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MYARIAN FOSSILS FROM THE CENOZOIC DEPOSITS OF HOKKAIDÔ AND KARAHUTO

By

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With 3 Plates

(Contribution from the Department of Geology and Mineralogy,
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Fossils belonging to the genus *Mya*⁽¹⁾ are frequently met with in the Cenozoic deposits of Hokkaidô and Karahuto⁽²⁾. The Collection of our Department in Sapporo contains very numerous specimens of this genus which have been obtained from various localities in

(1) Hitherto known species from Japan are as follows:

- Mya grewingkii* MAKIYAMA
- M. cuneiformis* (BÖHM)
- M. donaciformis* KURODA (= *M. cuneiformis*)
- M. peternalis* MATSUMOTO (= *M. donaciformis*)
- M. urusikuboana* NOMURA (= ? *M. cuneiformis*)
- M. miyagiensis* NOMURA
- M. uzenensis* NOMURA
- M. arenaria* L. (including *arenaria japonica* JAY)
- M. truncata* L.
- M. arenaria kitahukuokaensis* HATAI

Among these, many specimens reported under the name *M. arenaria* or *japonica* may belong to *cuneiformis* of BÖHM.

(2) The following forms have been reported to occur in the Cenozoic deposits in Karahuto (Russian Saghalin included) and Hokkaidô.

- M. grewingkii* MAKIYAMA. Poronai Series (Asagaian), Karahuto.
- M. cuneiformis* (BÖHM). Oiwake Series, Rumoe in the province of Tesio and the Tesio Oil-field, Hokkaidô.
- M. arenaria* L. Kawabata and Oiwake Series in various places in Hokkaidô and Karahuto. However, as stated later, many specimens ascribed to this may belong to *M. cuneiformis*. Mr. ÔNOMIKADO has reported this from the Sisinai beds of Isikari.
- M. truncata* L. Setana Series, Osima and Siribesi, Hokkaidô.

these two islands during the past ten years by the members and students of our Department. In the present note it is intended to review these specimens and to show the geological and geographical distribution of each species.

Among the specimens in the Collection, the following eight forms are distinguishable:

- Mya ezoensis* nov. sp.
M. grewingkii MAKIYAMA
M. grewingkii var. *kusiroensis* nov. var.
M. grewingkii var. *elongata* nov. var.
M. cuneiformis (BÖHM)
M. truncata L.
M. sp. aff. truncata L.
M. arenaria L.

The geological distributions of these forms are shown in the following table:

	Isikari Series (Palaeogene)	Poronai Series = Nisisakutan (Up. Oligocene- Low. Miocene)	Kawabata Series (Miocene)	Oiwake Series (Up. Miocene- Low. Pliocene)	Takikawa or Setana Series (Up. Pliocene)	Sisnai Series (Low. Pleistocene)	Recent
<i>Mya ezoensis</i> nov.	—						
<i>M. grewingkii</i> MAKIYAMA		—	—?				
<i>M. grewingkii</i> var. <i>elongata</i> nov.		—	—?				
<i>M. grewingkii</i> var. <i>kusiroensis</i> nov.		—					
<i>M. cuneiformis</i> (BÖHM)			—?	—			
<i>M. truncata</i> L.				—	—	—	
<i>M. sp. aff. truncata</i> L.		— ? —					
<i>M. arenaria</i> L.					—?	—	

DESCRIPTION OF SPECIES

Mya exoensis nov.

Pl. XXXIV (III), Figs. 2, 7-9.

Shell small, transversely much elongated, moderately inequilateral, the posterior side somewhat longer than the anterior; anterior end rounded, the posterior one rather acuminate or narrowly rounded, with a narrow gaping; anterior portion of shell inflated and the posterior attenuated. A round, indistinct angle extends from umbo to antero-ventral corner of shell, anterior to this the shell rather abruptly inclines toward the margin. Antero-dorsal margin short, slightly arcuated, and relatively steep in inclination, the postero-dorsal one nearly horizontal, and very slightly excavated, and the ventral one long, almost straight or faintly arched. Umbo not prominent, more or less convex, a little inclined posteriorly.

Surface covered with rude concentric lines which sometimes become distinct ridges. Test apparently thin. Adductor muscle scars not deep, the anterior one semi-ovate, the posterior one not well discernible.

Fourteen specimens were examined, most of which are represented by moulds. This species is distinguished from all forms hitherto reported from Japan in being much elongated and in having a nearly horizontal dorsal margin.

Locality and geological horizon: Kogutino-sawa⁽¹⁾, a small tributary of the Panke-gawa, province of Isikari. Isikari Series (Palaeogene).

Mya arenaria L.

Pl. XXXII (I), Figs. 11, 12, 14.

1758. *Mya arenaria* LINNAEUS: Syst. Nat., Ed. 10, p. 670.
1857. *M. japonica* JAY in PERRY: U. S. Japan Expedition, Vol. II, p. 292, pl. I, figs. 7, 10.
1865. *M. arenaria* WOODS: Monogr. Palaeont. Soc., Vol. IX, Crag. Moll. Vol. II, p. 279, pl. VI, figs. 2a-f.
1875. *M. arenaria* SOWERBY in REEVE: Conch. Icon., Vol. XX, *Mya*, pl. I, sp. 1.

(1) 石狩國夕張郡パンケ川支流コグチノ澤

1898. *M. intermedia* DALL: Trans. Wagner Inst. Sci., Phila., Vol. III, p. 857.
 1924. *M. arenaria* OLDROYD: Stanford Univ. Publ. Geol., Vol. I, p. 198, pl. XXXII, fig. 1.
 1924. *M. japonica* OLDROYD: Ibid., p. 199, pl. XV, fig. 5 (*intermedia*).
 1931. *M. arenaria* GRANT and GALE: Mem. San Diego Soc. Nat. Hist., Vol. I, p. 141.
 1931. *M. arenaria* L. var. *japonica* GRANT and GALE: Ibid., p. 412, pl. 21, fig. 13.
 1933. *M. arenaria* SASAKI: List Lamell. Hokkaidô and Karahuto, p. 9.
 1933. *M. japonica* SASAKI: Ibid., p. 9.
 1934. *M. arenaria japonica* KINOSITA: List Moll. Hokkaidô, Vol. I, p. 18, pl. XIV, fig. 103.
 1937. *M. arenaria japonica* ÔINOMIKADO: Jour. Geol. Soc. Japan, Vol. XLIV, p. 66.

