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Mollusca from the Upper Musashino of Western Shimôsa and Southern Musashi

By

Matajiro YOKOYAMA, *Rigakuhakushi*

With 2 Plates

In the collections of fossil shells left by the late Mr. Gordon Yamakawa and now kept in the Geological Institute of the Imperial University of Tokyo, I found some obtained at Matsudo[1], Western Shimôsa, and also at several places[2] in Southern Musashi, not far from the railway station of Tsurumi, both including interesting forms. Also, while I was engaged in their examination, Dr. Y. Ozawa of the Imperial University of Tokyo collected similar shells in Western Shimôsa at Ichikawa[3] and in Southern Musashi at Namamugi.[4] All of these fossils together with some brought back by myself from Hanéno,[5] Western Shimôsa, several years ago, form the subject of the present paper.

The number of species afforded by these localities, eight in all, amounts to one hundred and seventy-five, as shown in the following table:

1) 下總東葛飾郡松戸 2) The names of these places are: Shimo-Suyeyoshi (橘樹郡下末吉), Koyasu (同郡子安), Shinowara (同郡篠原) and Kikuna (同郡菊名). 3) 東葛飾郡市川 4) 橘樹郡生麥 5) 北相馬郡羽根野.

The fossils from Ichikawa were obtained from a bridge-abutment excavation on the bank of the Edogawa.

Gastropoda	Musashi: Shimo-Suyeyoshi	Musashi: Namamugi	Musashi: Koyasu	Musashi: Shinowara	Musashi: Kikuna	Shimōsa: Ichikawa	Shimōsa: Matsudo	Shimōsa: Haneno	Geological Occurrence
1. Solidula strigosa (Gld.)						+			Recent (Centr.– South. Japan). Up. Musashino
2. Tornatina exilis Dkr.	+		+						Rec. (West. Japan). Up. a. Low. Musashino
3. Tornatina simplex Ad.						+			Rec. (Japan). Up. Musashino
4. Tornatina longispirata Yam.		+							Up. Musashino
5. Tornatina koyasensis n. sp.			+						
6. Tornatina dulcis n. sp.	+								
7. Retusa globosa Yam.						+			Up. Musashino
8. Retusa gordonis n. sp.							+		
9. Retusa cucurbitina n. sp.			+						
10. Cylichna musashiensis Tok.						+			Rec. (Centr. Japan). Up. a. Low. Musashino
11. Cylichna yamakawai Yok.	+		+						Up. Musashino
12. Philine scalpta Ad.		+							Rec. (C. a. W. Japan). Up. Musashino
13. Ringicula musashinoensis Yok.	+		+	+	+	+	+		Rec. (C. Japan). Up. a. Low. Musashino
14. Terebra edoensis Yok.		+							Up. Musashino
15. Pleurotoma vertebrata Sm.		+				+	+		Rec. (C. a. W. Japan). Up. Musashino
16. Drillia principalis Pils.		+				+	+	+	Rec. (N. C. W. Japan). Up. a. Low. Musashino
17. Drillia nivalioides Yok.		+							Up. a. Low. Musashino
18. Mangilia deshayesii Dkr.						+			Rec. (C. a. W. Japan). U. a. Low. Musashino
19. Mangilia fukuchiana Yok.						+			Rec. (C. Japan). Up. Musashino
20. Cancellaria spengleriana Desh.		+				+	+	+	Rec. (C. Japan–Philippines). Up. Mus.– Pliocene.
21. Olivella fortunei (Ad.)							+	+	Rec. (C. Japan, China). Up. Mus.– Pliocene
22. Siphonalia spadicea (Rve.)								+	Rec. (N. a. C. Japan). Up. a. Low Musashino
23. Siphonalia trochulus (Rve.)								+	Rec. (C. Japan). Up. a. Low. Musashino
24. Eburna japonica Rve.		+				+	+	+	Rec. (N.–S. Japan). Up. Musashino
25. Nassa (Hima) japonica Ad.		+		+	+	+	+	+	Rec. (C. a. W. Japan). Up. Mus.– Pliocene
26. Nassa (Hima) festiva Pow.	+	+	+	+	+	+	+		Rec. (N.C.W. Japan). Up. a. Low. Musashino

	Musashi					Shimôsa			Geological Occurrence
	Shimo-Suyeyoshi	Namanugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Haneno	
27. Nassa (Niotha) livescens Phil.	+	+	+			+			Rec. (C. Japan-Philippines). Up. a. Low. Musashino
28. Columbella (Mitrella) dunkeri Try.		+			+		+	+	Rec. (N.C.W. Japan). Up. Musash.-Pliocene
29. Columbella (Atilia) martensi Lke.						+			Rec. (N.C.W. Japan). Musashino
30. Columbella (Atilia) smithi Yok.		+							Rec. (C. Japan). Up. Musash.-Pliocene
31. Columbella (Atilia) pumila Dkr.	+		+				+		Rec. (C. a. W. Japan). Up. Musashino
32. Ocinebra contracta (Rve.)						+			Rec. (N.- S. Japan). Coral Bed.
33. Rapana bezoar L. var. thomasiana Cr.	+	+	+			+	+		Rec. (N.C.W. Japan). Up. Mus.-Pliocene
34. Purpura alveolata Rve.							+		Rec. (C.W. Japan, Panama). Up. Mus. Pliocene
35. Dolium luteostomum Küst.		+				+	+	+	Rec. (N.- S. Japan). Up. a. Low. Musashino
36. Erato callosa Ad. et Rve.						+			Rec. (C. a. W. Japan. (hina). Up. Musashino
37. Strombus japonicus Rve.						+			Rec. (C.W.S. Japan). Up. Musashino
38. Bittium binodulosum Yok.	+				+				Up. a. Low. Musashino
39. Cerithium (Clava) kochi Phil.		+				+	+	+	Rec. (C. a. W. Japan, E. Africa). Up. Musashino
40. Potamides (Batillaria) zonalis Brug.	+	+	+			+	+		Rec. (N.-W. Japan, Hongkong). Up. Musashino.
41. Potamides (Batillaria) multiformis (Lke.)	+		+				+		Rec. (C. a. W. Japan). Up. Musashino
42. Potamides (Tympanotonos) fluviatilis (P. et M.)	+		+			+	+		Rec. (C. a. W. Japan). Up. Musashino
43. Cerithiopsis ichikawensis n. sp.						+			
44. Thylacodes medusae Pils.		+				+			Rec. (C.-S. Japan). Up. Musashino
45. Vermetus perplanorbis n. sp.			+						
46. Littorina adonis n. sp.			+						
47. Littorina lucida n. sp.			+						
48. Litiopa simplex Yok.						+			Up. Musashino
49. Rissoa (Cingula) paludinoides Yok.			+						Up. Musashino
50. Rissoa (Cingula) ichikawensis n. sp.						+			
51. Rissoa (Amphithalamus) edogawensis n. sp.						+			

