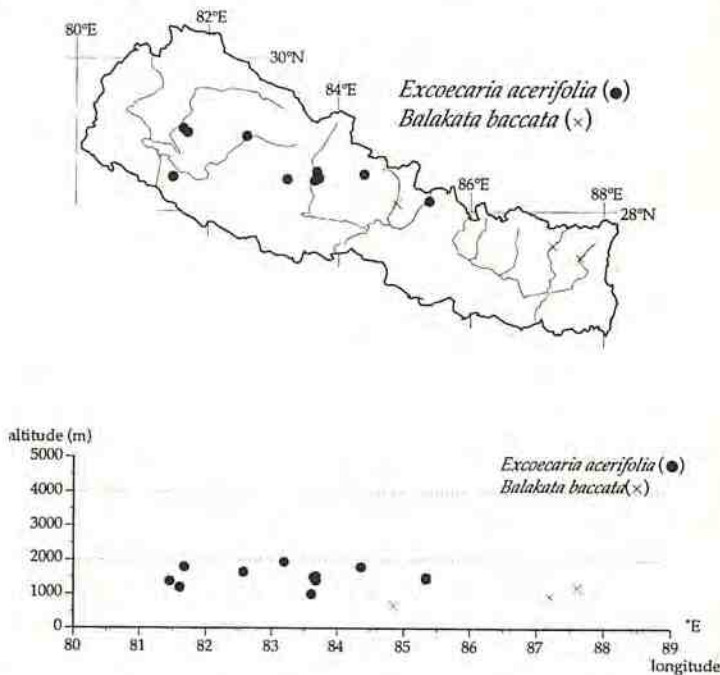


Fig. 37. Distribution of *Excoecaria acerifolia* Didr. and *Balakata baccata* (Roxb.) Esser in Nepal.



### 30. *Falconeria* Royle

*Falconeria* Royle, Ill. Bot. Himal. Mts.: 354 (1839). — Lectotype species designated by Pfeiffer, Nomencl. Bot. 1, 2: 1334 (1874): *Falconeria insignis* Royle

#### 1. *Falconeria insignis* Royle — Fig. 38.

*Falconeria insignis* Royle, Ill. Bot. Himal. Mts.: 354, t. 98, f. 2 (1839); Esser, Blumea 44: 162 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 923 (2000). — *Excoecaria insignis* (Royle) Müll. Arg. in DC., Prodr. 15(2): 1212 (1866). — *Carumbium insigne* (Royle) Kurz, Forest Fl. Burma 2: 412 (1877). — *Sapium insigne* (Royle) Trimen, Syst. Cat. Fl. Pl. Ceylon: 83 (1885); Hook. f., Fl. Brit. India 5: 471 (1888); Banerji, Rec. Bot. Surv. India 19(2): 83 (1966); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); Malla et al., Fl. Kathmandu Valley: 631 (1986); D. G. Long in Fl. Bhutan 1: 812 (1987); Stainton, Flow. Himal. Suppl.: 56, pl. 103 (1988); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 20 (1997); Philcox in Rev. Handb. Fl. Ceylon 11: 183 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 23 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 333 (1999); Rajbhandari, Ethnobot. Nepal: 61 (2001); Manandhar, Pl. People Nepal: 411 (2002). — Lectotype designated by Esser (1999): [*Royle s. n.*] (LIV n. v.), Deyra Doon and above Rajpore (India).

*Falconeria wallichiana* Royle, Ill. Bot. Himal. Mts.: 354, as "*wallichii*" in t. 84a or 98, f. 3 (1839). — Lectotype designated by Esser (1999): [*Royle s. n.*] (LIV n. v.), Buneepa (Burupa) in Nepal.

*Falconeria malabarica* Wight, Icon. Pl. Ind. Orient. 5(2): 20, t. 1866 (1852). — *Sapium insigne* Royle var. *malabaricum* (Wight) Hook. f., Fl. Brit. India 5: 472 (1888), "*malabarica*."

Monoecious shrub or small tree, 3–10 m high, stem diameter 12–23 cm. *Leaves* glabrous; petiole 2.5–6 cm long, with distal petiolar glands of 0.7–1.5 mm in diam.; blade elliptic or obovate, 15–28 by 5–10 cm, apex acuminate, base cuneate, margin serrulate, with a gland on each tooth, secondary veins 12–21 pairs. *Inflorescences* terminal on leafless twigs, elongated thyrses. *Staminate thyrses* 9–13 cm long, 3–4 mm in diam., glabrous, 6 or 7 flowers per node. *Staminate flowers* sessile; calyx lobes 2, obovate, ca. 1 by 1–1.5 mm, irregularly toothed, membranaceous, glabrous; stamens 2; anthers ca. 0.5 mm in diam. *Pistillate thyrses* ca. 6 cm long, ca. 5 mm in diam.; a pair of glands per node, elliptic, 2.5–3 by 1.3–2 mm; 1 flower per node. *Pistillate flowers* sessile; calyx lobes 2, depressed obovate, 0.7–1 by 1.7–2 mm, irregularly toothed, glabrous, membranaceous; ovary ovoid, 1.5–2 mm long, 1.3–1.7 mm across, glabrous, smooth; stigmas 2, sessile. *Infructescences* 7–19 cm long, 3–8 mm in diam. *Fruits* fleshy, globose or ovoid, 8–10 mm long, 8–9 mm in diam., glabrous, 1- or 2-seeded; columella persistent after dehiscence, 8–9 mm long, distinctly alate by ca. 3 mm. *Seeds* ovate, ca. 7 mm long, ca. 6 mm wide, ca. 3 mm thick, smooth.

*Distribution* — Sri Lanka, India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, Malaysia (Peninsular), China (South-central) (Esser 1999, Govaerts et al. 2000). *S Asian-Malaysian element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

*Habitat & Ecology* — Altitude 300–1800 m. On roadsides, on stream side, or on edge of cultivation. Occasional in eastern plains (Siwakoti & Varma 1999). Flowers from



January to May; fruits from March to June.

Vernacular names — Nepali: *khirro* (Siwakoti & Varma 1999, Rajbhandari 2001a, Manandhar 2002). Chepang: *rangati* (Manandhar 2002). Magar: *khirra* (Manandhar 2002), *mibalang* (Manandhar 2002). Majhi: *khirra* (Manandhar 2002). Tamang: *dese* (Manandhar 2002), *khalung* (Manandhar 2002), *khyuru* (Manandhar 2002).

Uses — Bark and leaf are used as fish poison (Manandhar 2002). Juice of plant, juice of root, juice of bark, and milky latex are medicinally applied for various diseases (Rajbhandari 2001a, Manandhar 2002).

### 31. *Triadica* Lour.

*Triadica* Lour., Fl. Cochinch. 2: 598 (1790). — Lectotype species designated by G. L. Webster, Ann. Missouri Bot. Gard. 81: 123 (1994): *Triadica sinensis* Lour.

#### 1. *Triadica cochinchinensis* Lour. — Fig. 38.

*Triadica cochinchinensis* Lour., Fl. Cochinch.: 610 (1790); Esser, Blumea 44: 201 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1562 (2000). — *Stillingia cochinchinensis* (Lour.) Baill., Adansonia 1: 351 (1861). — *Excoecaria loureiroana* Müll. Arg. in DC. Prodr. 15(2): 1217 (1866), nom. nov. — *Sapium cochinchinense* (Lour.) Pax & K. Hoffm. in Engl., Pflanzenr., IV, 147, V: 252 (1912), non (Lour.) Kuntze, Revis. Gen. Pl. 3(2): 293 (1898). — *Shirakia cochinchinensis* (Lour.) Hurus., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 6: 318 (1954). — Type: [*Loureiro s. n.*] (holo BM (fide Esser 1999), n. v.; iso BM (fide Esser 1999) n. v.), in sylvis Cochinchinae.

*Stillingia discolor* Champ. ex Benth., Hooker's J. Bot. Kew Gard. Misc. 6: 1 (1854). — *Sapium discolor* (Champ. ex Benth.) Müll. Arg., Linnaea 32: 121 (1863); Hook. f., Fl. Brit. India 5: 469 (1888); Chakrab. & M. G. Gangop., J. Econ. Taxon. Bot. 14: 183 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 18 (1997). — *Excoecaria discolor* (Champ. ex Benth.) Müll. Arg. in DC., Prodr. 15(2): 1210 (1866). — Lectotype designated by Esser (1999): *Champion s. n.* (holo K, n. v.; iso GH, K n. v.), Hongkong.

*Stillingia lanceolaria* Miq., Fl. Ned. Ind., Eerste Bijv.: 183, 461 (1861). — *Excoecaria lanceolaria* (Miq.) Müll. Arg. in DC., Prodr. 15(2): 1221 (1866). — Type: *Teijsmann* [HB 549] (holo U (fide Esser 1999), n. v.; iso CAL (fide Esser 1999) n. v.), Poeloe Pisang bij Padang (Sumatra).

*Sapium eugeniaefolium* Buch.-Ham. [in Wall., Numer. List: 275, no. 7970 (1847), nom. nud.] ex Hook. f., Fl. Brit. India 5: 470 (1888); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); D. G. Long in Fl. Bhutan 1: 812 (1987), "*eugeniifolium*"; T. Kuros. in Newslett. Himal. Bot. no. 22: 23 (1998). — Type: *Duthie* (n. v.) from Kumaon, alt. 3–4000 ft.; *King* (n. v.), to Sikkim; [*F. Buchanan*] *Hamilton* [2120, 17 Aug. 1808] (n. v.; iso E!) Assam, at Goyalpara [Gualpara]; *J. D. Hooker & T. T.* (n. v.), Khasia Mts., alt. 4000 ft.

*Sapium laui* Croizat, J. Arnold Arbor. 21: 505 (1940). — Type: *S. K. Lau* 5498, Feb. 1935 (A n. v.), Hainan, Chim Fung near Fong Ngau Po Village, Kan-en District.

*Sapium discolor* Champ. ex Benth. var. *wanhsienensis* S. B. Ho, Fl. Tsinlingensis 1(3): 180, 451 (1981). — Type: *C. Y. Chang* 10447, 1 Sep. 1959 (n. v.), China, Kansu, Wen Hsien, Pi Kou, Fan-Pa, Miao-kou, in valley, alt 700 m.



Deciduous tree, 11–15 m high, 20–40 cm in diameter. *Twigs* glabrous. *Leaves* alternate, glabrous; stipules caducous; petiole 3–4.5 cm long; blade ovate or elliptic, 7.5–11 by 4–5.5 cm, base cuneate or obtuse, apex acute, upper surface with a pair of basal glands of ca. 1.2 by ca. 0.7 mm at the petiole attachment, lower surface whitish, with 1–3 glands per side, 0.5–0.8 mm diam., 1–3 mm distant from margin, secondary veins 8 or 9 pairs. *Inflorescences* terminal. *Staminate flowers* not seen. *Pistillate flowers* not seen. *Fruits*: pedicel 4–6 mm long; capsule dehiscent, globose, ca. 11 mm long, 11.5–12 mm in diam., glabrous, smooth, apex cuspidate; pericarp 1–1.2 mm thick; columella persistent after dehiscence, ca. 8–9 mm long, distinctly alate by ca. 2.5 mm. *Seeds* broadly ellipsoid or globose, ca. 5 mm long, 4.5–5 mm wide, ca. 4 mm thick, glabrous, smooth.

*Distribution* — India (Sikkim, Assam), Nepal, Bhutan, Burma, Thailand, Laos, Vietnam, Borneo, Philippines, China (South-central), Taiwan (Long 1987, Esser 1999, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central.

*Habitat & Ecology* — Altitude 1060–1130 m. On riversides. Fruits from August to October.

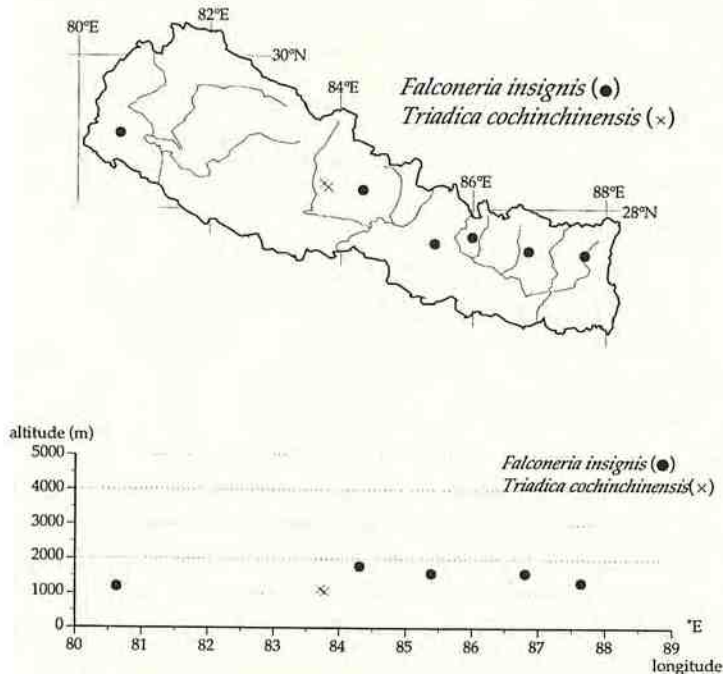


Fig. 38. Distribution of *Falconeria insignis* Royle and *Triadica cochinchinensis* Lour. in Nepal.

### 32. Balakata Esser

*Balakata* Esser, *Blumea* 44: 154 (1999). — Type species: *Balakata luzonica* (S. Vidal) Esser, based on *Myrica luzonica* S. Vidal

#### 1. *Balakata baccata* (Roxb.) Esser — Fig. 37.

*Balakata baccata* (Roxb.) Esser, *Blumea* 44: 155 (1999); Govaerts et al., *World Checkl. Bibliogr. Euphorb.*: 241 (2000). — *Sapium baccatum* Roxb., [*Hort. Bengal.*: 69 (1814),

nom. nud.] Fl. Ind. ed. 1832, 3: 694 (1832); Wight, Icon. Pl. Ind. Orient. 6: 6, t. 1950-2 (1853); Baill., Étude Euphorb.: 513 (1858); Müll. Arg., Linnaea 32: 121 (1863); Hook. f., Fl. Brit. India 5: 470 (1888); Short & Vickery in Enum. Flow. Pl. Nepal 3: 199 (1982); D. G. Long in Fl. Bhutan 1: 812 (1987); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 19, t. 4, f. 1-3 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 23 (1998); Manandhar, Pl. People Nepal: 411 (2002). — *Stillingia baccata* (Roxb.) Baill., Étude Euphorb.: 513 (1858). — *Excoecaria baccata* (Roxb.) Müll. Arg. in DC., Prodr. 15(2): 1211 (1866). — *Carumbium baccatum* (Roxb.) Kurz, Forest Fl. Burma 2: 412 (1877). — Type: [*Roxburgh s. n.*] (A, P, Icones Roxburghianae 2397 (fide Esser 1999) n. v.), [Silhet].

[*Sapium daidece* Ham. ex Wall., Numer. List: 274, no. 7965A, p. p. (1847), nom. nud.]

[*Sapium hexandrum* Wall., Numer. List: 274, no. 7965A, p. p. (1847), nom. nud.]

*Excoecaria affinis* Griff., Not. Pl. Asiat. 4: 486 (1851), non Endl., Prodr. Fl. Norfolk: 83 (1833); Müll. Arg. in DC., Prodr. 15(2): 1223 (1866). — [*Sapium populifolium* Wight, Icon. Pl. Ind. Orient. 6: 6, t. 1950-2 (1853), nom. inval.]. — Type: Griffith [704 or 706], Nov. 1834 (GH, K, TCD (fide Esser 1999) n. v.), Mergue (Burma).

*Stillingia paniculata* Miq., Fl. Ned. Ind., Eerste Bijv.: 183, 461 (1861). — Lectotype designated by Esser, Blumea 44: 156 (1999): *Teijsmann* [HB 3677] (U n. v.; iso K n. v.), Sumatra orient, in prov. Palembang, inter Kebus et Labat.

Monoecious tree, 9–24 m high, stem diameter 47–72 cm. *Leaves* glabrous; stipules caducous; petiole 2–5 cm long; blade ovate or narrowly ovate, 5.5–15 by 2.5–6.5 cm, base obtuse or rounded, apex acuminate, margin entire, secondary veins 8–16 pairs, marginal glands 4–6 per side on under surface, 0.5–0.8 mm diam., 0–1.5 mm distant from margin, basal glands 1.2–1.5 mm diam., on the lowest secondary veins. *Inflorescences* terminal and in the axils of few uppermost leaves, glabrous. *Staminate thyrses* 10–20 cm long, 1–2 mm in diam., with 1–5 branches, glabrous, 5–8 flowers per cymules; bracts depressed ovate, 0.4–1 mm long, glands elliptic, 1–1.5 by 0.4–0.8 mm. *Staminate flowers*: pedicel 1–2 mm long; calyx lobes irregularly toothed, 0.5–0.8 mm long, membranaceous, glabrous; stamens 2; filaments ca. 0.5 mm long. *Pistillate flowers* not seen. *Fruits*: pedicel 3–9 mm long; bacca globose, 8–13 mm long, 8–13 mm in diam., 1 or 2 seeded. *Seeds* not seen.

*Distribution* — India (Sikkim, Assam, Andamans Isls.), Nepal, Bhutan, Bangladesh, Burma, Thailand, Laos, Cambodia, Vietnam, Malaysia (Peninsular), Borneo, Sumatera, China (South-central) (Esser 1999, Govaerts et al. 2000). *SE Asian-Malaysian element*. In Nepal: Western, Central, Eastern.

*Habitat & Ecology* — Altitude 500–1200 m. On rocky slopes, in forests, or on river basin. Flowers in April; fruits from July to September.

*Vernacular name* — Nepali: *ban pipal* (Manandhar 2002).

*Uses* — Latex is medicinally applied to muscular swellings (Manandhar 2002).

### 33. *Euphorbia* L.

*Euphorbia* L., Sp. Pl.: 450 (1753). — Lectotype species designated by Millspaugh in Publ. Field Columbian Mus., Bot. 2: 306 (1909): *Euphorbia antiquorum* L.

Key to the subgenera

Subgeneric circumscriptions follow Turner (1995).



- A. Stipular spines present, if absent, main axis extremely short, cauline leaves radical; succulent
  - B. Floral leaves prominent, red, 10–12 mm wide; seeds carunculate ..... I. Subgenus **Lacanthis**
  - B. Floral leaves inconspicuous, scaly, greenish, 3–4 mm wide; seeds without caruncle ..... II. Subgenus **Euphorbia**
- A. Spines absent; succulent or non-succulent
  - B. Stipules present; involucre glands 1 or 2(–4); seeds without caruncle; non-succulent ..... III. Subgenus **Poinsettia**
  - B. Stipules absent; involucre glands 4 or 5; seeds carunculate; succulent or non-succulent
    - C. Succulent shrubs ..... IV. Subgenus **Tirucalli**
    - C. Non-succulent herbs ..... V. Subgenus **Esula**

I. Subgenus **Lacanthis** (Raf.) M. G. Gilbert

Subgenus *Lacanthis* (Raf.) M. G. Gilbert, Kew Bull. 42: 238 (1987). — *Lacanthis* Raf., Fl. Tell. 2: 94 (1837). — Type species: *Euphorbia splendens* Bojer ex Hook. (= *Lacanthis splendens* (Bojer ex Hook.) Raf.)

See *Euphorbia milii* Des Moul in Excluded taxa.

II. Subgenus **Euphorbia**

Key to the species

- A. Herb with root stock; main axis extremely short, without spines; cymes arising from the top of rhizome ..... 1. ***E. fusiformis*** Buch.-Ham. ex D. Don

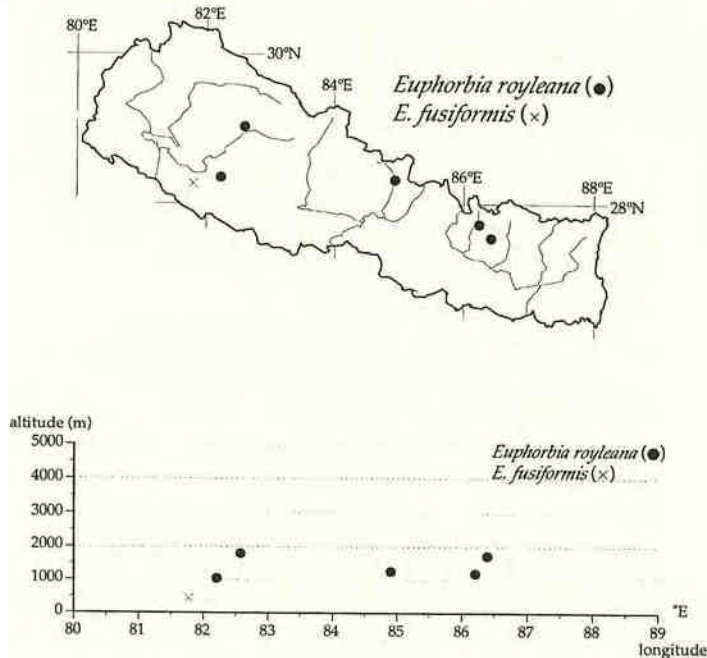


Fig. 39. Distribution of *Euphorbia royleana* Boiss. and *E. fusiformis* Buch.-Ham. ex D. Don in Nepal.

- A. Shrub with long spiny main axis; cymes arising above axiles of fallen leaves  
 B. Branches 3–5 cm in diam.; capsules ca. 9 mm in diam. (not seen in Nepalese plants)  
 ..... 2. *E. royleana* Boiss.  
 B. Branches ca. 1.9 cm in diam.; capsules ca. 13 mm in diam.  
 ..... excl. 4. *E. neriifolia* L.

**1. *Euphorbia fusiformis*** Buch.-Ham. ex D. Don — Plate 74; Fig. 39.

*Euphorbia fusiformis* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 62 (1825); Wall., Numer. List: 269, no. 7703 (1847); Boiss. in DC. Prodr. 15(2): 93 (1862); Hook. f., Fl. Brit. India 5: 257 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Oudejans, World Cat. Tribe Euphorbieae: 167 (1990); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 732 (2000). — Type: [*Buchanan*] *Hamilton* [s. n.] (holo BM!), Nepaliâ (Nepal).

*Euphorbia acaulis* Roxb., [Hort. Bengal.: 36 (1814), nom. nud.] Fl. Ind. ed. 1832, 2: 472 (1832); Boiss. in DC. Prodr. 15(2): 93 (1862). — Type: (n. v.), the Botanic garden at Calcutta, from Poornea, Bengal.

*Euphorbia humilis* Royle, Ill. Bot. Himal. Mts.: 329, t. 82, f. 3 (1836), non C. A. Mey. in Ledebour, Fl. Altaic. 4: 185 (1833). — Type: (n. v.), Kheree Pass, and low elevations in the Himalayas.

*Euphorbia nana* Royle, Ill. Bot. Himal. Mts.: 329, t. 82, f. 2 (1836); Boiss. in DC. Prodr. 15(2): 94 (1862). — Type: (n. v.), Kheree Pass and Suen Range.

Perennial herb, with extremely short main stem. *Rhizomes* cylindrical, 2.5–3.5 cm in diam. *Cymes* arising from the top of rhizome, dichotomous; rays 3.5–5 cm long, glabrous; bracts sessile, opposite, exstipulate, narrowly triangular or deltate, 5–6 by 3–4 mm, apex acute or apiculate, margin entire, glabrous. *Cyathia*: stalk 1–4 cm; involucre ca. 2.5 by 4–5 mm in diam., glabrous outside; glands transversely elliptic, ca. 2 mm in diam., surface flat, without appendage. *Fruits*: pedicel 1.1–1.3 cm long; capsule depressed ovoid, ca. 5 mm long, ca. 9 mm in diam., 3-lobed, glabrous, smooth. *Seeds* spheroid, ca. 3.5 mm in diam., smooth, black, without caruncles.

Distribution — India, Nepal (Govaerts et al. 2000). *NW Himalayan element*. In Nepal: Mid Western, Central.

Habitat & Ecology — Altitude 450 m. Flowers & fruits from April.

**2. *Euphorbia royleana*** Boiss. — Fig. 39.

*Euphorbia royleana* Boiss. in DC. Prodr. 15(2): 83 (1862); Hook. f., Fl. Brit. India 5: 257 (1887); L. H. J. Williams in J. RHS. 78: 329, "*roylei*"; Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Polunin & Stainton, Fl. Himal.: 360, pl. 112 (1984); Malla et al., Fl. Kathmandu Valley: 625 (1986); D. G. Long in Fl. Bhutan 1: 761 (1987); Oudejans, World Cat. Tribe Euphorbieae: 360 (1990); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Siwakoti & Varma, Pl. Divers. E. Nepal: 326 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 822 (2000); Rajbhandari, Ethnobot. Nepal: 59 (2001); Manandhar, Pl. People Nepal: 228 (2002). — *Euphorbia pentagona* Royle, Ill. Bot. Himal. Mts.: 329, t. 82, f. 1 (1836), non Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 14 (1790), nom. nud. nor Haw., Philos. Mag. Ann. Chem. 1: 187 (1827). — Type: (n. v.), along the foot of the hills, especially on Suen Range.



*Euphorbia ligularia* auct. non Roxb., [Hort. Bengal.: 36 (1814)] Fl. Ind. ed. 1832, 2: 465 (1832); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998).

Succulent shrub, 3–5 m high, stem diameter 18–25 cm. *Branches* terete, 3–5 cm in diam., 5-angled, glabrous, wings 7–15 mm broad. *Leaves* deciduous, sessile; stipules spiny, 2–4 mm long; blade obovate or oblanceolate, 4–10 by 1–5 cm, base cuneate or attenuate, apex obtuse, margin entire, glabrous. *Cymes* above axils of fallen leaves, sessile; bracts elliptic, ca. 2.5 by ca. 2 mm, apex rounded. *Cyathia* sessile; involucre ca. 2 mm long, ca. 4 mm in diam., glabrous outside; glands transversely elliptic, 2–3 mm in diam., without appendage, surface flat. *Fruit* not seen. *Seeds* not seen.

Distribution — Pakistan, India, Nepal, China (Tibet-Qinghai, South-central, Southeast) (Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Mid Western, Western, Eastern.

Habitat & Ecology — Altitude 1050–1800 m. On sunny riversides or on dry slopes. Flowers from March to June.

Vernacular names — Nepali: *siudi* or *siundi* (Siwakoti & Varma 1999, Rajbhandari 2001a), *syuri* (Manandhar 2002). Chepang: *jeri* (Manandhar 2002), *jeru* (Manandhar 2002), *syuri* (Rajbhandari 2001a, Manandhar 2002). Danuwar: *mahur* (Manandhar 2002), *parsidha* (Manandhar 2002), *sidha* (Rajbhandari 2001a, Manandhar 2002), *syundi* (Manandhar 2002). Gurung: *syuri* (Manandhar 2002). Limbu: *seritakma* (Manandhar 2002), *srisin* (Manandhar 2002). Magar: *dha* (Manandhar 2002), *mete* (Manandhar 2002), *simjha* (Manandhar 2002). Majhi: *kanpate* (Manandhar 2002). Mooshar: *pasij* (Rajbhandari 2001a, Manandhar 2002). Newari: *duri kan* (Manandhar 2002). Rai: *mukrim* (Manandhar 2002), *patechurdham* (Manandhar 2002). Sherpa: *dhersya* (Manandhar 2002). Sunwar: *baro* (Manandhar 2002). Tamang: *deshe* (Rajbhandari 2001a), *desya* (Manandhar 2002). Tharu: *seunwahar* (Manandhar 2002), *seuri* (Manandhar 2002).

Uses — This species is cultivated as hedge plant. This species is also grown in pot and kept on the roof (Manandhar 2002). Boiled pith is pickled for food (Manandhar 2002). Pith, leaf and milky latex are medicinally used for various diseases (Rajbhandari 2001a, Manandhar 2002). Cutted plant into pieces is used as fish poison (Rajbhandari 2001a, Manandhar 2002).

Notes — Cited specimen as *E. ligularia* Roxb. by Short & Vickery (1982) (*Polunin et al.* 3224, BM!) is a juvenile succulent shrub without any reproductive organs. I believe it belongs not to *E. ligularia* but *E. royleana* because it has thick stems (3 cm in diam.) with wide wings (7 mm broad).

### III. Subgenus **Poinsettia** (Graham) House

Subgenus *Poinsettia* (Graham) House, Bull. N. Y. State Mus. 254: 472 (1924). — *Poinsettia* Graham, Edinb. New Phil. J. 20: 412 (1836). — Type species: *Euphorbia pulcherrima* Willd. (= *Poinsettia pulcherrima* (Willd.) Graham)

#### Key to the species

- A. Shrubs; floral leaves red ..... **3. E. pulcherrima** Willd. ex Klotzsch  
 A. Annual herbs  
   B. Floral leaves usually pandurate, reddish; involucre glands oblong  
   ..... excl. **5. E. cyathophora** J. A. Murray

B. Floral leaves ovate or lanceolate, whitish green; involucre glands orbicular

..... 4. *E. heterophylla* L.

**3. *Euphorbia pulcherrima* Willd. ex Klotzsch — Fig. 40.**

*Euphorbia pulcherrima* Willd. ex Klotzsch in Otto & Dietr., Allg. Gartenzeitung 2: 27 (1834); Boiss. in DC. Prodr. 15(2): 71 (1862); Kurz, Forest Fl. Burma 2: 418 (1877); C. R. Rao, Ind. For. 93: 55 (1967); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Polunin & Stainton, Fl. Himal.: 360 (1984); D. G. Long in Fl. Bhutan 1: 762 (1987); Oudejans, World Cat. Tribe Euphorbieae: 342 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 63, t. 16, f. 1–3 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 814 (2000); Manandhar, Pl. People Nepal: 228 (2002). — *Poinsettia pulcherrima* (Willd. ex Klotzsch) Graham, Edinburgh New Philos. J. 20: 412 (1836); Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966). — Type: (BW 9259† (fide Coode et al. 1982)), Mexique.

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of central America, widely cultivated (Govaerts et al. 2000). In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 1050–1950 m. On roadsides. Flowers from September to April.

Vernacular names — Nepali: *lalupate* (Manandhar 2002). Bhojpuri: *lalpatta* (Manandhar 2002). Danuwar: *lalpate* (Manandhar 2002). Gurung: *olat* (Manandhar 2002). Lepcha: *lopahirarip* (Manandhar 2002). Limbu: *hekaphekwa* (Manandhar 2002).

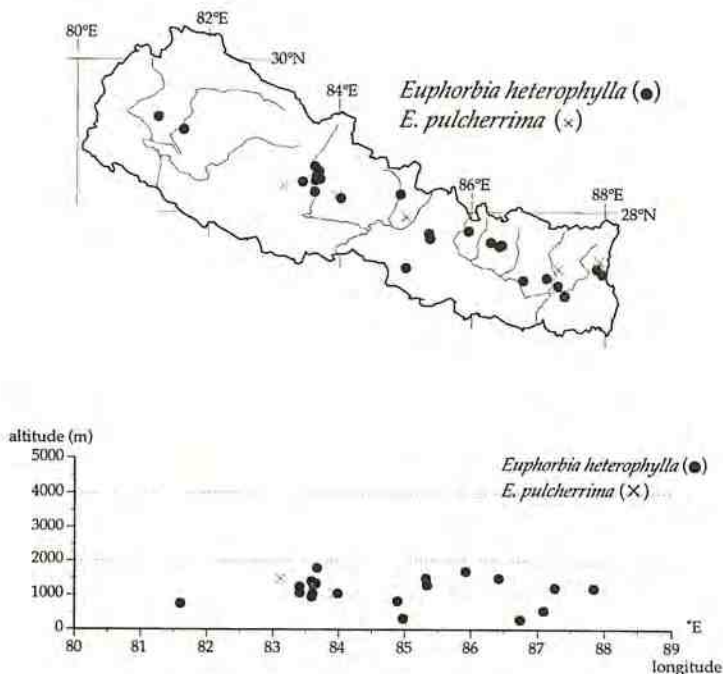


Fig. 40. Distribution of *Euphorbia heterophylla* L. and *E. pulcherrima* Willd. ex Klotzsch in Nepal.



Magar: *lalpote* (Manandhar 2002). Newari: *lalpatya* (Manandhar 2002). Rai: *halabakabu* (Manandhar 2002). Sunwar: *lalmapha* (Manandhar 2002). Tamang: *lalpate mhendo* (Manandhar 2002). Tharu: *lalpate* (Manandhar 2002).

Uses — This species is cultivated as ornamental. Milky latex is medicinally applied to boils (Manandhar 2002). Paste of leaves is medicinally applied for various cutaneous diseases (Manandhar 2002). Infusion of inflorescences has a galactagogue property (Manandhar 2002).

#### 4. *Euphorbia heterophylla* L. — Fig. 40.

*Euphorbia heterophylla* L., Sp. Pl.: 453 (1753); Boiss. in DC., Prodr. 15 (2): 72 (1862); Murata, Acta Phytotax. Geobot. 25: 114 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Malla et al., Fl. Kathmandu Valley: 624 (1986); Oudejans, World Cat. Tribe Euphorbiae: 193 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 67, t. 17, f. 5–8 (1997); Philcox in Rev. Handb. Fl. Ceylon 11: 200 (1997), p. p.; T. Kuros., Newsl. Himal. Bot. no. 22: 24 (1998); T. Kuros. in Fl. Hinku & Hunku Valleys: 117 (2000); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 746 (2000); Manandhar, Pl. People Nepal: 227 (2002). — *Tithymalus heterophyllus* (L.) Haw., Syn. Pl. Succ.: 141 (1812). — *Cyathophora heterophylla* (L.) Raf., Fl. Tellur. 4: 117 (1838). — *Poinsettia heterophylla* (L.) Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 253 (1859). — Type fide Coode et al. (1982): Plukenet, Alm: 369, t. f. 6 (1969) (n. v.), America calidiore.

*Euphorbia geniculata* Ortega, Nov. Pl. Descr. Dec. 2: 18 (1797); Boiss. in DC. Prodr. 15(2): 72 (1866); Siwakoti & Varma, J. Econ. Taxon. Bot. 18: 496 (1994); Siwakoti & Varma, Pl. Divers. E. Nepal: 324 (1999). — *Poinsettia geniculata* (Ortega) Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 253 (1859); Hurus. & Ya. Tanaka in Fl. E. Himal.: 181 (1966). — Type: *Hort. Madrid* (MA? (fide Radcliffe-Smith 1987b), n. v.), Cuba.

*Euphorbia prunifolia* Jacq., Pl. Hort. Schoenbr. 3: 15, t. 277 (1798); Wall., Numer. List: 269, no. 7690A (1847); Hook. f., Fl. Brit. India 5: 266 (1887). — *Tithymalus prunifolia* (Jacq.) Haw., Syn. Pl. Succ.: 143 (1812). — *Poinsettia prunifolia* (Jacq.) Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 253 (1859).

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of central America, now a pantropical weed (Webster & Burch 1968; Short & Vickery 1982). In Nepal: Far Western, Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 290–1800 m. On roadsides, on riversides, or in crop fields. A common weeds. Flowers & fruits from April to November.

Vernacular names — Nepali: *maitula jhar* (Manandhar 2002). Chepang: *dudhiya* (Manandhar 2002). Tamang: *nator chhe* (Manandhar 2002).

Uses — Milky latex is medicinally applied to boils (Manandhar 2002). Juice is medicinally applied to cuts and wounds (Manandhar 2002).

Notes — Siwakoti & Varma's record (1999) of this species is referable to *E. cyathophora* by its red upper leaf and glands with a fissure-like apex.

IV. Subgenus **Tirucalli** (Boiss.) S. Carter

Subgenus *Tirucalli* (Boiss.) S. Carter, Kew Bull. 40: 823 (1985). — Section *Tirucalli* Boiss. in DC. Prodr. 15 (2): 94 (1862). — Type species: *Euphorbia tirucalli* L.  
See *Euphorbia tirucalli* L. in Excluded taxa.

V. Subgenus **Esula** Pers.

Subgenus *Esula* Pers., Synop. Pl. 2: 14 (1806). — Type species: *Euphorbia esula* L.  
Sectional circumscriptions follow Prokhanov (1949).

## Key to the species

(See also Table 8)

- A. Involucral glands semicircular or lunate, with 2 horn-like appendages on both sides; floral leaves opposite
- B. Perennial herbs with ligneous rhizome; involucre ca. 2.5 mm long; glands 1–1.8 mm in diam.; capsules ca. 5.5 mm long, ca. 6 mm in diam.  
..... Section **Esula**, 5. **E. prolifera** Buch.-Ham. ex D. Don
- B. Annual herbs without rhizome; involucre ca. 1 mm long; glands ca. 1 mm in diam.; capsules 3–4 mm long, ca. 4 mm in diam. — Section **Cymatospermum** (Prokh.) Prokh.
- C. Cauline leaves oblanceolate or narrowly obovate, 0.8–1.4 cm wide; verticillate leaves elliptic or oblanceolate, 0.9–1.3 cm wide ..... 6. **E. maddenii** Boiss.
- C. Cauline leaves linear, 0.3–0.4 cm wide; verticillate leaves linear, 0.2–0.3 cm wide  
..... 7. **E. dracunculoides** Lam.
- A. Involucral glands transversely elliptic, without appendages; floral leaves opposite or 3(or more)-whorled
- B. Cauline leaves more than 16; ovary smooth or with obtuse verrucae; styles bifid; capsules 3.5–4 mm long, ca. 4.5 mm in diam. (not seen in Nepalese *E. sikkimensis*)  
— Section **Tulocarpa** (Raf.) Prokh.
- C. Stems 49–193 cm long, arising from rhizome; seeds smooth
- D. Stems 49–65 cm long, axillary ray 0 or 1; ovary smooth or almost smooth, glabrous or pilose ..... 8. **E. sikkimensis** Boiss.
- D. Stems 80–193 cm long, axillary rays 3–11; ovary with obtuse verrucae or almost smooth, glabrous  
..... 9. **E. pseudosikkimensis** (Hurus. & Ya. Tanaka) Radcl.-Sm.
- C. Stems 30–50 cm long, arising from woody stock; seeds rough or nearly smooth  
..... 10. **E. cashmeriana** Royle
- B. Cauline leaves 0–20; ovary smooth; styles entire; capsules 4–6 mm long, 4.3–8 mm in diam. (not seen in Nepalese *E. himalayensis*) —  
..... Section **Holophyllum** Prokh.
- C. Stems 33–70 cm long; involucre 3–4 mm long, glands 4–4.5 x 1.3–1.8 mm; styles 3–4 mm long; capsules ca. 6 mm long, ca. 8 mm in diam.; seeds 4.3–4.5 mm long, 3.8–4 mm wide ..... 11. **E. wallichii** Hook. f.
- C. Stems 0–40 cm long; involucre 1.5–2.5 mm long, glands 1–2.2 x 0.6–1 mm; styles 1–3 mm long; capsules 4–4.5(–5) mm long, 4.3–6 mm in diam.; seeds 2.5–3.5(–4.2) mm long, 1.6–3 mm wide



D. Cauline leaves (2–)3.6–9.3 by 1–3 cm; verticillate leaves (1.9–)2.5–6.2 by 1.2–2.7 cm; involucre ca. 2.5 mm long; styles ca. 3 mm long

..... **12. *E. luteoviridis*** D.G. Long

D. Cauline leaves 0.5–4.5 by 0.2–1.5 cm; verticillate leaves 0.4–3.3 by 0.2–1.2 cm; involucre 1.5–2 mm long; styles 1–2.5 mm long

E. Stems 2.5–36 cm long; vegetative branches 3–5, erect; cauline leaves narrowly ovate or narrowly elliptic, 1–4.5 by 0.3–1.5 cm; branch leaves narrowly elliptic or narrowly ovate, 1.7–4.3 by 0.7–1.3 cm; verticillate leaves narrowly ovate, narrowly elliptic or elliptic, 0.7–3.3 by 0.5–1.2 cm; involucre 1.7–2 mm long ..... **13. *E. himalayensis*** (Klotzsch) Boiss.

E. Stems 0–3.5 cm long; vegetative branches 4–20, procumbent or ascending; cauline leaves oblanceolate or narrowly obovate, 0.5–1.1 by 0.2–0.6 cm; branch leaves orbicular, widely elliptic or widely ovate, 0.5–1.1 by 0.3–1 cm; verticillate leaves obovate, 0.4–1 by 0.2–0.6 cm; involucre ca. 1.5 mm long

..... **14. *E. stracheyi*** Boiss.

**5. *Euphorbia prolifera*** Buch.-Ham. ex D. Don — Plate 75, 76; Fig. 41.

*Euphorbia prolifera* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 62 (1825); Hook. f., Fl. Brit. India 5: 264 (1887); Murata, Acta Phytotax. Geobot. 25: 114 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 480 (1983); Oudejans, World Cat. Tribe Euphorbieae: 335 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 118, t. 39, f. 1–4 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 812 (2000). — *Galarrhoeus proliferus* (Buch.-Ham. ex D. Don) H. Hara, J. Jap. Bot. 14: 356 (1938), "*Galarrhoeus prolifera*." — *Tithymalus proliferus* (Buch.-Ham. ex D. Don) Soják, Cas. Nár. Mus., Odd. Prir. 140: 175 (1972). — Type: [*Buchanan*] Hamilton [*s. n.*] (holo BM!), Nepaliá (Nepal).

*Euphorbia cuneifolia* Roxb., [Hort. Bengal.: 91 (1814), nom. nud.] Fl. Ind. ed. 1832, 2: 471 (1832), non Guss., Pl. Rar.: 190 (1826); Wall., Numer. List: 269, no. 7701 (1847). — Type: (n. v.), the northern parts of Hindoostan.

*Euphorbia nepalensis* Boiss. in DC. Prodr. 15(2): 157 (1862). — Type: [*T.*] Thomson [*s. n.*, 18 Oct. 1849] (K!), Pundjah [Panjab]; Royle (n. v.), Pandjah; [*Mayir*] Madden [*s. n.*] (K!), Almorah, [500 ft.]; Edgew (K!), Loudhiana; Strachey (K!), Kumaon ad Chiring pass; Wallich, List no. 7698A (G-DC (IDC microfiche in TI) n. v.; iso K!, BM!, TI!), Nepaliá (Nepal).

*Euphorbia pinus* H. Lév., Repert. Spec. Nov. Regni Veg. 11: 296 (1912). — Type: *Jul. Cavalerie* 3779, 3 June 1910 (holo E (fide Lauener 1983) n. v.), Kouy-Tchéou [Kweichow], Tin-Lan, montagnes, 1550 m (China).

Summer-green perennial herb. *Rhizomes* ligneous. *Stems* slender, deciduous, 2–5 from a rhizome, erect, 20–29 cm long, glabrous, 0 or 1 vegetative branches at upper part; rays 3–5. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous, midrib raised beneath; cauline leaves 18–70, alternate, lanceolate or narrowly obovate, 1.5–4.5 by 0.4–0.8 cm, apex acute or obtuse, base rounded; branch leaves many, alternate, lanceolate; verticillate leaves 3–5, ovate, 1.2–2 by 0.5–0.8 cm, base rounded, apex obtuse or rounded; floral leaves opposite, widely ovate, ovate or depressed ovate, base truncate, apex obtuse. *Cyathia* in the terminal pleiochasium and some lateral dichasia; involucre ca.

TABLE 8. Comparison of characters of Nepalese *Euphorbia* section Tulocarpa and section Holophyllum species

	<i>E. sikkimensis</i>	<i>E. pseudosikkimensis</i>	<i>E. cashimeriana</i>	<i>E. wallichii</i>	<i>E. luteoviridis</i>	<i>E. himalayensis</i>	<i>E. stracheyi</i>
Stem length (cm)	49–65	80–193	30–50	33–70	(13–)18–40	2.5–36	0–3.5
surface	glabrous or villous	glabrous or upper part rarely villous	glabrous or sparsely pilose	villous	upper part villosulous	villous	glabrous or villous
Vegetative branches	3–6	0–8	4–6	0–6	4 or 5	3–5	4–20
Rays	5 or 6	5–8, often 5	5 or 6, often 5	5–6, often 5	5	4–8	3–5, often 5
length (cm)	not seen	4–11	1.3–7	2–12	0.7–2.7	2.6–9	1.4–3.5
surface	villous or glabrate	glabrous	glabrous	villous	villosulous	villosulous	glabrous or villous
Axillary rays	0 or 1	3–11	0–2	0–1	0–2	0–4	0–4
Cauline leaves	17–28	many	many	10–20	(4–)9–18	2–11	0–5
size (cm)	5.5–10 × 0.8–1.6	6.8–14 × 1.5–2.5	6–11.5 × 1–2	(4.5–)6.1–12 × 1.4–4.1	(2–)3.6–9.3 × 1–3	1–4.5 × 0.3–1.5	0.5–1.1 × 0.2–0.6
Verticillate leaves							
size (cm)	3–6.5 × 1.2–1.8	3.5–6 × 1.5–2.5	3.5–5.5 × 1.3–2	3.5–8 × 1.7–3.7	(1.9–)2.5–6.2 × 1.2–2.7	0.7–3.3 × 0.5–1.2	0.4–1 × 0.2–0.6
Involucre length (mm)	3–4	ca. 3	ca. 3	3–4	ca. 2.5	1.7–2	ca. 1.5
gland size (mm)	ca. 2 × ?	1.2–2 × 0.6–1.2	1.2–1.5 × 0.5–0.8	4–4.5 × 1.3–1.8	1.8–2.2 × ca. 0.8	1.3–2 × 0.8–1	1–2 × 0.6–0.7
Styles	bifid	bifid	bifid	entire	entire	entire	entire
length (mm)	ca. 2.5	2–3.5	2.5–3.5	3–4	ca. 3	1.3–2.5	1–1.7
Ovary surface	smooth or almost smooth; glabrous or pilose	with obtuse verrucae or almost smooth; glabrous	with obtuse verrucae; glabrous or pilose	smooth; glabrous	smooth; glabrous	smooth; glabrous	smooth; glabrous
Capsule length (mm)	(not seen)	3.5–4	ca. 4	ca. 6	ca. 4.5	ca. 4.2	ca. 4(–5)
diameter (mm)	(not seen)	ca. 4.5	ca. 4.5	ca. 8	ca. 6	ca. 4.5	ca. 4.3
Seed size (mm)	(not seen)	2.7–3 × 2–2.2	ca. 2.8 × 1.9–2	4.3–4.5 × 3.8–4	ca. 3.5 × 2.7–3	2.7–3 × 1.6–1.8	2.5–2.9(–4.2) × 1.6–1.9(–2.6)
surface	(not seen)	smooth	rough or nearly smooth	smooth	smooth	smooth	smooth



2.5 mm long, outside glabrous; glands semicircular, 1–1.8 mm in diam., with horn-like appendages on both sides; involucre lobes triangular or deltate, margin serrate. *Pistillate flower*: ovary glabrous, smooth; styles ca. 1.4 mm long, shortly bifid. *Fruits*: pedicel 7–10 mm long; capsule widely ovoid, 3-ridged, ca. 5.5 mm long, ca. 6 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 3.6 mm long. *Seeds* not seen.

**Distribution** — Pakistan, India (Kumaon), Nepal, Thailand, China (South-central) (Short & Vickery 1982, Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Far Western, Western, Central.

**Habitat & Ecology** — Altitude 900–1900 m. On bare grasslands or cultivated fields. Flowers from April to May; fruits from April to June.

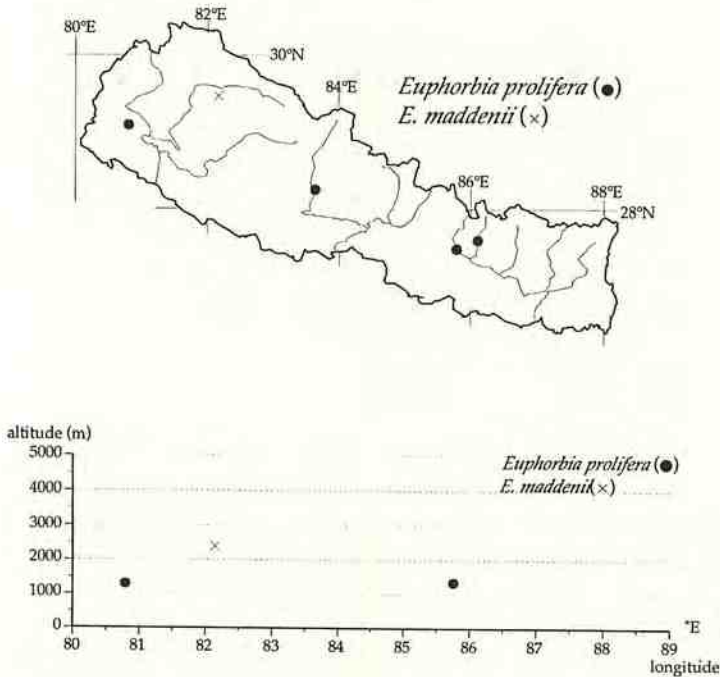


Fig. 41. Distribution of *Euphorbia prolifera* Buch.-Ham. ex D. Don and *E. maddenii* Boiss. in Nepal.

## 6. *Euphorbia maddenii* Boiss. — Fig. 41.

*Euphorbia maddenii* Boiss. in DC. Prodr. 15(2): 141 (1862), "*maddenii*"; Hook. f., Fl. Brit. India 5: 263 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Oudejans, World Cat. Tribe Euphorbieae: 251 (1990); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 773 (2000). — *Tithymalus maddenii* (Boiss.) Soják, Cas. Nár. Mus., Odd. Prír. 140: 173 (1972). — Type: *Edgeworth* (K!), circa Simla; [*Mayir*] *Madden* [25] (K!), Nynee Tal [Nynee Tall, 7300 ft]; [*R.*] *Strachey* [& *J. E. Winterbottom* 15] (K!), Nynee Tal [Naini Tal], 6400', [Kumaon]; [*T.*] *Thomson* [572, Apr. 1844] (G-DC (IDC microfiche in TI) n. v., K!), Nynee Tal, [Kumaon].

Annual herb without rhizome. *Stems* slender, erect, 15–25 cm long, glabrous, branched at base; rays 3–5. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous,

midrib raised beneath; cauline leaves 5–15, alternate, oblanceolate or narrowly obovate, 2.5–4 by 0.8–1.4 cm, base acute or cuneate, apex rounded; verticillate leaves 3–5, elliptic or oblanceolate, 1.8–3.4 by 0.9–1.3 cm, base acute, apex obtuse or rounded; floral leaves opposite, ovate, base truncate or obtuse, apex obtuse or rounded. *Cyathia* in the terminal pleiochasium and 0–2 lateral dichasia; involucre ca. 1 mm long, outside glabrous; glands semicircular, ca. 1 mm in diam., with horn-like appendages on both sides. *Pistillate flowers*: ovary glabrous, smooth. *Fruits*: pedicel 4–5 mm long; capsule depressed ovoid, 3-lobed, ca. 3 mm long, ca. 4 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 2.3 mm long. *Seeds* ellipsoid, carunculate, ca. 2 mm long, ca. 1.4 mm in diam., glabrous, with 6 longitudinally elliptic pits.

Distribution — Pakistan, India (Kumaon), Nepal (Govaerts et al. 2000). *NW Himalayan element*. In Nepal: Mid Western.

Habitat & Ecology — Altitude 2400 m. On stony ground. Flowers & fruits in May.

### 7. *Euphorbia dracunculoides* Lam. — Plate 78.

*Euphorbia dracunculoides* Lam., Encycl. 2: 428 (1788); Roxb., Fl. Ind. ed. 1832, 2: 474 (1832), "*dracunculoides*"; Boiss. in DC. Prodr. 15(2): 139 (1862); Boiss., Icon. Euphorb.: t. 91 (1866); Hook. f., Fl. Brit. India 5: 262 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Oudejans, World Cat. Tribe Euphorbieae: 137 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 118, t. 38, f. 1–4 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 714 (2000). — *Tithymalus dracunculoides* (Lam.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859: 84 (1860). — [*Euphorbia dracunculoides* Lam. subsp. *eudracunculoides* Maire, Bull. Soc. Hist. Nat. Afrique N. 1929: 734 (1929), nom. inval.] — Type: *M. Commerson* 545 (holo P-LA (fide Radcliffe-Smith 1987b) n. v.), Mauritius.

*Euphorbia angustifolia* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 62 (1825), non (Haw.) Steud., Nomencl. Bot. ed. 1: 323 (1821); Hook. f., Fl. Brit. India 5: 265 (1887). — *Euphorbia hamiltonii* Oudejans, Phytologia 67: 46 (1989), nom. nov.; Oudejans, World Cat. Tribe Euphorbieae: 187 (1990); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 742 (2000). — Type: [*Buchanan*] *Hamilton* [s. n., 26 March 1802] (holo BM!), ad Norcoteria Nepalensium (Nepal).

*Euphorbia lanceolata* Spreng., Mant. Prim. Fl. Hal.: 41 (1807).

*Euphorbia dracunculoides* Lam. var. *africana* Rikli & Schröt., Vierteljahrschr. Naturf. Ges. Zürich 57: 127 (1912).

Annual herb. *Stems* slender, erect, more than 20 cm long, glabrous, without branches; rays 3. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous, midrib raised beneath; cauline leaves alternate, linear, 3.5–4.5 by 0.3–0.4 cm, base obtuse, apex acute or obtuse; verticillate leaves 3, linear, 4–4.5 by 0.2–0.3 cm, base obtuse, apex acute; floral leaves opposite, linear or lanceolate, base obtuse, apex acute or obtuse. *Cyathia* in the terminal pleiochasium and some lateral dichasia; involucre ca. 1 mm long, outside glabrous; glands semicircular, ca. 1 mm in diam., with horn-like appendages on both sides. *Pistillate flowers*: ovary glabrous, smooth. *Fruits*: capsule widely ovoid, 3-lobed, ca. 4 mm long, ca. 4 mm in diam., glabrous, smooth. *Seeds* not seen.

Distribution — Northern Africa, West Tropical Africa, Northeast Tropical Africa,



Middle Atrantic Ocean, Gulf States, Oman, Saudi Arabia, Kuwait, Iran, Iraq, Pakistan, India, Nepal, China (South-central) (Govaerts et al. 2000). In Nepal: Central.

Habitat & Ecology — Flowers & fruits in March.

**8. *Euphorbia sikkimensis* Boiss. — Fig. 42.**

*Euphorbia sikkimensis* Boiss. in DC., Prodr. 15(2): 113 (1862), excl. *Griffith 963* (type of *E. griffithii*); Hook. f., Fl. Brit. India 5: 259 (1887); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 481 (1983); D. G. Long in Fl. Bhutan 1: 764 (1987); Oudejans, World Cat. Tribe Euphorbieae: 383 (1990); Turner, Euphorbias: 161 (1995); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 76, t. 21, f. 2–5 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 835 (2000). — *Tithymalus sikkimensis* (Boiss.) Hurus. & Ya. Tanaka in Fl. E. Himalaya: 184 (1966). — Type: *J. D. Hooker* [s. n., 23 May 1849] (K!) & *J. D. Hooker* [s. n., 20 Aug. 1849] (K!), in ditione Sikkim temperatâ ad Chongtam [Choongtam]; *J. D. Hooker* [s. n., 31 July & 1 Oct. 1849] (K!), in ditione Sikkim temperatâ ad Luchong, alt. 9000'–11000'; *J. D. Hooker* [s. n., 24 Oct. 1849] (K!), in ditione Sikkim temperatâ ad Luchong, alt. 10000 ft.

*Euphorbia chrysocoma* H. Lév. & Vaniot, Bull. Herb. Boissier, II, 6: 762 (1906); Lauener, Notes Roy. Bot. Gard. Edinburgh 40: 478 (1983). — Type: *J. Bodinier 1615*, 1 June 1897 (holo E (fide Lauener 1983) n. v.), Kouy-Tchéou [Kweichow], mont de Lou-Tsoung-Koan (China).

*Euphorbia chrysocoma* H. Lév. & Vaniot var. *glaucophylla* H. Lév. & Vaniot, Bull. Herb. Boissier, II, 6: 762 (1906). — Type: *Ducloux 118*, Mar. 1897 (holo E (fide Lauener 1983) n. v.), Yun-Nan, environs de Yun-Nan-Sen, My-Tsao, Te-Tse-Sen (China).

Summer-green perennial herb. *Rhizomes* not seen. *Stems* slender, deciduous, erect, 49–65 cm long, glabrous or villous, with 3–6 well developed vegetative branches from upper part; rays 5 or 6, with 0 or 1 axillary ray, trichotomous, villous or glabrate. *Leaves* sessile, exstipulate, margin entire, upper surface glabrous, lower surface villous on midrib or glabrous, midrib raised beneath; cauline leaves 17–28, alternate, lanceolate or narrowly elliptic (lower ones oblanceolate), 5.5–10.5 by 0.8–1.6 cm, base cuneate, apex acute; verticillate leaves 5 or 6, narrowly elliptic or narrowly ovate, 3–6.5 by 1.2–1.8 cm, base obtuse, apex acute or obtuse; floral leaves elliptic or circular, base obtuse or rounded, apex obtuse or rounded; the first floral leaves 3-whorled; other floral leaves not seen. *Cyathia* in the terminal and 0 or 1 lateral pleiochasia; involucre 3–4 mm long, outside glabrous or pilose; glands transversely elliptic, ca. 2 mm in diam., surface flat, without appendage; involucral lobes transversely elliptic, emarginate, margin entire, ciliate. *Pistillate flowers*: ovary glabrous or pilose, smooth or almost smooth; styles ca. 2.5 mm long, shortly bifid. *Fruit*: not seen. *Seeds* not seen.

Distribution — India (Sikkim), Nepal, Bhutan?, China (Tibet-Quinghai, South-central, Southeast), Vietnam (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Far Western, Mid Western.

Habitat & Ecology — Altitude 2100–2400 m. On stream sides. Flowers from April to May.

Notes — *Euphorbia sikkimensis* described by Boissier (1862) based on Sikkim Himalayan plant (*Hooker s. n.*) and Bhutan plant (*Griffith 963*). Hooker (1886–1888),

however, pointed out the latter having scarlet coloured floral leaves and treated it as a new species, *E. griffithii*. Long (1987) suggested them as being subspecifically distinct.

This is a poorly-known and misunderstood species in Himalayan region (Long 1987). The records of this species from Ganesh Himal by Amano (1999) and from east Nepal by Short & Vickery (1982) are referable to *E. luteoviridis* and *E. pseudosikkimensis*, respectively. In addition to the record from Bhutan as pointed by Long (1987), those from China may also require confirmation, because the illustration and the description in Ma & Tseng (1997) are distinct from original description in many characters such as leaf shape and stem length.

Ma & Wu (1993) recorded *Euphorbia griffithii* from Nepal with the citation of two specimens, *Polunin* (as "*Polumin*") *et al.* 1859, E, and *Polunin et al.* (as "*Grierson & Long*") 4083, E. The former was not found and the latter is referable to *E. sikkimensis*.

Hooker (1886–1888) pointed out that *E. sikkimensis* was distinguished from *E. pseudosikkimensis* (as *E. longifolia*) by its leaves narrowed into a slender petiole, short involucre, and smooth capsules. It was, however, difficult for me to delimit between *E. sikkimensis* and *E. pseudosikkimensis*, partly because verrucae of ovary and capsule in herbarium specimens of *E. pseudosikkimensis* are variable in size and often obscure, partly because Hooker's delimitation (1886–1888) is insufficient or these two taxa are not good species. Hence, some identification of the two species in here may be subjective and doubtful.

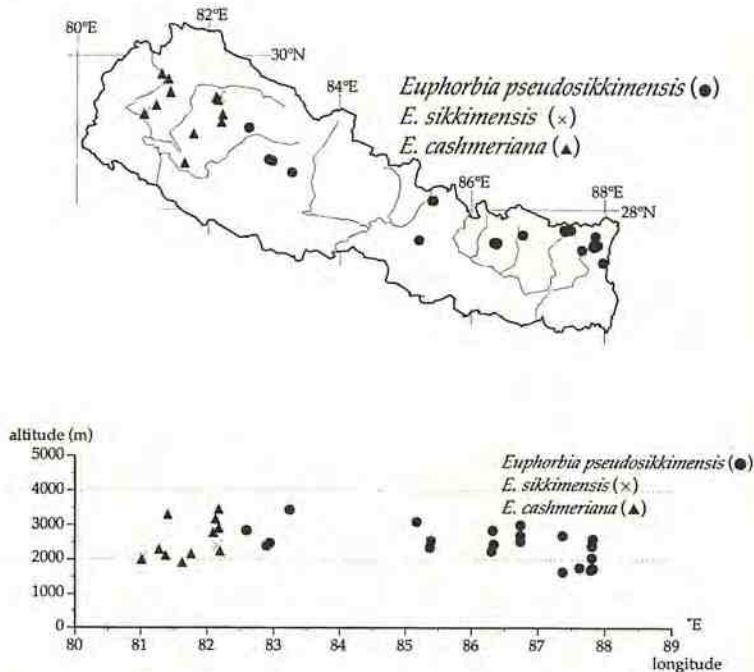


Fig. 42. Distribution of *Euphorbia pseudosikkimensis* (Hurus. & Ya. Tanaka) Radcl.-Sm., *E. sikkimensis* Boiss., and *E. cashmeriana* Royle in Nepal.



**9. *Euphorbia pseudosikkimensis*** (Hurus. & Ya. Tanaka) Radcl.-Sm. — Fig. 42.

*Euphorbia pseudosikkimensis* (Hurus. & Ya. Tanaka) Radcl.-Sm., Kew Bull. 36: 216 (1981); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Oudejans, World Cat. Tribe Euphorbieae: 340 (1990); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 813 (2000). — *Tithymalus pseudosikkimensis* Hurus. & Ya. Tanaka in Fl. E. Himal.: 182 (1966). — Type: [Tuyama 6306778], 9 Nov. 1963 (holo TI!), Nepal, above Lelep, 2600 m. See Kurosawa & Shimizu (2000) for a photograph of the holotype.

*Euphorbia donii* Oudejans, Phytologia 67: 45 (1989), nom. nov.; Oudejans, World Cat. Tribe Euphorbieae: 136 (1990); Turner, Euphorbias: 102 (1995); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 83 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); T. Kuros. in Fl. Hinku & Hunku Valleys: 116 (2000); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 714 (2000). — *Euphorbia longifolia* D. Don, Prodr. Fl. Nepal.: 62 (1825), non Gueldenst., Reis. Russland 1: 192 (1787), nec Lam., Encycl. 2: 417 (1788); Boiss. in DC., Prodr. 15(2): 120 (1862); Hook. f., Fl. Brit. India 5: 261 (1887); Kitam. in Fauna Fl. Nepal Himal.: 172, t. 35 (1955); Murata, Acta Phytotax. Geobot. 25: 114 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Polunin & Stainton, Fl. Himal.: 361 (1984); D. G. Long in Fl. Bhutan 1: 765 (1987); Ohba & Akiyama, Alpine Fl. Jaljale Himal.: 40 (1992). — *Tithymalus longifolius* (D. Don.) Hurus. & Ya. Tanaka in Fl. E. Himal.: 182 (1966). — Type: *Hamilton* (n. v.), Nepaliä.

*Euphorbia schillingii* Radcl.-Sm., Kew Mag. 4: 112 (1987); Oudejans, World Cat. Tribe Euphorbieae: 369 (1990); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 825 (2000). — Type: *Schilling 2060* (K!), Nepal.

*Euphorbia schillingii* Radcl.-Sm. var. *praecox* Radcl.-Sm., Kew Mag. 8: 46 (1991). — Type: *Wight s. n.* (K!), Nepal.

*Euphorbia sikkimensis* auct. non Boiss. in DC., Prodr. 15(2): 113 (1862); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982).

Summer-green perennial herb. *Rhizomes* thick. *Stems* slender, deciduous, 1 to several from a rhizome, erect, 80–193 cm long, glabrous (rarely upper part villous), with 0–8 vegetative branches from upper part; rays 5–8, often 5, with 3–11 axillary rays, 4–11 cm long, glabrous, tetrachotomous, trichotomous or dichotomous, then dichotomous. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous, midrib raised beneath; cauline leaves many, alternate, oblanceolate or narrowly elliptic, 6.8–14 by 1.5–2.5 cm, apex acute or obtuse, base cuneate; verticillate leaves 5–8, usually 5, narrowly elliptic or narrowly ovate, 3.5–6 by 1.5–2.5 cm, apex obtuse, base obtuse; floral leaves elliptic or circular, apex obtuse or rounded, base obtuse or rounded; the first floral leaves 3- or 4-(rarely 5-)whorled; other floral leaves opposite or 3-whorled. *Cyathia* in the terminal and 3–11 lateral pleiochasia; involucre ca. 3 mm long, outside glabrous; glands without appendage, transversely elliptic, 1.2–2 by 0.6–1.2 mm, surface flat; involucre lobes widely ovate, minutely irregularly toothed, margin ciliate. *Pistillate flowers*: ovary glabrous, with obtuse verrucae; styles 2–3.5 mm long, bifid. *Fruits*: capsule sphaeroidal, 3.5–4 mm long, ca. 4.5 mm in diam., with sparse obtuse verrucae or almost smooth, glabrous; columella persistent after dehiscence, 3–3.3 mm long. *Seeds* carunculate, broadly ellipsoid, 2.7–3 mm long, 2–2.2 mm wide, smooth, brown or grayish.



Distribution — India (Sikkim), Nepal, Bhutan, China (Tibet-Qinghai) (Long 1987, Govaerts et al. 2000). *E Himalayan element*. In Nepal: Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 1650–3510 m. On stream sides, on grassy slopes, in forests, on forest clearings, or in open meadows. Flowers from May to November; fruits from May to November.

Notes — *Euphorbia pseudosikkimensis* was described from Mechi Zone in East Nepal characterized by its subpetiolate leaves, obscurely warted capsules, and glabrous stem (Hurusawa & Tanaka 1966). These characters, however, almost agree with Hooker's description of *E. longifolia* D. Don as "glabrous or sparsely hairy", "leaves sessile", and "capsule covered obscurely and sparsely with conical warts."

The name widely accepted for this species, *Euphorbia longifolia* D. Don, was recently revealed as the later homonym of *E. longifolia* Gueldenst. and renamed *E. donii* by Oudejans (1989). A Hurusawa & Tanaka's name (1966), *Euphorbia pseudosikkimensis*, is prior to *E. donii*, although I had erroneously united the former under the latter (Kurosawa 1998, 2002).

Another East Nepalese species, *Euphorbia schillingii*, was recently described by Radcliffe-Smith (1987a). He pointed out the species is restricted to Dudh Kosi valley and separates from *E. longifolia* D. Don by later flowering period (mid-July to mid-September), and by broader (up to 3 cm), obtuse, membranaceous cauline leaves. However, the range of flowering period and leaf apex of *E. schillingii* in Radcliffe-Smith (1987a) are included in that of *E. pseudosikkimensis*. Although its leaf width slightly exceeds the range, I think that *E. schillingii* should be regarded as conspecific with *E. pseudosikkimensis*.

In some case, this species is difficult to distinguished from *E. sikkimensis* because of obscured verrucae on capsules in herbarium specimens. See note under *E. sikkimensis*.

*Euphorbia cashmeriana* also resembles this species. See note under *E. cashmeriana*.

#### 10. *Euphorbia cashmeriana* Royle — Plate 79; Fig. 42.

*Euphorbia cashmeriana* Royle, Ill. Bot. Himal. Mts.: 329, t. 82, f. 4 (1836); Boiss. in DC., Prodr. 15(2): 120 (1862); Oudejans, World Cat. Tribe Euphorbieae: 95 (1990). — Type: (n. v.), Cashmere and neighbouring mountains.

*Tithymalus cognatus* Klotzsch ex Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859: 66 (1860); Klotzsch in Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar: 114, t. 19 (as *E. consanguinea*) (1862). — *Euphorbia cognata* (Klotzsch ex Klotzsch & Garcke) Boiss. in DC., Prodr. 15(2): 120 (1862); Oudejans, World Cat. Tribe Euphorbieae: 107 (1990). — *Euphorbia pilosa* L. var. *cognata* (Klotzsch ex Klotzsch & Garcke) Hook. f., Fl. Brit. India 5: 261 (1887). — Type: Hoffmeister (n. v.), Himalaya.

