

Original Article

Discovery of the middle Campanian (Late Cretaceous) “Soya Fauna” ammonoids in the Hidaka area, Hokkaido, Japan

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Abstract. Middle Campanian (Late Cretaceous) ammonoids of the “Soya Fauna” are reported from the Hidaka area, south-central Hokkaido, northern Japan. The fauna comprises nine ammonoid species: *Menuites soyaensis*, *Menuites* sp., *Schluterella kawadai*, *Canadoceras multicoatum*, *Saghalinites teshioensis*, *Gaudryceras crassicoatum*, *Gaudryceras* sp., *Desmophyllites diphyloides* and *Damesites* sp. Because the fauna has not been found in areas other than the Soya area of northernmost Hokkaido and Sakhalin, its discovery in the Hidaka area of south-central Hokkaido strongly suggests that the fauna was distributed over a wide area in the Cretaceous Yezo Basin; thus, its ammonoids are ideal for the precise biostratigraphic correlation of middle Campanian strata in this particular basin.

Key words: ammonoid, Cretaceous, Hidaka, Hokkaido, middle Campanian, Soya Fauna
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Introduction

The “Soya Fauna” of middle Campanian (Late Cretaceous) age is characterized by the presence of *Menuites soyaensis* (Matsumoto and Miyauchi, 1984) and associated ammonoids, e.g. *Schluterella kawadai* Matsumoto and Miyauchi, 1984, *Canadoceras multicoatum* Matsumoto, 1954, *Desmophyllites diphyloides* (Forbes, 1846) and *Gaudryceras crassicoatum* (Jimbo, 1894). The fauna is well documented from exposure of the Orannai Formation (Yezo Group) in Soya harbor, located 6 km southwest of Cape Soya at the northernmost point of Hokkaido, northern Japan (Matsumoto and Miyauchi, 1984); it is also known from the Krasnoyarka Formation in the Naiba and Makarov areas in southern Sakhalin, Russian Far East (Kodama *et al.*, 2002; Maeda *et al.*, 2005). Until now, the “Soya Fauna” in Hokkaido has only been reported from the Soya area, but we recently discovered ammonoids representative of the fauna in float concretions collected from a small tributary of the Pankeushappu River in the Hidaka area, south-central Hokkaido (Figures 1, 2). Most specimens of *Menuites soyaensis* from the Soya area and Sakhalin are badly

deformed, but some specimens from the Hidaka area are well preserved with no distortion, thus exhibiting easily understood shell morphology.

In this paper, we document the “Soya Fauna” in the Hidaka area and discuss its biostratigraphic implications for the middle Campanian in south-central Hokkaido.

Notes on stratigraphy

The Chinomigawa Formation of the Yezo Group is exposed along the upper course of a small tributary of the Pankeushappu River. The strata, striking N20° westward to N15° eastward and dipping 30–75° eastward, consist mainly of sandy mudstone with sandstone (Figure 1). Float concretions containing middle to late Campanian ammonoids are abundant, but *in-situ* concretions with age-diagnostic ammonoids or inoceramids are extremely rare. Thus far, Shigeta and Izukura (2018) have found only one *in-situ* concretion from the area, which contained the late Campanian ammonoid *Patagiosites alaskensis* Jones, 1963 and an inoceramid bivalve *Inoceramus shikotanensis* Nagao and Matsumoto, 1940. Although the exact localities from which the concretions containing the “Soya

