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728. SOME CONIACIAN AMMONITES FROM HOKKAIDO*

(STUDIES OF THE CRETACEOUS AMMONITES FROM HOKKAIDO**—XL)

TATSURO MATSUMOTO

c/o Department of Geology, Kyushu University, Fukuoka 812

KIKUWO MURAMOTO

Mikasa Museum, Mikasa 068-22

HIROMICHI HIRANO

Department of Geology, Waseda University, Tokyo 160

and

TAKEMI TAKAHASHI

28-109, Yayoi, Mikasa 068-22

Abstract. In this paper four species of Coniacian ammonites are described to supplement previously published monographs (MATSUMOTO, 1965-1971). They are two new species of *Peroniceras*, which are allied to *P. stefaninii* VENZO and *P. besairiei* VAN HOEPEN respectively, *Sornayceras* cf. *proteus* MATSUMOTO, which is based on a large specimen, and *Barroisiceras onilahyense* BASSE. The localities and stratigraphic positions of the described specimens are explained at length.

As an appendix, remarks are given by one of us (T. M.) on the Coniacian biostratigraphy in western Europe and other selected regions and also on the zonation and correlation of the Coniacian equivalent in Japan.

Introduction

To cooperate with the Coniacian to Maastrichtian Working Group (Leader Dr. F. SCHMID) of the IUGS Subcommission on the Cretaceous Stratigraphy (Chairman Professor Tove BIRKELUND), one of us (T. M.) has been studying ammonites from the Japanese province to compare them with those from northwest Europe and other well studied regions. For the purpose of inter-regional correlation, ammonites of the Collignoniceratidae are the most useful.

One of us has already published a monograph of that family in series (MATSUMOTO, 1965a, b, 1969, 1970a, 1971).

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** Numbering follows that of the title "Studies of the Cretaceous ammonites from Hokkaido & Saghalien".

Recently some additional ammonites have been obtained by several persons who have worked in cooperation with T. M. One of them, a Santonian species of Texanitinae, has been described by MATSUMOTO and HARAGUCHI (1978), in the appendix of which the problem of Santonian zonation has been discussed. In this paper some Coniacian ammonites are described by coauthorship of relevant persons in two parts and the problem of Coniacian zonation is discussed by one of us (T. M.) as an appendix.

Acknowledgements:—Before going further, we thank Mr. Hisayoshi TANIGUCHI and Mr. Fumio SUZUKI, who have kindly provided fine specimens for our study, and also Drs. Kazushige TANABE and Masayuki NODA, who have friendly helped us. Thanks are extended to Drs. H. SUMMESBERGER (Vienna), E. SEIBERTZ, S. KELLER (both Hannover), J. WIEDMANN (Tübingen) and W. J. KENNEDY (Oxford) for their kind replies to the inquiries from one of us (T. M.). Miss Kazuko HARA has assisted us in preparing the typescript.

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Palaeontogical Description

Part I

Additional Ammonites of the Peroniceratinae from Hokkaido

T. MATSUMOTO and K. MURAMOTO

The ammonites belonging to the subfamily Peroniceratinae from the Cretaceous of Hokkaido were monographed by one of us (MATSUMOTO, 1965b), in which ten species were described. Among the subsequent collections there are three large interesting specimens. We describe them below. Although one of us (T. M.) is mainly responsible for the palaeontological description, coauthorship is taken because the other of us (K. M.) is responsible for collecting and cleaning the specimens.

Family Collignoniceratidae WRIGHT, 1952

Subfamily Peroniceratinae HYATT, 1900

Remarks:—Pending the issue of the paper by KENNEDY and KLINGER (1975) on the Peroniceratinae from South Africa, we would not discuss too much on the relationships between the genera and subgenera proposed or redefined by VAN HOEPEN (1965) with those of MATSUMOTO (1965b).

Genus *Peroniceras* DE GROSSOUVRE, 1894

Type species:—*Peroniceras moureti* DE GROSSOUVRE, 1894 (original designation).

Remarks:—The two species to be described below are certainly referred to *Peroniceras*.

Peroniceras latum sp. nov.

Pl. 6, Fig. 1; Pl. 7, Fig. 1; Text-fig. 1

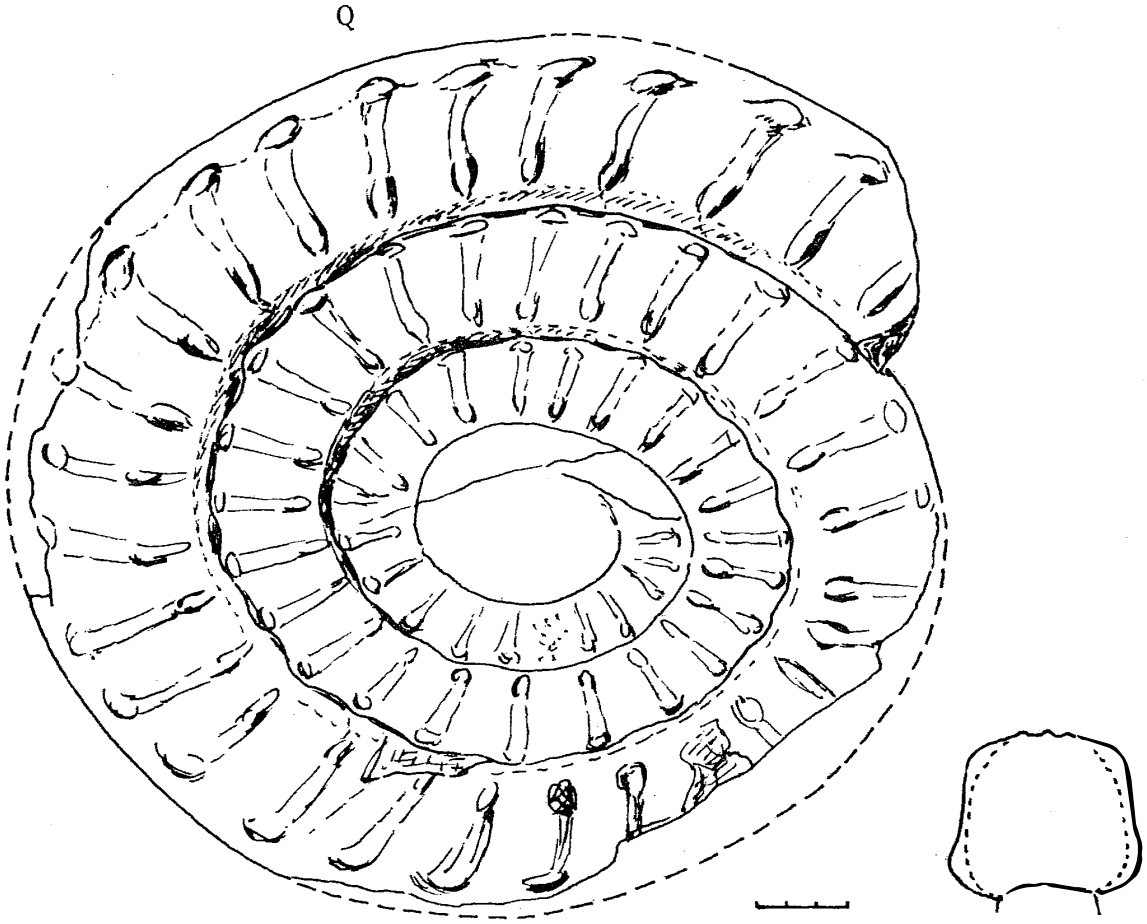
Material:—Holotype, "HCS. 73", obtained from loc. Ik 1540, main stream of the Ikushumbets, by H. TANIGUCHI and K. MURAMOTO in July 1965.

Description:—The shell is very large in the adult stage, somewhat over 300 mm in diameter. It is much evolute, consisting of slowly enlarging polygyral whorls with little overlap. The diameter of the umbilicus is about 63 per ct. of that of

the entire shell. The body-chamber is very long, occupying somewhat more than one full volution, although the very apertural margin is not preserved.

The whorl is nearly as high as broad in the intercostal section; thickest at some distance from the abruptly rounded umbilical shoulder in its lower part (accordingly between the umbilical tubercles in the costal section); the umbilical wall is low but nearly vertical. The venter is broadly arched and weakly to moderately tricarinate; the ventrolateral shoulders are sloping on the intercostal parts, but subangular along the costae.

The ribs are moderately broad, fairly distant, but numerous, numbering 28 on the outer whorl and 24 on the next inner one and about 20 on the still inner one. They are mostly simple on the outer two whorls but occasionally bifurcate on the inner ones. They are nearly rectiradiate on the septate whorls and slightly prorsiradiate or gently flexuous on the body whorl. Each of them has a bullate tubercle around the umbilical margin and a rather clavate one at the ventrolateral shoulder; the former is highest slightly above the umbilical shoulder; the latter is typically clavate on the inner whorls but obliquely rounded and thickened on the body-whorl.



