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Fossil on the cover is *Bellerophon jonesianus* DE KONINCK from the Late Permian Akasaka Series in Gifu Prefecture.

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611. BIOSTRATIGRAPHIC STUDY OF THE JURASSIC TOYORA GROUP* PART II

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ジュラ紀豊浦層群の化石層序学的研究 — その2: 豊浦層群より産するアンモナイトのうち，主として西中山層および歌野層下部の Whitbian および Yeovilian を示す Hildoceratidae の6属11種につき記載した。YOKOYAMA (1904) による *Hildoceras chrysanthemum* と *H. densicostatum* は，その分類の根拠とされている肋数につき検討した結果，同一種と判定し前者の名称をとった。またその属は長らく問題であったが，腹部および側面の特徴から *Harpoceras* (s. str.) に帰されるべきものと判断した。これとは別に，新たに *Hildoceras* に最も近い側面装飾を示すものを *Hildoceras* sp. として報告した。従来 *Haugia* aff. *japonica* とされていたものは，*Haugia* ではなく *Phymatoceras* が妥当である。*Lillia toyorana* とされていた種についても検討の結果，*Phymatoceras*に属するものと判断した。主要ルートで得られた東長野層，西中山層，歌野層の柱状図と化石産出層準も詳細に示してある。

平野弘道

Introduction

This article is Part II of the biostratigraphic study of the Jurassic Toyora Group. In Part I lithostratigraphy was explained and Domerian ammonites were described (HIRANO, 1971). In this part 6 genera including 11 species of Toarcian Hildoceratidae and Hammatoceratidae are described.

Palaeontology (continued from Part I)

Subfamily Harpoceratinae NEUMAYR, 1875

Genus *Harpoceras* WAAGEN, 1869

Type-species:—Ammonites falcifer SOWERBY, 1820 (designated by ARKELL, 1951, I. C. Z. N. Opinion 363, 1954).

* Received Feburuary 12, 1973; read Jan. 23, 1971, at Tokyo.

Subgenus *Harpoceras* WAAGEN, 1869

Harpoceras (*Harpoceras*) *chrysanthemum* (YOKOYAMA)

Pl. 1, Figs. 1-3; Pl. 2, Figs. 1-3; Pl. 3, Figs. 6-9.

1904. *Hildoceras chrysanthemum* YOKOYAMA; YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo*, vol. 19, art. 20, pp. 11-12, pl. 2, figs. 1-4.

1904. *Hildoceras densicostatum* YOKOYAMA; YOKOYAMA, *ibid.*, pp. 12-13, pl. 3, figs. 1-2.

1947. *Hildoceras* (s.l.) *chrysanthemum* YOKOYAMA; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, pp. 27-28.

1947. *Hildoceras* (s.l.) *densicostatum* YOKOYAMA; MATSUMOTO *in* MATSUMOTO & ONO, *ibid.*, vol. 2, no. 1, p. 28.

1956. *Hildoceras chrysanthemum* YOKOYAMA; ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.

1956. *Hildoceras densicostatum* YOKOYAMA; ARKELL, *op. cit.*, p. 421.
1962. *Hildoceras chrysanthemum* YOKOYAMA; SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.
1962. *Hildoceras densicostatum* YOKOYAMA; SATO, *ibid.*, no. 94, p. 59.
1963. *Hildoceras chrysanthemum* YOKOYAMA; TAKAI, MATSUMOTO and TORIYAMA ed., Geology of Japan, Univ. Tokyo Press, p. 83.
1963. *Hildoceras densicostatum* YOKOYAMA; TAKAI, MATSUMOTO and TORIYAMA ed., *op. cit.*, p. 83.

Types:—Here I designate one of the illustrated four specimens by YOKOYAMA (1904, pl. 2, fig. 1) as the lectotype of *H. chrysanthemum*, MM. 7058a, and the three other specimens as the paralectotypes (YOKOYAMA, 1904, pl. 2, figs. 2-4), MM. 7059-7061. They were obtained at loc. 47.

At the same time I designate one of the illustrated two specimens by YOKOYAMA (1904, pl. 3, fig. 1) as the lectotype of *H. densicostatum*, MM. 7064a, and the other (pl. 3, fig. 2) as the paralectotype, MM. 7065. The former was obtained at Nishinagano and the latter at loc. 47.

Material:—Two hundreds and thirty-eight specimens are examined, of which seventy-two specimens, MM. 7058-7061, GK. G. 2431-2441, 2443-2455, 2457-2492, 2501-2508, were previously regarded as *Hildoceras chrysanthemum*, eighty-eight specimens, MM. 7064-7065, GK. G. 2551-2565A, B, 2566-2577, 2579-2584A, B, 2585-2610A, B-2633, as *Hildoceras densicostatum*, thirty-nine specimens, GK. G. 2509-2519, 2521-2548, as an intermediate form and thirty-nine specimens, GK. G. 11318-11322, 11356-11379, GYU. M. 1058-1067, are newly examined.

Diagnosis:—A species of *Harpoceras* (s. str.) whose ribs have somewhat clear relief, moderate curve and the haft as long as inner one-third of the flank.

Description:—The whorls enlarge moderately and are somewhat evolute. The umbilical periphery is more or less sharp and the wall is steep but not so high. The venter is unicarinate-bisulcate. The ribs spring on the umbilical seam and go on forward. At about one-third or two-fifths of the flank the ribs sharply curve backward. Near the ventral shoulder the ribs recurve forward and more or less projected on the ventral shoulder but soon fade away. The detailed curvature of the ribs varies one by one, as illustrated by many figures in the plates. The ribs become coarser toward outer one-third of the flank, but they are not very weak on the inner part of the flank. The number of ribs per whorl varies to some extent. Sometimes there are striae, lirae, bifurcation and insertion. Bifurcation arises at one-third of the flank where the ribs curve backward. In some specimens ribs become weaker toward the aperture and many fine riblets are there instead of the major ribs. In one specimen such a change occur at 90 mm. diameter but in another specimen already at 34 mm. diameter. In a small stage (e. g., diameter 10 mm.) the curve of ribs is generally weak and more or less similar to that of *Fuciniceras nakayamenses*. In a few specimens the sutures are incompletely preserved, showing a narrow and deep lateral lobe.

Measurements:—

No.	D.	U.	H.	U/D	H/D	Rn½
MM. 7058a	87.0	38.9	26.2	0.45	0.31	25
MM. 7059	42.8	15.1	16.7	0.35	0.39	22
MM. 7060	40.1	14.8	15.1	0.37	0.38	19
MM. 7065	66.5	27.0	22.4	0.41	0.34	33
GK. G. 2552	46.2	20.0	22.0	0.43	0.48	39
GK. G. 2557	39.8	13.8	16.4	0.35	0.41	32

Statistics:—About seventy specimens are available for counting the ribs per

whorl at a given diameter. Here the assumption is made that the sample is collected at random from one fossil population with the normal distribution of the characters.

The results of the chi-square test are as follows.

Table 1. The number of ribs per half a whorl at 20 mm diameter. Data classified for the chi-square test. The classes between 27.5 and 31.5 are evaluated as one class.

Class	Oi	Ei
13.5～15.5	2	2.44
15.5～17.5	6	6.06
17.5～19.5	16	10.74
19.5～21.5	13	14.45
21.5～23.5	12	13.98
23.5～25.5	7	9.72
25.5～27.5	8	5.13
27.5～29.5	1	1.93
29.5～31.5	1	0.53
Total	66	64.98

$N=66$, $\bar{x}=21.29$, $s=3.53$, $V=16.58$, $\chi^2=5.53$, $\chi^2_{0.05(\nu=5)}=11.07$, $P \gg 0.05$, Not significant.

Table 2. The number of ribs per half a whorl at 30 mm diameter. Data classified for the chi-square test. The two classes between 17.5 and 21.5 are evaluated as one class and likely two classes between 29.5 and 33.5 are done.

Class	Oi	Ei
17.5～19.5	2	1.76
19.5～21.5	6	4.06
21.5～23.5	6	6.87
23.5～25.5	7	8.39
25.5～27.5	8	7.86
27.5～29.5	6	5.34
29.5～31.5	2	2.64
31.5～33.5	2	1.00
Total	39	37.92

$N=39$, $\bar{x}=24.95$, $s=3.59$, $V=14.39$, $\chi^2=1.28$, $\chi^2_{0.05(\nu=3)}=7.81$, $P \gg 0.05$, Not significant.
The number of ribs per half a whorl at 50 mm. diameter.
$N=11$, $\bar{x}=30.45$, $s=3.45$, $V=11.31$.

By the test as mentioned above no significant difference is found from the normal distribution. The frequency distribution of the number of ribs at each diameter seems to be unimodal.

Remarks:—Hitherto several palaeontologists and biostratigraphers have had a question concerning the taxonomic position of the present species in the generic rank. For example MATSUMOTO (in MATSUMOTO & ONO, 1947) dealt it as *Hildoceras* (s. l.) and SATO (1967, p. 391) suggested that it might belong to *Harpoceras*. In this paper the present species is referred to the genus *Harpoceras*.

Hildoceras HYATT, 1867, was established on the basis of the two species, *H. bifrons* and *H. walcotti*. Later ZITTEL (1885, pp. 458-463) dealt *Hildoceras* as a subgenus of *Harpoceras* WAAGEN, 1869 under his *Arieticeras*-series and from that time the diagnoses of *Hildoceras* and *Harpoceras* become wider. HAUG (1885, pp. 632-646) spread the scope of *Hildoceras* without clear definition and his genus *Hildoceras* included *Lillia bayle*, *Harpoceras levisoni*, *Hildaites borealis*, *Harpoceras serpentinum*, etc. GEMMELLARO (1885) and FUCINI (1900, 1904, 1905, 1923-28) used *Hildoceras* without clear definition in much wider meaning than that of HYATT. FUCINI's diagnoses of *Harpoceras*, *Grammoceras* and *Hildoceras* were confusing in his articles. BETTONI (1900, pp. 53-66) also used genus *Hildoceras* in a wide sense. The diagnosis given by him was different from that of HYATT. *Hildoceras chrysanthemum* and *Hildoceras densicostatum* were established in such an age. In the present paper I employ the diagnosis given by ARKELL (1957).

The present species has a unicarinate-bisulcate venter and no longitudinal groove on the flank, and therefore it is clearly excluded from *Hildoceras*.

The present species is closely allied to *Hildaites borealis* (BUCKMAN) as YOKOYAMA (1904) mentioned. *Hildaites* belongs to the subfamily Hildoceratinae as was treated in the "Treatise" by ARKELL (1957). The present species, however, does not belong to *Hildoceras* as mentioned above. On the other hand, the characters of the present species are not inconsistent with the diagnosis of the Harpoceratinae, and *Harpoceras* is suitable for its generic position.

The present species has been hitherto divided into *Hildoceras* (s. l.) *chrysanthemum* and *H* (s. l.) *densicostatum*. YOKOYAMA (1904) described that the latter was distinguishable from the former by the greater number of ribs. MATSUMOTO (in MATSUMOTO & ONO, 1947) revised partly the diagnoses of the two species and pointed out that there are some specimens which show intermediate characters.

I have examined more than 200 specimens including type specimens of the two nominal species and biometrically treated about 70 specimens. On the basis of the results of statistics as well as other observations, all the specimens of the sample are regarded as belonging to one species. Considering the page precedancy in YOKOYAMA's paper, I choose the former as the specific name.

Comparison:—The present species occurs together with *Harpoceras* (s. str.) sp. cf. *H. exaratum*, but is distinguishable by its less strongly curved ribs.

YOKOYAMA (1904) said that the present species was closely allied to *Hildaites borealis* (BUCKMAN). Indeed in the mode of the ribs *Hildaites borealis* is quite similar to the present species, but the hafts of the ribs are shorter in the former than in the latter. The venter of *H. borealis* is unicarinate-tabulate and has somewhat subangular ventro-lateral shoulders. On the other hand the venter of the present species is unicarinate-bisulcate and not acute but has gentle ventrolateral shoulders.

Harpoceras mulgravium (YOUNG & BIRD) is somewhat similar to the present species, but the former has longer hafts of the ribs and more acute curve of ribs on the middle of the flank.

Occurrence:—Loc. 3: 113, loc. 30: 29, loc. 26: 12, loc. 47: 10, loc. 5: 8, loc. 28′: 8, loc. 9; 5, loc. 2: 4, loc. 4: 3, loc. 6: 3, loc. 22: 3, loc. 40: 3, loc. 1: 2, loc. 35: 2, loc. 47B: 2, loc. 18E: 1, loc. 41: 1, unknown loc. of the Sakuraguchi-dani: 6, Tabe district: 1, unknown loc.: 22.

Harpoceras (*Harpoceras*) *inouyei* (YOKOYAMA)

Pl. 1, Figs. 4–5; Pl. 3, Fig. 5.

1904. *Hildoceras inouyei* YOKOYAMA; YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo*, vol. 19, art. 20, pp. 13–14, pl. 2, figs. 5–6.
1947. *Hildoceras* (s.l.) *inouyei* YOKOYAMA; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ.*, vol. 2, no. 1, p. 28.
1956. *Hildoceras inouyei* YOKOYAMA; ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.
1962. *Hildoceras inouyei* YOKOYAMA; SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.
1962. *Hildoceras inouyei* YOKOYAMA; TAKAI, MATSUMOTO and TORIYAMA ed., Geology of Japan, Univ. Tokyo Press, p. 83.

Types:—As YOKOYAMA (1904) established this species on several syntypes, one of his illustrated specimens (1904, pl. 2, fig. 6) is here designated as the lectotype, MM. 7063, and another illustrated specimen (1904, pl. 2, fig. 5) as the paralectotype, MM. 7062. They were obtained at loc. 47.

Material:—Seventy-two specimens,

Types, GK. G. 2641-2652, 2654-2666, 2668-2676, 2679-2681, 2683-2685, 11299, 11316-7, 11342-11349, GYU. M. 1028-1047.

Diagnosis:—The diagnosis of the present species, as noted by YOKOYAMA (1904) and supplemented by MATSUMOTO (in MATSUMOTO & ONO, 1947), is: A species of *Harpoceras* (s. str.) which has a fairly narrow umbilicus (usually less than 1/3 of diameter in every size) and bifurcated, indistinctly fasciculated and/or occasionally inserted ribs.

Description:—The whorls enlarge rapidly, with a fairly narrow umbilicus. The venter is probably unicarinate-bisulcate, although the specimens with a completely preserved venter are not available. The umbilical periphery is rounded, but the wall is steep and low. The ribs spring on the umbilical wall and go on forward. At a point one-third or two-fifths of the flank the ribs curve backward with increasing coarseness, drawing arcs, and then recurve forward near the ventral shoulder. They usually are very weak and often inperceptible on the umbilical periphery. The bifurcation occurs at one-third or two-fifths of the flank where the ribs curve backward. The fasciculation is indistinctly visible on the innermost part of the flank. Inserted ribs occasionally occur on the outer two-thirds of the flank. The lirae and striae are rare, but, if present, they are visible along the ribs. In some specimens the sutures are partly preserved, but the preservation is too poor for tracing details. An example is shown in Pl. 3, Fig. 5.

Measurements:—

No.	D.	U.	H.	U/D	H/D	Rn½
MM. 7062	26.1	8.6	10.4	0.33	0.40	28
MM. 7063	39.1	11.0	16.8	0.28	0.43	29
GK. G. 2642	41.0	14.3	16.2	0.35	0.40	37
GK. G. 2668	42.9	15.4	19.2	0.36	0.45	36
GK. G. 2672	52.3	12.2	25.7	0.23	0.49	28

Comparison:—The present species is closely allied to *Harpoceras chrysanthemum* (YOKOYAMA) in general characters, especially in the quite similar curvature of ribs. The former has, however, distinctly involute shell and sometimes show fasciculation and inserted characters of the ribs.

The present species is also very similar to *Hildaites borealis* (BUCKMAN) (WRIGHT, 1883, p. 438) in the mode of ribs. The present species, however, is characterized by the involute shell and the unicarinate-bisulcate venter.

The mode of insertion and bifurcation of the ribs is somewhat similar to that of *Lioceratoides yokoyamai* (MATSUMOTO), but the latter shows more eminent and regular bifurcation and insertion.

Occurrence:—Loc. 3: 25, loc. 5: 12, loc. 30: 11, loc. 1: 3, loc. 26: 3, loc. 47: 5, loc. 2: 1, loc. 4: 2, loc. 18D: 1, loc. 18E: 1, loc. 27: 1, loc. 28: 1, loc. 35: 1, loc. 42: 1, unknown: 4.

Harpoceras (*Harpoceras*) sp. cf. *H.* (*H.*) *mulgravium* (YOUNG & BIRD)

Pl. 1, Fig. 6.

Material:—A fragmentary specimen, GK. G. 11355.

