

A New Heteromorph Ammonite from Hokkaido in the Collection
of Yoshitaro KAWASHITA
(Studies of Cretaceous Ammonites from Hokkaido-XLI)

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Introduction

Mr. Yoshitaro KAWASHITA of Mikasa (Hokkaido) is cooperating in the activity of the National Science Museum, Tokyo to obtain fossil specimens from the mountainous areas of Hokkaido, for research as well as educational purpose. One of the specimens of his recent acquisition is a heteromorph ammonite which shows a distinctive character new to our knowledge. Although it is fragmentary, as fossils of heteromorph ammonoids are often so, we describe it in this paper with some discussion on the mode of life.

Palaeontological Description

Family Nostoceratidae HYATT, 1900

Genus *Neocrioceras* SPATH, 1921

Type species: *Crioceras spinigerum* JIMBO, 1894

Remarks: The type and other species included in this genus have been established on more or less incompletely preserved specimens in which the characters at successive growth-stages have not necessarily been known sufficiently. In other words, there is some obscurity in the generic diagnosis. Under these circumstances, the diagnosis given by WRIGHT (1957) in the "*Treatise*" is pertinently comprehensive and we have no positive evidence which enables us to revise it.

The ammonite to be described below is also an incomplete specimen but can be ascribed to the comprehensively defined genus *Neocrioceras*.

Neocrioceras dentatum sp. nov.

Pl. 1, fig. 1; Pl. 2, fig. 1

Material: Holotype is a fragmentary whorl of an uncoiled ammonite, with shell

layers preserved in part. The external mould of its ventral part is also available. They are in the collection of Yoshitaro KAWASHITA.

Diagnostic characters: This has no septum and represents a body-chamber. It is gently arcuate, with length of about 180 mm and much broader than high. The whorl increases very slowly in height (H) and breadth (B), as far as the preserved part is concerned. The whorl-section is broadly subelliptical, with a nearly flat dorsal side, inflated flanks and a gently convex ventral side. It is measured as $H=26$ mm, $B=39$ mm and $B/H=1.5$ at about the middle of the arc.

Numerous, low ribs encircle the whorl. They are nearly perpendicular to the growth-axis, without flexuosity. In addition to them there are four, low and broad major ribs within the preserved part of the whorl. Their distance increases gradually with growth, measuring 27, 35, and 47 mm. On each of the major ribs there are four, remarkably clavate tubercles, of which those on both sides of the siphonal zones are upright and fairly approximated, with an interval of 12–13 mm between the top of the tubercles, and those on the ventrolateral shoulders are produced obliquely sideways, showing an aspect of short wings. Each clavus has an asymmetric shape, with a steep anterior and a gentle posterior slopes. Its length along the growth-axis is 13–15 mm on its top and 17–20 mm at its base. There are minor crenulations on the summit of the platy tubercle, numbering 5 in the posterior first tubercle and 4 in the posterior second. The anterior two tubercles are not so sharply headed as the posterior two. Two or three minor ribs on the flank are looped at the tubercle and on the venter there are minor ribs corresponding in number to the crenulations on the tubercles.

Suture-line is not preserved.

Comparison: On account of its curved form, depressed whorl with quadrituberculate major ribs and looped minor ribs, this ammonite has characters which are essentially common with *Neocrioceras spinigerum* and, therefore, is referable to the genus *Neocrioceras*, provided that its lost phragmocone is assumed to show a crioceratoid coiling.

The specimen represents a new species which is clearly distinguished from *N. spinigerum* by its (1) much larger size, (2) gently arcuate curvature, (3) four tubercles being situated extraordinarily on the external side, (4) extremely clavate shape of the tubercles and (5) the presence of minor crenulations on top of the tubercles.

"Ancyloceras" kossmati SIMIONESCU (1899, p. 257, pl. 1, figs. 6–8), which may be referred to *Neocrioceras*, is gently arcuate in some part, but its major ribs are narrow and the tubercles on them are very small, at which minor tubercles are not looped. Thus it has some characters which suggest an affinity with *Pseudoxybeloceras*.

There is, in the collection of Hokkaido University, a specimen (with no. 9467) from Hokkaido, which resembles *N. spinigerum*, but its spiral curvature varies to show a gently arcuate form in the late growth-stage. It tells that *Neocrioceras* can take a gently arcuate form in the late stage in some species.

To sum up, this specimen represents a peculiar new species of *Neocrioceras*, but it is necessary to make clear the characters in earlier growth-stages by further search of

more specimens.

