

The earliest Cenomanian ammonoid *Tanabeceras yezoense* (Shigeta) from the Hobetsu area, Hokkaido

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Abstract

Two well-preserved specimens of *Tanabeceras yezoense* (Shigeta, 1996) are described from the lower part of the Lower Cenomanian (Upper Cretaceous) in the Hobetsu area, Hokkaido (Northern Japan). These specimens add significantly to our morphological knowledge of this poorly known taxon. Ornamentation on one specimen is shown to consist of constrictions and very weak ribs, prominent on the inner flank and forming a very shallow sinus on the venter. The other specimen, entirely septate (diameter 32.1 mm at last septum), represents the largest known example of this taxon (diameter of complete shell estimated to be 60-65 mm). It exhibits a change in whorl cross section, which we interpret to probably be an indication of a later growth stage.

Key words: ammonoid, Cenomanian, Cretaceous, Hobetsu, Hokkaido, *Tanabeceras*
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Introduction

Gaudryceratid ammonoids from the Lower Cenomanian of Hokkaido, northern Japan are more diverse and abundant than in underlying older sediments (Matsumoto *et al.*, 1972, 1997; Matsumoto, 1984, 1995; Shigeta, 1996; Shigeta *et al.*, 2010). Most taxa are endemic species restricted to Hokkaido and Sakhalin. One of these taxa, *Tanabeceras yezoense* (Shigeta, 1996) of the subfamily Gabbioceratinae Breistroffer, 1953 was established on only three very rare specimens obtained from the lower part of the Lower Cenomanian of the Yezo Group in the Horokanai and Wakkanai areas, Hokkaido. Later, another specimen referable to this species was reported from the lowest Cenomanian of the Oyubari area (Kawabe, 2000, pl. 4, fig. 12). Nishida *et al.* (1997, pl. 7, fig. 6) and Shigeta (2001, pl. 54, figs. 1-3) also illustrated two additional specimens from the Horaokanai area. One of the two specimens assigned to *Parajaubertella kawakitana* Matsumoto, 1943, by Zonova *et al.* (1993, pl. 63, fig. 7) and Yazykova *et al.* (2004, fig. 7.1) from the Lower Cenomanian of the Sinegorsk area, southern Sakhalin, Russia is identical to this species. Thus, up till now a total of seven specimens

have been described or illustrated, but they are all less than 18 mm in diameter and are probably immature shells.

Co-author M. Izukura recently discovered two well-preserved specimens referable to *Tanabeceras yezoense* in the Lower Cenomanian in the Hobetsu area, Hokkaido. Although one specimen (HMG-1600), the largest example of this species discovered thus far, lacks most of the body chamber, its diameter at the last septum is nevertheless 32.1 mm. The smaller specimen (HMG-1601) exhibits well-preserved ornamentation. We herein describe these newly found specimens and discuss the mature shell form of the taxon.

Paleontological description

Systematic descriptions basically follow the classification established by Klein *et al.* (2009). Morphological terms in the systematic description are those used in the Treatise on Invertebrate Paleontology (Moore, 1957). Quantifiers used to describe the shape of ammonoid shell replicate those proposed by Matsumoto (1954, p. 246) and modified by Haggart (1989, table 8.1).

Abbreviations for shell dimensions.—D = shell diameter; U = umbilical diameter; H = whorl height; W =

