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JOURNAL OF THE COLLEGE OF SCIENCE, TOKYO IMPERIAL UNIVERSITY.
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Fossils from the Upper Musashino of Kazusa and Shimosa.

By

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With 17 Plates.

General Remarks

The Upper Musashino Formation[1] which consists of horizontal interstratified layers of clays, sands and gravels overlaid only by a brown unstratified loam generally believed to be Pleistocene in age, though without any palaeontological evidence, forms a low but extensive plateau around Tokyo whose height above the sea-level varies from a little over ten metres near the sea-coast up to more than a hundred in the interior. This plateau is variously dissected by valleys along whose sides it often shows steep escarpments fairly well exposing the rock-layers of which it is composed. In these escarpments there is frequently a sand-layer more or less filled with fossils which are mainly Mollusca, and therefore usually known under the name of *shell-layer* which is found, not only in and around the city of Tokyo,[2] but also in Kazusa and Shimosa,

1) Explained in my paper entitled "Fossils from the Miura Peninsula and its Immediate North" (Art. 6, Vol. XXXIX, Jour. Coll. Sci., Imp. Univ. Tokyo, 1920).

2) The fossils found in and around Tokyo have already been studied by David Brauns in his "Geology of the Environs of Tokio" (Mem. Sci. Departm. Tokio Daigaku, No. 4, 1885) and S. Tokunaga in his "Fossils from the Environs of Tokyo (Art. 2, Vol. XXI, Jour. Sci. Coll. Imp. Univ. Tokyo, 1906). Brauns described 87 species of Mollusca and Brachiopoda all of which he identified with the living forms and still called them Pliocene. Tokunaga recognized 168 species of Mollusca of which he found a little more than 20 not known to him as living (he says that at least 10 are surely extinct). But unfortunately he ignored many of the small-sized shells, as difficult of determination, whereby the percentage of extinct forms against the living became not quite correct. Consequently his conclusion, drawn from it, that the layer is probably Pleistocene can not be called quite certain. It is here to be noted that most of the shells described by Brauns and Tokunaga are also found among those described by me in this paper.

provinces lying to the east of it. The Mollusca and the Brachiopoda described in the present paper are those obtained from the shell-layer of the latter.

The position which this shell-layer occupies in the Upper Musashino is not far from the overlying loam, though at various distances from it. At Oji, a northern suburb of Tokyo, where Brauns and Tokunaga obtained a great deal of their materials,[1] the shell-layer is given by them as separted from loam by layers of clays, sands and gravels which together make up a thickness of about 4,3 metres, and which, according to Tokunaga, grows to about 6,6 metres at Tabata, a place about 3 kilometres south-east of Oji, and diminishes to about 2,5 metres at Shinagawa[2], a suburb at the southern extremity of Tokyo. At Ōtake, Shimosa, the intervening layer is a sand about 3,6 metres in thickness, while at Shitō, Kazusa, it is between 2 and 4 metres. From these we know that the shell-layer occupies a position very near to the upper boundary of the Upper Musashino Formation.

As to the thickness of the shell-layer itself, it is sometimes considerable. At Ōtake and Takatano-Seki, it attains a thickness of nearly 7 metres in which shells are in such close heaps that the layer is to a greater part made up of them.

The loam and the underlying layers of the Upper Musashino are generally conformable with one another. But at Kido, Tegamura, on the south bank of Tega Swamp in Shimosa, the shell-layer is superposed on a yellowish clay whose surface is full of deep pits and holes, and this clay which is about 1,5 metres thick on an average is again on a blue clay whose surface is very uneven.

The localities from which the fossils have been collected are in all six, viz.:

1. Ōtake, Shimosa.[3] Very near the railway station of Manzaki on the Abiko-Sawara line.

1) I have been collecting these fossils for more than 15 years, during which time I was assisted by several gentlemen among whom I may mention Messrs, N. Fukuchi, M. Ōyu, T. Ogura, T. Matsumoto and S. Tsuboi, to whom my thanks are due.

2. The shell-layer formerly exposed at Oji, Tabata and Shinagawa is at present not accessible for collection.

3) 下總印旛郡八生村大竹

2. Kioroshi, Shimosa.[1] About 14 kilometres west of Otake and close to the railway station of the same name on the same line as above.

3. Kamenari, Shimosa.[2] About 4 kilometres south-west of Kioroshi.

4. Tega, Shimosa.[3] On the south bank of the swamp of the same name and about 8 kilometres west of Kioroshi. The fossil-layer is exposed at several places of which Kido and Kizaki are the most important.

5. Shisui, Shimosa.[4] About 8 kilometres south of Otake, and in a railway-cutting of the station of the same name on the Narita-line.

6. Shitō. Kazusa.[5] At places from 1,5 to 3,5 kilometres south of the railway-station of Honda on the Bōsō line, which lies about 22 kilometres south of Shisui. The shell-layer is exposed at several places of which three may be mentioned, Semata-no-Seki, Takata and Takatano-Seki.

The number of species of the Mollusca and the Brachiopoda collected in the above named localities amounts to 335 in all, as shown in the following table :

MOLLUSCA	Ōtake	Shisui	Kamenari	Kioroshi	Tega	Shitō	Lower Musashino	LIVING
Gastropoda								
Family Actaeonidae.								
1. Solidula strigosa (Gld.)	+	..	..	..	..	+	..	Central, Western, Southern Japan.
2. Solidula clathrata Yok.	..	..	..	..	..	+	..	
3. Leucotina gigantea (Dkr.)	+	..	..	..	..	+	..	Japan (Dunker).
Family Tornatinidae.								
4. Tornatina exilis Dkr.	+	+	..	..	+	+	..	Western Japan.
5. Tornatina longispirata Yam.	+	..	..	..	+	..	..	
6. Retusa globosa Yam.	+	+	..	..	..	+	..	
7. Retusa truncata Yam.	+	..	..	..	..	+	..	
8. Retusa minima Yam.	+	..	..	..	..	+	+	
9. Volvula angustata (Ad.) var.	+	..	..	..	..	+	..	Northern Japan. Philippines. N. Guinea.

1) 下總印旛郡木下町　2) 同郡大杜村龜成　3) 東葛飾郡手賀村城戸，木崎　4) 上總市原郡市東村瀬又ノ堰，高田，高田ノ堰

		Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Inower Musashiino	LIVING
10.	Volvula acutaeformis Yok.	..	..	..	..	..	+	..	
	Family Scaphandridae								
11.	Cylichna musashiensis Tok.	+	+	..	..	..	+	+	Central Japan.
	Family Philinidae.								
12.	Philine scalpta Ad.	..	+	..	..	..	..	..	Central and Western Japan.
13.	Philine pygmaea Yok.	..	+	..	..	..	..	..	Central Japan.
14.	Philine takatensis Yok.	..	..	..	..	..	+	..	
	Family Bullidae.								
15.	Bulla multiarata Yok.	..	..	..	..	..	+	..	
16.	Bulla ovula Sow.	..	+	..	..	..	..	..	Central and Southern Japan.
	Family Ringiculidae.								
17.	Ringicula musashinoensis Yok.	+	+	..	+	+	+	+	Central Japan.
	Family Terebridae.								
18.	Terebra lischkeana Dkr.	+	..	..	..	..	+	+	Central and Western Japan.
19.	Terebra gotoensis Smith.	+	..	..	..	..	..	..	Western Japan.
20.	Terebra hedleyi Pils.	+	..	..	..	..	..	..	Western Japan.
21.	Terebra recticostata Yok.	..	+	..	..	..	..	+	
22.	Terebra chibana Yok.	+	..	..	..	..	+	..	
23.	Terebra smithi Yok.	+	..	..	..	..	..	..	Central Japan.
24.	Terebra quadriarata Yok.	..	..	..	..	..	+	..	
25.	Terebra latisulcata Yok.	..	..	..	..	..	+	..	
26.	Terebra suavidica Yok.	..	..	..	..	..	+	..	
27.	Terebra tsuboiana Yok.	..	..	..	+	..	+	..	Central Japan.
28.	Parviterebra raritans Yok.	+	..	..	..	..	..	..	
	Family Pleurotomidae.								
29.	Pleurotoma vertebrata Smith.	+	+	+	..	..	+	..	Central and Western Japan.
30.	Genotia pseudopannus Yok.	+	..	..	..	..	+	..	
31.	Genotia ogurana Yok.	+	..	..	..	..	..	+	
32.	Drillia principalis Pils.	+	..	..	..	+	..	+	Northern, Central and Western Japan.
33.	Drillia subauriformis Smith.	+	..	+	..	..	..	..	Central and Western Japan.
34.	Drillia glabriuscula Yok.	..	..	..	..	..	+	..	
35.	Mangilia deshayesii Dkr.	+	..	..	..	+	..	+	Central and Western Japan
36.	Mangilia ojiensis Tok.	..	..	..	..	..	+	..	
37.	Mangilia fukuchiana Yok.	+	..	..	..	..	..	..	Central Japan.
38.	Mangilia (Cythara) rugosolabiata Yok.	+	..	..	..	..	..	..	
39.	Mangilia (Cythara) oyuana Yok.	..	+	..	..	..	..	..	

		Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
40.	Bela rugulata Tros. var. schneideri Harm.	+	..	..	..	..	..	..	(Fossil in English Crag).
41.	Bela recticostulata Yok.	..	..	..	..	..	+	..	
	Family Cancellariidae.								
42.	Cancellaria spengleriana Desh.	+	..	+	+	+	+	+	From Central Japan to Australia.
43.	Cancellaria nodulifera Sow.	+	..	+	..	+	+	..	Central and Western Japan.
44.	Cancellaria asperula Lam. var. reeveana Crosse.	+	..	..	..	+	+	..	From Central Japan to Philippines.
	Family Olividae.								
45.	Olivella fortunei (Ad.)	+	+	+	+	+	+	..	Central Japan, China.
46.	Olivella spretoides Yok.	..	..	..	..	..	+	..	
47.	Ancilla hinomotoensis Yok.	..	..	..	..	..	+	..	
	Family Marginellidae.								
48.	Marginella cotamago Yok	..	..	..	..	..	+	..	Central Japan.
49.	Marginella perovulum Yok.	..	..	..	..	..	+	..	
	Family Volutidae.								
50.	Voluta megaspira Sow.	..	..	..	..	..	+	+	Northern, Central and Western Japan.
	Family Mitridae.								
51.	Mitra hondana Yok.	..	..	..	..	..	+	..	
52.	Mitra pirula Yok.	..	..	..	..	..	+	..	
	Family Fasciolariidae.								
53.	Fusus perplexus Adams.	+	+	..	..	+	+	+	Northern, Central and Western Japan.
54.	Fusus coreanicus Smith.	+	+	..	..	..	+	..	Western Japan.
55.	Fusus niponicus Smith.	..	..	..	..	..	+	+	Central Japan (52 fathoms).
	Family Buccinidae.								
56.	Chrysodomus arthriticus Val.	+	+	+	+	+	+	..	Northern Japan.
57.	Chrysodomus schrencki Yok.	..	..	..	..	..	+	+	Northern Japan.
58.	Sipho obesiformis Yok.	..	..	..	..	..	+	+	
59.	Sipho (Parasipho) niponicus Yok.	+	..	..	..	..	..	..	(Very close to S. Kroeyeri Möll. of the Arctic).
60.	Siphonalia spadicea Rve.	..	..	..	..	..	+	..	Northern and Central Japan.
61.	Siphonalia trochulus Rve.	+	+	+	..	+	+	+	Central Japan.
62.	Siphonalia kellettii Forbes.	..	..	..	..	..	+	..	Central to Southern Japan. California.
63.	Volutharpa perryi Jay.	+	+	..	..	..	+	+	Northern and Central Japan.
64.	Eburna japonica Rve.	+	+	..	..	+	..	..	Northern to Southern Japan.

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family Nassidae.								
65. Nassa (Hima) japonica Ad.	+	+	+	..	+	+	..	Central and Western Japan.
66. Nassa (Hima) festiva Pow.	+	..	..	..	+	+	+	Northern, Central and Western Japan.
67. Nassa (Hima) fraterculus Dkr.	+	..	..	..	..	..	..	Northern, Central and Western Japan.
Family Columbellidae.								
68. Columbella (Atilia) burchardi Dkr.	..	..	..	..	..	+	+	Western Japan.
69. Columbella (Atilia) smithi Yok.	+	..	+	..	+	..	..	Central Japan.
70. Columbella (Atilia) turriculata Yok.	+	..	..	..	..	..	..	
71. Columbella (Atilia) praecursor Yok.	+	..	..	..	+	+	..	Western Japan.
72. Columbella (Atilia) masakadoi Yok.	+	..	..	..	+	+	..	Central Japan.
73. Columbella (Mitrella) dunkeri Tryon.	+	+	+	..	+	+	+	Northern, Central and Western Japan.
Family Muricidae.								
74. Trophon pachyrhaphe Sm.	..	..	..	..	+	..	..	Western Japan.
75. Trophon subclavatus Yok.	..	..	..	..	+	+	+	(Very close to T. clavatus Sars of boreal seas).
76. Typhis arcuatus Hinds.	..	..	..	..	..	+	..	Western Japan, China, Cape of Good Hope.
77. Ocinebra falcata Sow.	..	..	..	..	+	+	..	Northern, Central and Western Japan.
78. Ocinebra spectata Yok.	+	+	..	..	..	+	..	Central Japan.
79. Rapana bezoar L. v. thomasiana Cr.	+	+	..	+	+	+	..	Northern, Central and Western Japan.
80. Purpura heysiana Dkr.	..	..	..	..	..	+	..	Central Japan.
Family Tritonidae.								
81. Triton tenuiliratus Lke.	..	..	..	..	..	+	..	Central and Western Japan.
82. Priene oregonensis Redf.	..	..	..	..	..	+	+	North. Japan, Alaska, Oregon, Chile, Strait of Magellan.
Family Cassididae.								
83. Cassis strigata Gmel.	+	..	..	..	+	..	..	Central and Western Japan.
Family Doliidae.								
84. Dolium luteostomum Küst.	+	+	..	+	+	+	+	Central and Western Japan, Indian Ocean.
Family Cypraeidae.								
85. Erato callosa Ad. et Rve.	+	..	..	..	..	+	..	Central and Western Japan, China.
Family Strombidæ.								
86. Strombus japonicus.	+	..	..	..	..	..	..	Central and Western Japan, Bonins.

	Otake.	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family Cerithiidae.								
87. Cerithium (Clava) kochi Phil.	+	..	..	..	..	..	..	Centr. and West. Japan. East Africa.
88. Potamides (Tympanotonos) fluviatilis Mich. et Post.	+	..	..	..	..	..	+	Centr. and West. Japan, Philippines. Indian Ocean.
89. Potamides (Batillaria) zonalis Brug.	+	..	+	..	..	..	..	North., Centr., West. Japan, Hongkong, Australia.
90. Potamides (Batillaria) multiformis Lke.	..	..	+	..	..	+	+	Northern, Central and Western Japan.
Family Cerithiopsidae.								
91. Cerithiopsis nodosocostatus Yok.	..	..	..	..	..	+	..	
92. Cerithiopsis (Seila) trisulcatus Yok.	..	..	..	..	..	+	..	
Family Triforidae.								
93. Triforis otsuensis Yok.	...	..	..	..	..	+	+	Central Japan.
94. Triforis multigyrata Yok.	..	..	..	..	..	+	..	
Family Trichotropidae.								
95. Trichotropis unicarinata Br. et Sow.	..	..	..	..	..	+	..	Northern to Western Japan.
Family Vermetidae.								
96. Thylacodes medusæ Pils.	+	..	..	..	..	..	+	Central to Southern Japan.
Family Caecidae.								
97. Cæcum vitreum Carp.	..	..	..	..	..	+	..	Central and Western Japan.
Family Melaniidae.								
98. Melania niponica Smith.	+	..	..	..	+	..	..	Central Japan.
Family Solariidae.								
99. Solarium (Philippia) cingulum Kien.	..	..	..	..	..	+	..	Central Japan, Philippines, South Sea.
100. Solarium (Philippia) pseudoperspectivum Broc.	..	..	..	..	..	+	..	Central Japan, Mediterranean Sea. (Pliocene of Italy).
101. Torinia elegantula Yok.	..	..	..	..	..	+	..	
Family Rissoidae.								
102. Rissoa (Cingula) plebeja Yok.	..	..	..	..	..	+	..	
103. Rissoina (Moerchiella) manzakiana Yok.	+	..	..	..	..	..	..	
104. Fenella septentrionalis Tok.	+	..	..	..	+	..	..	Central Japan.
Family Skeneidae.								
105. Skenea nipponica Yok.	..	+	..	..	+	..	+	Central Japan.
106. Skenea planorboides Yok.	..	..	..	..	..	+	..	Central Japan.

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family Capulidae.								
107. Capulus badius Dkr.	..	..	+	..	..	..	..	Western Japan.
108. Calyptraea mammilaris Brod,	..	..	..	..	..	+	+	West coast of America (Oregon to Magellan).
109. Crepidula grandis Midd.	..	..	..	..	..	+	..	Northern to Western Japan, Behring Sea.
Family Naticidae.								
110. Natica janthostoma Desh.	+	+	.	..	+	+	+	Northern and Central Japan, Kamchatka.
111. Polinices powisianus Recl.	+	..	..	..	..	..	..	Central and Western Japan, Philippines.
112. Polinices (Neverita) ampla Phil.	+	+	+	+	+	+	+	Northern and Central Japan, China, Australia.
113. Sigaretus (Eunaticina) papilla. Gm.	+	+	+	..	+	+	..	Central and Western Japan, Philippines.
114. Sigaretus (Eunaticina) oblongus Rve.	..	..	..	..	..	+	..	Habitat unknown.
Family Scalariidae.								
115. Scalaria aurita Sow.	+	..	..	+	..	..	..	Central Japan.
116. Scalaria maculosa Ad. et Rve.	+	..	..	..	..	..	..	Western Japan, China Sea.
117. Scalaria azumana Yok.	+	..	..	..	+	+	..	Central Japan.
118. Scalaria kazusensis Yok.	..	..	..	..	..	+	..	Central Japan.
119. Scalaria yamakawai Yok.	+	..	..	..	..	..	..	Central Japan.
120. Scalaria conjuncta Yok.	..	..	..	..	+	+	..	
121. Scalaria subfrondicula Yok.	..	..	..	..	..	+	..	
122. Scalaria picturata Yok.	..	..	..	..	..	+	..	Central Japan.
Family Eulimidae.								
123. Eulima (Leiostraca) unicincta Yok.	+	..	..	..	..	+	..	
124. Eulima (Leiostraca) tokunagai Yok.	+	..	..	..	+	..	..	
125. Eulima (Leiostraca) glabroides Yok.	..	..	..	..	..	+	..	
126. Eulima (Leiostraca) krishna Yok.	..	..	..	..	..	+	..	
Family Pyramidellidae.								
127. Pyramidella (Tiberia) pulchella Ad.	+	..	+	..	+	..	..	Central and Western Japan.
128. Pyramidella (Agatha) virgo Ad. var. brevis Yok.	+	+	+	..	+	+	..	P. virgo lives in Central Japan.
129. Pyramidella (Syrnola) cinnamomea Ad.	+	..	..	..	..	..	..	Western Japan.
130. Pyramidella (Iphiana) mira Yok.	..	..	..	..	..	+	..	

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
131. Pyramidella (Iphiana) siva Yok.	..	..	..	..	..	+	..	
132. Pyramidella (Actæopyramis) eximia Lke.	+	+	..	..	+	+	..	Central and Western Japan.
133. Odostomia sublimpida Yok.	+	..	..	..	..	..	+	
134. Odostomia gordonis Yok.	+	+	..	+	+	+	..	Central Japan.
135. Odostomia shimosensis Yok.	+	..	..	+	..	..	..	Central Japan.
136. Odostomia limpida D. et B.	+	..	..	..	..	+	..	Western Japan.
137. Odostomia desimana D. et B.	+	+	..	..	..	+	..	Central and Western Japan.
138. Odostomia kizakiensis Yok.	..	..	..	..	+	..	..	
139. Odostomia venusta Yok.	+	+	..	+	..	+	..	
140. Odostomia toneana Yok.	+	..	..	..	+	..	..	
141. Odostomia suboxia Yok.	+	..	..	..	..	..	..	Central Japan.
142. Odostomia (Odetta) neofelix Yok.	..	+	..	..	..	..	..	Central Japan.
143. Odostomia (Egilina) marielloides Yok.	+	..	..	..	+	..	..	
144. Turbonilla (Ptycheulimella) misella Yok.	+	..	..	..	+	..	..	
145. Turbonilla (Chemnitzia) imbana Yok.	..	+	..	..	+	+	..	Central Japan.
146. Turbonilla (Mormula) paucicostulata Tok.	+	..	..	..	..	+	..	
147. Turbonilla (Mormula) scrobiculata Yok.	+	..	..	..	..	..	..	Central Japan
148. Turbonilla (Chemnitzia) kidoensis Yok.	..	..	..	..	+	..	..	Central Japan.
149. Turbonilla (Chemnitzia) teganumana Yok.	..	..	..	..	+	..	..	Central Japan.
150. Turbonilla (Chemnitzia) sematana Yok.	..	..	..	..	..	+	..	
151. Turbonilla (Pyrgolampros) planicostata Yok.	..	+	..	..	..	..	..	Central Japan.
152. Turbonilla (Strioturbonilla) sagamiana Yok.	+	..	..	..	..	..	..	Central Japan.
153. Turbonilla (Strioturbonilla) pacifica Yok.	..	..	..	..	..	+	..	Central Japan.
154. Turbonilla (Cingulina) triarata Pils.	+	+	..	..	..	..	..	Western Japan.
155. Turbonilla (Careliopsis) obscura Yok.	..	..	..	..	..	+	..	
156. Turbonilla (Careliopsis) angulifera Yok.	..	..	..	..	..	+	..	

	Otake.	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family Turbinidae.								
157. Turbo (Marmorostoma) granulatus Gm.	+	..	..	..	..	..	..	Central and Western Japan, China, Indian Ocean.
158. Leptothyra purpurescens Dkr.	+	+	..	..	+	+	+	Japan (Dunker).
159. Leptothyra pygmaea Yok.	..	..	..	..	+	..	..	Central Japan.
160. Leptothyra crassilirata Yok.	..	..	..	..	+	..	..	Central Japan.
Family Trochidae.								
161. Trochus spinigera Yok.	..	..	..	..	..	+	..	
162. Minolia tasmanica Tenison Wood.	+	..	..	..	..	+	..	Tasmania.
163. Solariella philippensis Wats.	+	..	..	..	+	+	..	Central Japan, Southern Australia.
164. Solariella angulata Tok.	..	..	..	..	..	+	..	
165. Turcica imperialis A.Ad.	..	..	..	..	..	+	+	Northern, Central and Western Japan.
166. Calliostoma unicum Dkr. var. shinagawensis Tok.	+	+	..	..	+	+	..	C. unicum lives in N.-W. Japan
167. Basilissa ? laeviuscula Yok.	..	..	..	..	..	+	..	
168. Umbonium giganteum Les.	..	..	..	..	+	..	+	Central and Western Japan.
169. Umbonium costatum Val.	+	+	..	+	+	+	+	Northern, Central and Western Japan.
Family Cyclostrematidae.								
170. Cyclostrema stillicidiatum Yok.	..	..	..	..	..	+	..	
Family Stomatellidae.								
171. Stomatella lyrata Pils.	+	..	..	..	+	..	..	Northern, Central and Western Japan.
Family Fissurellidae.								
172. Macroschisma sinensis Ad. var. laevis Yok.	+	..	..	..	+	..	+	Central Japan, China Singapore.
173. Puncturella nobilis Ad.	..	..	..	..	..	+	..	Northern Japan.
174. Emarginula vadososinuata Yok.	..	..	..	..	..	+	..	
Family Patellidae.								
175. Helcioniscus pallidus Gld.	..	..	..	..	..	+	+	Northern and Central Japan.
Scaphopoda								
Family Dentaliidae.								
176. Dentalium weinkauffi Dkr.	+	+	..	+	+	+	+	Central Japan.
177. Dentalium octogonum Lam.	+	..	..	..	..	+	..	Central to Southern Japan, China, Australia, Ceylon.
178. Dentalium edoense Tok.	+	+	..	..	+	+	..	

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Misashino	LIVING
179. Dentalium (Fustiaria) nipponicus Yok.	..	..	..	..	..	+	..	
Lamellibranchiata.								
Family Pholadidae.								
180. Pholas fragilis Sow.	+	..	..	..	..	..	+	Northern to Western Japan, Philippines.
181. Jouannetia kamakurensis Yok.	..	..	..	..	..	+	..	Central Japan.
Family Saxicavidae.								
182. Panope generosa Gld.	+	..	..	..	+	+	..	Northern Japan, Washington to California. (Fossil in Miocene to Pleistocene of the West.)
183. Saxicava orientalis Yok.	..	..	..	..	..	+	+	
Family Corbulidae.								
184. Corbula erythrodon Lam.	+	..	..	+	..	..	..	Central and Western Japan.
185. Corbula venusta Gld.	+	+	+	..	+	+	+	Northern Japan.
186. Corbula frequens Yok.	+	+	..	..	+	+	..	
187. Corbula pustulosa Yok.	+	+	..	..	..	..	..	
188. Corbula sematensis Yok.	..	..	..	..	..	+	..	
189. Corbula pygmæa Yok.	+	..	..	+	+	..	..	
190. Corbula substricta Yok.	..	..	..	..	..	+	..	
Family Myacidae.								
191. Cryptomya busoensis Yok.	+	..	+	..	..	..	..	Central Japan.
Family Mactridae.								
192. Mactra sulcataria Desh.	+	+	+	+	+	+	..	Northern to Southern Japan. North China, Possiet Bay.
193. Mactra veneriformis Desh.	+	..	..	..	+	..	+	Northern to Western Japan, North China.
194. Mactra ovalina Lam.	+	+	..	..	+	..	..	Central Japan, Puget Sound in British Columbia.
195. Mactra dunkeri Yok.	..	+	..	..	+	..	..	Central Japan.
196. Mactra sachalinensis Schr. var. imperialis Yok.	+	+	..	..	..	+	..	Typical form lives in North. and Cent. Japan.
197. Spisula grayana Schr.	..	..	..	..	..	+	..	North. Japan, Behring Sea, Massachusetts.
198. Spisula bernardi Pils.	..	..	..	+	..	+	..	Western Japan.
199. Raeta yokohamensis Pils.	+	+	+	..	+	..	..	Central Japan.
200. Raeta pellicula Desh.	+	..	..	..	..	..	..	Japan (Reeve).
201. Raeta elliptica Yok.	..	..	+	+	+	..	..	
202. Raeta magnifica Yok.	..	..	..	..	+	..	..	
203. Tresus nuttalli Conr.	+	+	..	..	+	+	..	North. to West. Japan, Alaska to San Diego. (Pliocene and Pleistocene of California).
204. Lutraria maxima Jon.	+	..	..	+	..	+	..	Western Japan.

	Otake.	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family So'enidae.								
205. Solen grandis Dkr.	+	..	..	..	+	..	..	Central and Western Japan, Philippines.
206. Solen krusensternii Sch.	+	+	+	..	+	+	..	Northern Japan.
207. Siliqua pulchella Dkr.	+	..	..	..	+	..	..	Central and Western Japan.
208. Solecurtus divaricatus Lke.	+	..	..	..	+	+	..	Central and Western Japan.
Family Donacidae.								
209. Donax introradiatus Rve.	..	..	..	..	+	..	..	Central Japan.
Family Psammobiidae.								
210. Psammobia kazusensis Yok.	..	..	..	..	..	+	..	
211. Soletellina violacea Lam.	+	..	+	+	..	..	..	Northern to Western Japan. Philippines.
212. Soletellina olivacea Jay.	+	+	..	..	..	+	..	Northern to Western Japan, Cheefoo.
Family Tellinidae.								
213. Tellina jedoensis Lke.	+	..	..	..	+	..	..	Central and Western Japan.
214. Tellina venulosa Sohr.	+	..	..	+	+	+	..	Northern Japan, Okhotsk Sea.
215. Tellina nitidula Dkr.	+	+	+	..	+	+	+	Central and Western Japan.
216. Tellina alternata Say. var. chibana Yok.	+	..	+	..	..	+	..	Central Japan.
217. Tellina ojiensis Tok.	+	..	..	..	..	..	+	Northern and Central Japan.
218. Tellina miyatensis Yok.	+	..	+	+	+	+	+	
219. Tellina delta Yok.	+	..	+	+	+	..	..	Central Japan.
220. Macoma prætexta Mart.	+	+	..	..	+	+	..	Central and Western Japan.
221. Macoma nipponica Tok.	+	+	+	..	+	+	..	Northern Japan.
222. Macoma inquinata Desh.	..	..	+	..	..	..	+	Okhotsk Sea to W. Japan, Alaska to San Diego. (Pliocene and Pleistocene of California).
223. Macoma dissimilis Mart.	+	..	..	..	+	..	..	Central Japan.
224. Macoma secta Conr.	+	..	..	..	+	..	..	Centr. and West. Japan, California. (Pliocene and Pleistocene of California.)
Family Veneridae.								
225. Dosinia troscheli Lke.	+	+	+	+	+	+	+	Central and Western Japan.
226. Dosinia bilunulata Gray.	+	..	..	..	..	..	..	Central Japan.
227. Cyclina chinensis Chem.	+	..	..	..	+	..	+	North. to West. Japan, Cochin China.
228. Lucinopsis divaricata Lke.	..	..	..	..	..	+	..	Central and Western Japan.
229. Meretrix meretrix Linné.	+	..	+	+	+	..	..	North. Japan to Moluccas.
230. Meretix chinensis Chem.	+	+	+	..	+	+	+	North. to West. Japan, China Sea, Australia.
231. Sunetta excavata Hanl.	+	..	+	+	+	..	..	N. to W. Japan, South Australia

	Otake	Shisui	Kamonari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
232. Venus (Mercenaria) stimpsoni Gld.	+	+	..	..	..	+	..	Northern to Western Japan.
233. Venus jedoensis Lke.	+	..	..	+	+	..	+	Northern, Central and Western Japan.
234. Venus neastartoides Yok.	+	..	+	+	+	+	..	Central Japan.
235. Chione isabellina Phil.	+	+	..	..	+	..	+	Japan (Dunker), China Sea.
236. Chione mindanensis Sm.	..	..	..	..	..	+	..	Philippines (in depth of 52 fathoms).
237. Venerupis semipurpurea Dkr.	+	..	+	+	..	..	..	Northern to Western Japan.
238. Tapes euglyptus Phil.	..	..	..	+	..	..	..	Central and Western Japan.
239. Tapes philippinarum Ad. et Rve.	+	..	..	..	..	+	+	North. to West. Japan, Philippines.
240. Tapes variegatus Hanl.	+	+	+	+	+	..	+	Central and Western Japan. Philippenes.
241. Saxidomus purpuratus Sow.	+	+	..	+	..	+	+	North. to West. Japan, Bonin I. Sitka to California, Chile.
Family Cardiidae.								
242. Cardium burchardi Dkr.	..	..	+	..	+	..	..	Central and Western Japan.
243. Cardium californiense Desh.	+	+	..	..	+	+	+	North. to West. Japan, Behring Sea. British Columbia. California.
244. Cardium muticum Rve.	+	+	+	..	+	..	+	Northern to Western Japan. Philippines, East Indies.
345. Cardium modestum Ad. et Rve.	..	..	..	..	..	+	+	Central Japan.
246. Cardium braunsi Tok.	+	..	..	..	+	+	+	
247. Cardium tokunagai Yok.	+	+	..	..	+	+	..	
Family Leptonidae.								
248. Montacuta japonica Yok.	+	+	..	..	..	+	..	Central Japan.
249. Montacuta oblongata Yok.	..	..	..	..	..	+	..	
250. Montacuta yamakawai Yok.	..	+	..	..	..	..	..	
251. Thyasira trigonata Yok.	..	..	..	..	..	+	..	
Family Diplodontidae.								
252. Diplodonta usta Gld.	+	+	..	+	+	+	+	Northern and Central Japan.
253. Diplodonta japonica Phil.	+	..	+	+	..	..	+	Central Japan.
254. Diplodonta semiaspera Phil.	+	+	..	..	+	+	+	Centr. and West. Japan, Mazatlan, West Indies, Patagonia.
Family Lucinidae.								
255. Lucina pisidium Dkr.	+	+	..	..	+	..	+	North. to South. Japan. New South Wales.
256. Lucina borealis L.	+	+	..	..	+	+	+	Centr. Japan. Iceland to Mediterranean. (Miocene to Glacial of Europe).
257. Lucina contraria Dkr.	+	..	+	+	+	..	+	Central Japan.

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
Family Chamidae.								
258. Chama semipurpurata Lke.	+	..	..	..	..	+	+	Central to Southern Japan.
Family Carditidae.								
259. Venericardia cipangoana Yok.	+	+	+	+	+	+	+	Central and Western Japan. (Fossil in Miocene of Hokkaido).
260. Venericardia ferruginea Ad.	+	..	+	..	..	+	+	Central Japan.
261. Venericardia toneana Yok.	+	..	..	..	+	+	..	
Family Astartidae								
262. Astarte borealis Chem.	..	..	..	..	..	+	..	North. Japan. Arctic Seas. Britain.(Fossil in English Crag.)
263. Astarte hakodatensis Yok.	..	..	..	..	..	+	..	Northern Japan.
Family Crassatellidae.								
264. Crassatella oblongata Yok.	..	..	..	..	..	+	+	
265. Crassatella kioroshiana Yok.	..	..	..	+	..	..	..	
266. Crassatella heteroglypta Pils.	..	..	..	+	..	..	..	Central and Western Japan.
Family Cyrenidae.								
267. Corbicula sandaiformis Yok.	+	..	+	..	..	+	..	Central Japan.
268. Corbicula kobelti Yok.	+	..	..	..	..	+	..	Central Japan.
Family Pleurophoridae.								
269. Coralliophaga coralliophaga Chem.	..	..	..	..	..	+	..	Central and Western Japan. Red Sea. W. Indies.
270. Trapezium nipponicum Yok.	+	..	..	..	..	..	..	Central and Western Japan.
271. Trapezium ventricosum Yok.	+	..	..	..	..	..	..	
272. Trapezium liratum Rve.	+	..	..	..	..	..	..	Central Japan.
Family Cuspidariidae.								
273. Cuspidaria ligula Yok.	..	..	..	..	..	+	..	
Family Lyonsiidae.								
274. Lyonsia prætenuis Dkr.	+	..	..	..	..	..	..	Western Japan.
275. Entodesma naviculoides Yok.	..	..	..	..	..	+	..	
Family Myochamidae.								
276. Myodora fluctuosa Gld.	+	+	+	+	+	+	..	Western Japan.
277. Myodora reeviana Sm.	+	+	..	..	..	+	+	Western Japan, China.
Family Thraciidae.								
278. Thracia papyracea Poli.	+	..	+	..	..	..	..	Norway to Mediterranean.

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
279. Thracia transmontana Yok.	+	..	+	..	+	+	..	Central Japan.
280. Thracia sematana Yok.	..	..	..	..	..	+	..	
Family Poromyidae.								
281. Poromya flexuosa Yok.	..	..	..	..	..	+	..	
Family Mytilidae.								
282. Modiola barbata L.	+	..	..	..	+	+	..	Northern to Western Japan. Mediterranean Sea. (Fossil in English Crag).
283. Modiola modiolus L.	..	..	..	..	..	+	+	Northern to Western Japan. North Atlantic. (Pliocene of Europe).
284. Lithophaga zitteliana Dkr.	+	..	..	..	..	..	..	Western Japan.
285. Crenella divaricata Yok.	..	..	..	..	..	+	..	Central Japan.
Family Anomiidae.								
286. Anomia nipponensis Yok.	+	..	+	+	+	+	+	Northern, Central and Western Japan.
287. Anomia lunula Yok.	+	..	..	+	..	+	..	
288. Anomia sematana Yok.	..	..	..	..	..	+	..	
Family Limidae.								
289. Lima angulata Sow.	+	+	..	..	+	+	+	Northern and Central Japan. Philippines, Panama, New South Wales.
290. Lima subauriculata Mont.	+	+	..	..	+	+	+	Greenland to Mediterranean Sea. (Fossil in Miocene and Pliocene of Europe.)
291. Lima quantoensis Yok.	..	..	..	..	..	+	+	Central Japan.
292. Lima vulgatula Yok.	..	..	..	..	..	+	..	
Family Spondylidae.								
293. Spondylus cruentus Lke.	+	..	..	..	..	..	..	Central and Western Japan.
294. Plicatula cuneata Dkr.	..	..	+	..	..	..	..	Central and Western Japan.
Family Pectinidae.								
295. Pecten squamatus Gm.	+	..	..	..	+	..	+	Central and Western Japan. Philippines.
296. Pecten lætus Gould.	+	..	..	..	+	+	+	Northern, Central and Western Japan.
297. Pecten subplicatus Sow.	..	..	..	+	..	..	..	Western Japan, Philippines, Moluccas.
298. Pecten crassicostatus Sow.	..	..	..	..	..	+	+	Central to Southern Japan.
299. Pecten vesiculosus Dkr.	..	..	..	..	..	+	+	Central Japan.

	Otake	Shisui	Kamenari	Kiorogbi	Tega	Shito	Lower Musashino	LIVING
300. Pecten intuscostatus Yok.	..	..	..	..	..	+	+	
301. Pecten tokyoensis Tok.	+	..	..	..	..	+	+	
302. Pecten tissoti Bern.	..	..	..	..	..	+	..	Japan (Dunker).
303. Pecten laqueatus Sow.	+	+	+	+	+	+	+	Northern, Central and Western Japan.
304. Pecten excavatus Ant.	+	..	..	..	+	+	..	North. and Centr. Japan, China Sea.
305. Pecten tenuicostulatus Yok.	..	..	..	..	..	+	..	
Family Ostreidae.								
306. Ostrea gigas Thunb.	+	+	+	+	+	+	+	Northern, Central and Western Japan. Coast of Manchuria and Shantung
307. Ostrea denselamellosa Lke.	+	..	..	..	..	..	+	Northern to Southern Japan.
308. Ostrea musashiana Yok.	+	..	..	..	..	+	+	
Family Pinnidae.								
309. Pinna japonica Hanl.	..	..	..	..	..	+	..	Central and Western Japan.
Family Arcidae.								
310. Arca kobeltiana Pils.	+	..	..	..	..	+	+	Northern and Central Japan.
311. Arca symmetrica Rve.	+	..	..	..	..	..	+	Central Japan to Philippines.
312. Arca (Anomalocardia) granosa L.	+	+	+	..	+	+	..	Central Japan to Philippines.
313. Arca (Anomalocardia) inflata Rve.	+	+	..	..	..	+	..	Northern Japan to Philippines.
314. Arca (Scapharca) subcrenata Lke.	+	+	+	+	+	+	..	Central, Western and Southern Japan.
315. Pectunculus albolineatus Lke.	+	..	..	..	..	..	..	Central Japan.
316. Pectunculus vestitus Dkr.	+	..	+	+	+	..	+	Central Japan.
317. Pectunculus yessoensis Sow.	+	+	+	+	+	+	+	Northern Japan.
318. Pectunculus pilsbryi Yok.	..	..	..	..	..	+	+	
319. Pectunculus yamakawai Yok.	..	..	..	..	..	+	..	Central Japan.
Family Paral elodontidae.								
320. Parallelodon obliquatus Yok.	..	..	..	..	..	+	+	Northern and Central Japan.
321. Cucullaria orientalis Yok.	..	..	..	..	..	+	..	
Family Limopsidae.								
322. Limopsis woodwardi Ad.	+	..	..	..	+	..	..	Central Japan.
323. Limopsis crenata Ad.	+	..	..	..	..	..	+	Northern, Central and Western Japan.
324 Limopsis azumana Yok.	+	..	..	..	..	+	+	

	Otake	Shisui	Kamenari	Kioroshi	Tega	Shito	Lower Musashino	LIVING
325. Limopsis adamsiana Yok.	..	..	..	..	..	+	+	
326. Limopsis areolata Yok.	..	..	..	..	..	+	..	
327. Limopsis nipponica Yok.	..	..	..	+	..	+	..	
Family Ledidæ.								
328. Leda confusa Hanl.	..	+	+	..	+	+	..	Central Japan.
329. Leda ramsayi Sm.	..	..	..	..	..	+	+	New South Wales (at 950 fath.)
330. Yoldia notabilis Yok.	+	+	..	..	..	..	..	
Family Nuculidæ.								
331. Nucula insignis Ad.	+	+	..	..	..	+	+	Northern Japan.
MOLLUSCOIDEA.								
Brachiopoda.								
Family Terebratulidæ.								
332. Terebratella coreanica A. et R.	..	..	..	..	..	+	+	Northern, Central and Western Japan.
333. Terebratella pulvinata Gld.	..	..	..	..	..	+	+	Puget Sound, Washington.
334. Eudesia grayi Dav.	..	..	..	..	..	+	..	Northern, Central and Western Japan, California.
Family Rhynchonellidæ.								
335. Rhynchonella psittacea Chem. var. woodwardi Ad.	..	..	..	..	..	+	..	Northern to Western Japan.

The number of species yielded by each locality is as follows :

Ōtake	196 of which	164 or 83.6% are found in one or more of the other localities.
Shisui	81 of which	74 or 91.0% are found in one or more of the other localities.
Kamenari	56 of which	52 or 93.0% are found in one or more of the other localities.
Kioroshi	49 of which	44 or 90.0% are found in one or more of the other localities.
Tega	117 of which	99 or 84.6% are found in one or more of the other localities.
Shito	218 of which	192 or 88.0% are found in one or more of the other localities.

From this it is quite clear that the faunae of all the localities are very similar to one another. And this is what might be expected from the position of the shell-layer in which they were collected and which, seen from a geological point of view, can not be considered as representing more than a single horizon. And this horizon I propose to call *Manzakian* from the railway station of Manzaki[1] close to which the fossil locality of Ōtake lies.

1) Written Matsuzaki (松崎), but read *Manzaki*.

In the first place, the number of species which are not yet known to be living now, amount to 103, which make 30.7% of the whole fauna. But if we take into account 16 Pteropoda[1] already described by Yamakawa and Ishikawa from Semata-no-Seki in Shitō and which are all living, the above percentage becomes 29.3, which is a little more than one-fourth of the whole fauna. This percentage, though somewhat lower than that of the Lower Musashino (about 37%), must still be called a tolerably high one, if the overlying loam is really *Pleistocene* as is believed by many. Of course, as I have stated in the case of the Lower Musashino, also in this case, there is a possibility of the reduction of the above percentage by the discovery of so-called non-living forms as living. How far this reduction goes, it is at present impossible to say. Admitting, however, that it goes down to one-half which is very improbable, there still remain about 14.6% of non-living forms, making about one-seventh of the whole fauna. When we compare this percentage with those of the Crags of England, for instance with the 7% of the Norwich Crag and the 10% of the Red Crag which are both considered as Pliocene, I can not ascribe to the *Manzakian* an age younger than the *Uppermost Pliocene*. Sometimes the occurrence of *Elephas namadicus* Falc. et Cautl. is adduced against the Pliocene age of the layer. It is true that this elephant which was first discovered in the Narbada bed of India and subsequently also in China is usually considered Pleistocene.[2] But it must be remembered that it is still uncertain whether it is really distinct from *El. antiquus* Falc., a species which in Europe is not only *Lower Pleistocene*, but also *Upper Pliocene*. By so saying, however, I am far from denying the possibility of the layer being younger. I am only viewing the matter from the present

1) Some Pteropoda from the Neogene of Semata (Jour. Geol. Soc. Tokyo, vol. XIX, 1912). The described species are *Limacina inflata* (d'Orb.), Clio (Crescis) acicula Rang., *Clio* (*Crescis*) *virgula* Rang., *Clio* (*Styliola*) *subulata* Q. et G., *Clio pyramidata* L., *Clio cuspidata* (Bosc), *Clio balantium* (Rang.), *Cuvieria columella* (Rang.), *Cavolinia* (*Diacria*) *trispinosa* (Les.), *Cavolinia* (*Diacria*) *quadridentata* (Les), *Cavolinia longirostris* (Les.), *Cavolinia globosa* (Rang.), *Cavolinia gibbosa* (Rang.), *Cavolinia tridentata* (Foxsk.), *Cavolinia uncinata* (Rang.) and *Cavolinia inflexa* (Les.), all found in Japanese waters except *Clio balantium* which occurs only more south.

2) Osborn seems to consider the Narbada bed Upper Pliocene. The Age of Mammals, p. 335.

state of our knowledge of its Molluscan fauna. For the layer to be *Pleistocene*, there must be some unmistakable evidence, and until that evidence is found, I deem it most expedient to assign to the layer a place in the *Upper Pliocene*.

Be the age as it may, there is an important fact which deserves our fullest attention. It is the general character of the fauna in relation to that of the recent as well as of the Lower Musashino from a climatic point of view. If we divide the living species, 232[1] in all, according to their habitat, we get the following result :

(1) Species now living only near the fossil localities (Central Japan)[2] or in about the same latitudes (Western Japan).....114.
Percentage of the whole fauna 49.1

(2) Species now living in Central or Western Japan as well as north of it (Northern Japan).....45.
Percentage of the whole fauna 19.4

(3) Species now living in Central or Western Japan as well as south of it (Southern Japan) .....29.
Percentage of the whole fauna 12.5

(4) Species now living in whole Japan (Northern-Southern) .....16.
Percentage of the whole fauna 6.9

(5) Species now living only in Northern Japan.....14.
Percentage of the whole fauna 6.0

(6) Species now living only outside of Japan ..... 8.
Percentage of the whole fauna 3.5

(7) Species whose habitat is not accurately known..... 6.
Percentage of the whole fauna 3.6

1) The species which, though living, have been separated as varieties are not counted in this number. They are *Bela rugulata* Tr. var. *schneideri* Harm., *Pyramidella virgo* Ad. var. *brevis* Yok., *Macroschisma chinensis* Ad. var. *laevis* Yok., *Calliostoma unicum* Dkr. var. *shinagawensis* Tok. and *Mactra sachalinensis* Schr. var. *imperialis* Yok.

2) Japan, as in my previous paper, has been divided into four parts viz.: Northern, Central, Western, and Southern Japan. Northern Japan is that part of the country lying north of the 38th parallel north latitude, while Central Japan is the part lying south of the same parallel and east of 136° east longitude. Western Japan is the part west of the same longitude, including Chugoku, Shikoku, and Kyushu. Southern Japan is south of Kyushu including the Ryukyu Islands, Formosa and the Ogasawaras or Bonins.

It will be seen from the above that the species which form the main mass of the fauna are still living either near the fossil localities (Central Japan) or in the same latitudes more to the west (Western Japan). But among these forms, we have to distinguish those which live exclusively in Central or Western Japan from those which at the same time live either north (in Northern Japan) or south (in Southern Japan) of it. As might be expected, the forms which live exclusively in Central or Western Japan amount to about one-half (114 or about 50%), while those which live at the same time either north or south are much less (74 or 32%). But if we compare the forms which at the same time live north with those which at the same time live south, the former are considerably more in number (45 or 19.4%) than the latter (29 or 12.5%). Moreover, we must note that there are, besides, 14 species which at present are known only from Northern Japan. They are the following :

1. *Chrysodomus arthriticus* Val.
2. *Chrysodomus schrencki* Yok.
3. *Priene oregonensis* Redf.
4. *Puncturella nobilis* Ad.
5. *Panope generosa* Gld.
6. *Corbula venusta* Gld.
7. *Spisula grayana* Schr.
8. *Solen krusensternii* Schr.
9. *Tellina venulosa* Schr.
10. *Macoma nipponica* Tok.
11. *Astarte borealis* Chem.
12. *Astarte hakodatensis* Yok.
13. *Pectunculus yessoensis* Sow.
14. *Nucula insignis* Ad.

And among the foreign forms, there are also two which may be counted among the northern ones. They are *Terebratella pulvinata* Gld, of Puget Sound in Washington and *Leda ramsayi* Smith[1] of New South Wales, found at a depth of 950 fathoms. It

1) I was recently told that a form which is either identical with, or close to, this bivalve is found in Northern Japan.

is true that there are also two forms which are hitherto known only from tropical regions, namely : *Chione mindanensis* Smith of the Philippines and *Crassatella nana* Ad. et Rve. of Borneo. But these two can hardly have any weight on the sixteen northern forms which constitute about 7% of the whole fauna. From this we are obliged to infer that the waters on the Pacific side of Central Japan during the *Manzakian* time were somewhat *cooler* than at present. However, when we compare the northerly character of the Manzakian fauna with that of the Lower Musashino,[1] it is decidedly *less* marked, for the latter contains some 20% of the exclusively northern forms, and not a single one of the southern. This shows to a certainty that the waters of the Musashino Epoch which at one time[2] were tolerably *cold* became *less so* toward its end. And this, must be called truly remarkable,[3] as in Europe just the opposite was the case. There, as is well known, the climate of the Pliocene time which on the whole was quite temperate became gradually cold toward its end, and in the succeeding Pleistocene it became so cold as to cause the so-called Ice-age.

What I have stated above are plain facts as revealed by the study of the Musashino fossils. Why things were so is at present difficult to say. But an opinion I have, and this opinion has already been advanced in my paper entitled "Climatic Changes in Japan since the Pliocene Epoch."[4]

1) Fossils from the Miura Peninsula, p. 22.

2) Koshiba zone, Ibid. p. 24.

3) Still more remarkable is the occurrence of the so-called Coral-bed of Awa which I take for younger than the Upper Musashino, and perhaps also younger than the overlying loam. In this bed, as already pointed out in my "Climatic Changes," are found, besides large reef-building corals, Molluscan remains which contain several exclusively tropical forms together with several others not yet known to be living. These remains will form the subject of my next paper.

4) Jour. Sci. Coll., Imp. Univ. Tokyo, Vol. XXXII, Art. 5, 1911.

Description of the Species

Phylum **Mollusca.**

Class **GASTROPODA.**

Family **Actæonidæ.**

Genus **SOLIDULA,** Fischer von Waldheim.

CM20728-1-1
CM20729
CM20730

1. *Solidula strigosa* (Gould).

Pl. I. Fig. 1.

Solidula strigosa. Pilsbry, Cat. Mar. Moll. Japan, p. 6. Tryon, Man. Conch., vol. XV, p. 137, pl. XXA, figs. 60, 61.

Buccinulus strigosus. Gould, Proc. Bost. Soc. Nat. Hist., VII, p. 141. Otia Conchologica, p. 114.

Tornatella strigosa. Lischke, Jap. Meeresconch., II, p. 104, pl. V, figs. 12, 13.

Buccinulus fraterculus. Dunker, Ind. Moll. Mar. Japon., p. 161, pl. XIII, figs. 21–23.

Solidula fraterculus. Pilsbry, Cat. Mar. Moll. Jap., p. 6.

A small rather solid shell, ellipsoidal in form, and with whorls which number between five and six. The spire is short, being less than one-fourth the height of the shell. The surface-sculpture consists of fine, impressed and punctured, spiral lines which number four on the penultimate and about twenty-five on the ultimate whorl. A fine interstitial line is also present, most conspicuons on the lower half of the last whorl. Of the two columella-folds which are present, the upper is weak and simple, while the lower is strong and bilobed, the lobes being generally nearly equal in size.

All of the four specimens which were obtained are a trifle broader than those described by the above authors. The largest measures 11.7 millim. in height and 5 millim. in diameter.

The shell described by Dunker as *Buccinulus fraterculus* is surely identical with Gould's species.

Fossil occurrence :—Otake and Shito.

Living :—Central, Western and Southern Japan.

CM20731-1-2
CM20732

2. *Solidula clathrata*, Yokoyama.

Pl. I. Fig. 2.

Shell moderate in size, solid, ovately oblong. Whorls about seven, somewhat convex. Spire short and pointed, the body-whorl occupying about four-fifths the height of the shell. The sculpture consists of spiral sulci which number usually five on the upper whorls and twenty or more on the body-whorl. These sulci which are almost always narrower than the flat interspaces are finely latticed by raised lines of growth which, though prominent on the front-side of the body-whorl, are either indistinct or obsolete on its back-side and also on the upper whorls. Aperture long, equalling to almost two-thirds the height of the shell, widened and rounded in front, narrowed and acuminate behind. Columella-folds two ; the upper weak and not prominent, the lower strong and bilobed, the lower lobe being weaker than the upper. Sutures subchanneled. Height 19.3 millim. Diameter 9.5 millim. Height of body-whorl 16 millim. Length of aperture 13 millim.

This species is closely related to the preceding, but it grows larger, and the sulci are latticed and not punctured. Also the aperture is not so produced, and the two lobes of the lower columella-fold are unequal in size.

Fossil occurrence :—Shito (only three specimens).

CM20733-1-3
CM20734
CM20735

Genus **LEUCOTINA**, A. Adams.

3. *Leucotina gigantea*, (Dunker).

Pl. I. Fig. 3.

Leucotina gigantea. Pilsbry, Cat. Mar. Moll. Jap., p. 7. Tryon, Man. Conch., vol. XV, p. 167, pl. XVIII, figs. 92, 93.
Actæon giganteus. Dunker, Index Moll. Mar. Jap., p. 160, pl. II, fig. 59.
Tornatella gigantea. Tokunaga, Foss. Env. Tokyo, p. 31, pl. II, fig. 10.

Many specimens. The largest measures 29 millim. in height and 13 millim. in diameter. The whorls number eight with flat spiral ribs on them, ten on the penultimate and twenty two on the ultimate whorl. Under a lens the interspaces appear cross-striated,

the direction of the striae coinciding with that of incremental lines. The outer lip is thin and sulcate within. The margin is crenulate.

Fossil occurrence :—Frequent at Shito, rarer at Otake. Also found at Oji and Shinagawa in Musashi.

Living.—Japan (Dunker).

CM20736-1-4
CM20737
CM20738
CM20739

Family **Tornatinidæ**.

Genur **TORNATINA**, A. Adams.

4. *Tornatina exilis*, Dunker.

Pl. I. Fig. 4.

Tornatina exilis. Dunker, Moll. Jap., p. 25, pl. II, fig. 14. Pilsbry, Cat. Mar. Moll. Jap., p. 7. Tryon, Man. Conch., XV, p. 190, pl, XXII, fig. 25. Tokunaga, Foss. Env. Tokyo, p. 31, pl. II, fig. 9. Brauns, Geol. Env. Tokio, p. 34. Yamakawa, Foss. Opisthobr. Diluv. Depos. Japan. (Journ. Geol. Soc. Tokyo. vol. XVIII) p. 40, pl. X, figs. 4–7.

This small shell has already been figured by Tokunaga and Yamakawa in the works above cited, the latter giving, morover, a full description of it.

Fossil occurrence.—Very frequent at Otake, rarer at Shisui, Tega and Shito. Also found at Oji and Shinagawa in Musashi.

Living.—Western Japan.

(71) CM20740-1-5
CM20741
CM20742

5. *Tornatina longispirata*, Yamakawa.

Pl. I. Fig. 5.

Tornatina longispirata. Yamakawa, Foss. Opisthobr. Dil. Dep. Jap. (Jour. Geol. Soc. Tokyo, vol, XVIII), p. 41, pl. X, figs. 8, 9, 10.

Tornatina longispirata var. otakensis. Yamakawa, loc. cit., p. 42, pl. X, figs. 11, 12, 13.

A full description of this species is found in the work of Yamakawa who distinguished a typical form and a variety, the former having five whorls and the latter four. Besides, he says that the spire in the variety is *more* pointed, which seems to be a mistake for *less* pointed. Anyhow I deem the separation unnecessary.

Fossil occurrence.—Rarely found at Otake and Tega.

(42) CM20743-1-6
CM20744
CM20745

Genus **RETUSA**, Broun.

6. ***Retusa globosa***, Yamakawa.

Pl. I. Fig. 6.

Retusa globosa. Yamakawa, Foss. Opisthobr. Dil. Dep. Jap., p. 43, pl. X, figs. 14–16.

Yamakawa gives the diagnosis of this species as follows :

"Shell small, subcylindrical, rather solid, mucronate above and obtuse below. Spire very short. Whorls four, the first one the most prominent, the second generally the shortest. Body-whorl long, almost as long as the shell. Surface with fine, almost obsolete lines of growth. Aperture narrow, linear, dilated below into an oval spathulate form without any fold on the columella. Lip curved forward. Wall of the aperture callous."

Some of our specimens have the aperture more produced in front than in the figure of Yamakawa. The height of the shell is about twice its diameter, or a little less. The largest specimen is only 3.5 millim. in height.

Fossil occurrence.—Rarely found at Otake, Shisui and Shito, and so also at Oji and Kurumacho (Shiba-quarter, Tokyō).

CM20746-1-7

7. ***Retusa truncata***, Yamakawa.

Pl. I. Fig. 7.

Retusa truncata. Yamakawa, Foss. Opisthobr. (Jour. Geol. Soc. Tokyo, vol. XVIII). p. 44, pl. X, figs. 17–20.

This is a quite cylindrical shell, more slender than the preceding. The spire is hidden in a sunken pit, so that the shell-top appears truncated when seen sidewise. The whorls number four, with the surface smooth. The largest specimen measures 4.3 millim. in height and 2 millim. in diameter.

Fossil occurrence.—Rarely found at Otake and Shito. Yamakawa mentions it also from Oji in Musashi.

CM20747
CM20748

8. ***Retusa minima***, Yamakawa.

Retusa minima. Yamakawa, Foss. Opisthobr., p. 47, pl. XI, figs. 21–25. Yokoyama, Foss. Miura Penin., p. 26, pl. I, fig. 1.

This shell like the foregoing has its top truncate and the spire hidden in a pit. The diameter increases towards below or front, being smallest at about one-third the shell-height from the top and greatest near the middle or a little above it. The surface where the diameter is smallest appears slightly concave. The height of the largest specimen is 3 millim.

Fossil occurrence.—Otake and Shito (rare at both). Oji. Lower Musashino of Miyata and Naganuma Zones.

CM20749-1-8
CM20750
CM20751

9. *Volvula angustata*, (A. Adams), var.

Pl. I. Fig. 8.

Volvula angustata. Pilsbry, Catalogue, p. 8. Tryon, Manual Conch., XV, p. 240, pl. XXVI, fig. 67.

Bulla angustata. A. Adams in Sowerby's Thes. Conch., II, p. 596, pl. CXXV, fig. 153.

A few specimens. The shape agrees well with the above mentioned species of Adams except the apex which is somewhat blunter in our fossil. This difference, however, can hardly be considered as more than a varietal one. The general shape of the shell is cylindrical, tapering slightly towards behind. The aperture is linear and much dilated in front. The outer lip is somewhat contracted in the middle.

Fossil occurrence.—Otake and Shito.

Living.—Northern Japan. Philippines. New Guinea.

(52) CM20752-1-9
CM20753

10. *Volvula acutæformis*, Yokoyama.

Pl. I. Fig. 9.

Shell rather small, thin, fusiform, with apex ending in a blunt spine. The greatest diameter is in the middle of the shell. Aperture long, linear, dilated below and bordered on the inner side by an elevated margin somewhat bent outward. Height twice the diameter, or a trifle less. The largest specimen measures 5.5 millim. in height.

This species is quite like *Volvula minuta* Bush (Tryon, Man. Conch., XV, p. 237, pl. XXII, fig. 20, pl. XXVI, fig. 57) which is

considered by Dall as identical with *Volvula acuta* d'Orbigny (not *Volvula acuta* Tokunaga, a species which I unite with *V. acuminata* Brug.). But the presence of the raised margin on the inner side of the apertural end and the larger size of the shell distinguish the Japanese fossil from the above mentioned living shell from America. *Volvula oxytata* Bush (Man. Conch., pl. XXVI, fig. 63), also a living American shell and allied to our fossil, is somewhat more slender.

Fossil occurrence.—Shito (frequent).

Family **Scaphandridæ**.

CM20754-1-10.
CM20755
CM20756
CM20757

Genus **CYLICHNA**, Loven.

11. *Cylichna musashiensis*, Tokunaga.

Pl. I. Fig. 10.

Cylichna musashiensis. Tokunaga, Foss. Env. Tokyo, p. 32, pl. II, fig. 12. Yokoyama, Foss. Miura Penin., p. 27, pl. I, fig. 4.

Bulla cylindracea. Brauns, Geol. Env. Tokio, p. 35.

Although the shell-form is generally cylindrical, with the greatest diameter in its middle portion, there are rarely specimens which somewhat taper above. The height varies between 2.2 and 2.5 times the diameter. The transverse striations which Tokunaga omitted to mention are sometimes very distinct, especially on the lower portion of the shell. The largest example measures 16 millim. in height.

Fossil occurrence.—Otake, Shisui and Shito. Oji and Tabata in Musashi. Lower Musashino of Koshiba.

Living.—Central Japan.

Family **Philinidæ**.

CM20758-1-11
CM20759-1-12

Genus **PHILINE**, Ascanius.

12. *Philine scalpta*, A. Adams.

Pl. I. Fig. 11, 12.

Philine scalpta. A. Adams, Ann. Mag. Nat. Hist., 1862, vol. IX, p. 160. Lischke, Jap. Meeresconch., III, p. 76, pl. V, figs. 15, 16.

A thin shell oblong-ovate in form and longitudinally subplicate, with distant impressed spiral lines and a large aperture. It agrees quite well with the figures and descriptions given of Adams' species by Lischke.

We possess two specimens, about one (fig. 12) of which we are still in doubt whether it belongs here or not, on account of its bad state of preservation.

Fossil occurrence.—Shisui and Kioroshi (?).

Living.—Central and Western Japan.

CM 20760 -1-13
CM 20761

13. *Philine pygmæa*, Yokoyama.

Pl. I. Fig 13.

Shell small, thin, roundly quadrate in outline. Spire none, the apex being somewhat sunken. Body-whorl large with its middle portion slightly excavated. Incremental lines distinct, crossing the dense, wavy, punctate, impressed spiral lines. Height 4 millim. Breadth 3.5 millim.

This species is readily recognized by its small size and subquadrate shape.

Fossil occurrence.—Shisui (rare).

Living.—Central Japan.

CM 20762-5-4

14. *Philine takatensis*, Yokoyama.

Pl. V. Fig. 4.

Shell rather small, thin, swollen, oval in outline, with the anterior end sharper than the posterior. About fifteen distant elevated spiral riblets ornament the surface. Lines of growth numerous and distinct. Aperture very large, oval, with a broad and shallow notch at the place where it touches the coiled portion of the shell.

A single specimen measuring 8.4 millim. in height and 7.4 millim. in apertural breadth.

Fossil occurrence.—Shito.

Family **Bullidæ**.

Genus **BULLA**, Linne.

15. *Bulla multiarata*, Yokoyama. CM 20763-1-14 CM 20764

Pl. I. Fig. 14.

Shell small, moderately thick, oval. Spire sunken and with a small hole. Body-whorl inflated, ornamented with over thirty equidistant puncticulate impressed spiral lines. Aperture a little longer than the shell-height, narrowed above, dilated and rounded below. Umbilicus open as a small hole. Outer lip thin, the greater part running vertically downward, with only a slight curvature. Height 4 millim. Diameter 2 millim.

This is a nice little shell easily known by its puncticulate spiral lines.

Fossil occurrence.—Shito (rare).

16. *Bulla ovula*, Sowerby. CM 20765-1-15

Pl. I. Fig. 15.

Bulla ovula. Sowerby, Reeve's Conch. Icon., Bulla fig. 5.