Description:—The whorls enlarge rather rapidly, and the umbilicus seems to be somewhat narrow. The venter seems to be unicarinate-bisulcate, though it is poorly preserved. Ribs are strongly falcoid and somewhat prorsiradiate. They are straight and inclined forward on the inner half of the flank. At the middle of the flank they abruptly curve backward and near the ventral shoulder they recurve forward, moderately projecting on the venter. They are accompanied by lirae on the preserved last stage. The ribs are numerous and separated by in-

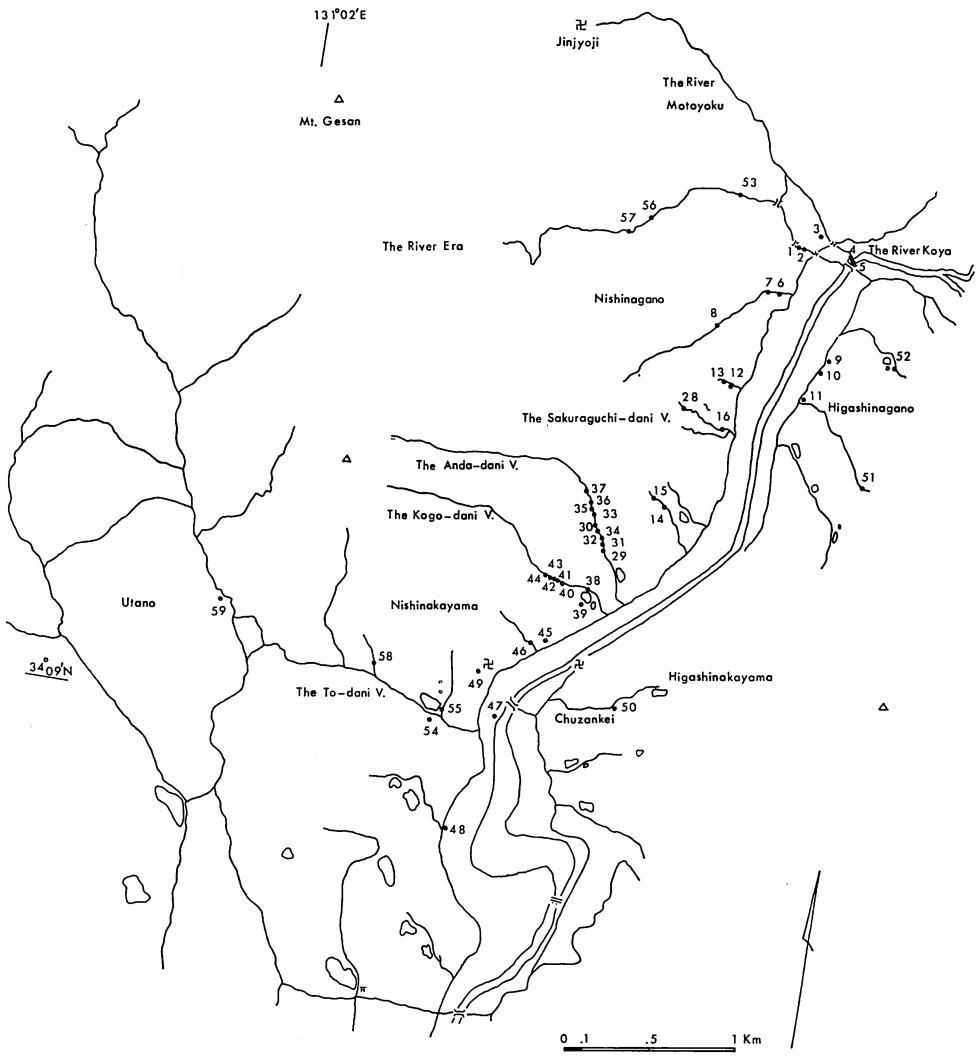

Fig. 1. Map showing the studied area and the fossil localities.

terspaces narrower than the ribs. They are strong on the outer half of the flank and somewhat weak on the inner half.

Measurements:—H: 46.1

Comparison:—The present specimen is similar to the British specimens of *Harpoceras mulgravium* (YOUNG & BIRD) (WRIGHT, 1882, p. 433, BUCKMAN, 1909, p. 4b) in the mode of volution, venter and ribs, but it is fragmentary and its characters of the young stage is not observable. Therefore I tentatively describe it under *Harpoceras* cf. *mulgravium* (YOUNG & BIRD).

H. mulgravium (YOUNG & BIRD) is allied to *H. falcifer* (SOWERBY) (PINNA, 1968, pp. 37-39), but is distinguished in its wider umbilicus, less involute shell and straight hafts of the ribs.

Occurrence:—Loc. 28: 1.

Harpoceras (*Harpoceras*) sp. cf. *H.* (*H.*) *exaratum* (YOUNG & BIRD)

Pl. 2, Fig. 4; Pl. 3, Fig. 1.

1904. *Harpoceras* sp.; YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo*, vol. 19, art. 20, p. 15, pl. 4, fig. 2.
1947. *Harpoceras* (s. str.) sp. aff. *H. exaratum* (YOUNG & BIRD); MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 28.
1962. *Harpoceras* sp. aff. *H. exaratum* (YOUNG & BIRD); SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.

Material:—Twelve specimens, GK. G. 2711, 2716, 11336-11341, GYU. M. 1025-1027, MM. 7071.

Description:—The whorls enlarge rapidly and the umbilicus is narrow. The venter bears a less stout keel. Whether the venter has sulci or not is not confirmable. The mode of ribs is falciform and is characteristic of *Harpoceras* (s. str.). The ribs are usually simple. The angle of the curved ribs near the middle of the flank is about 120° to 150°. The space of the ribs varies to some extent, being wider than the interspace in most specimens. Much finer ribs are occasionally visible along the major ribs, and in a large fragmentary specimen numerous fine ribs are characteristic. One specimen has its aptychus which may be referred to *Cornaptychus*.

Measurements:—

No.	D.	U.	H.	U/D	H/D	Rn½
GK. G. 2711	ca. 45	10.9	21.1	0.24	0.47	40

Comparison:—The present specimens have been regarded as *Harpoceras* (s. str.) sp. aff. *H. exaratum* (YOUNG & BIRD). Indeed the present specimens are very similar to the European specimens of *Harpoceras* (s. str.) *exaratum* (YOUNG & BIRD) in the dense ribbing, the mode of falciform ribs and the involute shell. According to BUCKMAN (1909, p. 5b) three ontogenetic stages are discerned in *H.* (*H.*) *exaratum*, of which later two stages, "(2) the single ribs, falciform stage; (3) the finer rib stage, less falciform" are confirmed in the Toyora specimens. As the detailed nature of venter is not visible, I treat the present specimens as *Harpoceras* (*H.*) sp. cf. *H. exaratum* (YOUNG & BIRD).

The present species is similar to *Harpoceras* (*H.*) *okadai* (YOKOYAMA) but is distinguished by its wider umbilicus and stronger curve and longer hafts of the ribs.

Occurrence:—Loc. 28: 3, loc. 2: 2, loc. 47: 3, loc. 1: 1, loc. 22: 1, loc. 36: 1, loc. 36′: 1.

Subgenus *Harpoceratoides* BUCKMAN, 1909

Type-species:—*Ammonites alternatus* SIMPSON in BUCKMAN, 1909.

Harpoceras (*Harpoceratoides*) *nagatoensis* sp. nov. [MATSUMOTO, MS.]

Pl. 3, Figs. 2-4.

1947. *Grammoceras* (*Pleydellia*) sp.; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 27, pl. 1, fig. 7.
1953. *Harpoceratoides nagatoensis* MATSUMOTO (nom. nud.); MATSUMOTO *in* MATSUMOTO *et al.* ed., "Historical Geology" (in Japanese), Asakura Book Ltd., p. 359.
1962. *Harpoceratoides nagatoensis* MATSUMOTO; SATO (nom. nud.) *Mém. Soc. Géol. France*, no. 94, p. 59.

Types:—The specimen illustrated by MATSUMOTO (in MATSUMOTO & ONO, 1947, pl. 1, fig. 7) is designated here as the

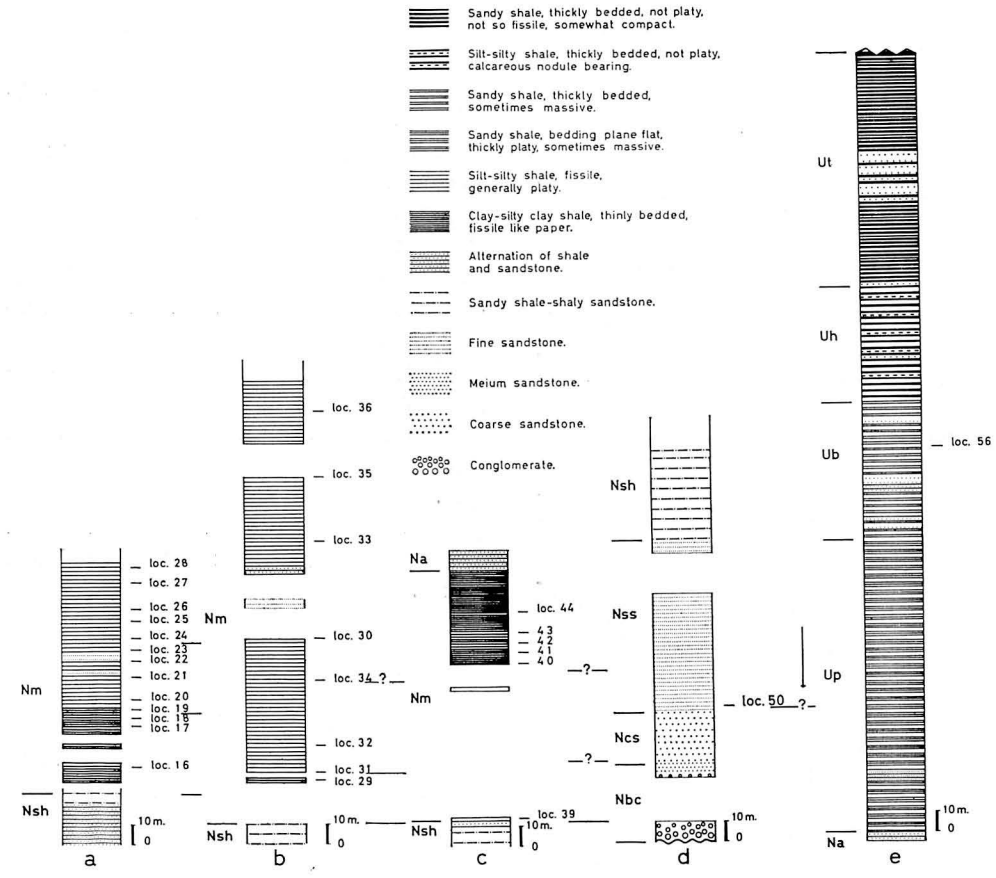

Fig. 2. Columnar sections showing localities. The horizontal bars are the boundaries of the formations (left side of the column) and the boundaries of the zones (right side). The locality numbers correspond to the numbers in the systematic description.

a : Column along the sequence in the Sakuraguchi-dani ; b : Column along the Anda-dani ; c : Column along the Kogo-dani ; d : Column along the Chuzankei Ravine, Higashinakayama ; e : Column along the River Era.

Explanation of Plate 1

(Natural size)

Figs. 1–3. *Harpoceras* (s. str.) *chrysanthemum* (YOKOYAMA)
1. MM. 7058a, Lectotype, loc. 47 ; 2. MM. 7059, Paralectotype, loc. 47 ; 3. MM. 7060, Paralectotype, loc. 47.

Figs. 4–5. *Harpoceras* (s. str.) *inouyei* (YOKOYAMA)
4. MM. 7062, Lectotype, loc. 47 ; 5. MM. 7063, Paralectotype, loc. 47.

Fig. 6. *Harpoceras* (s. str.) sp. cf. *H. mulgravium* (YOUNG & BIRD)
GK. G. 11355, loc. 28.

Fig. 7. *Dumortieria* ? sp.
Rubber cast of GK. G. 2797, loc. 58.

Fig. 8. *Grammoceras* (s. str.) sp. aff. *G. obesum* (BUCKMAN)
GK. G. 2781, loc. 55.

1

8

2

5

4

7

6

3

holotype, GK. G. 2007, which was obtained at loc. 9. Five specimens, GK. G. 2381-2384, 2391, are designated as paratypes.

Material:—The above mentioned six specimens.

Etymology:—"Nagato" is the old name of the southwestern part of Yamaguchi Prefecture.

Diagnosis:—A species of *Harpoceratoides* which has fine, numerous and moderately curved ribs and proportionally wide umbilicus.

Description:—The whorls enlarge moderately or somewhat rapidly. The volutions are moderately tight in most of the specimens and in others somewhat involute. A keel is visible on the venter and may be unicarinate. The ribs are so fine that they look like lirae. Their curve is falciform and is characteristic of *Harpoceras*. At inner one-third of the flank, they curve backward moderately. They are numerous, crowded and fasciculated on the inner lateral and the umbilical wall. They are wider than their interspace. The apertural part of a large specimen (Pl. 3, Fig. 3) is covered by numerous lirae instead of the ribs.

Measurements:—

No.	D.	U.	H.	U/D
GK. G. 2007	26. 0	8. 9	10. 3	0. 34
GK. G. 2383	32. 4	14. 2	10. 4	0. 44
GK. G. 2382	58. 6	22. 9	21. 5	0. 39

Comparison:—The present species is similar to *Protogrammoceras nipponicum* (MATSUMOTO) in its curvature of ribs but the latter does not show the fasciculation of the ribs.

The present species is similar to *Harpoceratoides serotinum* BETTONI (1900, pp. 65-66; HAAS, 1913, pp. 106-109; MONESTIER, 1931, pp. 31-32) but is distinguished by its more evolute shell and rather weaker curve of ribs.

Occurrence:—Loc. 9; 4, loc. 22: 1, loc. 30: 1.

Genus *Pseudolioceras* BUCKMAN, 1889

Type-species:—*Ammonites compactilis* SIMPSON *in* BUCKMAN, 1889.

Pseudolioceras sp.

Pl. 3, Figs. 10-11.

1947. *Hyperlioceras* sp.; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ.*, vol. 2, no. 1, p. 29, pl. 2, fig. 2.
1956. *Pseudolioceras*? sp.; ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.
1962. *Pseudolioceras* sp.; SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.
1963. *Pseudolioceras* sp.; TAKAI, MATSUMOTO and TORIYAMA ed., Geology of Japan, Univ. Tokyo Press, p. 83.

Material:—Ten unfavourably preserved specimens, GK. G. 2012, 2772-2776, 2782, 2792, 2793, 2798.

Description:—The whorls enlarge very rapidly and the umbilicus is very narrow. The venter is unicarinate-tabulate. The umbilical wall is low and more or less steep. The ribs are moderately falciform. They spring on the umbilical wall and go on somewhat forward. At the middle of the flank they curve moderately backward and then recurve forward near the ventral shoulder. The ribs are wide and rather low. The interspaces of the ribs are also wide. In one specimen, GK. G. 2773, lirae are present on the ribs of the last whorl.

Measurements:—

No.	D.	U.	U/D	H.
GK. G. 2010	64. 1	11. 5	0. 18	33. 9
GK. G. 2772	44. 7	ca. 9	0. 20	24. 4
GK. G. 2773	ca. 34. 7	ca. 10. 7	0. 31	ca. 13. 5

Comparison:—The present species is similar to *Pseudolioceras andromacoi* FUCINI (1923, pp. 61-62) in the tight involution and falciform ribs, but is distinguished by its less dense ribs. It is somewhat similar to *Pseudolioceras sublythense* (HAAS) (1913, pp. 113-114), but is distinguished by its wider ribs.

As the available specimens are unfavourably preserved, precise specific identification is hardly done.

Occurrence:—Loc. 55: 8, loc. 53: 1, loc. 54: 1.

Subfamily Hildoceratinae HYATT, 1867

Genus *Hildoceras* HYATT, 1867

Type-species:—*Ammonites bifrons* BRUGUIÈRE, 1789 (subsequently designated by BUCKMAN, 1889).

Hildoceras sp. aff. *H. bifrons* (BRUGUIÈRE)

Pl. 4, Figs. 4-5; Pl. 2, Fig. 10 in Part III.

Material:—Five specimens, GYU. M. 1068, GK. G. 11351-11345, of incomplete preservation.

Description:—The whorls enlarge slowly and the umbilicus is proportionally wide. The venter is tricarinate-bisulcate. The umbilical periphery is rounded but the wall is nearly perpendicular and somewhat high. Therefore the whorl-section is roughly rectangular. The flank is flat. The curvature of a rib is falcoid and characteristic of *Hildoceras*. The ribs curve backward at the middle of the flank. Usually they are very weak or sometimes imperceptible on the inner half of the flank but stout on the outer half. They are widely interspaced. Lirae are present on the inner half of the flank.

Measurements:—Height of the whorl of the last stage: GK. G. 11351=28.1, 11352=32.1, 11353=24.8, 11354=33.2, GYU. M. 1068=51.7.

Comparison:—The present specimens are similar to the British specimens of *Hildoceras bifrons* (BRUGUIÈRE) (WRIGHT, 1882, p. 436, pl. 59, figs. 1-2) in the mode of volution, venter and stout ribs, but the curvature of ribs in the former is not so abrupt as in the latter. In the present specimens the inner part of the flank is not grooved but flattened and this may be a diagnostic character of the present specimens. Because the character of the small stage is unknown and only the fragmentary specimens are available, I tentatively treat the present specimens under *Hildoceras* sp. aff. *H. bifrons*, although they could possibly represent a new species.

Occurrence:—Loc. 7: 1, loc. 25: 1, loc. 27: 1, loc. 40: 1, loc. 44: 1.

