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Tertiary Mollusca from Southern Tôtômi

By

Matajiro YOKOYAMA, *Rigakuhakushi*

With 4 Plates

General Remarks

In the year 1923, I described some Pliocene shells from Dainichi[1] Southern Tôtômi, which I had collected more than fifteen years before. Subsequently Mr. Makiyama, Assistant Professor of Geology in the Imperial University of Kyoto, studied the geology of the Tertiary Formation of the neighbourhood of Kakegawa, a town about eleven kilometres south-south-east of Dainichi. In his conclusive results, which were published in a Japanese journal of geography called Chikyu,[2] he not only divides the formation into series and beds, but also mentions some of the fossils contained in it. Meanwhile, Mr. Y. Chitani of the Imperial Geological Survey was making geological investigations for the Survey's sheet maps of Sagara and Shizuoka, which not only include the region studied by Makiyama, but also the eastern portion of the coast-region of Southern Tôtômi. During this investigation fossils were collected at several places and from several beds, and afterward sent to me for examination. On a cursory inspection of these fossils, however, I saw that from some layers there were too few of them to make it possible to form an adequate idea of their general faunistic character. Therefore, early this spring, I requested Dr. Ozawa of the Imperial University of Tokyo who was then on his way to Nagato for researches

1) Tertiary Mollusca from Dainichi in Tôtômi. Jour. Sci. Coll. Imp. Univ. Tokyo, Vol. XIV, Art. 2.

2) Classification of the Tertiary Layers of the Environs of Kakegawa, Tôtômi. Chikyu, Vol. III, No. 6, 1925.

of his own to stop off, if possible, for a few days in Southern Tōtōmi in order to make collections from necessary layers. This request was kindly granted, and Dr. Ozawa not only brought back the necessary fossils, but also those of Dainichi and other places, so that the number of species was greatly increased, enabling me to form a much better idea of the faunae of the several layers than had before been possible.

The *Cainozoic Formation* which constitutes the entire hilly regions of Southern Tôtômi, Mr. Chitani classifies as follows :

I. Quaternary Formation

Mainly composed of gravel with layers of sand and clay between, in which latter at Furuya[1] living shells such as *Potamides fluviatilis* P. et M., *Potamides multiformis* Lke., *Ostrea gigas* Th., *Arca granosa* L., etc. as well as semi-fossilized wood are found. Chitani takes these layers for *Pleistocene*, and he is probably correct.

II. Tertiary Formation

1. *Ogasayama*[2] *Conglomerate.* Essentially made up of conglomerate, although occasionally intercalating sandstone, sandy shale, or even thin layers of tuffite. Fossils absent.

2. *Hijikata*[3] *Beds.* Mainly composed of sandy shale, which sometimes contains thin beds of sandstone and sometimes even passes into it. At Shimomata, however, a thin tuffite is intercalated. Fossils present.

3. *Satsuka*[4] *Beds.* Consisting either of sandstone, sandy shale and tufaceous shale, or of alternating layers of sandstone and shale. Fossils present. Those of Dainichi already described by me belong here.

4. *Iozumi*[5] *Tuffites.* Pumiceous tuffite either fine- or coarse-grained; when fine-grained, usually banded (showing colour-bands). Fossils absent.

5. *Uchida*[6] *Beds.* Consisting either of sandstone alone, or of alternating layers of sandstone and shale, the shale being often sandy. Fossils present.

6. *Hotta*[7] *Tuffites.* Similar to the Iozumi Tuffites (No. 4). Fossils absent.

7. *Horinouchi-Tamari*[8] *Beds.* Consisting in the upper part of

1) 小笠郡川野村古谷. 2) 小笠山. 3) 土方. 4) 佐束. 5) 五百濟. 6) 內田.
7) 堀田 8) 堀ノ內ー湍水.

sandstone with subordinate layers of shale, and in the lower part either of alternations of sandstone, shale and conglomerate, or of sandstone and sandy shale, or of sandy shale (the so-called Tamari Beds). Fossils present.

8. *Hagima*[1] *Conglomerate.* Essentially made up of conglomerate which, however, intercalates sandstone and shale, and south of Hagima even passes gradually into sandstone. Fossils absent.

9. *Sagara*[2] *Beds.* Composed of various layers such as alternations of sandstone and shale, sandy shale and black shale, rarely intercalating layers of conglomerate or of tuffite. Petroliferous. Fossils present.

10. *Ōigawa*[3] *Beds.* Consisting of shale, siliceous shale, sandstone, tufaceous sandstone, conglomerate, etc. In the upper part a limestone is intercalated, yielding at Mekami certain fossils such as *calcareous algae, corals, foraminifers, mollusks*, etc.

According to Mr. Chitani, a line of unconformability is found not only between the Quaternary and the Tertiary, but also between the Ogasayama Conglomerate and the Hijikata Beds as well as between the Sagara and Ōigawa Beds, and very probably also between the Hagima Conglomerate and the Sagara Beds.

The number of fossil species obtained from the various layers above enumerated together with those of Dainichi described by me three years ago amounts to one hundred twenty-two, which are given in the following table :

Gastropoda.	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
Fam. Actaeonidae.						
1. Solidula strigosa (Gld.).				+		Upper Musashino-Recent.
Fam. Scaphandridae.						
2. Cylichna musashiensis Tok.				+		Lower Musashino-Recent.
Fam. Ringiculidae.						
3. Ringicula musashinoensis Yok.				+		Lower Musashino-Recent.
Fam. Terebridae.						
4. Terebra lischkeana Dkr.				+		Lower Musashino-Recent.
5. Terebra recticostata Yok.				+		Lower Musashino.
6. Terebra smithi Yok.				+		Lower Musashino-Recent.
7. Terebra triseriata Gray.				+		Recent.
8. Terebra tsuboiana Yok.				+		Upper Musashino-Recent.

1) 荻間. 2) 相良. 3) 大井川.

	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
9. Terebra cf. subtextilis Sm.				+		Recent.
10. Terebra asukensis n. sp.				+		
11. Terebra dainichiana n. sp.				+		
12. Terebra ozawai n. sp.				+		
Fam. Conidae.						
13. Conus sp.	+					
Fam. Pleurotomidae.						
14. Pleurotoma vertebrata Sm.				+		Upper Musashino-Recent.
15. Pleurotoma subdeclivis n. sp.	+		+			
16. Pleurotoma shimomatana n. sp.					+	
17. Genotia luedorfi (Lke.).				+		Pliocene-Recent.
18. Drillia pseudo-principalis Pils.				+		Musashinos.
19. Drillia quantoana Yok.				+		Lower Musashino.
20. Drillia braunsi Yok.		+		+		Lower Musashino.
21. Drillia sobrina Yok.				+		
22. Drillia dainichiensis Yok.				+		
23. Drillia asukana n. sp.				+		
24. Drillia sp.				+		
25. Mangilia fukuchiana Yok.				+		Upper Musashino-Recent.
Fam. Cancellariidae.						
26. Cancellaria spengleriana Desh.		+		+		Lower Musashino-Recent.
27. Cancellaria nodulifera Sow.				+		Upper Musashino-Recent.
28. Cancellaria bocageana Cr.et Deb.				+		Recent.
29. Cancellaria asperella Lam. var. reeviana Cr.				+		Upper Musashino-Recent.
Fam. Olividae.						
30. Oliva irisans Lam.				+		Recent.
31. Olivella fortunei Ad.				+		Pliocene-Recent.
32. Olivella spretoides Yok.				+		Upper Musashino.
33. Ancilla rubiginosa (Swain.).				+		Recent.
34. Ancilla okawai Yok.		+		+		
35. Ancilla suavis n. sp.					+	
Fam. Volutidae.						
36. Voluta megaspira Sow.				+	+	Miocene? Pliocene-Recent.
37. Voluta hirugayensis n. sp.	+					
Fam. Mitridae.						
38. Mitra pristina Yok.				+		
Fam. Fasciolariidae.						
39. Fusus perplexus Ad.			+			Upper Pliocene-Recent.

	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
40. Fusus niponicus Sm.					+	Upper Musashino-Recent.
41. Hemifusus ternatanus (Gm.).				+		Upper Musashino-Recent.
Fam. Buccinidae.						
42. Siphonalia cassidaraeformis (Rve.).		+	+	+		Pliocene, Upper Musashino-Recent.
43. Siphonalia declivis n. sp.				+		
44. Nassaria magnifica Lke.					+	Recent.
45. Eburna elata Yok.				+		
Fam. Nassidae.						
46. Bullia (Adenus ?) chitanii n. sp.				+		
47. Nassa (Hima) japonica Ad.				+		Pliocene-Recent.
48. Nassa (Hima) demissa Yok.				+		
49. Nassa (Niotha) congrua n. sp.				+		
Fam. Columbellidae.						
50. Columbella (Atilia) smithi Yok.				+		Upper Musashino-Recent.
51. Columbella (Mitrella) dunkeri Try.				+		Lower Musashino-Recent.
Fam. Muricidae.						
52. Murex spinicosta Bronn.				+		Miocene of Europe.
53. Murex (Phyllonotus) bullocki Yok.				+		Pliocene.
54. Urosalpinx birileffi Lke.	+					Pliocene-Recent.
55. Rapana bezoar L. var. thomasiana Cr.				+		Upper Musashino-Recent.
56. Purpura alveolata Rve.				+		Lower Musashino-Recent.
Fam. Tritonidae.						
57. Triton tenuiliratus Lke.				+		Upper Musashino-Recent.
58. Priene oregonensis (Redf.).				+		Pliocene-Recent.
Fam. Cassididae.						
59. Galeodea (Sconsia) japonica Yok.				+		Pliocene.
Fam. Doliidae.						
60. Melongena miranda n. sp.	+			+		
Fam. Cerithiidae.						
61. Bittium misellissimum n. sp.				+		
Fam. Turritellidae.						
62. Turritella perterebra Yok.				+		
63. Turritella kiiensis Yok.		+		+		Pliocene.
Fam. Solariidae.						
64. Solarium (Philippia) cingulum Kien.				+		Upper Musashino-Recent.

	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
Fam. Naticidae.						
65. Natica janthostoma Desh.		+		+		Miocene-Recent.
66. Polinices (Neverita) ampla(Phil.)		+	+	+		Pliocene-Recent.
67. Sigaretus (Eunaticina) papilla Gm.				+		Pliocene-Recent.
Fam. Eulimidae.						
68. Eulima (Leiostraca) hosoyama n. sp.					+	
Fam. Pyramidellidae.						
69. Pyramidella (Actaeopyramis) eximia (Lke.).				+		Upper Musashino-Recent.
70. Odostomia (Miralda ?) clandestina n. sp.				+		
Fam. Trochidae.						
71. Calliostoma unicum (Dkr.).				+		Recent.
72. Umbonium suchiense Yok.		+		+		
73. Umbonium mysticum Yok.		+	+	+		
Scaphopoda.						
Fam. Dentaliidae.						
74. Dentalium weinkauffi Dkr.		+	+	+		Pliocene-Recent.
75. Dentalium octogonum Lam.					+	Lower Musashino-Recent.
Lamellibranchiata.						
Fam. Saxicavidae.						
76. Panope generosa (Gld.).				+		Pliocene-Recent.
Fam. Corbulidae.						
77. Corbula erythrodon Lam.				+		Recent.
Fam. Mactridae.						
78. Mactra crossei Dkr.				+		Recent.
79. Mactra spectabilis Lke.		+				Pliocene-Recent.
80. Raeta yokohamensis Pils.				+		Upper Musashino-Recent.
Fam. Solenidae.						
81. Solen krusensternii Schr.				+		Pliocene-Recent.
Fam. Tellinidae.						
82. Tellina sp.			+			
83. Macoma praetexta (Mart.).				+		Miocene-Recent.
Fam. Veneridae.						
84. Dosinia troscheli Lke.				+		Pliocene-Recent.
85. Dosinia sp.		+				
86. Meretrix iizukai Yok.	+					Pliocene.

	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
87. Meretrix ôyüana n. sp.				+		
88. Meretrix (Callista) chinensis (Chem.).	+	+	+	+		Miocene-Recent.
89. Clementia speciosa Yok.		+		+		Pliocene.
90. Venus (Mercenaria) stimpsoni Gld.			+			Pliocene-Recent.
91. Venus ozawai n. sp.	+		+			
92. Chione isabellina (Phil.).		+	+	+		Lower Musashino-Recent.
93. Chione casinaeformis n. sp.	+	?				Recent.
94. Chione chitaniana n. sp.		+				
95. Tapes euglyptus Phil.		+		+		Upper Musashino-Recent.
Fam. Cardiidae.						
96. Cardium muticum Rve.		+				Pliocene-Recent.
97. Cardium nuttalii Cour.				+		Miocene-Recent (Alaska, British Columbia.)
98. Cardium ? egregium n. sp.	+					
Fam. Diplodontidae.						
99. Diplodonta japonica Pils.				+		Lower Musashino-Recent.
Fam. Lucinidae.						
100. Lucina (Phacoides) borealis(L.).		+				Miocene-Recent.
Fam. Carditidae.						
101. Cardita panda, n. sp.	+	+		+		
Fam. Crassatellidae.						
102. Crassatella pauxilla Yok.	+					Pliocene.
103. Crassatella heteroglypta Pils.				+		Lower Musashino-Recent.
104. Crassatella uchidana n. sp.			+			
Fam. Pectinidae.						
105. Pecten praesignis Yok.	+	+	+	+		
106. Pecten clancularius n. sp.					+	
Fam. Ostreidae.						
107. Ostrea gigas Thunb.					+	Pliocene-Recent.
108. Ostrea cucullata Born.				+		Pleistocene-Recent.
109. Ostrea sp.				+		
110. Ostrea sp.	+					
Fam. Pinnidae.						
111. Pinna japonica Houl.				+		Pliocene-Recent.
Fam. Arcidae.						
112. Arca (Anomalocardia) inflata Rve.		+	+	+		Lower Musashino-Recent.
113. Pectunculus vestitus Dkr.	+	+	+	+		Miocene-Recent.
114. Pectunculus albolineatus Lke.				+		Lower Musashino-Recent.

