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DEAN OF THE FACULTY OF SCIENCE, IMPERIAL UNIVERSITY OF TOKYO.

Molluscan Fossils from Karafto

By

Matajiro YOKOYAMA

With 6 Plates

General Remarks

Long since, the northern half of the island of Karafto¹⁾, or Sakhalin²⁾ as it is also called, belonging to Russia was known to produce rock-oil in regions bordering on its eastern coast. In the year 1908 the *Comité Géologique* of St. Petersburg had for the first time sent P. Polevoi, a mining engineer, to explore these regions, the results of which appeared as a short report³⁾ in the 28th volume of the *Bulletins* of the same *Comité*, fully establishing the occurrence of the oil at several places north of the 50th parallel, north latitude, up to near the neck of the Schmidt Peninsula which forms the northern end of the island, although it was not until its occupation in 1920 by the Japanese that any serious attention was given by our government to this useful mineral. Since then, during the occupation which lasted until 1925 as well as after it, many of our geologists have been sent to make regular surveys of the oil-regions, most of whom brought back fossils, chiefly Mollusca, found in the oil-bearing layers. Unfortunately, however, those brought back prior to the great earthquake of Tokyo of September 1st 1923 and kept in the museum of the Imperial Geological Survey were destroyed by fire following the disaster, so that only a few deposited in the Geological Institute of the Imperial University of Tokyo were saved. These together with those collected after the earthquake in North as well as in

1) Japanese name of an unknown origin.

2) A name of Manchu origin.

3) Vorläufiger Bericht über das Erdölgebiet des östlichen Sachalin. Bull. Comité Géol. St. Petersburg, Vol. 191, 1909, pp. 415-456, in Russian with a resumé in German (pp. 456-462).

South Karafto I had an opportunity to examine, the results of which are set forth in the following pages.¹⁾

The regions in which the fossils of North Karafto have been collected are five in number. The most northern is that of the rivers *Kydylanii*, *Moktov* and *Paromai*, lying approximately between the parallels 53° and 52° 50' north latitude. The collector is Mr. Y. Chitani, Geologist of the Imperial Geological Survey. The next region is that surveyed by Mr. H. Kamiya, a geologist attached to the Mitsubishi Mining Company, which is situated immediately south of the river *Paromai*, extending as far as the river *Pilitun* (approximately 52° 45'). Then comes that surveyed by Mr. T. Uchida, a geologist of the ~~Nissocki~~ *Nissocki* ^{Nissocki} Petroleum Company, lying between the rivers *Dagoe* (52° 7') and *Uinii* (51° 55'). The next region is found between the rivers *Kongi* (51° 55') and *Nampi* (50° 55') surveyed by Mr. K. Watanabe of the Imperial Geological Survey. Lastly, the most southern is that surveyed by Mr. Uyemura also of the Imperial Geological Survey, lying between the rivers *Wengeli* (50° 35') and *Fuhdji* (50° 20').

The regions in which the fossils of South Karafto have been collected are partly near the town of *Ōdomari* and partly far from it. The region of *Ōdomari* has been surveyed by Mr. K. Murayama of the Imperial Geological Survey on suspicion that it may produce oil. However, according to what Mr. Murayama has told me, there seems to be not a trace of it in the whole region. The other regions lie partly north and partly west of *Ōdomari* where Mr. S. Takahashi, a teacher in the Middle School of *Ōdomari*, was kind enough to collect fossils for me.

1. Region of the Rivers *Kydylanii* and *Paromai*.

Along the eastern coast of North Karafto, the Pleistocene is formed by terrace-deposits of sand and gravel below which the more or less disturbed oil-bearing strata constitute thick beds, sometimes attaining several thousands of metres in thickness. In the region of the *Kydylanii*

1) Concerning these fossils, no paper treating them systematically has appeared until now, though the names only based on a cursory examination are given in the report of Polevoi before mentioned as well as in the two following papers:

N. N. Tichanovitch. Vorläufiger Bericht über die Expedition im Jahre 1908 auf die Halbinsel Schmidt im nördlichen Sachalin. Bull. Comité Géol. St. Petersburg, vol. 28. Russian with resumé in German.

J. Makiyama. Stratigraphy of the Tertiary Formation of the Schmidt Peninsula. Chikyū, vol. 11, 1924 (Japanese).

and the Paromai, they have been estimated to be about 3000 metres, divided by Mr. Chitani into the following beds :

- | | | |
|----------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Upper Part | { | a. <i>Upper Quartz Sandstone</i> . Occasionally with conglomerate and shale.
b. <i>Lower Quartz Sandstone</i> . Intercalating calcareous sandstone, shale and conglomerate. Rich in fossils, apparently arranged in three zones, upper, middle and lower. |
| 2. Middle Part | { | c. <i>Shaly Sandstone</i> . With some fossils.
d. <i>Quartz Sandstone</i> . Rarely with fossils.
e. <i>Sandy Shale</i> . Stained brown with iron hydrate. |

2. Region of the Rivers Paromai and Pilitun.

Mr. H. Kamiya who visited the place in 1921 divides the formation lying below the Pleistocene as follows :

- | | | |
|----------------|---|-----------------------------------------------------------------------------------------------------------------------|
| 1. Upper Part | { | a. <i>Alternations of Sandstone and Conglomerate</i> .
b. <i>Alternations of Shale and Sandstone</i> with fossils. |
| 2. Middle Part | { | c. <i>Alternations of Sandstone and Conglomerate</i> .
d. <i>Shaly Sandstone</i> . |
| 3. Lower Part | { | e. <i>Fine-grained Sandstone</i> with fossils.
f. <i>Sandy Shale</i> . |

The thickness has been estimated to be about 1000 metres for the Upper Part, 600 metres for the Middle and 360 metres for the Lower.

3. Region of the Rivers Dagoe and Uinii.

Mr. K. Uchida divides the oil-bearing formation of the river Dagoe as follows :

- a. *Nutovo Beds*. Sandstone coloured brown with iron hydrate.
- b. *Okobikai Beds*. Sandy shale with *Thyasira bisecta*.
- c. *Atoa Beds*. Sandstone with some shale, clay and coal.
- d. *Soft Shale*.
- e. *Dagoe Beds*. Hard siliceous shale.

The thickness of the five beds altogether has been roughly estimated at 3500 metres.

Along the river Uinii, the beds c, d and e are lacking.

4. Region of the Rivers Kongi and Nampi.

Below the Pleistocene terrace-deposits, Mr. K. Watanabe recognized the presence of the following two beds, each of which is divisible into three subbeds or layers:

- | | | |
|---------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Kongi Beds | { | a. <i>Upper Sandstone</i> .
b. <i>Sandstone and Shale</i> . In some places <i>Sandy Shale</i> instead. Fossils present.
c. <i>Lower Sandstone</i> . Fossils found in nodules imbedded in the sandstone. |
| 2. Nampi Beds | { | d. <i>Hard Shale</i> . Dark grey to black. With some fossil shells and plants.
e. <i>Sandstone</i> . Light greyish green, fine-grained and containing nodules.
f. <i>Conglomerate</i> . Made up of pebbles of greywacke, quartzite, slate, etc. |

The Kongi Beds are thought to be about 1300 metres in thickness and the Nampi Beds to be more than 2000 metres.

5. Region of the Rivers Wengeli and Fuhdji.

In this most southern of the five regions of Karafto, Mr. K. Uyemura, the surveyor, enumerates the following five beds as lying below the terrace deposits:

- a. *Upper Sandstone*. Generally fine-grained, but interspersed with pea-sized pebbles, intercalating conglomerate and hard sandstone, the latter of which contains nodules including fossils. About 350 metres in thickness.
- b. *Intermediate Beds*. Alternating layers of sandstone and sandy shale. About 200 metres in thickness.
- c. *Sandy Shale*. Intercalating layers of shale and sandstone. About 3500 metres in thickness.
- d. *Siliceous Shale*. Mostly coloured brown with iron hydrate, though dark grey where unstained. Fossils present. About 150 to 800 metres in thickness.
- e. *Lower Sandstone*. Grey, fine-grained and rather soft, changing into a dark grey *sandy shale* as we go north. About 120 to 500 metres thick.

Below the lowest beds there are the so-called *Petroleum River Beds* below which there are again rocks which are generally taken for those of the *Palaeozoic*. These two, however, do not belong to the oil-bearing series.

The mutual relations of the various beds of the five regions above mentioned are given in the following table :

Regions	Kydylanii-Paromai (Chitani)	Paromai-Pilitun (Kamiya)	Dagoe-Uinii (Uchida)	Kongi-Nampi (Watanabe)	Wengeli-Fuhdji (Uyemura)
I	Upper Quartz Sandstone Lower Quartz Sandstone	Sandstone a. Conglomerate Sandstone a. Shale Sandstone a. Conglomerate	Nutovo Beds	Upper Sandstone (Upper Kongi)	Upper Sandstone
II	Shaly Sandstone Quartz Sandstone Sandy Shale	Shaly Sandstone Fine Sandstone Sandy Shale	Okobikai Beds	Sandstone a. Shale (or Sandy Shale) (Middle, Kongi)	Intermediate Beds Sandy Shale
			Atoa Beds	Lower Sandstone (Lower Kongi)	
III			Soft Shale Dagoe Beds	Hard Shale Sandstone Conglomerate	Siliceous Shale Lower Sandstone

6. Region of Odomari, South Karafto.

Mr. Murayama gives the layers found in this region as follows :

- a. *Alluvium*.
- b. *Pleistocene* with fossils.
- c. *Tertiary*.
 - A. *Alternations of Shale and Sandstone* with more shale than sandstone. Fossils present.
 - B. *Alternations of Sandstone and Shale* with more sandstone than shale.
 - C. *Shale* with two zones of fossils, upper and lower.
 - D. *Green sandstone* with fossils.

Concerning the layer or layers from which Mr. Takahashi collected his fossils, nothing is known. The localities are Ōdomari,¹⁾ Kawakami Hot Spring,²⁾ the Chagamagawa,³⁾ the Dorogawa (Otomari, Notoro-Peninsula),⁴⁾ the Shiraishizawa⁵⁾ and one other place not named. However, I believe that at least some fossils have been obtained in a layer or layers enumerated by Murayama, although at present it is not possible to know it quite accurately.