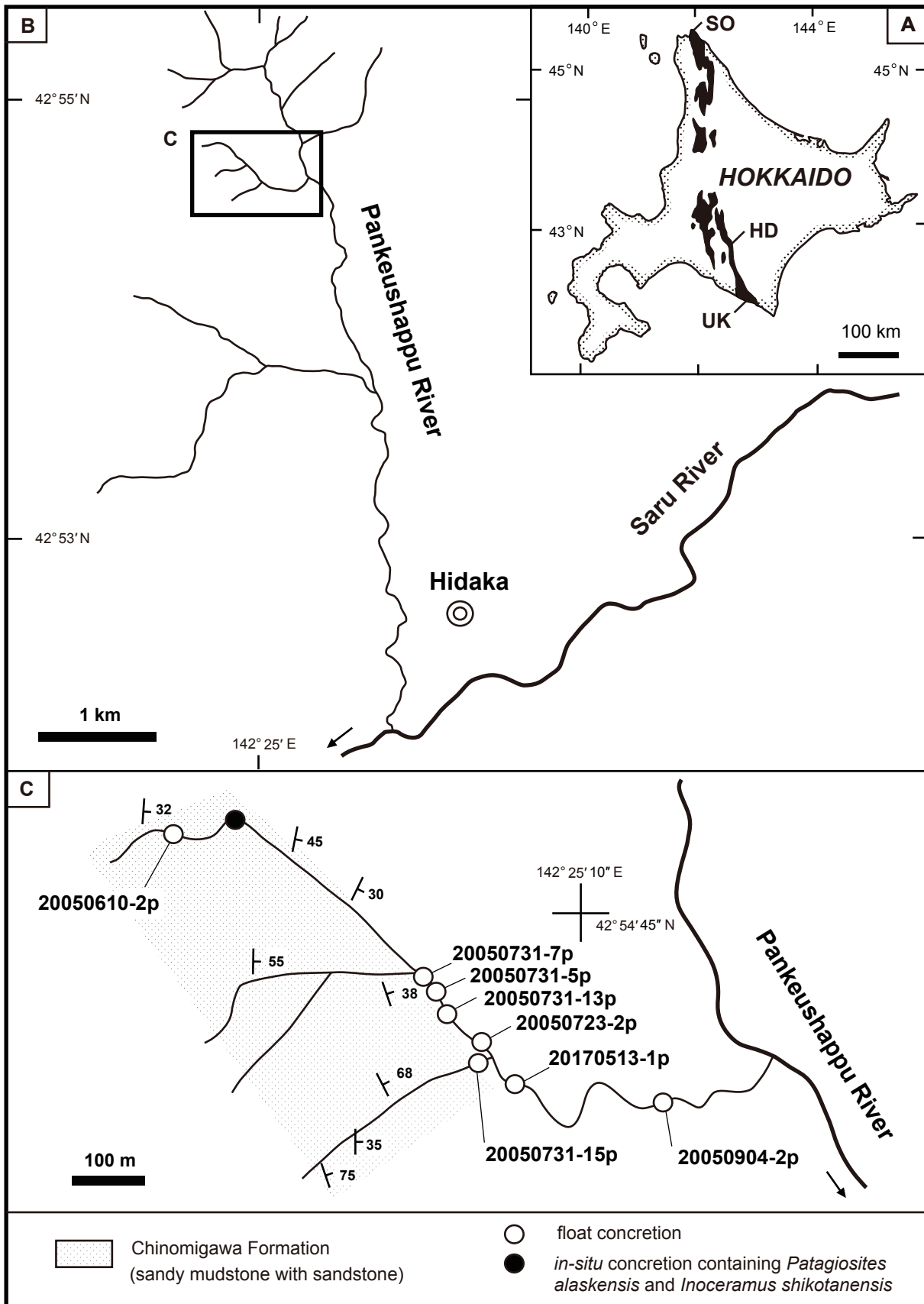


Figure 1. Index map showing distribution of the Yezo Group (black areas) in Hokkaido (A), studied area (B), and geological map and localities of concretions containing the “Soya Fauna” (white circles) and in-situ late Campanian (solid black circle, after Shigeta and Izukura, 2018) fossils along a small tributary of the Pankeushappu River in the Hidaka area (C). HD, Hidaka; SO, Soya; UK, Urakawa.

Table 1. List of ammonoids and inoceramid from eight float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. Concretion and Hobetsu Museum (HMG) specimen numbers are shown. *Sgh*, *Saghalinites teshioensis*; *Gsp*, *Gaudryceras* sp.; *Gcr*, *Gaudryceras crassicostatum*; *Dsp*, *Damesites* sp.; *Ddiphy*, *Desmophyllites diphyloides*; *Cmt*, *Canadoceras multicostatum*; *Mso*, *Menuites soyaensis*; *Msp*, *Menuites* sp.; *Schl*, *Schluterella kawadai*; *Iba*, *Inoceramus balticus*.

Concretion	<i>Sgh</i>	<i>G sp</i>	<i>Gcr</i>	<i>D sp</i>	<i>Ddiphy</i>	<i>Cmt</i>	<i>Mso</i>	<i>Msp</i>	<i>Schl</i>	<i>Iba</i>
20050731-5p						1839				
20050731-7p		1828		1830	1831, 1832		1840			1846
20050731-13p					1835	1838				
20050731-15p			1829		1834		1842	1843		
20050610-2p					1833			1844		
20050723-2p	1827									
20050904-2p					1836, 1837				1845	
20170513-1p							1841			

Fauna" originated are uncertain, judging from the localities where they were found, and the geological structure and *in-situ* late Campanian fossils, they almost certainly came from the uppermost reaches of the tributary.

Fossil occurrences

Eight float concretions containing fossils representative of the "Soya Fauna" were collected in a small tributary of the Pankeushappu River (Figure 1, Table 1). Three of the concretions (20050731-7p, 20050731-15p, 20170513-1p) contained *Menuites soyaensis*. Concretion 20050731-7p also contained *Desmophyllites diphyloides*, *Damesites* sp., *Gaudryceras* sp. and the inoceramid *Inoceramus balticus* Böhm, 1909; concretion 200507-15p also contained *Gaudryceras crassicostatum*, *D. diphyloides* and *Menuites* sp. One concretion (20050904-2p) contained *Schluterella kawadai* together with *D. diphyloides*. *Canadoceras multicostatum* was found in two concretions (20050731-5p, 20050731-13p), and concretion 20050731-13p also contained *Desmophyllites diphyloides*. *Saghalinites teshioensis* Matsumoto, 1984a was found in 20050723-2p. One concretion (20050610-2p) contained *D. diphyloides* and *Menuites* sp.

Paleontological description

Morphological terms are those used in Arkell (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* = whorl width.

Institution abbreviations.—BMNH = Natural History Museum, London; GK = Department of Earth and Planetary Sciences, Kyushu University, Fukuoka; HMG = Hobetsu Museum, Mukawa; NMNS = National Museum of Nature and Science, Tsukuba; UMUT = University Museum, University of Tokyo.

Suborder Lytoceratina Hyatt, 1889

Superfamily Tetragonitoidea Hyatt, 1900

Family Tetragonitidae Hyatt, 1900

Genus *Saghalinites* Wright and Matsumoto, 1954

Type species.—*Ammonites cala* Forbes, 1846.

Saghalinites teshioensis Matsumoto, 1984a

Figure 2A

Saghalinites teshioensis Matsumoto, 1984a, p. 27, pl. 9, figs. 1–3; Matsumoto, 1988, p. 179, pl. 51, fig. 1; Maeda *et al.*, 2005, p. 90, fig. 45; Takahashi *et al.*, 2007, pl. 5, figs. 6, 7; Shigeta *et al.*, 2016, p. 331, fig. 7A–C.

Holotype.—GK. H5971, figured by Matsumoto (1984a, p. 27, pl. 9, fig. 1), from the *Hoplitoplacenticeras fugen* Subzone of the *Metaplacenticeras subtilistriatum* Zone (middle Campanian) in the Uttsu River area, Teshio Mountains, northern Hokkaido.

Material examined.—One specimen, HMG-1827, from 20050723-2p.

Description.—Very evolute, rounded ventral shoulders and slightly convex flanks. Umbilicus fairly wide with low, nearly vertical wall and rounded shoulders. Ornamentation consists only distant constrictions and very fine growth lines, which are prorsiradiate on flanks.

Remarks.—The described specimen is only a fragment, but it well illustrates the diagnostic features of *Saghalinites teshioensis* (see Matsumoto, 1984a, p. 27 for the diagnosis). See Shigeta *et al.* (2016) for a recent discussion of *S. teshioensis*.

