HOKKAIDO UNIVERSITY

Title	Neogene Molluscan Fauna in Hokkaido : Part III. Description of the Ainonai Fauna Associated with Desmostylus cf. minor Nagao, from Kitami District, East Hokkaido
Author(s)	Uozumi, Satoru; Fujie, Tsutomu; Matsui, Masaru
Citation	Journal of the Faculty of Science, Hokkaido University. Series 4, Geology and mineralogy, 13(2), 165-183
Issue Date	1966-02
Doc URL	https://hdl.handle.net/2115/35945
Type	departmental bulletin paper
File Information	13(2)_165-184.pdf

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

NEOGENE MOLLUSCAN FAUNA IN HOKKAIDO

Part III. Description of the Ainonai fauna associated with *Desmostylus* cf. *minor* NAGAO, from Kitami district, East Hokkaido.

by

Satoru UOZUMI, Tsutomu FUJIE and Masaru MATSUI

Contribution from the Department of the Geology and Mineralogy, Faculty of Science, Hokkaido University, Sapporo. No, 971

In September, 1962, a molar of *Desmostylus* was unexpectedly found from the Tertiary deposits cropping out at the cliff of the river of Muka, near Ainonai-Mura, Tokoro-gun (about 43°47′30″N, 143°44′30″E), East Hokkaido. This was discovered by Mr. Y. KATO, at the occasion of excursion held under the auspices of Kitami *Heimatkunde* group.

The molar was kindly submitted to the present authors for study. It may perhaps belong to the right lower, *Desmotylian* tooth and possibly the second or

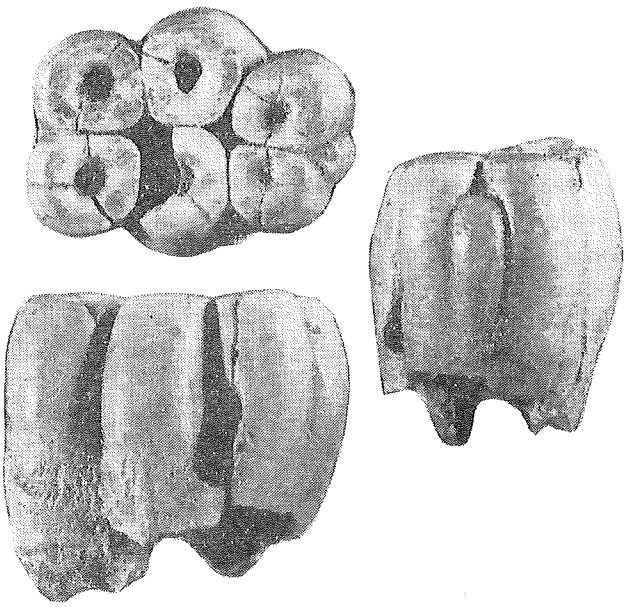


Fig. 1
Desmostylus cf. *minor* NAGAO newly found from Kitami. (nat. size)

third one and may be referable to *Desmostylus minor* NAGAO with slight doubt.

Then the present writers visted there and cooperated to the members of the Kitami *Heimatkunde* group in field work in order to get correct knowledge about the stratigraphy of the formations, in which the mentioned molar was found. Fortunately we could make certain collection of molluscan fossils at the locality where the *Desmostylian* tooth was found.

As a result, we are now of the opinion that the stratigraphical horizon of the fossils stated above indicates the early Neogene with certainty. The present short note will present the stratigraphical account of *Desmostylus minor*? bearing formation and description of molluscan fossils found in association with this *mammalian* tooth.

Before going into further, the writers wish to record his deep gratitude to Professor Dr. Masao MINATO of Hokkaido University, for his invaluable advice in the course of the present study and for kind reading of this paper prior to be printed. They are also indebted to Dr. Makoto KATO for his kind assistance in preperation of this paper.

Acknowledgements are also due to the members of the Kitami *Heimatkunde* group and the students of the Ainonai middle school for allowing us free use of fossils specimens in their private collections and kind assistance in the field work. Especially the authors are deeply gratitude to Messrs. I. YAMAMOTO and Y. KAGAWA, teachers of the Kitami Hokuto high school, and Mr. S. NAKAGOE, teacher of the Ainonai middle school, for the kind cooperation in the research work in field.

Outline of the Ainonai fauna

The Tertiary deposits are fairly widely developing at the outskirts of Kitami City, especially in the northwest of the City. Generally speaking, these deposits seem to show monoclinal structure, gently dipping towards southeast. The lowest part among them is composed of coarse materials, in which the plant fragments and marine fossils are occasionally found. This basal part merges upwards into the so-called " hard shale " formation in lithologic nature and the uppermost part is represented by silt facies.

The detailed lithologic sequence of the lowest part of the Neogene observed at the locality where *Desmostylian* tooth was found is as follows, in descending order.

" Hard shale " formation

Light gray tuffaceous, coarse to fine grained sandstone, sometimes intercalated with hard banded, medium grained sandstone. Fossils rather rare. .....about 2 m in thickness.

Massive tuffaceous coarse grained sandstone with rather abundant pebbles. Two or three marine molluscan beds. Horizon of the *Desmostylus*. .....about 5 m in thickness.

Ainonai formation: Fine conglomeratic sandstone, with less numerous fossils. .....about 3 m in thickness.

Basal conglomerate, locally replaced by the light greenish gray tuff breccia, containing plant remains. .....about 1–2 m in thickness.

unconformity

Nikoro Group: mostly composed of "*Schalstein*" (basic tuff), shale, chart and limestone.

The Ainonai formation in which the fossils, now in problem, were found is very thin as above stated. Further, it may be also noted that this formation seems to be variable in thickness from place to place. Furthermore, the Ainonai formation is observed to be changeable in lithologic nature within rather narrow strip. To the contrary, the overlying formation, mainly composed of the so-called hard shale is rather uniform in lithologic nature and considerably thick in this region. Accordingly, we are now inclined to consider the Ainonai formation designated here to be the basal part of the Miocene hard shale formation, and it may not be quite independant stratigraphical unit from the latter. At any case, to settle the correlation of the Ainonai formation seems to need further detailed study in future, both from the stratigraphical and palaeontological side.

Outline of the Ainonai fauna

As it was stated in the foregoing pages, all the molluscan fossils to be described in this paper were collected from the Ainonai formation, especially in its lower part which is chiefly consisting in conglomerate or coarse grained sandstone. The Ainonai formation is observed to directly cover the Jurassic deposits called the Nikoro group in the subuerb of Kitami City.

Now, the fossils of the Ainonai formation are mainly composed of molluscs, brachiopods and echinoids; almost all the specimens are observed to be strongly crushed into pieces which constitute the matrix of conglomerate in general. Molluscan remains are generally found as isolated fragmental shells. Remains of branchiopods and echinoids are also observed to be generally badly crushed and imperfect. Besides, fragments of shell of *Balanus* are also rarely found in association with the organic remains above stated.

All the evidences observed in respect to the state of preservation on fossils of the Ainonai formation seem to indicate the deposits above stated to have been brought near the sea shore of older days, under rather rough waves. All the

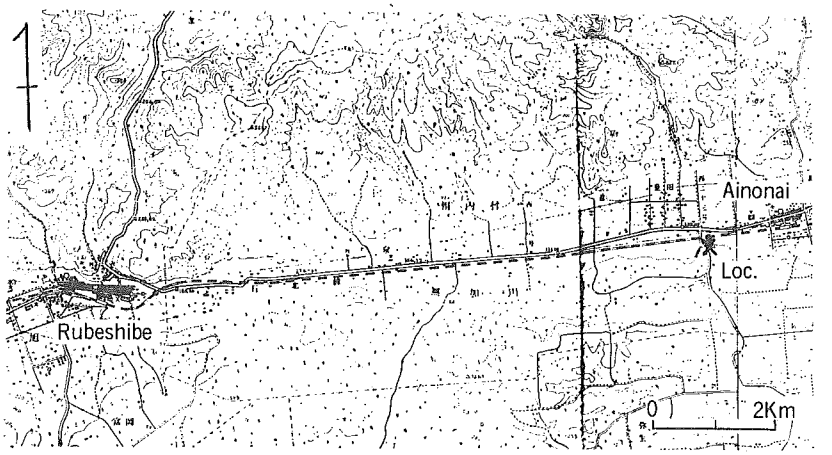


Fig. 2
Showing the geographic position of the locality, where the fossils were found in association with *Desmostylian* tooth.

animals, now preserved as fossils, may have perhaps inhabitated not far distant place from the area where the Ainonai formation is now cropped out, even though they were certainly transported by waves from the original place where they once lived.

