No. 50 — 1990

THE ALBIAN AMMONITES OF POLAND

(AMONITY ALBU POLSKI)

BY

RYSZARD MARCINOWSKI AND JOST WIEDMANN

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

WARSAWA—KRAKOW 1990

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PAŃSTWOWE WYDAWNICTWO NAUKOWE
In Memory of Professor
Edward Passendorfer
(1894—1984)

RYSZARD MARCINOWSKI and JOST WIEDMANN

THE ALBIAN AMMONITES OF POLAND
(Plates 1—25)


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 Marcinkowski, 1985. The genus Scaphamites Wiedmann et Marcinkowski, 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.

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Streszczenie. — Analiza albskich zespołów amonitowych w profilach Góry Chelmowej koło Przedborza, Annapola nad Wistą i Wielkiej Równi w Tatrach (fig. 1—2, 4, 6, 9; tab. 2—7) oraz ogólne to paleogeograficzne wskazują na zróżnicowanie środowisk sedimentacji. W polskiej części basenu centralnoeuropejskiego osady z amonitami tworzyły się w warunkach odpowiadających wewnętrzemu szelfowi, zaś w serii wierchowej Tatry w środowisku wskazującym na szelf zewnętrzny i jego granicę ze stokiem kontynentalnym (fig. 1, 8). Obecność górnoalbskich amonitów w skrajnie płytkomorskich osadach Góry Chelmowej wywołana została pośmiertnym dryfem muszli w strefie płytcz (fig. 3). Masowe nagromadzenia amonitów w Annapolu i serii wierchowej Tatry (Mała Łąka, Wielka Rówień, Biała Woda) miały miejsce na wyniesieniach dna, w wyniku kondensacji stratygraficznej w zblizonym interwalu czasowym w poszczególnych profilach (fig. 4, 6 oraz tab. 5—6). W rejonie Annapola powstanie skondensowanej stratygraficznie warstwy fosforytowej (alb środkowy i górny) wiązać należy z tektoniką synsedymentacyjną i zmianami dynamiki środowiska (sztormy). Pozytywny ruch wzmińający nic doprowadził jednak do ominięcia progów, był bowiem kompenzowany custatycznym wzrokiem poziomu morza (fig. 5). Natomiast sedimentacja skondensowanych stratygraficznie węglano-wfosforytowych osadów serii wierchowej Tatry odbywała się w dość głębokim środowisku zuto-wodnym platformy węglano wegetalnej uryguna (fig. 7).

Zespoły amonitowe w profilach Góry Chelmowej i Annapola są zdominowane przez borealne hoplitesy, o wydatnej ornamentacji muszli (por. fig. 1A, 9 K—L; tab. 2—4), podczas gdy w profilu Wielkiej Równi dominują formy o muszli gładkiej lub słabo ornamentowanej (desmocerasy, fyllocerasy, tetragnocerasy, 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 sedimentacji serii wierchowej (por. fig. 1B, 8). Borealne wpływy w medyterańskim zespole amonitowym serii wierchowej Tatry (por. fig. 1A oraz tab. 7) umożliwiają stosowanie jednostowego, „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 Chelmowej, zanika w kierunku południowo-wschodnim i jest prawie nieobecny w profilu Annapola nad Wisłą (por. tab. 3—4). Zatem mortonicery nie mogły migrować z geosynkliny karpackiej. W górnym albie, mimo rozwoju transgresji (fig. 1C), następuje wzrost prowincjализmu 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 prowincjализmu wiązać należy z klimatem i batymetrią, w mniejszym zaś stopniu z barierami fizycznymi w postaci lądów, czy też kordylier pojawiających się efemerycznie w geosynkinie alpejskiej (Wiedmann 1973, Marcynowski 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 również często są notowane w obu tych prowincjach (fig. 9). Brak prowincjализmu wśród wiodących bentonicznych i epibentonicznych tryb życia heteromorfów wyjaśnił dużą tolerancję środowiskową ich stadium młodocianego oraz zdolnością zasiedlania różnych stref ekologicznych (Marcynowski 1974, 1980).

Paleontologiczna część pracy (figs. 10—27, pl. 1—25) zawiera opis 92 gatunków i podgatunków, w tym dwóch nowych: *Hemiptychoceras tatricium* i *Hamites (Metalmmites) passendorferi*. Dokładniej opisano *Scaphamites passendorferi* Wiedmann i Marcynowski, 1985, ...
ALBIAN AMMONITES OF POLAND

5

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

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Genus Pseudhelicoeras SPATH, 1922 .................................................................................................................................................................................................... 47
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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 while the Tatra Mountains were embraced by the Alpino-Carpathian geosyncline (fig. 8). 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.

INTRODUCTION

The present monography is an extension of the authors' previous comprehensive report (Marcinowski and Wiedmann 1985) on the Albian ammonites of Poland. The content of the mentioned above preliminary paper which was published without any palaeontological 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 Periflattum 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.
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 Fennoscandian Shield; the northern margin of the Carpathians is overthrust.

(Belgien 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. Chelmowa — 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 1959b, 1965, 1976; Książkiewicz 1961, 1962; Jaskowiak-Schoenichowa 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 (gaites 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

<table>
<thead>
<tr>
<th>Substage</th>
<th>Ammonite Zones</th>
<th>Ammonite Subzones</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPPER ALBIAN</td>
<td>Stoliczkaia dispar</td>
<td><em>Mortoniceras (Mortoniceras)</em> perinflatum</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Stoliczkaia (Stoliczkaia)</em> blancheti</td>
</tr>
<tr>
<td></td>
<td>Mortoniceras inflatum</td>
<td><em>Hysteroceras varicosum</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Hysteroceras orbignyi</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Diploceras (Diploceras)</em> cristatum</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Gallihoplites auritus</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Mertonieeras inflatum</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Stoliczkaia (Stoliczkaia)</em> blancheti</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Euhoplites lautus</em></td>
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<tr>
<td>MIDDLE ALBIAN</td>
<td>Euhoplites loricatus</td>
<td><em>Euhoplites nitidus</em></td>
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<td></td>
<td><em>Euhoplites maundrius</em></td>
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<tr>
<td></td>
<td></td>
<td><em>Diploceras (Diploceras)</em> subdelberti</td>
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<tr>
<td></td>
<td></td>
<td><em>Diploceras (Diploceras)</em> nitidus</td>
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<tr>
<td></td>
<td></td>
<td><em>Anahoplites daviesi</em></td>
</tr>
<tr>
<td></td>
<td>Hoplites (Hoplites) dentatus</td>
<td><em>Hoplites (Hoplites)</em> spathii</td>
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<td></td>
<td></td>
<td><em>Lycelliceras lyelli</em></td>
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<tr>
<td></td>
<td></td>
<td><em>Mopilites (Isohoplites)</em> oedentus</td>
</tr>
<tr>
<td>LOWER ALBIAN</td>
<td>Douvilleiceras mammillatum</td>
<td><em>Protohoplites puzosianus</em></td>
</tr>
<tr>
<td>(upper part)</td>
<td></td>
<td><em>Otohoplites raumimanus</em></td>
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<tr>
<td></td>
<td></td>
<td><em>Cleoniceras floridum</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Sonneratia kitchini</em></td>
</tr>
</tbody>
</table>

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.

Acknowledgements. — The authors give their most sincere, cordial thanks to the late Professor E. Passendorfer, University of Warsaw, for his kindness in providing his excellent collection of Albian ammonites from the Tatra Mountains for use in this research and for his encouragement on the subject. Thanks are also extended to Docent S. Czniński, Geological Survey of Poland, for making his collection from Annopol-on-Vistula available, and to Dr. K. Krajewski, Polish Academy of Sciences, Warsaw, for providing further ammonites from the Tatra Mountains. R. Marcinowski wishes to express many thanks to Dr. J. M. Hancock, Kings College of London, Dr. W. J. Kennedy and Dr. C. W. Wright, University of Oxford, and Dr. H. G. Owen, British Museum (Natural History), for their discussion on the Albian ammonites housed at the British Museum as well as for their help and advice during his visit to England in 1981. We would also like to thank Mr. J. Gee and Mr. L. Hoberg for their linguistic revision of the manuscript, Mr. W. Wetzel (Tübingen) and Mr. S. Ulatowski (Warsaw) for the photographs, and H.-D. Bergner (Tübingen) for preparing the text drawings.

This work was conducted under the auspices of the Alexander-von-Humboldt Stiftung; in addition, R. Marcinowski wishes to acknowledge the Alexander-von-Humboldt Stiftung for providing financial support during his stay from 1983 to 1985 at the University of Tübingen.

AMMONITE SPECTRA AND STRATIGRAPHY IN THE KEY SECTIONS

MT. CHELMOWA

(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.

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 trachyostreaceous 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 (Spaeth 1927: 202). *Mortoniceras* (*Mortoniceras* kiliani (Lasswitz), a species hitherto known in Europe exclusively from the Altonense and Blancheti Subzones (Spaeth 1932, Breistroffer 1947, Kennedy and Hancock 1978) most probably comes from a higher stratigraphic position because the ammonites from the Mt. Chelmowa 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 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.