Subfamily Grammoceratinae BUCKMAN, 1904

Genus *Grammoceras* HYATT, 1867

Type-species:—*Ammonites striatulus* SOWERBY, 1823 (subsequently designated

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Explanation of Plate 2

(Natural size)

Figs. 1-3. *Harpoceras* (s. str.) *chrysanthemum* (YOKOYAMA)
1. MM. 7065, loc. 47; 2. MM. 7061, Paralectotype, loc. 47; 3. MM. 7064, Rubber cast, Nishinagano

Fig. 4. *Harpoceras* (s. str.) sp. cf. *H. exaratum* (YOUNG & BIRD)
MM. 7071, loc. 47.

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by BUCKMAN, 1890).

Subgenus *Grammoceras* HYATT, 1867

Grammoceras (*Grammoceras*) sp. aff. *G.* (*G.*) *obesum* (BUCKMAN)

Pl. 1, Fig. 8.

1947. Cf. *Grammoceras* sp.; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 27.

Material:—Five specimens, GK. G. 2781, 2783, 2787, 2784, 2795.

Description:—The whorls enlarge moderately and the venter has a small keel. The umbilical periphery is rounded and the wall is low. The ribs are moderately falcoid. They spring on the umbilical seam and go on forward with flexuosity. After they proceed one-fourth or one-third of the flank, they curve backward and recurve forward near the ventral shoulder. They are simple, somewhat elevated and separated by wider interspaces.

Measurements:—

No.	D.	U.	U/D	H.	Rn½
GK. G. 2781	59. 4	20. 4	0. 34	22. 7	ca. 21

Comparison:—The present species resembles *Grammoceras obesum* (BUCKMAN) (1904, pp. 150-151) in the mode of ribs, but has a tighter volution and somewhat stronger curvature of ribs.

The present species is somewhat similar to *Grammoceras thouarsense* (D'ORBIGNY) in the curvature of ribs, but is distinguished by its tighter volution and sparser ribbing.

As the available specimens are not numerous and unfavourably preserved, I provisionally treat the present species as *Grammoceras* sp. aff. *G. obesum* (BUCKMAN).

Occurrence:—Loc. 55: 5.

Genus *Dumortieria* HAUG, 1885

Type-species:—*Ammonites levesquei* D'ORBIGNY, 1884 (subsequently designated by BUCKMAN, 1890).

Dumortieria? sp.

Pl. 1, Fig. 7.

1947. *Dumortieria* (?) sp.; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 29.
1956. ? *Dumortieria* sp.; ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.
1962. *Dumortieria*? sp.; SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.

Material:—A single fragmentary specimen, GK. G. 2797.

Description:—The whorls enlarge somewhat rapidly and consequently the umbilicus is rather narrow. The venter is invisible. The ribs, which spring at the umbilical seam, are somewhat flexuous, slightly falcoidal, fine, simple and widely interspaced.

Measurements:—

No.	D.	U.	U/D	Rn½
GK. G. 2797	ca. 18	ca. 7	ca. 0. 39	17

Comparison:—The present species somewhat resembles *Dumortieria tabulata* BUCKMAN (1905, p. 185) in the mode of ribs and volution, but it has finer ribs. It is similar to *Dumortieria levesquei* (D'ORBIGNY) (HAUG, 1885, pp. 662-663) in the somewhat fine and widely interspaced ribs, but has more flexuous ribs. On the other hand it is apparently similar to *Tmetoceras* in its simple and fine ribs. Because only a single specimen with poorly preserved venter is available, a precise identification cannot be done.

Occurrence:—Loc. 58: 1.

Family Hammatoceratidae
BUCKMAN, 1887

Subfamily Phymatoceratinae
HYATT, 1867

Genus *Phymatoceras* HYATT, 1867

Type-species:—*Phymatoceras robustum* HYATT, 1867.

Phymatoceras toyoranum (MATSUMOTO)

Pl. 4, Fig. 3.

1947. *Lillia toyorana* MATSUMOTO; MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 29, pl. 2, fig. 1.
1956. *Phymatoceras toyoranum* (MATSUMOTO); ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.
1962. *Phymatoceras toyoranum* (MATSUMOTO); SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.
1962. *Phymatoceras toyoranum* (MATSUMOTO); TAKAI, MATSUMOTO and TORIYAMA ed., Geology of Japan, Univ. Tokyo Press, p. 83.

Types:—Here I designate one of the twelve syntypes, GK. G. 2763, as the lectotype and others, GK. G. 2011, 2761, 2764, 2765, 2766, 2768, 2768, 2770, 2771, 2777, as paralectotypes, of which one specimen, GK. G. 2011 was previously illustrated by MATSUMOTO (1947, pl. 2, fig. 1).

Material:—The above mentioned twelve specimens.

Diagnosis:—A species of *Phymatoceras* which has slightly to moderately sigmoidal, widely interspaced ribs and no tubercles.

Description:—The whorls enlarge somewhat rapidly and consequently the umbilicus is narrow in the young stage of about 20 mm. in diameter. In the later stages the whorls enlarge somewhat slowly and the umbilicus is proportionally moderate. The venter is unicarinate-bisulcate. The ribs spring at the umbilical seam and go on forward. At a point inner one-third of the flank they curve backward and near the ventral shoulder they recurve forward. They are, thus, slightly sigmoidal and they become stouter toward the ventral shoulder. They are interspaced widely and often bifurcate at the umbilical periphery. In some specimens the ribs are slightly elevated at the umbilical periphery where the bifurcation arises, but the elevation is not so strong as to

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Explanation of Plate 3

(Natural size)

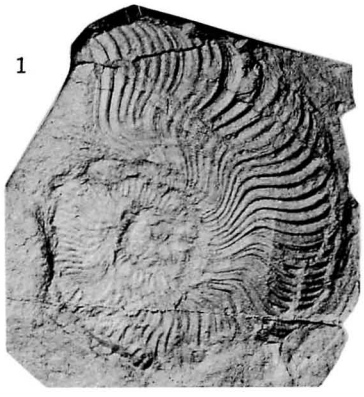
Fig. 1. *Harpoceras* (s. str.) sp. cf. *H. exaratum* (YOUNG & BIRD)
Rubber cast of GK. G. 2711, loc. 2.

Figs. 2-4. *Harpoceras* (*Harpoceratoides*) *nagatoensis* sp. nov.
2. GK. G. 2383, Paratype, loc. 9; 3. GK. G. 2381, paratype, loc. 30; 4. GK. G. 2007, Holotype, loc. 9.

Fig. 5. *Harpoceras* (s. str.) *inouyei* (YOKOYAMA)
GK. G. 2642, loc. 3.

Figs. 6-9. *Harpoceras* (s. str.) *chrysanthemum* (YOKOYAMA)
6. GK. G. 2572, loc. 3; 7. GK. G. 2552, loc. 3; 8. GK. G. 2557, loc. 3; 9. GK. G. 2504, loc. 3.

Figs. 10-11. *Pseudolioceras* sp.
10. GK. G. 2773, loc. 55; 11. GK. G. 2012, loc. 55.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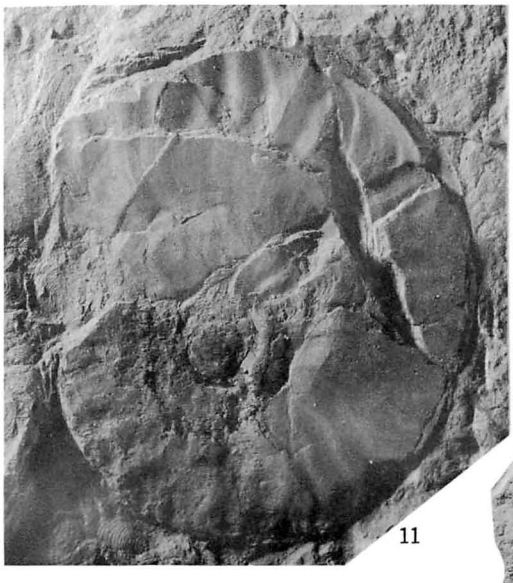
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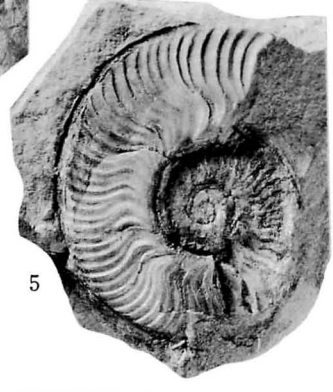
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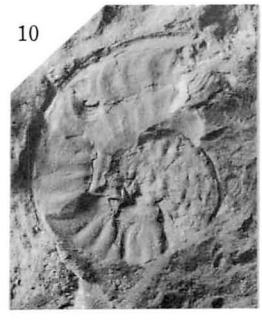
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be called tubercles. One specimen, GK. G. 2763, with a diameter of 64 mm., has some lirae on the apertural part.

Measurements:—

No.	D.	U.	U/D	$Rn\frac{1}{2}$
GK. G. 2763	ca. 61	21. 6	ca. 0. 35	20

Comparison:—The present species is similar to *Phymatoceras pulcher* MERLA (1933, pp. 30-31) in the mode of volution and the curvature of ribs, but is distinguished by its stouter ribs and indistinctness of tubercles at the umbilical periphery.

The present species is similar to *Phymatoceras malagma* (DUMORTIER) (BUCKMAN, 1899, p. 21) in the curvature of ribs, the bifurcation and the volution. The unmistakable distinction between the two species is the considerably dominant tubercles in the latter.

The present species resembles *Phymatoceras obtecta* (BUCKMAN) (1899, p. 21) in the mode of ribs. The latter is distinguished in its more dominant and numerous tubercles in younger stages and more rapidly enlarging whorls.

The present species is also similar to *Phymatoceras narbonensis* (BUCKMAN) (MONESTIER, 1931, p. 21) in the mode of bifurcation. They are distinguished in that the ribs are more flexuous and considerably elevated at the umbilical periphery and the whorls enlarge more rapidly in the latter than in the former.

Occurrence:—Loc. 55: 13.

Phymatoceras sp.

Pl. 4, Figs. 1-2

1947. *Haugia* aff. *japonica* (NEUMAYR); MATSUMOTO *in* MATSUMOTO & ONO, *Sci. Rep. Fac. Sci., Kyushu Univ., Geol.*, vol. 2, no. 1, p. 29, pl. 2, fig. 5.

1956. *Haugia* aff. *japonica* (NEUMAYR); ARKELL, Jurassic Geology of the World, Oliver & Boyd Ltd., p. 421.

1962. *Haugia* aff. *japonica* (NEUMAYR); SATO, *Mém. Soc. Géol. France*, no. 94, p. 59.

Material:—Two specimens, GK. G. 2801, 11350.

Description:—The whorls enlarge slowly and consequently the umbilicus is proportionally wide. The venter has a low keel. The presence of sulci is not confirmed. The umbilical periphery is rounded and the wall is steep. Somewhat prominent tubercles are present between the umbilical wall and the umbilical shoulder, and two ribs spring from every tubercle in the growth stages less than 50 mm. in diameter. The ribs go on backward on the flank and near the ventral shoulder they curve forward.

In the late growth stage with diameters between ca. 50 mm. and ca. 100 mm., the tubercles are weak or very weak, and the twin becomes obscure. The ribs are sigmoid, very weak on the inner one-third of the flank and somewhat strong on the ventral shoulder. The curvature of the rib in this stage is the same as that in the younger stages. In one specimen, GK. G. 2801, lirae occur in the part with diameters between ca. 70 mm. and ca. 85 mm. and they are prominent on the umbilical shoulder. The tubercles and ribs become very weak and finally fade away in the last stage over 100 mm. in diameter.

Measurements:—

No.	D.	U.	H.	U/D	$Rn\frac{1}{2}$
GK. G. 2801	ca. 83	38. 9	ca. 23. 7	ca. 0. 47	ca. 27
GK. G. 11350	—	54. 8	30. 9	—	25

Remarks:—The present species has been considered as being allied to *Haugia japonica* (NEUMAYR) from Shikoku for a long time. The taxonomic position of *Haugia japonica* has so far been discussed by many students (NEUMAYR in NAUMANN & NEUMAYR, 1890,

p. 35; YEHARA, 1927, pp. 37-39; SHIMIZU, 1928, pp. 219-222; KOBAYASHI, 1935, pp. 79-83) and recently ZEISS (1956, p. 76) pointed out that it is closely allied to *Hecticoceras* (*Putealiceras*) *mathayense* (KILIAN). HAYAMI & MATSUMOTO (MATSUMOTO *et al.*, 1963, p. 35) regarded it as *Hecticoceras*? (*Putealiceras*) *japonicum*.

H.? (*P.*?) *japonicum* has less sigmoidal ribs and tubercles at a point about one-third from the umbilical margin to the venter, but the present species has more sigmoid ribs and tubercles on the umbilical shoulder. There are unmistakable differences between them.

Although the present species is represented only by two specimens, it is not referred to the genus *Hecticoceras* by the following ground. Ribs are strong in *Hecticoceras* but moderate or weak in the present species. In *Hecticoceras* the ribs end at the ventrolateral tubercles, but such a character is not shown by the present species. *Hecticoceras* has tubercles through the growth stage, but in the present species the tubercles are weakened in a late stage with diameters between 50 to 100 mm. and finally fade away.

The present species is not referred to the genus *Haugia*, because it has a low keel and sigmoid ribs.

Considering all the observable characters it is better to ascribe the present species to *Phymatoceras*.

Comparison:—The present species is similar to *Phymatoceras pulcher* MERLA (1933, pp. 30-31) in the mode of volution and ribs, but is distinguished by its less persistent tubercles.

The present species is similar to *Phymatoceras robustum* HYATT (ARKELL *et al.*, 1956, p. L265) in the mode of tubercles and volution. In the former, twinned ribs arises from every tubercle in the younger stages. On the other hand, in the latter the ribs are simple, twinned or triploid from tubercles and the mode is irregular.

The present species is similar to *Phymatoceras toyoranum* in the mode of volution and ribbing, but is distinguished by its dominant tubercles at the umbilical shoulder in the younger stages and somewhat weaker ribs.

Occurrence:—Loc. 56: 2.

(to be continued)

Explanation of Plate 4

(Natural size unless otherwise indicated)

Figs. 1-2. *Phymatoceras* sp.
1. Gypsum cast of GK. G. 11350, loc. 56, ×0.8; 2. Gypsum cast of GK. G. 2801, loc. 56, ×0.8.

Fig. 3. *Phymatoceras toyoranum* (MATSUMOTO)
Rubber cast of GK. G. 2763, Lectotype, loc. 55.

Figs. 4-5. *Hildoceras* (s. str.) sp. aff. *H. bifrons* (BRUGUIÈRE)
4. GK. G. 11351, loc. 40; 5. GK. G. 11354, loc. 27.

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Trans. Proc. Palaeont. Soc. Japan, N. S., No. 89, pp. 15-23, pls. 5, 6, April 20, 1973

612. CORAL FOSSILS FROM THE KOSODE FORMATION, YAMANASHI PREFECTURE*

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山梨県，小袖累層のサンゴ化石： 山梨県の北東端に分布する小袖累層から産出したサンゴ化石類を検討し，10種を識別し記載した。その中 2種は新種である。これらサンゴ化石群の構成要素の多くは，佐川盆地を中心とした鳥巣層群および鳥巣層群相当層産のものに同一または近似の種であり，小袖累層は上部ジュラ系に属することに疑いはない。小袖累層をはじめとするこの地域のジュラ系の層序および地質構造について概説した。 西宮克彦・山際延夫

Introduction and acknowledgements

The Kosode Formation is a characteristic member composing the zonal structure in the Kanto-Mountainland, and is extending from Kosode toward Aoiwadani in the surveyed area, the northeastern part of Yamanashi Prefecture (Text-fig. 1). The stratigraphical and structural studies of the formation have been carried out by FUJIMOTO (1939), FUJIMOTO and SUZUKI (1969), Yamanashi Prefecture Government (1970), and NISHIMIYA and YAMAGIWA (1971). There has been, however, published no palaeontological report, although corals are rather dominant in limestone lenses at Kosode and Aoiwadani, and occur sometimes in association with stromatoporoids.

The coral fauna may be regarded as very valuable in order to discuss the geological age, correlation and palaeoenvironment of the Kosode Formation, so far as other leading fossils are indeed lacking. Ten coral species are discriminated from the formation, and described in the present paper. In addition, the Jurassic Torinosu Series is briefly mentioned, making special refrence to the Kosode Formation.

On publishing the present paper, the writers wish to express their sincere thanks to Professor Keiji NAKAZAWA of the Kyoto University for his continuous suggestions. Thanks are due to Mr. Toyohiko IWAHASHI of the Osaka Kyoiku University for his photographic work, and also due to Mr. and Mrs. Yasuo NOGAMI of the Kyoto University for their helps in preparation for the manuscript.

* Received Oct. 20, 1972; read June 27, 1971, at Nara.

