

# Ainoceras, A New Heteromorph Ammonoid Genus from the Upper Cretaceous of Hokkaido : Studies of the Cretaceous Ammonites from Hokkaido and Saghalien—XVI

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## ***Ainoceras*, A New Heteromorph Ammonoid Genus from the Upper Cretaceous of Hokkaido**

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

By

Tatsuro MATSUMOTO and Yasumitsu KANIE

### **Abstract**

A new heteromorph ammonoid genus is established in this paper under the family Nostoceratidae. It has helical septate whorls and a crioceratoid body-chamber. It is ornamented with distant ribs which are flared in later growth-stages.

Two new species are described under this new genus. They occur in the zone of *Inoceramus orientalis*, substage K5 $\gamma$ , approximately Lower Campanian, of Hokkaido.

### **Introduction**

Fairly numerous heteromorph ammonoids occur in the Upper Cretaceous of Hokkaido. Many of them are referable to the previously established genera but some seem to be new. Specimens are, however, often found in an imperfect state of preservation, and the establishment of new taxa has been refrained. This is one of the reasons why the senior author hesitated to monograph the heteromorph ammonoids from Japan.

More than twenty years ago the senior author obtained several specimens which were considered as possibly representing a new genus but temporarily referred to *Bostrychoceras*. They came from the zone of *Inoceramus orientalis* SOKOLOV in the Abeshinai-Saku area, Teshio Province, and the Urakawa area, Hidaka Province (MATSUMOTO, 1942–43). He has recently undertaken further field work in the Abeshinai-Saku area, where Messrs. Tatsuo MURAMOTO, Kikuwo MURAMOTO, and Takemi TAKAHASHI assisted him and have successfully obtained better preserved specimens. He has also revisited the Urakawa area.

In the meanwhile the junior author (Y.K., 1966) carried out a revised field work on the Cretaceous of the Urakawa area, where he added more examples of the interesting heteromorph ammonites.

A result of the study is presented in this paper, in which MATSUMOTO is responsible for the establishment of a new genus and MATSUMOTO and KANIE are

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responsible for the description of two new species.

## Proposal of a New Genus

by

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Order Ammonoidea

Superfamily Turrilitaceae

Family Nostoceratidae HYATT, 1894

Genus *Ainoceras* nov.

*Type-species*.—*Ainoceras kamuy* MATSUMOTO and KANIE, sp. nov. (to be described below).

*Generic diagnosis*.—Helical septate whorls are followed by a crioceratoid last whorl, which is mainly occupied by the body-chamber. The axis of the helix is oblique to that of the crioceratoid coiling. Transverse ribs are distant, sharp on top, and flared, especially remarkably so at the upper lateral shoulder. Siphuncle is situated near the upper lateral margin of the helical whorls. Sutures are lytoceratid, consisting of E, L, U, and I. Lobes and saddles are deeply and finely incised.

*Etymology*.—Derived from the *Ainu*, a race in Hokkaido (Yezo).

*Comparison and affinity*.—*Ainoceras* is closely allied to *Eubostrychoceras* MATSUMOTO, 1967, in the mode of coiling and ribbing of the septate whorls and in the pattern of sutures but is distinct in the crioceratoid body chamber and distant ribs which are often flared at the upper lateral shoulder. *Eubostrychoceras* is long ranging from Upper Albian to Santonian as described in another paper. As *Ainoceras* occurs in the Lower Campanian and has more specialized characters, it is probably a derivative from *Eubostrychoceras*.

*Jouaniceras* BASSE, 1939, represented by the type-species *J. sicardi* (GROSSOUVRE, 1894), from the Santonian of France, is similar to *Ainoceras* in that its coiling changes from helical to planospiral. Its later whorls are, however, contiguous lytoceratid, instead of separated crioceratoid, and the axis of the early helix is perpendicular to that of lytoceratid coiling and not oblique to the latter. *Jouaniceras* likewise has distant, narrow but sharp, sometimes flared ribs on the late whorls. Because of its greater change of coiling and because of its smaller proportion of the helix to the entire shell, *Jouaniceras* does not seem to be an immediate ancestor of *Ainoceras*. It is probably another, earlier, specialized offshoot from *Eubostrychoceras*.

Just as *Jouaniceras* is homoeomorphic with *Colchidites* DJANELIDZÉ, 1924, of the Lower Cretaceous Heteroceratidae, *Ainoceras* is apparently similar to *Heteroceras* D'ORBIGNY, 1849 (see D'ORBIGNY, 1850), of Barremian and Aptian ages. *Heteroceras* has a more straightened shaft and then final, hooked bend; its early helical part is much smaller in proportion to the entire size of the shell. Its ribs are denser.

