A RECORD OF NEOPTYCHITES FROM THE CRETACEOUS OF HOKKAIDO

(Studies of the Cretaceous Ammonites from Hokkaido and Saghalian—XXXII)

TATSURO MATSUMOTO

Department of Geology, Kyushu University, Fukuoka 812, Japan

ABSTRACT

This is the first record of *Neoptychites cephalotus* (Courtiller) from Japan. This discovery is an important addition to the knowledge of the Vascoceratidae from this country. The species is represented by a single, fairly well preserved adult shell, which is described at length in this paper. In addition to the age correlation of the Lower Turonian by means of this species, a biogeographic implication of this occurrence is discussed, showing distribution data on a tentatively reconstructed palaeogeographic map.

Introduction

Ammonites belonging to Vascoceratidae occur commonly in the Turonian (Upper Cretaceous) of the Tethys region and its extensions. The Cretaceous basin of Hokkaido and Sakhalin, called the Yezo geosyncline, belongs to the northwestern Pacific province, where ammonites of the Desmocerataceae, Phylloceratacae, Lytocerataceae and heteromorpha occur more commonly than those of the Hoplitaceae and Acanthocerataceae. However, investigations over the past several years have made it clear that a considerable number of examples of the latter groups, especially the Acanthocerataceae, did exist in the same province (for example, see Matsumoto *et al.*, 1957, 1969; Matsumoto, 1960, 1965-1971, 1975; Matsumoto and Obata, 1963, 1965; Matsumoto and Inoma, 1975). This means that the relative abundance of a given group seems to depend much on facies or environmental conditions and not necessarily on palaeobiogeographic factors. How far this statement can be applied to the ammonites of the Vascoceratidae is a question, because, they are, together with those of the Tissotiidae and the Coilopoceratidae, much predominant in the Tethys and adjacent regions.

When I described a few examples of this family some years ago (Matsumoto, 1973), I thought that they might have drifted from their main distributional region, just as the post-mortem shells of recent *Nautilus*, occasionally found in the coastal area of Japan, have been drifted by ocean currents from the tropical seas of the western Pacific. This could still be held as one of the alternative interpretations.

Meanwhile, an increasing number of Vascoceratid ammonites are being reported from Hokkaido and Saghalien, as reported in another paper (Matsumoto and Muramoto, in press). To quote from that, and other previously published papers the following species are known to occur there :

1. *Vascoceras* sp. aff. *V. durandi* (Thomas and Peron)
2. *Fagesia thevestensis* (Peron)
3. *Fagesia* sp. cf. *F. rudra* (Stoliczka)
4. *Fagesia spheroidalis* (Pervinquière)
5. *Fagesia japonica* Matsumoto and Muramoto
6. *Hourcquia pacifica* Matsumoto
7. *Hourcquia hataii* Hashimoto

In addition to being palaeobiogeographically significant vascoceratid ammonites are useful for interregional correlation. The first five in the above list come from the Lower Turonian and the last two probably from the Lower Senonian.

Now in this paper I am going to describe one more species from Hokkaido. That is *Neoptychites cephalotus* (Courtiller), a world-wide index of Lower Turonian.

Palaeontological Description

Superfamily : Acanthocerataceae de Grossouvre, 1894
Family : Vascoceratidae Spath, 1925
Genus : *Neoptychites* Kossmat, 1895

Types-species. *Ammonites telinga* Stoliczka, 1865

[=*Ammonites cephalotus* Courtiller, 1860]

Remarks. Generic diagnosis has been given at length by Kossmat (1895, p. 165), Pervinquière (1907, p. 391) and concisely by Reyment (1954, p. 65) and Wright (1957, p. L 421). Valuable comments have been added by Freund and Raab (1969, p. 47) and also by Cobban and Scott (1972, p. 89). These are not repeated here, but I follow them. Too many species of less distinct differences may be a question to be clearly sorted, but a study of the solitary specimen from our province would not be adequate to settle that problem.

Neoptychites cephalotus (Courtiller, 1860)
Pl. 1, Fig. 1; Text-Fig. 1

1860. ***Ammonites cephalotus*** Courtiller : Courtiller *Mem. Soc. Imp. Agr. Sci. Arts, Angers*, (3), **3**, p. 248, pl. 2, figs. 1-4.