For further synonyms, see GRANT and GALE: Op. cit. Vol. I, 1931, pp. 414, 421.

Among numerous recent specimens in the Collection obtained from various places extending from Karahuto to the province of Nagato, two types of *Mya* are distinguished. They are common in some features but distinct in a few other important characters. All the specimens of the first of these types here designated as the group of *M. arenaria-japonica*, have been collected from Tisima (the Kuriles), Hokkaidô, and Karahuto, and those of the second came from the seas around Honsyû and Sikoku, but not from Hokkaidô and Karahuto. The first form is a thick-shelled, relatively short, and nearly equilateral shell with its posterior extremity more or less well rounded or slightly truncated, while the second one is characterised by its generally thin, long, more or less very inequilateral shell with a narrowly rounded or frequently acuminate posterior extremity. As far as the specimens at hand are concerned, the chondrophore seems to be different in these two forms; the chondrophore in the first is nearly perpendicular to the antero-posterior diameter of the shell, narrower, more deeply excavated and its inner border less convex than in the second. The posterior ridge is not so well differentiated from the chondrophore as seen in the latter. Moreover, the shell margin beneath the umbo in the left valve is distinctly depressed or excavated along the anterior border of the chondrophore. For convenience, this lunule-like excavation in the left valve is here designated as "the subumbonal excavation". In the second type, this depression is not observable. The second type was long mistaken by Japanese conchologists, as

already pointed out by Prof. MIKIYAMA⁽¹⁾, as conspecific with *M. japonica* JAY. It was distinguished from *japonica* by MAKIYAMA, who considered that it is an unnamed species.

The first group with a thick tested shell comprises the following forms:

a) Those which are nearly equilateral with both extremities somewhat broadly rounded, belonging to *M. japonica* JAY. b) Those which are somewhat truncated posteriorly, may be identical with *M. intermedia* DALL. However, there are many intermediate specimens, which are, at the same time, closely similar and almost indistinguishable from typical *M. arenaria* L. *M. japonica* may properly be considered⁽²⁾ as synonymous with *arenaria*.

A few specimens have been obtained from the youngest Neogene or early Pleistocene deposits in the province of Tokati, which are considered to belong to this species. The test is thick, with a somewhat truncated posterior extremity and a rounded anterior one. The chondrophore is quite identical with that of the specimens of this species. The "sub-umbonal excavation" is very well developed.

Localities and geological horizons: Tyôta⁽³⁾ near Obihiro, province of Tokati, the upper part of the Ikeda beds (upper Pliocene) or the lower part of the Obihiro beds (Lower Pleistocene). Mr. OINOMIKADO reported this species from the Sisinaï bed (Lower Pleistocene) at Sisinaï⁽⁴⁾ near Tôbetu, Isikari-gun, province of Isikari, and there are a few referable specimens in our material which came from this same locality.

Mya grewinkii MAKIYAMA

Pl. XXXII (I), Figs. 1, 7-10; Pl. XXXIII (II), Figs. 7, 8.

1921. *Mya crassa* MAKIYAMA: Jour. Geol. Soc., Tôkyô, Vol. XXVIII, p. 301.
 1924. *M. crassa* YOKOYAMA: Jour. Coll. Sci., Imp. Univ. Tôkyô, Vol. LV, Art. 3, p. 12, pl. I, figs. 11-16.
 1932. *M. crassa* YOKOYAMA; Rep. Inst. Geol. Surv., Japan, No. III, p. 12, pl. I, figs. 3, 1, 9.
 1934. *M. grewinkii* MAKIYAMA: Mem. Coll. Sci., Kyôto Imp. Univ., Ser. B, Vol. X, no. 2, p. 156, pl. VII, figs. 50-52.

(1) MAKIYAMA: Mem. Coll. Sci., Kyôto Imp. Univ., Ser. B. Vol. X, 1934, p. 159.

(2) See also YOKOYAMA: Jour. Fac. Sci., Tôkyô Imp. Univ., Sect. II, Vol. I, 1926, p. 241; ÔTUKA: Bull. Earthq. Research Inst., Vol. XIII, 1935, p. 900; NOMURA: Saitô Hô-on Kai Mus., Research Bull., No. 6, 1935, p. 68.

(3) 十勝國帯廣附近蝶多

(4) 石狩國石狩郡當別村獅子内

In the material are included more than sixty specimens collected from the Tertiary of Karahuto and Hokkaidô, which are invariably short, rather deep and well identifiable with *Mya grewingkii* MAKIYAMA from the Asagai series of Yotukura in the province of Iwaki, Honsyû. MAKIYAMA holds the opinion that his *grewingkii* is distinct from GREWINGK's *crassa*⁽¹⁾ (*M. profundior* GRANT and GALE⁽²⁾), although some authors are inclined to believe their synonymy.

The specific description of this species by MAKIYAMA is precise and holds for most of the specimens examined.

The outline of the shell is subject to some variation among the individuals, being sometimes rather long and less inflated with a gently sloped postero-dorsal margin. Consequently and especially when deformed after burial in sediments, it approaches *M. cuneiformis* (BÖHM) and also some specimens of *M. arenaria* L. However, the typical specimens are distinguishable from the other forms above cited. The pallial sinus is broad and deep, and almost always reaches beyond the median vertical line of the shell. The umbones tend to be inclined backward, but not so distinctly as in *M. cuneiformis*, from which it differs, moreover, in being less inequilateral and in having a more prominent umbonal angle and a deeper pallial sinus. The hinge apparatus of this species is closely similar to that of *M. cuneiformis* on the one side and *M. arenaria* on the other. The chondrophore of the left valve is intermediate in forward inclination, it has a spoon-shaped appearance between *M. cuneiformis* and *M. arenaria*, and its junction with the posterior ridge is almost identical in feature with that of *M. arenaria* rather than *M. cuneiformis*. But it is more oblique than in *M. arenaria*. The "subumbonal excavation" is usually less demarcated than both of these last forms.

Localities and geological horizons: This species distributes from the northern extremity of Russian Saghalin, through Hokkaidô, to the province of Iwaki in Northern Honsyû and seems to have a rather restricted geological range as already demonstrated by Prof. MAKIYAMA. Most of the specimens at hand have been derived from the Poronaiian (Asagaian).

