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Tertiary Shells from the Coal-Field of Haboro, Teshio

By

Matajiro YOKOYAMA, *Rigakuhakushi*

With 2 Plates

In the autumn of 1923, Mr. K. Uyemura of the Imperial Geological Survey was engaged in the geological investigation of the coal-field of Haboro in the province of Teshio whence he brought back fossil shells which I recently had an occasion to examine. The following pages treat of the results of this examination.

According to Mr. Uyemura, the strata constituting the coal-field partly belong to the Tertiary and partly to the Cretaceous. The beds into which they are divisible, in downward succession, are as follows:

1. *Kotambets*[1] *Beds.* Consisting of sandstone, conglomerate and shale, devoid of coal-seams as well as of fossils.

2. *Chikbets*[2] *Beds.* Consisting of the *Upper Sandstone,* the *Middle Shale* and the *Lower Sandstone.* The boundaries, however, are not well defined, as near them the sandstone and the shale are seen alternating with each other. There is no coal, but fossils are found both in the Upper Sandstone as well as in the Lower, though far more common in the latter.

3. *Haboro*[3] *Beds.* The upper part is made up of a fossiliferous sandstone with some shale, conglomerate and several coal seams. The lower part is also mainly sandstone which intercalates some conglomerate, shale, coaly shale and thin seams of coal of an inferior quality, and also contains pieces of coal and silicified wood.

4. *Cretaceous Formation.* Mostly composed of shale with thin layers of sandstone and coal between. Marl nodules contained in the shale include fossils of Ammonites.

1) 古丹別 Japanized form of Kotampet of the Ainu.
2) 築別 Chikpet of the Ainu.
3) 羽幌 Haporo of the Ainu.

The lines of unconformability are said to exist between the Kotambets and Chikbets Beds as well as between the Haboro Beds and the Cretaceous.

The fossils which I have examined are those obtained from the Upper and Lower Sandstones of the Chikbets Beds and from the Haboro Beds. The names are given in the following table.

	Chikbets Beds		Haboro Beds	Geological Occurrence
	Upper	Lower		
1. Cancellaria cf. lischkei Yok.		+		Upper Musashino
2. Mitra pristina Yok.		+		Pliocene
3. Chrysodomus despectus (L.)		+	+	Recent-Miocene
4. Chrysodomus sp.		+		
5. Buccinum leucostoma Lke.			+	Recent-Miocene
6. Priene oregonensis (Redf.)		+		Recent-Pliocene
7. Trophon felix n. sp.		+	+	
8. Turritella sp.		+		
9. Crepidula sp.		+		
10. Natica janthostoma Desh.	+	+	+	Recent-Miocene
11. Dentalium cf. weinkauffii Dkr.	+		+	Recent-Pliocene
12. Dentalium exaratum n. sp.	+	+		
13. Panope generosa (Gld.)		+		Recent-Pliocene
14. Mya arenaria L.		+		Recent-Pliocene
15. Mactra haboroensis n. sp.		+		
16. Spisula grayana (Schr.)		+		Recent-Miocene
17. Soletellina (?) sp.	+	+		
18. Tellina venulosa Schr.		+		Recent-Upper Musashino
19. Tellina izurensis Yok.		+		Pliocene
20. Macoma dissimilis (Mart.)		+		Recent-Miocene
21. Macoma cf. praetexta (Mart.)		+		Recent-Miocene
22. Meretrix (Callista) chinensis Chem.	+			Recent-Miocene
23. Chione chitaniana Yok.		+		Pliocene
24. Tapes (?) uyemurai n. sp.			+	
25. Cardium nuttalii Cour.		+		Recent-Miocene
26. Cardium muticum Rve.	?	+	?	Recent-Pliocene
27. Cardium ainuanum n. sp.			+	
28. Venericardia cipangoana Yok.		+		Recent-Pliocene
29. Mytilus sp.		+		
30. Ostrea sp.			+	
31. Nucula mirabilis Ad. et Rve.		+		Recent-Pliocene
32. Nucula sp.			+	
33. Yoldia sagittaria Yok.		+		Pliocene-Miocene

I. Upper Chikbets Beds

The species yielded by the Upper Sandstone of the Chikbets Beds are the following six:

1. Natica janthostoma Desh.
2. Dentalium cf. weinkauffii Dkr.
3. Dentalium exaratum Yok. n. sp.
4. Soletellina (?) sp.
5. Meretrix (Callista) chinensis (Chem.)
6. Cardium muticum Rve. (?)

