Turrilitid ammonoid *Carthaginites* from Hokkaido (Studies of the Cretaceous ammonites from Hokkaido and Sakhalin—XCIV)

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**Abstract.** This paper gives a revised definition of the genus *Carthaginites* Pervinquière, 1907 on the basis of material from Hokkaido, Japan, that enhances previously available material. Two species from the middle Cenomanian rocks of Hokkaido are described: *C. asiaticum* (Matsumoto and Takahashi, 2000) and *C. yamashitai* sp. nov. Brief comments are also made on some species which were previously described from the upper Cenomanian rocks of North America and Europe. Morphologically and stratigraphically *Carthaginites* is intimately related to *Neostlingoceras* Klinger and Kennedy, 1978, of early Cenomanian age.

**Key words:** *Carthaginites*, Cenomanian, Cretaceous, Hokkaido, *Neostlingoceras*, *Raynautia*

**Introduction**

A well preserved specimen of a turreted ammonite was collected by Minoru Yamashita and was provided to me for study in 1981, but it was left undescribed, because I failed to understand adequately its peculiar characters. Meanwhile my work on the turrilitid ammonoids proceeded step by step, mostly with coworkers, and in this connection I noticed that the species described as *Neostlingoceras asiaticum* Matsumoto and Takahashi, 2000 is peculiar in its very small size and much weaker ornamentation. I also noticed that its suture is so peculiar that my previous drawing should be revised. Thus, the genus *Carthaginites* Pervinquière, 1907 came to my mind. At the same time I became aware that the specimen provided by Yamashita is an excellent example of *Carthaginites*. These two species came from the middle, instead of the lower, part of the Cenomanian. In this paper the results of my study are presented in the customary style of systematic description.

**Conventions.**—The specimens from Hokkaido described in this paper are kept at the Kyushu University Museum under the heading GK. Other specimens mentioned are cited according to the usual form used for the given institutions.

Sutural elements are designated E, L, U, and I for the external, lateral, umbilical and internal lobes, following normal usage for the group.

**Systematic descriptions**

Order Ammonoidea Zittel, 1884  
Suborder Ancylocerata Wiedmann, 1966  
Superfamily Turrilitoidea Gill, 1871  
Family Turrilitidae Gill, 1871  
Genus *Carthaginites* Pervinquière, 1907

**Type species.** — *Turrilites* (*Carthaginites*) kerimensis Pervinquière, 1907 (p. 101, pl. 4, figs. 18, 19; text fig. 29) by original designation (Pervinquière, 1907, p. 96).

**Diagnosis.**—Small turreted shell, with low apical angle; surface in early growth stage nearly smooth, with a shallow median spiral depression; later row of faint nodes discernible above the median depression and another row of numerous, tiny tubercles along the lower whorl seam. Suture abnormal in showing L and in part E/L and L/U saddles on the exposed whorl face, without full half of E. In other words, the siphuncle does not run along the upper edge of the whorl but deviates at some distance toward the umbilical margin of the preceding whorl.

**Discussion.**—*Carthaginites* was proposed by Pervinquière (1907, p. 96) as a subgenus of *Turrilites* Lamarck, 1801. It was raised to the rank of a full genus by Dubourdieu (1953, p. 44), who erected another species *Carthaginites krorzaensis* Dubourdieu (1953, p. 66, pl. 4, figs. 49–52, text-fig. 20) on the basis of a single isolated whorl, which is about 3 mm in height and 5 mm in diameter. There is a very shallow spiral depression at midflank
and a row of narrow clavi along the lower whorl seam. Owing to the isolated condition of the whorl, the suture was fully illustrated from the umbilicus of the lower surface, via the whorl flank, to the upper surface, and the position of the siphuncle is shown much apart from the angle of the upper whorl seam to the vicinity of the umbilicus of the upper surface (see Dubourdieu, 1953, text-fig. 20).