Text-fig. 1. *Peroniceras latum* sp. nov. Diagrammatic sketch of the holotype. Lateral view and whorl-section at Q.
Bar: 30 mm. (T. M. *delin.*)

Measurements (in mm) of *Peroniceras latum*:—

Specimen	Diameter	Umbilicus	Height	Breadth (costal)	Breadth[B′] (intercostal)	B/H	B′/H
HCS. 73	323.0(1)	206.0(.64)	62.0(.19)	70.0(.22)	62.0(.19)	1.1	1.0
For comparison: *P. stefaninii*							
VENZO's	240.0(1)	134.0(.56)	62.0(.26)	60.0(.25)	50.0(.21)	0.97	0.8

The suture follows the general pattern of *Peroniceras* suture (as explained by MATSUMOTO, 1965b, p. 212), but the stem of its lateral lobe (L) has some breadth and is not so extremely narrowed as in *Peroniceras* aff. *platicostatum* VAN HOEPEN (see MATSUMOTO, 1965b, pl. 36, fig. 1; text-fig. 2), or in *P. westphalicum* var. *australis* VENZO (1936, pl. 11, fig. 8).

Comparison and discussion:—This specimen resembles the holotype of *Peroniceras stephaninii* VENZO (1936, p. 102, pl. 9, fig. 8; pl. 10, fig. 10; pl. 12, fig. 6), from the Coniacian of Zululand (South Africa) in many respects. The latter is 240 mm in diameter, but the body-chamber seems to be incompletely preserved. Should its body-chamber completely preserved, it would be 310 mm or so in diameter, that is nearly the same size as the present specimen.

The specimen from Hokkaido is likewise similar to the illustrated specimen from the Coniacian of Armenia, which was identified with *Peroniceras haasi* YOUNG by ATABEKIAN and AKOPIN (1972, p. 8, pl. 2, fig. 4a; pl. 3, fig. 1b). That Armenian form has coarser, stronger and more rounded ribs than *P. haasi* YOUNG (1963, p. 72, pl. 34, figs. 3, 4; pl. 35, figs. 1–3), from the Lower Coniacian of Texas, and is closer to or possibly identical with *P. stefaninii*.

In the holotype of *P. stephaninii*, as in the specimen from Armenia, the umbilicus is about 55 per ct. of the shell diameter and the ribs number about 20–22 per whorl. The specimen from Hokkaido has much wider umbilicus, i.e. about 63 per ct. of the shell diameter, more slowly enlarging whorl and more numerous ribs, numbering 28 on the outer whorl despite their fairly wide intervals.

YOUNG (1963, p. 75) thought that *P. stephaninii* would be placed in synonymy with *P. westphalicum* of SCHLÜTER (1867, 1872). As YOÜNG himself mentioned, the figured examples from Texas described under *P. westphalicum* closely resemble the holotype of *P. stephaninii*.

Unless examining the original specimens (syntypes) of *Ammonites westphalicus* VON STROMBECK (1859, p. 56), and its topotypes from the "Grauer Mergel" (Coniacian) of Westphalia (West Germany), it seems me difficult to understand definitely this "famous" species. SCHLÜTER's earlier paper (1867, p. 30, pl. 6, fig. 2) is also ambiguous in that he did not illustrate the lateral view of his specimen. He described, however, that the ribs number 19 around the umbilicus and 24 at the ventrolateral part. STROMBECK recognized "rarely and irregularly intercalated ribs in the late growth-stage" of his specimen. According to SCHLÜTER's later paper (1872, p. 45, pl. 13, figs. 5, 6), *Ammonites westphalicus* has fairly frequently intercalated or bifurcated secondary ribs, with the result to have more numerous ventrolateral tubercles than the umbilical ones (e.g. the former counted 27 in contrast to 19 or 21 of the latter). In this and other respects, one of the illustrated specimens of DE GROSSOUVRE (1894, p. 98, pl. 12, fig. 4), from

the Coniacian of France, is a good example of *P. westphalicum* in the sense of SCHLÜTER, but the other (DE GROSSOUVRE, 1894, pl. 12, fig. 1) differs from "the type", as GROSSOUVRE himself mentioned. We hesitate to identify the latter to the same species.

If the above discussion is warranted, then it follows that "*Peroniceras westphalicum*" of YOUNG (1963, p. 74, pl. 28, figs. 2-4; pl. 29, figs. 1, 2; text-fig. 15d), from Division A of the Austin Chalk (Texas), may not be the named species. We suggest that YOUNG's *P. westphalicum* is probably *P. stefaninii* and that *P. stefaninii* and *P. westphalicum* are distinguishable.

Coming back to the specimen from Hokkaido, we hesitate to decide conclusively whether the described differences deserve specific or subspecific distinction from *P. stefaninii*. If we consider the resemblance in essential points but for the extremely wide umbilicus and the consequent increase of rib numbers, the Hokkaido specimen could possibly regarded as representing a subspecies of *P. stefaninii* in the Japanese province. YOUNG (1963, p. 74), however, has shown that the umbilicus size ranges from 43 to 58 per ct. of the diameter in the Texas specimens (of his *P. westphalicum*). This variation is of large extent, but the Hokkaido form (63 per ct.) distinctly exceeds that range. Therefore, at least for the time being, we describe it as representing a new species.

Should the extent of variation in our province be made clear on more specimens to overlap slightly with that of the Texas or South African form, then the new name *latum* might be ranked down to subspecific. Be that as it may, it cannot be denied that there is a discrepancy in geological age (i. e. Late Coniacian of our species as compared with Early Coniacian of Texas or South African species) as well as the difference in geographical distribution.

Occurrence:—Loc. Ik 1540, dark grey mudstone of the Upper Yezo Group exposed on the left bank of the main stream of the River Ikushumbets, about 100 m downstream from the confluence with the tributary Samatazawa (Text-fig. 4). In the same mudstone unit *Inoceramus* (*Platyceramus*) *yubarensis* NAGAO et MATSUMOTO occurs and this part is assigned to the upper part of Lower Urakawan [K5a2], approximately Upper Coniacian.

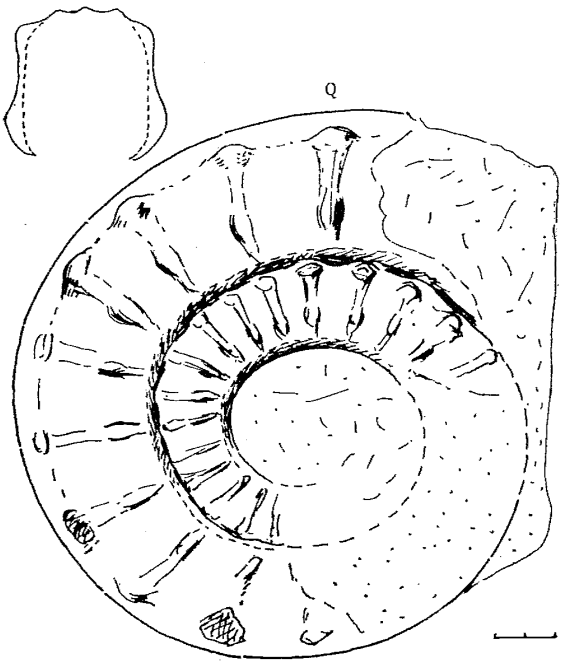
Peroniceras yubarense sp. nov.

Pl. 6, Fig. 2; Pl. 7, Fig. 2; Text-fig. 2

Material:—Holotype, Yb5152 of K. MURAMOTO's Collection in a calcareous nodule from the River Shiyubari.

Description:—The shell is 197 mm in diameter at the last septum. The body-chamber is only partly and poorly preserved and its actual length is unknown. Should it be assumed to occupy two thirds whorl, the entire shell diameter would be about 350 mm, which can be said very large. It is fairly evolute, consisting of moderately enlarging whorls with a slight overlap. The umbilicus is about 52 per ct. of the entire shell diameter.

The whorl is somewhat higher than broad in the intercostal section but broader than high in the costal section, being broadest between the umbilical tubercles. The venter is tricarinate, with the highest keel in the middle. It is broadly arched in the intercostal section. On the interspaces of the ribs the flanks are nearly parallel and only gently convex, with the maximum breadth at about the middle of the flank. The umbilical shoulder is abruptly rounded; the umbilical wall is



Text-fig. 2. *Peroniceras yubarense* sp. nov. Diagrammatic sketch of the holotype. Lateral view and whorl-section at Q. Bar: 20 mm. (T. M. *delin.*)

low but almost vertical.

Ribs are all simple, long and nearly rectiradiate or sometimes slightly rursiradiate, so far as the observable parts are concerned. They are broadly rounded and distant on the outer whorl, numbering 8 in a half whorl of the last septate stage; on the inner whorl of an earlier stage, about 100 mm or so in diameter, they are less distant, being separated by the interspaces nearly as wide as or only slightly broader than the ribs.

The umbilical tubercles are more or less bullate and highest at a point slightly below the middle of the flank instead of near the umbilical shoulder. The ventrolateral tubercles are clavate at their base and on the outer whorl moderately elevated and rounded.

