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SOME CRETACEOUS MOLLUSCA FROM JAPANESE SAGHALIN AND HOKKAIDO

(Lamellibranchiata and Gastropoda)

By

Takumi NAGAO

With 4 Plates.

Cretaceous molluscs, aside from ammonites, derived from Saghalin and Hokkaido have not yet much described, though they are met with in abundance at places. Among others, the following three papers are the most important of earlier date on this subject:

I. F. SCHMIDT: Ueber die Petrefakten der Kreideformation von der Insel Sachalin. Mém. de l'Acad. Imp. des Sci. de St. Petersb., Ser. VII, Vol. XIX, No. 3, 1873.

II. M. YOKOYAMA: Versteinerungen aus der japanischen Kreide. Palaeontographica, Vol. XXXVI, 1890.

III. K. JIMBO: Beiträge zur Kenntnis der Fauna der Kreideformation von Hokkaido. Palaeont. Abhandl., Vol. VI, 1894.

Lately Prof. H. YABE of the Institute of Geology and Palaeontology in Sendai and the present author published two papers on the Upper Cretaceous molluscs, excluding ammonites, derived from Russian Saghalin and Hokkaido and kept in the Collection of that Institute; they are:

I. H. YABE and T. NAGAO: New or Little-Known Cretaceous Fossils from North Saghalin (Lamellibranchiata and Gastropoda). Sci. Rep. Tôhoku Imp. Univ., Sendai, Ser. II, Vol. VII, No. 4, 1925.

II. H. YABE and T. NAGAO: Cretaceous Fossils from Hokkaido: Annelida, Gastropoda and Lamellibranchiata. Ibid., Vol. IX, No. 3, 1928.

The material dealt with in the present note partly belongs to the Institute of Geology and Palaeontology in Sendai and partly to our Department of Geology and Mineralogy in Sapporo. Most of the

specimens have been obtained from the Upper Ammonite Beds[1] (Senonian) of Hokkaido and the contemporaneous deposits of Japanese Saghalin and some from the underlying *Trigonia* Sandstone (Cenomanian) of Hokkaido. Only one example came from the Cape de la Jonquière Group[2] (Senonian) exposed at Cape de la Jonquière, Russian Saghalin.

A number of fossils collected from the Hakobuchi Sandstone and Lower Ammonite Beds of Hokkaido are not treated in this note; the descriptions of these will be published upon another occasion.

The Upper Cretaceous molluscs to be described in the following pages are enumelated below:

I. The *Trigonia* Sandstone.

Solemya angusticaudata NAGAO nov.
Grammatodon sachalinensis (SCHMIDT)
Pinna sp. aff. *P. breveri* GABB
Gervillia (*Pseudoptera*) *acuticarinata* NAGAO nov.
Siliqua (?) sp.
Pharella (?) sp.
Anchura (?) sp.

II. The Upper Ammonite Beds.

Nucula formosa NAGAO
N. radiatocostata NAGAO nov.
N. (*Acila*) *hokkaidoensis* NAGAO nov.
Nuculana mactraeformis NAGAO nov.
Grammatodon sachalinensis (SCHMIDT)

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(1) For the stratigraphy of the Cretaceous deposits of Hokkaido see H. YABE: Zur Stratigraphie und Palaeontologie der oberen Kreide von Hokkaido und Sachalin. Zeit. d. deutsch. geol. Gesell., Vol. LXI, 1909, pp. 402–444; A New Scheme of the Stratigraphical Subdivision of the Cretaceous Deposits of Hokkaido. Proc. Imp. Acad. Japan, Vol. II, 1926, pp. 214–218; S. SHIMIZU: Cretaceous deposits of North and South Saghalin; a Comparison. Ann. Rep. Work Saito Ho-on Kai, Sendai, No. 5, 1929. H. IMAI: The Stratigraphical Relation between the Coal-bearing Tertiary (the Ishikari Series) and the Cretaceous Deposits in the Ishikari Coal-field (in Japanese). Jour. Geol. Soc. Tôkyô, Vol. XXXI, 1924.

The Cretaceous deposits of Hokkaiko are divided into the following groups in descending order:—

IV. The Hokobuchi Sandstone (Senonian).
III. The Upper Ammonite Beds (Senonian, including some part of Turonian).
II. The *Trigonia* Sandstone (Cenomanian and some part of Turonian included ?).
I. The Lower Ammonite Beds (Aptian to Gault).

(2) H. YABE and S. SHIMIZU: Stratigraphical Sequence of the Lower Tertiary and Upper Cretaceous Deposits of Russian Saghalin. Japan. Jour. Geol. and Geogr., Vol. III, 1924, No. 1, p. 4.

Glycymeris hokkaidoensis (YABE and NAGAO)
var. *multicostata* NAGAO nov.
Pecten (*Propeamusium*) *cowperi* WARING var. *yubarensis* YABE and NAGAO
Callissta (?) sp. cf. *C. arata* (GABB)
Tessarolax japonicus YABE and NAGAO
T. acutimarginatus NAGAO nov.
Rostellaria japonica NAGAO nov.
Pseudogaleodea tricarinata NAGAO nov.
Semifusus (*Mayeria ?*) *sachalinensis* NAGAO nov.
Avellana problematica NAGAO nov.

DESCRIPTION OF SPECIES

Solemya, LAM.

Solemya angusticaudata nov. sp.

Pl. V, Fig. 7.

Shell transversely elongate, the height being about one-third the length; very inequilateral with the beak placed far posteriorly; moderately convex from the beak to the ventral margin; dorsal and ventral margins nearly straight, parallel to each other, but the latter fairly convex toward the ends; anterior margin broken, probably rounded, and the posterior narrow with the postero-dorsal margin sloping backward and downward to the posterior end.

Surface radially ribbed; ribs usually broad, flat, and separated from one another by narrow and shallow grooves, sometimes there appearing a few very narrow ribs between two broader ones; those on posterior one-fourth of the surface narrow, more crowded and often divided into two or three parts by longitudinal grooves; median portion of the shell rather smooth with a few very faint radial grooves. Lines of growth fine and crowded. Test very thin.

An imperfect specimen without the posterior portion was examined. This species is distinguished from *S. subplicata* MEEK and HAYDEN[1] from the Fox Hills Group of North America in having the ventral margin more arcuate and the radial ribs more distant

(1) F. B. MEEK: A Report of the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country. Rep. U. S. Geol. Surv., Dept. of the Interior., Vol. IX, 1876, p. 129, Pl. XXVIII, fig. 19.

and more numerous. *S. tokunagai* YOKOYAMA[1] from the Japanese Tertiary is similar in several points to the present form, but in the former the shell is generally more slender with the postero-dorsal margin slightly more gradually sloped backward to the well rounded posteror end. Moreover, the radial ribs on the anterior portion are fewer in number and alternated with broader interstitial grooves, and the median smooth area is broader in *S. tokunagai*.

Dimensions :

Length	Height
ca. 56 mm. (estimated)	20 mm.

Locality and geological horizon : The *Trigonia* Sandstone exposed along the upper course of the Ikushumbets, province of Ishikari, Hokkaido.

Nucula, LAM.

Nucula formosa NAGAO

Pl. V, Figs. 2, 3.

1930. *Nucala formosa* NAGAO : On Some Cretaceous Fossils from the Islands of Amakusa, Kyûshû, Japan. Jour. Fac. Sci., Hokkaido Imp. Univ., Ser. IV, Vol. I, No. 1, p. 1, Pl. II, Fig. 2.

This species was based on two imperfect specimens from the Himenoura Group (Senonian) of Amakusa. We have two better specimens derived from the contemporaneous deposits of Saghalin, which, the author believes, are specifically identical with those from Amakusa. The Amakusa specimens are somewhat deformed so as to take an outline slightly longer and more round along the margins than they should originally be. The present specimens from Saghalin show well the features of the area and lunule which are partly concealed in those from Kyûshû. The escutcheon is broad and circumscribed by a groove. There is a narrow but distinct depression near and along the antero-dorsal margin.

These specimens belong to the Institute of Geology in Sendai (G.I.S.).

Dimensions :

Height	Length	Thickness
15 mm.	21 mm.	10 mm.

(1) M. YOKOYAMA : Moll. Rem. Uppermost Pt. Jô-Ban Coal-field. Jour. Coll. Sci., Imp. Univ., Tôkyô, Vol. XLV, 1925, p. 31, Pl. VI, figs. 1–3.

Locality and geological horizon: The Upper Ammonite Beds exposed at Oku-Kawakami along the Suzuya-gawa, Japanese Saghalin.

Nucula radiatocostata nov. sp.

Pl. V, Fig. 12.

Shell moderately large, subrhomboid, transversely elongate; very inequilateral, the anterior side being a little shorter than twice the posterior; relatively thin, convexity being small, with the most convex portion situated near the median vertical line, gradually attenuating toward both ends.

Anterior margin broken, but, as suggested by lines of growth, apparently round continuing with the evenly convex antero-ventral margin; antero-dorsal margin almost straight and the postero-dorsal long and oblique with a produced and angulated posterior end.

Umbo not prominent, pointed; lunule narrow-lanceolate, circumscribed beyond a sharp ridge by a narrow and shallow depression running from the umbo to the posterior end; escutcheon cordate and deep; area long-lanceolate, pouching, bordered by a distinct round ridge, and divided into two parts, the upper convex and lower concave; a fine longitudinal ridge running near the lower margin of the upper part. Lunule and area, together with the depression behind the former ornamented with numerous distinct concentric lines.

Flank of the valve provided with numerous radial ribs and concentric lines of growth. Radial ribs of three kinds; about eight occupying anterior one-fourth of the surface rounded on top, separated from one another by distinct concave interspaces, of these ribs middle three or four being broader than the others; about ten ribs on posterior one-fourth of the surface slightly rounded on top alternating with almost equally broad concave grooves; those on the middle portion of the valve narrower, more crowded than the anterior and posterior ones, and flat-topped, separated by fine, shallow incised lines and seldom split into two parts by a longitudinal line. Lines of growth crowded, curved downwad in the interstitial grooves between the radial ribs, distinct both anteriorly and posteriorly, giving to the ribs a granular appearance. Inner margin finely crenulated; Test rather thick.

