A study of Neocardioceras (Ammonoidea) from Hokkaido
Studies of Cretaceous ammonites from Hokkaido and Sakhalin -XCII

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Abstract: A specimen collected years ago by Tatsuo Muramoto from Loc. Ik 1038 in the Ikushunbetsu Valley, central Hokkaido, was temporarily labeled as Neocardioceras (?) sp., without description. It is restudied on the basis of a review of previous works. As a result, it is now recognized as representing a new species of Neocardioceras, named N. muramotoi, sp. nov. The previously known species of Neocardioceras from various regions of the world can be arranged in five biostratigraphic zones of the upper part of the Cenomanian Stage (Cretaceous) in the tripartite scale. On the ground of biostratigraphic correlation, N. muramotoi is assigned to the Zone of Metoicoceras geslinianum-Euomphaloceras septemseriatum in the middle part of the Upper Cenomanian Substage. In this zone no species of Neocardioceras has been recognized previously.

Key words: Ammonoidea; Neocardioceras; Cenomanian; Cretaceous; biostratigraphic zone; correlation; Hokkaido.

Introduction. The basic material for this study is a paleontological specimen which was collected years ago in the Ikushunbetsu Valley of the Mikasa district, Hokkaido, by Tatsuo Muramoto with me. It was tentatively labeled as Neocardioceras (?) sp., but has been left undescribed for some reasons. Kikuo Muramoto, son of Tatsuo, kept the specimen at his home. At the suggestion of Takemi Takahashi, the specimen was provided to me for more careful study. Regrettably Kikuo passed away by disease, while I was investigating the material. As a result of the study, it has become clear that the above specimen represents a new species of Neocardioceras.

The primary purpose of this paper is to give a systematic paleontology of this species, including short remarks on previous works about the genus Neocardioceras. In the later part of the paper discussions are given on the biostratigraphic and paleogeographic implications of the new findings.

Conventions. For brevity the following abbreviations may be used in the description, especially in Table I. Repository of the specimen: GK = Geological Collection of the Kyushu University Museum, Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan. For the measurements: D=diameter of shell, U = that of umbilicus, H = whorl height, W = whorl breadth, R + r = number of primary and secondary ribs, respectively per half a whorl.

Systematic description.

Order Ammonoidea Zittel, 1884
Family Acanthoceratidae Grossouvre,1894
Genus Neocardioceras Spath, 1926
Type species.—Ammonites juddii Barrois and Guerne, 1878 ( p. 46, pl. 1, figs. 1, 2) by original designation.

Diagnosis.—Shell small, more or less compressed and flat-sided, with fairly small or moderate umbilical ratio; ornamented by numerous rectiradiate or prorsiradiate and weakly flexuous ribs of unequal length, and small but distinct tubercles at the umbilical, inner and outer ventrolateral, and midventral points. Primary ribs start from the bullate umbilical tubercle. All the ribs are bent more or less forward at the ventrolateral tubercles, forming chevrons on the venter. Suture rather simple, showing massive saddles and shallow minor incisions.

Remarks.—When the genus Neocardioceras was established by Spath (1926), the generic diagnosis was not clear, because its type species Ammonites juddii Barrois and Guerne from Sarthe, France, was
based on very small specimens which were artificially illustrated. Wright and Kennedy (1981, p. 49) studied primarily the British material, i.e., fairly numerous specimens from the “Neocardioceras Pebble Bed” in the basal part of the Middle Chalk, Devon. According to the authors the specimens are indigenous and not pebble fossils. At any rate, they gave a generic diagnosis mainly on the basis of their studied material.

Subsequently Cobban (1988) and Cobban and others (1989) investigated numerous, well preserved specimens from several stratigraphic levels of the upper Cenomanian strata in the extensive regions of the United States Western Interior-Gulf Coast. In the above two papers altogether eight species, including two unnamed Neocardioceras spp., are treated, in which *N. juddii* is described precisely with fine illustration of numerous specimens. The generic diagnosis written above depends mainly on Cobban’s work with slight modification.

I am in favour of Cobban’s (1988, p. 25) idea to presume *Neocardioceras* as a probable derivative from *Tarrantoceras* Stephenson, 1955 of late middle to early late Cenomanian age on the grounds of both morphologic and stratigraphic relations between the two genera.

**Occurrence.**—*Neocardioceras* has been recorded from western and central Europe, Western Interior and Gulf Coast regions of the United States and also Brazil. Now, Hokkaido (northern Japan) is added to the above.

Genus *Neocardioceras* characterizes the upper Cenomanian substage in the tripartite scale of the Stage. About 10 species are classified in the genus. They occur in several biostratigraphic zones, depending on species.

