SCIENCE REPORT OF THE YOKOSUKA CITY MUSEUM, NO. 29, pp. 9-22, pls. 1-2
December, 1982

On three Cretaceous keeled ammonites from the Urakawa area, Hokkaido (Studies of Cretaceous ammonites from Hokkaido-XLIII)

Tatsuro MATSUMOTO* and Yasumitsu KANIE**

(With 6 text-figures and 2 plates)

北海道浦河地域産のキールのある白亜紀アンモナイト3種について

松本達郎*・蟹江康光**

浦河地域では白亜系の装飾性アンモナイトはまれにしか産しないが，前回（MATSUMOTO and KANIE, 1979）に引き続き，ここにキール（竜骨）をもったアンモナイト3種を報告する。

その1は *Mortoniceras* cf. *kiliani* (LASSWITZ) で，松本・岡田 (1973) が村本辰雄氏の助力を得て，向別の高津川沿いから得ていたことを報じていた。ここではこれの古生物学的記載をするとともに，その産出が中部蝦夷層群下部の M1a 層の上部から由来したものと決定し，その時代（アルビアン後期）が付近の微化石からの時代論と矛盾のないことを述べた。なお産出化石の記載に先立ち，*Mortoniceras* MEEK, 1876 の属の模式種 *Ammonites vespertinus* MORTON, 1834 の原標本とその後の標本（ともに米国湾岸地域の Duck Creek 層産）の観察（松本訪米中）に基づき，この種の特性を明記した。また，その属名が有効であることを論述した。

その2は *Texanites quinquenodosus* (REDTENBACHER) で，斎藤　登氏が井寒台の海食棚上のノジュール（転石）より得た資料を研究に提供したものである。最近，本種の原標本ならびにこれを産したオーストリアの Gosau 層産のものが再記載されたので，同定は確実である。産出は U1 層からと推定され，この化石はサントニアンを明示する。ただし本種がサントニアンのどの部分から産するかは地理区によって異なる。オーストリアでは下部からとの判断があるが，マダガスカルでは上部に出ると報告されている。井寒台での今回の産出は断定的ではないが，サントニアン上部を示唆する。

その3は *Paratexanites compressus* MATSUMOTO で，これも斎藤氏の採集標本だが，完・副模式標本の特性とよく一致する。ただし，それらより少し小型である。井寒台の陸側の小沢のサントニアンの比較的上部から産した。

Introduction

As we mentioned previously (MATSUMOTO and KANIE, 1979), ornate ammonites of generally shallow sea habitats are poor in the Cretaceous deposits of the Urakawa area. The area is situated in the eastern subbelt of the meridional Cretaceous belt in Hokkaido and, speaking generally, the sediments there repre-

* 西南学院大学・九州大学　c/o Department of Geology, Kyushu University 33, Fukuoka, 812 Japan.
** 横須賀市博物館　Yokosuka City Museum, Yokosuka, 238 Japan.
Manuscript received Sept. 4, 1982. Contribution from the Yokosuka City Museum, No. 305.

sent comparatively offshore facies of the Cretaceous basin, although there may be variation from stage to stage or from place to place in the details. Anyhow, on this account radiolaria and planktonic foraminifera occur fairly abundantly in them (see TAKETANI, 1982; Dr. S. MAIYA's personal information; TAKAYANAGI and MATSUMOTO, 1981). Under these circumstances the records of ornate ammonites are valuable to coordinate micro- and mega-fossil biostratigraphy.

In this paper we describe three species of keeled and ornate ammonites, although they are insufficiently preserved. They belong to *Mortoniceras, Texanites* and *Paratexanites* respectively which are of good indices of age. For the description of *Mortoniceras*, one of us (T. MATSUMOTO) alone has authorship and for that of *Texanites* and *Paratexanites* we both are responsible.