Natica janthostoma, Dentalium weinkauffii, Meretrix chinensis and *Cardium muticum* are all living species, although they occur also as fossils, the first and the third in the Pliocene and Miocene, and the second and the fourth in the Pliocene. It is probable that the strata containing them are *Pliocene,* for the beds next treated seem also to be of the same age.

II. Lower Chikbets Beds

The Lower Sandstone of the Chikbets Beds afforded the greatest number of fossils, amounting to twenty-six. They are the following:

1. Cancellaria cf. lischkei Yok.
2. Mitra pristina Yok.
3. Chrysodomus despectus (L.)
4. Chrysodomus sp.
5. Priene oregonensis Redf.
6. Trophon felix nov. spec.
7. Turritella (?) sp.
8. Crepidula sp.
9. Natica janthostoma Desh.
10. Dentalium exaratum nov. spec.
11. Panope generosa (Gld.)
12. Mya arenaria L.
13. Mactra haboroensis nov. spec.
14. Spisula grayana Schr.
15. Soletellina (?) sp.
16. Tellina venulosa Schr.
17. Tellina izurensis Yok.
18. Macoma dissimilis (Mart.)
19. Macoma cf. praetexta (Mart.)

20. Chione chitaniana Yok.
21. Cardium nuttalii Cour.
22. Cardium muticum Rve.
23. Venericardia cipangoana Yok.
24. Mytilus sp.
25. Nucula mirabilis Ad. et Rve.
26. Yoldia sagittaria Yok.

Of the twenty-one specifically determined species, eight are hitherto only fossil and thirteen living as well as fossil. Of the former, one (*Cancellaria lischkei*) is Upper Musashino, three (*Mitra pristina, Tellina izurensis* and *Chione chitaniana*) are Pliocene, one (*Yoldia sagittaria*) is Pliocene and Miocene, and the remaining three (*Trophon felix, Dentalium exaratum* and *Mactra haboroensis*) are new. Of the latter, one (*Tellina venulosa*) hitherto goes up only to the Upper Musashino, six (*Priene oregonensis, Panope generosa, Mya arenaria, Cardium muticum, Venericardia ferruginea*, and *Nucula mirabilis*) go up to the Pliocene, and six (*Chrysodomus despectus, Natica janthostoma, Spisula grayana, Macoma dissimilis, Macoma praetexta* and *Cardium nuttalii*) to the Miocene. From this we see that the species which are hitherto Pliocene are greatest in number, being more than twice those which are hitherto Miocene, that is to say, sixteen against six, so that we can safely ascribe the beds containing them to the *Pliocene*, especially when we consider that more than one-half of the species are still living.

III. Haboro Beds

The species obtained from these beds are the following ten:

1. Chrysodomus despectus (L.)
2. Buccinum leucostoma Lke.
3. Trophon felix nov. spec.
4. Natica janthostoma Desh.
5. Dentalium cf. weinkauffii Dkr.
6. Tapes (?) uyemurai nov. spec.
7. Cardium muticum Rve. (?)
8. Cardium ainuanum nov. spec.
9. Ostrea sp.
10. Nucula sp.

Leaving out from the ten species above enumerated three which are not well determined, there remain seven of which three (*Trophon felix, Tapes uyemurai* and *Cardium ainuanum*) are new and only fossil, and

four living as well as fossil. Of the latter, one (*Dentalium weinkauffii*) goes up to the Pliocene, while three (*Chrysodomus despectus, Buccinum leucostoma*, and *Natica janthostoma*) go up to the Miocene. *Ostrea* and *Nucula*, although not specifically determined, show a great resemblance to those found in the Miocene. From these considerations, it is not at all improbable that the Haboro beds are *Miocene* in age, although a final decision must be postponed until a greater number of species has been obtained.