	Musashi					Shimōsa			Geological Occurrence
	Shimo-Suyeyoshi	Namanugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Hanemo	
52. Fenella septentrionalis Tok.	+		+		+	+	+		Rec. (C. Japan). Up. Musashino
53. Fenella tokunagai Yok.	+		+						Up. Musashino
54. Fenella perpupoides n. sp.	+		+						
55. Calyptraea mammilaris (Brod.)		+							Rec. (W. Coast America). Up. Mus.-Miocene
56. Natica janthostoma Desh.							+	+	Rec. (N. a. C. Japan). Up. Mus.-Miocene
57. Polinices (Neverita) ampla (Phil.)		+			+	+	+	+	Rec. (N.- S. Japan). Up. Mus.-Pliocene
58. Sigaretus (Eunaticina) papilla (Gm.)			+			+			Rec. (C.W. Japan, Philippines). Up. Mus.-Pliocene.
59. Scala picturata Yok.						+			Rec. (C. Japan). Up. Musashino
60. Scala conjuncta Yok.						+			Up. Musashino
61. Scala densicostata Yok.		+							Up. a. Low. Musashino
62. Eulima (Leiostraca) sagamiana Yok.						+			Low. Musashino
63. Eulima (Leiostraca) tokunagai Yok.							+		Up. Musashino
64. Eulima (Leiostraca) krishna Yok.							+		Up. Musashino
65. Eulima (Subularia) ozawai n. sp.						+			
66. Pyramidella (Actaeopyramis) eximia (Lke.)						+		+	Rec. (C. a. W. Japan). Up. Mus.-Pliocene
67. Pyramidella (Agatha) virgo (Ad.) var. brevis						+		+	Rec. (C. Japan). Up. Musashino
68. Pyramidella (Tiberia) pulchella (Ad.)						+			Rec. (C. a. W. Japan). Up. Musashino
69. Pyramidella (Iphiana) mira Yok.		+							Up. Musashino
70. Odostomia (Odostomia) limpida D. et B.				+					Rec. (W. Japan). Up. Musashino
71. Odostomia (Odostomia) sublimpida Yok.					+				Up. Musashino
72. Odostomia (Odostomia) desimana D. et B.						+			Rec. (C. Japan). Up. Musashino
73. Odostomia (Heida) rusticella n. sp.						+			
74. Turbonilla (Cingulina) cingulata Dkr.						+	+		Rec. (C. a. W. Japan)
75. Turbonilla (Cingulina) triarata Pils.						+			Rec. (W. Japan). Up. Musashino

	Musashi					Shimôsa			Geological Occurrence
	Shino-Suyeyoshi	Namamugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Haneno	
76. Turbonilla (Pyrgisculus) shigeyasui Yok.	+		+						Up. Musashino
77. Turbonilla (Careliopsis) filiola n. sp.			+						
78. Turbo (Marmorostoma) granulatus Gm.						+			Rec. (C. a. W. Japan, Ind. Ocean). Up. Musashino
79. Leptothyra purpurescens (Dkr.)		+					+	+	Rec. (Japan). Up. Musashino
80. Calliostoma unicum (Dkr.) var. shinagawensis Yok.		+			+			+	Up. Musashino
81. Umbonuim costatum (Val.)		+			+	+		+	Rec. (N.C.W. Japan). Up. a. Low. Musashino
82. Umbonium giganteum (Les.)							+		Rec. (C. a. W. Japan). Up. a. Low. Musashino
Scaphopoda									
83. Dentalium octogonum Lam.	+	+				+			Rec. (N.C.W. Japan. Ceylon). Up. a. Low. Musashino
84. Dentalium semipolitum Sow.		+							Rec. (C. W. Japan, Lower. California). Up. Musashino
85. Siphonodentalium ozawai Yok.						+			Rec. (C. Japan). Up. Musashino.
Lamellibranchiata									
86. Pholas fragilis Sow.					+	+			Rec. (W. Japan, Philippines). Up. Musashino
87. Pholas cupula Yok.			+						Coral Bed.
88. Teredo sp.			+						
89. Panope generosa (Gld.)		+				+			Rec. (N. Japan). Up Musash.–Pliocene
90. Corbula venusta Gld.						+		+	Rec. (N. Japan). Up. Musash.–Pliocene
91. Mya arenaria L.					+	+			Rec. (N.C.W. Japan, N. Atlantic). Pliocene
92. Cryptomya busoensis Yok.		+	+						Rec. (C. Japan). Up. Musashino
93. Cryptomya tachibanensis n. sp.		+				+			
94. Mactra sulcataria Desh.		+			+	+	+	+	Rec. (N.C.W. Japan). Up. Musash.
95. Mactra veneriformis Desh.						+	+		Rec. (N.C.W. Japan). Up. Musash.
96. Mactra dunkeri Yok.						+			Rec. (C. Japan). Up. Musashino
97. Mactra ovalina Lam.								+	Rec. (C. Japan). Up. Musashino