(1) GREWINGK: Beitr. z. Kennt. d. N-W.-küste Amerikas, 1850, p. 282, pl. VI, figs. 2a-d.

(2) GRANT and GALE: Mem. San Diego Soc. Nat. Hist., Vol. I, 1931, p. 414.

Poronaiian (Upper Oligocene-Lower Miocene):

Karahuto

Nisisakutan beds: The third tributary of the Horokisi-gawa⁽¹⁾, Usiro-gun; four places near Maoka⁽²⁾, Maoka-gun, viz., Teigawa⁽³⁾, Yunosawa⁽⁴⁾, Ohodomari-sawa⁽⁵⁾, and Hiroti-sawa⁽⁶⁾; upper course of the Siinai-gawa⁽⁷⁾, Honto-gun.

About 16 specimen from the Nisisakutan beds exposed along the Budô-zawa⁽⁸⁾, Esutoru-mati, are considered as conspecific with this species, although invariably smaller in size, and frequently transversely more elongated. Moreover, they are sometimes more or less inequilateral. (Pl. XXXIII, figs. 7, 8)

Nisisakutan beds or *Akusu beds* (Lower Miocene or Basal Middle Miocene): Tokombo-zawa, Honto-gun; Takinosawa, Toyohara-gun. The first and third tributaries of the Kasiho-gawa; Yanke-gawa; Hure; all in Motodomari-gun. The formation exposed at these four localities has been considered by Mr. ISIZAKI as contemporaneous with the Nisisakutan, but it is not improbably an Akusu bed.

Nisisakutan (?): Huzisima-zawa⁽⁹⁾ and Uryû-gawa⁽¹⁰⁾, Noto-ro-gun.

Hokkaidô

Poronai Series: basal part of the Tokoro beds of the Poronai-zawa⁽¹¹⁾, Tokoro-gun, province of Kitami.

A few much deformed moulds, provisionally ascribed to this same species⁽¹²⁾ have been collected from the following places: Simokinebetu⁽¹³⁾, the upper course of the Obirasibe-gawa, province of Tesio (? *basal Kawabata*), a place near the Horosin Railway Station⁽¹⁴⁾ Uryû-gun, province of Isikari (*basal Kawabata*), and

(1) 鵜城郡幌岸川 (2) 眞岡郡眞岡町 (3) 手井川 (4) 湯ノ澤

(5) 小帆泊澤 (6) 廣地澤 (7) 本斗郡椎内川

(8) 名好郡恵須取町武道澤

(9) 能登呂郡能登呂村藤島澤 (10) 同村雨龍川

(11) 北見國常呂郡常呂村幌内澤 (常呂層)

(12) Among the specimens, those which are somewhat elongated, are transitional to var. *elongata*. Moreover, some inequilateral specimens, when deformed, are very near and sometimes likely almost confounded with *M. cuneiformis*.

(13) 天鹽國小平藁川下キネベツ (14) 石狩國雨龍郡幌新澤

Miruto⁽¹⁾ Kurisawa-mura, Sorati-gun, province of Isikari (*basal Kawabata*)⁽²⁾.

Mya grewingkii MAKIYAMA var. *elongata* nov. var.

Pl. XXXIII (II), Figs. 1-4.

There are in the material a number of specimens which are very closely similar to *M. grewingkii*, with which they were secured from several places in Karahuto; they are considered to be conspecific with the type form. However, they are distinguishable from the latter in being transversely much elongated and narrowly rounded or often subacuminated behind with a sinuated ventral margin. The anterior side is much inflated but rather abruptly attenuated posteriorly. Hence it is regarded at present as an extreme variety of the type form.

Measurements: (mm.)	Length	Height	Thickness
(Moulds)	58	32	23
(")	63	35	18+
(")	60	33	24

Localities and geological horizons: This form is common in Karahuto. At all the localities enumerated below, it is found together with the type species.

Nisisakutan beds (Poronaian): Siinai-gawa⁽³⁾, Honto-gun, and Uryû-gawa,⁽⁴⁾ Notoro-gun; both in Karahuto. Besides, some intermediate specimens have been obtained from the basal part of the Neogene deposits at numerous localities near Siritoru⁽⁵⁾. Some referable specimens also come from the Tokoro beds (Poronaian) of the Poronai-zawa⁽⁶⁾, Tokoro-mura, province of Kitami, Hokkaidô.

Mya grewingkii MAKIYAMA var. *kusiroensis* nov.

Pl. XXXII (I), Figs. 2-6.

Shell closely similar to *M. grewingkii* MAKIYAMA in general, but smaller and usually longer and more compressed. Concentric

(1) 石狩國空知郡栗澤村美流渡

(2) Besides the localities above enumerated, Dr. YOKOYAMA figured a specimen from the Koganezawa, Siranui, Sakaehama-gun, and the third tributary of the Hisitori-gawa, Rûtaka-gun, respectively. These specimens have been derived most probably from the Nisisakutan.

(3) 樺太本斗郡椎内川

(4) 樺太能登呂郡雨龍川

(5) 樺太元泊郡知取

(6) 北見國常呂郡常呂村幌内澤(常呂層)

ridges more pronounced. Moreover, the shell is nearly equilateral, very often only a little swollen anteriorly, the central portion not much depressed. Anterior end semicircular, the posterior narrowly rounded, slightly gaping at the extremity. Antero-dorsal margin, arched, convex, gradually continuing with the anterior one, postero-dorsal very slightly convex, rather rapidly inclined posteriorly, and the ventral margin usually almost straight. Umbo small, not prominent, nearly central. The "subumbonal excavation" not very prominent.

Measurements: (mm.)

Length	Height
45	26
34	21
30	16

About 20 specimens from the Sitakara beds (Pornaian) in the Yûbetu Coal-field,⁽¹⁾ province of Kuro, are at hand, most of which are more or less imperfect, being frequently deformed. In general features this form is very closely similar to *M. grewingkii* and considered to be conspecific with the latter at present. More and better material will make clear the relation between these two forms.

