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Tertiary Mollusca from the Coalfield of Uryu, Ishikari

By

Matajiro YOKOYAMA, *Rigakuhakushi*

With 4 Plates

In the spring of the year 1931 Mr. T. Tokuda of the Mitsui Mining Company brought to me for determination a large number of fossil shells which he had collected in the year preceding during his survey of the coalfield of Uryu in the province of Ishikari. The present paper deals with the results of the examination of these fossils.

In surveying Mr. Tokuda divided the above coalfield into five sections which he called A, B, C, D and E, for each of which he constructed a columnar geological section according to which the strata composing each section of the field, counted from above, are as follows:

I. Section A or Shōwa Coal Mine Region

- | | |
|-----------------------|---|
| 1. <i>Rumoe Beds</i> | { The upper part consists of a dark-grey sandy shale, while the lower consists of a black coloured conglomerate. The shale contains fossils. Thickness unknown. |
| 2. <i>Numata Beds</i> | {
<i>Upper Numata</i> lacking.
<i>Middle Numata</i> made up of a green sandstone intercalating thin layers of a sandy shale. Fossiliferous. Thickness about 250 feet.
<i>Lower Numata</i> consisting of a green to greenish grey sandstone alternating with a dark brown shale with many layers of coaly shale. Fossils present. Thickness about 230 feet. |

- | | | |
|----------------------------------|---|--|
| | | <p><i>Upper Tachibets.</i> Alternations of a black shale and a greenish grey sandstone. Shells and plants present. Thickness about 270 feet.</p> <p><i>Middle Tachibets.</i> Alternations of a greenish grey sandstone and a dark grey shale, intercalating tuffites and coal-seams. Fossils present. Thickness about 150 feet.</p> <p><i>Lower Tachibets.</i> A greenish grey sandstone and a conglomerate rich in grains of white quartzite. Thickness about 265 feet.</p> |
| 3. <i>Tachibets Beds</i> | } | |
| 4. <i>Uryu Coal-bearing Beds</i> | | <p>Alternations of shale and sandstone with layers of workable coal between. Thickness about 700 feet.</p> |
| 5. <i>Shiroki Beds</i> | | <p><i>Upper Shiroki.</i> Consisting of a grey sandy shale. Thickness about 470 feet. Fossiliferous.</p> <p><i>Lower Shiroki.</i> Consisting of sandstone and shale with sandpipes and coal-seams. Fossiliferous. Thickness uncertain.</p> |

The uppermost *Rumoe Beds* are separated from the next *Numata* by a fault, while the lowest *Shiroki* rest unconformably on a *Cretaceous* containing *Ammonites*.

II. Section B or Okada Region

- | | | |
|----------------------|---|--|
| | | <p><i>Upper Okada.</i> In the uppermost part there is a hard dark grey sandy shale with some sandstone layers. Thickness about 240 feet. Then comes a dark coloured sandstone about 450 feet in thickness and containing fossils. In the lowest part there is again a hard dark grey sandy shale rarely with fossils and about 220 feet in thickness.</p> <p><i>Middle Okada.</i> A dark coloured sandstone about 190 feet thick and containing fossils is underlaid by a dark green conglomerate about 1,030 feet thick including pebbles of older rocks, large and small.</p> <p><i>Lower Okada.</i> A blackish sandstone with stratification indistinct. Thickness about 1,220 feet. Fossils present.</p> |
| 1. <i>Okada Beds</i> | } | |
| | | |
| | | |

2. *Nisei Beds* { Consisting of a black to dark brown shale containing some organic matter and intercalating some layers of sandstone and coaly shale. Fossils present, but very badly preserved. Thickness about 1,200 feet.
3. *Numata Beds* { *Upper Numata.* Consisting of a dark brown shale and greenish grey sandstone intercalating thin layers of a coaly shale. Fossils present. Thickness about 300 feet.
Middle Numata. A green sandstone interbedded with shale as in Section A. Fossils present. Thickness about 250 feet.
Lower Numata. Alternations of a green or greenish grey sandstone and a dark brown shale as in Section A. Fossiliferous. Thickness about 300 feet.
4. *Tachibets Beds* { *Upper Tachibets.* Rocks as in A. Thickness about 250 feet. Fossils present.
Middle Tachibets. Rocks as in A. Thickness 160 feet.
Lower Tachibets. Rocks as in A. Thickness about 265 feet.

III. Section C or Region of the Rivers Urashima and Mappu

1. *Urashima Beds* { A black to dark brown shale with some layers of sandstone containing organic matter and coaly shale. Fossils present. Thickness about 230 feet.
2. *Numata Beds* { *Upper Numata.* Rocks as in A. Thickness about 300 feet.
Middle Numata. Rocks as in A. Thickness about 250 feet.
Lower Numata. Rocks as in A. Thickness about 300 feet.
3. *Tachibets Beds* { *Upper Tachibets.* Rocks as in A. Thickness about 400 feet.
Middle Tachibets. Rocks as in A. Thickness about 160 feet.

- | | | |
|--------------------------|---|--|
| | { | <i>Lower Tachibets.</i> Rocks as in A. Thickness about 200 feet. |
| 4. <i>Morokoshi Beds</i> | | <i>Upper Morokoshi.</i> Consisting of a greenish conglomerate made up of pea-sized pebbles. Some fossils present. Thickness uncertain. |
| | | <i>Lower Morokoshi.</i> An indistinctly stratified earthy shale with fossils. Thickness about 100 feet. |

IV. Section D or Region of the Asano Coal Mines

- | | | |
|--------------------------|---|--|
| 1. <i>Rumoe Beds</i> | { | The upper part consists of a dark grey shale, the middle of a dark brown conglomerate and the lower of a sandstone. Fossils present. Thickness about 1,000 feet. |
| 2. <i>Numata Beds</i> | | <i>Upper Numata.</i> Rocks as in B. Thickness about 300 feet. |
| | | <i>Middle Numata.</i> Rocks as in A. Thickness about 250 feet. |
| | <i>Lower Numata.</i> Rocks as in A. Thickness about 300 feet. | |
| 3. <i>Tachibets Beds</i> | { | <i>Upper Tachibets.</i> Rocks as in A. Thickness about 400 feet. |
| | | <i>Middle Tachibets.</i> Rocks as in A. Thickness about 160 feet. |
| | | <i>Lower Tachibets.</i> Rocks as in A. Thickness about 200 feet. |
| 4. <i>Morokoshi Beds</i> | { | <i>Upper Morokoshi.</i> Rocks as in C. Thickness uncertain. |
| | | <i>Lower Morokoshi.</i> Rocks as in C. Thickness about 100 feet. |

The *Morokoshi Beds* are directly underlaid by a *Cretaceous* formation with a line of fault between.

V. Section E or Poroshin Region

- | | | |
|-------------------------|---|--|
| 1. <i>Rumoe Beds</i> | { | The rocks are as in D. Thickness about 500 feet. |
| 2. <i>Poroshin Beds</i> | | A greenish grey to light grey sandstone with some layers of shale. The sandstone contains fossil shells and the shale fossil plants. Thickness about 6,000 feet. |

3. *Urashima Beds*(?) { Rocks as in C. Thickness about 200 feet.
 4. *Upper Numata Beds* { Rocks as in B. Thickness about 300 feet.

The beds which compose the five sections or regions above stated, when put together, are as follows :

A	B	C	D	E
Rumoe			Rumoe	Rumoe
	Okada			Poroshin
	Nisei	Urashima		Urashima
Numata	Numata	Numata	Numata	Numata
Tachibets	Tachibets	Tachibets	Tachibets	
Uryu		Morokoshi	Morokoshi	
Shiroki				
Cretaceous			Cretaceous	

Looking at the above table, one is led to think that the Okada Beds of Section B correspond in geological horizon to the Poroshin Beds of Section E, the Nisei Beds of Section B to the Urashima Beds of Sections C and E, and the Uryu Beds (Coal-bearing Series) of Section A to the Morokoshi Beds of Sections C and D. But this is at present uncertain. Why the surveyor applied different names to the beds is because their petrographical features are different, although he assumes that they are on the same level. According to what he had told to me, he is not even sure whether the Okada Beds are really below those of Rumoe. He says that these two beds may perhaps be the same. Under such circumstances the only thing which can settle these questions is their fossil content about which I will speak soon hereafter.