Description of the Species

1. Cancellaria cf. lischkei, Yokoyama

Pl. LII. Fig. 8b

The specimen shown in the above cited figure represents the body-whorl of a *Cancellaria* which shows a close resemblance to that of *Cancellaria lischkei* which I described from the Upper Musashino of Sado (Foss. Shells from Sado, p. 264, pl. XXXII, figs. 16, 17), the only difference being in the breadth of the spiral cords which are greater in the present specimen. The spire is preserved, but extremely worn.

Fossil occurrence.—*Lower Chikbets Beds:* Rōrenai.

2. Mitra pristina, Yokoyama

Mitra pristina. Yokoyama, Tert. Moll. Dainichi, p. 8, pl. I, figs. 8-12. Tert. Moll. Shiobara, p. 130, pl. XVI, figs. 1c, 2, 3. Tert. Moll. South. Tôtômi, p. 336.

A few mutilated examples.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt, a tributary of the Haboro. Pliocene of Shiobara and Dainichi.

3. Chrysodomus despectus, (Linné)

Chrysodomus despectus. Tert. Moll. Shinano a. Echigo, p. 5, pl. I, fig. 3. Neog. Shells Kôzuké a. oth. Prov., p. 231. Tert. Moll. Oilf. Embets a. Etaibets, p. 239.

Specimens are all fragmentary.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt, a tributary of the Haboro. Pliocene and Miocene.

Living.—Northern Japan. Japan Sea. Okhotsk and Bering seas. Circumpolar seas. North Atlantic.

4. Chrysodomus sp.

A fragment of a body-whorl, angulated at the shoulder and with traces of several coarse tubercles on it, so that it resembles *Chrysodomus arthriticus* (Val.) (Yokoyama, Fossils from the Upper Musashino of Kazusa and Saimōsa, pl. II, fig. 11).

Fossil occurrence.—*Lower Chikbets Beds:* the Haboro.

5. Buccinum leucostoma, Lischke

Buccinum leucostoma. Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 9. Tert. Moll. Shinano, p. 5, pl. II. fig. 6. Tert. Moll. Mino, p. 217. Tert Moll. Oilf. Embets a. Etaibets, p. 239. Foss. Moll. Oilf. Akita, p. 378.

An ill preserved specimen only.

Fossil occurrence.—*Haboro Beds:* exact locality not stated. Upper Musashino. Pliocene and Miocene.

Living.—Central Japan.

6. Priene oregonensis, (Redfield)

Priene oregonensis. Yokoyama, Moll. Rem. Upperm. Jô-Ban Coalf., p. 11. Tert. Moll. Shinano, p. 6. Moll. Tert. Basin Chichibu, p. 116. Tert. Moll. Shiobara, p. 131. Moll. Rem. Mid. Part Jô-Ban Coalf., p. 12. Tert. Moll. South. Totomi, p. 342. Foss. Moll. Akita Oilf., p. 382.

A few examples only.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt; the Rōrenai.

7. Trophon felix, nov. spec.

Pl. LII. Figs. 6, 8a

Shell small, fusiform. Spire very short. Whorls about six, bluntly angulate slightly above the middle, with the surface above the angle flat and steeply sloping, below nearly vertical. Longitudinally plicate; plicae many (about twenty?), straight, more or less roof-like with valleys narrower. Periphery rounded. Base gradually narrowed downward, with plicae continuing into it. Aperture narrowly ovate, with peristome quite distinct from the inner lip.

The canal is broken in all the specimens; but it seems to have been moderately long. The diameter of the shell is about 6 millim. The height seems to have been about twice as much.

This shell has some resemblance to *Trophon nipponicus* Yok. (Foss. Miura Penin., p. 61, pl. III, figs. 13, 14), though the plicae are much more numerous.

Fossil occurrence.—*Lower Chikbets Beds:* the Rorenai. *Haboro Beds:* exact locality not stated.

8. **Turritella** sp.

Pl. LII. Fig. 8c

A form with several spiral ridges. There are two examples, one of which is an internal mould and the other (the cited figure) a longitudinal section of the shell.

Fossil occurrence.—*Lower Chikbets Beds:* the Rorenai; the Chuptaushnai.

9. **Crepidula** sp.

