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The Fossil Corbiculids from the Palaeogene Isikari Series in the Isikari Coal-Field, Hokkaidô

By

Takumi NAGAO and Ken-itirô ÔTATUME

With 3 Plates and 1 Text-figure

(Contribution from the Department of Geology and Mineralogy, Faculty of Science, Hokkaidô Imperial University, Sapporo. No. 304).

Fossil mollusca from the Isikari Series[1], though the number of species is rather small, are not rare at places. It is now intended to describe the species of corbiculids which are sometimes very common in the complex throughout the Isikari Coal-field. The material here dealt with contains the specimens obtained by the writers and those kindly donated by a number of geologists, and comprises the following 6 forms:

Polymesoda (*Geloina*) *hokkaidoensis*, nov. sp.
P. (*G.*) *hokkaidoensis* var. *bibaiensis*, nov. var.
P. (*G.*) *takaoi*, nov. sp.
Corbicula tokudai (YOKOYAMA)
C. sunagawaensis, nov. sp.
Batissa muratai, nov. sp.

1) IMAI, H.: Stratigraphical Studies of the Coal-bearing Tertiary of the Isikari Coal-Field, the Isikari Series (in Japanese). Journ. Georg. Soc. Tôkyô, Vol. XXXVI, 1924. IMAI subdivided the Isikari Series as follows (in descending order):
Asibetu Coal-bearing Beds (蘆別夾炭層)
Upper *Corbicula* Beds (上部蜆介層)
Ikusyumbetu-*Woodwardia* Beds (幾春別夾炭層－羊歯砂岩層
Lower *Corbicula* Beds (下部蜆介層)
Bibai Coal-bearing Beds (美唄夾炭層)
Wakkanabé Beds (若菜邊層
Yûbari Coal-bearing Beds (夕張夾炭層)
Horokabetu Shale (幌加別頁岩層)
Noborikawa Coal-bearing Beds (登川夾炭層)

All these forms have been obtained from the Sorati Coal-field (the northern part of the Isikari Coal-field), no corbiculids having been obtained from the Yûbari Coal-field (the southern part of the Isikari Coal-field). *C. tokudai,* is one of the most common species in this district ranging from the Wakkanabé Beds to the Upper *Corbicula* Beds, while the other forms are rare and, except for *P. hokkaidoensis,* found only in the Wakkanabé Beds. Among these forms, *Geloina* has been known in fossil state only from the Syokkôzan Formation of Taiwan (Formosa) in Japan, its recent species being found in Taiwan, Ryûkyû and the province of Satuma. The occurrence of this genus, together with that of *Batissa,* proves a warm climate of the Isikari Series, coincident with the fact that the contemporaneous flora contains some warm temperate plants.

Family Corbiculidae

Genus *Polymesoda,* RAFINESQUE, 1828

Subgenus *Geloina,* GRAY, 1842

Polymesoda (Geloina) hokkaidoensis, nov. sp.

Pl. I(I), Figs. 1, 1a, 2, 3, 4; Pl. II(II), Figs. 1, 2, 3a, 4, 4a, 5, 6, 7.

Shell moderately large, thick-tested, very inequilateral, the anterior side being quite the shorter, nearly as high as long or frequently higher than long; transversely short-ovate or roundly trapezoid in outline; anterior extremity rather rounded and the posterior one vertically truncated; antero-dorsal margin straight, being only faintly excavated beneath the umbo, and very steeply inclined forward and downward, the postero-dorsal one also nearly straight, and the basal one evenly and broadly convex. Umbones approximate, elevated, convex, curved inward and a little forward, not eroded, with a blunt but distinct angle running from it to the postero-ventral end. Surface ornamented with crowded concentric lines and rough ridges.

Hinge teeth $\frac{\text{(R) } 2.111.2}{\text{(L) } 1.111.1}$. Hinge of the left valve consisting of three slightly divergent cardinals and two laterals; anterior cardinal nearly vertical or a little oblique backwards, the middle one fairly so and broadest of all, apparently bifid, and the posterior one very

narrow and elongated; laterals apparently smooth, of which the anterior one is short, stout, triangular in outline, much projected from the surface of the hinge plate, with its anterior end close to the upper margin of the anterior adductor muscle-scar; posterior lateral longer and narrower than the anterior one, remote from the cardinals, its end reaching to the upper margin of the posterior adductor muscle-scar. Hinge of the right valve with three divergent cardinal besides the laterals; anterior cardinal very small, short oblique a little forward, the middle one stout, oblique forward, and the posterior one longest of all; laterals smooth, the anterior one consisting of two longitudinal ridges, of which the upper one is narrower than the lower one, the posterior lateral remote from the cardinals, also composes of two ridges, of which the lower one is longer and stouter than the upper one.

Inner margin of the shell smooth; adductor muscle-scars distinct, the posterior one oval and slightly larger than the anterior one which is a rounded one; pallial line almost integripalliate, but slightly angular beneath the posterior adductor muscle-scar.