Dimensions :

Height	Length
20 mm.	ca. 28 mm. (estimated)

A right valve, the monotype, was examined. This species is peculiar in its ornamentation and easily distinguishable from all known Japanese recent and fossil forms. Among the latter, *N. hizenensis* NAGAO from the Palaeogene of Kyûshû[1] is ornamented with distinct radial ribs, but these ribs are narrower, more numerous and more homogeneous all over the surface than in the present species. It differs from *N. pectinata* SOW.[2] from the Gault and Upper Greensand of England and Continental Europe, to which it is somewhat akin, in being thinner and ornamented with less distinct radial ribs in the middle portion and in having a longer area.

The external cast figured by F. SCHMIDT[3] from the Upper Cretaceous of Russian Saghalin and tentatively referred by him to Trigonia, is somewhat similar in form and ornamented with numerous radial ribs, besides a series of short "ribs" along the antero-dorsal margin. If this last ribbing is really a part of the surface ornamentation pressed on the cast and does not represent some portion of the hinge, then this specimen may be generically distinct from ours.

Locality and geological horizon: The Upper Ammonite Beds exposed at Oku-Kawakami along the Suzuya-gawa, Japanese Saghlain.

This specimen belongs to the Institute of Geology in Sendai.

(*Acila* H. and A. ADAMS)

***Nucula* (*Acila*) *hokkaidoensis* nov. sp.**

Pl. V, Figs. 17, 18.

Shell moderate-sized, very inequilateral, the anterior side about twice the posterior; anterior end rounded and the posterior obliquely truncated; rather slight in convexity. Anterior margin slightly arcuate, the ventral evenly convex in its greater length and provided

(1) T. NAGAO: Palaeogene Fossils of the Islands of Kyûshû, Japan, Pt. II, Sci. Rep., Tôhoku Imp. Univ., Ser. II, Vol. XII, No. 1, 1928, p. 19, Pl. VII, figs. 11–16, 18.

(2) For the synonyms of this species see H. WOODS: A Monograph of Cretaceous Lamellibranchiata of England, Vol. I. Palaeont. Soc. London, 1899, p. 16.

(3) F. SCHMIDT: Ueber die Petrefakten der Kreideformation von der Insel Sachalin, 1873, p. 24, Pl. V, fig. 4.

with a somewhat produced and subangulated posterior end. Umbo relatively prominent, convex, opisthogyrous; lunule very narrow, bordered by a sharp ridge, smooth except for numerous fine lines of growth; escutcheon deeply deprssed, broad, and circumscribed by a ridge; area elongate-ovate, pouching, and composed of two parts, the upper covex and ornamented with radial ribs and the lower concave and smooth.

Surface ornamented with numerous radial ribs, diverging at an acute angle from a line which stretches from the umbo to a point anterior to the middle of the ventral margin; ribs crowded, round, and alternated with deep grooves which are narrower than the ribs. Toward the anterior and posterior margins ribs becoming more numerous, split into two riblets or new ribs intervening between them. A few inverted V-shaped markings occurring just in front of the area. Inner margin apparently smooth. Test rather thick.

Dimensions:

Length	Height	Thickness of one valve
25 mm.	19 mm.	6.5 mm.
30 mm.	20 mm.	5.0 mm.
30 mm.	22 mm.	? (holotype)

We have a few recent and fossil Japanese species which deserve comparison with the present from, viz., *N.* (*A.*) *mirabilis* AD. et RVE.[1] and var. *ashiyaensis* NAGAO,[2] *N.* (*A.*) *insignis* GOULD,[3] *N.* (*A.*) *pictulata* YOK.,[4] and a specimen referred by M. YOKOYAMA[5] to *N.* (*A.*) *coboldiae* SOW. The present species is easily separable from these in that the line, from which the radial ribs diverge downward, is placed much anteriorly to the median vertical.

(1) S. TOKUNAGA: Foss. Env. Tôkyô. Jour. Coll. Sci., Imp. Univ. Tôkyô, Vol. XXI, 1906, p. 56. D. BRAUNS: Geol. Env. Tôkyô. Mem. Sci. Dept. Univ. Tokio, No. 4, 1881, p. 46 (*N. cobboldiae*). M. YOKOYAMA: Foss. Miura Pen. Jour. Coll. Sci., Imp. Univ. Tôkyô, Vol. XXXIX, p. 180, Pl. XIX, fig. 9.

(2) T. NAGAO: Palaeogene Fossils from Kyûshû, Pt. II, Op. cit., p. 21, Pl. VII, figs. 6–8, 10, (?) 9.

(3) S. TOKUNAGA: Op. cit., p. 56. M. YOKOYAMA: Foss. Miura Penin. Op. cit., p. 179, Pl. XIX, figs. 7, 8; Foss. Upper Musashino. Jour. Coll. Sci. Imp. Univ. Tôkyô, Vol. LIV, 1922, p. 198.

(4) M. YOKOYAMA: Versteinenngen aus der japanischen Kreide. Op. cit., p. 194, Pl. XXV, figs. 1, 2.

(5) M. YOKOYAMA: Tert. Moll. Oil-field Embets and Etaibets. Jour. Fac. Sci., Imp. Univ. Tôkyô, Sect. II, Vol. I, 1926, p. 246, Pl. XXXI, figs. 3, 4.

J. BOEHM[1] described several species of Mollusca from Russian Saghalin, which he thought to be of Cretaceous age. All of them, except *Pholadomya glehni* SCHMIDT, are now known to be Tertiary forms, and *N.* (*A.*) *gottchei* BOEHM[2] may be ascribed to some of the Japanese species above cited, especially *N.* (*A.*) *insignis*.

Localities and geological horizon: The Uppre Ammonite Beds; several places in the vicinity of Shibunnai along the Abeshinai-gawa, province of Teshio, Hokkaido.

The right bank of the Abeshinai at Ômagari.
The Tannosawa, a small tributary of the Abeshinai.
The Wakkawen-zawa, a tributary of this river.
Shibunnai.
A small unnamed tributary east of Shibunnai.

Nuculana, LINK.

Nuculana mactraesormis nov. sp.

Fig. V, Figs. 4–6, 8, 9, 16.

Shell small, transversely ovate-trigonal; subequilateral, the posterior side being slightly longer than the anterior; very convex near the umbo, flattened toward the ventral margin; anterior margin narrowly rounded, passing gradually into the evenly convex ventral, the posterior obliquely subtruncated, forming obtuse angles with the dorsal margins; postero-dorsal margin slightly excavated beneath the umbo and inclined more rapidly than the faintly arched antero-dorsal. Umbons nearly central, convex, broad, prosogyrous and approximate, with an indistinct angle extending from them to the postero-ventral end. Postero-dorsal portion of the shell compressed and flattish with a shallow median longitudinal depression. Escutcheon narrow-lanceolate, not well defined. Surface ornamentation consisting of numberous regular concentric ribs and fine striae in alternation. Hinge composed of numerous small teeth. Test moderately thick.

(1) J. BOEHM: Ueber Kreideversteinerungen von Sachalin. Jahrb. d. Kgl. Preuss. Geolog. Landesanst., 1915, I, pp. 551–558.

(2) J. BOEHM: Ibid., p. 556, Pl. XXIX, figs. 5–7, 13.

Dimensions:

Height	Length	Thickness of one valve
14 mm.	24 mm.	ca. 6 mm.
12.5 mm.	17 mm.	4 mm.
10 mm.	14 mm.	4 mm.
10 mm.	14 mm.	3.5 mm.

Numerous specimens were examined, which recall some forms of *Mactra* or *Spisula* in the external features. The present species somewhat akin to *Yoldia obtusa* STOL.[1] from the Arrialur Group of South India, from which it is distinguished in being relatively higher and in having a broader and lower umbo, It is also different from *Nuculana sanchuensis* YABE and NAGAO[2] from the Lower Cretaceous of the Kwantô Mountainland by its more equilateral shell and its dorsal margins forming a larger angle.

Localities and geological horizon: The Upper Ammonite Beds exposed at the following four places along the Abeshinai and its tributaries in the province of Teshio:

A point about 100 m. south of the junction of the Abeshinai with a small tributary called the Sakai-zawa.
Ômagari along the Abeshinai.
The Wakkawen-zawa and the Nigori-kawa, tributaries of the same river.

Grammatodon, MEEK.

Grammatodon sachalinensis (SCHMIDT)

Pl. VI, Figs. 1–5.

1873. *Cucullaea sachalinensis* SCHMIDT: Ueber der Petrefakten der Kreideformation von der Insel Sachalin. Op. cit., p. 24, Pl. V, Fig. 5; Pl. VIII, figs. 6, 7.
1873. *Cucullaea* aff. *striatella* SCHMIDT: Ibid., p. 24, Pl. V, fig. 7.
1873. *Macrodon* aff. *japeticum* SCHMIDT: Ibid., p. 25, Pl. V, fig. 6; Pl. VIII, Fig. 8.
1890. *Cucullaea* cfr. *sachalinensis* YOKOYAMA: Versteinerungen aus der japanischen Kreide. Op. cit., p. 176, Pl. XVIII, Fig. 8.
1927. *Grammatodon sachalinensis* YABE: Cretaceous Stratigraphy of the Japanese Islands. Sci. Rep. Tôhoku Imp. Univ., Sec. Ser. Vol. XI, No. 1, p. 32.

(1) F. STOLICZKA: Op. cit., p. 324, Pl. XVII, figs. 7–10.
(2) H. YABE, T. NAGAO, and S. SHIMIZU: Cretaceous Mollusca from the Sanchû Graben in Kwanto Mountainland, Japan. Sci. Rep. Tôhoku Imp. Univ., Second Ser. Vol. IX, No. 1, 1926, p. 42, Pl. XII, figs. 21–23.

F. SCHMIDT early described several cuculloid shells from the Senonian of Russian Saghalin, of which two moulds were referred by him to "*Cucullaea*" *striatella* MICH. and a few to *Macrodon japeticum* (FORBES), while the rest were taken for creation of a new species "*C.*" *sachalinensis*.

Later M. YOKOYAMA figured an allied specimen from the Upper Cretaceous of Hokkaido and compared it with SCHMIDT's *C. sachalinensis*.

