

145.146

東京帝國大學理學部紀要

第二類 地質學 礦物學 地理學 地震學

第一冊 第七篇

1926c

NO. 24

CM 22840

CM 22942

22857.004

+CM 27096

(LR)

JOURNAL

OF THE

FACULTY OF SCIENCE

IMPERIAL UNIVERSITY OF TOKYO

SECTION II

GEOLOGY, MINERALOGY, GEOGRAPHY, SEISMOLOGY

Vol. I Part 7

1926e

230.18

NO. 26

23069

+CM 27097

+CM 27098

TOKYO

Published by the University

May 31, 1926

(LR)

The "JOURNAL OF THE FACULTY OF SCIENCE" is the continuation of the "JOURNAL OF THE COLLEGE OF SCIENCE" published by this University in forty-five volumes (1887-1925), and is issued in five sections:

Section I.—Mathematics, Astronomy, Physics, Chemistry.

Section II.—Geology, Mineralogy, Geography, Seismology.

Section III.—Botany.

Section IV.—Zoology.

Section V.—Anthropology.

Committee on Publication

Prof. S. Goto, Dean, *ex officio*.

Prof. K. Matsubara.

Prof. K. Fujii.

Prof. N. Yamasaki.

Prof. N. Yatsu.

All communications relating to this JOURNAL should be addressed to the
DEAN OF THE FACULTY OF SCIENCE, IMPERIAL UNIVERSITY OF TOKYO.

Tertiary Mollusca from the Oil-Fields of Embets and Etaibets

By

Matajiro YOKOYAMA, *Rigakuhakushi*

With 3 Plates

Some years ago, Mr. K. Uyemura, a geologist of the Imperial Geological Survey, brought back from the oil-fields of Embets,¹⁾ Etaibets²⁾ and Horonobe³⁾ in the northwestern part of the main island of the Hokkaido⁴⁾ some fossils which he submitted to me for examination. They are mostly Mollusca, though there are also some plants, fish-remains, a *Balanus* and an echinid. The strata composing the oil-fields are given by Uyemura as follows :

I. Quaternary Formation.

II. Tertiary Formation.

1. Beds A. Yûchi Sandstone.

2. Beds B. Grey Shale or Koitoi Shale.

3. Beds C. Hard Shale or Wakkanai Shale. Oil-bearing.

4. Beds D. Kotambets Sandstone. Oil-bearing.

5. Poronai Beds.

6. Coal-bearing Beds.

III. Cretaceous Formation.

The fossil Mollusca described in the following pages are those collected in the three beds, A, B, and C of the Tertiary Formation. Their names and distribution are given in the following table :

1) 天鹽國天鹽郡遠別 2) 石狩國雨龍郡恵侍別 3) 天鹽國天鹽郡幌延

4) The name Hokkaidô is taken by many for that of a ray-shaped island lying just south of Sakhalin. But in reality it is not. It is a name given to one of the main divisions or "dô" into which Japan was formerly divided, and simply means "provinces bordering the northern sea" just as Tokaido means "those bordering the eastern sea" and Saikaido those bordering the western sea." Why our people speak of the island as Hokkaidô is because it forms the main part of its division. At present the island has no name, for its former name, Yezo, is no longer used. Therefore, geographically speaking, the only way of designating the island correctly is to call it "the main island of the Hokkaido."

		Beds			Geological Occurrence
		A	B	C	
CM 23016	1. <i>Fusus uyemurai</i> n. sp. ✓	(+)		+	
CM 23017	2. <i>Chrysodomus despectus</i> L.			(+)	Miocene-Recent.
CM 23018	3. <i>Buccinum leucostomum</i> Lke.		+	(+)	Miocene-Recent.
CM 23019	4. <i>Turritella nipponica</i> Yok.	(+)	(+)	(+)	Pliocene-Recent?
CM 23020	5. <i>Galeodea japonica</i> York.	+		(+)	Pliocene.
CM 23021	6. <i>Natica janthostoma</i> Desh.	(+)		(+)	Miocene-Recent.
CM 23022	7. <i>Mya arenaria</i> L. ✓	(+)		(+)	Pliocene-Recent.
CM 23023	8. <i>Mactra semmiana</i> Yok.	(+)			Pliocene.
CM 23024	9. <i>Spisula grayana</i> Schr.	(+)			Miocene-Recent.
CM 23025	10. <i>Psammobia</i> sp.	(+)			
CM 23026	11. <i>Tellina optiva</i> Yok.		+	(+)	Pliocene.
CM 23027	12. <i>Macoma dissimilis</i> Mart.			(+)	Pliocene-Recent.
CM 23028	13. <i>Macoma inquinata</i> Desh.	+	+	(+)	Miocene-Recent.
CM 23029	14. <i>Cardium muticum</i> Rve.	(+)	(+)	(+)	Pliocene-Recent.
CM 23030	15. <i>Cardium pauperculum</i> Yok.		+	(+)	Pliocene.
CM 23031	16. <i>Thyasira bisecta</i> Conr. var. <i>nipponica</i> Yabé.		(+)	(+)	Miocene-Recent.
CM 23032	17. <i>Lucina</i> (<i>Phacoides</i>) sp.	+		(+)	
CM 23033	18. <i>Venericardia ferruginea</i> Ad.	(+)			Miocene-Recent.
CM 23034	19. <i>Astarte teshioensis</i> n. sp.	(+)	+		Pliocene-Recent.
CM 23035	20. <i>Mytilus grayanus</i> Dkr.	+	(+)		Pliocene-Recent.
CM 23036	21. <i>Modiola barbata</i> L.	(+)			Musashinos-Recent.
CM 23037	22. <i>Pecten swifti</i> Bern.	(+)			Pliocene-Recent.
CM 23038	23. <i>Pecten poculum</i> n. sp.	(+)			
CM 23039	24. <i>Pectunculus</i> sp.	(+)			
CM 23040	25. <i>Leda</i> sp.			(+)	
CM 23041	26. <i>Leda</i> sp.			(+)	
CM 23042	27. <i>Nucula cobboldiae</i> Low.	(+)		(+)	Pliocene-English Crag.
CM 23043	28. <i>Yoldia sagittaria</i> Yok.			(+)	Miocene-Pliocene.
CM 23044	29. <i>Yoldia scapha</i> n. sp.		(+)	(+)	

As may be seen above, the greatest number of species were yielded by *Beds A* at Embets. Their names are as follows :

1. *Fusus uyemurai* n. sp.
2. *Natica janthostoma* Desh.
3. *Mya arenaria* L.
4. *Macra semmiana* Yok.
5. *Spisula grayana* Schr.
6. *Psammobia* sp.
7. *Cardium muticum* Rve.
8. *Venericardia ferruginea* Ad.
9. *Astarte teshioensis* n. sp.
10. *Modiola barbata* L.
11. *Pecten swiftii* Bern.
12. *Pecten poculum* n. sp.
13. *Pectunculus* sp.
14. *Nucula cobboldiae* Sow.