Bulla vernicosa Gould var. *ovula.* Tryon, Man. Conch., XV, p. 349, pl. XXXVI, figs. 34, 35.

Bulla (*vernicosa* var ?) *ovulum.* Pilsbry, Catalogue, p. 10.

A single but perfect specimen.

The shell is oval in outline and smooth on surface. It measures 11 millim. in height and 7.5 millim. in diameter. In Tryon's Manual of Conchology above quoted, weak spiral grooves are mentioned as present on the inner side of the outer lip which, however, are absent in our fossil specimen.

Fossil occurrence.—Shisui.

Living.—Central, Western and Southern Japan (Ryukyu).

CM20766-1-16
CM20767-1-17
CM20768
CM20769
CM20770

Family **Ringiculidæ**.

Genus **RINGICULA**, Deshayes.

17. *Ringicula musashinoensis*, Yokoyama.

Pl. I. Figs. 16, 17.

Ringicula musashinoensis. Yokoyama, Foss. Miura Penin., p. 30, pl. I. Figs, 3. 8.
Ringicula arctata. Brauns, Geol. Env. Tokio, p. 30. Tokunaga, Foss. Env. Tokyo, p. 32, pl. II, fig. 11.

That this shell is not *Ringicula arctata* Gould as asserted by Brauns and Tokunaga has already been explained in my work above cited. I have here to add that there are specimens (pl. I, figs. 16, 17) which have the outer lip not so thickened as in the typical ones, so that they approach in this respect *Ringicula doliaris* Gould living in our seas, (Tryon's Manual, XV, p. 403. pl. VII, figs, 82, 83). But these are connected with the typical form by intermediate forms and differ from *R. doliaris* by the more abruptly sloping body-whorl below the suture. The spiral lines of the surface which are generally distinct may often become obsolete.

Fossil occurrence.—Otake (very numerous), Shisui, Tega, Kioroshi, Shito (numerous). Also Oji, Shinagawa and Tabata in Musashi. Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Central Japan.

CM20771
CM20772

Family **Terebridæ**.

Genus **TEREBRA**, Adanson.

18. *Terebra lischkeana*, Dunker.

Terebra lischkeana. Dunker, Index Moll. Mar. Jap., p. 71, pl. V. figs. 13–16. Pilsbry, Catalogue, p. 12. Tryon, Man. Conch., VII, p. 37, pl. XII, fig. 22. Yokoyama, Foss. Miura Penin., p. 31, pl. I, fig. 10.

A few young specimens, the largest of which attains the height of 30 millim.

Fossil occurrence.—Otake and Shito. Lower Musashino of Miyata.

Living.—Central and Western Japan.

CM20993-1-18

19. *Terebra gotoensis*, Smith.

Pl. I. Fig. 18.

Terebra gotoensis. Smith, Proc. Zool. Soc. London, 1879, p. 183, pl. XIX, figs. 1, 1a. Pilsbry, Catalogue, p. 12. Dunker, Index Moll., p. 73.

Terebra alveolata Hinds var. *gotoensis,* Tryon, Man. Conch., vol. VII, p. 23, pl. V, figs. 85, 91.

Shell subulate. Whorls about seventeen, flat, slightly concave on the upper third, longitudinally weakly plicate. Plicae numerous, close together, about twenty-six on the body-whorl, somewhat sinuous, vertical at the upper end, then bending backward and then forward, the lower end being directed obliquely forward. Periphery obtusely angulate, with the base abruptly contracted, the angle formed at the periphery being about 130°. Base smooth, with coarse lines of growth only. Aperture subrhombic. Canal short and curved.

There are two specimens, both of which are not quite perfect. The height is about 20 millim. and the diameter 5 millim.

Tryon's opinion that *Terebra gotoensis* is only a variety of *Terebra alveolata* Hinds, a species living in the Strait of Malacca, I am at present unable to confirm. What Tokunaga calls *Terebra alveolata* Hinds (Foss. Env. Tokyo, pl. I, fig. 17) seems to be a quite different shell.

Fossil occurrence.—Otake.

Living.—Western Japan.

CM20778-1-19
CM20795

20. *Terebra hedleyi*, Pilsbry.

Pl. I. Fig. 19.

Terebra hedleyi. Pilsbry, New Jap. Mar. Moll., Gastropoda (Proc. Acad. Nat. Sci. Philad., Jan., 1904) p. 3, pl. I, figs. 1, 1a.

The shell is subulate with about fifteen flat whorls of which one and a half are embryonal and smooth ; the remaining whorls are ornamented with flat spiral cords whose first or uppermost is the broadest, occupying about one-third of a whorl and is tuberculate, the tubercles being distinct on the upper whorls and indistinct or obsolete on the lower. The second cord is somewhat narrower

than the first and weakly tuberculate only on the upper whorls. The third cord is about as broad as the second, and on the whorls near the body-whorl often splits into two by an impressed spiral line which appears in the middle of the cord. The three further cords which are still present are narrower. The impressed spiral lines separating the above cords are punctate. The base of the shell is contracted quite abruptly, giving rise to a bluntly angulate periphery.

Pilsbry in describing his specimens states that the height is more than five times the diameter. In the four examples which were obtained, it is only four times and a half. The largest example measures 30 millim. in height.

Fossil occurrence.—Otake.

Living.—Central and Western Japan.

CM20776

21. *Terebra recticostata*, Yokoyama.

Terebra recticostata. Yokoyama, Foss. Miura Penin., p, 32, pl. I. fig. 11.

A single specimen, 23 millim. in height and 5.5 millim. in diameter. The ribs are not so sharp and strong as in the specimens found in the Lower Musashino.

Fossil occurrence.—Shisui, Lower Musashino of Naganuma.

CM20777-120
CM20778
CM20779

22. *Terebra chibana*, Yokoyama.

Pl. I. Fig. 20.

Shell subulate. Whorls about fifteen, slightly concave on the upper third and a trifle convex on the lower two-thirds, longitudinally plicate and spirally striated. Plicæ often weak and indistinct, about twelve on the penultimate whorl and somewhat curved with the concave side towards front. Spiral striae about six in number, with the uppermost at a little distance from the suture and provided with a small tubercle at the point of intersection with the plicae and separated from others by a wide smooth space occupying the concave portion of the whorls. Of the remaining five striae, the third is the most conspicuous, being found on the most convex

portion of the whorls ; the lowest one is close to the suture. These striae are often very indistinct on the upper whorls. Periphery rounded. Base rather abruptly narrowed below, usually with two spiral striae on its surface. Aperture subrhombic. Canal short, bent a little backward. Height 24 millim. Diameter 5.5 millim. Length of aperture 5.5 millim.

Fossil occurrence.—Shito (numerous) and Otake.

23. *Terebra smithi* Yokoyama. CM 20780-1-24

Pl. I. Fig. 21.

Shell subulate. Whorls about seventeen, flattish, longitudinally costulate and spirally striate. Costulae about twenty on the penultimate whorl, more or less roof-shaped, interrupted by a shallow spiral groove running a little above the middle of the whorls, the part above the groove being somewhat in advance of the part below the same. The groove is more or less indistinct on the upper whorls. The interspaces between the costulae are furnished with very fine spiral striations, some of which on the lower whorls may grow into coarser ones. These coarser ones in crossing the costulae make them tubercular. On the penultimate whorl there are two such coarser threads above the groove and three below it, while on the body-whorl there are four between the groove and the periphery, and about as many on the base. Periphery rounded. Aperture subrhombic. Outer lip thin and sharp. Canal very short, somewhat recurved. Height 36 millim. Diameter 8 millim.

Only a single specimen. This species is still living in our seas, attaining a height of 80 millim. It is brown-coloured when fresh.

I doubt if this is not the shell called *Terebra granulosa* by Smith in the Annals and Magazines of Natural History of 1873 (p. 268), a name afterwards changed by the author himself into *Terebra pustulosa* (Proc. Zool. Soc. London, 1879, p. 186). Unfortunately the shell has never been figured.

Fossil occurrence.—Otake.

Living.—Central Japan.

CM 20781-1-22

24. *Terebra quadriarata*, Yokoyama.

Pl. I. Fig. 22.

Shell subulate, tolerably solid. Whorls many (more than thirteen), nearly flat, ornamented with four impressed spiral lines. The uppermost line is found at some distance from the upper suture, equalling about one-third of a whorl, while the second is nearly in its middle. The two remaining ones are on the lower half of the whorls, the distance between the second and the third being generally greater than that between the third and the fourth. Periphery rounded. Base abruptly narrowed. Canal short and recurved. The apex as well as the outer lip is broken. The shell, if perfect, would measure about 30 millim. in height. The diameter is 6.5 millim.

Fossil.—Shito (rare).

CM20782-1-23
CM20783

25. *Terebra latisulcata*, Yokoyama.

Pl. I. Fig. 23.

Shell subulate. Whorls about thirteen, with a subsutural row of weak distant tubercles numbering about twelve on the penultimate whorl. Below this row of tubercles there is a broad shallow groove with a deeply impressed line at its bottom which, however, may be either indistinct or wholly obsolete. Below the groove the surface is somewhat convex and longitudinally weakly plicate, the number of plicae being generally equal to that of the tubercles above the groove. Each of these plicae begins at the top with the tubercle just mentioned, is flatly roof-shaped, often so flat as to become indistinct or even obsolete. Periphery rounded. Base abruptly narrowed, with faint indications of longitudinal plicae only. Sutures deep. Aperture subrhombic. Canal short, bent somewhat backward. Height 30 millim. Diameter 6 millim.

Fossil occurrence.—Shito (rare).

CM20784-1-24
CM20785

26. *Terebra suavidica*, Yokoyama.

Pl. I. Fig. 24.

Shell turrete. Whorls about eleven, the first two smooth and rounded, the following slightly convex and longitudinally weakly plicate on the upper whorls, the plicae generally disappearing on the lower ones. Usually there is a somewhat depressed spiral area in the upper part of the whorls dividing the plicae into two very unequal parts, of which the upper often looks like an elongated tubercle (found just below the suture). Periphery rounded. Base rather abruptly narrowed, convex, generally only with coarse flexuous lines of growth. Inner lip broadly angulate, making the aperture look four-sided. Canal very short, somewhat recurved. Height 22 millim. Diameter 6 millim.

This shell resembles the preceding in sculpture, but is not so subulate in shape.

Fossil occurrence.—Shito (frequent).

CM20786-1312
CM20787-1313 ?
CM20788

27. *Terebra tsuboiana*, Yokoyama.

Pl. XIII. Fig. 12, 13.

Shell subulate, large. Whorls about sixteen, the upper two-fifths flat, the lower three-fifths slightly convex, longitudinally plicate and spirally threaded. Plicae generally weak, numerous, equal or unequal, sometimes indistinct, oblique on the flat portion of the whorls, nearly vertical below, varying in number (up to thirty on the body-whorl). Spiral threads more or less unequal, often fine and indistinct, also varying in number; but there is invariably a coarse one at the boundary between the flat and convex portions of the whorls. Above this thread there are two, the one just below the suture and the other midway between it and the boundary one. The latter is somewhat elevated, the surface above as well as below it appearing a trifle excavated. Below the boundary-thread, there are several finer ones which may be close and many, or distant and few. The intersection-points between the

threads and plicae are always more or less tuberculous. The body-whorl has the periphery rounded, and the base quickly narrowed and covered with several spiral tubercular threads down to near the caudal end where there is a sharp spiral ridge bounded behind by a broad groove. Aperture elongated, angulate behind and widened in front. Canal very short, recurved. The largest of the three specimens obtained measures 62.5 millim. in height and 13.5 millim. in diameter.

This species is still living, the specimens obtained near Kamakura attaining a somewhat larger size than the fossil. Contrary to the great inconstancy of the surface-sculpture, the shape seems to be tolerably fixed. The colour is dusky brown.

Fossil occurrence.—Kioroshi, Shito.

Living.—Central Japan.

Genus **PARVITEREBRA**, Pilsbry.

28. *Parviterebra raritans*, Yokoyama.

Pl. I. Fig. 25.

Shell small, solid, lanceolate. Whorls about seven, the first two smooth and rounded, the remaining very little convex and longitudinally weakly plicate. Plicae nearly straight, numerous about twenty on the penultimate whorl, indistinct or obsolete on the body-whorl. There are also impressed spiral lines numbering a little over ten on the penultimate whorl. Body-whorl very large higher than the spire and with the spiral lines down to the caudal end. Aperture elongated, acuminate behind and truncate in front. Inner lip covered with a callus. Outer lip rather sharp. Height 8 millim. Diameter 2.2 millim. Height of body-whorl 4 millim. Length of aperture 2.3 millim.

Parviterebra paucivolvis Pilsbry (New Jap. Mar. Moll., Gastr., Proc. Acad. Nat. Sci. Philad., Jan., 1904, p. 5, pl. I, fig. 4) from Southern Kyushu is somewhat like the present species. But in the former the shell as well as the aperture is longer and the callus of the inner lip absent.

Fossil occurrence.—Otake (rare).

Family **Pleurotomidæ.**

Genus **PLEUROTOMA**, Lamarck.

CM 20790-1-26
CM 20791
CM 20792
CM 20793

29. *Pleurotoma vertebrata*, Smith.

Pl. I. Fig. 26.

Pleurotoma vertebrata. Smith, Ann. Mag. Nat. Hist., 1875. p. 416. Proc. Zool. Soc. London, 1879, p. 186, pl. XIX, fig. 6a. Pilsbry, Catalogue, p. 15. Tokunaga, Foss. Env. Tokyo, p. 13, pl. I, fig. 22. Chemnitz and Martini, Conch. Cab., IV, pt. 3, p. 31.

The shell is quite characteristic by its fusiform shape and angulate whorls, the angle being a little below their middle. The sculpture consists only of spiral threads large and small, the large ones being one at the angle, one above the suture and one below it. The sinus is somewhat distant from the suture, deep, very wide at mouth, and much narrowed and rounded at bottom. The largest specimen obtained is 32 millim. high and 10 millim. broad. Tryon unites this species with *Pleurotoma violacea* Hinds (Man. Conch., vol. VI, p. 169) of the South Sea.

Fossil occurrence.—Otake, Shisui, Kamenari and Shito. Rather rare at all the above localities, though frequent at Oji in Musashi.

Living.—Central and Western Japan.

Genus **GENOTIA**, H. and A. Adams.

CM 20794-1-27
CM 20795-1-28

30. *Genotia pseudopannus*, Yokoyama.

Pl. I. Figs. 27, 28?

Shell moderately thick, subfusiform. Whorls seven and a half, the first two and a half smooth and rounded, the remaining somewhat shouldered, the surface above the shoulder steeply sloping and slightly excavated, below vertical and a little convex. The sculpture consists of longitudinal plicæ and spiral grooves. The plicae are obtuse and broad, wider than the interspaces and about twenty on the penultimate whorl, while on the body-whorl they are almost obsolete. As to the spiral grooves, there are two of

them below the shoulder, one of which is close to it and the other near the lower suture. Besides the grooves, there are also very fine impressed spiral lines on other parts of the whorls. Body-whorl somewhat higher than the spire, convex (the shoulder indistinct) and furnished with more than ten grooves below the two above mentioned, their breadth gradually growing as they get downward. Aperture longly oval, pointed behind. Inner lip with a thin callus, distinctly bounded toward outside and with a faint indication of an oblique fold. Outer lip thin, with a wide and shallow notch at a little distance from the suture. Height 17 millim. Diameter 6 millim.

This shell is not unlike the one described as *Oligotoma pannus* (Basterot) (Harmer, Plioc. Moll. Grt. Brit., II, Pal. Soc., vol. LXVIII, p. 215, pl. XXVII, figs. 8-11) from the English Crag and also from the French and Italian Miocene, but the whorls in the latter are nearly flat, with a columellar fold on the inner lip.

Fossil occurrence.—Otake (only a single specimen). There is a specimen (fig. 28) from Semata, Shito showing a similar sculpture, but more slender in form. It may possibly be only a variety to which I intend to give the name of var. *sematensis*, if it should prove hereafter to be such.

31. *Genotia ogurana*, Yokoyama.

CM 20796-1-29

Pl. I. Fig. 29.

Shell moderately thick, fusiform. Whorls about seven and a half, the first two embryonal, smooth and rounded, the remaining somewhat concave on the upper half and slightly convex on the lower, and ornamented with longitudinal as well as with spiral sculptures. The longitudinal sculpture consists of plicae bent in the middle with the concave side toward the front; these plicae are about twenty-seven in number on the penultimate whorl, broad and obtuse, not quite equidistant and more or less unequal, though generally wider than the interspaces, and on the last two whorls interrupted by a concave surface below the suture. The spiral sculpture is divisible into striae and sulci., the former being

on the upper half of the whorls and the latter on their lower half. The striae are many, fine and close, while the sulci are generally very narrow and line-like, number three as a rule and are rather distant. Body-whorl about twice as long as spire. Periphery rounded. Base gradually tapering toward its caudal end. The plicae on the body-whorl become evanescent on the base, while the spiral sulci are many, cover the whole surface and are broadest near the middle of the base where they are wider than the interspaces. Sutures subchannelled. Aperture elongated, angular behind. Inner lip with a thin callus. Outer lip sharp, receding both above and below with the sinus shallow and wide, and distant from the suture. Canal short, straight. Height 15 millim. Diameter 6 millim.

A single specimen.

This shell looks very much like the preceding, but on a closer examination, there are many minor distinctions, especially in the sculpture.

Fossil occurrence.—Otake.

Genus **DRILLIA**, Gray.

CM20797
CM20798

32. *Drillia principalis*, Pilsbry.

Drillia principalis. Pilsbry, Catalogue p. 17, pl. II, figs. 9, 10.

Pleurotoma (Drillia) principalis. Tokunaga, Foss. Env. Tokyo, p. 14, pl. I, fig. 13.
Yokoyama, Foss. Miura Penin., p. 36, pl. I. fig. 20.

This species has already been described by Tokunaga and myself in the works above quoted, the fuller description, however, being found in Pilsbry's catalogue also above mentioned. It is not found at many places, but where found, it is rather frequent.

Fossil occurrence.—Otake and Tega. Also Oji and Shinagawa in Musashi. Lower Musashino of Koshiba and Naganuma.

Living.—Northern, Central and Western Japan.

CM 20799-1-30
CM 20800

33. *Drillia subauriformis*, Smith.

Pl. I. Fig. 30.

Drillia subauriformis. Pilsbry, Cat., p. 18. Tryon, Man. Conch., VI, p. 207, pl. 12, fig. 35. Dunker, Index Moll., p. 24, pl. IV, figs. 5-7. Smith, Proc. Zool. Soc. London, 1879, p. 195, pl. XIX, fig. 23.

Pleurotoma (*Drillia*) *subauriformis.* Tokunaga, Foss. Env. Tokyo, p. 14, pl. I, fig. 24.

This is a pretty little shell with about ten convex whorls, longitudinally ribbed and spirally striate. The ribs are about eighteen on the penultimate whorl, although sometimes less. The spiral striae are six on the penultimate and one less on a whorl preceding it. The outer lip is thickened by the last rib. Height 12 millim. Diameter 3.6 millim. Rare.

Fossil occurrence.—Otake and Kamenari. Also Oji in Musashi.

Living.—Central and Western Japan.

CM 20801-1-31
CM 20802
CM 20803-1-32
CM 20804

34. *Drillia glabriuscula*, Yokoyama.

Pl. I. Figs. 31, 32.

Shell small, turrete. Whorls about nine, the first smooth and mammillated, the second also smooth and rounded, the remaining a little concave just below the sutures and somewhat convex on the lower portion. The sculpture is made up of longitudinal costulae and spiral striae. The costulae are generally present only on the upper whorls, about twelve on the whorl preceding the penultimate, broad, low, rounded, oblique and wider than the intervals. The spiral striae are about four in number, equally distributed and often indistinct. Now and then there is an interstitial stria. Periphery rounded. Base gradually tapering downward, covered with spiral threads. Aperture elongated, narrow, with a short straight canal. Outer lip thin, with a deep and rather wide sinus just below the suture. Inner lip with a thin callus.

The sculpture is often indistinct, and there are even specimens in which the lower whorls are entirely devoid of it. Sometimes the base narrows rather abruptly downward.

Frequent. The largest specimen measures 18 millim. in height and 4.8 millim. in diameter.

Besides the typical form just described, there is a shorter one (fig. 32) with a less number of whorls and the canal usually somewhat wider. I consider this merely as a variety, for which I propose the name of *brevis*.

Fossil occurrence.—Shito.

CM 20805
CM 20806

Genus **MANGILIA**, Risso.

35. *Mangilia deshayesii*, Dunker.

Mangilia deshayesii. Dunker, Moll. Japon., p. 3, pl. I, fig. 3. Pilsbry, Catalogue, p. 19. Tryon, Man. Conch., VI, p. 256, pl. XXII, fig. 71.

Pleurotoma (*Mangilia*) *deshayesii*. Yokoyama, Foss. Miura Penin., p. 41, pl. I, fig. 24.

A few specimens. The description of the shell is given in my work above referred to.

Fossil occurrence.—Otake and Tega. Oji (frequent). Lower Musashino of Koshiba.

Living.—Central and Western Japan.

CM 20807-1-33
CM 20808

36. *Mangilia ojiensis*, (Tokunaga).

Pl. I. Fig. 33.

Pleurotoma ojiensis. Tokunaga, Foss. Env. Tokyo, p. 15, pl. I, fig. 28.

Shell small, rather solid. Whorls seven of which five are post-nuclear, convex, somewhat angulate a little above the middle, with the surface above the angle steeply sloping. The sculpture consists of longitudinal ribs and spiral striae. The ribs are about fifteen on the penultimate whorl, perpendicular to the suture above the angle, somewhat oblique below with the upper end directed somewhat forward, obtuse, much narrower than the interspaces. Spiral striae fine, numerous, more or less unequal, often indistinct. On the body-whorl the longitudinal ribs vanish toward the base, while the spiral striae are quite distinct. Periphery rounded. Aperture fusiform, pointed behind, truncate in front, with a very short straight canal. Outer lip varicose without. Sinus very

shallow, obtuse-angled at bottom. Height 10 millim. Diameter 5.5 millim.

In general, the shoulder-angle is most conspicuous in the specimens with sharp sculptures, while in those with fainter ones it is more or less rounded. A few specimens found at Shito show the latter character.

Fossil occurrence.—Shito. Oji (numerous).

CM20809-1-34

37. *Mangilia fukuchiana*, Yokoyama.

Pl. I. Fig. 34.

Shell small, tolerably solid, subfusiform. Whorls about eight, the first two smooth and rounded, the remaining obtusely subangulate a little below the middle with the surface above the angle flat and obliquely sloping, below nearly vertical. The sculpture consists of longitudinal ribs and spiral striae. Ribs about eight in number, rounded, oblique, somewhat curved with the concave side towards the front, separated by intervals of a nearly equal breadth. Spiral striae fine, numerous, close together, rather indistinct (seen only with a lens). Body-whorl somewhat longer than spire, rounded, rather gradually tapering anteriorly, with the ribs evanescent on the base. Aperture ovate, posteriorly acute, anteriorly truncate, with a broad, hardly developed canal. Inner lip varicose without. Lip-sinus moderate in depth. A single specimen, 65 millim. in height and 4 millim. in diameter.

Fossil occurrence.—Otake.

Living.—Central Japan.

CM20810-135
CM20811

38. *Mangilia* (*Cythara*) *rugosolabiata*, Yokoyama.

Pl. I. Fig. 35.

Shell small, rather solid, fusiform. Whorls eight and a half, the first two and a half smooth and rounded, the remaining bluntly angulate a little below the middle, with the surface above the angle slightly concave and steeply sloping, below flat and nearly vertical. Longitudinally ribbed and spirally striate. Ribs eight on the

penultimate whorl, coarse, blunt, somewhat curved above the angle, straight and vertical below, separated by much wider interspaces, sometimes indistinct or obsolete on the body-whorl. Spiral striae very fine, only visible with a lens by a good reflection of light. Body-whorl longer than spire. Periphery rounded. Base gradually tapering towards the front and usually with the whorl-ribs continuing into it. Aperture elongated, acute behind. Canal short, straight. Inner lip with a reflexed callus on which there are seven to nine unequal, distant, transverse striae or ridges which are most distinct on the lower half of the lip. Outer lip varicose without, transversely dentate within. Lip-sinus rather shallow, cut into the concave surface above the angle and a little below the suture. Height 12 millim. Diameter 3.5 millim. Rather rare.

Fossil occurrence.—Otake.

39. *Mangilia* (*Cythara*) *oyuana*, Yokoyama. CM 20812-1-36

Pl. I. Fig. 36.

Shell small, subfusiform. Whorls eight, the first two smooth and rounded ; of the remaining ones, the younger are subangulate, while the older are convex. The sculpture consists of longitudinal ribs and spiral striae. Ribs eleven on the penultimate whorl, strong, somewhat oblique and curved, obtuse, a little narrower than interspaces. Spiral striae three, the uppermost in the middle of the whorls, the lowest close to the suture and indistinct on the whorls preceding the penultimate. Besides these striae there are also many very fine spiral lines on the upper half of the whorls, only visible with a strong lens. Body-whorl a little longer than spire, with periphery rounded and furnished with more than ten spiral striae. The ribs on the base are nearly vertical. Aperture elongated with a short straight canal. Inner lip with a callus on which there are three teeth, the one which is blunt near the posterior end and the other two (the upper coarse and the lower not so conspicuous) in the middle part. Outer lip thickened, varicose without and with a few coarse teeth within. Lip-sinus moderately

deep, rounded and wide-mouthed. Height 8.5 millim. Diameter 3 millim.

Fossil occurrence.—A single specimen from Shisui.

CM 20813 -1-37
CM 20814

Genus **BELA** (Leach), Gray.

10. *Bela rugulata*, *Troschel*, *var. schneideri*, Harmer.

Pl. I. Fig. 37.

Bela rugulata var. schneideri. Harmer, Plioc. Moll. Grt. Brit., part II, p. 284, pl. XXXI, figs. 15, 16. Palaeontogr. Soc. LXVIII.

The shell is rather small, ovato-fusiform in shape, with the spire about half as long as the body-whorl. The whorls number between six and seven and are angulate a little above the middle, the surface above the angle forming a sloping shelf. The sculpture consists of longitudinal ribs and spiral threads, the former being about sixteen on the body-whorl, somewhat narrower than the interspaces and nodulous at the angle. The spiral threads number five, one at, and four below, the angle and slightly tuberculous at their points of intersection with the ribs. Above the angle there are several fine spiral striae. On the body-whorl the spiral threads increase in number to about twenty, are rather unequal and often at unequal distances. Aperture longly obovate. Height 9 millim. Diameter 4 millim.

The two specimens which were obtained are most like the above species of the English Crag with which I do not hesitate to unite them.

The typical form of *Bela rugulata* Tr. is now living in the boreal seas.

Fossil occurrence in Japan.—Otake.

Fossil occurrence in foreign countries.—Coralline Crag, Waltonian, Newbournian, Butleyan and Icenian of England.

CM 20815 -1-38

11. *Bela recticostulata*, Yokoyama.

Pl. I. Fig. 38.

Shell fusiform. Whorls convex, longitudinally ribbed and spirally striate. Ribs about seventeen on the penultimate whorl,

flatly rounded, wider than interspaces, somewhat oblique, nearly straight, curving slightly toward the front at the upper end. Spiral striae about twelve on the penultimate whorl, alternately large and small. Body-whorl higher than spire with ribs gradually weakening on its base, while spiral striae are numerous and conspicuous down to the caudal end. Aperture rhomboidal, pointed behind. Inner lip with a thin callus. Outer lip thin. Sinus shallow, rounded, close to suture. Canal short, wide, a little bent.

In the single specimen obtained, the apex and the lips are broken. The diameter is about 6 millim. The height, if the shell is perfect, would be about 16 millim.

This shell is closely related to *Bela pyramidalis* Stroem (Mart. u. Chemn., Syst. Conch. Cab., IV, part 3, p. 159, pl. 32, fig. 14) of Polar Seas in which, however, the ribs are sigmoidal.

Fossil occurrence.—Shito.

Family **Cancellariidæ.**

VR 9 M 20816
CM20817
CM20818
CM20819
CM20820
CM20821

Genus **CANCELLARIA**, Lamarck.

42. ***Cancellaria spengleriana***, Deshayes.

Cancellaria spengleriana. Sowerby, Thes. Conch., vol. II, p. 439, pl. 93, fig. 29. Dunker, Ind. Moll., p. 103. Pilsbry, Catalogue, p. 21. Watson, Challenger Gastropoda, p. 273. Tokunaga, Foss Env. Tokyo, p. 11, pl. I, fig. 15. Yokoyama, Foss. Miura Penin., p. 44, pl. II, figs. 2, 3.

Although not always in great numbers, this shell is found at several localities.

Fossil occurrence.—Otake, Tega, Kioroshi, Kamenari, Narita, Shito. Shinagawa and Oji in Musashi. Lower Musashino of Yokosuka.

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

CM20822-21
CM20823
CM20824
CM20825
CM20826

43. ***Cancellaria nodulifera***, Sowerby.

Pl. II. Fig. 1.

Cancellaria nodulifera. Sowerby, Thes. Conch., II, p. 440, pl. 94, fig. 57. Lischke, Jap. Meeresconch., II, p. 55. Dunker, Ind. Moll. p. 103, pl. VI, figs. 24, 25. Pilsbry, Cat., p. 22. Tokunaga, Foss. Env. Tokyo, p. 12, pl. I, fig. 16.

This species is distinguished from the foregoing by its shorter and more ventricose form and also by broadly channelled sutures. The three folds of the columella-lip mentioned by Sowerby are more or less indistinct in our fossils, the two lower ones being somewhat distant from the uppermost. The shoulder-tubercles are more or less spiny in the fossil specimens as may be seen in our figure and also in that of Tokunaga.

Fossil occurrence.—Otake, Kamenari, Tega, Shito. Oji in Musashi. Rare at all the above places.

Living.—Central and Western Japan.

CM20827-2-2
CM20828
CM20829
CM20830

44. *Cancellaria asperella, Lamarck, var. reeviana,* Crosse.

Pl. II. Fig. 2.

Cancellaria asperella var. reeviana. Pilsbry, Cat., p. 22.

Cancellaria reeviana. Dunker, Index Moll., p. 104. Lischke, Jap. Meeresconch., II, p. 56. Mart. u. Chemn., Syst. Conch. Cab., IV, part 3, p. 12, pl. II, figs. 7–9. Crosse, Jour. de Conch., IX, p. 237.

Cancellaria elegans. Sowerby, Thes. Conch., II, p. 446, pl. 93, fig. 36, pl. 96, fig. 104. Reeve, Conch. Icon., X, pl. III, fig. 12. (Not C. elegans Desh.).

This is a very variable species. In some specimens the shell is thick, while in others it is rather thin. The whorls are somewhat angulate a little above the middle and not convex throughout as shown in the figures given in the "Systematischen Conchylien-Cabinet." But the general appearance is alike. The ribs number sixteen or seventeen on the penultimate whorl. The spiral threads number about four above the angle and five below it. The intersection-points of ribs and threads are more or less tuberculous. Columella folds three, strong and oblique. On some specimens there is a thin callus. The outer lip is either dentate or smooth within.

The specimens are all young, the largest measuring 19 millim. in height and 10 millim. in diameter. Rare.

Fossil occurrence.—Otake, Tega and Shito.

Living.—Central and Western Japan. Philippines.

CM20831-2-3
CM20832
CM20833
CM20834
CM20835
CM20836
CM20837

Family **Olividæ.**

Genus **OLIVELLA,** Swainson.

45. *Olivella fortunei,* (A. Adams).

Pl. II. Fig. 3.

Olivella fortunei. Pilsbry, Cat., p. 23, pl. II, fig. 11. Tryon, Man. Conch., V. p. 69, pl. XVI, figs. 12–15.

Oliva fortunei. Marrat in Sowerby's Thes. Conch., IV, p. 36, pl. XXIII (Oliva), figs. 422, 423.

Olivella consobrina. Tokunaga, Foss. Env. Tokyo, p. 10, pl. I. fig. 13. Brauns, Geol. Env. Tokio, p. 29. (Not *O. consobrina* Lke.).

This species has been taken by Tokunaga and Brauns for *Olivella consobrina* Lischke which is identical with *O. fulgurata* Adams and Reeve, and possibly also with *O. fabula* Marrat. Compared with *O. consobrina, O. fortunei* grows larger and is broader in form. A fine figure of a recent shell is given by Pilsbry in his Catalogue above referred to. Of the three oblique columella-folds present, the uppermost is usually indistinct, while the middle is broad and mostly obliquely striated.

Very frequent. The largest specimen measures 19 millim. in height and 8 millim. in diameter, while the smaller ones are generally a little more slender.

Fossil occurrence.—Otake, Shisui, Tega, Kamenari, Kioroshi, Shito. Oji in Musashi.

Living.—Central Japan. China.

CM20838-2-4
CM20839

46. *Olivella spretoides,* Yokoyama.

Pl. II. Fig. 4.

Shell small, longly oval, shining. Whorls about four and a half, the first one and a half embryonal and rounded, the succeeding sloping, only a little convex, smooth. Body-whorl very large, broadly rounded, somewhat tapering below toward the caudal end, the greatest diameter being nearly in the middle of the shell. Sutures channelled, the channel-end being distinctly impressed on the body-whorl as a broad, shallow, transverse

depression above the posterior end of the aperture which is elongated and angular behind. Columella-lip covered with a thin translucent glaze whose lower end is furnished with an oblique bifid fold. Outer lip thin, the margin being nearly straight. Height 5.5 millim. Diameter 2.5 millim.

This shell which is rather frequent is very much like the one taken by Smith (Proc. Zool. Soc. Lond., 1879, p. 216, pl. XX, fig. 55) for *Olivella spreta* Gould (never figured); but our fossil has the body-whorl more curved and a little more tapering downward.

Fossil occurrence.—Shito.

CM20840 ~~CM20841~~
CM2084/

Genus **ANCILLA**, Lamarck.

47. *Ancilla hinomotoensis*, Yokoyama.

Pl. II. Fig. 5.

Shell solid, subfusiform. Spire obtuse, entirely covered with spirally indistinctly striated callus which on the lateral side (right from the aperture) of the shell overlaps each other with the left end above. The sutural portion of the body-whorl is also concealed by the callus, while its exposed portion is covered with coarse lines of growth as well as with fine, rather indistinct, spiral ones. Spiral sulcus broad. Basal area with a spiral ridge in the middle, dividing it into two nearly equal parts. Aperture fusiform, pointed behind, truncate in front. Inner lip covered with a portion of the callus extending from above and with the caudal end obliquely grooved; grooves four or five in number. Outer lip thin, its upper portion being also covered with the callus. Height 33 millim. Diameter 9 millim. Length of aperture about 20 millim.

This fossil is not unlike *Ancilla montrouzieri* Souv. (Syst. Conch. Cab., V, *Ancillaria*, p. 17, pl. V, figs. 5, 6) from the South Sea. But in the former the callus on the apertural side of the shell extends more downward, and the acute embryonal end found in the latter is absent.

Fossil occurrence.—Shito (frequent).

Family **Marginellidæ.**

Genus **MARGINELLA**, Lamarck.

CM20842-2-6
CM20843

48. *Marginella cotamago*, Yokoyama.

Pl. II. Fig. 6.

Shell minute, rather solid, ovoid, the greatest diameter being a little above the middle of the shell, smooth. Spire concealed. Apex rather rounded. Aperture as long as the shell, narrow. Inner lip with four plaits of which the lowest is the strongest and most oblique ; the next upper one is also prominent but more horizontal, while the two uppermost which are nearly horizontal are thin and often indistinct. Outer lip thickened, receding both above and below, smooth within. Rare. The largest example measures 2 millim. in height and 1.5 millim. in diameter.

This shell looks like *Marginella minuta* Pfr. (Tryon, Man. Conch., V, pl. XII, figs. 60-63) of the Atlantic which, however, has the outer lip denticulate within.

Fossil occurrence.—Shito.

Living.—Central Japan.

49. *Marginella perovulum*, Yokoyama. CM20844-2-7

Pl. II. Fig. 7.

Shell small, ovoid, rather thin. Spire hidden. Apex very obtusely pointed. Body-whorl smooth, broadest a little above the middle. Aperture as long as the shell, somewhat dilated in front. Inner lip with four plaits of which the lowest is the strongest, while the other three are nearly equal in size and all quite distinct. Outer lip not thickened, sharp, smooth within. Height 2 millim. Diameter 1.2 millim.

This shell closely resembles *Marginella ovulum* Sow. (Thes. Conch., I, pl. 78, fig. 188) from Australia which, however, tapers more sharply downward.

Fossil occurrence.—At Shito, but rather rare.

Family **Volutidæ.**

CM20845

Genus **VOLUTA**, Linné.

50. *Voluta megaspira*, Sowerby.

Voluta megaspira. Sowerby, Thes. Conch., I, p. 208, pl. 48, figs. 31, 32. Dunker, Index Moll., p. 49. Lischke, Jap. Meeresconch., II, p. 167, III, p. 43. Pilsbry, Cat., p. 24. Yokoyama. Foss. Miura Penin., p. 46, pl. II, fig. 18.

Several large specimens, though all more or less broken.

Fossil occurrence.—Shito. Lower Musashino of Miyata, Kamakura, Kanazawa, Koshiba and Naganuma.

Living.—Northern, Central and Western Japan.

Family **Mitridæ.**

CM20846-2-8

Genus **MITRA**, Lamarck.

CM20847

51. *Mitra hondana*, Yokoyama.

Pl. II. Fig. 8.

Shell small, thick, fusiform. Whorls six, the first two smooth and rounded, the remaining convex, with a slightly excavated area at some distance from the upper suture, longitudinally weakly plicate. Plicæ very obtuse, vertical, separated by interspaces of a narrower breadth, about twenty on the penultimate whorl and indistinct or obsolete on the ultimate one which is very large and twice as high as the spire. Sutures margined below by a weak spiral cord which is, however, often indistinct. Aperture longly fusiform. Columella-plaits four, somewhat oblique, the two upper ones nearly equal in size, the third more oblique and smaller, the fourth the smallest and most oblique. Outer lip thin, simple, smooth within. Canal short, straight. Height 10 millim. Diameter 4.2 millim.

This species resembles *Mitra albina* Adams (Tryon, Man. Conch., IV, p. 129, pl. 37, fig. 97) from Luzon which, however, is larger, with the aperture more parallel-sided. Also *Mitra lachryma* Reeve (Man. Conch., loc. cit., pl. 37, ffg. 93) seems to be an allied form.

Fossil occurrence.—Shito (rare).

CM20848-29

52. *Mitra pirula*, Yokoyama.

Pl. II. Fig. 9.

Shell small, thick, shortly fusiform. Whorls about four and a half, the first one and a half smooth and rounded rendering the apex blunt and mammillated, the remaining indistinctly shouldered with the surface above the shoulder slightly excavated, longitudinally plicate. Plicæ coarse, more or less unequal, indistinct or obsolete on the body-whorl which is very large and about three times as high as the spire. Periphery rounded. Base rather abruptly tapering downward into a short straight canal. Aperture subsemilunar. Columella-folds four, somewhat oblique, the upper three nearly equal in size and more or less parallel, the lowest smaller and more oblique. Outer lip thin and simple, broadly arcuate. Height 4 millim. Diameter 25 millim.

A single specimen. It looks somewhat like the preceding species, but is shorter and more inflated.

Fossil occurrence.—Shito.

CM20849
CM20850
CM20851
CM20852

Family **Fasciolariidæ.**

Genus **FUSUS,** Lamarck.

53. *Fusus perplexus*, A. Adams.

Fusus perplexus. A. Adams, Journ. Linn. Soc., 1864, VII, p. 106. Pilsbry, Catalogue, p. 26. Tryon, Man. Conch., III, p. 54, pl. 33, figs. 102–107. Tokunaga, Foss. Env. Tokyo, p. 6, pl. I, fig. 6. Yokoyama, Foss. Miura Penin., p. 50, pl. II, fig. 17.

Fusus inconstans. Lischke, Jap. Meeresconch., I, p. 34, pl. II, figs. 1–6, II, p. 26, pl. III, figs. 1–5. Brauns, Geol. Env. Tokio, p. 55.

Although not numerous, there are several fine specimens of this shell so common among the living ones hitherto collected in Central Japan.

Fossil occurrence. — Otake, Tega, Shisui, Shito. Lower Musashino of Naganuma.

Living.—Northern, Central and Western Japan.

CM20853-2-10
CM20854
CM20855
CM20856

54. *Fusus coreanicus*, Smith.

Pl. II. Fig. 10.

Fusus coreanicus. Smith, Proc. Zool. Soc. London, 1879, p. 204, pl. XX, fig. 36. Pilsbry, Catalogue p. 27.

Ptychatractus coreanicus. Tryon, Man. Conch., III, p. 72, pl. 40, fig. 186.

The three specimens which were collected all lack the apex. The shell is fusiform with whorls convex in general, but flat or slightly concave just below the sutures. The sculpture consists of longitudinal ribs and spiral threads. Longitudinal ribs coarse, rounded, slightly oblique, wider than interspaces, about twenty on the penultimate whorls, generally indistinct on the body-whorl and quite obsolete on its base; spiral threads many, close, unequal, every third usually larger. Aperture oval. Canal short, bent sideward as well as a little backward. Inner lip covered with a smooth callus and devoid of plaits. Outer lip thin, crenulate at margin, with distant transverse striae within corresponding in position to larger threads without.

Smith seems to have had a young shell. He gives the height as 22 millim, and the diameter as 8 millim. Among our specimens there is one with the height about 30 millim. and the diameter 12 to 13 millim.

Tryon in his Manual of Conchology brings this shell under the genus *Ptychatractus*. But as it has no columella-plaits, I deem it more proper to let it remain under *Fusus*.

Fossil occurrence.—Otake, Shisui, Shito. Rather rare at all places.

Living.—Western Japan.

CM20857-2-11
CM20858

55. *Fusus niponicus*, Smith.

Pl. II. Fig. 11.

Fusus niponicus. Smith, Proc. Zool. Soc. London, 1879, p. 203, pl. XX, fig. 12. Sowerby, Thes. Conch., IV, Fusus, p. 79, pl. 411 (7), fig. 70. Pilsbry, Catalogue, p. 26. Tryon, Man. Conch., III, p. 65, pl. 39, fig. 169. Yokoyama, Foss. Miura Penin., p. 49, pl. II, fig. 7.

Fusus suboblitus. Pilsbry, New Jap. Mar. Moll., Gastr., Proc. Acad. Nat. Sci., Philad., 1904, p. 18, pl. I, fig. 5.

This species already described from the Lower Musashino is represented by better preserved specimens some of which are larger than that figured by Smith.

The fossil is up to 33 millim. in height and 11 millim. in diameter, moderate in thickness, and quite fusiform. The whorls number about seven and a half, of which the first one and a half are embryonal, smooth and mammillary, the remaining sloping above and convex below, somewhat contracted at the lower suture, longitudinally plicate and spirally striate. The plicae are obtuse, broad, wider than intervals and rather indistinct on the last part of the body-whorl. The number is variable, but in a specimen of 30 millim. in height it is between twelve and fifteen. The spiral striae are equal, there being generally three coarse ones on the convex part of the whorl which on crossing the plicae elevate themselves into transversely elongated tubercles, a character most distinct in adult specimens. The finer striae which cover the sloping shelf and the interspaces between the coarser ones are often unequal, especially on the body-whorl which is provided with more than ten tuberculated striae, the tubercles becoming indistinct and finally obsolete toward the caudal end of the base. The aperture is ovate with the inner lip covered with a thin glaze. Outer lip thin, crenate at margin. Canal long, somewhat oblique.

Fusus suboblitus Pilsbry is undoubtedly a species founded on a specimen of *Fusus niponicus* more grown (the height is given as 36.5 millim.) than the present fossil.

Not rare.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Koshiba.

Living.—Central Japan (Smith gives the locality as south of Honshu at 52 fathoms).

CM 20859-2-12
CM 20860
CM 20861
CM 20862
CM 20863
CM 20864
CM 20865

Family **Buccinidæ.**

Genus **CHRYSODOMUS**, Swainson.

56. *Chrysodomus arthriticus*, (Valenciennes) Bernardi.

Pl. II. Fig. 12.

Chrysodomus arthriticus. Pilsbry, Catalogue, p. 28.

Neptunea arthritica. Dunker, Index Moll., p. 14. Lischke, Jap. Meeresconch., I, p. 37. Brauns, Geol. Env. Tokio, p. 28, pl. II, fig. 1.

Fusus arthriticus. Valenciennes, Comptes Rendues, tome 46, p. 761. Bernardi, Jour. Conch., 1857, p. 386, pl. XII, fig. 3.
Tritonium arthriticum. Schrenck, Moll. Amurl, u. d. nordjap. Meeres, p. 421.
Neptunea despecta. Tokunaga, Foss. Env. Tokyo, p. 7.

This is a very variable shell. But the greater part of the fossils belongs to a form with keeled and nodulous shoulders, although occasionally those with rounded ones are met with. The longitudinal ribs may be distinct or not.

If this is really identical with *Chrysodomus* (*Neptunea*) *despectus* Linné as mentioned in Tryon's Manual of Conchology (vol. III, p. 116), then its distribution becomes circumpolar.

Fossil occurrence.—Otake, Tega, Kioroshi, Shisui, Kamenari, Shito. Oji and Shinagawa in Musashi. More or less frequent in all the localities.

Living. — Northern Japan (from Rikuzen northward). Northern Sakhalin. Strait of Mamiya (Tartary).

CM20866 2-13
CM20867

57. *Chrysodomus schrencki*, Yokoyama.

Pl. II. Fig. 13.

Chrysodomus schrencki. Yokoyama, Foss. Miura Penin, p. 51, pl. III, fig. 1.

A few bad fragments.

This species is very closely akin to *C. pericochlion* Schrenck of Northern Japan and probably a mere variation of the latter.

Fossil occurrence.—Shito.

Living.—Northern Japan (according to Prof. Yabe).

CM20868

Genus **SIPHO**, Klein.

58. *Sipho obesiformis*, Yokoyama.

Sipho obesiformis. Yokoyama, Foss. Miura Penin., p. 52, pl. II, fig. 13.

This species which I founded on a few specimens from the Lower Musashino is rather frequent in the Upper. All the examples which I have show the longitudinal plicae only on the uppermost whorls, so that its resemblance to *Sipho obesus* Sow. already alluded to in my work above mentioned becomes

stronger. But the Japanese species does not grow to such a great size as the European (Tryon figures a specimen 60 millim. in height, while the Japanese hardly attains 15 millim. in height) and its canal is shorter.

Fossil occurrence.—Shito, Shinagawa. Lower Musashino of Naganuma.

59. *Sipho* (*Parasipho*) *nipponicus*, Yokoyama. CM 20869-2-14

Pl. II. Fig. 14.

An imperfect specimen probably belonging to a young shell. But it exactly coincides in form with the figure of *Sipho kroeyeri* Möller described as *Parasipho kroeyeri* by Harmer in his Pliocene Mollusca of Great Britain (part 1, p. 148, pl. XV, figs. 4, 5. Palaeontogr. Soc., vol. LVII, 1913), the only difference being the presence of two spiral threads dividing the surface of the whorls into three nearly equal parts. These threads are distinctly visible on the interspaces of the longitudinal plicae, while on the plicae themselves they are obsolete. The body-whorl is without any plicae. The fine spiral threads are also present, though only seen with a lens.

This shell may possibly be a mere variety of the well known Arctic species above mentioned. But until more specimens are obtained, it seems to be prudent to treat it as a separate species.

Fossil occurrence.—Otake.

CM 20870

Genus **SIPHONALIA**, (Swainson).

60. *Siphonalia spadicea*, (Reeve).

Siphonalia spadicea. A. Adams, Ann. Mag. Nat. Hist., 1863, XI, p. 203. Smith, Proc. Zool. Soc. London, 1879, p. 205, pl. 20, fig. 38. Dunker, Ind. Moll., p. 16. Yokoyama, Foss. Miura Penin., p. 53, pl. III, figs. 8–11.

Buccinum spadiceum. Reeve, Conch. Icon., Buccinum Index.

Buccinum fusoides. Reeve, Conch. Icon., spec. 64 (not spec. 9).

Neptunea (*Siphonalia*) *spadicea*. Mart. u. Chem., Syst. Conch. Cab., III, pt. 3, p. 130. pl. 42, fig. 8.

A fine perfect specimen 40 millim. in height, but with the canal a little more bent than usual, and several fragments.

Fossil occurrence.—Shito.

Living.—Northern and Central Japan.

CM20871-2-15
CM20872-2-16
CM20873-2-17
CM20874-2-18
CM20875
CM20876
CM20877
CM20878
CM20879

61. *Siphonalia trochulus*, (Reeve).

Pl. II. Fig. 15–18.

Siphonalia trochulus. Dunker, Index Moll., p. 16. Pilsbry, Catalogue, p. 30. Tryon, Man. Conch., III, p. 136, pl. 55, fig. 373. Yokoyama, Foss. Miura Penin., p. 54, pl. III, fig. 14.

Buccinum trochulus. Reeve, Conch. Icon., spec. 7.

Neptunea (Siphonalia) trochulus. Kobelt in Mart. u. Chem. Syst. Conch. Cāb., III, pt. 3, p. 128, pl. 42, figs. 2, 3.

The great variability of this shell is well shown by numerous examples, both young and adult, brought from several localities.

A greater part of the examples shows either no longitudinal plicae or very weak ones only on the body-whorl. But occasionally specimens are met with which possess such, though weak, also on the penultimate whorl. The canal is generally more or less bent. The inside of the outer lip is usually smooth, but now and then transversely ridged, in which case the lip is thicker.

Siphonalia stearnsii, a species founded by Pilsbry (Catalogue, p. 29. pl. II, figs. 1, 2) on a shell closely resembling the present one in shape, but having the upper whorls longitudinally plicate may possibly be one of the many forms of *S. trochulus*.

Fossil occurrence. — Otake (frequent), Kamenari, Shisui (frequent), Tega, Shito (very frequent). Oji and Shinagawa in Musashi. Lower Musashino of Naganuma.

Living.—Central Japan.

CM20880-5-1

62. *Siphonalia kellettii*, (Forbes).

Pl. V. Fig. 1.

Siphonalia kellettii. Pilsbry, Cat., pp. 30 and 168. Tryon, Man. Conch., III, p. 134, pl. 54, fi. 352. Lischke, Jap. Meeres conchl., I, p. 38, pl. III, figs. 3, 4. Carpenter, Report II, p. 663.

Fusus kellettii. Forbes, Proc. Zool. Soc. Lond., 1850, p. 274, pl. IX, figs. 9, 10.

A large specimen 140 millim. in height, though not quite well preserved. The species is readily recognized by the fusiform

shape, the long bent canal, and the angulate whorls with coarse nodules at the angle and many unequal spiral threads. In the present specimen the nodules are in many places double, that is to say, a second somewhat smaller nodule is found below the principal one. Lischke figures a specimen measuring about 120 millim. in height, while Carpenter mentions one which is 160 millim. high.

Fossil occurrence.—Shito.

Living.—Central, Western and Southern Japan. California. Lower California.

Genus **VOLUTHARPA**, Fischer.

CM20881-2-19
CM20882
CM20883
CM20884

63. *Voluthарpa perryi*, (Jay).

Pl. II. Fig. 19.

Volutharpa perryi. Dunker, Index Moll., p. 33. Pilsbry, Catalongue, p. 32. Tokunaga, Foss. Env. Tokyo, p. 8, pl. I, fig. 11. Yokoyama, Foss. Miura Penin., p. 55, pl. III, fig. 12.

Bullia perryi. Jay, Report on Shells coll. by Jap. Exped. under Comm. Perry, 1856, p. 295, pl. V, figs. 13–15.

Tritonium (*Volutharpa*) *perryi.* Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 347.

Numerous examples, though mostly broken. The whorls which are generally smooth are occasionally ornamented with spiral striations, excepting the last one. Moreover, just beneath the sutures the whorls do not immediately slope but somewhat bulge, so that the sutures become more or less channelled. The figured specimen shows such a character.

Fossil occurrence.— Otake, Shisui, Shito. Also Oji. Lower Musashino of Miyata.

CM20885-2-20
CM20886
CM20887
CM20888

Living.—Northern and Central Japan.

Genus **EBURNA**, Lamarck.

64. *Eburna japonica*, Reeve.

Pl. II. Fig. 20.

Eburna japonica. Reeve, Conch. Icon., Eburna spec. 3. Sowerby, Thes. Conch., III, p. 70, pl. 215, fig. 11. Schrenck. Moll. Amurl. u. d. nordjapan. Meeres, p. 440. Lischke, Jap. Meeresconch., I, p. 67, pl. II, p. 58. Dunker, Moll. Jap., p. 8. Index Moll., p.

34. Pilsbry, Cat., p. 34. Tryon, Man. Conch., III, p. 211, pl. 82, fig. 463. Brauns, Geol. Env. Tokio, p. 64. Tokunaga, Foss. Env. Tokyo, p. 9.

This shell so common among the living ones near Tokyo is also not infrequently found as a fossil.

Fossil occurrence.—Otake, Shisui, Tega. Oji (frequent) and Shinagawa according to Tokunaga.

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

CM20889
CM20890
CM20891
CM20892
CM20893

Family **Nassidæ**.

Genus **NASSA**, Lamarck.

65. ***Nassa* (*Hima*) *japonica***, A. Adams.

Nassa (*Hima*) *japonica*. Pilsbry, Catalogue, p. 86. Yokoyama, Foss. Miura Penins., p. 56, III. fig. 5.

Nassa japonica. A. Adams, Proc. Zool. Soc. Lond., 1851, p. 110. Lischke, Jap. Meeresconch., III, p. 37, pl. II, figs 20–23. Brauns, Geol. Env. Tokio, p. 29, Tokunaga, Foss. Env. Tokyo, p. 9.

Nassa tenuis. Smith, Ann. Mag. Nat. Hist., 1875, p. 423, Proc. Zool. Soc. Lond., 1879, p. 211.

This species which has been fully described in my work above cited is very frequent at some localities. It is easily distinguished from the following species by its finer sculpture, the number of the longitudinal costae being more than twenty on the body-whorl.

Fossil occurence.—Otake (abundant), Shisui, Kamenari, Tega, Shito. Oji, Tabata and Shinagawa (abundant) in Musashi.

Living.—Central and Western Japan.

CM20894
CM20895
CM20896

66. ***Nassa* (*Hima*) *festiva***, Powis.

Nassa (*Hima*) *festiva*. Pilsbry, Catalogue, p. 35. Yokoyama, Foss. Miura Penin., p. 57, pl. IV, fig. 6.

Nassa festiva. Powis, Proc, Zool. Soc. London, 1835, p. 95, Lischke, Jap. Meeresconch., II, p. 53. Dunker, Index Moll. p. 37. Tryon, Man. Conch., IV, p. 46, pl. 14, figs. 239–242.

Nassa lirata. Dunker, Moll. Jap., p. 7, pl. I, fig. 22.

Several examples. The shell which in its sculpture resembles *Nassa fraterculus* mentioned below is easily distinguished by its larger and more inflated form with a shorter spire. The tubercula-

ted longitudinal plicae number about eleven on the last whorl. The largest specimen measures about 20 millim. in height and 10 millim. in diameter.

Fossil occurrence.—Otake, Tega, Shito. Oji, Shinagawa, Tabata and Dokwanyama in Musashi. Lower Musashino of Miyata and Naganuma.

Living.—Northern, Central and Western Japan.

67. *Nassa* (*Hima*) *fraterculus*, Dunker. CM 20897-2-21

Pl. II. Fig. 21.

Nassa (*Hima*) *fraterculus.* Pilsbry, Catalogue, p. 36.
Nassa fraterculus. Dunker, Moll. Jap., p. 7, pl. I, fig. 15. Index Moll. Mar. Jap., p. 37. Lischke, Jap. Meeresconch., I, p. 60, II, p. 54, pl. IV, figs. 7, 8.
Tritonium (*Nassa*) *fraterculum.* Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 435.

A single example. The shell is rather thick and consists of about seven volutions and a half of which the first one and a half are embryonal and smooth ; the remaining whorls are convex, separated by deep sutures, longitudinally ribbed and spirally corded. The ribs are strong, convex, narrower than interspaces, eleven or twelve on the last whorl. There is also a varix at the end of the penultimate whorl as well as on the outer lip which is consequently thickened. The spiral cords are usually four in number, broad and flat ; of these four cords, the lower three are quite close together, being separated only by an impressed line between, while the uppermost is situated midway between the upper suture and the second cord and is comparatively distant from both. The impressed lines above mentioned cut the ribs on crossing them, so that the latter appear tuberculous. Their number on the body-whorl is about seven. Height 11 millim. Diameter 5 millim.

Fossil occurrence.—Otake.

Living.—Northern, Central and Western Japan.

Family **Columbellidæ.** CM 20898

Genus **COLUMBELLA**, Lamarck.

68. *Columbella* (*Atilia*) *burchardi*, (Dunker).

Columbella (*Atilia*) *burchardi.* Yokoyama, Foss. Miura Penin., p. 59, pl. III, fig. 17.
Columbella (*Mitrella*) *burchardi.* Tryon, Man. Conch., V. p. 129, pl. 49, fig. 17.

Amycla burchardi. Dunker, Ind. Moll., p. 55, pl. IV, figs. 3, 4. Pilsbry, Catalogue, p. 40.

Many specimens which invariably belong to the form with a shorter spire like those found in the Lower Musashino. The longitudinal plicae found on the younger or upper whorls are more conspicuous than those on the older. The outer lip is more or less dentate within. The largest specimen obtained measures 17 millim. in height and 8 millim. in diameter.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Yokosuka.

CM20899-2-24
CM20900
CM20901

69. *Columbella* (*Atilia*) *smithi*, Yokoyama.

Pl. II. Fig. 24.

Shell small, subfusiform. Whorls nine, the apical ones smooth and rounded, the following somewhat convex with the upper ones more or less longitudinally plicate and the lower ones smooth. Plicae usually about fourteen, straight, obtuse, as broad as interspaces, gradually becoming indistinct and obsolete on the lower whorls, though sometimes more or less visible even on the penultimate whorl. The whorls having no plicae are smooth except near the upper suture where a spiral thread margins it. This thread is also found at the periphery of the body-whorl which is distinctly angulate. Base suddenly contracted, smooth except near the caudal portion which is furnished with several oblique sulci. Aperture subquadrangular, more or less resembling a rhombic form. Columella lip bent in the middle, with the lower half vertical. Outer lip thin, smooth within. Canal short, recurved. Height 11 millim. Diameter 4.5 millim. Height of body-whorl 6.5 millim.

This shell is somewhat like *Columbella* (*Atilia*) *lischkei* Smith (Proc. Zool. Soc. Lond., 1879, p. 207, pl. XX, fig. 41.) which, however, has the outer lip varicose without and subtuberculate within.

Fossil occurrence.—Otake (numerous), Kamenari, Tega.

Living.—Central Japan.

70. *Columbella* (*Atilia*) *turriculata*, Yokoyama. CM20902-2-22

Pl. II. Fig. 22.

Shell turrete. Whorls about ten, the two apical ones smooth and rounded, the following flatly convex with the two uppermost longitudinally weakly plicate and the rest apparently smooth, though by a good reflection of light fine spiral striae are visible. Sutures with a raised margin below, so that they look somewhat channelled. Body-whorl a little shorter than spire. Periphery subangulate. Base suddenly narrowed into a rostrum which is obliquely grooved. Aperture rhombic. Outer lip thin, smooth within. Canal short, well defined, almost straight. A single example which measures 14.5 millim. in height and 5 millim. in diameter.

The species is much like the preceding, but somewhat larger, though more slender, with the whorls a little more convex and the periphery not so sharply angulate.

Fossil occurrence.—Otake.

71. *Columbella* (*Atilia*) *præcursor*, Yokoyama. CM20903-2-25 CM20904 CM20905 CM20906

Pl. II. Fig. 2~~4~~ 5

A few specimens.

The shell is subfusiform with about eight whorls, of which the apical ones are smooth, the one or two following longitudinally weakly costate and the remaining smooth, only a little convex and separated by deep subchannelled sutures. The body-whorl is somewhat higher than the spire and abruptly narrowed below into the base whose caudal portion is furnished with more than ten oblique grooves. Periphery rounded. Aperture four-sided with the posterior angle acute. Columella-lip bent in the middle, the upper half obliquely sloping and the lower half vertical. Outer lip varicose without, smooth within. Canal short, well defined, curved a little sideward as well as backward. Height 12 millim. Diameter 5 millim.

This species is closely akin to *Columbella* (*Atilia*) *niveomarginata*

Smith (Proc. Zool. Soc. Lond., 1879, p. 208, pl. XX, fig. 42) which, however, has the outer lip tuberculated within and the canal broader.

Fossil occurrence.—Shito, Tega, Otake. Also Tabata and Shinagawa in Musashi.

Living.—Western Japan.

CM20907-2-23
CM20908
CM20909
CM20910

72. *Columbella* (*Atilia*) *masakadoi*, Yokoyama.

Pl. II. Fig. 23.

Shell small, shortly fusiform. Whorls about eight with apex pointed, only slightly convex, smooth excepting the uppermost ones which are more or less longitudinally plicate. Sutures deep with the raised margin. Body-whorl about twice as high as spire, suddenly narrowed below into the base. Periphery rounded. Caudal portion of the base with several oblique furrows. Aperture rhomboidal with columella-lip bent in the middle. Outer lip thin, smooth within, or as is rarely the case, somewhat thickened and subtuberculate within. Canal short, a little bent. Height 10 millim. Diamer 4.5 millim. Several specimens.

The longitudinal plicae of the upper whorls are more or less distinct, if the specimens are not too much worn. In one young example, they are distinct even on the penultimate whorl.

Columbulla (*Mitrella*) *aurantiaca* Dall (Tryon, Man. Conch., V, pl. 50, fig. 39) of California is nearly like the present shell in form. But it is devoid of the longitudinal plicae as well as of the caudal furrows.

Fossil occurrence.—Otake, Tega, Shito. Oji and Dokwanyama in Musashi.

CM20911-2-26 Living.—Central Japan.

CM20912
CM20913
CM20914
CM20915
CM20916

73. *Columbella* (*Mitrella*) *dunkeri*, Tryon.

Pl. II. Fig. 26.

Columbella (*Mitrella*) *dunkeri*. Tryon, Man. Conch., V, p. 129, pl. 49, fig. 15. Yokoyama, Foss. Miura Penin., p. 59, pl. III, fig. 15.

Amycla varians. Dunker, Malak. Blätt., 1860, p. 231, Moll. Jap., p. 6, pl. I, fig. 17.

Ind. Moll., p. 55. Smith, Proc. Zool. Soc. Lond., 1879, p. 210, pl. XX, fig, 44. Pilsbry, Catalogue, p. 40.

This well known shell is quite frequent, especially at Otake. The two specimens collected at Shito, one of which is represented in the above figure, is more slender than usual, with the end of the aperture more contracted and narrower. The transverse ridges on the inner side of the outer lip is also obsolete in one of them.

Fossil occurrence.—Otake, Shisui, Tega, Kamenari, Shito. Also Tabata and Shinagawa in Musashi. Lower Musashino of Miyata and Yokosuka.

Living,—Northern, Central and Western Japan.

Family **Muricidæ**.

Genus **TROPHON**, Montfort.