The names of the fossil species found in all the places of North and South Karafto are given in the following table :

1) 大泊 2) 豊原郡豊北村川上温泉 3) 新間郡東知取村茶釜川 4) 留多加郡能登呂村尾泊泥川 5) 元泊郡帆寄村白石澤

	North Karafto Beds			South Karafto		Geological Occurrence
	I	II	III	Pleistocene	Tertiary	
1. <i>Cylichna</i> sp.					+	
2. <i>Pleurotoma</i> sp.		+				
3. <i>Chrysodomus despectus</i> (L.)	+	+				Rec. (N. Japan). Behring Sea. Low. Mus.—Miocene
3a. <i>Chrysodomus despectus</i> (L.) var. <i>tuberculata</i> nov.				+		
4. <i>Chrysodomus arthriticus</i> (Val.)	+			+		Rec. (N. Japan). Up. Musashino
5. <i>Buccinum leucostoma</i> Lke. var. <i>sachalinensis</i> n.	+					
6. <i>Volutharpa perryi</i> (Jay.)	+					Rec. (N.C. Japan). Up. Mus.—Pliocene
7. <i>Potamides uyemurai</i> n. sp.		+				
8. <i>Turritella nipponica</i> Yok.		+	+			Rec. ? Low. Musashino—Miocene
9. <i>Turritella kiiensis</i> Yok.		+			+	Pliocene
10. <i>Turritella</i> sp.	+	+			+	
11. <i>Natica janthostoma</i> Desb.	+	+			+	Rec. (N.C. Japan). Up. Mus.—Miocene
12. <i>Teredo</i> sp.	+					
13. <i>Mya arenaria</i> L.	+	+		+	+	Rec. (N.C.W. Japan). Up. Mus.—Pliocene
14. <i>Macra sachalinensis</i> Schr.				+		Rec. (N.C. Japan). Up. Musashino.
15. <i>Macra sulcataria</i> Desh.	+					Rec. (N.C.W. Japan). Up. Mus.—Pliocene
16. <i>Macra semmiana</i> Yok.	+				+	Pliocene
17. <i>Macra</i> aff. <i>ovalina</i> Lam.		+				
18. <i>Spisula grayana</i> (Schr.)	+					Rec. (N. Japan.) Up. Mus.—Miocene
19. <i>Siliqua costata</i> (Say.)	+					Rec. (N. Japan. Okhotsk a. Behring Seas.)
20. <i>Tellina venulosa</i> Schr.	+					Rec. (N. Japan). Up. Mus.—Pliocene
21. <i>Tellina besshoensis</i> Yok.		+			+	Miocene
22. <i>Macoma dissimilis</i> (Mart.)	+	+				Rec. (N.C. Japan). Up. Mus.—Miocene
23. <i>Macrocallista brevisiphonata</i> (Carp.)	+	+			+	Rec. (N. Japan). Up. Mus.—Miocene
24. <i>Chione astartoides</i> (Beck)	+					Rec. (N. Japan)
25. <i>Cardium groenlandicum</i> Chem.	+	+			+	Rec. (N. Japan, Circumpolar seas). Crag.
26. <i>Cardium nuttallii</i> Conr.	+	+			+	Rec. (Alaska). Up. Mus.—Miocene
27. <i>Thyasira bisecta</i> (Conr.)	+	+				Rec. (N. Pacific). Up. Mus.—Miocene
28. <i>Thyasira gouldii</i> (Phil.)	+					Rec. (N. Japan). Up. Musashino

	North Karafto Beds			South Karafto		Geological Occurrence
	I	II	III	Pliocene	Tertiary	
29. <i>Venericardia tokunagai</i> Yok.		+			+	Miocene
30. <i>Lucina</i> sp.	+		+			
31. <i>Mytilus edulis</i> L.		+				Rec. (N. Japan). Crag
32. <i>Mytilus grayanus</i> Dkr.		+				Rec. (N-S. Japan). Pliocene
33. <i>Pecten watanabei</i> n. sp.			+			
34. <i>Pecten</i> sp.			+			
35. <i>Ostræa gigas</i> Thunb.				+		Rec. (N-S. Japan). Up. Mus. — Pliocene
36. <i>Glycimeris chitanii</i> n. sp.		+				
37. <i>Leda confusa</i> Hanl.		+				Rec. (C. Japan). Up. Mus. — Pliocene
38. <i>Leda</i> sp.					+	
39. <i>Yoldia scapha</i> Yok.					+	Miocene
40. <i>Yoldia sagittaria</i> Yok.			+			Miocene
41. <i>Yoldia notabilis</i> Yok.	+	+			+	Up. Musashino
42. <i>Acila mirabilis</i> Ad. et Rve.					+	Rec. (C.W. Japan). Up. Mus. — Pliocene

A. Fossils from North Karafto

The various layers of North Karafto which yielded 36 species altogether, I grouped into three beds which, for simplicity's sake, were called I, II and III, as shown in the foregoing table. Beds I, gave 22 species, Beds II, 21 species and Beds III, 5 species. These will be treated separately in the following lines.

Beds I.

The species obtained from Beds I are the following :

1. *Chrysodomus despectus* (L.)
2. *Chrysodomus arthriticus* (Val.)
3. *Buccinum leucostoma* Lke. var. nov. *sachalinensis*.
4. *Volutharpa perryi* (Jay.)
5. *Turritella* sp.
6. *Natica janthostoma* Desh.
7. *Teredo* sp.

8. *Mya arenaria* L.
9. *Mactra sulcataria* Desh.
10. *Mactra semmiana* Yok.
11. *Spisula grayana* (Schr.)
12. *Siliqua costata* (Say.)
13. *Tellina venulosa* Schr.
14. *Macoma dissimilis* (Mart.)
15. *Macrocallista brevisiphonata* (Carp.)
16. *Chione astartoides* (Beck)
17. *Cardium groenlandicum* (Chem)
18. *Cardium nuttallii* (Conr)
19. *Thyasira bisecta* (Conr)
20. *Thyasira gouldii* (Phil)
21. *Lucina* sp.
22. *Yoldia notabilis* Yok.

Of these 22 species, 3 are not specifically determined. Therefore if we leave out these 3, there remain 19 of which 3 or about 15% are those now not known to be living. They are *Buccinum leucostoma sachalinensis*, *Mactra semmiana* and *Yoldia notabilis*. The first is a new variety of the living species, the second a Pliocene form and the third occurs in the Upper Musashino of Central Japan.

Of the 16 living species, 2 (*Siliqua costata* and *Chione astartoides*) have not yet been found as fossils. Of the remaining 14, 2 (*Chrysodomus arthriticus* and *Thyasira gouldii*) date back to the Upper Musashino, 5 (*Volutharpa perryi*, *Mya arenaria*, *Mactra sulcataria*, *Tellina venulosa* and, *Cardium groenlandicum*) to the Pliocene and 7 (*Chrysodomus despectus*, *Natica janthostoma*, *Spisula grayana*, *Macoma dissimilis*, *Macrocallista brevisiphonata*, *Cardium nuttallii* and *Thyasira bisecta*) to the Miocene. From these considerations it is quite certain that the fauna is Pliocene, and judging from the low percentage of the extinct forms, Young Pliocene.

Considered from the climatological point of view, the fauna represents that of a cold region just like the present Karafto. The 16 living species are those now actually living in the neighbouring seas, and indeed, 11 exclusively in them, the remaining 5 being found further south as well, that is to say in Central and Western Japan. The exclusively northern forms are the following:

1. *Chrysodomus despectus* (L.)
2. *Chrysodomus arthriticus* (Val.)
3. *Spisula grayana* (Schr.)

4. *Siliqua costata* (Say.)
5. *Tellina venulosa* (Schr.)
6. *Macrocallista brevisiphonata* (Carp.)
7. *Chione astartoides* (Beck)
8. *Cardium groenlandicum* Chem.
9. *Cardium nuttallii* Conr.
10. *Thyasira bisecta* (Conr.)
11. *Thyasira gouldi* (Phil.)

The 5 species which live as well south are the following :

1. *Volutharpa perryi* (Jay.)
2. *Natica janthostoma* Desh.
3. *Mya arenaria* L.
4. *Mactra sulcataria* Desh.
5. *Macoma dissimilis* (Mart.)

In my papers hitherto published on the Pliocene fauna of Japan Proper, I repeatedly stated that it represents that of a somewhat *cooler* sea than the present, and that this character is more marked on the fauna of Taiwan (Formosa) than on that of Japan Proper. Now, as far as my present investigation goes, this character is not at all to be seen on the Karafto fauna. From this I am naturally led to infer that the difference of temperature of the *Pliocene* and *Recent* seas, if there was any, was greatest in the south, then diminishing as we go north, until in the extreme north or North Karafto it was not at all to be noticed. For the confirmation of the above inference, further studies will be necessary.

Beds II

The species obtained from these beds are the following 21 :

1. *Pleurotoma* sp.
2. *Chrysodomus despectus* (L.)
3. *Potamides uyemurai* n. sp.
4. *Turritella nipponica* Yok.
5. *Turritella kiensis* Yok.
6. *Turritella* sp.
7. *Natica janthostoma* Desh.
8. *Mya arenaria* L.
9. *Mactra* aff. *ovalina* Lam.

1) Mollusca from the Oilfield of Taiwan. Reports of Imp. Geol. Surv. Japan, No. 101, 1928, p. 17.

10. *Tellina besshoensis* Yok.
11. *Macoma dissimilis* (Mart.)
12. *Macrocallista brevisiphonata* (Carp.)
13. *Cardium groenlandicum* Chem.
14. *Cardium nuttallii* Conr.
15. *Thyasira bisecta* (Conr.)
16. *Venericardia tokunagai* Yok.
17. *Mytilus edulis* L.
18. *Spisula grayana* (Schr.)
19. *Glycimeris chitanii* n. sp.
20. *Leda confusa* Hanl.
21. *Yoldia notabilis* Yok.

Leaving out the 3 species which are not well determined there remain 18, of which 6 or one-third at least (counting *Turritella nipponica* among the living) are those hitherto not known to be living. They are

1. *Potamides uyemurai* n. sp.
2. *Turritella kiiensis* Yok.
3. *Tellina besshoensis* Yok.
4. *Venericardia tokunagai* Yok.
5. *Glycimeris chitanii* n. sp.
6. *Yoldia notabilis* Yok.

Of these 6, 1 (*Yoldia notabilis*) is Upper Musashino in age, 1 (*Turritella kiiensis*) Pliocene, 2 (*Tellina besshoensis* and *Venericardia tokunagai*) are Miocene and 2 (*Potamides uyemurai* and *Glycimeris chitanii*) new.