	Sagara	Horinouchi	Uchida	Satsuka	Hijikata	Geological Occurrence
115. Pectunculus nipponicus Yok.	+	+	+	+		Upper Musashino.
Fam. Parallelodontidae.						
116. Cucullaea concamerata Mart.				+		Recent.
Fam. Limopsidae.						
117. Limopsis crenata Ad.		+	+	+	+	Lower Musashino-Recent.
118. Limopsis chitaniana n. sp.				+		
Fam. Ledidae.						
119. Leda confusa Hanl.		+		+		Pliocene-Recent.
Fam. Nuculidae.						
120. Nucula mirabilis Ad. et Rve.		+	+			Pliocene-Recent.
121. Nucula insignis Ad.				+		Miocene-Recent.
Fam. Solemyidae.						
122. Solemya sp.		+				

I. Hijikata Beds[1)]

The uppermost fossiliferous layers of the Tertiary Formation to which the name of Hijikata Beds was given yielded the following ten species:

1. Pleurotoma shimomatana Yok., n. sp.
2. Ancilla suavis Yok., n. sp.
3. Voluta megaspira Sow.
4. Fusus niponicus Sm.
5. Nassaria magnifica Lke.
6. Eulima hosoyana Yok., n. sp.
7. Dentalium octogonum Lam.
8. Pecten clancularius Yok,, n. sp.
9. Ostrea gigas Thunb.
10. Limopsis crenata A. Ad.

Of these ten species, four (*Pleurotoma shimomatana, Ancilla suavis, Eulima hosoyana* and *Pecten clancularius*) are *new*, and at present it is not certain whether they are living or not; while the remaining six are all found living in our seas, and excepting one (*Nassaria magnifica*) also fossil, four are in the *Pliocene* and one in the *Upper Musashino*. But

1) Fossil localities: Shimomata (下俣), Hosoya (細谷), Tombé (富部), Nakagawara (中川原)

even were the first four really extinct, it would be out of the question to compute their percentage to the whole number, because this whole number is so small that the presence of comparatively many extinct forms may be purely accidental. It is highly probable that the Beds, when judged from their stratigraphical position below a thick conglomerate (the Ogasayama Conglomerate), correspond in their geological horizon to the *Clay Beds* of Kunôsan, a hill situated more to the east in the province of Suruga. They too are overlaid by a thick conglomerate and according to my own observation, entomb fossils of the *Lower Musashino Formation* of the district south of Tokyo. This formation, as stated in my study on its fossils, is undoubtedly *Upper Pliocene.*

II. Satsuka Beds[1]

The fossiliferous beds lying next below are those of Satsuka, which have afforded the greatest number of fossil species, in comparison with the others. They amount to ninety-three, consisting of the following elements :

1. Number of species hitherto found only living 8
2. Number of species hitherto found only fossil 35
3. Number of species hitherto found living as well as fossil 48
4. Number of species not specifically determined . . . . 2.

Of the thirty-five exclusively fossil forms, one is *Miocene*, seven are *Pliocene* (including Lower Musashino), two *Upper Musashino* (including Pleistocene), one *Lower* and *Upper Musashino*, and twenty-three entirely *new*, while one falls between *Miocene* and *Upper Musashino*. Of the forty-eight species, living as well as fossil, six go up to the *Miocene*, twenty-six to the *Pliocene*, and sixteen to the *Upper Musashino*. From this we see that the *Satsuka Beds* are also *Pliocene*.

As to the percentage of extinct forms, the total number of the species obtained being tolerably large, I believe this can be stated fairly accurately. The species regarded as extinct being thirty-four in number, they represent 37 % of the whole fauna, though this percentage is liable to be more or less reduced in future, as some of the forms now considered to be extinct will doubtless turn out to be living. Therefore, if we take the extinct forms as amounting to about 33 % of the whole, I believe we shall be not far from the truth.

From these considerations, it is very likely that the Satsuka Beds, if not Lower Pliocene, are at latest not younger than Middle Pliocene.

1) Fossil localities: Asuka (飛鳥), Dainichi (大日), Kamiyashiki (上屋敷), Taruki (垂木), Yanokuchi (谷ノ口).

III. Uchida Beds[1]

The species obtained from these beds are as follows:

1. Pleurotoma declivis Yok., n. sp.
2. Fusus perplexus Ad.
3. Siphonalia cassidaraeformis Rve.
4. Polinices ampla (Phil.).
5. Umbonium mysticum Yok.
6. Dentalium weinkauffii Dkr.
7. Tellina sp.
8. Meretrix (Callista) chinensis (Chem.).
9. Venus (Mercenaria) stimpsoni Gld.
10. Venus ozawai Yok., n. sp.
11. Chione isabellina (Phil.).
12. Crassatella uchidana Yok., n. sp.
13. Pecten praesignis Yok.
14. Arca inflata Rve.
15. Pectunculus vestitus Dkr.
16. Pectunculus nipponicus Yok.
17. Limopsis crenata Ad.
18. Nucula mirabilis Ad. et Rve.

Of the seventeen specifically determined species, eleven are found also in the Satsuka Beds, two in the Pliocene of other parts of Japan, one also in the Upper Musashino and two in the lower-lying Sagara Beds, while one is new. From these facts we can infer that, in spite of the intermingling of a few older elements, the whole fauna has a close relationship to that of the overlying beds, and is also *Pliocene* in age.

The number of extinct forms is six, which gives a percentage not very different from that of Satsuka; but it is useless to compute it, as the whole number of species obtained is too small for such a purpose.

IV. Horinouchi Beds[2]

The Beds yielded the following twenty-nine species:

1. Drillia braunsi Yok.

1) Fossil localities: Mitare (水垂), Hatsumma (初馬), Nito (仁藤), Yokota (横田).

2) I call these simply the Horinouchi Beds, and not Horinouchi-Tamari as Chitani does, because it seems superfluous to apply a combination of two geographical names to the same beds.

Fossil localities: Honjo (本庄), Senba (千羽), Kumomyo (公文名), Isbigami (石上), Tomoda (友田).

2. Cancellaria spengleriana Desh.
3. Ancilla okawai Yok.
4. Siphonalia cassidaraeformis (Rve.).
5. Turritella kiiensis Yok.
6. Natica janthostoma Desh.
7. Polinices ampla (Phil.).
8. Umbonium suchiense Yok.
9. Umbonium mysticum Yok.
10. Dentalium weinkauffii Dkr.
11. Mactra spectabilis Lke.
12. Dosinia sp.
13. Meretrix (Callista) chinensis (Chem.).
14. Clementia speciosa Yok.
15. Chione isabellina (Phil.).
16. Chione casinaeformis Yok., n. sp. (?)
17. Chione chitaniana Yok., n. sp.
18. Tapes euglyptus Phil.
19. Cardium muticum Rve.
20. Lucina (Phacoides) borealis (L.).
21. Cardita panda Yok., n. sp.
22. Pecten praesignis Yok.
23. Arca inflata Rve.
24. Pectunculus vestitus Dkr.
25. Pectunculus nipponicus Yok.
26. Limopsis crenata Ad.
27. Leda confusa Haul.
28. Nucula mirabilis Ad. et Rve.
29. Solemya sp.

Leaving out from the above enumerated twenty-nine species three which are not well determined, there remain twenty-six of which seventeen are those found in the *younger beds*, that is to say, either in *Uchida*, or in *Satsuka* or in *both*, four in the *younger* as well as in the *older* (*Sagara*) *beds*, three in the *Pliocene* and one in the *Miocene* and *Pliocene* of the other parts of Japan, while one is *new*. From this it is quite evident that the Horinouchi fossils are in general closely related to those of Uchida and Satsuka, and are decidedly *Pliocene* in age. Of the whole fauna the extinct forms constitute about 40 % which may not be far from the truth, although the whole number is too small to give a trustworthy result.

V. Sagara Beds

The lowest beds from which fossils were obtained are those of Sagara which yielded only sixteen, as shown below:

1. Conus sp.
2. Pleurotoma subdeclivis Yok., n. sp.
3. Voluta hirugayensis Yok., n. sp.
4. Urosalpinx birileffi Lke.
5. Melongena miranda Yok., n. sp.
6. Meretrix iizukai Yok.
7. Meretrix (Callista) chinensis (Chem.).
8. Venus ozawai Yok., n. sp.
9. Chione casinaeformis Yok., n. sp.
10. Cardium (?) egregium Yok., n. sp.
11. Cardita panda Yok., n. sp.
12. Crassatella pauxilla Yok.
13. Pecten praesignis Yok.
14. Ostrea sp.
15. Pectunculus vestitus Dkr,
16. Pectunculus nipponicus Yok.

If we leave out of consideration *Conus* and *Ostrea* which are not specifically determined, ten of the remaining fourteen belong to forms hitherto known only in a fossil state. Of these ten, six occur in one or more of the *overlying beds*, two in the *Pliocene* of other parts of Japan, and two are quite *new*. Of these new forms, *Cardium egregium* is a shell which, so far as my own knowledge is concerned, seems to be of a type quite new, at least in Japanese fossil conchology. Of the four living species, *Urosalpinx birileffi* has already been reported from the *Pliocene* of Kii, *Meretrix chinensis* and *Pectunculus vestitus* from the *Miocene* and *Pliocene* of some parts of Japan as well as from the overlying *younger beds*, while *Chione casinaeformis* seems to be found also in the *Horinouchi Beds*, although this can not be asserted with certainty, as the specimen found in the latter is too imperfect for a strict comparison.

As a whole, the combination of species constituting the fauna, in spite of their being few in number, is such as to bestow on it a character somewhat different from that of the overlying beds, and very probably we have here to deal with a group of fossils which belong to a different geological age, viz., the *Miocene*, inasmuch as the beds which are immediately below, i.e. the *Ōigawa*, are generally considered to be

Miocene.[1] Consequently, Mr. Chitani's assumption that the line of demarcation between *Pliocene* and *Miocene* lies between the *Hagima Conglomerate* and the *Sagara Beds* is most probably correct.

Description of the Species

GASTROPODA

RCM 23313

Family Actaeonidae

1. Solidula strigosa, (GOULD)

Solidula strigosa. Yokoyama, Foss. Up. Musashino. Kazusa a. Shimosa, p. 22, pl. I, fig. 1.

Solidula clathrata. Yokoyama, Foss. Up. Musash., p. 23, pl. I. fig. 2.

In my work on the fossils of the Upper Musashino above cited, I created a new species under the name of *Solidula clathrata* and described it as distinct from *Solidula strigosa* Gould on the ground that the spiral sulci are latticed and not punctured as in the latter. However, subsequent investigations convinced me that what produces the latticed structure in the larger specimens gives the punctured appearance to the smaller ones. And other distinctions which I then mentioned being of minor importance, I take this opportunity of uniting the two species.

Only a single fragmentary specimen.

Fossil occurrence.—*Satsuka Beds*: Dainichi. Upper Musashino.

Living.—Central, Western and Southern Japan.

Family Scaphandridae

RCM 23314

2. Cylichna musashiensis, TOKUNAGA

Cylichna musashiensis. Yokoyama, Foss. Miura Penin., p. 27, pl. I, fig. 4. Foss. Up. Musash., p. 27, pl. I, fig 10. Tert. Moll. Dainichi, p. 4. Foss. Shells Sado, p. 259.

Fossil occurrence.—*Satsuka Beds*: Dainichi, Musashinos.

Living.—Central Japan.

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1) Nishiwada: Some Organic Remains from the Tertiary Limestone near Sagara, Tōtōmi. Jour. Coll. Sci., Vol. VII, 1895.

(2) CM23315
(3) CM23316

Family Ringiculidae

3. Ringicula musashinoensis, Yokoyama

Ringicula musashinoensis. Yokoyama, Foss. Miura Penin., p. 30, pl. I, figs. 3, 8. Foss. Up. Musash., p. 30, pl. I, figs. 16, 17.

Several specimens with spiral lines on the surface.

Fossil occurrence.—*Satsuka Beds:* Asuka; Dainichi. Musashinos.

Living.—Central Japan.

Family Terebridae

(R) CM23317

4. Terebra lischkeana, Dunker

Terebra lischkeana. Yokoyama, Foss. Miura Penin., p. 31, pl. I, fig. 10. Foss. Up. Musash., p. 80. Tert. Moll. Dainichi, p. 4.

A few examples.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Musashinos.

Living.—Central and Western Japan.

(R) CM23318

5. Terebra recticostata, Yokoyama

Terebra recticostata. Yokoyoma, Foss. Miura, Penin., p. 32, pl, I, fig. 11. Foss. Up. Musash., p. 32.

Only one fragment.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Musashinos.

R CM23319

6. Terebra smithi, Yokoyama

Terebra smithi. Yokoyama, Foss. Up. Musashino, p. 33, I. fig. 21.

Quite numerous.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central Japan.

R CM23320
R CM23321

7. Terebra triseriata, Gray

Pl. XXXVIII. Fig. 1.

Terebra triseriata. Dunker, Index Moll. Mar. Jap., p. 72, pl. V, figs. 19, 20.

Two fragmentary specimens which, however, are readily recognized by the peculiar sculpture of the surface.

Fossil occurrence.—*Satsuka Beds:* Asuka.

Living.—Central and Western Japan.

CM 23322
CM 23323

8. Terebra tsuboiana, Yokoyama

Terebra tsuboiana. Yokoyama, Foss. Up. Musash., p. 35, pl. XIII, figs. 12, 13. Tert. Moll. Dainichi, p. 4.

The specimens obtained at Asuka differ from those of the recent seas as well as of the Musashino Formation in the tubercular nature of the longitudinal folds being much less distinct. Rather rare.

Fossil occurrence.—*Satsuka Beds:* Asuka; Dainichi. Upper Musashino.

Living.—Central Japan.

9. Terebra cfr. subtextilis, Smith

CM 23324

Pl. XXXVIII. Fig. 2.

A single specimen of a subulate shell which lacks the apical portion, the whorls intact being six. It is ornamented with longitudinal plicae, about nineteen on the last whorl, roof-like, somewhat curved and oblique, divided into two unequal parts by a spiral groove running at a distance equal to about one-third of the whorl from the upper suture. The periphery is rounded with the base abruptly narrowed.

This shell closely resembles *Terebra subtextilis* Smith (Proc. Zool. Soc., 1879, p. 185, pl. 19, fig. 3) living in the Japanese waters. But the spiral striae which are present in the latter are lacking. This may possibly be due to our only specimen being greatly worn.

