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ON SOME OLIGOCENE MOLLUSCAN FOSSILS FROM HOKKAIDO, JAPAN

By

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(With 2 plates)

Contributions from the Department of Geology and Mineralogy, Faculty of Science Hakkaido University. No. 761

This short note presents descriptions of some gastropod species of the molluscan fauna from Onbetsu, Shitakara formation in the Kushiro coal field, and Poronai, Momijiyama formation in the Ishikari coal field, Hokkaido, which are thought to belong to the Oligocene age.

The stratigraphical positions and faunal contents of these formations have been studied by many stratigraphers and palaeontologists. Formerly the Onbetsu formation was correlated by many authors to the Poronai and Momijiyama formations, while the Urahoro group, including the Shitakara formation in its upper part, to the upper part of the Ishikari group. Moreover, this latter group and the Urahoro group had been commonly believed to be unconformably overlain by the Poronai and Onbetsu formations.

Recently, Hisakatsu YABE (1951) held a view, that the Ishikari group may be almost contemporaneous with the Poronai formation. Kiyoshi ASANO (1950) assumed the lower half of the Poronai formation to be equivalent with the middle and upper part of the Ishikari group, on the basis of his studies of the smaller foraminiferal remains.

Masao MINATO and others (1952), including the present writer himself, also recognized the close relationship between the molluscan faunal contents of the Onbetsu formation, Urahoro group (especially of Shitakara formation) and Poronai formation. They stated their opinions, that the Poronai molluscan fauna may have already appeared in the Urahoro group in the Kushiro coal field.

Describing the general contents of the molluscan fauna of these Oligocene formations, Hidezo Takeda (1953) stated that these formations may be generalizable as the "Poronai formation" and that their fossil fauna may be called "Poronai fauna".

Nevertheless, detailed faunal studies of these formations were not complete. The writer (1958) has made clear some species of Genus

Neptunea which have been collected from various horizons of the Palaeogene formations in the Kushiro coal field. Moreover, with the need in mind for more precise correlations and better understanding of these formations, the writer has undertaken a detailed study of the faunal succession of these strata. Accordingly, the writer recognizes, besides many species which continue throughout these formations, as previously reported and newly ascertained, also some species which are found in only restricted horizons.

The following conspicuous molluscan species are found commonly in the Shitakara, Onbetsu and Poronai formations, namely, *Yoldia laudabilis, Y. sobrina, Portlandia watasei, Conchocele bisecta, Periploma besshoensis, Venericardia expansa, Venericardia elliptica, Venericardia ezoensis, Macoma* cf. *sejugata, Turritella poronaiensis, Scaphander multistriata,* etc.

As for the Kushiro coal field, some characteristic species are recognizable in the Shitakara formation. They are *Nemocardium ezoense, Chlamys kushiroensis, Neptunea shoroensis, Neptunea huruhatai, Molopophorus kushiroensis, M. shitakarensis, Epitonium* (*Boreoscala*) *yamamotoi, Turricula shitakarensis,* etc.

On the one hand, the Onbetsu formation is characterized by *Acila* (*A.*) *vigilia, Malletia poronaica, Propeamusium kushiroensis, Trochocerithium wadanum, Neptunea subcarinata, Ancistrolepis japonicus, Neopsephaea antiquior, Turricula sakhalinensis, Antiplanes rugosa, Epitonium* (*Gyroscala?*) *poronaiensis* and *Olivella ezoana.*

Moreover, *Neptunea dispar, Scaphander ezoana, Tudicula japonica* and *T. ishiii* may be characteristic species which are restricted to the upper part of the Onbetsu formation.

These data may be interpreted not only as providing material on palaeoecological conditions but also on the faunal succession of these horizons. It may be possible on the basis of the succession of mollusca to establish a zoning by further detailed studies.

As one step to analyse the fauna of these formations, the writer wishes in this short note to describe the following 11 species. Of them 9 species are new to science.

Here the writer wishes to express his sincere thanks to Prof. Masao MINATO of the Department of Geology and Mineralogy, for his kind guidance during these investigations. Further the writer would offer his thanks to Messrs. Satoru UOZUMI, Tsutomu FUJIE and Jiro ISHII of this Department, and to Mr. Toshio YAMAMOTO, a geologist of the Meiji Coal Mining Company, Messrs. Nagaharu SHIGEMOTO, Masayuki AOKI, geologists of Yubetsu Coal Mining Company, for their kind sharing

species	*geological horizon*
Epitonium (*Gyroscala ?*) *poronaiensis* Matsui n. sp.	Poronai formation, Onbetsu formation
E. (*Cirsotrema*) *ezoensis* Matsui n. sp.	Shitakara formation
E. (*Boreoscala*) *yamamotoi* Matsui n. sp.	Shitakara formation
E. sp.	Shitakara formation
Olivella ezoana Matsui n. sp.	Onbetsu formation, Poronai formation
Molopophorus shitakarensis Matsui n. sp.	Shitakara formation
Tudicula ishiii Matsui n. sp.	Onbetsu formation
Turricula shitakarensis Matsui n. sp.	Shitakara formation
Spirotropis (*Antiplanes*) *yubetsuensis* Matsui n. sp.	Onbetsu formation
Scaphander multistriata (Takeda)	Shitakara, Onbetsu and Poronai formation
Scaphander ezoana Matsui n. sp.	Onbetsu, Poronai and Momijiyama formation

of information connected with this study.