	Musashi					Shimōsa			Geological Occurrence
	Shimo-Suyeyoshi	Namamugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Haneno	
98. Mactra sachalinensis Schr. var. imperialis Yok.							+		Up. Musashino
99. Raeta yokohamensis Pils.		+							Rec. (C. Japan). Up. Mus.–Pliocene
100. Raeta elliptica Yok.					+				Up. Musashino
101. Solen krusensternii Schr.		+			+			+	Rec. (N. Japan). Up. Mus.–Pliocene
102. Solen gouldii Conr.						+			Rec. (N.C.W. Japan). Up. Mus.–Pliocene
103. Solecurtus divaricatus (Lke.)						+		+	Rec. (C. a. W. Japan). Up. Musashino
104. Donax paululus n. sp.							+		
105. Soletellina violacea Lam.								+	Rec. (N.C.W. Japan, Philippines). Up. Musashino
106. Soletellina olivacea Joy.						+			Rec. (N.C.W. Japan, Chefoo). Up. Musashino
107. Theora lubrica Gld.					+				Rec. (N.C.W. Japan). Up. Musashino
108. Tellina venulosa Schr.					+				Rec. (N. Japan). Up. Musashino
109. Tellina nitidula Dkr.	+	+	+		+	+			Rec. (C.a.W. Japan). Up. a. Low Musashino
110. Tellina iridella Mart.						+			Rec. (C. a. Japan). Up. Musashino
111. Tellina pallidula Lke.	+		+						Rec. (W. Japan)
112. Tellina delta Yok.					+	+		+	Rec. (C. Japan). Up. Musashino
113. Tellina alternata Say, var. chibana Yok.								+	Rec. (C. Japan). Up. Musashino
114. Tellina ojiensis Tok.						+		+	Rec. (N.a.C. Japan). Up. Musashino
115. Macoma dissimilis (Mart.)		+	+	+		+			Rec. (C. Japan). Up. Mus.–Pliocene
116. Macoma nipponica (Tok.)								+	Rec. (N. Japan). Up. Musashino
117. Macoma praetexta (Mart.)					+				Rec. (C. a. W. Japan). Up. Mus.–Miocene
118. Macoma secta (Cour.)						+			Rec. (C.a.W. Japan). Up. Mus.–Pliocene
119. Dosinia troscheli Lke.						+			Rec. (C.a.W. Japan). Up. Mus.–Pliocene
120. Dosinia angulosa Phil.		+	+			+			Rec. (C. W. Japan, Plilippines). Up. Mus.–Pliocene
121. Cyclina chinensis (Chem.)			+			+			Rec. (N.C.W. Japan, Annern). Up. Mus.– Pliocene

	Musashi					Shimôsa			Geological Occurrence
	Shimo-Suyeyoshi	Namamugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Haneno	
122. Meretrix meretrix (L.)	+		+			+	+		Rec. (N.C.W. Japan, Philippines) Up. Mus.–Pliocene.
123. Meretrix (Callista) chinensis (Chem.)		+				+		+	Rec. (N.C.W. Japan, China). Up Mus.–Miocene.
124. Sunetta excavata (Hanl.)							+	+	Rec. (N.C.W. Japan). Up. Musashino
125. Venus neastartoides Yok.							+	+	Rec. (C. Japan). Up. Musashino
126. Venus jedoensis Lke.								+	Rec. (N.C.W. Japan). Up. Musashino
127. Chione isabellina (Phil.)						+			Rec. (Japan. China). Up. Mus.–Pliocene
128. Chione crenifera (Sow.)						+			Rec. (W. Japan, Peru)
129. Tapes variegatus Hanl.		+			+			+	Rec. (C.W. Japan, Plilippines). Up. Mus.–Pliocene
130. Tapes philippinarum Ad. et Rve.						+			Rec. (N.C.W. Japan, Philippines.). Up. Musashino
131. Tapes undulatus Born.			+	+					Rec. (C. Japan). Pliocene
132. Gomphina melanaegis (Rve.)						+			Rec. (C. a. W. Japan)
133. Saxidomus purpuratus Sow.		+				+			Rec. (N.–S. Japan). Up. Musashino
134. Cardium muticum Rve.		+		+	+	+		+	Rec. (C. Japan, Philippines). Up. Mus.–Pliocene
135. Cardium braunsi Tok.		+	+	+	+			+	Up. Musashino
136. Cardium tokunagai Yok.	+							+	Up. Musashino
137. Cardium burchardi Dkr.							+		Rec. (C. a. W. Japan). Up. Musashino
138. Montacuta oblongata Yok.			+						Up. Musashino
139. Thyasira bisecta (Conr.)		+							Rec. (N. Pacific). Up. Musashino
140. Thyasira gouldii Phil.		+							Rec. (N. Japan). Up. Musashino
141. Diplodonta semiaspera Phil						+			Rec. (C. W. Japan, W. Indies). Up. a. Low. Musashino
142. Diplodonta japonica Pils.								+	Rec. (C. Japan). Up. a. Low. Musashino
143. Diplodonta gouldi Yok.		+							Rec. (C. Japan). Up. Musashino
144. Diplodonta lunaris Yok.		+							Up. Musashino
145. Diplodonta (?) crassidentata n. sp.		+							
146. Lucina contraria Dkr.		+				+		+	Rec. (C. Japan). Up. a. Low. Musashino
147. Lucina pisidium Dkr.	+		+		+	+		+	Rec. (N–S. Japan). Up. a. Low. Musashino