Fossil occurrence.—*Satsuka Beds:* Asuka.

Living.—Smith's species is found in Central and Western Japan.

10. Terebra asukensis, n. sp.

CM 23325

Pl. XXXVIII. Fig. 3.

A single specimen with the upper part of the spire broken, the remaining whorls being six in number.

The shell is quite subulate with whorls flat and longitudinally plicate. The plicae are numerous, about twenty on the penultimate whorl and a few more on the ultimate, rounded or bluntly roof-shaped, narrower than interspaces, more or less sinuous, interrupted in the middle by a broad smooth field taking up about one-third of the whorl, although the continuity is still shown by faint lines crossing the field. The plicae lying above the smooth field have their upper ends more forward than their lower, while those lying below are reversed in position. Moreover, the ends bordering the field both above and below

are more or less swollen. Periphery rounded with a fine spiral thread on it, the longitudinal plicae terminating at this thread. Base rather gradually narrowed with three spiral threads on it approximately equal in size to the peripheral one. The distance of the uppermost from the latter is wide, and is equal to that of the midde from the upper, while the lowest is close to the middle one. All the threads including that of the periphery on crossing the growth-lines become delicately tubercular. Near the caudal end of the base, there is a sharp spiral ridge. Canal narrow, somewhat bent sideways. The outer lip is broken. The height, if perfect, would be about 40 millim. Diameter 6.7 millim.

Fossil occurrence.—*Satsuka Beds:* Asuka.

CM23326-4
CM23327-5
CM23328

11. **Terebra dainichiana,** n. sp.

Pl. XXXVIII. Figs. 4, 5.

CM24754
CM24755
CM24756
CM24757

Shell subulate, many-whorled; whorls almost flat and longitudinally finely plicate. Plicae varying in number, sixteen to twenty-four on the body-whorl, usually straight and vertical, though sometimes slightly swollen. Periphery rounded. Base rather abruptly narrowed, smooth save for a spiral ridge near the caudal end. Aperture subrhomboidal. Outer lip thin. Canal short, bent.

Specimens are not rare; but the spire invariably has its upper part broken. The largest specimen has diameter of 4 millim. The height, if perfect, would be a little over 20 millim.

This species resembles *Terebra gotoensis* Smith (Yokoyama, Foss. Up. Musash., p. 31, pl. I, fig. 18) as well as *Terebra awajiensis* Pilsbry (New Jap. Mar. Moll., Gastr., p. 4, pl. I, fig. 3) without exactly agreeing with them.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

CM23329-9
RCM23330

12. **Terebra ozawai,** n. sp.

Pl. XXXVIII. Fig. 9.

Shell small, subulate. Whorls about ten, flat, longitudinally finely plicate. Plicae about twenty-two on the last whorl, roof-like in shape, though blunt on top, interrupted by a shallow spiral groove running a little above the middle of the whorl, the part above the groove being somewhat more forward in position than the part below which is, however, connected with the part above by a low ridge and curved, with the concave side directed to the front. Periphery rounded and

furnished with a spiral cord at which the longitudinal plicae terminate. Base rapidly narrowed, convex, with three distant spiral cords similar to that of the periphery and a sharp spiral ridge near the caudal end. Aperture rhombic. Canal short, bent sideways.

Two examples, one of which is imperfect. The perfect one measures 12 millim. in height and 3.2 millim. in diameter.

Fossil occurrence.—*Satsuka Beds :* Dainichi.

Family Conidae

13. Conus sp.

An indeterminable fragment somewhat resembling *Conus sieboldi* Reeve (Yokoyama, Foss. Miura Penin., pl. I, fig. 14) in shape.

Fossil occurrence.—*Sagara Beds :* Ōsawa.

Family Pleurotomidae

14. Pleurotoma vertebrata, Smith

Pleurotoma vertebrata. Yokoyama, Foss. Up. Musash., p. 37, pl. I, fig. 26.

Many immature individuals.

Fossil occurrence.—*Satsuka Beds :* Dainichi. Upper Musashino.

Living.—Central and Western Japan.

15. Pleurotoma subdeclivis, n. sp.

Pl. XXXVIII. Fig. 8.

Shell fusiform, with spire somewhat shorter than body-whorl. Whorls about nine, carinate a little above the suture, generally smooth. Carina very prominent though not quite sharp, with surface above somewhat excavated, steeply sloping, below flat and receding. Base abruptly narrowed and smooth. Aperture subtriangular, the inner lip forming the base of the triangle. Outer lip thin. Sinus deep, v-shaped, with bottom blunt, occupying the sloping shelf of the whorl. Canal long, rather straight.

This shell is closely akin to *Pleurotoma declivis* Mart. (Conchol. Mittheil., p. 39, pl. IX, fig. 2) of Northern Japan, but is distinguished by the absence of spiral sculpture on the base as well as its more abruptly narrowed character.

Two examples, one of which has the body-whorl broken. The other is nearly perfect, only lacking the apex and the lower end of the canal. It is 11 millim. in diameter. The height, if perfect, would be about 27 millim.

Fossil occurrence.—*Sagara Beds*: Hirugaya. *Uchida Beds*: Mitaré.

CM 23335-6
CM 23336-7

16. Pleurotoma shimomatana, n. sp.

Pl. XXXVIII, Figs. 6, 7.

This species is closely related to the preceding in shape, the only essential difference being the tuberculate nature of the angle, the tubercles which are about fifteen on the body whorl continuing down to the lower suture. It is not impossible that is this is only a mutation of the preceding.

Two rather imperfect specimens.

Fossil occurrence.—*Hijikata Beds*: Shimomata.

CM23337

17. Genotia luedorfi, (Lischke)

Genotia luedorfi. Pilsbry, Cat. Mar. Moll. Japan, p. 16.
Pleurotoma luedorfi. Lischke, Jap. Meeresconch., III, p. 23, pl. I, figs. 2-4.
Pleurotoma sp. Yokoyama, Moll. Rem. Upperm. Part. Jô-Ban Coalf., p. 5, pl. I, fig. 8.

A single worn specimen of the body-whorl quite like that of Izura which I described as resembling *Pleurotoma kamakurana* Pils. in the work above cited. But I am now convinced that it undoubtedly belongs to what Lischke figured and described under the name of *Pleurotoma luedorfi*.

Fossil occurrence.—*Satsuka Beds*: Asuka, Shirado Beds of the Jô-Ban Coal field.

Living.—Central Japan.

CM23338

18. Drillia pseudo-principalis, Yokoyama

Drillia pseudo-principalis. Yokoyama, Foss. Miura Penin., p. 37, pl. I, fig. 21. Tert Moll. Dainichi, p. 5.

Frequent.

Fossil occurrence.—*Satsuka Beds*: Dainichi. Musashinos.

19. Drillia quantoana, YOKOYAMA

Drillia quantoana. Yokoyama, Foss. Miura Penin., p. 38, pl. I, fig. 22. Tert. Moll. Dainichi, p. 5.

Several specimens.

Fossil occurrence.—*Satsuka Beds:* Dainichi Lower Musashino.

20. Drillia braunsi, YOKOYAMA

Drillia braunsi. Yokoyama, Foss. Miura Penin., p. 40. pl. I, fig. 25.

Only one specimen from each locality.

Fossil occurrence.—*Horinouchi Beds:* Honjo. *Satsuka Beds:* Dainichi. Lower Musashino.

21. Drillia sobrina, YOKOYAMA

Drillia sobrina. Yokoyama, Tert. Moll. Dainichi, p. 5, pl. I, fig. 1.

Rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

22. Drillia dainichiensis, YOKOYAMA

Drillia dainichiensis. Yokoyama, Tert. Moll. Dainichi, p. 6, pl. I, fig. 2.

Several specimens.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

23. Drillia asukana, n. sp.

Pl. XXXVIII. Fig. 18.

Shell small, fusiform. Whorls about seven, of which one and a half are nuclear, smooth and rounded; postnuclear whorls bluntly angulate a little below the middle, with subsutural rounded cord, the surface above the angle being sunken and provided with a few spiral lirae, below flat, receding and also furnished with one or more spiral lirae. The angle is the place where the old sinus-band is present, on which the periodic ends of the sinus remain as tubercles, fifteen to seventeen in a whorl. Periphery rounded with a spiral cord on it. Base rather abruptly narrowed, with about ten spiral cords which gradually become weaker as they go downward. Aperture rhomboidal. Outer lip thin, with a deep v-shaped sinus, blunt at bottom and somewhat distant from the suture. Canal of a moderate length, slightly bent sideways.

A single example, 9 millim. in length, 3 millim. in diameter, with the body-whorl 5.1 millim. high.

Fossil occurrence.—*Satsuka Beds:* Asuka.

RCM23345

24. Drillia sp.

Pl. XXXVIII. Fig. 22.

A shell closely resembling the preceding, but with the angle sharper, the surface above it being more concave and apparently without any spiral sculpture.

A single imperfect specimen.

Fossil occurrence.—*Horinouchi Beds:* Honjo.

RCM23346

25. Mangilia fukuchiana, Yokoyama

Mangilia fukuchiana. Yokoyama, Foss. Up. Musashino, p. 42, pl. I, fig. 34.

A worn and imperfect specimen, with the base somewhat more gradually narrowed and the aperture narrower than in the form hitherto described.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central Japan.

Family Cancellariidae

RCM23347
RCM23348

26. Cancellaria spengleriana, Deshayes

Cancellaria spengleriana. Yokoyama, Foss. Miura Penin., p. 44, pl. II, figs. 2, 3. Foss. Up. Musash., p. 45.

Only two specimens, one of which is a mere fragment.

Fossil occurrence.—*Horinouchi Beds:* Kumomyô. *Satsuka Beds:* Asuka. Musashinos.

Living.—Central and Western Japan. Philippines. Australia.

RCM23349

27. Cancellaria nodulifera, Sowerby

Cancellaria nodulifera. Yokoyama, Foss. Up. Musash., p. 45, pl. II, fig. 1.

Several examples.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central and Western Japan.

28. Cancellaria bocageana, Crosse et Debeaux

Pl. XXXVIII. Fig. 10.

Cancellaria bocageana. Lischke, Jap. Meeresconch., II, p. 167, III, p. 41, pl. II, fig. 12.

Cancellaria thomasiana. Tryon, Man. Conch., VII, p. 79, pl. VI, figs. 92-94.

Cancellaria crispata. Yokoyama, Tert Moll. Dainichi, p. 7, pl. I, fig. 3.

Not rare.

In my work on the shells of Dainichi, this species was described as *Cancellaria crispata* Sow. But subsequent examination showed it to be *Cancellaria bocageana* Cr. et Deb., still living in our seas. The difference is not great, though the shell of the former is broader, thicker-ribbed with the shoulder-spines more prominent.

Fossil occurrence.—*Satsuka Beds :* Dainichi ; Asuka.

Living.—Central and Western Japan. China.

29. Cancellaria asperella, Lamarck var. reeviana, Crosse

Cancellaria asperella, var. reeviana. Yokoyama, Foss. Up. Musash., p. 46, pl. II, fig. 2.

Only one fragment.

Fossil occurrence.—*Satsuka Beds :* Asuka. Upper Musashino.

Living.—Central and Western Japan. Philippines.

Family Olividae

30. Oliva irisans, Lamarck

Pl. XXXVIII. Fig. 12.

Oliva irisans. Pilsbry, Catalogue, p. 23. Iwakawa, Cat. Jap. Mar. Moll., Nat. Hist. Dep. Tokyo Imp. Mus., p. 148. Tryon, Man. Conch., V, p. 79, pl. 24, figs. 31, 32, 34 and 42,

This is the first time that this beautiful shell has been found fossil in Japan. The specimens are frequent and show no marked difference from the living.

Fossil occurrence.—*Satsuka Beds :* Asuka.

Living.—Western and Southern Japan. Philippines. Indian Ocean.

31. Olivella fortunei, A. Adams

Olivella fortunei. Yokoyama, Foss. Upper Musash., p. 47, pl. II, fig. 3. Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 9. Moll. Tert. Basin Chichibu, p. 115.

Only one example.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocene of Chichibu. Shirado Beds. Upper Musashino.

Living.—Central Japan. China.

32. **Olivella spretoides,** YOKOYAMA

Pl. XXXVIII. Figs. 14, 15.

Olivella spretoides. Yokoyama, Foss. Up. Musash., p. 47, pl. II, fig. 4. Tert. Moll. Dainichi, p. 7.

Specimens are common. Some are comparatively larger than those found in the Upper Musashino. One from Asuka measures 10 millim. in height and 4.2 millim. in diameter, while another measures 9.4 millim. in height and 4.1 in diameter.

Fossil occurrence.—*Satsuka Beds:* Asuka; Dainichi. Upper Musashino.

33. **Ancilla rubiginosa,** (SWAINSON)

Pl. XXXVIII. Fig. 11.

Ancillaria rubiginosa. Tryon, Man. Conch., v, p. 94, pl. 37, fig. 25.

Ancillaria albo-callosa. Lischke, Jap. Meeresconch., III, p. 44, pl. II, figs, 24, 25.

A single example. It differs only a little from what is figured in the Manual of Conchology above cited.

Fossil occurrence.—*Satsuka Beds:* Kamiyashiki, Taruki.

Living.—Central and Western Japan. China. Indian Ocean.

34. **Ancilla okawai,** YOKOYAMA

Ancilla okawai. Yokoyama, Tert. Moll. Dainichi, p. 7, pl. I, figs. 4-7.

Very frequent at Dainichi, though rare at Honjo.

Fossil occurrence.—*Horinouchi Beds:* Honjo. *Satsuka Beds:* Dainichi.

35. **Ancilla suavis,** n. sp.

Pl. XXXVIII. Fig. 17.

Shell solid, subcylindrical, tapering above with summit pointed. Body-whorl almost twice as high as spire. The callus not only covers the spire, but on the back side of the shell also covers the upper portion

of the body-whorl, occasionally sending long narrow processes down to the spiral sulcus, while on the front side it comes down to the sulcus as a broad belt covering the upper part of the inner lip. On this account the suture separating the body-whorl from the spire is hidden for two-thirds of its length under the callus. Spiral sulcus broad, with a deep oblique valley below, followed by several spiral folds. Aperture long, pointed above. Canal very short, notched behind.

