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SOME MOLLUSCAN FOSSILS FROM THE
CRETACEOUS DEPOSITS OF HOKKAIÐÔ
AND JAPANESE SAGHALIEN

Part I. Lamellibranchiata and Scaphopoda.

By

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With 3 Plates

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With the exception of ammonites and some lamellibranchs such as *Inoceramus* and *Trigonia*, molluscan remains are rather rare in the Cretaceous rocks of Hokkaidô and Japanese Saghalien. Moreover, they are usually ill preserved and sometimes very insufficient for specific identification. Many of them, however, are often considerably wide in their geographical distribution and important as horizon indicators, being restricted to certain beds of the Cretaceous formations.

In the present note the writer intends to describe some lately acquired specimens from the Cretaceous deposits of Hokkaidô and Japanese Saghalien. These specimens have been derived from various formations ranging from the Lower Ammonites beds (Lower Aptian to Gault), through the *Trigonia* Sandstone (mainly Cenomanian), to the Upper Ammonites beds (Turonian to Upper Senonian). Those from the Hakobuti Sandstone, the uppermost subdivision of the Cretaceous rocks, are treated in another paper forming a part of this Volume (pp. 31-56).

Part I deals with fourteen species of Lamellibranchiata and two species of Scaphopoda.

(1) The species of *Inoceramus*, which are sometimes abundant at places, will be described in another paper by T. MATUMOTO and the present writer.

They are,

Solemya cf. *angusticaudata* NAGAO

Nucula formosa NAGAO

Nuculana sambonsugii NAGAO nov.

N. (Ezonuculana) mactraeformis NAGAO

Yoldia sp. a

Yoldia sp. b

Parallelodon (Nanonavis?) sp.

Pinna saitoi NAGAO nov.

Anomia subovalis NAGAO nov.

Cuspidaria brevirostris NAGAO nov.

Anthonya apicalis NAGAO nov.

A. ensiformis NAGAO nov.

Lucina (Myrtea) ainuana NAGAO nov.

Tellina sp.

Dentalium cooperi GABB var. *ezoensis* NAGAO nov.

D. otatumei NAGAO nov.

DESCRIPTION OF SPECIES

Solemya. LAM.

Solemya cf. *angusticaudata* NAGAO

Pl. XIV (I), Figs. 1, 2.

Compare:

1932. *Solemya angusticaudata* NAGAO: Some Cretaceous Mollusca from Japanese Saghalin and Hokkaidô (Lamellibranchiata and Gastropoda). This Journal, Ser. IV, Vol. II, p. 25, Pl. V, fig. 7.

Three more or less deformed moulds and casts have been collected from the Lower Ammonites beds of Hokkaidô. They are nearly as large as the type specimen of *S. angusticaudata* NAGAO from the Trigonina Sandstone of the Ikusyumbetu district and, moreover, as far as the present imperfect specimens are concerned, quite identical with the latter in many features. The shells are transversely much elongated and very inequilateral, with subparallel dorsal and ventral margins. The anterior and posterior ends are deformed, but the former appears to be very broadly rounded along the margin and subvertically truncated, while the latter is somewhat produced and narrowly rounded. The postero-dorsal margin is inclined very

steeply backwards. The radial ribs are numerous; six or seven anterior ones covering the anterior half of the shell are broad, distinct, and separated from one another by very narrow grooves, each with a very narrow riblet. The ribs on the posterior half are shown to be narrower, more crowded and fainter. One of the specimens measures 62 mm. in length and 18 mm. in height.

There is at hand another small specimen from the Upper Ammonites beds of Japanese Saghalien. Although the radial ribs are rather well preserved, this specimen is very imperfect, its posterior portion being missing. Otherwise, in its smallness (19 mm. in length), outline of the shell, and sculpture, it is comparable with the specimen from the Hakobuti Sandstone of Hokkaidô.⁽¹⁾ Among these specimens from the Cretaceous rocks of Hokkaidô and Saghalien, two forms may be distinguished, those from the Lower Ammonites beds and the Trigonina Sandstone representing one and those from the Upper Ammonites beds and the Hakobuti Sandstone the other.

Localities and geological horizons: Pombetu near the Iku-syumbetu Coal-mine, province of Isikari, Hokkaidô; the Lower Ammonites beds. The Kawakami Colliery, Toyohara-gun, Saghalien; the *Nipponosaurus* bed of the Upper Ammonites beds.

Nucula formosa NAGAO

Pl. XIV (I), Fig. 3.

1930. *Nucula formosa* NAGAO: On Some Cretaceous Fossils from the Islands of Amakusa, Kyûshû, Japan. This Journal, Ser. IV, Vol. I, p. 14, Pl. II, fig. 2.
1932. *N. formosa* NAGAO: Some Cretaceous Mollusca from Japanese Saghalin and Hokkaidô (Lamellibranchiata and Gastropoda). This Journal, Ser. IV, Vol. II, p. 26, Pl. V, figs. 2, 3.

A small, rather well preserved right valve from the Upper Ammonites bed of Hokkaidô has been examined. This species has a wide geographical distribution in the Upper Cretaceous rocks of Japan, since it is also known to occur in the Himenoura group (Senonian) of the Islands of Amakusa, Kyûsyû, and the equivalent rocks of the Suzuya-gawa, Saghalien.

Locality and geological horizon: The middle course of the Obirasibe-gawa, province of Tesio.

(1) T. NAGAO and K. GTATUME; Moll. Foss. Hakobuti Sandstone. This Volume, p. 36, pl. I, fig. 11.

N. solitaria GABB⁽¹⁾ seems to be an allied form, but it is smaller and has a more prominent beak than the Japanese species.

Nuculana, LINK.

Nuculana sambonsugii nov. sp.

Pl. XIV (I), Figs. 10, 10 a-c.

Shell small, compressed, attenuated posteriorly, transversely much elongated, the length being nearly twice the height, very inequilateral, the anterior side less than one-half as long as the posterior; anterior end evenly rounded, the posterior portion produced and apparently vertically truncated, though the end itself is missing. Antero-dorsal margin short, evenly arched, inclining steeply downward, and the postero-dorsal one long, sloped very gently backward, and nearly straight, with a faint excavation behind the umbo; basal margin slightly convex. Umbones small, pointed, not prominent, approximate, and curved inward and slightly backward; anterior umbonal angle not well defined, the posterior one distinct, but low and broad, extending from the umbo to the postero-ventral end; the surface behind this angle flattened and that in front slightly excavated. Lunule not demarkated; escutcheon very narrow, long, depressed and circumscribed by distinct ridges.

Surface ornamented with numerous, rather regular, slightly elevated, incremental concentric ribs which are more distinct near the ventral margin, besides very fine crowded concentric striae and intermittent, rather irregularly spaced concentric ridges at intervals. There are also shown, though almost invisible to the naked eye, crowded linear grooves, slightly oblique to the lines of growth and separated by broader and flat interspaces. Hinge partly exposed; the posterior row of teeth very long. Inner features not well examinable.

| Dimensions: | Length | Height | Thickness |
|-------------|------------|--------|-----------|
| | ca. 15 mm. | 6 mm. | 3 mm. |

An imperfect specimen has come under examination. This species possesses some features of *Nuculana* (s. str.), but the pallial

(1) W. M. GABB: Paleontology of California, Vol. II, 1869, p. 197, pl. XXXII, fig. 94. J. F. WHITEAVES: Mesozoic Fossils, Vol. I, Pt. 3, 1884, p. 232, pl. XXXI, fig. 94.

sinus or the chondrophore not being known, its proper position in *Yoldia* or *Nuculana* is at present uncertain. It is, though much shorter, somewhat similar to *N. solea* (D'ORB.)⁽¹⁾ from the Gault of Europe, a species thought by STEWART⁽²⁾ to be congeneric with *Perrisonota protexta* CONRAD,⁽³⁾ the genotype of *Perrosonota* CONRAD, from the Upper Cretaceous of North America. According to STEWART (p. 52) *P. protexta* has "an elongate, posterior, immersed but external opisthodontic ligamental groove", suggesting that this genus may be transferable to the Malletidae. The Japanese species seems to be generically distinct from that North American form, as there is no trace of an external ligament.

Locality and geological horizon: Urakawa-mati, province of Hidaka; the Upper Ammonites beds.

The specific name is in honor of Mr. M. SAMBONSUGI, geologist of the Industrial Laboratory of the Hokkaidô Office, by whom this specimen has been presented to the writer.

Ezonuculana nov. subgen.

Type: *Nuculana mactraeformis* NAGAO.

Shell mactraeform, convex, nearly equilateral with a rather prominent central umbo; extremities narrowly or broadly rounded, not gaping nor rostrated; umbonal angles indistinct; no lunule, escutcheon excavated, but faintly defined by impressed lines along the rounded margin; pallial line distinct, the sinus almost obsolete, the posterior end of the line being a little truncated. Inner margin smooth. Hinge taxodont, teeth in two angular rows almost equi-length; chondrophore rather broad, situated beneath the umbo and very slightly oblique backward. Test not pearly inside. Surface concentrically sculptured.