	Musashi					Shimōsa			Geological Occurrence
	Shimo-Suyeyoshi	Namamugi	Koyasu	Shinowara	Kikuna	Ichikawa	Matsudo	Haneno	
148. Loripes philippiana (Rve.)				+					Rec. (C. a. W. Japan). Up. Musashino
149. Venericardia cipangoana Yok.								+	Rec. (C. a. W. Japan). Up. a. Low. Musashino
150. Astarte hakodatensis Yok.							+		Rec. (N. Japan). Up. a. Low. Musashino
151. Corbicula saudaiformis Yok.							+		Rec. (C. Japan). Up. Musashino
152. Trapezium liratum (Rve.)			+					+	Rec. (C. Japan). Up. Musashino.
153. Myodora fluctuosa Gld.									Rec. (W. Japan). Up. Musashino
154. Thracia papyracea (Poli)		+				+			Rec. (Atlantic). Up. Musashino-Miocene
155. Thracia transmontana Yok.					+				Rec. (C. Japan). Up. Musashino
156. Crenella spectabilis Ad.		+							Rec. (W. Japan). Up. Musashino
157. Anomia lischkei F. et D.		+				+		+	Rec. (N.C.W. Japan). Up. a. Low. Musashino
158. Lima angulata Sow.		+							Rec. (N. a. C. Japan). Up. a. Low. Musashino
159. Pecten laetus Gld.		+			+				Rec. (N.C.W. Japan). Up. Mus.-Pliocene
160. Pecten subplicatus Sow.						+			Rec. (W. Japan, Philippines). Up. Musashino
161. Pecten laqueatus Sow.		+				+		+	Rec. (N. C. W. Japan). Up. Musashino
162. Pecten excavatus Hanl.						+			Rec. (N. a. C. Japan). Up. Musashino
163. Ostrea gigas Thunb.		+		+			+		Rec. (N.C.W. Japan). Up. Mus.-Pliocene
164. Ostrea denselamellosa Lke.						+			Rec. (N.- S. Japan). Up. Musashino
165. Ostrea irregularis Tok.			+			+			Rec. (C. Japan). Up. Musashino
166. Arca kobeltiana Pils.		+			+				Rec. (N. a. C. Japan). Up. a. Low. Musashino
167. Arca granosa L.	+		+			+	+		Rec. (C.W. Japan, Philippines), Up. Musashino
168. Arca inflata Rve.		+		+	+				Rec. (C.- S. Japan). Up. a. Low. Musashine
169. Arca satowi Dkr.							+		Rec. (C. a. W. Japan)
170. Arca subcrenata Lke.					+	+	+	+	Rec. (N.C.W. Japan). Up. Mus.-Pliocene.
171. Pectunculus vestitus Dkr.							+	+	Rec. (C. Japan). Up. Musash.-Miocene
172. Pectunculus yessoensis Sow.							+		Rec. (N. Japan). Up. Musash.-Pliocene
173. Limopsis woodwardi Ad.						+			Rec. (C. Japan). Up. Musashino
174. Leda confusa Hanl.		+							Rec. (C. Japan). Up. Musash.-Pliocene

If, from the above enumerated species, we omit one which is not specifically determined, there remain one hundred and seventy three, which may be classified as follows:

1.	Species hitherto found only Recent	5
2.	Species hitherto found Recent as well as Youngest Pleistocene	2
3.	Species hitherto ranging between Recent and Upper Musashino	77
4.	Species hitherto ranging between Recent and Lower Musashino	7
5.	Species hitherto ranging between Recent and Pliocene older than Lower Musashino	35
6.	Species hitherto ranging between Recent and Miocene	6
7.	Species hitherto found only in Upper Musashino	21
8.	Species hitherto found in Upper as well as Lower Musashino	3
9.	Species hitherto not described (new)	17
		173

From this we see that the Recent species are the most numerous, amounting to one hundred and thirty-two or 76% of the whole. That this percentage is liable to be more or less increased in the future is self-evident, because there may be several species which, although now regarded as extinct, will be found still living. Such being the case, it is quite certain that the fauna, geologically considered, is very young. That it belongs to the Upper Musashino Formation is evident from the fact that the number of species which have already been found in this formation, or which we may surely expect to find in it is the greatest, the two taken together amounting to one hundred and forty-nine, or 86% of the whole; while those which actually occur or which we may confidently expect to occur in the Lower Musashino are only fifty-one, or about 29%.

Grouping the Recent species according to their present habitats, we get a result, the interest in which lies in the more northern character of the species, as is the case with all the fauna of the Musashino Formation that I have thus far studied. The groupings are as follows:

1.	Species now living near the fossil localities (Central Japan) or in about the same latitudes (Western Japan)	69
2.	Species now living in Central and Western Japan as well as further north (Northern Japan)	25
3.	Species now living in Central and Western Japan as well as further south (Southern Japan or further south)	17
4.	Species now living throughout Japan (Northern-Southern)	3
5.	Species now living only in Northern Japan	9
6.	Species whose exact habitat in Japan is not known, or whose habitat is foreign	9
		132

It is true that the species which are actually living in the seas near the fossil localities form the majority, amounting to one hundred and thirteen in number, or nearly 86%. But we must not forget that there are also nine which now live only in Northern Japan, while there is none which live only in Southern Japan. Moreover, among the species which live near the fossil localities, those which live at the same time further north are more numerous than those which at the same time live further south, being twenty-five as against seventeen.

A close examination of the Musashino fossils[1] always gives the same result irrespective of their place of occurrence, viz., that they all possess one common character, and that is their more northerly distribution as compared with the living.

Description of New or Important Species

I. Gastropoda

1. **Tornatina koyasensis,** nov. spec.

Pl. LI. Fig. 1

Shell small, cylindrical, with body-whorl slightly tapering both above and below. Surface ornamented with incised spiral lines, unequal in size as well as in the breadth of the interstices, though generally not very close together. Aperture somewhat shorter than body-whorl, linear in the upper half, gradually dilated in the lower. Inner lip with a layer of glaze, sharply marked off from the surface of the shell on the external side. Sutures channelled.

A single specimen, rather worn and with the spire slightly broken. It measures 3.4 millim. in height and 1.5 millim. in diameter.

This shell resembles *Tornatina exilis* Dkr. (Yokoyama, Foss. Up. Musash., p. 24, pl. I. fig. 4), but tapers less both above and below, and is provided with incised spiral lines not present in the latter.

Fossil occurrence.—Koyasu.

1) The species described from the Upper Musashino together with those which occur in formations presumably of the same age already number about six hundred.

2. **Tornatina dulcis,** nov. spec.

