

A New Gaudryceratine Ammonite from the Cenomanian of Hokkaido : Studies of the Cretaceous Ammonites from Hokkaido and Saghalien-XXV

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A New Gaudryceratine Ammonite from the Cenomanian of Hokkaido

(Studies of the Cretaceous Ammonites from
Hokkaido and Saghalien—XXV)

By

Tatsuro MATSUMOTO

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Abstract

A new species is established on a number of specimens from the Lower Cenomanian (zone of *Mantelliceras japonicum*) of the Ikushumbetsu area. It is referred to a new subgenus of *Kossmatella*, together with allied species from the Pacific Coast of North America, *K. filicinatum* (WHITEAVES) and *K. cappsii* IMLAY. The new subgenus is characterized by the *Kossmatella* type ribs and constrictions on the inner whorls of 10–15 mm, infrequent and indistinct appearance of such ribs in the middle growth-stages and again prominent fold ribs and furrows on the probably adult outer whorl. The intimate relationships of *Kossmatella* with *Eogaudryceras* and *Anagaudryceras* are discussed.

Introduction

Ammonites belonging to the subfamily Gaudryceratinae of the Tetragonitidae occur fairly abundantly in the Turonian to Campanian sequences of Hokkaido and Saghalien. They mostly belong to the species which were described by JIMBO (1894), YABE (1903) and MATSUMOTO (1938). In the Cenomanian sequences of the same region gaudryceratine ammonites are less well known. One of them was briefly described by MATSUMOTO (1942) under a new genus *Parajaubertella* and another is identical with a species from Alaska, *Zelandites inflatus* MATSUMOTO, 1959.

In the present paper we report another new species from the Cenomanian of Hokkaido, which has long been left undescribed because of the uncertainty in its systematic position. For the generic (subgeneric) and suprageneric assignment of this problematic species MATSUMOTO is solely responsible, and for the description of the species the three authors are all responsible.

Before going further we thank Mr. Akio TOMITA, Mikasa, who has generously provided two valuable specimens of his collection for this study, Mr. C. W. WRIGHT, London, who critically read the first draft, and Dr. Itaru HAYAMI and Miss Seiko HAYAKAWA who have assisted us in preparing the plate and typescript.

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Systematic Description

1. Supraspecific Description by Tatsuro MATSUMOTO
Family Tetragnostidae HYATT, 1900
Subfamily Gaudryceratinae SPATH, 1927

Although this taxon is ranked at family level by some authors, I am inclined to follow WRIGHT (1957) and MURPHY (1967) in treating it as a subfamily. The framework of classification by WIEDMANN (1962a) emended by MURPHY (1967) is followed in this paper. I would especially agree with them in suppressing the subfamily Kossmatellinae BREISTROFFER, 1953, and assigning the genus *Kossmatella* to the Gaudryceratinae, because it is very closely related to *Eogaudryceras* and *Anagaudryceras*.

A new species from the Cenomanian of Hokkaido, to be described below, seems to have its ancestral background in the Lower Cretaceous. Although I have little experience of the Lower Cretaceous members of the Tetragnostidae, I have been much enlightened by recent works of WIEDMANN (1962a, b), IMLAY (1960), JONES (1967) and especially of MURPHY (1967) who studied specimens both from Europe and from the Pacific Coast of North America.

Genus *Kossmatella* JACOB, 1907

Type-species.—*Ammonites agassizianus* PICTET, 1847 (original designation).

Diagnosis.—This genus is distinct in its characteristic ribs and intervening furrows which can be regarded as being derived from the approximation of constrictions. In some species (e.g. *K. ventrocincta*) the rib is so elevated as to form a ventrolateral or lateral tubercle. The shell size is small to moderate. There is a considerably wide range in shell-form from a depressed, sometimes trapezoid whorl, through a rounded one, to a fairly compressed high whorl, depending on species and also on growth-stages. The suture is of typical gaudryceratine pattern.

Distribution.—Species of *Kossmatella* were primarily known from the Upper Aptian and Albian of southern and central Europe. Their wider distribution in various parts of the world, such as Sinai, southern India, Japan, Alaska, British Columbia, Texas and Mexico, has been clarified. The genus ranges up to the Lower Cenomanian.