Dimensions		
Length (m.m.)	Height (m.m.)	Thickness (m.m.)
46	47	16
47	46	16
48	43	16
48	44	15
52	44	34*
ca. 48	43	26*
ca. 52	52	17
44	40	17
43	39	17
32	30	ca. 18*

* Both valves united.

A number of specimens belonging to this form have been examined. Among the specimens some variation in outline of the shell are observable, usually being as high as long, but sometimes higher than long. This form differs from *Polymesoda* (*Geloina*) *luchuana* (PILSBRY), a species living in Taiwan, Ryûkyû, and

Satuma,[1] and also known from the Neogene Syokkôzan Formation of Taiwan,[2] being higher, shorter and more distinctly trapezoid in outline, with its antero-dorsal margin more arched, its posterior end more sharply truncated, and its umbonal angle more attenuated, than in the latter. *Cyrena compta* DESH.[3] from the Eocene of France is similar in many points to the present species, but has the anterior lateral tooth different from that of the Japanese one.

Localities and geological horizon: Torii-zawa, Pombetu Colliery, Mikasa-mati[4]; Mitui-Bibai Colliery, Bibai-mati[5]; the upper course of Garo-no-sawa, Bibai-mati[6]; Kamisunagawa Colliery, Sunagawa-mati[7]; Utasinai-mura[8]; Akabira-mura[9]; all of them Soratigun, in the province of Isikari. Wakkanabé Beds. S. MURATA, Y. HATTORI and K. ÔTATUME coll.

Polymesoda (Geloina) hokkaidoensis NAGAO and ÔTATUME var. *bibaiensis*, nov. var.

Pl. I(I), Fig. 5.

There is in our disporsal a single left valve closely similar to the preceding species. It seems, as preserved, to be slightly larger and obliquely more elongated than the latter and has a smaller and

1) *Cyrena luchuana* PILSBRY, Cat. Mar. Moll. Japan, p. 183, pl. IV, figs. 4, 5, 1895.
C. *yaeyamaensis* PILS., Ibid., pl. VIII, fig. 6.
C. *fissidens* PILS., Ibid., p. 183, pl. VIII, figs. 6, 7.
These species are treated by T. KURODA as synonyms. Cat. Shell-bearing Moll. Amami-Oshima, p. 8, No. 90, 1928.
Geoloina luchuana (PILS.), HIRASE, S.: A. Coll. Jap. Shells, pl. XXI, fig. 5, 1935.
Geloina luchuana (PILS.), HORIKAWA, Y.: Fresh-water Moll. from Taiwan, Venus, Vol. V, p. 28, 1935.

2) *Polymesoda (Geloina) luchuana* (PILS.), TAN, K.: Some Mull. Foss. Syokkôzan Formation, Jap. Jour. Geol. and Geogr., vol. XV, nos. 1–2, p. 22, pl. II, figs. 1–2, 1938.

3) DESHAYES, P. G.: Descrip. des Anim. sans Vert. decouv. dans le Bassin de Paris. I, p. 491, pl. 35, figs. 1–3; pl. 36, figs. 19, 20, 1860.

4) 石狩國空知郡三笠町奔別炭坑，鳥居澤.

5) 同 上 美唄町三井美唄炭山.

6) 同 上 我路ノ澤.

7) 同 上 砂川町上砂川炭山.

8) 同 上 歌志内村.

9) 同 上 赤平村.

more prominent umbo. The posterior extremity is figured to be rounded, but this part of the shell has been injured in preparation. In reality, the posterior extremity in this specimen is also vertically truncated and the postero-ventral corner angulated, if less distinctly, as the preceding one. The umbonal angle is less prominent, but this is without doubt due to a different state of preservation. Moreover, the hinge although very imperfectly observable in the present specimen, seems to be quite identical in these two forms. Consequently the writers are warranted to consider this shell as conspecific with and inclined to take it as a variety of the other for the time being.

Dimensions		
Length (m.m.)	Height (m.m.)	Thickness of one valve (m.m.)
70	62	? 17

Locality and geological horizon: The Mitubisi Bibai Colliery, Bibai-mati, Sorati-gun, in the Province of Isikari. Wakkanabé Beds. H. IMAI Coll.

Polymesoda (Geloina) takaoi, nov. sp.

Pl. II(II), Figs. 8, 8a; Pl. III(III), Figs. 1, 1a, 2, 3, 3a.

Shell rather small, moderately convex, relatively thin-tested, transversely elongated-ovate in outline, inequilateral, the anterior side being slightly shorter; anterior end somewhat produced and narrowly rounded, the posterior one subtruncated almost vertically; antero-dorsal margin rather long and nearly straight with a slight concavity beneath the umbo, the postero-dorsal one also straight, sloping backwards more slowly than the antero-dorsal, and the ventral one apparently broadly convex, passing gradually into the anterior margin and forming a blunt angle with the posterior one. Umbones relatively low, broad, not eroded, curved inward and slightly forward, with a blunt angle running from it to the postero-ventral end, the surface behind it somewhat flattened. Surface smooth except for dense, fine lines of growth.

