

Bivalve fossils from the type Monobegawa Group (Part II)

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Introduction

This part II is mainly composed of the description of the Lower Cretaceous bivalves from the "Monobegawa Group" (Nankai Group and Monobegawa Group by Tashiro, 1985), in the Monobe and Ryoseki areas, Kochi, Japan. 35 species of 20 genera, inclusive 9 new species, belonging to the orders Pterioidea and Trigonioidea, are treated. In addition to the description, some species from the Doganaro Formation in the Shimanto Terrain, and the Hanoura and Hoji Formations in the Chichibu Terrain of Tokushima Prefecture, all of the Lower Cretaceous strata, are also described.

Before going into the description, we wish to express our sincere thanks to Mrs. Yoshihiro Kawaji of Kumamoto, Hideyuki Hirose of Gifu, and Seiji Matsuda of Kochi, for their supplied us of many specimens of bivalves from the variable localities of the Lower Cretaceous strata in Tokushima Prefecture. We also thanks to Mr. Keiji Takahashi, of Kochi, for his supplied us of some specimens of bivalves from the Doganoro Formation of Kochi Prefecture.

The materials described in this part II (KSG) are kept in the Faculty of Science, Kochi University, Kochi (780).

Systematic description

Class Bivalvia

Subclass Pteriomorpha

Order Pterioidea

Suborder Pteriina

Superfamily Pteriacea Gray

Family Pteriidae Gray, 1847

Subfamily Pterinellinae Hayami, 1965

Genus *Pterinella* Toula, 1882

Pterinella shinoharai Hayami

Plate 1, figs. 15, 16; Plate 8, figs. 1, 5

1965. *Pterinella shinoharai* Hayami, *Mem. Fac. Sci. Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 265-268, pl. 31, figs. 1-3; pl. 32, figs. 1-6; pl. 33, figs. 1-2; pl. 34, figs. 1-2; pl. 35, figs. 1-2; text-fig. 2.
1975. *Pterinella shinoharai* Hayami; Hayami, *Univ. Mus. Univ. Tokyo*, Bull. 10, p. 42, pl. 2, fig. 1.

Material: -KSG 3687, internal mould of right valve, from Doiban of Odochi, Monobe area; KSG 3776, imperfect left internal mould, from north of Todoronotaki, Odochi, Monobe area; KSG 3688-KSG 3689, internal and external moulds of left and right valves, from Katsuura in Tokushima Prefecture.

Measurements (in mm.): -

Specimen	Length	Height
KSG 3687 r. ext. mould	45.7+	33.7
KSG 3689 r. ext. mould	90.0+	111.6

Remarks: -The available specimens are almost incomplete. The characteristic features which had been described in detail by Hayami (1965) are, however, well preserved in each specimens.

Occurrence: -Silty mudstone of the Monobe Formation of the Monobegawa Group at about 300 m north of Todoronotaki, Hibihara, Monobe area. Dark-gray shale or siltstone of the Hanoura Formation of the Monobegawa Group at Tatsukawa, Hanoura of Kamikatsu, Tokushima Prefecture: Upper Hauterivian.

Family Bakevellidae King, 1850

Genus *Bakevellia* King, 1848

Subgenus *Neobakevellia* Nakazawa, 1959

Bakevellia (*Neobakevellia*) *pseudorostrata* (Nagao)

Plate 6, Fig. 9

1934. *Gervillia pseudorostrata* Nagao, *Jour. Fac. Sci., Hokkaido Imp. Univ., Ser. 4*, Vol. 2, No. 3, p. 199, pl. 31, figs. 6-9.
- 1965a. *Bakevellia pseudorostrata* (Nagao); Hayami, *Mem. Fac. Sci. Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 273, pl. 37, figs. 3-6.
- 1965a. *Bakevellia iwatensis* Hayami, *Mem. Fac. Sci. Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 275, pl. 35, figs. 7-8.
1975. *Bakevellia* (*Neobakevellia*?) *pseudorostrata* (Nagao); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 44.

Remarks: -Single specimen, KSG 3795, 9.5 mm long and 15.0 mm high, is a right external mould, from Hibihara of the Monobe area. This is undoubtedly conspecific with *Bakevellia* (*Neobakevellia*) *pseudorostrata* (Nagao), from the Miyako Group (Aptian to Albian) of northeast Japan (Hayami, 1965a), because of its entirely same features of

valve which were described in detail by Nagao (1935) and Hayami (1965a).

Occurrence; - Dark-gray shale or siltstone of the Upper Member of the Hibihara Formation of the Monobegawa Group at Hibihara, Monobe area, Kochi Prefecture; Upper (?) Albian.

Genus *Gervillia* DeFrance, 1820

Subgenus *Gervillia* DeFrance, 1820

Gervillia (Gervillia) forbesiana d'Orbigny

Plate 1, figs. 1-9

1899. *Gervillia forbesiana* d'Orbigny; Woods, *A monograph of the Cretaceous Lamellibranchia of England*, Vol. 1, p. 85, pl. 12, figs. 1-5.
1926. *Gervillia forbesiana* d'Orbigny; Yabe, Nagao and Shimizu, *Sci. Rep. Tohoku Imp. Univ.*, Ser. 2, Vol. 9, No. 2, p. 57, pl. 12, figs. 36-37; pl. 14, figs. 8-9.
1927. *Gervillia forbesiana* d'Orbigny; Yabe, *Sci. Rept. Tohoku Imp. Univ.*, Ser. 2, Vol. 11, No. 1, pl. 5, fig. 5.
1934. *Gervillia forbesiana* d'Orbigny; Nagao, *Jour. Fac. Sci., Hokkaido Imp. Univ.*, Ser. 4, Vol. 2, No. 3, p. 197, pl. 24, fig. 8; pl. 25, figs. 8-10.
1951. *Gervillioopsis forbesiana* (d'Orbigny); Shinohara, *Atlas of fossils in Shikoku*, p. 26, pl. 11, fig. 2.
- 1965a. *Gervillia (Gervillia) forbesiana* d'Orbigny; Hayami, *Mem. Fac. Sci., Kyushu Univ.*, Ser. D, Geol., Vol. 15, No. 2, p. 276, pl. 37, figs. 7-8, pl. 38, figs. 1-5.
1972. *Gervillia (Gervillia) forbesiana* d'Orbigny; Shikama and Suzuki, *Sci. Rep. Yokohama Nat. Univ.*, Ser. 2, Vol. 19, pl. 4, fig. 13.
1975. *Gervillia (Gervillia) forbesiana* d'Orbigny; Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 47.
1979. *Gervillia* sp. aff. *G. forbesiana* d'Orbigny; Katto and Tashiro, *Res. Rep., Kochi Univ.*, Vol. 27 (for 1978), *Nat. Sci.*, p. 145, pl. 1, fig. 3.
1980. *Gervillia forbesiana* d'Orbigny; Tashiro, Kozai, Okamura and Katto, *Geol. and Palaeont. Shimanto Belt, Taira and Tashiro eds.*, pl. 10, fig. 1.

Material: -KSG 3702 - KSG 3707, internal moulds of left and right valves; KSG 3708 - KSG 3710, external moulds of left and right valves; All from about 300 north of Todoronotaki of Hibihara, and Sasano of Doiban, both of the Monobe area.

Measurements (in mm.): -

Specimen		Length	Height
KSG 3705,	r. int. mould	61.3	13.5
KSG 3703,	r. int. mould	27.5	6.4
KSG 3702,	l. int. mould	36.0	10.3

Remarks: -A lot of specimens, mostly incomplete materials, are in our hands. The specific characters of this species are well preserved in each specimen. This is undoubtedly conspecific

with *Gervillia* (*Gervillia*) *forbesiana* d'Orbigny, in its same diagnostic features.

Occurrence: - Darkgray siltstone of the Monobe Formation at about 300 m. north of Todoronotaki, Hibihara, Monobe area; Sandstone of the Lower Member of the Hibihara Formation at Sasano of Doiban, Monobe area; both of belongs to the Monobegawa Group. This species is known from the Doganaro Formation of the Shimanto Terrain, the Tosakamo Formation and the Kurohara Formation of the Monobegawa Group in Sakawa area, and the Hanoura Formation and the Hoji Formation of the Monobegawa Group at Katsuura area in Tokushima, all of in Shikoku.

Genus *Gervillaria* Cox, 1954

Gervillaria haradae (Yokoyama)

Plate 1, figs. 10, 12—14; Plate 6, figs. 7—8, Plate 8, figs. 7, 8

1890. *Avicula haradae* Yokoyama, *Palaeontographica*, Vol. 36, p. 199, pl. 25, fig. 12.
 1926. *Gervillia haradae* (Yokoyama); Yabe, Nagao and Shimizu, *Sci. Rep. Tohoku Imp. Univ.*, Ser. 2, Vol. 9, No. 2, p. 58, pl. 13, figs. 1—3, 7; pl. 14, fig. 2.
 1934. *Gervillia* cf. *haradae* (Yokoyama); Nagao, *Jour. Fac. Sci., Hokkaido Imp. Univ.*, Ser. 4, Vol. 2, No. 3, p. 199, pl. 31, fig. 13.
 1957. *Bakevellia* sp.; Amano, *Kumamoto Jour. Sci.*, Ser. B, Sec. 1, Vol. 2, No. 2, p. 86, pl. 1, figs. 14—15.
 1963. *Gervillaria haradae* (Yokoyama); Matsumoto, Hayami and Asano, *Pal. Soc. Japan, 25th Anniv. Vol.*, p. 23, pl. 51, fig. 12.
 1965a. *Gervillaria haradae* (Yokoyama) Hayami, *Mem. Fac. Sci., Kyushu Univ.*, Ser. D, *Geol.*, Vol. 15, No. 2, p. 269, pl. 35, fig. 3—6; pl. 36, fig. 1; pl. 37, fig. 2.
 1975. *Gervillaria haradae* (Yokoyama); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 46.
 1980. *Gervillaria haradae* (Yokoyama); Tashiro, Kozai, Okamura and Katto, *Geol. and paleont. Shimanto Belt, Taira and Tashiro eds.*, pl. 10, fig. 8.
 1986. *Gervillaria haradae* (Yokoyama); Tashiro and Matsuda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 142, p. 373, pl. 75, figs. 1—5, 13.

Material: - KSG 3690-KSG 3693, external moulds of left valves, from Sasano of Doiban, Monobe area; KSG 3694-KSG 3697, external and internal moulds of left and right valves, from Hagino of Birafu, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3691,	l. ext. mould	32.0+	27.8	11.3
KSG 3694,	l. int. mould	29.6	35.5	—
KSG 3695,	l. int. mould	41.5+	65.6	—
KSG 3696,	l. int. mould	39.4	57.5	—
KSG 3697,	r. int. mould	17.7	23.0	—

Remarks: -The specimens from this Monobe area are divided into two shapes, judging from the distinctional features of the external ornamentations, as mentioned bellow.-

Radiate Form: -The specimens inclusive this shape are characterized by distinct radial ribs on the surface. The ribs are variable in number and are usually stronger on the posterior wing than on the disk. The specimens of this shape occur from the Hibihara Formation of the Monobegawa Group.

Obsolate Form: -The specimens belonging to this shape are characterized by nearly smooth surface or very weak radial ribs on the disk. *Bakevellia* sp. by Amano (1957), is identical with this shape, and are known from the Hagino and Bunjo Formations (see Tashiro and Matsuda, 1986) of the Nankai Group.

The typical specimen of this species from the Ishido Formation (Yokoyama, 1890), is nearly identical with the specimens of the radiate Form from the Hibihara Formation. The specimens which had been treated as this species by Hayami (1965a), from the Yatsushiro Formation of central Kyushu, are distinguishable from those two shapes from the Monobe area, in its development of secondary radial riblets on the surface. It seems that the distinctions among three shapes, each of which occurs from the Monobegawa Group, Nankai Group and Yatsushiro Formation, are artificial. The minor distinctions are probably suggested the varieties in the same species, and are probably shown the differences of the surrounding environments or geographical distance of the living places in each shape of this species.

Occurrence: -Fine to medium grained sandstone of the middle part of the Lower Member of the Hibihara Formation of the Monobegawa Group, at Sasano of Doiban, Monobe area: Aptian. Fine grained arenite sandstone of the Hagino Formation of the Nankai Group, at Hagino of Birafu, Monobe area: Aptian.

Gervillaria hokutoi, sp. nov.

Plate 1, fig. 11; Plate 2, figs. 19, 20; Plate 4, figs. 1, 2

Material: -Holotype, KSG 3698, external mould of left valve: paratypes, KSG 3699-KSG 3701, external and internal moulds of immature left valves; all specimens from Sasano of Doiban, Monobe area. These materials were collected by late Mr. Hokuto Ogasawara of Odochi Primary School.

Diagnosis: -Shell medium in size, trapezoidal in outline, inequilateral; umbo prosogyrous, weakly prominent; posterior wing well developed with strongly granulated radial ribs: anterior wing subtriangular: disk broad, well inflated, ornamented with several granulated radial ribs.

Description: -Shell trapezoidal in outline except for expanded posterior wing, well inflated in left valve, taller than length; umbo small for the genus, strongly prosogyrous, pointed at about one fifth from front of the valve; anterior dorsal margin short; posterior dorsal margin nearly straight, horizontal with about three times long than length of anterior one; anterior margin subvertical; anterior margin of the anterior wing oblique; ventral margin nearly straight, forming nearly right angle with the anterior margin on the antero-ventral part; posterior margin broadly concave; postero-ventral part bluntly angulated with

about 120° ; postero-dorsal marginal part narrowly rounded; anterior wing subtrigonal with distinctly crowded growth lines; posterior wing broad, subtrigonal in outline, ornamented with strong granulated or sometimes spinose radial ribs; disk ornamented with granulated radial ribs which are stronger on posterior half than on anterior half of the disk; anterior byssal sinus distinctly angulated with about 120° .

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3698,	holotype, l. ext. mould	35.0+	39.0	9.6
KSG 3699,	paratype, l. ext. mould	6.8	6.3	1.9
KSG 3700,	paratype, l. int. mould	10.7	7.6	—
KSG 3701,	paratype, l. ent. mould	8.6+	7.6	1.6

Observation: -Specific feature of this holotype is very well in the preservation. The radial ribs on the posterior wing are variable in strength and their arrangements, generally counted about 9 in number. The radial ribs on the disk are also very variable in number and their arrangements. On the anterior half of the disk, the ribs very weak and numerous with about 15 or more. On the other hand the ribs on the posterior half of the disk very strong but less numerous with about 7 or less, and widely spaced.

Comparison: -This species is clearly distinguishable from *Gervillaria haradae* (Yokoyama) (op. sit.) in its strong and granulated radial ribs and well expanded posterior wing.

Occurrence: -Fine to medium grained sandstone of the middle part of the Lower Member of the Hibihara Formation of the Monobegawa Group at Sasano of Doiban, Monobe area, Kochi Prefecture; Aptian.

Family Isognomonidae Woodring, 1925

Genus *Isognomon* Lightfoot, 1786

Subgenus *Isognomon* Lightfoot, 1786

Isognomon (Isognomon) choshiensis Hayami

Plate 6, Figs. 5, 6

1965. *Isognomon (Isognomon) choshiensis* Hayami, *Mem. Fac. Sci. Kyushu Univ., Ser. D. Geol.*, Vol. 15, No. 2, p. 276, pl. 39, fig. 1.
1975. *Isognomon (Isognomon) choshiensis* Hayami; Hayami, *Univ. Mus., Univ. Tokyo, Bull.* 10, p. 49.

Material: -KSG 3711 and KSG 3712, internal moulds of right valves, from Doiban of Odochi, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3711,	r. valve	10.0+	8.2+	8.2+
KSG 3694,	r. valve	54.4+	54.4+	68.2+

Remarks: -The specimens in our hands are internal moulds of imperfect right valves. The specific characters are, however, well preserved. The specimens are referable to *Isognomon choshiensis* Hayami (1965) from the Choshi Group of Central Japan, in their arrangements of the ligamental pits and obliquely expanded outlines. This species is discriminated from *Isognomon (Melina) ichikawai* Hayami (1965) from the Ishido Formation of Sanchu, in its widely spaced ligamental pits.

Occurrence: -Sandstone of the middle part of the Lower Member of the Hibihara Formation at Sasano of Doiban, Odochi of Monobe area, Kochi Prefecture; Aptian.

