697. NEW SPECIES OF APIOTRIGONIA AND SENIS FROM THE UPPERMOST CRETACEOUS OF HOKKAIDO*

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Abstract. Apiotrigonia hetonaiana sp. nov. from the Hakobuchi Group and the Chinomigawa Formation in Hokkaido, is probably a derivative from Apiotrigonia crassoradiata Nakano. The former is restricted to the Upper Campanian and Maestrichtian, while the latter is known from the Lower to Middle Campanian in Hokkaido, Shikoku and Kyushu. Senis japonica sp. nov. is an edentulous bivalve, occurring from the Hakobuchi Group (Maestrichtian) in Hokkaido. This is the first record of Senis in the Cretaceous of Japan.

Introduction and Acknowledgements

This paper deals with the description of two new bivalve species, Apiotrigonia hetonaiana sp. nov. and Senis japonica sp. nov., and also Apiotrigonia crassoradiata Nakano from the Hetonaian of the Upper Cretaceous in Hokkaido. Nagao and Otatume (1938) referred the specimens from two localities, 'Hetonaï' and 'Omagari', both at Tomiuchi, Iburi District, Hokkaido, to Trigonia subovalis JImbo var. minor Yabe and Nagao. The specimens from 'Hetonaï' are actually referable to Apiotrigonia hetonaiana sp. nov., and the specimens from 'Omagari' belong to Apiotrigonia crassoradiata Nakano. Apiotrigonia hetonaiana sp. nov. may have been derived from Apiotrigonia crassoradiata Nakano in the same lineage. The former is restricted in the Upper Campanian and Maestrichtian. On the other hand, the latter is known from the Lower to Middle Campanian (Nakano, 1957, 1960; Noda and Tashiro, 1972; Tashiro and Noda, 1972; Tashiro, 1976). Senis japonica sp. nov., is probably the first species of this genus known from the Japanese Cretaceous.

Before going into the description, I wish to express my sincere thanks to Professor Minoru Tamura of Kumamoto University, for his kind encouragement and reading of this manuscript. I also thank Emeritus Professor Tatsuro Matsumoto of Kyushu University for supplying me precious data about the Hakobuchi Group and his kind advice.

Systematic description

Family Trigiidae Lamarck, 1819

Genus Apiotrigonia Cox, 1952

Apiotrigonia hetonaiana, sp. nov.

Plate 54, Figs. 1-4, Text-fig. 2

Text-fig. 1: Maps showing fossil localities
I. Tomiuchi Area, O: Omagari P: Panketosanosawa T: Tomiuchi
   a: Apiotrigonia hetonaiana, sp. nov.
   b: Senis japonica, sp. nov.
   c: Apiotrigonia crassoradiata NAKANO
II. Urakawa Area, U: Urakawa C: Chinomigawa
   d: Apiotrigonia hetonaiana, sp. nov.

1-2, pp. 42-43, pl. 1, figs. 7 and (?) 9 (non. fig. 8).

Material:—The holotype (KE 2776) is a left valve collected from Panketosanosawa of Tomiuchi, Hokkaido. Three paratypes (KE 2777–KE 2779) were collected from the same locality as the holotype. Two other paratypes (KE 2780–KE 2781) are internal and external moulds of right valves collected from Chinomigawa of Urakawa, Hokkaido.

Description:—Shell large for Apiotrigonia, triangularly subovate, longer than high, moderately inflated; anterior margin semi-circular; ventral margin nearly straight or slightly convex on anterior half and a little concave on posterior half; posterodorsal margin nearly straight except for weakly concave umbonal region; siphonal margin short, well rounded; umbo weakly prominent, a little opisthoscyous, located at about one-fourth of length from front of valve; escutcheon narrow, wedge-shaped, well depressed, ornamented with about 15 plain and horizontal costellae; area narrow, smooth except for fine
growth lines; disk ornamented with about 12 broad and low subradial costae which are crossed by growth lines on the posterior half the foremost subradial costa extends from a point on marginal carina a little behind the umbo toward ventral margin; two or more anterior subradial costae short, stretch nearly vertically but do not reach ventral margin; next four or more costae long, subvertical, sometimes bifurcated on ventral part; several remaining costae run obliquely; anterior half of the disk nearly smooth except for irregularly spaced growth lines; subinternal surface of anterior half of disk characterized by numerous and fine radial striae; posterior carina not elevated, only visible as a boundary line between smooth area and costellated escutcheon; marginal carina not angulated except for near umbo, forming a broad and blunt ridge, by which the disk is bordered from depressed postero-dorsal part; median groove of area narrow but distinct; inner anterior margin finely crenulated; inner postero-ventral margin coarsely crenulated; inner postero-dorsal margin more coarsely crenulated than anterior marginal crenulations but more finely than postero-ventral margin; These three sorts of the crenulations are related to the subradial costae on posterior half of disk, subinternal radial striae on anterior half of disk and horizontal costellae on escutcheon.

