MEMOIRS OF THE COLLEGE OF SCIENCE UNIVERSITY OF KYOTO, SERIES B.
Vol. XX, No. 4, Article 4, 1953.

Discovery of *Claraia* and *Eumorphotis* from Triassic Yakuno Group, Kyoto Pref., Japan.

By

Keiji NAKAZAWA

Geological and Mineralogical Institute, University of Kyoto

(Received Aug. 3, 1953)

Abstract

The Yakuno group distributed in the Maizuru zone has been considered Anisian in age. Lately the author confirmed that the age of its lower part belongs to the Scythian by discovering the Eo-triassic pelecypods and ammonoids. Species of *Claraia* and *Eumorphotis* of the former are described.

Preface

The Maizuru (舞鶴) district is characterized by a zonal arrangement of the Permian Maizuru group, the Lower and Middle Triassic Yakuno (夜久野) and Kawanishi (河西) groups, the Upper Triassic Nabae (難波江) group and the so-called

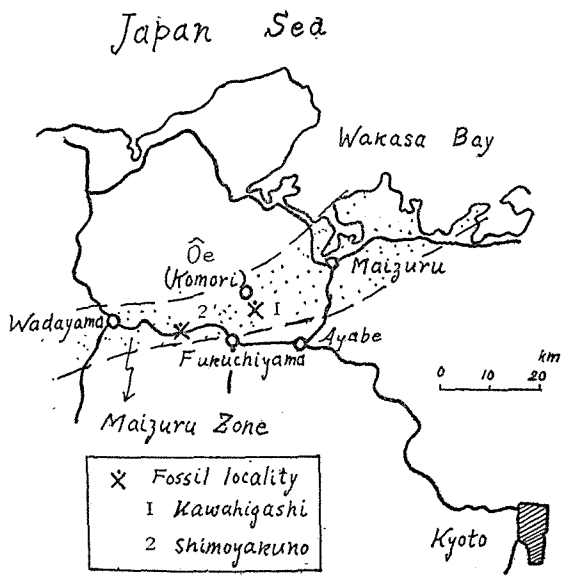


Fig. 1. Index Map of Fossil Locality

Yakuno basic intrusive rocks as reported briefly in the preceeding paper (Nakazawa, 1952a), and is called the "Maizuru zone" by S. Matsushita (1950, p. 41; 1953, pp. 3,4). (See Textfigure 1) . This zone is now confirmed to continue into Okayama (岡山) Pref., about 130 km WSW from Maizuru (Nakazawa, 1952b, p. 288), and its upper Triassic fossils were partly described by T. Kobayashi and K. Ichikawa (1952), N. Kambe (1951), and the author (1952a), but none of the fossils from any other groups except only one gastropod species *Sisenna* (?) *japonica* Kob. and Ich. from the Yakuno group (1952, pp. 79-81, Pl. II, figs. 7-9). The age of the Yakuno group has been considered as Anisian by the discovery of ammonoids including "*Danubites*" and some ceratitic ammonites (T. Koga, 1948, p. 15). But when the author took a survey of the Yakuno and the Ōe (大江) districts in this zone, he collected many Eo-triassic animal fossils, which convinced him that the lower parts of the group belong to Scythian age. The species of *Claraia*, which is of the first occurrence in Japan, and *Eumorphotis* among these fossils are described here.

