BIVALVE FOSSILS FROM THE UPPERMOST FORMATION OF
THE UPPER HIMENOURA SUBGROUP IN
AMAKUSA-SHIMOJIMA ISLAND, KYUSHU (Part 1)

Masayuki TASHIRO* and Masao OTSUKA**

ABSTRACT
The purpose of this paper is to describe the bivalve fossils from the Uppermost Formation (Formation U-IV) of the Upper Himenoura Subgroup and the 'Akasaki' Formation of the Miroku Group, in the Amakusa-Shimojima Island, Kumamoto Pref., Kyushu. Geological age of the lower part (Member U-IVa) and middle part (Member U-IVb) of Formation U-IV were assigned as the Maastrichtian. The age of the upper part (Member U-IVc) is, however, not clearly determined. The age of the 'Akasaki' Formation was assigned as the lower part of the Middle Eocene.

This part I deals with explanation of the biostratigraphic outline of the Upper Himenoura Subgroup and the 'Akasaki' Formation, and the description of 12 species of bivalves, belonging to Paleotaxodonta, Pteriomorpha and Palaeeotheterodontona inclusive of a new subgenus, Cnestriella, 4 new species, i.e., Acila (Truncacila) yoshidae, sp. nov., Septifer ushibukensis, sp. nov., Dimya akasakienisis, sp. nov., and Anomia (Paraplaucuna) reticularis, sp. nov., and a new subspecies, Nanonavis elongatus amakusensis, subsp. nov.

INTRODUCTION
Recently we found several molluscan assemblages from the beds of the Uppermost Formation (Formation U-IV) of the Upper Himenoura Subgroup and the 'Akasaki' Formation (TASHIRO and OTSUKA, 1978) of the Miroku Group, at several localities in Amakusa-Shimojima Island, Kyushu. We recognized 25 bivalve species from the formations. They are as follows. —

Acila (Truncacila) shimojimensis TASHIRO
Acila (Truncacila) yoshidae, sp. nov.
Nanonavis turgida TASHIRO
Nanonavis elongatus amakusensis, subsp. nov.
Portlandia (Cnestriella) cuneistriata ICHIKAWA and MAEDA, subgen. nov.
Inoceramus (Endocostea) cf. goldfussianus D'ORBIGNY
Glycymeris (Glycymerita) japonica TASHIRO
Parvamusium sp.
Septifer ushibukensis, sp. nov.
Anomia (Paraplaucuna) reticularis, sp. nov.

Dimya akasakienisis, sp. nov.
Apiotrigonia (?Apiotrigonia) dubia TASHIRO
Clisocolus japonica, sp. nov. M. S.
Leptosolen cf. japonica ICHIKAWA and MAEDA
Fleistarteye yokakuensis, sp. nov. M. S.
Agnomyx elegans TASHIRO
Tenea japonica ICHIKAWA and MAEDA
Miltha sp.

Izumia trapezoidalis ICHIKAWA and MAEDA
Amakusatapes ovatus, gen. and sp. nov. M. S.
Loxo japonica (AMANO)
Mesochione trigonalis TASHIRO
Crassatella? sp. aff. Crassatella (?) protracta COLLIGNON

Periploma cf. ambigua TASHIRO
Varicorbula ushibukensis, sp. nov. M. S.
Palumicorbula obsoleta, sp. nov. M. S.

This part deals with the biostratigraphic outline of the Upper Himenoura Subgroup and the 'Akasaki' Formation, and the descriptions of 12 species of bivalve fossils belonging to the Paleotaxodonta, Pteriomorpha and

Received September 18, 1979
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Palaeoheterodontia inclusive of a new subgenus, Cnestria, 3 new species and a new subspecies from the formations.

Before going into our study, we wish to express our grateful thanks to Prof. Minoru Tamura of Kumamoto Univ., for his kind guidance and reading this manuscript. Thanks are also due to Emelius Prof. Tatsuro Matsumoto of Kyushu Univ., for his kindly encolagement and valuable suggestion about the ammonites from the Uppermost Formation of the Subgroup. We also thank to Prof. Saburo Yoshida of Yamagata Univ. who supplied us the bivalve specimens from the Eastern Hokkaido, Dr. Masayuki Noda of Oita who gave us valuable advice about the inoceramid fossils from the formation, and Dr. Akihiko Matsukuma of Kyushu Univ. who supplied us the type species of Glycymerid from New Zealand. We also thank to Ph. D. Asahiko Taira of Kochi Univ. for his kindly suggestion from sedimentological point of view.

STRATIGRAPHICAL NOTES

The Upper Himenoura Subgroup is divided into four formations, i.e., Lower, Middle, Upper and Uppermost Formations (Tashiro and Noda, 1973; Tashiro, 1976). The Lower Formation (Formation U-I) is characterized by the occurrence of Inoceramus (Sphenoceramus) orientalis s. str. Sokolow, Apriotrigonia (Microtrigonia) imutensis (Tashiro), Nanonavis sachalinensis (Schmidt), Glycymeris (Glycymeris) amakusensis Nagao, etc. The geological age of Formation U-I is determined to the Lower Campanian (K6a1 by Matsumoto, 1977). The Middle Formation (Formation U-II) is divided into two members, i.e., the Lower Member (Member U-IIa) and the Upper Member (Member U-IIb). Member U-IIa is considered to the Middle Campanian (K6a2) because of the occurrence of I. (S.) sachalinensis Nagao and Matsumoto, Apriotrigonia (Apriotrigonia) crassoradiata Nakano, Yaadia (Yeharella) japonica japonica (Yehara), N. brevis Ichikawa and Maeda, Dipromoceras sp., etc. Member U-IIb is probably determinable to the Upper Campanian (K6a3). A. (M.) amanoi (Nakano). I. (S.) aff. schmidtii Michell, I. (Endocostea) balticus balticus Bohm, etc. are reported from Member U-IIb. Formation U-III is also divided into the lower (Member U-IIIa) and the upper (Member U-IIIb) members. Member U-IIIa is characterized by the occurrence of many marine mollusks, e.g., A. (M.) postonodosa Nakano, Limopsis kogata (Ichikawa and

Text-fig. 1. Map showing the location of Amakusa-Shimojima Island
MAEDA), N. awajianus (ICHIKAWA and MAEDA), G. (Glycymeris) japonica TASHIRO, Agnomayx elegans TASHIRO, I. (E.) n. sp., Baculites sp. etc. Member U-IIIa is tentatively correlated with the Azonotani Formation of the Izumi Group in the Izumi Mountains by TASHIRO and NODA (1973) and TASHIRO (1976). The geological age of Member U-IIIa is Uppermost Campanian or Maastrichtian. Member U-IIIb do not yields any fossil.