Subgeneric classification.—In addition to typical *Kossmatella* (*Kossmatella*), to which most of the hitherto known species belong, WIEDMANN (1962b) introduced the subgenus *Guderianites*, with *K. costata* H. DOUVILLÉ, 1916, as its type-species. This is said to be characterized by the presence of multiple ribs or tubercles between the constrictions. For a new species to be described below and certain other species, from the Albian to Lower Cenomanian of northern Pacific region, another new subgenus is proposed here.

Subgenus *Murphyella* MATSUMOTO, nov.

Type-species.—*Kossmatella* (*Murphyella*) *enigma* sp. nov. to be described below.

Subgeneric diagnosis.—The *Kossmatella* type ribs occur on relatively early inner whorls (with diameters from several millimeters to 10 or 15 mm.), but on the late inner whorls the ribs and furrows are sparse and rather weak. In other words smoothish part is predominant over the ribbed or constricted part in the middle growth-stage. In the late septate whorl and the adult body-whorl the fold ribs and intervening furrows are distinct.

Remarks.—In addition to *K. (M.) enigma*, from the Lower Cenomanian of Hokkaido, *Ammonites flicinctum* WHITEAVES, 1876, from the Albian (Haida Formation) of western British Columbia, and *Kossmatella cappsii* IMLAY, 1960, from the Albian (Kennicott Formation) of Alaska, are assigned to the subgenus *Murphyella*, because they show clearly the above characters. For the same reason, a specimen from Alaska, which was described and illustrated under *Anagaudryceras aurarium* by IMLAY (1960, p. 99, pl. 11, fig. 24) may not be true *Eogaudryceras aurarium* (ANDERSON, 1938) (see MURPHY, 1967, p. 13) but seems to be another example of *K. (Murphyella)*.

The subgeneric name is dedicated to Dr. Michael A. MURPHY who has made an excellent contribution to our knowledge of the Tetragonitidae.

Comparison and affinity.—*Eogaudryceras* BREISTROFFER, 1947, *Kossmatella* JACOB, 1907, and *Anagaudryceras* SHIMIZU, 1934, are closely allied to one another. *Eogaudryceras* is finely lirate and has periodic constrictions and collars which are more distinct on the probably adult, outer whorl. *Anagaudryceras* is closely allied to *Eogaudryceras*, but is distinguished by the finely lirate fold ribs developed on the outer whorl. *Kossmatella* is characterized by the fold ribs (sometimes tubercles) which are developed on both the immature and mature whorls.

Now in the subgenus *K. (Murphyella)* the fold ribs on the inner whorls are fairly variable in intensity and persistence, occurring typically in a limited part of early immature stage. The shell of its late immature stages (i.e. "middle growth-stages") is not much different from that of *Eogaudryceras* and *Anagaudryceras*, although fold ribs and/or approximated constrictions or furrows may occur infrequently and weakly in *K. (Murphyella)* (see the description of *K. (M.) enigma*). Fold ribs and furrows are very distinct on the outer, probably adult whorl of *K. (Murphyella)*, as on that of certain species of *Anagaudryceras* (e.g. *A. sacya* and *A. whitneyi*). These facts seem to suggest that *Anagaudryceras* may have been derived from *Kossmatella* and that *K. (Murphyella)* may be regarded as showing intermediate features.

According to MURPHY (1967) *Eogaudryceras aurarium* (ANDERSON), from the Albian of California, has "thin sharp-crested flanges" on the flank and periphery at approximately the second whorl. The flanges may foreshadow the ribs or tubercles of *Kossmatella*.

On the other hand IMLAY (1960, pl. 11, fig. 24) illustrated an interesting specimen from the Albian of Alaska, under the name of *Anagaudryceras aurarium* (ANDERSON), which has on the earlier part of the inner whorl (with diameters of about 10–15 mm.) prorsiradiate ribs, on the late part of the inner whorls only periodic constrictions and collars, and on its adult body-whorl broad flat ribs separated by fairly deep furrows. These characters were not particularly mentioned by IMLAY, but the specimen seem to show apparently intermediate

features between *Eogaudryceras* and *K. (Murphyella)*.

It could, thus, be presumed that *Kossmatella (Kosmatella)* and *K. (Murphyella)* might have been derived from *Eogaudryceras* almost simultaneously or the former might have descended from *Eogaudryceras* by way of the latter. The actual lines of descent at specific level should be inferred through the study of sufficiently numerous specimens obtained from successive sequences under the concept of population palaeontology.