The only specimen we possess is 25 millim. in height and 9 millim. in diameter. The apertural length is 13 millim., while the height of the spire is 8.5 millim.

This may possibly be a young form of *Ancilla rubiginosa* above mentioned; but at present it is too slender to be united with it.

Fossil occurrence.—*Hijikata Beds:* Shimomata.

Family Volutidae

36. Voluta megaspira, Sowerby

Voluta megaspira. Yokoyama, Foss. Miura Penin., p. 46, pl. II, fig. 18. Foss. Up. Musash., p. 50. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 9. Neog. Shells Kozuké a. Other Prov., p. 232, pl. XXIX, fig. 1.

Voluta megaspira var. striata. Yokoyama, Moll. Tert. Basin Chichibu, p. 115, pl. XIV, figs. 2, 3.

Very rare.

Fossil occurrence.—*Satsuka Beds*: Kamiyashiki, Taruki. *Hijikata Beds:* Shimomata. Miocene (?) of Kôzuké. Pliocenes of Isé and Chichibu. Musashinos.

Living.—Northern, Central and Western Japan.

37. Voluta hirugayensis, n. sp.

Pl. XXXVIII. Fig. 16.

Only a body-whorl, yet so characteristic in form that it is worth being created into a new species. It is 28 millim. long and 22 millim. in diameter, and possesses nine strong, straight, rounded, longitudinal ribs which begin at the upper suture and reach the lower end of the base, although, gradually weakened as they approach the latter. Spiral sculpture absent. Aperture elongated. Outer lip sharp, but thickened immediately behind by the last longitudinal rib. Labial folds four, the uppermost being the weakest. Canal short, somewhat bent back.

Fossil occurrence.—*Sagara Beds:* Hirugaya.

RCM23369

Family Mitridae

38. Mitra pristina, Yokoyama

Mitra pristina. Yokoyama, Tert. Moll. Dainichi, p. 8, pl. I, figs. 8-12. Tert. Moll. Shiobara, p. 130, pl. XVI, figs. 1c, 2, 3.

Frequent.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocene of Shiobara.

Family Fasciolariidae

RCM23370

39. Fusus perplexus, A. Adams

Fusus perplexus. Foss. Miura Penin., p. 50, pl. II, fig. 17. Foss. Up. Musash., p. 51. Moll. Rem. Mid. Part Jô-Ban Coalf., p. 12.

Two broken specimens, one of which, however, has the characteristic long canal well preserved.

Fossil occurrence.—*Uchida Beds:* Mitaré. Minato Beds (Hitachi). Musashinos.

Living.—Northern, Central and Western Japan.

RCM23371

40. Fusus niponicus, Smith

Fusus niponicus. Yokoyama, Foss. Upper Musash., p. 52, pl. II, fig. 11.

A fine specimen, though the canal is broken.

Fossil occurrence.—*Hijikata Beds:* Shimomata. Upper Musashino.

Living.—Central Japan.

RCM23372

41. Hemifusus ternatanus, (Gmelin)

Hemifusus ternatanus. Yokoyama, Tert. Moll. Dainichi, p. 9.

A single fragment of the basal portion.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino (of Shinagawa).

Living.—Central and Western Japan. Philippines. Indian Ocean.

RCM23373
RCM23374
RCM23375
RCM23376
RCM23377

Family Buccinidae

42. Siphonalia cassidariaeformis, (Reeve)

Siphonalia cassidariaeformis. Yokoyama, Tert. Moll. Dainichi, p. 9, pl. I, figs. 13-15. Moll. Rem. Tert. Mino, p. 217.

Frequent at Dainichi.

Fossil occurrence.—*Horinouchi Beds*: Kumomyo; Senba. *Uchida Beds*: Hatsumma; Mitaré. *Satsuka Beds*: Dainichi. Pliocene of Mino. Upper Musashino (of Oji).

Living.—Northern, Central and Western Japan.

CM 23378 – 19
CM 23399 – 20
CM 23400 – 21
CM 23401

43. Siphonalia declivis, n. sp.

Pl. XXXVIII. Figs. 19-21.

Shell moderate in size, solid, subfusiform with body-whorl much higher than spire. Whorls about seven, convex in the younger, angulate in the older, the angle which is either rather sharp or quite blunt being present a little above the suture; surface above the angle either flat or slightly concave and steeply sloping, below flat and vertical or somewhat receding. Longitudinally plicate and spirally striate. Plicae about thirteen on the body-whorl, eleven or twelve on the preceding one, distinct on the younger whorls and running from the upper suture to the lower, though weakest at the former and strongest at the latter; on the older whorls, however, distinct only on the angle, looking more like elongated tubercles rather than plicae and vanishing near the extreme end of the body-whorl. Spiral striae many, more than ten in number, subequal or alternately large and small. Base rapidly narrowed, with many spiral striae which become gradually coarser towards the caudal end, often with a finer interstitial between, terminating at the strong spiral ridge which is usually followed by a rounded spiral belt and a valley. Aperture fusiform, with a short posterior channel. Outer lip generally transversely ridged within, with ridges sharp and distant from one another, although occasionally quite smooth. Inner lip covered with a layer of glaze, which on the inner side shows a sharp boundary and on the outer side forms a continuous peristome with the outer lip. Canal short, strongly bent sideways and backward.

This species greatly varies in shape, some being higher than others. The three specimens shown in the figures show this variation quite distinctly. The highest is 40 millim. in length and 20 millim. in diameter, the lowest 30 millim. in length and 20 millim. in diameter, while the one which comes between is 32.5 millim. in height and 18 millim. in diameter.

The already known forms which resemble the present are *Siphonalia fuscolineata* Pease (Tryon's Manual, III, p. 136, pl. 87, fig. 618) and *Siphonalia longirostris* Dkr. (Index Moll., p. 16, pl. I, figs. 13, 14),

both living in our seas. However, the former has a much higher spire, and the latter more rounded whorls and a longer canal.

Not rare.

Fossil occurrence.—*Satsuka Beds:* Asuka.

R CM23379

44. Nassaria magnifica, Lischke

Pl. XLI. Fig. 6.

Nassaria magnifica. Lischke, Jap. Meeresconch., II, p. 38, pl. IV, figs. 11, 12; III, pl. I, figs. 5, 6.

A single example of a young individual, about 30 millim. and almost perfect. The longitudinal plicae number ten on the last whorl as well as on the preceding, the last one which is behind the outer lip being particularly large and varix-like.

Fossil occurrence.—*Hijikata Beds:* Shimomata.

Living.—Central and Western Japan.

RCM23380
RCM23381

45. Eburna elata, Yokoyama

Eburna elata. Yokoyama, Tert. Moll. Dainichi, p. 9, pl. I, figs. 16, 17.

Frequent at Dainichi, rare at Asuka.

Fossil occurrence.—*Satsuka Beds:* Dainichi; Asuka.

Family Nassidae

R CM23382

46. Bullia (Adenus ?) chitanii, n. sp.

Pl. XLI. Fig. 17.

A single example.

The shell is small, elongato-ovate. Whorls about six, rapidly growing, convex, provided with two flat-bottomed spiral grooves below the suture, leaving between and also between the upper groove and the suture a flat spiral cord of about equal breadth. Below the grooves there are several incised lines down to the lower suture, of which the uppermost and those near the suture are more conspicuous than the others. Body-whorl higher than spire. Periphery rounded. Base with about six spiral grooves separated by interspaces of about equal breadth, followed below by a sharp spiral ridge with a broad shallow groove and a deep narrow valley beneath. Aperture ovate. Outer lip thin and broken, but with indications of a few transverse teeth within. Inner lip with a broad glaze, terminating below at the caudal end and above

going up a little beyond the upper corner of the aperture. Canal short, strongly bent sideways as well as backward. Height 15.4 millim. Diameter 8 millim. Height of body-whorl about 10 millim.

Fossil occurrence.—*Satsuka Beds :* Asuka.

47. Nassa (Hima) japonica, A. Adams

Nassa (Hima) japonica. Yokoyama, Foss. Miura Penin., p. 56, pl. III, fig. 5. Foss. Up. Musash., p. 40. Moll. Tert. Dainichi, p. 10. Moll. Tert. Basin Chichibu, p. 116. Moll. Foss. Tert. Mino, p. 218, Foss. Shells Sado, p. 266.

Only one example.

Fossil occurrence.—*Satsuka Beds :* Dainichi. Pliocenes of Chichibu and Mino. Musashinos.

Living.—Central and Western Japan.

48. Nassa (Hima) demissa, Yokoyama

Nassa (Hima) demissa. Yokoyama, Tert, Moll. Dainichi, p. 10, pl. II, figs. 8, 9.

Frequent.

Fossil occurrence.—*Satsuka Beds :* Dainichi.

49. Nassa (Niotha) congrua, n. sp.

Pl. XLI. Fig. 18.

Shell small, ovate. Whorls about five, rapidly growing, convex, longitudinally and spirally corded with the cross-points of the cords tuberculate. Longitudinal cords many, about twenty-two on the penultimate whorl, rounded, narrower than interspaces, straight, oblique, becoming indistinct on the last part of the body-whorl. Spiral cords about seven on the penultimate and one or two more on the ultimate, rounded, with a finer intercalary always on the latter, rarely on the former. Aperture subovate, pointed behind. Outer lip thin, sharp, transversely costate within. Inner lip with a layer of glaze, which is marked off from the base by a groove ; the lower end bent outward so as to form a sharp ridge. Canal short, bent. A single example measuring 8.7 millim. in height and 5 millim. in diameter.

Fossil occurrence.—*Satsuka Beds :* Asuka.

Family Columbellidae

RCM23386

50. Columbella (Atilia) smithi, Yokoyama

Columbella smithi. Yokoyama, Foss. Upper. Musashino, p. 60, pl. II, fig. 24.

A young individual with the periphery angulate and shorter in form than the specimens found in the Musashino Formation.

Fossil occurrence.—*Satsuka Beds:* Asuka. Upper Musashino.

Living.—Central Japan.

RCM23387

51. Columbella (Mitrella) dunkeri, Tryon

Columbella (Mitrella) dunkeri. Yokoyama. Foss. Miura Penin., p. 59, pl. III, fig. 15. Foss. Up. Musash., p. 62, pl. II, fig. 26. Foss. Shells Sado, p. 267.

Two examples.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Musashinos.

Living.—Northern, Central and Western Japan.

RCM23388-25
RCM23389-26

Family Muricidae

RCM23390

52. Murex spinicosta, Brown

Pl. XXXVIII. Figs. 25, 26.

Murex spinicosta. Yokoyama, Tert. Moll. Dainichi, p. 11.

In my work here cited, this species was not figured. Therefore I take this opportunity of figuring it, in spite of the specimens being incomplete. Rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Miocene of Europe (Austria, Poland, Italy etc.).

RCM23391-[illegible]

RCM23392

53. Murex (Phyllonotus) bullocki, Yokoyama

Pl. XXXVIII. Fig. 13.

Murex (Phyllonotus) bullocki. Yokoyama, Tert. Foss. Kii, p. 51, pl. VI, figs. 5, 6.

The species was first created by me on imperfect specimens from the Pliocene of Kii. Now we have a better one which shows seven whorls of which two at least are nuclear. The post-nuclear whorls are each provided with three prominent varices which at the whorl-angle send out a spine. On the body-whorl, however, there are three more spines below, although gradually diminishing in length toward the

lower end of the whorl. The longitudinal folds are indistinct on the last part of the body-whorl.

Fossil occurrence.—*Satsuka Beds:* Asuka. Pliocene of Kii.

54. Urosalpinx birileffi, (Lischke)

Pl. XLI. Fig. 16.

Urosalpinx cf. birileffi. Yokoyama, Tert. Foss. Kii, p. 51, pl. VI, fig. 1.

A single example larger than that found in Kii. It is 24 millim. high and 13 millim. in diameter.

Fossil occurrence.—*Sagara Beds:* Hirugaya. Pliocene of Kii.

Living.—Central and Western Japan.

55. Rapana bezoar Linne, var. thomasiana, Crosse

Rapana bezoar var. thomasiana. Yokoyama, Foss. Up. Musashino, p. 66, pl. III, fig. 6. Tert. Moll. Dainichi, p. 11.

Rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Northern, Central and Western Japan.

56. Purpura alveolata, Reeve

Purpura alveolata. Yokoyama, Foss. Miura Penin., p. 64, pl. III, fig 16.

Only one example.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Musashinos.

Living.—Northern Japan. Alaska. Oregon. Chile. Straits of Magellan.

Family Tritonidae

57. Triton tenuiliratus, Lischke

Pl. XLI. Fig. 14.

Triton tenuiliratus. Yokoyama, Foss. Up. Musash., p. 67, pl. III, fig. 8.

A single example obtained is slightly different from those hitherto found in having the longitudinal plicae more prominent, every fourth or fifth elevating itself into a varix. On the younger whorls, plicae are not distinguishable from varices.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central and Western Japan.

RCM23397
RCM23398

58. Priene oregonensis, (Redfield)

Priene oregonensis. Yokoyama, Foss. Miura Penin., p. 64, pl. III, figs. 19, 20. Foss. Up. Musash., p. 68. Moll. Rem. Upperm. Part Jō-Ban Coalf, p. 11. Tert. Moll. Shinano a. Echigo, p. 6. Moll. Tert. Basin Chichibu, p. 116. Tert. Moll. Shiobara, p. 131. Moll. Rem. Middle Part Jō-Ban Coalf., p. 12.

A few-ill preserved specimens.

Fossil occurrence.—*Satsuka Beds:* Asuka; Kamiyashiki. Pliocenes of Shinano, Chichibu and Shiobara. Minato Beds. Shirado Beds. Musashinos.

Living.—Northern, Central and Western Japan. Alaska down to Washington.

RCM23402

Family Cassididae

59. Galeodea (Sconsia) japonica, Yokoyama

Galeodea (Sconsia) japonica. Yokoyama, Tert. Moll. Dainichi, p. 11. Foss. Moll. Neog. Izumo, p. 3, pl. II, fig. 4. Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 11, Pl. I, fig. 10. Tert. Moll. Oilf. Embets a. Etaibets, p. 240.