**Neocardioceras muramotoi**, sp. nov.

*Fig. 1.*

Holotype.—GK. H8614, collected by T. Muramoto from the mudstone at Loc. Ik 1038, about 450m downstream from the Katsurazawa Dam of the Ikushunbetsu Dam.
River (see Fig. 2). It is at present a sole material for this species.

**Specific name.**—In memory of Tatsuo and Kikuo Muramotos, both contributed much to paleontology with their distinguished collections.

**Diagnosis.**—Shell fairly small, with umbilicus of moderate width. Primary and secondary ribs of normal spacing regularly alternated; nearly rectiradiate around the umbilicus and gently projected at the ventrolateral tubercles.

**Description.**—The holotype is 50mm or so in diameter at about the preserved end, that is nearly half way to the inferred end of the body chamber. The umbilicus is shallow, showing the umbilical ratio \((U/D)\) 1/3. The whorl is higher than broad, with the ratio \(B/H\) about 0.8 (see Table I).

Radial ribs are fairly numeous, \(9R+9r\) in half of the outer whorl. They are moderately sharp, at first nearly rectiradiate and then gently curved forward on the ventrolateral part, crossing the venter with a moderate to slight projection. Primary ribs arise from the bullate umbilical tubercles, which are pointed at the umbilical edge. Secondary ribs start at about or somewhat below the midflank. All the ribs have small tubercles of normal intensity at the inner and outer ventrolateral points and on the siphonal line. They are somewhat clavate on the venter. The ribs of the next inner whorl are relatively coarser than those of the outer whorl.

Partly exposed suture shows minor incisions on broad saddles.

**Comparison.**—This species is certainly assigned to *Neocardioceras* on account of its general characters. It is similar to *N. juddii* in the shell form and size, but it shows different mode of ornamentation. In *N. juddii* the ribs are more numerous, somewhat flexuous, and branched or intercalated secondary ribs occur frequently, whereas in *N. muramotoi*, the ribs are rigid and show regular alternation of long and short ones.

*Neocardioceras uptonense* Cobban (1988, p. 20, pl. 10, figs. 36-70) is somewhat similar to the present...
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species in having rather coarse and sparse ribs and fairly conspicuous tubercles, but its long ribs are predominant over short ones, and the ribs show more pronounced projection at the inner ventrolateral tubercles. Furthermore, on the flank of immature shells of N. uptonense, the ribs are effaced. Generally the ornamentation of N. muramotoi is quite regular.

Occurrence.—This species is based solely on the holotype from Loc. Ik 1038. The mudstones, about 15 m in thickness, exposed at Loc. Ik 1038 have yielded a number of ammonoid species. Based on the faunal assemblage, this unit is referred to the Zone of Euomphaloceras septemseriatum at about the middle or upper-middle part of the upper Cenomanian substage. The details of the faunal correlation are to be discussed in the next item.

Biostratigraphic zonation and correlation.
In the Western Interior of the United States the Upper Cretaceous sequence of strata is finely subdivided into biostratigraphic zones mainly on the basis of the successive change of the faunal assemblage of ammonoids. Because of the diversity in the faunal distribution from place to place, the proposed scheme of zones may be somewhat dissimilar between provinces, for instance between Montana and New Mexico. Fig. 3 in this paper depends primarily on Cobban (1988, 1993)\(^5\) and Cobban and others (1989).\(^5\) It is, however, somewhat modified in the naming of the zones from the viewpoint of interregional correlation with Europe and elsewhere.

In the right column of Fig. 3, the ranges of the previously described species of Neocardioceras are indicated. As N. muramotoi is at present represented only by a single specimen, its range is provisionally shown by a broken line. It is most probably allocated in the middle of the five zones by the reason of the faunal similarity as explained below.

The mudstones about 15 m in thickness, exposed at Loc. Ik 1038, have yielded fairly numerous ammonoid species, which are important for the interregional correlation. They are Euomphaloceras septemseriatum (Cragin), Pseudocalycoceras angolaense (Spath) [= P. uptonense (Moreman)]. Simitomaloceras faustum Matsumoto and Muramoto, Desmoceras japonicum Yabe, Puzosia elegans Matsumoto, Wellmanites japonicus Matsumoto, Takahashi, and Sanada, Gaudioceras steinianii Verzo, Allococeras annulatum (Shumard) and Septonoceras kosaumi Matsumoto. They have been already described in several papers. On the basis of the faunal assemblage this fossiliferous unit is most probably correlated with the Zone of Metoicoceras geslianae (= Euomphaloceras septemseriatum), although Metoicoceras is absent in Japan probably for the reason of paleobiogeography.

The above assignment of N. muramotoi to the middle part of the upper Cenomanian substage is noteworthy, since no species of Neocardioceras has been recorded in this part. It should be also noted that the ten species of Neocardioceras indicated in Fig. 3 do not necessarily show successive changes of morphological characters, but they have their own independent features.

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References