Mya cuneiformis (BÖHM)

Pl. XXXIV (III), Figs. 1-6

1915. *Pleuromya cuneiformis* BÖHM: Jahrb. d. königl. preussisch. geol. Landesanst., Vol. XXVI, p. 557, pl. XXIX, figs. 1a-c, text-figs. 1, 2.
- ?1925. *Mya arenaria* L. var. *japonica* YOKOYAMA: Jour. Fac. Sci., Tôkyô Imp. Univ., Sect. II, Vol. 1, p. 10, pl. III, figs. 3, 4.
1926. *Mya arenaria* YOKOYAMA: Ibid., Vol. I, p. 241, pl. XXX, fig. 1.
1927. *Mya arenaria* YOKOYAMA: Ibid., Vol. II, p. 201, pl. LI, fig. 2.
1927. *Mya arenaria* YOKOYAMA (in part): Ibid., Vol. II, p. 385, pl. LXXIV, fig. 3 (Chagama, Shiritoru).
- ?1930. *Mya japonica* MATSUMOTO: Scie Rep., Tôhoku Imp. Univ., Ser. II, Vol. XIII, p. 98, pl. XXXIX, fig. 11.
1930. *Mya peternalis* MATSUMOTO: Ibid., Vol. XIII, p. 98, pl. XXXIX, figs. 5-10.
- ?1931. *Mya japonica* KURODA in HOMMA: Geology of Central Sinano, Fossil Mollusca, p. 64, pl. VIII, fig. 55, pl. IX, figs. 57, 58.
1931. *Mya donaciformis* KURODA in HOMMA: Ibid., p. 63, text-fig. 7.
- ?1934. *Mya urusikuboana* NOMURA: Saito Hô-on Kai Mus., Research Bull., No. 5, p. 119, pl. V, figs. 6, 7.
1936. *Mya cuneiformis* MAKIYAMA: Mem. Coll. Sci., Kyôto Imp. Univ., Ser. B, Vol. XI, p. 216.
1937. *Mya cuneiformis* KANEHARA: Jour. Geol. Soc., Japan, Vol. XLIV, p. 706.
1937. *Mya cuneiformis* KANEHARA: Ibid., Vol. XLIV, p. 792.

(1) 釧路國阿寒郡雄別炭田 (舌辛層)

This species was founded on a few somewhat deformed specimens from the Tertiary of Russian Saghalin and is characterised by its moderately convex and very inequilateral shell with a rounded and sometimes well marked umbonal keel extending from the umbo to the postero-ventral corner but not so prominent as in *M. grewingkii* MAKIYAMA. The umbo is high, generally more or less pointed, turned inward and forward, but inclined backward. The postero-dorsal margin is long, rather steeply inclined backward and usually slightly concave especially behind the umbo. The posterior extremity is more or less narrowly rounded. The anterior margin is well rounded and the ventral long, usually very slight in curvature or frequently straight.

There are in the Collection more than three hundred specimens collected from various geological formations at numerous places in Karahuto and Hokkaidô. Most of the specimens are well adapted to the description given by BÖHM and sometimes remarkably well preserved, for the examination of various features of this species.

The outline of the shell is rather constant in many individuals from Hokkaidô and Karahuto, but sometimes is subject to variation to some extent.

Usually a little inequilateral, but the posterior side sometimes much elongated; the antero-dorsal margin generally sloped downwards, but frequently broadly arched and forming a nearly semi-circular curvature with the anterior margin. In well preserved specimens, the ventral margin is slightly arched. Umbones rather low, but sometimes prominent and elevated.

Pallial sinus deep, but shallower and narrower than in *M. grewingkii*, and the umbonal angle usually indistinct and the shell less inflated in front, more gradually tapering backwards, inequilateral, and longer, than in the latter.

As compared with *M. arenaria* L., this species is more inequilateral, more trigonal in outline with a more elevated and backwards more inclined umbo. Moreover, its postero-dorsal margin is generally more steeply sloped and more concave, although rarely a little arched and slowly inclined as in the former. The anterior portion of the shell is more inflated in general. However, some specimens are difficult to be distinguished from *arenaria*, especially when they have been deformed.

Six specimens from six different localities have been prepared to

show the chondrophore which is proved to be nearly constant among the specimens. This organ is closely similar to that of *M. grewingkii* and distinct from that of *M. arenaria* L. The chordrophore is rather long, trigonal, oblique posteriorly, the anterior border being nearly perpendicular to the antero-posterior diameter of the shell. The inner border is almost straight; the upper surface is weakly excavated, steeply inclined forward, and decorated with distinct concentric striae. The posterior portion of the organ is narrowly separated from the main portion by a convex ridge and provided with a shallow and narrow groove posteriorly, by which it is separated from the posterior ridge. The posterior ridge is long, very oblique, moderately elevated and faintly grooved longitudinally.

Measurements: (mm.)

Length	Height	Thickness
95	66	37
78	66	35
78	52	32
71	53	33
61	40	23
45	32	18

Localities and geological horizons: This species is the most common and widely distributed *Mya* in the Neogene deposits of Karahuto and Hokkaidô. It does not seem to be rare also in Honsyû⁽¹⁾, and is also reported from Northern Tyôsen (Korea). It ranges from the basal Kawabata Series (Lower Miocene or basal Middle Miocene) to the basal Takikawa (Upper Pliocene).

(I) *Kawabata Series* (Miocene):

Karahuto

Akusyu beds (basal Kawabata); Yunosawa⁽²⁾, Kamikanta, Esutoru-mati; Esutoru-gawa; Taihei Coal-mine⁽³⁾, Esutoru-mati;

(1) Many of the specimens recorded under the name *M. arenaria* or *japonica* may belong to this species. Moreover, *M. donaciformis* KURODA founded on an imperfect specimen from the Miocene of Sinano, is most probably identical with the present form, there being some specimens of *M. cuneiformis* at hand which are trigonal in outline with an elevated umbo as in *M. donaciformis*. Moreover, *M. peternalis* MATSUMOTO from the Miocene of Rikutyû may also be synonymous. *M. urusikuboana* NOMURA based upon moulds from the Upper Miocene or Lower Pliocene of Iwasiro may be an ally of, if not identical to, this species.

(2) 名好郡恵須取町上肝太湯ノ澤

(3) 同町大平炭坑

Tyatya-gawa⁽¹⁾, a tributary of the Esutoru-gawa; the Daini-matuo-gawa⁽²⁾; all in Nayosi-gun. Nakasôko⁽³⁾ and the fifth and sixth tributaries of the Raitisi-gawa⁽⁴⁾; these three localities in Usiro-gun.