*Glyptoceras* SPATH, 1925, as exemplified by *G. indicum* (FORBES, 1846) (see MATSUMOTO, 1959, p. 167, pl. 42, figs. 2–6), has a closed helix at the initial stage, but its helical part occupies only a very small portion of the septate whorls, being soon followed by a crioceratoid to planospiral coil and finally passing into an elliptical coil, up to the broadly U-shaped last part. It is again ornamented with denser ribs.

*Ainoceras* is somewhat similar to *Anaklinoceras* STEPHENSON, 1941, in the mode of coiling, especially in that the septate whorls form a closed helix. The latter has a straightened and then hook-like, instead of crioceratoid, body-chamber, which embraces the septate whorls, with axis of the turricon on the plane of the looped last whorl. *Anaklinoceras* has more crowded ribs and normally two rows of distinct tubercles. It can be regarded as a specialized offshoot of *Nostoceras* HYATT, 1894, or a derivative of *Didymoceras* HYATT, 1894. Therefore the line of descent from *Eubostrychoceras* to *Ainoceras* is parallel to that from *Nostoceras* to *Anaklinoceras*. *Anaklinoceras* and *Ainoceras* are heterochronous and show different distribution, as far as the available evidence is concerned.

*Occurrence*.—The type-species and another species are confined to the zone of *Inoceramus orientalis*, K5 $\gamma$  (Infrahetonaian), approximately Lower Campanian, of Hokkaido. The shell-form seems to suggest a benthonic life in the adult stage. The fossils occur in fine-sandy siltstone.

As the genus is based only on two species, the true geological range and extent of geographical distribution should be determined by further studies.

## Descriptions of Species

by

Tatsuro MATSUMOTO and Yasumitsu KANIE

Two new species, the type-species and the other, are described below under this new genus. The specimens which we have studied belong to the following institutions, with abbreviated symbols in brackets:

Type-Specimen Room, Department of Geology, Kyushu University, Fukuoka (GK.)

Department of Geology and Palaeontology, University Museum, University of Tokyo, Hongo, Tokyo (GT.)

Geological Institute, Yokohama National University, Yokohama (GY.)

Institute of Geology and Palaeontology, Tohoku University, Sendai (IGPS.)

Those indicated with asterisk are at present in the private possession of the collectors (T. and K. MURAMOTO and T. TAKAHASHI) but temporarily registered at GK. to which they would eventually be transferred.

### 1. *Ainoceras kamuy* sp. nov.

Pl. 20, Figs. 1–6; Text-figs. 1–4

*Etymology*.—*Kamuy*, the god deified by the Aino people.

*Material*.—Holotype, GK. H5575, from the zone of *Inoceramus orientalis* at

the third tributary of the Nio-no-sawa, Toyosato, Nakagawa-mura, Nakagawa-gun, Teshio Province, Hokkaido (collected by Takemi TAKAHASHI in a field work conducted by T. M.)

Paratypes, GK. H5577, H5580\*, H5581\* (near the type-locality), GK. H5579 (Sakugakko-no-sawa), GT. I-3575 (loc. T960p, Shibunnai-Takagi-no-sawa), and GT. I-3572 (loc. T522p, Abeshinai-Rubeshibets), from the zone of *Inoceramus orientalis* in the Abeshinai-Saku area, Nakagawa-gun, Teshio Province (Coll. T. and K. MURAMOTO, T. TAKAHASHI; T. MATSUMOTO); GY. 1-1, GY. 1-2, GY. 2-1, and GY. 3, from loc. U260 of Y.K. (Hattori ranch), and also GK. H5583, from loc. U710 of T. M. (Hattori ranch), zone of *Inoceramus orientalis* in the Urakawa area, Hidaka Province, south central Hokkaido (Coll. Y. KANIE; T. MATSUMOTO).

A number of other fragmentary specimens from the two areas are probably ascribed to the present species.

*Specific characters.*—The main part of the phragmocone (i.e. septate shell) is helical, consisting of several, moderately growing, contiguous whorls. The helical coiling is tight, the earlier whorl being overlapped by the next later one. The apical angle of the helix is acute (30 to 40 degrees) in the early growth-stage, enlarging with growth. The whorl is rounded on the outer side and less so on the inner, i.e. umbilical side, being subelliptical in intercostal section, with height more or less larger than breadth\*. The umbilicus of the helical whorl is narrow, being smaller than the whorl breadth.

The last whorl, which is mainly occupied by a body-chamber, is separated from the helical whorls and forms a crioceratoid volution. When the whorl changes from helical to crioceratoid coiling, it is somewhat twisted, so as to make a larger dimension (i.e. height which has been perpendicular to the plane of helical coiling) incline into that parallel to the plane of crioceratoid coiling. At this transitional stage the whorl shows a compressed elliptical section. While the whorl is curved in a planospiral crioceratoid coiling, it is sooner or later broadened and inflated, becoming subcircular in section. The whorl enlarges slowly in this period.