Family Inoceramidae Giebel, 1852

Genus *Inoceramus* Sowerby, 1814

Inoceramus anglicus Woods

Plate 6, Figs. 3 and 4

1988. *Inoceramus anglicus* Woods; *A monogr. Cretaceous Lamell. England*, Vol. 2, p. 264, pl. 45, figs. 8-10, text-fig. 29
1964. *Inoceramus anglicus* Woods; Matsumoto and Harada, *Mem. Fac. Sci. Kyushu Univ., Ser. D*, Vol. 15, No. 1, p. 94, pl. 9, figs. 2.
1975. *Inoceramus (Inoceramus) anglicus* Woods; Hayami, *Univ. Mus. Univ. Tokyo*, Bull. 10, p. 52.
1985. *Inoceramus anglicus* Woods; Tashiro, Matsuda and Tanaka, *Mem. Fac. Sci. Kochi Univ., Ser. E, Geol.* Vols. 5-6, p. 7, pl. 2, figs. 1, 2.
1986. *Inoceramus anglicus* Woods; Tashiro and Matsuda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 142,

Material: -KSG 3714, right valve; KSG 3713, left valve; both from Hibihara of Odochi, Monobe area.

Measurements (in mm.): -

Specimen	Length	Height	Thickness
KSG 3713, l. valve	17.7	29.0	—
KSG 3714, l. valve	11.9	12.5+	—

Remarks: -The specimens from the Hibihara Formation are certainly identical with *Inoceramus anglicus* Woods (1899), from the Albian of England, in their external characters which were described by Woods (1899).

Occurrence: -Dark-gray siltstone of the upper part of the Middle Member of the Hibihara Formation at Hibihara of Odochi Monobe area, Kochi Prefecture; Albian.

Subgenus *Birostrina* Sowerby, 1821

Inoceramus (Birostrina) subsulcatus Wiltshire

Plate 6, Figs. 1-2

1899. *Inoceramus concentricus* var. *subsulcatus* Wiltshire; Woods, *A monogr. Cretaceous Lamell. England*, Vol. 2, p. 268, pl. 47, figs. 3-14.
1964. *Inoceramus concentricus subsulcatus* Wiltshire; Matsumoto and Harada, *Mem. Fac. Sci. Kyushu Univ., Ser. D*, Vol. 15, No. 1, p. 94, pl. 9, fig. 3.
1975. *Inoceramus (Birostrina) concentricus subsulcatus* Wiltshire; Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 52

Material: -KSG 3718 and KSG 3719, right valves; KSG 3716 and KSG 3717, left valves; all from Hibihara of Odochi, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height
KSG 3718,	r. valve	5.7+	7.8+
KSG 3716,	l. valve	12.7	10.9
KSG 3717,	l. valve	9.1	10.8+

Remarks: -The specimens from this area are undoubtedly conspecific with *Inoceramus concentricus* var. *subsulcatus* Wiltshire (Woods, 1899) from the Albian of England, in their plicated radial costae on the surface. Although Matsumoto and Harada (1965) had been classified this shape as a subspecies of *Inoceramus concentricus* Woods, we have treated this shape as a distinct species, because of its distinct numerous radial plications and more regularly spaced concentric ribs on the surface than those of *I. concentricus*.

Occurrence: -Dark-gray siltstone of upper part of the Middle Member of the Hibihara Formation of the Monobegawa Group, at Hibihara of Odochi, Monobe area, Kochi Prefecture; Albian.

Superfamily Pectinacea Rafinesque

Family Entoliidae Korobkov, 1960

Genus *Entolium* Meek, 1865

Entolium tosaense, sp. nov.

Plate 2, Figs. 14-16

Material: -Holotype, KSG 3665, left valve; paratypes, KSG 3666 and KSG 3667, internal and external moulds of right valves; from north of Todoronotaki, Hibihara of Odochi, Monobe area.

Diagnosis: -Shell medium in size, roundly ovate, nearly equilateral; surface smooth; anterior and posterior ears nearly equal in size, rather broad in size for the genus; umbo nearly central, less prominent.

Description: -Shell roundly ovate, nearly equivalves and equilaterals, slightly inflated; umbo not prominent, located at nearly central point of the valve; umbonal angle is about 100°; posterior and anterior margins short, nearly straight; ventral margin well rounded in semicircular; both lateral ears nearly equal in size; surface entirely smooth, rather

polished; inner surface smooth; ligament pit very small, under the beak; hinge crurae on both sides of the ligament pit, very short, horizontal.

Measurements (in mm.): -

Specimen		Length	Height
KSG 3665,	holotype, l. valve	20.4	21.3
KSG 3666,	paratype, r. ext. mould	20.6	20.9
KSG 3667,	paratype, r. int. mould	20.6	20.9

Observation: -Several specimens of this new species are well preserved materials of internal and external moulds, and casts. The very fine concentric striae are observable on the both lateral ears on KSG 3666, Although the hinge margin is generally straight and horizontal, the margin some times weakly concave concerning with the developments of the both lateral ears.

Comparison: -This species is closely similar to *Entolium obovatum* (Stoliczka) from the Cretaceous of India (Stoliczka, 1870) in its smooth surface, but differs from *E. obovatum* in its more rounded outline and larger apical angle. This is discriminated from *Entolium sanchuense* Hayami (1965a), from the Ishido Formation of central Japan, by its smooth surface and smaller valve.

Occurrence: -Dark-gray siltstone of the Monobe Formation of the Monobegawa Group, at about 300 m north of Todoronotaki, Hibihara in Monobe area; Lower Barremian.

Family Propeamussiidae Abbot, 1954

Genus *Parvamussium* Sacco, 1817

Parvamussium kimurai (Hayami)

Plate 3, figs. 23.24; Plate 6, fig. 18

1965a. *Variamussium kimurai* Hayami, *Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol.* Vol. 15, No. 2, p. 320, pl. 46, figs. 1-4.

1975. *Parvamussium kimurai* (Hayami); Hayami, *Univ. Mus., Univ. Tokyo, Bull.* 10, p. 83.

Material: -KSG 3720, internal mould of right valve, from north of Todoronotaki, Hibihara, Monobe area; KSG 3721-KSG 3722, internal and external moulds of left and right valves, from Tatsukawa of Katsuura, Tokushima Prefecture; KSG 3724, internal and external moulds of right valve, from Ryoseki of Nangoku City, Ryoseki area.

Measurements (in mm.): -

Specimen		Length	Height
KSG 3720,	r. int. mould	10.8	14.5
KSG 3721,	l. ext. mould	9.8	12.6
KSG 3722,	l. ext. mould	10.7	12.0
KSG 3723,	r. int. mould	4.4	5.3

Remarks: -Primary inner radial ridges of this species number about 8. Secondary inner radial ridges are very short, appear in the interspaces between primary ones on the ventral part of the valve with about 3 in number.

Occurrence: -Dark-gray siltstone of the upper part of the Monobe Formation of the Monobegawa Group, at Okuminotani and Shingai of Ryoseki, area, and about 300 m north of Todoronotaki, Monobe area; Dark-gray siltstone of the Hanoura Formation of the Monobegawa Group at Tatsukawa of Hanoura, Tokushima Prefecture.; Barremian.

Parvamussium tosaense Tashiro et Matsuda

Plate 2, Figs. 2-13; Plate 3, Figs. 21, 22;

1986. *Parvamussium tosaense* Tashiro et Matsuda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 142, p.377, pl. 76, figs. 3, 5-6, 11-12.

Material: -KSG 3726-KSG 3733, internal and external moulds of left valves; KSG 3734-KSG 3736, internal moulds of right valves; all from Hibihara of Odochi, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height
KSG 3726,	l. ext. mould	16.6	14.0
KSG 3727,	l. int. mould	12.9	13.7
KSG 3731,	l. ext. mould	13.5	13.4
KSG 3733,	l. int. mould	15.5	13.9
KSG 3734,	r. ext. mould	14.1	12.8
KSG 3735,	r. int. mould	13.0	16.0

Remarks: -The specimens from the Monobe area are safely referable to *Parvamussium tosaense* Tashiro et Matsuda (1986) as already debted by us. The type specimen of this species was described from the Yotsushiro Formation of the Sakawa area, Shikoku. This is also known from Tomochi Formation of central Kyushu.

Occurrence: -Darkgray siltstone of the upper part of the Middle Member of the Hibihara Formation at Hibihara of Odochi, Monobe area; Upper (?) Albian.

Family Pectinidae Rafinesque, 1815

Subfamily Pectininae Rafinesque, 1815

Genus *Neithea* Drouet, 1825

Subgenus *Neithea* Drouet, 1825

Neithea (Neithea) atava (Römer)

Plate 9, figs. 1-4; Plate 10, figs. 1, 2

1952. *Neithea atava* (Romer); Matsumoto and Kanmera, *Guide books of the geological excursions. The lower Valley of the Kuma*, p. 45.
1954. *Neithea atava* (Roemer); Cox, *Jour. Paleontology*, Vol. 28, No. 5, p. 627, pl. 64 figs. 1, 4.
1954. *Neithea atava* (Roemer); Fujii, *Jour. Geol. Soc. Japan*, Vol. 60, No. 707, p. 418.
1956. *Neithea (Neitheops) atava* (Roemer); Alencaster, *Paleont. Mexicana*, No. 2, p. 12, pl. 2, figs. 5-7.
1960. *Neithea atava* Roemer; Druschiza and Kudrjajtser, *Low. Cret. Fauna from Caucasus and Crimea*, p. 190, pl. 11, figs. 4-6.
- 1965a. *Neithea (Neithea) kanmerai* Hayami, *Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 305, pl. 43, figs. 1-5, pl. 52, fig. 3.
1973. *Neithea (Neithea) atava* (Roemer); Dhondt, *Mem. Inst. roy. Sci. Nat. Belgique*, No. 176, p. 40, pl. 1, figs. 2a, b.
1975. *Neithea (Neithea) atava* (Römer); Hayami, *Univ. Mus., Univ. Tokyo, Bull.* 10, p. 74.
1977. *Neithea (Neithea) atava* (Römer); Hayami and Noda, *Trans. Proc. Palaeont. Soc. Japan*, No. 105, p. 40, pl. 5, figs. 4-5; pl. 6, figs. 1-2.
1980. *Neithea (Neithea) atava* (Römer); Tashiro, Kozai, Okamura and Katto, *Geol. and Paleont., Shimanto Belt, Taira and Tashiro eds.*, pl. 11, fig. 6.

Material: -KSG 3745-KSG 3746, internal and external moulds of left and right valves, from Kasanokawa of Ryoseki, area; KSG 3747-KSG 3749, internal external moulds of right valves, from Tatsukawa of Katsuura, Tokushima Prefecture; KSG 3750, external mould of right valve, from Todoronotaki of Hibihara, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3745,	l. ext. mould	97.7 +	62.6 +	—
KSG 3746,	r. ext. mould	100.6 +	35.5 +	24.9
KSG 3747,	r. ext. mould	84.9 +	65.6 +	21.2
KSG 3748,	r. ext. mould	96.1	57.5 +	33.6

Remarks: -The specimens from the Monobe, Ryoseki and Katsuura areas, are almost internal and external moulds. The specific characters are, however, well preserved.

Occurrence: -Fine grained sandstone of the Monobe Formation of the Monobegawa Group at Kasanokawa of Okho, Ryoseki area; Medium grained sandstone of the Monobe Formation at about 300 m north of Todoronotaki, Hibihara, Monobe area; Fine grained sandstone of the Hanoura Formation of the Monobegawa Group at Tatsukawa of Katsuura, Tokushima Prefecture; Upper Hauterivian. This species is probably restricted within the Upper Hauterivian to Lower Barremian (Haidateyama Formation in Ohita Prefecture), in Japan.

Neithea (Neithea) ficalhoi (Choffat)

1934. *Pecten* (*Neithea*) *morrissi* Pictet and Renevier; Nagao, *Jour. Fac. Sci. Hokkaido Imp. Univ., Ser. 4*, Vol. 2, No. 2, p. 206, pl. 26, figs. 2-6.
- 1965a. *Neithea* (*Neithea*) *ficalhoi* (Choffat); Hayami, *Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 302, text-fig. 4, pl. 42, figs. 5-16.
1973. *Neithea* (*Neithea*) *alpina* (d'Orbigny); Dhondt, *Mem. Inst. roy. Sci. Belgique*, p. 15.
1975. *Neithea* (*Neithea*) *ficalhoi* (Choffat); Hayami, *Univ. Mus. Univ. Tokyo, Bull.* 10, p. 76.
1977. *Neithea* (*Neithea*) *ficalhoi* (Choffat); Hayami and Noda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 105, p. 44.

Material: -KSG 3751, external mould of right valve, from Sasano of Doiban, Monobe area.

Remarks: -Single specimen, KSG 3751, 10.7 mm long, 11.5 mm high and 3.5 mm thick, is an incomplete right external mould. The specific characters which were designated in detail by Hayami (1965a), and Hayami and Noda (1977), are well preserved. This species is characterized by two secondary radial ribs between the primary ribs on the surface.

Occurrence: -Fine to Medium grained sandstone of the Lower Member of the Hibihara Formation of the Monobegawa Group at Sasano of Doiban, Odochi in Monobe area; Aptian.

Neithea (*Neithea*) *matsumotoi* Hayami

Plate 10, figs. 5, 6

- 1965a. *Neithea* (*Neithea*) *matsumotoi* Hayami, *Mem. Fac. Sci., Kyushu Univ. Ser. D, Geol.*, Vol. 15, No. 2, p. 294, text-fig. 4, pl. 41, figs. 1-7.
1967. *Neithea* (*Neithea*) *matsumotoi* Hayami; Hayami and Kawasawa, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 66, p. 76, pl. 9, fig. 2.
1975. *Neithea* (*Neithea*) *matsumotoi* Hayami; Hayami, *Univ. Mus., Univ. Tokyo, Bull.* 10, p. 76.
1977. *Neithea* (*Neithea*) *matsumotoi* Hayami; Hayami and Noda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 105, p. 46.
1985. *Neithea* (*Neithea*) *matsumotoi* Hayami; Tashiro and Matsuda in Tashiro, Matsuda and Tanaka, *Mem. Fac. Sci., Kochi Univ., Ser. E, Geol.*, Vol. 5-6, p. 7, pl. 1, figs. 24-25; pl. 2, figs. 3-4.

Material: -KSG 3743-KSG 3744, internal and external moulds of right valves, from Mochie of Susaki, Kochi Prefecture.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3691,	r. ext. mould	25.0	26.7	9.5
KSG 3694,	r. int. mould	14.9	17.6	9.2

Remarks: -The present specimens were collected from the Doganaro Formation of the Shimanto Terrain in Kochi Prefecture. The specimens are characterized by strong primary ribs and fine secondary ribs on the surface. The secondary ribs are usually counted 4 between the interspaces of primary ribs, but are number 3 on some specimens. The very fine radial striae

(probable subinternal structure) are observable on the full surface.

We classify present specimens into *Neithea* (*Neithea*) *matsumotoi* Hayami with in some doubts. The specimens are somewhat akin to *Neithea* (*Neithea*) *syriaca amanoi* Hayami, from the Aptian Hagino Formation of the Monobe area. The specimens are probably discriminated from *N.* (*N.*) *syriaca amanoi*, in it more pointed umbo and broadened ventral part of the valve. *Neithea* (*Neithea*) *syriaca syriaca* (Conrad), from the Aptian of Lebanon (Vokes, 1946), closely resembles these specimens in its number of secondary ribs and pointed umbo, but differs in its stronger secondary ribs than those of the present specimens.

Occurrence: -Greenishgray siltstone of the B Member of the Doganaro Formation of the Shimanto Terrain at Mochie of Aso, Susaki City, Kochi Prefecture; Aptian.

Neithea (*Neithea*) *syriaca amanoi* Hayami

Plate 4, figs. 3-8

1957. *Pecten* (*Neithea*) cf. *morrissi* (Pictet and Renevier); Amano, *Kumamoto Jour. Sci., Ser. B*, Vol. 2, No. 2, p. 88, pl. 1, figs. 17-18, 20-25, 27-29.
- 1965a. *Neithea* (*Neithea*) *amanoi* Hayami, *Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 229, text-fig. 4, pl. 41, figs. 8-10, pl. 42, figs. 1-4.
1973. *Neithea* (*Neithea*) *syriaca* (Conrad); Dhondt, *Mem. Inst. roy. Sci. Nat. Belgique*, No. 176, p. 37.
1975. *Neithea* (*Neithea*) *syriaca* (Conrad); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 75.
1977. *Neithea* (*Neithea*) *syriaca amanoi* Hayami; Hayami and Noda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 105, p. 49.
1986. *Neithea* (*Neithea*) *syriaca amanoi* Hayami; Tashiro and Matsuda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 142, p. 376, pl. 74, figs. 21-22.
1985. *Neithea syriaca amanoi* Hayami; Tashiro and Matsuda, *Res. Rep. Kochi Univ.*, Vol. 34, Nat. Sci., pl. 1, fig. 11.