Hinge plate of the left valve rather narrow with three divergent cardinal teeth and two lateral ones; anterior cardinal moderately oblique forwards, the middle one broadest, seemingly bifid, and a

1) 石狩國空知郡美唄町三菱美唄炭山, 若菜邊層.

trifle oblique backwards, and the posterior one narrow, very oblique, and longest of the three; lateral teeth smooth, of which the anterior one is as long as the posterior, situated close to the anterior cardinal, moderately projected from the hinge plate, but not so much as the cardinals, posterior lateral rather short for the genus, far remote from the cardinals; both laterals apparently devoid of crenulation. On the right valve, the anterior cardinal tooth very small and short, the middle one slightly and the posterior one very oblique backwards; anterior lateral consisting of two longitudinal ridges, of which the lower one arcuate downwards, posterior lateral remote from the cardinals and with two ridges.

Inner margin of the valve smooth. Adductor muscle-scar small and rounded; pallial line simple except for a round angulation beneath the posterior adductor muscle-scar.

Dimensions		
Length (m.m.)	Height (m.m.)	Thickness of one valve (m.m.)
36	ca. 28	11
32	26	10
53	ca. 42	14

Five specimens have been examined. This form closely resembles *P.* (*G.*) *hokkaidoensis,* nov. and especially var. *bibaiensis,* nov.. However, it is distinguished in being more equilateral, with a more produced anterior extremity, and a greater angle between the antero- and postero-dorsal margins. The hinge plate is narrower in this species with its anterior cardinal tooth oblique forwards and its anterior lateral tooth less projected from the plate than in *hokkaidoensis,* nov..

The specific name is dedicated in honour of Mr. S. TAKAO, chief geologist of the Tankô-Kisen Co. by whom the type specimen was submitted for examination.

Localities and geological horizon: Akama-no-sawa, Akabira-mura[1]; Naié- and Naé-gawa[2]; Mitui-Bibai Colliery, Bibai-mati[3]; Torii-zawa, Pombetu Colliery, Mikasa-mati[4]; all of them Sorati-

1) 石狩國空知郡赤平村赤間ノ澤.
2) 同 上 奈井江川及ビ奈江川.
3) 同 上 美唄町三井美唄炭山.
4) 同 上 三笠町奔別炭坑鳥居澤.

gun, in the Province of Isikari. Wakkanabé Beds. S. TAKAO, S. KOBAYASI, Y. HATTORI, and K. HUZIOKA coll.

Genus *Corbicula* MERGELE, 1811

Corbicula tokudai (YOKAYAMA)

Pl. III(III), Figs. 4–9.

1932. *Circe tokudai*, YOKOYAMA: Tertiary Mollusca from the Coalfield of Uryû, Ishikari. Journ. Fac. Sci., Imp. Univ. Tôkyô, Sec. III, vol. III, pt. 6, p. 240, pl. II, figs. 3, 4, and ?2.

1941. *Corbicula atrata tokudai* (YOKOYAMA), SUZUKI: Some Non-Marine Mollusca from the Oligocene Isikari Series in the Isikari Coal-Field, Hokkaidô. Jour. Fac. Sci., Imp. Univ. Tôkyô, Sec. II, vol. VI, pt. 1, p. 9, text-figs. 1, 2; pl. I, figs. 11, 12; pl. II.

1941. *Corbicula atrata tokudai* (YOKOYAMA), SUZUKI: Notes on the Tertiary Non-Marine Mollusca from the Coal-Field of Uryû, Hokkaidô. Ibid., pt. 2, p. 32, pl. II, figs. 6–12.

A number of specimens of the genus *Corbicula* are met with, sometimes in aggregation, at various places in the Isikari Coal-field and range from the Wakkanabé Beds to the Upper *Corbicula* Beds. They represent one of the most common species in these complexes and identical with some specimens derived from the Palaeogene of the Uryû Coal-field and described by YOKOYAMA as *Circe tokudai*. Among the specimens figured by YOKOYAMA, that from the Upper Numata Bed (fig. 3) is closely akin to those from the Isikari Coal-field and conspecific without doubt with the latter, while that from the Upper Okada Bed seems, if it really belongs to the same species, to be more orbicular with its anterior end more broadly rounded along the margin than usual.

"Shell moderately thick, somewhat convex, roundly pentagonal, inequilateral, slightly rounded in front, obliquely subtruncate behind, broadly arched at ventre, antero-dorsal margin nearly straight, steeply sloping and going over into anterior margin without making any angle, postero-dorsal also nearly straight and sloping, though less steeply than antero-dorsal. Surface smooth save for rough incremental lines. Beaks blunt, often eroded. A blunt edge runs from the beak to the postero-ventral corner. Height 20 millim., length 25 millim., thickness about 12.5 millim.

The teeth have been observed in one of the right valves. The three main teeth are approximately from one another, and of nearly equal size." (M. YOKOYAMA: pp. 240–241.)

