On the Systematic Positions of the two Ammonite Genera Hourcquia COLLIGNON, 1965 amd Pseudobarroisiceras SHIMIZU, 1932 : Studies of the Cretaceous Ammonites from Hokkaido-XLVIII

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On the Systematic Positions of the two Ammonite Genera *Hourcquia* COLLIGNON, 1965 and *Pseudobarroisiceras* SHIMIZU, 1932

(Studies of the Cretaceous Ammonites from Hokkaido—XLVIII)*

Tatsuro MATSUMOTO** and Seiichi TOSHIMITSU

Abstract

One of us (T. M., 1970) once described two ammonites belonging to *Hourcquia* and *Pseudobarroisiceras* under different families and their exact geological ages were uncertain. In this paper two new species of these genera are described on the material from the Upper Turonian of the Haboro area, northwestern Hokkaido. Also the age of the previously described specimen of *P. nagaoi* is revised to the Upper Turonian on the basis of a revised biostratigraphy of the Turonian and Coniacian of the Ikushumbets area, central Hokkaido. The described new species have several diagnostic features which show an intimate relationship between the two genera and also some affinity with *Mesiaporites* and *Neoptychites*. To sum up, we concluded to group at least the three genera *Hourcquia*, *Mesiaposites* and *Pseudobarroisiceras* into the subfamily Hourcquiinae of the Vascoceratidae. They lived in the Turonian, but whether *Hourcquia* and *Pseudobarroisiceras* persisted to the Coniacian or not should be worked out in the future.

Introduction

Some years ago one of us (MATSUMOTO, 1970) described examples of the genera *Pseudobarroisiceras* SHIMIZU, 1932 and *Hourcquia* COLLIGNON, 1965 which were found uncommonly from the Upper Cretaceous of Hokkaido and Sakhalin [Saghalien]. At that date their precise stratigraphic positions and geologic ages were uncertain, although they were presumed somewhere in the Coniacian and Turonian. Their systematic assignment was not convincing, although *Pseudobarroisiceras* was tentatively referred to the Collignoniceratidae and *Hourcquia* to the Vascoceratidae.

Since then some more examples of *Hourcquia* have been reported (HASHIMOTO, 1973; MATSUMOTO and OBATA, 1982), but their stratigraphic positions have remained uncertain. Through our study of the relevant specimens recently found from the Haboro area of northwestern Hokkaido, as well as the hitherto described ones, we have obtained some interesting facts which would be useful for the solution of the problems. In this paper we present them in detail, with notes on stratigraphy and palaeontological descriptions. On the evidence of our

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new observations, we attempt to give remarks on the systematic positions as well as the geological ages of the two genera.

Notes on Stratigraphy and Occurrence

The following three notes are given briefly before the description and discussion of the relevant ammonites.

1. *A short note on the ammonite bearing beds of the Haboro area.*—The Haboro area, which is situated to the north of the celebrated Obira area (studied by many persons, e.g. TANAKA, 1963 etc.) and to the south of the Abeshinai-Saku area (e.g. MATSUMOTO, 1942), is now under investigation by one of us (S. T.) for the Upper Cretaceous biostratigraphy. A result of that study is now under preparation for publication and only a brief report of progress was preliminarily presented (TOSHIMITSU, 1983).

To cite from it, the Upper Cretaceous deposits of the Haboro area are mainly referred to the Upper Yezo Group and assigned to the Coniacian and Santonian, and only the Saku Formation of the Middle Yezo Group, Upper to Middle Turonian in age, is distributed in a limited area in the eastern part of the mapped area (Fig. 1). The Saku Formation, locally called the Shirochi Formation in this area, is made up of strata of mudstone and sandstone alternating in various grades of thickness. It is exposed along a narrow valley called the Shirochiune-zawa, an eastern branch in the upper reaches of the Nakanofutamata-gawa, which, in turn, is one of the eastern tributaries of the Haboro River. The lower part of the Shirochi Formation, which is referable to the Zone of *Inoceramus hobetsensis,* that is the Middle Turonian in the Japanese scale, is very limited in this valley, whereas the upper part which is referred to the Zone of *Inoceramus teshioensis* occupies the majority of the outcrops, although there are repetitions of strata owing to minor folds. We have obtained in this zone *I. teshioensis* NAGAO et MATSUMOTO, *I. tenuistriatus* NAGAO et MATSUMOTO, *Mytiloides incertus* (JIMBO), *M.* aff. *M. striatoconcentricus* (GÜMBEL), *M.* aff. *M. sublabiatus* (MÜLLER), *Sciponoceras* cf. *S. intermedium* MATSUMOTO et OBATA, *Lewesiceras* sp., *Subprionocyclus* sp. etc. This assemblage indicates evidently the Upper Turonian. Anyhow, the Upper Yezo Group does not occur in the valley of the Shirochiune-zawa, where no species which clearly indicates a Coniacian age has been found. The Coniacian and Santonian strata are distributed much more extensively westward from the point at the confluence of the Shirochiune-zawa with the Nakanofutamata-gawa. The material for the palaeontological description below consists of several specimens which all came from the Upper Turonian of the Shirochiune-zawa, especially its southern branch called the Karasemi-zawa, as indicated in Fig. 1.

In addition to the above specimens, there is a fine specimen of *Hourcquia mirabilis* COLLIGNON, now in display at Mikasa Museum, which was obtained by M. Takahashi from a floated nodule (G in Fig. 1) in a small branch stream of the Shirochiune-zawa. At loc. RH 2100 c (F in Fig. 1), close to the above mentioned locality G, one of us (S. T.) found two fragmentary pieces of a keeled ammonite which resembles a portion of that specimen. *Inoceramus teshioensis*

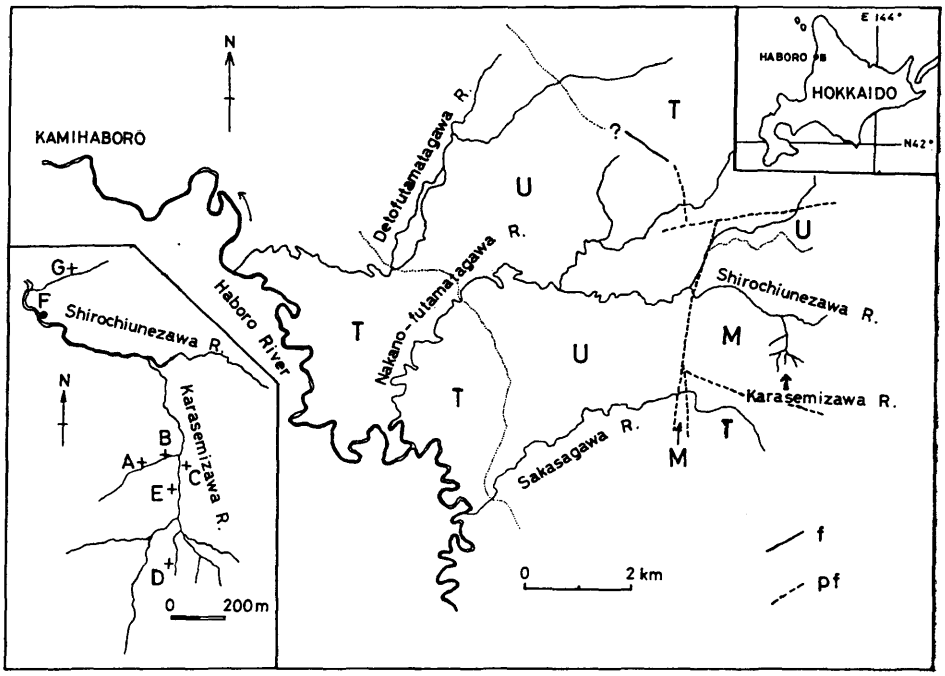

Fig. 1. Map of the upper reaches of the Haboro River, showing a geological outline and localities of the described specimens. M: Saku Formation (=Shirochi Formation) of the Middle Yezo Group, U: Upper Yezo Group; T: Tertiary; f: fault (actual); pf: fault (inferred). Index map of Hokkaido at the upper right corner and an enlarged map of the Karasemizawa and a part of the Shirochiune-zawa at the lower left corner, showing locations of the specimens A–G described or mentioned in the text. ● in situ, + floated or fallen nodule.

and *Sciponoceras* cf. *S. intermedium* were also obtained from the same outcrop.