This form approaches *Yoldia* on the one hand and *Nuculana* on the other. The chondrophore seems as small as many of the *Nuculana* and the pallial line recalls that of *Nucula* or *Nuculana*. A new sub-

(1) A. D'ORBIGNY: Pal. Franç. Terr. Crét., Vol. II, p. 170, pl. CCCIV, figs. 4-6, H. WOODS: Cret. Lammell. England, p. 5. pl. I, figs. 18-24.

(2) R. B. STEWART: GABB's California Cret. Tert. Type Lemall. Acad. Nat. Sci. Philadelphia, Special Publ., No. 3, 1930, p. 52.

(3) R. P. WHITFIELD: Brachiop. and Lamell. Raritan Clays and Greensand Marls New Jersey. U. S. Geol. Surv., Monogr., Vol. IX, 1885, p. 110, pl. XI, figs. 14, 15.

generic name is proposed to receive this species and is provisionally placed under *Nuculana*.

Nuculana (Exonuculana) mactraeformis NAGAO

Pl. XIV (I), Figs. 4-8.

1932. *Nuculana mactraeformis* NAGAO: Some Cretaceous Mollusca from Japanese Saghalin and Hokkaidô. This Journal, Ser. IV, Vol. II, p. 30, Pl. V, figs. 8, 9, 16.

This species was founded on a few imperfect specimens from the Upper Cretaceous of Hokkaidô. Now it is known to occur at various places in Saghalien and Hokkaidô. Some of the specimens at hand are well preserved.

The following is the original description of this species:

"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. Umbones 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 numerous regular concentric ribs and fine striae in alternation. Hinge composed of numerous small teeth. Test moderately thick."

The shell is mactracformis, perfectly equilateral. The posterior truncation is very often indistinct, then the posterior margin is evenly convex. The umbo is prominent, central and rather opisthogyrous, not prosogyrous as before observed. The hinge, condrophore, adductor muscle-scars, and pallial line are described in the foregoing lines.

One of the larger specimens measures 18 mm. in length and 14 mm. in height.

Localities and geological horizon: Kawakami, Toyohara-gun, and Keton, Sisuka-mati, both in Saghalien. From three places near Urawa-mati, province of Hidaka, Hokkaidô. The syntypes came from

the Abesinai district in the province of Tesio. The Upper Ammonites bed.

Yoldia, MÖLLER.

Yoldia sp. indet. a.

Pl. XIV (I), Fig. 14.

An imperfect specimen is at hand. Since the inner features are not observable, its reference to *Yoldia* is somewhat doubtful.

Shell small, inequilateral, the posterior side being slightly longer; thick and very ventricose, transversely elongate ovate. Anterior end incomplete, but probably rounded and the posterior one produced, subpointed above and slightly rostrate; antero-dorsal margin injured, but apparently rather short, a little arched, the postero-dorsal one long, nearly straight and faintly inclined; basal margin broadly and rather strongly convex. Umbo small, low?; escutcheon narrow-lanceolate and depressed. An indistinct ridge extending from the umbo to the postero-dorsal end along the dorsal margin. Test thick.

Surface ornamented with rather irregular, rude, somewhat incremental concentric lines. Hinge not exposed.

| | | | |
|-------------|------------|--------|-----------|
| Dimensions: | Length | Height | Thickness |
| | ca. 16 mm. | 10 mm. | 10 mm. |

This specimen is easily distinguished from *Y. hakobutsensis* NAGAO and ÔTATUME⁽¹⁾ from the Hakobuti Sandstone in being more ventricose, with a narrower posterior end. The posterior umbonal angle, which is distinct in the latter, is not well developed in the present form.

Locality and geological horizon: the eastern wing of the Ikusyumbetu Cretaceous syncline along the Ikusyumbetu-gawa, province of Isikari; the Trigonina Sandstone.

Yoldia sp. indet. b.

Pl. XIV (I), figs. 11-13.

There are at hand a few internal and external moulds, representing a species different from the preceding form.

(1) T. NAGAO and K. ÔTATUME: Molluscan Fossils of the Hakobuti Sandstone of Hokkaidô. This Volume, p. 38, pl. I, figs. 2-6.

Shell small, rather short, moderately convex, slightly inequilateral, the posterior side very little longer; anterior end narrowly rounded and the posterior one roundly subpointed; antero-dorsal margin faintly arched, inclined rather steeply forward, the postero-dorsal one relatively small in inclination, slightly concave; ventral margin broadly and evenly arcuated, rather rapidly ascending toward the posterior end. Umbo apparently small, not prominent without any marked umbonal angle. Two rows of teeth subequal in length. Ornamentation uncertain, but as suggested by an external cast, probably composed of numerous fine more or less incremental concentric lines.

| Dimensions (moulds) : | Length | Height |
|-----------------------|------------|-------------|
| | ca. 12 mm. | ca. 7 mm. |
| | ca. 9 mm. | ca. 5.5 mm. |

The present specimens are distinguished from *Y. hakobetsensis* NAGAO and ÔTATUME⁽¹⁾ in being shorter, without a well defined posterior umbonal angle. In these points, it differs also from *Nuculana sanchuensis* YABE and NAGAO⁽²⁾ from the Santyû Graben of the Kwantô Mountainland in Honsyû.

Locality and geological horizon: Asahi-mati, Yûbari-mati, province of Isikari; the uppermost part of the Trigonina Sandstone or the basal part of the Upper Ammonites bed.

Parallelodon, MEEK and WORTHEN.

(*Nanonavis*, STEWART.)

Parallelodon? (*Nanonavis?*) sp. indet.

Pl. XIV (I), figs. 9, 9 a.

A mould of a cuculloid shell was collected from the province of Tesio. The mould is of moderate size, thick, transversely elongated, with a long hinge line, inequilateral. The umbones are high and curved forward and inward, far apart from each others. The hinge margin is almost straight and has numerous, vertical, small teeth beneath the umbo. The posterior end is truncated vertically, the

(1) T. NAGAO and K. ÔTATUME: Moll. Foss. Hakobuti Sandstone. This Volume, p. 38, pl. I, figs. 2-6.

(2) H. YABE, T. NAGAO, and S. SHIMIZU: Cretaceous Moll. Sanchû Graben Kwantô Mountainland. Sci. Rep. Tôhoku Imp. Univ., 2nd Ser., Vol. IX, 1926, p. 42, pl. XII, figs. 21-23.

anterior one injured but apparently oblique and convex, and the basal one broadly arcuated, forming an obtuse angle with the posterior margin.

The ligamental area is shown to be broad and long, with numerous inverted V-shaped grooves.

Dimensions: A little more than 54 mm. in length, 39 mm. in height, and more than 33 mm. in thickness.

This is distinctly longer and thicker than *P. (Nanonavis) sachalinensis* (SCHMIDT)⁽¹⁾, a very common species from the Upper Ammonites bed of Saghalien and Hokkaidô.

Locality and geological horizon: the Omosirusibetu, a tributary of the Abesinai-gawa, province of Tesio, Hokkaidô; the Upper Ammonites bed.

Pinna, LINN.

Pinna saitoi nov. sp.

Pl. XV (II), Figs. 9, 9 a, 10.

1932. *Pinna* aff. *breweri* NAGAO: Some Cretaceous Mollusca from Japanese Saghalin and Hokkaidô. Loc. cit., p. 35, Pl. V, figs. 1, 1 a.

A large specimen (160 mm. long) of a *Pinna* was lately collected from the Trigonina Sandstone exposed along the Ponhôrokabetu near the Yûbari Coal-mines. This specimen is considered as conspecific with those which were described from the same Sandstone of the Ikusyumbetu district and referred to *P. breweri* GABB from the Chico group of California.

The following is the original description of this form:

"Shell long, rather slender, trigonal and cunaeform with a sub-rhomboidal 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."

(1) M. F. SCHMIDT: Ueber die Petrefakten der Kreideformation von der Insel Sachalin, 1873, pp. 24-25, pl. V, figs. 5-7; pl. VIII, figs. 6-8.

T. NAGAO: Some Cret. Moll. Japan. Saghalin and Hokkaidô. Loc. cit., 1932, p.31, pl. VI, figs. 1-5.

The shell is elongate-trigonal, thick-trapezoid in cross-section near the umbo, and rather slowly increasing in height backwards. The dorsal margin is slightly arched near the apex, almost straight through the greater part of its length, while the ventral border is a little concave in the umbonal region, nearly straight or very faintly convex in the remaining portion. The buccal end is missing. There is a rather indistinct longitudinal depression impressed on the cast, showing the presence of a ridge or sulcus at the median angle of the shell. The ribbed area of the upper part of the ventral surface is very narrow and ornamented with three or four longitudinal ribs, the remaining portion of this surface being covered with numerous, crowded, rather rude concentric lines. The ribbed area is crossed with dense, very fine concentric striae of growth.