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Description of Species

Family EPITONIIDAE

Genus *Epitonium* (*"Bolten"*) ROEDING, 1798

Genotype. *Epitonium pretiosum* (LAMARCK)

Subgenus *Gyroscala* de Boury, 1877

Subgenotype. *Epitonium commutatum* (MONTS.)

Epitonium (*Gyroscala ?*) *poronaiensis* MATSUI n. sp.

Pl. I, Figs. 1, 2.

Shell medium-sized, tall; moderately thin; whorls well-rounded; greatest convexity slightly above the center of whorl; suture moderately deep; whorls about 6 (nuclear whorls missing in all specimens at hand); axial sculpture of latter whorls consisting of about 10, thin, somewhat recurved and regular-sized varices. Varices are rather obliquely subparallel to left side of shell, equidistant from one another, continuous whorl to whorl, and callus not prominent. The interspaces between varices are slightly concave, 3 or 4 times as broad as the varices; no spiral rib

or striae present. In the type specimen, basal part of body-whorl missing, but in one specimen of paratype, basal disk present, limited by a strong, peripheral, continuous keel. Anterior part of the body whorl unfortunately missing in all specimens at hand.

Dimensions.—Diameter of holotype, 14.5 mm., Height, 41.7 mm., whorls (incomplete) 6.

Occurrences.—Poronai formation: Middle course of Pankemaya zawa, Yubari city, Ishikari Province. (300 m. above the base of formation). Collect. Satoru UOZUMI. Onbetsu formation: Kamishoro, Shiranuka machi, Kushiro Province.

Repository.—Holotype, U. H. Reg. No. 13311 (U. H.—Dept. Geol. Min. Fac. Sci., Hokkaido Univ., Sapporo.); paratype, 13312.

Remarks. Only 5 incomplete specimens of this form are at hand. This form with 10 varices, strongly peripheral keel, no spiral rib, is very distinctive among the recent and tertiary species of Japan. This species seems to belong in subgenus *Gyroscala* on the basis of its general characteristics, but better material is needed to determine anything more definite.

Epitonium (*Gyroscala*) *effingeri* DURHAM (1937) is a comparable species but the present species is specifically different in rather strong varices and prominent basal keel.

Subgenus *Cirsotrema* MÖRCH, 1852

Subgenotype. *Epitonium varicosum* (LAMARCK)

Epitonium (*Cirsotrema*) *ezoensis* MATSUI n. sp.

Pl. I, Figs. 3, 4, 5.

Shell of moderate size, thick and massive, high-truncated; whorls well-rounded, closely coiled; nuclear whorls lost in all specimens at hand; number of whorls uncertain, probably about 7 or more; each whorl nearly semicircular in outline, relatively low, its height sometimes less than two-thirds its width; separated by distinct impressed sutures from the next higher or lower whorls. Each whorl crossed by 12 to 14 strongly reflexed varices varying from thin to heavy. The varices reflected posteriorly, bending slightly back as they leave the suture and then straightening out to form a slight coronating point just below the suture. The interspaces between the varices rather flat, nearly four times as wide as the base of varices, and ornamented with faint spiral ribs.

The base of the body whorl slightly angulated almost forming a basal

keel. Aperture slightly ovate; outer lip thickened by last varix; inner lip with callus of same width as outer lip on lower portion.

Dimensions.

	Height	Diameter	Apical angle
Holotype	31 mm. (Upper part missing)	18 mm.	24°
Paratype	39 (,,)	17	24°
,,	25.5 (,,)	12.5	23°

Occurrences.—Shitakara formation: Shitakara-gawa, 2 km. upstream from the Yubetsu coal mine; Kamishoro, Shiranuka machi, Kushiro Province.

Repository.—Holotype, U. H. Reg. No. 13315; paratype, U. H. Reg. No. 13313, 13316.

Remarks. Only 4 specimens of this form are at the writer's disposal for study. All of them are characteristic in respect to numerous fairly spiral ribs, 12 to 14 prominent varices and slightly angulated basal keel. The indications are that these specimens may belong to subgenus *Cirsotrema*, and may be specifically distinguishable from all hitherto known forms.