A fragment resembling the apical portion of *Crepidula convxa* Yok. (Moll. Rem. Mid. Part Jô-Ban Coalf., p. 14, pl. III, fig. 3) from the Minato Beds in Hitachi.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt.

10. **Natica janthostoma,** Deshayes

Natica janthostoma. Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 12, pl. I, fig. 20. Moll. Foss. Tert. Mino, p. 220. Foss. Shells Sado, p. 278. Tert. Moll. South. Tôtômi, p. 344. Foss. Moll. Oilf. Akita, p. 380.

Specimens are common, though none are perfect.

Fossil occurrence.—*Upper Chikbets Beds:* a branch stream of the Haboro. *Lower Chikbets Beds:* the Epérapt; the Haboro; the Chuptaushnai. *Haboro Beds:* exact locality unknown. Musashino, Pliocene, Miocene.

Living.—Northern and Central Japan.

11. **Dentalium cf. weinkauffii,** Dunker

Pl. LII. Fig. 8d

Several fragments of a *Dentalium,* in greater part smooth, but longitudinally striate near the apical portion. Seem to belong to *Dentalium weinkauffii* which is still living, but also very common in our Pliocene strata.

Fossil occurrence.—*Upper Chikbets Beds:* a branch stream of the Haboro. *Haboro Beds:* the Chebotsnai.

12. **Dentalium exaratum,** nov. spec.

Pl. LI. Fig. 14

Fragments only; but the sculpture is quite characteristic. It consists of more than thirty longitudinal grooves with interspaces flat and rather unequal, on which there are fine longitudinal striations. A fragment which seems to be the apical portion of the same shell has more than ten ribs. A fuller description will be given when better specimens are obtained.

Fossil occurrence.—*Upper Chikbets Beds:* a branch stream of the Haboro. *Lower Chikbets Beds:* the Rōrenai.

13. **Panope generosa,** (GOULD)

Panope generosa. Yokoyama, Tert. Moll. Shinano a. Echigo, p. 10. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 16, pl. VI, fig. 6. Moll. Tert. Basin Chichibu, p. 118. Tert. Moll. Shiobara, p. 122. Foss. Shells Sado, p. 289. Tert. Moll. South. Tôtômi, p. 347. Foss. Moll. Oilf. Akita, p. 382.

A cast of a young individual.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt. Upper Musashino. Pliocene.

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

14. **Mya arenaria,** LINNÉ

Pl. LI. Fig. 2

Mya arenaria. Yokoyama, Tert. Moll. Oilf. Embets a. Etaibets, p. 241, pl. XXX, fig. 1.

Mya arenaria var. japonica. Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 16, pl. VI, fig. 4. Neog. Shells Kozuké a. oth. Prov., p. 231. Tert. Moll. Shiobara, p. 132.

Specimens are numerous and comparatively well preserved.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt; the Haboro; the Chuptaushnai. Pliocene.

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

15. **Mactra haboroensis,** nov. spec.

Pl. LII. Figs. 3, 4

Shell rather thin, convex, oval, somewhat longer than high, rounded both in front and behind, though more sharply behind than in front,

inequilateral, posterior side being about one and a half times anterior. Surface smooth. Beaks prominent, pointed at end. Length about 50 millim. Height about 45 millim. Thickness about 30 millim.

The species resembles *Mactra spectabilis* Lke. (Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 17, pl. I, figs. 7, 8), though somewhat higher. *Mactra veneriformis* Desh. (Yokoyama, Foss. Miura Penin., pl. VII, fig. 10) is also its ally, but has the beaks more swollen.

Fossil occurrence.—*Lower Chikbets Beds:* the Haboro; the Epérapt; the Rōrenai.

16. Spisula grayana, (Schrenck)

Pl. LII. Fig. 7

Spisula grayana. Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 17, pl. VII, fig. 11. Moll. Rem. Mid. Part, p. 16. Tert. Moll. Shinano a. Echigo, p. 11, pl. IV, fig. 3. Tert. Moll. Shiobara, p. 132. Foss. Shells Sado, p. 290. Foss. Moll. Oilf. Akita, 181.

A few casts only.

Fossil occurrence.—*Lower Chikbets Beds:* the Chuptaushnai; a branch of the Chikbets. Upper Musashino. Pliocene. Miocene

Living.—Northern Japan. Sea of Okhotsk.