Hinge of the right valve consisting of three divergent cardinal teeth and two elongate teeth; cardinals approximately equidistant

from one another, of which the anterior one small, short, and subvertical, the middle and posterior ones nearly equal in size and oblique backwards; of the laterals, the anterior one slightly shorter and straighter than the posterior one, both crenulated and composed of two longitudinal ridges. Hinge of the left valve also with three cardinals and two laterals; anterior cardinal slightly oblique forwards, the posterior one thin; posterior lateral a little longer than the anterior and gently curved. Nymph platy. Inner margin of valve smooth, anterior adductor muscle-scar rounded, the posterior one oval, pallial line simple.

The outline of the valves is somewhat variable among the individuals; the shell is usually only a trifle longer than high, though there are some specimens which are moderately longer than high. They are often roundly trapezoid, but in general more or less orbicular.

Dimensions

Length (m.m.)	Height (m.m.)	Thickness (m.m.)	
33	29	16	(both valves united)
28	23	12	(both valves united)
32	26	17	(both valves united)
29	24	15	(both valves united)
29	25	7	(one valve)

The senior writer[1] once suggested that YOKOYAMA's *Circe tokudai* is one of corbiculids which are very common in the Isikari Series. Recently K. SUZUKI published to notes on the Palaeogene non-marine molluscan fossils, one[2] dealing with fossils from the Isikari Series of Hokkaidô and the other the revisional study of YOKOYAMA's work[4] on the fossils from the Uryû Coal-field of Hokkaidô. In the former note SUZUKI proposed a name *Corbicula atrata tokudai* (YOK.) for YOKOYAMA's *Circe tokudai*[5] and moreover, he

1) T. NAGAO: Palaeogene Tertiary. Iwanami Kôza, 1933, p. 58.
2) K. SUZUKI: Some Non-Marine Shells from the Oligocene Isikari Series in the Isikari Coal-Field, Hokkaidô. Journ. Coll. Science, Imp. Univ. Tôkyô, Sect. II, vol. VI, pt. 1, 1941.
3) K. SUZUKI: Notes on the Tertiary Non-Marine Mollusca from the Coal-Field of Uryû, Hokkaidô. Ibid., pt. 2, 1941.
4) M. YOKOYAMA: Tertiary Mollusca from the Coal-Field of Uryû, Hokkaidô. Journ. Fac. Sci., Imp. Univ. Tokyo, vol. III, pt. 6, 1932.
5) M. YOKOYAMA: 1932, op. cit., p. 240, pt. 6, pl. II, figs. 2–4.

considered YOKOYAMA's *Diplodonta semiaspera* YOK.[1] from the Isikari Series is to be synonymous with *Corbicula atrata tokudai*. In the latter note, SUZUKI put also YOKOYAMA's *Cyrena verecunda*[2] from the Uryû Coal-field into the *genus* Astarte, however, the diagnostic feature of it into the synonymy of the present species.

Localities and geological horizons: Utasinai and Kamoi Collieries, Utasinai-mura;[3] Akama-no-sawa, Akabira-mura;[4] Asibetumati[5]; of all in Sorati-gun, the Province of Isikari. Wakkanabé Beds, Lower and Upper *Corbicula* Beds. Collected by S. MURATA, S. TAKAO, S. KOBAYASI, E. TAKAHASI, T. SHIMOGAWARA, besides the present authors.

Corbicula sunagawaensis, nov. sp.

Pl. III(III), Figs. 10, 10a.

Shell small, roundly trapezoid in outline, thick-tested, very inequilateral, the anterior side much shorter than the posterior one, nearly as high as long; anterior end incomplete, but seemingly rounded, the posterior one subtruncated almost vertically; antero-dorsal margin rather long, very steeply inclined forwards, forming a right angle with the postero-dorsal which is rather short, arcuated and more gentle in inclination, and the ventral very convex, passing gradually into the anterior margin and forming a blunt angle with the posterior one. Umbo convex, curved inward, eroded at apex, with an indistinct angle running from it to the postero-ventral extremity. Surface with rude concentric lines.

Hinge of the left valve with three divergent cardinals and two elongated and crenulated laterals, anterior cardinal strongest of all, subvertical, the middle one oblique backwards and the posterior one marrow and very oblique; nymph platy, prominent; ventral margin of the hinge plate roundly angulated beneath the posterior cardinal.

Inner margin of the shell apparently smooth, anterior adductor muscle-scar oval.

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1) M. YOKOYAMA: Neogene Shells from Karahuto and Hokkaidô. Journ. Fac. Sci., Imp. Univ. Tôkyô, Sect. II, vol. III, pt. 4, 1931, p. 189.
2) M. YOKOYAMA: 1932, op. cit., p. 242, pt. 6, pl. III, fig. 5.
3) 石狩國空知郡歌志內村歌志內炭坑及ビ神威炭坑.
4) 同　上　赤平村赤間ノ澤.
5) 同　上　蘆別町.

Dimensions		
Length (m.m.)	Height (m.m.)	Thickness of one valve (m.m.)
29	30	10

There is in the material only a single left valve of *Corbicula* which is, although imperfectly preserved, distinguishable from *C. tokudai* (YOKOYAMA). It differs from the latter in being more convex, higher, and more thick-tested, with a smaller angle between the antero- and postero-dorsal margins. In the present form the postero-dorsal margin is less arched and consequently the posterior lateral tooth is less curved, than in *tokudai*. Moreover, the anterior and posterior portions of the hinge plate meet each other in a smaller angle than in the other species in which the lower margin of this plate is regularly and broadly curved. Furthermore, the laterals are longer than in the latter form.