This species is closely related to *Epitonium* (*Cirsotrema*) *saundersi* TEGLAND (1933), reported from the Oligocene of the West Coast of North America. But this form is distinguishable from the latter, in that the varices are thin, and the interspaces between the varices are ornamented with numerous adjacent spiral ribs, while the latter has rather heavy varices and 3 spiral sculptures on the region of greatest convexity.

Epitonium hospitum NAGAO (1928) and *Epitonium submaculosum* NAGAO (1928) from the Palaeogene of Kyushu, Japan, are also allies of the present species in general outlines, but they have a larger apical angle and less numerous varices.

Epitonium (*Boreoscala*) *nagaminensis* OTUKA (1934) from the Miocene of northwestern Iwate, Japan, is of the same category as the present form, as far as its outer form is concerned, but the former has a small and less numerous spiral threads. The new species has a more massive shell and slightly angulated basal keel.

Subgenus *Boreoscala* KOBELT, 1902

Subgenotype. *Epitonium greenlandicum* (PERRY)

Epitonium (*Boreoscala*) *yamamotoi* MATSUI n. sp.

Pl. I, Figs. 6a, 6b, 7a, 7b.

Shell of moderate size, strong; apical angle about 24°; whorls 6 (incomplete), each whorl rather inflated, its height being a half of its width; sutures fairly deep; about 14 varices on the ultimate whorls, crossed by 10 or more slightly-elevated spirals, with wide interspaces occupied by secondary and tertiary spiral striae; each varix reflexed against the corresponding one of the preceding whorl and depositing a triangular area of callus in the adjacent sutural area; some varices much heavier than the others but usually equidistant; the interspaces are about 5 times as wide as the varices; the spiral sculptures are not conspicuous, and they being more crowded nearer the suture than in area distant form it, spiral sculptures never crenulate the edge of the varices.

Base of the body whorl marked by a continuous prominent keel, which crenulates the edge of the varices, while below the keel there is no evidence of any spiral ornamentation. Aperture ovate, somewhat higher than wide, outer lip broken, inner lip thin.

Dimensions. — Diameter of holotype, 21.5 mm., height, 60.5 mm., whorls (incomplete) 6.

Occurrences.—Shitakara formation: Shoro coal mine, Shiranuka machi, Kushiro Province.

Repository.—U. H. Reg. No. 13318 (holotype), 13319.

Remarks. The species minutely examined by the writer were collected from the middle part of the Shitakara formation by Toshio YAMAMOTO. These specimens are characteristic in respect to the about 14 varices with triangular callus deposits, about 10 primary spirals, numerous secondary and tertiary spiral striae, fairly deep sutures, prominent continuous basal keel. Judging from these characteristics, this species may belong to the subgenus *Boreoscala*. This form resembles *Epitonium* (*Boreoscala*) *yabei* NOMURA (1937) from upper Miocene, Mashiba formation of Iwate Prefecture in general aspects, but the present shell has a large size, somewhat heavier varices and weaker spirals than that species.

Epitonium (*Boreoscala*) *condoni* DALL and *E.* (*B.*) *condonii* var. *quimperense* DURHAM (1937), the common species of the Oligocene in the West Coast region of North America, resemble rather closely the present species although, the shells of the former have less numerous heavy varices.

Epitonium sp. indet.

Pl. I. Fig. 8.

Shell large, fairly heavy; only 2 complete whorls are preserved,

greatest convexity slightly below center of each whorl; suture fairly deep; 18 to 20 heavy axial-varices, each reflexed against the corresponding varix of the preceding whorl and depositing a triangular area of callus in the adjacent sutural area. On each interspace of these heavy axial varices are two or three faint secondary varices.

Diameter.—28 mm.

Occurrence. — Shitakara formation: Shoro coal mine, Shiranuka machi, Kushiro Province.

Repository.—U. H. Reg. No. 13320.

Remarks. Only two fragmental specimens were brought from a river cliff of the Shoro gawa near the Shoro coal mine. The present specimens are doubtlessly quite unique in their large form and characteristic varices, in which features they are easily separable from all the hitherto known fossil species of the genus *Epitonium*. But the writer thinks that it may not be at all reasonable to give a specific name for such imperfect materials.

Family OLIVIDAE

Genus *Olivella* SWAINSON, 1931

Genotype. *Oliva purpurata* SWAINSON

Olivella ezoana MATSUI n. sp.

Pl. I. Figs. 9a, 9b, 10a, 10b, 11, 12a, 12b, 13a, 13b.

Shell small, moderately elongated; whorls four and a half; surface smooth except for faint growth lines; sutures filled with callus, but on weathered specimens the callus is sometimes eroded and the sutures appear grooved. Columella short, almost straight.

