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THE ALBIAN AMMONITES OF POLAND

(AMONITY ALBU POLSKI)

BY
RYSZARD MARCINOWSKI AND JOST WIEDMANN

(WITH 27 TEXT-FIGURES, 7 TABLES AND 25 PLATES)

WARSZAWA—KRAKÓW 1990

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In Memory of Professor
Edward Passendorfer
(1894—1984)

RYSZARD MARCINOWSKI and JOST WIEDMANN

THE ALBIAN AMMONITES OF POLAND

(Plates 1—25)

MARCINOWSKI, R. and WIEDMANN, J.: The Albian ammonites of Poland. Palaeontologia Polonica, 50, 3—94, 1990.

Taxonomic and ecological analysis of the ammonite assemblages, as well as their general paleogeographical setting, indicate that the Albian deposits in the Polish part of the Central European Basin accumulated under shallow or extremely shallow marine conditions, while those of the High-Tatra Swell were deposited in an open sea environment. The Boreal character of the ammonite faunas in the epicontinental area of Poland and the Tethyan character of those in the Tatra Mountains are evident in the composition of the analyzed assemblages. During the Middle Albian, Boreal hoplitids migrated to the Polish areas from the west or northwest, and they gradually spread through the western Ukraine towards the High-Tatra Swell located deep within the Tethyan Realm (i.e., Alpino-Carpathian geosyncline). In the Upper Albian, in spite of an increasing marine transgression, distinct provincialism became evident both in the Boreal and in the Tethyan ammonite assemblages. This apparently resulted from the bathymetry-distance filter which separated the High-Tatra Swell from the platform areas of Poland, a filter which worked more efficiently in the Upper Albian than during Middle Albian time. This phenomenon was widespread in Europe and was caused by changes in climatic and bathymetric conditions rather than by the development of physical barriers (such as landmasses or cordilleras).

In the paleontological section of this paper, two new taxa are described: *Hemiptychoceras tatricum* sp. n. and *Hamites* (*Metahamites*) *passendorferi* sp. n. Described in more detail is *Scaphamites passendorferi* WIEDMANN and MARCINOWSKI, 1985. The genus *Scaphamites* WIEDMANN et MARCINOWSKI, 1985 evolved from hamitids and is the presumed ancestor of the genus *Scaphites* PARKINSON, 1811. It provides evidence that the superfamily Scaphitaceae MEEK, 1876 belongs to the suborder Ancyloceratina WIEDMANN, 1966 rather than to the suborder Lytoceratina HYATT, 1899.

The good state of preservation of the adult specimens permits recognition of micro- and macroconchs among representatives of the genera *Anahoplites* HYATT, 1900, *Callihoplites* SPATH, 1925, and *Mortoniceras* MEEK, 1876.

Key words: Ammonites, taxonomy, paleobiogeography, Albian, Poland.

Ryszard Marcinowski, Institute of Geology, University of Warsaw, Al. Żwirki i Wigury 93, PL-02089 Warszawa, Poland; Jost Wiedmann, Institut und Museum für Geologie und Paläontologie der Universität Tübingen, Sigwartstrasse 10, D-7400 Tübingen, Federal Republic of Germany. *Received: August 1987.*

Streszczenie. — Analiza albskich zespołów amonitowych w profilach Góry Chełmowej koło Przedborza, Annopola nad Wisłą i Wielkiej Równi w Tatrach (fig. 1—2, 4, 6, 9; tab. 2—7) oraz ogólne tło paleogeograficzne wskazują na zróżnicowanie środowisk sedymentacji. W polskiej części basenu centralnoeuropejskiego osady z amonitami tworzyły się w warunkach odpowiadających wewnętrznemu szelfowi, zaś w serii wierchowej Tatr w środowisku wskazującym na szelf zewnętrzny i jego granicę ze stokiem kontynentalnym (fig. 1, 8). Obecność górnoalbskich amonitów w skrajnie płytkomorskich osadach Góry Chełmowej wywołana została pośmiertnym dryfem muszli w strefę płycizn (fig. 3). Masowe nagromadzenia amonitów w Annopolu i serii wierchowej Tatr (Mała Łąka, Wielka Równień, Biała Woda) miały miejsce na wyniesieniach dna, w wyniku kondensacji stratygraficznej o zbliżonym interwale czasowym w poszczególnych profilach (fig. 4, 6 oraz tab. 5—6). W rejonie Annopola powstanie skondensowanej stratygraficznie warstwy fosforytowej (alb środkowy i górny) wiązać należy z tektoniką synsedymentacyjną i zmianami dynamiki środowiska (sztormy). Pozytywny ruch wznoszący nie doprowadził jednak do emersji progu, był bowiem kompensowany eustatycznym wzrostem poziomu morza (fig. 5). Natomiast sedymentacja skondensowanych stratygraficznie węglanowo-fosforytowych osadów serii wierchowej Tatr odbywała się w spokojnym środowisku zatopionej platformy węglanowej urgonu (fig. 7).

Zespoły amonitowe w profilach Góry Chełmowej i Annopola są zdominowane przez borealne hoplitesy, o wydatnej ornamentacji muszli (por. fig. 1A, 9K—L; tab. 2—4), podczas gdy w profilu Wielkiej Równi dominują formy o muszli gładkiej lub słabo ornamentowanej (desmocerasy, fyllocerasy, tetragonitesy, lytocerasy). W tym ostatnim profilu zwraca również uwagę znaczny udział heteromorfów (por. fig. 9 M oraz tab. 7). W albie środkowym borealne hoplitesy migrowały do Polski z północnego zachodu i zachodu i poprzez depresję lwowską docierały do geosynkliny karpackiej, w tym również do strefy sedymentacji serii wierchowej (por. fig. 1B, 8). Borealne wpływy w medyterańskim zespole amonitowym serii wierchowej Tatr (por. fig. 1A oraz tab. 7) umożliwiają stosowanie jednolitego, „borealnego" podziału biostratygraficznego (tab. 1). W albie górnym borealny charakter fauny amonitowej w polskiej części basenu centralnoeuropejskiego jest nadal silnie zaakcentowany, mimo pojawienia się medyterańskiego rodzaju *Mortoniceras*. Rodzaj ten, stosunkowo pospolity w profilu Góry Chełmowej, zanika w kierunku południowo-wschodnim i jest prawie nieobecny w profilu Annopola nad Wisłą (por. tab. 3—4). Zatem mortonicerasy nie mogły migrować z geosynkliny karpackiej. W górnym albie, mimo rozwoju transgresji (fig. 1C), następuje wzrost prowincjalizmu zarówno wśród borealnych, jak i medyterańskich zespołów amonitowych, wywołany powstaniem „filtru" głębokościowo-odległościowego, który separował Tatry od obszaru platformowego Polski skuteczniej niż miało to miejsce w albie środkowym. Ten wzrost prowincjalizmu wiązać należy z klimatem i batymetrią, w mniejszym zaś stopniu z barierami fizycznymi w postaci lądów, czy też kordylier pojawiających się efemerycznie w geosynklinie alpejskiej (WIEDMANN 1973, MARCINOWSKI i WIEDMANN 1985). W prowincji borealnej albskie zespoły amonitowe zdominowane są przez formy odznaczające się wydatną ornamentacją muszli, natomiast w medyterańskiej przez formy gładkie i słabo ornamentowane, przy czym heteromorfy równie często są notowane w obu tych prowincjach (fig. 9). Brak prowincjalizmu wśród wiodących bentoniczny i epibentoniczny tryb życia heteromorfów wyjaśniono dużą tolerancją środowiskową ich stadium młodocianego oraz zdolnością zasiedlania różnych stref ekologicznych (MARCINOWSKI 1974, 1980).

Paleontologiczna część pracy (figs. 10—27, pl. 1—25) zawiera opis 92 gatunków i podgatunków, w tym dwóch nowych: *Hemiptychoceras tatricum* i *Hamites* (*Metahamites*) *passendorferi*. Dokładniej opisano *Scaphamites passendorferi* WIEDMANN i MARCINOWSKI, 1985,

który jest formą przejściową pomiędzy hamitesami i skafitesami. Zmienia to dotychczasową pozycję systematyczną nadrodziny Scaphitaceae MEEK, 1876, która należy raczej do podrzędu Ancyloceratina WIEDMANN, 1966 niż podrzędu Lytoceratina HYATT, 1899. Dobry stan zachowania dorosłych okazów umożliwił rozpoznanie mikro- i makrokonch w obrębie rodzajów *Anahoplites* HYATT, 1900, *Callihoplites* SPATH, 1925 i *Mortoniceras* MEEK, 1876.

CONTENTS

INTRODUCTION

The present monography is an extension of the authors' previous comprehensive report (MARCINOWSKI and WIEDMANN 1985) on the Albian ammonites od Poland. The content of the mentioned above preliminary paper which was published without any paleontological data is purposefully repeated to a large extent here (with several new figures) in order to bring together the investigated ammonites to their geographic and stratigraphic settings along with remarks on their environmental and depositional background. These ammonites, with a stratigraphic age ranging from the *Floridum* to the *Perinflatum* Subzone (Table 1), occur primarily in two regions, namely, in the Central Polish Uplands (Polish Jura and Holy Cross Mountains) and the High-Tatric series of the Tatra Mountains, Inner Carpathians (fig. 1). The geotectonic settings of these two regions during Albian time were different, just as they were throughout the entire Mesozoic. The Central Polish Uplands were part of the southern, marginal part of the epicontinental Central European Basin (see MARCINOWSKI and RADWAŃSKI 1983), while the Tatra Mountains were embraced by the Alpino-Carpathian geosyncline (fig. 8). This difference in geotectonic setting evidently controlled a pronounced faunal differentiation: a Boreal character in the Central Polish Uplands and a Mediterranean one in the Tatra Mountains.

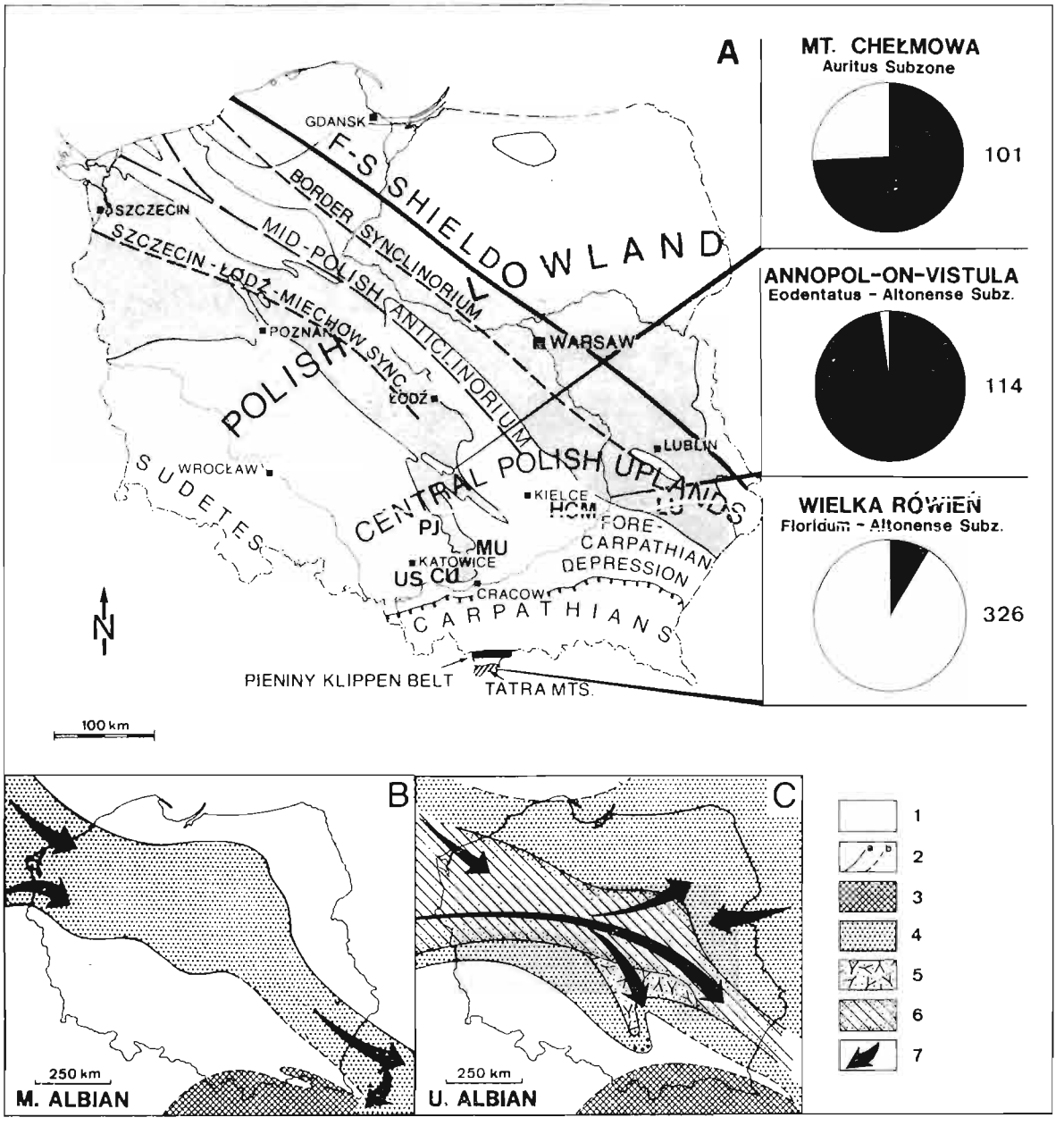

Fig. 1.

The Albian of Poland (after MARCINOWSKI and WIEDMANN 1985)

A — Tectonic sketch map of Poland (without overlying Cenozoic and Upper Cretaceous material) showing distribution of Albian deposits (stippled areas).

The major Laramide tectonic units are indicated by their axial zones; the thick line labelled "F-S Shield" indicates the general outline of the stable margins of the Fenno-Sarmatian Shield; the northern margin of the Carpathians is overthrust. (Albian deposits in the Carpathians are omitted.)

The Central Polish Uplands areas discussed in the text are indicated as follows: *US* — Upper Silesia; *PJ* — Polish Jura; *CU* — Cracow Upland; *MU* — Miechów Upland; *HCM* — Holy Cross Mountains; *LU* — Lublin Upland.

Locations of profiles with known percentages of hoplitid Boreal ammonite fauna (black) and the number of specimens are given here for particular sections: Mt. Chełmowa — *Auritus* Subzone, Annopol-on-Vistula — *Eodentatus* through *Altonense* Subzones, Wielka Rówień — *Floridum* through *Altonense* Subzones.

B—C — Middle and Upper Albian paleogeography of Poland, compiled from the literature (CIEŚLIŃSKI 1959*b*, 1965, 1976; KSIĄŻKIEWICZ 1961, 1962; JASKOWIAK-SCHOENEICHOWA 1979; RACZYŃSKA 1979) and observations from the present study in the Central Polish Uplands. *1* — land areas; *2* — boundaries between land and depositional areas (a: highly probable, b: speculative); *3* — flysch; *4* — shallow water sand (mostly glauconitic); *5* — sand consisting of sponge material (gaizes and spongiolites); *6* — sandy marl and marly sand (mostly with phosphatic nodules and glauconite); *7* — routes of migration of the Boreal hoplitid fauna.

Table 1

Standard biostratigraphic zonation of the Albian in Poland

Substage	Ammonite Zones	Ammonite Subzones
UPPER ALBIAN	Stoliczkaia dispar	Mortoniceras (Mortoniceras) perinflatum Stoliczkaia (Stoliczkaia) blancheti
	Mortoniceras inflatum	Mortoniceras (Mortoniceras) altonense Callihoplites auritus Hysteroceras varicosum Hysteroceras orbignyi Dipoloceras (Dipoloceras) cristatum
MIDDLE ALBIAN	Euhoplites lautus	Anahoplites daviesi Euhoplites nitidus
	Euhoplites loricatus	Euhoplites meandrinus Dipoloceras (Dipoloceroides) subdelaruei Dimorphoplites niobe Anahoplites intermedius
	Hoplites dentatus	Hoplites (Hoplites) spathi Lyelliceras lyelli Hoplites (Isohoplites) eodentatus
LOWER ALBIAN (upper part)	Douvilleiceras mammillatum	Protohoplites puzosianus Otohoplites raulinianus Cleoniceras floridum Sonneratia kitchini

Note: within this zonation, the presence or absence of the *Altonense* Subzone is still under discussion (cf. KENNEDY and HANCOCK 1978, and OWEN 1984). Recently, OWEN (op. cit.) placed the *Eodentatus* Subzone in the uppermost Lower Albian

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AMMONITE SPECTRA AND STRATIGRAPHY IN THE KEY SECTIONS

MT. CHEŁMOWA

(figs. 2, 3 and 9K, and Tables 2 and 3)

The sandy, Upper Albian deposits (see CHLEBOWSKI *et al.* 1978) attain a thickness of some 180 meters, and they contain ammonites only within the middle (20 m thick) portion of the section (fig. 2). This portion consists of medium- to coarse-grained quartz sandstone, locally

cross-bedded, with irregular interbeds of quartz gravels (pebbles 2—10 mm in diameter). Silicified wood fragments bored by bivalves and *Chondrites*-type trace fossils are common, while inoceramids and sponges are less frequent. There are also rare plant fragments (?buried reeds) in growth position.

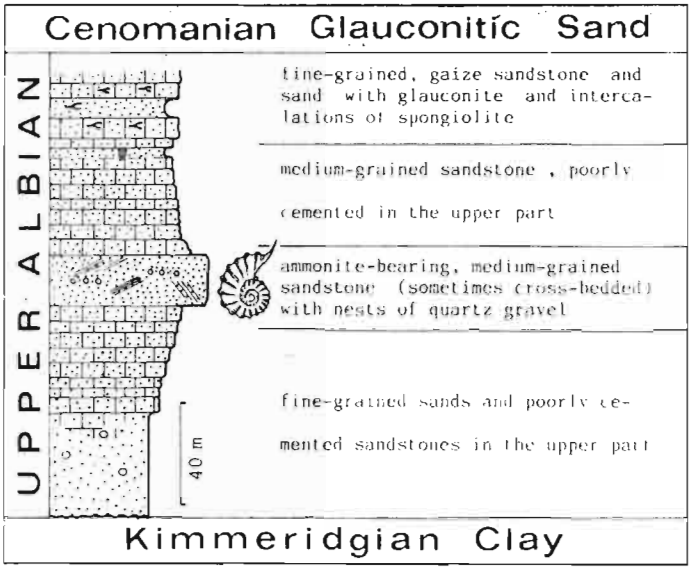


Fig. 2.

Profile of the Upper Albian deposits from Mt. Chełmowa, central Poland.

Ammonites are very scarce in these deposits. Over a twenty-year period, only about one hundred specimens have been collected. They consist primarily of normally coiled shells corresponding to the adult stages of very large or even huge individuals (see Tables 2 and 3). The phragmocones and juveniles of some forms are completely absent.

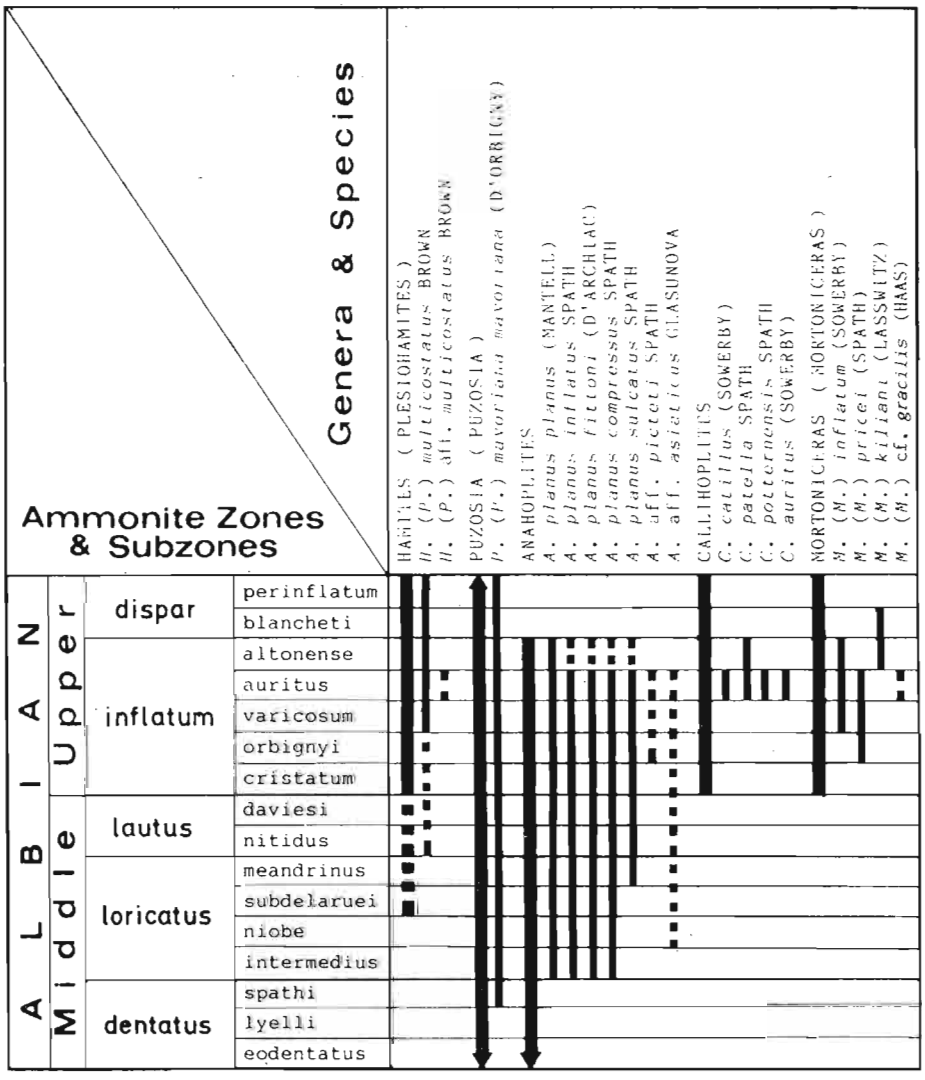
The ammonite assemblage is characterized by the presence of coiled forms displaying pronounced shell ornamentation (e.g., *Callihoplites*, *Anahoplites*, and *Mortoniceras*), which thus corresponds to the trachyostraceous group; few of the ammonites have weakly ornamented shells, thus corresponding to the leiostraceous group (*Puzosia*). In addition, uncoiled forms (heteromorphs) are present. This assemblage is dominated by Boreal hoplitids (see Table 3 and figs. 1A and 9K).

The investigated assemblage (Table 2) is attributed to the *Auritus* Subzone of the *Mortoniceras inflatum* Zone (CHLEBOWSKI *et al.* 1978). This position is confirmed by the large representatives of the genus *Anahoplites* HYATT (up to 190 mm in diameter), which sometimes have smooth body chambers of the *Callihoplites catillus*-type. These features are characteristic of forms of the genus *Anahoplites* HYATT from the *Auritus* Subzone (SPATH 1927: 202). *Mortoniceras* (*Mortoniceras*) *kiliani* (LASSWITZ), a species hitherto known in Europe exclusively from the *Altonense* and *Blancheti* Subzones (SPATH 1932, BREISTROFFER 1947, KENNEDY and HANCOCK 1978) most probably comes from a higher stratigraphic position because the ammonites from the Mt. Chełmowa quarries were not collected from their particular horizons.

The sedimentary environment of the discussed assemblage is thought to have been extremely shallow marine (as indicated by the presence of cross-bedding, gravels, and fragments of wood and plants in growth position). The large, empty ammonite shells were certainly driven by

Table 2

Stratigraphic range of the ammonites from Mt. Chełmowa, central Poland; stratigraphic ranges for the particular genera are also given



Broken line indicates supposed range resulting from (*a*) imprecise stratigraphic dates of the various regions (correlation error), (*b*) imprecise determination of the investigated specimen, or (*c*) from the fact that the form is known exclusively from the condensed sequence; arrow shows that the given taxon extends beyond the stratigraphic interval presented in the tables; double arrow (Table 6) shows that the species is also known from a stratigraphic interval older or younger than that presented in the tables.

the wind toward the shallows which existed far from the mainland (see fig. 3). An extremely shallow marine environment is also inferred, at least in part, by the virtual absence of heteromorphs, whose benthic or epibenthic mode of life required less agitated waters.

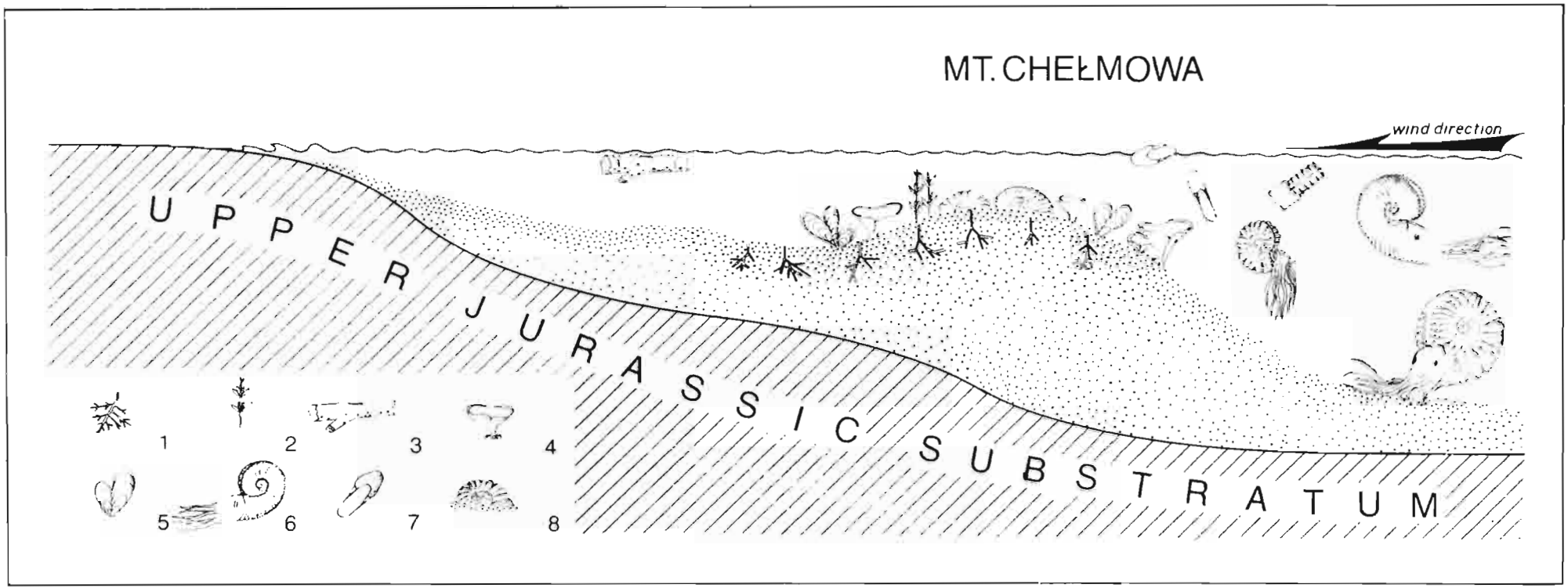


Fig. 3.

Environmental scheme for the ammonite-bearing sandstone from Mt. Chełmowa, central Poland (position of these deposits within the profile is given in fig. 2).
1 — *Chondrites* burrows; *2* — plants (?buried reeds) in growth position; *3* — bored and floating pieces of plants; *4* — sponges; *5* — inoceramids; *6—8* — ammonites: *6* — in life position; *7* — post mortem drift of the shells; and *8* — directly deposited shells.

Table 3

Percentage composition of the ammonites (*Auritus* Subzone) at Mt. Chełmowa, Central Poland (after MARCINOWSKI and WIEDMANN 1985)

Families and Genera	Percentage	Max. diameter in mm
HOPLITIDAE DOUVILLÉ 1890	72.28	
Callihoplites SPATH 1925	44.56	219.5
Anahoplites HYATT 1900	27.72	190
BRANCOCERATIDAE SPATH 1933		
Mortoniceras (Mortoniceras) MEEK 1876	23.76	428
DESMOCERATIDAE ZITTEL 1895		
Puzosia (Puzosia) BAYLE 1875	1.98	215
HAMITIDAE HYATT 1900		
Hamites (Plesiohamites) BREISTROFFER 1947	1.98	Wh=56

ANNOPOL-ON-VISTULA
(figs. 4, 5 and 9L, and Table 4)

The Albian sequence, which overlies Kimmeridgian limestone, begins with poorly glauconitic sand (2 m thick) overlain by compact sandstone, locally quartzitic (up to 3 m thick). This sandstone (unit "A_3" in the lithostratigraphic subdivision of CIEŚLIŃSKI 1959*a*; see also fig. 4) has yielded some rare ammonites (22 specimens). Associated fossils include the large nautiloid *Cymatoceras*, inoceramids, and *Chondrites*-type trace fossils (impregnated with phosphates, and commonly occurring in the topmost part of the unit). All the body fossils are preserved as quartzitic moulds impregnated with phosphates; they are a taphonomical remnant of the original community, i.e., only those organic remains which had been phosphatized prior to diagenetic dissolution and silification have persisted.

The age of the ammonite assemblage (fig. 4) is documented (see MARCINOWSKI and RADWAŃSKI 1983, 1989; MARCINOWSKI and WALASZCZYK 1985) by the presence of *Hoplites* (*Isohoplites*), a subgenus confined to the *Hoplites* (*Isohoplites*) *eodentatus* Subzone of the *Hoplites dentatus* Zone (cf. OWEN 1971, DESTOMBES *et al.* 1973, DESTOMBES 1979). Noteworthy is the occurrence of *Hoplites* (*Otohoplites*) *normanniae* DESTOMBES, 1973, which had formerly been reported from this location under the name *Hoplites* (*Dimorphoplites*) *hilli* SPATH. (We would like to thank Dr. H. G. OWEN, London, for correcting the previous identification).

The sandy deposits certainly accumulated in a shallow marine environment comparable to that in the Mt. Chełmowa section. As at Mt. Chełmowa, large ammonite shells could have floated into the shallow areas, and the absence of heteromorphs could have resulted from unfavorable environmental conditions.

The upper part of the Albian sequence is developed as a bipartite phosphorite bed (units "A_5—A_8" in the lithostratigraphic subdivision of CIEŚLIŃSKI 1959*a*; see also fig. 4).

The lower part of the "phosphorite bed" (units "A_5—A_7" of CIEŚLIŃSKI 1959*a*), which is about 20 cm thick, is highly condensed, as evidenced by the abrasion of all the fossils and by the postdepositional reworking of both phosphatic lumps and fossils (cf. SAMSONOWICZ 1925; MARCINOWSKI and RADWAŃSKI 1983, 1989; MARCINOWSKI and WALASZCZYK 1985). The fossil assemblage consists of normally coiled ammonites, sponges, decapods, inoceramids, bony material (shark and sauropterigian teeth) as well as frequent pieces of wood bored by the bivalve "*Gastrochaena*" *amphisbaena* GEINITZ. All these fossil remains are preserved as phosphatic moulds or as phosphatized parts of skeletons, the wood fragments included.

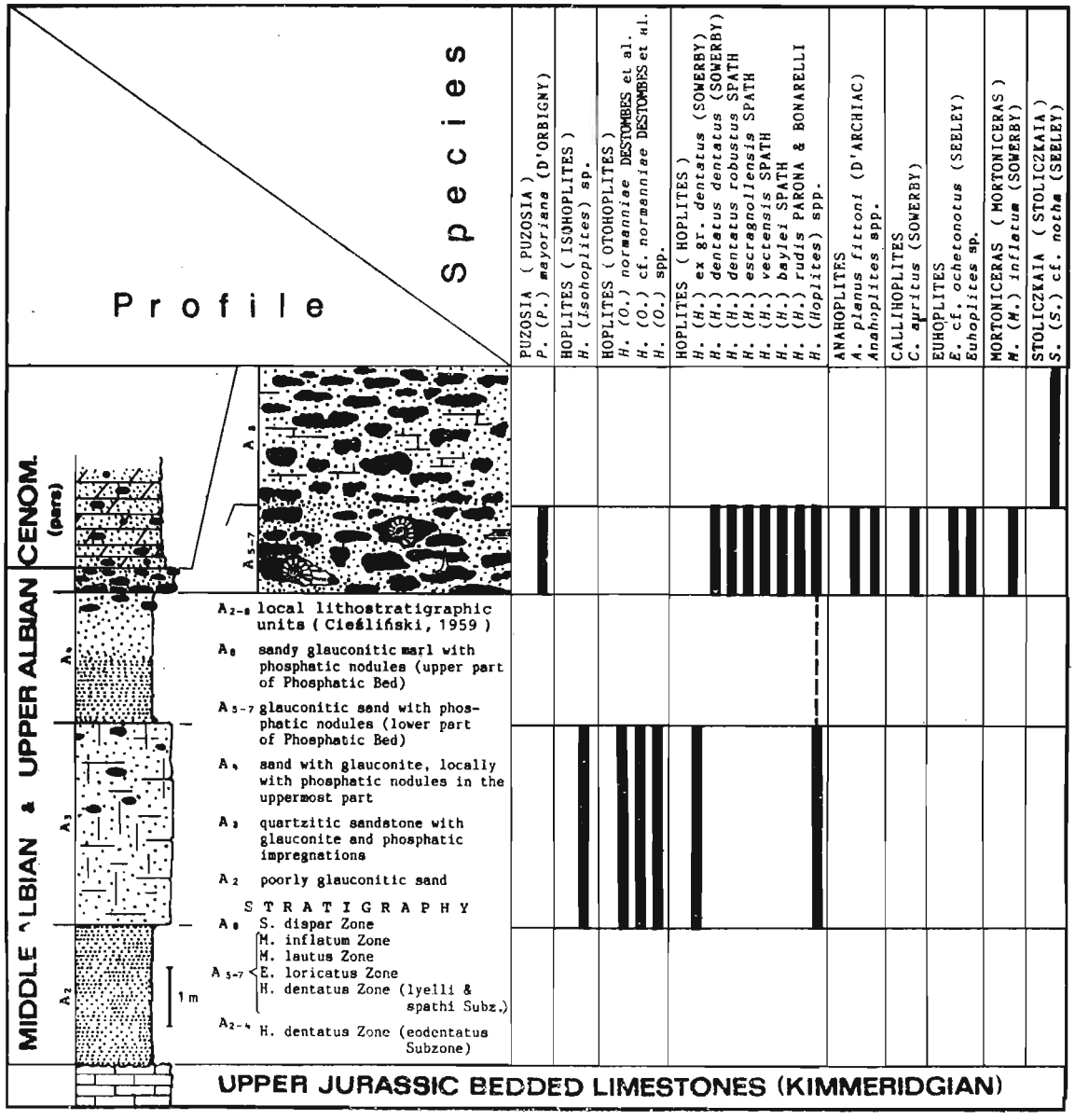


Fig. 4.

Profile of the Albian deposits with stratigraphically condensed phosphatic bed in the uppermost part, and ammonite distribution at Annopol-on-Vistula, central Poland (profile after MARCINOWSKI and RADWAŃSKI 1983).

The age of this ammonite assemblage (92 specimens) spans the full stratigraphical range from the *Lyelli* and *Spathi* Subzones of the *Hoplites dentatus* Zone, through the two successive Middle Albian zones (*Euhoplites loricatus* and *Euhoplites lautus*), up to the lower Upper Albian *Mortoniceras inflatum* Zone (see MARCINOWSKI and RADWAŃSKI 1983, 1989; MARCINOWSKI and WALASZCZYK 1985).

The Middle to lower Upper Albian ammonite assemblage, collected from the quartzitic sandstone and the lower part of the phosphorite bed, is composed almost exclusively of hoplitids, whereas the puzosiids and brancoceratids are present only as accessories (Table 4).

The mass occurrence of fossils in the lower part of the phosphorite bed is due to early phosphatization and redeposition (fig. 5). The phosphatization took place beneath the sediment-

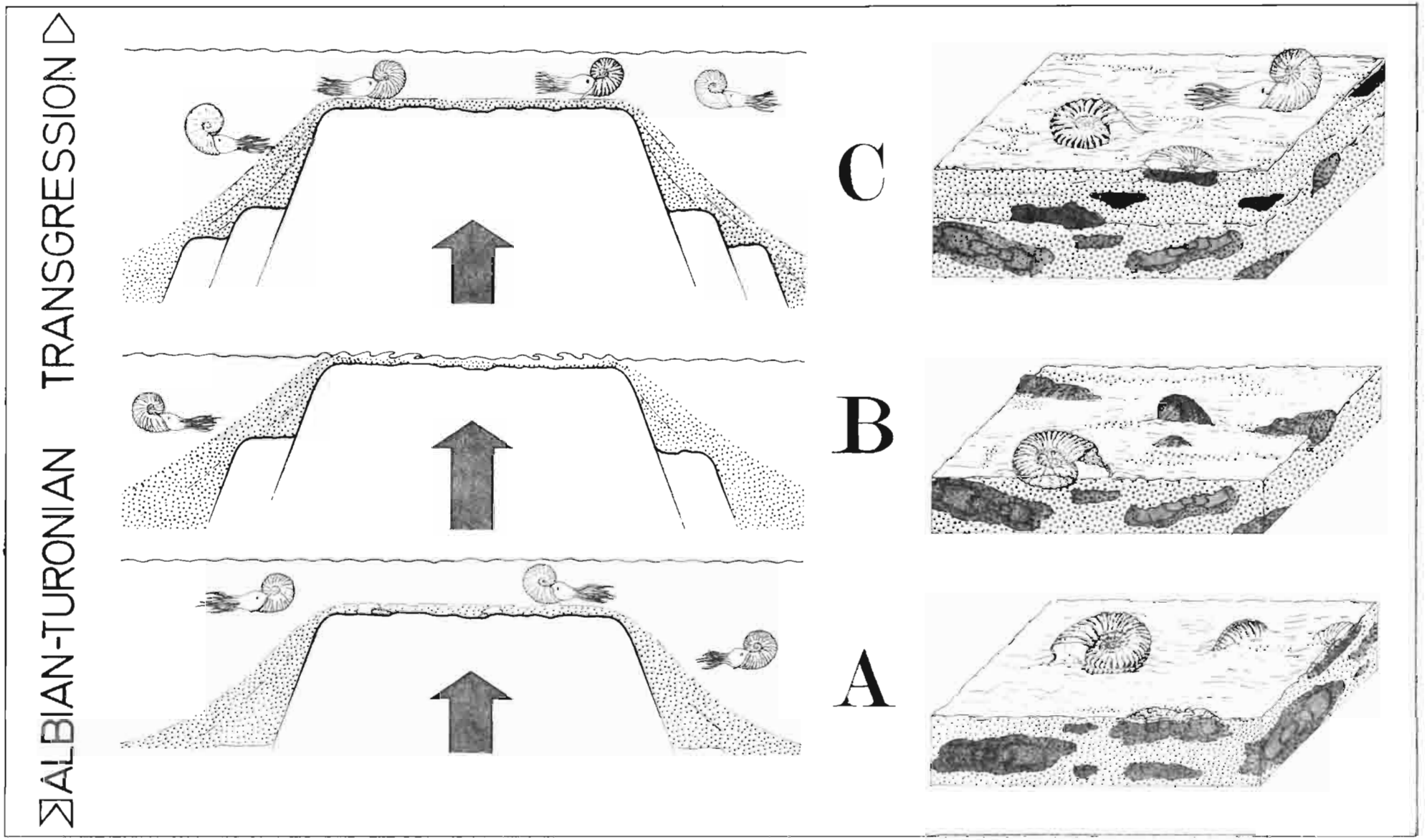


Fig. 5.

Environmental and postdepositional scheme for the lower part of the ammonite-bearing phosphatic bed at Annopol -on-Vistula, central Poland.
A — gradual, "en block" uplift of the area and simultaneous eustatic sea level increase. The trachyostraceous ammonites (mainly hoplitids) settled on the submarine swell, on which sandy glauconitic sediments were slowly deposited and early phosphatization took place in the ammonite shells and moulds as well as in parts of the glauconitic sand (below the sediment-water interface); *B* — periodically rapid uplift of the area, resulting in shallow water conditions on the swell and creating environmental conditions unprofitable for the ammonites. Break in sedimentation (caused by storms?) seen in erosion of the sediment and redeposition of the phosphatized ammonite shells and moulds as well as phosphatized lumps in the sand: *C* — uplift rate decreasing to produce deepening of the swell area and a return to stage "A" above.

Table 4

Percentage composition of the ammonites from the uncondensed and stratigraphically condensed deposits (*Eodentatus* through the *Altonense* Subzones, units "A_3" and "A_{5-7}" in fig. 4) at Annopol-on-Vistula (after MARCINOWSKI and WIEDMANN 1985)

Families and Genera	Percentage
HOPLITIDAE DOUVILLÉ 1890	98.24
Hoplites (Hoplites) NEUMAYR 1875	76.31
Hoplites (Otohoplites) STEINMANN 1925	9.65
Hoplites NEUMAYR 1875	5.26
Anahoplites HYATT 1900	3.51
Euhoplites SPATH 1925	1.75
Hoplites (Isohoplites) CASEY 1954	0.88
Callihoplites SPATH 1925	0.88
DESMOCERATIDAE ZITTEL 1895	
Puzosia (Puzosia) BAYLE 1878	0.88
BRANCOCERATIDAE SPATH 1933	
Mortoniceras (Mortoniceras) MEEK 1876	0.88

water interface and affected primarily the organic remains (even plant fragments). It was certainly interrupted several times, and then followed by exhumation and redeposition of the more or less phosphatized remains; this is seen in the variable degree of damage of the ammonite moulds and phosphatic lumps containing different fossils (cf. SAMSONOWICZ 1925; MARCINOWSKI and RADWAŃSKI 1983, 1989). The formation of the condensed sequence is thus thought to have developed in a high energy environment, whereas phosphatization was possible only during periods of lower hydrodynamic activity (fig. 5). Changes in the water dynamics were related to sedimentary movements, which, however, still did not lead to emersion because of the coeval eustatic sea level rise (cf. HANCOCK 1975, NAIDIN *et al.* 1980).

The upper part of the phosphorite bed (unit "A_8" of CIEŚLIŃSKI 1959*a*) is less condensed, and it contains only two specimens of *Stoliczkaia* (*Stoliczkaia*) cf. *notha* (SEELEY), indicative of the uppermost Albian *Stoliczkaia dispar* Zone (CIEŚLIŃSKI 1959*a*). The upper part of the phosphorite bed completes the Albian sequence, which is conformably overlain by the lowermost Cenomanian strata (MARCINOWSKI and WALASZCZYK 1985).

MAŁA ŁĄKA AND WIELKA RÓWIEŃ
(figs. 6, 7 and 9M, and Tables 5—7)

A band of unstratified, dark-green, glauconitic limestone (0.3—0.5 m thick), which begins the Albian sequence at Wielka Równień and which is replete with diverse fauna (PASSENDORFER 1921, 1930, 1983), contains numerous ammonites, usually preserved as more or less phosphatized moulds (figs. 6 and 7, and Tables 5 and 6).

This assemblage is dominated by forms of the leiostraceous group (desmoceratids, phylloceratids, gaudryceratids, and tetragonitids) while the trachyostraceous group is subordinate (fig. 9M and Table 7). Noteworthy is the relatively large number of heteromorphs (34.35%). All these features serve to distinguish this assemblage from that of similar age at Annopol-on-Vistula and from the Upper Albian assemblage at Mt. Chełmowa (fig. 1A, and Tables 3 and 4).

The mass occurrence of the perfectly preserved, phosphatized ammonite moulds (sometimes also of their shells) in the glauconitic limestone is due to their earlier phosphatization and redeposition (that is, overturning) *in situ*. A stromatolitic layer associated with a hard-

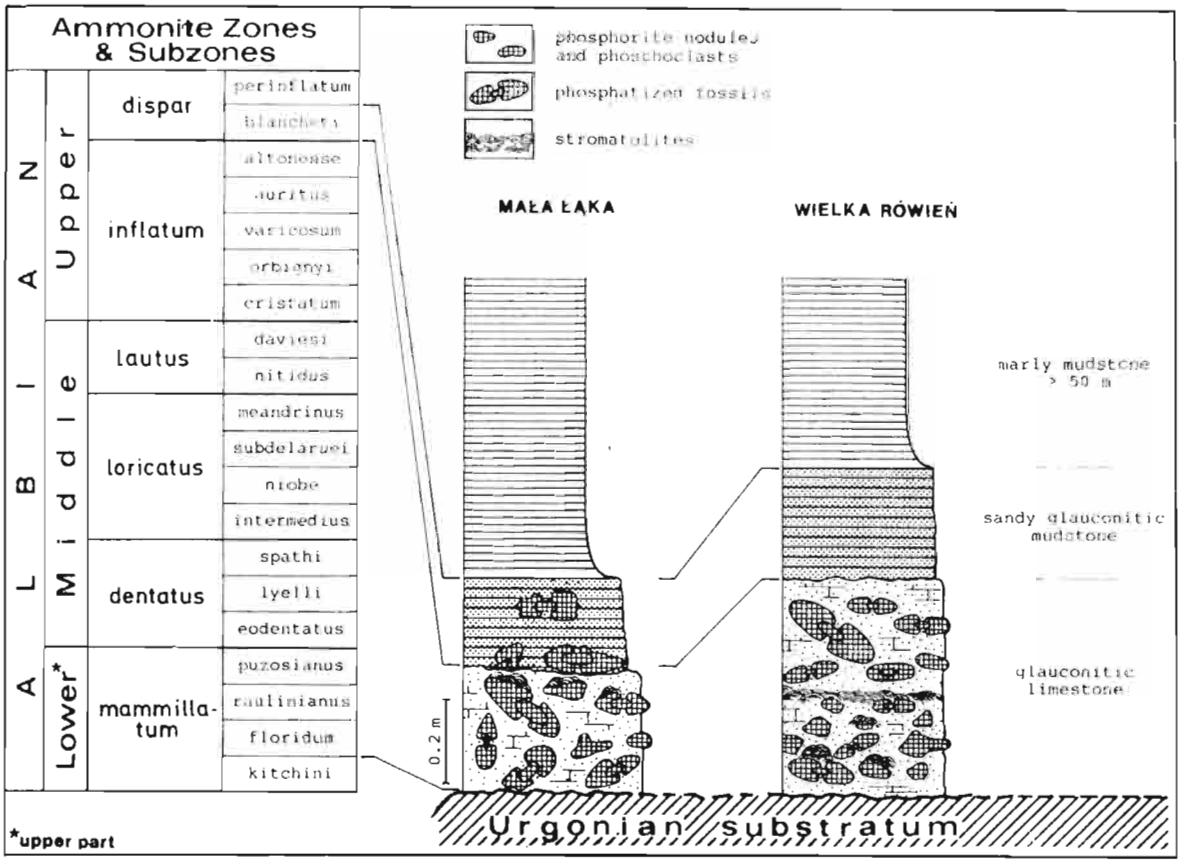


Fig. 6.

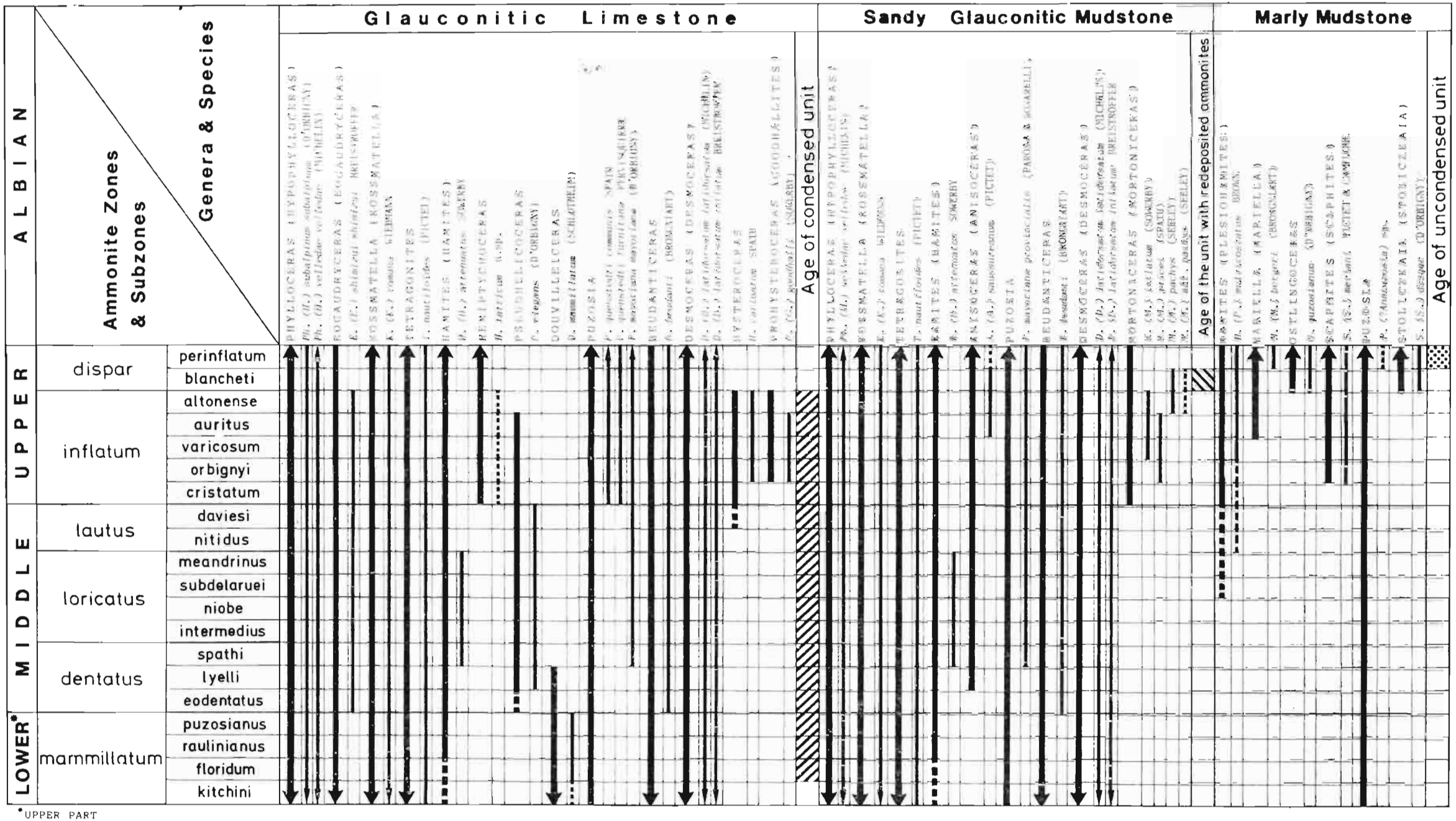
Profiles of the Albian deposits and their stratigraphic correlation in the High-Tatric Series, southern Poland (geological profiles after PASSENDORFER 1930, and KRAJEWSKI 1984; see also Tables 5 and 6).

ground subdivides the glauconitic limestone at Wielka Rówień. According to KRAJEWSKI (1981: 738; 1984, fig. 2C), during formation of the hard-ground heavy mineralization and intraformational reworking took place, but this process was limited to the uppermost part of the sediment. This interpretation is somewhat contrary to the stratigraphical dates documented by the co-occurrence of ammonite species from various biostratigraphic zones (cf. PASSENDORFER 1930). Therefore, redeposition must have occurred in the sediments below and above the stromatolitic layer. It is more probable that phosphatization of the deposited organic remains (in addition to ammonites there are frequent belemnites, brachiopods, pelecypods, gastropods, and echinoids) occurred earlier than lithification of the surrounding carbonate ooze, which had been deposited very slowly (fig. 7B). Such a situation possibly caused redeposition by weak currents of the unconsolidated carbonate sediments, while earlier phosphatized organic remains were reworked *in situ*, and this produced the residual lag (fig. 7C). A break in sedimentation produced the hard-ground which is associated with the stromatolite. Early consolidation of the hard-ground and stromatolitic layer stabilized the underlying sediments (fig. 7E). Formation of a new residual lag then began above the stromatolitic layer (cf. also GEBHARD 1983, fig. 15). Glauconitic limestone with phosphatic nodules originated on a submarine swell as a result of very slow sedimentation under open shelf conditions (KRAJEWSKI 1981; cf. also figs. 7 and 8).

