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岐阜県荘川村の手取層群から産出したジュラ紀末期ー白亜紀初期アンモナイト

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Latest Jurassic - Early Cretaceous ammonites from the Tetori Group in Shokawa, Gifu Prefecture

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Abstract

A Jurassic ammonite was known since some time from Mitarai, Shokawa in Gifu Prefecture. Sato and Kanie (1963) described a *Lilloetia* (recte *Lilloettia*) and attributed the Callovian (middle Jurassic) age to the Mitarashi (original spelling) Formation from which the specimen was procured. This has been thought to be a sole time indicator of the Formation until very recent time. In the meantime the members of the Tokai Fossil Society collected a number of ammonites from the same and neighboring localities, which include *Delphinella* cf. *obtusenodosa* (a berriasellid species with ornament-free living chamber). This indicates the uppermost Jurassic to lowest Cretaceous age. Moreover, the above-said *Lilloettia* (revised as *Megaphylloceras* (recte *Macrophylloceras*) by Sato and Westermann, 1991) turned out to be a strongly ribbed phylloceratid as indicated by *Phylloceras*-type sutures observable on some of the new collections. Phylloceratids are generally long-ranging and are not controversial with the above age assignment.

Key words: Latest Jurassic, Early Cretaceous, Ammonites, Tetori Group, Mitarashi Formation, Shokawa

はじめに

福井県南東部九頭竜川上流から岐阜県北部庄川上流地域にかけて手取層群が広く分布する．庄川上流域では濃飛流紋岩に隠されて分布は狭まっているが，全体として手取川上流地域に広く広がる手取層群分布域の東縁部にあたる．地質調査所の 20 万分の 1 地質図「金沢」(鹿野ほか, 1999) には，この地域の層序が手取川上流地域に広く分布する手取層群の下部，九頭竜亜層群ならびに石徹白亜層群の下部を代表するように示されている．

この地域では古く崑(1940)が手取層群の分布・層序・構造を記述した論文を発表している．そこではアンモナイトが産出し，その年代が上部ジュラ紀(原記載のまま)であることが書かれているが，古生物学的な記載はなく単に *Perisphinctes* と示されているだけである．その後前田(1952)が層序の改訂を行い，その中で多数の軟体動物化石の産出を報じた．アンモナイトもその中に含まれているが，この時期にはまだ漠然と Perisphinctid, "*Calliphylloceras*"といった同定にとどまっている．前田は後に手取層群全体のとりまとめを書き，その中でこの地域のジュラ系層序に触れている(前田, 1961)が，庄川上流域のものは属・種名を記さず，Callovian のアンモナイトを産出すると記述するにとどまっている．

この地域から出たアンモナイトを記載したのは Sato & Kanie (1963)が始めてで，庄川支流の御手洗から *Lilloetia* (正確には *Lilloettia*) sp.を報じた．これが現在まで当地域の手取層群から正式に記載された唯一のアンモナイトで，これにもとづくカロビアンの時代が最近まで引用されてきた．

東海化石研究会では当地域から別種のアンモナイトが産することに気づいており，その機関誌「化石の友」の45号(1998)の表紙に以下に記載する*Delphinella*の大型標本の写真が載せられている(リトセラス属の1種と命名されている)．2002年の秋，筆者らは東海化石研究会会員の所有するアンモナイト化石を検討する機会があり，問題の庄川上流の御手洗付近から採集された多数の標本を見ることができた．また瑞浪市化石博物館に所蔵されている同地点産の標本も検討する機会があった．それらの中には，これまで信じられていたジュラ紀中期のカロビアン期のものとは思えないものが含まれていて，地質時代の改訂が迫られる可能性が高くなった．その後代表的な標本について佐藤が鑑定を進め，ジュラ紀末期から白亜紀初頭に生存したBerriasellidae科の仲間があることが明らかになった．

一方，Sato & Kanieの*Lilloettia*は当初から同定に疑問が持たれていたが，その後Sato & Westermann (1991)によって螺環の形や肋の強さなどなどからアラスカから産する*Megaphylloceras* (recte *Macrophylloceras*) *grossicostatum* Imlayに同定し直された．ただしここではPhylloceratidae科の同定に重要な縫合線が観察されていないという弱点があった．今回調べた東海化石研究会会員のコレクションの中には，外見がこれと全く同じで，明らかな*Phylloceras*型の縫合線をもつものがあることがわかり，Phylloceratidae科の属であるという同定の信憑性が保証された．このため，新たに加わった材料を含めて，この類の再鑑定を進めたところ，Phylloceratidae科の一員である*Partschiceras*とするのが適当であるという結論になった．この属はその生存期間が長く，ジュラ紀前期から白亜紀前期におよび，上記のBerriasellidが示す年代との矛盾はない．

この論文では以下にこれらのアンモナイトの記載を中心にして，地質時代の改訂を試みることにする．

産出地点

問題のアンモナイト化石群集は御母衣ダム南端の牧戸で庄川本流に南西方向から合流する御手洗川沿いの数地点である．牧戸の南西にある御手洗集落のすぐ西側の地点を中心に国道156号線沿いに分布する．アンモナイトの産出地点とそのごく近傍のスケッチ・マップを第1図に示す．

化石産地#1はかってSato & Kanie (1963)が記載した*Lilloettia*が発見された地点である．この露頭は一時採石場であったところで，これまで大型の*Berriasella*類や*Lytoceras*類のものを含め多数の化石を産したようである．現在は斜面下部の露頭として残っているのみで，風化が進みこれ以上の探索はできない状態である．本論文中で記載したものを含め，*Delphinella* cf. *obtusenodosa*や，*Partschiceras* cf. *otekense*の標本がこの地点から採集されている．

化石産地＃2は同じく採石場の一部であったもので，アンモナイトも発見されている．*Delphinella* cf. *obtusenodosa*を産した．

化石産地＃3は砕石に際して残された堅硬な岩塊で，その走向傾斜が特異な方向をとることから判断して，砕石場稼働時に背後の斜面上部から転落したものと思われる．本論文で記述するものを含め，*Dephinella* cf. *obtusenodosa, Partsciceras* cf. *otekense*の標本が発見されている．なお，*Berriasella*の種と思われるものもここから発見されている．

化石産地#4は御手洗川の河岸の連続した露頭で，アンモナイトやほかの軟体動物化石が多数発見される．*Partschiceras* cf.