The suture is of the *Peroniceras* pattern (see MATSUMOTO, 1965b, p. 212) (also DE GROSSOUVRE, 1894, figs. 37-39). The second lateral lobe [U2] is rather gently oblique. In the late stage the branches (lobules) of the first lateral lobe (L) are deep and much narrowed.

Comparison and discussion:—With respect to the shell-form and the strength of the ornamentation, this specimen resembles one of the illustrated specimens of *Peroniceras westphalicum* of SCHLÜTER (1872, pl. 13, fig. 6), but that specimen has more frequently intercalated or branched ribs, as has been mentioned in the foregoing page.

Taking account of the predominant simple ribs, without or with only occasional intercalation of the secondary ribs, and the highest elevation of the umbilical tubercles slightly below the middle of the flank, we consider that the present specimen is closer to the holotype from Zululand (South Africa) and another example from Madagascar of *Peroniceras besairiei* VAN HOEPEN (1965, p. 4, pl. 1; text-fig. 1a) (COLLIGNON, 1965, p. 54, pl. 437-438, fig. 1803). These specimens from South Africa and Madagascar differ from the Hokkaido specimen in their wider umbilicus, slower rate of whorl-growth and more numerous ribs.

Again it might be possible to regard

Measurements (in mm) of *Peroniceras yubarense*:—

	Diameter	Umbilicus	Height	Breadth (c.)	B′ (ic.)	B/H	B′/H
Yb 5152	197.0 (1)	102.0 (.52)	56.0 (.28)	58.0 (.29)	48 (.24)	1.05	0.86
For comparison: *P. besairiei*							
HOEPEN's	132 (1)	73 (.55)	34 (.26)	37 (.28)		1.07	
COLLIGNON's	220 (1)	135 (.61)	52 (.24)	55 (.25)		1.05	

the present form as representing a subspecies of *P. besairiei* in the Japanese province, if the extents of variation were overlapped between the forms from Japan and South Africa-Madagascar. So far as the available material is concerned, the distriction is so clear that we regard, at least provisionally, the Hokkaido specimen as representing a new species which is closely allied to *P. besairiei*.

Incidentally, the ammonite from Madagascar, which was described under *Peroniceras subtricarinatum* (D'ORBIGNY) by BESAIRIE (1930, p. 634, pl. 66, figs. 4-6), was regarded as another example of *P. besairiei* by VAN HOEPEN (1965). We are in favour of BESAIRIE, because it has more frequently intercalated or branched secondary ribs and because its umbilical nodes are highest at or near the umbilical shoulder.

Occurrence:—The calcareous nodule containing this ammonite was obtained by one of us (K. M.) as one of the transported boulders on the gravel of the main stream of the Shiyubari, at a point close to loc. Y102 of MATSUMOTO (1942, route map of pl. 15). For a considerable distance upstream from this point along the river, Coniacian strata consisting of the Zone of *Inoceramus uwajimensis* and the Zone of *Inoceramus mihoensis* are exposed repeatedly on account of minor thrusts (see geological map and profile of MATSUMOTO, 1942, pls. 13, 14 and map of MATSUMOTO and HARAGUCHI, 1978, fig. 1). Therefore this nodule is presumed to have been derived from either of these two zones. We should confirm the precise stratigraphic position of this species through further field work.

Genus *Sornayceras* MATSUMOTO, 1965

Type-species:—*Sornayceras proteus* MATSUMOTO, 1965 (original designation).

Remarks:—This genus was established with a clear definition by MATSUMOTO (Nov. 20, 1965b, p. 226), as a relative of *Gauthiericeras* and *Peroniceras*. Nomenclaturally, however, it may be synonymous with one of the genera (or subgenera) established independently by VAN HOEPEN (July, 1965). Further discussion about this point will be given by KENNEDY and KLINGER. I use for the time being the generic name *Sornayceras* until the issue of their forthcoming paper.

Sornayceras sp. cf. *S. proteus* MATSUMOTO

Pl. 7, Fig. 3; Text-fig. 3

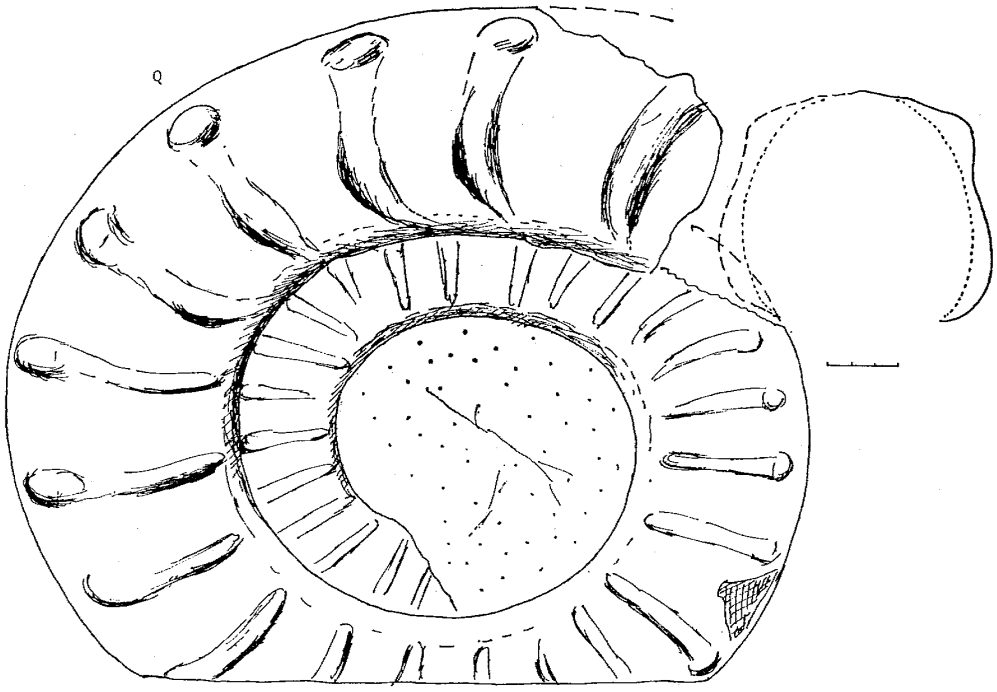
1960. *Sornayceras proteus* MATSUMOTO, *Mem. Fac. Sci., Kyushu Univ.*, [D], vol. 16, no. 3, p. 227, pl. 40, fig. 1; pl. 41, fig. 1; text-fig. 11, 12.

Material:—A large specimen of K. MURAMOTO's Collection, figured in this paper, is concerned with the present description.

Description:—The specimen is somewhat deformed into an elliptical form and its right side is dissolved into the rock matrix. The measurements (in mm) at about 90° behind the preserved end are as follows in the deformed state:

Diameter	340(1)
Umbilicus	170(.50)
Height	100(.29)
Breadth (costal)	*ca.* 58×2
B'. (interc.)	*ca.* 50×2

The shell is large, rather evolute and widely umbilicate. The whorl is nearly as high as broad in the intercostal section, but the proportion of B/H cannot be accurately measured on account of the half dissolved condition. It is broadest in its lower part and its flank is gently inflated. The venter is broad and low roof-shaped. The keel at the middle of the venter is low and there is a smooth



Text-fig. 3. *Sornayceras* sp. cf. *S. proteus* MATSUMOTO, from loc. Ik 1509, diagrammatic sketch. Lateral view and whorl-section at Q. Bar: 30 mm. (T. M. *delin.*)

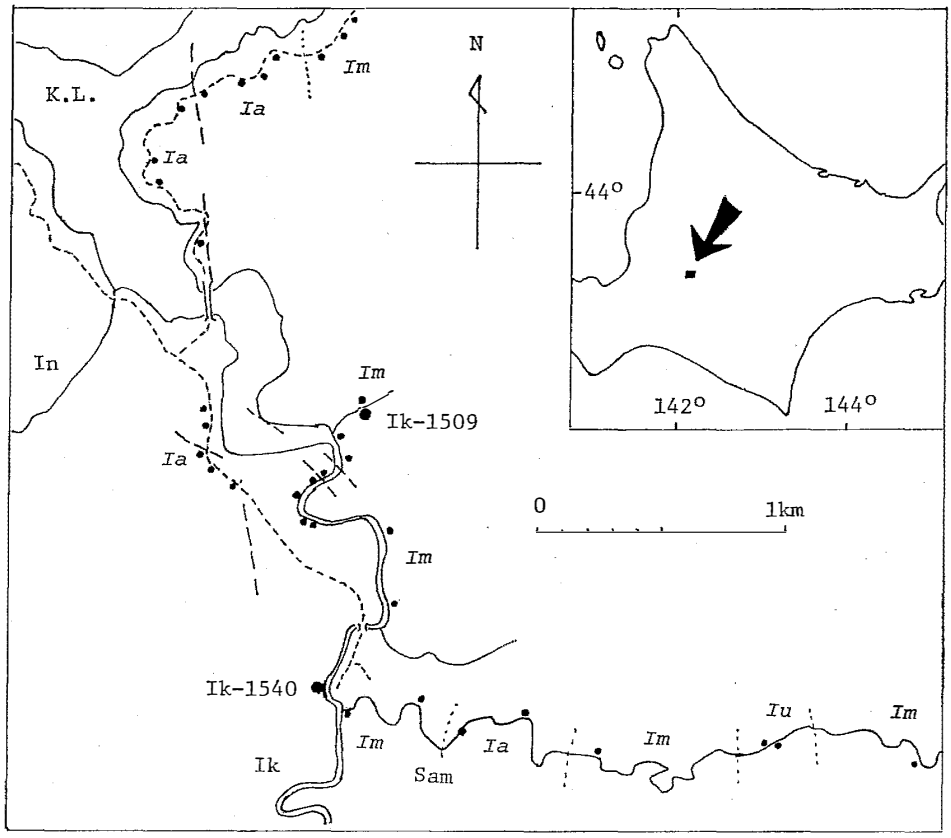
zone on either side of it instead of a groove.