Very rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocene of Izumo and the Hokkaido. Shirado Beds.

RCM23403-15
RCM23404

Family Doliidae

60. Melongena miranda, n. sp.

Pl. XLI. Fig. 15.

Melongena pugilina. Yokoyama, Tert. Foss. Kii, p. 50, pl. VI, figs. 2, 3, 13.

In my work here cited, I took the present species for *Melongena pugilina* Born, from which, however, it differs in several points, being an entirely new form.

Shell moderate in size, pyriform with a very short spire. Whorls about five, rapidly growing, angulate in the middle, with the surface above the angle flattish and only slightly sloping, longitudinally plicate and spirally striate. Plicae coarse, about twelve on the body-whorl, low, rounded, separated by intervals of greater breadth, elevating themselves into spines at the angle. Spiral striae many, usually alternately large and small. Base gradually narrowed, convex in the upper part, somewhat concave in the lower, ornamented all over with spiral striae like those of the whorls. In the caudal part of the base there is

a broad spiral groove. Aperture ovate (?), pointed behind, with the outer lip thin. Inner lip covered with a thin glaze.

Three examples of which the largest is the best preserved. It is about 42 millim. high and 30 millim. in diameter.

Fossil occurrence.—*Sagara Beds:* Hirugaya. *Satsuka Beds:* Asuka.

Family Cerithiidae

61. Bittium misellissimum, n. sp.

Pl. XLI. figs. 19, 20.

Shell small, turrete. Whorls about eight, flattish in the upper half, somewhat convex in the lower, longitudinally and spirally corded. Spiral cords more conspicuous than longitudinal ones, four in number, with the upper two larger than the lower two, rounded, separated by narrower interstices. Longitudinal cords about fifteen on the older whorls, distinct only in interstices, yet forming tubercles on crossing the spiral ones. Periphery somewhat angulate with a spiral cord on it. Base abruptly narrowed, with a few spiral cords. Aperture short-oval with a slight indication of a channel. Height 5.5 millim. Diameter 1.5 millim.

One perfect specimen and a fragment of the lower portion. The former, however, is much worn.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

Family Turritellidae

62. Turritella perterebra, Yokoyama

Turritella perterebra. Yokoyama, Tert. Moll. Dainichi, p. 11, pl. II, figs. 3–5,

Very common.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

63. Turritella kiiensis, Yokoyama

Pl. XXXIX. Figs. 3, 4.

Turritella kiiensis. Yokoyama, Tert. Foss. Kii, p. VI, figs. 9, 10.

This shell is closely related to the preceding, but is distinguished by the whorls being flat in the lower portion as well as by the abrupt recession of the lowest portion below the lowest ridge whereby the boundary becomes angulate. The number of spiral ridges is usually six

with several equal or unequal, spiral lirae upon them as well as between. In fact, there is no regularity either in the number of the spiral ridges or in their size. The specimens from Kii, though quite numerous, do not clearly show the above characters, all of them being wave-worn.

Fossil occurrence.—*Horinouchi Beds*: Ishigami, Tomoda (rare). *Satsuka Beds*: Asuka (not rare). Pliocene of Kii.

Family Solariidae

64. Solarium (Philippia) cingulum, KIENER

Solarium (Philippia) cingulum. Yokoyama, Foss. Up. Musash., p. 77, pl. III, fig. 19.

A single imperfect specimen.

Fossil occurrence.—*Satsuka Beds*: Asuka. Upper Musashino.

Living.—Central and Southern Japan. Philippines. South Seas.

Family Naticidae

65. Natica janthostoma, DESHAYES

Natica janthostoma. Yokoyama, Foss. Miura Penin., p. 76, pl. V. figs. 3, 4. Foss. Up. Musash., p. 33. Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 12, pl, I, fig. 20. Moll. Foss. Tert. Mino. p. 220. Tert. Moll. Dainichi, p. 12. Foss. Shells Sado, p. 278.

Frequent.

Fossil occurrence.—*Horinouchi Beds*: Honjo. *Satsuka Beds*: Dainichi. Musashinos. Miocene of Iwaki. Pliocenes of several parts of Japan.

Living.—Northern and Central Japan. Kamchatka.

66. Polinices (Neverita) ampla, (PHILIPPI)

Polinices (Neverita) ampla. Yokoyama, Foss. Miura Penin., p. 78, pl. V, figs. 5, 6. Tert. Moll. Dainichi, p. 12.

Rather common.

Fossil occurrence.—*Horinouchi Beds*: Kumomyo; Honjo. *Uchida Beds*: Mitaré. *Satsuka Beds*: Dainichi; Asuka; Kamiyashiki. Pliocenes of several parts of Japan. Shirado Beds. Musashinos.

Living.—Northern, Central and Western Japan. Philippines.

67. Sigaretus (Eunaticina) papilla, GMELIN

Sigaretus (Eunaticina) papilla. Yokoyama, Foss. Up. Musash., p. 84, pl. V, fig. 8. Tert. Moll. Dainichi, p. 12. Tert. Foss. Kii, p. 53.

Rarely found.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocene of Kii. Upper Musashino.

Living.—Central and Western Japan. Philippines. Moluccas.

Family Eulimidae

68. Eulima (Leiostraca) hosoyana, n. sp.

Pl. XLI. Fig. 12.

Shell small, white, polished, subulate. Whorls nine, smooth, younger ones slightly convex, older flat and near the lower suture somewhat receding, forming a blunt angle between. Periphery bluntly angulate. Base quickly narrowed, somewhat convex. Aperture narrow, ovate, with posterior corner acute. A single example measuring 5.2 millin. in height and 1.3 millim. in diameter.

Fossil occurrence.—*Hijikata Beds:* Hosoya.

Family Pyramidellidae

69. Pyramidella (Actaeopyramis) eximia, (LISCHKE)

Pyramidella (Actaeopyramis) eximia. Yokoyama, Foss. Up. Musash., p. 95. pl. VI, Fig. 1.

Some immature individuals.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central and Western Japan.

70. Odostomia (Miralda ?) clandestina, n. sp.

Pl. XXXVIII. Figs. 23, 24.

Shell small, ovately conical. Whorls about six and a half, of which two are embryonal; the succeeding ones, almost flat or only slightly convex, shouldered at the summit, faintly plicate longitudinally and still more faintly spirally corded. The plicae are so faint as to be visible

only near the shoulders. Cords apparently few in number. Periphery rounded. Base rapidly narrowed, convex. Aperture ovate, pointed behind. Outer lip transversely striate within. Inner lip with a distinct oblique fold.

Two examples, one of which measures 3 millim. in height and 1.2 in diameter.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

Family Trochidae

71. Calliostoma unicum, (Dunker)

Pl. XLI. fig. 13.

Calliostoma unicum. Yokoyama, Tert. Moll. Dainichi, p. 13.

Rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

Living.—Northern, Central, Western and Southern Japan.

72. Umbonium suchiense, Yokoyama

Umbonium suchiense. Yokoyama, Tert. Moll. Dainichi, p. 13, pl. II, fig. 1.

Very frequent. The variation is great, especially in the form of subsutural tubercles which can assume a spine-like appearance.

Fossil occurrence.—*Horinouchi Beds:* Tomoda; Kumomyo; Senba; Ishigami. *Satsuka Beds:* Asuka; Yanokuchi; Dainichi.

73. Umbonium mysticum, Yokoyama

Umbonium mysticum. Yokoyama, Tert. Moll. Dainichi, p. 13, pl. II, figs. 6, 7.

This is also a variable species. The subsutural band which is normally crenate may occasionally become weakly tuberculate. Frequent.

Fossil occurrence.—*Horinouchi Beds:* Senba; Kumomyo. *Uchida Beds:* Hatsumma. *Satsuka Beds:* Dainichi.

Mr. Makiyama in his „Evolution of Umbonium" (Jap. Jour. Geol. Geogr., Vol. III, 1924) shows how these Umboniums are variable, elucidating in full the changes which the so-called species undergo in the course of time.

SCAPHOPODA

Family Dentaliidae

CM23438
CM23439
CM23440

74. Dentalium weinkauffii, DUNKER

Dentalium weinkauffii. Yokoyama, Foss. Miura Penin., p. 102, pl. VI, figs. 19-21. Foss. Up. Musash., p. 118, pl. VI, fig. 6. Foss. Shells Saishu, p, 4. Moll. Rem. Upperm. Part Jō-Ban Coalf., 16. Tert. Moll. Shinano a. Echigo, p. 9. Moll. Tert. Basin Chichibu, p. 118.

A few specimens.

Fossil occurrence.—*Horinouchi Beds:* Honjo ~~*Uchida Beds:*~~ Hatsumma (doubtful fragments). *Satsuka Beds:* Asuka. Pliocenes of Shinano and Chichibu. Shirado Beds. Musashinos.

Living.—Central Japan.

RCM23441

75. Dentalium octogonum, LAMARCK

Dentalium octogonum. Yokoyama, Foss. Miura Penin., p. 103, pl. VI, figs. 22-24. Foss. Up Musash., p. 118.

Rare.

Fossil occurrence.—*Hijikata Beds:* Hosoya. Musashinos.

Living.—Northern, Central and Western Japan. China. Australia. Ceylon.

LAMELLIBRANCHIATA

RCM23442

Family Saxicavidae

76. Panope generosa, (GOULD)

Panope generosa. Yokoyama, Foss. Up. Musash., p. 121, pl. VI, figs. 14. 15. Foss. Moll. Neog. Izumo, p. 4. Tert. Moll. Dainichi, p. 14. Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 16, pl. VI, fig. 6. Moll. Rem. Mid. Part, p. 16. Tert. Moll. Shinano a. Echigo, p. 10. Moll. Tert. Basin Chichibu, p. 118. Tert. Moll. Shiobara 122. Foss. Shells Sado, p. 289.

Rather rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocenes of several parts of Japan. Shirado Reds. Upper Musashino.

Living.—Northern Japan. West Coast of North America.

Family Corbulidae

77. Corbula erythrodon, Lamarck

Pl. XLI. Fig. 3.

Corbula erythrodon. Yokoyama, Foss. Up. Musash., p. 122, pl. VI, figs. 8, 9.

A single left valve.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

Living.—Central and Western Japan.

Family Mactridae

78. Mactra crossei, (Dunker)

Mactra crossei. Yokoyama, Tert. Moll. Dainichi, p. 14.

Rarely found.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

Living.—Central Japan.

79. Mactra spectabilis, Lischke

Mactra spectabilis. Yokoyama, Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 17, pl. I, figs. 7, 8.

One left valve much worn and cast-like, the greater part of the shell having disappeared.

Fossil occurrence.—*Horinouchi Beds:* Ishigami. Shirado Beds.

Living.—Central and Western Japan.

80. Raeta yokohamensis, Pilsbry

Raeta yokohamensis. Yokoyama, Foss. Up. Musash., p. 131, pl. VIII, figs. 5, 6. Tert. Moll. Dainichi, p. 15.

Very rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Uppper Musashino.

Living.—Central Japan.

Family Solenidae

81. Solen krusensternii, Schrenck

Solen krusensternii. Yokoyama, Foss. Upper Musash., p. 134, pl. IX, fig. 5. Tert. Moll. Shinano a. Echigo, p. 12.

Very rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocene of Shinano. Upper Musashino.

Living.—Northern Japan.

Family Tellinidae

82. Tellina sp.

RCM23448

A small imperfect specimen, not accurately determinable.

Fossil occurrence.—*Uchida Beds:* Hatsumma.

83. Macoma praetexta, (Martens)

RCM23449

Macoma praetexta. Yokoyama, Foss. Upper Musash., p. 142, pl. X, figs. 2, 3. Tert Moll. Dainichi, p. 15. Moll. Rem. Lowest Part Jō-Ban Coalf., p. 13. Moll. Tert Basin Chichibu, p. 118. Tert. Moll. Shiobara, p. 4.

Rare.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Asagai Beds (Miocene). Pliocene of Chichibu, Shinano and Shiobara. Upper Musashino.

Living.—Central and Western Japan.

Family Veneridae

RCM23450

84. Dosinia troscheli, Lischke

Dosinia troscheli. Yokoyama, Foss. Miura Penin., p. 119, pl. VIII, figs. 5, 6. Foss. Up. Musash., p. 144. Tert. Moll. Dainichi, p. 15. Moll. Rem. Up. Part Jō-Ban Coalf., p. 10. Moll. Rem. Mid. Part, p. 17. Moll. Tert. Basin Chichibu, p. 118. Moll. Foss. Mino, p. 222. Foss. Shells Sado, p. 291.

Several specimens.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Pliocenes of Chichibu, Shiobara and Mino. Minato Beds. Shirado Beds. Musashinos.

Living.—Central and Western Japan.

85. Dosinia sp.

RCM23451-454

Pl. XLI. Fig. 4.

An imperfectly preserved specimen which from its general form reminds us of *Dosinia dunkeri* Phil. (Voy. Samarang, Moll., pl. XXI, fig. 17) as well as of *Dosinia excisa* Chem (Philippi, Abbild. I, Cytherea, pl. II, fig. 4).

Fossil occurrence.—*Horinouchi Beds:* Senba.

RCM23452

86. Meretrix iizukai, Yokoyama

Meretrix iizukai. Yokoyama, Moll. Rem. Up. Part Jō-Ban Coalf., p. 20, pl. III, Figs. 2, 3.

One small left valve.

Fossil occurrence.—*Sagara Beds:* Ōsawa. Shirado Beds.

RCM23453-4-5

87. Meretrix ōyuana, n. sp.

Pl. XLI. Fig. 5.

Shell very small, roundly ovate, moderately convex, about as high as long, almost equilateral, rounded in front and behind, though more broadly in the former; antero-dorsal border nearly straight, sloping, postero-dorsal slightly convex and also sloping, ventral broadly arched. Surface apparently smooth, though under a lens distant concentric elevated striae are visible. Inner border smooth. Beak small, pointed. Main teeth three, diverging, the middle being the thickest and the anterior the longest; anterior lateral tooth of the left valve transversely elongated.

Only a left valve 2 millim. in height and length, and 0.8 millim. in depth.