Measurements (in mm):—

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE 2776, l. v.</td>
<td>50.2</td>
<td>36.0</td>
<td>9.5</td>
</tr>
<tr>
<td>KE 2777, r. int. mol.</td>
<td>49.8</td>
<td>33.4</td>
<td>—</td>
</tr>
<tr>
<td>KE 2780, r. v.</td>
<td>49.8</td>
<td>34.3</td>
<td>9.7</td>
</tr>
<tr>
<td>KE 2778, r. ext. mol.</td>
<td>44.8</td>
<td>29.4</td>
<td>6.0</td>
</tr>
<tr>
<td>KE 2779, l. v.</td>
<td>8.5</td>
<td>4.4</td>
<td>1.0</td>
</tr>
<tr>
<td>KE 2782, imperfect r. int. mol.</td>
<td>41.2+</td>
<td>26.5+</td>
<td>—</td>
</tr>
</tbody>
</table>

Observation:—This species is characterized by the fine crenulations on the inner anterior margin. The number of crenulations are 18 or more in the distance of 1 cm along the margin of the adult specimens. The concentric or subhorizontal costae which are one of the important characters of Apiotrigonia (‘anterior series’ by Nakano, 1957; Maeda and Kawabe, 1966; Tashiro, 1972) appear on the anterior half of the disk in the immature
specimen of this species (See pl. 1, fig. 3). The radial striae on the subinternal surface of the anterior half of the disk are particularly crowded on the upper part of the anterior marginal region. The striae are observable on the disk, if the surface is more or less weathered.

Remarks:—These specimens are undoubtedly conspecific with a part of the specimens which was described by NAGAO and OTATUME (1938) as “Trigonina subovalis JIMBO var. minor YABE and NAGAO” from Tomiuchi (Hetonai), Hokkaido. One of their specimens (NAGAO and OTATUME, 1938: pl. 1, fig. 7) is an internal mould of right valve which is similarly characterized by the marginal crenulations of three orders. The other specimen (fig. 9) shows ill-preserved surface ornamentation, but has weak subradial costae on the posterior half of the disk.

Comparison:—This species is closely similar to Apiotrigonia cressoradiata NAKANO, 1957 (TASHIRO, 1976) from the Lower Campanian of the Izumi Group of Shikoku, and the Middle Campanian of the Upper Himenoura Subgroup of Koshikijima island of Kyushu, in having a smooth area and the occasionally bifurcated subradial costae on the posterior half of the disk. This species can however, be discriminated from Ap. cressoradiata by the entirely smooth anterior half of the disk and the finely crenulated inner anterior margin. Apiotrigonia obsoleta NAKANO, 1957 (TASHIRO, 1972) from the Izumi Group and the Lower Himenoura Subgroup of Kyushu, somewhat resembles this species in the smooth area and the nearly smooth anterior half of the disk, but Ap. obsoleta clearly differs from this species in the smaller shell, smaller number of the subradial costae on the posterior half of the disk (4-7 in obsoleta and 12 or so in this form), and not crenulated inner anterior margin. This species is distinguishable from “Megatrigonia (Apiotrigonia) subovalis (JIMBO)” (LIVEROVSKAJA, 1959) from the Cenomanian of Penzhinskaja by the elongated outline and the more numerous subradial costae on the posterior half of the disk. “Apiotrigonia” dampieriensis SKWARKO (1969) from the Lower Cretaceous of Western Australia has the radial striae on the anterior half of the disk like the present new species. The radial striae of the present species are, however, subinternal. Ap. hetonaiana sp. nov. differs from “Ap.” dampieriensis in the costellated escutcheon.