Locality and geological horizon: Kamisunagawa Colliery, Sunagawa-mati, Sorati-gun, in the province of Isikari[1]. Wakkanabé Beds. S. MURATA coll.

Genus *Batissa*, GRAY, 1852

Batissa muratai, nov. sp.

Text-figs. 1, 1a; Pl. III (III), Figs. 11, 12, 12a.

Shell small, convex, oblique, half-moon shaped in outline, very inequilateral, the anterior side far produced and much longer than the posterior one which is very short; anterior margin narrowly rounded, the posterior very convex, the antero-dorsal long, nearly straight, and inclined rather steeply backwards, the antero-ventral and the ventral margins forming together a circular curveture, postero-ventnral margin slightly concave. Umbo low, broad, slightly eroded. A distinct angle running umbo to the postero-ventral extremity, its ridge somewhat rounded, and slightly depressed behind. Lunule long, escutcheon indistinctly defined. Surface ornamented with crowded fine concentric line.

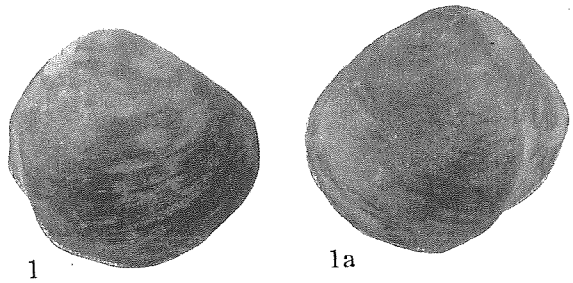
Hinge of the left valve is observable; provided with three divergent cardinals and two laterals; anterior cardinal small and very short, nearly vertical in position, the middle one broadest,

1) 石狩國空知郡砂川町上砂川炭山.

oblique backwards, and with a trace of bifurcation, and the posterior one very narrow. Anterior lateral long, with its anterior end not extending as far as the upper margin of the anterior adductor muscle-scar, posterior lateral longer than the anterior one, slightly curved posteriorly. Nymph platy, low. Inner margin of the shell only partly visible; anterior adductor muscle-scar roundly ovate in outline.

Dimensions		
Length (m.m.)	Height (m.m.)	Thickness of one valve (m.m.)
30	25	9
31	27	10
35	31	12

Three specimens have been examined, the holotype preserving both valves united and the paratype represented by a left valve without the postero-ventral portion.



1 1a

Text-figs. 1, 1a. *Batissa muratai* NAGAO and ÔTATUME. Utasinai-mura, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. No. 3908. 1. right valve, 1a. left valve. Natural size.

This species belongs without doubt to *Batissa* Gray. *Cyrena* (Batissa) *ponderosa* NAGAO[1] from the Palaeogene deposits of Kyûsyû is a larger, more rounded, and more equilateral shell with a more convex and more elevated umbo than in the present species. The

1) NAGAO, T.: Pal. Foss. Isl. Kyûsyû, in Japan. Sci. Rep. Tôhoku Imp. Univ. 2nd Ser., vol. IX, 1928, pl. XX, figs. 10, 30; pl. XXI, fig. 21; pl. XXII, figs. 16–19, p. 108; *Batissa nagaoi* SUZUKI (=*Cyrena* (*Batissa*) *ponderosa* NAGAO), SUZUKI, K.: Palaeogene Corbiculids of Northwestern Kyûsyû. Jour. Fac. Sci., Imp. Univ. Tôkyô, Sec. II, vol. VI, pt. 3, 1941, p. 46, text-figs. 1–3; pl. I, figs. 1, 2.

surface is also differently sculptured from the latter. *Cyrena* (*Batissa*) *subtrigonalis* KRAUSE[1] from the Melawi Group of Borneo is similar to the form now in question, but it is higher and more convex with a more distinct umbonal angle than the latter.

The specific name of this peculiar form is dedicated in honour of Mr. S. MURATA, former chief geologist of the Tankô-Kisen Co. by whom the specimen has been presented to the writers for examination.

Locality and geological horizon: Kyôéi-zawa, Kamoi Colliery, Utasinai-mura, Sorati-gun, in the Province of Isikari.[3] Wakkanabé Beds. S. MURATA coll.

In conclusion the writers wish to express their obligation to Messrs. S. MURATA, S. TAKAO, S. KOBAYASI, Y. HATTORI and K. HUZIOKA, who kindly donated the specimens for study. Furthermore, they must acknowledge important advice given by Messrs. K. SUZUKI and K. ÔYAMA (Division of Geology, Sigen Kagaku Kenkyûzyo).

1) KRAUSE, P. G.: Ueber tertiäre Ablagerungen aus West-Borneo. Samm. Geol. Reichs-Mus. Leiden, I Ser., V, 1889–99, S. 193–199, Tab. XIII, Fig. 1–10.