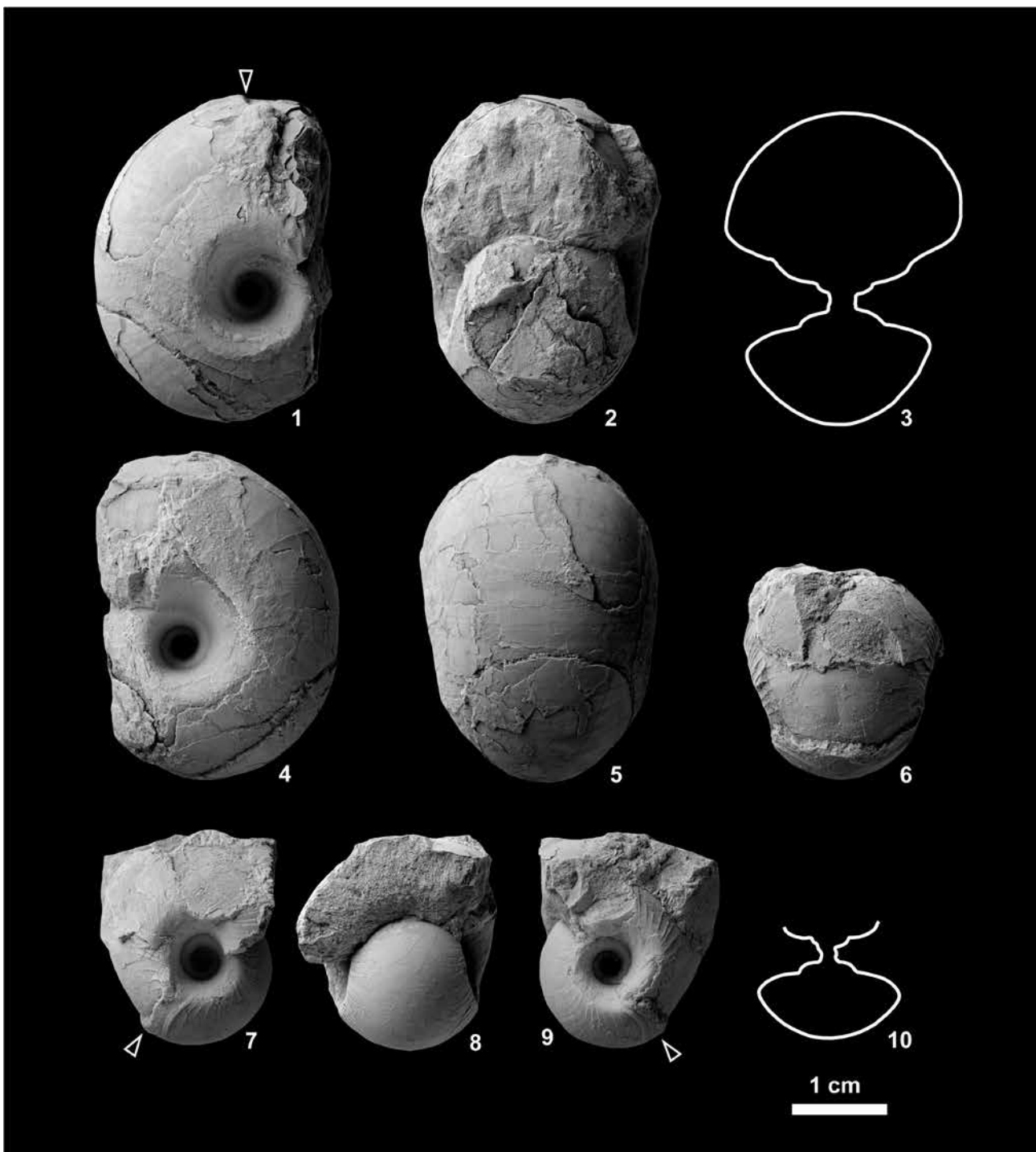


Figure 1. *Tanabecerases yezoense* (Shigeta, 1996) from the Hobetsu area, Hokkaido. **1-5**, HMG-1600; **6-10**, HMG-1601. Arrows indicate position of whorl cross sections, which are drawn at the last septum.

whorl width.

2012

Institution abbreviations: HMG = Hobetsu Museum, Mukawa; NMNS = National Museum of Nature and Science, Tsukuba.

Type species: *Gabbioceras yezoense* Shigeta, 1996.

Tanabecerases yezoense (Shigeta, 1996)

Figures 1–3

Superfamily Tetragonitoidea Hyatt, 1900

Family Gaudryceratidae Spath, 1927

Subfamily Gabbioceratinae Breistroffer, 1953

Genus *Tanabecerases* Shigeta, Futakami and Hoffmann,

Gabbioceras michelianum (d'Orbigny). Shigeta, 1993, table 1.