The age of this assemblage is indicative of the full stratigraphical range from the *Floridum* Subzone of the *Douvilleiceras mammillatum* Zone through the *Altonense* Subzone of the

Table 5

Stratigraphic range of the ammonites from the uncondensed and stratigraphically condensed lithostratigraphic units at Mała Łąka, High-Tatric Series, southern Poland (cf. also fig. 6); symbols as in Table 2



*UPPER PART

Table 6

Stratigraphic range of the ammonites from the stratigraphically condensed glauconitic limestone at Wielka Rówień, High-Tatric Series, southern Poland (cf. also fig. 6); symbols as in Table 2

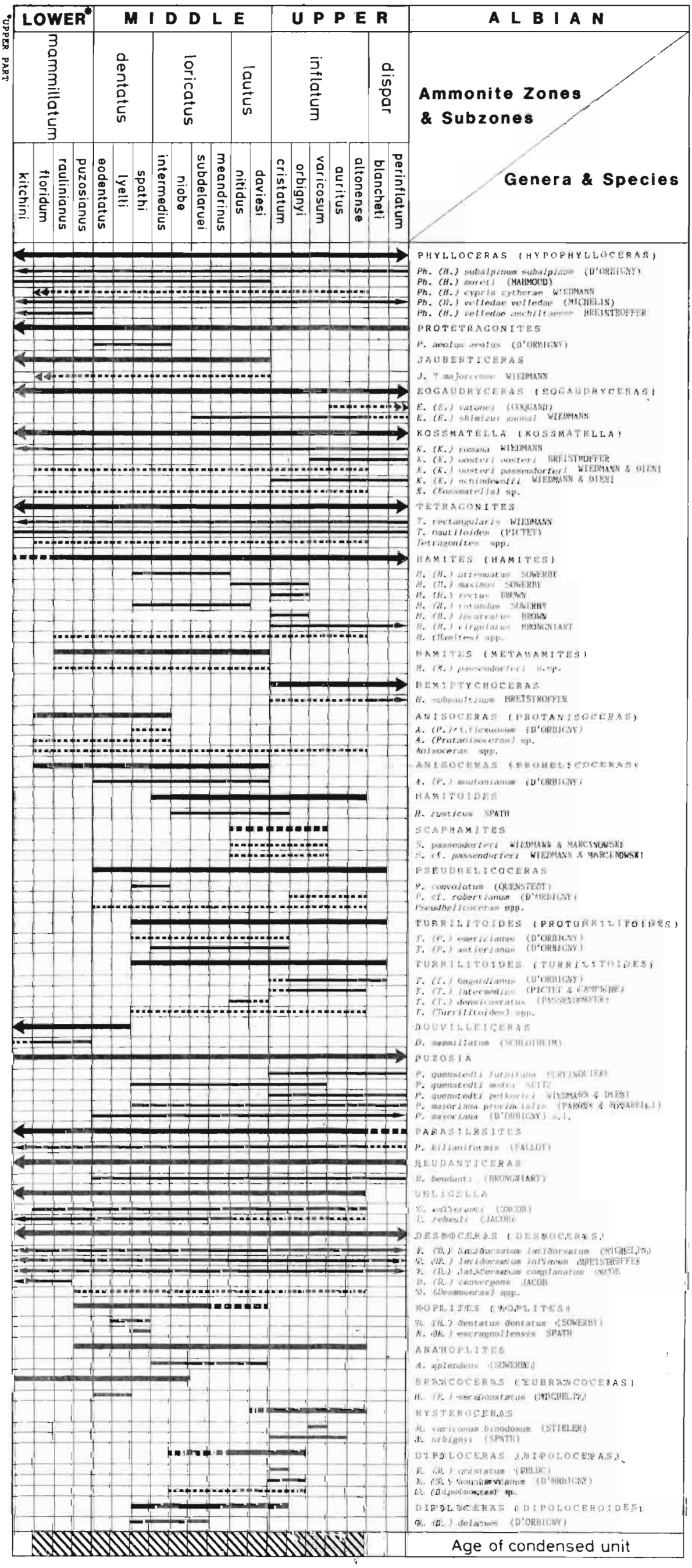


Table 7

Percentage composition of the ammonites from the stratigraphically condensed glauconitic limestone (*Floridum* through *Altonense* Subzones) at Wielka Rówień, High-Tatric Series, southern Poland

Families & Genera		%
Normally coiled ammonites		65.65
DESMOCERATIDAE ZITTEL 1895		36.81
Puzosia	BAYLE 1878	16.87
Desmoceras (Desmoceras)	ZITTEL 1884	9.51
Uhligella	JACOB 1907	4.29
Beudanticeras	HITZEL 1902	3.37
Parasilesites	IMLAY 1959	2.76
HOPLITIDAE DOUVILLE 1890		8.59
Hoplites (Hoplites)	NEUMAYR 1875	7.97
Anahoplites	HYATT 1900	0.61
PHYLLOCERATIDAE ZITTEL 1894		7.36
Phylloceras (Hypophylloceras)	SALFELD 1924	7.36
GAUDRYCERATIDAE SPATH 1927		5.21
Kossmatella (Kossmatella)	JACOB 1907	3.68
Gaudryceras (Gaudryceras)	SPATH 1927	0.92
Jauberticeras	JACOB 1907	0.61
TETRAGONITIDAE HYATT 1900		3.68
Tetragonites	KOSSMAT 1895	3.68
BRANCOCERATIDAE SPATH 1933		2.76
Dipoloceras	HYATT 1900	0.92
Dipoloceras (Dipoloceras)	HYATT 1900	0.61
Hysteroceras	HYATT 1900	0.61
Brancoceras (Eubrancoceras)	BREISTROFFER 1952	0.31
Dipoloceras (Dipoloceroides)	BREISTROFFER 1947	0.31
LYTOCERATIDAE NEUMAYR 1875		0.92
Protetragonites	HYATT 1900	0.92
DOUVILLEICERATIDAE PARONA & BONARELLI 1897		0.31
Douvilleiceras	DE GROSSOUVRE 1894	0.31
Heteromorphs		34.35
HAMITIDAE HYATT 1900		17.79
Hamites (Hamites)	PARKINSON 1811	10.43
Scaphamites	WIEDMANN & MARCINOWSKI 1985	1.84
Hamites (Metahamites)	SPATH 1930	1.23
Anisoceras	PICTET 1854	1.23
Anisoceras (Prohelicoceras)	SPATH 1925	1.23
Anisoceras (Protanisoceras)	SPATH 1923	0.92
Hemiptychoceras	SPATH 1925	0.61
Hamitoides	SPATH 1925	0.31
TURRILITIDAE MEEK 1876		16.56
Turrilitoides	SPATH 1923	13.80
Pseudhelicoceras	SPATH 1922	2.76

Mortoniceras inflatum Zone. Its lower limit is determined by the appearance of the subgenera *Anisoceras* (*Prohelicoceras*) and *Anisoceras* (*Protanisoceras*), as well as by the species *Douvilleiceras mammillatum* (SCHLOTHEIM) and *Uhligella walleranti* JACOB (see Tables 5 and 6). The upper limit can be established only in the section at Mała Łąka, where the glauconitic limestone is overlain (with a sedimentary break) by sandy glauconitic mudstone containing, among others, such ammonite species as *Hamites* (*Hamites*) *attenuatus* SOWERBY, *Anisoceras* (*Anisoceras*) *saussureanum* (PICTET), *Mortoniceras* (*Mortoniceras*) *pricei* (SPATH), *M.* (*M.*) *inflatum* (SOWERBY), and *M.* (*M.*) *pachys* (SEELEY) (see Table 5). These ammonites are preserved as fragmentary moulds and are more or less eroded, particularly the large forms (PASSENDORFER 1930: 526, 656). The surface of these moulds is glauconitized, but the matrix is composed of glauconitic limestone. This state of preservation clearly indicates redeposition of ammonites derived from the glauconitic limestone. The eroded glauconitic limestone included *M.* (*M.*) *inflatum* (SOWERBY) and *M.* (*M.*) *pachys* (SEELEY), species which indicate the *Altonense* Subzone. Consequently, the sandy glauconitic mudstone with redeposited ammonites at Mała Łąka is interpreted as the equivalent of the *Blancheti* Subzone. The stratigraphic gap associated with this redeposition represents a very short interval. The presence of *H.* (*H.*) *attenuatus* (SOWERBY), a species known exclusively from the Middle Albian, and *M.* (*M.*) *pricei* (SPATH), which ranges only up to the *Auritus* Subzone, indicates a lack of stratification in the underlying sediments; hence this confirms the stratigraphically condensed nature of the glauconitic limestone. The sandy glauconitic mudstone passes conformably into the marly mudstone with ammonites indicative of the *Perinflatum* Subzone of the *Stoliczkaia dispar* Zone (see PASSENDORFER 1930; herein fig. 6 and Table 5).

AMMONITE BIOGEOGRAPHY

The Central European Basin was part of the European Zoogeographic Realm (NAIDIN 1959, 1969, 1991), the limits of which coincided with the Hoplitinid Faunal Province during Albian and Cenomanian times (OWEN 1971, 1976, 1979; MARCINOWSKI 1980, 1983; SAVELEV 1981). This province was comprised of eastern Greenland, Spitsbergen, the North Sea Basin, the London—Paris Basin, the Central European Basin, the Russian Platform, the Crimea, northern Caucasus, the Aral region, Mangyshlak, Kopet-dag, and northern Iran. The presence of hoplitids in the Lower Albian of eastern Greenland, Spitsbergen, eastern England, northern France, northern Germany, and Bornholm (OWEN 1971, 1979; KENNEDY *et al.* 1981) and their subsequent appearance throughout the platform areas of Poland during the Middle Albian clearly indicate a migration of these ammonites from the north and northwest (see fig. 1B). The Middle Albian ammonite assemblage from Annopol-on-Vistula is composed almost exclusively of Boreal hoplitids (see fig. 1A and Table 4). Although the percentage of hoplitids in the Mediterranean assemblage from the High-Tatra Swell is as low as 8.59%, they are nevertheless the second most abundant component of the families counted there (see Table 7). Mediterranean influences are unknown throughout the platform areas of Poland, and migration is therefore thought to have progressed unidirectionally from the Danish-Polish Trough through the Lwow region towards the Carpathian geosyncline. During Middle Albian time the hoplitids migrated from western Europe to the Russian Platform and Mid-Asian area via the Lwow region; at that time was no direct connection between the Central European Basin and central Russia (see fig. 1B).

In the Lower Cretaceous, up to the Aptian, a direct connection between the Boreal Sea and the Alpine geosyncline existed along the western side of the Urals. This connection closed in the Albian, after which an east-west basin developed on the Russian Platform, uniting it

with the Central European Basin via the Polesie region and eastern Poland, at least during the Upper Albian (see fig. 1C; and SASONOVA and SASONOV 1967, NAIDIN *et al.* 1980, NAIDIN 1981). In Podolia, as well as on the Moesian Platform, the Mediterranean influences recognizable within the Albian ammonite assemblage are indicative of an area close to the Carpathian geosyncline (see NOWAK 1917, PASTERNAK *et al.* 1968, MUȚIU 1984).

During the Upper Albian, the Central European Basin and the sea which was spreading over the Russian Platform established wider connections due to the advance of the global mid-Cretaceous transgression (see fig. 1C). The Boreal hoplitids could then migrate from western Europe to the mid-Asian regions along a direct seaway which was clearly much shorter than that along the southern regions bordering the Carpathian geosyncline. The disappearance of Boreal forms within the Upper Albian ammonite faunas of the High-Tatra Swell can easily be explained by such a paleogeographic setting. The Boreal character of the Upper Albian ammonite faunas was still pronounced in the Polish part of the Central European Basin, although heavily ornamented Mediterranean brancoceratids represented solely by the genus *Mortoniceras* had already appeared. The latter genus is relatively common in the Mt. Chełmowa section, but it vanishes in the southeastern areas (i.e., Annopol-on-Vistula section; see Tables 3 and 4). This fact excludes the possibility of its migration from the Carpathian geosyncline through the Lwow region.

A general eastward migration of the family Brancoceratidae is thus well-exemplified by their occurrence in Poland; this is compatible with former observations by OWEN (1976, 1979), which concern the spreading of the Upper Albian brancoceratids from the Alpine geosyncline to the Central European Basin via the London—Paris Basin. The lack of Boreal influences in the High-Tatra Swell and of Mediterranean forms in the platform areas of Poland during

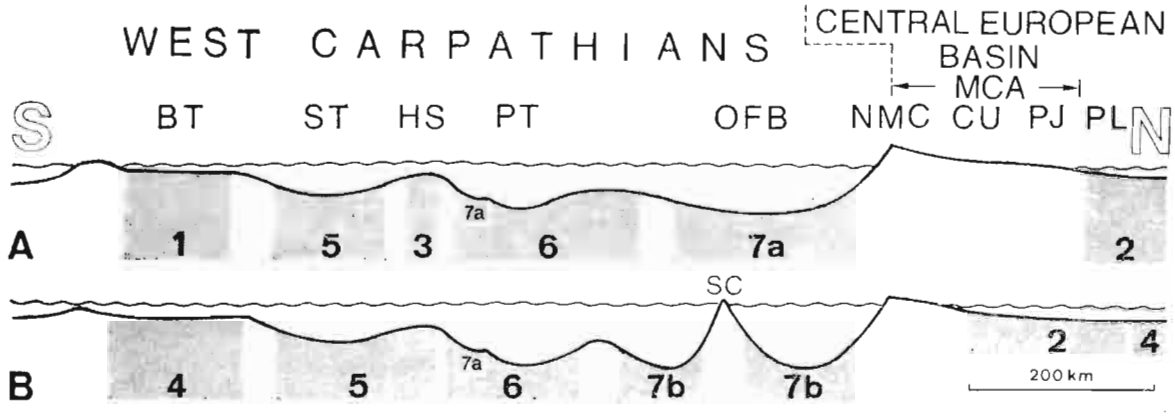


Fig. 8.

The West Carpathian geosyncline and the southern part of the Central European Basin during the Middle (A) an Upper (B) Albian (after MARCINOWSKI and WIEDMANN 1985). Distribution of facies and the relationships between particular regions based on information from the literature (KSIĄŻKIEWICZ 1958, 1961, 1962, 1977; BIRKENMAJER 1960, 1977; ANDRUSOV 1965; ŚLĄCZKA 1976; CSASZAR and HAAS 1979).

BT — Bakony Trough; *ST* — Sub-Tatra Trough; *HS* — High-Tatra Swell; *PT* — Pieniny Trough; *OFB* — Outer Flysch Basin; *SC* — Silesian Cordillera; *NMC* — North Margin Cordillera; *MCA* — Meta-Carpathian Arch; *CU* — Cracow Upland; *PJ* — Polish Jura; *PL* — Polish Lowland.

Shelf facies: *1* — shallow water organodetrital and reef limestones; *2* — shallow water sand and sandstone, mostly glauconitic; *3* — open shelf glauconitic limestone, stratigraphically condensed; *4* — open shelf marl; continental slope facies: *5* — mesopelagic marl and mudstone intercalated with sandstone; *6* — bathypelagic marl with siliceous chert and radiolarite; *7* — flysch (*a*: sandstone and shale, *b*: mainly shale with spongiolite and gaize). The terms "meso-" and "bathypelagic" are used as in "The Encyclopedia of Oceanography" edited by R. W. FAIRBRIDGE (1966), but relative depths of the facies were classified in accordance with the modern subdivisions of stable (Atlantic type) continental margins (cf. BOILLOT 1983).

the Upper Albian is thought to have resulted from advanced provincialism, which distinguished the Boreal and the Tethyan Realms in Poland more efficiently than it had during Middle Albian time. This provincialism was certainly favoured by the regional deepening of the West Carpathian geosyncline, which acquired its maximum width at that time.

Consequently, the phenomenon of the bathymetry distance filter increased. Both factors hampered further migration of the ammonite faunas and separated the High-Tatra Swell from the platform areas of Poland more effectively than during Middle Albian time. Landmass barriers, which included part of the Meta-Carpathian Arch and the Silesian Cordillera within the Outer Flysch Basin (see figs. 1C and 8), certainly played no decisive role in ammonite provincialism. This latter interpretation is supported by the fact that Mediterranean influences in the Berriasian and Valanginian ammonite faunas in the platform areas of Poland were much greater than in the Upper Cretaceous epoch. During this time (i.e., since the Cenomanian) the Central European Basin throughout the Central Polish Upland possessed wide, direct seaway connections with the Carpathian geosyncline. Increased provincialism in the Upper Albian ammonite faunas is also recognizable in Spain (WIEDMANN 1962*a*, 1982) and in the sub-Alpine chains of southeastern France. In the latter region, distinct boreal influences were still evident in the Middle Albian (cf. PARONA and BONARELLI 1897, GEBHARD 1983*a*).

The data lead to an unexpected conclusion: An increase of provincialism in the Upper Albian ammonite faunas was associated with the advance of the mid-Cretaceous transgression, which was responsible for the elimination of isolated basins and their ecosystems. The decisive factor controlling distribution of the ammonites can therefore be ascribed to climate and bathymetry (see also WIEDMANN 1973, 1982; SCHOLZ 1979*a*; KLINGER and WIEDMANN 1983). The latter factors were also decisive for the separation of the Central European Bioprovince from the Tethyan Bioprovince during the Upper Cretaceous, although good seaway connections did exist.

REMARKS ON ECOLOGICAL AND BATHYMETRIC REQUIREMENTS OF ALBIAN AMMONITES

The Albian ammonite assemblages at Mt. Chełmowa and Annopol-on-Vistula are dominated by trachyostraceous forms (hoplitids and brancoceratids), whereas leiostraceous forms and heteromorphs are practically missing (see fig. 9K—L and Tables 3 and 4). When the style of ornamentation of these ammonites is considered, they evidently coincide with group "A" of TANABE *et al.* (1978). The dominance of leiostraceous forms (group "C" — desmoceratids, phylloceratids, gaudryceratids, and tetragonitids) and the high percentage of heteromorphs (group "B") in the ammonite assemblage of Wielka Rówień indicate either an offshore environment and greater depths (cf. WIEDMANN 1973, TANABE *et al.* 1978) or a boundary between the lower neritic and the upper bathyal zone in the classic model of SCOTT (1940).

The Albian heteromorphs usually occur in the clay and marly facies rather than in the sandy facies (cf. SPATH 1934—1943; MARCINOWSKI and NAIDIN 1976; SCHOLZ 1979*a*, *b*). A similar situation is also known from the Middle Jurassic deposits of the Swabian Alb in West Germany, where the heteromorphs are remarkably frequent in the clay facies, which, due to its quiet water environment, provided optimum biotope conditions (see DIETL 1978).

Generally, the Albian ammonite assemblages of the Boreal Realm are dominated by trachyostraceous forms associated with heteromorphs, whereas in the Tethyan Realm leiostraceous forms and heteromorphs are dominant (fig. 9). Such a general feature clearly indicates the

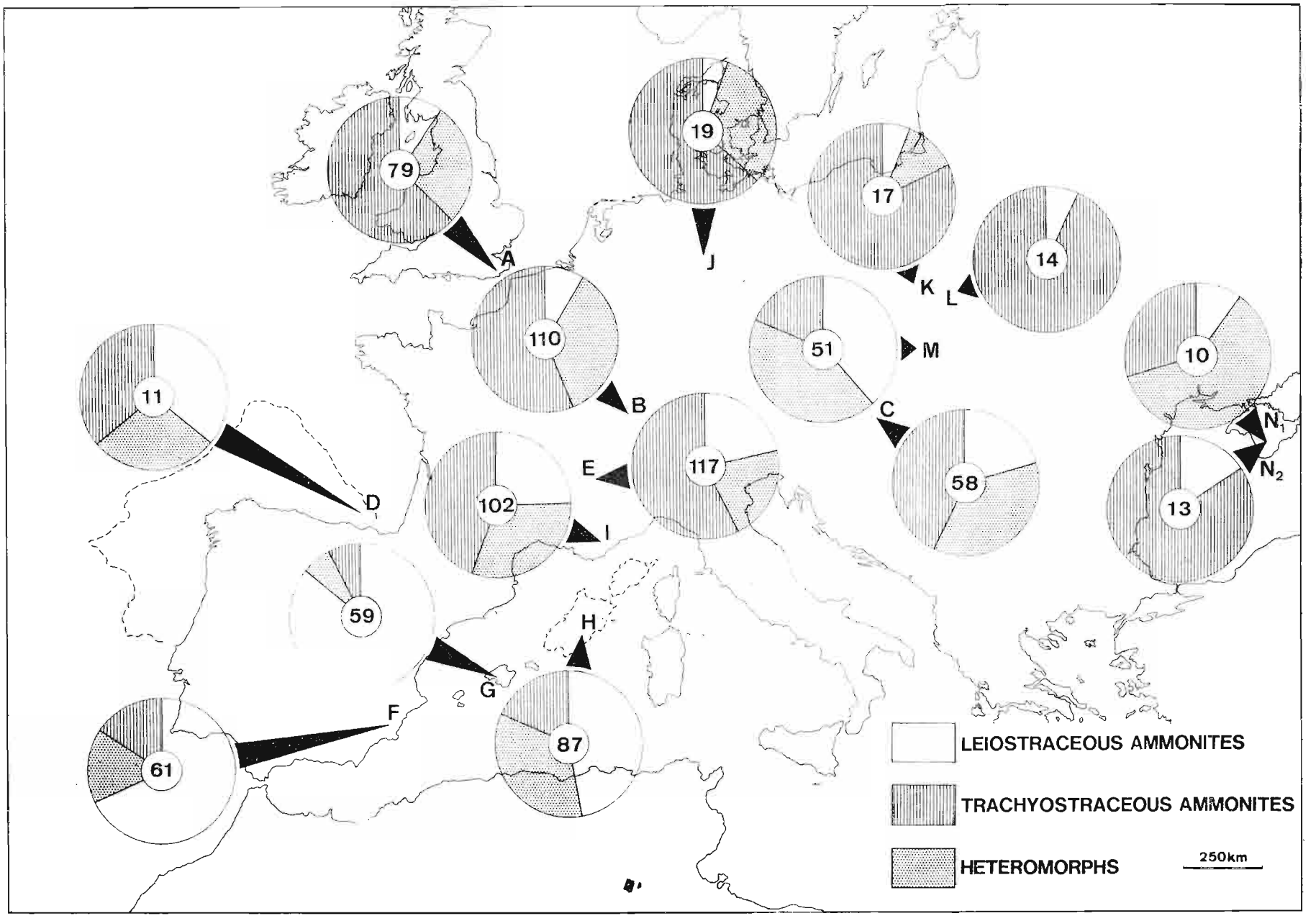


Fig. 9.

Composition of the Albian ammonite fauna in some sections of Europe (total number of species or subspecies in each section is indicated). After WIEDMANN (1978) with new data by MARCINOWSKI and WIEDMANN (1985).

Leiostraceous ammonites, phylloceratids, gaudryceratids, tetragonitids, and dasmoceratids; trachyostraceous ammonites: hoplitids, brancoceratids, and lyelliceratids; heteromorphs: turrilitids, hamitids, anisoceratids, and scaphitids.

Ammonite localities: A — *Stoliczkaia dispar* Zone of Folkestone, southeastern England (SPATH 1923—1942); B — *Stoliczkaia dispar* Zone of Sainte-Croix, Switzerland (RENZ 1968); C — *Stoliczkaia dispar* Zone of the Bakony Mts., Hungary (SCHOLZ 1979*a*); D — *Stoliczkaia dispar* Zone of the Vascogotic Ranges, northern Spain (WIEDMANN 1962*a*); E — *Stoliczkaia dispar* Zone of Salazac, Gard, southern France (BREISTROFFER 1940, 1947); F — Upper Albian of the Subbetic of Caravaca, Murcia, southern Spain (WIEDMANN, unpublished data); G — Upper Albian of Mallorca (WIEDMANN 1962*b*, 1964 and unpublished data); H — *Stoliczkaia dispar* Zone of the Orosei area, eastern Sardinia (WIEDMANN and DJENI 1968); I — *Hoplites dentatus* through *Stoliczkaia dispar* Zones, condensed sequences of the Subalpine Ranges, southwestern France (GEBHARD 1983*a*); J — *Mortoniceras perinflatum* Subzone of Salzgitter, northern Germany (SCHOLZ 1979*b*); K — *Callihoplites auritus* Subzone of the *Mortoniceras inflatum* Zone of Mt. Chełmowa, central Poland; L — *Hoplites dentatus* through *Mortoniceras inflatum* Zones, mostly condensed sequence of Annopol-on-Vistula, Poland; M — *Hoplites dentatus* through *Mortoniceras inflatum* Zones, condensed sequence of Wielka Rówień, Tatra Mts., Poland; N — Upper Albian of the southwestern Crimea highland, Soviet Union (MARCINOWSKI and NAIDIN 1976); N_1 — *Mortoniceras inflatum* Zone in clay facies; N_2 — uppermost *Mortoniceras inflatum* and *Stoliczkaia dispar* Zones in sandy facies.

low tendency for provincialism displayed by the heteromorphs, whose mode of life was benthic or epibenthic. This certainly resulted from two factors: (1) high tolerance of the juvenile pelagic stages of these ammonites with respect to the environment; and (2) considerable resistance to environmental change when they settled after the juvenile pelagic stadium in various geographic zones (MARCINOWSKI 1974, 1980; cf. also KENNEDY and COBBAN 1976).

The mass occurrences of Albian ammonites on both the submarine platforms in the Alpino-Carpathian geosyncline are usually connected with stratigraphically condensed deposits which developed on submarine swells under environmental conditions corresponding to the present day open shelf. Extremely shallow marine environments and those beyond the neritic zone were never favored by mid-Cretaceous and younger ammonites (cf. WIEDMANN 1973).

SYSTEMATIC DESCRIPTION

Location of the specimens

The described ammonite collection is housed at the Institute of Geology of Warsaw University (abbr. IGPUW). The catalog number shows the occurrence of ammonites in particular sections:

Central Polish Uplands

RM.Ch — Mt. Chełmowa (figs. 1 and 2)
RM.A — Annopol-on-Vistula (figs. 1, 4)

Tatra Mts. (High-Tatric Series)

WR — Wielka Rówień, glauconitic limestone (figs. 1, 6)
MŁw — Mała Łąka, glauconitic limestone (fig. 6)
MŁr — Mała Łąka, marly mudstone (fig. 6)
MDm — Mała Dolinka, marly mudstone
BW — Biała Woda, glauconitic limestone
TR — Turnia Ratusz, glauconitic limestone

Dimensions

Linear measurements of specimens are given in millimeters; values in parentheses are the proportion of the shell diameter:
D — shell diameter
Wh — intercostal whorl height; Wh max — costal whorl height
Wb — intercostal whorl width (or thickness); Wb max — costal whorl width
U — umbilical width
R — number of ribs per whorl (when the specimen consists only of a fragment, the number is written in parentheses)
R/Wh — number of ribs in a distance equal to the whorl height (for heteromorphs)
Tu — number of umbilical tubercles per whorl (as above)
Tv — number of ventrolateral (marginal) tubercles per whorl (as above)

Suture terminology

The suture terminology of WEDEKIND (1916; see KULLMANN and WIEDMANN 1970) is used in the present paper:
I = Internal lobe
U = Umbilical lobes
L = Lateral lobe
E = External lobe

Order **Phylloceratida** ARKELL, 1950
Superfamily **Phylloceratacea** ZITTEL, 1884
Family **Phylloceratidae** ZITTEL, 1884
Genus **Phylloceras** SUESS, 1865

Type species: Ammonites heterophyllus SOWERBY, 1820.

In this paper the systematic revision of phylloceratids by WIEDMANN (1964) is followed.

Subgenus *Ph.* (*Hypophylloceras*) SALFELD, 1924

Type species: Phylloceras onoense STANTON, 1895.

Occurrence. — The redefined subgenus *Hypophylloceras* is cosmopolitan, and ?Tithonian, Valanginian to Maastrichtian in range.

Ph. (*Hypophylloceras*) *subalpinum* (d'ORBIGNY)

Earlier (WIEDMANN 1964), the inclusion of *Ph. ellipticum* KOSSMAT in the present species on the subspecific level was proposed. Both species have nearly identical measurements and suture lines. The reasons for separating *Ph. ellipticum* KOSSMAT were the more elliptical whorl section of the slightly younger Indian species and the presence of a fine, phylloceratid striation on the ventral living chamber. The co-occurrence of both forms in the Balearic Albian, however, was an additional argument favouring their synonymy.

The Polish material also supports this idea: Those specimens (pl. 1: 4, 5) having their shell preserved, combine the *subalpinum*-like whorl section with the *ellipticum*-like sculpture, even on the phragmocone. Moreover, it was PASSENDORFER (op. cit.: 620) who mentioned the presence of *subalpinum*-cotypes having an elliptical whorl section. Unfortunately, since none of these forms are preserved for study, the subspecific separation of both forms is maintained (see also *Ph.* (*H.*) *moreti*).

Ph. (*H.*) *subalpinum subalpinum* (d'ORBIGNY)
(pl. 1: 3—5; fig. 10)

1850. *Ammonites subalpinus* d'ORBIGNY, 124.
1930. *Phylloceras subalpinum* d'ORB.; PASSENDORFER, 620; fig. 4; pl. 2: 45.
1964. *Phylloceras* (*Hypophylloceras*) *subalpinum subalpinum* (d'ORB.); WIEDMANN, 195, fig. 45, pl. 15: 2, pl. 18: 2 (with synonymy).
1979*a*. *Phylloceras* (*H.*) *subalpinum* (d'ORB.); SCHOLZ, 46; fig. 12A, B.

Material. — 11 specimens, Nos. IGPUW/WR3. 8—16, MŁw. 4, BW. 2.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 3	28	16(0.57)	?14(?0.50)	2.5(0.09)	0.87
pl. 1: 4	27	16(0.59)	12.5(0.46)	2(0.07)	0.78
pl. 1: 5	ca. 28	17(0.61)	14(0.50)	2.5(0.09)	0.83

Remarks. — The specimens available for examination have the typical subtriangular whorl section of the present subspecies, with their maximum thickness near the umbilical border. Forms transitional with *Ph.* (*H.*) *subalpinum ellipticum* KOSSMAT (with elliptical whorl sections that have their maximum thickness near the center) were not at our disposal. As previously presumed (WIEDMANN 1964: 198), the fine phylloceratid striation can also exist on the present subspecies if the shell is preserved (pl. 1: 5). It is, however, restricted to the ventral portion of the whorls.

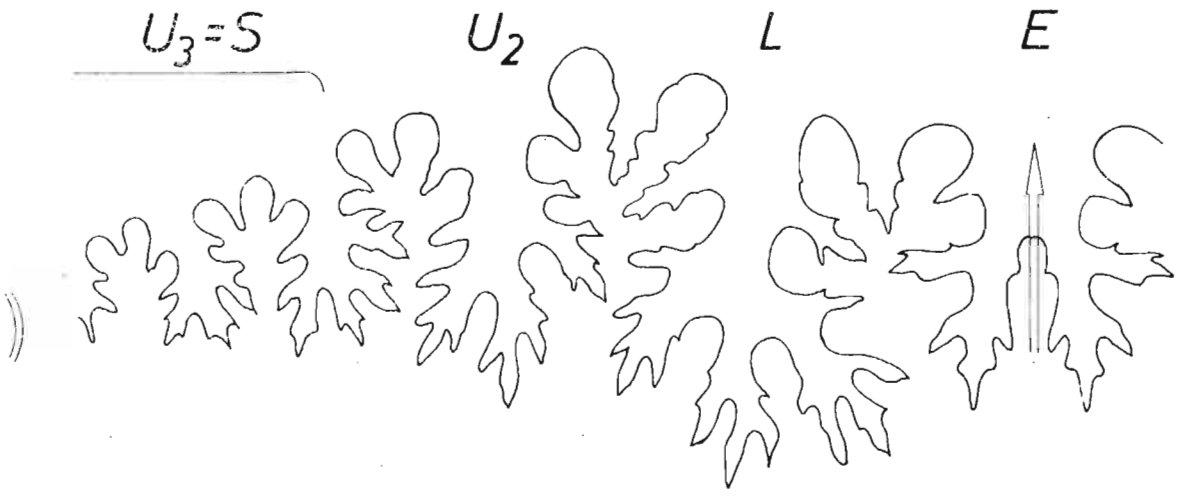


Fig. 10.

Suture of *Ph.* (*Hypophylloceras*) *subalpinum subalpinum* (d'ORB.), IGPUW/BW. 2, Wh = 14 mm, (cf. pl. 1: 4).

The suture line (fig. 10) shows the typical characteristics of the present species and subspecies. All saddles are clearly diphyllic, the lobe *L* is subsymmetrically trifid, much deeper than *E*, and have a limited degree of incision.

Occurrence. — *Ph.* (*H.*) *subalpinum subalpinum* (d'ORBIGNY) was found in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień, Mała Łąka, and Biała Woda, in the High-Tatric Series, southern Poland. It is of widespread stratigraphic and paleogeographic distribution in the Albian of southern Europe and Africa.

Ph. (*Hypophylloceras*) *moreti* (MAHMOUD)

(pl. 1: 6; fig. 11)

pars 1923. *Phylloceras subalpinum* d'ORB.; SPATH, 15, pl. 1: 1, 2 (only).
pars 1930. *Ph. subalpinum* d'ORB.; PASSENDORFER, 620.
1956. *Salfeldiella* (*Goretophylloceras*) *Moreti* MAHMOUD, 76, fig. 44, pl. 5: 2—4.
1964. *Ph.* (*Hypophylloceras*) *moreti* (MAHMOUD); WIEDMANN, 200, fig. 46, pl. 19: 2.
1968. *Ph.* (*H.*) *moreti* (MAHMOUD); WIEDMANN and DIENI, 23, pl. 3: 6.
1984. *Ph.* (*H.*) *moreti* (MAHMOUD); MICHALIK and VAŠIČEK, 568, fig. 6c, pl. 1: 3.

Material. — One specimen, IGPUW/WR. 7.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 6	25	15.5(0.62)	11.6(0.47)	1.5(0.06)	0.75

Remarks. — This rather rare species has been re-established by WIEDMANN (1964). It is very similar to the preceding *Ph.* (*H.*) *subalpinum* (d'ORBIGNY), but can be separated by the more elliptical whorl section (pl. 1: 6), the very distinct ribbing of the ventral whorls, and above all by the triphyllic configuration of the saddle L/U_2 (fig. 11).

PASSENDORFER (1930), as well as SPATH (1923), included these forms in *Ph. subalpinum* (d'ORBIGNY). Considering the number of different features, the specific separation proposed by MAHMOUD (1956) is reasonable.

Occurrence. — *Ph.* (*H.*) *moreti* (MAHMOUD) is recorded from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-

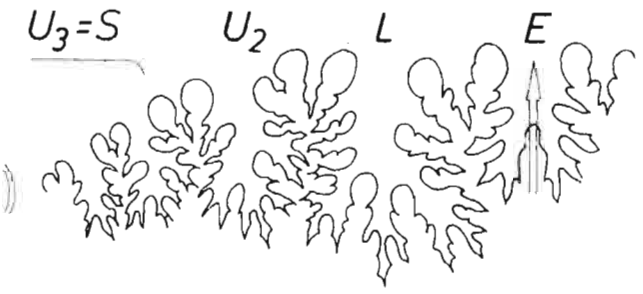


Fig. 11.

Suture of *Ph.* (*Hypophylloceras*) *moreti* (MAHMOUD), IGPUW/WR. 7, Wh = 14 mm, (cf. pl. 1: 6).

Tatric Series, southern Poland. It has a rather limited distribution. It is known from the Lower and Middle Albian of the Sinai Peninsula, the Balearic Islands, England, and Italy, and was recently described from the Aptian-Albian boundary of the Slovakian Carpathians.

Ph. (*Hypophylloceras*) *cypris* FALLOT and TERMIER

WIEDMANN's (1964) classification has again been adapted in this case.

Ph. (*H.*) *cypris cytherae* WIEDMANN
(pl. 1: 7; fig. 12)

pars 1930. *Phylloceras velledae* MICH.; PASSENDORFER, 619.
1964. *Ph.* (*Hypophylloceras*) *cypris cytherae* WIEDMANN, 218, fig. 51, pl. 12: 2, 7, pl. 15: 8.

Material. — 1 specimen, IGPUW/WR3. 17.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 7	30	18(0.60)	9(0.33)	2(0.07)	0.50
and the holotype for comparison:					
GPITCe 1220/78	16.5	10.5(0.65)	6.1(0.37)	1.2(0.07)	0.58

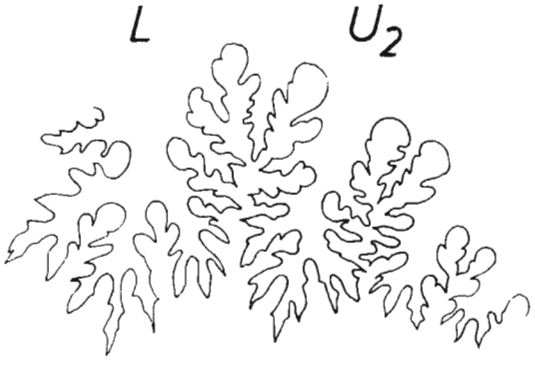


Fig. 12.

Suture of *Ph.* (*Hypophylloceras*) *cypris cytherae* WIEDMANN, IGPUW/WR3.17, Wh = 10 mm, (cf. pl. 1: 7).

Remarks. — One specimen of PASSENDORFER'S cotype of *Ph. velledae* (MICHELIN) shows the rapid increase in whorl height and nearly parallel flanks, typical features of *Ph.* (*H.*) *seresitense* PERVINQUIÈRE *s. l.* But the suture (fig. 12) has — at a whorl height of 10 mm — a nearly symmetrical saddle L/U_2, which is not characteristic of the latter species. Moreover,

the distinct ribs can only be detected in the ventral area, but bundles of ribs can be recognized on the inner portion of the flanks. Finally, the umbilicus is quite open.

Occurrence. — *Ph.* (*H.*) *cypris cytherae* WIEDMANN is described from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. Moreover, it is known from the Upper Aptian/Lower Albian of the Balearic Islands.

Ph. (*Hypophylloceras*) *velledae* (MICHELIN)

Subspecific classification of this comprehensive species is taken from WIEDMANN (1964). Two of the subspecies seem to be represented in the Polish Albian.

Ph. (*H.*) *velledae velledae* (MICHELIN)

(pl. 1: 1; fig. 13)

1834. *Ammonites Velledae* MICHELIN, pl. 35.
1930. *Phylloceras Velledae* MICH.; PASSENDORFER, 619, fig. 3.
1964. *Ph.* (*Hypophylloceras*) *velledae velledae* (MICH.); WIEDMANN, 201, fig. 49, pl. 11: 1, pl. 13: 4, pl. 21: 4 (with synonymy).
1964. *Ph. velledae* MICH.; COLLIGNON, 4, pl. 318: 1347.
1968. *Ph.* (*H.*) *velledae velledae* (MICH.); WIEDMANN and DIENI, 25, pl. 1: 5.
1968. *Ph.* (*H.*) *velledae velledae* (MICH.); RENZ, 17, fig. 6g, pl. 1: 3.
1977*b*. *Ph.* (*H.*) *velledae velledae* (MICH.); KENNEDY and KLINGER, 360, pl. 4: 5, pl. 5: 4, pl. 6: 1, pl. 7: 2 and 3, pls. 8, 10 and 11.
1978. *Ph.* (*H.*) *velledae velledae* (MICH.); WIEDMANN and NEUGEBAUER, 710, pl. 1: 1.
1979. *Ph.* (*H.*) *velledae velledae* (MICH.); DESTOMBES, 64, pl. 4—18: 5, pl. 4—26: 1.

Material. — 9 specimens, IGPUW/WR2. 1—5, MŁw. 1—3 and BW. 1.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 1	28	16(0.57)	11(0.39)	—	0.68

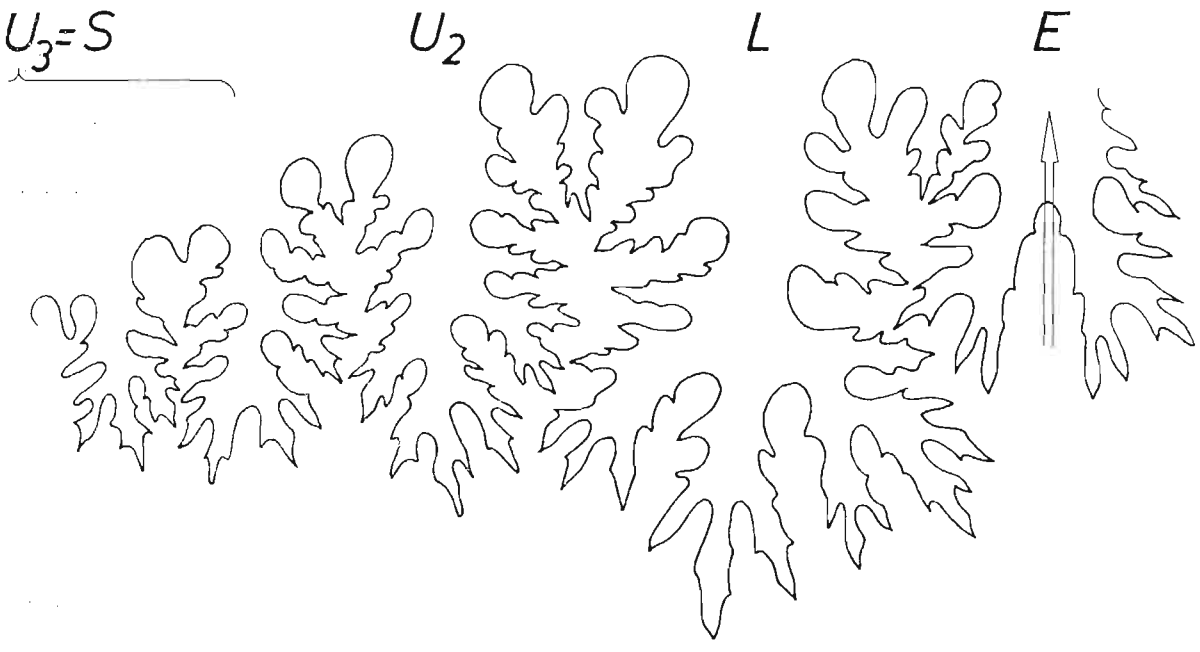


Fig. 13.

Suture of *Ph.* (*Hypophylloceras*) *velledae velledae* (MICH.), IGPUW/MŁw. 1, Wh = 17 mm.

Remarks. — This large-sized typical subspecies is represented by a number of large-scale fragments, which demonstrate all of the typical characteristics. A poorly preserved inner whorl is shown (pl. 1: 1) to demonstrate the early appearance of the characteristic pronounced ribbing of *Ph.* (*H.*) *velledae* (MICHELIN). From another, fragmentary specimen the external suture line was drawn (fig. 13) with the subdiphyllic saddle *E/L* and the asymmetrically triphyllic saddle L/U_2. Nothing has to be added to the description given by WIEDMANN (1964).

Occurrence. — *Ph.* (*H.*) *velledae velledae* (MICHELIN) was found in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień, Mała Łąka, Biała Woda as well as in the sandy glauconitic mudstone (*Blancheti* Subzone) of Mała Łąka, High-Tatric Series, southern Poland. Furthermore, it is known from the Albian of western Europe, the Middle Aptian to Upper Albian of the South Atlantic, South Africa and Mozambique, and the Albian to Cenomanian of Madagascar.

Ph. (*H.*) *velledae aschiltaense* BREISTROFFER
(pl. 1: 2)

1899. *Phylloceras* ex aff. *Velledae* MICH.; ANTHULA, 96, pl. 5: 2.
1947. *Ph. aschiltaense* BREISTROFFER, 55.
1964. *Ph.* (*Hypophylloceras*) *aschiltaense* BREISTR.; WIEDMANN, 213; pl. 19: 1 (with synonymy).

Material. — 1 specimen, IGPUW/WR2. 6.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 2	48	28.5(0.60)	22(0.46)	2(0.04)	0.77

Remarks. — One specimen from Wielka Rówień agrees in all its features with the present subspecies, which was originally described as *Ph.* ex aff. *velledae* MICH. from the Aptian of Dagestan by ANTHULA (1899), separated as an individual species by BREISTROFFER (1947), and again included in *Ph. velledae s. l.* by WIEDMANN (1964). As is obvious from pl. 1: 2, the present form is really very near to *Ph. velledae*, and, moreover, it has the same type of suture line. However, the whorls increase more rapidly in width and have a more elliptical whorl section than the typical subspecies. The umbilicus is distinctly funnel-shaped and is slightly more open than in *velledae velledae*.

Occurrence. — *Ph.* (*H.*) *velledae aschiltaense* BREISTROFFER is described from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. It ranges from the Aptian of Dagestan and northern Germany (?) into the Albian of the Balearic Islands.

Order **Lytoceratida** HYATT, 1889
Suborder **Lytoceratina** HYATT, 1889
Superfamily **Lytocerataceae** NEUMAYR, 1875
Family **Lytoceratidae** NEUMAYR, 1875
Genus *Protetragonites* HYATT, 1900

Type species: Ammonites quadrisulcatus d'ORBIGNY, 1841.

Remarks. — The genus *Protetragonites* HYATT, 1900 is broadly considered by WIEDMANN (1962*b*: 17ff.), i.e., including the genera *Leptotetragonites* SPATH, 1927 and *Hemitetragonites* SPATH, 1927. Moreover, this interpretation makes the family Protetragonitidae, as proposed by SPATH (1927), unnecessary.

Occurrence. — The genus *Protetragonites* HYATT is known from the Tithonian and Lower Cretaceous of Europe, Asia, Africa, and Madagascar.

Protetragonites aeolus (d'ORBIGNY, 1850)

This poorly known and therefore largely misunderstood species has been redefined by WIEDMANN (1962*b*: 24ff.) to also include *P. aeoliformis* (P. FALLOT) as a subspecies. With *P. aeolus neptuni* WIEDMANN, a further subspecies has been proposed. In the Tatric material only the typical subspecies can be recognized.

P. aeolus aeolus (d'ORBIGNY)
(pl. 1: 8, 9; fig. 14)

1850. *Ammonites Aeolus* d'ORBIGNY, 125.
1930. *Lytoceras* sp.; PASSENDORFER, 622, fig. 5, pl. 2: 41.
1962*b*. *Protetragonites aeolus aeolus* (d'ORB.); WIEDMANN, 24, fig. 6, pl. 10: 3 (with synonymy).

Material. — 3 specimen, IGPUW/WR3. 27—29. (The specimen described and figured by PASSENDORFER is only partially preserved).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 9	29	9(0.31)	10(0.35)	14(0.48)	1.11
pl. 1: 8	22	7(0.32)	8(0.36)	9.5(0.43)	1.15
Lectotype (for comparison)	31	10.5(0.34)	12.5(0.40)	14.5(0.47)	1.19

Description. — *P. aeolus aeolus* typically increases in whorl thickness rather than in whorl height. The whorl section is thus broadly rounded, semi-lunate, having its maximum width near the umbilical border. At the same time, the umbilical width is smaller than usual. The outer surface of the whorls is nearly smooth. On the inner whorls — in addition to the lytoceratid striation — there are 4—5 flares per whorl. These flares are equivalent to the shallow constrictions on the mould. On the outer whorl, the number of constrictions or flares increases irregularly. It has a normal lytoceratid suture line.

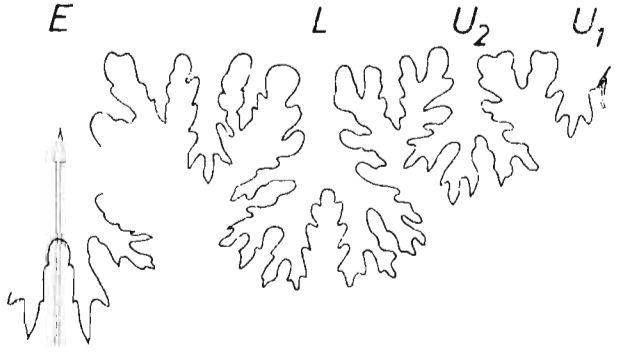


Fig. 14.

Suture of *Protetragonites aeolus aeolus* (d'ORB.), IGPUW/WR3.27, Wh = 6.5 mm, (cf. pl. 1: 8).

Remarks. — PASSENDORFER (1930: 622) placed the present specimens in the vicinity of *P. aeoliformis* (P. FALLOT), and there is indeed a certain affinity. But as pointed out by WIEDMANN (1962*b*: 26), this subspecies has whorls increasing in height rather than in thickness, a subcircular whorl section, and open whorls (*P. laevis* WIEDMANN, 1962*b* has the same whorl

section but can easily be distinguished by the lack of constrictions). There is, however, perfect agreement with the typical subspecies as redefined. Moreover, the figured specimens demonstrate the transitional character of Albian protetragonitids towards *Eogaudryceras*. The main differences from the time-equivalent eogaudryceratid species are the rapidly decreasing umbilical width and the increasing incision of the umbilical lobe U_1 (fig. 14).

Occurrence. — *P. aeolus aeolus* (d'ORBIGNY) is described here from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. The restricted species is only known from the condensed Albian of Clar and Escragnolles, southern France.

Superfamily **Tetragonitaceae** HYATT, 1900
Family **Gaudryceratidae** SPATH, 1927
Subfamily **Gaudryceratinae** SPATH, 1927
Genus *Eogaudryceras* SPATH, 1927

Type species: Lytoceras numidum COQUAND in SAYN, 1890.

Remarks. — Following WIEDMANN (1962*a*: 150), *Eotetragonites* BREISTROFFER, 1947 should also be included in *Eogaudryceras* as a subgenus. The specimens from the High Tatra Mts., however, belong to the typical subgenus.

Occurrence. — The genus *Eogaudryceras* SPATH is known from Barremian to Albian strata of Europe, North America, Africa, and Madagascar.

E. (*Eogaudryceras*) *vatonnei* (COQUAND)
(pl. 1: 10)

1862. *Ammonites Vatonnei* COQUAND, 173, pl. 1: 9, 10.
1910. *Lytoceras* (*Gaudryceras*) *Vatonnei* COQUAND; PERVINQUIÈRE, 11, pl. 1: 9, 10.
1930. *Gaudryceras* aff. *Vatonnei* COQ.; PASSENDORFER, 629, pl. 2: 39.

Material. — 1 specimen, IGPUW/WR3. 25.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 10	?30	12.5(0.42)	12(0.40)	9.5(0.31)	0.96

Remarks. — This uncommon Algerian species can be separated from any other eogaudryceratid on the basis of its oval to subtriangular whorl section, which is nearly as wide as it is high. The flanks converge towards the rounded venter, resulting in a maximum width near the steep umbilical border. The umbilicus is medium-sized and funnel shaped. In the Polish specimen the shell is preserved, showing the fine, lytoceratid striation, interrupted 3 or 4 times per whorl by very shallow, collared constrictions.

PASSENDORFER's description and drawings of the whorl section have to be confirmed. The differences he observed with the Algerian types are regarded as normal variations in the eogaudryceratids.

Occurrence. — Until now, *E.* (*E.*) *vatonnei* (COQUAND) has only been described from the lowermost Cenomanian (*Submantelliceras* beds) of Algeria. The present specimen comes from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland.

E. (*Eogaudryceras*) *shimizui* BREISTROFFER

Both of the subspecies previously defined by WIEDMANN (1962*a*) are now recognized in the High-Tatric material.

E. (*E.*) *shimizui shimizui* BREISTROFFER
(pl. 2: 2)

1930. *Lytoceras* sp.; PASSENDORFER, 623, fig. 38b bis, pl. 2: 38a (*non* b).
1936*a*. *Eogaudryceras shimizui* BREISTROFFER *in* BESAIRIE, 176.
1962*a*. *E.* (*E.*) *shimizui shimizui* BREISTR.; WIEDMANN, 152, fig. 12, pl. 13: 1 (with synonymy).

Material. — 1 specimen, IGPUW/MŁw. 10.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 2: 2	30	12.5(0.41)	15(0.50)	13(0.43)	1.20

Remarks. — *E. shimizui shimizui* BREISTROFFER has been extensively described by WIEDMANN (1962*a*). There is no doubt that PASSENDORFER's "*Lytoceras* sp." (op. cit., pl. 2: 38a) has to be included in BREISTROFFER's later species. Despite the deformation of the Polish specimen, the measurements and the oval whorl section agree with those of the hypotype from Haute Savoy, France, described by WIEDMANN (op. cit.). PASSENDORFER's specimen is illustrated to show the fine, lytoceratid striation, which is occasionally interrupted by shallow constrictions and flares. The umbilicus is not as wide as in the French hypotype. The suture lines are identical.

Occurrence. — *E.* (*E.*) *shimizui shimizui* BREISTROFFER has been described from the Middle and Upper Albian of SE France and Madagascar, to which the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Mała Łąka in the High-Tatric Series, southern Poland, is added.

E. (*E.*) *shimizui gaonai* WIEDMANN
(pl. 2: 3)

1930. *Gaudryceras Bourritianum* PICT.; PASSENDORFER, 630, fig. 43b bis, pl. 2: 43a (*non* b).
1962*a*. *E.* (*Eogaudryceras*) *shimizui gaonai* WIEDMANN, 153, fig. 13, pl. 8: 4.

Material. — 1 specimen, IGPUW/WR3. 26.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 2: 3	25	10(0.40)	12(0.48)	9(0.36)	1.20
Holotype (for comparison)	27.5	10(0.36)	13(0.47)	10(0.36)	1.30

Remarks. — *E.* (*E.*) *shimizui gaonai* WIEDMANN has been separated from the typical subspecies due to the rapid increase in whorl thickness resulting in a broadly rounded rather than oval whorl section. In this respect, and in its measurements and sculpture, PASSENDORFER's "*Gaudryceras bourritianum*" conforms perfectly to the description of the present subspecies. *E.* (*E.*) *bourritianum* (PICTET) was redefined by WIEDMANN (1962*a*: 154) on the basis of a neotype from PICTET's collection, having a very different whorl section and umbilical width.

Occurrence. — In the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. The holotype of *E.* (*E.*) *shimizui gaonai* WIEDMANN was described from the upper part of the Middle Albian of northern Spain.

Genus *Kossmatella* JACOB, 1907

Type species: Ammonites agassizianus PICTET, 1847.

Remarks. — Of the two subgenera, *Kossmatella s. str.* and *Guderianites* WIEDMANN, previously recognized (WIEDMANN 1962*b*), only the typical subgenus is present.

Occurrence. — The genus *Kossmatella* JACOB is cosmopolitan and ranges from the Albian to the Early Cenomanian.

K. (*Kossmatella*) *romana* WIEDMANN
(pl. 2: 7)

1930. *Kossmatella Agassizi* PICT.; PASSENDORFER, 627.
1962*a*. *K.* (*Kossmatella*) *romana* WIEDMANN, 164, figs. 21—24, pl. 8: 6, 7, pl. 13: 12 (with synonymy).
1962*b*. *K.* (*Kossmatella*) *romana* WIEDMANN, 50, pl. 3: 8, pl. 4: 1, 5, pl. 5: 3.
1968. *K.* (*K.*) *romana* WIEDMANN; WIEDMANN and DIENI, 38, pl. 1: 10, 11, pl. 2. 7, pl. 3: 10.
1979*a*. *K. romana* WIEDM.; SCHOLZ, 53, fig. 15.
?1979. *K.* (*K.*) aff. *romana* WIEDM.; KENNEDY and KLINGER, 167, pl. 14: 5, 7, 9, 10.
1983. *K. romana* WIEDM.; WEIDICH *et al.*, 565, pl. 2. 2.

Material. — 1 specimen, IGPUW/WR3.35.
Measurements (in mm):

	D	Wh	Wb_{max}	U
pl. 2: 7	?32	11(0.34)	11(0.34)	13.5(0.42)
Holotype (for comparison)	46	16(0.35)	16(0.35)	19(0.41)

Remarks. — After the redescription of *K.* (*K.*) *agassiziana* (PICTET) and the separation of *K.* (*K.*) *romana* by WIEDMANN (1962*a*), PASSENDORFER's specimen of *K. agassiziana* also has to be moved to the well-known, widespread *K. romana* WIEDMANN. In contrast to the highly elevated whorl section of PICTET's species, *K. romana* WIEDMANN has a more subcircular to oval whorl section and at the same time a larger umbilicus. Moreover, the radial bulges start at the umbilicus with a pronounced tubercle. One of the High Tatra specimens can be attributed to this species. The specimen described by KENNEDY and KLINGER (1979) from the Upper Albian of Zululand cannot be attributed to *K. romana* WIEDMANN with certainty since they show distinct constrictions.