Summer-green perennial herb or subshrub. *Roots* ligneous. *Stems* 1–3 from woody stocks, slender, erect, 30–50 cm long, glabrous or sparsely pilose, with 4–6 vegetative branches from upper part; rays 5 or 6, often 5, with 0–2 axillary rays, 1.3–7 cm long, glabrous, trichotomous or dichotomous, then dichotomous. *Leaves* sessile, exstipulate, margin entire, upper surface glabrous, lower surface glabrous or sparsely pilose on midrib, midrib raised beneath; cauline leaves many, alternate, oblanceolate, narrowly



elliptic, 6–11.5 by 1–2 cm, base cuneate, apex acute; verticillate leaves 5 or 6, usually 5, lanceolate or narrowly elliptic, 3.5–5.5 by 1.3–2 cm, apex acute or obtuse, base obtuse; floral leaves ovate or widely ovate, apex obtuse, base obtuse; the first floral leaves opposite or 3-whorled; other floral leaves opposite. *Cyathia* in the terminal and 0–2 lateral pleiochasia; involucre ca. 3 mm long, outside glabrous; glands transversely elliptic, 1.2–1.5 by 0.5–0.8 mm, without appendage, surface flat; involucre lobes widely ovate, hairy on margin. *Pistillate flowers*: ovary glabrous or sparsely pilose, with obtuse verrucae; styles 2.5–3.5 mm long, bifid. *Fruits*: capsule sphaeroidal, ca. 4 mm long, ca. 4.5 mm in diam., with sparse obtuse verrucae, glabrous or pilose; columella persistent after dehiscence, ca. 3.3 mm long. *Seeds* carunculate, broadly ellipsoid, ca. 2.8 mm long, 1.9–2 mm wide, rough or nearly smooth, dark brown or grayish.

Distribution — Afghanistan, Pakistan, India (Kashmir), Nepal (Govaerts et al. 2000). *NW Himalayan element*. In Nepal: Far Western, Mid Western.

Habitat & Ecology — Altitude 1850–3490 m. In grasslands, in forests, and on roadsides. Flowers from July to September; fruits from July to September.

Notes — This is the first record of the species from Nepal.

*Euphorbia pseudosikkimensis* resembles *E. cashmeriana* in its middle sized capsule with sparse obtuse swellings. In herbarium specimens, the latter is distinguished only by its shorter stems arising from woody stocks, occasional pilose ovaries and capsules, and rough or nearly smooth seeds.

Another closely related species is *E. cornigera*, from Pakistan, Kashmir and northwestern India. It differs in its conical swellings of ovaries and capsules, smooth seeds, and serrulate leaves (Hooker 1886–1888, Turner 1995).

### 11. *Euphorbia wallichii* Hook. f. — Fig. 43.

*Euphorbia wallichii* Hook. f., Fl. Brit. India 5: 258 (1887); Baehni, Candollea 17: 70 (1959); A. R. Smith, B. Mag. 175: t. 442 (1964); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982), p. p.; Polunin & Stainton, Fl. Himal.: 361, pl. 111 (1984); Oudejans, World Cat. Tribe Euphorbieae: 437 (1990); J. S. Ma & C. Y. Wu, Collect. Bot. (Barcelona) 21: 111 (1992), p. p.; J. S. Ma & C. Y. Wu, Acta Bot. Yunnan. 15: 115 (1993), p. p.; Turner, Euphorbias: 174 (1995); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 88, t. 25, f. 5–8 (1997), p. p.; T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Amano in Contr. Fl. Ganesh Himal.: 46 (1999); T. Kuros. in Fl. Hinku & Hunku Valleys: 117 (2000); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 859 (2000), p. p.; Manandhar, Pl. People Nepal: 229 (2002). — [*Euphorbia involucreata* Wall., Numer. List: 269, no. 7696 (1847), nom. nud.] — *Tithymalus wallichii* (Hook. f.) Soják, Cas. Nár. Mus., Odd. Prír. 140: 177 (1972). — Type: *Wallich*, List no. 7696A, [in 1821] (K-WALL (IDC microfiche in TI) n. v.), Nepal, [Gossain Than]; *Aitchison* [94, Aug. 1877] (K!), Kashmir; [*T.*] *Thomson* [s. n., 9 May 1848] (K!), [Himal. Bor. Occ., Banahal Pass]; [*T.*] *Thomson* [s. n., 4 June 1848] (K!), [Himal. Bor. Occ., Badarwar, E. Kashmir, near Padri Pass].

Summer-green perennial herb. *Rhizomes* thick, creeping horizontally, 2–3.5 cm in diam. *Stems* slender, deciduous, erect, 33–70 cm long, villous, with 0–6 vegetative branches; rays 5 or 6, often 5, with 0 or 1 axillary ray, 2–12 cm long, villous. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous or villous at base (rarely lower surface

densely woolly), midrib raised beneath; cauline leaves 10–20, alternate, oblanceolate, narrowly elliptic or narrowly ovate, (4.5–)6.1–12 by 1.4–4.1 cm, base cuneate or obtuse, apex acute; branch leaves 12–18, narrowly elliptic, 3.7–5.3 by 0.7–1.2 cm, base cuneate, apex acute, obtuse or rounded; verticillate leaves 5 or 6, usually 5, narrowly ovate or ovate, 3.5–8 by 1.7–3.7 cm, base obtuse or rounded, apex acute or obtuse; floral leaves ovate or widely ovate, base obtuse or rounded, apex acute or obtuse; the first floral leaves 3- or 4-whorled; other floral leaves 3-whorled. *Cyathia* in the terminal and 0 or 1 lateral pleiochasia; involucre 3–4 mm long, glabrous or villous outside; glands transversely elliptic, 4–4.5 mm in diam., 1.3–1.8 mm long, without appendage, surface flat; involucre lobes widely ovate, irregularly toothed, margin ciliate. *Pistillate flowers*: ovary glabrous, smooth; styles 3–4 mm long, entire. *Fruits*: capsule sphaeroidal, ca. 6 mm long, ca. 8 mm in diam., glabrous, smooth; columella persistent after dehiscence, 6–7 mm long. *Seeds* carunculate, broadly ellipsoid, 4.3–4.5 mm long, 3.8–4 mm wide, smooth.

**Distribution** — Afghanistan, Pakistan, India, Nepal, China (Tibet–Quinghai, South-central) (Govaerts et al. 2000). *Pan-Himalayan element*. In Nepal: Far Western, Mid Western, Western, Central, Eastern.

**Habitat & Ecology** — Altitude 2250–4500 m. On open slopes, in forests, in forest clearings, in grasslands, or in kharka. Flowers from April to August; fruits from May to September.

**Vernacular name** — Tibetan: *duk* (Manandhar 2002).

**Uses** — Milky latex is medicinally used to treat goiter (Manandhar 2002).

**Notes** — Some specimens from Jumla District in Mid Western development region (*O. Polunin et al. 2129*, BM, E; *O. Polunin et al. 952*, BM) have leaves with remarkable woolly hairs on undersurface.

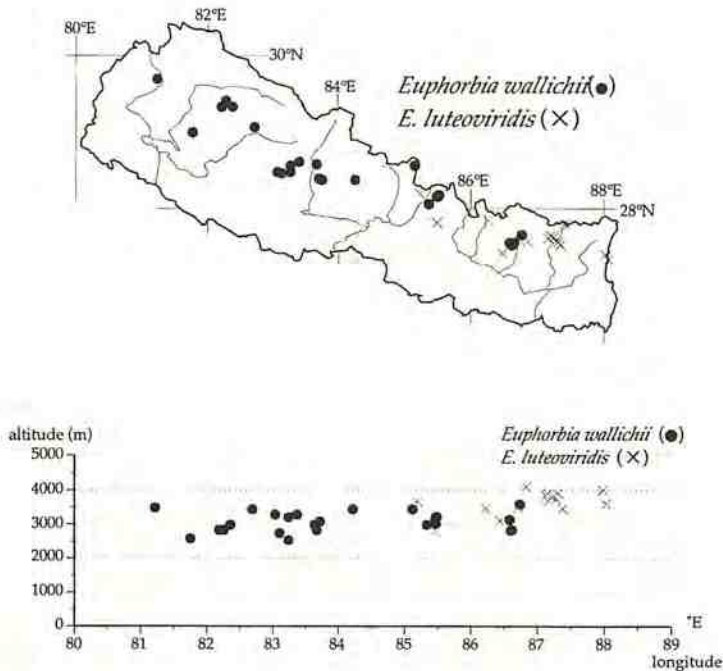


Fig. 43. Distribution of *Euphorbia wallichii* Hook. f. and *E. luteoviridis* D. G. Long in Nepal.



**12. *Euphorbia luteoviridis* D. G. Long** — Fig. 43.

*Euphorbia luteoviridis* D. G. Long, Notes Roy. Bot. Gard. Edinburgh 44: 163 (1986); D. G. Long in Fl. Bhutan 1: 764 (1987); Oudejans, World Cat. Tribe Euphorbieae: 245 (1990); Turner, Euphorbias: 128 (1995); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); T. Kuros. in Fl. Hinku & Hunku Valleys: 117 (2000). — Type: [*R. E.*] Cooper 160, 5 Jul. 1913 (holo E!), Sikkim, Kapup, 3960 m [13000'].

*Euphorbia himalayensis* auct. non (Klotzsch) Boiss. in DC., Prodr. 15(2): 113 (1862): Hook. f., Fl. Brit. India 5: 258 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982), p. p. — *Tithymalus himalayensis* auct. non Klotzsch: Hurus. & Ya. Tanaka in Fl. E. Himal.: 182 (1966).

*Euphorbia griffithii* auct. non Hook. f., Fl. Brit. India 5: 259 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998).

*Euphorbia wallichii* auct. non Hook. f., Fl. Brit. India 5: 258 (1887); J. S. Ma & C. Y. Wu, Collect. Bot. (Barcelona) 21: 111 (1992), p. p.; J. S. Ma & C. Y. Wu, Acta Bot. Yunnan. 15: 115 (1993), p. p.; J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 88 (1997), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 771 (2000), p. p.

*Euphorbia sikkimensis* auct. non Boiss. in DC., Prodr. 15(2): 113 (1862): Amano in Contr. Fl. Ganesh Himal.: 40 (1999).

Summer-green perennial herb. *Rhizomes* thick. *Stems* somewhat thick or slender, deciduous; subterranean part of stems 2.5–8 cm long, glabrous, scaly, simple; aerial part of stems erect, (13–)18–40 cm long, with 4 or 5 vegetative branches, lower part glabrate, upper part villosulous; vegetative branches erect, 3.5–12 cm long; rays 5, with 0–2 axillary rays, 0.7–2.7 cm long, villosulous. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous, green, midrib raised beneath; cauline leaves (4–)9–18, alternate, narrowly elliptic, elliptic or widely elliptic, (2–)3.6–9.3 by 1–3 cm, apex acute or obtuse, base cuneate or obtuse; branch leaves 7–16, narrowly elliptic, (2.8–)3.7–4.5 by 0.8–1.7 cm, apex acute or obtuse, base cuneate; verticillate leaves 5, elliptic, narrowly ovate or narrowly elliptic, (1.9–)2.5–6.2 by 1.2–2.7 cm, apex acute, base cuneate; the first floral leaves 3-whorled. *Cyathia* in the terminal and 0–2 lateral pleiochasia; involucre ca. 2.5 mm long, outside villous or glabrous; glands transversely elliptic, 1.8–2.2 by ca. 0.8 mm, without appendage, surface flat; involucre lobes widely ovate, margin irregularly toothed, ciliate. *Pistillate flowers*: ovary glabrous, smooth; styles ca. 3 mm long, entire. *Fruits*: capsule sphaeroidal, ca. 4.5 mm long, ca. 6 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 4 mm long. *Seeds* carunculate, broadly ellipsoid, ca. 3.5 mm long, 2.7–3 mm wide, smooth.

Distribution — India (Sikkim, W Bengal), Nepal, China (Tibet-Qinghai)? (Long, 1986). *E Himalayan element*. In Nepal: Central, Eastern.

Habitat & Ecology — Altitude 2800–4100 m. On rocky slopes, on grassy slopes, in open meadows, or in *Rhododendron* bushes. Flowers from May to August; fruits from August to October.

Notes — This is a much misunderstood species in Nepalese Flora. As pointed by Long (1986), the species had been confused with *E. himalayensis* for a long time. *Euphorbia griffithii* in Short & Vickery (1982) (based on Lancaster & Morris 44) and *E. sikkimensis* in Amano (1999) (based on F. Miyamoto et al. 9440086, BM!) are referable to the species.

Ma & Wu (1992, 1993) and Govaerts et al. (2000) regarded *E. luteoviridis* as a synonym of *E. wallichii* in spite of distinct differences of size of involucre and capsules.

**13. *Euphorbia himalayensis* (Klotzsch) Boiss.** — Plate 77; Fig. 44.

*Euphorbia himalayensis* (Klotzsch) Boiss. in DC., Prodr. 15(2): 113 (1862); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982), p. p.; D. G. Long, Notes Roy. Bot. Gard. Edinburgh 44: 167; D. G. Long in Fl. Bhutan 1: 765 (1987); Oudejans, World Cat. Tribe Euphorbieae: 195 (1990); Turner, Euphorbias: 120 (1995); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998). — *Tithymalus himalayensis* Klotzsch in Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar: 115, t. 20 (1862); Hurus. & Ya. Tanaka in Fl. E. Himal.: 182 (1966). — Type: *Hoffmeister s. n.* (B† (fide Ma & Wu 1993, p. 115)), Himalaya entdeckt.

*Euphorbia stracheyi* auct. non Boiss. in DC., Prodr. 15(2): 114 (1866); Hand.-Mazz., Symb. Sin. 7: 228 (1931), p. p.; J. S. Ma & C. Y. Wu, Collect. Bot. (Barcelona) 21: 109 (1992), p. p.; J. S. Ma & C. Y. Wu, Acta Bot. Yunnan. 15: 113 (1993), p. p.; J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 81, t. 23, f. 3–8 (1997), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 841 (2000), p. p.

Summer-green perennial herb. *Stems* slender, deciduous; subterranean part of stems 5–11 cm or more, glabrous, scaly, simple; aerial part of stems erect, 2.5–36 cm long, villous, with 3–5 vegetative branches; rays 4–8, with 0–4 axillary rays, 2.6–9 cm long, villosulous; vegetative branches erect, 4.5–58 cm long, villosulous. *Leaves* sessile, exstipulate, margin entire, both surfaces glabrous, midrib raised beneath; cauline leaves 2–11, alternate, narrowly ovate or narrowly elliptic, 1–4.5 by 0.3–1.5 cm, base attenuate,

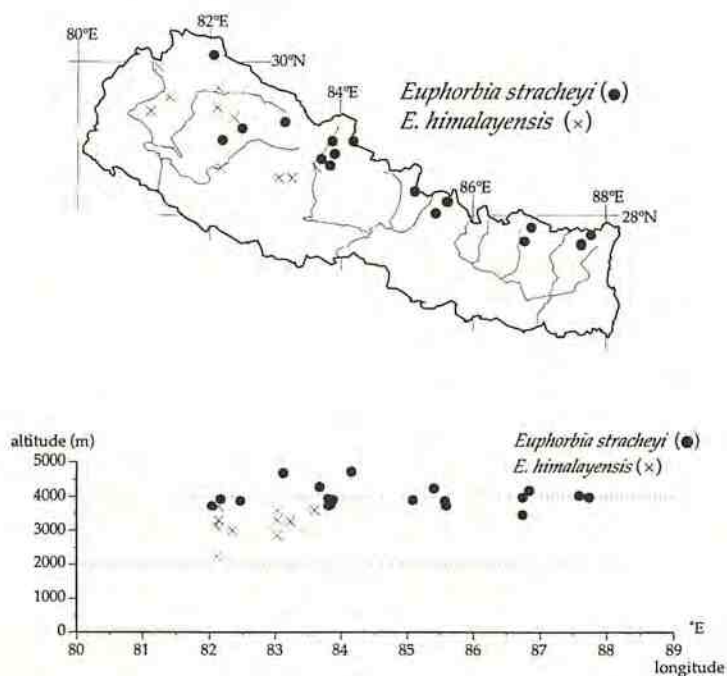


Fig. 44. Distribution of *Euphorbia stracheyi* Boiss. and *E. himalayensis* (Klotzsch) Boiss. in Nepal.



rounded or truncate, apex acute or obtuse; branch leaves 7–18, blade narrowly elliptic or narrowly ovate, 1.7–4.3 by 0.7–1.3 cm, base rounded or truncate, apex acute; verticillate leaves 4–8, narrowly ovate, narrowly elliptic or elliptic, 0.7–3.3 by 0.5–1.2 cm, base attenuate or obtuse, apex acute or obtuse; floral leaves ovate, widely ovate or orbicular, base obtuse or rounded, apex obtuse or rounded; the first floral leaves 4-whorled; other floral leaves 3- or 4-whorled. *Cyathia* in the terminal and some lateral pleiochasia; involucre 1.7–2 mm long, outside villous or glabrous; glands transversely elliptic, 1.3–2 by 0.8–1 mm, without appendage, surface flat; involucre lobes widely oblong, margin entire. *Pistillate flowers*: ovary glabrous, smooth; styles 1.3–2.5 mm long, entire. *Fruits*: capsule sphaeroidal, ca. 4.2 mm long, ca. 4.5 mm in diam., glabrous, smooth; columella persistent after dehiscence. *Seeds* carunculate, broadly ellipsoid, 2.7–3 mm long, 1.6–1.8 mm wide, smooth.

Distribution — Nepal, Bhutan, China (Tibet) (Long 1986). *Tibetan element*. In Nepal: Far Western, Mid Western, Western, Central.

Habitat & Ecology — Altitude 2100–3700 m. In forests, on grassy slopes, in kharka, or on exposed slopes. Flowers from April to July; fruits from May to September.

Notes — This species is closely related to *E. stracheyi*. Habit of some plants with short aerial stem is quite similar to that of *E. stracheyi*. Some authors have been treated this species as a synonym of *E. stracheyi* (Handel-Mazzetti 1929–1936, Ma & Wu 1992, 1993, Ma & Tseng 1997, Govaerts et al. 2000).

*Euphorbia luteoviridis* had been confused with this species (Long 1986).

#### 14. *Euphorbia stracheyi* Boiss. — Fig. 44.

*Euphorbia stracheyi* Boiss. in DC., Prodr. 15(2): 114 (1862); Hook. f., Fl. Brit. India 5: 259 (1887); Hand.-Mazz., Symb. Sin. 7: 228 (1931), p. p.; Kitam. in Fauna Fl. Nepal Himal.: 172 (1955); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Polunin & Stainton, Fl. Himal.: 361 (1984); D. G. Long in Fl. Bhutan 1: 765 (1987); Oudejans, World Cat. Tribe Euphorbieae: 394 (1990); Ohba & Akiyama, Alpine Fl. Jaljale Himal.: 40 (1992); J. S. Ma & C. Y. Wu, Collect. Bot. (Barcelona) 21: 109 (1992), p. p.; J. S. Ma & C. Y. Wu, Acta Bot. Yunnan. 15: 113 (1993), p. p.; J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 81, t. 23, f. 1 (1997), p. p.; T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 841 (2000), p. p.; Manandhar, Pl. People Nepal: 229 (2002). — *Tithymalus stracheyi* (Boiss.) Hurus. & Ya. Tanaka in Fl. E. Himal: 184 (1966). — Type: *Strachey & Winterbottom* (K!), in Tibeto ad Renikim; [*R.*] *Strachey* & [*J. E.*] *Winterbottom* [18] (K!), in Tibeto ad Kyanger; *Strachey* (K!), Kumaon ad Champwar; *Edgew.* 147 (K!), ad Choor; *J. D. Hooker* [*s. n.*, 11 Sep. 1949] (G-DC (IDC microfiche in TI) n. v., K!), in prov. Sikkim alt. 16000p, [Samdug]; *Jacquem.* 857 (n. v.), ad Kedarkanta.

*Euphorbia megistopoda* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 218 (1912). — Type: *G. Forrest* 2237, June 1906 (E!; iso CAL (fide Ramamurthy & Samaddar 1985) n. v.), China, [N. W. Yunnan], Lichian Range, Lat. 27°10'N, alt. 10,000 ft.

Summer-green perennial herb. *Roots* thick; rhizomes thick. *Stems* slender, deciduous; subterranean part of stems 1–12 cm or more, glabrous, scaly, simple; aerial part of stems, erect, 0–3.5 cm long, glabrous or villous, with 4–20 vegetative branches; rays 3–5, often 5, with 0–4 axillary rays, 1.4–3.5 cm long, glabrous or villous; vegetative branches



procumbent or ascending, 3–22 cm, villous or glabrate. *Leaves* exstipulate, margin entire, both surfaces glabrous or villous, midrib raised beneath; cauline leaves sessile, 0–5, alternate, oblanceolate or narrowly obovate, 0.5–1.1 by 0.2–0.6 cm, apex obtuse or rounded, base attenuate or cuneate; branch leaves 13–22 or more, petiole 0.5–1.5 mm long, blade orbicular, widely elliptic or widely ovate, 0.5–1.1 by 0.3–1 cm, base obtuse or attenuate, apex rounded or emarginate; verticillate leaves sessile, 3–5, usually 5, obovate, 0.4–1 by 0.2–0.6 cm, base attenuate or cuneate, apex rounded; floral leaves sessile, orbicular or widely obovate, base obtuse, apex rounded; the first floral leaves 4-whorled; the second floral leaves 3- or 4-whorled. *Cyathia* in the terminal and some lateral pleiochasia; involucre ca. 1.5 mm long, outside glabrous; glands 4 or 5, transversely elliptic, 1–2 by 0.6–0.7 mm, without appendage, surface flat; involucre lobes widely oblong, margin entire or irregularly toothed. *Pistillate flowers*: ovary glabrous, smooth; styles 1–1.7 mm long, entire. *Fruits*: capsule sphaeroidal, ca. 4(–5) mm long, ca. 4.3 mm in diam., glabrous, smooth; columella persistent after dehiscence, ca. 4 mm long. *Seeds* carunculate, ellipsoid, 2.5–2.9(–4.2) mm long, 1.6–1.9(–2.6) mm wide, smooth.

Distribution — India (Garhwal), Nepal, Bhutan, China (Tibet-Quinghai, Southeast) (Short & Vickery 1982). *Tibetan element*. In Nepal: Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 3600–4700 m. In alpine meadows, on open grassy slopes, on rocky slopes, or exposed ground. Flowers from April to September; fruits from May to September.

Vernacular name — Tamang: *sangmen* (Manandhar 2002).

Uses — Paste is medicinally applied for diarrhea (Manandhar 2002).

Notes — One collection from Mustang District (*S. Noshiro et al.* 20106092, TI) has larger capsules (ca. 5 mm long) and larger ovoid seeds (3.8–4.2 mm long, 2.2–2.6 mm wide).

#### 34. *Chamaesyce* S. F. Gray

*Chamaesyce* S. F. Gray, Nat. Arrang. Brit. Pl. 2: 260 (1821). — Type species: *Chamaesyce maritima* S. F. Gray

#### Key to the species

(See also Table 9)

#### A. Glandular appendages equal

#### B. Stems ascending to erect; leaf blades 13–40 by 5–18 mm

C. Stems with yellowish hairs; leaf blades obliquely rhombic-ovate; appendages of involucre glands 0.1–0.2 mm long; capsules 1–1.1 mm long, 1.2–1.4 mm in diam.; seeds ca. 0.8 mm long, ca. 0.4 mm wide ..... **1. *C. hirta* (L.) Millsp.**

C. Stems with white hairs or glabrous; leaf blades obliquely elliptic or narrowly elliptic, appendages of involucre glands 0.3–0.8 mm long; capsules ca. 1.5 mm long, 1.8–2 mm in diam.; seeds 1–1.2 mm long, 0.7–0.8 mm wide

D. Stems and leaves villous, villosulous or glabrous; cyathia in cymes; involucre ca. 0.6 mm long

E. Stems villosulous, leaves and capsules villous

..... **2. *C. parvifolius* (L.) Soják**



- E. Stems, leaves and capsules glabrous  
 ..... excl. 7. **C. hypericifolia** (L.) Millsp.
- B. Stems procumbent or ascending; leaf blades 3–9 by 2–5 mm  
 C. Capsules 1.2–1.3 mm long, 1.3–1.4 mm in diam., velloous on ridges, completely exerted from involucre; seeds 0.7–0.8 mm long .... 4. **C. prostrata** (Aiton) Small  
 C. Capsules ca. 1 mm long, ca. 1 mm in diam., villosulous throughout, not completely exerted from involucre; seeds ca. 0.6 mm long  
 ..... 5. **C. thymifolia** (L.) Millsp.
- A. Glandular appendages of 2 large, of 2 very small  
 ..... excl. 8. **C. rosea** (Retz.) G. L. Webster

**1. Chamaesyce hirta** (L.) Millsp. — Fig. 45.

- Chamaesyce hirta* (L.) Millsp., Publ. Field Columbian Mus., Bot. Ser. 2: 303 (1909); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966); Malla et al., Fl. Kathmandu Valley: 623 (1986); T. Kuros., Newslett. Himal. Bot. no. 22: 25 (1998); Rajbhandari, Ethnobot. Nepal: 57 (2001). — *Euphorbia hirta* L., Sp. Pl.: 454 (1753); Roxb., Fl. Ind. ed. 1832, 2: 472 (1832); Banerji, Rec. Bot. Surv. India 19(2): 82 (1966); C. R. Rao, Ind. For. 93: 55 (1967); Murata, Acta Phytotax. Geobot. 25: 114 (1973); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); D. G. Long in Fl. Bhutan 1: 766 (1987); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 196 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 44, t. 8, f. 5–8 (1997); Philcox in Rev. Handb. Fl. Ceylon 11: 198 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 324 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 750 (2000); Manandhar, Pl. People Nepal: 228 (2002). — [*Euphorbia hirta* L. var. *typica* L. C. Wheeler, Contr. Gray Herb. 127: 68 (1939), nom. inval.] — Lectotype designated by Wheeler (1939): *Herb. Linnaeus 630-7* (LINN (fide Esser & Cafferty 2001) n. v.), India.
- Euphorbia pilulifera* auct. non L., Sp. Pl.: 454 (1753); Boiss. in DC. Prodr. 15(2): 21 (1862), p. p.; Hook. f., Fl. Brit. India 5: 250 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Kitam. in F. Fl. Nepal Himal.: 172 (1955).
- Euphorbia oblitterata* Jacq., Enum. Syst. Pl.: 22 (1760).
- Euphorbia capitata* Lam., Encycl. 2: 422 (1788).
- Euphorbia gemella* Lag., Ben. Sp. Pl.: 17 (1816). — *Chamaesyce gemella* (Lag.) Small, Fl. Maiami: 110 (1913).
- Euphorbia globulifera* Kunth in Humboldt et al., Nov. Gen. Sp. 2: 56 (1817).
- Euphorbia verticillata* Vell., Fl. Flumin.: 202 (1829), non Fisch., Mém. Soc. Imp. Naturalistes Moscou 3: 81 (1812), nec Poir. in Lam., Encycl., Suppl. 2: 611 (1812). — *Euphorbia nudiflora* Steud., Nomencl. Bot., ed. 2, 1: 613 (1840), nom. nov.
- Euphorbia pilulifera* L. var. *discolor* Engelm. in Emory, Rep. U. S. Mex. Bound. 2(1): 188 (1859).
- Euphorbia karwinskyi* Boiss., Cent. Euphorb.: 6 (1860). — *Chamaesyce karwinskyi* (Boiss.) Millsp., Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 407 (1916).
- Euphorbia bancana* Miq., Fl. Ned. Ind., Eerste Bijv.: 463 (1861). — Type: A, Oct. 1858 (n. v.), Bangka, locis graminosis prope Muntok.
- Chamaesyce rosei* Millsp., Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 402 (1916).
- Euphorbia chrysochaeta* W. Fitzg., J. Roy. Soc. W. Australia 3: 162 (1918).

TABLE 9. Comparison of characters of Nepalese *Chamaesyce* species

	<i>C. hirta</i>	<i>C. parviflora</i>	<i>C. hispida</i>	<i>C. prostrata</i>	<i>C. thymifolia</i>
Stem	ascending to erect	erect	ascending to erect	procumbent	procumbent or ascending
surface	strigose with short white hairs and hirsute with yellowish multicellular hairs	villosulous	hirsute with white multicellular hairs	villosulous on upper side	villosulous on upper surface
Leaf shape	rhombic-ovate	elliptic	elliptic or narrowly	elliptic	ovate or elliptic
size (mm)	15–40 × 6–18	21–26 × 10–14	elliptic	3–4 × 2–3	5–9 × 2–5
upper surface	strigose	glabrate	13–19 × 5–9 hirsute with white multicellular hairs	glabrous	glabrous
lower surface	strigose with short white hairs and hirsute with yellowish multicellular hairs	villose	hirsute with white multicellular hairs	villous at least on margin and at apex	glabrous or with curved white hairs
Cyathia	in glomerules	in cymes		solitary at nodes usually on	on congested lateral
Involucres			solitary at nodes	congested lateral branches	branches
length (mm)	0.5–0.7	ca. 0.6		0.6–0.7	ca. 0.8
glandular appendage length (mm)	0.1–0.2	0.3–0.5	ca. 1	obscure	obscure
Capsule length (mm)	1–1.1	ca. 1.5	0.4–0.8	1.2–1.3	ca. 1
diameter	1.2–1.4	ca. 1.8	ca. 1.5	1.3–1.4	ca. 1
surface	with appressed short white hairs	villous	ca. 2	villous on ridges	villosulous
Seed size (mm)	ca. 0.8 × ca. 0.4	1.1–1.2 × 0.7–0.8	glabrous ca. 1 × ca. 0.8	0.7–0.8 × ca. 0.3	ca. 0.6 × ca. 0.3



*Euphorbia hirta* L. var. *destituta* L. C. Wheeler, Contr. Gray Herb. 127: 70 (1939). —

Type: *A. Weberbauer* 5953, March 1912 (Gray Herb. n. v.), Peru, Dept. Piura, between Piura and Ñomala, alt. 100-250 m.

Herb. *Roots* slender, sometimes ligneous. *Stems* ascending to erect, 5–70 cm long, strigose with short white hairs and hirsute with yellowish multicellular hairs, branched at lower nodes, base sometimes ligneous. *Leaves*: stipules free, narrowly triangular, 1–1.1 by ca. 0.2 mm, incised, strigose; petiole 1–2 mm long, strigose and hirsute; blade obliquely rhombic-ovate, 15–40 by 6–18 mm, base obliquely cuneate, obtuse or rounded, apex acute or obtuse, margin serrulate, upper surface strigose, green or reddish, sometimes with an elongate purple spot centrally, lower surface strigose with short white hairs and hirsute with yellowish multicellular hairs, 3–5 secondary veins raised beneath. *Cyathia* in glomerules; peduncle 3–10 mm long; bracts lanceolate, small; stalk up to 1 mm long, strigose; involucre 0.5–0.7 mm long, outside strigose; glands transversely elliptic, ca. 0.1 mm wide; glandular appendages white, 0.1–0.2 mm long; ovary densely covered with appressed short white hairs. *Fruits*: capsule broadly depressed ovoid, 3-ridged, 1–1.1 mm long, 1.2–1.4 mm in diam., with appressed short white hairs. *Seeds* ovoid, 4-ridged, ca. 0.8 mm long, ca. 0.4 mm wide, transversely wavy, brown.

Distribution — Pantropical (Webster & Burch 1968). In Nepal: Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 160–1500 m. On roadsides, on riversides, on banks, or in crop fields. A common weed. Flowers & fruits throughout the year.

Vernacular names — Nepali: *aank(h)le jha(a)r* (Rajbhandari 2001a, Manandhar 2002), *chimphar jhar* (Manandhar 2002), *dudhe* (Manandhar 2002), *dude jhar* or *dudhe jhar* (Siwakoti & Varma 1999, Manandhar 2002), *jotane jhar* (Manandhar 2002), *ratango* (Manandhar 2002), *rhatulo* (Manandhar 2002), *kanguil* (Manandhar 2002). Chepang: *byauli* (Manandhar 2002), *dudhe jhaar* (Rajbhandari 2001a), *hanuman* (Manandhar 2002), *kapram* (Rajbhandari 2001a), *tikapara* (Rajbhandari 2001a, Manandhar 2002). Danuwar: *dudhiya* (Rajbhandari 2001a), *dudhiya jhar* (Manandhar 2002). Darai: *rani-dubi* (Rajbhandari 2001a). Gurung: *chimphar jha(a)r* (Rajbhandari 2001a, Manandhar 2002), *taleno* (Manandhar 2002). Magar: *dudhi jhar* (Manandhar 2002). Majhi: *dudhe aainar* (Manandhar 2002). Mooshar: *dudhiya* (Rajbhandari 2001a, Manandhar 2002). Rai: *dudhe* (Manandhar 2002), *dudhiya* (Manandhar 2002). Satar: *sangadare* (Rajbhandari 2001a). Tamang: *chhumen* (Rajbhandari 2001a, Manandhar 2002), *dapranchhu* (Manandhar 2002), *glenoba* (Manandhar 2002), *makaman* (Manandhar 2002), *trishubha mran* (Manandhar 2002). Tharu: *dudhiya-jhyang* (Rajbhandari 2001a).

Uses — Tender shoots are cooked (Rajbhandari 2001a, Manandhar 2002). Plant paste and saps are medicinally applied to various skin disease, to relieve body pain, or to other diseases (Rajbhandari 2001a, Manandhar 2002). Plant extraction is given to lactating mother for increasing milk (Rajbhandari 2001a). Anthelmintic, laxative and cooling properties of the plant is used as a tonic (Manandhar 2002). Smoke of dried plant is inhaled to treat asthma (Manandhar 2002). Inflorescences are chewed to relieve headaches (Manandhar 2002).

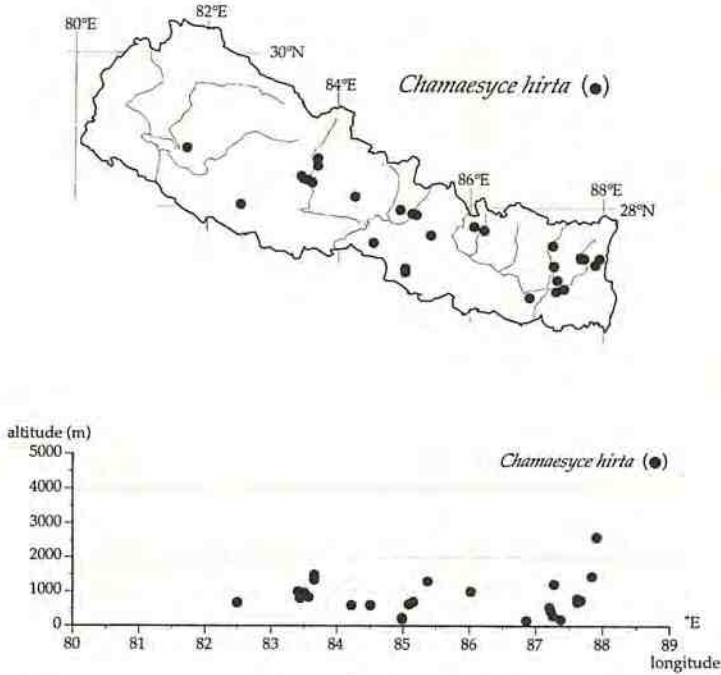


Fig. 45. Distribution of *Chamaesyce hirta* (L.) Millsp. in Nepal.

## 2. *Chamaesyce parviflora* (L.) Soják — Plate 81; Fig. 46.

*Chamaesyce parviflora* (L.) Soják, Cas. Nár. Mus., Odd. Přír. 140: 169 (1972); T. Kuros., Newslett. Himal. Bot. no. 22: 25 (1998). — *Euphorbia parviflora* L., Syst. Nat. ed. 10, 2: 1047 (1759); Roxb., Fl. Ind. ed. 1832, 2: 472 (1832); Boiss. in DC., Prodr. 15(2): 20 (1862); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 306 (1990); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 799 (2000); Esser & Chayamarit, Harvard Pap. Bot. 6: 263 (2001); Manandhar, Pl. People Nepal: 228 (2002). — Lectotype designated by Esser & Chayamarit (2001): Burm., Thes. Zeyl. t. 105, f. 2 (1736); epitype designated by Esser & Chayamarit (2001): *P. Hertog s. n.* (G (fide Esser & Chayamarit 2001) n. v.), Sri Lanka.

*Euphorbia pilulifera* L., Sp. Pl.: 454 (1753), provisional synonym; Esser & Cafferty, Taxon 50: 2001. — Lectotype designated by Brown et al. in Oliver, Fl. Trop. Afr. 6(1): 497–498 (1911); *Herb. Linnaeus No. 630-8* (LINN n. v.).

*Euphorbia granulata* Forssk. var. *decumbens* Forssk., Fl. Aegypt.-Arab.: 112 (1775). — *Euphorbia decumbens* (Forssk.) Willd., Enum. Pl., Suppl.: 27 (1814).

*Euphorbia indica* Lam., Encycl. 2: 423 (1788); Boiss. in DC., Prodr. 15(2): 22 (1862); Wall., Numer. List: 269, no. 7711A (1847); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 208 (1990); Philcox in Rev. Handb. Fl. Ceylon 11: 196 (1997); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 757 (2000). — *Anisophyllum indicum* (Lam.) Schweinf., Beitr. Fl. Aethiop. 1: 34 (1867). — *Chamaesyce indica* (Lam.) Croizat, Lilloa 6: 299 (1941). — Type: *M. Sonnerat* (P-LA (fide Coode 1982) n. v.), les Indes orientalis.



- Euphorbia androsaemoides* Dennst., Schlüssel Hortus Malab.: 36 (1818).  
*Euphorbia pubera* Blume, Bijdr.: 635 (1826). — *Euphorbia indica* Lam. var. *angustifolia* Boiss. in DC., Prodr. 15(2): 22 (1862). — Type: (n. v.), circa Bataviam in graminosis.  
*Euphorbia tenuis* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal.: 61 (1825); Oudejans, World Cat. Sp. Name Tribe Euphorbiae: 407 (1990). — Type: [*Buchanan*] *Hamilton* [*s. n.*, 10 Mar. 1802] (holo BM!), ad Bassaria Nepalensium (Nepal).  
*Euphorbia purpurascens* Schmach. & Thonn. in Schumach., Beskr. Guin. Pl.: 253 (1827), non Schousb. in Hornem., Hort. Bot. Hafn.: 508 (1815).  
*Euphorbia uniflora* Roxb., Fl. Ind. ed. 1832, 2: 473 (1832), non (Haw.) G. Don in Loud., Suppl. Hort. Brit.: 588 (1850). — Type: not designated.  
*Euphorbia ovalifolia* Kostel., Allig. Med.-Pharm. Fl. 5: 1724 (1836).  
*Euphorbia cassioides* C. Presl, Bot. Bemerk: 119 (1844).  
*Euphorbia indica* Lam. var. *procumbens* Pax, Bot. Jahrb. Syst. 19: 117 (1894). — Type: *Stuhlmann* 308, 5 Dec. 1889 & Jan. 1890 (n. v.), Deutsch-Ostafrika, Pangani.  
*Euphorbia hypericifolia* auct. non L., Sp. Pl.: 454 (1753); Hook. f., Fl. Brit. India 5: 249 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 195 (1982); Siwakoti & Varma, Pl. Divers. E. Nepal: 325 (1999), p. p. — *Chamaesyce hypericifolia* auct. non (L.) Millsp., Publ. Field Columbian Mus., Bot. Ser. 2: 302 (1909); T. Kuros., Newsllett. Himal. Bot. no. 22: 25 (1998).

Herb. *Roots* slender. *Stems* erect, 7–30 cm long, villosulous, branched throughout. *Leaves*: stipules fused or free, shallowly triangular, 0.7–1.3 by ca. 1 mm, incised, strigose; petiole 1.5–2 mm long, villosulous; blade obliquely elliptic, 21 or 26 by 10–14 mm, base obliquely emarginate, apex rounded or obtuse, margin serrulate, upper surface glabrate, lower surface villous, midrib raised beneath. *Cyathia* in cymes at the top of branches; bracts lanceolate, small; stalk up to 1 mm long, glabrous; involucre ca. 0.6 mm long, glabrous; glands transversely elliptic, 0.1–0.2 mm wide; glandular appendages white or pink, 0.3–0.5 mm long; ovary villosulous. *Fruits*: capsule, broadly depressed ovoid, 3-ridged, ca. 1.5 mm long, ca. 1.8 mm in diam., villous; columella persistent after dehiscence, ca. 1.5 mm long. *Seeds* ovoid, 4-ridged, 1.1–1.2 mm long, 0.7–0.8 mm wide, whitish.

Distribution — Pakistan, Sri Lanka, Maldives, India, Nepal, Bhutan, Burma, Cambodia, Laos, Thailand, Vietnam (Long 1987 as *E. hypericifolia*, Govaerts et al. 2000, Esser & Chayamarit 2001). *S Asian-Malaysian element*. In Nepal: Mid Western, Western, Central, Eastern.

Habitat & Ecology — Altitude 160–1950 m. On roadsides, on stream sides, on banks, or in crop fields. A common weed. Flowers & fruits from January to September.

Vernacular names — Nepali: *dudhi* (Manandhar 2002), *masino dudhi* (Manandhar 2002). Tharu: *chikini dudhi* (Manandhar 2002).

Uses — Milky latex is medicinally applied to wounds and boils (Manandhar 2002). Infusion of dried leaf is medicinally used as astringent and feebly narcotic (Siwakoti & Varma 1999 as *Euphorbia hypericifolia*). Squeezed plant is used for washing clothes (Manandhar 2002).

Notes — This species is closely related to *C. hypericifolia*. They differ only in hairiness on stems and ovaries (Esser & Cafferty 2001). Long (1987) treated this species in "*Euphorbia hypericifolia* L. agg."

The cited specimen of *E. hypericifolia* in Short & Vickery (1982) (*Shakya 9112*, BM!) is a young plants without fruits, but is referable to *C. parviflora* by its villosulous stems and villous undersurface of leaves. The records of *E. hypericifolia* by Siwakoti & Varma (1999) at least in part also may be this species, judging from thier description.

Govaerts et al. (2000) treated that *Euphorbia indica* is identical with *E. hypericifolia*.

Esser & Cafferty (2001) considered the type of *Euphorbia pilulifera* L. to be identical with *E. parviflora*, and proposed the former name for rejection.

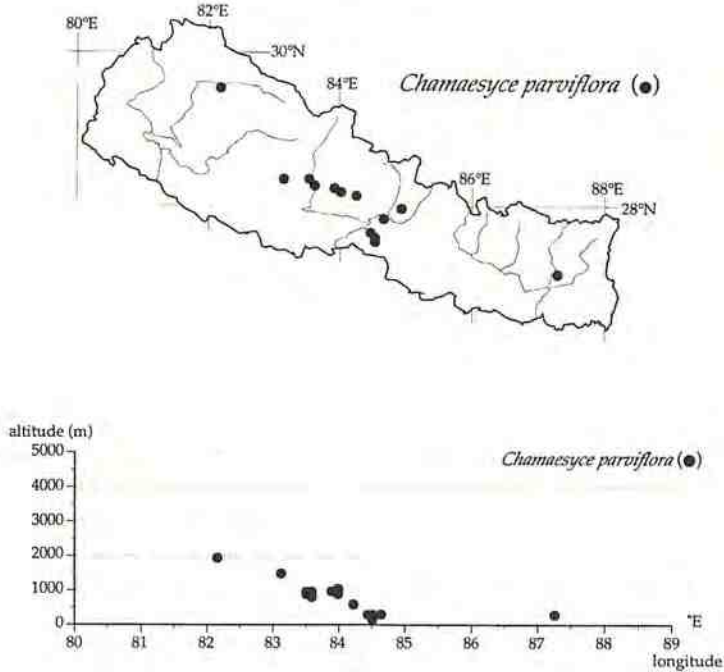


Fig. 46. Distribution of *Chamaesyce parviflora* (L.) Soják in Nepal.

### 3. *Chamaesyce hispida* (Boiss.) V. S. Raju & P. N. Rao — Plate 80; Fig. 47.

*Chamaesyce hispida* (Boiss.) V. S. Raju & P. N. Rao, *Phytologia* 37: 454 (1977). — *Euphorbia hispida* Boiss., *Cent. Euphorb.*: 8 (1860); Boiss. in DC., *Prodr.* 15(2): 37 (1862); Hook. f., *Fl. Brit. India* 5: 265 (1887); Oudejans, *World Cat. Tribe Euphorbiaceae*: 197 (1990). — Type: *Wallich*, *List no. 207 & 325* (K n. v.), India orientali ad Hawalbaugh. The numbers of Wallich's Numerical List cited in the original description (Boissier 1860) may be incorrect (Hooker 1886–1888).

*Euphorbia emodi* Hook. f., *Fl. Brit. India* 5: 250 (1887). — *Chamaesyce emodi* (Hook. f.) Soják, *Cas. Nár. Mus., Odd. Prír.* 140: 169 (1972). — Type: *Edgeworth* [8055] (K!), Kulu; [*H.*] *Jaeschke* [*s. n.*, in 1865] (K!), Lahul, [Panjaub]; *Clarke* (n. v.), *Ellis* (n. v.), Simla, Kulu, Chamba and Lahul, alt. 4000–4500 ft; *C. B. Clarke* (n. v.), Iskardo, alt. 6–7000 ft.

Herb. *Roots* slender. *Stems* ascending to erect, 30–60 cm long, hirsute with white multicellular hairs, branched throughout; stipules free, lanceolate or narrowly triangular, 1–1.8 by 0.2–0.3 mm, glabrous. *Leaves*: petiole 0.7–2 mm long, hirsute; blade obliquely elliptic or narrowly elliptic, 13–19 by 5–9 mm, apex rounded, base obliquely emarginate



or truncate, margin serrulate, both surfaces hirsute with white multicellular hairs, midrib raised beneath. *Cyathia* solitary at the nodes; stalk 1.2–2 mm long, glabrous; involucre ca. 1 mm long, glabrous outside; glands transversely elliptic, ca. 0.2 mm wide; glandular appendages white or pink, 0.4–0.8 mm long. *Pistillate flowers*: ovary glabrous. *Fruits*: capsule, broadly depressed ovoid, 3-ridged, ca. 1.5 mm long, ca. 2 mm in diam., glabrous; columella persistent after dehiscence. *Seeds* ovoid, 4-ridged, ca. 1 mm long, ca. 0.8 mm wide, obscurely transversely wavy, white.

Distribution — Kwait, Afghanistan, Iran, Pakistan, Nepal (Govaerts et al. 2000). *NW Himalayan element*. In Nepal: Far Western, Mid Western.

Habitat & Ecology — Altitude 1333–1606 m. On open ground or in grassland. Flowers & fruits in August.

Notes — This is the first record of this species from Nepal. This species was recognized as *Chamaesyce* sp. (pro parte) in my previous report (Kurosawa 1998).

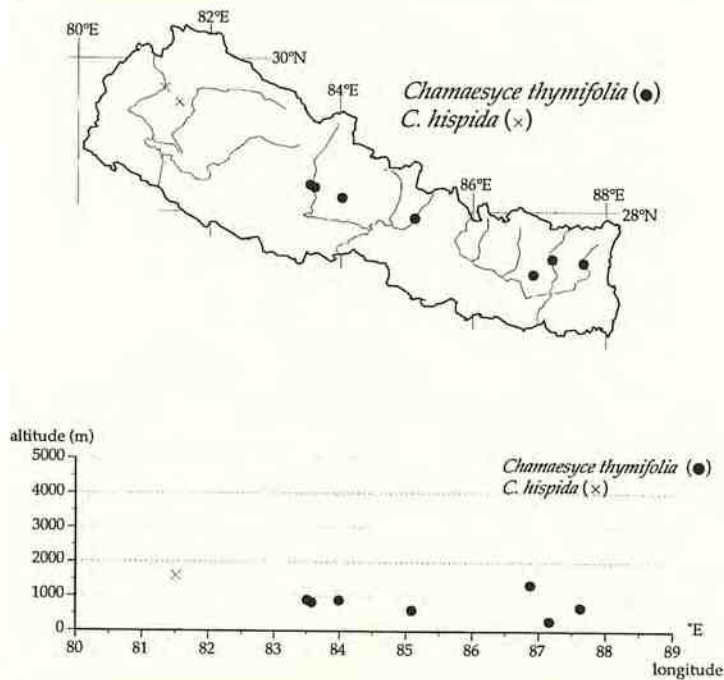


Fig. 47. Distribution of *Chamaesyce thymifolia* (L.) Millsp. and *C. hispida* (Boiss.) V. S. Raju & P. N. Rao in Nepal.

#### 4. *Chamaesyce prostrata* (Aiton) Small — Fig. 48.

*Chamaesyce prostrata* (Aiton) Small, Fl. S. E. U. S.: 713 (1903); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966); Malla et al., Fl. Kathmandu Valley: 623 (1986); T. Kuros., Newslett. Himal. Bot. no. 22: 25 (1998). — *Euphorbia prostrata* Aiton, Hort. Kew. 2: 139 (1789); Boiss. in DC., Prodr. 15(2): 47 (1862); Hook. f., Fl. Brit. India 5: 266 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 336 (1990); D. G. Long in Fl. Bhutan 1: 767 (1987); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 51, t. 10, f. 5–8 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 325 (1999); Govaerts et al., World Checkl. Bibliogr.

Euphorb.: 812 (2000); Manandhar, Pl. People Nepal: 228 (2002). — *Anisophyllum prostratum* (Aiton) Haw., Syn. Pl. Succ.: 163 (1812). — *Tithymalus prostratus* (Aiton) P. Bubani, Fl. Pyren. 1: 116 (1897). — Type: Philip Miller (holo BM (fide Coode et al. 1982) n. v.), cultivated in 1758 in England, Nat. of the West Indies.

*Euphorbia chamaesyce* sensu Wheeler, Rhodora 43: 265 (1941), non L., Sp. Pl.: 455 (1753).

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of Central USA to N. Argentina, now pantropical. In Nepal: Far Western, Mid Western, Central, Eastern.

Habitat & Ecology — Altitude 300–1350 m. On roadsides or on stone walls. Common in eastern plains (Siwakoti & Varma 1999). Flowers & fruits throughout the year.

Vernacular names — Nepali: *kanike ghans* (Manandhar 2002). Tharu: *dudhai* (Manandhar 2002).

Uses — Plant paste is applied to snakebites (Manandhar 2002).

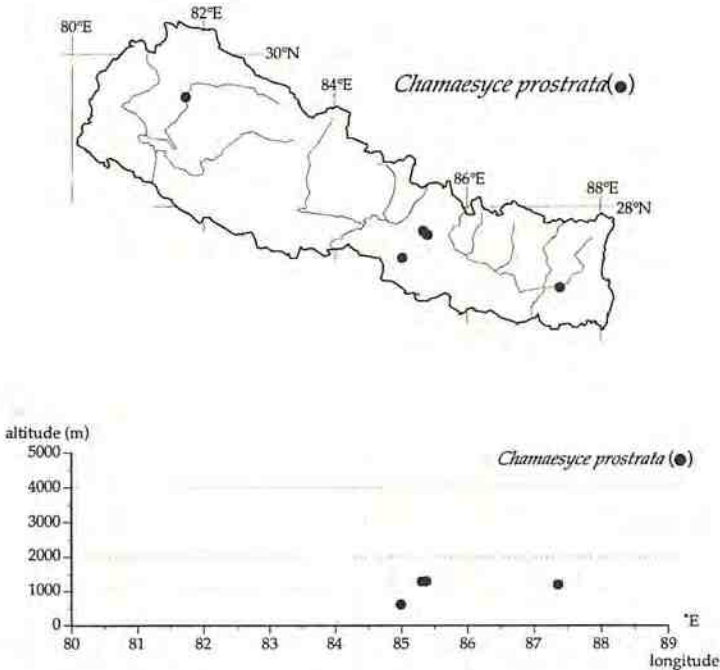


Fig. 48. Distribution of *Chamaesyce prostrata* (Aiton) Small in Nepal.

##### 5. *Chamaesyce thymifolia* (L.) Millsp. — Fig. 47.

*Chamaesyce thymifolia* (L.) Millsp., Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 412 (1916); T. Kuros., Newslett. Himal. Bot. no. 22: 25 (1998). — *Euphorbia thymifolia* L., Sp. Pl.: 454 (1753); Roxb., Fl. Ind. ed. 1832, 2: 473 (1832); Wall., Numer. List: 269, no. 7710A, B (1847); Boiss. in DC., Prodr. 15(2): 47 (1862); Hook. f., Fl. Brit. India 5: 252 (1887); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 410 (1990); D. G. Long in Fl. Bhutan 1: 766 (1987); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 52, t. 11, f. 6–11 (1997);



- Philcox in Rev. Handb. Fl. Ceylon 11: 201 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 326 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 848 (2000). — *Anisophyllum thymifolium* (L.) Haw., Syn. Pl. Succ.: 160 (1812). — Type: *Herb. Linnaeus 630-10* (LINN (fide Coode et al. 1982) n. v.), India.
- Euphorbia microphylla* Lam., Encycl. 2: 423 (1788). — *Chamaesyce microphylla* (Lam.) Soják, Cas. Nár. Mus, Odd. Prír. 140: 169 (1972). — Type: *Commerson* (P-LA (fide Coode et al. 1982) n. v.), Rodrigues.
- [*Euphorbia botryoides* Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 14 (1790), nom. nud.]
- Euphorbia rubicunda* Blume, Catalogus: 73 (1823).
- Euphorbia foliata* Buch.-Ham. ex Dillwyn, Rev. Hortus Malab.: 52 (1839).
- Euphorbia thymifolia* L. var. *suffrutescens* Boiss. in DC., Prodr. 15(2): 47 (1862). — *Chamaesyce thymifolia* (L.) Millsp. f. *suffrutescens* (Boiss.) Hurus., J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 6: 287 (1954). — Type: *Comm.* (herb. Lam., n. v.), in insulâ Rodrigue; *Bory* (G-DC (IDC microfiche in TI) n. v.), *Mauritio*; (Mus. Par., n. v.), Philippinis.
- Euphorbia rubrosperma* Lotsy, Bot. Gaz. 20: 349 (1895). — *Chamaesyce rubrosperma* (Lotsy) Millsp., Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 411 (1916).
- Euphorbia afzelii* N. E. Br. in Oliver, Fl. Trop. Afr. 6(1): 506 (1911).
- Chamaesyce mauritiana* Comm. ex Denis, Euphorb. Iles Austr. Afr.: 37 (1921).
- Chamaesyce supina* auct. non (Raf.) Moldenke, Annot. Classif. List Moldenke Collect.: 135 (1939); Hurus. & Ya. Tanaka in Fl. E. Himal.: 176 (1966).

Herb. *Roots* slender or ligneous. *Stems* procumbent or ascending, 5–26 cm long, branched throughout, upper surface villosulous, lower surface glabrous. *Leaves*: stipules free, linear or narrowly triangular, 0.5–1.2 mm long, incised, hairy; petiole 0.5–1 mm long, villosulous; blade obliquely ovate or elliptic, 5–9 by 2–5 mm, base obliquely truncate, apex rounded, margin serrulate, upper surface glabrous, lower surface glabrous or with curved white hairs, with raised midrib. *Cyathia* on congested lateral branches from nodes; bracts scaly or leaf-like; stalk up to 0.8 mm long, villosulous; involucre ca. 0.8 mm long, outside villosulous; glands transversely elliptic, ca. 0.1 mm wide; glandular appendages obscure. *Pistillate flowers*: ovary villosulous. *Fruits*: capsule depressed ovoid, 3-ridged, ca. 1 mm long, ca. 1 mm in diam., villosulous, not completely exerted from involucre. *Seeds* ovoid, 4-ridged, ca. 0.6 mm long, ca. 0.3 mm wide, transversely wavy, brown with one longitudinal dark brown line.

Distribution — Pantropics (Govaerts et al. 2000). In Nepal: Western, Central, Eastern.

Habitat & Ecology — Altitude 300–1350 m. On riversides, on stone walls, on banks, or in crop fields. A common weed. Flowers & fruits from April to October.

Uses — Leaf is medicinally used as stimulant, astringent anthelmintic and laxative (Siwakoti & Varma 1999).

### 33. *Pedilanthus* Necker & Poit.

*Pedilanthus* Necker ex Poit., Amm. Mus. Nat. Hist. Nat. 19: 388 (1812). — Type species: *Pedilanthus tithymaloides* (L.) Poit.

See *Pedilanthus tithymaloides* (L.) Poit. in Excluded taxa.

## Excluded Taxa

***Acalypha indica* L.**

*Acalypha indica* L., Sp. Pl.: 1003 (1753); Müll. Arg. in DC., Prodr. 15(2): 868 (1866); Hook. f., Fl. Brit. India 5: 416 (1887); Siwakoti & Varma, J. Econ. Taxon. Bot. 18: 496 (1994); Philcox in Rev. Handb. Fl. Ceylon 11: 132 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 320 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 68 (2000). — *Ricinocarpus indicus* (L.) Kuntze, Revis. Gen. Pl. 2: 618 (1891). — Lectotype designated by Radcliffe-Smith (1987b): *Herb. Hermann 3: #2* (BM n. v.), Indiis ad fimeta [Ceylon].

*Acalypha decidua* Forssk., Fl. Aegypt.-Arab.: 161 (1775). — *Ricinocarpus deciduus* (Forssk.) Kuntze, Revis. Gen. Pl. 2: 617 (1891).

*Acalypha spicata* Forssk., Fl. Aegypt.-Arab.: 161 (1775). — Type: *Forsskål s. n.* (LD (fide Hepper & Friis 1994) n. v.).

*Acalypha caroliniana* Blanco, Fl. Filip.: 748 (1837), non Walter, Fl. Carol.: 238 (1788), nec Elliott, Sketch Bot. S. Carolina 2: 645 (1824). — Type: not designated.

[*Acalypha canescens* Wall., Numer. List: 271, no. 7785 (1847), nom. nud.]

[*Acalypha ciliata* Wall., Numer. List: 271, no. 7779J (1847), nom. nud.]

*Acalypha fimbiata* Baill., Adansonia 1: 272 (1861).

*Acalypha bailloniana* Müll. Arg., Linnaea 34: 44 (1865). — *Ricinocarpus baillonianus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 617 (1891). — *Acalypha indica* L. var. *bailloniana* (Müll. Arg.) Hutch. in D. Oliver, Fl. Trop. Afr. 6(1): 904 (1912). — Type: *Boivin* [Apr. –May 1845] (holo P (fide Radcliffe-Smith 1987b) n. v.), in Zanzibaria.

*Acalypha somalium* Müll. Arg., Bremen Abh. 7: 27 (1880). — Type: *Hildebrandt 1518* (holo BREM† (fide Radcliffe-Smith 1987b); iso G (fide Radcliffe-Smith 1987b) n. v.), Somalia, Meid.

*Acalypha somalensis* Pax, Bot. Jahrb. Syst. 19: 100 (1894). — Type: *Hildebrandt 1455*, April 1875 (n. v.), Somaliland, Gebirgsregion Ahl bei Meid, 1000 m.

*Acalypha cupamenii* Dragend., Heilpfl.: 380 (1898).

*Acalypha minima* H. Keng, Taiwania 6: 32 (1955). — *Acalypha indica* L. var. *minima* (H. Keng) S. F. Huang & T. C. Huang, Taiwania 36: 83 (1991). — Type: *T. Hosokawa 2056* (n. v.), Taiwan, Liukiu-yu, Kaoshung.

*Acalypha chinensis* auct. non Roxb., Fl. Ind. ed. 1832, 3: 677 (1832); Benth, Fl. Hongk.: 303 (1861).

Distribution — West Tropical Africa, West-Central Tropical Africa, Northeast Tropical Africa, East Tropical Africa, South Tropical Africa, Southern Africa, Western Indian Ocean, Pakistan, Sri Lanka, India, Thailand, Malaysia (Peninsular), Sumatera, Jawa, Lesser Sunda Isls., New Guinea, Philippines, Taiwan, Japan (Nansei-Shoto [Ryukyu]) (Govaerts et al. 2000).

Habitat & Ecology — According to Siwakoti & Varma (1994, 1999), this species is occasionally found in moist waste place on plains.

Notes — Siwakoti & Varma (1994, 1999) were reported this species from Biratnagar based on *Siwakoti 475* (Bhagalpur University Herbarium, n. v.).

***Tragia involucrata* L.**

*Tragia involucrata* L., Sp. Pl.: 980 (1753); Müll. Arg. in DC., Prodr. 15(2): 943 (1866);



Kurz, Forest Fl. Burma 2: 398 (1877); Hook. f., Fl. Brit. India 5: 465 (1888); Philcox in Rev. Handb. Fl. Ceylon 11: 140 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 334 (1999); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 1547 (2000); Rajbhandari, Ethnobot. Nepal: 62 (2001). — [*Tragia involucrata* L. var. *genuina* Müll. Arg. in DC., Prodr. 15(2): 943 (1866), nom. inval.] — Type: (n. v.), India.

*Croton urens* L., Sp. Pl.: 1005 (1753). — Type: (n. v.), India.

[*Tragia trifida* Wall., Numer. List: 271, no. 7795E (1847), nom. nud.]

Distribution — Sri Lanka, India, Bangladesh (Govaerts et al. 2000).

Habitat & Ecology — According to Siwakoti & Varma (1999), this species is common in forest hedges and thickets in eastern plains.

Vernacular names — Nepali: *lahare sisnu* (Siwakoti & Varma 1999). Satar: *sangelsim* (Rajbhandari 2001a).

Uses — Paste of leaf is medicinally applied on swelling of hand and foot (Rajbhandari 2001a).

Notes — Siwakoti & Varma (1999) was reported this species from Charkoshe Jhari, based on *Siwakoti 463* (Bhagalpur University Herbarium, n. v.).

The cited specimen of Short & Vickery (1982) as *T. involucrata* is treated as "*Tragia* sp." in this checklist. See note under *Tragia* sp.

### **Euphorbia milii** Des Moul.

*Euphorbia milii* Des Moul., Bull. Hist. Nat. Soc. Linn. Bordeaux 1: 27 (1826); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); D. G. Long in Fl. Bhutan 1: 762 (1987); Oudejans, World Cat. Tribe Euphorbieae: 266 (1990); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 779 (2000); Manandhar, Pl. People Nepal: 228 (2002). — Type: *Bojer s. n.* (P? (fide Coode et al. 1982) s. n.), Madagascar.

See Govaerts et al. (2000) for synonyms.

Distribution — Native of Madagascar (Govaerts et al. 2000). According to Manandhar (2002) this species distribute to the throughout Nepal.

Habitat & Ecology — According to Short & Vickery (1982), this species is commonly naturalized on the tops of walls in Kathmandu valley.

Vernacular name — Nepali: *simri* (Manandhar 2002).

Uses — This species is cultivated in gardens and on walls (Manandhar 2002). Milky latex is medicinally applied to sprains (Manandhar 2002).

Notes — Short & Vickery (1982) recorded this species without specimen citation.

### **Euphorbia neriifolia** L.

*Euphorbia neriifolia* L., Sp. Pl.: 451 (1753); Roxb., Fl. Ind. ed. 1832, 2: 467 (1832), "*neriifolia*"; Boiss. in DC. Prodr. 15(2): 79 (1862); Kurz, Forest Fl. Burma 2: 416 (1877); Hook. f., Fl. Brit. India 5: 255 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 786 (2000). — Type fide Coode et al. (1982): *Herb. Linnaeus, No. 630-1* (LINN n. v.), Chine.

*Euphorbia edulis* Lour., Fl. Cochinch.: 298 (1790). — *Tithymalus edulis* (Lour.) H. Karst., Deut. Fl.: 587 (1882).

[*Euphorbia pentagona* Noronha, Verh. Batav. Genootsch. Kunsten 5(4): 14 (1790), nom. nud.]

*Euphorbia pentagona* Blanco, Fl. Filip.: 413 (1837), non Haw., Philos. Mag. Ann. Chem. 1: 187 (1827), nor Royle, Ill. Bot. Himal. Mts.: 329, t. 82, f. 1 (1836).

Distribution — Iran, Pakistan, India, Burma, Thailand, Vietnam, Borneo, Lesser Sunda Is., Moluccas, New Guinea, China (South-Central, Hainan, Southeast, Tibet-Quinghai) (Govaerts et al. 2000).

Notes — Burkill (1910) reported this species from Central Nepal, based on *Burkill 29915* (CAL n. v.).

### ***Euphorbia cyathophora* Murray**

*Euphorbia cyathophora* Murray, Commentat. Soc. Regiae Sci. Gott. 7: 81 (1786); Oudejans, World Cat. Tribe Euphorbieae: 121 (1990); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 706 (2000). — *Tithymalus cyathophorus* (Murray) Moench, Methodus: 667 (1794). — *Poinsettia cyathophora* (Murray) Klotzsch & Garcke, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 1859: 253 (1859). — *Euphorbia heterophylla* L. var. *cyathophora* (Murray) Griseb., Fl. Brit. W. I.: 45 (1859). — *Euphorbia heterophylla* L. f. *cyathophora* (Murray) Voss, Vilm. Blumengärtn. ed. 3, 1: 898 (1895). — Type: (holo GOET (fide Coode et al. 1982) n. v.; iso MO (fide Coode et al. 1982) n. v.), Hort. Bot. Goett.

*Euphorbia heterophylla* auct. non L., Sp. Pl.: 453 (1753); Philcox in Rev. Handb. Fl. Ceylon 11: 200 (1997), p. p.; Siwakoti & Varma, Pl. Divers. E. Nepal: 324 (1999).

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of Central U.S.A. to Venezuela (Govaerts et al. 2002).

Habitat & Ecology — According to Siwakoti & Varma (1999, as *E. heterophylla*), this species is occasional in waste place on eastern plains.

Notes — Siwakoti & Varma (1999) recorded this species from Biratnagar based on *Siwakoti 68* (Bhagalpur University Herbarium, n. v.), as *E. heterophylla* L.

### ***Euphorbia tirucalli* L.**

*Euphorbia tirucalli* L., Sp. Pl.: 452 (1753); Roxb., Fl. Ind. ed. 1832, 2: 470 (1832); Wall., Numer. List: 269, no. 7687A (1847); Boiss. in DC. Prodr. 15(2): 96 (1862); Kurz, Forest Fl. Burma 2: 417 (1877); Hook. f., Fl. Brit. India 5: 254 (1887); Burkill, Rec. Bot. Surv. India 4: 130 (1910); Short & Vickery in Enum. Flow. Pl. Nepal 3: 196 (1982); Oudejans, World Cat. Tribe Euphorbieae: 412 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 58, t. 14, f. 5–6 (1997); T. Kuros., Newslett. Himal. Bot. no. 22: 24 (1998); Govaerts et al., World Checkl. Bibliogr. Euphorb.: 849 (2000). — *Tithymalus tirucalli* (L.) Haw., Syn. Pl. Succ.: 139 (1812). — *Arthrothamnus tirucalli* (L.) Klotzsch & Garcke, Monatschr. Königl. Preuss. Akad. Wiss. Berlin 1859: 251 (1859). — Lectotype fide Coode et al. (1982) and Philcox (1997): Commel., Hort. Med. Amst. 1: 27, t. 14 (n. v.), grown in Amsterdam, introduced from Ceylon.

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of Macaronesia, West Tropical Africa, West-Central Tropical Africa, Northeast Tropical Africa, East Tropical Africa, South Tropical Africa, Southern Africa, Western Indian Ocean, North Indian Ocean (Govaerts et al. 2000).

Notes — Burkill (1910) reported this species from Central Nepal without specimen citation.