Material: -KSG 3737 - KSG 3739, external and internal moulds of right valves; KSG 3740 - KSG 3742, external and internal moulds of left valves; all from Hagino of Birafu, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3737,	r. int. mould	15.3	19.3	5.5
KSG 3738,	r. int. mould	14.5	19.3	7.5
KSG 3739,	r. int. mould	21.2	23.2	8.9
KSG 3740,	l. int. mould	17.7	16.4	—
KSG 3742,	l. int. mould	22.7	19.8	—

Remarks: -Numerous specimens, all of external and internal moulds, are collected from the type locality of this species, *Neithea* (*Neithea*) *syriaca amanoi* Hayami, (= *N.* cf. *morrissi* by Amano) by Amano (1957). A specimen, KSG 3776, (see Tashiro and Matsuda 1985, pl. 1, fig. 11), from the Mamidani Formation of the Nankai Group in Tokushima Prefecture, is

undoubtedly conspecific with this species.

Occurrence: -Fine grained arenite sandstone of the Hagino Formation of the Nankai Group at Hagino of Birafu, Monobe area; Aptian.

Neithea (Neithea) hanourensis, sp. nov.

Plate 4, figs. 11-13

Material: -Holotype, KSG 3752, right valve, from Tatsukawa of Katsuura, Tokushima Prefecture.

Diagnosis: -Shell small, trigonal ovate, well inflated; umbo strongly prominent; primary ribs on the surface very weak for the genus; secondary ribs distinctly impressed with 3 in each interspace between the primary ribs.

Description: -Shell small, trigonal ovate or roundly triangular in outline, well inflated, slightly taller than length; umbo very prominent, orthogyrous, pointed at nearly center of valve; anterior and posterior margins nearly straight, with almost the same length in each other; ventral margin broadly arched; apical angle is about 40°; surface ornamented with 6 primary ribs and numerous secondary roundtoped radial ribs which are somewhat narrower than their interspaces; primary ribs weak for the genus, slightly stronger than secondary ribs; secondary ribs are countable 3 in each interspace between primary ones; both lateral ears trigonal, moderate in size but slightly larger in anterior than in posterior.

Remarks: -Single specimen, KSG 3752, 14.5 mm long, 14.7 mm high and 6.2 mm thick, is a well preserved right valve. The features of left valve and inner right valve are unknown. This species is similar to *Neithea (Neithea) atava* Römer and *N. (N.) syriaca amanoi* Hayami, in its 3 secondary radial ribs on the surface, but discriminated from *N. (N.) atava*, in its small valve and less developed primary ribs, and differs from *N. (N.) syriaca amanoi*, in its prominent umbo and less developed primary ribs.

Occurrence: -Fine grained sandstone of the Hanoura Formation of the Monobegawa Group at Tatsukawa of Katsuura, Kami-katsu-gun, Tokushima Prefecture; Upper Hauterivian.

Subfamily Chlamydiae Korobkov, 1960

Genus *Chlamys* Röding, 1798

Chlamys kawajii, sp. nov.

Plate 10, figs. 3, 4

Material: -Holotype, KSG 3754, internal mould of right valve; paratype, KSG 3753, external mould of right valve; both specimens from Tatsukawa of Katsuura, Tokushima Prefecture.

Diagnosis: -Shell subovate, taller than length; surface with about 13 strong radial ribs; inner surface ornamented with strong radial ridges which are concerned with the ribs on the surface.

Description: -Shell small, subovate, taller than length, weakly inflated; umbo less promi-

ment, pointed at nearly center of the valve; apical angle with about 60° ; anterior margin nearly straight or very slightly concave; posterior margin straight as long as the anterior ones; ventral margin well rounded in semicircular; hinge line short with about a thirds of valve length; byssal notch deep with about 6 ctenoria; surface ornamented with 13 strong radial ribs and very narrow but prominent and laminate concentric riblets which are somewhat regularly spaced on the umbonal area or younger stage of the valve, but gradually changing into distinctly but irregularly spaced concentric wrinkles; radial ribs are usually nodulated or bluntly spinose on the ventral part of the valve; both lateral ears moderate in size, ornamented with fine concentric growth lines and weak radial ribs; inner surface impressed by strong radial and flat-topped ridges, with about 12 in number, each of which is concerned with the radial ribs on the surface; adductor scar indistinct; ligament pit very small under the beak.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3754,	holotype, r. internal mould	21.0+	24.5	2.8
KSG 3753,	paratype, r. external mould	21.0	25.3+	—

Observation: -This species is characterized by strong radial ornamentations on the inner and external surfaces of the valve. The radial ribs are somewhat crowded on the main part of the disk to on both lateral marginal parts of the valve.

Comparison: -This is similar to *Chlamys robinaldinus* d'Orbigny, from the Upper Greensand of England (Woods, 1901), and the Miyako Group of northeast Japan (Hayami, 1965a), in its strong radial ribs on the surface, but differ in its less numerous radials and strongly impressed radial ridges on the inner surface.

Occurrence: -Fine grained sandstone of the Hanoura Formation of the Monobegawa Group at Tatsukawa of Katsura, Kami-katsu-gun, Tokushima Prefecture; Upper Hauterivian. Fine grained sandstone of the Ofunato Formation, at Ofunato of Kesenuma, Miyagi Prefecture; Upper Hauterivian.

Chlamys hayamii, sp. nov.

Plate 2, fig. 1; Plate 8, fig. 5

1965a. *Chlamys* (?) *shikokuensis* Amano; Hayami, *Mem. Fac. Sci., Kyushu Univ., Ser. D, Geol.*, Vol. 15, No. 2, p. 312, pl. 44, fig. 8.

Material: -KSG 3669, internal and external moulds of left valve, from Todoronotaki of Hibihara, Monobe area.

Diagnosis: -Shell very small, subovate in outline, well inflated; both lateral ears large; external surface ornamented with numerous strong radial ribs which are composed of well developed primary ones and somewhat weak secondary ones.

Description: -Shell very small, roundly subtrigonal or subovate in outline, longer than high, well inflated; umbo less prominent, pointed at nearly center of the valve; apical angle is about 80° or more; both lateral margins nearly straight; ventral margin broadly

arched; hinge line straight with about two thirds of the valve length; both lateral ears very large, subtrigonal in outline, larger in anterior than in posterior; external surface of the disk ornamented with about 18 primary radial ribs and several secondary ribs which mainly appear on ventral part; inner surface ornamented with round-topped radial ridges which are concerned with the ribs on external surface.

Remarks: -Present specimen, KSG 3669, 4.6 mm long and 4.3 mm high, from the Monobe area, is a younger stage of *Chlamys hayamii*, sp. nov.. On the holotype of this new species, we select the specimen, GKH 6289, described as *Chlamys* (?) *shikokuensis* Amano, by Hayami (1965a). The typical specimen of *Chlamys shikokuensis* Amano (1957), from the Hagino Formation of the Nankai Group, is clearly discriminated from this present specimen and GKH 6289, by Hayami, in its oblong outline and weaker and more numerous radial ribs on the external surface.

Occurrence: -Darkgray siltstone of the upper part of the Monobe Formation of the Monobegawa Group, at about 300 m north of Todoronotaki, Hibihara, Monobe area, Kochi Prefecture; Lower Barremian. The holotype, GKH 6289, had been described from the Monobe Formation of Ryoseki area, Kochi Prefecture, by Hayami (1965a).

Genus *Mimachlamys*, Dhondt, 1973

Subgenus *Nippononectes* Tashiro, 1982

Mimachlamys (*Nippononectes*) *elegans* (Tashiro)

Plate 2, fig. 17; plate 6, figs. 11-17

1982. *Nippononectes elegans* Tashiro, *Mem. Fac. Sci., Kochi Univ., Ser. E, Geol.*, Vol. 3, p. 4, pl. 1, figs. 1-9; pl. 2, figs. 12-14.

Material: -KSG 2986, and KSG 2992, external moulds of right valves; KSG 2987-KSG 2991, external moulds of left valves; KSG 2933 and KSG 2994, internal moulds of left valves; KSG 2995, internal mould of right valve; all specimens from Sasano of Doiban, Odochi, Monobe area.

Description, observation and comparison: - (see Tashiro, 1983).

Remarks: -*Nippononectes* was firstly established as a distinct genus of Pterioidea by one of us Tashiro (1983). The diagnostic features of the *Nippononectes* are, however, nearly identical with the features of genus *Mimachlamys* Dhondt (1973), in their external ornamentations which were shown by fine divergent riblets and spinose radial ribs. In our opinion, several European species belonging to genus *Mimachlamys*, e. g., *Mimachlamys cretosa* (Defrance) (Woods, 1902; Cox, 1975), type species of *Mimachlamys*, are stronger and more numerous in radial ribs, and are less developed in divergent riblets than the species belonging to *Nippononectes*. Therefore we rank down *Nippononectes* as a subgenus *Mimachlamys*, not classify to a synonymy of *Mimachlamys*. The species, *Mimachlamys* (*Nippononectes*) *elegans* (Tashiro), is similar to *Chlamys robinaldinus* d'Orbigny (Woods, 1901), from the Lower Cretaceous in Europe, and Japan (Hayami, 1965a), in its oblong outline, but differs in having its very small valve and less numerous and weaker radial ornamentations.

Occurrence: -Fine to medium grained sandstone of the Lower Member of the Hibihara Formation of the Monobegawa group, at Sasano of Doiban, Odochi, Monobe area, Kochi Prefecture; Aptian. This species is also known from the Miyaji Formation of Central Kyushu.

Family Plicatulidae Watson, 1930

Genus *Plicatura* Lamarck, 1801

Plicatura kiiensis Hayami

Plate 3, Figs. 1-7, 10, 12

1965a. *Plicatura kiiensis* Hayami, *Mem. Fac. Sci. Kyushu Univ. Ser. D, Geol.* vol. 15. no. 2, p. 323, pl. 46, figs. 6-8.

1975. *Plicatura kiiensis* Hayami; Hayami, *Univ. Mus. Univ. Tokyo*, Bull. 10, p. 84.

Material: -KSG 3656-KSG 3657, external and internal moulds of left valves; KSG 3658-KSG 3661, the same of right valves; both from north of Todoronotaki, Monobe area. The other materials, KSG 3662-KSG 3664, external and internal moulds of left and right valves from Okuminotani of Ryoseki area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3656,	r. int. mould	22.0	24.2	-
KSG 3657,	r. int. mould	35.7	33.6	-
KSG 3658,	l. int. mould	21.1	23.9	-
KSG 3659,	l. int. mould	29.1	30.8	-
KSG 3660,	l. int. mould	24.3	23.2	-
KSG 3661,	l. ext. mould	31.3	28.4	4.1

Remarks: -Abundant specimens of this species are in our hands. They are almost internal and external moulds except for several imperfect specimens. They are safely referable to *Plicatura kiiensis* Hayami, from the Aridagawa Formation of the Kii Peninsula of Southwest Japan, in their characteristic features which are identical with those of the type species by Hayami (1965a).

Occurrence: -Darkgray siltstone of the Monobe Formation of the Monobegawa Group at Okuminotani of Ryoseki, Nangoku City, Kochi Prefecture, and about 300 m north of Todoronotaki of Odochi, Monobe-mura, Kami-gun, Kochi Prefecture: Upper Hauterivian and Lower Barremian. This species also occurs abundantly from the Hanoura Formation at Tatsukawa, Tokushima Prefecture, and the Haidateyama Formation (Formation III of the Haidateyama Group by Tashiro, Tanaka and Matsuda, 1983) at Haidateyama hills of Oita Prefecture, northeast Kyushu.

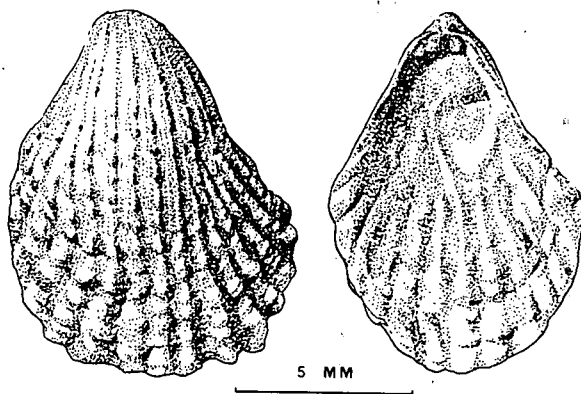
Plicatula kochiensis sp. nov.

Plate 3, Figs. 13–20; Plate 8, fig. 10; text-fig. 1

Material: -Holotype, KSG 3670, external mould of left valve, from Doiban of Odochi, Monobe area; paratypes, KSG 3671–KSG 3676, from the same locality with the holotype; are internal and external moulds of left and right valves.

Diagnosis: -Shell small, subtriangular, inequivalve; disk with about 13 strong tuberculated radial ribs which appear on the ventral part; umbo of right valve prominent but of left valve less prominent; both lateral ears nearly indistinct.

Description: -Shell small, subtrigonal or rain-dolop-like outline, inequivalve, nearly equilateral, taller than length; test rather thick; umbo of right valve prominent, orthogyrous, pointed nearly central part, or slightly anterior to the mid-point of the valve length; umbonal angle of the right valve is about 60°; umbo of left valve less prominent; the right valve moderately inflated; the left valve nearly flat but slightly swollen nearest umbo; anterior and posterior margins nearly straight; ventral margin well rounded in semi-circular; surface ornamented with strong tuberculated radial ribs except for the umbonal part with about 13 in number; the ribs generally broader than their interspaces; the umbonal part nearly smooth except for fine tuberculations which are line up to radial trend; inner surface of right valve with weak but broad radial ridges and with a weak but large ovate adductor scar which located before the posterior margin; inner surface of left valve smooth except for weak but large ovate adductor scar and rather deep but weak palial line; ventral margin smooth; two small but strong cardinal teeth under the narrow trigonal ligament area in each left and right valves.



Text-fig.1: *Plicatula kochiensis*, sp. nov.
(L: left valve R: right valve)

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3670,	holotype, l. ext. mould	6.2	7.6	2.5
KSG 3672,	paratype, l. int. mould	9.4	9.0	—
KSG 3673,	paratype, r. int. mould	10.3	12.4	—
KSG 3674,	paratype, l. int. mould	8.1	8.4	—
KSG 3675,	paratype, r. ext. mould	6.7	7.0	1.0

Observation: -The outline of this species is rather uniform for the genu *Plicatula*. The radial ribs are undulated in general and begin to appear on about one third from the umbo towards the ventral margin in the height. The growth lines of the surface are generally weak on the umbonal part but distinctly crowded on the other parts.

Comparison: -This species is discriminated from *Plicatula kiiensis* Hayami, from the Upper Hauterivian and Lower Barremian of south-west Japan (op. sit.), in its trigonal outline, and less numerous and less diverging radial ribs on the surface. This is somewhat similar to *Plicatula placunea* Lamarck from the Hythe Beds of Europe (Woods, 1900), in the trigonal outline, but differs in its regularly arrangement of the radial ribs.

Occurrence: -Fine to medium grained sandstone of the upper part of the Lower Member of the Hibihara Formation of the Monobegawa Group at Sasano of Doiban, Odochi, Monobemura, Kami-gun, Kochi Prefecture; Aptian.

Plicatula takahashii, sp. nov.

Plate 4, Figs. 17-23; text. fig. 2

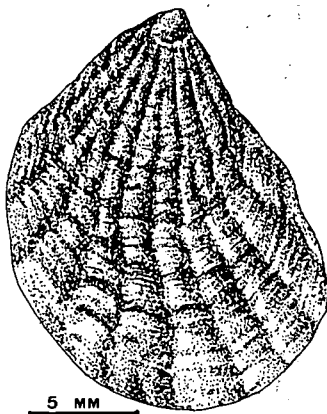
Material: -Holotype, KSG 3777, external mould of right valve; paratypes, KSG 3778-KSG 3783, external moulds of left and right valves; all from Mochiie of Susaki, Kochi Prefecture; the other specimens (KSG 3785 and KSG 3786) from Nakaizu of Katsuura, Tokushima Prefecture.

Diagnosis: -Shell trigonal or faned in outline, taller than length, inequivalve, nearly equilateral; surface with about 10 strong tuberculated ribs; right valve strongly inflated; left valve slightly swollen.

Description: -Shell small, trigonal or fan-like outline, inequivalve with strongly inflated on right valve but weakly inflated on left valve, nearly equilateral; test thick; umbo of right valve prominent, nearly orthogyrous, pointed at nearly center in the valve length; apical angle is about 50° or less; umbo of left valve slightly prominent; dorsal margin very short; anterior and posterior margins nearly straight or slightly concave; ventral margin broadly arquated; surface ornamented with about 10 or less strong radial ribs which are broader than their interspaces, tuberculated in distinctly; inner surface with several radial ridges each of whic concerned to the radial ribs of the surface.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3777,	holotype, r. ext. mould	11.2	11.8	—
KSG 3778,	paratype, r. ext. mould	10.0	9.9	—
KSG 3780,	paratype, r. ext. mould	13.9	15.0	—
KSG 3781,	paratype, r. valve.	7.4	8.4	0.8
KSG 3782,	paratype, l. ext. mould	8.4	8.1	1.4



Text-fig.2 *Plicatula takahashii*, sp. nov.
(right valve)

Observation: -Several specimens are collected from the Doganaro Formation of the Shimanto Belt in Shikoku by Mr. Keiji Takahashi, of Asahi Junior Highschool in Kochi City. The specimens are all internal and external moulds. The specific features of the specimens are, however, well preserved in each specimen. This is characterized by very strong but less numerous radial ribs on the surface. Both lateral ears of this species are very miserable, nearly indistinct on all specimens.