The fossil shells have been collected in all the beds lying above the Cretaceous excepting those of Nisei and Uryu. Although numerous, they are mostly ill preserved. Still I was able to distinguish the following 97 species :

		Okada			Poroshima		Numata		Tachibets		Morokoshi		Shi-roki		Geological Occurrence
		Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower		
Gastropoda															
CM25998	1. Pleurotoma sadoensis Yok.			+											Musashino
CM25999	2. Siphonalia sp.			+											
CM26000	3. Buccinum undatum (L.)			+											Recent-Neogene
CM26001	4. Buccinum sp.			+											
CM26002	5. Perissolax lymani n. sp.			+											
CM26003	6. Coralliophila tokudai n. sp.			+											
CM26004	7. Searlesia japonica Yok.														Musashino
CM26005	8. Cerithidea ishikariensis n. sp.			+											
CM26013	9. Vermetus sp.			+											
CM26014	10. Turritella kiiensis Yok.			+											Musashino-Neogene
CM26015	11. Viviparus uryuensis n. sp.			+											
CM26016	12. Thiara fiscina n. sp.			+											
CM26017	13. Crepidula jimboana Yok.			+											Neogene?
CM26018	14. Natica janthostoma Desh.			+											Recent-Neogene
CM26050	15. Natica kiritaniana Yok.			+											Neogene
CM26051	16. Natica sp.			+											
CM26071	17. Sinum neritoideum (L.)			+											Recent
CM26072	18. Calliostoma subunicum n. sp.			+											
CM26073	19. Umbonium ishiiianum Yok.			+											Neogene
CM26074	20. Umbonium sp.			+											
CM26075	21. Patella sp.			+											
Scaphopoda															
CM26083	22. Dentalium cf. weinkauffi Dkr.			+											Recent-Neogene
CM26084	23. Dentalium sp.			+											
Lamellibranchiata															
CM26087	24. Martesia pulchella n. sp.														+
CM26088	25. Teredo sp.														+
CM26089	26. Panope generosa (Gould)			+											Recent-Neogene
CM26090	27. Corbula iburica Yok.			+											Neogene?
CM26091	28. Corbula pumpellyi n. sp.			+											
CM26092	29. Mactra sulcataria Desh.			+											Recent-Neogene
CM26093	30. Mactra sachalinensis Schr.			+											Recent-Neogene
CM26094	31. Solen cf. krusensterni Gld.			+											Recent-Neogene
CM26095	32. Solen sp.														
CM26096															
CM26097															
CM26098															
CM26099															
CM26100															
CM26101															
CM26102															
CM26103															
CM26104															
CM26105															
CM26106															
CM26107															
CM26108															

	Rumoe	Okada			Poroshin	Urashima	Numata			Tachibets			Morokoshi	Shiroki		Geological Occurrence
		Upper	Middle	Lower			Upper	Middle	Lower	Upper	Middle	Lower	Upper	Lower	Lower	
CM26260																
CM26261																
CM26262																
CM26263																
CM26264																
CM26265																
CM26266																
CM26267																
CM26268																
CM26269																
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CM26307-90																
CM26308-91																
CM26309-92																
CM26310-93																
CM26311-94																
CM26312-95																
CM26313-96																
CM26314-97																
CM26315-97																

I. Rumoe Beds

The number of species afforded by these beds is in all nine which are the following:

1. *Natica* sp.
2. *Corbula pumpellyi* n. sp.
3. *Macoma nipponica* (Tok.)

4. *Venericardia* cf. *ferruginea* (A. Ad.)
5. *Glycimeris* sp.
6. *Yoldia scapha* Yok.
7. *Yoldia* sp.
8. *Leda* sp.
9. *Nucula poronaica* Yok.

Of these nine species, four are not specifically determined and one is new, so that there are only four which are available for the determination of the geological horizon or age. Of these four, one (*Macoma nipponica*) is hitherto *Musashino* in age, while three others (*Venericardia ferruginea*, *Yoldia scapha* and *Nucula poronaica*) are, so far as our present knowledge goes, *Neogene* (Pliocene or Miocene). Therefore, in spite of a very small number of these species, the beds containing them are probably *Neogene*. Whether they are Pliocene or Miocene, I can not say anything with certainty, although I presume that they are *Miocene*.

II. Okada Beds

Of all the beds constituting the coalfield of Uryu, those which have afforded the greatest number of fossil species are the Okada, amounting in all to fifty-two species which are the following:

1. *Pleurotoma sadoensis* Yok.
2. *Buccinum undatum* L.
3. *Buccinum* sp.
4. *Perissolax lymani* n. sp.
5. *Coralliophila tokudai* n. sp.
6. *Cerithidea ishikariensis* n. sp.
7. *Vermetus* sp.
8. *Turritella kiiensis* Yok.
9. *Thiara fuscina* n. sp.
10. *Crepidula jimboana* Yok.
11. *Natica janthostoma* Desh.
12. *Natica* sp.
13. *Sinum neritoideum* (L.)
14. *Calliostoma subunicum* n. sp.
15. *Umbonium ishiiianum* Yok.
16. *Patella* sp.
17. *Dentalium* sp.
18. *Panope generosa* (Gld.)

19. *Mactra sulcataria* Desh.
20. *Mactra sachalinensis* Schr.
21. *Solen* cf. *krusensternii* Gld.
22. *Macoma nipponica* Tok.
23. *Macoma praetexta* (Mart.)
24. *Macoma dissimilis* (Mart.)
25. *Tellina venulosa* Schr.
26. *Tellina* sp.
27. *Tellina* sp.
28. *Cyclina chinensis* Chem.
29. *Macrocallista brevisiphonata* (Carp.)
30. *Venus stimpsoni* Gld.
31. *Venus rigidus* Gld.
32. *Venus okadana* n. sp.
33. *Circe tokudai* n. sp.
34. *Paphia philippinarum* (Ad.)
35. *Cardium groenlandicum* Chem.
36. *Cardium nuttallii* Conr.
37. *Cardium tristiculum* Yok.
38. *Diplodonta usta* Gld.
39. *Phacoides borealis* (L.)
40. *Venericardia tokunagai* Yok.
41. *Venericardia* cf. *ferruginea* (Ad.)
42. *Mytilus grayanus* Dkr.
43. *Modiola* cf. *barbatus* L.
44. *Lima* sp.
45. *Chlamys yessoensis* (Jay.)
46. *Chlamys takahashii* Yok.
47. *Chlamys tokyoensis* (Tok.)
48. *Chlamys swiftii* (Bern.)
49. *Ostrea gigas* Thunb.
50. *Arca kobeltiana* Pils.
51. *Yoldia sagittaria* Yok.
52. *Nucula* sp.

Of these fifty-two species, those which are specifically determined are forty-three, of which one (*Sinum neritoideum*) is hitherto only *Recent*, twenty-five *Recent* as well as *fossil* (*Neogene*) and seventeen only *fossil*. Of these seventeen fossil ones, two (*Pleurotoma sadoensis* and *Macoma nipponica*) are hitherto *Musashino*, eight (*Turritella kiiensis*, *Crepidula jimboana*, *Umbonium ishikianum*, *Cardium tristiculum*, *Venericardia*

tokunagai, *Chlamys takahashii*, *Chlamys tokyoensis* and *Yoldia sagittaria*) *Neogene* and seven (*Perissolax lymani*, *Coralliophila tokudai*, *Cerithidea ishikariensis*, *Thiara fiscina*, *Calliostoma subunicum*, *Venus okadana* and *Circe tokudai*) entirely *new*. From these it may be safely inferred that the Okada Beds are *Neogene* and probably *Miocene*. As to their relation to the Rumoe Beds it is at present uncertain, because the number of well determinable species of the latter is too small to be availed of in the comparison of the two beds. The same thing may be said about their relation to the Poroshin Beds which have given only a few well determinable species as may be seen from the following lines:

III. Poroshin Beds

The species found in these beds are:

1. *Umbonium* sp.
2. *Dentalium* cf. *weinkauffii* Dkr.
3. *Cultellus* sp.
4. *Cardium*
5. *Venericardia* cf. *ferruginea* (Ad.)
6. *Corbicula* sp.
7. *Corbicula* sp.
8. *Ostrea gigas* Thunb.
9. *Arca* sp.

The well determined species are only three which are Recent as well as *Neogene*. What we can say about the beds in which these fossils are contained is that they are probably *Neogene*.