Table 2

Stratigraphic range of the ammonites from Mt. Chelmowa, central Poland: stratigraphic ranges for the particular genera are also given.
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 - *Nodosites* 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.
The Albian sequence, which overlies Kimmicridian limestone, begins with poorly glauconitic sand (2 m thick) overlain by compact sandstone, locally quartzitic (up to 3 m thick). This sandstone (unit "A3" in the lithostratigraphic subdivision of Cieśliński 1959a; 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 Walaszczyzk 1985) by the presence of Hoplites (Isosoclites), a subgenus confined to the Hoplites (Isosoclites) 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. Chelmowa section. As at Mt. Chelmowa, 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 “A5—A8” in the lithostratigraphic subdivision of Cieśliński 1959a; see also fig. 4).

The lower part of the “phosphorite bed” (units “A5—A7” of Cieśliński 1959a), 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 Walaszczyzk 1985). The fossil assemblage consists of normally coiled ammonites, sponges, decapods, inoceramids, bony material (shark and sauropoterigian teeth) as well as frequent pieces of wood bored by the bivalve “Gastrochaena” amphibaena 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-
Environmental and postdepositional scheme for the lower part of the ammonite-bearing phosphatic bed at Annopol - on-Vistula, central Poland.

A — gradual, "on block" uplift of the area and simultaneous eustatic sea level increase. The trachystraceous ammonites (mainly hojitids) 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 *Altomerse* Subzones, units “A3” and “A5–7” in fig. 4) at Annopol-on-Vistula (after MARCINOWSKI and WIEDMANN 1985)

<table>
<thead>
<tr>
<th>Families and Genera</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOPLITIDAE DOUVILLÉ 1890</td>
<td>98.24</td>
</tr>
<tr>
<td>Hoplites (Hoplites) NEUMAYR 1875</td>
<td>76.31</td>
</tr>
<tr>
<td>Hoplites (Otohoplites) STEINMANN 1925</td>
<td>9.65</td>
</tr>
<tr>
<td>Hoplites NEUMAYR 1875</td>
<td>5.26</td>
</tr>
<tr>
<td>Anahoplites HYATT 1900</td>
<td>3.51</td>
</tr>
<tr>
<td>Euohoplites SPATH 1925</td>
<td>1.75</td>
</tr>
<tr>
<td>Hoplites (Isohoplites) CASEY 1954</td>
<td>0.88</td>
</tr>
<tr>
<td>Callihoplites SPATH 1925</td>
<td>0.88</td>
</tr>
<tr>
<td>DESMOCERATIDAE ZITTEL 1895</td>
<td></td>
</tr>
<tr>
<td>Puzosia (Puzosia) BAYLE 1878</td>
<td>0.88</td>
</tr>
<tr>
<td>BRANCOCERATIDAE SPATH 1933</td>
<td></td>
</tr>
<tr>
<td>Mortoniceras (Mortoniceras) ME CK 1876</td>
<td>0.88</td>
</tr>
</tbody>
</table>

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 RADWÄNSKI 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 “A₄” of CIEŚLINSKI 1959a) is less condensed, and it contains only two specimens of *Stoliczkaia* (*Stoliczkaia*) cf. *notha* (SEELEY), indicative of the uppermost Albian *Stoliczkaia dispar* Zone (CIEŚLINSKI 1959a). 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 ŁACA 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 Rówień 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 Annopolon-Vistula and from the Upper Albian assemblage at Mt. Chelmowa (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-
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 re-deposition 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 Malatka, High-Tatric Series, southern Poland (cf. also fig. 6); symbols as in Table 2.
on the submerged Urgonian mound, very slow glauconitic carbonate sedimentation starts. This mound is settled on by benthic organisms including heteromorphs, associated with epibenthic and nectonic ammonites (trachyostraceous and leiostraceous groups, respectively).

- early phosphatization of the fossil remains under a thin glauconitic carbonate sediment cover.

- current activity and removal of the glauconitic carbonate sediments; formation of the fossil residual lag. The phosphatized fossils are partly overturned in situ and exposed for an extended period on the bottom; some of them are overgrown by stromatolites.

- very slow glauconitic carbonate sedimentation begins again.

- break in sedimentation connected with hard-ground formation which is overgrown by stromatolites. Hard-ground and stromatolitic layers, as a result of their earlier cementation, stabilize the underlying sediments with their residual lag.

Fig. 7.

Environmental (A) and postdepositional (B–E) schemes for the ammonite-bearing glauconitic limestone at Wielka Rówień, High Tatric Series, southern Poland.
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

<table>
<thead>
<tr>
<th>Families &amp; Genera</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normally coiled ammonites</strong></td>
<td>65.65</td>
</tr>
<tr>
<td>Desmoiceratidae</td>
<td>36.81</td>
</tr>
<tr>
<td><em>Duzia</em> (Desmoiceratidae)</td>
<td>16.87</td>
</tr>
<tr>
<td><em>Desmoiceras</em> (Desmoiceratidae)</td>
<td>9.51</td>
</tr>
<tr>
<td><em>Uhljeffia</em></td>
<td>4.29</td>
</tr>
<tr>
<td><em>Neumanticeras</em></td>
<td>3.37</td>
</tr>
<tr>
<td><em>Pranlicerites</em></td>
<td>2.76</td>
</tr>
<tr>
<td>Hoplitidae</td>
<td>8.59</td>
</tr>
<tr>
<td><em>Hoplites</em> (Hoplites)</td>
<td>7.97</td>
</tr>
<tr>
<td><em>Anahoplites</em></td>
<td>0.61</td>
</tr>
<tr>
<td>Phylloceratidae</td>
<td>7.36</td>
</tr>
<tr>
<td><em>Phylloceras</em> (Hyperphylloceras)</td>
<td>7.36</td>
</tr>
<tr>
<td>Gaudryceratidae</td>
<td>5.21</td>
</tr>
<tr>
<td><em>Kosmatella</em> (Kosmatella)</td>
<td>3.68</td>
</tr>
<tr>
<td><em>Logaudryceras</em> (Logaudryceras)</td>
<td>0.92</td>
</tr>
<tr>
<td><em>Logaukericeras</em></td>
<td>0.61</td>
</tr>
<tr>
<td>Tetragonitidae</td>
<td>3.68</td>
</tr>
<tr>
<td><em>Tetragonites</em> KOSSMAT 1895</td>
<td>3.68</td>
</tr>
<tr>
<td>Brancoceratidae</td>
<td>2.76</td>
</tr>
<tr>
<td><em>Diploceras</em></td>
<td>0.92</td>
</tr>
<tr>
<td><em>Diploceras</em> (Diploceras)</td>
<td>0.61</td>
</tr>
<tr>
<td><em>Hysloceras</em></td>
<td>0.61</td>
</tr>
<tr>
<td><em>Brancoceras</em> (Diploceroceras)</td>
<td>0.31</td>
</tr>
<tr>
<td><em>Diploceras</em> (Diploceroceras)</td>
<td>0.31</td>
</tr>
<tr>
<td>Lytoceratidae</td>
<td>0.92</td>
</tr>
<tr>
<td><em>Protetragonites</em> HYATT 1900</td>
<td>0.92</td>
</tr>
<tr>
<td>Douvilleiceras</td>
<td>0.31</td>
</tr>
<tr>
<td><em>Douvilleiceras</em> DE GROSSOUVRE 1894</td>
<td>0.31</td>
</tr>
<tr>
<td>Heteromorphs</td>
<td>34.35</td>
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<td>Hamitidae</td>
<td>17.79</td>
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<td><em>Hamites</em> (Hamites)</td>
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<td><em>Scaphamites</em></td>
<td>1.84</td>
</tr>
<tr>
<td><em>Hamites</em> (Rehhamites)</td>
<td>1.23</td>
</tr>
<tr>
<td><em>Anisoceras</em></td>
<td>1.23</td>
</tr>
<tr>
<td><em>Anisoceras</em> (Prohelicoceras)</td>
<td>1.23</td>
</tr>
<tr>
<td><em>Anisoceras</em> (Protonisoceras)</td>
<td>0.92</td>
</tr>
<tr>
<td><em>Hemiplychoceras</em></td>
<td>0.61</td>
</tr>
<tr>
<td><em>Hemileides</em></td>
<td>0.31</td>
</tr>
<tr>
<td>Turritilitidae</td>
<td>16.56</td>
</tr>
<tr>
<td><em>Turritilitoides</em></td>
<td>13.80</td>
</tr>
<tr>
<td><em>Pseudehelicoeras</em></td>
<td>2.78</td>
</tr>
</tbody>
</table>
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 Dowilleiceras 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 Blancheri 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, Mutiu 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. Chelmowa 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 Marcinkowski 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; Słązczka 1976; Czaszar 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. Bolliot 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 1962a, 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 1983a).

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 1979a; 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. Chelmowa and Annopol-on-Vistula are dominated by trachyostraceous forms (hoplitids and branoceratids), 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, 1982; Scholz 1979a; 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.