The features described above are the most important characters of the genus *Carthaginites*. It should be also noted that the suture is not necessarily simple but moderately incised like that of immature *Ostlingoceras* (see fig. 2 in Matsumoto and Takahashi, 2000). Generally the degree of sutural incision depends on species, growth stage and mode of preservation or effect of weathering. In any event, in regard to the above points Wright and Kennedy (1996, p. 361) seem to have inadequately presented the generic diagnosis. However, I agree with them in their allotment of their British specimen (BMNH C76469) (Wright and Kennedy, 1996, p. 361, pl. 98, fig. 11) to the genus *Carthaginites*.

Dubourdieu (1953, p. 67) and also Wright and Kennedy (1996, p. 361) described the distinction between *Carthaginites* and *Raynaudia* Dubourdieu, 1953 (type species *Turrilitites* (*Carthaginites*) raynaudiensis Collignon (1932, p. 19, pl. 1, figs. 22–25; text-figs. 24–26). Dubourdieu (1953, fig. 13) presumed that *Carthaginites* evolved from *Raynaudia*, but no substantial evidence was given. Judging from the shell form and ornamentation, *Carthaginites* is related more closely to *Neostlingoceras* Klinger and Kennedy, 1978 (type species *Turrilitites* carcinanensis Matheron, 1842). Generally the former is smaller and more faintly ornamented than the latter. The unusual position of the siphuncle and the consequent abnormal disposition of the sutural elements are particular to *Carthaginites*.

**Distribution.**—The type species (*C. kerimensis*) was recorded by Pervinquière (1907, p. 101) from the “Vraconian” of Tunisia, but it is regarded as a late Cenomanian species by Wright and Kennedy (1996, p. 361). *C. krozensis* is from the upper Cenomanian rocks in the neighbourhood of Djebel Quenza, SE of Djebel Krozeh in Algeria (Dubourdieu, 1953, p. 68). The British specimen (*vide supra*) is from the upper Cenomanian *Calycoceras guerangeri* Zone of Devon, southern England (Wright and Kennedy, 1996, p. 363). The two species from Hokkaido (northern Japan), described below, came from the middle Cenomanian *Calycoceras* (*Newboldiceras*) *asiaticum* Zone. Some of the species described under *Neostlingoceras* from the upper Cenomanian rocks of the North American Western Interior region are to be transferred to *Carthaginites* (see discussion below).

![Figure 1. Carthaginites asiaticus (Matsumoto and Takahashi). Sutures on the whorl flank. A. GK H8536 (holotype), x10. B. GK H8537 (younger paratype), x12.](image)
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because it has a small and feebly ornamented shell and abnormal configuration of the suture. *N. bayardense* Cobban, Hook and Kennedy (1989, p. 60, figs. 95R, 96R) from the same zone may be another species of *Carthaginites*, although its suture was not illustrated.

Occurrence.—The holotype and the two paratypes of this species came from Loc. Ik 1103 (for the location see Matsumoto and Takahashi, 2001, fig. 4), where the middle Cenomanian Zone of *Calycoceras* (*Newboldiceras*) *asiaticum* Zone is exposed.

**Carthaginites yamashitai** sp. nov.

Figures 2 and 3

**Material.**—Holotype is GK. H8539 (Figure 2) collected by Minoru Yamashita from a cutting, SE of Poronai, Mikasa district and later donated to the Kyushu University Museum. This is well preserved, but no other specimens are available.

**Diagnosis.**—Small flat-sided turricone, with estimated apical angle of 18°. Young whorls look almost smooth, but for faint spiral depression at midflank and numerous minute tubercles aligned immediately above the lower whorl seam. In later growth stages blunt major tubercles developed above the spiral depression and minor ones along the lower whorl seam. The latters are pointed at their top immediately above the lower whorl seam but

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Figure 2. *Carthaginites yamashitai* sp. nov. Lateral views (A–E anticlockwise turned) and basal view (F) of GK. H8539 (holotype), ×3. Photos courtesy of T. Nishida.