Of the 12 living species, 6 (*Turritella nipponica*, *Mya arenaria*, *Cardium groenlandicum*, *Mytilus edulis*, *Spisula grayana* and *Leda confusa*) date back to the Pliocene and 6 (*Chrysodomus despectus*, *Natica janthostoma*, *Macoma dissimilis*, *Macrocallista brevisiphonata*, *Cardium nuttallii* and *Thyasira bisecta*) date back to the Miocene.

Thus we see that the species which point to the Pliocene are 13 in number, while those which point to the Miocene are 8, so that we have here a fauna which is still Pliocene in age, though the greater percentage of the extinct ones compared to those of Beds I shows that it is not Young Pliocene, representing either *Middle Pliocene* or *Old Pliocene* or perhaps both.

As to the climatological character of the fauna, it can not be said to be much different from that of Beds I. Of the 12 living species 6 (*Chrysodomus despectus*, *Macrocallista brevisiphonata*, *Cardium groenlandicum*, *Cardium nuttallii*, *Thyasira bisecta* and *Mytilus edulis*) are exclusively northern, 4 (*Natica janthostoma*, *Mya arenaria*, *Macoma dissimilis* and *Mytilus grayanus*) northern as well as farther southern and only 1

(*Leda confusa*) or possibly 2 (together with *Turritella nipponica*) are hitherto exclusively southern, so that the fauna may be taken for approximately similar, if not quite, to that of the overlying beds.

Beds III

Here we have only 5 species which are

1. *Turritella nipponica* Yok.
2. *Lucina* sp.
3. *Pecten watanabei* n. sp.
4. *Pecten* sp.
5. *Yoldia sagittaria* Yok.

Turritella nipponica is preeminently a Pliocene form, *Pecten watanabei* new, and *Yoldia sagittaria* Miocene in Japan, while the 2 others are not determined. From these it is hardly possible to form any definite opinion on the age of the beds in which they were found. Fortunately, however, an impression of a conifer called *Sequoia disticha* Heer was found in a shale of the river Nampi. This plant occurs in beds generally considered to be *Miocene* in age. Therefore it is very probable that Beds III belong to this age.

B. Fossils from South Karafto

These are very limited in number. The names of the species collected in the various fossil zones of the region of Ōdomari are as follows:

Pleistocene Beds

1. *Chrysodomus despectus* (L.) var. *tuberculata* nov.
2. *Chrysodomus arthriticus* (Val.)
3. *Mya arenaria* L.
4. *Mactra sachalinensis* Schr.
5. *Ostrea gigas* Thunb.

Beds A of the Tertiary

1. *Macoma dissimilis* (Mart.)
2. *Yoldia scapha* Yok.
3. *Yoldia notabilis* Yok.
4. *Acila mirabilis* (Ad. et Rve.)

Upper Zone of Beds C of the Tertiary

1. *Venericardia tokunagai* Yok.

Lower Zone of Beds C of the Tertiary

1. *Cylichna* sp.
2. *Leda* sp.

Beds D of the Tertiary

1. *Venericardia tokunagai* Yok.

The 5 species which Mr. Murayama, the surveyor, takes for *Pleistocene* are very probably so. They are very young-looking, resembling those of the Upper Musashino of the neighbourhood of Tokyo in preservation, that is to say, like recent ones only with colours faded.

The four species of Beds A are probably *Pliocene* as all are those found in that age, *Macoma dissimilis* alone dating back to the Miocene.

The other beds C and D may be *Pliocene* or *Miocene*, as *Venericardia tokunagai* which is Miocene in Central Japan occurs also in Beds II of North Karafuto which I take for *Pliocene*.

The fossils collected and sent to me by Mr. Takahashi grouped according to their localities are as follows:

a. Ōdomari, Ōdomari-gun.

1. *Turritella* sp.
2. *Macoma dissimilis* (Mart.)
3. *Lucina* sp.
4. *Yoldia scapha* Yok.
5. *Acila mirabilis* (Ad. et Rve.)

b. Kawakami Hot Spring, Toyohara-gun.

1. *Turritella kiiensis* Yok.
2. *Natica janthostoma* Desh.
3. *Mya arenaria* L.
4. *Mactra semmiana* Yok.
5. *Macrocallista brevisiphonata* (Carp.)
6. *Cardium groenlandicum* Chem.
7. *Venericardia tokunagai* Yok.

c. The River Chagama, Shirtor, Niitō-gun.¹⁾

1. *Mya arenaria* L.

d. The River Doro, Otomari, Noto, Rutaka-gun.²⁾

1. *Macoma dissimilis* (Mart.)
2. *Venericardia tokunagai* Yok.

e. Shiraishizawa³⁾, Hoyose, Mototomari-gun.

1. *Cardium groenlandicum* Chem.

f. Locality Unknown.

1. *Cardium nuttallii* Conr.

The layers which yielded these fossils seem all to be *Pliocene* although c, d, e and f may also be *Miocene*.

1) 新潟郡東知取村茶釜川 2) 留多加郡能登呂村尾泊泥川 3) 元泊郡帆寄村白石澤

Description of the Species

CM 26873

1. *Cylichna* sp.

A single specimen, cylindrical in shape, with both ends rounded and ornamented with close spiral impressed lines. Preservation imperfect.

Fossil occurrence.—Lower Zone of *Beds C* (of South Karafto). In a dark hard shale of the Fifth Stream "emptying into Lake Waai, Nagahama-mura" Nagahama-gun.¹⁾

CM 26874

2. *Pleurotoma* sp.

Three mutilated specimens, all belonging to the apertural portion of the shell. The whorls are rounded like those of *Pleurotoma sadoensis* Yok. (Foss. Shells Sado, pl. XXXII, fig. 3) of the Upper Musashino of Sado, although not quite identical.

Fossil occurrence.—*Beds II* (of North Karafto): in the "Sandy Shale" of the sea-shore north of the river Pohle and also south of the river Petroleum.

3. *Chrysodomus despectus*, (LINNE)

CM 26875

CM 26876-71-2

Pl. LXXI. Fig. 2

Chrysodomus despectus. Yokoyama, Tert. Shells Coalfield Haboro, p. 195. Tert. Moll. Oif. Embets a. Etalbets, p. 239. Tert. Moll. Shinano a. Echigo, p. 5, pl. I, fig. 3.

Several immature individuals. The preservation is rather imperfect so that it is not possible to know to which variety of the species they belong. However, some, if not all, resemble var. *subantiquata* Maton and Rackett (Harmer, Plioc. Shells, Part II, Pl. XVII, figs. 6, 7) now living in the circumpolar seas as well as fossil in the Pleistocene and Pliocene of Europe.

Fossil occurrence.—*Beds I* (of North Karafto): in the middle zone of the "Lower Quartz sandstone" of the river Kydylanii. *Beds II*: in the "Sandy Shale" of the river Pohle; in a marly nodule found in the "Sandy Shale" of the sea-shore north of the same river; in a dark grey coarse sandstone of the river Dagoe²⁾ (Okobikai Beds).

Lower Musashino, Pliocene and Miocene of Japan.

Living.—Northern Japan. Japan Sea. Okhotsk Sea. Bering Sea.

1) 長濱郡長濱村和愛湖 2) The name is sometimes written *Dagi*.

CM 26877-71-1

CM 26878

Var. *tuberculata* nov.

Pl. LXXI. Fig. 1

C

A large example with the outer lip somewhat broken. The whorls are keeled so that the shell is closely related to var. *subantiquata* above referred to, though differing in the presence of blunt tubercles on the keel of the penultimate whorl as well as of the first half of the ultimate. The number of these tubercles is eight on the former. Another difference to be noted is in the position of the spiral cord lying below the keel; namely, it is not midway between the keel and suture, but close to the latter. The canal is also somewhat more bent than in the specimen shown in Harmer's figure.

Height 113 millim. Diameter 61 millim.

Fossil occurrence.—*Pleistocene* of Sannosawa, Chitose, Ōdomari-gun¹⁾ (South Karafuto).

This variety may be still living, although at present it is not quite certain.

CM 26879

CM 26880-71-4

4. *Chrysodomus arthriticus*, (VALENCIENNE)

Pl. LXXI. Fig. 4

Chrysodomus arthriticus. Yokoyama, Foss. Up. Mus. Kaz. Shim., p. 53, pl. III, fig. 12. Moll. Up. Mus. Tokyo a. its Sub., p. 394.

Specimens are from the Pleistocene as well as from the Tertiary. The former are excellently preserved, though the latter are only casts. The whorls in the former are weakly angulate with blunt tubercles on the angle.

Fossil occurrence.—*Beds I*: in a brown limonitic sandstone of the rivers Moktov and Paromai (Nutovo Beds, Tellina or Upper Zone). *Pleistocene* of Sannosawa, Chitose.

Upper Musashino of Japan.

Living.—Northern Japan.

C

CM 26881-72-1

CM 26882-72-2

CM 26883

CM 26884

CM 26885

5. *Buccinum leucostoma*, LISCHKE var. *sachalinensis* nov.

Pl. LXXII. Figs. 1, 2

Numerous examples which, however, are all ill preserved, being strongly worn on the surface. But so far as we can make out of them, the sculpture seems to be somewhat different from that of the typical

1) 大泊郡千歳村三澤

form. Namely, it does not consist as in the latter of prominent spiral ribs and threads, but of spiral grooves with interspaces resembling broad flat ribs. This is the reason why I separate the Karafto fossil as a *variety*.

Fossil occurrence.—*Beds I*: in the "Upper Sandstone" (Nutovo Beds) of the river Uinii.

The typical form is fossil in the Musashinos and Pliocene of Japan as well as living in the seas of central and northern parts of it.

6. *Volutharpa perryi*, (JAY)

CM 26886

Volutharpa perryi. Yokoyama, Foss. Miura Penin., p. 55, pl. IV, fig. 11. Foss. Up. Musash. Kaz. Shim., p. 57, pl. II, fig. 19. Moll. Up. Musash. Tokyo a. its Sub., p. 394. Moll. Rem. Upper. Part Joban Coal., p. 10.

A single specimen of a body-whorl.

Fossil occurrence.—*Beds I*: in a brown limonitic sandstone of the river Tchermenii.

Musashinos and Pliocene of Japan.

Living.—Northern and Central Japan.

7. *Potamides uyemurai*, n. sp.