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
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; trachystraceous ammonites: hoplitids, brancoceratids, and lyellliceratids; 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-Groix, Switzerland (RENN 1968); C — *Stoliczkaia dispar* Zone of the Bakony Mts., Hungary (SCHOLZ 1979a); D — *Stoliczkaia dispar* Zone of the Vascogotic Ranges, northern Spain (WIEDMANN 1962a); E — *Stoliczkaia dispar* Zone of Salazac, Gard, southern France (BREIBROFFER 1940, 1947); F — Upper Albian of the Subbetic of Caravaca, Murcia, southern Spain (WIEDMANN, unpublished data); G — Upper Albian of Mallorca (WIEDMANN 1962b, 1964 and unpublished data); H — *Stoliczkaia dispar* Zone of the Orosee area, eastern Sardinia (WIEDMANN and DIENI 1968); I — *Hoplites dentatus* through *Stoliczkaia dispar* Zones, condensed sequences of the Subalpine Ranges, southwestern France (GEBHARD 1983a); J — *Mortoniceras perinflatum* Subzone of Salzgitter, northern Germany (SCHOLZ 1979b); K — Callihoplites auritus Subzone of the *Mortoniceras inflatum* Zone of Mt. Chelmowa, 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 Równia, Tatra Mts., Poland; N — Upper Albian of the southwestern Crimea highland, Soviet Union (MARCELINSKI and NAIDIN 1976); Ns — *Mortoniceras inflatum* Zone in clay facies; Ns — 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. Chelmowa (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)
MLw — Mała Łąka, glauconitic limestone (fig. 6)
MLr — 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 **Phyllocerataceae** 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 **Pasendorfer** (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.; Pasendorfer, 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).
1979a. Phylloceras (H.) subalpinum (d'Orb.); Scholz, 46; fig. 12A, B.

**Material.** — 11 specimens, Nos. IGPUW/WR3. 8—16, MLw. 4, BW. 2.

**Measurements (in mm):**

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

**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.
The suture line (fig. 10) shows the typical characteristics of the present species and subspecies. All saddles are clearly diphylic, 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)

**Material.** — One specimen, IGPUW/WR. 7.

**Measurements (in mm):**

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>15.5(0.62)</td>
<td>11.6(0.47)</td>
<td>1.5(0.06)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

**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-
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):

<table>
<thead>
<tr>
<th>pl. 1: 7</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>18(0.60)</td>
<td>9(0.33)</td>
<td>2(0.07)</td>
<td>0.50</td>
<td></td>
</tr>
</tbody>
</table>

and the holotype for comparison:

GPITCe 122078 | 16.5 | 10.5(0.65) | 6.1(0.37) | 1.2(0.07) | 0.58 |

**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.
1964. *Ph. (Hypophylloceras) velledae velledae* (Mich.); Wiedmann, 201, fig. 49, pl. 11: 1, pl. 13: 4, pl. 21: 4 (with synonymy).
1968. *Ph. (H.) velledae velledae* (Mich.); Renz, 17, fig. 6g, pl. 1: 3.
1977b. *Ph. (H.) velledae velledae* (Mich.); Kennedy and Klingler, 360, pl. 4: 5, pl. 5: 4, pl. 6: 1, pl. 7: 2 and 3, pls. 8, 10 and 11.
1979. *Ph. (H.) velledae velledae* (Mich.); Destombes, 64, pl. 4—18: 5, pl. 4—26: 1.

**Material.** — 9 specimens, IGPUW/WR2. 1—5, MLw. 1—3 and BW. 1.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 1: 1</td>
<td>28</td>
<td>16(0.57)</td>
<td>11(0.39)</td>
<td>—</td>
</tr>
</tbody>
</table>

**Fig. 13.**

Suture of *Ph. (Hypophylloceras) velledae velledae* (Mich.), IGPUW/MLw. 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. 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, Malá Lôka, Biała Woda as well as in the sandy glauconitic mudstone (Blancheti Subzone) of Malá Lôka, 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)

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):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wh/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 1: 2</td>
<td>48</td>
<td>28.5(0.60)</td>
<td>22(0.46)</td>
<td>2(0.04)</td>
</tr>
</tbody>
</table>

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 Albían of the Balearic Islands.

Order Lytoceratida Hyatt, 1889
Suborder Lytoceratina Hyatt, 1889
Superfamily Lytoceratae 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 (1962b: 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 (1962b: 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.
1962b. 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 1: 9</td>
<td>29</td>
<td>9(0.31)</td>
<td>10(0.35)</td>
<td>14(0.48)</td>
<td>1.11</td>
</tr>
<tr>
<td>pl. 1: 8</td>
<td>22</td>
<td>7(0.32)</td>
<td>8(0.36)</td>
<td>9.5(0.43)</td>
<td>1.15</td>
</tr>
<tr>
<td>Lectotype</td>
<td>31</td>
<td>10.5(0.34)</td>
<td>12.5(0.40)</td>
<td>14.5(0.47)</td>
<td>1.19</td>
</tr>
</tbody>
</table>

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.

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 (1962b: 26), this subspecies has whorls increasing in height rather than in thickness, a subcircular whorl section, and open whorls (P. laevis WIEDMANN, 1962b 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 namidum* COQUAND in SAYN, 1890.

**Remarks.** — Following WIEDMANN (1962a: 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) vatonei** (COQUAND) (pl. 1: 10)

1862. *Ammonites Vatonei* COQUAND, 173, pl. 1: 9, 10.
1910. *Lytoceras* (Gaudryceras) Vatonei COQUAND; PERVINQUIÈRE, 11, pl. 1: 9, 10.

**Material.** — 1 specimen, IGPW/WR3. 25.

**Measurements** (in mm):

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Wh</td>
<td>Wb</td>
<td>U</td>
<td>Wb/Wh</td>
</tr>
</tbody>
</table>
| pl. 1:10 | 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.

**Occurrence.** — Until now, *E. (E.) vatonei* (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 (1962a) 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).
1962a. E. (E.) shimizui shimizui BREISTR.; WIEDMANN, 152, fig. 12, pl. 13: 1 (with synonymy).

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

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 2</td>
<td>30</td>
<td>12.5(0.41)</td>
<td>15(0.50)</td>
<td>13(0.43)</td>
</tr>
</tbody>
</table>

Remarks. — E. shimizui shimizui BREISTROFFER has been extensively described by WIEDMANN (1962a). 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 Mala 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).
1962a. E. (Eogaudryceras) shimizui gaonai WIEDMANN, 153, fig. 13, pl. 8: 4.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 3</td>
<td>25</td>
<td>10(0.40)</td>
<td>12(0.48)</td>
<td>9(0.36)</td>
</tr>
<tr>
<td>Holotype (for comparison)</td>
<td>27.5</td>
<td>10(0.36)</td>
<td>13(0.47)</td>
<td>10(0.36)</td>
</tr>
</tbody>
</table>

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 (1962a: 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 1962b), 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)

1962a. *K. (Kossmatella) romana* Wiedmann, 164, figs. 21—24, pl. 8: 6, 7, pl. 13: 12 (with synonymy).
1962b. *K. (Kossmatella) romana* Wiedmann, 50, pl. 3: 8, pl. 4: 1, 5, pl. 5: 3.

**Material.** — 1 specimen, IGPUW/WR3.35.

**Measurements** (in mm):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wbmax</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 7</td>
<td>?32</td>
<td>11(0.34)</td>
<td>11(0.34)</td>
<td>13.5(0.42)</td>
</tr>
<tr>
<td>Holotype (for comparison)</td>
<td>46</td>
<td>16(0.35)</td>
<td>16(0.35)</td>
<td>19(0.41)</td>
</tr>
</tbody>
</table>

**Remarks.** — After the redescription of *K. (K.) agassiziana* (Pictet) and the separation of *K. (K.) romana* by Wiedmann (1962a), 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 Klinge (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* Subzone) as well as in the sandy glauconitic mudstone (*Blancheti* Subzone) of Mala 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. rencreulensis* 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 renurelensis Jacob; Passendorfer, 627.
pars 1930. K. aff. Mühlenbecki Fallot; Passendorfer, 625.
1936b. 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wbmax</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 4</td>
<td>38</td>
<td>14(0.37)</td>
<td>17(0.45)</td>
<td>15(0.40)</td>
</tr>
<tr>
<td>pl. 2: 5</td>
<td>27</td>
<td>8(0.30)</td>
<td>13(0.48)</td>
<td>11.5(0.42)</td>
</tr>
</tbody>
</table>

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. renurelensis 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wbmax</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 6</td>
<td>27</td>
<td>9(0.33)</td>
<td>12.4(0.46)</td>
<td>11.8(0.43)</td>
</tr>
</tbody>
</table>

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 whors 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.


Measurements (in mm):

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 2: 8</td>
<td>31</td>
<td>9(0.29)</td>
<td>11(0.35)</td>
</tr>
<tr>
<td>Holotype (for comparison)</td>
<td>32</td>
<td>9.5(0.30)</td>
<td>12(0.37)</td>
</tr>
</tbody>
</table>

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. muenhlebecki* (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.
1974. *T. rectangularis rectangularis* Wied.; 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):

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

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.

![Image of Tetragonites rectangularis](image)

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

Remarks. — This is a series of typical specimens of the present species, all of which agree perfectly with the neotype (*in Wiedmann 1962a, 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/MLw. 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.


