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A *Foordiceras* from the Permian Formation of Central Japan.

With 1 Plate

By

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In a small lot of the Permian fossils collected by OZAKI, one of the writers, in 1953, in the upstream region of the Kuzuryū, Fukui prefecture, there is an incomplete, fragmentary specimen of a nautiloid. The specimen is an inner mold attached to a slab of dark gray, calcareous shale, representing about 1/3 of a whorl, which probably is the last one, having the ventral zone of the adoral part of the specimen broken away. The umbilicus is quite large, but is firmly filled with the rock matrix: umbilical shoulder distinct with a steep wall. The conch is flat, discoidal, but it is certain that the specimen yielded to compression, as is shown by the accompanying fragmentary specimens of indeterminable corals exposing cut edges of compressed corallites.

Along the ventro-lateral zone there are nodes in a revolving series: they laterally extend into rather prominent ribs a little trending adapically, and gradually diminishing dorsad, until entirely disappear at a little distance to the umbilical shoulder. There are several suture-lines naturally exposed: they form shallow lateral lobes; also ventral and dorsal lobes are formed, although their form is not clearly shown owing to the deformation of the conch. The form of the whorl is not known exactly, but the flat, wide lateral zone suggests that it is squarish or rectangular originally. Nothing is observed of the siphuncle. Ventral area is concave.

As to the size of the fossil, it is not of much sense to make measurements of such an incomplete and deformed specimen: the picture given (Pl. I, Fig. 1) is in the natural size.

All the features observed of the specimen make the writers regard the fossil to belong to the genus *Foordiceras* HYATT, 1893, although the flat, discoidal form of the conch looks like unusual in the latter genus as far as is hitherto known. It is, however, very likely that the specimen is strongly flattened, as stated above.

MILLER and YOUNGQUIST, in their monograph of the Permian Nautiloids of America, 1949,¹⁾ united in *Foordiceras* many of the species of *Metacoceras* known up to then, because of the development of the lateral ribs continuous with the nodes. Of the 10 American species of *Foordiceras* described by them none so closely resembles the present Japanese species as the type of the genus, *Foordiceras goliathus* (WAAGEN, 1879)²⁾, because in none of the American species the lateral ribs seem to so gradually fade away dorsad as in the Indian and the Japanese forms. Perhaps *F. cooperi*

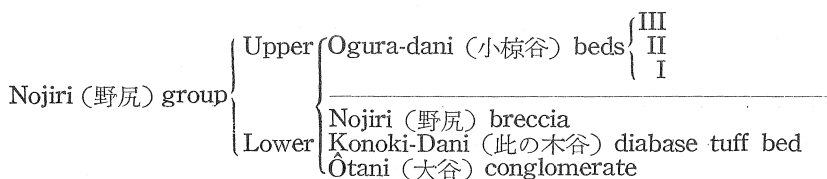
(MILLER)³⁾ and *F. megaphorum* (MILLER)⁴⁾ may be regarded to show this tendency in some specimens. Some other American species differ from the Asiatic fossils in the form of the nodes. *Metacoceras cornutum* GIRTY⁵⁾, an old species which seems to develop faint lateral ribs also resembles the Japanese specimen.

The Japanese fossil as stated above, looks quite like the type species of the genus *F. goliathus* (WAAGEN) with respect to the form of the lateral ribs. The former, however, differs from the latter in forming ventro-lateral nodes that do not appear in the latter. In this regard the affinity seems very much closer between the Japanese species and the one of the other Indian species, *F. wynnei* (WAAGEN)⁶⁾ (Pl. I, Fig. 2). As a matter of fact, excepting that the Japanese specimen is much more compressed and flatter, the two are hardly distinguishable from each other in the surface relief of the conch : the ventral area is concave, too, as stated elsewhere.

Thus, the writers are strongly inclined to regard the Japanese species closely allied to the said Indian species which was recorded from the Upper *Productus*-limestone of Khund Ghât, Salt Range. However, the undulatory ventro-lateral margin of the Salt Range species, *F. wynnei*, due to its the more conspicuous nodes, distinguishes it from the Japanese species. Until we shall obtain some more and better specimens, in the future the latter will be tentatively called *Foodiceras whnneiforme*, nov. sp.