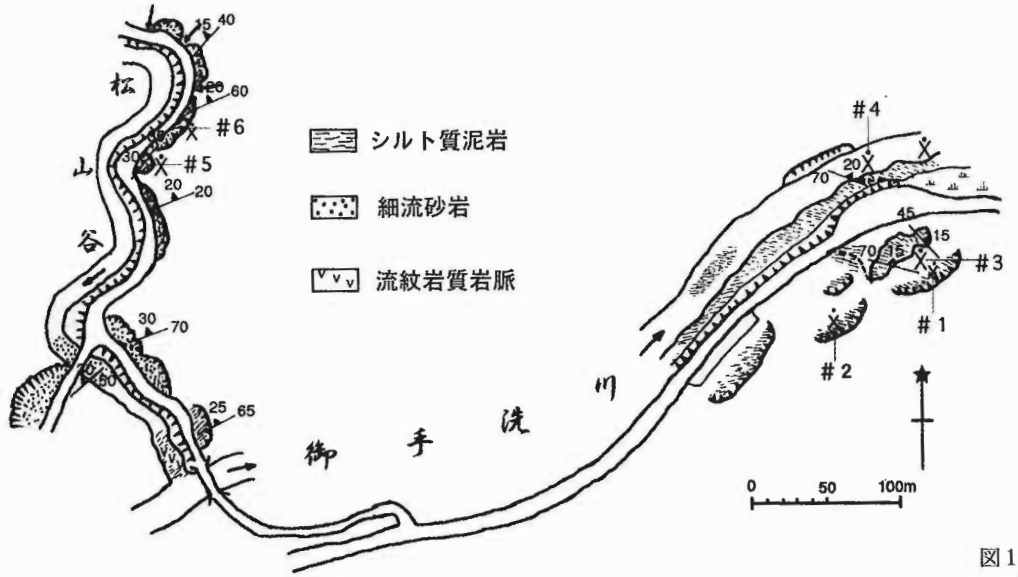


図1．アンモナイト産出地点付近地質スケッチ・マップ．
Fig. 1. Sketch map around the localities of ammonites.

otekense(幼殻)が発見されている．この露頭で見られる地層の走向・傾斜はこの地域の一般方向を示していると考えられる．

化石産地# 5 は松山谷の入り口の道路脇の切割で，道路工事に際して多数のアンモナイトが発見された．*Delphinella* cf. *obtusenodosa, Partschiceras* cf. *otekense, Lytoceras* sp.を産する．*Delphinella* cf. *obtusenodosa* の成殻はこの地点から発見された．

化石産地＃ 6 もほぼ同じ層準で，かってアンモナイト化石を少数産した．*Partschiceras* cf. *otekense* がこの地点から発見されている．

以上の 6 地点間の層序関係はまだ確かめられていない．とくに，やや離れた地点＃ 5，6 と地点 1, 2, 3, 4 の間の層位関係を地質図学的に確かめることができない．したがって各化石の精密な層序上の位置を決定することができないのが現状である．しかし，一般的な地層の走向傾斜や，含有する化石群集の構成からみて，以上の産出地点がおおまかには同じ層準にあることは確実である．

層　序

従来御手洗川に沿うシルト質岩および砂岩は，手取層群の一員に含められており，崑(1940)によって御手洗層の名前が与えられた．この層の分布はこれまで発表されてきた地質図によって多少分布に違いはあるが，一般的にほぼ東西の走向をもち，ゆるく北方向に傾く同斜状構造をとる．今回あらためて化石産地付近の層序の詳細を調べたが，これに改訂を加える必要はなかった．後述するように，この論文に記載するアンモナイト群集によって，時代はこれまで受け入れられていたものより若いと推定されるが，層序区分自体はこれまで通りで差し支えないものと考えられる．

なお御手洗の地名は「みたらい」と発音するのが正確のようであるが，地層名は原著者(崑 1940)の綴りを尊重して英文では Mitarashi Formation と表記した．

Systematic Descriptions of Ammonites

(Number of specimen starting with the code MFM denotes the registered number of Mizunami Fossil Museum)

Family Phylloceratidae Zittel, 1884
Genus *Partschiceras* Fucini, 1923

Partschiceras cf. *otekense* Stevens, 1997

(Pl. 1, Figs. 1-3, 5-7)

1963 *Lilloetia* sp. Sato and Kanie, p. 8, Text-fig. 1.
1991 *Megaphylloceras* (recte *Macrophylloceras*) *grossicostatum* Imlay, Sato and Westermann, p. 87.
cf. 1997 *Partschiceras otekense* Stevens, p. 21, pl. 2, figs. 2, 3.

Materials: Some tens of specimens all incomplete, but showing characteristic whorl section and ribbing of *Partschiceras*. All collected from the fossil localities around Mitarai. Collections of many collectors of the Tokai Fossil Society, and all described herein are stored in Mizunami Fossil Museum.

Measurements: Most of the specimens are crushed or immature. Measurements of the preserved whorls of the following three specimens are given below. D: Diameter; UD: Umbilical Diameter; U/D: ratio of UD to D; H: Whorl height, in cm.

Specimen MFM220101 (Pl. 1, Fig. 1): D 7; UD 1.5; U/D 0.21; H 3.5

Specimen MFM220102 (Pl. 1, Fig. 2): D(observable maximum) 7; UD ca 0.7cm; U/D ca 0.1; H(observable maximum) 3.5.

Specimen MFM220106 (Pl. 1, Fig. 6): D 3.8; UD ca 0.7; U/D 0.18; H 1.7.

Description: Whorls very involute, flank largely inflated, ventral region rounded. Ribbing more or less dense, blunt, fine on the juvenile whorls but more obtuse on the adult whorls, generally rectiradiate, mostly simple but some acutely bifurcate on the lower to middle part of the flank, with rather frequent intercalatory ribs on the outer part of the flank. Ribs continuous until umbilical margin. No constrictions. Suture lines definitely phylloceratid, deeply incised, characterized by leaf like folioles on the saddles.

Comparison and Remarks: The specimens studied here are all fragmentary, except a few specimens rather well preserved up to the mature stage (Pl. 1, Figs. 1 and 2), which show very involute whorls with inflated whorl section. The whorls are ornamented with well distinguishable but rather obtuse ribs, unlike generally fine ribbing of *Phylloceras*. Sato and Kanie's *Lilloettia* sp. obviously belongs to this same species, judged by characteristic whorl shape and ornamentation. Ribs on some of the inner whorls are fasciculate at the umbilical margin and sometimes bifurcate at the middle of the flank (see Pl. 1, Fig. 3). It is however not certain whether these features are general rules of this species or not; these immature specimens could belong to other species.