IV. Urashima Beds

From these beds we have only two species, (1) *Natica* sp. and (2) *Paphia variegata* (Hanl.) which latter is Recent as well as *Neogene*. The beds are probably also *Neogene*, but their relation to those of other sections, for example to the Okada, is totally unknown.

V. Numata Beds

The following twenty-five species have been found in these beds:

1. *Siphonalia* sp.
2. *Searlesia japonica* Yok.
3. *Thiara fiscina* n. sp.
4. *Natica janthostoma* Desh.

5. *Natica kiritaniana* Yok.
6. *Umbonium ishiiianum* Yok.
7. *Dentalium* sp.
8. *Corbula iburica* Yok.
9. *Mactra sulcataria* Derh.
10. *Solen* cf. *krusensternii* Gld.
11. *Siliqua* sp.
12. *Tellina*? sp.
13. *Dosinia angulosa* Phil.
14. *Macrocallista brevisiphonata* (Carp.)
15. *Venus okadana* n. sp.
16. *Circe tokudai* n. sp.
17. *Paphia variegata* (Hanl.)
18. *Paphia munroei* n. sp.
19. *Cardium tristiculum* Yok.
20. *Crassatellites heteroglyptus* Pils.
21. *Nodularia* cf. *biwae* Kob.
22. *Mytilus grayanus* Dkr.
23. *Modiolus barbatus* L.
24. *Ostrea gigas* Thunb.
25. *Yoldia* sp.

Of the twenty well determined species, one (*Nodularia biwae*) is hitherto only Recent, ten (*Natica janthostoma*, *Mactra sulcataria*, *Solen krusensternii*, *Dosinia angulosa*, *Macrocallista brevisiphonata*, *Paphia variegata*, *Crassatellites heteroglyptus*, *Mytilus grayanus*, *Modiolus barbatus* and *Ostrea gigas*) are Recent as well as Neogene, one (*Searlesia japonica*) Musashino, four (*Natica kiritaniana*, *Umbonium ishiiianum*, *Corbula iburica* and *Cardium tristiculum*) Neogene, and four (*Thiara fiscina*, *Venus okadana*, *Circe tokudai* and *Paphia munroei*) new. The fauna on the whole resembles that of the overlying beds (Okada), thirteen species being actually common with them. Consequently I am inclined to consider it still as Neogene (Miocene). What is worthy of notice in it is the intermingling of *Nodularia biwae* which is at present a fresh-water form.

VI. Tachibets Beds

The number of species obtained from these beds are in all twelve. They are the following:

1. *Viviparus uryuensis* n. sp.

2. *Thiara fiscina* n. sp.
3. *Tellina* sp.
4. *Circe tokudai* n. sp.
5. *Venericardia* sp.
6. *Crassatellites heteroglyptus* Pils.
7. *Nodularia subjapanensis* n. sp.
8. *Nodularia pisciformis* n. sp.
9. *Nodularia* cf. *biwae* Kob.
10. *Margaritana perdahurica* n. sp.
11. *Modiolus* cf. *barbatus* L.
12. *Yoldia breviscapa* n. sp.

Of the ten specifically determined species, one (*Nodularia biwae*) is Recent, two (*Crassatellites heteroglyptus* and *Modiolus tartatus*) Recent as well as Neogene, and seven (*Viviparus uryuensis*, *Thiara fiscina*, *Circe tokudai*, *Nodularia subjapanensis*, *Nodularia pisciformis*, *Margaritana perdahurica* and *Yoldia breviscapa*) new. The exclusively fossil forms predominate and the Recent ones very few, so that the beds containing them can not be Neogene, but *Palaeogene*. This is also made probable by the age of the next lower beds, the *Morokoshi*, being decidedly *Palaeogene*. In the West, the uppermost *Palaeogene* is called *Oligocene*, and although at present there are no fossil forms in our beds which prove that they are *Oligocene*, the order of the vertical succession of the beds points to that age. Besides, what is noteworthy is the increase of the fresh-water forms *Viviparus*, *Thiara*, *Nodularia* and *Margaritana* compared to the overlying beds. This shows that the medium in which the beds had been deposited was no more marine, but brackish.

VII. Morokoshi Beds

The following species have been obtained from these beds :

1. *Solen* sp.
2. *Paphia munroei* n. sp.
3. *Cardita mandaica* Yok.
4. *Cyrena verecunda* n. sp.
5. *Cyrena* sp.
6. *Nodularia* cf. *biwae* Kob. (?)
7. *Anodonta suavis* n. sp.
8. *Pholadomya* sp.

Here we have no living species if we except a form which looks like *Nodularia biwae* which, however, is too ill preserved for exact

determination. There are two species which make the beds decidedly *Palaeogene*. They are *Cardita mandaica* and *Pholadomya* sp. The former occurs in the *Palaeogene* (probably *Eocene*) of Miike in Chikugo, Kyushu, while the latter, although not specifically determined, closely resembles a species found in the layers of the same age, such as *Pholadomya margaritacea*. It is highly probable that the Morokoshi Beds are also *Eocene*.

Here again there are several fresh-water forms, *Cyrena*, *Nodularia* and *Anodonta*. The beds are probably brackish. The beds which are apparently an equivalent of Morokoshi in Section A, the Uryu Coal-bearing Series, although I obtained no fossils from them, are also probably either fresh-water or brackish.

VIII. Shiroki Beds

The lowest beds of the Uryu Coalfield, the Shiroki, have yielded the following forms:

1. *Cerithidea ishikariensis* n. sp. (?)
2. *Martesia pulchella* n. sp.
3. *Teredo* sp.
4. *Tellina* sp.
5. *Cyclina* (?) *shirokiana* n. sp.
6. *Venus sannosawensis* n. sp.
7. *Paphia munroei* n. sp.
8. *Cyrena* sp.
9. *Anodonta* (?) sp.

The five specifically determined species are all new, of which one (*Paphia munroei*) occurs also in the overlying Morokoshi Beds. From the order of succession of the various beds, the Shiroki are the lowest. Therefore they may be provisionally taken for *Palaeocene*, although there is no positive proof that they are so. As to the fresh-water shells there are two, *Cyrena* and *Anodonta*, so that the beds are still somewhat brackish, though in a less degree than Tachibets and Morokoshi.

Above are the results obtained by studying the fossil shells. But Mr. Tokuda, the surveyor of the coalfield, says that he feels that the boundary between Neogene and *Palaeogene* lies somewhat higher, that is to say, between Nisei and Numata, in which case the latter are to be considered as *Palaeogene*. This opinion is, I believe, mainly due to the difference of petrographical characters of Numata from those of the overlying beds. To this I have no serious objection, especially as I have

at present no positive proof which is against it. The shell fauna of the Uppermost Palaeogene, the Oligocene, is hitherto hardly known in Japan, and some species which have been described from Kyushu are not at all represented in ours, so that their direct comparison is not possible. Fortunately, however, the beds seem to contain many plant remains whose study, I hope, will throw more light on the subject.

Description

H CM 26002-1-1

5. *Perissolax lymani*, nov. spec.

Pt. 6, Pl. I. Fig. 1

An imperfect specimen lacking the spire as well as the canal. Nevertheless, the form is so peculiar and characteristic that I can not leave it without a name.

The body-whorl is globular and patulous, with the surface below the suture rather flattened, only gently sloping and going over into the convex lateral side without forming any perceptible angle. The base narrows rather abruptly and then passes into a canal which seems to have been long. The sculpture consists of spiral cords whose number on the flattened upper surface is three, one close to the suture, one close to the lateral side and one between, the interspaces being very wide. On the lateral surface there are also three cords with a somewhat weaker intercalary, while on the base there are many, close, unequal ones. The spire seems to have been low and short.

The shell in its general appearance shows a close resemblance to some species of *Tudicla* e.g. to *Tudicla rusticula* (Bast.) (Hörnes, Moll. Wiener Beckens, pl. XXVII) without exactly agreeing with them. But *Tudicla* is provided with a fold on the inner lip, which in our species is hardly indicated. This is the reason why I bring it under the genus *Perissolax*.

Fossil occurrence.—*Upper Okada Beds*: Along the stream Nankazawa, a branch of the Urashimagawa.

6. *Coralliophila tokudai*, nov. spec.

