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THE HALOBIIDAE FROM THAILAND

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With Plate IV

In his reconnaissance Wallace LEE discovered fossils on the road side 8 km. south of Chiang Rai near the northern border of Thailand. They were submitted by him to the U.S. Geological Survey in 1923. T. W. STANTON distinguished in the collection, *Hoernesia* (?) spp., *Macrodon* (?) sp., *Myophoria radiata* LOCZY, *Myophoria* sp. ex. gr. *M. leavigata* and *Trigonodus* (?) sp. and suggested Middle Triassic for this fauna.

Later HEIM and HIRTSCHI (1939) found pelecypods in the green shale formation in the north of Lampang on the highway to Chiang Rai. The fossil was identified as typical *Daonella* by WANNER, indicating the Middle to Upper Triassic age for the formation. Still later *Halobia* was identified by IMLAY among the pelecypods from the same locality (BURAVAS, 1957).

Lately, Triassic fossils were found further at two spots of the Mae Moh tributary, 50 km. east of Lampang. According to PITAKPAIVAN (1955) there are three fossiliferous beds. The Mae Moh collections were sent to KUMMEL for identification. As the result the followings were determined and Anisic to Carnic was suggested for the age of the fauna.

1. Doi Chang shale and sandstone containing *Balatonites*, *Beyrichites*, *Paratrachyceras*, *Ptychites* and *Sturia*.
2. Hong Hoi shale and sandstone containing *Paratrachyceras*, *Joanites*, *Halobia*, *Lobites*, *Balaonites* and *Sturia*.
- 2-3. Doi Chang or Hong Hoi sandstone and shale yielding *Joanites*, *Ptychites* and *Cladiscites*.
3. Fossiliferous limestone of Doi Chang with *Spirigera*.

Last summer (1958) Mr. Saman BURAVAS, chief of the Geological Survey Division, Royal Department of Mines, Bangkok, Thailand has sent the senior another a small lot of Mesozoic fossils for determination. Beside two specimens from Lampang district there is one from a formation at Na Thawi, Songkhala near Thailand-Malayan border, which was formerly thought Triassic but lately of Carboniferous age. Here the specimen in question is determined as a member of the Triassic Halobiidae and most probably a Carnic species of *Daonella*. Precisely speaking, the Halobiidae from the three localities are as follows:

1. *Daonella sumatrensis* from Na Thawi (S 1017/1938). This species was first described from northern Sumatra. According to VOLZ it coexists with *Daonella cassiana* and 6 species of *Halobia* including *styriaca* and cfr. *charlyana*. He assigned this fossil horizon to the Raibl equivalent.

2. *Daonella* sp. ex. gr. *D. pichleri* from about 60 km. on Lampang—Chiang Rai Highway (TF 4). It is not so well preserved to discuss in detail.

3. *Halobia* cfr. *comata* and *H. cfr. styriaca* from a locality (TF 167) east of Lampang. *H. comata* is one of the most abundant species in Timor and a lower Carnic index in the eastern part of the Tethyan province, occurring from the Himalaya, Yunnan and South China. *H. styriaca* is another leading member of the Timorian fauna with which this Thailand form

is most probably conspecific. They are, however, not quite identical with *H. styriaca* (s. str.) which is an index to the Carnic stage of the North Alps, Dinaric Alps, Greece and (?) Spiti.

Thus these four forms are all related to the Carnic species of the Alpine-Himalayan province and especially of the Southeastern Asiatic regions. None of them is, however, common or closely related to the Carnic species of Japan or East Siberia.

In the recent compilation of the geology of Thailand BROWN and others (1953) proposed "Khorat series" to include the Kamawkala limestone and all other Mesozoic formations with the thought that the age of the series is Triassic and Jurassic. The Khorat series on the Khorat plateau is, however, as pointed out by the senior author (1958), a continental formation containing Dicotyledonous plants which must be either Palaeogene or younger Cretaceous in age. Therefore the marine Triassic and Jurassic formations in the median and western zones of Thailand must be excluded from the Khorat series. It is a remarkable fact that the Khorat series so defined is horizontal or gently undulated, while the Jurassic and Triassic formations are strongly folded. Therefore the principal phase of crustal movement in this part of Southeastern Asia must be in the Cretaceous or late Jurassic period.