The radial ribs are distant, coarse, mostly simple and provided with an umbilical and a ventrolateral rows of tubercles. They are nearly rectiradiate on the main part of the flank, but on the body-whorl they show a backward curvature around the umbilical margin. The umbilical tubercles are bullate and on the body-chamber they are thickened and highest at some distance from the umbilical margin. The ventrolateral tubercles are rounded to somewhat clavate and also thickened on the body-chamber.

There are 9 ribs on the preserved part of the body-whorl, that is a half volution. On the preceding septate whorl there are 24 ribs, of which only two are shorter than others. Still inner whorls are not well shown.

The suture is as complex as that of *S. proteus* (MATSUMOTO, 1965b, text-fig. 12). The last suture is at about 280 mm in diameter.

Comparison:—This specimen essentially resembles the holotype of *Sornayceras proteus* MATSUMOTO (cited above), but is much larger and its ribs are mostly simple, without intercalated shorter rib on the outer whorl. On the inner whorl there are a few shorter ones. In the original description (MATSUMOTO, 1965b), another large fragmentary whorl was described, on which no shorter rib is shown. It was called *Sornayceras* sp. cf. *S. proteus*. The present specimen is better preserved than that fragmentary one and seems to show the change in the mode of ribbing with growth. Unfortunately, its inner whorl as large as the holotype, about 95 mm in diameter, is not well preserved. Therefore we call it for the time being *Sornayceras* sp. cf. *S.*



Text-fig. 4. Route map of the River Ikushumbets around the localites of *Peroniceras latum* (Ik-1540) and *Sornayceras* cf. *proteus* (Ik-1509). Ik: main stream of the Ikushumbets, In: Inari-zawa, K. L.: Katsura-zawa Lake, Sam: Samata-zawa. *Ia*: Zone of *Inoceramus amakusensis* (lower Santonian), *Im*: Zone of *I. mihoensis*, *Iu*: Zone of *I. uwajimensis*, *Im*+*Iu*: Coniacian, ●: mega-fossil locality, broken thick line: fault. Inset at the upper right corner is the index map of Hokkaido. (Geol. Surv. by T. MATSUMOTO)

proteus MATSUMOTO.

Occurrence:—Loc. Ik 1509, mudstone in a small stream running to the right side of the main stream of the River Ikushumbets, immediately above the artificial lake of the Katsura- zawa dam (see Text-fig. 4). In the mudstone and contained calcareous nodules there are *Inoceramus* cf. *mihoensis* MATSUMOTO and *I.* (*Platyceramus*) cf. *yubarensis* NAGAO et MATSUMOTO. Therefore, the host bed is certainly assignable to the Zone of *I. mihoensis*, as in the case of the holotype. It is upper part of the Lower Urakawan [K5a2], approximately Upper Coniacian.

Part II

A New Record of *Barroisiceras* from Hokkaido

T. MATSUMOTO, H. HIRANO and T. TAKAHASHI

When one of us (MATSUMOTO, 1969) monographed the Barroisiceratinae, no example of *Barroisiceras* in a strict sense was known from Hokkaido and only *B.* (*Basseoceras*) *inornatum* MATSUMOTO was described. On the basis of recent acquisitions, we now can describe a species of

B. (*Barroisiceras*) from our province.

Subfamily Barroisiceratinae BASSE, 1947

Genus *Barroisiceras* DE GROSSOUVRE, 1894

Type-species:—*Ammonites haberfellneri* HAUER, 1866 (subsequent designation by SOLGER, 1904).

Remarks:—Pending the issue of the revision of *Ammonites haberfellneri* HAUER by KENNEDY and SUMMESBERGER now in preparation, we temporarily follow MATSUMOTO (1969) for the generic diagnosis and the subdivision into the subgenera, *Barroisiceras* and *Basseoceras* COLLIGNON, 1965.

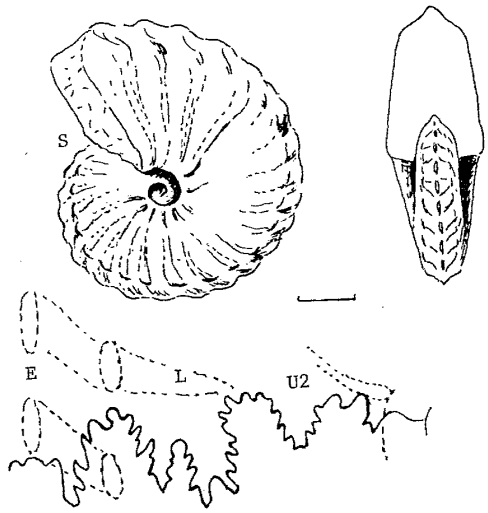
Barroisiceras (*Barroisiceras*) *onilahyense* BASSE

Pl. 8, Figs. 1-3; Text-figs. 5, 6

1907. *Schloenbachia* (*Barroisiceras*) *haberfellneri* et var., BOULE, LEMOINE & THÉVENIN, *Ann. Paléont.*, vol. 2, p. 43-45, pl. 11, figs. 2-4.
1947. *Barroisiceras onilahyense* BASSE, *Ann. Paléont.*, vol. 33, p. 100-109, pls. 1-5; pl. 6, figs. 1-4; pl. 7, fig. 1, 1a; pl. 8, figs. 1, 2; text-figs. 1-3.
1965. *Barroisiceras onilahyense*, COLLIGNON, *Atlas de Fossiles Caractéristiques de Madagascar* (Ammonites), fasc. 13, p. 68, pl. 444, figs. 1815-1817; p. 69, pl. 445, fig. 1819.

Material:—GK. H5733, obtained by H. HIRANO, in a field-work with K. TANABE, from loc. R2638j, now kept at Geological Type Collections of Kyushu University, and T. TAKAHASHI's Collection (TTC. 79-7-1) obtained by Fumio SUZUKI in a field-work with T. TAKAHASHI, from another exposure along the main course of the River Obirashibe, Rumoi district, Hokkaido.

Description:—The two specimens look so dissimilar that the individual characters are described at first.



Text-fig. 5. *Barroisiceras onilahyense* BASSE. Diagrammatic sketch of GK. H5733. Right side and frontal views and external suture at S (on left side). Bar: 10 mm. (T. M. *delin.*)

GK. H5733 (Pl. 8, Fig. 2; Text-fig. 5) has a tight involution (i. e., the growth ratio of the umbilical radius to the spiral is very small), a narrow umbilicus, much compressed whorl, weak and gently flexuous and somewhat prorsiradiate ribs and weak umbilical bullae.

The whorl is broadest at a point slightly outward from the umbilical margin and the flanks are convergent toward the shouldered, roof shaped venter. The ventral keel is serrated and provided with narrow clavae which correspond to the ribs. The long ribs start from low, slightly rursiradiate bullae, which number 7 or 8 per half whorl. At a short distance from the umbilical margin, the ribs are curved forward and then gently prorsiradiate on the main part of the flank, sometimes showing a gentle flexuosity. As a rule, the long ribs are alternated with shorter ribs on the outer part of the flank. The ribs are low and some-

what broad, being separated by narrower interspaces. At the ventrolateral shoulder all the ribs have distinct, somewhat clavate tubercles, from which they run forward toward the ventral clavae, showing chevrons. The ventrolateral tubercles are 13 or 14 per half whorl.

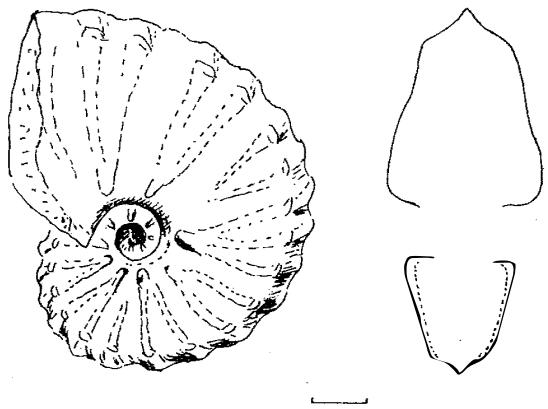
The suture, exposed on the part at whorl-height of about 16 mm, has rather massive saddles, irregularly subdivided lobes and rather shallow minor incisions.