Occurrence. — The Polish specimen is from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień; revision of PASSENDORFER's (1930) dates indicates that this species also occurs in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) as well as in the sandy glauconitic mudstone (*Blancheti* Subzone) of Mała Łąka, High-Tatric Series. *K.* (*K.*) *romana* WIEDMANN is an extremely long-ranging species. Its occurrence in the Upper Aptian of the Venetian Alps, Italy, is doubtful, but it ranges throughout the Albian of southern Germany, SE France, Sardinia, and Spain.

K. (*Kossmatella*) *oosteri* BREISTROFFER

WIEDMANN and DIENI (1968) separated two different subspecies, one of them based on PASSENDORFER's "*Kossmatella* aff. *rencurelensis* JACOB". Both are present in the condensed Albian of the High Tatra Mts.

K. (K.) oosteri oosteri BREISTROFFER
(pl. 2: 4, 5)

pars 1930. *Kossmatella rencurelensis* JACOB; PASSENDORFER, 627.
pars 1930. *K.* aff. *Mühlenbecki* FALLOT; PASSENDORFER, 625.
1936*b*. *K. Oosteri* BREISTROFFER, 1492.
1968. *K. (Kossmatella) oosteri oosteri* BREISTR.; WIEDMANN and DIENI, 40, figs. 9, 10, pl. 2: 8, pl. 4: 12, pl. 5: 7 (with synonymy).

Material. — 2 specimens, IGPUW/WR2.33—34.
Measurements (in mm):

	D	Wh	Wb_{max}	U
pl. 2: 4	?38	14(0.37)	17(0.45)	15(0.40)
pl. 2: 5	27	8(0.30)	13(0.48)	11.5(0.42)

Remarks. — One of PASSENDORFER's "*rencurelensis*" specimens (pl. 2: 4) has the typical sub-trapezoidal whorl section of the typical subspecies. There are probably 12 conical tubercles at the base of the pronounced radial bulges. They are, however, not as sharp as they would be in *K. oosteri oosteri* BREISTROFFER. Moreover, the specimen is somewhat more involute than the Mediterranean forms. However, the other specimen (pl. 2: 5), which was attributed to "*K.* aff. *mühlenbecki*" by PASSENDORFER, is a typical *K. oosteri oosteri.*

Occurrence. — *K. (K.) oosteri oosteri* BREISTROFFER is known from the Late Albian of Switzerland, SE France, and Sardinia, to which the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland, can be added.

K. (K.) oosteri passendorferi WIEDMANN et DIENI
(pl. 2: 6; fig. 15)

1930. *Kossmatella* aff. *rencurelensis* JACOB.; PASSENDORFER, 627, pl. 2: 40.
1968. *K. (Kossmatella) oosteri passendorferi* WIEDMANN and DIENI, 41.

Material. — One specimen, IGPUW/WR2.32 — the holotype.
Measurements (in mm):

	D	Wh	Wb_{max}	U
pl. 2: 6	27	9(0.33)	12.4(0.46)	11.8(0.43)

Description. — Small kossmatellid form with very sharp tubercles on much protracted lateral bulges, about 14 per whorl. Relatively involute whorls with subtriangular section and irregularly spaced constrictions. Narrowly rounded, smooth venter.

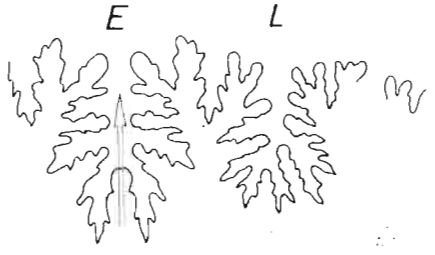


Fig. 15.

Suture of *K. (Kossmatella) oosteri passendorferi* WIEDMANN et DIENI, IGPUW/WR2.32 — holotype, Wh = 6 mm, (cf. pl. 2: 6).

Remarks. — Due to its subtriangular whorl section and the existence of very sharp tubercles on the strongly protracted bulges, this subspecies can easily be distinguished from the typical one. Moreover, the whorls are irregularly constricted. Finally, *K. oosteri passendorferi* WIEDMANN et DIENI is a small form with a phragmocone diameter of 18 mm. Suture (fig. 15) of the normal kossmatellid type.

Occurrence. — At the moment, *K.* (*K.*) *oosteri passendorferi* WIEDMANN et DIENI is known only from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland.

K. (*Kossmatella*) *schindewolfi* WIEDMANN et DIENI
(pl. 2: 8)

pars 1930. *Kossmatella* aff. *Mühlenbecki* FALLOT; PASSENDORFER, 625, pl. 2: 44.
1968. *K.* (*Kossmatella*) *schindewolfi* WIEDMANN et DIENI, 41, figs. 11, 12, pl. 3: 13, pl. 4: 1—3.
1983. *K. schindewolfi* WIEDMANN et DIENI; WEIDICH *et al.*, 564.

Material. — 2 specimens, IGPUW/WR2.30—31.
Measurements (in mm):

	D	Wh	Wb_{max}	U
pl. 2: 8	31	9(0.29)	11(0.35)	15(0.48)
Holotype (for comparison)	32	9.5(0.30)	12(0.37)	16(0.50)

Remarks. — This species was based on a larger collection of material from the Upper Albian of Sardinia, combining the characteristics of *K. oosteri* BREISTROFFER and *K. muhlenbecki* (E. FALLOT). *K. schindewolfi* WIEDMANN et DIENI has a sub-trapezoidal whorl section with a flat, smooth venter and distinct marginal edges. The umbilicus increases in width, the sculpture in density. 15 or more radial bulges bear sharp conical tubercles. There are three cotypes labelled "*K.* aff. *mühlenbecki*" by PASSENDORFER, two of which may belong to the present species. The third one (the measurements of which are given by PASSENDORFER, op. cit.: 625) is, however, a true *K.* (*K.*) *oosteri oosteri* (see pl. 2: 5). PASSENDORFER's figured specimen has unfortunately been lost.

Occurrence. — *K.* (*K.*) *schindewolfi* WIEDMANN et DIENI is known from the condensed Upper Albian of southern Germany, SE France, and Sardinia, and is now additionally described from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland.

Family **Tetragonitidae** HYATT, 1900
Genus *Tetragonites* KOSSMAT, 1895

Type species: Ammonites timotheanus PICTET, 1847.

Occurrence. — The genus *Tetragonites* is cosmopolitan and ranges from the Late Aptian into Maastrichtian (WIEDMANN 1974).

Tetragonites rectangularis WIEDMANN
(pl. 1: 11; fig. 16)

pars 1930. *Tetragonites Timotheanus* MAYOR; PASSENDORFER, 624.
1962*a*. *T. rectangularis* WIEDMANN, 178, fig. 39, pl. 14: 3 (with synonymy).
1974. *T. rectangularis rectangularis* WIEDM.; WIEDMANN, 596, pl. 1: 1, pl. 4: 2, pl. 7: 1, 2 (with synonymy).

Material. — 4 specimens from Wielka Rówień, assigned to *T. timotheanus* by PASSENDORFER; IGPUW/WR3.20, WR2.21—23.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 11	29.3	13.2(0.45)	19.5(0.66)	6.4(0.22)	1.48
fig. 16	15	7(0.47)	10(0.67)	4(0.27)	1.43
Holotype	50	22(0.44)	31(0.62)	12.8(0.25)	1.40

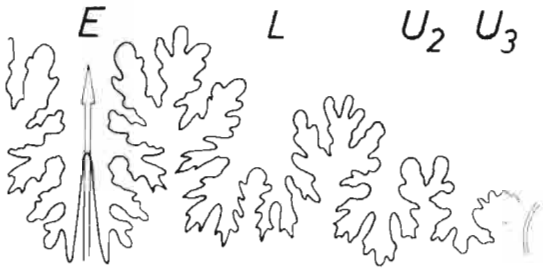


Fig. 16.

Suture of *Tetragonites rectangularis* WIEDMANN, IGPUW/WR2.22, Wh = 5 mm.

Remarks. — Nothing has to be added to the description of this widespread, easily recognizable species. The whorl section is trapezoidal to rectangular at first, becoming broadly rounded with age. 5—6 protracted constrictions per whorl persist throughout life. The suture line is shown on fig. 16.

Occurrence. — *T. rectangularis* WIEDMANN is a widespread species ranging throughout the Albian and occurring in SW Europe, Great Britain, and Madagascar. The specimens described here were found in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland.

Tetragonites nautiloides (PICTET)

(pl. 1: 12, 13; fig. 17)

1847. *Ammonites Timotheanus* var. *nautiloides* PICTET, 296, pl. 3: 2.
pars 1930. *Tetragonites Timotheanus* MAYOR; PASSENDORFER, 624.
1962*a*. *T. nautiloides* (PICTET); WIEDMANN, 174, figs. 34, 35, pl. 8: 11, pl. 14: 1 (with synonymy).
1974. *T. nautiloides nautiloides* (PICTET); WIEDMANN, 606, fig. 10, pl. 8: 2, 5—8 (with synonymy).

Material. — 8 specimen, IGPUW/WR2.18—19, 24 and IGPUW/MŁw. 5—9, assigned to *Tetragonites timotheanus* MAYOR by PASSENDORFER.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 1: 13	38	15(0.40)	?24(0.64)	9(0.24)	?1.60
pl. 1: 12	13	5.3(0.41)	7.7(0.59)	3.2(0.25)	1.45
Neotype (*in* WIEDMANN 1962*a*)	30	13(0.43)	19(0.64)	8(0.27)	1.46

Remarks. — This is a series of typical specimens of the present species, all of which agree perfectly with the neotype (*in* WIEDMANN 1962*a*, pl. 14: 1) as regards the trapezoidal section of the unconstricted whorls and the closed umbilicus. The suture line (fig. 17) also agrees with those previously illustrated.

Occurrence. — *T. nautiloides* (PICTET) is widespread in the Upper Albian of Western Europe, sporadic in the Lower and Middle Albian of SE France and the Balearic Islands, and is now

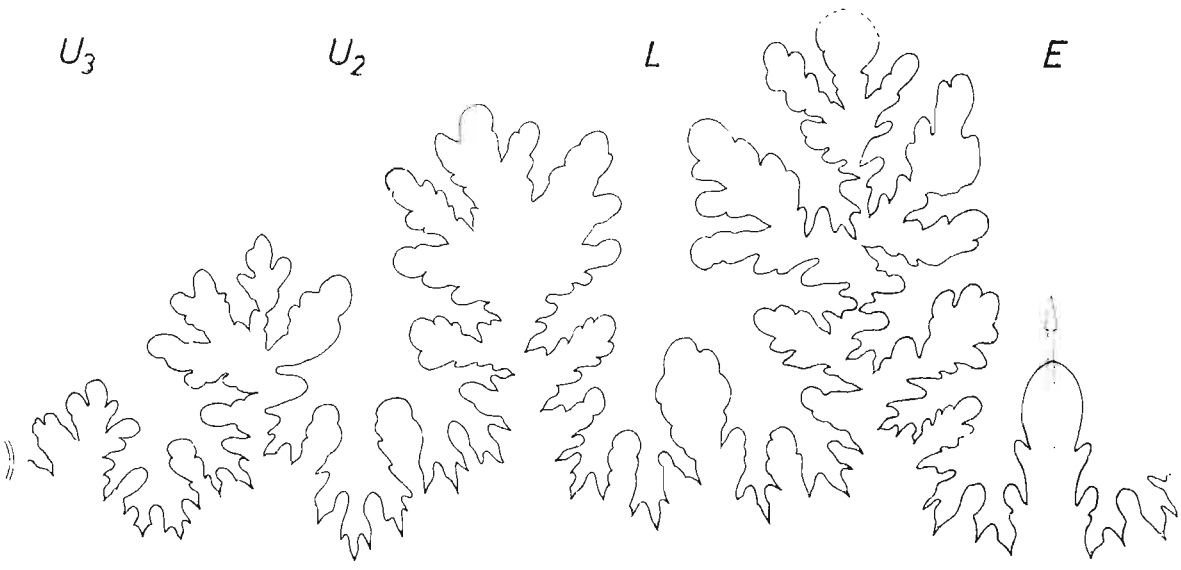


Fig. 17.

Suture of *Tetragonites nautiloides* (PICTET), IGPUW/MŁw. 5, Wh = 16.5 mm, (cf. pl. 1: 13).

also described from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień and Mała Łąka as well as from the sandy glauconitic mudstone (*Blancheti* Subzone) of Mała Łąka, High-Tatric Series, southern Poland.

Tetragonites jurinianus (PICTET)

(pl. 2: 1; fig. 18)

1847. *Ammonites Jurinianus* PICTET, 297, pl. 3: 3.
1930. *Tetragonites Jurinianus* PICTET et ROUX; PASSENDORFER, 625.
1962*a*. *T. jurinianus* (PICTET); WIEDMANN, 176, figs. 36—38, pl. 14: 2 (with synonymy).
1968. *T. jurinianus* (PICTET); RENZ, 19, figs. 6d, 7a—b, pl. 1: 6 and 7.
1974. *T. jurinianus* (PICTET); WIEDMANN, 608, pl. 8: 3 and 4 (with synonymy).
1979. *T.* (*T.*) *jurinianus* (PICTET); COOPER and KENNEDY, 185, figs. 5 and 6.

Material. — 1 specimen, IGPUW/BW. 3.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 2: 1	43	20(0.46)	?26(0.60)	11(0.25)	?1.30
Holotype	74	36(0.48)	42(0.57)	17(0.23)	1.17

Remarks. — *T. jurinianus* (PICTET) is characterized by a rounded whorl section and lack of constrictions throughout the animal's life time. Compared with *T. timotheanus*, it is a large species. The suture line of the Polish specimen is shown in fig. 18. The inclusion of this specimen in *T. jurinianus* by PASSENDORFER (1930) was correct.

Occurrence. — *T. jurinianus* (PICTET) is widespread in the Upper Albian of SW Europe, Africa, and Central America; it may also occur in the Lower Cenomanian. The figured specimen is from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Biała Woda in the High-Tatric Series, southern Poland.

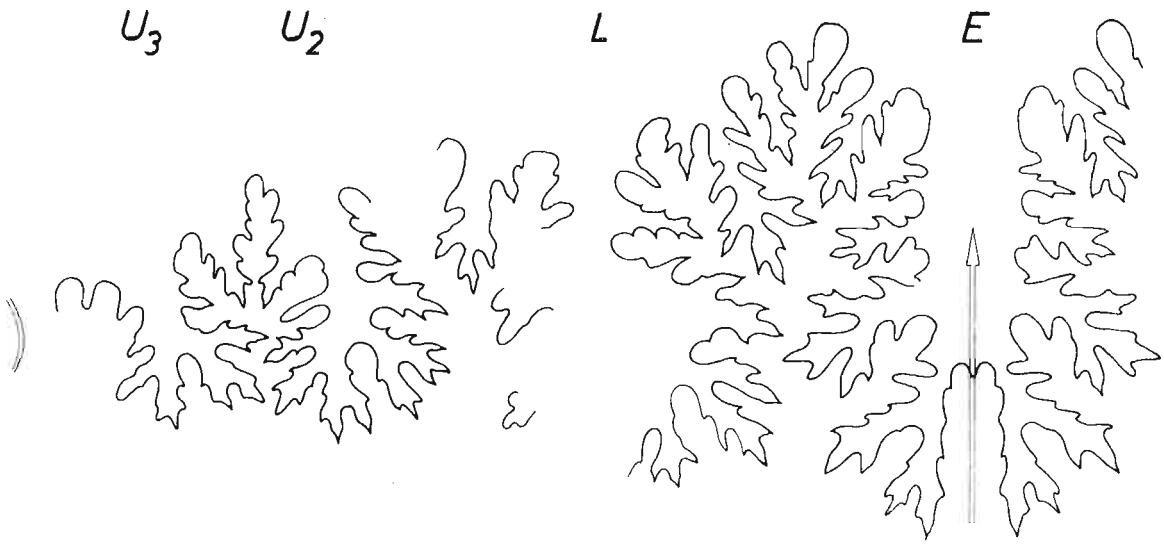


Fig. 18.

Suture of *Tetragonites jurinianus* (PICTET). IGPUW/BW. 3, Wh = 13.5 mm, (cf. pl. 2: 1).

Suborder **Ancyloceratina** WIEDMANN, 1966
Superfamily **Ancyloceratacea** MEEK, 1876
Family **Hamitidae** HYATT, 1900
(incl. **Anisoceratidae** HYATT, 1900)

In contrast to earlier attempts to classify Hamitidae HYATT with the Baculitidae MEEK (WIEDMANN 1962*b*, WIEDMANN and DIENI, 1968), in this paper Hamitidae are separated. This separation is the consequence of an increasing number of tuberculate hamitids described by SCHOLZ (1979*a*), thus making the separate classification of Hamitidae HYATT and Anisoceratidae HYATT rather difficult, if not impossible. Moreover, there is no question that turrilitids originated in both groups, in which case there is no chance for separating tuberculate from non-tuberculate forms. Nevertheless, baculitids and ptychoceratids are not too far away from hamitids, even if the family Baculitidae MEEK becomes reestablished.

Genus *Hamites* PARKINSON, 1811

Type species: Hamites attenuatus J. SOWERBY, 1814.

Remarks. — Classification of the genus *Hamites* PARKINSON has been revised by WIEDMANN (1962*a*) and WIEDMANN and DIENI (1968). In the present paper the following subgenera are treated:

Hamites PARKINSON, 1811
Metahamites SPATH, 1930
Plesiohamites BREISTROFFER, 1947

Metahamites SPATH has to be redefined on the basis of its type species, and likewise the genus *Hemiptychoceras* SPATH.

Occurrence. — The genus *Hamites* PARKINSON has a world-wide distribution and ranges from the Upper Aptian through the Lower Turonian.

Subgenus *H.* (*Hamites*) PARKINSON, 1811

1940. *H.* (*Stomohamites*) BREISTROFFER, 156.
1947. *Hamitella* BREISTROFFER, 84.

Remarks. — The synonymy of the nominal subgenus was largely discussed by WIEDMANN (1962*a*, 1962*b*), WIEDMANN and DIENI (1968), and SCHOLZ (1979*a*), and it includes the above-mentioned taxa.

Occurrence. — As for the genus.

H. (*Hamites*) *attenuatus* J. SOWERBY
(pl. 2: 9—11; fig. 19)

1814. *Hamites attenuatus* J. SOWERBY, 137, pl. 61: 4 and 5.
1930. *H. attenuatus* SOW.; PASSENDORFER, 665, fig. 22, pl. 4: 67.
Hamites sp.; PASSENDORFER, 667, pl. 4: 79.
1938. *H. attenuatus* J. SOW.; SPATH, 607, fig. 218, pl. 67: 1—13, 19 (with synonymy).

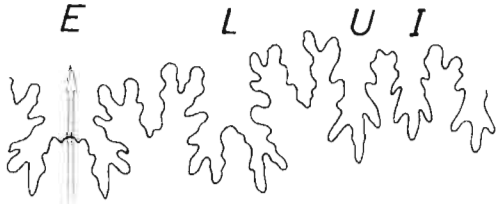


Fig. 19.

Suture of *H.* (*Hamites*) *attenuatus* SOW., IGPUW/WR3.38, Wh = 5 mm, (cf. pl. 2: 11).

Material. — 4 specimens, IGPUW/WR3.36—38, MŁr. 1.

Remarks. — *H.* (*H.*) *attenuatus* SOWERBY is one of the most abundant Middle Albian hamitids. It is represented in the Polish material by a variety of forms with quite different diameters. Nevertheless, the dominant characteristics can be observed throughout: the subcircular whorl section, only slightly higher than it is broad; 6—7 strongly projecting ribs per equivalent whorl height; and the typical suture line (fig. 19) with slender and trifid *U*. The suture line of the smallest specimen is reproduced to show the complete agreement with SPATH'S suture (1938, fig. 218h).

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień; redeposited in the sandy glauconitic mudstone (*Blancheti* Subzone) of Mała Łąka; High-Tatric Series, southern Poland. *H.* (*H.*) *attenuatus* J. SOWERBY seems to be of world-wide distribution and occurs mainly in the Middle Albian.

H. (*Hamites*) *maximus* J. SOWERBY
(pl. 3: 1)

1814. *Hamites maximus* J. SOWERBY, 138, pl. 62: 1.
1941. *H. maximus* J. SOW.; SPATH, 621, fig. 224, pl. 68: 20, pl. 69: 1—5, pl. 70: 1 (with synonymy).

Material. — 3 fragmentary specimens, IGPUW/WR3.52—54.

Remarks. — This is a large species with a circular whorl section and marked, widely spaced ribbing (4—5 per whorl height). One of the poorly preserved, large fragments is reproduced (pl. 3: 1) to show the sub-helicoidal coiling.

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. *H.* (*H.*) *maximus* J. SOWERBY has a long duration, ranging through the Middle Albian into the lower part of the Upper Albian. It is known with certainty only from central and western Europe.

H. (*Hamites*) *rectus* BROWN

(pl. 2: 14; fig. 20)

1837. *Hamites rectus* BROWN, 3, pl. 1: 11.
pars 1842. *H. attenuatus* J. SOW.; d'ORBIGNY, only pl. 69: 7—9.
1930. *Hamites* sp.; PASSENDORFER, 661, fig. 18, pl. 4: 74.
1941. *H. maximus* var. *rectus* BROWN.; SPATH, 623, pl. 68: 15 and 16, pl. 69: 4 and 6—9, pl. 70: 18.

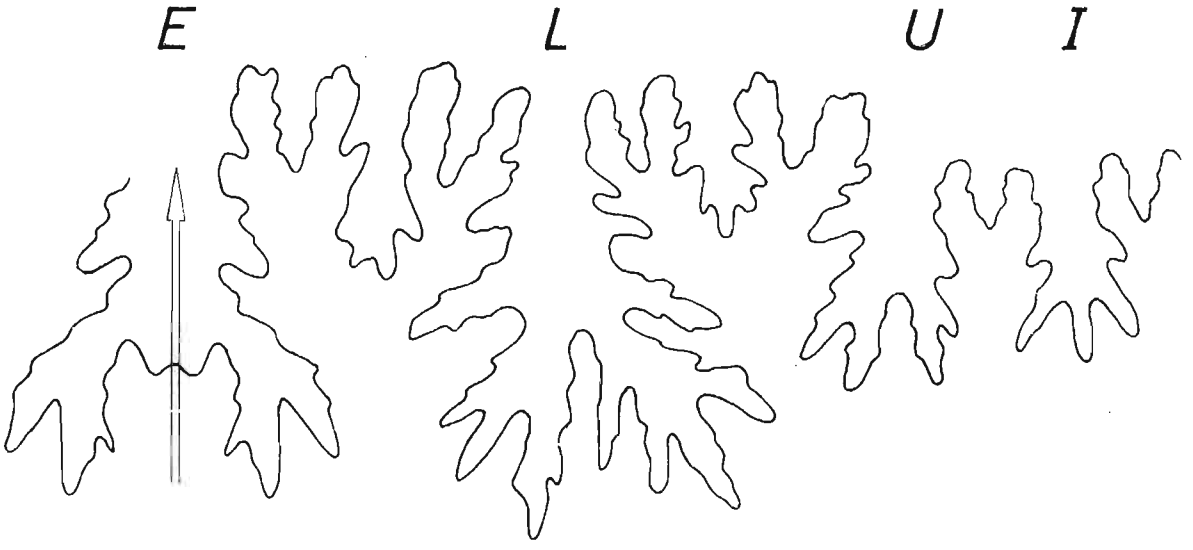


Fig. 20.

Suture of *H.* (*Hamites*) *rectus* BROWN, IGPUW/WR2.50, Wh = 7.8 mm, (cf. pl. 2: 14).

Material. — 1 specimen, IGPUW/WR2.50.

Remarks. — The present species is poorly known and was included by Spath (op. cit.: 623) in *H.* (*H.*) *maximus* J. SOWERBY. We think, however, that it can be separated due to its smaller size, the predominance of straight fragments, and the different type of ribbing. One of the Wielka Rówień specimens might be included in this species, which has the same type of ribbing as in *Stomohamites*. The irregularity of the ribbing shows that the shaft — even if it is straight — is twisted. Some very faint traces of irregular tubercles are also an anisoceratid feature. The suture (fig. 20) and the circular whorl section are those of the closest relative, *H.* (*H.*) *maximus* J. SOWERBY.

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, Southern Poland. At present, *H.* (*H.*) *rectus* BROWN seems to be restricted to the British Middle Albian.

H. (*Hamites*) *rotundus* J. SOWERBY
(pl. 2: 13)

1814. *Hamites rotundus* J. SOWERBY, 136, pl. 61. 2 and 3.
1930. *H. rotundus* d'ORB.; PASSENDORFER, 663.
1941. *H. rotundus* J. SOW.; SPATH, 611, fig. 219, pl. 67: 14—18, pl. 68: 1 (with synonymy).

Material. — 10 fragmentary specimens, IGPUW/WR2.44—49, WR3.40—43.

Remarks. — *H.* (*H.*) *rotundus* J. SOWERBY is another circularly whorled hamitid, but in this case the ribbing is annular to retracted (about 6 ribs per whorl height). The ribs disappear on the dorsum. The coiling seems to be helicoidal throughout, as can be seen in the illustrated specimen (pl. 2: 13). Thus, these forms are intermediate between *Hamites* and *Proturrilitoides* BREISTROFFER.

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. *H.* (*H.*) *rotundus* J. SOWERBY is another Middle Albian species of Europe and Africa.

H. (*Hamites*) *incurvatus* BROWN

1811. *Hamites* sp. PARKINSON, pl. 10: 2.
1837. *H. incurvatus* BROWN, 2, pl. 1: 4.
1941. *H. incurvatus* BROWN; SPATH, 619, fig. 223, pl. 68: 18 and 19.

Material. — 1 fragment, IGPUW/WR2.51.

Remarks. — Only one poorly preserved fragment has the laterally compressed whorl section and the widely spaced, strong ribbing (4—5 per whorl height) of the present species. This nearly straight fragment is again twisted.

As in the paratype (SPATH 1941: 619), the umbilical lobe (*U*) of the Polish specimen is bifid.

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. *H.* (*H.*) *incurvatus* BROWN ranges from the Middle into lower Upper Albian. It is known only from western Europe.

H. (*Hamites*) *virgulatus* BROGNIART
(pl. 2: 12)

1822. *Hamites virgulatus* BROGNIART in CUVIER and BROGNIART, pl. 0: 6.
?1847. *H. Venetzianus* PICTET, 390, pl. 14: 6.
1861. *H. duplicatus* PICTET et CAMPICHE, 98.
1930. *H. virgulatus* BROGN.; PASSENDORFER, 660.
H. aff. *Venetzianus* PICT. et ROUX; *ibidem*, 666, fig. 23, pl. 4: 72.
1968. *H.* (*H.*) *virgulatus* BROGN; WIEDMANN and DIENI, 53, figs. 21—27, pl. 5: 1, 2 and 10, pl. 7: 1 and 2 (with synonymy).
1968. *H.* (*Stomohamites*) *virgulatus virgulatus* BROGN.; RENZ, 65, fig. 23b—d, pl. 11: 9—11.
H. (*Stomohamites*) *virgulatus interruptus* RENZ, 66, figs. 23m, 24c, pl. 11: 25 and 26.
H. (*Stomohamites*) *venetzianus venetzianus* PICTET; RENZ, 67, figs. 23f, 24b, pl. 11: 15 and 16.
H. (*Stomohamites*) *venetzianus sulcatus* RENZ, 67, fig. 23n, pl. 11: 27.
H. (*Stomohamites*) *subvirgulatus* SPATH; RENZ, 66, figs. 23e, 24a, pl. 11: 13 and 14.
H. (*Stomohamites*) *duplicatus* PICTET et CAMPICHE; RENZ, 68, figs. 23h—k, pl. 11: 19—21.
pars 1979*a*. *H.* (*H.*) *virgulatus* BROGN.; SCHOLZ, 18.
1979. *H. virgulatus* BROGN.; COOPER and KENNEDY, 227, figs. 16F, H, 32B, C.
?1982. *H.* (*H.*) cf. *virgulatus* BROGN.; RENZ, 60, pl. 20: 5 and 11.

Material. — 2 specimens, IGPUW/WR. 3. 39, WR. 58.

Remarks. — The extreme degree of variation within this well-defined species has been discussed by various authors (SPATH 1940, WIEDMANN and DIENI 1968, COOPER and KENNEDY 1979, SCHOLZ 1979*a*) and does not need to be repeated. Also, the separation of a genus or subgenus *Stomohamites* was discussed and refuted (WIEDMANN and DIENI 1968: 51).

It remains doubtful whether or not the specimens with crioceratid coiling which RENZ (1982) illustrated from Venezuela should be included in the present species.

Occurrence. — In the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. *H.* (*H.*) *virgulatus* BROGNIART, as now mostly understood, is known from Europe, Africa, and North America and ranges from the Upper Albian into lowermost Cenomanian.

Subgenus *H.* (*Metahamites*) SPATH, 1930

Type species: Hamites sablieri d'ORBIGNY, 1842.
Lectotype: see WIEDMANN and BOESS 1984, figs. 4A and B.

Remarks. — WIEDMANN and DIENI (1968: 58f) largely discussed how to define and restrict the "genus" *Metahamites*. There is no question that the large anisoceratids around "*Metahamites*" *dubius* COLLIGNON (1949, 1963) have to be excluded. *H.* (*M.*) *sablieri*, in coiling and untubercled ribbing, is a true hamitid, which can, however, be separated from *Hamites s. str.* due to its periodic change in ornamentation on the phragmocone. This was the reason to include the Sardinian *H.* (*M.*) *dalpiazi* WIEDMANN and DIENI (1968). But at the same time, we drew attention to the close relationship with the hamitid genus *Hemiptychoceras* SPATH, 1925. Based on new observations of the Tatric material and a revision of the type species of both genera, we can conclude that both genera develop convergent sculptures but can be separated by internal suture lines. As becomes obvious from the suture lines, *H.* (*M.*) *sablieri* has a small internal lobe *I* and an inferior degree of incision of the whole suture line (GEBHARD 1979), while *Hemiptychoceras gaultinum* (PICTET) has a large lobe *I* and a much higher degree of sutural incision. Due to this redefinition, *H.* (*M.*) *dalpiazi* WIEDMANN et DIENI must be transferred to *Hemiptychoceras*; "*Hamites*" *tatricus* sp. n. must also be a *Hemiptychoceras* while the second new Tatric species, *Hamites passendorferi* sp. n., must be included in *Metahamites*. Both genera have identical periodic ribs and/or constrictions on the smaller shaft(s) and an identical change in ornamentation towards the final shaft (cf. fig. 22 and pl. 3: 6 with pl. 3: 2 and 3). They might also be different in the mode of coiling, which is in the form of an open spiral in *Metahamites* and three (?) touching, parallel shafts in *Hemiptychoceras*. Finally, *H.* (*M.*) *passendorferi* sp. n. has periodic marginal tubercles (indicating that "Hamitidae" and "Anisoceratidae" are really indistinguishable). Despite the fact that most of the *Metahamites* and *Hemiptychoceras* specimens are found in condensed beds, we can now determine their ages more precisely: *Metahamites* seems to be restricted to the late Lower and Middle Albian of Europe and Madagascar, while *Hemiptychoceras* is restricted to the Upper Albian.

H. (*Metahamites*) *passendorferi* sp. n.
(pl. 3: 2 and 3; fig. 21)

1930. *Hamites* sp.; PASSENDORFER, 662, fig. 20, pl. 4: 78.

Material. — Three specimens, IGPUW/WR2.67—69.
Holotype: Specimen IGPUW/WR2.67 — pl. 3: 2.
Paratypes: IGPUW/WR2.68 and 69.

Diagnosis. — Coiling is in the form of a narrow hamitid spiral in one plane. The whorl section is high to subrectangular, with flattened sides. A significant change in sculpture is: crowded ribs join in pairs or triplets in the form of flares (and sometimes with marginal tubercles on the smaller shaft) and are separated by narrower constrictions with only one or two ribs. Ribbing on the final hook is uniform, crowded at first, but much stronger and spaced towards the mouth; these ribs have tubercle-like swellings on the marginal border. The suture line has a sub-bifid *U* and small, trifid *I*.

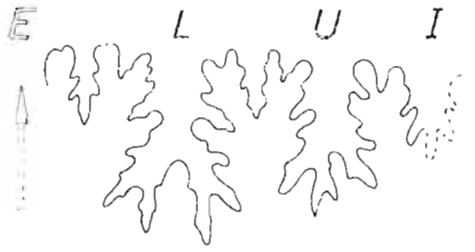


Fig. 21.

Suture of *H.* (*Metahamites*) *passendorferi* sp. n., IGPUW/WR2.67 — holotype, Wh = 6 mm, (cf. pl. 3: 2).

Description. — All three specimens are portions of the final hook which represents the body chamber. On the inner shaft we notice an alternation of flares (with two or three ribs) and constricted intervals (with only one or two ribs). In some of the flares, the ribs join in marginal tubercles. While most of the ribs cross the venter, the tubercled ribs show looping (pl. 3: 2b). With the beginning of the final hook, the ribbing becomes uniform and is first fine and crowded but much stronger and with wider interspaces towards the mouth (pl. 3: 2a). At the same time, the course of the ribbing changes from projected to reclined. The final ribs, moreover, show thickening towards the marginal shoulder (pl. 2: 3a); since all specimens are moulds, these marginal swellings could correspond to tubercles on the shell. The whorl section is subrectangular with flat, lateral sides and a small, rounded venter and dorsum.

Measurements (in mm):

	Wh_{max}	Wb_{max}
pl. 3: 2 — holotype	8	6
pl. 3: 3 — paratype	7	5
IGPUW/WR2.69 — paratype	7	5.5

The suture line (fig. 21) is characterized by a low degree of incision, a subbifid *U*, and a small trifid *I*.

Relations: PASSENDORFER (1930: 662) was the first to notice the problem not only of classification of the present species, but also of hamitids. Describing this form in open nomenclature, he suggested the relationship with *Hamites sablieri* d'ORBIGNY but described the presence of marginal tubercles which would include these specimens in *Anisoceras* PICTET. Indeed, there is some similarity with *Protanisoceras* SPATH or *Idiohamites* SPATH, but there is no question that the real relationship is with *H.* (*M.*) *sablieri.*

Nevertheless, *H.* (*M.*) *passendorferi* sp. n. differs in several aspects from *H.* (*M.*) *sablieri.* The latter species (cf. WIEDMANN and BOESS 1984, figs. 4A—C) has a rounded whorl section. On the smaller shaft, the ribs join in pairs to form flares, forming a kind of lateral swelling; these broader intervals also bear two ribs running parallel. No marginal tubercles can be recognized. But the general ornamentation as well as the final size and suture lines are very similar. In *H.* (*M.*) *sablieri*, lobe *U* has a more trifid shape (GEBHARD 1979).

Genus *Hemiptychoceras* SPATH is easily separated by its much larger size, three (?) nearly

straight shafts in contact, and a more complicated suture line with a large internal lobe. The problem of separation of "Hamitidae" and "Anisoceratidae" (HYATT 1900) has been discussed from time to time (WIEDMANN 1962*b*, WIEDMANN and DIENI 1968, SCHOLZ 1979*a*). From the present observation of *Metahamites*, this separation should be abandoned.

Occurrence. — The holo- and paratypes were collected in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of the Albian of Wielka Rówień in the High-Tatric Series, southern Poland.

Subgenus *H.* (*Plesiohamites*) BREISTROFFER, 1947

Type species: Hamites multicostatus BROWN, 1837.

Remarks and occurrence. — The subgenus *Plesiohamites* includes a number of large hamitids with fine, dense ribbing. It is known from the latest Middle (?) and Upper Albian of England, France, northern Spain, Switzerland, the southern Soviet Union, and Poland.

H. (*Plesiohamites*) *multicostatus* BROWN
(pl. 3: 5, pl. 25: 2)

1837. *Hamites multicostatus* BROWN, 3, pl. 2: 9.
1941. *H.* (*Stomohamites*?) *multicostatus* BROWN.; SPATH, 648, fig. 236c—f, pl. 71: 15—17.
1961. *Lytohamites similis* sp. n.; CASEY, 92.
1971. *Plesiohamites multicostatus* (BROWN); KENNEDY, 8, pl. 3: 10.
1976. *H.* (*Plesiohamites*) *similis* (CASEY); MARCINOWSKI and NAIDIN, 99, pl. 1: 1 (with synonymy).
1978. *Lytohamites similis* CASEY; KENNEDY and HANCOCK, 10.

Material. — Two specimens, IGPUW/RM. Ch 51, MDm. 1.
Measurements (in mm):

	Wh	Wb	Wb/Wh
pl. 25: 2	?20	19	?0.95

Description. — Whorl section almost circular. Ribs inconspicuous, numbering 10 at a whorl fragment equal in its length to the costal whorl height. The ribs are more pronounced on the venter, arch slightly into a shallow sinus, and fade out towards the dorsum; on the whorl side they remain straight. In the middle of the larger specimen is a weak constriction, caused by the disappearance of one rib.

Remarks. — Due to the density of ribbing and the presence of weak constrictions, the larger specimen (pl. 25: 2) is close to the "typical" specimen presented by SPATH (1941, fig. 236c—e), which differs in its less circular whorl section.

CASEY (1961: 92) included the species *multicostatus*, as illustrated formerly by SPATH (1941, fig. 236c—f, pl. 71: 15—17), into his new taxon *Lytohamites similis*. WIEDMANN (1962*a*: 225) and RENZ (1968: 69) recognized this new species only, while the genus *Lytohamites* they regarded as synonymous with *Plesiohamites* BREISTROFFER, 1947. The authors' present opinion is that *Lytohamites similis* CASEY is synonymous with the species *H.* (*P.*) *multicostatus*, contrary to the opinion of KENNEDY (1971: 8).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland; marly mudstone (*Perinflatum* Subzone) of Mała Dolinka in the High-Tatric Series, southern Poland. *H.* (*P.*) *multicostatus* is known, moreover, from the ?uppermost Middle and the Upper Albian of England, France, Switzerland, northern Spain, and Crimea in the Soviet Union.

H. (*Plesiohamites*) aff. *multicostatus* BROWN
(pl. 15: 2)

Material. — Fragment of the body chamber of a large specimen, IGPUW/RM. Ch 50. Measurements (in mm):

	Wh	Wb	Wb/Wh
pl. 15: 2	56	?48	?0.86

Description. — In the present specimen, the whorl section is oval; the ribs are oblique and inconspicuous, numbering 10 at a whorl fragment equal in its length to the costal whorl height. The ribs are the most pronounced on the venter, where they arch slightly into a shallow sinus. On the dorsum, the ribs are weaker and form a narrower sinus towards the apex.

Remarks. — The investigated specimen displays great similarities to *H.* (*P.*) *multicostatus* in its oval whorl section and the oblique course of the ribs (cf. SPATH 1941, fig. 236a and b) but differs in the retroversal arching on the dorsum. This change in ornamentation may result from the nature of the body chamber of the specimen, thereby resembling the body chamber of the specimens of *Hamites attenuatus* SOWERBY, e.g. SPATH (1941: 611, pl. 68: 5). Both the difference in ornamentation and the extreme size do not justify the inclusion of the investigated specimen in *H.* (*P.*) *multicostatus*.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland.

Genus *Hemiptychoceras* SPATH, 1925

Type species: Ptychoceras gaultinum PICTET, 1847.

Remarks. — The genus *Hemiptychoceras* has to be redefined. In addition to the previous diagnostic features — three (?) straight shafts attached to each other and a pronounced change in the sculpture of smaller shafts, final hook, and body chamber shaft — the suture line (fig. 23) is added and characterized by the degree of incisions and a large, trifid internal lobe.

As a result of this redefinition of *Hemiptychoceras* and *Metahamites*, the Sardinian *Hamites* (*Metahamites*) *dalpiazi* WIEDMANN et DIENI (1968) has to be transferred to *Hemiptychoceras*; moreover, *H. tatricum* sp. n. has to be included. The holotype of the type species is reillustrated (fig. 22).

Occurrence. — Despite the fact that most *Hemiptychoceras* come from condensed sections, the range of the genus can probably be restricted to the Upper Albian and lowermost Cenomanian. The genus is known from southern Europe, India, and Madagascar.

Hemiptychoceras gaultinum (PICTET)
(fig. 22)

1847. *Ptychoceras gaultinum* PICTET, 395, pl. 15: 5 and 6.
1925. *Hemiptychoceras gaultinum* (PICTET); SPATH, 189.
1968. *H. gaultinum* (PICTET); WIEDMANN and DIENI, 61, figs. 34 and 35, pl. 5: 6 and 8, pl. 6: 12(?).
1978. *H. gaultinum gaultinum* (PICTET); SCHOLZ, pl. 3: 12.
1979*a*. *H. gaultinum gaultinum* (PICTET); SCHOLZ, 20.

Material. — The lectotype in PICTET 1847, pl. 15: 5 (teste SPATH 1941: 652); see also fig. 22.

Diagnosis. — The smaller shaft belongs to the phragmocone and has a circular whorl section. Sharp, crowded ribs are slightly prorsiradiate and about 9 ribs correspond to the equivalent whorl height. They are separated by periodic sharp constrictions which are accompanied by collared ribs. The last constriction coincides with the end of the phragmocone.

At the living chamber bend, the ribs are even more crowded, becoming sharpened and spaced on the final shaft. Here, four ribs correspond to the equivalent whorl height; they have a retroradiate course. The whorl section is now broadly rounded, wider than it is high. The last two shafts are attached to each other.

Measurements (in mm):

	Wh	Wb	Wb/Wh	R/Wh
Lectotype: living chamber	14.5	17.5	1.21	4
phragmocone	10	10	1	9

Fig. 22.

Hemiptychoceras gaultinum (PICTET 1847, pl. 15: 5): cast of the lectotype, body chamber and associated phragmocone shaft are visible, × 1; *a* — ventral view of the body chamber, *b* — lateral view of the body chamber and phragmocone (final and middle shafts), *c* — ventral view of the phragmocone, *d* — lateral view of the phragmocone and final hook. Condensed Late (?) Albian, Mt. Saxonet (Hte Savoie, France, Mus. Hist. nat. Genève coll.).

Remarks. — We do not follow the concept of SCHOLZ (1979*a*) who regarded all previous species of *Hemiptychoceras* as subspecies of *H. gaultinum*, i.e., *H. subgaultinum* BREISTROFFER and *H. tropicum* (KOSSMAT). Moreover, he separated a new nodate subspecies, *H. gaultinum nodosum* SCHOLZ. This disagreement points out yet again the problems involved in separating hamitids and anisoceratids.

Occurrence. — The type species was described by PICTET from the condensed Upper Albian of Mt. Saxonet (Haute Savoie, France). In addition to southeastern France, the species is known from the condensed Upper Albian of Sardinia and the uppermost Albian of Romania.

Hemiptychoceras subgaultinum BREISTROFFER
(pl. 3: 6)

1907. *Hamites* (*Ptychoceras*) *gaultinus* PICT.; BOULE *et al.*: 56, pl. 13: 1.
1940. *Hemiptychoceras subgaultinum* BREISTROFFER, 89.
1979*a*. *H. gaultinum subgaultinum* BREISTR.; SCHOLZ, 20, pl. 1: 18.
1980. *H. gaultinum subgaultinum* BREISTR.; MARCINOWSKI, 251, pl. 3: 3 and 4.

Material. — 2 specimens, IGPUW/WR2.59—60.

Measurements (in mm):

	Wh	Wb	Wb/Wh	R/Wh
IGPUW/WR2.59	14	15	1.07	6—7 (body chamber)
IGPUW/WR2.60	9	10	1.11	

Remarks. — In light of the general treatment of species in the hamitids, *H. subgaultinum* should also be regarded as a separate species. Few features for separation of the species are available in the present genus, but *H. subgaultinum* has much denser and sharper ribs throughout than the type species. While *H. gaultinum* (PICTET) has four ribs equivalent to the height of the body chamber, *H. subgaultinum* (pl. 3: fig. 6) has six to seven ribs. Moreover, the increase in whorl thickness is much slower compared to the type species. Also, the poorly known *H. sulcatostriatum* (WIEDMANN) may be separated due to its much smaller size, much weaker ornamentation, and somewhat older age.

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. *H. subgaultinum* is known from the high Upper Albian of southwestern Europe and Hungary, and from the Cenomanian of Crimea and Madagascar.

Hemiptychoceras tatricum sp. n.
(pl. 3: 4; fig. 23)

1930. *Hamites* sp.; PASSENDORFER, 662, fig. 19, pl. 4: 71.

Holotype: Specimen IGPUW/MŁw. 11.

Diagnosis. — Subcircular whorl section of the straight phragmocone; alternation of slightly projecting rib triplets with shallow constrictions on the phragmocone. Suture line highly incised with bifid *U* and large trifid *I*.

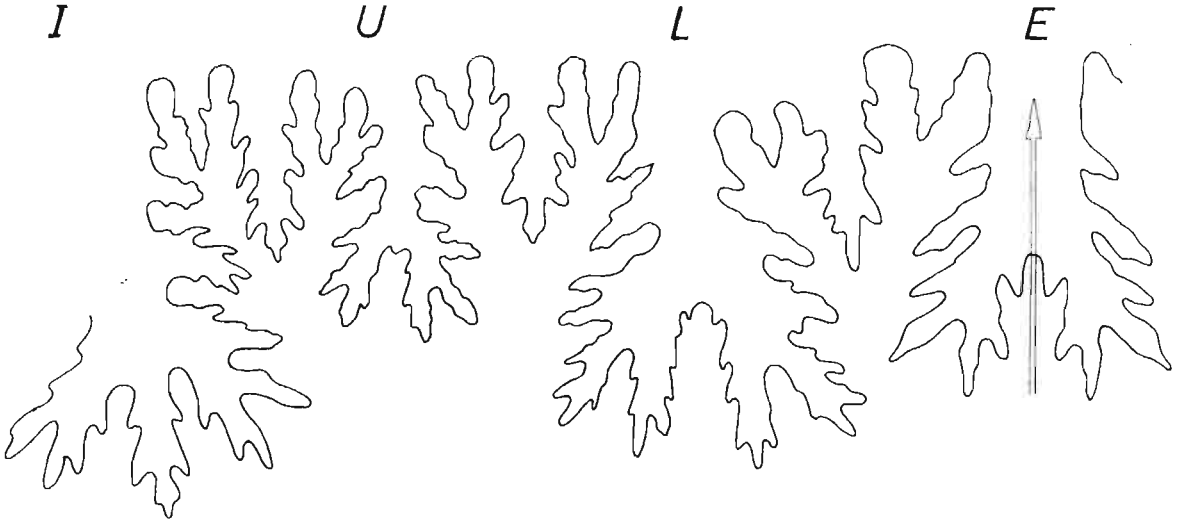


Fig. 23.

Suture of *Hemiptychoceras tatricum* sp. n., IGPUW/MŁw. 11 — holotype, Wh = 10 mm, (cf. pl. 3: 4).

Description. — *H. tatricum* sp. n. is known only from the holotype, which consists of part of a phragmocone. The cross section of the nearly straight shaft (pl. 3: 4) is subcircular. The fragment is slightly curved towards the venter (!). Triplets of ribs alternate with one constriction. The ribs are as broad as the spaces between; the constrictions, however, are two times as broad. The ribs project slightly on the flanks and pass the venter; they disappear on the dorsum.

The suture line (fig. 23) is characterized by much incised lobes and saddles. The lobes are very large, especially the trifid *I*; *U* is much smaller and bifid.

Measurements (in mm):

	Wh_{max}	Wb_{max}	Wb/Wh	R/Wh
IGPUW/MŁw. 11	10	10	1	6

Relations. — *H. tatricum* sp. n. is fairly distinct from all other hemiptychoceratid species due to its singular sculpture with rib triplets. There is some similarity in this respect with *H. nodosum* SCHOLZ, which is, however, separated by the presence of small marginal tubercles. *H. dalpiazi* (WIEDMANN et DIENI) is also a similar species, but it can be separated on the basis of the very irregular, *Serpula*-like ribbing.

Occurrence. — *H. tatricum* sp. n. is known only from the stratigraphically condensed glauconitic limestone of the Albian (*Floridum* to *Altonense* Subzones) of Mała Łąka, High-Tatric Series, southern Poland.

Genus *Anisoceras* PICTET, 1854

Type species: Hamites saussureanus PICTET, 1847.

Remarks. — A broad definition of the genus *Anisoceras* is adopted here. As discussed by WIEDMANN (1962*b*) and WIEDMANN and DIENI (1968), *Protanisoceras* SPATH, 1923 and *Prohelicoceras* SPATH, 1925 are connected with *Anisoceras* by all transitional forms and have to be included as subgenera. Moreover, SCHOLZ (1979*a*) included the previous genera *Idiohamites* SPATH, 1925 and *Pseudhelicoceras* SPATH, 1921 which, however, is not accepted in this paper.

Occurrence. — The genus *Anisoceras* shows world-wide distribution in the Lower Albian to Turonian.

Subgenus *A.* (*Anisoceras*) PICTET, 1854
A. (*Anisoceras*) *saussureanum* (PICTET)
(pl. 3: 9)

1847. *Hamites Saussureanus* PICTET, 118, pl. 13: 1—4.
1930. *Anisoceras* (*Hamites*) cf. *armatum* SOW.; PASSENDORFER, 667.
1939. *Anisoceras saussureanum* (PICTET); SPATH, 551, fig. 193, pl. 61: 1 and 2, pl. 62: 1, pl. 64: 9 (with synonymy).
1968. *A.* (*A.*) *saussureanum* (PICTET); WIEDMANN and DIENI, 66, fig. 40, pl. 7: 7 (with synonymy).
1979*a*. *A.* (*A.*) *saussureanum* (PICTET); SCHOLZ, 24. fig. 7 (with synonymy).

Material. — 8 specimens, IGPUW/MŁr. 2—10.

Remarks. — The specimen referred to as *A.* (*A.*) cf. *armatum* by PASSENDORFER is a true *A. saussureanum*. The whorl section is elliptical (Wh:Wb = 20:16). Between the looped and tubercled main ribs there are two or three finer, untubercled intermediates. All the ribs cross the venter; the main ribs are looped again, but are weakened on the dorsum. The lateral tubercles are in the central part of the flanks. The nearly straight shaft is slightly twisted.

Occurrence. — *A.* (*A.*) *saussureanum* is a cosmopolitan species with its maximum distribution in the middle part of the Upper Albian. Most of the High-Tatric moulds are corroded and obviously reworked. They occur exclusively in the sandy glauconitic mudstone of Mała Łąka, i.e., above the condensed glauconitic limestone (PASSENDORFER 1930: 656). From their preservation, we can assume that they are redeposited from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones).

Subgenus *A.* (*Protanisoceras*) SPATH, 1923

Type species: Hamites raulinianus d'ORBIGNY, 1842.

Remarks. — In SPATH's (1939: 564) diagnosis, *Protanisoceras* is said to be "like *Anisoceras*, but smaller, and far less helicoid or asymmetrical". This makes separation rather difficult. The second part of SPATH's diagnosis concerns the suture line which is said to be "rather simpler, with trifid second lateral lobe, and asymmetrical dorsal lobes". In our earlier papers (WIEDMANN 1962*b*), we shared SPATH's opinion and separated *Protanisoceras* with a small, trifid lobe *U* from *Anisoceras* with a large, bifid one. But later (WIEDMANN and DIENI 1968, fig. 45), we were able to recognize both lobes on two sides of the same specimen of *A.* (*Anisoceras*) *nanaense* (v. HAUER). This means that even subgeneric separation of *Anisoceras* and *Protanisoceras* is rather delicate, and SCHOLZ (1979*a*) was probably right in combining both groups.

Occurrence. — The first *Protanisoceras* have been described from the Upper Aptian (WIEDMANN 1962*b*), but they are at their peak in the Lower and Middle Albian. *Protanisoceras* is known from Europe, the Indo-Madagascar Realm, and South America.

A. (*Protanisoceras*) cf. *flexuosum* (d'ORBIGNY)

cf. 1842. *Hamites flexuosus* d'ORBIGNY, 535, pl. 131: 14—16.

Material. — Two fragments, IGPUW/WR2.65, WR3.66.

Remarks. — The two fragments, which can be tentatively attributed to *Anisoceras flexuosum*, both differ — in different ways — from that species. Specimen WR2.65 is a curved part of the living chamber with slightly protracted, sharp ribs (6—7 per whorl height). Ribs disappear on the dorsum. Every third rib bears marginal tubercles as the true *A. flexuosum* does. But the whorl section is much higher than it is wide (18:15).

Specimen WR3.66 is a straight portion of a phragmocone and has the circular whorl section of *A. flexuosum* (Wh:Wb = 9:9); it has strong radial ribs (3 per whorl height), but in this case every rib bears clavate marginal tubercles.

Occurrence. — *A.* (*P.*) *flexuosum* has its maximum distribution in the *Dentatus* Zone of the Middle Albian (SPATH 1939: 578). The described fragments are from the condensed glauconitic Albian (*Floridum* to *Altonense* Subzones) from Wielka Rówień, High-Tatric Series, southern Poland.

Subgenus *A.* (*Prohelicoceras*) SPATH, 1925

Type species: Helicoceras thurmanni PICTET et CAMPICHE, 1861.

The authors do not follow SCHOLZ (1979*a*) in including *Prohelicoceras* in *Pseudhelicoceras* SPATH. There is no question about the gradual transitions between hamitids/anisoceratids and turrilitids; but *Pseudhelicoceras* might be better included in Turrilitidae. *A.* (*Prohelicoceras*) is of Lower and Middle Albian age, and known from Europe and Madagascar.