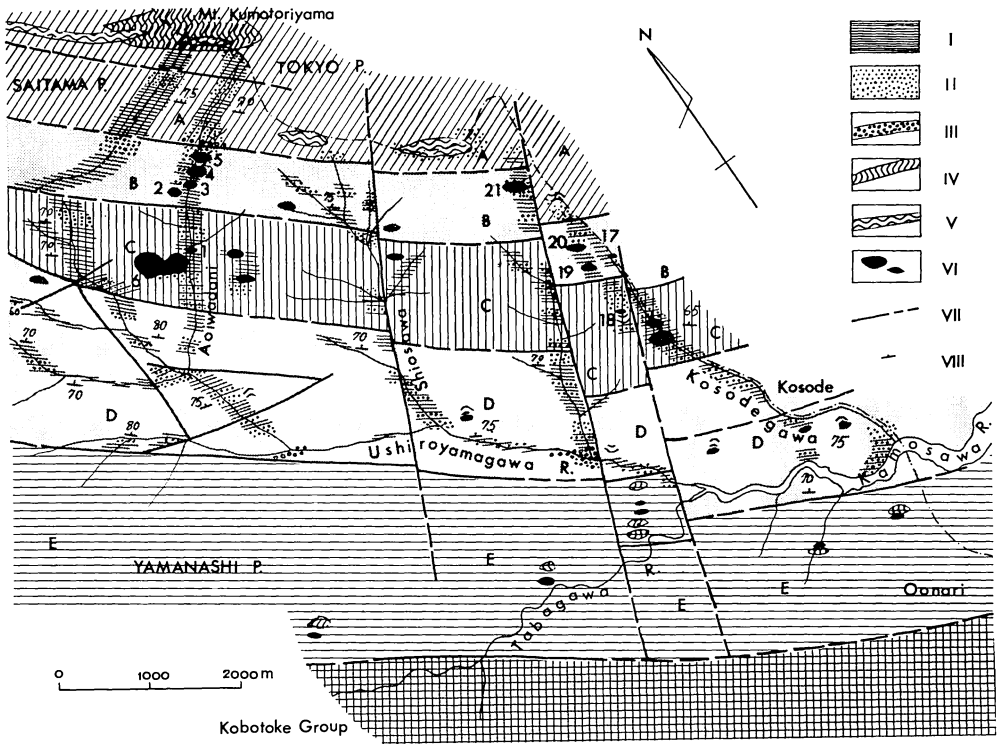


Fig. 1. Geological map of the northeastern part of Yamanashi Prefecture.
A: Kumotoriyama Formation, B: Kosode Formation, C: Aoiwadani Formation, D: Kamosawa Formation, E: Oonari Formation, I: shale or slate, II: sandstone, III: conglomerate, IV: schalstein, V: chert, VI: limestone, VII: fault, VIII: strike and dip, 1-21; Sample loc.

Stratigraphy

The Jurassic strata were studied by FUJIMOTO (1939) in the Kogochi District and by FUJIMOTO and SUZUKI (1969) in the Oborogawa District. They are subdivided as follows:

Kogochi District	Oborogawa District
Kogochi Group (Jurassic)	Otaki Group (Jurassic)
Takanosuyama Formation	Tochimoto Formation
	Kawamata Formation
Kosode Formation	Sogoyadani Formation
	Kosode Formation
Oonari Formation	Koreisan Formation

The stratigraphy of the surveyed Aoiwadani-Kosode area is summarized, as shown in Table 1. The Jurassic Torinosu Series is separately distributed in three belts, namely, the Oonari Formation in the southern belt, the

Table 1. Stratigraphical subdivision in the surveyed area.

	Aoiwadani-Kosode Area			
Cretaceous	Shimanto Series	Kobotoke Group		
		(fault)		
Jurassic	Torinosu Series	Kosode F.	Kamosawa F.	Oonari F.
		(fault)		
Triassic?		Aoiwadani Formation		
		(fault)		
Permian	Chichibu Series	Kumotoriyama Formation		

Kamosawa Formation in the middle belt, and the Kosode Formation in the northern belt. The boundaries of these formations are bounded by fault.

The Oonari Formation: Typically developed at Oonari, well cropping out along the middle stream of the Tabagawa River; mainly composed of sandstone, shale and slate, subordinately made up of schalstein and chert, intercalating blackish grey limestone lenses; about 2000 m thick.

The formation showing a general trend of NW-SE, dipping to northeast and southwest at angles 50-80°, generally characterized by homoclinal structure. Several faults trending to NW-SE and NE-SW. The boundary between the present formation and the Kamosawa Formation in the middle belt is marked by fault, which is cut off by NE-SW faults.

The Kamosawa Formation: Typically cropping at Kamosawa; mainly composed of shale and slate, intercalating sandstone, thin limestone and chert; about 1200 m thick.

The formation showing a strike of N45-80°W, dipping to northeast or southwest at angles 40-80°. Several faults trending to NW-SE and NE-SW. The boundary between the present formation and the presumably Triassic Aoiwadani Formation is marked by a fault, which is cut off by NE-SW faults.

The Kosode Formation: Typically exposed along the upper stream of the Kosodegawa River and at Aoiwadani; composed of slate (often changed into phyllite) and sandstone, occasionally intercalating blackish grey limestone lenses, which yield hexacorals and stromatoporoids; about 500 m thick.

The formation showing a general trend of NW-SE, dipping to northeast at angles 40-70°. A considerable number of faults trending to NW-SE and NE-SW. The formation is bounded on the north by the Permian Kumotoriyama Formation and on the south by the Aoiwadani Formation. These formations are in contact with each other by faults, which are cut off by NE-SW faults.

The limestone lenses intercalated in the Kosode Formation yield corals, as shown in Table 2.

The fauna of corals listed in Table 2 are equivalent or similar to those from the Upper Jurassic in Japan, and the Kosode Formation can be safely correlated with the Torinosu Series in the Sagawa basin, Southwest Japan. The Kamosawa Formation and the Oonari

Table 2. List of the Jurassic corals from the Kosode Formation.

Species \ Locality	Aoiwadani				Shiosawa (boulder)	Kosodegawa			
	Loc. 2	Loc. 3	Loc. 4	Loc. 5		Loc. 17	Loc. 19	Loc. 20	Loc. 21
Actinastrea? sp. indet.		×							
Calamophyllia sp. indet.	×		×					×	
Dimorphoseries tabayamensis				×					
Enallhelia sp. indet.					×			×	
Isastrea? sp. indet.	×								
Stylina kantoensis								×	
Stylina? sp. indet.									×
Thamnasteria huzimotoi	×							×	
T. aff. *huzimotoi*					×				
T. sp. A	×								
T. sp. B				×					
Trocharea sp. indet.	×								
Hexacoral gen. et sp. indet.						×	×		

Formation, from which any valuable fossil has never been obtained, are tentatively regarded as the Jurassic, judging from their lithic resemblance to the well ascertained Torinosu Series in the surveyed area. The details of the correlation will be discussed by the writers in the near future.

Systematic description

Order Scleractinia BOURNE, 1900

Suborder Astrocoeniina VAUGHAN & WELLS, 1943

Family Thamnasteriidae VAUGHAN & WELLS, 1943

Genus *Thamnasteria* LESAUVAGE, 1823

Thamnasteria huzimotoi EGUCHI

Plate 5, figs. 2a-c

1951. *Thamnasteria huzimotoi* EGUCHI, Sci. Rep. Tohoku Univ., 2nd ser. (Geol.), vol. 24, p. 79, pl. 26, fig. 10.

Corallum massive and thamnasterioid. Corallites small and confluent, without distinct wall; central distance 2.0-4.0 mm. Septa slightly sinuous, confluent with those of the adjacent corallites, 30-45 in number, 10-13 of them extending to center; laterally by synapticulae. Perforations generally scarce. Columella styliform, but in some corallites rudimentary.

Comparison: The present form is closely allied to the type specimen of *Thamnasteria huzimotoi* EGUCHI (1951, p. 79, pl. 26, fig. 10) from the Torinosu group in Itsukaichi, Kanto-Mountainland in many common characters. However*, the former's perforations are more scarce than the latter's. It is similar to *T. torinosuensis* EGUCHI (1951, p. 67, pl. 24, fig. 9; MORI, 1963, p. 58, pl. 22, fig. 3) from the Upper Jurassic in the Sagawa basin and the Soma area, but the former differs from the latter in having more numerous septa. It resembles *T. crateriformis* GREGORY, (1900, pp. 135-136, pl. 17, figs. 4, 5, 7) from the Upper Cutchum formation in Cutch in many points. However, the former can be distinguished from the latter by its smaller corallites and less numerous septa.

Occurrence: Loc. 2 at Aoiwadani and Loc. 20 at Kosodegawa, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Thamnasteria sp. A indet.

Plate 5, figs. 3a, b

Corallum massive and thamnasterioid. Corallites somewhat irregular in size, without distinct wall. Corallite centers 3.5-6.0 mm. Septa gently flexous, somewhat perforate, confluent between corallites. Corallites 30-45 septa; 11-15 of them (first and second cycles) extending to center and some of them joint with a columella. Synapticulae present. Columella styliform, but in some corallites rudimentary. No longitudinal section.

* According to the writers' observations, the septa of the type specimen are about 40 in number.

Comparison: The present form is very similar to *Thamnasteria huzimotoi* EGUCHI (1951, p. 79, pl. 26, fig. 10; NISHIMIYA & YAMAGIWA, the present paper) from the Upper Jurassic in the Kanto-Mountainland, but differs from the latter in having less numerous synapticulae and longer central distance. It resembles *T. torinosuensis* EGUCHI (1951, p. 67, pl. 24, fig. 9; MORI, 1963, p. 58, pl. 22, fig. 3). However, the former has more numerous septa.

Occurrence: Loc. 2, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Thamnasteria sp. B indet.

Plate 5, figs. 1a, b

Corallum thamnasterioid. Corallites relatively large and united by septa, about 8.0 mm between calicural centers. Septa slightly sinuous and less numerous (20+?); perforate, about 12 of them extending to center. Columella distinct and styliform. Synapticulae present. No longitudinal section.

Comparison: The present species somewhat resembles *Thamnasteria abukumaensis* MORI (1963, p. 58, pl. 21, figs. 6, 7) from the Upper Jurassic in the Soma area. However, the former is separable from the latter in having perforate septa and a styliform columella.

Occurrence: Loc. 5, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Family Astrocoeniidae KOBY, 1890

Subfamily Astrocoeniinae KOBY, 1890

Genus *Actinastrea* D'ORBIGNY 1849

Actinastrea ? sp. indet.

Plate 6, fig. 6

Corallum massive. Corallites subpolygonal in transverse section, united by wall; generally 1.2-1.5 mm in diameter. Septa about 24, straight; 6 of first cycle long and reach to columella, 6 of second cycle slightly shorter than the first and reach to near the columella. Septa of third cycle slightly developed. No longitudinal section.

Comparison: The present form is represented by a single transverse section. It is similar to the species belonging to the genus *Stylina*, but differs from the latter in having subpolygonal corallites. It resembles *Astrocoenia* sp. (MORI, 1963, p. 56, pl. 21, fig. 8) from the Upper Jurassic in the Soma area, Northeast Japan. However, the calicural wall of the former is subpolygonal in transverse section and the corallites of the former are not well preserved.

Occurrence: Loc. 3, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Family Stylinidae D'ORBIGNY, 1851

Subfamily Stylininae D'ORBIGNY, 1851

Genus *Stylina* LAMARCK, 1816

Stylina kantoensis, sp. nov.

Plate 6, fig. 1

Corallum massive. Corallites circular in transverse section, subequal in size; generally 1.3-1.5 mm in diameter. Corallites united by coastae. Corallite centeres 2.2-3.0 mm. Septa thick, 12 in number, arranged in two hexameral cycles; 6 of first cycles extending to near columella. Columella styliform, circular in transverse section; 0.2-0.3 mm in diameter. Wall thick. Intercorallite area well developed, formed of costae. Costae subequal, 24 in number. No longitudinal section.

Comparison: The present form resembles *Stylina sugiyamai* EGUCHI (1951, p. 60, pl. 22, fig. 7) from the Upper Jurassic Torinosu group in the Sagawa basin, Southwest Japan, but differs from the latter, having longer central distance. It can be distinguished from *S. higoensis* EGUCHI (1951, p. 74, pl. 12, figs. 6-9) from the Sakamoto formation in Kuma Mountainland, southwest Japan in having broader corallites and longer central distance.

Occurrence: Loc. 20, Kosodegawa, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

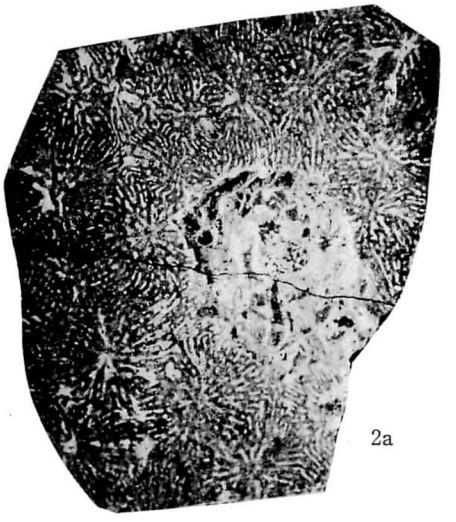
Geological horizon: Upper Jurassic.

Explanation of Plate 5

All figs. ×3

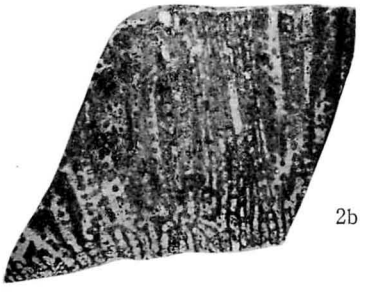
Fig. 1. *Thamnasteria* sp. B indet.
a) Transverse section, reg. no. 72092401a; b) Longitudinal section, reg. no. 72092401b.
Fig. 2. *Thamnasteria huzimotoi* EGUCHI
a) Transverse sectioh, reg. no. 72092402a; b) Longitudinal section, reg. no. 72092402b; c) Transverse (somewhat oblique) section, reg. no. 72092403.
Fig. 3. *Thamnasteria* sp. A indet.
a) Transverse section, reg. no. 72092404; b) Transverse section, reg. no. 72092404.

1a



2a

1b



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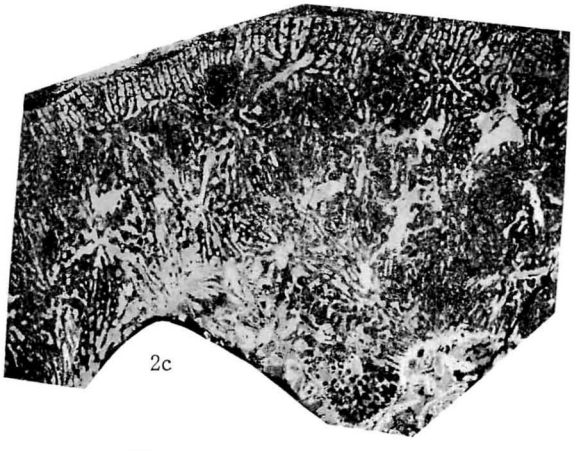

2c

3a

3b

Subfamily Euheliinae
DE FROMENTEL, 1861

Genus *Enallhelia* EDWARDS & HAIME, 1850

Enallhelia sp. indet.

Plate 6, figs. 7a, b

The present species almost agrees with the genus *Enallhelia* in many important characters. It is closely similar to *E. nipponica somaensis* EGUCHI (1942, pp. 143-144, pl. 6, figs. 8, 9; MORI, 1963, pp. 56-57, pl. 23, fig. 3) from the Upper Jurassic in the Soma area in many common characters. However, it is separable from the latter in having a compressed columella. It is related to *E. nipponica* EGUCHI (1942, pp. 142-143, pl. 6, figs. 4-7) from the Lower Cretaceous in Miyagi Prefecture, but the former's calices are smaller than the latter's.

Occurrence: Loc. 20 at Kosodegawa and a boulder at Shiosawa, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Suborder Fungiina VERRILL, 1865

Superfamily Fungiicae DANA, 1846

Family Synastreidae ALLOITEAU, 1952

Genus *Dimorphoseris* DUNCAN, 1872

Dimorphoseris tabayamensis, sp. nov.

Plate 6, figs. 2a, b

Coralum thamnasterioid and turbinate; about 18 mm in diameter. Colony formation by circumoral budding. There is a large central primary calice; septa numerous, 19 of them extending to center. Secondary (marginal) calice only one. In this calice, about 12 of septa extending to center. Septa slightly sinuous and somewhat perforate. Distance of primary and secondary centers about 6.5 mm. Wall relatively thin. Columella trabecular in central calice, but rudimentary in marginal one. Synapticulae numerous and distinct.

Comparison: The present species resembles *Dimorphoseris oolitica* DUNCAN (1872, pt. 3, pp. 22-23, pl. 4, figs. 1-4) from the Oolites series in Europe in many common characters. However, it differs from the latter in having smaller coralum, trabecular columella and less numerous septa extending to columella.

Occurrence: Loc. 5, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Superfamily Agariciicae GRAY, 1847

Family Calamophyllidae VAUGHAN & WELLS, 1943

Genus *Calamophyllia* BLAINVILLE, 1830

Calamorphyllia sp. indet.

Plate 6, fig. 3

The present form is not well preserved. It may belong to the genus *Calamophyllia* than the genus *Stylosmilia* in having no styliform columella. It resembles *Rhabdophyllia* or *Stylosmilia* (EGUCHI, 1951, pl. 23, fig. 5) from the Upper Jurassic Torinosu group at Ogawa, Ogawa-mura, Takaoka-gun, Kochi Prefecture in many respects. However, the former has somewhat larger corallites than the latter.

Occurrence: Loc. 2 and 4 at Aoiwadani and Loc. 20 at Kosodegawa, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Genus *Isastrea* EDWARDS & HAIME, 1851

Isastrea ? sp. indet.