Pl. LI. Fig. 2

Shell small, cylindrical, truncate above, rounded below. Spire almost flat, consisting of about four whorls, with sutures deeply and broadly channelled, so that the whorls are reduced to narrow ridges. Body-whorl slightly narrowed at the upper end as well as at the lower. Surface ornamented with many distant incised spiral lines in its upper third, smooth in the lower two-thirds. Aperture only slightly shorter than shell-height, linear in the upper half, gradually dilated downward in the lower. Inner lip covered with a glaze and provided with a very weak oblique fold.

A single example, measuring 2.5 millim. in height and 1.1 millim. in diameter.

Fossil occurrence.—Shimo-Suyeyoshi.

3. **Retusa gordonis,** nov. spec.

Pl. LI. Fig. 3

Shell small, thick, subcylindrical, with spire elevated, conical and blunt at apex. Whorls four and a half, provided with a spiral ridge in the middle, above which the surface is somewhat concave, perfectly smooth. Aperture elongated, slightly shorter than shell-height, linear in the upper part, gradually widened in the lower, being widest at the lower end, which is rounded. A strong, oblique and blunt fold is present. The glaze covering the inner lip spreads outward from its lower part, so as to cover a portion of the shell-base. Outer lip rather thick.

Only one example, somewhat worn. Height of shell 3.4 millim. Diamter 1.7 millim. Height of aperture 3.2 millim.

Fossil occurrence.—Matsudo.

4. **Retusa cucurbitina,** nov. spec.

Pl. LI. Fig. 4

Shell small, subcylindrical, inflated in the lower half and slightly so also near the upper end, so that the surface between appears excavated, truncate at the upper end and rounded at the lower. Spire sunken. The surface-sculpture consists only of coarse lines of growth. Aperture as long as the height of the shell, and slightly longer than that of the body-whorl, linear in the upper half, gradually dilated in the lower,

being broadest just above the lower end. Outer lip, thin, straight in the upper half, curved outward in the lower.

A single specimen, measuring 2.2 millim. in height and 1 millim. in diameter.

This species resembles *Retusa minima* Yam. (Yokoyama, Foss. Miura Penin., p. 26, pl. 1, fig. 1) in shape, but the excavation of the upper half of the shell is much stronger.

Fossil occurrence.—Koyasu.

5. **Cerithiopsis pontilis,** nov. spec.

Pl. LI. Fig. 7.

Shell small, turrete, with apex blunt. Whorls about ten, of which the younger (usually three, rarely even five) are convex and smooth; the remaining flat and spirally corded. Cords usually six, alternately large and small, the uppermost being invariably the larger; the larger ones beaded, the number of beads varying from ten to eighteen; these beads are so placed as to form longitudinal rows. Periphery angulate, with a cord on it. Base flattish, abruptly narrowed downward, with several unequal spiral cords which are usually alternately large and small. Aperture quadrate. Outer lip thin. Inner lip with a spiral fold, below which there is still a stronger one forming the inner side of the short, somewhat bent, canal.

Several specimens. The largest measures 9 millim. in height and 3 millim. in diameter.

Fossil occurrence.—Ichikawa.

6. **Vermetus perplanorbis,** nov. spec.

Pl. LI. Fig. 14

Shell minute, discoidal, spirally wound, attached with one surface to some foreign object, provided with three sharp, longitudinal keels on the free surface, and transversely coarsely striated. Aperture subcircular, with diameter about 1.5 millim.

This shell resembles *Vermetus planorbis* Dunker (Moll. Jap., p. 18, pl. II, fig. 16) which, however, has only a single keel.

Fossil occurrence.—Koyasu.

7. **Littorina adonis,** nov. spec.

Pl. LI. Fig. 8

Shell small, turbinate, with apex acute. Whorls six, of which one and a half are nuclear and smooth; postnuclear whorls convex, somewhat step-like, ornamented with incised spiral lines which are usually nine in number, equidistant and with the three uppermost deeper and groove-like. Periphery rounded. Base convex, provided with about nine incised spiral lines which are rather coarse and groove-like. Aperture ovate. Inner lip covered with a layer of glaze, and in the lower part having a longitudinal valley running parallel to its margin.

The only specimen we possess lacks the lower end of the aperture. It is about 6 millim. in height and 4 millim. in diameter.

Fossil occurrence.—Koyasu.

8. **Littorina lucida,** nov. spec.

Pl. LI. Fig. 9

Shell small, turbinate. Whorls five, somewhat convex, slightly shouldered, smooth. Sutures distinct. Periphery rounded. Base convex. The shape of the aperture is not quite clear, the shell being broken at this part; but it seems to have been more or less semilunar Inner lip with a broad layer of glaze.

One specimen only. Height 5 millim. Diameter 3 millim.

Fossil occurrence.—Koyasu.

9. **Rissoa** (**Cingula**) **ichikawensis,** nov. spec.

Pl. LI. Fig. 5

Shell small, somewhat pupoid. Whorls seven or eight, of which the first three or four are small as compared with the succeeding which enlarge rather slowly, are convex and provided with about ten incised spiral lines. Aperture oval, with peristome continuous. Base convex, with several incised spiral lines.

Several specimens. One with seven whorls measures 2.7 millim. in height and 1 millim. in diameter, while another with eight whorls measures 2.5 millim. in height and 0.9 millim. in diameter. Some specimens are more slender than others.

Fossil occurrence.—Ichikawa.

10. **Rissoa (Amphithalamus) edogowensis,** nov. spec.

Pl. LI. Fig. 13

Shell small, thick, ovato-conic, with apex blunt. Whorls four, convex, smooth. Body-whorl twice as high as spire. Aperture nearly circular, with peristome continuous and separated from the inner lip by a narrow valley.

One example. Height 2.5 millim. Diameter 1.5 millim.

This species has some resemblance to *Rissoa badia* Wats. (Challenger Gastropoda, pl. 46, fig. 3), though different in several points.

Fossil occurrence.—Ichikawa.

11. **Fenella perpupoides,** nov. spec.

Pl. LI. Figs. 11, 12

Shell small, pupoidal. Whorls convex, about eight in number, of which the first two or three are smooth, the rest spirally and longitudinally striate. Spiral striae about seven, subequal, subequidistant. Longitudinal striae resembling coarse growth-lines, often not quite reaching to the lower suture. Base convex, with about seven spiral striae similar to those of the whorls. Aperture oval, with peristome interrupted.