**Chamaesyce hypericifolia** (L.) Millsp.

*Chamaesyce hypericifolia* (L.) Millsp., Publ. Field Columbian Mus., Bot. Ser. 2: 302 (1909). — *Euphorbia hypericifolia* L., Sp. Pl.: 454 (1753); Boiss. in DC., Prodr. 15(2): 23 (1862); Oudejans, World Cat. Tribe Euphorbieae: 203 (1990); J. S. Ma & Y. C. Tseng, Fl. Reipubl. Pop. Sin. 44(3): 41 (1997); Siwakoti & Varma, Pl. Divers. E. Nepal: 325 (1999), p. p.; Govaerts et al., World Checkl. Bibliogr. Euphorb.: 753 (2000). — *Aplarina hypericifolia* (L.) Raf., New. Fl. 4: 99 (1838). — *Xamesike hypericifolia* (L.) Raf., Autikon Bot.: 98 (1840). — *Anisophyllum hypericifolium* (L.) Haw., Syn. Pl. Succ.: 161 (1812). — *Galarrhoeus hypericifolius* (L.) Nakai, Bull. Natl. Sci. Mus. (Tokyo) 31: 70 (1952), "*Galarrhoeus*." — Lectotype designated by Burch (1966): Sloane, Voy. Jamaica: 197, t. 126 (1707), from Jamaica.

*Euphorbia papilligera* Boiss., Cent. Euphorb.: 8 (1860). — Type: *Wallich*, List no. 581 (n. v.), in India orientali ad Hyauk Talong.

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of tropical or subtropical America (Govaerts et al. 2000).

Uses — Infusion of dried leaf is medicinally used as astringent and feebly narcotic (Siwakoti & Varma 1999).

Notes — This species resembles *C. parviflora* but differs in that it is glabrous throughout. Short & Vickery's record (1982) is referable to *C. parviflora* (see note under *C. parviflora*).

Siwakoti & Varma (1999) recorded this species from Biratnagar on the basis of *Siwakoti 669* (Bhagalpur University Herbarium, n. v.). It is possible that the record is not referable to *C. hypericifolia* but to *C. parviflora* because Siwakoti & Varma (1999) treated both species as conspecific.

**Chamaesyce rosea** (Retz.) G. L. Webster

*Chamaesyce rosea* (Retz.) G. L. Webster, J. Arnold Arbor. 48: 423 (1967). — *Euphorbia rosea* Retz., Observ. Bot. 4: 26 (1786–1787); Boiss., Icon. Euphorb.: t. 21 (1866); Boiss. in DC., Prodr. 15(2): 50 (1862); Hook. f., Fl. Brit. India 5: 251 (1887); Oudejans, World Cat. Tribe Euphorbieae: 358 (1990); Philcox in Rev. Handb. Fl. Ceylon 11: 204 (1997). — *Anisophyllum roseum* (Retz.) Haw., Syn. Pl. Succ.: 163 (1812). — *Tithymalus rosea* (Retz.) Raf., Fl. Tellur. 4: 115 (1838). — Type: *König* (n. v.), in arena mobili Indiae Orientalis.

*Euphorbia satureioides* Lam., Encycl. 2: 424 (1788). — Type: *M. Sonnerat* (n. v.), dans l'Inde.

Distribution — Afghanistan, Pakistan, Sri Lanka, Laccadive Isl., India, Vietnam (Govaerts et al. 2000).

Notes — The record of this species from Nepal appears only in Malla et al. (1976) without any specimen citation and locality data.

**Pedilanthus tithymaloides** (L.) Poit.

*Pedilanthus tithymaloides* (L.) Poit., Ann. Mus. Natl. Hist. Nat. 19: 390, t. 19 (1812); Kurz, Forest Fl. Gurma 2: 418 (1887); Boiss. in DC., Prodr. 15(2): 5 (1862); D. G. Long in Fl. Bhutan 1: 767 (1987); Oudejans, World Cat. Sp. Name Tribe Euphorbieae: 412 (1990); Siwakoti & Varma, Pl. Divers. E. Nepal: 329 (1999); Govaerts et al.,

World Checkl. Bibliogr. Euphorb.: 1243 (2000). — *Euphorbia tithymaloides* L., Sp. Pl.: 453 (1753). — *Tithymalus tithymaloides* (L.) Croizat, Amer. J. Bot. 24: 704 (1937). — Type: (n. v.), Curassao; (n. v.), India.

See Govaerts et al. (2000) for further synonyms.

Distribution — Native of Mexico & tropical America (Govaerts et al. 2000).

Habitat & Ecology — According to Siwakoti & Varma (1999) this species escapes in plains (Siwakoti & Varma 1999).

Uses — This species is cultivated in gardens (Siwakoti & Varma, 1999).

Notes — Siwakoti & Varma (1999) reported this species from Biratnagar based on *Siwakoti 798* (Bhagalpur University Herbarium, n. v.).



## Appendix: Specimens Examined from Nepal

### 1.1. *Bridelia tomentosa* Blume

Eastern: **Koshi Zone, Morang Distr.:** Chula chuli (*Williams & Stainton 8511*, K); Kathgare–Rangali (*H. Kanai et al. 6306835*, KYO, TI). **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306834*, K, KYO, TI); Ghorwa–Sanichare (*H. Hara et al. s. n.*, 10 Dec. 1963, TI). **Jhapa Distr.:** Sibganja–Mahara Bahara (*G. Murata & M. Togashi 6306836*, KYO, TI); Gauriganja–Rangali (*H. Hara et al. 6306833*, TI), (*H. Hara et al. 6306834*, KYO).

### 1.2. *Bridelia stipularis* (L.) Blume

Far Western: **Seti Zone, Kailali Distr.:** Ataria (*H. Tabata et al. 402*, KYO); between Dhangarhi and Ataria (*H. Tabata et al. 351*, KYO).

Mid Western: **Bheri Zone, Bardiya Distr.:** Royal Bardia National Park, Danawatal (*M. Mikage et al. 9689061*, TUS); Royal Bardia National Park, near the head quarter, Thakurduar (*M. Mikage et al. 9681374*, TUS), (*M. Mikage et al. 9689001*, TUS).

Western: **Lumbini Zone, Palpa Distr.:** Butwal (*Stainton et al. 8824*, E).

Central: **Narayani Zone, Bara Distr.:** NW. of Amlekganj, E. of Bherah Khola (*M. Mikage et al. 9550597*, TUS); en route from Parasuwa to Bakeya (*H. Tabata et al. 9613*, KYO). **Chitawan Distr.:** Sauraha–Devi Tal (*M. Mikage et al. 9611819*, TUS); between Sauraha and Kasara (*H. Tabata et al. 7562*, KYO).

Eastern: **Koshi Zone, Sunsari Distr.:** Kushaha, Koshi Tappu Wildlife Reserve, SW. of Headquarter Office (*M. Mikage et al. 9550639*, TUS). **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306829*, KYO, TI); Ghorwa–Sanichare (*H. Hara et al. 6306830*, TI); Illam–Ranga Pani (*H. Hara et al. 6306832*, TI). **Jhapa Distr.:** Gauriganja–Rangali (*H. Hara et al. 6306831*, TI).

### 1.3. *Bridelia pubescens* Kurz

Eastern: **Mechi Zone, Ilam Distr.:** Mai Khola, Soktim (*J. D. A. Stainton 6493*, TI); 5 mile E. of Soktim Tea Estate (*J. D. A. Stainton 6886*, TI).

### 1.4. *Bridelia retusa* (L.) A. Juss.

Far Western: **Mahakali Zone, Kanchanpur Distr.:** Royal Suklaphanta Wildlife Reserve, Pipariya, along Mahakari river (*M. Mikage et al. 9689181*, TUS).

Mid Western: **Bheri Zone, Bardiya Distr.:** Royal Bardia National Park, near the head quarter, Thakurduar (*M. Mikage et al. s. n.*, 2 Oct. 1996, TUS); Royal Bardia National Park, Tiger top (*M. Mikage et al. s. n.*, 3 Oct. 1996, TUS). **Jajarkot Distr.:** Kuepani, near Jajarkot (*O. Polunin et al. 5765*, E). **Rapti Zone, Distr. unknown:** Tin Pipla (*K. R. Rajbhandari & B. Roy 4771*, KYO).

Western: **Gandaki Zone, Gorkha Distr.:** Anp Pipal (*A. Blachshaw 54*, E). **Distr. unknown:** Pokharatar–Tarku Ghat (*H. Kanai 670624*, KYO, TI). **Lumbini Zone, Palpa Distr.:** Butwal (*Stainton et al. 8819*, E, TI).

Central: **Narayani Zone, Bara Distr.:** Nijgar–Patraia (*H. Kanai 675192*, TI). **Chitawan Distr.:** Sauraha–Kasara (*M. Suzuki et al. 9611754*, TUS); Sauraha–Devi Tal (*M. Mikage et al. 9611818*, TUS). **Makawanpur Distr.:** Hitaura, Churia Hills (*Williams*



& *Stainton 8240*, K). **Distr. unknown:** Lothar, Rapti Valley (*Williams & Stainton 8308*, TI).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhankuta (*H. Hara et al. s. n.*, 19 Oct. 1963, TI); Panche–Dihale (*M. Suzuki et al. 8860042*, E). **Morang Distr.:** Rangali–Biratnagar (*H. Kanai et al. 6306827*, KYO, TI), (*H. Kanai et al. 6306828*, KYO, TI). **Sankhuwasabha Distr.:** Sabha Khola–Khandbari (*S. Noshiro et al. 9755079*, TI); Tumlingtar–Baireni Bagar (*S. Noshiro et al. 9840218*, E). **Mechi Zone, Jhapa Distr.:** Sibganja–Gauriganja (*H. Hara et al. s. n.*, 12 Oct. 1963, TI).

### 1.5. *Bridelia sikkimensis* Gehrm.

Far Western: **Seti Zone, Bajura Distr.:** Jugado (*H. Tabata et al. 2501*, KYO).

Far Western or Mid Western: **Zone unknown:** Karnali Valley (*J. D. A. Stainton 6151*, TI).

Western: **Gandaki Zone, Gorkha Distr.:** Buri Gandaki River, 16 miles above Araghat Bazar (*P. C. Gardner 239*, TI). **Kaski Distr.:** Pokhara (*Stainton et al. 7150*, E, TI). **Manang Distr.:** Marsyandi Khola, Jagat–Bahundanda (*H. Ohba et al. 8340382*, E). **Dhaulagiri Zone, Myagdi Distr.:** Tatopani–Ghorepani (*M. Mikage et al. 9455377*, E, TUS), Mayangdi Khola (*Stainton et al. 9187*, TI).

### 2.1. *Leptopus cordifolius* Wall. ex Decne.

Far Western: **Seti Zone, Bajhang Distr.:** Talkot–Aagar (*M. Suzuki et al. 9170773*, TI); between Basala and Jugado (*H. Tabata et al. 2489*, KYO); between Dharagaon and Dilbagar (*H. Tabata et al. 1348*, KYO). **Doti Distr.:** between Barigad and Galsera (*H. Tabata et al. 693*, KYO).

Mid Western: **Bheri Zone, Jajarkot Distr.:** Gad Rangchi (*Polunin et al. 5737*, E). **Karnali Zone, Kalikot Distr.:** Badarigaon–Kota (*M. Suzuki et al. 9194111*, E); Khallagad to Talaserogaon (*K. R. Rajbhandari & B. Roy 3134*, KYO).

Western: **Dhaulagiri Zone, Myagdi Distr.:** Muri–below Dhar (*M. Mikage et al. 9684148*, TUS); Dhar–Lumsung (*M. Mikage et al. 9686096*, TUS); Lumsung–Dhara Khola (*M. Mikage et al. 9682994*, TUS), (*M. Mikage et al. 9684291*, TUS); Boghara–Dobang (*M. Mikage et al. 9685214*, TUS). **Gandaki Zone, Gorkha Distr.:** Buri Gandaki, between Kal Tal and Ngyak (*S. Nakao s. n.*, 2–4 Dec. 1952, KYO). **Mustang & Myagdi Distr.:** Lower Lete–Tatopani (*M. Mikage et al. 9455370*, TUS). **Syangja Distr.:** Bhanjang–Tikabhairab (*Kanai & Bista 11072*, TI).

Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu Valley, Nagarjun (*H. Ohba et al. 8350016*, TUS). **Lalitpur Distr.:** Godavari, near Kathmandu (*H. Hara et al. 6306803*, TI); Godavari–Phulchauki, Kathmandu (*H. Kanai et al. 3102*, TI); Phulchoki, Kathmandu (*H. Idzumi & M. Togashi s. n.*, 3 Oct. 1978, TI). Phulchauki Danda, Kathmandu Valley (*Williams & Stainton 8125*, K), Godavari, Kathmandu Valley (*A. D. Schilling & C. D. Sayers 557*, K). **Rasuwa Distr.:** Syabru Bensi–Lama Hotel (*S. Akiyama et al. 20100030*, TUS); Chilime and Langtan Valleys, Syaprubensi (*H. Kanai & P. R. Shakya 675191*, KYO, TI); Rasua Ghari–Thangjet (*O. Polunin 960*, E). **Janakpur Zone, Dolakha Distr.:** Tamba Koshi, Pikhuti–Totlabari (*H. Ohba et al. 8331584*, E, TUS). **Zone unknown:** (*Wallich, List no. 7913B*, K)

Eastern: **Janakpur Zone, Ramechhap Distr. & Sagarmatha Zone, Solukhumbu**



**Distr.:** Bhandar–Sete (*H. Ohba et al. 8571748*, TUS).

Region unknown: Kawa, Khater Dara (*O. Polunin et al. 830*, E)

### 3.1. *Flueggea virosa* (Roxb. ex Willd.) Voigt subsp. *himalaica* D. G. Long

Far Western: **Seti Zone, Bajura Distr.:** Berma–Kolti (*M. Suzuki et al. 9194145*, E).

Western: **Dhaulagiri Zone, Baglung Distr.:** Charaudi (W of Baglung) (*Stainton et al. 516*, E). **Myagdi Distr.:** above Rithum Khola (*Stainton et al. 2733*, E, TI); Tatopani, Kali Gandaki Valley (*Stainton et al. 5459*, E). **Parbat Distr.:** Kusma (*Stainton et al. 570*, E). **Gandaki Zone, Lamjung Distr.:** Midan Khola (*Stainton et al. 5163*, E, TI); Madi Khola, Karelung (*Stainton et al. 5907*, E).

Central: **Janakpur Zone, Dolakha Distr.:** Chaubas (*K. Yoda s. n.*, 21 Jun. 1963, KYO); Kapure (*K. Yoda s. n.*, 18 Jun. 1963, KYO); Chittare (*K. Yoda s. n.*, 19 Jun. 1963, KYO). **Narayani Zone, Chitawan Distr.:** en route from Sauraha to Dumre (*H. Tabata et al. 9773*, KYO); en route from Parasuwa to Bakeya (*H. Tabata et al. 9603*, KYO).

Eastern: **Koshi Zone, Dhankuta Distr.:** Mohamabedi Khola–Dhara Pani (*H. Kanai et al. 721216*, TI); Dhara Pani–Teku nala (*H. Kanai et al. 724030*, TI); Tamur Bridge (*H. Kanai et al. 721206*, TI). **Mechi Zone, Taplejung Distr.:** Khokling–Thunglung (*M. Suzuki et al. 9263022*, E, TUS).

### 4.1. *Phyllanthus parvifolius* Buch.–Ham. ex D. Don

Western: **Dhaulagiri Zone, Myagdi Distr.:** Babichor–Dharapani (*M. Mikage et al. 9685109*, TUS). **Gandaki Zone, Kaski Distr.:** Pokhara to Hyenda (*Y. Suehiro 101*, KYO); near Lumle (*K. Nishioka 112*, KYO); en route from Ghandrung to Chandrakot (*Y. Suehiro 1515*, KYO); Naudanda (*Y. Suehiro 2072*, KYO); Chandrakot (*Y. Suehiro 2181*, KYO); near Suikett (*K. Nishioka 175*, KYO); near Biretati (*K. Nishioka 706*, KYO). **Parbat Distr.:** between Khaniyaghat and Benari, near Kusma (*H. Tabata et al. 3981*, KYO). **Syangja Distr.:** between Hyanja and Naudara (*H. Tabata et al. 6425*, KYO).

Central: **Bagmati Zone, Kathmandu Distr.:** Sheopuri, north of Kathmandu (*H. Kanai & T. B. Shresta 670016*, TI); Kathmandu, Phulchoki (*H. Kanai & P. R. Shakya 674920*, KYO, TI); Kakani (*H. Hara et al. s. n.*, 24 Sep. 1963, TI). **Lalitpur Distr.:** Godavari (*C. Chuma s. n.*, 8 Sep. 1970, TI), (*H. Hara et al. s. n.*, 18 Sep. 1963, TI). **Rasuwa Distr.:** between Manigaon and Ramche (*H. Tabata et al. 8559*, KYO); Sim Chotala–Gram (*H. Kanai et al. 724047*, TI); Latsu–Bhorlang (*H. Kanai et al. 724045*, TI). **Janakpur Zone, Dolakha Distr.:** en route from Bishnutole to Busti (*H. Tabata et al. 10081*, KYO); Rolwaling Himal, Dadin (*K. Yoda s. n.*, 23 Apr. 1963, KYO); Rolwaling Himal, Dumure (*K. Yoda s. n.*, 21 Jun. 1963, KYO). **Zone unknown:** (*Wallich, List no. 7901B*, BM, K); Bassaria (*Buchanan s. n.*, 5 June 1802, BM).

Eastern: **Koshi Zone, Bhojpur Distr.:** Deurali–Bastim (*M. Mikage et al. 9554256*, E, TUS). **Dhankuta Distr.:** Hile–Diyale (*S. Noshiro et al. 9755011*, TI). **Sankhuwasabha Distr.:** Chichila–Khandbari (*M. Suzuki et al. 8821259*, TUS); below Kiraubi Chlap (*M. Ohsawa & P. R. Shakya 2812*, TI); near Hatiya, Upper Arun Valley (*D. G. Long et al. 737*, E); Arun Valley, ridge between Khandbari and Bhotebas (*D. G. Long et al. 33*, E). **Sunsari Distr.:** Phusri–Dhara Pani (*H. Hara et al. 6306774*, K, KYO). **Mechi Zone, Taplejung Distr.:** Tapejung–Garhi Danra (*H. Hara et al. 630672*, TI); Khebang–Bharomdin (*H. Hara et al. 6306774*, TI). **Sagarmatha Zone, Solukhumbu Distr.:**



Kharikhola–Nunthala (*M. Wakabayashi et al. 9720332*, TI).

#### 4.2. *Phyllanthus* aff. *clarkei* Hook. f.

Eastern: **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306794*, KYO, TI).

#### 4.3. *Phyllanthus clarkei* Hook. f.

Far Western: **Seti Zone, Doti Distr.:** between Doti and Rhikula (*H. Tabata et al. 985*, KYO). **Kailali Distr.:** Sahejpur (*H. Tabata et al. 609*, KYO).

Mid Western: **Bheri Zone, Dailekh Distr.:** Lade to Subachhena (*K. R. Rajbhandari & B. Roy 2717*, KYO). **Jajarkot Distr.:** Dhimia (*O. Polunin et al. 521*, BM). **Karnali Zone, Jumla Distr.:** between Sukadhik and Tolibagar (*H. Tabata et al. 2766*, KYO); Luma, E. of Jumla (*O. Polunin et al. 4941*, E, TI); Dillikot to Odan (*K. R. Rajbhandari & B. Roy 3015*, KYO). **Kalikot Distr.:** Chaukebada–Badarigaon (*M. Suzuki et al. 9192172*, BM). **Mugu Distr.:** Toli (*H. Tabata et al. 2845*, BM, KYO); Pina (Ping) near Rara (*O. Polunin et al. 3048*, E).

Western: **Dhaulagiri Zone, Myagdi Distr.:** Muri–below Dhar (*M. Mikage et al. 9686090*, TUS); near Lumsum (*Stainton et al. 9121*, E, TI). **Gandaki Zone, Gorkha Distr.:** Ekle Ghar–Sardu Khola (*M. Suzuki et al. 9455144*, E, TUS); Kasigaon–Keronje (*T. Namba 0930098*, KYO, TI); Buri Gandaki, between Kal Tal and Ngyak (*S. Nakao s. n.*, 2–4 Dec. 1952, KYO). **Kaski Distr.:** Ghorepani–Birethani Bazar (*M. Mikage et al. 9480234*, E, TUS); near Ulleri (*K. Nishioka 651*, KYO); Yangjakot (*Stainton et al. 8999*, BM, E, TI); en route from Ghandrung to Chhumro (*Y. Suehiro 746*, KYO). **Kaski Distr. & Dhaulagiri Zone, Parbat Distr.:** Tirkhedhunga–Ghorepani (*M. Mikage et al. 9550060*, TUS).

Central: **Bagmati Zone, Kathmandu Distr.:** Sheopuri, north of Khathmandu (*H. Kanai & T. B. Shresta 670015*, KYO, TI). **Rasuwa Distr.:** Khodang Danda–Latsu (*H. Kanai et al. 722053*, TI); Syabru–Lama Hotel (*S. Noshiro 9154258*, BM). **Sindhupalchok Distr.:** Kalingchok, Thala–Tale Bisauna (*H. Kanai et al. 70110*, TI), (*H. Kanai et al. 672783*, KYO, TI). **Janakpur Zone, Dolakha Distr.:** Jiri–Sibalaya (*F. Miyamoto et al. 9584001*, TI). **Ramechhap Distr.:** Sibalaya–Bandar (*F. Miyamoto et al. 9580013*, TI); Kyama–Patkare (*H. Ohba et al. 8571290*, K); Choarma–Kyama (*H. Ohba et al. 8571160*, K).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhara Pani–Dhankuta (*H. Hara et al. 6306795*, KYO, TI). **Mechi Zone, Taplejung Distr.:** Yamphodin–Ghatte (*H. Kanai et al. 6306793*, K, KYO, TI); Ghatte (*H. Hara et al. 6306797*, TI); Ghatte–Khebang (*H. Hara et al. 6306775*, KYO, TI); Khebang (*H. Hara et al. 6306796*, TI). **Sagarmatha Zone, Solukhumbu Distr.:** Kensa–Deorali (*F. Miyamoto et al. 9596628*, TI).

Region unknown: near Dhaman (*J. L. Creech & F. de Vos 1309*, TI); Cekhu Bari (*Unknown collector 8315*, BM).

#### 4.4. *Phyllanthus simplex* Retz.

Western: **Gandaki Zone, Kaski Distr.:** Surauti Khola (*Stainton et al. 6849*, E, TI).

Central: **Janakpur Zone, Dolakha Distr.:** en route from Bishnutole to Busti (*H. Tabata et al. 10095*, KYO). **Dolakha Distr.:** Rolwaling Himal, Pachkhal (*M. Numata 1812*, KYO). **Narayani Zone, Bara Distr.:** Adhabar, vicinity of Parsa Wildlife Reserve



Headquarter Office (*M. Mikage et al. 9554011a*, E, TUS), (*M. Mikage et al. 9552758*, TUS).

Eastern: **Koshi Zone, Bhojpur Distr.:** Bumlingtar—a Shorea forest (*S. Noshiro et al. 9760561*, E, TUS). **Dhankuta Distr.:** Diyale–Bhainse (*S. Noshiro et al. 9760043*, TUS). **Dhankuta Distr. & Sankhuwasabha Distr.:** Ramrista–Khahare (*M. Suzuki et al. 8880124*, E, TUS). **Sankhuwasabha Distr.:** Tumlingtar–Baireni Bagar (*S. Noshiro et al. 9820126*, TI). **Morang Distr.:** Biratnagar (*H. Hara et al. 6306814*, KYO, TI). **Mechi Zone, Jhapa Distr.:** Mahara Bahara–Kathgara (*H. Kanai et al. 6306815*, KYO, TI). **Sagarmatha Zone, Udayapur Distr.:** Beltar–Kattike (*M. Mikage et al. 9552993*, E, TUS). **Zone unknown:** Pelwa Ghat (*M. Osawa & P. R. Shakya s. n.*, 1 Sep. 1971, TI).

#### 4.5. *Phyllanthus sikkimensis* Müll. Arg.

Western: **Gandaki Zone, Kaski Distr.:** Pokhara (*H. Kanai et al. 26093*, TI), (*H. Kanai et al. 26080*, TI). **Syangja Distr.:** between Hyanja and Naudara (*H. Tabata et al. 6426*, KYO).

Eastern: **Koshi Zone, Bhojpur Distr.:** en route from Phedi to Sagangma along Irkhua Khola (*H. Tabata et al. 10973*, KYO), (*H. Tabata et al. 10974*, KYO). **Sunsari Distr.:** Dharan–Dhara Pani (*H. Kanai et al. 724042*, TI). **Mechi Zone, Taplejung Distr.:** Tuwa–Taplethok (*H. Hara et al. 6306799*, K, KYO, TI); Saju Khola–Dingla (*H. Kanai et al. 720991*, TI); Bhirkuna–Chiruwa (*M. Suzuki et al. 9240229*, E, TUS), (*M. Suzuki et al. 9263119*, E, TUS).

#### 4.7. *Phyllanthus glaucus* Wall. ex Müll. Arg.

Western: **Dhaulagiri Zone, Myagdi Distr.:** Titre, Kali Gandaki valley (*Stainton et al. 5475*, E, TI); Kali Gandaki, Tatopani–Ghasa (*H. Ohba et al. 8340192*, E, TUS). **Gandaki Zone, Gorkha Distr.:** Ekle Ghar–Sardu Khola (*M. Suzuki et al. 9455129*, E, TUS); Ripche (*S. Nakao & J. H. E. s. n.*, 10 Jul. 1953, KYO). **Manang Distr.:** Marsyandi Khola, Dhanagyang–Tal (*H. Ohba et al. 8340339*, E, TUS); Marsyandi Khola, Dhanagyang–Dharapani (*H. Ohba et al. 8311119*, E, TUS).

Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu. Godavari–Phlchoki (*H. Kanai 11331*, KYO, TI), (*H. Kanai et al. 3041*, TI). **Lalitpur Distr.:** Phulchoki, south of Kathmandu (*H. Ohashi & H. Ohba 724029*, TI); Phulchoki (*P. Pradhan & S. Gurung 10567*, TI). **Rasuwa Distr.:** Dhunche station–Dunche (*H. Tabata et al. 8668*, KYO); Chilime and Langtang valleys, Dhunche (*H. Kanai & P. R. Shakya 672020*, KYO, TI); Dhunche–Syabru (*H. Takayama et al. 9239039*, E, TUS); Dhunche–Deolari (*T. Hoshino et al. 9535019*, TI); Dhunche (*Saman & Bista 13061*, TI); above Dhunche along the Trisula Khola–Gosainkund (*H. Hara et al. 69186*, TI); Dunche–Singum Gompa (*H. Kanai et al. 724032*, TI); Trisuli Valley, Syabrubensi (*S. Bowes Lyon 28*, E); between Bharkhu and Syabru (*D. G. Long & S. E. McDermott 21927*, E); Dunche–Syabru (*M. Suzuki & S. Noshiro 540013*, E). **Janakpur Zone, Dolakha Distr.:** Rolwaling Himal, Donla–Kensa (*K. Yoda s. n.*, 28 Apr. 1963, KYO). **Ramechhap Distr.:** en route from Those to Shibalaya (*H. Tabata et al. 10190*, KYO); Patkare–Bhandar (*H. Ohba et al. 8571322*, E). **Janakpur Zone, Ramechhap Distr. & Sagarmatha Zone, Solukhumbu Distr.:** Bhandar–Sete (*M. Wakabayashi et al. 9715010*, TI). **Zone unknown:** (*Wallich, List no. 7821*, K); (*Wallich, List no. 7927A*, K).



Eastern: **Mechi Zone, Taplejung Distr.:** Thakpa Bazar–Ramsyang Pati (*M. Suzuki et al. 9240273*, E, TUS).

#### 4.8. *Phyllanthus reticulatus* Poir.

Western: **Gandaki Zone, Gorkha Distr.:** Macha Khola–Syaule Bhatti (*M. Suzuki et al. 9455084*, E, TUS); Arkhet Bazar–Khorsanedanda (*M. Suzuki et al. 9455054*, TUS); Arughat Bazar, Buri Gandaki River (*P. C. Gardner 223*, BM, E). **Lamjung Distr.:** Madi Khola, Karelung (*Stainton et al. 5876*, BM, E). **Zone unknown:** Kali Gandaki R, Gunsa (*Stainton et al. 8934*, BM).

Eastern: **Koshi Zone, Morang Distr.:** Kathgara–Rangali (*H. Kanai et al. 6306800*, TI), (*H. Kanai et al. 6306813*, KYO, TI); Biratnagar (*H. Hara et al. 6306812*, KYO, TI). **Mechi Zone, Ilam Distr.:** Tea Garden hill (*D. H. Nicholson 3117*, BM, TI). **Distr. unknown:** Mechi bank (*J. S. Gamble 2837A*, K); Mechi bank Nepal side (*J. S. Gamble s. n.*, K). **Sagarmatha Zone, Udayapur Distr.:** between Ghanta and Kanchira (*H. Tabata et al. 7899*, KYO).

#### 4.9. *Phyllanthus leschenaultii* Müll. Arg.

Western: **Gandaki Zone, Syangja Distr.:** Andhi Kola, 300 m above conflux with Kali Gandaki, south bank (*K. A. Lye 17609*, E).

#### 4.10. *Phyllanthus acidus* (L.) Skeels

Eastern: **Koshi Zone, Morang Distr.:** Charkosya Jhari, Letang (*Williams & Stainton 8537*, BM, K).

#### 4.11. *Phyllanthus emblica* L.

Far Western: **Seti Zone, Kailali Distr.:** Godawari (*H. Tabata et al. 425*, KYO); between Buditola and Bhasu (*H. Tabata et al. 518*, KYO).

Mid Western: **Karnali Zone, Kalikot Distr.:** Kiurithani, Karnali valley (*Polunin et al. 796*, E, TI); near Kalikot, Tila Valley (*O. Polunin et al. 1922*, E); Kota–Phukgad (*M. Suzuki et al. 9194124*, E). **Rapti Zone, Salyan Distr.:** Sitalpati (*O. Polunin et al. 1262*, E).

Western: **Dhaulagiri Zone, Baglung Distr.:** between Tagum and Darbang (*H. Tabata et al. 3937*, KYO). **Mustang & Myagdi Distr.:** Lower Lete–Tatopani (*M. Mikage et al. 9455375*, E, TUS). **Myagdi Distr.:** Babichor–Dharapani (*M. Mikage et al. 9684038*, TUS); near Mayangdi Khola (*Stainton et al. 2543*, E). **Gandaki Zone, Gorkha Distr.:** Buri Gandaki, Arughat Bazaar (*S. Nakao s. n.*, 10 Dec. 1952, KYO). **Kaski Distr.:** Biretatti (*K. Nishioka 471*, KYO), (*K. Nishioka 650*, KYO); Surauti (Suranti?) Khola (*Stainton et al. 6866*, E).

Central: **Bagmati Zone, Dhading Distr.:** Charangi Pauwa (*M. Suzuki et al. 9460026*, TUS). **Kabhre Distr.:** Panchkhal (*H. Tabata et al. 9503*, KYO). **Janakpur Zone, Dolakha Distr.:** Rolwaling Himal, Pachkhal (*K. Yoda s. n.*, 19 Apr. 1963, KYO). **Narayani Zone, Bara Distr.:** Bakeya (*H. Tabata et al. 9707*, KYO). **Chitawan Distr.:** Sauraha–Harda Khola (*M. Mikage et al. 9611799*, TUS). **Parsa Distr.:** Parsa Wildlife Reserve, along Mahadev Khola (*M. Mikage et al. 9550586*, TUS); Parsa Wildlife Reserve, along Bhalu Khola (*M. Mikage et al. 9550614*, TUS).

Eastern: **Koshi Zone, Sunsari Distr.:** Daran Bazar, Biratnagar (*J. D. A. Stainton 49*,



E). **Sankhuwasabha Distr.:** Tumlingtar–Baireni Bagar (*S. Noshiro et al. 9840217*, E). **Mechi Zone, Panchthar Distr.:** Tharpu–near Chyangthaphu (*H. Kanai et al. 6306809*, KYO, TI). **Taplejung Distr.:** Dumhan, by the Tamur River (*G. Murata et al. 6306810*, TI); Dumhan (*H. Hara et al. 6306810*, KYO); Upper Gorzha (*K. Nishioka 1166*, KYO). **Sagarmatha Zone, Khotang Distr.:** Regmitar–Khani Danda (*M. Mikage et al. 9555069*, TUS).

Region unknown: between Chamche and Tagring (*T. Fujimura s. n.*, 22 Oct. 1953, KYO).

#### 4.12. *Phyllanthus* aff. *embergeri*

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhankuta (*H. Hara et al. 6306807*, KATH, TI); (*Hara et al. s. n.*, 18 Oct. 1963, TI).

#### 4.13. *Phyllanthus lepidocarpus* Siebold & Zucc.

Far Western: **Seti Zone, Bajura Distr.:** Serigaon–Bashala (*M. Suzuki et al. 9160597*, TUS).

Mid Western: **Bheri Zone, Bardiya Distr.:** Royal Bardia National Park, near the head quarter, Thakurduar (*M. Mikage et al. 9689068*, TUS).

Western: **Dhaulagiri Zone, Myagdi Distr.:** Muri–below Dhar (*M. Mikage et al. 9684152*, TUS); above Mayangdi Khola (*Stainton et al. 4037*, E, TI). **Baglung Distr. & Myagdi Distr.:** Baglung (*M. Mikage et al. 9682052*, TUS). **Gandaki Zone, Kaski Distr.:** Pokhara (*Stainton et al. 6740*, E).

Central: **Bagmati Zone, Kathmandu Distr.:** between Kathmandu and Thankot (*H. Kanai s. n.*, 20 Sep. 1963, TI). **Lalitpur Distr.:** Godavari, south of Kathmandu (*C. Chuma 675190*, TI). **Narayani Zone, Chitawan Distr.:** Sauraha–Padampur (*K. Yoda 9614101*, TUS); ca. 4 km east of Mugling (*M. Mikage et al. 9552040*, TI). **Parsa Distr.:** Parsa Wildlife Reserve, along Mahadev Khola (*M. Mikage et al. 9552781*, TUS).

Eastern: **Koshi Zone, Morang Distr.:** Biratnagar (*H. Hara et al. 6306808*, TI). **Sankhuwasabha Distr.:** below Lum Lum La (*M. Ohsawa & P. R. Shakya 1893*, TI), (*M. Ohsawa & P. R. Shakya 1930*, TI). **Koshi Zone, Sunsari Distr. & Sagarmatha Zone, Saptari Distr.:** Koshi Tappu Wildlife Reserve, Simana–Kanchanpur (*M. Mikage et al. 9552945*, TUS).

#### 4.14. *Phyllanthus embergeri* Haicour & Rossignol

Mid Western: **Rapti Zone, Distr. unknown:** Jimali (*K. R. Rajbhandari & B. Roy 4792*, KYO).

Western: **Dhaulagiri Zone, Myagdi Distr. & Mustang Distr.:** Tatopani–Ghasa (*T. Hoshino et al. 9666048*, E, TUS); Beni–Babichor (*M. Mikage et al. 9687038*, TUS), (*M. Mikage et al. 9685077*, TUS). **Gandaki Zone, Kaski Distr.:** Pokhara (*Stainton et al. 6756*, TI). **Syangja Distr.:** Andhi Khola, 300 m above conflux with Kali Gandaki, south bank (*K. A. Lye 17605*, E).

Central: **Narayani Zone, Bara Distr.:** Adhabar, vicinity of Parsa Wildlife Reserve Headquarter Office (*M. Mikage et al. 9554011b*, TUS). **Chitawan Distr.:** Sauraha–Padampur (*K. Yoda et al. 9614101b*, TUS), (*K. Yoda et al. 9614101*, E).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhankuta (*H. Hara et al. 6306807*, KYO).

**Koshi Zone, Sunsari Distr. & Sagarmatha Zone, Saptari Distr.:** Koshi Tappu Wildlife Reserve, Simana–Kanchanpur (*M. Mikage et al. 9552945*, E). **Sankhuwasabha Distr.:** Apsuwa Doban–Pikhuwa (*S. Noshiro et al. 9760510*, E, TUS); Kyawa Khola–Kyawabesi (*S. Noshiro et al. 9760066*, TUS); Tumlingtar–Baireni Bagar (*S. Noshiro et al. 9820122*, TI). **Sankhuwasabha Distr. or Mechi Zone, Taplejung Distr.:** Mul Pokhari–Dumhan (*H. Hara et al. s. n.*, 30 Oct. 1963, TI). **Sunsari Distr.:** Phusri–Dhara Pani (*H. Hara et al. s. n.*, 16 Oct. 1963, TI). **Mechi Zone, Panchthar Distr.:** near Chyangthaphu–Birwa (*H. Kanai et al. s. n.*, 27 Nov. 1963, TI). **Taplejung Distr.:** Dumhan, by the Tamur River (*G. Murata et al. 6306804*, TI); Dumhan–Taplejung (*H. Kanai et al. 6306805*, TI), Khebang (*H. Hara et al. 6306806*, TI), (*H. Hara et al. s. n.*, 23 Nov. 1963, KYO); Bharomdin–Tharpu (*H. Hara et al. s. n.*, 25 Nov. 1963, TI).

#### 4.15. *Phyllanthus amarus* Schumach. & Thonn.

Eastern: **Sagarmatha Zone, Khotang Distr.:** Dihigaon–Regmitar (*M. Mikage et al. 9558110*, E, KATH); Dihigaon–Ritha Bote (*M. Mikage et al. 9558110*, TUS).

#### 4.16. *Phyllanthus fraternus* G. L. Webster

Mid Western: **Bheri Zone, Banke Distr.:** Nepalganj (*N. P. Manandhar 6982*, KATH). **Dailekh Distr.:** Dungsar–Strithan (*M. Suzuki et al. 9160146*, BM).

Western: **Gandaki Zone, Kaski Distr.:** Pokhara (*Stainton et al. 6731*, BM, KATH, TI), (*Stainton et al. 7631*, E, TI), (*T. Wraber 119*, BM); Pokhara, Simalchaur (*N. P. Manandhar & L. P. Katel 11347*, KATH). **Lumbini Zone Rupandehi Distr.:** Bhairawa (*D. P. Joshi & M. M. Amatya 73/857*, KATH).

Eastern: **Koshi Zone, Dhankuta Distr.:** Mul Ghat–Dhan Kula (*M. Ohsawa & P. R. Shakya 74*, TI). **Sankhuwasabha Distr.:** Khandbari–Tumlingtar (*M. Suzuki et al. 8821289*, BM).

Region unknown: Garhwa, Dang (*N. P. Manandhar & N. K. Bhattarai 8520*, KATH).

#### 4.17. *Phyllanthus airy-shawii* Brunel & J. P. Roux

Central: **Narayani Zone, Chitawan Distr.:** Sauraha–Harda Khola (*M. Mikage et al. 9614208*, TI, TUS).

Eastern: **Koshi Zone, Bhojpur Distr.:** Bumlingtar—a *Shorea* forest (*S. Noshiro et al. 9760559*, TI, TUS); Arun bridge–Chapabote (*S. Noshiro et al. 9760576*, TI). **Dhankuta Distr.:** Teku Nala–Dhara Pani (*H. Ohashi et al. 771369*, TI). **Sankhuwasabha Distr.:** Pikhuwa–Bumlingtar (*S. Noshiro et al. 9760549*, TI); Arun valley, Tumlingtar (*T. Wraber 488*, BM). **Mechi Zone, Taplejung Distr.:** Sangrati Pati–Doban (*H. Ohashi et al. 771136*, TI), (*H. Ohashi et al. 775406*, TI).

#### 5.1. *Sauropus quadrangularis* (Willd.) Müll. Arg.

Western: **Dhaulagiri Zone, Baglung Distr.:** Bhujji Khola (*Stainton et al. 9053*, E); Bongakhani (*Stainton et al. 3950*, E). **Gandaki Zone, Gorkha Distr.:** Ekle Ghar–Deng (*M. Suzuki et al. 9455239*, E, TUS). **Kaski Distr.:** Tolka–Ghandruk (*M. Suzuki et al. 8881126*, TUS); Mardi Khola (*Stainton et al. 8449*, E); Chhumro (*Y. Suehiro 2265*, KYO). **Lumbini Zone, Nawalparasi Distr.:** Daunedanda (*H. Tabata et al. 9863*, KYO).

Central: **Janakpur Zone, Dolakha Distr.:** Rolwaling Himal, Pachkhal (*M. Numata*



1820, KYO); Kirentechap (*M. Numata 1691*, KYO); en route from Bishnutole to Busti (*H. Tabata et al. 10083*, KYO). **Narayani Zone, Bara Distr.:** near Amlekhgani, S. Nepal (*Grey-Wilson & Phillips 55*, K). **Chitawan Distr.:** Kasara (In Chitwan National Park) (*H. Tabata et al. 7918*, KYO); between Dumre and Kashara (*H. Tabata et al. 9791*, KYO). **Makawanpur Distr.:** Hitaura, Rapti valley (*Williams & Stainton 8186*, K).

Eastern: **Mechi Zone, Ilam Distr.:** Illam–Ranga Pan (*H. Hara et al. 6306811*, TI).

Region unknown: Garam (*H. Kanai 673212*, TI).

## 5.2. *Sauropus androgynus* (L.) Merr.

Eastern: **Koshi Zone, Sunsari Distr.:** Phusri–Dhara Pani (*H. Hara et al. 6306773*, KYO, TI).

## 6.1. *Breynia retusa* (Dennst.) Alston

Central: **Zone unknown:** (*Wallich, List no. 7911*, E), (*Wallich, List no. 7911D*, TI).

Eastern: **Koshi Zone, Dhankuta Distr.:** Gholi Kharka–Ramrista (*M. Minaki et al. 9040048*, E, TI); Hile–Diyale (*S. Noshiro et al. 9755014*, TI). **Sunsari Distr.:** Dhara Pani–Sanguri Bhanjyang (*H. Kanai et al. 721231*, TI). **Mechi Zone, Ilam Distr.:** Mai Pokhari–Illam (*S. Noshiro et al. 9241121*, E, TUS).

## 6.2. *Breynia vitis-idaea* (Burm. f.) C.E.C. Fisch.

Central: **Narayani Zone, Bara distr.:** en route from Parasuwa to Bakeya (*H. Tabata et al. 9607*, KYO).

Eastern: **Koshi Zone, Morang Distr.:** Kathgara–Rangali (*H. Kanai et al. 6306826*, KYO, TI); Mahara Bahara–Kathgara (*H. Kanai et al. 6306824*, K, KYO, TI); Biratnagar (*H. Hara et al. 6306825*, KYO, TI).

## 7.1. *Glochidion multiloculare* (Roxb. ex Willd.) Voigt.

Central: **Narayani Zone, Chitawan Distr.:** Khagendramalli–Machan Wildlife Resort (*M. Mikage et al. 9614262*, BM, E, TUS), (*M. Mikage et al. 9614265*, BM, E, TUS); Lathn (Chitwan area) (*P. R. Shakya 9127*, BM). **Makawanpur Distr.:** Hitaura, Rapti valley (*Williams & Stainton 8208*, BM, K).

Eastern: **Koshi Zone, Morang Distr.:** Rangali–Biratnagar (*H. Kanai et al. 6306757*, TI), (*H. Kanai et al. 6306758*, BM, TI); Kathgara–Rangali (*H. Kanai et al. 6306759*, KYO, TI).

## 7.2. *Glochidion nubigenum* Hook. f.

Western: **Gandaki Zone, Kaski Distr.:** Bakhri Kharka, north of Pokhara (*O. Polunin et al. (J. D. A. Stainton ?) 5007*, E).

Central: **Bagmati Zone, Lalitpur Distr.:** Phulchoki, south of Kathmandu (*H. Kanai 722139*, BM). **Narayani Zone, Distr. unknown:** Jaspal–Juleri (*Kanai & Bista 12071*, TI). **Zone unknown:** (*Wallich, List no. 7852*, BM, center plant).

Eastern: **Mechi Zone, Ilam Distr.:** Mai Pokhari–Dhara Pani (*H. Hara et al. 6306762*, TI). **Taplejung Distr.:** Taplethok–Helok (*H. Hara et al. 6306760*, BM, KYO, TI); Ghatte–Khebang (*H. Hara et al. 6306761*, BM, TI). **Sagarmatha Zone, Solukhumbu Distr.:** Dudh Kosi, Josing (*J. D. A. Stainton 5959*, BM).

**7.3. *Glochidion triandrum*** (Blanco) C. B. Rob.

Central: **Zone unknown:** (*Wallich, List no. 7885*, BM, E, K), (*Wallich, List no. 7821*, K); (*Wallich s. n.*, BM).

**7.4. *Glochidion heyneanum*** (Wight & Arn.) Wight

Far Western: **Seti Zone, Bajura Distr.:** Tolebhir–Berma (*M. Suzuki et al. 9194141*, E); Jugado (*H. Tabata et al. 8913*, KYO). **Kailali Distr.:** Sahejpur (*H. Tabata et al. 610*, KYO). **Doti Distr.:** between Barigad and Galsera (*H. Tabata et al. 690*, KYO).

Mid Western: **Bheri Zone, Dailekh Distr.:** Tal Pokhari to Dungesar (*K. R. Rajbhandari & B. Roy 2765*, KYO). **Surkhet Distr.:** Surkhet–Katukuwa (*M. Suzuki et al. 916005*, TUS), (*M. Suzuki et al. 9160005*, E), (*M. Suzuki et al. 9191005*, E), (*M. Suzuki et al. 9194009*, E). **Karnali Zone, Kalikot Distr.:** Lower Tila Valley (*O. Polunin et al. 1992*, E); Thana, Tila Vadlley (*O. Polunin et al. 3941*, E); Mulpha to Tari (*K. R. Rajbhandari & B. Roy 3184*, KYO). **Rapti Zone, Distr. unknown:** Mahabharat Lekh to Ambas (*K. R. Rajbhandari & B. Roy 4846*, KYO).

Western: **Dhaulagiri Zone, Myagdi Distr.:** Mayangdi Khola, Arman (*Stainton et al. 154*, E); between Sikha and Tatopani (*H. Tabata et al. 6104*, KYO). **Gandaki Zone, Gorkha Distr.:** Khorsanedanda–Macha Khola (*M. Suzuki et al. 9455063*, E, TUS). **Kaski Distr.:** Madi Khola, near Pokhara (*Stainton et al. 6458*, E). **Lumbini Zone, Nawalarasi Distr.:** Nawal Parasi, Girwari forest (*J. Makin 251*, TI).

Central: **Bagmati Zone, Dhading Distr.:** Mulabari–Arkhet Bazar (*M. Suzuki et al. 9480017*, E, TUS). **Janakpur Zone, Dolakha Distr.:** Tamba Kosi, Malephu–Pikhuti (*H. Ohba et al. 8350998*, E), (*H. Ohba et al. 8340412*, E), (*H. Ohba et al. 8331529*, E), (*H. Ohba et al. 8340422*, E); en route from Bishnutole to Busti (*H. Tabata et al. 10059*, KYO); Rolwaling Himal, Kirentechap (*K. Yoda s. n.*, 19 Jun. 1963, KYO). **Zone unknown:** (*Wallich, List no. 7852*, E, K–WALL); Katakote (*K. Yoda s. n.*, 24 Apr. 1963, KYO).

Eastern: **Koshi Zone, Dhankuta Distr.:** Diyale–Kyawa Khola (*S. Noshiro et al. 9755029*, TI); Gholi Kharka (Dholikharka)–Ramrista (*M. Suzuki et al. 8820117*, E), (*M. Suzuki et al. 8840038*, E). **Sankhuwasabha Distr.:** Arun Valley, Hinwan Khola, north of Chainpur (*J. D. A. Stainton 1527*, E); en route from Hedangna to Gola (*H. Tabata et al. 11156*, KYO). **Mechi Zone, Taplejung Distr.:** Sangrati Pati–Doban (*H. Ohashi et al. 775390*, E, TUS). **Sagarmatha Zone, Solukhumbu Distr.:** Bhote Kosi (*J. D. A. Stainton 4466*, E).

**7.5. *Glochidion ellipticum*** Wight

Western: **Lumbini Zone, Rupandehi Distr.:** Nawal Parasi (*J. Makin 83*, BM).

Central: **Narayani Zone, Bara Distr.:** en route from Parasuwa to Bakeya (*H. Tabata et al. 9617*, KYO), (*H. Tabata et al. 9600*, KYO).

Eastern: **Koshi Zone, Morang Distr.:** Charkosya Jhari (*Williams & Stainton 8539*, BM, K). **Sankhuwasabha Distr.:** Gadhi Danda–Mude (*S. Noshiro et al. 9840197*, E, TUS); Arun Valley, Num, north of Chainpur (*J. D. A. Stainton 128*, BM, E). **Mechi Zone, Taplejung Distr.:** Tamur Valley, Mewa Khola (*J. D. A. Stainton 5861*, BM); Dingla (*Banerji et al. 3273*, BM).



**7.6. *Glochidion lanceolarium* (Roxb.) Voigt**

Central: **Narayani Zone, Chitawan Distr.:** northeast section of the Park, south of Rapti River (*R. G. Troth* 782, BM).

Eastern: **Koshi Zone, Sunsari Distr.:** Dharan Bazar (Biratnagar) (*J. D. A. Stainton* 47, BM). **Mechi Zone, Ilam Distr.:** 5 miles E. of Soktim Tea Estate (*J. D. A. Stainton* 6807, BM); Mai Khola (*J. D. A. Stainton* 6405, BM). **Jhapa Distr.:** Bhadrapur forest (*D. H. Nicolson* 3055, BM); Bhadrapur (*J. D. A. Stainton* 5724, BM).

**7.7. *Glochidion daltonii* (Müll. Arg.) Kurz**

Western: **Gandaki Zone, Gorkha Distr.:** Khorsanedanda–Macha Khola (*M. Suzuki et al.* 9455069, TI); Buri Gandaki River, 14 miles above Arughat Bazar (*P. C. Gardner* 257, BM).

Central: **Janakpur Zone, Dolakha Distr.:** Tamba Kosi, Malephu–Pikhuti (*H. Ohba et al.* 8340417, TI); Kapure (*K. Yoda s. n.*, 18 Jun. 1963, KYO).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Apsuwa Doban–Pikhuwa (*S. Noshiro et al.* 9755253, TI); Arun Valley, Sangkhua Khola (*J. D. A. Stainton* 5933, BM). **Mechi Zone, Taplejung Distr.:** Tamur Valley Taplejung (*J. D. A. Stainton* 5852, BM). **Sagarmatha Zone, Solkhumbu Distr.:** Bhote Kosi (*J. D. A. Stainton* 4462, BM).

**8.1. *Putranjiva roxburghii* Wall.**

Far Western: **Mahakali Zone, Kanchanpur Distr.:** Royal Suklaphanta Wildlife Reserve, Pipariya, along Mahakari river (*M. Mikage et al.* 8563, TI), (*M. Mikage et al.* 8238, TI).

**9.1. *Baccaurea ramiflora* Lour.**

Central: **Narayani Zone, Chitawan Distr.:** Royal Chitwan National Park, northeast section of the Park, south of Rapti River (*R. G. Troth* 816, TI).

Eastern: **Mechi Zone, Ilam Distr.:** Mai Khola, Soktim (*J. D. A. Stainton* 6484, TI). **Distr. unknown:** Ganjbari (*J. D. A. Stainton* 5747, TI).

**10.1. *Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery**

Central: **Narayani Zone, Chitwan Distr.:** between Kasara and Dhoba (*H. Tabata et al.* 7600, KYO). **Makawainpur Distr.:** Churya Ghati, north of Amlekhgamj (*J. D. A. Stainton* 5295, TI). **Zone unknown:** Eттаura (*Hamilton s. n.*, 2 Apr. 1802, BM).

Eastern: **Koshi Zone, Morang Distr.:** Chula Chuli (*L. H. J. Williams* 282, TI). **Mechi Zone, Distr. unknown:** Ganjbari (*J. D. A. Stainton* 5737, TI).

**11.1. *Antidesma ghaesembilla* Gaertn.**

Central: **Narayani Zone, Chitawan Distr.:** Chitwan, Ramnagar (*K. Wesche* 5173, BM). **Zone unknown:** Napalia (*Wallich, List no.* 7280B, BM).

**11.2. *Antidesma bunius* (L.) Spreng.**

Central: **Bagmati Zone, Dhading Distr.:** Lapang–Mulabari (*M. Suzuki et al.* 9455034, BM, E, TUS).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Khandbari–Bhotebas (*M. Suzuki et al.*

8820234, BM, E, TUS).

### 11.3. *Antidesma acuminatum* Wight

Mid Western: **Bheri Zone, Bardiya Distr.:** Royal Bardia National Park, Tiger top. (*M. Mikage et al. 9681391*, TUS).

Western: **Gandaki Zone, Kaski Distr.:** Pokhara (*Stainton et al. 6720*, BM, E).

Eastern: **Koshi Zone, Morang Distr.:** Chula Chuli (*Williams & Stainton 8505*, BM). **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306749*, TI). **Distr. unknown:** Retua Khola (W. of Mai Khola) (*J. D. A. Stainton 6920*, TI).

### 11.4. *Antidesma acidum* Retz.

Mid Western: **Bheri Zone, Distr. unknown:** near Babai (*K. R. Rajbhandari & B. Roy 2615*, KYO).

Western: **Dhaulagiri Zone, Myagdi Distr.:** Tatopani–Beni (*M. Mikage et al. 9550543*, TUS); Babichor–Ratorunga (*M. Mikage et al. 9684030*, TUS); Beni–Babichor (*M. Mikage et al. 9681178*, TUS); Ranipauwa, north of Beni (*Stainton et al. 598*, E), (*Stainton et al. 587*, E); Mayangdi Khola (*Stainton et al. 2738*, E). **Baglung Distr. & Myagdi Distr.:** Ratnechour–Beni (*M. Mikage et al. 9687035*, TUS). **Gandaki Zone, Kaski Distr.:** Phewa Tal (*Stainton et al. 5295*, E), (*Stainton et al. 5255*, E). **Lamjung Distr.:** Marsyandi Khola, Bahundanda–Shimalchaur (*H. Ohba et al. 8340392*, TUS). **Lumbini Zone, Palpa Distr.:** Butwal (*Stainton et al. 8842*, E).

Central: **Bagmati Zone, Dhading Distr.:** Lapang–Mulabari (*M. Suzuki et al. 9480016*, E, TUS), (*M. Suzuki et al. 9455031*, E, TUS). **Janakpur Zone, Dolakha Distr.:** Tamba Kosi, Pikhuti–Tatlabari (*H. Ohba et al. 8331580*, E, TUS), (*H. Ohba et al. 8351032*, E); en route from Busti to Namdu (*H. Tabata et al. 10124*, KYO); Rolwaling Himal, Chaubas (*K. Yoda s. n.*, 21 Jun. 1963, KYO), (*K. Yoda s. n.*, 21 Jun. 1963, KYO). **Narayani Zone, Chitawan Distr.:** Royal Chitwan National Park, northeast section of the Park, south of Rapti River (*R. G. Troth 874*, TI), (*R. G. Troth 875*, TI). **Parsa Distr.:** Parsa Wildlife Reserve, along Mohadev Khola (*M. Mikage et al. 9554034*, E, TUS); Parsa Wildlife Reserve, along Bhalu Khola (*M. Mikage et al. 9550612*, TUS).

Eastern: **Koshi Zone, Bhojpur Distr.:** en route from Gothebazar to Kulungagrakhe (*H. Tabata et al. 11000*, KYO). **Sankhuwasabha Distr.:** Khahare–Tumlingtar (*M. Minaki et al. 9040061*, E, TI); Pikhuwa–Bumlingtar (*S. Noshiro et al. 9755269*, TI); Arun Valley, Hinwan Khola, N of Chainpur (*J. D. A. Stainton 1524*, E). **Mechi Zone, Panchthar Distr.:** Tharpu–near Chyangthaphu (*H. Kanai et al. 6306750*, KYO, TI). **Taplejung Distr.:** Mitlung–Khokling (*M. Suzuki et al. 9263011*, E, TUS).

Region unknown: Lidi Khola (*Stainton et al. 6806*, E).

### 12.1. *Bischofia javanica* Blume

Far Western: **Seti Zone, Kailali Distr.:** between Godawari and Buditola (*H. Tabata et al. 486*, KYO).

Mid Western: **Bheri Zone, Banke Distr.:** Nepalganj (*J. D. A. Stainton 6240*, TI).

Central: **Narayani Zone, Chitawan Distr.:** Sauraha–Padampur (*K. Yoda et al. 9613001*, E, TUS); Sauraha–Devi Tal (*M. Mikage et al. 9611042*, TUS); Rapti Valley, Tikoli (*J. D. A. Stainton 5271*, TI); between Sauraha and Kasara (*H. Tabata et al. 7549*,



KYO); en route from Sauraha to Dumre (*H. Tabata et al.* 9777, KYO).

Eastern: **Mechi Zone, Jhapa Distr.:** Sibganja–Mahara Bahara (*G. Murata & M. Togashi* 31212, TI); Kankani River (*D. H. Nicolson* 3107, TI).

### 13.1. *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng.

Eastern: Koshi Zone, Morang Distr.: Biratnagar (L. H. J. Williams 50, TI).

### 14.1. *Alchornea mollis* (Benth.) Müll. Arg.

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Gola–Simbung (*S. Noshiro et al.* 9840040, E, TUS); Arun Nadi–Vedghari (*M. Suzuki et al.* 8860138, E, TUS); Chyurebas (*P. R. Shakya & M. Ohsawa* 1111, TI); Num–Sedua (*M. Suzuki et al.* 8820342, E). **Mechi Zone, Panchthar Distr.:** Tharpu–near Chyangthaphu (*H. Kanai et al.* 6306816, KYO, TI).

### 15.1. *Ricinus communis* L.

Far Western: **Karnali Zone, Kalikot Distr. & Seti Zone, Bajura Distr.:** Phukgad–Tolebhir (*M. Suzuki et al.* 9160409, TUS). **Seti Zone, Bajura Distr.:** Tolebhir–Berma (*M. Suzuki et al.* 9194144, E).

Mid Western: **Karnali Zone, Dolpa Distr.:** Phulchangi, Thuli, Bheri River (*O. Polunin et al.* 3328, E). **Kalikot Distr.:** Thibru, Karnali valley (*O. Polunin et al.* 4008, E). **Rapti Zone, Salyan Distr.:** Kumak Ridge, north of Sallyana (*O. Polunin et al.* 1807, E).

Western: **Dhaulagiri Zone, Baglung & Myagdi Distr.:** Ratnechour–Beni (*M. Mikage et al.* 9686004, TUS). **Myagdi Distr.:** Mayangdi Khola (*Stainton et al.* 127, E).

Eastern: **Mechi Zone, Taplejung Distr.:** Tuwa–Taplethok (*H. Hara et al.* 6306792, TI).

### 16.1. *Mercurialis leiocarpa* Siebold & Zucc.

Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu, Godavari–Phulchoki (*H. Kanai* 11329, TI). **Zone unknown:** Manjet Khola (*S. Bowes Lyon* 134, E).

Eastern: **Mechi Zone, Panchthar Distr.:** Bhuspate Danra–Mai Majuwa (*H. Hara et al.* 6306787, KYO, TI); Batasay–Bhuspate Danra (*H. Hara et al.* 6306788, KYO, TI).

### 17.1. *Cleidion spiciflorum* (Burm. f.) Merr.

Eastern: **Mechi Zone, Ilam Distr.:** Mai Khola, Soktim (*J. D. A. Stainton* 6495, TI).

### 18.1. *Macaranga pustulata* King ex Hook. f.

Far Western: **Seti Zone, Doti Distr.:** between Sahjpur and Doti (*H. Tabata et al.* 9051, KYO); between Rauttukatte and Barigad (*H. Tabata et al.* 730, KYO); between Barigad and Galsera (*H. Tabata et al.* 689, KYO).

Mid Western: **Bheri Zone, Distr. unknown:** Daragaon (*K. R. Rajbhandari & B. Roy* 4679, KYO). **Rapti Zone, Salyan Distr.:** Marma Khola (*O. Polunin et al.* 3783, E).

Western: **Dhaulagiri Zone, Mustang & Myagdi Distr.:** Lower Lete–Tatopani (*M. Mikage et al.* 9550506, TUS). **Gandaki Zone, Kaski Distr.:** Pokhara–Suiket (*H. Ohba et al.* 8343016, TUS), (*H. Ohba et al.* 8340040, TUS); Pathana–Tolka (Thorka) (*H. Ohba et al.* 8330221, E, TUS), (*M. Suzuki et al.* 8860532, E); Bhichuk (Bhedi Kharka)–Tolka

(Thoraka) (*M. Suzuki et al. 8860530*, E); near Bhadauri (*Stainton et al. 2498*, E); en route from Ghandrung to Chandrakot (*Y. Suehiro 1509*, KYO), (*Y. Suehiro 1511*, KYO), (*Y. Suehiro 1523*, KYO), (*Y. Suehiro 1524*, KYO); near Sudame (*K. Nishioka 485*, KYO). **Manang Distr.:** Marsyandi Khola, Tal-Jagat (*H. Ohba et al. 8331369*, E, TUS).

Central: **Bagmati Zone, Sindhupalchok Distr.:** between Lamusangu and Bilaunepani (*H. Tabata et al. 9900*, KYO).

Eastern: **Koshi Zone, Bhojpur Distr.:** en route from Phedi to Sagangma along Irkhua Khola (*H. Tabata et al. 10978*, KYO). **Dhankuta Distr.:** Hile-Gholi Kharka (*M. Minaki et al. 9040014*, E, TI); Dhara Pani-Dhankuta (*H. Hara et al. 6306755*, TI); Hile-Diyale (*S. Noshiro et al. 9755007*, TI). **Sankhuwasabha Distr.:** Manebanjang-Chichila (*M. Minaki et al. 9040100*, E, TI); Nurbu Gaon-Nurbu Chaur (*S. Noshiro et al. 9755151*, TI). **Mechi Zone, Taplejung Distr.:** Tuwa-Taplethok (*H. Hara et al. 6306756*, KYO, TI); Taplejung-Garhi Danra (*H. Hara et al. 6306754*, KYO, TI). **Sagarmatha Zone, Khotang Distr.:** Khani Danda-Dorpa Churi Danda (*M. Mikage et al. 9555080*, TUS). **Solukhumbu Distr.:** Dudh Kosi (*J. D. A. Stainton 6562*, TI).

### 18.2. *Macaranga indica* Wight

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Arun Khora-Dhadkhet (*M. Minaki et al. 9060133*, TI). **Mechi Zone, Taplejung Distr.:** Khebang-below Siling Tzokupa (*H. Hara et al. 6306802*, KYO, TI).

### 18.3. *Macaranga denticulata* (Blume) Müll. Arg.

Western: **Gandaki Zone, Gorkha Distr.:** Macha Khola-Syaule Bhatti (*M. Suzuki et al. 9455083*, E, TUS); Buri Gandaki, Ngyak-Arughat Bazaar (*S. Nakao s. n.*, 4-9 Dec. 1952, KYO). **Lumbini Zone, Nawalparasi Distr.:** Nawal Parasi, Kusunde Forest (*J. Makin 261*, TI).

Central: **Narayani Zone, Chitawan Distr.:** Sauraha-Harda Khola (*M. Mikage et al. 9611798*, TUS); Royal Chitwan National Park, northeast section of the Park, south of Rapti River (*R. G. Troth 885*, TI).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Arun Valley, Sabhaya Khola (*J. D. A. Stainton 5906*, TI); below Lum Lum La (*M. Ohsawa & P. R. Shakya 1878*, TI); Arun Nadi-Vedghari (*M. Suzuki et al. 8860135*, E). **Mechi Zone, Ilam Distr.:** Ratua Khola (*L. H. J. Williams 305*, TI).

### 19.1. *Mallotus philippensis* (Lam.) Müll. Arg.

Far Western: **Karnali Zone, Kalikot Distr.:** Kota-Phukgad (*M. Suzuki et al. 9194123*, E). **Karnali Zone, Kalikot Distr. & Seti Zone, Bajura Distr.:** Phukgad-Tolebhiri (*M. Suzuki et al. 9160406*, TUS), (*M. Suzuki et al. 9193163*, TUS). **Mahakali Zone, Kanchanpur Distr.:** Royal Shuklaphanta Wildlife Reserve, Jhilmila, Shuklaphat (*M. Mikage et al. 9681434*, E, TUS). **Seti Zone, Kailali Distr.:** Ataria (*H. Tabata et al. 377*, KYO).

Mid Western: **Bheri Zone, Bardiya Distr.:** Royal Bardia National Park, near the headquarter, Thakurduar (*M. Mikage et al. 9681373*, TUS), (*M. Mikage et al. 9689009*, TUS). **Dailekh Distr.:** Dungsar-Shrithan (*M. Suzuki et al. 9193095*, TUS), (*M. Suzuki et al. 9194052*, E); Rajigaon (Ranigaon ?) (*K. R. Rajbhandari & B. Roy 2784*, KYO).



**Surkhet Distr.:** Surkhet–Katukuwa (*M. Suzuki et al. 9160004*, TUS), (*M. Suzuki et al. 9194002*, E). **Rapti Zone, Dangdeukhuri Distr.:** between Kurpani and Ghorai (*O. Polunin et al. 1329*, E). **Salyan Distr.:** Lawamjula (*O. Polunin et al. 5866*, E).

Western: **Dhaulagiri Zone, Baglung Distr.:** Baglung (*T. Hoshino et al. 9662140*, TI). **Myagdi Distr.:** Babichor–Ratorunga (*M. Mikage et al. 9686022*, TUS); Beg Khola–Rahughat (*M. Mikage et al. 9550544*, TUS), (*M. Mikage et al. 9551135*, TUS); Myangdi Khola (*Stainton et al. 2550*, E); between Darban and Sasdhara (*H. Tabata et al. 3955*, KYO); Sindure, at Bek Khola (*J. Kawakita s. n.*, 26 Jan. 1964, KYO, TI). **Baglung & Myagdi Distr.:** Baglung–Ratnechour (*M. Mikage et al. 9686003*, TUS); Baglung–Beni (*M. Mikage et al. 9687008*, TUS), (*M. Mikage et al. 9687017*, TUS); Darbang–Babichor (*M. Mikage et al. 9686212*, TUS). **Gandaki Zone, Gorkha Distr.:** Soti (*M. Suzuki et al. 9460046*, E, TI, TUS); Arkhet Bazar–Khorsanedanda (*M. Suzuki et al. 9455048*, E, TI, TUS); Luitel (*H. Kanai 670612*, KYO, TI); Buri Gandaki, Ngyak–Arghat Bazaar (*S. Nakao s. n.*, 4–9 Dec. 1952, KYO). **Lumbini Zone, Nawalparasi Distr.:** Island Jungle Resort–vicinity of Bharatpur (*M. Mikage et al. 9611847*, TUS).

Central: **Bagmati Zone, Rasuwa Distr.:** between Manigaon and Ramche (*H. Tabata et al. 8563*, KYO). **Narayani Zone, Bara Distr.:** NW. of Amlekganj, E. of Bherah Khola (*M. Mikage et al. 9550604*, TUS), (*M. Mikage et al. 9550593*, TUS), (*M. Mikage et al. 9554051*, E, TUS); Bakeya (*H. Tabata et al. 9711*, KYO); Simra–Patraia (*Kanai & Bista 11394*, KYO, TI). **Chitawan Distr.:** Khagendramalli–Machan Wildlife Resort (*M. Mikage et al. 9611829*, TUS); between Saurha and Kasara (*H. Tabata et al. 7551*, KYO).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhara Pani–Dhankuta (*H. Hara et al. 6306766*, KYO, TI), (*H. Hara et al. 6306767*, KYO, TI); Diyale–Kyawa Khola (*S. Noshiro et al. 9755035*, TI). **Morang Distr.:** Kathgara–Rangali (*H. Kanai et al. 6306763*, KYO, TI); Rangali–Biratnagar (*H. Kanai et al. s. n.*, 15 Dec. 1963, TI); Biratnagar (*H. Hara et al. 6306771*, KYO, TI). **Sunsari Distr.:** Phusri–Dhara Pani (*H. Hara et al. s. n.*, 16 Oct. 1963, TI). **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306768*, K, TI), (*H. Hara et al. 6306764*, KYO, TI); Illam–Ranga Pani (*H. Hara et al. 6306765*, TI). **Jhapa Distr.:** Sibganja–Mahara Bahara (*G. Murata & M. Togashi 6306770*, KYO, TI); Gauriganja–Rangali (*H. Hara et al. s. n.*, 13 Dec. 1963, TI); near Rang Danda (*H. V. T. et al. N212*, TUS). **Taplejung Distr.:** Bharomdin–Tharpu (*H. Hara et al. 6306769*, TI), between Mitlung and Taplejung (*K. Nishioka 1031*, KYO).