The Hong Hoi greenish grey shale containing the Carnic *Halobiae* are distributed at some places between Lampang and Chiang Rai, presumably on the east side of a tectonic boundary between the western and median tectonic zones of Thailand. In further northeast in High Laos HOFFET has shown that the boundary in question is a thrust of the Burma arc on the North Laos arc. It is further a remarkable fact that a similar Carnic shale occurs in the southern part of Peninsular Thailand which the senior author thinks to belong also to the median zone. Then the Carnic Hong Hoi shale as well as the Middle Triassic Doi Chang shale are two important members in the stratigraphy of Thailand.

None of the above Triassic fossils has as yet been described or illustrated. Though the material which the authors examined is small and imperfect, the above statement is documented with its palaeontological description. Here the authors record their warmest thanks to Mr. Saman BURAVAS for the supply of the interesting material.

Genus *Daonella* MOJSISOVICS

Group of *D. pichleri*

1. *Daonella* (?) ex gr. *D. pichleri* MOJSISOVICS

Plate IV, figure 8

MM3561-4-8

A fragment of a right valve at hand is provided with stout, straight, simple, regular and round-topped ribs, widest in middle and narrowing backwards though still distinct. The ribs suggest the greater possibility of being a *Daonella* rather than a *Halobia*. If so, it may belong to KITTL's *pichleri* group, although its outline is unknown. Its ribs closely resemble those of *pauli* KITTL from the Ladinic of Bukowina, but the anterior flattened subhinge area is not so wide as *pauli*. If the area is absent, it may be related to *reticulata* or *pichleri*.

Occurrence:—Greenish grey shale in stream cutting near 60 km. on Lampang-Chiang Rai Highways, northwest Thailand (TF 4). According to BURAVAS this is in the same horizon with the Hong Hoi shale containing ammonites and *Halobia*. This specimen has been thought a *Halobia*.

2. *Daonella sumatrensis* VOLZ

Plate IV, figures 5-7.

1443559-4-57

1899. *D. sumatrensis* VOLZ, Z. Deutsch. Geol. Ges., Bd. 51, S. 30, Taf. 1, Fig. 2, 3.

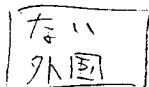
Description:—Shell small, subovate, obliquely elongated and longer than high. Hinge straight, long, rounded at anterior end and obtusely angulated at posterior end. Umbo prosogyrous at about anterior 1/5. Ribs simple, fine, present only in postero-ventral part; *Posidonia*-like stage long; concentric wrinkles distinct through surface.

Observation and comparison:—A nearly complete specimen (MM 3559/1, fig. 1) is 7.3 mm. long and 4.1 mm. high; several fragmentary specimens similar in size, all somewhat compressed. The ribbing, outline and dimension assign this form to Carnic *sumatrensis* VOLZ, although ribs are somewhat finer, weaker and a little more than the typical form. Among Japanese species *hiratai* is the closest, but shorter and has a less prominent umbo.

Occurrence:—Several shells in a small slab of fine greenish grey clayslate from a tributary of Khlong Mak, Na Takwi, Songkhla near Malayan Border (S 1017/1938). VOLZ's is coexistent with 4 *Halobiae* and lies below the *styriacassiana* zone in north Sumatra.

Genus *Halobia* BROWNGroup of *H. styriaca*4. *Halobia* cfr. *styriaca* by KRUMBECK, 1924.

Plate IV, figure 10.



1924. *Halobia styriaca*, KRUMBECK, Pal. Timor, 22. Bd., S. 132, Taf. 187, Fig. 8; Taf. 188, Fig. 10

A photograph of *Halobia* sent from BURAVAS closely resembles *styriaca* from Timor. It is characterized by subrounded outline, short hinge, regular and later bifurcating ribs and flattened posterior subhinge area. In comparison with typical *styriaca* it is more rounded and has a shorter hinge and more ribs. RENZ's Greek form (1906) has a longer hinge and VOLZ's Sumatra form (1899) bears a smaller number of ribs. KRUMBECK's Timor form is closest, although ribs are more numerous and more regularly bifurcated in it. Together with Timor form, it can be separated from the typical Alpine species at least in subspecific rank.