1962a. *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):**

<table>
<thead>
<tr>
<th>Pl. 2: 1</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pl. 2: 1</td>
<td>43</td>
<td>20(0.46)</td>
<td>226(0.60)</td>
<td>11(0.25)</td>
<td>21.30</td>
</tr>
<tr>
<td>Holotype</td>
<td>74</td>
<td>36(0.48)</td>
<td>42(0.57)</td>
<td>17(0.23)</td>
<td>1.17</td>
</tr>
</tbody>
</table>

**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.
In contrast to earlier attempts to classify Hamitidae Hyatt with the Baculitidae Meek (Wiedmann 1962b, 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 (1979a), 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 (1962a) 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. *Hamiiella* Breistroffer, 84.

Remarks. — The synonymy of the nominal subgenus was largely discussed by Wiedmann (1962a, 1962b), Wiedmann and Dieni (1968), and Scholz (1979a), 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.

*Hamites sp.;* Passendorfer, 667, pl. 4: 79.
1938. *Hamites attenuatus* J. Sow.; Spath, 607, fig. 218, pl. 67: 1—13, 19 (with synonymy).


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 Mala 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)

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.
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.

\[Suture of \text{H. (Hamites) rectus BROWN, IGUPUWR2.50, Wh = 7.8 mm, (cf. pl. 2: 14).}\]

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.


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**


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)


*H. aff. Venetzianus Pict. et Roux; ibidem*, 666, fig. 23, pl. 4: 72.

1968. *H. (H.) virgulatus Broon; Wiedmann and Djeni*, 53, figs. 21—27, pl. 5: 1, 2 and 10, pl. 7: 1 and 2 (with synonymy).

1968. *H. (Stomohamites) virgulatus Broon.; 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, 24h, 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.


**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 1979a) 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 Rôwien in the High-Tatric Series, southern Poland. H. (H.) virgulatus BROGGNIART, 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 $I$.

**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):**

<table>
<thead>
<tr>
<th></th>
<th>$W_{b_{max}}$</th>
<th>$W_{b_{max}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 3: 2 — holotype</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>pl. 3: 3 — paratype</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>IGPUW/WR2.69 — paratype</td>
<td>7</td>
<td>5.5</td>
</tr>
</tbody>
</table>

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 1962b, Wiedmann and Dieni 1968, Scholz 1979a). 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)

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); Marcinkowski and Naidin, 99, pl. 1: 1 (with synonymy).

**Material.** — Two specimens, IGPUW/RM. Ch 51. MDm. 1.

**Measurements (in mm):**

<table>
<thead>
<tr>
<th>Wh</th>
<th>Wb</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 25: 2</td>
<td>20</td>
<td>19</td>
</tr>
</tbody>
</table>

**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 (1962a: 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. Chelmowa, central Poland; marly mudstone (Perinflatum Subzone) of Mala 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.
RYSZARD MARCINOWSKI & JOST WIEDMANN

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):

<table>
<thead>
<tr>
<th>Wh</th>
<th>Wb</th>
<th>Wh/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 15: 2</td>
<td>56</td>
<td>748</td>
</tr>
</tbody>
</table>

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. Chelmowa, 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: 5 and 8, pl. 6: 12(?).
1978. H. gaultinum gaultinum (Pictet); Scholz, pl. 3: 12.
1979a. 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 retro-radiate 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):

<table>
<thead>
<tr>
<th></th>
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<th>Wb</th>
<th>Wb/Wh</th>
<th>R/Wh</th>
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<tr>
<td>Lectotype: living chamber</td>
<td>14.5</td>
<td>17.5</td>
<td>1.21</td>
<td>4</td>
</tr>
<tr>
<td>phragmocone</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

**Fig. 22.**

*Hemiptychoceras gaultinum* (Pictet 1847, pl. 15: 5): east 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 (Haute Savoie, France, Mus. Hist. nat. Genève coll.).**

**Remarks.** — We do not follow the concept of Scholz (1979a) 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)

1940. *Hemiptychoceras subgaultinum* Breistroffer, 89.

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

Measurements (in mm):

<table>
<thead>
<tr>
<th></th>
<th>Wh</th>
<th>Wb</th>
<th>Wb/Wh</th>
<th>R/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/WR2.59</td>
<td>14</td>
<td>15</td>
<td>1.07</td>
<td>6—7</td>
</tr>
<tr>
<td>(body chamber)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGPUW/WR2.60</td>
<td>9</td>
<td>10</td>
<td>1.11</td>
<td></td>
</tr>
</tbody>
</table>
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 Rówien 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, 1930, pl. 4: fig. 19.

*Holotype:* Specimen IGPUW/MLw. 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.](image)

Suture of *Hemiptychoceras tatricum* sp. n., IGPUW/MLw. 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):**

<table>
<thead>
<tr>
<th>Wh(_{\text{max}})</th>
<th>Wb(_{\text{max}})</th>
<th>Wb/Wh</th>
<th>R/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

**Relations.** — \( H. \) tetricum 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.** — \( H. \) tetricum sp. n. is known only from the stratigraphically condensed glauconitic limestone of the Albian (Floridum to Altonense Subzones') of Mała Łaka, 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 (1962b) 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 (1979a) included the previous genera Idiohamites SPATH, 1925 and Pseuclhelicoceras 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**

\( A. (\text{Anisoceras}) \) saussureanum (Pictet)

(pl. 3: 9)

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).
1979a. \( A. (A.) \) saussureanum (Pictet); Scholz, 24, fig. 7 (with synonymy).

**Material.** — 8 specimens, IGPUW/ML\(_{\text{r.}}\) 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 Łaka, 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 raulitianus 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 1962b), 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 (1979a) was probably right in combining both groups.

Occurrence. — The first Protanisoceras have been described from the Upper Aptian (WIEDMANN 1962b), 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)


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 (1979a) in including Prohelicoceras in Pseudhelicoceras SPATH. There is no question about the gradual transitions between hamitids/anisoceratids and turritilids; but Pseudhelicoceras might be better included in Turritilidae. 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); S PATH, 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).

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 Escagnolles (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 biciplicate 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*, pl. 602 (nom. nud.).
1941. *H.* (? *rusticus* *SPATH*, pl. 66: 2.


**Material.** — 4 fragments, IGP UW/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)


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 Eoscapheites Breistroffer. Except for the helicoidal coil and the general twisting of the shell, the similarity with Eoscapheites 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 Eoscapheites, 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 Meech, 1876

Subfamily Turrilitinae Meech, 1876

Genus Pseudhelicoceras Spath, 1922

Pseudhelicoceras convolutum (Quenstedt)

(pl. 3: 10 and 11)


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 (Quenstedt); 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.
Pseudohelicoceras elegans (d’Orbigny)

(pl. 4: 1 and 2)

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

Remarks. — In revising Passendorfer’s “Turrilites elegans” and the validity of Spath’s Pseudohelicoceras 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 lowest row of tubercles.

Occurrence. — The smaller specimen is from the condensed Albian of Biala Woda, and the larger one from Malá 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.

Pseudohelicoceras 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:W 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 1962a: 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 astiericus* d’Orbigny, 1842.

*Proturrilitoides* is known from the European Middle Albian.

*T. (Proturrilitoides) emericianus* (d’Orbigny)

(pl. 4: 3 and 4)

1930. *Heteroceras* sp. aff. *Emericianum* d’Orb.: Passendorfer, 668, fig. 25, pl. 4: 68.

*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.

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)* Spatb, 1923

*Type species:* *Turrilites hugardianus* d’Orbigny, 1842.

*Turrilitoides* occurs in the Eurasian Upper Albian.

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**T. (Turrilitoides) hugardianus (d'Orbigny)**

(pl. 4: 9 and 10)


1868. *Turrilitoides* (Turrilitoides) hugardianus (d'Orb.; Wiedmann and Dieni, 78, figs. 57 and 58, pl. 9: 3.

1868. *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 1979a. *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 (1979a) 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)


1968. *Turrilitoides* (Turrilitoides) intermedius (P. et C.); Renz, 84, fig. 30f, pl. 17: 24–26 (with synonymy). *Turrilitoides* (Turrilites) intermedius (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.


1978. *T. densicostatus* (Pass.); Klinger and Kennedy, pl. 9: M, O.


**Holotype:** Specimen IGPUW/WR2.90 (here pl. 4: 11).
1962. *Douvilleiceras mammillatum* (Schlotheim); *Casey*, 265, figs. 102a, b, pl. 40: 4, pl. 41: 4, pl. 42: 6 and 9 (with synonymy).

*D. mammillatum* var. *aequinodum* (Questen); *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.


*D. mammillatum* var. *aequinodum* Questen; *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.


**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 *Weidicke* 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):

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<th>D</th>
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<tbody>
<tr>
<td>IGPUW/BW 15</td>
<td>55</td>
<td>23(0.42)</td>
<td>30(0.55)</td>
<td>16(0.29) 12 ribs/half whorl.</td>
</tr>
<tr>
<td>IGPUW/BW 19</td>
<td>41</td>
<td>18(0.44)</td>
<td>25(0.61)</td>
<td>15(0.37) 12 ribs/half whorl.</td>
</tr>
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</table>

**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, Biala Woda, and from Żeleźniak Kościeliski, Tatra Mts. The species can be regarded as cosmopolitan.

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*D. orbignyi* Hyatt


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).