Occurrence:—Dark greenish sandstone of the middle part of the Fukashi Sandstone of the Hakobuchi Group at Panketosanosawa of Tomiuchi, Iburi District, Hokkaido: Maestrichtian (Upper Hetonaiian), Inoceramus shikotanensis Zone by MATSUMOTO (1959). Greenish grey and coarse sandstone of the uppermost part of the Chinomigawa Formation (KANIE, 1966) at Chinomigawa of Urakawa, Hidaka District, Hokkaido: upper Upper Campanian or Maestrichtian (Upper part of Lower Hetonaiian), a little younger than Inoceramus schmidtii Zone.

Apiotrigonia cressoradiata NAKANO

Plate 54, Fig. 5, Text-fig. 3


Description:—Shell pyriform, longer than high, moderately inflated; anterior margin semi-circular; ventral margin weakly arched on anterior and nearly straight or slightly sinuated on posterior; siphonal margin small, well rounded; postero-dorsal margin weakly concave; umbo small, slightly opisthogyrous, a little prominent, located at about one-fourth of length from front of valve; escutcheon narrow, ornamented with about 20 plain and subhorizontal costellae; area entirely smooth except for very fine growth lines; disk ornamented with two sorts of plain costae; costae of the anterior series is distributed on anterior half of disk, concentric or subhorizontal, about 15 in number; costae of the posterior series distributed on posterior half of the disk; among the costae of the posterior series three or more anterior ones short, subvertical or slightly opisthocline start from the points on a marginal carina near umbo but soon disappear without reaching ventral margin; next two or more costae broadly spaced, stretch subvertically and weakened near the ventral margin; succeeding eight or more costae strong, subvertical on anterior but gradually becoming prosocline on posterior; posterior carina indistinct, but a sulcus extends along the boundary between the costellated escutcheon and the smooth area; median groove very weak; marginal carina indistinct except for near umbo; an elevated but not angulated ridge which bounds the depressed postero-dorsal part from the main part of the shell, extends from umbo to postero-ventral margin; the ridge merges into the marginal carina on umbonal region.

Remarks:—Three imperfect specimens (KE 2783-2785) were collected from the Fukaushi Sandstone at Omagari of Tomi-uchi, Hokkaido. The locality is probably identical with the locality by NAGAO and OTATUME (1938), where “Trigonia subovalis var. minor” was described by them. Apiotrigonia crassoradiata NAKANO is known from the Izumi Group (NAKANO, 1957; NODA and TASHIRO, 1972) and the Upper Himenoura Subgroup (TASHIRO and NODA, 1972; TASHIRO, 1976). The Izumi and Himenoura specimens are characterized by the smooth area, the broad and strong subradial costae on the posterior half of the disk (posterior series) and the large size for Apiotrigonia. The subradial costae are sometimes bi- or trifurcated near the ventral margin in some adult specimens. The arrangement of the costae of anterior series is considerably variable in the adult stage as shown in Text-fig.

Text-fig. 3: Apiotrigonia crassoradiata NAKANO, scale : 1 cm. This is illustrated chiefly on the basis of the specimens from the Izumi Group at Himezuka of Dogo. Matsuyama City, Ehime Prefecture.
4. The specimen from the Fukauashi Sandstone (pl. 1, fig. 5) is small in size and does not possess such bi- or trifurcated subradial costae on the disk. This is, however, undoubtedly identified with *Apiotrigonia crassoradiata* NAKANO by the smooth area and the broad and strong costae of the posterior series. *Trigonia subovalis* var. *minor* by NAGAO and OTA-TUME (1938, pl. 1, fig. 8) from the Fukauashi Sandstone is probably another example of this species.