H CM 26003-2-1

Pt. 6, pl. II. Fig. 1

Shell small, solid. Whorls about six, rapidly growing, the last one being twice as high as the spire, moderately convex and spirally grooved. Grooves deep, five or six on the penultimate whorl and about sixteen on the ultimate, dividing the surface into more or less broader

flattish or rounded cords. Longitudinal sculpture absent except on the last part of the body-whorl where there are three varix-like ribs near together. Aperture fusiform. Inner lip smooth, flattened, separated from the surface of the whorl by a longitudinal furrow, distinct near the anterior end, but getting gradually indistinct posteriorly and finally disappearing in the posterior half. Outer lip crenulate at margin. Canal short. A single example which measures 17.3 millim. in height and 12 millim. in diameter.

This species is closely akin to *Coralliophila stearnsii* Pilsbry (Catalogue, p. 45, pl. II, fig. 12), a living one which, however, possesses many longitudinal plicae on all the whorls.

Fossil occurrence.—*Middle Okada Beds*: In the Gengorozawa, a branch of the Urashimagawa.

8. *Cerithidea ishikariensis*, nov. spec.

Pt. 6. Pl. I. Figs. 4-7

Shell moderate in size, turrete. Whorls about eight, somewhat convex, separated by distinct sutures, longitudinally plicate and spirally striate. Plicae twenty or more on the penultimate whorl, low, rounded, with interspaces subequal, slightly curved with concave side towards front. Spiral striae about ten, close, with interspaces usually narrower. Aperture rounded. One of the examples measures 10 millim. in height and 7.5 millim. in diameter, but there are fragments whose diameter is up to 11 millim.

The specimens are not rare, but on account of their brittleness they are more or less broken.

The shell is closely allied to *Cerithidea moerchii* A. Ad. (Tryon's Man. Conch., p. 163 pl. XXXII., fig. 68) living in Southern Japan, but differs in possessing no varices and a somewhat less number of longitudinal plicae.

Fossil occurrence.—*Middle Okada Beds*: The Gengorozawa, a branch of the Urashimagawa. *Lower Okada Beds*: The Okadagawa; the Tsumetazawa, a branch of the Urashimagawa. *Upper Shirokei Beds*: The Sannosawa, a tributary of the Shirokeigawa (the preservation is very bad and it is doubtful whether we have here the same species or not).

11. *Viviparus uryuensis*, nov. spec.

Pt. 6. Pl. I. Figs. 8, 9, 10

Whorls about six, smooth save for rough lines of growth, flatly convex, shouldered and step-like with shoulders blunt. Periphery subangu-

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late. Base convex. Aperture not well preserved, probably oval. Height somewhat greater than diameter, the proportion being about ten to eight.

One example measures 25 millim. in height and 20 millim. in diameter, while another is 23 millim. in height and 17.5 millim. in diameter. The largest is up to 30 millim. in height.

This species closely resembles some forms of a living Japanese one called *Viviparus ingallsianus* (Kob.) (Fauna Extramar. Japon., p. 124, pl. X, figs. 14-18, pl. XI, 2) from which, however, it is distinguished by more step-like whorls.

Fossil occurrence.—*Upper Tachibets Beds*: The Akaganezawa, a branch of the Okadagawa; the Tomisawa, a branch of the Nasuzawa which is again a branch of the Urashimagawa; the Shimizusawa, a branch of the Tachibetsgawa; the Sasakizawa. *Middle Tachibets Beds*: the Okadagawa. *Lower Tachibets Beds*: the Shōwagawa.

12. *Thiara fiscina*, nov. spec.

Pt. 6. Pl. I. Figs. 2, 3

Shell rather small. Whorls intact three or four, the rest probably lost by erosion, flat or flatly convex, longitudinally plicate and spirally striate. Plicae varying in number from ten to fourteen, with interspaces also varying in breadth, sometimes equal, sometimes narrower, sometimes broader, straight or often slightly oblique with lower end more forward, rounded, often vanishing before reaching the lower suture either near it or in the middle of the whorl. Spiral striae fine, sharp, narrower than interspaces, about ten on the penultimate whorl. Base without longitudinal plicae, being ornamented by spiral striae only. Aperture not well preserved.

Rather frequent, but the specimens are all more or less imperfect. The diameter is up to 6 millim.

Fossil occurrence.—*Lower Okada Beds*: the Okadagawa. *Upper Numata Beds*: The Yorikizawa, a branch of the Urashimagawa. *Lower Numata Beds*: The Mappugawa; the Mappugoshizawa; the Katsurazawa; the Kajisawa, a branch of the Horonitachibetsgawa; the Sakurazawa, a branch of the Shisengawa. *Upper Tachibets Beds*: The Rakwanzawa, a branch of the Shisengawa; the Katsurazawa.

17. *Sinum neritoideum*, (Linné)

Sigaretus neritoideus. Tryon, Man. Conch., p. 55, pl. XXII, fig. 35, pl. XXIII, figs. 38-40.

Sigaretus insculptus. A. Adams and Reeve, Voy. Samarang, p. 53, pl. XIII, fig. 10.

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Sigaretus latifasciatus. Ibid. pl. XIII, fig. 11.

Two rather ill preserved specimens. Characterized by very quickly growing whorls, assuming, as the specific name implies, a *Nerita*-like appearance. A form described by me under the name of *Sigaretus estivus* (Tert. Moll. Shinano a. Echigo, p. 8, pl. I, fig. 6) from the Neogene of Shinano is our close ally.

Fossil occurrence.—*Upper Okada Beds*: The Ennosawa, a branch of the Urashimagawa. *Middle Okada Beds*: The Gengorozawa, a branch of the same river.

Living.—Western Japan. Eastern Seas.

✓ CM26087-1-11

18. *Calliostoma subunicum*, nov. spec.

Pt. 6. Pl. I. Fig. 11

A conical shell, 12 millim. high and 11 millim. in diameter. Whorls about five, rapidly growing, convex and spirally corded. The cords number about eight on the penultimate whorl and six on the one preceding, with interspaces somewhat broader and filled with one, two or three unequal spiral striae. Periphery bluntly angulate with a cord on it. Base flattened, with numerous fine spiral striae. Aperture roundish. Outer lip broken.

This species closely resembles *Calliostoma unicum* (Dkr.) (Moll. Jap. p. 23, pl. III, fig. 3) from which, however, it differs by its less quickly growing whorls as well as by the presence of striae on the base instead of grooves as in Dunker's species.

Fossil occurrence.—*Middle Okada Beds*: The Gengorozawa, a branch of the Urashimagawa.

✓ CM26095-2-5

24. *Martesia pulchella*, nov. spec.

Pt. 6. Pl. II. Fig. 5

A left valve 20 millim. long, 10 millim. high and deep. It is transversely elongated, highest and most swollen near the rounded anterior end, and gradually getting lower and more compressed towards the back terminating in a rounded end. A fine straight longitudinal furrow runs from the beak to the ventral margin, slightly oblique with the lower end somewhat more posterior than the upper, dividing the surface into two very unequal portions. The larger posterior portion is finely concentrically grooved with interspaces much broader and appearing like flat cords. Anterior to the longitudinal furrow there are fine striae which are, so to say, the continuations of the cord-like interspaces

of the other portion. These striae are very finely serrated, at first oblique but soon curve up, bending with a sharp angle beyond which they run almost horizontally and reach the anterior margin of the shell.

This species resembles in many respects *Martesia striata* (L.) (Sowerby, Thes. Conch., Vol. II, p. 494, pl. 104, figs. 40-42) which is still living in Japan as well as in Europe. But the sculpture is decidedly finer in the fossil form.

Fossil occurrence.—*Lower Shiroki Beds*: Sannosawa, Shirokigawa.

28. *Corbula pumpellyi*, nov. spec.

Pt. 6. Pl. II. Fig. 6

A single right valve.

The shell is convex, subtrigonal, longer than high, inequilateral, with posterior side twice as long as anterior, bluntly angulate in front, rather sharply rounded behind, antero-dorsal margin almost straight, steeply sloping, postero-dorsal also sloping, at first straight, then gradually curving and passing into rounded posterior without forming any angle, ventral very broadly arched. Beak pointed, a rather sharp edge running from it to the postero-ventral corner, being flattened near the latter. Surface smooth, only with concentric lines of growth. Length 20 millim. Height 11 millim. Depth 3 millim.

Fossil occurrence.—*Rumoe Beds*: The Nakayamazawa, a branch of the Shisengawa.

46. *Cyclina? shirokiana*, nov. spec.