Gabbioceras yezoense Shigeta, 1996, p. 2, fig. 1.1, 2.1, 2.2, 2.7;

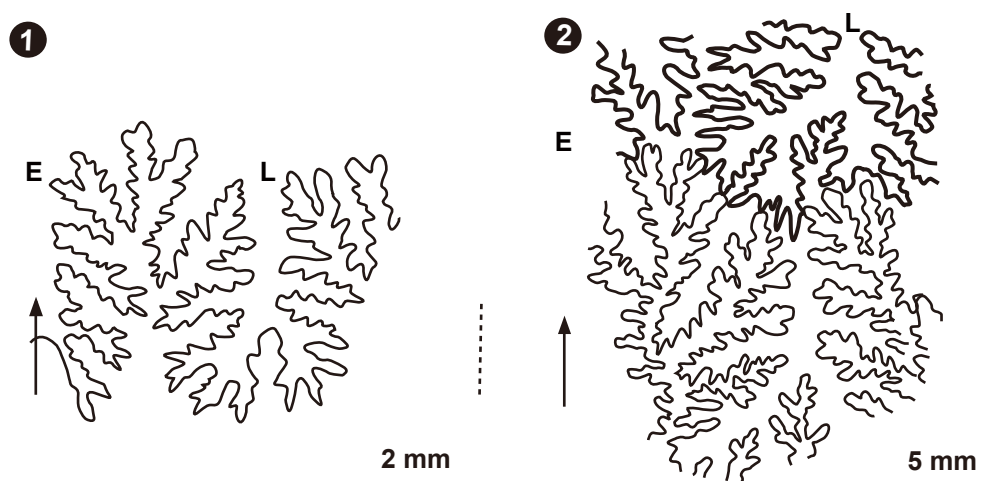


Figure 2. Suture lines of *Tanabeceras yezoense* (Shigeta, 1996) from the Hobetsu area, Hokkaido. **1**, HMG-1601 at H=5.5 mm; **2**, HMG-1600. Bold line represents ultimate suture at D=32.1 mm, and fine line represents penultimate suture. Arrow indicates siphuncle. Broken line indicates position of umbilical shoulder. E, external (ventral) lobe; L, lateral lobe.

Nishida *et al.*, 1997, pl. 7, fig. 6; Kawabe, 2000, pl. 4, fig. 12; Shigeta, 2001, pl. 54, figs. 1–3.

non *Gabbioceras yezoense* Shigeta. Nishida *et al.*, 1997, pl. 7, fig. 5.

Parajaubertella kawakitana Matsumoto. Zonova, Kasintsova and Yazykova, 1993, p. 149, pl. 63, fig. 7; Yazykova, Peryt, Zonova and Kasintsova, 2004, fig. 7.1.

Holotype.—NMNS PM8300, figured by Shigeta (1996, p. 2, figs. 1.1, 2.2), from the lower part of the Lower Cenomanian (*Graysonites adkins*–*G. wooldridgei* Zone of Toshimitsu *et al.*, 1995) in the Yezo Group at Loc. NMNS PCL3-35-4 of the Shumarinai River, Horokanai area, Hokkaido, Japan.

Material.—HMG-1600 (Figure 1.1–1.5), measuring 32.1 mm in shell diameter at last septum, extracted from a float calcareous concretion (with *Sharpeiceras* sp.) 1.5 km upriver from the mouth of the Sasao-no-sawa River (42°51'19"N, 142°11'16"E), a branch of the Hobetsu River, in the Hobetsu area. This specimen consists of the phragmocone (diameter 32.1 mm) and the initial portion of the body chamber.

HMG-1601 (Figure 1.6–1.10), measuring about 16 mm in shell diameter at last septum, extracted from a float calcareous concretion 1.0 km upriver from the mouth of the Imamura-no-sawa River (42°51'55"N, 142°10'59"E), a branch of the Hobetsu River, in the Hobetsu area. It consists of the phragmocone (diameter about 15 mm) and a part of the body chamber.