2) 石狩國空知郡歌志内村神威炭山.

EXPLANATION OF PLATES

(The figures are of natural size)

Plate I (I)

Figs. 1, 1a. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Torii-zawa, Pombetu Colliery, Mikasa-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. No. 9285.

Fig. 2. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Hutamata, Kamisunagawa, Sunagawa-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. No. 9286.

Figs. 3, 4. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Garo-no-sawa, Mitubisi-Bibai Colliery, Bibai-mati, Isikari Province. Wakkanabé Beds. Reg. Nos. 9287, 9288.

Fig. 5. *Polymesoda* (*Geloina*) *hokkaidoensis* var. *bibaiensis* NAGAO and ÔTATUME. Mitubisi-Bibai Colliery, Bibai-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Monotype. Reg. No. 5923.

Plate II (II)

Fig. 1. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Hutamata, Kamisunagawa Colliery, Sunagawa-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Holotype. Reg. No. 5912.

Figs. 2, 3, 3a, 4, 4a, 5. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Torii-zawa, Pombetu Colliery, Mikasa-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. Nos. 9289, 9290, 9291, 9292.

Figs. 6, 7. *Polymesoda* (*Geloina*) *hokkaidoensis* NAGAO and ÔTATUME. Mitui-Bibai Colliery, Bibai-mati, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. Nos. 9293, 9294.

Figs. 8, 8a. *Polymesoda* (*Geloina*) *takaoi* NAGAO and ÔTATUME. Naé-gawa, Sunagawa-mati, Isikari Province. Wakkanabé Beds. Neg. No. 9295.

Plate III (III)

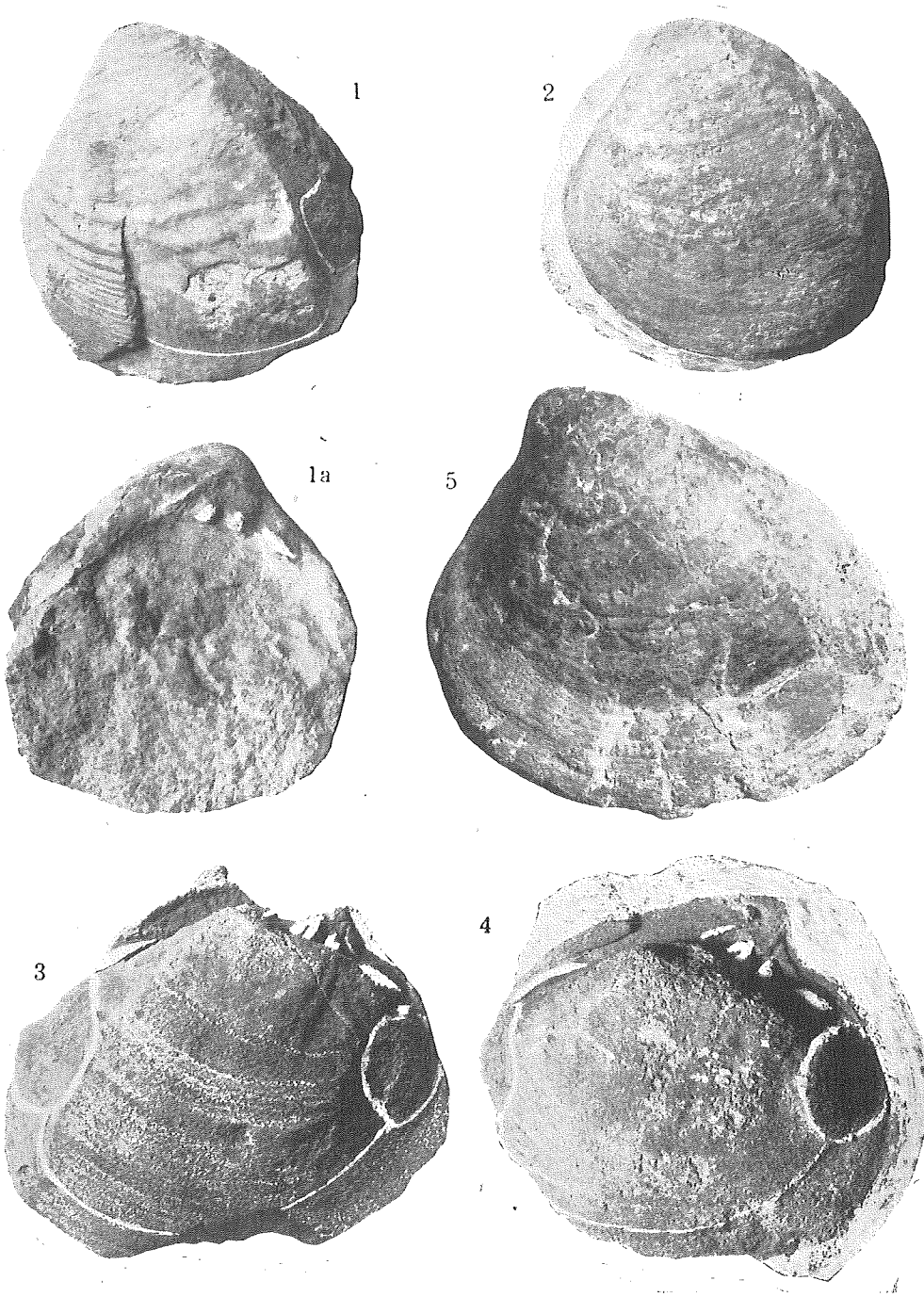
Figs. 1, 1a, 2. *Polymesoda* (*Geloina*) *takaoi* NAGAO and ÔTATUME. Akama-no-sawa, Akabira-mura, Sorati-gun, Isikari Province. Wakkanabé Beds. 1. Holotype. Reg. Nos. 9296, 9297.