The helical coiling is dextral or sinistral. The last whorl is not retroversally curved but uncoiled in somewhat oblique orientation, forming an open planospiral like that of *Crioceratites*. The axis of the helix forms about 60 to 70 degrees with that of the crioceratoid coiling.

The shell is ornamented with transverse ribs which are somewhat oblique and gently sinuous on the helical whorls and ring like and sometimes slightly sinuous on the crioceratoid whorl. The ribs are separated by wider interspaces, about 12 to 17 per whorl in the helical part, becoming as a rule more distant on the crioceratoid whorl, although the interval may be shortened or become irregular in some cases. The rib is elevated by the flaring of the test, being most prominent at the upper lateral shoulder. It is sharp headed on the test but is truncated and

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\* Since the siphuncle is deviated, the height of the helical whorl is defined as a dimension measured in parallel to the axis of the helix and the breadth as that measured along a radial line in perpendicular to the axis.

may look rather blunt on the internal mould. A weaker secondary rib may occasional occur and faint lirae may be discernible on the wide interspaces between the ribs.

The siphuncle is deviated toward the upper lateral part in the helical stage. It is shifted back nearer to, but not precisely at the middle of the flank when the whorl is changed from helical to planospiral.

The suture is florid and of modified lytoceratid type. The elements are bifid except for trifold I, deeply and finely incised and their stems are narrowed, except for that of E. Their arrangement is considerably asymmetric.

*Measurements in mm:*

Specimen	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(2)/(6)
GK. H5575	26+	25.0	9.8	7.5	13	52.8	15.0	15.2	23.5	12	0.47
GK. H5577	(18)	12.1	6.5	4.4	17	(30+)	8+	8+	—	8+?8	(0.4)
GK. H5579	(18)	12.5	6.2	4.8	16	(34)	10	8+	—	12+	0.37
GK. H5580	22.5	16.3	8.0	7.0	12	(40)	10.5	11.4			
(intercostal)							9.2	9.0			
GY. 1-1	11+	10.5	3.9	—	—	33.6	11.5	—	15.0	12	0.31
GY. 1-2	(12.5)	—	(4)	—	—	(33+)	(9+)	—	16.0	17	—
GY. 2-1	—	15	—	—	—	46+	14.0	15.0	24.5	12	0.32

(1): height of helix; (2), (3), (4): diameter, height, and breadth of the last helical whorl; (5): number of ribs in the last helical whorl; (6), (7), (8), (9): diameter, height, breadth, and umbilicus of the crioceratoid whorl (which are measured in the same way as in the normal planospiral ammonites); (10): Number of ribs in a half of the crioceratoid whorl. The measurements in parentheses are approximate, when a specimen is defective. Specimens GY. 1-1 and GY. 1-2 are secondarily compressed.

*Variation.*—Although the available specimens are not numerous, they show a certain extent of variation in the size of the shell, proportion of the helix to the crioceratoid part, strength and density of ribs, etc. The above measurements show some of the situation.

The holotype is 53 mm in diameter of the crioceratoid last whorl and slightly over 26 mm in height of the helix. Seven other specimens (paratypes) are smaller than the holotype, being less than 40 mm in diameter of the crioceratoid whorl and vary from 23 mm to 11 mm in height of the helix. On the other hand there are larger specimens than the holotype, although they are fragmentary. For example, specimen GY. 3, from Urakawa, is a portion of a crioceratoid whorl of presumably 75 mm or so in diameter.

To know the size proportion of a helical part to the crioceratoid part, the ratio of a diameter of the last helical whorl to that of the crioceratoid one is taken here. It is 0.47 in the holotype, but 0.37 in GK. H5579 and still smaller in GY. 1-1 and GY. 2-1. In the last mentioned specimen (Pl. 20, Fig. 6) the crioceratoid part consists of one and a half whorls and is obviously longer than in others.

In the holotype the apical part (of presumably two volutions) are missing, on which ribs may be less distant as in certain paratypes. Except for this earliest part, the ribs are widely separated on both the helical and crioceratoid

whorls of the holotype. The distance is on the average about two thirds of the whorl height, but is slightly shortened or broadened at places. It is especially shortened at the point where the whorl changes from helical to crioceratoid. A secondary rib is intercalated at two points in the middle part of the last whorl of the holotype and at other places on the paratypes. Anyhow, it occurs infrequently. As the test is mostly worn away on the helical whorls of the holotype, the ribs show only a moderate elevation and are truncated on top. The test is preserved on a part of the last helical whorl, where the rib is remarkably elevated by flaring of the test and sharp on top. The flaring is most prominent on the upper lateral part. The ribs on the last crioceratoid whorl likewise show flaring, being most prominent on the upper lateral and outer rounded sides and less so on the somewhat flattened lower side.