Partschiceras is characterized by blunt ribbing gradually setting on venter and outer flank. Arkell et al. (1956) held the generic status for this phylloceratid, and included *Macrophylloceras* as a synonym. Among many species belonging to this subgenus, *P. otekense* Stevens (Stevens, 1997, Pl. 2, Figs. 2, 3) from New Zealand is judged to be very close to the Mitarai species by similar ribbing and whorl shape, especially by persistence of ribs at the umbilical border. However, because of imperfect state of preservation, the present species is here described as a comparable species of *P. otekense*.

The former identification of *Lilloettia* by Sato and Kanie was done on a single, fragmentary specimen from Mitarai, without observing its sutures. In the present collection, a small specimen (MFM220106, Pl. 1, Figs. 6a, b), which can be judged to belong to the same species, shows clearly phylloceratid sutures with rounded leaf-like lobules on the saddles (Pl.1, Figs. 6c, d). This is the definite evidence in favor of the assignment to a genus of Phylloceratidae.

Sato and Westermann (1991) erroneously introduced the generic name *Megaphylloceras* in the Range chart of Japanese Jurassic

ammonites, which should be corrected as *Macrophylloceras*. However, this identification should be abandoned as described above.

Geologic Formation: Mitarashi Formation (original spelling by Iwaya, 1940), Tetori Group.

Geologic Age: Lower Jurassic to Lower Cretaceous.

Collection: M. Umemoto (MFM220101, Pl. 1, Fig. 1); Mizunami Fossil Museum (MFM220102, Pl. 1, Fig. 2); S. Tomita (MFM220103, Pl. 1, Fig. 3); K. Yano (MFM220105, Pl. 1, Fig. 5; MFM220106, Pl. 1, Fig. 6).

Family Lytoceratidae Neumayr, 1875
Genus *Lytoceras* Suess, 1865

***Lytoceras* sp.**
(Pl. 1, Fig. 8)

Material: A fragmentary specimen collected from Locality #5 (Masuyama-dani). Collection K. Yano, stored in Mizunami Fossil Museum.

Measurements: The following measurements are made on the preserved part, in cm.

Specimen MFM220107 (Pl. 1, Fig. 7): D 5.4; UD 2.1; U/D 0.38; H 1.

Description: Whorls evolute, overlapping only peripheral part of the preceding whorls. Whorl section unknown but flank slightly inflated and umbilical shoulder distinct and abruptly inclined toward shallow umbilicus.

Ornamentation changes during the ontogeny. Up to the diameter of about 2-3 cm, the whorls look smooth and devoid of ribs. In the following stage, with diameter more than about 3 cm, whorls are covered entirely by very fine, straight, undivided simple ribs. Narrow, straight constrictions, 4-5 in number per whorl are clearly observable throughout the ontogeny. Sutures unknown.

Comparison and Remarks: The present specimen is apparently immature, judged from their overall sizes, which prohibits the decisive identification. However, the smooth young whorls followed by very fine, dense straight ribs and regularly spaced sharp constrictions reveal that the specimens belong to a *Lytoceras* without flared ribs. Typical is *L. elegans*, on which Beznossov (1956) established a genus *Valentolytoceras*. This genus was later treated as a sysnonym of *Lyotoceras* s.s. by Wright et al.(1996). The present specimen, at least in its ribbed stage, is very similar to *elegans*.

Geologic Formation: Mitarashi Formation, Tetori Group.

Geologic Age: The genus *Lytoceras* suggests a wide range covering Jurassic and Cretaceous, but incapable to point more detailed age.

Collection: K. Yano (MFM220107, Pl. 1, Fig. 7).

Family Berriasellidae Spath, 1922
Genus *Delphinella* Le Hegarat, 1971

***Delphinella* cf. *obtusenodosa* (Retowski)**
(Pl. 2, Figs.1a, b; Pl. 3; Pl. 4, Figs. 1-8)

Materials: More than eight specimens collected from the Localities #1, 2. 3 and 5 (Fig. 1). Three adult specimens are collected from Locality #5 (Matsuyama-dani). All specimens are more or less compressed and deformed into elliptical shape. Various collections of the members of Tokai Fossil Society. All specimens described herein are stored in Mizunami Fossil Museum.

Measurements: Measurements are made on some of the relatively well preserved whorls, D: Diameter of preserved whorls; UD: Umbilical diameter; U/D: Ratio of umbilical diameter to diameter; H: Height of whorl, in cm.

Specimen MFM220108 (Pl. 2, Figs. 1a, b, Pl. III): D 18; UD 6.7; U/D 0.37; H 5.

Specimen MFM220109 (Pl. 4, Fig. 1); D 4.8; UD 1.8; U/D 0.31; H 1.7.

Specimen MFM220110 (Pl. 4, Fig. 2): D 5.3; UD 2cm; U/D 0.37; H 2

Specimen MFM220112 (Pl. 4, Fig. 4): D 3.3; UD 1.4; U/D 0.42; H 1.4

Specimen MFM220113 (Pl. 4, Fig. 5): D 4.6; UD 1.7; U/D 0.36; H 1.6

Specimen MFM220114 (Pl. 4, Fig. 6a, b): D 8.5; UD 3.2; U/D 0.37; H 3.5

Specimen MFM220115 (Pl. 4, Fig. 7): D 6; UD 2.3; U/D 0.38; H 2.5

Description: Shell of moderate to large size, developing rather rapidly. Whorl shape and ornamentation change distinctly during the ontogeny; general feature of the inner whorls is of Berriasellid type (young stage), while the outer whorls become almost entirely smooth with blunt swells (senile stage). Transition between these two stages is rather abrupt, taking place at the diameter of about 4-5 cm. Whorls evolute throughout the ontogeny, with open shallow umbilicus in the young stage, and relatively narrower and deeper umbilicus in the senile stage. Flanks in the young stage are flat, but inflated in the senile stage, with strongly inclined umbilical wall. Ventral region is difficult to examine, because of poor preservation, but in the senile stage it is smooth and rounded. Ribs in the young stage generally rectiradiate and sinuous, irregularly biplicate (rarely triplicate) at the middle flank; intercalatory ribs are often inserted on the outer part of the flank. Primary ribs are sometimes swelled on the inner flank, but never develop to true bullae or tubercles. In the senile stage ribs almost fade away, and radial irregular swells remain on the flank, especially on the outer part. No constrictions. Sutures are characterized by strong, trifid first lateral lobe and rapidly declining umbilical lobes. Some of the small specimens (e.g. MFM220109, Pl. 4, Fig. 1) are judged to be micoconches as suggested by moderately developed lappet and irregular ribbing near the aperture.