The specimen has the incompletely preserved body-chamber and is only 56 mm in diameter. On the body-chamber the ribs become broader and lower and the umbilical bullae and ventrolateral tubercles are much weakened. Lirae and striae may be discernible on the surface. They run in parallel with the ribs. They show some irregularity at about the ocular sinus on the preserved last part of the left side (Pl. 8, Fig. 3). This is probably an injury.

The other specimen (Pl. 8, Fig. 1; Text-fig. 6) is stouter in shell-form and ornamentation than GK. H5733. It is also fairly involute and narrowly umbilicate, but U/D is 0.14–0.15 as compared with 0.12 of the latter. The umbilical wall is nearly vertical or somewhat overhanging. The whorl is higher than broad, but broader than in GK. H5733, showing B/H =0.77 as compared with 0.53 in the latter. It is broadest a little outside the subrounded or abruptly rounded umbilical shoulder and the flanks are convergent toward the shouldered and keeled venter.

The ribs are moderately coarse and strong. Strong umbilical tubercles are only 3 or 4 per half whorl. Some of the ribs arise from those umbilical tubercles but others start from near the umbilical margin without tubercles or from a weak bulla. The ribs are normally bifurcated at or near the umbilical margin and occasionally still shorter ones are intercalated on the outer half.

The ribs are gently flexuous on the flank of the outer whorl and projected forward on the venter, forming chevrons. The ribs are gradually broadened outward. The clavate tubercles at the ventrolateral shoulder and on the ventral keel are moderately strong. They number 12–13 per half whorl.



Text-fig. 6. *Barroisiceras onilahyense* BASSE. Diagrammatic sketch of TTC. 79-7-1. Lateral view and cross-section. Bar: 10 mm. (T. M. *delin.*)

This specimen also has the incompletely preserved body-chamber. The ornament tends to be somewhat weakened on the body-chamber, if not so remarkably weakened as in GK. H5733. Lirae and striae are in places discernible on the ribs and the interspaces in parallel with the ribs. Again, there is a slight injury at about the last portion of the phragmocone on the middle of the left flank. This is soon recovered on the body-chamber.

Measurements (in mm) of *Barroisiceras* (*Barroisiceras*) *onilahyense* :—

	Diameter	Umbilicus	Height	Breadth	B/H
GK. H5733 (last)	55.6(1)	6.7(.12)	29.8(.54)	—	—
〃 (−90°)	45.0(1)	5.2(.12)	24.4(.54)	13.0(.29)	0.53
TTC. 79-7-1 (last)	69.0(1)	10.0(.14)	38.0(.55)	28.6+α	0.75+α
〃 (−30°)	59.0(1)	9.2(.15)	32.4(.55)	25.0(.42)	0.77

Comparison :—The two specimens look so dissimilar to each other that they might be regarded as representing distinct species. However, in view of the great variability of *B. onilahyense* demonstrated by BASSE (1947) on the material from Madagascar, careful comparison is required. In fact, GK. H5733 is fairly similar to certain very involute, much compressed and weakly ornamented examples from Madagascar (e. g., BASSE, 1947, pl. 5, figs. 3, 3a; pl. 3, fig. 3, 3a). Although the umbilical tubercles of GK. H5733 are weaker than those of BASSE's pl. 5, fig. 3, those of BASSE's pl. 3, fig. 3 are as weak as ours. Therefore, GK. H5733 can well be regarded as an extreme variant along the same line.

On the other hand, TTC. 79-7-1 closely resembles another example from Madagascar (i. e., BASSE, 1947, pl. 2, fig. 6). Although the former is somewhat less compressed than the latter, there are examples from Madagascar (e. g., BASSE, 1947, pl. 2, figs. 4, 4a; 5, 5a; 1, 1a) whose whorls are as broad as or somewhat broader than ours.

There could be a possibility of subspecific separation between Madagascar and Japan, seeing that some of the ribs in our two examples are slightly more flexuous than those in many Madagascar examples. To examine this possibility we need more specimens from our province. At the moment this is left undecided and we regard the two specimens at our disposal as being within the extent of variation of *B. onilahyense*.

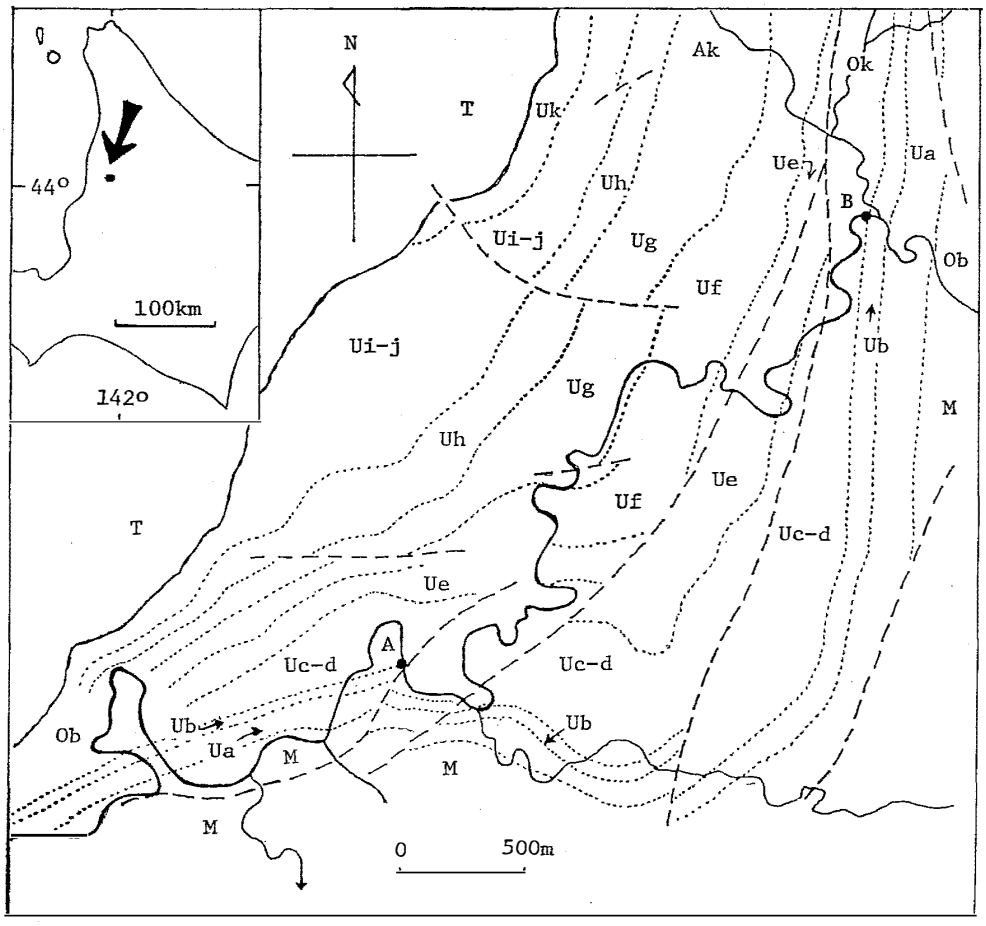
In addition to Madagascar, *B. onilahyense* has recently been reported from the Coniacian of the Middle East (LEWY and RAAB, 1978), although it is only listed without detailed description.

Occurrence :—GK. H5733, from a nodule contained in the sandy siltstone of loc. R2638 j, exposed on the left bank of the River Obirashibe (point A in Text-fig. 7). This siltstone is assignable either to the upper part of Unit Ub or to the lower part of Unit Uc in the TANAKA's (1963) lithostratigraphic subdivision. From the same bed *Damesites damesi* (JIMBO), *Gaudryceras denseplicatum* (JIMBO), *Otoscaphites* (*Hyposcaphites*) *matsumotoi* TANABE, *Inoceramus uwajimensis* YEHARA, *Didymotis akamatsui* (YEHARA), etc. have been obtained.

TTC. 79-7-1 was in a calcareous nodule contained in a bed of siltstone exposed on the floor of the main stream of River Obirashibe at a point (indicated as B in Text-fig. 7), 8 m upstream from the bridge, about 150 m downstream from the confluence with the tributary Okufutamatagawa. This siltstone is probably assigned to the lower part of Unit Uc, close to the Uc-Ub boundary. From the same nodule, *Inoceramus* cf. *uwajimensis* was obtained.

In short, the two specimens came from the middle part of the Lower Urakawan [K5a] of the Obira area.

In Madagascar *B. onilahyense* is characteristic of the "Middle Coniacian" (COLLIGNON, 1965).



Text-fig. 7. Geological map of the Obira area (part) (adapted from TANAKA, 1963 and TANABE et al., 1977). Ak: Akano-sawa, Ob: main stream of the Obirashibe, Ok: Okufutamata-gawa, M: Middle Yezo Group, Ua–Uk: subdivided units of Upper Yezo Group, T: Tertiary. ● (A, B): locality of *Barroisiceras onilahyense*, thick broken line: fault. Inset at the upper left corner is the index map of Hokkaido.