Occurrence.—Described specimen was collected from a float concretion that contained no additional characteristic “Soya Fauna” fossils. *Saghalinites teshioensis* occurs in the *Schluterella kawadai* Subzone of the *Metaplacenticeras subtilistriatum* Zone (middle Campanian) in the Soya Cape area, Hokkaido (Matsumoto, 1984b), in the Naiba and Makarov areas, southern Sakhalin (Matsumoto, 1988; Maeda *et al.*, 2005) and in the *Hoplitoplacenticeras fugen* Subzone of the *M. subtilistriatum* Zone (middle Campanian) in the Teshio Mountains, Hokkaido (Matsumoto, 1984a). It is also known from the *Baculites subanceps* Zone (lower upper Campanian) in the Urakawa area (Shigeta *et al.*, 2016).

Family Gaudryceratidae Spath, 1927
Genus *Gaudryceras* Grossouvre, 1894

Type species.—*Ammonites mitis* Hauer, 1866.

Gaudryceras crassicostatum (Jimbo, 1894)
Figure 2E, F

Lytoceras crassicostatum Jimbo, 1894, p. 182, pl. 22, fig. 7.
Gaudryceras crassicostatum (Jimbo). Yabe, 1903, p. 29, pl. 4, fig. 4; Matsumoto, 1984c, p. 6, pl. 4, figs. 1–3, pl. 5, figs. 1, 2; Matsumoto *et al.*, 1985, p. 20, pl. 1, figs. 1–3, pl. 2, figs. 1–4, pl. 3, figs. 7–10; Maeda *et al.*, 2005, p. 66, fig. 25.7–25.10.
Gaudryceras cf. *crassicostatum* (Jimbo). Shigeta *et al.*, 2016, p. 334, fig. 8A–C.

Holotype.—UMUT. MM7492, figured by Jimbo (1894, p. 182, pl. 22, fig. 7), from the Cretaceous in the Soya area, northern Hokkaido. Its exact collection locality and horizon are unknown.

Material examined.—One specimen, HMG-1829,

from 20050731-15p.

Description.—Fairly evolute, fairly compressed shell with elliptical cross section at middle growth stage. As shell growth, umbilical width becomes smaller. Ornamentation on body chamber consists of very fine, dense lirae and collar-like ribs, which arise at umbilical seam and become slightly sigmoidal before passing over venter with a broad convex arch.

Remarks.—The described specimen is a fragment, but the ornamentation with collar-like ribs suggests that it is an adult or sub-adult shell of *Gaudryceras crassicostatum*.

Occurrence.—Described specimen was collected from a float concretion that also contained *Menuites soyaensis*. *Gaudryceras crassicostatum* is known from the *Schluterella kawadai* Subzone of the *Metaplacenticeras subtilistriatum* Zone (middle Campanian) in the Soya Cape area and the middle Campanian in the Urakawa area, Hokkaido as well as from several areas in southern Sakhalin (Matsumoto *et al.*, 1985; Shigeta *et al.*, 1999, 2016; Maeda *et al.*, 2005).

Gaudryceras sp.
Figure 2B–D

Material examined.—One specimen, HMG-1828, from 20050731-7p.

Description.—Very evolute, slightly depressed shell with arched venter, indistinct ventral shoulders, and slightly convex flanks with maximum whorl width at mid-flank. Umbilicus fairly wide with moderately high, vertical wall and rounded shoulders. Ornamentation consists of fine, dense, slightly sinuous lirae, which arise at umbilical seam and pass over venter in a broad convex arch. Intercalation of lirae occurs on umbilical shoulder and lower flank. Each whorl has variable dense or distant, rounded, collar-like ribs, running parallel to lirae.

Measurements.—Taken at $D = 57.0$ mm of HMG-1828, $U = 25.4$ mm, $H = 17.5$ mm, $W = 18.7$ mm, $U/D = 0.45$, $W/H = 1.07$.

Remarks.—The described specimen is very similar to the inner whorls of *Gaudryceras mamiyai* Matsumoto and Miyauchi, 1984, but the lack of adult features prevents a definitive species assignment.