This neat shell was named in commemoration of Mr. Masao Oyu, a hopeful geologist who many years ago had helped me in collecting the fossils of Dainichi and whom untimely death in 1920 tore from this world.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

RCM23454
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RCM23457

88. Meretrix (Callista) chinensis, (Chemnitz)

Meretrix (Callista) chinensis. Yokoyama, Foss. Miura Penin., p. 120, pl. VIII, figs. 9, 10. Foss. Up. Musash., p. 146, pl. XI, fig. 5. Moll. Rem. Lowest Part Jō-Ban Coalf., p. 14, pl. II, figs. 7, 8. Moll. Tert. Basin Chichibu, p. 119. Moll. Foss. Tert. Mino, p. 222. Tert. Moll. Dainichi, p. 15. Foss. Shells Sado, p. 292.

Rather common.

Fossil occurrence.—*Sagara Beds:* Ōsawa. *Horinouchi Beds:* Ishigami. *Uchida Beds:* Hatsumma. *Satsuka Beds:* Dainichi. Iwaki Beds (Miocene). Pliocenes of Mino and Chichibu. Shirado Beds. Musashinos.

Living.—Northern, Central and Western Japan. China Sea. Australia.

89. Clementia speciosa, YOKOYAMA

Clementia speciosa. Yokoyama, Tert. Moll. Dainichi, p. 15, pl. II, figs. 14, 15. Moll. Rem. Up. Part Jō-Ban Coalf., p. 21, pl. I, fig. 6. Moll. Tert. Basin Chichibu, p. 119. Moll. Foss. Tert. Mino, p. 222.

Rare.

Fossil occurrence.—*Horinouchi Beds:* Ishigami. *Satsuka Beds:* Dainichi. Pliocenes of Chichibu and Mino. Shirado Beds.

90. Venus (Mercenaria) stimpsoni, GOULD

Venus (Mercenaria) stimpsoni. Yokoyama, Foss. Up. Musash., p. 148, pl. XI, figs. 11, 12. Foss. Moll. Neog. Izumo. p. 6, pl. I, fig, 5. Moll. Rem. Upperm. Part Jō-Ban Coalf., p. 21. Moll. Rem. Mid. Part, p. 18. Tert. Moll. Shinano a. Echigo, p. 13. Foss. Shells Sado, p. 292.

A fragment of a right valve.

Fossil occurrence.—*Uchida Beds:* Mitaré. Pliocenes of Izumo, Chichibu, Echigo, etc. Upper Musashino.

Living.—Northern, Central and Western Japan.

91. Venus ozawai, n. sp.

Pl. XXXIX. Fig. 5.

Shell small, thick, moderately convex, trigonal, inequilateral, rounded in front and behind, rather sharply in the latter. Surface radiately ribbed; ribs about thirty in number, flatly rounded, separated by narrower interspaces, coarsest near the anterior border whence posteriorly they gradually become finer, made nodose by lines of growth. Beaks small, pointed. Main teeth three, diverging.

Examples are rare, and mostly in a bad state of preservation. The only one which is perfect is a left valve from the Sagara Beds, 11 millim. in length, 9 millim. in height, and 3.5 millim. in depth.

The shell has some resemblance to *Venus costellifera* Ad. et Rve. (Voy, Samarang, Zoology, p. 79, pl. XXI, fig. 18) living in the Philippines.

Fossil occurrence.—*Sagara Beds:* Hirugaya. *Uchida Beds:* Hatsumma.

92. Chione isabellina, (PHILIPPI)

Chione isabellina. Yokoyama, Foss. Miura Penin., p. 121, pl. VIII, fig. 13. Foss. Up. Musash., p. 149. Tert. Moll. Dainichi, p. 16.

Frequent at certain places.

Fossil occurrence.—*Horinouchi Beds:* Ishigami; Kumomyo. *Uchida Beds:* Hatsumma. *Satsuka Beds:* Asuka; Dainichi. Musashinos.

Living.—Japan (according to Dunker). China Sea.

CM23467-7
RM23468-8
RM23469-9

93. **Chione casinaeformis**, n. sp.

Pl. XXXIX. Figs. 7-9.

Shell moderate in size, thick, somewhat convex, round in outline, with length a little greater than height, postero-dorsal border almost straight and making a blunt angle with posterior, inequilateral, posterior side being almost twice as long as anterior. Surface with regular distant concentric lamellae, irregularly crenate on top, usually with one or more concentric striae between, which may also be elevated and appear like intercalary lamellae. Inner border crenulate, in front up to the beak, while behind the crenulation terminates at the posterior angle. Beaks small, acute, lunula cordate, bounded by a deep incised groove on each side, elevated in the middle and provided with irregular divergent grooves. Area lanceolate, distinct laterally bounded by angulate edges. Pallial sinus rather indistinct, small, shallow, triangular. Main teeth three, anterior and middle weakly bifid; lunular tooth of the left valve tubercle-like, distinct.

This species has a striking resemblance in shape to *Chione casina* (Linné) (Syst. Conch. Cab., Veneridae, p. 137, pl. VIII, figs. 4, 5) of the European seas. But the sculpture is much finer in the Japanese species, with the tubercular tooth more prominent.

The shell seems to be still living in Japan, figs. 8 and 9 showing a recent one. The fossil specimens are rare, but differ in no respect from the recent, except in the proportion of length and height. In the former it is 10 to 9.4, while in the latter it is 10 to 8.5 on an average. The depth of each valve in the latter is 2.5 on an average, while in the former it is a little greater (2.7).

Fossil occurrence.—*Sagara Beds:* Hirugaya. *Horinouchi Beds:* Ishigami (a doubtful specimen).

Living.—Central Japan.

CM23470-13
RCM23471

94. **Chione chitaniana**, n. sp.

Pl. XXXIX. Fig. 13.

The shell is rather large, thick and moderately convex. It is ovately trigonal in outline, somewhat longer than high and very inqui-

lateral, the anterior side being only about one-half of the posterior. The surface of all the specimens is much worn, but this much is certain, that it is radiately costulated, with costulae numerous, close, flattish, broader than interspaces and occasionally crossed by coarse lines of growth. The beaks are moderately swollen with the end pointed and curved in. A distinct lunula is present, cordate in outline and bounded by a sharp ridge on each side. Dentition unknown, so that the generic denomination remains to be confirmed.

A nearly perfect left valve shown in the figure is 64 millim. long, 52 millim. high and about 14 millim. deep. But there is a larger, though broken, specimen measuring more than 80 millim. in length.

Rather frequent.

Fossil occurrence.—*Horinouchi Beds:* Tomoda.

95. Tapes euglyptus, (Philippi)

Tapes euglyptus. Yokoyama, Foss. Up. Musash., p. 152, pl. XII, fig. 8. Tert. Foss. Kii, p. 56, pl. VI, fig. 17. Tert. Moll. Dainichi, p. 16.

Very common.

Fossil occurrence.—*Horinouchi Beds:* Honjo. *Satsuka Beds:* Dainichi. Upper Musashino.

Living.—Central and Western Japan.

Family Cardiidae

96. Cardium muticum, Reeve

Cardium muticum. Yokoyama, Foss. Miura Penin., p. 128, pl. IX, fig. 11. Foss. Up. Musash., p. 154, pl. XII, fig. 7. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 23. Tert. Moll. Oilf. Embets a. Etaibets, p. 243. Foss. Shells Sado, p. 293.

A few examples.

Fossil occurrence.—*Horinouchi Beds:* Senba. Pliocene of the Hokkaido. Shirado Beds. Musashinos.

Living.—Northern, Central and Western Japan. Philippines.

97. Cardium nuttalii, Conrad

Cardium nuttalii. Conrad, Jour. Acad. Nat. Sci. Philad., vii, 1837, p. 229, pl. XVII, fig. 3. Middendorff, Malac. Ross., III, p. 39, pl. XVI, figs. 1–5.

Cardium californianum. Conrad, Jour. Acad. Nat. Sci, Phil., vii, p. 229, pl. VII, fig. 4.

Cardium shinjiense. Yokoyama, Foss. Moll. Neog. Izumo, p. 7, pl. II, fig. 6. Moll. Rem. Lowest Part Jô-Ban Coalf., p. 16, pl. III, figs. 13-15. Moll. Rem. Mid. Part, p. 18, pl. III, Figs. 10, 11. Foss. Shells Sado, p. 293, pl. XXXIV, figs. 17, 18.

Cardium sp. Yokoyama, Tert. Moll. Dainichi, p. 16.

By the discovery in Sado of perfect specimens (Foss. Shells Sado, pl. XXXIV, figs. 17, 18) I have become convinced that what I have hitherto been calling *Cardium shinjiense*, is identical with what Middendorff takes for the young stage of *Cardium nuttalii* Conr. which Conrad described as a distinct species under the name of *Cardium californianum*. The Sado shell, however, is not without some difference; namely the ribs are roof-shaped with v-shaped, interspaces while Middendorff speaks of them as rounded. Nevertheless, I regard this only as a variation, as the Japanese fossils from other parts show the ribs rounded and not roof-like.

The mature form of *Cardium nuttalii* Conr. as figured in Reeve's Conchologia Iconica (Cardium, pl. XXI, fig. 121) is a large splendid shell, quite different in appearance from what I called *Cardium shinjiense*, but showing a close relationship to *Cardium braunsi* Tok. of the Upper Musashino of the environs of Tokyo which may possibly be identical with Conrad's species. To this question I shall recur in a future paper.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Miocene of Iwaki. Pliocenes of Mino, Shinano and Izumo. Minato and Shirado Beds. Musashino of Sado.

Living.—Alaska. British Columbia.

R CM 23476-37-10

98. **Cardium egregium**, n. sp.

Pl. XXXIX. Fig. 10.

A single example of the right valve of a large shell, thick, rounded in outline, compressed, inequilateral, with a small, pointed beak. The surface is ornamented with fine radiating riblets which on the posterior side run parallel to the postero-dorsal border of the shell. This border is gently curved and gradually goes over into the subtruncate posterior border.

The shell is broken on the ventral side as well as on the anterior, and as it is not possible to ascertain the dentition, an exact generic determination is impossible. The surface sculpture is such as I have never met with in our shells fossil or recent.

Fossil occurrence.—*Sagara Beds:* Hirugaya.

Family Diplodontidae

99. Diplodonta japonica, PILSRY

Diplodonta japonica. Foss. Miura Penin., p. 131, pl. X, fig. 4. Foss. Up. Musash., p. 159.

Diplodonta sp. Tert. Moll. Dainichi, p. 17.

A single specimen of a right valve.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Musashinos.

Living.—Central Japan.

Family Lucinidae

100. Lucina (Phacoides) borealis, (LINNÉ)

Lucina (Phacoides) borealis. Yokoyama, Foss. Miura Penin., p. 133, pl. X, fig. 7. Foss. Up. Musash., p. 160. Moll. Rem. Up. Part. Jô-Ban Coalf., p. 24, pl. V, figs. 5-8. Moll. Rem. Mid. Part, pl. I, fig. 2, p. 18, pl. III, figs. 1, 2. Tert. Moll. Shinano a. Echigo, p. 14. Moll. Tert. Basin Chichibu, p. 121. Tert. Moll. Shiobara, p. 134. Tert. Foss. Kii, p. 57, pl. VI, fig. 11. Moll. Foss. Tert. Mino, p. 223. Neog. Shells Kōzuké a. Other Prov., pp, 229, 230, 231. Foss. Shells Sado, p. 296.

Only one specimen of a small right valve.

Fossil occurrence.—*Horinouchi Beds:* Tomoda. Miocene and Pliocene of Japan. Musashinos.

Living.—Central Japan. Atlantic.

Family Carditidae

101. Cardita panda, n. sp.

Pl. XXXIX. Figs. 1, 2.

Shell moderate in size, very thick, convex, obliquely ovato-trigonal, very inequilateral, rounded in front, somewhat obliquely truncate behind, broadly arched at ventre, with postero-ventral corner obtusely subangulate. Surface radiately ribbed; ribs coarse, about fifteen in number, broad, flat-topped with interspaces somewhat narrower, usually more or less coarsely imbricate in the anterior and posterior portions of the shell, especially towards its ventral border. Beaks pointed, incurved. Inner border coarsely crenate. Length, height and depth of the valves are in the ratio of 10, 8 and 3.6 on an average.

The largest example we possess is a right valve measuring 50 millim. in length, 40 millim. in height and 17.5 millim. in depth. There is a fragment of an immature left valve showing the ribs more elevated and rounded at top than in other specimens.

This species bears some resemblance to *Megacardita jouanneti* Bast. (Sacco, I. Moll. del Piem. et della Liguria, part XXVII, pl. III) of the European Miocene, which, however, has the ribs broader. *Megacardita intermedia* (Broc.) (Ibid., pl. IV, fig. 5) also resembles the present species, although its ribs are more numerous.

Examples are common.

Fossil occurrence.—*Sagara Beds:* Ebina; Teragaya. *Horinouchi Beds:* Ishigami; Senba. *Satsuka Beds:* Asuka (numerous); Dainichi.

RCM23487

Family Crassatellidae

102. Crassatella pauxilla, YOKOYAMA

Crassatella pauxilla. Yokoyama, Moll. Tert. Basin Chichibu, p. 122, pl. XV, figs. 8-10.

A single valve which, on comparison with the examples of the named species from Chichibu, agrees quite well.

Fossil occurrence.—*Sagara Beds:* Hirugaya. Pliocene of Chichibu.

RCM23488

103. Crassatella heteroglypta (PILSBRY)

Crassatella heteroglypta. Yokoyama, Foss. Miura Penin., p. 141, pl. XI, figs. 10, 11. Foss. Up. Musash., p. 165.

A fragment.

Fossil occurrence.—*Satsuka Beds:* Dainichi; Musashinos.

Living.—Central and Western Japan.

RCM23489-6
RCM23490

104. Crassatella uchidana, n. sp.

Pl. XXXIX. Fig. 6.

Shell small, rather thick, moderately compressed, somewhat inequilateral, ovately subtrigonal, longer than high, rounded in front, truncate behind with postero-ventral corner obtusely angulate. Surface bluntly edged behind, the edge running from beak to postero-ventral corner, concentrically regularly furrowed, with furrows over thirty in number and separated usually by somewhat narrower interspaces. Beaks small, pointed. Inner border crenulate. Dentition: main teeth two, thin, diverging; posterior lateral single, long.

