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An Occurrence of Jurassic Conodonts from Japan

By

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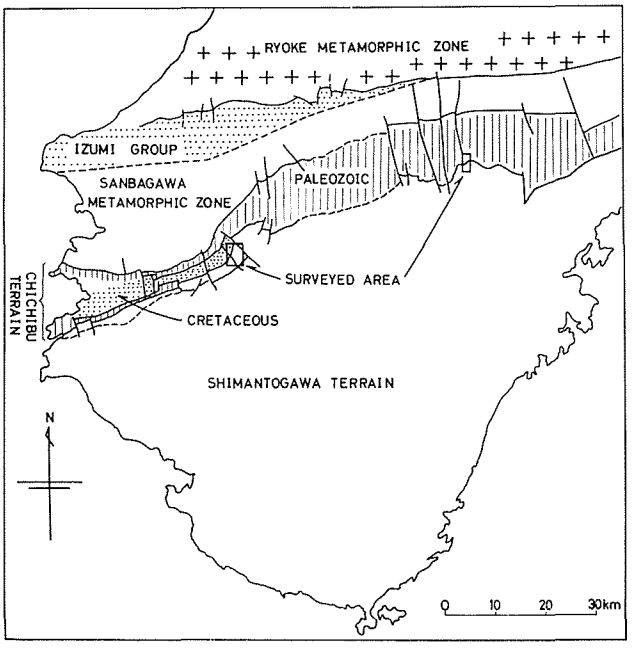
Abstract

No information is available in regard to the Jurassic conodonts. The Upper Jurassic formations are found in the northern part of the Kii Peninsula, Japan. The conodont faunule from these formations provides the basis for the present report. The faunule is composed of only two species, *Gladigondolella abneptis* and *Hindeodella* sp., which are very common to or intimate with those of the Upper Triassic and Cretaceous faunas. The exact age of those formations can be determined by associated molluscan fossils. The conodonts are believed to be indigenous to the strata in which they were found.

I Introduction and Acknowledgements

At present we have a few informations, especially of stratigraphy, on the Mesozoic formations distributed in the Shimantogawa Terrain of the Kii Peninsula, because of the barrenness of reliable fossils, complicated geological structure and monotonous lithofacies. Since 1965 the senior author (NOHDA) has surveyed the area of the upper course of the River Aritagawa, and the junior author (SETOGUCHI) the area of the upper course of the River Yoshinogawa of this Terrain. During their survey, they found some useful molluscan fossils and conodonts from the "Jurassic" formations of those areas. Although numerous reports on the conodonts have been made time after time concerning the various areas of the world and of the various ages, none has been made concerning the Jurassic conodonts. Therefore, they will treat in this article the first occurrence of the Jurassic conodonts.

The authors express their sincere thanks to Emerithus Prof. S. MATSUSHITA, Prof. K. NAKAZAWA, Prof. T. KAMEI and Dr. Y. NOGAMI of Kyoto University and Dr. E. MATSUMOTO of Kobe University for their guidance and advices. Acknowledement is also due to Dr. M. TAMURA of Kumamoto University who gave them kind suggestions for identification of pelecypod fossils.



Text-Figure 1. Index map.