Palaeontological description

Family Brancoceratidae SPATH, 1933

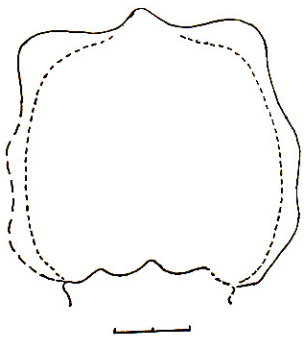
Genus *Mortoniceras* MEEK, 1876

Type species: *Ammonites vespertinus* MORTON, 1834

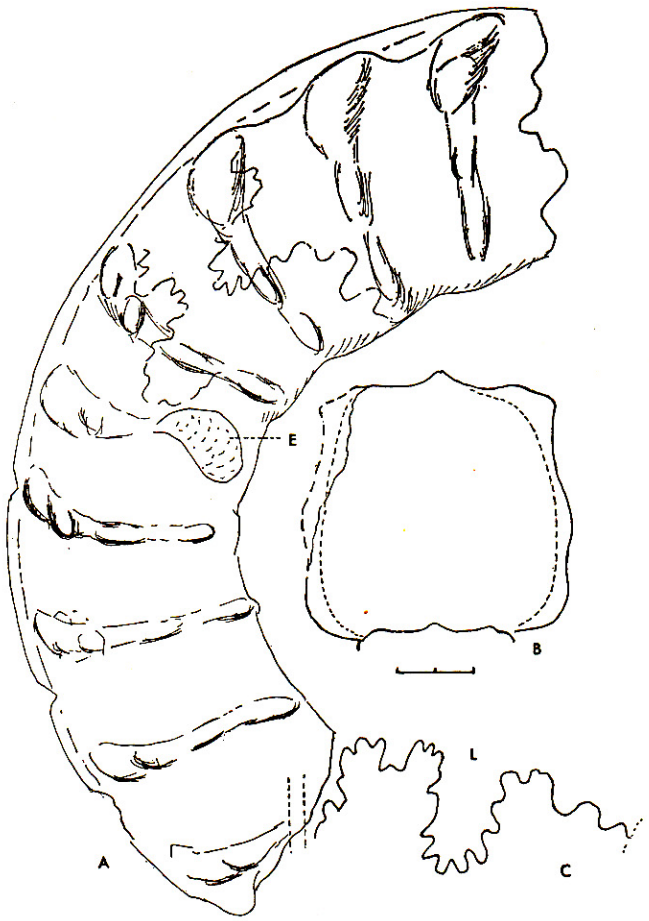
Discussion: As I briefly mentioned previously (MATSUMOTO, 1960, p. 37), *Ammonites vespertinus* MORTON is clearly defined by its diagnostic characters as follows:

Rather evolute, widely umbilicate large shell. Whorl enlarging slowly, subquadrate in section, nearly as high as broad with gently convex flanks and a strong carinate, broad venter.

Inner whorl provided with coarse ribs which are as a rule branching at the umbilical tubercle. On the outer whorl ribs are simple, very coarse and distantly spaced, numbering 5 or 6 per quarter whorl. Tubercles are fairly thick. The umbilical tubercle is bullate; lateral ones bulged or thickened on the rib and more or less bullate; ventrolateral ones doubled in early growth stages,



Text-fig. 1. *Mortoniceras vespertinum* (MORTON).
Whorl-section of the MORTON's illustrated syntype. Scale bar=20 mm.
(T. MATSUMOTO *delin.*)

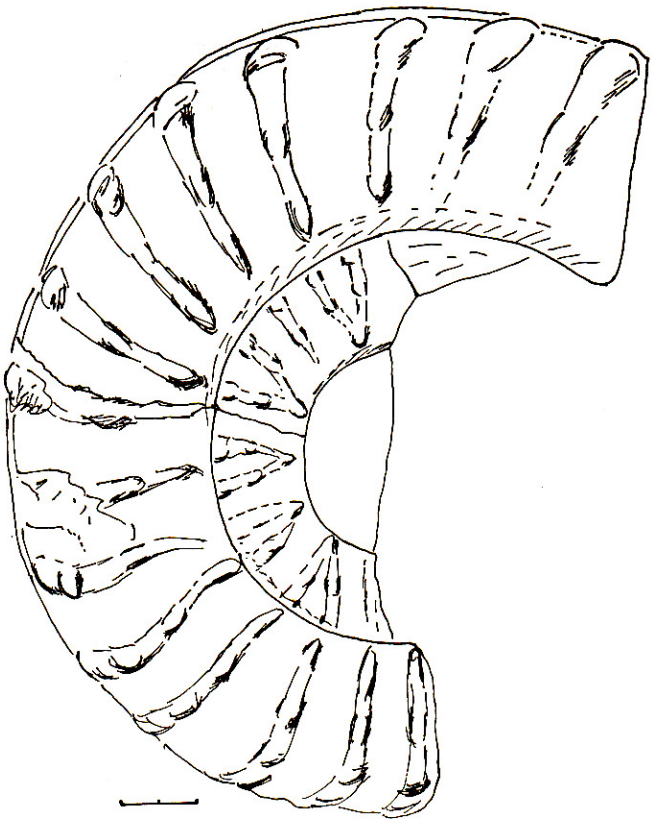


Text-fig. 2. *Mortoniceras vespertinum* (MORTON).
Sketch of lateral view (A), whorl-section (B) and external suture (C) of the other of the two syntypes. E: Epifauna. Scale bar=20 mm.
(T. MATSUMOTO *delin.*)

consisting of a stronger inner node and weaker outer clavus, which are united into a single prominent node in the late growth stage (with whorl-height over 60 mm).

Sutures fundamentally of acanthoceratid type, showing massive, bipartite lateral saddles and subrectangular lateral lobe (L) of moderate depth; minor incisions not much deep, although the details are obliterated by erosion in the type specimen.

The above description is based on my study of the two syntypes of *Ammonites vespertinus* MORTON, 1834, which are kept at the Philadelphia Academy of Natural Sciences under the same number, 4783 (Text-figs. 1, 2), and another example of subsequent collection in the Palaeontological Collection of the U. S. Geological Survey (G.S.) at Denver (Text-fig. 3), which Dr. W. A. COBBAN kindly showed me. The syntypes of MORTON are recorded on the label to have came



Text-fig. 3. *Mortoniceras vespertinum* (MORTON).
Sketch (lateral view) of an example in a subsequent collection, U. S. G. S. Denver, "H1-2-KdC". Scale bar=20 mm.
(T. MATSUMOTO *delin.*)

from "Choctaw County, plains of the River Kiamichi, Arkansas, probably Duck Creek Formation, Washita Group" and the U. S. G. S. specimen is from the middle of the Duck Creek, high in *trinodosum* Zone, Duck Creek Formation, Texas. The concerned specimens are illustrated here. ADKINS (1928, p. 322) added another locality "near Fort Washita, northwestern Bryan County, Oklahoma" but I have not examined the specimen from that locality.