Now, the fossils found from the Ainonai formation will be listed below:

Portlandia kakimii UOZUMI .....R*
Mizuhopecten kitamiensis n.sp .....F
Chlamys kaneharai (YOKOYAMA).....A
C. cosibensis hanzawae MASUDA .....R
Swiftopecten swiftii (BERNARDI) .....F
Anomia sp.....A
Serripes laperousii (DESHAYES) .....F
Papyridea harrimani (DALL) .....A
Peronidia sp .....R
Crepidula sp .....R
Amathina nobilis (ADAMS) .....R
Hemithyris psitacea (GENILIN) .....A
Coptothyris gray (DAVIDSON) .....A
Balanus sp.....F

Among forms above listed, *Papyridea harrimani* and *Chlamys kaneharai* are most abundantly found. The former is one of the common elements of the so-

* Abbreviation; A: abundant; F: common; R: rare.

called Oligocene Poronai-Asagai fauna, but has been never found from the Neogene deposits in Japan up to the present. While, the latter is belonging to the species, commonly found in the middle to the late Miocene deposits developed in northeast Honshu, Japan. And this is perhaps the first record of occurrence of that species in Hokkaido.

Chlamys cosibensis hanzawae is also known to range from early Miocene to late Miocene. *Portlandia kakimii* has been only known to occur from the Wakkanai stage, possibly middle to late Miocene in age. *Amathina nobilis* is the species ranging from Miocene to Recent in Hokkaido.

Accordingly, the Ainonai fauna seems to indicate Miocene in age as a whole. At the present moment, the collection is not perfect and the species found are rather few. But we do think to step into more detailed correlation of this fauna, because the association of species seems to be rather peculiar in comparison with the so-called Miocene fauna known in other regions in Hokkaido. First of all, the Ainonai fauna may be perhaps younger than that of the Takinoue in which *Yoldia uranoi*, *Anadara ogawai*, *Glycimeris vestitoides*, *Dosinia nomurai*, *Venericardia niniuensis*, *Paphia siratoriensis*, *Spisula onnechiuria*, *Soletellina minoensis*, *Batillaria tateiwai*, *B. yamanarii* and *Crepidula jimbona* are the most common species. None of such elements can be, however, found from the Ainonai fauna.

In the meantime, the Ainonai fauna seems to be perhaps older than the Togeshita fauna, if we compare the species belonging to *Pectinidae* found from both formations with each other: in the former the fossil species belonging to *Pectinidae* are represented by *Mizuhopecten kitamiensis*, *Chlamys kaneharai* and *C. cosibensis hanzawae*, while in the latter they are represented by *Mizuhopecten togeshitaensis* and *M. ibaragiensis*, allied to *M. yessoensis*.

Further, the present authors now believe the Ainonai fauna to be closely related to the so-called Chirai fauna in its association, the latter of which was reported by W. HASHIMOTO and S. KANNO in 1958 from the Chirai formation, developed at Chirai, Kamisaroma, Kitami Province in Hokkaido. HASHIMOTO and KANNO, however, held a view that the Chirai formation may be perhaps synchronous but heterofacies to the so-called green tuff formation, middle to lower Miocene in age. Namely, they concluded that the Chirai formation mainly composed of conglomerate and sandstone may be the marginal deposits, which replace the green tuff formation. Both the Ainonai and the Chirai formations are directly covered by the so-called hard shale formation, or they may be rather regarded to form the basal part of the hard shale formation. While the green tuff formation is lying underneath the hard shale formation in general. Accordingly, it is almost certain, that the Ainonai and Chirai formations are situated at least at a little higher stratigraphical position than the green tuff formation.

In the next, *Desmostylian* tooth must be brought into consideration to settle the stratigraphical position of the Ainonai formation.

Until present, a number of *Desmostylus* fossils have been found in many places in the Japanese islands including Saghalin. According to Late Prof. T. NAGAO, there are at least two stratigraphical horizons in concerning to the *Desmostylus* fossils, *viz.*, the lower of them may be situated in the Upper Oligocene formation in which relatively smaller *Desmostylian* teeth are found in general. *Desmostylus minor* NAGAO is the leading form. To the contrary, the higher horizon is generally found in the Middle Miocene formation in which comparatively large sized *Desmostylian* teeth are found. *Desmostylus japonica* and *mirabilis* are the leading forms of the higher horizon. Thus, NAGAO believed that the smaller type of *Desmostylian* teeth can be the representative of the ancestral form and the larger ones, the dencendant form in the phylogenical course of this animal through the ages.

For this conclusion, Dr. H. YABE stated an objection, because the *Desmostylian* tooth, once described by Dr. H. MATSUMOTO under the name *Desmostylus* cf. *japonica* TOKUNAGA and IWASAKI from the Obirasibe district, North Hokkaido, facing Japan Sea, is actually collected from the Tappu formation developed there, the age of which is Upper Oligocene with certainty. Thus, the larger form of *Desmostylian* teeth must be regarded to range from Upper Oligocene to Middle Miocene. At the same time, the smaller form of *Desmostylian* teeth can be also regarded to show wide range by this new finding in the Ainonai formation. In other words, the smaller type should be also considered to have been ranging from Upper Oligocene to Middle Miocene. Therefore, *Desmostylus* can not be so much reliable to settle the detailed stratigraphical position of formations, as formerly believed.

Systematic Description

Family NUCULANIDAE

Genus ***Portlandia*** MÖRCH, 1857

Portlandia kakimii UOZUMI

1957. *Portlandia kakimii* UOZUMI, Jour. Fac. Sci. Hokkaido Univ., Ser. 4, Vol. 9, no. 4, pp. 569–570, pl. 2, figs. 1, 1a-b.

This species is characteristic in having the shells ornamented by somewhat oblique concentric lines to the growth lines. This kind of ornamentation is quite similar to that of the shells belonging to the genus *Cnesterium*. However, as stated by UOZUMI in 1957, the species now in consideration would be better places in the genus *Portlandia*, instead of *Cnesterium*, because the shell of the present species is elongate-oblong in outline, with remarkable depression at the posterior area.

Dimensions (in mm):

Length	Height
33.0	19.5

Repository: U.H. Reg. No.*. 13702.

It is already fairly well known that this species is widely found from the Miocene deposits in Hokkaido. All of them can be correlated to the Wakkanai stage, represented by the so-called " hard shale " facies. They are the Morai, Sasakizawa, Kamicharo and Atsunai formations respectively.

Family PECTINIDAE

Genus *Mizuhopecten* MASUDA 1963

Mizuhopecten kitamiensis n.sp.

Pl. 14, Figs. 4, 5; Pl. 15, Figs. 2, 3.