Comparison: -This is distinguishable from *Plicatula kochiensis* Tashiro et Kozai (op. cit.), from the Hibihara Formation, in its strong and less numerous radial ribs on the surface. This is closely similar to *Plicatula inflata* Sowerby from the Cretaceous of Europe (Woods, 1900) and *Tarfaya* (Freneix, 1972), in its less numerous but, strong radial ribs, but differs in its rather uniform outline and narrow apical angle.

Occurrence: -Fine grained sandstone or silty sandstone of the B Member of the Doganaro Formation of the Shimanto Terrain, at Mochie of Susaki City, Kochi Prefecture. Fine grained sandstone of the Nakaizu Formation of Nankai Group, Tokushima Prefecture. Aptian.

Plicatula monobensis, sp. nov.

Plate 2, fig. 21; Plate 3, figs. 8, 9, 11; Plate 4, figs. 14–16; text-fig. 3.

Material: -Holotype, KSG 3683, internal mould of right valve, from Todoronotaki of Hibihara, Monobe area; paratypes, KSG 3680–KSG 3682, internal moulds of left and right valves; the other paratypes, KSG 3684–KSG 3685, external moulds of left and right valves; all paratypes, from the same locality with the holotype.

Diagnosis: -Shell small, roundly ovate; surface ornamented with spinose radial ribs; marginal hinge crurae of right valve reverse v-shaped.

Description: -Shell medium to small, roundly ovate or orbicularly subtrigonal, slightly taller than length, very weakly inflates; umbo less prominent, orthogyrous, pointed at nearly center of valve; both lateral ears nearly indistinct; surface ornamented with about 10 flexible radial spinose ribs which are generally narrower than their interspaces; both marginal lateral crurae of right valve strongly apart from each other for the genus *Plicatula*, situated as like as reverse V-shaped; two inner crurae or teeth of right valve narrow but distinct, paralleled vertically between marginal crurae; lateral marginal crurae on left valve strong, paralleled vertical; vertical two inner crurae of left valve very narrow but distinct; inner surface smooth; adductor scar weakly impressed; growthline of external surface distinctly crowded, developed into fine laminate concentric wrinkles on marginal part of valve.

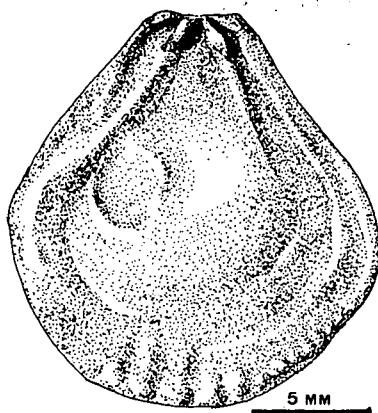
Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3683,	holotype, r. int. mould	14.8	15.9	—
KSG 3781,	paratype, l. int. mould	12.6	14.9	—
KSG 3682,	paratype, l. int. mould	12.3	13.1	—
KSG 3684,	paratype, r. ext. mould	15.5	17.0+	—
KSG 3685,	paratype, r. ext. mould	6.8	8.7	—

Observation: -The right valve of this species is attached at the umbonal part which occupies about a half or more area of the surface, to another external surface of bivalve such as *Gervillia* (*Gervillia*) *forbesiana* d'Orbigny. For that reason the radial ribs of the right valve are usually observable only the marginal part of the valve.

Comparison: -This species resembles *Plicatula kiiensis* Hayami (1965a) from the same locality with this species, in its spinose radial ribs on the surface, but is clearly discriminated from the latter in having its less inflated and rounded valve, and features of characteristic hinge structures of this species. In so far as we can see, any species of *Plicatula* of which shown the hinge structures of right valve as like as this species are not yet known.

Occurrence: -Darkgray siltstone or fine grained sandstone of the Monobe Formation of the Monobegawa Group at about 300 m north of Todoronotaki, Hibihara, Monobe area, K Prefecture; Upper Hauterivian.



Text-fig.3 *Plicatula monobensis*, sp. nov.
(left valve)

Superfamily Anomiacea Rafinesque, 1815

Family Anomiidae Rafinesque, 1815

Genus *Anomia* Linné, 1758

Anomia (s. l.) sp.

Plate 8, fig. 9

Material: -KSG 3771, right valve, from Sasano of Doiban, Monobe area.

Description: -Shell small, roundly ovate, weakly inflated, a little taller than length; umbo less prominent, located at slightly anterior than mid-point of valve; surface smooth except for finely lamerate growth lines.

Remarks: -Single specimen, KSG 3771, 11.7 mm long, 9.1 mm high and 2.5 mm thick, are well preserved right valve. The characteristics of left valve and inner right valve are, however, unknown. We tentatively classify this specimen as a member of genus *Anomia* (s. l.).

Occurrence: -Fine to medium grained sandstone of the Lower Member of the Hibihara Formation of the Monobegawa Group, at Sasano of Doiban, Odochi, Monobe area, Kochi Prefecture; Aptian.

Genus *Placunopsis* Morris et Lycett, 1858

Placunopsis (?) *hibiharensis*, sp. nov.

Plate 4, figs. 9, 10

Material: -Holotype, KSG 3772, left valve; paratype, KSG 3773, left valve; paratypes, KSG 3774 and KSG 3775, internal moulds of right (?) valves; all specimens from Yunoki of

Odochi, Monobe area.

Diagnosis: -Shell roundly ovate, moderately swollen in left valve, but flat in right valve; surface smooth; inner surface smooth.

Description: -Shell medium to small, roundly ovate or roundly subquadrate in outline, slightly taller than length, weakly inflated in left valve but nearly flat in right valve; right valve attached by almost its entire surface to the surface of the other bivalves such as *Hayamina solida* Tashiro et Ohnishi (see Tashiro and Ohnishi, 1985); umbo less prominent, pointed at nearly center or slightly anterior to mid-length of valve; surface smooth except for fine growth lines; inner surface smooth; adductor scar nearly indistinct; hinge structures less developed only two nodulate ridges under beak; a ligamental pit-like small depression located between the nodulate ridges.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3772,	holotype, l. valve	14.9	15.9	2.6
KSG 3773,	paratype, l. valve	17.0	16.1	2.5
KSG 3774,	paratype, r. valve	13.8	16.7	2.9
KSG 3775,	paratype, r. valve	14.8	16.0	2.0

Observation: -This species is uncertain in the classification of the generic order. We refer this species to a member under the genus *Placunopsis* with some doubt, because of its less developed hinge structure and less byssal retractor.

Comparison: -This species is similar to *Placunopsis plana* (Giebel) from the Triassic of Europe (Seilacher, 1954), in its rounded outline, but differs in its less developed radial striae on the disk.

Occurrence: -Darkgray-greenish siltstone of the Basal Member of the Hibihara Formation of the Monobegawa Group, at Yunoki of Kajisako, Monobe area, Kochi Prefecture; Aptian.

Superfamily Limacea Rafinesque

Family Limidae Rafinesque, 1815

Genus *Limatula* Wood, 1839

Limatula nagaoi Hayami

Plate 6, fig. 19

1934. *Lima* (*Limatula*) *ishidoensis* Yabe et Nagao; Nagao, *Jour. Fac. Sci. Hokkaido Imp. Univ.*, Ser. 4, Vol. 2, No. 3, p. 213, pl. 27, figs. 9-10.
- 1965a. *Limatula nagaoi* Hayami, *Mem. Fac. Sci. Kyushu Univ.*; Ser. D, Geol., Vol. 15, No. 2, p. 333, pl. 49, figs. 1-4.
1972. *Limatula nagaoi* Hayami; Shikama and Suzuki, *Sci. Rep. Yokohama Nat. Univ.*, Ser. 2, Vol. 19, pl. 5, fig. 4.
1975. *Limatula nagaoi* Hayami; Hayami, *Univ. Mus., Univ. Tokyo, Bull.* 10, p.89

Material: -KSG 3787, external mould of right valve; KSG 3725, internal mould of right valve; both specimens from Hibihara of Odochi, Monobe area.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3787,	r. ext. mould	8.0+	14.8	3.7
KSG 3725,	r. int. mould	14.8	16.7	3.9

Remarks: -Present specimens of this species are well preserved external and internal moulds. This species is undoubtedly identical with *Limatula nagaoui* Hayami (1965a), from the Aptio-Albian Miyako Group of north-east Japan, because of its characteristics of radial ribbing on the surface and highly oblong outline of the shell, all of which are same with those of type specimen by Hayami (1965a).

Occurrence: -Darkgray shale or siltstone of the Upper Member of the Hibihara Formation of the Monobegawa Group, at Hibihara of Odochi, Monobe area, Kochi Prefecture; Upper Albian. This species is also known from the darkgray shale of the Fujikawa Formation of the Monobegawa Group at Hanoura in Tokushima Prefecture; Upper Albian.

Suborder Ostreina Ferussac, 1822

Superfamily Ostreacea Rafinesque

Family Gryphaeidae Vyalov, 1936

Subfamily Exogyrinae Vyalov, 1936

Genus *Amphidonte* Fischer de Waldheim, 1829

Subgenus *Amphidonte* Fischer de Waldheim, 1829

Amphidonte (Amphidonte) sp. aff. A. (A.) subhaliotoidea (Nagao)

Plate 8, fig. 2

Compare: -

1934. *Exogyra subhaliotoidea* Nagao, *Jour. Fac. Sci., Hokkaido Imp. Univ.*, Ser. 4, Vol. 2, No. 3, p. 203, pl. 30, figs. 1-4.
- 1965a. *Amphidonta (Amphidonta) subhaliotoidea* (Nagao); Hayami, *Mem. Fac. Sci., Kyushu Univ.*, Ser. D, Geol., Vol. 15, No. 2, p. 343, pl. 50, figs. 6-9, pl. 51, figs. 1-2.
1967. *Amphidonte (Amphidonte) subhaliotoidea* (Nagao); Hayami and Kawasawa, *Trans. Proc. Palaeont. Soc. Japan*, N. S., No. 66, p. 78, pl. 9, fig. 5.
1972. *Amphidonte (Amphidonte) subhaliotoidea* (Nagao); Shikama and Suzuki, *Sci. Rep. Yokohama Nat. Univ.*, Ser. 2, Vol. 19, p. 10-14.
1975. *Amphidonte (Amphidonte) subhaliotoidea* (Nagao); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 90, pl. 4, fig. 2.

Material: -KSG 3686, internal mould of left valve, from Todoronotaki of Hibihara, Monobe area.

Remarks: -Single perfect internal mould of left valve, 23.2 mm long and 2.0 mm high, and several fragmental external and internal moulds, are in our hands. These specimens are closely similar to *Amphidonte* (*Amphidonte*) *subhaliotoidea* (Nagao), from the Miyako Group in northeast Japan (Nagao, 1934; Hayami, 1965a), in its inner features of the valve, but somewhat differs from the latter in its small valve and more or less small and pointed umbo.

Occurrence: -Darkgray silty sandstone of the Monobe Formation of the Monobegawa Group, at about 300 m north of Todoronotaki, Hibihara, Monobe area, Kochi Prefecture; Upper Hauterivian.

Family Ostreidae Rafinesque, 1815

Subfamily Ostreinae Rafinesque, 1815

Genus *Crassostrea* Sacco, 1897

Crassostrea sp.

Plate 8, fig. 4

Material: -KSG 3796, internal mould of right valve, from Todoronotaki of Hibihara, Monobe area.

Description: -Shell small, highly suboptical in outline; ligamental area rather narrow, triangular; umbo small, slightly prosogyrous, pointed at a little anterior to central point of valve: anterior margin nearly vertical, or slightly concave; posterior margin very weakly convex and stretched vertically; ventral margin very narrowly rounded.

Remarks: -Several fragmental external and internal moulds, and a nearly perfect right internal mould, KSG 3796, 33.1 mm long and 92.6 mm high, are obtained. Since the features of left valve and external right valve are unknown in detail, we classify tentatively these specimens to the genus *Crassostrea*.

Occurrence: -Darkgray silty sandstone of the Monobe Formation of the Monobegawa Group at about 300 m north of Todoronotaki, Hibihara, Monobe area, Kochi Prefecture; Upper Hauterivian.

Subfamily Lophinae Vyalov, 1936

Genus *Rastellum* Faujas-Saint-Fond, 1799

Subgenus *Arctostrea* Pervinquire, 1910

Rastellum (*Arctostrea*) *carinatum* (Lamarck)

Plate 8, fig. 3; plate 9, fig. 5

1871. *Ostrea* (*Alectryonia*) *carinata* Lamarck; Stoliczka, *Palaeont. Indica*, Ser. 4, vol. 3, pelecypoda, p. 468, pl. 48, fig. 5, pl. 49, figs. 1-2.

1889. *Ostrea carinata* Brown, *Atlas fossil conchology*, London, pl. 71, fig. 6.
 1890. *Alectryonia* cf. *carinata* Lamarck; Yokoyama, *Palaeontographica*, Bd. 36, p. 198.
 1913. *Ostrea diluviana* Linnaeus; Woods, *Monogr. Cret. Lamell. England*, vol. 2, p. 342.
 1926. *Ostrea diluviana* Linnaeus; Yabe, Nagao and Shimizu, *Sci. Rep. Tohoku Imp. Univ.*, Ser. 2, vol. 9, No. 2, p. 62, pl. 13, figs. 4-6.
 1927. *Ostrea diluviana* Linnaeus; Nagao, *Sci. Rep. Tohoku Imp. Univ.*, Ser. 2, vol. 11, No. 1, pl. 5, fig. 4.
 1947. *Ostrea* (*Arctostrea*) *carinata* Lamarck; Santon. U. S., *Geol. Surv., prof. Paps.*, No. 211, p. 18, pl. 7, figs. 8-13.
 1965a. *Lopha* (*Arctostrea*) *carinata* (Lamarck); Hayami, *Mem. Fac. Sci. Kyushu Univ.*, Ser. D, Geol., Vol. 15, No. 2, p. 340, pl. 49, fig. 13.
 1971. *Rastellum* (*Arctostrea*) *carinata* (Lamarck); Newell, *Treaties on invertebrate paleontology, mollusca* 6, vol. 3, n 1166, figs. 1a-1b, 2a-2c.
 1975. *Rastellum* (*Arctostrea*) *carinatum* (Lamarck); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 91.
 1980. *Lopha* (*Arctostrea*) *carinata* (Lamarck); Tashiro, Kozai, Okamura and Katto. *Geol. Paleonta Shimanto Belt, Taira and Tashiro eds.*, pl. 10, fig. 6.

Material -KSG 3758, internal and external moulds of left and right valves, from Todoronotaki of Hibihara, Monobe area; KSG 3759-KSG 3760, external moulds of left and right valves, from Tatsukawa of Katsuura, Tokushima Prefecture.

Remarks: -Many specimens, internal and external moulds, are collected from the Monobe, Hanoura Formations in Shikoku. In addition to the collection, we have several specimens of this species from the Haidateyama Group in Kyushu, for this study. This species is undoubtedly referable to well known Lower Cretaceous oyster, *Rastellum* (*Arctostrea*) *carinatum* (Lamarck) from Europe (Woods, 1900; Newell, 1971), because of its characteristic zigzag pattern of costae on the surface of the valve. The largest specimen in our hands is measured 83.0 mm long and 14.6 mm high (KSG 3754).

Occurrence: -Darkgray siltstone of the Monobe Formation of the Monobegawa Group, at about 300 m north of Todoronotaki, Hibihara, Monobe area, Kochi Prefecture; Upper Hauterivian. Darkgray siltstone or very fine grained sandstone of the Hanoura Formation of the Monobegawa Group, at Tatsukawa of Katsuura, Kami-katsu-gun, Tokushima Prefecture; Upper Hauterivian. This species is also known from the Ishido Formation of Sanchi, Nagao Prefecture, and the Haidateyama Formation of Oita in Kyushu.