Observation: At first glance, it seems that the figured specimens represent two different species; one large, smooth species and the

other small Berriasellid. However, if we trace the ontogeny on some well-preserved specimens, it is clear that the small *Berriasella*-like whorls represent the young stage, while large, smooth whorls the senile stage. In fact, the *Berriasella*-like inner whorls are observable in the umbilicus of the large specimens (see for instance Pl. 2, Fig. 1a and Pl. 4, Fig. 6a).

In the young, ribbed stage, whorls are rather evolute, with compressed oval whorl section, presumably much higher than wide, and ornamented with irregularly bifurcated, more or less sinuous ribs. There are no tubercles at the points of furcation but on some specimens ribs are slightly swollen on the inner half of the flank (Pl. 4, Fig. 3). The ventral region is generally difficult to observe, but is likely to have no keels in the young stage. It is definitely rounded and devoid of furrows nor keels in the senile stage. Umbilicus is open and shallow, as large as about 40 % of the diameter. A specimen (MFM220109, Pl. 4, Fig. 1) shows a short lateral lappet, accompanied with irregular sinuous ribs near the aperture. This suggests that the specimen is a microconch. Specimens MFM20110 and 220113 (Pl. 4, Figs. 2 and 5) seem to be microconches as well, as suggested by irregular ribbing appearing at the latest part of the preserved whorls. In the senile, smooth stage, all the ribs become suddenly faint and eventually fade away. Sometimes gentle swells survive, especially on the outer flank (e.g. Pl. 3). In some cases, fine striae are seen on some of the outer whorls, instead of swells (Pl. 4, Fig. 6). In this stage the whorls grow rather rapidly, and whorl section becomes more inflated laterally than in the young stage. Umbilicus becomes deeper, bounded by gently convex umbilical margin. Unfortunately no apertural margin is preserved in the senile whorls, but the general shape suggests that these represent macroconches.

The transition from the younger to senile stages is rather abrupt, as seen on large specimens (Pl. 2; Pl. 3; Pl. 4, Fig. 6).

On a specimen (MFM220108, Pl. 2, Fig.1a), sutures show deeply incised lobes and saddles, with an important first lateral lobe, asymmetrically trifid, followed by rapidly reducing in size but still deeply incised, umbilical lobes.

Comparison: In general, *Berriasella* comprises forms of widely variable ornamentation, as pointed out by Mazenot (1939). He accordingly classified the genus into 2 sections and 3 series, each of which is further divided into form groups on the basis of such aspects as existence or absence of ventral groove, mode of furcation of ribs, number of rows of tubercles on the side, etc. Among these, he identified two groups with smooth adult whorls, represented by *Berriasella delphinensis* and by *Berriasella fischeri* respectively. The first group is characterized by the existence of ventral furrow, while the second by the non-existence of it. The first group is later designated as a genus, *Delphinella*, by Le Heggarat (1971), of which the type species is *Hoplites delphinensis* Kilian. Among the species attached to this genus, *Delphinella obtusenodosa* (Retowski) resembles the present species to a considerable degree, in its whorl shape and ornamentation. As the young whorls of *D. obtusenodosa* are provided with more regular, straight, dense ribbing and with more prominent umbilical bullae on the smooth whorls, the Mitarai form can not be totally identified with this species, but remains a comparable species of *D. obtusenodosa*.

Mazenot (1939) cited also a group of *Berriasella fischeri*, which has also smooth adult whorls, but without ventral groove. He cited in this group only *B. ardescensis* (Mazenot, 1939, Pl. 23, Fig.6), which has rather strong ribs on the penultimate whorl, and is clearly different from the present one. Nikolov (1982) created a genus *Boncheviceras*, based solely on this species, but it seems useless to establish an independent genus.

The two-stage ontogeny can be seen in other species of *Delphinella*, but all others are to some degree different from the Mitarai species in whorl features and ornamentation. Despite the ventral region remains unknown, the present species is here designated as *Delphinella* cf. *obtusenodosa* (Retowski).

Geologic Formation: Mitarashi Formation, Tetori Group.

Geologic Age: *Delphinella* ranges from Late Tithonian to Berriasian in age, mostly in Tethys-Pacific region. *D. obtusenodosa* is commonly known in the Upper Tithonian and Berriasian of the Tethys region, such as SE France, Tunisia and Crimea. The more precise age of the present Mitarai specimens is not decided, because no age-sensitive companion ammonites are discovered so far, so that it is here dated simply from Upper Tithonian to Berriasian.

Collections: Various collections of the members of Tokai Fossil Society. K. Kato (MFM220108, Pl. 2); K. Yano (MFM220109, Pl. 4, Fig. 1; MFM220111, Pl. 4, Fig. 3); S. Tomita (MFM20110, Pl. 4, Fig. 2); Mizunami Fossil Museum (MFM220112, Pl. 4, Fig. 4); H. Kato (MFM220113, Pl. 4, Fig. 5); K. Hachiya (MFM220114, Pl. 4, Fig. 6); F. Sakakura (MFM220115, Pl. 4, Fig. 7).

Genus *Berriasella* Uhlig, 1905

***Berriasella* sp.**

(Pl. 1, Fig. 4; Pl. 4, Fig. 8)

Materials: Small incomplete specimens from Loc. #3 and 5. Mitarai and Matsuyama-dani.

Measurements: On preserved whorls, D: Diameter of preserved whorls; UD: Umbilical diameter; U/D: Ratio of umbilical diameter to diameter; H: Height of whorl, in cm.

Specimen MFM220116 (Pl. 4, Fig. 8): D ca 5.5; UD 1.3; U/D ca 0.23; H 2.3.

Observation: These are incomplete specimen showing somewhat different ribbing from accompanying *Delphinella*, and are here treated as a separate species. The preserved whorls show rather involute coiling, with relatively small umbilicus (U/D about 0.2), with flat flank and rounded narrow ventral region, in which no ventral furrow seems to exist. The flank is ornamented with irregularly bifurcated or sometimes bidichotomous ribbing. Some irregular interspaces between ribs are observable. Some of the primary ribs are slightly swollen, but at the umbilical margin, ribs fade away, without any umbilical bullae nor tubercles. No sutures are visible.