Shell large, rather thin; orbicular, equilateral. Right valve is more convex than the left valve, with about 11 low, rather flat-topped, squarish radials, with sharp demarcation in interspaces. Radial ribs unequal and much broader than the interspaces, usually sculptured by one or two weak radial threads near the ventral margin; a few radials in the central part of shell provided with a rather distinct longitudinal furrow in its center, except for the above-mentioned weak threads; interspace between radial ribs is narrower than ribs; the former is about 1/3 the latter in breadth, deep and smooth. Anterior auricle subequal to posterior, provided with wide and shallow byssal notch, and sculptured by distinct concentric lines; posterior auricle also provided with fine concentric striations. Left valve slightly convex, with 12 narrow, round-topped straight radial ribs which are not dichotomizing; interspaces between radial ribs much broader than the ribs; besides a very fine intercalating thread can be rarely found near margin; all the surface of left valve ornamented with microscopic network. Auricles sculptured with several very fine radial threads and rather distinct concentric lines. Hinge of both valve unknown. Apical angle is nearly equal in both valves which is about 100°.

Dimensions (in mm):

Length	Height	Depth	Apcial angle
86+	85+	9+	100°

Repository: U.H. Reg. No. 13703 a, b.

The present species is characteristic in having the right valve with 11 flat-topped squarish radial ribs, which tend to be dichotomously or tri-chotomously

* Abbreviation for the Department of Geology and Mineralogy Hokkaido Uuiversity, Sapporo, Japan.

on the ventral side. While the present species has left valve with 12 much narrow, round-topped ribs. The present species, now in problem, seems to resemble *Mizuhopecten hashimotoi* AKIYAMA (1962), *Kotorapecten sannohensis* (CHINZEI) (1961), *K. yamasakii ninohensis* MASUDA (1954) and *K. tryblium* (YOKOYAMA) (1925) in the nature of branching of ribs of the right valve, but it specifically differs from all of them in having less numerous ridial ribs. Also the present species may be resembled *Mizuhopecten ibaragiensis* (MASUDA) (1953) described from the Upper Miocene formation in Ibaragi Prefecture, but the former is distinct from the latter in the points to be stated below: ribs of both right and left valves are less numerous than that of the latter and interclary threads between the ribs in left valve is not observable in the former.

Mizuhopecten kudoi (NOMURA) (1935) and *M. subyessoensis* (YOKOYAMA) (1930) may be the another allied species to the present form, but the former two species were poorely known about their specific nature; they were established as independant species based either on a single, imperfect, water worn shell (*M. kudoi*) or on an internal mould (*M. subyessoensis*) of shell. Therefore, the detailed comparsion between the present species and the above two species is almost impossible. Yet, *M. kudoi* may be distingishable from the species now in question by strong radial ribs which are nearly equal to their interspaces. Further, in concern to *M. subyessoensis*, character of the right valve is imperfectly known. According to YOKOYAMA's description and illustration, *M. subyessoensis* seems to have flat shell and rather narrower apical angle than that of the present species.

Genus ***Chlamys*** RÖDING, 1798

Chlamys kaneharai (YOKOYAMA)

Pl. 14, Figs. 3, 3a.

1926. *Pecten kaneharai* YOKOYAMA, Jour. Fac. Sci. Imp. Univ. Sec. 2, Vol. 1, pt. 4, p. 135, pl. 18, fig. 1; pl. 19, fig. 5, 6, 7, 12.
1931. *Pecten kaneharai* YOKOYAMA, Ibid. Vol. 3, pt. 4, p. 203, pl. 13.
1936. *Pecten kaneharai* NOMURA et HATAI, Saito Ho-on Kai Mus. Res. Bull No. 10, p. 119, pl. 13, figs. 3, 4.
1937. *Pecten (Chlamys) kanehrai* NOMURA et HATAI, Ibid. no. 13, p. 127, pl. 8, figs. 1, 2.
1940. *Pecten (Chlamys) kaneharai* NOMURA et ONISHI, Japanese Jour. Geol. Geogr. Vol. 17, nos. 3–4, p. 181, pl. 18, fig. 8.
1956. *Chlamys kaneharai* MASUDA, Trans. Proc. Palaeont. Soc. Japan, N.S. No. 21, pp. 129–133, pl. 20, figs. 1–7.
1956. *Chlamys kaneharai* SHIBATA, Trans. Proc. Palaeont. Soc. Japan, N.S. No. 24, pp. 230–231, pl. 32, figs. 5a, b.
1962. *Chlamys kaneharai* MASUDA, Sci. Rep. Tohoku Univ. 2nd Ser. Vol. 33, no. 2, p. 187, pl. 20, fig. 7; pl. 22, figs. 8–10; pl. 26, figs. 11, 12.

This characteristic Miocene species of *Pectinidae* is rather rich in the Ainonai formation, although most specimens are fragmental and do not show satisfactry state of preservation. However, they show the following features to be described and can be accordingly identified to the named species with certainty:

Description: The left valve is slightly less convex than the right valve and is ornamented by about 20 or a little more distinct radial ribs. The radial ribs are nearly equal or sightly broader than their interspaces in breadth and usually divided into three parts by two shallow longitudinal furrows as shown in magnified figure Pl. 14, Fig. 3 a. Interspaces between radial ribs are usually sculptured by one intercalary threads running subparallel to radial ribs. The anterior auricle is much longer than the posterior one, sculptured by distinct radial and concentric lines and

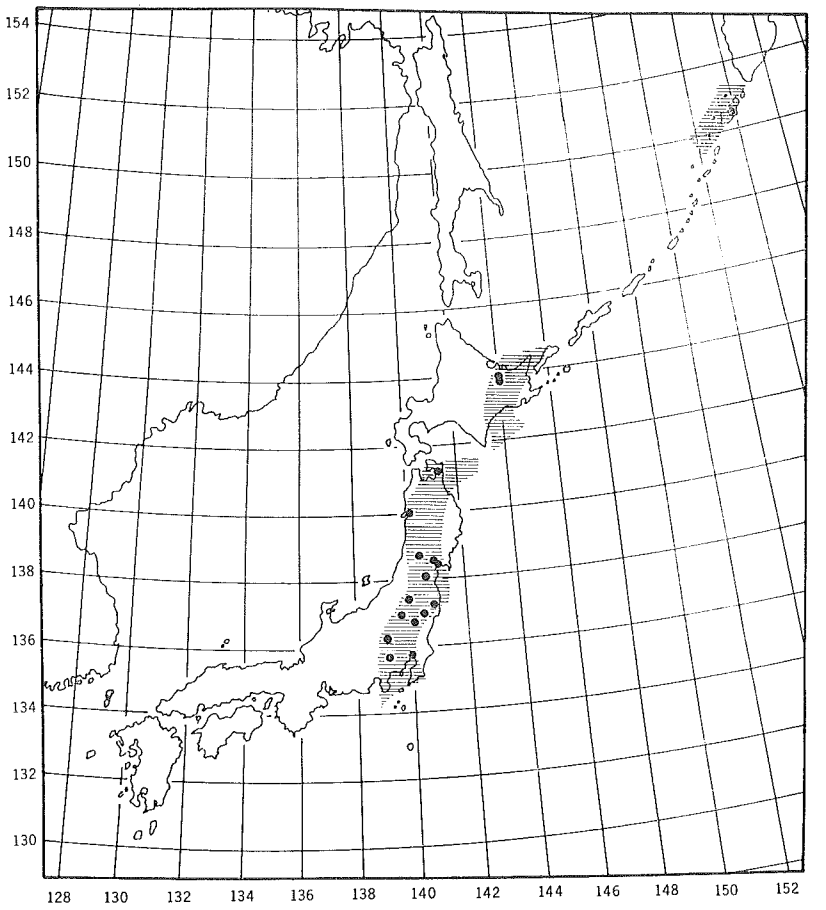


Fig. 3
Showing the distribution of *Chlamys kaneharai*.

provided with wide byssal area. The hinge of the specimens possess deep and wide resilial pit.

Dimensions (in mm):

	Length	Height	Depth	Apical angle
Right valve	51+	59+	?	?
	42.4	50.5	8.4	97°
Left valve	37.6	42+	9.7	84°

Repository: U.H. Reg. No. 13704, 13705, 13706.