Subclas Palaeoheterodonta

Order Trigonioida Dall

Superfamily Trigoniacea Lamarck, 1819

Family Trigoniidae Lamarck, 1819

Subfamily Pterotrigoniinae van Hoepen, 1929

Genus *Pterotrigonia* van Hoepen, 1929Subgenus *Pterotrigonia* van Hoepen, 1929*Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama)

Plate 5, figs. 1, 2, 6; plate 7, figs. 1-11

1881. *Trigonia pocilliformis* Yokoyama, *Jour. Coll. Sci. Imp. Univ., Tokyo*, Vol. 4, No. 2, p. 361, pl. 40, figs. 1-3.
1923. *Trigonia pocilliformis* Yokoyama: Yehara, *Jour. Geol. Geogr.*, Vol. 2, No. 3, p. 71, pl. 9, figs. 8-10, pl. 10, figs. 4-6.
1926. *Trigonia pocilliformis* Yokoyama; Yabe, Nagao and Shimizu, *Sci. Rep. Tohoku Imp. Univ., Ser. 2*, Vol. 9, No. 2, p. 45, pl. 14, fig. 3.
1927. *Trigonia pocilliformis* Yokoyama; Yabe, *Sci. Rep. Tohoku Imp. Univ., Ser. 2*, Vol. 11, No. 1, pl. 4, fig. 3.
1954. *Pterotrigonia pocilliformis* (Yokoyama); Kobayashi, *Jour. Geol. Geogr.* Vol. 25, Nos. 1-2, p. 77.
1957. *Pterotrigonia pocilliformis* (Yokoyama); Kobayashi and Nakano, *Jour. Geol. Geogr.*, Vol. 28, No. 4, p. 229, pl. 16, figs. 8-10.
1958. *Pterotrigonia pocilliformis* (Yokoyama); Kobayashi and Nakano, *Jour. Geol. Geogr.*, Vol. 29, Nos. 1-3, p. 147, pl. 11, fig. 12.
1964. *Pterotrigonia pocilliformis* (Yokoyama); Matoba, *Trans. Proc. Palaeont. Soc. Japan*, N.S., No. 55, pl. 37, figs. 6-7.
1967. *Pterotrigonia pocilliformis* (Yokoyama); Maeda and Kawabe, *Annual Rep. Foreign Students, Coll. Chiba Univ.*, No. 1, p. 91, pl. 1, figs. 1-3.
1978. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Katto and Tashiro, *Res. Rep. Kochi Univ.*, Vol. 2, p. 145, pl. 1, figs. 7-9.
1980. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Tashiro, Kozai, Okamura and Katto, *Geol. Paleont. Shimanto Belt, Taira and Tashiro eds.*, pl. 10, figs. 14.
1981. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Hayami and Oji, *Trans. Proc. Palaeont. Soc. Japan*, N. S., No. 120, p. 431, pl. 52, fig. 7.
1983. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Tashiro and Matsuda, *Mem. Fac. Sci., Kochi Univ., Ser. E, Geol.*, Vol. 4, p. 18, pl. 8, figs. 6-11, text-fig. 3.
1986. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Tashiro and Matsuda, *Mem. Fac. Sci., Kochi Univ., Ser. E, Geol.*, Vol. 7, pl. 1, figs. 6-11, text-fig. 3.
1986. *Pterotrigonia* (*Pterotrigonia*) *pocilliformis* (Yokoyama); Tashiro, Yanagisawa and Kitamura, *Jour. Geol. Japan*, Vol. 92, No. 10, Pl. 1, figs. 11, 12.

Material and remarks: -See Tashiro and Matsuda (1983 and 1986).

Occurrence: -Sandstone of the Lower Member of the Hibihara Formation at Sasano of Doiban, Odochi, Monobe area; Aptian. Siltstone of the A Member of the Doganaro Formation of the Shimanto Terrain at Obama, of Susaki, Kochi Prefecture; Lower Barremian. Sandstone of the Monobe Formation at Kasanokawa of Nangoku City, Ryoseki area; Upper

Hauterivian. The type locality of this species by Yokoyama (1881) is Saoyama of Ryoseki area. This species is known from the Hanoura and Hoji Formations in Tokushima Prefecture. This is one of the characteristic species from the Upper Hauterivian to Aptain strata belonging to the Monobegawa Group in southwest Japan.

Pterotrigonia (Pterotrigonia) yokoyamai (Yehara)

Plate 10, figs. 7-8

1915. *Trigonia yokoyamai* Yehara, *Sci. Rept. Tohoku Imp. Univ., Ser. 2*, Vol. 2, No. 3, p. 205.
1934. *Trigonia yokoyamai* Yehara; Nagao, *Jour. Fac. Sci. Hokkaido Imp. Univ., Ser. 4*, Vol. 2, No. 3, p. 205.
1954. *Pterotrigonia yokoyamai* (Yehara); Kobayashi, *Jour. Geol. Geogr.*, Vol. 25, Nos. 1-2, p. 77.
- ?1967. *Pterotrigonia (Pterotrigonia) hokkaidoana* (Yehara); Hayami and Kawasaki, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 66, p. 79, pl. 9, figs. 6-9.
1975. *Pterotrigonia (Pterotrigonia) yokoyamai* (Yehara); Hayami, *Univ. Mus., Univ. Tokyo Bull.* 10, p. 118.
1983. *Pterotrigonia (Pterotrigonia) aff. yokoyamai* (Yehara); Tashiro and Matsuda, *Mem. Fac. Sci. Kochi Univ., Ser. E, Geol.*, Vol. 4, p. 21, pl. 10, figs. 7-8; pl. 12, figs. 10-14.
1985. *Pterotrigonia (Pterotrigonia) sp. cf. P. (P.) yokoyamai* (Yehara); Tashiro, Matsuda and Tanaka, *Mem. Fac. Sci. Kochi Univ., Ser. E, Geol.*, Vol. 5-6, p. 9, pl. 2, figs. 11-12.
1985. *Pterotrigonia (Pterotrigonia) sp. cf. P. (P.) yokoyamai* (Yehara); Tashiro and Kawaji, *Res. Rep. Kochi Univ.*, Vol. 34, Nat. Sci., pl. 1, figs. 11-13.

Material: -KSG 3797-KSG 3798, external moulds of left and right valves, from Igenoki of Tosayamada, Kochi Prefecture. KSG 3799-KSG 3800, left and right valves, from Mochie of Susaki, Kochi Prefecture. KSG 3801-KSG 3802, external and internal moulds of right valves, from Ikuna of Katsuura, Tokushima Prefecture.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3796,	l. v.	20.0+	22.1	6.0
KSG 3802,	r. int. mould	25.6	26.0	—
KSG 3803,	r. ext. mould	30.2	25.8	7.2

Remarks: -This species is characterized by smooth subradial ribs on the disk. Although this species is closely similar to *Pterotrigonia (Pterotrigonia) poculiformis* (Yokoyama), this differs from the latter in its smooth radial ribs.

Occurrence: -Dark-greenish siltstone of the Igenoki Formation of the Nankai Group at Igenoki of Tosayamada, Nangoku City, Kochi Prefecture. Gray-greenish siltstone of the B Member of the Doganaro Formation of the Shimanto Terrain at Mochie of Susaki City, Kochi

Prefecture; both are Aptain. Fine grained sandstone of the Ikuna Formation of the Nankai Group at Ikuna of Katsura, Tokushima Prefecture; Upper Aptain or Lower Albian.

Subgenus *Scabrotrigonia* Dietrich, 1933

Pterotrigonia (? *Scabrotrigonia*) *moriana* (Yehara)

Plate 5, figs. 3, 4

1927. *Trigonia moriana* Yehara, *Japan. Jour. Geol. Geogr.*, Vol. 5, Nos. 1-2, p. 33, pl. 3, figs. 7-8.
1954. *Pterotrigonia moriana* (Yehara); Kobayashi, *Japan. Jour. Geol. Geogr.* Vol. 25, Nos. 1-2, p. 77.
1957. *Acanthotrigonia moriana* (Yehara); Kobayashi and Nakano, *Japan Jour. Geol. Geogr.*, Vol. 28, No. 4, p. 233, pl. 16, figs. 5-6, pl. 17, figs. 9-10.
1975. *Pterotrigonia* (*Acanthotrigonia*) *moriana* (Yehara); Hayami, *Univ. Mus., Univ. Tokyo*, Bull. 10, p. 119.
1983. *Pterotrigonia* (? *Scabrotrigonia*) *moriana* (Yehara); Tashiro and Matsuda, *Mem. Fac. Sci. Kochi Univ., Ser. E, Geol.*, Vol. 4, p. 23, pl. 6, figs. 1 - 21, text-fig. 4.
1986. *Pterotrigonia* (? *Scabrotrigonia*) *moriana* (Yehara); Tashiro and Matsuda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 142, p. 380, pl. 74, fig. 23.

Material, description, observation and comparison: -See Tashiro and Matsuda (1983)

Occurrence: -Fine grained arenite sandstone of the Hagino Formation of the Nankai Group at Hagino of Birafu, Monobe area, Kochi Prefecture; Aptian. This species had been collected from the Hagino Formation at Mama of Kochi City, by Hirata (1975). Recently this species was described from the Bunjo Formation of the Nankai Group in Sakawa area, Kochi Prefecture, by Tashiro and Matsuda (1986).

Pterotrigonia (? *Scabrotrigonia*) *pseudomoriana* Tashiro et Matsuda

Plate 5, fig. 5

1986. *Pterotrigonia* (? *Scabrotrigonia*) *pseudomoriana* Tashiro et Matsuda, *Mem. Fac. Sci. Kochi Univ., Ser. E, Geol.*, Vol. 7, p. 16, pl. 1, figs. 12, 13, text-fig. 16.

Material, diagnosis, description, observation and comparison: -See Tashiro and Matsuda (1986).

Occurrence: -Fine grained sandstone of the upper part of the Monobe Formation of the Monobegawa Group, at Okho near Kasanokawa, Ryoseki area, Kochi Prefecture; Lower Barremian.

Subfamily Trigoninae Lamarck, 1819

Genus *Nipponitrigonia* Cox, 1952*Nipponitrigonia sakamotoensis* (Yehara)

Plate 5, figs. 7-13

1921. *Trigonia sakamotoensis* Yehara, *Jour. Geol. Soc. Tokyo*, Vol. 28, No. 329, p. 10, pl. 5, fig. 4.
1921. *Trigonia kikuchiana* Yokoyama; Yehara, *Jour. Geol. Soc. Tokyo*, Vol. 28, pl. 5, fig. 3.
1923. *Trigonia naumanni* Yehara, *Japan. Jour. Geol. Geogr.*, Vol. 2, No. 3, p. 81, pl. 8, figs. 1-3, pl. 9, fig. 6.
1954. *Nipponitrigonia sakamotoensis* (Yehara); Kobayashi, *Japan. Jour. Geol. Geogr.*, Vol. 25, Nos. 1-2, p. 77.
1957. *Nipponitrigonia naumanni* (Yehara); Kobayashi, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 26, p. 54, pl. 10, figs. 12-13; pl. 11, figs. 1-2.
1957. *Nipponitrigonia sakamotoensis* (Yehara); Kobayashi, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 26, p. 55, pl. 10, fig. 15; pl. 11, fig. 8.
1958. *Nipponitrigonia naumanni* (Yehara); Kobayashi and Nakano, *Japan. Jour. Geol. Geogr.*, Vol. 29, Nos. 1-3, p. 144.
1962. *Nipponitrigonia naumanni* (Yehara); Maeda, *Trans. Proc. Palaeont. Soc. Japan, N. S.*, No. 46, p. 510, pl. 6, figs. 1-12; pl. 7, figs. 1-14.
1964. *Nipponitrigonia naumanni* (Yehara); Maeda and Kitamura, *Jour. Coll. Arts and Sci. Chiba Univ.*, Vol. 4, No. 2, p. 54, pl. 2, figs. 1-11; pl. 3, figs. 1-14; pl. 4, figs. 1-15.
1967. *Nipponitrigonia naumanni* (Yehara); Maeda and Kawabe, *Annual. Rep. Foreign Students' Coll. Chiba Univ.*, No. 2, p. 91, pl. 1, fig. 4.
1975. *Nipponitrigonia sakamotoensis* (Yehara); Hayami, *Univ. Mus, Univ. Tokyo, Bull.* 10, p. 104.
1980. *Nipponitrigonia cf. sakamotoensis* (Yehara); Tashiro, Kozai, Okamura and Katto, *Geol. Paleont. Shimanto Belt, Taira and Tashiro eds.*, p. 75.

Material: -KSG 3788-KSG 3789, external and internal moulds of right and left valves, from Ryoseki of Nangoku City, Ryoseki area. KSG 3790, external mould of left valve, from Todoronotaki of Hibihara, Monobe area. KSG 3763-KSG 3764, external and internal moulds of right and left valves, from Sasano of Doiban, Monobe area. KSG 3761-KSG 3762, external and internal moulds of left and right valves, from Katsuura, Tokushima Prefecture.

Measurements (in mm.): -

Specimen		Length	Height	Thickness
KSG 3761,	l. int. mould	63.7+	43.5	—
KSG 3762,	l. ext. mould	64.6+	44.0+	14.0
KSG 3763,	l. ext. mould	34.0+	50.6	18.0

Remarks: -The subconcentric ribs on the disk of this species are variable in number and strength. This species is similar to *Nipponitrigonia kikuchiana* (Yehara), in its roundly trigonal outline of the valve and features of the inner valve, but differs in its less inflated valve and development of the subradial ribs on the disk. On some case, this species occurs from more coarse grained sediments than those of the case in *N. kikuchiana*.

Occurrence: -Very coarse grained sandstone or conglomeratic sandstone of the Monobe Formation of the Monobegawa Group at Ryoseki of Nangoku City, Kochi Prefecture. Very coarse grained sandstone of the Monobe Formation at Todoronotaki of Hibihara, Monobe area, Kochi Prefecture. Both in the Upper Hauterivian. Conglomeratic sandstone of the Lower Member of the Hibihara Formation of the Monobegawa Group at Sasano of Doiban, Monobe area; Aptian. Very coarse grained sandstone of the Hoji Formation of the Monobegawa Group at Katsuura, Kami-katsu-gun, Tokushima Prefecture; Aptian.

Nipponitrigonia kikuchiana (Yokoyama)

Plate 7, figs. 13-28

1891. *Trigonia kikuchiana* Yokoyama, *Jour. Coll. Sci. Imp. Univ. Tokyo*, Vol. 18, No. 6, p. 363, pl. 40, figs. 4-6.
1891. *Trigonia rotundata* Yokoyama, *Jour. Coll. Sci. Imp. Univ. Tokyo*, Vol. 18, No. 6, p. 365, pl. 40, figs. 7-9.
1954. *Nipponitrigonia kikuchiana* (Yokoyama); Kobayashi, *Japan. Jour. Geol. Geogr.*, VI. 25, Nos. 1-2, p. 76.
1954. *Nipponitrigonia rotundata* (Yokoyama); Kobayashi, *Japan. Jour. Geol. Geogr.*, Vol. 25, Nos. 1-2, p. 77.
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1980. *Nipponitrigonia convexa* Kobayashi; Tashiro, Kozai, Okamura and Katto, *Geol. Paleont. Shimanto Belt, Taira and Tashiro eds.*, pl. 10, fig. 13.
1986. *Nipponitrigonia kikuchiana* (Yokoyama); Tashiro and Matsuda, *Trans. Proc. Palaeont. Soc. Japan*, N. S., No. 142, p. 378.

Material: -KSG 3765-KSG 3768, external moulds of right and left valves, from Sasano of Doiban, Monobe area. KSG 3769-KSG 3770, external and internal moulds of left and right valves, from Katsuura, Tokushima Prefecture.

Measurements (in mm.): -

Specimen	Length	Height	Thickness
KSG 3765, l. ext. mould	27.8	28.3	11.5
KSG 3766, r. ext. mould	30.7+	28.6	12.5
KSG 3767, l. ext. mould	20.4	20.5	8.0
KSG 3768, e. ext. mould	13.9	11.7	5.3

Remarks: - (See Tashiro and Matsuda, 1986)

Occurrence: -Sandstone of the Lower Member of the Hibi-hara Formation of the Monobegawa Group at Sasano of Doiban, Monobe area, Kochi Prefecture. Sandstone of the Hoji Formation of the Monobegawa Group at Katsuura of Kamikatsu-gun, Tokushima Prefecture. Both in the Aptian.

(to be continued)

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PLATES 1 ~ 10

Explanation of plate 1

Gervillia (Gervillia) forbesiana d'Orbigny

- Fig. 1. lateral view of right valve, gum cast, of external mould, KSG 3709, $\times 1$; loc. Sasano of Doiban, Monobe area.
- Fig. 2. lateral view of left valve, gum cast of external mould, KSG 3710, $\times 1$; loc. Todoronotaki of Hibihara, Monobe area.
- Fig. 3. inner view of right valve, KSG 3780, $\times 2$; loc. ditto.
- Fig. 4. inner view of left valve, $\times 1$; loc. ditto.
- Fig. 5. inner view of left valve, gum cast of internal mould, KSG 3702, $\times 2$; loc. ditto.
- Fig. 6. inner view of right valve, gum cast of internal mould, KSG 3707, $\times 2$; loc. ditto.
- Fig. 7. inner view of right valve, gum cast of internal mould, KSG 3705, $\times 2$; loc. ditto.
- Fig. 8. inner view of right valve, gum cast of internal mould, KSG 3706, $\times 2$; loc. ditto.
- Fig. 9. inner view of right valve, gum cast of internal mould, KSG 3704, $\times 2$; loc. ditto.