There are several similar forms known from foreign Cretaceous rocks, such as *P. brewerii* GABB⁽¹⁾ from the Chico of California referred to above, *P. calamitoides* SCHMARD⁽²⁾ from the Nanaimo group of Vancouver Island, and *P. decussata* GOLDF.⁽³⁾ from the Cenomanian and Senonian of Europe. These three forms may be, if not identical, closely related to one another. *P. brewerii* was based on a very bad specimen but seems to be distinct from the Japanese form in having more numerous ribs, 10 in number, on the upper part of the ventral surface as indicated in the figure of a lectotype of this species, given by STEWART. The Japanese species may well be identical with *P. calamitoides*. In the latter, however, the ventral ribs are stated to be two in number. Moreover, the dorsal ribs are crossed in the present species by rather widely separated, slightly elevated, transverse fine lines which become very dense toward the posterior buccal end. These concentric lines are not stated nor figured in the Canadian specimen, though this may be attributed to the bad state of preservation. WARING⁽⁴⁾ figured an imperfect

(1) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 188, pl. XXV, figs. 17 a-b; Vol. II, 1869, p. 195, pl. XXXII, fig. 93. R. B. STEWART; GABB's Cal. Cret. and Tert. Type Lamell. Op. cit., p. 133, fig. 4.

(2) J. F. WHITEAVES: Mesozoic Fossils, Vol. I, pt. 2, 1879, p. 167, pl. XX, fig. 1.

(3) A. GOLDFUSS: Petrefacta Germaniae, Vol. II, 1833, p. 166, pl. CXXVIII, figs. 1, 2. H. B. GEINITZ: Das Elbthalgebirge in Sachsen. Palaeontographica, Vol. XX, 1871-1875, Pt. I, Der untere 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.

(4) C. A. WARING: Stratigraphical and Faunal Relations of the Martinez to the Chico and Tejon of Southern California. Proc. Cal. Acad. Sci., 4th Ser., Vol. VII, 1917, p. 64, pl. IX, fig. 4.

specimen from the Chico under the name *P. calamitoides* SCHMARD and included GABB's shell into this same species, but STEWART doubts this identity. According to WARING his specimen has three radial ribs on the ventral surface of the valve.

On the other hand, *P. decussata* seems to be closely similar to the present form, but this European species increases more rapidly its breadth toward the buccal end and has the dorsal ribs farther apart.

Among the Indian species reported by STOLICZKA, *P. arata* STOL.⁽¹⁾ and *P. laticostata* STOL.⁽²⁾ deserve comparison with the species under consideration. The first of those forms has more numerous dorsal ribs, owing to the presence of intermediate ribs. The concentric striae of growth are more crowded than in the new species. In the second of the Indian forms, the longitudinal ribs are more crowded near the dorsal margin and farther apart on the median portion than in ours.

Locality and geological horizon: the Ponhorokabetu near the Yûbari Coal-mines, Yûbari-gun, province of Isikari; the Trigonía Sandstone.

There is at hand another fragment obtained in the Upper Ammonites bed of the province of Tesio. This fragment (Pl. XVI (III), fig. 10) is about 21 mm. in length and represents a small portion near the umbo. The surface ornamentation is rather well preserved in this specimen. The apex is acutely pointed; both dorsal and ventral borders are also acute and the median angle of the shell is rather rounded. The dorsal margin is somewhat arcuate and the ventral one slightly concave. The dorsal ribs number about 10 and the ventral ones 5 or 6; these ribs are narrow and widely spaced. Although the ventral ribs are slightly more numerous, this specimen agrees well with those of the Trigonía Sandstone in many other respects.

Locality and geological horizon: near the Saku Primary School, Nakagawa-gun, along the Abesinai-gawa, province of Tesio; the Upper Ammonites bed.

(1) F. STOLICZKA: Cret. Founa South. India, Pelecypoda. Palaeont. Indica, 1871, p. 384, pl. XXIV, fig. 5; pl. XXV, fig. 1; pl. XXVI, fig. 5.

(2) F. STOLICZKA: Ibid., p. 385, pl. XXV, figs. 2, 3; pl. XXVI, fig. 4.

(3) R. P. WHITFIELD: Brachiopod and Lamell. Raritan Clays and Greensand Marls, New Jersey. U. S. Geol. Surv., Monogr. Vol. IX, 1885, p. 198, pl. XVI, figs. 3, 4. S. WELLER: Rep. on Cret. Pal. N. Jersey. Geol. Surv. N. J., Pal. Ser., Vol. 4, 1907, p. 420, pl. XXXVII, figs. 2, 3.

The specific name is in honor of Mr. R. SAITÔ, geologist of the South Manchuria Railway Co., who has contributed much to the knowledge of the stratigraphy of the Cretaceous deposits in Hokkaidô.

Ostrea, LAM.

Ostrea tesioensis nov. sp.

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

An imperfect upper valve of *Ostrea* has been examined.

Shell small, oval in outline, weakly convex near the umbo, flattened ventrally, much higher than long. Anterior and posterior margins evenly convex, the basal one rounded. Umbo subcentral, not spirally curved. Ligamental area broad. Inner margins smooth. Adductor muscle-scar semicircular and excentric. Surface ornamented with rude concentric undulations and fine lines of growth.

| | | |
|-------------|--------|--------|
| Dimensions: | Height | Length |
| | 29 mm. | 21 mm. |

Locality and geological horizon: Ômagari along the Abesinai-gawa, province of Tesio; the Upper Ammonites bed.

Pecten, MÜLLER.

(*Syncyclonema*, MEEK)

Pecten (*Syncyclonema*?) sp. aff. *obovatus* STOL.

Pl. XVI (III), Figs. 1, 2.

Compare:

1871. *Pecten* (*Syncyclonema*) *obobatus* STOLICZKA: Cretaceous Fauna of Southern India, Pelecypoda. Palaeontologia Indica, p. 435, Pl. XXXII, figs 6-9.
1928. *P.* (*S.*) cf. *obovatus* YABE and NAGAO: Cretaceous Fossils from Hokkaidô: Annelida, Gastropoda, and Lamellibranchiata. Sci. Rep. Tôhoku Imp. Univ., 2nd Ser., Vol. IX, p. 87, Pl. XVII, figs. 3-6.

Two very poor internal moulds were collected from the Lower Ammonites bed of Hokkaidô. The shell is apparently very thin, flattened, with an apical angle of about 110°, nearly equilateral, and almost as long as high. The ears are small, with the outer margin sloping outwards.

The present specimens are quite identical with those previously described from the Trigonia Sandstone of the Ikusyumbetu-gawa and the Horomui-gawa, except for the more orbicular form of the shell, probably due to variation among individuals. If this reference is correct, then this form ranges in Japan from the Lower Ammonites bed to the Trigonia Sandstone. Those from the Trigonia Sandstone are almost indistinguishable from the specimens of *P. (S.) obovatus* STOL.⁽¹⁾ found in the Indian Cretaceous and also from some of *P. (S.) membranaceous* NILLSON.⁽²⁾ *P. (S.) operculiformis* GABB⁽³⁾ from the western coast of North America seems to be another very closely allied species.

(*Propeamusium*, GREGORIO)

Pecten (Propeamusium) cooperi WARING var.

yubarensis YABE and NAGAO

Pl. XVI (III), Fig. 3.

1928. *Pecten (Propeamusium) cooperi* WARING var. *yubarensis* YABE and NAGAO: Cretaceous Fossils from Hokkaidô. Op. cit., p. 88, Pl. XVI, figs. 17-19.
1932. *P. (P.) cooperi* WARING var. *yubarensis* NAGAO: Some Cretaceous Mollusca from Japanese Saghalin and Hokkaidô. Op. cit., p. 38, Pl. VI, figs. 7, 8, 12, 13.

This species is known to occur from various localities in Hokkaidô ranging from the Abesinai district in the province of Tesio to Urakawa in the province of Hidaka, its geological horizon being the Upper Ammonites bed. Lately ÔISHI and MATUMOTO obtained a few imperfect specimens from the equivalent rocks in Japanese Saghalien, which are doubtless identical with those from Hokkaidô.

Locality and geological horizon: Keton, Sisuka-mati, Saghalien; the Upper Ammonites bed. Formerly reported from many places in

(1) F. STOLICZKA: Cret. Fauna S. India, Pelecypoda. Op. cit., 1871, p. 435, pl. XXXII, figs. 6-9.