Among Japanese Tertiary Pectinidae, *Chlamys kaneharai* is one of the leading fossils found from the Miocene deposits developed in the so-called green tuff region in Honshu. In spite of it, the present species has been not commonly known from the Tertiary deposits in Hokkaido.

The localities where the present species were found in Hokkaido and Kurile islands will be listed below:

1) Bottom of the sea, 7 m deep, Kakumabetsu-Bay, Paramushir, Kurile islands, greeish gray medium-grained sandstone deposits (Formation name unknown), Coll, Unknown.

2) Chirai, Saroma-Machi, Kitami-Province, East Hokkaido, Chirai formation, Coll. H. TAKEDA and Y. KITAGAWA.

3) Ainonai formation as stated above, Coll. S. UOZUMI.

The geographic distribution of this species is shown in Text-Figure 3. All of them are found from the green tuff regions both in North Honshu and Hokkaido including Kurile islands.

Chlamys cosibensis hanzawae MASUDA

Pl. 14, Fig. 1.

1925. *Pecten swiftii* YOKOYAMA, Jour. Fac. Sci. Imp. Univ. Tokyo, Ser. 2, Vol. 1, pt. 3, p. 123, pl. 15, fig. 3.
1936. *Pecten (Manupecten) cosibensis* NOMURA et HATAI, Saito Ho-on Kai Mus. Res. Bull. No. 10, p. 163, pl. 18, figs. 5, 39, 42.
1937. *Pecten (Swiftopecten) swiftii* NOMURA et HATAI, Ibid. no. 13, p. 129, pl. 18, fig. 6.
1959. *Chylamys cosibensis hanzawae* MASUDA, Trans. Proc. Palaeont. Soc. Japan, N.S. No. 35, pp. 125–126, pl. 13, figs. 10–15.
1962. *Chlamys cosibensis hanzawae* MASUDA, Sci. Rep. Tohoku Univ. Sendai, 2nd Ser. Vol. 33, no. 2, pp. 163–164, pl. 18, figs. 27. 28.

Owing to an inadequate description given by YOKOYAMA, when he first established the present species, many confusions have been arison in classification of *Chlamys cosibensis* YOKOYAMA and allied forms by the subsequent investigators.

However Dr. MASUDA recently re-examined in detail this group of *Chlamys* including YOKOYAMA's species and divided the present form into four subspecies: *cosibensis*, *hanzawae*, *turpicula* and *heteroglypta*.

The specimen, now in concern, is composed of a single right valve, although it is almost perfect in preservation which is doubtlessly identical with *Chlamys cosibensis hanzawae* MASUDA. It may be, however, worth while noting that the Ainonai specimen is more larger in size than the specimens illustrated and described by MASUDA. According to him, among the specimens referable to the present subspecies, the stratigraphically younger the larger the specimen, besides the younger one has more convex shell than that of the geologically older one. Namely, the late Miocene form is larger than that of the early Miocene one, while the former is more convex in the shell than that of the early Miocene form. Such tendency may have been resulted step by step through the lapse of the time. And similar inclination was once pointed out by NOMURA and HATAI (1936) in *Chlamys cosibensis cosibensis*.

Dimensions (in mm):

	Length	Height	Depth	Apical Angle
Right valve	48.8	49.0	1.0	88

Reposotory: U.H. Reg. No. 13707

Genus ***Swiftopecten*** HERLEIN, 1935

Swiftopecten swiftii (BERNARDI)

Pl. 14, Fig. 2.

1867. *Pecten swiftii* SCHRENCK, Moll. Amurl. Nordijap. Meereas, p. 487, pl. 21, figs. 1–3.
1882. *Pecten swiftii* KOCHIBE, Rika Kai-shi, Tokyo Univ. Press. No. 4, p. 75, pl. 5, fig. 2.
1888. *Pecten swiftii* KUSTER und KOBELT in MARTINI und CHEMINITZ, Syst., Conch. Cab. Vol. 7, pt. 2. p. 142, pl. 40, fig. 3.
1902. *Pecten swiftii* YOSHIWARA, Zool. Mag. Tokyo, Vol. 14, no. 162, p. 144, pl. 2, figs. 6a-b.
1925. *Pecten swiftii* YOKOYAMA, Jour. Coll. Sci. Imp. Univ. Vol. 45, art. 5, p. 27, pl. 2, fig. 1.
1926. *Pecten swiftii* YOKOYAMA, Jour. Fac. Sci., Imp. Univ. Tokyo, Vol. 1, pt. 8, p. 303, pl. 37, figs. 5, 6.
1931. *Pecten (Pallium) swiftii* GRANT and GALE, Mem. San Diego Soc. Nat. Hist. Vol. 1, p. 171, pl. 10. figs. 1a-b, 4a-b.
1934. *Chlamys swiftii* KINOSHITA and ISAHAYA, Rep. Fish. Surv., Hokkaido Fish. Exp. Stat. No. 33, p. 14, pl. 10, fig. 74.
1935. *Pecten (Pallium) swiftii* NOMURA and HATAI, Saito Ho-on Kai Mus., Res. Bull. No. 6, p. 98, pl. 9, fig. 8; pl. 10, figs. 3, 4; pl. 11, fig. 8; pl. 13, fig. 3.
1950. *Chlamys islandicus* var. *swiftii* KUBOTA, Cenozoic Res. No. 6, p. 12, figs. 66, 67.

1951. *Chlamys swiftii* HABE, Genera of Japanese shells, No. 1, p. 74, fig. 150.
1955. *Chlamys swiftii* HABE, Publ. Akkeshi Mar. Biol. Stat., No. 4, p. 6, pl. 2, fig. 7.
1958. *Chlamys (Swiftopecten) swiftii* HABE, Publ. Seto Mar. Biol. Lab., Vol. 6, no. 3, p. 263, pl. 12, fig. 18.
1959. *Chlamys (Swiftopecten) swiftii* MASUDA, Trans. Proc. Palaeont. Soc. Japan, N.S. No. 34, PP. 86–89, pl. 9, figs. 1–7.
1960. *Swiftopecten swiftii* MASUDA, Sci. Rep. Tohoku Univ. 2nd Ser. Spec. Vol. 4, p. 340, pl. 39, figs. 9, 10.

The present species, now widely living in the water of the northern hemisphere including the sea around Hokkaido is also known as fossil from Piocene and Pleistocene formations in Japan. Yet the record on the occurrence of this species from the Miocene formation in Hokkaido is rather rare, although it is fairly common from the late Miocene deposits developed in Honshu, Japan.

The specimens now in the writers' disposal possess distinct four radiating ribs which are broader than their interspaces and ornamented by four concentric constrictions. The anterior auricle of these specimens is very large, trianglular in shape, and sculptured by fine or distinct radial threads. The detailed description to concern to taxonomic, ecologic and geologic problems on this species was already given in detail by MASUDA (1960). There may be need to add here any more on his study.

Dimensions (in mm):

	Length	Height	Depth	Apical angle
valve	64	81.0	14	75

Repository: U.H. Reg. No. 13708.

Family CARDIIDAE

Genus ***Serripes*** GOULD, 1841

Serripes laperousii (DESHAYES)

Pl. 15, Fig. 5.

1939. *Cardium laperousii* DESHAYES, Rev. Zool. Soc. p. 360,
1923. *Macira fujinensis* YOKOYAMA, Japanese Jour. Geol. Geogr. Vol. 2, no. 1, p. 5, pl. 2, figs. 2a-b.
1935. *Serripes laperousii* NOMURA, Saito Ho-on Kai Mus. Res. Bull. No. 5, p. 114, pl. 7, figs. 1–3.
1935. *Serripes laperousii* OTUKA, Jour. Geol. Soc. Japan, Vol. 42, p. 602, pl. 16, figs. 1–2.
1962. *Serripes laperousii* NODA, Sci. Rep. Tohoku Univ. 2nd Ser. Spec. Vol. 5, pp. 225–226, pl. 36, figs. 6a-b; pl. 37, figs. 2a-b, 6, 7; pl. 38, figs. 5, 6.