Gervillaria haradae (Yokoyama)

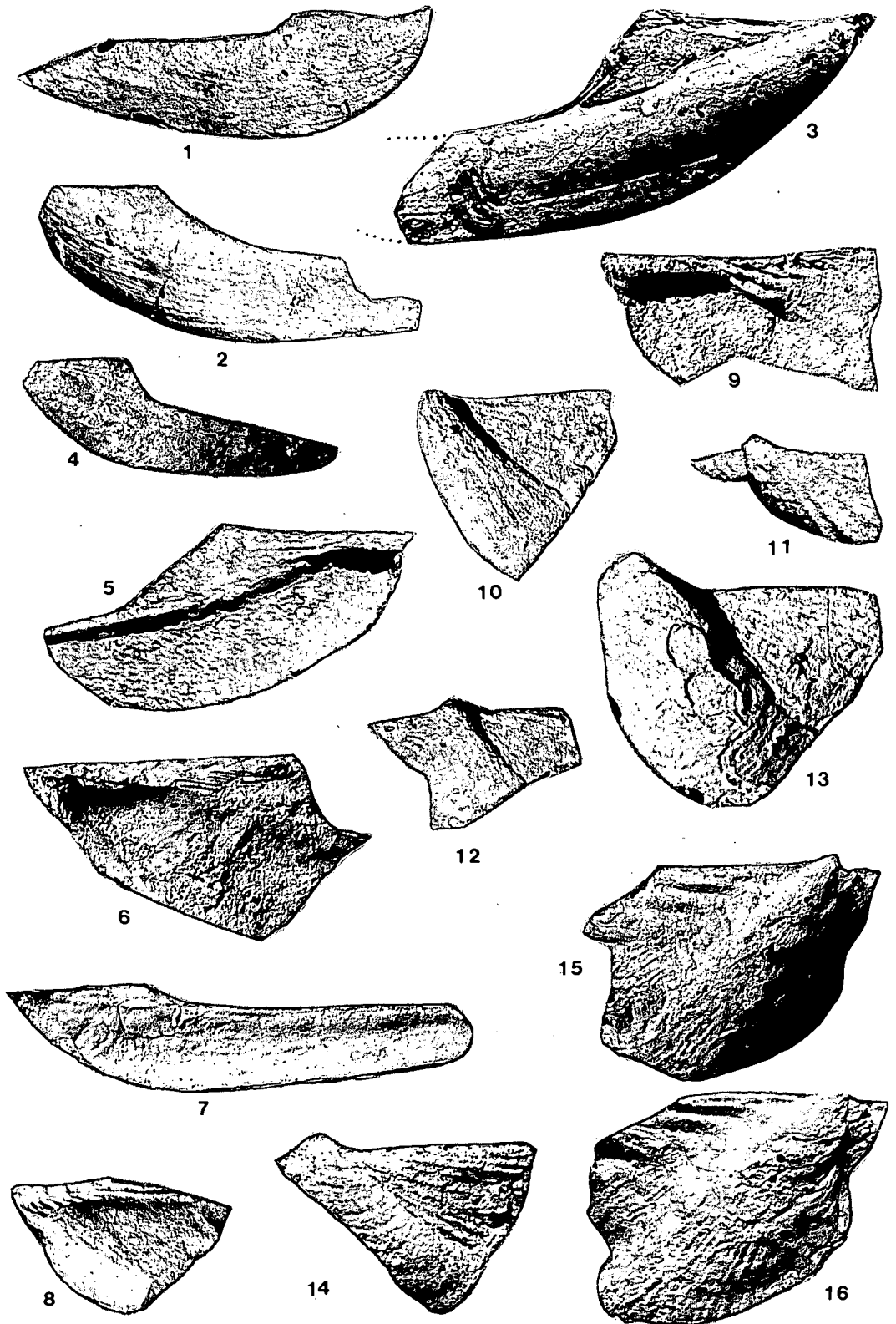
- Fig. 10. lateral view of left valve, gum cast of external mould, KSG 3692, $\times 3$; loc. Sasano of Doiban, Monobe area.
- Fig. 12. lateral view of left valve, gum cast of external mould, KSG 3693, $\times 3$; loc. ditto.
- Fig. 13. lateral view of left valve, gum cast of external mould, KSG 3691, $\times 1.5$; loc. ditto.
- Fig. 14. lateral view of left valve, gum cast of external mould, $\times 3$; loc. ditto.

Gervillaria hokutoi, sp. nov.

- Fig. 11. lateral view of left valve, gum cast of external mould, KSG 3699, $\times 3.5$; loc. Sasano of Doiban, Monobe area.

Pterinella shinoharai Hayami

- Fig. 15, 16. laterale view of right valve, gum cast of external mould, KSG 3687, $\times 1.5$; loc. Todoronotaki of Hibihara, Monobe area.



Explanation of plate 2

Chlamys hayamii, sp. nov.

Fig. 1. lateral view of left valve, gum cast of internal mould, KSG 3669, $\times 1.5$; loc. Todoronotaki of Hibihara, Monobe area.

Parvamussium tosaense Tashiro et Matsuda

Fig. 2. lateral view of left valve, gum cast of external mould, KSG 3730, $\times 2$; loc. Minamiike of Odochi, Monobe area.

Fig. 3. lateral view of left valve, gum cast of external mould, KSG 3726, $\times 2.5$; loc. ditto.

Fig. 4. lateral view of left valve, gum cast of internal mould, KSG 3727, $\times 2$; loc. ditto.

Fig. 5. lateral view of left valve, gum cast of external mould, KSG 3728, $\times 2$; loc. ditto.

Fig. 6. lateral view of left valve, gum cast of external mould, KSG 3733, $\times 2$; loc. ditto.

Fig. 7. lateral view of right valve, gum cast of external mould, KSG 3736, $\times 1.5$; loc. ditto.

Fig. 8. lateral view of left valve, gum cast of external mould, KSG 3729, $\times 2$; loc. ditto.

Fig. 9. lateral view of right valve, gum cast of internal mould, KSG 3735, $\times 2$; loc. ditto.

Fig. 10. lateral view of left valve, gum cast of external mould, KSG 3731, $\times 2$; loc. ditto.

Fig. 11. lateral view of right valve, gum cast of external mould, KSG 3734, $\times 2$; loc. ditto.

Fig. 12. lateral view of left valve, gum cast of external mould, KSG 3732, $\times 2$; loc. ditto.

Fig. 13. lateral view of left valve, $\times 1.5$; loc. ditto.

Entolium tosaense, sp. nov.

Fig. 14. lateral view of right valve, KSG 3668, $\times 1.3$; loc. north of Todoronotaki, Monobe area.

Fig. 15. lateral view of left valve, KSG 3665, $\times 1$; loc. ditto.

Fig. 16. lateral view of right valve, KSG 3666, $\times 1.5$; loc. ditto.

Mimachlamys (Nippononectes) elegans (Tashiro)

Fig. 17. lateral view of left valve, $\times 1$; loc. Sasano of Doiban, Monobe area.

Mimachlamys (Nippononectes) kozaii (Tashiro)

Fig. 18. lateral view of left valve (for comparison).

Gervillaria hokutoi, sp. nov.

Fig. 19. lateral view of left valve, gum cast of external mould, KSG 3701, $\times 2$; loc. Sasano of Doiban, Monobe area.

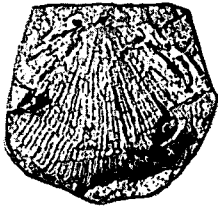
Fig. 20. lateral view of left valve, gum cast of external mould, KSG 3698, $\times 1.5$; loc. ditto.

Plicatura monobensis, sp. nov.

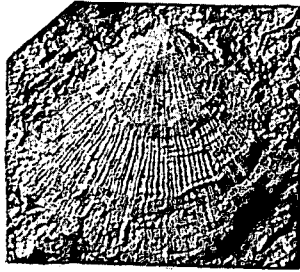
Fig. 21. inner view of right valve, gum cast of internal mould, KSG 3680, $\times 1.5$; loc. Todoronotaki of Hibihara, Monobe area.



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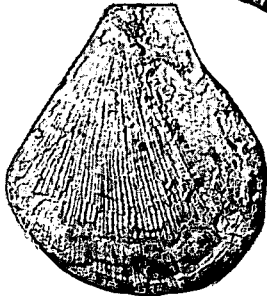
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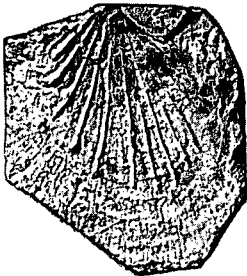
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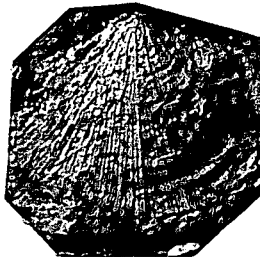
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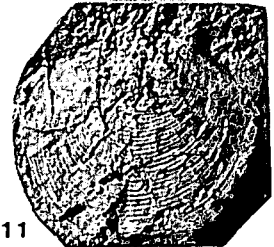
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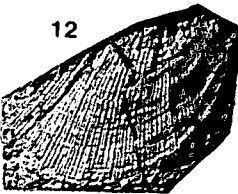
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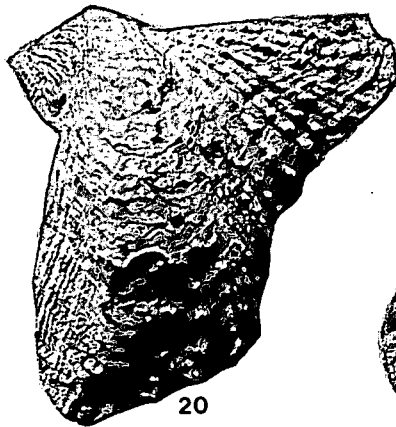
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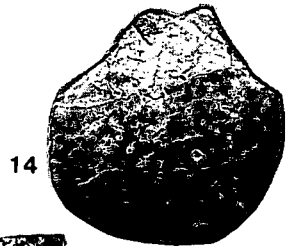
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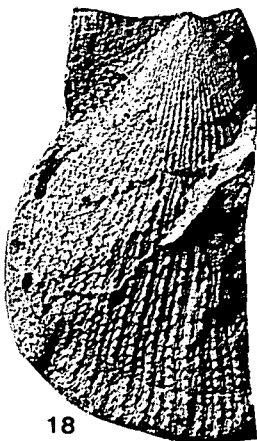
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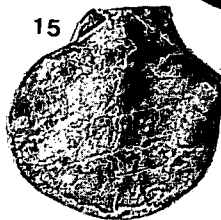
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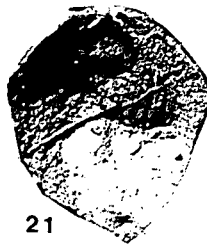
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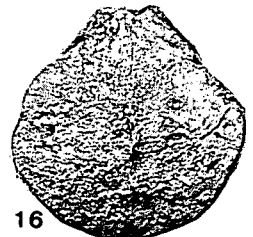
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Explanation of plate 3

Plicatula kiiensis Hayami

- Fig. 1. lateral view of left valve, gum cast of external mould, KSG 3662, $\times 1.5$; loc. Todoronotaki, Monobe area.
Fig. 2. lateral view of left valve, gum cast of external mould, KSG 3663, $\times 2$; loc. ditto.
Fig. 3. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 4. lateral view of left valve, gum cast of external mould, KSG 3664, $\times 1.5$; loc. ditto.
Fig. 5. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 6. inner view of left valve, gum cast of internal mould, KSG 3659, $\times 1.5$; loc. ditto.
Fig. 7. inner view of right valve, gum cast of internal mould, KSG 3658, $\times 1.5$; loc. ditto.
Fig. 10. inner view of right valve, gum cast of internal mould, KSG 3669, $\times 1.5$; loc. ditto.
Fig. 12. inner view of right valve, gum cast of internal mould, KSG 3660, 1.5 ; loc. ditto.

Plicatula monobensis, sp. nov.

- Fig. 8. lateral view of left valve, gum cast of external mould, KSG 3685, $\times 2$; loc. Todoronotaki, Monobe area.
Fig. 9. inner view of left valve, gum cast of internal mould, KSG 3681, $\times 1$; loc. ditto.
Fig. 11. inner view of left valve, gum cast of internal mould, KSG 3683, 1.2 ; loc. ditto.

Plicatula kochiensis, sp. nov.

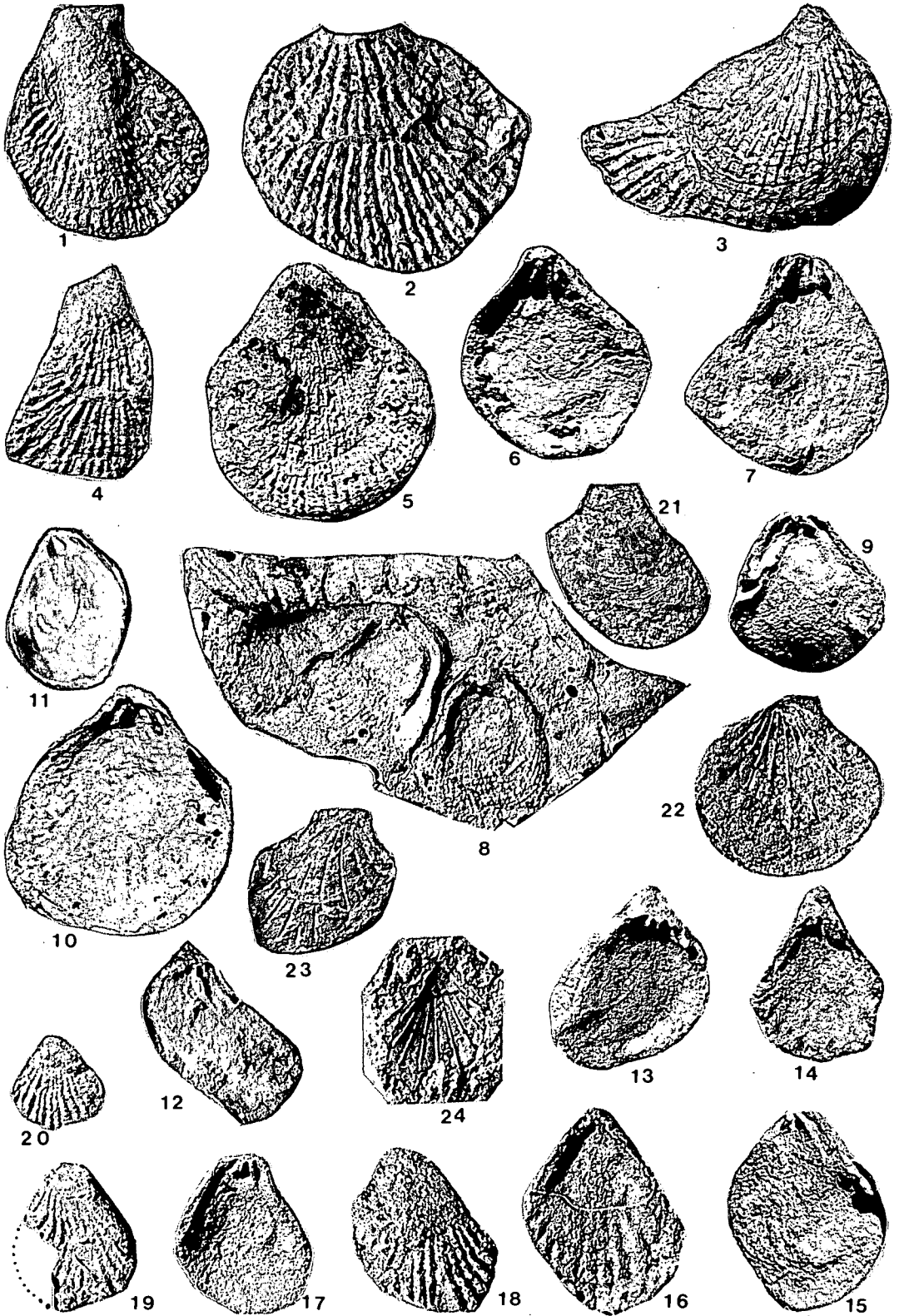
- Fig. 13. inner view of left valve, gum cast of internal mould, KSG 36671, $\times 2.5$; loc. Sasano of Doiban, Monobe area.
Fig. 14. inner view of right valve, gum cast of internal mould, $\times 2.5$; loc. ditto.
Fig. 15. inner view of right valve, gum cast of internal mould, KSG 3673, $\times 3$; loc. ditto.
Fig. 16. inner view of left valve, gum cast of internal mould, KSG 3674, $\times 3$; loc. ditto.
Fig. 17. inner view of left valve, gum cast of internal mould, KSG 3672, $\times 3$; loc. ditto.
Fig. 18. lateral view of left valve, gum cast of external mould, KSG 3670, $\times 3$; loc. ditto.
Fig. 19. lateral view of right valve, gum cast of external mould, KSG 3676, $\times 3$; loc. ditto.
Fig. 20. lateral view of right valve, gum cast of external mould, KSG 3675, $\times 2.5$; loc. ditto.