Although the characters of the early immature shells are not known, the above three specimens give us well the specific diagnosis of *Ammonites vespertinus*. Since the type species is so clearly understood that the genus *Mortoniceras* MEEK, 1876 is valid. I agree with WRIGHT (1957 in *Treatise*, p. L406) in his concise description of the generic diagnosis of *Mortoniceras* as well as that of the diagnosis of the subgenus *Mortoniceras* (*Mortoniceras*).

YOUNG (1957, p. 3) thought that *Mortoniceras* is always bituberculate, but *Mortoniceras* in the correct sense has a lateral row of tubercles, as clearly shown

by the type species.

Incidentally *M. vespertinum* is the most coarsely ornamented among the species of *M.* (*Mortoniceras*). It is somewhat allied to *M.* (*M.*) *stoliczkai* SPATH, 1921 [= *Ammonites inflatus* of STOLICZKA (*non* J. SOWERBY), p. 48, pls. 27, 29, fig. 2] in the subquadrate whorl section and the coarse ornamentation, but its ribs are still more distant. The rib density and the strength of ornament may vary from a species to another within the same subgenus as are the shell size and the width of umbilicus. Similarly the bifurcated ribs may change to the single, distant ribs at a variable point within comparatively later growth stage among the species of the same subgenus.

In other words, *Ammonites vespertinus* MORTON, *A. inflatus* J. SOWERBY, and *A. rostratus* J. SOWERBY are of the same subgenus, because they show commonly the branching of ribs at umbilical tubercles on more or less early whorls and the single, more or less distant ribs on later whorl and because they have mediolateral tubercles in addition to the umbilical and ventrolateral ones, the last of which may be doubled in certain stage. Although *Mortoniceras* MEEK, 1876, *Pervinquieria* BOEHM, 1910 and *Subschloenbachia* SPATH, 1921 were established on the above three species respectively, on the above mentioned grounds *Pervinquieria* and *Subschloenbachia* fall in the synonymy of *Mortoniceras*, as WRIGHT (1957) has already indicated.

This argument is repeated here, since some of the recent authors (e.g. SCHOLZ, 1979, p. 105) still use *Pervinquieria* instead of *Mortoniceras*.

I should add, furthermore, that I have seen a smaller specimen in Dr. COBBAN's collection, from the Duck Creek Formation (10 feet above base) which shows the characters apparently intermediate between *M. kiliani* and *M. vespertinum*.

Mortoniceras sp. cf. *M.* (*M.*) *kiliani* (LASSWITZ)
Pl. 1, figs. 1–4

Compare:

1904. *Schloenbachia kiliani* LASSWITZ, *Geol. Palaeont. Abh.*, [N. F.], 6(4), p. 245, pl. 19, fig. 1; text-fig. 6.

1928. *Pervinquieria kiliani* (LASSWITZ); ADKINS, *Univ. Texas Bull.*, 2838, p. 233, pl. 5, fig. 4.

1932. *Mortoniceras* (*Pervinquieria*) *kiliani* (LASSWITZ); SPATH, *Ammonoidea of the Gault*, pt. 9, p. 408, pl. 38, figs. 1, 2; pl. 42, fig. 1; pl. 47, fig. 1; text-fig. 140.

Material: GK.H5931, from loc. U932p of MATSUMOTO and OKADA (1973) collected by T. MATSUMOTO, H. OKADA and T. MURAMOTO.

Description: The specimen is a poorly preserved phragmocone, whose umbilical part can not be observed. The whorl is carinate on the venter, slightly higher than broad and subrectangular in section.

The ribs are numerous, bifurcated at the umbilical tubercle, altogether 21 or 22 per half whorl, fairly close-set. In the late growth-stage, over 110 mm in diameter, they become to be single, coarser and more distant. The tubercles are in four rows, at the umbilical margin, at about the middle of flank, at the ventrolateral shoulder and on the venter. The last two are on the common base and can be called inner and outer ventrolateral tubercles. On a part of the venter they are covered by fine longitudinal lirae.

The sutures are partly exposed, showing the *Mortoniceras* pattern (see SPATH, 1932, text-fig. 130).

Comparison: The specimen is too poorly preserved for the precise identification, but the observed characters resemble essentially those of *M.* (*M.*) *kiliani* (LASSWITZ, 1904), from the Duck Creek Formation of Texas and from the Upper Albian (*auritus* and *aequatorialis* Subzones) of England (SPATH, 1932).

Occurrence: Loc. U932p of MATSUMOTO and OKADA (1973, p. 302, text-fig. 20), Mukobetsu, Urakawa area, southern Hokkaido. The specimen came certainly from the shale of the formation consisting of predominant shale and sandy shale with some laminated fine-grained sandstone. The formation is assigned to Unit M1a, the lower part of the Middle Yezo Group in the Urakawa area. In addition to the described ammonite, *Desmoceras* cf. *D. latidorsatum* (MICHELIN) was obtained from the nearby loc. U933p, which came from the same formation (see Text-fig. 5).