II Geological Note

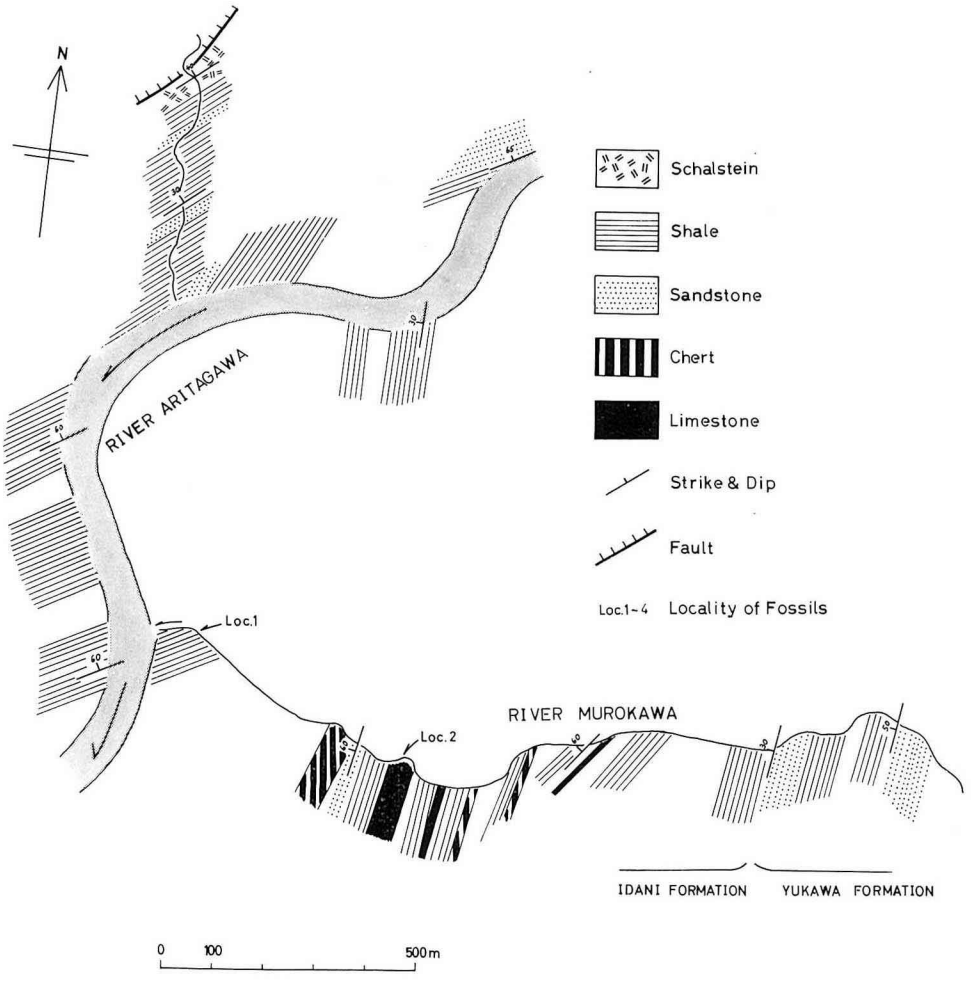
The basement structure of the northern part of the Kii Peninsula is characterized by zonal arrangement, namely, from north to south, the Sambagawa Metamorphic Zone, the Chichibu Terrain and the Shimantogawa Terrain. Among them the Shimantogawa Terrain is separated from the Chichibu Terrain by the thrust fault, viz. Itokawa-Butsuzo tectonic line.

The above-mentioned structure is typically developed in both areas, the upper course of the River Aritagawa (Text-Figure 2) and of the River Yoshinogawa (Text-Figure 3).

A) The upper course of the River Aritagawa

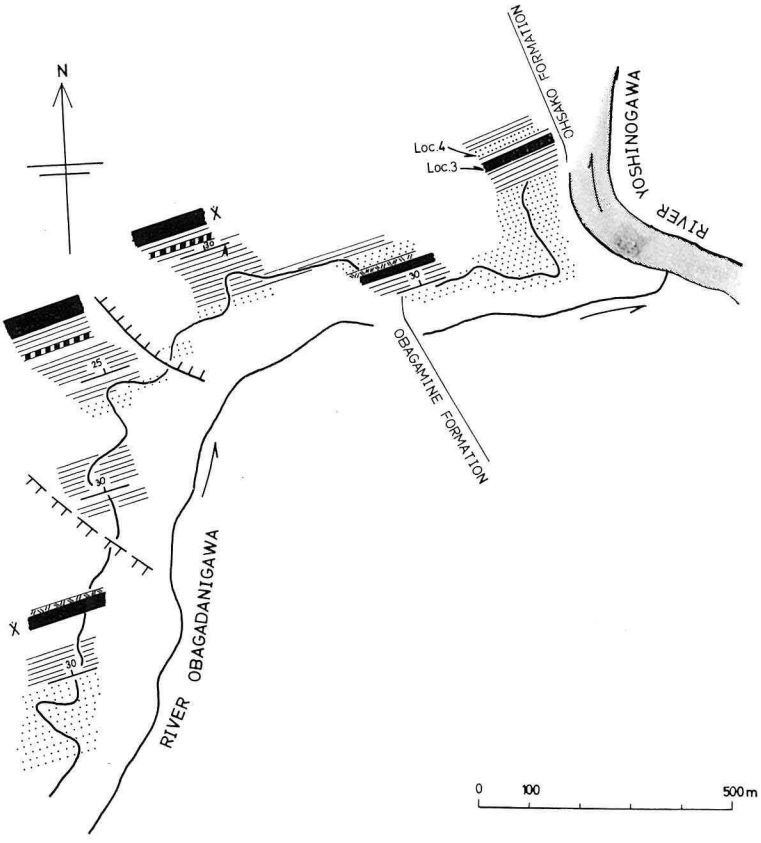
This area which is a part of the Shimantogawa Terrain consists of the Yukawa, Idani and Ishigaki formations (TANAKA, 1956)*, among which the Idani formation is exposed typically along the River Murokawa, one of the tributaries of the River Aritagawa. The composition of this formation is shale, chert, sandstone and