The Uppermost Formation (Formation U-IV) is divided into three members, i.e., the lower (Member U-IVa), the middle (Member U-IVb) and the upper (Member U-IVc), by our previous study (TASHIRO and OTSUKA, 1978). This Uppermost Formation is about 2000m in total thickness. Member U-IVa is composed mainly by black silt stone inserted several pebbly mudstone of about 700m thick. The geological age of this member is determined the Maastrichtian (K6b) judging from the occurrence of I. (E.) cf. goldfussianus d’ORBIGNY (MATSUMOTO and TASHIRO, 1979). Member U-IVb is alternation of sandstone and shale inserted several conglomerate beds. The thickness of Member U-IVb is about 500m. Several molluscan beds are inserted in this member. This member is also determined with the Maastrichtian, because of the occurrence of Baculites cf. rex ANDERSON and A. (?A.) dubia TASHIRO (MATSUMOTO, 1959; TASHIRO, 1979). Member U-IVc is composed by thick sandstone, conglomerate and thin shale. A few acidic tuff-beds are inserted in the upper part. Several mollusks and brachiopods occur in the sandstone and shale. The thickness of Member U-IVc is about 800m. The geological age of Member U-IVc is doubtfull whether is the Maastrichtian or the Danian. The top of Member U-IVc is nonconformably covered by the Tertiary ‘Akasaki’ Formation of the Miroku Group. The age of the ‘Akasaki’ Formation is determined to lower part of the Middle Eocene judging from the occurrence of many calcareous nanno fossils (TASHIRO et al. 1979). The bivalve species of the Uppermost Formation of the Upper Himenoura Subgroup and the ‘Akasaki’ Formation are described bellow. The distribution of the Uppermost Formation and the ‘Akasaki’ Formation in Amakusa-Shimojima Island is shown in Text—figs. 1 and 2.

LOCALITY RECORDS
In the following list are shown fossil localities with a brief note on lithology, stratigraphic unit and geological age at each locality. For geographic position of the localities also refer Text-fig. 2.

Loc. 1. Roadside exposure, about 2km west of Nishikone, Miyanokawachi, Kawaura-machi, Amakusa-gun, Kumamoto Prefecture; fine grained sandstone of basal part of Member U-IVa; Maastrichtian (Upper Hetonaiian).

Loc. 2. Northern beach of Shiba, Kameura, Futaura-machi, Ushibuka City, Kumamoto Prefecture; black silstone of the middle part of Member U-IVa; Maastrichtian (Upper Hetonaiian).

Loc. 3. Northern beach of Hayaura, Futaura-machi, Ushibuka City; black silstone of the middle part of Member U-IVa; Maastrichtian (Upper Hetonaiian).

Loc. 4. Shirahama, about 600m south of Onoura, Kutama-machi, Ushibuka City; fine grained sandstone of the upper part of the Member U-IVb; Maastrichtian (Upper Hetonaiian) or younger than it.

Loc. 5. Matsugahana beach near Kameura, Futaura-machi, Ushibuka City; silty sandstone of the middle part of member U-IVb; Maastrichtian (Upper Hetonaiian).

Loc. 6. Roadside exposure, about 300m north-west of Masuno, Oniki-machi, Ushibuka City; silty sandstone of the middle part of Member U-IVb; Maastrichtian (Upper Hetonaiian).

Loc. 7. Roadside exposure, about 300m north-west of Loc. 6; sandstone of the lower part of Member U-IVb; Maastrichtian (Upper Hetonaiian).

Loc. 8. Roadside exposure of Toboshida, Oniki-machi, Ushibuka City; sandstone of the lower or middle part of Member U-IVb; Maastrichtian (Upper Hetonaiian).

Loc. 9. Roadside exposure, about 150m east of Shiba, Kameura, Futaura-machi, Ushibuka City; silty sandstone of the middle part of Member U-IVb; Maastrichtian (Upper Hetonaiian).

Loc. 10. Daian, about 800m east of Shirakigawachi, Takahama, Amakusa-machi, Amakusa-gun (= Loc. 020, by TASHIRO, 1976); sandstone of the middle part of Member U-IVb; Maastrichtian (Upper Hetonaiian).
Loc. 11. Roadside exposure, about 400m east of Loc. 10; sandstone of the middle part of Member U-IVb; Maastrichtian (Upper Hettanaian).

Loc. 12. Roadside exposure of Myokengaura, Amakusa-machi, Amakusa-gun; fine grained sandstone of Member U-IVb; Maastrichtian (Upper Hettanaian).

Loc. 13. Roadside exposure of Kikaigaura, Amakusa-machi, Amakusa-gun; fine grained sandstone of the basal part of Member U-IVc; Maastrichtian (Upper Hettanaian).

Loc. 14. Katsuzaki beach of Kutama-machi, Ushibuka City; coarse grained sandstone of the basal part of Member U-IVc; Paleocene or Maastrichtian.

Loc. 15. Shirato beach, about 600m east of Nakanoura, Kutama-machi, Ushibuka City; siltsilt of the basal part of Member U-IVc; Paleocene or Maastrichtian.

Loc. 16. Shimoda, Amakusa-machi, Amakusa-gun; shale of the middle part of Member U-IVb; Maastrichtian (Upper Hettanaian).

Loc. 17. Roadside exposure, about 750m south-west of Kokuryu, Fukuregi, Amakusa-machi, Amakusa-gun; shale of the middle part of U-IVc; Paleocene or Maastrichtian.

Loc. 18. Southern beach of Akashi-misaki, Kutama-machi, Ushibuka City; black siltstone of the middle part of the ‘Akasaki’ Formation of the Miroku Group; lower part of the Middle Eocene (see, TASHIRO et al. 1980).