Plate 6, fig. 4

The present specimens may belong to the genus *Isastrea* in having the following characters. 1) cerioid colonies, 2) corallite wall present, but with septa confluent partly absent, 3) monocentric corallites, but rarely dicentric, 4) trabecular columella, but feeble. It is similar to some species of the genus *Latomeandra*. The corallites of the latter, however, are mostly di- or tricentric.

Occurrence: Loc. 2, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi Prefecture.

Geological horizon: Upper Jurassic.

Superfamily Poriticae GRAY, 1842

Family Microsolenidae KOBY, 1890

Genus *Trocharea* ETALLON, 1864

Trocharea sp. indet.

Plate 6, fig. 5

Corallum simple. Calicural diameter about 15mm in transverse section. Thin wall developed, although it is not recognizable in part. Septa numerous, 70–80 in number. Septa slightly sinuous in part and geniculate in part, with perforations. Columella trabecular. Synapticulae present but a few. No longitudinal section.

Comparison: The present form is closely related to *Trocharea* sp. (EGUCHI, 1951, pl. 25, fig. 1) from the Torinosu group at Ogawa, Ogawa-mura, Sagawa basin, Southwest Japan in having many common characters. However, the former one has less numerous septa than the latter.

Occurrence: Loc. 2, Aoiwadani, Tabayama-mura, Kitatsuru-gun, Yamanashi

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Explanation of Plate 6

Fig. 1. *Stylina kantoensis*, sp. nov.
Transverse section of the holotype, ×3, reg. no. 72092405.

Fig. 2. *Dimorphoseris tabayamensis*, sp. nov.
a) Transverse section of the holotype, ×3, reg. no. 72092406a; b) Longitudinal section of the holotype, ×3, reg. no. 72092406b.

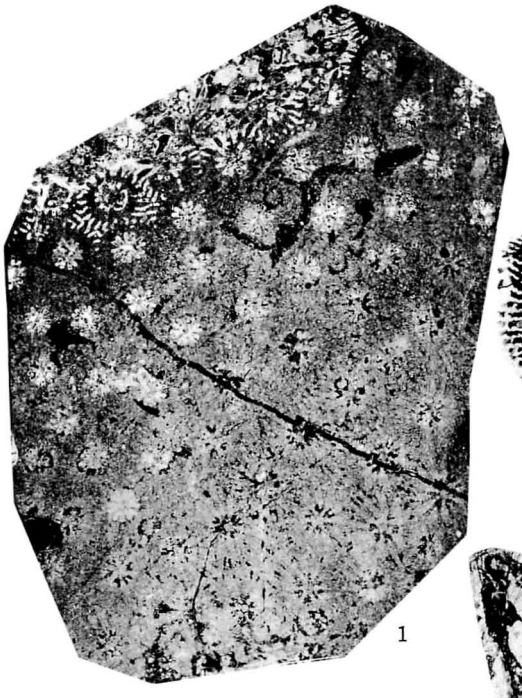
Fig. 3. *Calamophyllia* sp. indet.
Transverse section, ×3, reg. no. 72092407.

Fig. 4. *Isastrea*? sp. indet.
Transverse section, ×3, reg. no. 72092408.

Fig. 5. *Trocharea* sp. indet.
Transverse section, ×3, reg. no. 72092409.

Fig. 6. *Actinastrea*? sp. indet.
Transverse section, ×5, reg. no. 72092410.

Fig. 7. *Enallhelia* sp. indet.
a) Transverse section, ×5, reg. no. 72092411; b) Transverse section, ×5, reg. no. 72092412.



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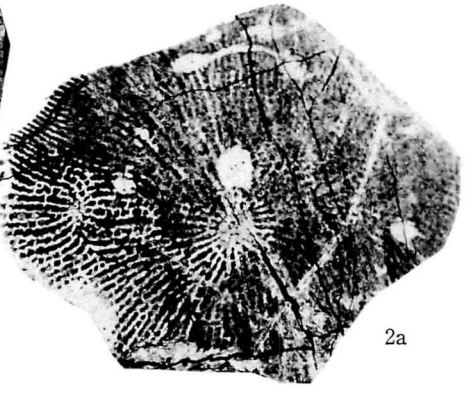

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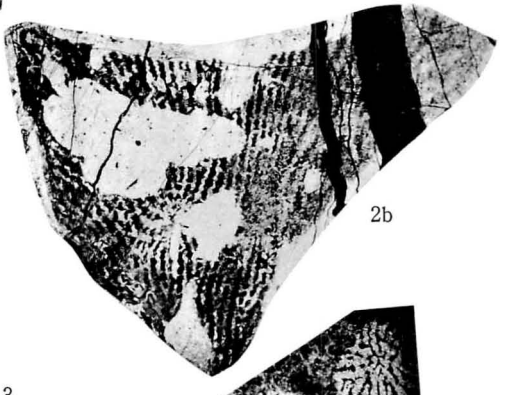


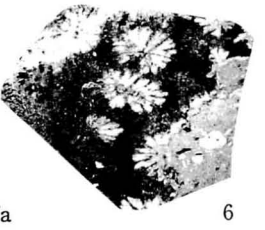
2b

3

4

7a

7b



6

5

Prefecture.

Geological horizon: Upper Jurassic.

All the figured specimens are collected by Katsuhiko NISHIMIYA, and are deposited at the Institute of Geoscience, Osaka Kyoiku University; reg. nos. 72092401 to 72092412.

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Aoiwadani	青岩谷	Kumotoriyama	雲取山
Kitatsuru-gun	北都留郡	Shiosawa	塩沢
Kosode	小袖	Tabayama-mura	丹波山村
Ushiroyamagawa	後山川	Kamosawa	鴨沢
Oonari	大成	Tabagawa	丹波川

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 89, pp. 24-26, pl. 7, April 20, 1973

613. A TRIASSIC HEPATICA FROM THE OMINE COAL-FIELD, SOUTHWEST HONSHU, JAPAN*

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and

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Faculty of Literature and Science,
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大嶺炭田産三畳紀苔類化石：山口県大嶺炭田萩嶺炭砿の美祢統桃ノ木層（中部カーニック）より産した苔類化石 *Hepaticites oishii*（新種）を記載した。東亜の *Onychiopsis* Series（上部ジュラ紀－下部白亜紀）の *Marchantites yabei* KRYSHTOFOVICH (*Thallites yabei* (KRYSHT.) HARRIS に改められている）に比し，葉状体の幅が細く，分岐間隔も短いし，主脈裏側から仮根が密生している。日本最古の苔化石である。　藤岡一男・高橋英太郎

Hepaticites oishii dealt with in this paper occurred from the Upper Triassic Momonoki Formation of the Miné Group at the Hagiminé colliery in the Ominé coal-field, Yamaguchi Prefecture, southwest Honshû. The Miné Group, a coal-bearing deposit, was subdivided by KATAYAMA (1939) into three formations, the lower or the Hirabara Formation, the middle or the Momonoki Formation and the upper or the Aso Formation.

The undermentioned fossil plants, together with *Hepaticites oishii*, have been known from the Middle Carnian Momonoki Formation at the Hagiminé colliery (TAKAHASI, 1959; KON'NO, 1962): *Equisetites minensis* KON'NO, *E. takahashii* KON'NO, *Equisetostachys* (*Neocalamites*?) *pedunculatus* KON'NO *takahashii* KON'NO, *Neocalamites carrerei* (ZEILLER) HALLE, *Todites goeppertianus* (MÜNSTER), *T. recurvatus* HARRIS, *Clathropteris meniscoides* BRONGNIART, *C. obovata* OISHI, *Dictyophyllum* sp., *Cladophlebis haiburnensis* (LINDLEY et HUTTON), *C. nebbensis* (BRONGNIART), *C.* sp., *Taeniopteris minensis* OISHI, *Podozamites concinnus* OISHI et HUZIOKA, and *P. atsuensis* TAKAHASI.

The Mesozoic hepatics are rather rare in the world. *Thallites yabei* (KRYSHTOFOVICH) HARRIS (syn. *Marchantites yabei* KRYSHTOFOVICH, 1930), an only known species of the Mesozoic Hepaticae in Japan, is one of the most characteristic elements in the *Onychiopsis* Series (Upper Jurassic to Lower Cretaceous) of Japan (OISHI, 1940), and also in the Naktong flora (YABE, 1905; KRYSHTOFOVICH,

* Received Nov. 30, 1972; read June 26, 1954. at Sendai.

1930) of southern Korea and the Nikan flora (KRYSHTOFOVICH, 1930) of the Far East.

Several form-genera of the fossil Hepaticae, such as *Thallites*, *Hepaticites* and *Marchantites*, have been established by the previous authors. According to WALTON (1925) and HARRIS (1942), *Marchantites* is restricted to the hepatics agreeing with the Oligocene *Marchantites sezannensis* SAPORTA, the type species, in which marchantiaceous air chambers, ventral scales and reproductive organs have been demonstrated. The form-genus *Thallites* WALTON (1925) is to be used for thalloid fossils showing no character proving that they belong to the Hepaticae rather than to the Algae. The form-genus *Hepaticites* WALTON is used for thalloid fossils showing some definite character of the Hepaticae. In practice this is usually the rhizoids.

The thallus of *Hepaticites oishii* are well-impressed on the dark-coloured shale, but are not sufficiently preserved to permit their anatomical studies. This species is the oldest representative of the Hepaticae in Japan, being of the Upper Triassic (Middle Carnian) age.

At this place the writers express their cordial thanks to Mr. N. NAMBA who collected the materials from the Hagiminé colliery of the Ominé coal-field.

Description of species

Class Hepaticae

Form-genus *Hepaticites* WALTON, 1925

Hepaticites oishii HUZIOKA et TAKAHASI new species

Pl. 7, figs. 1, 1a, 1b, 2, 3

Description:—Thallus regularly and dichotomously branched, narrow, 0.3-0.4 cm broad, composed of midrib and lamina, repeatedly forked at angles of 30-80 degrees and intervals of 1.0-1.5 cm. Midrib thick, distinct, ridged at under surface, with numerous rhizoids. Lamina transversally bullate, often spotted, entire to wavy at margin. Rhizoids borne on midrib, rigid, regularly and densely arranged, frequently forked.

The midrib and rhizoids are shown in fig. 1a. The spotted surface (air chamber ?) and the wrinkled surface are shown in fig. 1b. The thallus of this fossil hepatica is restored as shown in fig. 3.

Comparison and remarks:—Compared with *Thallites yabei* (KRYSHTOFOVICH) HARRIS (1942) (syn. *Marchantites yabei* KRYSHTOFOVICH, 1930) which is shown in fig. 4, a well-known Upper Jurassic—Lower Cretaceous Hepatica in eastern Asia, this Triassic thallus are much narrower, forking at shorter intervals. HARRIS (1931) reported two species of *Hepaticites*, *H. globosus* HARRIS and *H. laevis* HARRIS, from the *Thaumatopteris* Zone of Scoresby Sound, East Greenland. Of them, *H. oishii* closely resembles *H. laevis*, but in the former species the midrib is strongly ridged at the under-surface and bears numerous rigid rhizoids which are often furcated.

H. oishii is somewhat similar to but distinguishable from the Jurassic *H. arcuatus* (LINDLEY et HUTTON) HARRIS (1942) (syn. *Marchantites erectus* (LECK.) SEWARD) from England, and the Upper Triassic *H. solenotus* HARRIS (1938) of England, and also *Thallites uralensis* KRYSHTOFOVICH et PRINADA (1933) from eastern Urals.

Occurrence and collection:—Hagiminé colliery, Ominé coal-field, Yamaguchi Prefecture; Momonoki Formation (Middle Carnian) of the Miné Group. Holotype, AKMG-7019; paratype, AKMG-7020. Coll. N. NAMBA.

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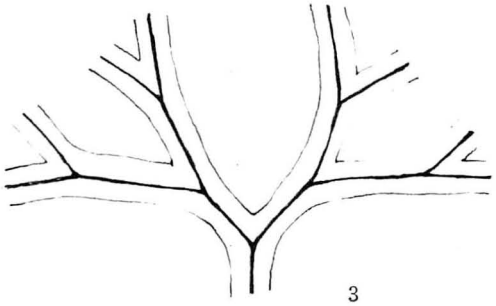
Aso	麻生	Miné	美祢
Hagiminé	萩嶺	Momonoki	桃ノ木
Hirabara	平原	Ominé	大嶺

Explanation of Plate 7

Figs. 1, 1a, 1b, 2, 3. *Hepaticites oishii* new species, from the Hagiminé colliery. 1. Holotype, AKMG-7019. 1a and 1b. Enlarged to show the detailed characters of thallus, ×3 and ×2, respectively. 2. Paratype, AKMG-7020. 3. A restoration of *Hepaticites oishii*.

Fig. 4. *Thallites yabei* (KRYSHTOFOVICH) HARRIS (syn. *Marchantites yabei* KRYSHTOFOVICH), from the Naktong Series of southern Korea. Reproduced for comparison; YABE, 1905, p. 41, pl. 3, fig. 16a; originally, *Sagenopteris bilobata* YABE var. *major* YABE.



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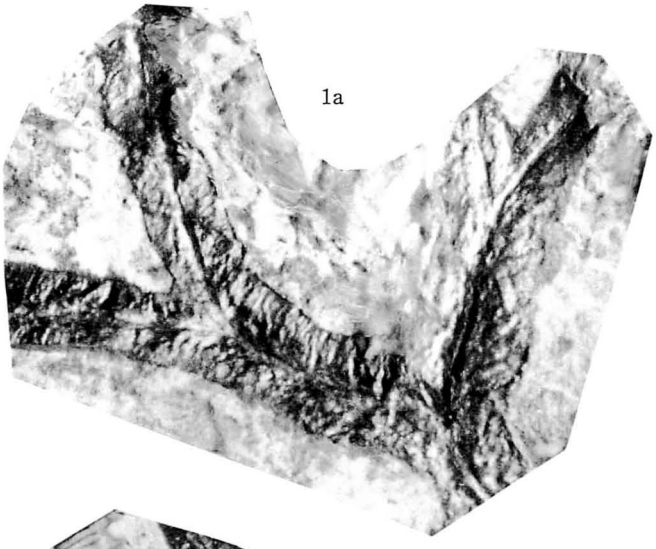

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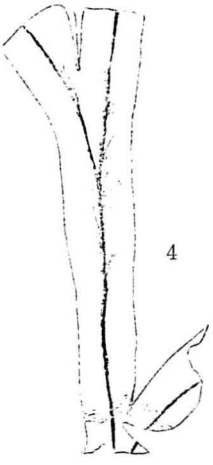

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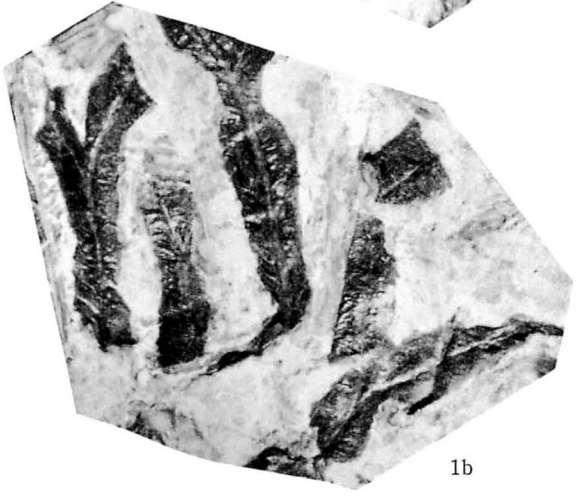

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Trans. Proc. Palaeont. Soc. Japan, N.S., No. 89, pp. 27-41, pl. 8, April 20, 1973

614. VASCOCERATID AMMONITES FROM THE TURONIAN OF HOKKAIDO

(STUDIES OF THE CRETACEOUS AMMONITES FROM HOKKAIDO AND SAGHALIEN—XXVI)

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北海道チューロニアン産バスコセラス科菊石：Vascoceratidae はテチス海の陸棚域に多産するが，太平洋地域ではきわめてまれである。ここに北海道の下部チューロニアンからまれに見出された 4 標本を，*Vascoceras* sp. aff. *V. durandi* (THOMAS and PERON), *Fagesia thevestensis* (PERON), *Fagesia* sp. cf. *rudra* (STOLICZKA) の 3 種に同定し，図示して記載する。さらにチューロニアン期における同科菊石の古生物地理的分布を調べ，論述を試みる。Vascoceratids の特有な分布は，単に古地理的な意味だけでなく，その偽セラタイト型縫合線，まるこい殻形，装飾の弱化などの形態に対応した機能上の特異性をも考慮すべきで，生息場所や生活様式に特異性があったのではあるまいか。日本にも産した 3 種は，比較的縫合線が複雑で，たぶん遊泳性で分布の広い種類であったように思われる。漂流の可能性も考えうるが，分布を論ずるに当たり，アジア南部各地について知識が不備なことが気付かれる。

松本達郎

Introduction

The Vascoceratidae are typically Tethyan in occurrence. This has been evidenced by numerous works of predecessors. In my concise note on the palaeobiogeography of the late Cretaceous Ammonoidea (MATSUMOTO, 1973), I have mentioned that some immigrants of the vascoceratids are found outside the Tethys region.

In this paper I describe three species of the vascoceratid ammonites which occurred rarely in the Turonian of Hokkaido. After the description supplementary remarks are given on the biogeographical distribution of the vascoceratid ammonites, presenting a map which I had to omit for brevity in my last paper.