17. Soletellina (?) sp.

Several examples of a transversely elongated compressed shell with the cardinal and ventral borders subparallel and rounded both in front and behind.

Fossil occurrence.—Upper Chikbets Beds: a branch stream of the Haboro. Lower Chikbets Beds: the Chuptaushnai; the Chebotsnai, a branch of the Kotambets; the Epérapt.

18. Tellina venulosa, Schrenck

Pl. LII. Fig. 5

Tellina venulosa. Yokoyama, Foss. Up. Musash., p. 139, pl. X, fig. 1.

This shell is very rare as a fossil, being hitherto found only in the Upper Musashino of the neighbourhood of Tokyo. It is represented by only a single valve.

Fossil occurrence.—Lower Chikbets Beds: a branch stream of the Haboro. Upper Musashino.

Living.—Northern Japan. Okhotsk Sea.

19. Tellina izurensis, Yokoyama

Pl. LII. Figs. 1, 2

Tellina izurensis. Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 19, pl. II, fig. 12.

We possess a right valve and a cast of the left. A specimen quite similar to the latter was already figured in my paper above cited. The right valve is transversely oval with the sharper end behind. It is somewhat longer than high, being 55 millim. long and 45 millim. high, almost equilateral and quite compressed. Surface smooth. The left valve has the posterior dorsal border steeply sloping, meeting with the broadly arcuate ventral in a broadly rounded angle.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt; a branch stream of the Kotambets. Pliocene.

20. Macoma dissimilis, (Martens)

Macoma dissimilis. Yokoyama, Moll. Rem. Upperm. Part Jô-Ban Coalf., p. 20, pl. V, fig. 5. Tert Moll. Shiobara, p. 133, pl. XVI, fig. 4. Moll. Foss. Tert. Mino, p. 211, pl. XXVIII, fig. 10.

Rather frequent.

Fossil occurrence.—*Lower Chikbets Beds:* the Chebotsnai; the Epérapt. Musashinos. Pliocene. Miocene.

Living.—Central Japan.

21. Macoma cf. praetexta, (Martens)

A left valve which seems to belong to *Macoma praetexta* (Mart.) which is living as well as fossil in the Pliocene and Miocene (Yokoyama, Moll. Rem. Low. Part Jô-Ban Coalf., p. 13).

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt.

22. Meretrix (Callista) chinensis, Chemnitz

Pl. LI. Fig. 1

Meretrix (Callista) chinensis. Yokoyama, Moll. Rem. Low. Part Jô-Ban Coalf., p. 14, pl. II, figs. 7, 8. Moll. Tert. Basin Chichibu, p. 119. Moll. Tert. Mino, p. 222. Tert. Moll. South. Tôtômi, p. 350. Foss. Shells Sado, p. 292. Foss. Moll. Oil. Akita, p. 379.

One example only.

Fossil occurrence.—*Upper Chikbets Beds:* a branch stream of the Haboro. Musashinos. Pliocene. Miocene.

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

23. Chione chitaniana, Yokoyama

Pl. LI. Figs. 3, 4

Chione chitaniana. Yokoyama, Tert. Moll. South. Tôtômi, p. 352, pl. XXXIX, fig 13.

Not rare.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt. Pliocene (Horinouchi Beds).

24. Tapes (?) uyemurai, nov. spec.

Pl. LI. Figs. 9-13

Shell moderate in size, thick, convex, somewhat longer than high, obliquely oval in outline, very inequilateral, posterior side being about twice as long as anterior, rounded both in front and behind, though more sharply in front. Beaks prominent, pointed. Surface concentrically corrugated. Pallial sinus large though short, linguiform.

Specimens are ill preserved. One of the right valves measures 45 millim. in length, 37 millim. in height, about 11 millim. in depth, while another measures 43 millim. in length, 34 millim. in height and about 10 millim. in depth.

Fossil occurrence.—*Haboro Beds:* exact locality unknown.

25. Cardium nuttalii, Conrad

Cardium nuttalii. Yokoyama, Tert. Moll. South. Tôtômi, p. 353.