The change in the mode of ornamentation (and in the whorl shape) with growth and with taxa seems to imply some change in the mode of life in the ontogenetic and phylogenetic history of these gaudryceratine ammonoids.

2. Description of Species by Tatsuro MATSUMOTO, Tatsuo MURAMOTO
and Takemi TAKAHASHI

Kossmatella (Murphyella) enigma

MATSUMOTO, MURAMOTO and TAKAHASHI, sp. nov.

Pl. 33, Figs. 1-3; Text-fig. 1

Material.—Holotype, GK. H5667, from loc. Ik 1100, zone of *Mantelliceras japonicum*, Ikushumbets, collected on May 12, 1963 and then donated to Kyushu University by Mr. Akio TOMITA (previously a student of the Mikasa High School). Ten other specimens (paratypes), of which two are immature or inner whorls, GK. H5671 (coll. A. TOMITA) and GK. H5673 (coll. T. TAKAHASHI), and five are probably mature: GK. H5670 and GK. 5668 (both coll. T. TAKAHASHI), T. TAKAHASHI coll. 41-6.15, and two specimens of T. MURAMOTO's collection from the type locality; three other mature shells probably derived from the same zone of the Ikushumbets area: GK. H5669, from Ik 2505 (Suido-no-sawa) (coll. T. TAKAHASHI), GK. H5672, from Ik 9500 (Kami-ichi-no-sawa) (coll. T. TAKAHASHI), and T. TAKAHASHI coll. 421022, from Ik 6006 (the sixth tributary of the Kami-ichi-no-sawa).

Specific characters.—Shell of rather small to moderate size, about 75 to 80 mm. in diameter at the adult stage. Whorl enlarges moderately, embracing about two fifths of the inner one; hence, umbilicus of moderate width, ranging from 38 to 31 percent of the shell diameter, with a general tendency of gradual decrease with growth.

The main part of the first whorl is fairly inflated up to the stage where the first constriction appears. The succeeding whorl ranging from 1.5 to 3.0 mm. in diameter is nearly as high as broad and circular in section. Except for these initial stages, the whorls are subrounded, somewhat broader than high, with a gradual change of shell form. The earlier part, with diameters below 30 mm., is somewhat broader than high (b/h: 1.3 to 1.2), with a broadly rounded venter; the rest main part, up to the adult body-whorl, is slightly broader than high, keeping a fairly constant (i.e. less variable) proportion of breadth/height at about 1.1. Its venter is moderately rounded. The umbilical shoulder is subrounded throughout growth and the umbilical wall becomes steep and moderately high on the outer whorl.

The earliest whorl is smooth, except for constrictions. In the succeeding whorls, up to the diameter of about 10 or 15 mm., prorsiradiate broad ribs and intervening furrows occur fairly frequently, as can be seen in the holotype and several other specimens (GK. H5669, GK. H5671, GK. H5673 etc.). They are less numerous and generally weaker than those of the adult stage. They are, however, fairly variable in intensity, frequency and persistence among individuals. In the succeeding, late immature stages (i.e. the so-called middle growth-stages) weak plane ribs and intervening furrows (or approximated constrictions) occur periodically, constituting a dominantly smoothish phase.

In the late part of the septate whorl, immediately preceding to the adult body-whorl, a set of several (3 ± 1) fold ribs and intervening narrow furrows alternates with a wide flat part, the latter of which may have a faint furrow. The fold ribs at this stage are fairly convex in some specimens but low and may be better called plane ribs in others. The wide flat part may occasionally occur even in the early part of the body-whorl, as seen in GK. H5672.

Fairly strong, convex, fold ribs separated by narrow and deep furrows are characteristic of the adult body-whorl. The fold ribs and furrows are somewhat prorsiradiate on the inner part of the flank and nearly rectiradiate or slightly prorsiradiate on the outer part, crossing the venter with a gently forward curvature. The fold ribs are asymmetric, with adaptically gentle and adorally steep inclination, suggesting an orientation of the locomotion of the shelled animal in the sea-water and the mode of settlement at the bottom. The fold ribs on the adult whorl are normally of regular breadth and intensity, gradually becoming more elevated toward the aperture, but there is a certain extent of variation. Some of them are considerably elevated immediately behind the furrow on the inner part of the flank, but they never form tubercles. In some specimens (e.g. GK. H5667, T. T. coll. 41-6.15, T. M. coll. Ik 1051 b) a much narrower fold rib is occasionally intercalated between the normal ones.