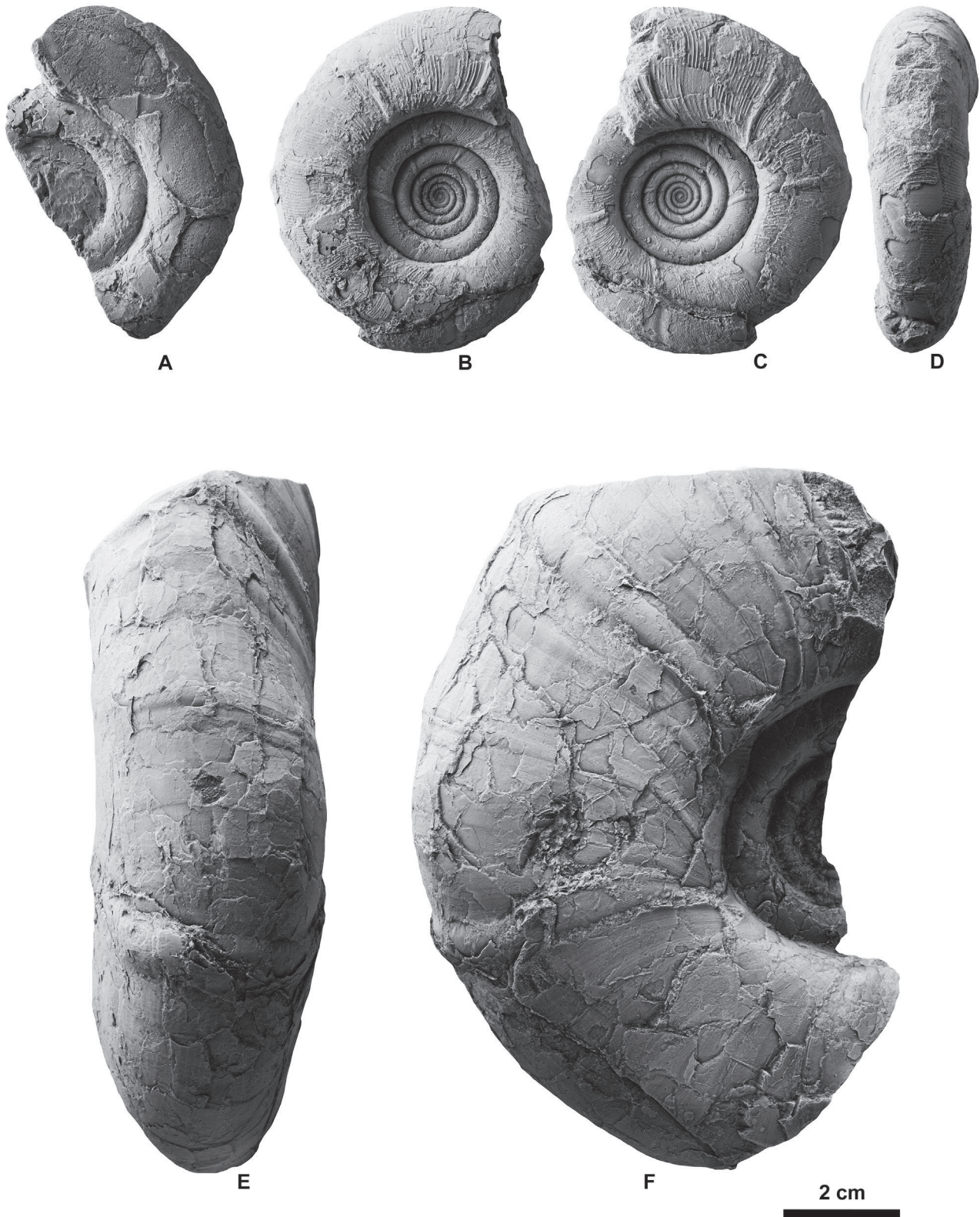


Figure 2. *Saghalinites* and *Gaudryceras* from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. **A**, *Saghalinites teshioensis* Matsumoto, 1984a, HMG-1827, from 20050723-2p; **B–D**, *Gaudryceras* sp., HMG-1828, from 20050731-7p; **E, F**, *Gaudryceras crassicostatum* (Jimbo, 1894), HMG-1829, from 20050731-15p.

Occurrence.—Described specimen was collected from a float concretion that also contained *Menuites soyaensis*.

Suborder Ammonitina Hyatt, 1889
 Superfamily Desmoceratoidea Zittel, 1895
 Family Desmoceratidae Zittel, 1895
 Genus **Damesites** Matsumoto, 1942

Type species.—*Desmoceras damsii* Jimbo, 1894.

Damesites sp.
 Figure 3A–C

Material examined.—One specimen, HMG-1830, from 20050731-7p.

Description.—Very involute, fairly compressed shell with elliptical whorl section, rounded venter with distinct keel, rounded ventral shoulders, and nearly flat flanks with maximum whorl width at ventral shoulder. Umbilicus deep and very narrow with vertical wall and rounded shoulders. Ornamentation consists only of very fine, sinuous growth lines.

Remarks.—The described specimen is very similar to *Damesites hetonaiensis* Matsumoto, 1954 and *D. sugata* (Forbes, 1846) in having a rounded venter with a distinct keel. However, the fragmental nature of the specimen prevents a definitive species assignment.

Occurrence.—Described specimen was collected from a float concretion that also contained *Menuites soyaensis*.

Genus **Desmophyllites** Spath, 1929

Type species.—*Desmoceras lartei* Seunes, 1891.

Desmophyllites diphylloides (Forbes, 1846)
 Figure 3D–Y

Ammonites diphylloides Forbes, 1846, p. 105, pl. 8, fig. 8.
Desmophyllites diphylloides (Forbes). Matsumoto and Obata, 1955, p. 121, pl. 24, figs. 1, 5, pl. 30, fig. 1; Matsumoto, 1959, p. 9, pl. 3, fig. 3, text-fig. 2; Howarth, 1965, p. 388, pl. 11, fig. 3; Matsumoto, 1984a, p. 12, pl. 1, fig. 2; Henderson and McNamara, 1985, p. 54, pl. 4, figs. 1–4; Haggart, 1989, p. 193, pl. 8.4, figs. 1–13; Kennedy and Henderson, 1992, p. 405, pl. 6, figs. 1–9, pl. 16, figs. 1–3, 7, 8, pl. 17, figs. 4–7, text-fig. 3F; Alabushev and Wiedmann, 1997, p. 22, pl. 6, figs. 3–5; Ando and Ando, 2002, pl. 3, fig. 4;

Ifrim *et al.*, 2004, p. 1594, text-fig. 9F; Maeda *et al.*, 2005, p. 104, fig. 53.7–53.14; Takahashi *et al.*, 2007, pl. 5, figs. 4, 5; Misaki and Maeda, 2009, fig. 8I–L; Shigeta *et al.*, 2016, p. 335, figs. 8F, G, 10, 11.
 non. *Desmophyllites diphylloides* (Forbes). Matsumoto and Obata, 1955, p. 121, pl. 24, figs. 2–4, text-fig. 1.

Lectotype.—Specimen designated by Matsumoto and Obata (1955, p. 122), is BMNH C22682, original of Forbes (1846, p. 105, pl. 8, fig. 8) from the Maastrichtian? of Pondicherry, southern India.

Material examined.—Two specimens, HMG-1831, 1832, from 20050731-7p; one specimen, HMG-1833, from 20050610-2p; one specimen, HMG-1834, from 20050731-15p; one specimen, HMG-1835, from 20050731-13p; two specimens, HMG-1836, 1837, from 200506904-2p.

Description.—Very involute, fairly compressed shell with elliptical whorl section, rounded venter and rounded ventral shoulder. Umbilicus deep and very narrow with vertical wall and rounded shoulders. Ornamentation consists of distant constrictions and very fine, growth lines, which arise at umbilical seam, become slightly sigmoidal on flank and project sharply forward on ventral shoulder before passing over venter in a narrow, convex arch.

Remarks.—The described specimens well illustrates the characteristics of *Desmophyllites diphylloides* which has been reported by Matsumoto (1984a), Maeda *et al.* (2005) and Shigeta *et al.* (2016) from the middle to upper middle Campanian in Hokkaido and Sakhalin. See Shigeta *et al.* (2016) for a recent discussion of *D. diphylloides*.