Remarks: As they are a fragmentary specimens, no definitive sys-

tematic assignment is possible. However, judged by the general feature of ribbing, it can be compared to some of the *Berriasella* species.

Among many *Delphinella* specimens collected from the nearby localities, these specimens show particular ornamentation, so that They are treated as a separate species.

Geologic Formation: Mitarashi Formation, Tetori Group.

Geologic Age: Age uncertain, but most probably Late Jurassic to Early Cretaceous, judged from the age of the accompanying species.

Collection: K. Hachiya (MFM22014, Pl. 1. Fig. 5); T. Hayashi (MFM220116, Pl. 4, Fig. 8).

地質時代

これまで御手洗層の年代は Sato & Kanie(1963)の *Lilloettia* sp. に基づいてカロビアンに対比されていた. この同定はその後 Sato & Westermann (1991) によって *Megaphylloceras grossicostatum* に改訂されたが, その年代は従来とおりに保持されていた. 今回, これまで蒐集されてきたアンモナイトの標本を調べてみると, これまでカロビアンとの対比の根拠とされた *Lilloettia* という同定は不完全な標本による誤った同定であることが明らかになったので, この対比を採用することはできない. 一方, 新たに記載された *Delphinella* は Berriasellidae 科の属で, これまで日本から報告されたことはない. しかし, 広義の Berriasellid はこれまでに日本各地から知られている. たとえば, 南部北上山地, 阿武隈地方, 大分県下からの産出が報告されている (Sato, 1958 ; Sato & Takizawa, 1971 ; Noda, 1972). このうち南部北上山地と阿武隈地方のものは, 随伴する属種との組み合わせから Berriasian を指示するものと考えられている. 御手洗層の *Delphinella* は, それ単独ではジュラ紀最後期から白亜紀初期を指示するにとどまり, それ以上の細かい年代は分からない.

さらに詳しい年代の対比には他の種との組み合わせが必要である. 同伴するアンモナイトのうち, *Lytoceras* は詳細な年代を決定するのに有効でなく, 漠然とジュラ紀ないし白亜紀を指示するにとどまっている. またこれまで *Lilloettia* とされてきた *Partschiceras*) もジュラ紀後期に多産する傾向があるが, 詳しい年代を指示することができない. 比較した種 *P. otekense* はニュージーランドの Tithonian 中部から産するが, この特定の種の年代をそのまま日本に適用できるかどうかは疑問である.

したがってここに記載したアンモナイト群集が示す地質時代は Tithoninan-Berriasian を示すに留まる. しかしながらこれまでジュラ紀中期とされてきた年代が, 大幅に若返ることになり, この地域におけるジュラ系／白亜系の境界が御手洗層を挟んでその上下のいずれかにあることを示すことになる.

最近, 小松(2002)によって手取層群の淡水・汽水成層の化石群集の解析が進み, 御手洗層の上位に続くジュラ・白亜系境界層から産出する二枚貝類が明らかに白亜紀の年代を示すことが指摘され, この地域におけるジュラ系・白亜系の境界の位置が問題とされるにいたった. この小論で明らかになった新たな年代はこの問題に重要な鍵を与えることになろう.

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Plate 1

図 1. *Partschiceras* cf. *otekense* Stevens, × 1. 松山谷, 地点＃ 6, MFM220101 梅基昌之採集.
図 2. *Partschiceras* cf. *otekense* Stevens, × 1. 御手洗, 地点＃ 3, MFM220102 瑞浪市化石博物館蔵. a. 側面, b. 腹面.
図 3. *Partschiceras* cf. *otekense* Stevens, × 1. 御手洗, 地点＃ 1, MFM220103 冨田進採集.
図 4. *Berriasella* sp. × 1 . 松山谷, 地点＃ 5, MFM220104 蜂矢喜一郎採集.
図 5. *Partschiceras* cf. *otekense* Stevens, 幼殻, × 1 . 御手洗, 地点＃ 4, MFM220105 矢野一生採集.
図 6. *Partschiceras* cf. *otekense* Stevens, 幼殻, × 1 . 松山谷, 地点＃ 5, MFM220106 矢野一生採集. a. 外型, 全体の側面, × 3;b. a と同じ標本, ただし縫合線を示す螺環の一部を元の位置においたもの(左上のやや白っぽい部分). × 3;c. b の縫合線を示す部分の側面, × 3;d. b の縫合線を示す部分の腹面, × 3. c と d で見られるフィロセラス型縫合線, とくに丸い葉型の総部に注意.
図 7. *Lytoceras* sp., × 1.松山谷, 地点＃ 5, MFM220107 矢野一生採集.

Fig. 1. *Partschiceras* cf. *otekense* Stevens, × 1. Matsuyama-dani, Loc. #6, MFM220101, coll. Masayuki Umemoto.
Fig. 2. *Partschiceras* cf. *otekense* Stevens, × 1. Mitarai, Loc. #3. MFM220102, Mizunami Fossil Museum. a. Lateral view, b. Ventral view.
Fig. 3. *Partschiceras* cf. *otekense* Stevens, × 1. Mitarai, Loc. #1, MFM220103, coll. Susumu Tomita.
Fig. 4. *Berriasella* sp. × 1. Matsuyama-dani, Loc. #5, MFM220104, coll. Kiichiro Hachiya.
Fig. 5. *Partschiceras* cf. *otekense* Stevens, inner whorls,× 1. Mitarai, Loc. #4, MFM220105, coll. Kazuo Yano.
Fig. 6. *Partschiceras* cf. *otekense* Stevens, inner whorls. Matsuyama-dani, Loc. #5, MFM220106, coll. Kazuo Yano. a. Lateral view of the outer mold, × 1; b. Same specimen as a, × 1, lateral view of the inner mold, showing a part of phragmocones with suture lines (upper left part of whitish tint); c. Enlarged lateral view of the septate whorls of b, × 3; d. Enlarged ventral view of the septate whorls of b, × 3. Note the phylloceratid saddles on Figs. 6c and d.
Fig. 8. *Lytoceras* sp., × 1. Matsuyama-dani, Loc. #5, MFM220107, coll. K. Yano.