**SYSTEMATIC DESCRIPTION**

Class BIVALVIA

Order NUCULOIDEA

Superfamily Nuculacea GRAY

family Nuculidae GRAY

Genus *Acila* ADAMS and ADAMS, 1858

Subgenus *Truncacila* GRANT and GALE, 1931

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**Acila (Truncacila) shimojimensis TASHIRO**

Plate 1, Figs. 1-7


**Material.**—KSG 2130 is a conjoined valves collected from Yotsuinosako of Kamihira, Miyanokawachi, Kawaura-machi, Amakusa-Shimojima Island; KSG 2131-2133 are external moulds from Daian of Shirakigawachi, Amakusa-machi, Amakusa Shimojima Island; KSG 2134 and 2135 are external moulds from Myokengaura of Shimoda, Amakusa-machi. Holotype (KE 2024) of this species was described from Ono of Hongo, Miyanokawachi (Loc. 024) (see TASHIRO, 1976).

**Remarks.**—This species is characterized by numerous fine divergent ribs on the disk. A bisecting line extending from the umbo to the ventral margin is generally located on the posterior half of the disk.

This species is abundant from the Lower Member of the Upper Formation of the Upper Himenoura Subgroup (Member U-IIIa), but rare from the Uppermost Formation of the Upper Himenoura Subgroup (Formation U-IV).

*Acila (Truncacila) decisa* (CONRAD) (SCHENCK 1938) from the Eocene Formation of California, is closely similar to this species in its inflated valve and the subtrigonal outline, but differs from this species in its less numerous diverging ribs and more anterior location of the bisecting line.

**Occurrence.**—Loc. 10 and 12.

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*Acila (Truncacila) yoshidai, sp. nov.*

Plate 1, Figs. 7-8, Text-fig. 3

1958. *Acila (Truncacila)* sp., ICHIKAWA and MAEDA; Jour. Inst. Polyt. Osaka City Univ., p.80, pl. 3, fig. 12 and 13

<table>
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<th>Measurements (in mm).-</th>
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<td>KSG 2135, left external mould</td>
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Text-fig. 2. Geological map and fossil localities of the Uppermost Formation (Formation U-V) of the Upper Himenoura Subgroup in Amakusa-shimojima Island
Material.—KSG 2136 is an external mould of left valve (holotype) collected from Shiiba, Futaura-machi, Ushibuka City, Amakusa-Shimojima Island; KSG 2137-2138 (paratypes) are internal and external moulds from Umikizu of Shimokoshikijima Island, Kagoshima Pref.; KSG 2139-2140 (paratypes) are internal and external moulds from Senboshi of Attusu, Nemuro District, Hokkaido; A specimen (pl. 1, fig. 8; plaster cast reg. no. KSG 2141) is a right valve from Attusu, Nemuro District, collected by prof. S. YOSHIDA (MATSUMOTO and YOSHIDA, 1979).

Description.—Shell roundly subquadrate, longer than high, moderately inflated; anterior dorsal margin long and weakly arched; posterior dorsal margin short and weakly concave; anterior margin semicircular produced anteriorly; ventral margin broadly arched; posterior margin short and nearly straight, forming about 90° to ventral margin; umbo small, less prominent, opisthogyous, located at about one fifth from the rear of the valve; pseudolunule very narrow with several subhorizontal ribs; posterior area separated from the disk by an weakly elevated and slightly concaved posterior ridge, ornamented with about 10 oblique ribs, each of which continues to a rib of the disk; disk ornamented with chevron-shaped divergent ribs; each apical angle of the chevron is about 60°, but somewhat larger on the ventral part than on the umbonal part; a bisecting line of the chevron extending from a point a little anterior to the umbo to a point which located about a fourth from front of the ventral margin; the ribs anterior to the bisecting line about 27, subvertical; the ribs posterior to the line about 18, subradiated; inner margin finely crenulated; hinge plate narrow with numerous taxodont teeth; both lateral scars weakly impressed; growth line weak.

Observation.—The specimens (KSG 2139, 2140 and 2141) from the Nemuro Group of Hokkaido are undoubtedly conspecific with the specimen (KSG 2136) from Member U-Iva of the Upper Himenoura Subgroup of Amakusa-Shimojima Island. The specimens (KSG 2137-2138) from Shimokoshikijima Island of Kagoshima Pref., are larger in size and more numerous in number of the divergent ribs on the disk than the specimens from the Amakusa and Hokkaido. The specimens from the Koshikijima are probably the mature examples of this species.

Comparison.—Acila (Truncacila) Shimo-jimensis TASHIRO (1976) from member U-IIIa, U-Ivb and Formation U-1 of the Upper Himenoura Subgroup, is clearly discriminated from this species in its subtrigonal outline, very inflated valve, fine and numerous divergent ribs, and more posterior location of the bisecting line. This species resembles Acila (Truncacila) hokkaidoensis (NAGAO) (1932, NAGAO and FUZIOKA, 1941; ICHIKAWA and MAEDA, 1958; SAITO, 1962; TASHIRO, 1976) from the Santonian and Campanian of Japan, in having the subquadrate outline, but differs in its more anterior location of the umbo and more

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<th>Specimen</th>
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<th>Thickness</th>
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<td>17.0</td>
<td>15.1</td>
<td>2.3</td>
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anterior location of the bisecting line. *Acila (Truncacilia) pusilla* TASHIRO (1976), from the Lower Himenoura Subgroup of Amakusa-Kamishima Island, is also similar to this species in the subquadrature outline. *A. (T.) pusilla* is, however, characterized by the tuberculate and less numerous divergent ribs on the disk. *Acila (Truncacilia) bivirgata* (SOWERBY) from the Lower Greensand and Gault (WOODS, 1899; SCHENCK, 1936; also see, FRENEIX, 1972, 1959, and QUENSTEDT, 1930), is resembles this species in its arrangement of the divergent ribs on the disk, but differs in its more rounded outline and more anterior location of the bisecting line than those of this species.

**Occurrence.**—Loc. 1 and 2; Black shale of Member U-IIb of the Upper Himenoura Subgroup at Ukimizu of Imuta, Kashiwamura, Kagoshima Pref.; Gray siltstone of the N3 Formation of the Nemuro Group at the roadside exposure of Senboshi, Attsukeshi, Nemuro District, Hokkaido; Gray siltstone of the Senboshi Formation of the Nemuro Group at Attsukeshi, Hokkaido (see, MATSUMOTO and YOSHIDA, 1979). *Acila (Truncacilia)* sp. (ICHIKAWA and MAEDA, 1958) from the Izumi Group, is probably conspecific with this species. According to ICHIKAWA and MAEDA, the locality of the specimen is Yamamoto of Nada, Awaji Island (Shimonada white sandstone).

Superfamily Nuculanacea ADAMS and ADAMS  
Family Nuculanidae ADAMS and ADAMS  
Genus *Portlandia* MORCH, 1857  
Subgenus *Cnestriella*, nov.