Upper Kawabata series (Desmostylus beds): Upper course of the Hatuyuki-zawa⁽⁵⁾, a tributary of the Keton-gawa, Sisuka-gun.

N. B. As described before, some of the deformed specimens from the basal part of the Neogene in Motodomari-gun⁽⁶⁾ may belong to this species. The complex developed here is provisionally ascribed to the Nisisakutan beds (Poronaian), although there is some probability of its belonging to the Akusyu.

Hokkaidô

Kawabata series: Horonobe Coal-mine⁽⁷⁾, province of Tesio. Upper course of the Haboro-gawa (Tikubetu beds)⁽⁸⁾, Tomamae-gun, province of Tesio. Porobesi⁽⁹⁾, Horonuka; Sandomari⁽¹⁰⁾, Rumoe-mati; sea-coast of Onidomari⁽¹¹⁾, Obirasibe-mura; all in Rumoe-gun, province of Tesio. Sakkuru⁽¹²⁾, Nakagawa-gun, province of Tesio. Takinoue⁽¹³⁾, Yûbari-mati, province of Isikari. Yûkesi-zawa⁽¹⁴⁾, Saru-gun; Makubetu⁽¹⁵⁾, Itibu, Sizunai-gun; all in the province of Hidaka. Niwan⁽¹⁶⁾, Yûhutu-gun, province of Iburi.

(II) Oiwake Series (Upper Miocene to Pliocene):

Karahuto

Oiwake Series: Lower course of the Hatuyuki-zawa⁽¹⁷⁾, a tributary of the Keton-gawa, Sisuka-gun; Tyagama⁽¹⁸⁾, north of Siritoru and the Koyanke-gawa, Motodomari-gun; Byôbuiwa and Motiku⁽¹⁹⁾, both south of Esutoru-mati, Nayosi-gun; lower course of the Horokisi-gawa⁽²⁰⁾ and the Kotân-gawa, Usiro-gun.

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|--------------------|----------------------|------------|
| (1) 惠須取川支流茶々川 | (2) 第二松尾川 | (3) 鶴城郡中倉庫 |
| (4) 來知志川 | (5) 敷香郡氣屯川支流初雪澤 | (6) 元泊郡 |
| (7) 天鹽國天鹽郡幌延村幌延炭坑 | (8) 天鹽國苫前郡羽幌町羽幌川 | |
| (9) 天鹽國留萌郡幌糠ボロベシ | (10) 留萌郡留萌町三泊 | |
| (11) 留萌郡小平藁村鬼泊 | (12) 天鹽國中川郡常盤村咲來 | |
| (13) 石狩國夕張町瀧ノ上 | (14) 日高國沙流郡右左府村ユークシ澤 | |
| (15) 日高國靜内郡靜内村市父幕別 | (16) 膽振國湧拂郡似瀧村似瀧 | |
| (17) 敷香郡氣屯川支流初雪澤 | (18) 元泊郡知取北方茶釜及コヤンケ川 | |
| (19) 名好郡惠須取町屏風岩及茂竹 | (20) 鶴城郡幌岸川及古丹川 | |

Hokkaikô

Sea coast of Motikubetu⁽¹⁾, Tomamae-gun, province of Tesio. Tadosi⁽²⁾, Uryû-gun; Bannosawa⁽³⁾, Kabato-gun; both in the province of Isikari. Three places near the Yûbetu Coal-mine⁽⁴⁾, province of Kusi-ro.

(III) *Upper Oiwake* or *Lower Takikawa*; Gabari⁽⁵⁾, Saru-gun, province of Hidaka, Hokkaidô.

(IV) *Basal Takikawa beds* (Upper Pliocene).

Na-ka-Akabira⁽⁶⁾, province of Isikari, Hokkaidô⁽⁷⁾.

Mya truncata L.

Pl. XXXIII (II), Figs. 5, 9, 10.

- 1758. *Mya truncata* LINNAEUS: Syst. Nat., Ed. 10, p. 670.
- 1856. *M. truncata* WOODS: Monogr. Palaeont. Soc., Vol. IX, Crag Moll., Vol. II, p. 277, pl. XXVIII, figs. 1a-f.
- 1875. *M. truncata* SOWERBY in REEVE: Conch. Icon., Vol. XX, Mya, pl. I, sp. 4.
- 1907. *M. truncata* ARNOLD: Proc. U. S. Nat. Mus., Vol. XXXII, p. 145, pl. L, fig. 1.
- 1907. *M. truncata* ARNOLD: Bull. U. S. Geol. Surv., No. 309, pl. 40, fig. 1.
- 1909. *M. truncata* DALL: Prof. Paper, U. S. Geol. Surv., no. L, p. 132.
- 1922. *M. truncata* HOWES: Univ. Calif. Publ. Geol., Vol. XIV, p. 92.
- 1924. *M. truncata* OLDROYD: Stanford Univ. Publ. Geol., Vol. I, p. 197 pl. 10, fig. 4.
- 1929. *M. truncata* WATERFALL: Univ. Calif. Publ. Geol., Vol. XVIII, p. 78.
- 1931. *M. truncata* GRANT and GALE: Mem. San Diego Soc. Nat. Hist., Vol. I, p. 414.
- 1933. *M. truncata* SASAKI: List. Lamell. Hokkaidô and Karahuto, p. 9.
- 1936. *M. truncata* ÔSUGI: The Setana Series and its Fauna (MS), p. 188.
- 1937. *M. truncata* ÔINOMIKADO: Jour. Geol. Soc., Japan, Vol. LXIV, p. 66.

For further synonyms, see GRANT and GALE: Op. cit. Vol. I, 1931, p. 414.