Before entering in the description I thank Dr. Hakuyu OKADA and Mr. Kazunari TANABE who found an interesting specimen in a field work with me and provided it for this study, Mr. Hajime KOYAMA who showed me another interesting specimen, and Professor Tetsuro HANAI who gave me facility to study some specimens preserved in the University of Tokyo. Dr. Itaru HAYAMI and Miss Mutsuko HAYASHIDA kindly assisted me in preparing the plates and typescript.

Description of Species

Family Vascoceratidae SPATH, 1925

The classification of the Vascoceratidae is more or less different between

* Received Dec. 31, 1972; read Jan. 16, 1973 at Sendai.

authors (e. g. FURON, 1935, SCHNEEGANS, 1943; REYMENT, 1954, 55; BARBER, 1957; WRIGHT, 1957; COLLIGNON, 1958; WIEDMANN, 1964; FREUND and RAAB, 1969). The material from Japan is too poor to give comments on the problem, but I had fortunately an experience to look through a number of specimens from Nigeria and talked with REYMENT and BARBER, though separately, when we were studying Cretaceous ammonites at the British Museum (Natural History), 1953-54. From my general impression, I was rather inclined to agree with SCHNEEGANS' attitude in treating of the material. Anyhow, it is worthwhile to note that great many varieties of vascoceratid ammonites were differentiated within a short time interval in the early Turonian of the Tethys region. It would be interesting to study the mode of evolution through examining ontogeny and variation from population to population.

To describe a small number of incompletely preserved specimens from Hokkaido, I have to depend, for convenience sake, on some previously proposed framework of classification.

Genus *Vascoceras* CHOFFAT, 1898

Type-species:—*Vascoceras gamai* CHOFFAT, 1898.

Remarks:—This genus has a globose to subglobose, involute shell, in which umbilical tubercles and fold like costae are distinct only in early stages and lost with growth. In *Fagesia* PERVINQUIÈRE, 1907, the shell is inflated cadicone with ornament similar to but more persistent than that of *Vascoceras*. In *Plesiovascoceras* SPATH, 1926, the whorl is evolute, coronate and ornamented with strong obtuse tubercles at the umbilical margin. The three genera are closely allied to one another and have more or less similar sutures. Typically the suture of *Fagesia* is the most complicated of the family. It is more deeply incised and consists of higher saddles and narrower or deeper lobes than that of *Vascoceras*.

In *Paravascoceras* FURON, 1935, there are external ribs but no umbilical tubercles. *Pachyvascoceras* FURON, 1935, is regarded by SCHNEEGANS (1943), BARBER (1957), and FREUND and RAAB (1969) as a synonym of *Paravascoceras*, because there is a continuous series between their type-species, *V. crassum* FURON, 1935, and *V. cauvini* CHUDEAU, 1909. I would agree with FREUND and RAAB (1969, p. 19) in regarding *Broggiliceras* BENAVIDES-CÁCERES, 1956, as another synonym of *Paravascoceras*. Some species which were referred to *Pachyvascoceras* may not automatically transferred to *Paravascoceras*. *V. durandi* (THOMAS and PERON) can be reckoned as such an example.

Discovascoceras COLLIGNON, 1958 was commented by WIEDMANN (1959, p. 757) as indistinct. Its type-species, *D. tesselitense* COLLIGNON 1958, was regarded by WIEDMANN as a synonym of *Vascoceras* (*Pachyvascoceras*) *triangulare* FARAUD, 1940 and then by FREUND and RAAB (1969, p. 23) as that of *Paravascoceras obessum* (TAUBENHAUS, 1920). COLLIGNON (1965, p. 179 [17]), however, redefined *Discovascoceras*, describing the change of characters with growth and the presence of three keels. On the grounds of its stratigraphic occurrence at the very base of the Turonian and also of its morphologic characters, COLLIGNON considers to allocate *Discovascoceras* at the initial part where the Vascoceratidae and the Tissotiidae are going to branch apart (see REYMENT, 1954, text-fig. 8).

Vascoceras sp. aff. *V. durandi* (THOMAS and PERON)

Pl. 8, Fig. 1, Text-fig. 1

Compare.—

1889. *Pachydiscus durandi* THOMAS et PERON, *Moll. Foss. Tunisie*, p. 27, pl. 18, figs. 5-8.
1896. *Pachydiscus durandi*, PERON, *Mém. Soc. Géol. France, Paléont.*, Mém. No. 17, p. 44, pl. 4, fig. 1; pl. 5, fig. 1; pl. 17, fig. 5.
1898. *Vascoceras douvillei* CHOFFAT, *Faune Crét. Portugal*, p. 59, pl. 10, figs. 3, 6; pl. 11, figs. 2-5; pl. 21, figs. 13-16.
1907. *Vascoceras durandi*, PERVINQUIÈRE, *Études Paléont. Tunisienne*, vol. 1, p. 332, pl. 21, fig. 1a-b; text-fig. 125.
1965. *Vascoceras (Pachyvascoceras)* aff. *douvillei-durandi*, COLLIGNON, *Atlas Fossiles Caracteristiques de Madagascar* (Ammonites), fasc. 12, p. 43, pl. 394, fig. 1676.
1969. *Vascoceras durandi*, FREUND and RAAB, *Special Papers in Palaeont.*, no. 4, p. 29, text-fig. 6h-i.

Material:—GK. H5674, from loc. R2513a, the Obira, collected and supplied by H. OKADA and K. TANABE, 1971.

Description:—The specimen is fairly well preserved on the right side but badly crushed on the left. It is wholly septate and the body-whorl has mostly gone. The measurements are as follows:

Diameter	Umbilicus	Height	Breadth	B./H.
115 mm.(1)	26(.23)	54(.47)	33×2(.57)	1.22

The coiling is considerably involute and seems to be somewhat eccentric. The whorl is inflated on the flanks, broader than high and broadest near the umbilical shoulder in the lower part. The flanks are convergent passing into a rather flattened venter which occupies the breadth of the external lobe. The shell is as a whole subglobose in general aspect.

The umbilicus is deep and surrounded by a high and vertical wall which forms an angular edge with the flank.

So far as the observable part is concerned, the shell is free from distinct ornament. But a very faint buldge is discernible outside the umbilical edge of the outer whorl. This is probably a reduced umbilical tubercle, although no distinct umbilical nodes are observed on the visible part of the inner whorl. From the low buldge mentioned above runs a very indistinct, low rib, on which several fine riblets and lirae are superimposed. They are somewhat prorsiradiate and gently concave on the flank. The mode of ribbing, if any, on the external part of the inner whorl is not known, as it is difficult to take out the deeply overlapping outer whorl. Only a faint umbilical buldge is perceptible.

Sutures are pseudoceratitic, with pointed lobules and phylloid folioles. The external lobe (E) is subrectangular in rough outline, although its details are obscured for unfavourable preservation. The first lateral saddle between E and L is asymmetric, steep on the side of E and gently sloping towards L. The first lateral lobe (L) is opened V-shaped in rough outline, moderately deeply incised by several lobules and bipartite at the bottom. The second lateral saddle is roughly dome-shaped and shallowly incised on top, leaving phylloid folioles. The second lateral lobe (U2) is much narrower than L and moderately incised, having a narrow and deeply pointed lobule at its bottom. The saddle inside U2 is nearly as high as the second lateral saddle, subquadrate in rough outline and apparently tripartite

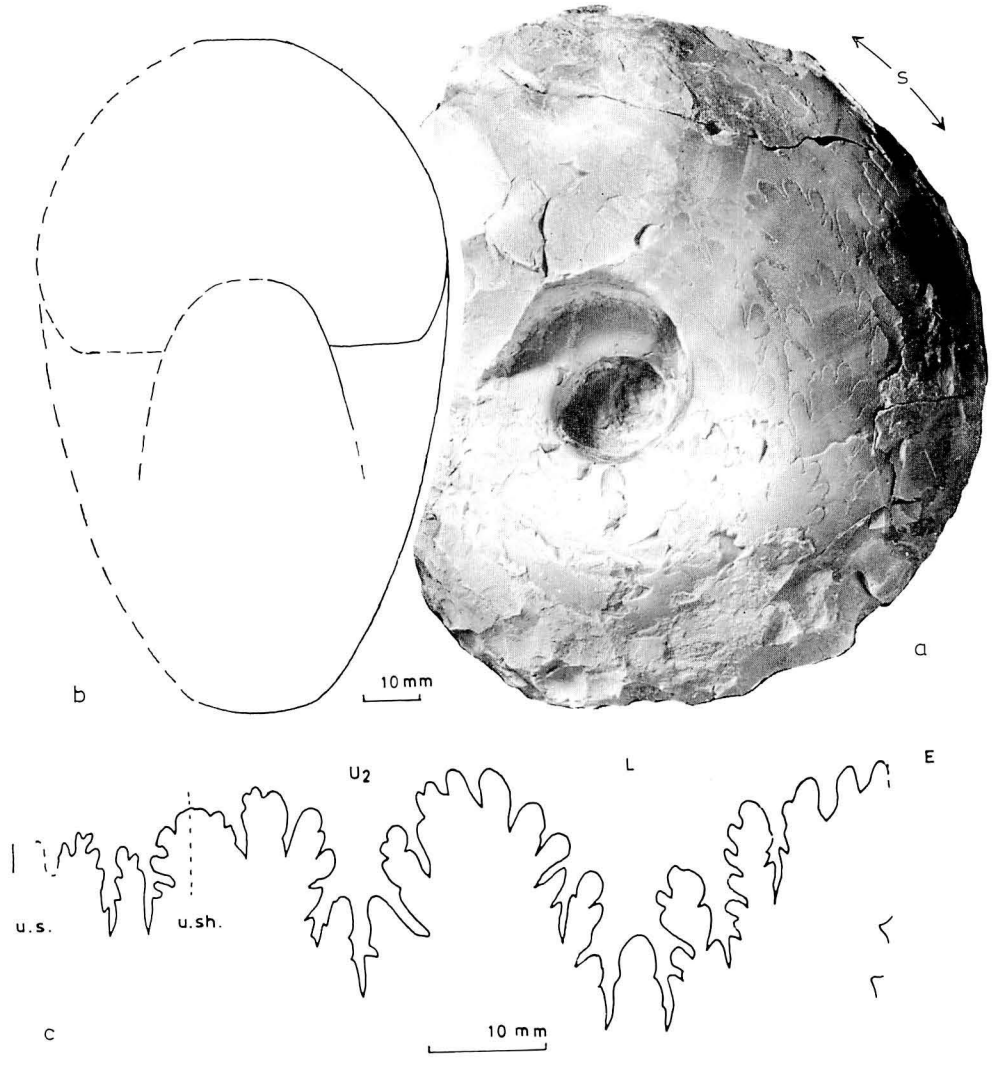


Fig. 1. *Vascoceras* sp. aff. *V. durandi* (THOMAS and PERON). GK. H5674, from loc. R2513a. Photographic lateral view (a), with whitening; diagrammatic frontal view (b); external suture (c) at s.

into folioles of unequal size, with the narrowest one on the side of U2, the moderate one in the middle and the broadest one on the umbilical shoulder. Narrow U3 and a part of U5 are visible on the umbilical wall.

Comparison:—Although the specimen from Hokkaido is incompletely preserved, the observed characters suggest that it is very close to the extreme end of the variation of *Vascoceras durandi* (THOMAS and PERON) (see PERVINQUIÈRE, 1907),

which has been known from the Lower Turonian of Tunisia, Algeria, Portugal and Israel. Its umbilicus is considerably narrower than that of the measured specimens from these areas. In the dimensions of the umbilicus, whorl-height and breadth in proportion to the diameter, the present specimen is closest to the specimen from the Turonian zone of *Mammites conciliatum* of Madagascar described by COLLIGNON (1965b) under the name of *Vascoceras* (*Pachyvascoceras*) aff. *douvillei-durandi*. It differs from that Madagascar specimen in that it has less distinct ornament and not so subquadrate whorl-section as the Madagascar one. It has rather a rounded subtrapezoidal whorl-section. In this respect and in the general aspects in lateral view, the present specimen is apparently similar to *Choffaticeras meslei* (PERON, 1897), from the Turonian of Algeria and Israel. It is distinguished from that species by the absence of keels, more inflated and broader whorls and more complex sutures which show dissimilar pattern (compare Text-fig. 1 with PERON's pl. 17, fig. 1). The suture of the Hokkaido specimen is close to, if not exactly identical with, that of *P. durandi* as illustrated by PERVINQUIÈRE (1907, text-fig. 125).

On account of the characteristic shell-form and the indistinct, almost obsolute ornament, I thought that the present form could be referred to *Discovascoceras* COLLIGNON, 1958, which should be provided with keels as redefined by COLLIGNON (1965b). Our species has no keel and the lobes of its suture are more deeply incised and less numerous on the flank than those of *D. tesselitense* COLLIGNON and other related species. Thus it is not referable to *Discovascoceras*, if *Discovascoceras* is excluded from *Paravascoceras* as independent genus.

To sum up, it is difficult to identify precisely the present form, unless the characters of the early shell is more distinctly known. It is, however, highly possible that the described specimen is close to the extreme end of the variation of *Vascoceras durandi* (THOMAS and PERON), although it could represent a geographically separated subspecies or another closely allied species.

Occurrence:—The described specimen was obtained at loc. R2513a, from a calcareous nodule in the mudstone of the Middle Yezo Group exposed along the Okufutamata, a tributary of the Obira [Opirashibets], by H. OKADA and K. TANABE, during the field work conducted by me in 1971. The mudstone of loc. R2513a is allocated at the middle of unit Mj of TANAKA (1963). No mega-fossils were associated with this ammonite at this locality. In the Nakakinebetsu valley, another tributary of the Obira, about 13 km southwest from loc. R2513a, a probable extension of unit Mj and subjacent part down to the middle of unit Mh are more prolific, where I obtained, among others, *Inoceramus* (*Mytiloides*) *labiatus*, *Mammites* sp., and *Pseudaspidoceras* sp. On the grounds of available evidence I refer the sequence from the upper part of Mh to the top of Mj to the Lower Turonian.

Location of R2513a is about 850 m east and 3900 m south from the point, N 44° 10′-E 142°0′, northwest corner of the Horokanai sheet, geological map of 1:50,000, published by the Geological Survey of Japan (1958). It is in the Rumoi district, Teshio province, northwest Hokkaido.

Genus *Fagesia* PERVINQUIÈRE, 1907

Type-species:—*Olcostephanus superstes* KOSSMAT, 1897.

Remarks:—This genus is well defined, as mentioned by FREUND and RABB (1969, p. 33). They commented, however, that numerous species of very wide distribution included later in this genus differ considerably from a well-defined group formed by *F. superstes*, *F. thevestensis*, *F. rudra*, *F. peroni* and *F. bomba*, from India, Middle East, Spain and North Africa, so that in several cases the generic position is uncertain. In fact, *Fagesia californica* ANDERSON, 1935 and *F. shastensis* ANDERSON, 1935, from California, should be better transferred to *Plesiovascoceras*, as I have already pointed out (MATSUMOTO, 1959, p. 102).

The species from Japan described below undoubtedly belong to the typical group of *Fagesia*.

Fagesia thevestensis (PERON)

Pl. 8, Fig. 2, Text-fig. 2

1896. *Mammites* (?) *thevestensis* PERON, *Mém. Soc. Géol. France, Paléont.*, Mém. No. 17, p. 23, pl. 7, figs. 2, 3.
1904. *Ammonites kotoi* YABE, *Jour. Coll. Sci., Imp. Univ. Tokyo*, vol. 20, art. 2, p. 26, pl. 6, figs. 3 and 4.
1907. *Fagesia thevestensis*, PERVINQUIÈRE, *Études Paléont. Tunisienne*, vol. 1, p. 325, pl. 20, figs. 5, 6; text-figs. 123, 124.
1969. *Fagesia thevestensis*, FREUND and RAAB, *Special Papers in Palaeont.*, no. 4, p. 35, text-fig. 7g.

Material:—GT. I-3249, from loc. T610b-c, Saku area (coll. T. MATSUMOTO). GT. MM 7561, from a rolled nodule of the Yubari, the holotype of *Ammonites kotoi*, is also examined.

Measurements:—

Specimen	Diameter	Umbilicus	Height	Breadth	B./H.
GT. I-3249	80(1)	20(.25)	36(.45)	45(.56)	1.25
GT. MM7561	100(1)	27(.27)	44(.44)	53(.53)	1.2
PERON's type	80(1)	25(.31)	34(.42)	45(.56)	1.3

Descriptive remarks:—GT. I-3249 represents a fairly large individual, but its outer whorl, is incomplete and shows eroded sutures. Therefore its inner whorl alone is measured and illustrated. GT. I-3249 and GT. MM7561 are complementary with each other, showing altogether the following characteristic features.

The outer whorl, of GT. I-3249, though incomplete, is as large as or somewhat larger than the large specimen of PERVINQUIÈRE (1907, pl. 20, fig. 6). They are both still septate and the shell must have reached about 200 mm., if the adult body-whorls were preserved. PERON's holotype must have been an immature shell, with which the inner whorl of GT. I-3249 is well comparable in dimensions. Some difference in the size of umbilicus is probably within the variation of a species, as FREUND and RAAB (1969, p. 35) generally admitted.