**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):

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<tr>
<td>IGPUW/BW 21</td>
<td>36</td>
<td>16(0.45)</td>
<td>21.5(0.60)</td>
<td>10(0.28) 8—9 ribs/half whorl</td>
</tr>
<tr>
<td>IGPUW/BW 22</td>
<td>37</td>
<td>19(0.51)</td>
<td>23(0.62)</td>
<td>10(0.27) 7—8 ribs/half whorl</td>
</tr>
</tbody>
</table>

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 Biala 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 Douville, 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 (1979a) 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. I., 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)

Material. — 1 specimen, IGPUW/BW. 6; the specimen from Mala 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:

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<th>U</th>
<th>Wh/Wb</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/BW. 6</td>
<td>46</td>
<td>20(0.43)</td>
<td>16.2(0.35)</td>
<td>13.8(0.30)</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Occurrence. — The Polish specimens are from the condensed Albian of Biała Woda and Mala 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, MLw. 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):

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<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/MLw. 14</td>
<td>34</td>
<td>15(0.44)</td>
<td>13(0.38)</td>
<td>9.5(0.30)</td>
<td>0.86</td>
</tr>
<tr>
<td>IGPUW/WR3.103</td>
<td>21</td>
<td>9.5(0.45)</td>
<td>8.7(0.43)</td>
<td>5.5(0.26)</td>
<td>0.92</td>
</tr>
<tr>
<td>IGPUW/WR 107</td>
<td>18</td>
<td>7.5(0.44)</td>
<td>6(0.33)</td>
<td>6.5(0.36)</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Occurrence. — The Polish specimens arc from the condensed Albian of Wielka Rówien 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.

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):

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<thead>
<tr>
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<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
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<tbody>
<tr>
<td>IGPUW/BW 7</td>
<td>50</td>
<td>19(0.38)</td>
<td>18(0.36)</td>
<td>17(0.34)</td>
<td>0.95</td>
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</table>

Occurrence. — P. quenstedti s. str. seems to be a Middle to Upper Albian form. The Polish specimen is from the condensed Albian of Biala 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. Emeriti 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):
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.

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):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/WR2.102</td>
<td>29</td>
<td>12(0.41)</td>
<td>13(0.45)</td>
<td>10(0.35)</td>
</tr>
</tbody>
</table>

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 1920. *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):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/RM.Ch 55</td>
<td>215</td>
<td>90(0.42)</td>
<td>68(0.32)</td>
<td>?65(0.30?)</td>
</tr>
<tr>
<td>IGPUW/MŁw. 13</td>
<td>—</td>
<td>65</td>
<td>58</td>
<td>—</td>
</tr>
</tbody>
</table>
Fig. 25.

Albian Ammonitina; a, b. Puzosia mayorana 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 (1979a) — 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. odensis Kosmat, P. crebrisulcata Kosmat, 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. Chelmowa, 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, MLr. 11, MLw. 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:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb/Wh</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPuw/WR.97c</td>
<td>76</td>
<td>31(0.41)</td>
<td>?31(0.41)</td>
<td>25(0.33)</td>
<td>?1.00</td>
</tr>
<tr>
<td>IGPuw/WR.101</td>
<td>25</td>
<td>10(0.40)</td>
<td>10(0.40)</td>
<td>8(0.32)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

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. ballatus 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.
Parcisites 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. Par cisites 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/WR3.146</td>
<td>25</td>
<td>8.5(0.34)</td>
<td>6(0.24)</td>
<td>10(0.4)</td>
<td>0.71</td>
</tr>
</tbody>
</table>

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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/BW. 14</td>
<td>60</td>
<td>17(0.28)</td>
<td>17(0.28)</td>
<td>31.5(0.52)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

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 Biala 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.
1968. *Beudanticeras beudanti* (Brogn.); Wiedmann and Dieni, 128, pl. 11: 10 (with synonymy).
1979a. *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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/TR.1</td>
<td>130</td>
<td>72(0.55)</td>
<td>38(0.29)</td>
<td>19(0.15)</td>
<td>0.53</td>
</tr>
<tr>
<td>IGPUW/MŁr.12</td>
<td>90</td>
<td>45(0.50)</td>
<td>22(0.24)</td>
<td>16(0.18)</td>
<td>0.49</td>
</tr>
</tbody>
</table>

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 Rówień. *Beudanticeras beudanti* is widespread in the European Middle and Upper Albian and may be present in the Albian of Angola.

*Beudanticeras revoili* (Pervinquièrè)

(fig. 25e, f)

1907. *Desmoferas Revoili* Pervinquièrè, 131, fig. 48, pl. 5: 13—15.
1930. *Desmoferas Revoili* Perv.; Passendorfer, 644, fig. 13, pl. 4: 62.

*B. sp. aff. revoili* Perv.; Collignon, 71, pl. 267: 1164.


*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 Pervinquièrè’s species. It has the following measurements (in mm):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/BW</td>
<td>13</td>
<td>28</td>
<td>15(0.53)</td>
<td>8.4(0.30)</td>
<td>4.4(0.16)</td>
</tr>
</tbody>
</table>

The suture line of B. revoili, as published by Pervinquièrè (1907, fig. 48) and Passendorfer (1930, fig. 13), has a much incised and trifid or subtrifid lateral lobe. This means that the distinction, Scholz (1979a) 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.

**Occurrences.** — The Tatra specimen came from the condensed Albian of Biala 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)**

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

1908. Desmoceras (Uhligella) Walleranti Jacob, 31, figs. 17 and 18, pl. 3: 1—4.
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. 25.](image)

Suture of Uhligella walleranti Jacob, IGPUW/WR2.128, Wh = 12 mm.
Material. — 7 specimens, IGPUW/WR2.127—130, BW. 8—9, 11.

Remarks. — *U Hilgella 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):

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/WR2.127</td>
<td>82</td>
<td>40(0.49)</td>
<td>26(0.32)</td>
<td>17(0.21)</td>
<td>0.65</td>
</tr>
<tr>
<td>IGPUW/WR2.130</td>
<td>18</td>
<td>9.5(0.56)</td>
<td>6.8(0.38)</td>
<td>4.2(0.23)</td>
<td>0.73</td>
</tr>
</tbody>
</table>

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 “varieties” *rotunda* and *lateumbilicata*. The type specimens of both “varieties” 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.

**U Hilgella rebouli (Jacob)**

(pl. 6: 6 and 7)

1908. *Desmoceras (U Hilgella) Rebouli* Jacob, 32, pl. 4: 1—5.

1930. *D. (U Hilgella) Rebouli* Jacob; Passendorfer, 647, figs. 15 and 56b bis, pl. 3: 56 and 60.

1968. Beudanticeras (“*U Hilgella*”) rebouli (Jacob); Weidmann and Deni, 129, pl. 10: 6 (with synonymy).

1982. *B. (“U Hilgella”) 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):

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/WR2.124</td>
<td>57</td>
<td>27.5(0.55)</td>
<td>19.5(0.34)</td>
<td>10.5(0.18)</td>
<td>0.71</td>
</tr>
<tr>
<td>IGPUW/WR2.122</td>
<td>25.5</td>
<td>14.8(0.52)</td>
<td>9.5(0.33)</td>
<td>5(0.18)</td>
<td>0.64</td>
</tr>
</tbody>
</table>

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 southwestern Europe and Venezuela.

**U Hilgella balmensis (Jacob)**

(pl. 6: 8)

1908. *Desmoceras (U Hilgella) balmensis* Jacob, 33, fig. 20, pl. 3: 6—9.

1930. *D. (U Hilgella) cf. balmensis* Jacob; Passendorfer, 647, pl. 4: 63.


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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/BW. 12</td>
<td>25</td>
<td>11(0.44)</td>
<td>9.7(0.39)</td>
<td>5.4(0.22)</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Collignon’s (1963) “var. pinguis” cannot be distinguished from U. balmenis.

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)

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).
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.
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.

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):
ALBIAN AMMONITES OF POLAND

“var. complanata”

<table>
<thead>
<tr>
<th>IGPUW/WR2.145</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>10(0.55)</td>
<td>8.5(0.47)</td>
<td>2.8(0.16)</td>
<td>0.85</td>
<td></td>
</tr>
</tbody>
</table>

“var. media”

| IGPUW/MLr. 13 | 71 | 35(0.49) | 33(0.47) | 15(0.21) | 0.94 |

“typical form”

| IGPUW/MLw. 24 | 22.5 | 10.5(0.47) | 13(0.58) | 3.5(0.14) | 1.23 |

“var. inflata”

| IGPUW/WR3.14 | 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 Rôwien and Mala Łaka, 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).


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).
1930. *H. dentatus* Sow.; Passendorfer, 653, fig. 17?
1935. *H. dentatus* Sow.; Glasunova, 64, fig. 28, pl. 15: 1 and 2.
1959a. *H. dentatus* (Sow.); Ciesliński, 47, pl. 5: 1.
Material. — Several tens of specimens, variously preserved.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wb</th>
<th>Wb/Wh</th>
<th>U</th>
<th>Wb/Wh</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 9: 1</td>
<td>141</td>
<td>58(0.41)</td>
<td>39.2(0.28)</td>
<td>42.4(0.30)</td>
<td>0.67</td>
</tr>
</tbody>
</table>

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, prosiradial ribs. These ribs thicken upwards, and they terminate at the ventro-lateral margin with well pronounced swell 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 nominate subspecies and the others represent Anahoplites splendidens (Sow.) and H. (Hoplites) escagnollensis 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 A8–7 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)

Material. — Several specimens.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 10: 1</td>
<td>164.5</td>
<td>72.5(0.44)</td>
<td>55(0.33)</td>
<td>44(0.27)</td>
<td>0.76</td>
</tr>
</tbody>
</table>

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 Alionense 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):
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 (un-condensed quartzitic sandstones — unit A3 in fig. 4), central Poland.