CM 20917-3-1

74. ***Trophon pachyrhaphe***, (Smith.)

(R)

Pl. III. Fig. 1.

Trophon pachyrhaphe. Pilsbry, Catalogue, p. 40. Dunker, Ind. Moll., p. 10.
Coralliophila pachyrhaphe. Tryon, Man. Conch., II, p. 209, pl. 70, figs. 441, 442.
Fusus pachyrhaphe. Smith, Proc. Zool. Soc. London, 1879, p. 205, pl. XX, figs. 37, 37a. Kobelt, Mart. u. Chem. Syst. Conche Cab., p. 202, figs. 10, 11.

A single example. The shell is fusiform with about eight shouldered whorls which are flat and sloping above the shoulder and vertical below it. The sculpture consists of longitudinal ribs and spiral cords. The ribs on the penultimate whorl are nine in number, coarse, and rounded, while they are more or less flattened on the body-whorl. The spiral cords are close together and alternately large and small. Incremental lines scaly on crossing the cords. Aperture obovate. Outer lip crenate at margin and furnished within with a few faint transverse striae which do not attain the margin. Canal short, bent somewhat sideward as well as backward. Height 19 millim. Diameter 9 millim.

Fossil occurrence.—Tega.

Living.—Western Japan.

CM20918-3-2
CM20919
CM20920

75. *Trophon subclavatus*, Yokoyama.

Pl. III. Fig. 2.

Trophon subclavatus. Yokoyama, Foss. Miura Penin., p. 60, pl. III, fig. 2, pl. VI, figs. 13, 14.

There are several examples of this species which is closely related to, if not quite identical with, the North European *Trophon clavatus* Sars. The long canal is bent as in those already described in the work above cited.

Fossil occurrence.—Shito, Tega. Oji in Musashi. Lower Musashino of Miyata.

CM20921-3-3
CM20922

Genus **TYPHIS**, Montfort.

76. *Typhis arcuatus*, Hinds.

Pl. III. Fig. 3.

Typhis arcuatus. Pilsbry, Catalogue, p. 41. Hinds, Voy. Sulph., Moll., p. 10, pl. III, figs. 1, 2. Dunker, Ind. Moll., p. 9. Sowerby, Thes. Conch., III, p. 320, pl. 284, figs. 3, 4, 5. Reeve, Conch. Icon., XIX, pl. III, fig. 10 abc. Tryon, Man. Conch., II, p. 136, pl. 30, figs. 293, 297.

Typhis japonicus. A. Adams, Proc. Zool. Soc. London, 1862, p. 374.

This neat little shell is short-fusiform in shape. It has six whorls of which the apical ones are smooth and mammillary, while the succeeding ones are shouldered and furnished with varices numbering ten on the body-whorl, every two of which approach at the shoulders and form a tubular spine. Of these two varices, the anterior one is more bent than the posterior. Canal long and bent.

Several specimens, all with tubular spines broken. They are smaller than those figured by Sowerby, the largest (only 77 millim. in height) being not quite one-half as large.

Fossil occurrence.—Shito.

Living.—Western Japan. China. Cape of Good Hope.

CM20923-3-K
CM20924
CM20925

Genus **OCINEBRA**, Leach.

77. *Ocinebra falcata*, (Sowerby).

Pl. III. Fig. 4.

Ocinebra falcata. Pilsbry, Cat., p. 42. Tryon, Man. Conch., II, p. 127, pl. 38, fig. 457.
Murex falcatus. Sowerby, Thes. Conch., IV, p. 44, pl. 394, fig. 149. Dunker, Ind. Moll., p. 6. Lischke, Jap. Meeresconch., II, p. 30. Tokunaga, Foss. Env. Tokyo, p. 4, pl. I, fig. 1. Schrenck, Moll. Amurl. u. d. nord-jap. Meeres, p. 410.

This characteristic shell already described by Tokunaga from Shinagawa is more or less variable in shape. The number of varices is usually five to seven, but rarely four. The spines born on the shoulders of the varices are sometimes long and acute, sometimes short and blunt.

Fossil occurrence.—Shito (frequent), Tega. Shinagawa in Musashi.

Living.—Northern, Central and Western Japan.

CM20926-3-5
CM20927

78. *Ocinebra spectata*, Yokoyama.

Pl. III. Fig. 5.

Shell pyriform. Spire short. Body-whorl very large, occupying about four-fifths the total height of the shell. Whorls about seven, shouldered. Shoulders angulate, the surface above the shoulders being flat and nearly horizontal, below flat and vertical. The sculpture consists of longitudinal varices and spiral threads. Varices twelve on the penultimate whorl, thirteen on the preceding one and only eight on the last, straight, rib-like, rounded, somewhat narrower than interspaces, spiny at shoulders. Spiral threads very flat, weak, distinct only below the shoulders where they number three on the penultimate whorl and the preceding one with an interstitial thread in the former. Of these three threads, the uppermost is just on the shoulder and the lowest near the lower suture, while the middle one is just midway between the two. The spines of the body-whorl are first directed upward and then somewhat inward, hollow and canal-like, the opening being at the anterior side.

The body-whorl tapers quickly downward and is furnished on its lateral surface with numerous, close, unequal spiral threads which are scaly where crossed by incremental lines. Aperture oval, thickened, uneven at margin and with some blunt tubercles at some distance from it. Canal long, straight, closed.

Several specimens. The largest measures 30 millim. in height, and 16 millim. in diameter.

Fossil occurrence.—Otake, Shisui, Shito.

Living.—Central Japan.

CM20928-3-6
CM20929
CM20930
CM20931

Genus **RAPANA**, Schumacher.

79. *Rapana bezoar*, *Linné*, *var. thomasiana*, Crosse.

Pl. III. Fig. 6.

Rapana bezoar var. thomasiana. Pilsbry, Cat. Mar. Moll, Jap., p. 44.
Rapana bezoar. Lischke, Jap. Meeresconch., I, p. 51. Brauns, Geol. Env. Tokio, p.51. Tokunaga, Foss. Env. Tokyo, p. 5.
Rapana thomasiana. Crosse, Jour. de Conch., vol. IX, pp. 178, 268, pl. IX, X.
Rapana bezoar var. japonica. Dunker, Ind. Moll., p. 42.
Pyrula bezoar var. japonica. Dunker, Moll. Jap., p. 4.

This is a very frequent fossil in the neighbourhood of Tokyo. But all the specimens hitherto found belong to a smoother form without any strong spiral ribs, known under the name of var. *thomasiana.*

Fossil occurrence.—Otake, Kioroshi, Shisui, Tega, Shito. Oji, Tabata and Shinagawa in Musashi.

Living.—Northern, Central and Western Japan.

CM20932-3-7
CM20933

Genus **PURPURA**, Bruguière.

80. *Purpura heyseana*, Dunker.

Pl. III. Fig. 7.

Purpura heyseana. Dunker, Ind. Moll., p. 40, pl. XIII, figs. 10, 11. Pilsbry, Catalogue, p. 44.

Dunker founded his species on a single specimen of a young shell. The adult shells have the spire a little more elevated than in Dunker's figure.

As a fossil, a single mutilated example was found with the greater part of the spire lacking. It is about 25 millim. in diameter.

Fossil occurrence.—Shito.

Living.—Central Japan.

Family **Tritonidæ.**

Genus **TRITON**, Montfort.

CM 20934-3-8
CM 20935

81. *Triton tenuiliratus*, Lischke.

Pl. III. Fig. 8.

Triton tenuiliratus. Lischke, Jap. Meeresconch., III, p. 30, pl. II, figs. 18, 19. Tryon, Man. Conch., III, p. 22, pl. XII, fig. 105.

Tritonium tenuiliratum. Pilsbry, Cat., p. 47.

An adult and a young specimen.

The shell is fusiform with large body-whorl. The whorls are generally more or less angulate a little above the middle. The surface above the angle is flat and gently sloping, while below it is more or less vertical and somewhat contracted toward the lower suture. The varices number three on the last two whorls with the fourth one at the boundary between the penultimate whorl and the one preceding it. Between the varices there are many close longitudinal threads, some of which are coarser than others and often assume the appearance of small ribs. Spiral threads about eight on the penultimate whorl, three above the angle, one upon it and usually double (divided into two by an impressed line), and the rest on the vertical wall and unequal in size. The body-whorl possesses many spiral threads, of which the three above the angle are equal-sized, while those below the same are alternately large and small, although sometimes there are two smaller ones between the larger. Periphery rounded, Aperture obovate. Outer lip with a varix without and sulcate within. The canal in our specimens is broken, but it is evidently long, narrow, and somewhat bent. Height about 36 millim. Diameter 13.5 millim.

Fossil occurrence.—Shito.

Living.—Central and Western Japan.

CM20936

Genus **PRIENE**, H. et A. Adams.

82. *Priene oregonensis*, (Redfield).

Priene oregonensis. Pilsbry, Catal., p. 47. A. Adams in Proc. Zool. Soc. Lond., 1864, vol. VII, p. 106.

Triton oregonensis. Redfield, Ann. Lyc. Nat. Hist. New York, 1846, vol. IV, p. 165, pl. XI, fig. 2 ab. Küster in Syst. Conch. Cab. Mart. u. Chem., p. 247, pl. 66, fig. 2.

Tritonium oregonense. Martins, Mal. Blätt., XIX, 1872, p. 30.

Tritonium cancellatum. Schrenck, Moll. Amurl., p. 431.

Triton (Priene) oregonensis. Yokoyama, Foss. Miura Penin., p. 64, pl. III. figs. 19, 20.

Only some fragments.

Fossil occurrence.—Shito. Lower Musashino of Kamakura, Yokosuka and Koshiba.

Living.—Northern Japan. Alaska, Oregon, Chile, Strait of Magellan.

Family **Cassididæ.**

CM20937-3-9
CM20938
CM20939

Genus **CASSIS**, Lamarck.

83. *Cassis strigata*, (Gmelin).

Pl. III. Fig. 9.

Cassis strigata. Dunker, Ind. Moll., p. 65. Pilsbry, Cat., p. 48. Tryon, Man. Conch., VII, p. 276, pl. 7, fig. 85. Reeve, Conch. Icon., V, fig. 26.

Cassis undata. Küster in Mart. u. Chem. Syst. Conch. Cab., III, part 1, p. 89, pl. 52, figs. 1, 2.

Buccinum strigatum. Gmelin, Linne, Syst. Nat. ed. 13, p. 3477.

Cassis zebra. Lamarck, Anim. sans Vert.l X, p. 28.

Of the four examples obtained, two are entirely devoid of varices. The spiral grooves of the body-whorl in one of the specimens are only distinct on the lower two-thirds of the surface. The largest specimen measures 65 millim. in height, while the figured one is not quite 60 millim. high.

Fossil occurrence.—Otake, Tega.

Living.—Central and Western Japan.

CM20940-370 (R)
CM20941
CM20942
CM20943
CM20944
CM20945

Family **Doliidæ.**

Genus **DOLIUM**, Lamarck.

84. *Dolium luteostomum*, Küster.

Pl. III. Fig. 10.

Dolium luteostomum. Küster in Syst. Conch. Cab., vol. III, part 1, B, p. 66, pl. 58, fig. 2. Lischke, Jap. Meeresconch., I, p. 65, II, p. 57. Pilsbry, Catal., p. 49. Brauns Geol. Env. Tokio, p. 60. Tokunaga, Foss. Env. Tokyo, p. 17, pl. I. fig. 30. Yokoyama, Foss. Miura Penin., p. 66, pl. IV, fig. 2.

Dolium japonicum. Dunker, Nov. Conch., p. 104, pl. 35, fig. 36.

Dolium variegatum. Schrenck, Moll. Amurl., p. 403.

Very frequent at some of the localities.

Fossil occurrence.— Otake, Kioroshi, Shisui, Tega and Shito. Shinagawa in Musashi. Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Northern, Central and Western Japan. Indian Ocean (Küster).

Family **Cypræidæ.**

Genus **ERATO**, Risso.

CM20946-371
CM20947

85. *Erato callosa*, A. Adams et Reeve.

Pl. III. Fig. 11.

Erato callosa. Adams and Reeve, Zool. Voy. Samarang, p. 25, pl. 10, fig. 32. Sowerby, Thes. Conch., III, p. 82, pl. 219, figs. 35–37. Lischke, Jap. Meeresconch., II, p. 68. Dunker, Moll. Jap., p. 9. Ind. Moll., p. 56. Tryon, Man. Conch., V, p. 9, pl. 4, figs. 38, 39. Pilsbry, Cat., p. 52. Tokunaga, Foss. Env. Tokyo, p. 10, pl. I, fig. 12.

This shell is characterized by A. Adams and Reeve as follows: "Shell pyriform, strong, thickly enamelled, callous; spire subobtuse columella excavated, outer lip distinctly denticulate ''

A few specimens of an *Erato* obtained agree very well with the above description and are, therefore, to be assigned to the same species.

In Sowerby's Thesaurus Conchyliorum there is a species

called *Erato lachryma* Gray (vol. III, pl. 219, figs. 4, 5, 6) described also from Japan. It is said to have "the crenulations of the outer lip not very perceptible," but in shape it is hardly distinguishable from *Erato callosa*. Moreover, the specimens of the latter have occasionally the denticulations indistinct. Therefore it is possible that the two forms belong to the same species.

Tokunaga's figure of *Erato callosa* must be said to be not quite correct.

Fossil occurrence.—Otake (rare), Shito (not rare). Shinagawa.

Living.—Central and Western Japan. China.

Family **Strombidæ.**

Genus **STROMBUS**, Linné.

86. ***Strombus japonicus***, Reeve.

Pl. III. Fig. 12.

Strombus japonicus. Reeve, Conch. Icon., fig. 42. Lischke, Jap. Meeresconch., I, p. 30, pl. V, fig. 7. Tryon, Man. Conch., VII, p. 115, pl. 5, fig. 48. Pilsbry, Cat., p. 55.
Strombus vittatus Linne, *var.* Dunker, Index Moll., p. 95.

Two specimens, one of which is young. The adult specimen agrees quite well with the figure of Lischke, except in the upward prolongation of the expanded outer lip which in the present specimen does not go up higher than the shoulder of the body-whorl, while in Lischke's figure it goes much higher, reaching the third whorl from the last.

The younger specimen which is about 20 millim. high has the outer lip thin and not expanded, the shell thereby assuming the appearance of a *Hemifusus*. Such is also the case with young specimens of the living shell.

Fossil occurrence.—Otake.

Living.—Central and Western Japan. Bonins or Ogasawara-jima.

Family **Cerithiidæ.**

Genus **CERITHIUM**, Adanson.

87. *Cerithium*, (*Clava*) *kochi*, Philippi. CM 20949-3-13

Pl. III. Fig. 13.

Cerithium kochi. Philippi, Abbild. u. Beschr., III, Cerithium, p. 2 (14), pl. I, fig. 3. Lischke, Jap. Meeresconch., I, p. 76, III, p. 49. Tokunaga, Foss. Env. Tokio, p. 24, pl. I, fig. 49.
Cerithium (*Vertagus*) *kochi.* Tryon, Man. Conch., IX, pl. 28, figs. 48, 49.
Vertagus kochii. Dunker, Ind. Moll., p. 108.
Clava kochi. Pilsbry, Cat., p. 56.

Two specimens of a narrowly turrete shell. The whorls are flat and ornamented with seven close, flat, spiral ribs which are alternately large and small. The uppermost rib which is a smaller one is often rather indistinct, being close to the suture. The larger ribs are all tuberculate, while the smaller are either smooth or only indistinctly tuberculate. Columella-fold single, weak, and oblique, but towards the interior high and strong. Height 35 millim. Diameter 10 millim.

Fossil occurrence.—Otake. Shinagawa in Musashi.

Living.—Central and Western Japan. East Coast of Africa.

Genus **POTAMIDES**, Brongniart.

88. *Potamides* (*Tympanotonos*) *fluviatilis*, CM 20950
(Postiez et Michand).

Potamides (*Tympanotonos*) *fluviatilis.* Pilsbry, Cat., p. 57. Tokunaga, Foss. Env. Tokyo, p. 25, pl. I, fig. 52. Yokoyama, Foss. Miura Penin., p. 68, pl. IV, fig. 14.
Potamides fluviatilis. Lischke, Jap. Meeresconch., I, p. 76, II, p. 69.
Tympanotonos fluviatilis. Dunker, Ind. Moll., p. 110.
Cerithium fluviatile. Postiez et Michaud, Cat. Moll. Douai, p. 363, pl. 31, figs. 19, 20. Sowerby, Thes. Conch., II, p. 891, pl. 186, figs. 295, 298.
Potamides cf. incisus. Tokunaga, Foss. Env. Tokyo, p. 26, pl. I, fig. 53.

This shell is characterized by flat whorls on which there are three flat distant ribs. These ribs are furnished with tubercles which form longitudinal rows linked together by a thread.

Fossil occurrence.—Otake (rather frequent). Tabata. Lower Musashino of Yokosuka.

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

CM20957
CM20952

80. *Potamides (Batillaria) zonalis*, Bruguiere.

Potamides (Batillaria) zonalis. Pilsbry, Catalogue, p. 67.

Potamides (Lampania) zonalis. Tryon, Man. Conch. IX, p. 167, pl. 34, figs. 3, 4, pl. 35. fig. 14. Tokunaga, Foss. Env. Tokyo, p. 25.

Lampania zonalis. Liscke, Jap. Meeresconch., I, p. 73, pl. VI, figs. 15, 16, II, p. 69. Dunker, Ind. Moll., p. 109.

Like the living shell described by Lischke, the fossil one too has longitudinally plicate and spirally striate whorls. The longitudinal plicae which number eleven on the penultimate whorl are somewhat oblique and are usually severed into two, sometimes into three, tubercles by spiral grooves. The peristome is continuous except at the anterior end where it is cut by a deep canal. The outer lip is markedly produced near this canal.

Several examples, though more or less broken.

Fossil occurrence.—Otake, Kamenari. Oji and Tabata.

Living.—Northern, Central and Western Japan. Hongkong. Australia.

CM20953
CM20954

90. *Potamides (Batillaria) multiformis*, (Lischke.)

Potamides (Batillaria) multiformis. Pilsbry, Catalogue, p. 57. Yokoyama, Foss. Miura Penin., p. 69, pl. IV, fig. 9.

Lampania multiformis. Lischke, Jap. Meeresconch., I, p. 74, pl. VII, figs. 1–10, II, p. 69. Dunker Ind. Moll., p. 109. Tryon, Man. Conch., IX, p. 167, pl. 35, fig. 13, pl. 34, fig. 6, 8.

Lampania zonalis. Brauns, Geol, Env. Tokio, p. 52, pl. II, fig. 12. (non *L. zonalis* Brug.).

The typical form of this shell is characterized by its short shape, a specimen from Kamenari being such a one. Among those from Semata, however, there are also more slender forms which may be considered as a variety.

What Brauns described as *Lampania zonalis* from Surugadai, Tokyo is evidently this variety, his figure clearly showing it.

Fossil occurrence.—Kamenari, Shito (not rare). Surugadai (Tokyo) and Dokwanyama in Musashi. Lower Musashino of Yokosuka.

Living.—Northern, Central and Western Japan.

Family **Cerithiopsidæ.**

Genus **CERITHIOPSIS**, Forbes et Hanley.

CM20955-3-14
CM20956

91. *Cerithiopsis nodosocostatus*, Yokoyama.

Pl. III. Fig. 14.

Shell small, turrete. Whorls about thirteen, the first three embryonal, smooth and rounded, the succeeding flat, shouldered, with a narrow sloping shelf above the shoulder and somewhat contracted near the lower suture where there is a suprasutural spiral thread. The sculpture consists of longitudinal riblets, sixteen or seventeen on the penultimate whorl, straight, vertical, usually made up of two nodules placed one above the other and linked together by a low ridge. Of these two nodules the lower may become obsolete, in which case the whorls appear to be furnished with a single spiral row of nodules at the shoulder. Interspaces equal to, or slightly broader than riblets, and furnished with a few faint spiral striae. Periphery angulate, with the suprasutural thread elevated and sharp. Below the peripheral thread there is a second angle marked by a thread and quite obtuse. Base flat, smooth or with faint spiral lines. Aperture squarish. Canal short, narrow, a little bent. Height 6.5 millim. Diameter 2 millim.

Of the three specimens obtained, one has a single spiral row of nodules on lower whorls.

Fossil occurrence.—Shito.

CM20957-3-15
CM20958

92. *Cerithiopsis* (*Seila*) *trisulcatus*, Yokoyama.

Pl. III. Fig. 15.

Shell small, subulate. Whorls about seventeen, the first two smooth and rounded, the succeeding flat in the upper third and

somewhat convex in the lower two-thirds, spirally grooved; grooves three, dividing the surface of the whorls into four parts of which the upper three are nearly equal in breadth, while the lowest is a little narrower. Periphery subangulate. Base with two spiral grooves near the periphery. Aperture rhomboidal. Outer lip thin Canal short, narrow, bent sideward as well as backward. Height 11.5 millim. Diameter 2.5 millim.

In one of the specimens, which are not at all rare, the upper portion of the spire is slightly curved, and in young ones the whorls may be all nearly flat.

Fossil occurrence.—Shito.

CM20959-3-16
CM20960

Family **Triforidæ.**

Genus **TRIFORIS**, Deshayes.

93. *Triforis otsuensis*, Yokoyama.

Pl. III. Fig. 16.

Triforis otsuensis. Yokoyama, Foss. Miura Penin., p. 69, pl. IV, fig. 11.

This species which I founded on a single specimen from the Lower Musashino of Yokosuka is represented by four specimens, in two of which the apex is not preserved. The whorls number about twelve, the first three being embryonal. The middle spiral rib of the body-whorl which is equal in size to the other two in the specimens of Yokosuka is in the present ones always more or less weak, as on the preceding whorls. The aperture is a rounded square. Height about 5.5 millim. Diameter 1.5 millim.

Fossil occurrence.—Shito. Lower Musashino of Yokosuka.

Living.—Central Japan.

CM20961-5-5

94. *Triforis multigyrata*, Yokoyama.

Pl. V. Fig. 5.

A single specimen of a small, subulate, subcylindric shell with the apex a little broken, but still with eighteen whorls preserved. Its height is 13 millim. and its diameter 2.8 millim. The whorls are flat and triseriately granose with interspaces narrower than the

grains which are round, close, more or less contiguous either directly or by a short prolongation sent off from their lateral sides. These grains are also linked vertically by a short, somewhat oblique riblet. On the last part of the body-whorl there is an interstitial spiral thread also granose at the extreme end (near the aperture). Aperture squarely rhombic. Canal bent sideward and also backward.

Fossil occurrence.—Shito.

(R) CM-20962-13-11
CM20963

Family **Trichotropidæ.**

Genus **TRICHOTROPIS**, Broderip et Sowerby.

95. *Trichotropis unicarinata*, Broderip et Sowerby.

Pl. XIII. Fig. 11.

Trichotropis unicarinata. Sowerby, Thes. Conch., III, p. 323, pl. 285, fig. 10. Dunker, Index Moll., p. 105, pl. I, figs. 11, 12. Tryon, Man. Conch., IX, p. 44, pl. 7, fig. 56. Pilsbry, Cat., p. 59. Tokunaga, Foss. Env. Tokyo, p. 20, pl. I, fig. 38.

Trichotropis coronata. Brauns. Geol. Env. Tokio, p. 34 (not *T. coronata* Gould).

This is a very characteristic shell easily recognized by its tabularly shouldered whorls with an elevated and crenulate keel on the shoulder, a large umbilicus surrounded by a sharp and elevated margin, ovate aperture and a very short straight canal. The sculpture is almost absent save some faint spiral striae or threads sometimes visible on the body-whorl below the shoulder.

Fossil occurrence.—Shito (frequent). Oji and Shinagawa in Musashi.

Living.—Northern to Western Japan.

Family **Vermetidæ.**

Genus **THYLACODES**, Guttard.

CM 20964-3-17

96. *Thylacodes medusae*, Pilsbry.

Pl. III. Fig. 17.

Thylacodes medusae. Pilsbry, Proc. Acad. Nat. Sci. Phil., 1891, p. 471, pls. 17, 18. Catalogue, p. 59, pls. IV, V. Yokoyama, Foss. Miura Penin., p. 71, pl. IV, fig. 7.

Only a single fragment.

Fossil occurrence.—Otake. Lower Musashino of Miyata and Yokosuka.

Living.—Central to Southern Japan.

Family **Cæcidæ.**

Genus **CÆCUM**, Fleming.

CM20965-3-18

97. *Cæcum vitreum*, Carpenter.

Pl. III. Fig. 18.

Caecum vitreum. Carpenter, Monogr. Caecidae, Proc. Zool. Soc. Lond., 1858, p. 432, spec. 29. A. Adams, Ann. Mag. Nat. Hist., 1868, p. 364. Tryon, Man. Conch., VIII, p. 215, pl. 66, fig. 54.

A single specimen of a small arched smooth shell, 2 millim. in length and about 0.5 millim. in diameter. The tube is somewhat larger near the anterior end where it is more sharply curved than in the other parts.

A shell like this, having neither characteristic form nor markings is extremely difficult to determine, especially when it is a fossil. But as the presence of this species in the Japanese waters has been already noted by A. Adams, I believe, I am justified in assigning this to the same species.

Fossil occurrence.—Shito.

Living.—Central and Western Japan.

Family **Melaniidæ.**

CM20966-4-1
CM20967

Genus **MELANIA**, Lamarck.

98. *Melania niponica*, Smith.

Pl. IV. Fig. 1.

Melania niponica. Smith, Descript. Some New Spec. Land a. Freshw. Shells a. Rem. on Other Spec. found in Japan, Quart. Journ. Conchol., I, p. 118 (1876). Kobelt, Fauna Moll. Extramar. Japon., p. 131, pl. 19, figs. 5–7, 10–14.

Two decollated specimens, both with the upper whorls broken, The whorls grow rather rapidly and are ornamented with slightly curved longitudinal costae, numbering sixteen on the penultimate whorl and crossed by distant spiral cords (six on the penultimate), the intersection-points being tubercular. On the base there are only spiral cords, the longitudinal costae ending at the periphery.

The specimens belong to the so-called short forms of the species like fig. 6 of Kobelt.

Fossil occurrence.—Otake. Tega.

Living.—Central Japan (both in lakes and near sea-coasts).

Family **Solariidæ.**

Genus **SOLARIUM**, Lamarck.

CM20968-3-19. CM20969

99. *Solarium* (*Philippia*) *cingulum*, Kiener.

Pl. III. Fig. 19.

Solarium (*Philippia*) *cingulum*. Sowerby, Thes. Conch., III, Solarium, p. 237, pl. 253 (IV), figs. 55, 56. Tryon, Man. Conch., IX, p. 15 pl. V, figs. 63, 64.

Solarium cingulum. Kiener, Coq. viv., Solarium, p. 6, 6a. Pilsbry, Cat., p. 65.

Shell conical. Whorls five, very little convex, spirally striate and with two suprasutural cords, the lower of which is at the suture and stronger than the upper which is immediately above. Base somewhat convex with a spiral cord below, and close to the corded periphery, and also several spiral striae on the whole surface. Umbilicus about one-fourth the shell-diameter, with margin broadly crenate and divided into two unequal parts by a deep, narrow, spiral groove, the inner being broader than the outer. Aperture triangular with sides somewhat curved. Height 12 millim. Diameter 19 millim. Diameter of umbilicus 5 millim.

Fossil occurrence.—Shito (rare).

Living.—Central Japan. Bonin Islands. Philippines. South Sea.

100. *Solarium* (*Philippia*) *pseudoperspectivum*, (Brocchi). CM20970-3-20 CM20971

Pl. III. Fig. 20.

Solarium (*Philippia*) *pseudoperspectivum*. Tryon, Man. Conch., IX, p. 15, pl. 5, figs. 67, 68.

Solarium perspectivum. Weinkauff, Moll. Mittelm., p. 260. Sowerby, Thes. Conch., III. Solarium, p. 235, pl. 254 (V), figs. 83, 84. Sacco, Moll. Terr. Tert. Piem. et Lig., pt. 12, p. 48, pl. I, figs. 60–65.

Trochus pseudoperspectivus. Brocchi, Conch. Foss. Subap., II, p. 359, pl. V, fig. 18.

Three examples, one of which, though the smallest, is excellently preserved.

Shell flatly conical. Whorls five, slightly convex to nearly flat, spirally banded both above and below the suture. The infrasutural band or cord is single, followed by a sulcus, while the suprasutural one is double, having a groove in the middle. A narrower groove is also found just above the band. Incremental lines very conspicuous, regular, looking like striae and causing the band to appear crenulate. Periphery angular, formed by the lower half of the double band. Base somewhat convex with the peripheral portion flattened and with two spiral grooves of which the one next to the periphery is the broadest. The base is ornamented with incremental striae radiating from the umbilicus which is comparatively small with margin coarsely crenate and encircled by a deep spiral impressed line. Aperture trapezoidal. Height 7 millim. Diameter 14 millim. Umbilical diameter 3.5 millim. The largest specimen is 21 millim. in diameter.

Very probably this is only one form of *Solarium pseudoperspectivum* of the Mediterranean which has separated into several varieties. Comparing the Japanese fossil with the figures and descriptions of the above species given by Sacco, it seems to come nearest to a variety called *suprastriatula* (fig. 65 of Sacco).

Fossil occurrence.—Shito. Pliocene of Italy.

Living.—Central Japan (hitherto not mentioned in conchological works relating to Japan, but a specimen is at hand brought from Awa (Boshu). Mediterranean.

Genus **TORINIA**, Gray.

101. *Torinia elegantula*, Yokoyama.

Pl. IV. Fig. 2.

Shell small, almost discoidal, with spire very low. Whorls four, flat, ornamented with six unequal spiral threads of which the uppermost (subsutural) and the two lowest are stronger than the others, and of the two lowest the upper is somewhat stronger than the lower. Crossing these threads are incremental striae which are close and elevated with a bead at the point of intersection. Periphery formed by a cord and angulate. Base angulate in the

middle, also with a cord at the angle; the surface between this angle and the periphery is flat with spiral threads on it, while that between the same and the umbilical margin is somewhat convex and furnished with two spiral threads. All these threads together with the angle-cords are crossed by incremental striae, the points of intersection being bead-like. Umbilicus large with margin crenate. Aperture quadratic. Height 1.5 millim. Diameter of shell 3.5 millim. Diameter of umbilicus 1.2 millim.

A single specimen.

Fossil occurrence.—Shito.

Family **Rissoidæ.**

Genus **RISSOA**, Freminville.

CM 20973-4-3
CM 20974

120. *Rissoa* (*Cingula*) *plebeja*, Yokoyama.

Pl. IV. Fig. 3.

Shell small, turrete. Whorls about nine, the first three embryonal and very small, the succeeding more or less angulate at about one-third distance from the lower suture, the surface both above and below the angle being a little convex. Sometimes the angle may be rather indistinct in which case the whorls appear strongly convex. The sculpture consists of very faint spiral striae only visible with a magnifier under a good reflection of light. Periphery rounded. Base abruptly narrowed, convex, smooth. Aperture ovate. Inner lip covered with a thin glaze. Outer lip thin, sharp. Height 5 millim. Diameter 2 millim.

The specimens are frequent, but none of them has the outer lip perfect, owing to its thin and fragile nature.

Fossil occurrence.—Shito.

Genus **RISSOINA**, d'Orbigny.

CM 20975-4-4
CM 20976

103. *Rissoina* (*Moerchiella*) *manzakiana*, Yokoyama.

Pl. IV. Fig. 4.

Shell small, ovately fusiform, rather solid. Whorls six, the first two smooth and rounded, the succeeding somewhat convex,

longitudinally plicate. Plicae straight, vertical, blunt, narrower than interspaces, about twenty in number, very weak on the penultimate whorl and almost obsolete on the ultimate, which latter is higher than the spire. Base spirally striate. Periphery broadly rounded. Aperture ovately semilunar, pointed behind, rounded in front, with peristome continuous. Height 4.5 millim. Diameter 1.8 millim.

Fossil occurrence.—Otake (frequent).

CM20977-4-5
CM20978-4-6
CM20979

Genus **FENELLA**, A. Adams.

104. *Fenella septentrionalis*, (Tokunaga).

Pl. IV. Fig. 5, 6.

Rissoa septentrionalis. Tokunaga, Foss. Env Tokyo, p. 26, pl. I, fig. 55.

Shell small, turriculate, pupoidal. Whorls nine, the first two smooth and rounded, the remaining convex, usually with two prominent spiral cords, the one on the upper and the other on the lower half of the whorl, making its surface often subangulate at these places. Besides these two cords, there are also two spiral threads less prominent than the cords and situated just above and below the suture. Sometimes there is a third thread between the cords. These cords and threads may sometimes become nearly equal in size on the body-whorl. The longitudinal sculpture consists of rigid, vertical, distant riblets nearly equal in size to the cords. The riblets, however, are often indistinct and obsolete. Intersection-points of spiral and longitudinal sculptures more or less tubercular. Periphery rounded with a spiral thread on it, which is a continuation of the suprasutural one of the preceding whorls. Base convex with several spiral threads. Umbilicus sometimes furnished with a small narrow chink. Aperture oval, bluntly angulate behind.

The shells are very variable in shape, some being long and slender (height 4.9 millim and diameter 1.4 millim.), while others are short and more pyramidal (height 2.6 millim. and diameter 1.2 millim.). These, however, are connected by intermediate forms. In several specimens, one of the upper whorls is specially

large, which is generally the case with the whorl preceding the penultimate. The subsutural chestnut band found in the living specimens is often preserved also in the fossil ones. Rather rare.

Fossil occurrence.—Otake, Tega. Tabata (according to Tokunaga).

Living.—Central Japan.

Family **Skeneidæ.**

Genus **SKENEA**, Fleming.

CM 20980-4-1

105. *Skenea nipponica*, Yokoyama.

Pl. IV. Fig. 7.

Skenea nipponica. Yokoyama, Foss. Miura Penin., p. 75, pl. V. fig. 1.

Two specimens, one of which is somewhat larger than that described from the Lower Musashino, being 2.2 millim. in diameter.

Fossil occurrence. — Shisui, Tega. Lower Musashino of Yokosuka.

Living.—Central Japan.

CM 20981-4-8

106. *Skenea planorboides*, Yokoyama.

Pl. IV. Fig. 8.

Shell small, thin, almost discoidal, broadly umbilicated, Whorls four and a half, rapidly growing, smooth, convex, separated by deep sutures. Periphery roundly angulate. Base somewhat convex. Umbilical margin angulate. Umbilical wall nearly vertical. Aperture roundly triangular, one of the angles being in the middle portion of the outer lip at the extreme end of the periphery. A single specimen which is 2.5 millim. in height and 4.5 millim. in diameter.

This species is closely akin to *Skenea planorbis* Fabr. (Tryon, Man. Conch., IX, pl. 60, fig. 100) of northern seas from which it is distinguished by its angulate periphery.

The living specimens of this shell obtained in the Sea of Sagami (Central Japan) are milk-white and translucent, and ornamented with very fine spiral striae which are almost obliterated in the fossil.

Fossil occurrence.—Shito.
Living.—Central Japan.

Family **Capulidæ.**

Genus **CAPULUS**, Montfort.

CM20982-4-9

107. *Capulus badius*, Dunker.

Pl. IV. Fig. 9.

Capulus badius. Dunker, Index Moll., p. 124, pl. XIII, figs. 15–17. Pilsbry, Catalogue, p. 69. Tryon, Man. Conch., vol. VIII, p. 132, pl. 39, figs. 77, 78.

A single specimen.

The thick capuliform shell is laterally somewhat compressed with the spirally coiled vertex extending beyond the anterior margin of the aperture. The position of the vertex is not quite in the median line of the shell owing to a distortion by pressure. Surface radiately costellate. Aperture ovate and posteriorly dilated.

Fossil occurrence.—Kamenari.
Living.—Western Japan.

CM20983

Genus **CALYPTRÆA**, Lamarck.

108. *Calyptræa mammilaris*, (Broderip).

Calyptræa mammilaris. Tryon, Man. Conch., VIII, p. 120, pl. 34, figs. 64–75, 78–81. Yokoyama, Foss. Miura Penin., p. 75, pl. IV, fig. 5.
Trochita mammilaris. Sowerby, Thes. Conch., V, p. 65, pl. 450, figs. 69–71.

Many examples, but all below 10 millim. in diameter.

Fossil occurrence.—Shito. Lower Musashino of Miyata.

Living.—West Coast of America from Puget Sound down to the Strait of Magellan.

Genus **CREPIDULA**, Lamarck.

CM20984-4-10

109. *Crepidula grandis*, Middendorff.

Pl. IV. Fig. 10.

Crepidula grandis. Middendorff, Beitr. zu einer Malak. Ross., II, p. 101, pl. XI, figs. 8–10. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 382. Dunker, Ind. Moll., p. 123, pl. VI, figs. 1, 2. Pilsbry, Catalogue, p. 70.

A single worn specimen with the longer diameter of the elliptical aperture about 35 millim. It agrees well with the figures and descriptions given in the works above mentioned.

Tryon considers this species as identical with *Crepidula dilatata* Lam. (Man. Conch., IX, p. 127) which lives along the west coast of America from Alaska down to Patagonia.

Fossil occurrence.—Shito.

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

Family **Naticidæ.**

CM20985
CM20986
CM20987

Genus **NATICA**, Adanson.

110. *Natica janthostoma*, Deshayes

Natica janthostoma. Deshayes, Revue Zool., p. 361. Philippi in Syst. Conch. Cab. Mart. u. Chemn., II, part 1, Natica und Amaura, p. 53, pl. VIII, fig. 8. Lischke, Jap. Meeresconch., I, p. 81. Dunker, Index Moll., p. 61. Pilsbry, Cat., p. 71. Yokoyama, Foss. Miura Penin., p. 77, pl. V, figs. 3, 4.

Natica clausa. Tokunaga, Foss. Env. Tokyo, p. 17, pl. I, fig. 31.

Natica clausa var. janthostoma. Middendorff, Mal. Ross., II, p. 209. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 373. Tryon, Man. Conch., VIII, p. 31, pl. 19, fig. 89.

Very frequent.

Fossil occurrence.—Otake (numerous), Shisui (do), Tega, Shito (abundant). Shinagawa, Oji and Tabata in Musashi. Lower Musashino of Miyata, Yokosuka, Kamakura, Koshiba and Naganuma.

Living.—Northern and Central Japan, Kamchatka.

Genus **POLINICES**, Montfort.

111. *Polinices powisianus*, (Recluz).

CM20988-4-12
CM20989

Pl. IV. Fig. 12.

Polinices powisianus. Pilsbry, Catalogue, p. 72.

Natica powisiana. Recluz, Proc. Zool. Soc. London, 1843, p. 210. Philippi in Syst. Conch. Cab. Mart. u. Chem., II, part 1. 46, pl. VII, fig. 4.

Natica (Mamma) powisiana. Tryon, Man. Conch., VIII, p. 42, pl. 15, fig. 42, pl. 19, fig. 92, pl. 20, figs. 99, 100.

Uber powisianum. Dunker, Ind. Moll., p. 62.

Characterized by the large umbilicus which in form of a deep and broad channel surrounds the callous process of the columella, the so-called funiculum, in a semicircle.

Fossil occurrence.—Otake (rare).

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

CM20990
CM20991
CM20992
CM20993
CM20994

112. *Polinices* (*Neverita*) *ampla*, (Philippi).

Polinices (*Neverita*) *ampla*. Pilsbry, Catalogue, p. 72. Yokoyama, Foss. Miura Penin., p. 78, pl. V, figs. 5, 6.

Natica ampla. Philippi, Zeitschr. Malak. 1845, p. 156. Tokunaga, Foss. Env. Tokyo, p. 18, pl. I, fig. 32.

Natica (*Neverita*) *ampla*. Tryon, Man. Conch., VIII, p. 32, pl. 10, figs. 81–83, 85, 86, pl. 1, figs. 91–95, pl. 12, fig. 6.

Neverita vesicalis. Dunker, Ind. Moll., p. 61.

Natica bicolor. Schrenck (non Philippi), Moll. Amurl. u. d. nordjap. Meeres, p. 378.

Natica robusta. Dunker, Moll. Jap., p. 13, pl. II, fig. 24.

Natica lamarckiana. Brauns, Geol. Env. Tokio, p. 30. Lischke, Jap. Meeresconch., I, p. 80.

Natica papyracea. Tokunaga, Foss. Env. Tokyo, p. 19, pl. I. fig. 33.

The specimens of this species are usually thick-shelled, but now and then there are thin-shelled ones which Tokunaga separated under the name of *Natica papyracea* Bush. But as it is quite certain that the latter is only an abnormal form of the former, such a separation is unnecessary. Whether *Natica papyracea* of Bush belongs to the same species or not, I am now unable to decide.

Fossil occurrence. — Otake (numerous), Shisui, Kioroshi, Kamenari, Tega, Shito (numerous). Shinagawa and Tabata in Musashi. Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Northern and Central Japan. China, Australia, Indian Ocean.

CM20995-5-8
CM20996
CM20997
CM20998
CM20999

Genus **SIGARETUS**, Lamarck.

113. *Sigaretus* (*Eunaticina*) *papilla*, (Gmelin).

Pl. V. Fig. 8.

Sigaretus (*Eunaticina*) *papilla*. Pilsbry, Catalogue, p. 73. Tryon, Man. Conch., VIII, p. 58, pl. 25, figs. 78, 79, 87, 88.

Sigaretus papilla. Lischke, Jap. Meersconch., III, p. 54.

Naticina papilla. Dunker, Ind. Moll., p. 63.

Natica papilla. Philippi in Syst. Conch. Cab. Mart. u. Chem., II, pt. 1, p. 36, pl. IV, fig. 18.
Nerita papilla. Gmelin, Syst. Nat. ed. 13, p. 3675.

A longly oval shell, rather thin and consisting of only four whorls and a half which grow very rapidly and are covered with numerons spiral grooves. Umbilicus narrow. Aperture ovate or pear-shaped.

Fossil occurrence.—Shito (rare), Otake (do), Shisui, Kamenari and Tega. Shinagawa in Musashi.

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

CM21000-4-11
CM21001
1921726-5-9

114. *Sigaretus (Eunaticina) oblongus*, Reeve.

Pl. IV. Fig. 11, Pl. 5, fig. 9.

Sigaretus (Eunaticina) oblongus. Tryon, Man. Conch., VIII, p. 58, pl. 25, fig. 83.

This species is distinguished from the foregoing only by its sculpture which consists not of spiral grooves but of spiral striations. Tryon doubts whether it is really a distinct species, an opinion with which I quite concur.

Several specimens were obtained, some of which, however, are apparently quite smooth on the surface.

Fossil occurrence.—Shito.

Living.—Habitat unknown.

Family **Scalariidæ.**

CM21002-4-13
CM21003
CM21004

Genus **SCALARIA**, Lamarck.

115. *Scalaria aurita*, Sowerby.

Pl. IV. Fig. 13.

Scalaria aurita. Sowerby, Thes. Conch., I, Scalaria, p. 92, pl. XXXIII, fig. 62. Tryon, Man. Conch., IX, p. 59, pl. 12, fig. 84. Dunker, Ind. Moll., p. 67.
Scala aurita. Pilsbry, Cat., p. 75.

Shell moderately thick, turriculate, Whorls nine, the first two smooth and rounded, the succeeding convex with distant decumbent varices which are mostly thin, thirteen on the body-whorl, the last one being situated at the outer margin of the aper-

ture. In one of the specimens, there are three broad varices on the whole shell, two on the body-whorl and one at the end of the penultimate. Umbilicus open, narrow. The three spiral chestnut-bands found on the body-whorl of recent specimens can still be seen also on the fossil. The largest example measures 11 millim. in height and 5 millim. in diameter.

Fossil occurrence.—Otake (rare) and Kioroshi (do).

Living.—Central Japan.

CM21005-4-14
CM21006

116. *Scalaria maculosa*, A. Adams et Reeve.

CM21665

Pl. IV. Fig. 14.

Scalaria maculosa. A. Adams and Reeve, Voy. Samarang, p. 51, pl. XI, fig. 14. Tryon, Man. Conch., IX, p. 59, pl. 12, fig. 86.

A. Adams and Reeve give the diagnosis of this species as follows:

"Shell longly turrete, hardly umbilicate. Whorls ten, rounded, smooth, polished. Ribs annular, subdistant, thin, broader and flexuous near the suture. Colour bluish white with dark spots (two between annular ribs)."

There are several specimens of this nice shell which measure up to 20 millim. in height and 9 millim. in diameter. The ribs number nine on the ultimate as well as on the penultimate whorl. In one specimen the original dark dots are preserved as brown ones placed one above the other.

Fossil occurrence.—Otake (not rare).

CM21007-4-15
CM21008
CM21009
(2) CM21010

Living.—Western Japan (according to Iwakawa). China Sea.

117. *Scalaria azumana*, Yokoyama.

Pl. IV. Fig. 15.

Shell turriculate. Whorls many (about ten ?), very convex, longitudinally costellate and spirally striate. Costellæ about seventeen on the body-whorl, thin, lamellar, erect, aculeate at shoulders, generally equal in size in young specimens, though in adult ones some may grow larger and become varix-like. Spiral striae found only between the costellæ, many, equidistant, with one or more

finer ones between. Aperture subcircular, surrounded by a broad peristome. Umbilicus imperforate.

Many specimens, all of which, however, lack the apex. The one with eight whorls is 11 millim. in height and 4 millim. in diameter. A large specimen with only three whorls preserved and measuring 7 millim. in diameter shows three or four costellae on each whorl stronger than others.

Specimens from Oji where they are quite frequent show the lamellar costellae higher and more prominent and the shoulder-spines more acute.

This species is closely related to *Scalaria eximia* Adams and Reeve (Voy. Samarang, p. 51, pl. XI, fig. 16), but longer.

Fossil occurrence.—Otake (rare), Tega (do), Shito (do). Oji, in Musashi.

Living.—Central Japan (Sagami).

118. *Scalaria kazusensis*, Yokoyama. CM21071-4-16 CM21012

Pl. IV. Fig. 16.

Shell small, turriculate. Whorls many (about eight ?), convex, longitudinally costellate and spirally striate. Costellae rather thick, lamellar, straight, equal, about twenty on the body-whorl. Spiral striae between costellae fine, equal, distant. Aperture subcircular, surrounded by a somewhat broad peristome. Height 9 millim. Diameter 3,5 millim.

This species resembles the preceding, but is shorter and without the shoulder-spine on the costellae which are also somewhat greater in number.

Fossil occurrence.—Shito (rare).

Living.—Central Japan (Sagami).

119. *Scalaria yamakawai*, Yokoyama. CM21013-4-17

Pl. IV. Fig. 17.

Shell small, ovately turrete. Whorls convex, with rather thick, lamellar, erect, equal riblets aculeate at shoulders and num-

bering thirteen on the body-whorl. Spaces between riblets finely and indistinctly spirally striate. Aperture subcircular with a broad peristome. Height 5.5 millim. Diameter 3 millim.

A single specimen lacking the apex. The number of whorls seems to be about eight. The apical angle of the shell is about 35°.

This species looks like *Scalaria denticulata* Sow. (Thes. Conch., I, pl. 32, figs. 25, 26) from the Philippines which, however, has a less number of riblets.

Fossil occurrence.—Otake.

Living.—Central Japan.

CM21014-4-18

CM21015

120. *Scalaria conjuncta*, Yokoyama.

Pl. IV. Fig. 18.

Shell turriculate. Whorls convex. longitudinally costellate. Costellae lamellar, erect, low, equal, about twenty-five on the body-whorl, occasionally continuous from one whorl to the other. Interspaces smooth. Aperture subcircular, surrounded by a somewhat broad peristome. Height about 13 millim. Diameter 4.5 millim.

A single specimen lacking the apex. The whorls preserved are eight in number.

A very small specimen only 4 millim. high from Shito seems to be a young of this species. The number of whorls is seven.

Fossil occurrence.—Tega, Shito(?)

CM21016-4-19

121. *Scalaria subfrondicula*, Yokoyama.

Pl. IV. Fig. 19.

Shell turriculate, many-whorled. Whorls convex, with about fourteen longitudinal, somewhat oblique, lamellar, equal riblets aculeate at shoulders. Interspaces between riblets smooth. Aperture roundly elliptical.

A single specimen lacking the apex. The whorls preserved are eight, measuring 20 millim. in height and 7 millim. in diameter.

This species is very much like *Scalaria frondicula* Wood (Crag

Moll., I, Univalves, p. 92, pl. VIII, fig. 16) of the Coralline Crag of England in which, however, the ribs are less in number (generally twelve).

Fossil occurrence.—Shito.

CM21017-4-20

122. *Scalaria picturata*, Yokoyama.

Pl. IV. Fig. 20.

Shell turriculate. Whorls about twelve, the first two smooth, the succeeding convex, longitudinally finely costellate and spirally striate. Costellae very fine, filiform, much narrower than interspaces, about sixty on the body-whorl. Spiral striae equally fine, found only on the lower three-fifths of the whorls, about eight in number on the penultimate, quite as distant as the riblets themselves and crossing them, so that the surface appears cancellated. Periphery angulate. Aperture suborbicular. Base somewhat convex, with longitudinal striae only.

Two specimens. The larger seems to be worn. It shows the riblets obtuse and the spiral striae nearly obsolete. Its height is 20 millim. with the diameter 5.5 millim. The figured specimen is the smaller one which is 13 millim. in height and 5 millim. in diameter.

This species has some resemblance to *Scalaria scaberrima* Micht. (Bellardi et Sacco, Moll. Piem., IX, p. 57, pl. II, figs. 45–47) of the Italian Pliocene, although different in details.

What Tokunaga figured as *Scalaria acuminata* Sow. (Foss. Env. Tokyo, pl. I, fig. 37) seems to be this species. Sowerby's species, however, is more slender and has no spiral striae.

Fossil occurrence.—Shito. Oji in Musashi.

Living.—Central Japan.

CM21018-4-21
CM21019
CM21020

Family **Eulimidæ.**

Genus **EULIMA,** Risso.

123. *Eulima* (*Leiostraca*) *unicincta*, Yokoyama.

Pl. IV. Fig. 21.

Shell small, subulate, polished. Whorls about ten, somewhat convex, separated by indistinct sutures, with an interstitial impress-

ed spiral line a little below the suture, perfectly smooth elsewhere. Body-whorl very large, a trifle higher than one-half the shell-height. Periphery broadly rounded. Aperture elongated, acute behind, rounded in front. Inner lip with a narrow reflexed margin covering lower two-thirds of it. Height 6 millim. Diameter 1.5 millim. Length of aperture 2.5 millim.

This species looks somewhat like *Eulima psila* Watson (Challenger Gastr., pl. 35, fig. 1) from the West Indies which, however, has no spiral line below the suture, and moreover, has the body-whorl as well as aperture comparatively shorter.

Fossil occurrence.—Otake (rare), Shito (do).

CM21021-4-22
CM21022
CM21023

124. *Eulima* (*Leiostraca*) *tokunagai*, Yokoyama.

Pl. IV. Fig. 22.

Shell small, subulate, polished. Apical portion sometimes slightly curved sidewise. Whorls about eleven, flat, smooth, with sutures indistinct. Body-whorl shorter than one-half the height of the shell. Periphery broadly rounded. Aperture ovately conic, acute behind, rounded in front. Inner as well as outer lip very obtusely angulate in the middle. Height 6 millim. Diameter 1.5 millim. Length of aperture 1.5 millim.

The living shells which can be compared with the present are *Eulima acerrima* Watson (Challenger Gastr., pl. 36, fig. 1) and *Eulima sarissa* Watson (loc, cit., pl. 36, fig. 2). The former, however, has the shape of the body-whorl as well as of the aperture different, while the latter is in general more subulate in form.

Fossil occurrence.—Otake (frequent), Tege.

CM21024-4-23
CM21025

125. *Eulima* (*Leiostraca*) *glabroides*, Yokoyama.

Pl. IV. Fig. 23.

Shell small, high-pyramidal. Apex blunt. Whorls about nine, nearly flat, with more or less distinct sutures. Body-whorl a little lower than one-half the shell-height. Periphery rounded. Base rather abruptly narrowed. Aperture ovate, pointed behind, somewhat produced and rounded in front. Margin of inner lip

reflexed outward. Height 6.5 millim. Diameter 2 millim. There is also a specimen which measures 3 millim. in diameter, but lacking a greater part of the spire.

This species is not unlike *Eulima glabra* Jeffreys (Tryon, Man. Conch., VIII, pl. 69, fig. 61), a form living in the Atlantic. But the shape of the aperture is different.

Fossil occurrence.—Shito (rare).

126. *Eulima* (*Leiostraca*) *krishna*, Yokoyama. CM21026-4-24

Pl. IV. Fig. 24.

Shell very small, pyramidal. Apex obtuse, with the upper part of the spire somewhat curved. Whorls six, nearly flat, smooth, with sutures more or less indistinct. Body-whorl a little higher than half the shell-height. Periphery sharply rounded. Aperture ovate, posteriorly pointed, anteriorly somewhat produced and bluntly pointed. A single example present measures 1.7 millim. in height and 0.6 millim. in diameter.

This shell looks like *Eulima yokoskensis* Yok. (Foss. Miura Penin., p. 79, pl. V, fig, 7) from Yokosuka, but is smaller and less acute.

Fossil occurrence.—Shito.

Family **Pyramidellidæ.**

CM21027-5-6
CM21028
CM21029
CM21030

Genus **PYRAMIDELLA**, Lamarck.

127. *Pyramidella* (*Tiberia*) *pulchella*, (A. Adams).

Pl. V. Fig. 6.

Pyramidella (*Tiberia*) *pulchella*. Dall and Bartsch, Notes on Jap., Indopac. a. Amer. Pyramidellidae, Proc. U. S. Nat. Mus., vol. XXX, p. 323, pl. XXV, fig. 4.

Pyramidella pulchella. Tryon, Man. Conch., VIII, p. 301, pl. 72, fig. 75. Pilsbry, Cat. Mar. Moll. Jap., p. 79.

Obeliscus pulchellus. A. Adams, Proc. Zool. Soc. London, 1862, p. 232. Sowerby, Thes. Conch., II, p. 807, pl. 171, fig. 20. Dunker, Index Moll., p. 74.

A longly conical pyramidal shell with flat whorls shouldered at the summit, and when fresh, ornamented with a spiral chestnut

band just at the lower sutures which appears on the body-whorl at the subangulate periphery. Aperture subovate. Outer lip thin. Columella straight, biplicate with the posterior fold larger. The largest specimen measures 13 millim. in height. The diameter somewhat varies according as the specimen belongs to a broader or a narrower form. In the former it is a little over (36%), and in the latter a little less (30%) than one-third the shell-height.

The chestnut band is also more or less preserved in all the fossil specimens.

Fossil occurrence.—Otake (frequent), Tega, Kamenari. Oji, Tabata and Dokwanyama in Musashi.

Living.—Central and Western Japan.

CM21031-5-3
CM21032
CM21033
CM21034
CM21035
CM21036

128. *Pyramidella (Agatha) virgo* (*Adams*), *var. brevis* Yokoyama.

Pl. V. Fig. 8.

Dall and Bartsch give the description of *Pyramidella virgo* in their "Japanese, Indopacific and American Pyramidellidae," p. 335 as follows:

"Shell elongate-conic, subturrited, milk-white. Nuclear whorls two, small, well rounded, obliquely about one-half immersed in the first post-nuclear whorl. Post-nuclear whorls rather high between the sutures, inflated, well rounded, shouldered, marked by irregular lines of growth which lend the surface a somewhat uneven appearance and many fine, closely placed, wavy spiral striations; sutures strongly marked. Periphery of the last whorl with a faint suggestion of an angulation. Base prolonged, gently rounded, marked like the spaces between the sutures. Aperture elongate-ovate, posterior angle obtuse, somewhat effuse at the junction of the lip and columella; outer lip thin without internal lirations; columella short, curved, with a very strong, acute, oblique fold near its insertion which fuses directly and is continuous with the anterior reflected portion of the columella; parietal wall covered by a very thin callus."

Numerous specimens. But they are invariably more or less

shorter than the specimen figured by Dall and Bartsch (loc. cit. pl. XVIII, fig. 2). The number of post-nuclear whorls is about seven and not ten as the authors say.

The largest example measures 13 millim. in height with the diameter varying from 4.3 millim. to 4.9 millim. (Dall gives: Length 13.7 millim. Diameter 4.4 millim.).

Fossil occurrence.—Otake, Shisui, Kamenari, Tega, Shito, Shinagawa, Oji, Tabata and Dokwanyama in Musashi.

Living.—Central Japan.

CM21037-5-2

129. *Pyramidella* (*Syrnola*) *cinnamomea*, (A. Adams).

Pl. V. Fig. 2.

Pyramidella (*Syrnola*) *cinnamomea.* Dall and Bartsch, Notes on Jap., Indopac. and Amer. Pyramidellidae, p. 332, pl. XXVI, fig. 1.
Pyramidella (*Elusa*) *cinnamomea.* Pilsbry, Cat., p. 82.
Elusa cinnamomea. A. Adams, Proc. Zool. Soc. London, 1862, p. 237.

A single specimen. A long slender apically blunt shell with about eight post-nuclear whorls which are perfectly flat and apparently smooth. Periphery and base rounded. Aperture ovate, pointed behind. Columella-fold indistinct. Height 4.8 millim. Diameter 1.3 millim.

The specimen agrees quite well with the figure and the description of the above species, save in the absence of minute spiral striations which are said to be found in the living one examined by Dall and Bartsch.

Fossil occurrence.—Otake.

Living.—Western Japan.

CM21038-4-25
CM21039

130. *Pyramidella* (*Iphiana*) *mira*, Yokoyama.

Pl. IV. Fig. 25.

Shell medium-sized, slender, *Terebra*-like. Whorls many (eleven preserved), slightly convex, separated by well-marked somewhat channel-like sutures, very finely spirally striate (only visible with a lens). Periphery rounded. Base abruptly narrowed, convex. Aperture subquadrate with a strong oblique columella-fold. Height about 15 millim. Diameter 3 millim.

Two specimens both broken at apex. In a fresh state the shell seems to have been provided with a coloured band close to the lower suture.

A close ally of this species is *Pyramidella tenuiscripta* Lke. (Dall and Bartsch, Notes on Jap. Pyram. already cited, p. 334, pl. XXVI, fig. 3) which Lischke himself has described as *Obeliscus tenuiscriptus* (Jap. Meeresconch., III, pp. 58, 59, pl. III, figs. 7, 8). But the present species is more slender, has the body-whorl more rounded, the columella-fold more oblique and the antero-inner corner of the aperture more obtuse.

Fossil occurrence.—Shito. Oji in Musashi.

CM21040-4-26

131. *Pyramidella* (*Iphiana*) *siva*, Yokoyama.

Pl. IV. Fig. 26.

Shell medium-sized, subulate. Nuclear whorls helicoid, standing on edge but partly immersed in the first post-nuclear whorl, Post-nuclear whorls about eight in number with surface slightly convex, somewhat shouldered at the summit so that the sutures appear subchannelled, finely spirally striate, the striae usually visible only with a lens. Periphery rounded, Base convex. Aperture partly broken but seems to have been longly subquadrate. Columella-fold very oblique. Height 8 millim. Diameter 1.8 millim. A single specimen.

CM21041-6-1

Fossil occurrence.—Shito.

CM21042
CM21043
CM21044
CM21045

132. *Pyramidella* (*Actaeopyramis*) *eximia*, (Lischke).

Pl. VI. Fig. 1.

Pyramidella (*Actaeopyramis*) *eximia*. Dall and Bartsch, Jap., Indopac. a. Americ. Pyramid., p. 327, pl. XXIII, fig. 1. Pilsbry, Cat., p. 84.
Pyramidella eximia. Tokunaga, Foss. Env. Tokyo, p. 23, pl. I. fig. 46.
Monoptygma eximium. Lischke, Jap. Meeresconch., III, p. 59, pl. III, figs. 4–6.
Monoptygma puncticulata. Brauns, Geol. Env. Tokio, p, 31.

This is a large species with many somewhat convex, spirally incised whorls shouldered at the summit. Spiral striations about seven on the penultimate, and about twelve on the ultimate whorl including those of the base. Columella fold only weakly indicated.

The largest example measures 25 millim. in height and 7 millim. in diameter.

Fossil occurrence.—Otake (frequent), Shisui (do), Tega, Shito (do). Oji in Musashi.

Living.—Central and Western Japan.

CM21046

Genus **Odostomia**, Fleming.

133. *Odostomia* (*Odostomia*) *sublimpida*, Yokoyama.

Odostomia (*Odotomia*) *sublimpida*, Yokoyama, Foss. Miura Penin., p. 82, pl. V, fig. 13.

A single specimen. It is a little larger and broader than the one described from the Lower Musashino. Height 3.5 millim. Diameter 1.8 millim.

Fossil occurrence.—Otake. Oji in Musashi. Lower Musashino of Miyata.

CM21047-4-27
CM21048
CM21049
CM21050
CM21051
CM21052

134. *Odostomia* (*Odostomia*) *gordonis*, Yokoyama.

Pl. IV. Fig. 27.

Shell small, elongately ovate. Post-nuclear whorls five or six, slightly convex, somewhat shouldered near the upper suture with a narrow sloping shelf above the shoulder which shows only a faint suggestion of angulation, covered with almost microscopic spiral striae. Incremental lines also very fine. Body-whorl large, nearly as high as the spire or a little higher. Periphery rounded. Base convex. Aperture ovate, pointed behind and rounded in front. Inner lip with a thin narrow coating of glaze. Columella-fold strong, oblique. Height 5 millim. Diameter 2.5 millim.

This shell is characterized by its more or less subtabulated form.

What Tokunaga described from Oji as *Odostomia plana* Gould (Foss. Env. Tokyo, p. 22) may possibly be this species, as it is quite common at that place. But Gould's species whose habitat is given as Hongkong seems to be quite different.

Fossil occurrence.—Otake (frequent), Shisui, Kioroshi, Tega, Shito. Oji in Musashi.

Living.—Central Japan.

CM21053-4-28
CM21054
CM21055

135. *Odostomia* (*Odostomia*) *shimosensis*, Yokoyama.

Pl. IV. Fig. 28.

Shell small, elongate-conic. Post-nuclear whorls six, slightly convex, somewhat shouldered at the summit so that the sutures appear subchannelled, smooth. Body-whorl about as high as spire. Periphery subangulate. Aperture longly ovate, acute behind, produced and sharply rounded in front. Columella-fold strong, oblique. Height 5 millim. Diameter 2 millim. Rare.

This shell resembles *Odostomia limpida* Dall and Bartsch (Notes on Jap., Indopac. a. Amer. Pyamidellidae, p. 346, pl. XXVI, Fig. 7) living in our seas; but the fossil is somewhat more slender.

Fossil occurrence.—Otake, Kioroshi.

Living.—Central Japan.

CM21056-14-1
CM21057

136. *Odostomia* (*Odostomia*) *limpida*, Dall et Bartsch.

Pl. XIV. Fig. 1.

Odostomia (*Odostomia*) *limpida*. Dall and Bartsch, Notes on Jap., Indopac. a. Amer. Pyram., p. 364, pl. XXV, fig. 7.

A small elongate-conic shell with the nuclear whorls to a greater part obliquely immersed in the first post-nuclear one. Post-nuclear whorls about five, only slightly convex, smooth. Body-whorl a trifle longer than one-half the shell-height. Periphery feebly angulate. Aperture subovate, with posterior angle acute and anterior end somewhat produced and rounded. Columella with a distinct lamellar fold. Height 3 millim. Diameter 1.5 millim.