Basal fasciole broad, and covered with low folded callus. Aperture long and narrow, acuminate posteriorly, deeply notched in front. Three or four medial plications on the columella. These plications appear on about the middle or lower half of the inner lip, become broad in front and extend outwards on a callus which covers the basal fasciole. Outer lip simple, basal notch broad and deep.

Dimensions.

	Length	Width	
Holotype	15.5 mm.	6.2 mm.	
Paratype	14.5	5.3	(body whorl exfoliated)
,,	13.6	6.0	
,,	11.5	5.5	(lower part missing)
,,	18.0	8.0	

Occurrences.—Onbetsu formation: Berutsunai gawa, Akan mura; Shakubetsu coal mine, Onbetsu mura; Kamishoro, Shiranuka machi, Kushiro Province.

Poronai formation: Momijiyama, Yubari city.

Repository.—U. H. Reg. No. 13323 ,holotype), 13324, 13325, 13326.

Remarks. This species has been collected from the Onbetsu formation in the Kushiro coal field and from the uppermost part of the Poronai formation in Yubari coal field. This small shell may be distinguished by its slender outline, two or three medical plications, broad basal fasciole and deep basal notch.

No allied species are known in Japan except *Olivella consoblina* (Lischke) (OTUKA, 1934) and *O. iwakiensis* NOMURA and HATAI (1936). The present species differs in having broader outlines and a more slender body whorl, than *iwakiensis*. *Olivella consoblina* differs from the species under consideration in respect to its more acuminate spire.

Olivella mathewsonii GABB. (WEAVER, 1942) is also akin to the present species, but the aperture of the former is longer and the spire more acuminate.

This species in general outline resembles *Acteon umpquaensis* TURNER (1938), but differs in generic characters of the broad and deep basal notch, in the anterior end of the aperture.

Ancilla suavis YOKOYAMA (1926), from southern Totomi, differs in broader outline and acuminate spire.

Ancilla blakeleyensis DURHAM (1944) is also very similar to this species in general outline, but this form is easily distinguished from it having medial plications on the columella. *Ancilla blakeleyensis* has smooth columella and no plication.

Family *NASSARIIDAE*

Genus *Molopophorus* GABB. 1869

Genotype. *Bullia* (*Molopophorus*) *striata* GABB.

Molopophorus shitakarensis MATSUI n. sp.

Pl. I. Figs. 14a, 14b, 15. Pl. II. Figs. 1a, 1b, 2, 3a, 3b.

Shell small, broad fusiform, spire moderately elevated; whorls about four or five; earlier whorls roundly convex. The other whorls with a well marked shoulder. Surture distinct and canaliculated. Ultimate whorl slightly concave between suture and periphery, but roundly convex at peripheral zone. Surface ornamented by numerous longitudinal and

transverse ribs which give the middle portion of the whorls a tesellated appearance. The ribs are strongest on the lower portion of the ultimate whorl. These longitudinal plicae of growth, about 15 to 20 in number, are rather high and wide. The interspaces concave, slightly narrower than the ribs themselves. The axial ribs are rather sharp, five in number on each whorl, 12 to 15 on ultimate whorl, but sometimes, on the lower portion of the body whorl, they disappear.

Aperture broad and elongated, anterior notch is deep, canal short, wide, recurved; inner lip with callus, outer lip thin and smooth.

Dimensions.

	Height	Diameter	Apical Angle
Holotype	21.0 mm.	13.4 mm.	47°
Paratype	18.6	12.0	48°
,,	23.0 (upper part missing)	14.3	49°
,,	18.5 (,,)	10.8	46°
,,	19.7	13.0	52°?

Occurrences.—Shitakara formation: A river cliff of the Shoro gawa, near Shoro coal mine, Shiranuka machi, Kushiro Province.

Repository.—U. H. Reg. No. 13331 (holotype), 13332, 13333, 13334, 13335.

Remarks. This species from the Shitakara formation is specifically characterized by its relatively high spire, comparatively marked shoulder, numerous longitudinal and transverse ribs, broad aperture and slightly recurved short canal.

From amongst the hitherto reported forms from Japan, the present one shows some resemblance to *Molopophorus watanabei* OTUKA (1937), *M. kushiroensis* TAKEDA (1953), and *Nassa densellineata* NAGAO (1928). The present specimens, however, are different from *M. watanabei,* reported from Joban coal field by Yanosuke OTUKA, in respect to having a remarkable shoulder and axial ribs; the latter does not have these characters.

M. kushiroensis is also comparable in respect to its outline, but is distinguishable by lower spire, lack of axial ribs, sharp and numerous longitudinal ribs.

Nassa denselineata, reported from Yamaga beds in Chikuho coal field, is slightly similar in the characters of longitudinal and transverse ribs.