Paratypes GY. 1-1 (Text-fig. 1), GK. H5580 (Pl. 20, Fig. 5) and GK. H5581 (Pl. 20, Fig. 3) are similar to the holotype in the distance and strength of the ribs, although they are somewhat smaller than the holotype. Another specimen, GY. 1-2 (Text-fig. 2), embedded in the same rock as GY. 1-1, has more numerous, accordingly less distant ribs. Another paratype, GK. H5579 (Pl. 20, Fig. 4), has likewise less distant ribs than the holotype and another one, GK. H5577 (Pl. 20, Fig. 2), has still denser ribs. In all of these specimens the ribs are as a rule less distant in the early growth-stage than in the late stages.

Of 12 specimens 3 are sinistral and 9, including the holotype, dextral. As seen in paratypes GK. H5577 and H5579, at the stage with whorl diameters of 3 to 5 mm there is a change in the orientation of the oblique ribs. This seems to imply a sudden change in the mode of coiling as in the early stage of *Eubostrychoceras muramotoi* MATSUMOTO, 1967. In fact in GK. H5577 the earliest whorl is preserved in the axial part of the helix as in the holotype of *E. muramotoi* MATSUMOTO (1967, pl. 19, fig. 1).

In GK. H5580 (Pl. 20, Fig. 5) the coiling is not so tight as in others; the lower two whorls of the helix is rather in light contact with each other. This feature is somewhat similar to that in the other species (described below), but otherwise this specimen closely resembles the holotype and other typical examples of the present species, to which it should better be referred.

*Affinity and comparison.*—This new species may have derived from some Santonian species of *Eubostrychoceras*, but we are not yet successful in obtaining examples which could be regarded as its immediate ancestor.

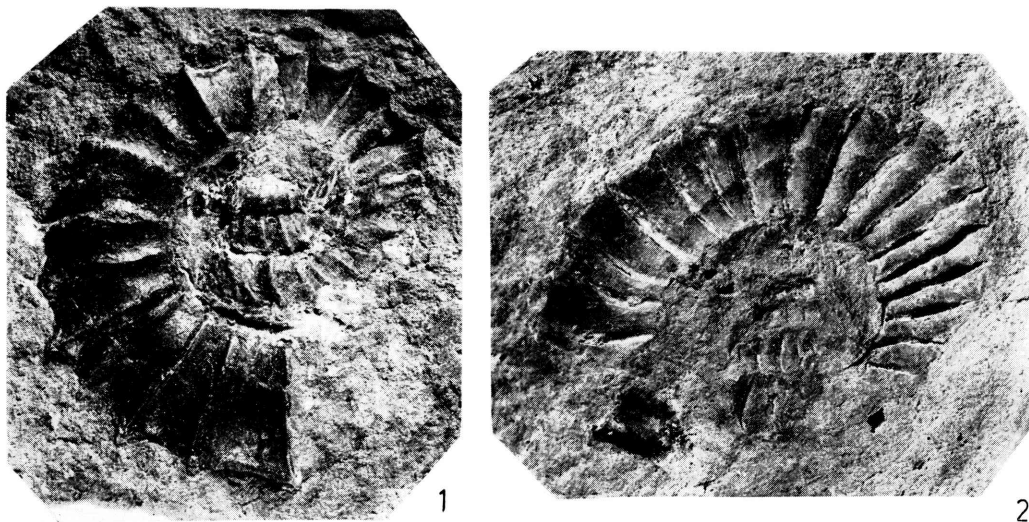
In the early growth-stage the present species is similar to *Didymoceras* (*Bostrychoceras*) *elongatum* (WHITEAVES) (1903, p. 331, pl. 44, fig. 2; USHER, 1952, p. 105, pl. 28, figs. 3, 4; pl. 31, fig. 24), from the Nanaimo Group of the Vancouver Island, British Columbia\*, but the former has a much smaller helix. In the late growth-stage the distinction is clear in its more distant, flared ribs and crioceratoid coiling.

*Occurrence.*—Nio-no-sawa, Sakugakko-no-sawa, Shibunnai-Takagi-no-sawa,

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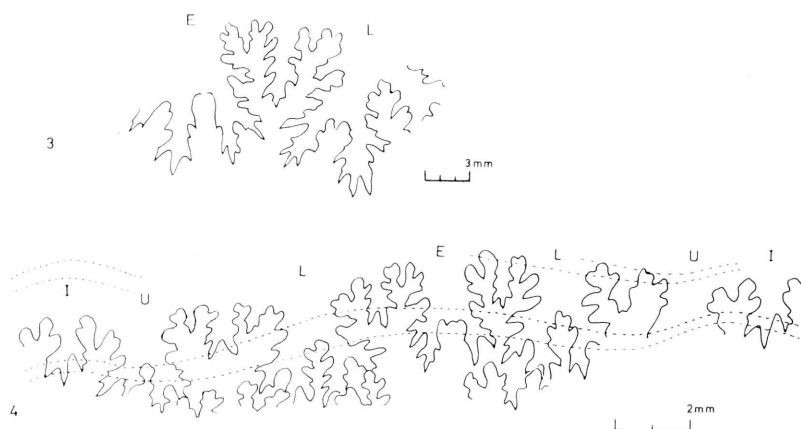
\* The specimens referable to *D.(B.) elongatum* have been obtained from the Abeshinai-saku area, Teshio Province, Hokkaido (GK. H5574 and GT. I-3574, from Chikabunnai).