Cardium shinjiense. Yokoyama, Foss. Moll. Neog. Izumo, p. 7, pl. II, fig. 6. Moll. Rem. Low. Part Jô-Ban Coalf., p. 16, pl. III, figs. 13-15. Moll. Rem. Mid. Part, p. 18 pl. III, figs. 10, 11.

One example only.

Fossil occurrence.—*Lower Chikbets Beds:* the Haboro. Upper Musashino. Pliocene. Miocene.

Living.—Alaska. British Columbia.

26. Cardium muticum, Reeve

Cardium muticum. Yokoyama, Moll. Rem, Upperm. Part Jô-Ban Coalf., p. 23. Tert. Moll. Oilf. Embets a. Etaibets, p. 243. Foss. Shells Sado, p. 293. Tert. Moll. South. Tôtômi, p. 353. Foss. Moll. Oilf. Akita, p. 381. Foss. Shells Atsumi Penin., p. 370. Tert. Shells Tosa, p. 366.

Several young individuals.

Fossil occurrence.—*Upper Chikbets Beds:* doubtful specimens from a branch stream of the Haboro. *Lower Chikbets Beds:* the Haboro. *Haboro Beds:* doubtful specimens from the Chebotsnai. Musashinos. Pliocene.

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

27. Cardium ainuanum, nov. spec.

Pl. LI. Figs. 5, 6, 7

Shell moderate in size, compressed, ovate in outline, slightly longer than high, inequilateral, rounded in front, obliquely subtruncate behind, broadly arched at ventre. Surface with straight radiating ribs about forty in number. Beaks pointed.

Although the specimens are not rare, they are all incomplete, many being decorticated. However, the characters are such that they do not quite agree with those of the already known forms.

A broken left valve, 32 millim. in height, seems to be about 34 millim. in length.

Fossil occurrence.—*Haboro Beds:* the Rorenai.

28. Venericardia cipangoana, Yokoyama

Venericardia cipangoana. Yokoyama, Foss. Miura Penin., p. 137, pl. X, figs. 2. Foss. Shells Saishu, p. 5. Foss. Shells Sado, p. 297. Foss. Moll. Oilf. Akita, p. 379.

A few well preserved examples.

Fossil occurrence.—*Lower Chikbets Beds:* the Haboro. Musashinos. Pliocene.

Living.—Central and Western Japan.

29. Mytilus sp.

A large form of *Mytilus,* but so badly preserved that it is impossible to determine the species.

Fossil occurrence.—*Lower Chikbets Beds:* the Chuptaushnai.

30. Ostrea sp.

A large ovate shell resembling *Ostrea gigas* Thunb. (Yokoyama, Foss. Miura Penin., pl. XV).

Fossil occurrence.—*Haboro Beds:* the Chebotsnai, a tributary of the Kotambets.

31. Nucula mirabilis, A. Adams et Reeve

Nucula mirabilis. Yokoyama, Moll. Rem. Upperm. Port Jô-Ban Coalf., p. 30. Moll. Rem. Mid. Part, p. 21, pl. III, fig. 6. Moll. Tert. Basin Chichibu, p. 125. Tert. Moll. South Tôtômi, p. 362.

Numerous, though all ill preserved.

Fossil occurrence.—*Upper Chikbets Beds:* a doubtful specimen was found in a branch stream of the Haboro. *Lower Chikbets Beds:* the Nakashima-no-Sawa, a tributary of the Chikbets; the Chuptaushnai. Musashinos. Pliocene.

Living.—Central and Western Japan.

32. Nucula sp.

A single valve, more triangular in outline than the preceding and resembling *Nucula eximia* Yok. (Moll. Rem. Mid. Part Jô-Ran Coalf., p. 11, pl. I, figs. 14–16) of the Kamenoo Beds (Miocene) of Iwaki.

Fossil occurrence.—*Lower Chikbets Beds:* the Chebotsnai, a branch of the Kotambets.

33. Yoldia sagittaria, Yokoyama

Pl. LI. Fig. 8

Yoldia sagittaria. Yokoyama, Moll. Rem. Middle Part Jô-Ban Coalf., p. 10, pl. II, figs. 10, 11.

Specimens are not uncommon, but perfect ones are very rare.