Fossil occurrence.—Shito, Otake.

Living.—Western Japan.

(2) CM21058-5-17
CM21059
CM21060
CM21061

137. *Odostomia* (*Odostomia*) *desimana*, Dall et Bartsch.

Pl. V. Fig. 7.

Odostomia (*Odostomia*) *desimana*. Dall and Bartsch, Jap., Indopac. a. Amer. Pyram., Proc. U. S. Nat. Mus., XXX, p. 362, pl. XXV, fig. 3, pl. XXVI, fig. 2.

Odostomia lactea. Dunker, Moll. Jap., p. 17, pl. II, fig. 4. Pilsbry, Catalogue, p. 84.

Shell small, elongate-conic. Nuclear whorls almost completely immersed in the first post-nuclear one. Post-nuclear whorls about

six in a specimen 5.5 millim. high, slightly convex and apparently smooth, though with a strong lens fine spiral lines are visible. Periphery rounded. Aperture subovate, acute behind, produced and rounded in front. Columella-fold strong and oblique.

Dall and Bartsch figure a young as well as an adult specimen in which the anterior end of the aperture is somewhat different. Such a difference, though not so strong, is also found in our fossil.

Perfect specimens do not exceed 5.5 millim. in height with diameter 2 millim. But there is an imperfect one with the last three whorls preserved. It is 6 millim. in height and 3 millim. in diameter.

Fossil occurrence.—Otake (rare), Tega (do), Shito (not very rare).

Living.—Central and Western Japan.

138. *Odostomia* (*Odostomia*) *kizakiensis*, Yokoyama. CM21062-4-29

Pl. IV. Fig. 29.

Shell small, elongate-conic. Post-nuclear whorls five, smooth, only a little convex and shouldered at the summit, so that the shell appears subtabulated. Body-whorl a little higher than one-half the height of the shell. Periphery broadly rounded, Base convex, Aperture ovate, pointed behind, a little produced and rounded in front. Lamellar plait distinct, oblique. Height 4 millim. Diameter 1.8 millim. A few specimens

Fossil occurrence.—Tega.

CM21063-4-30
CM21064
CM21065
CM21066

139. *Odostomia* (*Odostomia*) *venusta*, Yokoyama.

Pl. IV. Fig. 30.

Shell small, elongate-oval. Post-nuclear whorls about four, somewhat convex, shouldered at the summit. Body-whorl very large, the height being more than double that of the spire. Periphery very broadly rounded. Aperture longly ovate, acute behind, much produced and rounded in front. Columella-fold very strong and oblique, its anterior portion forming the inner peristome of the

anterior part of the aperture. Outer lip thin and simple. Umbilicus closed. Height 4 millim. Diameter 2 millim.

A. Adams describes a species found living at Awashima under the name of *Odostomia ovoidea* (Ann. Mag. Nat. Hist., 1860 p. 416) which seems to resemble the present fossil in form. But he says that the aperture is oblong and the fold small.

Fossil occurrence.—Otake, Shisui, Kioroshi, Shito (rather frequent). Oji in Musashi.

CM21067-4-31
CM21068
CM21069

140. *Odostomia* (*Odostomia*) *toneana*, Yokoyama.

Pl. IV. Fig. 31.

Shell small, ovate-conic, rather solid. Post-nuclear whorls about five, smooth, convex with sutures very distinct. Body-whorl very large, a little higher than spire. Periphery rounded. Base convex. Aperture ovate, acute behind, produced and rounded in front. Columella-fold very strong, oblique, its anterior elongation forming the inner peristome of the anterior part of the aperture. Height 4 millim., of which the body-whorl seen from the apertural side occupies 2.6 millim. Diameter 2 millim.

In shape this species is like *Odostomia culta* Dall and Bartsch (Notes on Pyramidellidæ before quoted, p. 361, pl. XXVI, fig. 9), but it is shorter and has the whorls more convex.

Fossil occurrence.—Otake, Tega (not rare). Oji in Musashi.

CM21070-4-32

141. *Odostomia* (*Odostomia*) *suboxia*, Yokoyama.

Pl. IV. Fig. 32.

A single specimen.

Shell small, ovate-conic. Whorls few, post-nuclear four, slightly convex, smooth. Sutures well marked. Body-whorl a little shorter than two-thirds the height of the shell. Aperture ovate, pointed behind, produced and rounded in front. Fold oblique, strong. Height 3 millim. Diameter 1.4 millim.

This shell is extremely like *Odostomia oxia* Watson (Challenger Gastr., p. 484, pl. XXXI, fig. 4) from North-East Australia, and

if not for the faint spiral lines said to be found in the latter, I would unite the two.

Fossil occurrence.—Otake.

Living.—Central Japan.

142. *Odostomia* (*Odetta*) *neofelix*, Yokoyama. CM 2107-4-33

Pl. IV. Fig. 33.

Shell small, ovate-conic. Whorls about five and a half, of which one and a half are nuclear. Post-nuclear ones convex, shouldered a little below the sutures giving the shell a tabulated appearance, spirally ribbed. Ribs flatly rounded, a trifle broader than the interspaces which are finely longitudinally striate, three on the first post-nuclear whorl, four on the next one, six on the penultimate and more than ten on the ultimate. Of the four ribs of the second post-nuclear whorl, the uppermost is much narrower than the others. Of the six ribs of the penultimate whorl, the uppermost is very faint and close to the suture, the next one rather distinct, but weak, the succeeding three larger and nearly equal in size, while the lowest one is somewhat weaker, though strong when compared with the second. On the body-whorl, the first subsutural rib is very weak, the next one somewhat stronger, the following still stronger and nearly equal in size, though they again diminish in size and get closer toward the caudal end of the shell. Periphery rounded. Base convex. Umbilicus open. Aperture oval, with posterior corner blunt and anterior rounded. Tooth weak but distinct, on the some level as the umbilical hole, the peristome anterior to it being a little reflexed outward. Height 3.2 millim. Diameter 1.6 millim. Height of body-whorl seen from apertural side 1.6 millim.

The species is closely related to *Odostomia felix* Dall and Bartsch (Notes on Pyramidellidæ before cited, p. 358, pl. XXI, fig. 2) now living in Japan. But the latter has fewer ribs and the umbilicus closed.

Fossil occurrence.—Shisui (very rare). Oji in Musashi.

Living,—Central Japan.

CM21072-4-34
CM21073

143. *Odostomia* (*Egilina*) *marielloides*, Yokoyama.

Pl. IV. Fig. 34.

Shell small, ovate-conic. Post-nuclear whorls five, nearly flat, somewhat shouldered at the summit, so that the shell appears more or less tabulated, longitudinally costulate. Costulæ numerous, broadly rounded, close, broader than interspaces, somewhat oblique and flexuous, the lower end being more posterior than the upper. Body-whorl somewhat higher than spire. Periphery subangulate, bounded below by a puncticulate spiral groove which is on the same level as the suture of the last part of the body-whorl. Below this groove there are still a few more grooves of the same nature. Base abruptly narrowed. Aperture ovate, posteriorly pointed, anteriorly produced and rounded, with the margin somewhat reflexed outward. Outer lip thin, sharp. Columella-tooth weak, but distinct. Height 4 millim. Diameter 1.8 millim.

This shell resembles *Odostomia mariella* Dall and Bartsch (Notes on Pyram., p. 354, pl. XXII, fig. 4) in which, however, the apex is truncate and the costulæ oblique in the opposite sense, that is to say, with the lower end more anterior than the upper.

Fossil occurrence.—Otake (rare), Tega (do). Oji in Musashi.

CM21074-4-36
CM21075

Genus **TURBONILLA,** Risso.

144. *Turbonilla* (*Ptycheulimella*) *misella*, Yokoyama.

Pl. IV. Fig. 36.

Shell small, elongate-conic. Nuclear whorls standing on edge at the summit. Post-nuclear whorls about seven only slightly convex, longitudinally plicate. Plicæ about sixteen on the whorl preceding the penultimate, flattened, with narrower interspaces, very weak and faint on the penultimate and obsolete on the body-whorl, so that the latter appears quite smooth. Periphery rounded. Aperture ovate, acute behind. Outer lip thin. Height 3.6 millim. Diameter 1.2 millim. A single specimen.

Fossil occurrence.—Otake, Tega.

145. *Turbonilla* (*Chemnitzia*) *imbana*, Yokoyama.

CM21076-4-35

Pl. IV. Fig. 35.

Shell small, elongate-conic, gradually tapering posteriorly. Nuclear whorls helicoid, standing on edge at the summit. Post-nuclear whorls about nine, somewhat convex, separated by deep sutures, longitudinally plicate. Plicæ twenty on the penultimate whorls, very obtuse, slightly curved, oblique, the lower end being more anterior than the upper. Interspaces between plicæ very narrow, much narrower than plicæ themselves which are free at both ends. Periphery somewhat angulate. Base abruptly narrowed, with only faint indications of plicæ. Aperture subquadrate, obtuse behind. Height 5 millim. Diameter 1.5 millim. Rare.

CM21666 CM21667

This is somewhat like *Turbonilla dunkeri* Clessin (Dall and Bartsch, Pyramidellidæ loc. cit., p. 336, pl. XX, fig. 3) in which, however, the interspaces between the plicæ are wider and the plicæ fuse with one another at the periphery.

Fossil occurrence.—Shisui (rare), Tega (do), Shito (do). Oji in Musashi.

Living.—Central Japan.

146. *Turbonilla* (*Mormula*) *paucicostulata*, Tokunaga.

CM21077-4-37
CM21698
CM27679

Pl. IV. Fig. 37.

Turbonilla paucicostulata. Tokunaga, Foss. Env. Tokyo, p. 22.

Tokunaga in the above work gives neither the description nor the figure of this species, but simply says that it is like *Turbonilla elegantissima* Mont., the only difference being in the number of whorls and ribs. The following description is based on the specimens left by him in the museum of the the Imperial University of Tokyo.

Shell medium-sized, elongate-conic. Nuclear whorls helicoid, standing on edge at the summit. Post-nuclear whorls eleven or twelve, flatly convex, longitudinally costellate and finely spirally striate. Costellæ rounded, about twenty on the penultimate

whorl, slightly curved and oblique, the lower end being more forward than the upper, with broader interspaces, fused with one another at the lower suture. Occasionally two or three costellæ unite together to form a broad flat varix. Spiral striations very faint, visible only on interspaces which are provided at the lower end with a transverse pit. Periphery bluntly angulate. Base abruptly narrowed, with only faint indications of costellæ, besides a few feeble spiral threads. Aperture squarish, the inner lip being bent into an angle somewhat greater than a right angle. Outer lip thin, nearly straight. Anterior margin of the aperture broadly rounded. Height 11.5 millim. Diameter 3.2 millim.

Fossil occurrence.—Otake, Shito. Oji in Musashi (frequent).

147. *Turbonilla* (*Mormula*?) *scrobiculata*, Yokoyama.

Pl. IV. Fig. 38.

Shell medium-sized, elongate-conic. Nuclear whorls three with the axis at right angles to that of the shell. Post-nuclear whorls about fourteen, moderately convex, longitudinally costellate. Costellæ blunt, generally straight though rarely somewhat flexuous or curved, nearly vertical, slightly narrower than interspaces, separate above, fused below at the suture, with a pit at the lower end of each interspace, occasionally forming a broad flat varix (by fusion of two or three costellae). The number of costellae is about twenty-three on the body-whorl on which they end at the subangulate periphery which is marked by a spiral cord formed by the fusion of the lower ends of the costellae. Base only with coarse lines of growth, rather flat, the convexity being very slight. Sutures deep. Aperture subquadrate. Inner lip bent at an obtuse angle in the middle. Outer lip thin. Height 11 millim. Diameter 2 millim.

This shell is like the preceding, but the whorls are more numerous and have no spiral striations.

Fossil occurrence.—Otake (rare). Oji in Musashi.

Living.—Central Japan.

148. *Turbonilla* (*Chemnitzia*) *kidoensis*, Yokoyama. CM21081-4-39

Pl. IV. Fig. 39.

Shell rather small, elongate-conic. Nuclear whorls decollated. Post-nuclear whorls many (ten ?), convex, longitudinally costellate. Costellæ numerous, about twenty-eight on the body-whorl, obtuse, slightly oblique and somewhat flexuous, broader than interspaces, ending at the rounded periphery of the body-whorl. Base convex, smooth. Aperture subquadrate, the inner lip being bent at an angle which is a little greater than a right angle. Height 11 millim.(?) Diameter 2.5 millim. A single specimen.

Fossil occurrence.—Tega.

Living.—Central Japan.

149. *Turbonilla* (*Chemnitzia*) *teganumana*, Yokoyama. CM21082-4-40 (?) CM21083

Pl. IV. Fig. 40.

Shell rather small, elongate-conic. Nuclear whorls standing on edge at the summit, post-nuclear whorls about eight, nearly flat, somewhat shouldered at the upper margin, longitudinally costellate. Costellæ rounded, broader than interspaces, nearly straight, slightly oblique with the upper end more forward than the lower, about twenty on the penultimate, nearly obsolete on the body-whorl. Periphery rounded. Base convex, smooth. Aperture pear-shaped, the posterior angle being a little less than a right angle, while the angle in the middle of the inner lip is much greater. Height 6,5 millim. Diameter 2 millim.

Two specimens. In the smaller one (only 4.5 millim. high) the number of post-nuclear whorls are seven and the costellæ are also distinct on the body-whorl, but they vanish near the periphery.

Fossil occurrence.—Tega.

Living.—Central Japan.

150. *Turbonilla* (*Chemnitzia*) *sematana*, Yokoyama. CM21084-4-41 CM21085

Pl. IV. Fig. 41.

Shell small, elongate-conic. Nuclear whorls standing on edge at the summit. Post-nuclear whorls six, a little convex, longitudi-

nally ribbed. Ribs broad, flatly rounded, separated by much narrower interspaces, slightly flexuous and oblique, about sixteen on the body-whorl in which they end at the periphery without fusing with one another. Periphery subangulate. Base convex, smooth. Aperture subquadrate, the inner lip bending in the middle at a broad angle. Height 4 millim. Diameter 1.3 millim. Rare.

Fossil occurrence.—Shito.

CM21086-5-11

151. *Turbonilla* (*Pyrgolampros*) *planicostata*, Yokoyama.

Pl. V. Fig. 11.

Shell small, elongate-conic. Nuclear whorls two, smooth, rounded, standing on edge at the summit. Post-nuclear whorls about nine, moderately convex, straight, nearly vertical, twenty-one on the penultimate and twenty-three on the ultimate whorl, separated by much narrower interspaces which are finely spirally striate. On the body-whorl the costellæ continue a little into the convex base and then vanish, leaving the place near the umbilicus smooth. Periphery rounded. Aperture oval, the bending of the inner lip in its middle being slight. Height 7.3 millim. Diameter 2 millim. A single specimen.

This species is still living, and the shell, when fresh, is ornamented with two chestnut spiral bands, the one in the middle of the whorls and the other near the lower suture. In the fossil the upper band is distinctly preserved.

Fossil occurrence.—Shisui.

Living.—Central Japan.

CM21087-5-12

152. *Turbonilla* (*Strioturbonilla*) *sagamiana*, Yokoyama.

Pl. V. Fig. 12.

Shell small to medium-sized, elongate-conic. Nuclear whorls one and a half, immersed to a greater part in the first post-nuclear whorl. Post-nuclear whorls nine, flat, somewhat shouldered at the summit and contracted near the lower suture. The sculpture consists of longitudinal costellæ and spiral threads and striae. Costellæ

numerous (over thirty on the body-whorl), weak, obtuse, flexuous, oblique, wider than interspaces, very indistinct on the last part of the body-whorl, united a little above the lower suture by a spiral thread followed below by a suprasutural spiral one. Just above the upper thread there is a faint impressed spiral line crossing the costellæ. Intervals between costellæ furnished with very fine spiral striations intersecting growth-lines. Periphery obtusely angulate. Base convex, with fine spiral line cutting those of growth. Umbilicus with a small chink. Aperture ovate, somewhat pointed behind, produced and rounded in front. Inner lip bent in the middle at a very broad angle. Outer lip thin. Height 8 millim. Diameter 2. 5 millim.

Fossil occurrence.—Rarely at Otake.

Living.—Central Japan.

153. *Turbonilla* (*Strioturbonilla*) *pacifica*, Yokoyama.

Pl. V. Fig. 13.

CM 21088-5-13

Shell small, elongate-conic. Nuclear whorls standing on edge at the summit. Post-nuclear whorls eight, somewhat convex, longitudinally costellate. Costellæ flatly rounded, very slightly curved or sometimes even a little flexuous, somewhat oblique, about eighteen on the body-whorl. Interspaces very narrow, much narrower than costellæ themselves, very finely spirally striate. Periphery subangulate, the costellæ ending at this place. Base convex, smooth. Aperture subquadrate. Inner lip oblique in the upper half, vertical in the lower. Outer lip nearly vertical. Anterior margin of the aperture rounded. Height 9.5 millim. Diameter 1.2 millim. Rare.

Fossil occurrence.—Shito.

Living.—Central Japan.

CM21089-5-14
CM21090
CM21091

154. *Turbonilla* (*Cingulina*) *triarata*, Pilsbry.

Pl. V. Fig. 14.

Turbonilla (*Cingulina*) *triarata.* Pilsbry, New Jap. Mar. Moll., Gastr., Proc. Acad. Nat. Sci. Philad., Jan. 1904, p. 31, pl. V, fig. 48.

A slender shell with flat whorls (post-nuclear thirteen) ornamented with three spiral grooves. Sutures channelled. The largest specimen measures nearly 8 millim. in height and 2 millim. in diameter. Not rare.

Fossil occurrence.—Otake, Shisui.

Living.—Western Japan.

CM 21092-5-15 **155.** ***Turbonilla* (*Careliopsis?*) *obscura*,** Yokoyama.

Pl. V. Fig. 15.

A single specimen.

Shell small, elongate-conic. Nuclear whorls standing on edge at the summit. Post-nuclear whorls six, convex, very finely spirally striate, the striæ crossing the growth-lines and giving the surface a reticulate appearance which, however, can only be seen with a strong lens. Body-whorl comparatively large, about one-fifth the shell-height. Periphery rounded. Aperture ovate, produced and rounded in front. Inner lip describing a broad curve. Outer lip fractured. Height 5 millim. Diameter 1.5 millim.

Fossil occurrence.—Shito.

CM 21093-5-16 **156.** ***Turbonilla* (*Careliopsis?*) *angulifera*,** Yokoyama.
CM 21094

Pl. V. Fig. 16.

Shell small, elongate-conic. Whorls about ten, of which one and a half are nuclear and smooth. Post-nuclear whorls angulate in the middle, the angle becoming gradually obtuse as the whorls grow, on the penultimate and ultimate whorls almost obsolete, so that they look quite convex. Spirally striate; striæ about ten, close, separated only by fine impressed lines. Periphery angulate. Base flatly convex, smooth. Aperture subquadrate, the inner lip being bent at an angle a little greater than a right angle. Outer lip thin. Height 6 millim. Diameter 1.8 millim. Only two specimens, one of which lacks the body-whorl.

Fossil occurrence.—Shito.

Family **Turbinidæ.**

Genus **TURBO,** Linné.

157. *Turbo (Marmorostoma) granulatus,* Gmelin.

Pl. V. Fig. 10. CM21095-5/10

Turbo (Marmorostoma) granulatus. Pilsbry, Catalogue, p. 89.
Turbo granulatus. Lischke, Jap. Meeresconch., I, p. 87. Tokunaga, Foss. Env. Tokyo, p. 28, pl. I, fig. 59.
Turbo coronatus var. granulata. Tryon, Man. Conch., vol. X, p. 27, pl. 46, fig. 18.
Lunella granulata var. minor. Dunker, Ind. Moll., p. 128.

Putting aside the question whether *Turbo granulatus* is an independent species or merely a variety of *Turbo coronatus* Gm. as asserted by some, a single specimen obtained is a depressed-turbinate shell with about five whorls ornamented with a spiral series of nodules and granules of which the sub-and supra-sutural series are the most prominent. On the body-whorl there are four such prominent series; the uppermost is subsutural, the next is in the continuation of the suprasutural of the penultimate whorl, the third is at the periphery and the fourth is somewhat below the periphery on the base, the place where the last three are present being more or less angulate. Umbilicus open.

Fossil occurrance.—Narita near Otake.

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

Genus **Leptothyra,** Carpented.

CM21096 CM21097 CM21098 CM21099

158. *Leptothyra purpurescens,* (Dunker).

Leptothyra purpurescens. Pilsbry, Catalogue, p. 90. Tryon, Man. Conch., X, p. 251, pl. 69, fig. 24. Yokoyama, Foss. Miura Penin., p. 86, pl. v, fig. 22.
Collonia purpurescens. Dunker Ind. Moll., p. 129, pl. XII, figs. 1—3.

This shell already described by me from the Lower Musashino of Miyata is very numerous wherever it is found. Yet even the largest specimen is not larger than that found in the above formation, being only about 11 millim. in height and diameter.

Fossil occurrence.—Otake, Shisui, Tega, Shito (most numerous). Lower Musashino of Miyata.

Living.—Japan (Dunker)

CM21100-5-17
CM21101

159. *Leptothyra pygmæa*, Yokoyama.

Pl. V. Fig. 17.

Shell small, turbinate. Whorls four, rapidly growing, shouldered, the surface above the shoulder a little sloping and below angulate in the middle. The sculpture consists of spiral threads which are commonly alternately large and small. The shoulders are marked with a large thread above which, that is to say, on the sloping shelf, there are two larger ones. The angle below the shoulder is also marked with a coarse thread. On the body-whorl, between the shoulder and the angle, there is another coarse thread, though somewhat weaker, and between the latter and the angulate periphery there is also a similar one. Between the coarser threads there is generally found a weaker one as stated above. The base is flatly convex with several spiral threads. Growth-lines generally distinct between the threads and looking like minute striations. Umbilicus perforate, rather small but deep. Aperture circular. Height and diameter 4 millim.

Fossil occurrence.—Tega (frequent).

Living.—Central Japan.

CM21102-5-22
CM21103

160. *Leptothyra crassilirata*, Yokoyama.

Pl. V. Fig. 22.

Shell small, turbinate. Whorls about four, angulate in the middle with the surface above the angle flat and gently sloping, below vertical, spirally ornamented with threads and cords which are altogether five on the penultimate whorl, one at the angle and two both above and below the same, the two above being weaker than the other three. On the body-whorl there is another strong cord at the periphery which makes it angulate. The spaces between the cords are longitudinally finely striated by incremental lines. Base abruptly narrowed, rather flattened, with several spiral threads which gradually diminish in size toward the narrowly perforate umbilicus. Aperture circular. Height and diameter 3.5 millim.

Fossil occurrence.—Tega (rare)
Living.—Central Japan.

Family **Trochidæ.**

Genus **TROCHUS,** Linné,

161. ***Trochus spinigera,*** Yokoyama. CM 21104-5-18

Pl. V. Fig. 18.

Shell small, conical. Whorls about six, slightly convex, furnished with unequal spiral threads set with numerous, close, pointed, spine-like tubercles. Each whorl has two main threads which divide it into three nearly equal parts with a finer thread on each. Periphery angulate, with a smooth thread on it. Base flattened, spirally grooved; grooves several, the outermost the broadest, the other ones being more like impressed lines, although the innermost one or two are somewhat stronger. Aperture (outer lip fractured) roundly quadrate. Height 5 millim. Diameter 4 millim.

A single specimen, but very characteristic by its spinose tubercles.

Fossil occurrence.—Shito.

Genus **MINOLIA,** A. Adams.

162. ***Minolia tasmanica,*** Tenison-Woods. CM 21105-5-19
CM 21106

Pl. V. Fig. 19.

Minolia tasmanica. Tryon, Man. Conch., XI, p. 263, pl. 61, figs. 38—40.
Margarita (*Minolia*) *tasmanica.* Tenison-Woods, Proc. Roy. Soc. Tasm., 1876, p. 143 (1877)

Shell small, thin, depressed, with a low-conoidal spire. Whorls about five, terraced above, convex below. Terraces horizontal, flat or even somewhat concave, with very fine spiral lines. Convex surface spirally striate; striæ equal, close, six on the penultimate whorl. Periphery rounded. Base convex with several close spiral striæ. Umbilicus open, with walls funnel-like and outer margin rounded. The walls may be very steep or not; in the first

case the hole at the bottom is comparatively large, while in the second it is comparatively small. Aperture subcircular. Columella-lip covered with a thin callus. Outer lip thin. Height 3.5 millim. Diameter of shell 4.5 millim. Diameter of umbilical margin about 1.5 millim.

A few specimens, all of which are smaller than those described by Tryon and Tenison-Woods.

Fossil occurrence.—Otake, Shito.

Living.—Tasmania.

CM21107-5-21
CM21108
CM21109
CM21110

Genus **SOLARIELLA**, Woods.

163. *Solariella philippensis*, Watson.

Pl. V. Fig. 21.

Solariella philippensis. Watson, Challenger Gastr., p. 73, pl. VI, fig. 10.

Shell small, turbinate-conic, thin. Whorls about five, sharply angulate a little above the middle. Surface above the angle flat, nearly horizontal or a little sloping, below very steep, flat or very slightly convex. The sculpture consists generally of two spiral threads, the one forming the angle and the other situated near the lower suture. Between these two, there are often one or two fainter threads which sometimes may become rather coarse. Besides the spiral threads, oblique lines of growth are everywhere conspicuous, giving the shell a longitudinally striated appearance. Periphery angulate with a thread upon it, striated by the above mentioned lines of growth. Base slightly convex, with a few spiral threads either on the whole surface or only near the large open umbilicus. Umbilical margin bluntly angulate. Umbilical wall very steep and ornamented with spiral striæ crossed by lines of growth. Bottom-hole tolerably large. Aperture subcircular, with peristome discontinuous. Outer lip thin. Height and Diameter 4 millim.

The original colour of the shell is preserved in many specimens. On the terrace above, there are several lathe-shaped dark purplish blotches in a spiral row. Such blotches are also found on the

steep lateral surface near the suture. On the base there is a row of rectangular patches of the same colour.

Specimens are all smaller than those described by Watson.

Fossil occurrence.—Otake (not rare), Tega (rare), Shito (do). Oji (numerous).

Living.—Central Japan. Off Port Phillip, South Australia.

CM21111-5-20
CM21112

164. *Solariella angulata*, (Tokunaga).

Pl. V. Fig. 20.

Trochus (*Minolia*) *angulatus*. Tokunaga, Foss. Env. Tokyo, p. 36, pl. II, fig. 5.

Shell medium-sized, turbinate-conic, rather thin. Whorls about six, shouldered; shoulders furnished with a spiral cord, the surface above the cord being slightly excavated (a character not distinct in younger whorls), below somewhat convex with four narrow spiral grooves. These grooves make the interspaces look like broad flattish spiral cords of which the third from above is some what broader and more elevated than the others. Lines of growth elevated and prominent on the younger whorls, looking like longitudinal striations. On the body-whorl these lines are not so prominent, though quite coarse. Periphery rounded. Base convex with several inequidistant spiral grooves. Umbilical margin rounded. Umbilical wall with several spiral grooves, the spaces being convex, cord-like and often made crenate by coarse lines of growth. Aperture circular with thin continuous peristome. Height 11 millim. Diameter 12 millim.

The original colour of the shell is present on many specimens as brown longitudinal streaks.

Fossil occurrence.—Shito (very frequent). Oji in Musashi.

Genus **TURCICA**, A. Adams.

CM21113-5-23
CM21114

165. *Turcica imperialis*, A. Adams.

Pl. V. Fig. 23.

Turcica imperialis. A. Adams, Proc. Zool, Soc. Lond., 1863, p. 507. Pilsbry, Catalogue, p. 98, in Tryon's Man. Conch., XI, p. 414, pl. 63, figs. 30, 31. Yokoyama, Foss. Miura Penin., 10. 91, pl. V. fig. 31.

Trochus imperialis. Lischke, Jap. Meeresconch., III, p. 67, pl. IV, figs. 5,6. Tokunaga, Foss. Env. Tokyo, p. 28 pl. I, fig. 60.

Trochus adamsianus. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 358, pl. XVI, fig. 3.

A few specimens.

Fossil occurrence.—Shito. Shinagawa in Musashi. Lower Musashino of Miyata.

Living.—Northern, Central and Western Japan.

CM21115-5-25
CM21116
CM21117
CM21118
CM21119
CM21120

Genus **CALLIOSTOMA**, Swainson.

166. *Calliostoma unicum* (*Dunker*), *var. shinagawensis*, Tokunaga.

Pl. V. Fig. 25.

Trochus (*Calliostoma*) *shinagawensis.* Tokunaga, Foss. Env. Tokyo, p. 29, pl. II, fig. 4.

Shell turbinate-conic, pretty solid. Whorls eight, first two nuclear, smooth and rounded. Post-nuclear whorls shouldered a little above the middle; surface above shoulder flat, somewhat sloping, below steep with a slight angulation a little above the middle. Sculpture: Shoulders as well as angles with a coarse spiral cord on them; flat surfaces with spiral threads which are mostly alternately large and small. Of the larger threads, the subsutural one is coarse, somewhat weaker than, or nearly as strong as, the shoulder-cord, consisting of a series of more or less transversely elongated grains. The coarser threads found on the shelf above may likewise become granulate, especially on the older whorls. Body-whorl angulate, with a strong cord on the angle. Base convex, with many unequal spiral threads which are often made graniferous by incremental lines. Umbilicus closed, though in some specimens it is excavated. Aperture roundly quadrate. the breadth being a little greater than the height. Outer lip thin. Height 21 millim. Diameter 22 millim. In younger specimens, the cords as well as the threads are much sharper and all granulate. The figure given by Tokunaga is that of such a specimen.

Tokunaga considered this as a new species, but it is so closely allied to *Calliostoma unicum* Dunker (Moll. Jap., p. 23, pl. III, fig.

3) living in Northern to Western Japan that it can not be considered as more than a variety. The chief difference of the fossil is in the angulation of the whorls being sharp and distinct, while it is less sharp or even indistinct in the living form. Besides, the fossil shows on its base spiral threads instead of distant spiral grooves.

Fossil occurrence.—Otake (frequent), Shisui, Tega, Shito (frequent). Shinagawa (rare).

Genus **BASILISSA**, Watson.

167. *Basilissa? læviuscula*, Yokoyama. CM 2112/-524

Pl. V. Fig. 24.

Shell thin, turbinate-conic. Whorls about six of which the first two are nuclear and rounded. Post-nuclear whorls convex, with two faint angulations dividing the surface into three nearly equal parts. Each angulation marked by a fine spiral stria. Surface between angulations very finely spirally striate, the striæ being visible only with a magnifier. Periphery sharply angulate and somewhat projecting above the general surface of the body-whorl. Base convex with very fine spiral lines. Umbilicus provided with a chink. Aperture irregularly and roundly four-sided. Outer lip very thin. Height 8 millim. Diameter 7 millim.

A single specimen. The nuclear whorls are coloured dark brown, while the remaining part is dirty light green. These colours may be the remains of some original coloration.

Fossil occurrence.—Shito.

Genus **UMBONIUM**, Link. CM 21122

168. *Umbonium giganteum*, (Lesson).

Umbonium giganteum. Pilsbry in Tryon's Man. Conch., XI, p. 454, pl. 58, figs. 17–19. Catalogue, p. 100. Dunker, Ind. Moll., p. 134. Yokoyama, Foss. Miura Penin., p. 94, pl., VI, fig. 5.

Rotella gigantea. Lesson, Illustr. de Zool., tome 17, 1831. Kiener, Spec. et Icon. Coq. Viv., p. 16, Pl. 3, fig. 7. Sowerby, Thes. Conch., V, p. 136, pl. 472, figs. 15, 16.

Globulus giganteus. Lischke, Jap. Meeresconch., III, p. 63.

A single specimen, but readily recognized by its smooth whorls.

Fossil occurrence.—Tega. Lower Musashino of Naganuma.

Living.—Central and Western Japan.

CM21123
CM21124
CM21125
CM21126
CM21127

169. *Umbonium costatum*, (Valenciennes).

Umbonium costatum. Pilsbry in Tryon's Man. Conch., XI, p. 454, pl. 59, figs. 34, 35. Dunker, Ind. Moll., p. 134. Yokoyama, Foss. Miura Penin., p. 95, pl. VI, fig. 6.
Rotella costata. Valenciennes in Kiener's Spec. et Icon. Coq. Viv., p. 10, pl. II, fig. 2.
Globulus costatus. Lischke, Jap. Meeresconchylien, I, p. 91. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 367.

Many specimens of which one is nearly as large as the preceding species.

Pilsbry in his Catalogue p. 101 mentions *Umbonium superbum* Gould as a mere variety of *Umbonium costatum.* I should go a step further and make no distinction between the two, as it is impossible to distinguish them when they are present in numerous specimens. Pilsbry himself says that the only difference is in size, but even this character fails to be applicable in many cases.

I leave the question open as to whether *Umbonium moniliferum* Lam. which is often like *U. superbum* is a good species or not.

Fossil occurrence.—Otake (frequent), Shisui (do), Kioroshi, Tega, Shito. Lower Musashino of Naganuma.

Living.—Northern, Central and Western Japan.

Family **Cyclostrematidæ.**

Genus **CYCLOSTREMA**, Marryatt.

CM21128-5-26

170. *Cyclostrema stillicidiatum*, Yokoyama.

Pl. V. Fig. 26.

Shell small, depressed-globose, thick. Whorls three, smooth, rounded. Body-whorl with a blunt keel a little below the upper suture, the surface between being shallowly excavate. Periphery rounded. Base convex, with distinct lines of growth. Umbilicus open, large, with margin bluntly angulate and wall nearly vertical. Aperture oval, with the longer axis slightly oblique, sharply round-

ed behind, broadly in front. Peristome continuous, thick. Height 25 millim. Diameter 2 millim. A single specimen.

This is somewhat like *Cyclostrema sulcatum*, Watson (Challenger Gastr., pl. VIII, fig. 11) which, however, has the umbilicus much larger.

Fossil occurrence.—Shito.

Family **Stomatellidæ**.

Genus **STOMATELLA**, Lamarck.

CM21129-6-2
CM21130

171. *Stomatella lyrata*, Pilsbry.

Pl. VI. Fig. 2.

Stomatella lyrata. Pilsbry in Tryon's Man. Conch., XII., p. 12, pl. 2, figs. 3–5. Catalogue, p. 104.

A depressed-globose shell with a short spire and three convex, rapidly growing whorls. The sculpture consists of distant spiral threads with interspaces latticed by oblique raised striæ.

Only three specimens, the largest measuring 6 millim. in height and 8.5 millim. in diameter.

Fossil occurrence.—Otake, Tega.

Living.—Northern, Central and Western Japan.

Family **Fissurellidæ**.

CM21131-63
CM21132

Genus **MACROSCHISMA**, Swainson.

172. *Macroschisma sinensis*, A. Adams, ***var. brevis***, Yokoyama.

Pl. VI. Fig. 3.

Shell oblong with the length a little less than twice the breadth. Lateral margins straight (or very slightly concave), parallel. Anterior margin rounded, posterior also in general rounded, but truncated in its middle portion. Anterior slope somewhat convex and a little longer than half the length of the shell. Lateral slopes straight and flat. Posterior slope very short, a trifle longer than the eroded portion behind the hole, broad and shallowly excavated like a gutter. Hole wedge-shaped with nearly straight

sides, very narrow in front, gradually becoming broader toward behind where it is broadly rounded, having the length a little greater than one-third that of the shell. Peristome horizontal laterally, curved up both in front and behind, less so in the former than in the latter.

Two specimens. The larger shows the following dimensions: Length 15.5 millim.; breadth 8 millim.; height 4.2 millim.; length of hole 5.5 millim. By comparing it with the typical specimens of this species (Pilsbry's Cat., p. 107 and Tryon's Man. Conch., XII, p. 190, pl. 59, figs. 56–59), the shell is somewhat shorter, and in outline more like *Macroschisma lischkei* Pilsbry (Cat., p. 108, pl. VI, figs. 1–5) which, however, differs from the fossil in many minor points.

Fossil occurrence.—Otake, Tega. Lower Musashino of Yokosuka (typical form).

Living.—The typical form of the species lives in Central Japan, China, and Singapore.

CM21133-6-4
CM21134

Genus **PUNCTURELLA**, Lowe.

173. *Puncturella nobilis*, (A. Adams).

Pl. VI. Fig. 4.

Puncturella nobilis. Pilsbry, Catalogue, p. 109. In Tryon's Man. Conch., XII, p. 231, pl. 63, figs. 34–37.

Cemoria nobilis, A. Adams in Sowerby's Thes. Conch., III, p. 208, figs. 6–9. Sowerby in Reeve's Conch. Icon., XIX, fig. 6. Dunker, Index Moll., p. 154.

A. Adams gives the description of this species as follows: "Elevated-conical, vertex acuminate, inclined, acute; radiating ribs strong, equidistant; interstices concentrically striated. Fissure narrow, lanceolate. Margin deeply crenulated. Resembling *Cemoria cucullata* Gould, but with the ribs stronger, wider apart and equal; the apex moreover is considerably more elevated and acute."

Two specimens, the larger of which is only a fragment. The other which is 7 millim. long, 6 millim. broad and 5 millim. high, has about nineteen radiating ribs between which there is always a weaker interstitial not attaining the apex.

Fossil occurrence.—Shito.

Living.—Northern Japan.

Genus **EMARGINULA**, Lamarck.

174. *Emarginula vadososinuata*, Yokoyama. CM21135-6-5 CM21136

Pl. VI. Fig. 5.

Shell low-conic, thick, the apex recurved, situated at a little less than the posterior third of the length of the shell. Sculpture consisting of numerous riblets latticed by elevated lines of growth. Riblets unequal especially on the posterior slope where they are alternately large and small. The riblets of the anterior portion of the shell are more equal, although occasionally with a fine thread between. Aperture somewhat elongate-oval, tapering in front. Slit very shallow, looking like a slight notch. Slit-fasciole a little elevated, ornamented with raised lamellæ. Height 8 millim. Length 23 millim. Breadth 15 millim. Rare.

This shell is like *Subemarginula* in having the slit shallow, but the slit-band is elevated and distinct as in *Emarginula*.

Fossil occurrence.—Shito.

Family **Patellidæ.**

Genus **HELCIONISCUS**, Dall. CM21137

175. *Helcioniscus pallidus*, (Gould).

Helcioniscus pallidus. Pilsbry in Tryon's Man. Conch., XIII, p. 133, pl. 67, figs. 9, 10. Catalogue, p. 112. Yokoyama, Foss Miura Penin., p. 101, pl. VI, figs. 16,17.

Patella pallida. Gould, Proc. Bost. Soc. Nat. Hist., VII, p. 162. Dunker, Ind. Moll., p. 156. Lischke, Jap. Meeresconch., I, p. 112.

Patella lamanonii. Schrenck, Moll. d. Amurl. u. d. nordjap. Meeres, p. 303, pl. XIV, figs. 6-9.

A single specimen. This species has already been described from the Lower Musashino in my work above quoted.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Koshiba.

Living.—Northern and Central Japan.

CM21138-6-6
CM21139
CM21140
CM21141
CM21142
CM21143
CM21144

Class **SCAPHOPODA.**

Family **Dentalinidæ.**

Genus **DENTALIUM,** Linné.

176. *Dentalium weinkauffii,* Dunker.

Pl. VI. Fig. 6.

Dentalium weinkauffii. Dunker, Ind. Moll, p. 153, pl. V, fig. 1. Pilsbry, Catalogue, p. 116. In Tryon's Man. Conch., XVII, p. 40, pl. II, fig. 26. Yokoyama, Foss. Miura Penin., p. 102, pl. VI, fig. 19–21.

Dentalium cf. weinkauffii. Tokunaga, Foss. Env. Tokyo, p. 33, pl. II, fig. 16.

The ribs which are present only on the apical portion of the shell are often unequal, being then alternately large and small.

Specimens are very frequent at some places, as at Otake and Shito.

Fossil occurrence.—Otake, Shisui, Kioroshi, Tega, Shito, Shinagawa in Musashi. Lower Musashino of Naganuma, Koshiba, Kanagawa, and Miyata.

Living.—Central Japan.

CM21145
CM21146

177. *Dentalium octogonum,* Lamarck.

Dentalium octogonum. Lamarck, Anim. sans Vert., V, p. 344. Lischke, Jap. Meeresconch., II, p. 103, III, p. 75, pl. V, figs. 1–3. Dunker, Ind. Moll., p. 153. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 381. Brauns, Geol. Env. Tokio, p. 95. Tokunaga, Foss. Env. Tokyo, p. 33, pl. II, fig. 15. Yokoyama, Foss. Miura Penin., p. 103, pl. VI, figs. 22–24.

This Dentalium already known by the names of *D. octangulatum, D. hexagonum* and *D. sexcostatum* is represented by a few fragments which are either six-, eight-, or nine-sided. The angles are ribbed in some specimens, having several finer riblets between.

Fossil occurrence.—Otake and Shito. Oji and Shinagawa. Lower Musashino of Miyata, Yokosuka and Naganuma.

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

CM21147
CM21148
CM21149

178. *Dentalium edoense*, Tokunaga.

Dentalium edoense. Tokunaga, Foss. Env. Tokyo, p. 34. pl. II, fig. 17. Yokoyama, Foss. Miura Penin., p. 103, pl. VI, fig. 28. CM21152

This apparently smooth-shelled form is very frequent at some places, although mostly in fragments.

Fossil occurrence.—Otake, Shisui, Tega, Shito. Oji and Shinagawa in Musashi. Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Central and Western Japan.

179. *Dentalium* (*Fustiaria*) *nipponicum*, Yokoyama. CM21150-6-7
Pl. VI. Fig. 7. CM21151

Shell rather small, slightly curved, pretty rapidly growing smooth, circular in section, provided with a deep narrow slit not quite straight and often with the sides not strictly parallel, some parts swelling in breadth. Posterior opening narrowed, longly ovate.

The specimens, though numerous, are more or less broken at the larger end. The largest measures 27 millim. in length, and 3 millim. in diameter (larger end) with the slit 4 millim. in length.

Fossil occurrence.—Shito.

Class **LAMELLIBRANCHIATA.**

Order **Teleodesmacea.**

Family **Pholadidæ.**

CM21153

Genus **PHOLAS,** Linné.

180. *Pholas fragilis*, Sowerby.

Pholas fragilis. Sowerby, Thes. Conch., vol. II, p. 488, pl. 108, figs. 92, 93. Lischke, Jap. Meeresconch., I, p. 143. Yokoyama, Foss. Miura Penin., p. 104, pl. VI, fig. 29.

Barnea fragilis. Dunker, Ind. Moll., p. 170.

A right valve not quite perfect. Its anterior end is obtusely pointed.

Fossil occurrence.—Otake. Lower Musashino of Yokosuka.

Living.—Northern and Western Japan. Philippines.

Genus **JOUANNETIA**, Desmoulins.

CM21154-6-10 CM21155

181. *Jouannetia kamakurensis*, Yokoyama.

Pl. VI. Fig. 10.

A single fractured right valve which, however, agrees exactly with a living shell picked up on the coast of Kamakura.

Shell small, roughly four-sided in outline, with surface divided into two parts by a mesial groove. The anterior half is very convex with the dorsal margin very short and slightly concave, and the ventral margin steeply ascending, almost twice as long as the dorsal, and at first straight, but excavated near the upper end, so that the front border of the shell becomes pointed, though blunt at apex. The sculpture consists of concentric and radiating riblets. The radiating riblets are unequal, rather distant, about ten in number, alternately large and small in the middle portion of the surface and quite absent in a small space immediately bordering the mesial groove. The concentric riblets are close, rounded and going over the radiating ones, giving them a crenate appearance. The margin is also crenate. The dorsal margin of the posterior half of the shell is double the length of that of the anterior half, scarcely convex, sloping, the meeting point with the ascending, somewhat undulatory ventral margin being subtruncate. Margin smooth.

The fossil specimen is only 4.5 millim. in length and 3.6 millim. in height, while a recent one from Kamakura is 7.6 millim by 5.2 millim.

Allied to *Jouannetia japonica* Yokoyama (Fossils from Miura Peninsula, p. 105, pl. VII. Fig. 5) from the Lower Musashino which, however, shows a coarser sculpture.

Fossil occurrence.—Shito.

Living.—Central Japan.

Family **Saxicavidæ.**

Genus **PANOPE**, Menard.[1]

CM21156-6-14
CM21157-6-15
CM21158
CM21159
CM21160

182. ***Panope generosa*** (Gould).

Pl. VI. Fig. 14, 15.

Panopæa generosa. Gould, Proc. Bost. Soc. Nat. Hist., vol. III, p. 215. Wilke's Expedition, p. 385, pl. XXXIV, fig. 507. Otia Conch., p. 165. Brauns, Geol. Env. Tokio, p. 36, pl. III, fig. 14. Tokunaga, Foss. Env. Tokyo, p. 38. Dall, Tert. Fauna Florida, pt. IV, 830. Arnold, Pal. & Strat. Mar. Plioc. a. Pleist. San Pedro, California, p. 182.

Glycimeris generosa. H. and A. Adams, Gen. Rec. Moll., p. 350. Gabb, Pal. Cal., II, 89. Keep, West Coast Shells, p. 209, fig. 178. Pilsbry, Cat. Mar. Moll. Jap., p. 117.

This shell excellently figured by Brauns in his work above cited is very variable in shape as well as in thickness. The typical form is rather thin-shelled, nearly equilateral, transversely oblong, anteriorly rounded, posteriorly subtruncate, with the proportion of length to height equal to about 10 to 6.6 on an average. But there is also a more elongated arcuate form characterized by a thick and solid shell with the length nearly twice the height.

Dall in his ,,Tertiary Fauna of Florida'' p. 831, mentions two varieties of the species which he calls *solida* and *globosa*, of which var. *solida* seems to correspond to our longer form, although I can not assert it with certainty, as he does not give figures of his so-called varieties.

In our plate, the typical as well as the longer form is figured.

Fossil occurrence in Japan.—Otake (frequent), Tega, Semata. Also Oji and Shinagawa.

Fossil occurrence in America.—Miocene, Pliocene and Pleistocene of California.

Living.—Northern Japan. West Coast of N. America from Puget Sound to San Diego.

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1) Often written erroneously *Panopæa* (Zittel's Text-book of Palæontology edited by Eastman 1913, p. 500).

CM21161

Genus **SAXICAVA**, Fleuriau de Bellevue.

183. *Saxicava orientalis*, Yokoyama.

Saxicava orientalis. Yokoyama, Foss. Miura Penin., p. 106, pl. VII, fig. 2, 3.

A left valve much larger than the specimens hitherto obtained, but not quite perfect. The general shape and the thin state of the shell are, however, alike.

Fossil occurrence.—Shito. Lower Musashino of Yokosuka.

CM21162-6-8
CM21163-6-9
CM21164

Family **Corbulidæ**.

Genus **CORBULA**, Bruguière.

184. *Corbula erythrodon*, Lamarck.

Pl. VI. Figs. 8, 9.

CM21668
Exch.

Corbula erythrodon. Lamarck, Anim. sans Vert., VI, p. 138. Lischke, Jap. Meeresconch., I, p. 136. Dunker, Ind. Moll., p. 176. Pilsbry, Catalogue, p. 117. Reeve, Conch. Icon., Corbula, pl. I, fig. 4.

This species is easily recognized by its thick, ovate, nearly equilateral, carinated shell which is concentrically grooved on the surface. A perfect specimen with both valves preserved measures 25 millim. in length, 14 millim. in height and 9 millim. in thickness.

Together with the typical specimens, there occur several which are rather thin-shelled, but without any marked difference in shape. Such thin-shelled ones occur also among the living, the two being bridged over by intermediate forms.

Fossil occurrence.—Otake (rare), Kioroshi (do).

CM21165
CM21166
CM21167
CM21168
CM21169

Living.—Central and Western Japan.

185. *Corbula venusta*, Gould.

Corbula venusta. Gould, Bost. Soc. Nat. Hist., vol. VIII, p. 25. Otia Conchologica, p. 164. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 505, pl. XXV, figs. 1–4. Dunker, Index Moll., p. 177. Tokunaga, Foss. Env. Tokyo, p. 39, pl. II, fig. 22. Yokoyama, Foss. Miura Penin., p. 107, pl. VII, figs. 4–6. Pilsbry, Catalogue, p. 117.

This species which is now living in Northern Japan is frequent at some localities.

Fossil occurrence.—Otake, Shisui, Kamenari, Tega, Shito. Oji in Musashi. Lower Musashino of Miyata, Yokosuka, Koshiba and Naganuma.

CM21170-6-16
CM21171-6-17
CM21172
CM21173
CM21174

186. *Corbula frequens*, Yokoyama.

Pl. VI. Fig. 16, 17.

Shell rather thick and solid, triangular in outline, moderately swollen, inequivalve, subequilateral, anterior side a little longer than posterior, anterior margin broadly rounded, posterior obliquely truncate (the obliquity being very variable; when it is very great, the truncation becomes indistinct and the posterior end appears more or less beaked), ventral margin arcuate. Surface with rough lines of growth making it more or less concentrically undulate. A blunt keel runs from the beak to the postero-ventral corner of the shell. Tooth of the right valve strong and triangular, that of the left smaller and divided into two lobes by a groove running longitudinally. Pallial line distinct, with sinus very shallow. Anterior muscular impression elongated, with the lower half broader than the upper, posterior ovate.

The following are some of the measurements:

	Length.	Height.	Depth.
Right valve (very obliquely truncate).	31.4 millim.	23.2 millim.	9.4 millim
„ „ (less „ „).	22.8 „	16.8 „	6.5 „
„ „ (least „ „).	22.1 „	16.3 „	7.5 „
Left „ (very obliquely „).	22.6 „	17.2 „	6.7 „

Although the outline is rather variable, the proportion of length to height is tolerably constant, being 10 to 7.3–7.6.

Fossil occurrence.—Otake, Shisui, Tega, Shito (abundant).

CM21175-6-18
CM21176
CM21177

187. *Corbula pustulosa*, Yokoyama.

Pl. VI. Fig. 18.

Shell moderately thick, transversely ovate, inequivalve, nearly inequilateral, the beaks being only a little in front of the middle; anterior margin more or less rounded, posterior obliquely

subtruncate, postero-dorsal convex, antero-dorsal straight, ventral broadly arcuate; postero-ventral corner bluntly pointed. Surface with a blunt edge running from beak to postero-ventral angle, smooth in general, though incremental lines are more or less rough. Tooth of right valve triangular, with a large fossa behind it. Pallial line rather indistinct. Anterior muscular impression elongated and pear-shaped, posterior more rounded, though with a short pointed process above. The interior of the shell is marked with irregularly distributed pits which may be due to the formation of pearls.

In general outline this shell resembles the preceding, but it is thinner, less triangular, and always provided with the pits above mentioned which are absent in the other species described in this paper.

The following are some of the measurements:

	Length.	Height.	Depth.
Right valve	17.9 millim.	12.6 millim.	5.3 millim.
„ „	17.5 „	12.0 „	4.4 „
Left „	14.3 „	9.2 „	4.0 „
„ „	15.3 „	10.0 „	4.3 „

Fossil occurrence.—Otake (rare), Shisui (do).

C142 1178-6-19
C142 1179-6-20
C142 1180

188. *Corbula sematensis*, Yokoyama.

Pl. VI. Figs. 19, 20.

Shell rather thin, moderately ventricose, transversely oblong, nearly equilateral. Right valve a little longer than left, rounded at both ends, but more sharply so behind, while the left valve has the posterior border obliquely subtruncate. Surface with faint radiating striae near the ventral border. An obtuse edge runs from the beak to the postero-ventral angle, and in the left valve there is a shallow depression running from the beak to the antero-ventral corner. Pallial line indistinct. Anterior muscular impression elongated, posterior more triangular.

The measurements of three valves are as follows:

	Length.	Height.	Depth.
Left valve	14.3 millim.	10.2 millim.	4.1 millim
Right ,,	9.3 ,,	6.0 ,,	2.1 ,,
,, ,,	7.5 ,,	5.2 ,,	1.9 ,,

Fossil occurrence.—Shito (rare).

189. *Corbula pygmæa*, Yokoyama. CM2 1181-7-4 CM2 1182-7-5 CM2 1183 CM2 1184 CM2 1185

Pl. VII. Figs. 4, 5.

Several specimens, but mostly right valves.

Shell small, thick, swollen, high triangular, somewhat oblique, inequivalve, inequilateral; anterior side a little longer than posterior, anterior border rounded, posterior truncate, postero-ventral angle roundly angular, ventral border broadly arcuate. Surface ornamented with regular concentric grooves. Beaks inflated, with an obtuse edge running to postero-ventral corner. Anterior muscular impression curved and pear-shaped, posterior ovate. Pallial line very shallowly indented, the sinus looking only like a broad crescent.

A specimen with both valves perfect measures 4.3 millim. in length, 3.6 millim. in height and 2.7 millim. in thickness.

Some of the specimens have the surface rather smooth, a phenomenon probably due to friction.

Fossil occurrence.—Otake (rather frequent), Kioroshi, Tega.

190. *Corbula substriata*, Yokoyama. CM2 1186-7-3

Pl. VII. Fig. 3.

A single right valve. It is small, thick, ventricose, subquadrate, inequilateral, with anterior side shorter than posterior, rounded in front and quite truncate behind. The postero-dorsal angle is obtuse, while the postero-ventral is roundly right-angled. Ventral margin broadly arcuate. Surface with coarse irregular concentric grooves. Beaks large and swollen, a sharp edge running from them to the postero-ventral corner with a second but weaker one near the hinge-margin. Between these edges the surface is somewhat excavated. Tooth bluntly pointed. Pallial line distinct, simple. Length 4 millim. Height 3.6 millim. Depth 2 millim.

This shell looks like *Corbula striata* Walther and Boys (Wood, Crag Moll., II, Bivalves, p. 274, pl. XXX, fig. 3) from the English Crag, although more quadrate in shape.

Fossil occurrence.—Shito.

CM21187-7-1 (k)
CM21188-7-2
CM21189
CM21190
CM21191

Family **Myacidæ.**

Genus **CRYPTOMYA**, Conrad.

191. *Cryptomya busoensis*, Yokoyama.

Pl. VII. Figs. 1, 2.

Shell small, thin, transversely elliptical, convex, nearly equilateral, rounded in front, obliquely truncate behind, the truncated border forming tolerably sharp angles both above and below. Antero-dorsal margin arched, postero-dorsal nearly straight, ventral broadly arcuate. Surface smooth, with beaks small, a sharp edge running from them to the postero-ventral corner, behind which the surface is slightly concave. Left valve with a triangular ligamental spoon and a tooth behind it. Anterior muscular impression elongated-fusiform, somewhat bent in the middle, posterior short-fusiform. Pallial line simple.

Specimens are rare. The largest we have is a left valve 18.5 millim. in length, 11 millim. in height and 3 millim. in depth. The next largest is a right valve 17.5 millim. in length, 11 millim. in height and 3.5 millim. in depth.

This species is closely akin to *Cryptomya elliptica* Adams (Dunker, Ind. Moll., p. 178, pl. VII, figs. 17–19), but lacks the radial striations of the latter.

Fossil occurrence.—Otake, Kamenari. Oji in Musashi.

Living.—Central Japan.

CM21192-7-6
CM21193
(k) CM21194
CM21195
CM21196
CM21197
CM21198

Family **Mactridæ.**

Genus **MACTRA**, Linné.

192. *Mactra sulcataria*, Deshayes.

Pl. VII. Fig. 6.

Mactra sulcataria. Deshayes, Proc. Zool. Soc. London, 1855, p. 15. Reeve, Conch. Icon., Mactra, sp. 5. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 570, pl.

XXIII, figs. 1, 2. Lischke, Jap. Meeresconch., I, p. 133. Pilsbry, Cat., p. 118. Tokunaga, Foss. Env. Tokyo, p. 40, pl. II, fig. 26.

Trigonella sulcataria. Dunker, Ind. Moll., p. 182.

This rather thin-shelled species is easily recognized by its ovately triangular shape, longer than high, somewhat equilateral and with both extremities rounded, posterior somewhat more sharply than anterior. Convexity moderate. The surface is concentrically but unequally grooved. Lunula and area hardly developed.

The shell attains a large size, the largest in our collection being 78 millim. in length and 67 millim. in height.

Fossil occurrence.—Otake (in thousands), Kamenari (frequent), Kioroshi (do), Shisui (do), Tega (do), Shito. Oji and Shinagawa in Musashi.

Living.—Northern to Western Japan. North China. Possiet Bay (near Vladivostok).

CM21199
CM21200

193. *Mactra veneriformis*, Deshayes.

Mactra veneriformis. Deshayes, Proc. Zool, Soc. London, 1853, p. 15. Reeve, Conch. Icon., Mactra, pl. IX, fig. 78. Lischke, Jap. Meeresconch., I, p. 133, II, p. 121, pl. IX, figs. 7, 8. Brauns, Geol. Env. Tokio, p. 38, pl. IV, fig. 17. Tokunaga, Foss. Env. Tokyo, p. 40. Yokoyama, Foss. Miura Penin., p. 109, pl. VIII, fig. 10.

Trigonella veneriformis. Dunker, Ind. Moll., p. 182.

This shell, which is found in thousands in the seas near Tokyo, is represented only by two specimens, a left and a right valve. Its rarity as a fossil in general is quite noteworthy. When compared with the preceding species, it is usually somewhat smaller, but higher and more inflated.

Fossil occurrence.—Otake, Tega. Lower Musashino of Yokosuka.

Living.—Northern to Western Japan.

CM21201-1-12
CM21202-1-13
CM21203
CM21204
CM21205

194. *Mactra ovalina*, Lamarck.

Pl. VII. Fig. 12, 13.

Mactra ovalina. Lamarck, Hist. Nat., 2d. Ed., VI, p. 104. Reeve, Conch. Icon., Mactra, pl. XIV, fig. 66. Mart. Chemn. Syst. Conch. Cab., Mactra, p. 69, pl. XXV, figs. 1, 1a, pl. XXVIII, fig. 3.

The shell is thin, flat, transversely oval, inequilateral with the posterior end somewhat gaping. The area is distinct, bounded in each valve by a sharp edge running from beak to postero-ventral corner. Within the area there is an obtuse ridge dividing the surface into two longitudinal, somewhat concave parts. Lunula present, but indistinct. Beaks very small, approaching. Surface only concentrically striate. Ligamental pit triangular. Pallial sinus large and deep, elliptical, reaching somewhat beyond the beak.

The largest specimen is a broken right valve 43 millim. in height. The length, if perfect, would be about 63 millim. The largest perfect right valve obtained measures 32 millim. in length, 20.6 millim. in height and 5.4 millim. in depth, while the largest left measures 31.7 millim. in length, 20.8 millim. in height and 5.7 millim. in depth. Rare at all the localities.

Fossil occurrence.—Otake, Shisui, Tega. Oji in Musashi.

Living.—Central Japan. Puget Sound in Washington.

CM21206-7-7
CM21207-7-8
CM21208
CM21209
CM21210

195. *Mactra dunkeri*, Yokoyama.

Pl. VII. Fig. 7, 8.

Shell small, rather thin, moderately convex, triangular in general outline, somewhat longer than high, subequilateral, anterior end sharply rounded, posterior bluntly pointed, antero-dorsal border broadly arched, postero-dorsal very convex, somewhat angulate in the middle so as to make the shell appear obliquely subtruncate behind, ventral broadly arcuate. Surface smooth bluntly carinated. Pallial sinus moderately deep, finger-like.

This shell stands in form between *Mactra straminea* (Ind. Moll, p. 183, pl. VII, figs. 5, 6) and *M. crossei* (Ibid. p. 183, pl. VII, figs. 1–4) of Dunker, being more triangular than the former and higher than the latter. Moreover, it is generally smaller.

The fossil specimens, which are pretty frequent, do not attain more than 7 millim. in length, while the living found in the Sea of Sagami are somewhat larger. There is a left valve measuring

11.3 millim. in length, 10.2 millim. in height and 3 millim. in depth. It is coloured pinkish, especially near the beak.

Fossil occurrence.—Shisui (frequent), Tega.

Living.—Central Japan.

196. *Mactra sachalinensis*, Schrenck *var. imperialis*, Yokoyama.

Pl. VII. Fig. 9, 10.

CM21211-7-9
CM21212-7-10
CM21213
CM21214
CM21215

Mactra sachalinensis. Tokunaga, Foss. Env. Tokyo, p. 39, pl. II, fig. 25.

Shell large, thick, tumid, triangular, anterior side shorter than posterior, rounded at both ends though generally more sharply behind than in front, postero-dorsal slope either straight or only a little arched, ventral margin broadly curved with the anterior half sometimes less curved or even nearly straight, postero-ventral and antero-ventral corners generally indistinctly and obtusely angulate. Surface with very unequal and irregular concentric grooves. Beaks comparatively small, very obtuse, with indistinct edges running both to postero-ventral and antero-ventral corners near which they become more or less distinct. Ligamental pit triangular, protruding downward far out of the hinge-margin. Anterior muscular impression fig-shaped, posterior more squarely oval. Pallial sinus deep, tongue-shaped.

There is a considerable variation in the shape of the shell, some being more ovate than others.

The figured specimens are very large ones, if not the largest. The right valve (fig. 10) measures 119 millim. in length, 90.5 millim. in height and 33 millim. in depth, while the left (fig. 9) which is more triangular in shape is 111 millim. in length, 86,5 millim. in height and 33 millim. in depth. There is also a broken right valve 110 millim. in height.

Tokunaga identified this shell with the above named species of Schrenck. But there are several well-marked distinctions between the two. The fossil shell is more triangular in outline, with the anterior muscular impression shorter and the ligamental pit larger and more protruding downward. The pallial sinus, too, is perhaps a little deeper (Tokunaga figures it as if pointed,

which is an error). On these accounts, I separate the fossil as a variety of the living shell.

Fossil occurrence.—Otake (frequent), Shisui, Shito. Oji and Tabata in Masashi.

CM21216-8-1
CM21217-8-2
CM21218

Genus **SPISULA**, Gray.

197. *Spisula grayana*, (Schrenck).

Pl. VIII. Fig. 1, 2.

Spisula grayana. Pilsbry, Cat., p. 119.
Mactra (*Spisula*) *grayana.* Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 572.
Mactra ovalis. Reeve, Conch. Icon., Mactra, pl. IX, fig. 36.
Mactra ponderosa. Philippi, Abbild., I, Mactra, p. 1 (165), pl. I, fig, 1.

A rather thin, flatly convex, triangular shell with the anterior side a little longer than the posterior. Both ends rounded, much more sharply in front than behind. Surface smooth, only with lines of growth. Pallial sinus deep, finger-like, subtruncate or rounded at end.

The following are the measurements of the two valves figured:

	Length.	Height.	Depth.
Right valve	63.0 millim.	45.2 millim.	11.9 millim.
Left „	52.5 „	38.3 „	9.3 „

Fossil occurrence.—Shito (frequent).

Living.—Northern Japan. Okhotsk Sea. Behring Sea. Massachusetts.

(7) CM21219-8-3
CM21220-8-4
CM21221

198. *Spisula bernardi* Pilsbry.

Pl. VIII. Fig. 3, 4.