2. *A note on the Turonian-Coniacian boundary in the Ikushumbets area.*— The current scheme of zonation for the Upper Cretaceous of Japan (e.g. MATSUMOTO, 1977, fig. 2; TAKAYANAGI & MATSUMOTO, 1981, fig. 1) depends much on several reference sequences in Hokkaido (e.g., see MATSUMOTO *et al.*, 1978). It is, however, tentative and should be revised in accordance with the progress of research. Of a number of reference sequences in Hokkaido, that of the Ikushumbets area (which may be called the Mikasa district in the modern place name), is one of the fundamental sequences for that zonal scheme.

One of us (MATSUMOTO, 1984) has recently shown a revision of the zonal scheme for the Upper Turonian and Coniacian on the basis of the new observations in the Ikushumbets and adjacent areas. This is concerned with the Turonian-Coniacian boundary in the Japanese province. In that study the stage boundary is set at the base of the second green sandstone in the outcrops along the main stream of the River Ikushumbets, as shown in fig. 2 of that paper. It is the boundary of the Zone of *Inoceramus teshioensis* below and the Zone of *I. uwajimensis* above.

Now, the specimen of *Pseudobarroisiceras nagaoi* SHIMIZU from the Ikushumbets area described as a probably adult shell by MATSUMOTO (1970, p. 306, pl. 48, fig. 1) was obtained at a forestry railway cutting from the greenish silty fine-grained sandstone. Although it was immediately above the prolific part of *Reesidites minimus* (HAYASAKA et FUKADA), the exposed rock of that cutting wholly belongs to the "subzone of *Reesidites minimus*". No Coniacian species has been found there. Unfortunately that green silty sandstone was misinterpreted as the second green sandstone (MATSUMOTO, 1970, p. 310). The latter is actually much more coarse-grained and still somewhat higher in this section. Since the construction of the Katsura-zawa Dam, this outcrop and also the adjacent ones have been submerged under the artificial lake.

To sum up, the stratigraphic position of *Pseudobarroisiceras nagaoi* in the Ikushumbets sequence is in a comparatively higher part of the Upper Turonian, although the species must have a true range of a certain extent.

3. *Summarized list of the hitherto described specimens, with records of occurrence, in the papers published in Japan.*

(1) *Pseudobarroisiceras nagaoi* SHIMIZU, 1932. Holotype, IGPS. 36853, from the lower reaches of the Wakkawen, a tributary of the Abeshinai, Teshio province. SHIMIZU, 1932, p. 3, pl. 1, figs. 1, 2, 4–8; MATSUMOTO, 1970, p. 306, pl. 49, fig. 1; text-fig. 3. Its stratigraphic position is not exactly known, although a possibility of its derivation from Unit III a (Coniacian) of the Upper Yezo Group was mentioned by MATSUMOTO.

(2) *P. nagaoi*. Hypotype: GK-H5461 [=T. MURAMOTO's Coll. 9300], from loc. Ik1003, Ikushumbets area, described by MATSUMOTO, 1970, p. 306, pl. 48, fig. 1; text-fig. 1. Its stratigraphic position is in the upper part of the Subzone of *Reesidites minimus*, Upper Turonian (see above discussion).

(3) *Hourcquia pacifica* MATSUMOTO, 1970. Holotype, GK. H5203, from the Upper Cretaceous near the colliery of Kawakami, South Sakhalin (S. NAGAOKA Collection before 1940), described by MATSUMOTO, 1970, p. 311, pl. 49, fig. 2; text-fig. 4. Its stratigraphic position is uncertain, being presumed somewhere in the Miho Group (Turonian-Santonian).

(4) *Hourcquia hataii* HASHIMOTO, 1973. Holotype, TKU. 30492, from one of the floated nodules in the Nigori-kawa, a branch in the upper reaches of the Abeshinai-gawa, Nakagawa-machi, Teshio province (W. HASHIMOTO Coll.), described by HASHIMOTO, 1973, p. 346, pl. 35, figs. 1, 2; text-fig. 2. Its stratigraphic position is uncertain but presumed by HASHIMOTO to be the "Nishichirashinai Formation" [=III a of MATSUMOTO] (Coniacian). In the published geological map of Nakagawa-machi (Hashimoto *et al.*, 1967) the upper part of the Saku Formation (Turonian) is intimately associated with the Nishichirashinai Formation in the narrow valley of the Nigori-kawa.

(5) *Hourcquia ingens* COLLIGNON, 1965. Hypotype, YKC. 50–7–10, from a floated nodule of the Obirashibetsu, Rumoi province, described by MATSUMOTO & OBATA, 1982, p. 79, pl. 4, fig. 2. According to K. MURAMOTO (personal information) its locality record is quite uncertain.

Repositories.—GK: Geological Collections, Faculty of Science, Kyushu University, Fukuoka; IGPS: Institute of Geology & Palaeontology, Tohoku Univer-

sity, Sendai; TKU: Geological Collections, Tokyo Kyoiku University, Tokyo (now removed to Tsukuba University); YKC: Y. KAWASHITA's Collections, Mikasa.

Palaeontological Description

Family Vascoceratidae H. DOUVILLÉ, 1911
Genus *Hourcquia* COLLIGNON, 1965
Hourcquia kawashitai sp. nov.
Pl. 32, Figs. 1–2; Pl. 33, Figs. 1–3; Pl. 34, Figs. 2;
Text-figs. 2–3

Material.—Holotype: YKC. 57–6–20–E of Y. KAWASHITA's Collection (Pl. 32, Fig. 1), from the Karasemi-zawa, Haboro area, northwestern Hokkaido. It may be called Specimen E in this paper.

The following two specimens of dissimilar sizes are regarded as belonging to the same species: Specimen C, GK. H5990, from loc. RH2715 p, the Karasemi-zawa; Specimen D, YKC. 57–9–10–D, of Y. KAWASHITA's Coll., from the Karasemi-zawa.

Specific diagnosis.—Large, much compressed species of *Hourcquia,* with weaker ornaments than in typical species. Suture of similar pattern to that of typical ones but with deeper L than in the latter and U4 outside the umbilical shoulder in late growth-stages.

Measurements (in mm).—

Specimen	Diameter	Umbilicus	Height	Breadth	B./H.
Holotype	>230	*ca.* 48	110	—	—
−360°	144.0	27.0(.19)	73.0(.51)	*ca.* 56(.32)	.63
D (deformed)	*ca.* 90	*ca.* 14(.16)	*ca.* 40(.44)	*ca.* 28(.31)	.7
−270°	—	—	24.5	17.4	.71
C (outer wh.)	146.0	24.5(.17)	74.6(.51)	46.4(.32)	.62
(inner wh.)	—	—	25.0	17.3	.69

Description.—The holotype is somewhat more than 230 mm in diameter, but its outer whorl is badly eroded and devoid of the left half. It is probably adult and its body-chamber occupies about 270°, although its apertural margin is not well shown. The outer whorl is higher than broad, although the poor preservation prevents us from precise measurements. It looks nearly smooth, but for obscure radial bulges on the inner half of the flank, where shell layers remain from the erosion.

The next inner whorl, which represents the late stage of the phragmocone, is better shown on the left side. It is involute, about four fifths or more being overlapped by the outer whorl, expanding fairly rapidly in height. The umbilicus is fairly narrow, with U/D=0.19, and surrounded by a nearly vertical wall. The whorl is higher than broad, with B/H=0.6 or so, broadest in its lower part below the mid-flank; having a blunt median keel on the roof-shaped venter, obtuse ventrolateral shoulder and gently convergent main part of the flank, with a shallowly concave zone between the keel and the ventrolateral

shoulder and another shallower and broader one between the shoulder and the mid-flank. The ribs on the flank are extremely weak and flattened, consisting of longer and shorter ones. The ventrolateral tubercles are weak but distinct, low and subrounded in outline, numbering 14 in a half whorl at this stage. The long ribs are very bluntly bullate around the umbilicus.