Occurrence.—Described specimen was collected from five float concretions in which typical “Soya Fauna” fossils were also found. *Desmophyllites diphylloides* is known from the Santonian to the upper Maastrichtian in southern India (Kennedy and Henderson, 1992), Western Australia (Henderson and McNamara, 1985), northeastern Mexico (Ifrim *et al.*, 2004) and Angola (Howarth, 1965), but it has been reported only from the middle to upper Campanian interval in Hokkaido (Matsumoto, 1984a, b; Shigeta *et al.*, 2016), southern Sakhalin (Maeda *et al.*, 2005), Vancouver (Haggart, 1989) and from the middle Campanian in Wakayama, southwestern Japan (Misaki and Maeda, 2009).



Figure 3. *Damesites* and *Desmophyllites* from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. **A–C**, *Damesites* sp., HMG-1830, from 20050731-7p; **D–Y**, *Desmophyllites diphylloides* (Forbes, 1846); **D–G**, HMG-1831, from 20050731-7p; **H–K**, HMG-1832, from 20050731-7p; **L, M**, HMG-1833, from 20050610-2p; **N, O**, HMG-1834, from 20050731-15p; **P–S**, HMG-1835, from 20050731-13p; **T–W**, HMG-1836, from 20050904-2p; **X, Y**, HMG-1837, from 20050904-2p.

Family Pachydiscidae Spath, 1922

Genus *Canadoceras* Spath, 1922

Type species.—*Ammonites newberryanus* Meek, 1876.

Canadoceras multicostatum Matsumoto, 1954

Figure 4

Canadoceras multicostatum Matsumoto, 1954, p. 304, pl. 34, figs. 1, 2, text-fig. 28; Matsumoto, 1984a, p. 18, pl. 3, figs. 1–3; Matsumoto and Miyauchi, 1984, p. 47, pl. 18, figs. 1, 2, pl. 20, fig. 2; Maeda *et al.*, 2005, fig. 12.3, 12.4; Takahashi *et al.*, 2007, pl. 5, figs. 9, 10; Shigeta *et al.*, 2016, p. 339, fig. 15.

Mesopuzosia densicostata Matsumoto. Matsumoto, 1984a, p. 13, pl. 2, figs. 1, 2.

Holotype.—UNUT MM9118, figured by Matsumoto (1954, p. 304, pl. 34, fig. 1), from the Upper Cretaceous in the Togushi (= Gorbusha) area of the Nishinotoro (= Kril'on) Peninsula, southern Sakhalin.

Material examined.—One specimen, HMG-1838, from 20050731-13p; one specimen, HMG-1839, from 20050731-5p.

Description.—Moderately evolute, fairly compressed shell with elliptical whorl section, rounded venter, indistinct ventral shoulders, and gently convex flanks with maximum whorl width at mid-flank. Umbilicus moderately wide with moderately high, vertical wall and rounded shoulders. Ornamentation consists of numerous, prorsiradiate ribs as well as distinct constrictions, major ribs and umbilical tubercles.

Remarks.—The described specimens well illustrate the features of the early to middle ontogenetic stages of *Canadoceras multicostatum*, which were reported by Matsumoto (1954) and Matsumoto (1984a). See Shigeta *et al.* (2016) for a recent discussion of *C. multicostatum*.

Occurrence.—Described specimens were collected from two float concretions that contained no other characteristic “Soya Fauna” fossils. *Canadoceras multicostatum* is known from the middle Campanian in the Urakawa area, Teshio Mountains, Soya Cape area in Hokkaido and the Naiba and Makarov areas in southern Sakhalin (Matsumoto, 1954, 1984a; Matsumoto and Miyauchi, 1984; Maeda *et al.*, 2005; Shigeta *et al.*,

2016).

Genus *Menuites* Spath, 1922

Type species.—*Ammonites menu* Forbes, 1846.

Menuites soyaensis (Matsumoto and Miyauchi, 1984)

Figures 5, 6A–D

Pachydiscus soyaensis Matsumoto and Miyauchi, 1984, p. 41, pls. 11–13, pl. 16, fig. 1, pl. 17, fig. 2, pl. 21, fig. 3. *Menuites soyaensis* (Matsumoto and Miyauchi). Kodama *et al.*, 2002, fig. 8A, B; Maeda *et al.*, 2005, fig. 13.1, 13.2

Holotype.—GK. H5972, figured by Matsumoto and Miyauchi (1984, p. 41, pl. 11), from the *Schlueterella kawadai* Subzone of the *Metaplacenticerias subtilistriatum* Zone (middle Campanian) at the Soya harbor (Loc. W7B in Matsumoto and Miyauchi, 1984), in the Soya area, northern Hokkaido.

Material examined.—One specimen, HMG-1840, from 20050731-7p; one specimen, HMG-1841, from 20170513-1p; one specimen, HMG-1842, from 20050731-15p.

Description.—Moderately involute with circular whorl section, rounded venter, indistinct ventral shoulders, and gently convex flanks with maximum whorl width at mid-flank. Umbilicus fairly narrow, with high, convex wall and rounded shoulders. Ornamentation consists of long ribs that form a tubercle with elongated base near umbilical shoulder and shorter intercalated ribs that begin on the umbilical shoulder or inner flank. Ribs curve slightly forward on the ventral shoulder and pass over venter in a broad convex arch.

Remarks.—Kodama *et al.* (2002) changed the generic assignment of this species from *Pachydiscus* Zittel, 1884 to *Menuites* without explanation, but the features of the moderately involute shell with tubercles above the umbilical shoulder support the assignment by Kodama *et al.* (2002). All of the specimens examined by Matsumoto and Miyauchi (1984) are at least slightly deformed and a few are very badly distorted. This preservation may have let them to believe that the shell was more slender, and similar in shape to *Pachydiscus*. Furthermore, the fact that the outer shell material is missing from most of the specimens may have