### 19.3. *Mallotus repandus* (Willd.) Müll. Arg.

Western: **Lumbini Zone, Nawalparasi Distr.:** Island Jungle Resort–vicinity of Bharatpur (*M. Mikage et al. 9611839*, BM, TUS).

### 19.4. *Mallotus roxburghianus* Müll. Arg.

Central: **Narayani Zone, Chitawan Distr.:** Chitwan, Ramnagar (*K. Wesche 11120*, BM).

Eastern: **Koshi Zone, Bhojpur Distr.:** Bumlingtar–a Shorea forest (*S. Noshiro et al. 9760562*, TI).

### 19.5. *Mallotus nepalensis* Müll. Arg.

Western: **Dhaulagiri Zone, Baglung Distr.:** Lukarban Khola, west of Beni (*Stainton*



*et al.* 439, BM, E). **Mustang Distr.:** Kali Gandaki, Ghasa–Kalopani (*H. Ohba et al.* 8330555, BM, E, TUS); Titre, Kali Gandaki valley (*Stainton et al.* 5470, BM, E, TI). **Myagdi Distr.:** Lumsum (*Stainton et al.* 2896, BM, E), Ghar Khola (*Stainton et al.* 5436, E). **Mustang & Myagdi Distr.:** Lower Lete–Tatopani (*M. Mikage et al.* 9455369, E, TUS). **Gandaki Zone, Gorkha Distr.:** Ekle Ghar–Sardu Khola (*M. Suzuki et al.* 9455138, BM, E, TUS).

Central: **Bagmati Zone, Lalitpur Distr.:** Phulchoke S. of Kathmandu (*A. D. Schilling* 801B, TI), (*A. D. Schilling* 801A, TI); Godawari N. Nepal valley (*Proud* 277, BM); Nepal Valley, Phulchoki (*J. D. A. Stainton* 5389-1, BM), (*J. D. A. Stainton* 5389-2, BM). **Rasuwa Distr.:** between Syabru Bensi and Bamboo, S. side of Langtang Khola (*S. Akiyama et al.* 20100074, TUS); Dhunche–Syabru (*H. Takayama et al.* 9220002, TUS); Lama Hotel–Syabru (*M. Suzuki & S. Noshiro* 8540094, TUS); Chilime and Langtang valleys, Thade (*H. Kanai & P. R. Shakya* 671984, BM, KYO); Ramche–Thade (*Malla* 6561, BM).

Eastern: **Janakpur Zone, Ramechhap Distr. & Sagarmatha Zone, Solukhumbu Distr.:** Bhandar–Sete (*H. Ohba et al.* 8540230, TUS). **Koshi Zone, Sankhuwasabha Distr.:** Arun Valley, Chyamtang (*J. D. A. Stainton* 417, E), below Chamtang–Chyangrima (*S. Noshiro et al.* 9840113, BM, E, TUS); Num–Chichila (*M. Suzuki et al.* 8840393, TUS); Nurbu Gaon–Nurbu Chaur (*S. Noshiro et al.* 9755148, TI). **Mechi Zone, Taplejung Distr.:** Mewa Khola (*J. D. A. Stainton* 7040, E). **Sagarmatha Zone, Solukhumbu Distr.:** Dudh Kosi, Jubing (*J. D. A. Stainton* 5958A, BM), (*J. D. A. Stainton* 5958, BM).

Region unknown: Phaploo (*L. Dhwoj* 87, BM, E).

#### 19.6. *Mallotus oreophilus* Müll. Arg.

Eastern: **Mechi Zone, Ilam Distr.:** Goruwale Bhanjang–Mai Pokhari (*S. Noshiro et al.* 9261377, TUS). **Panchthar Distr.:** Mahabharat Lekh, west of Ilam (*Williams & Stainton* 8480, BM, K, TI).

#### 19.7. *Mallotus tetracoccus* (Roxb.) Kurz

Central: **Janakpur Zone, Dolakha Distr.:** Tamba Kosi, Totlabari–Simigaon (*H. Ohba et al.* 8340435, TUS).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Gola–Gadhi Danda (*S. Noshiro et al.* 9840188, BM, E, TUS); Semma–Gola (*S. Noshiro et al.* 9840031, E, TUS); Baidep–Num (*H. Ohba et al.* 9154233, TUS); Num–Sedua (*S. Noshiro et al.* 9755139, TI); above Lumlumba (*P. R. Shakya & M. Ohsawa* 910, TI); en route from Hedangna to Gola (*H. Tabata et al.* 11148, KYO). **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al.* 6306786, TI).

#### 20.1. *Trewia nudiflora* L.

Far Western: **Seti Zone, Kailali Distr.:** Dhangarhi (*H. Tabata et al.* 312, KYO).

Mid Western: **Bheri Zone, Banke Distr.:** Nepalganj (*J. D. A. Stainton* 6239, E). **Bardiya Distr.:** Royal Bardia National Park, near the head quarter, Thakurduar (*M. Mikage et al.* 9681377, TUS).

Central: **Janakpur Zone, Sindhuli Distr.:** Kamla Khola (*J. D. A. Stainton* 8502, E). **Narayani Zone, Chitawan Distr.:** Sauraha–Padampur (*M. Suzuki et al.* 9611759, TUS);



Royal Chitwan National Park, northeast section of the Park, south of Rapti River (*R. G. Troth* 703, TI); Sauraha (*H. Tabata et al.* 9724, KYO). **Makawanpur Distr.:** Rapti valley, Hetaura (*J. D. A. Stainton* 5233, E).

Eastern: **Koshi Zone, Dhankuta Distr. & Sankhuwasabha Distr.:** Ramrista–Khahare (*M. Suzuki et al.* 8820143, E), (*M. Minaki et al.* 9040054, E). **Morang Distr.:** Charkosya Jhari (*Williams & Stainton* 8549, TI). **Koshi Zone, Sankhuwasabha Distr.:** Tumlingtar–Baireni Bagar (*S. Noshiro et al.* 9840212, E, TUS). **Sunsari Distr.:** Kushaha, Koshi Tappu Wildlife Reserve, SW. of Headquarter Office (*M. Mikage et al.* 9555005, TUS).

### 21.1. *Acalypha supera* Forssk.

Western: **Dhaulagiri Zone, Baglung Distr.:** Bongakhani (*Stainton et al.* 3958, BM, E).

Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu City, Thamel, Chhetrapati (*M. Mikage & K. Yonekura* 9682006, TUS), (*M. Mikage & K. Yonekura* 9552007, TUS). **Lalitpur Distr.:** Pulchoki (*Manandhas & party* 7327, TI). **Zone unknown:** (*Wallich, List no.* 7786B, TI).

Eastern: **Koshi Zone, Sunsari Distr.:** Sanguri Lekh, N. of Dharan (*Williams & Stainton* 8333, BM).

### 22.1. *Tragia* sp.

Eastern: **Mechi Zone, Ilam Distr.:** S. of Ilam (*L. H. J. Williams* 361, BM).

### 23.1. *Manihot esculenta* Crantz

Eastern: **Mechi Zone, Ilam Distr.:** Illam (*H. Hara et al.* 63751, TI).

### 24.1. *Jatropha gossypifolia* L.

Central: **Narayani Zone, Chitwan Distr.:** between Kasara and Narayanghat (*H. Tabata et al.* 7642, KYO).

Region unknown: Rajbiraj? (*N. P. Manandhar* 17093, TI).

### 24.2 *Jatropha curcas* L.

Far Western: **Seti Zone, Doti Distr.:** between Napani and Dipai (*H. Tabata et al.* 966, KYO). **Kailali Distr.:** Dhangarhi (*H. Tabata et al.* 9000, KYO).

Mid Western: **Bheri Zone, Surkhet Distr.:** Surkhet–Katukuwa (*M. Suzuki et al.* 9194012, TI, TUS).

Western: **Dhaulagiri Zone, Baglung Distr.:** Kali Gandaki Valley, near Baglung (*Stainton et al.* 581, E). **Baglung & Myagdi Distr.:** Baglung–Beni (*M. Mikage et al.* 9687020, TUS), (*M. Mikage et al.* 9687016, TUS). **Myagdi Distr.:** Jugepani–Dhola Khola (*M. Mikage et al.* 9686085, TUS); Kali Gandaki, Tatopani–Ghasa (*H. Ohba et al.* 8330479, E). **Parbat Distr.:** Shikha–Tatopani (*H. Ohba et al.* 8330466, TI). **Gandaki Zone, Lamjung Distr.:** Midam Khola, Nalma (*Stainton et al.* 5180, E). **Tanahun Distr.:** Marsyandi Khola, Kani Gaon–Bahundanda (*H. Ohba et al.* 8311220, E, TI, TUS).

Central: **Bagmati Zone, Rasuwa Distr.:** Sim chotala–Ramche (*H. Kanai* 673007, TI). **Sindhupalchok Distr.:** Jaljare–Barabise (*H. Kanai* 671918, TI). **Janakpur Zone, Dolakha Distr.:** Dadin (*K. Yoda s. n.*, 20 Jun. 1963, KYO); Kirentechap (*K. Yoda s. n.*, 19 Jun. 1963, KYO); en ronte from Shera to Bishnutole (*H. Tabata et al.* 10047, KYO).

Eastern: **Koshi Zone, Bhojpur Distr.:** en route from Gothebazar to Kulungagrakhe (*H. Tabata et al. 10999*, KYO). **Dhankuta Distr.:** Diyale–Kyawa Khola (*S. Noshiro et al. 9755026*, TI); Gholi Kharka–Panche (*M. Minaki et al. 9060010*, E, TI); Dihale–Bhainse (*M. Suzuki et al. 8850121*, TI); Panche–Dihale (*M. Suzuki et al. 8860040*, E, TI); Gholi Kharka–Ramrista (*M. Suzuki et al. 8880110*, E, TI), (*M. Suzuki et al. 8810071*, TI), (*M. Suzuki et al. 8820136*, E), (*M. Minaki et al. 9080022*, E). **Dhankuta Distr. & Sankhuwasabha Distr.:** Ramrista–Khahare (*M. Minaki et al. 9020150*, E, TI). **Morang Distr.:** Biratnagar (*H. Hara et al. 6306784*, KYO, TI). **Sunsari Distr.:** Phusri–Dhara Pani (*H. Hara et al. s. n.*, 16 Oct. 1963, TI). **Mechi Zone, Taplejung Distr.:** Bharomdin–Tharpu (*H. Hara et al. 6306785*, TI); Upper Garzha (*K. Nishioka 1162*, KYO).

Region unknown: between Rumre and Bodegaun (*T. Fujimura 22*, KYO).

### 25.1. *Ostodes paniculata* Blume

Central: **Bagmati Zone, Nuwakot Distr.:** Trisuli Bazar–Samre Bhanjyang (*M. Suzuki et al. 9455010*, E, TUS).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Num–Sedua (*S. Noshiro et al. 9755122*, TI), (*S. Noshiro et al. 9755121*, TI); Ha-uling–Bungim (*P. R. Shakya & M. Ohsawa 853*, TI); Dhadkhet–Arun Khora (*M. Minaki et al. 9060053*, E); Danda Pangma–Sekaha (*M. Minaki et al. 9060034*, E); Arun valley Kandbari, E. of Dingla (*J. D. A. Stainton 100*, E); en route from Phasida to Hedangna (*H. Tabata et al. 11118*, KYO). **Mechi Zone, Ilam Distr.:** Dhara Pani–Illam (*H. Hara et al. 6306752*, TI); Dhara Pani–Dharan Bazar (*H. Ohba et al. 775600*, E). **Panchthar Distr.:** Yektin–Akasay (*H. Hara et al. 6306751*, KYO, TI). **Taplejung Distr.:** Khebang–Bharomdin (*H. Hara et al. 6306753*, TI); Maewa Khola (*L. H. J. Williams 1060*, TI); en route from Taplejung to Tagwa (*H. Tabata et al. 11977*, KYO).

### 26.1. *Baliospermum montanum* (Willd.) Müll. Arg.

Mid Western: **Bheri Zone, Jajarkot Distr.:** between Tatagoan & Jajarkot, Bheri River (*O. Polunin et al. 3809*, E).

Western: **Gandaki Zone, Gorkha Distr.:** Arghat (*H. Kanai 670586*, TI); Arghat Bazar (*H. Kanai 670586*, KYO).

Eastern: **Mechi Zone, Ilam Distr.:** Ranga Pani–Ghorwa (*H. Hara et al. 6306819*, TI); (*H. Hara et al. 6306820*, KYO, TI); Illam–Ranga Pani (*H. Hara et al. 6306821*, KYO, TI).

### 26.2. *Baliospermum corymbiferum* Hook. f.

Eastern: **Mechi Zone, Ilam Distr.:** Mai Majuwa–Dhara Pani (*H. Hara et al. 6306822*, KYO, TI), (*H. Hara et al. 6306823*, KYO, TI). **Panchthar Distr.:** Mahabharat Lekh, west of Ilam (*Williams & Stainton 8485*, K). **Zone unknown:** N. of Chula Chuli (*Williams & Stainton 8522*, K).

### 27.1. *Croton bonplandianus* Baill.

Western: **Lumbini Zone, Rupandehi Distr.:** Rupandehi Khasyauli Road Camp (*J. Makin 166*, BM).

Central: **Janakpur Zone, Dolakha Distr.:** Chisa pani (*J. D. A. Stainton 5660*, BM).



Eastern: **Koshi Zone, Morang Distr.:** Biratnagar (*H. Hara et al. 6306817*, KYO, TI). **Sankhuwasabha Distr.:** Koshe Jahr (*M. Ohsawa & P. R. Shakya 3318*, TI); Teku Nala–Dhara Pani (*H. Ohashi et al. 771340*, E), (*H. Ohashi et al. 773144*, E); Dharan (*Williams & Stainton 8323*, BM, K). **Sunsari Distr.:** Kosi Tappu (*H. Tabata et al. 12052*, KYO).

#### 27.2. *Croton roxburghii* N. P. Balakr.

Central: **Narayani Zone, Bara Distr.:** Simra–Patraia (*Kanai & Bista 11412*, KYO); Sekti Mohar Khola (*Kanai & Bista 11412*, TI). **Makawanpur Distr.:** Churya Ghati, north of Amlekhganj (*J. D. A. Stainton 5296*, BM, E); Churia area (*T. B. Shrestha 3946*, BM). **Janakpur Zone, Distr. unknown:** Kamla Khola (*J. D. A. Stainton 5653*, BM).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Koshe Jahr (*M. Ohsawa & P. R. Shakya 1171*, TI).

#### 27.4. *Croton caudatus* Geiseler

Eastern: **Koshi Zone Morang Distr.:** W of Chula Chuli (*Williams & Stainton 8529*, BM, K). **Mechi Zone, Ilam Distr.:** Tea Garden (*D. H. Nicolson 3125*, BM, KATH); Illam–Ranga Pani (*H. Hara et al. 6306818*, TI); Ratna Khola (*T. B. Shrestha 15345*, KATH); Ratua Khola (*L. H. J. Williams 316*, TI); Soktim T. E. [Tea Estate] (Mai Khola) (*J. D. A. Stainton 6776*, BM, TI). **Jhapa Distr.:** Sanishcare (*P. Pradhan et al. 189/74*, KATH), (*P. Pradhan et al. 312/74*, KATH).

#### 27.5. *Croton tiglium* L.

Eastern: **Mechi Zone, Taplejung Distr.:** Maewa Khola (*L. H. J. Williams 1059*, BM).

#### 29.1. *Excoecaria acerifolia* Didr.

Far Western: **Seti Zone, Bajura Distr.:** Serigaon–Bashala (*M. Suzuki et al. 9194194*, E), (*M. Suzuki et al. 9160603*, E).

Mid Western: **Karnali Zone, Dolpa Distr.:** below Luhu, Bheri River (*O. Polunin et al. 3255*, E). **Kalikot Distr.:** Kalikot, Tila Valley (*O. Polunin et al. 3943*, E); Karnali Tila Junction (*O. Polunin et al. 1981*, E).

Western: **Dhaulagiri Zone, Baglung Distr.:** near Bongakhani (*Stainton et al. 2709*, E). **Myagdi Distr.:** Tatopani–Beni (*M. Mikage 9550528*, TUS); Dana, Kali Gandaki valley (*Stainton et al. 623*, E); Shika–Narchang (Nracheng) (*M. Suzuki et al. 8840516*, E), (*M. Suzuki et al. 8881394*, E). **Gandaki Zone, Manang Distr.:** Marsyandi Khola, Dhanayang–Tal (*H. Ohba et al. 8311126*, TUS), (*H. Ohba et al. 83400341*, E); Dhanagyang–Dharapani (*H. Kanai 11126*, E).

Central: **Bagmati Zone, Rasuwa Distr.:** between Syabru Bensi and Syabru, S. side of Langtang Khola (*S. Akiyama et al. 20100012*, TUS); Trisuli river, Syabrubensi (*S. Bowes Lyon 25*, E); Chilime and Langtang Valleys, Syaprubensi (*H. Kanai & P. R. Shakya 672047*, KYO).

#### 30.1. *Falconeria insignis* Royle

Far Western: **Seti Zone, Kailali Distr.:** Sahejpur (*H. Tabata et al. 615*, KYO), (*H. Tabata et al. 635*, KYO), (*H. Tabata et al. 8902*, KYO).

Mid Western: **Rapti Zone, Salyan Distr.:** Phulgaon (*O. Polunin et al. 3782*, E).

Western: **Gandaki Zone, Lamjung Distr.:** between Ghanpokhara and Lamjung (*Stainton et al. 5137, E*).

Central: **Bagmati Zone, Lalitpur Distr.:** Godavari (*D. H. Nicolson 2912, TI*). **Janakpur Zone, Dolakha Distr.:** en route from Nigale to Shera gaon (*H. Tabata et al. 10041, KYO*).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Bairini–Pelwa (*M. Ohsawa & P. R. Shakya 1334, TI*). **Mechi Zone, Taplejung Distr.:** Tuwa–Taplethok (*H. Hara et al. 6301150, TI*); Khokling–Thunglung (*M. Suzuki et al. 9263017, E*). **Sagarmatha Zone, Solukhumbu Distr.:** between Chochumi to Sotang (*H. Tabata et al. 7779, KYO*).

### 31.1. *Triadica cochinchinensis* Lour.

Western: **Dhaulagiri Zone, Parbat Distr.:** between Lamduri and Birethanti (*H. Tabata et al. 6682, KYO*). **Gandaki Zone, Kaski Distr.:** Ghorepani–Birethanti Bazar (*M. Mikage et al. 9455389, E, TUS*).

Central: **Janakpur Zone, Dolakha Distr.:** Tamba Kosi, Malephu–Pikhuti (*H. Ohba et al. 8331552, E, TUS*), (*H. Ohba et al. 8340424, E, TUS*).

### 32.1. *Balakata baccata* (Roxb.) Esser

Western: **Gandaki Zone, Gorkha Distr.:** Arkhet Bazar–Khorsanedanda (*M. Suzuki et al. 9455056, E, TUS*).

Central: **Bagmati Zone, Sindhupalchok Distr.:** Basin of Malemchi River (*D. H. Nicolson 2676, TI*).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Nurbu Chaur–Apsuwa Doban (*S. Noshiro et al. 9755247, E, TUS*). **Mechi Zone, Taplejung Distr.:** Tamur Valley, Taplejung (*J. D. A. Stainton 5850, TI*); near Fikkal (*K. Nishioka 578, KYO*).

### 33.1. *Euphorbia fusiformis* Buch.-Ham. ex D. Don

Mid Western: **Bheri Zone, Banke Distr.:** Nord de Nepalganj (*J. F. Dobremez 2397, BM*).

Central: **Bagmati Zone, Kabhre Distr.:** Bagdeo–Saraswati (*Kanai & Bista 11491, TI*). **Zone unknown:** (*Buchanan s. n., BM*).

### 33.2. *Euphorbia royleana* Boiss.

Mid Western: **Karnali Zone, Dolpa Distr.:** Ila, Bheri River (*O. Polunin et al. 3224, BM, TI*). **Rapti Zone, Salyan Distr.:** Sitalpati, near Sallyan (*O. Polunin et al. 3756, BM, TI*).

Western: **Gandaki Zone, Gorkha Distr.:** Syaule Bhatti–Jagat (*M. Suzuki et al. 9455108, TI*).

Eastern: **Janakpur Zone, Ramechhap Distr. & Sagarmatha Zone, Solukhumbu Distr.:** Bhandar–Sete (*H. Ohba et al. 8540236, BM*). **Sagarmatha Zone, Solukhumbu Distr.:** Bhote Kosi Khari Khola (*J. D. A. Stainton 4660, BM*).

### 33.3. *Euphorbia pulcherrima* Willd. ex Klotzsch

Western: **Dhaulagiri Zone, Baglung Distr.:** Bhuli Khola, S. of Dhorpatan (*Stainton et al. 323, BM*). **Myagdi Distr.:** Dana–Paudwar (*M. Suzuki et al. 8840586, E*). **Gandaki**



**Zone, Kaski Distr.:** Hills N. of Pokhara (*Stainton et al. 4831*, BM, E).

Central: **Bagmati Zone, Dhading Distr.:** Taluphu–Katonje (*T. Namba 0924042*, KYO).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhara Pani–Dhankuta (*H. Hara et al. 6306790*, KYO, TI). **Sankhuwasabha Distr.:** Kharang (*Bowring 21*, BM). **Mechi Zone, Taplejung Distr.:** Bharomdin–Tharpu (*H. Hara et al. s. n.*, 25 Nov. 1963, TI); below Siling Tzokupa–Khebang (*H. Hara et al. 6306791*, BM, KYO, TI).

### 33.4. *Euphorbia heterophylla* L.

Far Western: **Seti Zone, Bajura & Achham Distr.:** Babali–Sanfebagar (*M. Suzuki et al. 9161163*, TUS).

Mid Western: **Karnali Zone, Kalikot Distr.:** near junction of Karnali and Tila river (*O. Polunin et al. 1972*, E).

Western: **Dhaulagiri Zone, Baglung & Myagdi Distr.:** Buglung (*M. Mikage et al. 9682081*, TUS). **Mustang & Myagdi Distr.:** Tallo Ghansa–Dana (*M. Suzuki et al. 8881724-1*, TUS); Tatopani–Ghasa (*T. Hoshino 9666052*, E, TUS). **Myagdi Distr.:** Babichor–Dharapani (*M. Mikage et al. 9687075*, TUS), (*M. Mikage et al. 9685096*, TUS); Shika–Narchang (*M. Suzuki et al. 8811039*, TUS); Narchang (Narcheng)–Gaunapani (*M. Suzuki et al. 8860987*, E); Beg Khola (*T. Hoshino et al. 9662121*, E). **Gandaki Zone, Gorkha Distr.:** Macha Khola–Syaule Bhatti (*M. Suzuki et al. 9470127*, E). **Kaski Distr.:** Pokhara (*Stainton et al. 6734*, E).

Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu (*G. Murata et al. 6306789*, KYO, TI), (*T. Namba 0918006*, KYO). **Sindhupalchok Distr.:** Kalingchok Barabise–Thala (*H. Kanai et al. 724099*, TI). **Janakpur Zone, Dolakha Distr.:** Rolwaling Himal, Pasbkhal (*M. Numata 1844*, KYO). **Narayani Zone, Bara Distr.:** NW. of Amlekganj, E. of Bherah Khola (*M. Mikage et al. 9552812*, E, TUS).

Eastern: **Janakpur Zone, Ramechhap Distr. & Sagarmatha Zone, Solukhumbu Distr.:** Bhandar–Sete (*H. Ohba et al. 8571747*, E, TUS). **Ramechhap Distr.:** Jiri–Shivalaya (*M. Suzuki et al. 8580882*, E). **Koshi Zone, Bhojpur Distr.:** Deurali–Bastim (*M. Mikage et al. 9554254*, E, TUS). **Dhankuta Distr.:** Dhara Pani–Dhankuta (*H. Hara et al. s. n.*, 17 Oct. 1963, TI); Gholi Kharka–Ramrista (*M. Suzuki et al. 8880102*, TUS). **Mechi Zone, Panchthar Distr.:** Tharpu (*H. Hara et al. s. n.*, 26 Nov. 1963, TI); Dabale Deurali–Prangbung (*S. Noshiro et al. 9241035*, E). **Sagarmatha Zone, Khotang Distr.:** Regmitar–Khani Danda (*M. Mikage et al. 9558132*, E, TUS). **Solukhumbu Distr.:** Kensa–Deorali (*F. Miyamoto et al. 9584349*, TI).

### 33.5. *Euphorbia prolifera* Buch.-Ham. ex D. Don

Far Western: **Seti Zone, Doti Distr.:** Pasala (*J. F. Dobremez 1855*, K).

Western: **Dhaulagiri Zone, Baglung Distr.:** Baglung (*Stainton et al. 55*, BM).

Central: **Bagmati Zone, Kabhre Distr.:** Manga Deorali (*D. McCosh 5*, BM). **Janakpur Zone, Dolakha Distr.:** Rolwaling Himal, Yarusu (*K. Yoda s. n.*, 25 Apr. 1963, KYO); Kirentechap (*M. Numata 1711*, KYO). **Zone unknown:** (*Wallich, List no. 7698A*, BM, E, K, K–WALL, TI); (*Wallich s. n.*, in 1819, BM); (*Wallich s. n.*, in 1820, BM); (*Buchanan s. n.*, BM); Tambur Kosi (*J. D. A. Stainton 8245*, E).



**33.6. *Euphorbia maddenii* Boiss.**

Mid Western: **Karnali Zone, Mugu Distr.:** Pina (Ping), near Rara (*O. Polunin et al. 4084*, BM).

**33.7. *Euphorbia dracunculoides* Lam.**

Central: **Zone unknown:** Norcotera (*Buchanan s. n.*, 28 Mar. 1802, BM).

**33.8. *Euphorbia sikkimensis* Boiss.**

Far Western: **Seti Zone, Doti Distr.:** Doti (*J. F. Dobremez 1910*, BM).

Mid Western: **Karnali Zone, Mugu Distr.:** Pina near Rara (*O. Polunin et al. 4083*, BM, E, TI).

**33.9. *Euphorbia pseudosikkimensis* (Hurus. & Ya. Tanaka) Radcl.-Sm.**

Mid Western: **Karnali Zone, Dolpa Distr.:** Kaigaon area (*T. B. Shrestha 5086*, BM). **Rapti Zone, Rukum Distr.:** above Maikot (*Stainton et al. 3268*, E); Yamakar (*J. F. Dobremez 150*, BM).

Western: **Dhaulagiri Zone, Myagdi Distr. & Baglung Distr.:** Jalja La–Maraini (*M. Mikage et al. 9682665*, BM).

Central: **Bagmati Zone, Rasuwa Distr.:** Syabru–Lama Lodge (*H. Takayama et al. 9239102*, TI); Syarpagaon (*O. Polunin 140*, BM). **Sindhupalchok Distr.:** Kuri–Charikot (*H. Kanai et al. 674664*, KYO, TI). **Janakpur Zone, Ramechhap Distr.:** Shivalaya–Bhandar (*M. Wakabayashi et al. 9730017*, TI); Deorali–Serdingma (*H. Ohba et al. 8530104*, TI); Shivalaya–Deorali (*H. Ohba et al. 8570131*, E, TUS); en route from Shibalaya to Bhandar (*H. Tabata et al. 10242*, KYO). **Narayani Zone, Makawanpur Distr.:** Chitlang, 12 miles southwest of Kathmandu (*K. de B. Codrington 165*, BM). **Zone unknown:** (*Wallich, List no. 7694A*, BM, E, K, TI).

Eastern: **Koshi Zone, Sankhuwasabha Distr.:** Hatiya–Hongaon (*S. Noshiro et al. 9820041*, TI); Chyamtang (*L. W. Beer 12237A*, BM); Hatia Gola–Honkon (*H. Ohashi et al. 770416*, BM), (*H. Ohashi et al. 774736*, BM). **Mechi Zone, Taplejung Distr.:** Helok–Baroya Khimty (*H. Kanai et al. 6306781*, K, KYO, TI), (*H. Hara et al. 6306779*, KYO, TI); Iladanda–Helok (*H. Kanai et al. 6306338*, TI); Siling Tzokupa (*H. Hara et al. 6306780*, BM, KYO, TI); Thakpa Bazar–Ramsyang Pati (*M. Suzuki et al. 9240271*, TI); Sakathum–Amjilasa (*S. Noshiro et al. 9240516*, TI); Thunglung–Papung (*M. Suzuki et al. 9240058*, TI); Shewaden–Papung (*H. Kanai et al. 724036*, BM, TI); Shewaden–Mewa Khola (*H. Kanai et al. 720939*, BM); above Lelop (*T. Tuyama 6306778*, TI); S. W. of Amjilassa, Ghunsa Khola (*S. Crawford et al. KEKE 246*, E); Tamur Valley, Mewa Khola, S. E. of Topke Gola (*J. D. A. Stainton 325*, BM); Mewa Khola (*J. D. A. Stainton 7023*, BM), (*L. W. Beer 25685*, BM), (*L. W. Beer et al. 10626*, BM); between Wallun chun Gola and Pembu Tsoki (*K. Nishioka 797*, KYO). **Sagarmatha Zone, Solukhumbu Distr.:** near Chauri–Karka (Khumbu) (*J. H. Haas 2896*, BM); en route from Namche to Lamjo (*H. Tabata et al. 10746*, KYO). **Zone unknown:** Dongen (*L. W. Beer 25711*, BM).

Region unknown: Jansala (*S. Einarsson et al. 101a*, BM).

**33.10. *Euphorbia cashmeriana* Royle**

Far Western: **Seti Zone, Bajhang Distr.:** Rasa–Roshiadanda (*M. Suzuki et al. 9193368*,



TUS), (*M. Suzuki et al. 9160850*, BM); Khaptad–Kaudegaon (*M. Suzuki et al. 9161092*, BM); Godilekh (*H. Tabata et al. 2436*, KYO); Dhuli (*H. Tabata et al. 1618*, KYO). **Doti Distr.:** between Doti and Rhikula (*H. Tabata et al. 987*, KYO).

Mid Western: **Bheri Zone, Dailekh Distr.:** Lade to Subachhena (*K. R. Rajbhandari & B. Roy 2713*, KYO). **Surkhet Distr.:** Katukuwa–Ranimatta (*M. Suzuki et al. 9160061*, TI), (*M. Suzuki et al. 9193045*, TI). **Distr. unknown:** Chhanna to Bhabasen (*K. R. Rajbhandari & B. Roy 2877*, KYO). **Karnali Zone, Jumla Distr.:** Bibeya–Deula Deuli (*M. Minaki et al. 9108045*, BM); Jumla–Bibeya (*M. Minaki et al. 9104018*, BM), (*M. Minaki et al. 9105009*, E, TI), (*M. Minaki et al. 9109003*, TI); Jumla (*K. R. Rajbhandari & B. Roy 3303*, KYO). **Mugu Distr.:** Ghurchi Lekh (*K. R. Rajbhandari & B. Roy 3585*, KYO); Rara Lake (*H. Tabata et al. 2998*, KYO).

Region unknown: near Dudila (*Bis Ram 338*, BM).

### 33.11. *Euphorbia wallichii* Hook. f.

Far Western: **Seti Zone, Bajhang Distr.:** Ramkot (*J. F. Dobremez 2184*, BM).

Mid Western: **Bheri Zone, Dailekh Distr.:** Bhabasen to Mubu pass (*K. R. Rajbhandari & B. Roy 2905*, KYO), (*K. R. Rajbhandari & B. Roy 2906*, KYO). **Karnali Zone, Jumla Distr.:** Padmara, N. E. of Jumla (*O. Polunin et al. 4036*, BM, E); Chaudhabise Khola (*O. Polunin et al. 952*, BM, E); near Balangra Pass, between Jumla and Tibrikot (*O. Polunin et al. 2129*, BM, E); between Deoli Patan and Kuta (?) (*O. Polunin et al. 3183*, BM); Bundi Lagna, N. of Jumla (*J. D. A. Stainton 5434*, BM).

Western: **Dhaulagiri Zone, Baglung Distr.:** Okhaldhungagaon, S. of Dhorpatan (*Stainton et al. 353*, BM, E); Uttar Ganga, near Dhorpatan (*Stainton et al. 2628*, BM, E). **Mustang Distr.:** Ghasa, south of Tukucha, Kali Gandaki valley (*Stainton et al. 1534*, BM, E); Beside trail from Kuldi Ghar to Hinko (*C. Barclay & P. M. Synge 2369*, K). **Myagdi Distr.:** Valley of Konaban Khola, Dobang–Camp Site (*M. Mikage et al. 9681273*, TUS); Ghar Khola (*Stainton et al. 5409*, BM, E, TI); Gurjakhani (*Stainton et al. 2954*, BM). **Myagdi & Baglung Distr.:** Upper Valley of Gurjaghat Khola (*M. Mikage et al. 9682673*, TUS), (*M. Mikage et al. 9684213*, TUS). **Gandaki Zone, Gorkha Distr.:** Ganesh Himal Shiar Khola (*P. C. Gardner 451*, BM). **Kaski Distr.:** Rambrong, Lamjung Himal (*Stainton et al. 6000*, BM, E); Ban Thanti to Ghorepani Deorali (*H. Kanai 10335*, BM).

Central: **Bagmati Zone, Rasuwa Distr.:** between Thyangsyapu and Langtang, N. side of Langtang Khola (*S. Akiyama et al. 20100132*, TUS); E. of Thyangsyapu, N. side of Langtang Khola (*S. Akiyama et al. 20100129*, TUS); E. of Ghora Tabela, N. side of Langtang Khola (*S. Akiyama et al. 20100117*, TUS); Thale Patil–Mane (*Kanai & Malla 674944*, TI); Chilime and Langtang Valleys, Para Gaon (*H. Kanai & P. R. Shakya 672084*, TI); N. bank of Langtang Khola, Ghora Tabela (*D. G. Long & S. E. McDermott 21948*, E); Ankhu Khola, Jarung (*S. Bowes Lyon 104*, BM, E); Langtang (*Durham University Himalayan Expedition 105*, BM); Dunche Camp–Singum Gompa (*Unknown collector 673175*, KYO); Chilime and Langtan Valleys, Yatumbal–Oo Kharka (*H. Kanai & P. R. Shakya 672157*, KYO). **Distr. unknown:** Tsedang Pokhari–Panghu Danda (*Kanai & Malla 674664*, KYO). **Zone unknown:** Lamrak (*L. Dhevoj 192*, BM, E).

Eastern: **Sagarmatha Zone, Solukhumbu Distr.:** Taktor–Ringmo (*M. Wakabayashi et al. 9710056*, TI); Mopung–Thosa Kharka (*H. Ohba et al. 8530978*, E, TUS); Junbesi (*D. McCosh 26*, BM, E); Namche Bazar (*C. Stonor 35*, K); Solu Khola Johbesi (*J. D. A.*



*Stainton 4635*, BM); en route from Sallung to Ringmo (*H. Tabata et al. 10393*, KYO).

Region unknown: (*T. Wult 25*, E); Sosminkunb (Dhimsha) (*K. R. Fell 34*, BM); Jansala (*S. Einarsson et al. 79*, BM).

### 33.12. *Euphorbia luteoviridis* D. G. Long

Central: **Bagmati Zone, Rasuwa Distr.:** Trisuli valley, Mailung Khola (*S. Bowes Lyon 138*, BM, E); Paldol Base Camp—a Kharka (*F. Miyamoto et al. 9440086*, BM). **Distr. unknown:** Bhanjyang, N. of Kathmandu (*Grey-Wilson & Phillips 146*, BM); **Janakpur Zone, Dolakha Distr.:** Dakcho (*M. L. Dhwoj 13*, BM, E); Rolwaling Himal, Numbur (*K. Yoda s. n.*, 3 Jun. 1963, KYO).

Eastern: **Koshi Zone, Dhankuta Distr.:** Hile Chok—Ghopte (Tal Pokhari) (*H. Kanai et al. 720342*, BM). **Sankhuwasabha Distr.:** Chyakesha (*S. Noshiro et al. 9760355*, E, TUS); Cha Ding Kharka—Khongma (*M. Suzuki et al. 8821030*, E, TUS), (*M. Minaki et al. 9010170*, BM); Camp Site—Kipu Pokhari (*S. Noshiro et al. 9820089*, TI); Arun Valley, Kasuwa Khola, N. of Num (*J. D. A. Stainton 530*, BM, E, TI); Arun Valley, Maghang Khola (*J. D. A. Stainton 595*, BM, E, TI); ridge between Kauma and Shipton La (*D. G. Long et al. EMAK311*, E); Khongma (Kauma)—Shipton Pass (Keke la) (*M. Suzuki et al. 8850423*, E); Milke Danda (*L. W. Beer et al. 10085*, BM); between Tudam and Arun Khola (*L. W. Beer 9460*, BM). **Mechi Zone, Panchthar Distr.:** Phedung Danda (Budipani Kharka)—Gairi Kharka (*S. Noshiro et al. 9240919*, E). **Taplejung Distr.:** Bhitte Kharka—Iwanagi Kharka (*S. Noshiro et al. 9240842*, E). **Sagarmatha Zone, Okhaldhunga Distr.:** Lamche (Ramche?) Danda (*J. F. Dobremez 252*, BM). **Solukhumbu Distr.:** Kurki—Kharikhola (*M. Wakabayashi et al. 9720316*, TI); Chhatarwa—Kurke (*F. Miyamoto et al. 9592497*, TI); Chalem Kharka—Khola Kharka (*M. Wakabayashi et al. 9715087*, TI); N. of Khumgung (Khumbu) (*J. H. Haas 2959*, BM).

Region unknown: Pangchen La. (*F. M. Bailey 37*, BM).

### 33.13. *Euphorbia himalayensis* (Klotzsch) Boiss.

Far Western: **Seti Zone, Bajhang Distr.:** Saipal (*H. Tabata et al. 2000*, KYO). **Bajure Distr. & Bajhang Distr.:** Pategaon—Badigaon (*M. Suzuki et al. 9160690*, BM). **Doti Distr.:** Kapthadi (*H. Tabata et al. 1269*, KYO).

Mid Western: **Karnali Zone, Dolpa Distr.:** near Tarakot, Bheri River (*O. Polunin et al. 2396*, BM, E, TI); Tarakot (*S. Einarsson et al. 1424*, BM). **Humla Distr.:** between Chankheli Lagna and Darma (*O. Polunin et al. 4133*, BM, E, TI). **Jumla Distr.:** Sialgarhi, Chaudhabise Khola (*O. Polunin et al. 2070*, BM, E, TI); Chautha, Ghurchi Lagna (*O. Polunin et al. 4079*, E, TI).

Western: **Dhaulagiri Zone, Baglung Distr.:** Okhaldhungagaon, south of Dhorpatan (*Stainton et al. 372*, E, TI), (*Stainton et al. 369*, E); near Dhorpatan (*Stainton et al. 2659*, E, TI). **Myagdi & Baglung Distr.:** Jalja La—Maraini (*M. Mikage et al. 9682660*, TI). **Mustang Distr.:** Lete, Kali Gandaki valley (*Stainton et al. 5586*, E).

Central: **Zone unknown:** (*Wallich, List no. 7685*, K, E).

### 33.14. *Euphorbia stracheyi* Boiss.

Mid Western: **Karnali Zone, Humla Distr.:** Dozam Khola, near Simikot (*O. Polunin et al. 4252*, E, TI). **Jumla Distr.:** Bajari Binnu—the highest peak—pass—Camp Site (*M.*



*Minaki et al. 9104226*, TI); Babaria Lekh (Tibrikot–Jumla) (*O. Polunin et al. 2117*, E, TI).

Western: **Dhaulagiri Zone, Baglung Distr.**: between Purba and Puphal Daha (*H. Tabata et al. 3641*, KYO). **Mustang Distr.**: Alubari Kharka—a mountain ridge above Yak Kharka (*S. Noshiro et al. 20106042*, TI); a kharka–Damodar Kunda (*S. Noshiro et al. 20106173*, TI); Muktinath (*Y. Iokawa et al. 20020227*, TI); Syangmochen–Ghami (*S. Noshiro et al. 20106092*, TI). **Gandaki Zone, Gorkha Distr.**: Ganesh Himal (*M. Farille et al. 847084*, K). **Manang Distr.**: Trail to Tilicho (*C. Barclay & P. M. Synge 2484*, K), (*C. Barclay & P. M. Synge 2600*, K).

Central: **Bagmati Zone, Rasuwa Distr.**: E. side of Tajar Chu, N. of Kyangjin Gompa (*S. Akiyama et al. 20100159*, TUS); Gosainkund Lake (*Kanai & Malla 67492*, TI); Mul Kharka, Chilime Khola (*Kanai & Shakya 672226*, TI); Kyanging, Langtang Khola (*H. Kanai & P. R. Shakya 245*, TI).

Eastern: **Mechi Zone, Taplejung Distr.**: Saju Pokhari–Topke Gola (*H. Kanai et al. 724034*, TI); Topke Gola–Shinsade Kharka (*M. Suzuki et al. 9261026*, TUS); Deuma Kharka–Mongma Kharka–Tipta Kharka–Deuma Kharka (*M. Suzuki et al. 9240364*, E). **Sagarmatha Zone, Solukhumbu Distr.**: Namche Bazar (*Rikkyo University Petanze Team s. n.*, Apr. –May 1964, TI); (*collector unknown s. n.*, Sep. 1964, TI); Khumbu, Dingboche (*J. D. A. Stainton 7155*, E); Pheriche (*H. Tabata et al. 10679*, KYO); en route from Namchebazar to Phungitenga (*H. Tabata et al. 10628*, KYO).

Region unknown: Midway between Jengla and Tarag (*Grey-Wilson & Phillips 731*, K); Second to most west Camp (*S. Nakao & J. H. E. s. n.*, May 1953, KYO).

#### 34.1. *Chamaesyce hirta* (L.) Millsp.

Mid Western: **Bheri Zone, Dailekh Distr.**: Dugesar–Shrithan (*M. Suzuki et al. 9191068*, E). **Rapti Zone, Dangdeukhuri Distr.**: Ghorahi (*K. R. Rajbhandari & B. Roy 4899*, KYO). **Distr. unknown**: Phalabang (*O. Polunin et al. 653*, E).

Western: **Dhaulagiri Zone, Myagdi Distr.**: Beni–Babichor (*M. Mikage et al. 9681053*, TUS), (*M. Mikage et al. 9685058*, TUS); Babichor–Ratorunga (*M. Mikage et al. 9687074*, TUS); Kali valley near Beni (*Stainton et al. 2525*, E, TI); Tatopani, south of Dana, Kali Gandaki valley (*Stainton et al. 7562*, E); Mayangdi Khola, near Beni (*Stainton et al. 108*, E); Dana (*T. Hoshino et al. 9662058*, E). **Myagdi & Mustang Distr.**: Tatopani–Ghasa (*T. Hoshino et al. 9666056*, E, TUS), (*H. Ohba et al. 8330485*, E). **Kaski Distr.**: Pokhara City, Airport (*M. Mikage et al. 9552056*, E, TUS); Madi Khola (*J. D. A. Stainton 8776*, E). **Lamjung Distr.**: Madi Khola, Karelung (*Stainton et al. 5894*, E).

Central: **Bagmati Zone, Dhading Distr.**: Chauranghi–Sarentar (*T. Namba 0925013*, TI). **Kathmandu Distr.**: Kathmandu Air Port (*H. Hara et al. 6306782*, KYO, TI). **Nuwakot Distr.**: Trisuli Bazar (*M. Suzuki et al. 9485008*, E, TUS); Trisuli–Myobasu (*T. Namba 0923024*, KYO). **Sindhupalchok Distr.**: Kalingchok (*H. Kanai et al. 724098*, TI). **Janakpur Zone, Dolakha Distr.**: Rolwaling Himal (*M. Numata 233*, KYO); Rolwaling Himal, Chitare–Koretechap (*M. Numata 461*, KYO). **Narayani Zone, Bara Distr.**: Adhabar, vicinity of Parsa Wildlife Reserve Headquarter Office (*M. Mikage et al. 9552759*, TUS). **Chitawan Distr.**: Sauraha–Nandan Tal (*M. Mikage et al. 9614144*, E, TUS).

Eastern: **Koshi Zone, Dhankuta Distr.**: Dhikure–Gorikharka (*S. Noshiro et al.*



9760032, TUS). **Sankhuwasabha Distr.:** Apsuwa Doban–Pikhuwa (*S. Noshiro et al.* 9760522, TUS); Tumlingtar–Baireni Bagar (*S. Noshiro et al.* 9820121, TI); Mul Ghat–Dhan Khuta (*M. Ohsawa & P. R. Shakya* 1238, TI); below Lum Lum La (*M. Ohsawa & P. R. Shakya* 1915, TI); Arun valley, Chainpur (*J. D. A. Stainton* 1520, E, TI). **Mechi Zone, Panchthar Distr.:** Tharpu (*H. Hara et al. s. n.*, 26 Nov. 1963, TI). **Taplejung Distr.:** Khebang–below Siling Tzokupa (*H. Hara et al. s. n.*, 20 Nov. 1963, TI); Doban (*H. Kanai et al.* 721033, TI); Tamur valley, Dhankuta (*J. D. A. Stainton* 62, E, TI); Tamur valley, Taplejung (*Stainton et al.* 1267, E); Dumhan (*G. Murata et al. s. n.*, 31 Oct. 1963, TI). **Narayani Zone, Bara Distr.:** Patraia–Sakti, Mohar Khola (*Kanai & Bista* 11418, TI). **Sagarmatha Zone, Udayapur Distr.:** Beltar–Simule (*M. Mikage et al.* 9552988, E, TUS).

### 34.2. *Chamaesyce parviflora* (L.) Soják

Mid Western: **Karnali Zone, Mugu Distr.:** Gum, near Rara Daha (*O. Polunin et al.* 5174, BM, E, TI), (*O. Polunin et al.* 5189, BM, E).

Western: **Dhaulagiri Zone, Baglung Distr.:** Bhuli Khola, S. of Dhorpatan (*Stainton et al.* 324, BM). **Baglung & Myagdi Distr.:** Baglung–Ratnechour (*M. Mikage et al.* 9682105, BM, TUS); Baglung (*M. Mikage et al.* 9682068, TUS), (*M. Mikage et al.* 9682053, TUS); Beni–Ratnechour (*M. Mikage et al.* 9684311, TUS). **Myagdi Distr.:** Beni–Babichor (*M. Mikage et al.* 9681055, TUS), (*M. Mikage et al.* 9685073, TUS); Mayangdi Khola (*Stainton et al.* 4108, BM, E); Ranipauwa, north of Beni, Kali Gandaki valley (*Stainton et al.* 7613, BM). **Gandaki Zone, Kaski Distr.:** Pokhara–Naudanda Phedi (Naudhara Phedi) (*M. Suzuki et al.* 8881032, TI); Pokhara (*Stainton et al.* 6473, BM, E, TI), (*T. Wraber* 120, BM). **Lamjung Distr.:** Karelung, Madi Khola (*Stainton et al.* 5887, BM).

Central: **Bagmati Zone, Dhading Distr.:** Chauranghi–Sarentar (*T. Namba* 0925027, KYO). **Narayani Zone, Chitawan Distr.:** ca. 4 km E. of Mugling (*M. Mikage et al.* 9552044, TUS); Sauraha–Padampur (*K. Yoda et al.* 9614126, E, TUS); Loltscer–Bharatpur (*P. R. Shakya* 9112, BM); Tikoli, Rapti valley (*Williams & Stainton* 8252, K), (*Williams & Stainton* 8285, BM). **Zone unknown:** (*Wallich s. n.*, BM): Bassaria (*Buchanan s. n.*, 10 Mar. 1802, BM).

Eastern: **Koshi Zone, Dhankuta Distr.:** Lagowa–Leguwa (*S. Noshiro* 9760060, E, TUS).

### 34.3. *Chamaesyce hispida* (Boiss.) V. S. Raju & P. N. Rao

Far Western: **Seti Zone, Bajura Distr.:** Porakya–Serigaon (*M. Suzuki et al.* 9191339, TI); Aagar–Kinara (*M. Suzuki et al.* 9191493, TI); between Ukhadigaon and Jilli (*H. Tabata et al.* 2525, KYO).

Mid Western: **Karnali Zone, Jumla Distr.:** between Sukadhik and Ratopani (*H. Tabata et al.* 2775, KYO).

### 34.4. *Chamaesyce prostrata* (Aiton) Small

Far Western: **Seti Zone, Bajura Distr.:** Berma–Kolti (*M. Suzuki et al.* 9191282, E).

Mid Western: **Rapti Zone, Distr. unknown:** Phalabang (*O. Polunin et al.* 636, BM, E, TI).



Central: **Bagmati Zone, Kathmandu Distr.:** Kathmandu City, west of Chhetrapati, along Vishnumati River (*M. Mikage & K. Yonekura 9682018*, TUS); Kathmandu Air Port (*H. Hara et al. 6306783*, KYO, TI). **Narayani Zone, Bara Distr.:** south of Churiya (*M. Mikage et al. 9552801*, E, TUS). **Chitwan Distr.:** Rapti Valley (*O. Polunin et al. 3608*, TI).

Eastern: **Koshi Zone, Dhankuta Distr.:** Dhankuta (*H. Hara et al. s. n.*, 19 Oct. 1963, TI).

#### 34.5. *Chamaesyce thymifolia* (L.) Millsp.

Western: **Gandaki Zone, Kaski Distr.:** Pokhara (*T. Wraber 121*, BM). **Dhaulagiri Zone, Myagdi Distr.:** Beni–Babichor (*M. Mikage et al. 9685064*, TUS); Kali, Nr. Beni (*Stainton et al. 2520*, BM, E, TI).

Central: **Bagmati Zone, Nuwakot Distr.:** Horagaru (*M. Suzuki et al. 9485014*, TUS). **Narayani Zone, Chitwan Distr.:** Rapti Valley (*Polunin et al. 3608A*, BM).

Eastern: **Koshi Zone, Bhojpur Distr.:** Bumlingtar–Chewa Besi (*S. Noshiro et al. 9760577*, TUS). **Mechi Zone, Taplejung Distr.:** Dumhan (*G. Murata et al. s. n.*, 31 Oct. 1963, TI); Maewa Khola (*L. H. J. Williams 1031*, BM, TI). **Sagarmatha Zone, Khotang Distr. & Koshi Zone Bhojpur Distr.:** Dorpa Churi Danda–Deurali Danda (*M. Mikage et al. 9558201*, TUS). Region unknown: Sampi Khola (*P. C. Gardner 159*, BM, TI).

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<i>daltonii</i>	221	<i>patens</i>	208
<i>debilis</i>	203, 204	<i>pendulus</i>	204
<i>distichus</i>	196	<i>perlisensis</i>	190
<i>diversifolius</i> var. <i>longifolius</i>	218, 219	<i>pomaceus</i>	208
var. <i>wightiana</i>	219	<i>praetervisus</i>	186
<i>embergeri</i>	198, 200, 202, 316	<i>prieurianus</i>	193
<i>emblica</i>	195, 196, 315	<i>quadrangularis</i>	205
<i>erythrocarpus</i>	194	<i>rhamnoides</i>	205, 210
<i>flaxinifolius</i>	220	<i>reticulatus</i>	185, 191, 192, 315
<i>flexuosus</i>	191	<i>retusus</i>	208
<i>flueggeiformis</i>	191	<i>scandens</i>	193
<i>fraternus</i>	198, 202, 203, 317	<i>secundiflora</i>	189
<i>furticosus</i>	188	<i>sepiarius</i>	211
<i>glaucus</i>	155, 191, 314	<i>sikkimensis</i>	189, 314
<i>glomeratus</i>	197	<i>simplex</i>	185, 188, 313
<i>gracilipes</i>	189	var. <i>geminus</i>	188
<i>griffithii</i>	187	var. <i>oblongifolius</i>	188
<i>griseus</i>	191, 193	<i>sinensis</i>	193
<i>gymnanthus</i>	234	var. <i>dalbergioides</i>	193
<i>hamiltonianus</i>	189	sp.	204
<i>heyneanus</i>	217	<i>speciosus</i>	207
<i>hoffmeisteri</i>	182, 183	<i>spinescens</i>	193
<i>hookeri</i>	200	<i>stipulatus</i>	183
<i>jamaicensis</i>	193	<i>strictus</i>	207
<i>juniperinus</i>	155, 186	<i>suffultus</i>	209
var. <i>obovatus</i>	186	<i>takaoensis</i>	194
<i>lanceolarius</i>	220	<i>taxifolius</i>	196
<i>lepidocarpus</i>	198, 200, 202, 316	<i>tetrandrus</i>	196
<i>leschenaultii</i>	159, 185, 191, 194, 315	<i>tinctorius</i>	211
var. <i>tenellus</i>	205	<i>triandrus</i>	216
<i>lonphali</i>	203	<i>tristis</i>	210
<i>maderaspatensis</i>	185	<i>turbinatus</i>	209
<i>mairei</i>	197	<i>urinaria</i>	198, 200, 201
<i>malabaricus</i>	218	<i>velutinus</i>	217
<i>marginatus</i>	188	<i>virgatus</i>	189
<i>microcarpus</i>	193	<i>vitis-idaea</i>	210
var. <i>dalbergioides</i>	193	<i>Pierardia flaccida</i>	224
var. <i>geminus</i>	193	<i>sapida</i>	224

<i>Pinus</i>	192	var. <i>gardnerianus</i>	207
<i>Poinsettia cyathophora</i>	307	var. <i>genuinus</i>	207
<i>geniculata</i>	280	var. <i>intermedius</i>	207
<i>heterophylla</i>	280	var. <i>zeylanicus</i>	207
<i>prunifolia</i>	280	androgynus	204, 207, 318
<i>pulcherrima</i>	279	<i>ceratogymum</i>	205
Pseudanthaceae	155	<i>compressus</i>	205
Putranjiva	156, 171, 222	<i>gardnerianus</i>	207
<i>amblyocarpa</i>	222	<i>indicus</i>	207
<i>roxburghii</i>	222, 320	<i>macranthus</i>	207
<i>spaerocarpa</i>	222	<i>parviflorus</i>	207
Putranjivaceae	155	<i>pubescens</i>	205
<i>Pycnosandra timorensis</i>	222	quadrangularis	204, 205, 206, 210, 317
		var. <i>compressus</i>	205
		var. <i>puberulus</i>	205
<i>Reidia hamiltoniana</i>	189	<i>scandens</i>	207
<i>Rhamnus vitis-idaea</i>	210	<i>sumatranus</i>	207
Rhododendron	292	<i>zeylanicus</i>	207
<i>Ricinocarpus baillonianus</i>	305	<i>Scepa stipulacea</i>	225
<i>brachystachyus</i>	255	<i>Securinea virosa</i>	183
<i>decidius</i>	305	Schima	243
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<i>montanus</i>	261	<i>Stilago bunis</i>	229
<i>speciosus</i>	237	<i>diandra</i>	231
<i>spectabilis</i>	237	<i>lanceolaria</i>	231
<i>Rottlera alba</i>	252	<i>Stillingia baccata</i>	275
<i>ferruginea</i>	252	<i>cochinchinensis</i>	273
<i>mollissima</i>	236	<i>discolor</i>	273
<i>peltata</i>	248	<i>himalayensis</i>	270
<i>scabrifolia</i>	247	<i>lanceolaria</i>	273
<i>scandens</i>	247	<i>paniculata</i>	275
<i>tetracocca</i>	252	<i>Stipellaria mollis</i>	236
<i>tinctoria</i>	245	<i>Stylodiscus trifoliatius</i>	233
<i>Sapium baccatum</i>	274		
<i>cochinchinense</i>	273	<i>Tigllium klotzschianum</i>	267
<i>cordifolium</i>	236	<i>officinale</i>	268
<i>crassifolium</i>	229	<i>Tithymalus cognatus</i>	289
<i>daidece</i>	275	<i>cyathophorus</i>	307
<i>discolor</i>	273	<i>dracunculoides</i>	285
var. <i>wanhsienensis</i>	273	<i>edulis</i>	306
<i>eugeniaefolium</i>	273	<i>heterophyllus</i>	280
<i>hexandrum</i>	275	<i>himalayensis</i>	292
<i>insigne</i>	272	<i>longifolius</i>	288
var. <i>malabaricum</i>	272	<i>maddenii</i>	284
<i>lauri</i>	273	<i>proliferus</i>	282
<i>populifolium</i>	275	<i>prostratus</i>	303
Sauropus	170, 204	<i>prunifolia</i>	280
<i>albicans</i>	204, 207	<i>pseudosikkimensis</i>	288



<i>rosea</i>	308
<i>sikkimensis</i>	286
<i>stracheyi</i>	294
<i>tirucalli</i>	307
<i>tithymaloides</i>	308
<i>wallichii</i>	290
Tragia	171, <b>255</b> , 256
<i>filiformis</i>	239
<i>hispida</i>	256
<i>involucrata</i>	255, 256, <b>305</b> , 306
var. <i>genuina</i>	306
var. <i>rheediana</i>	256
<i>involucrata</i>	256
<i>montana</i>	256
sp.	255, <b>256</b> , 306, 326
<i>tenuis</i>	255
<i>trifida</i>	306
<i>volubilis</i>	255
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<i>hernandifolia</i>	242
<i>integerrima</i>	253
<i>macrophylla</i>	253
<i>macrostachya</i>	253
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<i>polycarpa</i>	253
Triadica	156, 172, <b>273</b>
<i>cochinchinensis</i>	<b>273</b> , 329
<i>sinensis</i>	273
Vernicia	156, 172, <b>270</b>
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<i>cordata</i>	270
<i>fordii</i>	<b>270</b>
<i>montana</i>	270
<i>Xamesike hypericifolia</i>	308

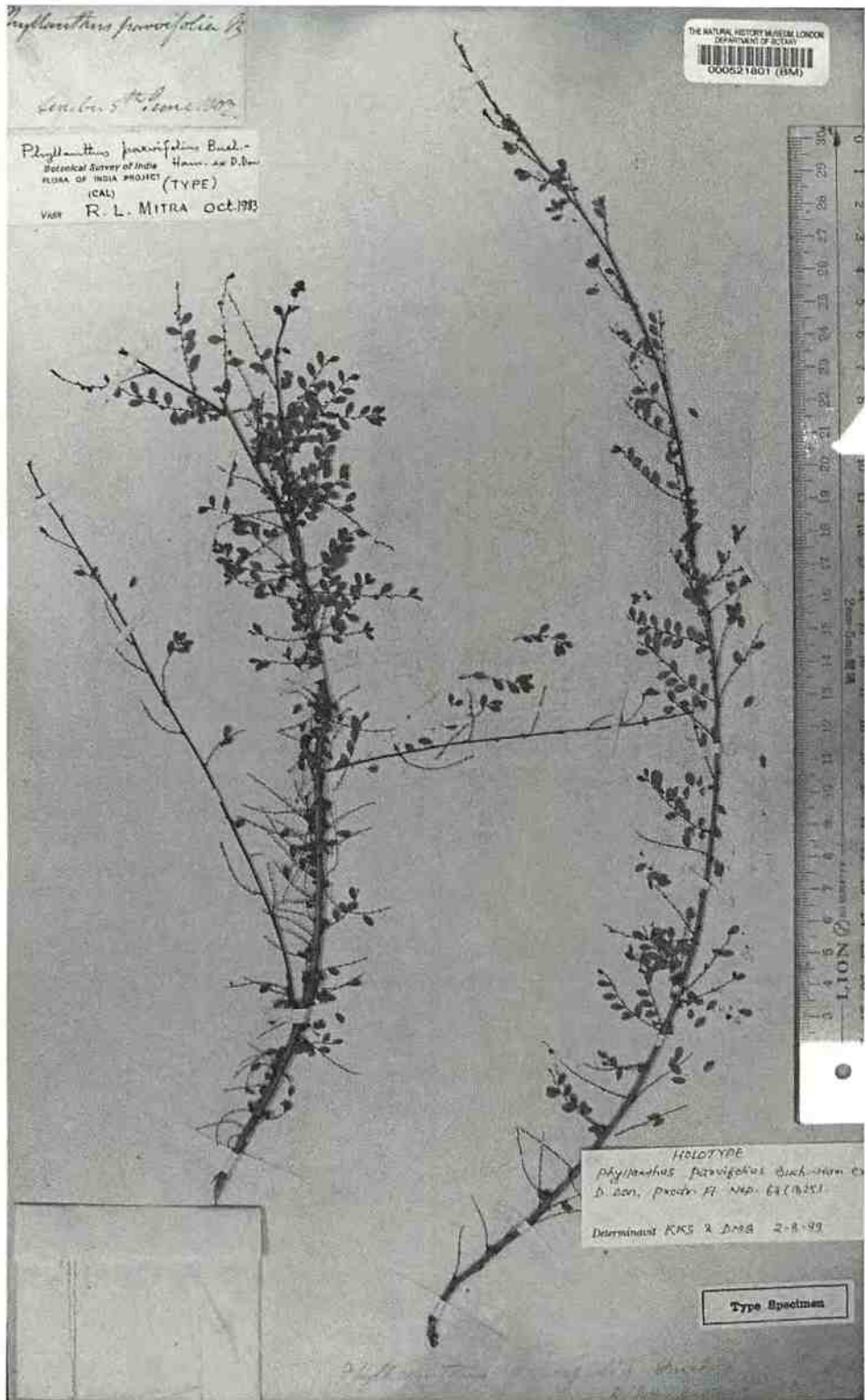


Plate 63. *Phyllanthus parvifolius* Buch.-Ham. ex D. Don (*Hamilton s. n.*, 5 June 1802, BM, holotype).





Plate 64. *Phyllanthus parvifolius* Buch.-Ham. ex D. Don (Wallich, List no. 7901B, K, syntype of *Phyllanthus juniperinus* Wall. ex Müll. Arg.).



Plate 65. *Phyllanthus glaucus* Wall. ex Müll. Arg. (Wallich, List no. 7927A, K-WALL, isotype).





FLORA OF NEPAL

*Phyllanthus clarkei* Hook. f. ?  
EUPHORBACEAE

WESTERN NEPAL: Gandaki zone: Syangja district: Andhi Khola, 300 m above conflux with Kali Gandaki, south bank, 83°36' & 27°55'N, in grassland near the river, 510 m.

Kåre A. Lye 17609

7/10-1991

181124/5

Plate 66. *Phyllanthus leschenaultii* Müll.Arg. (K. A. Lye 17609, E).



Plate 67. *Glochidion heyneanum* (Wight & Arn.) Wight (Wallich, List no. 7852 K-WALL, isotype of *Phyllanthus nepalensis* Müll. Arg.).





Plate 68. *Glochidion triandrum* (Blanco) C.B.Rob. (Wallich, List no. 7885, K-WALL, isotype of *Glochidion acuminatum* Müll. Arg.).



Plate 69. *Glochidion daltonii* (Müll.Arg.) Kurz (H. Ohba et al. 8340417, TI).



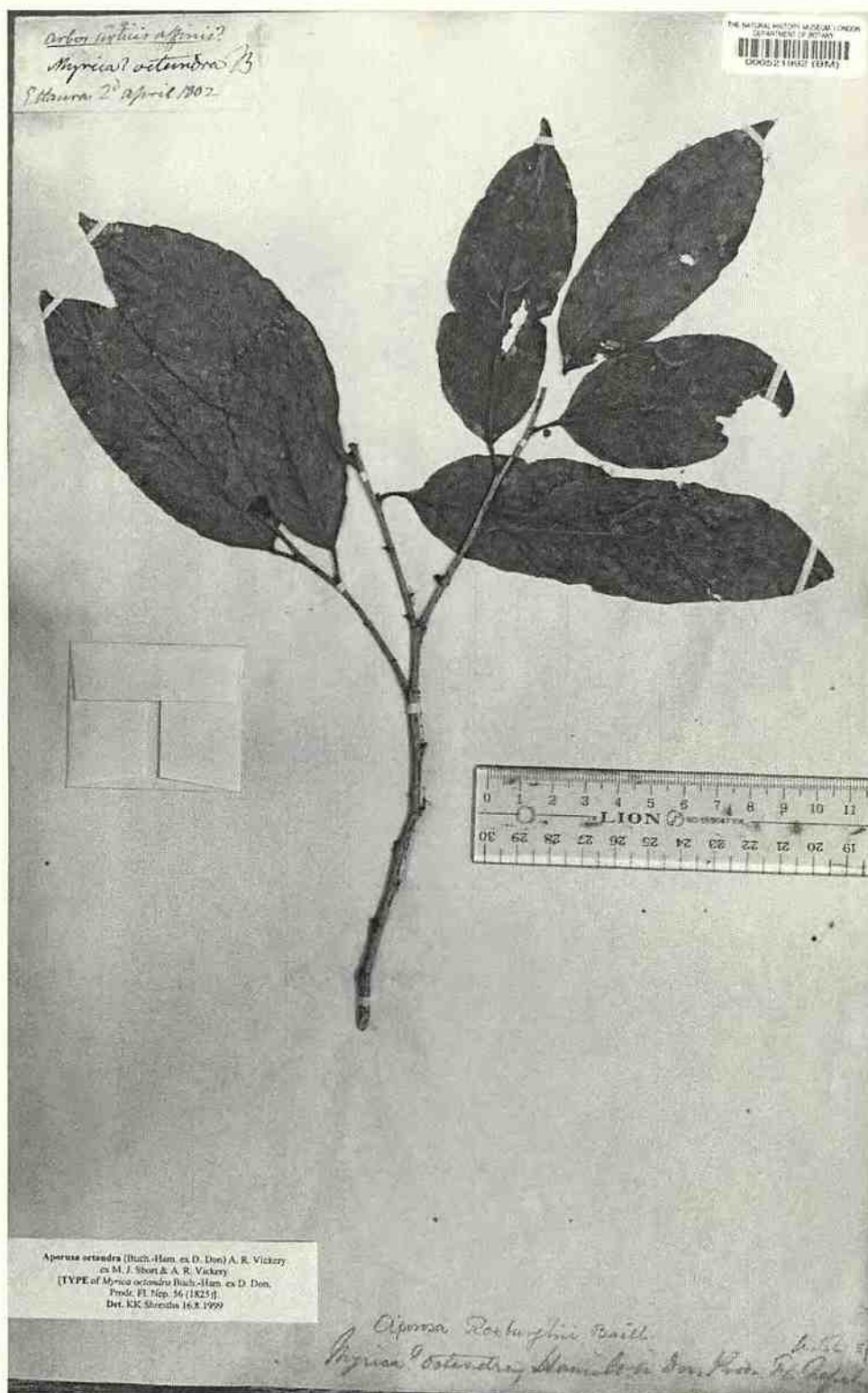


Plate 70. *Aporosa octandra* (Buch.-Ham. ex D. Don) A. R. Vickery (*Hamilton s. n.*, 2 April 1802, BM, holotype of *Myrica octandra* Buch.-Ham. ex D. Don).