Family Collignoniceratidae WRIGHT et WRIGHT, 1951
Subfamily Texanitinae COLLIGNON, 1948
Genus *Texanites* SPATH, 1932

Type species: *Ammonites texanus* RÖMER, 1852

Remarks: For the up-to-date account of the genus *Texanites* see MATSUMOTO (1970) and KLINGER and KENNEDY (1980). *Texanites* was subdivided into the subgenera *T.* (*Texanites*) and *T.* (*Plesiotexanites*) by the former author and *Plesiotexanites* has been ranked up to the generic level by the latter authors whom we follow in this paper.

Texanites quinquenodosus (REDTENBACHER)
Pl. 2, figs. 1, 2

1873. *Ammonites quinquenodosus* REDTENBACHER, *Abh. Geol. Bundesanst.*, **5**, p. 108, pl. 24, fig. 3a, b.

1948. *Texanites quinquenodosus* REDTENBACHER; COLLIGNON, *Ann. Géol. Serv. Mines* (*Madagascar*), **13**, p. 69, text-fig. 2.

1966. *Texanites quinquenodosus* REDTENBACHER; COLLIGNON, *Atlas des Fossiles Caracteristiques de Madagascar* (*Ammonites*), **14**, p. 128, pl. 510, fig. 2021.

1981. *Texanites quinquenodosus* (REDTENBACHER); KENNEDY, SUMMERSBERGER and

KLINGER, *Ann. S. Afr. Mus.*, 86(4), p. 126, text-figs. 8–16 (with full list of synonymy).

1982. *Texanites quinquenodosus* (REDTENBACHER); IMMEL, KLINGER and WIEDMANN, *Zitteliana*, 8, p. 23, pl. 9, fig. 1.

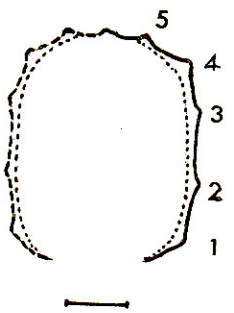
Material: YCM.GP583. A fragmentary but distinct specimen obtained by Mr. Noboru SAITO in 1980 from loc. U304p of KANIE.

Description: About 150° of the unseptate outer whorl is preserved, but its ventral part is deficient. The umbilicus seems to be fairly wide (about 40 per cent of diameter in a restored measurements). The whorl increases with growth with a moderate rate. It is higher than broad, with measurements of H=39 mm, B=31 mm and B/H=0.79, and is subrectangular in section, having steeply inclined umbilical walls and only slightly convex, nearly parallel flanks.

The ribs are simple, nearly rectiradiate and of moderate density, being separated by the interspaces slightly wider than the ribs themselves. There are 7 ribs in a quarter whorl. The tubercles in 5 rows are distinct. Their clavate character is more distinct on the outer part, but even the lower lateral one (2) is sometimes slightly clavate. The distance between (1) and (2) is nearly equal to (but slightly shorter than) that between (2) and (3), which is longer than that of (3) and (4) or (4) and (5). The distance between (3) and (4) is nearly equal to (but slightly shorter than) that between (4) and (5) (Text-fig. 4).

Remarks: The redescription by KENNEDY *et al.* (1981, p. 126, figs. 8–16) on the specimens from the Gosau Beds, including the originals of REDTENBACHER (1873), has enlightened us much in getting proper concept of *T. quinquenodosus*.

The present specimen is essentially similar to the lectotype (REDTENBACHER, 1873, pl. 24, fig. 3a, b; KENNEDY *et al.*, 1981, fig. 8) at the corresponding growth-stage, although its tubercles are as prominent as the paralectotype (KENNEDY *et al.*, fig. 9; unillustrated by REDTENBACHER, 1873) or the hypotype illustrated by WIEDMANN (in HERM *et al.*, 1979, pl. 7, figs. C, D). KENNEDY *et al.* (1981)



Text-fig. 4. *Texanites quiquenodosus* (REDTENBACHER).
Diagramatic whorl-section of the described specimen YCM. GP583, with numbering the tubercle. Scale bar=20 mm. (T. MATSUMOTO *delin.*)

mentioned that the intensity of tubercles vary to some extent between individuals and in accordance with the mode of preservation. The present specimen is, therefore, certainly identified with *T. quinquenodosus*.

The suture drawn by KENNEDY *et al.* (1981, fig. 11) seems to have been deviated from the actual state. As shown in their photographs of figures 8, 9, 13 and 15, L is subrectangular in rough outline and not so narrowly constricted and minor incisions are not so deep as in their figure 11.

Previously one of us (MATSUMOTO, 1970, p. 273, pl. 42, fig. 3; pl. 46, fig. 1–3) noticed that in the specimens from the Ikushumbets and Haboro areas (central and northwestern Hokkaido) the ribs are considerably projected on the ventral part and accordingly the ventral clavus is somewhat ahead of the ventrolateral one. This character is not so distinctly shown in the present specimen, whose ventral part is unfortunately very incompletely preserved. This point may be a minor difference within a species, as KENNEDY *et al.* (1981, p. 131) mentioned, but we should examine more specimens to know its proper significance.