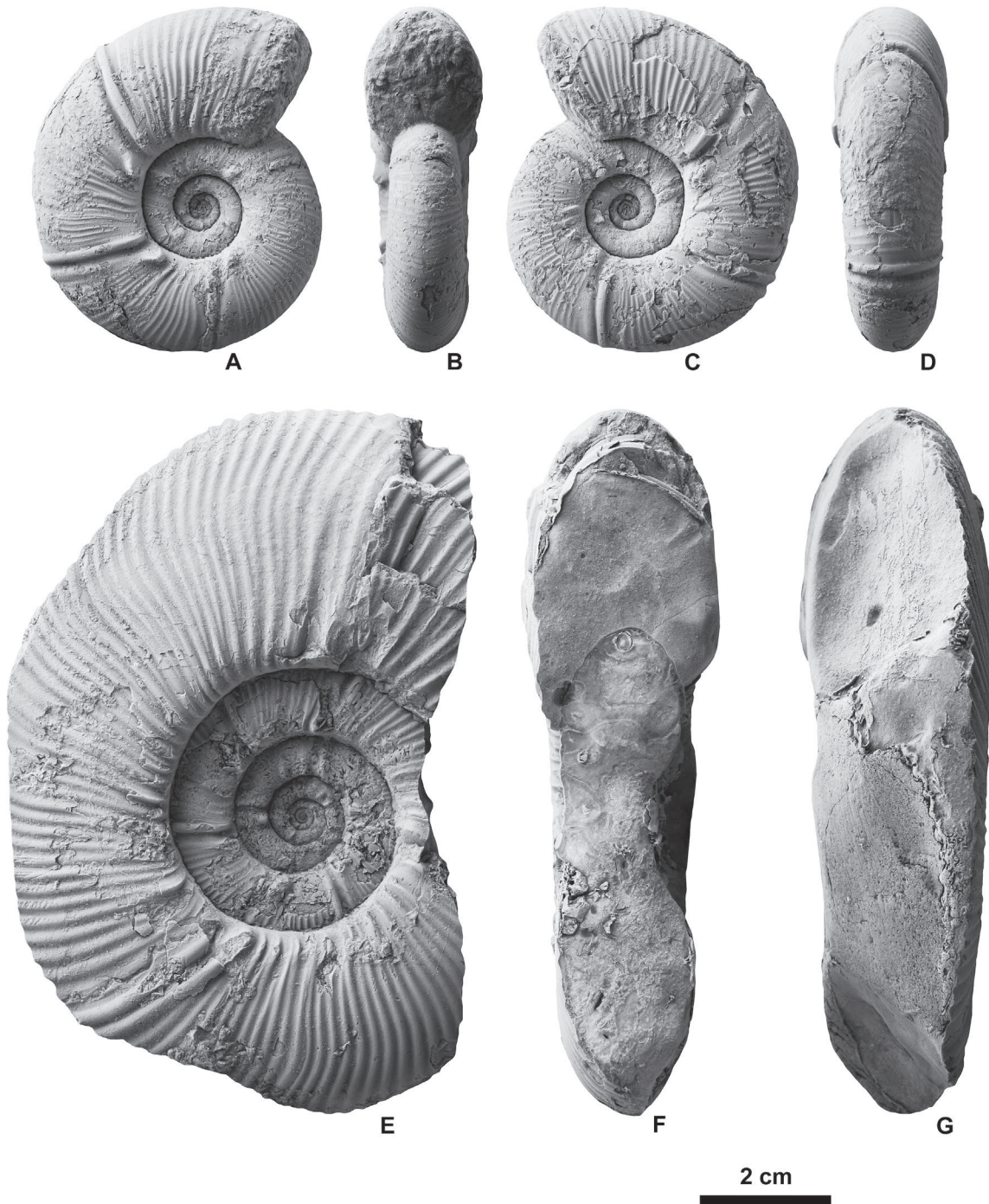


Figure 4. *Canadoceras multicostatum* Matsumoto, 1954 from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. **A–D**, HMG-1838, from 20050731-13p; **E–G**, HMG-1839, from 20050731-5p.

contributed to this misunderstanding. Additionally, the missing shell material makes the elongated base of the umbilical tubercle appear somewhat similar to the umbilical bullae of *Pachydiscus*.

Occurrence.—Described specimens were collected from three float concretions. *Menuites soyaensis* is known from the middle Campanian in the Soya Cape area in Hokkaido and the Naiba and Makarov areas in

southern Sakhalin (Matsumoto and Miyauchi, 1984; Kodama *et al.*, 2002; Maeda *et al.*, 2005).

Menuites sp.

Figure 6E–L

Pseudomenites sp. Matsumoto and Miyauchi, 1984, p. 47, pls. 16, fig. 1, pl. 17, fig. 1; Maeda *et al.*, 2005, fig.



Figure 5. *Menuites soyaensis* (Matsumoto and Miyauchi, 1984) from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. **A–C**, HMG-1840, from 20050731-7p; **D–F**, HMG-1841, from 20170513-1p.