A single example. Height 3 millim. Diameter 1.2 millim.

This species is closely related to *Fenella pupoides* A. Ad. (Tryon's Man. Conch., vol. IX, pl. 60, fig. 76) which lives in our seas, but is distinguished from it by having the shell as well as the body-whorl shorter, the whorls more convex, and the aperture not so strongly dilated below. Nevertheless, it is not impossible that it is only a variety.

Fossil occurrence.—Shimo-Suyeyoshi and Koyasu.

12. **Eulima (Subularia) ozawai,** nov. spec.

Pl. LI. Fig. 15

Shell small, subulate. Whorls about nine, flat, smooth, with body-whorl nearly as high as spire. Aperture long and triangular, rounded in front, pointed behind. There are two narrow chestnut-coloured bands on the surface, the upper lying slightly below the middle of the whorl and the lower close to the lower suture.

A single specimen, measuring 8.3 millim. in height and 1.6 millim. in diameter.

This shell resembles *Eulima bilineata* Alder of the North Atlantic (Tryon's Man. Conch., vol. VIII, p. 279, pl. 70, figs. 72–74) which, however, has the spire higher.

Fossil occurrence.—Ichikawa.

13. Odostomia (Heida) rusticella, nov. spec.

Pl. LI. Fig. 10

Shell small, thick, ovato-conic. Whorls about four, blunt at apex, somewhat convex, slightly shouldered, smooth. Periphery rounded. Base convex. Aperture semilunar, resembling that of the genus *Rissoina*. Columella-fold single, strong.

One specimen only. It measures 4.5 millim. in height and 2 millim. in diameter.

A near ally of this species is *Odostomia panamensis* Dall and Bartsch (Notes on Jap., Indopac., a. Amer. Pyramidellidae p. 365, pl. XXVI, fig. 4) of the west coast of America; but the aperture in the latter is more narrowly semilunar than in ours.

Fossil occurrence.—Ichikawa.

14. Turbonilla (Cingulina) cingulata, Dunker

Pl. LI. Fig. 6

Turbonilla cingulata. Dunker, Moll. Jap., p. 16, pl. VIII, fig. 13. Dall and Bartsch, Notes on Jap., Indopac., a. Amer. Pyramidellidae, p. 344, pl. XXI, fig. 1.

This is a living species, found for the first time as a fossil in Japan. The whorls are characterized by three strong, rounded, spiral ribs separated by interspaces of about equal breadth. The base is furnished with about five spiral riblets or cords. The full description is found in the work of Dall and Bartsch above cited

Fossil occurrence.—Ichikawa and Matsudo.

Living.—Central and Western Japan.

15. Turbonilla (Careliopsis) filiola, nov. spec.

Pl. LI. Fig. 16

A single example lacking the apical portion.

Shell small, turrete. Whorls slowly enlarging, comparatvely high, the number present being five and a half, somewhat convex, though

more so in the younger ones. Spirally striate ; striae coarse, about fourteen in number, the distance between being greater near the upper suture as well as near the lower. Periphery quite rounded, there being no sharp boundary between the flank of the body-whorl and the convex base, which latter is provided with several spiral striae. Aperture semilunar, with peristome continuous. Height (without apex) 3.6 millim. Diameter 1 millim.

Fossil occurrence.—Koyasu.

II. Lamellibranchiata

16. **Pholas cupula,** YOKOYAMA

Pl. LII. Fig. 1

Pholas cupula. Yokoyama, Moll. Coral Bed Awa, p. 37, pl. II, fig. 15.

Three years ago, I described a left valve of a small *Pholas* from the Coral Bed of Awa under the above name. Recently I obtained a right valve, only a little smaller (3.8 millim long, 2.3 millim. high and 1.7 millim. deep), but almost equal in shape as well as in sculpture to that from Numa. I have nothing to add to the description cited.

Fossil occurrence.—Koyasu.

17. **Teredo sp.**

Pl. LII. Fig. 2

Several fillings of the burrows of a *Teredo,* cylindrical in form, more or less crooked and tapering at one end. The largest is 5 millim. in diameter.

Fossil occurrence.—Koyasu.

18. **Cryptomya tachibanensis,** nov. spec.

Pl. LII. Fig. 5

Shell thin, rather compressed, somewhat inequivalve, inequilateral, transversely subelliptical. Right valve : broadly rounded in front, obliquely truncate behind, the posterior border making with the postero-dorsal and the ventral an obtuse angle, though much greater in the former ; ventral border broadly arched, the curvature being greatest at

both extremities. Left valve: more sharply rounded in front than in the right valve. Beaks small. Surface with fine radiating striae which are absent in the anterior portion. Pallial line indistinct. A spoon-like ligamental pit horizontally extended is present in the left valve.

One nearly perfect right valve and two broken left. The right valve measures 18 millim. in length, 13 millim. in height and 4 millim. in depth. One of the left valves is 15 (?) millim. long, 12 millim. high and 4 millim. deep, while the other is 19 millim. long and 5 millim. deep, the height being uncertain.

This species is closely allied to *Cryptomya elliptica* Dunker (Index Molluscorum, p. 178, pl. VII, figs. 17–19), but is higher in form.

Fossil occurrence.—Namamugi and Ichikawa.

19. **Solen gouldii,** CONRAD

Pl. LI. Fig. 17

Solen gouldii. Yokoyoma, Moll. Rem, Upperm. Part Jô-Ban Coalf., p. 18, pl. II. fig. 5

This shell, already described from the Shirado Beds of the Jô-Ban Coal-field as well as from the Upper Musashino of Oji near Tokyo, is represented by many fine specimens, one of which is here figured. It differs from *Solen krusensternii* Schr. and *Solen grandis* Gld., which also occur in the same formation, in being comparatively longer.

Fossil occurrence.—Ichikawa.

Living.—Northern and Central Japan.

20. **Donax paululus,** nov. spec.