Of the many species from the West Coast of North America, *Molopo-*

phorus dalli ANDERSON et MARTIN (WEAVER, 1942), is a comparable form. But it has greater convexity of body whorl and irregular axial ridges.

Family TURBINELLIDAE

Genus *Tudicula* (*Bolten*) ROEDING, 1798

Genotype. *Murex spirillus* LINNE

Tudicula ishiii MATSUI n. sp.

Pl. II. Fig. 4.

Shell depressed fusiform with very short spire consisting of 3 or 4 whorls, they are conically inflated; apical angle about 90°; whorls almost smooth except for the revolving angle at lower portion of each one. Body whorl with two revolving angles, upper one is situated at base of upper surface of whorl and forms a keel, the lower at middle of base. On these angles of body whorl, there are sharp long spinose nodes.

Aperture broad, oval and narrowing a short distance from anterior end of canal. Canal narrow, straight and very long; columella thick and smooth except one gentle fold on the anterior part of it.

Dimensions.—Height of type specimen 31.5 mm., maximum diameter of the body whorl 14.0 mm., length of the aperture and canal 25.0 mm., width of the aperture about 5 mm.

Occurrence.—Onbetsu formation: a river cliff 2 km. east of Kami-atsunai railway station, Urahoro mura, Tokachi Province.

Repository.—U. H. Reg. No. 13336.

Remarks. Only some imperfect specimens for this species were found in the middle and upper part of the Onbetsu formation. The present specimens are doubtlessly quite unique in the characters of the shell, viz., depressed shape, very long and straight canal, excavated columella bearing a fold, two rows of spinose nodes on the body whorl, of which the upper is situated on the keel. Because of these features, the writer believes that the present forms may belong to the genus *Tudicula*.

This genus is a very rare form in Japan, as Hidezo TAKEDA (1953) pointed out. Hitherto only one species has been reported from the Poronai formation by H. TAKEDA. *Tudicula japonica* is somewhat similar to the present form, but can be distinguished from the latter specifically by the festooned whorl at the sutural part in the last whorl, distinct keel, but lack of tubercles on the last whorl and by its smooth (?) columella.

Family TURRIDAE

Genus *Turricula* SCHMACHER, 1817

Genotype. *Turricula flammea* SCHMACHER

Turricula shitakarensis MATSUI n. sp.

Pl. II. Figs. 5a, 5b, 6a, 6b, 9, 10a, 10b, 11, 12.

Shell small, slender, elongate, fusiform; apex acute; suture distinct; whorls 6 or 7 in number and rather long between sutures; shouldered at summit, more or less receding below, areas between suture and shoulder concave; lower surface of whorls slightly convex; surface obliquely nodose and sculptured by numerous faint spiral ribs. All of them are confined to the interspaces of angulated shoulder and the surface below it. Interspaces between spiral ribs are broad, shallow and concave bottomed. Their width nearly equal to spiral ribs themselves. Surface of body whorl sculptured with faint close set longitudinal ribs, too, which are undulating and correspond to the sharply incised posterior sinus; apex of sinus above the angular shoulder.

Canal moderately long and nearly straight; inner lip smooth, plication uncertain; outer lip thin, aperture narrow and elongate.

Dimensions.

Holotype: Altitude to broken end of canal 10 mm., diameter 7.8 mm., elevation of spire 12.0 mm., angle of spire 25°.

	Height	Diameter	Apical Angle
Paratype	22.0 mm.	8.2 mm.	25°
,,	22.5	8.5	24°
,,	23.0	10.0	27°
,,	16.0	6.0	24°
,,	22.5	9.3	27°

Occurrences.—Shitakara formation: a river cliff on the Shoro gawa, near Shoro coal mine, Akan machi, Kushiro Province.

Repository—U. H. Reg. No. 13339 (holotype), 13340, 13341, 13342, 13343, 13345.

Remarks. This obliquely noded, elongate fusiform Gastropoda is abundant in Shitakara formation at the type locality and in Shoro—Shiranuka district. The characteristic features of the specimens are prominent nodes, sharply incised posterior sinus and rather stepped form sculptured by numerous faint spirals and longitudinal ribs.

The generic position of this species is not quite certain, but it was

previously referred to *Turricula* as it resembles *Turricula sobrina* (YOKOYAMA) (1932) and *T. washingtonensis* (WEAVER) (1942).

The writer examined about 50 individual specimens and recognized a variation from the typical form (see Pl. II, fig. 9) viz., round angular and almost degenerated nodes; they are shown in figs. 5a, 5b, 6a, 6b, 12.

Turricula washingtonensis (WEAVER) from the Lincoln formation in North America, is most nearly related to the present species but the former specifically differs in its distinct angular whorls and numerous nodes.