A. (*Prohelicoceras*) *moutonianum* d'ORBIGNY
(pl. 3: 7 and 8; fig. 24)

1850. *Helicoceras Moutonianum* d'ORBIGNY, 127.
1930. *Helicoceras* (*Heteroceras*) *Moutonianum* d'ORB.; PASSENDORFER, 670, fig. 28, pl. 4: 75.
?1939. *Prohelicoceras* sp. nov.? aff. *thurmanni* (PICT. et CAMPICHE); SPATH, 563, figs. 199h, i.

Material. — 4 fragments, IGPUW/WR3.61—64.

Diagnosis. — Small anisoceratid with helicoidal open coiling, circular whorl section, and sets of three annular ribs, one of them more pronounced and bearing two marginal tubercles.

Description. — *A.* (*Prohelicoceras*) *moutonianum* is easily recognized by its open coiling and its sculpture. The annular ribs are more pronounced on the venter than on the dorsum and obliquely cross the circular whorls. Every third rib is strengthened and bears one pair of rounded tubercles at the ventral margins. In some cases (pl. 3: 8b) the ribbing between is looped. At the lower lateral margin there is sometimes a slight inflation on these ribs, the presumed beginning of lateral tuberculation. The intercalatory ribs do not show any tuberculation, except for one rib which is intercalated (pl. 3: 8).

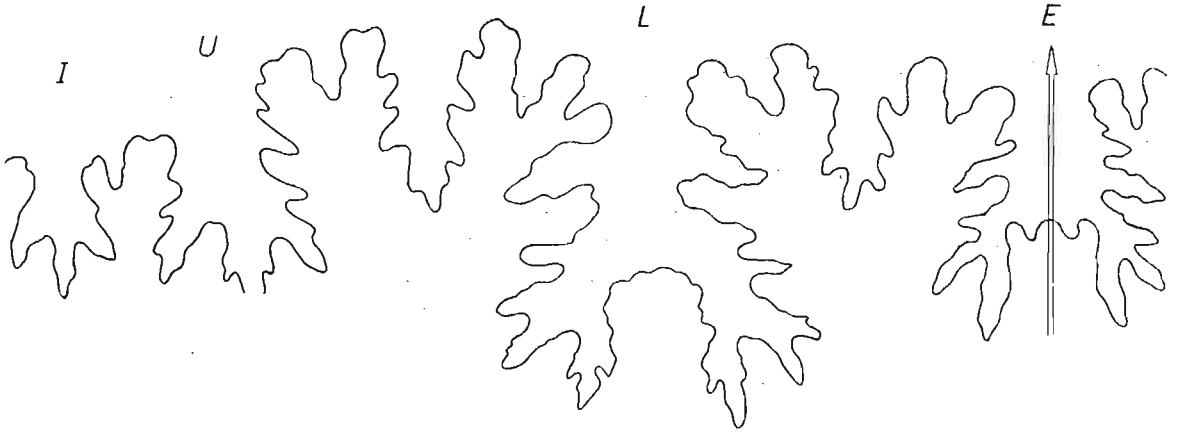


Fig. 24.

Suture of *A.* (*Prohelicoceras*) *moutonianum* (d'ORB.), IGPUW/WR3.61, Wh = 9 mm, (cf. pl. 3: 7).

The suture line (fig. 24) can only partly be recognized and has a large bifid *L*, a relatively short, non-bifid *U*, and a small trifid *I*.

Remarks. — PASSENDORFER (1930) was the only author who presented this briefly described species of d'ORBIGNY's Prodrome. Not too much can be added to his excellent description. In contrast, in *A.* (*P.*) *thurmanni* (PICT. et CAMP.) and *A.* (*P.*) *anglicum* SPATH, every rib is tubercled. *A.* (*P.*) *moutonianum* seems to be a small species. Specimen WR3.63 shows the last septum at a whorl height of 7 mm (pl. 3: 8). The larger specimen (pl. 3: 7) is chambered throughout. There is an even larger specimen in PASSENDORFER's collection (WR3.64), which can only doubtfully be referred to this species due to its poor preservation.

Occurrence. — *A.* (*P.*) *moutonianum* is known only from the condensed Albian of Escragnolles (southern France) and Wielka Rówień, High-Tatric Series, southern Poland.

Genus *Hamitoides* SPATH, 1925

Type species: Hamites studerianus PICTET, 1847.

The recognition of forms transitional between hamitids and scaphitids, described by WIEDMANN and MARCINOWSKI (1985) as *Scaphamites*, makes it necessary to reconsider the position of the systematically isolated genus *Hamitoides*. *Hamitoides* was separated from hamitids and anisoceratids due to the existence of biplicate and triplicate ribs, sometimes with tuberculation. The genus was thus thought to be transitional between hamitids and

labeceratids and was included in the family or subfamily Labeceratidae (SPATH 1939, WRIGHT 1957, WIEDMANN and DIENI 1968). Since, however, biplicated ribs also occur in *Scaphamites* and the previous distinction of Hamitinae and Anisoceratinae cannot be retained, the present genus may also be better included in the extended family Hamitidae. *Hamitoides* is a late Middle to early Upper Albian genus which sporadically occurs in Europe, the Indo-Madagascan Realm, and southern Africa.

Hamitoides rusticus SPATH
(pl. 3: 12)

1939. *Hamitoides* (?) *rusticus* SPATH, 602 (*nom. nud.*).
1941. *H.* (?) *rusticus* SPATH, pl. 66: 2.
H. (?) sp. ind. SPATH, pl. 66: 3—5.

Material. — 4 fragments, IGPUW/WR3.70—73.

Diagnosis. — Hamitid species with subcircular whorl section, single, biplicated ribs crossing the venter and weakening on the dorsum; large. Coiling of initial part and suture line unknown.

Remarks. — *H. rusticus* became valid only with the publication of the plate figure (SPATH 1941) and not with description as a *nom. nud.* (SPATH 1939). *H. rusticus* preserves even more hamitid features, and therefore makes separation of the genus from Hamitidae rather difficult.

Nearly all known specimens are — as is the illustrated one (pl. 3: 12) — fragments of the final hook. They show that the ribbing of the last shaft is largely uniform and therefore hamitid, while biplication starts in most cases with the hook but still includes single ribs as well. In *H. rusticus*, no tuberculation can be observed at the point of bifurcation, in some cases a scarcely pronounced swelling of the ribs. The ribbing is strong on the venter, but much weaker on the dorsum. The cross-section is circular on the shaft, becoming broadly rounded with a slightly flattened dorsum on the hook.

Since *Hamitoides* is known mostly — or only — from living chamber fragments, no suture line is known. But it can be assumed to be hamitid.

H. rusticus can be regarded as the initial species of the genus with characteristics of the ancestral genus *Hamites* still preserved. Fragments of the phragmocone may be barely distinguishable from *Hamites maximus* (J. SOW.).

Occurrence. — The Polish specimens of this species are from the condensed Albian (*Floridum* to *Altonense* Subzones) of Wielka Rówień, Tatra Mts.; the specimens presented by SPATH (1941) and now referred to *H. rusticus* are from beds III and VII of the *Cristatum* Zone of Folkestone, Sevenoaks (Kent), and Aylesbury (Bucks.), England.

Genus *Scaphamites* WIEDMANN et MARCINOWSKI, 1985

Type species: Sc. passendorferi WIEDMANN et MARCINOWSKI, 1985.

Diagnosis. — This genus has rapidly increasing, rounded whorls which are twisted throughout. While the phragmocone forms a narrow helicoidal coil, the living chamber follows with a scaphitid hook. The ribs are simple. The suture line has four lobes of which the umbilical one is undivided.

Remarks and **Occurrence.** — The genus *Scaphamites* is represented by the type species, which so far is restricted to the stratigraphically condensed Albian (*Floridum* to *Altonense* Subzones) of the Tatra Mts., Poland. The genus is thought to be the ancestor of Scaphitaceae, and its phylogenetic position suggests a stratigraphic range of upper Middle/lower Upper Albian age (cf. WIEDMANN and MARCINOWSKI 1985, fig. 7).

Scaphamites passendorferi WIEDMANN et MARCINOWSKI
(pl. 5: 1—4)

1985. *Scaphamites passendorferi* WIEDMANN et MARCINOWSKI, 453, figs. 2, 3 and 6.

Material. — Seven fragmentary specimens.
Holotype: Specimen IGPUW/WR.96.
Paratypes: Specimens IGPUW/WR2.90a, 91a, 92a; WR3.93b, 95b.
Diagnosis. — As the genus.
Remarks. — No complete specimens has yet been discovered, but the species can be easily reconstructed (WIEDMANN and MARCINOWSKI 1985, fig. 6) by the great number of existing fragments. As seen from the generic diagnosis, the genus and its type species can be described by the narrowly coiled and helicoidal phragmocone in which the rounded whorl section rapidly increases in height and width; probably, an open initial coil was present. It is followed by the final hook of the living chamber which is very similar to *Eoscaphites* BREISTROFFER. Except for the helicoidal coil and the general twisting of the shell, the similarity with *Eoscaphites* is obvious. Since a late Middle to early Upper Albian age for the Tatric species can be inferred, *Scaphamites passendorferi* can be interpreted as an ancestor of the early Upper Albian *Eoscaphites*, and, in consequence, for Scaphitaceae as a whole. Inclusion in the hamitids is favored, however, due to the fact that hamitid characteristics prevail (WIEDMANN and MARCINOWSKI 1985: 461).
Occurrence. — All specimens of *Sc. passendorferi* were found in the condensed Albian (*Floridum* to *Altonense* Subzones) of Wielka Rówień, High-Tatric Series, southern Poland.

Family **Turrilitidae** MEEK, 1876
Subfamily **Turrilitinae** MEEK, 1876
Genus *Pseudhelicoceras* SPATH, 1922
Pseudhelicoceras convolutum (QUENSTEDT)
(pl. 3: 10 and 11)

1847/48. *Turrilites catenatus convolutus* F. A. QUENSTEDT, 299, pl. 21: 24.
1930. *Turrilites catenatus* d'ORB.; PASSENDORFER, 671, fig. 29.
T. aff. *Moutonianus* d'ORB.; PASSENDORFER, 672, pl. 4: 77.
T. aff. *bituberculatus* d'ORB.; PASSENDORFER, 672.
1968. *Pseudhelicoceras convolutum* (QUENST.); WIEDMANN and DIENI, 76, figs. 55 and 56, pl. 8: 8, pl. 15: figs. 5 and 6.

Material. — 5 fragmentary specimens, IGPUW/WR3.74—78.
Remarks. — *P. convolutum* (QUENSTEDT) was reestablished by WIEDMANN and DIENI (1968: 76) for those forms of the *catenatum* group in which ribbing is less crowded, untubercled ribs may be intercalated between the looped main ribs, and a third tubercle appears at the lower margin. All these features can be recognized in the Polish forms described in synonymy. In the two presented fragments, the number of tubercled ribs per whorl is below 20; the intercalation of one untubercled rib can be seen in specimen WR3.74 (pl. 3: 10) as well as the existence of an additional, but less pronounced tubercle on the lower surface (pl. 3: 11b) or as an impression on the upper one (pl. 3: 10b). Due to this tuberculation, the whorl section becomes sub-pentagonal and slightly broader than it is high:

IGPUW/WR3.74	Wh:Wb = 7:9
IGPUW/WR3.75	Wh:Wb = 14:18

Occurrence. — The Polish specimens are from the condensed Albian of Wielka Rówień. Moreover, the species is known from the condensed Middle Albian of Escragnolles, France and Upper Albian of Orosei, Sardinia.

Pseudhelicoceras elegans (d'ORBIGNY)

(pl. 4: 1 and 2)

1842. *Turrilites elegans* d'ORBIGNY, 577, pl. 150: 6 and 7.
1861. *T. elegans* d'ORB.; PICTET and CAMPICHE, 125, pl. 56: 9 and 10.
1930. *T. elegans* d'ORB.; PASSENDORFER, 673.
1937. *Pseudhelicoceras quadrituberculatum* SPATH, 531, fig. 190d—f.
1978. *P. elegans* (d'ORB.); KLINGER and KENNEDY, pl. 1: L.

Material. — 2 fragments, IGPUW/BW. 4, MŁw. 12.

Remarks. — In revising PASSENDORFER'S "*Turrilites elegans*" and the validity of SPATH'S *Pseudhelicoceras quadrituberculatum*, the authors are convinced that both species are identical. In separating his new species from *P. elegans*, SPATH (1937: 531) referred to the absence of intermediate, untubercled ribs. But in his short diagnosis he said "but with irregular, untuberculate, intermediary ribs (two, one, or none)". In number of ribs per whorl, in the position of the typical four tubercles per rib, and in the mode of coiling and whorl section, both species are indistinguishable.

Two specimens of PASSENDORFER'S collection can be included in *P. elegans*. They have about 20 tubercled main ribs per whorl. Untubercled intermediate ribs seem to be irregularly placed. The tubercles are elongated in the direction of the ribs. Looping of ribs is not as common as in the previous species.

Another typical feature of the species is the flat upper surface of the whorls (pl. 4: 1a and 1b) with the impression of the lowermost row of tubercles.

Occurrence. — The smaller specimen is from the condensed Albian of Biała Woda, and the larger one from Mała Łąka, Tatra Mts., Poland. The French type is from the condensed Middle-Late Albian of Perte du Rhône (Ain, France). In addition, the species has been reported from western Switzerland.

Pseudhelicoceras cf. *robertianum* (d'ORBIGNY)

cf. 1842. *Turrilites Robertianus* d'ORBIGNY, 585, pl. 142: 1—6.
1930. *Turrilites* sp.; PASSENDORFER, 674.

Material. — 2 poorly preserved specimens, IGPUW/WR3.79, 80.

Remarks. — Two large specimens from PASSENDORFER'S collection may belong to *P. robertianum*, but designation remains uncertain due to the very poor preservation. Specimen WR3.79 is the "*Turrilites* sp." described by PASSENDORFER (1930: 674). Wb:Wh is 37:47, and therefore the whorl section is more oval than it is circular. It may have 20 ribs per whorl, all of them tubercled. The existence of three or four blunt tubercles per rib can be assumed. Hence, these two specimens may fit into the diagnosis of *P. robertianum*.

Occurrence. — Both specimens are from the condensed Albian of Wielka Rówień. *P. robertianum* is a widespread species (Europe, Madagascar, and Texas) and seems to be restricted to the lower part of the Upper Albian.

Genus *Turrilitoides* SPATH, 1923

As has been proposed previously, *Proturrilitoides* BREISTROFFER, 1947 is included as a subgenus (WIEDMANN 1962*a*: 189; WIEDMANN and DIENI 1968: 77). Both subgenera are represented in the Polish Albian faunas. They are of Middle and Upper Albian age and of Eurasian occurrence.

Subgenus *T.* (*Proturrilitoides*) BREISTROFFER, 1947

Type species: Turrilites astierianus d'ORBIGNY, 1842.

Proturrilitoides is known from the European Middle Albian.

T. (*Proturrilitoides*) *emericianus* (d'ORBIGNY)
(pl. 4: 3 and 4)

1842. *Turrilites Emericianus* d'ORBIGNY, 580, pl. 141: 3—6.
1930. *Heteroceras* sp. aff. *Emericianum* d'ORB.; PASSENDORFER, 668, fig. 25, pl. 4: 68.
Heteroceras sp.; PASSENDORFER, 696, pl. 4: 69.

Material. — 2 specimens, IGPUW/WR2. 81 and 82.

Remarks. — The two reillustrated specimens from PASSENDORFER'S collection differ slightly from d'ORBIGNY'S types but nevertheless may be included in d'ORBIGNY'S species. The apical angle and umbilicus of the Polish specimens are even larger; the whorl section is not circular but slightly flattened laterally. The number of strongly curved ribs per whorl (25) is identical, but in one of the Polish specimens (WR2.82; pl. 4: 3) some ribs branch irregularly and some constrictions are irregularly spaced.

The suture line drawn by PASSENDORFER (1930, fig. 25) is absolutely correct; it is drawn from the siphonal line to the left. This means that the large bifid element is the *L*. We assume that d'ORBIGNY'S suture line drawing (1842, pl. 141: 6) is not correct with regard to the trifid lateral lobe.

Occurrence. — The Polish specimens are from the condensed Albian of Wielka Rówień, Tatra Mts.; d'ORBIGNY'S type material is from the condensed Albian of Escragnolles (Var, France).

T. (*Proturrilitoides*) *astierianus* (d'ORBIGNY)
(pl. 4: 5)

1842. *Turrilites Astierianus* d'ORBIGNY, 578, pl. 140: 8—11.
1930. *Heteroceras* aff. *Senequierianum* d'ORB.; PASSENDORFER, 696, fig. 26.
1978. *Proturrilitoides astierianus* (d'ORB.); KLINGER and KENNEDY, pl. 9: H, L.

Material. — 1 specimen, IGPUW/WR2.83.

Remarks. — *T.* (*Proturrilitoides*) *astierianus* is similar to *T.* (*P.*) *emericianus* and *T.* (*P.*) *senequierianus* in the mode of coiling, whorl section, and course of single untuberculated ribs. The main difference seems to be the number of 40 ribs per whorl, in contrast to about 20 in the first and 60 in the second species. The illustrated specimen (pl. 4: 5) has about 40 ribs per whorl and thus may be included in the present species. It agrees, moreover, with d'ORBIGNY'S types in the apical angle. It differs slightly in that it has a larger umbilicus and a depressed whorl section (Wh:Wb = 7:8.5).

Occurrence. — The illustrated specimen is from the condensed Albian of Wielka Rówień. The types are reported from Escragnolles (Var, France), where new specimens of the species were collected by G. GEBHARD (1979) in his "Grabungsbereich II", i.e., in the Middle Albian part of the condensation.

Subgenus *T.* (*Turrilitoides*) SPATH, 1923

Type species: Turrilites hugardianus d'ORBIGNY, 1842.

Turrilitoides occurs in the Eurasian Upper Albian.

T. (*Turrilitoides*) *hugardianus* (d'ORBIGNY)
(pl. 4: 9 and 10)

1842. *Turrilites Hugardianus* d'ORBIGNY, 588, pl. 147: 9—11.
1968. *Turrilitoides* (*Turrilitoides*) *hugardianus* (d'ORB.); WIEDMANN and DIENI, 78, figs. 57 and 58, pl. 9: 3.
1968. *T.* (*Turrilitoides*) *hugardianus hugardianus* (d'ORB.); RENZ, 84, fig. 30a, d, pl. 17: 18—21 (with synonymy).
T. (*Turrilitoides*) *hugardianus crassicostatus* SPATH; RENZ, 84.
1978. *T. hugardianus* (d'ORB.); KLINGER and KENNEDY, pl. 9: K.
pars 1979*a*. *Turrilites* (*Turrilitoides*) *hugardianus hugardianus* (d'ORB.); SCHOLZ, 34; figs. 11A—D?, pl. 7: 1, 3, 5, 8, 9, 13 (only).

Material. — 3 fragments, IGPUW/WR2.87—89.

Remarks. — The comprehensive interpretation of *T.* (*T.*) *hugardianus* proposed by SCHOLZ (1979*a*) is not shared in this paper. *T. intermedius* (PICTET et CAMPICHE) and *T. densicostatus* (PASSENDORFER) are maintained as separate species, despite the fact that separation may be difficult. All three species have the same type of ribbing, and similar apical angles and whorl sections. The only difference is the density of ribbing.

In accordance with d'ORBIGNY, the number of 24 ribs per whorl can be regarded as a specific feature of the type species. Three fragments of PASSENDORFER's collection can be attributed to the present species due to their relatively coarse ribbing.

Occurrence. — The Polish specimens attributed to this species are from the condensed Albian of Wielka Rówień. Moreover, the species is known from the lower part of the Upper Albian (*Aequatoralis — Substuderi* Subzones), Cambridge Greensand (England), and the Lower Vraconian of France, Switzerland, Sardinia, and Hungary.

T. (*Turrilitoides*) *intermedius* (PICTET et CAMPICHE)
(pl. 4: 6—8)

1861. *Turrilites intermedius* PICT. et CAMP., 127, pl. 57: 14 (only).
1968. *Turrilitoides* (*Turrilitoides*) *intermedius* (P. et C.); RENZ, 84, fig. 30f, pl. 17: 24—26 (with synonymy).
pars 1979. *Turrilites* (*Turrilitoides*) *hugardianus hugardianus* (d'ORB.); SCHOLZ, pl. 7: 2, 4, 6, 7, 10, 11, 12, 14, 16 (only).

Material. — 3 specimens, IGPUW/WR2.84, 86 and WR. 85.

Remarks. — This species has been redescribed in detail by RENZ (1968), where the lectotype was also reproduced. We fully agree that — for the time being — *T.* (*T.*) *intermedius* can be separated from *T.* (*T.*) *hugardianus* and *T.* (*T.*) *densicostatus* on the basis of a larger apical angle of the helix, a more circular whorl section, and a number of about 30 ribs per whorl. In contrast to the type species, these ribs run straight across the whorls instead of curving.

Occurrence. — The three illustrated specimens are from the condensed Albian of Wielka Rówień, Tatra Mts. The species was also described from the middle part of Upper Albian of northern Spain, and the lower Vraconian of southern France, western Switzerland, and Hungary.

T. (*Turrilitoides*) *densicostatus* (PASSENDORFER)
(pl. 4: 11 and 12)

1930. *Turrilites densicostatus* PASSENDORFER, 673, pl. 4: 70.
1937. *Turrilitoides densicostatus* (PASSEND.); SPATH, 529, fig. 186, pl. 58: 5—7.
?1963. *T. densicostatus* (PASS.); COLLIGNON, 46, pl. 258. 1119.
1978. *T. densicostatus* (PASS.); KLINGER and KENNEDY, pl. 9: M, O.
1979. *Turrilites* (*Turrilitoides*) *hugardianus densicostatus* PASSEND.; SCHOLZ, 35.

Holotype: Specimen IGPUW/WR2.90 (here pl. 4: 11).

Additional material. — 8 specimens, IGPUW/WR2.91—95, WR3.96—98.

Remarks. — In *T.* (*T.*) *densicostatus*, the apical angle of the helix and the size of the species are comparatively small. The number of ribs per whorl varies between 30 and 40. The ribs are straight again, disappearing on the upper surface and becoming weakened on the lower one (pl. 4: 11b). The umbilicus is very narrow. The whorl section is extremely depressed and is much broader than it is high; in the holotype the Wh:Wb ratio is 7:10.5.

Occurrence. — *T.* (*T.*) *densicostatus* is relatively abundant in the condensed Albian of Wielka Rówień, Tatra Mts. The English specimens from Folkestone are of Middle Albian age (*Nitidus* Subzone). The Madagascan specimen is too poorly preserved to be identified with certainty.

Genus *Ostlingoceras* HYATT, 1900

Type species: Turrilites puzosianus d'ORBIGNY, 1842.

Ostlingoceras is of Middle Albian to Lower Cenomanian age and occurs in Europe and Africa.

Ostlingoceras puzosianum (d'ORBIGNY)

(pl. 4: 13)

1842. *Turrilites Puzosianus* d'ORBIGNY, 587, pl. 143: 1 and 2.
1930. *Turrilites* cf. *Puzosianus* d'ORB.; PASSENDORFER, 672.
1968. *Ostlingoceras* (*O.*) *puzosianum* (d'ORB.); WIEDMANN and DIENI, 79, pl. 9: 1 and 4.
1968. *O.* (*O.*) *puzosianum* (d'ORB.); RENZ, 92, pl. 18: 12—15.
pars 1979*a*. *Turrilites* (*O.*) *puzosianus* d'ORB.; SCHOLZ, 42, fig. 11K, pl. 9: 5, 6, 9—13 (only).

Material. — One specimen, IGPUW/MŁm. 1.

Remarks. — The specimen in pl. 4: 13 is crushed but nevertheless shows all typical features of the present species. Straight ribs bear two rows of tubercles near the lower margin of the strongly depressed whorls. The apical angle is extremely low. The number of ribs per whorl can be calculated from the uppermost preserved whorl and is about 30.

Occurrence. — The illustrated specimen comes from the marly Upper Albian of Mała Łąka, Tatra Mts. *O. puzosianum* is widespread and abundant in the European and African Late Albian (Vraconian).

Superfamily **Douvilleicerataceae** PARONA et BONARELLI, 1897
Family **Douvilleiceratidae** PARONA et BONARELLI, 1897

Of the large group of re-coiled heteromorphs, only the genus *Douvilleiceras* has been recognized in the Albian of the Tatra Mts.

Genus *Douvilleiceras* GROSSOUVRE, 1894
Douvilleiceras mammillatum (SCHLOTHEIM)

(pl. 7: 5 and 6)

1813. *Ammonites mammillatus* SCHLOTHEIM, 111.
1847/48. *Amm. monile aequinodus* QUENSTEDT, 137, pl. 10: 2.
1930. *Douvilleiceras mammillatum* SCHLOTH.; PASSENDORFER, 651.

1962. *Douvilleiceras mammillatum* (SCHLOTH.); CASEY, 265, figs. 102a, b, pl. 40: 4, pl. 41: 4, pl. 42: 6 and 9 (with synonymy).
D. mammillatum var. *aequinodum* (QUENST.); CASEY, 271, figs. 94a—c, 95a—b, 102d, 103a—b, pl. 40: 5, pl. 41: 5—7, pl. 42: 10 (with synonymy).
D. mammillatum var. *praecox* CASEY, 272, figs. 94d—e, 102c, pl. 41: 8.
1963. *D. mammillatum* SCHLOTH.; COLLIGNON, 109, 112, pl. 283: 1241, pl. 284: 1242.
1979. *D. mammillatum mammillatum* (SCHLOTH); DESTOMBES, 69, pl. 4—21: 1.
D. mammillatum var. *aequinodum* QUENST.; DESTOMBES, 71, pl. 4—4: 1, pl. 4—5: 2, pl. 4—21: 2.
D. mammillatum var. *praecox* CASEY; DESTOMBES, 71, pl. 4—21: 3.
1983. *D. aequinodum* (QUENST.); WEIDICH *et al.*: 566, pl. 2: 6.

Material. — 6 specimens, IGPUW/WR. 147, BW 15, BW 17—20, ZK 1.

Remarks. — The opinion of CASEY (1962) and DESTOMBES (1979) cannot be shared; *D. mammillatum* and its "varieties" *aequinodum* and *praecox* are really indistinguishable and are included here in the older species. A larger collection from Escragnolles (GEBHARD 1979) caused us to also refuse the interpretation of WEIDICH *et al.* (1983), *D. aequinodum* should be better related with *D. monile* (J. SOW.) and therefore regarded as a separate species. Possibly, *D. monile* (J. SOW.) should also be included in the present species (GEBHARD 1979).

A characteristic feature of *D. mammillatum* is the presence of 20—25 single ribs per whorl, running straight or curving slightly over the flanks and bearing up to 8 clavate tubercles on each side in the adult. The whorl section is broadly rounded, and the umbilicus is medium-sized.

The measurements of the illustrated specimens are (in mm):

	D	Wh	Wb	U	
IGPUW/BW 15	55	23(0.42)	30(0.55)	?16(0.29)	12 ribs/half whorl.
IGPUW/BW 19	41	18(0.44)	25(0.61)	15(0.37)	12 ribs/half whorl.

Occurrence. — *D. mammillatum* is a widespread index species for the upper portion of the Lower Albian. The Polish specimens come from the condensed Albian of Wielka Rówień, Mała Łąka, Biała Woda, and from Żeleźniak Kościeliski, Tatra Mts. The species can be regarded as cosmopolitan.

Douvilleiceras orbignyi HYATT

1903. *Douvilleiceras orbignyi* HYATT, 110.
1930. *D. mammillatum* var. *Baylei* SPATH; PASSENDORFER, 652.
1962. *D. orbignyi* HYATT; CASEY, 279, figs. 99, 100, 102h, pl. 40: 6—8, pl. 42: 12 and 13 (with synonymy).
?1963. *D.* aff. *Baylei* SPATH; COLLIGNON, 118, pl. 287: 1248.
1979. *D. orbignyi* HYATT; DESTOMBES, 71, pl. 4—5: 1, pl. 4—6: 1.

Material. — 3 specimens, IGPUW/BW 16, 21, 22.

Remarks. — The present species is easily distinguished from the previous one due to the low number of ribs (15 per whorl) and the distinctly stronger tuberculation, even in young individuals. The middle-sized Polish specimens have the measurements (in mm):

	D	Wh	Wb	U	
IGPUW/BW 21	36	16(0.45)	21.5(0.60)	10(0.28)	8—9 ribs/half whorl
IGPUW/BW 22	37	19(0.51)	23(0.62)	10(0.27)	7—8 ribs/half whorl

They show typical separation of the marginal tubercles (with three clavi each) from the tuberculation (2—3 tubercles) of the interior flanks by a kind of lateral sulcus.

This is exactly what PASSENDORFER (1930: 652) called *D. mammillatum* var. *baylei* SPATH.

Occurrence. — All Polish specimens attributed to this species are from the condensed Albian of Biała Woda, Tatra Mts. In addition, the species has been described from the *Mammillatum* Zone of France, England, and Madagascar.

Order **Ammonitida** HYATT, 1899
Superfamily **Hoplitaceae** DOUVILLÉ, 1890
Family **Desmoceratidae** ZITTEL, 1895
Subfamily **Puzosiinae** SPATH, 1922
Genus *Puzosia* BAYLE, 1878

Type species: Ammonites planulatus J. de C. SOWERBY, 1827.

Remarks. — Specimens representative of this genus show four to seven sinuous constrictions per whorl; the ribbing (likewise sinuous) is restricted to the outer half of the whorls. The shell is moderately evolute. All these characteristics are easily discernible in the investigated material. The genus is abundant in the high Lower to low Upper Albian condensed limestones in the High-Tatric Series. However, the majority of specimens are preserved as internal whorls, making the recognition of sexual dimorphism, obviously present in the genus *Puzosia* (cf. MARCINOWSKI 1980: 271), almost impossible. There is indeed a high degree of variation in puzosiids; nevertheless, SCHOLZ' (1979*a*) comprehensive interpretation regarding all Albian and most Cenomanian species as synonymous with *Puzosia planulata* (J. de C. Sow.) cannot be accepted. For classification of the Albian "species", the authors follow the concept elaborated by WIEDMANN and DIENI (1968); the "Formenkreise" (of *P. quenstedti* and *P. mayoriana*), however, are better regarded as species with their respective subspecies.

Occurrence. — The genus *Puzosia* shows a world-wide distribution, ranging from the Lower Albian to Upper Turonian.

Puzosia quenstedti (PARONA et BONARELLI)

The previous "Formenkreis der *Puzosia quenstedti*" was defined by the presence of six to seven constrictions less pronounced and less sinuous than in *P. mayoriana s. l.*, the presence of a convex sinus on the venter, flattened flanks, and a medium-sized umbilicus. All five subspecies can be recognized in the condensed faunas.

Puzosia quenstedti communis SPATH
(pl. 5: 6)

pars 1923. *Puzosia communis* SPATH, 47, fig. 11a, pl. 2: 3a, b (only).
1930. *P. Mayoriana* var. *octosulcata* SHARPE; PASSENDORFER, 635, fig. 7, pl. 3: 53.
1968. *P. communis* SPATH; WIEDMANN and DIENI, 111, pl. 10: 9, pl. 11: 11 (with synonymy).
1968. *P. (Puzosia) communis* SPATH; RENZ, 20, figs. 6c, 7d, pl. 1: 5, ?10, 11.

Material. — 1 specimen, IGPUW/BW. 6; the specimen from Mała Łąka which was illustrated by Passendorfer (see above) is lost.

Remarks. — *Puzosia quenstedti communis* includes those specimens of the *quenstedti* group in which whorl height largely exceeds whorl thickness. This is obviously true for the specimen, PASSENDORFER referred to as *P. mayoriana* var. *octosulcata*. It would, however, be better placed in the present subspecies, with all its diagnostic features: smaller umbilicus and flanks converging towards the narrowly rounded venter, thereby causing a more subtriangular whorl section. There is also full agreement in the measurements:

	D	Wh	Wb	U	Wh/Wb
IGPUW/BW. 6	46	20(0.43)	16.2(0.35)	13.8(0.30)	0.81

Occurrence. — The Polish specimens are from the condensed Albian of Biała Woda and Mała Łąka, Tatra Mts. The subspecies is known, moreover, from the Late Albian of England and Sardinia, and possibly from the Cenomanian of Madagascar.

Puzosia quenstedti furnitana PERVINQUIÈRE
(pl. 6: 2)

1907. *Puzosia Mayoriana* var. *Furnitana* PERVINQUIÈRE, 158, pl. 6: 27 and 28.
1930. *Puzosia Mayoriana* var. *Furnitana* PERV.; PASSENDORFER, 634.
1968. *Puzosia furnitana* (PERV.); WIEDMANN and DIENI, 112, figs. 70, 71, pl. 10: 12, pl. 11: 6 (with synonymy).

Material. — Three specimens, IGPUW/WR3.103, WR 107, MŁw. 14.

Remarks. — In the present subspecies, (1) whorl height still exceeds whorl thickness, and (2) the sculpture between the six constrictions per whorl is reduced to absent (pl. 6: 2).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/MŁw. 14	34	15(0.44)	13(0.38)	9.5(0.30)	0.86
IGPUW/WR3.103	21	9.5(0.45)	8.7(0.43)	5.5(0.26)	0.92
IGPUW/WR 107	18	7.5(0.44)	6(0.33)	6.5(0.36)	0.80

Occurrence. — The Polish specimens are from the condensed Albian of Wielka Rówień and Mała Łąka, Tatra Mts. The present subspecies is widespread in the Upper Albian of Europe and Africa.

Puzosia quenstedti quenstedti (PARONA et BONARELLI)
(pl. 5: 7)

1897. *Desmoceras Quenstedti* PARONA et BONARELLI, 81, pl. 11: 3.
pars 1930. *Puzosia Mayoriana* d'ORB.; PASSENDORFER, 631, pl. 3: 57 and 58.
1968. *P. quenstedti* (PAR. et BON.); WIEDMANN and DIENI, 114, figs. 72 and 73, pl. 10: 11, pl. 12: 3 (with synonymy).
1978. *P. quenstedti* (PAR. et BON.); WIEDMANN and NEUGEBAUER, 711, pl. 2: 1.
1982. *P. quenstedti* (PAR. and BON.); RENZ, 34, pl. 4: 8.

Material. — One specimen, IGPUW/BW. 7.

Remarks. — The typical subspecies was separated from the previously treated forms by its whorl section, which is slightly higher than it is broad, and a more pronounced ribbing of the external whorls. These slight differences can be recognized in the specimen PASSENDORFER referred to as *P. mayoriana* which is presented again in pl. 5: 7.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/BW 7	50	19(0.38)	18(0.36)	17(0.34)	0.95

Occurrence. — *P. quenstedti s. str.* seems to be a Middle to Upper Albian form. The Polish specimen is from the condensed Albian of Biała Woda, Tatra Mts. The subspecies is also known from France, Sardinia, Angola, the South Atlantic, Madagascar, and Venezuela.

Puzosia quenstedti media SEITZ
(pl. 6: 1)

1897. *Desmoceras* cfr. *Emerici* RASP.; PARONA and BONARELLI, 80, pl. 11: 1.
1931. *Puzosia quenstedti* var. *media* SEITZ, 402, pl. 16: 5.
1968. *P. media* SEITZ; WIEDMANN and DIENI, 115.
1982. *P. media* SEITZ; RENZ, 34, pl. 4: 9 and 11.

Material. — At least one specimen, IGPUW/WR2.98c.

Remarks. — The present subspecies was separated from *P. quenstedti* by SEITZ (1931) on the basis of a whorl section as high as it is broad. This feature can be observed in one of PASSENDORFER's Puzosias, with the following measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.98c	30	12(0.40)	12(0.40)	8(0.27)	1.00

Occurrence. — This specimen is from the condensed Albian of Wielka Rówień, Tatra Mts. *P. quenstedti media* is also of Middle to Upper Albian age. It is known from Austria, southern France, Sardinia, Mallorca, Madagascar, Venezuela, and possibly from Angola.

Puzosia quenstedti petkovici WIEDMANN et DIENI
(figs. 25g—i)

1930. *Puzosia Mayoriana* var. *africana* KIL.; PASSENDORFER, fig. 6, pl. 3: 47.
1968. *Puzosia petkovici* WIEDMANN et DIENI, 116, pl. 11: 8 (with synonymy).

Material. — One specimen, IGPUW/WR2.102, the holotype of the present subspecies.

Remarks. — In the present subspecies, whorl thickness exceeds whorl height, as is obvious from the measurements of the holotype (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.102	29	12(0.41)	13(0.45)	10(0.35)	1.09

The name *P. petkovici* was proposed by WIEDMANN and DIENI to substitute *Puzosia africana* KILIAN, 1913, non *Puzosia africana* KRENKEL, 1910.

Occurrence. — The holotype of the subspecies is from the condensed Albian of Wielka Rówień, Tatra Mts. *P. quenstedti petkovici* is also reported from the Upper Albian of Sardinia and perhaps Yugoslavia.

Puzosia mayoriana (d'ORBIGNY)

In contrast to *P. quenstedti*, the present species has four to six, more sinuous, pronounced constrictions per whorl, in most cases with an angular course on the venter. The flanks are generally subparallel and the venter is broadly rounded. The umbilicus is generally larger than in the previous species.

Puzosia mayoriana mayoriana (d'ORBIGNY)
(pl. 5: 5)

1841. *Ammonites Mayorianus* d'ORBIGNY, 267, pl. 79: 1—3.
pars 1930. *Puzosia Mayoriana* d'ORB.; PASSENDORFER, 631, *non* pl. 3: 57 and 58 (sed *P. quenstedti quenstedti*).
1978. *P. mayoriana* (d'ORB.); WIEDMANN and NEUGEBAUER, 711, pl. 1: 4 and 5.
pars 1984. *P. (Puzosia) mayoriana* (d'ORB.); WRIGHT and KENNEDY, 55, figs. 1A, B, 2C, H, M, 3N—R, 4A—E; pl. 3: 1, 2, 4, 6, 9—12, pl. 4: 1, 2, 5—7 (with synonymy).

Material. — Two specimens, IGPUW/RM. Ch 55 and MŁw. 13.

Remarks. — Again, the concept of WIEDMANN and DIENI (1968) is followed in defining and subdividing the *mayoriana* group. As mentioned by these authors, the forms of the present group in which whorl height greatly exceeds whorl thickness, were separated by IMLAY (1959) in the separate "genus" *Parasilesites*. Therefore, the *mayoriana* group starts with forms in which whorl height just slightly exceeds whorl thickness. This is the case in the nominal subspecies. *P. mayoriana mayoriana* is a large species, as is documented by the Polish specimens which have the following measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/RM.Ch 55	215	90(0.42)	68(0.32)	?65(0.30?)	0.75
IGPUW/MŁw. 13	—	65	58	—	0.89

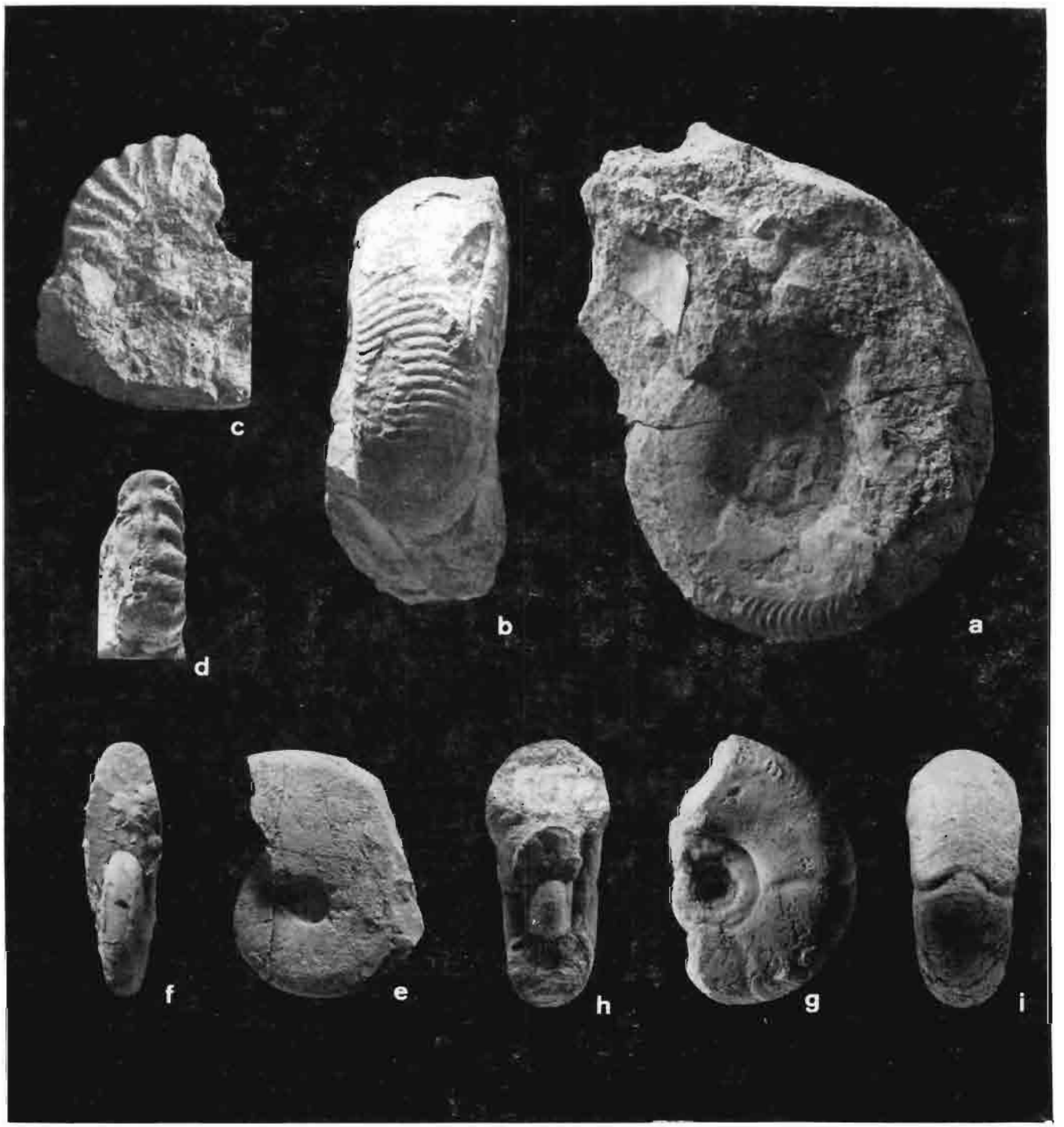


Fig. 25.

Albian Ammonitina; a, b. *Puzosia mayoriana provincialis* (PARONA et BONARELLI), IGPUW/WR2.99, × 1; *a* — lateral, and *b* — ventral views; c, d. *Hysteroceras orbignyi* (SPATH), IGPUW/WR. 154, × 1; *c* — lateral, and *d* — ventral views; e, f. *Beudanticeras revoili* (PERV.), IGPUW/BW. 13, × 1.5; *e* — lateral, and *f* — frontal views. *g*—*i*; *Puzosia petkovici* WIEDM. et DIENI, IGPUW/WR2.102, × 1.5; *g* — lateral, *h* — frontal, and *i* — ventral views. Except for *e*, *f* (from Biała Woda), from Wielka Rówień.

Despite their large size, both specimens are still chambered (pl. 5: 5).

WRIGHT and KENNEDY (1984) give a detailed discussion of the present species. We completely agree that *Amm. planulatus* J. SOWERBY (*non* SCHLOTHEIM) — in contrast to SCHOLZ (1979*a*) — is not valid and should be replaced by *Amm. mayorianus* d'ORBIGNY. Within this species, WRIGHT and KENNEDY (op. cit.: 55f) include *Puzosia octosulcata* (SHARPE), *Puzosia subplanulata* (SCHLÜTER), *P. odiensis* KOSSMAT, *P. crebrisulcata* KOSSMAT, *P. takei* POPOVICI-HATZEG, *P. furnitana* PERVINQUIÈRE, *P. sharpei* SPATH, and *P. communis* SPATH. This interpretation is not completely followed here, but it is obvious from all publications over the last several years that puzosiids require serious revision.

Occurrence. — The nominal subspecies in the present systematic interpretation is a rather rare form. It is very rare in the *Auritus* Subzone of Mt. Chełmowa, central Poland; it is also rare in the lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones) of the condensed sequence exposed at Annopol-on-Vistula, central Poland, and in the Tatra Mts., where it is recognized only in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Mała Łąka. Nevertheless, *P. mayoriana mayoriana* has a widespread distribution in Europe, Asia, the South Atlantic, and Africa, and can be traced from the Upper Albian into the Cenomanian.

Puzosia mayoriana provincialis (PARONA et BONARELLI)
(pl. 6: 3; fig. 25a, b)

1897. *Desmoceras provinciale* PARONA et BONARELLI, 81; pl. 11: 4.
1968. *Puzosia provincialis* (PAR. et BON.); WIEDMANN and DIENI, 118, figs. 74 and 75, pl. 10: 1 and 8, pl. 11: 1, 2, 4, 5, 7, 12 (with synonymy).
1968. *P.* (*Puzosia*) *sharpei* SPATH; RENZ, 21, figs. 6b, 7e, pl. 1: 4 and 8.

Material. — 26 specimens, IGPUW/WR2.97c, 99, 100, 108—121, WR. 101, 104—106, BW. 5, MŁr. 11, MŁw. 15—17.

Remarks. — In WIEDMANN and DIENI's (1968) definition, the present subspecies comprises those forms of the *mayoriana* group having a whorl height/whorl thickness ratio of 1. As in the Sardinian fauna, the majority of specimens have to be included in the present subspecies. The measurements (in mm) of the illustrated specimens are:

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.99	76	31(0.41)	?31(0.41)	25(0.33)	?1.00
IGPUW/WR.101	25	10(0.40)	10(0.40)	8(0.32)	1.00

Occurrence. — The majority of the Tatra puzosiids belongs to the present subspecies, which is represented in the condensed Albian of Wielka Rówień, Mała Łąka, and Biała Woda. *P. mayoriana provincialis* is widespread in the European Middle and Upper Albian, and it probably occurs in the Albian of Madagascar.

Genus *Parasilesites* IMLAY, 1959

Type species: P. bullatus IMLAY, 1959.

This is a somewhat doubtful genus, comprising (as mentioned above) the laterally compressed specimens of the group of *P. mayoriana*. Therefore, the existence of the genus needs to be reconsidered. For the time being, the genus is kept separate from *Puzosia*, especially since only one specimen can be attributed to it. The genus occurs in the Lower and Middle Albian of Europe, the North Atlantic, the Americas, and Africa.

Parasilesites kilianiformis (FALLOT)
(pl. 7: 4)

1910. *Puzosia Nolani* var. *Kilianiformis* P. FALLOT, 26, fig. 8, pl. 1: 5.
1930. *P.* aff. *compressa* KOSSMAT; PASSENDORFER, 636, figs. 8 and 61b bis, pl. 3: 59 and 61a.
1968. *Parasilesites kilianiformis* (P. FALLOT); WIEDMANN and DIENI, 124, fig. 79, pl. 10: 7 (with synonymy).
1979. *P. kilianiformis* (FALL.); RENZ, 364, pl. 2: 1.
1982. *P. kilianiformis* (FALL.); RENZ, 37, fig. 25c, pl. 5: 10.

Material. — One specimen, IGPUW/WR3.146; PASSENDORFER's second specimen (op. cit. pl. 3: 61) is apparently lost.

Remarks. — This species is easily recognized due to its high, nearly parallel flanks which converge towards the narrowly rounded venter. The umbilicus is relatively open. The Polish specimen (pl. 7: 4) has four constrictions on the last whorl which are strongly sinuous but irregularly spaced. Between the constrictions, the external flanks are covered by sinuous ribs visible even on the internal mould. The suture line (PASSENDORFER 1930, fig. 8) is indistinguishable from *Puzosia* sutures. The measurements are (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR3.146	25	8.5(0.34)	6(0.24)	10(0.4)	0.71

Occurrence. — *P. kilianiformis* is now described from the condensed Albian of Wielka Rówień, Tatra Mts. Furthermore, it is known from the Lower Albian of the Balearic Islands and Spain, and the Upper Albian of Sardinia, the North Atlantic, and Venezuela.

Genus *Silesitoides* SPATH, 1925

Type species: Silesites escragnollensis JACOB, 1908.

The subgenus *Puzosia* (*Jacobella*), proposed by PASSENDORFER (1930: 637), was an objective synonym of *Silesitoides* SPATH, both established with the same type species. It was also a homonym of *Jacobella* JEANNET, 1908. It is rare in the Lower and Middle Albian of Europe.

Silesitoides tatricus (PASSENDORFER)
(pl. 7: 9)

1930. *Puzosia* (*Jacobella*) *escragnollensis* var. *tatrica* PASSENDORFER, 638, fig. 9, pl. 3: 51.

Material. — The holotype only, IGPUW/BW. 14 (here reproduced).

Remarks. — Little has to be added to PASSENDORFER's description.

The suture line (PASSENDORFER op. cit., fig. 9) is very *Puzosia*-like, and there is no question that *Silesitoides* includes strongly ribbed, evolute puzosiids. Nevertheless, *Silesitoides* is a random and poorly known genus. Not knowing too much about the degree of variability within this genus, it may be hasty to consider *S. tatricus* as a separate species, the only distinction from *S. escragnollensis* being the whorl section, which is as wide as it is high.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/BW. 14	60	17(0.28)	17(0.28)	31.5(0.52)	1.00

As PASSENDORFER mentioned, the last half whorl of the holotype represents the body chamber. Some of the body chamber-ribs bifurcate. The last whorl may have finely marked, radiating constrictions well pronounced on the venter (pl. 7: 9). Ribs on both sides of these constrictions are strengthened.

Occurrence. — *S. tatricus* is known only from the condensed Albian of Biała Woda, Tatra Mts. The type species is of Lower Albian age and known only from southern France and the Balearic Islands.

Subfamily **Beudanticeratinae** BREISTROFFER, 1953
Genus *Beudanticeras* HITZEL, 1902

Type species: Ammonites beudanti BROGNIART, 1822.

WIEDMANN and DIENI (1968: 127) proposed including the genus *Uhligella* JACOB, 1907 in *Beudanticeras*, because no separation can be made on the basis of shell form and sculpture. Scholz (1979: 69), however, pointed out that there seem to be differences in the shape of the lateral lobe, facilitating separation at least of *B. beudanti* and the *Uhligella walleranti* group. This is the reason why both groups are treated separately in the present paper. *Beudanticeras* is a cosmopolitan genus of Albian age.

Beudanticeras beudanti (BROGNIART)
(pl. 7: 1)

1822. *Ammonites Beudanti* BROGNIART, 95, pl. 7: 2.
1930. *Desmoceras Beudanti* BROGN.; PASSENDORFER, 645, fig. 14.
1968. *Beudanticeras beudanti* (BROGN.); WIEDMANN and DIENI, 128, pl. 11: 10 (with synonymy).
1979*a*. *B. beudanti* (BROGN.); SCHOLZ, 68, fig. 21, pl. 13: 1 and 6.

Material. — Two specimens, IGPUW/TR. 1 and MŁr. 12.

Remarks. — Two large specimens of the Tatra collection can be referred to as *B. beudanti* due to their slender whorls with the typical traces of ribbing (pl. 7: 1). The measurements are (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/TR. 1	130	72(0.55)	38(0.29)	19(0.15)	0.53
IGPUW/MŁr. 12	?90	45(0.50)	22(0.24)	16(0.18)	0.49

Both specimens are chambered throughout.

The suture line given by PASSENDORFER (1930, fig. 14) shows perfectly the large, subbifid *L* very different from the trifid *L* of *Uhligella walleranti* (fig. 26).

Occurrence. — The described specimens come from Turnia Ratusz and Mała Łąka, Tatra Mts., while PASSENDORFER also mentioned Biała Woda as well as Wielka Równień. *Beudanticeras beudanti* is widespread in the European Middle and Upper Albian and may be present in the Albian of Angola.

Beudanticeras revoili (PERVINQUIÈRE)
(fig. 25c, f)

1907. *Desmoceras Revoili* PERVINQUIÈRE, 131, fig. 48, pl. 5: 13—15.
1930. *Desmoceras Revoili* PERV.; PASSENDORFER, 644, fig. 13, pl. 4: 62.
1950. *Beudanticeras Revoili* PERV.; COLLIGNON, 40, pl. 7: 1.
1963. *B. revoili* PERV.; COLLIGNON, 74, pl. 268: 1167.
B. sp. aff. *revoili* PERV.; COLLIGNON, 71, pl. 267: 1164.

Material. — One specimen, IGPUW/BW. 13.

Remarks. — This is a typical *Beudanticeras*, easily recognizable. *B. revoili* has whorls much higher than they are broad with flattened flanks, separated from the narrowly rounded venter

by a distinct marginal edge. The umbilicus is very small. The sculpture is very fine to almost absent. One of the Tatra specimens clearly belongs to PERVINQUIÈRE's species. It has the following measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/BW. 13	28	15(0.53)	8.4(0.30)	4.4(0.16)	0.56

The suture line of *B. revoili*, as published by PERVINQUIÈRE (1907, fig. 48) and PASSENDORFER (1930, fig. 13), has a much incised and trifid or subtrifid lateral lobe. This means that the distinction, SCHOLZ (1979*a*) proposed for separation of *Beudanticeras* and *Uhligella* is really restricted only to the type species, *B. beudanti*. The suture line of the present species, without any doubt a true *Beudanticeras*, is identical with those of *Uhligella* described below.

Occurrence. — The Tatra specimen came from the condensed Albian of Biała Woda; the species is also known from the Lower (?) and Middle Albian of Tunisia and Madagascar.

Genus *Uhligella* JACOB, 1907

Type species: Desmoceras clansayense JACOB, 1905.

Uhligella s. str. ranges from Upper Aptian to Upper Albian and occurs in Europe, Africa and the Americas.

Uhligella walleranti (JACOB)

(pl. 6: 4 and 5; fig. 26)

1908. *Desmoceras* (*Uhligella*) *Walleranti* JACOB, 31, figs. 17 and 18, pl. 3: 1—4.
1930. *D.* (*Uhligella*) *Walleranti* var. *rotunda* PASSENDORFER, 648, pl. 3: 55.
D (*Uhligella*) *Walleranti* var. *lateumbilicata* PASSENDORFER, 649, fig. 16, pl. 3: 50.
1968. *Beudanticeras* ("*Uhligella*") *walleranti* (JACOB); WIEDMANN and DIENI, 129 (with synonymy).
1982. *B.* ("*Uhligella*") *walleranti* (JACOB); RENZ, 35, fig. 23a, pl. 4: 12 and 13.