The suture is well shown on the flank at about the middle of the last septate whorl (when H=60 to 65 mm). It is moderately deeply and finely incised. E is not well exposed; L is fairly deep, asymmetric and has narrow and fairly long lobules; saddle between E and L is extremely asymmetrically divided by a narrow and long lobule, with a narrower outer branch; that between L and U2 is asymmetrically divided, with a broader inner branch; U2 is nearly a half as small as L; U4 is still smaller but situated distinctly outside the umbilical shoulder; saddle between U2 and U4 is lower but nearly as broad as that between L and U2.

The characters of still inner whorls are not observable in the holotype.

Specimen C is incomplete but shows both the outer and inner whorls. The outer whorl is squashed and partly destroyed away. It is about 146 mm in diameter at a measurable stage and has the last septum at about H=60 mm, but is already nearly smooth on the surface, only with blunt bullae around the

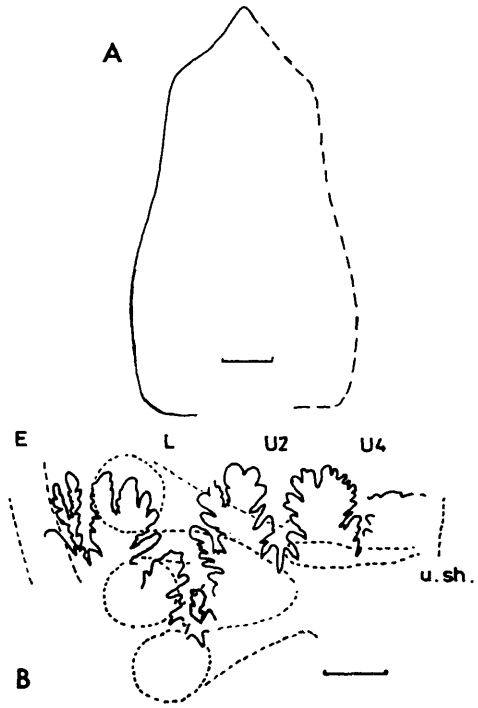

Fig. 2. *Hourcquia kawashitai* sp. nov.
A. Diagrammatic cross-section of the septate whorl of the holotype (Specimen E). Scale bar=10 mm. (T. M. *delin.*)
B. External suture of the holotype (E), at whorl height=57 mm. Scale bar=10 mm. (S. T. *delin.*)

umbilicus. Fragmentary pieces of the body-chamber beyond this measured stage are also smooth. The whorl of the measured stage is higher than broad, with B/H=0.62, broadest in the lower part, and subtrigonal in section, having a pointed (rather than keeled) mid-venter, very indistinct ventrolateral shoulders, gently convex and convergent flanks, subangular umbilical shoulder and vertical or even overhanging umbilical wall.

A part of the inner whorl (about 360° prior to the last septum) is observable, if we take out a destroyed piece of the outer whorl. It is higher than

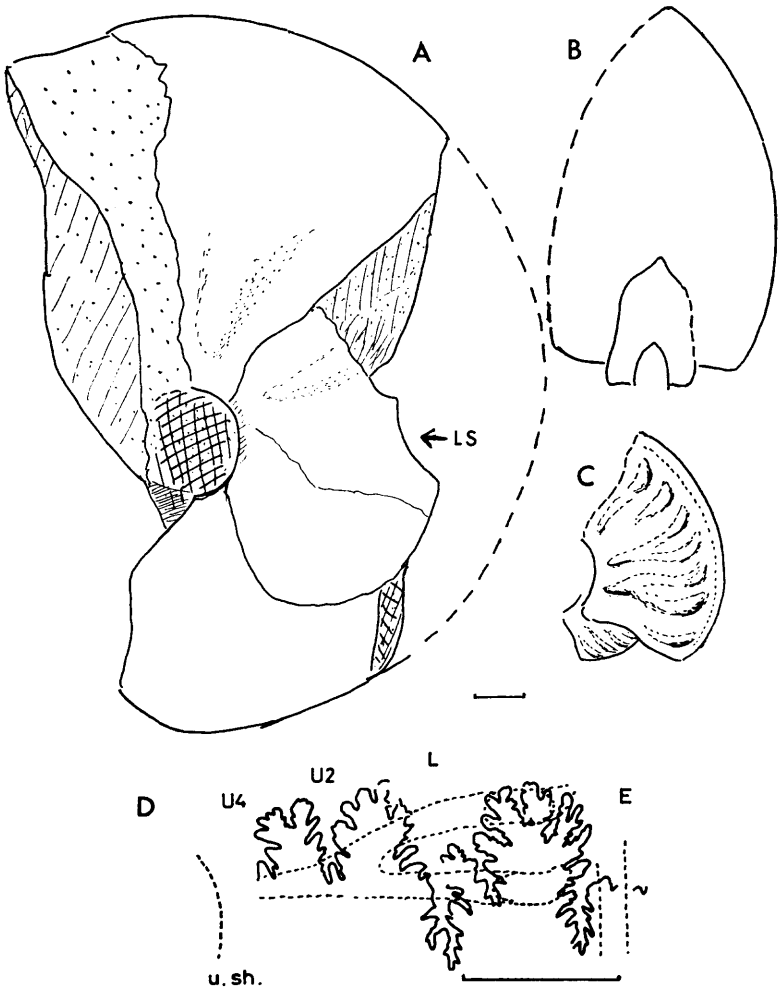

Fig. 3. *Hourcquia kawashitai* sp. nov.
Sketch of Specimen C (GK. H5990). A. Lateral view of the part consisting of the last part of the phragmocone and the beginning of the body-chamber. LS: position of the last suture. B. Cross-section of A (distorted body-chamber) and C (inner whorl). C. Lateral view of the next inner whorl (part) with a portion of the still inner whorl. Scale bar (for A–C) =10 mm. D. External suture of the inner whorl (C). Scale bar=10 mm. (T. M. [A–C] & S. T. [D] *delin.*)

broad, with B/H=0.69, broadest in the lower part between the umbilical bullae, bluntly keeled at mid-venter, weakly concave between the mid-venter and the obtuse ventrolateral shoulder and very shallowly concave slightly above the mid-flank. Thus the whorl section is of similar outline to that of the septate stage of the holotype, although it is smaller than the latter. Ribs on the flank are weak and flexuous, with bifurcated or intercalated shorter ones; long ribs are bullate near the umbilical margin; each rib is bluntly tuberculate at the ventrolateral shoulder. Thus *Hourcquia* type ornaments and shell-form are well shown at this stage, although the shell is more compressed and the ornaments are weaker than in the typical species. The external suture is well shown at this stage. It is generally similar to that of the late stage of the holotype. E is nearly as deep as L but is narrower than L. U4 is outside the umbilical shoulder.

A portion of the still inner whorl is observable. Its mid-venter is bluntly pointed. The ventrolateral tubercle is not distinctly developed but the ribs are abruptly bent at the indistinct ventrolateral shoulder, running forward and fading away as they approach the mid-venter. A constriction appears occasionally as on the inner whorl of *Neoptychites*. Suture is not well exposed at this stage.

Specimen D is about 90 mm in diameter under a somewhat distorted condition. It is bluntly keeled and has a shallowly concave zone between the keel and the ventrolateral shoulder. The other concave zone inside the ventrolateral shoulder is very shallow and indistinct on this deformed specimen. The early part of this specimen is weakly ribbed and bluntly tuberculate (bullate) as the inner whorl of specimen C at the corresponding size (i.e. at H=25 mm or so), but its later part has more distinct ventrolateral tubercles of subrounded shape at a moderate distance, low and faint ribs which are bluntly bullate near the umbilical margin. Thus the late part is similar to the illustrated septate stage of the holotype. Its shell-form is generally similar to that of the late septate stage of the holotype, although it is smaller than the latter. Whether this specimen represents an adult microconch or a middle-aged stage of a larger individual is hardly decided from the available material.