Two left valves and one right, of which only one (the left) is perfectly preserved. It is 12.5 millim. in length, 10 millim. in height and 3.5 millim. in depth.

Closely related to *Crassatella oblongata* Yok. (Foss. Miura Penin., p. 142, pl. XI, figs. 8, 9) of the Lower Musashino, although more trigonal in form and more finely furrowed.

Fossil occurrence.—*Uchida Beds:* Mitaré.

Family Pectinidae

105. Pecten praesignis, Yokoyama

Pl. XL. Figs. 1, 2. Pl. XLI. Fig. 1.

Pecten praesignis. Yokoyama, A New Species of Pecten from the Neogene of Japan, p. 1, pl. V, figs. 1-3. Jour. Geol. Soc. Tokyo, Vol. XXXIX, Nov. 1922.

This species was founded by me on an example kept in the Museum of the Geological Institute of the Imperial University of Tokyo bearing no locality. It has now become almost certain that its locality lies somewhere in Southern Tôtômi. The species may be characterized as follows:

Shell large, rather thin, greatly compressed, orbicular in outline, somewhat broader than high, slightly inequivalve, the left valve being a little flatter than the right, equilateral, radiately ribbed on the external surface as well as on the internal; ribs about sixteen, broad, low, flat-topped, straight, becoming gradually lower towards the ventral and lateral borders, often splitting into two or more riblets near the latter; the interspaces are on the right valve narrower than the ribs themselves, while on the left the contrary is the case; the ribs on the internal surface are at the beginning flat, but sooner or later become concave as they proceed toward the ventral border, until at last the concave portion assumes the same level as the neighbouring interspaces, leaving both margins standing as prominent ridges. Growth-lines more or less distinct, looking in some places like concentric striations. Ears subequal, the anterior in the right valve being somewhat wavy at the anterior border, with the corner acute, while the posterior is obliquely truncate behind. Byssal notch hardly indicated. The perfect specimen from the unknown locality above mentioned measures 120 millim. in length and 109 millim. in height; the thickness is 18 millim. of which 10 millim. belongs to the right valve.

Rather frequent.

Fossil occurrence.—*Sagara Beds:* Hirugaya. *Horinouchi Beds:* Senba. *Uchida Beds:* Hatsumma; Yokota. *Satsuka Beds:* Asuka.

R CM 23498-7
R CM 23499-8

106. Pecten clancularius, n. sp.

Pl. XLI. Figs. 7-11.

R CM 24758-9
R CM 24759-10
R CM 24760-11

Shell small, thin, somewhat translucent, compressed, orbicular in outline, right and left valves being almost of equal convexity. Right valve: external surface with numerous, regular, concentric, incised lines; internal surface with seven elevated radiating ridges, which before reaching the ventral border terminate with ends somewhat swollen. Left valve: external surface with very fine almost microscopic radiating lines; internal surface not quite clear, but apparently with the radiating ridges like the right valve, though probably not so elevated. Ears somewhat unequal, the anterior of the right valve being larger than its posterior, with a shallow byssal notch below.

The shell is very fragile and difficult to detach from the stone, so that the internal ridges are known mostly by their impressions on the stone. However, I was able to secure one of the right valves which shows the inner side. It is shown in fig. 11. Frequent.

The largest specimen is 10 millim. in length and height.

Fossil occurrence.—*Hijikata Beds:* Tombé.

Family Ostreidae

R CM 23500

107. Ostrea gigas, Thunberg

Ostrea gigas. Yokoyama, Foss. Miura Penin., p. 162, pl. XV, figs. 1, 2. Foss. Up. Musash., p. 184. Mol. Coral Bed Awa, p. 57. Moll. Rem. Up. Part Jô-Ban Coalf., p. 28. Tert Moll. Shinano a. Echigo, p. 19. Moll. Tert. Basin Chichibu, p. 124.

A few examples.

Fossil occurrence.—*Hijikata Beds:* Nakagawara. Pliocenes of several parts of Japan. Shirado Beds. Musashinos. Pleistocene of Awa.

Living.—Northern, Central and Western Japan. China Sea.

R CM 23501

108. Ostrea cucullata, (Born).

Ostrea cucullata. Yokoyama, Coral Bed Awa, p. 57, pl. IV, figs. 12, 13.

A single valve of a young individual.

Fossil occurrence.—*Satsuka Beds:* Asuka. Pleistocene of Awa.

Living.—Northern, Central and Western Japan. Nicobar Islands.

109. **Ostrea** sp.

Two small flat valves, roundly ovate in form and with inner margins crenate near the beak. They may possibly belong to *Ostrea plicata* Chem. (Yokoyama, Foss. Miura Penin., p. 163, pl. XVII, figs. 1, 2, 3.), although it is difficult to assert it with certainty.

Fossil occurrence.—*Satsuka Beds:* Dainichi.

110. **Ostrea** sp.

An upper valve of an *Ostrea* elongated in shape and resembling *Ostrea mundana* Yok. (Moll. Rem. Lowest Part Jô-Ban Coalf., p. 21, pl. V, fig. 3 ab) occurring in the Iwaki Beds (Miocene) of the Jô-Ban Coal-field.

Fossil occurrence.—*Satsuka Beds:* Hirugaya.

Family Pinnidae

111. Pinna japonica, HANLEY

Pinna japonica. Yokoyama, Foss. Up. Musash., p. 185, pl. XV, fig. 8. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 28. Tert. Moll. Dainichi, p. 17.

Very rarely found.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Shirado Beds. Upper Musashino.

Living.—Central and Western Japan.

Family Arcidae

112. **Arca (Anomalocardia) inflata,** REEVE

Arca (Anomalocardia) inflata. Yokoyama, Foss. Miura Penin., p. 167, pl. XVII, fig. 9. Foss. Up. Musash., p. 187, pl. XV, fig. 9.

Arca castellata. Yokoyama, Tert. Moll. Dainichi, p. 17, pl. II, figs. 10-13.

A recent collection of more specimens at Dainichi has shown that *Arca castellata* founded by me on more or less imperfect specimens is quite identical with *Arca inflata* Reeve still living in our seas and also common in the Musashino Formation.

Fossil occurrence.—*Horinouchi Beds:* Senba; Kumonyo. *Uchida Beds:* Hatsunima. *Satsuka Beds:* Dainichi. Musashinos.

Living.—Central and Western. Philippines.

RCM23509
RCM23510
RCM23511
RCM23512
RCM23513

113. Pectunculus vestitus, Dunker

Pectunculus vestitus. Yokoyama, Foss. Miura Penin., p. 167, pl. XVII, figs. 10, 11. Foss. Up. Musash., p. 189, pl. XVI, figs. 1–3. Moll. Rem. Lowest Part Jô-Ban Coalf., p. 21. Moll. Rem. Mid. Part, p. 20. Moll. Rem. Up. Part, p. 29.

Widely distributed, although specimens are not many.

Fossil occurrence.—*Sagara Beds:* Tsuchizawa (Hagima-mura). *Horinouchi Beds:* Senba; Honjo. *Uchida Beds:* Hatsumma. *Satsuka Beds:* Yanokuchi; Asuka. Iwaki Beds (Miocene). Minato Beds. Shirado Beds. Musashinos.

Living.—Central Japan.

RCM23514

114. Pectunculus albolineatus, Lischke

Pectunculus albolineatus. Yokoyama, Foss. Up. Musash., p. 188, pl. XVII, figs. 1–3.

Two broken specimens which, however, are readily recognized by their longer shells when compared with those of the other species mentioned in this paper.

Fossil occurrence.—*Satsuka Beds:* Asuka. Upper Musashino.

Living.—Central Japan.

RCM23515
RCM23516
RCM23517
RCM23518

115. Pectunculus nipponicus, Yokoyama

Pectunculus nipponicus. Yokoyama, Foss. Up. Musash., p. 168, pl. XVIII, figs. 3–6.

This species, though more or less variable in outline, is distinguished by its somewhat obliquely oval shell. Frequent.

Fossil occurrence.—*Sagara Beds:* Teragaya. *Horinouchi Beds:* Honjo; Tomoda. *Uchida Beds:* Yokota. *Satzuka Beds:* Yanokuchi; Kamiyashiki; Asuka. Upper Musashino.

Family Parallelodontidae

RCM23519-41-2

116. Cucullaea concamerata, (Martini)

Pl. XLI. Fig. 2.

Cucullaea concamerata. Iwakawa, Cat. Jap. Moll., Tokyo Imp. Mus., p. 242. Pilsbry, Cat. Mar. Moll. Jap., p. 151.

Arca. sp. Yokoyama, Tert. Moll. Dainichi, p. 18.

A broken specimen of an *Arca*-like shell mentioned as such in my paper on the Mollusca of Dainichi has subsequently proved to belong

to *Cucullaea concamerata* (Mart.) which is distinguished by its thin shell, high convexity and numerous radiating grooves crossed by fine concentric incised lines.

Fossil occurrence.—*Satsuka Beds :* Dainichi.

Living.—Central and Western Japan. China Sea.

Family Limopsidae

117. Limopsis crenata, A. Adams

Limopsis crenata. Yokoyama, Foss. Miura Penin., p. 173, pl. XVIII, figs. 17, 18. Foss. Up. Musash., p. 193. Foss. Shells Sado, p. 298.

Rather rare.

Fossil occurrence.—*Horinouchi Beds :* Honjo. *Uchida Beds :* Nitō. *Satsuka Beds :* Asuka. *Hijikata Beds :* Hosoya. Musashinos.

Living.—Northern, Central and Western Japan.

118. Limopsis chitaniana, n. sp.

Pl. XXXIX. Figs. 11, 12.

Shell small, moderately thick, rather compressed, somewhat obliquely ovate, length equal to height or a little greater, rounded both in front and behind, though more sharply in front, with postero-dorsal border almost straight and steeply sloping. Surface radiately striated, with striae usually alternately large and small, and often somewhat sinuous. Inner border flattened, smooth. Teeth about eight, both in front and behind.

The largest example we possess is a right valve measuring 9 millim. in length, 9.5 millim. in height and 2.7 millim. in depth, while the largest left is 7.2 millim. in length and height, and 2.2 millim. in depth.

This species greatly resembles the preceding, though decidedly more triangular in outline. Besides, the inner border is not crenate.

Frequent.

Fossil occurrence.—*Satsuka Beds :* Asuka.

Family Ledidae

119. Leda confusa, Hanley

Leda confusa. Yokoyama, Foss. Up. Musash., p. 195, pl. XVII, fig. 4. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 29. Moll. Tert. Basin Chichibu, p. 124. Tert. Moll. Mino. p. 226. Neog. Shells Kozuké a. Oth. Prov., p. 229.

Rare.

Fossil occurrence.—*Horinouchi Beds:* Senba. *Satsuka Beds:* Asuka; Dainichi. Pliocene of Mino, Kozuké and Chichibu. Shirado Beds. Upper Musashino.

Living.—Central Japan. China Sea.

RCM23529
RCM23530

Family Nuculidae

120. Nucula mirabilis, A. Adams et Reeve

Nucula mirabilis. Yokoyama, Foss. Miura Penin., p. 180, pl. XIX, fig. 9. Foss. Moll. Neog. Izumo, p. 9. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 30. Moll. Rem. Mid. Part, p. 21, pl. III, fig. 6. Moll. Tert. Basin. Chichbu, p. 125. Tert. Moll. Shiobara, p. 137. Moll. Foss. Tert. Mino, p. 226. Neog. Shells Kozuké a. Oth. Prov., p. 230.

Only a few examples.

Fossil occurrence.—*Horinouchi Beds:* Ishigami. *Uchida Beds:* Hatsumma. Pliocenes of Mino, Chichibu, Sagami and Izumo. Minato Beds. Shirado Beds. Musashinos.

Living.—Central and Western Japan.

RCM23531

121. Nucula insignis, A. Adams

Nucula insignis. Yokoyama, Foss. Miura Penin., p. 179, pl. XIX, figs. 7, 8. Foss. Up. Musash., p. 190. Foss. Shells Saishu, p. 7. Moll. Rem. Lowest Part Jô-Ban Coalf., p. 21. Moll. Rem. Upperm. Part Jôb. Coalf., p. 30.

Rarely found.

Fossil occurrence.—*Satsuka Beds:* Dainichi. Asagai Beds. Shirado Beds. Musashinos.

Living.—Northern Japan.

Family Solemyidae

RCM23532

122. Solemya sp.

An ill-preserved specimen whose specific determination is not possible.

Fossil occurrence.—*Horinouchi Beds:* Kumomyo.