Three specimens belonging to the genus *Serripes* were found in the collection from the Ainonai formation, but in all of them shells are found completely destroyed.

In addition they are unfortunately more or less deformed. Description follows: Shell rather small in size, inequilateral, beak situated anterioroly at 1/3 the length of the shell; ovately rounded in outline; anterior margin is also equally rounded, merges into the ventral margin; ventral margin boradly rounded; posterior end subtruncate; posterior dorsal margin rather short, nearly straight; surface ornamention entirely unknown.

Dimensions (in mm):

Length	Height	Depth
47	43	22
45	39.5	19

Repository: U.H. Reg. No. 13709, 13713.

These specimens now in problem, can be identified to the *Serripes laperousii* with certainty and may be easily distingishable form *Serripes grenlandicus* in having more higher shell and more curved beaks.

Genus ***Papyridea*** SWAINSON, 1840

Papyridea harrimani DALL

Pl. 15, Figs. 1, 7.

1904. *Papyridea harrimani* DALL, HARRIMAN Alaska Exped. Geol. Vol. 4, p. 114, pl. 10, fig. 5.
1934. *Cardium (Papyridea) harrimani* MAKIYAMA, Mem. Coll. Sci. Kyoto Univ. Ser. B, Vol. 10, no. 2, pl. 6, fig. 34 (in part).
1955. *Papyridea harrimani* HIRAYAMA, Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, no. 29, p. 100, pl. 2, fig. 24.
1962. *Papyridea harrimani* KAMADA, Paleont. Soc. Japan, Spec. Paper, No. 8, p. 107–108, pl. 11, figs. 3–5.

The specimens referable to the present species are rather abundantly found in the Ainonai formation. They seem to be somewhat larger in general than the specimens described and figured by MAKIYAMA from the Asagai formation, Joban coal-field.

A few specimens of *Papyridea harrimani*, collected by the present writers from the Asagai formation cropping out at Yumoto, Jo-ban coal-field, and specimens of *P. kurodai* collected also by the writer from the Setana formation, Oshima Peninsula, Southwest Hokkaido, were brought into direct comparison with the present specimens from the Ainonai formation.

As a result, the specimens from the Ainonai formation are observable to have the same type and same number of ribs ranging from 31–36 as those from the Asagai formation. To the contrary, they are quite distinct from *Papyridea kurodai* HATAI

and NISHIYAMA (1952) which possesses 49 raidating ribs. Also the present specimens are somewhat resembled *Papyridea nipponica* YOKOYAMA (1924) known from the Futaba district, Jo-ban coal-field in outline of shell but the former differs from the latter in having less numerous ribs.

In the meantime, YOKOYAMA (1927) once described a shell under the name of "*Cardium ainuanum*" from the Chikubetsu formation, Haboro coal-field in the northern part of Central Hokkaido. Recently, the present writers examined several specimens referable to the YOKOYAMA's species, collected by him from the type locality of this species. As a result, the species seems to be assignable into genus *Papyridea* with certainty. Further, YOKOYAMA's species seems to be also somewhat resembled the Ainonai specimens now in problem, but the former is still distingishable from the latter by having a more sharply rounded posterior margin.

Dimensions (in mm):

Length	Height	Thickness
26.5	19+	10
60+	44.2	?
98+	78.6	21

Repository: U.H. Reg. No. 13410, 13711, 13712.

Generally speaking, both *Papyridea harrimani* and *nipponica* have been regarded in Japan to indicate Upper Oligocene in age, while *P. ainuanum*, Lower Miocene and *P. kurodai*, Pliocene. New finding of the present species from the Ainonai formation may be accordingly somewhat interesting from the viewpoint of geological and geographical distributions of this species.

Family AMALTHEIDAE

Genus ***Amathina*** GRAY 1847

Amathina nobilis (ADAMS)

Pl. 14, Fig. 7.

1867. *Cupulus nobilis* ADAMS, Proc. Zool. Soc. P. 312, pl. 19, fig. 27.
1895. *Amathina nobilis* PILSBRY, Catal. Moll. Japan, p. 70.
1931. *Amathina nobilis* YOKOYAMA, Jour. Fac. Sci. Imp. Univ., Tokyo, Sec. 2, Vol. 3, p. 194, pl. 11, fig. 4.
1960. *Amathina nobilis* KIRA, Illust. Shell, Japan, p. 130, pl. 13, fig. 4.

The present form is known as a living species in the water around Saghalin and Kurile islands. As a fossil record it has been only known by YOKOYAMA (1931) from the Suttu(?) formation, Southwest Hokkaido.

Incidentally, the present writer collected the specimens referable to the present species from the Setana formation cropped out at the cliff of the Shuta-gawa,

about 2 km northeast from Kuromatsunai-machi, Suttu-gun, Shiribeshi Province, Southwest Hokkaido. Therefore, YOKOYAMA's specimens may have been perhaps collected from the Setana formation developed in Suttu, including the locality above mentioned.

The specimen to be identified to the present species, collected from the Ainonai formation is composed only one imperfect mold of shell, but still keeps the following features: surface of shell is ornamented by two distinct radial ribs running subparallel with each other on the dorsal area; apex is acute and involved towards behind and slightly turned to the right side of the shell.

From these characteristic features mentioned above, the Ainonai specimen can be identified with satisfaction to the present species. Directly comparing with the Setana specimens to the present species reveals that the Ainonai specimen has a slightly narrower aperture than that of the Setana ones, but the former should not be specifically distingishable from the latter.

	Length	Diameter
Dimensions (in mm):	22+	9.6

Repositiory: U.H. Reg. No. 13714.

Family RHYNCHONELLIDAE GRAY, 1848

Genus ***Hemithyris*** D'ORBIGNY, 1847

Hemithyris psitacea (GMELIN)

Pl. 14, Figs. 6, 6 a, 8.

1846. *Terebratula psitacea* GMELIN, SOWERBY Thes. Conch. Vol. 1, p. 342, pl. 71, figs. 78–80.
1861. *Rhynchonella psitacea* REEVE, Conch. Econ. Vol. 13, pl. 1, figs. 2a-c.
1920. *Hemityris psitacea* DALL, Proc. U.S. Nat. Mus. Vol. 57, p. 284.
1927. *Hemithyris psitacea* THOMSON, Brach. Morph. A Gen. p. 151, fig. 45.
1936. *Hemithyris psitaces* HATAI, Japanese Jour. Geol. Geogr. Vol. 13, nos. 1–2, p. 74, pl. 14, figs. 17, 22–24.
1936. *Hemithyris psitacea* NOMURA and HATAI, Saito Ho-on Kai Mus. Res. Bull. No. 10, p. 185, pl. 19, figs. 1, 2.
1938. *Hemithyris psitacea* HATAI, Ibid. No. 16, p. 175, pl. 18, figs. 29, 30.
1941. *Hemithyris psitacea* HATAI, Japanese Jour. Geol. Geogr. Vol. 18, no. 3, p. 117, pl. 8, figs. 5–8, 11.

Several specimens at hand show to possess very densely arranged growth lines as commonly observed in the subspecies *woodwardi* of the present species, but moreover the surface of the shell is provided with the radial sculpture which is rather distinct and well observable without aid of magnifying lens.

The latter feature is very characteristic in the present species and not of subspecies *woodwardi*.

Dimensions (in mm):

Length	Height	Thickness
20.8	20.0	12.4
17.6	17.1	8.5

Repository: U.H. Reg. No. 13715, 13716

Family TEREBRATELLIDAE KING, 1850

Genus ***Coptothyris*** JACKSON, 1916

Coptothysis grayi (DAVIDSON)

Pl. 15, Fig. 6.