Description.—Small to medium-sized whorls (up to 25 mm in diameter). Very involute, very depressed shell characterized by a depressed reniform whorl section with

a gently convex umbilical wall, sub-angular umbilical shoulders, and broadly arched venter. Maximum whorl width occurs on umbilical shoulders at about one third of whorl height. Umbilicus fairly narrow, deep and funnel-shaped. Ornamentation consists only of constrictions and fine lirae that are prominent on inner flank and form a very shallow sinus on venter. Suture early gaudryceratid-type with bifid first lateral saddle.

Larger-sized whorls (over 25 mm in diameter). As size increases, whorl section becomes more compressed and venter becomes highly arched. Height of umbilical wall decreases progressively. Shell surface nearly smooth.

Measurements.—Taken at the last septum of HMG-1600, D = 32.1 mm, U = 7.1 mm, H = 15.0 mm, W = 24.2 mm, U/D = 0.22, W/H = 1.61 and at the last septum of HMG-1601, D = 15.4 mm, U = 3.5 mm, H = 6.9 mm, W = 14.5 mm, U/D = 0.23, W/H = 2.10.

Remarks.—Nishida *et al.* (1997) assigned two specimens to *Tanabeceras yezoense* from the lower part of the Lower Cenomanian of the Horokanai area. One specimen (pl. 7, fig. 6) exhibits morphology typical of *T. yezoense*, but the other (pl. 7, fig. 5) differs by its wider umbilicus and more compressed whorls. It should be assigned to a different species of *Tanabeceras*. Hayakawa and Nishino (1999, p. 5, pl. 5i–j) described a specimen from the Nakagawa area, northern Hokkaido as *T. yezoense*, but we refer it to *T. mikasaense* (Shigeta, 1996).

Occurrence.—Both specimens were collected from

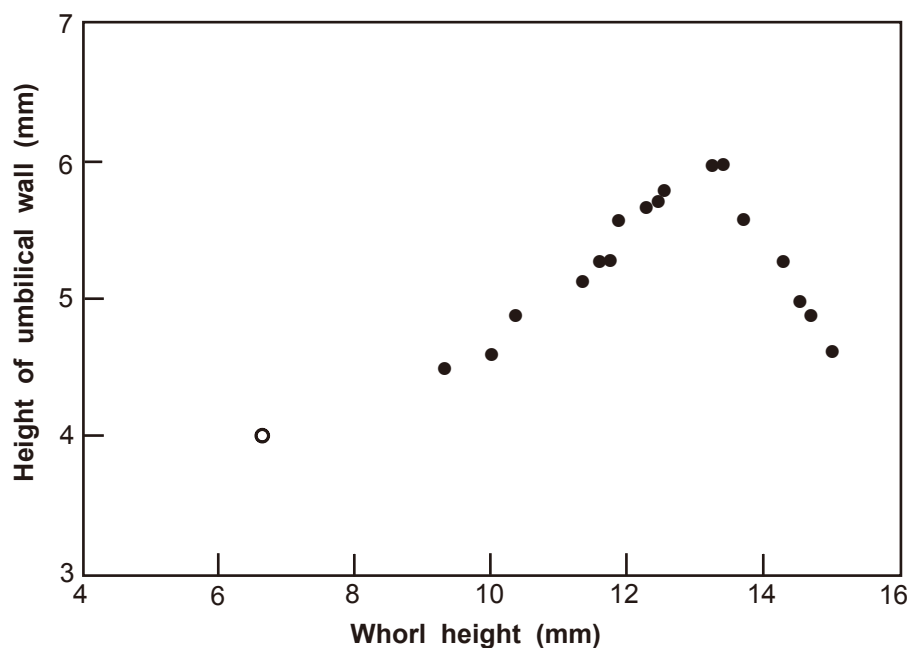


Figure 3. Ontogenetic change of height of umbilical shoulder versus whorl height for *Tanabecerases yezoense* (Shigeta, 1996) from the Hobetsu area, Hokkaido. Black circle, HMG-1600; White circle, HMG-1601.