**Comparison:**—*Apiotrigonia crassoradiate* NAKANO is easily distinguishable from *Apiotrigonia minor* (YABE and NAGAO) (1928; YEHARA, 1915) from the Gyliakian of the Middle Yezo Group of Hokkaido, by the smooth area and broader and stronger subradial costae of the posterior series. *Apiotrigonia obsoleta* NAKANO, 1957 (see also TASHIRO, 1972) from the Izumi Group of Shikoku and the Lower Himenoura Subgroup of Kyushu, and *Apiotrigonia heteraiana* sp. nov. are similar to this species in having a smooth area. *Ap. obsoleta*, however, differs from this species in the smaller shell size, less numerous subradial costae of the posterior series and nearly effaced costae of the anterior series. The distinction between *Ap. heteraiana* sp. nov. and this species was mentioned already. *Columbitrigonia jackassensis* POULTON (1977) and *Trigonia condoni* PACKARD (1921) both from the Lower Cretaceous of North America, resemble this species in having strong costae of the posterior series and a smooth area. The American species, however, differ
Text-fig. 5: The resemblance of irregularly waved costae of the anterior series and the bi- or trifurcated costae of the posterior series, between *Heterotrigna subovalis* (JIMBO) (A) and *Apiotrigonia crassinodii* NAKANO (B).

(A) is restored on the basis of a specimen from the Middle Yezo Group at Ikushunbetsu of Hokkaido, and (B) is from the Upper Himenoura Subgroup at Shimokoshikijima island of Kagoshima Prefecture (See Text-fig. 4). scale 1 cm.

from this species in the broad and oblique costae on the anterior half of the disk. *Heterotrigna subovalis* (JIMBO) (NAKANO, 1957, 1961) resembles this species in having variably arranged costae of the anterior series, bi- or trifurcated subradial costae of the posterior series and the large size of the valve, but the former differs from the latter in having distinct radial costellae on the area. If the area were broken off it might be difficult to discriminate whether the specimen belongs to *Ap. crassinodii* or *Het. subovalis* (see Text-fig. 5).

*Occurrence*.—Greenish gray sandstone of the Fukaushi Sandstone of the Hakobuchi Group at Omagari of Tomiuchi, Iburi District, Hokkaido: Lower Campanian (lower Hetonalian), *Inoceramus orientalis orientalis* Zone.

*Family Culitellidae DAVIES, 1935*

*Genus Senis STEPHENSON, 1953*

*Senis japonica*, sp. nov.

Plate 54, Figs. 6-10, Text-fig. 6

*Material*.—The holotype (KE 2786) is a left valve collected at Panketoosanosawa of Tomiuchi (Hetonaï), Hokkaido. The paratypes (KE 2787-KE 2788) are external moulds. A paratype (KE 2789) is an internal mould of right valve. The other paratype (KE 2790) is a left valve. All the paratypes were collected at the same locality as the holotype.

*Description*.—Shell elongate-ovate, weakly inflated; test thin; antero-dorsal margin straight or slightly convex, occupied about a half length of valve; anterior margin rounded or somewhat truncated on upper side; ventral margin very long, weakly arched; posterior margin subtruncate, a little oblique to posterior, nearly straight; postero-dorsal margin short, nearly straight, occupying about one-third of length of valve; umbo small, impromptinent, situated at about four-sevens of length from front of valve; a bluntly elevated ridge extends from umbo to antero-dorsal margin; posterior carina weak, not angulated, extends from umbo to postero-ventral margin; ligament external, narrowly elongated along postero-dorsal margin, from umbo to a mid-point of the margin; lunule and escutcheon indistinct; posterior area triangular, nearly flat; surface smooth except for fine growth line which are somewhat crowded near ventral margin; hinge area smooth without teeth; nympha elongated below antero- and postero-dorsal
697. Two New Species of Apiotrigonia and Senis

A: external view of left valve, B: internal view of right valve. scale 1 cm.

Text-fig. 6: Senis japonica, sp. nov.

Margins, occupying about two-thirds of valve length; nymph on posterior margin is shorter but wider than on anterior; pallial line and pallial sinus indistinct; posterior adductor scar small, weakly prominent under postero-dorsal margin; anterior adductor scar indistinct; inner margin smooth.