Appendix

Notes on the Coniacian Biostratigraphy

Tatsuro MATSUMOTO

The nomenclatural type locality of the Coniacian stage is at Cognac in the northern part of the Aquitaine basin of southwestern France. The stage was proposed and defined by COQUAND (1856, 1857) as the lowest unit of the quadripartite Senonian in this area. He subdivided the Coniacian of this area into two parts, A (lower) and B (upper). Subsequently ARNAUD (1877) described the stratigraphy comprehensively, but essentially kept COQUAND's idea.

For a long time the type Coniacian had been little studied, until SÉRONIE-VIVIEN (1960, 1972) restudied it. According to SÉRONIE-VIVIEN, the type Coniacian is made up of glauconitic sandstone (6 m) in the lower part (i. e. A of COQUAND) and sandy limestone (8 m) in the upper part (i. e. B of COQUAND). The former lies unconformably on the Turonian *Hippurites* limestone. Recently VAN HINTE (1979) has stated that the fossil contents

and the sections in the type Coniacian are fully satisfactory for a definition of the stage and that they deserve standard for inter-regional correlation. This statement may be adequate for the microfossils, but the lower unit (A) at Cognac has no fossils of correlative value and the mega-fossil fauna from the upper unit (B) has few species which are useful for inter-regional correlation. Moreover, there is some difficulty as to *Micraster coranguinum* (KLEIN), which otherwise may be a valuable index species of a certain level (see LEWY, 1975, p. 22; RAWSON et al., 1978, p. 25).

The subdivison of the Coniacian stage into the lower Zone A, i. e., "Zone of *Barroisiceras haberfellneri*" and the upper Zone B, i. e. "Zone of *Paratexanites emscheris*" was proposed by GROSSOUVRE (1894, 1901) on the basis of the ammonites from "Craie de Villedieur (Touraine)" on the southwestern side of the Paris basin. This place is about 230 km distant from Cognac, but the sequence represents the lower part of D'ORBIGNY's Senonian in a general sense. The scheme of ammonite zonation by GROSSOUVRE for the Senonian were cited frequently by many subsequent authors up to RAWSON et al., (1978) and the sequence of Craie de Villedieur has become practically a standard reference section of the Coniacian for mega-fossil biostratigraphy.

It should be pointed out that the names of the above two zones are misleading, if not entirely incorrect. The reasons are as follows: (1) The ammonites which GROSSOUVRE (1894) called *B. haberfellneri* are mostly other species, such as *Forresteria* (*Reesideoceras*) *galica* (BASSE), *Harleites harlei* (GROSSOUVRE) etc., as pointed out by BASSE (1947) and other authors. (2) The exact stratigraphic position of the holotype of *B. haberfellneri* (HAUER) in the Gosau basin (the East Alps) is not clear (H. SUMMESBERGER in lit., 1980-2-15). (3) GROSSOUVRE (1894, p. 69) regarded *Ammonites emscheris* SCHLÜTER, 1867 as a synonym of *Ammonites serratomarginatus* REDTENBACHER, 1873, although I do not agree with his conclusion (MATSUMOTO, 1970, p. 262). (4) The original locality (Glanegg) of *A. serratomarginatus*, which species is now referred to *Paratexanites* (*Parabevahites*), is not in a sequence and isolated from the other Gosau localities (SUMMESBERGER in lit. 1980-2-15), although the species is of Coniacian age from the evidence of associated ammonites and its occurrence in other regions. (5) The stratigraphic range of *P.* (*Parabevahites*) *emscheris* in Germany is not very clear, although it is presumed to be Middle to Upper Coniacian (E. SEIBERTZ *in lit.*, 1980-4-16).

If I were admitted to select other species from the assemblages of the GROSSOUVRE's zones, I would propose to call as follows:

Zone of *Protexanites bourgeoisi* (upper)
Zone of *Peroniceras subtricarinatum* (lower)

As to the Coniacian in the British Isles, RAWSON et al. (1978) have given adequate remarks. Ammonites are very few there and inoceramid species are preliminarily allocated stratigraphically (KAUFFMAN, 1978).

The Coniacian equivalent in Germany is defined and subdivided clearly by several species of *Inoceramus*, although the lower part of the Coniacian had long been erroneously called "Oberturon", until SEIBERTZ (1979a) gave correction. According to SEITZ (1959), TRÖGER and HALLER (1966), SEIBERTZ (1979b also *in lit.* 1980-4-16) and TRÖGER (oral comm. at Dresden 1980, through S. KELLER *in lit.*, 1980-4-25), the following zones are recognized:

Above: Zone of *I.* (*Platyceramus*) *undulatoplicatus* (Lower Santonian)

(3) Zone of *Gonioteuthis praewestfalica*
(2b) Z. of *I.* (*Volviceramus*) *involutus*
(2a) Z. of *I.* (*Volviceramus*) *koeneni*
(1) Zone of *I. schloenbachi*
Below: Z. of *Mytiloides striatoconcentricus* (Upper Turonian)

The subdivisions (1), (2a+2b) and (3) are called the Lower, Middle and Upper Coniacian in the revised German scheme. Besides the zonal indices, *I.* (*Magadiceramus*) *subquadratus* SCHLÜTER occurs in the Zone of *G. praewestfalica*, though less abundantly. *I.* (*I.*) *kleini* MÜLLER and *I.* (*Platyceramus*) *mantelli* MERCEY (BARROIS) occur along with *I.* (*V.*) *koeneni* MÜLLER and *I.* (*V.*) *involutus* SOWERBY may range slightly upward. The true ranges of ammonite species in terms of the above zones are not exactly determined, because ammonites are mostly of older collections. According to WIEDMANN (1979) and SEIBERTZ (1979 and *in lit.*, 1980-4-16), *Peroniceas subtricarinatum* and *P. westphalicum* (VON STROMBECK) seem to occur in the Lower to Middle Coniacian, whereas *Gauthiericeras margae* (SCHLÜTER), *Paratexanites* (*Parabevahites*) *emscheris* (SCHLÜTER) and *P.* (*Paratexanites*) *pseudotexanus* (ANDERT) seem to occur in the Middle and/or Upper Coniacian.

Incidentally, *I. schloenbachi* BÖHM, 1912 could either be synonym of *I. deformis* MEEK, 1876 (see SEITZ, 1959) or a later descendant of the latter (SEIBERTZ, 1979b). *I. rotundatus* FIEGE seems to be the earliest form of the same lineage. The last form is at or near the Turonian-Coniacian boundary and its age may be said as either the basal Coniacian or top of the Turonian or the transition of Turonian-Coniacian, depending on the definition of the stage boundary. For the definition of the stage boundary the sequence in the type Cognac area lacks sufficient evidence, because there is an unconformity and because the basal sandstone is poor in fossil contents. The succession of inoceramid species in the Senonian of France does not seem to have been well correlated with that of Germany.

Turning to the North American Interior province, the succession of inoceramid species is well studied (but not yet fully described) by KAUFFMAN (in KAUFFMAN et al., 1978) and can be approximately correlated with that of Germany. To cite from him, with some simplification, the zones in the Coniacian are as follows:

Upper Coniacian: Zone of *Scaphites ventricosus*
(7) Zone of *I.* (*Magadiceramus*) *subquadratus* (with *I.* (*V.*) *involutus* in the upper part of its range)
Middle Coniacian: Zone of *Scaphites preventricosus*, upper half
(6) Zone of "*I.*" *wandereri* (with *I.* (*V.*) *koeneni* in the middle part of its range)
(5) Zone of "*I.*" *schloenbachi* (with *I.* (*V.*) *koeneni* and *I.* (*V.*) *involutus* in the early part of their ranges)
(4) Zone of "*I.*" *browni* CRAGIN
Lower Coniacian: Zone of *Scaphites preventricosus*, lower half
(3) Zone of "*I.*" *deformis* (which can be subdivided into two subzones by subspecies)
(2) Zone of "*I.*" *erectus* (which again can be subdivided into two subzones by subspecies)
(1) Zone of "*I.*" *rotundatus*

KAUFFMAN et al. (1978, p. 15) discussed at length about the Turonian-Coniacian boundary. Their opinion is acceptable in principle.

The ammonite zones of the Coniacian through Maastrichtian in the Interior province of North America are indeed very fine, but the zonal indices are mostly

endemic species, with occasional intermingling of more widespread species. The top of the Turonian in this province may be defined by the extinction of *Prionocyclus* and the base of the Coniacian by the first appearance of the genera of Barroisiceratinae. KAUFFMAN et al. (1978) record the lowest occurrence of *Forresteria* sp. in the Zone of "*I.*" *rotundatus*, although without palaeontological description and illustration.