Fossil occurrence.—*Lower Chikbets Beds:* the Epérapt. Mizunoya Beds (Miocene) of Iwaki.

Explanation of Plates

Plate LI

Fig. 1. Meretrix (Callista) chinensis Chem. Upper Chikbets Beds: a branch stream of the Haboro. P. 200

Fig. 2. Mya arenaria L. Lower Chikbets Beds: the main course of the Haboro. P. 198

Figs. 3, 4. Chione chitaniana Yok. Lower Chikbets Beds: the Eperapt. P. 201

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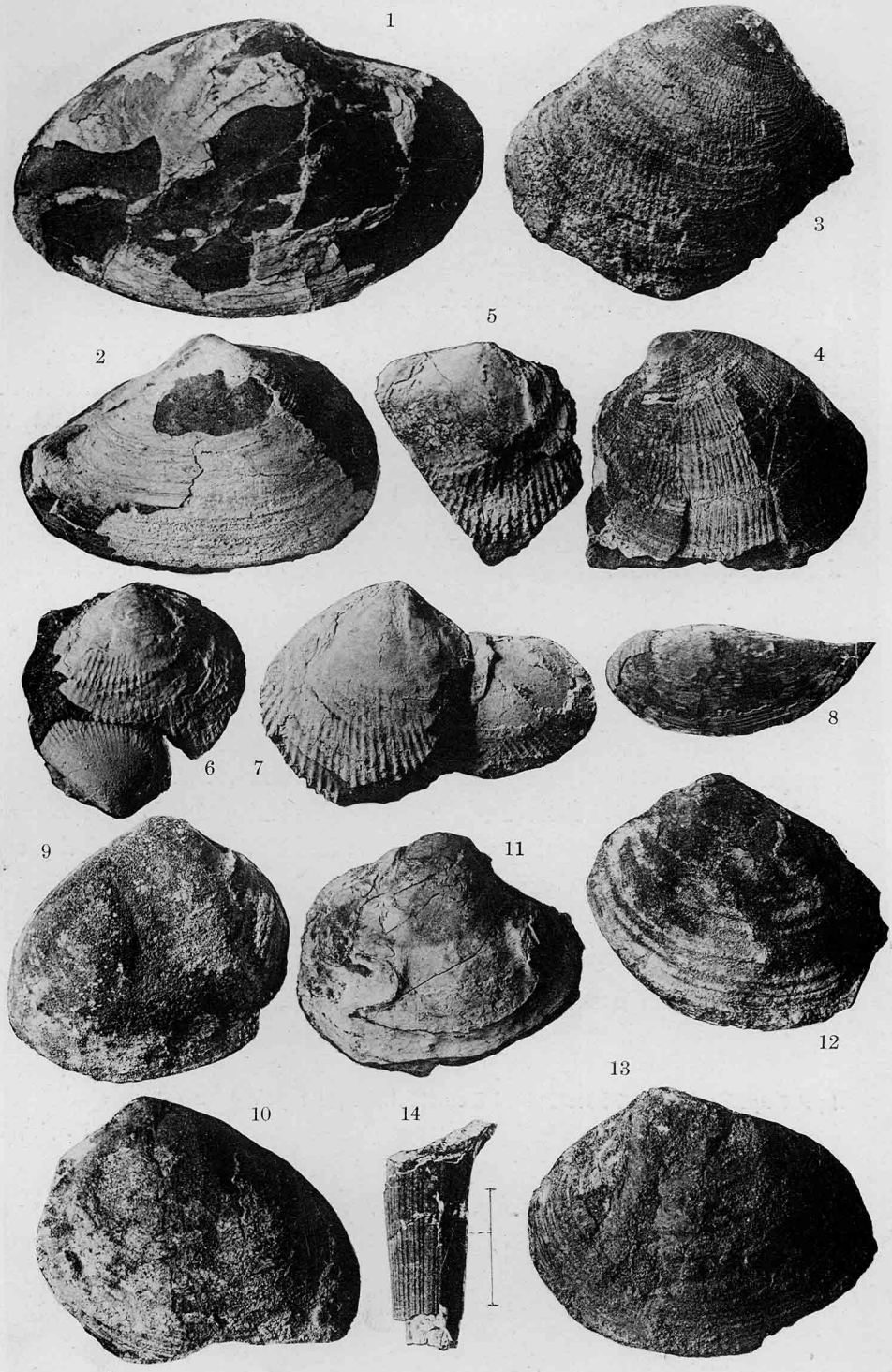