From these 14 species, if we take away 2 which are not specifically determined, there remain 12, of which 3 (*Natica janthostoma*, *Spisula grayana* and *Venericardia ferruginea*) range between *Miocene* and *Recent*; 4 (*Mya arenaria*, *Cardium muticum*, *Modiola barbata*, and *Pecten swiftii*) between *Pliocene* and *Recent*; 2 (*Macra semmiana* and *Nucula cobboldiae*) are exclusively *Pliocene*; and 3 (*Fusus uyemurai*, *Astarte teshioensis* and *Pecten swiftii*) are new. Thus we see that the species found in the *Pliocene* are most numerous (9), so that the beds are also to be assigned to that age.

Beds B gave only the following six species :

- ✓ 1. *Turritella nipponica* Yok.
- ✓ 2. *Tellina optiva* Yok.
- ✓ 3. *Cardium muticum* Rve.
- ✓ 4. *Thyasira bisecta* Conr. var. *nipponica* Yabé et Nom.
- 5. *Mytilus grayanus* Dkr.
- 6. *Yoldia scapha* n. sp.

Of these, *Thyasira bisecta* is *Miocene*, *Pliocene* and *Recent*; *Turritella nipponica*, *Cardium muticum* and *Mytilus grayanus* are *Pliocene* and *Recent*; *Tellina optiva* is exclusively *Pliocene*; and *Yoldia scapha* is new. Therefore it is evident that here again we have to deal with *Pliocene* strata.

The species yielded by *Beds C* are as follows :

1. *Chrysodomus despectus* L.
2. *Buccinum leucostomum* Lke.
3. *Galeodea japonica* Yok.
4. *Natica janthostoma* Desh.

5. *Mya arenaria* L.
6. *Tellina optira* Yok.
7. *Macoma dissimilis* Mart.
8. *Macoma inquinata* Desh.
9. *Cardium pauperculum* Yok.
10. *Thyasira bisecta* Conr. var. *nipponica* Yabé et Nom.
11. *Lucina* (*Phacoides*) sp.
12. *Leda* sp.
13. *Leda* sp.
14. *Nucula cobboldiae* Sow.
15. *Yoldia sagittaria* Yok.
16. *Yoldia scapha* n. sp.

Out of the 13 specifically determined species, 6 (*Chrysodomus despectus*, *Buccinum luteostomum*, *Natica janthostoma*, *Macoma inquinata*, *Thyasira bisecta* and *Yoldia sagittaria*) occur in strata ranging from *Miocene* to *Recent*; 2 (*Mya arenaria* and *Macoma dissimilis*) in strata ranging from *Pliocene* to *Recent*; 4 (*Galeodea japonica*, *Tellina optiva*, *Cardium pauperculum* and *Nucula cobboldiae*) exclusively in those of the *Pliocene*; and 1 (*Yoldia scapha*) is new. Here again we have the *Pliocene* forms in preponderance, so that *Beds C* must also be considered *Pliocene*.

As to *Beds D*, there are no Mollusca which have been undoubtedly found in them. A few badly preserved ones which have been doubtfully ascribed to them contain a *Mya* resembling *Mya arenaria* which, therefore, tells nothing about the age. Fortunately, however, there are some plants found at Horonobé, belonging to the genera *Sequoia* and *Planera* which are generally considered to be *Miocene*. Therefore it is highly probable that the line of demarcation between the *Pliocene* and *Miocene* strata is to be found between beds C and D.

2CM 23016

Description of the Species

1. *Fusus uyemurai*, n. sp.

Pl. XXX. Fig. 4.

A single specimen lacking the apex and a portion of the outer lip, yet characteristic enough to be created into a new species.

The spire is short and seems to have consisted of about five whorls of which three are actually preserved. The body-whorl is high and large, much higher than the spire. The whorls are angulate a little

above the middle, with the shelf above the angle somewhat excavated and its upper margin somewhat raised above the suture; while the surface below is vertical and slightly convex. The sculpture consists of longitudinal ribs and spiral cords crossing each other and giving to the surface a clathrate appearance. The longitudinal ribs number about seventeen on the penultimate whorl and about twenty on the ultimate, are ridge-like and sharp, separated by wide valleys of a broad v-shape and run quite obliquely on the upper shelf, making angles varying from 50° to 70° with the shelf-edge, while below on the vertical wall they are quite perpendicular to it. The spiral cords are present only on the vertical wall and number three—all equally distributed on it; on the body-whorl, however, there is an indication of an intercalary between the second and the third from above. Periphery rounded. Base rapidly narrowed, with about twelve further cords crossed by longitudinal ribs which reach down to near the canal-end where they suddenly turn to the right and terminate at the channel. Height 33 millim. Diameter 16.2 millim.

This species has some resemblance to what Dall figures as *Colus* (*Aulacofusus*) *trombinus* in his "Illustrations of Unfigured Types of Shells in the Collection of the United States National Museum (No. 2554—Proc. U. S. Nat. Mus., Vol. 66. Art 17), p. 14, pl. II. fig. 9 from off the Pribilof Islands, although the latter has the whorls rounded and not angulate.

Fossil occurrence.—Beds A, Embets.

RCM 23017

2. *Chrysodomus despectus*, (LINNÉ).