and Rubeshibets in the Abeshinai-Saku area, Teshio Province, Hokkaido; Hattori ranch (U260-h and U260), Azumacho (U478), Urokobetsu (U40) and Nishihorobetsu (U118), in the Urakawa area, Hidaka Province, Hokkaido. Always in the zone of *Inoceramus orientalis*, more or less sandy siltstone of the upper part of the Upper Yezo Group.



Figs. 1,2. *Ainoceras kamuy* sp. nov.

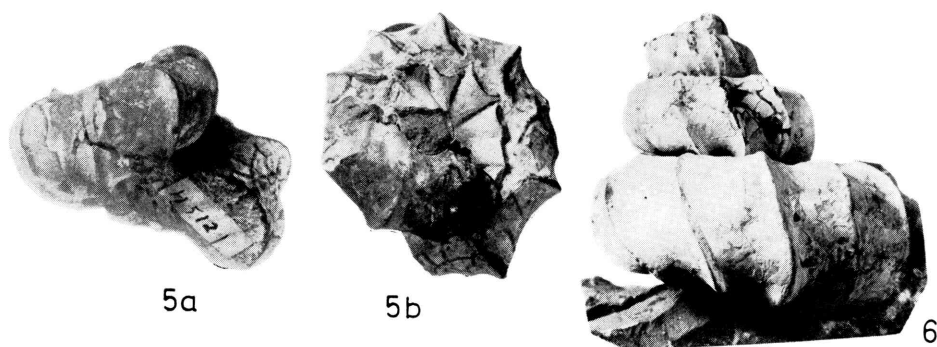
1. GY. 1-1, paratype, from loc. U260, Hattori ranch, Urakawa,  $\times 5/3$ . This is smaller than the holotype.
2. GY. 1-2, another paratype (plaster model), from the same rock as above, showing less distant ribbing,  $\times 5/3$ .



Figs. 3,4. Sutures of *Ainoceras kamuy* sp. nov.

3. GK. H5575, holotype (part of the last second suture at the beginning of the crioceratoid coiling).
4. GK. H5577, paratype (at the transitional stage from the helical to the crioceratoid coiling). (T.M. *delin.*)





Figs. 5,6. *Ainoceras paucicostatum* sp. nov.

5. GK. H5121, paratype, from the Abeshinai area, Lateral (a) and apical (b) views of an incomplete helix,  $\times 1$ .
6. GK. H5582, paratype, from the fourth tributary of the Rubeshibets, Abeshinai area. Lateral view of a helix,  $\times 1$ .

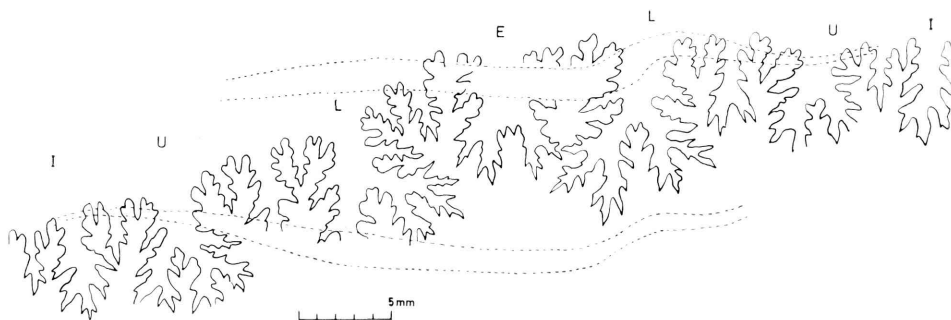


Fig. 7. Suture of *Ainoceras paucicostatum* sp. nov.

on a helical whorl of GK. H5121, at whorl height=11.0mm, breadth=10.0mm.  
(T.M. delin.)

## 2. *Ainoceras paucicostatum* sp. nov.

Pl. 21, Figs. 1-5; Text-figs. 5-7

1942. *Bostrychoceras paucicostatum* MATSUMOTO, MS. *nom.nud.* *Mem. Fac. Sci., Kyushu Imp. Univ.*, Ser. D, Vol. 1, No. 3, p. 205, p. 269 (listed only).