CM 26887-71-3

Pl. LXXI. Fig. 3

H

Shell large, many-whorled. Whorls flat or even slightly concave in the last part of the body-whorl, somewhat shouldered making the sutures quite distinct, perfectly smooth save for coarse lines of growth. Periphery obtusely angulate. Base convex. Aperture rhomboidal, with a short somewhat bent canal.

The only specimen we possess lacks the upper portion of the spire, the intact whorls being the last four whorls. The diameter is 51 millim. The height, if the shell is perfect, would be about 120 millim. The lower half of the outer lip as well as the canal is broken.

This shell somewhat resembles *Potamides wichmanni* Martin (Foss. v. Java, pl. XXXII, fig. 479) from Fialarang in Timor, which, however, is said to have two spiral grooves on the whorls.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the sea-shore south of the river Kongas.

CM26888-72-8

CM26889

8. *Turritella nipponica*, YOKOYAMA

Pl. LXXII. Fig. 8

Turritella nipponica. Yokoyama, Foss. Miura Penin., p. 71, pl. IV, figs. 16-19. Moll. Tert. Basin Chichibu, p. 116. Moll. Rem. Mino, p. 220. Tert. Moll. Oilf. Embets a. Etaibets, p. 240.

This four-ridged species so frequent in the Neogene deposits of Central Japan is also not very rare in Karafto.

Fossil occurrence.—*Beds II*: in the nodules found in the "Sandy Shale" of the mouth of the river Pohlé and also of a sea-shore lying somewhat north of the same river. *Beds III*: in a pebble of a shale of the Nampi Beds picked up in the river Nampi.

Lower Musashino, Pliocene and Miocene of Japan.

CM26890-72-7

CM26891

9. *Turritella kiiensis*, YOKOYAMA

Pl. LXXII. Fig. 7

Turritella kiiensis. Yokoyama, Tert. Moll. Kii, p. 12, pl. VI, figs. 9, 10. Tert. Moll. Totomi, p. 343. Tert. Foss. West. Hizen, p. 115. Plioc. Shells Hyuga, p. 333.

A few specimens. The shell is several-ridged with ridges unequal.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the sea-shore south of the river Kongas. *Beds* (?); in a sandstone collected near Kawakami Hot Spring, South Karafto.

Pliocene of Japan.

CM26892

CM26893

CM26894

10. *Turritella* sp.

Internal casts. The shell seems to be different from the preceding ones, resembling more *Turritella tokunagai* Yok. and *T. importuna* Yok. (Moll. Rem. Lowest Part Joban Coalf., pl. I, figs. 6-10), although too imperfect for exact determination.

Fossil occurrence.—*Beds I*: in the "Upper Sandstone" of the mouth of the river Langari. Similar casts are also found in a brown sandstone of the Paromai oilfield. *Beds II*: in the "Shaly Sandstone" of the sea-shore near the river Petroleum. *Beds* (?): in a shale of Odomari, South Karafto.

CM26895

CM26896

CM26897

11. *Natica janthostoma*, DESHAYES

Natica janthostoma. Yokoyama, Foss. Miura Penin., p. 76, pl. V, figs. 3, 4. Foss. Shells Sado, p. 278. Tert. Moll. So. Totomi, p. 344. Foss. Moll. Oilf. Akita, p. 380. Tert. Shells Coalf. Haboro, p. 197.

Widely distributed, though not very frequent at any one locality.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the river Kydylanii; in a yellowish brown ferruginous sandstone of the river Moktov; in a ferruginous sandstone of the Paromai oilfield; in the "Quartz Sandstone" of Etchesko Hill; in a sandstone (Nutovo Beds) of the mouth of the Great Uinii. *Beds II*: in the "Lower Sandstone" (Lower Kongi Beds) of the rivers Kongi and Tokkoshkii (a tributary of the Nampi); in the nodules found in the "Sandy Shale" of the river Pohlé, of the sea-shore north of the same river and also of the north bank of the river Langari near its mouth. *Beds* (?): near Kawakami Hot Spring.

Musashinos, Pliocene and Miocene of Japan.

Living.—Northern and Central Japan.

CM 26898

12. *Teredo* sp.

Fillings of the holes bored by a species of *Teredo*. They are worm-like, round in section, with diameters varying between 3 millim. and 7 millim. The variously bent form reminds us strongly of human intestines.

Fossil occurrence.—*Beds I*: in the "Sandy Shale" of a sea-shore south of the river Kongas.

13. *Mya arenaria*, LINNE

Pl. LXXIV. Fig. 3

Mya arenaria. Yokoyama, Moll. Rem. Upperm. Part Jôban Coalf., p. 16, pl. VI, fig. 4. Tert. Moll. Shiobara, p. 132. Neog. Shells Kozuke etc., p. 231. Tert. Shells Coalf. Haboro, p. 128, pl. LI, fig. 2. Moll. Up. Musash. W. Shimosa a. S. Musashi, p. 443.

Many specimens, some of which are excellently preserved.

Fossil occurrence.—*Beds I*: in the "Upper Sandstone" of the river Nutovo; in a brown ferruginous sandstone of the river Tchermenii; in a yellowish sandstone (Lower Quartz Sandstone) of the river Paromai. *Beds II*: in the "Sandy Shale" of the river Pohlé and of a sea-shore lying north of it; in a grey weathered sandstone (Okobikai Beds) of the upper course of one of the tributaries of the river Moktov, about 12 kilometres from Lake Kyakr. *Pleistocene* of Sannosawa, Chitosé, Ôdo-mari-gun. *Beds* (?): in a hard sandstone of Kawakami Hot Spring; in a grey sandstone of Chagama, Shirtor.

Musashinos and Pliocene of Japan.

Living.—Northern, Central and Western Japan.

CM 26899
CM 26900
CM 26901
CM 26902-74-3

CM26903-73-1

14. *Mactra sachalinensis*, SCHRENCK

Pl. LXXIII. Fig. 1

Mactra sachalinensis. Schrenck, Moll. Amurl. n. d. nordjap. Meeres, p. 575, pl. XXIII, figs. 3-7.

A few examples. Quite like those of the recent seas.

Fossil occurrence.—*Pleistocene* of Sannosawa, Chitosé, Ōdomari-gun.¹⁾

Living.—Northern and Central Japan.

CM26904

15. *Mactra sulcataria*, DESHAYES

Mactra sulcataria. Yokoyama, Foss. Up. Mus. Kazusa a. Shimōsa, p. 126, pl. VII, fig. 6. Moll. Rem. Upper. Joban Coalf., p. 17. Tert. Moll. Shinano, p. 10.

Only two casts.

Fossil occurrence.—*Beds I*: in a yellowish brown soft weathered sandstone of the Paromai oilfield.

Musashinos and Pliocene of Japan.

Living.—Northern, Central and Western Japan.

CM26905-74-10

16. *Mactra semmiana*, YOKOYAMA

CM26906

Pl. LXXIV. Fig. 10

Mactra semmiana. Yokoyama, Tert. Moll. Shinano, p. 11, pl. IV, fig. 5. Moll. Foss. Mino, p. 220.

This thin-shelled *Mactra*, though rare in Central Japan, is quite frequent in Karafto.

Fossil occurrence.—*Beds I*: in a grey sandstone (so-called *Mactra*-zone) of the river Paromai. *Beds* (?): in a hard grey sandstone of Kawakami Hot Spring.

Pliocene of Japan.

CM26907

17. *Mactra* aff. *ovalina*, LAMARCK

A left valve imperfectly preserved, but closely resembling *Mactra ovalina* Lam. (Yokoyama, Foss. Up. Musash. Kazusa a. Shimosa, pl. VII, figs. 12, 13) fossil in the Upper Musashino of Central Japan and also living in the seas of the same place.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the river Tehamgu (Lower Kongi Beds).

1) 大泊郡千歳村三澤

18. *Spisula grayana*, (SCHRENCK)

CM26908-74-11

pl. LXXIV. Fig. 11

Spisula grayana. Yokoyama, Foss. Up. Musashino Kazusa a. Shimosa, p. 130, pl. VIII, figs. 1, 2. Moll. Rem. Upperin. Part Jōban Coal., p. 17, pl. II, fig. 11. Moll. Rem. Mid. Part Joban Coal., p. 16. Tert. Moll. Shinano, p. 11, pl. IV, fig. 3. Foss. Moll. Oilf. Akita, 181. Tert. Shells. Coal. Haboro, p. 199, pl. LII, fig. 7.

A few specimens.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the river Kydylanii and Etchesko Hill.

Musashinos, Pliocene and Miocene of Japan.

Living.—Northern Japan. Okhotsk Sea. Bering Sea.

CM26909-72-4
CM26910-72-5
CM26911
CM26912
CM26913-72-3

XX

19. *Siliqua costata*, (SAY)

Pl. III. Figs. 3, 4, 5

Machaera costata. Middendorff, Reise in Sibirien, Mollusken, p. 269. Beitr. z. Malac. Ross., III, p. 78, pl. XXI, figs. 4-10.

Aulus costatus. Dunker, Ind. Moll. Mar. Jap., p. 174. Schrenck, Moll. d. Amurl. u. d. nord jap. Meeres p. 590.

Many examples, though all are casts. But the species is readily distinguished by a strong straight internal rib which in most cases is directed a little forward, though rarely somewhat backward. Schrenck's opinion that *Siliqua pulchella* Dkr. is a junior state of *Siliqua costata* (Say) is doubtful. The length of the shell is usually about twice its height.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of Etchesko Hill, Dsalaun Hill and the river Kydylanii; in a yellow and red sandstone of the Paromai Oilfield.

Living.—Northern Japan. Okhotsk Sea. Behring Sea. American coast of the Atlantic north of Massachusetts.

CM26914-72-6

20. *Tellina venulosa*, SCHRENCK

Pl. LXXII. Fig. 6

Tellina venulosa. Yokoyama, Foss. Up. Musash. Kaz. a. Shim., p. 139, pl. X, fig. 1. Tert. Shells Coal. Haboro, p. 199, pl. LII, fig. 5. Foss. Shells Kaga, p. 168.

All the specimens are casts, though quite frequent. Still they are readily recognized as belonging to the above named species by their flat elongate shape and a flat shallow oblique groove caused by an internal rib-like elevation found below the beak which, however, vanishes before attaining the ventral margin.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the mouth of the river Kydylanii, of a place about 6 kilometres higher up, and of Etchesko Hill.

Musashinos and Pliocene of Japan.

Living.—Northern Japan. Okhotsk Sea.