Chrysodomus despectus, Yokoyama, Tert. Moll. Shinano a Echigo, p. 5, pl. I. fig. 3. Neog. Shells Kozuké and other Provinces, p. 231.

Three more or less imperfect specimens.

Fossil occurrence.—Beds C, Etaibets. Miocene and Pliocene of the Jô-Ban Region. Pliocenes of Oki and Shinano. Lower Musashino. Pliocene and Pleistocene of Europe.

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

3. *Buccinum leucostoma*, LISCHKE.

RCM 23018

Buccinum leucostoma, Yokoyama, Moll. Up. Part Jô-Ban Coal., 9. Tert. Moll. Shinano a. Echigo, p. 5 pl. II, fig. 6. Tert. Moll. Mino, p. 217. Neog. Shells Kozuké a. oth. Prov., p. 230.

Three fragmentary specimens.

Fossil occurrence.—Beds C, Etaihets. Miocene and Pliocene of the Jō-Ban Region. Pliocenes of Shinano and Mino. Upper Musashino. Living.—Central Japan.

RCM 23019

RCM 27077

4. *Turritella nipponica*, YOKOYAMA.

Turritella nipponica. Yokoyama, Moll. Remain Mino p. 220. Moll. Tert. Basin Chichibu, p. 116. Foss. Miura Penin., p. 71, pl. IV, figs. 16-19.

An external cast and an internal mould. The former shows four spiral ridges of which the uppermost is weaker than the other three. The latter can not be well determined, though presumably it belongs to the same species.

My recent examination of the living species of Japanese *Turritellae* led me to suspect that the fossil one which I had hitherto described under the above name was a young specimen of *Turritella bacillum* Kiener, a species which is normally six-ridged. The variability of these fossils is very great, as I had already had occasion to find while examining specimens from several localities. However, a typical example of *Turritella nipponica* was found among the subfossils of Daitō in Kazusa which are very probably recent, so that even when it is not identical with *Turritella bacillum*, it must now be considered not only as a fossil, but also as a recent one. To this question I intend to return in near future.

Fossil occurrence.—Beds B, Embets. Beds A also? (internal cast). Pliocenes of Chichibu, Mino and Jō-Ban Region. Lower Musashino. Recent (?) of Daitō.

RCM 23020

5. *Galeodea (Sconsia) japonica*, YOKOYAMA.

Galeodea (Sconsia) japonica. Yokoyama, Foss. Moll. Neog. Izumo, p. 3, pl. I, fig. 4. Moll. Rem. Up. Part Jō-Ban Coal., p. 11. pl. I, fig. 10.

An example lacking the spire.

Fossil occurrence.—Beds C, Embets. Pliocenes of Izumo and the Jō-Ban Region.

RCM 23021
RCM 23022

6. *Natica janthostoma*, DESHAYES.

Natica janthostoma. Yokoyama, Foss. Miura Penin. p. 76, pl. V, figs. 3, 4. Moll. Tert. Basin Chichibu, p. 116. Moll. Rem. Tert. Mino, p. 220.

Several specimens, though not well preserved.

Fossil occurrence.—Beds A and C, Embets. Miocene of Iwaki. Pliocenes of Mino, Chichibu, Izumo, etc. Musashinos.

Living.—Northern and Central Japan. Kamchatka.

7. *Mya arenaria*, LINNÉ.

Pl. XXX. Fig. 1.

RCM 23023
RCM 23024-1
RCM 23025

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

Three perfect specimens and several imperfect ones.

The opinion that the Japanese form of *Mya arenaria* is a variety of the European seems to be not tenable, as in some cases it is impossible to find a clear distinction between the two. Therefore, I unite the previously described forms from Shiobara, the Jô-Ban Coalfield and Oki with the typical European one.

Fossil occurrence.—Beds A and C Embets. Pliocenes of the Jô-Ban Region. Shiobara and Oki.

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

RCM 23026

8. *Mactra semmiana*, YOKOYAMA.

Mactra semmiana. Yokoyama, Tert. Moll. Shinano a. Echigo, p. 11, pl. IV, fig. 3. Moll. Rem. Tert. Mino, p. 222.

A small right valve which, though imperfect, agrees quite well with that of the above named species in form.

Fossil occurrence.—Beds A, Embets. Pliocene of Shinano and Mino.

RCM 23027

9. *Spisula grayana*, (SCHRENCK).

Spisula grayana. Yokoyama, Tert. Moll. Shinano a. Echigo, p. 11, pl. IV, figs. 3. Foss. Up. Musashino, p. 130, pl. VIII, figs. 1, 2. Tert. Moll. Shiobara, p. 132.

Two large left valves, one of which is perfect and measures 110 millim. in length.

Fossil occurrence.—Beds A, Embets. Miocene of Iwaki. Pliocenes of Shinano, Shiobara and the Jô-Ban Region. Musashinos.

Living.—Northern Japan. Okhotsk Sea.

RCM 23028

10. *Psammobia*, sp.

A fragment of a right valve, tolerably thick and resembling *Psammobia kazusensis* Yokoyama (Foss. Up. Musash., p. 136, pl. IX, fig. 4) in form, although somewhat flatter.

Fossil occurrence.—Beds A, Embets.

RCM 23029
RCM 23030—2
RCM 2303111. *Tellina optiva*, YOKOYAMA.

Pl. XXX. Fig. 2.

Tellina optiva. Yokoyama, Foss. Moll. Neog. Izumo, p. 6, pl. II, figs. 3, 4. Moll. Rem. Upper. Part Jô-Ban Coalf., p. 19. Moll. Tert. Basin Chichibu, p. 118, pl. XV, figs. 4, 5.

The specimens are frequent in Beds C and of greater size than hitherto known. The one figured is 90 millim. long and 73 millim. high. But there is a cast which is almost 110 millim. long. The surface, when weathered and deprived of its uppermost shell-layer, shows radial striations.

Fossil occurrence.—Beds B and C, Embets. Pliocenes of Izumo Chichibu. Shirado Beds.

RCM 23032

12. *Macoma dissimilis*, (MARTENS).