To sum up, the above described three specimens can well be regarded as showing characters of various growth-stages of one and the same species. There

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Explanation of Plate 32

Figs. 1–2. *Hourcquia kawashitai* sp. nov. .....Page 233

1. Specimen E (YKC. 57-6-20-E), holotype, from the Karasemi-zawa, Haboro area (Y. KAWASHITA Coll.). Lateral view of the phragmocone, encircled by the inner part of the body-chamber, ×2/3.
2. Specimen D (YKC. 57-9-10-D), paratype, from the Karasemi-zawa, Haboro area (Y. KAWASHITA Coll.). Lateral (a), ventral (b) and frontal (c) views, ×9/10.

Photos (Pls. 32–35) by M. NODA & S. TOSHIMITSU

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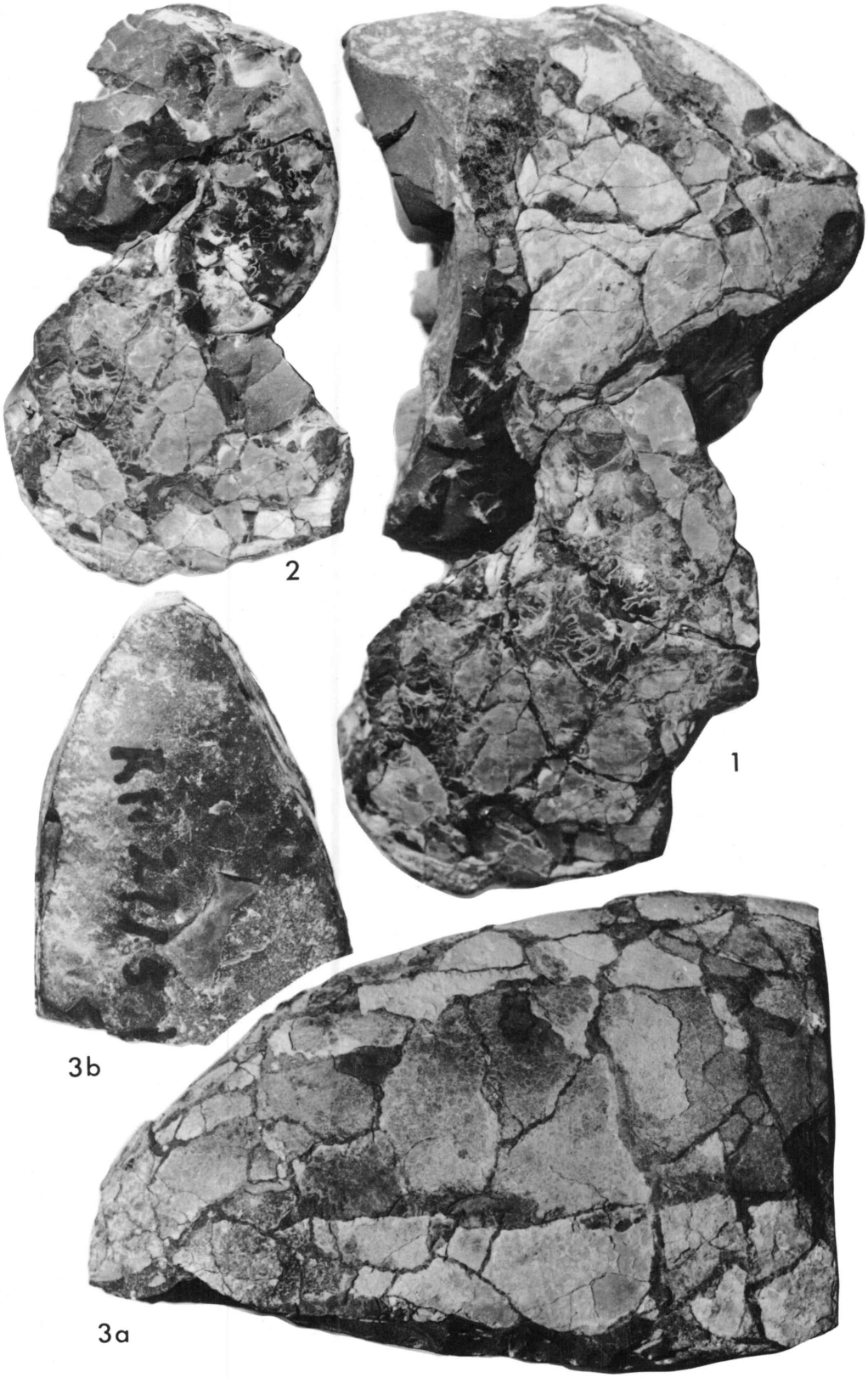

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may be a variation in the growth-stage (represented by whorl size) when a certain diagnostic character appears.

Occurrence.—The three specimens (C. D. E) are all in the fallen or floated calcareous nodules obtained at nearby localities in the Karasemi-zawa (see Fig. 1), where Upper Turonian strata (Shirochi Formation) are exposed. In the same nodule as Specimen C, there are *Inoceramus teshioensis, Tetragonites glabrus* (JIMBO), *Gaudryceras denseplicatum* (JIMBO), *Baculites undulatus* D'ORBIGNY and *Reesidites* sp.

Comparison.—The characters of the inner whorl of this species are essentially similar to those of previously described species of *Hourcquia,* such as *H. mirabilis* COLLIGNON, 1965 (type species), *H. ingens* COLLIGNON, 1965, *H. pacifica* MATSUMOTO, 1970 and *H. hataii* HASHIMOTO, 1973, in the shell-form, mode of ornamentation and sutural pattern. Therefore this species is assigned to *Hourcquia,* but it is much more compressed and has weaker ornament than most of them. Only a form described under *H. ingens* var. *antsakoazatensis* COLLIGNON (1965, p. 82, pl. 413, figs. 1707, 1710) is fairly close to *H. kawashitai* in its less inflated flank with a shallow spiral zone and weak ornaments, but the latter is still more compressed and more involute and has low but subrounded ventrolateral tubercles in the late stage of the phragmocone.

In almost all the hitherto illustrated specimens of *Hourquia,* the body-chamber is lacking or only incompletely preserved. We do not known the true size and characters of *H. mirabilis* and related species. *H. kawashitai* has a large body-chamber with a high subtrigonal whorl-section, a bluntly pointed midventer, indistinct ventrolateral shoulders and nearly smooth surface except for blunt radial bullae around the umbilicus. Thus, the adult shell of *H. kawashitai* is somewhat similar to *Mesiaposites carinatus* COLLIGNON, 1965, including a form called *M. carinatus* var *costulata,* but *M. carinatus* has much broader whorls, distinct median keel and subcarinate ventrolateral shoulders. With respect to the pattern of suture, *H. kawashitai* is closer to *H. mirabilis* than to *M. carinatus.*

Genus *Pseudobarroisiceras* SHIMIZU, 1932
Pseudobarroisiceras compressum sp. nov.
Pl. 34, Fig. 1; Pl. 35, Fig. 1; Text-figs. 4–5

Material.—Holotype, YKC. 57–6–20 B (Pl. 34, Fig. 1) of Y. KAWASHITA's Collection from the Karasemi-zawa, Haboro area, northwestern Hokkaido. It

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Explanation of Plate 33

Figs. 1–3. *Hourcquia kawashitai* sp. nov. .....Page 233

1. Specimen C (GK. H5990), paratype from loc. RH2715pl, Karasemi-zawa, Haboro area (coll. by T. MATSUMOTO, M. NODA, Y. KAWASHITA & S. TOSHIMITSU). Lateral view of the last part of the phragmocone and the beginning of the body-chamber, ×1.
2. Inner whorl of specimen C, right lateral view, ×1.
3. Fragmentary body-chamber of Specimen C, later than 1. Lateral view (a) and whorl-section (b), ×0.95.

may be called specimen B in this paper. Another larger specimen, A in this paper, YKC. 54-8-27 A of Y. KAWASHITA's Collection from the Karasemi-zawa is tentatively referred to this species and described here.