We have a number of specimens derived from the Upper Ammonite Beds of Hokkaido, beside a few examples from the underlying *Trigonia* Sandstone. All of these are quite identical with *C. sachalinensis*. Though SCHMIDT stated that in the original specimens of this species the ornamentation is almost equal in both valves in one individual, yet it is different as far as our specimens are concerned. Based on our material which contains a few better examples, the specific diagnosis is rewritten as follows.

Shell usually samall, though rarely large attaining in one case about 54 mm. in length and 35 mm. in height; transversely elongate; rather convex especially near the umbo; very inequilateral, the anterior side being much shorter than the posterior. Dorsal margin long, straight, and the ventral subparallel or slightly oblique to the hinge margin. Anterior margin oblique backward, bearing a subpointed and more or less produced antero-dorsal end between it and the dorsal margin; posterior margin nearly vertical or a little oblique backward; anterior part of the shell attenuate, the postero-dorsal area more or less excavated especially in the left valve.

Umbo broad, prominent, convex. and very prosogyrous, with the umbonal angle sharp in the left valve and more blunt in the opposite. Ligamental area narrow, elongate, with numerous crowded and fine ligemental grooves; hinge narrow, with two or three anterior teeth and four posterior, beside numerous short, nearly vertical central ones; anterior teeth rather short, slightly divergent upward; of the posterior teeth, three dorsal long and one ventral short, subparallel to the hinge margin.

Ornamentation consisting of numerous concentric lines and radial ribs and somewhat different in the two valves; on the left valve, the radial ribs very narrow, separated from one another by much broader grooves, the latter usually with a fine riblet; ribs on the posterior area smaller and more crowded than in the middle on the shell; radial ribs on the right valve more numerous, rather broader, and more crowded.

Adductor muscle-scars distinct, the anterior one small and the posterior large and oval in outline; pallial line distinctly observable. Inner margin of the shell apparently smooth.

This species bears some resemblance to *G. yokoyamai* YABE and NAGAO[1] from the Lower Cretaceous of the Kwantô Mountainland in Honshû. One of the most different features between these two forms is in the ornamentation; the right valve of the former is provided in its postero-dorsal area with three prominent radial ribs, besides numerous crowded ones, and in its flank with the radial ribs intercalated by from one to three interstitial riblets between them.

It is distinguished from "*Macrodon*" *japeticum* (FORBES)[2] of the Arrialur Group of South India in being less oblique, smaller in convexity and in having more numerous narrower radial ribs.

C. aff. *japeticum* SCHMIDT is represented by imperfect specimens and there is evidence for believing its specific identity with *C. sachalinensis*; its round anterior margin illustrated by SCHMIDT is most probably attributed to incompleteness of this part of the shell, and the rather blunt umbonal angle, a feature thought by SCHMIDT to be characteristic to this form, may be confined to the right valve, because his observation was based on this side of the valve. It is certainly known in our specimens referred to *G. sachalinensis* that the umbonal angle is far blunter in the right valve than in the opposite. Moreover, as to *C.* aff. *striatella* of SCHMIDT, it is doubtlessly conspecific with the present species. Its postero-dorsal area is stated to be moderately excavated, as it is in the author's specimens. It will be worthy to note here that this area is more pronouncedly excavated in the left valve than the right and that both of SCHMIDT's specimens are also left valves. Furthermore, the surface ornamentation is described identically in these two forms.

Localities and geological horizons: The *Trigonia* Sandstone exposed along the upper course of the Ikushumbets, Sorachi-gun, province of Ishikari. The Upper Ammonites Bed; the Ikushumbets and its tributary, Kikumenzawa, Sorachi-gun, province of Ishikari; Ôyûbari and Noborikawa, Yûbari-gun, province of Ishikari; Nakahobets along the Hobets-gawa and Hetonai along the Mukawa, Yufutsu-gun, province of Iburi; Osachinai, Saru-gun, province of Hidaka; several places along the tributaries of the Abeshinai in the

(1) H. YABE, T. NAGAO, and S. SHIMIZU: Cretaceous Fossils from Sanchû Graben. Op. cit., p. 44, Pl. XII, figs. 12, 13, 25.

(2) F. STOLICZKA: Op. cit., p. 350, Pl. XVIII, figs. 6–11.

province of Teshio, such as the Nigori-kawa, the Osôshinai-zawa, the Wakkawen-zawa, the Tanno-sawa, and the Shibunnai-zawa. All these localities are in Hokkaido.

Glycymeris, DA COSTA

Glycymeris hokkaidoensis YABE and NAGAO

var. *multicostata* nov. var.

Pl. V, Figs. 10, 11.

We have a number of specimens of Glycymeris derived from the Upper Ammonite Beds of Hokkaido, which are almost identical with *G. hokkaidoensis* YABE and NAGAO, one of the commonest fossils in the *Trigonia* Sandstone of the Ishikari Coal-field. The differences by which the present specimens are distinguished from the latter appear to be rather minor, though usually constantly observed, so that the former had better be regarded as a variety of the type species.

Shell rather small, one of the larger specimens in hand not exceeding 25 mm. in length, relatively convex; suborbicular in outline, being rounded anteriorly and obliquenly subtruncated posteriorly, with a faint depression extending from the umbo to the posterior margin. Umbo very convex, rather low; posterior umbonal angle indistinct. Area norrow-triangular, bearing a few inverted V-shaped ligamental grooves; hinge margin curved, with five or six anterior and posterior teeth. Inner margin finely crenulated. Test thick.

Ornamentation consisting of fine concentric lines of growth and numerous radial ribs; radial ribs crowded, about fifty in number, narrow and slightly rounded on top, separated from one another by narrower interstitial grooves or incised lines; those ribs near both anterior and posterior ends much crowded and very often obsolete owing to the prominency of the concentric lines.

This variety differs from the type species[1] in its usually less prominent umbo. One of the most remarkable differences between them seems to be in the radial ribs which in the new variety are more numerous and more crowded than in the type species. They are, moreover, covered with a few longitudinal riblets in the latter.

(1) H. YABE and T. NAGAO: Cretaceous Fossils from Hokkaido. Op. cit., p. 82. Pl. XVII, fig. 22.

G. amakusensis NAGAO[1] from the Himenoura Group (Senonian) of Amakusa, Kyûshû, is also closely similar to ours. This species was established on a few imperfect specimens in which the surface is more or less eroded and the area invisible. We have in our possession a few better examples lately acquired from the type locality in Amakusa; in these the area is shown to be short with a few lorenzo-shaped ligamental grooves as in *G. hokkaidoensis* and var. *multicostata*. The radial ribs are rather broad, each bearing a few riblets on its surface, a feature seen also in *G. hokkaidoensis*. Moreover, *G. amakusensis* is distinguished from the present form under consideration in having less numerous and broader radial ribs and in being less convex.

Among the foreign species, *G. geinitzii* (D'ORB.)[2] from the Upper Cretaceous of Continental Enrope, *G. sublaevis* (SOW.)[3] aud *G. umbonatus* (SOW.)[4] from the Greensand of England stand near to ours, but the first and second of these European forms are less orbicular, and the third is provided with a less prominent and broader umbo, than the latter.

Localities and geological horizon: The Upper Ammonite Beds exposed on the right bank of the Abeshinai, about 100 m. south of the junction of this river and its tributary Sakai-gawa, in the province of Teshio, Hokkaido.

Pinna, LINN.

Pinna sp. aff. *P. breveri* GABB

Pl. V, Figs. 1, 1 a.

Compare:

1864. *Pinna breveri* GABB: Paleontology of California, Vol. I, p. 188, Pl. XXV, Figs. 175, 175 a.

We have a few imperfect specimens of Pinna, in all of which test is only partly preserved and hence the surface ornamentation is relatively ill-represented. It is obvious, however, that they

(1) T. NAGAO: On Some Cretaceous Fossils from Amakusa. Op. cit., p. 15, Pl. II, figs. 4–7.

(2) E. HOLZAPFEL: Die Mollusken der Aachener Kreide, III, Lamellibranchiata. Palaeontogr., Vol. XXXV, 1883–1888, p. 210, Pl. XXIII, figs. 11, 12; Pl. XXIV, figs. 1–10.

(3) H. WOODS: A Monograph of the Lamaellibranchiata of England, Vol. I, p. 67, Pl. XIV, figs. 1–7.

(4) H. WOODS: Ibid., p. 69, Pl. XIV. figs. 8–12.

are similar in some respects to *P. breveri* GABB from the Chico Group of California.

Shell long, rather slender, trigonal and cuneaform with a subrhomboidal cross-section; upper and lower margins diverging at an angle of about 20°; divided by a median keel into two subequal halves, or the ventral one sometimes broader than the upper. Postero-ventral margin broadly arcuate, as suggested by the lines of growth.

Surface, except ventral two-thirds of the ventral half, ornamented with round radial ribs which are about nine in number on the dorsal half and two or three on the ventral one; lines of growth rather distinct on the ventral part of the shell.

Dimensions: The figured specimen measures more than 12 cm. in length and 4 cm. in height.

As the original specimen of *P. breveri* is far from being perfect, further comparison of it with the Japanese specimens is prevented. Our specimens are, on the other hand, somewhat akin to *P. arata* FORBES[1] from the Trichinopoly Group of South India, though the latter is provided with larger ribs alternated with smaller ones.

Moreover, the present specimens approaches *P. decussata* GOLDF.[2] from the Cenomanian and Senonian of Europe but seem to differ from it in having the ventral half of the shell with a broader smooth area. Of the Japanese fossils, *P. asakurensis* NAGAO[3] from the Eocene of Kyûshû has some features in common with these specimens under consideration, but the apical angle is larger and the ribbed area on the ventral half of the shell broader in the former.

Locality and geological horizon: The *Trigonia* Sandstone exposed at the Ikushumbets gorge near the Ikushumbets Colliery, province of Ishikari.

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(1) F. STOLICZKA: Cretaceous Fauna of S. India, Pelecypoda. Palaeontologia Indica, 1871, Vol. III, p. 384, Pl. XXIV, fig. 5; Pl. XXV, figs. 1, 5.

(2) A. GOLDFUSS: Petrefacta Germaniae, Vol. II, 1833, p. 166, Pl. CXXVIII, figs. 1, 2. H. B. GEINITZ: Das Elbthalgebirge in Sachsen. Palaeontgr., Vol. XX, 1871–1875, Pt. I, Der Unter Quader, p. 211, Pl. XLVII, figs. 4, 5; Pt. II, Der Mittlere und obere Quader, p. 53, Pl. XV, figs. 2, 3; Pl. XVI, fig. 1.