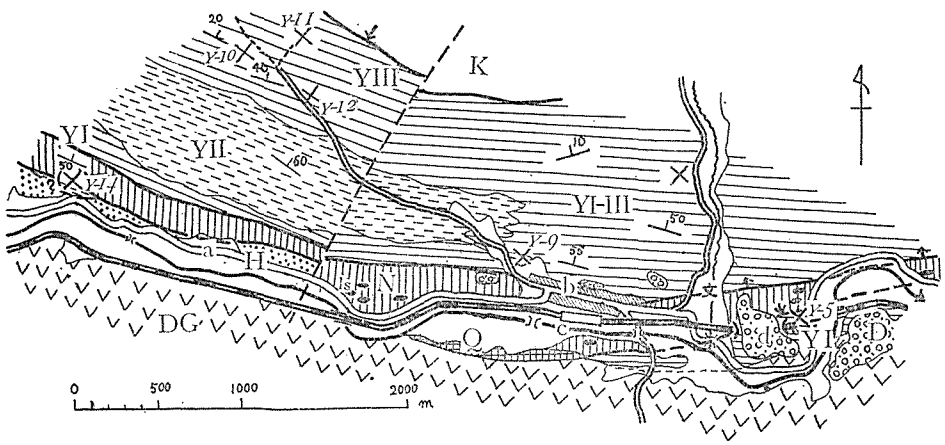


Fig. 2. Geological Map of Shimoyakuno District

H : Heki formation
Y : Yakuno group
YI Lower formation
YII Middle formation
YIII Upper formation
D : Dilluvium (Terrace)
K : Kawanishi group
ls : Limestone lens
Q : Quartz Porphyry
a : Heki (日置)
b : Nukada (額田)
c : Shimoyakuno station (下夜久野駅)
N : Nukada formation
DG : Basic rocks
d : Chigono (稚児野)
× : Fossil locality

Occurrence and Horizon of *Claraia* and *Eumorphotis*

1. Yakuno District (See Textfig. 2) :— As the result of his recent survey (Nakazawa, 1951, pp. 1-6), Kambe's opinin about the geology of the Yakuno district (in Nak. Ich. and Kambe, 1951, pp. 40-43; Kob. and Ich. 1952, pp.

56,57) should be emended as follows. Kambe's A zone is not paleozoic but the western extension of the Kawanishi group equivalent to the Yakuno group, and contains no chert but highly silicified shale caused by granitic intrusion. D zone is not only composed of the Heki formation (now included in the Nabae group), but also of the lower part of the Yakuno group (YI) in its estern half. The Yakuno group constructing B zone and a part of D zone is devided into three formations as given below in ascending order:

Lower Formation (YI)……Dark blue, thin-bedded shale, or sandy shale, and thick-bedded sandy shale, partially calcareous and slaty, especially so near faults. Fossil rare. Thickess 130m+.

Middle Formation (YII)……Mainly dark blue to dark grey, fine- to, often, medium-grained massive sandstone, more or less calcareous, intercalating thin conglomerate and sandy shale beds. Fossil rare. Thickness 380m−.

Upper Formation (YIII)……Dark blue, slaty, laminated, often calcareous, rather thick-bedded sandy shale and thin-bedded black shale, with fine-grained sandstone. Fossiliferous. Thickness 280m+.

The occurrence of ammonoids and gastropods hitherto known were all from the upper formation (such as Loc. Y−10,11,12 in Text-figure 2). The middle formation changes gradually and laterally its rock-facies into sandy shale and shale eastwards, and it makes him difficult to subdivide the group. He obtained some fossils as below from the transitional part at Nukada (Loc. Y−9),

Sisenna (?) *japonica* Kob. and Ich.

Nuculopsis sp.,

and at Heki (日置, Loc. Y−14) from a block of fine-grained sandstone of the YII formation,

Eumorphotis sp. aff. *multiformis* Bittn.

Spiriferina sp.

? *Sisenna* (?) *japonica* Kob. and Ich..

From dark greenish blue slaty shale of YI formation near the east entrance of the tunnel of the San-in Railroad Line at about 1.3km east of Shimoyakuno station, he discovered many fossils, crowded in thin layer, as follows,

Pseudomonotis (*Claraia*) *pulchella* n. sp.

Paleoneilo sp. α

Pinna sp., "*Xenodiscus*" sp.

Meekoceratids?, gastropods.

This formation there is thrusted by the Permian Nukada formation at its north side and intruded by the basic rocks at its south side.