**H. (Hoplites) vectensis** Spath

(pl. 10: 2)

Material. — Several specimens.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>102.6</td>
<td>36.6(0.36)</td>
<td>25(0.24)</td>
<td>35.6(0.35)</td>
</tr>
</tbody>
</table>

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)

Material. — One specimen, badly preserved, IGPUW/RM. A 56.

Measurements (in mm):

<table>
<thead>
<tr>
<th>Wh</th>
<th>Wb</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>19</td>
<td>1.36</td>
</tr>
</tbody>
</table>

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...
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.
1981. *H. rudis* Par. et Bon.; Saveliev, 44.

**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.
1947. *H. escragnollensis* Spath; Breistroffer, 28.
1981. *H. escragnollensis* Spath; Saveliev, 44.
1983. *H. (H.) escragnollensis* Spath; Marcinkowski and Radwański, 73, pl. 5: 4.

**Material.** — Two specimens, IGPUW/RM. A 60 and WR3.148.

**Measurements (in mm):**

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 7: 7</td>
<td>52</td>
<td>19.5(0.37)</td>
<td>19.6(0.38)</td>
</tr>
</tbody>
</table>

**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

1959a. *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 (un-condensed quartzitic sandstone — unit A₃ 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)


1973. *Otohoplites normanniae* Destombes et al., 77, fig. 8(1—3), pl. 3: 4, pl. 5: 1—3.


**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):**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 11: 1</td>
<td>—</td>
<td>50</td>
<td>36</td>
<td>—</td>
<td>0.72</td>
</tr>
<tr>
<td>pl. 11: 2</td>
<td>78</td>
<td>36(0.46)</td>
<td>—</td>
<td>18.4(0.23)</td>
<td>—</td>
</tr>
<tr>
<td>(phragmocone)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pl. 11: 2</td>
<td>—</td>
<td>70.5</td>
<td>50</td>
<td>—</td>
<td>0.71</td>
</tr>
<tr>
<td>(body chamber)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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: la). 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: lb). 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 A3), 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 *Leptoplites* 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 *Leptoplites* are a fairly homogeneous assemblage but might well have been left in *Anahoplites*. *Leptoplites*, 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. KENNY and HANCOCK 1978). We may not exclude the possibility that, when these genera co-occur, some of the representatives of *Leptoplites* 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. Chelmowa 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.

1930. Hoplitodes dentatus Sow.; Passendorfer, 653.

1971. Anahoplites splendens (Sow.); Owen, 154.

1978. A. splendens (Sow.); Kennedy and Hancock, 7.


Material. — Two specimens, IGPUW/WR3.149 and 150.

Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 7: 8</td>
<td>20.4</td>
<td>8.5(0.42)</td>
<td>5.5(0.27)</td>
<td>4.3(0.21)</td>
</tr>
</tbody>
</table>

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.

1825. Anahoplites planus (Mant.); Spath, 137, figs. 39a, 740a—b, c; pl. 12: 8a and 79, 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.


1973. A. planus (Mant.); Destombes et al., 86.


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):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 12: 1</td>
<td>128.4</td>
<td>54(0.42)</td>
<td>27(0.21)</td>
<td>730(70.23)</td>
</tr>
<tr>
<td>pl. 12: 2</td>
<td>149.7</td>
<td>63.5(0.42)</td>
<td>26(0.17)</td>
<td>740(70.27)</td>
</tr>
<tr>
<td>pl. 13: 1</td>
<td>186</td>
<td>79(0.42)</td>
<td>32(0.17)</td>
<td>36.6(0.20)</td>
</tr>
</tbody>
</table>
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 whors 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 1962a, 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 whors of either a micro- or macroconch. The latter has a greater number of whors (MAKOWSKI 1962a, b); thus pronounced ornamentation appears (or is preserved) at greater diameters (cf. also GLASUNOVA 1953, pl. 21).

Occurrence. — Upper Albian (Auritus Subzone), Mt. Chelmowa, 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.
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):

<table>
<thead>
<tr>
<th></th>
<th>D Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 14: 1</td>
<td>180.7</td>
<td>74.7(0.41)</td>
<td>45(0.25)</td>
<td>46(0.25)</td>
</tr>
<tr>
<td>151</td>
<td>67.5(0.45)</td>
<td>42.3(0.28)</td>
<td>33.4(0.22)</td>
<td>63</td>
</tr>
<tr>
<td>pl. 15: 1</td>
<td>181.5</td>
<td>68.5(0.38)</td>
<td>740(0.22)</td>
<td>45.5(0.25)</td>
</tr>
</tbody>
</table>

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. Chelmowa, 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. Anommites fittoni d’ARCHIAC; d’ORBIGNY, 225, pl. 64: 1—2.
A. planus (MANT.) forma fittoni (d’ARCHIAC); SPATH, 143, figs. 40h—41.
1959a. A. cf. fittoni (d’ARCHIAC); CIEŚLINSKI, 50.
1962. Euhoplites inornatus; CHLEBOWSKI, 225, fig. 1.
1971. A. planus gracilis SPATH; OWEN, 133.
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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 16: 1</td>
<td>182</td>
<td>78(0.43)</td>
<td>—</td>
<td>42.5(0.23)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>147.6</td>
<td>58.6(0.40)</td>
<td>28(0.19)</td>
<td>34(0.23)</td>
<td>0.48</td>
</tr>
</tbody>
</table>

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. Chelmowa 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.


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):**

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>138.5</td>
<td>62.5(0.45)</td>
<td>21(0.15)</td>
<td>25(0.18)</td>
<td>0.35</td>
</tr>
</tbody>
</table>

**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. Chelmowa, 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.


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):**

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>98</td>
<td>40(0.41)</td>
<td>23(0.23)</td>
<td>27(0.27)</td>
<td>0.57</td>
</tr>
</tbody>
</table>

**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.
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):**

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>U</th>
<th>Tu</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/RM.Ch 38</td>
<td>190</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>pl. 17: 1</td>
<td>180</td>
<td>82(0.45)</td>
<td>35(0.19)</td>
<td>0.5(7)</td>
<td>ca. 64</td>
</tr>
</tbody>
</table>

**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 phragmcone 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):**

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>U</th>
<th>Tu</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 18: 4</td>
<td>128</td>
<td>66(0.51)</td>
<td>29.5(0.23)</td>
<td>0.5(7)</td>
<td>ca. 64</td>
</tr>
<tr>
<td>80</td>
<td>39.5(0.49)</td>
<td>21.8(0.27)</td>
<td>0.5(6)</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

**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. transascipicus* Glasunova (1953: 72, pl. 20: 1—4), due to its strongly bifurcating ribs and intercalary ribs, seems to be a closely related species or a synonym of *A. costosus* Spat (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* Spat (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 assignment 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. Chelmowa, central Poland. The species *A. asiaticus* has been recorded from the upper part of the Middle Albian (*Hoplitites 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 Spat, 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).


**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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>fig. 27</strong></td>
<td>219.5</td>
<td>80(0.36)</td>
<td>?55(0.25)</td>
<td>?70(0.32)</td>
<td>70.69</td>
</tr>
<tr>
<td><strong>pl. 24: 1</strong></td>
<td>183</td>
<td>74.5(0.41)</td>
<td>45.7(0.25)</td>
<td>43.7(0.24)</td>
<td>61.61</td>
</tr>
<tr>
<td><strong>IGPUW/RM.Ch 20</strong></td>
<td>194</td>
<td>75(0.39)</td>
<td>?40(0.21)</td>
<td>54.3(0.28)</td>
<td>70.53</td>
</tr>
</tbody>
</table>

**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 swellings on the umbilical margin. One of them yields similarly delicate, slightly falcoïd 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. Chelmowa.