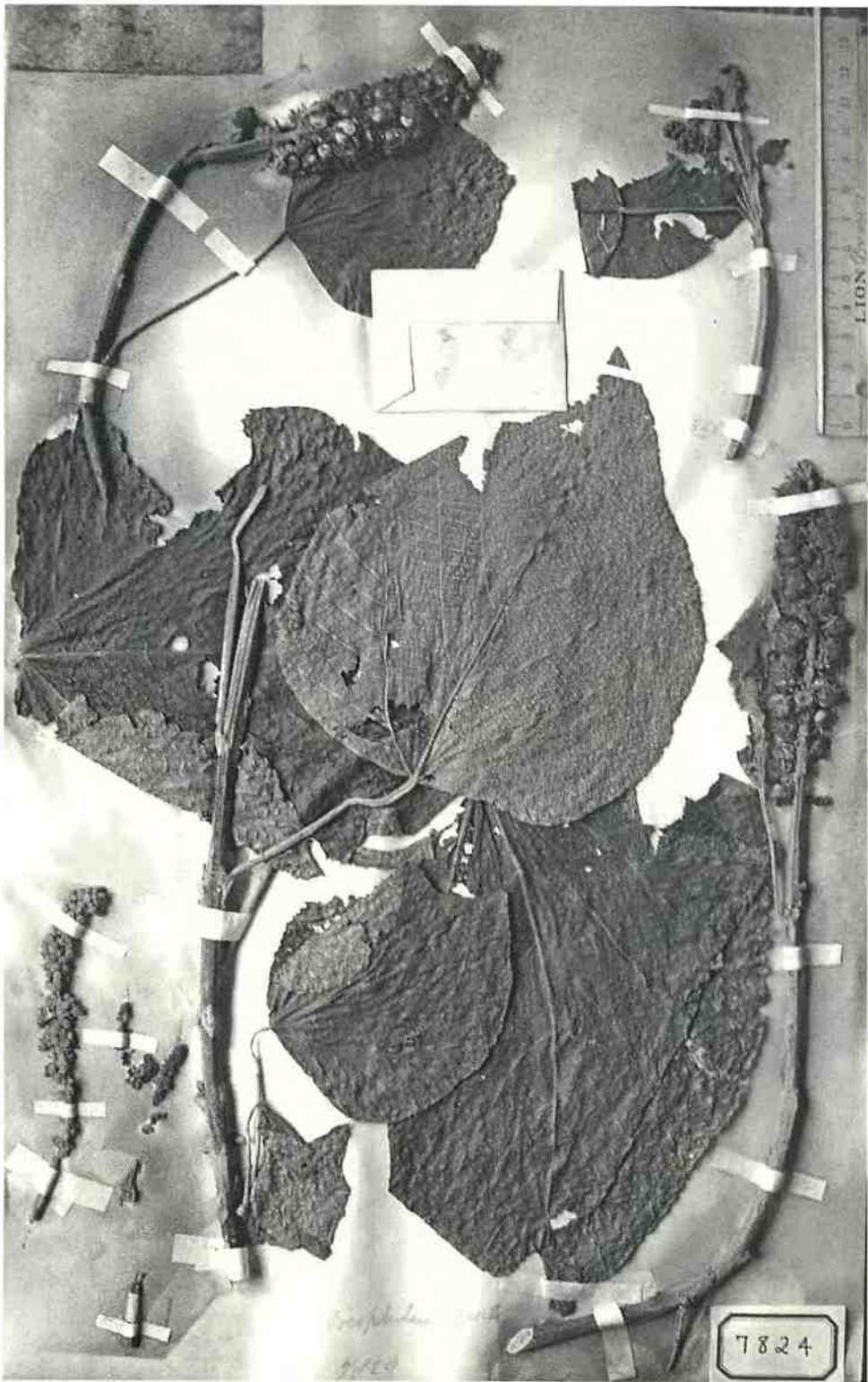
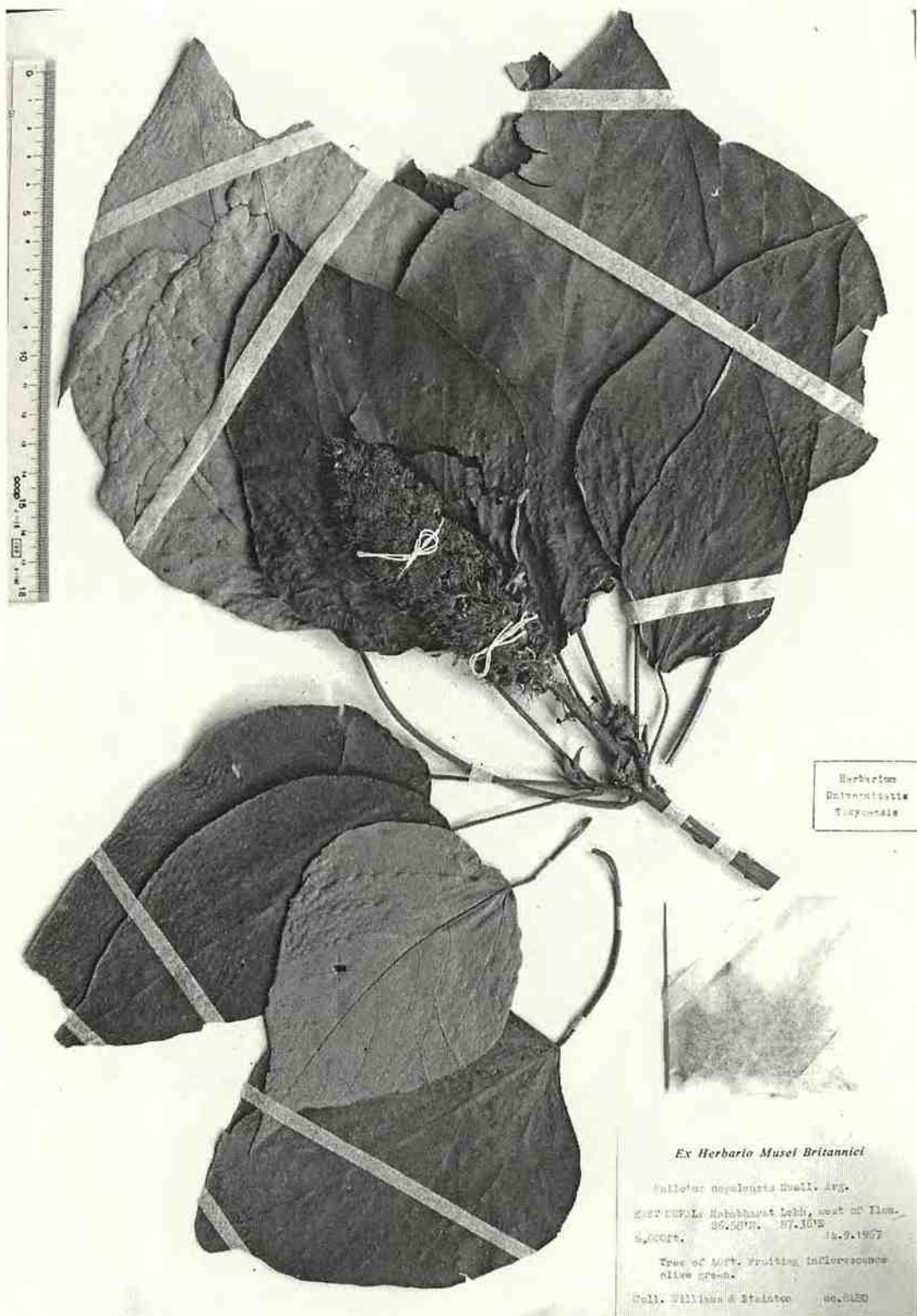


Plate 71. *Mallotus nepalensis* Müll.Arg. (Wallich, List no. 7824, K-WALL, isotype).





Herbarium  
Universitatis  
Tokyensis

*Ex Herbario Musaei Britannici*

*Mallotus oreophilus* Müll. Arg.

Dist. Nepal, Bababharat Lehi, west of Ilam,  
26,500 ft. 87,300 ft.

6,000 ft. 14,000 ft.

Tree of 50 ft. Fruiting inflorescence  
olive green.

Coll. Williams & Stainton 8480

Plate 72. *Mallotus oreophilus* Müll. Arg. (Williams & Stainton 8480, T1).

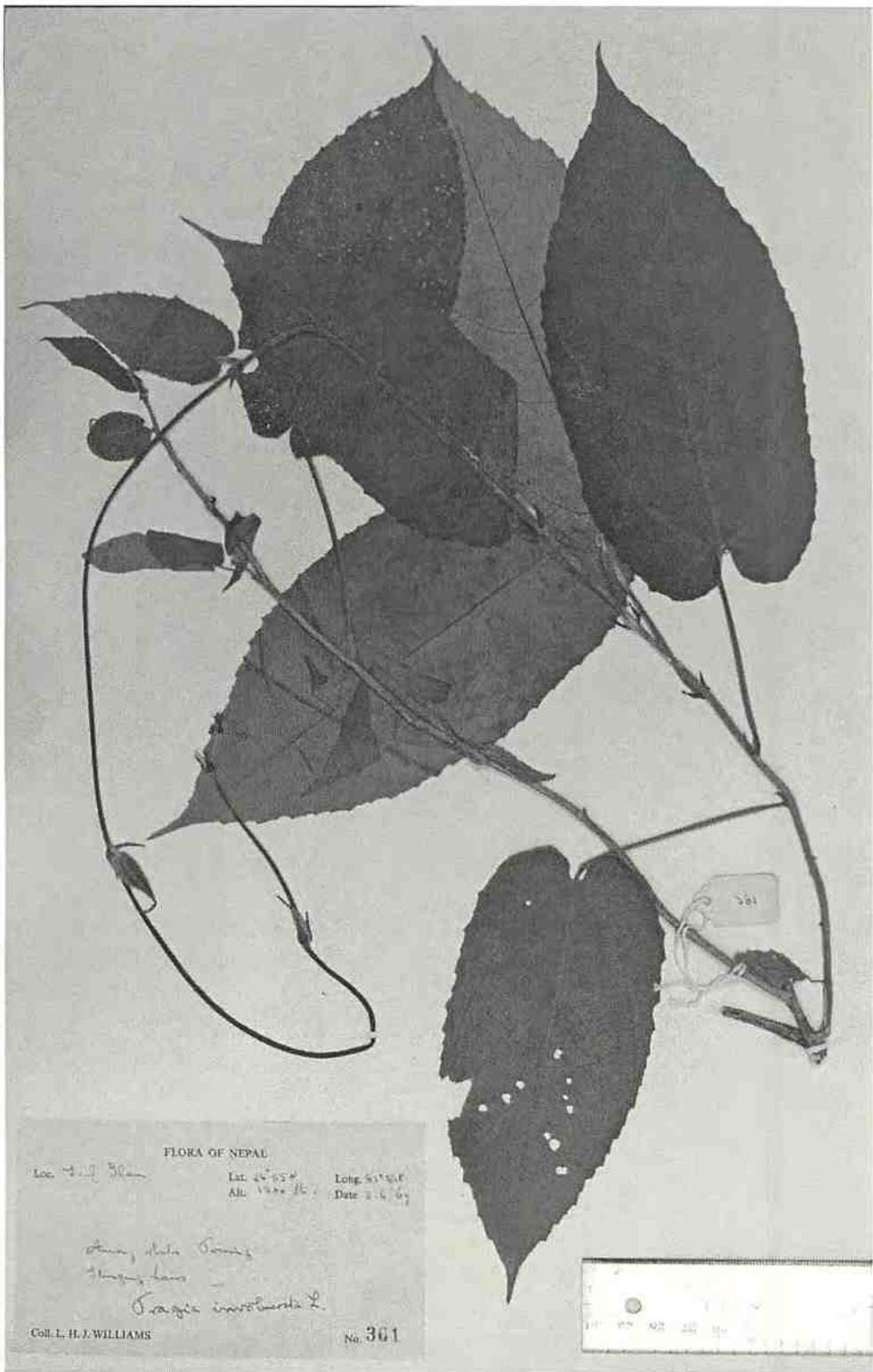


Plate 73. *Tragia* sp. (L. H. J. Williams 361, BM).



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000521005 (0001)



*Euphorbia fusiformis* Buch.-Ham. ex D. Don  
Type  
Determined: KKS + TPQ, 2 Aug. 1979

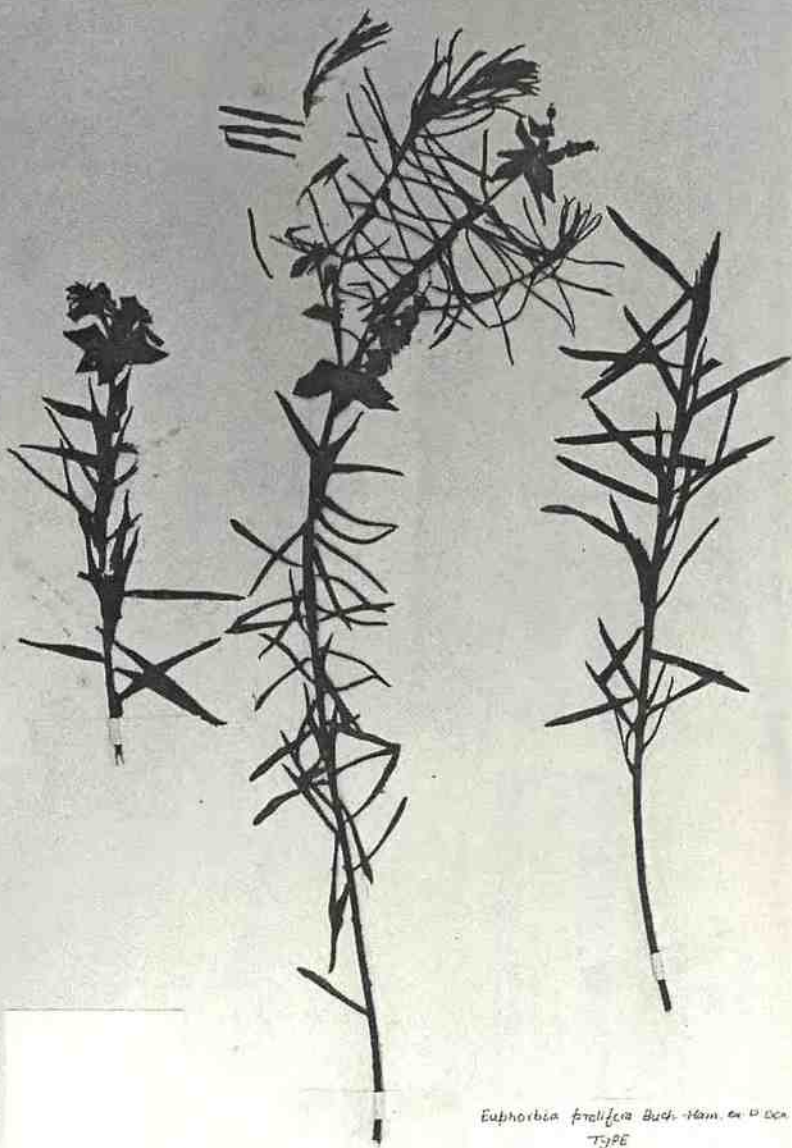
on back of sheet:  
"Nepal. Dr. Buchannan"

*Euphorbia fusiformis* Buch.-Ham. ex D. Don  
at Royal Botanic Garden Edinburgh

Plate 74. *Euphorbia fusiformis* Buch.-Ham. ex D. Don (Hamilton s. n., BM, holotype).

*Euphorbia prolifera* B. Knapton, J. B. B. B. B.

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000521807 (BM)



*Euphorbia prolifera* Buch.-Ham. ex D. Don  
TYPE

Determined KKS + DMB 2 Aug 1999

*Euphorbia prolifera* Hamilton s. n. Don. Herbar. Bot. Kew. p. 12  
*Euphorbia prolifera* Buch.-Ham. ex D. Don. Bot. Beechey, p. 157

Plate 75. *Euphorbia prolifera* Buch.-Ham. ex D. Don (Hamilton s. n., BM, holotype).



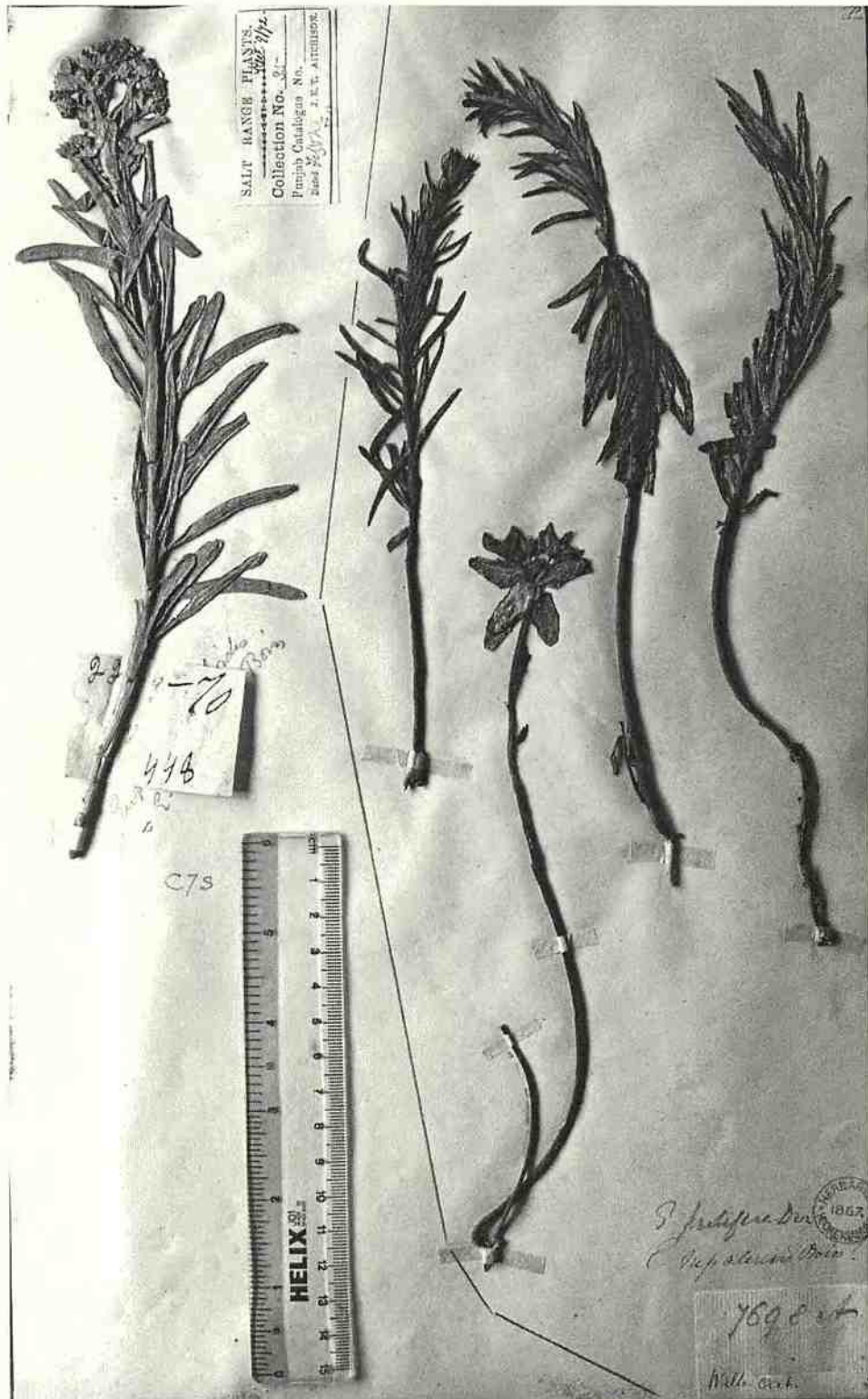


Plate 76. *Euphorbia prolifera* Buch.-Ham. ex D.Dont (Wallich, List no. 7698A, K, isotype of *Euphorbia nepalensis* Boiss.).

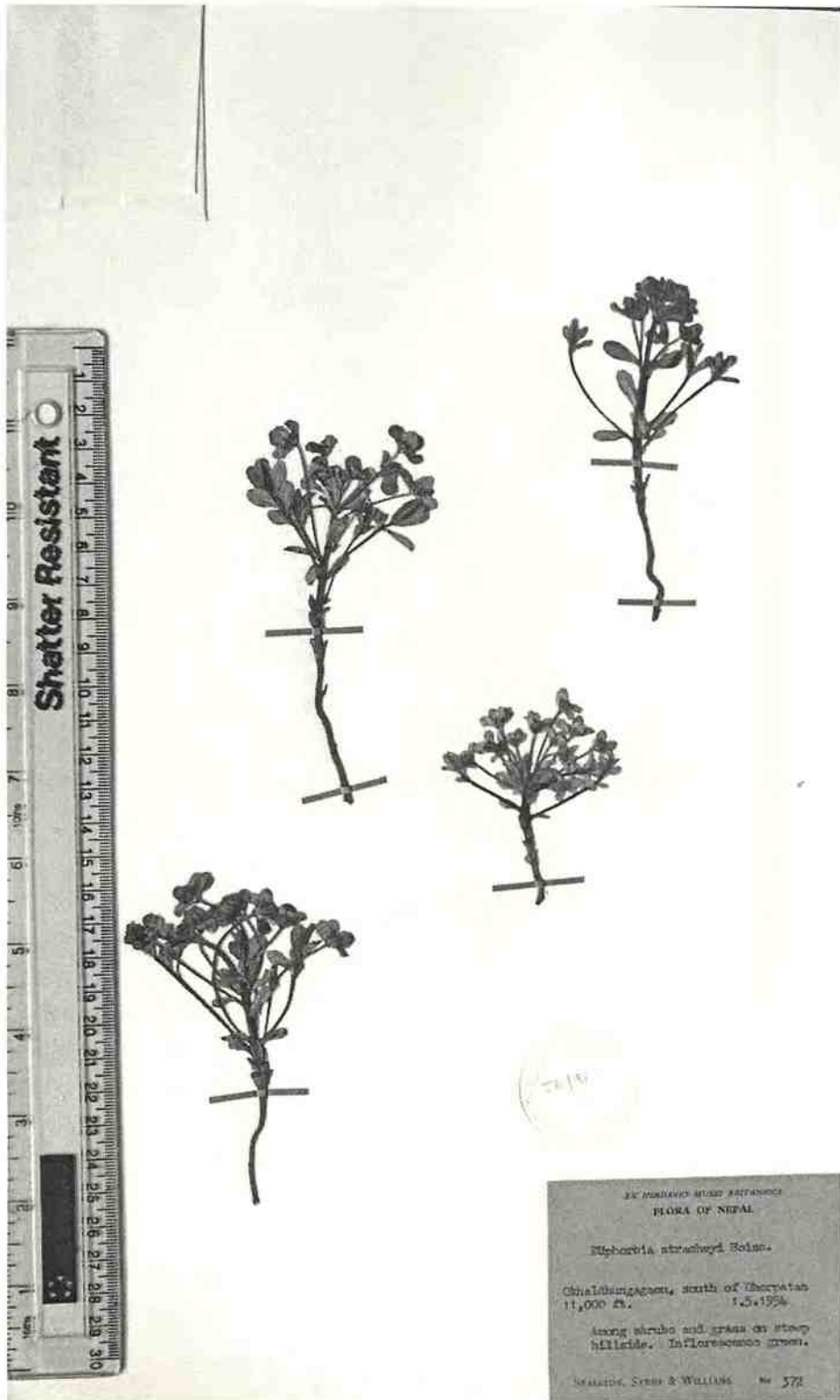


Plate 77. *Euphorbia himalayensis* (Klotzsch) Boiss. with short stem (Stainton et al. 372, E).



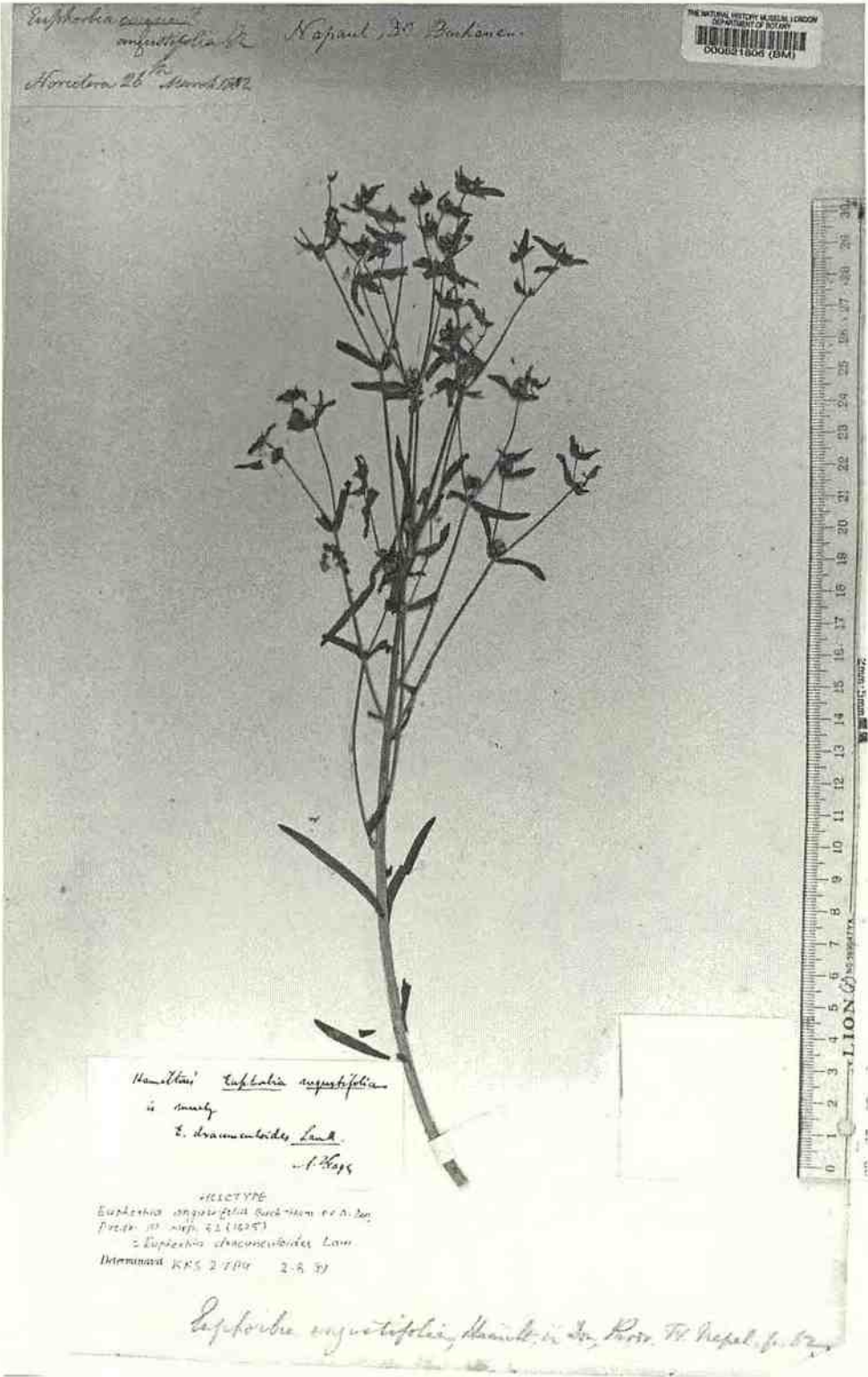
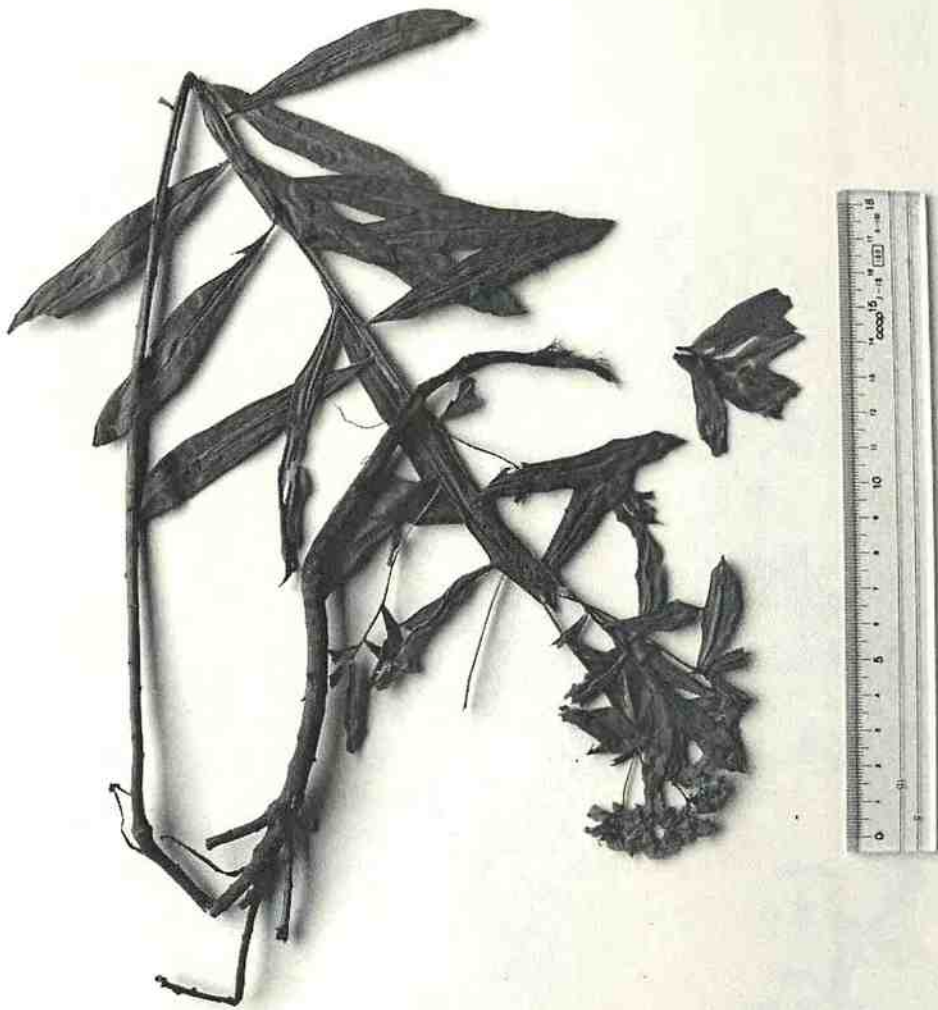


Plate 78. *Euphorbia dracunculoides* Lam. (Hamilton s. n., 26 March 1802, BM, holotype of *Euphorbia angustifolia* Buch.-Ham. ex D. Don).



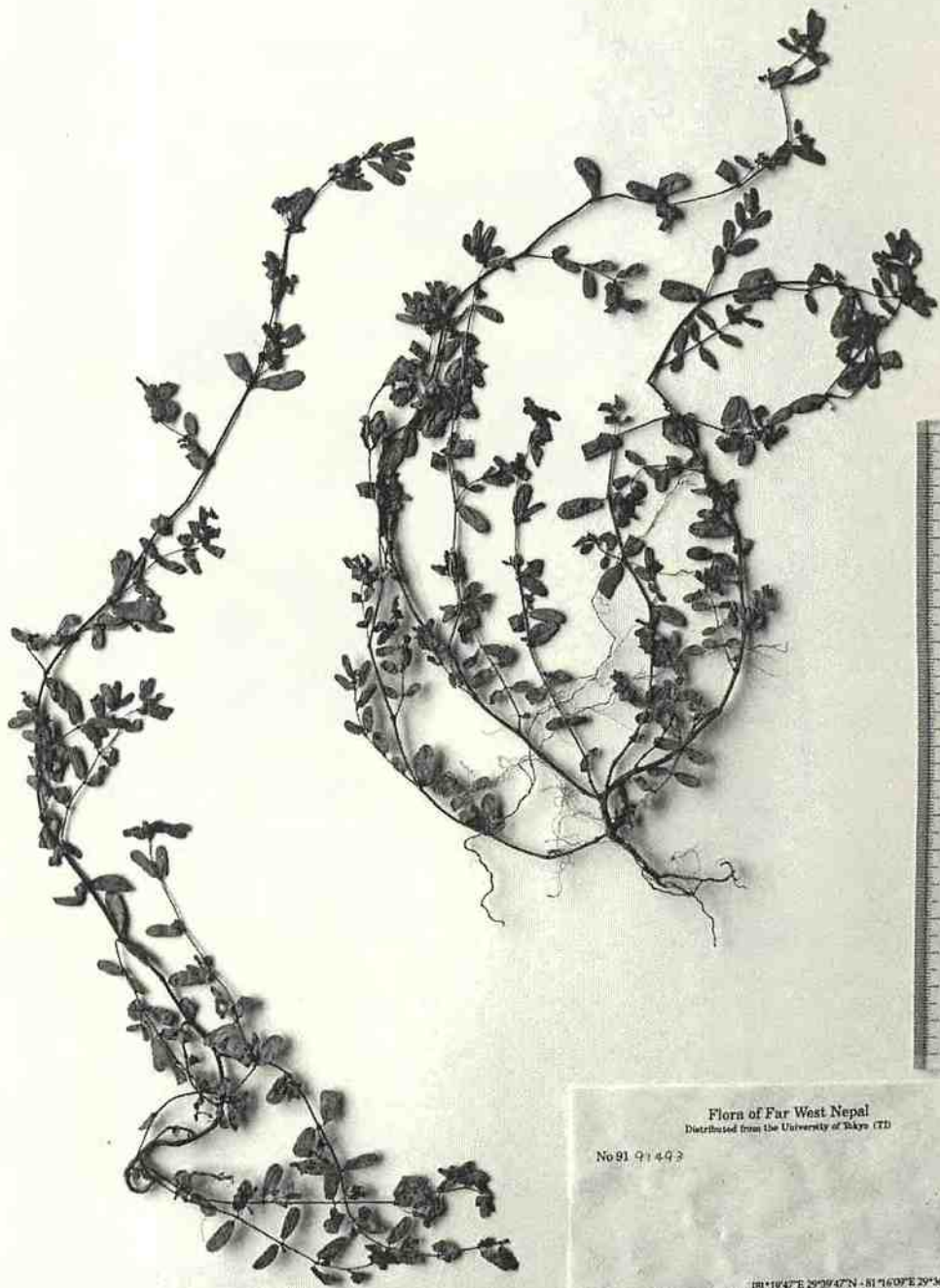
Flora of Far West Nepal  
 Distributed from the University of Tokyo (TD)  
 No 9193045

1945 m alt

[80°32'24"E 28°28'03"N - 81°37'39"E 28°41'28"N]  
 Far. W. Nepal, Inner Zone, Surkhet Dist., Kaskuwa (1360m) - Sidhapalla  
 (1870m) - Khatimasta (2170m).  
 30 July 1991 Herb. on roadside slope. Flowers yellow. Stem to 60 cm.  
 M Suzuki, H Hata, N Kurokaki, M Wajige, F Miyamoto, K R Rabhdhari,  
 H Takayama & K Terada

Plate 79. *Euphorbia cashmeriana* Royle (M. Suzuki et al. 9193045, T1).





Flora of Far West Nepal  
Distributed from the University of Tokyo (TD)

No 91 493

m. alt  
88°19'47"E 28°39'47"N - 81°16'07"E 29°36'12"N  
Far W Nepal: Seti Zone, Baling Dhar, Anar (1910m) - a pass (2180m) - a  
river (1860m) - a pass (2070m) - Sero (1780m) - Talkot (1650m) -  
Talokot Gad (1450m) - Kinara (1300m).

23 August 1991  
M Suzuki, H Hattori, N Kurosaki, M Mikage, F Miyamoto, K R Rajbansari,  
H Takayama & K Terada

Plate 80. *Chamaesyce hispida* (Boiss.) V. S. Raju & P. N. Rao (*M. Suzuki et al. 9191493, TI*).

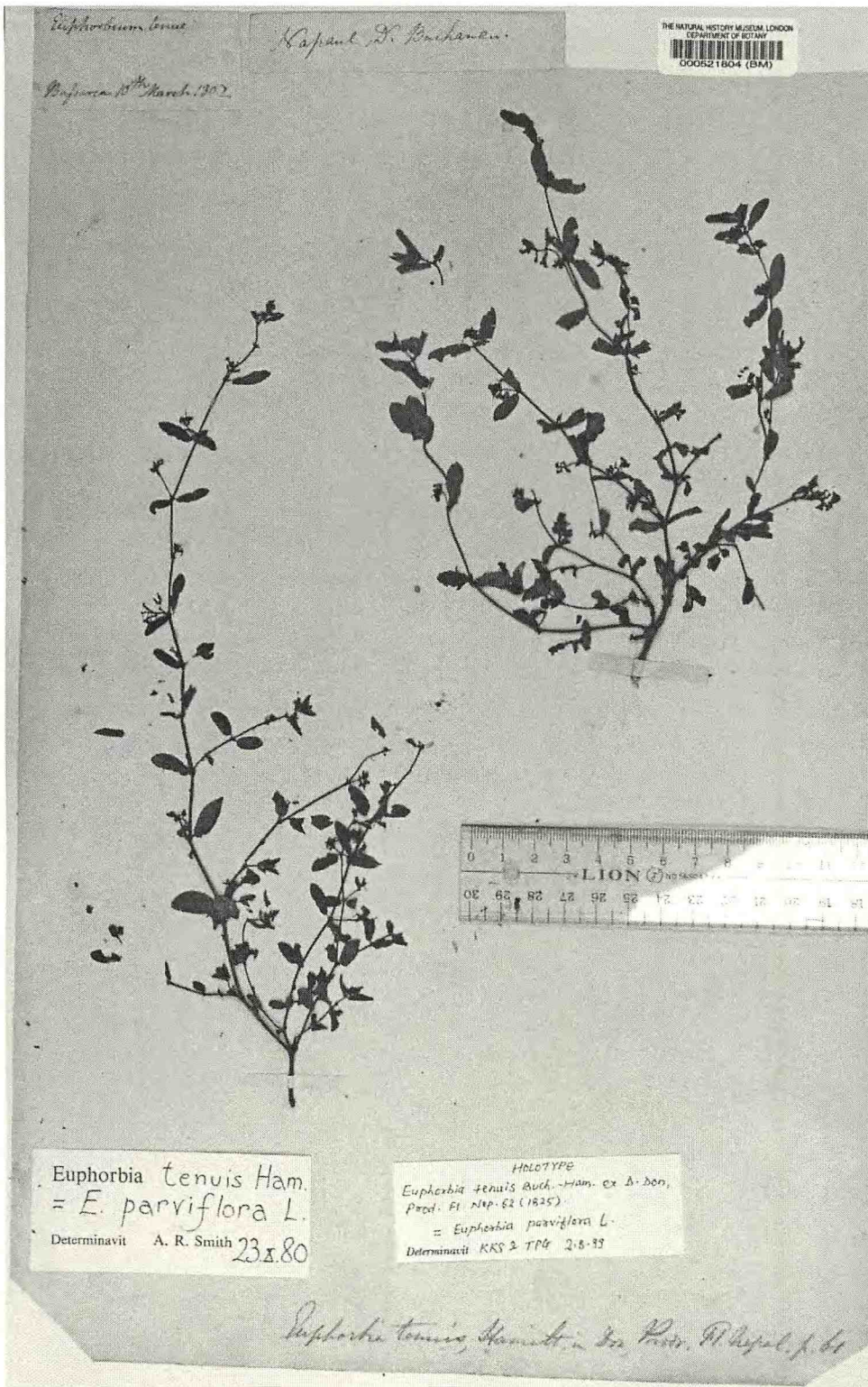


Plate 81. *Chamaesyce parvifolia* (L.) Soják (*Hamilton s. n.*, 10 March 1803, BM, holotype of *Euphorbia tenuis* Buch.-Ham. ex D. Don).



## WOOD STRUCTURE OF HIMALAYAN PLANTS, IV

Shuichi NOSHIRO, Akira TAKAHASHI, Chika MOURI, and Mitsuo SUZUKI

This is the fourth report on the wood structure of Nepal Himalayan woody plants. The first part of this series was published in *Himalayan Plants*, Volume 1, pp. 341–397; 1988 (ed. by H. Ohba and S.B. Malla), the second part was in *Himalayan Plants*, Volume 2, pp. 17–65; 1991 (ed. by H. Ohba and S.B. Malla), and the third part in *Himalayan Plants*, Volume 3, pp. 119–170; 1999 (ed. by H. Ohba). We describe here the wood structure of 35 species in three families: Berberidaceae (11 species), Coriariaceae (2), and Euphorbiaceae (22).

We made ten sets of microscopic slides for each wood sample. The microscopic slides of the previous parts will be deposited in the following institutes or laboratories: National Herbarium and Plant Laboratories, Department of Forestry and Plant Research, Nepal, Kathmandu; Department of Botany, the University Museum, University of Tokyo, Tokyo; Forestry and Forest Products Research Institute, Tsukuba; Wood Research Institute, Kyoto University; National Herbarium of the Netherlands, Leiden Branch, Leiden; Royal Botanic Gardens, Kew; Forest Products Laboratory, U.S. Department of Agriculture, Madison, Department of Biology, Faculty of Science, Tohoku University, Sendai, and Hyogo Prefectural Museum of Human and Nature, Sanda. Voucher herbarium specimens will be deposited in the following herbaria: the Department of Forestry and Plant Research (KATH), Nepal, Kathmandu, Department of Botany, the University Museum, University of Tokyo (TI), Tokyo, and Department of Biology, Faculty of Science, Tohoku University (TUS), Sendai.

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Asterisked specimens are those on which the descriptions and microscopic photographs are mainly based on.

### BERBERIDACEAE (Chika MOURI and Akira TAKAHASHI)

*Berberis angulosa* Wall. ex Hook. f. et Thoms.

[Plate 82]

Deciduous shrubs in the subalpine zone.

SPECIMENS. No. 9684253, d=1.5 cm, h=1.3 m, alt. 3740 m: Gandaki Zone, Myagdi Distr., Chhau Kharka (3680 m), M. Mikage et al., Sep. 19, 1996.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.1–1.0 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 36–80 and 35–70  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1.5–2.5  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 4.5–35 and 10–25  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 115–285  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 5–7  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, constituting ground mass of wood, but the wood mostly occupied by narrow vessel elements in very narrow growth rings. Fibers very short, 270–520  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–22.5 and 5–13(–16)  $\mu\text{m}$  in radial and tangential diameters, thin walled 1.3–3  $\mu\text{m}$  thick. Septate fibers invisible. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 2–2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, rarely uniseriate, 2–5 rays/mm in tangential section. Uniseriate rays 10  $\mu\text{m}$  wide and 3 cells, 75  $\mu\text{m}$  tall. Multiseriate rays (2–)3–10 cells and (15–)20–97(–210)  $\mu\text{m}$  wide, and (100–)300–7400 (or more)  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 10–25 x 3–12.5 x 35–90  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 20–90 x 10–21 x 10–43  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits round to horizontally elongated, about 3  $\mu\text{m}$  in horizontal diameter, with small oval or vertically elliptic apertures. Crystals absent.

*Berberis asiatica* Roxb. ex DC.

[Plate 83]

Evergreen shrubs in the temperate zone.

SPECIMENS. No. 9460185, d=3 cm, h=1.8 m, alt. 2010 m: Gandaki Zone, Manang Distr., Gup (1780 m), M. Suzuki et al., Aug. 3, 1994. No. 9460324, d=5 cm, h=1.5 m, alt. 1885 m: Gandaki Zone, Manang Distr., Dharapani (1850 m), M. Suzuki et al., Aug. 13, 1994. No. 9551040\*, d=7 cm, h=2.5 m, alt. 1400 m: Dhawalagiri Zone, Myagdi Distr., Ghara (1550 m) — Tatopani (1240 m), M. Mikage et al., Sep. 17, 1995.

DESCRIPTION. Wood ring porous or semi-ring porous; in the material of No. 9551040, ring porosity obscure because large pores present in late wood. Growth rings distinct or indistinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.5–3.0 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 52–117 and 40–110  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2–3  $\mu\text{m}$  thick, arranged in 1 row at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in late wood, 10–40 and 7.5–37.5  $\mu\text{m}$  in radial and



tangential diameters, with thin walls of 1  $\mu\text{m}$  thick. In the material of No. 9551040, pores evenly distributed from early wood to late wood.

Vessel elements short, 160–350  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 5–6  $\mu\text{m}$  in horizontal diameter, with small oblique slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers constituting ground mass of wood. Fibers short, 410–680  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 6–27.5 and 4–20  $\mu\text{m}$  in tangential and radial diameters, thin walled 2–2.5  $\mu\text{m}$ . Septate fibers visible. Pits on both radial and tangential walls, nearly simple or minutely bordered, 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–4 rays/mm in tangential section. Multiseriate rays (5–)8–17 cells and (65–)95–245(–275)  $\mu\text{m}$  wide, and (220–)475–1975  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 17.5–37.5 x (4–)6–30 x 50–210  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 28–87.5 x 12.5–35 s 20–55  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Ray vessel pits oval, 6–7 and 6–10  $\mu\text{m}$  in vertical and horizontal diameters. Crystals absent.

*Berberis ceratophylla* G. Don

[Plate 84]

Evergreen shrubs in the temperate zone.

SPECIMENS. No. 9686116, d=3 cm, h=2 m, alt. 2900 m: Gandaki Zone, Myagdi Distr., Maraini (2520 m) — Jalja La (3300 m), M. Mikage et al., Sep. 15, 1996.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.2–0.8 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 45–100 and 50–92  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2–3  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 7.5–40 and 12–43  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 175–350  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates. Intervessel pits alternate and dense, circular or horizontally oblong, 4–8  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, constituting ground mass of wood. Fibers very short, 280–610  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–29 and 4–26  $\mu\text{m}$  in radial and tangential diameters, thin walled 2.5–3  $\mu\text{m}$  thick. Septate fibers present among clusters of narrow vessel elements. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–3 rays/mm in tangential section. Multiseri-

ate rays (3–)11–13 cells and (40–)180–205  $\mu\text{m}$  wide, and (143–)1800–3175  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 8–32 x 5–17.5 x 40–117  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 26–85 x 8–25 x 20–50  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits round to horizontally elongated, 3–4  $\mu\text{m}$  in horizontal diameters with small oval or vertically elliptic apertures. Crystals absent.

*Berberis concinna* Hook. f. et Thoms. var. *extensiflora* Ahrendt

[Plate 85]

Semi-evergreen shrubs in the subalpine zone.

SPECIMENS. No. 9684190, d=1.5 cm, h=0.5 m, alt. 3400 m: Dhawalagiri Zone, Myagdi Distr., Ridge SE of Jalja La (3300 m), M. Mikage et al., Sep. 15, 1996.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.2–1.1 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 27.5–71 and 30–67.5  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 8–31 and 5–22.5  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 175–275  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates. Intervessel pits alternate and dense, circular or horizontally oblong, about 5  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, usually constituting ground mass of wood. Fibers short, 335–515  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–22 and 5–17  $\mu\text{m}$  in radial and tangential diameters, thin walled about 2.5  $\mu\text{m}$  thick. Septate fibers invisible. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, multiseriate, 3–4 rays/mm in tangential section. Multiseriate rays 3–9 cells and 40–90  $\mu\text{m}$  wide, and 660 to over 9400  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent cells partly sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 12.5–31 x 6–17 x 45–125  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 25–90 x 7–17.5 x 10–40  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits alternate and moderately spaced, round to horizontally elongated, about 2.5–4  $\mu\text{m}$  in diameter, with oval and vertically elliptic apertures, sometimes unilaterally compound. Crystals absent.

*Berberis hookeri* Lemaire

[Plate 86]

Evergreen shrubs in the temperate zone.

SPECIMENS. No. 9460308\*, d=2 cm, h=1.8 m, alt. 2690 m: Gandaki Zone, Manang Distr., Suggi Khoka (2570 m), M. Suzuki et al., Aug. 12, 1994. No. 9681253, d=1.2 cm, alt. 2625 m: Dhawalagiri Zone, Myagdi Distr., Dobang (2360 m) — Camp site (3300 m), M. Mikage et



al., Sep.8, 1996.

DESCRIPTION. Wood semi-ring porous. Growth rings distinct, delineated by radially flattened tracheary elements at the end of growth rings, narrow, 0.1–1.4 mm. Pores usually angular in outline, in clusters and in dendritic pattern in late wood, gradually reduced in size from the beginning of growth rings toward late wood, 7.5–41.3 and 6–35  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1–2  $\mu\text{m}$  thick.

Vessel elements short, 140–395  $\mu\text{m}$  long, end walls moderately oblique with simple perforation plates. Intervessel pits alternate and dense; pit borders circular to polygonal, 4–5  $\mu\text{m}$  in diameter, with oblique slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, constituting ground mass of wood. Fibers very short, 180–450  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 3.5–19  $\mu\text{m}$  in tangential diameter, walls 1.7–3  $\mu\text{m}$  thick. Septate fibers sometimes present. Pits on both radial and tangential walls, nearly simple or minutely circular bordered, about 1  $\mu\text{m}$  in diameter, with oblique slit-like small apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–4 rays/mm in tangential section. Multiseriate rays usually 3–10 up to 18 cells and 35–150 up to 320  $\mu\text{m}$  wide, and usually 0.3–1.3 mm, occasionally more than 10 mm tall, with 1–3 marginal cells; consisting of procumbent, square, and upright cells; central cores of procumbent cells partly sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 12–27 x 6–22 x 35–120  $\mu\text{m}$  in vertical, tangential, and radial diameters, respectively. Square or upright cells elliptic or vertically oblong in tangential section, 22–153 x 13–24 x 18–52  $\mu\text{m}$  in vertical, tangential, and radial diameters, respectively. Vessel-ray pits rare, small round or elliptic. Crystals absent.

*Berberis koehneana* Schneid.

[Plate 87]

Deciduous shrubs in the subalpine zone.

SPECIMENS. No. 9460361\*, d=5 cm, alt. 3170 m: Gandaki Zone, Manang Distr., Humre (3210 m), M. Suzuki et al., Aug. 16, 1994. No. 9460364, d=1.2 cm, h=1.3 m, alt. 3250 m: Gandaki Zone, Manang Distr., Humre (3210 m), M. Suzuki et al., Aug. 16, 1994. No. 9965171, d=1.0 cm, h=0.4 m, alt. 3250 m: Dhawalagiri Zone, Mustang Distr., Eklebatti (2780 m) — Jharkot (3500 m), M. Mikage et al., Aug. 18, 1999. No. 9965172, d=1.0 cm, h=1 m, alt. 3280 m: Dhawalagiri Zone, Mustang Distr., Eklebatti (2780 m) — Jharkot (3500 m), M. Mikage et al., Aug.18, 1999. No. 9965175, d=1.5 cm, h=2 m, alt. 3300 m: Dhawalagiri Zone, Mustang Distr., Jharkot (3500 m), M. Mikage et al., Aug. 18, 1999. No. 9965179, d=1.5 cm, h=0.3 m, alt. 3420 m: Dhawalagiri Zone, Mustang Distr., Jharkot (3500 m) — Muktinath (3800 m), M. Mikage et al., Aug. 20, 1999. No. 20100432, d=3 cm, h=3 m, alt. 3140 m: Bagmati Zone, Rasuwa Distr., Langtang (3380 m), S. Akiyama et al., May.23, 2001. No. 20100433, d=3 cm, h=3 m, alt. 3110 m: Bagmati Zone, Rasuwa Distr., Langtang (3380 m), S. Akiyama et al., May. 23, 2001.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.6–1.0(–1.3) mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 39–142 and 36–110  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2–2.5  $\mu\text{m}$  thick, arranged

in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 10–36 and 12–38  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 125–315  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates. Intervessel pits alternate and dense, circular or horizontally oblong, 4–6  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, usually constituting ground mass of wood. Fibers very short, 230–520  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–25 and 6.5–20  $\mu\text{m}$  in radial and tangential diameters, thin walled about 2–2.5  $\mu\text{m}$  thick. Septate fibers invisible. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, multiseriate, 2–5 rays/mm in tangential section. Multiseriate rays 3–12 cells and 40–150  $\mu\text{m}$  wide, and 200–2825  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 8–26 x 8–20 x 40–152.5  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 20–140 x 12.5–20 x 20–45  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits alternate and moderately spaced, round to horizontally elongated, about 2.5–4  $\mu\text{m}$  in diameter, with oval and vertically elliptic apertures, sometimes unilaterally compound. Prismatic crystals and druses present in ray cells only in the material of No. 9460361.

*Berberis mucrifolia* Ahrendt

[Plate 88]

Deciduous shrubs in the temperate zone.

SPECIMENS. No. 9460444, d=2.1 cm, alt. 2615 m: Dhawalagiri Zone, Mustang Distr., Syang (2620 m), M. Suzuki et al., Aug. 24, 1994. No. 9551061\*, d=1.3 cm, h=2 m, alt. 2430 m: Dhawalagiri Zone, Mustang Distr., Ghasa (2020 m) — Tukuche (2590 m), M. Mikage et al., Sep. 19, 1995. No. 9965163, d=0.8 cm, h=0.3 m, alt. 2960 m: Dhawalagiri Zone, Mustang Distr., Eklebhatti (2780 m) — Jharkot (3500 m), M. Mikage et al., Aug. 18, 1999. No. 9965184, d=1.0 cm, h=0.3 m, alt. 2620 m: Dhawalagiri Zone, Mustang Distr., Marpha (2635 m), M. Mikage et al., Aug. 22, 1999. No. 9965185, d=1.0 cm, h=0.3 m, alt. 2600 m: Dhawalagiri Zone, Mustang Distr., Marpha (2635 m), M. Mikage et al., Aug. 22, 1999.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.3–0.8 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential clusters of 2–3, 32.5–78 and 25–71  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2.5–3  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 7.5–32 and 10–22.5  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 190–320  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 3–6  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.



Non-perforated tracheary elements fibers, usually constituting ground mass of wood, but the wood mostly occupied by narrow vessel elements when growth rings width very narrow. Fibers very short, 250–540  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–18(–28) and 6–15  $\mu\text{m}$  in radial and tangential diameters, thin walled about 2–2.5  $\mu\text{m}$  thick. Septate fibers present. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 1.5–2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, uniseriate and 2–5 seriate, 2–4 rays/mm in tangential section. Uniseriate rays 2–10 cells and 50–245  $\mu\text{m}$  tall. Multiseriate rays 2–5 cells and 25–75  $\mu\text{m}$  wide, and 120–2675  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells. Procumbent cells round or elliptic in tangential section, 12–30 x 8–15 x 35–85  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 22–92 x 12.5–22.5 x 12–53  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits alternate and moderately spaced, round to horizontally elongated, about 2.5–4  $\mu\text{m}$  in diameter, with oval and vertically elliptic apertures, sometimes unilaterally compound. Crystals absent.

*Berberis sikkimensis* (Schneid.) Ahrendt var. *baileyi* Ahrendt

[Plate 89]

Evergreen shrubs in the temperate zone.

SPECIMENS. No. 9460202, d=3.5 cm, alt. 2495 m: Gandaki Zone, Gorkha Distr., Namru (2500 m), M. Suzuki et al., Aug. 4, 1994. No. 9460305, d=5 cm, h=3 m, alt. 2740 m: Gandaki Zone, Manang Distr., Suggi Khola (2570 m), M. Suzuki et al., Aug. 12, 1994. No. 9460454\*, d=7 cm, h=5 m, alt. 2460 m: Dhawalagiri Zone, Mustang Distr., Kothethati (2410 m), M. Suzuki et al., Aug. 25, 1994. No. 9551013, d=6 cm, h=2.5 m, alt. 2015 m: Gandaki Zone, Kaski Distr., Ulleri (2020 m) — Banthanti (2200 m), M. Mikage et al., Sep. 16, 1995. No. 9551049, d=4 cm, h=2.5 m, alt. 2030 m: Dhawalagiri Zone, Mustang Distr., Ghasa (2020 m) — Tukche (2590 m), M. Mikage et al., Sep. 19, 1995. No. 9551051, d=2.7 cm, h=8 m, alt. 2180 m: Dhawalagiri Zone, Mustang Distr., Ghasa (2020 m) — Tukche (2590 m), M. Mikage et al., Sep. 19, 1995. No. 9551059, d=2.5 cm, h=3 m, alt. 2420 m: Dhawalagiri Zone, Mustang Distr., Ghasa (2020 m) — Tukche (2590 m), M. Mikage et al., Sep. 19, 1995. No. 9684167, d=3 cm, h=2 m, alt. 2400 m: Gandaki Zone, Myagdi Distr., Dhara Khola (2160 m) — Maraini (2520 m), M. Mikage et al., Sep. 14, 1996. No. 9686043, d=5.5 cm, h=2.5 m, alt. 2700 m: Gandaki Zone, Myagdi Distr., Dobang (2360 m) — Camp site (3300 m), M. Mikage et al., Sep. 8, 1996. No. 9687238, d=2.5 cm, h=3 m, alt. 2340 m: Gandaki Zone, Myagdi Distr., Lapche Kharka (2060 m) — Dobang (2360 m), M. Mikage et al., Sep. 10, 1996. No. 20100407, d=11 cm, h=5 m, alt. 2350 m: Bagmati Zone, Rasuwa Distr., Bamboo (1980 m) — Lama Hotel (2480 m), S. Akiyama et al., May. 18, 2001. No. 20100414, d=8 cm, h=4 m, alt. 2850 m: Bagmati Zone, Rasuwa Distr., Lama Hotel (2480 m) — Ghora Tabela, S. Akiyama et al., May. 19, 2001.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.3–3.4 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 46–150 and 35–123  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 3–4  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 5–35 and 6–31  $\mu\text{m}$  in radial and tangential diameters, with thin walls

of 1  $\mu\text{m}$  thick.

Vessel elements short, 220–351  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 3–7.5  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, constituting ground mass of wood. Fibers short, 265–740  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–21 and 5–20  $\mu\text{m}$  in radial and tangential diameters, thin walled 2.5  $\mu\text{m}$  thick. Septate fibers present among clusters of narrow vessel elements. Pits on both radial and tangential walls, nearly minutely bordered, about 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–3 rays/mm in tangential section. Multiseriate rays (4–)8–15 cells and (45–)70–150  $\mu\text{m}$  wide, and 480–2875  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 9.5–27 x 6–17 x (28–)40–170  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 20–107 x (25–)12.5–20 x (11–)25–41  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Ray vessel pits round to horizontally elongated, 6–7 and 5–15  $\mu\text{m}$  in vertical and horizontal diameters with small oval or vertically elliptic apertures, sometimes unilaterally compound. Crystals absent.

*Berberis tsarica* Ahrendt

[Plate 90]

Deciduous shrubs in the subalpine zone.

SPECIMENS. No. 9460249, d=1.2 cm, h=0.6 m, alt. 3530 m: Gandaki Zone, Gorkha Distr., Thangmanang Kharka (3730 m), M. Suzuki et al., Aug. 7, 1994. No. 9460389\*, d=1.2 cm, h=0.6 m, alt. 3985 m: Gandaki Zone, Manang Distr., Churi Lattar (4000 m), M. Suzuki et al., Aug. 18, 1994.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.1–0.8 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 35–84 and 27.5–87.5  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2–3  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 4–27.5 and 12–27.5  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 190–305  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 3.5–5  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements. Vessel elements sometimes contain brown gum.

Non-perforated tracheary elements fibers, constituting ground mass of wood, but the wood mostly occupied by narrow vessel elements when growth rings width very narrow. Fibers very short, 205–590  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–26(–32) and 3–17.5  $\mu\text{m}$  in radial and tangential diameters, thin walled about 2.5  $\mu\text{m}$  thick. Septate fibers invisible. Pits on both radial and tangential walls, nearly simple to minutely



bordered, about 2–2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–4 rays/mm in tangential section. Multiseriate rays (2–)5–10 cells and (15–)55–160(–290)  $\mu\text{m}$  wide, and (120–)480–3850  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; central cores of procumbent and square cells sheathed by square and upright cells. Procumbent cells round or elliptic in tangential section, 14–29 x 10–20 x 40–95  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 26–160 x 11–25 x 17–50  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits alternate and moderately spaced, round to horizontally elongated, about 3–5  $\mu\text{m}$  in diameter, with oval and vertically or horizontally elliptic apertures, sometimes unilaterally compound. Crystals absent.

*Berberis umbellata* Wall. ex G. Don

[Plate 91]

Evergreen shrubs in the temperate and subalpine zone.

SPECIMENS. No. 9460143\*, d=2.5 cm, h=3 m, alt. 3125 m: Gandaki Zone, Gorkha Distr., Lungdang Gompa (3150 m), M. Suzuki et al., Jul. 30, 1994. No. 9460252, d=3.0 cm, h=2.5 m, alt. 3340 m: Gandaki Zone, Gorkha Distr., Syallagaon (3300 m), M. Suzuki et al., Aug. 7, 1994. No. 9460298, d=4.5 cm, h=4 m, alt. 3010 m: Gandaki Zone, Manang Distr., Bimtang (3350 m), M. Suzuki et al., Aug. 12, 1994. No. 9551023, d=2.0 cm, h=2.3 m, alt. 2570 m: Dhawalagiri Zone, Myagdi Distr., Ghorepani (2710 m) — Tatopani (1240 m), M. Mikage et al., Sep. 17, 1995. No. 9687214, d=2.0 cm, alt. 2890 m: Dhawalagiri Zone, Myagdi Distr., Dobang (2360 m) — camp site (3300 m), M. Mikage et al., Sep. 8, 1996. No. 9687235, d=2.0 cm, alt. 3100 m: Dhawalagiri Zone, Myagdi Distr., above Dobang (2360 m), M. Mikage et al., Sep. 9, 1996.

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 0.4–1.7 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential clusters of 2–3, 40–113 and 35–105  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2.5–5  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 8–42 and 5–35  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short, 160–320  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 5–10  $\mu\text{m}$  in horizontal diameter, with small oblique slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, constituting ground mass of wood. Fibers very short, 155–561  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–25 and 5–15  $\mu\text{m}$  in radial and tangential diameters, thin walled 1.5–4  $\mu\text{m}$ . Septate fibers rarely present. Pits on both radial and tangential walls, nearly simple or minutely bordered, 1.5–2  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, usually multiseriate, 2–4 rays/mm in tangential section. Multiseriate rays 3–5 cells and 30–65  $\mu\text{m}$  wide, and 220–2000  $\mu\text{m}$  up to 3325  $\mu\text{m}$  tall, with 1–2 mar-

ginal cells; consisting of procumbent, square and upright cells; outside mostly of square and upright cells. Procumbent cells round or elliptic in tangential section, 7–28 x 7–17.5 x 36–163  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 24–145 x 7.5–20 x 18–45  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Ray vessel pits oval, 2.5–3 and 1.5–2  $\mu\text{m}$  in vertical and horizontal diameters. Crystals present in some materials (No. 9460252, 9551023, 9687214, 9687235); prismatic crystals and druses in procumbent ray cells

*Berberis zebeliana* Schneid.

[Plate 92]

Deciduous shrubs in the temperate zone.

SPECIMENS. No. 9460344, d=6 cm, h=5 m, alt. 2650 m: Gandaki Zone, Manang Distr., Kaleku (2680 m), M. Suzuki et al., Aug. 15, 1994

DESCRIPTION. Wood ring porous. Growth rings distinct, delineated by ring porosity and radially flattened tracheary elements, narrow, 1.0–1.3 mm. Pores of two distinct sizes; larger round or slightly angular pores solitary and in tangential culsters of 2–3, 60–120 and 50–116  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 2–2.5  $\mu\text{m}$  thick, arranged in 1–2 rows at the beginning of growth rings; smaller angular pores in clusters and in dendritic pattern in latewood, 12.5–52 and 10–47  $\mu\text{m}$  in radial and tangential diameters, with thin walls of 1  $\mu\text{m}$  thick.

Vessel elements short to medium sized, 165–453  $\mu\text{m}$  long; end walls moderately oblique with simple perforation plates, sometimes with long tails. Intervessel pits alternate and dense, circular or horizontally oblong, 7–7.5  $\mu\text{m}$  in horizontal diameter, with small slit-like apertures. Helical thickenings present on inner walls of vessel elements, conspicuous on narrow elements.

Non-perforated tracheary elements fibers, usually constituting ground mass of wood. Fibers short, 405–720  $\mu\text{m}$  long, round to polygonal in cross sectional outline, 5–25 and 7–20  $\mu\text{m}$  in radial and tangential diameters, thin walled about 2–3  $\mu\text{m}$  thick. Septate fibers invisible. Pits on both radial and tangential walls, nearly simple to minutely bordered, about 2.5  $\mu\text{m}$  in diameter, with small slit-like apertures.

Axial parenchyma absent.

Rays heterocellular, mostly multiseriate rarely uniseriate, 3–5 rays/mm in tangential section. Uniseriate rays 9 cells and 160  $\mu\text{m}$  tall. Multiseriate rays 3–7 cells and 40–120  $\mu\text{m}$  wide, and 200–2575  $\mu\text{m}$  tall, with 1–2 marginal cells; consisting of procumbent, square and upright cells; outside mostly of square and upright cells. Procumbent cells round or elliptic in tangential section, 11–33 x 10–20 x 45–135  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Square or upright cells elliptic or oblong in tangential section, 34–98 x 17.5–26 x 20–55  $\mu\text{m}$  in vertical, tangential and radial diameters respectively. Vessel-ray pits alternate and moderately spaced, round to horizontally elongated, about 2.5–4  $\mu\text{m}$  in diameter, with oval and vertically elliptic apertures, sometimes unilaterally compound. Crystals absent.

#### CORIARIACEAE (Mitsuo SUZUKI)

*Coriaria napalensis* Wall.

[Plate 93]

Deciduous shrub or small trees in the temperate zone.



SPECIMENS. No. 8340287\*, d=25 cm, h=5 m, alt. 2850 m: Gandaki Zone, Manang Distr., Bardang (2850 m) — Chame (2630 m), H. Ohba et al., Aug. 5, 1983. Nos. 854009 & 854010, d=20 cm, h=5 m, alt. 2050 m: Bagamati Zone, Rasuwa Distr., Dunche (1980 m) — Barke (1840 m) — Munga (2050 m) — Syabru (2240 m), M. Suzuki & S. Noshiro., May 23, 1985.

DESCRIPTION. Wood diffuse to semi-ring porous. At the beginning of growth rings, clusters of large pores arranged in one concentric series. Growth rings fairly distinct or sometimes indistinct, 0.5–4 mm.

Pores and pore clusters often arranged in tangential direction showing distinct tangential bands with confluent parenchyma, rather few, 24–52/mm<sup>2</sup>, mostly grouped in clusters with several pores (2–20, mostly 2–6 pores in a multiple) and rarely solitary, mostly polygonal in outline with rather thin walls, moderately large in earlywood (140–210 x 160–240 µm in tangential and radial diameters) and a little smaller in latewood (35–120 x 35–115 µm in tangential and radial diameters).

Vessel elements short (120–195 µm). Perforation plates exclusively simple. Intervessel pits dense (35–43 pits/ 1000 µm<sup>2</sup>), polygonal in outline with about 5–10 µm in diameter and arranged in alternate; vestured pits invisible. Spiral thickenings absent.

Non-perforated tracheal elements libriform fibers; fibers constituting ground mass of wood, polygonal in transverse section, 10–25 x 18–23 µm in radial and tangential diameters, with rather thick walls, about 3 µm, fairly short, 120–230 µm, very small pits with slit-like apertures often present. Fibers tending to be storied with wood parenchyma and narrow vessel elements.

Wood parenchyma abundant, vasicentric and confluent, polygonal in transverse section, 12–30 µm in diameter, mostly fusiform and sometimes strands with two or four cells; fusiform parenchyma 130–180 µm in length, crystals invisible.

Rays heterogeneous and sheathed, very large and variable in size, 3–24 cells or 50–480 µm in width, very high, 0.33–5.35 mm or more. Rays occupying great quantity of total wood volume, 32.7–45.4%. Rays consisting of three kinds of cells; very high and short upright cells (60–170, 18–25 and 18–35 µm in vertical, tangential and radial diameters, respectively) around the central cores of the square cells (25–47, 20–23 and 28–47 µm in vertical, tangential and radial diameters, respectively) and procumbent cells (18–22, 8–15 and 55–88 µm in vertical, tangential and radial diameters, respectively). Crystals often present in the square cells. Upright cells sheathing rays often very tall, up to the height of fusiform parenchyma cells, making exact recognition of upright cells from parenchyma cells fairly difficult.

*Coriaria terminalis* Hems.

[Plate 94]

Herbaceous plants of about 1 m tall with persistent rhizomes with small amount of secondary growth.

SPECIMEN. No. 12316\*, d=1.3 cm (three years old), h=1 m: Bhutan, Upper Mo Chu, Chamsa (3500 m) — Kohina (3000 m) — Yabu Thang (3200 m), H. Kanai et al., May 15, 1967.

DESCRIPTION. Wood diffuse to semi-ring porous. Growth rings fairly distinct or sometimes indistinct, 1.5–3 mm.

Pores and pore clusters arranged in oblique tangential direction, rather few, 32–52/mm<sup>2</sup>,

mostly grouped in clusters with several pores (2–6 pores in a multiple) and rarely solitary, mostly polygonal in outline with rather thin walls, small in earlywood (55–110 x 85–120  $\mu\text{m}$  in tangential and radial diameters) and a little more small in latewood (40–55 x 35–85  $\mu\text{m}$  in tangential and radial diameters).

Vessel elements short (115–170  $\mu\text{m}$ ). Perforation plates exclusively simple. Intervessel pits dense (48–58 pits/ 1000  $\mu\text{m}^2$ ), polygonal in outline with about 5  $\mu\text{m}$  in diameter and arranged in alternate; vestured pits invisible. Spiral thickenings absent.