CM26915-74-1

CM26916

21. *Tellina besshoensis*, YOKOYAMA

Pl. LXXIV. Fig. 1

Tellina besshoensis. Yokoyama, Moll. Rem. Lowest Part Jōban Coal. p. 14, pl. II, figs. 1-5. Neog. Shells Oilf. Higashiyama, p. 353.

Many large and splendid examples.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the rivers Pohlé, Petroleum and Langari. *Beds* (?): in the river Doro, about one kilometre above its mouth, Otomari, Peninsula of Notoro.

Miocene of Japan.

CM26917

CM26918-74-2

22. *Macoma dissimilis*, (MARTENS)

Pl. LXXIV. Fig. 2

Macoma dissimilis. Yokoyama, Foss. Miura Penin., p. 116, pl. VII, figs. 19, 20. Moll. Rem. Mino. p. 221. Tert. Moll. Embets a. Etaibets, p. 242. Tert. Shells Coal. Haboro, p. 200.

This shell is also mostly found as casts, though very frequent.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the river Kydylanii and Etchesko Hill; in the Upper Sandstone of the mouth of the river Langari as well as in the nodules of a sea-shore north of the same river. *Beds II*: in the "Sandy Shale" of the lower course of the river Tchamgu (Middle Kongi Beds), of the river Kongi (Lower Kongi Beds), of the Nampi above its trifurcation, of the rivers Pohlé, Great Fuhdji, Kongi and of the mouth of the Kongas. *Beds* (?): in the nodules of Ōdomari and Sannosawa (Chitosé).

Musashinos, Pliocene and Miocene of Japan.

Living.—Northern and Central Japan.

CM26919

CM26920

CM26921-75-4

23. *Macrocallista brevisiphonata*, (CARPENTER)

Pl. LXXV. Fig. 4

Macrocallista ezoensis. Yokoyama, Moll. Oilf. Taiwan, p. 77, pl. VIII, fig. 1.

Macrocallista chishimana. Pilsbry, Proc. Acad. Nat. Sci. Philad., 1905, p. 119.

Callista chinensis. Yokoyama, Foss. Miura Penin., p. 120, pl. VIII, figs. 9, 10. Moll. Rem. Lowest Part Jōban Coal., p. 14, pl. XIV, figs. 7, 8.

Thanks to the investigations of Mr. J. Makiyama, the species taken by me for *Callista chinensis* Chem. was found to be *Macrocallista chishimana* Pilsbry which is said to have been identified by Tomlin (*Nautilus*, vol. 36, p. 26, 1923) with *Saxidomus brevisiphonata* Carp. (*Proc. Zool. Soc.* 1865, p. 203).

The specimens obtained in Karafto are few, but there is a right valve very well preserved. It is only somewhat shorter than the recent or Pleistocene ones as are most of those found in the Neogene.

Fossil occurrence.—*Beds I*: in the upper zone of the "Lower Quartz Sandstone" (coloured brown) of the river Moktov. *Beds II*: in the "Sandy Shale" of the rivers Pohlé and Langari. *Beds (?)*: in a dark grey hard sandstone of Kawakami Hot Spring.

Musashinos, Pliocene and Miocene of Japan.

Living.—Northern Japan.

CM 26922-74-4
CM 26923-74-5
CM 26924-74-6
CM 26925-74-7

24. *Chione astartoides*, (BECK)

Pl. LXXIV. Figs. 4-7

Chione astartoides. Dunker, Ind. Moll. Mar. Jap., p. 198.

Venus astartoides. Middendorff, *Sibirische Reise*, Bd. II, Theil 1, p. 252, pl. XX, fig. 5-13. Philippi, *Abbild.*, I, Venus, pl. IX, fig. 4, p. 35 (61). Schrenck, *Moll. Amurl. u. d. nordjap. Meeres*, p. 529.

Numerous specimens, especially in the sandstone of the Kydylanii, filling the whole rock. They are so heaped up on one another that it is quite difficult to obtain good specimens, nearly all being in the form of external and internal casts.

The form of the shell, so far as we can make out of these casts seems to be very variable, which may possibly be due to pressure. Many are oval in shape, while some are more triangular as in the recent specimens. The pallial sinus which is very characteristic is short-triangular, pointing somewhat upward. Most of the specimens are small like those shown in figs. 5-9 of Middendorff, though rarely larger forms like figs. 10-13 of the same author seem to be present.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the rivers Kydylanii and Dagoe, and of the hills of Etchesko and Dsalaun; in the upper zone of the same rock (brown sandstone) of the river Moktov.

Living.—Northern Japan. Sea of Okhotsk. Northeast coast of North America. Greenland.

CM26926
CM26927-73-2
CM26928-73-3

25. *Cardium groenlandicum*, CHEMNITZ

Pl. LXXIII. Figs. 2, 3

Cardium groenlandicum, Schrenck, Moll. d. Amurl. u. d. nordjap. Meeres, p. 516. Middendorff, Beitr. z. Malacoz. Ross., III, p. 41. Wood, Crag Moll., Bivalves, p. 160, pl. XIII, figs. 1a-d.

This well known circumpolar species which on the Pacific side comes down to Northern Japan is represented by numerous specimens both adult and young. The concentric striae of the surface are present on nearly all of them, but the radiating lines or striae only on young ones.

I here mention the two forms previously described by me as *Cardium pauperculum* (Foss. Moll. Izumo, p. 6, pl. I, fig. 2) and *Mactra haboroensis* (Tert. Shells Coalfield Haboro, p. 198, pl. LII, figs. 3, 4) showing a close resemblance to *Cardium groenlandicum*, especially the latter whose generic determination is not certain. It is generally admitted that *Cardium groenlandicum* has a strong *Mactra*-like appearance, and it is quite possible that at least the shell bearing the name of *Mactra haboroensis* is identical with this circumpolar species. Unfortunately the specimens from Izumo as well as from Haboro are few and ill preserved, so that at present I am not able to decide the question.

Fossil occurrence.—*Beds I*: in the upper zone of the "Lower Quartz Sandstone" (brown sandstone) of the river Paromai about 7 kilometres from its mouth, and also in a similar rock of the rivers Moktov and Tchermenii; in the lower zone of the "Upper Sandstone" of the Great Uinii; in the lower zone of the "Lower Quartz Sandstone" of the river Kydylanii (specimens are strongly deformed). *Beds II*: in the "Sandy Shale" of the Great Fuhdji, of the mouth of the Pohlé, and of a sea-shore north of the Pohlé; in the "Lower Sandstone" (Lower Kongi Beds) of the river Myngi. *Beds (?)*: in a dark grey sandstone of Kawakami Hot Spring, Chagama and Shiraishizawa.¹⁾

Crag Formation of England.

Living.—Circumpolar seas. Okhotsk Sea. Behring Sea. Northern Japan.

CM26929
CM26930-74-8
CM26931

26. *Cardium nuttalii*, CONRAD

Pl. LXXIV. Fig. 8

Cardium nuttalii. Yokoyama, Tert. Shells Coalfield Haboro, p. 201. Tert. Moll. So. Totomi, p. 353.

1) 川上温泉, 茶釜, 白石澤.

Cardium shinjiense, Yokoyama, Foss. Moll. Neog. Izumo, p. 7, pl. II, fig. 6. Moll. Rem. Lowest Part Joban Coal., p. 16, pl. III, figs. 13-15. Moll. Rem. Mid. Part Joban Coal., p. 18, pl. III, figs. 10, 11.

This shell frequent in the Pliocene of Japan is represented by several examples from Karafto.

Fossil occurrence.—*Beds I*: in the "Upper Sandstone" of the mouth of the river Langari. *Beds II*: in the "Sandy Shale" of the river Pohlé, of a sea-shore north of the river Fuhdji and of the Kumanosawa. *Beds (?)*: from a locality in South Karafto not named.

Pliocene and Miocene of Japan.

Living.—Alaska. British Columbia.

CM 26932
CM 26933-72-9

27. *Thyasira bisecta*, (CONRAD)

Pl. LXXII. Fig. 9

Thyasira bisecta. Yokoyama, Neog. Shells Oilf. Higashiyama, p. 354. Moll. Up. Musash. W. Shimosa a. So. Musashi, p. 457, pl. LI, fig. 11. Foss. Shells Sado, p. 294, pl. XXXV, fig. 3. Tert. Moll. Shinano, p. 14. Moll. Rem. Low. Part Joban Coal., p. 18, pl. III, fig. 2.

Most of the specimens belong to the so-called var. *nipponica* Yabe which has the beak obtuse-angled. But there is a somewhat young one in which it is somewhat less than a right angle. It seems to me that the young ones are generally more acute-beaked than the full-grown.

Fossil occurrence.—*Beds I*: in the lower zone of the "Upper Sandstone" of the river Nutovo. *Beds II*: in the Okobikai Beds of the river Dagoe; in the "Sandy Shale" of the Uwazagawa (Middle Kongi Beds), of the middle course of the Pohlé, of the lower course of the Langari and of the Kongas.

Upper Musashino, Pliocene and Miocene of Japan.

Living.—North Pacific. Puget Sound.

CM 26934-74-9

28. *Thyasira gouldii*, (PHILIPPI)

Pl. LXXIV. Fig. 9

Thyasira gouldii. Yokoyama, Moll. Up. Musash. Tokyo, p. 433, pl. I, fig. 9. Moll. Up. Musash. W. Shimosa a. So. Musashi, p. 457, pl. LII, figs. 3, 4.

One left valve only.

Fossil occurrence.—*Beds I*: in a sandstone of the river Kongi.

Upper Musashino of Japan.

Living.—Northern Japan. East coast of America from Greenland down to Connecticut.

CM26935

CM26936-175-2

29. *Venericardia tokunagai*, YOKOYAMA

Pl. LXXV. Fig. 2

Venericardia tokunagai. Yokoyama, Moll. Rem. Lowest Part Joban Coal., p. 18, pl. III, figs. 10-12.

This is a species hitherto found only in the Asagai Beds of the Joban Coal-field considered to be Miocene. The specimens are not frequent, but some are well preserved enough to show the characters of the species.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the river Pohlé of the mouth of the Fuhdji and of the Petroleum. Upper Zone of *Beds C*: in a shale of Tonai, Tonai-mura, Tonai-gun.¹⁾ *Beds D*: in a greenish grey sandstone of a place between Merei and Ōdomari, Fukaumi-mura, Ōdomari-gun.²⁾ *Beds (?)*: in a dark greenish grey sandstone of the Dorogawa" (Ōtomari, Notoro Peninsula) about a kilometre above its mouth; in a similar rock of Kawakami Hot Spring. Miocene of Japan.