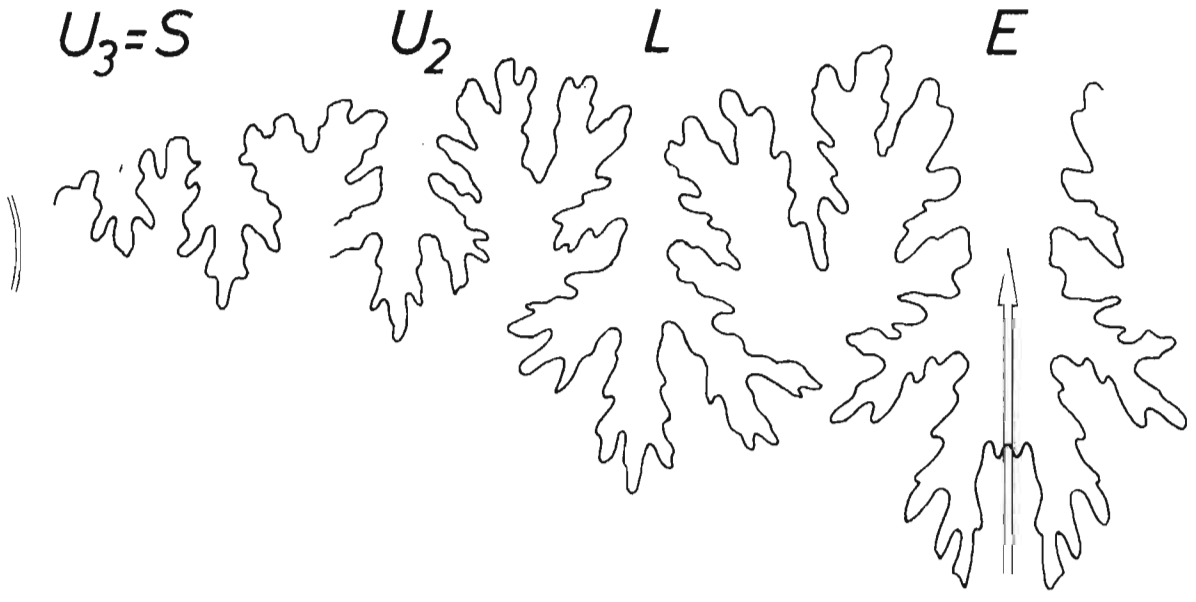


Fig. 26.

Suture of *Uhligella walleranti* JACOB, IGPUW/WR2.128, Wh = 12 mm.

Material. — 7 specimens, IGPUW/WR2.127—130, BW. 8—9, 11.

Remarks. — *Uhligella walleranti* is very similar to the beudanticeratids, but the whorls are somewhat more inflated, and the ribbing is more pronounced. Both characteristics can be seen in the illustrated specimens despite their relatively poor preservation (pl. 6: 4 and 5). Measurements of the illustrated specimens are (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.127	82	40(0.49)	26(0.32)	17(0.21)	0.65
IGPUW/WR2.130	18	9.5(0.56)	6.8(0.38)	4.2(0.23)	0.73

These measurements agree perfectly with those given by JACOB (1908: 31). The same can be said about the suture line (fig. 26) with its trifid lobes and asymmetrically subdivided saddles. The authors are, however, unable to follow PASSENDORFER in separating the "varities" *rotunda* and *lateumbilicata*. The type specimens of both "varities" are unfortunately lost.

Occurrence. — *U. walleranti* is thus a relatively abundant form in the condensed Albian of Wielka Rówień and Biała Woda, Tatra Mts. It is also known from the Lower and Middle Albian of southern Europe, Venezuela, and northern Africa (?), and from the Upper Albian of Sardinia.

Uhligella rebouli (JACOB)

(pl. 6: 6 and 7)

1908. *Desmoceras (Uhligella) Rebouli* JACOB, 32, pl. 4: 1—5.
1930. *D. (Uhligella) Rebouli* JACOB.; PASSENDORFER, 647, figs. 15 and 56b bis, pl. 3: 56 and 60.
1968. *Beudanticeras ("Uhligella") rebouli* (JACOB); WIEDMANN and DIENI, 129, pl. 10: 6 (with synonymy).
1982. *B. ("Uhligella") rebouli* (JACOB.); RENZ, 35, fig. 23b; pl. 4: 14 and 15.

Material. — Five specimens, IGPUW/WR2.122—126.

Remarks. — As can be seen from the specimens in pl. 6: 6 and 7, *U. rebouli* can easily be distinguished from the previous species by its stronger ribbing, even more inflated whorls, and narrower umbilicus. As visible from the well-preserved smaller specimen WR2.122 (pl. 6: 6), about 13 main ribs per whorl start at small but distinct umbilical tubercles, while two or three shorter ribs are intercalated on the outer flanks.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.124	57	27.5(0.55)	19.5(0.34)	10.5(0.18)	0.71
IGPUW/WR2.122	28.5	14.8(0.52)	9.5(0.33)	5(0.18)	0.64

Occurrence. — All Tatra specimens attributed to this species are from the condensed Albian of Wielka Rówień. *U. rebouli* is reported from the Lower and Middle Albian of south-western Europe and Venezuela.

Uhligella balmensis (JACOB)

(pl. 6: 8)

1908. *Desmoceras (Uhligella) balmensis* JACOB, 33, fig. 20, pl. 3: 6—9.
1930. *D. (Uhligella)* cf. *balmensis* JACOB; PASSENDORFER, 647, pl. 4: 63.
1963. *Uhligella balmensis* JACOB; COLLIGNON, 71, pl. 267: 1162.
Uhligella balmensis var. *pinguis* COLLIGNON, 74, pl. 268: 1168.

Material. — One specimen, IGPUW/BW. 12.

Remarks. — *U. balmensis* is even more strongly ribbed than the previous species and more inflated. Two to three ribs start from the umbilical tubercles and cross the flanks and broadly

rounded venter. Despite poor preservation of the Tatra specimen, these characteristics of the sculpture can be observed (pl. 6: 8).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
IGPUW/BW. 12	25	11(0.44)	9.7(0.39)	5.4(0.22)	0.88

COLLIGNON'S (1963) "var. *pinguis*" cannot be distinguished from *U. balmensis*.

Occurrence. — The Tatra specimen is from the condensed Albian of Biała Woda; the species is furthermore known from the Lower and Middle Albian of southeastern France and Switzerland and the Middle Albian of Madagascar.

Subfamily **Desmoceratinae** ZITTEL, 1895
Genus *Desmoceras* ZITTEL, 1884

Type species: Ammonites latidorsatus MICHELIN, 1838.

If *Pseudouhligella* MATSUMOTO, 1942 and *Lunatodorsella* BREISTROFFER, 1947 are considered as subgenera (C. W. WRIGHT 1957), the Albian fauna of the Tatra Mts. includes specimens of the subgenus *Desmoceras* only. This is cosmopolitan in occurrence and Upper Aptian to Cenomanian in range.

D. (*Desmoceras*) *latidorsatum* (MICHELIN)
(pl. 7: 2 and 3)

1838. *Ammonites latidorsatus* MICHELIN, 101, pl. 12: 9.
1930. *Latidorsella Paronae* KIL.; PASSENDORFER, 639, fig. 10.
Latidorsella latidorsata MICH.; PASSENDORFER, 640; fig. 11, pl. 3: 48 and 49.
1968. *D.* (*Desmoceras*) *latidorsatum* (MICH.); WIEDMANN and DIENI, 131, fig. 81, pl. 12: 2, 6—13 (with synonymy).
1968. *D.* (*D.*) *latidorsatum* (MICH.); RENZ, 20, pl. 1: 12.
1971. *Tetragonites* sp.; KENNEDY, 5, pl. 1: 9.
non *D.* (*D.*) *latidorsatum* (MICH.); KENNEDY, 34, pl. 45: 4 (sed *Tetragonites rectangularis* WIEDMANN).
D. (*D.*) cf. *inane* (STOLICZKA); KENNEDY, 34, pl. 10: 1 and 2.
Desmoceras sp.; KENNEDY, 34, pl. 10: 7.
1972. *D.* (*D.*) *latidorsatum latidorsatum* (MICH.); RENZ, 717, fig. 9, pl. 8: 5, pl. 9: 2, pl. 10: 1 and 2.
D. (*D.*) *latidorsatum inflatum* BREISTR.; RENZ, 718, pl. 9: 3.
1978. *D. latidorsatum* var. *inflata* BREISTR.; COLLIGNON, 15, pl. 4: 3.
1979*a*. *D.* (*D.*) *latidorsatum* MICH.; SCHOLZ, 61, fig. 18.
1979. *D.* (*D.*) *latidorsatum perinflatum* COOPER and KENNEDY, 237, figs. 36—38, 39d—f.
1979. *D.* (*D.*) *latidorsatum* (MICH.); IMMEL, 619, pl. 1: 6, pl. 2: 2.
1982. *D.* (*D.*) *latidorsatum* (MICH.); RENZ, 42, fig. 28, pl. 6: 3.
D. (*D.*) *latidorsatum complanatum* JACOB; RENZ, 36, fig. 24a, pl. 5: 1 and 2.
D. (*D.*) *latidorsatum latidorsatum* (MICH.); RENZ, 37, fig. 24b, pl. 5: 3—5 and 7.
D. (*D.*) *latidorsatum inflatum* BREISTR.; RENZ, 37, fig. 24c, pl. 5: 6, 8, 9.
1984. *D.* (*D.*) *latidorsatum* (MICH.); WRIGHT and KENNEDY, 61, figs. 2B, J, pl. 3: 3, 5, 7, 8, 13.

Material. — 22 specimens, IGPUW/WR2/3.131—145, MŁw. 18—23, MŁr. 13.

Remarks. — The extreme variability of this species needs no further comment (see WIEDMANN and DIENI 1968: 131ff). This variability affects the presence and absence of constrictions as well as the shape of the whorl section. All four "varieties" previously distinguished are present in the Tatra material.

Measurements (in mm):

"var. *complanata*"	D	Wh	Wb	U	Wb/Wh
IGPUW/WR2.145	18	10(0.55)	8.5(0.47)	2.8(0.16)	0.85
"var. *media*"					
IGPUW/MŁr. 13	71	35(0.49)	33(0.47)	15(0.21)	0.94
IGPUW/WR3.137	25	13.5(0.54)	13(0.52)	3.5(0.14)	0.96
"*typical* form"					
IGPUW/MŁw. 24	22.5	10.5(0.47)	13(0.58)	3.2(0.14)	1.23
"var. *inflata*"					
IGPUW/WR3.141	32	13.5(0.42)	22(0.69)	7(0.22)	1.62

The two illustrated specimens belong to the typical form (pl. 7: 2) and "var. *inflata*", respectively (pl. 7: 3). Also, the specimen presented by PASSENDORFER (op. cit., pl. 3: 49) clearly belongs to the typical form, which is identical with the specimens PASSENDORFER referred to as "*Latidorsella paronae*".

Occurrence. — *D.* (*D.*) *latidorsatum* is an abundant form in the condensed Albian fauna; specimens are from Wielka Rówień and Mała Łąka, Tatra Mts. *D. latidorsatum* is a cosmopolitan species ranging from the Lower Albian into the Upper Cenomanian.

Family **Hoplitidae** DOUVILLÉ, 1890
Subfamily **Hoplitinae** DOUVILLÉ, 1890
Genus *Hoplites* NEUMAYR, 1875

Type species: Ammonites dentatus SOWERBY, 1821.

Remarks. — The genus *Hoplites*, except the nominative subgenus, is comprised of the subgenera *Isohoplites* CASEY, 1954 and *Otohoplites* STEINMANN, 1925. The latter is interpreted by WRIGHT (1957: L396) as a separate genus, but in the authors' opinion the differences are rather of the subgeneric level (cf. also GEBHARD 1983, 1985).

Occurrence. — The genus *Hoplites* is known from the uppermost Lower Albian to Upper Albian, and its numerous occurrence indicates the Boreal Realm (cf. OWEN 1971, 1973, 1976, 1979).

Subgenus *H.* (*Hoplites*) NEUMAYR, 1875

Occurrence. — The subgenus *H.* (*Hoplites*) appears in the uppermost Lower Albian (*Puzosianus* Subzone) of France (cf. DESTOMBES *et al.* 1973), but it is primarily known from the Middle Albian of Europe and Transcaspia in the Soviet Union.

H. (*Hoplites*) *dentatus* (J. SOWERBY)
H. (*Hoplites*) *dentatus dentatus* (J. SOWERBY)
(pl. 9: 1)

1925. *Hoplites dentatus* (J. SOW.); SPATH, 101, figs. 23—24a, pl. 7: 5 and 6 (with synonymy).
pars 1930. *H. dentatus* SOW.; PASSENDORFER, 653, fig. 17?
1953. *H. dentatus* SOW.; GLASUNOVA, 64, fig. 28, pl. 15: 1 and 2.
1959*a*. *H. dentatus* (SOW.); CIEŚLIŃSKI, 47, pl. 5: 1.
1971. *H.* (*Hoplites*) *dentatus* (J. SOW.); OWEN, 153, pl. 2: 4.
1976. *H. dentatus* (SOW.); SAVELIEV, 121.
1977. *H. dentatus* SOW.; KOTETICHVILI, 62, pl. 27: 1.
1978. *H.* (*H.*) *dentatus* (J. SOW.); KENNEDY and HANCOCK, 6, pl. 1: 1.
1979. *H.* aff. *dentatus* (SOW.); DESTOMBES, 100, pl. 4—25: 1.

1981. *H. dentatus* (SOW.); SAVELIEV, 44.
1983. *H. (H.) dentatus dentatus* (SOW.); MARCINOWSKI and RADWAŃSKI, 73, pl. 5: 5.
1985. *H. (H.) dentatus* (SOW.); MARCINOWSKI and WALASZCZYK, 38, pl. 3: 1.

Material. — Several tens of specimens, variously preserved.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	R
pl. 9: 1	141	58(0.41)	39.2(0.28)	42.4(0.30)	0.67	32

Description. — Whorls with very slightly convex sides and the greatest thickness above the umbilical margin. Umbilicus with low, almost vertical wall and rounded margin. The pronounced and longitudinally flattened umbilical tubercles yield two slightly arched, prorsiradiate ribs. These ribs thicken upwards, and they terminate at the ventro-lateral margin with well pronounced swells of a blunt tubercle shape. Between the bifurcating ribs there sometimes appear intercalatory ribs which are sculptured only by the ventro-lateral, blunt tubercles. The ventral side is narrow, with a depression at its middle, formed by the elongated, alternating tips of the ribs (= blunt, ventro-lateral tubercles).

Remarks. — PASSENDORFER's collection is comprised of 28 hoplitids, described by this author as *H. dentatus* (see synonymy). Most of them belong to the nominative subspecies and the others represent *Anahoplites splendens* (SOW.) and *H. (Hoplites) escragnollensis* SPATH.

Occurrence. — Very common in the lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones) of the condensed sequence at Annopol-on-Vistula, central Poland (units A_{5-7} in fig. 4); quite frequent in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland (fig. 6 and Table 6). *H. (H.) dentatus dentatus* (SOW.) has often been recorded in the lower Middle Albian (*Dentatus* Zone) in the Boreal Realm of Europe and Transcaspia.

H. (Hoplites) dentatus robustus SPATH, 1925
(pl. 10: 1)

1925. *Hoplites dentatus* (J. SOWERBY) var. *robusta* SPATH, 103, fig. 24c, pl. 7: 7—9.
1971. *H. (Hoplites) dentatus robusta* SPATH; OWEN, 153.
1973. *H. dentatus* (J. SOW.) var. *robusta* SPATH; DESTOMBES *et al.*, 85.
1976. *H. dentatus* (SOW.) var. *robusta*; SAVELIEV, 121.
1978. *H. (H.) dentatus robusta* SPATH; KENNEDY and HANCOCK, 6.
1981. *H. dentatus* (SOW.) var. *robusta*; SAVELIEV, 44.
1983. *H. (H.) dentatus robustus* SPATH; MARCINOWSKI and RADWAŃSKI, 73, pl. 4: 4.

Material. — Several specimens.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	R
pl. 10: 1	164.5	72.5(0.44)	55(0.33)	44(0.27)	0.76	0.5(17)

Remarks. — Thicker and more convex whorls as well as less pronounced ornamentation differentiate the investigated specimen from *H. (H.) dentatus dentatus* (SOW.).

Occurrence. — Lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland. *H. (H.) dentatus robustus* SPATH is known in the lower Middle Albian (*Dentatus* Zone) in the Boreal Realm of Europe and Transcaspia.

H. (Hoplites) ex gr. *dentatus* (J. SOWERBY)
(pl. 9: 2)

Material. — One fragmentary specimen. IGPUW/RM. A 53.
Measurements (in mm):

	Wh	Wb	Wb/Wh
pl. 9: 2	48	38	0.79

Remarks. — The specimen differs from the typical *H. dentatus* (Sow.) in its more convex whorls, more pronounced ornamentation, and especially by its more elongate, sharp, ventro-lateral tubercles.

Occurrence. — Lower Middle Albian (*Eodentatus* Subzone) at Annopol-on-Vistula (uncondensed quartzitic sandstones — unit A_3 in fig. 4), central Poland.

H. (*Hoplites*) *vectensis* SPATH
(pl. 10: 2)

1925. *Hoplites vectensis* SPATH, 127, pl. 9: 8.
1947. *H. vectensis* SPATH; BREISTROFFER, 28.
1959*a*. *H.* cf. *vectensis* SPATH; CIEŚLIŃSKI, 49, pl. 5: 2.
1971. *H.* (*Hoplites*) *vectensis* SPATH; OWEN, 153.
1978. *H.* (*H.*) *vectensis* SPATH; KENNEDY and HANCOCK, 6.
1983. *H.* (*H.*) *vectensis* SPATH; MARCINOWSKI and RADWAŃSKI, 73, pl. 4: 3.

Material. — Several specimens.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	R
pl. 10: 2	102.6	36.6(0.36)	25(0.24)	35.6(0.35)	0.68	0.5(17)

Description. — Whorls narrow, with flat sides. The umbilical tubercles yield two strongly prorsi-flexiradiate ribs, one of which is less strongly connected to the umbilical tubercle. The alternating ventro-lateral tubercles are sharp and well pronounced. The ventral side is deeply concave.

Occurrence. — Lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland. *H.* (*H.*) *vectensis* has been recorded from the lower Middle Albian (*Dentatus* Zone) of England and France.

H. (*Hoplites*) *baylei* SPATH
(pl. 11: 3)

1925. *Hoplites baylei* SPATH, 118, fig. 29, pl. 11: 5.
1947. *H. Baylei* SPATH; BREISTROFFER, 27.
1971. *H.* (*Hoplites*) *baylei* SPATH; OWEN, 153.
1973. *H.* cf. *baylei* SPATH; DESTOMBES *et al.*, 83, fig. 8(4), pl. 5: 4.
1978. *H.* (*H.*) *baylei* SPATH; KENNEDY and HANCOCK, 6.
1979. *H. baylei* SPATH; DESTOMBES, 100, pl. 4—25: 2.
H. aff. *baylei* SPATH; DESTOMBES, 100, pl. 4—25: 4.
1983. *H.* (*H.*) *baylei* SPATH; GEBHARD, 41.

Material. — One specimen, badly preserved, IGPUW/RM. A 56.
Measurements (in mm):

	Wh	Wb	Wb/Wh
pl. 11: 3	14	19	1.36

Remarks. — The investigated specimen, although fragmentary, corresponds well to the description given by SPATH (1925: 118) and to the former illustrations of this species.

Occurrence. — Lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland. *H.* (*H.*) *baylei* SPATH has been recorded

from the uppermost Lower Albian (*Puzosianus* Subzone) of France (*H.* aff. *baylei* of DESTOMBES *et al.* 1973), and from the lowermost Middle Albian *Eodentatus* and *Lyelli* Subzones of the *H. dentatus* Zone) of France and England.

H. (*Hoplites*) *rudis* PARONA et BONARELLI

1897. *Hoplites rudis* PARONA et BONARELLI, 92, pl. 13: 2.
1925. *H. rudis* PARONA et BONARELLI; SPATH, 108, fig. 25, pl. 8: 10.
1947. *H. rudis* PAR. et BON.; BREISTROFFER, 28.
1971. *H.* (*Hoplites*) *rudis* PAR. et BON.; OWEN, 153.
1976. *H. rudis* PAR. et BON.; SAVELIEV, 122.
1978. *H.* (*H.*) *rudis* PAR. et BON.; KENNEDY and HANCOCK, 7.
1981. *H. rudis* PAR. et BON.; SAVELIEV, 44.
1983. *H.* (*H.*) *rudis* PAR. et BON.; GEBHARD, 41.

Material. — One specimen, badly preserved, IGPUW/RM. A 58.

Remarks. — Very pronounced lateral and ventro-lateral tubercles, as well as strong ribs (some of which bifurcate irregularly from the prominent lateral tubercles) are the features which are highly comparable to the typical forms of species.

Occurrence. — Lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence of Annopol-on-Vistula, central Poland. *H.* (*H.*) *rudis* has been recorded from the lower part of the Middle Albian (*Dentatus* Zone) of England and France; it also occurs in a similar stratigraphical position in Transcaspia in the Soviet Union.

H. (*Hoplites*) *escragnollensis* SPATH
(pl. 7: 7)

1897. *Hoplites dentatus* SOW. f.; PARONA and BONARELLI, 91, pl. 12: 2 and 3 (only).
1925. *H. escragnollensis* SPATH, 80 and 128, fig. 34.
pars 1930. *H. dentatus* SOW.; PASSENDORFER, 653.
1947. *H. escragnollensis* SPATH; BREISTROFFER, 28.
1971. *H.* (*Hoplites*) *escragnollensis* SPATH; OWEN, 153.
1976. *H. escragnollensis* SPATH; SAVELIEV, 122.
1978. *H.* (*H.*) *escragnollensis* SPATH; KENNEDY and HANCOCK, 6.
1981. *H. escragnollensis* SPATH; SAVELIEV, 44.
1983. *H.* (*H.*) *escragnollensis* SPATH; MARCINOWSKI and RADWAŃSKI, 73, pl. 5: 4.
1985. *H.* (*H.*) *escragnollensis* SPATH; MARCINOWSKI and WALASZCZYK, 36, pl. 2: 6.

Material. — Two specimens, IGPUW/RM. A 60 and WR3.148.
Measurements (in mm):

	D	Wh	Wb	U
pl. 7: 7	52	19.5(0.37)	—	19.6(0.38)

Remarks. — Our specimens, contrary to the hoplitids described above, are characterized by narrow, weakly ornamented whorls. One of the specimens of the PASSENDORFER collection also shows such features; he described the specimen as *H. dentatus* (SOW.) (see previous remarks on *H. dentatus dentatus*).

Occurrence. — Very rare in the lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland; also very rare in the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. This species is known from the lower Middle Albian (*Spathi* Subzone of the *H. dentatus* Zone) of England, France, and Transcaspia.

Subgenus *H.* (*Isohoplites*) CASEY, 1954

Type species: Parahoplites steinmanni JACOB, 1907.

Occurrence. — The subgenus *Isohoplites* is known from the lowermost Middle Albian (*Eodentatus* Subzone of the *H. dentatus* Zone) of England, France, and Poland; it also occurs in a similar stratigraphic position in Transcaspia in the Soviet Union.

H. (*Isohoplites*) cf. *steinmanni* JACOB

1959*a*. *Anahoplites* cf. *praecox* SPATH; CIEŚLIŃSKI, 51, pl. 6: 3.

Remarks. — Sides of the whorl are high and flat. The umbilical swell yields bifurcate, prorsiradiate ribs which arch strongly toward the aperture on the ventral side. These features allow the assignment of the specimen illustrated by CIEŚLIŃSKI to the subgenus *Isohoplites*. Fragmentary preservation of the specimen does not favor its positive specific recognition.

Occurrence. — Lower Middle Albian (*Eodentatus* Subzone) at Annopol-on-Vistula (uncondensed quartzitic sandstone — unit A_3 in fig. 4), central Poland.

Subgenus *H.* (*Otohoplites*) STEINMANN, 1925

Type species: Ammonites raulinianus d'ORBIGNY, 1841.

Remarks. — In some representatives of this subgenus, the marked, irregularly zigzagging ribs typical of the inner whorls vanish in the adult stage, and less pronounced single ribs appear on the body chamber (see description below). This feature supplements the definition of the subgenus *H.* (*Otohoplites*), which by some authors is interpreted as a separate genus (cf. WRIGHT 1957: L396; OWEN 1971, DESTOMBES *et al.* 1973, DESTOMBES 1979, SAVELIEV 1981).

Occurrence. — The subgenus *H.* (*Otohoplites*) is known from the upper part of the Lower Albian and lowermost Middle Albian (*Eodentatus* Subzone) of England, France, Poland, and Transcaspia in the Soviet Union.

H. (*Otohoplites*) *normanniae* DESTOMBES *et al.*
(pl. 11: 1 and 2)

1959*a*. *Dimorphoplites hilli* SPATH; CIEŚLIŃSKI, 51, pl. 6: 4.
1973. *Otohoplites normanniae* DESTOMBES *et al.*, 77, fig. 8(1—3), pl. 3: 4, pl. 5: 1—3.
1985. *Dimorphoplites* sp.; MARCINOWSKI and WALASZCZYK, 38, pl. 3: 2.
1985. *H.* (*Otohoplites*) *normanniae* DEST. *et al.*; MARCINOWSKI and WIEDMANN, 206.

Material. — Two specimens; fragmentary phragmocone — IGPUW/RM. A 54 (pl. 11: 1) and phragmocone with part of the body chamber — IGPUW/RM. A 55 (pl 11: 2).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	Tu	R
pl. 11: 1	—	50	36	—	0.72	ca. 0.5(9)	0.5(13)
pl. 11: 2 (phragmocone)	78	36(0.46)	—	18.4(0.23)	—	19	ca. 38
pl. 11: 2 (body chamber)	—	70.5	50	—	0.71	—	—

Description. — Whorls narrow and flat, attaining their greatest thickness at the umbilical margin. Umbilicus with vertical wall and rounded margin. On the phragmocone, the ribs begin at the umbilical wall and form a distinct, longitudinally flattened tubercle at the umbilical margin. This tubercle yields two arched, prorsiradiate ribs which are most pronounced just

above the middle of the whorl. A distinct, clavate ventrolateral tubercle is usually formed by the union of two ribs (not from the same biplicate pair), thus the ribs form an irregularly zigzagging pattern (pl. 11: 1a). Moreover, single ribs with the same features as the former ones sometimes appear. The ventral side is concave, bounded by pronounced ventrolateral tubercles whose distinct alternation produces a characteristic zigzagging line (cf. pl. 11: 1b). The partially preserved body chamber is ornamented by single blunt ribs, devoid of umbilical tubercles, and terminating at the ventrolateral margin in low, weakly outlined swells (rudimentary tubercles). The tips of the ribs do not alternate as on the phragmocone, and thus a zigzagging line does not appear on the slightly concave venter. Towards the aperture the body chamber becomes completely smooth (this is visible on the opposite side of the whorl from that presented in the photograph).

Occurrence. — Lower Middle Albian (*Eodentatus* Subzone) at Annopol-on-Vistula (uncondensed quartzitic sandstone — unit A_3), central Poland. *H.* (*O.*) *normanniae* DESTOMBES *et al.* has hitherto been reported from the lowermost part of the Middle Albian (*Eodentatus* Subzone) of England and France.

Genus *Anahoplites* HYATT, 1900

Type species: Ammonites splendens SOWERBY, 1815.

Remarks. — In the investigated collection, this genus is represented by large individuals (up to 190 mm in diameter), some of which (eg., *Anahoplites planus* (MANTELL) and its subspecies) exhibit smooth *Callihoplites catillus*-type body chambers. These features are characteristic of representatives of the genus *Anahoplites* from the *Auritus* Subzone (SPATH 1927: 202), making these forms similar to the genus *Lepthoplites* SPATH, 1925. The latter shows a tendency to develop an incipient keel on the inner whorls (WRIGHT 1957: L396), a feature which is not observed in our specimens. SPATH (1928: 233) already pointed out the great similarity between the genera discussed here: "the five forms now referred to *Lepthoplites* are a fairly homogeneous assemblage but might well have been left in *Anahoplites*". *Lepthoplites*, however, has a distinctly smaller diameter in the adult stage (cf. SPATH 1928, RENZ 1968) and its representatives occur mostly in the higher stratigraphic horizons, i.e., the *S. dispar* Zone (cf. KENNEDY and HANCOCK 1978). We may not exclude the possibility that, when these genera co-occur, some of the representatives of *Lepthoplites* are microconchs of *Anahoplites*. The large *A.* aff. *picteti* SPATH and the relatively well-ribbed *A.* aff. *asiaticus* GLASUNOVA are associated with *A. planus* (MANT.) in the Mt. Chełmowa section. It should be noted that during evolution of representatives of the genus *Anahoplites* the shell size increased, contrary to the representatives of the genus *Callihoplites* SPATH (the co-occurrence of the large forms of these genera seems to be restricted only to the *Auritus* and *Altonense* Subzones). SPATH (1925) distinguished many varieties within the species *A. planus* which display reduced ornamentation on the phragmocone. The completely preserved specimens of the investigated collection indicate that the variability reported by SPATH also commonly concerns the body chambers. It is therefore thought that the varieties described by SPATH should be regarded as separate taxa, at least at the subspecies level. The complete preservation of specimens also allowed recognition of dimorphism in the nominative subspecies (see below). SPATH (1925: 138) noted that *A. planus*, known from the middle Middle Albian to the lower Upper Albian, has an enormous stratigraphic range for an ammonite species. The reduction in ornamentation hampers the recognition of evolutionary trends.

Occurrence. — The genus *Anahoplites* is known from the middle Middle to lower Upper Albian of Europe; it is very commonly reported in an analogous stratigraphic position from Transcaspia in the Soviet Union (Mangyshlak and Kopet-Dag).

Anahoplites splendens (J. Sowerby)

(pl. 7: 8)

1925. *Anahoplites splendens* (Sow.); Spath, 144, figs. 42a, c—d.
A. aff. *splendens* (Sow.); Spath, pl. 12: 10.
pars 1930. *Hoplites dentatus* Sow.; Passendorfer, 653.
1971. *Anahoplites splendens* (Sow.); Owen, 154.
1978. *A. splendens* (Sow.); Kennedy and Hancock, 7.
1983. *Hoplites* (*Anahoplites*) *splendens* (Sow.); Gebhard, 41.

Material. — Two specimens, IGPUW/WR3.149 and 150.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 7: 8	20.4	8.5(0.42)	5.5(0.27)	4.3(0.21)	0.65

Description. — Whorls narrow, with tabulate venter and maximum thickness near the umbilical edge. The umbilicus is shallow with an almost vertical wall. The main ribs begin on the umbilical wall, and the secondary ones start below the mid-whorl. On the inner whorls all ribs are indistinct, then become more pronounced. At a larger diameter, comma-shaped umbilical bullae appear. At these bullae, two ribs start until they end as delicate tubercles at the ventro-lateral margin. Between these dichotomous ribs, intercalatory ribs rarely appear. This type of ribbing is larger and more strongly ornamented (non-illustrated specimen IGPUW/WR3.150).

Remarks. — In its distinctly delicate ornamentation, the larger number of secondary ribs on the inner whorls, the higher and flat-sided whorls, and the tabulate venter, *A. splendens* (Sow.) differs from *H. dentatus* (Sow.). Therefore, two specimens from Passendorfer's collection which he described as *H. dentatus* really represent *A. splendens* (see previous remarks on *H. dentatus dentatus*).

Occurrence. — Condensed, glauconitic limestone (*Floridum* to *Altonense* Subzones) of Wielka Rówień in the High-Tatric Series, southern Poland. The species is known from the middle and upper Middle Albian (*Loricatus* and *Lautus* Zones) of England and France.

Anahoplites planus (Mantell)
Anahoplites planus planus (Mantell)

(pl. 12: 1—2, pl. 13: 1)

1822. *Ammonites planus* Mantell, 90, pl. 21: 3.
1925. *Anahoplites planus* (Mant.); Spath, 137, figs. 39a, ?40a—b, e; pl. 12: 8a and ?9, pl. 13: 9, pl. 18: 7; *non* pl. 12: 8b (= *A. asiaticus* Glasunova 1953: 71).
1953. *A. planus* (Mant.); Glasunova, 75, fig. 37, pl. 21: 1—5.
1971. *A. planus* (Mant.); Owen, 153.
1973. *A. planus* (Mant.); Destombes *et al.*, 86.
1977. *A.* ex gr. *planus* Mant.; Kotetichvili, 63, pl. 27: 4.
1978. *A. planus* (Mant.); Kennedy and Hancock, 7—9.

Material. — Two completely preserved specimens, IGPUW/RM.CH 14 (pl. 12: 1), IGPUW/RM.Ch 30 (pl. 12: 2), and the body chamber of a large form, IGPUW/RM.Ch 31 (pl. 13: 1).
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 12: 1	128.4	54(0.42)	27(0.21)	?30(?0.23)	0.50
pl. 12: 2	149.7	63.5(0.42)	26(0.17)	?40(?0.27)	0.41
pl. 13: 1	186	79(0.42)	32(0.17)	36.6(0.20)	0.40

Description. — Whorls almost flat, with maximum thickness near the middle of the whorl. The inner parts of the phragmocone (cast of whorls in IGPUW/RM.Ch 31 — pl. 13: 1) are ornamented by relatively strong umbilical tubercles, associated with weak ribs. The ventrolateral margins of the phragmocone are sharp and crenulated by fine virguloid tubercles. Crenulation is also pronounced on the body chamber, and it may not fade until near the aperture. Faint umbilical tubercles are confined to the basis of the body chamber, and are associated with extremely delicate ribs which are inclined forward and which quickly vanish upwards (pl. 13: 1). In more poorly preserved specimens, the delicate umbilical tubercles are blurred (pl. 12: 1 and 2). The venter at the basis of the body chamber is flat and bounded by distinct margins. These margins gradually fade towards the aperture, and the venter becomes very slightly arched. The body chamber is almost smooth, bearing only delicate, anteriorly inclined and slightly sigmoidal striae. Just at the aperture, a weak constriction appears parallel to the striae. The aperture is provided with a short ventral lappet (pl. 12: 1).

Remarks. — In the adult Middle Albian representatives of *A. planus planus*, a distinct size differentiation of the shell is observable. In the fully preserved specimens from the western Kopet-Dag smaller forms exist, differing by a size ratio of 1: 1.8 from larger ones (cf. GLASUNOVA 1953, pl. 21: 3 and 4); their inner whorls are ornamented by ribs and tubercles, while the body chamber (forming about half a whorl) has anteriorly vanishing umbilical tubercles, and becomes completely smooth. Small as well as large specimens have identical ontogeny, and this is followed in the adult stages by size dimorphism (hiatus in size ranges) which is here interpreted (cf. MAKOWSKI 1962*a*, *b*) as sexual dimorphism. Because the macroconch of *A. planus planus* has a diameter of 129 mm (cf. GLASUNOVA 1953, pl. 21: 4), the larger specimens of the investigated collection (cf. biometry) are also macroconchs. It is noteworthy that sexual dimorphism is responsible for the variability in ornamentation of the specimens of the same or of comparable diameter, which may be the inner whorls of either a micro- or macroconch. The latter has a greater number of whorls (MAKOWSKI 1962*a*, *b*); thus pronounced ornamentation appears (or is preserved) at greater diameters (cf. also GLASUNOVA 1953, pl. 21).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland (cf. fig. 2 and Table 2). *A. planus planus* has been recorded from the middle Middle to lower Upper Albian of England and France, as well as from Transcaspia and ?Georgia in the Soviet Union.

Anahoplites planus inflatus SPATH

(pl. 14: 1; pl. 15: 1)

1925. *Anahoplites planus* (MANTELL) var. *inflata* SPATH, 137, fig. 39c.
1971. *A. planus inflata* SPATH; OWEN, 153.
1978. *A. planus inflata* SPATH; KENNEDY and HANCOCK, 7.

Material. — Two specimens, almost completely preserved; IGPUW/RM.Ch 28 (pl. 14: 1), RM.Ch 29 (pl. 15: 1).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 14: 1	180.7	74.7(0.41)	45(0.25)	46(0.25)	0.60
	151	67.5(0.45)	42.3(0.28)	33.4(0.22)	0.63
pl. 15: 1	181.5	68.5(0.38)	?40(?0.22)	45.5(0.25)	?0.58

Description. — Whorls with slightly convex sides, and with maximum thickness near the middle of the whorl. The umbilicus is eccentric, with a rounded margin and nearly vertical wall. On the umbilical margin there appear, both along the phragmocone and the body chamber faint, rounded tubercles, approximately 10 per half a whorl. On the phragmocone, these

tubercles yield two or three very delicate, slightly sigmoidal and anteriorly inclined ribs (almost invisible in pl. 15: 1). On the ventrolateral margins these ribs terminate in virguloid tubercles. The venter of the phragmocone and the basis of the body chamber are narrow and flat, bounded by pronounced margins. They become slightly rounded towards the aperture (pl. 14: 1b—c). The body chamber is almost completely smooth, bearing only very delicate striae, and with locally preserved, very delicate crenulation of the ventrolateral edges. Near the aperture, very delicate constrictions appear which outline the striae. These constrictions display a slightly sigmoidal form; they are anteriorly inclined on the whorl sides and elongated to form a rather wide sinus on the venter. The aperture presumably displayed a similar outline, as indicated by the partially preserved ventral lappet in specimen IGPUW/RW. Ch 28 (pl. 14: 1a).

Remarks. — This subspecies differs from the nominative one in its distinctly thicker whorls (Wb:Wh = 0.58—0.63 and 0.40—0.50, respectively), stronger umbilical tubercles on the body chamber, and a more convex venter in the later ontogenetic stages.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *A. planus inflatus* has been recorded from the middle Middle to lower Upper Albian of England.

Anahoplites planus fittoni (d'ARCHIAC)
(pl. 16: 1)

1841. *Ammonites fittoni* d'ARCHIAC; d'ORBIGNY, 225, pl. 64: 1—2.
1925. *Anahoplites planus* (MANT.) var. *gracilis* SPATH, 137, pl. 14: 6.
A. planus (MANT.) forma *fittoni* (d'ARCHIAC); SPATH, 143, figs. 40h—41.
1959*a*. *A.* cf. *fittoni* (d'ARCHIAC); CIEŚLIŃSKI, 50.
1962. *Euhoplites inornatus*; CHLEBOWSKI, 225, fig. 1.
1971. *A. planus gracilis* SPATH; OWEN, 153.
1978. *A. planus gracilis* SPATH; KENNEDY and HANCOCK, 8.

Material. — Phragmocone with a partially preserved body chamber, IGPUW/RM.Ch 37 (pl. 16: 1).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 16: 1	182	78(0.43)	—	42.5(0.23)	—
	147.6	58.6(0.40)	28(0.19)	34(0.23)	0.48

Description. — Whorls flat with maximum thickness just below the middle. Umbilicus with a pronounced margin and steeply sloping wall. On the inner parts of the phragmocone above the umbilical margin, are delicate, sigmoidally arched ribs which fade out and do not reach the ventro-lateral margin (not visible in pl. 16: 1). The venter of phragmocone is flat with distinct crenulated margins. The body chamber has extremely delicate swells (rudimentary tubercles) at the umbilical margin.

The remaining part of the body chamber is devoid of any ornamentation with the exception of locally preserved, delicate striae. The ventro-lateral margins become rounded towards the aperture.

Remarks. — Smooth body chamber, eccentric umbilicus, as well as a narrow, flat ventral side are the features of this subspecies which, in comparison to those described above, displays a maximum reduction in ornamentation. In adult specimens, this feature becomes diagnostic for the subspecies discussed above, contrary to SPATH (1925: 142—143) who regarded this reduction as phenotypic variability within *A. planus*. Similarly reduced ornamentation is also displayed by *A. planus* var. *gracilis*, which is a younger synonym of the subspecies *fittoni* (see synonymy).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa and lower part of the

phosphatic bed (*Lyelli — Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland.

A. planus fittoni has been recorded from the middle Middle to lower Upper Albian of England and France.

Anahoplites planus compressus SPATH
(pl. 16: 2)

1925. *Anahoplites planus* (MANTELL) var. *compressa* SPATH, 137, fig. 39b.
1971. *A. planus compressa* SPATH; OWEN, 153.
1978. *A. planus compressa* SPATH; KENNEDY and HANCOCK, 7—8.

Material. — Part of the phragmocone, with almost complete body chamber, IGPUW RM. Ch 32 (pl. 16: 2), and three fragmentary specimens, IGPUW/RM.Ch 34—36.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 16: 2	138.5	62.5(0.45)	21(0.15)	25(0.18)	0.35

Description. — Whorls narrow and high. At the umbilical margin on the body chamber there are faint, round tubercles (8 per half whorl). At the basis of the body chamber these tubercles yield sparsely distributed, delicate, falcoid ribs, which are most pronounced on the upper half of the whorl side. These ribs quickly vanish towards the aperture (pl. 16: 2a). The venter is narrow and flat, and its margins are distinctly crenulated with fine virguloid tubercles (3—4 times more numerous than the umbilical ones).

Remarks. — Narrow, involute whorls (section coinciding with that given by SPATH 1925, fig. 39b), faint umbilical tubercles along the whole body chamber, and basal ribs on the body chamber are the distinctive features of this subspecies.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *A. planus compressus* has been recorded from the upper Middle and lower Upper Albian of England.

Anahoplites planus sulcatus SPATH
(pl. 22: 2)

1925. *Anahoplites planus* (MANTELL) forma *sulcata* SPATH, 137, fig 39d.
1971. *A. planus sulcata* SPATH; OWEN, 153.
1978. *A. planus sulcata* SPATH; KENNEDY and HANCOCK, 7.

Material. — One specimen with partially preserved body chamber, IGPUW/RM.Ch 39 (pl. 22: 2).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 22: 2	98	40(0.41)	23(0.23)	27(0.27)	0.57

Description. — Whorls slightly concave, with maximum thickness just below the middle of the whorl. Flattened, oblique tubercles occur on the low, rounded umbilical margin. Each umbilical tubercle yields three relatively broad ribs which are most pronounced on the upper half of the whorl (pl. 22: 2a). The median rib is more distinct than the other ones; all are slightly sigmoidal and anteriorly inclined. The ventro-lateral margin is sharp. The ribs terminate in clavi which run parallel to the margin. The venter has a distinct furrow in its middle (distinctly concave — pl. 22: 2b).

Remarks. — The investigated specimen is similar in its whorl section to that in the illustration by SPATH (1925: fig. 39d). Its ornamentation is similar to that of *Anahoplites* aff. *daviesi* SPATH

(1926, pl. 14: 7), which is transitional to the costate form of *A. planus*. A concave ventral side and strong ribbing (also on the body chamber) differentiate it from the other subspecies.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *A. planus sulcatus* has been recorded from the middle Middle to lower Upper Albian of England.

Anahoplites aff. *picteti* SPATH
(pl. 17: 1)

Material. — Two specimens with partially preserved body chambers IGPUW/RM.Ch 33. RM.Ch 38 (pl. 17: 1).

Measurements (in mm):

	D	Wh	U
IGPUW/RM.Ch 38	190	—	—
pl. 17: 1	180	82(0.45)	35(0.19)

Description. — Whorls narrow and high with flat sides which converge toward the venter, Whorl section highly trapezoidal with maximum thickness at the umbilical margin. Umbilicus narrow and deep with steeply inclined wall (= cone-shaped), and with a distinct margin. This margin is provided with faint, obliquely arranged tubercles, approximately 15 per half whorl. The tubercles yield delicate, anteriorly inclined, slightly falcoid ribs which are most pronounced in the middle of the whorl side. These ribs, as well as the umbilical tubercles, fade out towards the aperture (IGPUW/RM.Ch 33) or vanish completely (IGPUW/RM.Ch 38 — pl. 17: 1). Venter flat, very narrow, bounded by distinct margins which bear very delicate virguloid tubercles (not visible in the photograph).

Remarks. — Narrow, cone-shaped umbilicus, trapezoidal whorl section, and a very delicate crenulation of the ventro-lateral margins are features which are very similar to those of the species *A. picteti*. The investigated specimens differ from the typical forms of this species in their weaker ornamentation, since large specimens (190—200 mm in diameter) of *A. picteti* (Brit. Mus. Nat. Hist. — Nos. 70376-1, 70376-2) are evidently ribbed (cf. also SPATH 1926, pl. 13: 13). The investigated specimens are therefore tentatively included. It is noteworthy that the specimen of *A. picteti* (Inst. Geol. Sci. London — No. Zg 862) although the phragmocone is present at a diameter of 150 mm, is most similar to the Polish specimens (the latter have partly preserved body chambers).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. The species *A. picteti* has been recorded from the lower Upper Albian of England (*Orbignyi, Varicosum*, and *Auritus* Subzones), France, Switzerland, and Kopet-Dag in the Soviet Union.

Anahoplites aff. *asiaticus* GLASUNOVA
(pl. 18: 4)

1962. *Euhoplites alphalautus* SPATH; CHLEBOWSKI, 225, fig. 2.
1978. *E. alphalautus* SPATH; CHLEBOWSKI *et al.*, 92.

Material. — One specimen, IGPUW/RM.Ch 13 (pl. 18: 4).

Measurements (in mm):

	D	Wh	U	Tu	R
pl. 18: 4	128	66(0.51)	29.5(0.23)	0.5(7)	ca. 64
	80	39.5(0.49)	21.8(0.27)	0.5(6)	—

Description. — Whorls high with flat sides and maximum thickness just above the umbilical margin. Umbilical tubercles distinct, longitudinally flattened, and inclined anteriorly (situated obliquely to the umbilical margin). Each tubercle yields one falcoid or flexuous rib which thickens

upwards. The intercalatory ribs appear about one third of the way up the whorl. Some of them are weakly connected to the main ribs. The intercalatory ribs also thicken upward and become similar to the main ribs. Ornamentation, except on the umbilical tubercles, weakens on the exterior whorl (= towards the aperture). Venter bounded by distinct margins, and tabulate and flat.

Remarks. — Pronounced tubercles which are arranged obliquely to the umbilical margin, strong ribbing, and the presence of three intercalatory ribs between the falcoid main ribs — all these features are comparable to those of *Anahoplites asiaticus* GLASUNOVA (1953: 71, pl. 19: 1—6). The investigated specimen differs from that species in its stronger ornamentation at greater whorl diameters; it is therefore referred to with doubt. This difference may, however, result from dimorphism (cf. remarks for *A. planus planus* in the present paper). It is also noteworthy that *A. transcaspicus* GLASUNOVA (1953: 72, pl. 20: 1—4), due to its strongly bifurcating ribs and intercalatory ribs, seems to be a closely related species or a synonym of *A. costosus* SPATH (1926, pl. 15: 4). CHLEBOWSKI (1962, fig. 2), confused by the presence of bizarre ornamentation, considered the investigated specimen (pl. 18: 4) as a large form of *Euhoplites alphalautus* SPATH (1928, pl. 26: 1). The investigated specimen differs from this species in its larger, less numerous umbilical tubercles, in its more pronounced, more scarcely distributed ribs, and especially in its flat, smooth ventral side. This latter feature excludes the assignation of the investigated specimen to the genus *Euhoplites*, the venter of which is sculptured by a deep groove above the siphuncle.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. The species *A. asiaticus* has been recorded from the upper part of the Middle Albian (*Hoplites perarmatus* Zone) of Mangyshlak and Kopet-Dag in the Soviet Union (SAVELIEV 1976, 1981). In England it is known from slightly lower in the stratigraphic column (*Intermedius* Subzone, cf. GLASUNOVA and her designation of the holotype). If the described *A.* aff. *asiaticus* really belongs to this species, the stratigraphic range of the species will be greatly extended upward, i.e., to the *Auritus* Subzone of the *Mortoniceras inflatum* Zone (upper part of the lower Upper Albian, cf. Table 1).

Genus *Callihoplites* SPATH, 1925

Type species: Ammonites catillus J. SOWERBY, 1827.

Remarks. — Two groups of specimens within the genus *Callihoplites* from the *Auritus* Subzone are distinguishable. The first group is comprised of specimens attaining a diameter of 150 to 280 mm in the adult stage, displaying faint to delicate ornamentation of the phragmocone, and having reduced ornamentation on the body chamber. Included in this group are the large species *C. catillus* and *C. patella* (= *C. strigosus*), as well as *C. potternensis* and *C. variabilis*. The latter two species usually attain the lowermost dimension of the size range.

The second group is comprised of specimens attaining diameters less than 150 mm (averaging 100—130 mm) with pronounced ornamentation on the phragmocone and less advanced reduction on the body chamber. Included in this group are such species as *C. formosus*, *C. auritus*, and *C. horridus*.

The variability in size and shell ornamentation is at least partially connected with the dimorphism which is recognizable in the species *C. patella*. The sparse material which is currently available makes recognition of this phenomenon in other species of the genus impossible at this point.

Occurrence. — The genus *Callihoplites* is known from the Upper Albian, mostly from the Boreal province of Europe and Central Asia (Iran as well as Mangyshlak and Kopet-Dag in the Soviet Union).

It appears in Europe within the *Hysteroceras varicosum* Subzone, but in central Asia the representatives of the genus *Callihoplites* have been recorded in the *Anahoplites rossicus* Zone, which corresponds approximately to the *Diploceras cristatum* Subzone (cf. SAVELIEV 1981).

Callihoplites catillus (J. SOWERBY)

(pl. 24: 1; fig. 27)

1927. *Callihoplites catillus* (SOW.); SPATH, 190, fig. 56, pl. 19: 4 (with synonymy).
1947. *Pleurohoplites* (*Callihoplites*) *catillus* SOW.; BREISTROFFER, 35.
1978. *C. catillus* (SOW.); KENNEDY and HANCOCK, 9.

Material. — Three fragments, two of which are body chambers: specimens IGPUW/RM. Ch 19 (pl. 24: 1) and IGPUW/RM.Ch 20; specimen IGPUW/RM.Ch 15 (fig. 27) is the body chamber associated with the partially preserved cast of the inner whorl. Over a dozen fragments of whorls (not numbered) are also tentatively attributed to this species.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
fig. 27	219.5	80(0.36)	?55(?0.25)	?70(?0.32)	?0.69
pl. 24: 1	183	74.5(0.41)	45.7(0.25)	43.7(0.24)	0.61
IGPUW/RM.Ch 20	194	75(0.39)	?40(?0.21)	54.3(0.28)	?0.53

Description. — Specimen IGPUW/RM.Ch 15 (fig. 27) bears inner whorls ornamented by distinct umbilical tubercles and very faint falcoid ribs (not visible in the photograph). The body chamber is almost completely smooth. The umbilical margin is relatively distinct and the umbilical wall is vertical. Towards the aperture appear three very delicate swells on the umbilical margin. One of them yields similarly delicate, slightly falcoid ribs which fade out at mid-whorl. This delicate ornamentation is not visible in the photograph but can be seen on the cast.

The body chamber of specimen IGPUW/RM.Ch 19 (pl. 24: 1) consists of over a half whorl; and it is also almost smooth except for the ventro-lateral edges, where sparsely distributed, very fine virguloid tubercles appear in places. These tubercles form an anahoplitid-type crenulation (not visible in the photograph). The aperture is constricted and has a slightly sigmoidal projection on the side of the whorl and a relatively short, wide ventral lappet (pl. 24: 1). In all specimens, the body chamber has slightly convex sides, the maximum whorl thickness occurs just below the mid-whorl, and the venter is slightly arched.

Remarks. — Specimen IGPUW/RM.Ch 19 displays very delicate anahoplitid-type crenulation, a feature which was noted by SPATH (1927: 204) only in large specimen of *C. patella* (ca. 200 mm in diameter). The aperture of the investigated specimen IGPUW/RM.Ch 19 (pl. 24: 1) is identical to that of a specimen labelled *Callihoplites* sp. (Brit. Mus. Nat. Hist. — No. C 29604), which is here thought to be *C. catillus*; it is relatively small (ca. 160 mm). It is noteworthy that the species *C. catillus* supposedly reached much a larger size, as indicated by another *Callihoplites* sp. (Inst. Geol. Sci. London — No. 6277) which attained 275 mm in diameter, with its body chamber about half a whorl not including the aperture; this specimen is determined here as *C.* cf. *catillus*, because its compaction hampers a precise specific recognition.

The intraspecific variability of *C. catillus*, as exemplified by the Polish and English specimens, shows that the end of the phragmocone in the adult forms occurs at a diameter of 110 to 190 mm, and the total diameter ranges from 160 to 280 mm. The body chamber accounts for 60—70% of the whorl. The Polish specimens display whorls which are somewhat thicker than the English ones, which are always compacted (cf. also SPATH 1927: 190—191).

Fig. 27.

Callihoplites catillus (Sow.), IGPUW/RM.Ch 15, × 0.80; cast of the ornamented phragmocone and smooth body chamber, Mt. Chełmowa.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *C. catillus* has been recorded from the *Auritus* Subzone of England, and it seems to occur in a similar stratigraphic position in France and Switzerland.

Callihoplites patella SPATH

(pl. 18: 1—3, pl. 19: 1, pl. 20: 3, pl. 23: 2)

1927. *Callihoplites patella* SPATH, 192, figs. 57 and 58, pl. 20: 5, pl. 21: 4.
C. strigosus SPATH, 194, pl. 18: 3, pl. 19: 1, pl. 20: 4.
C. strigosus var. *cristata* SPATH, 195, fig. 59, pl. 17: 2 (microconch of *C. patella*).
1947. *Pleurohoplites* (*Callihoplites*) *patella* SPATH; BREISTROFFER, 35.
P. (*Callihoplites*) *strigosus* SPATH et var. *cristata* SPATH; BREISTROFFER, 35.
1978. *C. patella* SPATH; CHLEBOWSKI *et al.*, 92.
C. cf. *strigosus* SPATH; CHLEBOWSKI *et al.*, 92.
1978. *C. patella* SPATH; KENNEDY and HANCOCK, 9.
C. strigosus SPATH; KENNEDY and HANCOCK, 9.