Parvamussium tosaense Tashiro et Matsuda

- Fig. 21. inner view of right valve, $\times 2$; loc. Minamiike, Monobe area.
Fig. 22. inner view of left valve, loc. ditto.

Parvamussium kimurai (Hayami)

- Fig. 23. inner view of left valve, $\times 2$; loc. Todoronotaki, Monobe area.
Fig. 24. inner view of right valve, gum cast of internal mould, KSG 3702, $\times 2$; loc. ditto.



Explanation of plate 4

Gervillaria hokutoi, sp. nov.

Fig.1,2. inner view of left valve, gum cast of internal mould, KSG 3662, $\times 3$; loc. Sasano of Doiban, Monobe area.

Neithea (Neithea) syriaca amanoi Hayami

Fig. 3. lateral view of right valve, KSG 3739, $\times 2$; loc. Hagino, Monobe area.

Fig. 4. lateral view of left valve, KSG 3741, $\times 2$; loc. ditto.

Fig. 5. lateral view of right valve, KSG 3737, $\times 2$; loc. ditto.

Fig. 6. lateral view of left valve, KSG 3742, $\times 2$; loc. ditto.

Fig. 7. lateral view of left valve, KSG 3740, $\times 2$; loc. ditto.

Fig. 8. lateral view of right valve, KSG 3738, $\times 2$; loc. ditto.

Placunopsis (?) hibiharensis, sp. nov.

Fig. 9. lateral view of left valve, 3772, $\times 2.5$; loc. Kawanouchi, Monobe area.

Fig.10. lateral view of left and right valves, KSG 3773, 3774, 3775, $\times 2$; loc. ditto.

Neithea (Neithea) hanourens, sp. nov.

Fig.11. lateral view of right valve, KSG 3752, $\times 2$; loc. Katsuura, Tokushima Prefecture.

Fig.12. anterior dorsal view of same valve, $\times 3$.

Fig.13. dorsal view of same valve, $\times 2$.

Plicatula monobensis, sp. nov.

Fig.14. inner view of right valve, cast of internal mould, KSG 3682, $\times 1.5$; loc. Todoronotaki, Monobe area.

Fig.15. inner view of right valve, gum cast of internal mould, KSG 3684, $\times 2$; loc. ditto.

Fig.16. inner view of left valve, gum cast of internal mould, KSG 4006, $\times 2$; loc. ditto.

Plicatula takahashii, sp. nov.

Fig.17. lateral view of right valve, gum cast of external mould, KSG 3777, $\times 1$; loc. Mochiie of Susaki, Kochi Prefecture.

Fig.18. inner view of right valve, KSG 3781 $\times 1$; loc. ditto.

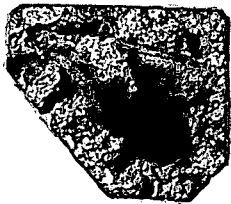
Fig.19. lateral view of left valve, KSG 3780, $\times 1$; loc. ditto.

Fig.20. lateral view of left valve, gum cast of external mould, KSG 3782, $\times 1.5$; loc. ditto.

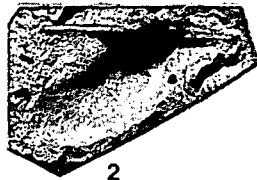
Fig.21. lateral view of left valve, gum cast of external mould, KSG 3783, $\times 1.5$; loc. ditto.

Fig.22. lateral view of right valve, gum cast of external mould, KSG 3778, $\times 1.5$; loc. ditto.

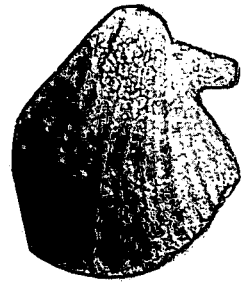
Fig.23. lateral view of right valve, gum cast of external mould, KSG 3779, $\times 1.5$; loc. ditto.



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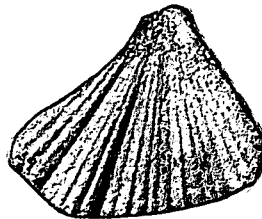
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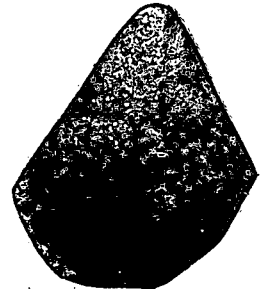
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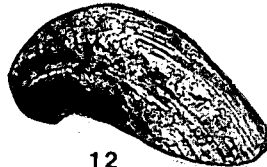
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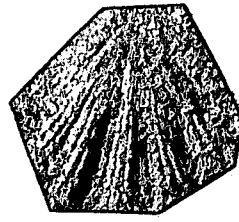
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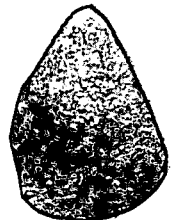
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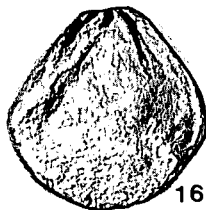
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Explanation of plate 5

Pterotrigonia (*Pterotrigonia*) *pocilliformis* (Yokoyama)

- Fig. 1. lateral view of left valve, gum cast of external mould, $\times 2$; loc. Sasano of Doiban, Monobe area. B form.
Fig. 2. dorsal view of conjoined valves, $\times 1.5$; Todoronotaki, Monobe area. A form.
Fig. 6. dorsal view of conjoined valves, $\times 1.5$; loc. Sasano of Doiban. Monobe area. B form.

Pterotrigonia (? *Scabrotrigonia*) *moriana* (Yehara)

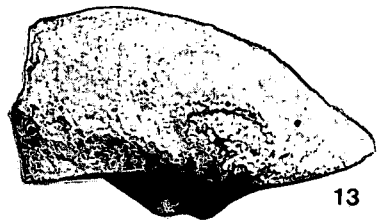
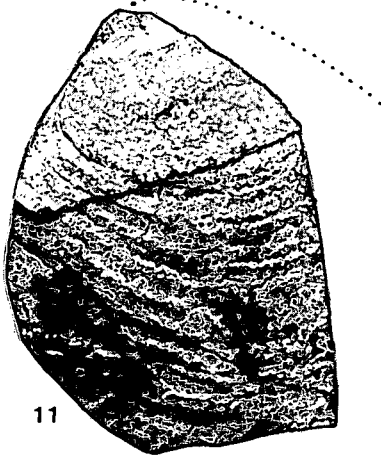
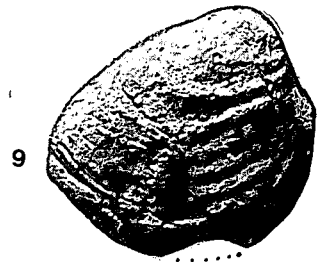
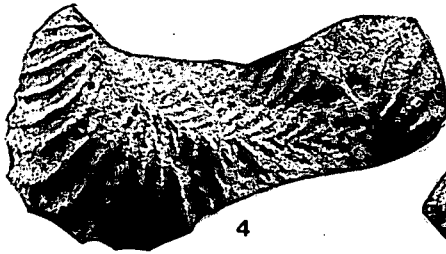
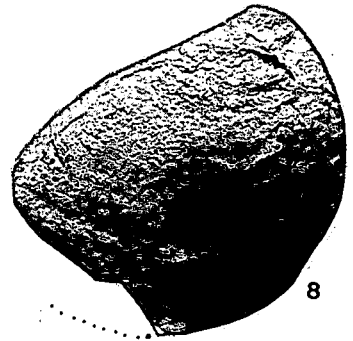
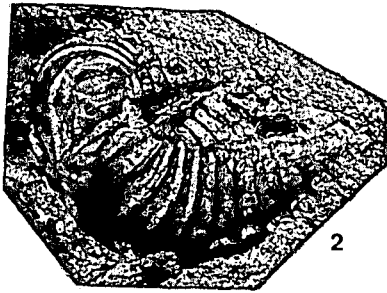
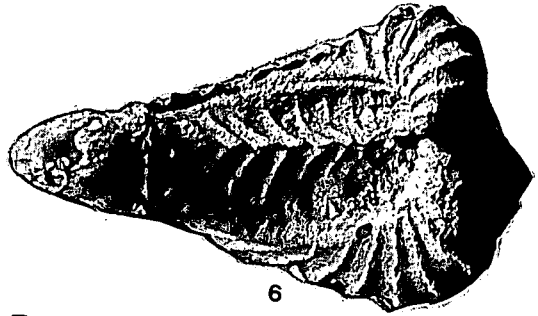
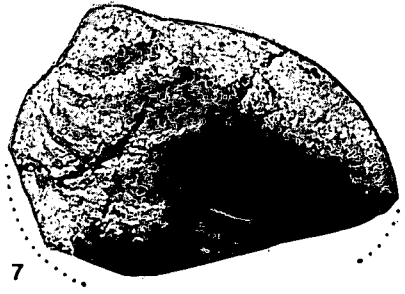
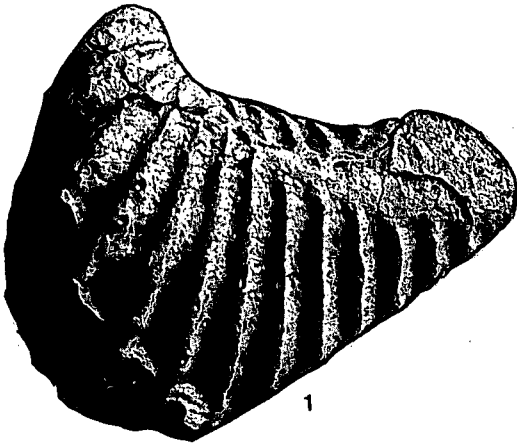
- Fig. 3. lateral view of left valve, gum cast of external mould, $\times 1$; loc. Hagino, Monobe area.
Fig. 4. lateral view of left valve, gum cast of external mould, $\times 1.5$; loc. ditto.

Pterotrigonia (? *Scabrotrigonia*) *pseudomoriana* Tashiro et Matsuda

- Fig. 5. lateral view of right valve, gum cast of external mould, $\times 1$; loc. Okho, Roseki area, Kochi Prefecture.

Nipponitrigonia *sakamotoensis* (Yehara)

- Fig. 7. lateral view of left valve, $\times 1$; loc. Katsuura, Tokushima Prefecture.
Fig. 8. lateral view of right valve, gum cast of external mould, $\times 1$; loc. Sasano, Monobe area.
Fig. 9. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 10. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 11. lateral view of left valve, gum cast of external mould, KSG 3763, $\times 1$; loc. ditto.
Fig. 12. dorsal view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 13. dorsal view of left valve, gum cast of external mould, $\times 1$; loc. ditto.



Explanation of plate 6

Inoceramus (Birostrina) subsulcatus Wiltshire

Fig. 1. lateral view of right valves, KSG 3718 and KSG 3719, $\times 2$; loc. Minamiike, Monobe area.

Fig. 2. lateral view of left valve, KSG 3716 and KSG 3717, $\times 2$; loc. ditto.

Inoceramus anglicus Woods

Fig. 3. lateral view of left valve, KSG 3715, $\times 2$; loc. Minamiike, Monobe area.

Fig. 4. lateral view of right valve, KSG 3714, $\times 2$; loc. ditto.

Isognomon (Isognomon) choshiensis Hayami

Fig. 5. inner view of left valve, $\times 2.5$; loc. Sasano, Monobe area.

Fig. 6. inner view of right valve, KSG 3771, $\times 4$; loc. ditto.

Gervillaria haradae (Yokoyama)

Fig. 7. inner view of right valve, $\times 1$; loc. Sano, Tosayamada, Monobe area.

Fig. 8. inner view of left valve, $\times 1$; loc. ditto.

Bakevellia (Neobakevellia) pseudorostrata (Nagao)

Fig. 9. lateral view of right valve, KSG 3795, $\times 2$; loc. Minamiike, Monobe area.

Neithea (Neithea) ficalhoi (Choffat)

Fig. 10. lateral view of right valve, gum cast of external mould, KSG 3751, $\times 2$; loc. Sasano, Monobe area.

Mimachlamys (Nippononectes) elegans (Tashiro)

Fig. 11. inner view of left valve, gum cast of internal mould, $\times 2$; loc. Sasano, Monobe area.

Fig. 12. inner view of right valve, gum cast of external mould, $\times 2$; loc. ditto.

Fig. 13. lateral view of left valve, gum cast of external mould, $\times 1.5$; loc. ditto.

Fig. 14. lateral view of left valve, gum cast of external mould, $\times 6$; loc. ditto.

Fig. 15. lateral view of left valve, gum cast of external mould, $\times 2$; loc. ditto.

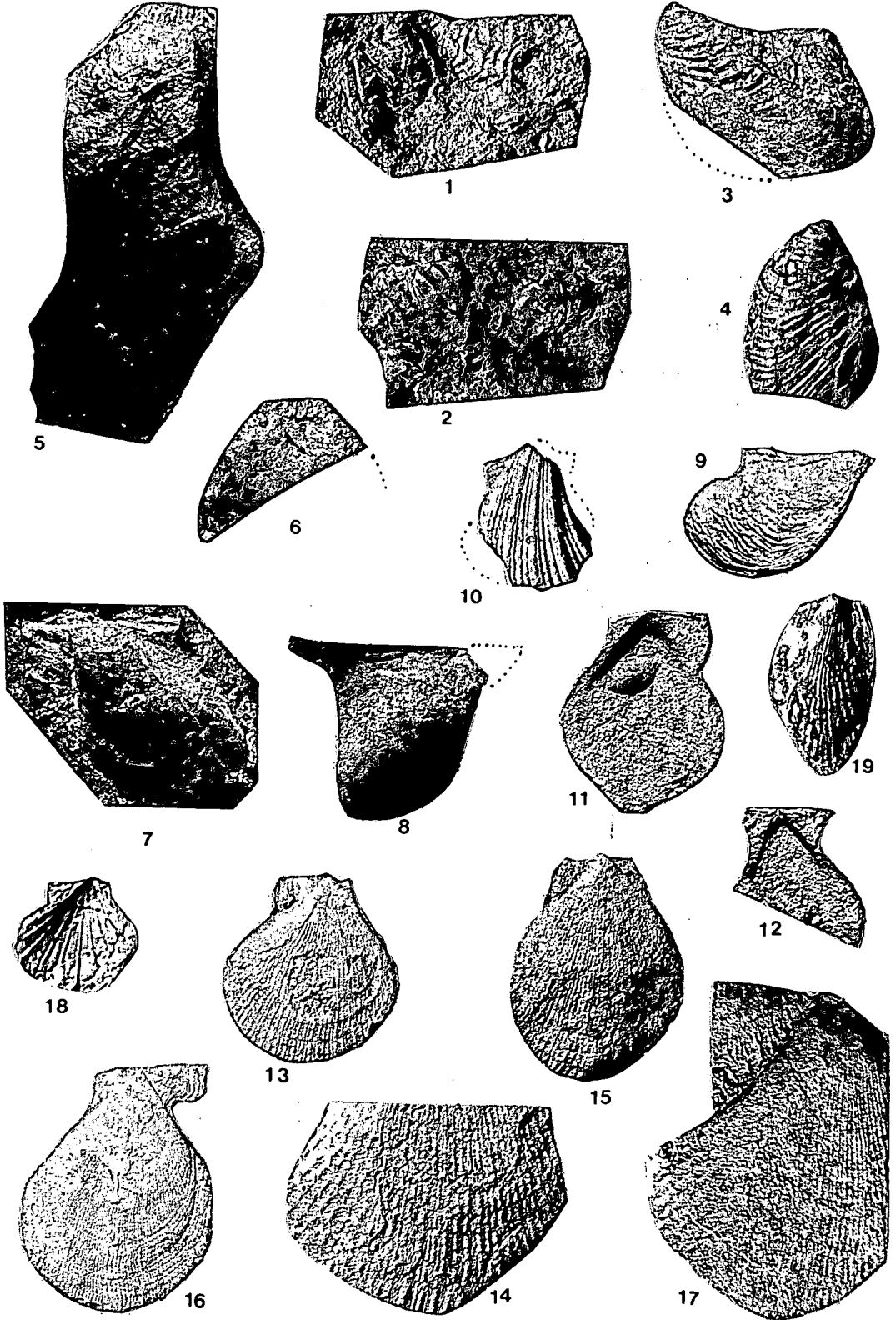
Fig. 16. lateral view of right valve, gum cast of external mould, $\times 2$; loc. ditto.