Pl. 6. Pl. II. Fig. 7

A single specimen not well preserved, though both valves are intact. The form is almost circular, rather compressed, nearly equilateral and ornamented with fine concentric striae. The beaks are small, but prominent and somewhat pointed. The height and length are nearly equal, measuring about 30 millim. The thickness is about 15 millim.

Fossil occurrence.—*Lower Shiroki Beds*: The Sannosawa, a branch of the Shirokigawa.

50. *Venus? sannosawensis*, nov. spec.

Pt. 6. Pl. III. Fig. 6

Shell small, somewhat convex, trigonal in shape, very inequilateral, rounded in front and behind, though somewhat more sharply in front.

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CM 26126-2-7

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CM 26135

Antero- and postero-dorsal margins sloping, ventral broadly arched. Surface regularly concentrically finely grooved. Beaks small, but pointed. Two right valves, one of which is 12 millim. long and 9 millim. high.

Somewhat resembling *Venus mitsuiana* Yok. (Tert. Foss. Miike Coalfield, pl. I, fig. 5) which is, however, smooth.

Fossil occurrence.—*Upper Shirokei Beds*: The Sannosawa, a branch of the Shirokeigawa.

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CM26137-2-9

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CM26145

51. *Venus? okadana*, nov. spec.

Pt. 6. Pl. II. Figs. 8, 9

Shell of moderate size, very thick quite swollen, roundly elliptical, slightly longer than high, very inequilateral, rounded both in front and behind. Surface with rough concentric lines of growth. Beaks not very prominent.

A perfectly preserved specimen measures 34 millim. in length, 30 millim. in height and 21 millim. in thickness. The largest is about 40 millim. in height. Frequent.

This shell resembles *Venus rigidus* Gld (Yokoyama, Moll. Upper Mushashino Tokyo a. its Sub., pl. I, fig. 3) fossil as well as living in Japan, though lacking the radial sculpture of the latter.

Fossil occurrence.—*Upper Okada Beds*: The Okadagawa; the Jushichinenzawa, a branch of the Okadagawa. *Middle Okada Beds*: The Kaisekizawa, a branch of the Urashimagawa. *Lower Okada Beds*: The Okadagawa. *Middle Numata Beds*: Jushichinenzawa.

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52. *Circe tokudai*, nov. spec.

Pt. 6. Pl. II. Figs. 2, 3, 4

Shell moderately thick, somewhat convex, roundly pentagonal, inequilateral, sharply rounded in front, obliquely subtruncate behind, broadly arched at ventre, antero-dorsal margin nearly straight, steeply sloping and going over into anterior margin without making any angle, postero-dorsal also nearly straight and sloping, though less steeply than antero-dorsal. Surface smooth save for rough incremental lines. Beaks blunt, often eroded. A blunt edge runs from the beak to the postero-ventral corner. Height 20 millim. Length 25 millim. Thickness about 12.5 millim.

The teeth have been observed in one of the right valves. The

three main teeth are approximately equidistant from one another, and of nearly equal size.

The species is closely allied to our living *Circe scripta* (L.), (Yokoyama, Semifossil Shells from Noto, p. 127, pl. XX, fig. 2). Moll. Oilfield Taiwan, pl. VIII, figs. 7, 8), but is somewhat more convex and not regularly sulcated on the surface. There is also some difference in dentition, the middle tooth of the right valve of *Circe scripta* being thicker than the others.

Very frequent. Most frequent in the Lower Numata Beds.

Fossil occurrence.—The specimens have been picked up at about thirty-five localities as given below:

Lower Okada Beds: In the Okadagawa as well as in the branch-streams of the Urashimagawa. Four places in all.

Upper Numata Beds: In two places, one in the Yorikizawa (a branch of the Urashimagawa) and one in the Jūshichinenzawa (a branch of the Okadagawa).

Middle Numata Beds: In the branch-streams of the Urashimagawa, in the Shisengawa and its tributary called Urushizawa, in the Sasaki-gawa and Nakakinenbetsugawa. Six places in all.

Lower Numata Beds: In the Ponponzawa, the Kyokkōzawa, the Tachibetsugawa, in the Urashimagawa and its tributaries, in the branches of the Horonitachibetsugawa as well as of the Shisengawa, in a tributary of the Sasaki-gawa, and in the Mappugawa and its tributaries. Seventeen places in all.

Upper Tachibets Beds: In the Katsurazawa, a branch of the Sasaki-gawa and in the three branch-streams of the Shisengawa. Four places in all.

Lower Tachibets Beds: In the Showagawa. One place.

Upper Shiroki Beds: In the Tennosawa, a branch of the Shiroki-gawa. One place.

55. *Paphia munroei*, nov. spec.

Pt. 6. Pl. III. Figs. 3, 4

Many left valves and an outer impression of a right one.

Shell moderately thick, only weakly convex, subtrigonal, longer than high, very inequilateral, posterior portion being nearly twice as long as anterior, rounded in front and behind, broadly arched at ventre. Surface with numerous regular concentric grooves, the interspaces looking like fine riblets. Dentition unknown so that the generic determination

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is only provisional. One of the left valves is 23 millim. long and 15 millim. high, while another is 31 millim. long and 19 millim. high.

Fossil occurrence.—*Middle Numata Beds*: In the Tomisawa, a branch of the Nasuzawa which is a branch of the Urashimagawa. *Lower Morokoshi Beds*: In the Morokoshizawa, the Urushizawa, the Wasawa, the Shimodazawa and the Takinosawa, all of which are the tributaries of the Shisengawa. *Upper Shirokei Beds*: In the Ninosawa, the Sannosawa and the Tennosawa, all being the tributaries of the Shirokeigawa.

④ CM26267 - 2-10

⑤ CM26248

62. *Cardita mandaica*, Yokoyama

Pt. 6. Pl. II. Fig. 10

Cardita mandaica Yokoyama, Tert. Foss. Miike Coalfield, p. 9, pl. II, figs. 8-11.

One undoubted specimen from the Upper Morokoshi and a few imperfect ones from the Lower.

Fossil occurrence.—*Upper Morokoshi Beds*: In the Morokoshizawa, a tributary of the Shisengawa. *Lower Morokoshi Beds*: In the Urushizawa, a branch of the Shisengawa. *Lower Tertiary* of Miike (Eocene).

CM26260 - 3-5a

CM26261 - 3-5b

69. *Cyrena verecunda*, nov. spec.

Pt. 6. Pl. III. Fig. 5

Shell medium-sized, convex, roundly trigonal, slightly longer than high, inequilateral, rounded in front and behind, though more sharply in front. Antero- and postero-dorsal margins almost straight, sloping, the former more steeply than the latter, ventral broadly arched. Postero-ventral corner rounded. Surface smooth save for rough lines of growth. One of the right valves measures 29 millim. in length, 26 millim. in height and about 7.5 millim. in depth, while one of the left measures 29 millim. in length, 26 millim. in height and about 7.2 millim. in depth.

Fossil occurrence.—*Lower Morokoshi Beds*: In the Shimodazawa as well as in the Urushizawa, both tributaries of the Shisengawa.

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71. *Nodularia subjapanensis*, nov. spec.

Pt. 6. Pl. IV. Fig. 3

Shell of moderate size, compressed, transversely elliptical, rounded in front and behind, antero-dorsal margin rather steeply sloping, postero-dorsal at first horizontal and then sloping, ventral almost straight, only

curved at extremities; inequilateral, posterior portion twice as long as anterior. Surface dark-coloured, smooth save for concentric lines of growth. Only a single good example which measures about 45 millim. in length, 30 millim. in height and 13.5 millim. in thickness.

This species shows a great resemblance to our living one called *Nodularia japonensis* (Lea) (Kobelt, Fauna Moll. Extramarin. Jap., p. 139, pl. XII, figs. 1, 2) in which, however, there are v-shaped decorations on the surface.

Fossil occurrence.—*Upper Tachibets Beds*: In the Sasakigawa. *Lower Tachibets Beds*: In the Kenbokuzawa, a tributary of the Mappugawa (a strongly deformed specimen).

72. *Nodularia pisciformis*, nov. spc.

Pt. 6. Pl. III. Figs. 1, 2

Shell moderately convex, transversely elongated, lanceolate, rounded in front, gradually narrowed and rostrate behind terminating in a rounded end. Beaks near the anterior side. A blunt edge runs from the beak to the posterior end, gradually flattening as it recedes from the beak, and getting indistinct near the posterior extremity. Surface smooth only with concentric lines of growth. One of the examples measures 73 millim. in length, 26 millim. in height and about 10 millim. in depth.