The specimens at hand also somewhat resemble *Turricula sobrinaeformis* NOMURA (1937), which was described and illustrated from Pliocene of Tosa, in respect to its prominent nodes, but differ from it not only in their outlines but also in their sculpture.

Genus *Spirotropis* SARS, 1878

Genotype. *Spirotropis carinata* PHILIPPI

Subgenus *Antiplanes* DALL, 1902

Subgenotype. *Pleurotoma* (*Surcula*) *pervesa* GABB.

Spirotropis (*Antiplanes*) *yubetsuensis* MATSUI n. sp.

Pl. II. Figs. 7, 8.

Shell small, elongate pagoda-form, apical angle about 40°; whorls 6 or 7 in number; suture deep; each whorl is characterized by a very pronounced angle situated at about two-thirds the distance of the length of the whorl between the suture; the angle between the upper and lower surface of each whorl is approximately 90°. On the angulate portion of body whorl and penultimate whorl, somewhat prominent nodes are formed by the longitudinal ribs.

The surface above the keel is very slightly concave, and below the angle, it is straight or very slightly concave. Surface of whorls is ornamented by growth lines and faint spiral ribs; growth lines show the characteristic of a posterior sinus which reverses just above the angle; aperture sub-pyriform, outer lip thin, inner lip with narrow callus; canal moderately elongate and nearly straight.

Dimensions.

	Length	Diameter	Apical Angle
Holotype	21.6 mm.	9.2 mm.	38°
Paratype	20.0	8.5	40°

Occurrence.—Onbetsu formation: Okuyokunnai zawa, near Yubetsu coal mine, Akan mura, Kushiro Province.

Repository.—U. H. Reg. No. 13337 (holotype), 13338.

Remarks. This small shell which was obtained from the upper part of the Onbetsu formation in Yubetsu coal mine area, is characterized by its comparatively high pagoda-form spire, sharply angulated whorls, elongate aperture, rather long canal and notched shoulder band.

Amongst the hitherto reported species from Japan, *Pleurotoma subdeclivis* YOKOYAMA (1926) resembles the present form. But the present species differs from the former in having smaller shell, longer canal and prominent keel.

An Oligocene species from the West Coast of North America, *Hemipleurotoma borgensis* (TEGLAND) (WEAVER, 1942) can be differentiated by its larger form, and by having no nodes on any whorls. *Spirotropis dickersoni* (WEAVER) reported from Upper Oligocene of southern Alaska by B. L. CLARK (1932) is somewhat similar but it posesses 10 whorls, numerous faintly revolving ribs and prominent keel with 3 rounded ribs on it.

Family SCAPHANDRIDAE

Genus *Scaphander* MONTFORT, 1810

Genotype. *Bulla lignaria* LINNAEUS

Scaphander murtistriata (TAKEDA)

Pl. II. Figs. 14, 15a, 15b, 16a, 16b.

1953. *Cylichna murtistriata* TAKEDA: Geol. Sec. Hokkaido Association Coal Min. Tech. Studies on Coal Geol. No. 3. pp. 61-62, Pl. IV, figs. 1-4, 10; Pl. V, fig. 7.

Doctor Hidezo TAKEDA, in his paper entitled, "The Poronai Formation (Oligocene Tertiary) of Hokkaido and South Sakhalin and its Fossil Fauna", gave a general description of *Cylichna murtistriata* TAKEDA. He examined 5 specimens and figured 3 forms, which came from the Onbetsu formation in the Kushiro coal field and from South Sakhalin. His description was based upon a study of rather exfoliated specimens.

The present writer found numerous specimens of this genus from not only the Onbetsu formation but also from the Shitakara formation, developing along the Shitakara gawa and in the Shoro coal mine area. A few specimens were found also from the middle and basal part of the Poronai formation in the Ishikari coal field. In the material from these localities a number of the specimens are practically identical with those

of *Cylichna murtistriata* TAKEDA. These specimens now under study are characterized by oval outline, aperture very wide in front.

According to the observation of present specimens and TAKEDA's original description, the present writer believes that these specimens may belong to Genus *Scaphander*; Genus *Cylichna* has more narrow cylindrical outline and narrow elongated aperture.

The following is TAKEDA's original description of the species.

"Shell small, thin, cylindrical, gradually tapering toward both ends, flat on top, lower and roundly pointed. Spire involute with a small apical concavity; aperture long and narrow, dilated below; outer lip thin, expanded. Surface ornamented with many spiral flat ribs, over 40 in number."

Occurrences.—Shitakara formation: Shitakara gawa, near Yubetsu coal mine, Akan mura; Shoro gawa, near Shoro coal mine, Shiranuka machi, Kushiro Province.

Onbetsu formation: Kamishoro, Shiranuka machi; Shakubetsu coal mine, Shakubetsu mura, Kushiro Province.