* TANAKA described the stratigraphical succession of those formations as the Yukawa, Idani and Ishigaki formations in descending order, but this should be examined in more detail.



Text-Figure 2. Route map of the Idani formation.

limestone. Near the Itokawa-Butsuzo tectonic line, partly serpentinized schalstein and disturbed shale are found. Shales are intercalating sandstones at several horizons. Limestones are partly oolitic or alternated with thin chert, and large lenses of these amount to about 50 m thick. Fossils so far found in the limestone are *Stromatopora japonica* YABE, *Petrophyton tenue* YABE, *Milleporidium* sp., *Chaetetopsis crinata* NEUMAYR and *Cenosphaera* sp. (INOUE, 1933; TANAKA, 1956). Therefore, this formation has been generally referred to the Jurassic in age, but these fossils are not reliable as exact horizon markers.



Text-Figure 3. Route map of the Ohsako formation.

In shale road cut at a point about 50m east of the mouth of the River Murokawa (Loc. 1), new materials of molluscan fossils were newly found and these were identified as follows; *Myophorella* (*Promyophorella*) cf. *obsoleta* KOBAYASHI and TAMURA, *Grammatodon takiensis* KIMURA, *Entolium yatsujiense* KURATA and KIMURA, *Plicatula yatsujiensis* TAMURA, *Exogyra* cf. *kumensis* TAMURA, *Pleuomya*? *punctostriae* TAMURA, *Myophorella* (*Haidaia*) sp., *Nucula* sp., *Astarte* sp., *Palaeoneilo* sp. and *Nuculopsis* sp.. The faunule is indicative of the Upper Jurassic Torinosu Series. In addition, from the limestone of the same formation at a point (Loc. 2) about 450 m east of Loc. 1, two conodont species, *Gladigondolella abneptis* (HUCKRIEDE) and *Hindeodella* sp. were obtained after dissolving with 12–13% acetic acid.

B) The upper course of the River Yoshinogawa

The geological structure of the area has the same zonal pattern as the preceding

area. In this area, the sediments in the Shimantogawa Terrain consist of the Ohsako, Obagamine, Amagase and Nishihara formations in descending order. The Ohsako formation is distributed typically along the River Obagadani, one of the tributaries of the River Yoshinogawa. It consists mainly of shale, chert, schalstein, limestone and fine-grained sandstone. From the limestone, *Stylina* sp., *Thamnasterina* sp., *Stromatopora* sp., *Girvanella* (?) sp., *Nipponophycus ramosus* YABE and SUGIYAMA, *Maeandrastraea* sp. and *Rhabdophyllia* (?) sp. were reported by IIZUKA (1932) and SHIIDA (1962). This assemblage is generally considered to be indicative of the Jurassic in age, but those fossils are not reliable as exact horizon markers. On the other hand, some molluscan fossils were collected in the fine-grained sandstone (Loc. 4) which is conformable with the limestone (Loc. 3). These were described by ICHIKAWA (1954) as follows; *Opis* (*Trigonopis*) n. sp. aff. *O.* (*T.*) *collarina* DAMON, "*Eocallista*"? sp., *Plicatula* sp. and *Antyxiella* (*Nerinoides*) n. sp.. The faunule is considered as the Upper Jurassic. In addition to these, from limestones (Loc. 3 and two other localities), conodont fossils were newly discovered. These conodonts were identified as follows; *Gladigondolella abneptis* (HUCKRIEDE) and *Hindeodella* sp.. The specimens from the above two formations are considered to be conspecific with each other.