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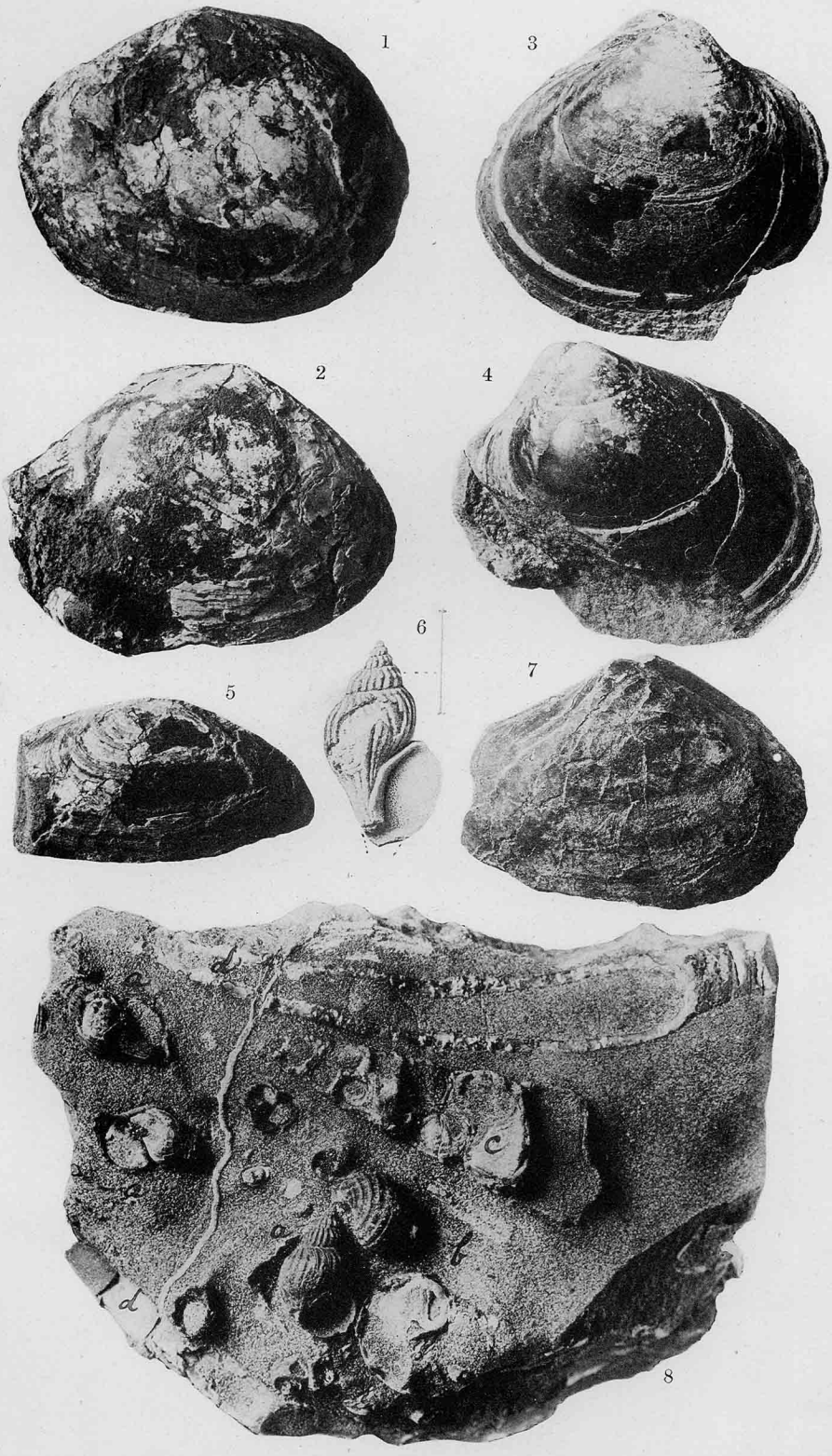

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