2. Ōe District:— In this district at about 16km east of Shimoyakuno, there is distriduted the Kawanishi group at the west of the Yura river (由良川) and the eastern extension of the Yakuno group at its east. The latter group which formerly called the Kawahigashi (河東) group tentativelly, was divided into two

formations by the author as given below (in Nak., Ich. and Kambe, 1951, pp. 43–45).

Narabara (奈良原) Formation (lower).....Dark blue, banded or laminated sandy shale and shale, more or less slaty and often calcareous, with fine-grained sandstone. Fossiliferous. Thickness 600m+.

Okubatake (奥畑) Formation (upper).....Mainly pale blue to dark blue, massive or thick-bedded, fine- to medium-grained, rarely pebble-bearing sandstone, more or less calcareous, intercalating rather thick beds of dark blue to black shale and sandy shale. Thickness 700m+.

From the uppermost horizon of the Narabara formation at the south of Okuyama (奥山), Kawahigashi (Loc. KH–2), the following fossils were collected,

Pseudomonotis (*Claraia*) sp. indet.
Lima sp., *Ophiceras* sp.
"*Bakevellia*" sp., "*Xenodiscus*" sp.

And from the horizon about 100m below the preceeding one (Loc. KH–4),

Pseudomonotis (*Claraia*) sp. aff. *decidens* Bittn.
Paleoneilo sp. γ, δ
Myophoria sp., *Lima* sp.
"*Bakevellia*" sp., gartropods and others were collected.

Judging from the above stated fossils and their stratigraphic positions, it is surely concluded that the lower parts of the Yakuno group (YI formation, Narabara formation, and perhaps YII formation) go up to Scythian in age.

Description of species

Family Pteriidae Meek
Genus *Pseudomonotis* Beyrich, 1862
Subgenus *Claraia* Bittner, 1901

Pseudomonotis (*Claraia*) *pulchella* Nakazawa, n. sp.
Pl. III, Figs. 1–7

Diagnosis:— Since all specimens are intensly deformed, it is difficult to build the original shape. But it is, nevertheless, possible to describe it with considerable accuracy by observing many specimens.

Shell very small, mostly 3 to 8 mm, maximum 12 mm in length, suborbicular, height almost equal to length. Hinge-line straight, relatively short about two-thirds of the length of the shell. Left valve fairly convex, umbo situated at about two-fifths of the length behind the anterior end, salient above the hinge-line. Anterior ear smaller, slightly depressed, posterior ear larger, but not bordered distinctly from the rest of the shell, and never protruded backward with rounded posterior margin. Right valve almost flat or a little convex, umbo never projected

over the hinge-line. Anterior ear small, embracing deep byssal notch under it. Anterior margin ascending up with rounded antero-ventral, but sharply bending backward, forming concave anter-odorsal margin.

Surface of both the valves almost smooth (Pl. III, Figs. 1,4, 7a) or ornamented with very weak or, rarely, fairly dstinct costae (Pl. III, Figs. 2,3). Smooth and costated individuals connot be separated from each other owing to transitional forms (Pl. III, Fig. 6). Concentric wrinkles almost absent or a few in number and feeble, almost limited on umbonal half.

Measurements

No.	Length	Height		Hinge length		Umbonal distance from ant. end	Apparent elongation by deformation
1 (Right, Holotype)	7.4mm	6.3mm	(85%)	4.5mm	(61%)	3.5mm	laterally
2 (〃)	5.0	4.2	(84)	3.5	(70)	1.8	〃
3 (〃)	5.5	6.8	(124)	4.0	(71)	3.0	longitudinally
4 (〃)	7.2	10.0	(139)	3.3	(43)	2.0	〃
5 (Left)	7.2	7.5	(104)	4.5	(64)	3.0	〃
6a (〃, Paratype)	6.5	9.0	(138)	5.0	(77)	2.2	〃
7 (〃)	7.0	5.5	(79)	4.4	(63)	2.0	laterally

%: Ratio to the length

Comparison and Remarks:— This species has a little resemblance to *Cl. griesbachi* Bittn. (1899b, p. 2. pl. I, figs. 1-4 and other authors') and *Cl. wangi* Patte (1935, p. 23, Pl. II, figs 7-16) in its radial sculptur and outline, but distinguished by the almost absence of the concentric sculpture, very small size and relatively long and concave antero-dorsal margin sharply bending down to rounded antero-ventrals.