Specific diagnosis.—A species of *Pseudobarroisiceras* characterized by a large, much compressed and involute shell with much weakened ornament. Suture similar to that of the type species (*P. nagaoi* SHIMIZU).

Measurements.—

Specimen	Diameter	Umbilicus	Height	Breadth	B./H.
Holotype (B)	76.5	6.3(.08)	40.6(.53)	19.6(.25)	.48
54-8-27-A	322	31(.09)	169+(.52+)	70+β(.22)	*ca.* 42
−180°	—	—	122	55	.45
−270°	—	—	98	48	.47

Description.—Specimen B, the holotype, is badly squashed in its outer whorl and partly taken out to show the inner whorl. The less deformed, septate inner whorl is measured as indicated in the above table. It is much higher than broad, with B/H somewhat below 0.5. The shell is much involute and very narrowly umbilicate, with U/D somewhat less than 0.1, showing a fairly high ratio in the increase of whorl height. The venter is narrow and bluntly pointed or indistinctly keeled at the middle, passing to an obscure ventrolateral shoulder. The main part of the flank is very gently convex to give the maximum whorl-breadth in the lower part somewhat below the mid-flank. The umbilical shoulder is abruptly subrounded to fall down to the low but nearly vertical umbilical wall.

The flank is ornamented with very weak, gently flexuous ribs which are alternately long and short. The umbilical bullae at the end of the long ribs are very faint and the thickening of the ribs at the ventrolateral shoulder is also very indistinct and becomes obsolete in the late part.

The suture is fairly deeply and finely incised, showing E, L, U2 and U4 outside the umbilical shoulder. L is slightly deeper than E, longer than broad and asymmetric, having larger branches on the outer side. Saddle between E and L is asymmetrically divided by a narrow and moderately deep lobule into a tall and upright outer branch and a somewhat broader and oblique inner one. U2 is much smaller than L; U4 still smaller.

The outer whorl is so poorly preserved that its characters are hardly described with precision. It seems to have a similar form to that of the next inner whorl and its surface looks nearly smooth, except for some indistinct

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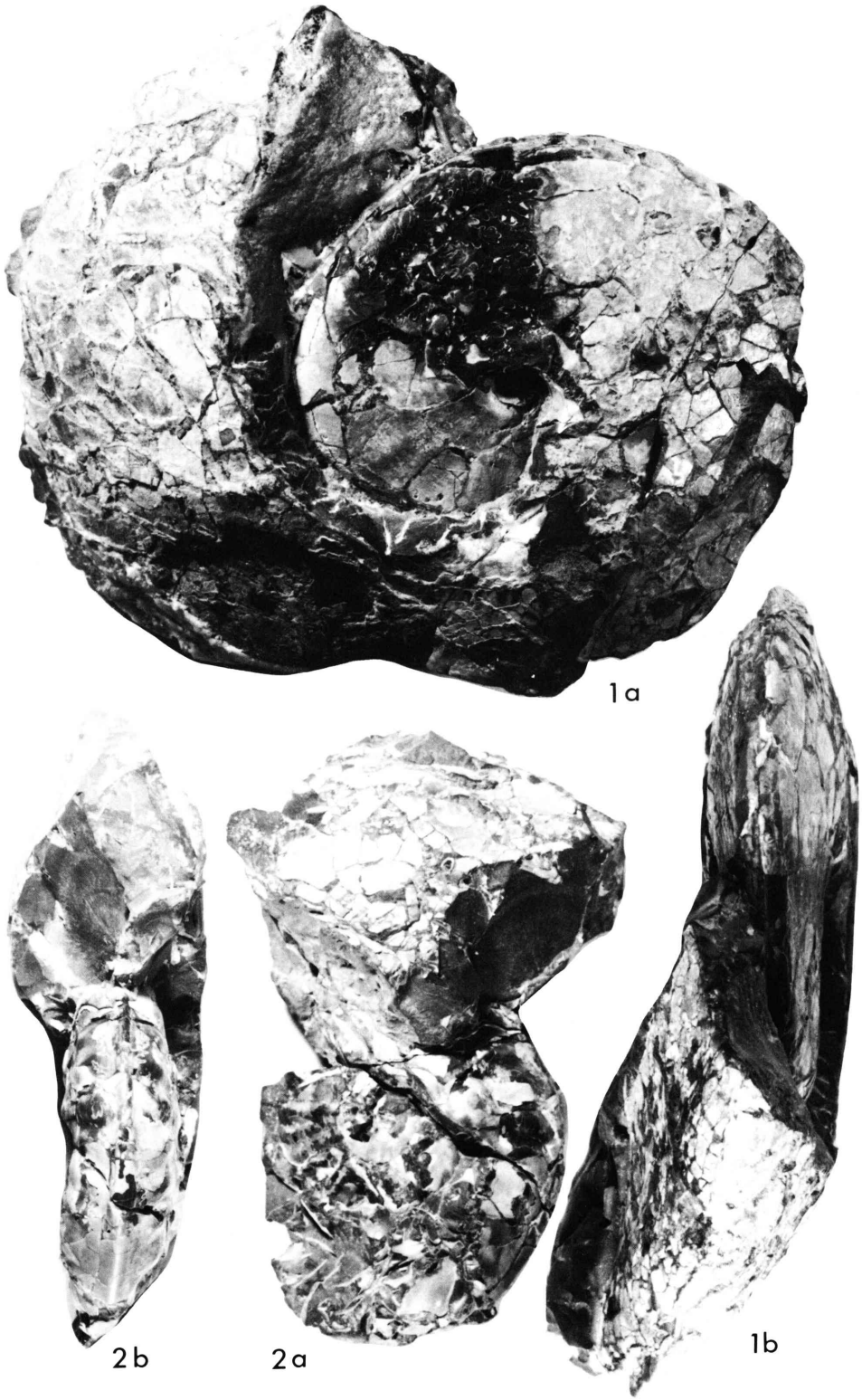
Explanation of Plate 34

Fig. 1. *Pseudobarroisiceras compressum* sp. nov. .....Page 237
Specimen B (YKC. 57-6-20-B), holotype, from the Karasemi-zawa (Y. KAWASHITA Coll.). Lateral view of the phragmocone and the destroyed body-chamber (a), ×9/10; ventral view of the phragmocone with a distorted portion of the body-chamber (b), ×9/10.

Fig. 2. *Hourcquia kawashitai* sp. nov. .....Page 233
Inner whorl of Specimen C, left lateral (a) and frontal (b) views, ×1. (See Pl. 33, Fig. 2)