III Discussion

In considereing the geological age of conodonts, the pelecypod fossils, such as, *Myophorella* (*Promyophorella*) cf. *obsoleta, Entolium yatsujiense, Plicatula yatsujiensis* and *Grammatodon takiensis*, etc. obtained from the Aritagawa area are important. All these fossils are common to those of the Upper Jurassic Torinosu Series and surely included in the Torinosu fauna (TAMURA, 1961; HAYAMI, 1961), although *Myophorella* (*Promyophorella*) *obsoleta* and *Grammatodon takiensis* are also found in the Berriasian Isokursa formation in the Kitakami, Northeast Japan (HAYAMI et al., 1960).

Loc. 2 which yields conodonts is at a distance of about 450 m from Loc. 1, seemingly lower horizon than Loc. 1. No remarkable fault was recognized in the Idani formation, especially between the two localities in spite of the authors' detailed geological survey. Consequently, the conodonts are considered to be definitely contemporaneous with the molluscan fossils. Conodonts were also obtained from the Ohsako formation, and the conodont-yielding limestones (Loc. 3 and two other localities) are conformable with the sandstone which is in the same formation and contains the Upper Jurassic molluscan faunule (Loc. 4). Furthermore, the correlation is also supported by the fact that molluscan faunules of the same age (the "Late Jurassic") were found in both formations, as a result of the

authors' work, so the age of conodonts is concluded as the Late Jurassic, more safely speaking, including Berriasian, which is usually referred as the Eariest Cretaceous.

As to the question that the conodonts may have been redeposited from the Triassic formations, the following facts should be mentioned.

a) The conodonts at hand are in rather good state of preservation.
b) The conodonts are obtained from the two areas that are about 50 km apart and yet on the same stratigraphical horizon.
c) The sediments in which the conodonts are found are really of the Late Jurassic.
d) The Triassic formations are recognized neither in the surveyed areas nor in their vicinities.

From these, it can be safely concluded that the conodonts at hand are indigenous to the formation of the Late Jurassic in age.

The conodont faunule treated here is not essentially different from that of the Upper Triassic of the Alps in having *Gladigondolella abneptis* as a major element. On the other hand, the faunule, which is reported by DIEBEL (1956b) from the Upper Cretaceous in Cameroons, Africa, is composed mainly of *Gladigondolella mungoensis* (DIEBEL). The direct phylogenetical relationship between *Gladigondolella abneptis* and *Gladigondolella mungoensis* has not been clarified yet, since there is no reports on the conodonts from the Lower and Middle Cretaceous. But the authors assume that *Gladigondolella mungoensis* developed from *Gladigonodolella abneptis* judging from the specific characters.

IV Descrition of Species

Conodont fossils

Genus *Gladigondolella* MÜLLER, 1962

Gladigondolella abneptis (HUCKRIEDE, 1958)

Plate 2, Fig. 1–7

1956 *Polygnathus* n. sp. indet., DIEBEL, Geologie, **5,** p. 431, pl. 5, figs. 3a, b.
1958 *Polygnathus abneptis* HUCKRIEDE, Paläont. **Z.**, **32,** p. 156, 157, pl. 11, fig. 33; pl. 12, figs. 30–36b; pl. 14, figs. 1–3, 5, 12–14, 16–22, 26, 27, 32, 47–58.
1962 *Gladigondolella abneptis*, ZANKL, **Z.** deutsch. geol. Ges., **116,** p. 229, pl. 1, figs. 6g-i.
1966 *Gladigondolella* cf. *abneptis*, ISHII and NOGAMI, Jour. Geosci., Osaka City Univ., **9,** p. 94, pl. 1, figs. 3–5b.