(3) T. NAGAO: Palaeogene Fossils of the Island of Kyûshû, Japan. Sci. Rep. Tôhoku Imp. Univ., Second Ser., Vol. XII, No. 1, 1928, p. 31, Pl. VIII, figs. 16, 18, 20–22.

Gervillia, DEFR.

(*Pseudoptera*, MEEK)

Gervillia (*Pseudoptera*) *acuticarinata* nov. sp.

Pl. V, Figs. 13-15.

Shell rather small, obliquely triangular, with a short dorsal margin ; very inequilateral; anterior margin sloping obliquely backward, faintly arcuate and passing abruptly into the rather long, nearly straight and vertical postero-ventral margin; posterior end obtusely angulated. Left valve very convex, with a sharp carina extending from the umbo to the postero-ventral angle. Umbo pointed and prominent, lying near the anterior extremity and projecting beyond the dorsal margin. Anterior part in front of the carina slightly convex, bent sharply along its whole length, almost perpendicular to the part behind the carina, and ornamented with about six prominent, more or less spiny radial ribs; ribs widely separated from one another by flat interspaces, the latter bearing sometimes a few narrower riblets; a few ribs present also on the top of the carina. The part behind the carina flat or slightly concave, generally smooth except for the distinct crowded growth-ridges and lines; posterior wing narrow, short, much compressed, separated from the remainder of the shell by a distinct but relatively shallow groove, and smooth except for fine concentric lines. Anterior ear rather small, narrow, with a convex margin, rather distinctly separated from the remainder of the shell, and apparently smooth except for the growth ridges. Test thin.

Dimensions :

Height	Length	Length of the hinge
ca. 29 mm.	ca. 32 mm.	ca. 18 mm.
18 mm.	23 mm.	13 mm.

A numer of specimens were examined, all of which are imperfect but show several features sufficent for a specific discrimination.

This species doubtlessly belongs to the group of "*Avicula*" *anomala* SOW.[1] from the Upper Greensand of England, on which was based *Psuedoptera* MEEK.,[2] a subgenus of *Gervillia*. It is dif-

(1) H. WOODS: A Monogr. Cret. Lamell. England., Vol. II, p. 64, Pl. IX, figs. 2-4.

(2) F. B. MEEK: A Rep. Invert. Cret. and Tert. Foss. Upper Missouri Country. Op. cit., p. 29.

ferent from the latter and *G.* (*P.*) *raricostata* (REUSS)[1] from the Upper Cretaceous of Europe in being less oblique and in having a shorter dorsal line. Moreover, *G. anomala* is ornamented with numerous radial ribs on the flank behind the carina and on the posterior wing.

The present form seems to be closely allied to *G.* (*P.*) *haldonensis* WOODS[2] from the Upper Greensand of England, from which it is distinguished, however, by its relatively larger obliquity, short hinge line, better defined and smooth anterior ear, and sharper anterior umbonal angle.

Locality and geological horizon: The *Trigonia* Sandstone; Pombets near the Ikushumbets Coal-mine, Sorachi-gun, province of Ishikari, Hokkaido.

Pecten, MÜLLER
(*Propeamusium*, GREGORIO)
Pecten (*Propeamusium*) *cowperi* WARING
var. *yubarensis* YABE and NAGAO

Pl. VI, Figs. 7, 8, 12, 13.

1928. *Pecten* (*Propeamusium*) *cowperi* WARING var. *yuberensis* YABE and NAGAO: Cretaceous Fossils from Hokkaido. Op. cit., p. 88, Pl. XVI, Figs. 17–19.

This small, suborbicular and flat species was established on a few imperfect specimens obtained from the Ishikari Coal-field. There are in our possession a number of specimens derived from various localities in Hokkaido, some of which are figured in an accompanying plate. In some better specimens the outline of the shell is somewhat constant, being usually equal in height and length, though sometimes slightly longer or sometimes higher. The right valve is almost flat and ornamented with very fine, almost invisible radial striae, while the left valve is slightly convex and provided with numerous radial riblets and narrower interstitial grooves in alterna-

(1) REUSS: Char. d. Kreideschicht. in den Ostalpen. Denkschr. d. k. Akad. Wissensch. in Wien, Math.-nat. Cl., Vol. VII, 1854, p. 147, Pl. XXVIII, fig. 16. K. A. ZITTEL: Die Bivalven d. Gosaugeb. Ibid., Vol. XXV, pt. 2, 1866, p. 90, Pl. XIII, fig. 6. H. B. GEINITZ: Das Elbthalgeb. in Sachsen. Palaeotogr. Vol. XX, pt. 1, 1873, p. 22, Pl. III, fig. 7 (*Avicula glabra* GEINITZ). F. NOETLING: Die Fauna d. baltisch. Cenoman. Palaeont. Abhandl., Vol. II, 1885, p. 22, Pl. III, fig. 9.

(2) H. WOODS: A Monograph Cret. Lamell. England. Vol. II, 1905, p. 66, Pl. IX, figs. 5–10.

tion, the ribs being broader and more distant than in the opposite valve. The number of the internal ridges ranges from seven to ten on each valve, though usually eight or nine.

Localities and geological horizon: To the formerly known three localities, two in the province of Ishikari and one in the province of Iburi, the following have been added: On the sea coast near Urakawa, province of Hidaka; the Kikumenzawa, a small tributary of the Ikushumbets in the province of Ishikari; numerous places along the Abeshinai and its tributaries in the province of Teshio, namely, Ômagari, the Sakai-zawa, the Shibumnai-zawa, the Tannosawa, and the Wakkawen-zawa. This species ranges from the lower part to the upper in the Upper Ammonite Beds.

Callista, MÖRCH

Callista (?) sp. cf. C. arata (GABB)

Pl. VI, Figs. 6, ba.

Compare:

1865. *Meretrix arata* GABB: Paleontology of California, Vol. I, p. 166, Pl. XXX, Fig. 250.
1869. *M. arata* GABB: Ibid., Vol. II, p. 240.
1879. *Cytherea* (*Calliata*) *laciniata* WHITEAVES (non STOLICZKA): Mesozoic Fossils, Vol. I, p. 148, Pl. XVII, Fig. 13; Pl. XIX, Fig. 4.
1903. *C.* (*C.*) *arata* WHITEAVES: Ibid., p. 378.

A small, probably young specimen was obtained from the Upper Ammonite Bed of Hokkaido, whose generic position is somewhat doubtful owing to the invisibility of the hinge. It belongs, however, most probably to *Callista*.

Shell small, moderately convex, obliquely ovate; inequilateral; anterior side slightly shorter, with the extremity a little produced, and more narrowly rounded along the margin than the posterior; anterodorsal margin faintly excavated beneath the umbo, the posterodorsal rather long and nearly straight; basal margin broadly arcuate, passing gradually into both anterior and posterior extremities. Umbones convex, relatively prominent, curved inward and backward, and adjacent; no distinct umbonal angle. Escutcheon narrow, short and depressed; lunule broad-cordate, circumscribed by incised lines. Test thin.

Surface covered with crowded concentric ribs which are distinct, rounded, regularly disposed and separated by grooves narrower than the ribs themselves.

Dimensions :

Length	Height
11 mm.	8 mm.

As the present specimen on which the above diagnosis is based represents probably a young individual, its comparison with some known larger species may not be worth while yet it exhibits essential features indicating its close resemblance to *C. arata* (GABB) from the Chico Group of California and the Nanaimo Group of Vancouver Islands. This latter species according to GABB is "ornamented by regular, concentric, acute impressed lines." But WHITEAVES, when he described a specimen which he ascribed to GABB'S species, stated that this form is covered by small, concentric, rounded ribs, with very narrow furrows between them, a frature well represented in our specimen. As a whole, *C. arata* seems to be more trigonal in outline than ours.

C. laciniata STOL.[1] from the Arrialur Group of South India, to which WHITEAVES formerly referred his Nanaimo specimen, is more distantly akin to ours than *C. arata* itself.

We know from the Japanese Upper Cretaceous a species of *Callista*, *C. pseudoplana* YABE and NAGAO[2]. This form, including its three varieties, was secured from the *Trigonia* Sandstone of Hokkaido and Saghalin, and is characterized by the finer concentric lines and the more arcuated postero-dorsal margin than the present form in question.

Locality and geological horizon: The Upper Ammonite Beds exposed at Okuhobets along the Hobets-gawa, province of Iburi, Hokkaido.

This specimen belongs to G. I. S.

Pharella, GRAY

Pharella (?) sp. indet.

Pl. VI, Fig. 9.

A very imperfect internal mould of a species probably belonging to this genus has been obtained from the *Trigonia* Sandstone in the

(1) F. STOLICZKA: Op. cit., p. 174, Pl. VII, figs. 5, 6.

(2) H. YABE and T. NAGAO: New or Little-Known Cretaceous Fossils from North Saghalin. Sci. Rep. Tôhoku Imp. Univ., Second Ser., Vol. VII, No. 4, 1925, p. 120, Pl. XXVIII, figs. 9, 10; Pl. XXIX, figs. 1–6.

Ishikari Coal-field, in which the surface sculpture is only partly preserved and the posterior extremity broken.

Shell small, elongate, evenly convex from the dorsal margin to the ventral and attenuate toward the anteior end; upper and lower margins nearly straight and parallel to each other; anterior margin rather narrowly rounded, its lower half running obliquely downward and backward. Umbo not prominent, situated at about one third the distance from the anterior end. Ornamentation apparently consisting of numerous crowed fine lines of growth.

The present specimen is not unlike *P.* (?) sp.[1] reported from the Lower Cretaceous of the Sanchû Graben in the Kwantô Mountainland and Yuasa, province of Kii. The former, however, seems to be more elonagate with its umbo nearer to the anterior end than the latter. It is distinct from *P. delicatula* STOL.[2] from the Trichinopoly Group of South India in being more elongate. *P.* (?) *dakotensis* (MEEK and HAYDEN)[3] from the Dokota Group of Nebraska, North America, appears to be akin to ours, though a precise comparison between them is impossible.