More than ten imperfect specimens have been examined, which are quite identical with *M. truncata* L. in general features. On the

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|-------------------|-------------------|
| (1) 天鹽國苫前郡初山別村茂築別 | (2) 石狩國雨龍郡多度志村多度志 |
| (3) 同樺戸郡新十津川村盤ノ澤 | (4) 釧路國阿寒郡雄別炭山 |
| (5) 日高國沙流郡門別村賀張 | (6) 石狩國空知郡中赤平 |

(7) Besides, among the specimens reported by YOKOYAMA under the name *M. arenaria* L., from the Neogene of North and South Karahuto are contained some of this species, viz., *M. arenaria* L. from Tyagama (Chagama) near Siritoru. Moreover, the specimens figured by YOKOYAMA from the Wakkanai beds and Yûti Sandstone, both from the Oiwake series, and from the Tikubetu beds (basal Kawabata) along the Haboro-gawa are certainly nothing but this form. Furthermore, KANEHARA reported its occurrence in the Oiwake of Tesio and Isikari.

other hand, they are also closely similar to *M. cuneiformis* (BÖHM), only differing therefrom in being sharply truncated behind with a wide gaping. In its chondrophore, it is rather akin to *M. cuneiformis* than to *M. arenaria*. The chondrophore is rather trigonal in outline, moderately long, and rather steeply inclined anteriorly. The "subumbonal excavation" is well developed. The specimens from the Setana series are quite identical with those figured from the west coast of North America, in having a distinct umbonal angle and a nearly horizontal postero-dorsal margin. However, in the large examples from the older formations the umbonal angle is usually less demonstrated and the postero-dorsal margin more abruptly sloped as in the figures given by WOODS. The hinge apparatus of these specimens is so closely similar to *M. cuneiformis*, that the Japanese form may be more closely related to the latter than to *truncata* of Europe⁽¹⁾:

Measurements: (mm.)	Length	Height
Etaibetu	10	51
Gabari	54	38

Localities and geological horizons: *Oiwake series* (Up. Miocene-Pliocene); Kamoi-gawa⁽²⁾, Etaibetu, province of Isikari, a referable specimen from the sea-coast of Motikubetu⁽³⁾, province of Tesio. The uppermost part of the *Oiwake* or the *Setana series* (Upper Pliocene); Gabari⁽⁴⁾, province of Hidaka.

Setana series (Upper Pliocene); Yunosawa⁽⁵⁾, a tributary of the Nakano-kawa, province of Siribesi; two localities near the Pirika Railway Station,⁽⁶⁾ along the Tosibetu-gawa, province of Siribesi. Maruyama⁽⁷⁾, Setana-gun.

Sisinai beds (Lower Pleistocene); Sisinai⁽⁸⁾, province of Isikari. Mr. OINOMIKADO also listed this species from this locality.

1) According to GRANT and GALE, the chondrophore of *M. truncata* is distinguishable from that of *M. arenaria*, *japonica*, and *profundior* in being shorter, somewhat trigonal, less spoon-shaped and less rounded at the ends, and the posterior ridge never projects and is not separated from the chondrophore by a deep furrow. But some of these features do not hold true in the specimens at hand.

(2) 石狩國雨龍郡恵侍別鴨井川

(3) 天鹽國初山別村茂築別海岸

(4) 日高國沙流郡門別村賀張

(5) 後志國壽都郡湯別村中之川支流湯ノ澤

(6) 後志國瀬棚郡利別村利別川ビツカ驛

(7) 瀬棚郡東瀬棚南東丸山

(8) 石狩國當別村獅子内

Mya sp. aff. *truncata* L.

Pl. XXXIII (II), Figs. 6, 11

There are two imperfect specimens in which the test has been mostly lost. They are somewhat akin to *M. cuneiformis* (BÖHM), but the postero-dorsal margin is nearly horizontal except in its anterior portion behind the umbo, and the posterior extremity has a feature approaching to that of *M. truncata* L. The pallial sinus is shallow, shallower than in most of the specimens at hand of *M. cuneiformis* and *M. grewinkii*. The posterior extremity is not so sharply truncated as in *M. truncata*, the apparent truncation shown in the figures is to some extent due to imperfection of this part in the specimens at hand.

Measurements:	Length	Height
	56 mm. +	33 mm.

Locality and geological horizon: Kusyunnai, Karahuto⁽¹⁾. Middle Kusyunnai Series of Mr. WATASE; this series is considered by WATASE as contemporaneous with the Nisisakutan beds (Poronaiian).

The authors express their thanks to the Department of Education for the grant-in-aid (Government Expenditure for Scientific Research) in collecting and studying some of the fossils contained in the present note.

EXPLANATION OF THE PLATES XXXII (I)–XXXIV (III)

(All figures are of natural size)

Plate XXXII (I)

- Fig. 1. *Mya* cfr. *grewinkii* MAKIYAMA. Budô-zawa, Esutoru-mati. A specimen transitional between *M. grewinkii* and *M. cuneiformis* (BÖHM). Nisisakutan beds.
- Figs. 2–6. *Mya grewinkii* MAKIYAMA var. *kusiroensis* NAGAO and INOUE nov. Yûbetu, province of Kusiro. Sitakara beds.
- Figs. 7–9. *Mya grewinkii* MAKIYAMA. Near Maoka, Karahuto. 9, in a dorsal view, showing the hinge apparatus of the left valve. Nisisakutan beds.