Figure 3. *Carthaginites yamashitai* sp. nov. Stutures on the flank of three successive whorls of GK. H8539 (holotype), ×8.
clavate at their base, forming a wavy spiral line. Thus, a kind of double feature is shown. Configuration of the sutural elements abnormal in showing the entire L and parts of the saddles E/L and L/U on the exposed whorl face; E almost entirely unexposed on the flank (Figure 3).

Description.—This single available specimen consists of 9 whorls, without the youngest part and the destroyed last portion of the body chamber. It is 27 mm in total height, and the diameter of the last whorl is 10 mm. Each whorl is trapezoidal in lateral view, with the larger dimension along the lower row of small tubercles. For instance, the ratio of height to lower diameter is 0.45 and of height to upper diameter 0.50.

The shallow spiral depression is better discernible on the internal mould. It is at about the midflank in young whorls and gradually shifted downward with growth. I notice a questionable feature that several minutely pointed upper tubercles are discernible in a part of the preserved first whorl (see Figure 2C, D). Whether this is a constant character or merely accidental cannot be decided without examining more specimens.

In later growth stages major tubercles of the upper row may be somewhat bullate upward. The tubercles of the lower row are small but fairly distinctly pointed and slightly bullate upward. They are twice as numerous as the nodes of the upper row; for instance 30 against 15 in the whorl of the middle growth stage. They rest on a wavy spiral ridge which forms an edge between the flank and the lower face of the whorl. On the basal face of the preserved last whorl a radial rib runs from each wave of the ridge toward the umbilicus with gentle curvature (Figure 2F).

The suture on the flank of the successive three whorls is illustrated in Figure 3.

Comparison.—This species is undoubtedly referred to Carthaginites on account of its small size, faint ornamentation with a shallow spiral groove at about the midflank and the deviation of the siphuncle from the upper edge of the whorl flank inward below the upper whorl face as shown by the particular configuration of the sutural elements.

The estimated apical angle of C. yamashitai is larger than that in C. kerimensis and C. asiaticus. As to the degree of minor sutural incisions, there is no significant difference between C. yamashitai and C. krozaensis or C. asiaticus, if the gradual change with growth is taken into consideration. The gradual change of ornamentation with growth in this species is analogous to that of C. asiaticus. The two species are distinguished by the difference in the whorl shape and the style of ornamentation.

Occurrence.—The holotype was collected from the middle Cenomanian Calycoceras (Newboldiceras) asiaticum Zone exposed at a cutting of a forestry road, about 3500 m S60° E from the Poronai colliery, Mikasa district. This fossil locality is marked in the official geological map "Iwamizawa" (Matsuno et al., 1964). I went there later but failed to obtain additional material. The fossiliferous bed is referred to the Mikasa Formation which consists mainly of sandy sediments of shallow sea facies.

Concluding remarks

(1) The genus Carthaginites Pervinquière, 1907 was previously represented by small and more or less incompletely preserved specimens of rare occurrence from Tunisia and Algeria. In addition to the original works of Pervinquière (1907) and Dubourdieu (1953) the better preserved specimens from Hokkaido are taken into consideration, and thus the diagnosis of the genus Carthaginites is given clearly in this paper.

(2) The species previously called Neostiingoceras asiaticum Matsumoto and Takahashi, 2000 is revised in this paper to Carthaginites asiaticus (Matsumoto and Takahashi, 2000) and redescribed with necessary amendment. Furthermore, Carthaginites yamashitai sp. nov. is established on a fine specimen collected by M. Yamashita. The above two species occurred in the middle Cenomanian Calycoceras (Newboldiceras) asiaticum Zone in the Mikasa district of central Hokkaido.

(3) Morphologically and stratigraphically Carthaginites is intimately related to Neostiingoceras but differs in its smaller size, weaker ornamentation and especially by the deviated position of the siphuncle to the inner part of the whorl.

(4) In view of the peculiar characters as mentioned above, Carthaginites is presumed to have had a peculiar mode of life, but this ecological problem is not treated in this paper and left for further investigation.

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