(2) A. GOLDFUSS: Petref. Germ., Vol. II, p. 75, pl. XCIX, fig. 7. K. A. ZITTEL: Bivalven d. Gosaugeb., II, p. 31, pl. XVII, fig. 3. E. HOLZAPFEL: Die Moll. d. Archener Kreide. Palaeontogr. Vol. XXXV, 1889, p. 233, pl. XXVI, figs. 3, 5. H. B. GEINITZ: Das Elbthalgeb. in Sachsen, II. Op. cit., p. 191, pl. XLIII, figs. 8-11. II, p. 33, pl. IX, 15-18. F. STOLICZKA: Op. cit., p. 436, pl. XXXII, fig. 5; pl. XLI, figs. 7, 8.

(3) W. M. GABB: Pal. Calif., Vol. I, 1864, p. 201, pl. XXVI, fig. 188.

Hokkaidô. A specimen was lately collected by SAMBONSUGI in the Urakawa district. This is very well preserved (Pl. XVI (III), fig. 3).

Anomia, MÜLLER.

Anomia subovalis nov. sp.

Pl. XVI (III), Figs. 12-17.

Shell of moderate size, thin-tested, nearly equal in length and height; variable in form, but usually broadly and somewhat trigonally ovate; inequilateral, the anterior side being a trifle shorter, the posterior side more or less produced obliquely; variable in ventricosity from flat to very convex, sometimes being hemispherical; inflated anteriorly and somewhat compressed postero-dorsally. Anterior and ventral margins evenly convex, forming together a more or less continuous circular curvature; posterior end narrowly rounded, situated at about the midheight; postero-dorsal margin straight, sloped downward, and slightly excavated behind the umbo, the postero-ventral one broadly convex, passing gradually into the ventral. Hinge margin short, straight. Hinge edentulous, short, roughly striated with horizontal lines. Resilifer submerged, placed within the margin, elongated, deeply impressed, finely striated and broadly notched above. The central part of the inner side of the shell ovately depressed, occupying one half of the antero-posterior diameter and circumscribed by the marginal pearly portion. Four muscle scars seem present; of these the uppermost one is situated just in front of and slightly lower than the resilifer, small and rounded, the lowermost two scars placed close together and also near the lower margin of the central area above cited, of these two the anterior one slightly larger than the posterior; probably another round and large scar differentiated from the preceding ones, indistinct, occupying the upper half of the area but very indistinctly defined dorsally.

Surface ornamented with concentric growth ridges and lines; the ridges rather regular, far apart, broad, rounded and prominent near the umbo, giving place toward the ventral margin to crowded and somewhat lamellose concentric lines. Inner margin smooth, sometimes undulated at the antero-dorsal portion.

A number of specimens have been examined, most of which are, however, more or less exfoliated. The shell appears to be moderately

variable in outline and convexity. This species is distinguished from *A. lineata* GABB⁽¹⁾ of California and *A. linensis* WHITEAVES⁽²⁾ from the Queen Charlotte Islands in being only concentrically sculptured; there are no radial lines perceptible even under a powerful lens. These two North American species were sometimes considered as conspecific with each other. They have crowded fine radial lines visible to the naked eye. *A. vancouverensis* GABB⁽³⁾ figured by WHITEAVES,⁽⁴⁾ a form appearing very closely related to the Japanese one, is usually more inequilateral and longer than the present one and has a marginal umbo. Moreover, the surface is described to have numerous, dense, sinuous, radial lines, though almost microscopic. A left valve, the holotype of this species, almost circular in outline with a large perforation is figured by STEWART.⁽⁵⁾

On the other hand, the present form is in the form of the shell, somewhat similar to *A. tellinoides* MORTON⁽⁶⁾ from the Upper Cretaceous of the Gulf region which is, however, more trigonal with a more produced umbo. *A. variata* STOL.⁽⁷⁾ from the Arrialur group of Southern India is distinguished from the new species in having a distinctly incurved dorsal margin.

A. pseudotruncata YABE and NAGAO⁽⁸⁾ from the Lower Cretaceous of the Santyû (Sanchû) Graben in the Kwantô Mountainland is usually smaller, more orbicular and, though very finely, radially sculptured.

(1) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 203, Pl. XXVI, fig. 193.

(2) J. F. WHITEAVES: Mesozoic Fossils, Vol. I, pt. 4, 1900, p. 301, pl. XXXIX, fig. 2.

(3) W. M. GABB: Paleontology of California, Vol. II, 1869, p. 202, pl. XXXIII, fig. 102.

(4) J. F. WHITEAVES: Mesozoic Fossils, Vol. I, pt. 2, 1879, p. 175, pl. XX, figs. 5, a-d.

(5) R. B. STEWART: GABB's California Cret. and Tert. Type Lamell. Op. cit., 1930, p. 65, pl. II, fig. 6.

(6) R. P. WHITFIELD: Brach. and Lamell. Raritan Clays and Greensand Marls. Op. cit., 1885, p. 43, p. IV, figs. 12, 13. S. WELLER: Rep. Cret. Paleont. N. J. Op. cit., 1907, p. 496, (in part), pl. LIV, fig. 15. L. W. STEPHENSON: Cret. Form. N. Carolina, pt. 1, Invert. Foss. Upper Cret. Form. North Carolina Geol. and Econ. Surv., Vol. V, 1923, p. 223, pl. LX, figs. 1-7.

(7) F. STOLICZKA: Cret. Fauna S. India, Pelecypoda. Op. cit., 1871, p. 479, pl. XLVIII, figs. 9-12.

(8) H. YABE and T. NAGAO, and S. SHIMIZU: Cret Moll. Sanchû Graben. Op. cit., 1926, p. 62, pl. XII, figs. 26, 27; pl. XIII, figs. 27, 28, 36, 37.

| Dimensions: | Length | Height |
|-------------|--------|--------|
| | 22 mm. | 20 mm. |
| | 20 | 18 |
| | 14 | 12.5 |
| | 10.5 | 10 |

There are two other flat specimens with the left-side margin rounded and the right-side margin subangulated. The marginal portion is provided with crowded lamellose concentric lines. Although the large opening observable in these shells is not impossibly due to an injury, these may be left or fixed valves of this species. (Pl. XVI (III), Fig. 17).

Localities and geological horizon: Takinosawa near the Kawakami Colliery, Sagalien, and the Omosirusibetu, a tributary of the Abesinai-gawa, province of Tesio; the Upper Ammonites beds.

Cuspidaria, NARDO.

Cuspidaria brevirostris nov. sp.

Pl. XVI (III), Figs. 7-9 a.

Shell moderately large, inflated, slightly longer than high, inequilateral; antero-dorsal part somewhat flattened and inclined abruptly toward the margin; antero-dorsal margin convex in the upper part, nearly straight in the lower one, inclining rather steeply and passing gradually, over the rounded anterior end, into the evenly and broadly convex ventral margin; postero-dorsal margin sloped rather slowly, distinctly excavated behind the umbo and straightened posteriorly. Anterior end narrowly rounded, the posterior portion of the shell produced into a rather short rostriform projection; postero-ventral margin straight and weakly concave at the origin of the produced portion which is distinctly separated from the flank by an excavation, its end abruptly and vertically truncated. Umbones subcentral, broad, prominent, curved inwards and backwards, the right one a little in advance of the left. Escutcheon long, narrow, deeply excavated and bounded by distinct ridges. Pallial sinus, as preserved on the cast, very broad and considerably deep, with its end reaching near the anterior end of the shell. Posterior adductor muscle scar distinct, deep, elongate-trigonal.

Surface ornamented with numerous, regular concentric lines and interspaces in alternation; concentric lines elevated, broad,

rounded on top, and the interspaces nearly as broad as the lines themselves. Inner side of the shell with numerous fine radial grooves.

| Dimensions | Length | Height | Thickness |
|------------|--------|--------|-----------|
| | 25 | 18 | 14 |
| | 19 | 15 | ? |
| | ?24 | 19 | ? |

Localities: an imperfect specimen with its test rather well preserved has been obtained from the Upper Ammonites beds of Saghalien. Three other specimens at hand have come from Hokkaidô, but the locality is uncertain at present, because the label has been lost. Some internal features are well preserved in one of them which is a cast.

The present species is closely similar to *C. jerseyensis* WELLER⁽¹⁾ from the Upper Cretaceous of New Jersey and Alabama which has been founded on a single internal cast and a less perfect specimen. The Japanese form is, however, distinguished from that American one by its more inflated shell with a narrower anterior margin and a more steeply inclined antero-dorsal margin. The posterior rostriform prolongation is more sharply defined in the species under consideration than in *C. jerseyensis*.

An internal cast from the Upper Greensand of England was figured by H. WOODS⁽²⁾ and provisionally referred to *C. pulchra* (Sow.). This specimen is somewhat akin to the present form, but has a less concave and longer postero-dorsal margin. The posterior portion of the shell passes more gradually into the middle part than in the Japanese species. The latter is higher than *C. detecta* (STOL.)⁽³⁾ from the Utatur group of Southern India and also differs from *C. mutua* (STOL.)⁽⁴⁾ of the Trichinopoly group by its more oblique shell with a more prominent umbo.