Locality and geological horizon: The *Trigonia* Sandstone exposed along the Sentarô-zawa, a small tributary of the Ikushumbets, province of Ishikari, Hokkaido.

Siliqua, M. v. MÜHLFELD.

Siliqua (?) sp. indet.

Pl. VI, Fig. 14.

There are several internal moulds and external casts of an elongate shell, all of which are very incomplete, the extremities being lost.

Mould elongate, slightly convex from top to bottom; upper and lower margins almost straight and subparallel to each other or the latter faintly arched; anterior end vertical and moderately convex, as suggested by the lines of growth; internal ridge broad, vertical and long, nearly reaching the lower margin. Surface smooth except for fine lines of growth.

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(1) H. YABE, T. NAGAO, and S. SHIMIZU: Cretaceous Mollusca from the Sanchû Graben in the Kwantô Mountainland, Japan. Sci. Rep. Tôhoku Imp. Univ., Ser. II, Vol. IX, No. 2, 1926, p. 54, Pl. XII, figs. 7, 14, 38; Pl. XIII, figs. 12, 13.

(2) F. STOLICZKA: Op. cit., p. 101, Pl. I, figs. 14, 14a.

(3) F. B. MEEK: Op. cit., p. 251, Pl. I, fig. 3.

The hinge being entirely invisible on the specimens, it is uncertain whether the present form belongs to *Siliqua* or to *Leptosolen*. It is distinguished from *Siliqua limata* STOL.[1] from the Trichinopoly Group of South India in being much larger and in having a vertical internal ridge, which is oblique in the Indian species. On the other hand, if the present form may adequately be assignable to *Leptosolen*, then it is distinct from *L. conradi* MEEK[2] from the Dakota Group of Kansas, North America, in being more slender with a longer internal ridge.

Locality and geological horizon: The *Trigonia* Sandstone exposed along the Tômatsu-zawa, near the Ikushumbets Coal-mine, province of Ishikari, Hokkaido.

Tessarolax, GABB.

Tessarolax japanicus YABE and NAGAO

Pl. VI, Figs. 11, 11a.

1928. *Tessarolax japonicus* YABE and NAGAO: Cretaceous Fossils from Hokkaido: Annelida, Gastropoda and Lamellibranchiata. Sci. Rep. Tôhoku Imp. Univ., Ser. II, No. 3, p. 94, Pl. XVIII, Figs. 9-10a.

Tessarolax established by W. M. GABB on *T. distorta* GABB from the Chico Group of California was regarded by M. COSSMANN[3] as a subgenus of Chenopus, who enumerated ten species, including the genotype, of which eight forms were reported from Europe and one from the Arrialur Group of South India. Lately R. B. STEWART[4] ascribed "*Helicaulax*" *bicarinata* GABB and also, though with some doubt, "*Surcula*" (*Surculites*) *inconspicua* GABB to *Tessarolax*. *T. japonicus* YABE and NAGAO was founded on two imperfect specimens from the Upper Ammonite Beds of Hokkaido, in which the upper and lower extremities and apertural spines are missing. Three other examples of this species now in our possession are also unfortunately incomplete, but some hitherto unknown features are partly shown in them. The anterior canal is long and curved backward and the lower one of the apertural spines which are two in number also long and oblique to the outer lip being rather abruptly

(1) F. STOLICZKA: Op. cit., Pelecypoda, p. 101, Pl. I, figs. 12, 13.

(2) F. B. MEEK: Op. cit., p. 253, Pl. II, fig. 12.

(3) M. COSSMANN: Essais de Paléontologie comparée, Vol. 6, 1904, 56-58.

(4) R. B. STEWART: GABB's California Fossil Type Gastropods. Proc. Acad. Nat. Sci. Philadelphia, Vol. LXXVIII, 1926, pp. 284-447.

bent downward. In one of the specimens there is preserved on the body whorl a prominent tubercle at some distance from the aperture. The upper apertural spine is very long, more than 30 mm. in length, almost straight, and directed a little obliquely upward.

Localities and geological horizon: The Upper Ammonite Beds; Ôyubari, Yûbari-gun, province of Ishikari and the Sakaizawa, a tributary of the Abeshinai, province of Teshio, both in Hokkaido.

Tessarolax acutimarginatus nov. sp.

Pl. VI, Figs. 10, 15.

Shell semifusiform; spire slightly higher than the aperture, with an apical angle of about 35°, completely incrusted by a thick deposit so as to obliterate the sutures and ornamentation. Spire-whorls about seven in numbers; each worl moderately convex, with an angulated shoulder and a slightly concave lower surface. Upper part of the spire bearing a varix-like process which is flattened on both sides and elongated vertically; this process originating above at a point about opposite to the outer lip and running obliquely backward and downward up to the upper margin of the penultimate whorl. Spire-whols ornamented with two spiral ribs, one on the shoulder and the other along the lower suture, besides numerous fine spiral striae all over.

Body whorl rather short with convex sides, very acute at the periphery near the aperture; three spiral carinae on the surface above the periphery, of which the lowest one on the periphery itself is the broadest and becomes very prominent near the aperture. Base flat, low conical, ornamented with two distant spiral ribs in its upper portion, besides numerous crowded and fine spiral striae all over. Anterior canal broken, but apparently narrow; posterior canal ascending along the spire, long, its lower portion being preserved. Two apertural spines, originating each from the uppermost and lowest carina of the body whorl respectively, probably well developed, their greater part being lost; of these spines the lower one directed outward and downward.

Two specimens were examined. In one of them obtained from the Upper Ammonite Beds of Hokkaido the ornamentation is well shown, while in the other which belongs to G. I. S. and comes from Japanese Saghalin the shell is very thickly incrusted all over. This species is easily distinguished from the preceding form as well as

all species hitherto known from foreign countries in that its body whorl is low and provided with an acute periphery and flat base.

Localities and geological horizon: The Upper Ammonite Beds exposed in the vicinity of the Kawakami Coal-mine, Japanese Saghalin, and the Nigori-kawa, a small tributary of the Abeshinai, province of Teshio, Hokkaido.

Rostellaria, LAM.

Rostellaria japonica nov. sp.

Pl. VII, Fig. 1–3, 5, 6.

Shell turreted, consisting of numerous whorls; spire very high with an apical angle of about 20°; each spire-whorl rather high, flatly convex in the lower half and slightly flattened or concave in the upper with a distinct suture above; surface ornamented with numerous crowded, narrow and subequal spiral striae, alternating with interspaces; interspaces between the spiral striae flat, usually narrower than the striae themselves, and narrower and more crowded in the lower half of the whorl; lines of growth fine and sinuous, running a little backward for some distance from the upper suture and convex forwardly on the shoulder. Body whorl rather short with convex sides and a round periphery; aperture moderately expanded; outer lip thin, bearing two processes of unknown length which originate from low, relatively indistinct carinae on the body whorl; inner lip smooth, sinous, with a callosity; anterior canal very imperfectly preserved; base weakly convex, contracting below, and ornamented with numerous narrow spiral ribs and broader grooves in alternation.

This species is represented by a number of specimens, in all of which the extremities are broken and the outer lip only partly preserved. Under these circumstances, the reference of the present form to *Rostellaria* must be uncertain. In several features, however, it is similar to *R. turonica* SPENGLER[1] from the Upper Utatur Group of South India, from which it is distinct in having a more slender spire consisting of less convex whorls and a longer body whorl. It it also much more slender than *R. arenosa* (REUSS)[2] from the Lower Senonian of Brunswick.

(1) E. SPENGLER: Nachträge zur Oberkreidefauna des Trichinopoly-Distriktes in Südindien. Beitr. z. Geol. u. Palaeont. d. Oesterr. Ung. u. d. Orients, Vol. XXVI, 1913, p. 229, Pl. XV, fig. 6.

(2) G. MÜLLER: Die Molluskenfauna des Untersenon von Brunschweitz und Ilseda. Abh. d. Preus. Geol. Landesanst., N. F., Heft 25, p. 17, Pl. XV, figs, 11–15.

Among numerous species referred to *Anchura* from the Upper Cretaceous of the West Coast of North America, a few deserve some consideration here. *A.* (?) *angulata* (GABB)[1] from the Chico of California has some points in common with the present form; in the former, however, the outer lip has a long spine with two branches oppositely directed to each other. *A.* (?) *fasciformis* (GABB)[2] from the Chico and *A. callosa* WHITEAVES[3] from the Nanaimo are also similar in outline of the shell to ours, but the latter two have numerous varices. As the Japanese form under consideration has most probably two apertural spines or digitations as shown in one example, it is perhaps separable from *Anchura* of CONRAD, although a close resemblance is present between *A. angulata* (GABB) above cited and ours, except for the apertural spines.

Notwithstanding the imperfectly known characters of the present species, the author has ventured to give it a new name, for it is rather common and well recognized in the Upper Cretaceous deposits of Saghalin and Hokkaido.

Localities and geological horizon: The Upper Ammonite Beds; seven specimens derived from the vicinity of the Kawakami Coal-mine along the Hôshin Line, Japanese Saghalin; four specimens from the Omoshiroshibets, a tributary of the Abeshinai in the province of Teshio, Hokkaido. The *Inoceramus Schmidti* Zone (Senonian); one specimen from Cape de la Jonquière, Russian Saghalin. The Saghalin specimens belong to G. I. S.

Anchura, CONRAD.

Anchura (?) sp. indet.

Pl. VII, Figs. 4, 4a.

The are two very imperfect internal moulds preserving only a small part of the test. The extremities, outer and inner lips as well as the canals being missing, its generic position is uncertain. They are distinguished from the preceding form by their larger apical angle.

Mould consisting of more than four whorls with a high conical spire; each spire-whorl rather low, subangulated below the middle,

(1) W. M. GABB: Paleont. Calif., Vol. I, p. 128, pl. XX, fig. 84; R. B. Stewart: Op. cit., p. 361, Pl. XXII, figs. 4, 5.

(2) W. M. GABB: Op. cit., Vol. I, p. 127, Pl. XX, fig. 83; STEWART: Op. cit., p. 360, Pl. XXII, figs. 9.

(3) J. F. WHITEAVES: Mesozoic Fossils, Vol. I. Op. cit., p. 123, Pl. XV, fig. 11.

and provided with a nearly flat upper surface. Body whorl large, long, much longer than the spire, with a dorsal carina; base slightly convex and contracted below. Ornamentation unknown.