Macoma dissimilis. Yokoyama, Foss. Miura Penin., p. 116, pl. VII, figs. 19, 20. Tert. Moll. Shiobara, p. 133, pl. XVI, fig. 4. Moll. Rem. Up. Part Jô-Ban Coalf., p. 20, pl. V, fig. 9. Moll. Rem. Tert. Mino, p. 221.

Several specimens more or less imperfect.

Fossil occurrence.—Beds C, Embets. Pliocenes of Mino, Shiobara and Isé. Shirado Beds. Musashinos.

Living.—Central Japan.

RCM 23033

13. *Macoma inquinata*, DESHAYES.

Macoma inquinata. Yokoyama, Moll. Rem. Lowest Part Jô-Ban Coalf., p. 13. Moll. Rem. Mid. Part, p. 17. Tert. Foss. Kii, p. 56. Foss. Miura Penin., p. 117, pl. VIII, figs. 1, 2. Foss. Up. Musash., p. 142.

A few casts.

Fossil occurrence.—Beds C, Embets. Miocene of Iwaki (Iwaki Beds). Pliocenes of Kii and Chichibu. Minato Beds. Musashinos.

Living.—Northern, Central and Western Japan. West Coast of America.

RCM 23034
RCM 2303514. *Cardium muticum*, REEVE.

Cardium muticum. Yokoyama, Moll. Tert. Basin Chichibu, p. 121. Moll. Rem. Upper. Part Jô-Ban Coal., p. 23. Foss. Miura Penin., p. 128, pl. IX, fig. 11.

Several examples, although more or less imperfect in preservation.

Fossil occurrence.—Beds A and B, Embets. Pliocene of Chichibu. Shirado Beds. Musashinos.

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

RCM 23036-3
RCM 2303715. *Cardium pauperculum*, YOKOYAMA.

Pl. XXX. Fig. 3.

Cardium pauperculum. Yokoyama, Foss. Moll. Neog. Izumo, p. 6, pl. I, fig. 2. Moll. Tert. Basin Chichibu, p. 121, pl. XIV, figs. 12, 13.

A tolerably good specimen and a few bad ones.

Fossil occurrence.—Beds C, Embets. Pliocenes of Izumo and Chichibu.

RCM 23038-3-12
RCM 2303916. *Thyasira bisecta*, (CONRAD) var. *nipponica*, YABÉ ET NOM.

Pl. 31, fig. 12

Thyasira bisecta nipponica. Yabé a. Nomura. Notes on Rec. a. Tert. Spec. Thyasira fr. Japan (Sci. Rep. Tohoku Imp. Univ., II Series, Vol. VII, No. 4), p. 84 (2), Pl. XXIII, fig. 3, XXIV, figs. 2-4.

RCM 23098

Yabé and Nomura have recently separated the most frequent form of *Thyasira bisecta* Conr., fossil in Japan, as a new variety on account of the umbonal angle (between the anterior and dorsal margins) being not so great (equal to about a right angle) as in the typical form. Such is also the form occurring in the oil-fields of the Hokkaido.

Fossil localities.—Beds B and C, Embets. Miocene and Pliocene of several parts of Japan.

Living.—Alaska. Puget Sound. Japan Sea (?)

RCM 23040

17. *Lucina* (*Phacoides*) sp.

A single internal cast, partly deformed. It resembles *Lucina* (*Phacoides*) *borealis* L. so frequent in our Pliocene strata.

Fossil occurrence.—Beds C, Etaibets.

RCM 23041

18. *Venericardia ferruginea*, (ADAMS).

Venericardia ferruginea, Yokoyama, Moll. Rem. Upper. Part, Jô-Ban Coal., p. 24, pl. V, fig. 4. Moll. Rem. Mid. Part, pp. 9, 19.

Venericardia sp. Yokoyama, Moll. Rem. Low. Part, p. 19, pl. III, figs. 8, 9.

Two small broken specimens.

Fossil occurrence.—Beds A, Embets. Miocene and Pliocene of the Jō-Ban Region. Musashinos.

Living.—Northern Japan.

RCM 23042-1

RCM 23043-2

RCM 23044

19. *Astarte teshioensis*, n. sp.

Pl. XXXI. Figs. 1, 2.

Shell rather large, very thick, compressed, roundly trigonal, sub-equilateral, posterior side only a little longer than anterior, rounded both in front and behind, though more sharply in the latter, antero-dorsal border slightly excavated, postero-dorsal slightly convex, both passing respectively into anterior and posterior borders without making any perceptible angle, ventral border broadly arched with the curvature in the anterior portion greater. Surface smooth, with only concentric lines of growth, the intervals being more or less unequally grooved. Beaks pointed. Lunula deep, lanceolate, bounded by blunt edges on both sides. Cardinal teeth in the left valve two, nearly equal in size and diverging, in the right valve three, of which the middle one is much thicker than the others, the posterior small and thin, and the anterior the smallest and thinnest; posterior lateral tooth developed only in the left valve, horizontal and thinner than the cardinals. Anterior adductor impression bean-shaped, posterior somewhat semilunar, though the inner side is somewhat convex in the upper part. Pedal scars also very distinct and deep, the anterior being on the inner side of the upper end of the adductor impression, while the posterior is above the posterior adductor and close to it. Length 47 millim. Height 45 millim. Thickness 22 millim.

One large perfect example; also a large broken right valve and a small perfect left.

At first I took this shell for an abnormally thick, somewhat deformed specimen of *Astarte borealis* L. to which the small left valve has a great resemblance. But the outline is markedly trigonal, so that in the absence of intermediate forms, such an assumption seems to be rather hazardous. Therefore I deem it prudent to treat it for the present as a new species.

Fossil occurrence.—Beds A, Embets.

RCM 23045

20. *Mytilus grayanus*, DUNKER.

Mytilus grayanus. Yokoyama, Moll. Rem. Upper. Part Jō-Ban Coal., p. 25, pl. II, fig. 10. Tert. Moll. Shinano a. Echigo, p. 15, pl. II, fig. 1.

Several specimens, although in the form of external impressions.