Spisula (*Oxyperas*) *bernardi.* Pilsbry, New Jap. Mar. Moll., Pelecypoda, Proc. Acad. Nat. Sci. Phil., July, 1904, p. 550, pl. XXXIX, figs. 4–6.

A transversely elongated triangular shell almost twice as long as high. Surface concentrically grooved, although smooth near the beaks. Lateral teeth normally crenulate.

Although the shell is generally moderately thick, there are occasionally thin shelled specimens among the younger ones.

Fossil occurrence.—Shito (not rare), Kioroshi.

Living.—Western Japan.

Genus **RAETA**, Gray.

199. *Raeta yokohamensis*, Pilsbry.

CM21222-8-5
CM21223-8-6
CM21224
CM21225
CM21226
CM21227

Pl. VIII. Fig. 5, 6.

Raeta yokohamensis. Pilsbry, Catalogue, p. 119, pl. III, figs. 4, 5.

A thin, fragile, white, swollen shell ovately triangular in shape, compressed, bluntly pointed and a little gaping behind, with the surface concentrically corrugated.

Fossil occurrence.—Otake (rather frequent), Tega (frequent). Shisui, Kamenari. Oji in Musashi.

Living.—Central Japan (Tokyo Bay).

200. *Raeta pellicula*, (Deshayes)

CM21228-9-6

Pl. IX. Fig. 6.

Raeta pellicula. Pilsbry, Cat. Mar. Moll. Jap., p. 119.

Mactra pellicula. Deshayes, Proc. Zool. Soc. Lond., 1854, p. 68. Reeve, Conch. Icon., Mactra, pl. XXI, fig. 124.

An imperfect left valve swollen and rounded in front, somewhat flattened and truncate behind. The thin shell shows concentric furrows on the surface. It is 23 (?) millim. long, 18.5 millim. high and 6 millim. deep.

Fossil occurrence.—Otake.

Living.—Japan (according to Reeve).

CM21229-8-7
CM21230
CM21231
CM21232

201. *Raeta elliptica*, Yokoyama.

Pl. VIII. Fig. 7.

Shell thin, fragile, transversely ovately elliptical, inflated, somewhat flattened near the posterior end, with posterior side a little shorter than anterior, rounded at both ends, though some-

times rather subtruncate behind. Anterior and posterior margins more or less straight, going over into lateral margins without any angulation; ventral margin arcuate, slightly gaping behind. Surface more or less concentrically corrugated, especially so toward lateral margins, somewhat flattened or even excavated a little behind the middle. Pallial line and sinus generally indistinct, the latter large but shallow and rounded.

The largest right valve measures 18.2 millim. in length, 13 millim. in height, 4.1 millim. in depth, while the largest left measures 14.6 millim. in length, 10 millim. in height and 3 millim. in depth.

This shell seems to have been more or less hyaline when fresh, as some of the specimens show such a character and are translucent.

Fossil occurrence.—Tega (very frequent), Kamenari, Kioroshi.

CM21233-8-12,13
~~CM21234-8-13~~

202. *Raeta magnifica*, Yokoyama.

Pl. VIII. Fig. 12, 13.

Shell comparatively large, thin, inquilateral, anterior side somewhat shorter than posterior, transversely oval, swollen and broadly rounded in front, compressed and quickly narrowed behind, with the end truncate and a little gaping. Surface with numerous irregular concentric plications. Main teeth rather small, two in the left valve and one in the right, the posterior one in the former being somewhat deltoid in shape. Posterior lateral tooth very long. Pallial sinus very large and deep, horizontal, finger-like.

A single shell with both valves perfect. Length 42.5 millim. of which about 20 millim. belong to the anterior side. Height 37 millim. Thickness 25.5 millim.

This species is somewhat like *Raeta anatinoides* (Reeve) shown in Conch. Icon., Mactra, pl. XXI, fig. 123 from an unknown locality, which, however, is more pointed behind.

Fossil occurrence.—Tega (Kizaki).

CM21235-8-8
CM21236
CM21237
CM21238
CM21239

Genus **TRESUS**, Gray.

203. *Tresus nuttali* (Conrad).

Pl. VIII. Fig. 8.

Tresus nuttali. Dunker, Ind. Moll., p. 184. Pilsbry, Cat., p. 120. Tokunaga, Foss. Env. Tokyo, p. 42. Arnold, Pal. a. Strat. San Pedro, California, p. 178.

Lutraria nuttali. Conrad, Jour. Acad. Nat. Sci. Phil., vol. VII, 1837, p. 235, pl. XVIII fig. 1. Lischke, Jap. Meeresconch., I, p. 136. Brauns, Geol Env. Tokio, p. 38, pl. IV, fig. 6.

Lutraria maxima. Middendorff, Mal. Ross., III, p. 66, pl. XIX, figs. 1–4. Reeve, Conch. Icon., Lutraria, pl. V, fig. 18. Non *L. maxima* Jonas.

This large shell excellently figured by Brauns is frequent both living and fossil in the neighbourhood of Tokyo.

Although comparatively thin-shelled in general, some of the fossil specimens are rather thick and attain the length of 165 millim. with the height of 120 millim.

Fossil occurrence in Japan.—Otake (quite frequent), Shisui, Tega, Shito (frequent). Oji and Shinagawa in Musashi.

Fossil occurrence in America.—Pliocene and Pleistocene of San Pedro, California.

Living.—Northern, Central and Western Japan. Alaska to San Diego on the west coast of America.

CM21240-8-9
CM21241-8-10
CM21242
CM21243
CM21244

Genus **LUTRARIA**, Lamarck.

204. *Lutraria maxima*, Jonas.

Pl. VIII, Figs. 9, 10.

Lutraria maxima. Jonas, Zeitschr. f. Malak., 1844, p. 34 (non *L. maxima* Midd.). Reeve, Conch. Icon., Lutraria, pl. III, fig. 11. Lischke, Jap. Meeresconch., I, p. 138. Pilsbry, Cat., p. 120.

Characterized by a transversely elongate-oblong, compressed, very inequilateral shell more than twice as long as high. The surface is smooth.

This shell is somewhat like *Lutraria ovalis* Tokunaga (Foss. Env. Tokyo, p. 41, pl. II, fig. 28) from Shinagawa which is possibly identical with *Lutraria sieboldi* Reeve (no. 15 of his Conch. Icon.), but it is decidedly longer.

	Length.	Height.	Depth.
Left valve	126.7 millim.	61.2 millim.	13.2 millim.
Right „	127.2 „	64.3 „	13.5 „

Fossil occurrence.—Otake (frequent), Kioroshi, Shito.
Living.—Western Japan.

CM21245-9-1
CM21246
CM21247

Family **Solenidæ.**

Genus **SOLEN**, Linné.

205. *Solen grandis*, Dunker.

Pl. IX. Fig. 1.

Solen grandis. Dunker, Nov. Conch., II, p. 71, pl. XXIV, fig. 5. Ind. Moll., p. 172. Lischke, Jap. Meeresconch., I, p. 141. Mart. u. Chem., Syst. Conch. Cab., XI, part 3, Solenaceæ, p. 18, pl. VII, fig. 1. Pilsbry, Cat., p. 190.

This splendid shell is either straightly truncate or slightly concave in front, while it is rounded behind. The length is 4.3–4.4 times the height. The largest specimen obtained measures 135 millim. in length, 30 millim. in height and 18.5 millim in thickness.

Brauns in his "Geology of the Environs of Tokio" (p. 56) says that this species is very frequent at Oji, but as not a single specimen has since been found, it is very likely that he mistook the next species for it.

Fossil occurrence.—Otake (very frequent), Tega.

CM21248-9-5 Living.—Western Japan. Philippines.

CM21249
CM21250
CM21251
CM21252
CM21253

206. *Solen krusensternii.* Schrenck.

Pl. IX. Fig. 5.

Solen krusensternii. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 594, pl. XXV, figs. 9–12. Pilsbry, Catalogue, p. 190. Tokunaga, Foss. Env. Tokyo, p. 36, pl. II, fig. 19.

Ensis krusensternii. Dunker, Ind. Moll., p. 178.

Although smaller in size than the preceding, this species is comparatively longer, and also somewhat longer than the living specimens. Schrenck says that the length is about four times and

a half the height. But in the fossil specimens the length is generally five times the height or even a little greater. The upper margin (hinge-margin) is often somewhat concave, though it is usually straight.

The fossil specimens are generally somewhat smaller than the living, the largest measuring 80 millim. in length and 15 millim. in height.

Fossil occurrence.—Otake (very frequent), Shisui (do), Kamenari, Tega, Shito, (very frequent). Oji, Tabata and Shinagawa in Musashi.

Living.—Northern Japan.*

Genus **SILIQUA**, Mühlfeld.

207. *Siliqua pulchella*, (Dunker).

Pl. IX. Fig 7.

Siliqua pulchella. Pilsbry, Catalogue, p.121.

Anlus pulchellus. Dunker, Zeitschrift für Malakol., 1852, p. 58. Nov. Conch., pt. II, p. 20, pl. VI, figs. 4, 5. Ind. Moll., p. 174. Lischke, Jap. Meeresconch., II, p. 124.

Machæra pulchella. Clessin, Mart. u. Chem Syst. Conch. Cab., vol. XI, pt. 3, Solenacea, p. 65. pl. XX, fig. 6.

The shell is thin, fragile, transversely much elongated, subelliptical, very inequilateral, smooth (in fresh state with fine radiating lines except on the posterior surface), with a strong inner rib which runs from the beak to the ventral margin.

Most of the specimens have the length a little greater than three times the height, but there is one from Tega which is shorter, the length being not quite three times the height. It is probably due to variation.

Fossil occurrence.—Otake (pretty frequent), Tega.

Living.—Central and Western Japan.

* Pilsbry mentions *Akashi* as one of the habitats of *S. krusensterni* (Catalogue, p. 190), on the authority of Stearns. But it is evidently a mistake for *Akkeshi* (Northern Japan).

CM 21256
CM 21257
(52) CM 21258

Genus **SOLECURTUS**, Blainville.

208. *Solecurtus divaricatus*, (Lischke).

Solecurtus divaricatus. Clessin in Mart. u. Chem. Syst. Conch. Cab., XI, pt. 3, p. 87, pl. 21, fig. 4. Yokoyama, Foss. Miura Penin., p. 112, pl. VII, fig. 14.
Macha divaricata. Lischke, Jap. Meeresconch., I, p. 142, pl. X, figs. 1, 2. Tokunaga, Foss. Env. Tokyo, p. 36, pl. II, fig. 20.
Solecurtus (*Macha*) *divaricatus.* Pilsbry, Cat., p. 121.

This shell first described and figured by Lischke is pretty frequent as a fossil. It is readily recognized by its transversely elongato-oblong form with distant, impressed, radiating lines on the surface.

Fossil occurrence.—Otake (pretty frequent), Tega, Shito. Oji in Musashi. Lower Musashino of Yokosuka.

Living.—Central and Western Japan.

(53) CM 21259-9-8
CM 21260-9-9

Genus **DONAX**, Linné.

209. *Donax introradiatus*, Reeve.

Pl. IX. Fig. 8, 9.

Donax introradiatus. Reeve, Conch. Icon., Donax, pl. IX, fig. 65. Römer in Syst. Conch. Cab., X, part 3, p. 75, pl. XIII, figs. 5-8.

A very young shell with both valves perfect. It is characterized by radiating striæ which are also visible from inside. In the anterior half of the shell, these striæ are rather indistinct. The posterior slope of the shell-margin is convex, with a somewhat wing-like projection. Ventral margin crenulate within. Length 4.2 millim. Height 31 millim. Thickness 2.4 millim.

Fossil occurrence.—Tega.

Living.—Central Japan.

CM 21261-9-4
CM 21262

Family **Psammobiidæ**.

Genus **PSAMMOBIA**, Lamarck.

210. *Psammobia kazusensis*, Yokoyama.

Pl. IX. Fig. 4.

Two left valves which, however, are quite characteristic.

Shell moderately large, rather thin, transversely oblong, pretty tumid, inequilateral, posterior side somewhat more than one and a half times the length of the anterior, rounded in front, obliquely subtruncate behind, antero-and postero-dorsal margins nearly straight and somewhat sloping. Surface with rude lines of growth, pretty uniformly convex except near the postero-dorsal margin where it is somewhat flattened. Beaks small. Teeth two, obliquely directed backward, with the posterior more so than the anterior which is thick and short while the posterior is thin and long. Muscular impressions more or less irregularly ovate, with the posterior broader than the anterior. Pallial sinus large, finger-like, horizontal and deep, reaching almost to below the beak.

The larger of the two specimens measures 80 millim. in length, 45 millim. in height and 13.5 millim. in depth.

This species closely resembles *Psammobia maxima* Desh. (Reeve, Conch. Icon., *Psammobia*, sp. 4) from Panama which, however, is more quadrate and more compressed.

Fossil occurrence.—Shito.

CM21263-9-13
CM21264-9-14
CM21265
CM21266
CM21267

Genus **SOLETELLINA**, Blainville.

211. *Soletellina violacea*, Lamarck.

Pl. IX. Figs. 13, 14.

Soletellina violacea. Lamarck, Hist. Nat., Ed. II, vol. VI, p. 60. Delessert, Recueil, pl. II, fig. 5. Lischke, Jap. Meeresconch., vol. I, p. 131. Pilsbry, Cat., p. 122.

Soletellina cumingiana. Deshayes, MSS. in Mus. Cuming. Reeve, Conch. Icon., Soletellina, pl. I, fig. 4.

Psammobia violacea. Deshayes, in Encycl. Meth.-Vers., III, p. 852. Philippi, Abbild., I, p. 97. Psammobia, I, fig. 2.

Solenotellina violacea. Dunker, Moll. Ind., p. 187.

This transversely oblong flat shell rounded in front and somewhat obliquely truncate behind is very numerous at some localities. The violet tint of the living shell is more or less preserved also in the fossil. It must here be remarked that the fossil specimens are somewhat shorter than the living figured by Reeve, the length being not quite double the height.

The largest specimens at hand are left valves, one of which measures 56 millim. in length and 31 millim. in height, while another with the same length shows the height of 35 millim.

Fossil occurrence.—Northern to Western Japan. Philippines. Moluccas

CM21268 - 9-11
CM21269
CM21270
CM21271 - 9-17

212. *Soletellina olivacea*, Jay.

Pl. VII. Fig. 11. Pl. IX. Fig. 17.

Soletellina olivacea. Jay, Report on Shells coll. by Jap. Exped. of Commodore Perry, 1856, p. 292, pl. I, figs. 8, 9. Lischke, Jap. Meeresconch., I, p. 131, III, p. 98, pl. VIII, figs. 7–12. Pilsbry, Cat., p. 122.

Solenotellina olivacea. Dunker, Ind. Moll., p. 188.

Soletellina japonica. Debeaux, Jour. de Conch., II, pp. 245, 254. Reeve, Conch. Icon., Soletellina, pl. IV, fig. 16.

This shell is shorter and more oval than the preceding. The right valve is almost flat, while the left is somewhat convex.

Fossil occurrence.—Otake (frequent), Shisui, Shito (very frequent).

Living.—Northern to Western Japan. North China (Cheefoo).

CM21272 - 9-15
CM21273 - 9-16
CM21274
CM21670

Family **Tellinidæ.**

Genus **TELLINA** Linné.

213. *Tellina jedoensis*, Lischke.

Pl. IX. Fig. 15, 16.

Tellina jedoensis. Lischke, Jap. Meeresconch., vol. III, p. 92, pl. IX, figs. 1–3. Dunker, Ind. Moll., p. 190. Pilsbry, Catalogue, p. 124. Brauns, Geol. Env. Tokio, p. 39. Tokunaga, Foss. Env. Tokyo, p. 43, pl. II, fig. 31.

Lischke describes this little species as follows:

"Shell oblong, rather thin, swollen in front, compressed behind. The anterior side is considerably longer than the posterior, the fold being pretty strongly marked. The dorsal margin is straight, passing gradually into the well-rounded anterior margin which also gradually goes over into the ventral; the latter runs at first almost straight or only slightly curved, and then ascends

somewhat upward, making an obtuse angle with the steeply descending, broadly curved posterior margin. The sculpture consists of fine incremental lines and some still finer radiating ones which can only be distinguished with a magnifier. The hinge has two cardinal teeth in each valve and two laterals in the right. Of the cardinal teeth, the posterior one in the right valve and the anterior in the left are strong, directed upward and split, while the other is oblique, narrow and simple. The lateral teeth are thin and distant from the beaks. The pallial sinus is very large, almost reaching the anterior muscular impression, its lower border coinciding with the mantle-line for its whole length....."

The fossil specimens agree quite well with this, Lischke's species.

Fossil occurrence.—Otake (rare), Tega. (rather frequent), Oji in Musashi.

Living.—Central and Western Japan.

CM21275-10-18
CM21276-10-18
CM21277
CM21278
CM21279
CM21280

214. *Tellina venulosa*, Schrenck.

Pl. X. Fig. 1.

Tellina venulosa. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 556, pl. XX, figs. 2–5. Dunker, Ind. Moll., p. 192. Pilsbry, Cat., p. 124.

A moderately thick, compressed, broadly triangular shell with the length a little more than one and a half times the height. The posterior lateral teeth are absent, while the anterior is single.

The largest specimen attains the length of 100.5 millim.

Fossil occurrence.—Otake (frequent), Kioroshi, Tega, Shito (frequent).

Living.—Northern Japan. Sea of Okhotsk.

CM21281-8-11
CM21282
CM21283
CM21284
CM21285

215. *Tellina nitidula*, Dunker.

Pl. VIII. Fig. 11.

Tellina nitidula. Dunker, Moll. Jap., p. 27, pl. III, fig. 14. Lischke, Jap. Meeresconch., I, p. 129, II, p. 113, pl. X, figs. 10, 11. Brauns, Geol. Env. Tokio, p. 39. Tokunaga, Foss. Env. Tokyo, p. 42, pl. II. figs. 30 abc. Yokoyama, Foss. Miura Penin., p. 112, pl. VII, fig. 15.

CM21671 ✓

This thin-shelled species already described by Brauns and Tokunaga from the environs of Tokyo and by me from the Lower Musashino of the Miura Peninsula is very frequent at some places.

Fossil occurrence.—Otake (frequent), Kamenari, Shisui (frequent), Tega, Shito (very frequent). Oji and Shinagawa in Musashi. Lower Musashino of Miyata and Naganuma.

Living.—Central and Western Japan.

CM21286-10-5
CM21287-10-6
CM21288
CM21289
CM21290

216. *Tellina alternata*, Say *var. chibana*, Yokoyama.

Pl. X. Figs. 5, 6.

Shell rather thin, compressed, transversely elongated, almost twice as long as high, a little inequilateral with posterior side somewhat shorter than anterior, rounded in front, obliquely subtruncate behind. Antero-and postero-dorsal margins nearly straight; ventral margin broadly arched. Surface concentrically grooved; grooves rather fine, pretty regular, although often indistinct through friction. Also fine discontinuous and irregular radiating lines present. A keel runs from the beak to the postero-ventral corner, behind which there is a very shallow depression. Pallial sinus large, deep and oblong. Anterior main tooth in left valve and posterior main tooth in right valve bifid. Lateral teeth two, one in front and one behind. Rather frequent.

The largest example is a right valve measuring 49.4 millim. in length, 26.6 millim. in height and 4.8 millim. in depth. The largest left measures 45.4 millim. in length, 27 millim. in height and 4.5 millim. in depth.

This shell still living near our coast agrees quite well with *Tellina alternata* Say (Philippi, Abbild., vol. II, p. 23, pl. III, fig. 1 and Syst. Conch. Cab., *Tellina*, pl. XXV, figs. 10–15) from the east coast of the United States in form, the only difference being the shallower pallial sinus and the absence of radiating lines in the latter. Therefore I deem it expedient to treat the Japanese form as a variety of the American.

Fossil occurrence,—Otake, Kamenari, Shito.

Living.—Central Japan.

CM21291

217. *Tellina ojiensis*, Tokunaga.

Tellina ojiensis. Tokunaga, Foss. Env. Tokyo, p. 44, pl. II, fig. 34. Yokoyama, Foss. Miura Penin., p. 113, pl. VII, figs. 16, 17.

A right and a left valve. The former measures 16 millim. in length, 11.5 millim. in height and 3 millim. in depth, the latter 10.5 millim. in length, 7.6 millim. in height and 1.5 millim. in depth.

Fossil occurrence.—Otake. Oji in Musashi. Lower Musashino of Miyata.

Living.—Northern and Central Japan.

CM21292
CM21293
CM21294
CM21295
CM21296

218. *Tellina miyatensis*, Yokoyama.

Tellina miyatensis. Yokoyama, Foss. Miura Penin., p. 115, pl. VII, fig. 18.

This small transversely elongated shell already described by me from the Lower Musashino is widely distributed in the Upper.

Fossil occurrence.—Otake (very mumerous), Kioroshi, Kamenari, Tega, Shito. Oji in Musashi. Lower Musashino of Miyata.

CM21297-10-8
CM21298-10-9
CM21299-10-10
CM21300
CM21301

219. *Tellina delta*, Yokoyama.

Pl. X. Figs. 8–10.

CM21302
CM21303

Shell small, rather thick, ovately and obliquely trigonal, moderately convex, nearly equivalve, strongly inequilateral with posterior side twice as long as anterior, rounded at both ends though more sharply in front than behind. Antero-and postero-dorsal margins nearly straight, meeting at an angle of about 110° at the beak; ventral margin broadly arcuate. Surface uniformly convex and furnished with close, regular, concentric furrows. Cardinal teeth two in each valve, the anterior in the left and the posterior in the right being larger. Lateral teeth two, one on each side of the cardinal ones. Pallial sinus large, with the upper border obliquely ascending and terminating near the anterior muscular impression with a blunt end.

The shell does not attain more than 8 millim. in length, 6.5 millim. in height and 3.2 millim. in thickness.

Fossil occurrence.—Otake (very common), Kioroshi, Kamenari, Tega (frequent).

Living.—Central Japan (Sea of Sagami).

CM21304-10-2
CM21305-10-3
CM21306
CM21307
CM21308
CM21309

Genus **MACOMA**, Leach.

220. *Macoma praetexta*, (Martens).

Pl. X. Figs. 2, 3.

Tellina praetexta. Martens, Ann. Mag. Nat. Hist., XVI, p. 430. Lischke, Jap. Meeresconch., vol. I, p. 180, vol. II, p. 113, pl. X, fig. 14. Dunker, Ind. Moll., p. 190. Pilsbry, Cat., p. 125.

This shell somewhat resembling *Tellina nitidula* Dkr. in shape as well as in its thin state is more triangular with the ventral margin more ascending behind, so that the end appears somewhat rostrate. The posterior fold is also more distinct than in Dunker's species. The lateral teeth are wholly wanting. The posterior main tooth of the right valve is thick and bifid.

The largest specimen obtained is 31 millim. in length, 20.5 millim. in height and 7.6 millim. in thickness.

Fossil occurrence.—Otake, Shisui, Tega, Shito (rather rare at all these localities). Dokwanyama in Musashi.

CM21310
CM21311
CM21312

Living.—Central and Western Japan.

221. *Macoma nipponica*, (Tokunaga).

Macoma nipponica. Yokoyama, Foss. Miura Penin., p. 117, pl. VIII, figs. 3, 4.
Tellina nipponica. Tokunaga, Foss. Env. Tokyo, p. 44, pl. II, fig. 36.

A full description of this species is given in my work above quoted.

Fossil occurrence.—Otake (not rare), Tega, Kamenari, Shisui, Shito (very common). Oji and Tabata in Musashi.

Living.—Northern Japan.

CM21313

222. *Macoma inquinata*, (Deshayes).

Macoma inquinata. Pilsbry, Cat., p. 124. Arnold, Pal. Strat. Mar. Plioc. Pleistoc. San Pedro, p. 162, pl. XVI, fig. 4. Yokoyama, Foss. Miura Penin., p. 117, pl. VIII, figs. 1, 2.

Tellina inquinata. Deshayes, Proc. Zool. Soc. Lond., 1854, p. 357. Römer in Syst. Conch. Cab., vol. X, part 4, p. 227, pl. 44, figs. 1–4. Dunker, Ind. Moll., p. 190.

Tellina inquinata var. *incongrua.* Lischke, Jap. Meeresconch., vol. II, p. 117, pl. X, figs. 12, 13.

Tellina incongrua. Martens, Ann. Mag. Nat. Hist., Series III, vol. 16, p. 430. Römer in Syst. Conch. Cab., X. pt. 4, p. 225, pl. 43, fig. 11–13.

Only a small left valve.

Fossil occurrence in Japan.—Kioroshi. Lower Musashino of Yokosuka and Miyata.

Fossil occurrence in America.—Pliocene and Pleistocene of San Pedro, California.

Living.—Northern, Central and Western Japan. Sea of Okhotsk. West coast of America from Alaska to San Diego in California.

CM2/3/4-10-4
CM2/3/5
CM2/3/6

223. *Macoma dissimilis*, (Martens).

Pl. X. Fig. 4.

Macoma dissimilis. Pilsbry, Cat., p. 125. Yokoyama, Foss. Miura Penin., p. 116, pl. VII, figs. 19, 20.

Macoma nasuta. Tokunaga, Foss. Env. Tokyo, p. 45, pl. II, fig. 2.

Tellina dissimilis. Martens, Ann. Mag., Series III, vol. XVI, p. 430.

Tellina nasuta. Brauns, Geol. Env. Tokio, p. 39.

Tellina nasuta var. dissimilis. Lischke, Jap. Meeresconch., II, p. 115, pl. IX, figs. 15–17.

A few examples.

Fossil occurrence.—Otake, Tega. Oji (quite abundant), Tabata (many) and Shinagawa in Musashi. Lower Musashino of Miyata and Yokosuka.

Living.—Central Japan.

CM2/3/7-11-1
CM2/3/8
CM2/3/9

224. *Macoma secta*, (Conrad).

Pl. XI. Fig. 1.

Macoma secta. Pilsbry, Cat., p. 125. Arnold, Pal. Strat. Mar. Plioc. Pleistoc. San Pedro, p. 164, pl. XVI, fig. 5.

Tellina secta. Conrad, Jour. Acad. Nat. Sci. Philad., VII, 1837, p. 257. Philippi, Abbild., II, p. 22, pl. IV, fig. 2. Reeve, Conch. Icon., Tellina, pl. II, fig. 5. Lischke, Jap. Meeresconch., II, p. 173.

The shell is comparatively large, though thin. It is triangular, compressed, rounded in front and bluntly angulate behind. The height is about three-fourths of the length. Surface smooth. Growth-lines distinct.

The examples are all left valves. The largest measures 58.7 millim. in length and 43.8 millim. in height.

Fossil occurrence in Japan.—Otake (rather rare). Tega.

Fossil occurrence in America.—Pliocene and Pleistocene of San Pedro, California.

Living.—Central and Western Japan. California (Bodega Bay to San Diego).

CM21320
CM21321
CM21322
CM21323
CM21326
CM21325

Family **Veneridæ.**

Genus **DOSINIA**, Scopoli.

225. *Dosinia troscheli*, Lischke.

CM21724

Dosinia troscheli. Lischke, Jap. Meeresconch., III, p. 89, pl. VIII, figs. 1–3. Dunker, Ind. Moll., p. 203. Yokoyama, Foss. Miura Penin., p. 119, pl. VIII, figs. 5,6.

Dosinia exoleta. Brauns, Geol. Env. Tokio, p. 41, pl. VI, fig. 22. Tokunaga, Foss. Env. Tokyo, p. 47.

This shell so scarce in the Lower Musashino is of a wide distribution in the Upper. That Lischke's species is distinct from its European ally, *Dosinia exoleta* L., was explained in my work above cited.

Fossil occurrence.—Otake, Shisui, Kamenari, Kioroshi, Tega, Shito. Oji (quite numerous), Tabata, Dōkwanyama and Shinagawa in Musashi. Lower Musashino of Miyata and Naganuma.

Living.—Central and Western Japan.

CM21336 6-10-12

CM21722 -10-13

226. *Dosinia bilunulata*, Gray.

Pl. X. Figs. 12, 13.

Dosinia bilunulata. Gray, Analyst. Quart. Jour., 1838, pars 24, p. 309. Reeve, Conch. Icon., Dosinia, sp. 22. Römer, Monogr. Dosinia in Nov. Conch., p. 83, pl. XVI, fig. 1. Lischke, Jap. Meeresconch., II, p. 172, III, p. 90. Dunker, Ind. Moll., p. 203. Pilsbry, Cat., p. 126.

A large and splendid species easily recognized by its double lunula, one within the other. There are two valves, a right and a left. The former is 83.3 millim. long, 82.3 millim. high and 15.7 millim. deep, while the latter is 74.1 millim. long, 72.6 millim. high and 14.2 millim. deep.

Fossil occurrence.—Otake.

Living.—Central Japan.

Genus ***Cyclina***, Deshayes.

CM 21327
CM 21328

227. *Cyclina chinensis*, (Chemnitz).

Cyclina chinensis. Deshayes, Traité Elément., I, pt. 2, p. 626, pl. 14, figs. 20–22. Pfeiffer in Syst. Conch. Cab., XI, pt. 1, p. 111, pl. II, fig. 5, pl. XXVIII, fig. 1. Lischke, Jap. Meeresconch., I, p. 126. Brauns, Geol. Env. Tokio, p. 53. Tokunaga, Foss. Env. Tokyo, p. 48. Yokoyama, Foss. Miura Penin., p. 119, pl. XI, figs, 7, 8.

Venus chinensis. Chemnitz, Conch. Cab., X, p. 356, pl. 171, fig. 1663.

Only two right valves.

Fossil occurrence.—Otake, Tega. Tabata in Musashi. Lower Musashino of Yokosuka.

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

Genus ***Lucinopsis***, Forbes et Hanley.

CM 21329-10-7

228. *Lucinopsis divaricata*, Lischke.

Pl. X. Fig. 7.

Lucinopsis divariata. Lischke, Jap. Meeresconch., III, p. 90, pl. VII, figs. 12–14.

A single left valve. It is rather thin, tolerably inflated, circular in general outline and nearly equilateral. Of the three main teeth, the middle one is very thick and bifid. The surface-sculpture has been obliterated by friction. Pallial sinus deep, ascending, triangular. Length 11.5 millim. Height 10.9 millim. Depth 3.3 millim.

Fossil occurrence.—Shito.

Living.—Central and Western Japan.

CM21330-1-4
CM21331
CM21332
CM21333
CM21334

Genus **MERETRIX**, Lamarck.

229. *Meretrix meretrix*, (Linné).

Pl. XI. Fig. 4.

Meretrix meretrix. Pilsbry, Catalogue, p. 126. Römer, in Malak. Blätter, p. 45, Monogr. Venus, p. 27, pl. 8, fig. 1.

Cytherea meretrix. Linné, Syst. Nat., Ed. 10, p. 686. Lischke, Jap. Meeresconch, I, p. 122, II, p. 108. Dunker, Ind. Moll. p. 199. Pfeiffer in Syst. Conch. Cab., vol. XI, pt. 1, p. 15, pl. III, figs, 4–9. Brauns, Geol. Env. Tokio, p. 53. Tokunaga, Foss. Env. Tokyo, p. 47, pl. III, fig. 5.

Venus (*Meretrix*) *meretrix.* Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 545.

This well known tumid triangular shell, so common in the seas around Japan, has already been described by Brauns and Tokunaga from the fossil layers near Tokyo.

The specimen figured is a large left valve about 84 millim. in length, 68 millim. in height and 25 millim, in depth. It is markedly triangular with the curvature of the ventral margin rather small.

Fossil occurrence.—Otake (rather frequent), Kamenari, Kioroshi, Tega (frequent). Shinagawa in Musashi.

Living.—Northern, Central and Western Japan. Philippines. Moluccas. Indian Ocean.

CM21335-11-5
CM21336
CM21337
CM21338
CM21339
CM21340

230. *Meretrix* (*Callista*) *chinensis*, (Chemnitz).

Pl. XI. Fig. 5.

Meretrix (*Callista*) *chinensis.* Pilsbry, Catalogue, p. 127. Yokoyama, Foss. Miura Penin., p. 120, pl. VIII, figs. 9, 10.

Cytherea chinensis. Pfeiffer in Mart. Chemn. Syst. Conch. Cab., XI, pt, 1, p. 31, X, fig. 2. Lischke, Jap. Meeresconch., I, p. 122. Tokunaga, Foss. Env. Tokyo, p. 46, pl. III, fig. 4.

Callista chinensis. Dunker, Ind. Moll., p. 200.

Venus chinensis. Chemnitz, Conch. Cab., XI, p. 227, pl. 202, fig. 1976.

Specimens are quite frequent. The largest is from Shito, measuring 120 millim. in length and 85 millim. in height.

Fossil occurrence.—Otake (common), Tega, Kamenari, Shisui, Shito (rather frequent). Oji and Shinagawa in Musashi. Lower Musashino of Naganuma.

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

CM21341-11-6
CM21342-11-7
CM21343-11-8
CM21344
CM21345
CM21346
CM21347

Genus **SUNETTA**, Link.

231. *Sunetta excavata* (Hanley).

Pl. XI. Figs. 6, 7, 8.

Sunetta excavata. Adams, Gen. Rec. Moll., II, p. 428. Pfeiffer, Syst. Conch. Cab., XI, pt. 1, p. 83, pl. XXIX, fig. 4. Dunker, Ind. Moll. p. 201. Pilsbry, Cat., p. 127.

Cytherea excavata. Hanley, Proc. Zool. Soc. Lond., 1842, p. 123, Descript. Cat., p. 109, pl. 15, fig. 19.

Meroe excavata. Sowerby, Thes. Conch., II, p. 610, pl. 126, figs. 13, 14. Reeve, Conch. Icon., Meroe, pl. III, fig. 11. Lischke, Jap. Meeresconch., II, p. 110.

Sunetta menstrualis. Römer, Monogr. Venus, II, p. 13, pl. IV, fig. 2. Pfeiffer, Syst. Conch. Cab., XII, pt. 1, p. 85, pl. XXIX, figs. 10, 11, 12. Pilsbry, Cat., p. 127.

Cytherea menstrualis. Menke, Moll. Nov. Holl., sp. 43. Philippi, Abbild., II, p. 96, no. 3, Cytherea, pl. IV, fig. 3.

Meroe menstrualis. Sowerby, Thes. Conch., II, p. 742, no. 8, pl. 163, fig. 17. Reeve, Conch, Icon , Meroe, pl. III, fig. 9.

Meroe magnifica. Reeve, Conch. Icon., Meroe, pl. I, fig. 2.

Lischke unites the two species of *Sunetta excavata* Hanley and *Sunetta menstrualis* Menke into one, and quite rightly. I have a few large specimens which are typical *Sunetta menstrualis* and many small ones which can be assigned to *S. excavata.* The former are up to 57 millim. in length, roundly oval in form, compressed and rounded at both ends, the anterior more sharply than the posterior, while the latter are more oblong or elliptical in shape, with the posterior end mostly truncate or subtruncate and smaller in size, usually being less than 20 miliim. in length. But on examining the young specimens of the living shell, I was convinced that the form gradually passes from the one into the other, so that there is no reason for separating the two.

Pfeiffer in "Systematisches Conchylien-Cabinet" above cited mentions the fine radiating lines of *Sunetta menstrualis* as one of the distinctions from the other species, but as such lines are very indistinct in young specimens, they can not be of much value in distinguishing the two.

The largest left valve measures 57.1 millim. in length, 47.2 millim. in height and 10.5 millim. in depth, while the largest right measures 54.3 millim. in length, 45 millim. in height and 9.5 millim. in depth.

Fossil occurrence.—Otake (numerous), Kioroshi, Kamenari (frequent), Tega.

Living.—Northern, Central and Western Japan. South Australia.

CM 21348—11-11
CM 21349—11-12
CM 21350
CM 21351
CM 21352
CM 21353

Genus **VENUS**, Linné

232. *Venus (Mercenaria) stimpsoni*, Gould.

Pl. XI. Figs. 11, 12.

Venus (*Mercenaria*) stimpsoni. Gould, Otia Conch., p. 169. Brauns, Geol. Env. Tokio, p. 40, pl. V, fig. 21. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 604.
Venus stimpsoni. Tokunaga, Foss. Env. Tokyo, p. 46.

Shell solid, rather compressed, ovately triangular, broader than high, bluntly angular behind, very inequilateral, the beaks being near the anterior margin. Surface ornamented with thin, erect, concentric lamellae. Lunula deep, well bounded, longly cordate. Area very long, rather distinctly bounded, taking nearly the whole length of the postero-dorsal slope of the shell. Of the three strong main teeth, the middle one in the left valve is bifid, while in the right the middle as well as the posterior are bifid. Pallial sinus small, shallow, triangular. The inner margin of the shell is finely crenulate, though Gould calls it simple.

The largest specimen obtained is a left valve measuring 95 millim. in length, 80 millim. in height and 23 millim. in depth.

Fossil occurrence.—Otake (frequent), Shisui (do), Shito (do). Oji in Musashi.

CM21354
CM21355
CM21356

Living.—Northern to Western Japan.

233. *Venus jedoensis*, Lischke.

Venus jedoensis. Lischke, Jap. Meeresconch., III, p. 84, pl. VII, figs. 1–9. Dunker, Ind. Moll., p. 196. Pilsbry, Cat., p. 127. Yokoyama, Foss. Miura Penin., p. 120, pl. VIII, figs. 9, 10.

This shell fully described by Lischke is readily known by its rather thick, tumid, transversely and shortly oval, inequilateral form with radiating ribs crossed by concentric lines of growth. Lunula cordate bounded by distinct grooves. Inner margin crenulate. Pallial sinus moderately deep, narrowing towards its

end which is bluntly pointed. Of the three main teeth, the middle in the left valve and the middle and the posterior in the right are bifid.

The young specimens of this species are more rounded in outline than the adult.

Fossil occurrence.—Otake (not rare), Kioroshi, Tega. Lower Musashino of Miyata and Yokosuka.

Living.—Northern, Central and Western Japan.

CM21357-11-9
CM21358-11-10
CM21359
CM21360
CM21361
CM21362

234. *Venus neastartoides*, Yokoyama.

Pl. XI. Figs. 9, 10.

Shell small, thick, rather compressed, triangular. Anterior side only a little longer than posterior. Anterior end sharply rounded. Antero-dorsal margin nearly straight, sloping. Postero-dorsal and posterior margins together forming a broad curve. Postero-ventral corner obtusely angulate. Surface smooth, only with lines of growth. Beaks small, pointed, curved in. Teeth three in each valve with the middle one thickest. No lunula. Inner margin smooth. Pallial sinus shallow, triangular, blunt at end. The largest right valve measures 20.3 millim. in length, 15.6 millim. in height and 5 millim. in depth, while the largest left measures 19.4 millim, in length, 14.6 millim. in height and 4.3 millim. in depth.

CM21672 ✓

The compressed state of this shell reminds us of the genus *Astarte*, but as the name *astartoides* is already used by Beck, *neastartoides* was chosen as the specific name.

Fossil occurrence.—Otake (frequent), Kamenari (do), Tega (do), Kioroshi (most frequent), Shito (rare).

Living.—Central Japan.

CM21363
CM21364
CM21365

Genus **CHIONE**, Megerle von Mühlfeldt.

235. *Chione isabellina*, (Philippi).

Chione isabellina. Deshayes, Conch. Brit. Mus., I, p. 124, no. 17. Dunker, Index Moll., p. 198. Yokoyama, Foss. Miura Penin., p. 121, pl. VIII, fig. 13.

Venus isabellina. Philippi, Zeitschr. f. Malak., p. 188, no. 65. Abbild., III, p. 83, no. 5. Venus, pl. X, fig. 5. Pfeiffer in Syst. Conch. Cab., XI, pt. 1, p. 194, pl. 25, fig. 9.

Venus foliacea. Tokunaga, Foss. Env. Tokyo, p. 46, pl. III, fig. 3, (non *V. foliacea* Phil).

Tokunaga mistook this shell for *Chione foliacea* Phil. which has the inner margin crenulate and not smooth as in the present species. The shape is also somewhat different, the height being somewhat greater in *Chione isabellina.*

Fossil occurrence.—Otake (rare), Shisui, Tega. Oji and Shinagawa in Musashi. Lower Musashino of Naganuma.

CM 21366-11-2
CM 21367-11-3
CM 21368

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

236. *Chione mindanensis,* Smith.

Pl. XI. Figs. 2, 3.

Venus (*Chione*) *mindanensis.* Smith, Challenger Report, Lamellibr., p. 130, pl. III, figs. 4, 4 b.

The shell is small, rather thin, moderately convex, inequilateral, subquadrate in outline, the four sides being formed by the postero-dorsal, posterior, anterior and ventral margins, of which the first is the shortest and the last the longest. The antero-dorsal and anterior margins together form a curved line, while the posterior is only slightly arched, meeting with the ventral usually in a rounded right angle. The surface has a blunt edge running from the beak to the postero-ventral corner, the part behind which is slightly depressed in the middle. The sculpture consists of radiating riblets and concentric lamellae. The former are rounded and generally furnished with an interstitial one which is either indistinct or obsolete near the beaks, while the latter are elevated, variable in number, and at unequal distances from one another. Lunula longly ovate, distinctly bordered by grooves and ornamented with a few radiating riblets. Shell-margin finely crenulate. Teeth three in each valve, the middle one being the strongest. As to the laterals, there is only one in the anterior part of the right valve, which is thin and rudimentary. Pallial sinus very shallow, broader than deep, narrowed at end.

	Length.	Height.	Depth.
Right valve	9.2 millim.	7.8 millim.	2.6 millim.
Left „	8.1 „	7.3 „	2.3 „

This shell has not yet been reported from Japanese waters.

Fossil occurrence.—Shito (very common).

Living.—Off Mindanao of the Philippines at the depth of 82 fathoms.

CM21369-12-1
CM21370-12-2
CM21371
CM21372
CM21373
CM21374

Genus **VENERUPIS**, Lamarck.

237. *Venerupis semipurpurea*, (Dunker).

Pl. XII. Figs. 1, 2.

Venerupis semipurpurea. Pilsbry, Catal., p. 129.
Rupellaria semipurpurea. Dunker, Ind. Moll. p. 208.

This shell which is more or less variable in outline may be described somewhat as follows:

Shell usually rather thin, convex, transversely elongated, oblong, inequilateral, rounded in front, more or less truncate behind. Dorsal margin more or less straight and mostly parallel with ventral margin. Surface with a blunt edge running from beaks to postero-ventral corner. The sculpture consists of numerous, close, flexuous, radiating riblets crossed by rude lines of growth. Of the three teeth present in each valve, the middle one is thick and bifid. Pallial sinus deep, reaching the middle of the valves, with the upper border horizontal and the lower oblique, so that the end becomes bluntly pointed.

The variability of the shell lies in its length (sometimes double, sometimes not quite one and a half times the height), in the degree of the parallel state of the dorsal margin with the ventral as well as of the inequilateral state and depth, in the shape of the anterior end (rarely truncate), etc.

The living specimens of this shell are coloured purplish in the hinder part, while the remaining parts are more or less white. Dunker in describing this species did not give any figure.

The following are some of the measurements:

	Length.	Height.	Depth.
Left valve.	39.2 millim.	22.2 millim	9.6 millim.
„ „	29.5 „	16.9 „	6.3 „
Right „	34.0 „	18.8 „	8.6 „
„ „	34.8 „	20.9 „	8.2 „

Fossil occurrence.—Otake (rather rare), Narita, Kamenari.
Living.—Northern, Central and Western Japan.

CM 21375-12-8

Genus **TAPES**, Megerle von Mühlfeldt.

238. *Tapes euglyptus*, (Philippi).

Pl. XII. Fig. 8.

Tapes euglyptus. Lischke, Jap. Meeresconch., vol. I, 119, III, p. 80, pl. V, figs. 8–10. Dunker, Ind. Moll., p. 206. Pilsbry, Catal., p, 129. Tokunaga, Foss. Env. Tokyo, p. 50, pl. III, fig. 8.
Venus euglypta. Philippi, Abbild., III, p. 76, pl. VII, fig. 3.

A fragment of a left valve. Yet the coarse concentric grooves as well as the general outline leave no doubt of its being the above named species.

Fossil occurrence.—Kioroshi. Shinagawà in Musashi.
Living.—Central and Western Japan.

(R) CM 21376
CM 21377

239. *Tapes philippinarum*, (Adams et Reeve).

Tapes philippinarum. Lischke, Jap. Meeresconchylien, I, p. 115, II, p. 108, III, p. 78. Pilsbry, Cat., p. 130. Yokoyama, Foss. Miura Penin., p. 125, pl. IX, fig. 6.
Venus philippinarum. Adams and Reeve, Voy. Samarang, Moll., p. 79, pl. XXII, fig. 10.
Venus decussata. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 533.
Tapes decussatus. Brauns, Geol. Env. Tokio, p. 53.

This shell which is closely akin to the following is represented by a few examples.

Fossil occurrence.—Otake, Shito. Tabata and Dokwanyama in Musashi. Lower Musashino of Yokosuka.

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

CM21378
CM21379
CM21380
CM21381

240. *Tapes variegatus*, Hanley.

CM21382

Tapes variegatus. Sowerby, Thes. Conch., II, p. 696, pl. 151, figs. 133–138. Lischke, Jap. Meeresconch., I, p. 118, II, p. 108, III, p. 79. Dunker, Ind. Moll., p. 209. Pilsbry, Cat., p. 130. Yokoyama, Foss. Miura Penin., p. 125, pl. IX, figs. 4,5.

Very frequent at some localities.

This species is distinguished from the foregoing by its longer and less inflated shell, The radiating riblets of the surface are similar in both. The size attained by fossil specimens is moderate. The largest left valve is 52.5 millim. long, 35.3 millim. high and 12.5 millim. deep.

Fossil occurrence.—Otake (very frequent), Tega (do), Kioroshi, Kamenari, Shisui. Lower Musashino of Miyata.

Living.—Central and Western Japan. Philippines.

CM21383–12–9
CM21384
CM21385
CM21386
CM21387

Genus **SAXIDOMUS**, Conrad.

241. *Saxidomus purpuratus*, (Sowerby).

Pl. XII. Fig. 9.

Saxidomus purpuratus. Deshayes in Cat. Conch. Brit. Mus., p. 138. Lischke, Jap. Meeresconch., vol. I, p. 127. Dunker, Ind. Moll., p. 206. Brauns, Geol. Env. Tokio, p. 40, pl. V, fig. 20. Yokoyama, Foss. Miura Penin., p. 127, pl. IX, fig. 8.

Saxidomus nuttali. Conrad, Jour. Acad. Sci., Phil, 1887, VII, p. 249, pl. XX, fig. 12. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 253. Tokunaga, Foss. Env. Tokyo, p. 45.

Several splendid examples from several localities.

Fossil occurrence.—Otake, Shisui, Kioroshi, Shito. Oji and Shinagawa in Musashi. Lower Musashino of Yokosuka.

Living.—Northern, Central and Western Japan. Ogasawara-jima or Bonin Islands. Indian Ocean. Sitka, California, Chile.

Family **Cardiidæ.**

Genus **CARDIUM**, Linné.

CM21388–12–3
CM21389

242. *Cardium burchardi*, Dunker.

Pl. XII. Fig. 3.

Cardium burchardi. Dunker, Ind. Moll., p. 210, pl. XVIII, figs. 4–6. Pilsbry, Catalogue, p. 131.

Two right valves and one left.

The shell is somewhat obliquely ovate, higher than long, moderately convex and ornamented with straight, rounded, radiating ribs separated from one another by deep narrow grooves and numbering a little over forty. The ribs found near the extreme end of the flattened posterior surface are accompanied by fine riblets which are roughly crenate, or even spiny, toward their lower ends.

The larger of the two right valves is 63.3 millim. in height, 59.7 millim. in length and 20.5 millim. in depth, while the smaller has the posterior and postero-dorsal margins more arched and is comparatively higher and less deep, being 20.8 millim. in height 20.6 millim. in length and 5.6 millim. in depth. The left valve is 37 millim. in height, 36 millim. in length and 11.5 millim. in depth.

Fossil occurrence.—Kamenari, Tega.

CM21390 CM21391

Living.—Central and Western Japan.

243. *Cardium californiense*, Deshayes.

Cardium californiense. Deshayes, Revue Zool., p. 1. Soc. Cuvierienne, p. 360. Middendorff, Sib. Reise, Meeresmollusken, p. 218, pl. XIX, figs. 6–11. Mal. Ross., III, p. 40, pl. XV, figs. 23–25. Schrenck, Moll. Amurl. u. d. nordjap, Meeres, p. 514. Lischke, Jap. Meeresconch., I, p. 144, III, p. 125. Brauns, Geol. Env. Tokio, p. 42. Yokoyama, Foss. Miura Penin., p. 127, pl, IX, fig. 10.

The specimens, though numerous, are mostly small. But there is a broken right valve from Shisui measuring 40 millim. in height.

Fossil occurrence.—Otake (frequent), Shisui, Tega, Shito (frequent). Oji and Shinagawa. Lower Musashino of Miyata and Yokosuka.

Living.—Northern, Central and Western Japan. Behring Sea. British Columbia. California.

CM21392–397 CM21393 CM21394 CM21395 CM21396

244. *Cardium muticum*, Reeve.

Pl. XII. Fig. 7.

Cardium muticum. Reeve, Conch. Icon., Cardium, pl. VI, fig. 32. Lischke, Jap.

Meeresconch., I, p. 144. Brauns, Geol. Env. Tokio, p. 42. Tokunaga, Foss. Env. Tokyo, p. 50, pl. III, fig. 10. Dunker, Ind. Moll., p. 212. Pilsbry, Catalogue, p. 131. Yokoyama, Foss. Miura Penin., p. 128, pl. IX, fig. 11.

Cardium japonicum. Dunker, Moll. Jap., p. 28, pl. III, fig. 16.

Cardium papyraceum. Römer in Syst. Conch. Cab., X, pt. 2, p. 78, pl. III, fig. 4, pl. XII, figs. 19, 20.

The figured specimen is a large right valve 83.5 millim. in length and 72.5 millim. in height.

Fossil occurrence.—Otake (common), Shisui, Kamenari, Tega (frequent). Oji and Shinagawa. Lower Musashino of Miyata, Yokosuka and Naganuma.

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

CM21397

245. *Cardium modestum*, Adams et Reeve.

Cardium modestum. Adams and Reeve, Voy. Samarang, Zoology, p. 77, pl. XXII, fig. 6. Dunker, Ind. Moll., p. 211. Pilsbry, Catal., p. 131. Yokoyama, Foss. Miura Penin., p. 128, pl. IX, figs. 12, 13.

This shell frequent in the Lower Musashino of Koshiba is rare in the Upper.

Living.—Central Japan.

CM21398-13-2
CM21399
CM21400

246. *Cardium braunsi*, Tokunaga.

Pl. XIII. Fig. 2.

Cardium braunsi. Tokunaga, Foss. Env. Tokyo, p. 51, pl. III, fig, 11, Yokoyama, Foss. Miura Penin., p. 129, pl. X, fig. 1.

That this species is akin to *Cardium tuberculatum* L. and *Cardium nuttali* Reeve has already been mentioned in my work above cited. The specimens which are rather rare are more or less decorticated on the surface. The largest specimen obtained is a right valve measuring about 91 millim. in length and height, and 34 millim. in depth. The ribs number twenty-four on an average and are made crenate near the ventral margin by rude lines of growth, a character which brings the species closer to the species of Reeve as well as of Linné.

Fossil occurrence.—Otake, Tega, Shito. Oji in Musashi. Lower Musashino of Miyata.

CM21401-12-4
CM21402-12-5
CM21403-12-6
CM21404
CM21405
CM21406

247. *Cardium tokunagai*, Yokoyama.

Pl. XII. Figs. 4, 5, 6.

Shell rather thin, tolerably inflated, suborbicular, a little broader than high, anterior border somewhat more broadly rounded than posterior, slightly inequilateral and oblique. The sculpture consists of about twenty-four broad, elevated, rather flatly topped, finely and indistinctly crenate ribs separated by somewhat broader and deep valleys. Beaks small, approaching. Inner margin coarsely crenate.

The following are some of the measurements of isolated valves:

	Length.	Height.	Depth.
Left valve	26.9 millim.	24.4 millim.	8.6 millim.
„ „	23.0 „	21.7 „	7.5 „
Right „	28.9 „	25.2 „	10.1 „
„ „	25.5 „	23.7 „	8.8 „

The surface in most specimens is more or less decorticated, the crenate character of the ribs being most marked in such. As to the shape, there is some variation. In some examples both anterior and posterior ends are equally rounded, while in others the posterior is subtruncate. Fig. 4 represents a right valve with such a subtruncate posterior end. It is ovate in shape and somewhat different in appearance from the typical form. I believe it is only an abnormal one, but should it prove to be constant in character I would propose for it the name of var. *ovata*. The specimen measures 30 millim. in length, 26.5 millim. in height and 10.5 millim. in depth. The ribs number twenty-three and are to a greater part decorticated.

The typical form of the species is allied to *Cardium sinense* Sowerby (Syst. Conch. Cab. Mart. Chem., Cardium, p. 73, pl. XII, figs. 11, 12) in which, however, the lunula as well as the area are well developed.

Tokunaga in his "Fossils from the Environs of Tokyo" seems to have mistaken this shell for *Cardium californiense* Desh., as can be judged from his figure (pl. III, fig. 9). The two species

are indeed somewhat alike, but a closer examination shows that *Cardium californiense* is flatter and longer.

Fossil occurrence.—Otake (numerous), Shito, Shisui, Tega. Oji (very frequent).

Family **Leptonidæ.**

Genus **MONTACUTA**, Turton.

CM21407-9-2
CM21408-9-3
CM21409
CM21410
CM2411

248. *Montacuta japonica*, Yokoyama.

Pl. IX. Figs. 2, 3.

Shell very small, rather thin, moderately inflated, transversely oval, very inequilateral with anterior side only about half as long as posterior. Anterior dorsal margin steeply sloping, slightly excavated, meeting nearly at a right angle with posterior dorsal which is less steep and somewhat convex. Anterior and posterior ends rounded, the former a little more sharply than the latter. Surface only with lines of growth. Beaks small, pointed. Muscular and pallial impressions distinct. Length 3.5 millim. Height 3.1 millim. Depth of each valve about 1.1 millim.

This species closely resembles *Montacuta bidentata* Mont. (Wood, Crag Moll., Biv., p. 126, pl. XII, fig. 17) of the English Crag, which is still living in the British seas. The English species, however, is larger and more rhombic in outline, with the dorsal and ventral margins subparallel.

Fossil occurrence.—Otake, Shisui, Shito. Oji (numerous).

Living.—Central Japan.

CM21412-13-9
CM21413-13-10
CM21414

249. *Montacuta oblongata*, Yokoyama.

Pl. XIII. Figs. 9, 10.

Shell very small, thin, compressed, transversely oblong, very inequilateral, rounded at both ends, a little more sharply in front than behind. Dorsal and ventral margins subparallel. Surface smooth. Beaks small and pointed, with an obtuse keel running to postero-ventral corner. Left valve with two diverging teeth which are very distinct. Length 4.5 millim. Height 3.1 millim. Depth of each valve about 1.0 millim. Very rare.

In shape this shell is much like *Montacuta* (?) *donacina* Wood, var. (Crag Moll., Bivalves, p. 131, pl. XI, fig. 3 a.) from the English Coralline Crag.

Fossil occurrence.—Shito. Oji in Musashi.

CM21415-9-10
CM21416

250. *Montacuta ? yamakawai*, Yokoyama.

Pl. IX. Fig. 10.

A few right valves.

The shell is very small, rather thin, compressed, transversely oblong, with the anterior border more sharply rounded than the posterior, and somewhat inequilateral, the anterior side being a little shorter than the posterior. The ventral margin is generally only slightly arched or straight or even concave, being as a whole subparallel with the very broadly arched dorsal margin. Surface with very faint radiating lines, only visible with a magnifier. Hinge with two diverging teeth and a triangular vacancy between.

One of the specimens measures 4.5 millim. in length, 32 millim. in height, and 0.9 millim. in depth, while another measures 3.6 millim. in length, 2.7 millim. in height and 0.6 millim. in depth.

The shell resembles in form the right valve of *Kellia suborbicularis* Mont. figured in Wood's Crag Mollusca (Bivalves, pl. XII, fig. 8 b), though the hinge is quite different.

Fossil occurrence.—Shisui.

CM21417-9-11
CM21418-9-12

Genus **THYASIRA**, Leach.

251. *Thyasira trigonata*, Yokoyama.

Pl. IX. Figs. 11, 12.

Shell small, rather thin, ovately triangular, moderately swollen, very inequilateral, posterior side being about two and a half times as long as anterior, sharply rounded in front, bluntly pointed behind. Antero-dorsal margin concave, postero-dorsal broadly convex, ventral strongly arcuate. Beaks small but conspicuous, bent forward. Surface with a weak posterior flexure, the furrow being very broad and shallow. The sculpture consists

of concentric striæ with fine radiating lines. Lunula ovate, deep and sunken. Muscular as well as pallial impressions obsolete.

One left and two right valves. The former measures 4.7 millim. in length, 3.9 millim. in height, and 1.3 millim. in depth, while one of the latter measures 5.3 millim. in length, 4.9 millim. in height and 1.9 millim. in depth.

Fossil occurrence.—Shito.

Family **Diplodontidæ.**

Genus **DIPLODONTA**, Broun.

CM21419-13-3
CM21420
CM21421
CM21422
CM21423
CM21424

252. ***Diplodonta usta***, Gould.

Pl. XIII. Fig. 3.

Diplodonta usta. Pilsbry, Catalogue, p. 133. Yamakawa, On Diplodonta usta Gld. (Japanese), Journ. Geol. Soc. Tokyo, 1909, vol. XVI, p. 482, pl. XIV, figs. 1–10. Yokoyama, Foss. Miura Penin., p. 130, pl. IX, figs. 14, 15. 16.

Mysia (Felania) usta. Gould, Otia Conch., p. 170.

Mysia pacifica. Tokunaga, Foss. Env. Tokyo, p. 53.

Diplodonta trigonula. Brauns, Geol. Env. Tokio, p. 44, pl. VI, ffg. 25 (non D. trigonula Broun).

This shell has already been described in my work above cited. The specimens are very frequent, much more so than in the Miura Peninsula. There is some variation in form.

Fossil occurrence.—Otake (very frequent), Shisui (do), Kioroshi, Tega, Shito (very frequent). Oji in Musashi. Lower Musashino of Miyata.

Living.—Northern and Central Japan.

CM21425
CM21426
CM21427

253. ***Diplodonta japonica***, Pilsbry.

Diplodonta japonica. Pilsbry, Catalogue, p. 132, pl. III, figs. 6, 7. Yokoyama, Foss. Miura Penin., p. 131, pl. X, fig. 4.

This shell so rare in the Lower Musashino is quite common in the Upper.

Fossil occurrence.—Otake, Kioroshi, Kamenari. Lower Musashino of Naganuma.

Living.—Central Japan.

CM21428-14-2
CM21429
CM21430
CM21431
CM21432

254. *Diplodonta semiaspera*, Philippi.

Pl. XIV. Fig. 2.

Diplodonta semiaspera. Philippi, Archiv. f. Naturgesch., I, 1836, p. 225, pl. VII, fiig. 2. Dunker, Ind. Moll., p. 48. Yokoyama, Foss. Miura Penin., p. 131, pl. X, figs. 2,3.
Mysia aff. semiaspera. Tokunaga, Foss. Env. Tokyo, p. 53, pl. III, fig. 13.

This species which resembles the preceding in outline is thinner, flatter and grows larger with beaks smaller and less swollen. There is a large right valve measuring 34.4 in length. The figured specimen is also a comparatively large one measuring 29.5 millim. in length, 27.2 millim. in height and 10 millim. in depth. Rather frequent.

Fossil occurrence.—Otake, Shisui, Tega, Shito. Oji in Musashi. Lower Musashino of Miyata and Koshiba.

Living.—Central and Western Japan. West Indies. Mazatlan. Patagonia.

CM21433
CM21434
CM21435

Family **Lucinidæ.**

Genus **LUCINA,** Bruguière.

255. *Lucina pisidium*, Dunker.

Lucina pisidium. Dunker, Moll. Jap., p. 28, pl. III, fig. 9. Ind. Moll., p. 216. Lischke, Jap. Meeresconch., vol. II, p. 133. Pilsbry, Cat., p. 133. Yokoyama, Foss. Miura Penin., p. 132, pl. X, fig. 6.
Lucina parvula. Gould, Otia, Conch., p. 174.

Rather rare,

Fossil occurrence.—Otake, Shisui, Tega. Oji. Lower Musashino of Miyata, Yokosuka and Naganuma,

Living,—Northern, Central, Western and Southern Japan, New South Wales.

CM21436
CM21437
CM21438

256. *Lucina borealis*, (Linné).

CM21673
V

Lucina borealis. Forbes and Hanley, Brit. Moll., II, p. 46, pl. 35, fig. 5. Wood, Crag Moll., Biv., p. 139, pl. XII, fig. 1. Nyst, Conch. Tert. de la Belgique, p. 176, pl. XIX, fig. 2. Brauns, Geol. Env. Tokio, p. 44. Tokunaga, Foss. Env. Tokyo, p. 52. Yokoyama, Foss. Miura Penin., p. 133, pl. X, fig. 7.
Venus borealis. Linné, Syst. Nat., ed. 12, p. 1134.

This well known Altantic shell not mentioned in any work relating to the recent conchology of Japan hitherto published is frequently met with living in the seas near Sagami (Central Japan). The fossil specimens are also common in the Upper Musashino as already pointed out by Brauns and Tokunaga.

Fossil occurrence in Japan.—Otake (common), Tega, Shisui, Shito. Oji, Tabata and Shinagawa. Lower Musashino of Miyata, Yokosuka and Naganuma.

Fossil occurrence in Europe.—Pliocene and Glacial of England. Pliocene of Belgium and Italy. Miocene of Austria, Poland, Switzerland, Russia, etc.

Living.—Central Japan. Atlantic from Iceland to the Mediterranean Sea.

CM21439
CM21440
CM21441
CM21442

257. *Lucina contraria*, Dunker.

Lucina contraria. Dunker, Ind. Moll., p. 215, pl. XIII, figs. 12, 13, 14. Yokoyama, Foss. Miura Penin., p. 134, pl. X, fig. 8.

Lascæa striata. Tokunaga, Foss. Env. Tokyo, p. 53, pl. III, fig. 14.

What Brauns described as *Lascæa rubra* Mont. in his "Geology of the Environs of Tokio" p. 43, without giving any figure, seems to be this species.

Fossil occurrence.—Otake (common), Kioroshi, Kamenari, Tega (frequent). Oji and Shinagawa in Musashi. Lower Musashino of Miyata.

Living.—Central Japan.

Family **Chamidæ.** CM21443-135

Genus **CHAMA,** Linné. CM21444

258. *Chama semipurpurata*, Lischke.

Pl. XIII. Fig. 5.

Chama semipurpurata. Lischke, Jap. Meeresconch., II, p. 180, pl. VIII, fig. 1. Pilsbry, Catalogue, p. 134. Yokoyama, Foss. Miura Penin., p. 136, pl. X, figs. 13, 14.

A single upper and a single lower valve of two young individuals.

The lower valve is nearly elliptical in outline, with coarse corrugated concentric laminæ on the free portion of the shell. The inner margin is finely crenulate up to near the beak at the anterior side. Length 19 millim. Height 25 millim.