Occurrence: According to the information given by Mr. Y. KAWASHITA, the specimen was obtained by him in a small branch stream in the upper reaches of the Nakano-futamata-gawa, a tributary to the River Haboro, northwestern Hokkaido. *Inoceramus teshioensis* NAGAO et MATSUMOTO, *Mesopuzosia* sp., *Yokoyamaoceras* aff. *Y. kotoi* (JIMBO) and *Gaudryceras denseplicatum* (JIMBO) are associated with the above described ammonite in the same nodule of calcareous siltstone. The assemblage suggests a Turonian age, probably Upper Turonian. In the published geological maps, the strata referable to the Turonian and Coniacian. In the published geological maps (YAMAGUCHI & MATSUNO, 1963 and HASHIMOTO *et al.*, 1965), the strata referable to the Turonian and Coniacian are exposed in the upper reaches of the Nakano-futamata-gawa, with repetition by folding and faulting.

N. spinigerum occurs commonly in the Santonian of Hokkaido. Therefore, the present new species seems to appear somewhat earlier than *N. spinigerum*. Further geological field work is needed to make clear the true state.

Remarks on the Mode of Life

Neocrioceras spinigerum has spinose tubercles which may have been useful protection against its enemies.

In the present species, the clavate tubercles are very rigid and situated extraordinarily on the external side, with minor crenulation on their summit. When this ammonite was reposed on the soft sediments at the bottom of the sea, with its body-chamber disposed in the lower part, these tubercles must have operated as a brake or skidproof to settle the shell. The longitudinally elongate and asymmetric shape of the tubercles, with a steep anterior and a gentle posterior inclinations, is favourable for the occasional locomotion to the posterior in the sea-water by jet-pumping from the funnel at the shell aperture.

One of us (MATSUMOTO, 1977; MATSUMOTO & NIHONGI, 1979; MATSUMOTO *et al.*, 1981) has expressed an opinion that many of the heteromorph ammonoids may have been mainly benthic in life but also been able to float and sink or to swim in the sea-water when necessary. This has been led from the study of the characters of the shell and also the mode of occurrence. The above remarks on the characters of the present species support this conclusion.

Acknowledgements: We thank Mr. Yoshitaro KAWASHITA who provided this interesting ammonite for our study with necessary information. Thanks are due to Dr. Kazushige TANABE, Dr. Masayuki NODA for thier helps in preparing the plates and Miss Kazuko HARA for typewriting the manuscript.

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Explanation of Plates

Plate 1

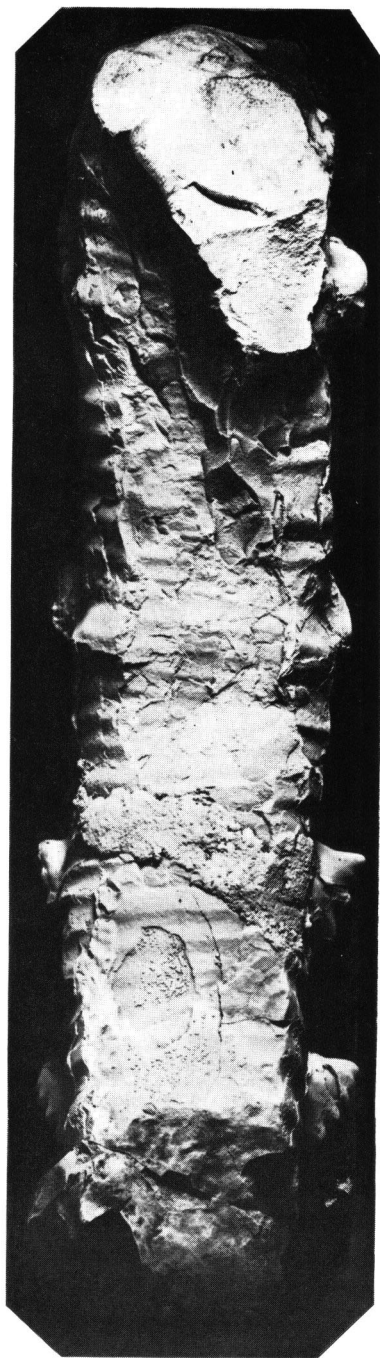
- Fig. 1. *Neocrioceras dentatum* sp. nov.Page 115
 Holotype, KAWASHITA Coll. from the upper reaches of the Naka-no-futamata-gawa, a tributary to the River Haboro, northwestern Hokkaido. Ventral (a) and dorsal (b) views, $\times 0.92$.
 Photos by M. NODA, with whitening.

Plate 2

- Fig. 1. *Neocrioceras dentatum* sp. nov.Page 115
 Holotype (see Pl. 1). Two lateral (a, b) views, $\times 0.92$.
 Photos by M. NODA, with whitening.



1a



1b