(1) 樺太久春内郡久春内

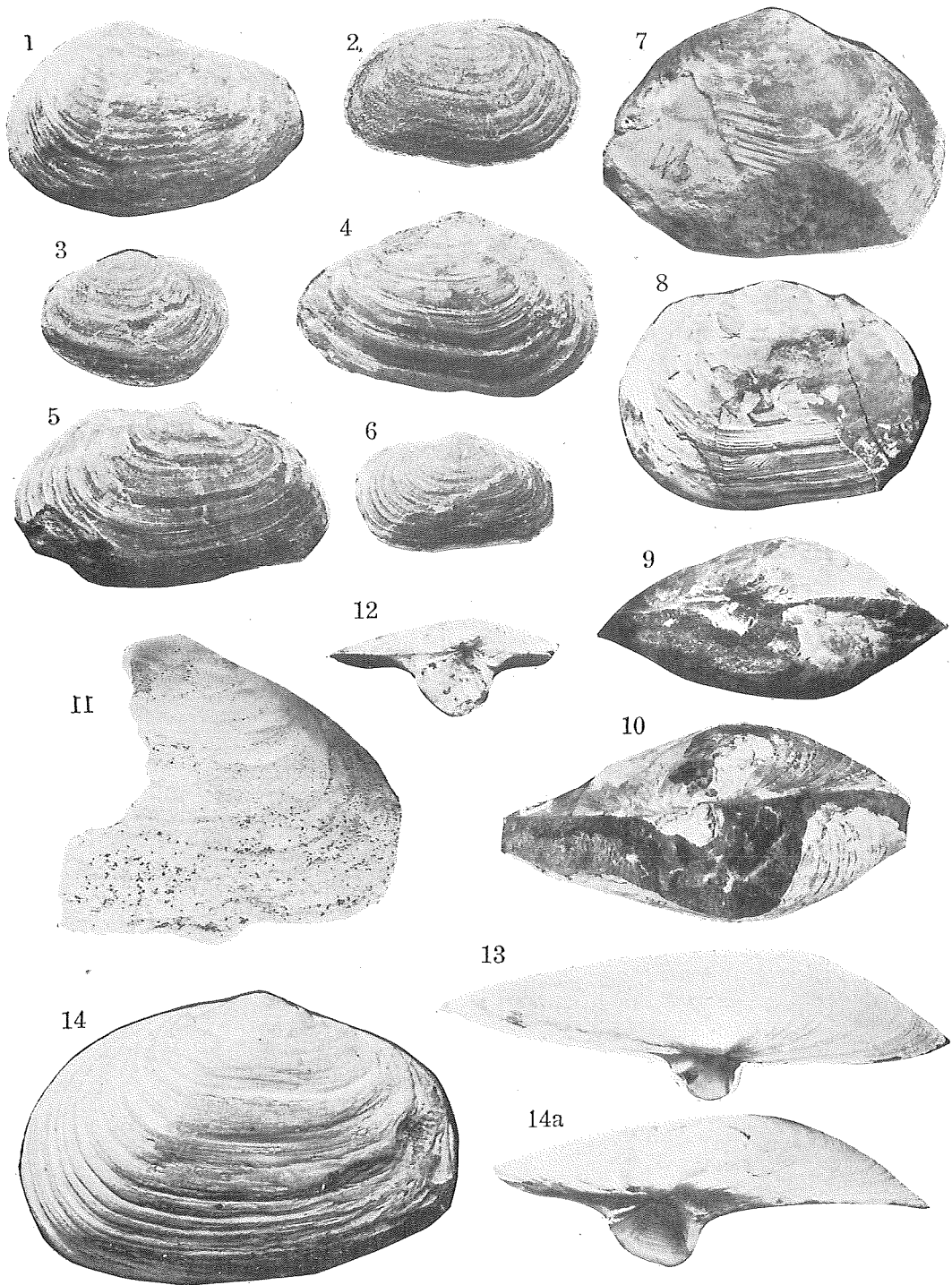
- Fig. 10. *Mya grewingkii* MAKIYAMA. Yotukura, province of Iwaki. Asagai series. This specimen is figured for comparison.
- Figs. 11, 12. *Mya arenaria* L. Tyôta near Obihiro, province of Tokati. Uppermost part of the Ikeda beds or the basal part of the Obihiro beds. 12, hinge apparatus.
- Fig. 13. *Mya* sp. nov. A recent specimen belonging to a form hitherto ascribed to *M. arenaria* L. Toyoura-gun, province of Nagato. Dorsal view to show the hinge apparatus.
- Figs. 14, 14a. *Mya arenaria* L. A recent specimen belonging to the type of *M. "intermedia"* DALL. Esutoru-mati, Karahuto. 14a, a dorsal view, is figured for comparison with Fig. 13.

Plate XXXIII (II)

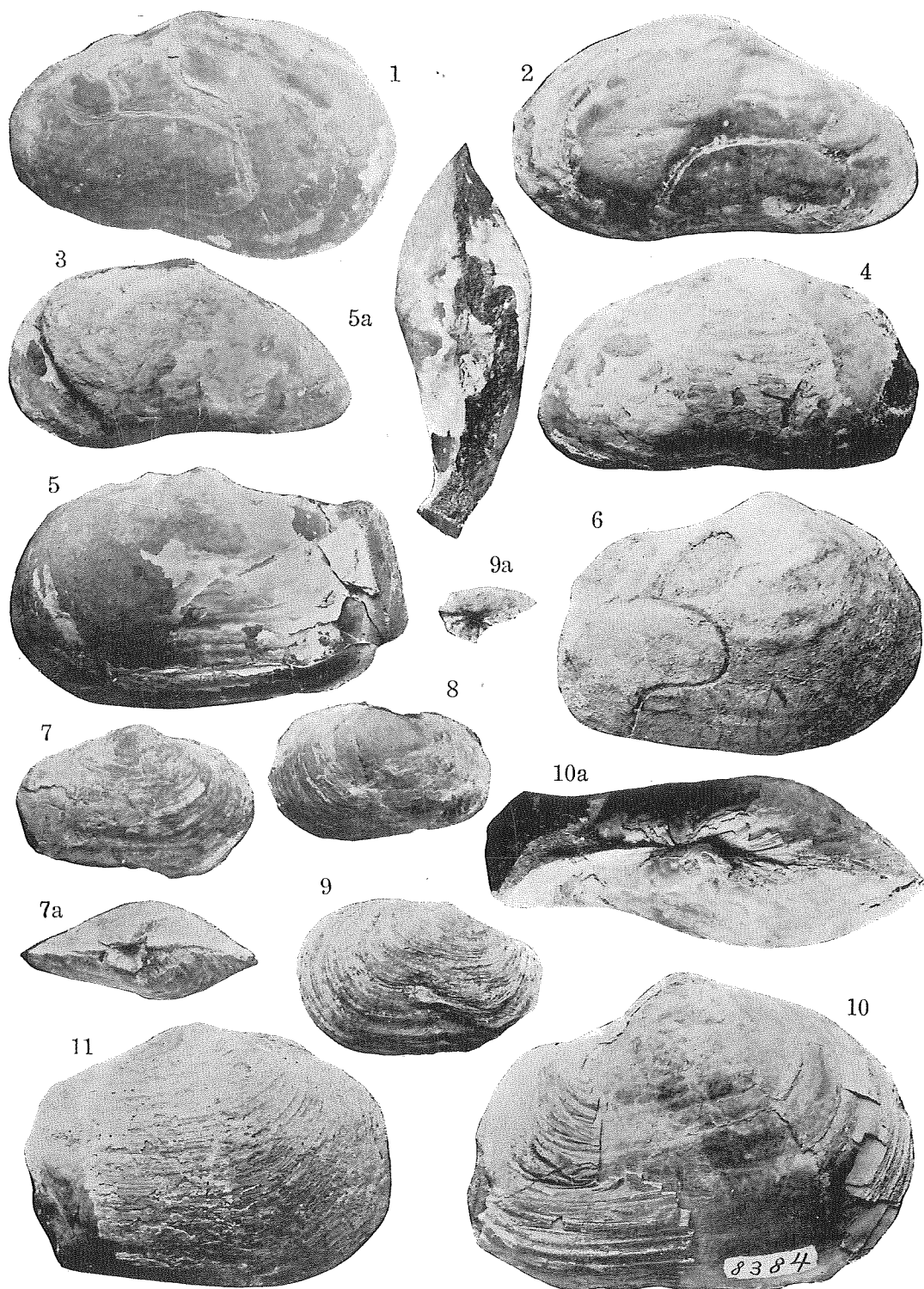
- Figs. 1-4. *Mya grewingkii* MAKIYAMA var. *elongata* NAGAO and INOUE nov. Siinai-gawa Honto-gun, Karahuto. Nisisakutan beds.
- Figs. 5, 5a. *Mya truncata* L. Gabari, Monbetu-mura, province of Hidaka. Uppermost part of the Oiwake series or the lower part of the Setana. 5a, a dorsal view showing the hinge apparatus of the left valve.
- Figs. 6, 11. *Mya* sp. aff. *truncata* L. Kusyunnai, Karahuto. Middle Kusyunnai beds.
- Figs. 7, 8. *Mya* cf. *grewingkii* MAKIYAMA. Budô-zawa, Esutoru-mati.
- Figs. 9, 9a. *Mya truncata* L. Sisinaï, Tôbetu-mura, province of Isikari. Sisinaï beds. 9a, hinge apparatus of the left valve.
- Figs. 10, 10a. *Mya truncata* L. Kamoi-gawa, Etaibetu, Uryû-gun, province of Isikari. Oiwake series.