Non-perforated tracheal elements libriform fibers, short, 80–200  $\mu\text{m}$  in length, polygonal in transverse section, 10–18 and 15–23  $\mu\text{m}$  in tangential and radial diameters, with walls of 2  $\mu\text{m}$  thick, fairly short, 130–200  $\mu\text{m}$  in length, very small pits with slit-like apertures often present. Fibers non-storied.

Wood parenchyma sparse, vasicentric, polygonal in transverse section, 15–25  $\mu\text{m}$  in diameter, fusiform and strands with two or four cells; fusiform parenchyma 100–150  $\mu\text{m}$  in length; crystals invisible. Wood parenchyma tending to be storied.

Rays heterogeneous, 8–12 cells or 180–350  $\mu\text{m}$  in width, very high, 0.38–5.97 mm or more. Rays occupying great quantity of total wood volume, 40.7%. Rays consisting of upright cells (50–95, 12–20 and 20–35  $\mu\text{m}$  in vertical, tangential and radial diameters, respectively), square cells (40–55, 15–25 and 35–60  $\mu\text{m}$  in vertical, tangential and radial diameters, respectively) and rarely procumbent cells (10–13, 10–15 and 45–60  $\mu\text{m}$  in vertical, tangential and radial diameters, respectively). Crystals rarely present in square cells.

#### EUPHORBIACEAE (Shuichi Noshiro)

*Alchornea mollis* (Benth.) Müll.Arg.

[Plate 95]

Shrubs in the tropical zone.

SPECIMEN. No. 9840040, d=3 cm, h=3.5 m, alt. 1090 m: Koshi Zone, Sankhuwasawa Distr., Gola (1120 m) — Barun Dobhan (1110 m) — Simbung (1740 m), S. Noshiro et al., Aug. 15, 1998.

DESCRIPTION. Wood diffuse porous with medium-sized vessels often in radial multiples. Growth rings usually distinct, marked by smaller vessels and flattened fibers at the end of growth rings; false growth rings occasionally formed; growth ring width 0.2–3.15 mm.

Vessels evenly distributed, 33.8/mm<sup>2</sup>, reduced in size within the final 50  $\mu\text{m}$  of growth rings; solitary, in radial multiples of up to 12, or in clusters made of two fused radial multiples, radial multiples often continuing across growth ring boundaries; round, slightly polygonal in outline, (14–)41–85(–114) and (11–)36–101(–147)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thick (about 6  $\mu\text{m}$ ).

Vessel elements medium in length, (380–)460–690(–820)  $\mu\text{m}$ ; perforation plates simple; intervessel pits densely alternate, slightly polygonal, 7–12 and 7–15  $\mu\text{m}$  in vertical and horizontal diameters respectively; vessel-ray pits with reduced, but distinct borders, alternate to opposite, 7–10 and 7–25  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses common, thin-walled, pitted.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; rather short, (740–)770–1050(–1400)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 6–17 and 5–25  $\mu\text{m}$  in radial and tangential diameters respectively; walls fairly thin (about 2  $\mu\text{m}$ );



spiral thickenings absent; non-septate.

Axial parenchyma scanty paratracheal forming an incomplete sheath around vessels and in dense lines one cell wide sparser at the beginning of growth rings; mostly 7–8 cells per strand; crystals absent.

Rays heterocellular, 1–2(–3) cells wide, consisting of a mixture of tall and short upright cells with occasional short procumbent cells, 20–24 rays/mm in tangential section; multiseriate body usually consisting of short upright cells and occasional short procumbent cells, but rarely including tall upright cells; rays often merging with upper or lower rays, forming chains over 5 mm long; tall and short upright cells and short procumbent cells 40–125 and 7–15, 13–35 and 7–30, 8–20 and 25–85  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals, 15–25  $\mu\text{m}$  in side length, in short upright cells, usually one per cell. Silica bodies absent.

*Antidesma acidum* Retz.

[Plate 96]

Shrubs in the tropical zone.

SPECIMEN. No. 9455031, d=3 cm, h=2.5 m, alt. 980 m: Bagmati Zone, Dhading Distr., Lapang (580 m) — Ringne Bazar (590 m) — Karkigaon (980 m) — Mulabari (1260 m), M. Suzuki et al., July 18, 1994.

DESCRIPTION. Wood diffuse porous with small vessels. Growth rings distinct, marked by smaller vessels and flattened fibers at the end of growth rings, or indistinct; false growth rings occasionally formed; growth ring width 0.25–1.7 mm.

Vessels evenly distributed,  $68.6/\text{mm}^2$ , reduced in size within the final 50  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 5, rarely in clusters of up to 4; round, slightly polygonal in outline, (15–)26–52(–72) and (11–)30–65(–101)  $\mu\text{m}$  in radial and tangential diameters respectively, walls thin (about 1.5  $\mu\text{m}$  thick).

Vessel elements medium in length, (410–)520–790(–850)  $\mu\text{m}$ ; perforation plates with thick borders, simple or scalariform with up to 7 bars, often two perforation plates at one vessel end; intervessel pits alternate, slightly polygonal, about 5  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite or scalariform, 4–6 and 5–18  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4  $\mu\text{m}$  in diameter; rather short, (530–)850–1180(–1250)  $\mu\text{m}$ . Fibers constituting ground mass of wood, polygonal in outline, 10–32 and 12–30  $\mu\text{m}$  in radial and tangential diameters respectively; walls medium in thickness (about 3.5  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma diffuse, sparse.

Rays heterocellular, uniseriate and multiseriate, 13–17 rays/mm in tangential section. Uniseriate rays consisting of tall upright cells with occasional short upright to square cells, mostly 1–13 cells and 25–590  $\mu\text{m}$  tall. Multiseriate rays 2–5 cells and 30–80  $\mu\text{m}$  wide and up to 1040  $\mu\text{m}$  tall; multiseriate body made up of short upright to square cells occasionally with marginal tall upright cells and rarely with procumbent cells; uniseriate wings usually made up of 1–9 tall upright cells; tall upright, short upright to square, and procumbent cells 50–85 and 20–40, 25–50 and 25–50, 10–15 and 30–85  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells sporadic, with simple perforations occasionally with an incomplete bar. Prismatic crystals absent. Silica bodies, about 20  $\mu\text{m}$  in diameter,

in short upright and procumbent cells forming multiseriate ray body.

*Antidesma bunius* (L.) Spreng.

[Plate 97]

Small trees in the subtropical zone.

SPECIMEN. No. 9455034, dbh=30 cm, h=7 m, alt. 1100 m: Bagmati Zone, Dhading Distr., Lapang (580 m) — Ringne Bazar (590 m) — Karkigaon (980 m) — Mulabari (1260 m), M. Suzuki et al., July 18, 1994.

DESCRIPTION. Wood diffuse porous with small vessels. Growth rings weakly distinct marked by smaller vessels and flattened, thicker-walled fibers at the end of growth rings; growth ring width 1.3–3.75 mm.

Vessels evenly distributed,  $41.1/\text{mm}^2$ , reduced in size within the final 50–100  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 5; round, slightly polygonal in outline, (16–)33–76(–95) and (16–)37–84(–114)  $\mu\text{m}$  in radial and tangential diameters respectively, walls thin (about 2.5  $\mu\text{m}$  thick).

Vessel elements fairly long, (810–)1080–1600(–1870)  $\mu\text{m}$ ; perforation plates simple with thick borders, occasionally two perforation plates at one vessel end; intervessel pits densely alternate, polygonal, about 7–10  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite to scalariform or slanting (rarely palisade), 6–12 and 5–50  $\mu\text{m}$  in vertical and radial diameters respectively, occasionally unilaterally compound. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 6  $\mu\text{m}$  in diameter; fairly long, (1550–)1920–2690(–3125)  $\mu\text{m}$ . Fibers constituting ground mass of wood, polygonal in outline, 10–32 and 12–30  $\mu\text{m}$  in radial and tangential diameters respectively; walls medium in thickness (about 4  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma rarely scanty paratracheal or diffuse.

Rays heterocellular, uniseriate and multiseriate. Uniseriate rays consisting of upright cells with occasional square (including short upright to short procumbent) cells, mostly 1–17 cells and 25–2100  $\mu\text{m}$  tall, 2–5 rays/mm in tangential section. Multiseriate rays 2–5 cells and 40–130  $\mu\text{m}$  wide and up to 4.5 mm tall, 3–6 rays/mm in tangential section; multiseriate bodies made up of upright and square cells occasionally with procumbent cells and marginal upright cells; uniseriate wings usually made up of 1–9 upright cells; upright, square, and procumbent cells 60–180 and 30–50, 40–60 and 35–90, 15–20 and 65–125  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells common, with simple perforations. Prismatic crystals absent. Silica bodies, 10–20  $\mu\text{m}$  in diameter, in square and procumbent cells forming multiseriate bodies.

*Balakata baccata* (Roxb.) Esser

[Plate 98]

Trees in the tropical to subtropical zones.

SPECIMENS. No. 9455056\*, dbh=47 cm, h=9 m, alt. 680 m: Gandaki Zone, Gorkha Distr., Arkhet Bazar (570 m) — Soti (630 m) — Almara (700 m) — Khorsanedanda (830 m), M. Suzuki et al., July 20, 1994. No. 9755247, dbh=72 cm, h=24 m, alt. 950 m: Koshi Zone, Sankhuwasawa Distr., Nurbu Chaur (2080 m) — Yangluwa (1880 m) — Tenggaug (1750 m) — Thanke (1620 m) — Tallo Wollung (1340 m) — Apsuwa Doban (660 m), S. Noshiro et al., Aug. 30, 1997.



DESCRIPTION. Wood diffuse porous with sparse large vessels. Growth rings indistinct, barely marked by change in vessel size and flattened fibers.

Vessels evenly and sparsely distributed,  $2.1\text{--}8.8/\text{mm}^2$ ; solitary or in radial multiples of up to 5, radial multiples often continuous across indistinct growth ring boundaries; round in outline, (21–)50–205(–252) and (22–)49–266(–297)  $\mu\text{m}$  in radial and tangential diameters respectively, walls thick (about 8  $\mu\text{m}$  thick).

Vessel elements medium in length, (170–)260–740(–850)  $\mu\text{m}$ ; perforation plates simple; intervessel pits densely alternate, slightly polygonal, 8 and 8–14  $\mu\text{m}$  in vertical and horizontal diameters respectively; vessel-ray pits with reduced borders, alternate or opposite, rectangular, 7–12 and 7–14  $\mu\text{m}$  in vertical and radial diameters respectively, occasionally unilaterally compound. Helical thickenings absent. Tyloses common, thin-walled, pitted.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 5  $\mu\text{m}$  in diameter; medium in length, (625–)770–1400(–1475)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 8–30 and 8–60  $\mu\text{m}$  in radial and tangential diameters respectively; walls fairly thin (about 2  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma scanty paratracheal and in dense lines, 1–2 cells wide; mostly 6–8 cells per strand; crystals absent.

Rays heterocellular, 1–2(–3) cells wide, up to 820  $\mu\text{m}$  tall, consisting of a mixture of short upright, square, and short procumbent cells, 12–17 rays/mm in tangential section; short upright, square, and short procumbent cells 45–80 and 30–50, 35–65 and 40–65, 15–30 and 55–120  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals absent. Silica bodies, 5–8  $\mu\text{m}$  in diameter, throughout rays.

*Bridelia retusa* (L.) A. Juss.

[Plate 99]

Small trees in the tropical to subtropical zones.

SPECIMENS. No. 9755271\*, dbh=20 cm, h=6 m, alt. 490 m: Koshi Zone, Sankhuwasawa Distr., Pikuwa (610 m) — Mengtewa Besi (500 m) — Bumlingtar (460 m), S. Noshiro et al., Sept. 1, 1997. No. 9840218, dbh=25 cm, h=7 m, alt. 330 m: Koshi Zone, Sankhuwasawa Distr., Tumlingtar (440 m) — Katle Bhanjyang (410 m) — Sabha Khola (310 m) — Khahare (410 m) — Pikuwa Khola (320 m) — Surtibari (320 m) — Baireni Bagar (320 m), S. Noshiro et al., Aug. 31, 1998.

DESCRIPTION. Wood diffuse porous with medium-sized vessels. Growth rings weakly marked by difference in vessel diameter and marginal parenchyma; growth ring width from 0.6 to over 6 mm.

Vessels evenly distributed,  $11.5\text{--}12.2/\text{mm}^2$ , reduced in size within the final 100  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 5; round in outline, (28–)72–129(–149) and (21–)76–171(–204)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 5  $\mu\text{m}$ ).

Vessel elements medium in length, (380–)500–740(–790)  $\mu\text{m}$ ; perforation plates simple; intervessel pits densely alternate, polygonal, about 7–9  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite to alternate or scalariform (rarely palisade), 5–15 and 7–30  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses absent. Dark deposits in some vessels.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; long, (900–)1490–2100(–2300)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 6–26 and 8–33  $\mu\text{m}$  in radial and tangential diameters respectively; walls rather thin (about 2.5  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma vasicentric with narrow sheath, diffuse, and marginal; diffuse and marginal parenchyma consisting of slender cells 110–200  $\mu\text{m}$  tall, mostly 6–8 cells per strand; vasicentric parenchyma consisting of broad cells 30–140  $\mu\text{m}$  tall, mostly 8–10 cells per strand; prismatic crystals, 12–22  $\mu\text{m}$  in side length, occasionally in chambered cells.

Rays heterocellular, 1–5 cells and 15–95  $\mu\text{m}$  wide, up to 1.3 mm or more tall, consisting of a mixture of short upright, square, and short procumbent cells, about 7 rays/mm in tangential section; often merging with upper or lower rays, forming chains over 4 mm long; short upright, square, and short procumbent cells 55–100 and 18–40, 25–40 and 30–45, 12–25 and 45–100  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals absent. Silica bodies absent.

*Bridelia stipularis* (L.) Blume

[Plate 100]

Scrambling shrubs in the tropical zone.

SPECIMEN. No. 9194191, d=8.9 cm, h=2.5 m, alt. 1410 m: Seti Zone, Bajura Distr., Serigaon (1690 m) — Ukhadi (1630 m) — a river (1370 m) — Jugalo (1430 m) — a pass (1600 m) — Budhiganaga Khola (bridge) (1400 m) — Bashala (1760 m), M. Suzuki et al., Aug. 14, 1991.

DESCRIPTION. Wood diffuse porous with rather small vessels often in radial multiples. Growth rings distinct, weakly marked by difference in vessel diameter and marginal parenchyma; growth ring width 1–2 mm.

Vessels evenly distributed, 24.2/mm<sup>2</sup>, reduced in size within the final 100  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 7; round in outline, (18–)39–71(–95) and (15–)41–86(–123)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 5  $\mu\text{m}$ ).

Vessel elements rather short, (220–)330–510(–600)  $\mu\text{m}$ ; perforation plates simple; intervessel pits densely alternate, round, about 4–5  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite to alternate or scalariform (rarely palisade), 6–15 and 6–22  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; rather short, (710–)860–1170(–1300)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 8–20 and 8–38  $\mu\text{m}$  in radial and tangential diameters respectively; walls rather thin (about 2.5  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma vasicentric with narrow sheath, diffuse, and marginal; diffuse and marginal parenchyma consisting of slender cells 95–130  $\mu\text{m}$  tall; vasicentric parenchyma consisting of broad cells 30–100  $\mu\text{m}$  tall; mostly 6–8 cells per strand; prismatic crystals, 8–12  $\mu\text{m}$  in side length, frequently in chambered cells.

Rays heterocellular, 1–5 cells and 10–75  $\mu\text{m}$  wide, up to 1.7 mm tall, consisting of a mixture of short upright, square, and short procumbent cells, 11–13 rays/mm in tangential section; short upright, square, and short procumbent cells 50–95 and 25–40, 30–50 and 35–50,



13–30 and 35–95  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells with simple or scalariform perforations occasional. Prismatic crystals, 17–25  $\mu\text{m}$  in side length, common throughout rays, occasionally in chambered ray cells, one per cell or occasionally with smaller crystals, 2–4  $\mu\text{m}$  in side length. Silica bodies absent.

*Excoecaria acerifolia* Didr.

[Plate 101]

Deciduous shrubs in the subtropical to warm temperate zones.

SPECIMENS. No. 8840516\*, d=2.5 cm, h=2.5 m, alt. 1530 m: Dhawalagiri Zone, Myagdi Distr., Shika – Khipang (Khibang) – Paudwar – Jibang – Gaunapani – Narchang (Nracheng), M. Suzuki et al., Aug. 26, 1988. No. 9194194, d=3 cm, h=2.6 m, alt. 1380 m: Seti Zone, Bajura Distr., Serigaon (1690 m) — Ukhadi (1630 m) — a river (1370 m) — Jugalo (1430 m) — a pass (1600 m) — Budhiganaga Khola (bridge) (1400 m) — Bashala (1760 m), M. Suzuki et al., Aug. 14, 1991.

DESCRIPTION. Wood diffuse porous with small vessels often in radial multiples. Growth rings weakly or indistinctly marked by smaller vessels and flattened fibers at the end of growth rings; growth ring width 0.5–4 mm.

Vessels evenly distributed, 52.5–72.5/ $\text{mm}^2$ , reduced in size within the final 100  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 9; round in outline, (12–)27–56(–69) and (9–)20–58(–72)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 4  $\mu\text{m}$ ).

Vessel elements rather short, (210–)310–510(–570)  $\mu\text{m}$ ; perforation plates simple with thick borders; intervessel pits densely alternate, round to polygonal, about 6–8  $\mu\text{m}$  in diameter; vessel-ray pits with distinct borders, opposite to alternate, 5–8 and 5–11  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3–4  $\mu\text{m}$  in diameter; short, (430–)540–870(–1050)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 5–20 and 7–25  $\mu\text{m}$  in radial and tangential diameters respectively; walls rather thin (about 2  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma scanty paratracheal, diffuse-in-aggregate to in lines one cell wide, and in marginal lines; mostly 4–8 cells per strand; crystals absent.

Rays heterocellular, mostly uniseriate, rarely biseriate, consisting of a mixture of upright and square cells with occasional procumbent cells, 18–22 rays/mm in tangential section; upright, square, and procumbent cells 40–85 and 25–35, 25–40 and 22–45, 12–16 and 35–55  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells with simple perforations occasional. Prismatic crystals, about 10  $\mu\text{m}$  in side length, occasional in chambered square or upright cells, usually one per cell. Silica bodies absent.

*Glochidion ellipticum* Wight

[Plate 102]

Deciduous small trees in the tropical zone.

SPECIMEN. No. 9840197, dbh=15 cm, h=5 m, alt. 790 m: Koshi Zone, Sankhuwasawa Distr., Gadhi Danda (1180 m) — Arun Bridge (820 m) — Num (1540 m) — Mude (2000 m), S. Noshiro et al., Aug. 28, 1998.

DESCRIPTION. Wood diffuse porous with small vessels. Growth rings indistinct, barely marked by smaller vessels and marginal parenchyma; pith flecks common.

Vessels evenly distributed,  $17.0/\text{mm}^2$ ; solitary or in radial multiples of up to 6; vessel round, slightly polygonal in outline, (19–)36–73(–96) and (18–)45–105(–131)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 5  $\mu\text{m}$ ).

Vessel elements medium in length, (300–)390–730(–810)  $\mu\text{m}$ ; perforation plates simple with thick borders; intervessel pits densely alternate, round to polygonal, about 3–5  $\mu\text{m}$  in diameter; vessel-ray pits with distinct borders, densely alternate, round to elliptic, 4–7 and 4–12  $\mu\text{m}$  in vertical and radial diameters respectively, often unilaterally compound. Helical thickenings absent. Tyloses occasional, thin-walled, pitted.

Non-perforated tracheal elements fibers with dense, distinctly bordered pits mostly on radial walls with chambers of about 6  $\mu\text{m}$  in diameter; medium in length, (800–)1060–1650(–2025)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 10–35 and 10–40  $\mu\text{m}$  in radial and tangential diameters respectively; walls rather thin (about 3  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma scanty paratracheal, diffuse, and marginal; mostly 4–13 cells per strand; prismatic crystals, 20–115  $\mu\text{m}$  in longest axis, common, 1–3 per cell; druses rare, one per cell.

Rays heterocellular, 1–5 cells and 20–75  $\mu\text{m}$  wide, up to 900  $\mu\text{m}$  tall, 12–14.5 rays/mm in tangential section; multiseriate body consisting of a mixture of upright, square, and procumbent cells, uniseriate wings and uniseriate rays mostly of upright cells with occasional square cells; upright, square, and procumbent cells 50–125 and 25–70, 35–70 and 45–55, 15–25 and 50–125  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cell with simple perforations occasional. Prismatic crystals, 60–110  $\mu\text{m}$  in longest axis, occasional, 1–2 per cell. Silica bodies absent.

*Glochidion heyneanum* (Wight & Arn.) Wight

[Plate 103]

Deciduous small trees in the tropical to warm temperate zones.

SPECIMENS. No. 9194141, d=12.9 cm, h=2.5 m, alt. 1350 m: Seti Zone, Bajura Distr., Tolebhir (1700 m) — Kabhri (1500 m) — Berma (1170 m), M. Suzuki et al., Aug. 9, 1991. No. 9455063\*, dbh=17 cm, h=5 m, alt. 730 m: Gandaki Zone, Gorkha Distr., Khorsanedanda (830 m) — Lapubesi (830 m) — Kanbesi (920 m) — Macha Khola (850 m), M. Suzuki et al., July 21, 1994. No. 9755297, dbh=7 cm, h=6 m, alt. 520 m: Koshi Zone, Bhojpur Distr., Bumlingtar (460 m) — Arun bridge (450 m) — Chelisa Besi (530 m) — Chapabote (560 m) — Chewa Besi (370 m), S. Noshiro et al., Sept. 3, 1997.

DESCRIPTION. Wood diffuse porous with rather small vessels. Growth rings distinct, marked by smaller vessels, flattened fibers, and occasional marginal parenchyma at the end of growth rings, or indistinct; false growth rings occasional; growth ring width 1.1–5 mm.

Vessels evenly distributed,  $14.4\text{--}31.4/\text{mm}^2$ , reduced in size within the final 100–200  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 4, two to three multiples often merging radially or tangentially; round, slightly polygonal in outline, (21–)47–113(–149) and (17–)45–141(–192)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 4  $\mu\text{m}$ ).

Vessel elements medium in length, (290–)460–880(–1130)  $\mu\text{m}$ ; perforation plates simple with thick borders; intervessel pits densely alternate, polygonal, about 3.5  $\mu\text{m}$  in diameter; vessel-ray pits with distinct borders, opposite to alternate, round, about 4  $\mu\text{m}$  in diameters. Helical thickenings absent. Tyloses absent. Dark deposits occasional.



Non-perforated tracheal elements fibers with dense, distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; long, (550–)860–2090(–2325)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, and 12–45 and 12–50  $\mu\text{m}$  in radial and tangential diameters respectively; walls medium in thickness (about 5  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma vasicentric with narrow sheath, diffuse, and occasionally marginal; mostly 8 cells or more per strand; prismatic crystals, 35–95  $\mu\text{m}$  in longest axis, common, one per cell.

Rays heterocellular, 1–6 cells and 15–105  $\mu\text{m}$  wide, up to 2.5 mm tall, 7.5–10.5 rays/mm in tangential section; multiseriate body consisting of a mixture of upright, square, and procumbent cells, uniseriate wings and uniseriate rays mostly of upright cells with occasional square cells; upright, square, and procumbent cells 55–150 and 25–60, 40–50 and 35–55, 20–35 and 60–110  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cell with simple perforations occasional. Prismatic crystals, 65–75  $\mu\text{m}$  in longest axis, occasionally in upright or square cells, one per cell. Silica bodies absent.

*Leptopus cordifolius* Wall. ex Decne.

[Plate 104]

Shrubs in the subtropical and temperate zones.

SPECIMENS. No. 8840510, d=3 cm, h=2 m, alt. 1800 m: Dhawalagiri Zone, Myagdi Distr., Shika – Khipang (Khibang) – Paudwar – Jibang – Gaunapani – Narchang (Nracheng), M. Suzuki et al., Aug. 26, 1988. No. 9194111\*, d=2.5 cm, h=2.5 m, alt. 1290 m: Karnali Zone, Kalikot Distr., Badarigaon (1330 m) — Manma (1710 m) — Karnali Nadi (bridge) (810 m) — Rengila (850 m) — Kota (810 m), M. Suzuki et al., Aug. 6, 1991.

DESCRIPTION. Wood diffuse porous with small vessels, occasionally tending to be semi-ring-porous due to larger first-formed earlywood vessels along the growth ring boundaries. Growth rings distinct, marked by difference in vessel diameter across growth ring boundaries and flattened tracheids at the end of growth rings; false growth rings frequent; growth ring width 0.2–2.5 mm.

Vessels evenly and densely distributed, 235–272/mm<sup>2</sup>, gradually reduced in size toward growth ring boundaries; mostly solitary, rarely in radial multiples up to 4; polygonal in outline, (9–)16–33(–45) and (13–)23–44(–62)  $\mu\text{m}$  in radial and tangential diameters respectively, walls thin (about 2  $\mu\text{m}$ ).

Vessel elements medium in length, (410–)600–890(–1080)  $\mu\text{m}$ ; perforation plates simple with thick borders; intervessel pits laxly alternate, round, 4–6  $\mu\text{m}$  in diameter; vessel-ray pits with distinct borders, densely alternate or opposite, 3–7  $\mu\text{m}$  in diameter. Helical thickenings throughout body of vessel element. Tyloses absent.

Non-perforated tracheal elements fibers and vascular tracheids constituting ground mass of wood. Fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; medium in length, (720–)830–1250(–1430)  $\mu\text{m}$ ; rectangular or polygonal in outline, 7–28 and 7–28  $\mu\text{m}$  in radial and tangential diameters respectively; walls medium in thickness (about 3  $\mu\text{m}$ ); spiral thickenings absent; usually septate. Vascular tracheids in thin terminal bands, accompanying vessels, or in diffuse clusters; with distinctly bordered pits on both radial and tangential walls with chambers of about 6  $\mu\text{m}$  in diameter; helical thickenings throughout tracheids.

Axial parenchyma absent.

Rays heterocellular, 1–4(–5) cells wide, 20.5–22 rays/mm in tangential section; uniseriate rays and uniseriate wings of multiseriate rays consisting of tall upright cells; body of multiseriate rays mostly consisting of short upright cells with occasional tall upright, square, or procumbent cells; tall and short upright, square, and procumbent cells 50–130 and 17–25, 30–45 and 13–35, 30–35 and 25–30, 12–17 and 30–50  $\mu\text{m}$  in vertical and radial diameters respectively; rarely with perforated ray cells with simple perforations. Prismatic crystals absent. Silica bodies absent.

*Macaranga denticulata* (Blume) Müll.Arg.

[Plate 105]

Small trees in the tropical to subtropical zones.

SPECIMEN. No. 9455083, dbh=22 cm, h=4 m, alt. 830 m: Gandaki Zone, Gorkha Distr., Macha Khola (850 m) — Kholabesi (890 m) — Tatopani (930 m) — Dovan (990 m) — Syaule Bhatti (1070 m), M. Suzuki et al., July 22, 1994.

DESCRIPTION. Wood diffuse porous with medium-sized vessels often in radial multiples. Growth rings usually distinct or occasionally indistinct, marked by smaller vessels and flattened fibers at the end of growth rings; false growth rings occasional; growth ring width 0.9–4.75 mm; growth ring boundaries undulating.

Vessels evenly distributed,  $8.2/\text{mm}^2$ , reduced in size within the final 100–500  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 6; round, (16–)60–121(–154) and (23–)59–136(–175)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 4  $\mu\text{m}$ ).

Vessel elements medium in length, (200–)400–750(–960)  $\mu\text{m}$ ; perforation plates simple with thick borders; intervessel pits densely alternate, round or slightly polygonal, about 6  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite to scalariform, occasionally palisade, 5–25 and 5–28  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses common, thin-walled, sparsely pitted.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4  $\mu\text{m}$  in diameter; medium in length, (825–)980–1450(–1600)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 7–20 and 5–32  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 2  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma vasicentric and diffuse-in-aggregates to in short lines; diffuse-in-aggregates parenchyma consisting of slender cells 80–180  $\mu\text{m}$  tall; vasicentric parenchyma consisting of broad cells 25–130  $\mu\text{m}$  tall; mostly 4–6 per strand; prismatic crystals, 20–40  $\mu\text{m}$  in longest axis, or druses, about 30  $\mu\text{m}$  in diameter, occasionally in short non-chambered cells.

Rays heterocellular, 1–9 cells and 15–95  $\mu\text{m}$  wide, up to 1.1 mm tall, 14–16.5 rays/mm in tangential section; multiseriate body consisting of procumbent and square cells with an incomplete sheath of upright cells, uniseriate wings and uniseriate rays mostly of upright cells; upright, square, and procumbent cells 45–125 and 15–30, 25–45 and 30–40, 12–20 and 40–75  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cell with simple or scalariform perforations occasional. Prismatic crystals, 25–40  $\mu\text{m}$  in longest axis, in short enlarged cells frequent in uniseriate wings and uniseriate rays, occasional in marginal cells of multiseriate ray body. Silica bodies absent.



*Mallotus nepalensis* Müll.Arg.

[Plate 106]

Small trees in the temperate zone.

SPECIMENS. No. 9755148, dbh=14 cm, h=6.5 m, alt. 1930 m: Koshi Zone, Sankhuwasawa Distr., Nurbu Gaon (2120 m) — Dungameti (1900 m) — Isuwa Khola bridge (1650 m) — Nurbu Chaur (2050 m), S. Noshiro et al., Aug. 21, 1997. No. 9840113\*, dbh=15 cm, h=7 m, alt. 2180 m: Koshi Zone, Sankhuwasawa Distr., Below Chamtang (2070 m) — Deurali (2350 m) — Chumsur (2380 m) — Deurali (2450 m) — Chyangrima (2170 m), S. Noshiro et al., Aug. 20, 1998.

DESCRIPTION. Wood ring porous with gradual reduction in vessel size from medium to small vessels. Growth rings distinct, marked by difference in vessel size across growth ring boundaries and flattened fibers at the end of growth rings; growth ring width 2.3–6.8 mm; pith flecks occasional.

Earlywood vessels round, solitary or in radial multiples of up to 3;  $6.1\text{--}10.9/\text{mm}^2$ , (65–)110–164(–183) and (78–)151–259(–303)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thick (6–8  $\mu\text{m}$ ). Latewood vessels round or slightly polygonal, mostly solitary or occasionally in radial multiples or clusters of 2(–4);  $8.2\text{--}9.1/\text{mm}^2$ , (25–)28–72(–110) and (18–)30–104(–142)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thick (about 6  $\mu\text{m}$ ).

Vessel elements medium in length, (370–)600–810(–880)  $\mu\text{m}$ ; perforation plates simple, rarely scalariform with one bar, with rather thick borders; intervessel pits densely alternate, polygonal, 10  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, dense alternate to opposite, 4–8 and 4–12  $\mu\text{m}$  in vertical and radial diameters respectively, occasionally unilaterally compound. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 5  $\mu\text{m}$  in diameter; medium in length, (850–)960–1280(–1375)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 7–28 and 7–45  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 3  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma vasicentric with narrow sheath and diffuse, or occasionally diffuse-in-aggregates in the latewood; diffuse parenchyma consisting of slender cells 110–200  $\mu\text{m}$  tall, mostly 4–8 cells per strand; vasicentric parenchyma consisting of broad cells 20–120  $\mu\text{m}$  tall, mostly 10–16 cells per strand; prismatic crystals absent.

Rays heterocellular, uniseriate or partly biseriate, often merging with upper or lower rays, forming chains over 5 mm long, 14–16 rays/mm in tangential section; consisting of a mixture of upright, square, and procumbent cells; upright, square, and procumbent cells 55–80 and 25–45, 30–45 and 30–50, 15–25 and 60–100  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals rarely in upright or square cells. Silica bodies absent.

*Mallotus philippensis* (Lam.) Müll.Arg.

[Plate 107]

Evergreen small trees in the tropical to subtropical zones

SPECIMENS. No. 9194052\*, d=40 cm, h=9 m, alt. 690 m: Bheri Zone, Dailekh Distr., Dungsar (720 m) — Belpata (700 m) — Chupra (750 m) — Shrithan (790 m), M. Suzuki et al., Aug. 1, 1991. No. 9194123, d=24.5 cm, h=6.5 m, alt. 780 m: Karnali Zone, Kalikot Distr., Kota (810 m) — Sangligad (860 m) — Phukgad (930 m), M. Suzuki et al., Aug. 7, 1991. No. 9455048, dbh=20 cm, h=6 m, alt. 630 m: Gandaki Zone, Gorkha Distr., Arkhet

Bazar (570 m) — Soti (630 m) — Almara (700 m) — Khorsanedanda (830 m), M. Suzuki et al., July 20, 1994.

DESCRIPTION. Wood diffuse porous with medium sized vessels. Growth rings distinct or indistinct, usually marked by difference in vessel diameter across growth ring boundaries and flattened fibers at the end of growth rings; false growth rings common.

Vessels evenly distributed,  $10.0\text{--}18.5/\text{mm}^2$ , reduced in size over  $100\ \mu\text{m}$  across growth ring boundaries; solitary or in radial multiples of up to 6 or more; round, (14–)35–108(–129) and (15–)31–135(–178)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thick (6–8  $\mu\text{m}$ ).

Vessel elements rather short, (260–)330–620(–770)  $\mu\text{m}$ ; perforation plates simple with rather thick borders; intervessel pits densely alternate, round or slightly polygonal, 8–12  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, dense alternate to opposite, or scalariform to palisade, 4–12 and 7–15  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses occasional, thin-walled, sparsely pitted, with large prismatic crystals of 15–50  $\mu\text{m}$  in longest axis.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; short, (510–)670–1090(–1150)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 5–16 and 7–25  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin, about 1.5  $\mu\text{m}$ ; spiral thickenings absent; non-septate.

Axial parenchyma vasicentric with narrow sheath and in wavy lines; banded parenchyma consisting of slender cells 100–190  $\mu\text{m}$  tall, mostly 4(–8) cells per strand; vasicentric parenchyma consisting of broad cells 25–130  $\mu\text{m}$  tall, mostly 8–12 cells per strand; prismatic crystals, 10–30  $\mu\text{m}$  in longest axis, occasionally in chambered cells.

Rays heterocellular, 1–3 cells and 12–40  $\mu\text{m}$  wide, often merging with upper or lower rays, forming chains up to 3.2 mm long, 19–22 rays/mm in tangential section; multiseriate body consisting of procumbent cells, uniseriate wings and uniseriate rays of upright and square cells; upright, square, and procumbent cells 45–90 and 25–40, 25–40 and 30–40, 10–20 and 30–60  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals, 15–35  $\mu\text{m}$  in longest axis, common in chambered upright cells and square and procumbent cells; usually one, occasionally two per cell. Silica bodies absent.

*Mallotus tetracoccus* (Roxb.) Kurz

[Plate 108]

Small trees in the tropical to subtropical zones.

SPECIMENS. No. 9154233, d=25 cm, h=6 m, alt. 930 m: Koshi Zone, Sankhuwasawa Distr., Baidep (960 m) — Arun River (780 m) — Num (1520 m), H. Ohba et al., Aug. 13, 1991. No. 9840031\*, dbh=17 cm, h=7 m, alt. 1300 m: Koshi Zone, Sankhuwasawa Distr., Semma (1420 m) — Pathibhara Danda (1520 m) — Yekuwa (1310 m) — Deurali (1260 m) — Gola (1120 m), S. Noshiro et al., Aug. 14, 1998.

DESCRIPTION. Wood diffuse porous with large vessels often in radial multiples. Growth rings distinct, weakly marked by difference in vessel diameter across growth ring boundaries and flattened fibers at the end of growth rings; growth rings 2.8–6 mm wide.

Vessels evenly and rather sparsely distributed,  $6.9\text{--}8.3/\text{mm}^2$ , reduced in size over  $100\text{--}400\ \mu\text{m}$  across growth ring boundaries; solitary or in radial multiples of up to 5(–7); round, (22–)57–163(–237) and (16–)44–177(–256)  $\mu\text{m}$  in radial and tangential diameters respec-



tively, walls rather thick (5–8  $\mu\text{m}$ ).

Vessel elements long, (440–)620–1270(–1370)  $\mu\text{m}$ ; perforation plates simple with rather thick borders; intervessel pits densely alternate, round or slightly polygonal, 11–13  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, densely alternate to opposite, or scalariform to palisade, 7–27 and 7–33  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 5  $\mu\text{m}$  in diameter; rather long, (1100–)1330–1950(–2225)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 10–30 and 7–35  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 3  $\mu\text{m}$ ); spiral thickenings absent; non-septate; prismatic crystals, 22–30  $\mu\text{m}$  in longest axis, occasionally in chambered cells.

Axial parenchyma vasicentric with narrow sheath and in wavy lines; banded parenchyma consisting of slender cells 120–270  $\mu\text{m}$  tall, mostly 6–8 cells per strand; vasicentric parenchyma consisting of broad cells 50–130  $\mu\text{m}$  tall, mostly 12–16 cells per strand; prismatic crystals, 10–30  $\mu\text{m}$  in longest axis, occasionally in chambered cells.

Rays heterocellular, uniseriate or biseriate, occasionally merging with upper or lower rays, forming chains over 5 mm long, 12–19 rays/mm in tangential section; consisting of a mixture of upright, square, and procumbent cells; upright, square, and procumbent cells 65–200 and 20–40, 30–50 and 30–50, 20–30 and 50–100  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells with simple perforations occasional. Prismatic crystals, 20–50  $\mu\text{m}$  in longest axis, often in chambered upright to square cells and non-chambered square to procumbent cells. Silica bodies absent.

*Ostodes paniculata* Blume

[Plate 109]

Deciduous small trees in the tropical to subtropical zones.

SPECIMENS. No. 8840382, d=24 cm, h=13 m, alt. 890 m: Koshi Zone, Sankhuwasawa Distr., Sedua – Vedghari (Runruma) – Arun Nadi – Dhadkhet (Runbaun) – Num, M. Suzuki et al., Aug. 2, 1988. No. 9455010\*, dbh=27 cm, h=3.5 m, alt. 1170 m: Bagmati Zone, Nuwakot Distr., Trisuli Bazar (630 m) — Ragsinge Bazar (610 m) — Horagaru (880 m) — Chilaune Bas (1030 m) — Kabhre Bas (1110 m) — Samre Bhanjyang (1280 m), M. Suzuki et al., July 14, 1994. No. 9840195, dbh=23 cm, h=7.5 m, alt. 850 m: Koshi Zone, Sankhuwasawa Distr., Gadhi Danda (1180 m) — Arun Bridge (820 m) — Num (1540 m) — Mude (2000 m), S. Noshiro et al., Aug. 28, 1998.

DESCRIPTION. Wood diffuse porous with medium-sized vessels often in radial multiples. Growth rings indistinct, faintly marked by flattened fibers.

Vessels evenly and rather sparsely distributed, slightly reduced in size across seeming growth ring boundaries, 4.9–8.3/mm<sup>2</sup>; solitary or in radial multiples of up to 5(–7); round, (21–)43–127(–180) and (23–)48–189(–218)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 5  $\mu\text{m}$ ).

Vessel elements medium in length, (460–)610–1010(–1240)  $\mu\text{m}$ ; perforation plates simple with rather thick borders; intervessel pits densely alternate, polygonal, 10–16  $\mu\text{m}$  in horizontal diameter; vessel-ray pits with reduced borders, opposite to scalariform, or slanting, often unilaterally compound, 6–12 and 8–25  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses occasional, thin-walled, pitted, with pris-

matic crystals 30–90  $\mu\text{m}$  in longest axis.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4  $\mu\text{m}$  in diameter; medium in length, (950–)1240–1830(–2075)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 10–28 and 10–35  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 2.5  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma scanty paratracheal and in dense wavy lines; banded parenchyma consisting of slender cells 80–185  $\mu\text{m}$  tall, mostly 6–8 cells per strand; scanty paratracheal parenchyma consisting of broad cells 30–120  $\mu\text{m}$  tall, 8–12(–18) cells per strand; prismatic crystals rare, 30  $\mu\text{m}$  in longest axis.

Rays heterocellular, uniseriate and multiseriate, 15–18 rays/mm in tangential section. Uniseriate rays consisting mostly of tall upright cells, 1–23 cells and 100–1500  $\mu\text{m}$  tall. Multiseriate rays 2–3(–4) cells and 30–65  $\mu\text{m}$  wide and up to 1000  $\mu\text{m}$  tall; often merging with upper or lower rays, forming chains up to 5 mm long; multiseriate body mostly made up of procumbent cells with occasional upright cells; uniseriate wings made up of upright cells; upright, square, and procumbent cells 50–100 and 25–50, 35–50 and 30–50, 20–30 and 50–115  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells occasional, mostly with simple perforations, rarely with scalariform to reticulate perforations. Prismatic crystals, 25–50  $\mu\text{m}$  in longest axis, common in chambered upright cells. Silica bodies absent.

*Phyllanthus emblica* L.

[Plate 110]

Deciduous small trees in the tropical to warm temperate zones

SPECIMENS. No. 9194124\*, d=14 cm, h=4.5 m, alt. 800 m: Karnali Zone, Kalikot Distr., Kota (810 m) — Sangligad (860 m) — Phukgad (930 m), M. Suzuki et al., Aug. 7, 1991. No. 9755249, dbh=15 cm, h=7 m, alt. 780 m: Koshi Zone, Sankhuwasawa Distr., Nurbu Chaur (2080 m) — Yangluwa (1880 m) — Tenggaug (1750 m) — Thanke (1620 m) — Tallo Wollung (1340 m) — Apsuwa Doban (660 m), S. Noshiro et al., Aug. 30, 1997.

DESCRIPTION. Wood diffuse porous with medium-sized vessels often in radial multiples. Growth rings usually distinct, marked by small vessel flattened fibers in the end of growth rings; growth ring width 1.1–2.6 mm; pith flecks occasional.

Vessels evenly distributed, 17.8–20.4/mm<sup>2</sup>, reduced in size within the final 100–200  $\mu\text{m}$  of growth rings; solitary or in radial multiples of up to 4; round, (15–)46–121(–149) and (15–)42–133(–187)  $\mu\text{m}$  in radial and tangential diameters respectively, walls medium in thickness (about 5  $\mu\text{m}$ ).

Vessel elements medium in length, (370–)620–970(–1080)  $\mu\text{m}$ ; perforation plates simple; intervessel pits densely alternate, round or slightly polygonal, 8–10  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite or scalariform to palisade, 5–25 and 5–25  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses rare, thin-walled, unpitted.

Non-perforated tracheal elements fibers with dense, distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; rather long, (1025–)1320–2070(–2250)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 8–32 and 8–30  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin, about 3  $\mu\text{m}$ ); spiral thickenings absent; septate.



Axial parenchyma scanty paratracheal, mostly 6–8 cells per strand; prismatic crystals absent.

Rays heterocellular, uniseriate and multiseriate. Uniseriate rays consisting mostly of tall upright cells, 1–6(–14) cells and 100–550(–1150)  $\mu\text{m}$  tall, 0.5–2.5 rays/mm in tangential section. Multiseriate rays (3–)5–9 cells and (60–)100–200  $\mu\text{m}$  wide and up to 1500  $\mu\text{m}$  tall, 3.5–5.5 rays/mm in tangential section; multiseriate bodies mostly made up of procumbent and square cells with upright cells forming an incomplete sheath; uniseriate wings made up of upright cells; upright, square, and procumbent cells 70–200 and 20–50, 50–70 and 40–60, 20–50 and 60–140  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated rays cells with simple perforations occasional. Slender prismatic crystal, 40–90  $\mu\text{m}$  in longest axis, often throughout rays, 1(–2) per cell. Silica bodies absent.

*Phyllanthus parvifolius* Buch.-Ham. ex D. Don

[Plate 111]

Deciduous shrubs in the tropical to warm temperate zones.

SPECIMEN. No. 8840615, d=2 cm, h=2 m, alt. 1670 m: Bagmati Zone, Kathmandu Valley, Forest Office – Chhap – Shiwapuri Summit, M. Suzuki et al., Sept. 13, 1988.

DESCRIPTION. Wood diffuse porous with small vessels often in radial multiples. Growth rings distinct, marked by flattened fibers at the end of growth rings and one discontinuous row of earlywood vessels at the beginning of growth rings; growth ring width 0.2–0.6 mm.

Vessels evenly distributed, 204.7/mm<sup>2</sup>, reduced in size within the final 50–200  $\mu\text{m}$  of growth rings; solitary or in radial multiples of 2–4; polygonal, (10–)16–27(–41) and (11–)21–38(–50)  $\mu\text{m}$  in radial and tangential diameters respectively, walls thin (about 2.5  $\mu\text{m}$ ).

Vessel elements medium in length, (480–)540–790(–900)  $\mu\text{m}$ ; perforation plates simple or scalariform with 2–8 bars, often with distinct borders; intervessel pits densely alternate, round, 3  $\mu\text{m}$  in diameter; vessel-ray pits bordered, densely opposite to alternate, round to elliptic, 3–5  $\mu\text{m}$  in diameter. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4  $\mu\text{m}$  in diameter; medium in length, (640–)810–1120(–1340)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 8–27 and 7–25  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 3.5  $\mu\text{m}$ ); spiral thickenings absent; septate.

Axial parenchyma absent.

Rays heterocellular, of two distinct sizes; smaller rays 1–2 cells wide, forming long chains up to 3 mm or more, consisting of upright cells, 21–23 rays/mm in tangential section; larger rays 4–10 cells and 45–200  $\mu\text{m}$  wide, up to 5 m tall, body consisting of square and short upright cells and occasional procumbent cells with tall upright cells forming incomplete sheath, wings consisting of tall upright cells; upright, square, and procumbent cells 30–120 and 15–25, 20–30 and 20–25, 20–30 and 30–50  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells with simple or scalariform perforations occasional. Prismatic crystals, 15–25  $\mu\text{m}$  in longest axis, frequent in non-chambered cells. Silica bodies absent.

*Phyllanthus reticulatus* Poir.

[Plate 112]

Shrubs in the tropical zone.

SPECIMENS. No. 9455054, d=7 cm, h=1.2 m, alt. 620 m: Gandaki Zone, Gorkha Distr.,

Arkhet Bazar (570 m) — Soti (630 m) — Almara (700 m) — Khorsanedanda (830 m), M. Suzuki et al., July 20, 1994. No. 9455084\*, d = - cm, h = 1.8 m, alt. 830 m: Gandaki Zone, Gorkha Distr., Macha Khola (850 m) — Kholabesi (890 m) — Tatopani (930 m) — Dovan (990 m) — Syaule Bhatti (1070 m), M. Suzuki et al., July 22, 1994.

DESCRIPTION. Wood diffuse porous with large vessels often in radial multiples. Growth rings usually distinct marked by difference in vessel diameter across growth ring boundaries and flattened fibers at the end of growth rings; growth ring width 0.5–3.7 mm; false growth rings only with small vessels occasional.

Vessels densely and evenly distributed, 27.7–30.2/mm<sup>2</sup>; some vessels reduced in size within the final 300 µm of growth rings; solitary, in radial multiples of 2–7, or in radially elongated clusters up to 15; round, (17–)53–143(–210) and (12–)44–191(–296) µm in radial and tangential diameters respectively, walls rather thick (about 5 µm).

Vessel elements medium in length, (300–)410–910(–1140) µm; perforation plates simple with rather thick borders; intervessel pits densely alternate, polygonal, 8 µm in diameter; vessel-ray pits with reduced borders, opposite to scalariform, occasionally slanting, 7–15 and 10–32 µm in vertical and radial diameters respectively. Helical thickenings absent. Tyloses occasional, thin-walled, unpitted, with starch.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3–6 µm in diameter; medium in length, (580–)730–1420(–1500) µm. Fibers constituting ground mass of wood, rectangular or polygonal in outline, 7–38 and 7–45 µm in radial and tangential diameters respectively; walls medium in thickness (about 3.5 µm); spiral thickenings absent; septate.

Axial parenchyma scanty paratracheal, mostly 6–8 cells per strand; prismatic crystals, 15–30 µm in longest axis, occasional in chambered cells.

Rays heterocellular, uniseriate or multiseriate, 10–17 rays/mm in tangential section; uniseriate rays consisting of upright cell, up to 26 cells and 1.2 mm tall; multiseriate ray body consisting of short upright to square cells with occasional short procumbent cells, wings of upright cells, 2–7 cells and 20–90 µm wide, up to 1.3 mm tall; upright, square, and procumbent cells 45–105 and 15–35, 30–45 and 30–50, 20–25 and 45–85 µm in vertical and radial diameters respectively. Perforated ray cells with simple perforations occasional. Prismatic crystals, 10–35 µm in longest axis, frequent in chambered upright cells and non-chambered upright to square cells; mostly one, occasionally 2–3, per cell. Silica bodies absent.

*Phyllanthus sikkimensis* Müll.Arg.

[Plate 113]

Shrubs in the subtropical zone.

SPECIMEN. No. 9263119, d = 3 cm, h = 2 m, alt. 1240 m: Mechi Zone, Taplejung Distr., Bhirkuna (1980 m) — Manangkhe (1620 m) — Sapcho (deurali) (1620 m) — Chiruwa (1210 m), M. Suzuki et al., May 21, 1992.

DESCRIPTION. Wood diffuse porous with small vessels usually in radial multiples. Growth rings barely distinct, marked by slight change in vessel diameter across growth ring boundaries and flattened fibers at the end of growth rings, or indistinct. Growth rings 0.6–1.4 mm.

Vessels evenly distributed, 149.1/mm<sup>2</sup>; solitary or in radial multiples of 2–7, solitary vessels and multiples often aligned radially; round, (13–)23–37(–49) and (14–)24–44(–58)



µm in radial and tangential diameters respectively, walls rather thick (about 4 µm).

Vessel elements medium in length, (450–)530–670(–740) µm; perforation plates simple with rather thick borders; intervessel pits densely alternate, round, slightly polygonal, 4–5 µm in diameter; vessel-ray pits with distinct borders, opposite to alternate, dense and round, 4–5 µm in diameter. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 2 µm in diameter; rather short, (675–)730–1040(–1300) µm. Fibers constituting ground mass of wood, rectangular or polygonal in outline, 6–20 and 6–25 µm in radial and tangential diameters respectively; walls thin (about 2.5 µm); spiral thickenings absent; septate.

Axial parenchyma rarely diffuse or scanty paratracheal.

Rays heterocellular, 1–3 cells and 13–50 µm wide, up to 2 mm tall, 18–20 rays/mm in tangential section; uniseriate rays consisting of upright cells; multiseriate rays consisting mostly of upright and square cells with occasional procumbent cells; upright, square, and procumbent cells 35–120 and 15–45, 30–35 and 30–40, 15–20 and 45–85 µm in vertical and radial diameters respectively. Perforated ray cells with simple perforations or scalariform perforations with a few bars occasional. Prismatic crystals absent. Silica bodies absent.

*Sauropus quadrangularis* (Willd.) Müll. Arg.

[Plate 114]

Shrubs in the tropical to warm temperate zones.

SPECIMENS. No. 8840433, d=2.5 cm, h=1.8 m, alt. 1670 m: Gandaki Zone, Kaski Distr., Tolka (Thorika) – Landrung – Kyomi – Namjung – Ghandruk Lumle – Ghandruk (Ghandrung), M. Suzuki et al., Aug. 21, 1988. No. 9455239\*, d=3 cm, h=1.7 m, alt. 1530 m: Gandaki Zone, Gorkha Distr., Ekle Ghar (1620 m) — Luktar (1600 m) — Deng (1790 m), M. Suzuki et al., Aug. 2, 1994.

DESCRIPTION. Wood diffuse porous with small vessels often in radial multiples. Growth rings distinct, marked by smaller vessels and flattened fibers at the end of growth rings, or indistinct; growth ring width 0.4–4.4 mm.

Vessels evenly distributed, 55.7–75.0/mm<sup>2</sup>, reduced in size within the final 100 µm of growth rings; solitary or in radial multiples of 2–6; polygonal, (11–)20–43(–58) and (16–)25–61(–90) µm in radial and tangential diameters respectively, walls thin to rather thick (2.5–3.5 µm).

Vessel elements medium in length, (370–)460–690(–800) µm; perforation plates simple or rarely reticulate with distinct borders; intervessel pits densely alternate, round, 5 µm in diameter; vessel-ray pits bordered, opposite to alternate, round to elliptic, 4–8 µm in radial diameter. Helical thickenings absent. Tyloses absent.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4 µm in diameter; rather short, (570–)770–1130(–1250) µm. Fibers constituting ground mass of wood, rectangular or polygonal in outline, 8–20 and 8–35 µm in radial and tangential diameters respectively; walls thin (about 3 µm); spiral thickenings absent; septate.

Axial parenchyma rarely scanty paratracheal or diffuse.

Rays heterocellular, 1–5 cells and 10–60 µm wide, up to 1.4 mm, about 25 rays/mm in tangential section; multiseriate body consisting a mixture of tall and short upright cells with occasional square and procumbent cells, wings and uniseriate rays mostly of tall up-

right cells; upright, square, and procumbent cells 30–110 and 15–35, 15–30 and 20–35, 15–25 and 30–55  $\mu\text{m}$  in vertical and radial diameters respectively. Perforated ray cells with simple perforations occasional. Prismatic crystals absent. Druses, 12  $\mu\text{m}$  in diameter, rarely in radially elongated cells among tall upright cells. Silica bodies absent.

*Trewia nudiflora* L.

[Plate 115]

Deciduous small trees in the tropical zone.

SPECIMENS. No. 9555005\*, d=24 cm, h=10 m, alt. 80 m: Koshi Zone, Sunsari Distr., Kushaha, Koshi Tappu Wildlife Reserve, SW of Headquarter Office (60–65 m), M. Mikage et al., Oct. 21, 1995. No. 9840212, dbh=42 cm, h=9 m, alt. 440 m: Koshi Zone, Sankhuwasawa Distr., Tumlingtar (440 m) — Katle Bhanjyang (410 m) — Sabha Khola (310 m) — Khahare (410 m) — Pikuwa Khola (320 m) — Surtibari (320 m) — Baireni Bagar (320 m), S. Noshiro et al., Aug. 31, 1998.

DESCRIPTION. Wood diffuse porous with sparse large vessels often in radial multiples. Growth rings barely distinct, marked by reduction in vessel diameter across growth ring boundaries and flattened fibers at the end of growth ring, or indistinct. Pith flecks occasional.

Vessels evenly and sparsely distributed, 3.6–5.5/mm<sup>2</sup>, reduced in size over 200–300  $\mu\text{m}$  across growth ring boundaries; solitary or in radial multiples of 2–7, rarely in clusters formed by merging multiples; round, (26–)83–193(–245) and (17–)65–206(–266)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thick (5–6  $\mu\text{m}$ ).

Vessel elements medium in length, (360–)490–740(–800)  $\mu\text{m}$ ; perforation plates simple with rather thick borders; intervessel pits densely alternate, polygonal, about 12–15  $\mu\text{m}$  in diameter; vessel-ray pits with reduced, but distinct borders, opposite to scalariform, occasionally slanting, round to rectangular, 10–25 and 6–13  $\mu\text{m}$  in vertical and radial diameters respectively. Helical thickenings absent. Tyloses common, thin-walled, unpitted, with prismatic crystals or rare druses 15–80  $\mu\text{m}$  long.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 3  $\mu\text{m}$  in diameter; medium in length, (950–)1060–1430(–1600)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 7–40 and 7–45  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 1.5  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma scanty paratracheal and in dense lines; banded parenchyma consisting of slender cells 80–140  $\mu\text{m}$  tall, mostly 4–6 cells per strand; scanty paratracheal parenchyma consisting of broad cells 25–85  $\mu\text{m}$  tall, mostly 4–12 cells per strand; prismatic crystals absent.

Rays heterocellular, uniseriate and multiseriate, 13–16 rays/mm in tangential section; uniseriate rays, up to 15 cells and 800  $\mu\text{m}$  tall consisting of upright and square cells; multiseriate rays up to 5 cells and 80  $\mu\text{m}$  wide, up to 870  $\mu\text{m}$  tall, wings consisting of upright and square cells, body of procumbent cells; upright, square, and procumbent cells 40–120 and 15–60, 30–70 and 30–70, 15–25 and 50–140  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals, 25–65  $\mu\text{m}$  in longest axis, or druses, 25–45  $\mu\text{m}$  in diameter, common in chambered upright and non-chambered upright to square cells, or rarely in procumbent cells; mostly one, occasionally 2, per cell. Silica bodies absent.



*Triadica cochinchinensis* Lour.

[Plate 116]

Deciduous small trees in the tropical zone.

SPECIMENS. No. 9455389, dbh=20 cm, h=11 m, alt. 1130 m: Gandaki Zone, Kaski Distr., Ghorepani (2760 m) — Banthati (2180 m) — Ulleri (1950 m) — Tikhe Dhunga (1470 m) — Ramghai (1200 m) — Birethanti Bazar (1030 m), M. Mikage et al., Aug. 28, 1994. No. 9840211\*, dbh=25 cm, h=12 m, alt. 540 m: Koshi Zone, Sankhuwasawa Distr., Bhotebas (pass) (1840 m) — Mane Bhanjyang (1140 m) — Khandbari (1040 m) — Dunge Danda (920 m) — Tumlingtar Shiran (530 m) — Tumlingtar (440 m), S. Noshiro et al., Aug. 30, 1998.

DESCRIPTION. Wood diffuse porous with sparse large vessels often in radial multiples. Growth rings distinct, marked by reduction in vessel diameter across growth ring boundaries and flattened fibers at the end of growth ring, or indistinct. Pith flecks occasional.

Vessels evenly and sparsely distributed,  $2.2\text{--}7.1/\text{mm}^2$ , reduced in size in the final 0.5–1 mm of growth rings; solitary or in radial multiples of 2–5, rarely in clusters formed by merging multiples; round, (23–)51–241(–261) and (10–)50–301(–345)  $\mu\text{m}$  in radial and tangential diameters respectively, walls rather thin (3–4  $\mu\text{m}$ ).

Vessel elements medium in length, (440–)660–910(–1070)  $\mu\text{m}$ ; perforation plates simple with rather thick borders; intervessel pits densely alternate, polygonal, about 10–12  $\mu\text{m}$  in diameter; vessel-ray pits with reduced borders, opposite to alternate, rarely scalariform, round to rectangular, 8–12(–25)  $\mu\text{m}$  in radial diameter. Helical thickenings absent. Tyloses occasional, thin-walled, pitted.

Non-perforated tracheal elements fibers with distinctly bordered pits mostly on radial walls with chambers of about 4  $\mu\text{m}$  in diameter; medium in length, (800–)1000–1380(–1550)  $\mu\text{m}$ . Fibers constituting ground mass of wood, rectangular or polygonal in outline, 12–45 and 12–60  $\mu\text{m}$  in radial and tangential diameters respectively; walls thin (about 1.5–3  $\mu\text{m}$ ); spiral thickenings absent; non-septate.

Axial parenchyma scanty paratracheal and in dense lines; banded parenchyma consisting of slender cells 75–200  $\mu\text{m}$  tall, mostly 4–8 cells per strand; scanty paratracheal parenchyma consisting of broad cells 45–130  $\mu\text{m}$  tall, mostly 8–12 cells per strand; prismatic crystals, 15–30  $\mu\text{m}$  in longest axis, occasionally in chambered cells.

Rays heterocellular, 1–2(–3) cells and 10–30(–45)  $\mu\text{m}$  wide, up to 1.1 mm tall, 10–13 rays/mm in tangential section, consisting of upright, square, and procumbent cells; upright, square, and procumbent cells 45–110 and 30–50, 40–80 and 35–80, 20–50 and 50–230  $\mu\text{m}$  in vertical and radial diameters respectively. Prismatic crystals, 20–25  $\mu\text{m}$  in longest axis, occasionally in chambered upright cells, mostly one per cell. Druses, about 20  $\mu\text{m}$  in diameter, rarely in procumbent cells. Silica bodies absent.

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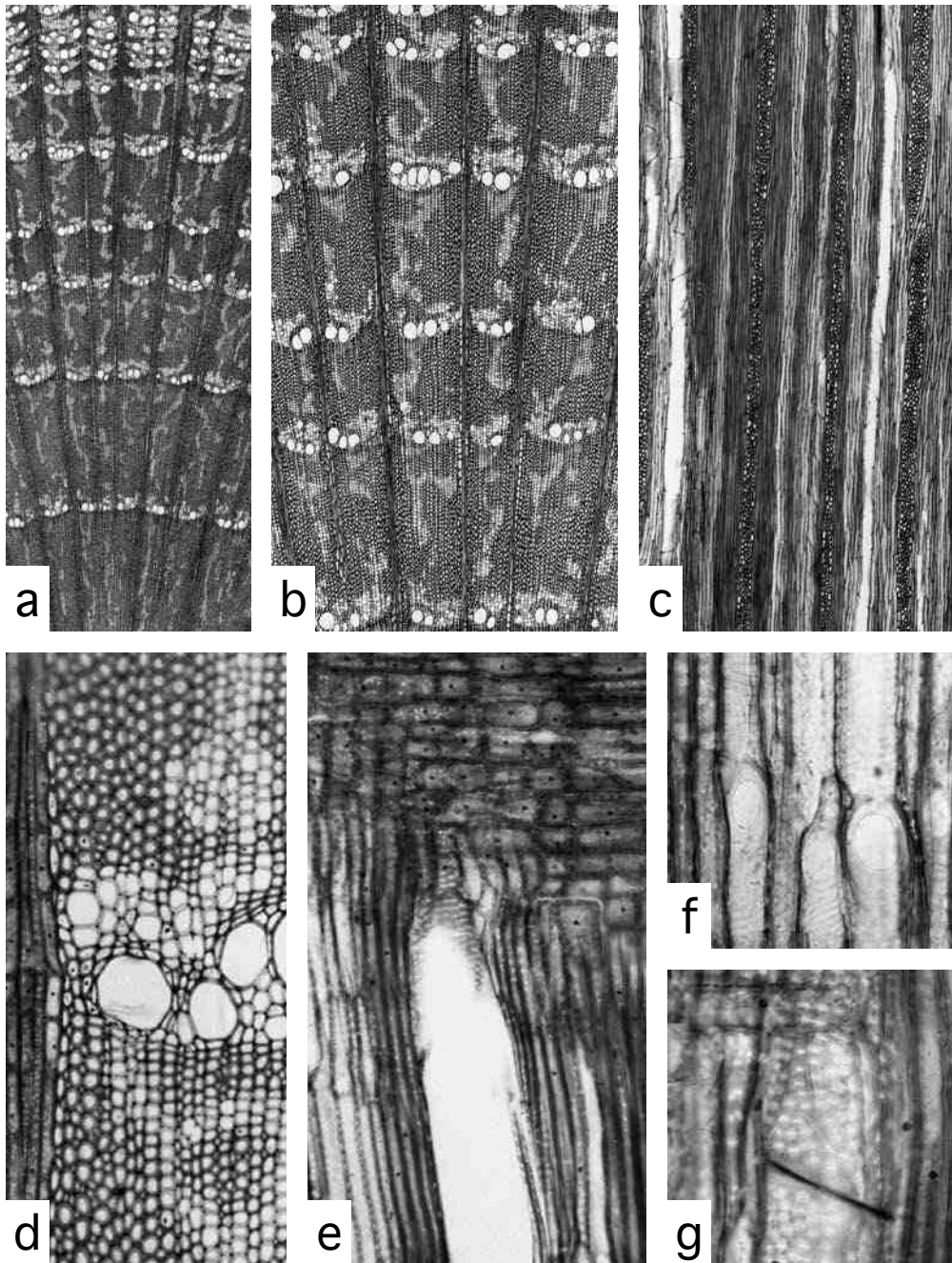


Plate 82. *Berberis angulosa* Wall. ex Hook. f. et Thoms. (No. 9684253). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large and small vessel elements and heterocellular ray cells. f: Radial section ( $\times 400$ ) showing small vessel elements with simple perforations and helical thickenings. g: Radial section ( $\times 400$ ) showing alternate intervessel pits and vessel-ray pits.