Description: Plate thick, asymmetrical, slightly arched. Axis slightly curved laterally. Platform turned downwards in posterior one-third, anteriorly depressed and bounding to blade. Surface ornamented by two lateral fused denticle rows. Posterior margin of most specimens rounded, but that of few specimens straight;

ridge present distal extremity of fest blade to the bifurcated branches. Blade composed of 9 to 12 compressed, fused denticles; aboral surface smooth, convex. Keel narrow, extended from anterior extremity to near posterior extremity, more or less uniformly tapered anteriorly with basal groove; flange present near posterior extremity. Narrow basal groove extended along keel. Attachment pit small, slit-like and confined to keel.

Remarks: MÜLLER (1962) proposed the genus *Gladigondolella* for *Polygnathus*-like forms that have a free blade but similar to that of *Gondolella*. The present specimens belong no doubt to the genus in lacking of a keel at the posterior extremity of the unit. The specimens at hand show a rather wide variation, but they are identical with the type specimens described and illustrated by HUCKRIEDE from the Upper Triassic of the Alps, as mentioned in the explanation of the plate.

Occurrences: Loc. 2, Idani, Shimizu-cho in Wakayama Prefecture; Loc. 3 and two other localities, Ohsako, Kawakami-mura in Nara Prefecture.

Material: Reg. no. JCD–1052 to JCD–1056, Loc, 2 in Idani formation; JCD–1057, Loc, 3 in Ohsako formation.

Genus *Hindeodella* ULRICH and BASSLER, 1926

Hindeodella sp. indet.

Plate 2, Fig. 8, 9

Description: Unit very small, blade-like, not curved laterally. Bar very thin, aboral edge straight and sharp; blade denticles elongated ellitic in section, discrete nearly same distance, pointed, inclined posteriorly; there is no pit or groove aboraly.

Remarks: The present form is similar to *Hindeodella triassica* MÜLLER, but it cannot be determined because of scarce available materials.

Occurences: Loc. 2, Idani, Shimizu-cho in Wakayama Prefecture; Loc. 3 and two other localities, Ohsako, Kawakami-mura in Nara Prefecture.

Material: Reg. no. JCD-1058, Loc. 2 in Idani formation; JCD-1059, Loc. 3 in Ohsako formation.

Bivalve fossils

Family TRIGONIIDAE LAMARCK

Genus *Myophorella* BAYLE, 1878

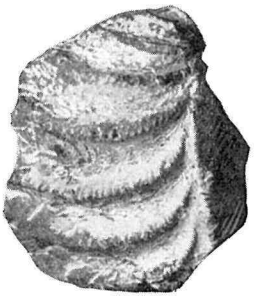
Subgenus *Promyophorella* KOBAYASHI and TAMURA, 1955

Myophorella (*Promyophorella*) cf. *obsoleta* KOBAYASHI and TAMURA, 1955

Text-Figure 4

cf. 1955 *Myophorella (Promyophorella) obsoleta,* KOBAYASHI and TAMURA, Jap. Jour. Geol. Geogr., XXVI, p. 99, pl. V, fig. 7.

cf. 1956 *Myophorella (Promyophorella) obsoleta,* KOBAYASHI, Jap. Jour. Geol. Geogr., XXVII, p. 2, pl. I, fig. 2.



Text-Figure 4 Text-Figure 5 Text-Figure 6 Text-Figure 7

Text-Figure 4. *Myophorella (Promyophorella)* cf. *obsoleta* KOBAYASHI and TAMURA (×1.5)
Text-Figure 5. *Grammatodon takiensis* KIMURA (×1.5)
Text-Figure 6. *Entolium yatsujiense* KURATA and KIMURA (×1.5)
Text-Figure 7. *Plicatula yatsujiensis* TAMURA (×1.5)

Remarks: A single, rather perfect specimen and a fragmental specimen from one locality are at hand. This species was established originally by KOBAYASHI and TAMURA (1955) on the basis of the specimen collected from the Kogoshio formation, Northeast Japan. According to them, this is allied to *Myophorella (Promyophorella) sugayensis* KOBAYASHI and TAMURA, and *Myophorella (Promyophorella) orientalis* KOBAYASHI and TAMURA, but is different in the stronger convexity of the shell, larger umbo and obsolete tubercles on the costae. The present specimens may be assigned to the species in above mentioned specific characters, although they seem to have weaker tubercles than the latter.