WHITEAVES reported a species of this genus, *C. suiensis* WHITEAVES,⁽⁵⁾ from the Vancouver Cretaceous. If this species is

(1) S. WELLER: Rep. on Cret. Pal. New Jersey. Op. cit., 1907, 534, Pl. LVIII, figs. 14, 15.

(2) H. WOODS: Cretaceous Lamell. England, Vol. II, p. 261, Pl. XLIV, fig. 1.

(3) F. STOLICZKA: Cretaceous Fauna of Southern India, Pelecypoda. Op. cit., p. 46, Pl. III, fig. 7.

(4) F. STOLICZKA: Ibid., p. 46, Pl. III, fig. 6.

(5) J. F. WHITEAVES: Mesozoic Fossils, Vol. I. pt. 5, 1903, p. 376, pl. LXVI, fig. 2.

generically determined with correctness, it is easily distinguished from the present form in being smaller, longer, and in having a smaller and less elevated umbo, a less excavated postero-dorsal margin, and a more horizontal antero-dorsal one.

Anthonya, GABB.

Anthonya apicalis nov. sp.

Pl. XV (II), Figs. 1-3.

Shell moderate in size, long, the length being about thrice the height, narrow, compressed, very thin, considerably inequilateral, somewhat curved upwards; anterior portion slightly convex from the umbo to the ventral margin, but tapering posteriorly; cardinal margin faintly concave, sub-horizontal but inclined backward and downward near the umbo, the ventral one broadly and rather evenly arched. Anterior margin almost vertical, slightly arcuate, and rounded below, the posterior one short, oblique backward and downward, and straight, forming an obtuse angle with the cardinal margin and a roundly acute angle with the ventral. Umbo sub-pointed, nearly terminal, small, rather elevated, with a nearly right angle. A distinct carina from the umbo to the postero-ventral angle, separating the concave postero-dorsal area from the flat flank. Lunule narrow, very deep, and bordered by acute ridges; no escutcheon. Test thin.

Hinge plate broad; left valve with two elongated divergent and oblique cardinal teeth; anterior muscle-scar deep, ovate, the posterior one unknown. A small deep pit occurs at the lower margin of the hinge plate, posterior to the anterior adductor muscle scar.

Surface ornamented with crowded, somewhat incremental concentric lines. Inner margin apparently smooth except the anterior portion which seems to be finely crenulated.

| | | |
|-------------|--------|--------|
| Dimensions: | Height | Length |
| | 13 mm. | 34 mm. |

A number of specimens have been obtained, most of which are more or less imperfect, some being represented by external and internal moulds. This species is distinguished from *A. subcantiana* NAGAO⁽¹⁾ of the Miyako Lower Cretaceous in being longer with a

(1) T. NAGAO: Cretaceous Mollusca from the Miyako District, Honshû, Japan. This Journal, Ser. IV, Vol. II, 1934, p. 222, pl. XXV, fig. 11; pl. XXX, figs. 6, 7.

finer ornamentation. The apical angle is a trifle smaller in that Lower Cretaceous form. *A. cantiana* WOODS⁽¹⁾ from the Gault of England and *A. lineata* KITCHIN⁽²⁾ of the Uitenhagen series of South Africa are shorter and less inequilateral than the present species, and *A. sp.* described and figured by WOODS⁽³⁾ from the Lower Greensand of England is as long as ours, but it has a longer anterior side than the latter. *A. cultriformis* GABB,⁽⁴⁾ the genotype, from the Chico of California is a closely similar species. This California form seems to be distinguished in being a little shorter with a more arched ventral margin.

Locality and geological horizon: the Ponhorokabetu-zawa, Poronai near the Ikusyumbetu Coal-mine, province of Isikari; the Trigonina Sandstone.

Anthonya ensiformis nov. sp.

Pl. XV (II), Figs. 4-8.

Shell large, much elongated, blade-shaped, curved upwards, very thin, compressed, and thin-tested. Dorsal margin slightly concave, nearly horizontal, the ventral one broadly arched and subparallel with the cardinal one. Anterior end curved upward, acutely pointed above, the posterior one not preserved but apparently truncated a little obliquely by a rather long straight margin. Umbo terminal, pointed, and prominent with a very acute angle; posterior umbonal carina seemingly distinct, as far as can be judged from the inner mould. Antero-ventral end not produced, inclining obliquely backward and downward and gradually continued with the ventral. Lunule narrow, elongated, and deep.

Hinge plate broad, with two elongated oblique teeth; anterior adductor muscle scar ovate, deep; a small, deep, circular pit occurs behind the preceding and near the lower margin of the hinge plate. Inner margin apparently smooth.

(1) H. WOODS: *Cretaceous Lamellibranchiata of England*, Vol. II, p. 130, pl. XIX, figs. 4, 5.

(2) F. L. KITCHIN: *Invert. Fauna Pal. Rel. Uitenhagen Ser. Ann. S. Afr. Mus.*, Vol. VII, 1908, p. 137, pl. VII, figs. 7, 8.

(3) H. WOODS: *Cret. Lamell. England*, Vol. II, p. 131, pl. XIX, fig. 6.

(4) W. M. GABB: *Paleontology of California*, Vol. I, 1864, p. 182, pl. XXX, figs. 236, 236 a. R. B. STEWART: *GABB's California Cretaceous and Tertiary Type Lamellibranchs*. *Op. cit.*, p. 148, pl. IV, fig. 5.

Surface with crowded fine concentric lines.

| | | |
|-------------|--------|----------|
| Dimensions: | Height | Length |
| | ca. 16 | 50 + mm. |

There are at hand a number of imperfect specimens of this species, most of them are represented by internal and external moulds, sometimes with only a small part of the test preserved. At first sight the present form recalls some species of *Gervillia* or *Cultellus* especially such species as *G. forbesiana* D'ORB. This fossil is characterized by its very long and distinctly upwardly curved shell, with a prominent terminal umbo. It is larger, much longer, and more curved, with a longer posterior margin than the preceding species. The apical angle is smaller and the anterior margin inclined downward and backward, with the antero-ventral end not produced.

The present species seems to be related to *A. elongata* WOODS⁽¹⁾ of the Upper Cretaceous of New Zealand, but is distinguished in being more curved upwards especially in the anterior portion and more inequilateral, the umbo being situated terminally.

Locality and geological horizon: The Trigonon Sandstone exposed at the eastern wing of the Ikusyumbetu anticline and along the Ikusyumbetu-gawa, province of Isikari.

Lucina, BRUG.

(*Myrtea*, TURTON)

Lucina (*Myrtea*) *ezoensis* nov. sp.

Pl. XVI (III), Figs. 4-6 a.

1890. *Lucina* cf. *fallax* YOKOYAMA: Versteinerungen aus der japanischen Kreide. Palaeontographica, Vol. XXXVI, p. 176, Pl. XVIII, fig. 9.

Shell rather small, somewhat pentagonally ovate in outline, slightly longer than high, subequilateral, moderately convex from the umbo toward the ventral margin, compressed and attenuated both anteriorly and posteriorly; antero-dorsal margin nearly horizontal, slightly excavated beneath the umbo, convex in the anterior length; postero-dorsal margin straight, inclined backward and downward; ventral margin broadly and evenly curved, passing gradually

(1) H. WOODS: Cret. Fauna North-eastern Part of the South Island of New Zealand. New Zealand Geol. Surv., Pal. Bull., No. 4, 1917, p. 29, pl. XV, figs. 11-13; pl. XVI, figs. 1-3.

into the anterior one which is arcuate and slightly oblique; antero-dorsal end a little produced and rounded along the margin; posterior end vertically truncated by a straight and rather long margin which forms an obtuse angle with the ventral. Umbones small, subcentral, not prominent, with a round posterior umbonal angle running from it to the postero-ventral end, the surface behind this angle compressed and flattened; anterior umbonal angle not well defined, antero-dorsal area bordered by a distinct groove which originates from the umbo and runs to the antero-dorsal end. Lunule small, very short, deep, bounded by sharp ridges. Ligamental groove deeply depressed; escutcheon well defined. Test relatively thin.

Surface with numerous, prominent and widely spaced concentric lamellae and flat interspaces in alternation, the latter having a few fine concentric lines. These lamellae prolonged on the ridge at the anterior margin of the escutcheon and also near the antero-dorsal margin. The lamellae and lines distinctly wavy on crossing the groove near the anterior margin.