Occurrence:—Greenish shale at railway cutting between Pong Pui and Phaukho, east of Lampang (TF 167). It is correlated to Hong Hoi shale.

Group of *H. comata*3. *Halobia* cfr. *comata* BITTNER

Plate IV, figure 9.

1443560-4-9

1899. *Halobia facigera* BITTNER, Pal. Indica, Ser. 15, Vol. 3, p. 45, pl. 7, fig. 15.
 1899. *H. comata* BITTNER, *ibid.*, p. 46, pl. 7, fig. 13.
 1899. *H. cfr. comata* BITTNER, *ibid.*, p. 47, pl. 7, fig. 16.
 1908. *H. comata*, DIENER, *ibid.*, Vol. 5, p. 47, pl. 3, figs. 2-4.

1912. *H. fascigera*, KITTL, Halobiidae usw. S. 1571.
 1912. *H. cfr. comata*, KITTL, *ibid.* S. 156.
 1912. *H. cfr. comata*, MANSUY, *Mem. Serv. géol. de l'Indochine, Tom 1, No. 1, pt. 2.* p. 130, pl. 24, fig. 6.

A laterally compressed right valve beside fragments is more or less diagonally elongated; umbo prosogyrous, at anterior 2/5 of hinge. Anterior ear wide, gently inflated and divided into two parts; dorsal part narrow and concave, while ventral is wide, inflated and defined by a distinct furrow. Ribs very fine, simple, narrow and not flexiate and weakened posteriorly. Concentric wrinkles distinct in young.

Due to compression postero-median ribs look finest; anterior ones widest; concentric wrinkles most distinct in antero-median part. A posterior subhinge area is fairly wide and provided with or without faint ribs, but whether it is secondary or not is a question.

Comparison:—This species was originally described from the Carnic of the Himalaya. According to KITTL his *comata* group is nearly equilateral, but Timor collection comprises various forms as KRUMBECK (1924) included oblique *fascigera* in it. Thailand specimens are more or less oblique and higher than others, although they are laterally compressed. The ribbing and ear safely assign them to *comata*. If their posterior area is original, they are related to *H. cfr. super-bescens* by KRUMBECK from Timor, or MOJSISOVICS' original form from Hallstatt. KRUMBECK's is somewhat different in the shape of anterior ear.

Occurrence:—Same as the preceding (TF 167 by BURAVAS).

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Explanation of Plate IV

- ✓ Fig. 1: *Daonella indica* BITTNER.....p. 14
A laterally compressed right valve (MM 3485), $\times 1$; loc. Tsuzurazaka at Usugatani in Sakuradani region.
- ✓ ✓ Figs. 2, 3: *Daonella kotoi* MOJSISOVICS.....p. 16
Laterally compressed right valves (MM 3505, 3504), $\times 2$; loc. ditto.
- ✓ Fig. 4: *Daonella iwayai* KOBAYASHI and TOKUYAMA.....p. 15
A right valve (MM 3537), showing the manner of deformation; $\times 1$, loc. ditto.
- Figs. 5-7: *Daonella sumatrensis* VOLZ.....p. 29
Clay casts of left valves (figs. 1 & 3) and a right valve (MM 3559/1-3), $\times 3$; loc.: Tributary of Khlong Mak, Na Takwi, Songkhla near Malayan Border (S 1017/1938)
- ✓ Fig. 8: *Daonella* (?) ex gr. *D. pichleri* MOJSISOVICSp. 28
A clay cast of a right external mould (MM 3561), $\times 1.5$. Loc.: At a stream cutting near Km. 60 on Lampang-Chiang Rai Highway, northwest Thailand. (TF 4).
- ✓ Fig. 9: *Halobia* cfr. *comata* BITTNERp. 29
A clay cast of a right external mould (MM 3560); $\times 1$. loc.: At a railway cutting between Pong Pui and Phaukho, east of Lampang (TF 167).
- Fig. 10: *Halobia* cfr. *styriaca* by KRUMBECKp. 29
A photograph sent from BURAVAS; loc.: ditto.

All illustrated specimens except fig. 10 are kept in the Geological Institute, University of Tokyo.

Fig 1