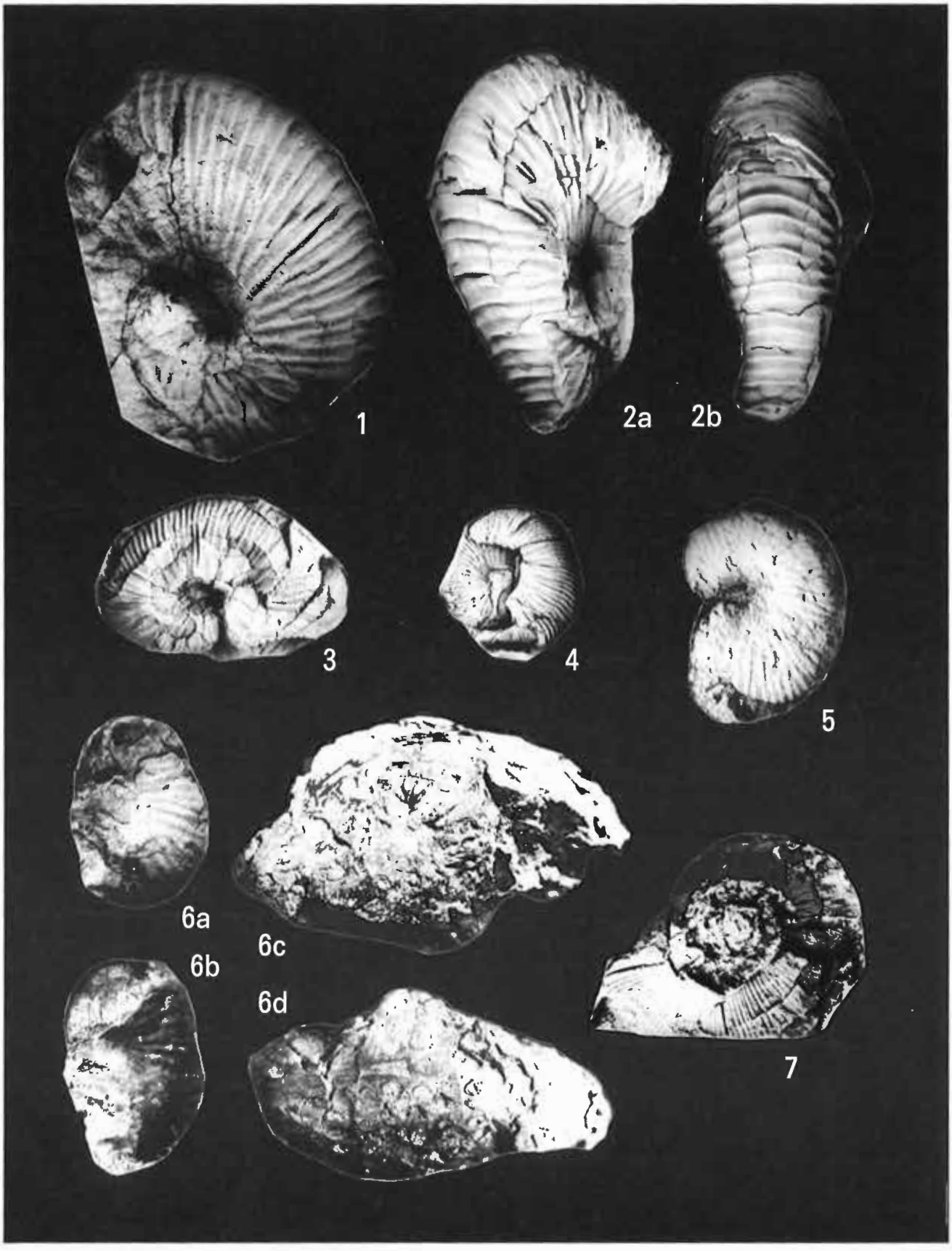

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2a
2b
3
4
5
6a
6b
6c
6d
7

Plate 2

図１．　*Delphinella* cf. *obtusenodosa* (Retowski). 松山谷, 地点＃ 5, MFM220108, 加藤和彦採集, 瑞浪市化石博物館蔵. × 1 . a. 内型の側面, b, 同腹面.

Fig.1.　*Delphinella* cf. *obtusenodosa* (Retowski). Matsuyamadani, Loc.#5, MFM220108, coll. Kazuhiko Kato. Repository: Mizunami Fossil Museum. × 1. a. Lateral view of the inner mold, b. Ventral view of the inner mold.