There is only one specimen which has a totally rounded anterior margin and distinct concentric wrinkles on the upper half of the shell. This is considered a variable form of the same species (Pl. III, Fig. 5).

Occurrence:— Lower formotion (YI) of Yakuno group, east entrance of the tunnel of the San-in Railroad Line at Chigono (稚児野), Shimoyakuno village (Loc. Y-5). Associated with *Paleoneilo* sp., *Pinna* sp., "*Xenodiscus*" sp., Meekoceratids? (Reg. Nos. JM 10047-56).

Pseudomonotis (*Claraia*) sp. aff. *decidens* Bittn.

Pl. III, Figs. 8, 9

Diagnosis:— Only one left valve and a slightly detached opposite valve known.

Left valve obliquely oval, inequilateral, strongly inflated, maximum at about 5 mm below the umbo, antero-ventral margin more broadly rounded than the postero-dorsal. Umbo situated at about the anterior two-fifths of the length,

prominent and projected above the hinge-line, curved inward forming orthogyrous beak. Hinge-line straight, short, less than two-thirds of the shell-length. Anterior ear very degenerated; posterior ear larger, but delimited obscurely from the main part of the shell, of which the posterior margin rounded up and forward joining to the hinge-margin with rounded obtuse angle.

Right valve slightly convex, more circular than the left, in general outline as well as in those of both the ears similar to the right valve of the preceeding species. Length nearly equal to height, ventral margin more broadly rounded than anterior and posterior ones. Umbo not projected above hinge-margin.

Surface of both valves nearly smooth, with only slight concentric growth-lines of various strength and intervals.

Measurements

	Length	Height	Depth	Hinge length
Left valve	12.2mm	13.5mm	3.5mm	7.2mm
Right "	13.0	12.8	ca 1.2	

Remarks and Comparison: – Both valves are rather different in shape, the right one is more circular and symmetric while the left is more slender and oblique. This is caused partly by differential deformation.

The slender left valve most resembles that of *Cl. decidens* Bittn. from Himalayan Lower Trias in general outline and ornamentation (Bittner, 1899b, p. 11, Pl. I, figs. 22–24; Diener, 1913, Pl. V, figs. 14ac), but differs in weaker convexity, smaller size, and slender umbo. Unfortunately the right valve connot be compared to that of *decidens* which is not described sufficiently because of its imperfect preservation (Diener, 1913, pp. 43, 44, Pl. V, Figs. 1). It is similar to that of *Cl. orbicularis* Richthofen from Alpine Trias (in Bittner, 1901, p. 588. Taf. XXIV, Figs. 16–20; Wittenburg, 1908, p. 26, Taf. 11, Fig. 12) in outline, but different in its nearly smooth surface.

Occurrence: – Lower horizon of Narabara formation. Narabara, Kawahigashi (Loc. KH–4). Associated with *Paleoneilo* spp., *Myophoria* sp., *Lima* sp., "*Bakevellia*" sp. etc. (Reg. Nos. JM. 10057 A, B, C).

Pseudomonotis (*Claraia*) sp. indet.

Pl. III, Fig. 11

Only one small right valve of the internal mould in hand.

Shell subcircular, nearly flat, 5 mm high and 5.7 mm long. Umbo situated at almost the middle of the hinge-line. Hinge-line straight, relatively long, and its anterior end as far out as the frontal extremity. Anterior ear large with distinct but relatively shallow byssal sinus below, posterior ear relatively small, undeveloped and hardly seperable from the body. Surface perhaps smooth.