Type species: *Portlandia* (subgen. nov. indet.) *cuneistriata* ICHIKAWA and MAEDA, 1958

**Diagnosis.**—Shell medium to small, elongatedly ovate, but weakly concaved on posterior dorsal margin, more or less inflated; umbonal area, orthogeryous, less prominent, located nearly mid-length or slightly anterior to the valve; disk ornamented by numerous concentric striae; the striae cut across the growth lines on the posterior part of the disk; escutcheon depressed, very narrow but elongate along posterior dorsal margin; area flat, bordered by somewhat angulated escutcheon carina on dorsal side, by bluntly elevated marginal carina on the marginal side; hinge line elongate, with numerous taxodont small teeth; resilifer modelate in size, situated vertically under the umbon; pallial sinus deep and large.

**Remarks.**—One of the important characters of this subgenus is its striae crossing with the growth lines on the posterior part of the disk, as already pointed out by ICHIKAWA and MAEDA (1958). Such the crossed striae appear on several recent genera and subgenera belonging to the family Nuculanidae, e.g., *Lembulus*, *Hilgardia*, *Costatoleda* and *Cnestierium*. *Costatoleda* and *Hilgardia* are discriminated from this subgenus in having thier strong radial ribbings on the posterior area. *Lembulus* also differs from this subgenus in its narrow area and strongly angulated posterior ridge and well rostrated posterior siphonal part. *Cnestierium* resembles closely this subgenus with the feature of ribbings on the disk and the elongate outline of the valve. *Cnestierium* is, however, characterized by distinct posterior gapping. As

<table>
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<th>Measurements (in mm).</th>
<th><em>Portlandia (Cnestriella) cuneistriata</em> ICHIKAWA and MAEDA</th>
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<td>KSG 2146, right internal mould</td>
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<td>KSG 2147, right internal mould</td>
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<td>KSG 2148, right internal mould</td>
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<td>18.3</td>
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<tr>
<td>KSG 2153, left internal mould</td>
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this subgenus lacks in the posterior gap, this belongs undoubtedly to genus *Portlandia*. ICHIKAWA and MAEDA (1958) suggested that this shape was considered as a new subgenus under the genus *Portlandia*, but they did not give the new name to this shape, only described as "subgen. nov. indet.". As we approve ICHIKAWA and MAEDA’s opinion, we establish a new subgenus, *Cnestriella*, belonging to *Portlandia* based on *Portlandia cuneistiota* ICHIKAWA and MAEDA.

List of species


*Portlandia furcata* ICHIKAWA and MAEDA, 1958, Upper Campanian, Izumi Group.


*Yoldia hakobutensis* NAGAO and OTATUME, 1938. Maastrichtian, Hakobuchi Group.

*Portlandia furcata* maybe conspecific with Neilonella obliquisitiota.

Age and distribution, —Sanionian to Maastrichtian, Japan.

*Portlandia (Cnestriella) cuneistiota* ICHIKAWA and MAEDA
Plate 1, Figs. 10-15, Plate 4, Figs. 17-18


Material. — KSG 2122-2149 are external moulds, KSG 2150 and 2151 are internal moulds, collected from Masuno, Ushibuka City, Amakusa-Shimojima Islands; KSG 2152 and 2153 are internal moulds and KSG 2154 is an external mould, from Shiiba, Ushibuka City.

Remarks. — This species was described firstly from the Shimonada fine-sandy siltstone of the Izumi Group in Awaji Island (uppermost part of the Izumi Group; Maastrichtian), by ICHIKAWA and MAEDA (1958). TASHIRO (1976) also described this species from the Uppermost Formation (Formation U-IV) of the Upper Himenoura Subgroup in Amakusa-Shimojima Island and Shimokoshikijima Island of Kagoshima Pref. We think, this species is undoubtedly restricted in the Maastrichtian in age. *Portlandia hakobutensis* (NAGAO and OTATUME) (= *Yoldia hakobutensis* NAGAO and OTATUME, 1938), from the Maastrichtian Hakobuchi Sandstone of Hokkaido, is smaller in size and more inflated in the thickness of the valve than this species.

Occurrence. — Loc. 5, Loc. 6, Loc. 7, Loc. 9 and Loc. 10.

Order ARCOIDA

Superfamily Arcacea LAMARCK

Family Parallelodontidae DALL

Subfamily Grammatodontinae BRANSON

Genus *Nanonavis* STEWART, 1930

*Nanonavis turgida* TASHIRO

Plate 2, Figs. 10-15, Plate 3, Figs. 15-16

Material. — KSG 2155-2158 are internal moulds from Masuno of Ushibuka City,

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<td>KSG 2165, left valve</td>
<td>28.0</td>
<td>23.0</td>
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Amakusa-Shimojima Island; KSG 2159-2164 are external moulds from the same locality; KSG 2165 is a left valve from the type locality of this species (Daian of Shirakigawachi, Takahama, Amakusa-machi; 020 by TASHIRO, 1976).

Remarks.—The radial ribs on the disk are very variable in number in the adult stage. One or two secondary ribs are countable in each interspace of the primary ribs on the anterior part of the left valve. But the secondary ribs are not distinctly discriminated from the primary ribs on the other part of the left valve and the full surface of the right valve.

Immature stage of this species resembles *Nanonevis sachalinensis* (SCHMIDT) from the Senonian of Japan (NAGAO, 1932; YABE, 1927; YOKOYAMA, 1890; SAIITO, 1962; HAYAMI, 1975; TASHIRO, 1976), in its subquadrate outline, *N. sachalinensis* is, however, discriminated easily from the immature stage of this species in its more numerous and weaker ribs on the disk than those of this species.

Occurrence.—Loc. 7 and Loc. 10 (020 by TASHIRO, 1976).

*Nanonevis elongatus amakusensis*, subsp. nov.

Plate 2, Figs. 1-9, Text-fig. 4

Material.—Holotype (KSG 2166) is a left internal mould from Matsugahana, Ushibuka City, Amakusa-Shimojima Island; paratypes (KSG 2167-2170) are internal and external moulds from the same locality of holotype; paratype (KSG 2171) is a left valve from the same locality; another paratypes (KSG 2172-2175) are internal and external moulds from Shiiba of Futaura, Ushibuka City.