The whorl is inflated and lunate in cross-section. It is broader than high, but is not so broad as in *F. superstes* (KOSSMAT, 1897). The measured proportion between height and breadth is of the order of that measured on the PERON's type, PERVINQUIÈRE's specimens I and III. The large outer whorl of GT. I-3249 seems to have broader whorl but cannot be accurately measured. The venter of the inner whorl is moderately rounded as in the holotype of PERON and the smaller specimen of PERVINQUIÈRE (1907, pl. 20, fig. 5). The umbilical wall is very steep or nearly vertical.

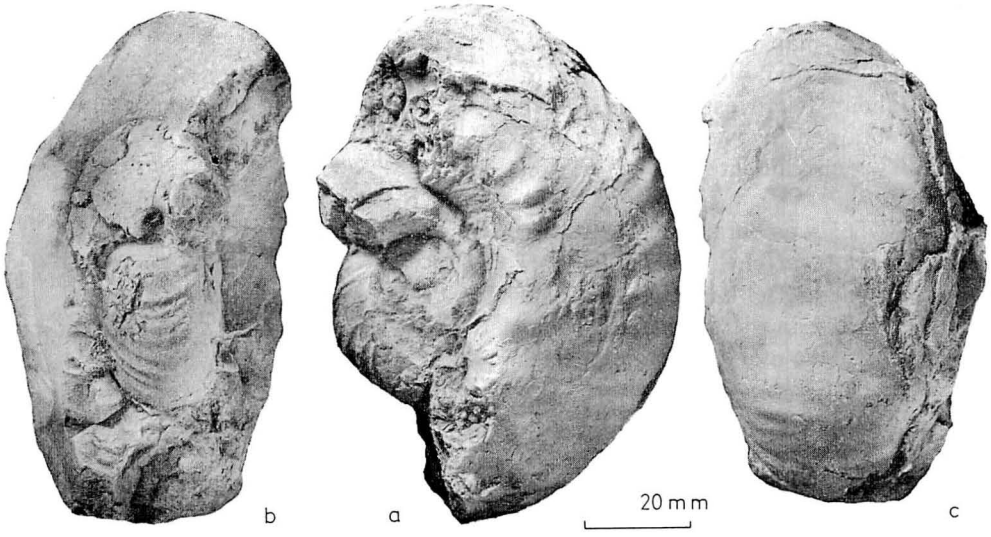


Fig. 2. *Fagesia thevestensis* (PERON). GT. MM7561, holotype of *Ammonites kotoi* YABE, 1904, from Yubari. Kyushu Univ. [I. H.] photos, with whitening.

The periumbilical tubercles are somewhat bullate or subrounded. Although they are not completely preserved in the Hokkaido specimens, they seem to be similar in intensity and density to those in the specimens described by PERVINQUIÈRE. The ribs are also very similar in intensity, density, forward curvature and mode of bifurcation to those of the holotype and the inner whorl of PERVINQUIÈRE. In the two specimens from Hokkaido some of the ribs are slightly more elevated than others and some of the interspaces are somewhat deeper than others, if not forming distinct constrictions. On the outer whorl the ornament is much weakened.

The suture is of typical *Fagesia* pattern, showing three, high, deeply incised saddles on the side and deeply incised lobes. The first lateral saddle is tripartite. L is nearly as deep as E and bifid at the bottom. The terminals of the subdivided folioles are somewhat phylloid.

To sum up the two specimens from Hokkaido are identified with *Fagesia thevestensis* (PERON), from the Lower Turonian of Algeria, Tunisia and Middle East. It is still highly possible that *Fagesia thevestensis* (PERON, 1896) and *Fagesia superstes* (KOSSMAT, 1897) could be within the variation of one and the same species, as PERON (1897, p. 84) at first pointed out. Without treating a sufficient number of specimens from place to place (Algeria, Tunisia, Israel and India), I cannot decide the matter. For the time being the two species are distinguished as PERVINQUIÈRE did. As there is no reason to regard the Japanese form as an independent species, *Ammonites kotoi* YABE, 1904, falls in the synonym of *Fagesia thevestensis* (PERON, 1896).

Occurrence:—GT. I-3249 was obtained by myself from loc. T610-c, Onoderazawa, a small branch of the Sakugawa [Sakotan-gawa], unit IIc of the Middle Yezo Group in the Saku area, Teshio

province, northwest Hokkaido (for the location see a map of pl. 12 in MATSUMOTO, 1942). From another locality of unit IIc about 3 km west of Saku, I have recently obtained *Inoceramus* (*Mytiloides*) *labiatus*, which indicates Lower Turonian.

GT. MM7561 was obtained by YABE in a rolled nodule of the Yubari, Ishikari province, central Hokkaido. Although I did a field work in the same area, I was not successful to get the same species from this area.

Fagesia sp. cf. *F. rudra* (STOLICZKA)

Text-fig. 3

Compare.—

1965. *Ammonites rudra* STOLICZKA, *Palaeont. Indica*, ser. 1, vol. 1, p. 122, pl. 60.
1897. *Olcostephanus rudra*, KOSSMAT, *Beitr. Paläont. Oesterr. Ungarns*, vol. 11. p. 29 [136].
1907. *Fagesia rudra*, PERVINQUIÈRE, *Études Paléont Tunisienne*, vol. 1, p. 322.
1965. *Fagesia rudra*, COLLIGNON, *Atlas Fossiles Caractéristiques de Madagascar* (Ammonites), fasc. 12, p. 48, pl. 369, fig. 1678-A; pl. 397, fig. 1678-B.

Material:—A specimen in the private collection of Hajime KOYAMA, Saku, Nakagawa-machi, Hokkaido.

Measurements:—

Specimen	Diameter	Umbilicus	Height	Breadth	B/.H.
KOYAMA's	120. 0(1)	29. 5(. 24)	50. 5(. 42)	100(. 83)	2
STOLICZKA's	170 (1)	— (. 23)	— (. 39)	—	2. 12
COLLIGNON's	180 (1)	36 (. 20)	95 (. 53)	136(. 76)	1. 43

Descriptive remarks:—The last suture is seen at 120 mm. in diameter and the main part of the body-whorl is badly crushed. Even the septate whorl is somewhat deformed on the left side. The above measurement of the whorl-breadth is approximately estimated from the little deformed right half. (see Fig. 3b).

The proportion of the dimensions of KOYAMA's specimen is closer to STOLICZKA's type rather than to COLLIGNON's specimen. The shell is considerably involute and subglobose in aspect. The whorl is about twice as broad as high, broadest between the umbilical shoulders, and semi-lunate in section. The umbilicus is narrow and deep, with a steep and high wall and subangular shoulder. The venter is broadly convex.

The last septate whorl is nearly smoothish, but very faint, blunt umbilical bulges are perceptible and also weak fine ribs are discernible, showing a gently forward curve on the venter. Fine lirae may be seen on the interspaces of the ribs.

The ornament of the inner whorl is not well seen.

The suture is of typical *Fagesia* pattern, showing asymmetrically tripartite, high, lateral saddles and deeply incised lobes.

The observed characters indicate that the described specimen is probably referable to *Fagesia rudra* (STOLICZKA), which has been reported from the Lower Turonian of southern India (STOLICZKA, 1865; KOSSMAT, 1897), Madagascar (COLLIGNON, 1965) and Spain (WIEDMANN, 1964, listed only).

Occurrence:—H. KOYAMA obtained this specimen at a locality close to my loc. T1158 or T1159, in the mudstone of unit IIc, Saku-gakko-no-sawa, Abeshinai-Saku area, Teshio province, northwest Hok-

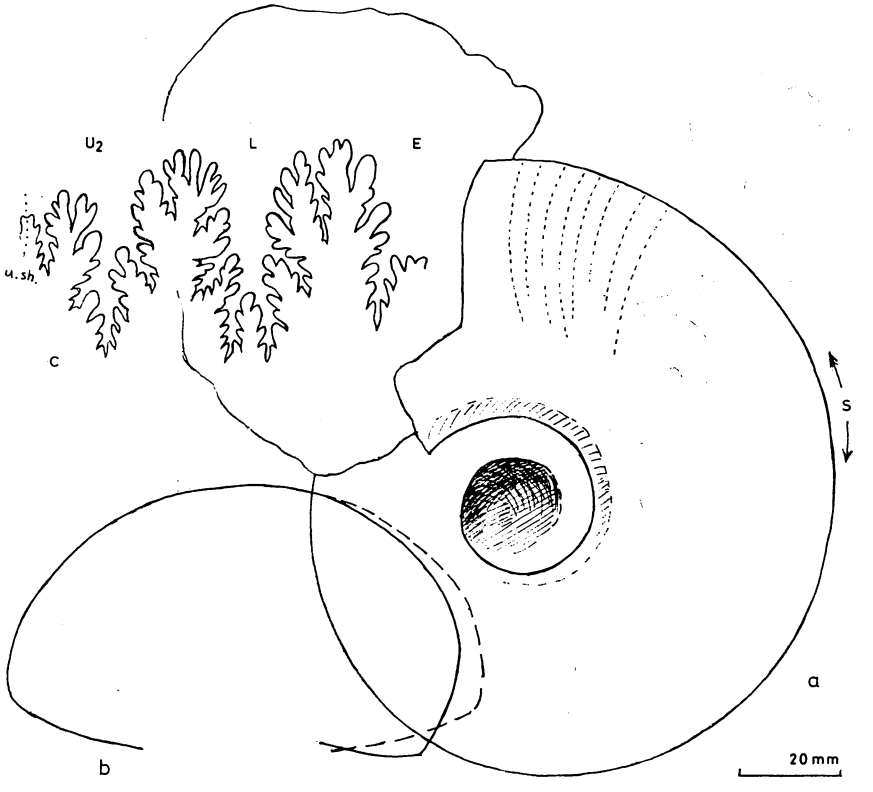


Fig. 3. *Fagesia* sp. cf. *F. rudra* (STOLICZKA). Diagrammatic sketch of a specimen of H. KOYAMA's collection from the Saku area. Lateral view (a), whorl-section (b) and external suture (c) at S. (T.M. *delin.*)

kaido. Calcareous nodules in unit IIc often shows a particular, light greenish tint. The rock matrix of this fossil shows the same colour. Unit IIc in this area contains *Inoceramus* (*Mytiloides*) *labiatus* and is assigned to Lower Turonian.

Note on the Biogeographical Distribution of the Vascoceratid Ammonites

Fig. 4 is a Turonian palaeogeographic map (without restoring the relative position of continents) in which the occurrence of selected ammonites are indicated. A comprehensive discussion on the palaeobiogeography has already been given in my last paper (MATSUMOTO, 1973). Here is given a supplementary note.

While several Turonian genera of the Acanthoceratidae and the Collignoniceratidae, such as *Kanabiceras*, *Watinoceras*, *Mammites*, *Pseudaspidoceras*, *Romaniceras*, *Collignoniceras* and *Subprionocyclus* show world-wide distribution, ammonites belonging to the Vascoceratidae and also the Tissotiidae characteristically occur in the Tethys Sea region in a broad sense.

Although the generic assignment of

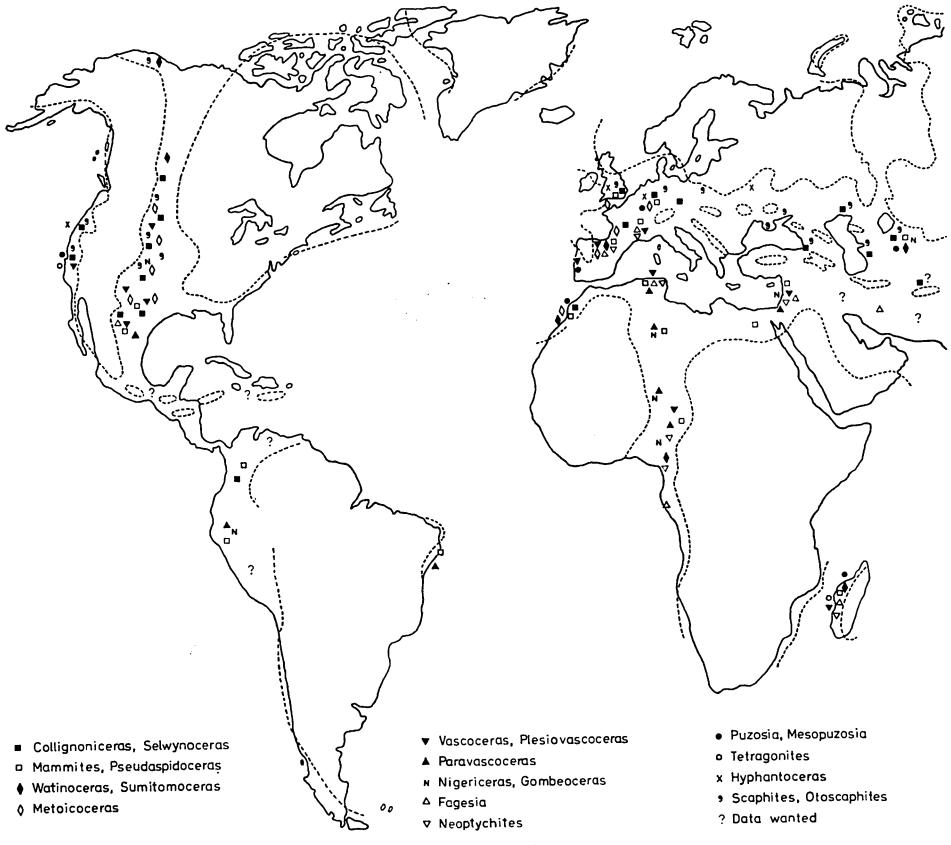
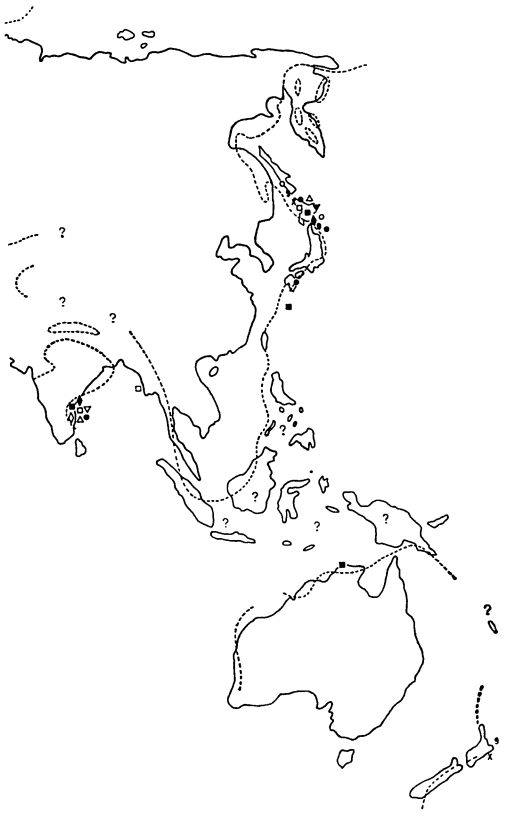


Fig. 4. Turonian palaeobiogeographic map of selected ammonoids.

the higherto described species has been revised in the light of up-to-date classification, some personal difference in identification may still remain. I am afraid that this may affect the conclusion about the distribution of the vascoceratid genera.

According to FREUND and RAAB (1969), *Paravascoceras* (in their sense) and *Paramammites* prevail in the southern shelf seas of the Tethys, such as those in the Middle East, Lybia, Tunisia, Algeria, Nigér, Nigeria, eastern Brazil and Peru, while *Vascoceras* and *Plesiovascoceras* are common in the northern shallow seas, such as those in Portugal, Spain, southern France, Mexico and Texas. The two authors state, furthermore, that *Nigericeras* and *Gombeoceras* are often associated with the *Paravascoceras* fauna and that *Metoicoceras* is so with the *Vascoceras* fauna. It is noted, however, that *Gombeoceras* occurs in Turkestan which is certainly situated on the north side of the Tethys, that *Vascoceras* is found in the Middle East and Nigeria where *Paravascoceras* prevails and that *Paravascoceras* is found in Mexico and adjacent parts where *Vascoceras* and *Plesiovascoceras* abound. A species of *Nigericeras* represented by a considerable number of specimens has



recently been reported from southeastern Colorado (COBBAN, 1971) and another species closely allied to *N. glabrum* BARBER from somewhere (locality uncertain) in North America (MATSUMOTO and OTSUKA, 1969). Furthermore, there are several genera of wider distribution, such as *Fagesia*, *Neoptychites* and *Thomasites*, which are not restricted to either of the northern and southern sides of the Tethys. The barrier between the northern and the southern provinces, if ever existent, must not have been very rigid. It was probably represented by a geosynclinal part of the Tethys, which may have comprised deep troughs and also rising islands. Currents may have passed across some part of this incomplete barrier.

I do not think that *Metoicoceras* of the Acanthoceratidae (Metoicoceratinae) is so intimately associated with the *Vascoceras* fauna. It is most commonly distributed in the Gulf Coast and the Interior provinces of North America, ranging from the upper Upper Cenomanian to the lower Lower Turonian. It is distributed fairly commonly in western Europe and Morocco, suggesting an intimate faunal relation on both sides of the north Atlantic ocean, which may have been narrow in the late Cretaceous times. The genus is rarely found in the Middle East, southern India, Nigeria and Madagascar (?) (the latter two areas in Upper Cenomanian only), but no immigrant nor floated remnant of *Metoicoceras* has been found in the Pacific region (see SASTRY and MATSUMOTO, 1967).