Considering from above-mentioned characters, this may be a juvenile of the preceeding species, as noticed by Bittner in his description of *Cl. tridentina* (1901, p. 589 [31], Taf. XXIV, figs. 1,2), but this specimen is only one in number associated with no other individuals of *Claraia* and prohibits the author to identify.

Occurrence:— Uppermost horizon of Narabara formation. South of Okuyama, Kawahigashi (Loc. KH−2). Associated with *Ophiceras* sp., "*Xenodiscus*" sp., "*Bakevellia*" sp., etc. (Reg. No. JM10058).

Genus *Eumorphotis* Bittner, 1901.

Eumorphotis sp. aff. *multiformis* Bittn

Pl. III, Figs. 10a, b

Diagnosis:— This species is represented by an almost complete internal, and a part of external, moulds of a left valve, compressed obliquely by deformation.

Shell inequilateral, strongly inflated with maximum depth at about one-third of the height below the umbo, general outline considerably oblique, antero-ventral margin broadly rounded, postero-ventral one rather acutely rounded rising steeply up and forward along posterior margin. The length exceeds the height. But the original shape supposed to be more symmetric and the length nearly equal to the height. Umbo of moderate size, lying at about two-fifths of the length from the front, projecting rather strongly above the hinge-line.

Anterior ear smaller, trigonal, convex, bordered from the main part of the shell by a deep sulcus, where the weak sinus is observed at the margin; posterior ear larger, depressed gradually from the body without any distinct border, perhaps the posterior auricular margin slightly arcuate backward.

Ornamentation composed of three orders of radial ribs: on the umbo 13 primaries are visible, later alternating the secondaries and still later, at about the middle of the height, the tertiaries inserted between them, making the ribbing system of 1 3 2 3 1, but on the posterior half the secondaries grow as strong as primaries where the ribbing seems the system of 1 2 1 2 1. Surface of both the ears also covered with radial ribs, but cannot be stated in detail owing to the internal mold only. Concentric sculpture cannot be observed except a constriction at the distance of 5 mm from the ventral margin.

Comparison:— This species has close resemblance to *Emorph. multiformis* Bittn. (1899a, p. 10, Taf. II, Figs. 11−22), but differs in less developed radial system — the former ornamented with radial ribs of three orders, while the latter, of from four to five orders in the equal size of the shell—, and perhaps in the smaller height in proportion to the length.

Occurrence:— Collected from the block of the middle formation (YII) of the Yakuno group, and so exact horizon unknown. Heki, Nakayakuno village (Loc. Y−14). Associated with *Spiriferina* sp. (Reg. Nos. JM 10059 A, B).

Acknowledgement

The author wishes to express his indebtness to Prof. S. Matsushita for his guidance and encouragement; to Mr. F. Kato for preparing these plates; to Prof. T. Kobayashi of Tokyo Univ., Mr. K. Ichikawa of Osaka City Univ. and Mr. J. Iwai of Tohoku Univ. for their kindness of examining the Triassic pelecypod fossils deposited in their universities.

References

Bittner, A. (1899a): Versteinerungen aus den Trias-Ablagerungen des Süd-Ussuri-Gebietes, *Mém. Com. Géol., Vol. VII, No. 4, St. Petersbourg.*

〃 (〃 b): Triassic Brachiopoda and Lamellibranchiata. *Pal. Indica, Ser. XV. Himalayan Fossils, Vol. III, Pt. 2.*

〃 (1900): Ueber Pseudomonotis telleri und verwandte Arten der unteren Trias, *Jahrb d. k. k. geolog. Reichsanstalt, Bd. 50, Heft 4.*

Diener, C. (1913): Triassic Fauna of Kashmir, *Pal. Indica, N. S. Vol. V, No. 1.*

Hsu. T. (1936–7): Contribution to the Marine Lower Triassic Fauna of Southern China. *Bull. Geol. Soc. China, Vol. XVI.*