Pl. LII. Fig. 6

A single left valve, much worn.

Shell small, rather thin, compressed, trigonal, longer than high, very inequilateral, the anterior side more than one and a half times the posterior, sharply rounded in front, subtruncate behind; antero-dorsal border straight, sloping; postero-dorsal also straight and more steeply sloping; posterior border short, and more steeply sloping than postero-dorsal with which it makes a very obtuse angle; ventral broadly arched, with posterior half almost straight. Surface provided with a sharp posterior edge, behind which it is flat and steeply inclined, and is moreover furnished with many divergent riblets which become weaker towards the outside; surface anterior to the edge smooth, although a few

radiating striae are visible near it. Inner border coarsely crenate only at the anterior end. Lunula narrowly lanceolate. Teeth (of the right valve) two with the anterior bifid. Length 11.5 millim. Height 7 millim. Depth 1.8 millim.

This species closely resembles *Donax californicus* Conr. (Syst. Conch. Cab., pl. VII, figs. 5–8) which, however, has the ventral border crenate throughout. Compared with *Donax semigranosus* Dunker (Index, p. 193, pl. VII, figs. 14, 15), the present species is longer.

Fossil occurrence.—Matsudo.

21. **Tellina pallidula,** LISCHKE

Pl. LII. Figs. 7, 8

Tellina pallidula. Lischke, Jap. Meereoconch., vol. II, p. 114, pl. X, figs. 6, 7, 7 a.

Resembling *Tellina nitidula* Dkr. as well as *Tellina iridella* Mart., this species is distinguished from the former by its more triangular shape, and from the latter by its shorter shell.

Fossil occurrence.—Shimo-Suyeyoshi and Koyasu.

Living.—Central and Western Japan.

22. **Chione crenifera,** (SOWERBY)

Pl. LII. Figs. 9, 10

Chione crenifera. Sowerby, Thes. Conch., vol. II, p. 715, 715, pl. 156. figs. 73, 74.

Venus portesiana. Pfeiffer in Sys. Conch. Cab., Veneracea, p. 234, pl. 40. figs. 4–6.

A small, markedly triangular, convex shell with radiating ribs on the surface, which in its middle part split into two, three or even more riblets. Crossing these ribs, there are distant, raised, concentric lamellae. Inner border crenulate. Cardinal teeth three, the middle in the left valve bifid and the posterior in the right also partly so. Pallial sinus moderate in depth, finger-like at end, but broader at mouth.

Examples are numerous. The largest is a right valve which attains only 13 millim. in length, 10.7 millim. in height, and 3.8 millim. in depth.

Fossil occurrence.—Ichikawa.

Living.—Western Japan. Peru. Brazil.

23. Gomphina melanaegis, Roemer

Pl. LII. Fig. 12

Gomphina melanaegis. Pilsbry, Catalogue, p. 130. Lischke, Jap. Meeres conch., vol. III, p. 86, pl. VII, figs. 10, 11.

A compressed, triangular, subequilateral shell with anterior end rounded and posterior bluntly pointed. Pallial sinus deep, horizontal, rounded at end. On the surface, there is a blunt posterior edge.

A right and a left valve of two immature individuals.

Living.—Central and Western Japan.

24. Thyasira bisecta, (Conrad)

Pl. LII. Fig. 11

Thyasira bisecta. Yokoyama, Foss. Shells Sado, p. 294, pl. XXXV, Fig. 3.

A cast of the typical form of the species which is distinguished from the more frequent variety *nipponica* Yabe and Nomura by its more pointed beak. Incidentally it seems to me that among the fossil forms of the species occurring in Japan, the younger ones generally show the outline assigned to the variety.

The discovery of the species in Southern Musashi is quite interesting, as it has until now never been found on the Pacific side of Honshu in a formation so young as the present.

Fossil occurrence.—Namamugi.

25. Thyasira gouldii, (Philippi)

Pl. LII. Figs. 3, 4

Thyasira gouldii. Yokoyama, Moll. Up. Musashino Tokyo a. its Suburbs, p. 433, pl. L, fig. 9.

This species was figured by me as from Shinagawa in the description above cited. But as another splendid specimen has been found at Namamugi, I give its figure again.

Fossil occurrence—Namamugi.

Living.—Northern Japan. East Coast of America from Greenland down to Connecticut in the United States.