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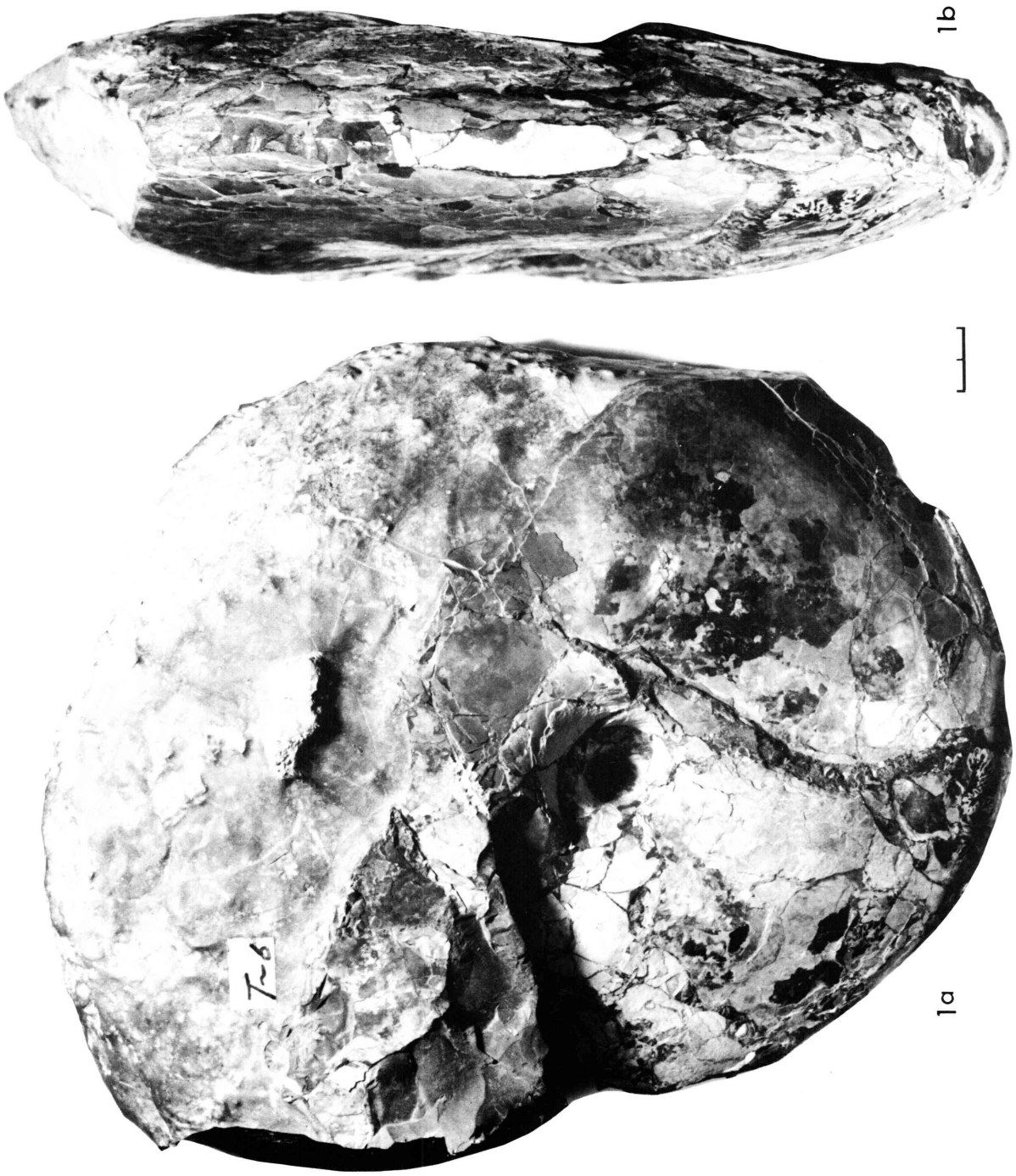

T. MATSUMOTO & S. TOSHIMITSU: *Hourcquia* and *Pseudobarroisiceras*

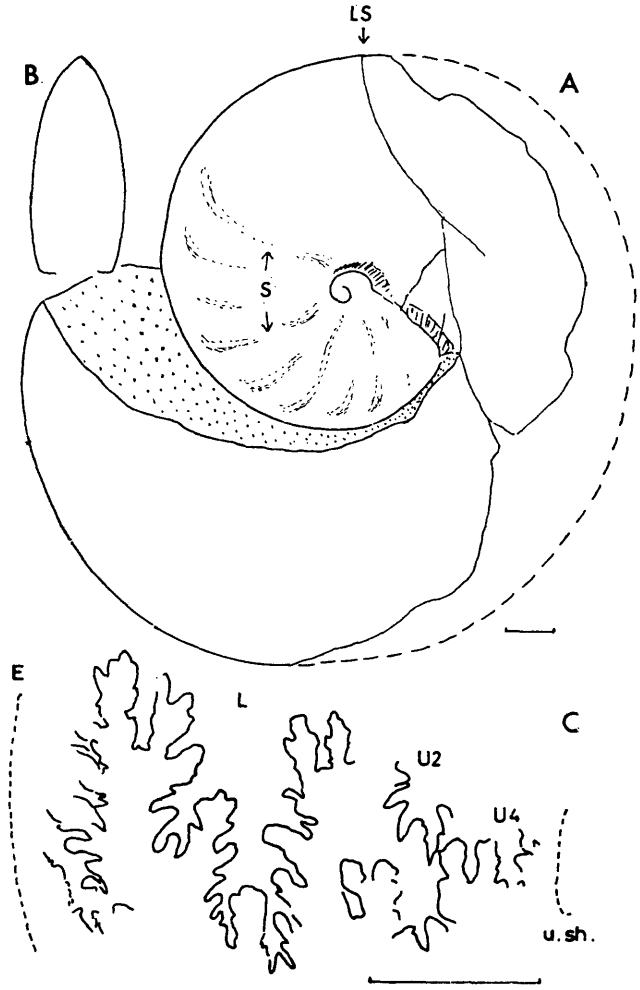

Fig. 4. *Pseudobarroisiceras compressum* sp. nov.
Sketch of the holotype (Specimen B), whose body-chamber is badly destroyed. A. Lateral view. Broken line: restored outline, LS: position of the last suture, S: position of the illustrated suture. B. Diagrammatic section of the septate whorl. Scale bar=10 mm. (T. M. *delin.*)
C: External suture at whorl-height=33 mm (S in A). Scale bar=10 mm. (S. T. *delin.*)

Explanation of Plate 35

Fig. 1. *Pseudobarroisiceras* cf. *P. compressum* sp. nov. .....Page 237
Specimen A (YKC. 54-8-27-A) from the Karasemi-zawa (Y. KAWASHITA Coll.). Lateral (a) and ventral (b) views. Scale bar=20 mm.