Figs. 3, 3a. *Polymesoda* (*Geloina*) *takaoi* NAGAO and ÔTATUME.. Torii-zawa, Pombetu Colliery, Mikasayama-mura, Sorati-gun, Isikari Province. Wakkanabé Beds. Reg. No. 9298.

Figs. 4, 5, 5a, 6, 7, 7a, 8, 9. *Corbicula tokudai* (YOKOYAMA). *Akama-no-sawa*, Akabira-mura, Sorati-gun, Isikari Province. Lower *Corbicula* Beds. Reg. Nos. 9299, 9300, 9301, 9302, 9303, 9304.

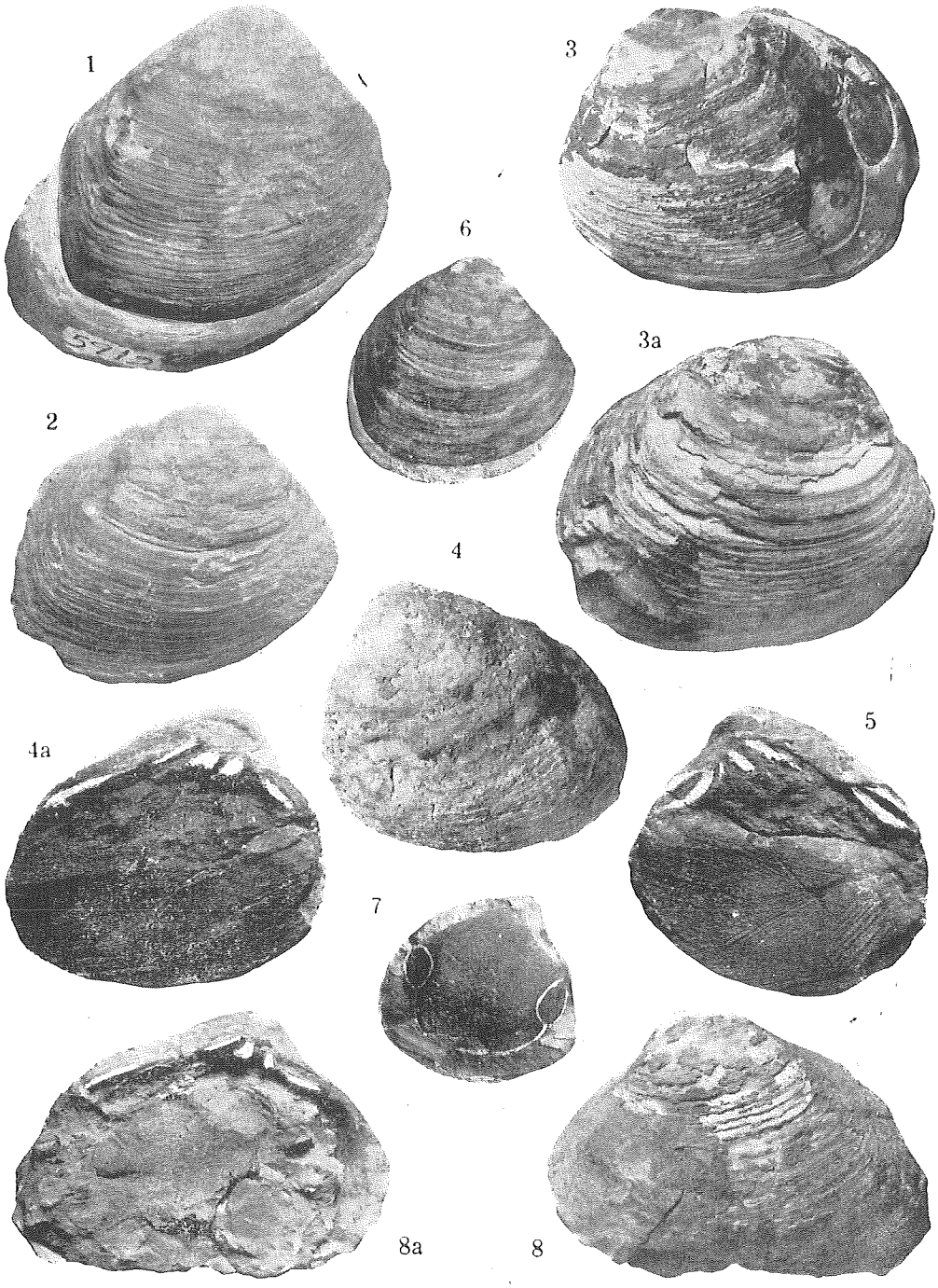
Figs. 10, 10a. *Corbicula sunagawaensis* NAGAO and ÔTATUME. Kamisunagawa Colliery, Sunagawa-mati, Isikari Province. Wakkanabé Beds. Monotype. Reg. No. 9305.