Locality and geological horizon: The *Trigonia* Sandstone exposed along the upper course of the Ikushumbets, province of Ishikari, Hokkaido.

Pseudogaleodea nov. gen.

The type: *Pseudogaleodea tricarinata* nov. The Upper Ammonite Beds.

Shell fusiform with a moderately elevated spire; aperture narrow, elongate, contracted both anteriorly and posteriorly; anterior canal narrow and oblique, posterior corner with a narrow groove; outer lip externally thickened, internally smooth, without an anterior notch; inner lip also smooth, sinuous, with the columella elongate and curved dorsally; no fasciole; callosity well developed, thickned near the posterior corner of the aperture; surface ornamented with a few prominent, not nodose, spiral carinae and all over incrusted with a thin film of deposit so as to obliterate the sutures and minor ornamentation.

The genus here proposed is based on a monotypic species described below, which recalls some forms of Cassidae[1]. Among the genera belonging to this family, the present form seems to stand near *Galeodea* LINK (*Morio* MONTF., *Cassidaria* LAM.), from its elongate and narrow aperture with a slender anterior canal and a narrow, long, and slightly recurved columella which is devoid of a distinct fasciole. It differs from Galeodea in the non-nodose and prominent carinae, much thickend outer lip which is smooth internally, smooth inner lip, more developed and apressed callosity, and incrusted surface.

Pseudogaleodea tricarinata nov. sp.

Pl. VIII, Figs. 1–7.

Shell fusiform; spire moderately elevated consisting of five whorls; spire-whorls rather broad, sharply and prominently angulated by a carina, and separated into a broad, flat or a slightly concave upper surface and a narrow nearly vertical lower surface; protoconch of one and half smooth, round whorls.

(1) SCHENK: Cassidae of Western America. Univ, Calif. Publ., Geol. Bull., Vol. VXI, No. 4, 1926.

Body whorl including the anterior canal more than twice as as long as the spire, convex at sides and narrowed below, ornamented with three prominent and round-topped spiral carinae with concave interspaces between them; of the carinae two upper more prominent than the third and placed on the upper and lower angle respectively; lowest carina slightly narrower and less elevated, being situated on the upper part of the base and separated from the second carina by an interspace slightly narrower than that between the other two. Aperture narrow, elongate, angulated posteriorly, produced into a rather long, narrow and slightly oblique canal anteriorly; outer lip somewhat sinuous, much thickened externally; inner lip undulate, being convex above and excavated below; columella slender, gradually recurved, without a fasciole; callosity well developed, very thick near the posterior corner of the aperture. Incrustation thin. Besides the carinae, a few fine spiral striae occurring along the suture; no vertical sculpture except for numerous lines of growth. Test rather thin.

Dimensions:

Height	Width
ca. 65 mm.	ca. 35 mm.
38 mm.	19 mm.
45 mm. (+)	26 mm.

Eight specimens. In one specimen, the sprial carinae are not developed and the body whorl takes an evenly convex contour. In this, however, the side is faintly concave at the middle and hence this feature is most probably owing to an individual difference and is not valuable for specific distinction. These specimens belong to G. I. S. except three examples.

Locality and geological horizon: The Upper Ammonite Beds exposed near the Kawakami Coal-mine, Toyohara-gun, Japanese Saghalin.

Semifusus, SWAINSON.

(*Mayeria,* BELLARDI.)

Semifusus (*Mayeria?*) *sachalinensis* nov. sp.

Pl. VII, Figs. 8–10.

Shell of medium-size, semi-fusiform; spire moderately elevated, with an apical angle varing from 40° to 50°, composed of six or

seven whorls separated from one another by more or less distinct and sometimes canaliculated sutures. Each spire-whorl sharply carinated below the middle of depth; carina covered with numerous spirally elongated indistinct nodes; surface above the carina faintly concave and sloped outward. Body whorl large, inflated and ventricose, much higher than the spire, ornamented with two carinae which are broad, prominent and nodose or tubercular, each carina corresponding to the upper and lower angles of the whorl respectively; upper carina more elevated and more prominently nodose, the nodes being spirally much elongated. Surface above the upper carina rather broad and moderately concave, and that between the carinae also excavated and almost parallel to the axis of the shell; base slightly concave in its upper part, gradually contracted toward the anterior extremity. Aperture broad, narrowly angulated posteriorly; outer lip thin and two-angulated, with a smooth inner surface; inner lip evenly concave above and convex below; anterior canal narrow, oblique and probably more or less elongated; callosity thin.

Surface ornamented, besides the carinae above descrided, with numerous fine, usually equal, spiral striae which are broadest and most distant from one another on the base of the body whorl. Lines of growth also distinct, running from the upper suture obliquely backward, curving forward near the upper carina, and then swinging a little backward again on the surface between the carinae.

Dimensions:

Breadth	Height
24 mm.	32 mm. (+)
24 mm.	35 mm. (+)
30 mm.	ca. 46 mm.

Eight specimens were examined. This species may be related to the group of "*Fusus*" (*Serrifusus*) *dakotensis* MEEK and HAYDEN,[1] the type of *Serrifusus* MEEK, and its variety *goniophorus* MEEK,[2] both from the Fox Hills Group of Dakota, North America. These two forms are distinct from ours in having a spiral carina on the base and a longer anterior canal. "*Fusus*" (*S.*) *dakotensis* var. *vancouverensis* WHITEAVES[3] from Horny Island, Strait of Georgia, is more akin to the present one, being distinguished from it by slightly

(1) F. B. MEEK: Op. cit. p. 374, Pl. XXXI, fig. 11; Pl. XXXII, fig. 6.
(2) F. B. MEEK: Ibid., p. 375, Pl. XXXII, fig. 7.
(3) J. F. WHITEAVES: Mesozoic Fossils, Vol. I. Op. cit., p. 119, Pl. XV, fig. 5.

different ornamentation. In this Canadian fossil there is only one prominent carina, instead of two, with two minute spiral ribs below it.

The validity of *Serrifusus* MEEK[1] is sometimes[2] doubted owing to the very incomplete state of the type species and attention has been called to its close resemblance to *Semifusus proboscidiferus* (LAM.)[3]. This recent species has also a longer anterior canal than ours under consideration.

On the other hand, there are two allied species reported from the Upper Cretaceous of South India, "*Lagena*" *nodulosa* STOL.[4] from the Trichinopoly Group and "*L.*" *secans* STOL.[5] from the Arrialur. The former of these is more closely related to ours in outline of the shell but differs in having a narrow spiral rib in the interspace between the two prominent carinae and another prominent spiral ridge on the upper part of the base. One of the Indian fossils, "*L.*" *secans* which has, moreover, a thick varix along the outer lip is regarded by M. CONSSMANN as belonging to *Mayeria* BELLARDI.

Two other similar forms, without the specific names, were described by H. WOODS[6] from the Upper Cretaceous of Pondoland, Africa, and referred with some doubt to *Mayeria*. One of them (fig. 6) is closely allied to ours, only differing in its higher spire and one-carinated body whorl.

Mayeria BELLARDI[7], to which the present species in question is here tentatively referred, was based on *M. autissima* BELL.[8] from the Miocene of Italy and is sometimes regarded as a subgenus of *Semifusus*. The type species is characterized, however, by a nearly straight columella and probably longer canal than ours, and hence that the latter may be subgenerically distinct from this Italian form is by no means deniable.

Locality and geological horizon: The Upper Ammonite Beds; Oku-Kawakami along the Suzuya-gawa, Japanese Saghalin. These specimens belong to G. I. S.

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(1) F. B. MEEK: Op. cit., p. 373.

(2) M. COSSMANN: Essais de Paléontologie comparée, Vol. IV, 1901, p. 8.

(3) W. TRYON: Man. Conch., Vol. III, p. 52, Pl. XXXII, fig. 93.

(4) F. STOLICZKA: Cretaceous Fossils of South India, Gastropoda. Op. cit., 137, Pl. XI, fig. 18.

(5) F. STOLICZKA: Ibid., p. 138, Pl. XI, fig. 19.

(6) H. WOODS: Cretaceous Fauna of Pondoland. Ann. S. Afr. Mus., Vol. IV, p. 324, Pl. XL, fig. 5; p. 325, Pl. XL, fig. 6.

(7) L. BELLARDI: I Molluschi dei Terreni Terziari del Piemonte e della Liguria, Pt, I, 1872, p. 156.

(8) L. BELLARDI: Ibid., p. 157, Pl. X, fig. 7.

Avellana, D'ORBIGNY.

Avellana problematica nov. sp.

Pl. VII, Figs. 7, 7 a, 7 b.

Shell small, globose and ventricose; spire very short, consisting of two whorls separated by distinct sutures. Last whorl convex especially near the shoulder; aperture narrow, elongate, anteriorly rounded and provided with a faint notch; outer lip partly broken, apparently without prominent tuberculation or denticulation, externally thickened into a broad and flat band which is smooth except for lines of growth; inner lip oblique, slightly convex above and excavated below, with a low parietal tooth and a simple columellar plication, the margin above this plication being moderately excavated; callosity thick.

Surface ornamented with numerous fine spiral sulci which are very minutely punctate and separated from one another by broad flat interspaces.

Dimensions:

Height	Breadth
7 mm.	6 mm.

This species is represented by only one imperfect specimen with the outer lip partly broken. It is similar to some forms of Eryptica in the ornamentation of the columella but seems to be distinct from most species of this genus in having a broad external thickening of the outer lip and in the absence of the internal tuberculation. It stands nearer to some species of *Avellana*, to which it is tentatively referred here, yet it is devoid of a well developed sinuation at the anterior extremity, a distinct feature of this genus.

A. scorbiculata STOL.[1] from the Arrialur Group of South India is akin to ours in the form of the shell but has the anterior notch more distinct and the outer lip ornamented anteriorly with a few teeth. The present species seems to be identical in sculpture with *A. sculptilis* STOL.[2] which is thought by COSSMANN to belong to *Eryptica*.

Locality and geological horizon: The Upper Ammonite Beds exposed on the left bank of the Abeshinai, south of Shibunnai, province of Teshio, Hokkaido.