Fossil occurrence.—Beds B, Embets. Pliocene of Shinano. Shirado Beds.

Living.—Northern Japan down to the Philippines and Tasmania.

RCM 23046

21. *Modiola barbata*, (LINNÉ).

Modiola barbata. Yokoyama, Foss. Up. Musash., p. 74, pl. XIV, fig. 19
Moll. Coral Bed Awa, p. 53.

A single broken right valve.

Fossil occurrence.—Beds A, Embets. Musashinos. Pleistocene of Awa.

Living.—Northern-Southern Japan. Atlantic.

RCM 23047

22. *Pecten swiftii*, BERNARD.

Pecten swiftii. Yokoyama, Foss. Miura Penin., p. 154, pl. XIV, fig. 11.
Moll. Rem. Up. Part Jô-Ban Coalf., p. 27, pl. II, fig. 1. Moll. Tert. Basin Chichibu, p. 123, pl. XV, fig. 3. Tert. Moll. Shiobara, p. 135.

Fragments only.

Fossil occurrence.—Beds A, Embets. Pliocenes of Chichibu and Shiobara. Shirado Beds. Lower Musashino.

Living.—Northern Japan. Alaska.

RCM 23048-2

23. *Pecten poculum*, n. sp.

RCM 23049-3

Pl. XXXII.

RCM 23050-1

Several fragments from which the right valve can be well restored, as there is a perfect specimen apparently from the same formation in one of the localities in Honshu.

Shell large, thick, orbicular, slightly higher than long, very inequivalve, almost equilateral. Right valve strongly convex, the convexity attaining about one-third the height, ornamented with about thirty radiating ribs which are much elevated, round-topped, occasionally showing a shallow median longitudinal groove in the lower half, and separated by deep valleys either of equal or greater breadth which are very finely and delicately scaled. Beaks swollen. Anterior ear somewhat larger than posterior with a few coarse radiating rounded ribs, and a shallow byssal notch. Left valve almost flat, also with radiating ribs which are weaker than those of the right valve. Anterior ear with four coarse radiating ribs. It attains a height of more than 130 millim.

RCM 23051

The perfect specimen shown in fig. 1 is from Kayasawa (Yamamoto-Gori, Ugo) occurring together with *Nucula insignis* Ad., a species which is Tertiary as well as Recent.

Fossil occurrence.—Beds A, Embets.

RCM 23052

24. *Pectunculus*, sp.

A few young examples of a *Pectunculus* resembling those of *Pectunculus vestitus* Dkr., a Neogene as well as Recent species.

RCM 23053-6

Fossil occurrence.—Beds A, Embets.

25. *Leda*, sp.

Pl. XXXI. Fig. 6.

A cast resembling *Leda confusa* Hanley in outline.

Fossil occurrence.—Beds C, Embets.

RCM 23054

26. *Leda*, sp.

Several casts of a posteriorly much narrowed shell like *Leda ramsayi* Smith.

Fossil occurrence.—Beds C, Embets.

RCM 23055-3

RCM 23056-4

RCM 23057

RCM 23058

RCM 23059

27. *Nucula cobboldiae*, SOWERBY.

Pl. XXXI. Fig. 3, 4.

Nucula cobboldiae. Wood, Crag Mollusca, Bivalves, p. 82, pl. X, fig. 9, a-b.

Numerous specimens which are hardly distinguishable from the English Pliocene species above named. Hitherto the *Nucula* of this type found in our Pliocene layers was assigned to *Nucula mirabilis* Ad. et Rve., first described from a living species found in Nagasaki Bay and distinguished from the British fossil species by its more four-sided outline (antero-dorsal and ventral borders being subparallel) and the presence of a shallow posterior groove just outside of the posterior edge bounding the area. However, in the specimens from Embets such a groove is either absent or only barely indicated, and the outline is markedly ovate so that I believe there is no reason to separate them from the British fossil. It is possible that the day may come when *Nucula mirabilis* and *Nucula cobboldiae* will be proved to belong to the same species, and even if that should not be, still it cannot be denied that there is a close relationship between the two. *Nucula insignis* Adams is also a species closely allied to the above two, and indeed may be the young of one of these species.

CM 23055-9
12

The largest specimen we possess is a left valve, larger than that figured by Wood. It is 34 millim. long, 27 millim. high and 8 millim. deep.

Fig. 5 is a specimen of *Nucula mirabilis* from Shinagawa (Musa-shino Formation) figured for comparison. RCM 23060

Fossil occurrence.—Beds A and C, Embets. Beds C, Etaibets. Crag of England. Pl. 31. fig. 5.

28. *Yoldia sagittaria*, YOKOYAMA.

Pl. XXXII. Fig. 4.

Yoldia sagittaria. Yokoyama, Moll. Rem. Mid. Part J6-Ban Coal, p. 10, pl. II, figs. 10, 11, p. 20. RCM 23061-4
RCM 23062

Two broken valves which are readily recognized as belonging to *Yoldia sagittaria* by their compressed, transversely elongated, and posteriorly narrowed form.

Fossil occurrence.—Beds C, Embets. Mizunoya Beds (Miocene). Shirado Beds (Pliocene).

29. *Yoldia scapha*, n. sp.

Pl. XXXI. Figs. 7-11. RCM 23063
RCM 23064-7
RCM 23065-8
RCM 23066-9
RCM 23067-10
RCM 23068-11
RCM 23069

Many specimens. But they are mostly more or less deformed.

Shell large, rather thin, moderately compressed, transversely oblong-subquadrate, inequilateral, anterior side being somewhat shorter than posterior. Anterior and posterior borders rounded, though the latter more broadly than the former, antero-dorsal only slightly arched, postero-dorsal straight, making a rounded angle with posterior, ventral almost straight in the middle, gradually increasing in curvature on both sides. Surface smooth, with a blunt edge running from beak to postero-ventral corner.