**Material.**—Holotype, GY. 16, from loc. U118, unit U2 $\beta$  of Kanie [Ur3 $\beta$  of MATSUMOTO], zone of *Inoceramus orientalis*, Nishihorobetsu, northeast of Ura-kawa, Hidaka Province, Hokkaido (Coll. Y. KANIE). Paratypes GK. H5578 and GK. H5582\* (Rubeshibets) (Coll. T. TAKAHASHI); GT. I-3577 (loc. T209p3, Oso-ushinai) (Coll. T. MATSUMOTO); GT. I-3572a, b and I-3573a (loc. T522p, Rubeshi-bets) (Coll. T. MATSUMOTO) and GK. H5121 (precise loc. uncertain) (Coll. S. NAGAOKA), all from the Abeshinai-Saku area, Teshio Province, Hokkaido. They occur along with *Inoceramus orientalis* and/or *Inoceramus elegans*. IGPS. 5387 (Coll. H. YABE), from the Rubeshibets of the same area, is probably a fragmentary last whorl of the present species. GT. I-3576 (loc. T944d, Osoushinai) (Coll. T. M.) is probably referable to the present species, although it is atypical.

**Specific characters.**—The main part of the phragmocone is helical, consisting

of several, rapidly growing, lightly contiguous whorls. The helix occupies a comparatively large part of the entire shell. Its apical angle is at first acute, showing a high turricone in the early stage. In the late part of the helix the whorl enlarges with a greater rate, slightly overlapping the preceding one; the adjoining whorls are in light contact with each other at the ribs but slightly separated at the interspaces. The entire helix is turbinate in general aspects, having a broad base. The whorl is subcircular to thickly elliptical in section, being a little higher than broad (with approximate proportion of 8:7). It is inflated on the outer side, rounded on the lower-lateral part, and somewhat flattened on the upper part, showing an upper-lateral shoulder in the late stage of the helical whorls.

The crioceratoid part in the holotype slightly exceeds a half volution. The axis of the crioceratoid coiling is much oblique to that of the helix. The whorl enlarges fairly rapidly even at the planospiral stage. It is depressed elliptical in section, in which a dimension measured along the radius of coiling (i.e. height) is smaller than that parallel to the axis of coiling (i.e. breadth).

The shell is ornamented with widely and regularly separated ribs, which are somewhat oblique and gently sinuous on the helical whorls and nearly radial (accordingly ring like) on the crioceratoid whorl. There are 10 to 12 ribs per whorl in the helical part and 9 or 10 on a half whorl of the crioceratoid part. The rib is much elevated by the flaring of the test, especially remarkably so at the upper lateral shoulder and less remarkably so in the lower lateral part, being more or less lowered on the middle of flank between the two flares. This character persists to the crioceratoid last whorl. The rib is sharp headed when the test is preserved, but it may be apparently truncated at the base of the flare. Several faint lirae may be discernible on the interspaces.

The siphuncle is situated near the upper lateral margin in the septate helical whorls. The suture is florid and of modified lytoceratid type, consisting of bifid E, L, U and saddles and trifold I, which are deeply and finely incised and have a narrow stem. The elements are asymmetrically arranged.

*Measurements in mm:*

Specimen	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(2) / (6)
GY. 16	42.0	34.0	17.2	(13+)	(10)	69.5	13.2	19.6	(37)	9	0.6
GK. H5582*	40(+12?)	41.0	21.5	(17+)	11	missing					
GK. H5578	42.0	35.0	16.5	14.5	12	missing					
GK. H5121	—	36.2	18.0	15.5	10	missing					
“ “ (intercostal)	—	33.5	16.8	14.5							
GT. I-3577	45(+5?)	34.5	17.6	(13.5)	10	missing					
IGPS. 5387							19.5	25.5			
“ “ (intercostal)							18.5	20.0			
GT. I-3576	—	15.5	8.3	6.9	12						

*Variation.*—The helical and crioceratoid parts are both preserved only in the holotype, whose body-chamber is secondarily deformed. In other cases the septate helical whorls are better preserved, while the crioceratoid last whorl occur only

as fragmentary specimens. Therefore there are little data as regards the relative size and orientation between the helix and the crioceratoid last whorl, to compare them with the feature shown by the holotype. Anyhow, the helical part is fairly large, ranging from 34 mm to 41 mm in diameter of the last helical whorl in the measured five specimens. GT. I-3576 (Pl. 21, Fig. 2) is, however, an exceptional example in which the last helical whorl is only 15.5 mm in diameter. It is, thus, atypically small, but otherwise it shows the characteristic ornamentation and light coiling of the present species.

As far as the specimens before the writers are concerned, the turbinate shape of the helix consisting of lightly contiguous whorls, and the regularly distant ribs, with characteristic flaring, are observed with little variation. There is no intercalation of a secondary rib. Even on the small whorls of the early growth-stage the ribs are fairly distant, although they are separated by narrower interspaces than on the whorls of the later growth-stages.