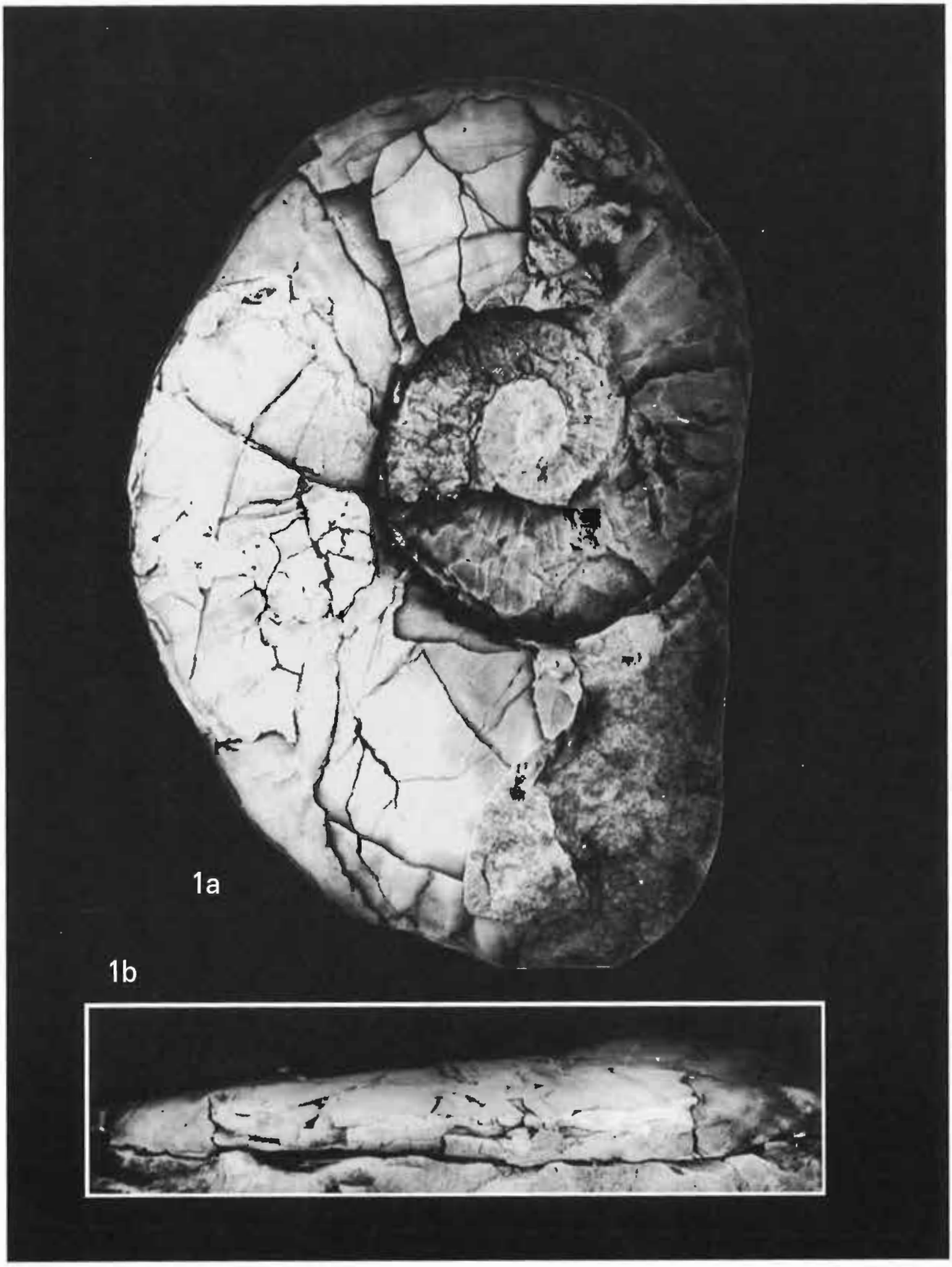

1a
1b

Plate 3

Dephinella cf. *obtusenodosa* (Retowski). 図版 II と同じ標本,外型, × 1.

Delphinella cf. *obtusenodosa* (Retowski). Same specimen as Pl. 2, outer mold, × 1 .

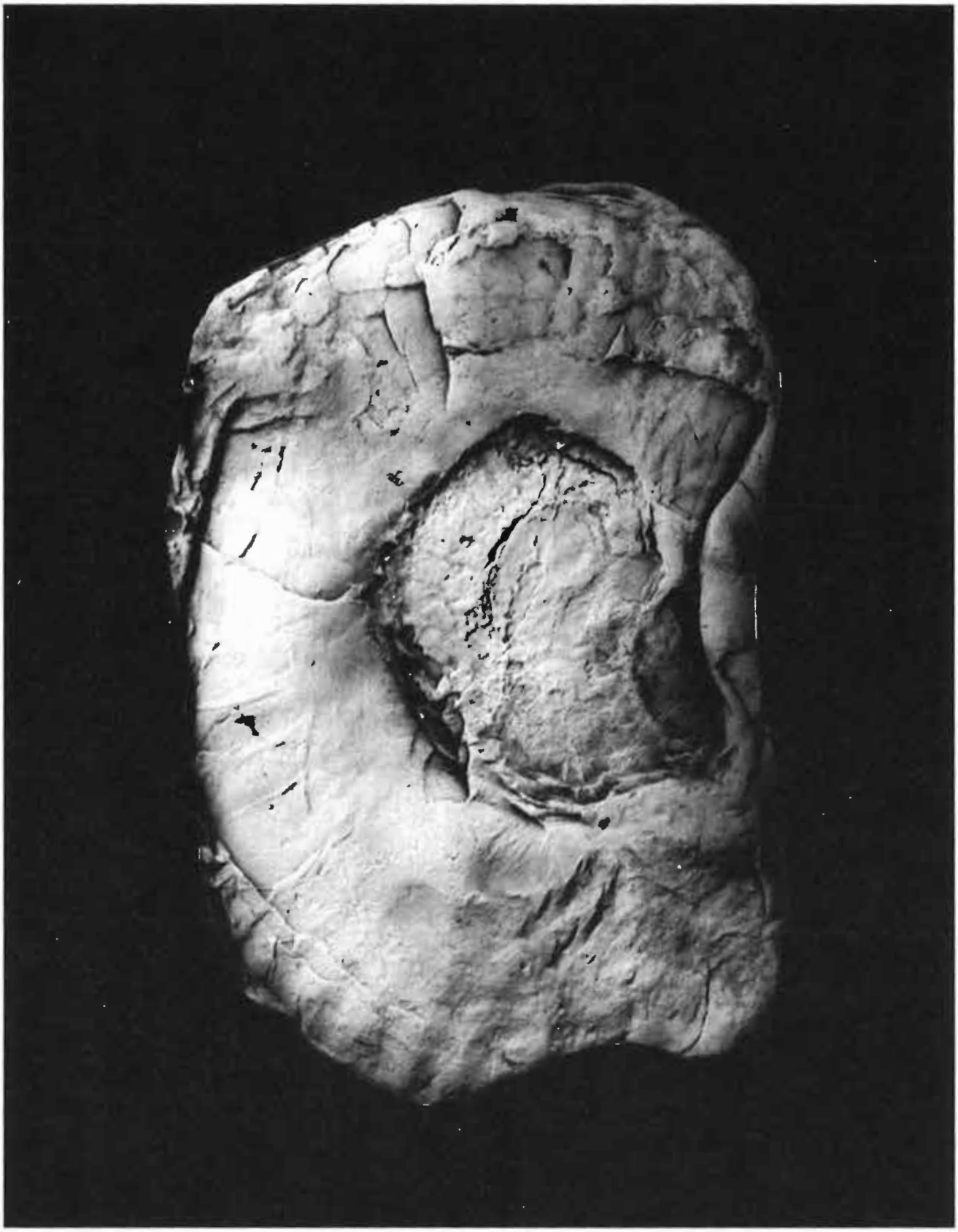
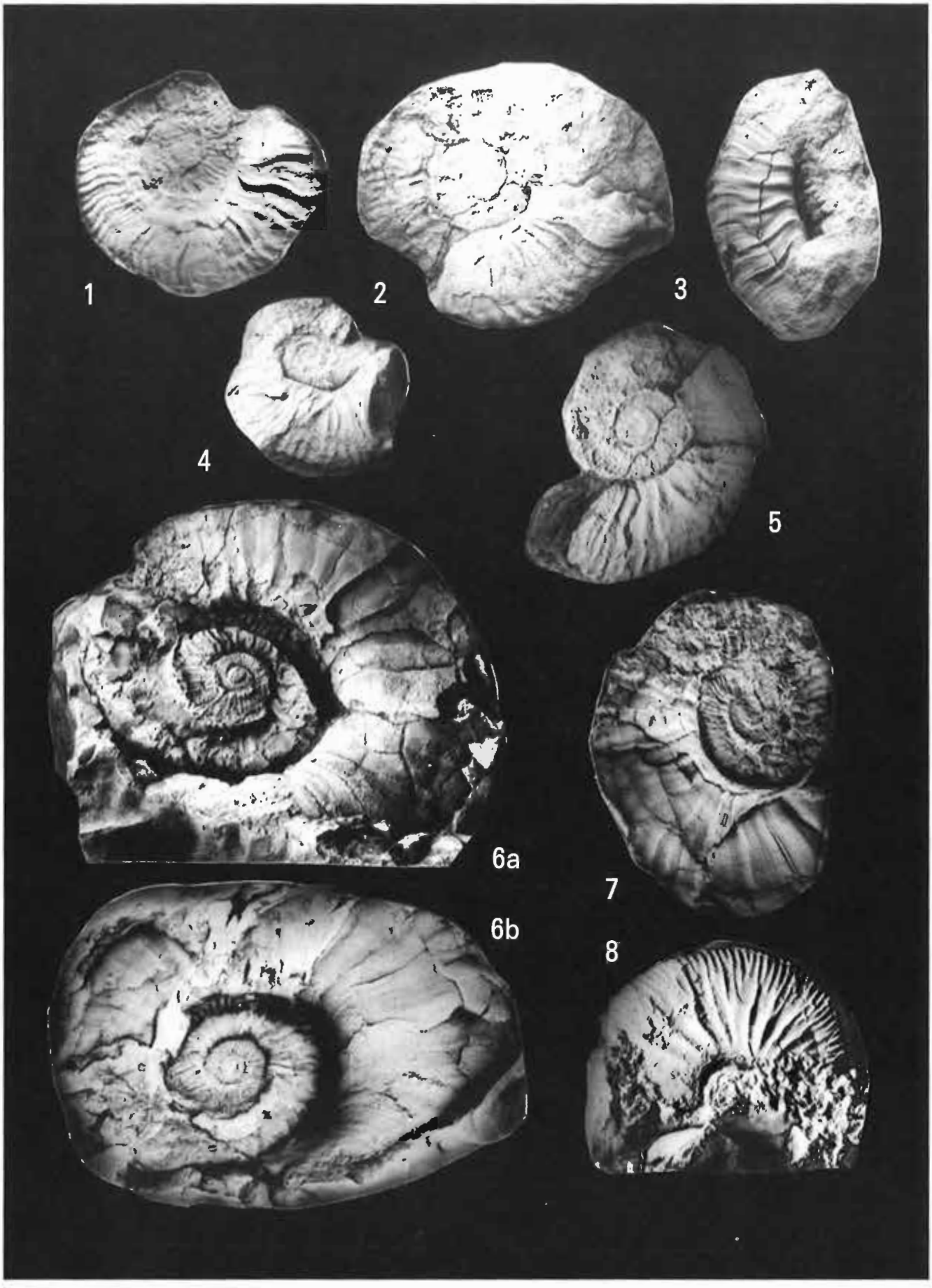