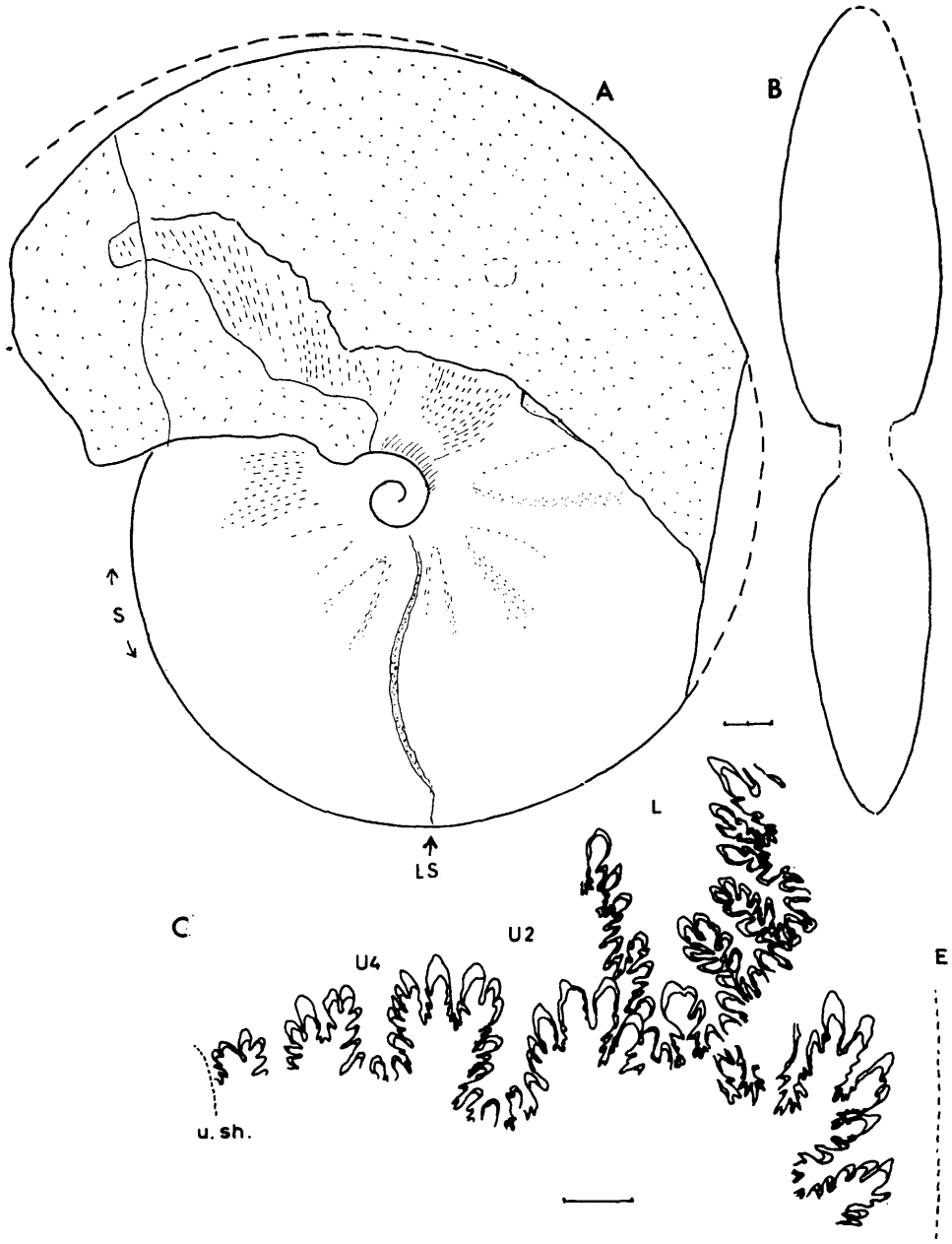

Fig. 5. *Pseudobarroisiceras* cf. *P. compressum* sp. nov.
Sketch of Specimen A (YKC. 54-8-27-A). A. Lateral view. Broken line: restored outline, dotted: eroded part where no shell layer is preserved. LS: position of the last suture, S: position of the illustrated suture. B. Diagrammatic section of A. Scale bar=20 mm. (T. M. *delin.*)
C. External suture at about whorl-height=55 mm (S in A). Doubled lines are drawn as they are shown at the terminals of folioles. This feature is probably caused by the obliquely inclined marginal part of a septum cut by inner and outer shell layers. The anterior line is more phylloid (with entire outline) than the posterior one. The doubling is reduced as the etching by the dilute hydrochloric acid proceeds. Scale bar=10 mm. (S. T. *delin.*)

bullae around the umbilicus. The squashed outer whorl of about 270° seems to represent the body-chamber of this specimen.

Specimen A is very large, attaining about 340 mm in diameter. It is discoidal and much involute, about eight ninths of the inner whorl being overlapped by the outer one. The whorl is much higher than broad, with B/H less than 0.5, broadest somewhat below the mid-flank in its lower part, roughly lenticular in cross-section, having a bluntly pointed or rather narrowly rounded venter, very gently convex flanks, abruptly rounded umbilical shoulders and low but nearly vertical umbilical wall. The umbilicus is very narrow, with U/D less than 0.1.

This specimen has a nearly smooth surface on the outer whorl, but for fine striae and very blunt radial bulges at wide intervals on the inner half of the flank. Its late outer surface is eroded; on other parts the test is fractured here and there.

The last suture is at about 125 mm in whorl-height and the body-chamber occupies about 270°. L of the suture at about 100 mm in whorl-height is poorly preserved, but L of the next suture supplements this deficiency. E, L and saddle between E and L are large, deeply and narrowly incised; U2 is much smaller than L; U4 still smaller and more auxiliary elements (2 saddles and a lobe) are seen outside the umbilical shoulder. The pattern is fundamentally similar to that of the holotype, but the stems of the lobes and saddles are slightly narrowed and have somewhat expanding branches which themselves are narrow.

The characters of the inner whorl of Specimen A are yet unknown, as we are unable to take out the overlapping part of the whorl without destruction.

Occurrence.—The two specimens are from the fallen nodules in a small western branch stream of the Karasemi-zawa, where Upper Turonian strata (lower member of the Shirochi Formation) are exposed.

Comparison.—The holotype of this species is fairly similar in the shell-form, ornamentation and suture to the hypotype of *Pseudobarroisiceras nagaoi* SHIMIZU described by MATSUMOTO (1970, p. 306, pl. 48, fig. 1; text-figs. 1, 2), but is evidently distinguished by its larger size, much more compressed whorl and weaker ornament. It represents certainly a new species of *Pseudobarroisiceras* which is allied to *P. nagaoi*.

The larger specimen A is here temporarily referred to this new species, because it has a quite similar shell-form and ornaments on the outer whorl and because the two specimens occur at quite nearby localities within the limited area of the same formation. We assume at present that its inner whorl would show similar characters to the septate part of the holotype, but this should be examined in the future. Until then specimen A should be called *Pseudobarroisiceras* cf. *P. compressum*.

We have observed several discoidal large shells with roughly lenticular thin whorl-sections embedded here and there in the same formation exposed in the Shirochiune-zawa, but they are secondarily distorted and very poorly preserved and cannot be identified with precision.

The difference in size between the holotype and specimen A may be merely the difference in growth-stage or may suggest a possibility of dimorphism or

otherwise. We need more material to give a definite conclusion.

Mr. Y. KAWASHITA at first thought that these two specimens might be a species of *Placenticeras* and brought them to us for more careful study. The difference in the pattern of suture is the prime distinction to reject *Placenticeras* for them.

It is interesting to note some similarity between the larger shell A of *Pseudobaroisiceras* cf. *P. compressum,* and the adult shell of *Neoptychites cephalotus* (COURTILLER, 1860 [=*Ammonites telinga* STOLICZKA, 1865 as reillustrated by KOSSMAT 1895, pl. 21, figs. 1 a-c] in shell-form and suture (especially pattern of L), but the diagnostic features at and near the aperture of the latter are not confirmed in the former because of its incomplete preservation. In this connexion a similarity in the immature stage between *H. kawashitai* (holotype) and *N. cephalotus* is also recalled. There are, however, clear distinctions in that *Neoptychites* has no keel and no tubercle at any stage of growth.

There is similarity in the nearly smooth outer whorl with obsolete ventral keel between *H. kawashitai* and *P. compressum* or *P.* cf. *P. compressum.*

Concluding Remarks

The genus *Hourcquia* COLLIGNON, 1965 was established for two species of ammonites from Madagascar. Subsequently, more examples were added from Sakhalin and Hokkaido, some of which are identical with the species from Madagascar and others new, altogether four species. In this paper one more species, *H. kawashitai* sp. nov., is established on the material from the Upper Turonian of the Haboro area, northwestern Hokkaido. It is peculiar in its compressed form and weaker ornaments in the phragmocone as compared with other species and its large, nearly smooth outer whorl with subdued ventral keel, but its septate shell is fairly similar to such a form as *H. ingens* var. *antsakoazatensis.*

Secondly, the occurrences of *Hourcquia kawashitai, H. mirabilis* and *H.* cf. *H. mirabilis* in the Upper Turonian of Japan is evident from our research in the biostratigraphy of the Haboro area. The uncertain records of age as to the previously described species of *Hourcquia* from Sakhalin and Hokkaido should be reexamined.

The genus *Pseudobarroisiceras* SHIMIZU, 1932 was established on a small, probably immature specimen from the Abeshinai area, northwestern Hokkaido, which was named *P. nagaoi* SHIMIZU. It was placed in the Collignoniceratidae [=Prionotropidae at that date] by SHIMIZU. MATSUMOTO (1970) described an adult example of the same species from the Ikushumbets area, central Hokkaido. Its stratigraphic position was considered Coniacian and its systematic position was set tentatively in the Barroisiceratinae of the Collignoniceratidae.