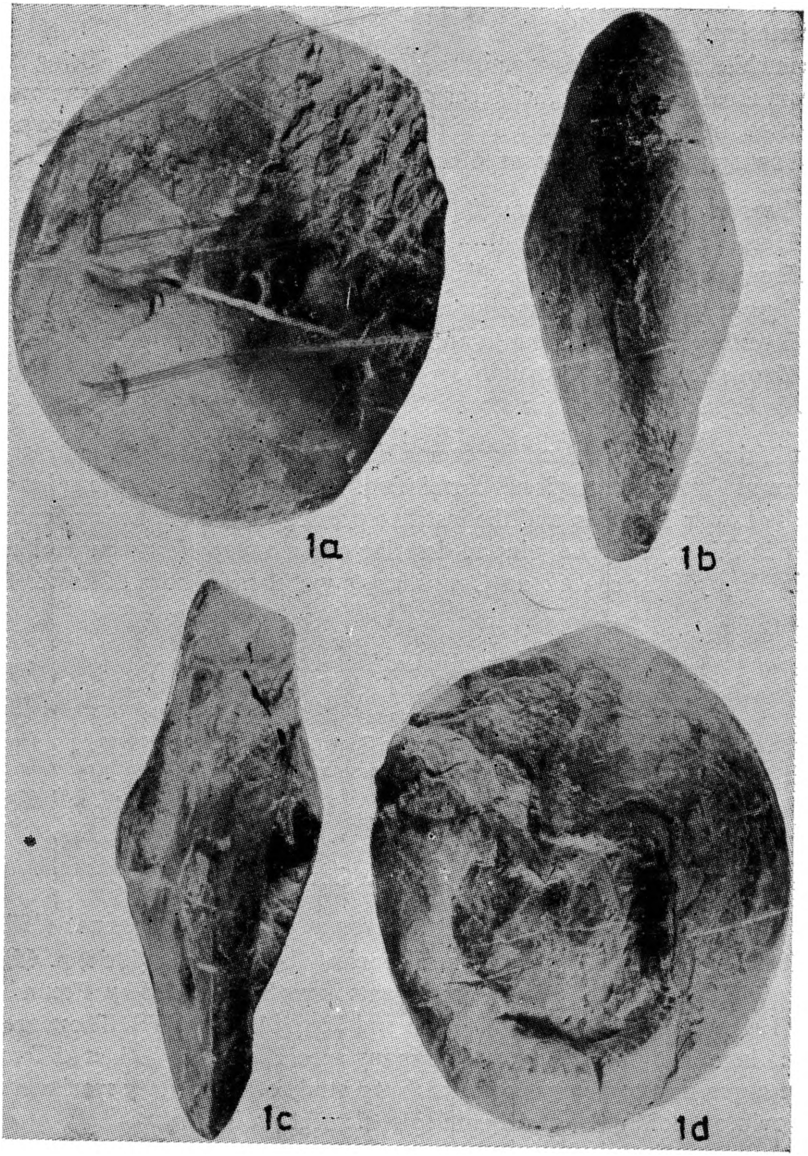

Plate 1. *Neoptychites cephalotus* (Courtiller). An example from loc. R 4601, Naka-kinembetsu, Obira area, Hokkaido, now in the collection of M. Nihongi, Sapporo. **a** Left lateral, **b** back, **c** frontal, and **d** right lateral views, Ca × 0.35. A keel like feature in Fig. **1c** is not a true keel but an edge of a broken part. Kyushu University (K. Tanabe) photos without whitening.

1865. *Ammonites telinga* Stoliczka : Stoliczka *Palaeont. Indica.* **1**, p. 125, pl. 62.
1867. *Ammonites cephalotus*, Courtiller : Courtiller *Ann. Soc. Lin. Maine-et-Loire, Angers*, **9**, p. 3, pl. 1, fig. 1-3; pl. 2, fig. 1-2.
1895. *Neoptychites telinga* (Stoliczka) : Kossmat, *Beitr. Paläont. Geol. Öst.-Ung. u.d. Orients*, **9**, p. 71, pl. 7, fig. la-c.
1896. *Neoptychites telinga* (Stoliczka) : Peron, *Mém. Soc. Géol. France, Paléont.*, (17), p. 38, pl. 6, fig. 1.
1907. *Neoptychites cephalotus* (Courtiller) : Pervinquière, *Etudes Paléont. Tunisienne*, **1**, p. 393, pl. 27, figs. 1-4.
1931. *Neoptychites cephalotus* (Courtiller) : Basse, *Mém. Serv. Min. Madagascar*, p. 34, pl. 4, fig. 9; pl. 11, fig. 5.
1940. *Neoptychites cephalotus* (Courtiller) : Basse, *Notes et Mém. Haut-Com. Rep. Fr. Syrie Liban*, **3**, p. 456, pl. 5, fig. 4.
1965. *Neoptychites cephalotus* (Courtiller) : Collignon, *Atlas des Fossiles Caracteristiques de Madagascar*, fasc. 12, p. 51, pl. 401, fig. 1685.
1969. *Neoptychites cephalotus* (Courtiller) : Freund and Raab, *Spec. Papers in Palaeont.*, **4**, p. 48.
?1972. *Neoptychites* cf. *N. cephalotus* (Courtiller) : Cobban and Scott, *U. S. Geol. Surv. Prof. Paper*, **645**, p. 90, pl. 30, fig. 9; text-figs. 49, 50.