This shell resembles *Yoldia thraciaeformis* Storer (Reeve, Conch. Icon., *Yoldia*, Species 1) from an unknown locality, the resemblance being closer to the form figured by Reeve as a young individual (fig. 1a). But Storer's species is described as being very ventricose, and judging from the figure, it seems to have been longer-shelled than ours:

A nearly perfect specimen which we possess, though a young individual, measures 34 millim. in length, 21 millim. in height and 14 millim. in thickness. However, the largest one is more than 50 millim. long.

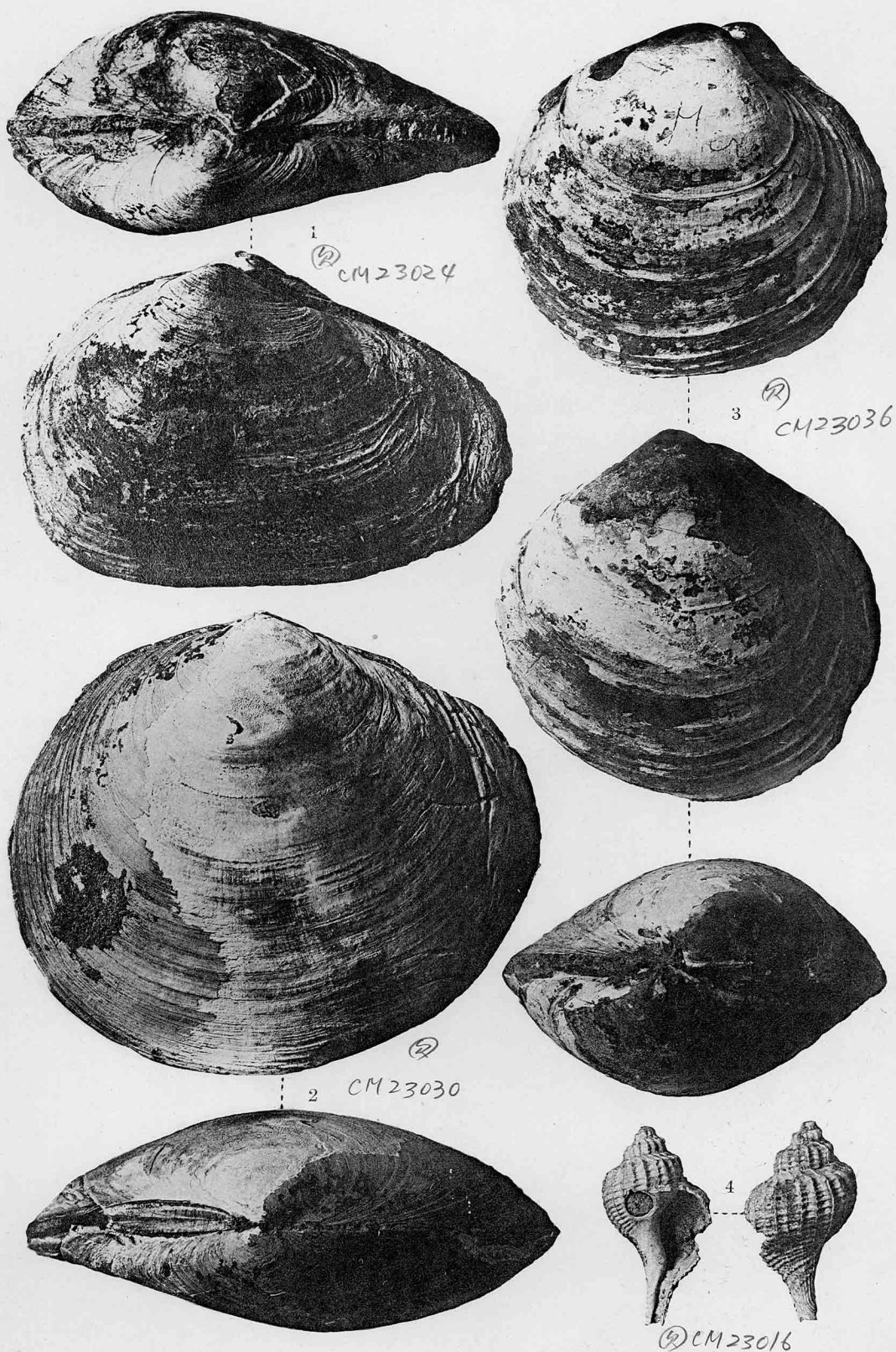
Fossil occurrence.—Beds B and C (numerous), Embets. Beds C, Etaibets.

INDEX.

	Page.		Page.
Astarte teshioensis Yok.	244	Mytilus grayanus Dkr.	244
Buccinum leucostoma Lke.	239	Natica janthostoma Desh.	240
Cardium muticum Rve.	243	Nucula cobboldiae Sow.	246
Cardium pauperculum Yok.	243	Pecten poculum Yok.	245
Chrysodomus despectus L.	239	Pecten Swiftii Bern.	245
Fusus nyemurai Yok.	238	Pectunculus sp.	246
Galeodea japonica Yok.	240	Psammodia sp.	242
Leda sp.	246	Spisula grayana Schr.	241
Lucina (Phacoides) sp.	243	Tellina optiva Yok.	242
Macoma dissimilis Mart.	242	Thyasira bisecta Conr.	243
Macoma inquinata Desh.	242	Turritella nipponica Yok.	240
Mactra semmiana Yok.	241	Venericardia ferruginea Ad.	243
Modiola barbata L.	245	Yoldia sagittaria Yok.	247
Mya arenaria L.	241	Yoldia scapha Yok.	247

Plate XXX.