Material. — Inner parts of two phragmocones, IGPUW/RM.Ch 1, RM.CH 4 (pl. 18: 2 and 3); one phragmocone with part of what is probably the body chamber, IGPUW/RM.Ch 8 (pl. 18: 1); one completely preserved specimen IGPUW/RM.Ch 2 (pl. 19: 1); three fragments of body chambers, IGPUW/RM.Ch 5 (pl. 20: 3), RM.Ch 6 and RM.Ch 24 (pl. 23: 2); several fragments of the phragmocone and body chambers (not numbered).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	Tu	Tv	R
				macroconchs				
IGPUW/RM.Ch 1	?53	21(?0.40)	—	13.7(?0.26)	—	0.5(5)	0.5(10)	0.5(17)
pl. 19: 1	166	69(0.41)	47(0.28)	45.5(0.27)	0.68	—	—	—
pl. 18: 2	78	34.4(0.44)	23(0.29)	21(0.27)	0.67	15	—	44
pl. 18: 3	?65	26(?0.40)	17.5(?0.27)	17.6(?0.27)	0.67	14	—	—
pl. 18: 1	137.5	50.5(0.37)	?30(?0.22)	?47(?0.34)	?0.59	14	—	45
pl. 23: 2	157	54(0.34)	41(0.26)	41(0.26)	0.76	0.5(6)	—	—
				microconch				
pl. 20: 3	106	41(0.39)	33.5(0.32)	37(0.35)	0.82	—	—	—

Description. — The inner parts of the phragmocone have somewhat convex whorls which are higher than they are wide and are ornamented with distinct, slightly falcoid ribs. A pronounced umbilical tubercle yields 3—4 of these ribs; when four ribs occur, the most external one has such a weak connection with the tubercle that it may be considered as an intercalatory rib. Some ribs join again near the ventro-lateral clavate tubercles to form looped ribs. The ventro-lateral tubercles, although distinct, are markedly smaller than the umbilical ones (cf. pl. 18: 1—3, pl. 19: 1a). The venter is slightly concave, later becoming flat, and sometimes bearing a delicate median line (subtabulate). This type of ornamentation continues until a diameter of approximately 100 mm is reached, than the more external whorls (phragmocone and ? a part of the body chamber) bear both ribs and ventro-lateral tubercles which are less distinct (cf. pl. 18: 1). The body chamber of specimen IGPUW/RM.Ch 2 (pl. 19: 1b) has pronounced umbilical tubercles which yield weak, wide ribs at the basis of the body chamber. These ribs vanish quickly towards the aperture, but the umbilical tubercles continue until the end. The ventro-lateral margins are sculptured by numerous fine tubercles which constitute anahoplitid-type crenulation. The delicate crenulation (not visible in the photo) fades out at the aperture. The sides of the body chamber are somewhat convex, and the venter is slightly convex, later becoming arched. The aperture is partly destroyed but has a ventral lappet. The body chamber of specimen IGPUW/RM.Ch 24 (pl. 23: 2) is thicker, its venter being wider and more convex, and its anahoplitid-type crenulation being discernible only at the basis of the body chamber.

The specimens IGPUW/RM.Ch 5 (pl. 20: 3) and RM.Ch 6, although much smaller at the adult stage, also belong to the species *patella* (see remarks and discussion below). The first of them has somewhat convex whorls whose thickness narrows upwards with the maximum

near the umbilical margin (pl. 20: 3b—c). The umbilicus is relatively wide, with a vertical wall and small tubercles at the margin. These tubercles yield three weak ribs which are most pronounced at the middle of the whorl side and which have a weak connection to the well-developed ventro-lateral clavi (pl. 20: 3a). These clavi alternate on the venter. The venter is originally distinctly concave, later becoming flat towards the aperture (pl. 20: 3b). A preserved suture indicates that the specimen represents the phragmocone and the basis of the body chamber, which is characterized by a rapid increase in whorl thickness — the Wb/Wh ratios measured at both ends being 0.70 and 0.82, respectively (cf. pl. 20: 3b—c). Specimen IGPUW/RW.Ch 6, although only ca. 70 mm in diameter, displays the same ornamentation type as the end of the phragmocone in the former specimen, IGPUW/RM.Ch 5. It is diagenetically deformed but the distinctly higher whorls suggest a similarity to the specimen presented by SPATH (1927, pl. 17: 2).

Remarks. — Within the species *C. patella*, the two groups of morphotypes to be distinguished are:

First Group (*patella — strigosus strigosus*).

This group includes specimens with relatively delicate ornamentation which attain a diameter ranging from 157 to ca. 220—240 mm at the adult stage. The end of the phragmocone occurs at 107—145 mm. Such specimens conform to the definition of *C. patella* and the typical *C. strigosus* of SPATH 1927 (cf. synonymy). The inner whorl of specimen IGPUW/RM.Ch 1 resemble those of *C.* aff. *patella* SPATH (1927, fig. 58). The completely preserved specimen, IGPUW/RM.Ch 2 (pl. 19: 1), corresponds exactly to the more coarsely ribbed, inflated variety of SPATH (1927: 193, No. B.M. 88717f). A still more inflated body chamber distinguishes specimen IGPUW/RM.Ch 24 (pl. 23: 2 — cf. also biometry). The presence of anahoplitid-type crenulation on the body chamber indicates that these specimens are large representatives of the species *patella* (cf. SPATH 1927: 204). Specimens IGPUW/RM.Ch 4 (pl. 18: 2—3) and RM.Ch 8 (pl. 18: 1), due to the delicate ornamentation of their phragmocones, are very close to the forms defined by SPATH (1927, pl. 18: 3, pl. 19: 1) as the typical *C. strigosus* (cf. synonymy). The completely preserved *C.* aff. *strigosus* (Inst. Geol. Sci. London — No. 92157), with a diameter of 181 mm (the end of the phragmocone at 125 mm), does not differ very much from the completely preserved holotype of *C. patella*. Both come from the same outcrop and attain a similar size. *C.* aff. *strigosus* differs from the latter holotype in its more delicate ornamentation, narrower whorls (partly as a result of compaction) and its longer ventral lappet. Such differences should be regarded as possible within the range of intraspecific variability. If the highly similar or almost identical ornamentation of the inner whorls in the specimens regarded as *C. patella* and the typical *C. strigosus* (as already noted by SPATH 1927: 193—195) is taken into account, it becomes evident that the latter forms are synonymous with the earlier described *C. patella*.

Second Group (*strigosus cristatus*)

This group includes specimens with a more pronounced ornamentation, especially on the phragmocone, which have ventro-lateral clavi present in the late adult stages. The adult specimens which attain a diameter of 80—120 mm (the end of the phragmocone occurring at 55 and 81 mm, respectively), conform to the definition of *C. strigosus cristatus*. In the investigated collection this group is represented by specimens IGPUW/RM.Ch 5 (pl. 20: 3) and RM.Ch 6. Also in this group are the nearly completely preserved and the complete specimens of *C. strigosus cristatus* (Brit. Mus. Nat. Hist. — Nos. C29595, C29609, C29623; their diameters being ca. 80, 118, 86.5 mm, respectively), the inner whorls of which are sculptured by umbilical tubercles, distinct ribs, and especially pronounced ventro-lateral clavi tubercles. The body chamber bears weak umbilical tubercles and distinct ventro-lateral clavi which continue to the middle of the body chamber and then fade out almost entirely towards the aperture (cf. also SPATH 1927, pl. 17: 2). The aperture, with its elongated ventral lappet and forward sigmoidal pro-

jection on the side of the whorl, is identical to the aperture developed in the specimens of the preceding group.

Discussion. — The two distinguishable groups of morphotypes in the species *C. patella* display a similar type of ornamentation, the only difference being its distinctiveness at comparable ontogenetic stages. They differ considerably, however, in the size of the shell in the adult stage. Both morphotype groups occur in the same beds, as evidenced by the discussion of specimens from the *Auritus* Subzone of England. The presented data allow the conclusion that the size differences of adult specimens might be interpreted as sexual dimorphism (cf. MAKOWSKI 1962*a*, *b*). Consequently, the first group of morphotypes might be recognized as macroconchs and the second group as microconchs. The species *C. patella* is characterized by macro- and microconchs which feature the same type of aperture (see remarks), a phenomenon which also occurs in some of the Middle Jurassic species, e.g., *Sphaeroceras brongniarti* (SOW.) and *Chondroceras wrighti* BUCKMAN (cf. MAKOWSKI 1962*b*). The available data suggest that within the genus *Callihoplites* the microconchs were devoid of lateral lappets. The adult macroconchs of *C. patella* differ from the large *C. catillus* — presumably also macroconchs — in their more pronounced tubercles, the ribbing of the phragmocone, the presence of more distinct rudimentary ribs at the basis of the body chamber, and in the umbilical tubercles developed in late ontogenetic stages (these tubercles are present along the whole body chamber but fade out gradually towards the aperture).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *C. patella* has been recorded from the *Auritus* and *Altonense* Subzones of England, and from a similar stratigraphic position in France.

Callihoplites potternensis SPATH
(pl. 20: 1—2, pl. 21: 1)

1927. *Callihoplites potternensis* SPATH, 203, fig. 63.
1947. *Pleurohoplites* (*Callihoplites*) *potternensis* SPATH; BREISTROFFER, 35.
1978. *C. potternensis* SPATH; KENNEDY and HANCOCK, 9.

Material. — Two specimens representing the inner parts of the phragmocone, IGPUW/RM. Ch 10 (pl. 20: 2), RM.Ch 18; inner whorls of a large specimen with ventral lappet, IGPUW/RM. Ch 16 (pl. 20: 1); and an almost completely preserved specimen, IGPUW/RM.Ch 9 (pl. 21: 1).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	Tu	Tv	R
pl. 21: 1	116	49(0.42)	?29(?0.25)	31(0.27)	?0.59	0.5(7)	0.5(30)	0.5(20)
pl. 20: 2	95.6	44(0.46)	20(0.21)	27.8(0.29)	0.45	0.5(9)	0.5(22)	—
pl. 20: 1	?155	—	—	—	—	—	—	—

Description. — Whorls narrow, with weakly convex sides. Umbilicus shallow with a vertical wall. Inner whorls of the phragmocone (cf. pl. 20: 1 and 2 and pl. 21: 1) ornamented by thin, densely distributed ribs which are distinctly falcoid. A small umbilical tubercle yields these ribs, usually three in number, which pass into fine clavate tubercles on the ventro-lateral margin and some of which join again near the ventro-lateral tubercles to form looped ribs.

The intercalatory ribs, if present, also terminate at a similar tubercle. As a result, the number of ventro-lateral tubercles is almost four, rather than three times as great as that of umbilical ones. The venter on the more internal part of the phragmocone is narrow and slightly concave, and becomes flat towards the body chamber. In the same direction, the ribbing weakens (cf. pl. 21: 1) or even vanishes completely (pl. 20: 2). The initial part of the body chamber is provided with faint, sparse ribs which fade out towards the aperture, contrary to the more pronounced umbilical tubercles (cf. pl. 21: 1a). Numerous, faint, ventro-lateral tubercles

make up the anahoplitid-type crenulation of the body chamber (pl. 21: 1b); this crenulation disappears almost totally towards the aperture. The venter has a raised median line, i.e., with a slight elevation at its middle.

Remarks. — Specimen IGPUW/RM.Ch 10 (pl. 20: 2), which is entirely a phragmocone (D = 95.6 mm), loses its ornamentation on the outermost whorls, similar to the loss of ornamentation in the holotype (cf. SPATH 1927, fig. 63). The nearly complete specimen, IGPUW/RM.Ch 9 (pl. 21: 1) loses its ribbing at a latter stage on the body chamber, but attains a smaller size (D = 116 mm). The size variability in *C. potternensis* is also evidenced by specimen IGPUW/RM.Ch 16 (pl. 20: 1) which bears a partially preserved ventral lappet and attains a diameter of ca. 155 mm. The delicate ribbing in this specimen is confined to the innermost parts of the phragmocone, and it fades out on the whorl preceding the body chamber. The material is not complete enough to attribute the distinctiveness of shell size to either dimorphism (see remarks and discussion concerning *C. patella*) or to variability within the morphotype. The species *C. potternensis* differs from the most closely related *C. variabilis* in its more delicate ornamentation, finer ventro-lateral tubercles, and narrower whorls. These two species were established on the basis of single phragmocones, and thus it is possible that they are synonymous and represent only the intraspecific variability of one species. Undoubtedly, these species differ from *C. catillus* and *C. patella* in their narrower whorls and more delicate ornamentation in juvenile growth stages as well as in their smaller size in the adult stage.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland. *C. potternensis* has been recorded from the *Auritus* Subzone of England, and from a similar stratigraphic position in France.

Callihoplites auritus (J. SOWERBY)
(pl. 18: 5, pl. 21: 2)

1927. *Callihoplites auritus* (SOW.); SPATH, 197, figs. 60 and 61, pl. 17: 1, pl. 19: 2 (with synonymy).
1947. *Pleurohoplites* (*Callihoplites*) *auritus* SOW.; BREISTROFFER, 35.
1962. *C. auritus* SOW.; CHLEBOWSKI, 226, fig. 3.
1975. *C. auritus* (SOW.); LUPPOV, 10.
1978. *C. auritus* (SOW.); CHLEBOWSKI *et al.*, 92.
1978. *C. auritus* (SOW.); KENNEDY and HANCOCK, 9.

Material. — Inner parts of the phragmocone, IGPUW/RM.Ch 3 (pl. 18: 5), RM.A 57, and a complete specimen, IGPUW/RM.Ch 7 (pl. 21: 2).

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	Tu	Tv	R
pl. 18: 5	?75	27(?0.36)	18(?0.24)	23(?0.30)	0.67	12	—	0.5(23)
pl. 21: 2	123	53(0.43)	34(0.28)	37(0.28)	0.64	16	0.5(11)	—

Description. — The whorls of the phragmocone are strongly ornamented. Twelve pronounced, snout-like umbilical tubercles each yield three slightly falcoid ribs. Two of them often join again to form looped ribs near the ventro-lateral clavi. All of the ribs are most pronounced at the middle of the whorl sides (pl. 18: 5). The venter is distinctly, deeply concave (IGPUW/RM.A 57) but not grooved as in the genus *Euhoplites*. Ventro-lateral clavi alternate, and their number is twice as great as the number of the distinctly smaller umbilical tubercles.

The completely preserved specimen IGPUW/RM.Ch 7 (pl. 21: 2) bears ornamentation on the last whorl which fades out towards the aperture. Near the aperture, the ribs and ventro-lateral clavi disappear, and the umbilical tubercles become smaller and smaller. The venter of the body chamber is initially tabulate and later slightly arched (pl. 21: 2b). The aperture has a relatively wide, short ventral lappet; although its sides are damaged, a slight constriction of its border is visible in places.

Remarks. — Relatively faint ribs on the phragmocone IGPUW/RM.Ch 3 (pl. 18: 5) are similar to the morphotype *C. strigosus cristatus* of SPATH (1927, fig. 59), which is a microconch of *C. patella* (see remarks on this species). However, it differs from that microconch in that the umbilical tubercles are distinctly larger and fewer in number. Specimen IGPUW/RM.Ch 7 (pl. 21: 2) bears ornamentation on the body chamber which is more delicate than the specimen of similar size of *C. auritus*, illustrated by SPATH (1927, fig. 61). It also differs in having a greater number of umbilical tubercles on the last whorl (16 instead of 12). These features resemble those of the discussed specimen assigned to *C.* aff. *auritus* illustrated by SPATH (1927, pl. 17: 1). In the authors' opinion, such differences fall within the variability range of the species *auritus*.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa and lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones) condensed sequence at Annopol-on-Vistula, central Poland. *C. auritus* has been recorded from the *Auritus* Subzone of England and from a similar stratigraphic position in France, Germany, and Transcaspia in the Soviet Union.

Superfamily **Acanthocerataceae** HYATT, 1900
Family **Brancoceratidae** SPATH, 1933
Subfamily **Brancoceratinae** SPATH, 1933
Genus *Brancoceras* STEINMANN, 1881

Type species: Ammonites senequieri d'ORBIGNY, 1841.

In agreement with G. GEBHARD (1979), *Eubrancoceras* BREISTROFFER, 1952 is regarded here as a subgenus of *Brancoceras*. Only *Eubrancoceras* is represented in the Polish material.

Subgenus *B.* (*Eubrancoceras*) BREISTROFFER, 1952

Type species: Brancoceras aegoceratoides STEINMANN, 1881.

As GEBHARD (1979) pointed out, in *Brancoceras s. str.* the inner whorls are distinctly keeled, which is not the case in *Eubrancoceras*. Moreover, *Eubrancoceras* appears stratigraphically earlier than the typical subgenus. It is Lower and lower Middle Albian in age and occurs — outside of Europe — in the Indo-Madagascan Realm and in South America.

B. (*Eubrancoceras*) *versicostatum* (MICHELIN)
(pl. 8: 2)

1838. *Ammonites versicostatus* MICHELIN, 97, pl. 12: 10.
1841. *A. versicostatus* MICH.; d'ORBIGNY, 273, pl. 81: 1—3.
1930. *Parahoplites* sp.; PASSENDORFER, 655, pl. 4; 65.
1931. *Raulniceras* (?) *versicostatum* (MICH.); SPATH, 313.
1979. *B.* (*Eubrancoceras*) *versicostatum* (MICH.); GEBHARD, 94, figs. 59 and 60, pl. 6: 9, pl. 7: 1.

Material. — Two specimens, IGPUW/WR3.152—153.

Remarks. — There are two poorly preserved specimens which were referred to as "*Parahoplites* sp." by PASSENDORFER. However, it is obvious from the illustration that the specimen belongs to the brancoceratids. The fragmentary specimen might have about 11—12 ribs per half whorl. (pl. 8: 2) These ribs are mainly single ribs, with one rib bifurcating on the outer flank. The ribs are sharp and straight on these flanks and the venter where they are uninterrupted and even more pronounced. The whorl section is oval. These are all characteristics of *B.* (*E.*) *versicostatum*, which has been referred to "*Raulniceras*" (= *Tegoceras*) by SPATH (1931) and

others. GEBHARD (1979) was able to demonstrate, however, that the suture line is pseudoceratitic, as is usual in brancoceratids.

In the Polish specimen WR 3.152 the ratio Wh:Wb is equal to 12:11.5.

Occurrence. — The Polish specimens are from the condensed Albian from Wielka Rówień, Tatra Mts. The species is otherwise known only from southern France, where it is restricted to the early Middle Albian (*Eodentatus* and *Lyelli* Subzones) but is also redeposited into younger stratigraphical horizons (cf. GEBHARD 1983).

Genus *Hysteroceras* HYATT, 1900

Type species: Ammonites varicosus J. de C. SOWERBY, 1824.

Hysteroceras is restricted to a late Middle and early Upper Albian age, but cosmopolitan in distribution.

Hysteroceras varicosum (J. de C. SOWERBY)
Hysteroceras varicosum binodosum (STIELER)
(pl. 8: 1)

1922. *Brancoceras binodosum* STIELER, 38, figs. 12—15.
1930. *Parahoplites* sp.; PASSENDORFER, 654, pl. 4: 64.
1934. *Hysteroceras varicosum* var. *binodosa* (STIELER); SPATH, 478, fig. 163.

Material. — One fragment, IGPUW/WR3.151.

Remarks. — The highly fragmentary specimen in pl. 8: 1, was referred to as "*Parahoplites* sp." (of *milletianus* group) by PASSENDORFER. The specimen is, however, identical with "*Brancoceras binodosum*", which was reasonably included in *Hysteroceras varicosum s. l.* by SPATH (1934: 478). Even from the poor illustration, the rectangular whorl section (Wh:Wb = 10:10), the strong marginal tuberculation, and the interruption of the ribs on the siphonal line can be recognized, thereby permitting inclusion in the present subspecies.

Occurrence. — The fragmentary specimen is from the condensed Albian of Wielka Rówień, Tatra Mts.; *H. varicosum binodosum* is a rather rare subspecies from the *Varicosum* Subzone of northern France and southern England.

Hysteroceras orbignyi (SPATH)
(fig. 25c, d)

1968. *Hysteroceras orbignyi* (SPATH); WIEDMANN and DIENI, 137, figs. 84 and 85, pl. 13: 1—3 (with synonymy).
1971. *H. orbignyi* (SPATH); RENZ, 578, figs. 2a—e, 3a; pl. 1: 1, 2, 4, 6—8; pl. 3: 4—6.
1976. *H. orbignyi* (SPATH); MARCINOWSKI and NAIDIN, 103, pl. 12: 1, 3, 4.
1982. *H. orbignyi* (SPATH); RENZ, 48, fig. 34a, pl. 11: 6.

Material. — One specimen, IGPUW/WR.154.

Remarks. — There is one fragmentary specimen in PASSENDORFER'S collection with all the characteristics of this very common species. The only measurements available are Wh:Wb = 8:8.

Occurrence. — Wielka Rówień, Tatra Mts., condensed Albian. Otherwise known from the *Cristatum-Auritus* Subzones from Europe, Africa, Madagascar, and Venezuela.

Hysteroceras carinatum SPATH
(pl. 8: 3)

1930. *Mortoniceras varicosum* SOW.; PASSENDORFER, 658.
1934. *Hysteroceras carinatum* SPATH, 482, figs. 161m, n, 166d; pl. 51: 5, pl. 53: 4, 5, 10, 11.
1982. *H. carinatum* SPATH; RENZ, 49, fig. 34c, pl. 11: 9—11 (with synonymy).

Material. — One specimen, IGPUW/MŁw. 25.

Remarks. — *H. carinatum* can easily be separated from all other hysteroceratids by its rectangular whorl section, generally alternating long or short ribs with umbilical and marginal tubercles, and the presence of a distinct siphonal keel. All these features can be observed in the present specimen (pl. 8: 3), which was referred to as *H. varicosum* by PASSENDORFER.

The ratio Wh:Wb is equal to 8:6.5.

Occurrence. — *H. carinatum* was collected by PASSENDORFER at Mała Łąka, Tatra Mts., in the condensed Albian sequence. It is a rather common species from the *Orbignyi-Auritus* Subzones of Europe, Africa, and Venezuela.

Subfamily **Mojsisovicsiinae** HYATT, 1903
Genus *Dipoloceras* HYATT, 1900

Type species: Ammonites cristatus DELUC in BROGNIART, 1822.

GEBHARD (1983*b*) was able to demonstrate that the type species of the genus *Mojsisovicsia* STEINMANN, i.e., *M. durfeldi* STEINMANN, actually belongs to *Falloticeras* PARONA et BONARELLI, 1897. Consequently, the previous synonym of *Mojsisovicsia*, the genus *Dipoloceroides* BREISTROFFER, 1947, becomes valid again. It is regarded as a subgenus of *Dipoloceras*.

Subgenus *D.* (*Dipoloceras*) HYATT, 1900

The typical subgenus ranges from late Middle to early Upper Albian and is recognized in Europe, Africa and the Americas.

D. (*Dipoloceras*) *cristatum* (DELUC in BROGNIART)
(pl. 8: 4)

1822. *Ammonites cristatus* DELUC in BROGNIART, pl. 0: 9.
1930. *Mortoniceras* (*D.*) *cristatum* DELUC; PASSENDORFER, 656.
1931. *Dipoloceras cristatum* (DELUC MS.) BROGN.; SPATH, 365, figs. 119—121, 122a, e—h; pl. 32: 1—3, pl. 33: 4, pl. 35: 6—8, 10—15 (with synonymy).
1963. *D. cristatum* (DELUC) BROGN.; COLLIGNON, 146, pl. 299: 1291, 1294, 1295.
1979. *D.* (*Dipoloceras*) *cristatum* (DELUC); GEBHARD, 103, figs. 70, 71; pl. 7: 8.

Material. — One specimen, IGPUW/WR2.155.

Remarks. — The reillustrated specimen in pl. 8: 4 was correctly identified by PASSENDORFER. It has a broadly rounded whorl section (Wh:Wb = 9:11), strong, bifurcated ribs with tubercles at the point of bifurcation, and a distinct keel, all characteristics of *D. cristatum*.

Occurrence. — *D.* (*D.*) *cristatum* was found in the condensed Albian of Wielka Rówień, Tatra Mts. It is a cosmopolitan species of the *Cristatum* Subzone at the base of the Upper Albian.

D. (*Dipoloceras*) *bouchardianum* (d'ORBIGNY)
(pl. 8: 5)

1841. *Ammonites bouchardianus* d'ORBIGNY, 300, pl. 88: 6—8.
1931. *Dipoloceras bouchardianum* (d'ORB.); SPATH, 374, figs. 122c, d, 124a—c, pl. 32: 19, pl. 33: 5, pl. 34: 4—7 (with synonymy).
1963. *D. bouchardi* d'ORB.; COLLIGNON, 143, pl. 298: 1286.

Material. — One specimen, IGPUW/WR.156.

Remarks. — *D. bouchardianum* differs from the previous species by more regular, more crowded ribbing, a more oval whorl section (in the present specimen Wh:Wb = 12.5:11.5), and a less pronounced keel. Based on these characteristics, one of the Tatra specimens (pl. 8: 5) is attributed to the present species.

Occurrence. — Wielka Rówień, Tatra Mts., condensed Albian, and *Cristatum* to *Orbignyi* Subzones from Europe and Africa.

Subgenus *D.* (*Dipoloceroides*) BREISTROFFER, 1947

Type species: Ammonites delaruei d'ORBIGNY, 1841.

This is a cosmopolitan Middle Albian group of forms.

D. (*Dipoloceroides*) *delaruei* (d'ORBIGNY)
(pl. 8: 6)

1841. *Ammonites Delaruei* d'ORBIGNY, 296, pl. 87: 6—8.
1897. *Schloenbachia Delaruei* d'ORB.; PARONA and BONARELLI, 88, pl. 2: 9 and 10.
1930. *Mojsisovicsia* sp. aff. *delaruei* (d'ORB.); SPATH, 61, pl. 9: 13 and 16.
1930. *Mortoniceras Delaruei* d'ORB.; PASSENDORFER, 657.
1931. *Dipoloceras delaruei* (d'ORB.); SPATH, 356, fig. 116.
1947. *D.* (*Dipoloceroides*) *delaruei* (d'ORB.); BREISTROFFER, 74.
1979. *D.* (*Mojsisovicsia*) *delaruei* (d'ORB.); GEBHARD, 99, figs. 65, 66; pl. 7: 4 and 5.

Material. — One specimen, IGPUW/WR3.157.
Measurements (in mm):

	D	Wh	Wb	U
pl. 8: 6	21	8(0.38)	10(0.48)	6(0.29)

Remarks. — The only specimen which can be attributed to this subgenus (pl. 8: 6) shows slight differences with the type and hypotypoids. The ribbing consists of slightly curved, single ribs as usual, but the ribbing is denser (about 35 ribs per whorl). Moreover, the section is not hexagonal but rectangular and broader than it is high; nevertheless, the maximum whorl thickness is slightly below the mid-flank due to a very faint swelling of the ribs. The marginal tubercles are very pronounced, and the ribs are strongly projected on the broad, flattened venter before disappearing near the distinct keel. The keel is broken (pl. 8: 6b) and is therefore not visible in the lateral view.

However, all these differences are too unimportant to justify separating the Tatra specimen from *D.* (*D.*) *delaruei*.

Occurrence. — Condensed Albian from Wielka Rówień, Tatra Mts. It is also known from the Middle Albian (*Spathi* to *Subdelaruei* Subzones) of western Europe and India.

Subfamily **Mortoniceratinae** SPATH, 1925
Genus *Mortoniceras* MEEK, 1876
Subgenus *M.* (*Mortoniceras*) MEEK, 1876

Type species: Ammonites vespertinus MORTON, 1834.

Remarks. — According to WRIGHT (1957), the subgenus *Pervinquieria* BÖHM is a synonym of the nominative subgenus *Mortoniceras*, and the present authors accept this statement.

Occurrence. — Upper Albian, world wide.

M. (*Mortoniceras*) *inflatum* (SOWERBY)
(pl. 22: 1, pl. 23: 1, pl. 25: 1)

pars 1921. *Mortoniceras inflatum* SOW.; PASSENDORFER, 244, *non* pl. 9: 4 (= *Mortoniceras* sp.) *non* pl. 9: 5 (= *Prohysteroceras* (*Goodhallites*) *goodhalli* (SOW.)).
pars 1930. *M.* (*Subschloenbachia*) *inflatum* SOW.; PASSENDORFER, 655 (*pars*, see above).
Mortoniceras sp. cf. *rostratum* SOW.; PASSENDORFER, 658.
1932. *M.* (*Pervinquieria*) *inflatum* (SOW.); SPATH, 381, figs. 125, 126c—d, 127—129, 130a—b, 137d; pl. 35: 9, pl. 37: 1, pl. 39: 2, pl. 42: 6, pl. 43: 1, pl. 46: 1—2 (with synonymy).
?1932. *M.* (*P.*) *commune* SPATH, 397, fig. 134, pl. 40: 6.
1932. *M.* (*P.*) *potternense* SPATH, 399, fig. 135, pl. 37: 5, pl. 46: 9 (microconch).
1955. *Pervinquieria inflata* SOW.; ERISTAVI, 137, pl. 6: 1.
1959*a*. *P.* cf. *inflatum* (SOW.); CIEŚLIŃSKI, 54.
1960. *M.* (*Pervinquieria*) *rostratum* (SOW.); CIEŚLIŃSKI, 12, pl. 5: 1 and 2.
?*M.* (*P.*) sp. *A*; CIEŚLIŃSKI, 12, pl. 6: 1.
1961. *Pervinquieria inflata* SOW. var. *gibbosa* SPATH; ILIN, 55, pl. 2: 1, pl. 5: 1—2.
1962. *M.* (*P.*) *inflatum* SOW.; CHLEBOWSKI, 226, fig. 4.
M. (*P.*) *rostratum* SOW.; CHLEBOWSKI, 227, fig. 5.
1969. *M.* (*P.*) *inflatum* (SOW.); HAKENBERG, 105, pl. 3.
1976. *M.* (*Mortoniceras*) *inflatum* (SOW.); MARCINOWSKI and NAIDIN, 105, pl. 3: 1 (with synonymy).
1977. *M.* (*M.*) *inflatum* SOW.; KOTETICHVILLI, 74, pl. 37: 1.
?*M.* (*M.*) ex gr. *inflatum* SOW.; KOTETICHVILI, 75, pl. 39: 4.
1978. *M.* (*M.*) *inflatum* (SOW.); *M.* (*M.*) *inflatum* aff. *aperta* SPATH; *M.* (*M.*) aff. *inflatum* (SOW.); *M.* (*M.*) cf *commune* SPATH.; CHLEBOWSKI *et al.*, 92, pl. 2.
1978. *M.* (*M.*) *inflatum* (SOW.); ?*M.* (*M.*) *commune* SPATH; *M.* (*M.*) *potternense* SPATH; KENNEDY and HANCOCK, 9.

Material. — Over 20 specimens, a few of which are nearly complete; IGPUW/RM.Ch 40 (pl. 25: 1), RM.Ch 41 (pl. 22: 1), RM.Ch 42 (CHLEBOWSKI 1962, fig. 4), RM.Ch 44, 52—53, RM.Ch 54 (CHLEBOWSKI 1962, fig. 5), RM.Ch 56 (pl. 23: 1), RM.Ch 57 and 302/II (CIEŚLIŃSKI 1960, pl. 5: 1 and 2); all of the specimens over 200 mm in diameter possess either a partial or complete body chamber.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	R
pl. 25: 1	366	84(0.23)	?70(?0.19)	187(0.51)	?0.83	—
	190	62(0.33)	?58(?0.30)	82(0.43)	?0.93	40
pl. 22: 1	267	87.5(0.33)	?68(?0.25)	119.4(0.45)	?0.78	30—32
	190.8	67.6(0.35)	53.6(0.28)	82(0.43)	0.83	42—44
IGPUW/RM.Ch 42	80	32(0.40)	—	27(0.34)	—	ca. 38
IGPUW/RM.Ch 53	238.5	68.5(0.28)	60(0.25)	103.5(0.43)	0.87	—
IGPUW/RM.Ch 54	252	?70(?0.28)	—	—	—	0.5(10)
	163.3	57(0.35)	—	68.5(0.42)	—	—
pl. 23: 1	428	116(0.27)	—	213(0.50)	—	0.7(20)

Description. — Whorls somewhat higher than they are wide, polygonal in sections through the ribs, and almost quadrate or rectangular in sections between the ribs. Umbilicus wide, with a vertical wall and a rounded margin. Phragmocone ornamented by more or less regularly

bifurcating ribs, the spliting of which takes place at the umbilical tubercles. These ribs become thicker upwards; about 2/3 of the distance from the umbilicus, they are provided with distinct lateral tubercles and are higher up the flanks with the more pronounced ventro-lateral ones. The latter end abruptly on the venter and do not reach the delicate concavity along the sides of the keel. The bifurcating ribs disappear abruptly by the end of the phragmocone. The body chamber is usually ornamented by simple, massive, slightly prorsiradiate ribs, and sometimes by projected ribs (IGPUW/RM.Ch 54). The lateral and ventro-lateral tubercles on these ribs are clearly discernible, although they weaken towards the aperture; the umbilical tubercles are weaker and usually are seen only as swelling of the ribs (cf. pl. 23: 1, pl. 22: 1b). At the aperture, the ribs become thinner and lean forward. The last rib is the thinnest and is devoid of a lateral tubercle (pl. 23: 1). On the body chamber the keel is distinct, and in large specimens (diameter over 300 mm) it attains a height of 12 mm. Another large specimen (pl. 25: 1) is provided with two rostra, the first of which is rudimentary and appears from the keel about 150 mm before the aperture. This rudimentary rostrum is ca. 40 mm high and 26 mm wide at its base. The proper apertural rostrum arches upward and is over 140 mm long (not wholly preserved) and 35 mm wide at its base. The apertural margin is provided with a distinct swelling. When two rostra are present in a specimen, it indicates a temporary hampering of growth (rudimentary rostrum), followed by the development of the final part of the body chamber.

Remarks. — Formerly described from the Mt. Chełmowa section as *Mortoniceras rostratum* (SOW.) (cf. CIEŚLIŃSKI 1960, CHLEBOWSKI 1962) it really represents the species *inflatum* (see also MARCINOWSKI and NAIDIN 1976: 108). PASSENDORFER'S material from the Tatra Mts. is rather poorly preserved, making determination of some specimens difficult. One specimen (PASSENDORFER 1921, pl. 9: 5) represents *Prohysteroceras* (*Goodhallites*) *goodhalli*, whereas another one (PASSENDORFER 1921, pl. 9: 4) seems to be undeterminable at the specific rank. It should be noted that in the material presented by PASSENDORFER (1921, 1930), there are some specimens which are unquestionably *M.* (*M.*) *inflatum*.

SPATH (1932: 388—389) distinguished several varieties in the species *M. inflatum*, but he stated that in ornamentation the differences vanish in the late ontogenetic stages. In the authors' opinion these varieties lie within the range of intraspecific variability. Another type of variability in *M. inflatum* is displayed by the size of the adult forms, as already stated by SPATH (1932: 384—385); this again allows the distinction of two groups of morphotypes.

First group:

This group is comprised of forms attaining slightly over 100 mm in the adult stage. It includes the "dwarfed example" in SPATH (1932, pl. 42: 6) and specimen No. C77673 (Brit. Mus. Nat. Hist.), the diameter of which is 115 mm at the base of the rostrum. The species *M. pottern*ense var. *evoluta* of SPATH (1932, pl. 46: 9), which attains a diameter of 95 mm in the adult stage, is also a representative of this group, but it is synonymous with *M. inflatum*. This is supported by the diagnosis given by SPATH (1932: 399): "like *M.* (*P.*) *inflatum*, but dwarfed and developing single costation on the body chamber at a small diameter". The body chamber in this group of morphotypes comprises 1/2 to 2/3 of the whorl and is provided with a long rostrum which bends upward.

Second group:

This group is comprised of forms which attain a size of 200 mm to over 500 mm in their adult stage, averaging 280—370 mm in diameter. In these morphotypes the body chamber accounts for up to 3/4 of the whorl; the intercalatory ribs seem to occur much less commonly than in the first group. Except for these small differences, both the phragmocone and the body chamber with its aperture are the same as in the first group. All of the forms illustrated in this paper belong to this large morphotype group which is better known in the literature.

Discussion. — The size-differentiated morphotypes of *M.* (*M.*) *inflatum* sometimes co-occur in the same bed, as evidenced by the specimens Nos. C77673, 88581E, 88581 (Brit. Mus. Nat.

Hist.) from the Upper Greensand of Devizes, Wiltshire which are completely preserved with the base of the apertural rostrum and attain a diameter of 115 mm, 280 mm, and 300 mm, respectively. This case of size differentiation in adult specimens may be attributed to sexual dimorphism (cf. MAKOWSKI 1962*a*, *b*). In consequence, the first group of morphotypes is regarded as the microconchs, and the second group as the macroconchs. In *M. inflatum*, both micro- and macroconchs display the same type of aperture, a phenomenon which also occurs in *C. patella* SPATH (see above).

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa: lower Upper Albian in the section of Mt. Majowa and Małogoszcz: lower part of the phosphatic bed (*Lyelli* to *Altonense* Subzones), condensed sequence at Annopol-on-Vistula, central Poland. In the High-Tatric Series the fragmentary moulds of *M. inflatum* bear traces of erosion, and they occur exclusively in the sandy-glauconitic mudstone of the Mała Łąka profile, i.e., above the stratigraphically condensed glauconitic limestone (PASSENDORFER 1930: 656).

These fossils were derived from the glauconitic limestone and redeposited in the younger deposits (*Blancheti* Subzone, cf. fig. 6). *M.* (*M.*) *inflatum* is a zonal index, and it is widely distributed in the lower Upper Albian of England, France, Germany, Crimea, Georgia, and Transcaspia in the Soviet Union, Morocco, and Angola.

M. (*Mortoniceras*) *pricei* (SPATH)

(pl. 8: 7)

1922. *Subschloenbachia pricei* SPATH, 101.

pars 1930. *Mortoniceras* (*Subschloenbachia*) *inflatum* SOW.; PASSENDORFER, 655.

1971. *Mortoniceras* (*Mortoniceras*) *pricei* (SPATH); RENZ, 595, figs. 5f—g, 7i; pl. 4:2, pl. 8: 2, pl. 9: 2 (with synonymy).

1976. *M.* (*M.*) *pricei* (SPATH); MARCINOWSKI and NAIDIN, 106, pl. 2: 8 and 9 (with synonymy).

1978. *M.* (*M.*) *pricei* (SPATH); CHLEBOWSKI *et al.*, 92.

1982. *M.* (*M.*) *pricei* (SPATH); RENZ, 52, fig. 36b, pl. 13: 2 (with synonymy).

Material. — Poorly preserved fragments of whorls; IGPW/RM.Ch 46, MŁr. 14.

Measurements (in mm):

	Wh	Wb	Wb/Wh
IGPUW/RM.Ch 46	48	31	0.64
pl. 8: 7	34	30.2	0.89

Description. — Specimen No. RM.Ch 46 has a whorl distinctly higher than it is wide, with flat sides and almost rectangular in section. The ribs begin at the umbilical margin with a faint, longitudinally flattened tubercle, and they bifurcate at 1/3 of the distance from the umbilical margin. Intercalatory ribs sometimes appear. All the ribs end with ventro-lateral tubercles which feature thin tips and arch forward on the ventral side. The tubercle tips do not reach the delicate concavities along the sides of the relatively distinct keel. Specimen No. MŁr. 14 (pl. 8: 7) shows a greater whorl thickness and bifurcation of the ribs on the umbilical tubercles, just above the umbilical margin.

Remarks. — Specimen IGPUW/RM.Ch 46 is most comparable to *M.* (*M.*) *pricei* var. *intermedia* SPATH (1932, pl. 38: 5), which is a form transitional to *M.* (*M.*) *kiliani* (LASSWITZ). It differs, however, in its lack of distinct lateral tubercles, in place of which it displays swelling of the ribs.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland; redeposited into sandy-glauconitic mudstone (*Blancheti* Subzone) of the Mała Łąka section, High-Tatric Series, southern Poland. *M.* (*M.*) *pricei* is widely distributed and has been recorded from the lower Upper Albian (*Orbignyi*, *Varicosum*, and *Auritus* Subzones) of England, France, Crimea, Caucasus and Transcaspia in the Soviet Union, Morocco, Algeria, Nigeria, Madagascar, Zululand, and the Venezuelan Andes.

M. (*Mortoniceras*) *kiliani* (LASSWITZ)

1904. *Schloenbachia Kiliani* LASSWITZ, 25, fig. 6, pl. 7: 1.
1932. *Mortoniceras* (*Pervinquieria*) *kiliani* (LASSWITZ); SPATH, 408, fig. 140, pl. 38: 1—2, pl. 42: 1, pl. 47: 1 (with synonymy).
1962. *Mortoniceras* sp.; CHLEBOWSKI, 227, fig. 6.
1978. *M.* (*Mortoniceras*) *kiliani* (LASS.); *M.* (*M.*) sp. close to *M. kiliani* (LASS.); CHLEBOWSKI *et al.*, 92.

Material. — Two weakly preserved phragmocones, IGPUW/RM.Ch 47 (CHLEBOWSKI 1962, fig. 6) and RM.Ch 48.

Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh	R
IGPUW/RM.Ch 47	132.8	46(0.35)	—	46(0.35)	—	0.5(28)
IGPUW/RM.Ch 48	?316	—	—	129.5(0.41)	—	—
	222	74.7(0.34)	69(0.31)	89.5(0.40)	0.92	—

Description. — Whorls almost quadrate in section. The umbilical tubercle yields a single rib which bifurcates at 1/3 of the distance from the umbilical margin. The bifurcating ribs bear lateral tubercles above the mid-whorl and are terminated by the more pronounced ventro-lateral tubercles. Intercalatory ribs sometimes appear. The tubercles are weaker on the inner parts of the phragmocone. The venter is flat with a clearly discernible margin and a relatively distinct keel.

Remarks. — The investigated specimens are comparable to *M.* (*M.*) *pricei*, but they differ in their more pronounced ornamentation, an almost quadrate whorl section, and in their well developed ventrolateral edges.

Occurrence. — Upper Albian (?*Auritus* or *Altonense* Subzone), Mt. Chełmowa, central Poland. *M.* (*M.*) *kiliani* has been recorded from the lower to high Upper Albian (*Altonense* and *Blancheti* Subzones) of England, France, Madagascar, Angola, Nigeria, and Texas.

M. (*Mortoniceras*) *pachys* (SEELEY)

pars 1930. *Mortoniceras* (*Subschloenbachia*) *inflatum* SOW.; PASSENDORFER, 655.
1932. *Mortoniceras* (*Pervinquieria*) *pachys* (SEELEY); SPATH, 405, figs. 130d, 138—139 (with synonymy).

Material. — Five whorl fragments, IGPUW/MŁr. 17—21.

Measurements (in mm):

	Wh	Wb	Wb/Wh
IGPUW/MŁr. 20	22.9	22.7	0.99
IGPUW/MŁr. 21	22.4	23.5	1.05

Description. — Our specimens have an almost square intercostal cross section and alternation of long and short strong ribs. These ribs are slightly sinuous and more pronounced at the ventro-lateral margin, and they do not have a third row of tubercles (upper lateral). The venter is flat with a pronounced keel.

Remarks. — The specimens described above were determined by PASSENDORFER (1930) as *M. inflatum*, but in our opinion they display more features of *M.* (*M.*) *pachys*.

Occurrence. — Sandy-glauconitic mudstone (*Blancheti* Subzone) of the Mała Łąka profile in the High-Tatric Series, southern Poland. These fossils were derived from the glauconitic limestone (*Floridum* to *Altonense* Subzones) and redeposited (cf. fig. 6 and Table 5). *M.* (*M.*) *pachys* has been recorded from the *Altonense* to *Blancheti* Subzones of Europe and probably occurs in a similar stratigraphical position in Zululand, Angola, and Madagascar.

M. (*Mortoniceras*) cf. *gracilis* (HAAS)
(pl. 24: 2)

Material. — One poorly preserved specimen, IGPUW/RM.Ch 49.
Measurements (in mm):

	D	Wh	Wb	U	Wb/Wh
pl. 24: 2	?115	32(?0.28)	?26(?0.23)	53(?0.46)	?0.81
	57.7	16.9(0.29)	13(0.22)	27(0.47)	0.77

Description. — Whorls evolute, provided with massive ribs. The whorl section is oval between the ribs, with its maximum thickness at 1/3 of the distance from the umbilicus. The umbilical wall is low with a rounded margin and sculptured by pronounced tubercles which yield two ribs. The ribs possess rather distinct upper lateral tubercles, and even stronger ventro-lateral ones at their ends. The last preserved whorl (?body chamber) bears intercalatory ribs which are more delicate and lack umbilical tubercles, and whose upper lateral and ventro-lateral tubercles take the form of swellings. On the whorl sides the ribs lean slightly forward; near the venter they incline backward.

Remarks. — The oval highly evolute whorls with a lack of distinct ventro-lateral margins and the specific ornamentation are features similar to those of *M.* (*M.*) *montraynaudensis gracilis* (HAAS 1942, pl. 13: 4). The state of preservation of the specimen hinders its more precise recognition. The specimen bears some resemblance to a large *Hysteroceras* sp. (Brit. Mus. Nat. Hist. — No. C78606) which is from the Upper Greensand (*Auritus* Subzone) near Edington, England.

Occurrence. — Upper Albian (*Auritus* Subzone), Mt. Chełmowa, central Poland.

Genus *Prohysteroceras* SPATH, 1921
Subgenus *P.* (*Goodhallites*) SPATH, 1932

Type species: Ammonites goodhalli J. SOWERBY, 1820.

Occurrence. — Lower Upper Albian, world-wide.

P. (*Goodhallites*) *goodhalli* (J. SOWERBY)
(pl. 8: 8)

1921. *Mortoniceras inflatum* var.; PASSENDORFER, 245, pl. 9: 5.
1930. *Mortoniceras* (*Subschloenbachia*) cf. *Neuparthi* CHOFF.; PASSENDORFER, 657.
1934. *Prohysteroceras* (*Goodhallites*) *goodhalli* (J. SOWERBY); SPATH, 447, figs. 153—155, 158a—b; pl. 49: 3, pl. 50: 1, pl. 51: 2 and 6, pl. 54: 2 and 10, pl. 56: 6—9.
1982. *Prohysteroceras* (*Goodhallites*) *goodhalli* (J. Sow.); RENZ, 51, fig. 35, pl. 12: 7.

Material. — One poorly preserved part of a whorl, IGPUW/MŁw. 26, which belongs to a phragmocone.
Measurements (in mm):

	Wh	Wb
pl. 8: 8	28	?20

Remarks. — High, flat-sided, keeled whorl, and sigmoidal ribs, irregularly bifurcating from small, umbilical tubercles and bearing transverse striae in the ventro-lateral margin area; these characteristics make our specimen similar to the outer whorls of *P.* (*G.*) *goodhalli* var. *shenleyensis* SPATH (1934, pl. 54: 10).

Occurrence. — Stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) of the Mała Łąka profile in the High-Tatric Series, southern Poland. *P.* (*G.*) *goodhalli* has been recorded from the lower Upper Albian of Europe, Angola, Zululand, Madagascar, and Venezuela.

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PLATES

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 1

1. *Phylloceras* (*Hypophylloceras*) *velledae velledae* (MICHELIN), IGPUW/WR2.2, Wielka Rówień, × 1.5.
2. *Phylloceras* (*Hypophylloceras*) *velledae aschiltaense* BRŁISTROFFER, IGPUW/WR2.6, Wielka Rówień, × 1.

3—5. *Phylloceras* (*Hypophylloceras*) *subalpinum subalpinum* (d'ORBIGNY); *3* — IGPUW/MŁw. 4, Mała Łąka, × 1; *4* — IGPUW/BW. 2, Biała Woda, × 1; *5* — IGPUW/WR3.8, Wielka Rówień, × 1.5.

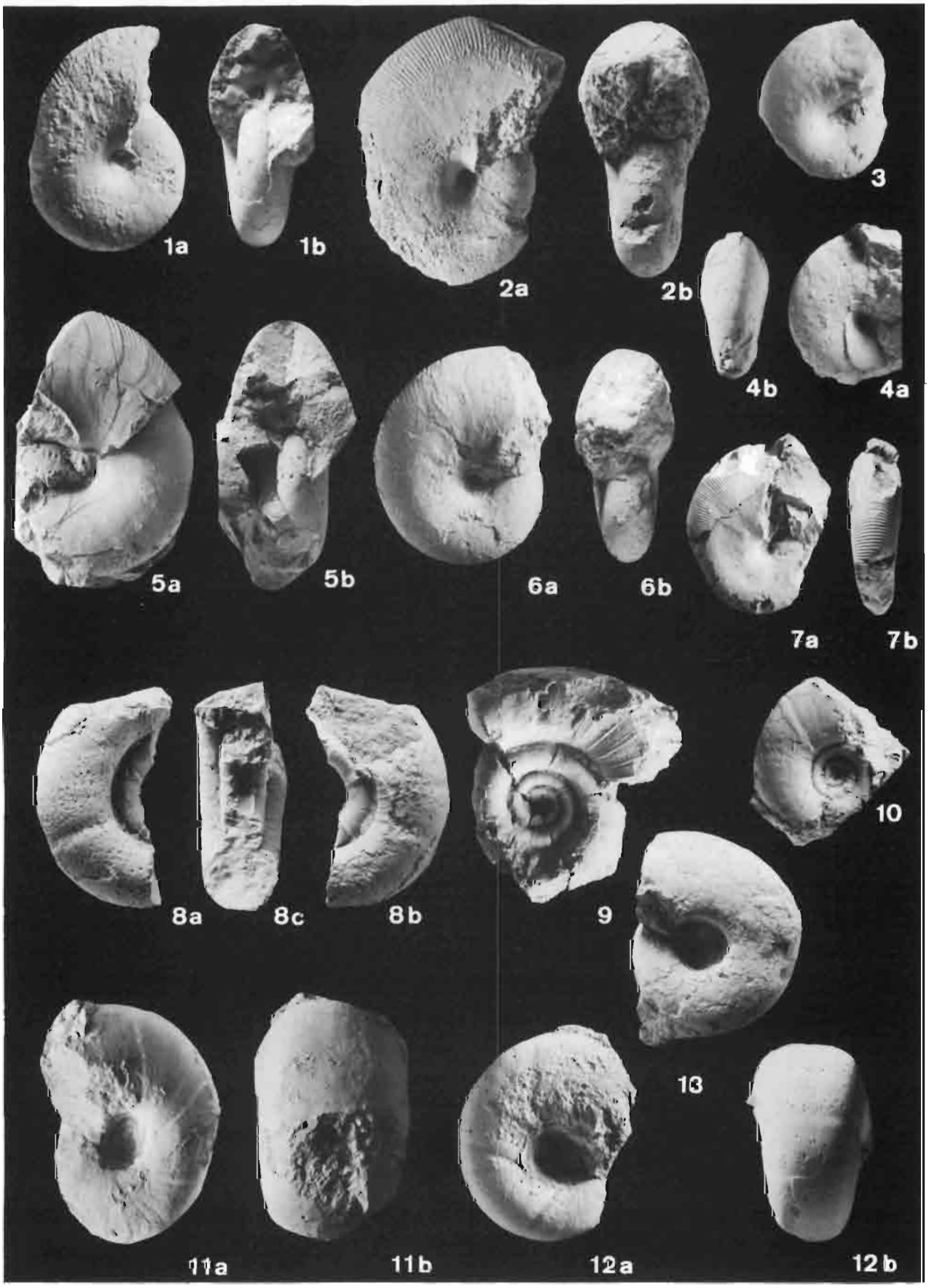
6. *Phylloceras* (*Hypophylloceras*) *moreti* (MAHMOUD), IGPUW/WR. 7, Wielka Rówień, × 1.5.
7. *Phylloceras* (*Hypophylloceras*) *cypris cytherae* WIEDMANN, IGPUW/WR3.17, Wielka Rówień, × 1.

8—9. *Protetragonites aeolus aeolus* (d'ORBIGNY), both from Wielka Rówień; *8* — IGPUW/WR3.27, × 2; *9* — IGPUW/WR3.28, × 1.5.

10. *Eogaudryceras* (*Eogaudryceras*) *vatonnei* (COQUAND), IGPUW/WR3.25, Wielka Rówień, × 1.
11. *Tetragonites rectangularis* WIEDMANN, IGPUW/WR3.20, Wielka Rówień, × 1.5.

12—13. *Tetragonites nautiloides* (PICTET): *12* — IGPUW/WR2.19, Wielka Rówień, × 3; *13* — IGPUW/MŁw. 5, Mała Łąka, × 1.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in the High-Tatric Series, southern Poland.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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 2

1. *Tetragonites jurinianus* (PICTET), IGPUW/BW. 3, Biała Woda, × 1.
2. *Eogaudryceras* (*Eogaudryceras*) *shimizui shimizui* BREISTROFFER, IGPUW/MŁw. 10, Mała Łąka, × 1.
3. *Eogaudryceras* (*Eogaudryceras*) *shimizui gaonai* WIEDMANN, IGPUW/WR3.26, Wielka Rówień, × 1.5.