Kambe, N. (1951): On the Myophorians from Kyoto Pref. (Prov. Tango), *Trans. Proc. Paleont. Soc. Japan, N. S. No. 2.*

Kobayashi, T. and Ichikawa K. (1952): The Triassic Fauna of the Heki Formation in the Province of Tamba (Kyoto Pref.), Japan, *Jap. Jour. Geol. Geogr., Vol. XXII.*

Koga, T. (1948): Discovery of Triassic Fossils at Shimoyakuno, Province of Tamba, *Mineral. and Geol., No. 7.* (in Japanese)

Matsushita, S. (1950): Geology of Kyoto Prefecture, *Sci. Earth, No. 2.* (in Japanese)

〃 (1953): Geology of Kinki Provinces (Regional Geology of Japan). (in Japanese)

Nakazawa, K. (1951): Geologic Structure of Yakuno District. *Sci. Earth, No. 4.* (in Japanese)

〃 (1952a): A Stndy on the Pelecypod-Fauna of the Upper Triassic Nabae Group in the Northern Part of Kyoto Prefecture, Japan, Pt. I, *Mem. Coll. Sci. Univ. Kyoto, Ser. B, Vol. XX, No. 2.*

〃 (1952b): So-called Unknown Mesozoic Formations in Hyogo and Eastern Half of Okayama Prefectures (Abstract), *Jour. Gol. Soc. Japan, Vol. 58, No. 682.* (in Japanese)

Nakazawa, K., Ichikawa, K. and Kambe, N. (1951): in Triassic Stratigraphy of Japan, *Rep. Spec. No., Geol. Surv. Japan.* (in Japanese)

Patte, E. (1935): Fossils Paléozoiques et Mésozoiques du sud-ouest de la Chine, *Palaeont. Sinica, Ser.* B, *Vol. XV, fasc. 2.*

Wittenburg, P. v. (1908): Beiträge zur Kenntnis der Werfener Schichten Südtirols, *Geol. u. Palaeont. Abhandl., N. F. Bd. XII, Heft 5.*

Explanation of Plate III

Pseudomonotis (*Claraia*) *pulchella* Nakazawa, n. sp.

Figs. 1a, 2, 5,.....Internal moulds of right valves

Fig. 3.....External mould of a left ? valve

Fig. 7a (Holotype, Reg. No. JM. 10047 A-a)..... External mould of a right valve

Figs. 1b, 4 (Paratype, Reg. No. JM. 10047 A-b), 6a, b, 7b, c..... Internal moulds of left valves

(All specimens from Lower formation of Yakuno group at Chigono, Shimoyakuno. Loc. Y-5. White numbers in figures coincide with numbers in measurements.)

Pseudomonotis (*Claraia*) sp. aff. *decidens* Bittner

Fig. 8..... Internal mould of a right valve. Narabara formation, Narabara, Kawahigashi. Loc. KH-4. (Reg. No. JM. 10057 B, C)

Fig. 9..... Gypsum cast of the external mould of a left valve. Loc. ditto. (Reg. No. JM. 10057 A, C)

Pseudomonotis (*Claraia*) sp. indet.