CM26937

CM26938

30. *Lucina* sp.

A few impressions of an orbicular shell with concentric lamellae on the surface. The two internal moulds found besides seem to indicate that the species is closely akin to *Lucina borealis* L., if not quite identic.

Fossil occurrence.—*Beds I*: in the middle zone of the "Lower Quartz Sandstone" of the river Kydylanii. *Beds III*: in a shale of the Nampi (Nampi Beds). *Beds (?)*: in a grey shale of Ōtomari.

CM26939-75-1

31. *Mytilus edulis*, LINNE

Pl. LXXV. Fig. 1

Mytilus edulis. Schrenck, Moll. d. Amurl. u.d. nordjap. Meeres, p. 504. Iwakawa, Cat. Jap. Moll. Nat. Hist. Mus., p. 245. Middendorff, Beitr. Malacoz. Ross., III, p. 25, pl. XIV, figs. 1-8.

There are several comparatively well preserved examples of a narrow, tumid *Mytilus* which are undoubtedly ascribable to the above named species well known in Europe, and also found in Japan.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the river Pohle as well as of a sea-shore situated to its north.

Crag Formation of England.

Living.—Northern Japan. Behring Sea. Scandinavia. Mediterranean.

1) 富内郡富内村富内

2) 大泊郡深海村女麗大泊間

3) 尾泊泥川

32. *Mytilus grayanus*, DUNKER

Pl. LXXVI. Fig. 3

Mytilus grayanus. Yokoyama, Moll. Rem. Upper. Part Jōban Coal., p. 25, pl. II, fig. 10. Tert. Moll. Shinano, p. 15, pl. II, fig. 1. Tert. Moll. Oilf. Embets a. Etaibets, p. 244.

Only one valve somewhat imperfect. The shell of this species is broader than that of the preceding.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of the Pohle.

Pliocene of Japan.

Living.—Northern Japan down to the Philippines and further south.

33. *Pecten watanabei*, n. sp.

14

CM 26941-76-4

Pl. LXXVI. Fig. 4

One external impression from which, however, we can make out the external characters of the shell. The right ear is slightly broken.

Shell small, flat, orbicular, as long as high, almost equilateral. Surface with many straight radiating engraved lines equidistant and somewhat apart from one another. Ears somewhat unequal (?) with many fine radiating striae crossed by lines of growth. Height and length 15 millim. each.

Fossil occurrence.—*Beds III*: in a grey shale (Nampi Beds) of the river Teharnikka.

CM 26942

34. *Pecten* sp.

Two casts of a small shell like the preceding, but with coarse concentric corrugations on the surface. Indeterminable.

Fossil occurrence.—*Beds III*: in the "Siliceous Shale" of the river Siifon, a tributary of the Nampi.

CM 26943-76-1

35. *Ostrea gigas*, THUNBERG

Pl. LXXVI. Fig. 1

Ostrea gigas. Yokoyama, Foss. Miura Penin., p. 162, pl. XV, figs. 1, 2. Tert. Moll. Shinano a. Echigo, p. 19. Tert. Moll. So. Totomi, p. 358. Moll. Oilf. Taiwan, p. 99, pl. XV, figs. 2, 3.

Two convex valves.

Fossil occurrence.—*Pleistocene* of Sannosawa, Chitose.¹⁾

Musashinos and Pliocene of Japan.

Living.—Northern to Southern Japan.

1) 千歳三澤

CM26944-75-3

35. *Glycimeris chitanii*, n. sp.

4

Pl. LXXV. Fig. 3

Shell moderate in size, thick, flatly convex, orbicular, slightly higher than long, almost equilateral, radially ribbed. Ribs fine, close, flattish, straight, separated by equal or narrower intervals, about fifty in number, getting finer towards both extremities. Beak small. Height 40 millim. Length 38 millim. Thickness about 22 millim.

There are two specimens grown on each other not possible to separate without breaking.

This species somewhat resembles *Glycimeris minochiensis* Yok. (Tert. Moll. Shinano, pl. II, fig. 7), but so far as we can see from the specimens we possess, the sculpture is decidedly coarser.

Fossil occurrence.—*Beds II*: in the "Sandy Shale" of a sea-shore lying south of the river Petroleum.

CM26945-76-5

36. *Leda confusa*, HANLEY

Pl. LXXVI. Fig. 5

Leda confusa. Yokoyama, Foss. Up. Musash. Kazusa a. Shimosa, p. 195, pl. XVII, fig. 4. Moll. Tert. Basin, Chichibu, p. 124. Tert. Moll. Mino, p. 226. Moll. Up. Musash. Tokyo, p. 403. Tert. Moll. So. Totomi, p. 361.

Mostly casts, though quite frequent.

Fossil occurrence.—*Beds II*: in the "Lower Sandstone" (Lower Kogi Beds) of the river Nampi just above its trifurcation.

Upper Musashino and Pliocene of Japan.

Living.—Central Japan.

CM26946

37. *Leda* sp.

A small example imperfectly preserved, resembling *Leda inermis* Yok. (Moll. Rem. Mid. Part Joban Coalf., p. 9, pl. II, figs. 1-6).

Fossil occurrence.—*Beds C* (of South Karafto): in a dark grey shale of the third branch of the river Ochiho, Tonai.¹⁾

CM26947

CM26948-75-5

CM26949-75-6

CM26950

38. *Yoldia scapha*, YOKOYAMA

Pl. LXXV. Figs. 5, 6

Yoldia scapha. Yokoyama, Tert. Moll. Oilf. Embets a. Etaibets, p. 247, pl. XXXI, figs. 7-11.

1) 富内落帆川

This species has already been found in the oilfields of the Hokkaido in layers which I took for Pliocene. Specimens from Karafto are not rare, though mostly found as casts.

Fossil occurrence.—Beds A (of South Karafto): in a grey shale of Nankei near Ōdomari¹⁾; in the marly nodules of Ōdomari as well as of Sannosawa, Chitose.

Pliocene of Japan (the Hokkaido).

CM26951-175-7

40—29. *Yoldia sagittaria*, YOKOYAMA

Pl. LXXV. Fig. 7

Yoldia sagittaria. Yokoyama, Moll. Rem. Mid. Part Joban Coalfield, p. 10, pl. II, figs. 10, 11, p. 20. Tert. Moll. Oilf. Embets a. Etaibets, p. 247, pl. XXXII, fig. 4.

A large external impression of a right valve, about 75 millim. long.

Fossil occurrence.—Beds III: in a grey shale (Nampi Beds) of the Tcharnikka.

Pliocene and Miocene of Japan.

41¹. *Yoldia notabilis*, YOKOYAMA

Pl. LXXV. Fig. 8

Yoldia notabilis. Yokoyama, Foss. Up. Musashi. Kazusa a. Shimosa, p. 196, pl. XVII, fig. 10. Moll. Up. Musashi. Tokyo, p. 403.

Very frequent, though all are casts.

Fossil occurrence.—Beds I: in the upper zone of the "Lower Quartz Sandstone" of the river Moktoy; in the middle zone of the "Lower Quartz Sandstone" of Dsalaun Hill; in a yellowish sandstone of the Tchermenii. Beds II: in the "Lower Sandstone" (Lower Kongi Beds) of the river Kongi. Beds A (of South Karafto): in a shale of Ichinosawa, Chitose.²⁾

Upper Musashino of Japan.

41². *Acila mirabilis*, (ADAMS ET REEVE)

Pl. LXXVI. Fig. 2

Nucula mirabilis. Yokoyama, Foss. Miura Penin., p. 180, pl. XIX, fig. 9. Moll. Rem. Uppern. Joban Coal., p. 30. Moll. Rem. Mid. Part Joban Coal., p. 21, pl. III, Fig. 6. Moll. Foss. Tert. Mino, p. 226.

One large good specimen and several casts.

Fossil occurrence.—Beds A (of South Karafto): in marly nodules of Sannosawa, Chitose. Beds (?) of South Karafto: in a shale of Ōdomari.

Musashinos and Pliocene of Japan.

Living.—Central and Western Japan.