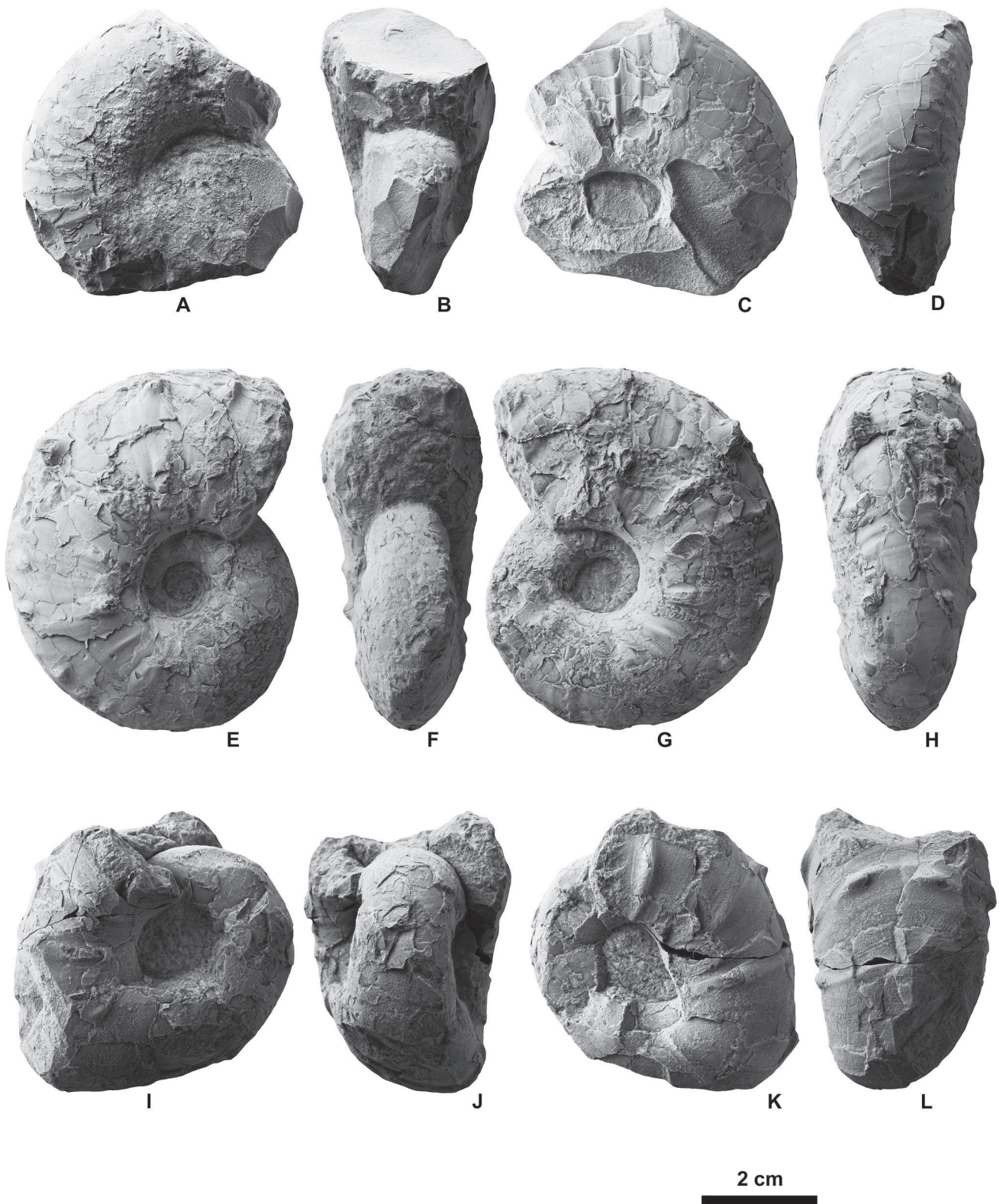


Figure 6. *Menuites* from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. A–D, *Menuites soyaensis* (Matsumoto and Miyauchi, 1984), HMG-1842, from 20050731-15p; E–L, *Menuites* sp.; E–H, HMG-1843, from 20050731-15p; I–L, HMG-1844, from 20050610-2p.

13.3–13.5.

Material examined.—One specimen, HMG-1843, from 20050731-15p; one specimen, HMG-1844, from 20050610-2p.

Description.—Moderately involute with circular whorl section, rounded venter, indistinct ventral shoulders, and gently convex flanks with maximum whorl width at mid-flank. Umbilicus fairly narrow, with high, convex wall and rounded shoulders. Ornamentation consists of major ribs that form umbilical and ventrolateral tubercles, and very weak, fine intercalated ribs. Ribs curve slightly forward on the ventral shoulder and pass over venter in a broad convex arch.

Remarks.—As Matsumoto and Miyauchi (1984) pointed out, this species is very similar to *Menuites soyaensis* but is smaller and has ventrolateral tubercles in the late growth stages. It is possible that the two forms might represent a dimorphic pair. However, sufficient study to support such hypothesis is beyond the scope of this work.

Occurrence.—Described specimens were collected from two float concretions, one of which also contained *Menuites soyaensis*.

Suborder Ancyloceratina Wiedmann, 1966
 Superfamily Turrilitoidea Gill, 1871
 Family Diplomoceratidae Spath, 1926
 Genus *Schluterella* Wiedmann, 1962

Type species.—*Ancyloceras pseudoarmatum* Schlüter, 1872.

Schluterella kawadai Matsumoto and Miyauchi, 1984
 Figure 7A–D

Hamites cf. *amartus* Sowerby. Kawada in Kawasaki, 1934, pl. 7, fig. 15, pl. 8, fig. 16.
Schluterella kawadai Matsumoto and Miyauchi, 1984, p. 61, pl. 26, fig. 1, pl. 27, fig. 3, 4, pl. 28, fig. 2, pl. 29, fig. 1, pl. 30, fig. 1, 2, pl. 31, fig. 3, text-fig. 9; Maeda *et al.*, 2005, p. 100, fig. 51.8–51.13.

Holotype.—GK. H5978, figured by Matsumoto and Miyauchi (1984, p. 61, pl. 26, fig. 1), from the *Schluterella kawadai* Subzone of the

Metaplacenticeras subtilistriatum Zone (middle Campanian) in the Soya harbor in the Soya area, northern Hokkaido.

Material examined.—One specimen, HMG-1845, from 20050904-2p.

Description.—HMG-1845, consisting of a slightly curved shaft, is ornamented by numerous ribs, which are slanted forward when viewed laterally. Periodic major ribs encircle the shell and each rib is adorned with four spinose tubercles, one on each side of the ventral zone and one at mid-flank on each side.

Remarks.—The described specimen is only a fragment, but it well illustrates the features of the middle ontogenetic stage of *Schluterella kawadai* (Matsumoto and Miyauchi, 1982).

Occurrence.—Described specimen was collected from a float concretion that also contained *Desmophyllites diphyloides*. *Schluterella kawadai* is known from the middle Campanian in the Teshio Mountains and Soya Cape areas in Hokkaido, and the Naiba and Makarov areas in southern Sakhalin (Matsumoto and Miyauchi, 1984; Matsumoto, 1984b; Maeda *et al.*, 2005).

Discussion

Until now, the “Soya Fauna”, which is primarily characterized by the presence of *Menuites soyaensis*, has been reported only from the middle Campanian of southern Sakhalin and northernmost Hokkaido (Matsumoto and Miyauchi, 1984; Kodama *et al.*, 2002; Maeda *et al.*, 2005). The discovery of the fauna in the Hidaka area of south-central Hokkaido strongly suggests that it was distributed in a wide area in the Cretaceous Yezo Basin, and thus, its fauna is ideal for the precise biostratigraphic correlation of middle Campanian strata in this particular basin.