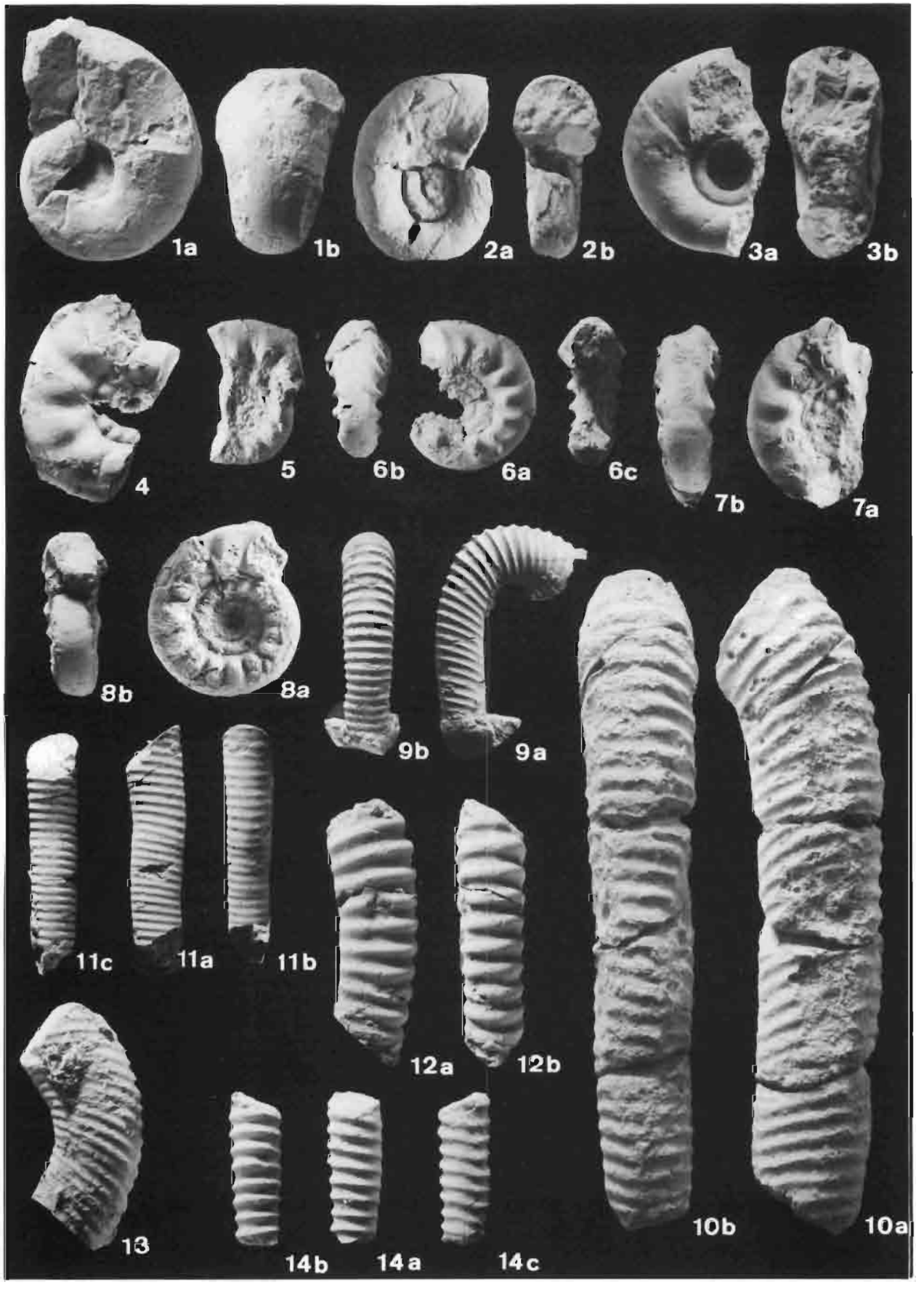
4—5. *Kossmatella* (*Kossmatella*) *oosteri oosteri* BREISTROFFER, both from Wielka Rówień, × 1; *4* — IGPUW/WR2.33; *5* — IGPUW/WR2.34.

6. *Kossmatella* (*Kossmatella*) *oosteri passendorferi* WIEDMANN et DIENI, IGPUW/WR2.32 — holotype, Wielka Rówień, × 1.
7. *Kossmatella* (*Kossmatella*) *romana* WIEDMANN, IGPUW/WR3.35, Wielka Rówień, × 1.
8. *Kossmatella* (*Kossmatella*) *schindewolfi* WIEDMANN et DIENI, IGPUW/WR2.30, Wielka Rówień, × 1.

9—11. *Hamites* (*Hamites*) *attenuatus* SOWERBY; *9* — IGPUW/WR3.36, Wielka Rówień, × 1; *10* — IGPUW/MŁr. 1, Mała Łąka, × 1; *11* — IGPUW/WR3.38, Wielka Rówień, × 2.

12. *Hamites* (*Hamites*) *virgulatus* BROGNIART, IGPUW/WR3.39, Wielka Rówień, × 2.
13. *Hamites* (*Hamites*) *rotundus* SOWERBY, IGPUW/WR3.41, Wielka Rówień, × 1.5.
14. *Hamites* (*Hamites*) *rectus* BROWN, IGPUW/WR2.50, Wielka Rówień, × 1.

For heteromorphs: *a* — lateral, *b* — ventral, and *c* — dorsal views. All specimens are from the stratigrapnically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 10 was redeposited from the glauconitic limestone in the sandy glauconitic mudstone (*Blancheti* Subzone); High-Tatric Series, southern Poland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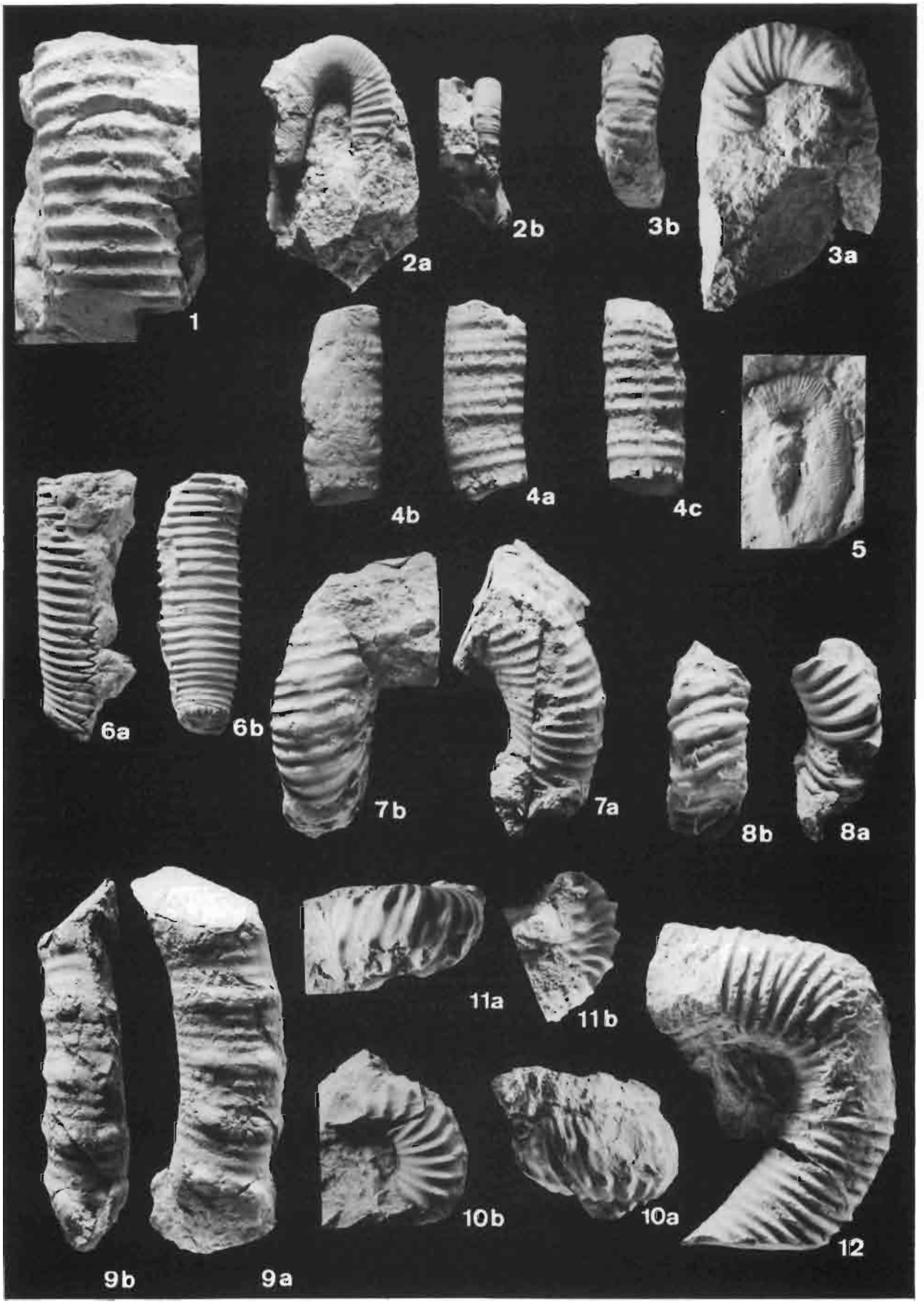
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 3

1. *Hamites* (*Hamites*) *maximus* BROWN, IGPUW/WR3.54, Wielka Rówień, ventral view, × 1.
2—3. *Hamites* (*Metahamites*) *passendorferi* sp. n., both from Wielka Rówień, *a* — lateral, and *b* — ventral view: *2* — IGPUW/WR2.67, holotype, × 1; *3* — IGPUW/WR2.68, × 2.
4. *Hemiptychoceras tatricum* sp. n., IGPUW/MŁw. 11 — holotype, Mała Łąka, *a* — lateral, *b* — ventral, and *c* — dorsal view, × 1.5.
5. *Hamites* (*Plesiohamites*) *multicostatus* BROWN, IGPUW/MDm.1, Mała Dolinka, lateral view, × 1.
6. *Hemiptychoceras subgaultinum* BREISTROFFER, IGPUW/WR2.59, Wielka Rówień, *a* — lateral, and *b* — ventral view, × 1.
7—8. *Anisoceras* (*Prohelicoceras*) *moutonianum* (d'ORBIGNY), both from Wielka Rówień, *a* — lateral, and *b* — ventral view, × 2; *7* — IGPUW/WR3.61; *8* — IGPUW/WR3.62.
9. *Anisoceras* (*Anisoceras*) *saussurcanum* (PICTET), IGPUW/MŁr. 2, Mała Łąka, *a* — lateral, and *b* — ventral view, × 1.
10—11. *Pseudhelicoceras convolutum* (QUENSTEDT), both from Wielka Rówień, *a* — outer face of the whorl, *b* — lower face of the whorl; *10* — IGPUW/WR3.75, × 1; *11* — IGPUW/WR3.74, × 2.
12. *Hamitoides rusticus* SPATH, IGPUW/WR3.70, Wielka Rówień, lateral view, × 1.

All specimens, except for that presented in 5, are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 5 comes from the uncondensed marly mudstone (*Perinflatum* Subzone); High-Tatric Series, southern Poland. The specimen presented in 9 was redeposited from the glauconitic limestone in the sandy glauconitic mudstone (*Blancheti* Subzone).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10a
12

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 4

1. *Pseudhelicoceras elegans* (d'ORBIGNY), IGPUW/BW. 4, Biała Woda; *a* — outer face of the whorl, *b* — lower face of the whorl, *c* — upper face of the whorl, × 2.
2. *Pseudhelicoceras elegans* (d'ORBIGNY), IGPUW/MŁw. 12, Mała Łąka; *a* — outer face of the whorl, *b* — lower face of the whorl, × 1.

3—4. *Turrilitoides* (*Proturrilitoides*) *emericianus* (d'ORBIGNY), both from Wielka Rówień, outer face of the whorls, × 2; *3* — IGPUW/WR2.82; *4* — IGPUW/WR2.81.

5. *Turrilitoides* (*Proturrilitoides*) *astierianus* (d'ORBIGNY), IGPUW/WR2.83, Wielka Rówień, outer face of the whorl, × 2.

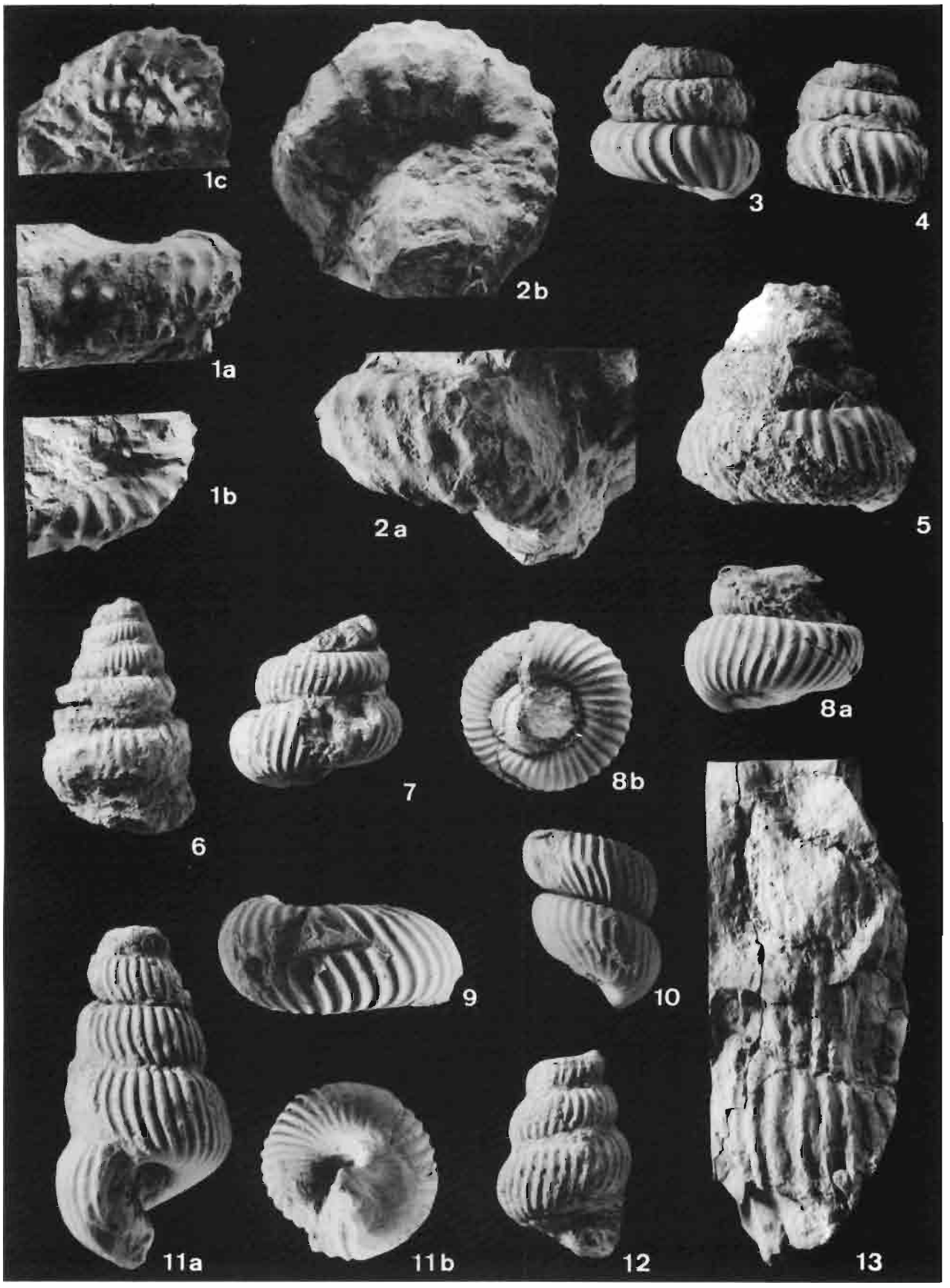
6—8. *Turrilitoides* (*Turrilitoides*) *intermedius* (PICTET et CAMPICHE), all from Wielka Rówień, outer faces of the whorls: *6* — IGPUW/WR2.84, × 1.5; *7* — IGPUW/WR. 85, × 2; *8* — IGPUW/WR2.86, *a* — outer face of the whorl, *b* — lower face of the whorl, × 2.

9—10. *Turrilitoides* (*Turrilitoides*) *hugardianus* (d'ORBIGNY), all from Wielka Rówień, × 2; *9* — IGPUW/WR2.87, outer face of the whorl; *10* — IGPUW/WR2.88, outer faces of the whorls.

11—12. *Turrilitoides* (*Turrilitoides*) *densicostatus* (PASSENDORFER), both from Wielka Rówień, × 2; *11* — IGPUW/WR2.90 — holotype, *a* — outer faces of the whorls, *b* — lower face of the whorl; *12* — IGPUW/WR2.91, outer faces of the whorls.

13. *Ostlingoceras puzosianum* (d'ORBIGNY), IGPUW/MŁm. 1, Mała Łąka, × 1.

All specimens, except for that presented in 13, are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 13 comes from uncondensed marly mudstone (*Perinflatum* Subzone); High-Tatric Series, southern Poland.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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 5

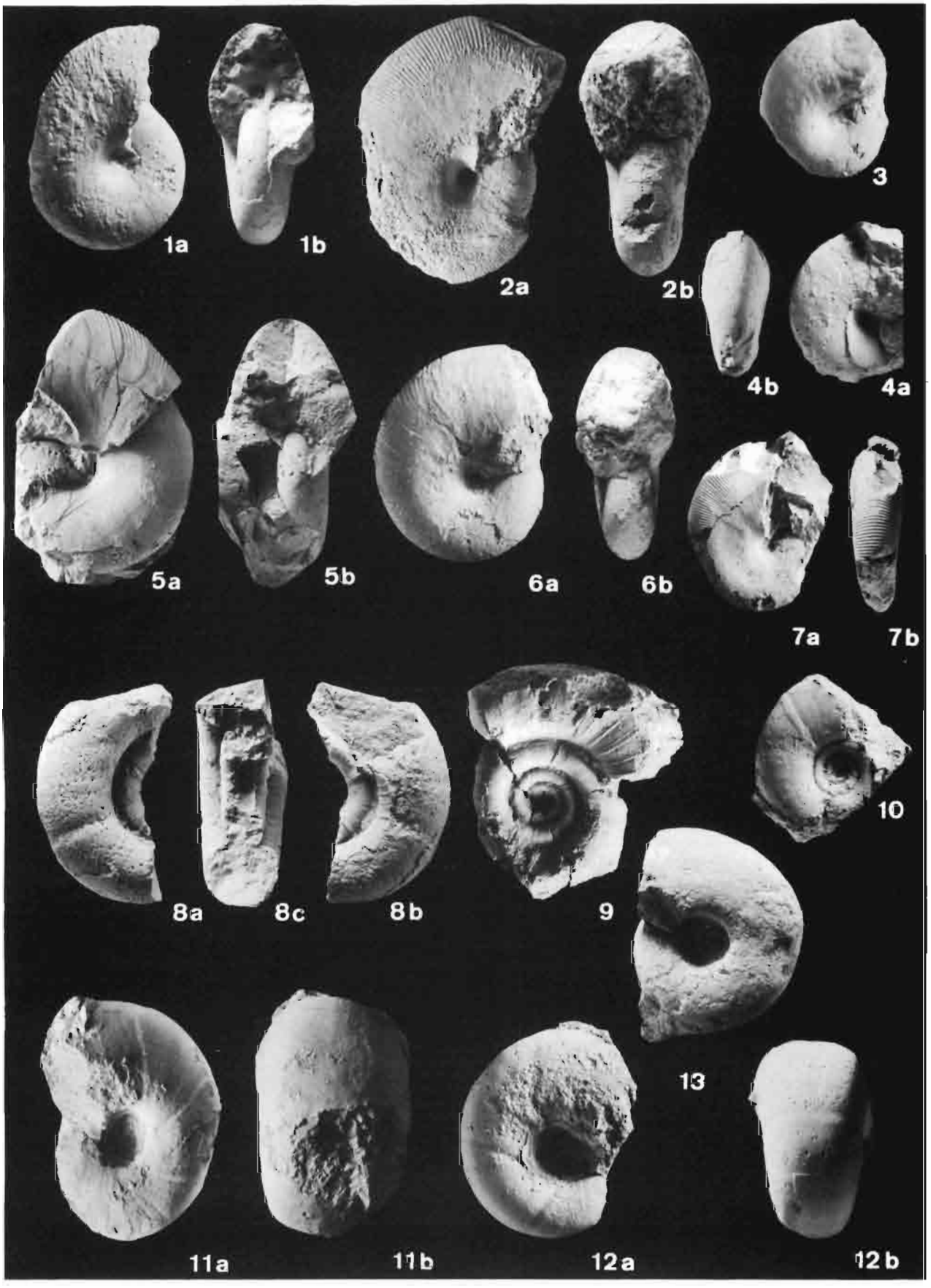
1—4. *Scaphamites passendorferi* WIEDMANN et MARCINOWSKI, all from Wielka Rówień; *a* — lateral, *b* — ventral, and *c* — frontal views; *1* — IGPUW/WR. 96 — holotype, × 2; *2* — IGPUW/WR2.90a, × 2; *3* — IGPUW/WR2.92a, × 2; *4* — IGPUW/WR3.93b, × 4.

5. *Puzosia mayoriana mayoriana* (d'ORBIGNY), IGPUW/MŁw. 13, Mała Łąka, × 0.6.

6. *Puzosia quenstedti communis* SPATH, IGPUW/BW. 6, Biała Woda, × 1.

7. *Puzosia quenstedti quenstedti* (PARONA et BONARELLI), IGPUW/BW. 7, Biała Woda, × 1.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in High-Tatric Series, southern Poland.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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 2

1. *Tetragonites jurinianus* (PICTET), IGPUW/BW. 3, Biała Woda, × 1.
2. *Eogaudryceras* (*Eogaudryceras*) *shimizui shimizui* BREISTROFFER, IGPUW/MŁw. 10, Mała Łąka, × 1.
3. *Eogaudryceras* (*Eogaudryceras*) *shimizui gaonai* WIEDMANN, IGPUW/WR3.26, Wielka Rówień, × 1.5.

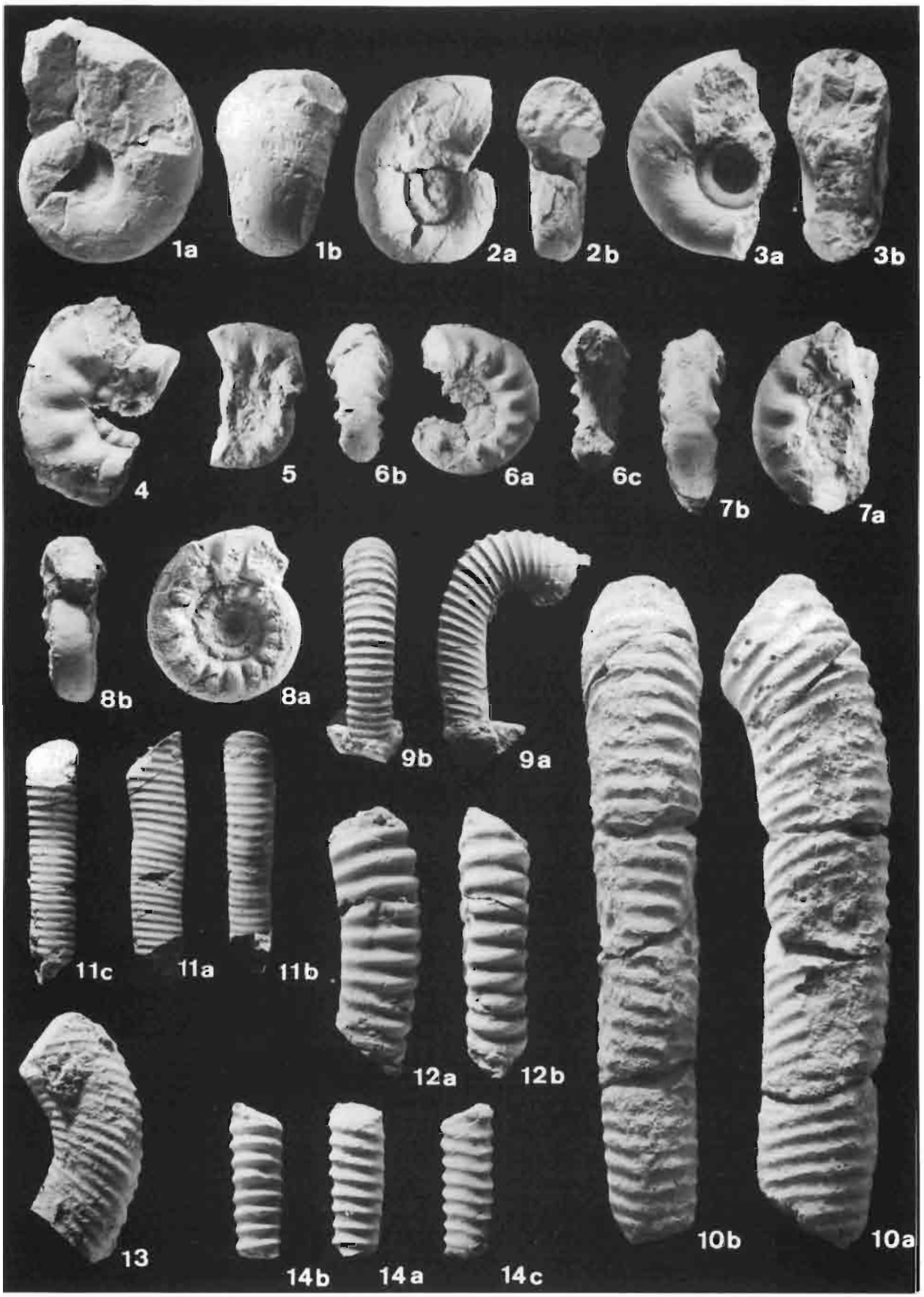
4—5. *Kossmatella* (*Kossmatella*) *oosteri oosteri* BREISTROFFER, both from Wielka Rówień, × 1; *4* — IGPUW/WR2.33; *5* — IGPUW/WR2.34.

6. *Kossmatella* (*Kossmatella*) *oosteri passendorferi* WIEDMANN et DIENI, IGPUW/WR2.32 — holotype, Wielka Rówień, × 1.
7. *Kossmatella* (*Kossmatella*) *romana* WIEDMANN, IGPUW/WR3.35, Wielka Rówień, × 1.
8. *Kossmatella* (*Kossmatella*) *schindewolfi* WIEDMANN et DIENI, IGPUW/WR2.30, Wielka Rówień, × 1.

9—11. *Hamites* (*Hamites*) *attenuatus* SOWERBY; *9* — IGPUW/WR3.36, Wielka Rówień, × 1; *10* — IGPUW/MŁr. 1, Mała Łąka, × 1; *11* — IGPUW/WR3.38, Wielka Rówień, × 2.

12. *Hamites* (*Hamites*) *virgulatus* BROGNIART, IGPUW/WR3.39, Wielka Rówień, × 2.
13. *Hamites* (*Hamites*) *rotundus* SOWERBY, IGPUW/WR3.41, Wielka Rówień, × 1.5.
14. *Hamites* (*Hamites*) *rectus* BROWN, IGPUW/WR2.50, Wielka Rówień, × 1.

For heteromorphs: *a* — lateral, *b* — ventral, and *c* — dorsal views. All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 10 was redeposited from the glauconitic limestone in the sandy glauconitic mudstone (*Blancheti* Subzone); High-Tatric Series, southern Poland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14c

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 3

1. *Hamites* (*Hamites*) *maximus* BROWN, IGPUW/WR3.54, Wielka Rówień, ventral view, × 1.
2—3. *Hamites* (*Metahamites*) *passendorferi* sp. n., both from Wielka Rówień, *a* — lateral, and *b* — ventral view: *2* — IGPUW/WR2.67, holotype, × 1; *3* — IGPUW/WR2.68, × 2.
4. *Hemiptychoceras tatricum* sp. n., IGPUW/MŁw. 11 — holotype, Mała Łąka, *a* — lateral, *b* — ventral, and *c* — dorsal view, × 1.5.
5. *Hamites* (*Plesiohamites*) *multicostatus* BROWN, IGPUW/MDm.1, Mała Dolinka, lateral view, × 1.
6. *Hemiptychoceras subgaultinum* BREISTROFFER, IGPUW/WR2.59, Wielka Rówień, *a* — lateral, and *b* — ventral view, × 1.
7—8. *Anisoceras* (*Prohelicoceras*) *moutonianum* (d'ORBIGNY), both from Wielka Rówień, *a* — lateral, and *b* — ventral view, × 2; *7* — IGPUW/WR3.61; *8* — IGPUW/WR3.62.
9. *Anisoceras* (*Anisoceras*) *saussurcanum* (PICTET), IGPUW/MŁr. 2, Mała Łąka, *a* — lateral, and *b* — ventral view, × 1.
10—11. *Pseudhelicoceras convolutum* (QUENSTEDT), both from Wielka Rówień, *a* — outer face of the whorl, *b* — lower face of the whorl; *10* — IGPUW/WR3.75, × 1; *11* — IGPUW/WR3.74, × 2.
12. *Hamitoides rusticus* SPATH, IGPUW/WR3.70, Wielka Rówień, lateral view, × 1.

All specimens, except for that presented in 5, are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 5 comes from the uncondensed marly mudstone (*Perinflatum* Subzone); High-Tatric Series, southern Poland. The specimen presented in 9 was redeposited from the glauconitic limestone in the sandy glauconitic mudstone (*Blancheti* Subzone).

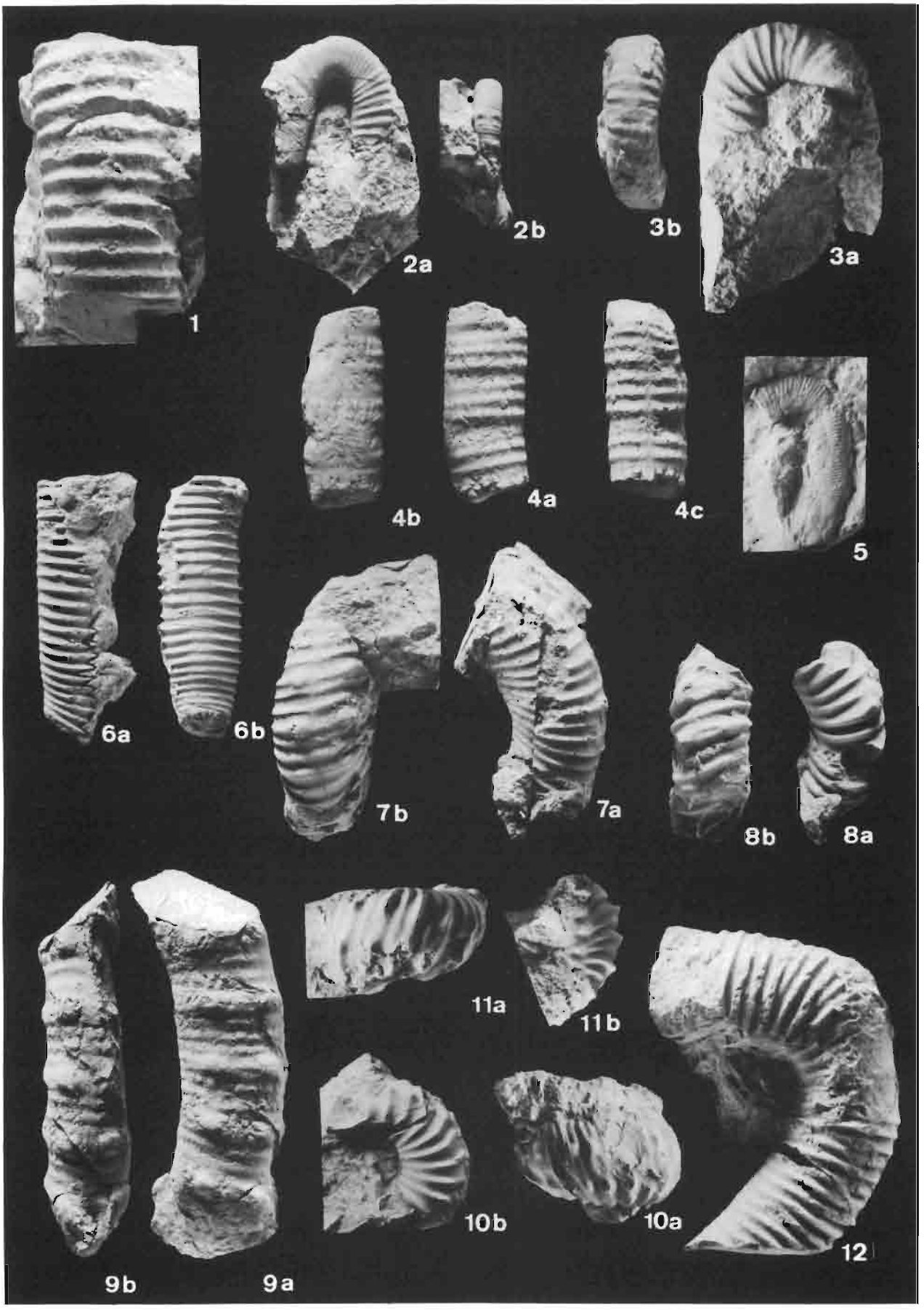

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PLATE 4

1. *Pseudhelicoceras elegans* (d'ORBIGNY), IGPUW/BW. 4, Biała Woda; *a* — outer face of the whorl, *b* — lower face of the whorl, *c* — upper face of the whorl, × 2.
2. *Pseudhelicoceras elegans* (d'ORBIGNY), IGPUW/MŁw. 12, Mała Łąka; *a* — outer face of the whorl, *b* — lower face of the whorl, × 1.

3—4. *Turrilitoides* (*Proturrilitoides*) *emericianus* (d'ORBIGNY), both from Wielka Rówień, outer face of the whorls, × 2; *3* — IGPUW/WR2.82; *4* — IGPUW/WR2.81.

5. *Turrilitoides* (*Proturrilitoides*) *astierianus* (d'ORBIGNY), IGPUW/WR2.83, Wielka Rówień, outer face of the whorl, × 2.

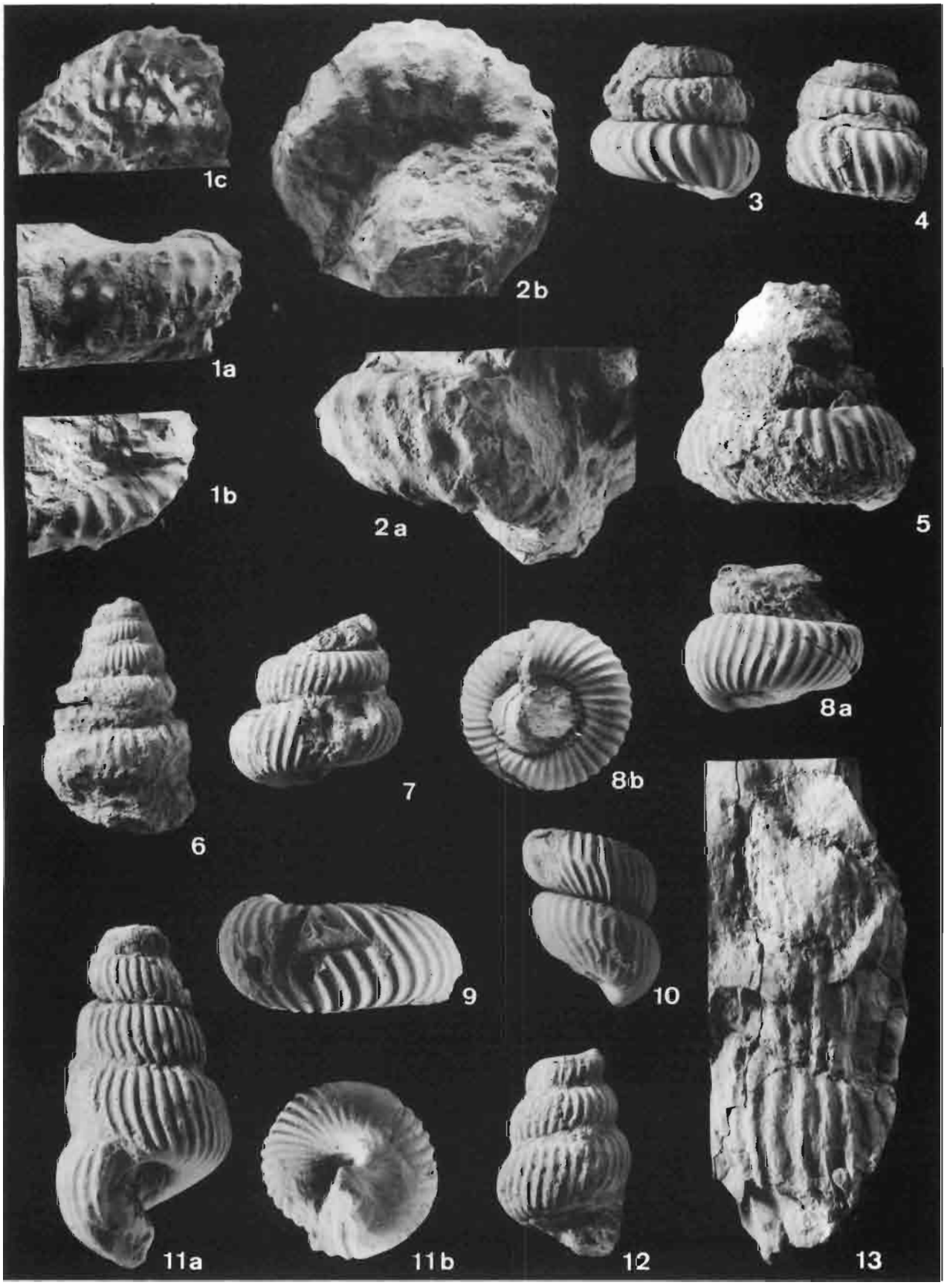
6—8. *Turrilitoides* (*Turrilitoides*) *intermedius* (PICTET et CAMPICHE), all from Wielka Rówień, outer faces of the whorls: *6* — IGPUW/WR2.84, × 1.5; *7* — IGPUW/WR. 85, × 2; *8* — IGPUW/WR2.86, *a* — outer face of the whorl, *b* — lower face of the whorl, × 2.

9—10. *Turrilitoides* (*Turrilitoides*) *hugardianus* (d'ORBIGNY), all from Wielka Rówień, × 2; *9* — IGPUW/WR2.87, outer face of the whorl; *10* — IGPUW/WR2.88, outer faces of the whorls.

11—12. *Turrilitoides* (*Turrilitoides*) *densicostatus* (PASSENDORFER), both from Wielka Rówień, × 2; *11* — IGPUW/WR2.90 — holotype, *a* — outer faces of the whorls, *b* — lower face of the whorl; *12* — IGPUW/WR2.91, outer faces of the whorls.

13. *Ostlingoceras puzosianum* (d'ORBIGNY), IGPUW/MŁm. 1, Mała Łąka, × 1.

All specimens, except for that presented in 13, are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones); the specimen presented in 13 comes from uncondensed marly mudstone (*Perinflatum* Subzone); High-Tatric Series, southern Poland.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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 5

1—4. *Scaphamites passendorferi* WIEDMANN et MARCINOWSKI, all from Wielka Rówień; *a* — lateral, *b* — ventral, and *c* — frontal views; *1* — IGPUW/WR. 96 — holotype, × 2; *2* — IGPUW/WR2.90a, × 2; *3* — IGPUW/WR2.92a, × 2; *4* — IGPUW/WR3.93b, × 4.

5. *Puzosia mayoriana mayoriana* (d'ORBIGNY), IGPUW/MŁw. 13, Mała Łąka, × 0.6.

6. *Puzosia quenstedti communis* SPATH, IGPUW/BW. 6, Biała Woda, × 1.

7. *Puzosia quenstedti quenstedti* (PARONA et BONARELLI), IGPUW/BW. 7, Biała Woda, × 1.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in High-Tatric Series, southern Poland.

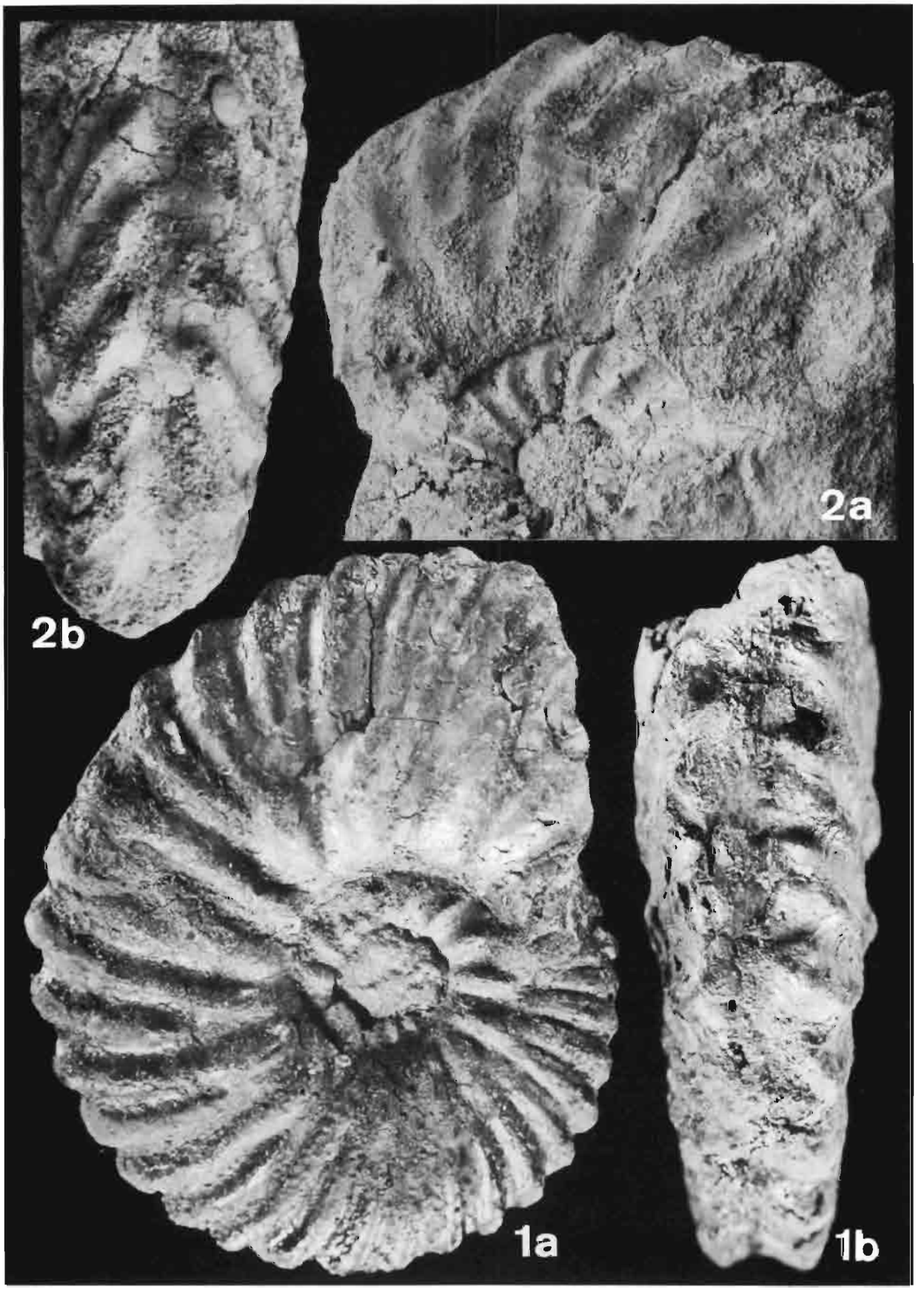
2a
2b
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PLATE 10

1. *Hoplites* (*Hoplites*) *dentatus robustus* SPATH, IGPUW/RM.A 50.
2. *Hoplites* (*Hoplites*) *vectensis* SPATH, IGPUW/RM.A 52.

Both specimens are from the lower part of the phosphatic bed, MiddleAlbian, Annopol-on-Vistula, central Poland, × 0.95.

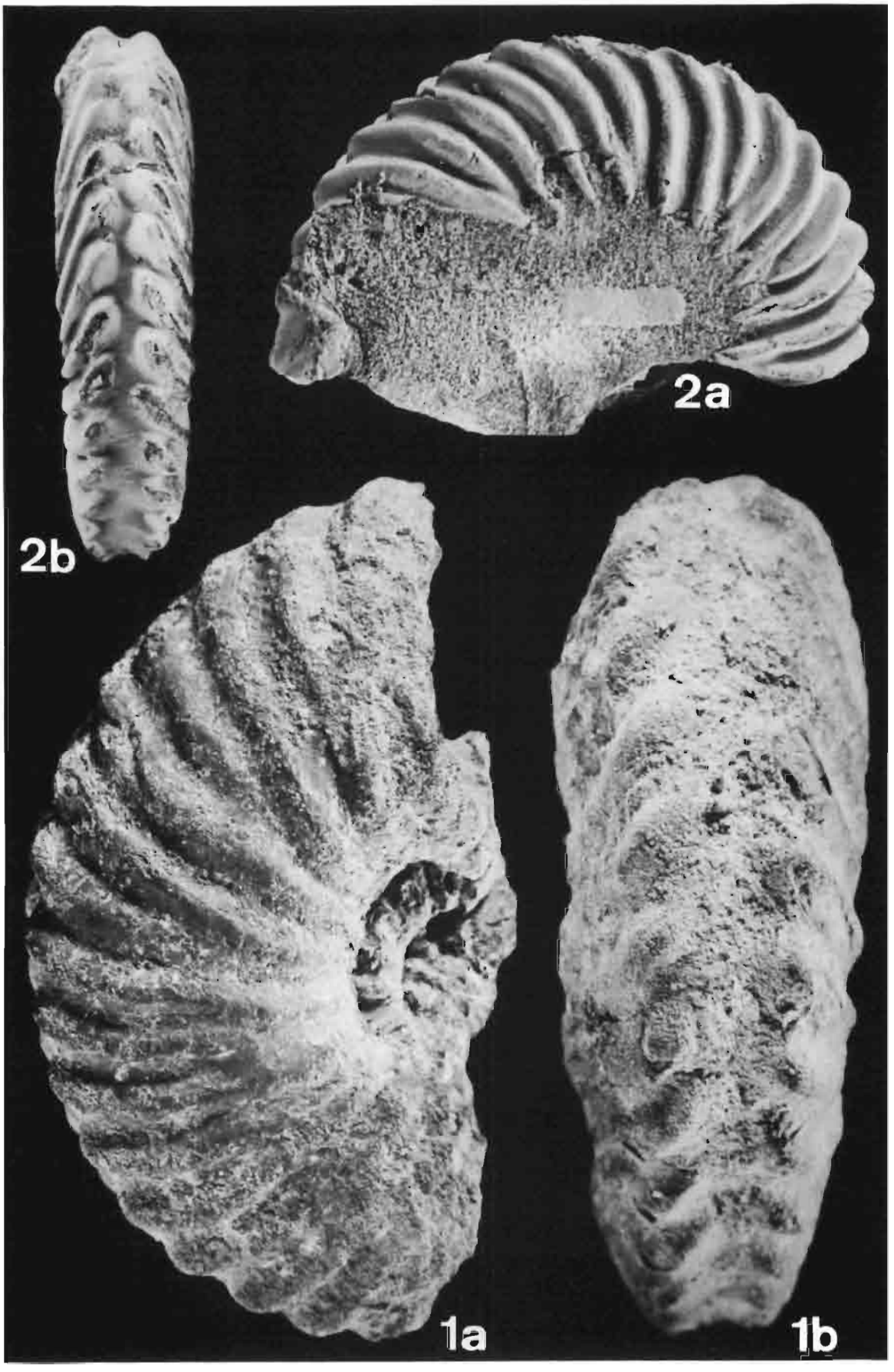
2a
2b
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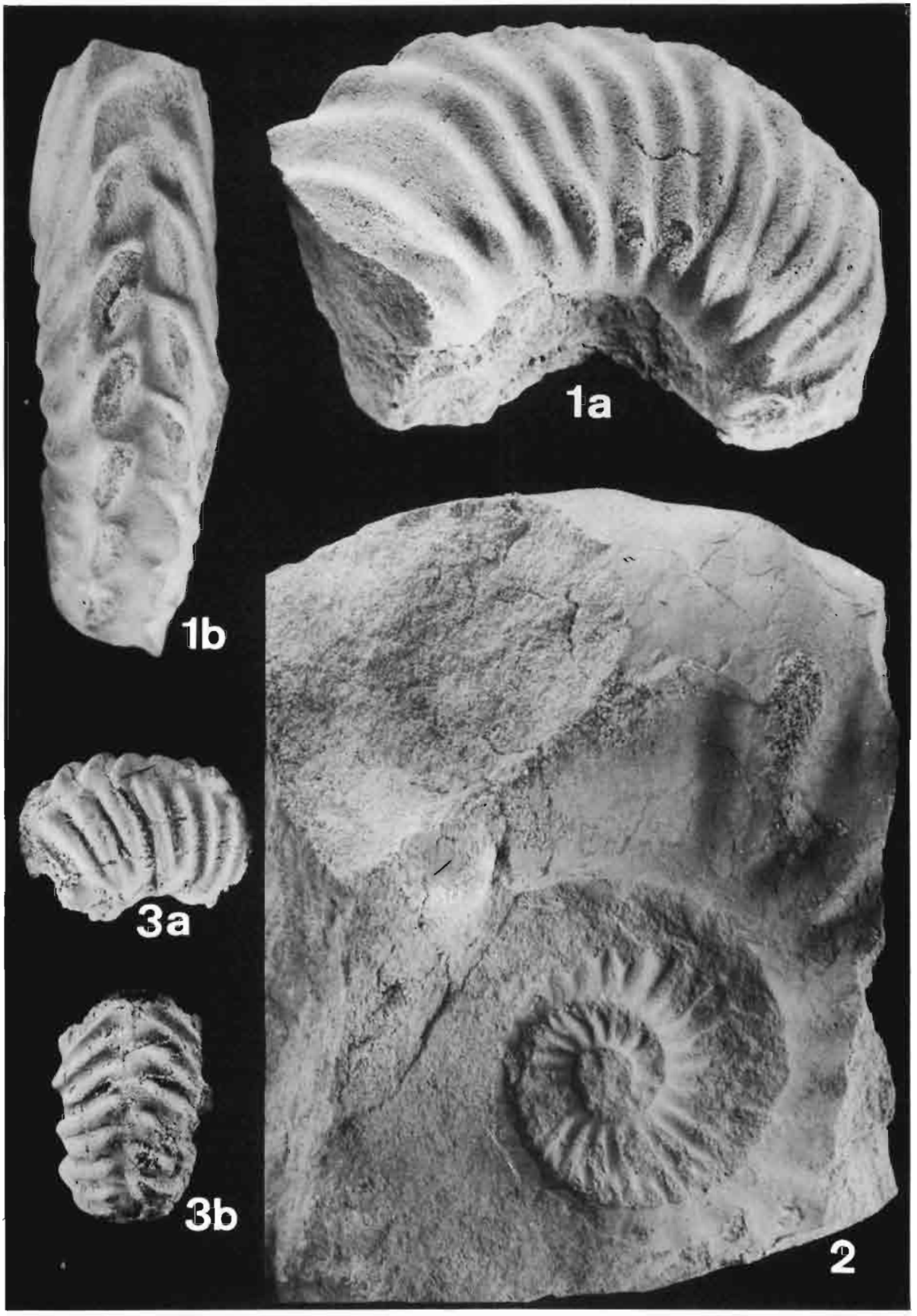
PLATE 11

1. *Hoplites* (*Otohoplites*) *normanniae* DESTOMBES *et al.*, IGPUW/RM.A 54, quartzitic sandstone, *Eodentatus* Subzone, × 0.9.
2. *Hoplites* (*Otohoplites*) *normanniae* DESTOMBES *et al.*, IGPUW/RM.A 55 (specimen with partly preserved body chamber), quartzitic sandstone, *Eodentatus* Subzone, × 0.9.
3. *Hoplites* (*Hoplites*) *baylei* SPATH, IGPUW/RM.A 56, lower part of the phosphatic bed, Middle Albian, × 1.70.

All specimens are from Annopol-on-Vistula, central Poland.


1a
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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 12

1. *Anahoplites planus planus* (MANTELL), IGPUW/RM.Ch 14 (macroconch).
2. *Anahoplites planus planus* (MANTELL), IGPUW/RM.Ch 30 (macroconch).

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9; arrow indicates the beginning of the body chamber.

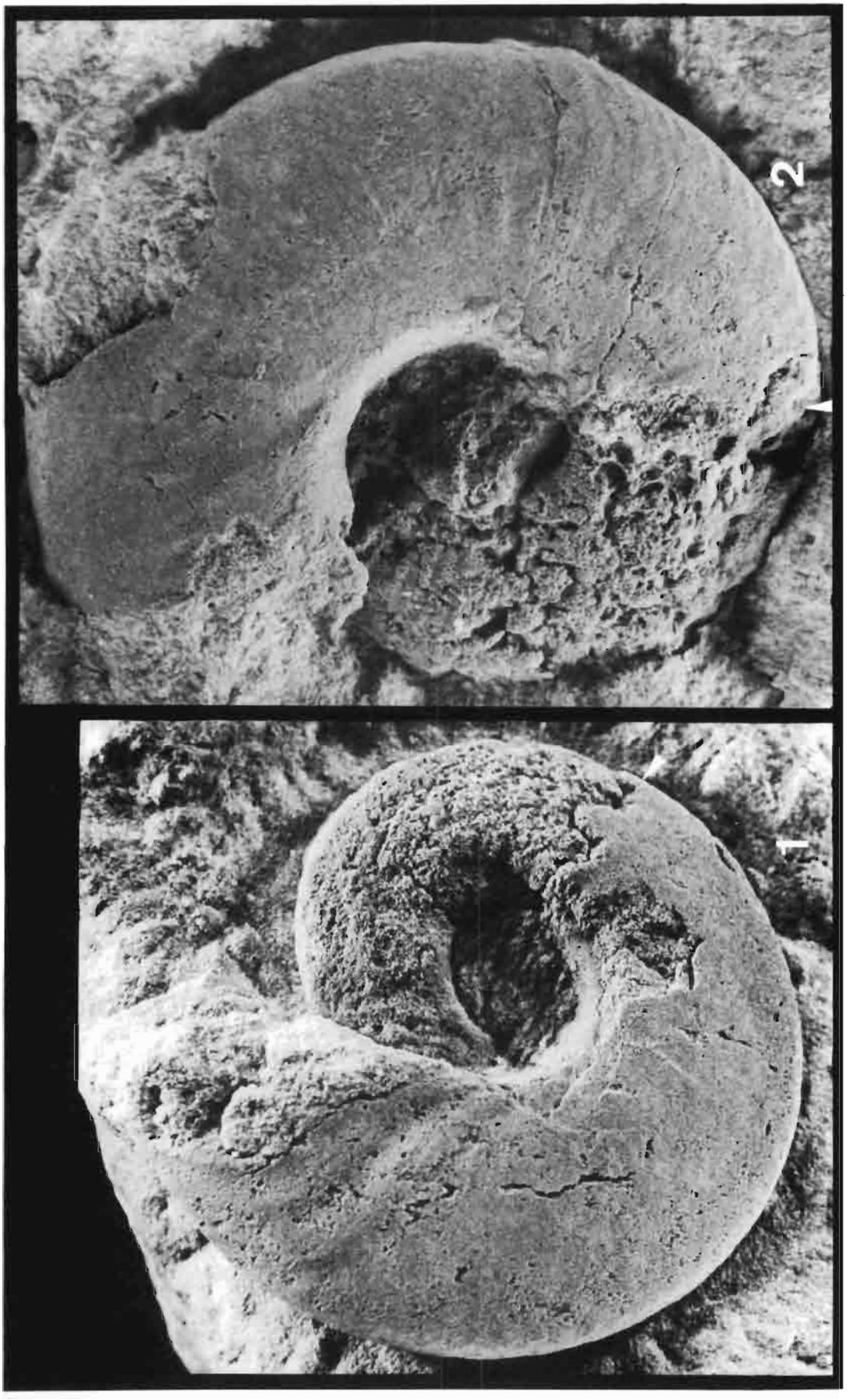

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PLATE 13

1. *Anahoplites planus planus* (MANTELL), IGPUW/RM.Ch 31 (macroconch), *Auritus* Subzone, Mt. Chełmowa, central Poland, × 1; arrow indicates the beginning of the body chamber.