Occurrences: Loc. 1, Idani, Shimizu-cho in Wakayama Prefecture.

Material: Reg. no. JM-11192, Loc. 1 in Idani formation.

Family CUCULLAEIDAE FINLAY and MARWICK

Genus *Grammatodon* MEEK and HAYDEN, 1860

Grammatodon takiensis KIMURA, 1956

Text-Figure 5

1956 *Grammatodon takiensis,* KIMURA, Jour. Earth Sci. Nagoya Univ., **4**, No. 2, p. 85, pl. 1, figs. 5, 6.

1959 *Grammatodon takiensis,* TAMURA, Trans. Proc. Palaeont. Soc. Japan, N.S., No. 34, p. 54, pl. 6, figs. 1, 2.

1959 *Grammatodon takiensis*, TAMURA, *Ibid.*, N.S., No. 36, p. 172, pl. 19, figs. 4–6.
1960 *Grammatodon takiensis*, HAYAMI, Jap. Jour. Geol. Geogr., XXXI, No. 1, p. 91, pl. VIII, figs. 6, 7.

Remarks: A single internal mould of left valve is at hand, and its dimension is 14 mm long, 8.5 mm high and 4.5 mm thick. *Grammatodon takiensis* was originally described by KIMURA (1956) on the basis of the specimens collected from the Upper Jurassic Yatsuji formation in Shikoku Isalnd. The present specimen can be correctly identitied to this species by essential characters.

Occurrences: Loc. 1, Idani, Shimizu-cho in Wakayama Prefecture.

Material: Reg. no. JM-11193, Loc. 1 in Idani formation.

Family AMUSIIDAE RIDEWOOD

Genus *Entolium* MEEK, 1865

Entolium yatsujiense KURATA and KIMURA, 1951

Text-Figure 6

1951 *Entolium yatsuiiense*, KIMURA, Jour. Fac. Sci. Univ. Tokyo, Sec. 2, **7**, p. 345, pl. I, figs. 18a-b.
1959 *Entolium yatsujiense*, TAMURA, Trans. Proc. Palaeont. Soc. Japan, N.S., No. 34, p. 60, pl. 6, fig. 30.
1959 *Entolium yatsujiense*, TAMURA, *Ibid.*, N.S., No. 36, p. 176, pl. 19, fig. 41.
1960 *Entolium yatsujiense*, TAMURA, Mem. Fac. Educ. Kumamoto Univ., **8**, p. 236.

Several well-preserved and fragmental specimens were collected from one locality.

Dimension:	Length (mm)	Height (mm)
Reg. no. JM-11194	9.0	9.5
Reg. no. JM-11195	7.0	9.5

Remarks: This species was established by KURATA and KIMURA (1951) on the basis of the specimens collected from the Torinosu Series in Shikoku Island. According to them, the species can be distinguished from *Entolium japonicum* by its orbicular outline and a larger apical angel. The present specimens can be correctly identified to this species.

Occurrences: Loc. 1, Idani, Shimizu-cho in Wakayama Prefecture.

Material: Reg. no. JM-11194, Reg. no. JM-11159, Loc. 1 in Idani formation.

Family PLICATULIDAE IREDALE

Genus *Plicatula* LAMARCK, 1801

Plicatula yatsujiensis TAMURA, 1960

Text-Figure 7

1960 *Plicatula yatsujiensis*, TAMURA, Mem. Fac. Educ. Kumamoto Univ., **8**, p. 237, pl. II, figs. 9–12.

A single nearly complete left and two deformed right valves were collected from one locality. Dimension of one of the right valve is 12.5 mm long and 10.0 mm high, and the left valve is 4.0 mm long and 3.5 mm high.