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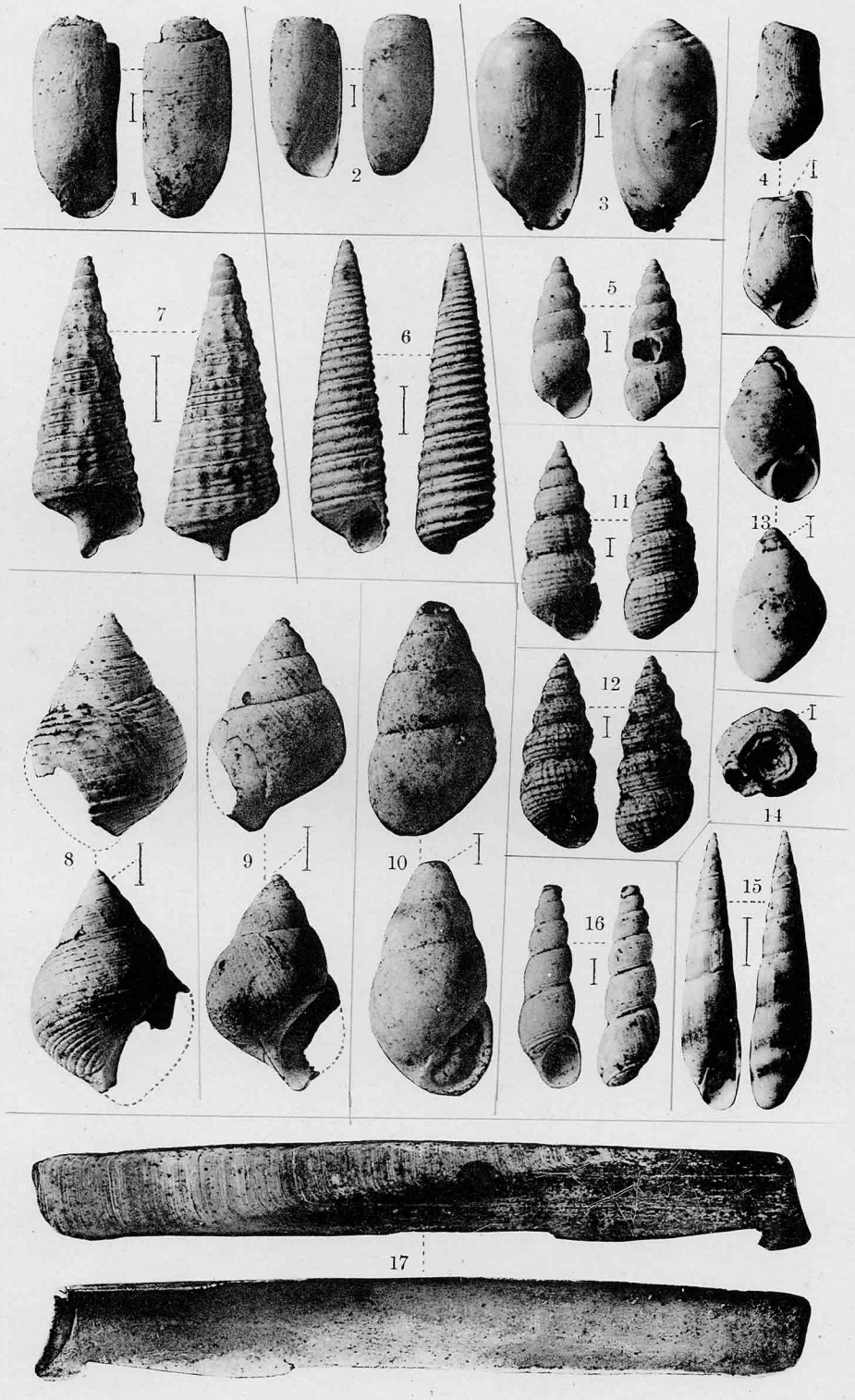

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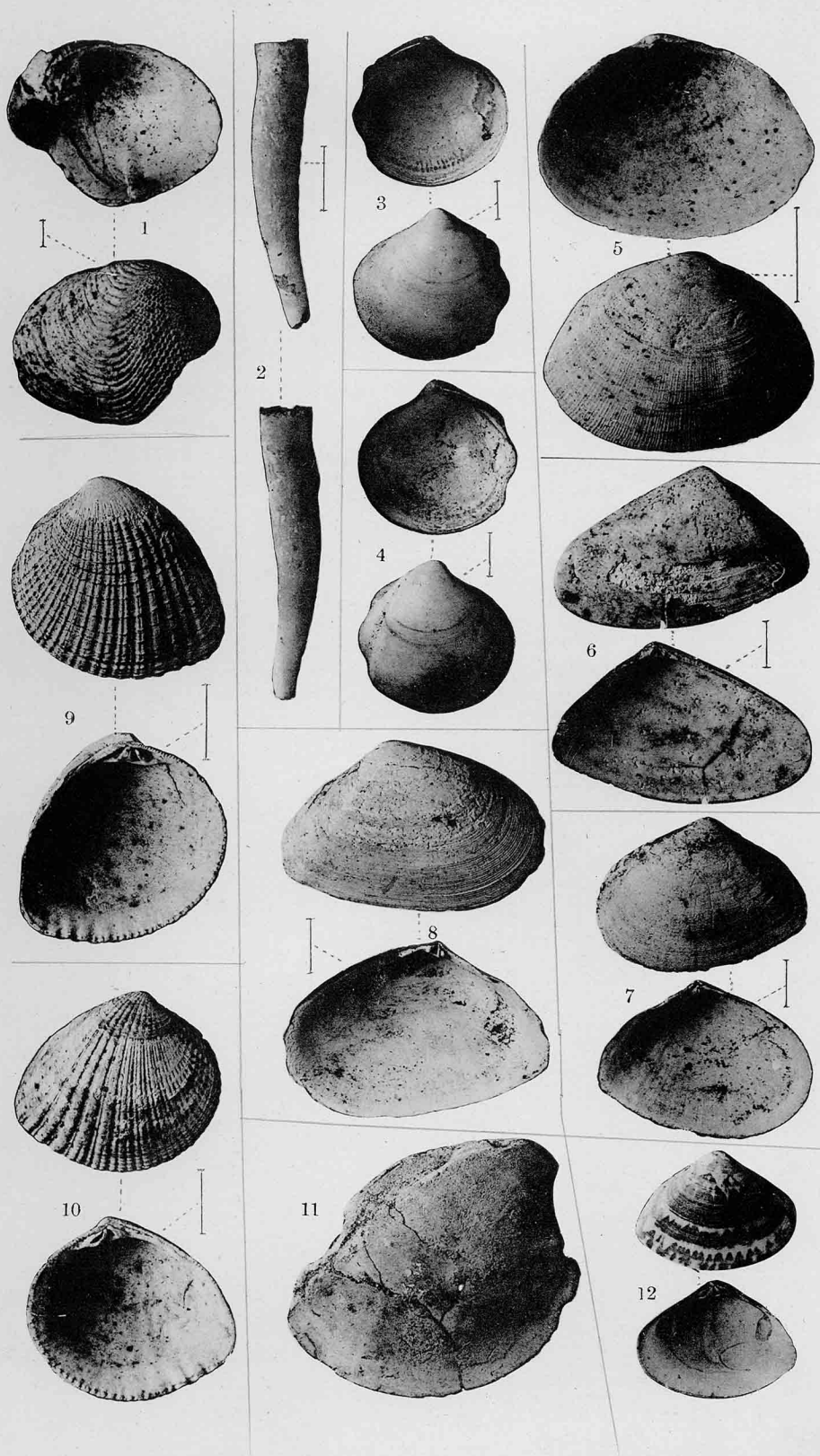

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