*Comparison.*—The present species resembles *Ainoceras kamuy*, described in the preceding paragraph, but is distinguished by its normally larger helical part in proportion to the entire shell, more rapid enlargement and lighter contact of the whorls, less twisting of the whorl from helical to crioceratoid, and on the average less numerous, more regularly distant ribs, on which flaring is more remarkable at the upper lateral shoulder and on the lower lateral part, with intervening more or less weakened part between the two points.

The helical part of the present species is somewhat similar to *Bostrychoceras sanctaenae* ANDERSON (1958, p. 206, pl. 52, figs. 3, 4), from the Campanian of California, but the former has more distant ribs than the latter. The Californian species might be another example of *Ainoceras*, but the conclusion should be refrained until the coiling of the last whorl is known.

Even if the specimens of the helical part alone are handled, the present species is distinguished from *Didymoceras* (*Bostrychoceras*) *elongatum* (WHITEAVES) (*op. cit.*) by its more rapid enlargement of whorls and much more distant, characteristically flared ribs.

By the distant ribs and two rows of special flaring and also by the shape of the helical part the present species might be confused with such species as *Tridenticeras peramplus* (LASSWITZ) (1904, p. 234[14], pl. 14[2], fig. 1), from the Austin Chalk of Texas. The similarity is, however, superficial, because the latter belongs to the Turrilitidae, having a tightly coiled turricone throughout life, major ribs without flaring, and three rows of tubercles.

The crioceratoid last whorl of the present species may sometimes be confused with the separated helical whorl of *Hyphantoceras venustum* (YABE) (1904, p. 11, pl. 3, fig. 4; pl. 5, figs. 1, 2=holotype), but the latter has numerous, fine ribs between the flared major ribs. When the better preserved specimens are handled, the two species are unmistakably distinguished by differences in the mode of coiling and ornamentation.

It is interesting to note that the helical part of the present species apparently resembles *Epitonium* (*Epitonium*) *scalare* LINNAEUS, a living gastropod species, in general aspects of the shell, especially in the mode of coiling and the flared ribs

by which whorls are lightly in contact but are slightly separated at the interspaces of the ribs. This is a good example of homoeomorphy.

*Occurrence*.—Nishihorobetsu (loc. U118) in the Urakawa area, Hidaka Province, Hokkaido; Rubeshibets and Osoushinai in the Abeshinai-Saku area, Teshio Province, Hokkaido. Zone of *Inoceramus orientalis*, K5 $\gamma$  (approximately Lower Campanan), in the two areas.

### Acknowledgements

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- N.B. Other references cited in this paper under the indications of ANDERSON (1958), BASSE (1939), FORBES (1846), GROSSOUVRE (1894), HYATT (1894, 1900), LASSWITZ (1904), MATSUMOTO (1959), SPATH (1925), STEPHENSON (1941), USHER (1952), WHITEAVES (1903) and YABE (1904) are the same as those listed in the immediately preceding paper by T. MATSUMOTO (1967) of this issue (pp. 345–347).

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from the Upper Cretaceous of Hokkaido