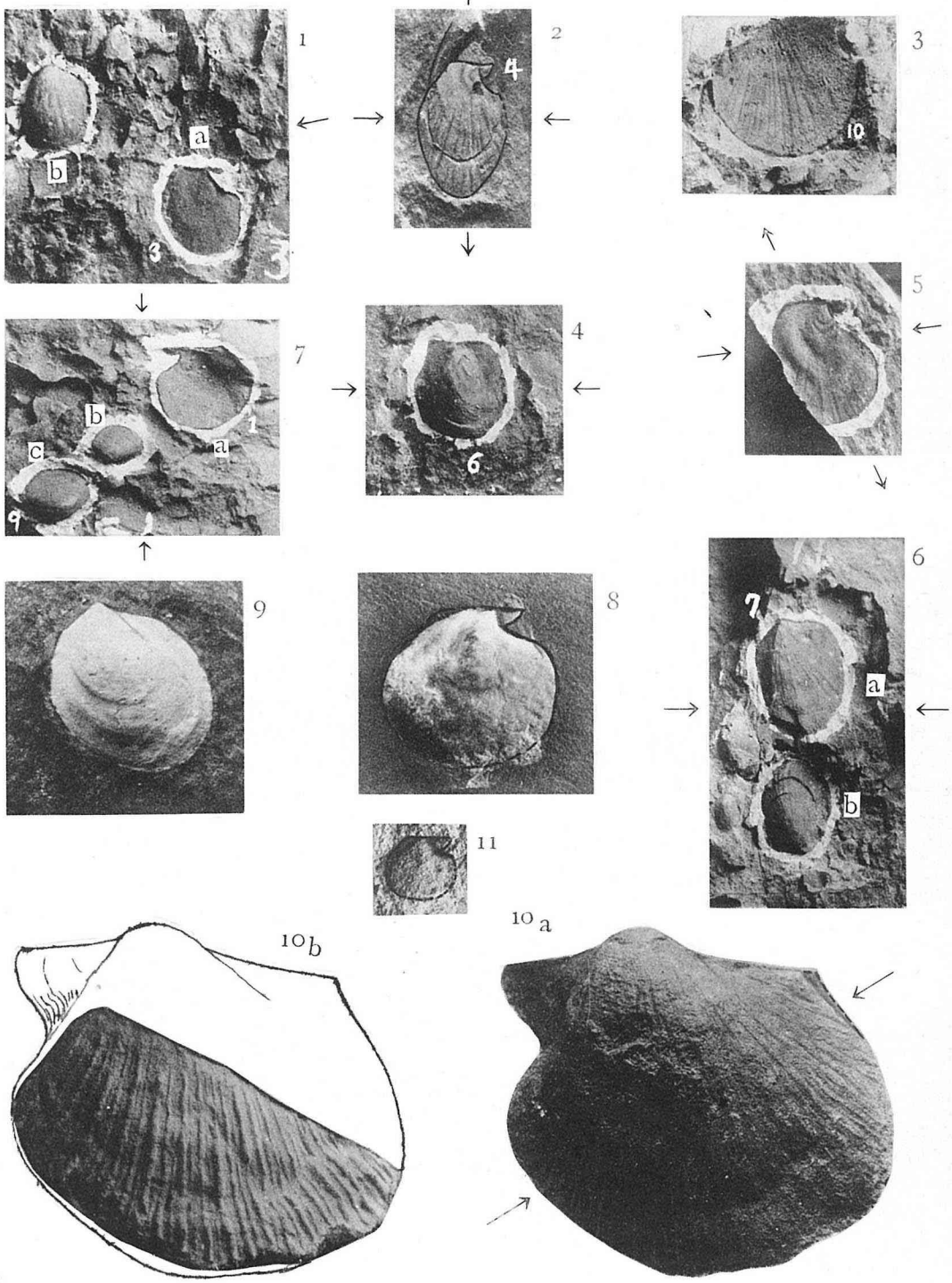
Fig. 11..... Internal mould of a right valve. Narabara formation, Narabara, Kawahigashi. Loc. KH-2. (Reg. No. JM. 10058)

Eumorphotis sp. aff. *multiformis* Bittner

Fig. 10a.....Internal mould of a left valve. Middle formation of Yakuno group, Heki, Nakayakuno. Loc. Y-12. (Reg. No. JM. 10059 A)

Fig. 10b.....Gypsum cast of the external mould of the same valve. (Reg. No. JM. 10059 B)

Notes: Arrows indicate the apparrent directions of compression or elongation by deformation. All figures are magnified twice as large. All specimens here illustrated are kept in the Geological and Mineralogical Institute, University of Kyoto.


1
a
b
3
2
4
3
10
5
4
6
7
a
b
c
1
9
9
8
6
7
a
b
11
10b
10a