A complete succession of marine fossil assemblages spanning the middle to upper Campanian has not yet been found in Hokkaido or Sakhalin. Shigeta *et al.* (2016) discovered a continuous succession yielding middle Campanian *Metaplacenticeras subtilistriatum* (Jimbo, 1894) and early late Campanian *Baculites subanceps* Haughton, 1925 together with *Didymoceras hidakense* Shigeta (in Shigeta *et al.*, 2016) in the Chinomigawa Formation in the Urakawa area of

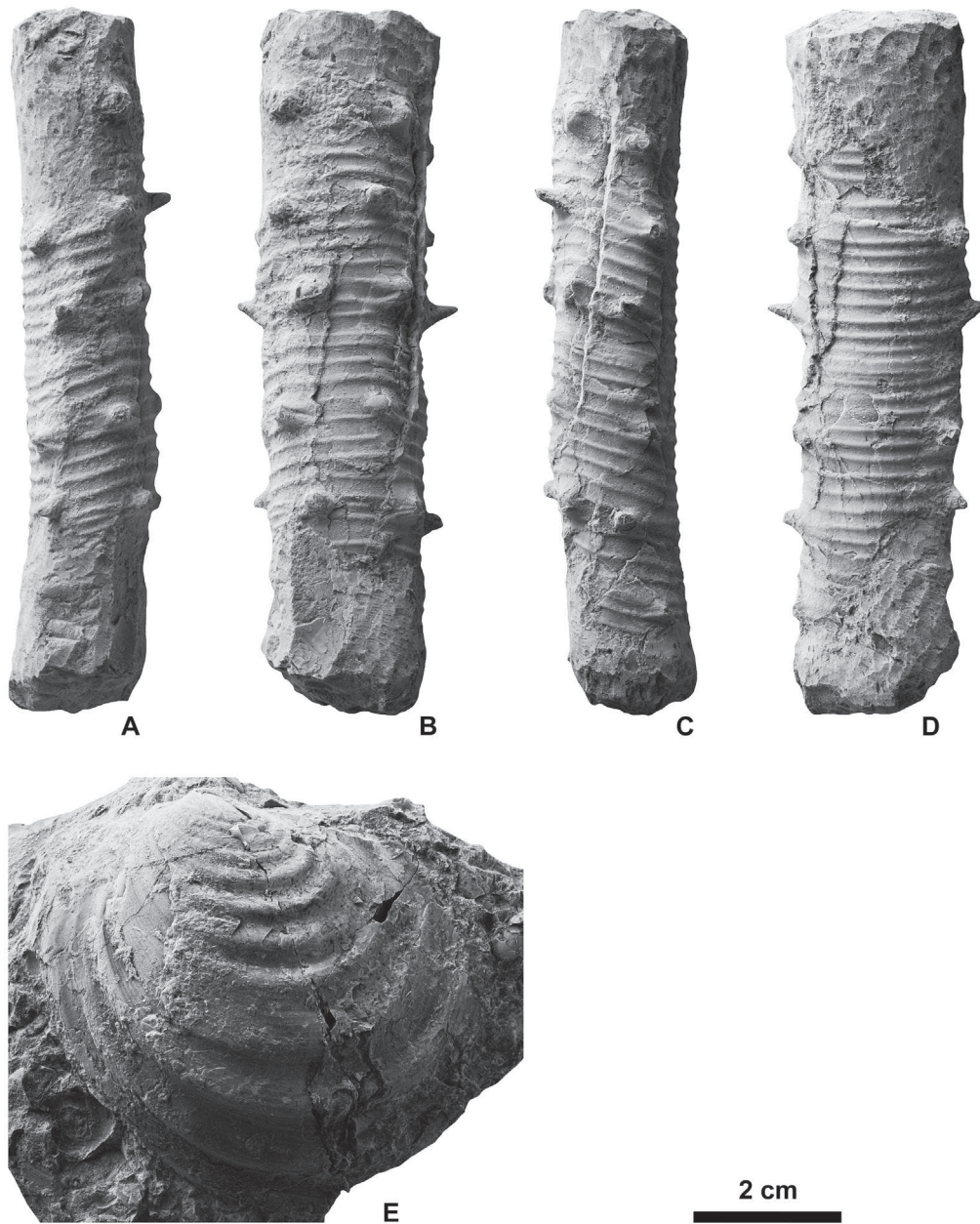


Figure 7. *Schlueterella* and *Inoceramus* from float concretions found in a small tributary of the Pankeushappu River in the Hidaka area, Hokkaido. **A–D**, *Schlueterella kawadai* Matsumoto and Miyauchi, 1984, HMG-1845, from 20050904-2p; **E**, *Inoceramus balticus* Böhm, 1909, HMG-1846, from 20050731-7p.

Hokkaido, but the “Soya Fauna” was missing.

The discovery of the “Soya Fauna” in this study and *Pravitoceras sigmoidale* Yabe, 1902 by Shigeta and Izukura (2018) suggests that middle to upper Campanian strata may crop out along the Pankeushappu River in the Hidaka area. Although a detailed stratigraphic study of the Cretaceous has not been conducted in the area, it is anticipated that further geological and paleontological work may provide a complete succession of marine fossil assemblages spanning the middle to late Campanian.

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(要旨)

北海道日高地域からカンパニアン期中期(白亜紀後期)のいわゆる宗谷型アンモナイト群を発見した。アンモナイトは9種で, *Menuites soyaensis*, *Menuites* sp., *Schluterella kawadai*, *Canadoceras multicoatum*, *Saghalinites teshioensis*, *Gaudryceras crassicoatum*, *Gaudryceras* sp., *Desmophyllites diphylloides*, *Damesites* sp. を含む。宗谷型アンモナイト群は、これまで北海道最北の宗谷地域やサハリンで産出が確認されていた。今回の発見により、このアンモナイト群が北海道やサハリンを含む白亜系エゾ堆積盆内に広く分布していたことがわかった。このことは、宗谷型アンモナイト群がエゾ堆積盆内においてカンパニアン階中部の精密対比に有効であることを強く示唆する。