1936. *Coptothyris grayi* HATAI, Japanese Jour. Geol. Geogr. Vol. 13, nos. 1–3, p. 81, pl. 14, figs. 11–14, 18, 19.
1936. *Coptothyris grayi* NOMURA and HATAI, Saito Ho-on Kai Mus. Res. Bull. No. 10, p. 180, pl. 18, fig. 18.
1937. *Coptothyris grayi* NOMURA and HATAI, Ibid. No. 13, p. 144, pl. 21, fig. 12.
1938. *Coptothyris grayi* NOMURA and HATAI, Ibid. No. 16, p. 220, pl. 20, figs. 28, 30–32, 37, 39.
1940. *Coptothyris grayi* HATAI, Sci. Rep. Tohoku Imp. Univ. 2nd Ser. Vol. 20, pp. 302–308, pl. 3, fig. 17; pl. 4, figs. 43, 48.

This species is very common in the water around north Japan and also in the Neogene deposits. The present species is observed to occur rather rich in the Ainonai formation like the preceding species.

Dimensions (in mm):

Length	Height	Thickness
24.8	24.6	17.4
37.6	33.0	20.2
27.6	31.0	?

Repository: U.H. Reg. No. 13717, 13718.

References

ADAMS A. (1865): On Some New Genera of Mollusca from the Sea of Japan. *Ann. Mag. Nat. Hist.*, Ser. 3, Vol. 15, pt. 88, pp. 322–324.

AKIYAMA M. (1962): Studies on the Phylogeny of *Patinopecten* in Japan. *Sci. Rep. Tokyo Kyoiku Daigaku*, Sec. C, Vol. 8, no. 74, pp. 63–122.

CHINZEI K. (1961): Molluscan Fauna of the Pliocene Sannohe Group of Northeast Honshu, Japan. 2. The Faunule of the Togawa Formation. *Jour. Fac. Sci. Univ. Tokyo* Ser. 2, Vol. 13, pt. 1, pp. 81–131.

DALL W. H. (1904): Neozoi Invertebrate Fossils. *Harriman Alaskan Expedition, Geology*, Vol. 4, pp. 99–122.

GRANT U. S. and GALE H. R. (1931): Catalogue of the Marine Pliocene and Adjacent Regions. *Mem. San Diego Soc. Nat. Hist.*, Vol. 1, pp. 1–1036.

HABE T. (1951): Genera of Japanese Shells, Pelecypoda. *Comm. Shell Literature Publ.*, No. 1, pp. 1–96.

—— (1955): Fauna of Akkeshi Bay. *Akkeshi Mar. Biol. Stat.*, No. 4, pp. 1–31.

—— (1958): Report on the Mollusca Chiefly collected by the S.S. Soya-maru of the Imperial Fisheries Experimental Station on the Continental Shelf bordering Japan, during the Years 1922–1930 *pt.* 3, Lamellebranchia. *Publ. Seto, Mar. Biol. Lab.* Vol. 3, pp. 241–273.

HATAI K (1940): Cenozoc Brachiopaoda from Japan. *Sci. Rep. Tohoku Imp. Univ. 2nd Ser.* Vol. 20, pp. 1–413.

—— (1914): On Some Fossils from the Oido Shell Beds Developed in Toda-gun, Rikuzen Province, Japan. *Japanese Jour. Geol. Geogr.* Vol. 18, no. 3, pp. 109–118.

HATAI K. and NISHIYAMA S. (1952): Check List of Japanese Tertiary Marine Mollusca. *Sci. Rep. Tohoku Univ. 2nd Ser. Spec.* No. 3, pp. 1–464.

HASHIMOT W. and NAGAO S. (1956): The Oil-Indication and Natural Gas from Monbetsu-gun, Kitamino-Kuni, Hokkaido. *Jour. Japan Assoc. Petr. Tech.* Vol. 21, no. 3, pp. 102–105. (in Japanese)

—— and KANNO S. (1958): Molluscan Fauna from the Tertiary formation of Chirai, Kamisaroma, Kitamino-Kuni, Hokkaido. *Trans. Proc. Palaeont. Soc. Japan N.S.* No. 32, pp. 285–290.

HAY O. P. (1924): Notes on the Osterology and Dentition of the Genera *Desmostylus* and *Cornwallius*. *Proc. U.S. Nat. Mus.*, Vol. 65, art. 8.

HIRAYAMA K. (1955): The Asagai formation and Its Molluscan Fossils in the Northern Region, Joban Coal-Field, Fukushima Prefecture, Japan. *Sci. Rep. Tokyo Kyoiku Daigaku*, Sec. C, Vol. 4, no. 29, pp. 49–130.

IJIRI S. and KAMEI T. (1961): On the Skulls of *Desmostylus mirabilis* NAGAO from south Sakhalin and of *Paleoparadoxia tabatai* (TOKUNAGA) from Gifu Prefecture, Japan. *Earth Sci.* No. 53, pp. 1–27 (in Japanese with English resume).

KAMADA Y. (1962): Tertiary Marine Mollusca from Joban Coal-Field, Japan. *Paleont. Soc. Japan, Spec. Paper*, No. 8, pp. 1–187.

KINOSHITA T. and ISAHAYA T. (1934): Catalogue of Marine Mollusca from Hokkaido. *Rep. Fish. Surv. Hokkaido Fish Exp. Stat.* No. 33, pp. 1–19.

KIRA T. (1959): Coloured Illustarations of the Shells of Japan, *Hoikusha printed*, pp. 1–239 (in Japanese).

KOCHIBE T. (1882): Johoku Chishitsu Hen (Geology of Northern Hitachi). *Rika kaishi Tokyo Univ. Press.* No. 4, pp. 1–153.

KUBOTA K. (1950): Explanation of Cenozoic Fossil *Pectinidae* from the Setana Series. *Cenozoic Research* No. 6, pp. 94–100, (in Japanese).

KUSTER H. C. and KOBELT W. in MARTINI und CHEMNITZ (1888): Die Gattungen *Spondylus* und *Pecten*. *Syst. Conch. Cab.*, Vol. 7, pt. 2, pp. 1–296.

MAKIYAMA J. (1934): The Asagaian Molluscs of Yotsukura and Matchgar. *Mem. Coll. Sci. Kyoto Univ.* Ser. B, Vol. 10, no. 2, pp. 121–167.

MINATO M. et al. (1957): On the Stratigraphical Position of the *Desmostylus*-tooth found in Tokachi Province, Hokkaido. *Jour. Geol. Soc. Japan* Vol. 63, no. 740 (in Japanese with English resume).

MASUDA K. (1953): A New Species of *Patinopecten* from Ibaragi Prefecture. *Inst. Geol. Palaeont. Tohoku Univ., Short Paters*, No. 5, pp. 41–50.

—— (1954): Fossil *Pectinidae* from Fukuoka-machi, Ninohe-gun, Iwate Prefecture. *Saito Ho-on Kai Mus. Res. Bull.* No. 23, pp. 11–14.

—— (1956): On the Miocen *Pectinidae* from the Environs of Sendai: pt. 7, on *Pecten kaneharai* YOKOYAMA. *Trans. Palaeont. Soc. Japan, N.S.* No. 22, pp. 175–183.

—— (1959): On the Miocene *Pectinidae* from the Environs of Sendai: pt. 15, *Pecten cosibensis* YOKOYAMA and Its Related Species. *Trans. Proc. Plaaeont. Japan N.S.* No. 35, pp. 130–141.

—— (1959): On the Miocene *Pectinidae* from the Environs of Sendai; pt 14, On *Pecten swiftii* BERNARDI. *Trans. Proc. Palaeont. Soc. Japan, N.S.* No. 34, pp. 101–111.