The upper valve is suboval in form and very small, only 4.1 millim. in length and 2.7 millim. in height. The sculpture consists of coarse concentric laminæ which in the lower two-thirds of the surface give out tubiform processes or spines.

Fossil occurrence.—Otake, Shito. Lower Musashino of Miyata.

Living.—Central to Southern Japan.

CM21445-13-4
CM21446
CM21447
CM21448
CM21449
CM21500

Family **Carditidæ.**

Genus **VENERICARDIA**, Lamarck.

259. ***Venericardia cipangoana***, Yokoyama.

Pl. XIII. Fig. 4.

Venericardia cipangoana. Yokoyama, Foss. Miura Penin., p. 137, pl. XI, Fig. 2.
Venericardia compressa. Yokoyama, Verst. a. d. jap. Kreide, Palæontographica, XXXVI, p. 196, pl. XXV, fig. 4.

A full description of this species was given in my work on the fossils of the Lower Musashino above cited.

The figured specimen is a large left valve from Otake, 34.2 millim. in length, 28.7 millim. in height and 9.7 millim. in depth.

Fossil occurrence.—Otake, Kioroshi. (common), Shisui, Kamenari, Tega, Shito (very common). Lower Musashino of Miyata and Naganuma. Miocene(?) of Poronai in the Hokkaido.

CM21451
CM21452
CM21453

Living.—Central and Western Japan.

260. ***Venericardia ferruginea***, (Adams).

Venericardia ferruginea. Yokoyama, Foss. Miura Penin,, p. 139, pl. XI, figs. 3, 4.
Cardita ferruginea. Clessin, in Syst. Conch. Cab. Mart. Chemn., pt. 1, p. 17, pl. VI, fig. 11. Pilsbry, Cat., p. 135.
Cardita rotunda. Tokunaga, Foss. Env. Tokyo, p. 55, pl. III, fig. 17.

Fossil occurrence.—Otake, Kamenari, Shito (very common). Oji and Shinagawa. Lower Musashino of Miyata, Yokosuka, Koshiba and Naganuma.

Living.—Northern Japan.

261. *Venericardia toneana*, Yokoyama.

Pl. XIII. Figs. 6, 7.

Shell very small, thick, triangularly ovate, moderately convex, somewhat oblique and inequilateral with anterior side shorter than posterior, rounded in front and behind. Antero- and postero-dorsal margins straight, meeting each other at somewhat less than a right angle, so that the beaks appear pointed. Surface radiately ribbed; ribs about thirteen in number, flatly rounded, separated by very narrow valleys, crenulate. Inner margin coarsely crenate. Lunula longly ovate, distinct, smooth. Main teeth accompanied by an anterior lateral. Length 2.2 millim. Height 2.1 millim. Thickness 1.7 millim.

Fossil occurrence.—Otake, Tega, Shito (numerous). Oji.

Family **Astartidæ.**

Genus **ASTARTE**, Sowerby.

262. *Astarte borealis*, (Chemnitz).

Pl. X. Fig. 11.

Astarte borealis. Forbes, Mem. Geol. Surv., vol. I, p. 413, 1846. Wood, Crag Moll., Biv., p. 175, pl. XVI, figs. 3a–d.

Astarte corrugata. Lovén, Ind. Moll. Scand., p. 37. Middendorff, Beitr. z. Malac. Ross., III, p. 46, pl. XVII, figs. 4–9.

Astarte arctica. Möller, Ind. Moll. Greenl., p. 19. Forbes and Hanley, Hist. Brit. Moll., I, p. 461, pl. XIX, fig. 7.

Venus borealis. Chemnitz, Conch. Cab., vol. VII, pl. XXXIV, fig. 42.

A single left valve which, however, undoubtedly belongs to the species above named. It is thick, much compressed, broadly ovate, somewhat longer than high, rounded in front, truncate behind. The surface is smooth and has an indistinct flattened carina behind. Inner margin smooth. Length 15.3 millim. Height 14.1 millim. Depth 2.9 millim. In shape it comes closest to what Middendorff calls var. *lactea* (loc. cit., pl. XVII, figs. 8, 9).

Fossil occurrence in Japan.—Shito.

Fossil occurrence in Europe.—English Crag.

Living.—Northern Japan (Kurile Islands). Behring Strait. Britain (deep water). Arctic seas.

CM21459

263. *Astarte hakodatensis*, Yokoyama.

Astarte hakodatensis. Yokoyama, Foss. Miura Penin., p. 140, pl. XI, figs. 5, 6.

This species is smaller and higher in form than the preceding. Its description is found in my work above mentioned.

Fossil occurrence.—Shito.

Living.—Northern Japan.

CM21460

Family **Crassatellidæ.**

Genus **CRASSATELLA,** Lamarck.

264. *Crassatella oblongata*, Yokoyama.

Crassatella oblongata. Yokoyama, Foss. Miura Penin., p. 142, pl. XI, figs. 8, 9.

A few young specimens which are somewhat flatter and more coarsely grooved on the surface than the adult ones. The largest obtained is a right valve, 9 millim. long, 6.5 millim. high and 2 millim. deep, with concentric grooves about seventeen in number.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Koshiba.

CM21461-B8

265. *Crassatella nana*, Adams et Reeve.

Pl. XIII. Fig. 8.

Crassatella nana. Adams and Reeve, Voy. Samarang. Moll., p. 81, pl. XXIII, fig. 2.

A single right valve. Shell thick, strongly compressed, subequilateral, somewhat pentagonal in outline, longer than high, rounded in front, truncate behind. Postero-dorsal margin straight, sloping, gradually passing into posterior margin with a curve; ventral margin broadly arcuate with inner side crenulate and postero-ventral corner obtusely angulate. Surface with concentric furrows. Beaks small, pointed, with an obtuse edge running to postero-ventral corner. Main teeth two, oblique with lower ends towards front and a triangular ligamental pit behind; anterior lateral tooth distinct, elongated. Anterior muscular impression somewhat pear-shaped, posterior more rounded. Length 15 millim. Height 12.1 millim. Depth 3 millim.

This shell resembles the preceding in general outline; but it is larger, flatter and smooth on the surface.

Fossil occurrence.—Kioroshi.

Living.—Eastern seas (according to Adams and Reeve).

266. *Crassatella heteroglypta*, (Pilsbry). (R) CM 21462

Crassatella heteroglypta. Yokoyama, Foss. Miura Penin., p. 141, pl. XI, figs. 10, 11.
Crassatellites heteroglypta. Pilsbry, Cat., p. 135.
Crassatella japonica. Sowerby, Jour. Linn. Soc., XX, p. 399, pl. 25, fig. 19.

A single right valve.

Fossil occurrence.—Kioroshi. Lower Musashino of Miyata and Naganuma.

Living.—Central and Western Japan.

Family **Cyrenidæ**.

CM 21463-13-14
CM 21464-13-15
CM 21465
CM 21466
CM 21467

Genus **CORBICULA**, Mühlfeldt.

267. *Corbicula sandaiformis*, Yokoyama.

Pl. XIII. Figs. 14, 15.

Shell thick, roundly triangular, about as high as long, a little inequilateral, moderately tumid. Anterior border rounded, posterior subtruncate, forming an obtuse angle with broadly curved ventral border; antero-dorsal meeting with postero-dorsal at an angle which is nearly a right angle; ventral less arched in posterior half than in anterior. Surface with a very blunt posterior carina and ornamented throughout with rude, unequal, concentric grooves. Beaks rather large, swollen, prominent. Lunula lanceolate, bounded by a fine impressed line on both sides.

The following are some of the measurements of the normal form:

	Length.	Height.	Depth.
Left valve	26.7 millim.	26.5 millim.	9.0 millim.
„ „	28.8 „	29.3 „	9.5 „
Right „	31.5 „	31.5 „	9.9 „

Besides, there are also forms which are either shorter or longer. One of the latter measures 21 millim. in length, 19.6 millim. in height and 6.7 millim. in depth, while one of the former

measures 32 millim. in length, 33.5 millim. in height and 10.5 millim. in depth.

This shell is closely allied to *Corbicula sandai* Reinhardt (Kobelt, Fauna Moll. Extramar. Jap., p. 153, pl. 20, fig. 3) from which it differs by the presence of a posterior carina.

Fossil occurrence.—Otake, Kamenari, Shito (common).

Living.—Central Japan (coast of Kazusa).

CM21468-1348
CM21469-1349
CM21470
CM21471

268. *Corbicula kobelti*, Yokoyama.

Pl. XIII. Figs. 18, 19.

Three left valves. The shell is decidedly longer (lower) than the preceding with beaks smaller and less swollen. The outline is ovato-trigonal, more or less rounded in front and truncate behind. The angle at which the antero- and postero-dorsal margins would meet, when produced, is somewhat greater than a right angle. Convexity of shell moderate. Surface with rude lines of growth which make it unequally grooved.

The measurements of the three valves are as follows:

Length.	Height.	Depth.
29.4 millim. (10)	27.0 millim. (9.0)	8.8 millim (2.9)
22.8 „ (10)	20.5 „ (8.9)	7.1 „ (3.1)
13.1 „ (10)	11.8 „ (9.0)	3.7 „ (2.9)

The nearest ally of this species seems to be *Corbicula pexata* Prime (Kobelt, loc. cit., p. 157, pl. 20, fig. 2) in which, however, the beaks are more tumid.

Fossil occurrence.—Shito, Otake.

Living.—Central Japan.

Family **Pleurophoridæ.**

Genus **CORALLIOPHAGA**, Blainville.

CM21492-14-5

269. *Coralliophaga coralliophaga*, (Chemnitz).

Pl. XIV. Fig. 5.

Coralliophaga coralliophaga. Pilsbry, Cat., p. 136. H. and A. Adams, Genera of Recent Mollusca, II, p. 439, pl. 109, figs. 6, 6a.

Coralliophaga lithophagella. Dunker, Ind. Moll., p. 209.

Cypricardia coralliophaga. Lischke, Jap. Meeresconch., II, p. 140.
Chama coralliophaga. Chemnitz, Conch. Cab., X, p. 359, pl. 172, figs. 1673, 1674.

Only a single right valve, 38 millim. in length, 19 millim. in height and 6.3 millim. in depth. It is characterized by a transversely elongated, more or less rectangular or oblong form with beaks near the anterior border and two main teeth accompanied by a posterior lateral. These teeth are more or less horizontal in position. The radiating riblets found in living specimens are not seen in the fossil, a result of friction.

On examining the recent specimens, there is a great variation in shape. The younger ones are generally shorter and often more oblong than the adult.

Fossil occurrence.—Shito.

Living.—Central and Western Japan. South Sea. Red Sea. West Indies.

CM 21473 - 6-12
CM 21474 - 6-13
CM 21475 - 13-17
CM 21476

Genus **TRAPEZIUM**, Mühlfeldt.

270. ***Trapezium nipponicum,*** Yokoyama.

pl. 6, figs 12, 13; Pl. XIII. Fig. 17.

Shell rather thick, transversely elongated, trapezoidal, swollen, very inequilateral, with anterior margin rounded, posterior truncate, ventral somewhat excavated, postero-dorsal sloping and meeting with posterior at an obtuse angle. Surface with a shallow median depression, and coarsely concentrically corrugated. A rounded edge runs from beak to postero-ventral corner. Area lanceolate, bounded by an elevated, rather blunt and irregular ridge on both sides. Beaks large, swollen. Main teeth two in each valve, oblique; posterior lateral single.

One right and three left valves. The former measures 27.5 millim. in length, 18 millim. in height and 8.6 millim. in depth, while the largest of the latter measures 11.2 millim. in length, 8.1 millim. in height and 4.3 millim. in depth.

Fossil occurrence.—Otake, Shito.

Living.—Central and Western Japan.

CM 21477-13-1

271. *Trapezium ventricosum*, Yokoyama.

Pl. XIII, Fig. 1.

Shell thick, somewhat higher than long, very inequilateral, much swollen, sharply rounded in front, truncate behind, with ventral margin only slightly arched. Beak very large, swollen, curved forward as well as inward, with two blunt edges, one running to postero-ventral and the other to antero-ventral corner. Space between these two edges flattened. The sculpture consists only of coarse lines of growth. Behind the beak there is a lanceolate area-like space bounded by a blunt ridge in each valve with three longitudinal ribs on it. Pallial line simple.

There is only a single left valve with a large part of the beak broken. The hinge is worn by friction, but so much is certain that there is at least one prominent main tooth. The posterior lateral is indistinct. It is 18.5. millim. long, 20 millim. high and 10 millim. deep.

Fossil occurrence.—Otake.

CM 21478-13-16

272. *Trapezium liratum*, (Reeve).

Pl. XIII. Fig. 16.

Trapezium liratum. Pilsbry, Catalogue, p. 136.
Cypricardia lirata. Reeve, Conch. Icon., I. Cypricardia, spec. 1,

Shell moderately thick, rather tumid, transversely elongated, strongly inequilateral, sharply rounded in front, truncate behind. Dorsal and ventral margins nearly straight and parallel. A flat ridge runs from the beak to the rounded postero-ventral corner. Surface with a shallow median depression and rugose concentric folds or ridges. Area lanceolete, bounded by a ridge on each side. Main teeth two, horizontal; laterals indistinct. Pallial line simple. Only a left valve, 20.5 millim. in length, 12 millim. in height and 5.3 millim. in depth.

Fossil occurrence.—Otake.

Living.—Central Japan.

Order **Anomalodesmacea.**

Family **Cuspidariidæ.**

Genus **CUSPIDARIA**, Nardo.

CM21479-14-3
CM21480-14-4
CM21481

273. *Cuspidaria ligula*, Yokoyama.

Pl. XIV. Figs. 3, 4.

Shell small, thin, moderately convex, transversely piriform, somewhat inequilateral with anterior side a little shorter than posterior, rounded in front, rostrate and truncate behind. Antero-dorsal margin slightly concave, ventral broadly convex except near posterior end where it is somewhat convex. Surface convex in general, being rather compressed only in the rostrum. Beaks very small, directed backward. A long lamellar tooth is present both in front of, and behind, the beaks, parallel with the hinge-margin. Sculpture present only on the area formed by a keel running from each beak to postero-ventral corner, consisting of fine concentric striae crossed and cut by fine impressed lines.

The following are the measurements:

	Length.	Height.	Depth.
Right valve	6.4 millim.	3.6 millim.	1.5 millim.
Left „	6.1 „	4.0 „	1.4 „

Fossil occurrence.—Shito (rare).

Family **Lyonsiidæ.**

CM21482-14-9
CM21483-14-10
CM21484

Genus **LYONSIA**, Turton.

274. *Lyonsia prætenuis*, Dunker.

Pl. XIV. Figs. 9, 10.

Lyonsia prætenuis. Dunker, Ind. Moll., p. 180, pl. VII, fig. 12. Pilsbry, Cat., p. 137.

The shell in very thin and fragile, transversely ovate, rather gibbous, rounded in front, produced and obliquely truncate behind, and ornamented with radiating costulae on the surface.

Only three isolated valves, more or less fractured. The least imperfect is a right valve, 14.7 millim. long, 9.3 millim. high and 3 millim. deep.

Fossil occurrence.—Otake.
Living.—Western Japan.

Genus **ENTODESMA**, Philippi.

CM 21485-6-11

275. *Entodesma naviculoides*, Yokoyama.

Pl. VI. Fig. 11.

A single left valve which is moderate in thickness, quadrately oblong, much longer than high, ventricose, strongly inequilateral, rounded in front, subtruncate behind. Ventral margin somewhat excavated, subparallel with equally excavated dorsal margin. Beak swollen. Surface much worn, apparently only with rude lines of growth. Teeth absent. Pallial line distinct with a shallow notch. Length 58 millim. Height 35 millim. Depth 14.6 millim.

The shell is extremely like *Entodesma navicula* Ad. et Rve. (Zool. Samarang, p. 83, pl. 23, fig. 11) and *E. truncatissima* Pilsbry (Catalogue p. 137, pl. III. figs. 11, 12) both of which, however, are described as thin and fragile. But it is not altogether impossible that this fossil may turn out to be an abnormally thick-shelled form of either of the above species.

Fossil occurrence.—Shito.

CM21486-14-6
CM21487-14-7
CM21488
CM21489
CM21490
CM21491
CM21492
CM21675

Family **Myochamidæ**.

Genus **MYODORA**, Gray,

276. *Myodora fluctuosa*, Gould.

Pl. XIV. Figs. 6, 7.

Myodora fluctuosa. Gould, Otia Conch., p. 161. Smith, Proc. Zool. Soc. London, 1880, p. 583. Brauns, Geol. Env. Tokio, p. 37. Tokunaga, Foss. Env. Tokyo, p. 39, pl. II, fig. 24. Pilsbry, Catal., p. 138.

The shell is generally of a moderate thickness, though sometimes rather thin. It is triangular in outline, somewhat longer than high, and somewhat inequilateral with the anterior side longer than the posterior. Beaks small, pointed, directed backward. The antero-dorsal margin is slightly convex and passes insensibly into the rounded anterior, while the postero-dorsal is somewhat concave and makes an obtuse angle with the truncate posterior;

the ventral is broadly arched. The valves are very unequal; while the right is moderately convex, the left is either flat or somewhat concave. Moreover, the right valve has a blunt posterior keel on the surface. The sculpture is the same in both valves, consisting of coarse concentric undulations. Behind the beaks there is an elongated areal excavation bounded by more or less distinct edges. The anterior muscular impression is longly pear-shaped and curved inward, while the posterior is ovate and upright. Pallial sinus shallow, rounded, somewhat ascending. Length 17.2 millim. Height 14.3 millim. Thickness 5.4 millim.

The variation in form lies chiefly in the degree of rotundity of the anterior end.

Fossil occurrence.—Otake (common), Tega (rather common), Shisui, Kamenari, Kioroshi, Shito (very common). Oji and Shinagawa.

Living.—Western Japan.

277. *Myodora reeviana*, Smith.

Pl. XIV. Figs. 8, 11.

Myodora reeviana. Pilsbry, New Jap. Mar. Moll., Pelecyp., Proc. Acad. Nat. Sci. Phil., July 1904, p, 558, pl. XLI, figs. 7–10. Yokoyama, Foss. Miura Penin., p. 143, pl. XI, figs. 12, 13.

This species has already been described by me from the Lower Musashino in the work above cited.

Fossil occurrence.—Otake, Shisui, Shito (rather common.) Lower Musashino of Miyata and Koshiba.

Living.—Western Japan. China.

Family **Thraciidæ.**

Genus **THRACIA**, Leach.

278. *Thracia papyracea*, (Poli).

Pl; XIV. Fig. 12.

Thracia papyracea. Hörnes, Foss. Moll. Tert. Beck. v. Wien, II, p. 49, pl. V, fig. 3. Wood, Crag Moll., Biv. Suppl., p. 156. Nyst. Conch. Terr. Tert. Belg., d. 215, pl. XXVII, fig. 6.

Odoncincta papyracea. Da Costa, Cat. Syst. Test. Sicil., p. 23, pl. II, figs. 1–4.

Tellina papyracea. Poli, Test. Utr. Sicil., I, p. 43, pl. XV, figs. 14–18.

Thracia phaseolina. Philippi, Enum. Moll. Sicil., I, p. 19, pl. I, fig. 7, II, p. 16. Wood, Crag Moll., Biv., p. 260, pl. XXVI, fig. 2 abc.

Two right valves and a broken left.

The shell is subquadrate, transverse, thin, convex, with the anterior side a little longer than the posterior, rounded in front and truncate behind. The dorsal margin is only slightly arched and subparallel with the straight ventral. The surface has a posterior carina which is distinct in spite of being rather blunt. The sculpture consists merely of rough lines of growth. Pallial sinus large, deep, rounded.

The larger of the two right valves is 17.4 millim. long, 10.5 millim. high and 4 millim. deep. It looks quite like the specimen figured by Wood in his Crag Mollusca above cited.

Fossil occurrence in Japan.—Otake, Kamenari.

Fossil occurrence in Europe.—Pliocene of England, Belgium and Italy; Miocene of Austria.

Living.—Norway, British seas, Mediterranean Sea.

CM21501-14-13
CM21502-14-14
CM21503
CM21504
CM21505
CM21506

279. *Thracia transmontana*, Yokoyama.

Pl. XIV. Figs. 13, 14.

Shell small, thin, inequivalve with right valve convex and left rather compressed, transversely elongated, subquadrate, inequilateral with anterior side a little longer than posterior, rounded in front, truncate behind. Antero-dorsal margin slightly excavated, postero-dorsal straight, ventral very little arched. A distinct, though not very sharp, posterior carina is present, behind which the surface is somewhat depressed in the middle. The sculpture is absent save lines of growth. Beaks small, pointed, bent backward. Pallial sinus deep, rounded at end and reaching almost the middle of the shell.

The following are the measurements.

	Length.	Height.	Depth.
Left valve	9.9 millim.	5.0 millim.	1.1 millim.
„ „	8.4 „	4.0 „	1.0 „
Right „	10.0 „	5.4 „	2.0 „
„ „	8.1 „	4.3 „	1.3 „

Fossil occurrence.—Otake, Kamenari, Tega, Shito (frequent). Oji in Musashi.

Living.—Central Japan.

CM21507-14-17
CM21508-14-18
CM21509

280. *Thracia sematana*, Yokoyama.

Pl. XIV. Figs. 17, 18.

Shell small, thin, longer than high, roundly pentagonal, rather compressed, inequilateral with anterior side a little longer than posterior, rounded in front, truncate behind. Antero-and postero-dorsal margins almost straight and sloping, ventral very little convex, postero-ventral corner roundly angulate. Surface smooth, with an obtuse posterior keel. Beaks small, pointed, directed backward. Lunula longly ovate, bounded on both sides by a blunt edge. Pallial sinus large, deep, broadly rounded, not reaching the middle of the shell. Examples are rare. One of the left valves measures 6.1 millim. in length, 4 millim. in height, and 1.3 millim. in depth, while one of the right measures 6.6 millim. in length, 4.8 millim. in height and 1.7 millim. in depth.

This shell looks like a young *Thracia papyracea*, but the beaks are smaller and more pointed, and the outline is more pentagonal.

Fossil occurrence.—Shito.

Family **Poromyidæ**,

CM21510-14-15
CM21511-14-16
CM2152

Genus **POROMYA**, Forbes.

281. *Poromya flexuosa*, Yokoyama.

Pl. XIV. Figs. 15, 16.

Shell small, thin, convex, triangularly ovate, longer than high, inequilateral with anterior side somewhat shorter than posterior, rounded in front, somewhat obliquely subtruncate behind, with ventral margin broadly convex. Surface with a blunt posterior carina and a shallow depression in front of it. The sculpture consists of minute granules arranged more or less radially and most distinct on the hinder and ventral parts, those on the other parts being often obliterated by friction. Lunula ovate, distinct. Hinge: In

the left valve there are two diverging eminences, with a triangular ligamental pit behind, divided into two parts by a median ridge; the right valve has but one tooth. Pallial sinus shallow, crescentiform. Not rare.

The following are the measurements:

	Length.	Height.	Depth.
Left valve	12.5 millim.	9.3 millim	4.0 millim.
„ „	10.2 „	7.4 „	3.0 „
Right „	10.3 „	7.6 „	3.0 „
„ „	11.0 „	8.2 „	3.3 „

Fossil occurrence.—Shito.

CM21513 - 14-19
CM21514 a
CM21515

Family **Modiolidæ.**

Genus **MODIOLA**, Lamarck.

282. *Modiola barbata*, (Linné).

Pl. XIV, Fig. 19.

Modiola barbata. Forbes and Hanley, Brit. Moll., II, p. 190, pl. XLIV, fig. 4. Pilsbry, Catal., p. 140. Wood, Crag Moll., Biv., p, 58, pl. VIII, fig. 2.
Mytilus barbatus. Linné, Syst. Nat., Ed. 12, p. 1156. Jeffreys, Brit. Conch., II, p. 114.

Only young shells. The largest is a left valve still preserving a little of the original reddish brown colour. It is ovately triangular in outline and obtusely pointed at the smaller and, with the ventral margin somewhat excavated. The other specimens which are all younger have a more posteriorly expanded shape, though, compared with the Crag form, the posterior expansion as well as the ventral excavation is less. Anyhow there is a great variation in outline as is evident on examining the specimens of the recent shell.

The greatest extension of the largest specimen above referred to is 11.8 millim., while the dimension across where it is greatest is 6.3 millim. The depth is 2.8 millim. There is also a smaller left valve 7.1 millim. long, 4.8 millim. broad and 2 millim. deep.

Fossil occurrence in Japan.—Tega (very rare), Otake (do), Shito (rare). Oji in Musashi.

Fossil occurrence in Europe.—English Crag.

Living.—Northern, Central and Western Japan. Britain. Mediteranean.

CM21516

283. *Modiola modiolus*, Linné.

Modiola modiolus. Linné, Syst. Nat., Ed. 10, p. 706. Lischke, Jap. Meeresconch., I, p. 156, II, p. 147, III, 109. Dunker, Ind. Moll., p. 222. Tokunaga, Foss. Env. Tokyo, p. 63. Yokoyama, Foss. Miura Penin., p. 145, pl. XI, fig. 21. Wood, Crag Moll., Biv., p. 57, pl. VIII, fig. 1. Nyst, Conch. Terr. Tert. Belg., p. 163, pl. XVII, fig. 5.

Specimens are all fragmentary, though of a large size.

Fossil occurrence in Japan.—Shito (rare). Lower Musashino of Miyata.

Fossil occurrence in Europe.—English Crag; Pliocene of Belgium and Italy.

Living.—Northern, Central and Western Japan. North Pacific. North Atlantic.

Genus **LITHOPHAGA**, Bolten.

CM21517-17-14
CM21518

284. *Lithophaga zitteliana*, Dunker.

Pl. XVII. Fig. 14.

Lithophaga zitteliana. Dunker, Ind. Moll., p. 226, pl. XIV, figs. 1, 2, 8, 9. Pilsbry, Cat., p. 140.

A transversely elongated subcylindrical shell, elliptical in cross-section, rounded at both ends, though posteriorly somewhat more expanded. The surface has only lines of growth.

A few small fragments.

Fossil occurrence.—Otake. Tabata in Musashi.

Living.—Western Japan.

CM21519-15-10
CM21520-15-11
CM21521

Genus **CRENELLA**, Brown.

285. *Crenella divaricata*, Yokoyama.

Pl. XV. Figs. 10, 11.

Shell minute, thin, translucent, longitudinally elongated, roundly oblong, tumid, subequilateral. Anterior and posterior margins broadly rounded, the former perhaps a little more sharply.

Surface with radiately divergent striae, the divergent character being most conspicuous on the anterior as well as on the posterior slope; striae fine, tolerably dense, with an interstitial one towards the ventral margin and cut by fine concentric lines of growth, whereby they become more or less crenulate, though not always distinct. Inner margin of shell crenulate all around. Beaks small, though somewhat inflated.

One of the left valves measures about 2 millim. in length, 2.5 millim. in height and 1 millim. in depth.

A. Adams described several species of *Crenella* from the Japan Sea in the "Annals and Magazines of Natural History" of 1862, without giving any figure. But none agrees exactly with the present one, though it seems to be closely allied to what he called *Crenella spectabilis*.

Compared with *Crenella decussata* Mont. (Forbes and Hanley, British Moll., IV, pl. 45, fig. 2) which lives in the Corea Strait, the fossil form has the cardinal margin more rounded and the beaks less pointed, approaching in these respects *Crenella elegans* Desh. of the Paris Basin (Descrip. Anim. sans Vert., Atlas, pl. 76, figs. 6–9) in which, however, the rounded nature of the cardinal margin is still greater.

Fossil occurrence.—Shito (not rare). Oji.

Living.—Central Japan.

CM21522
CM21523
CM21524
CM21525
CM21526
CM21527

Family **Anomiidæ.**

Genus **ANOMIA**, Linné.

286. *Anomia nipponensis*, Yokoyama.

Anomia nipponensis. Yokoyama, Foss. Miura Penin., p. 146, pl. XI, figs. 18, 19.

This species still living in Japan has already been described in my work above cited. It is much like *Anomia laqueata* Reeve, though more equilateral and generally provided with more prominent radiating wrinkles which, however, are almost obsolete in some specimens. The colour of the living shell is dull

reddish to light copper in the upper valve, and whitish to bluish or even greenish in the lower.

Fossil occurrence.—Otake, Kioroshi (frequent), Kamenari, Tega, Shito (very frequent). Oji, Tabata and Shinagawa in Musashi. Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Northern, Central and Western Japan.

CM21528-14-22,23
CM21529
CM21530
CM21531

287. *Anomia lunula*, Yokoyama.

Pl. XIV. Figs. 22, 23.

Shell thin, subcircular, with lower or right valve only a little convex and upper or left more or less flat. Surface either quite smooth or radiately and sinuously striated near the margin.

The size of the shell is usually below 20 millim. in diameter, though it is sometimes twice as large.

Fossil occurrence.—Otake (not rare), Kioroshi, Shito.

CM21532-14-20
CM21533-14-21
CM21534

288. *Anomia sematana*, Yokoyama.

Pl. XIV. Figs. 20, 21.

Only a few left valves. Shell small, rather thin, roundly elliptical, usually higher than long, swollen, ornamented with many, close, sinuous, granulated, radiating riblets which increase in number towards the shell-margin either by bifurcation or by the intercalation of new ones between.

The largest example measures 9.6 millim. in length, 10.7 millim. in height and 4.1 millim. deep.

Fossil occurrence.—Shito.

CM21535
CM21536
CM21537
CM21538

Family **Limidæ.**

Genus **LIMA,** Bruguière.

289. *Lima angulata*, Sowerby.

Lima angulata. Sowerby, Thes. Conch., I. p. 86, pl. XXIII, figs. 39, 40. Yokoyama, Foss. Miura Penin., p. 148, pl. XII, fig. 12.

Lima basilanica. Adams and Reeve, Voy. Samarang, Zool., p. 75, XXI, fig. 6.

Lima hakodatensis. Tokunaga, Foss. Env. Tokyo, p. 64, pl. III, fig. 26.

Several examples, though mostly damaged on account of the thin and fragile state of the shell.

Fossil occurrence.—Otake, Shisui, Tega, Shito (rather common). Shinagawa. Lower Musashino of Naganuma.

Fossil occurrence.—Neogene of New Zealand.

Living.—Northern and Central Japan. Philippines. New South Wales. Panama. Bay of Caracas.

CM21539
CM21540
CM21541
CM21542

290. *Lima subauriculata* (Montagu).

Lima subauriculata. Yokoyama, Foss. Miura Penin., p. 150, pl. XII, fig. 10.
Lima auriculata. Weinkauff, Conch. Mittelm., II, p. 245, no. 7. Forbes and Hanley, Hist. Brit. Moll., II, p. 263, pl. LIII, fig. 45. Wood, Crag. Moll., Biv., p. 47, pl. VII, fig. 3. Hörnes, Moll. Tert. Beck. Wien, II, p. 389, pl. LIV, fig. 6. Nyst, Conch. Terr. Tert. Belg., p. 158, pl. XVIII, fig. 3.
Pecten subauriculatus. Montagu, Test. Brit., Suppl., p. 65, pl. XXIX, fig. 2.

Specimens are quite frequent. The largest obtained is a left valve 8 millim. high, 4.7 millim. long and 2.3 millim. deep. The next largest is a right valve 7.6 millim. high, 4.4 millim. long and 2.4 millim. deep. There seems to be a slight variation in shape. The radiating costellae are distinct only in the median line of the shell toward the ventral margin.

Fossil occurrence in Japan.—Otake, Shisui, Tega, Shito (very common). Oji. Lower Musashino of Miyata.

Fossil occurrence in Europe.—Pliocene of England, Belgium and Italy. Miocene of France, Austria, Hungary, etc.

Living.—Mediterranean Sea, Britain, Norway, Greenland.

CM21543

291. *Lima quantoensis,* Yokoyama.

Lima quantoensis. Yokoyama, Foss. Miura Penin., p. 150, pl. XII, fig. 11.

This shell first described by me from the Lower Musashino is represented by several specimens which, however, are all young.

Fossil occurrence.—Shito. Lower Musashino of Koshiba.

Living.—Central Japan.

292. ***Lima vulgatula***, Yokoyama. CM21544-17-18 CM21585-17-19 CM21586

Pl. XVII. Figs. 18, 19.

A right and a left valve.

The shell is closely related to the preceding in its general shape. It is rather thin, moderately convex and obliquely ovate, with all the margins rounded except the antero-dorsal which is straight or somewhat excavated. The ears are small, especially the anterior. Lunula short-lanceolate in outline, deep, ornamented with a few longitudinal riblets. The surface is covered with radiating ribs which number about twenty-two and are flattish and broader than, or about as broad as, the interspaces. The right valve is 15.3 millim. long, 18.5 millim. high and 4.7 millim. deep, while the left is 14.1 millim. long, 15.9 millim. high and 4.1 millim. deep.

The distinctions of this species from the foregoing are the less number of ribs, a somewhat flatter shell and the subangulate form of the antero-ventral corner.

Fossil occurrence.—Shito.

Family **Spondylidæ.**

Genus ***Spondylus***, Linné.

293. ***Spondylus cruentus***, Lischke. CM21547-14-24

Pl. XIV. Fig. 24.

Spondylus cruentus. Lischke, Jap. Meeresconch., I. p. 172, pl. XII, figs. 1–5. Dunker, Ind. Moll., p. 246. Pilsbry, Cat., p. 143.

A single upper valve of a young individual. It is irregularly roundish, tolerably compressed and ornamented with distant radiating ribs which are mostly crenate or granular near the hinge-margin and foliaceous or spiny in the ventral. Between these ribs there are also several interstitial riblets. The diameter of the shell is a little greater than 12 millim.

Living.—Central and Western Japan.

Genus **PLICATULA**, Lamarck.

CM21548-14-25

294. *Plicatula cuneata*, Dunker.

Pl. XIV. Fig. 25.

Plicatula cuneata. Dunker, Malak. Bl., vol. 24, p. 73. Index Moll., p. 246, pl. XI, fig. 3.

A much worn right valve, 12.8 millim. long, 15.4 millim. high and 2.6 millim. deep. It is thick, cuneate in shape and has eight strong, flattened, radiating ribs with narrower interspaces. The ribs seem to have been lamellar when fresh.

Fossil occurrence.—Kamenari.

Living.—Central and Western Japan.

(R) CM21549
CM21550
CM21551
(R) CM21552

Family **Pectinidæ.**

Genus **PECTEN**, Müller.

295. *Pecten squamatus*, (Gmelin).

Pecten squamatus. Sowerby, Thes. Conch., I, Pecten, p. 70, pl. XIII, figs. 57, 58. Reeve, Conch. Icon., Pecten, sp. 82. Dunker, Ind. Moll., p. 240, pl. XI, fig. 14. Küster, in Syst. Conch. Cab., VII, pt. 2, Spondylus and Pecten, p. 113, pl. XXXII, fig. 4. Yokoyama, Foss. Miura Penin., p. 151., pl. XIV, figs. 3, 4.
Ostrea squamata. Gmelin, Syst. Nat., Ed. 13, p. 3329.

A few right valves of young individuals. They are flattish with a long anterior ear and ornamented with unequal radiating ribs whose interspaces are also unequal. The scales on the ribs are almost wholly worn away by friction.

Fossil occurrence.—Otake, Tega. Lower Musashino of Naganuma.

Living.—Central and Western Japan. Philippines.

CM21553-14-26
CM21554-14-26

296. *Pecten lætus*, Gould.

Pl. XIV. Figs. 26.

Pecten lætus. Gould, Otia Conch., p. 177. Lischke, Jap. Meeresconch., I, p. 169, pl. XII, figs. 6, 7, II, p. 157. Dunker, Ind. Moll., p. 241. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 603. Brauns, Geol. Env. Tokio, p. 57. Tokunaga, Foss. Env. Tokyo, p. 65, pl. V, fig. 2. Yokoyama, Foss. Miura Penin., p. 152, pl. XIV, figs. 1, 2.

(R) CM21677
(R) CM21678
(R) CM21680
(R) CM21723

Very frequent at some localities. The largest obtained has a height of 90 millim.

Fossil occurrence.—Otake, Shito (very common), Tega. Shinagawa and Oji (frequent). Lower Musashino of Miyata, Yokosuka and Naganuma.

Living.—Northern, Central and Western Japan.

297. *Pecten subplicatus*, Sowerby. CM 21555-1-3

Pl. XV. Fig. 3.

Pecten subplicatus. Sowerby, Thes. Conch., I, p. 64, pl. XIII, fig. 37, pl. XIV, figs. 72, 73, 81. Mart. u Chem., Syst. Conchyl. Cab., VII, Pectinacea, p. 157, pl. 44, figs, 3-5. Dunker, Ind. Moll., p. 242.

The right valve of a young individual. It has five radiating folds with a weak one on each side of them. The folds as well as the valleys are radially striated. Length 20.5 millim. Height 22.5 millim. Depth 4 millim.

Fossil occurrence.—Kioroshi.

Living.—Western Japan. Philippines. Moluccas.

298. *Pecten crassicostatus*, Lowerby, CM 21556

Pecten crassicostatus. Pilsbry, Cat., p. 143. Dunker, Ind. Moll., p. 239, pl. XIII, fig. 28. Lischke, Jap. Meeresconch., I, p. 168. Sowerby, Thes. Conch., I, p. 75, pl. XV, fig. 111, pl. XVII, fig. 152. Yokoyama, Foss. Miura. Penin., p. 153, pl. XII, fig. 7.

Pecten nobilis. Reeve, Conch. Icon., Pecten, pl. I, fig. 3.

A single left valve belonging to a young individual.

Fossil occurrence.—Shito. Lower Musashino of Naganuma.

Living.—Central to Southern Japan.

299. *Pecten vesiculosus*, Dunker. CM 21557

Pecten vesiculosus. Dunker, Ind. Moll., p. 241, pl. XI, fig. 1. Yokoyama, Foss. Miura Penin., p. 154, pl. XIII, figs. 11, 12, 13.

Very frequent, but most of the specimens are water-worn and lack the ears.

Fossil occurrence.—Shito. Lower Musashino of Koshiba.

Living.—Central Japan.

CM21558

300. *Pecten intuscostatus*, Yokoyama.

Pecten intuscostatus. Yokoyama, Foss. Miura Penin., p. 156, pl. XIII, figs. 9, 10.

This small shell already described from the Lower Musashino has the outer surface concentrically striated, while within there are coarse distant radiating riblets near the margin.

Fossil occurrence.—Shito (not rare). Lower Musashino of Miyata and Koshiba.

CM21559
CM21560

301. *Pecten tokyoensis*, Tokunaga.

Pecten tokyoensis. Tokunaga, Foss. Env. Tokyo, p. 68, pl. V, figs. 1–10. Yokoyama, Foss. Miura Penin., p. 158, pl. XIV, figs. 7, 8.

Pecten plica. Brauns, Geol. Env. Tokio, p. 48, (non Linné).

There are many large specimens, the largest being more than 160 millim. high.

Fossil occurrence.—Otake, Shito (very frequent). Oji (frequent) and Shinagawa. Lower Musashino of Miyata, Yokosuka and Naganuma,

CM21561-15-1
(4) CM21562-15-2

302. *Pecten tissoti*, Bernardi.

Pl. XV. Figs. 1, 2.

(2) CM21679

Pecten tissoti. Pilsbry, Cat., p. 144. Bernardi in Jour. d. Conch., VII, 1859, p. 91, pl. I, fig. 2. Kobelt in Syst. Conch. Cab., VII, part 2, Spondylus and Pecten, p. 143, pl. XL, fig. 5.

A small neat *Pecten* circular in form and tolerably swollen, with the anterior ear larger than the posterior. About twenty radiating ribs accompanied by a smaller one on both sides ornament the surface. Crossing these ribs, there are fine concentric lamellae which are most distinct in interspaces where there are one or two radiating striae. Inner margin crenate.

Only three valves of which two are right. The larger of the right valves measures 16.8 millim. in height, 16 millim. in breadth and 6.2 millim. in depth.

Fossil occurrence.—Shito.

Living.—Japan (according to Dunker).

CM 21563
CM 21560
CM 21565

303. *Pecten laqueatus*, Sowerby.

Pecten laqueatus. Sowerby, Thes. Conch., I, p. 46, pl. XV, fig. 101. Lischke, Jap. Meeresconch., I, p. 167, II, p. 157, pl. XII, figs. 1, 2. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 482. Brauns, Geol. Env. Tokio, p. 48. Tokunaga, Foss. Env. Tokyo, p. 64. Yokoyama, Foss. Miura Penin., p. 160, pl. XIV, figs. 9, 10.

CM 21566
CM 21567
CM 21568

Very frequent.

Fossil occurrence,—Otake, Shisui, Kioroshi, Kamenari, Tega, Shito. Oji and Shinagawa. Lower Musashino of Miyata and Yokosuka.

Living.—Northern, Central and Western Japan.

CM 21569
CM 21570
CM 21571-15-6
CM 21572-15-7

304. *Pecten excavatus*, Anton.

Pl. XV. Figs. 6, 7.

Pecten excavatus. Anton, Verzeichniss, p. 19, no. 710. Philippi, Abbild. u. Beschr., I, Pecten, p. 201, pl. II, fig. 1.

CM 21676

Vola excavata. Dunker, Index Moll., p. 243. Pilsbry, Cat., p. 145.

Pecten sinensis. Sowerby, Thes. Conch., I, p. 48, pl. XVI, figs. 120, 121, 134.

This shell which resembles the preceding is smaller and characterized by its valves being very unequal, more unequal than in the latter, for its left valve is markedly concave instead of being flat or only slightly concave, The right valve on the contrary is strongly convex, more so than in *Pecten laqueatus*. The ears are nearly equal, so that the shell appears to be almost equilateral. The radiating ribs of the convex valve are broad and flattened with lateral edges subangular and interspaces much narrower. The number of ribs is over ten, but it is difficult to give them exactly, for, besides the main ribs, there are one or more much weaker ones on both extremities of the shell, and also those in the middle portion often show a tendency to split. Near the beaks the ribs are almost obsolete, so that the surface becomes more or less smooth, Incremental lines very distinct. On the concave valve the ribs are narrower than the interspaces, with concentric growth-lines often somewhat lamellated. When lamellae are absent, the concave valve is often difficult to distinguish from that of *Pecten laqueatus*.

The specimens are all young, the largest being only 22 millim. both in height and length.

Fossil occurrence.—Otake (not rare), Tega, Shito. Oji and Shinagawa.

Living.—Northern and Central Japan. China Sea.

CM 21573-17-15
CM 21574

305. *Pecten tenuicostulatus*, Yokoyama.

Pl. XVII. Fig. 15.

Three left valves.

Shell small, thin, flatly convex, nearly circular, almost equilateral. Surface with weak, rounded, scaly, radiating riblets which are rather distant, more or less unequal and at unequal distances from one another; interspaces much broader with one or more interstitial riblets. The number of main ribs is not constant, but usually about twenty or a little more. Ears somewhat unequal with anterior larger than posterior.

The largest specimen measures 8.9 millim. both in length and height and 1.5 millim. in depth.

CM 21575
CM 21576
CM 21577
CM 21578
CM 21579
CM 21580

Fossil occurrence.—Shito.

Family **Ostreidæ.**

Genus **OSTREA**, Linne.

306. *Ostrea gigas*, Thunberg.

Ostrea gigas. Thunberg, Kongl. Vetensk. Akad. nya Handl., XIV, 1793, p. 140, pl. VI. figs. 1–3. Pilsbry, Cat., p. 145. Tokunaga, Foss. Env. Tokyo, p. 68, pl. IV, fig. 5. Brauns, Geol. Env. Tokio; pp. 48, 51, 55. Yokoyama, Foss. Miura Penin, p. 162, pl. XV, figs. 1, 2.

Ostrea laperousii. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 475, pl. XIX.

The elongated as well as the ovate form in numerous examples. Some are rather thin-shelled and even provided with some longitudinal folds.

Fossil occurrence.—Otake, Shisui, Kamenari, Kioroshi, Tega, Shito. Oji and Shinagawa. Lower Musashino of Yokosuka and Koshiba.

Living.—Northern, Central and Western Japan. Coast of Manchuria and Shantung in China.

CM21581

307. *Ostrea denselamellosa*, Lischke.

Ostrea denselamellosa. Lischke, Jap. Meeresconch., I, p. 79, pl. XIII, pl. IV, fig. 1. Brauns, Geol. Env. Tokio, p. 58. Pilsbry, Cat., p. 146. Tokunaga, Foss. Env. Tokyo, p. 68, pl. IV, fig. 6. Yokoyama, Foss. Miura Penin., p. 162, pl. XVI, fig. 6.

A few but good specimens of the lower valve.

Fossil occurrence.—Otake, Tega. Oji and Shinagawa. Lower Musashino of Yokosuka.

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

308. *Ostrea musashiana*, Yokoyama.

Pl. XV. Fig. 5.

Ostrea musashiana. Yokoyama, Foss. Miura Penin., p. 163, pl. XVI, figs. 1–5.

A few specimens. The shell is thin and usually more or less longly ovate, with the lower valve strongly convex.

Fossil occurrence.—Otake, Shito. Lower Musashino of Yokosuka and Koshiba.

Family **Pinnidæ.**

Genus **PINNA,** Linné.

309. *Pinna japonica*, Hanley.

Pl. XV. Fig. 8.

Pinna japonica. Hanley, Proc. Zool. Soc. 1858. p. 136. Reeve, Conch. Icon., fig. 47. Küster in Syst. Conchyl. Cab., VIII, pt. 1, p. 72, pl. 24, fig. 3, pl. 29, fig. 1. Pilsbry, Cat., p. 147.

Only a fragment belonging to the beak-portion. It is, however, easily recognized by its thin shell, distant radiating costulae and concentric corrugations as the above named species.

Fossil occurrence.—Shito. Oji in Musashi.

Living.—Central and Western Japan.

Family **Arcidæ.**

Genus **ARCA,** Lamarck.

310. *Arca kobeltiana*, Pilsbry.

Arca kobeltiana. Pilsbry, New Jap. Mar. Moll., Pelec., Proc. Acad. Nat. Sci. Phil.,

July, 1904, p. 559, pl. XI, figs. 16–19. Yokoyama, Foss. Miura Penin., p. 163, pl. XVII, fig. 4.

Arca ocellata. Kobelt in Syst. Conch. Cab., vol. VIII, p. 87, pl. 24, figs. 1–4 (non Reeve). Pilsbry, Cat., p. 148.

Arca rectangularis. Tokunaga, Foss. Env. Tokyo, p. 61, pl. III, fig. 28.

This shell has already been described from the Lower Musashino.

Fossil occurrence.—Otake, Shito (frequent). Lower Musashino of Miyata, Yokosuka, Kanazawa and Koshiba.

Living.—Northern and Central Japan.

CM21590

311. *Arca symmetrica*, Reeve.

Arca symmetrica. Reeve, Conch. Icon., Arca, sp. 117. Yokoyama, Foss, Miura Penin., p. 166, pl. XVII, figs. 7, 8.

A few isolated valves much worn by friction.

Fossil occurrence.—Otake. Lower Musashino of Yokosuka and Naganuma.

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

CM21591-15-4
CM21592
CM21593
CM21594
CM21595

312. *Arca* (*Anomalocardia*) *granosa*, Linné.

Pl. XV. Fig. 4.

Arca (*Anomalocardia*) *granosa.* Pilsbry, Cat., p. 149. Kobelt in Syst. Conch. Cab., VIII, pt. 2, p. 38, pl. III, fig. 7.

Arca granosa. Linné, Syst. Nat., Ed. 12, p. 1142. Reeve, Conch. Icon., Arca, spec. 15. Lischke, Jap. Meeresconch., I, p. 145. Tokunaga, Foss. Env. Tokyo, p. 59, pl. III, fig. 20.

Anomalocardia granosa. Dunker, Ind. Moll., p. 233.

Isolated valves from several localities which are not quite full-grown. The largest is only 55 millim. in length. This species is easily recognized by its thick, solid, swollen, somewhat oblique shell ornamented with coarse granular radiating ribs whose number in the fossil is seventeen or eighteen. It is here to be remarked that the fossil specimens are a little more oblique and the postero-ventral corner more produced than that represented in the figure of Kobelt.

Fossil occurrence.—Otake, Shisui, Kamenari, Tega, Shito. Tokunaga mentions this species from Tabata. Takigashira near Yokohama according to Brauns.

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

CM 21596-15-9
CM 21590
CM 21598
CM 21599

313. *Arca* (*Anomalocardia*) *inflata*, Reeve.

Pl. XV. Fig. 9.

CM 21600
CM 21601

Arca (*Anomalocardia*) *inflata*. Pilsbry, Cat. p. 149. Kobelt in Syst. Conch. Cab., VIII, pt. 2, p. 30, pl. X, figs. 1, 2.

Arca inflata. Reeve, Conch. Icon., Arca, sp. 30. Yokoyama, Foss. Miura Penin., p. 167, pl. XVII, fig. 9.

Arca broughtonii. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 575, pl. 24, figs. 1–3.

Arca tenuis. Tokunaga, Foss. Env. Tokyo, p. 58, pl. IV, fig. 1.

Some specimens are quite thin-shelled which induced Tokunaga to establish a new species which he called *A. tenuis*. The largest attains a length of more than 110 millim.

Fossil occurrence.—Otake, Shisui (frequent), Shito. Oji, Tabata and Shinagawa. Lower Musashino of Naganuma.

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

CM 21602-15-12
CM 21603
CM 21604
CM 21605
CM 21606
CM 21607
CM 21608
CM 21609

314. *Arca* (*Scapharca*) *subcrenata*, Lischke.

Pl. XV. Fig. 12.

Arca (*Scapharca*) *subcrenata*. Kobelt in Syst. Conch. Cab., VIII, pt, 2, p. 47, pl. XIII, figs. 5, 6. Pilsbry, Cat., p. 149. Yamakawa, Fossil Scapharca of the Neighbourhood of Tokyo, Jour. Geol. Soc. Tokyo, 1912, vol. XVIII, no. 219, p. 6. pl. III, IV, figs. 1–12.

Arca subcrenata. Lischke, Jap. Meeresconch., I, p. 146, pl. IX, figs. 1–3.

Scapharca subcrenata. Dunker, Ind. Moll., p. 234.

Arca kagoshimensis. Tokunaga, Foss. Env. Tokyo, p. 59, pl. III, fig. 21.

Distinguished from the preceding species by a less number of radiating ribs (twenty-eight to thirty-six, while in *A. inflata* usually over forty) and their subcrenate nature which in the left valve is seen on all the ribs anterior to the posterior carina, and

on the right only on those near the anterior end of the shell. A fuller account is found in the work of Yamakawa above cited.

Fossil occurrence.—Otake (very common), Kioroshi, Kamenari, Shisui (common), Tega (very frequent), Shito (rare). Oji.

Living.—Central, Western and Southern Japan.

CM21610-17-1
CM21611-17-2
CM21612-17-3
CM21613

Genus **PECTUNCULUS**, Lamarck.

315. *Pectunculus albolineatus*, Lischke.

Pl. XVII. Figs. 1, 2, 3.

Pectunculus albolineatus. Lischke, Jap. Meeresconch., III, p. 108, pl. IX, figs. 11, 12. Dunker, Ind. Moll., p. 236. Brauns, Geol. Env. Tokio, p. 45. Tokunaga, Foss. Env. Tokyo, p. 61. Pilsbry, Cat., p. 150.

Lischke who first described this species had only young shells of a more or less circular form whose length was below 40 millim. But there are specimens which are 80 millim. long. Such full-grown ones are not circular, but decidedly somewhat obliquely round-squarish, the antero-dorsal corner in front and postero-ventral corner behind being most produced. Such a squarish form we can also find among the young shells in which, if not both corners, at least the antero-dorsal corner is more or less produced. From this it is quite certain that there is a great variation in the outline of the shell. The surface ornamention consists of white radiating lines and fine dots.

The fossil specimens which I deem as belonging to this species are a few isolated valves which are quite grown. They are also in general roundly squarish, but the posterior margin is a little more rounded than in the recent shell, so that the protrusion of the postero-ventral corner is not so obvious. One of the left valves measures 68.6 millim. in length, 59.5 millim. in height and 17.3 millim. in depth, while one of the right measures 68 millim. in length, 56.5 millim. in height and 17.2 millim. in depth.

The surface-dots are obliterated in the fossil and the white radiating lines are present as impressed ones with several finer interstitials between.

CM21614-16-1
CM21615-16-2
CM21616-16-3
CM21617
CM21618
CM21619
CM21620

Fossil occurrence.—Otake. Oji.
Living.—Central Japan.

316. *Pectunculus vestitus*, Dunker.

Pl. XVI. Figs. 1, 2, 3.

Pectunculus vestitus. Dunker, Ind. Moll., p. 236, pl. XVI, figs. 7, 8. Pilsbry, Cat., p. 150.

Pectunculus rotundus. Dunker, Ind. Moll., p. 236, pl. XVI, figs. 7, 8. Pilsbry, Cat., p. 150. Yokoyama, Foss. Miura Penin., p. 167, pl. XVII, figs. 10, 11.

This species shows a great variation in the outline of the shell. The normal form is a rounded oval, slightly oblique, somewhat longer than high and with the beak-portion narrowed. What Dunker gives in his figure (pl. XVI, figs. 7, 8) is a less rotund form with the length somewhat greater than in the normal type. Young examples of this shell which can be collected in hundreds at some localities are more circular in form, and it is quite certain that Dunker's *Pectunculus rotundus* is a species founded on such examples. It is here to be noted that among the adult ones there are often forms which possess the more produced and subtruncate posterior end.

The surface in recent specimens is ornamented with white radiating lines as in the preceding species, which are present in the fossil as impressed lines with finer ones between. But the dots of the latter seem to be absent. Therefore the young circular form of the preceding species, when the dots are obliterated, is difficult to distinguish from the present.

The largest specimen in our collection is a right valve 76 millim. long and 68.5 millim. high.

Fossil occurrence.—Otake (numerous), Kioroshi (do), Kamenari, Tega (numerous). Tabata and Shinagawa. Lower Musashino of Miyata and Naganuma.

CM21621-16-6
(12) CM21622-16-7
CM21623
CM21624
CM21625
CM21626
CM21627

Living.—Central Japan.

317. *Pectunculus yessoensis*, Sowerby.

Pl. XVI. Fig. 6, 7.

Pectunculus yessoensis. Sowerby, Descr. Fourt. New Shells fr. China, Jap. a. Andam.

Isl., Proc. Zool. Soc. Lond., 1886, p. 570, pl. XXVIII, fig. 19. Pilsbry, Cat., p. 150. Yokoyama, Foss. Miura Penin., p. 168, pl. XVIII, figs. 1, 2.

The characteristic feature of this shell usually consists in the postero-dorsal margin being a little longer than the antero-dorsal, whereby the rounded or, as is sometimes the case, subangulate corner between the former and the posterior margin becomes more or less conspicuous. But it is here to be remarked that this character is not always obvious, especially in young specimens, so that the distinction from *Pectunculus vestitus* sometimes becomes very difficult, or even impossible.

The largest specimen obtained measures 65 millim. both in length and height.

Fossil occurrence.—Otake (frequent), Shisui, Kioroshi, Tega, Kamenari, Shito (very common). Lower Musashino of Miyata.

CM2/628-16-8 Living.—Northern Japan.

CM2/629-16-9

CM2/630

318. *Pectunculus pilsbryi*, Yokoyama.

Pl. XVI. Figs. 8, 9.

Pectunculus pilsbryi. Yokoyama, Foss. Miura Penin., p. 170, pl. XVIII, fig. 8.

This small oblique *Pectunculus* is generally characterized by the subangulate posterior end and the fine, close, unequal, radiating riblets which cover the whole surface. The posterior end, however, may sometimes be subtruncate or so produced as to assume a rostrate appearance as shown in the figure. The granulate nature of the riblets are not always distinct.

The largest example attains a length of 25 millim. and a height of 23 millim. The depth of a valve of such specimens is about 7 millim.

Fossil occurrence.—Shito (very common). Lower Musashino of Miyata (rare).

Living.—Central Japan.

CM2/631-16-4

CM2/632-16-5

319. *Pectunculus yamakawai*, Yokoyama.

Pl. XVI. Figs. 4, 5.

A right and a left valve. Both are flattened (right valve being 30.5 millim. long, 28 millim. high and 6 millim. deep), oblique

and oval with the sharper end at the posterior ventral corner. Antero- and postero-dorsal margins insensibly passing respectively into anterior and posterior ends which are both rounded, with the latter much more sharply than the former. Ventral margin broadly arcuate, crenate within. Ligamental area comparatively narrow, triangular, with two series of several straight grooves, the one parallel to the anterior and the other parallel to the posterior side of the area, which meet at an obtuse angle below the beak. Beaks small. Surface with fine, straight, radiating, impressed lines.

A shell quite like this fossil was found living on the coast of Awa (Boshu) with the posterior dorsal slope sometimes more straight, so that the posterior end appears more angulate. The surface is coloured brownish yellow with white radiating lines like those of *Pectunculus albolineatus* and *P. vestitus*. Although it is a little more convex than our fossil, there is no doubt of its being the same speceis.

Fossil occurrence.—Shito.

Living.—Central Japan.

Family **Parallelodontidæ.**

CM 21633

Genus **PARALLELODON**, Meek et Worthen.

320. *Parallelodon obliquatus*, Yokoyama.

Parallelodon obliquatus. Yokoyama, Foss. Miura Penin., p. 170, pl. XVIII, figs. 9–11

Only a single left valve.

Fossil occurrence.—Shito. Lower Musashino of Miyata, Yokosuka and Koshiba.

Living.—Northern and Central Japan.

CM 21634-17-8
CM 21635-17-9

Genus **CUCULLARIA**, Deshayes.

321. *Cucullaria orientalis*, Yokoyama. CM 21636

Pl. XVII. Figs. 8, 9.

A few isolated right valves.

Shell very small, rather thick, moderately convex, transversely elongated, narrowed in front, gradually dilated behind, strongly inequilateral, with posterior side four times as long as

anterior. Anterior and posterior ends rounded, the former passing insensibly into ventral margin, while the latter is oblique and forms a rounded angle with the same. Hinge nearly straight, with three or four short oblique teeth in front and about seven almost subhorizontal teeth behind, the space between being either smooth or provided with a few indistinct granules. Area very narrowly triangular. Surface with an obtuse posterior carina and a broad mesial depression which makes ventral margin straight or even somewhat excavated. The sculpture consists of subequal radiating ribs which are flatly rounded, broader than interspaces and number a little more than thirty; some of these ribs show a narrow longitudinal groove and a tendency to split. Occasionally some interspaces are unusually broad in which case there is usually an interstitial riblet, though only near the margin. Length 5.1 millim. Height 3 millim. Depth 1 millim.

The occurrence of this shell is quite noteworthy, as related forms have hitherto been found only in the Eocene, for example, *Cucullaria aldrichi* Dall (Tert. Fauna Florida, IV. pl. 32, fig. 10) in the Eocene of Florida and *Cucullaria gracilis* Desh (Anim sans Vert., I, pl. 69, figs. 22—24) in the Paris Basin.

Fossil occurrence.—Shito.

Family **Limopsidæ.**

Genus **LIMOPSIS.** Sasso.

322. *Limopsis woodwardi*, A. Adams.

Pl. XVII. Fig. 5.

Limopsis woodwardi. Adams, Proc. Zool. Soc. Lond., 1862, p. 231. Dunker, Ind. Moll., p. 237, pl. XVI, figs. 5, 6. Pilsbry, Catal., p. 150. Tokunaga, Foss. Env. Tokyo, p. 62.

Shell thick, convex, roundly ovate, about as long as high, somewhat oblique, rounded in front, rounded or obliquely subtruncate behind. Surface with numerous, rounded, radiating riblets alternately large and small, separated by broader interspaces and crossed by incremental lines which make them somewhat

granular. Hinge curved, with oblique lamellar teeth ten to fourteen on each side of the ligamental pit which is triangular and provided in some with two diverging ridges and a few transverse striae. Beaks small, pointed. Inner margin flattened and smooth.

There is some variation in form, the height being sometimes a little less, sometimes a little greater than the length. The convexity is also somewhat variable.

The largest specimen obtained is a left valve, 17.3 millim. long, 17.5 millim. high and 5.4 millim. deep.

Smith in his Challenger Lamellibranchiata (p. 256) unites *Limopsis woodwardi* with Reeve's *Limopsis cancellata* which lives in Northern Australia, Torres Strait, Singapore, etc. But at present I am not in a position to utter any opinion on it.

Fossil occurrence.—Otake, Tega. Oji (common) and Shinagawa.

Living.—Central Japan.

CM21639

323. *Limopsis crenata*, A. Adams.

Limopsis crenata. A. Adams, Descript. Limopsis of Cuming. Coll., Proc. Zool. Soc. Lond., 1862, p. 230. Yokoyama, Foss, Miura. Penin., p. 173, pl. XVIII, figs. 17, 18.

A few isolated valves.

Fossil occurrence.—Otake. Lower Musashino of Miyata, Kamakura, Kanazawa, and Koshiba.

Living.—Northern, Central and Western Japan.

CM21640
CM21641

324. *Limopsis azumana*, Yokoyama.

Limopsis azumana. Yokoyama, Foss. Miura Penin., p. 174. pl. XVIII, figs. 12–21.

More frequent than the preceding species.

Fossil occurrence.—Shito, Otake. Lower Musashino of Miyata and Koshiba.

CM21642

325. *Limopsis adamsiana*, Yokoyama.

Limopsis adamsiana. Yokoyama, Foss. Miura Penin., p. 175, pl. XIX, figs. 1, 2.

The species founded on two right valves from the Lower Musashino is somewhat frequent in the Upper. The left valves

which were found in the latter have nearly the same shape as the right. As to the surface-sculpture, most of the specimens are water-worn and smooth, but in one or two unequal concentric striae are visible which are crossed by very fine, rather indistinct, radiating lines.

The largest of the left valves is 6.4 millim. long, 5.8 millim. high and 1.9 millim. deep.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Koshiba.

CM21643-19-6
CM21644-19-7
CM21645

326. *Limopsis arcolata*, Yokoyama.

Pl. XVII. Figs. 6, 7.

Shell small, thick, compressed, obliquely short-oblong, inequilateral, rounded both in front and behind, though somewhat more sharply in the former than in the latter. Surface with fine impressed radiating lines interrupted by unequal concentric grooves. Beaks small and rounded. Hinge bent with teeth thick, lamellar to tubercular, about six in anterior row, somewhat less in posterior, rapidly diminishing in size in both rows from the middle to both sides. Ligamental pit broadly triangular. A deep narrow escutcheon is present just above and behind the posterior row of teeth whereby the hinge-margin behind the teeth is somewhat pushed inward. Beaks small, pointed. Fine radiating lines present just within the pallial line. Inner margin flattened and smooth.

The measurements of four isolated valves are as follows:

	Length.	Height.	Depth.
Left valve	15.0 millim	14.0 millim	3.3 millim.
„ „	13.8 „	12.5 „	2.4 „
Right „	12.5 „	12.2 „	2.4 „
„ „	11.0 „	12.4 „	2.3 „

This shell is easily recognized by its shortly oblong shape and the deep escutcheon behind the beak.

Fossil occurrence.—Shito (rare).

CM 21646-17-16
CM 21647-17-17
CM 21648
CM 21649.

327. *Limopsis nipponica*, Yokoyama.