Occurrence: Loc. U304p, in a floated calcareous nodule derived from the mudstone exposed at the time of low tide off the coasts of Ikandai, Urakawa area. It is assigned to the upper part of Member U1 of KANIE (1966, 1981) (see Text-fig. 6).

Genus *Paratexanites* COLLIGNON, 1948

Type species: *Mortoniceras zeilleri* de GROSSOUVRE, 1894

Remarks: See MATSUMOTO (1970) and KLINGER and KENNEDY (1980) for the general account of this genus. As the latter authors have pointed out, the subgeneric distinction between *Paratexanites* (s. s.) and *Parabevahites* COLLIGNON, 1948 is sometimes difficult. In this paper we avoid to indicate the subgenus.

Paratexanites compressus MATSUMOTO

Pl. 2, figs. 3–5

1970. *Paratexanites* (*Paratexanites*) *compressus* MATSUMOTO, *Mem. Fac. Sci., Kyushu Univ.*, [D], 20(2), p. 255, pl. 30, figs. 4, 5; text-fig. 13.

Material: YCM.GP584. A small but distinct specimen obtained by Mr. Noboru SAITO in 1982 from loc. U471 of KANIE.

Description: The shell is small, slightly less than 50 mm in diameter, but it has the body-chamber. As the last part shows somewhat scaphitoid coiling, the following dimensions are measured at about 40° prior to the preserved end.

Diameter	Umbilicus	Height	Breadth	B/H
46.2(1)	14.4(.31)	18.6(.40)	12.6(.27)	.68

The whorl is higher than broad, with flattened flanks and a narrow venter. It grows fairly rapidly in height with growth, but for the last part, where the increase is lowered and the coiling tends to be evolute.

The umbilicus is shallow and of moderate size, bordered by a low but steep or rather overhanging wall.

The septate whorl is ornamented with gently flexiradiate ribs which as a rule spring in pairs from the bullate tubercle pointed at the umbilical margin. There are 15 ribs and 7 umbilical tubercles in a half whorl. Fine lirae may be discernible in parallel to the ribs. The ribs end at the clavate tubercles on either side of the keel. On each rib a weaker tubercle exists at the ventrolateral shoulder. In the late part of the phragmocone an additional faint clavus is discernible below that ventrolateral tubercle, but it is hardly seen in earlier parts, where the rib is trituberculated as in *Protexanites bontanti* (GROSSOUVRE).

On the body-chamber, the ribs become mostly single, with occasional intercalation on its earlier part. They are more broadened than in the preceding stage. Close to the clavate ventrolateral tubercle on each rib there is a narrower and weaker clavate tubercle. The ventral tubercles are so distinctly elongated that a furrow is developed on either side of the keel. On the preserved last portion the ribs are weakened and the superimposed lirae become so distinct that minor crenulation may be seen on the ventral clavi. At the middle of the flank the ribs are slightly elevated, if the elevation is not so distinct as to be called a tubercle. This gives, together with the compressed shell-form, a superficial similarity to some species of *Submortoniceras*.

The suture shows a fairly narrow lateral lobe (L), whose pattern is essentially the same as in the paratype (MATSUMOTO, 1970, text-fig. 13).

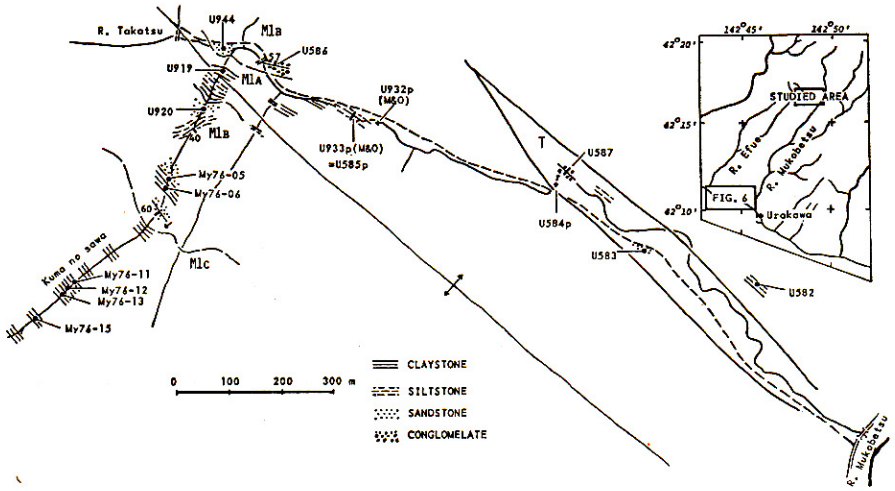
Remarks: The described specimen is certainly identified with the named species, because it has the same diagnosis as seen in the holotype and paratype. It should be noted that this species is allied to *Protexanites bontanti shimizui* MATSUMOTO (1970, p. 237, pl. 31, figs. 1, 2; text-fig. 6) in shell-form and ornamentation, but it has double ventrolateral tubercles in the late growth-stages and its lateral lobe in suture is narrower than in the latter.