Poronai formation: Ponbetsu coal mine, Ikushunbetsu coal field.

Repository.—U. H. Reg. No. 13348, 13349, 13350.

Scaphander ezoana MATSUI n. sp.

Pl. II. Figs. 13a, 13b, 17, 18, 19.

Shell large in size for the genus; elongate, subcylindrical, broad anteriorly; attenuate posteriorly, apex imperforate; outer lip produced considerably above the shell; whorl broadly and gently convex.

Surface ornamentation consists of about 50 to 60 deeply incised, narrow, spiral striae, which alternate with broad flat-topped ridges, increasing in its width on the medial portion of the bodywhorl to as much as three or four times that on anterior and posterior ends.

In one specimen, surface ornamented with fine lines of growth; spiral ribs and growth lines make a rectangular network.

Aperture rather narrow, dilated near the anterior end into an ovate shape. The course of the partial part of inner lip is not much deflected to the left. Test rather thick, outer lip thin, very gently arched in the greater part of its length and convex near the end; inner lip covered with a fairly heavy callus anteriorly.

Dimensions.

	Height	Width of body whorl
Holotype	36.0 mm.	21.0 mm.

Paratype	29.5 mm.	17.4 mm.
,,	27.5	16.0
,,	24.5	13.2

Occurrences.—Poronai formation: Upper part of Poronai formation, in Miruto district, Ishikari coal field.
Momijiyama formation: Momijiyama, Yubari city.
Onbetsu formation: Kamishoro, Shiranuka machi; Shinkushitakara gawa, Akan mura, Kushiro Province.

Repository.—U. H. Reg. No. 13351 (holotype), 13352, 13353, 13354.

Remarks: Among the forms hitherto recorded from Japan, *Scaphander murtistriata* (TAKEDA) (1953) is allied to this form; but the present species, described and illustrated here, is specifically distinguishable from it by larger, more slender outline and narrower aperture. The course of a part of the inner lip is less deflected to the left than it is in *S. murtistriata.*

This form rather closely resembles *Scaphander washingtonsis* var. *gordonii* TEGLAND (1933), a common species in the Blakeley formation (Upper Oligocene), Northwest Coast of North America. The principal difference is that the latter has a relatively slender body whorl with numerous spiral ribs.

Scaphander alaskensis CLARK (1932) is also akin to the present species, but the former has a rather broad aperture ornamented with less number of spiral ribs.

Cylichna paupercula NAGAO (1928) from the Palaeogene of Kyusyu, Japan, is somewhat allied to this species, but the former is smaller and its anterior and posterior ends are broader than those of the latter.

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Explanation of Plate 1

Explanation of Plate I.

Figs. 1, 2. *Epitonium* (*Gyroscala?*) *poronaiensis* MATSUI n. sp. U. H. Reg. No. 13311 (holotype), 13312. ×1.