Fossil occurrence.—*Upper Tachibets Beds*: The Sasakizawa; the Nasuzawa, a branch of the Urashimagawa. *Lower Tachibets Beds*: The Kikyoza, a branch of Mappugawa.

73. *Nodularia cf biwae*, Kobelt

Pt. 6. Pl. IV. Fig. 4

This is a form resembling *Nodularia subjapanensis* above described in general form, although transversely somewhat more elongated. The beaks are eroded and the original dark colour of the epidermis is to some degree preserved. It is hardly distinguishable from the recent species, *Nodularia biwae* Kobelt (Moll. Extramarin. Japon., p. 141, pl. XXIII, figs. 2-4) of Lake Biwa.

The specimens are mostly imperfect, the figured one being the best. It is about 50 millim. long, 23 millim. high and 12 millim. thick.

Fossil occurrence.—*Middle Numata Beds*: The Takahashizawa, a tributary of the Horonitachibetsgawa. *Upper Tachibets Beds*: The

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Sasakigawa. *Lower Tachibets Beds*: The Chikusakuzawa, a branch of the Mappugawa; the Shimodazawa, a branch of the Shisengawa.

CM 26277-4-2

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CM 26279

74. *Margaritana perdahurica*, nov. spec.

Pt. 6. Pl. IV. Fig. 2

Shell compressed, transversely elongated, longly subelliptical, very inequilateral, rounded in front and behind, though somewhat more sharply behind. Antero-dorsal margin convex, insensibly passing into anterior, postero-dorsal almost straight, subparallel to ventral, then sloping and passing into posterior without making any marked angle. Ventral margin slightly excavated in the middle. Surface only with concentric lines of growth. A blunt edge runs from the beak to the postero-ventral corner, at first distinct, but gradually flattening and becoming indistinct toward the posterior end.

Specimens are not rare, but mostly deformed. The one which is measurable is 67 millim. long and 30 millim. high, the beak being about 15 millim. from front.

This species resembles *Margaritana dahurica* Midd. (Kobelt, Fauna Moll. Extramar. Japon., p. 143, pl. XIII, figs. 1, 2) which lives in the Amoor Region and also in Northern as well as in Central Japan. But it is decidedly shorter.

Fossil occurrence.—*Upper Tachibets Beds*: The Rakkwanzawa, a branch of the Shisengawa; the Tomisawa and Hozawa, both branches of the Nasuzawa which is again a branch of the Urashimagawa; the Shimizusawa, a branch of the Okadagawa; the Meiji Mine, Numata; the Katsurazawa.

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75. *Anodonta suavis*, nov. spec.

Pt. 6. Pl. IV. Fig. 1

Shell thin, compressed, very inequilateral, transversely oval, longer than high, rounded in front, obtusely and indistinctly angulate behind, broadly arched at ventre. Surface smooth, save for rough concentric lines of growth.

A few specimens present are all flatly pressed and appear flatter than they really are. One of them measures 70 millim. in length and 44 millim. in height. The proportion of the posterior side to the anterior is about 5 to 2.

Resembling *Anodonta woodia* and *A. lauta* of Kobelt (Fauna Moll.

Extram. Jap., pl. XX, fig. 1 and pl. XXI, fig. 1), though our fossil species is not at all winged like these recent ones.

Fossil occurrence.—*Lower Morokoshi Beds*: The Shinodazawa, a branch of the Shisengawa; the Morokoshizawa, a branch of the same river.

77. *Pholadomya* sp.

Pt. 6. Pl. IV. Fig. 7

A cast of an obliquely elongated shell with beak terminal. In spite of its ill preservation, there is no doubt of its being a species of *Pholadomya* like *Pholadomya margaritacea* (Sow.) (Yokoyama, Tert. Foss. Miike Coalfield, pl. I, figs. 1-3) or *Pholadomya puschi* (Jour. Geol. Soc. Tokyo, 1927, vol. 32, pl. VIII).

Fossil occurrence.—*Lower Morokoshi Beds*: The Urushizawa, a tributary of the Shisengawa.

92. *Yoldia breviscapa*, nov. spec.

Pt. 6. Pl. IV. Fig. 5

Several specimens, though all imperfect, being deprived of the shell and only presenting the impressions of the inner side. Nevertheless, the shape is so characteristic that I can not help giving a name to it.

The shell resembles *Yoldia scapha* Yok. (Tert. Moll. Oilf. Embets a. Etaibets, p. 247, pl. XXXI, figs. 7-11), in general outline, but is shorter, the proportion of length to height being equal to about 5 to 4. It is rather convex, almost equilateral, subpentagonal in outline, subtruncate in front and behind. A blunt edge runs from the beak to the postero-ventral corner. The surface seems to have been concentrically striated. The beak is prominent, behind which the margin is somewhat excavated.

The figured specimen is a left valve, 29 millim. long, 23 millim. high and about 7 millim. deep.

Fossil occurrence.—*Lower Tachibets Beds*: The Showagawa.

Explanation of Plates

Part 6. Plate I

Fig. 1. *Perissolax lymani* n. sp. Upper Okada Beds. Nankazawa (a branch of the Urashima). P. 235

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(R) CM 26310 -4-5

Figs. 2, 3. *Thiara fiscina* n. sp. Upper Numata Beds. Yorikizawa (a branch of the Urashima). P. 237

Figs. 4-7. *Cerithidea ishikariensis* n. sp. Lower Okada Beds. 4-6 Okadagawa. 7. *Tsusetazawa* (a branch of the Urashima). p. 236

Figs. 8, 9, 10. *Viviparus uryuensis* n. sp. Upper Tachibets Beds. Akaganezawa (a branch of the Okada). P. 236

Fig. 11. *Calliostoma subunicum* n. sp. Middle Okada Beds. Gengorozawa (a branch of the Urashima). P. 238

Part 6, Plate II

Fig. 1. *Coralliophila tokudai* n. sp. Middle Okada Beds. Gengorozawa (a branch of the Urashima) P. 235

Figs. 2, 3, 4. *Circe tokudai* n. sp. 2, 4. Upper Okada Beds. Okadagawa. 3. Upper Numata Beds. Yorikizawa (a branch of the Urashima). P. 240

Fig. 5. *Martesia pulchella* n. sp. Lower Shiroki Beds. Sannosawa (a branch of the Shirokigawa). P. 238

Fig. 6. *Corbula pumpellyi* n. sp. Rumoe Beds. Nakayamazawa (a branch of the Shisen). P. 239

Fig. 7. *Cyclina* ? *shirokiana* n. sp. Lower Shiroki Beds. Sannosawa (a branch of the Shiroki). p. 239

Figs. 8, 9. *Venus* ? *okadana* n. sp. 8. Lower Okada Beds. Okadagawa. 9. Upper Okada Beds. Jūshichinenzawa. P. 240

Fig. 10. *Cardita mandaica* Yok. Upper Morokoshi Beds. Morokoshizawa (a branch of the Shisen). P. 242

Part 6, Plate III

Figs. 1, 2. *Nodularia pisciformis* n. sp. Upper Tachibets Beds. Sasakigawa. P. 243

Figs. 3, 4. *Paphia munroei* n. sp. Lower Morokoshi Beds. Shimodazawa (a branch of the Shisen). P. 241

Fig. 5. *Cyrena verecunda* n. sp. Lower Morokoshi Beds. Shimodazawa (a branch of the Shisen). P. 242

Fig. 6. *Venus* ? *sannosawensis* n. sp. Upper Shiroki Beds. Sannosawa (a branch of the Shiroki). P. 241

Fig. 7. *Pholadomya* sp. Upper Morokoshi Beds. Urushizawa (a branch of the Shisen). P. 245