Description.—Shell large, elongately subquadrate, well inflated; umbo prominent but not so large, weakly prosogyrous, located at about two fifths from front of valve; hinge margin long, nearly straight, as long as ventral margin; anterior margin well arched, obliquely truncated on upper part but gradually changing into ventral margin; ventral margin nearly paralleled with hinge margin, slightly arched on the anterior half but slightly sinuated or nearly horizontal on posterior half; posterior margin short with about a third of the valve length, nearly straight or slightly concave, obliquely truncated; angle between the hinge margin and the posterior margin is about 80°; postero-ventral corner somewhat angulated; posterior carina not angulated but well elevated, forming a round-topped blunt ridge, extending from umbo to the postero-ventral corner, nearly straight or slightly concave; a weak radial depression parallel with anterior side of posterior carina; disk ornamented by about 35 primary and secondary radial ribs on left valve, but more numerous and narrower on right valve than on left valve; ribs flat-topped, irregularly spaced, narrower than their interspaces; posterior area nearly flat, ornamented by fine radial primary and secondary riblets amounting to about 8 in total number; growth line strong on ventral part; hinge plate elongate but narrow, provided by each three anterior and posterior teeth and small and short median teeth on left valve, but two or three on each anterior and posterior on right valve; the both lateral teeth nearly horizontal, elongated, finely crenulated; anterior lateral ones shorter than posterior ones with about a third in length; median teeth about 7 in each valve, converging toward ventral; ligament area broad, elongately triangular, with about 5 or more chevron shaped ligament grooves; inner

<table>
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<th>Specimen</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSG 2166, left internal mould</td>
<td>50.0</td>
<td>28.0</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2167, right internal mould</td>
<td>60.2</td>
<td>30.0</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2169, right internal mould</td>
<td>47.2</td>
<td>24.5</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2170, left internal mould</td>
<td>55.3</td>
<td>32.6</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2171, left internal mould</td>
<td>33.4</td>
<td>23.0</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2172, left valve</td>
<td>52.0</td>
<td>34.5</td>
<td>15.8</td>
</tr>
<tr>
<td>KSG 2173, right internal mould</td>
<td>54.5</td>
<td>29.8</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2174, left valve</td>
<td>54.3</td>
<td>29.4</td>
<td>11.2</td>
</tr>
<tr>
<td>KSG 2175, right valve</td>
<td>37.2</td>
<td>21.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>
margin smooth, pallial line deep; both lateral adductor scars distinct.

Observation.—Some materials of this species usually occur as the internal and external moulds. The ratio of H/L of the valve is about 0.65 in the mature materials exceeding about 50mm in length. On the other hand the ratio indicates 0.7 or more in the younger materials. The umbo in the younger stage is located at more posterior than in the mature stage.

Comparison.—"Nanonavis sachalinensis (Schmidt)" and "Pleurogrammatodon spendence Ichikawa and Maeda" which were listed from Kameura, Ushibuka City, by Takai and Bojo (1961) are probably another specimens of this species. It seems that "N. sachalinensis" is conspecific with the younger stage of this species, and "P. spendence" is also considered as the mature stage of this species. The hinge structure of this species is nearly identifiable with that of Nanonavis turgida Tashiro. But N. turgida is characterized by more inflated valve, wider ligament area and less elongated valve than this species.

Pleurogrammatodon spendence Ichikawa and Maeda (1958) from the Izumi Group, is similar to species in its elongated and inflated valve, but differs in its vertical median teeth, strongly prosogulate and big umbo, and large valve. Parallelodon (Nanonavis) elongatus Naga and Oatume (1938; Pleurogrammatodon elongatus, Hayami, 1975) from the Hakobuchi Group of Hokkaido, is also one of similar species to this species in having its elongated and inflated valve. P. (N.) elongatus have larger and more prominent umbo and larger valve than this species. Nanonavis sachalinensis (Schmidt) which is widely distributed in the Senonian of Japan, is discriminated easily from this species in its narrow ligament area and less inflated valve.

Parallelodon (Nanonavis) bremeri Anderson (1958) from the Upper Cretaceous of California, closely resembles this species in the elongated and inflated valve. The foreign species is, however, characterized by the smaller umbo and less numerous radial ribs on the disk than those of this species.

Occurrence.—Loc. 5, 6 and 9.

Text-fig. 4. Nanonavis elongatus amakusensis, subsp. nov.

Superfamily Limopsacea Dall
Family Glycymerididae Newton
Subfamily Glycymeridinae Newton
Genus Glycymeris da Costa, 1778
Subgenus Glycymerita Finlya and
Marwick, 1937

Glycymeris (Glycymerita) japonica Tashiro
Plate 1, Figs. 16-22

1971. Glycymeris (Glycymerita) japonica

<table>
<thead>
<tr>
<th>Measurements (in mm).</th>
<th>Glycymeris (Glycymerita) japonica Tashiro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>Length</td>
</tr>
<tr>
<td>KSG 2176, right valve</td>
<td>35.2</td>
</tr>
<tr>
<td>KSG 2177, conjoined valve</td>
<td>—</td>
</tr>
<tr>
<td>KSG 2179, left internal mould</td>
<td>13.0</td>
</tr>
<tr>
<td>KSG 2180, right external mould</td>
<td>26.7</td>
</tr>
<tr>
<td>KSG 2181, right internal mould</td>
<td>34.0</td>
</tr>
</tbody>
</table>
Septifer ushibukensis sp. nov.

Plate 4, Figs. 3-9, Text-fig. 5

Material.- Holotype (KSG 2183) is a right valve; paratypes (KSG 2184-2188) are right valves; another paratype (KSG 2189-2191) are left valves. They are collected from Katsuzaki, Kutama-machi, Ushibuka City, Amakusa-shimojima Island.

Description.- Shell lanceolate, longer than high, weakly inflated; umbo terminal; umbonal angle is about 50°; posterior dorsal margin straight, occupying about a half or more to the valve length; anterior margin not remarked from the ventral margin; ventral margin long, obliquely extended, nearly straight; posterior margin broadly rounded; surface ornamented with numerous subradial ribs; the ribs weak, sometimes bifurcated on ventral part, broader than their interspaces, flat-topped, number about 50 or more on the surface; inner margin finely crenulated; growth line very weak.