A few specimens have been examined. One from the Obirasibe district in the province of Tesio is well preserved and accordingly selected as the holotype. However, the inner features are not observable in it. One of the two specimens collected in the Abesinai district which are considered conspecific with the holotype, shows some of the inner features impressed on a cast of the right valve. In this specimen, the lunule is very deeply impressed and very short and the hinge plate narrow, with a distinct and more or less elongated anterior lateral tooth. The posterior cardinal is narrow and slightly oblique backward. The socket in front of the posterior cardinal is also narrow and separates the latter from the anterior margin. The anterior cardinal is apparently obsolete. Anterior adductor muscle scar narrow, elongated, and the pallial line rather distant from the shell margin. The inner margins are smooth. The inner surface has numerous fine radial lines which are distinctly preserved on the cast.

| Dimensions: | Height | Length | Thickness |
|------------------------------|--------|--------|-----------|
| Holotype | 24 | 21 | 9 |
| One of the paratypes | 28 | 22 | ? |
| „ | 16 | 14 | ? |

This species is very common in the Upper Ammonites bed of Hokkaidô and the equivalent deposits of Saghalien. A small imper-

fect specimen was described some forty years ago by Prof. YOKOYAMA from the Upper Ammonites bed of Urakawa, province of Hidaka, Hokkaidô, and referred to *L. fallax* FORBES⁽¹⁾ of Southern India. It is most probably conspecific with the present species, for other small specimens specifically identical with the latter have been collected from the same locality.

The Indian species, though widely variable in outline according to STOLICZKA, is usually more orbicular with a more prominent anterior lateral tooth than the Japanese form. In the former, the posterior lateral tooth is also well developed and the cardinal teeth number two. The present species seems to be most closely related to *Myrtea*. *L. glebula* CONRAD,⁽²⁾ from the Upper Cretaceous of North America placed by STEWART⁽³⁾ under *Myrtea* with some doubt, is similar to ours, but it differs therefrom in being slightly longer and in having an angulated anterior end and two right cardinal teeth. *M.? gabbi* STEWART⁽⁴⁾ (*L. subcircularis* GABB)⁽⁵⁾ of the Chico of California is, though very imperfect, doubtless an allied form. *L. canterburensis* WOODS⁽⁶⁾ from the Upper Cretaceous of New Zealand is related to the Japanese form, being distinguished by the straighter antero-dorsal margin, the less sharply truncated posterior end, and the ornamentation with more distant concentric lamellae.

L. cf. occidentalis MORTON reported from the Senonian Himenoura group of the Islands of Amakusa, Kyûsyû,⁽⁷⁾ is transversely more elongated than the new species under consideration. *L. kotoi* NAGAO⁽⁸⁾ of the Lower Cretaceous of the Miyako district in Honsyû is smaller and thinner.

Localities and geological horizon: the specimen figured by YOKOYAMA was obtained at Urakawa, province of Hidaka. A few other

(1) F. STOLICZKA: Cret. Fauna Southern India, Pelecypoda. Op. cit., p. 256, pl. XIII, figs. 13, 15-17; pl. XIV, figs. 3-5, 7, 8.

(2) L. W. STEPHENSON: Cret. Form. N. Carolina, pt. 1, Invert. Foss. Upper Cret. Form. Op. cit., 1923, p. 279, pl. 69, figs. 4-6.

(3) R. B. STEWART: GABB's California Cretaceous and Tertiary Type Lamellibranchs. Op. cit., p. 187.

(4) R. B. STEWART: Ibid. p. 188, pl. 5, fig. 2.

(5) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 176, pl. 24, fig. 160.

(6) H. WOODS: Cret. Faunas N-E. Part S. Island, N. Z. Op. cit., p. 30, pl. XVI, figs. 4, 5.

(7) T. NAGAO: On Some Cret. Foss. Island of Amakusa, Kyûshû, Japan. This Journal, Ser. IV, Vol. I, 1930, p. 19, pl. II, fig. 8.

(8) T. NAGAO: Cret. Moll. Miyako District, Honshû, Japan. This Journal, Ser. IV, Vol. IV, 1934, p. 226, pl. XXIX, figs. 5, 6.

specimens have come also from the same district. The other localities are: the middle course of the Obirasibe-gawa, and the upper course of the Abesinai-gawa, both in the province of Tesio; Sanu-sube, Nakahobetu, province of Iburi. These localities are in Hokkaidô. Aton, Sisuka-mati, Saghalien. The Upper Ammonites bed.

Tellina, LINN.

Tellina sp. indet.

Pl. XVI (III), Fig. 11.

There is in our possession a right valve of a *Tellina*, which shows only the inner side of the shell.

Shell rather small, transversely oblong-ovata, nearly equilateral; test thin. Dorsal margins subequal in inclination, the antero-dorsal one a little arched and the postero-dorsal nearly straight; basal margin faintly convex and slightly elevated posteriorly. Anterior margin narrowly rounded and the posterior one subtruncated or narrowly rounded. Umbo apparently subcentral, not prominent.

Anterior adductor muscle scar oblong, the posterior one ovate in form; pallial sinus very deep, rounded at the end and nearly horizontal. Hinge weathered. Surface being inaccessible, the ornamentation unknown.

| | | |
|-------------|--------|--------|
| Dimensions: | Length | Height |
| | 31 mm. | 19 mm. |

The generic or subgeneric position of this species is uncertain, since the hinge teeth and the ornamentation are not available. It is somewhat akin to *T. equilateralis* MEEK and HAYDEN⁽¹⁾ of the Upper Cretaceous of the Upper Missouri, though it has a narrower anterior end and a less arched ventral margin, as far as we can refer to MEEK's figures of that American species.

T. parilis GABB⁽²⁾ from the Chico Cretaceous of California may be distinguished by its more oval outline of the shell with a more arched ventral margin. The California species seems to have the

(1) F. B. MEEK: Rep. Inv. Cret. and Tert. Foss Up. Miss. Co. Rep. U. S. Geol. Surv. Terr., Vol. IX, 1876, p. 196, pl. XXXIX, figs. 5, a-c.

(2) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 160, Pl. XXX, fig. 243. R. B. STEWART: GABB's Cal. Cret. and Tert. Lamell. Op. cit., 1930, p. 203, pl. I, fig. 11.

posterior end slightly broader than the anterior one. *T. ashburnerii* GABB⁽¹⁾ appears to be more closely similar to the new species, though its posterior end is more evenly rounded than in the latter.

Locality and geological horizon: the Ponhorokabetu near the Yûbari Coal-mines, province of Isikari; the Trigonía Sandstone.

Dentalium, LAM.

Dentalium cooperi GABB var.

exoense nov. var.

Pl. XV (II), Figs. 12-14.

Shell, when full grown, rather large, moderately curved near the small end, almost straight at the larger portion; cross section circular; test very thick at the middle and at the smaller end; gradually tapering toward the end.

Surface smooth to the naked eye except for crowded fine lines of growth which are slightly oblique to the axis of the shell; under a magnifying lens there is perceptible a faint and very minute reticulation formed by the lines of growth and numerous, crowded very minute longitudinal impressed striae which are finer and fainter than the lines of growth themselves. Smaller portion showing no longitudinal striae even viewed with a lens.

One of the better fragments attains 35 mm. in length, 4 mm. and 6 mm. in diameter at the larger and smaller ends respectively. Another large fragment measures 57 mm. long and 7.5 mm. wide.

The specimens under consideration are very closely similar to *D. cooperi* GABB⁽²⁾ from California and the specimen reported by WHITEAVES⁽³⁾ from the Vancouver Cretaceous and referred to the same species. WHITEAVES placed that form under *Entalis*. Since the specimens from Japan do not preserve the posterior extremity, their reference to *Entalis* is of course very doubtful. However, the Japanese form does not seem to differ much from the North American species, so that the writer is inclined to regard the former as con-

(1) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 159, pl. XXIII, fig. 139.

(2) W. M. GABB: Ibid., Vol. I, 1864, p. 139, Pl. XXI, fig. 100.

(3) J. F. WHITEAVES: Mesozoic Fossils, Vol. I, pt. 2, 1879, p. 134, pl. XVI, figs. 10, 10 a; pt. 5, 1903, p. 372.

specific with or closely related to the latter. The shell tapers more gradually, with finer longitudinal striae than the American form.

Localities and geological horizon: the Abesinai-gawa, province of Tesio, and another larger specimen from the Umpei-sawa, a tributary of the Uryû-gawa, Rûtaka-gun, Saghalien. The Upper Ammonites bed.

Dentalium otatumei nov. sp.

Pl. XV (II), Figs. 11, 11 a, 11 b.

Shell slender, small, rather rapidly increasing in diameter near the smaller end, slightly curved, with a circular cross section. Test relatively thin.

Surface ornamented with 16 primary longitudinal ribs separated by much broader interspaces; number of these ribs increased to double by the intercalation of one or, very rarely, two fine longitudinal lines between them. Toward the larger end, the surface with more than 30 ribs nearly equal in strength and distance, the secondary ones becoming broader and only faintly weaker than the main ribs.