Remarks: This species was established by TAMURA (1960) on the basis of the specimens collected in the Sakawa Basin in Shikoku Island. The species is characterized by numerous and non-scaly radial ribs, and the present specimens can be assigned to this species.

Occurrences: Loc. 1, Idani, Shimizu-cho in Wakayama Prefecture.

Material: Reg. no. JM-11196 to Reg. no. JM-11198, Loc. 1 in Idani formation.

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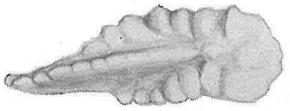
Explanation of Plate 2

Fig. 1–7. *Gladigondolella abneptis* (HUCKRIEDE), all ×50

1. Representative specimen, from the Idani formation, Loc. 2, a) upper view, b) inner lateral view, c) lower view, JCD-1052.
2. Specimen which is resemble to the specimen illustrated by HUCKRIEDE in pl. 14, fig. 13a, b, from Loc. 2, a) upper view, b) outer lateral view, c) lower view, JCD-1053.
3. Small specimen which is resemble to the specimen illustrated by HUCKRIEDE in pl. 14, fig. 20, from Loc. 2, a) upper view, b) inner lateral view, c) lower view, JCD-1054.
4. Small specimen which is resemble to the specimen illustrated by HUCKRIEDE in pl. 12, fig. 34, from Loc. 2, a) upper view, b) inner lateral view, c) lower view, JCD-1055.
5. Small specimen which is resemble to the specimen illustrated by HUCKRIEDE in pl. 14, fig. 5, from Loc. 2, a) upper view, b) inner lateral view, c) lower view, JCD-1056.
6. Small specimen which is resemble to the specimen illustrated by HUCKRIEDE in pl. 12, fig. 32, from Ohsako formation, Loc. 3, a) upper view, b) inner lateral view, c) lower view, JCD-1057.
7. Representative specimen from Portuguese Timor, for reference, a) upper view, b) inner lateral view, c) lower view.

Fig. 8, 9. *Hindeodella* sp. indet., both ×75

8. Lateral view, from the Idani formation, Loc. 2, JCD-1058.
9. Lateral view, from the Ohsako formation, Loc. 3, JCD-1059.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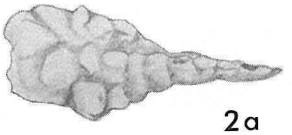
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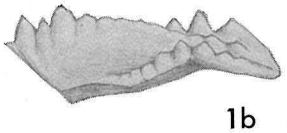
3a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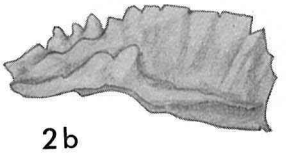
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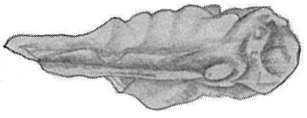
3b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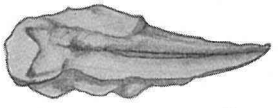
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3c


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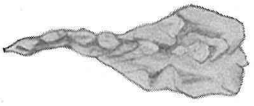
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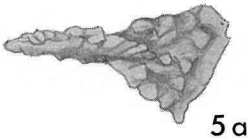
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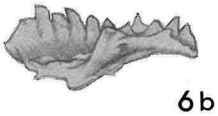
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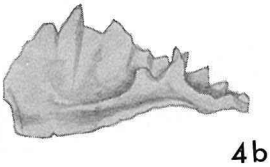
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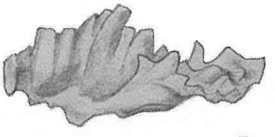
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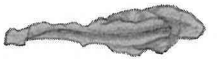
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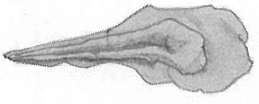
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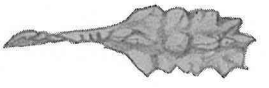
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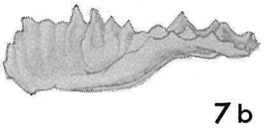
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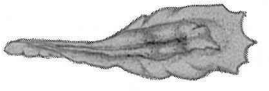
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9