The somewhat smaller size of the described specimen than the original types and the slightly scaphitoid shape at the last stage are particular to the present case. This may suggest dimorphism in *P. compressus*, but we should search for similar examples in other species of the Texanitinae. It might imply merely a malform.

Occurrence: Loc. U471p of KANIE, upper part of Unit U1β, in a small stream on the hill side of Ikandai, Urakawa (Text-fig. 6).

Correlation

As one of us (Y. K.) is preparing a revised report on the Cretaceous biostratigraphy of the Urakawa district, we give in this paper the locality records of the described three ammonites with an intention to evaluate them for the age



Text-fig. 5. Route map along the stream of the River Takatsu and the Kuma-no-sawa. Fossil localities and geological locations *in situ* (•) and as floated nodule (+). Inset at the upper right corner is the index map of the Urakawa area, showing the studied parts in two small rectangles: section of text-figure 5 in the north and that of text-figure 6 in the southeast. Read CONGLOMERATE for CONGLOMELATE.

correlation. Pending the issue of that report, we refer to the concisely summarized tables of KANIE (1966, 1981) in describing the local stratigraphy. Aside from the recently recognized Neocomian (KANIE *et al.*, 1981), the Cretaceous deposits of the Urakawa area are divided into the Lower Yezo, the Middle Yezo, the Upper Yezo and Hakobuchi Groups and they are subdivided into the units L1 and L2, M1 to M4, U0 to U5, and H1 and H2 respectively on lithostratigraphic grounds. Further subdivisions may be used; for instance, M1 is tripartite into M1a, M1b and M1c, each of units U1 to U5 divided into U1α and U1β etc. This scheme has already been cited by TAKAYANAGI and MATSUMOTO (1981) and also by TAKETANI (1982).

A. Locality record of *Mortoniceras* (*M.*) cf. *kiliani*

The described specimen was obtained in one of the calcareous nodules at loc. U932p of MATSUMOTO and OKADA (1973, p. 302) in the River Takatsu. It came from a member of mudstone which is asscribed to the uppermost part of Unit M1a (see Text-fig. 5).

M. (*M.*) *kiliani* itself came originally from the Upper Albian of Texas and was subsequently reported from the Upper Albian of England (SPATH, 1932, p. 409). Therefore, *M.* (*M.*) cf. *kiliani* suggests the Late Albian age of the upper part of M1a. At loc. U933p of MATSUMOTO and OKADA, close to their loc. U932p, *Desmoceras* cf. *latidorsatum* (MICHELIN) was obtained. This must have come from the same M1a, indicating the Albian.

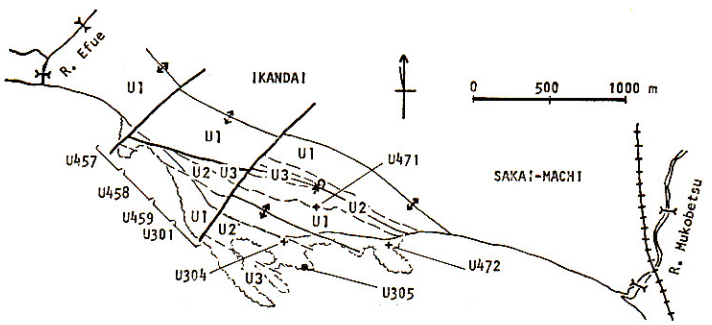
No microfossil has been reported from M1a of this place but from the claystone of the overlying M1b, which consists of alternating shale and sandstone (380 m) of a turbidite facies, radiolarians and foraminifers have been obtained at locs. My76-05 and My76-06 along the Kuma-no-sawa. According to TAKETANI (1982, figs. 9, 26), *Eusyringium spinosum* SQUINABOL, *Holcocryptocanium barbui* DUMITRICA and *Squinabollum fossilis* (SQUINABOL) have been identified among other poorly preserved radiolarians. The assemblage suggests the Zone of *Eusyringium spinosum* (probably its lower part) of a Late Albian-Early Cenomanian age. According to MAIYA (personal communication), the benthonic foraminifera from the same samples of Unit M1b are assigned to the *Tritaxia disjuncta* Assemblage-zone of MAIYA and TAKAYANAGI (1977), which is of Albian age.

Unit M1c, claystone of about 300 m in thickness in the section of Kuma-no-sawa, is more prolific in radiolarians than the underlying M1b. In the samples from locs. My76-11, My76-12, My76-13 and My76-15, numerous species of radiolaria have been identified by TAKETANI (1982), who referred the assemblage to the Zone of *Diacanthocapsa euganea-Thanarla elegantissima* of a Late Albian-Early Cenomanian age. The foraminifera assemblage from the same sample is assigned by MAIYA (personal communication) to the *Textularia hikagezawaensis* Range-zone and is Cenomanian in age.

On the grounds of the above described evidence of mega- and micro-fossils, which are complementary to each other, Unit M1a and also Unit M1b are correlated with the Upper Albian and Unit M1c probably with the Lower Cenomanian.

B. Locality record of *Texanites quiquenodosus*

The described specimen was obtained in one of the floated calcareous nodules, U304p1 of KANIE, resting on the wave cut terrace off the coast of Ikandai (Text-fig. 6). This point is near the boundary of Units U1 and U2. Accordingly the precise origin of this nodule is hardly determined, but it is probably derived from the mudstone of U1. Another floated nodule, U304p2, contains *Inoceramus*



Text-fig. 6. Route map of the coastal area of Ikandai. See text-figure 5 for other subjects of explanation.