—— (1962): Tertiary Pectinidae of Japan. *Sci. Rep. Tohoku Univ. 2nd Ser.* Vol. 33, no. 2, pp. 1–238.

NAGAO T. (1937): A New Occurrence of a Small *Desmostylus* Tooth in Hokkaido. *Proc. Imp. Acad. Tokyo*, Vol. 13, no. 4, pp. 110-113.

—— (1937): A New Species of *Desmostylus* from Japanese Saghalien and its Geological Significance. *Proc. Imp. Acad., Tokyo* Vol. 13, no. 2, pp. 45–49.

—— (1941): On the Skeleton of *Desmostylus*. *Mem. Lect. Commen, Prof. H. YABE's 60th Birthd.* pp. 43–52.

NODA H. (1962): *Serripes* (Mollusca) from Japan and Saghalien. *Sci. Rep. Tohoku Univ. Japan, 2nd Ser. Spec.* Vol. 5, pp. 219–232.

NOMURA S. (1935): Fossil Mollusca from the Vicinity of Ogino, Yama-gun, Fukushima-ken. *Saito Ho-on Kai, Mus. Res. Bull.* No. 5, pp. 101–125.

—— (1935): Miocene Mollusca from the Nisi-Tugaru District, Aomori-ken, Northwestern Honsyu, Japan. *Saito Ho-on Kai Mus. Res. Bull.* No. 6, pp. 19–74.

—— and HATAI K. (1936): Fossils from Yozawagi-mura, Ugo Province, Northeast Honsyu, Japan. *Ibid.* No. 10, pp. 157–181.

—— and —— (1936): Fossil from the Tanagura Beds in the Vicinity of the Town Tanagura, Hukushima-ken, Northeast Honsyu, Japan. *Ibid.* No. 10, pp. 109–155.

—— and —— (1937): A List of the Miocene Mollusca and Brachiopoda collected from the Region Lying North of the Nanakita Rever in the Vicinity of Sendai, Rikuzen Province, Japan. *Ibid.* No. 13, pp. 121–145.

—— and ONISHI H. (1940): Neogene Mollusca from Sennan District, Miyagi Prefecture, Japan. *Japanese Jour. Geol. Geogr.* Vol. 17, no. 3–4, pp. 181–194.

OTUKA Y. (1935): *Serripes* in Japan. *Geol. Soc. Japan*, Vol. 42, nos. 504, pp. 601–604.

PILSBRY H. A. (1895): Catalogue of the Marine Molluska of Japan, pp. 1–196.

SCHRENCK L. (1867): Mollusken des Amur Landes und des Nordjapanischen Meeres.

Reisen und Forschung Amurlande in denn, 1854–1856, Vol. 2, pt. 3, pp. 259–976.

SHIBATA M. (1956): A Fossil Fauna from the Northern Part of the Tanzawa Massif. *Trans. Palaeont. Soc. Japan, N.S.* No. 23, pp. 229–234.

TAKEDA H. and KITAGAWA Y. (1951): On the Limestone developed in the Environs of Chirai, Saroma, Kitamino-Kuni, Hokkaido. *Rep. Geol. Surv. Hokakido*, No. 6, pp. 12–16.

UOZUMI S. (1957): Studies on the Molluscan Fossils from Hokkaido. *Jour. Fac. Sci. Hokkaido Univ.* Ser. 4, Vol. 9, no. 4, pp. 539–596.

—— (1962): Neogene Molluscan Fauna in Hokkaido; pt 1, Sequence and Distribution of Neogene Molluscan Faunas. *Jour. Fac. Sci. Hokkaido Univ.* Ser. 4, Vol. 11, no. 3, pp. 507–544.

VANDERHOOF V. L. (1937): A Study of the Miocene Sirenian *Demostylus*. *Univ, Calif. Publ. Bull. Dep. Sci.* Vol. 24, no. 8, pp. 169–262.

YABE H. (1959): A Problem on the Geological Range and Geographical Distribution of *Desmostylids*. *Trans. Proc. Palaeont. Soc. Japan, N.S.* No. 33, pp. 44–51.

YOKOYAMA M. (1923): On Some Fossil Mollusca from the Neogene of Izumo. *Japanese Jour. Geol. Geogr.* Vol. 2, no. 1, pp. 1–9.

—— (1924): Molluscan Remains from the Lower Part of the Joban Coal-Field. *Jour. Coll. Sci. Imp. Univ. Tokyo* Vol. 45, art. 3, pp. 1–22.

—— (1925): Molluscan Remains from the Uppermost Part of the Joban Coal-Field. *Jour. Coll. Sci. Imp. Univ. Tokyo*, Vol. 45, art 5, pp. 1–34.

—— (1925): Tertiary Mollusca from Shinano and Echigo. *Fac. Sci. Imp. Univ Tokyo*, Sec. 2, pt. 1, pp. 1–23.

—— (1925): Mollusca from the Tertiary Basin of Chichibu. *Jour. Fac. Sci. Univ. Tokyo*, Sec. 2, Vol. 1, pt. 3, pp. 111–126.

—— (1926): Fossil Shells from Sado, *Ibid.* Vol. 1, pt. 8, pp. 249–312.

—— (1926): Tertiary Mollusca from Shiobara in Shimotsuke, *Ibid.* Vol. 1, pt. 4, pp. 127–138.

—— (1927): Tertiary Shells from the Coal-Field of Haboro, *Ibid*, Vol. 2, pt. 4, pp. 191–204.

—— (1930): Tertiary Mollusca from South Karafuto, *Ibid*, Vol. 2, pt. 10, pp. 407–418.

—— (1931): Tertiary Mollasca from Iwaki, *Ibid*, Vol. 3, Pt. 4, pp. 197–203.

—— (1931): Neogene Shells from Karafto and Hokkido, *Ibid*, Vol. 3, Pt. 4, pp. 185–196.

YOSHIWARA S. (1902): Japanese Shells (Lamelibranchs), *Zool. Mag. Tokyo.* Vol. 14, no . 168, pp. 256–358.

(Manuscript received Sept. 15, 1965)

Explanation of Plate 14

Explanation of Plate 14

(All figures natural size unless otherwise denoted)

Fig. 1. *Chlamys cosibensis hansawae* MASUDA. U. H. Reg. No. 13707, side view of right valve.
Locality : Cliff of the Muka-gawa, near Ainonai-mura, Tokoro-gun, Kitami Province, East Hokkaido.

Fig. 2. *Swiftopecten swiftii* (BERNARDI). U. H. Reg. No. 13708, side view of right valve of cast.
Locality : same as above.