Fig. 17. lateral view of left valve, gum cast of external mould, $\times 2$; loc. ditto.

Parvamussium kimurai Hayami

Fig. 18. inner view of right valve, gum cast of internal mould, $\times 2$; loc. Taniai of Kahokucho, Monobe area.

Fig. 19. lateral view of right valve, KSG 3787, $\times 2$; loc. Minamiike, Monobe area.



Explanation of plate 7

Pterotrigonia (Pterotrigonia) pocilliformis (Yokoyama)

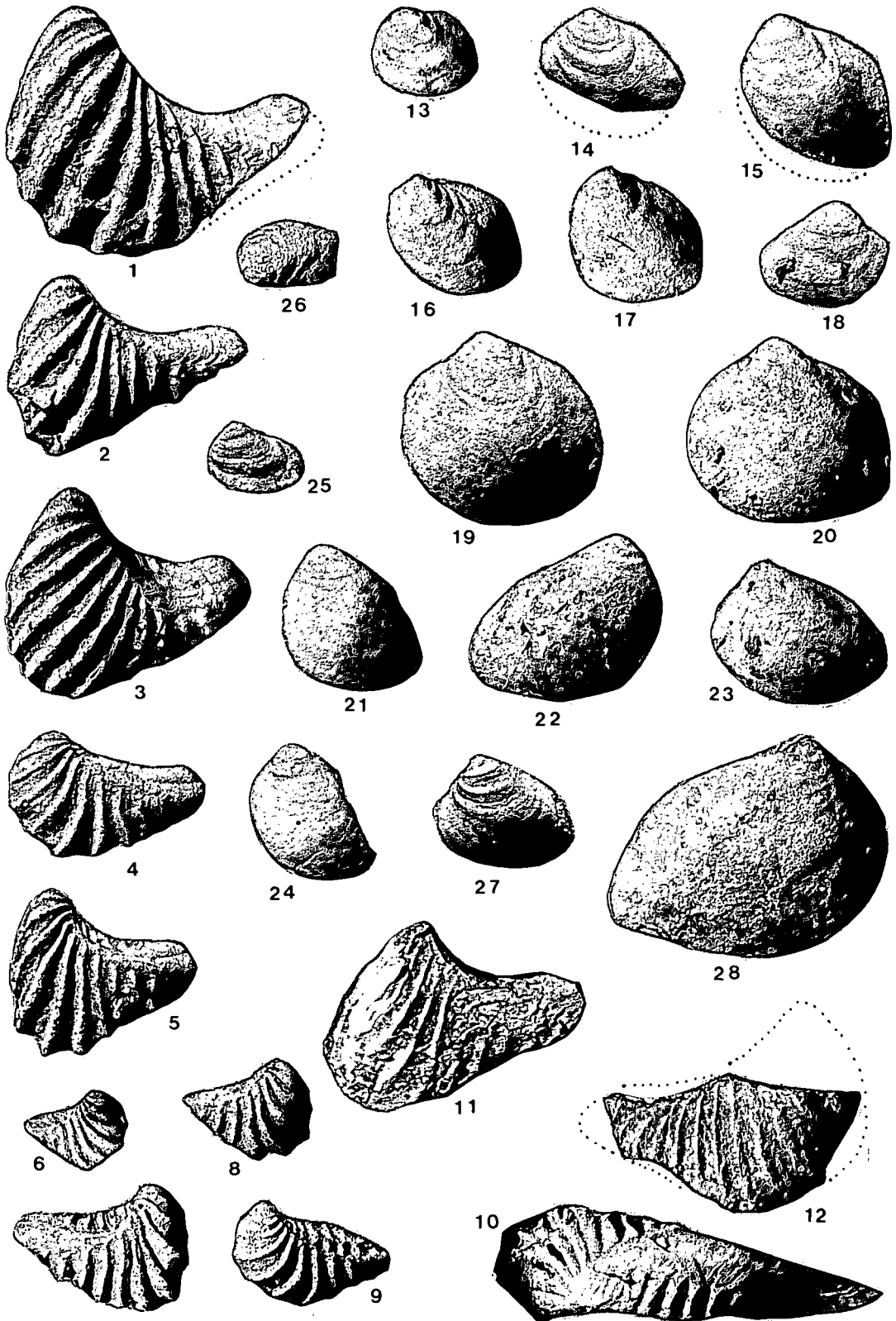
- Fig. 1. lateral view of left valve, $\times 1$; loc. Hoji, Tokushima Prefecture. B form.
Fig. 2. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 3. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 4. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 5. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 6. lateral view of right valve, gum cast of external mould, $\times 1$; loc. Sasano, Monobe area.
B form.
Fig. 7. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 8. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 9. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 10. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto. B form.
Fig. 11. lateral view of inner left valve, $\times 1$; loc. Kawanouchi, Monobe area. A form.
Fig. 12. lateral view of right valve, $\times 1$; loc. Todoronotaki, Monobe area. A form.

Nipponitrigonia kikuchiana (Yokoyama)

- Fig. 13. lateral view of right valve, gum cast of external mould, KSG 3768, $\times 1$; loc. Sasano.
Monobe area.
Fig. 14. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 15. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 16. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 17. lateral view of right valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 18. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 19. lateral view of left valve, gum cast of external mould, KSG 3763, $\times 1$; loc. ditto.
Fig. 20. lateral view of left valve, gum cast of external mould, KSG 3765, $\times 1$; loc. ditto.
Fig. 21. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 22. lateral view of right valve, gum cast of external mould, KSG 3766, $\times 1$; loc. ditto.
Fig. 23. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 24. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 25. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 26. dorsal view of left valve, gum cast of external mould, $\times 1$; loc. ditto.
Fig. 27. lateral view of left valve, gum cast of external mould, $\times 1$; loc. ditto.

Nipponitrigonia sakamotoensis (Yehara)

- Fig. 28. lateral view of right valve, $\times 1$; loc. Arida, Wakayama Prefecture.



Explanation of plate 8

Pterinella shinoharai Hayami

Fig. 1. lateral view of left valve, gum cast of external mould, $\times 2$; loc. Katsuura, Tokushima Prefecture.

Fig. 5. lateral view of left valve, KSG 3689, $\times 1$; loc. Todoronotaki, Monobe area.

Rastellum (Arctostrea) carinatum (Lamarck)

Fig. 3. right side view of both valves, gum cast of external mould, KSG 3760, $\times 1$; loc. Todoronotaki, Monobe area.

Crassostrea sp.

Fig. 4. inner view of right valve, gum cast of internal mould, KSG 3796, $\times 1$; loc. Todoronotaki, Monobe area.

Chlamys hayamii, sp. nov.

Fig. 5. lateral view of left valve, KSG 3689, $\times 2$; loc. Todoronotaki, Monobe area.

Gervillaria haradae (Yokoyama)

Fig. 7. inner view of right valve, KSG 3697, $\times 2$; loc. Hagino, Monobe area.

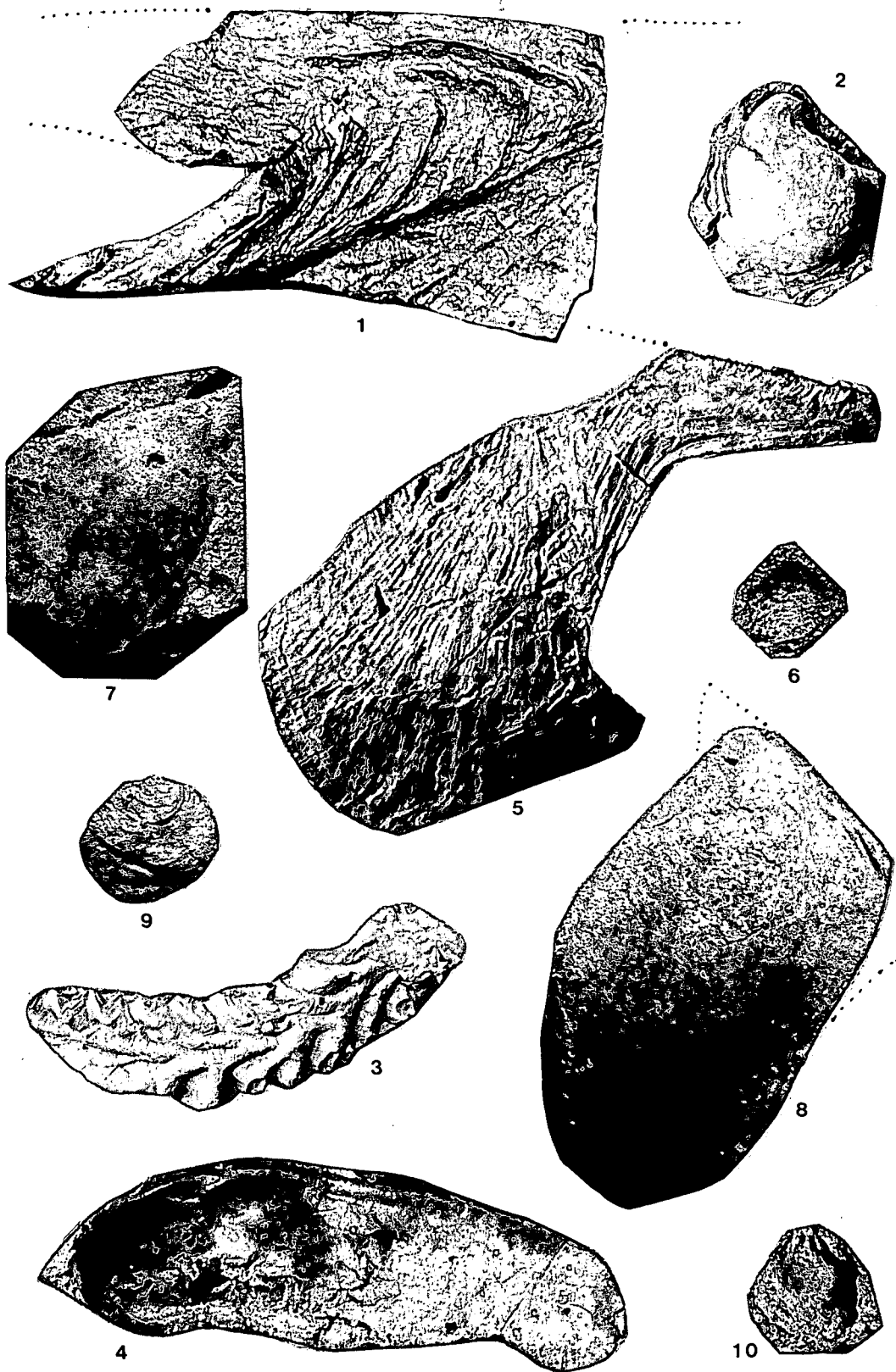
Fig. 8. inner view of left valve, KSG 3696, $\times 1.5$; loc. ditto.

Anomia (s.l.) sp.

Fig. 9. lateral view of right valve, gum cast of external mould, KSG 3771, $\times 2$; loc. Sasano, Monobe area.

Plicatura kochiensis, sp. nov.

Fig. 10. inner view of right valve, KSG 3804, $\times 3$; loc. Hoji, Tokushima prefecture.



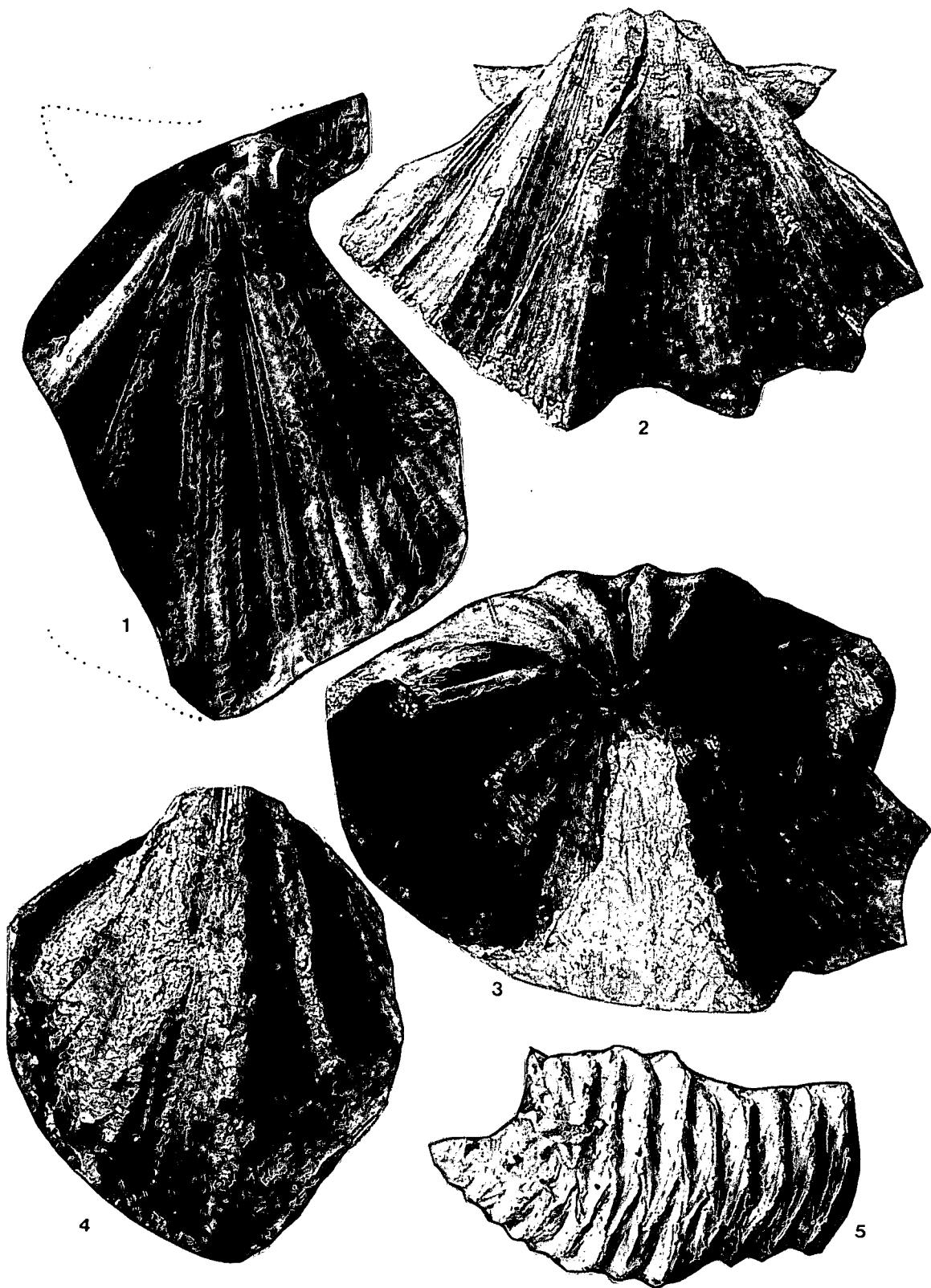
Explanation of plate 9

Neithea (Neithea) atava (Romer)

- Fig. 1. lateral view of left valve, $\times 1$; loc. Kasanokawa, Ryoseki area.
- Fig. 2. lateral view of right valve, KSG 3746, $\times 1$; loc. ditto.
- Fig. 3. dorsal view of both valves, KSG 3745, $\times 0.8$; loc. ditto.
- Fig. 4. lateral view of right valve, KSG 3747, $\times 0.5$; loc. Katsuura, Tokushima Prefecture.

Rasrellum (Arctostrea) carinatum (Lamarck)

- Fig. 5. anterior dorsal view of both valves, gum cast of external mould, $\times 1$; loc. Todoronotaki, Monobe area.



Explanation of plate 10

Neithea (Neithea) atava (Römer)

Fig. 1. lateral view of right valve, KSG 3748, $\times 1$; loc. Katsuura, Tokushima Prefecture.

Fig. 2. lateral view of right valve, KSG 3749, $\times 1$; loc. ditto.

Chlamys kawajii, sp. nov.

Fig. 3. lateral view of right valve, gum cast of external mould, KSG 3753, $\times 2$; loc. Tatsukawa of Katsuura, Tokushima Prefecture.

Fig. 4. lateral view of right valve, KSG 3754, $\times 2$; loc. ditto.

Neithea (Neithea) matsumotoi Hayami

Fig. 5. lateral view of right valve, KSG 3743, $\times 2$; loc. Mochie of Susaki, Kochi Prefecture.

Fig. 6. lateral view of right valve, KSG 3744, $\times 2$; loc. ditto.

Pterotrignia (Pterotrignia) yokoyamai (Yehara)

Fig. 7. lateral view of right internal mould, KSG 3801, $\times 1$; Loc. Ikuna of Katsuura, Tokushima Prefecture.

Fig. 8. lateral view of right valve, gum cast of external mould, KSG 3802; Loc. ditto.