(1) F. STOLICZKA: Cretaceous Fauna of Southern India, Vol. II, Gastropoda. Palaeotologia Indica, Ser. V, 1867, p. 421, Pl. XXVI, fig. 9; Pl. XXVIII, fig. 21.

(2) F. STOLICZKA: Ibid., p. 422, Pl. XXVIII, fig. 1; Pl. XXVIII, fig. 22.

Plate V

PLATE V

(All figures are of natural size).

Figs. 1, 1 a. *Pinna* sp. aff. *P. breveri* GABB. *Trigonia* Sandstone; the Ikushumbets gorge near the Ikushumbets Coal-mine, Sorachi-gun, province of Ishikari, Hokkaido.

Figs. 2–3 a. *Nucula formosa* NAGAO. Upper Ammonite Beds; Oku-Kawakami along the Suzuya-gawa, Japanese Saghalin.

Figs. 4–6, 8, 9, 16. *Nuculana mactraeformis* NAGAO. Upper Ammonite Beds; a point about 100 m. south of the junction of the Abeshinai with its tributary Sakai-zawa, province of Teshio, Hokkaido.

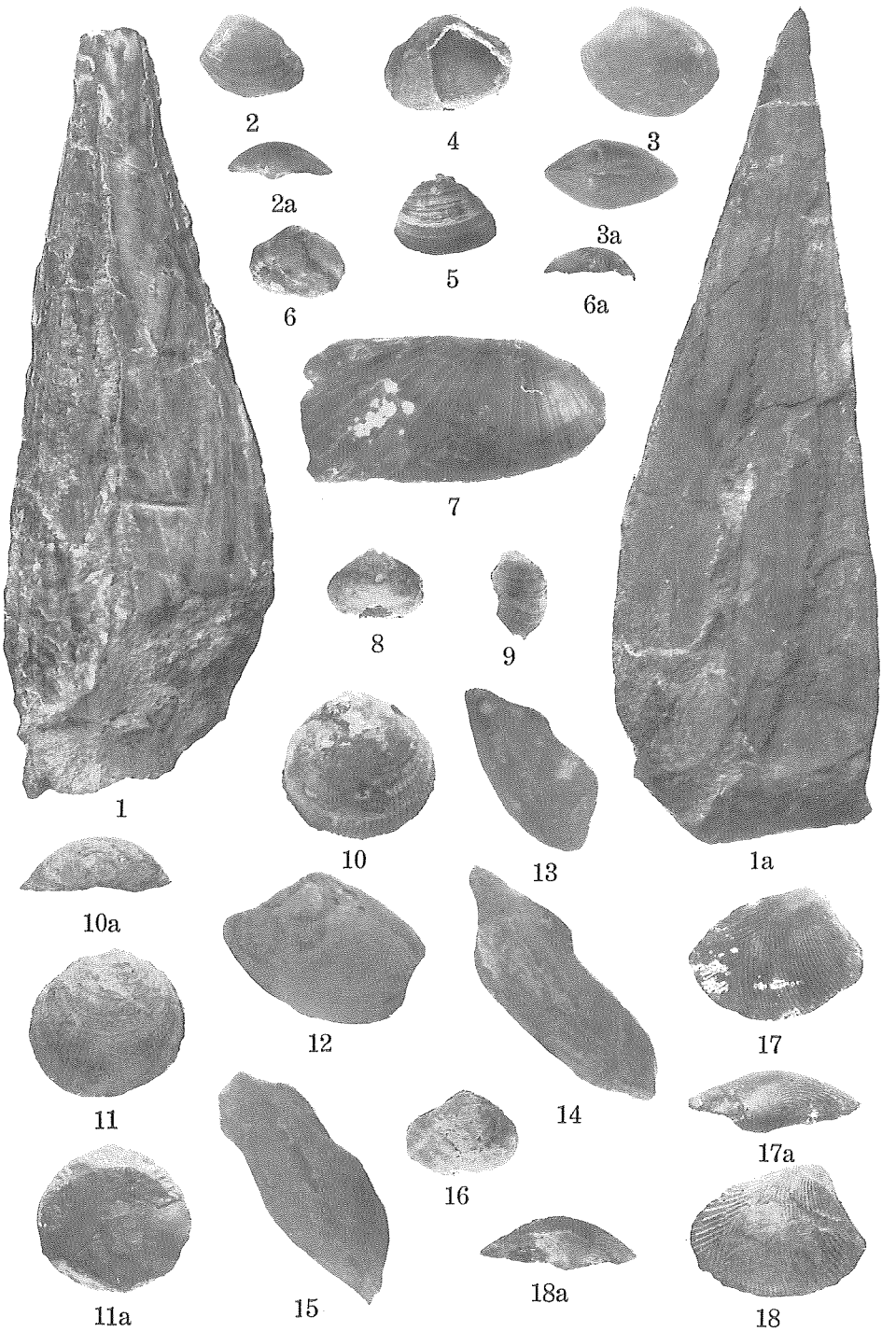
Fig. 7. *Solemya angusticaudata* NAGAO. *Trigonia* Sandstone; the upper course of the Ikushumbets, province of Ishikari.

Figs. 10–11 a. *Glycymeris hokkaidoensis* YABE and NAGAO var. *multicostata* NAGAO. Upper Ammonite Beds; a point about 100 m. south of the junction of the Abeshinai with its tributary Sakai-gawa, province of Teshio.

Fig. 12. *Nucula radiatocostata* NAGAO. Upper Ammonite Beds; Oku-Kawakami along the Suzuya-gawa, Japanese Saghalin.

Figs. 13–15. *Gervillia* (*Pseudoptera*) *acuticarinata* NAGAO. *Trigonia* Sandstone; Pombets near the Ikushumbets Coal-mine, province of Ishikari.

Figs. 17–18 a. *Nucula* (*Acila*) *hokkaidoensis* NAGAO. Upper Ammonite Beds; a point about 100 m. south of the junction of the Abeshinai with its tributary Sakai-gawa, province of Teshio.



Mashiko and Takeda photo.

T. Nagao: Cretaceous Fossils.

Plate VI

PLATE VI

(All figures are of natural size).

Figs. 1–5. *Grammatoden sachalinensis* (SCHMIDT). Upper Ammonite Beds; 1, Ôyubari, Yûbari-gun, province of Ishikari; 2, 4, a point south of the junction of the Abeshinai with its tributary Sakai-zawa, province of Teshio; 3, Hetonai, province of Iburi; 5, the Shibunnai-zawa near Shibunnai, province of Teshio.

Fig. 6, 6a. *Callista* (?) sp. cf. *C. arata* (GABB). Upper Ammonite Beds; Okuhobets along the Hobets-gawa, province of Iburi.

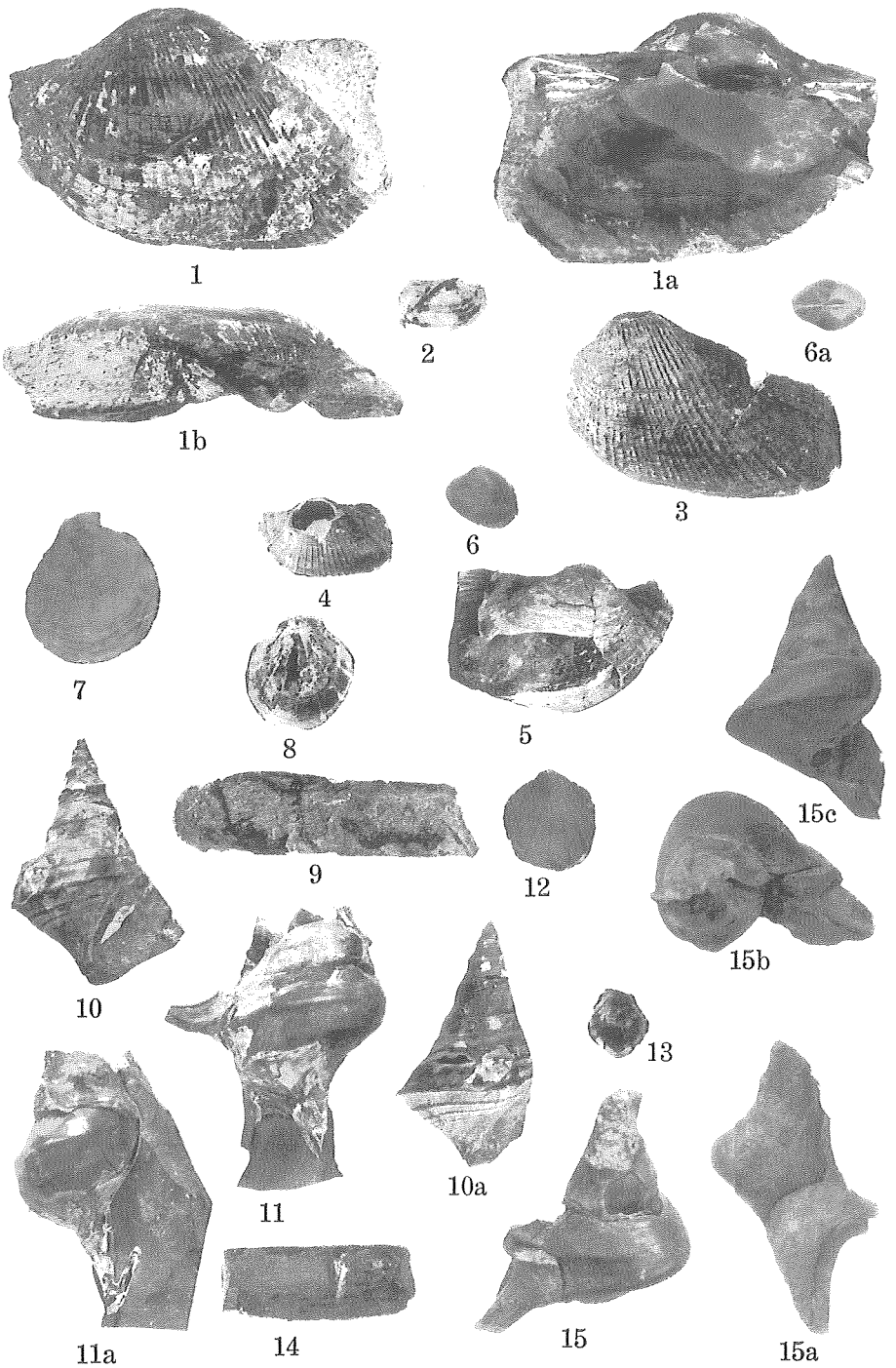
Figs. 7, 8, 12, 13. *Pecten* (*Propeamusium*) *cowperi* WARING var. *yuberensis* YABE and NAGAO. Upper Ammonite Beds; 7, 8, Shibunnai-zawa, a tributary of the Abeshinai; 12, Ômagari near Shibunnai; 13, Nigori-kawa, a tributary of the Abeshinai, all localities being in the province of Teshio.