In the Gulf Coast province, ammonites of wider geographical distribution occur more commonly. According to YOUNG (1963) the equivalent of the Coniacian in Texas is biostratigraphically subdivided as follows:

(3) Zone of *Prionocycloceras gabrielense*
(2) Zone of *Peroniceras westphalicum*
(1) Zone of *Peroniceras haasi*

Peroniceras haasi YOUNG resembles *P. platycostatum* VAN HOEPEN from South Africa. As has been discussed in the main text of this paper "*Peroniceras westphalicum*" from Texas is better transferred to *P. stefaninii*. In the second zone *Peroniceras moureti* GROSSOUVRE occurs and in the third zone *Protexanites planatus* (LASSWITZ), *Paratexanites sellardsi* YOUNG and *Prionocycloceras hazzardi* YOUNG are associated. YOUNG correlated the first and the second zones to the Lower Coniacian and the third to the Upper Coniacian of GROSSOUVRE.

Tripartite biostratigraphic subdivision is proposed by COLLIGNON (1965) for the Coniacian of Madagascar as follows:

Upper: Zone of *Prionocycloceras guyabanum—Gauthiericeras margae*
Middle: Zone of *Kossmaticeras theobaldianum—Barroisiceras onilahyense*
Lower: Zone of *Peroniceas dravidicum*

The Coniacian ammonite fauna of Madagascar contains many species which are identical or closely allied to those from Japan.

The biostratigraphic records for the Coniacian of Natal and Zululand (South Africa) have been described by KENNEDY and KLINGER (1975) and KENNEDY (1978). The sequences seem to yield some species which are identical or allied to those from the Japanese province. I omit, however, to review them here, because their palaeontological monographs have not yet been completed.

In the epicontinental shallow sea of the Tethys realm the Coniacian is finely subdivided by ammonites but the predominant faunal elements are different from those of the north temperate region. An example in the west is the zonation in northern Spain by WIEDMANN (1960, 1979; also in WIEDMANN and KAUFFMAN, 1978):

(5) Zone of *Hemitissotia lenticeratiformis* WIEDMANN
(4) Zone of *Hemitissotia turzoi* KARRENBERG
(3) Zone of *Gauthiericeras valleri* CIRY
(2) Zone of *Reymentoceras hispanicum* WIEDMANN
(1) Zone of *Tissotioides haplophyllus* (REDTENBACHER)

The first three zones were grouped into the Lower Coniacian and the rest into the Upper Coniacian in WIEDMANN's earlier paper but later the third zone was assigned to the Middle Coniacian.

Tissotia (*Metatissotia*) *ewaldi* (BUCH) occurs in the first zone, *Barroisiceras* spp. in the second, *Protexanites bourgeoisi* (D'ORBIGNY) in the second and the third, and *Paratexanites* (*Parabevahites*) *emscheris* in the fourth (WIEDMAMM, 1979).

Another example in the central Tethys is the zonal succession of ammonites in the Middle East reported by LEWY and RAAB (1978) as follows:

(5) *Tissotia* (*Metatissotia*) *ewaldi—T.* (*M.*) *fourneli* (BAYLE)
(4) *Heterotissotia neoceratites* PERON-

Buchiceras bilobatum HYATT

(3) *Allotissotia galeppei* (PERVINQUIÈRE) —*Barroisiceras onilahyense* BASSE

(2) *Plesiotissotia sinaitica* LEWY—*Roemeroceras parnesi* LEWY

(1) *Placenticeras tamulicum* (BLANFORD) —*Proplacenticeras eboroense* COLLIGNON

The authors grouped units (1)-(3) into the Lower Coniacian and units (4) and (5) into the Upper Coniacian, without using the Middle Coniacian. I am rather surprised to see the great difference in the stratigraphic occurrence of *T.* (*M.*) *ewaldi* between Spain and the Middle-East.

Now in Japan what we call the Lower Urakawan is the approximate equivalent of the Coniacian. It is biostratigraphically bipartite on the basis of several well studied sections in Hokkaido, Futaba area of Northeast Japan, Onogawa basin of Kyushu and Uwajima area of Shikoku. They are called

(2) Zone of *Inoceramus mihoensis*

(1) Zone of *Inoceramus uwajimensis*

In some sections, such as those in the Ikushumbets, Futaba and Onogawa areas, the two species are stratigraphically clearly separated, with *I. uwajimensis* YEHARA below and *I. mihoensis* MATSUMOTO above, as in the Naibuchi district of South Saghalien (where the type locality of *I. mihoensis* is situated). In some other sections, as in the Obira area of Hokkaido, the ranges of the two species are overlapping, with later appearance of *I. mihoensis*.

It should be noted that *I. uwajimensis* is similar to *I. kleini* and *I. stantoni* SOKOLOW (=*I. acuteplicatus* STANTON) and that *I. mihoensis* is allied to, if not identical with *I. deformis* and *I. erectus*. Consequently, there is discrepancy in the zonal succession of these allied species between Japan and Euramerica.

I. (*Platyceramus*) *yubarensis* NAGAO et MATSUMOTO occurs commonly in the Zone of *I. mihoensis* but appears already in the Zone of *I. uwajimensis*. This species is, in my opinion, allied to *I.* (*P.*) *mantelli*, which occurs in the Middle to Upper Coniacian of Germany. KAUFFMAN (1977, p. 182) holds the view that *I. yubarensis* is a subspecies of *I. walterdorfensis* ANDERT from the highest Turonian and Lower Coniacian of Germany and North America. If this is correct, the age discrepancy is again distinct. I do not, however, agree with KAUFFMAN's taxonomic assignment, because in *I.* (*P.*) *yubarensis* the growth-axis is not so oblique as in *I. walterdorfensis* but upright in the late growth-stage and the hinge-line is shorter.

Likewise, an ancestral form (species or subspecies) of *I.* (*Cordiceramus*) *cordiformis* SOWERBY (s. l.), with shallower sulcae than in the typical form, occurs fairly commonly in the Zone of *I. mihoensis* and is occasionally found together with *I. uwajimensis*. The typical representatives of *I.* (*C.*) *cordiformis* occurs in the Santonian of Japan as in Euramerica. Dr. NODA has coworked with me for this preliminary knowledge of the *cordiformis* group and will eventually give full descriptions of these forms from Japan. *Sphenoceramus yokoyamai* (NAGAO et MATSUMOTO) begins to appear in the Coniacian.

Among long-ranging ammonites, *Anagaudryceras limatum* (YABE) marks the later half of its range in the Coniacian and *Gaudryceras tenuiliratum* YABE begins to appear in the same stage. *Baculites yokoyamai* TOKUNAGA et SHIMIZU are common in the Coniacian of Japan, but *B.* cf. *yokoyamai* is reported from the Turonian of North America (COBBAN and SCOTT, 1972). *B. schencki* MATSUMOTO, whose original locality is in the Coniacian of California, occurs also in Japan, though less frequently (MATSUMOTO and OBATA, 1963). TANABE (1977) has recently made

clear that the scaphitid species of the Coniacian of Japan are distinct from those of the Turonian. The Coniacian group is represented by *Scaphites pseudoaequalis* YABE, *S. formosus* YABE, *Otoscaphites klamathensis* (ANDERSON), *O.* (*Hyposcaphites*) *matsumotoi* TANABE and *Cliioscaphites* (?) sp. The last species looks similar to *S. arnaudiformis* COLLIGNON from the Middle Coniacian of Madagascar (COLLIGNON, 1965), whereas the first species (*S. pseudoaequalis*) is reported from the Upper Turonian Chalk Rock of England (WRIGHT, 1979).

An aberrant ammonite species *Nipponites bacchus* MATSUMOTO et MURAMOTO ranges from the Upper Turonian to the lower part of the Coniacian (see MATSUMOTO and MURAMOTO, 1967). I have not yet confirmed an unmistakable example of *Eubostrychoceras indicum* (STOLICZKA) in Japan, but *E. indopacificum* MATSUMOTO is fairly common in the Coniacian of Japan, southern India and Madagascar (see MATSUMOTO, 1967, p. 333). Another species, *E. muramotoi* MATSUMOTO is allied to *E. saxonicum* (SCHLÜTER) from the English Chalk Rock but occurs in the Zone of *I. uwajimensis*.

Yezoceras nodosum MATSUMOTO and *Y. miotuberculatum* MATSUMOTO, among other nostoceratids, occurs in the Zone of *I. uwajimensis* and range somewhat upwards within the Coniacian (see MATSUMOTO, 1977).

Another species which characterizes the Coniacian of southern India and Madagascar is *Kossmaticeras theobaldianum* (STOLICZKA), which occurs also in the Zone of *I. uwajimensis*. There are some other species of *Kossmaticeras* (see MATSUMOTO, 1955, 54). Several species of *Yokoyamaoceras*, bituberculate microforms, range from the Upper Turonian to Coniacian or even to Lower Santonian. Similarly *Mesopuzosia yubarensis* (JIMBO) ranges from the Turonian to the Coniacian. More long-ranging species *Gaudryceras denseplicatum* (JIMBO), *Tetragonites glabrus* (JIMBO), *Hypophylloceras* (*Neophylloceras*) *subramosum* (SPATH) occur commonly in the Coniacian of Japan.