When the shell is well preserved, very fine lirae are discernible on its external surface, running parallel to the ribs and furrows.

The suture is of typical *Gaudryceras* pattern, consisting of E, L, U₂, U₁ [=S] and I (see Fig. 1). It is essentially similar to and as complex as that of *G. tenuiliratum* YABE (see MATSUMOTO, 1942, text-fig. 1).

The last septum is situated at the shell diameter of about 45 to 50 mm. The body-chamber occupies somewhat more than a half of the last whorl, although the very apertural margin is not preserved in any specimen on hand.

Measurements (in mm.)—

Specimen	Diameter	Umbilicus	Height	Breadth	B/H
GK. H5667*	70.0	22.2(.32)	30.0(.43)	32.4(.48)	1.08
(-80°)	60.6	19.8(.32)	26.0(.43)	27.4(.46)	1.07
GK. H5668	75.0	24.0(.32)	32.2(.43)	35.5(.47)	1.10
(-180°)	55.0	17.5(.32)	23.0(.42)	24+ α	—
(-360°)	32.0	11.8(.36)	14.2(.44)	16.0(.50)	1.09
GK. H5670*	61.0	19.0(.31)	25.0(.41)	—	—
(-150°)	43.6	14.0(.33)	18.3(.42)	20.6(.46)	1.10
GK. H5671	39.0	14.2(.36)	15.3(.40)	16.5(.42)	1.08
(-120°)	28.8	10.6(.36)	10.8(.37)	13.2(.46)	1.22