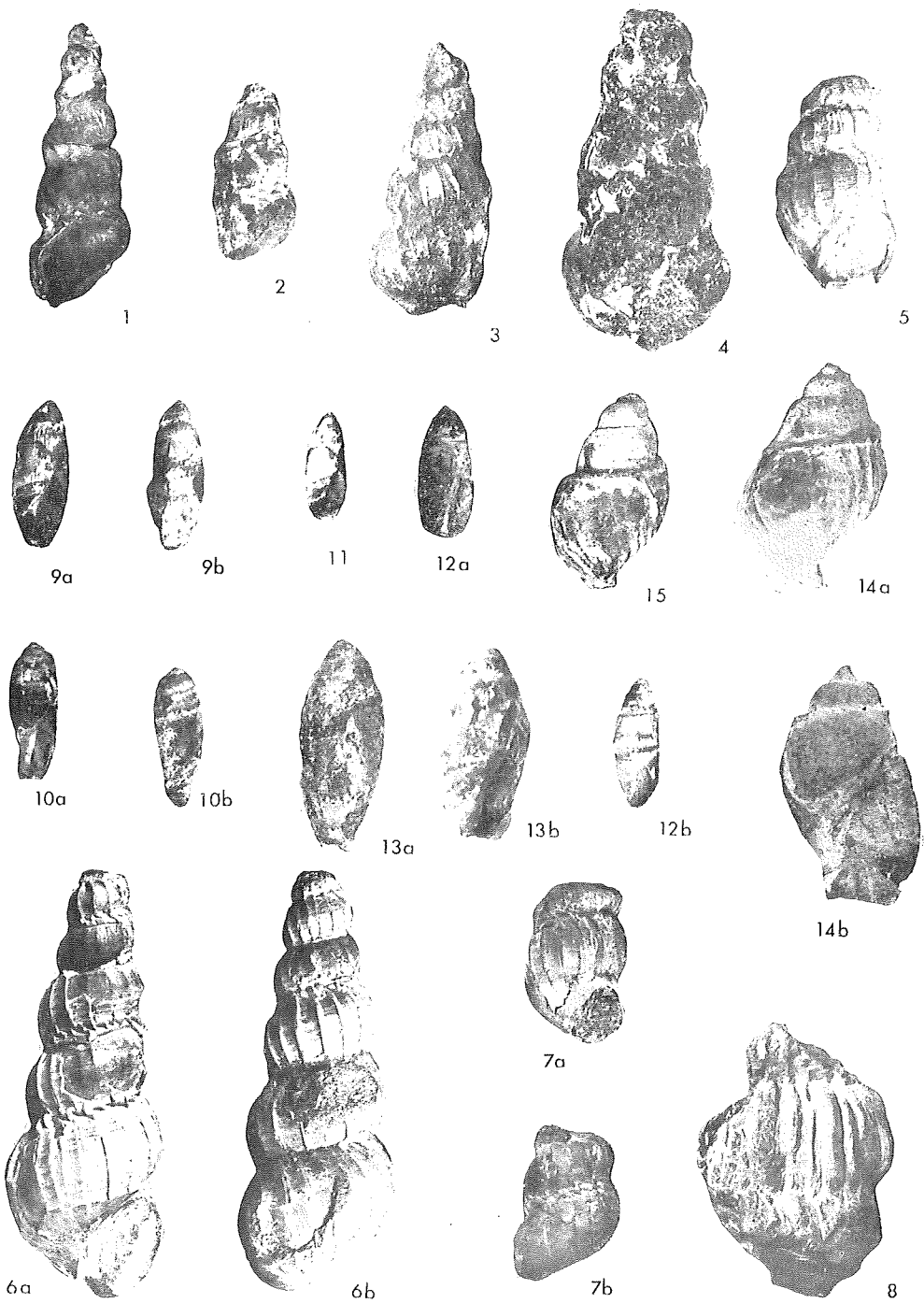
Figs. 3, 4, 5. *Epitonium* (*Cirsotrema*) *ezoensis* MATSUI n. sp. U. H. Reg. No. 13315 (holotype), 13313, 13316. figs. 3, 5. ×1; fig. 4×1.8.

Figs. 6a, 6b, 7a, 7b. *Epitonium* (*Boreoscala*) *yamamotoi* MATSUI n. sp. U. H. Reg. No. 13318 (holotype), 13319. ×1.

Fig. 8. *Epitonium* sp. U. H. Reg. No. 13320. ×1.

Figs. 9a, 9b, 10a, 10b, 11, 12a, 12b, 13a, 13b. *Olivella ezoana* MATSUI n. sp. U. H. Reg. No. 13323 (holotype), 13324, 13325, 13326. ×1.4.

Figs. 14a, 14b, 15. *Molopophorus shitakarensis* MATSUI n. sp. U. H. Reg. No. 13331 (holotype), 13332. ×1.5.


1
2
3
4
5
9a
9b
11
12a
15
14a
10a
10b
13a
13b
12b
14b
6a
6b
7a
7b
8

Explanation of Plate 2

Explanation of Plate II.

Figs. 1a, 1b, 2, 3a, 3b. *Molopophorus shitakaensis* MATSUI n. sp. U. H. Reg. No. 13333, 13334, 13335. ×1.5.

Fig. 4. *Tudicula ishiii* MATSUI n. sp. U. H. Reg. No. 12336. ×1.

Figs. 5a, 5b, 6a, 6b, 9, 10a, 10b, 11, 12. *Turricula shitakarensis* MATSUI n. sp. U. H. Reg. No. 13339 (holotype), 13340, 13341, 13342, 13343, 13345. figs. 5a. 5b, 6a, 6b, ×1.7; figs. 9, 12, ×1.; figs. 10a, 10b, 11, ×1.5.

Figs. 7, 8. *Spirotropis* (*Antiplanes*) *yubetsuensis* MATSUI n. sp. U. H. Reg. No. 13337 (holotype), 13338. ×1.

Figs. 14, 15a, 16b, 1ga, 16b. *Scaphander murtistriata* (TAKEDA) U. H. Reg. No. 13348, 13349, 13350. fig. 14, ×1; figs. 15a, 15b, 16a, 16b, ×1.6.

Figs. 13a, 13b, 17, 18, 19. *Scaphander ezoana* MATSUI n. sp. U. H. Reg. No. 13351, (holotype), 13352, 13353, 13354. figs. 13a, 13b, ×1.2; figs. 17, 18, 19, ×1.

1a

2

3a

3b

4

1b

5a

5b

6a

6b

7

8

9

10a

11

12

13b

15a

15b

10b

19

14

16a

16b

13a

17

18