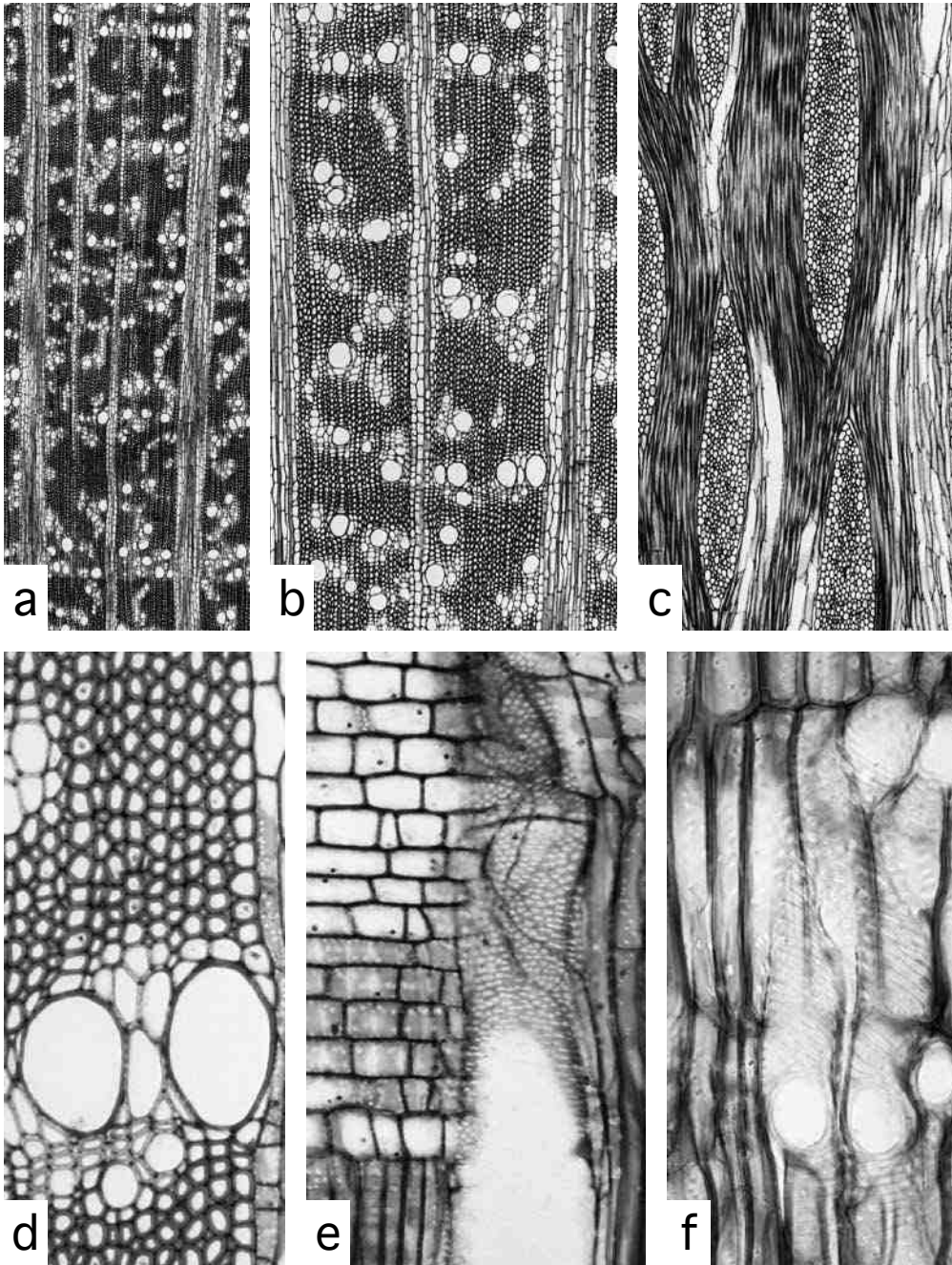


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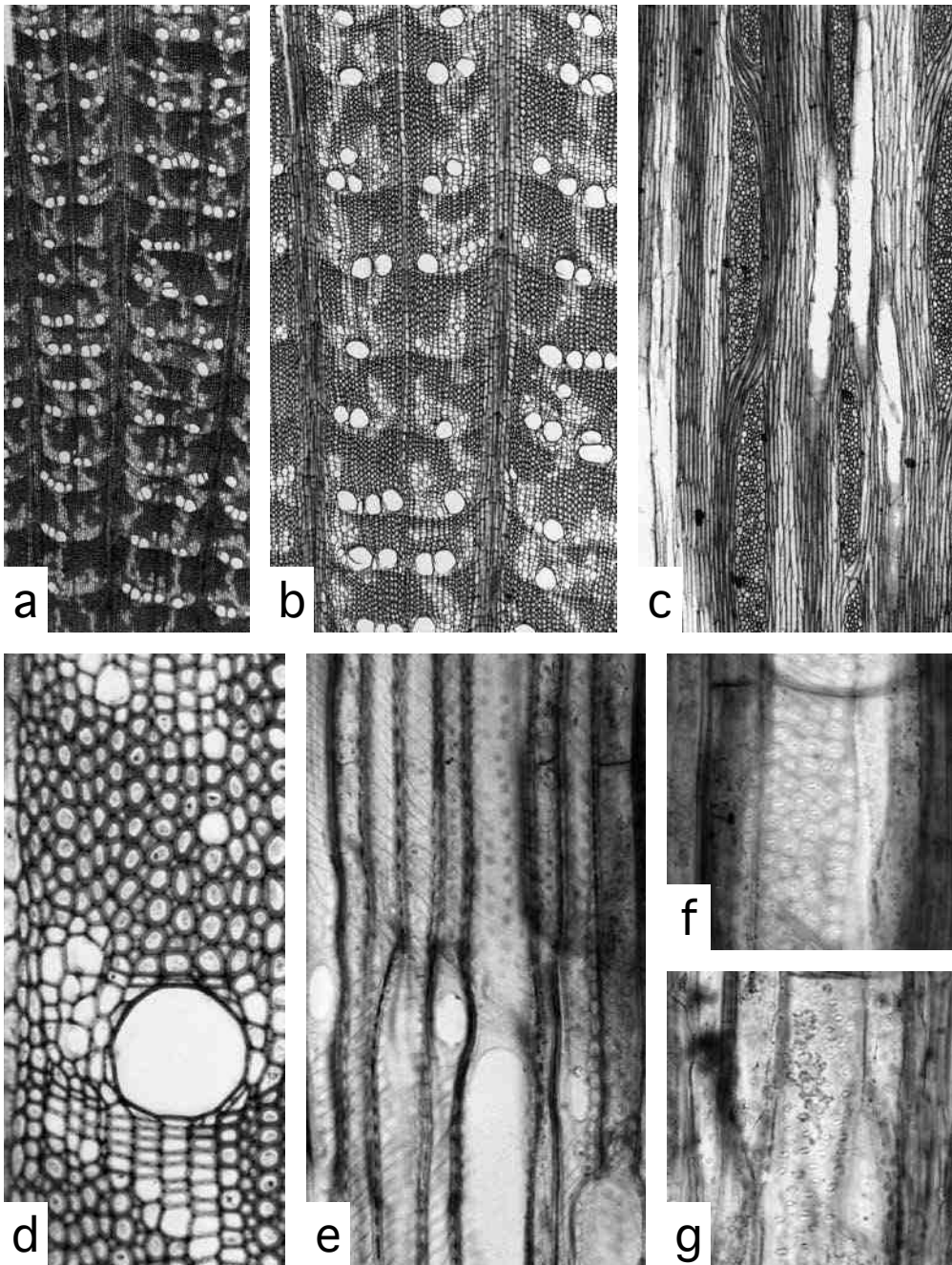


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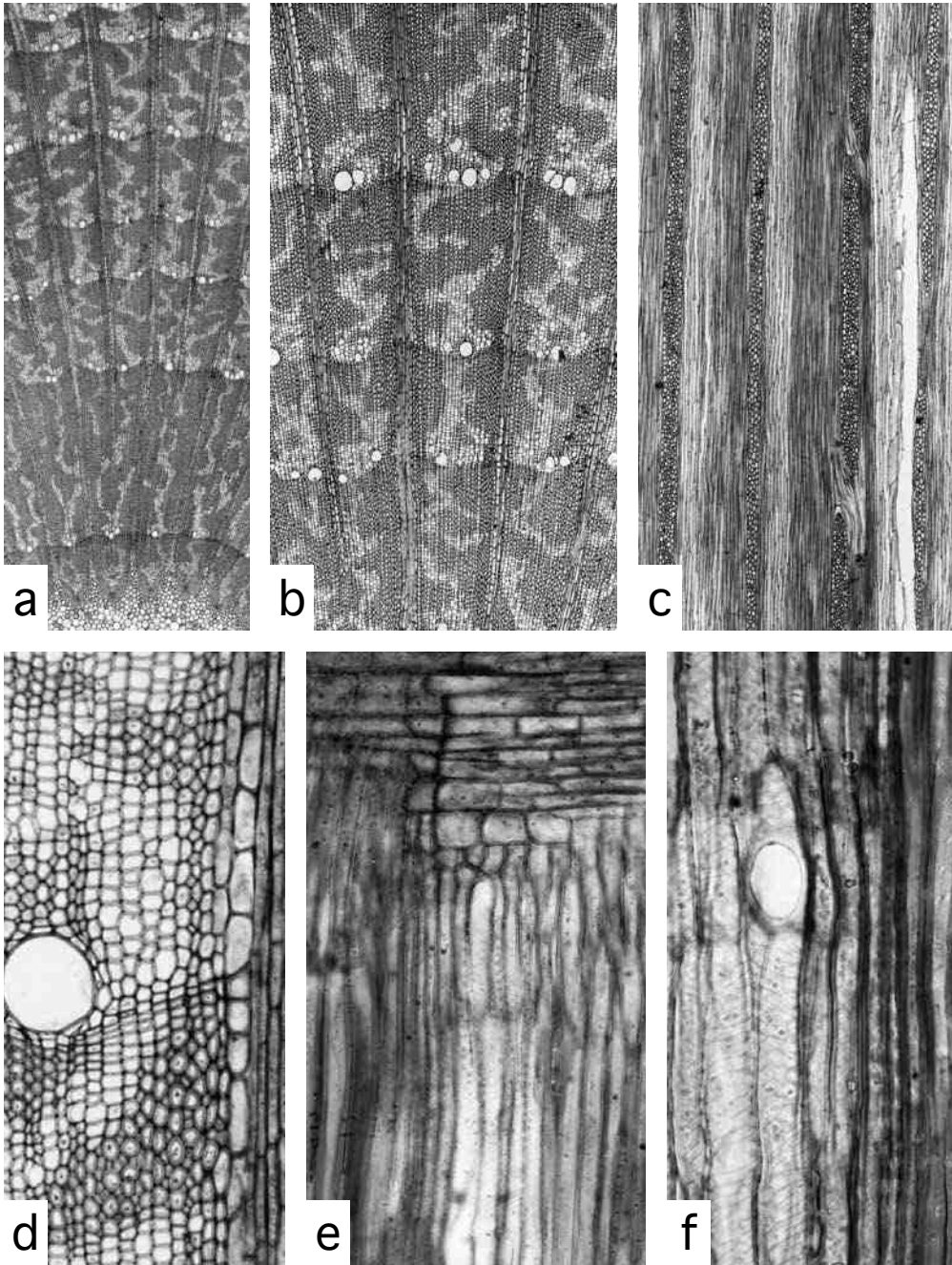


Plate 85. *Berberis concinna* Hook. f. et Thoms. var. *extensiflora* Ahrendt (No. 9684190). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing small vessel elements and heterocellular ray cells. f: Radial section ( $\times 400$ ) showing fiber pits and small vessel elements with simple perforations and helical thickenings.



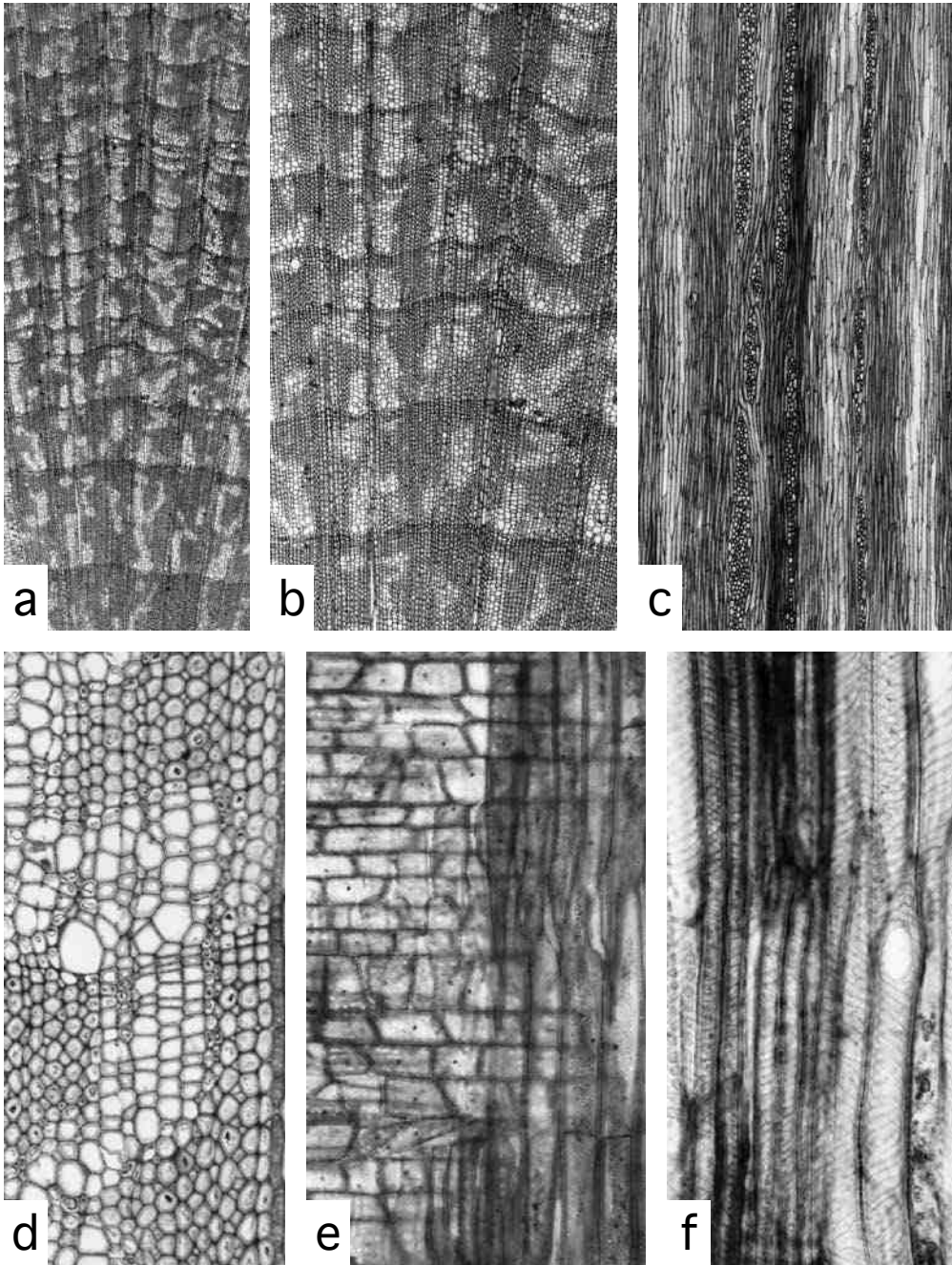


Plate 86. *Berberis hookeri* Lamaire (No. 9460308). a: Cross section ( $\times 20$ ) showing semi-ring porous wood. b: Cross section ( $\times 40$ ) showing pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing heterocellular ray cells. f: Radial section ( $\times 400$ ) showing vessel elements with a simple perforation and helical thickenings.

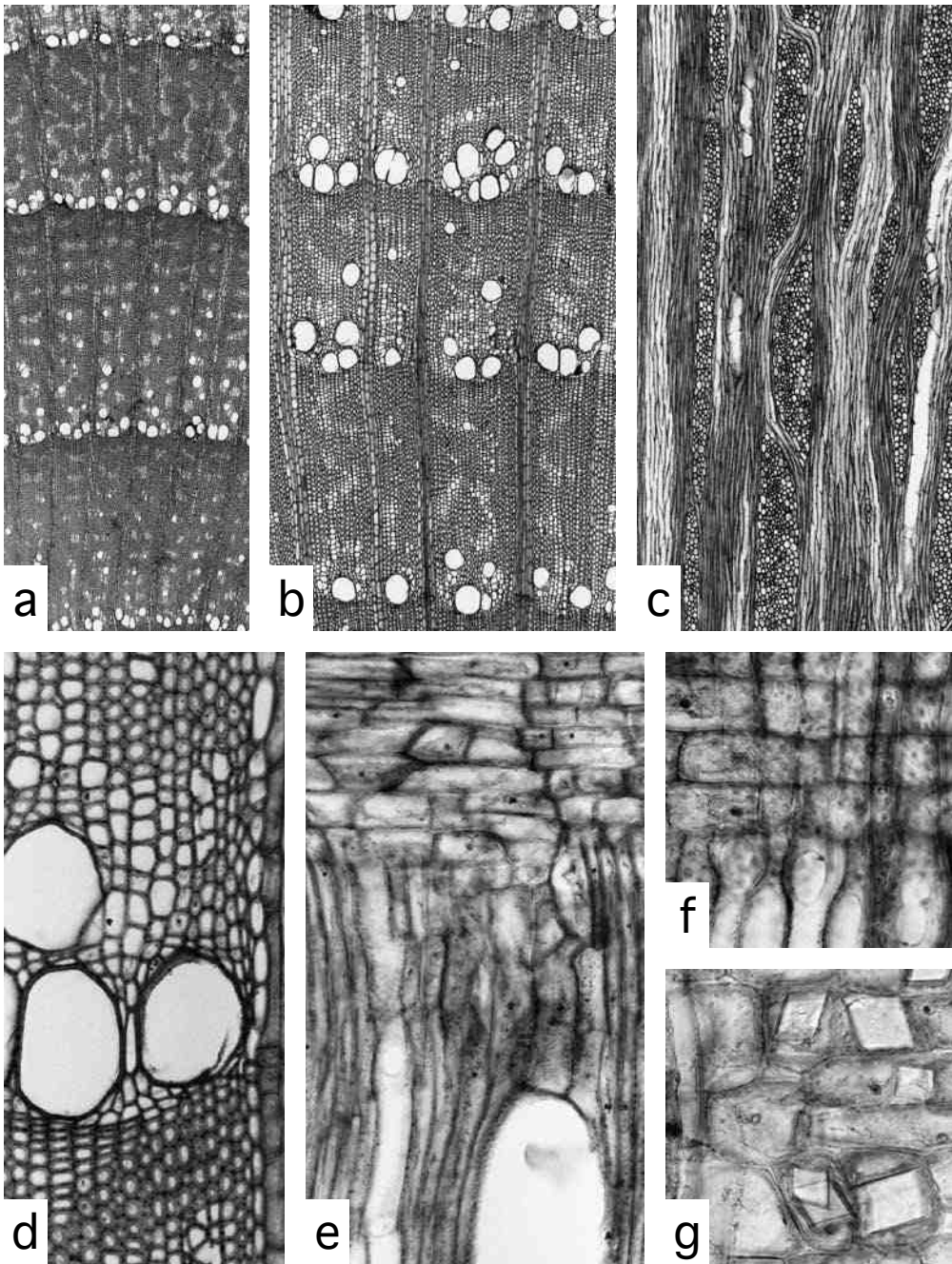


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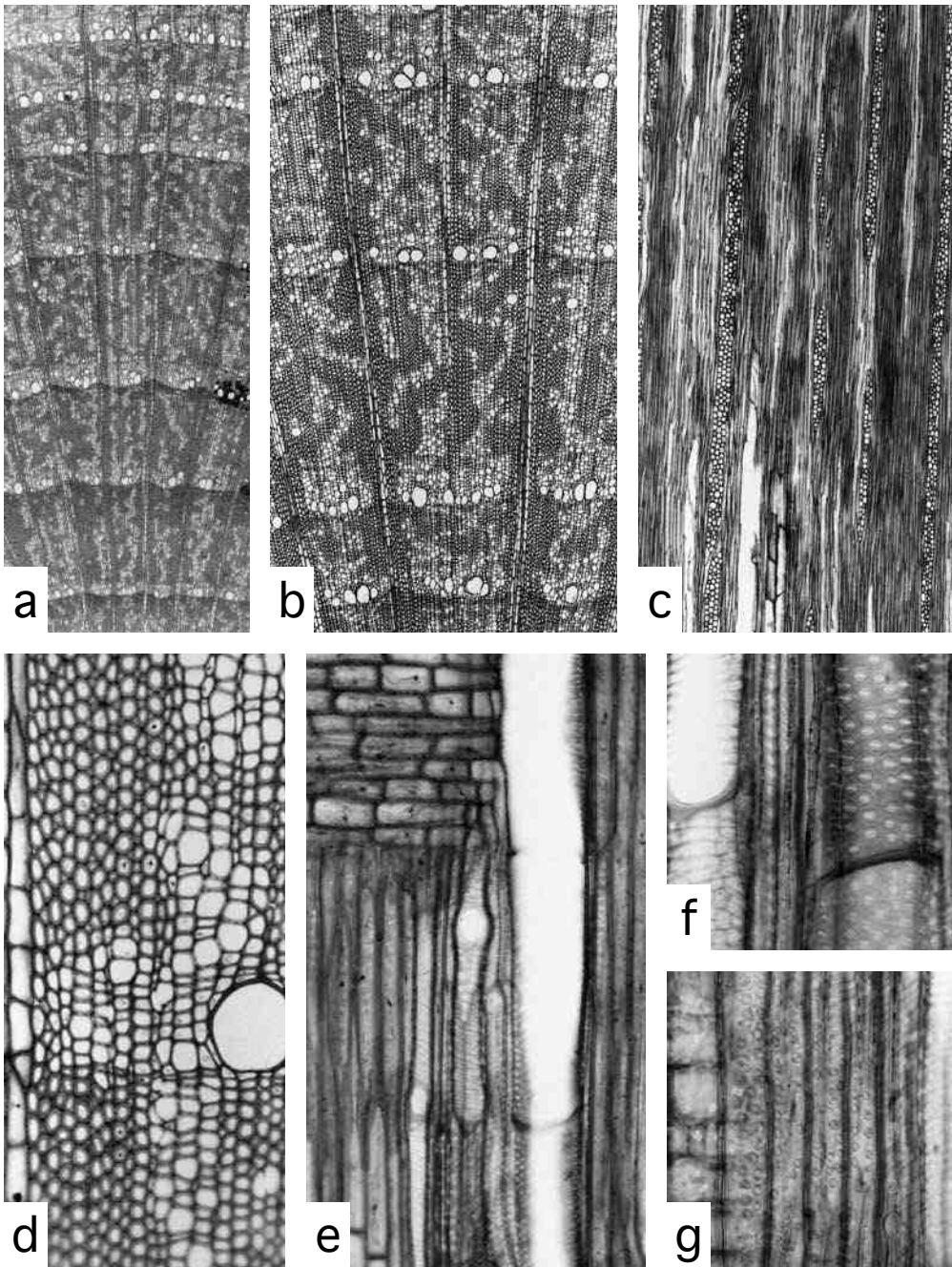


Plate 88. *Berberis mucrifolia* Ahrendt (No. 9551061). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large and small vessel elements, heterocellular ray cells and septate fibers. f: Radial section ( $\times 400$ ) showing alternate intervessel pits and helical thickenings. g: Radial section ( $\times 400$ ) showing vessel-ray pits.

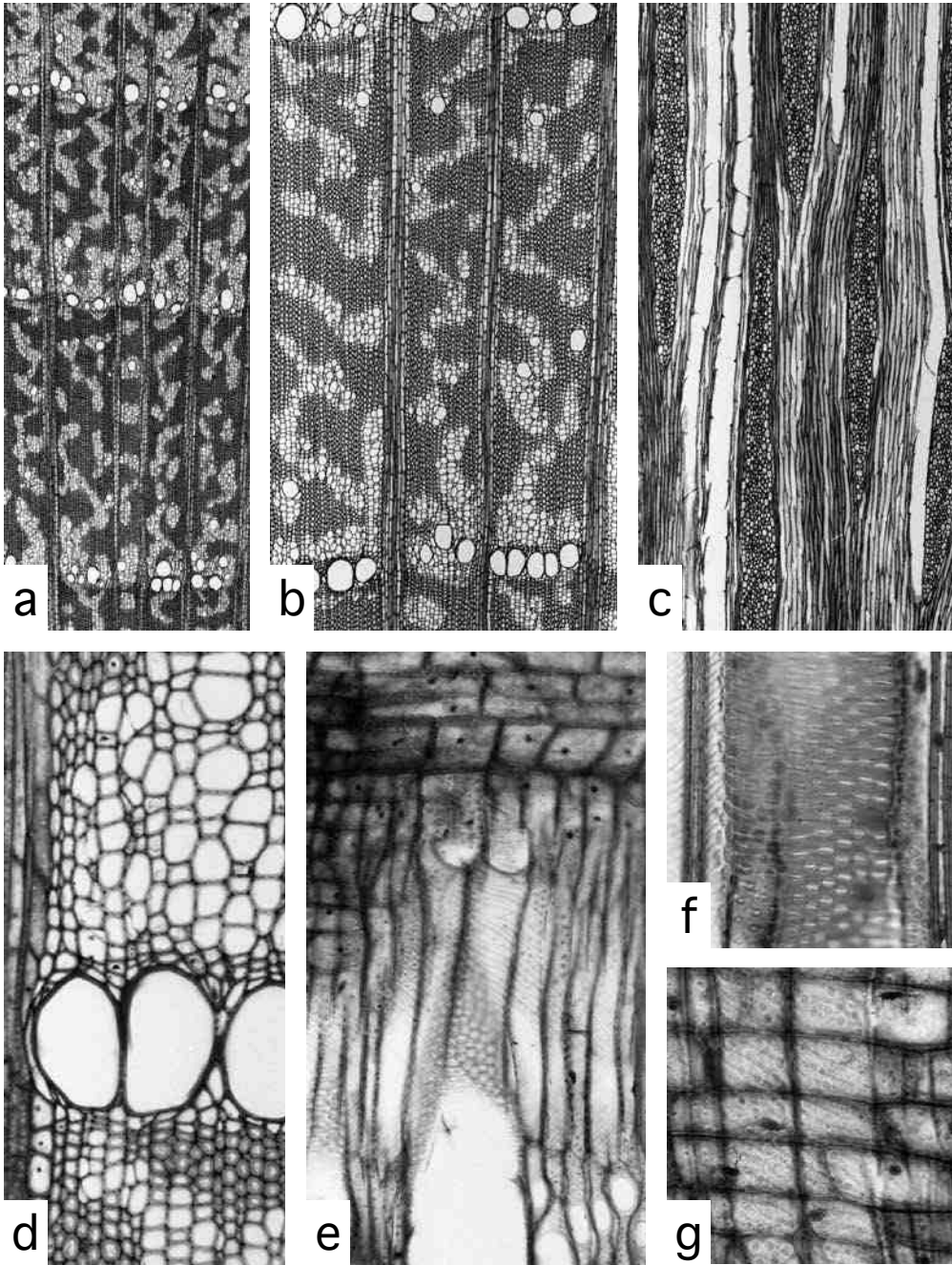


Plate 89. *Berberis sikkimensis* (Schneid.) Ahrendt var. *baileyi* Ahrendt (No. 9460454). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large and small vessel elements, heterocellular ray cells and septate fibers. f: Radial section ( $\times 400$ ) showing alternate intervessel pits. g: Radial section ( $\times 400$ ) showing vessel-ray pits .



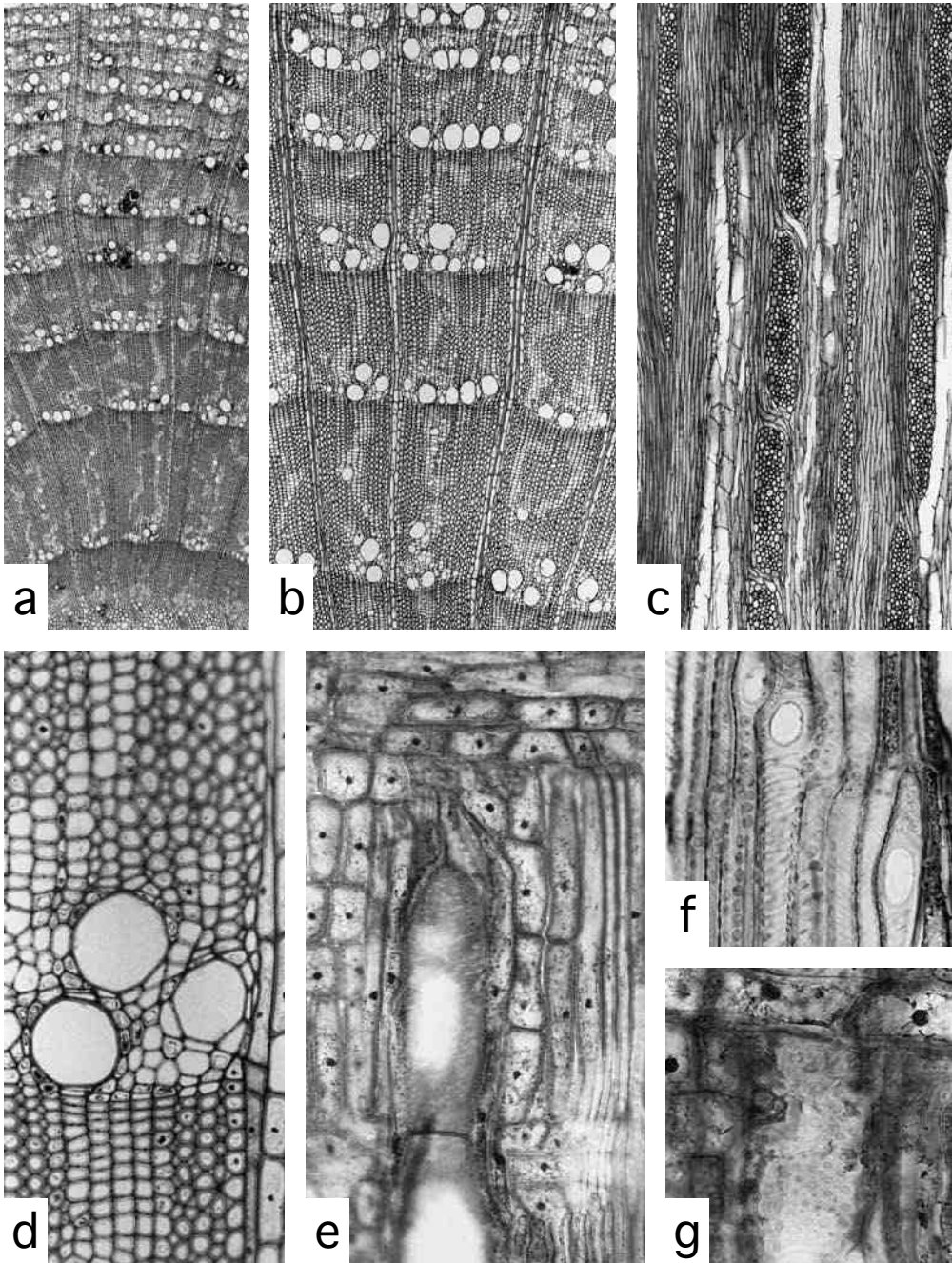


Plate 90. *Berberis tsarica* Ahrendt (No. 9460389). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large vessel elements and heterocellular ray cells. f: Radial section ( $\times 400$ ) showing small vessel elements with simple perforations and helical thickenings. g: Radial section ( $\times 400$ ) showing vessel-ray pits.

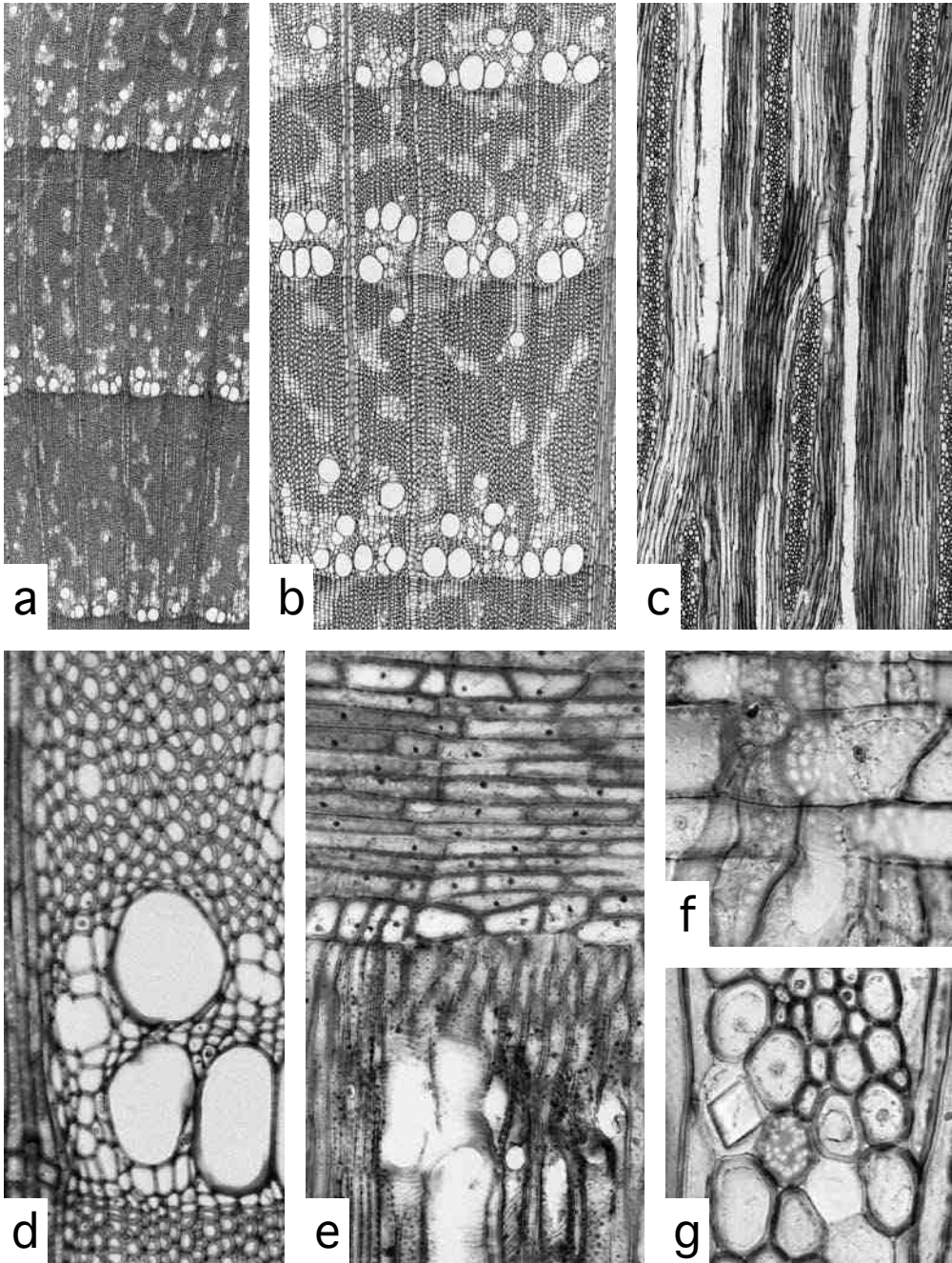


Plate 91. *Berberis umbellata* Wall. ex G. Don (No. 9460298). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in dendritic pattern in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large and small vessel elements and heterocellular ray cells. f: Radial section ( $\times 400$ ) showing vessel-ray pits. g: Tangential section ( $\times 400$ ) showing prismatic crystals.



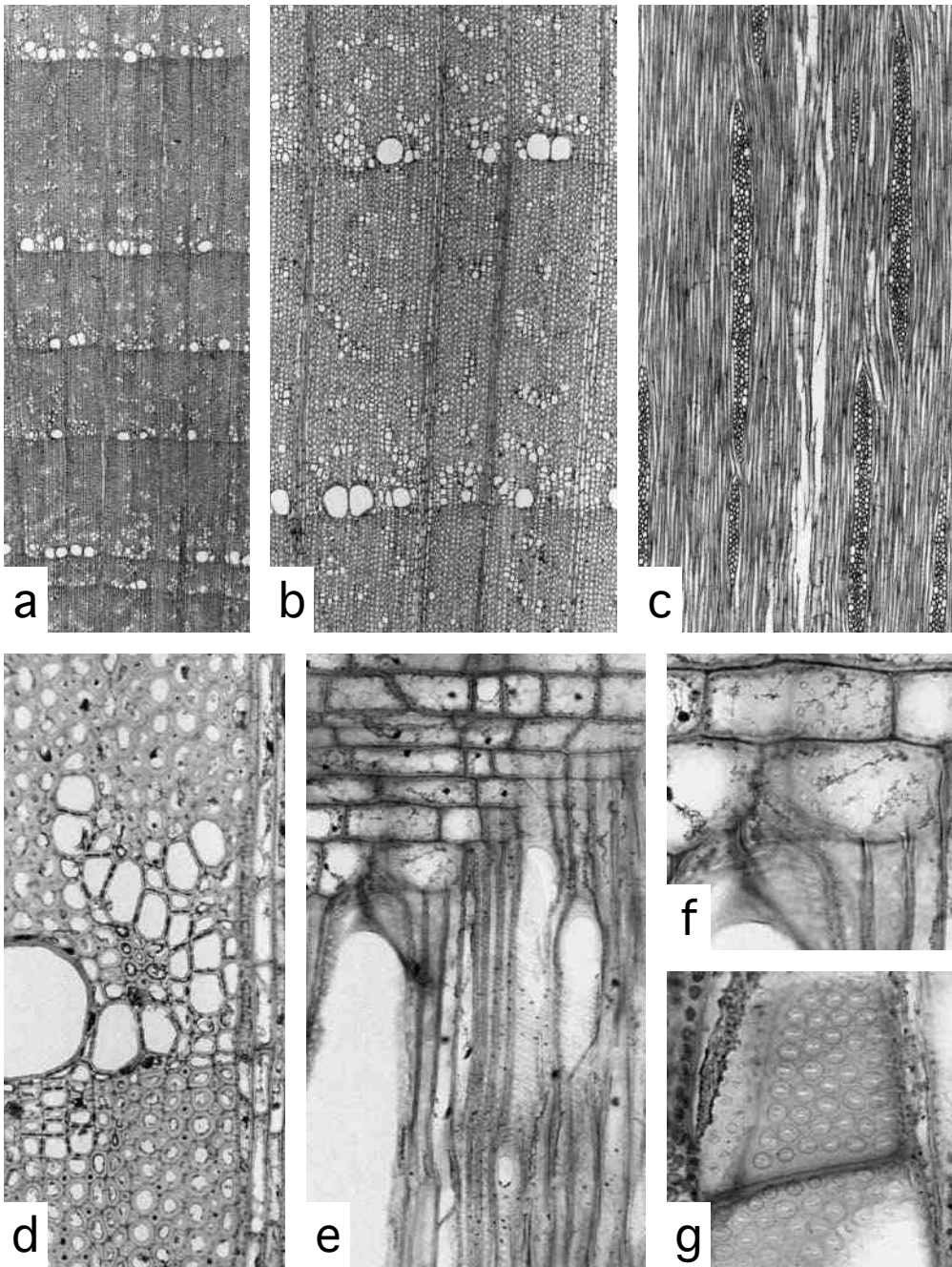


Plate 92. *Berberis zebeliana* Schneid. (No. 9460344). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing small pores in irregular clusters in late wood. c: Tangential section ( $\times 40$ ) showing heterocellular rays. d: Cross section ( $\times 200$ ) showing growth ring boundary. e: Radial section ( $\times 200$ ) showing large and small vessel elements and heterocellular ray cells. f: Radial section ( $\times 400$ ) showing vessel-ray pits. g: Radial section ( $\times 400$ ) showing alternate intervessel pits.

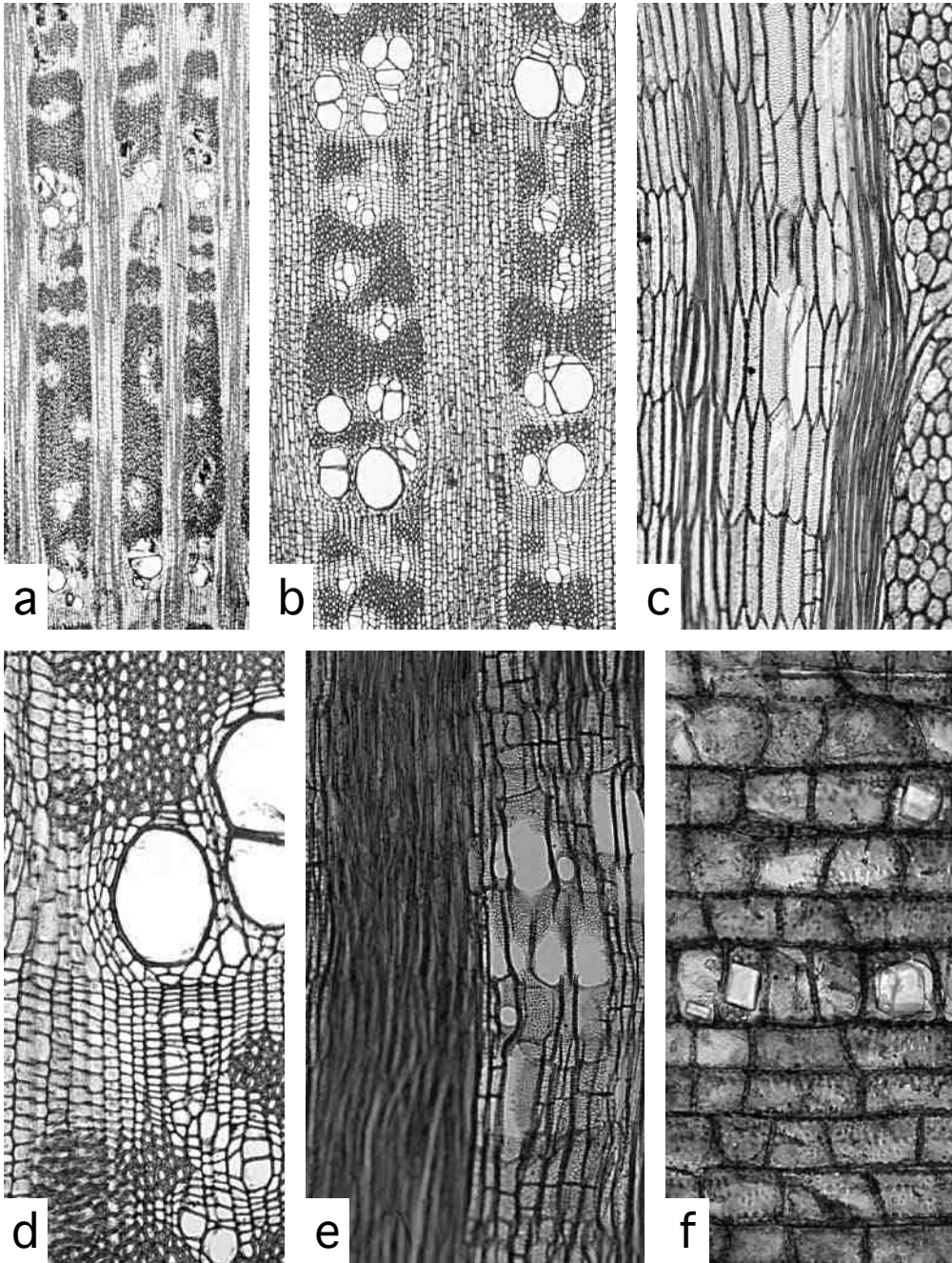


Plate 93. *Coriaria napalensis* Wall. (No. 8340287). a ( $\times 20$ ) & b ( $\times 40$ ): Cross sections showing semi-ring porous vessel arrangement, vascentric and confluent axial parenchyma and wide rays. c: Tangential section ( $\times 100$ ) showing parts of large rays and storied structure of narrow vessel elements and axial parenchyma. d: Magnified cross section ( $\times 100$ ) showing an annual ring boundary, a part of a large ray, wide vessels in earlywood and narrow vessels with vascentric and confluent axial parenchyma in latewood. e: Radial section ( $\times 100$ ) showing a part of ray, narrow vessels with simple perforation plates and axial parenchyma. f: magnified radial section ( $\times 200$ ) showing narrow vessels with simple perforation plates and axial parenchyma. g: Radial section ( $\times 200$ ) showing procumbent and square ray cells. Single crystals are often present in the square cells.



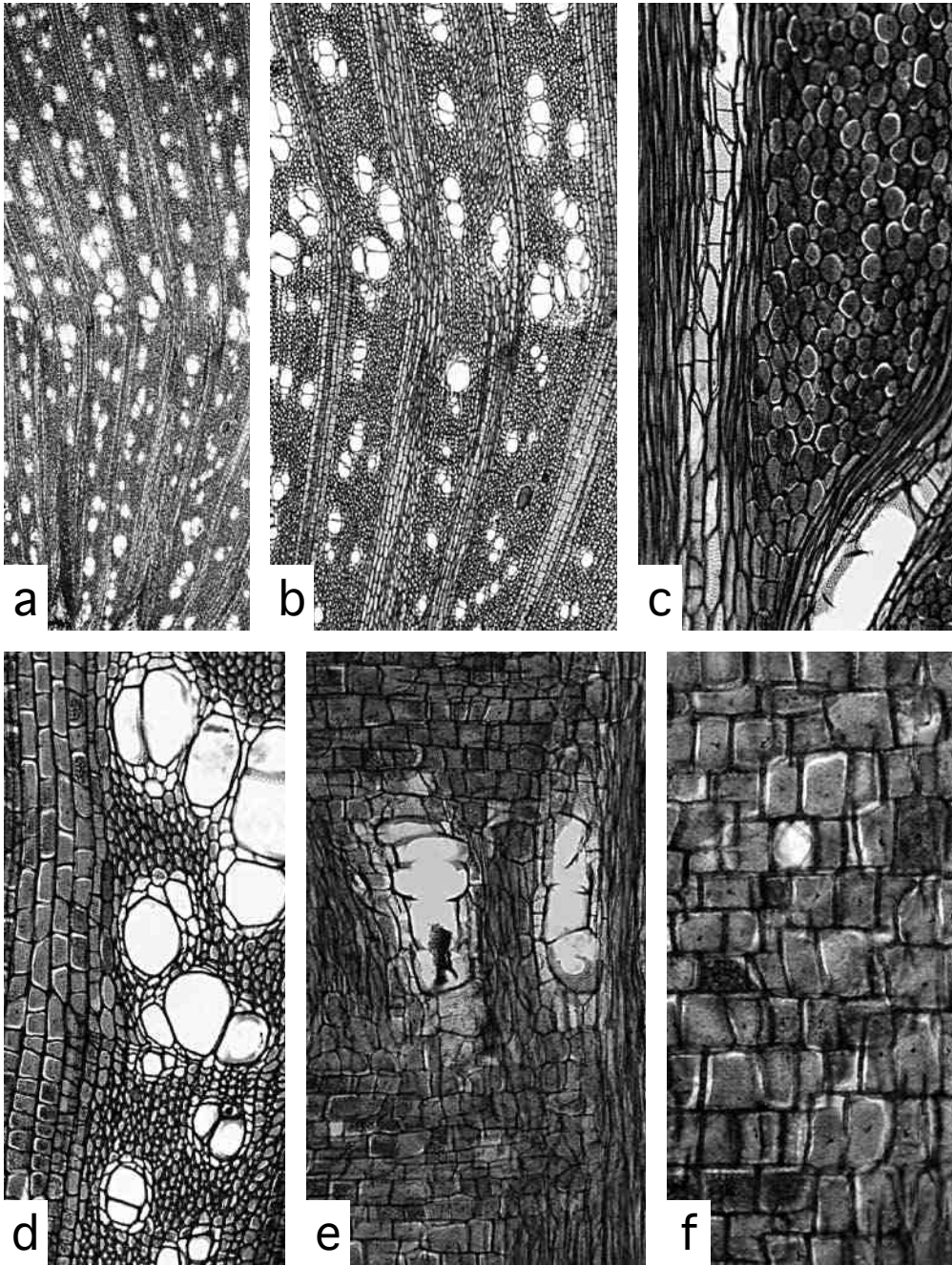


Plate 94. *Coriaria terminalis* Hems. (No. 12316). a ( $\times 20$ ) & b ( $\times 40$ ): Cross sections showing diffuse to semi-ring porous vessel arrangement, vasicentric axial parenchyma and wide rays. c: Tangential section ( $\times 100$ ) showing parts of large rays and weekly storied structure of narrow vessel elements and axial parenchyma. d: Magnified cross section ( $\times 100$ ) showing an annual ring boundary and wider vessels in earlywood and narrower vessels with vasicentric axial parenchyma in latewood. e: Radial section ( $\times 100$ ) showing the narrower vessels with simple perforation plates and vasicentric axial parenchyma. f: Radial section ( $\times 200$ ) showing procumbent and square ray cells. Single crystals are rarely present in the square cells.

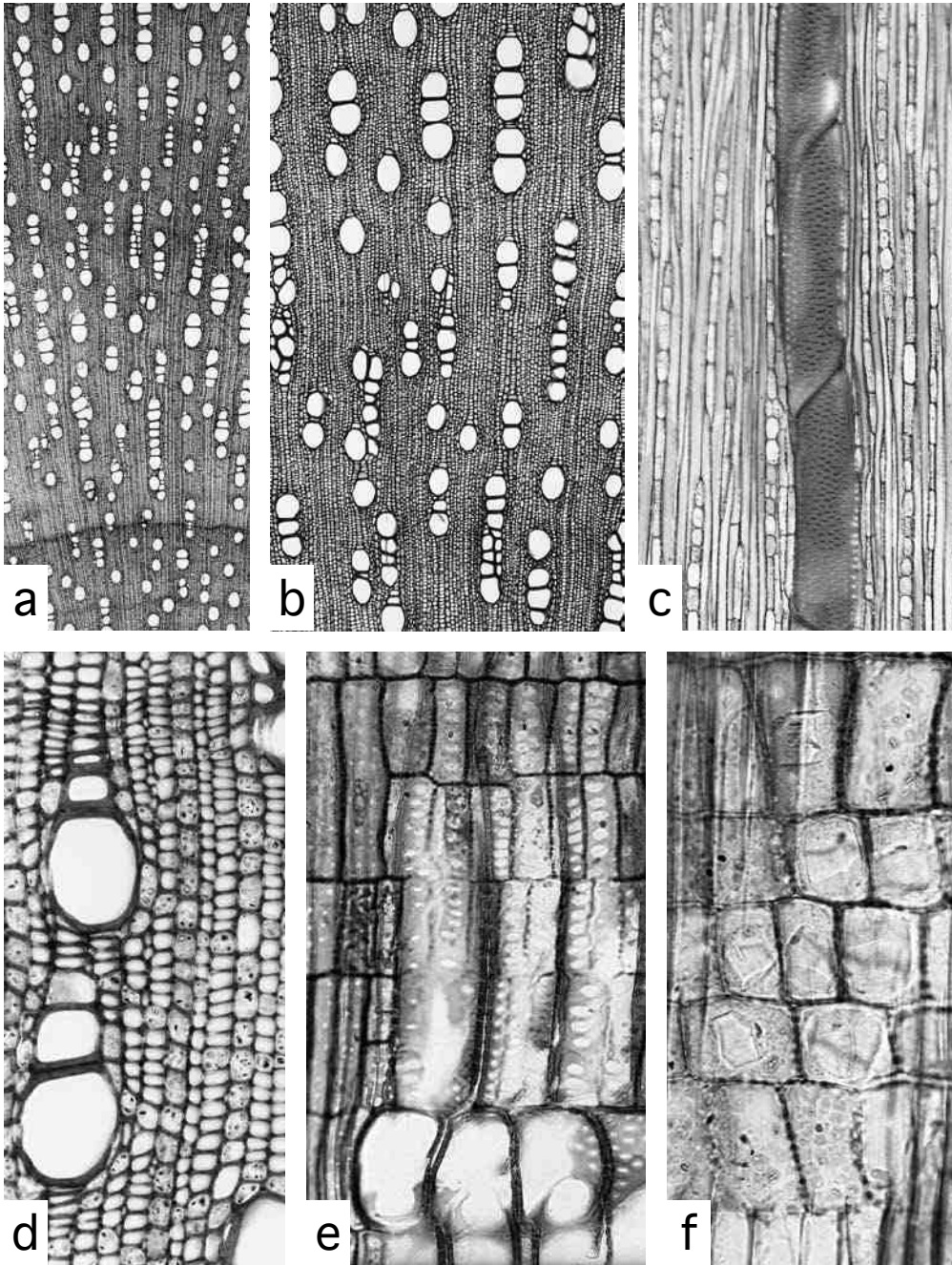


Plate 95. *Alchornea mollis* (Benth.) Müll.Arg. (No. 9840040). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels mostly in radial multiples or clusters. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessel multiples and scanty paratracheal and banded parenchyma. e: Radial section ( $\times 200$ ) showing simple perforations and scalariform vessel-ray pits. f: Radial section ( $\times 400$ ) showing prismatic crystals in ray cells.



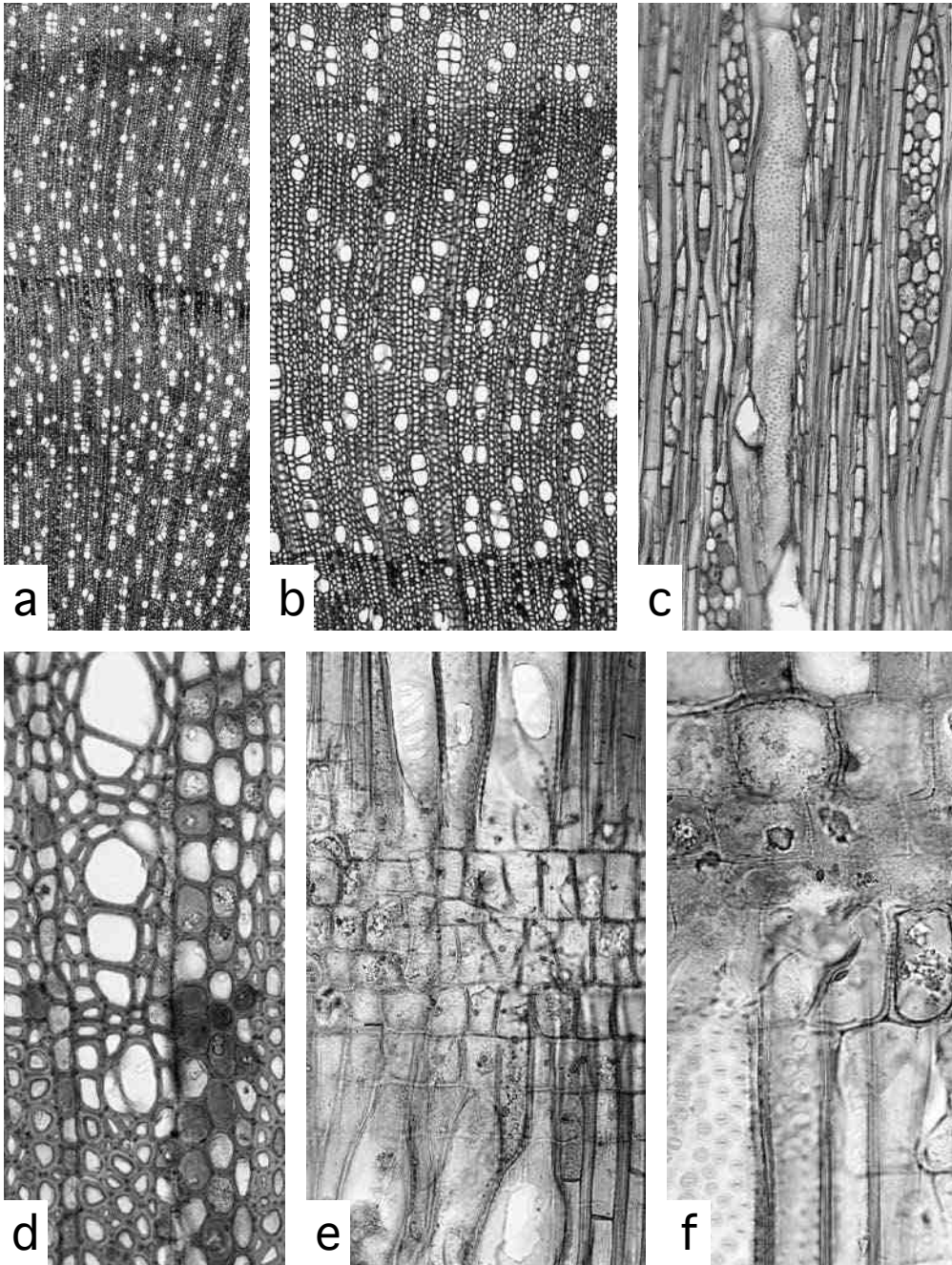


Plate 96. *Antidesma acidum* Retz. (No. 9455031). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing rather sparse small vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessel multiples and silica bodies in ray cells. e: Radial section ( $\times 200$ ) showing simple and scalariform perforations, septate fibers, and scalariform vessel-ray pits. f: Radial section ( $\times 400$ ) showing silica bodies in ray cells.

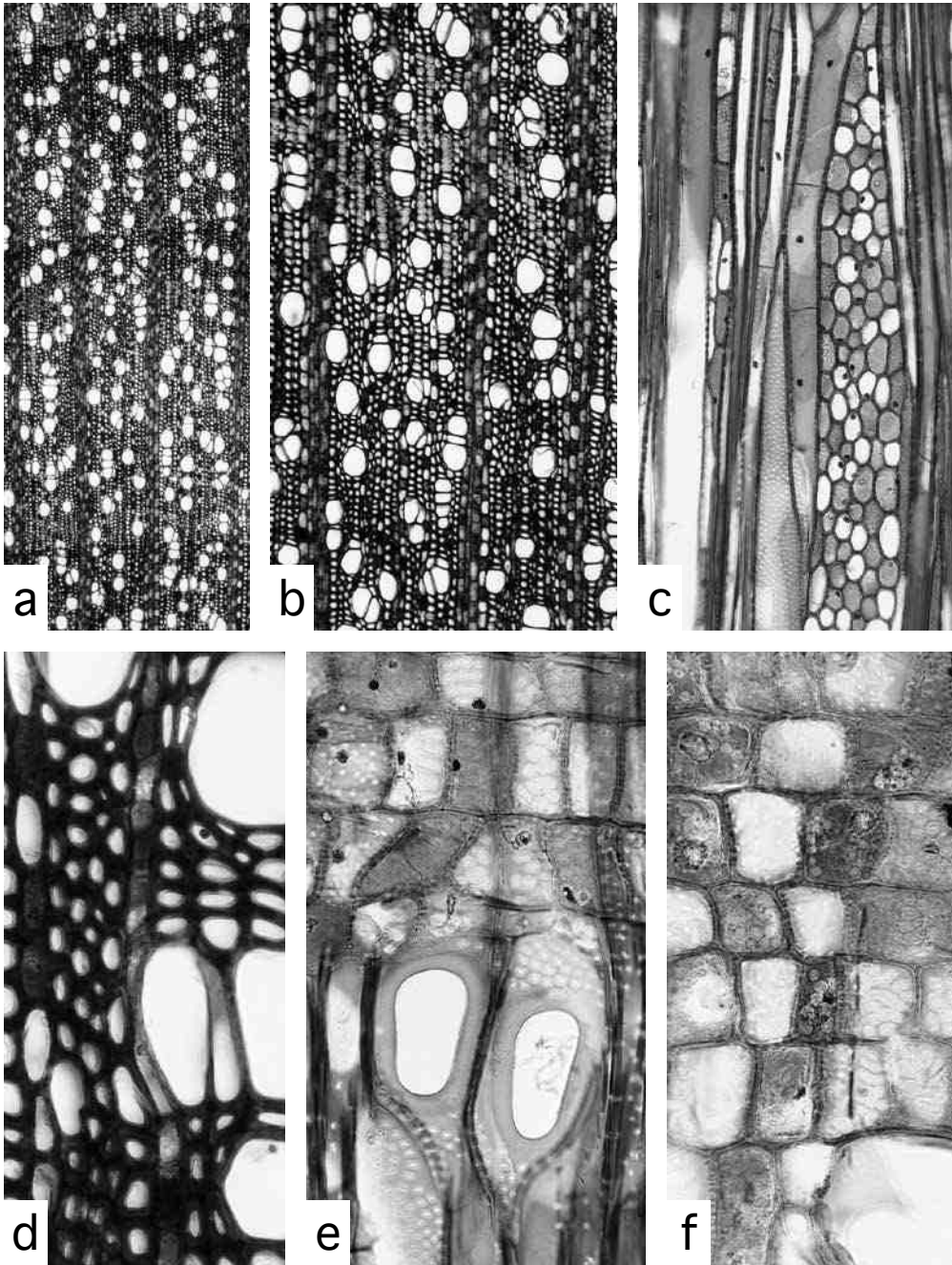


Plate 97. *Antidesma bunius* (L.) Spreng. (No. 9455034). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing round vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing large heterocellular rays and dense intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing simple perforations and opposite to scalariform vessel-ray pits. f: Radial section ( $\times 200$ ) showing a perforated ray cell with a simple perforation and silica bodies in ray cells.



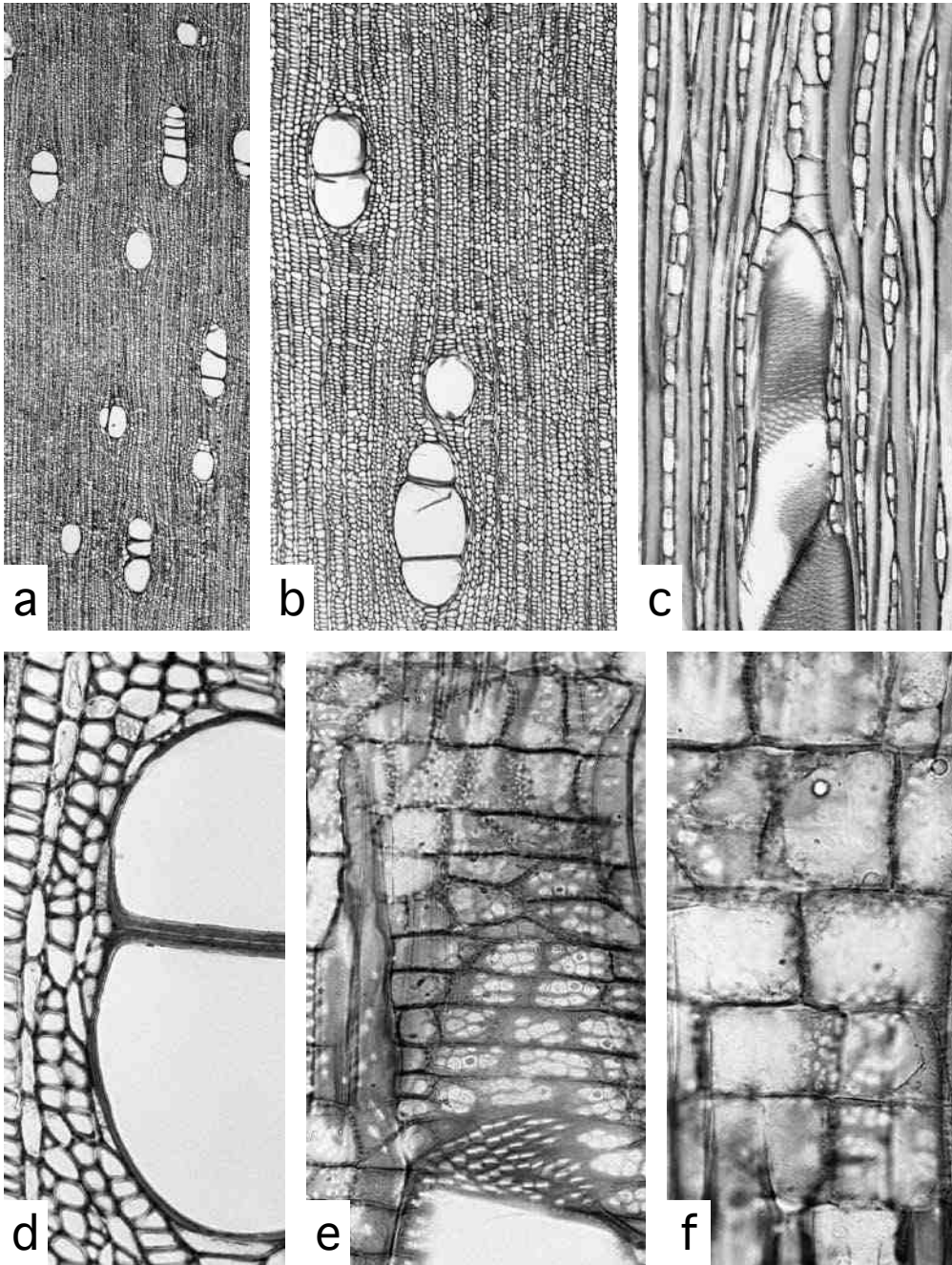


Plate 98. *Balakata baccata* (Roxb.) Esser (No. 9455056). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing sparse large vessels and axial parenchyma in dense lines. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays, paratracheal parenchyma, and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing vessel-ray pits with reduced borders. f: Radial section ( $\times 400$ ) showing small silica bodies in ray cells.

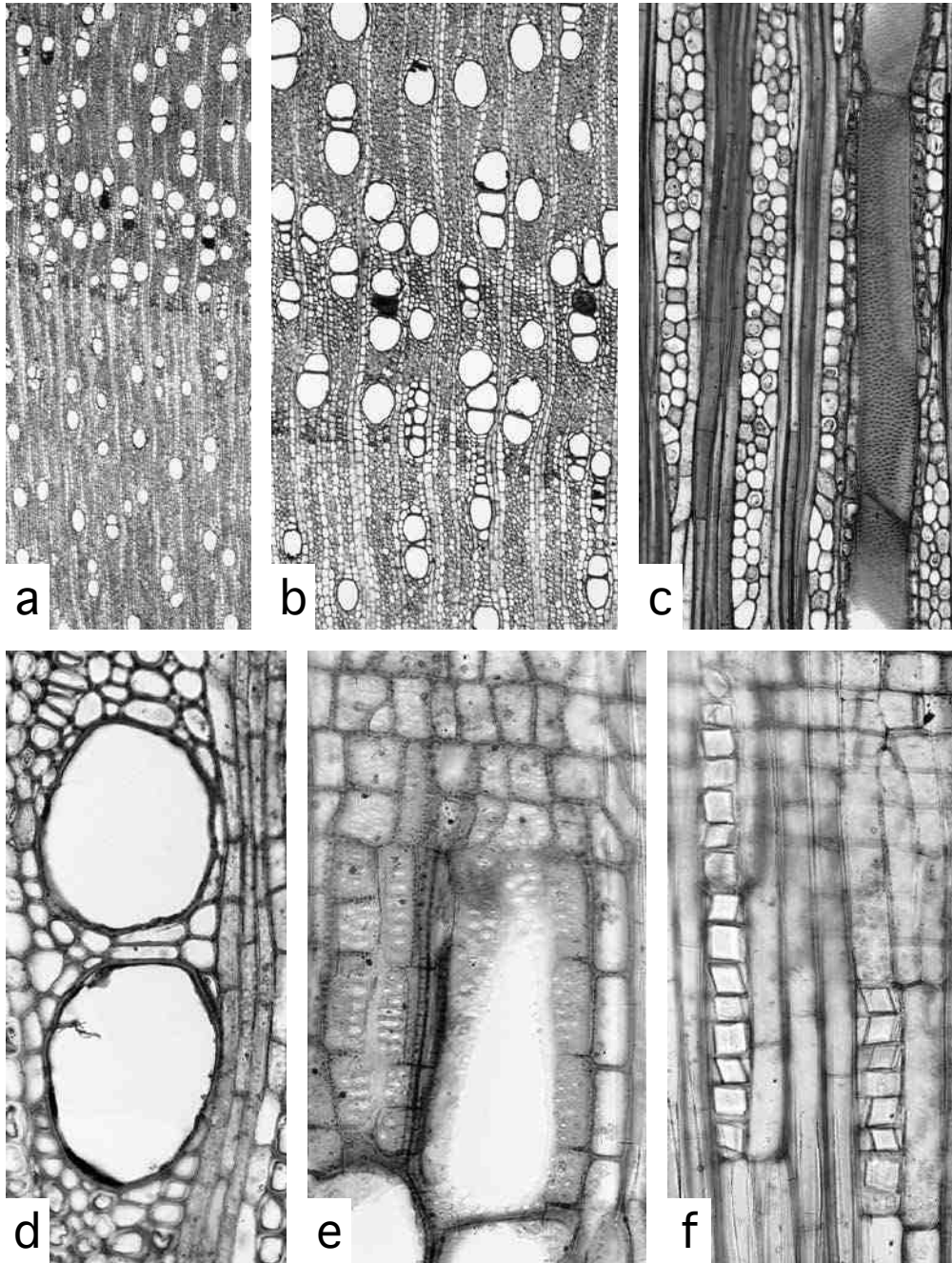


Plate 99. *Bridelia retusa* (L.) A. Juss. (No. 9755271). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing round vessels often in radial multiples and marginal parenchyma. c: Tangential section ( $\times 100$ ) showing tall heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric parenchyma. e: Radial section ( $\times 200$ ) showing opposite to scalariform vessel-ray pits and similar pits in axial parenchyma cells. f: Radial section ( $\times 200$ ) showing prismatic crystals in chambered axial parenchyma cells.



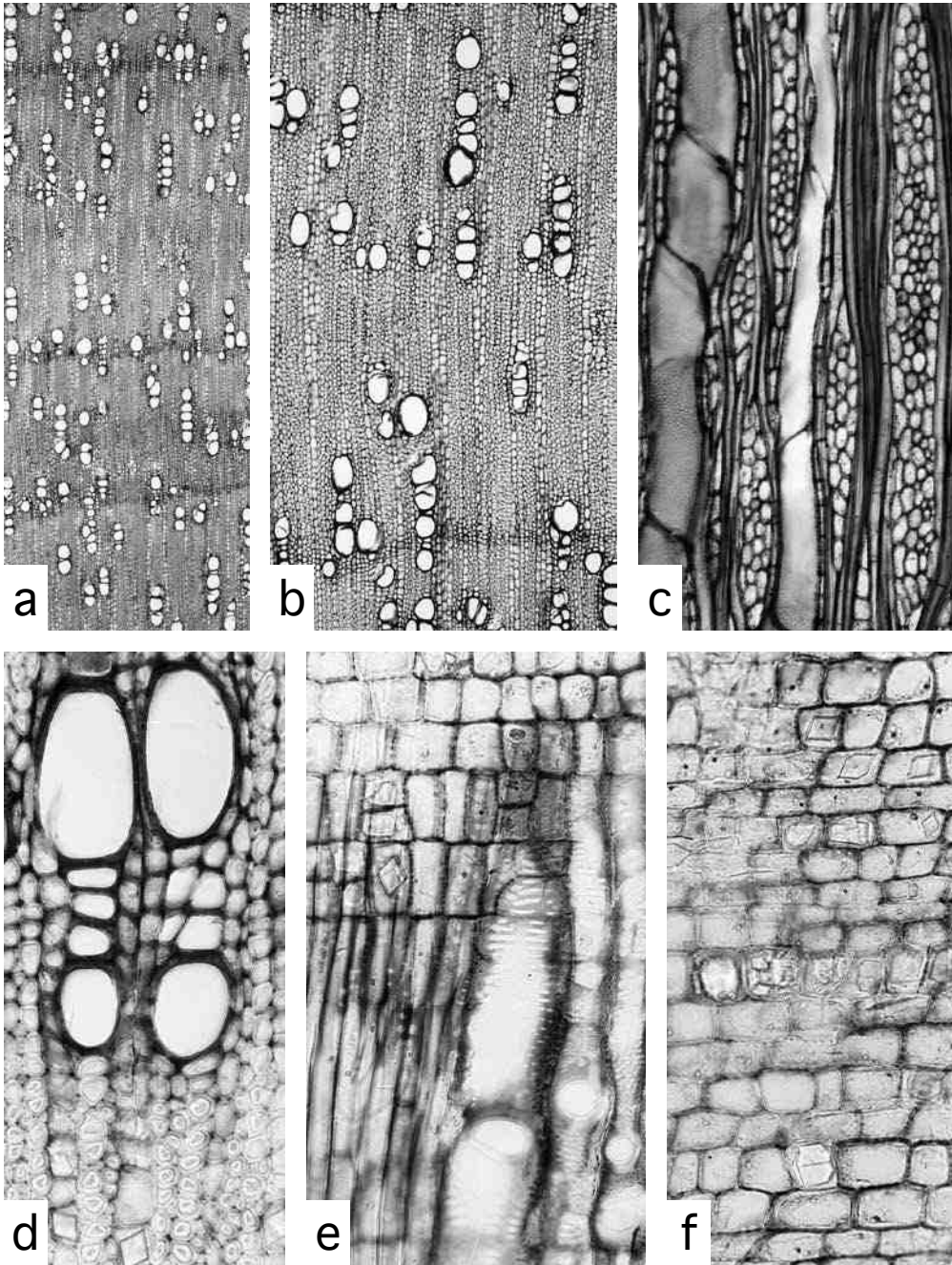


Plate 100. *Bridelia stipularis* (L.) Blume (No. 9194191). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and marginal parenchyma. e: Radial section ( $\times 200$ ) showing simple perforations, scalariform vessel-ray pits, and prismatic crystals in ray cells. f: Radial section ( $\times 200$ ) showing prismatic crystals in ray cells.