Part 6, Plate IV

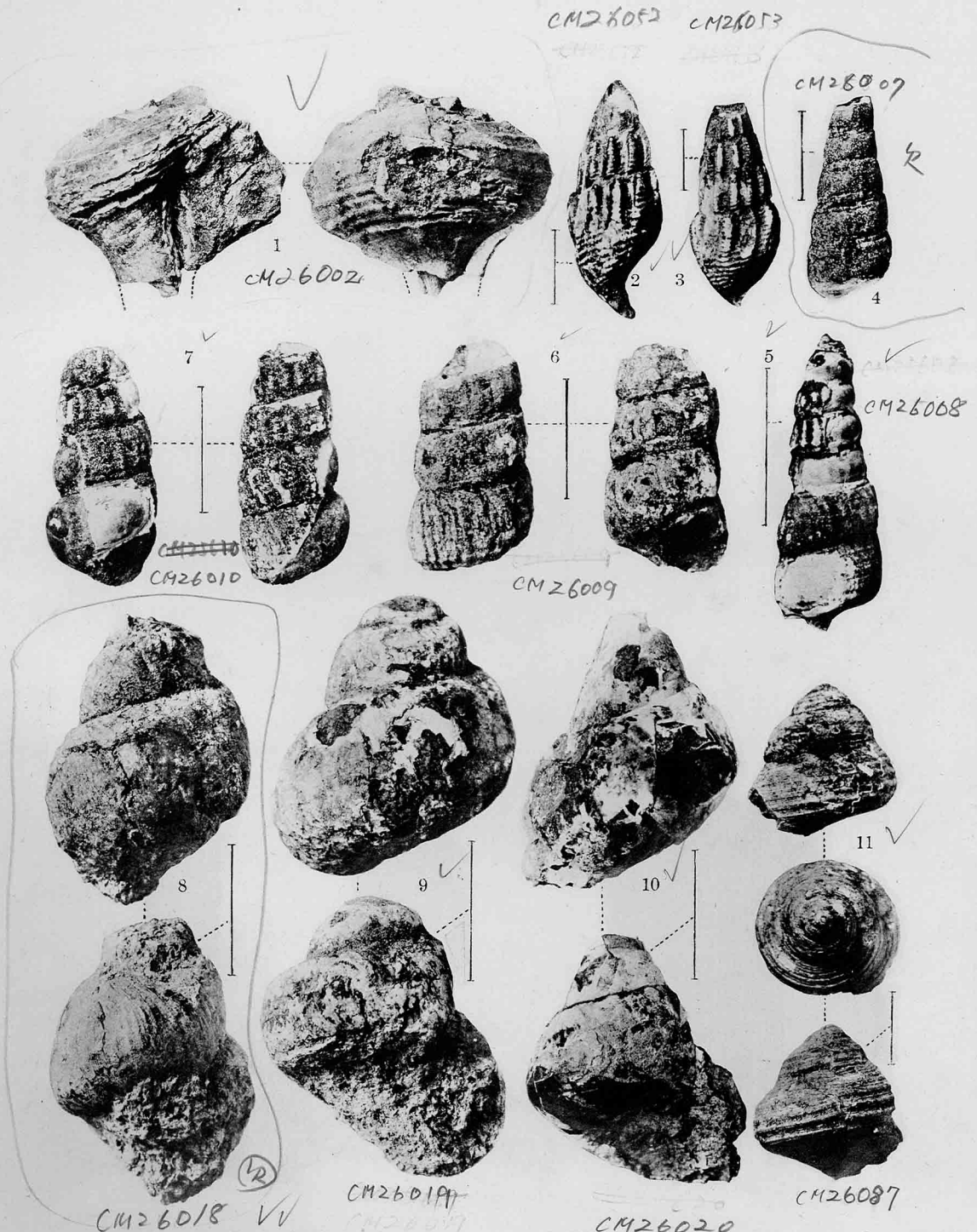
Fig. 1. *Anodonta suavis* n. sp. Lower Morokoshi Beds. Shimodazawa (a branch of the Shisen). P. 244

Fig. 2. *Margaritana perdahurica* n. sp. Upper Tachibets Beds. Rakkwanzawa (a branch of the Shisen). P. 244

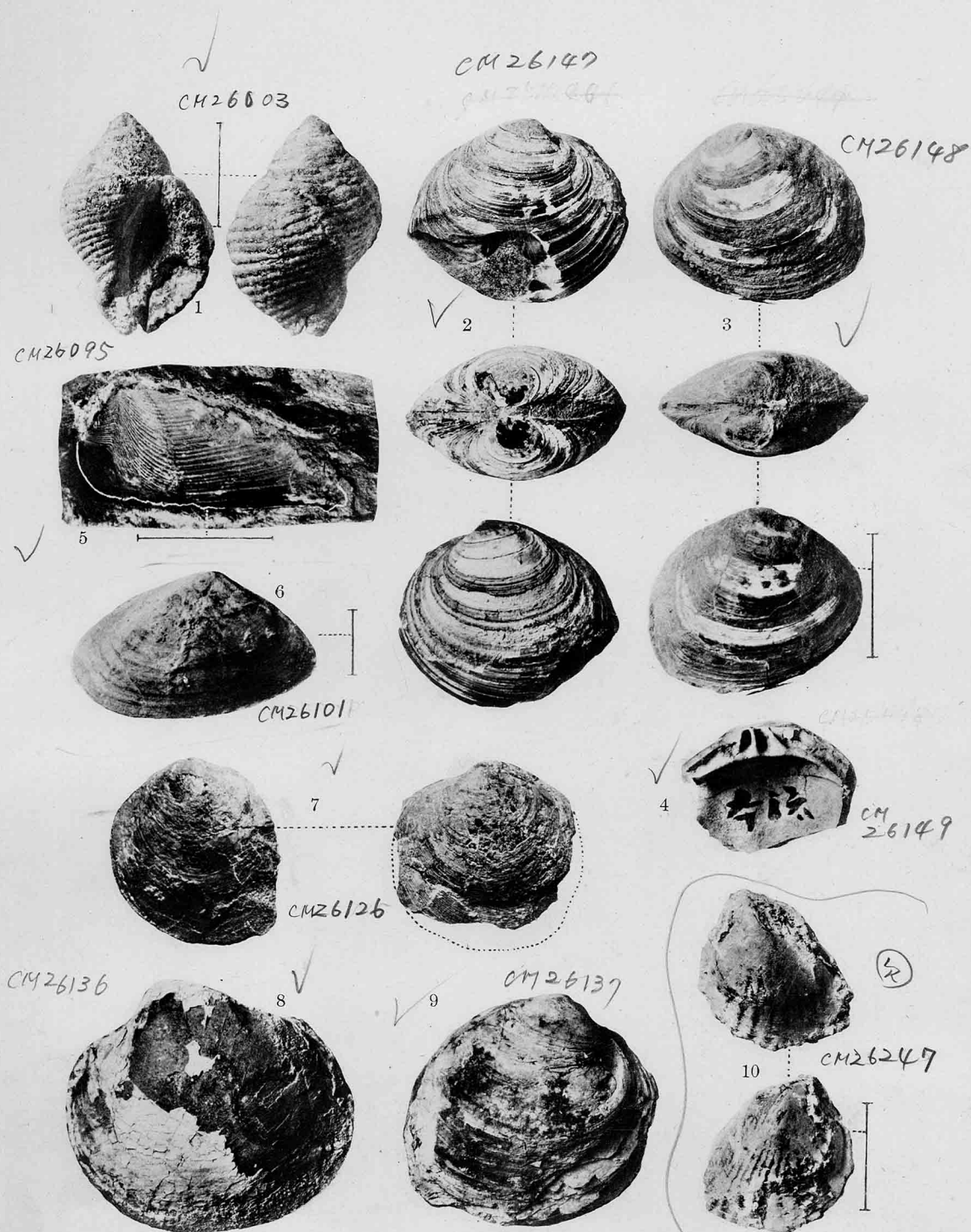
Fig. 3. *Nodularia subjapanensis* n. sp. Upper Tachibets Beds. Sasakigawa. P. 242

Fig. 4. *Nodularia* cf. *biwae* Kob. Middle Numata Beds. Takahashizawa (a branch of the Horonitachibets). P. 243