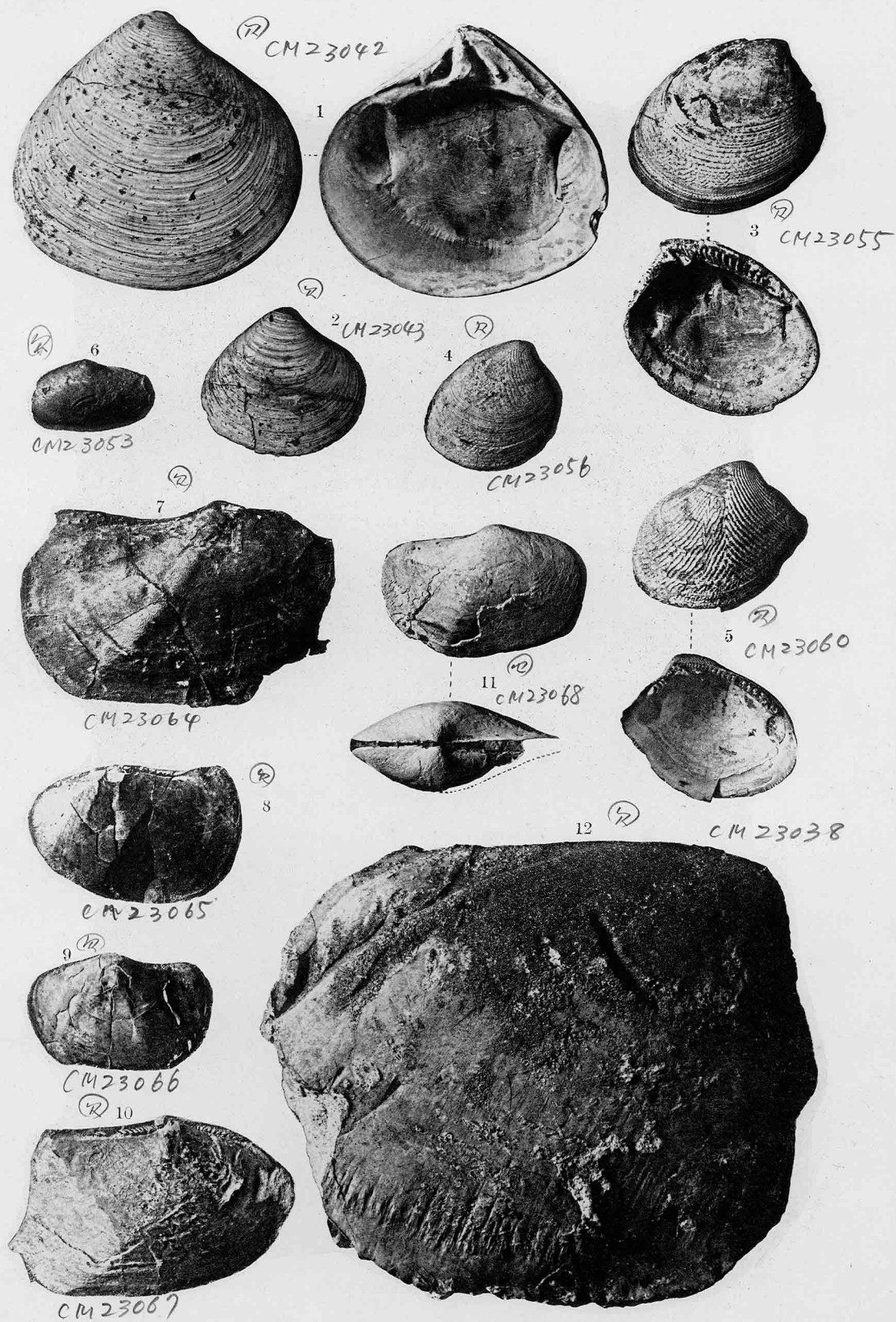
- Fig. 1. *Mya arenaria* L. Beds C, Embets. P. 241.
Fig. 2. *Tellina optiva* Yok. Beds C, Embets. P. 242.
Fig. 3. *Cardium pauperculum* Yok. Beds C, Embets. P. 243.
Fig. 4. *Fusus uyemurai* Yok. Beds B, Embets. P. 238.



M. Yokoyama: Tertiary Mollusca from Embets and Etaibets.

Plate XXXI.

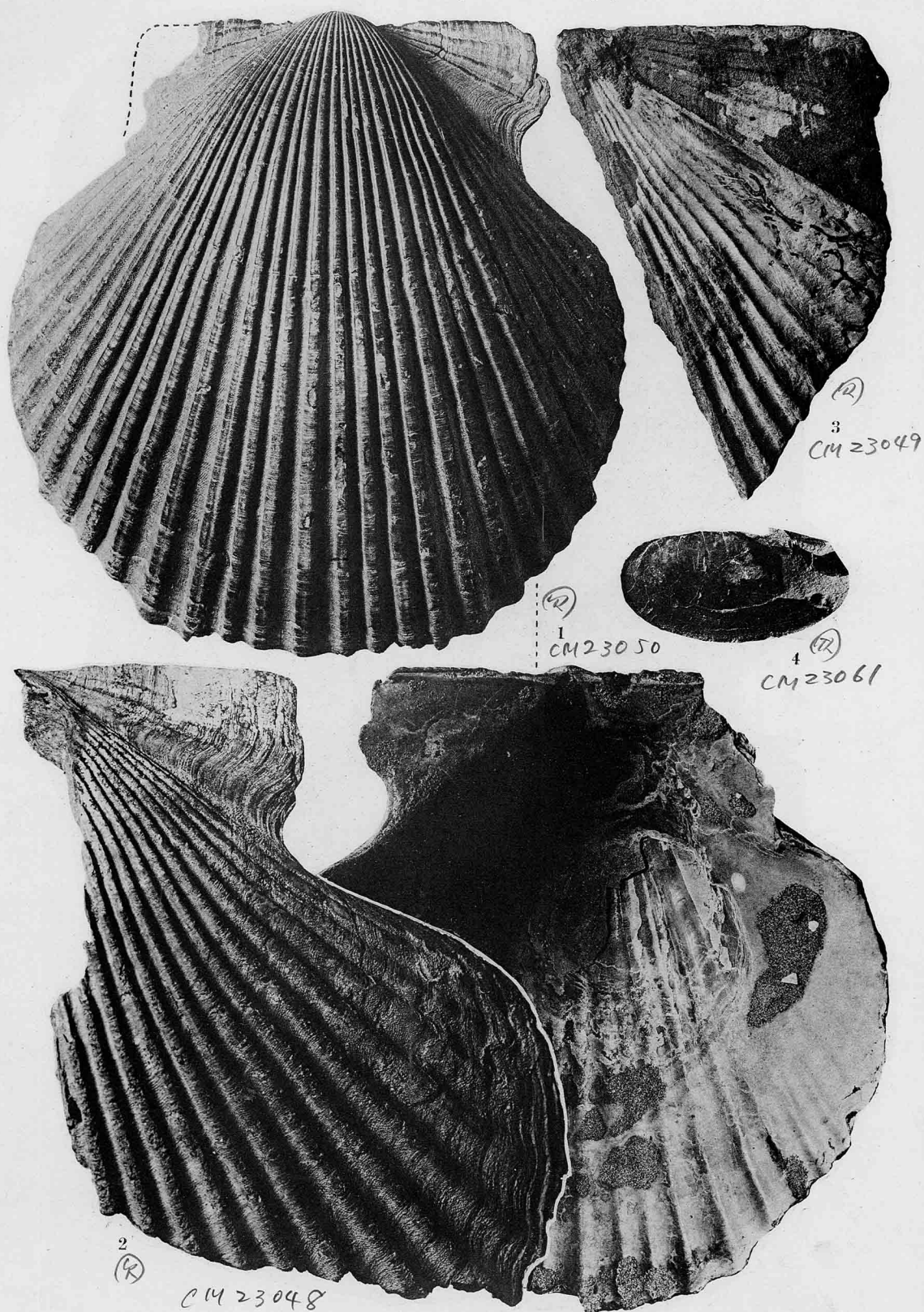
- Figs. 1, 2. *Astarte teshioensis* Yok. Right valves. Beds A, Embets. P. 244.
Figs. 3, 4. *Nucula cobboldiae* Sow. Beds A, Embets. P. 246.
Fig. 5. *Nucula mirabilis* Ad. et Rve. from the Upper Musashino of Shingawa near Tokyo for comparison. P. 246.
Fig. 6. *Leda* sp. Beds C, Embets. P. 246.
Figs. 7-11. *Yoldia scapha* Yok. Beds C, Embets. 7-10, Casts. P. 247.
Fig. 12. *Thyasira bisecta* Conr. *nipponica* Yabe et Nomura. Beds B, Embets. P. 243.