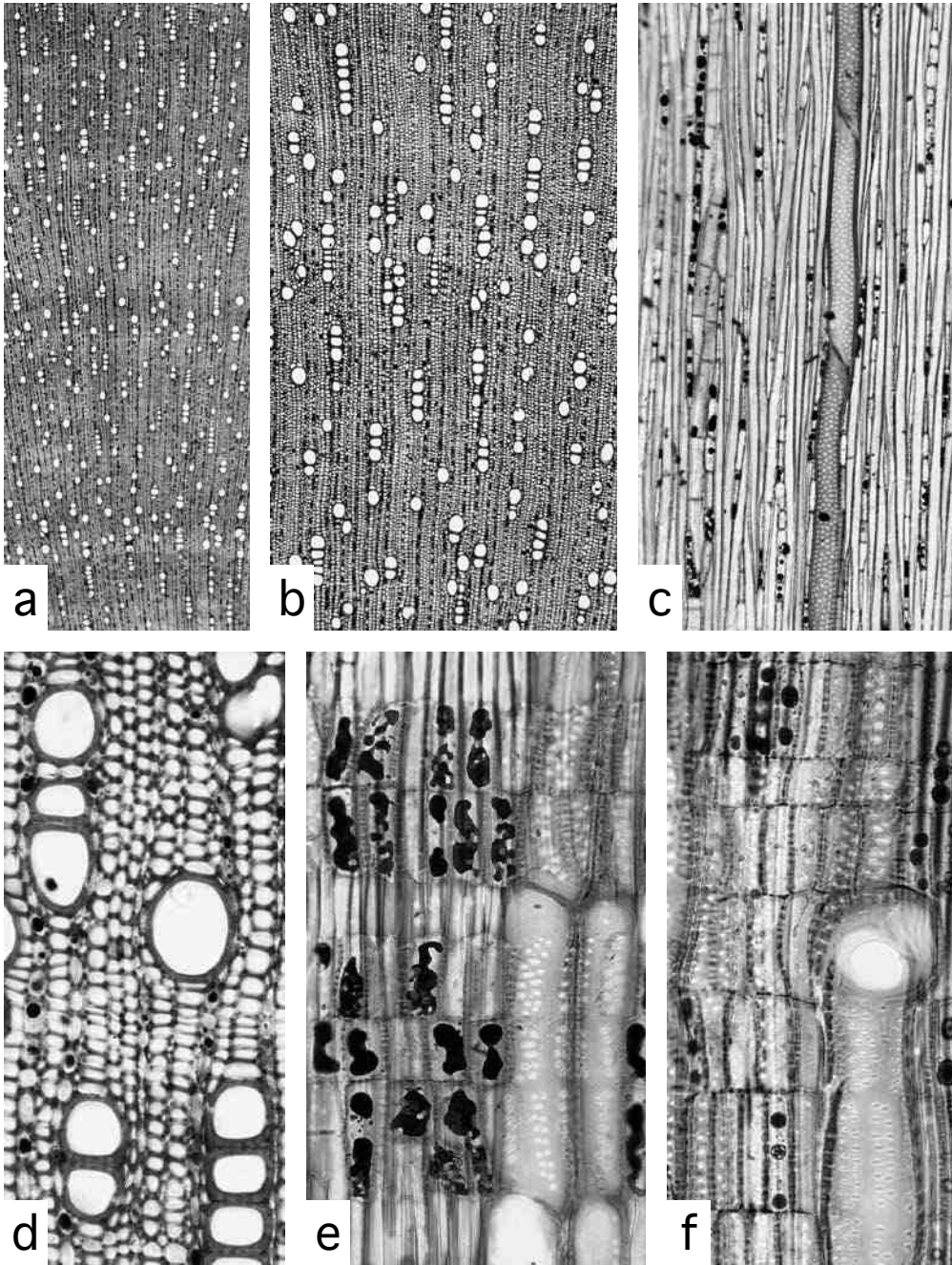


Plate 101. *Excoecaria acerifolia* Didr. (No. 8840516). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing small vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular uniseriate rays and intervessel pits. d: Cross section ( $\times 200$ ) showing thick-walled vessels and scanty paratracheal and marginal parenchyma. e: Radial section ( $\times 200$ ) showing opposite vessel-ray pits with distinct borders. f: Radial section ( $\times 200$ ) showing a perforated ray cell with a simple perforation.



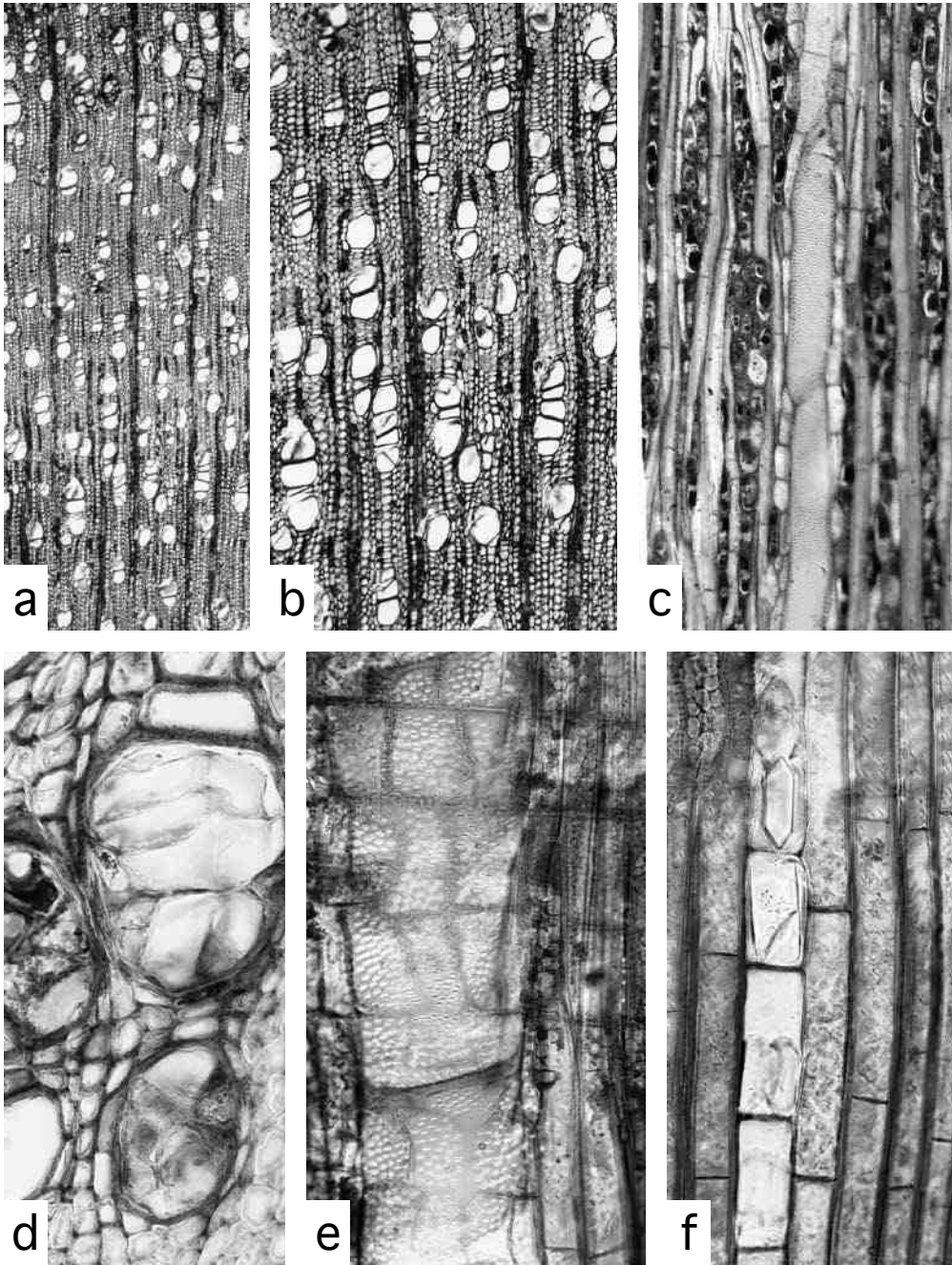


Plate 102. *Glochidion ellipticum* Wight (No. 9840197). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays, paratracheal parenchyma, and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels with thin-walled tyloses and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing densely alternate vessel-ray pits. f: Radial section ( $\times 200$ ) showing prismatic crystals in axial parenchyma and septate fibers.

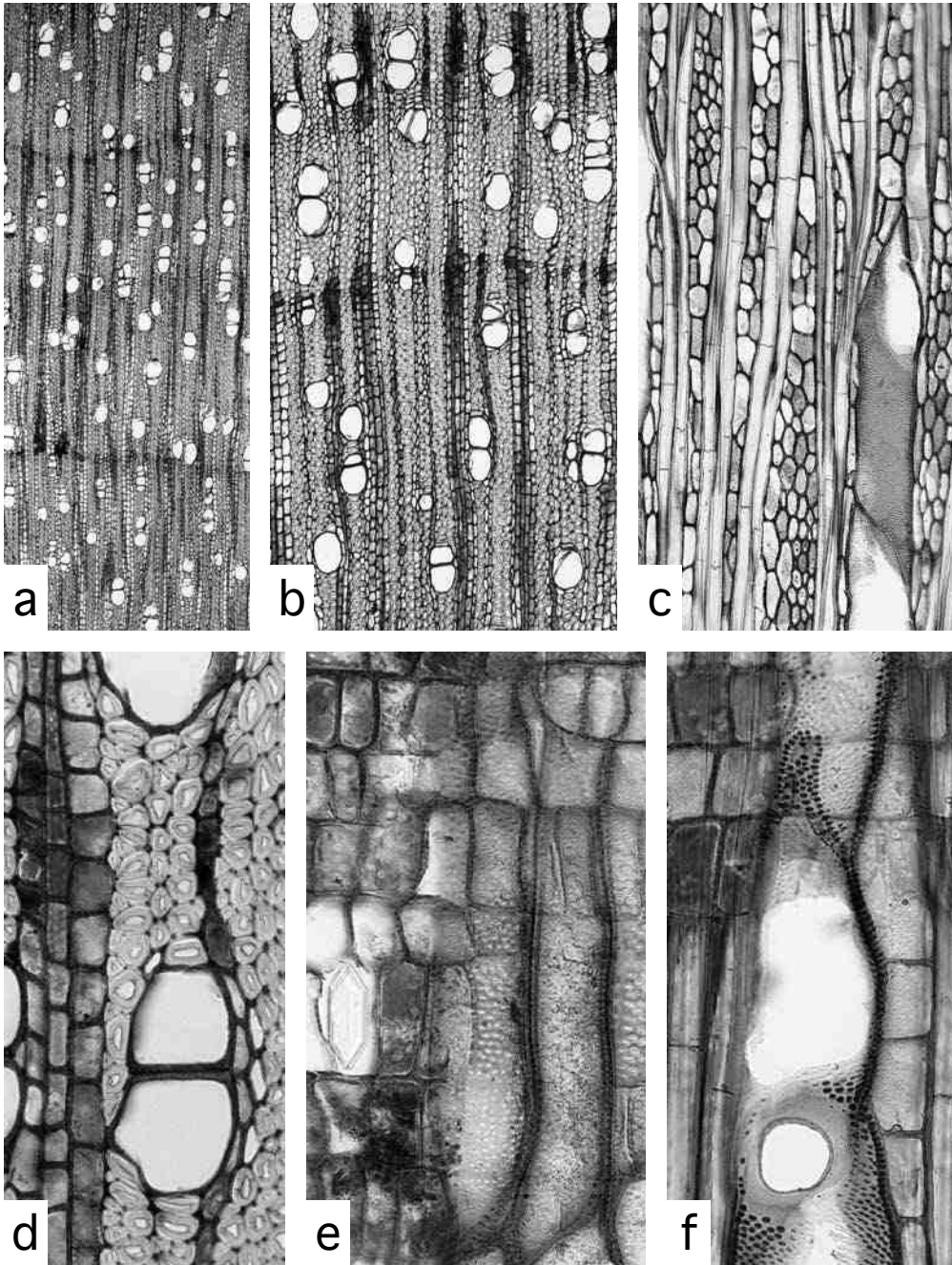


Plate 103. *Glochidion heyneanum* (Wight & Arn.) Wight (No. 9455063). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing rather sparse vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric parenchyma. e: Radial section ( $\times 200$ ) showing dense vessel-ray pits and a prismatic crystal in a ray cell. f: Radial section ( $\times 200$ ) showing a simple perforation, axial parenchyma, and septate fibers.



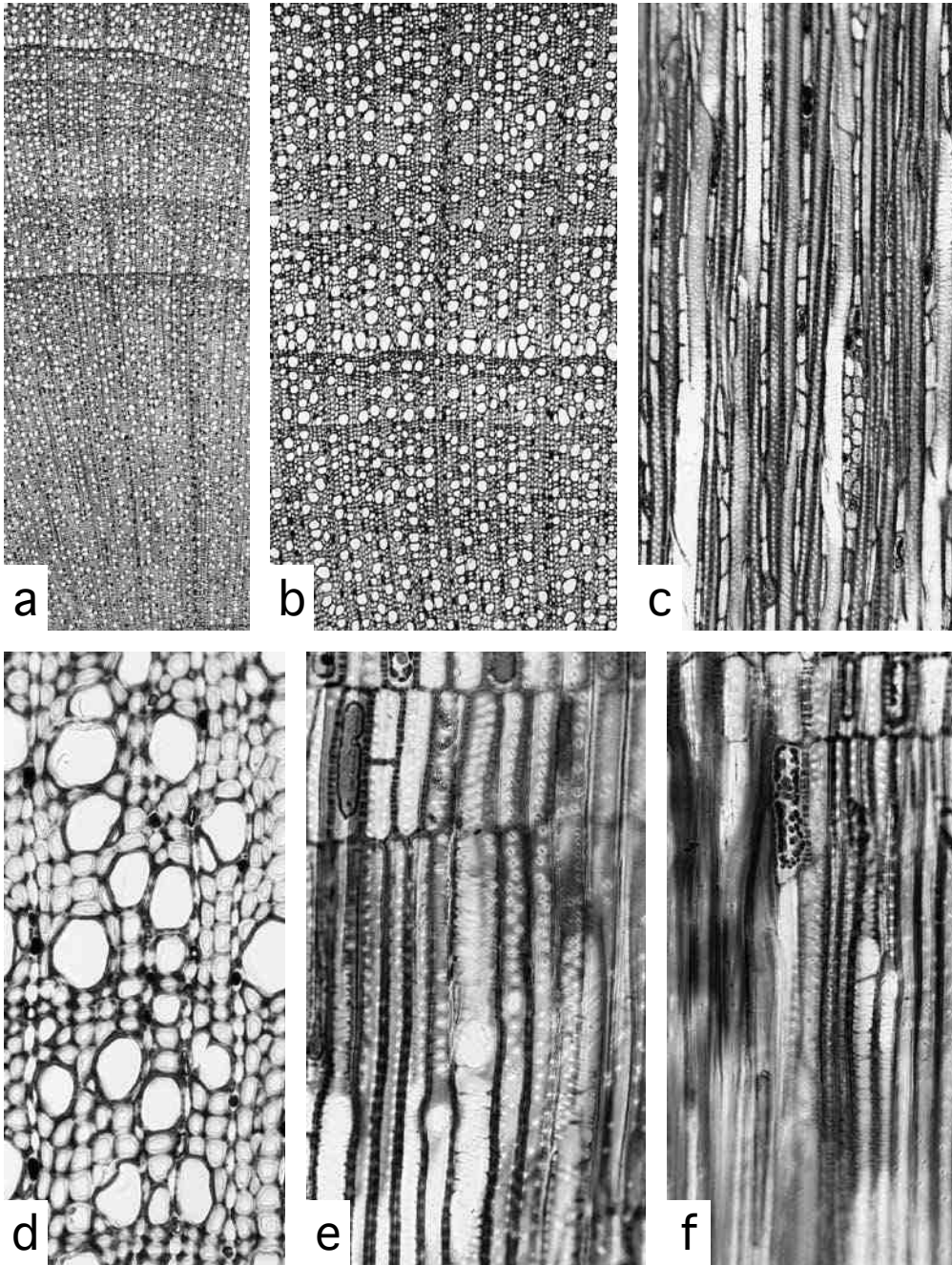


Plate 104. *Leptopus cordifolius* Wall. ex Decne. (No. 9194111). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing mostly solitary small vessels. c: Tangential section ( $\times 100$ ) showing heterocellular rays and lax intervessel pits. d: Cross section ( $\times 200$ ) showing polygonal vessels and terminal vascular tracheids. e: Radial section ( $\times 200$ ) showing simple perforations and vessel-ray pits with distinct borders. f: Radial section ( $\times 200$ ) showing terminal vessels and vascular tracheids with distinct helical thickenings.

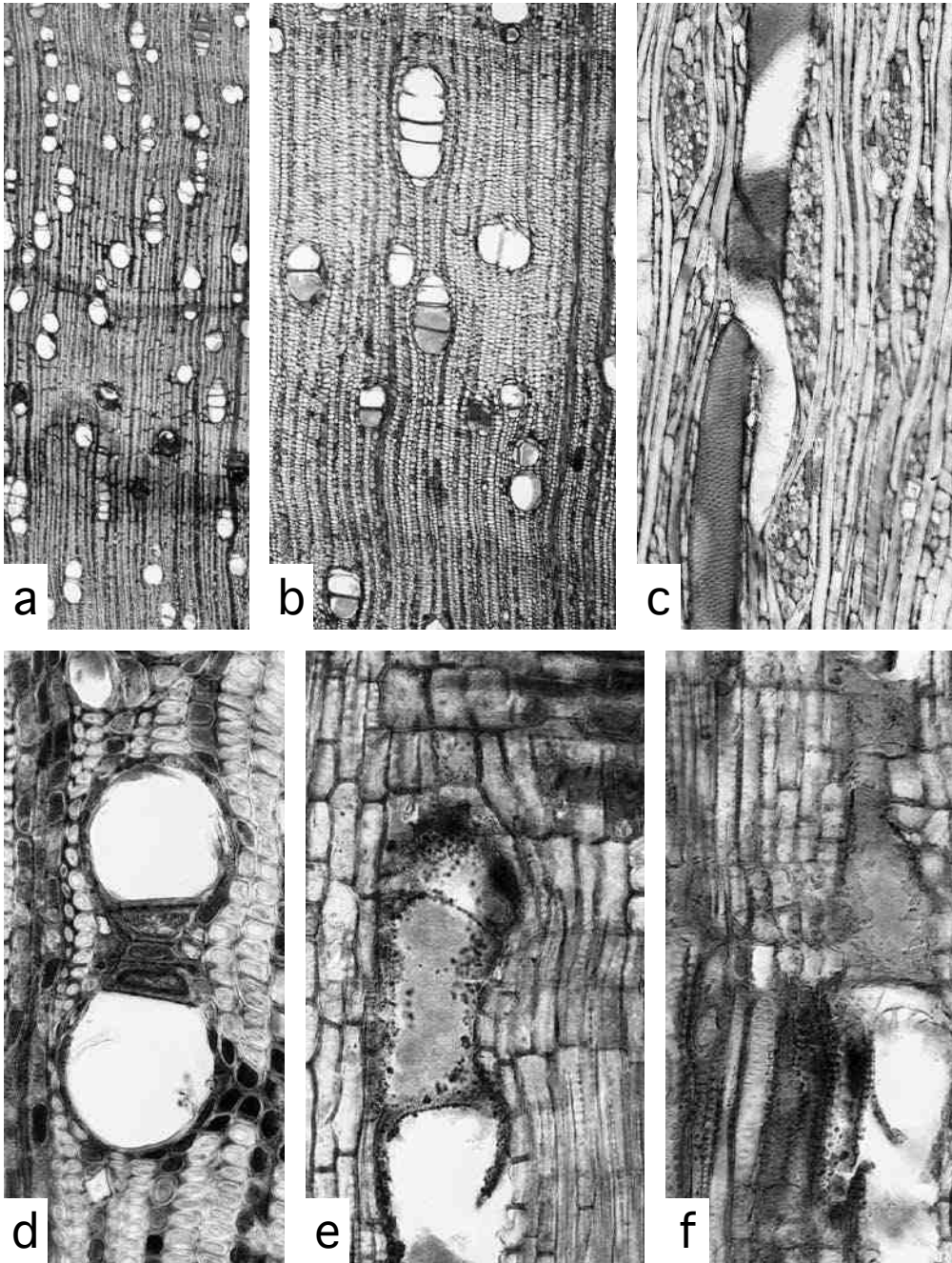


Plate 105. *Macaranga denticulata* (Blume) Müll.Arg. (No. 9455083). a: Cross section ( $\times 20$ ) showing diffuse porous wood with axial parenchyma diffuse to in lines. b: Cross section ( $\times 40$ ) showing sparse vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric parenchyma. e: Radial section ( $\times 200$ ) showing a simple perforation and prismatic crystal in chambered ray cells. f: Radial section ( $\times 200$ ) showing a perforated ray cell with a scalariform perforation.



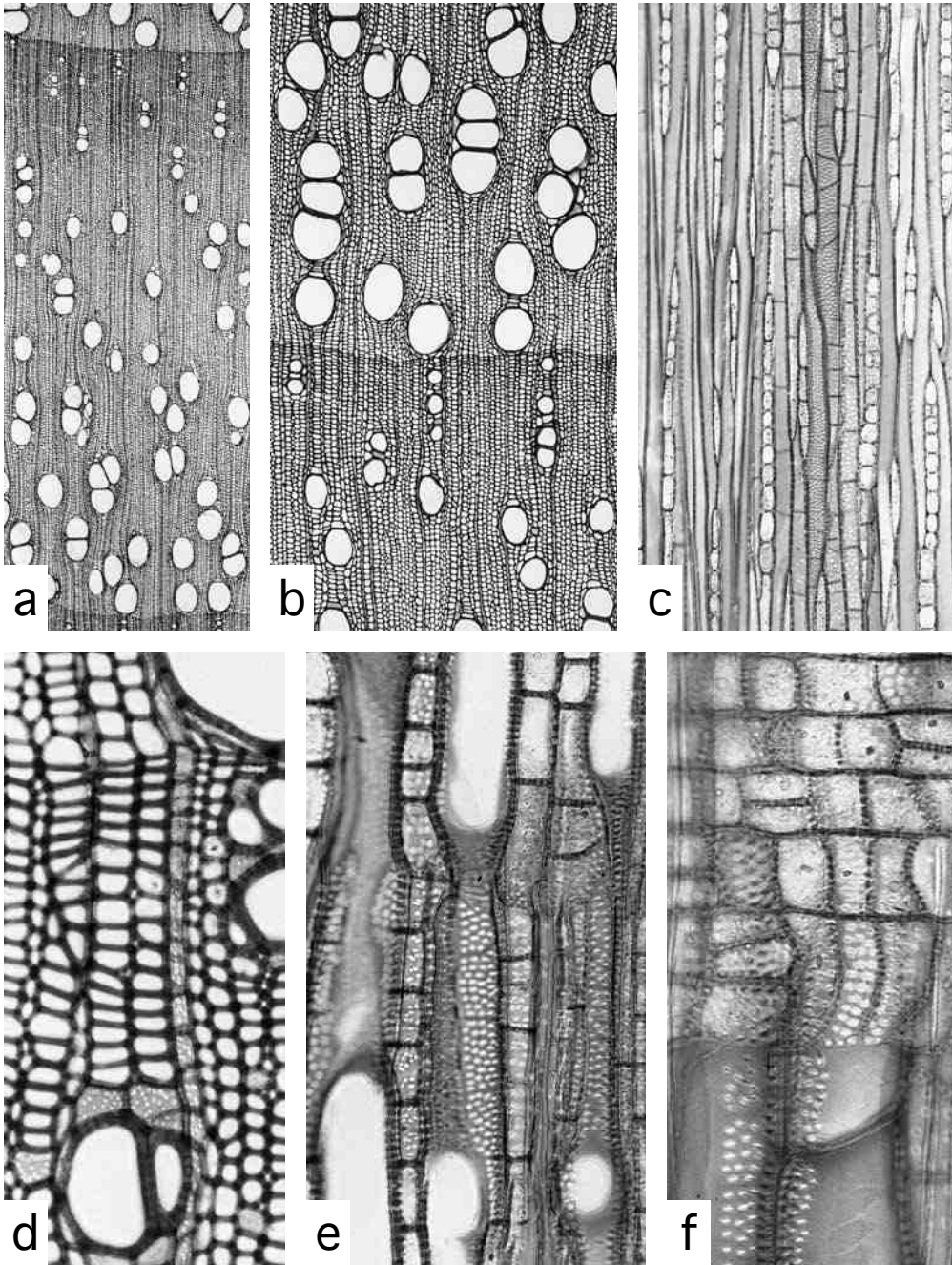


Plate 106. *Mallotus nepalensis* Müll.Arg. (No. 9840113). a: Cross section ( $\times 20$ ) showing ring porous wood. b: Cross section ( $\times 40$ ) showing vessels occasionally in radial multiples. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays, vasicentric parenchyma, and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric and diffuse-in-aggregate parenchyma. e: Radial section ( $\times 200$ ) showing vessels with simple perforations and alternating axial parenchyma. f: Radial section ( $\times 200$ ) showing dense vessel-ray pits.

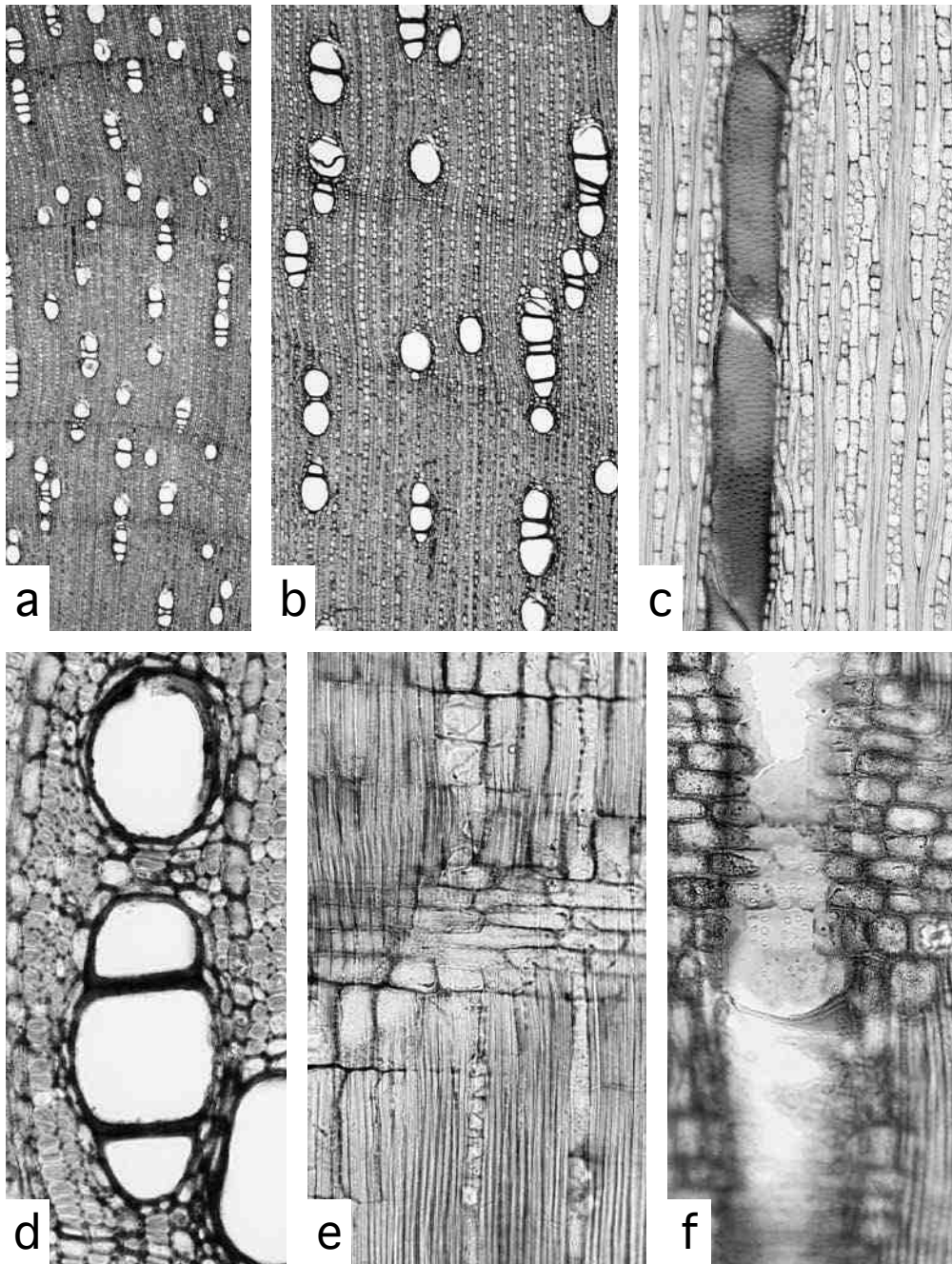


Plate 107. *Mallotus philippensis* (Lam.) Müll.Arg. (No. 9194052). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels often in radial multiples and axial parenchyma in wavy lines. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric parenchyma. e: Radial section ( $\times 200$ ) showing prismatic crystals in chambered ray and axial parenchyma cells. f: Radial section ( $\times 200$ ) showing a simple perforation and opposite to alternate vessel-ray pits.



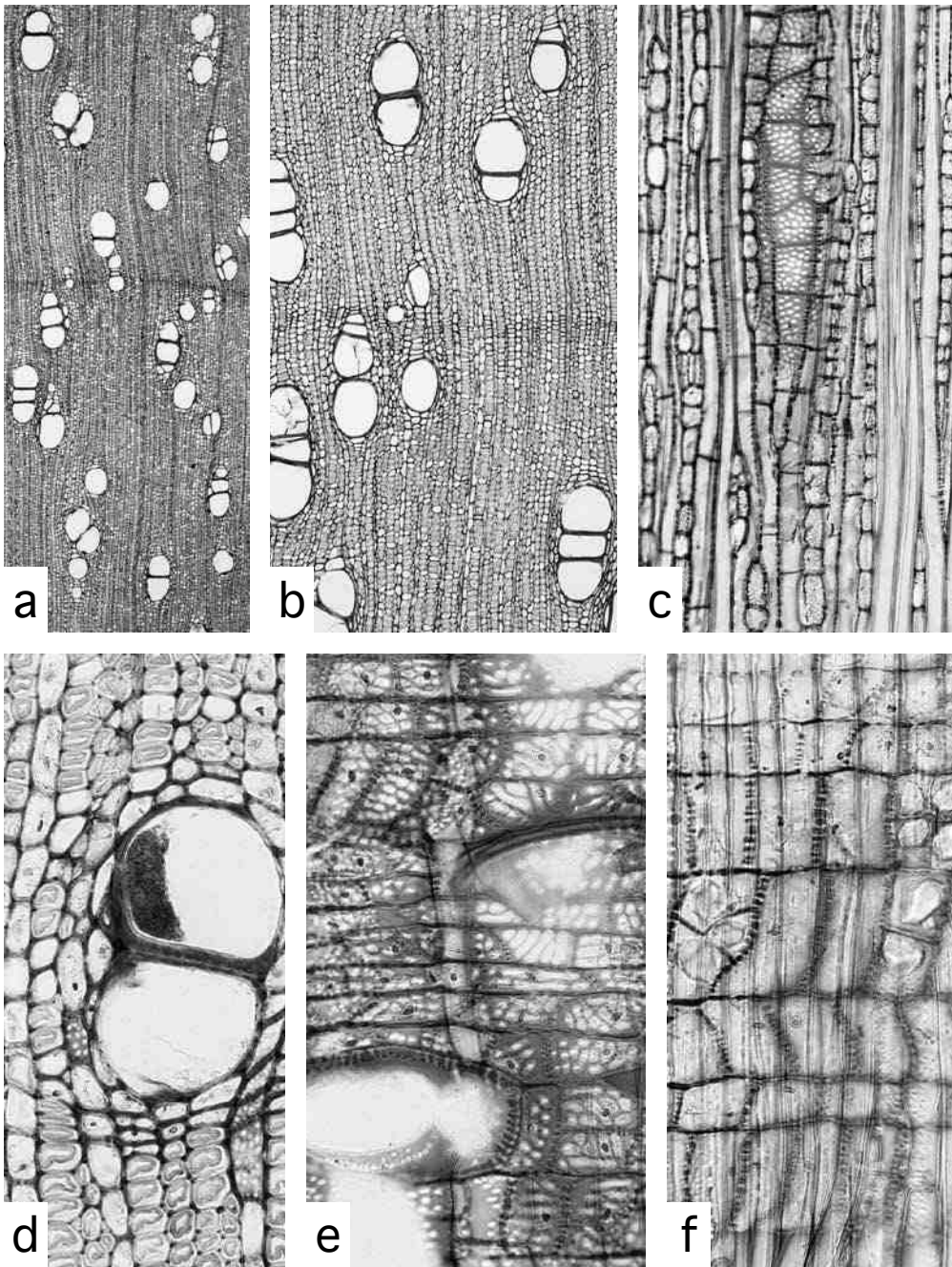


Plate 108. *Mallotus tetracoccus* (Roxb.) Kurz (No. 9840031). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels often in radial multiples and axial parenchyma in wavy lines. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays, vasicentric parenchyma, and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and vasicentric parenchyma. e: Radial section ( $\times 200$ ) showing scalariform to palisade vessel-ray pits and a perforated ray cell with a simple perforation. f: Radial section ( $\times 200$ ) showing prismatic crystals in chambered ray cells.

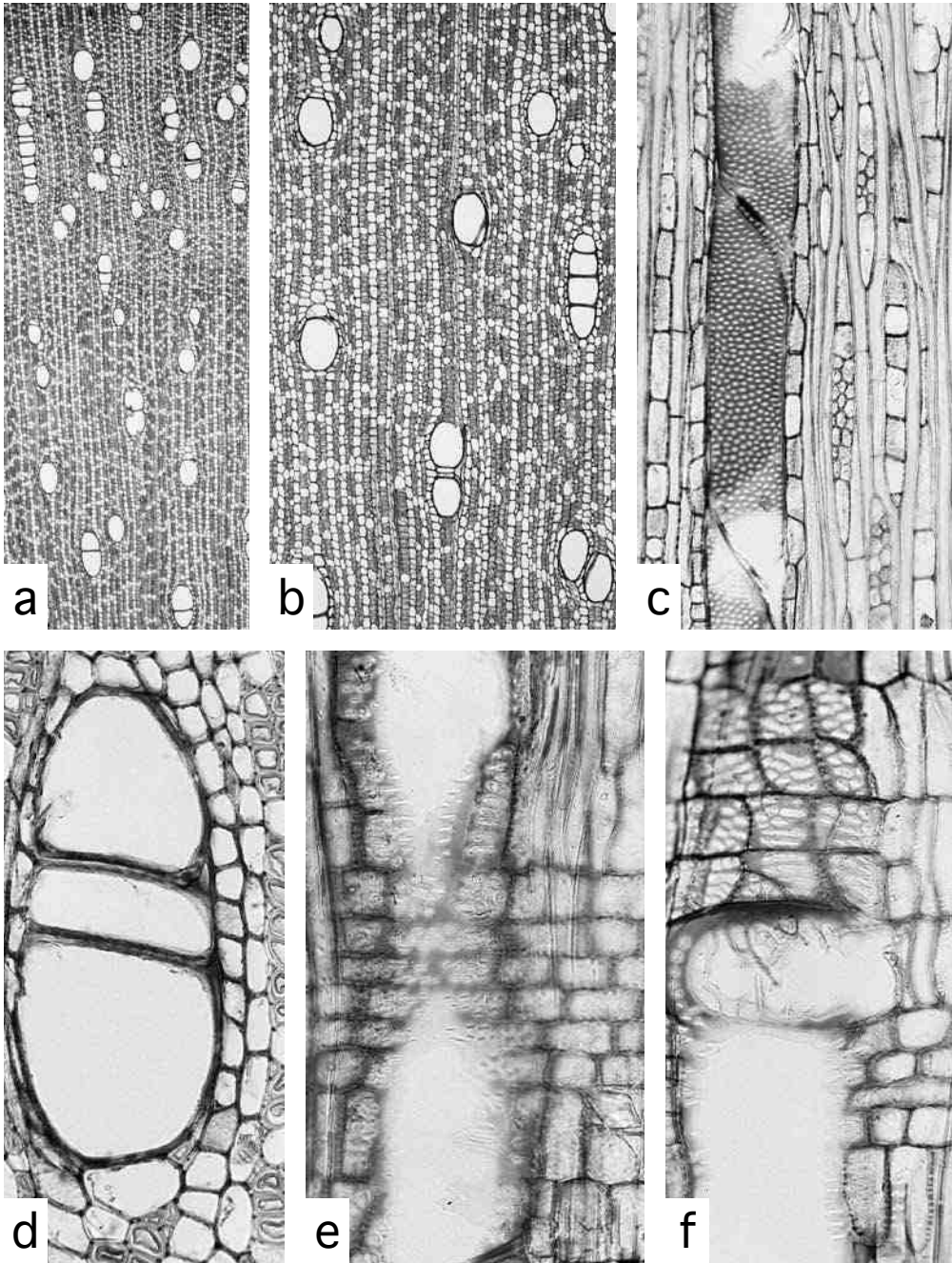


Plate 109. *Ostodes paniculata* Blume (No. 9455010). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing sparse vessels and axial parenchyma in dense wavy lines. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing vessel-ray pits and a prismatic crystal in a chambered ray cell. f: Radial section ( $\times 200$ ) showing opposite to scalariform vessel-ray pits and a perforated ray cell with a scalariform perforation.



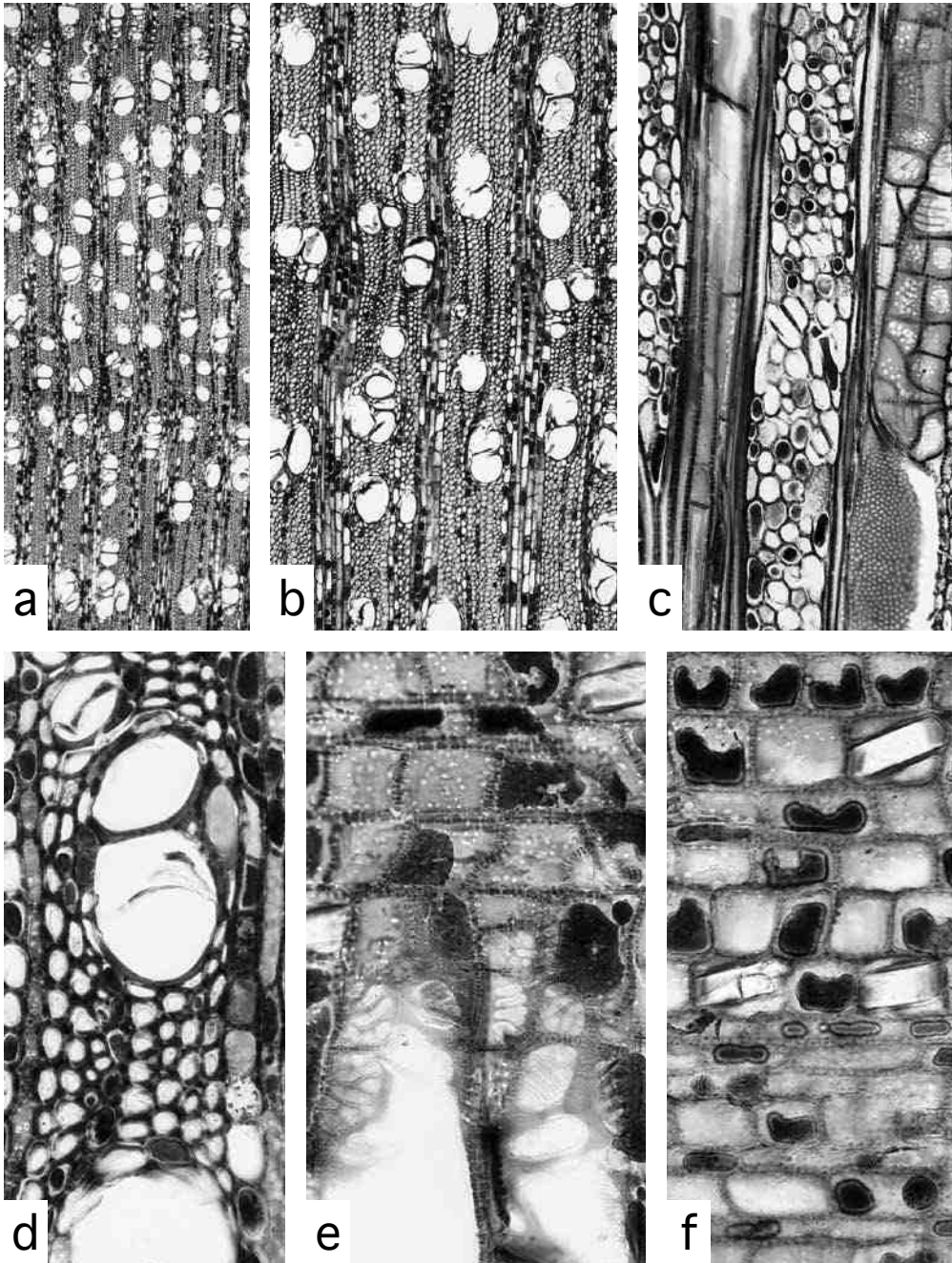


Plate 110. *Phyllanthus emblica* L. (No. 9194124). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing large heterocellular rays, paratracheal parenchyma, and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing scalariform to palisade vessel-ray pits. f: Radial section ( $\times 200$ ) showing large prismatic crystals in ray cells.

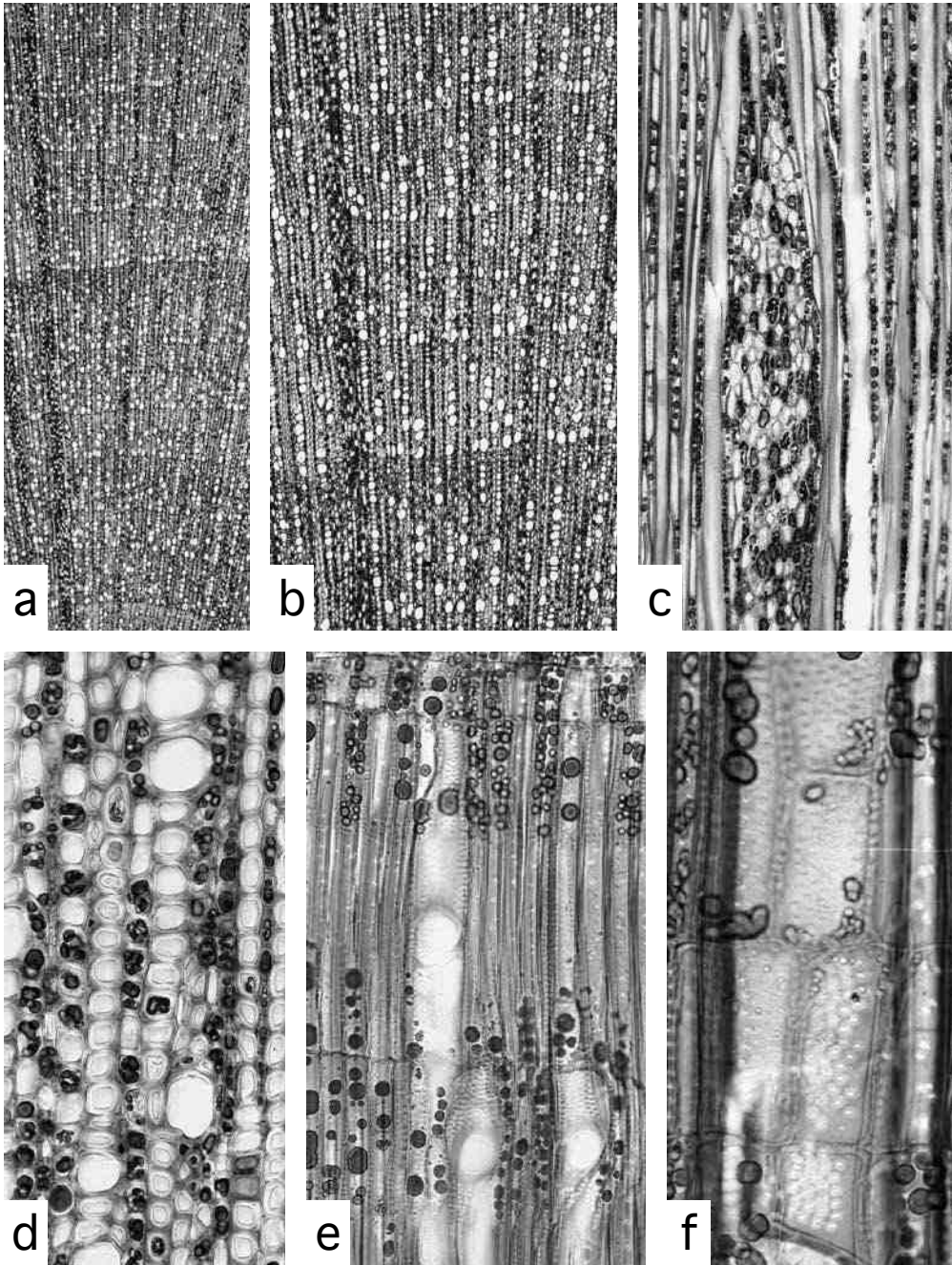


Plate 111. *Phyllanthus parvifolius* Buch.-Ham. ex D. Don (No. 8840615). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing evenly distributed small vessels forming a discontinuous row at the beginning of growth rings. c: Tangential section ( $\times 100$ ) showing heterocellular rays in two sizes with prismatic crystals and intervessel pits. d: Cross section ( $\times 200$ ) showing round vessels. e: Radial section ( $\times 200$ ) showing simple or scalariform perforations and septate fibers. f: Radial section ( $\times 400$ ) showing dense small vessel-ray pits.



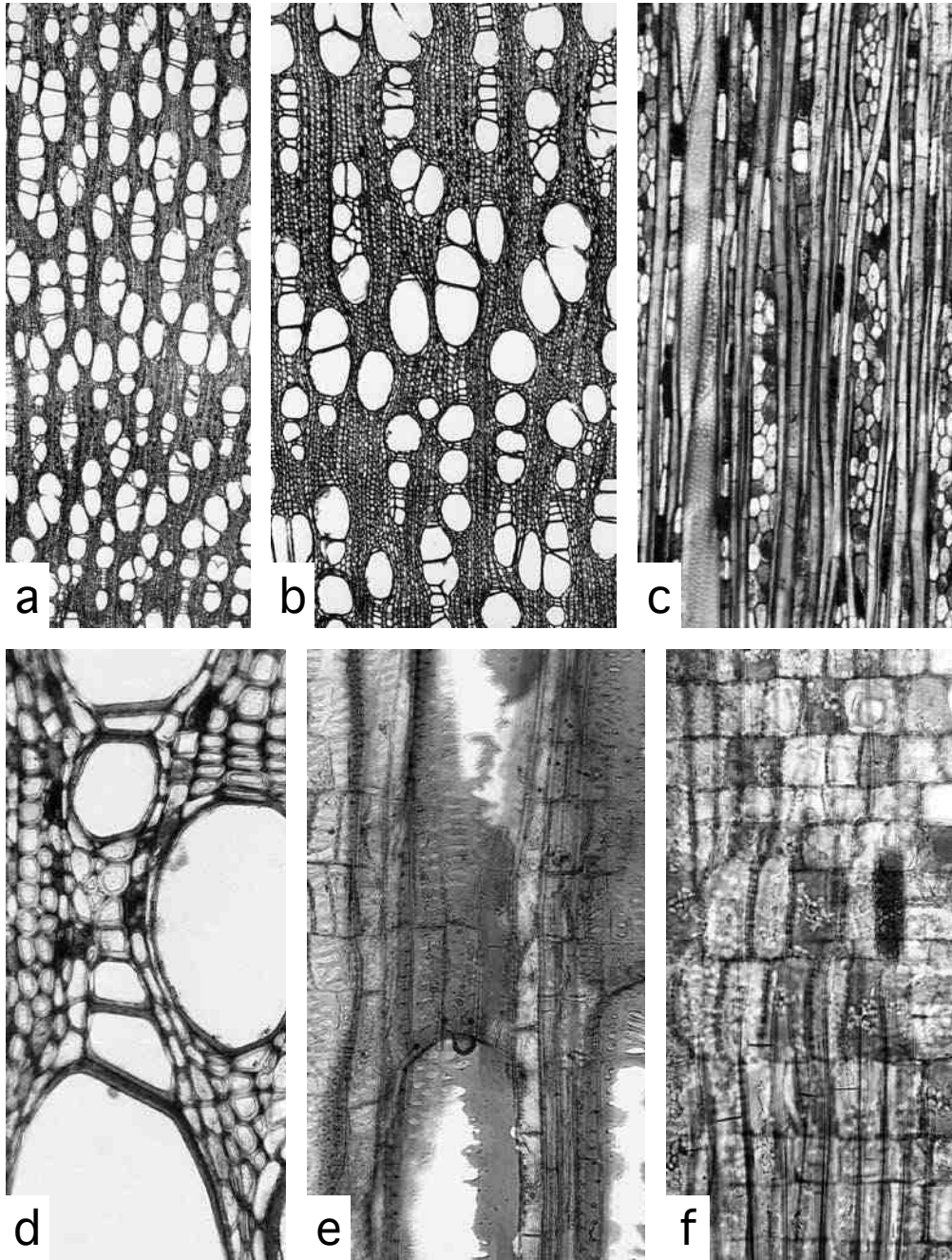


Plate 112. *Phyllanthus reticulatus* Poir. (No. 9455084). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing dense round vessels often in radial multiples c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing scalariform vessel-ray pits. f: Radial section ( $\times 200$ ) showing prismatic crystals in ray cells and septate fibers.

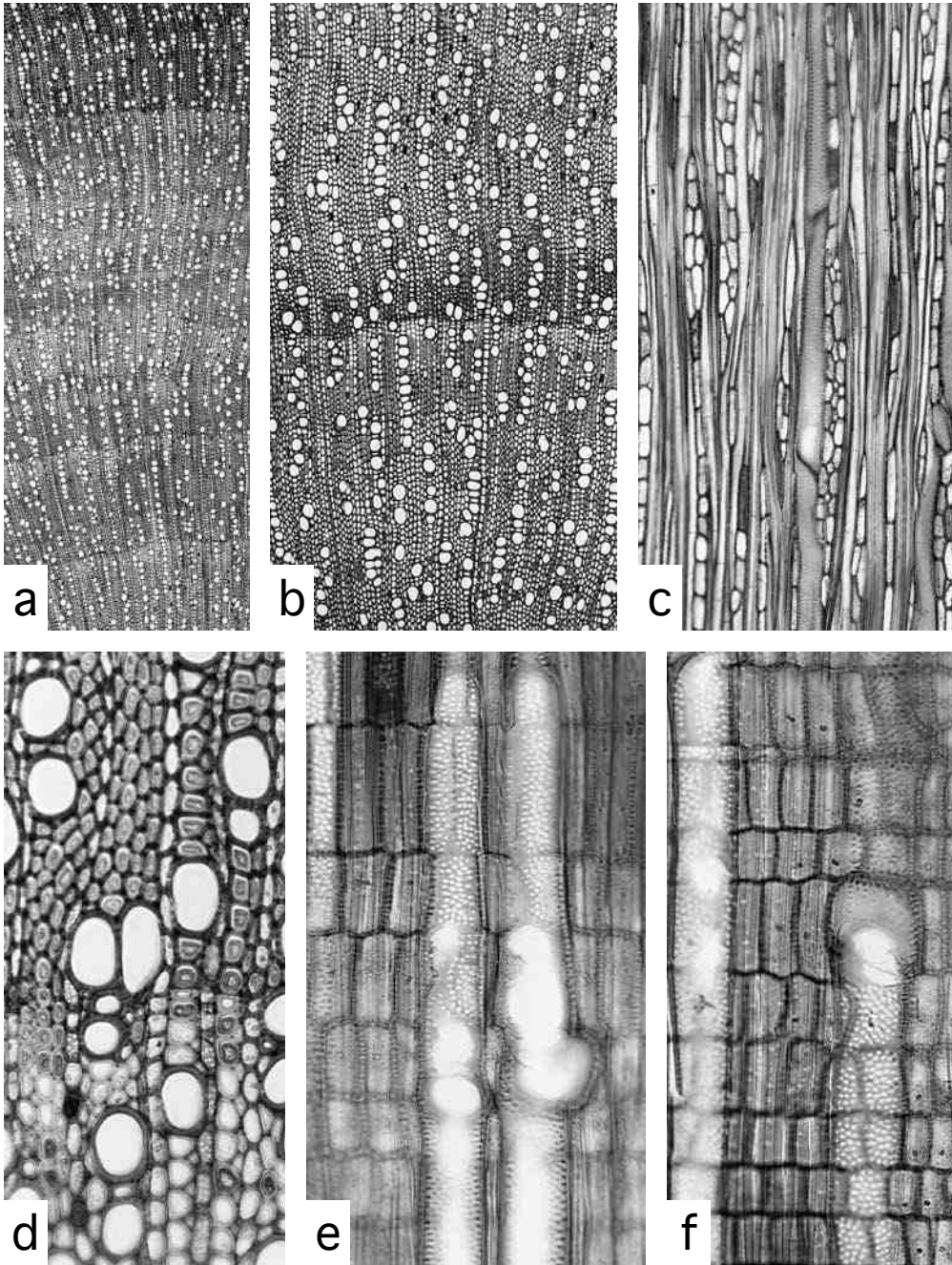


Plate 113. *Phyllanthus sikkimensis* Müll.Arg. (No. 9263119). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing small vessels often in radial multiples. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing rather thick-walled vessels. e: Radial section ( $\times 200$ ) showing simple perforations and dense small vessel-ray pits. f: Radial section ( $\times 200$ ) showing a perforated ray cell with a simple perforation.



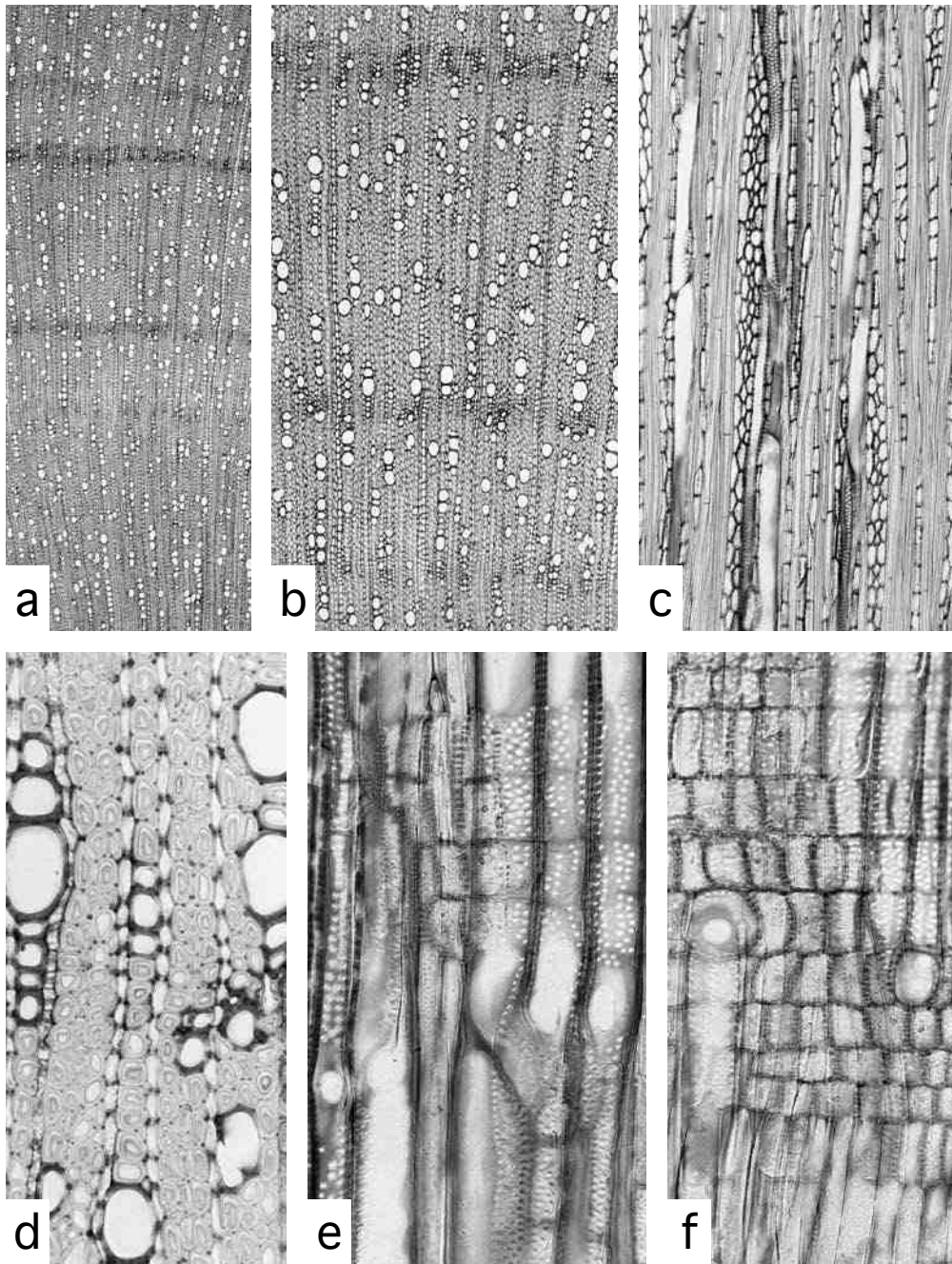


Plate 114. *Sauropus quadrangularis* (Willd.) Müll. Arg. (No. 9455239). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing sparse small vessels. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing rather thick-walled vessels. e: Radial section ( $\times 200$ ) showing simple perforations, bordered vessel-ray pits, and septate fibers. f: Radial section ( $\times 200$ ) showing perforated ray cells with a simple perforation.

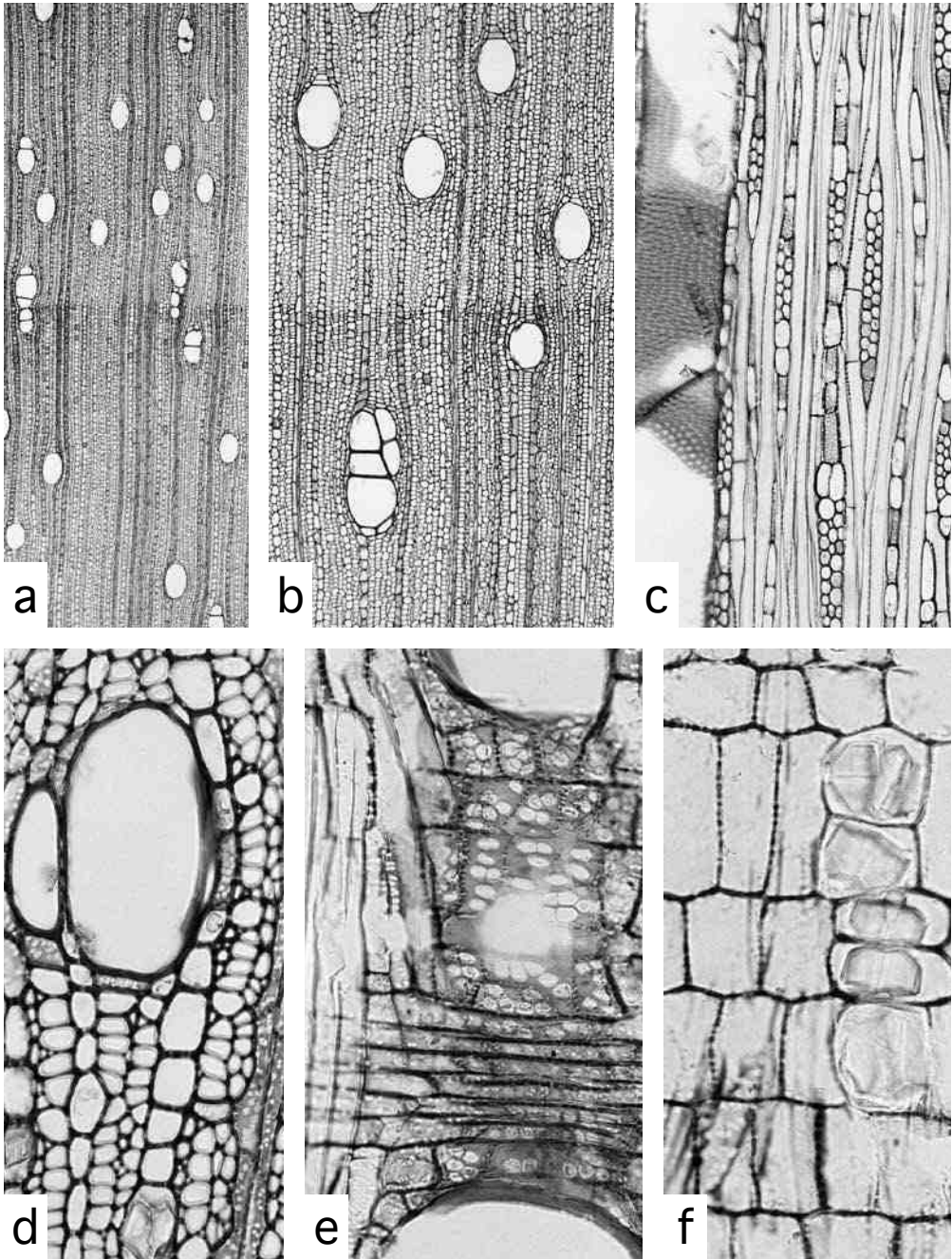


Plate 115. *Trewia nudiflora* L. (No. 9555005). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing sparse large round vessels. c: Tangential section ( $\times 100$ ) showing heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing opposite vessel-ray pits. f: Radial section ( $\times 200$ ) showing prismatic crystals in chambered and non-chambered ray cells.



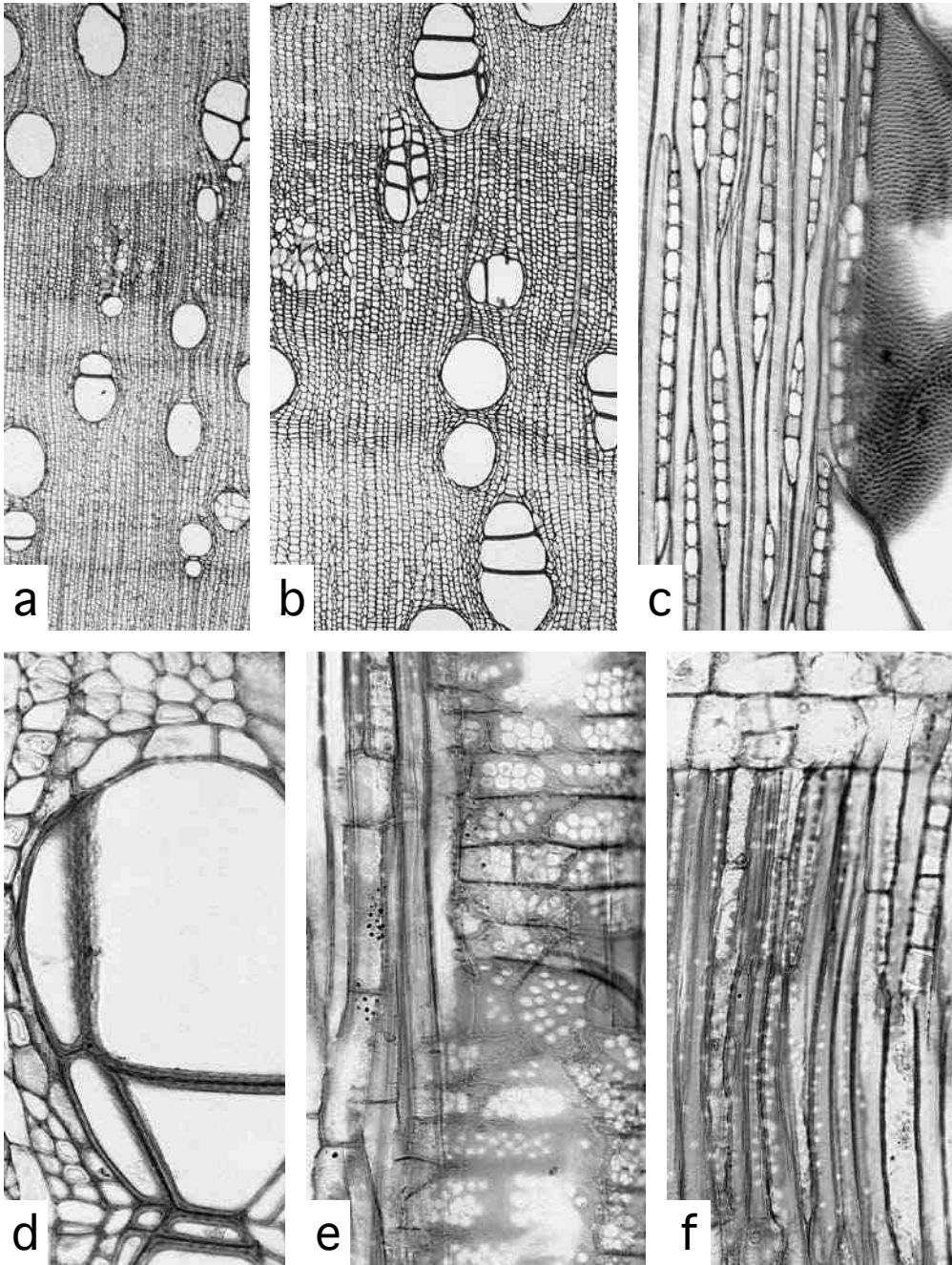


Plate 116. *Triadica cochinchinensis* Lour. (No. 9840211). a: Cross section ( $\times 20$ ) showing diffuse porous wood. b: Cross section ( $\times 40$ ) showing sparse large round vessels and axial parenchyma in dense lines. c: Tangential section ( $\times 100$ ) showing narrow heterocellular rays and intervessel pits. d: Cross section ( $\times 200$ ) showing vessels and scanty paratracheal parenchyma. e: Radial section ( $\times 200$ ) showing opposite to alternate vessel-ray pits. f: Radial section ( $\times 200$ ) showing prismatic crystal in chambered ray and axial parenchyma cells.

## LIST OF NEW NAMES

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