A few fragmental specimens have been collected, none of which perfectly preserves the extremities. This species seems closely akin to *D. stramineum* GABB⁽¹⁾ from the Cretaceous of California, *D. gracile* HALL and MEEK⁽²⁾ from the Fort Pierre group, and *D. nana-moensis* MEEK⁽³⁾ from the Nanaimo group of the Vancouver region. These three North American forms are very closely similar to one another and WHITEAVES suspected their being geographical and varietal forms of *D. decussatum* SOW.⁽⁴⁾ of Europe. The last species is distinguished from the Japanese form in being much larger, more prominently curved, and more rapid in tapering. In the European form the surface is more distinctly ornamented with longitudinal ribs. The American species above cited differ from one another

(1) W. M. GABB: Paleontology of California, Vol. I, 1864, p. 139, pl. XXI, fig. 101.

(2) F. B. MEEK: Rep. Invert. Cret. and Tert. Foss. Op. cit., 1876, p. 263, pl. XVIII, figs. 13, a-d.

(3) J. F. WHITEAVES: Mesozoic Fossils, Vol. I, pt. 2, 1879, p. 133, pl. XVI, figs. 9, a, b; pt. 5, 1903, p. 372.

(4) A. D'CRBIGNY: Pal. Franç. Terr. Crét., p. 440, pl. CCXXXVI, figs. 1-6. J. S. GARDNER: On the Cretaceous Dentalidae. Quart. Jour. Geol. Soc., 1878, p. 58, pl. II, figs. 1-12.

in several, though unimportant, features. *D. stramineum* is stated to bear thirty rounded primary ribs, and, moreover, seems to be larger and less curved than the present specimen. *D. gracile* appears distinct from the Japanese form in having 14, more prominent ribs, while *D. nanaimoense* seems to be more slender, as far as the figures given by WHITEAVES indicate. This last one is described as bearing 16 primary ribs as in the present species.

On the other hand, *D. alternans* MÜLLER⁽¹⁾ from the Cretaceous of Aix la Chapelle and *D. medium* Sow.,⁽²⁾ a widely distributed European Cretaceous species, are also similar in many features to the present species. *D. crassulum* STOL.⁽³⁾ of the Indian Cretaceous seems another allied form, but it differs in being larger and in bearing 11 primary ribs.

D. ashiyaensis NAGAO⁽⁴⁾ from the Ashiya formation of Kyûsyû (Kyûshû) is larger and has much more numerous primary ribs than the form under consideration.

Locality and geological horizon: the Ponporokabetu near the Yûbari Coal-mines, province of Isikari; the uppermost part of the Trigonina Sandstone or the basal part of the Upper Ammonites bed.

The specific name is in honor of Mr. K. ÔTATUME, geologist of the Tankô Kisen Co., who donated numerous fossils to the present writer for examination.

POSTSCRIPT

In a recent number of the Journal of the Geological Society of Japan (Vol. XLV, No. 532) which the writer received during the course of the printing of this article, Mr. T. MATUMOTO described a species of *Anthonya*, *A. japonica* nov. (p. 16, text-fig. 6), from the Gosyonoura (Goshonoura) group of Kyûsyû and stated that some conspecific specimens had been collected also from the Trigonina Sandstone of Hokkaidô (p. 25). Hence the specific name *Anthonya ensiformis* nov., proposed in this article (p. 135), must be replaced by *A. japonica* MATUMOTO.

(1) E. HOLZAPFEL: Moll. d. Archener Kreide. Palaeontolgr., Vol. XXXIV, 1888, p. 178, pl. XX, figs. 7, 8.

(2) H. B. GEINITZ: Elbthalg. Sachsen, pt. 2, mittl. u. obere Quader. Palaeontogr., Vol. XX, 2, 1872, 1875, p. 178, pl. XXX, figs. 3, 4. NEOTLING: Fauna d. balt. Cenom.-Gesch. Pal. Abh., Vol. II, pt. 4, 1885, p. 36, pl. VII, figs. 1-1 a.

(3) F. STOLICZKA: Cret. Fauna S. India, Gastrop., p. 444, pl. XXVII, fig. 21.

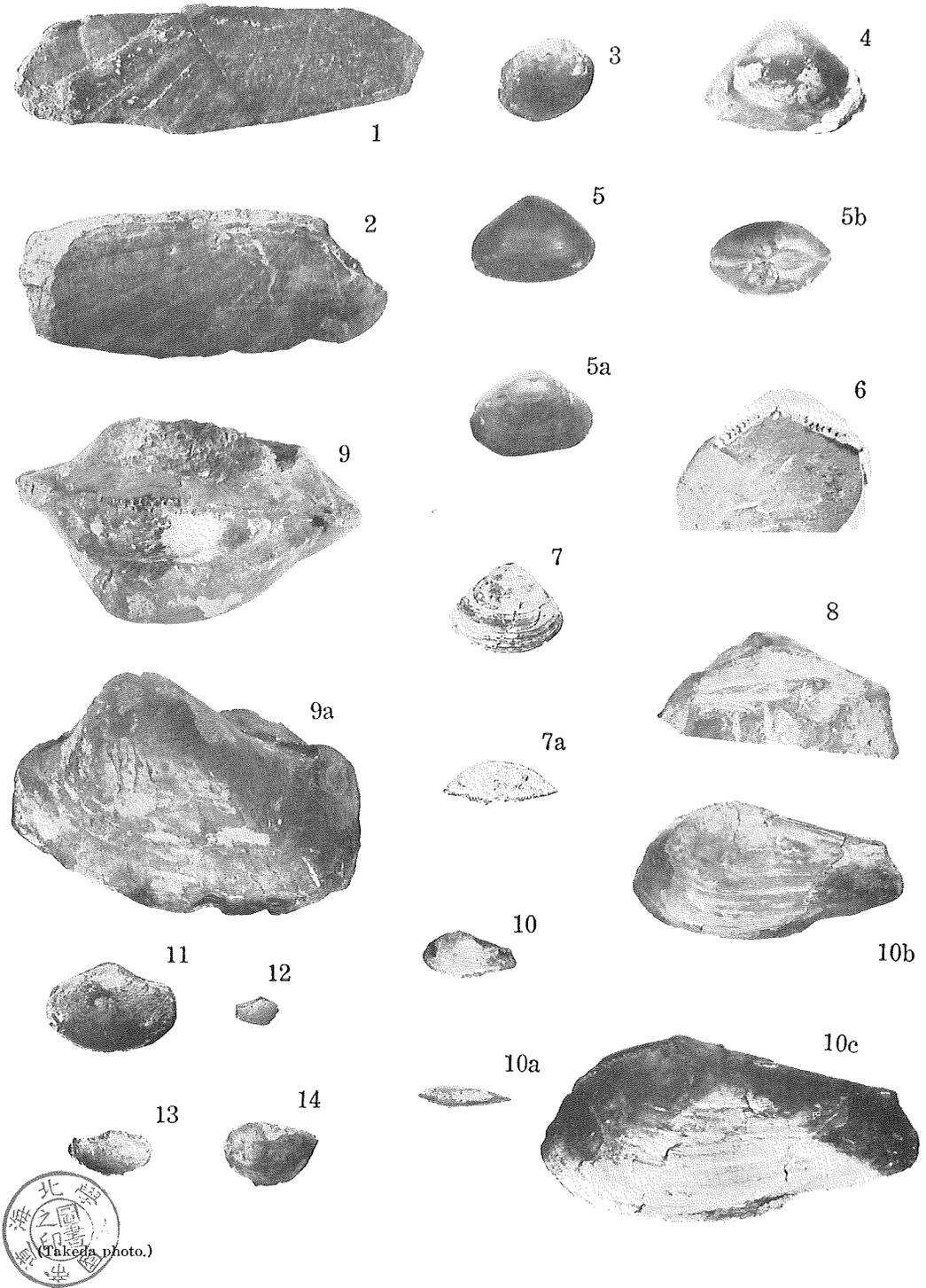
(4) T. NAGAO: Palaeogene Fossils of the Island of Kyûshû, Japan, pt. 2. Sci. Rep. Tôhoku Imp. Univ., 2nd Ser., Vol. XII, 1923, p. 88, pl. XIV, figs. 38-44.

Plate XIV (I)

PLATE XIV (I)

The figures are of natural size, unless otherwise stated.