Among the nautiloids described by KRUGLOV from the Ural mountains there is a species of "*Metacoceras*" which much resembles the Japanese species under consideration. It is "*M.*" *Piszovi* KRUGLOV mut. *artiensis* KRUGLOV, Artinskian in age.⁷⁾ In possessing lateral ribs it is doubtlessly a *Foodiceras*, according to the diagnosis by MILLER and YOUNGQUIST.¹⁾ The latter is characterized, however, by a gradual umbilical slope, which in the former is nearly vertical, as already referred to.

LOCALITY:— Oguradai, Ôtani, Kami-Anama-mura, Ôno-gun, Fukui prefecture (福井県大野郡上穴馬村大谷小椋谷) : Ogura-dani beds II. In the area around this locality the following stratigraphical succession is recognized.



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Ashidani (芦谷) group

The Ashidani group consisting chiefly of schalstein and phyllite, accompanying lenticular masses of limestone, is unconformably overlain by the Nojiri group. The latter is subdivided into two, the lower and the upper. It is in the middle or the II of the upper Oguradani beds that the *Foodiceras* was discovered : in the same horizon the occurrence of the fragmentary specimens of *Lyttonia* was reported sometime ago by HAYASAKA and MATSUI<sup>8)</sup> : an indeterminable species of *Parafusulina* was also found in association. It is certain, therefore, that the nautiloid belongs to the middle division

of the Japanese Permian.

***Meaning of the Occurrence of Foordiceras in Japan.***

As was summarized by HAYASAKA recently,<sup>9)</sup> there are only three younger Paleozoic nautiloids hitherto put on record in Japan, namely, *Cyclocera* sp. (n. sp. by SHIMIZU and OBATA, 1936), *Metacoceras* sp. (YABE and MABUTI, 1935) and *Coelonutilus* sp. (HAYASAKA 1954). These are all from the Kitakami mountains, the last one being early Carboniferous, and the others Permian in age. In this place the writers like to refer to the occurrence of an indeterminable species of *Koninckioceras* from the Permian *Fusulina*-limestone of Kinshô-zan, Gifu Prefecture, Central Japan: it has been studied by HAYASAKA, and the description contributed to the Japanese Journal of Geology and Geography.<sup>10)</sup> It is the fourth genus of the Japanese Paleozoic nautiloids. *Foordiceras* described in this note is, thus, the fifth. All these occurrences are represented by very scanty material, so that it is hardly possible to identify their species. However, it is worthwhile to put them on record, because our knowledge on the Paleozoic Cephalopods-nautiloids and ammonoids has been extremely limited until recently. It is also worthy to mention that another species of *Foordiceras*, quite like the one dealt with in this note, but not identical in some details was found sometime ago by a student of the Tôhoku University, Sendai<sup>11)</sup> at a place about 15 km NE of the locality where *Metacoceras* sp. was discovered long time ago by MABUTI.<sup>12)</sup> Details cannot be given here, because the only material at hand is a single gypsum mold and a picture presented to HAYASAKA by T. KODAKA of the Tôhoku University. According to KODAKA a molluscan faunule consisting of species of *Bellerophon*, *Paleophorus*, *Stroparollus*, *Dentalium* and others, has been subsequently found by H. HASE of the same University at about 3 km SW-ward from the nautiloid locality.<sup>13)</sup>

Although it has until recently been considered that nautiloids, and Cephalopods in general, are very scarce in the Japanese Paleozoic formations, it now is certain that it is not really the case. Of course the material is not excellent in fossilization, as has been stated. However, the paucity of specimens of fossils does not imply that these species were rare originally. Fossilization, no doubt, must have been difficult on account of certain circumstances. It is important, however, that these specimens belong to different genera. In the southern part of the Kitakami mountains alone, at least 4 nautiloid genera have been recognized to occur, ranging from the Carboniferous to the Permian. *Koninckioceras* and *Foordiceras wyneiforme* occurred in the Permian formations of Central Japan. The occurrence of such different genera can not but imply that different forms of nautiloids—and also of ammonoids—rather prospered in this part of the world during at least the latter period of the Paleozoic Era.

The authors are deeply indebted to Mr. T. KODAKA, Institute of Geology and Paleontology, Tôhoku University, Sendai, for his kindness shown to them by supplying important and useful informations concerning the materials of the younger Paleozoic

fossils of the southern Kitakami region recently acquired to that Institute.

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Kanazawa, Japan. October 9, 1954.