Pl. XVII, Figs. 16, 17.

Shell very small, moderately thick, longitudinally oblong, somewhat oblique, convex. Anterior and posterior margins only a little curved and subparallel; ventral rounded. Surface radiately striated; striae many, nearly straight, subequal, with equal or broader interspaces and cut by incremental lines, the points of intersection being more or less grain-like. Hinge-line about as long as shell-length, with about three teeth in front of ligamental pit and about five behind. Beaks small, pushed a little forward. Inner surface with fine radiating lines within the pallial line. Inner margin flattened and smooth. Length 2.9 millim. Height 3.5 millim. Depth of each valve 1.3 millim.

Fossil occurrence.—Kioroshi (very rare), Shito (do).

(9) CM 21650 -17-4
(2) CM 21651
(2) CM 21652.

Family **Ledidæ.**

Genus **LEDA,** Schumacher.

328. *Leda confusa*, Hanly.

Pl. XVII, Fig. 4.

Leda confusa. Hanley in Sowerby's Thes. Conch., III, Nuculidæ, p. 119, pl. 228. fig. 85. Lischke, Jap. Meeresconch., III, p. 109. Dunker, Ind. Moll., p. 238. Brauns, Geol. Env. Tokio, p. 45. Pilsbry, Cat., p. 56.

Hanley describes this shell as follows:

"Beaked-oval, convex or subventricose with a shining ash-coloured epidermis, closely, regularly, and concentrically grooved throughout (the dorsal areas excepted); sulci shelving in front, their intervals converted into flattened costæ on the umboes and towards the umbonal ridge which latter is neither elevated nor defined in front. Sides equal, or very nearly so: Anterior extremity rounded; posterior side rather abruptly beaked, the tip, which is either in the middle or just above it, upturned and sharply angular. Front dorsal slope very slight, convex with a sudden terminal retusion. Hinder dorsal slope moderate, at first straightish or plano-convex, eventually rather suddenly incurved. Ventral margin

much rising at both ends, arcuated (at the least in front), devoid of retusion. Dorsal areas large pouting, lanceolate; escutcheon carinately defined, sublongitudinally grooved; lunule impressly defined, its sulci finer. Interior bluish white, the front edge, in adult example, most minutely crenulated; hinge-margin broad, its teeth rather numerous on both sides. Cartilage-pit small, triangular."

Although in our specimens the fine crenulations of the inner-side of the front edge are not visible, still there is not the least doubt of their belonging to Hanley's species.

The largest example is a right valve measuring 20 millim. in length, 10.8 millim. in height and 3.5 millim. in depth. It is therefore somewhat larger than the one shown in Hanley's figure.

Fossil occurrence.—Shisui (rare). Kamenari, Tega (not rare), Shito (do). Oji and Shinagawa.

CM 21653

Living.—Central Japan. China sea.

329. *Leda ramsayi*, Smith.

Leda ramsayi. Smith, Report on Lamellibranchiata, Challeng. Exp., p. 241, pl. XX, fig. 3, 3a. Yokoyama, Foss. Miura Penin., p. 176, pl. XIX, fig. 3.

Three left valves, one of which attains 9.4 millm. in length, 5.4 millim. in height and 1.7 millim. in depth. Just as in the Lower Musashino, the specimens are very rare.

Fossil occurrence.—Shito. Lower Musashino of Miyata and Koshiba.

Living.—Off Sydney, New South Wales, in 950 fathoms (Smith). Also Northern Japan (?)

CM 21654 -17-10
CM21655

Genus **YOLDIA**, Möller.

330. *Yoldia notabilis*, Yokoyama.

Pl. XVII. Fig. 10.

Yoldia arctica. Brauns, Geol. Env. Tokio, p. 47. p. VI, fig. 29.
Yoldia lanceolata. Tokunaga, Foss. Env. Tokyo, p. 57, pl. III, fig. 18.

The shell is thin, compressed, transversely elongated, rounded in front, rostrated and pointed behind, inequilateral, the anterior side being much longer than the posterior (about 1.8 times as

long). The front dorsal margin is at first somewhat ascending and then very gradually descending, very little arched and going over into the rounded front end. The hinder dorsal margin is sloping, at first straight, but eventually becomes concave, meeting with the convexly ascending posterior margin at about a right angle. The ventral margin is broadly convex, ascending at both ends. The surface is subconcentrically grooved, with grooves narrow, so that the interspaces appear as broad flat ribs. These grooves and ribs, however, are somewhat oblique and not quite parallel with the ventral margin, so that those situated near it end at its posterior half. Teeth numerous, lamellar, outwardly bent in the middle, not quite thirty in number in the anterior and about half as many in the posterior row. Ligamental pit triangular, broader than high, and with a somewhat concave base. Lunula not developed. Area lanceolate, bounded by a sharp carina on both sides and with a high, elevated, very steep carina in the median line, whose lateral faces show only fine sublongitudinal striations. Anterior muscular impression larger than posterior, ovate in shape; posterior transversely oval, bounded within by a strong rounded ridge descending vertically from below the posterior end of the ligamental pit. Sinus large, rounded. The largest specimen is a right valve 36 millim. in length (anterior side 23 millim.), 18.6 millim. in height and 4.1 millim. in depth.

Brauns and Tokunaga took this shell for *Yoldia lanceolata* Sow. (Y. arctica Br. et Sow.) to which, indeed, it has a great resemblance. But the sculpture is quite different in the two. In the present species it consists of subconcentric grooves, while in *Y. lanceolata* of much more oblique striae which vanish toward the posterior end of the shell. Moreover, the Japanese fossil is somewhat more inequilateral, with the posterior end a little sharper.

Anyhow it is very interesting that a species much like *Yoldia lanceolata* was found in the Upper Musashino, as all the living forms of *Yoldia* are hitherto either arctic or at least boreal, *Y. lanceolata* itself being reported also from Kamchatka and Strait of Tartary.

Fossil occurrence.—Shisui (very rare), Otake (do). Oji.

CM21656
CM21657
CM21658

Family **Nuculidæ.**

Genus **NUCULA**, Lamarck.

331. *Nucula insignis*, Gould.

Nucula insignis. Gould, Otia Conch., p. 175. Tokunaga, Foss. Env. Tokyo, p. 56. Yokoyama, Foss. Miura Penin., p. 179. pl. XIX, figs. 7, 8.

Several specimens, the largest being 20 miliim. in length.

Fossil occurrence.—Otake, Shisui, Shito. Oji, Tabata and Shinagawa. Lower Musashino of Koshiba.

Living.—Northern Japan.

Phylum **Molluscoidea.**

Class **BRACHIOPODA.**

Family **Terebratulidæ.**

Genus **TEREBRATELLA**, d'Orbigny.

(12)
CM21659

332. *Terebratella coreanica*, Adams et Reeve.

Terebratella coreanica. Davidson, Monogr. Rec. Brach., p. 81, pl. XIII, figs. 8–9. Dall, Amer. Jour. Conch., VI, p. 121. Dunker, Ind. Moll., p. 252. Pilsbry, Cat., p. 151. Yokoyama, Foss. Miura Penin., p. 184, pl. XIX, figs. 25, 28.

Terebratula coreanica. Adams and Reeve, Voy. Samarang, Zool., p. 71, pl. XXI, fig. 3. Schrenck, Moll. Amurl. u. d. nordjap. Meeres, p. 168. Lischke, Jap. Meeresconch., I, p. 181.

This is a well known living shell in Japan. As stated by Davidson, its outline is very variable. In general, the breadth is somewhat less than the height or length, but there are specimens in which the height is much greater than the breadth. As to the mesial depression of the dorsal valve, it is here to be remarked that it is either very shallow or absent in which latter case the place is only flattish.

The largest of the perfect specimens is 36.5 millim. in height, but there is an isolated dorsal valve nearly as high, therefore the corresponding ventral must have been over 40 millim. in height.

Fossil occurrence.—Shito (frequent). Lower Musashino of Miyata.

Living.—Northern, Central and Western Japan.

CB26660

333. *Terebratella pulvinata*, (Gould).

Terebratella pulvinata. Davidson, Monogr. Rec. Brach., p. 90. pl. XVI, fig. 13. Dall. Amer. Jour. Conch., VI, p. 117. Yokoyama, Foss. Miura Penin., p. 185, pl. XIX, fig. 26.

Terebratula (Waldheimia) pulvinata. Gould, Otia Conch., pp. 97, 255.

A few specimens which are all smaller than the one figured by Davidson. The largest measures 13.5 millim. in height, 125 millim. in breadth and 6 millim. in thickness. The frontal edge of one of the specimens is a little more sharply rounded than in the others, a variation which must be admitted in a group of animals like the Brachiopods.

Fossil occurrence.—Shito. Lower Musashino of Miyata.

Living.—Puget Sound, Washington.

Genus **EUDESIA**, King.

CB21661-1742
CB21662-1742
CB21663

334. *Eudesia grayi*, (Davidson).

Pl. XVII. Figs. 11, 12.

Eudesia grayi. Pilsbry, Catal., p. 152.

Waldheimia grayi. Davidson, Monogr. Rec. Brach., p. 54, pl. X, figs. 1–4. Dunker, Ind. Moll., p. 252. Brauns, Geol. Env. Tokio, p. 58. Tokunaga, Foss. Env. Tokyo, p. 69, pl. IV, fig. 8.

Terebratula (Waldheimia) grayi. Schrenck., Moll. Amurl. u. d. nordjap. Meeres, p. 465.

A few isolated valves.

This shell is very variable in outline. The ventral valve which is very convex may be "squarely pentagonal" as Davidson says, or longitudinally oval. The dorsal valve which is only little convex and somewhat depressed in the middle is usually subtriangularly semicircular. Both valves are furnished with strong, angular, radiating ribs which often bifurcate. The strongest ribs are in the middle of the valves.

Fossil occurrence.—Shito. Shinagawa.

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

Family **Rhynchonellidæ.**

Genus **RHYNCHONELLA,** Fischer.

335. *Rhynchonella psittacea*, (Chemnitz) *var. woodwardi*, (Adams).

Pl. XVII. Fig. 13.

Rhynchonella psittacea var. woodwardi. Davidson, Monogr. Rec. Brach., p. 168, pl. XXIV, figs. 12. 13. Pilsbry, Cat., p. 153.

Rhynchonella woodwardi, Adams, Ann. Mag. Nat. Hist., 3d Ser., vol. XI, p. 100.

One perfect specimen and a few isolated valves.

The shell is somewhat triangular in outline, globose, broadest in the middle and laterally rounded. From the typical form of *R. psittacea* it is distinguished by the absence of radiating lines, the smaller and less curved beaks and the rounded ventral margin produced in the middle. The perfect specimen measures 22.3 millim. in height, 22 millim. in breadth and 16.5 millim. in thickness. It is therefore somewhat larger than that figured by Davidson in his monograph.

Fossil occurrence—Shito.

Living.—Northern and Western Japan.

INDEX.

Actæon giganteus Dkr. 23
Actæopyramis eximius Lke. 94
Agatha virgo Ad. var. brevis Yok. . . . 92
Amycla burchardi (Dkr.) 60
„ varians Dkr. 62
Ancilla hinomotoensis Yok. 48
„ montrouzieri Sow. 48
Anomalocardia granosa (L.) 186
„ inflata (Rve.) 187
Anomia laqueata Rve. 176
„ lunula Yok. 177
„ nipponensis Yok. 176
„ sematensis Yok. 177
Arca broughtonii Schr. 187
„ granosa (L.) 186
„ inflata Rve. 187
„ kagoshimensis Tok. 187
„ kobeltiana Pils. 185
„ ocellata Kob. 186
„ rectangularis Tok. 186
„ subcrenata Lke. 187
„ symmetrica Rve. 186
„ tenuis Tok. 187
Astarte arctica Möll. 163
„ borealis (Chem.) 163
„ corrugata Liv. 163
„ hakodatensis Yok. 164
Atilia burchardi (Dkr.). 59
„ masakadoi Yok. 62
„ praecursor Yok. 61
„ niveomarginata Sm. 61
„ turriculata Yok. 61
Aulus pulchellus Dkr. 135

Barnea fragilis Dkr. 119
Basilissa læviuscula Yok. 113
Batillaria multiformis (Lke.). 72
„ zonalis (Brug.). 72
Bela pyramidalis Stroem. 45
„ recticostulata Yok. 44
„ rugulata Tros. var. schneideri Harm. 44
Buccinulus fraterculus Dkr. 22
„ strigosus (Gld.). 22
Buccinum fusoides Rve. 55
„ spadiceum Rve. 55
Buccinum strigatum Gm. 68
„ trochulus Rve. 56
Bulla angustata Ad. 26
„ cylindracea Penn. 27
„ multiarata Yok. 29
„ ovula Sow. 29
„ vernicosa Gld. 29
Bullia perryi Jay. 57

Cæcum vitreum Carp. 76
Calliostoma shinagawensis Tok. 112
„ unicum Dkr. 112
Callista chinensis (Chem.) 146
Calyptræa mammilaris (Brod.) 82
Cancellaria asperella Lke. var. reeviana Cr. 46
„ elegans Sow. 46
„ nodulifera Sow. 45
„ reeviana Crosse. 46
„ spengleriana Desh. 45
Capulus badius Dkr. 82
Cardita ferruginea (Ad.). 162
„ rotunda Tok. 162
Cardium braunsi Tok. 155
„ burchardi Dkr. 153
„ californiense Desh. 154
„ japonicum Dkr. 155
„ modestum Ad. et Rve. 155
„ muticum Rve. 154
„ nuttali Rve. 155
„ papyraceum Rom. 155
„ sinense Sow. 156
„ tokunagai Yok. 156
„ tuberculatum L. 155
Careliopsis angulifera Yok. 106
„ obscura Yok. 106
Cassis strigata (Gm.) 68
„ undata Küst. 68
„ zebra Lam. 68
Cemoria cucullata Gld. 116
„ nobilis Ad. 116
Cerithiopsis nodosocostatus Yok. 73
„ trisulcatus Yok. 73
Cerithium kochi Phil. 71
Chama coralliophaga (Chem.). 167
„ semipurpurata Lke. 161

Chemnitzia imbana Yok. 101
„ kidoensis Yok. 103
„ sematana Yok. 103
„ teganumana Yok. 103
Chione isabellina (Phil.) 149
„ mindanensis Sm. 150
Chrysodomus arthriticus (Val.) 53
„ despecta Lin. 53
„ pericochlion Schr. 53
„ schrencki Yok. 53
Cingula plebeja Yok. 79
„ triarata Pils. 105
Clava kochi (Phil.). 71
Collonia purpurescens Dkr. 107
Columbella aurantiaca Dall. 62
„ burchardi Dkr. 59
„ dunkeri Tryon. 62
„ lischkei Sm. 60
„ masakadoi Yok. 62
„ niveomarginata Sm 61
„ praecursor Yok. 61
„ smithi Yok. 60
„ turriculata Yok. 61
Coralliophaga coralliophaga (Chem.). . . 166
„ lithophagella Dkr. . . . 166
Coralliophila pachyrhaphe (Sm.). . . . 63
Corbicula kobelti Yok. 166
„ pexata Pr. 166
„ sandai Reinh. 166
„ sandaiformis Yok. 165
Corbula erythrodon Lam. 122
„ frequens Yok. 123
„ pustulosa Yok. 123
„ pygmæa Yok. 125
„ sematensis Yok. 123
„ striata Walth. 126
„ substriata Yok. 125
„ venusta Gld. 122
Crassatella heteroglypta (Pils.). 165
„ japonica Sow. 165
„ nana Ad. et. Rve. 164
„ oblongata Yok. 164
Crassatellites heteroglypta Pils. 165
Crenella decussata Mont. 176
„ divaricata Yok. 175
„ elegans Desh. 176
„ spectabilis Ad. 176
Crepidula dilatata Lam. 83
„ grandis Midd. 82
Cryptomya busoensis Yok. 126
Cryptomya elliptica Ad. 126
Cucullaria aldrichi Dall. 191
„ gracilis Desh. 191
„ orientalis Yok. 191
Cuspidaria ligula Yok. 169
Cyclina chinensis (Chem.). 145
Cyclostrema stillicidiatum Yok. 114
„ sulcatum Wat. 115
Cylichna musashiensis Tok. 27
Cypricardia coralliophaga (Chem.). . . . 167
„ lirata Rve. 168
Cythara oyuana Yok. 43
„ rugosolabiata Yok. 42
Cytherea chinensis (Chem.). 146
„ excavata Havl. 147
„ menstrualis Mke. 147
„ meretrix L. 146

Dentalium edoense Tok. 119
„ hexagonum Gld. 118
„ nipponicum Yok. 119
„ octangulatum Don. 118
„ octogonum Lam. 118
„ sexcostatum Sow. 118
„ weinkauffi Dkr. 118
Diplodonta japonica Pils. 159
„ semiaspera Phil. 160
„ trigonula Br. 159
„ usta Gld. 159
Dolium japonicum Dkr. 69
„ luteostomum Küst. 69
„ variegatum Schr. 69
Donax introradiatus Rve. 136
Dosinia bilunulata Gray. 144
„ exoleta Br. 144
„ troscheli Lke. 144
Drillia glabriuscula Yok. 40
„ principalis Pils. 39
„ subauriformis Sm. 40

Eburna japonica Rve. 57
Egilina marielloides Yok. 100
Elusa cinnamomea Ad. 93
Emarginula vadososinuata Yok. 117
Ensis krusensternii (Schr.). 134
Entoconesma naviculа Ad. et R. 170
„ naviculoides Yok. 170
„ truncatissima Pils. 170
Erato callosa Ad. et Rve. 69
„ lachryma Gray. 70

Eudesia grayi (Dav.). 199
Eulima acerrima Wat. 90
„ glabra Jeffr. 91
„ glabroides Yok. 90
„ krishna Yok. 90
„ psila Wats. 90
„ sarissa Wat. 90
„ tokunagai Yok. 90
„ unicincta Yok. 89
Eunaticina oblonga Rve. 85
„ papilla (Gm.). 84

Felania usta Gld. 159
Fenella septentrionalis (Tok.) 80
Fustiaria nipponica Yok. 119
Fusus arthriticus Val. 54
„ coreanicus Sm. 52
„ inconstans Lke. 51
„ kelletii Forb. 56
„ niponicus Sm. 52
„ pachyrhaphe Sm. 63
„ perplexus Ad. 51
„ suboblitus Pils. 52

Genotia ogurana Yok. 38
„ pseudopannus Yok. 37
Globulus costatus (Val.). 114
„ giganteus (Les.). 113
Glycimeris generosus (Gld.). 121

Helcioniscus pallidus (Gld.). 117
Hima festiva (Pow.) 58
„ fraterculus (Dkr.) 59
„ japonica (Ad.) 58

Iphiana mira Yok. 93
„ siva Yok. 94

Jouannetia japonica Yok. 120
„ kamakurensis Yok. 120

Kellia suborbicularis Mont. 158

Lampania multiformis (Lke.). 72
„ zonalis (Brug.). 72
Lascea rubra Mont. 161
„ striata Tok. 161
Leda confusa Hanl. 195
„ ramsayi Sm. 196
Leiostraca glabroides Yok. 90
Leiostraca krishna Yok. 91
„ tokunagai Yok. 90
„ unicincta Yok. 89
Leptothyra crassilirata Yok. 108
„ purpurescens Dkr. 107
„ pygmæa Yok. 108
Leucotina gigantea (Dkr.). 23
Lima angulata Sow. 177
„ auriculata Wein. 178
„ basilanica Ad. et. Rve. 177
„ hakodatensis Tok. 177
„ quantoensis Yok. 178
„ subauriculata (Mont.). 178
„ vulgatula Yok. 179
Limopsis adamsiana Yok. 193
„ areolata Yok. 194
„ azumana Yok. 193
„ cancellata Rve. 193
„ crenata Ad. 193
„ nipponica Yok. 195
„ woodwardi Ad. 192
Lithophaga zitteliana Dkr. 175
Lucina borealis (L.). 160
„ contraria Dkr. 161
„ parvula Gld. 160
„ pisidium Dkr. 160
Lucinopsis divaricata Lke. 145
Lunella granulata Gm. var. minor Dkr. 107
Lutraria maxima Jon. 133
„ „ Mid. 133
„ nuttali Dkr. 133
Lyonsia praetenuis Dkr. 169

Macha divaricata Lke. 136
Machaera pulchella Cl. 135
Macoma dissimilis (Mart.). 142
„ inquinata (Desh). 142
„ nasuta (Conr.). 142
„ nipponica (Tok.). 142
„ praetexta (Mart.). 142
„ secta (Conr.). 142
Macroschisma sinensis Ad. var. brevis Yok. 115
Mactra crossi Dkr. 128
„ dunkeri Yok. 128
„ grayana Schr. 130
„ ovalina Lam. 127
„ ovalis Rve. 130
„ pellicula Desh. 131
„ ponderosa Phil. 128

Mactra sachalinensis Schr. var. imperialis 129
„ straminea Dkr. 128
„ sulcataria Desh. 126
„ veneriformis Desh. 126
Mangilia deshayesii Dkr. 41
„ fukuchiana Yok. 42
„ ojiensis (Tok.). 41
„ oyuana Yok. 43
„ rugosolabiata Yok. 41
Margarita tasmanica Ten. W. 109
Marginella cotamago Yok. 49
„ minuta Pfr. 49
„ ovulum Sow. 49
„ perovulum Yok. 49
Marmorostoma granulata Gm. 107
Melania niponica Sm. 76
Mercenaria stimpsoni Gld. 148
Meroe excavata (Hanl.). 147
„ magnifica Rve. 147
„ enstrualis (Mke.). 147
Meretrix chinensis (Chem.) 146
„ meretrix (L.). 146
Minolia angulata Tok. 112
„ tasmanica T.W. 109
Mitra albina Adams. 50
„ hondana Yok. 50
„ pirula Yok. 51
Mitrella burchardi (Dkr.). 59
„ dunkeri Tr. 62
Modiola barbata (L.). 174
„ modiolus L. 175
Moerchiella manzakiana Yok. 79
Monoptygma eximia Lke. 94
„ puncticulata Gld 94
Montacuta bidentata Mont. 157
„ donacina Wood. 158
„ japonica Yok. 157
„ oblongata Yok. 157
„ yamakawai Yok. 158
Mormula paucicostulata (Tok.). 101
„ scrobiculata Yok. 102
Murex falcatus Sow. 65
Myodora fluctuosa Gld. 170
„ reeviana Sm. 171
Mysia pacifica Tok. 159
„ aff. semiaspera (Phil.). 160
„ usta (Gld.). 159
Mytilus barbata L. 174

Nassa festiva Powis. 58
Nassa japonica Ad. 58
„ lirata Dkr. 58
„ tenuis Sm. 58
Natica bicolor Schr. 84
„ clausa Br. et. Sow. 83
„ janthostoma Desh. 83
„ lamarckiana Recl. 84
„ papyracea Bush. 84
„ powisiana (Recl.). 83
„ robusta Dkr. 84
Naticina papilla (Gm.). 84
Neptunea arthritica (Val.). 53
„ despecta L. 54
„ spadicea Rve. 55
„ trochulus (Rve.). 56
Nerita papilla Gm. 85
Neverita ampla (Phil.). 84
„ vesicalis Dkr. 84
Nucula insignis Ad. 198

Obeliscus pulchellus Ad. 91
„ tenuiscriptus Lke. 94
Ocinebra falcata (Sow.). 65
„ spectata Yok. 65
Odetta suboxia Yok. 98
Odoncincta papyracea (Poli.). 171
Odostomia culta D. et. B. 98
„ desimana D. et B. 95
„ felix D. et B. 99
„ gordonis Yok. 95
„ kizakiensis Yok. 97
„ lactea Dkr. 96
„ limpida D. et B. 96
„ mariella D. et B. 100
„ marielloides Yok. 100
„ neofelix Yok. 99
„ oxia Wats. 98
„ plana Gould. 95
„ shimosensis Yok. 96
„ sublimpida Yok. 95
„ suboxia Yok. 98
„ toneana Yok. 98
„ venusta Yok. 97
Oligotoma pannus (Bast.). 38
Oliva fortunei (Ad.) 47
Olivella consobrina Lke. 47
„ fabula Mar. 47
„ fortunei Ad. 47
„ fulgurata Ad. 47
„ spreta Gld. 48

Olivella spretoides Yok. 47
Ostrea denselamellosa Lke. 185
„ gigas Thunb. 184
„ laperousii Schr. 184
„ musashiana Yok. 185
„ squamata Gm. 180
Oxyperas bernardi Pils. 130
Panopæa generosa (Gld.) 121
Panope generosa (Gld.). 121
Parallelodon obliquatus Yok. 191
Parasipho kroyeri (Möll). 55
Parviterebra paucivolvis Pils. 36
„ raritans Yok. 36
Patella lamanonii Schr. 117
„ pallida Gld. 117
Pecten crassicostatus Sow. 181
„ excavatus An 183
„ intuscostatus Yok. 182
„ lætus Gld. 180
„ laqueatus Sow. 183
„ nobilis Rve. 181
„ plica L. 182
„ sinensis Sow. 183
„ squamatus Gm. 180
„ subauriculatus Mont. 178
„ subplicatus Sow. 181
„ tenuicostulatus Yok. 184
„ tissoti Bern. 182
„ tokyoensis Tok. 182
„ vesiculosus Dkr. 181
Pectunculus albolineatus Lke. 188
„ pilsbryi Yok. 190
„ rotundus Dkr. 189
„ yamakawai Yok. 190
„ yessoensis Sow. 189
„ vestitus Dkr. 189
Philine pygmaea Yok. 28
„ scalpta Ad. 27
„ takatensis Yok. 28
Philippia cingula (Kien.). 77
„ psendoperspectivum (Br.) . . 77
Pholas fragilis Sow. 119
Pinna japonica Hanl. 185
Pleuzotoma deshayesii (Dkr.). 41
„ ojiensis Tok. 41
Pleurotoma principalis (Pils.). 39
„ subauriformis (Sm.). 40
„ vertebrata Sm. 37
„ violacea Hds. 37
Plicatula cuneata Dkr. 180
Polinices ampla (Phil.). 84
„ powisianus (Recl.). 83
Poromya flexuosa Yok. 173
Potamides fluviatilis P. et M. 71
„ cf. incisus H. et J. 71
„ zonalis Brug. 72
Priene oregonensis (Redf.). 68
Psammobia kazusensis Yok. 136
„ maxima Desh. 137
„ viollacea (Lam.). 137
Ptychatractus coreanus Sm. 52
Pt. cheulimella misella Yok. 100
Puncturella nobilis Ad. 116
Purpura heyseana Dkr. 66
Pyramidella cinnamomea (Ad.). 93
„ eximia (Lke.) 94
„ mira Yok. 93
„ pulchella Ad. 91
„ siva Yok. 94
„ tenuiscripta Lke. 94
„ virgo Ad. var. brevis Yok. . 92
Pyrgolampros planicostata Yok. 104
Pyrula bezoar L. var. japonica Dkr. . . 66

Raeta anatinoides (Rve.). 132
„ elliptica Yok. 131
„ magnifica Yok. 132
„ pellicula (Desh.). 131
„ yokohamensis Pils. 131
Rapana bezoar L. 66
„ „ „ var. thomasiana Cr. . 66
„ „ „ „ japonica Dkr. . . 66
„ thomasiana Crosse. 66
Retusa globosa Yam. 25
„ minima Yam. 25
„ truncata Yam. 25
Rhynchonella psittacea Ch. var. woodwardi Ad. 200
„ woodwardi Ad. 200
Ringicula arctata Gld. 30
„ doliaris Gld. 30
„ musashinoensis Yok. 30
Rissoa plebeja Yok. 79
„ septentrionalis Yok. 80
Rissoina manzakiana Yok. 79
Rotella costata Val. 114
„ gigantea Less. 113
Rupellaria semipurpurea Dkr. 151

Saxicava orientalis Yok. 122

Saxidomus nuttali Conr. 153
„ purpuratus (Sow.). 153
Scala aurita (Sow.). 85
Scalaria aurita Sow. 85
„ acuminata Yok. 89
„ azumana Yok. 86
„ conjuncta Yok. 88
„ denticulata Sow. 87
„ eximia Ad. et Rve. 87
„ frondicula Wood. 88
„ kazusensis Yok. 87
„ maculosa Ad. et Rve. 83
„ picturata Yok 89
„ scaberrima Micht. 89
„ subfrondicula Yok. 88
„ yamakawai Yok. 87
Scapharca subcrenata (Lke.). 187
Seila trisulcata Yok. 73
Sigaretus oblongus Rve. 85
„ papilla (Gm.). 84
Siliqua pulchella (Dkr.). 135
Sipho kroyeri Möll. 55
„ nipponicus Yok. 55
„ obesiformis Yok. 54
„ obesus Sow. 54
Siphonalia kellettii (Forbes). 56
„ spadicea (Rve.). 55
„ stearnsii Pils. 56
„ trochulus (Rve.). 56
Skenea nipponica Yok. 81
„ planorbis Fabr. 81
„ planorboides Yok. 81
Solariella philippensis Wat. 110
„ angulata (Tok.). 111
Solarium cingulum Kien. 77
„ perspectivum Wein. 77
„ pseudoperspectivum (Br.) . . . 77
Solecurtus divaricatus (Lke.) 136
Solen grandis Dkr. 134
„ krusensternii Schr. 134
Solenotellina violacea (Desh.). 137
Soletellina cumingiana Desh. 137
„ japonica Deb. 138
„ olivacea Jay. 138
„ violacea Lam. 137
Solidula clathrata Yok. 24
„ fratercula Dkr. 22
„ strigosa (Gld.). 22
Spisula bernardi Pils. 130
„ grayana (Schr.). 130
Spondylus cruentus Lke. 179
Stomatella lyrata Pils. 115
Strioturbonilla pacifica Yok. 105
„ sagamiana Yok. 104
Strombus japonicus Rve. 70
„ vittatus L. 70
Sunetta excavata (Hanl.). 147
„ menstrualis (Mke.). 147
Syrnola cinnamomea (Ad.). 93

Tapes englyptus (Phil.). 152
„ philippinarum (Ad. et Rve.). . . . 152
„ variegatus Hanl. 153
Tellina alternata Say var. chibana Yok. 140
„ delta Yok. 141
„ incongrua Mart. 143
„ inquinata Desh. 142
„ jedoensis Lke. 138
„ miyatensis Yok. 141
„ nasuta Conr. 143
„ nipponica Tok. 142
„ nitidula Dkr. 139
„ ojiensis Tok. 141
„ papyracea Toki. 171
„ praetexta Mart. 142
„ secta Conr. 142
„ venulosa Schr. 139
Terebra alveolata Hds. 31
„ chibana Yok. 32
„ gotoensis Sm. 31
„ granulosa Sm. 33
„ hedleyi Pils. 31
„ latisulcata Yok. 34
„ lischkeana Dkr. 30
„ pustulosa Sm. 33
„ quadriarata Yok. 34
„ recticostata Yok. 32
„ smithi Yok. 33
„ suavidea Yok. 35
„ tsuboiana Yok. 35
Terebratella coreanica A. et R. 198
„ pulvinata Dav. 199
Terebratula grayi Dav. 199
„ pulvinata Gld. 199
Thracia papyracea (Poli). 171
„ phaseolina Phil. 172
„ sematana Yok. 173
„ transmontana Yok. 172
Thyasira trigonata Yok. 158
Thylacodes medusae Pils. 75

Tiberia pulchella (Ad.). 91
Torinia elegantula Yok. 78
Tornatella gigantea (Dkr.) 23
„ strigosa (Gld.). 22
Tornatina exilis Dkr. 24
„ longispirata Yam. 24
Trapezium liratum (Rve). 168
„ nipponicum Yok. 167
„ ventricosum Yok. 168
Tresus nuttali (Conr.). 133
Trichotropis coronata Br. 75
„ unicarinata Br. et Sow. . . 75
Triforis multigyrata Yok. 74
„ otsuensis Yok. 74
Trigonella sulcataria (Desh.). 126
„ veneriformis (Desh.). 126
Triton oregonensis Redf. 68
„ tenuiliratus Lke. 67
Tritonium arthriticum (Val.). 54
„ cancellatum Schr. 68
„ fraterculum (Dkr.). 59
„ oregonense Redf. 68
„ perryi (Jay). 57
„ tenuiliratum (Lke.) 67
Trochita mammilaris (Broad.). 82
Trochus adamsianus Schr. 111
„ angulatus Tok. 111
„ imperialis Ad. 111
„ pseudoperspectivum (Br.). . . . 77
„ shinagawensis Tok. 112
„ spinigera Yok. 109
Trophon clavatus Sars. 64
„ pachyrhaphe (Sm.). 63
„ subclavatus Yok. 64
Turbo coronatus Gm, ... 107
„ granulatus Gm. 107
Turbonilla angulifera Yok. 106
„ dunkeri Cless. 101
„ elegantissima Mont. 101
„ imbana Yok. 101
„ kidoensis Yok. 103
„ misella Yok. 100
„ obscura Yok. 106
„ pacifica Yok. 105
„ paucicostulata Yok. 101
„ planicostata Yok. 104
„ sagamiana Yok. 104
Turbonilla scrobiculata Yok. 102
„ sematana Yok. 103
„ teganumana Yok. 103
„ triarata Pils. 105
Turcica imperialis Ad. 111
Tympanotonos fluviatilis P. et M. . . . 71
Typhis arcuatus Hds. 64
„ japonicus Ad. 64

Uber powisianum (Pow.). 83
Umbonium costatum Val. 114
„ giganteum (Less.). 113
„ moniliferum Lam. 114
„ superbum Gld. 114

Venericardia cipangoana Yok. 162
„ compressa Yok. 162
„ ferruginea (Ad.). 162
„ toneana Yok. 163
Venerupis semipurpurea (Dkr.). 151
Venus borealis Chem. 163
„ „ L. 160
„ chinensis Chem. 145
„ decussata Schr. 152
„ euglypta Phil. 152
„ foliacea Phil. 150
„ isabellina Phil. 150
Venus jedoensis Lke. 148
„ meretrix L. 146
„ neastartoides Yok. 149
„ philippinarum Ad. et Rve. . . . 152
„ stimpsoni Gld. 148
Vertagus kochii (Phil.). 71
Vola excavata (Ant.). 183
Voluta megaspira Sow. 50
Volutharpa perryi (Jay). 57
Volvula acuminata Brug. 27
„ acuta d'Orb. 27
„ acutaeformis Yok. 26
„ angustata (Ad.). 26
„ minuta Bush. 26
„ oxytata Bush. 27

Waldheimia grayi Dav. 199

Yoldia arctica Br. 196
„ lanceolata Sow. 196
„ notabilis Yok. 196

ADDENDA.

On page 167, to the description of Trapezium nipponicum, the following lines should be added:

Two small left valves shown in figs. 12 and 13, plate VI, seem to be the young forms of this species. They are comparatively longer, with the surface-keel very sharp and more or less spiny.

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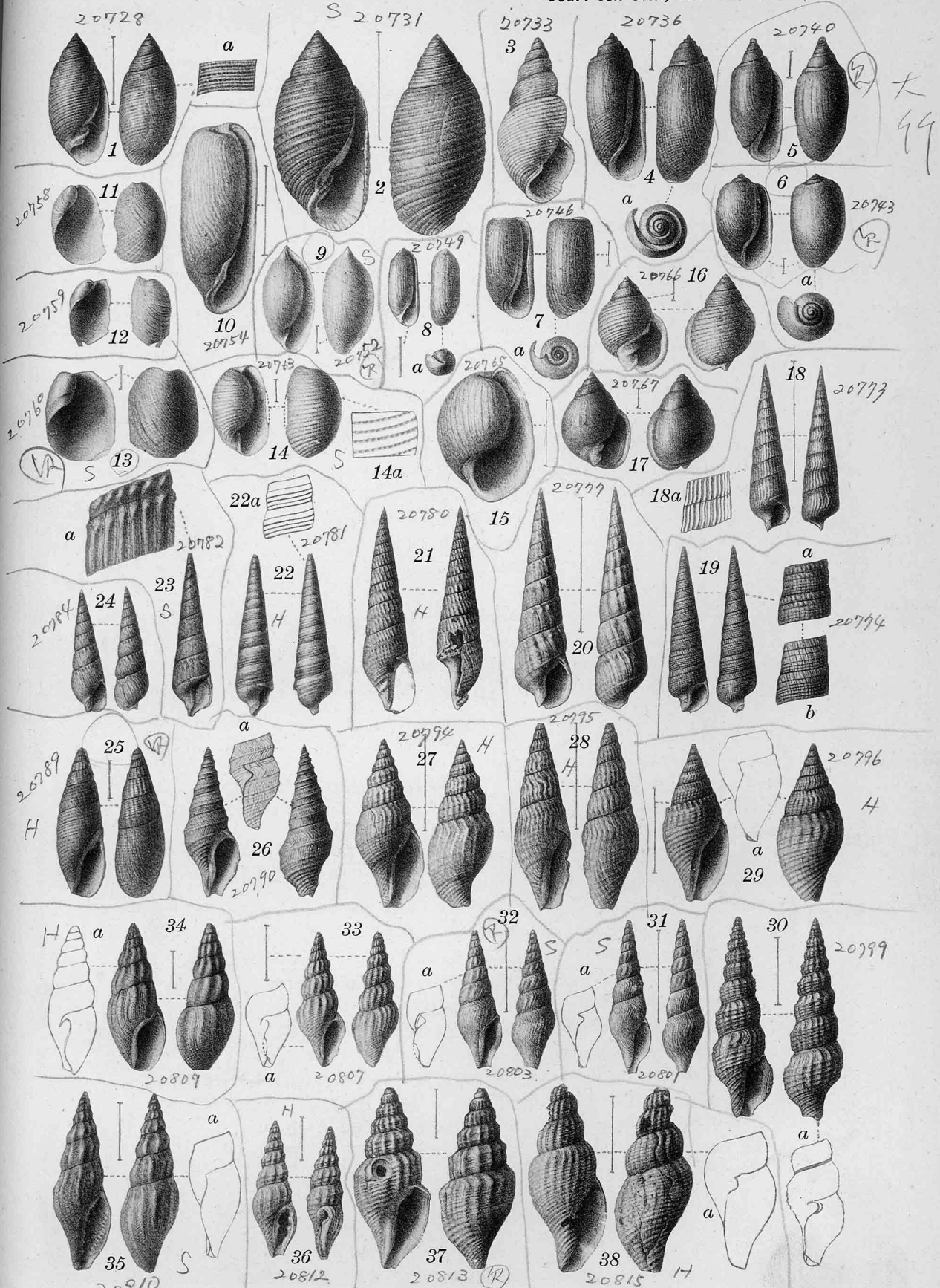
PLATE I.

Plate I.

Fig. 1. Solidula strigosa Gould. a. Surface enlarged to show punctured lines. Ōtake. P. 22.
Fig. 2. Solidula clathrata Yok. Shitō. P. 23.
Fig. 3. Leucotina gigantea Dkr. Ōtake. P. 23.
Fig. 4. Tornatina exilis Dkr. a. Apical view. Ōtake. P. 24.
Fig. 5. Tornatina longispirata Yam. Shitō. P. 24.
Fig. 6. Retusa globosa Yam. a. Apical view. Ōtake. P. 25.
Fig. 7. Retusa truncata Yam. a. Apical view. Ōtake. P. 25.
Fig. 8. Volvula angustata Ad. var. a. Apical view. Ōtake. P. 26.
Fig. 9. Volvula acutaeformis Yok. Shito. P. 26.
Fig. 10. Cylichna musashiensis Tok. Ōtake. P. 27.
Fig. 11. Philine scalpta Ad. Shisui. P. 27.
Fig. 12. Philine scalpta Ad. (?) Kioroshi. P. 28.
Fig. 13. Philine pygmaea Yok. Ōtake. P. 28.
Fig. 14. Bulla multiarata Yok. 14a. Surface enlarged. Shito. P. 29.
Fig. 15. Bulla ovula Sow. Shisui. P. 29.
Fig. 16, 17. Ringicula musashinoensis Yok. 16. Normal form. Shitō. 17. Smooth form. Ōtake. P. 30.
Fig. 18. Terebra gotoensis Smith. 18a. Surface enlarged. Ōtake. P. 31.
Fig. 19. Terebra hedleyi Pils. a. Upper whorls enlarged. b. Lower whorls enlarged. Ōtake. P. 31.
Fig. 20. Terebra chibana Yok. Ōtake. P. 32.
Fig. 21. Terebra smithi Yok. Ōtake. P. 33.
Fig. 22. Terebra quadriarata Yok. 22a. Whorls enlarged. Shitō. P. 34.
Fig. 23. Terebra latisulcata Yok. a. Surface enlarged. Shitō. P. 34.
Fig. 24. Terebra suavidica Yok. Shisui. P. 35.
Fig. 25. Parviterebra raritans Yok. Ōtake. P. 36.
Fig. 26. Pleurotoma vertebrata Smith. a shows the slit. Shitō. P. 37.
Fig. 27, 28. Genotia pseudopannus Yok. 27. Ōtake. 28. Var. sematensis. Shitō. P. 37.
Fig. 29. Genotia ogurana Yok. a shows the shallow lip-notch. Ōtaka. P. 38.
Fig. 30. Drillia subauriformis Smith. a shows lip-notch. Kamenari. P. 40.
Fig. 31, 32. Drillia glabriuscula Yok. 31a, 32a show lip-notch. 32. Var. brevis. Shitō. P. 40.
Fig. 33. Mangilia ojiensis Tok. a shows lip-notch. Shitō. P. 41.
Fig. 34. Mangilia fukuchiana Yok. a shows lip-notch. Ōtake. P. 42.
Fig. 35. Mangilia (Cythara) rugoso-labiata Yok. a shows lip-notch. Ōtake.
Fig 36. Mangilia (Cythara) oyuana Yok. Shisui. P. 43.
Fig. 37. Bela rugulata Tros. var. schneideri Harm. Ōtake. P. 44.
Fig. 38. Bela recticostulata Yok. a shows lip-notch. Shitō. P. 44.



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M. Yokoyama : Fossils from Kazusa and Shimosa.

Plate II.

Fig. 1. Cancellaria nodulifera Sow. Shitō. P. 45.
Fig. 2. Cancellaria asperella Lam. var. reeviana Cr. Ōtake. P. 46.
Fig. 3. Olivella fortunei Ad. 3a. Basal portion of the shell. Shisui. P. 47.
Fig. 4. Olivella spretoides Yok. Shito. P. 47.
Fig. 5. Ancilla hincmotoensis Yok. a. Lateral view (from left). Shitō. P. 48.
Fig. 6. Marginella cotamago Yok. a. Apical view. Shitō. P. 49.
Fig. 7. Marginella perovulum Yok. a. Apical view. Shitō. P. 49.
Fig. 8. Mitra hondana Yok. Shitō. P. 50.
Fig. 9. Mitra pirula Yok. Shitō. P. 51.
Fig. 10. Fusus coreanicus Smith. Shitō. P. 52.
Fig. 11. Fusus niponicus Smith. a. Surface sculpture enlarged. Shitō. P. 52.
Fig. 12. Chrysodomus arthriticus Val. Ōtake. P. 53.
Fig. 13. Chrysodomus schrencki Yok. Shitō. P. 54.
Fig. 14. Sipho (Parasipho) nipponicus Yok. Ōtake. P. 55.
Figs. 15, 16, 17. Siphonalia trochulus Rve. Shitō. P. 56.
Fig. 18. „ „ „ Ōtake. P. 56.
Fig. 19. Volutharpa perryi Jay. Shito. P. 57.
Fig. 20. Eburna japonica Rve. Ōtake. P. 57.
Fig. 21. Nassa (Hima) fraterculus Dkr. Ōtake. P. 59.
Fig. 22. Columbella (Atilia) turriculata Yok. Ōtake. P. 61.
Fig. 23. Columbella (Atilia) masakadoi Yok. Ōtake. P. 62.
Fig. 24. Columbella (Atilia) smithi Yok. Ōtake. P. 61.
Fig. 25. Columbella (Atilia) praecursor Yok. Shitō. P. 61.
Fig. 26. Columbella (Mitrella) dunkeri Tryon. Slender form. Shito. P. 62.

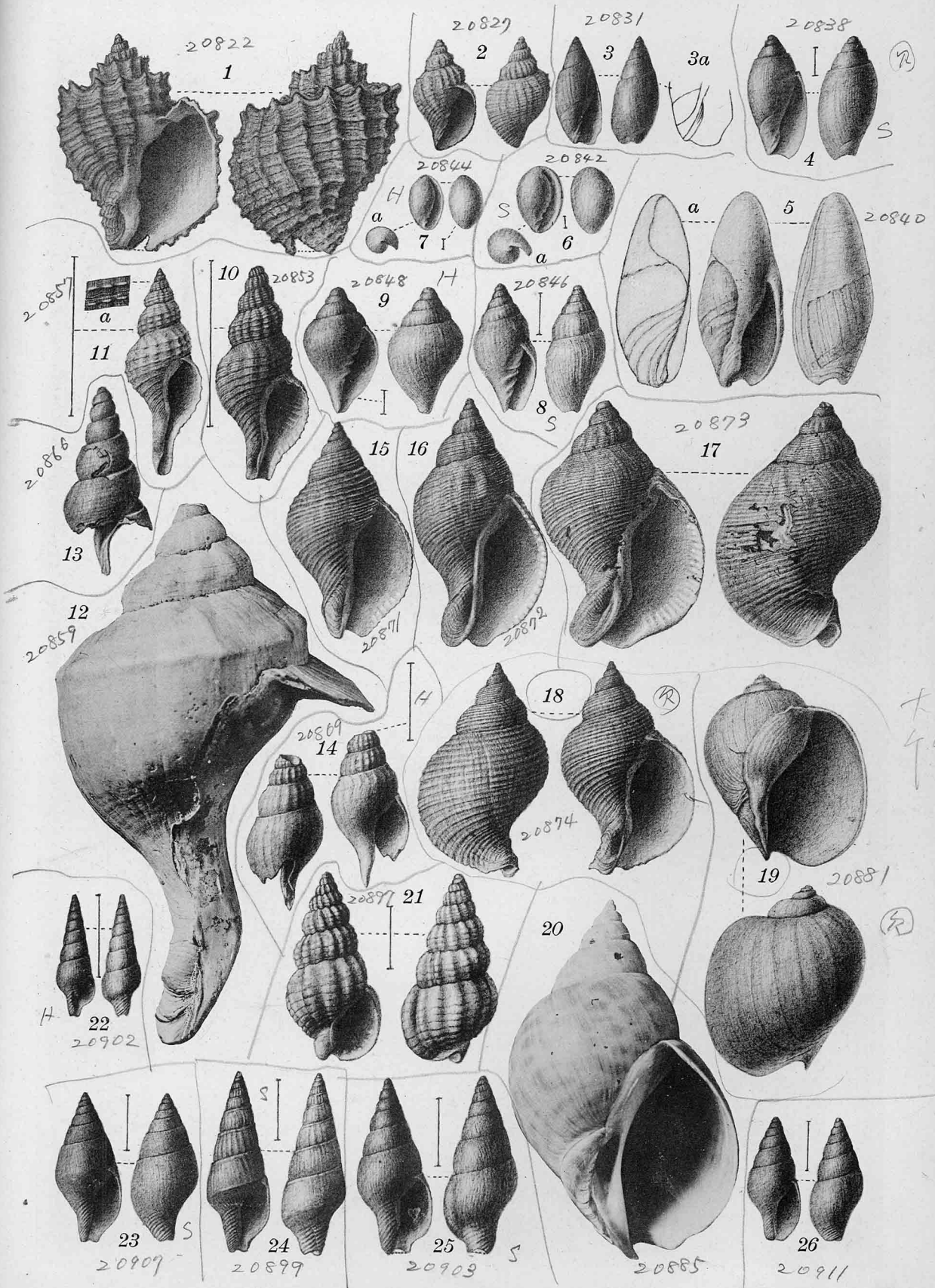

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Plate III.

Fig. 1. Trophon pachyrhaphe Smith. Tega. P. 63.
Fig. 2. Trophon subclavatus Yok. Shitō. P. 64.
Fig. 3. Typhis arcuatus Hinds. Shitō. P. 64.
Fig. 4. Ocinebra falcata Sow. Shitō. P. 65.
Fig. 5. Ocinebra spectata Yok. Ōtake. P. 65.
Fig. 6. Rapana bezoar L. var. thomasiana Crosse, ½ nat. Size. Ōtake. P. 66.
Fig. 7. Purpura heyseana Dkr. Shitō. P. 66.
Fig. 8. Triton tenuiliratus Lke. Shitō. P. 67.
Fig. 9. Cassis strigata Gm. Ōtake. P. 68.
Fig. 10. Dolium luteostomum Küst. Tega. P. 69.
Fig. 11. Erato callosa Ad. et Rve. a. Apical view. Ōtake. P. 69.
Fig. 12. Strombus japonicus Rve. Ōtake. P. 70.
Fig. 13. Cerithium (Clava) kochi Phil. Ōtake. P. 71.
Fig. 14. Cerithiopsis nodoso-costatus Yok. Shitō. P. 73.
Fig. 15. Cerithiopsis trisulcatus Yok. Shitō. P. 73.
Fig. 16. Triforis otsuensis Yok. Shitō. P. 74.
Fig. 17. Thylacodes medusae Pils. Shitō. P. 75.
Fig. 18. Cæcum vitreum Carp. Shitō. P. 76.
Fig. 19. Solarium cingulum Kien. Shitō. P. 77.
Fig. 20. Solarium pseudoperspectivum Broc. Shitō. P. 77.

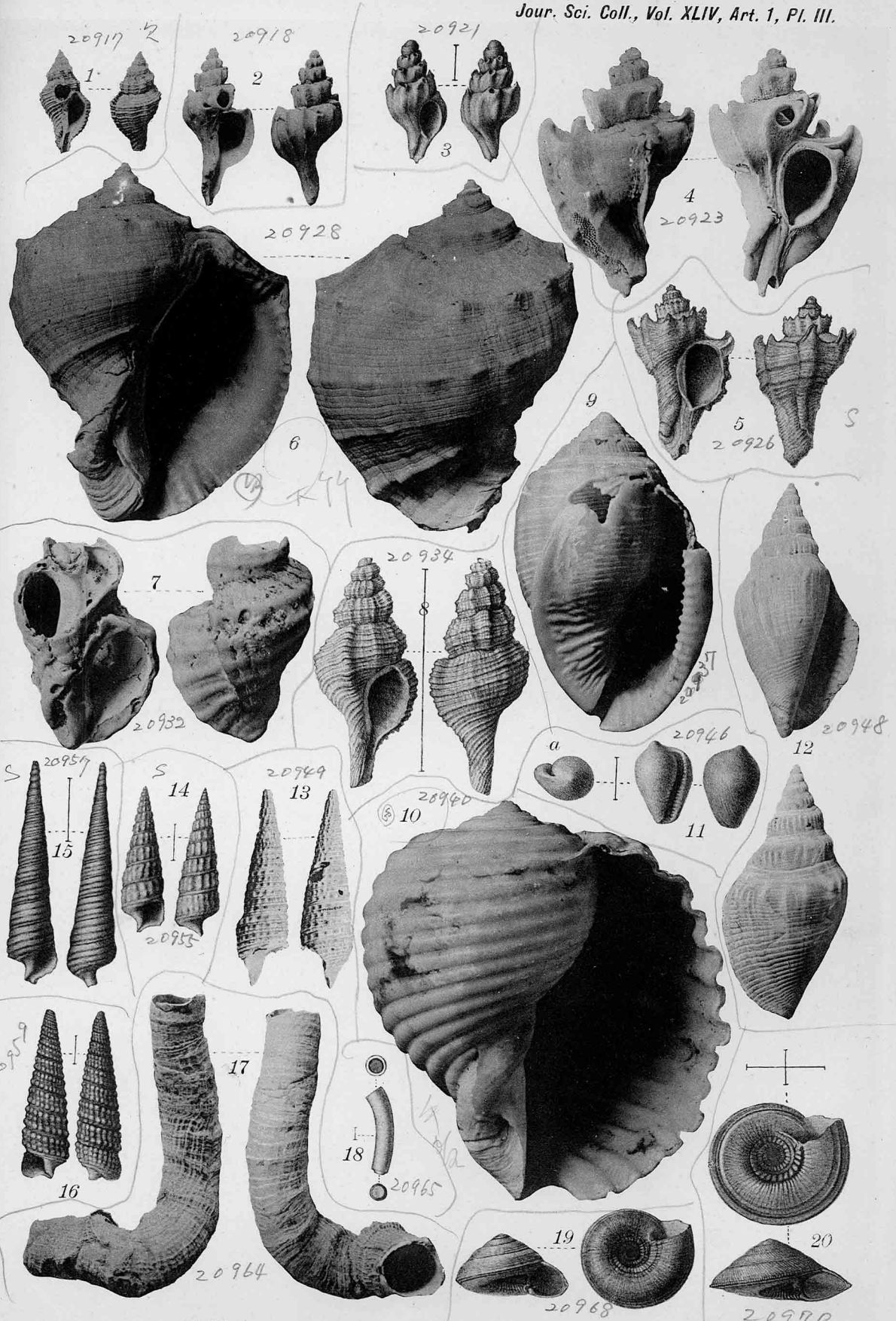

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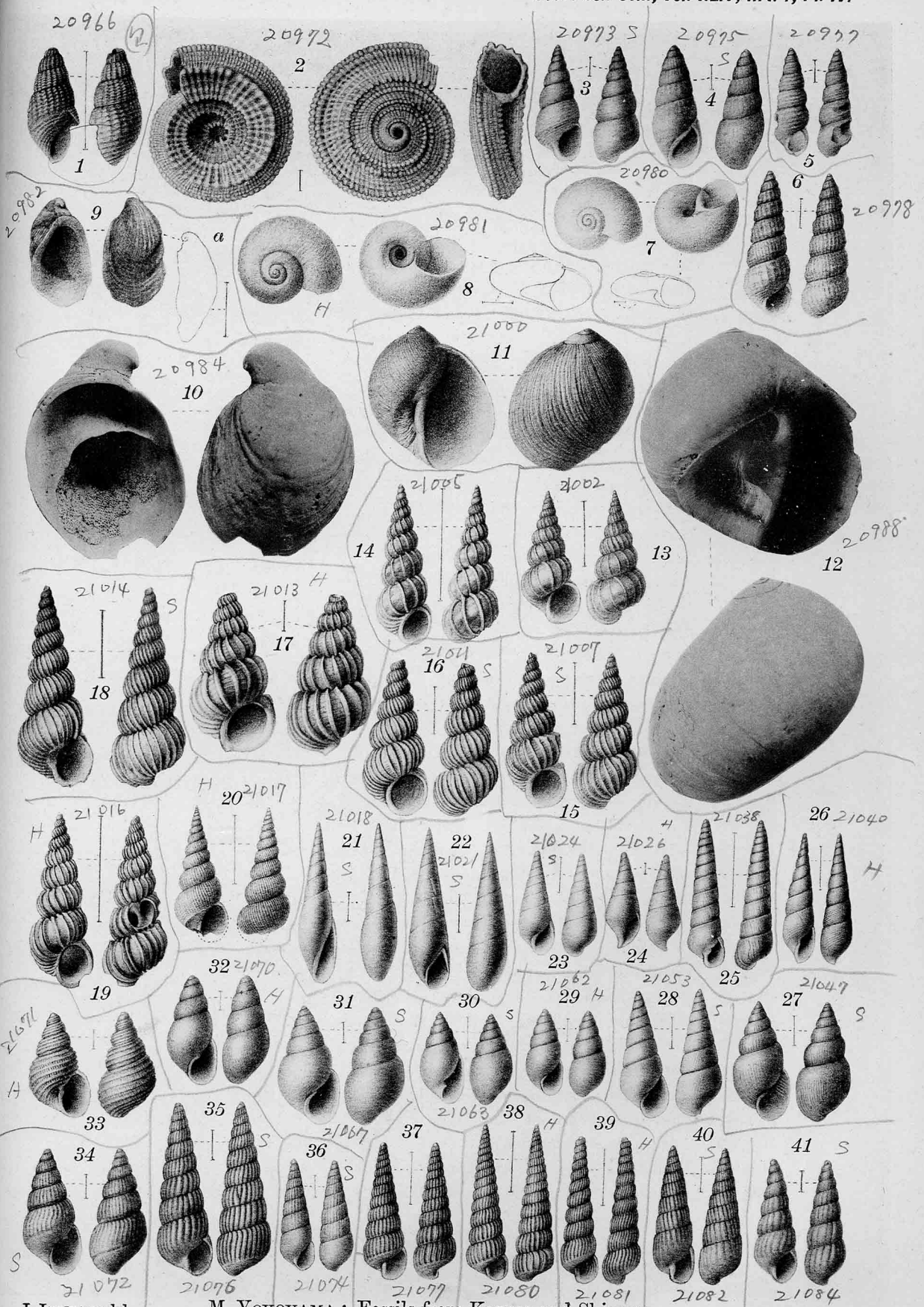
Plate IV.

Fig. 1. Melania niponica Smith. Ōtake. P. 76.
Fig. 2. Torinia elegantula Yok. Shitō. P. 78.
Fig. 3. Rissoa (Cingula) plebeja Yok. Shitō. P. 79.
Fig. 4. Rissoina (Moerchiella) manzakiana. Ōtake. P. 79.
Figs. 5, 6. Fenella septentrionalis Tok. 5. Ōtake. Vertical ribs indistinct. 6. Tega. P. 80.
Fig. 7. Skenea nipponica Yok. Tega. P. 81.
Fig. 8. Skenea planorboides Yok. Shito. P. 81.
Fig. 9. Capulus badius Dunk. a. Side-view. Kamenari. P. 82.
Fig. 10. Crepidula grandis Midd. Shitō. P. 82.
Fig. 11. Sigaretus (Eunaticina) oblongus Rve. Shitō. P. 85.
Fig. 12. Polinices powisianus Recl. Ōtake. P. 83.
Fig. 13. Scalaria aurita Sow. Ōtake. P. 85.
Fig. 14. Scalaria maculosa Ad. Ōtake. P. 86.
Fig. 15. Scalaria azumana Yok. Shitō. P. 86.
Fig. 16. Scalaria kazusensis Yok. Shitō. P. 87.
Fig. 17. Scalaria yamakawai Yok. Ōtake. P. 87.
Fig. 18. Scalaria conjuncta Yok. Tega. P. 88.
Fig. 19. Scalaria subfrondicula Yok. Shitō. P. 88.
Fig. 20. Scalaria picturata Yok. Shitō. P. 89.
Fig. 21. Eulima (Leiostraca) unicincta Yok. Ōtake. P. 89.
Fig. 22. Eulima (Leiostraca) tokunagai Yok. Ōtake. P. 90.
Fig. 23. Eulima (Leiostraca) glabroides Yok. Shitō. P. 90.
Fig. 24. Eulima (Leiostraca) krishna Yok. Shitō. P. 91.
Fig. 25. Pyramidella (Iphiana) mira Yok. Shito. P. 93.
Fig. 26. Pyramidella (Iphiana) siva Yok. Shitō. P. 94.
Fig. 27. Odostomia (Odostomia) gordonis Yok. Ōtake. P. 95.
Fig. 28. Odostomia (Odostomia) shimosensis Yok. Ōtake. P. 96.
Fig. 29. Odostomia (Odostomia) kizakiensis Yok. Tega. P. 97.
Fig. 30. Odostomia (Odostomia) venusta Yok. Shitō. P. 97.
Fig. 31. Odostomia (Odostomia) toneana Yok. Ōtake. P. 98.
Fig. 32. Odostomia (Odostomia) suboxia Yok. Ōtake. P. 98.
Fig. 33. Odostomia (Odetta) neofelix Yok. Shisui. P. 99.
Fig. 34. Odostomia (Egilina) marielloides Yok. Tega. P. 100.
Fig. 35. Turbonilla (Chemnitzia) imbana Yok. Shisui. P. 101.
Fig. 36. Turbonilla (Ptycheulimella) misella. Yok. Ōtake. P. 100.
Fig. 37. Turbonilla (Mormula) paucicostulata Tok. Shitō. P. 101.
Fig. 38. Turbonilla (Mormula) scrobiculata Yok. Ōtake. P. 102.
Fig. 39. Turbonilla (Chemnitzia) kidoensis Yok. Tega. P. 103.
Fig. 40. Turbonilla (Chemnitzia) teganumana Yok. Tega. P. 103.
Fig. 41. Turbonilla (Chemnitzia) sematana Yok. Shitō. P. 103.



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M. Yokoyama : Fossils from Kazusa and Shimosa.

Plate V.

Fig. 1. Siphonalia kellettii Forbes (somewhat reduced). Shito. P. 56.
Fig. 2. Pyramidella (Syrnola) cinnamomea Ad. Ōtake. P. 93.
Fig. 3. Pyramidella (Agatha) virgo Ad. var. brevis Yok. Ōtake. P. 92.
Fig. 4. Philine takatensis Yok. a (the lowest of the three figs., not shaded). Front-view. Shitō. P. 28.
Fig. 5. Triforis multigyrata Yok. Shito. P. 74.
Fig. 6. Pyramidella (Tiberia) pulchella Ad. Ōtake. P. 91.
Fig. 7. Odostomia desimana Dall et Bartsch. Shitō. P. 97.
Fig. 8. Sigaretus (Eunaticina) papilla Gmel. Shisui. P. 84.
Fig. 9. Sigaretus (Eunaticina) oblongus Reeve. Shitō. P. 85.
Fig. 10. Turbo (Marmorostoma) granulatus Gmel. Narita. P. 107.
Fig. 11. Turbonilla (Pyrgolampros) planicostata Yok. Shisui. P. 104.
Fig. 12. Turbonilla (Strioturbonilla) sagamiana Yok. Ōtake. P. 104.
Fig. 13. Turbonilla (Strioturbonilla) pacifica Yok. Shitō. P. 105.
Fig. 14. Turbonilla (Cingulina) triarata Pils. Shisui. P. 105.
Fig. 15. Turbonilla (Careliopsis) obscura Yok. a. Spiral sculpture (growth-lines not shown). Shitō. P. 106.
Fig. 16. Turbonilla (Careliopsis) angulifera Yok. Shitō. P. 106.
Fig. 17. Leptothyra pygmaea Yok. Tega. P. 108.
Fig. 18. Trochus spinigera Yok. Shitō. P. 109.
Fig. 19. Minolia tasmanica Tenison et Wood. Ōtake. P. 109.
Fig. 20. Solariella angulata Tok. Shitō. P. 111.
Fig. 21. Solariella philippensis Wat. Ōtake. P. 110.
Fig. 22. Leptothyra crassilirata Yok. Tega. P. 108.
Fig. 23. Turcica imperialis Ad. Shito. P. 111.
Fig. 24. Basilissa ? laeviuscula Yok. Shito. P. 113.
Fig. 25. Calliostoma unicum Dkr. var. shinagawensis Tok. Ōtake. P. 112.
Fig. 26. Cyclostrema stillicidiatum Yok. Shito. P. 114.