Material. A single specimen in a calcareous nodule from the Naka-kinembetsu, a tributary of the Obira, northwestern Hokkaido, was collected by Isamu Nakajima and is now preserved in the collection of Mitsutoshi Nihongi in Sapporo.

Description of the Hokkaido Specimen. The shell is fairly large, probably adult, with the preserved body chamber of 210°. It is extremely involute and the umbilicus of the outer whorl is closed, presumably covered by callus like substance. The next inner whorl is made observable on the right side by breaking away a part of the outer whorl. It shows a very narrow umbilicus.

The whorl is higher than broad, with nearly flat or gently inflated flanks and a narrowly rounded venter. The adult body-whorl is inflated around the umbilicus and its apertural part is compressed, although the whole margin is not preserved. The adult shell is, thus, lenticular disc in general aspect and fusiform in the frontal or back view.

The surface is nearly smooth on the outer whorl. On the inner whorl weak radial growth-lines are discernible but no ribs are developed. Still inner whorls should have weak ribs and periodic constrictions, but they are concealed.

The sutures are partly exposed. The last two or three sutures are more simplified and accordingly, more pseudoceratitic than the suture illustrated by Kossmat (1895, pl. 21, fig. 1c), but they generally follow the pattern of *Neoptychites*.

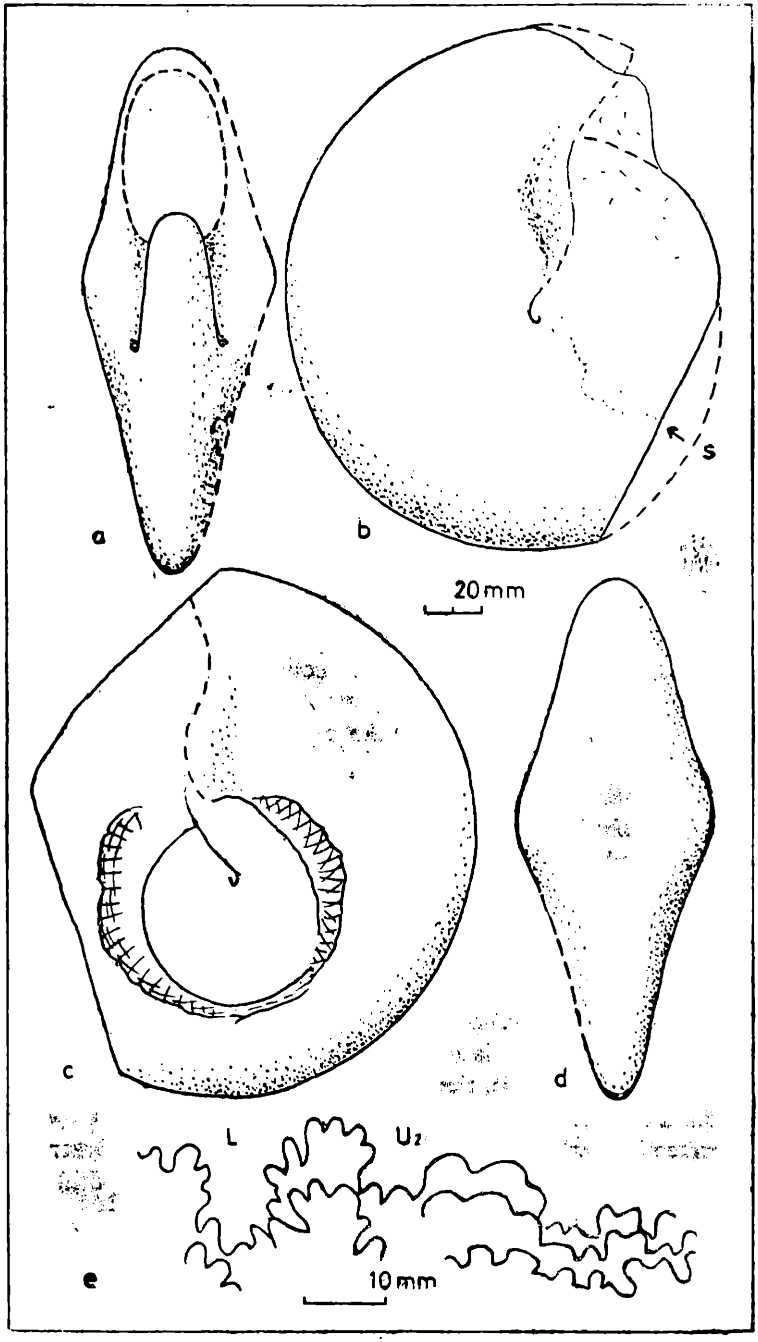

Fig. 1

→

An incompletely exposed suture of the inner whorl is similar to that illustrated by Karrenberg (1935, text-fig. 4).

Measurements (in mm).

Specimen	Diameter	Umbilicus	Height	Breadth (maximum)
Hokkaido	187.0	—	98.0(0.52)	76 (0.40)
India	265.0	13(0.05)	136.0(0.52)	102.0(0.38)

Remarks. From its characteristic features, the present specimen is identified with *Neoptychites cephalotus* (Courtiller) [=*Ammonites tellinga* Stoliczka, 1865], which was described in detail by Kossmat (1895) and Pervinquière (1907), among others. It is not so large as the illustrated specimen from India, but it probably represents the adult stage as it shows inflation around the umbilicus and narrowing at the apertural part as well as approximated sutures. Its next inner whorl, with less inflated flanks, is similar to an example from Madagascar (Collignon, 1965, pl. 401, fig. 1685).