- Figs. 1, 2. *Solemya* cf. *angusticaudata* NAGAO. Pombetu near the Ikusyumbetu Coal-mine, province of Isikari. The Lower Ammonites Beds.
- Fig. 3. *Nucula formosa* NAGAO. The middle course of the Obirasibe-gawa, province of Tesio. The Upper Ammonites Beds.
- Figs. 4-8. *Nuculana (Ezonuculana) mactraeformis* NAGAO. 4, the Wakkawenzawa, a tributary of the Abesinai-gawa, province of Tesio; internal mould (one of the syntypes), showing the pallial line without the sinus, $\times 2$. 6, inner side of a right valve, showing the hinge, from the Nigori-kawa, a tributary of the Abesinai-gawa, $\times 2$. 5, the Kawakami district, Saghalien. 7, 8, the Urakawa district, province of Hidaka. 8, inner side of a left valve, showing the hinge, $\times 3$. The Upper Ammonites Beds.
- Figs. 9, 9a. *Parallelodon (Nanonavis?)* sp. Omosirusibetu, a tributary of the Abesinai-gawa, province of Tesio. The Upper Ammonites Beds.
- Figs. 10, 10a, 10b, 10c. *Nuculana sambonsugii* NAGAO. Urakawa-mati, province of Hidaka. 10b, showing the ornamentation, $\times 3$. 10c, showing the oblique lines, $\times 4$. The Upper Ammonites Beds.
- Figs. 11-13. *Yoldia* sp. b. Asahi-mati, Yūbari-mati, province of Isikari. Three internal moulds. 11, $\times 2$. The basal part of the Upper Ammonites Beds?
- Fig. 14. *Yoldia* sp. a. An imperfect left valve. The eastern wing of the Ikusyumbetu Cretaceous anticline, province of Isikari. The Trigonía Sandstone.



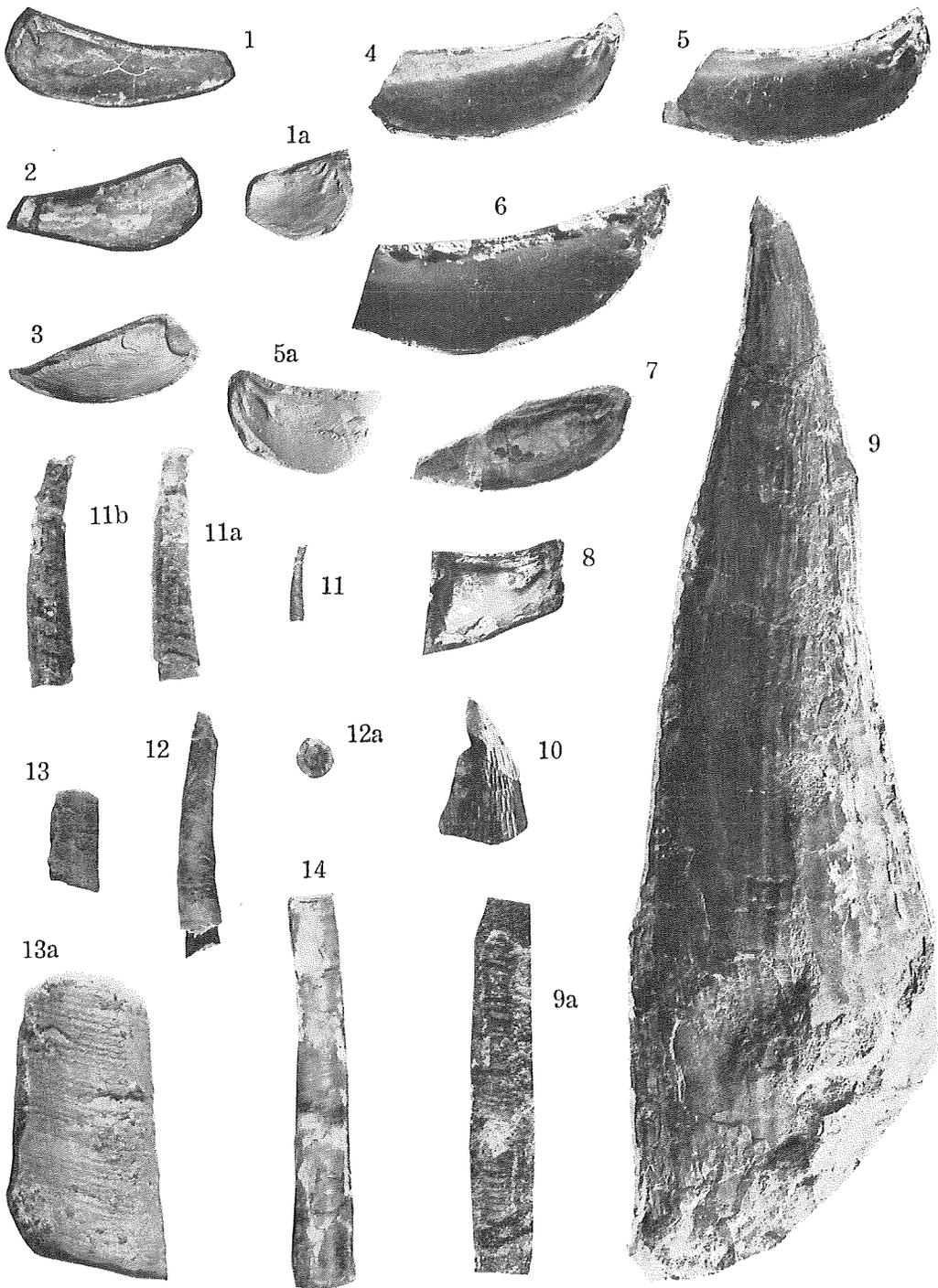
S. Nagao: Cretaceous Fossils.

Plate XV (II)

PLATE XV (II)

The figures are of natural size, unless otherwise stated.

- Figs. 1-3. *Anthonya apicalis* NAGAO. The Ponhorokabetu-zawa, Poronai near the Ikusyumbetu Coal-mine, province of Isikari. 1a, artificial mould of the umbonal portion of the specimen 1. The Trigonía Sandstone. 3, artificial external mould, showing the ornamentation.
- Figs. 4-8. *Anthonya ensiformis* NAGAO. The eastern wing of the Ikusyumbetu Cretaceous anticline, Ikusyumbetu, province of Isikari. 5a, artificial external mould of the umbonal portion of the specimen 5. 7, 8, internal views. The Trigonía Sandstone.
- Figs. 9, 9a. *Pinna saitoi* NAGAO. The Ponhorokabetu, Yûbari Coal-mines. 9a, an interspace between two ribs, showing fine concentric lines, $\times 5$. The Trigonía Sandstone.
- Fig. 10. *Pinna* cf. *saitoi* NAGAO. Near the Saku Primary School, Nakagawagun, province of Tesio. The Upper Ammonites Beds.
- Figs. 11, 11a, 11b. *Dentalium otatumei* NAGAO. The Ponhorokabetu, the Yûbari Coal-mines, province of Isikari. 11a-b, two different views, $\times 3$. The basal part of the Upper Ammonites Beds?
- Figs. 12-14. *Dentalium cooperi* GABB var. *ezoense* NAGAO. 12, 13, the Abesinai-gawa, province of Tesio. 14, the Umpei-zawa, a tributary of the Uryû-gawa, Saghalien. 13a, $\times 3$. The Upper Ammonites Beds.



T. Nagao : Cretaceous Fossils.

Plate XVI (III)

PLATE XVI (III)

The figures are of natural size, unless otherwise stated.

- Figs. 1, 2. *Pecten* (*Syncyclonema* ?) sp. aff. *obovatus* STOL. Pombetu near the Ikusyumbetu Coal-mine, province of Isikari. The Lower Ammonites Beds.
- Fig. 3. *Pecten* (*Propeamusium*) *cooperi* WARING var. *yuburensis* YABE and NAGAO. Urakawa-mati, province of Hidaka, $\times 3$. The Upper Ammonites Beds.
- Figs. 4-6. *Lucina* (*Myrtea*) *ezoensis* NAGAO. 4, the middle course of the Obirasibe-gawa, province of Tesio (the type). 5, Sanusube, Nakhobetu, province of Iburi. 6, 6a, two artificial external moulds of a specimen from the upper course of the Abesinai-gawa, province of Tesio. The Upper Ammonites Beds.
- Figs. 7-9a. *Cuspidaria brevirostris* NAGAO. 7 (the type), the Kawakami Colliery, Toyohara-gun, Saghalien; the Upper Ammonites Beds. 8, 9, the Tômatu-zawa, Ikusyumbetu, province of Isikari? The Trigonía Sandstone?
- Figs. 10-10b. *Ostrea tesioensis* NAGAO. Ômagari along the Abesinai-gawa, province of Tesio. The Upper Ammonites Beds.
- Fig. 11. *Tellina* sp.. The Ponorokabetu, the Yûbari Coal-mines. The Trigonía Sandstone.
- Figs. 12-17. *Anomia subovalis* NAGAO. 12 (the type), 14, 15, 17, Takinosawa near the Kawakami Colliery, Saghalien. 17, right valve? $\times 3$. 13, 16, the Omosirusibetu, a tributary of the Abesinai-gawa, province of Tesio. The Upper Ammonites Beds.