Plate 4

図 1 . *Delphinella* cf. *obtusenodosa* (Retowski), ♂. × 1. 御手洗, 地点＃ 2, MFM220109, 矢野一生採集, 外型.
図 2 . *Delphinella* cf. *obtusenodosa* (Retowski), おそらく microconch, × 1 . 御手洗, 地点＃ 1, MFM220110, 冨田進採集. 瑞浪市化石博物館蔵.
図 3 . *Delphinella* cf. *obtusenodosa* (Retowski), 幼殻, × 1 . 御手洗, 地点＃ 3, MFM220111, 矢野一生採集.
図 4 . *Delphinella* cf. *obtusenodosa* (Retowski), 幼殻, × 1 . 御手洗, 地点＃ 3, MFM220112, 瑞浪市化石博物館蔵.
図 5 . *Delphinella* cf. *obtusenodosa* (Retowski), 幼殻, × 1 . 御手洗, 地点＃ 5, MFM220113, 加藤久夫採集.
図 6 . *Delphinella* cf. *obtusenodosa* (Retowski), ♀, × 1 . 松山谷, 地点＃ 5, MFM220114, 蜂矢喜一郎採集. a. 内型, b. 外型.
図 7 . *Delphinella* cf. *obtusenodosa* (Retowski), ♀, 住房の一部を含む, × 1 . 御手洗,地点＃ 1,MFM220115, 坂倉不二男採集.
図 8 . *Berriasella* sp. 幼殻, × 1 . 御手洗, 地点＃ 3, MFM220116, 林常喜採集.

Fig. 1. *Delphinella* cf. *obtusenodosa* (Retowski), ♂. x 1. Mitarai, Loc. #2, MFM220109, coll. Kazuo Yano. Outer mold.
Fig. 2. *Delphinella* cf. *obtusenodosa* (Retowski), probably microconch, × 1. Mitarai, Loc. #1, MFM220110, coll. Susumu Tomida, Mizunami Fossil Museum.
Fig. 3. *Delphinella* cf. *obtusenodosa* (Retowski), inner whorls, × 1. Mitarai, Loc. #3, MFM220111, coll. Kazuo Yano.
Fig. 4. *Delphinella* cf. *obtusenodosa* (Retowski), inner whorls, × 1. Mitarai. Loc. # 3, MFM220112, Mizunami Fossil Museum.
Fig. 5. *Delphinella* cf. *obtusenodosa* (Retowski), inner whorls, × 1. Mitarai, Loc. #5, MFM220113, coll. Hisao Kato.
Fig. 6. *Delphinella* cf. *obtusenodosa* (Retowski), ♀, ×1. Matsuyama-dani, Loc. #5, MFM220114, coll. Kiichiro Hachiya. a. Inner mold, b. outer mold.
Fig. 7. *Delphinella* cf. *obtusenodosa* (Retowski), ♀, including parts of living chamber, × 1, Mitarai, Loc. #1, MFM220115, coll. Fujio Sakakura.
Fig. 8. *Berriasella* sp., inner whorls, × 1. Mitarai, Loc. #3, MFM220116, coll. Tsuneki Hayashi.


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6b
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