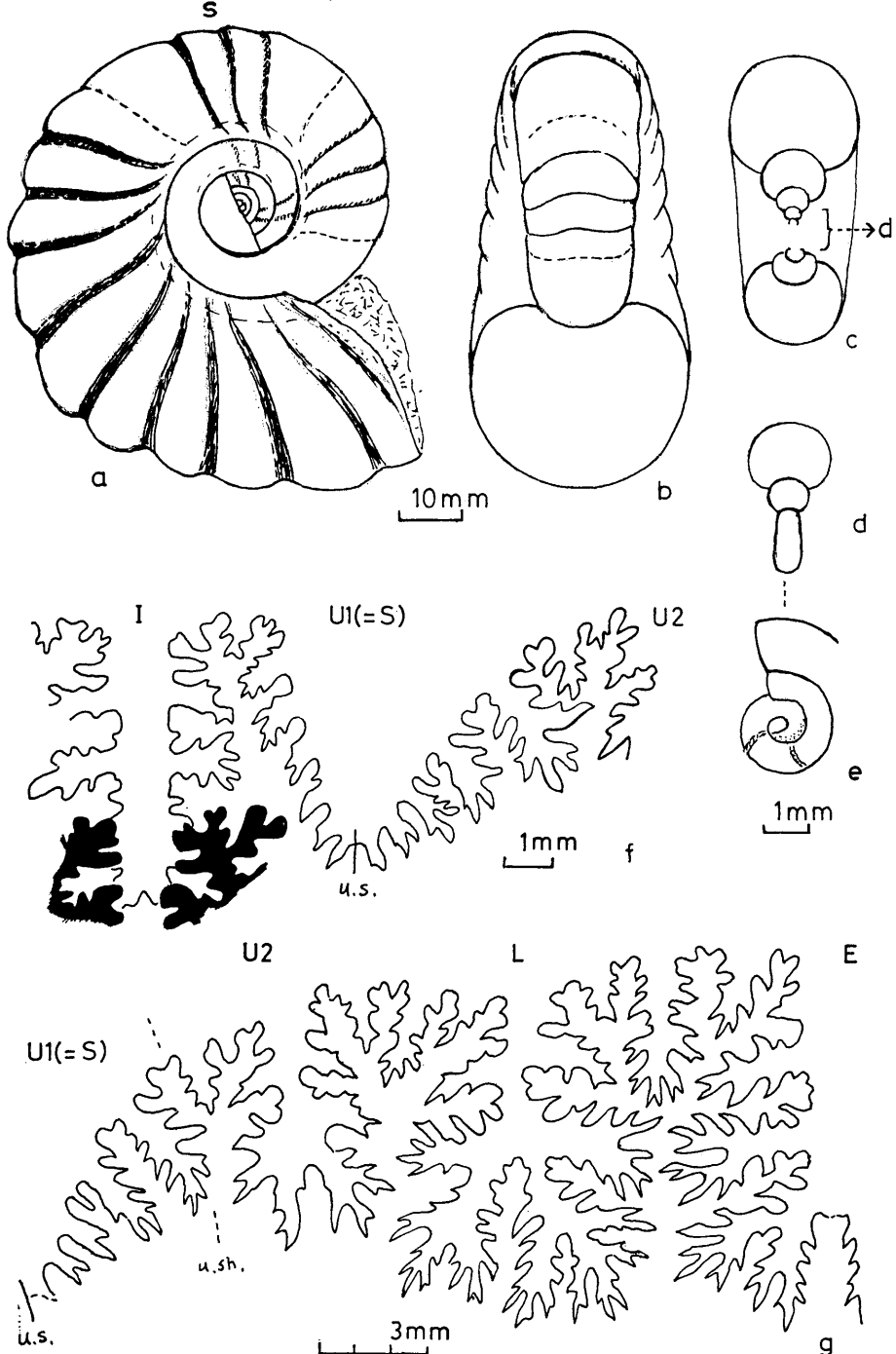


Fig. 1. *Kossmatella (Murphyella) enigma* MATSUMOTO, MURAMOTO and TAKAHASHI, sp. nov. Diagrammatic sketch of a paratype, GK. H5688, from loc. Ik 1100 (Coll. T. TAKAHASHI). Lateral (a) and frontal (b) views; cross-section of inner whorls (c); frontal (d) and lateral (e) views of the innermost part; internal suture and a part of the external suture (f) at whorl-height=11 mm., breadth=13 mm.; external suture (g) at whorl-height=17 mm., breadth=20 mm. s (in a): position of the last septum. (T. MATSUMOTO *delim.*)

Specimen	Diameter	Umbilicus	Height	Breadth	B/H
GK. H5672(-60°)	69.4	23.7(.34)	29.0(.42)	31.8(.46)	1.09
GK. H5673	23.4	8.9(.38)	9.0(.39)	11.2(.48)	1.24

* body-whorl somewhat deformed and measured approximately

Comparison.—*Kossmatella (Murphyella) enigma* n. sp. is distinguished from *K. (K.) agassiziana* (PICTET), the type-species of *Kossmatella* from the Albian of Europe (see WIEDMANN, 1962a, b for the amendment), by its larger shell, much broader and more rounded whorls and the particular ornamentation as described above. *K. (K.) romana* WIEDMANN, 1962, from the Upper Aptian (?) to Middle Albian of southern Europe (see WIEDMANN, 1962a, p. 164; 1962b, p. 50), has broader and more rounded whorls than *K. (K.) agassiziana*, but the whorl shape changes with growth in *K. (K.) romana*, from a broad subrectangular one, through a rounded one, to a higher subelliptical one. In *K. (M.) enigma* the whorl shape does not change so greatly as in that species, keeping a subrounded section and a fairly constant value of b/h at about 1.1 to 1.2 throughout the main growth-stages, except for the early part. *K. (K.) muhlenbecki* (FALLOT) (see WIEDMANN, 1962a, p. 168), from the Albian of southeast France and Spain, has broad, subrounded inner whorls, but its outer whorl is characteristically trapezoid. In the above mentioned three species of *K. (Kossmatella)* the fold ribs are considerably strong on the flanks but much weakened or almost obsolete on the venter. In *K. (M.) enigma*, however, the fold ribs are distinct and the furrows are well marked on both the ventral part and flanks of the outer whorl, although they are rather weak and infrequent on the inner whorls.

K. (M.) enigma closely resembles *K. (M.) cappsii* IMLAY, 1960, from the Albian of Alaska, and also *K. (M.) filicinatum* (WHITEAVES, 1876) (see MCLEARN, 1972, p. 33), from the Albian of western British Columbia, but it is distinguished from them by its somewhat broad, subrounded whorl throughout the growth-stages. In the latter two nominal species, which may be synonymous, the shape of the inner whorl is somewhat broad and subrounded as in the former, but the proportion of breadth to height gradually changes and the adult whorl is distinctly higher than broad. The alternating state of several fold ribs intervened by approximately distinct furrows and the broad smoothish part with or without a faint furrow is characteristic of the late part of the septate whorls of *K. (M.) enigma*.