Fig. 9. *Pharella* (?) sp. *Trigonia* Sandstone; Sentaro-zawa near the Ikushumbets Coal-mine, province of Ishikari.

Figs. 10, 15–15c. *Tessarolax acutimarginatus* NAGAO. Upper Ammonite Beds; 10, Nigori-kawa, province of Teshio; 15, Kawakami Coal-mine, Japanese Saghalin.

Figs. 11, 11a. *Tessarolax japonicus* YABE and NAGAO. Upper Ammonite Beds; Sakai-zawa, a tributary of the Abeshinai, province of Teshio.

Fig. 14. *Siliqua* (?) sp. *Trigonia* Sandstone; Tômatsu-zawa near the Ikushumbets Coal-mine, province of Ishikari.



Mashiko and Takeda photo.

T. Nagao: Cretaceous Fossils.

Plate VII

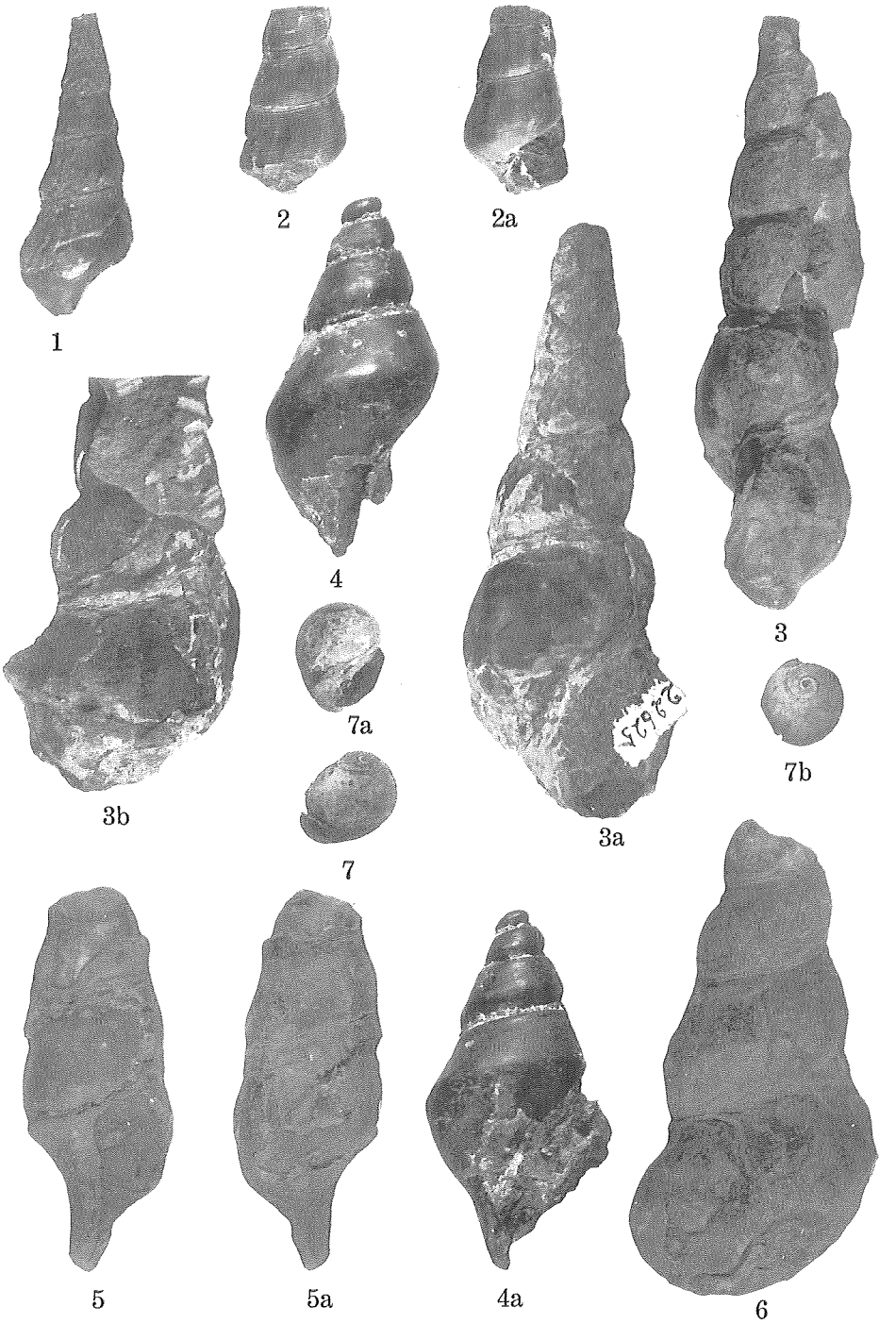
PLATE VII

(All figures are of natural size).

Figs. 1–3 b, 5–6. *Rostellaria japonica* NAGAO. Upper Ammonite Beds; 1, 5, 6, Kawakami Coal-mine, Japanese Saghalin; 2, Omoshiroshibets, a tributary of the Abeshinai, province of Teshio; 3, Cape de la Jonquière, Russian Saghalin.

Figs. 4, 4 a. *Anchura* (?) sp. *Trigonia* Sandstone; upper course of the Ikushumbets, province of Ishikari.

Figs. 7–7 b. *Avellana problematica* NAGAO. Upper Ammonite Beds; near Shibunnai along the Abeshinai, province of Teshio.



Mashiko and Takeda photo.

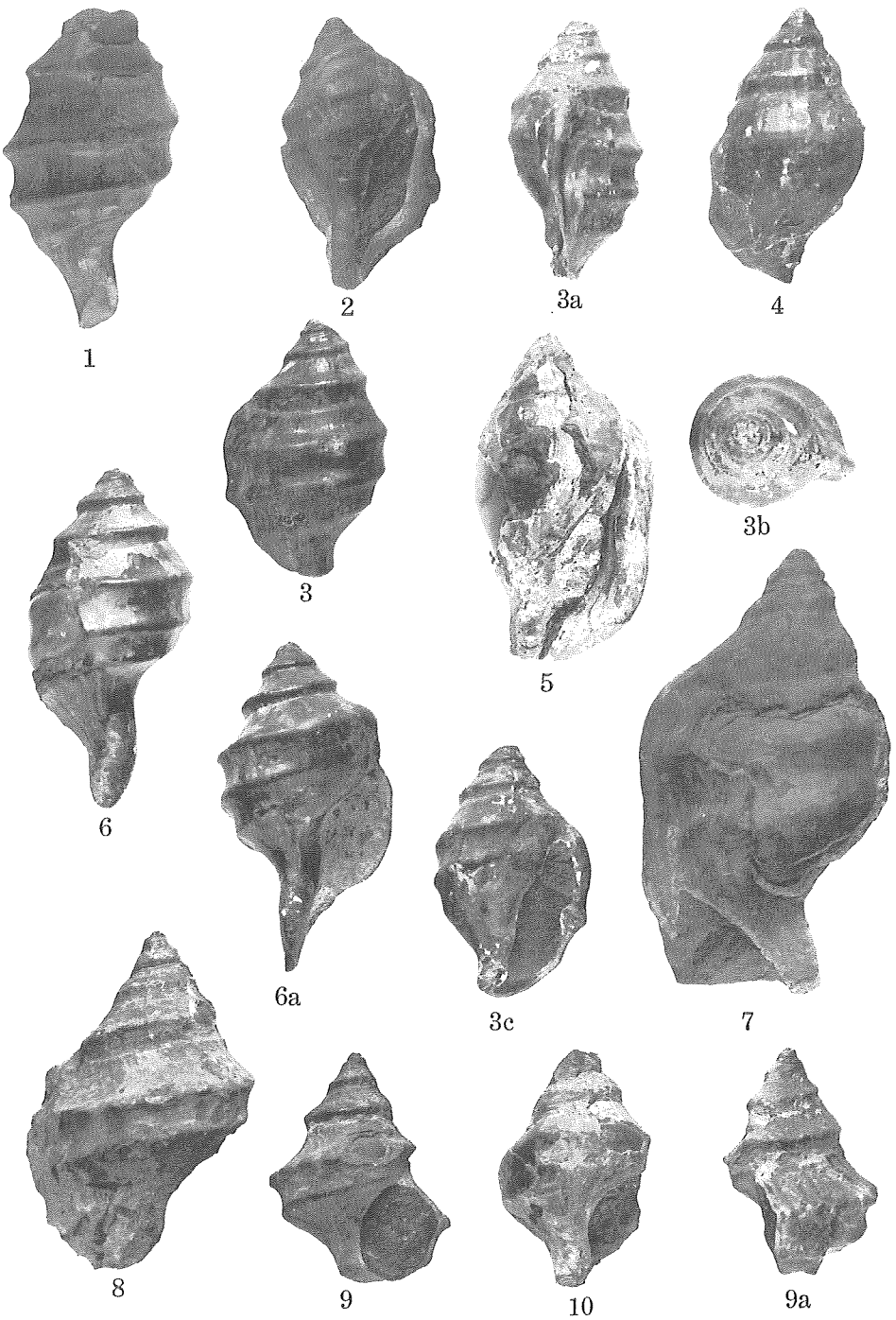
Plate VIII

PLATE VIII

(All figures are of natural size).

Figs. 1–7. *Pseudogaleodea tricarinata* NAGAO. Upper Ammonite Beds; Kawakami Coal-mine, Japanese Saghalin.

Figs. 8–10. *Semifusus* (*Mayeria*?) *sachalinensis* NAGAO. Upper Ammonite Beds; Oku-Kawakami along the Suzuya-gawa, Japanese Saghalin.



Mashiko photo.

T. Nagao: Cretaceous Fossils.