(*Sphenoceramus*) *sachalinensis* SOKOLOW, *Gigantocapulus giganteus* (SCHMIDT) and *Nanonavis sachalinensis* (SCHMIDT), suggesting its derivation from U2 or U3 of a Campanian age. From the greenish siltstone of U2 at loc. U305, *I.* (*S.*) *nagaoi* MATSUMOTO et UEDA, *Gaudryceras tenuiliratum* YABE, *Hauericeras angustum* YABE and *"Anisomyon" cassidarius* (YOKOYAMA) have been obtained. This assemblage suggests rather the upper part of the Santonian but could possibly be the lower part of the Campanian. As to the section of Ikandai there is no available information of micro-fossils.

In Europe *T. quiquenodosus* occurs in the Santonian but whether it is long-ranging or restricted to a particular part of Santonian has not yet been determined (KENNEDY *et al.*, 1981). Recently, IMMEL *et al.* (1982) have reported its occurrence in the Lower Santonian part of the Gosau Group. COLLIGNON (1948, 1966) reported it from the Upper Santonian of Madagascar. As one of us (MATSUMOTO *in* MATSUMOTO and HARAGUCHI, 1978) has discussed, some species of *Texanites* have a fairly long true range, but they show shorter but sometimes heterochronous local ranges between distant provinces. The reported occurrence of *T. quinquenodosus* at Ikandai suggests rather the Upper Santonian. Further search in other areas of Hokkaido would reveal the stratigraphical range of this species in the Japanese province.

C. Locality record of *Paratexanites compressus*

MATSUMOTO (1970) reported the holotype of this species from loc. Ik882, Inari-zawa, a branch of the River Ikushumbets. It was from the Santonian, without recording further subdivision. The described specimen is from the upper part of Unit U1β in the Urakawa area. This means the upper part of the Santonian.

Several better known species of *Paratexanites* have been reported from the Upper Coniacian and Lower Santonian in various regions of the world. The genus may be, however, polyphyletic, as suggested by MATSUMOTO (1970) and KLINGER and KENNEDY (1980). As *P. compressus* is allied to *Protexanites bontanti shimizui*, its occurrence from the Upper Santonian is feasible.

Acknowledgements

We thank Mr. Noboru SAITO (2-31, Kosei-cho, Shizunai, Hokkaido 056) for his courtesy to let us study his valuable collection and Dr. H. OKADA and Mr. Tatsuo MURAMOTO for their help in the field work. We owe much to Drs. Sakasuro MAIYA and Yoichiro TAKETANI for their help in micropalaeontology, including the kindness of providing unpublished information. One of us (T. M.) is grateful to Dr. H. RICHARD of Philadelphia and Dr. W. A. COBBAN of Denver for their help to let him study (in 1957) certain valuable specimens of *Mortoniceras* from the United States.

References cited

ADKINS, W. S. 1928. Handbook of Texas Cretaceous fossils. *Univ. Texas Bull.*, **2838**: 1–385, pls. 1–37.

BOEHM, J. 1970. Referat über die Arbeit von PERVINQUIÈRE, L. (1907). *N. Jb. f. Min., usw.*, **2**: 149–155.

COLLIGNON, M. 1948. Ammonites néocrétaces de Menabe (Madagascar). I. Les Texanitidae. *Ann. Géol. Serv. Mines*, **13**: 49–107, pls. 7–20; *Ibid.*, **14**: 1–60, pls. 15–32.

——— 1966. *Atlas des Fossiles Caracteristiques de Madagascar (Ammonites)*, **14** (Santonien): 1–134, pls. 455–515.

HERM, D., KAUFFMAN, E. and WIEDMANN, J. 1979. The age and depositional environment of the "Gosau" Group (Coniacian-Santonian), Brandenberg/Tirol, Austria. *Mitt. Bayer. Staatslg. Pal. Hist. Geol.*, **19**: 27–92, pls. 5–11. Münich.

IMMEL, H., KLINGER, H. C. and WIEDMANN, J. 1982. Die Cephalopoden des Unteren Santon der Gosau von Brandenberg/Tirol, Österreich. *Zitteliana*, **8**: 3–32, pls. 1–11.

LASSWITZ, R. 1904. Die Kreide-Ammoniten von Texas (Collectio F. ROEMER). *Geol. Palaeont. Abh.*, [N. F.], **6**(4): 223–259, pls. 25–32. Jena.

KANIE, Y. 1966. The Cretaceous deposits in the Urakawa district, Hokkaido (in Japanese with English abstract). *Jour. Geol. Soc. Japan*, **72**(7): 315–328.

——— 1981. Cretaceous biostratigraphy of the Urakawa area, Hokkaido (in Japanese). *Proc. 88th Ann. Meeting, Geol. Soc. Japan*: 135. Tokyo.

———, TAKETANI, Y., SAKAI, A. and MIYATA, Y. 1981. Lower Cretaceous deposits beneath the Yezo Group in the Urakawa area, Hokkaido (in Japanese with English abstract). *Jour. Geol. Soc. Japan*, **87**(8): 527–533, pl. 1.