Plate XXXIV (III)

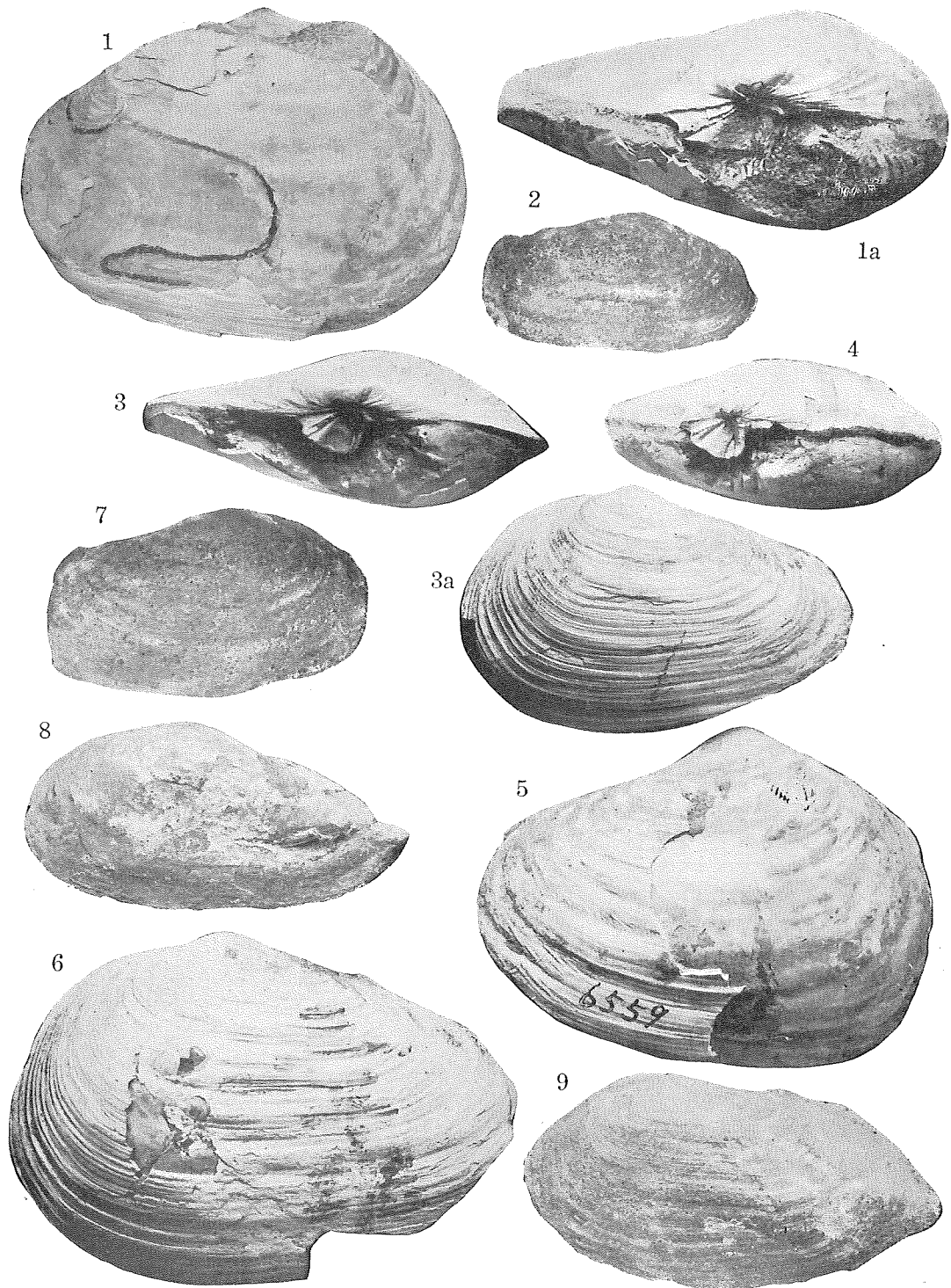
- Figs. 1, 5, 6. *Mya cuneiformis* (BÖHM). Hatuyukizawa, a tributary of the Keton-gawa, Karahuto. Oiwake series.
- Figs. 3, 4. *Mya cuneiformis* (BÖHM). Niwan, Yûhutu-gun, province of Iburi. Kawabata series.
- Figs. 2, 7-9. *Mya ezoensis* NAGAO and INOUE nov. Kogutinosawa, Yûbari-gun, province of Isikari. Isikari series.



Kumano photo.



Kumano photo.



Kumano photo.