In the last mentioned feature and the fold ribs of the adult whorl *K. (M.) enigma* is apparently similar to *Parajaubertella imlayi* MATSUMOTO, from the Cenomanian of Alaska (see MATSUMOTO, 1959, p. 71; JONES, 1967, p. 23), but the latter is characterized by its much inflated inner whorls which are free from fold ribs, its vertical umbilical wall and angular shoulder.

With respect to the fold ribs of the adult whorl *K. (M.) enigma* is similar to *Anagaudryceras sacya* (FORBES, 1845), (see STOLICZKA, 1865; WHITEAVES, 1884; MATSUMOTO, 1959; JONES, 1967; MCLEARN, 1972), from the Albian and Cenomanian of the Indo-Pacific region, but *A. sacya* has no fold ribs on its inner whorls which are only periodically constricted or collared.

Occurrence.—The holotype and several paratypes were obtained from loc.

Ik 1100, a local quarry of sandstone (now abandoned), where the lower part of member IIb, belonging to the zone of *Mantelliceras japonicum*, of the Mikasa Formation is exposed. Several other specimens were obtained from the extension of the same zone and from fallen blocks derived probably from the same zone. In most cases the adult body-whorl is preserved. Besides *M. japonicum*, *Zelandites inflatus*, *Turrilites costatus*, *Hypoturrilites komotai*, *Sharpeiceras kongo* are characteristics of this zone. *Anthonya japonica*, *Margarites funiculata* and other mollusks are associated with them. The bed was probably formed in the environment of shallow, open sea. The age of the bed is most probably Lower Cenomanian (see MATSUMOTO et al., 1969, p. 286-290). For the names of the persons who collected the described specimens see *Material*.

Summary of Results

(1) On the basis of the newly discovered species from the Cretaceous of Hokkaido and also the previously described ones, a new subgenus (*Murphyella*) is introduced under the genus *Kossmatella*. This is distinguished from *Kossmatella* (s. s.) by its less frequent and less prominent appearance of the fold ribs in its middle growth-stages.

(2) This and other available facts reveal that the genus *Kossmatella* is intimately related to *Eogaudryceras* on one hand and to *Anagaudryceras* on the other. They should be grouped into the subfamily Gaudryceratinae together with certain other genera. In other words the subfamily Kossmatellinae should be suppressed, as has already been done by WIEDMANN (1962a, b) and MURPHY (1967).

(3) The actual lines of descent from species to species have not yet been made clear. Therefore whether *K. (Murphyella)* represents an intermediate position from *Kossmatella* to *Anagaudryceras*, or *Kossmatella* (s. s.), *K. (Murphyella)* and *Anagaudryceras* were diverged almost simultaneously from *Eogaudryceras* or otherwise is not determined at present.

(4) A full description is given for *Kossmatella (Murphyella) enigma* sp. nov., from the Lower Cenomanian of Hokkaido. It is closely allied to but distinguished from *K. (M.) flicinctum* (WHITEAVES) [=? *K. (M.) cappsii* IMLAY], from the Albian of the Pacific coast of North America.

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Tatsuro MATSUMOTO
Tatsuo MURAMOTO and Takemi TAKAHASHI
A New Gaudryceratine Ammonite from
the Cenomanian of Hokkaido

Plate 33

Plate 33

Explanation of Plate 33

Figs. 1-3. *Kossmatella (Murphyella) enigma* sp. nov.Page 210

1. Holotype, GK. H5667, from loc. Ik 1100, zone of *Mantelliceras japonicum*, Ikushumbets, central Hokkaido (coll. T. TAKAHASHI). Lateral (a), frontal (b) and rear (c) views, $\times 1$; enlarged inner whorls (d), $\times 3$.
2. Paratype, GK. H5688, from loc. Ik 1100 (coll. T. TAKAHASHI). Lateral view, $\times 1$. (see text-fig. 1)
3. Paratype, GK. H5673, from loc. Ik 1100 (coll. T. TAKAHASHI). Two lateral (a, b) and rear (c) views, $\times 3/2$, of a probably immature shell.

Kyushu University (I. HAYAMI) photos, with whitening.