1) 大泊町南溪

CM26952-75-8

CM26953

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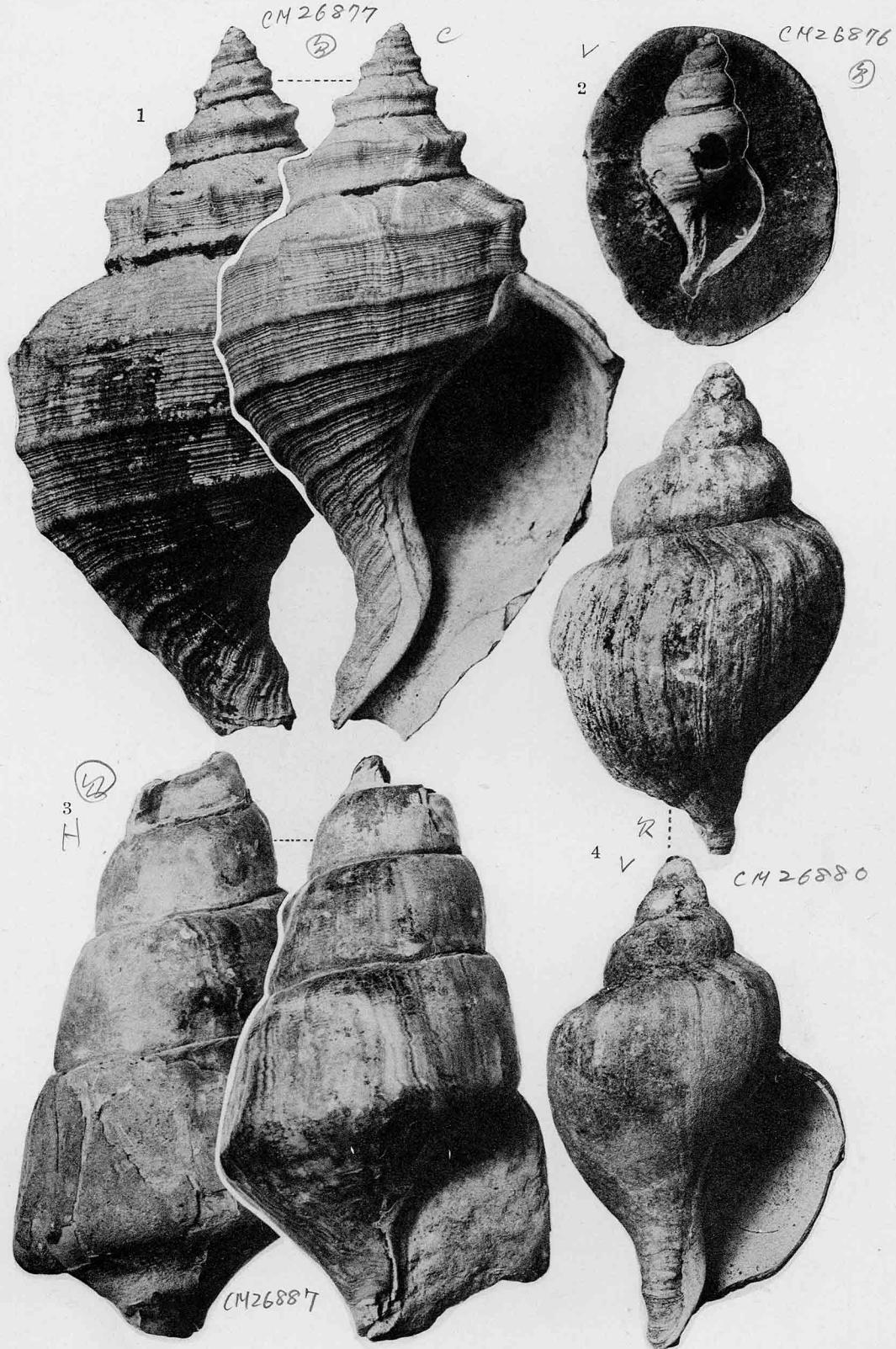
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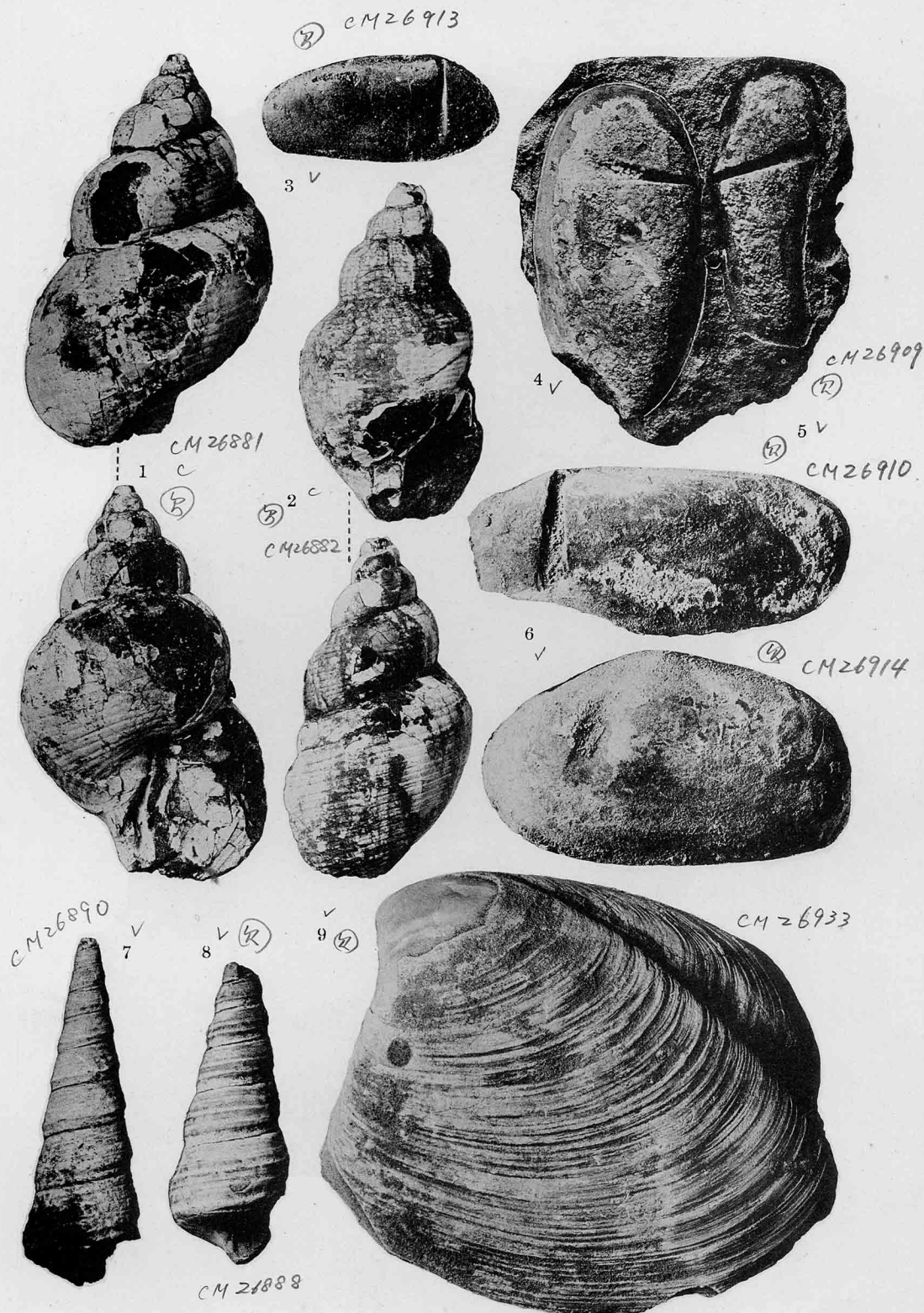
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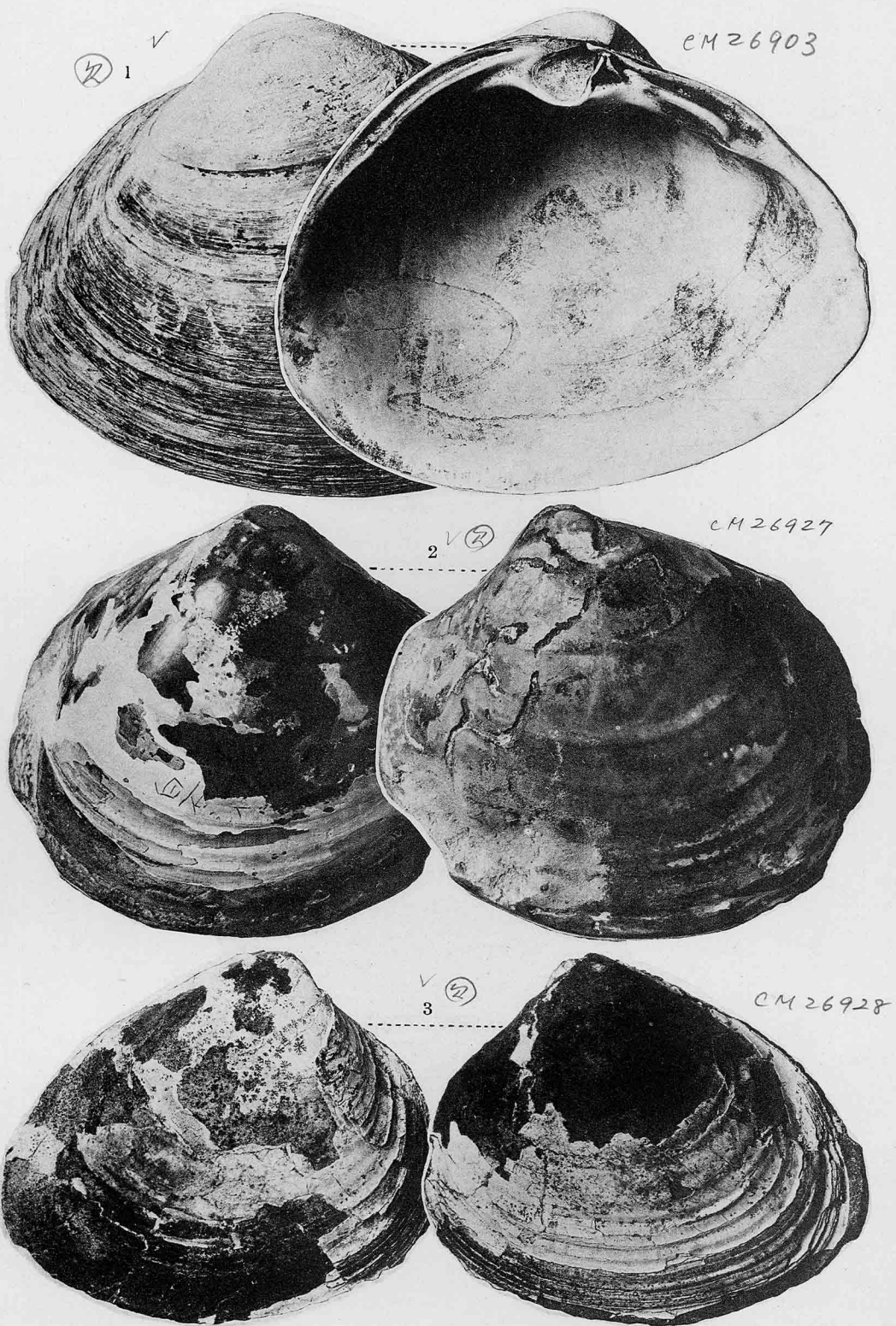