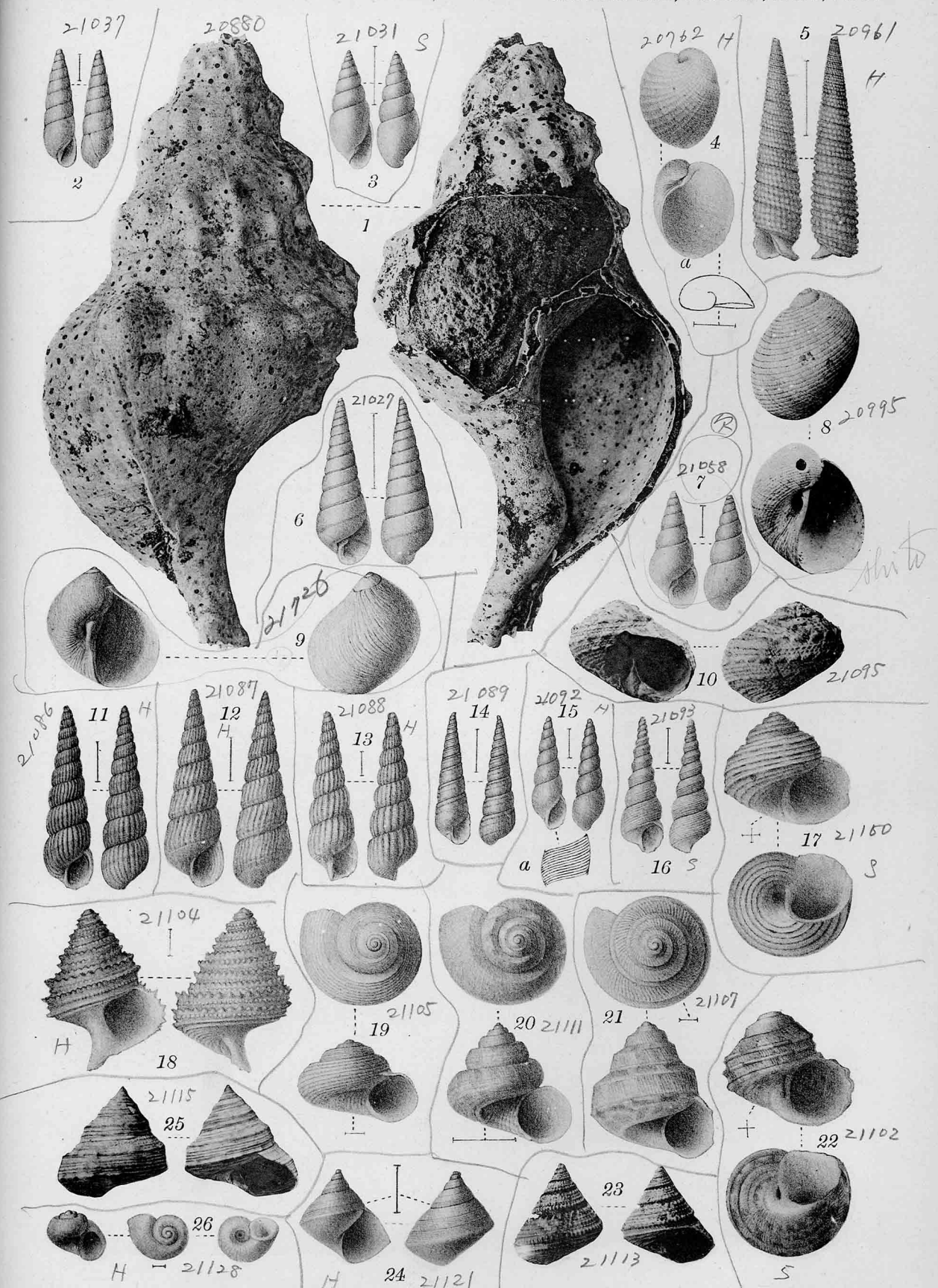

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Plate VI.

Fig. 1. Pyramidella (Actæopyramis) eximia Lke. Ōtake. P. 94.
Fig. 2. Stomatella lyrata Pils. Ōtake. P. 115.
Fig. 3. Macroschisma sinensis Ad. var. laevis Yok. Ōtake. P. 115.
Fig. 4. Puncturella nobilis Ad. Shitō. P. 116.
Fig. 5. Emarginula vadososinuata Yok. Shitō. P. 117.
Fig. 6. Dentalium weinkauffii Dkr. Ōtake. P. 118. (The concave side should have been drawn with a more uniform curve).
Fig. 7. Dentalium (Fustiaria) nipponicum Yok. Shitō. P. 119.
Figs. 8, 9. Corbula erythrodon Lam. $\frac{6}{5}$ nat. size. 8. Right valve. 9. Left valve. Ōtake. P. 122.
Fig. 10. Jouannetia kamakurensis Yok. Shitō. P. 120.
Fig. 11. Entodesma naviculoides Yok. Shitō. P. 170.
Figs. 12, 13. Trapezium nipponicum Yok. (very young specimens)?. Shitō. P. ~~270~~ 1617.
Figs. 14, 15. Panope generosa Gld. Left valves. 14. Normal form. Tega. 15. Elongated form. $\frac{3}{4}$ nat. size. Ōtake. P. 121.
Figs. 16, 17. Corbula frequens Yok. 16. Left valve. 17. Right valve. Shitō. P. 123.
Fig. 18. Corbula pustulosa Yok. Right valve. Ōtake. P. 123.
Figs. 19, 20. Corbula sematensis Yok. 19. Right valve. 20. Left valve. Shitō. P. 124.

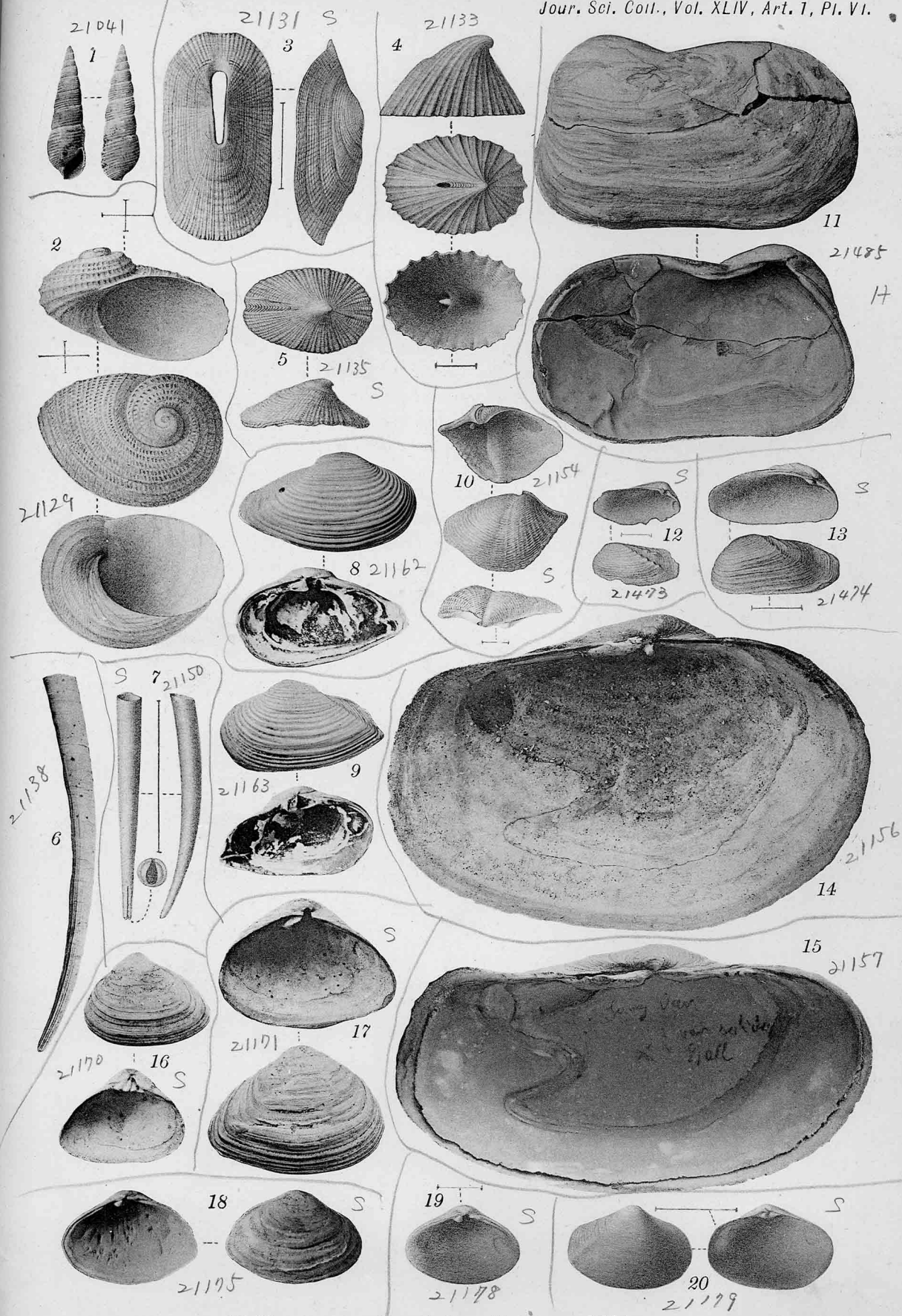

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Plate VII.

Figs. 1, 2. Cryptomya busoensis Yok. 1. Right valve. 2. Left valve. a shows depth. Ōtake. P. 126.

Fig. 3. Corbula substriata Yok. Right valve. Shitō. P. 125.

Figs. 4, 5. Corbula pygmaea Yok. 4. Right valve. a shows depth. 5. Left valve Tega. P. 125.

Fig. 6. Mactra sulcataria Desh. Shitō. P. 126.

Figs. 7, 8. Mactra dunkeri Yok. 7. Right valve. 8. Left valve. Shitō. P. 128.

Figs. 9, 10. Mactra sachalinensis Schr. var. imperialis Yok. $\frac{2}{3}$ nat. size. 9. Broad and triangular form. Shito. 10. Higher and more ovate form. Ōtake. P. 129.

Fig. 11. Soletellina olivacea Jay. Left valve. Shitō. P. 138.

Fig. 12, 13. Mactra ovalina Lam. 12. Left valve. Ōtake. 13. Right valve. Tega. P. 127.

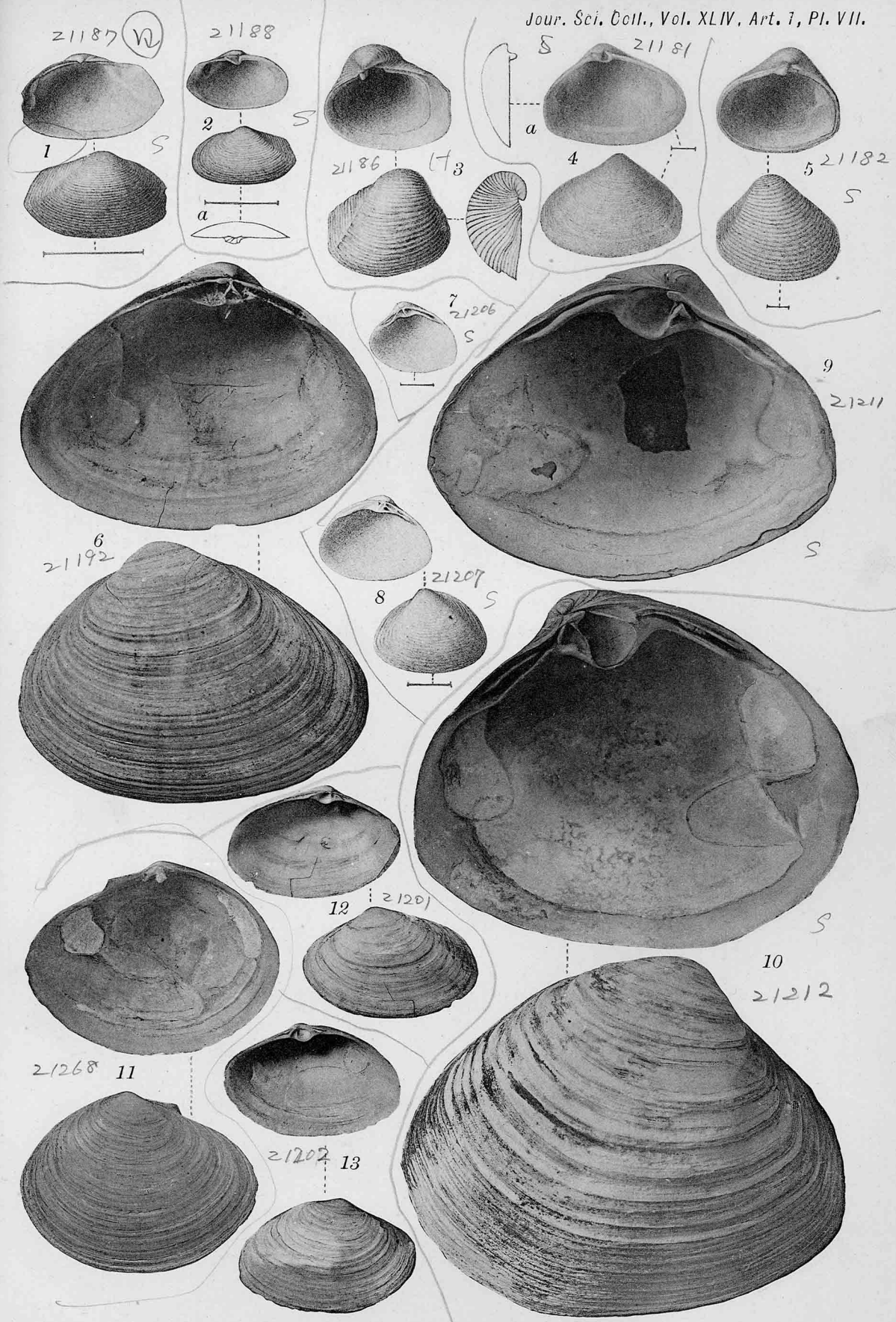

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Plate VIII.

Figs. 1, 2. Spisula grayana Schr. Shito. P. 130.
Figs. 3, 4. Spisula bernardi Pils. Kioroshi. P. 130.
Figs. 5, 6. Raeta yokohamensis Pils. Ōtake. P. 131.
Fig. 7. Raeta elliptica Yok. Tega. P. 131.
Fig. 8. Tresus nuttali Conr. ½ nat. size. Ōtake. P. 133.
Figs. 9, 10. Lutraria maxima Jon. ⅔ nat. size. Ōtake. P. 133.
Fig. 11. Tellina nitidula Dkr. Shisui. P. 139.
Figs. 12, 13. Raeta magnifica Yok. Tega. P. 132.

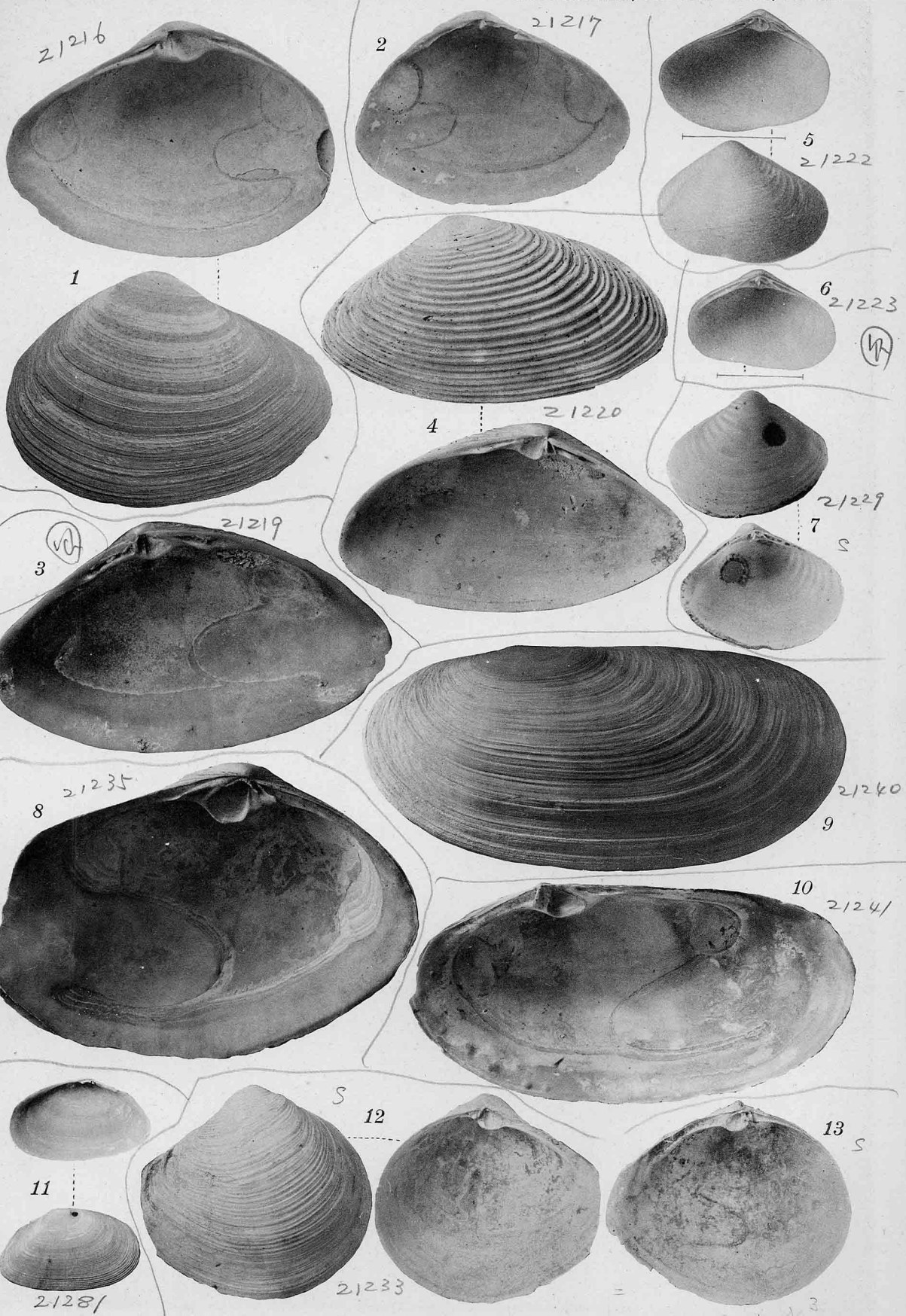

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Plate IX.

Fig. 1. Solen grandis Dkr. Left valve. Ōtake. P. 134.

Figs. 2, 3. Montacuta japonica Yok. 2. Left valve. 3. Right valve. Ōtake. P. 157.

Fig. 4. Psammobia kazusensis Yok. Left valve. Shitō. P. 136.

Fig. 5. Solen krusensterni. Schrenck. Right valve. Ōtake. P. 134.

Fig. 6. Raeta pellicula Desh. Left valve. Ōtake. P. 131.

Fig. 7. Siliqua pulchella Dkr. Right valve. Ōtake. P. 135.

Figs. 8, 9. Donax introradiatus Reeve. 8. Left valve. 9. Right valve. Tega. P. 136.

Fig. 10. Montacuta yamakawai Yok. Right valve. Shisui. P. 158.

Figs. 11, 12. Thyasira trigonata Yok. 11. Right valve. 12. Left valve. Shitō. P. 158.

Figs. 13, 14. Soletellina violacea Lam. 13. Right valve. 14. Left valve. Ōtake. P. 137.

Figs. 15, 16. Tellina jedoensis Lischke. 15. Left valve. 16. Right valve. Tega. P. 138.

Fig. 17. Soletellena olivacea Jay. Right valve. Shitō. P. 138.

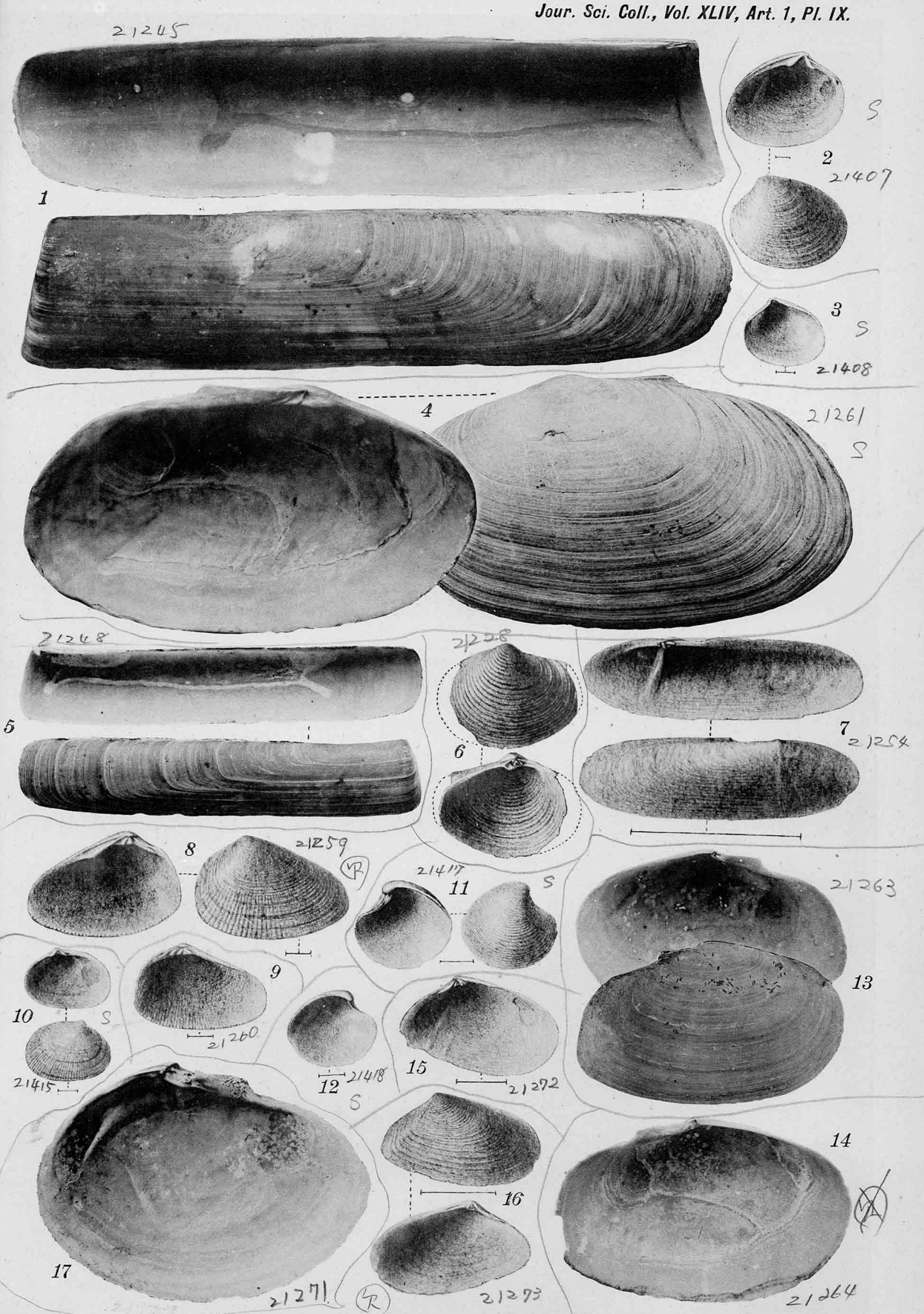

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Plate X.

Fig. 1. Tellina venulosa Schrenck. Left valve. Ōtake. P. 139.

Figs. 2, 3. Macoma praetexta Mart. 2. Right valve. 3. Left valve. Shisui. P. 142.

Fig. 4. Macoma dissimilis Mart. Left valve. Ōtake. P. 143.

Figs. 5, 6. Tellina alternata Say var. chibana Yok. 5. Left valve from Ōtake. 6. Right valve from Kamenari. P. 140.

Fig. 7. Lucinopsis divaricata Lischke. Left valve. a shows depth. Shitō. P. 145.

Figs. 8, 9, 10. Tellina delta Yok. 8. Right valve. 9. Left valve. 10. Seen from beak-side. Ōtake. P. 141.

Fig. 11. Astarte borealis Chem. Left valve. Somewhat enlarged (×1½). a. Inside. b. Outside. Shito. P. 163.

Figs. 12, 13. Dosinia bilunulata Gray. 12. Left valve. 13. Right valve. Ōtake. P. 144.

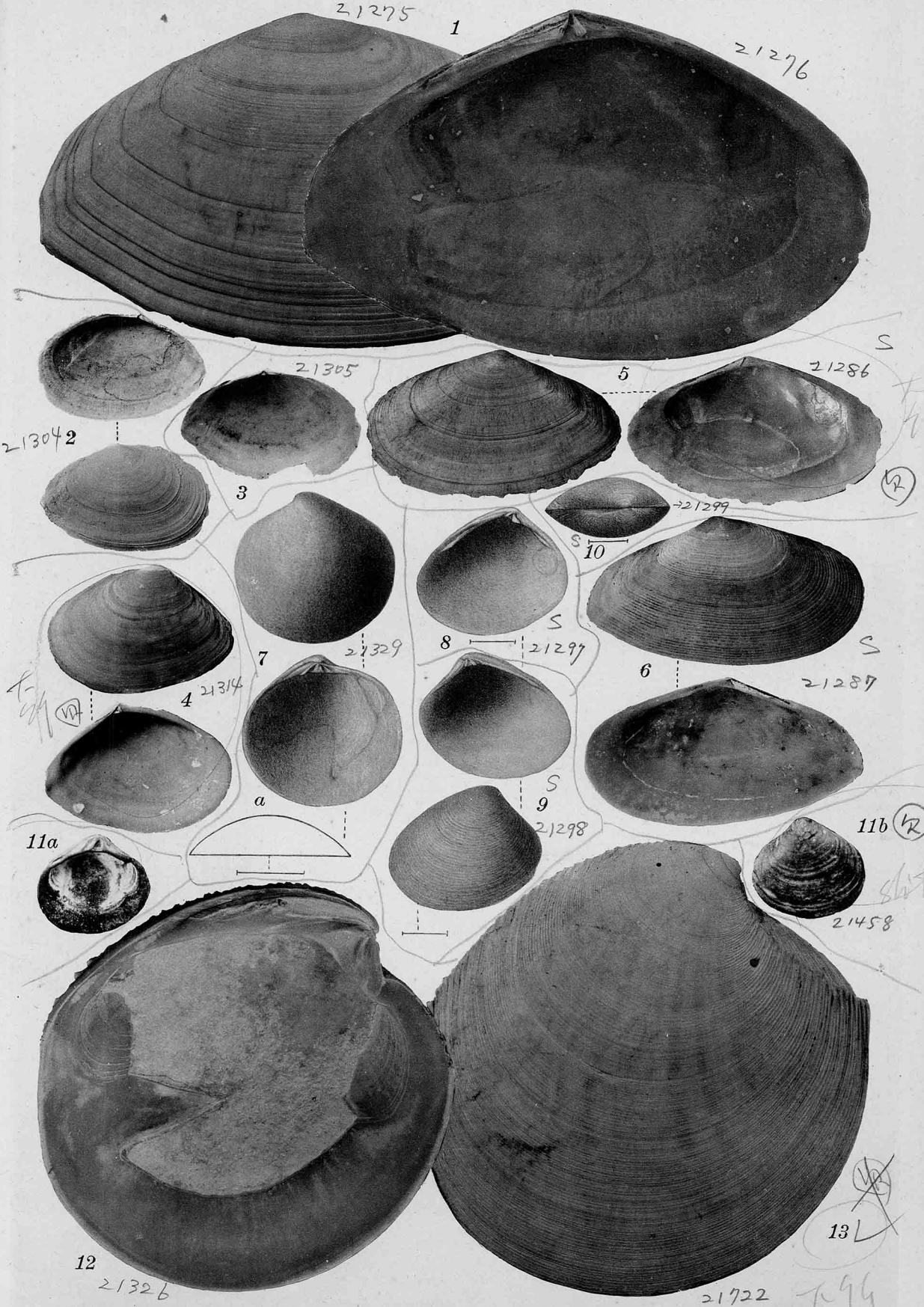

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Plate XI.

Fig. 1. Macoma secta Conrad. Left valve. Ōtake. P. 143.

Figs. 2, 3. Chione minlanensis Smith. 2. Right valve. 3. Left valve. Shitō. P. 150.

Fig. 4. Meretrix meretrix Linne. Left valve. Ōtake. P. 146.

Fig. 5. Meretrix (Callista) chinensis Chem. Right valve. Shitō. P. 146.

Figs. 6, 7, 8. Sunetta excavata Hanley. 6 ab. Left valve from Kioroshi, formerly considered to be a different species under the name of S. menstrualis Menke. 7. A young left valve from Ōtake (typical S. excavata). 8. A young right valve of menstrualis-type from Ōtake. P. 147.

Figs. 9, 10. Venus neastartoides Yok. Kioroshi. 9 ab. left valve. 10. Right valve. P. 149.

Figs. 11, 12. Venus stimpsoni Gould. Ōtake. 11. Left valve. 12. Right valve. P. 148.

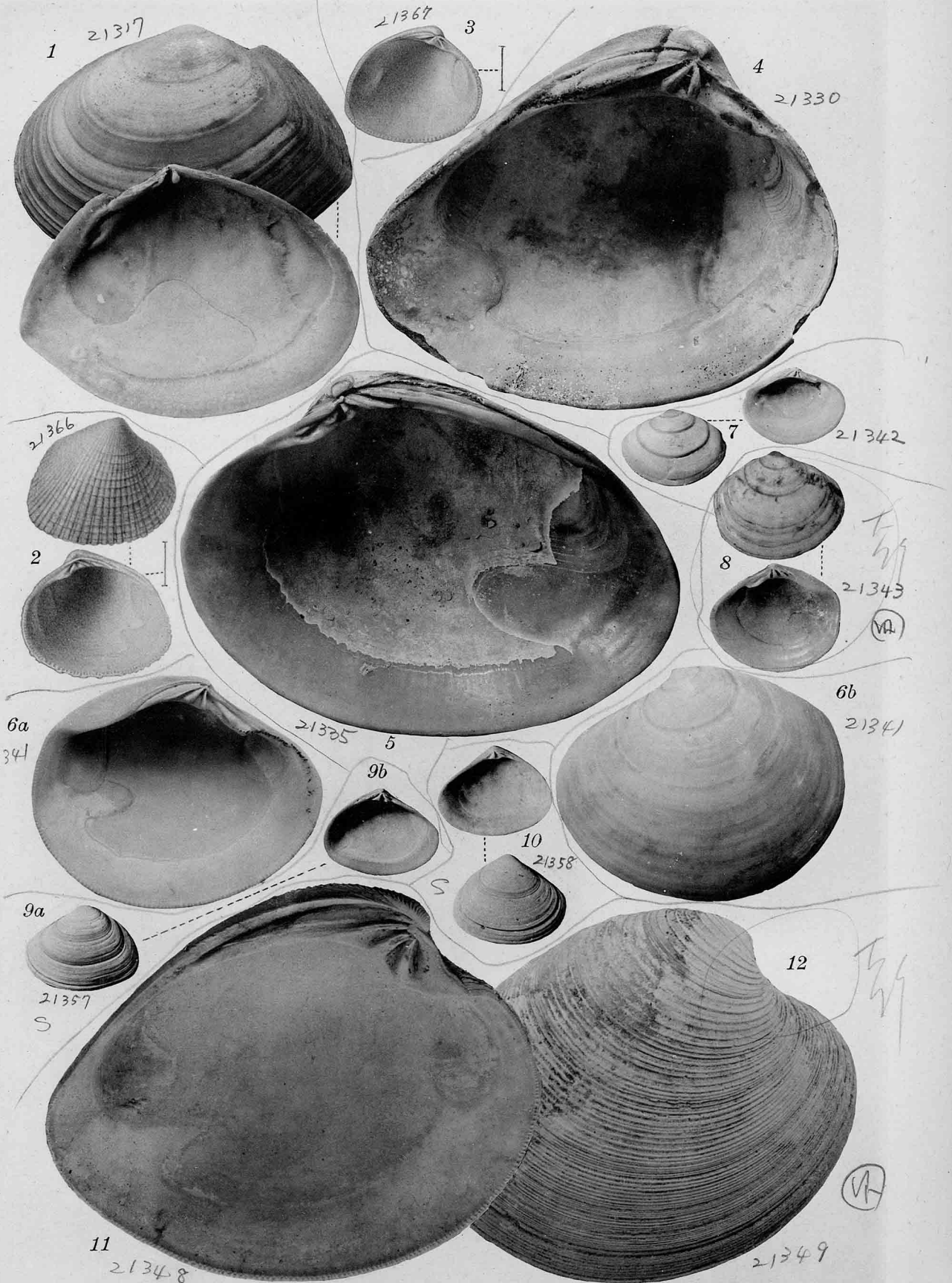

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Plate XII.

Figs. 1, 2. Venerupis semipurpurea Dkr. 1. Left valve. 2. Right valve (a form more truncate both in front and behind). Ōtake. P. 151.

Fig. 3. Cardium burchardi Dkr. Right valve. Ōtake. P. 153.

Figs. 4, 5, 6. Cardium tokunagai Yok. 4. Var. ovata. Shisui. 5, 6. Typical forms. Ōtake. P. 156.

Fig. 7. Cardium muticum. Reeve. Right valve. Ōtake. P. 154.

Fig. 8. Tapes euglyptus Phil. Left valve. Kioroshi. P. 152.

Fig. 9. Saxidomus purpuratus Sow. Right valve. Ōtake. P. 153.

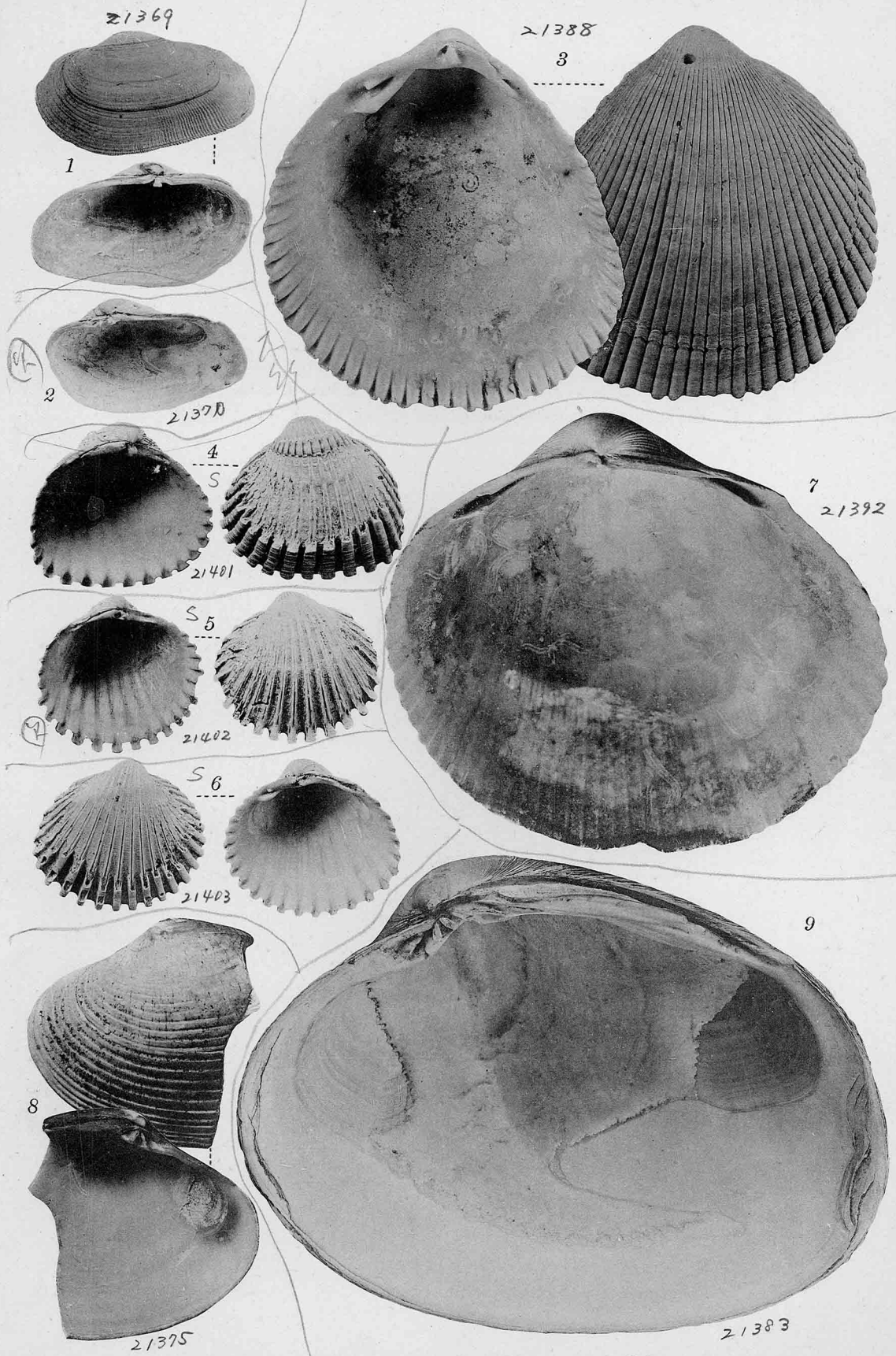

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Plate XIII.

Fig. 1 a b. Trapezium ventricosum Yok. Left valve. Ōtake. P. 108.
Fig. 2. Cardium braunsi Tok. Right valve. Ōtake. P. 155.
Fig. 3. Diplodonta usta Gld. Left valve. Ōtake. P. 159.
Fig. 4. Venericardia cipangoana Yok. Left valve. Ōtake. P. 162.
Fig. 5. Chama semipurpurata Lke. Convex valve. Ōtake. P. 161.
Figs. 6, 7. Venericardia toneana Yok. 6. Left valve. 7. Right valve. Shitō. Enlarged about 4 times. P. 163.
Fig. 8. Crassatella nana Ad. et Rve. Right valve. Kioroshi. P. 164.
Figs. 9, 10. Montacuta oblongata Yok. 9. Left valve. 10. Right valve. Drawn after Oji specimens, those from Kazusa and Shimosa being too imperfect for figuring. P. 157.
Fig. 11. Trichotropis unicarinata Brod. Shitō. P. 75.
Figs. 12, 13. Terebra tsuboiana Yok. 12. Kioroshi. 13. A living shell from Sagami Sea for comparison, the sculpture being more distinct. P. 35.
Figs. 14, 15. Corbicula sandaiformis Yok. 14. Left valve. 15. Right valve. Shitō. P. 165.
Fig. 16. Trapezium liratum Reeve. Left valve. Ōtake. P. 168.
Fig. 17. Trapezium nipponicum Yok. Right valve. Ōtake. P. 167. The left valves shown in figs. 12 and 13 of plate VI may be the young forms of this species.
Figs. 18, 19. Corbicula kobelti Yok. 18. Right valve. 19. Left valve. Shitō. P. 166.

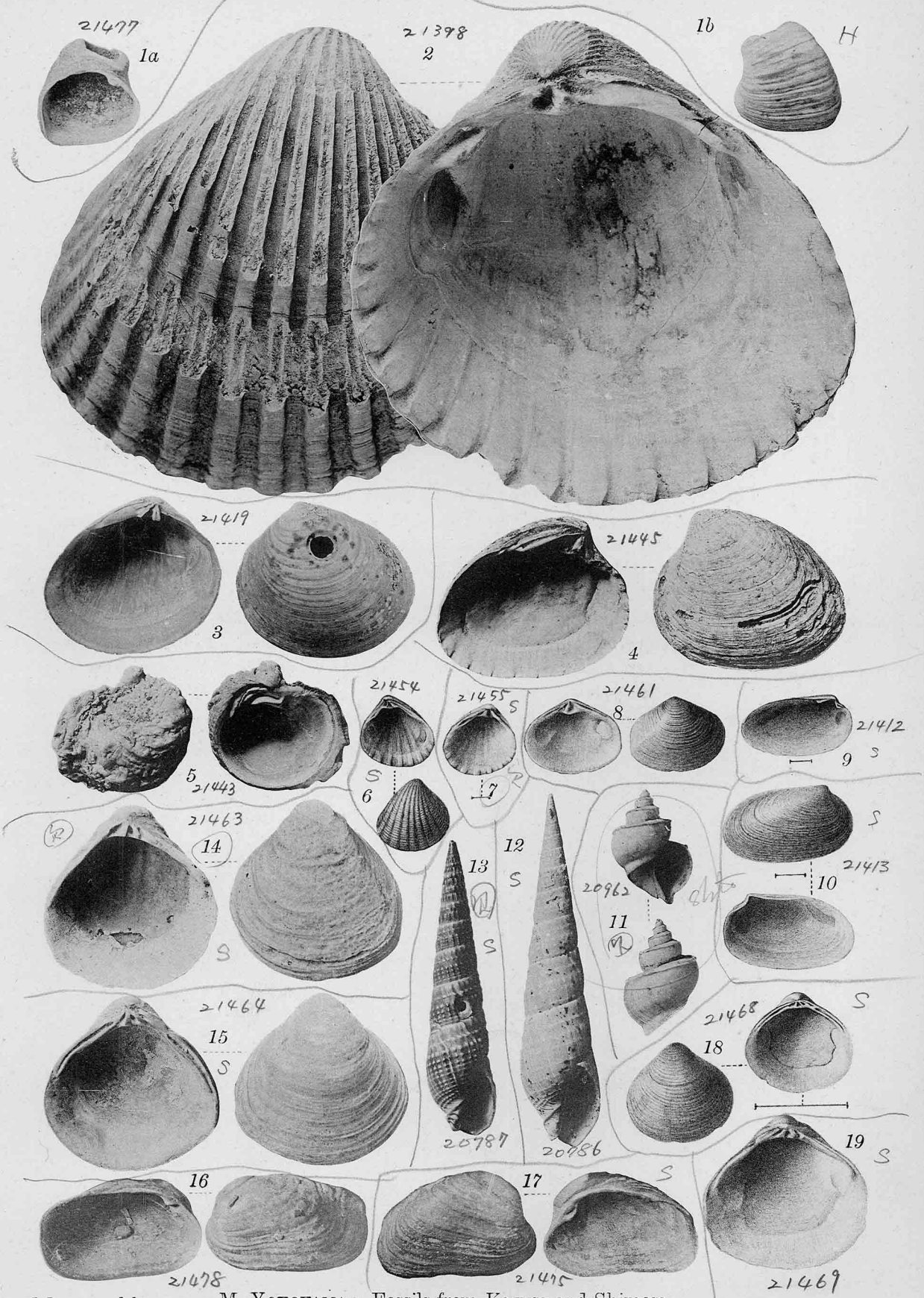

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Plate XIV.

Fig. 1. Odostomia limpida Dall. Ōtake. P. 96.

Fig. 2. Diplodonta semiaspera Phil. Right valve. Shisui. P. 160.

Figs. 3, 4. Cuspidaria ligula Yok. 3. Left valve. 4. Right valve. Shitō. P. 169.

Fig. 5. Coralliophaga coralliophaga Chem. Right valve. Shitō. P. 166.

Figs. 6, 7. Myodora fluctuosa Gld. 6. Left valve. 7. Right valve. Ōtake. P. 170.

Figs. 8, 11. Myodora reeviana Smith. 8. Right valve. a. Front view. 11. Left valve. a. Shows depth. Shito. P. 171.

Figs. 9, 10. Lyonsia praetenuis Dkr. 9. Right valve. 10. Left valve. Ōtake. P. 169.

Figs. 12. Thracia papyracea Poli. Right valve. a. Shows depth. Ōtake. P. 171.

Figs. 13, 14. Thracia transmontana Yok. 13. Right valve. a. Shows depth. 14. Left valve. Shitō. P. 172.

Figs. 15, 16. Poromya flexuosa Yok. 15. Left valve. a. Shows depth. 16. Right valve. Shitō. P. 173.

Figs. 17, 18. Thracia sematana Yok. 17. Right valve. a. Shows depth. 18. Left valve. Shitō. P. 173.

Fig. 19. Modiola barbata L. Right valve. Tega. P. 174.

Figs. 20, 21. Anomia sematana Yok. Somewhat enlarged ($\frac{4}{3}$). Convex valves. Shitō. P. 177.

Figs. 22, 23. Anomia lunula Yok. $\frac{4}{3}$. 22. Flat valve. 23. Convex valve. Ōtake. P. 177.

Fig. 24. Spondylus cruentus Lke. $\frac{4}{3}$. Upper valve. Ōtake. P. 179.

Fig. 25. Plicatula cuneata Dkr. $\frac{4}{3}$. Right valve. Kamenari. P. 180.

Fig. 26. Pecten laetus Gld. Shitō. P. 180.

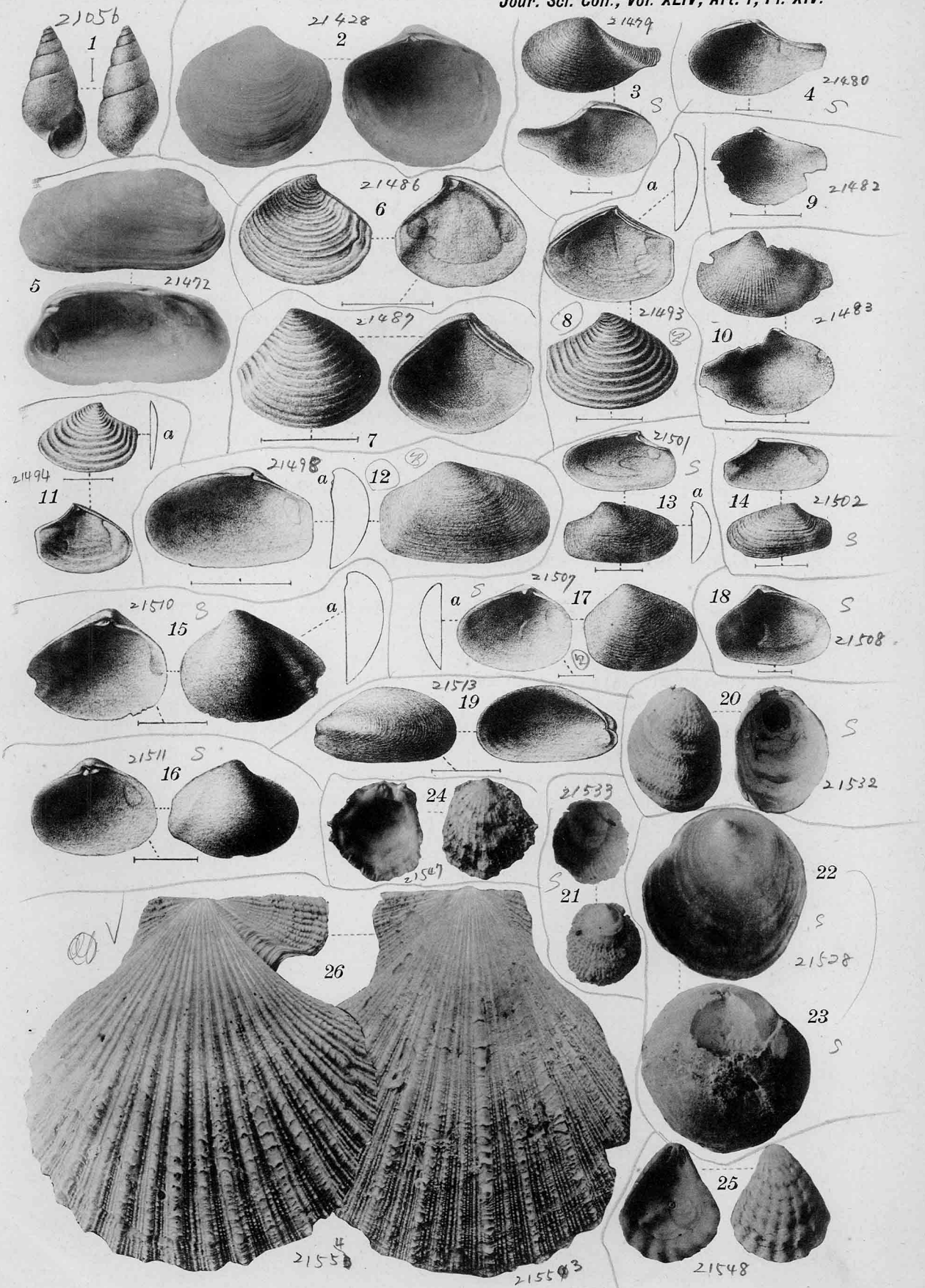

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Plate XV.

Figs. 1, 2. Pecten tissoti Bern. 1. Right valve. 2. Left valve. Shitō. P. 182.
Fig. 3. Pecten subplicatus Sow. Right valve. Kioroshi. P. 181.
Fig. 4. Arca (Anomalocardia) granosa L. Left valve. Shisui. P. 186.
Fig. 5. Ostrea musashiana Yok. Lower valve. Shitō. P. 185.
Figs. 6, 7. Pecten excavatus Ant. 6. Flat valve. 7. Convex valve. Shitō. P. 183.
Fig. 8. Pinna japonica Hanl. Fragment of a beak-portion. Shitō. P. 185.
Fig. 9. Arca (Anomalocardia) inflata Rve. Left valve. Ōtake. P. 187.
Figs. 10, 11. Crenella divaricata Yok. 10. Left valve. a shows depth. 11. Right valve. Shitō. P. 175.
Fig. 12. Arca (Scapharca) subcrenata Lke. Left valve. Ōtake. P. 187.

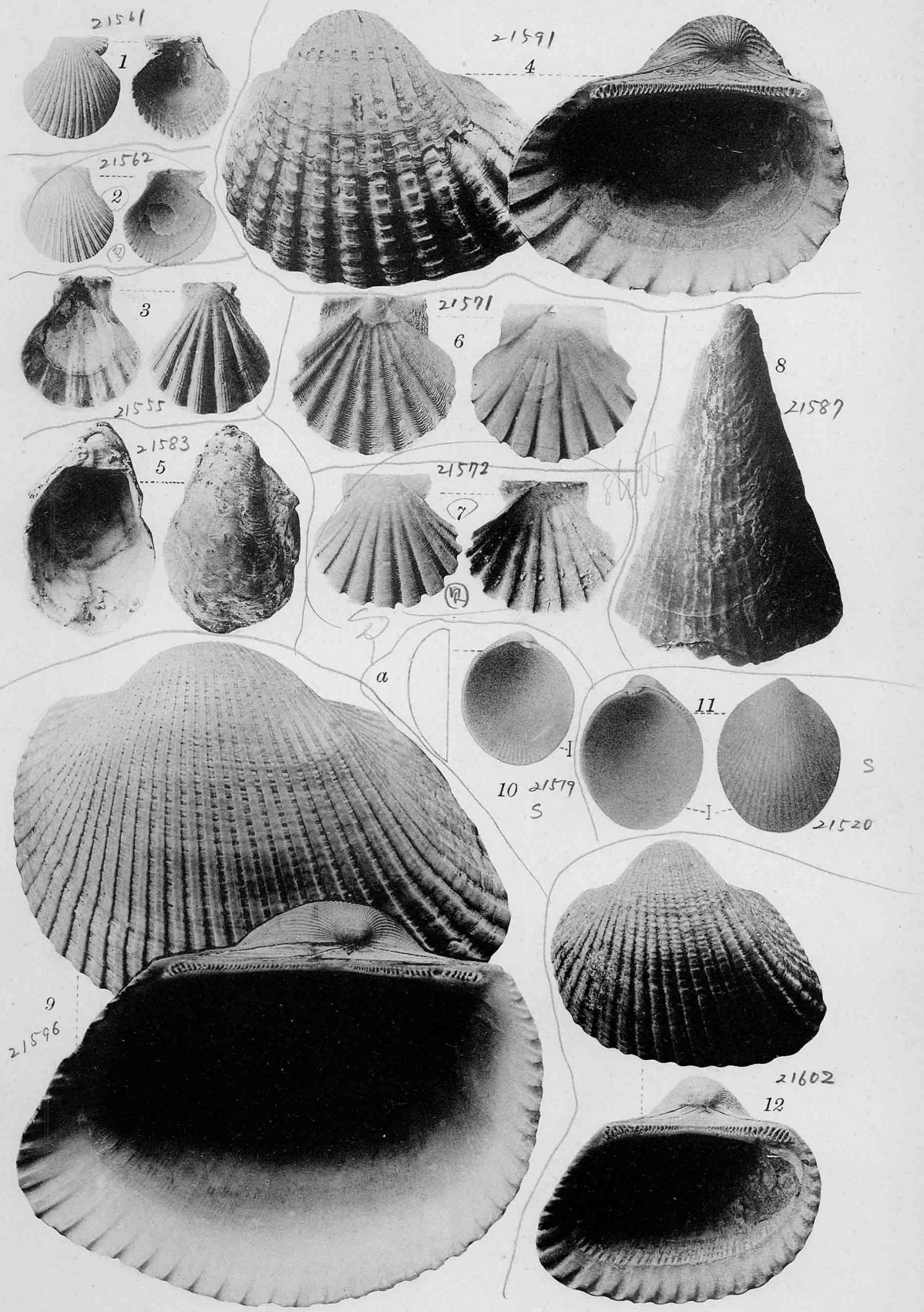

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Plate XVI.

Figs. 1, 2. Pectunculus vestitus Dkr. Adult specimens from Ōtake. 1. Right valve. 2. Left valve. P. 189.

Fig. 3. Do. Young right valve from Tega. P. 189.

Figs. 4, 5. Pectunculus yamakawai Yok. 4. Right valve. 5. Left valve. Shitō. P. 190.

Figs. 6, 7. Pectunculus yessoensis Sow. 6. Left valve. 7. Right valve. Shitō. P. 189.

Figs. 8, 9. Pectunculus pilsbryi Yok. 8. Left valve. 9. Right valve. Shitō. P. 190.

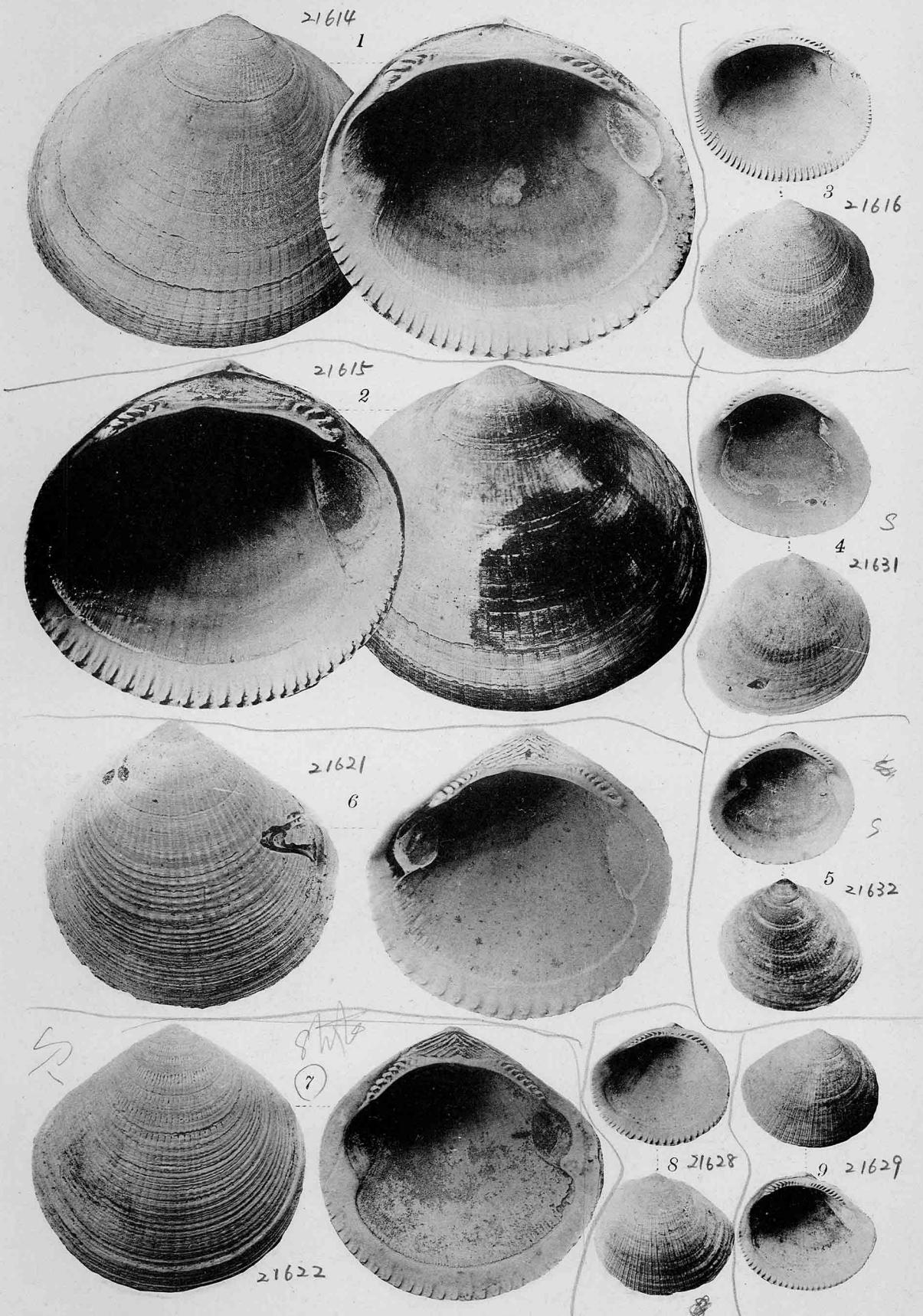

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Plate XVII.

Figs. 1, 2, 3. Pectunculus albolineatus Lke. Ōtake 1, 3. Left valves. 2. Right valve. P. 188.

Fig. 4. Leda confusa Hanl. Left valve. Tega. P. 195.

Fig. 5. Limopsis woodwardi Ad. Left valve. Tega. P. 192.

Figs. 6, 7. Limopsis areolata Yok. Shitō. 6. Left valve. 7. Right valve. P. 194.

Figs. 8, 9. Cucullaria orientalis Yok. Shitō. 8. Right valve. 9. Left valve. P. 191.

Fig. 10. Yoldia notabilis Yok. Right valve. Ōtake. P. 196.

Figs. 11, 12. Eudesia grayi Dav. Shitō. 11. Ventral valve. 12. Dorsal valve. P. 199.

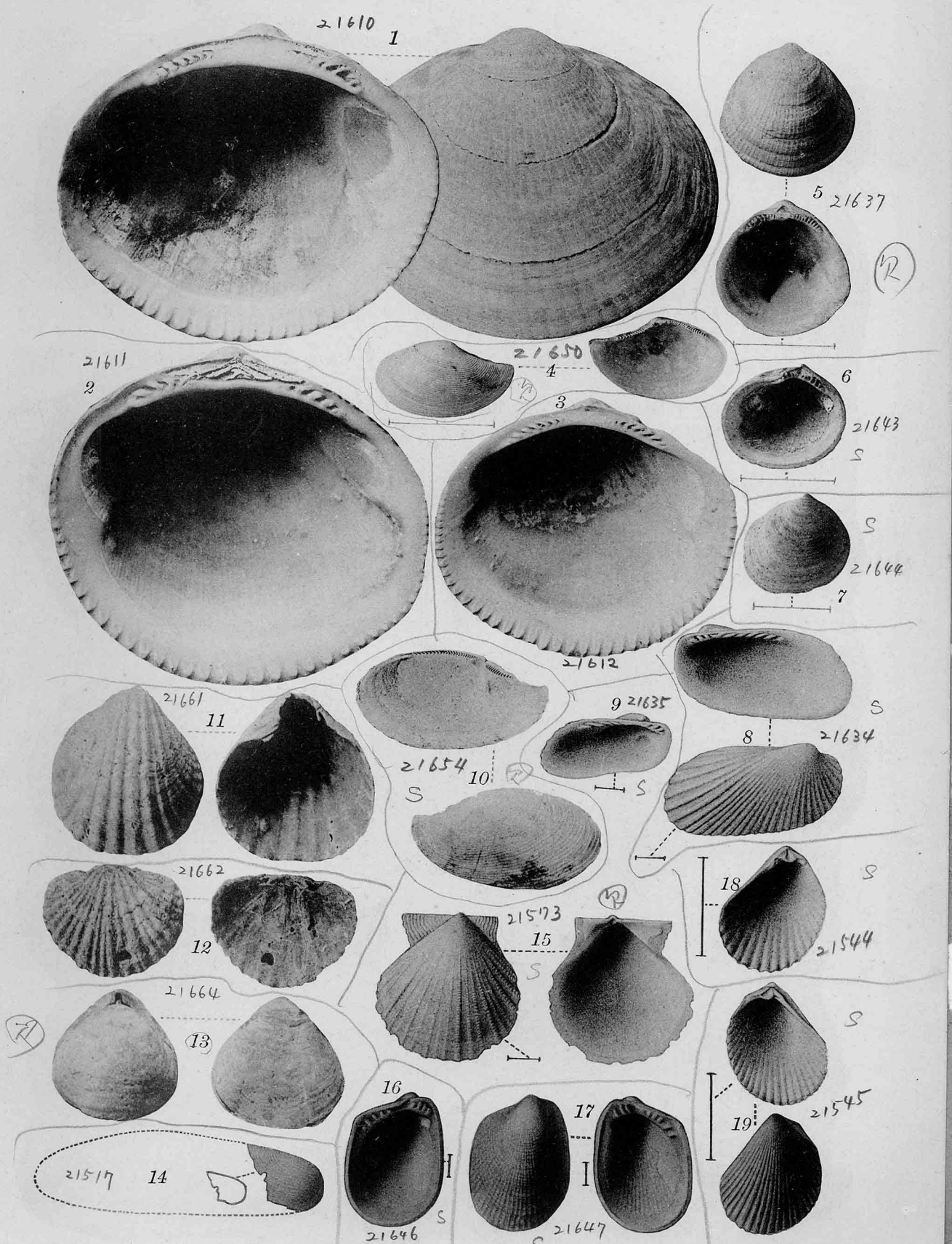
Figs. 13. Rhynchonella psittacea Chem. var. woodwardi Ad.. a. Dorsal view. b. Ventral view. P. 200.

Fig. 14. Lithophaga zitteliana Dkr. Ōtake. Fragment of a right valve. P. 175.

Fig. 15. Pecten tenuicostulatus Yok. Shitō. Left valve. P. 184.

Figs. 16, 17. Limopsis nipponica Yok. 16. Left valve. 17. Right valve. Kioroshi. P. 195.

Figs. 18, 19. Lima vulgatula Yok. Shitō. 18. Right valve. 19. Left valve. P. 179.



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NOTICE

Vol. XLII.:

Art. 1. R. Torii:—Etudes archéologiques et ethnologiques. Les Ainou des iles Kouriles. *Avec 38 planches et 118 illustrations dans le texte.* Publ. January 29th, 1919.

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Art. 6. S. Tsuboi:—Volcano Ôshima, Idzu. *With 6 plates and 42 text-figures.* Publ. May 10th, 1920.

Art. 7. M. Tahara:—Cytologische [illegible] an Einigen Kompositen. *Mit 4 Tafeln und 15 Textfiguren.* [illegible]ch 30th, 1921.

Art. 8. Y. Kudô:—Enum[illegible]atarum specierum varietatum formarumque in Insulis K[illegible]ensibus et Insula Yezoensi sponte nascentium. Publ. March 30th, 1921.

Vol. XLIV.:

Art. 1. M. Yokoyama:—Fossils from the Upper Musashino of Kazusa and Shimosa. *With 17 plates.* Publ. July 7th, 1922.

Art. 2. T. Kaburaki:—On some Japanese Freshwater Triclads; with a Note on the Parallelism in their Distribution in Europe and Japan. *With 1 plate and 14 text-figures.* Publ. June 23rd, 1922.

Art. 3. In press.

Art. 4. In press.