float calcareous concretions found in tributaries of the Hobetsu River in the Hobetsu area. Although the exact stratigraphic horizon from which these concretions came is uncertain, judging from the localities at which they were found and their lithology, they almost without doubt came from the mudstone of the Inasato Formation of the Yezo Group (Takahashi *et al.*, 2002). In this particular area, the Inasato Formation contains *Parajaubertella kawakitana*, which is characteristic of the *Graysonites adkins*–*G. wooldridgei* Zone in the lower part of the Lower Cenomanian in Hokkaido (Toshimitsu *et al.*, 1995). Therefore, it is highly probable that both came from the lower Lower Cenomanian.

Discussion

HMG-1600, the larger of the two specimens of *Tanabecerases yezoense*, is entirely septate. Had its body chamber been preserved, the shell diameter would be 60–65 mm, assuming a body chamber length of about 300 degrees as in other depressed gaudryceratids.

Because of their rarity, the adult shell size of most species of the subfamily Gabbioceratinae is unknown. *Gabbioceras angulatum* Anderson, 1902, a rare exception, occurs abundantly in the Upper Aptian of California, and specimens with complete body chambers up to 70 mm in diameter have been reported (Murphy,

1967).

In order to recognize an adult shell of *Tanabecerases yezoense*, a good understanding of mature shell modifications is very important. The following modifications are generally accepted as signs of ammonoid maturity: changes in coiling, changes in whorl cross section, changes in ornament, development of an apertural constriction, development of an apertural shell thickening, formation of a characteristic ultimate peristome, changes in the nature of shell deposition, septal approximation (i.e., progressive reduction of interseptal distance), progressive simplification of the last few sutures, thickening of the last septum, and development of muscle scars (Davis, 1972; Davis *et al.*, 1996).

The last two suture lines of HMG-1600 are partly visible, but indications of suture approximation, suture simplification or thickening of the last septum are not present (Figure 2.2). An absence of these particular modifications does not always imply that the specimen is not a mature shell, because many mature ammonoids are known without such modifications.

HMG-1600 exhibits subtle changes in whorl section during ontogeny; the height of the umbilical wall progressively increases until it reaches 13 mm (D about 25 mm), after which it decreases (Figure 3), resulting in a slightly more compressed whorl section. This change is

probably an indication of a later growth stage, because similar changes in whorl section are known only in later growth stages of *Gabbiceras angulatum* (Murphy, 1967). These lines of evidence suggest that HMG-1600 represents a later growth stage shell of *Tanabeceras yezoense*, and its adult shell size is estimated to be 60–65 mm in diameter.

All known specimens of *Tanabeceras yezoense* are smaller than 18 mm in shell diameter, with the exception of HMG-1600. This size difference may lead one to suggest that HMG-1600 is a macroconch and the others are microconches. However, mature modifications have not been recognized in the smaller specimens. Therefore, we are inclined to reject the premise that *T. yezoense* has a dimorphic pair. This assertion is also supported by the fact that there are almost no examples of dimorphic pairs (macroconch and microconch) reported in the literature for gaudryceratid ammonoids (Matsumoto, 1995, Matsumoto *et al.*, 1997).

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重田康成・伊豆倉正隆, 2013, 北海道穂別地域から産出したセノマニアン最前期アンモナイト *Tanabeceras yezoense* (Shigeta). むかわ町立穂別博物館研究報告, **28**, 1-6.

(要 旨)

北海道穂別地域の下部セノマニアン階（上部白亜系）の下部由来の転石から採集された保存良好な *Tanabeceras yezoense* (Shigeta) 2 個体について記載を行った。1 つ目の標本の殻表面には、くびれや弱い肋が観察され、それらは inner flank でよく発達し、venter で成長方向に対して後方に浅く湾曲する。もう一つの標本は、住房部を欠くが、最終隔壁での殻直径は 32.1 mm で、これまで知られている本種の標本の中では最大である。住房部を復元すると、殻直径は 60 ～ 65 mm と推定される。殻断面の変化パターンから、この標本は成長後期を示すと思われる。