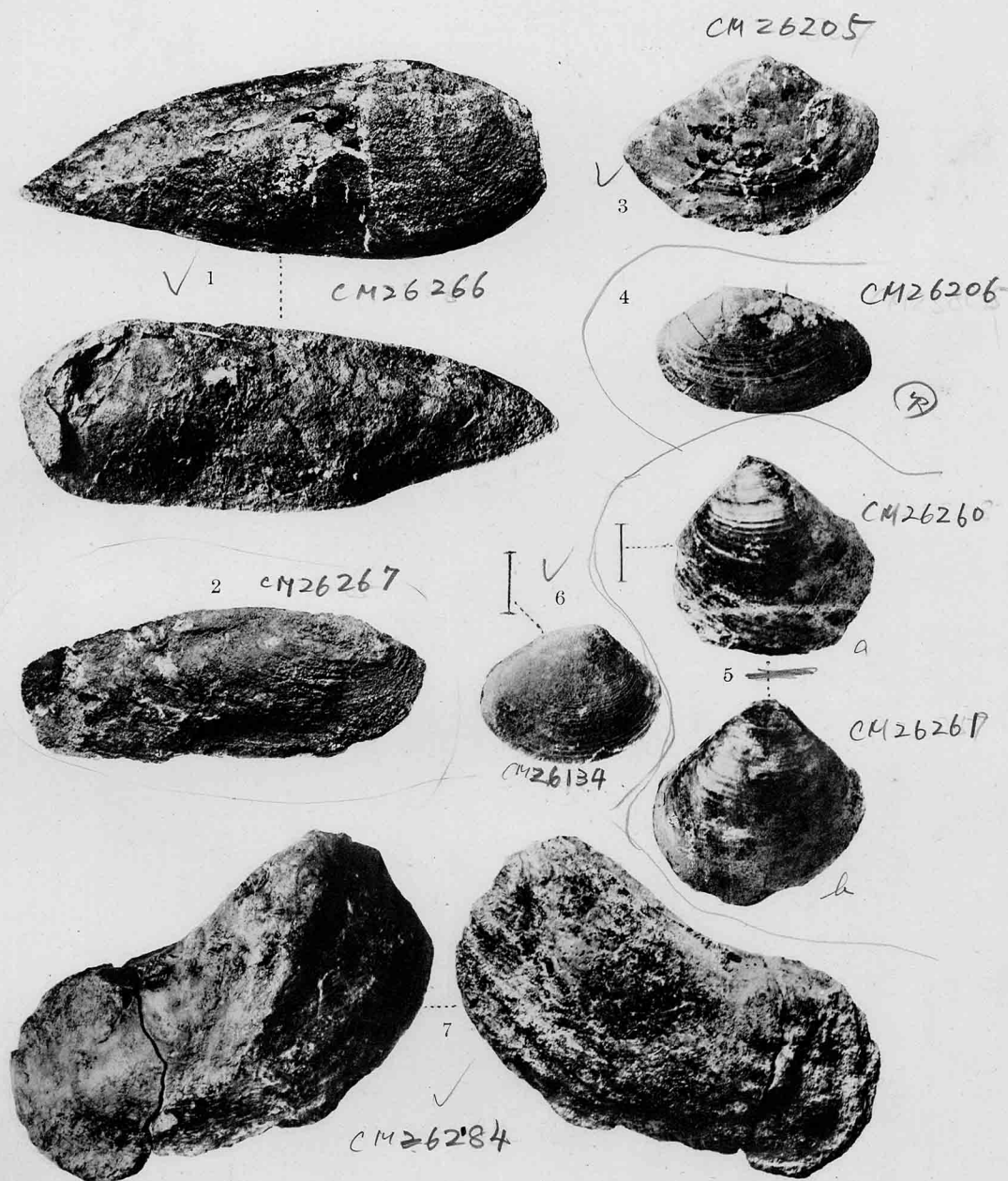
Fig. 5. *Yoldia breviscapa* n. sp. Lower Tachibets Beds. Showagawa. P. 245



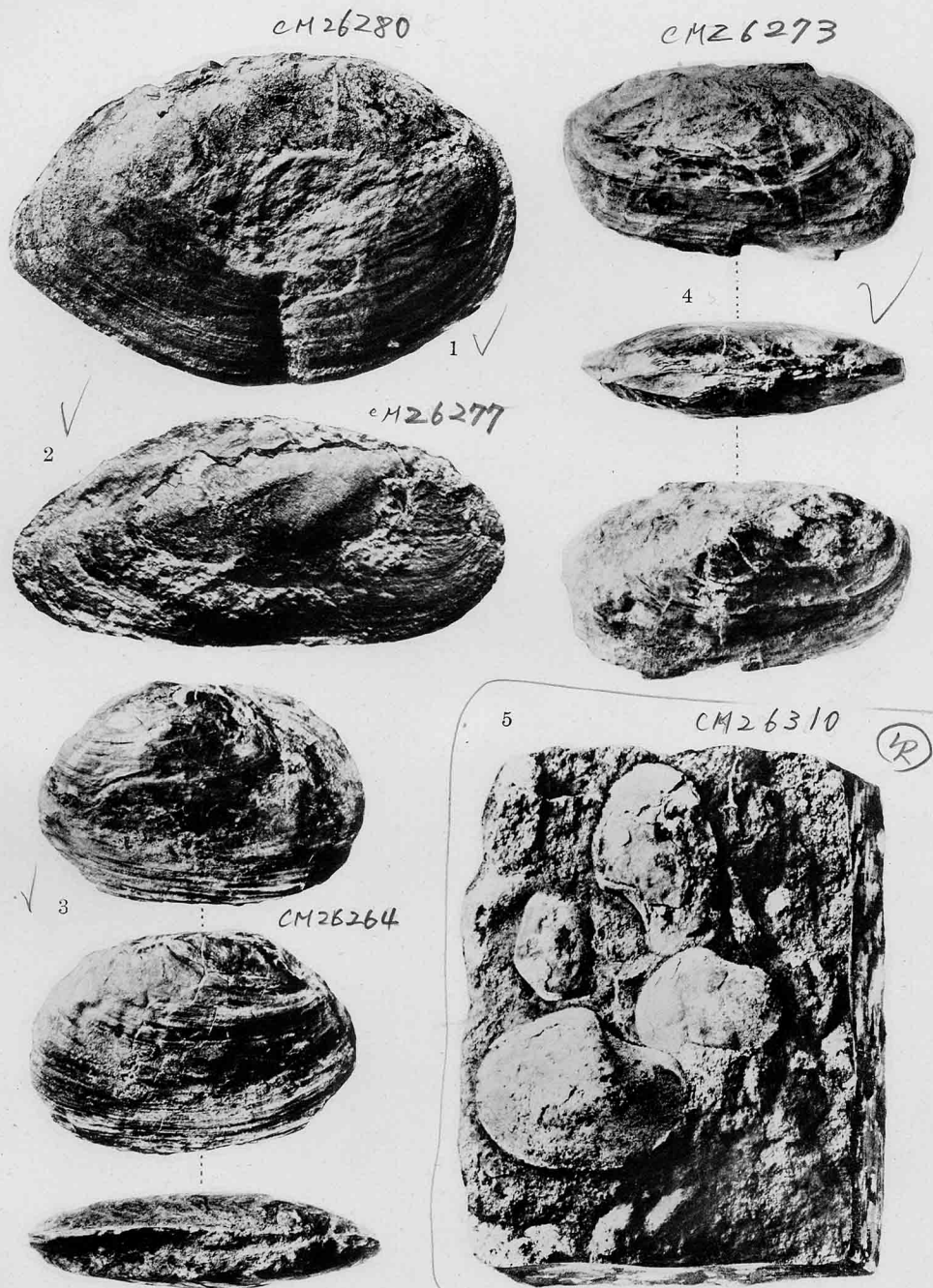
1. *Perissolax lymani* n. sp. 2, 3. *Thiara fiscina* n. sp.
 4-7. *Cerithidea islikariensis* n. sp. 8-10. *Viviparus uryuensis* n. sp.
 11. *Calliostoma subunicum* n. sp.



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|--|------------------------------------|
| 1. <i>Coralliophila tokudai</i> n. sp. | 2-4. <i>Circe tokudai</i> n. sp. |
| 5. <i>Martesia pulchella</i> n. sp. | 6. <i>Corbula pumpellyi</i> n. sp. |
| 7. <i>Cyclina</i> ? <i>shirokiana</i> n. sp. | 8, 9. <i>Venus okadana</i> n. sp. |
| 10. <i>Cardita mandaica</i> Yok. | |



- 1, 2. *Nodularia pisciformis* n. sp. 3, 4. *Paphia munroei* n. sp.
 5. *Cyrena verecunda* n. sp. 6. *Venus? sannosawensis* n. sp.
 7. *Pholadomya* sp.



1. *Anodonta suavis* n. sp.
2. *Margaritana perdahurica* n. sp.
3. *Nodularia subjapanensis* n. sp.
4. *Nodularia* cf. *biwae* Kob.
5. *Yoldia breviscapa* n. sp.