Measurements (in mm):

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE 2786, l. v.</td>
<td>68.8</td>
<td>25.6</td>
<td>5.4</td>
</tr>
<tr>
<td>KE 2790, l. v.</td>
<td>51.2</td>
<td>18.7</td>
<td>2.5</td>
</tr>
<tr>
<td>KE 2787, l. ext. mol.</td>
<td>68.0+</td>
<td>28.0</td>
<td>3.0</td>
</tr>
<tr>
<td>KE 2788, r. ext. mol.</td>
<td>55.4+</td>
<td>22.9</td>
<td>4.3</td>
</tr>
<tr>
<td>KE 2789, r. int. mol.</td>
<td>64.9+</td>
<td>23.5</td>
<td>—</td>
</tr>
</tbody>
</table>

Observation and Remarks:—This species is rather uniform in outline. It is characterized by the posterior location of the umbo and the edentulous hinge. It resembles the species belonging to the genera Phaxas, Siliqua and Leptosolen in the elongatedly ovate outline, but differs from them in lacking hinge tooth. Some species of the genus Gari and allied genera of the Psammobiinae show similarly elongated outline, but the present species differs from them in the not angulated posterior carina and undeveloped hinge tooth. The present new species probably belongs to the genus Senis in view of the edentulous hinge structure and the elongated valve.

Comparison:—Senis elongatus Stephenson (1953) from the Woodbine Formation of North America, is the only comparable species because no other species has been referred to Senis. This species can be discriminated from Senis elongatus by the more posteriorly located umbo and the not angulated outline.

Occurrence:—Greenish gray sandstone or siltstone of the upper part of the Fukaushi Sandstone of the Hakobuchi Group at Panketosanosawa of Tomiuchi, Iburi District, Hokkaido: Maestrictian (Upper Hetonaian), Inoceramus hetonaianus Zone.
Masayuki TASHIRO

gonia from the Futaba Group in the Joban District, North Japan. Prof. H. Shibata Memorial Volume, p. 420-425, pl. 1, Table 1.


**Explanation of Plate 54**

*Apiotrigonia hatonaiana* sp. nov.

Fig. 1. Left valve, holotype (KE 2776), Loc. Panketosanosawa of Tomuchi, Iburi District, Hokkaido; 1a: lateral view, ×1. 1b: dorsal view, ×1. 1c: umbonal view, showing subinternal radial striations, ×1.

Fig. 2. Internal mould of right valve, paratype (KE 2777), ×1, Loc. ditto.

Fig. 3. Immature stage of left valve, paratype (KE 2779), ×3, Loc. ditto.

Fig. 4. Right valve, paratype (KE 2780), Loc. Chominigawa of Urakawa, Hidaka District, Hokkaido; 4a: plaster cast of external mould, ×1. 4b: internal mould, ×1.

*Apiotrigonia cressoradiata* NAKANO

Fig. 5. Gum cast of imperfect external mould (KE 2783), ×1, Loc. Omagari of Tomuchi, Iburi District, Hokkaido.

*Senis japonica* sp. nov.

Fig. 6. Left valve, holotype (KE 2786), ×1, Loc. Panketosanosawa of Tomuchi, Iburi District, Hokkaido.

Fig. 7. Left valve, paratype (KE 2790), ×1, Loc. ditto.

Fig. 8. Gum cast of left external mould, paratype (KE 2787), ×1, Loc. ditto.

Fig. 9. Internal mould of right valve, paratype (KE 2789), ×1, Loc. ditto.

Fig. 10. Gum cast of external mould, imperfect right valve, paratype (KE 2788), ×1, Loc. ditto.
Two New Species of Apiotrigonia and Senis


Chinomigawa 乳香川, Hetonai 農富内, Hidaka 日高, Iburi 胆振, Otagaki 大曲, Panketosanosawa パンケトサの沢, Tomiuchi 富內, Urakawa 池河

北海道最上部白亜系より産する二枚貝 Apiotrigonia と Senis の 2 新種： 新種 Apiotrigonia hetonatana sp. nov. は、瀬満層群と乳香川層より産し、その時代は、カンバニアイ上部からマストリヒティアンである。本種は、おそらく Apiotrigonia crassoradiata NAKANO から由来したと思われる。なお、Ap. crassoradiata は、九州や四国ではカンバニアイ下部から中部に出現し、今回、北海道のカンバニアイ下部（瀬満層群）から産出が確認された。新種 Senis japonica sp. nov. は瀬満層群の上部（マストリヒティアン）から産する。なお、本属に属する種の産出は、本邦の白亜系ではこの報告が最初である。

田 代 正 之