KENNEDY, W. J., KLINGER, H. C. and SUMMESBERGER, H. 1981. Cretaceous faunas from Zululand and Natal, South Africa. Additional observations on the ammonite subfamily Texanitinae COLLIGNON, 1948. *Ann. S. Afr. Mus.*, **86**(4): 115–155.

KLINGER, H. C. and KENNEDY, W. J. 1980. Cretaceous faunas from Zululand and Natal, South Africa. The ammonite subfamily Texanitinae COLLIGNON, 1948. *Ann. S. Afr. Mus.*, **80**: 1–357.

MAIYA, S. and TAKAYANAGI, Y. 1977. Cretaceous foraminiferal biostratigraphy of Hokkaido. *Palaeont. Soc. Japan, Spec. Paps.*, (21): 41–51.

MATSUMOTO, T. 1960. On some type ammonites from the Gulf Coast Cretaceous (in Japanese with English abstract). *Sci. Rept., Dept. Geol., Kyushu Univ.*, **5**(1): 36–49.

——— 1970. A monograph of the Collignoniceratidae from Hokkaido. Part IV. *Mem. Fac. Sci., Kyushu Univ.*, [D], **20**(2): 225–304, pls. 30–47.

——— and HARAGUCHI, Y. 1978. A new texanitine ammonite from Hokkaido. *Trans. Proc. Palaeont. Soc. Japan*, [N. S.], (110): 306–318, pl. 42.

——— and KANIE, Y. 1979. Two ornate ammonites from the Urakawa Cretaceous area, Hokkaido. *Sci. Rept. Yokosuka City Mus.*, (26): 13–20, pl. 5.

——— and OKADA, H. 1973. Saku Formation of the Yezo geosyncline (in Japanese with English abstract). *Sci. Rept., Dept. Geol., Kyushu Univ.*, **11**(2): 275–309.

MEEK, F. B. 1876. In MEEK, F. B. and HAYDEN, F. V. A report on the invertebrate Cretaceous and Tertiary fossils of the Upper Missouri County. *U. S. Geol. Surv. Territ.*, **9**: 1–629, pls. 1–45.

MORTON, S. G. 1834. *Synopsis of the Organic Remains of the Cretaceous Group of the United States*: 88 pp., 19 pls., Philadelphia.

REDTENBACHER, A. 1873. Die Cephalopodenfauna der Gosauschichten in der nördöstlichen Alpen. *Abh. Geol. Reichsanst.*, **5**: 91–149, pls. 22–30.

SCHOLZ, G. 1979. Die Ammoniten des Vracon (Oberalb, *Dispar*-Zone) des Bakony-Gebirges (Westungarn) und eine Revision der wichtigsten Vracon-Arten der West-Mediterranen Faunenprovinz. *Palaeontographica*, [A], **165**: 1–80, pls. 1–13 (Pt. 1); 81–136, pls. 14–30 (Pt. 2).

SPATH, L. F. 1921. On Cretaceous Cephalopoda from Zululand. *Ann. S. Afr. Mus.*, **12**(7): 217–321, pls. 19–26.

STOLICZKA, F. 1863–1866. The fossil Cephalopoda of the Cretaceous rocks of southern India. *Palaeont. Indica*, [3], **1**: 41–56, pls. 26–31 (1863); **2–5**: 57–106, pls. 32–54 (1864); **6–9**: 107–154, pls. 55–80 (1865); **10–13**: 155–216, pls. 81–94 (1866).

TAKAYANAGI, Y. and MATSUMOTO, T. 1981. Recent advances in the Cretaceous biostratigraphy of Japan by coordinating mega- and micro-fossils. *Recent Progr. Nat. Sci. Japan*, **6**: 125–138, Sci. Council Japan.

WRIGHT, C. W. 1957. In MOORE, R. ed. *Treatise on Invertebrate Paleontology*, Part L. Mollusca, Cephalopoda, Ammonoidea: L1–L490. Geol. Soc. America & Univ. Kansas Press.

YOUNG, K. 1957. Upper Albian (Cretaceous) Ammonoidea from Texas. *Jour. Paleont.*, **31**(1): 1–33, pls. 1–10.

Explanation of plate 1

Figs. 1–4. *Mortoniceras* cf. *kiliani* (LASSWITZ)
GK.H5931 (Geological Collection of Kyushu University), from loc. U932p of MATSUMOTO and OKADA. Two lateral (1, 4), frontal (2) and ventral (3) views. ×4/5.
Photos by KANIE, without whitening.

Explanation of plate 2

Figs. 1, 2. *Texanites quiquenodosus* (REDTENBACHER)
YCM.GP583 (Palaeontological Collection of the Yokosuka City Museum), collected by, N. SAITO from loc. U304p2 of KANIE. Left side (1); a portion of the poorly preserved right side (2). ×1.

Figs. 3–5. *Paratexanites compressus* MATSUMOTO
YCM.GP584, collected by, N. SAITO from loc. U471p of KANIE. Ventral (3), right (4) and left side (5). ×1.
Photos by KANIE, with whitening.

1

2

3

4


1
2
3
4
5