Observation.- The H/L ratio is very

<table>
<thead>
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<th>Specimen</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSG 2183, right valve</td>
<td>37.0</td>
<td>17.0</td>
<td>3.9</td>
</tr>
<tr>
<td>KSG 2184, right valve</td>
<td>21.8</td>
<td>15.7</td>
<td>1.9</td>
</tr>
<tr>
<td>KSG 2185, right valve</td>
<td>22.3</td>
<td>14.7</td>
<td>2.2</td>
</tr>
<tr>
<td>KSG 2186, right valve</td>
<td>27.0</td>
<td>14.5</td>
<td>2.5</td>
</tr>
<tr>
<td>KSG 2187, right valve</td>
<td>27.0</td>
<td>16.3</td>
<td>3.0</td>
</tr>
<tr>
<td>KSG 2189, left valve</td>
<td>18.3</td>
<td>9.0</td>
<td>1.6</td>
</tr>
<tr>
<td>KSG 2190, left valve</td>
<td>24.5</td>
<td>12.2</td>
<td>2.6</td>
</tr>
<tr>
<td>KSG 2191, left valve</td>
<td>16.2</td>
<td>9.8</td>
<td>2.1</td>
</tr>
</tbody>
</table>
variable in each material. The radial ribs on the surface are also variable in number. The hinge structure is unknown in detail.

Comparison.- Septifer mifunensis TAMURA (1976) from the Cenomanian Mifune Group of Kumamoto, resembles this species in its arrangement of the ribs on the surface. However, this species is characterized by less inflated and more angulated valve than those of S. mifunensis. Septifer? ahaaalensis POJARKOVA (1976) from the Lower Campanian of Central Asia, is discriminated from this species in its inflated valve and less numerous radial ribs.

Brachiodontes nankoi ICHIKAWA and MAEDA (1958) from the Izumi Group, is easily discriminated from this species in its non-terminal umbo and elongate outline of the valve. Stegonocnochía fæxensis (RAVN) from the Middle Danian of Denmark (ROSENKRANTZ, 1970), have less numerous ribs on the surface and larger valve than those of this species.

Occurrence.- Loc. 14, 15

Order PTERIOIDIDA
Superfamily Pteriacea GRAY
Family Inoceramidae GIEBEL
Genus Inoceramus SOWERBY, 1814

Inoceramus (s. l.) sp., cf. I. goldfussianus D’ORBIGNY
Plate 4, Figs. 1-2

Remarks.- Materials of this species are investigating in the paleontological studies by Dr. Masayuki NODA of Oita, at our’s request.

Occurrence.- Loc. 3 (see, TASHIRO and OTSUKA, 1976).

Superfamily Pectinacea RAFINESQUE
Family Propeamussiidae ABBOTT
Genus Parvamussium SACCO, 1897

Parvamussium sp.
Plate 3, Figs. 1-2, Text-fig. 6

Material.- KSG 2192 are conjoined valves from Kamura of Ushibuka City, Amakusa-Shimojima Island; KSG 2193 and 2194 are external moulds from the same locality.

Description.- Shell medium in size, inequivalve, roundly ovate, weakly swollen; umbo not prominent, located nearly central; umbonal angle is about 90°; anterior and posterior margins short, nearly straight; ventral margin well rounded; hinge line horizontal, straight, occupying about a third of valve length; anterior ear truncated vertically; posterior one obliquely truncated with 120°; surface of left valve larger than right valve, nearly smooth except for the umbonal part which is ornamented with very fine numerous radial striae; surface of right valve ornamented with very fine crowded concentric striae or nearly smooth; inner radial ribs narrow with about 10 in number, extending from the umbo to ventral margin but not reaching the margin of the left valve; a paired narrow hinge crurae parallel to the dorsal margin; ligament pit small, triangular, situated under the beak.

Measurements (in mm).- Parvamussium sp.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSG 2192, left external mould</td>
<td>23.0</td>
<td>19.0</td>
</tr>
<tr>
<td>KSG 2193, right external mould</td>
<td>10.6</td>
<td>12.0</td>
</tr>
<tr>
<td>KSG 2194, right external mould</td>
<td>10.0</td>
<td>10.1</td>
</tr>
</tbody>
</table>
**Remarks.** - This species is characterized by very weak or nearly effaced striae on the surface. This species differs from the several Mesozoic *Paravamusium* from Japan, i.e., *P. yubarensis* (YABE and NAGAO) from the Cenomanian to Santonian of Japan (YABE and NAGAO, 1928; NAGAO, 1932; TASHIRO, 1976), *P. awajense* (ICHIKAWA and MAEDA, 1958) from the Izumi Group, *P. hinagensis* TAMURA (1973) from the Hinagu Formation, and *P. habunokawense* (KIMURA) from the Upper Jurassic of Japan (KIMURA, 1951; TAMURA, 1960; HAYAMI, SUGITA and NAGOMO, 1960); in its very weak or nearly effaced surface ornamentation. *Paravamusim inouei* (OMORI) from the Eocene Formation in Kyushu and Shikoku (OMORI, 1955; KATTO and TASHIRO, 1979), also differs from this species in its distinct ribs on the surface.

**Occurrence.** - Loc. 2.

Family Dimyidae P. FISCHER

Genus *Dimya* ROUAULT, 1850

*Dimya akasakiensis*, sp. nov.

Plate 4, Figs. 9-15, Text-fig. 7

**Materials.** - Holotype (KSG 2195) are conjoined valves collected from Akashi-misaki of Kutama, Ushibuka City, Amakusa-Shimojima Island; paratypes (KSG 2196-2197) are conjoined valves; paratypes (KSG 2198-2200) are internal moulds; all the paratypes are collected from the same locality of the holotype.

**Description.** - Shell small, subquadrate, taller than length, weakly inflated, somewhat inequivalve; umbo small, a little prosogyrous, slightly elevated from dorsal margin, located at about two fifth length from front of the valve; anterior dorsal margin nearly straight; posterior dorsal margin very weakly arched as long as the anterior one; anterior margin subvertical, truncated from anterior dorsal margin, nearly straight but weakly arched on antero-ventral part; ventral margin broadly arched; posterior margin obliquely truncated from posterior dorsal margin, nearly straight; surface of right valve ornamented with laminated concentric striae on most part but sometimes with numerous round-topped radial ribs near the umbo; surface of the left valve ornamented with same arrangements of the ribs and striae with the right valve but fairly strong radial ribs occupying on wider part near the umbo to right valve; inner margin smooth; bowl-shaped shallow depression on central part of internal surface encircled by ring-shaped flat marginal part and finely crenulated rim; anterior adductor scar distinct locating close to the antero-dorsal part of the rim, smaller than posterior one; posterior adductor scar elliptical, located close to the postero-ventral part of the rim; a small trigonal ligament pit located under the umbo; hinge unknown.