Occurrence. — Upper Albian (Auritus Subzone), Mt. Chelmowa, 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):

<table>
<thead>
<tr>
<th>Macroconchs</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
<th>Tu</th>
<th>Tv</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/RM.Ch 1</td>
<td>1053</td>
<td>21(0.40)</td>
<td>—</td>
<td>13.7(0.26)</td>
<td>—</td>
<td>0.5(5)</td>
<td>0.5(10)</td>
<td>0.5(17)</td>
</tr>
<tr>
<td>pl. 19: 1</td>
<td>166</td>
<td>34(0.44)</td>
<td>23(0.29)</td>
<td>21(0.27)</td>
<td>0.67</td>
<td>15</td>
<td>—</td>
<td>44</td>
</tr>
<tr>
<td>pl. 18: 2</td>
<td>78</td>
<td>26(0.40)</td>
<td>17.5(0.27)</td>
<td>17.6(0.27)</td>
<td>0.67</td>
<td>14</td>
<td>—</td>
<td>45</td>
</tr>
<tr>
<td>pl. 18: 3</td>
<td>65</td>
<td>30.5(0.37)</td>
<td>730(0.22)</td>
<td>747(0.34)</td>
<td>0.76</td>
<td>0.5(6)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>pl. 23: 2</td>
<td>157</td>
<td>54(0.34)</td>
<td>41(0.26)</td>
<td>41(0.26)</td>
<td>0.82</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>pl. 20: 3</td>
<td>106</td>
<td>41(0.39)</td>
<td>33.5(0.32)</td>
<td>37(0.35)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

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 whors 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 diagnostically 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 resembles 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 1962a, 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 1962b). 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. Chelmowa, 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; BREISTOFER, 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wh/Wh</th>
<th>Tu</th>
<th>Tv</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 21: 1</td>
<td>116</td>
<td>49(0.42)</td>
<td>229(0.25)</td>
<td>31(0.27)</td>
<td>0.59</td>
<td>0.5(7)</td>
<td>0.5(30)</td>
<td>0.5(20)</td>
</tr>
<tr>
<td>pl. 20: 2</td>
<td>95.6</td>
<td>44(0.46)</td>
<td>20(0.21)</td>
<td>27.8(0.29)</td>
<td>0.45</td>
<td>0.5(9)</td>
<td>0.5(22)</td>
<td>—</td>
</tr>
<tr>
<td>pl. 20: 1</td>
<td>7155</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

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 ($D = 95.6 \text{ mm}$), 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 ($D = 116 \text{ mm}$). 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. Chelmowa, 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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
<th>Tu</th>
<th>Tv</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 18: 5</td>
<td>775</td>
<td>27(30.36)</td>
<td>18(30.24)</td>
<td>23(30.30)</td>
<td>0.67</td>
<td>12</td>
<td>--</td>
<td>0.5(23)</td>
</tr>
<tr>
<td>pl. 21: 2</td>
<td>123</td>
<td>53(0.43)</td>
<td>34(0.28)</td>
<td>37(0.28)</td>
<td>0.64</td>
<td>16</td>
<td>0.5(11)</td>
<td>--</td>
</tr>
</tbody>
</table>

**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. Chelmowa 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 aegoceratoidei* 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)

1979. *B. (Eubrancoceras) versicostatum* (Mich.); Gebhard, 94, figs. 59 and 60, pl. 6: 9, pl. 7: 1.


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 "Rauliniceras" (= *Tegoceras*) by Spath (1931) and
others. Gebhard (1979) was able to demonstrate, however, that the suture line is pseudo-

ceratitic, 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. I. 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 Dini, 137, figs. 84 and 85, pl. 13: 1—3 (with synonymy).

1971. *H. orbignyi* (Spath); Renz, 578, figs. 2a—c, 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)

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/MLw. 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 Mojsisoviciinae Hyatt, 1903
Genus Dipoloceras Hyatt, 1900

Type species: Ammonites cristatus Deluc in Brogniart, 1822.

Gebhard (1983b) was able to demonstrate that the type species of the genus Mojsisovia Steinmann, i.e., M. durfeldi Steinmann, actually belongs to Falloticeras Parona et Bonarelli, 1897. Consequently, the previous synonym of Mojsisovia, 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. Mortoticeras (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).
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.); Spåth, 374, figs. 122c, d, 124a—c, pl. 32: 19, pl. 33: 5, pl. 34: 4—7 (with synonymy).

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 delartiei d'Orbigny, 1841.

This is a cosmopolitan Middle Albian group of forms.

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

1897. Schloenbachia Delaruei d'Orb.; Parona and Bonarelli, 88, pl. 2: 9 and 10.
1930. Mojsisoviciasia sp. aff. delaruei (d'Orb.); Spåth, 61, pl. 9: 13 and 16.
1931. Dipoloceras delaruei (d'Orb.); Spåth, 356, fig. 116.
1947. D. (Dipoloceroides) delaruei (d'Orb.); Breistroffer, 74.
1979. D. (Mojsisoviciasia) delaruei (d'Orb.); Gebhard, 99, figs. 65, 66; pl. 7: 4 and 5.


Measurements (in mm):

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl. 8: 6</td>
<td>21</td>
<td>8(0.38)</td>
<td>10(0.48)</td>
</tr>
</tbody>
</table>

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)

(par. 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 (= Prowyteroceras (Goodhallia) 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. 43: 1, pl. 46: 1—2 (with synonymy).


1932. *M. (P.) potternense* Spath; Erstavi, 137, pl. 6: 1.

1932. *M. (P.) inflatum* Sow.; Passendorfer, 655 (pars, sec above).

1932. M. (Subschloenbachia) inflatum Sow.; Passendorfer, 655, pl. 9: 4 (= Mortoniceras sp.).

1932. Mortoniceras inflatum Sow.; Passendorfer, 655, pl. 9: 5 ( = Pro-hysteroceras (Goodhallia) goodhalli (Sow.)).

1932. Mortoniceras inflatum Sow.; Passendorfer, 655, pl. 9: 6 ( = Pro-hysteroceras (Goodhallia) goodhalli (Sow.)).

1932. Mortoniceras inflatum Sow.; Passendorfer, 655, pl. 9: 7 ( = Pro-hysteroceras (Goodhallia) goodhalli (Sow.)).

1932. Mortoniceras inflatum Sow.; Passendorfer, 655, pl. 9: 8 ( = Pro-hysteroceras (Goodhallia) goodhalli (Sow.)).

Material. — Over 20 specimens, a few of which are nearly complete; IGPWU/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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
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<td>pl. 25: 1</td>
<td>366</td>
<td>84(0.23)</td>
<td>770(0.19)</td>
<td>187(0.51)</td>
<td>70.83</td>
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<tr>
<td></td>
<td>190</td>
<td>62(0.33)</td>
<td>758(0.30)</td>
<td>82(0.43)</td>
<td>70.93</td>
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<tr>
<td></td>
<td>267</td>
<td>87.5(0.33)</td>
<td>768(0.25)</td>
<td>119.4(0.45)</td>
<td>70.78</td>
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<tr>
<td></td>
<td>190.8</td>
<td>67.6(0.35)</td>
<td>53.6(0.28)</td>
<td>82(0.43)</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>252</td>
<td>770(0.28)</td>
<td>103.5(0.43)</td>
<td>0.87</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>163.3</td>
<td>57(0.35)</td>
<td>68.5(0.42)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>pl. 23: 1</td>
<td>428</td>
<td>116(0.27)</td>
<td>213(0.50)</td>
<td>0.7(20)</td>
<td>—</td>
</tr>
</tbody>
</table>

Description. — Whorls somewhat higher than they are wide, polygonal in sections through the ribs, and almost quadrato 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 splitting 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. Chelmowa section as Mortoniceras rostratum (Sow.) (cf. Ciesiński 1960, Chlebowski 1962) it really represents the species inlatum (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. potternense 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 1962a, 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. Chelmowa: 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-glaucolithic 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)


pars 1930. *Mortoniceras (Subschloenbachia) inflatum* Sow.; Passendorfer, 655.

1971. *Mortoniceras (Mortoniceras) pricei* (Spath); Renz, 595, figs. 5f—g, 7f; 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. 12: 13 (with synonymy).

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

Measurements (in mm):

<table>
<thead>
<tr>
<th></th>
<th>Wh</th>
<th>Wb</th>
<th>W0/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPW/RM.Ch 46</td>
<td>48</td>
<td>31</td>
<td>0.64</td>
</tr>
<tr>
<td>pl. 8: 7</td>
<td>34</td>
<td>30.2</td>
<td>0.89</td>
</tr>
</tbody>
</table>

**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. Intercalary 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 IGPW/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. Chelmowa, central Poland; redeposited into sandy-glaucolithic 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. Schloglenschia 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).
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):

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/RM.Ch 47</td>
<td>132.8</td>
<td>46(0.35)</td>
<td>—</td>
<td>46(0.35)</td>
<td>—</td>
<td>0.5(28)</td>
</tr>
<tr>
<td>IGPUW/RM.Ch 48</td>
<td>7316</td>
<td>—</td>
<td>—</td>
<td>129.5(0.41)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>222</td>
<td>74.7(0.34)</td>
<td>69(0.31)</td>
<td>89.5(0.40)</td>
<td>0.92</td>
<td>—</td>
</tr>
</tbody>
</table>

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 ventrolateral 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. Chelmowa, 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 (Subschloglenschia) inflatum SOW.; Passendorfer, 655.
1932. Mortoniceras (Pervinquieria) pachys (SEELEY); Spath, 405, figs. 130d, 138—139 (with synonymy).

Material. — Five whorl fragments, IGPUW/Mlr. 17—21.
Measurements (in mm):

<table>
<thead>
<tr>
<th></th>
<th>Wh</th>
<th>Wb</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGPUW/Mlr. 20</td>
<td>22.9</td>
<td>22.7</td>
<td>0.99</td>
</tr>
<tr>
<td>IGPUW/Mlr. 21</td>
<td>22.4</td>
<td>23.5</td>
<td>1.05</td>
</tr>
</tbody>
</table>

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-glaucenic 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):

<table>
<thead>
<tr>
<th>Pl</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>U</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>71.15</td>
<td>32(30.28)</td>
<td>26(20.23)</td>
<td>53(70.46)</td>
<td>70.81</td>
</tr>
<tr>
<td></td>
<td>57.7</td>
<td>16.9(0.29)</td>
<td>13(0.22)</td>
<td>27(0.47)</td>
<td>0.77</td>
</tr>
</tbody>
</table>

**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.) monraynaudensis 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.