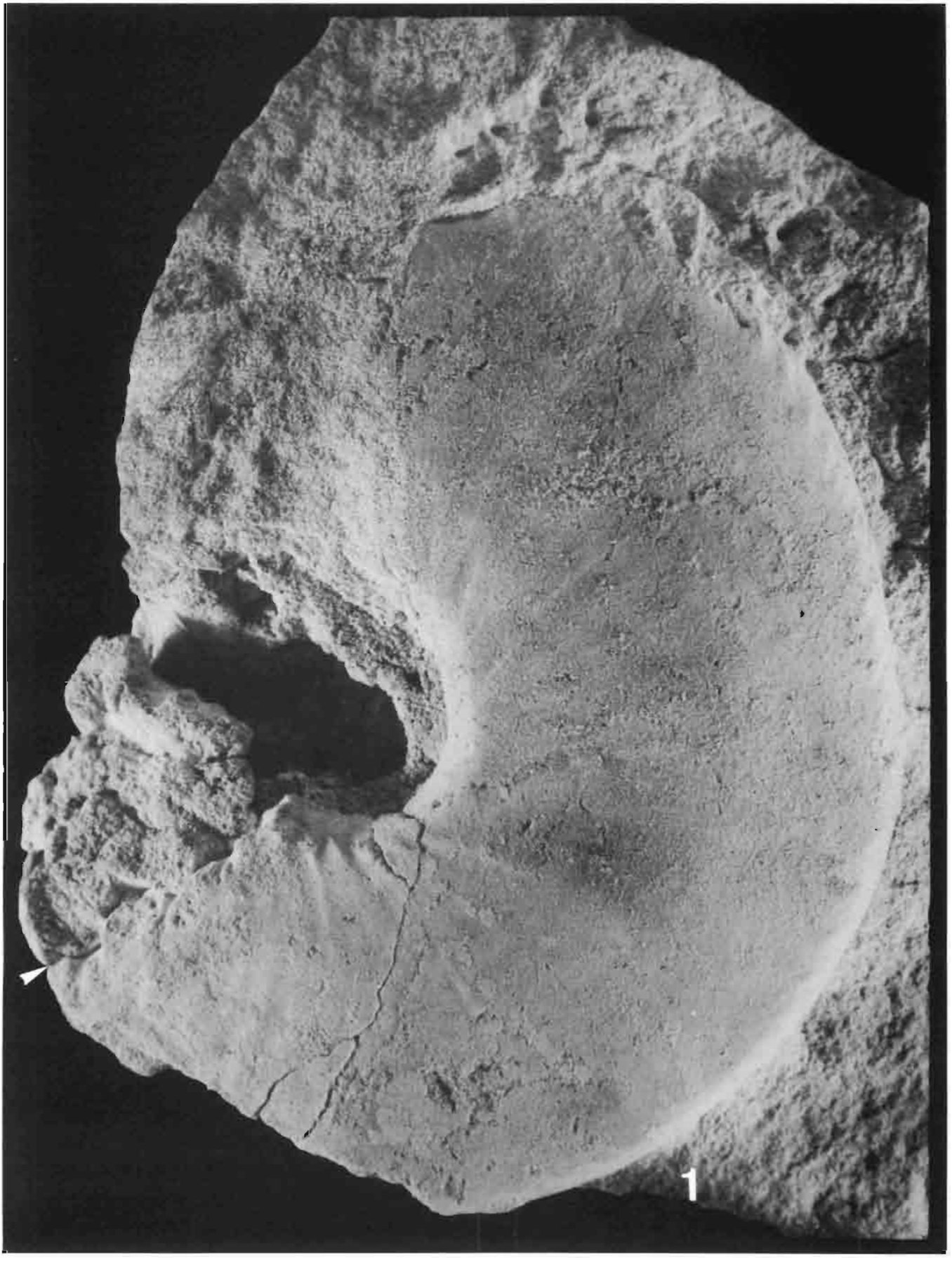

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PLATE 14

1. *Anahoplites planus inflatus* SPATH, IGPUW/RM.Ch 28, *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9, arrow indicates the beginning of the body chamber.

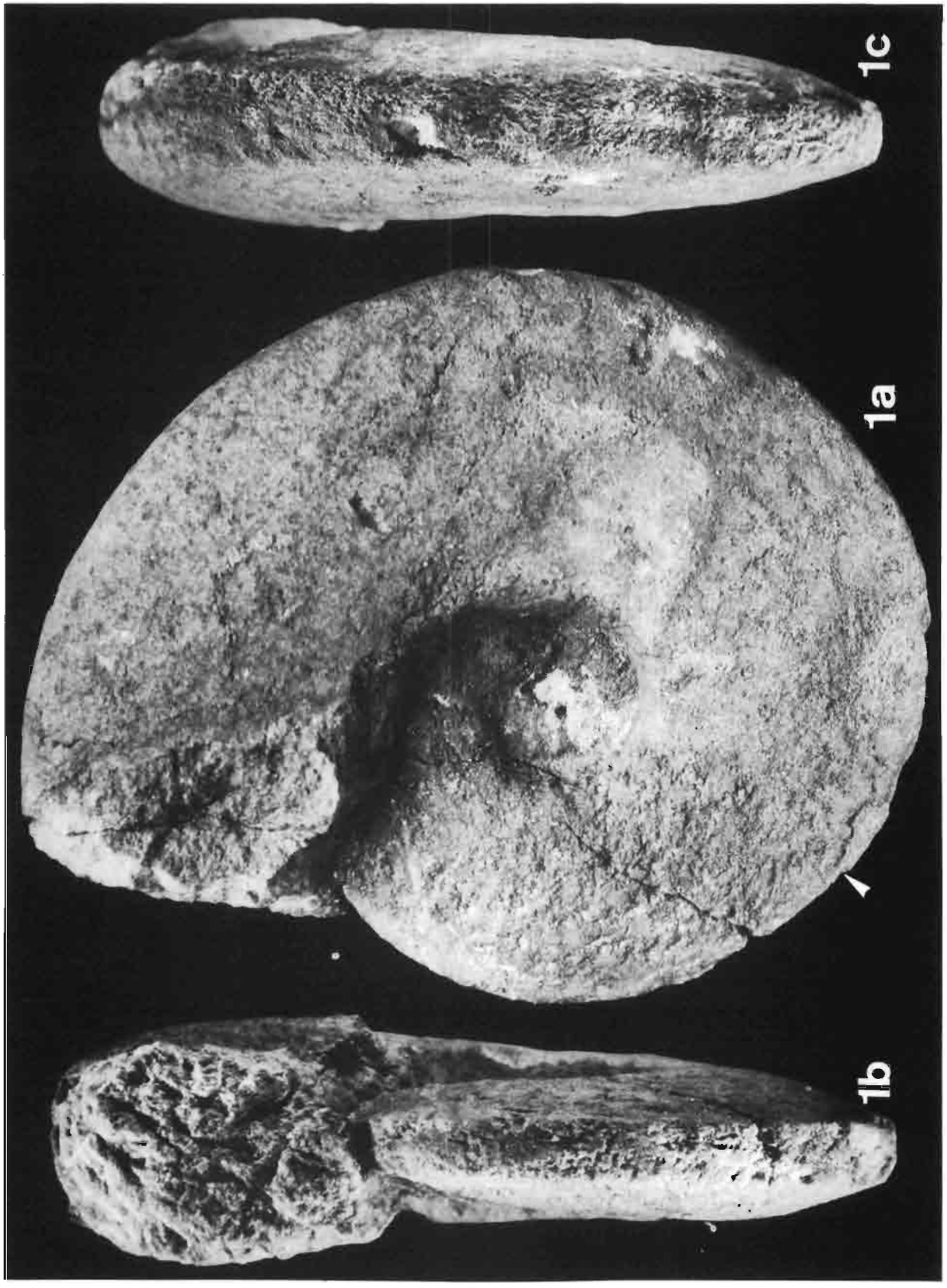
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PLATE 15

1. *Anahoplites planus inflatus* SPATH, IGPUW/RM.Ch 29; arrow indicates the beginning of the body chamber.
2. *Hamites* (*Plesiohamites*) aff. *multicostatus* BROWN, IGPUW/RM.Ch 50 (lateral view of the body chamber).
Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9.

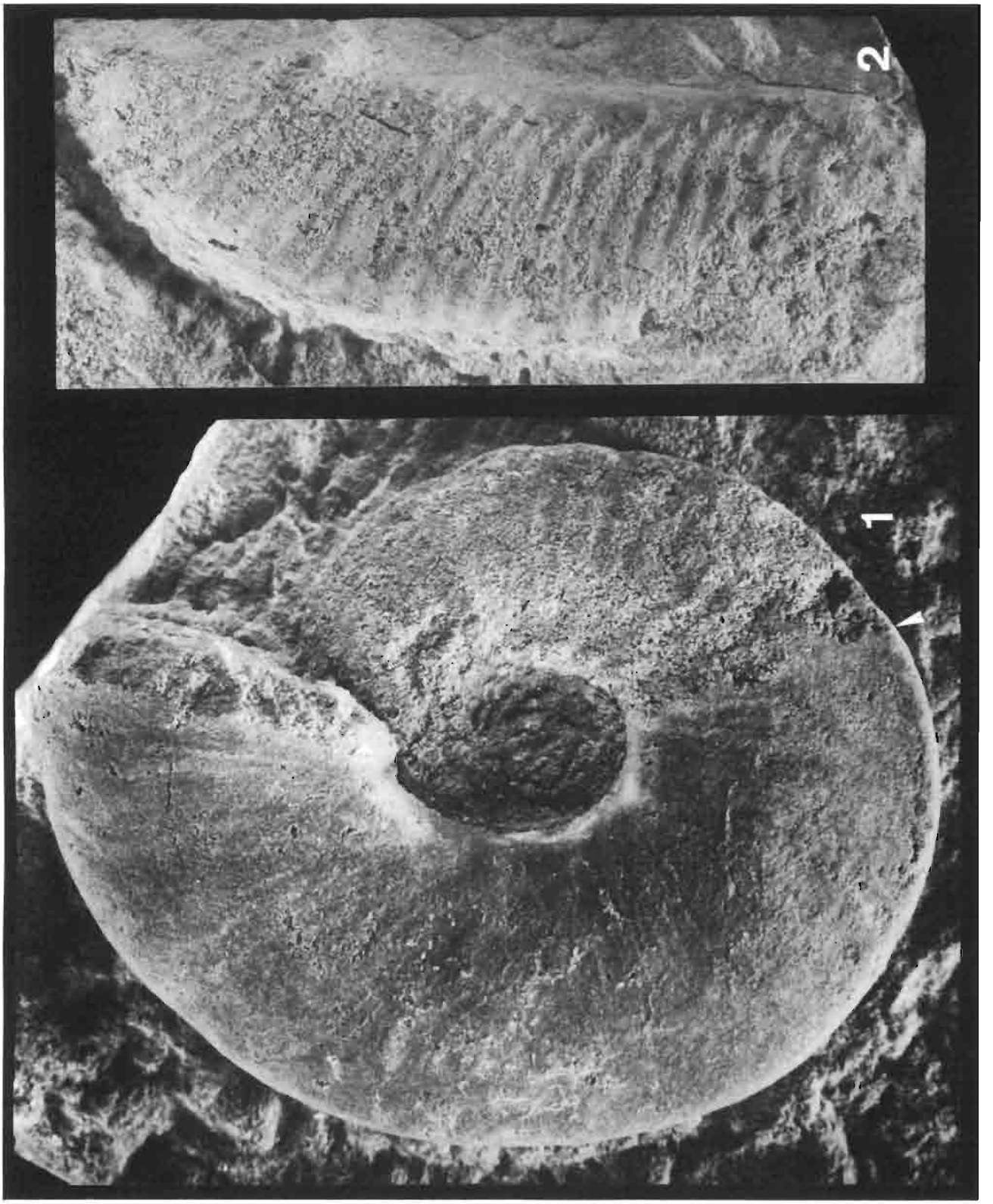
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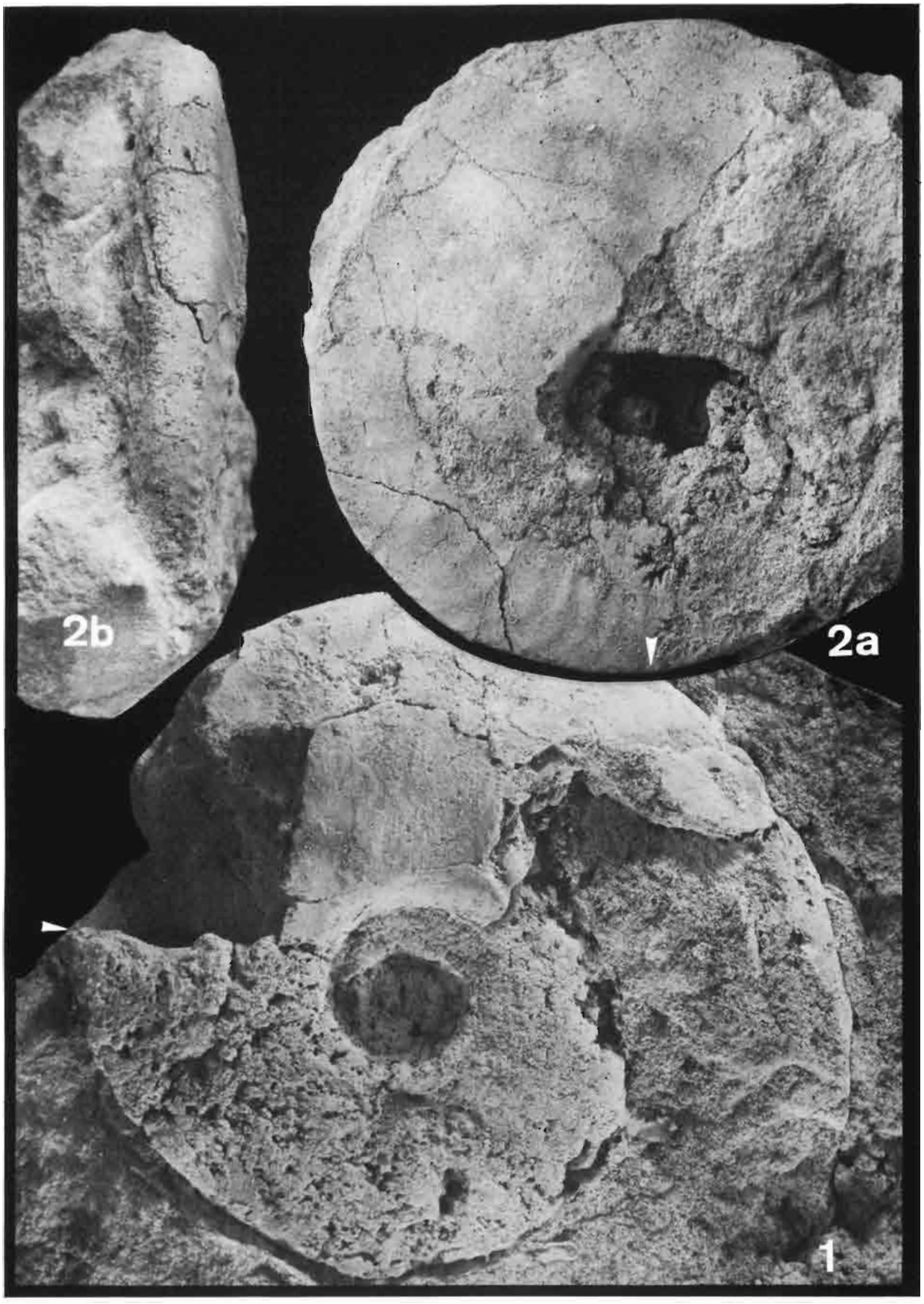
PLATE 16

1. *Anahoplites planus fittoni* (d'ARCHIAC), IGPUW/RM.Ch 37.
2. *Anahoplites planus compressus* SPATH, IGPUW/RM.Ch 32.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9; arrow indicates the beginning of the body chamber.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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 17

1. *Anahoplites* aff. *picteti* SPATH, IGPUW/RM.Ch 38, *Auritus* Subzone, Mt. Chełmowa, central Poland, × 1.

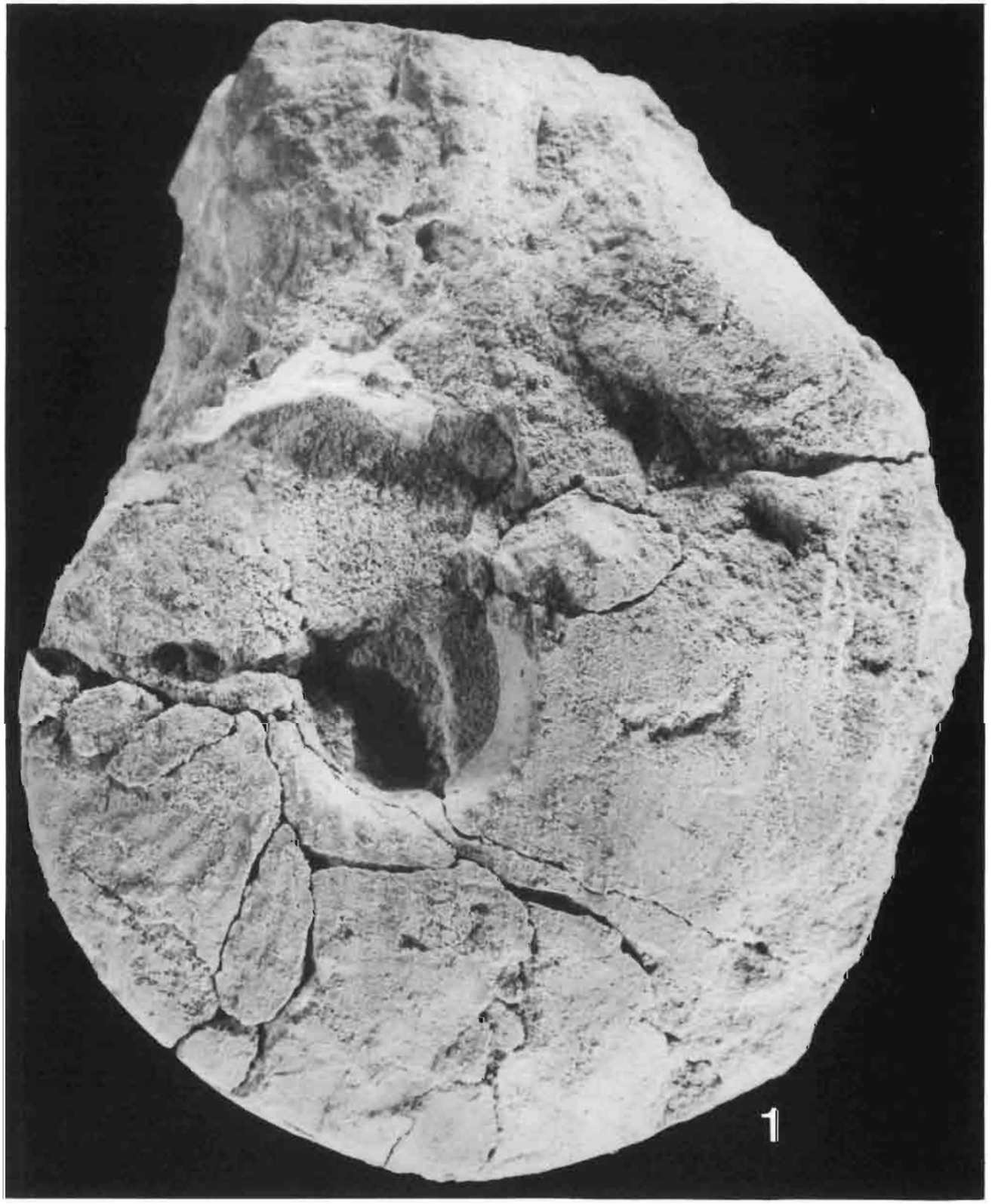
1

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PLATE 18

1. *Callihoplites patella* SPATH, IGPUW/RM.Ch 8 (the phragmocone and ?part of the body chamber of macroconch)

2– 3. *Callihoplites patella* SPATH, IGPUW/RM.Ch 4 (the phragmocone of macroconch); *3* — inner whorl cast of the specimen presented in *2*.

4. *Anahoplites* aff. *asiaticus* GLASUNOVA, IGPUW/RM.Ch 13.

5. *Callihoplites auritus* (SOWERBY), IGPUW/RM.Ch 3 (casts of the inner whorls).

All specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9.

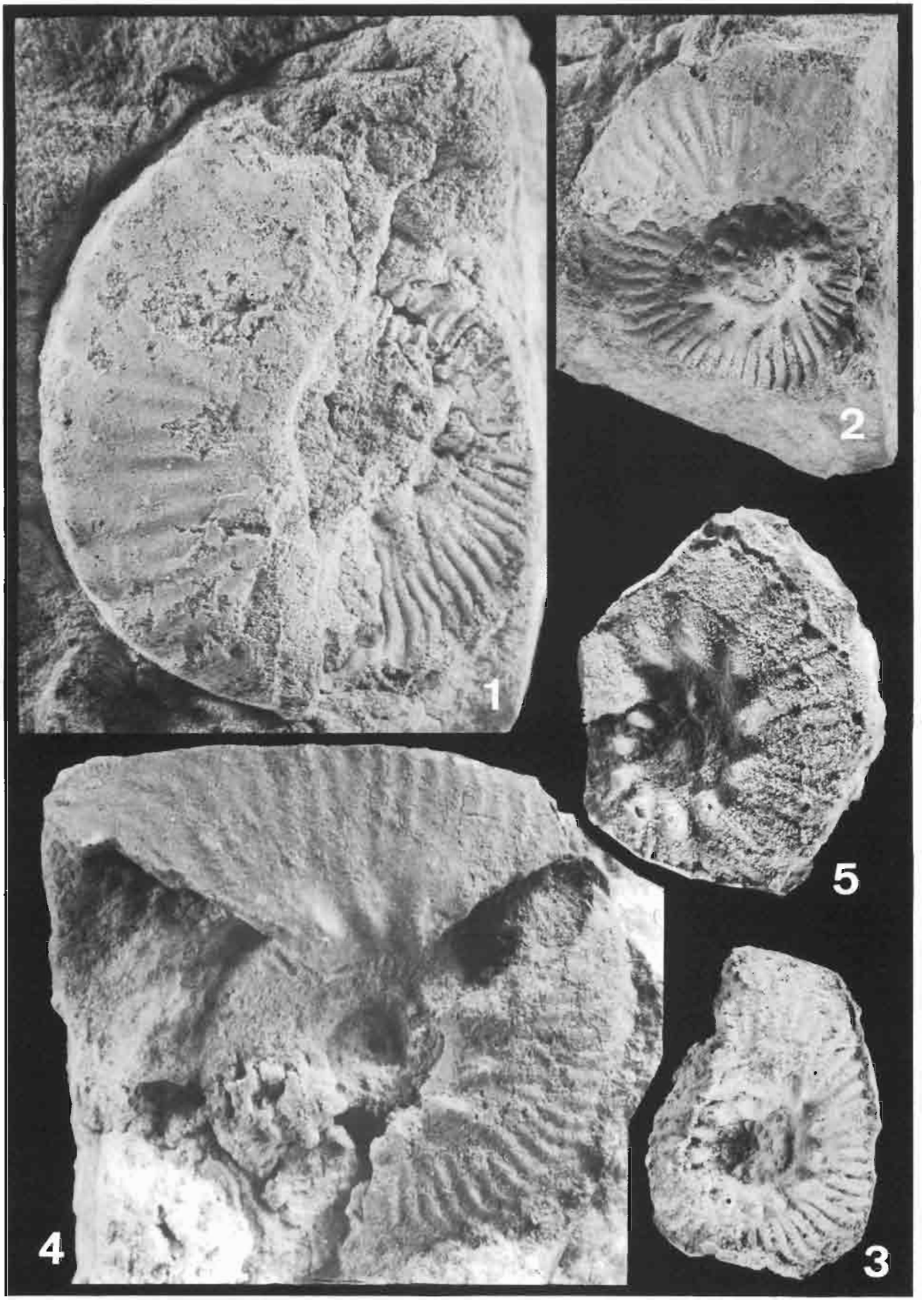
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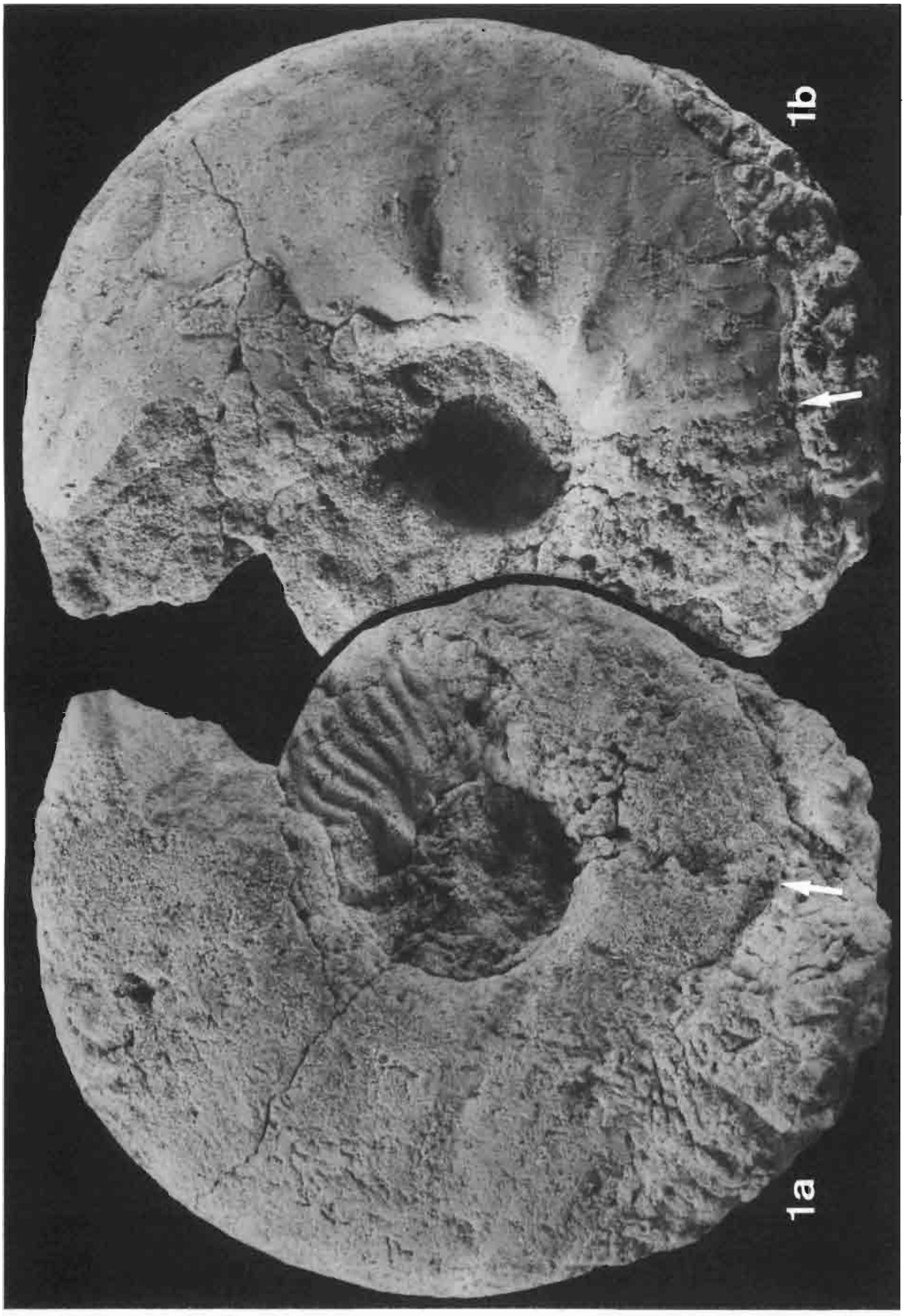
PLATE 19

1. *Callihoplites patella* SPATH, IGPUW/RM.Ch 2 (macroconch), *Auritus* Subzone, Mt. Chełmowa, central Poland. × 0.85; arrow indicates the beginning of the body chamber.


1b
1a

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 20

1. *Callihoplites potternensis* SPATH, IGPUW/RM.Ch 16 (part of the phragmocone and the body chamber); arrow shows the partly preserved ventral lappet.
2. *Callihoplites potternensis* SPATH, IGPUW/RM.Ch 10 (phragmocone).
3. *Callihoplites patella* SPATH, IGPUW/RM.Ch 5 (part of the phragmocone and the body chamber of microconch = *C. strigosus cristatus*, morphotype).

All specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.95.

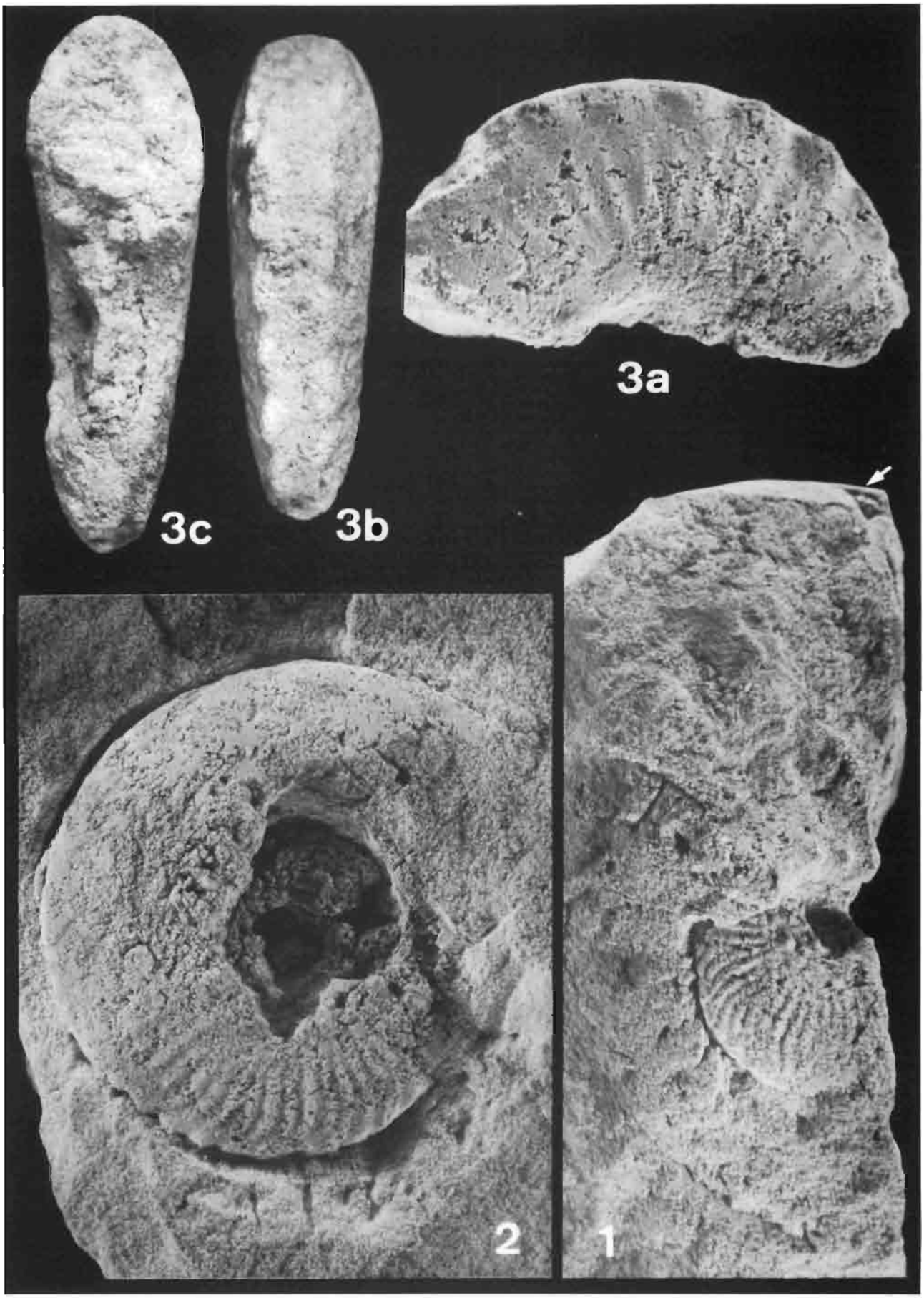


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PLATE 21

1. *Callihoplites potternensis* SPATH, IGPUW/RM.Ch 9.
2. *Callihoplites auritus* (SOWERBY), IGPUW/RM.Ch 7.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9; arrow indicates the beginning of the body chamber.

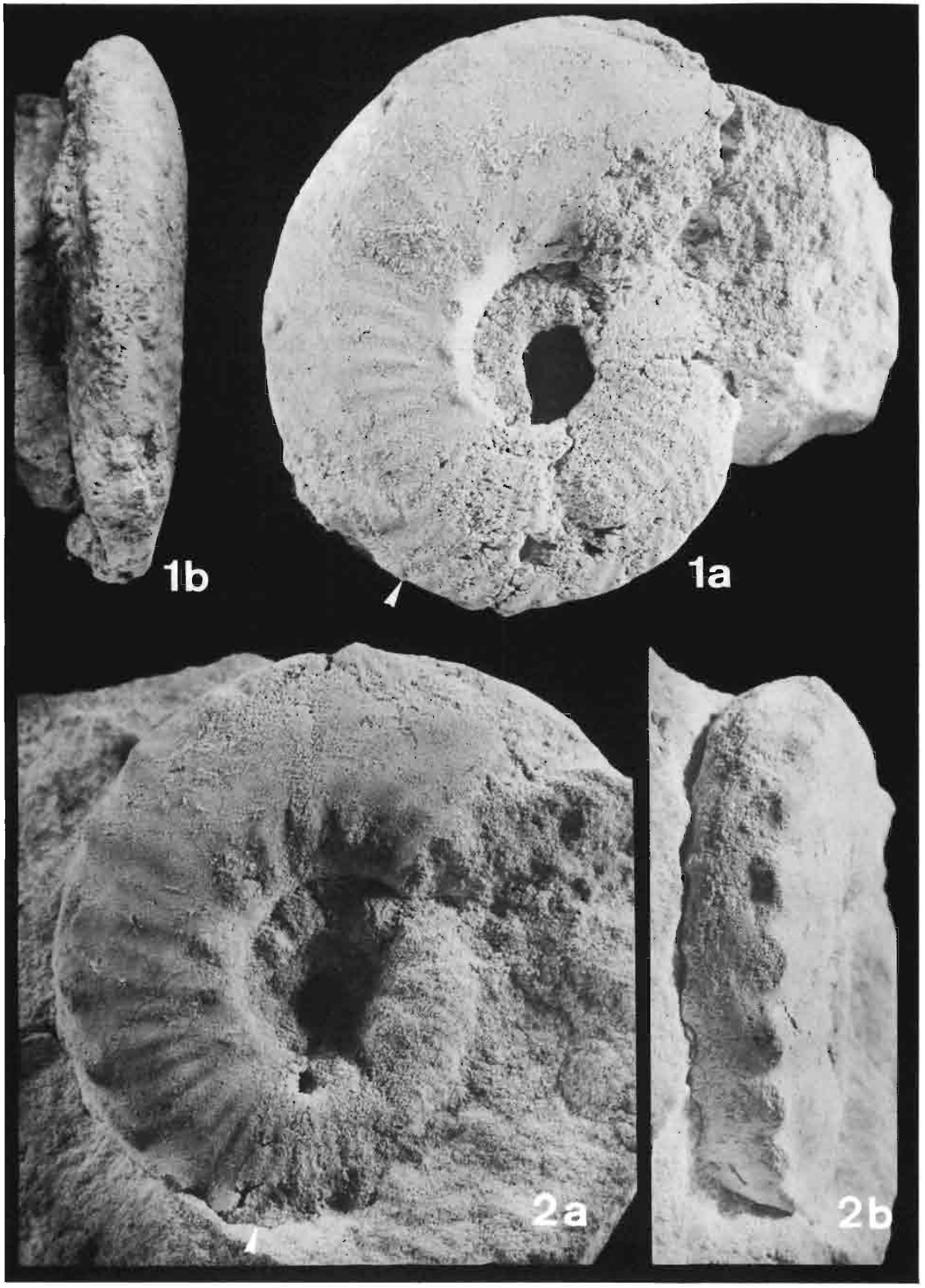
1b
1a
2a
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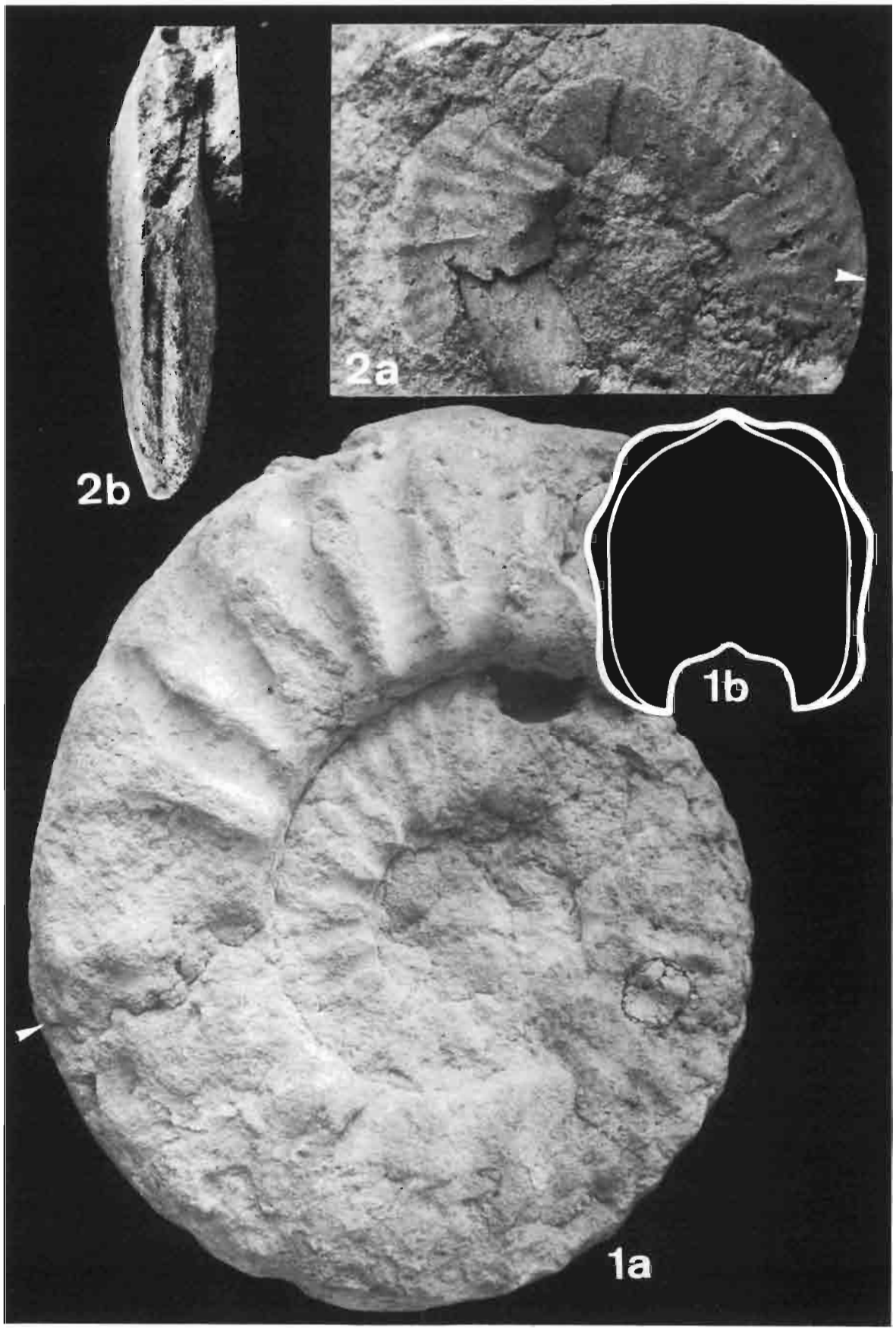
PLATE 22

1. *Mortoniceras* (*Mortoniceras*) *inflatum* (SOWERBY), IGPUW/RM.Ch 41 (macroconch), × 0.75.
2. *Anahoplites planus sulcatus* SPATH, IGPUW/RM.Ch 39, × 0.9.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland; arrow indicates the beginning of the body chamber.

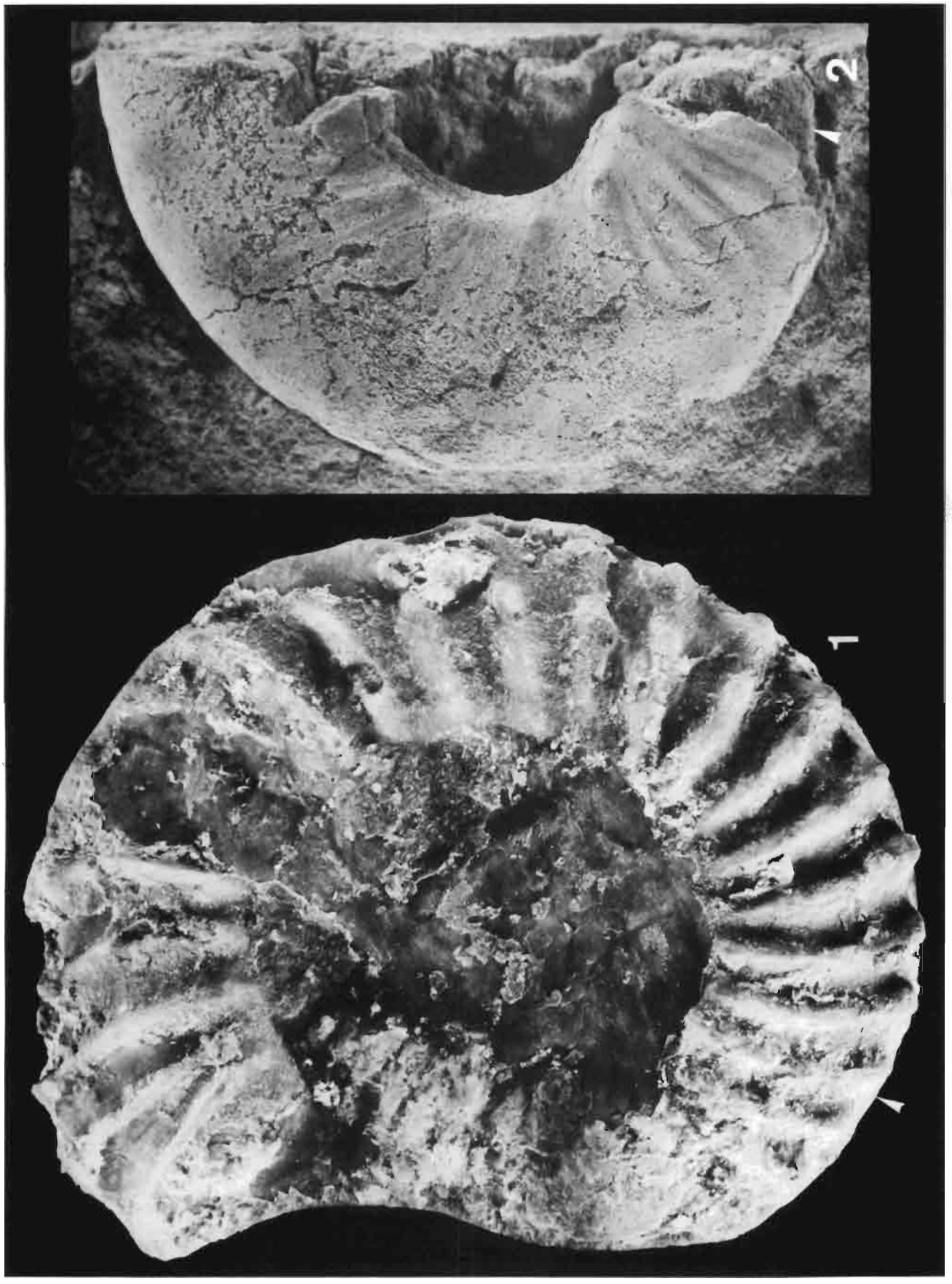

2a
2b
1b
1a

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 23

1. *Mortoniceras* (*Mortoniceras*) *inflatum* (SOWERBY), IGPUW/RM.Ch 56 (cast of macroconch), × 0.30.
2. *Callihoplites patella* SPATH, IGPUW/RM.Ch 24 (macroconch), × 0.9.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland; arrow indicates the beginning of the body chamber.

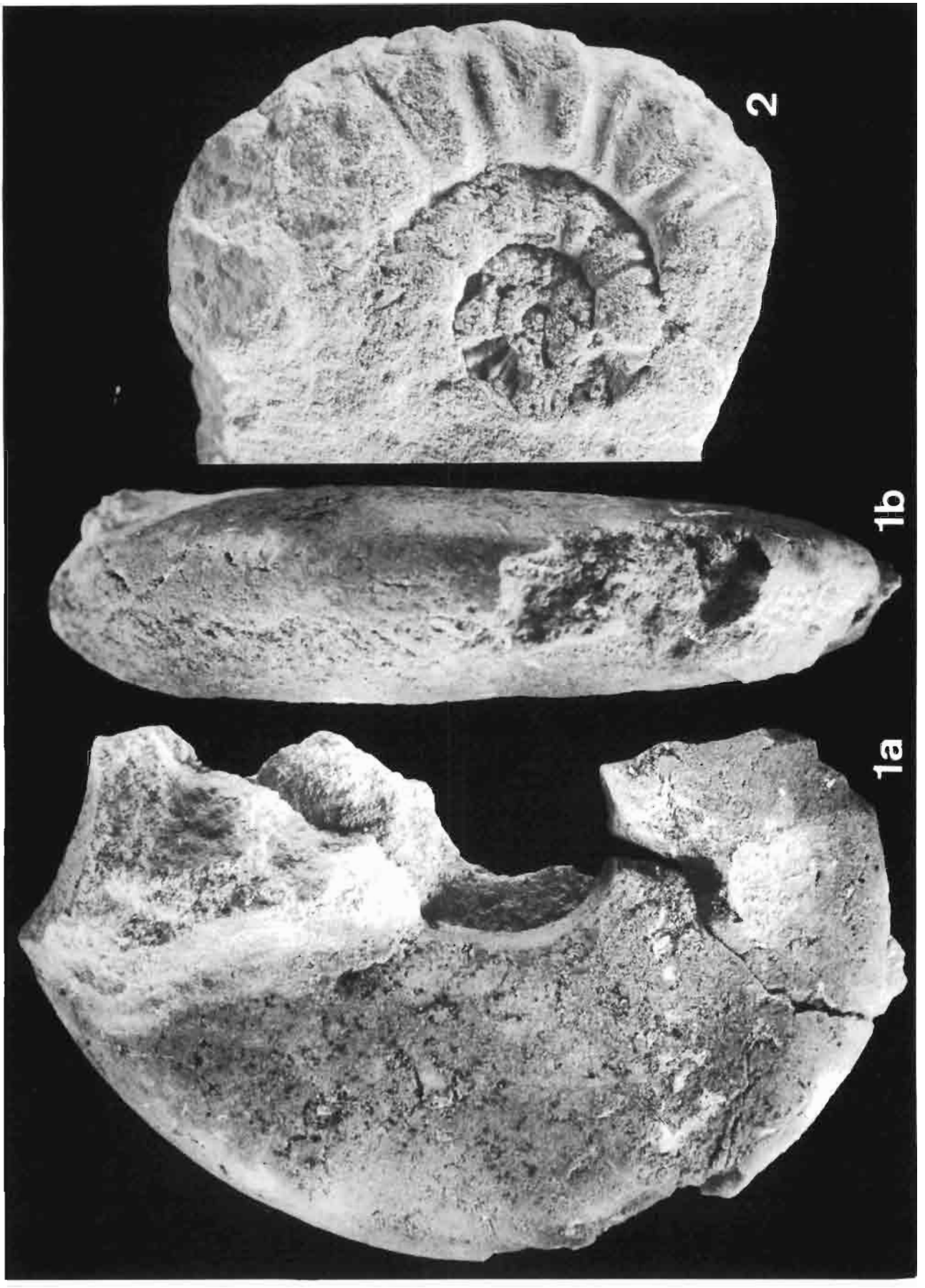

2
1

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 24

1. *Callihoplites catillus* (SOWERBY), IGPUW/RM.Ch 19 (body chamber).
2. *Mortoniceras* (*Mortoniceras*) cf. *gracilis* (HAAS), IGPUW/RM.Ch 49.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9.

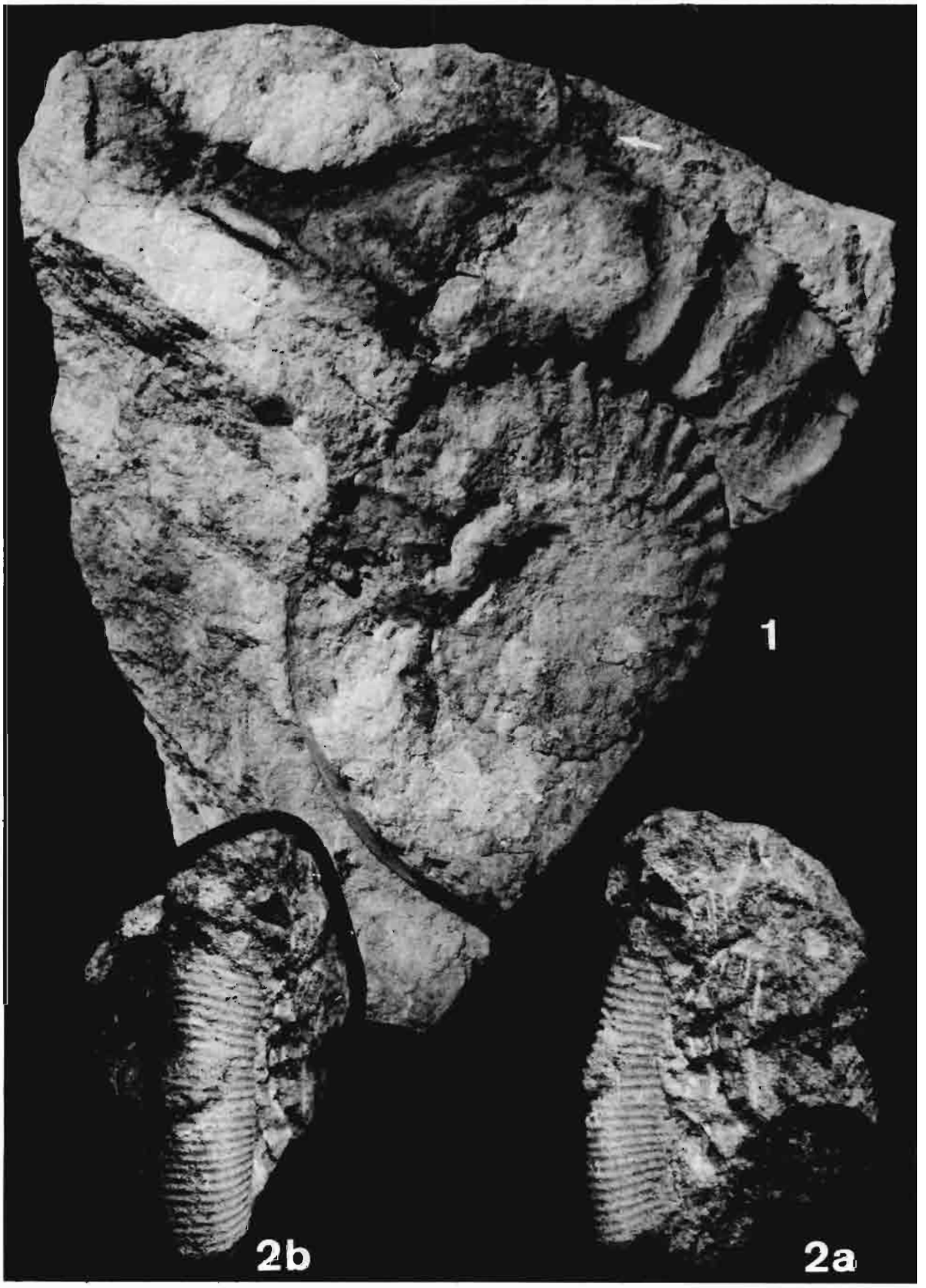

2
1b
1a

R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 25

1. *Mortoniceras* (*Mortoniceras*) *inflatum* (SOWERBY), IGPUW/RM.Ch 40 (macroconch); on the body chamber, two apertural rostra are present with arrow showing the first, rudimentary rostrum; × 0.30.
2. *Hamites* (*Plesiohamites*) *multicostatus* BROWN, IGPUW/RM.Ch 51, × 0.9; *a* — lateral, and *b* — ventral view.

Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland.


1
2b
2a

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