On the shell of the inner whorl, two spiral zones of darker colour are perceptible at about the mid-flank, which may be the remains of colour bands.

Occurrence. The specimen was obtained by Isamu Nakajima in one of the calcareous nodules scattered at loc. R4601, in the intensely meandering part of the creek of the Naka-kinembetsu, a large tributary of the River Obira, about 250 m WNW from its confluence with the smaller branch, 82 Rin-pan-no-sawa. The specimen was found, with only a piece of simple coral near the apertural part. From another calcareous nodule at the same spot, K. Muramoto obtained a larger specimen of *Fagesia japonica* which is to be described in another paper (Matsumoto and Muramoto, in press). At this and adjacent places along the stream, are exposed mudstones of Tanaka's (1963) unit Mj of the Middle Yezo Group.

As discussed in another paper (Tanabe *et al.*, 1977), the sequence from the uppermost part of unit Mh to the top of unit Mj is correlated to the Lower Turonian. Moreover species of *Fageisa* occur largely in the upper part of the Lower Turonian in Hokkaido (Matsumoto and Muramoto, in press). If the two nodules of loc. R4601 were derived from the same unit Mj, then the present specimen of *Neoptychites cephalotus* (Courtiller) could be assigned to the com-

Fig. 1. *Neoptychites cephalotus* (Courtiller). Diagrammatic sketch of a specimen of M. Nihongi's collection from the Obira area, Hokkaido. **a.** Restored frontal view, **b.** Left lateral view, with the last suture at *S*, **c.** Right lateral view, showing a part of the next inner whorl by breaking away a part of the outer whorl, **d.** Back view, **e.** Sutures exposed at *S*.

paratively upper part of the Lower Turonian. This assumption may be supported by the fact that the rock matrix of the nodules shows a particular drab olive colour like that of the more or less tuffaceous claystone of unit Mj.

The above mentioned stratigraphic assignment of the present specimen is tentative and needs further confirmation by collecting more specimens. This assignment is, however, favoured by the fact that *N. cephalotus* (Courtiller) has been found from comparatively upper part of the Lower Turonian in various areas of the world (see below).