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#### Notes and References

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- 8) HAYASAKA, Ichiro and MATSUO, Hidekuni (1951):— Permian Fossils from Ogura-dani, Nojiri, Kami-Anama-mura, Ôno-gun, Fukui Prefecture (in Japanese). Jour. Geol. Soc. Japan, vol. **57**, p. 266.
- 9) HAYASAKA, Ichiro (1954):— Younger Paleozoic Cephalopods from the Kitakami Mountains. Jour. Faculty of Science, Hokkaidô Univ., ser. **IV**, vol. **VIII**, no. 4, pp. 361—374.
- 10) In the press, Oct., 1954.
- 11) According to the communication of T. KODAKA the material seems to be quite rich in molluscs, although fossilization is by no means very favorable for a detailed study. The information about the faunule, however, throws some light on the knowledge of the younger Paleozoic paleontology of the Kitakami region as well as of the whole Japanese islands.
- 12) YABE, H. and MABUTI, S. (1935):— On Two Upper Paleozoic Nautiloids from Japan and China. Jap. Jour. Geogr. **XII**, p. 12, pl. 4, fig. 2. *Metacoceras* sp. indet. from the Maiya group ("Mid. Carb. to Low. Perm.") from Maiya, Miyagi prefecture, is described.
- 13) Communication of T. KODAKA, Tôhoku University, Sendai.

Explanation

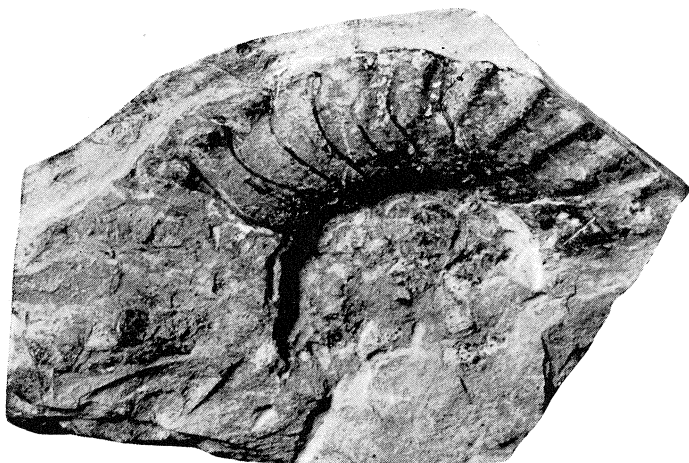


Fig. 1. *Foordiceras whyneiiforme* HAYASAKA et OZAKI. The only specimen at disposal, in natural size. The right half of the ventral margin in the figure is not complete.

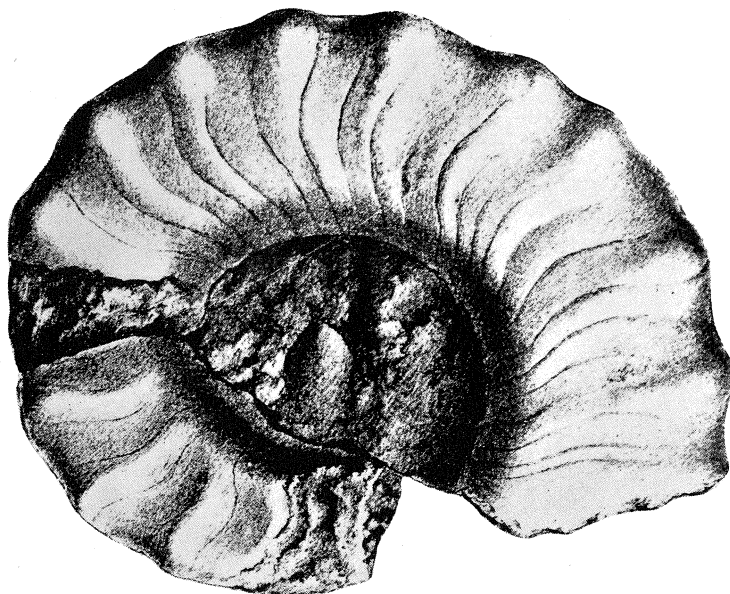


Fig. 2. *Nautilus* (= *Foordiceras*) *whynei* WAAGEN from the Upper *Productus*-Limestone of Salt Range, India, for comparison: about 5/6 of the original picture given by WAAGEN.