Plates 20 ~ 21

## Plate 20

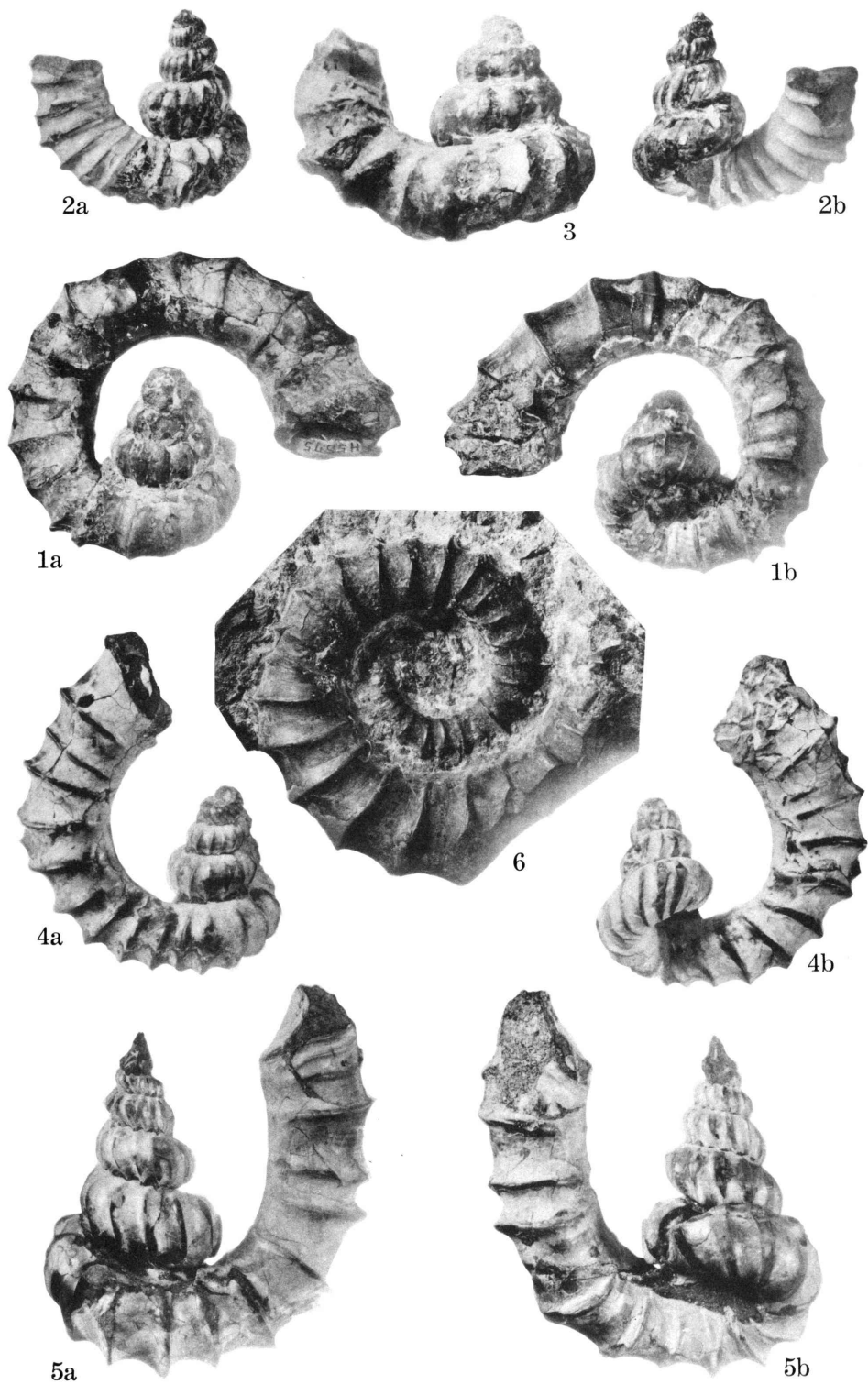
## Explanation of Plate 20

Figs. 1-6. *Ainoceras kamuy* gen. et sp. nov. ....Page 351

1. GK. H5575, holotype, from the 3rd tributary of the Nio-no-sawa, Saku area, Teshio Province, Hokkaido, in two views (a, b), with the plane of crioceratoid coiling parallel to the plate,  $\times 1$ .
2. GK. H5577, comparatively more densely ribbed paratype, from the type-locality, in two views (a, b),  $\times 1.5$ .
3. GK. H5581, paratype, from the type-locality,  $\times 1.5$ .
4. GK. H5579, paratype, from Gako-no-sawa, Saku area, Teshio Province, Hokkaido, in two views (a, b),  $\times 1.5$ .
5. GK. H5580, paratype, a sinistral form, from the type-locality, in two views (a, b),  $\times 1.5$ .
6. GY. 2-1, paratype, from loc. U260, Hattori ranch, Urakawa area, Hitaka Province, Hokkaido, showing the crioceratoid whorls and the basal surface of the small helix,  $\times 1$ .

All from the zone of *Inoceramus orientalis*, approximately Lower Campanian.

Kyushu University Photos, without whitening.





## Plate 21

## Explanation of Plate 21

Figs. 1–5. *Ainoceras paucicostatum* gen. et sp. nov. . . . . Page 356

1. GT. I-3573a, paratype, from loc. T522 p, Rubeshibets, Abeshinai area, Teshio Province, Hokkaido. Two lateral (a, b), apical (c) and basal (d) views of the helix,  $\times 1.5$ .
2. GT. I-3576, sinistral specimen, from loc. T944d, Osoushunai, Abeshinai area, Teshio Province. Lateral (a), apical (b) and basal (c) views, showing a change of helical coiling to crioceratoid at a smaller stage than in other examples,  $\times 1.5$ .
3. G K. H5578, paratype, from Rubeshibets, Abeshinai area, Teshio Province. Two lateral (a, b), apical (c) and basal (d) views of the helix,  $\times 1$ .
4. GT. I-3577, a paratype, from loc. T209 p3, Osoushunai, Abeshinai area. Lateral view of the helix,  $\times 1$ . This is closely similar to the helical part of the holotype.
5. GY. 16, holotype, from loc. U118-3, Nishihorobetsu, Urakawa area, Hidaka Province, Hokkaido, in two views,  $\times 1$ . The helical whorls are partly concealed.

All from the zone of *Inoceramus orientalis*, approximately Lower Campanian.

Kyushu University Photos, without whitening.