Palaeobiogeographic Implications

Species of *Neoptychites* have been reported to occur in the following areas of the world, of which those with asterisk contain *N. cephalotus* (Courtiller) :

Western Europe : France* (Courtiller, 1860, 1867), Spain* (Karrenberg, 1935; Wiedmann, 1960 listed only), Northern Africa : Tunisia* (Pervinquière, 1907), Northern Algeria* (Peron, 1896), Sahara (Collignon, 1965*a*), Morocco* (Collignon, 1966).

Middle East : Syria* (Basse, 1940), Israel* (Freund and Raab, 1969)

Southern India* (Stoliczka, 1865; Kossmat, 1895) Madagascar* (Basse, 1931; Collignon, 1965; Bessairie and Collignon, 1972)

Western Africa : Nigeria (Reyment, 1954), Cameroons (Solgar, 1904)

Eastern Brazil (Bengtson, 1975 oral communication)

Northern Andes: Trinidad-Colombia (Reyment, 1972)

Gulf Coast—Southern Western Interior of North America : Northeastern Mexico-Texas (Bose, 1920 ; Kummel and Decker, 1954; Powell, 1963), Colorado*?(Cobban and Scott, 1972)

Northwestern Pacific : Hokkaido (this paper)

The data are plotted on reconstructed palaeogeographic map of early Turonian age (Fig. 2). Although Collignon (1965*b*) has indicated the age of *N. cephalotus* (Courtiller) in Madagascar as Middle Turonian, it could be referred to the late Early Turonian, because it occurs in the Zone of *Pseudospidoceras conciliatum* (Stoliczka). The records of two species of *Neoptychites* in the Zone of *Watinoceras coloradoensis* (Henderson) below the Zone of *Mammites nodosoides* (Schlotheim) in the Greenhorn Limestone of Colorado (Cobban and Scott, 1972) seems to be exceptionally lower than those of other cases. Speaking strictly, however, an adequate scheme of subdivision of the Turonian has not yet been firmly established in the type area in western Europe (see Hancock *et al.*, 1977), and there are still difficulties in interregional zonal correlation.

Aside from the age correlation on a fine-scale, Fig. 2 may give some idea about the distribution of *Neoptychites*. The main distributional area of *Neoptychites* is in the shallow sea part of the Tethys, as represented by North Africa, Spain and the Middle East. France may be at the margin of this Tethys sea. Connected with the Tethys there was a seaway through West Africa to eastern Brazil. Another westward extension across the opening equatorial part of the