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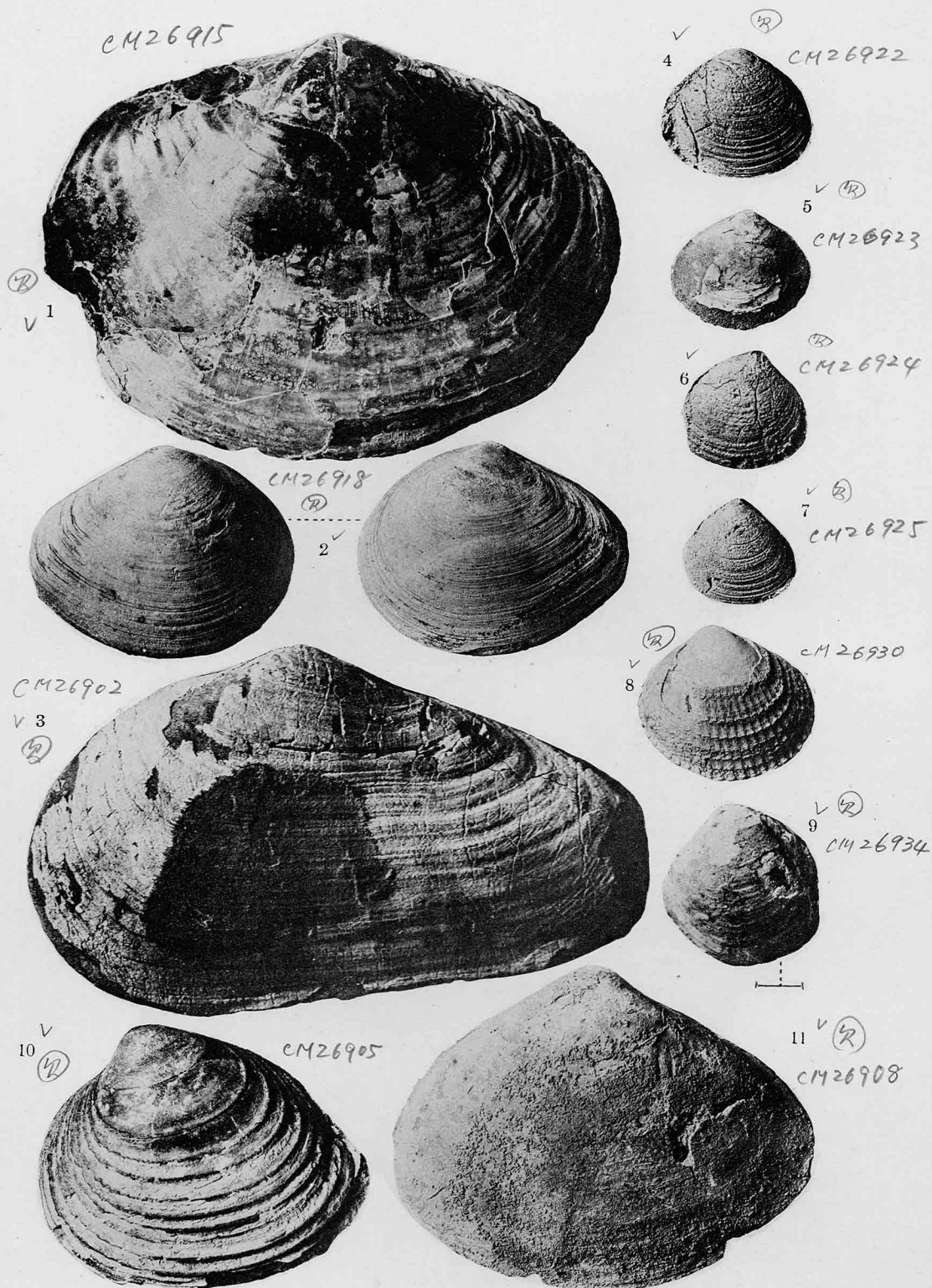
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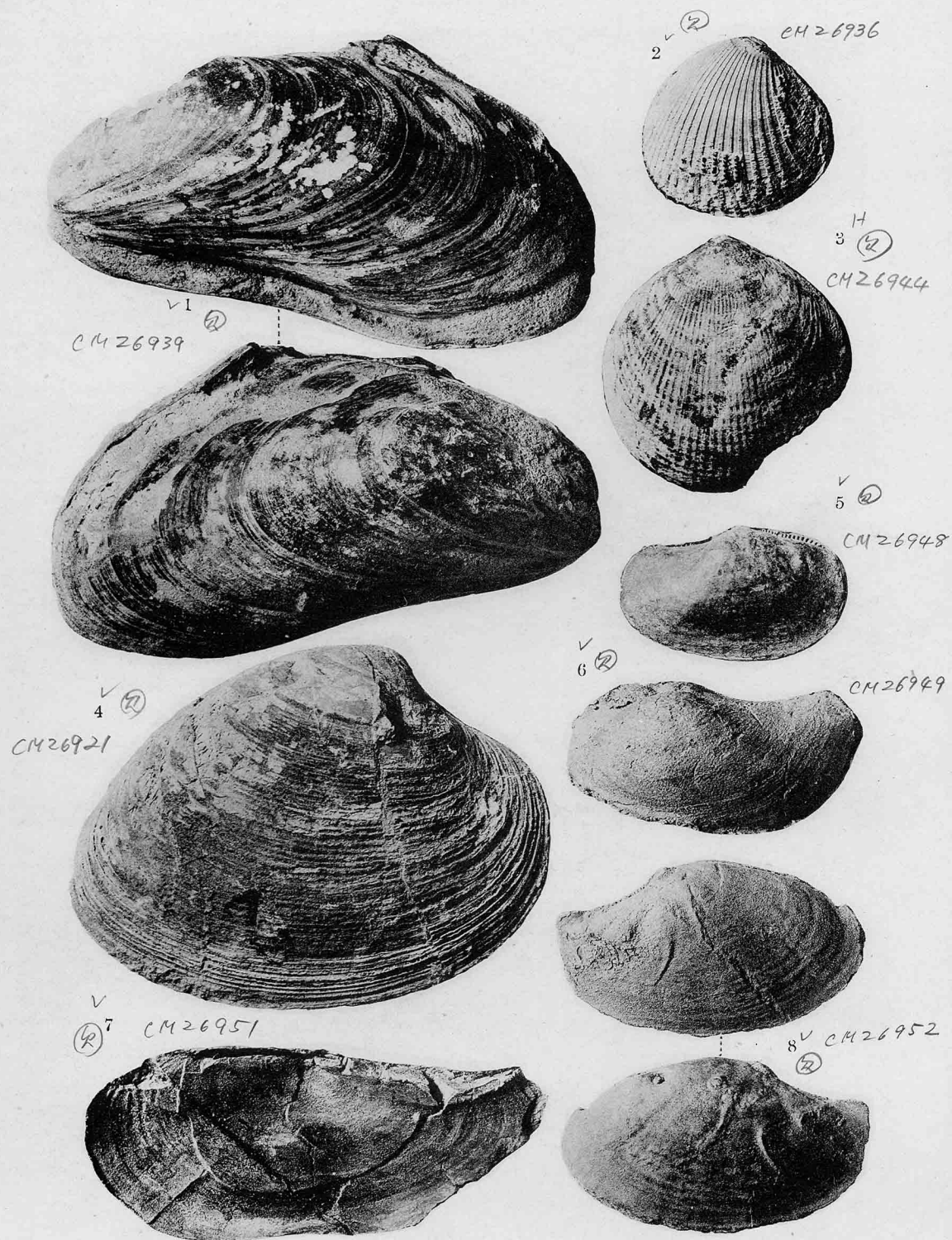
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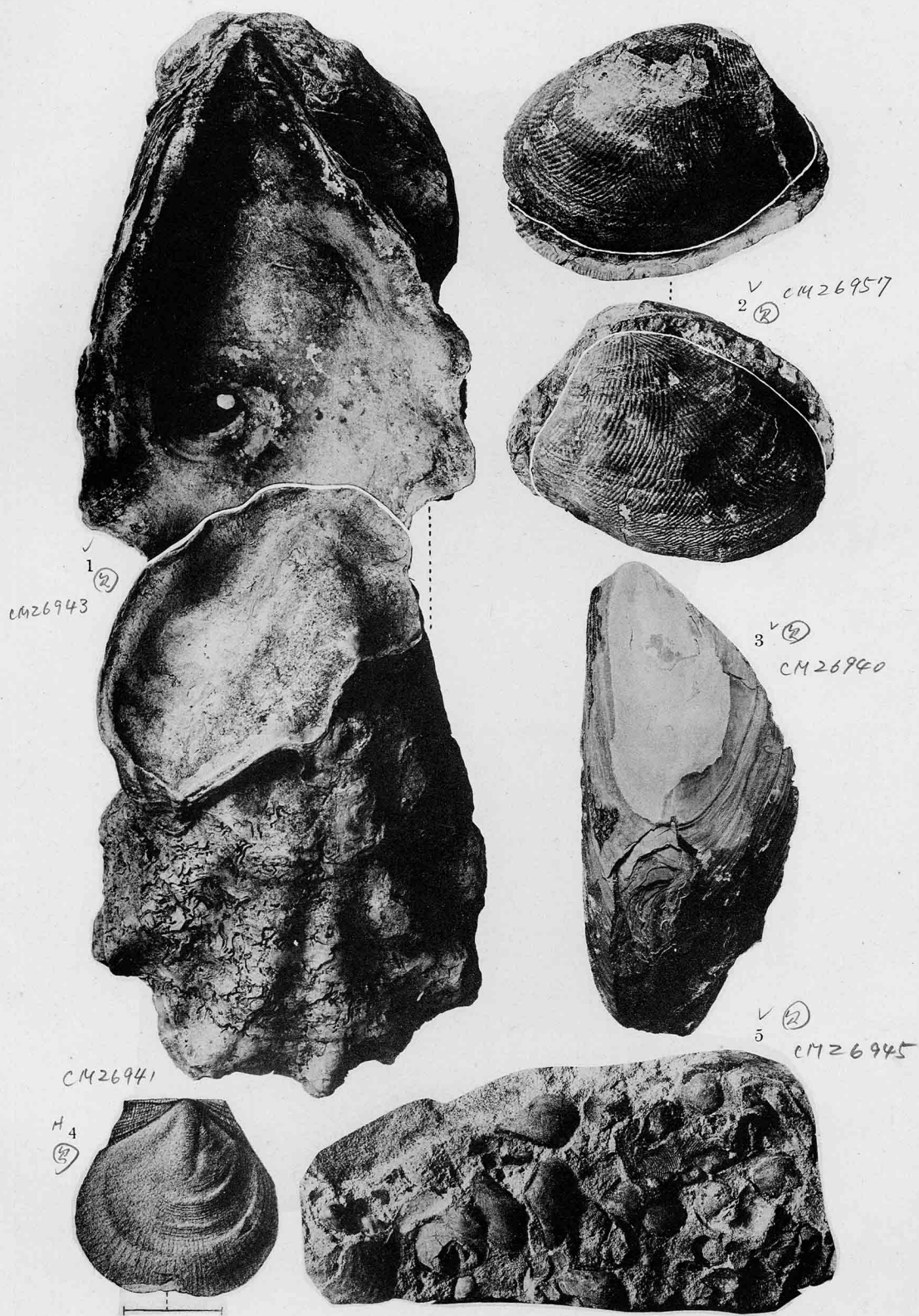
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