Among species of less frequent or rare occurrence, there are following species which are useful for inter-regional correlation. In the list (1) means the Zone of *I. uwajimensis* and (2) that of *I. mihoensis;* allied species are also indicated.

Lewesiceras kawashitai MATSUMOTO (1 or 2) (allied to *L. elmii* COLLIGNON, from the Middle Coniacian of Madagascar)

Nowakites mikasaensis MATSUMOTO (1) (allied to *N. tallavignesi* (D'ORBIGNY) from the Coniacian of France)

Prionocycloceras wrighti MATSUMOTO (1) (allied to *P. guayabanum* (STEINMANN), from the Coniacian of Colombia and Venezuela)

Prionocycloceras sigmoidale MATSUMOTO (1) (allied to *P. maarfiaense* SORNAY, from the Coniacian of Algeria)

Prionocycloceras sp. aff. *P. lenti* (GERHARDT) (1) (Coniacian of Venezuela)

Niceforoceras japonicum (?) MATSUMOTO

Explanation of Plate 6

Fig. 1. *Peroniceras latum* MATSUMOTO et MURAMOTO, sp. nov. ..... Page 52
Holotype, lateral view, ×1/3.

Fig. 2. *Peroniceras yubarense* MATSUMOTO et MURAMOTO, sp. nov. ..... Page 55
Holotype, lateral view, ×1/2.

Kyushu Univ. (K. TANABE) photos, without whitening.

1

2

(2 ?)

Peroniceras latum sp. nov. (2) (allied to *P. stefaninii* VENZO, from the Lower Coniacian of South Africa and Texas)

Peroniceras yubarense sp. nov. (1 or 2) (allied to *P. besairiei* VAN HOEPEN from the Lower Coniacian of South Africa)

Peroniceras sp. aff. *P. platycostatum* VAN HOEPEN (1 or 2) (Coniacian of South Africa)

Sornayceras proteus MATSUMOTO (2)

Sornayceras omorii MATSUMOTO (2) (allied to *S. bajuvaricum* (REDTENBACHER), from the Gosau beds and *S.* aff. *isamberti* (FALLOT) from the Lower Coniacian of France)

Sornayceras cf. *propoetidum* (REDTENBACHER) (2 ?) (Coniacian of the East Alps)

Ishikariceras binodosum MATSUMOTO (1) (allied to *I. schneeblii* (BOULE, LEMOINE et THÉVENIN) from the Coniacian of Madagascar)

Paratexanites (*Paratexanites*) *orientalis* (YABE) (2) (allied to *P.* (*P.*) *zeilleri* (GROSSOUVRE), from the Lower Coniacian of France and *P.* (*P.*) *umkwelanensis* (CRICK) from the Senonian of South Africa)

Paratexanites (*Paratexanites*) *mikasaensis* MATSUMOTO (2 ?) (allied to *P.* (*P.*) *canaensis* (GERHARDT), from the Lower Senonian of Venezuela)

Paratexanites (*Parabevahites*) *serratomarginatus* (REDTENBACHER) (1)

Pseudobarroisiceras nagaoi SHIMIZU (1)

Barroisiceras onilahyense BASSE (upper part of 1) (Middle Coniacian of Madagascar)

Barroisiceras (*Baseoceras*) *inornatum* MATSUMOTO (1) (allied to *B.* (*B.*) *colcanapi* COLLIGNON from the Upper Coniacian of Madagascar.)

Forresteria (*Forresteria*) *alluaudi* BOULE, LEMOINE et THÉVENIN) (1) (Middle Coniacian of Madagascar; Coniacian of South Africa, Peru, Utah)

Forresteria (*Forresteria*) *armata* MATSUMOTO (1)

Forresteria (*Muramotoa*) *yezoensis* MATSUMOTO (1) (allied to *F.* (*M.*) *ampozaloakensis* (BASSE), from the Coniacian of Madagascar)

Forresteria (*Muramotoa*) *muramotoi* MATSUMOTO (1)

Yabeiceras orientale TOKUNAGA et SHIMIZU (1) (allied to *Y. bituberculatum* COLLIGNON, from the Middle Coniacian of Madagscar)

Harleites cf. *harlei* (GROSSOUVRE) (1)

Hourquia hataii HASHIMOTO (1 and 2)

(Readers may refer to MATSUMOTO, 1965a, 1965b, 1969, 1970a, 1971, 1979 and HASHIMOTO, 1973 for the descriptions of the species listed above.)

As is clearly shown in the above list, some species occur in Japan in an unit which corresponds approximately to that of the extra-Japanese province(s) where the same or allied species occur, whereas others show disharmony in stratigraphic occurrences. Therefore, the zone by zone correlation is fairly difficult between Japan and other remote provinces. It may be generally concluded from the comprehensive viewpoint that the Zone of *I. uwajimensis* is approximately correlated with the Lower and Middle Coniacian of Madagascar and the Zone of *I. mihoensis* is so with the Upper Coniacian of the same area. Anyhow, the Lower Urakawan of Japan is certainly correlated with the Coniacian stage of Europe and other well studied areas by means of diagnostic species. Therefore, we can use the stage name Coniacian in the Japanese province.

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Explanation of Plate 7

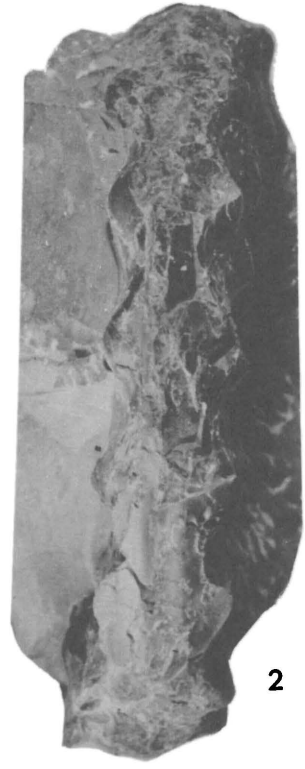
Fig. 1. *Peroniceras latum* MATSUMOTO et MURAMOTO, sp. nov. ..... Page 52
Holotype, ventral view, ×3/8.

Fig. 2. *Peroniceras yubarense* MATSUMOTO et MURAMOTO, sp. nov. ..... Page 55
Holotype, ventral view, ×1/2.

Fig. 3. *Sornayceras* sp. cf. *S. proteus* MATSUMOTO ..... Page 57
Muramoto Coll., from loc. Ik 1509, lateral view, ×1/4.

Kyushu Univ. (K. TANABE) (1, 2) and Mikasa Museum (3) photos, without whitening.

1



2

3

chapt. 18, p. 1-29.

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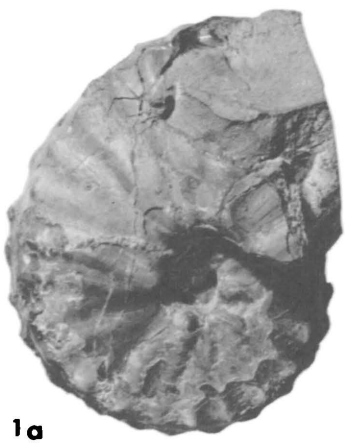
Explanation of Plate 8

Figs. 1-3. *Barroisiceras onilahyense* BASSE ..... Page 60

1. TTC. 79-7-1 (hypotype), two lateral (a, b), ventral (c) and frontal (d) view, ×1.
2. GK. H5733 (hypotype), right lateral (a), frontal (b) and ventral (c) view, ×1.
3. *Ditto*, part of left side, showing an injury, enlarged (×2.8).
4. *Inoceramus* cf. *uwajimensis* YEHARA, which occurred with TTC. 79-7-1. Waseda Univ. (H. HIRANO) photos, without whitening.



1a

1b

1c

2a

2b

2c

1d

4

3

北海道から産したコニアシアン期アンモナイトの若干：北海道白亜系産のアンモナイトでコニアシアンを特徴づける主要種は，すでに Collignoniceratidae 科のモノグラフ（MATSUMOTO, 1965-1971）中に記載したが，ここに補足として4種を記載した。その中の2種は新種で，それぞれ *Peroniceras stefaninii* VENZO と *P. besairiei* VAN HOEPEN に類似する。第3は *Sornayceras* cf. *proteus* MATSUMOTO で，これも前2種と同様大型である。第4は *Barroisiceras onilahyense* BASSE で，原産地マダガスカルで究められた変異の範囲に入る。これらの産地と層位についての調査結果も併記した。

松本達郎・村本喜久雄・平野弘道・高橋武美

付録として西欧その他のよく調べられている海外のコニアシアンの代表地域について，その化石層序（メガ化石）の現在の知識を紹介しながら論評し，日本におけるコニアシアン相当層の化石帯区分と国際対比の問題について論述した。 松本達郎

Postscript: After the manuscript of this paper was received by the editor, Dr. H. G. KLINGER (from Tübingen) sent me a photograph of SCHLÜTER's *Ammonites westphalicus* in lateral view, which shows that SCHLÜTER's description cited in p. 54 of this paper is correct. Dr. KLINGER was unable to trace VON STROMBECK's original material. I thank Dr. KLINGER for his kind help.