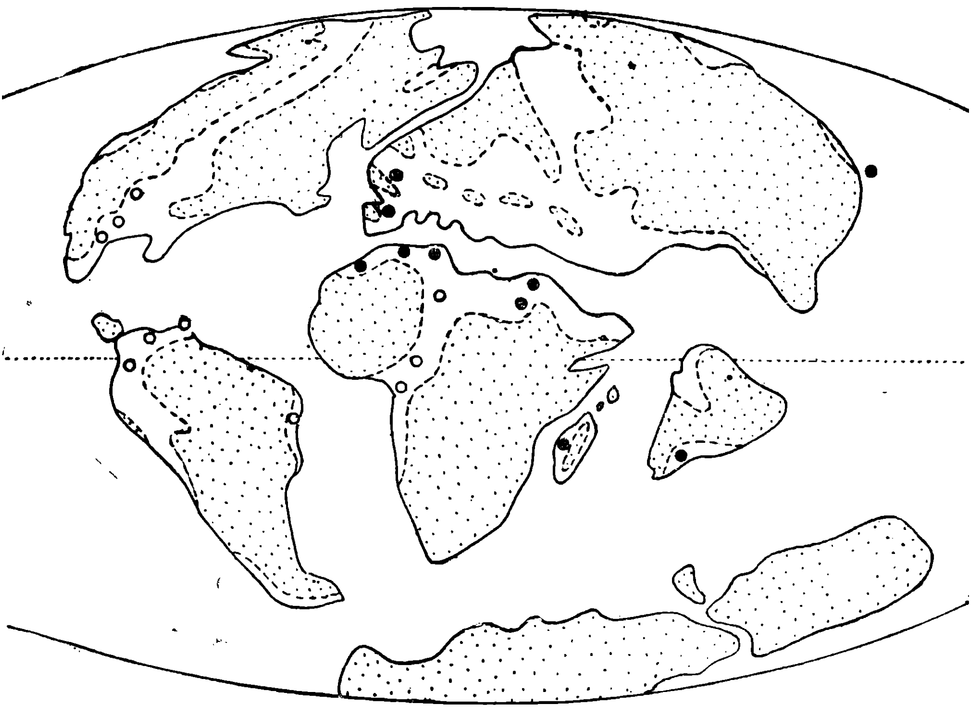

Fig. 2. Distribution of *Neoptychites* on a tentative Paleogeographic map of early Turonian Solid circle : *Neoptychites* fauna containing *N. cephalotus* (Courtiller); Empty circle : that without distinct *N. cephalotus* (Courtiller), Dots : dry land; blank outside broken lines : shallow sea on a continental basement; blank outside solid lines : ocean area. Palaeogeographic reconstruction modified from Dietz and Holden, 1970.

North Atlantic was the American Tethys, which may be conventionally called the Eocarribean Sea, as represented by Trinidad-Venezuela-Colombia on its southern margin and northeastern Mexico-western Texas on its northwestern margin, with which the southern part of the Western Interior province (Colorado) may have been connected. Another seaway directly connected with the Tethys was the opening Indian ocean, to which Madagascar and southern India may have been facing. How close India was located to the Tethys in Mid-Cretaceous Turonian times is an interesting problem to be worked out from various angles. The recently reported marine fauna of the Bagh beds in the Narmada valley (Dassarma and Sinha, 1975) contains some placenticeratid ammonites and several species if *Coilopoceras*, but no vascoceratids. This may be due to the difference in age, that is late Turonian to early Coniacian rather than early Turonian, and by no means implies the remoteness from the Tethys.

Now, Hokkaido (Japan) is quite distant from any of the above mentioned distributional areas of *Neoptychites*. In the reconstructed palaeogeographic map, southern India may have been comparatively less distant than others and it is reasonable to find the same species in common between the two areas. In addition to *N. cephalotus* (Courtiller), *Fagesia rudra* (Stoliczka) is also a common faunal element.

It may not be easy to draw palaeo-oceanic currents in this tentatively reconstructed palaeogeographic map. The migration (or drift) may have taken place from the Middle East through the postulated eastern Tethys to the northwestern Pacific or through the opening Indian ocean to the equatorial Pacific and then to the northwestern Pacific. Anyhow, we could expect future finds of *Neoptychites* and other vascoceratid ammonites somewhere in southeastern Asia, where Cretaceous faunas have been little explored (see Hashimoto *et al.*, 1975).

The trans-oceanic long distance migration from the Eocarribean and adjacent region along the northern equatorial Pacific to the northwestern Pacific is less probable, if not impossible. Actually *N. cephalotus* (Courtiller) has not yet been confirmed in that region, except for a doubtful example from Colorado.

Lastly I would like to discuss the question as to whether *Neoptychites* from Hokkaido implies a post-mortem drift or a migration in the true sense. The two interpretations could still remain as working alternatives, but I am rather inclined to the latter for the following reasons:

Firstly, the fossil described above is represented by an adult shell with an undamaged body-chamber. Then a smoothish discoidal shell with a fusiform cross-section may have been favourable for swimming in sea-water, but I think that *Neoptychites* must have lived primarily in the shallow sea, becouse it occurs commonly in the epicontinental neritic sediments and because it has simplified sutures. This rare occurrence of *Neoptychites* in Hokkaido may be ascribed to the narrowness of the optimum shelf sea in the Japanese province. This ammonite may have moved to an offshore part over a certain distance when it was alive, or its post-mortem shell may have floated to a certain distance to be settled down and embedded in the sediments of somewhat deeper off-shore facies. Judging from the completeness of the body-chamber, the distance may not have been great.

The second reason is the increasing number of records of vascoceratids from Hokkaido (Matsumoto and Muramoto, in press). The apparent scarcity may be due to collection failure.

Acknowledgements

I very much appreciate the keen eye-sight of Mr. Isamu Nakajima who discovered the above described specimen from the Obira area and am much indebted to Mr. Mitsutoshi Nihongi by whose courtesy I have freely studied that specimen in his possessions. Dr. Kazushige Tanabe has helped me in the field and laboratory work.

In view of the intimate palaeobiological relationship between India and Japan, I should like to dedicate this paper to Professor G. W. Chiplonkar to commemorate his seventieth birthday. I thank Drs. M.A. Ghare and K.B. Powar who have refined my manuscript for publication.

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