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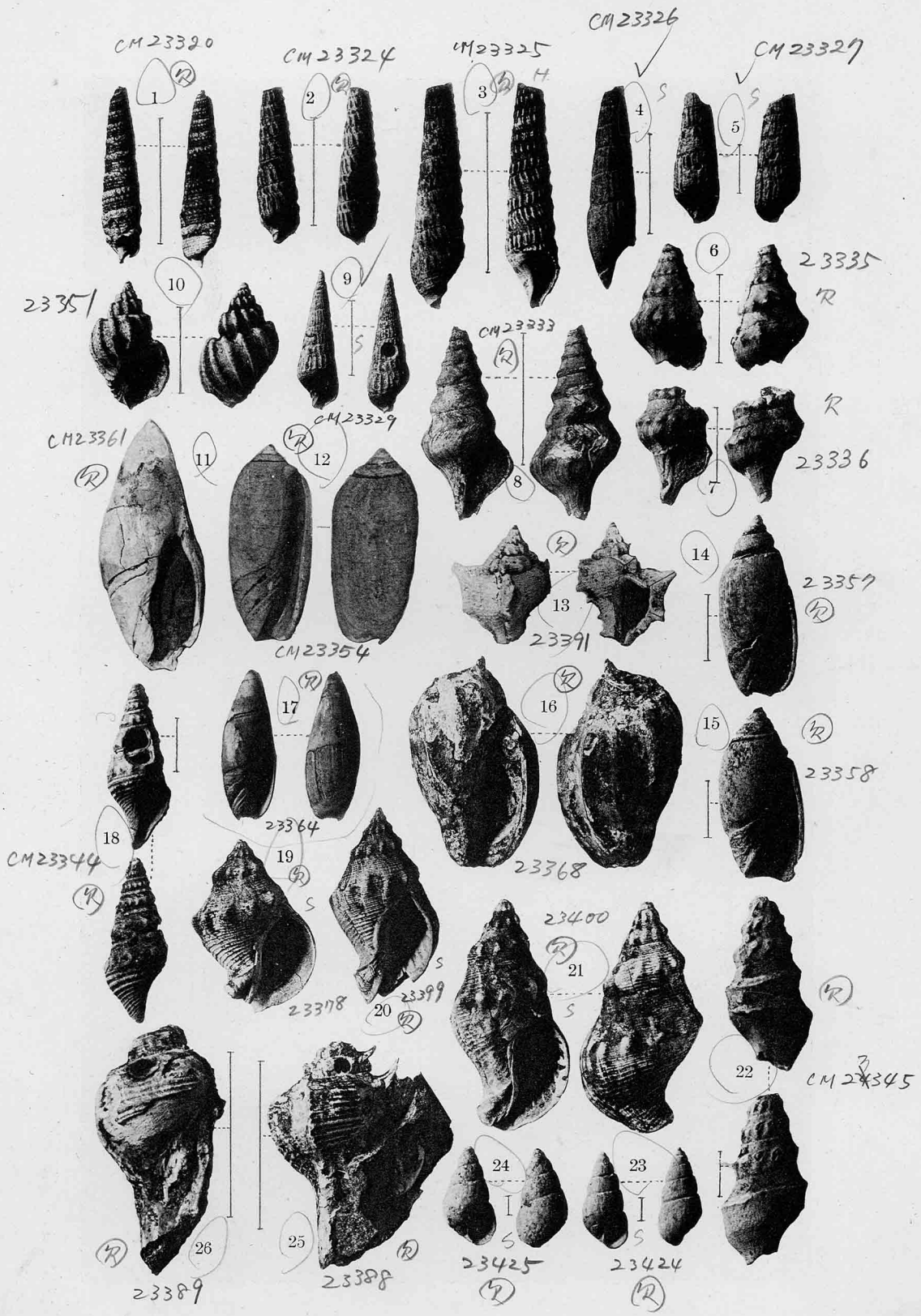

M. Yokoyama: Tertiary Mollusca from Southern Tôtômi.

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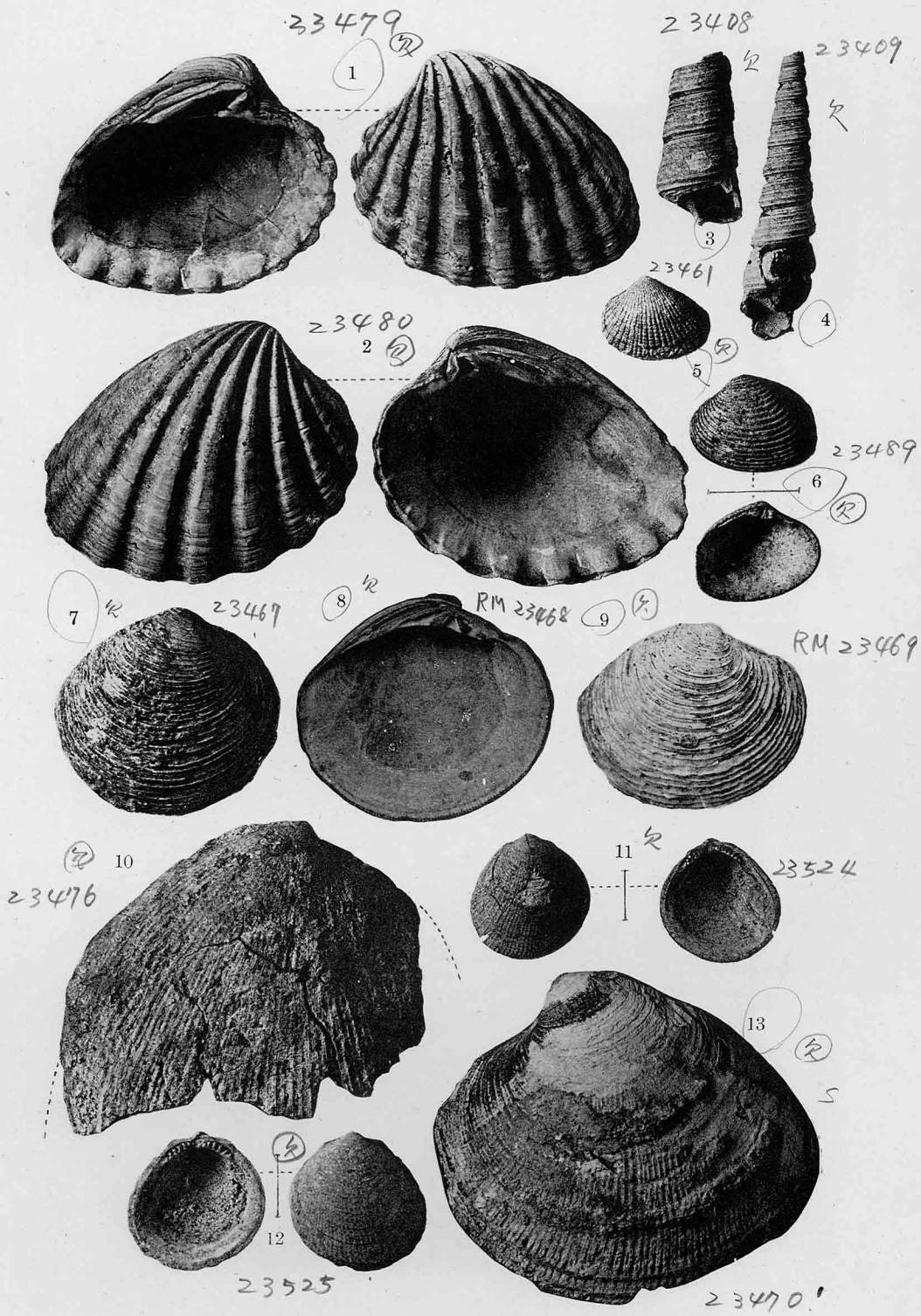
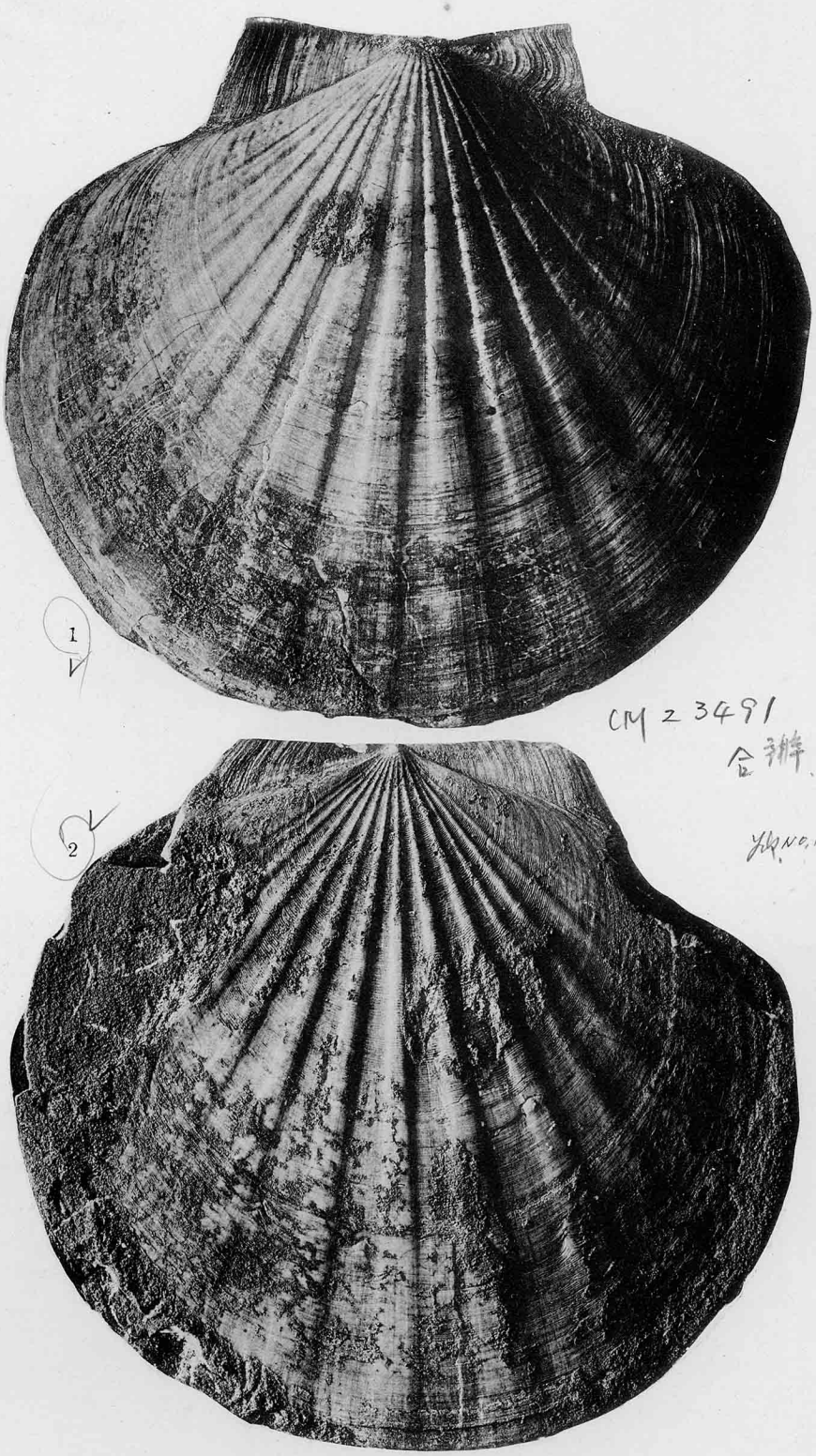


M. Yokoyama: Tertiary Mollusca from Southern Tôtômi.

Plate XL

Figs. 1, 2. Pecten praesignis Yok. 1. Right valve. 2. Left valve. This is the specimen kept in the Geological Institute of the Imperial University of Tokyo on which the species was first founded. The place where it was found is not known, although probably it is from some part of Southern Tôtômi. But so much is certain that it is not from Asuka where many specimens of this species were collected, because it is coloured whitish grey, while the fossils of Asuka are all tinged with light yellow due to the infiltration of oxide of iron. P. 357



M. YOKOYAMA: Tertiary Mollusca from Southern Tôtômi.

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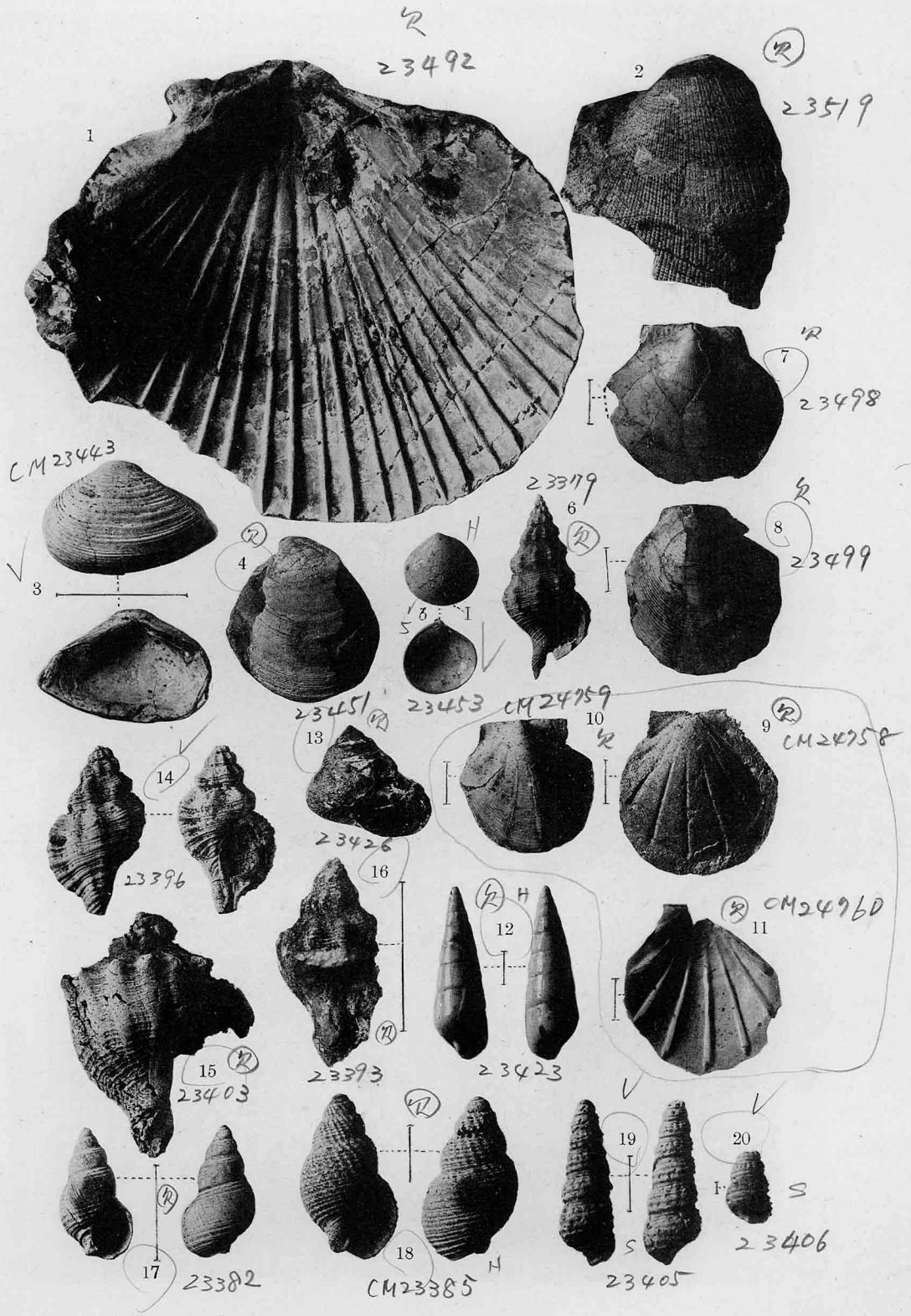

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