Figs. 11, 12, 12a. *Batissa muratai* NAGAO and ÔTATUME. Kyôéi-zawa, Kamoi Colliery, Utasinai-mura, Sorati-gun, Isikari Provinve. Wakkanabé Beds. 11. Holotype, 12. Paratype. Reg. Nos. 9306, 9307.



Kumano photo.

T. Nagao and K. Ôtatume : Fossil Corbiculids from the Palaeogene Isikari Series.



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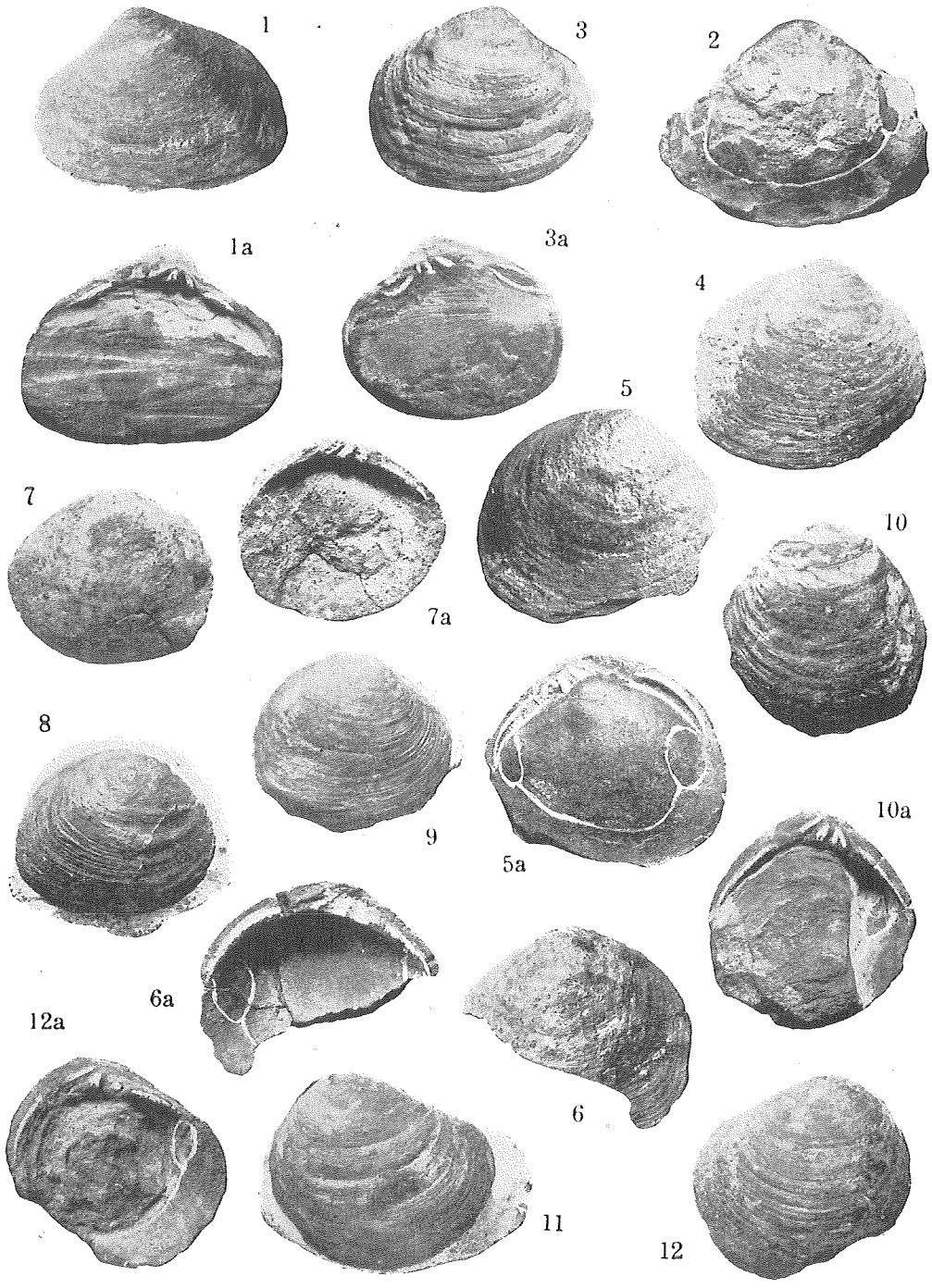
T. Nagao and K. Ôtatume: Fossil Corbiculids from the Palaeogene Isikari Series.



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