MATSUMOTO (1984) has recently restudied the biostratigraphy of the Ikushumbets [=Mikasa] area and arrived at the conclusion that the stratigraphic position of that adult specimen of *P. nagaoi* is in the Upper Turonian instead of the Coniacian.

In this paper an additional new species, *Pseudobarroisiceras compressum*

sp. nov. is established and another larger example which can be called *Pseudobarroisiceras* cf. *P. compressum* is also described. They came from the Upper Turonian of the Haboro area in close association with *Hourcquia kawashitai* sp. nov. mentioned above. The outer whorl of *P. compressum* shows a similarity to that of *Hourcquia kawashitai* and also to that of *Neoptychites cephalotus*. The suture of *P. compressum* is considerably similar to that of *H. kawashitai* and the suture of a larger example of *P.* cf. *P. compressum* is also similar in some respects to that of *Neoptychites*.

The immature holotype of *P. nagaoi* is somewhat similar in shell-form and mode of ornamentation to the inner whorl of *H. kawashitai* and also *H. hataii*, although the shallow concave spiral zones and the rounded ventrolateral tubercles are not developed in the former. The sutures of *P. nagaoi* and *P. compressum* resemble those of *H. mirabilis* and *H. kawashitai* in the general pattern, fairly deep and asymmetrically divided L, tall saddle between E and L which is asymmetrically bipartite by a narrow and fairly deep lobule, and other features.

To sum up, *Pseudobarroisiceras* is most closely allied to *Hourcquia* and should be placed in the subfamily Hourcquiinae of the Vascoceratidae together with *Hourcquia, Mesiaporites* and others. Whether it ranges from the Turonian to the Coniacian or is confined to the Upper Turonian should be worked out in the future. In this connexion *Schloenbachia boreaui* DE GROSSOUVRE, 1894 should be reexamined as MATSUMOTO (1970, p. 309) once pointed out.

In conclusion we redescribe below the subfamily Hourcquiinae with definition and discussion and also give the redefinition of the genera *Hourcquia* and *Pseudobarroisiceras*.

Subfamily Hourcquiinae RENZ, 1982.

A subfamily of the Vascoceratidae consisting of the genera *Mesiaposites* COLLIGNON, 1965, *Hourcquia* COLLIGNON, 1965 and *Pseudobarroisiceras* SHIMIZU, 1932. *Thomasites* PERVINQUIÈRE, 1907 and *Cibolaites* COBBAN et HOOK, 1983 could be referred to this subfamily as will be discussed below.

The ammonites of the Hourcquiinae have a ventral keel, ribs with bifurcation or intercalation on the flank, and tubercles around the umbilicus and at the ventrolateral shoulders at least in a certain stage of growth. Their shell is typically involute and narrowly umbilicate but less so in some cases. The whorl is typically inflated but not always so, and broadest at or near the umbilical shoulder with more or less convergent flanks. On the outer whorl the keel, ribs and tubercles tend to be reduced, but for blunt radial umbilical bullae and a fastigate or narrowly arched venter. Suture has rather deep L, which is asymmetrically divided into rather narrow lobules and folioles, typically tall, asymmetrically divided first lateral saddle (E/L), and smaller U2, U4 and other auxiliaries. Subphylloid aspect may be shown at the terminals of folioles.

As COLLIGNON (1965) suggested, the ultimate origin of this subfamily may be in *Neoptychites* from the Lower and lower Middle Turonian, but we exclude *Neoptychites* itself from this subfamily, because it has no tubercles and no keel at any growth-stage. It should be kept in the Vascoceratinae. Accord-

ingly the Neoptychitinae COLLIGNON, 1965 cannot be used for the Hourcquiinae. We should search for the representative of the Hourcquiinae in the Middle Turonian.

RENZ (1982) established the Hourcquiidae as an independent family, but he pointed out its intimate relation to *Plesiovascoceras* with respect to the suture. *In the general similarity in shell-form, ribbing and sutural pattern, Neoptychites* should be considered as a possible ancestor. As the suture is apparently variable in the Vascoceratidae, without examining the ontogenetic development, we hesitate to conclude the fundamental difference of the sutural formula between the vascoceratid genera. Anyhow, we think it better to treat the Hourcquiinae as a subfamily of the Vascoceratidae.

Thomasites, from the Lower Turonian, has characters which generally conform with the above described diagnosis of the subfamily, although its keel is serrated. *Cibolaites,* another peculiar genus of Lower Turonian, was assigned to the Barroisiceratinae of the Collignoniceratidae by COBBAN and HOOK (1983), but Barroisiceratinae are certainly Coniacian derivatives from the Late Turonian *Subprionocyclus.* It has also a serrated keel, ribs and tubercles like those of young *Thomasites,* although it is more evolute and more compressed than *Thomasites.* We are inclined to regard it as a relative of *Thomasites,* although it is a much deviated offshoot which shows a collignoniceratoid appearance. Z. LEWY (*in lit.* 31 May 1984) informed to one of us (T. M.) that he has recently found *Cibolaites,* together with *Neoptychites, Choffaticeras,* etc., from the Lower Turonian (T-6) of Israel, that is a typical area of the Tethys realm. One of us (T. M.) has seen a peculiar ammonite in KAWASHITA's Collection from the Lower Turonian of Hokkaido which shows intermediate features between *Thomasites* and typical *Cibolaites.* For the reasons mentioned above, *Thomasites* and also (?) *Cibolaites* could possibly be referred to the subfamily Hourcquiinae at least tentatively.

Subfamily Pseudotissotiinae were assigned to the family Tissotiidae (WRIGHT, 1957) but are at present transferred to the Vascoceratidae (WRIGHT, 1981). They include the keeled (typically bikeeled) ammonites and some of them are tuberculate, but the suture is pseudoceratitic and dissimilar to the more deeply incised suture of the Hourcquiinae. This is, however, a general distinction, since the suture shows a considerable variation in many genera of the Vascoceratidae. Be that as it may, the Pseudotissotiinae are not the derivatives of *Neoptychites* and consequently should be separated from the Hourcquiinae.

Genus Hourcquia COLLIGNON, *1965. Type species: H. mirabilis* COLLIGNON. Moderate to large shell, keeled on the mid-venter in the main part of the phragmocone, with a concave zone on either side of the ventral keel and another on the flank below the ventrolateral shoulder. Flexuous ribs springing in pairs from the umbilical tubercles or with some inserted shorter ones, Every rib tuberculate at the ventrolateral shoulder. Whorl typically inflated and subtrigonal in section with the maximum breadth between the umbilical tubercles; in some species fairly compressed and weakly ornamented. Adult

body-chamber smooth, only with blunt radial bullae around the umbilicus. L and the saddle between E and L asymmetrically divided. Folioles and lobules narrow and fairly long. Distribution; Upper Turonian in Madagascar, Venezuela, Texas, New Mexico (Anonym, 1981), Japan and Sakhalin, although more records are wanted. A doubtful species *Barroisiceras desmoulinsi* DE GROSSOVRE, 1894 might be referred to this genus. Should this be proved so, then *Hourcquia* would persist to the Coniacian and distribute in France. This should be reexamined.

Genus *Pseudobarroisiceras* SHIMIZU, 1932. Type species: *P. nagaoi* SHIMIZU, 1932. Shell moderate to large, involute and narrowly umbilicate; whorl compressed, broadest near the umbilical shoulder, having convergent flanks, obtusely rounded ventrolateral shoulders and fastiagte or very narrowly arched venter, with keel at first but later reduced or lost. Gently flexiradiate ribs on the inner whorl, springing in twos or threes from the weak umbilical bullae, with some inserted ones. Every rib somewhat elevated or swollen at the ventrolateral shoulder and then bent forward to disappear gradually near the mid-venter. Outer whorl nearly smooth with only faint radial bullae around the umbilicus. Suture fairly similar to that of *Hourcquia*. Distribution: Upper Turonian of Japan, although more records are wanted. *Schloenbachia boreaui* DE GROSSOUVRE, 1894, from the Coniacian of France might be referred to this genus.

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