M. Yokoyama: Tertiary Mollusca from Embets and Etaibets.

Plate XXXII.

- Fig. 1. *Pecten poculum* Yok. Right valve from Kayasawa, Ugo for comparison. Reduced to about $3/4$ natural size. P. 245.
- Fig. 2. *Pecten poculum* Yok. Right valve. Beds A, Embets. P. 245.
- Fig. 3. *Pecten poculum* Yok. Left valve. Beds A, Embets. P. 245.
- Fig. 4. *Yoldia sagittaria* Yok. Beds C, Embets P. 247.



M. Yokoyama: Tertiary Mollusca from Embets and Etaibets.

**MEMOIRS OF THE SCIENCE DEPARTMENT
UNIVERSITY OF TOKIO**

- Vol. 1, Pt. 1. *Shell Mounds of Omori.* By Edward S. Morse. 1879. Yen 2.80
An Appendix to the Vol. 1, Pt. 1. *Okadaira Shell Mound at Hitachi.* By I. Iijima and C. Sasaki. 1883. Yen 1.50
- Vol. 2. *On Mining and Mines in Japan.* By C. Netto. 1879. Yen 1.90
- Vol. 3, Pt. 1. *Report on the Meteorology of Tokio for the Year 1879.* By T. C. Mendenhall. 1880. Yen 2.40
- No. 4. *Geology of the Environs of Tokio.* By David Brauns. 1881. Yen 2.90
- No. 5. *Measurements of the Force of Gravity at Tokio and on the Summit of Fujinoyama*
By T. C. Mendenhall. 1881. Yen .60
- An Appendix to No. 5. *Measurement of the Force of Gravity at Sapporo.* By A. Tanakadate, R. Fujisawa and S. Tanaka. 1882. Yen .60
- An Appendix to No. 5. *Measurement of the Force of Gravity at Naha (Okinawa) and Kagoshima.* By S. Sakai and E. Yamaguchi. 1884. Yen .60
- An Appendix to No. 5. *Measurement of the Force of Gravity and Magnetic Constants at Ogasawarajima (Bonin Island).* Reported by A. Tanakadate. 1885. Yen .60
- No. 6. *The Chemistry of Sake-Brewing.* By R. W. Atkinson. 1881. Yen 2.80
- No. 7. *Report on the Meteorology of Tokio for the Year 1880.* By T. C. Mendenhall. 1881. Yen 3.60
- No. 8. *The Wave-Lengths of Some of the Principal Fraunhofer Lines of the Solar Spectrum.* By T. C. Mendenhall. 1881. Yen .70
- No. 9. *Earthquake Measurement.* By J. A. Ewing. 1883. Yen 3.50
- No. 10. *Phytochemische Notizen ueber einige japanische Pflanzen.* Von J. F. Eykman. 1883. Yen 1.90
- No. 11. *A System of Iron Railroad Bridges for Japan.* By J. A. L. Waddell. (Text) 1885. Ditto. (Table and Plates) 1885. (Out of Print)
- No. 12. *Leukoskop. Seine Anwendung und seine Theorie.* Von Diro Kitao. 1885. Yen 2.10

CONTENTS

- M. YOKOYAMA :—Molluscan Fossils from the Tertiary of Mino.
M. YOKOYAMA :—Neogene Shells from Kôzuke and other Provinces.
M. YOKOYAMA :—Tertiary Mollusca from the Oil-Fields of Embets and
Etaibets.

This JOURNAL is on sale at

MARUZEN Co., Ltd.

11-16, Nihonbashi Tori-Sanchome, Tokyo

R. FRIEDLÄNDER & SOHN

Carlstr. 11, Berlin, N. W. 6.

Price in Tokyo: Yen 1.50 for this Part.

編纂兼發行者

東京帝國大學

印刷者 東京市日本橋區兜町二番地
星野錫

印刷所 東京市日本橋區兜町二番地
東京印刷株式會社

賣捌所 東京市日本橋區通三丁目十四番地
丸善株式會社

大正十五年五月二十八日印刷
大正十五年五月三十一日發行