**Observation.** - The ratio of H/L is somewhat variable. The umbo is larger in left valve than in right valve. The thickness of the left valve is slightly stronger than that of the right valve.

**Comparison.** - The type species of *Dimya*

| Measurements (in mm). - *Dimya akasakiensis*, sp. nov. |
|---------------------------------|------|------|------|
| Specimen                       | Length | Height | Thickness |
| KSG 2195, conjoined valves     | 9.8  | 12.3  | 2.5/2   |
| KSG 2196, conjoined valves     | 10.5 | 12.6  | 2.7/2   |
| KSG 2197, conjoined valves     | 9.4  | —     | 1.9/2   |
| KSG 2198, right internal mould | 9.1  | —     | —       |
| KSG 2199, left internal mould  | 9.6  | 11.0  | —       |
D. deshayesiana ROUAULT (COX and HERTLEIN, 1969) from the Eocene Formation of France, is easily discriminated from this species in its numerous fine radial striae on the surface and the rounded outline. Dimya filipina BARTSCH (1913, HABE, 1977) from the Pacific coast of Recent, resembles this species in its subquadrate and oblong outline, and laminated concentric striae on the surface. This is, however, characterized by the radial ribs near the umbo and more rounded and flat marginal part in internal surface than of D. filipina.

Occurrence.- Loc. 18.

Superfamily Anomiacea RAFINESQUE
Family Anomiidae RAFINESQUE
Genus Anomia LINNÉ 1758

Subgenus Paraplacuna OPPENHEIM 1892
Anomia (Paraplacuna) reticularis, sp. nov.

Plate 3, Figs. 10-11, Plate 4, Figs. 3-8

Material.- Holotype (KSG 2200) is an external mould of left valve from Katsuzaki, Kutama-machi, Ushibuka City, Amakusa-Shimojima Island; paratypes (KSG 2201-2203) are same of left valves from the same locality of the holotype, paratypes (KSG 2204-2209) are internal moulds of left vlae and a paratype (KSG 2210) is an internal mould of right valve, from the same locality.

Description.- Shell large to medium in size, roundly ovate, highly inequivalve; umbo located nearly central, well elevated in left valve but nearly indistinct in right valve; surface of left valve ornamented with reticulated concentric laminae which are broadly spaced on umbonal part but closely crowded on ventral part; inner surface of left valve smooth; a large irregular elliptical muscle scar located under the beak in left valve; a small circular byssal pit situated under the beak, in an irregularly elliptical scar in inner surface of the right valve; hinge structure is unknown.

Observation.- The external features of the right valve is unknown. Since the outline of the valve is very variable, the ratio of H/L is rather uniform. The reticulated concentric laminae are narrower than their interspaces and are countable about 10 in the distance of 5 mm on the ventral part of the mature specimen.

Comparison.- This differs from Anomia hataei TASHIRO (1976) from Member U-IIIa of the same Group, in its reticulated laminae on the surface. Anomia foldia TAMURA (1977) from the Cretaceous Mifune Group in Kyushu, is similar this species in the inflated and rounded shell, but differs in its smooth surface. This species is undoubtedly referable to the subgenus Paraplacuna, judging from the reticulated ornamentation of the surface. The type species Paraplacuna, P. gregaria (BAYAN) (MYRA KEEN, 1969) from the Eocene of Europe, is, however, discriminated from this species, in its taller and smaller valve than those of this species.

Occurrence.- Loc. 14 and 15.

Order TRIGONIOIDIA

Superfamily Trigonioidea LAMARCK
Family Trigoniidae LAMARCK
Subfamily Apiotrigoniinae TASHIRO
Genus Apiotrigonia COX, 1952
Subgenus Apiotrigonia COX, 1952
Apiotrigonia (? Apiotrigonia) dubia TASHIRO
Plate 3, Figs. 13-14

| Measurements (in mm).- Anomia (Paraplacuna) reticularis, sp. nov. |
|-------------------------|----------------|-----------------|
| Specimen                | Length | Height | Thickness |
| KSG 2200, left external mould | 26.2   | 27.0   | 6.0        |
| KSG 2201, left external mould | 37.0   | 35.2   | 9.0        |
| KSG 2202, left external mould | 22.0   | 20.2   | 4.0        |
| KSG 2203, left external mould | 26.5   | 27.7   | 10.0       |
| KSG 2205, left internal mould | 36.0   | 35.3   | 9.0        |
| KSG 2206, left internal mould | 24.6   | 23.0   | 6.9        |
| KSG 2207, left internal mould | 25.5   | 28.0   | 5.8        |
| KSG 2210, right internal mould | 31.5   | 35.7   |          |


*Materials and Measurements* (see, TASHIRO, 1979).

*Remarks.* In this area, Amakusa-Shimojima Island, only two imperfect specimens were collected from lower part of the Middle Member of the Uppermost Formation (Member U-1Vb) of the Subgroup. This species is common in the occurrence from the Azenotani Formation of the Izumi Group of the Izumi Mountains. This species is characterized by the tuberculate ribs of the posterior series and two sorts of the costellae which are tuberculate on the area.

*Occurrence.* Loc. 7.

(to be continued)

**REFERENCES CITED**


_____ (1972): On the surface ornamentation of the pennatae trigonioids, and on the three new species of the Himenoura Group, Kyushu, Japan. Ibid. no. 86, p. 325-339, pls. 40-41


Plates 1–4
EXPLANATION OF PLATE 1

*Acila (Truncacilum) shimojimensis* TASHIRO

Figs. 1-2: Gum cast of left valve (KSG 2130), $\times 1.2$, Loc.
Yotsuinoshokyo of Miyakawachi, Kawaura-machi, Amakusa-Shimojima Island.

Fig. 3: Right valve of same specimen, $\times 1.2$.

Fig. 4: Dorsal view of same specimen, $\times 1.2$.

Fig. 5: Gum cast of imperfect left valve (KSG 2131), $\times 1.5$, Loc. 10.

Fig. 6: Gum cast of left valve (KSG 2135), $\times 3$, Loc. 12.

Fig. 7: Gum cast of imperfect right valve, $\times 2$, Loc. 10.

*Acila (Truncacilum) yoshidai*, sp. nov.

Fig. 8: Right valve, $\times 1$, Loc. Attakesh, Nemuro District, Hokkaido.