It would be desirable to examine the faunal comparison by means of a quantitative measure, as has been demonstrated by REYMENT and TAIT (1972, p. 322). It would be likewise necessary to observe carefully the mode of occurrence of the fossils. For instance, it has not yet been settled whether the small assemblage of the vascoceratids found at a locality in southern Montana (reported by REESIDE, 1923) represents an ammonite faunule migrated from the south or merely implies an accumulation of dead cephalopod shells floated from the main distribution area of the vascoceratids in the south. A map of palaeocurrent in the early Turonian seaway in North America has already been inferred by CLOUD (1961, fig. 10). This was hinted by the known distribution of the straight shelled ammonoid *Sciponoceras gracile* (SHUMARD), but can

also serve for explaining the dispersal or migration of *Plesiovascoceras* up to Montana and also to California.

Vascoceratid ammonites indeed seem to be generally prolific in the shelf seas of the Tethys, but they actually occur in particular beds which occupy a restricted part of Lower Turonian sequence, as recorded precisely by FREUND and RAAB (1969). This is also true for the mode of occurrence of the vascoceratids in southern Montana. The fact suggests that the ammonites belonging to the Vascoceratidae which are characterized by more or less pseudoceratitic sutures and reducing ornament may have had a particular habitat and mode of life. In this connexion it should be noted that *Neolobites* of the Engonoceratidae, which are phylogenetically unrelated to the Acanthoceratacеae but have likewise pseudoceratitic sutures, occurs characteristically in the late Cenomanian shelf seas of the Tethys, i. e. generally the same region as the main distributional area of the Vascoceratidae and the Tissotiidae. It should be furthermore noted that *Fagesia* which has more deeply incised sutures than other genera of the Vascoceratidae shows wider distribution.

Now in Japan the ammonites belonging to the Vascoceratidae are very few and no examples of the Tissotiidae and the Coilopoceratidae have been found. Only one specimen of *Vascoceras* sp. aff. *V. durandi*, two of *Fagesia thevestensis* and another of *Fagesia* sp. cf. *F. rudra* are known from the Lower Turonian of Hokkaido. This number of specimens is incomparably smaller than that of hundreds of vascoceratid ammonites from Nigeria. On the other hand desmoceratids and tetragonitids, which occur abundantly in Japan, are distributed very sparsely or almost absent in the Turonian shelf seas of the Tethys.

As the genus *Fagesia* is generally widespread, it would not be surprising to find several fossils of this genus from Japan. Their occurrence can be interpreted as either a rare immigrant or a float brought by current from the south. The known distribution of *Fagesia thevestensis* is, however, much apart from Japan, unless *F. superstes* is proved to be conspecific with *F. thevestensis*. A find of *Vascoceras* sp. aff. *V. durandi* is rather puzzling, since *V. durandi* occurs in Algeria, Tunisia, Portugal and Israel, which are situated around the present Mediterranean Sea. The Japanese form is, however, allied to a form from Madagascar called *V.* aff. *choffati-durandi*. There are several species of other families which are common or closely allied between Japan and Madagascar but not yet found elsewhere. This is probably caused by too poorly explored situation of the Cretaceous areas in southern Asia.

I have reported recently (MATSUMOTO, 1971) a find of *Hourcquia* from south Saghalien, a specialized member of the Vascoceratidae in late Turonian-Coniacian times. Professor W. HASHIMOTO has shown me another specimen of *Hourcquia* obtained in the Abeshinai-Saku area, Teshio province, Hokkaido. According to HASHIMOTO (1973), it probably came from the Coniacian. Although the age is younger than Lower Turonian, this is another example of the genus known only from Madagascar and the Japanese biogeographic province.

To sum up, it is worthwhile to report that several vascoceratid ammonites do occur, though rarely, in the Japanese province. To explain this fact we need more information about the Cretaceous ammonites in southeast Asia and adjacent areas which are expected to have

been the nearest source of the northward dispersal or migration of the vascoceratid ammonites up to Hokkaido and south Saghalien.

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Explanation of Plate 8

Fig. 1. *Vascoceras* sp. aff. *V. durandi* (THOMAS and PERON) .....Page 29
GK. H5674, from loc. R2513a, Member Mh of the Obira area. Lateral (a) and rear (b) views, ×0.9.

Fig. 2. *Fagesia thevestensis* (PERON).....Page 32
Inner whorl of GT. I-3249, from loc. T610 b-c, unit II b of the Saku area. Lateral (a), rear (b) and frontal (c) views, ×0.9.

Kyushu University [I. HAYAMI] photos, without whitening for Fig. 1 and with whitening for Fig. 2.

2b

2a

2c

1b

1a

Abeshinai	アベシナイ [安平志内]	Opirashibets	オピラシベツ [小平蘂]
Horokanai	幌加内	Rumoi	留萌
Ishikari	石狩	Saku	佐久
Nakagawa-machi	中川町	Saku-gakko-no-sawa	佐久学校の沢
Nakakinebetsu	中紀念別	Saku-gawa	佐久川
Obira	小平	Shakotan-gawa	佐古丹川
Okufutamata	奥二股	Teshio	天塩
Onodera-zawa	小野寺沢	Yubari, The	夕張川

PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

日本古生物学会 1973 年・年会・総会は，1973 年 1 月 16 日（火），17 日（水）に東北大学理学部地質学古生物学教室において開催された（参加者 68 名）。

海外学会出席報告

SCOR (Scientific Committee on Ocean Research) の Working Group 37 の活動について .....高柳洋吉
Committee on Pacific Neogene Stratigraphy の設立と会議計画について.....高柳洋吉
国際古生物学連合第 9 回総会 .....高井冬二

特別講演

北太平洋地域の新生代 .....増田孝一郎

総会

個人講演

化石帯の進化学的モデル .....速水 格
Some Lower Cretaceous plants newly found from the Ryoseki Group, Kochi Prefecture, Japan ...KIMURA, T. & M. HIRATA
Older Mesozoic plants from the Tae-Dong Series, Korea. Pt. 1 .....KIMURA, T. & B.-K. KIM
Phylogenetic system of vascular plants .....ASAMA, K.
宮城県仙北地方の竜ノ口層における珪藻群集について.....小泉 格
栃木県常陸太田付近に発達する第三系の地質時代について.....小泉 格
Lower Carboniferous conodonts from Mitsusawa, north of Itsukaichi, Tokyo .....IGO, H. & F. KOBAYASHI
Geologic age of the Mamba Group, Kanto Massif. Pt. 1. Corals and fusulinaceans .....IGO, H. & S. TAKIZAWA
Ditto. Pt. 2. Conodonts .....TAKIZAWA, S. & H. IGO
Upper Permian fusulinaceans from Kuzuu, Tochigi Prefecture, Japan....H. & H. IGO
Planktonic foraminiferal sequence in a piston core from off Sanin district, Japan Sea .....UJIIÉ, H. & M. ICHIKURA
Distribution of the Japanese *Miogypsina*, with a description of a new species ..... UJIIÉ, H.
浮遊性有孔虫化石から見た房総半島上総層群の層位について..... .....尾田太良
男鹿半島産石灰ナンノプランクトン化石について（予報）.....高山俊昭・北里 洋
Vascoceratid ammonites from the Turonian of Hokkaido .....MATSUMOTO, T.
Evolution of *Lepidolina multiseptata* (Permian foraminifer) in East Asia..... ..... OZAWA, T.
Genetic polymorphism and geographic variation in *Umbonium* (Preliminary observation) .....OZAWA, T.
秋田県二ツ井付近の大桑・万願寺動物群 ....鎮西清高
Growth of massive corals.....HAMADA, T.
"*Cladochonus*" from the red bed of Malaya (Malaysia) .....HAMADA, T.
On some fossil Scleractinia from Japan ..... EGUCHI, M.
Japanese Tertiary cassidids and their related species of the west coast of North America .....KANNO, S.
"*Pecten* (*Amusium*) *ocalanus* Dall" and some pectinid with internal radial ribs..... ..... KANNO, S.
小笠原・母島始新統産の"メオトミノガイ"について .....岩崎泰顕
アンモナイト諸形質の変異—*Gaudryceras* を素材として.....平野弘道
生物源炭酸塩中のトリウム同位体について ....大村明雄
Faunal analysis of the Upper Miaoli (Byoritsu) Group in the Tunghsiao area,

Miaoli Province, Formosa, China ....KOTAKA, T.
Proposed correlation of Neogene sediments in Noto and Oga Peninsulas, Japan, using planktonic diatoms (代読)..... ..... BURCKLE, L. H.
Late Cenozoic planktonic Foraminifera from the oil-bearing formations of Japan (代読) .. MAIYA, S., T. SAITO, & T. SATO
Planktonic foraminifers of the Nishikurosawa Formation, northwestern Honshu, Japan (代読) .....SAITO, T. & S. MAIYA

学 会 記 事

◎ 1972年末に行なわれた 1973・1974年度評議員選挙の結果，次の諸君が当選した（敬称略，ABC順）。浅間一男，浅野　清，鎮西清高，浜田隆士，花井哲郎，畑井小虎，速水　格，勘米良亀齢，小高民夫，松本達郎，鹿間時夫，首藤次男，高柳洋吉，棚井敏雅，氏家　宏。

◎ 1973年1月15日の評議員会において，1973・1974年度の会長は松本達郎，常務委員は浅間一男（会員），鎮西清高（庶務），浜田隆士（会計），花井哲郎（行事），勘米良亀齢（特別号），高柳洋吉（化石），氏家　宏（報告記事編集長）と決った。

◎ 同上評議員会において，賞の委員会委員半数改選を行なった結果，棚井敏雅，首藤次男の2名と決った。1973年の同委員は，会長，浜田隆士，鎮西清高，棚井敏雅，首藤次男の5人である。

◎ 同上評議員会において，これまで問題のある都度組織されていた科研費配分問題小委員会を，本会常置の小委員会とすることに決めた。1973年6月までの委員は，市川浩一郎（委員長），猪郷久義，佐藤　正，首藤次男，高柳洋吉，氏家　宏の6名である。

◎ 1973年度学術奨励金は，菅野三郎君（軟体動物による環太平洋地域新第三系の生層序の研究）および村田正文君（日本，とくに北上山地の上部古生界の生層序の研究）に授与された。

◎ 1972年度中に逝去された会員1名。森川六郎君。謹んで哀悼の意を捧げる。

◎ 1973年度よりの入会者（1973年1月15日の評議員会で承認）は普通会員9名，在外会員2名（敬称略，ABC順）。Robert John DOWLEN，堀口敏秋，市倉賢樹，稲田卓史，Hari Mohan KAPOOR，加藤　進，松田烝司，三宅　茂，丹波俊二，鈴木三男，横尾浩一。

◎ 次の諸君の退会が，同上評議員会で承認された。村田茂雄，奥野春雄，松野久也。

◎ 1973年度より，次の諸君が特別会員となった（敬称略，ABC順）。阿久津純，藤　則雄，石井　醇，小池敏夫，的場保望，森　啓，中世古幸次郎，大原　隆，佐田公好，橘　行一，高橋治之，高山俊昭。

お 知 ら せ

◎ **日本古生物学会報告・記事　編集出版規約の改正**　1973年1月16日の総会で承認された原案に基いて作製された改正規約が，投稿案内とともに同年3月上旬に全会員に送付された。4月以降受付の原稿より，同規約が適用される。おもな改正点は，編集委員会を設け（1973-1974年度の委員については表紙裏参照），さらに同委員会以外の適切な人に意見を徴することがあること，投稿カードの採用などである。今後の投稿に際しては，同上案内を十分に考慮されることが要望される。

◎ **化石，Nos. 23-24 の発行**　1972年12月30日付，1400円。「化石硬組織内の同位体」特集。内容は，北野康ほか：重炭酸カルシウム溶液からの炭酸カルシウム結晶の生成過程における同質多像形，ほか2篇，阪上正信：ラジウム同位体測定とその意義および環境モニターとしての生物硬組織，小西健二ほか：造礁性石サンゴとシャコガイよりもとめたアラレ石・海水間の Sr^{2+} に関する分配定数，大村明雄ほか：現生および化石サンゴ中のウランの偏在について，堀部純男・大場忠道：アラレ石－水および方解石－水系の温度スケール，青島睦治・鎮西清高：化石硬組織の酸素同位体比に基づく掛川層群堆積時の古水温推定，菅野三郎ほか：酸素同位体比からみた“成田層群”産貝化石の古水温とその古生物学的検討，井上雅夫：生物殻非晶質シリカの結晶化。

日本古生物学会特別号の原稿募集

PALAEONTOLOGICAL SOCIETY OF JAPAN, SPECIAL PAPERS NUMBER 17 を 1974 年度に刊行したく，その原稿を公募します。適当な原稿をお持ちの方は，次の事項に合わせて申込書を作成し，〒812 福岡市東区箱崎町 九州大学理学部地質学教室気付，日本古生物学会特別号編集委員会（代表者勘米良亀齢）宛に申し込んで下さい。

(1) 古生物学に関する論文で，欧文の特別出版にふさわしい内容のもの。同一の大題目の下に数篇の論文を集めたもの（例えばシンポジュウムの欧文論文集）でもよい。分量は従来発行の特別号に経費上ほぼ匹敵すること。学会から支出できる経費は 15 万円程度です。学会以外からも経費が支出される見込のある場合には，その金額に応じて上記よりも分量が多くてよい。

(2) 内容・文章ともに十分検討済の完成した原稿（または完成間近い原稿）で，印刷所に依頼して正確な見積りを算出できる状態にあること。なるべく原稿の写しを申込書とともに提出して下さい。（用済の上は返却致します）。

(3) 申込用紙は自由ですが，次の事項を明記し，〔 〕内の注意を守って下さい。
  (a) 申込者氏名；所属機関または連絡住所・電話番号。〔本会会員であること〕。
  (b) 著者名；論文題目。〔和訳を付記すること〕。
  (c) 研究内容の要旨。〔800～1200 字程度，和文で可〕。
  (d) 内容ならびに欧文が十分検討済であることの証明。〔校閲者の手紙の写しでもよい〕。
  (e) 本文の頁数（刷上り見込頁数または原稿で欧文タイプ 25 行詰の場合の枚数――ただし，パイカーかエリート字体かを添記すること）；また本文中小活字（8 ポ組み）に指定すべき部分があるときは，そのおよその内訳（総頁に対するパーセント）；挿図・表の各々の数と刷上り所要頁数；写真図版の枚数。
  (f) 他からの経費支出の見込の有無，その予算額，支出源。〔その見込の証明となる書類またはその写しを添えて下さい〕。〔1974 年度の文部省の刊行助成金を申請希望の場合も，その旨を上記の準じて添記して下さい。
  (g) その他参考事項。原稿が未完成の場合には，申込時における進行状況ならびに完成確約年月日を必ず記して下さい。

(4) 申込締切 1973 年 10 月 15 日（消印有効）。採否は 1974 年 1 月の評議員会で審議決定の上申込書に回答の予定です。ただしその前または後に，申込者との細部の交渉を，編集委員から求めることがあるかもしれません。

(5) 印刷予定論文が完全な場合には，決定後できるだけ早く印刷にとりかかる予定です。文部省の刊行助成金（「研究成果刊行費補助金」）を申請希望の場合には，学会から申請（例年は 11 月中旬中に申請締切）し，その採否・金額など決定後印刷にとりかかります。その場合は文部省との約束により，その年の秋（前例では 10 月 20 日）までに初校が全部出なければ，補助金の交付が中止されることになっています。

(6) 特別号の投稿規定はとくにありません。会誌に準じ，前例を参考とし，不明の点は編集委員会に問い合わせて下さい。経費がかかるので，特別な場合を除き，別刷は作成せず，本刷 25 部を著者に無料進呈します。それ以上は購入（但し著者には割引）ということになります。いくつかの論文を集めて 1 冊にするときには，世話人の方から指示して，体裁上の不統一のないようにして下さい。印刷上の指示事項が記入できるよう，原稿の左右両側・上下に十分空白をとって，タイプで浄書して下さい。

例　会　等　の　通　知

	開　催　地	開　催　日	講演申込締切日
111回例会	新潟大学	1973年6月23-24日	1973年4月20日
112回例会	東京大学	1973年10月20日	1973年8月20日
1974年　総会・年会	九州大学	1974年1月11-12日	1973年11月10日

◎ 111回例会（新潟大学）では，6月23日に「古生態と古環境に関するシンポジウム」（津田禾粒，長谷川美行両氏世話人），6月24日に「新潟油田の標準層序の見学と貝類化石の採集」（西田彰二・津田禾粒・小林巌雄氏らのガイド）が予定されている。

◎ **地質学地理学輯報**（Japanese Journal of Geology and Geography）原稿募集について　日本学術会議の図書出版に関する基本方針により，昭和48年度をもって発行を中止する。ただし本年分については，47年度と同様の規模と規約（本紙 No. 85, p. 294 を参照）によって出版される予定につき，投稿を歓迎。期限は8月末日，投稿先は東大理学部地質学教室同輯報編集委員長立見辰雄氏。投稿規定に関する細かい問合せは，古生物研連選出の編集委員（浜田隆士，市川浩一郎，木村敏雄，首藤次男，棚井敏雅）へ。

◎ 日本古生物学会報告・記事投稿案内（1973年1月）の訂正

p. 2 IIB-2　600 cm^2 で限度→600 cm^2 を限度

p. 6 II 7　章の見出しは左に寄せて→章の見出しは中央部に，節，項などの見出しは左に寄せて

◎ 本会誌の出版費の一部は文部省研究成果刊行費による。

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