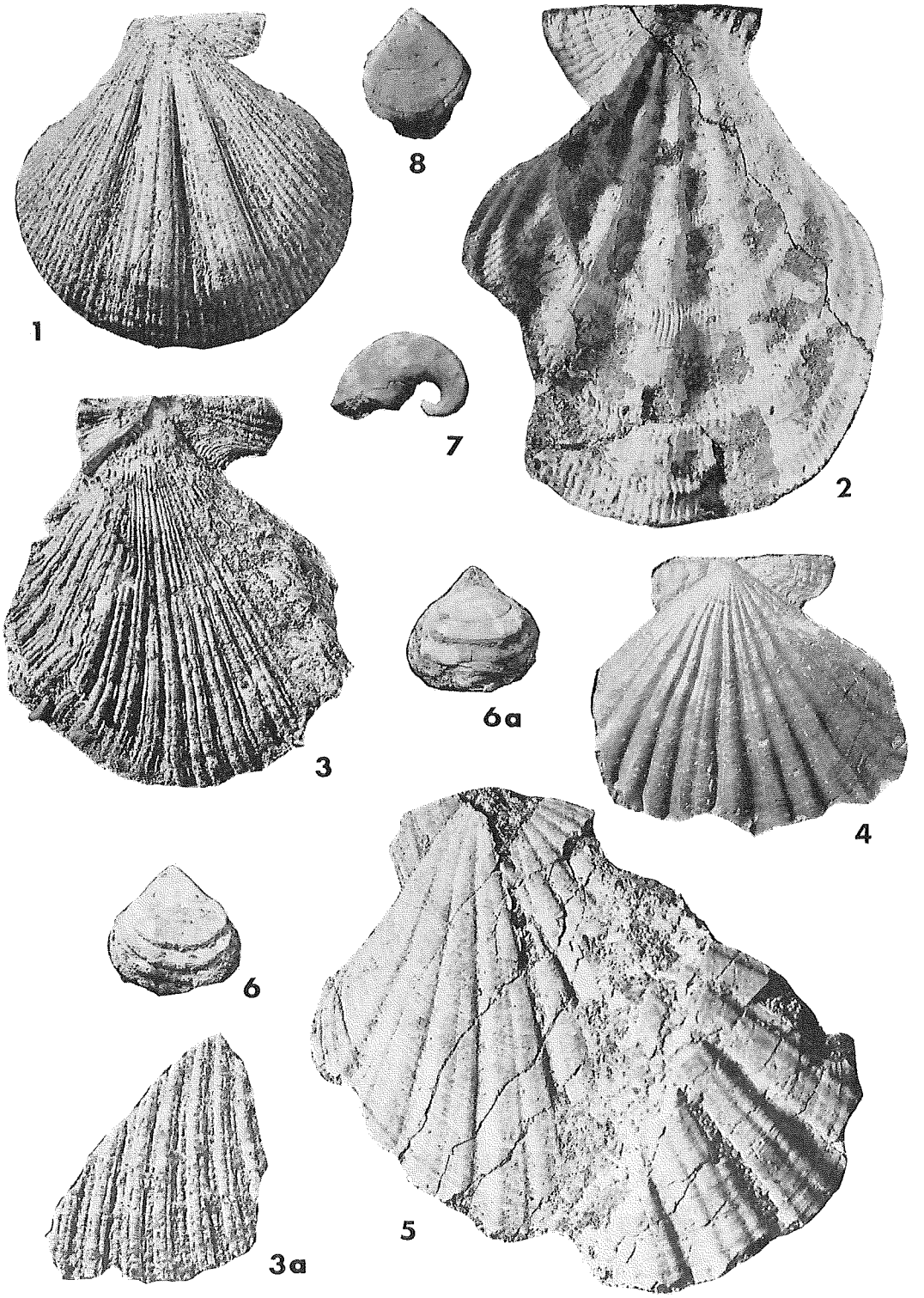
Figs. 3, 3a. *Chlamys kaneharai* (YOKOYAMA). 3 : U. H. Reg. No. 13704, side view of right valve of plastic cast ; 3a : U. H. Reg. No. 13706, magnified figure of ornamentation of right valve, x 1⅕.
Locality : same as above.

Figs 4, 5. *Mizuhopecten kitamiensis* n. sp. 4 : U. H. Reg. No. 13720, side view of right valve of plastic cast ; 5 : U. H. Reg. No. 13720, side view of right valve.
Locality : same as above.

Figs. 6, 6a, 8. *Hemithyris psitaces* (GMELIN). 6 and 6a : U. H. Reg. No. 13716, side view of ventral and dorsal valve ; 8 : U. H. Reg. No. 13716, side view of ventral valve.
Locality : same as above.

Fig. 7. *Amathina nobilis* (ADAMS). U. H. Reg. No. 13714, lateral view.
Locality : same as above.

Plate 14



Explanation of Plate 15

Explanation of Plate 15

(All figures natural size)

Figs. 1, 7. *Papyridea harrimani* DALL. 1 : U. H. Reg. No. 13710, side view of left valve ; 7 : U. H. Reg. No. 13711, side view of right valve.
Locality : Cliff of the Muka-gawa, near Ainonai-mura, Tokoro-gun, Kitami Province, East Hokkaido.

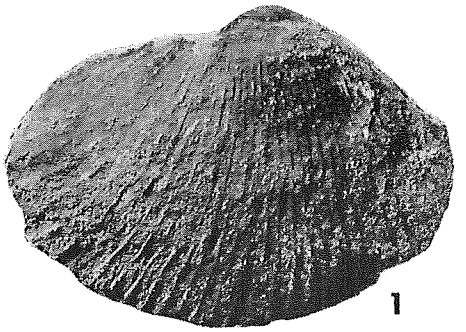
Figs. 2, 3. *Mizuhopecten kitamiensis* n. sp. 2 : U. H. Reg. No. 13730a, side veiw of right valve of plastic cast, (Holotype) ; 3 : U. H. Reg. No. 13703b, side view of left valve of plastic cast.
Locality : same as above.

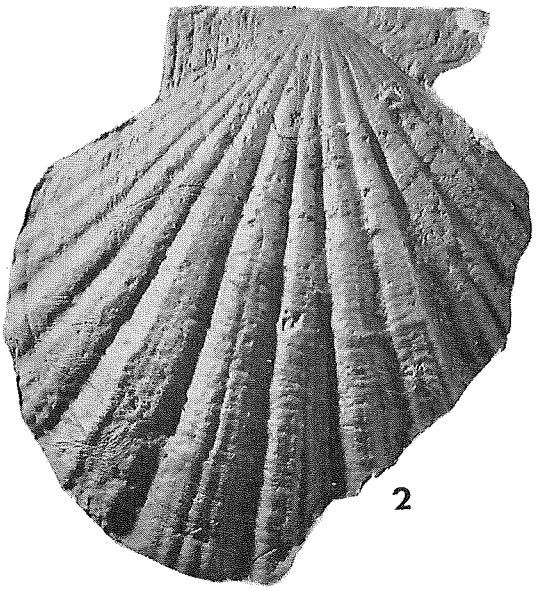
Fig. 4. *Peronidea* sp. U. H. Reg. No. 13721, side view of left valve.
Locality : same as above.

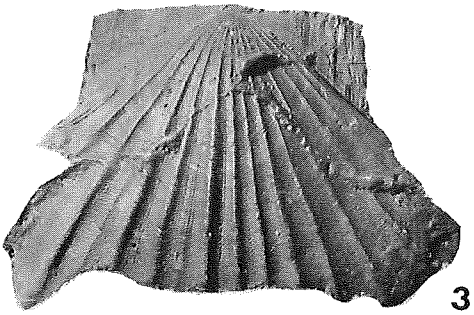
Fig. 5. *Serripes laperousii* (DESHAYES). U. H. Reg. No. 13709, side view of right valve.
Locality : same as above.

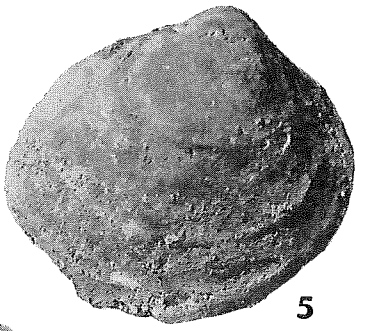
Fig 6. *Coptoryris grayi* (DAVIDSON). U. H. Reg. No. 13718, side view of dorsal valve.
Locality : same as above.

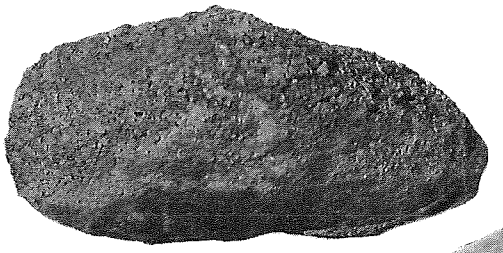
Plate 15


1

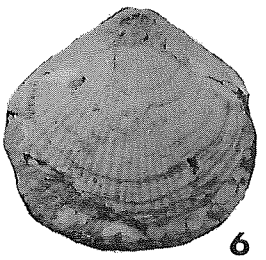

2


3


5


4


7


6