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**Genus Prohysteroceras** Spath, 1921

**Subgenus P. (Goodhallites) Spath, 1932**

*Type species: Anomoceras goodhalli* J. Sowerby, 1820.

**Occurrence.** — Lower Upper Albian, world-wide.

**P. (Goodhallites) goodhalli** (J. Sowerby)

(pl. 8: 8)

1921. *Mortoniceras inflatum* var.; Pasendörfer, 245, pl. 9: 5.


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.


**Material.** — One poorly preserved part of a whorl, IGPUW/MŁw. 26, which belongs to a phragmocone.

Measurements (in mm):

<table>
<thead>
<tr>
<th>Pl</th>
<th>Wh</th>
<th>Wb</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>28</td>
<td>27</td>
</tr>
</tbody>
</table>

**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 Mala 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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R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE I

1. *Phylloceras* (*Hypophylloceras*) *velledae velledae* (Michelin), IGPUW/WR2.2, Wielka Rówień, × 1.5.
3—5. *Phylloceras* (*Hypophylloceras*) *subalpinum subalpinum* (d'Orbigny); 3 — IGPUW/MLw. 4, Mała Łąka, × 1; 4 — IGPUW/BW. 2, Biała Woda, × 1; 5 — IGPUW/WR3.8, Wielka Rówień, × 1.5.
8—9. *Protetragonites aeolus aeolus* (d'Orbigny), both from Wielka Rówień; 8 — IGPUW/WR3.27, × 2; 9 — IGPUW/WR3.28, × 1.5.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in the High-Tatric Series, southern Poland.
R. Marcinowski and J. Wiedmann: Albian Ammonites
1. Tetragonites jurinianus (Pictet), IGPUW/BW. 3, Biała Woda, × 1.
2. Eoaudryceras (Eoaudryceras) himzui shimizu Breistroffer, IGPUW/MLw. 10, Mała Łąka, × 1.
3. Eoaudryceras (Eoaudryceras) shimizu 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.
13. Hamites (Hamites) rotundus Sowerby, IGPUW/WR3.41, Wielka Rówień, × 1.5.
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.

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. *Hemiptychothere tetricum* 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. *Hemiptychothere 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) saussurianum* (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.


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 (*Blanchetti* Subzone).
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 4

1. *Pseudohelicoceras elegans* (d'ORBIGNY), IGPUW/BW. 4, Biala Woda; a — outer face of the whorl, b — lower face of the whorl, c — upper face of the whorl, × 2.

2. *Pseudohelicoceras elegans* (d'ORBIGNY), IGPUW/MLw. 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* (PICIET 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/Mlm. 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.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
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/MLW. 13, Mała Łąka, × 0.6.
6. Puzosia quenstedti communis SPATI, 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.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 6

1. *Puzosia quenstedti media* SEITZ, IGPUW/WR2.98c, Wielka Rówień, × 1.
2. *Puzosia quenstedti furnitana* PERVINQUIÈRE, IGPUW/MLw. 14, Meła Ląka, × 1.
3. *Puzosia mayoriana provincialis* (PARONA et BONARELLI), IGPUW/WR. 101, Wielka Rówień, × 1.5.
4—5. *Uhligella walleranti* JACOB, both from Wielka Rówień; 4 — IGPUW/WR2.127, × 1; 5 — IGPUW/WR2.130, × 2.
6—7. *Uhligella rebouli* JACOB, both from Wielka Rówień, × 1; 6 — IGPUW/WR2.122; 7 — IGPUW/WR2.124.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in the High-Tatric Series, southern Poland.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 7

1. *Beudanticeras beudanti* (BRONGNIART), IGPUW/TR. 1, Turnia Ratusz, × 0.5.
2. *Desmoceras (Desmoceras) latidorsatum latidorsatum* (MICHELIN), IGPUW/MLw. 24, Mała Łąka, two lateral views of the same specimen, × 1.5.
5—6. *Douvilleiceras mammillatum* (SCHLOTHEIM), both from Biała Woda, × 1; 5 — IGPUW/BW. 19; 6 — IGPUW/BW. 15.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum* to *Altonense* Subzones) in the High-Tatric Series, southern Poland.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 8

1. *Hysteroceras varicosum binodosum* (Stie1er), IGPUW/WR3.151, Wilka Rówień, × 1.8.
3. *Hysteroceras carinatum* Spath, IGPUW/MLw. 25, Mała Łąka, × 1.
4. *Dipoloceras (Dipoloceras) cristatum* (Deluc), IGPUW/WR2.155, Wilka Rówień, × 1.8.
5. *Dipoloceras (Dipoloceras) bouchardianum* (d’Orbigny), IGPUW/WR. 156, Wilka Rówień, × 1.5.
7. *Mortoniceras (Mortoniceras) pricei* (Spath), IGPUW/MLr. 14, Mała Łąka, × 1.
8. *Prohysteroceras (Goodhallites) goodhalli* (Sowerby), IGPUW/MLw. 26, Mała Łąka, × 1.

All specimens are from the stratigraphically condensed glauconitic limestone (*Floridum to Altonense* Subzones); the specimen presented in 7 was redeposited from the glauconitic limestone in the sandy glauconitic mudstone (*Blancheti* Subzone); High-Tatric Series, southern Poland.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 9

1. *Hoplites* (*Hoplites*) *dentatus dentatus* (Sowerby), IGPUW/RM.A 51, lower part of the phosphatic bed, Middle Albian, × 0.9.

PLATE 10

1. *Hoplites (Hoplites) dentatus robustus* Spath, IGPUW/RM.A 50.
2. *Hoplites (Hoplites) vechensis* Spath, IGPUW/RM.A 52.

Both specimens are from the lower part of the phosphatic bed, Middle Albian, Annopol-on-Vistula, central Poland, \( \times 0.95 \).
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 11

1. *Hoplites (Otohoplites) normanniae* DESTOMBES et al., IGPUW/RM.A 54, quartzitic sandstone, *Eodontatus* Subzone, × 0.9.
2. *Hoplites (Otohoplites) normanniae* DESTOMBES et al., IGPUW/RM.A 55 (specimen with partly preserved body chamber), quartzitic sandstone, *Eodontatus* Subzone, × 0.9.
3. *Hoplites (Hoplites) baylei* SPAETH, IGPUW/RM.A 56, lower part of the phosphatic bed, Middle Albian, × 1.70. All specimens are from Annopol-on-Vistula, central Poland.
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.
R. Marcinkowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 13

1. *Anahoplites planus planus* (Mantell), IGPUW/RM.Ch 31 (macroconch), *Auritus* Subzone, Mt. Chelmowa, central Poland, × 1; arrow indicates the beginning of the body chamber.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 14

1. *Anahoplites planus inflatus* Spath, IGPUW/RM.Ch 28, *Auritus* Subzone, Mt. Chelmowa, central Poland, × 0.9, arrow indicates the beginning of the body chamber.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 15

1. *Anahoplites planus inflatus* Spath, IGPUW/RM.Ch 29; arrow indicates the beginning of the body chamber.

Both specimens are from the Auritus Subzone, Mt. Chełmowa, central Poland, × 0.9.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 16

1. *Anahoplites planus fittoni* (d'ARCHIAC), IGPUW/R.M.Ch 37.
2. *Anahoplites planus compressus* Spath, IGPUW/R.M.Ch 32.
Both specimens are from the *Auritus* Subzone, Mt. Chełmowa, central Poland, × 0.9; arrow indicates the beginning of the body chamber.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 17

R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

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.
5. Callihoplites auritus (Sowerby), IGPUW/RM.Ch 3 (casts of the inner whorls).
All specimens are from the Auritus Subzone, Mt. Chelmowa, central Poland, × 0.9.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 19

1. *Callihoplites patella* Spath, IGPUW/RM.Ch 2 (macroconch), *Auritus* Subzone, Mt. Chelmowa, central Poland, × 0.85; arrow indicates the beginning of the body chamber.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
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* Subzoné, Mt. Chełmowa, central Poland, $\times 0.95$. 
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 21

2. Calliophites auritus (Sowerby), IGPUW/RM.Ch 7.
Both specimens are from the Auritus Subzone, Mt. Chelmowa, central Poland, × 0.9; arrow indicates the beginning of the body chamber.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
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. Chelmowa, central Poland; arrow indicates the beginning of the body chamber.
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES
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. Chelmowa, central Poland; arrow indicates the beginning of the body chamber.
R. Marcinowski and J. Wiedmann: Albian Ammonites
R. MARCINOWSKI and J. WIEDMANN: ALBIAN AMMONITES

PLATE 24

1. *Callihoplites catillus* (Sowerby), IGPUW/RM.Ch 19 (body chamber).

Both specimens are from the *Auritus* Subzone, Mt. Chelmowa, central Poland, × 0.9.
R. Marcinowski and J. Wiedmann: Albian Ammonites
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. Chelmowa, central Poland.
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