Fig. 9: Gum cast of left valve (KSG 2136), $\times 1$, Loc. 2.

*Portlandia (Cnestriella) cnestriata* ICHIKAWA and MAEDA

Fig. 10: Internal mould of right valve (KSG 2149), $\times 2$, Loc. 7.

Fig. 11: Internal mould of left valve (KSG 2144), $\times 2$, Loc. 7.

Fig. 12: Internal mould of right valve (KSG 2147), $\times 2$, Loc. 7.

Fig. 13: Gum cast of right valve (KSG 2150), $\times 2$, Loc. 7.

Fig. 14: Internal mould of right valve (KSG 2142), $\times 3$, Loc. 7.

Fig. 15: Internal mould of left valve (KSG 2145), $\times 2$, Loc. 5.

*Glycymeris (Glycymerita) japonica* TASHIRO

Fig. 16: Gum cast of right valve (KSG 2180), $\times 1$, Loc. 7.

Fig. 17: Internal mould of left valve (KSG 2179), $\times 1$, Loc. 7.

Fig. 18: Imperfect left valve (KSG 2178), $\times 1$, Loc. 4.

Fig. 19: Right valve (KSG 2176), $\times 1$, Loc. 4.

Fig. 20: Posterior dorsal view of same specimen, $\times 1.2$.

Fig. 21: Dorsal view of conjoined valves (KSG 2177), $\times 1$, Loc. 4.

Fig. 22: Anterior dorsal view of same specimen, $\times 1$.

*Glycymeris (Glycymerita) concava* MARSHALL

Fig. 23: Plaster cast of left valve (holotype of the species), Loc. Wangaroan (Danian) of Newzealand, (for comparison).
EXPLANATION OF PLATE 2

*Nanona vis elongatus amakusensis*, subsp. nov.

Fig. 1: Internal mould of right valve (KSG 2169), × 1, Loc. 5.

Fig. 2: Internal mould of right valve (KSG 2173), × 1, Loc. 2.9

Fig. 3: Internal mould of right valve (KSG 2168), × 1, Loc. 5.

Fig. 4: Internal mould of left valve (KSG 2175), × 2, Loc. 2.9

Fig. 5: Imperfect left valve (KSG 2172), × 1, Loc. 2.

Fig. 6: Left valve (KSG 2174), × 1, Loc. 2.

Fig. 7: Internal mould of Left valve (KSG 2170), × 1, Loc. 5.

Fig. 8: Internal mould of Left valve (KSG 2171), × 2, Loc. 2.9

Fig. 9: Gum casts of imperfect left valve, × 1, Loc. 2.9

*Nanona vis turgida* TASHIRO

Fig. 10: Internal mould of left valve (KSG 2155), × 1, Loc. 7.

Fig. 11: Internal mould of left valve (KSG 2156), × 1.8, Loc. 7.

Fig. 12: Gum cast of left valve (KSG 2163), × 3, Loc. 7.

Fig. 13: Gum cast of left valve (KSG 2160), × 2.5, Loc. 7.

Fig. 14: Gum cast of right valve × 2.5, Loc. 7.

Fig. 15: Gum cast of left valve (KSG 2161), × 3, Loc. 7.
EXPLANATION OF PLATE 3

*Parvamussium*, sp.

Fig. 1: Gum casts of right external mould and left internal mould (KSG 2192), × 1, Loc. 2.
Fig. 2: same specimen, × 2.

*Septifer ushibukensis*, sp. nov.

Fig. 3: Right valve (KSG 2187), × 1, Loc. 14.
Fig. 4: Right valve (KSG 2184), × 1, Loc. 14.
Fig. 5: Right valve (KSG 2186), × 1, Loc. 14.
Fig. 6: Right valve (KSG 2183), × 1, Loc. 14.
Fig. 7: Left valve (KSG 2189), × 1, Loc. 14.
Fig. 8: Right valve (KSG 2190), × 1, Loc. 14.
Fig. 9: Left valve × 1, Loc. 14.

*Anomia (Paraplacuna) reticularis*, sp. nov.

Fig. 10: Gum cast of left valve (KSG 2200), × 2, Loc. 14.
Fig. 11: External mould of left valve (KSG 2201), × 1.2, Loc. 14.
Fig. 12: External mould of left valve (KSG 2202), × 1.2, Loc. 14.

*Apiotrigonia dubia* TASHIRO

Fig. 13: Gum cast of left valve (KSG 2090), × 3, Loc. 7.
Fig. 14: Gum cast of imperfect left valve (KSG 2091), × 4, Loc. 7.

*Nanonavis turgida* TASHIRO

Fig. 15: Gum cast of right valve (KSG 2159), × 1.5, Loc. 7.
Fig. 16: Gum cast of right valve (KSG 2162), × 1.2, Loc. 7.
EXPLANATION OF PLATE 4

*Inoceramus* sp., aff. *Inoceramus goldfussianus* d’Orbigny

Fig. 1: Right valve, × 1, Loc. 3.

Fig. 2: Right valves, × 1, Loc. 3.

*Anomia* (*paraplaeana*) reticularis, sp. nov.

Fig. 3: Gum cast of KSG 2202 (see, plate 3, fig. 12), × 2.

Fig. 4: Internal mould of left valve (KSG 2206), × 1, Loc. 14.

Fig. 5: Internal mould of left valve (2205), × 1, Loc. 14.

Fig. 6: Internal mould of left valve (KSG 2207), × 1, Loc. 14.

Fig. 7: Internal mould of left valve, × 1, Loc. 14.

Fig. 8: Internal mould of left valve, × 1, Loc. 14.

*Dimya* akasakiensis, sp. nov.

Fig. 9: Left valve (KSG 2197), × 2, Loc. 18.

Fig. 10: Right valve (KSG 2197), × 2.

Fig. 11: Left valve (KSG 2195), × 2, Loc. 18.

Fig. 12: Right valve (KSG 2195), × 2.

Fig. 13: Right valve (KSG 2195), × 3.

Fig. 14: Right valve (KSG 2196), × 2, Loc. 18.

Fig. 15: Left valve (KSG 2196), × 2.

Fig. 16: Right valve (KSG 2196), × 3.

*Portlandia* (*Cnestriella*) cneistriata I Chikawa and Maeda

Fig. 17: Gum cast of right valve (KSG 2151), × 1.5, Loc. 7.

Fig. 18: Posterior ventral part of the same specimen, × 6.

showing oblique striae on the posterior ventral part.