

# On some Turonian and Coniacian ammonites from the Czech Republic

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† *Herbert Summesberger died on the 11<sup>th</sup> of April 2023*

## ABSTRACT:

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Ammonites, chiefly from the Upper Turonian *Prionocyclus germari* Zone, the Lower Coniacian part of the *Forresteria (Harleites) petrocoriensis* Zone, and the Lower Coniacian *Peroniceras (Peroniceras) tridorsatum* Zone from the Czech Republic are figured and described, including classic material originally described by Fritsch (1872–1898) and Jahn (1892, 1896). In all, 25 species are recognised, including two, *Pseudojacobites* sp. and *Muniericeras* sp., that represent genera previously not known from the area.

**Key words:** Cretaceous; Turonian; Coniacian; Ammonites; Czech Republic.

## IN MEMORY OF HERBERT SUMMESBERGER (1939–2023)

I first met Herbert Summesberger in the mid-1970s during a visit to Vienna to collaborate with his colleague Heinz Kollmann on Albian ammonites from Upper Austria. From this meeting there developed a collaboration that was to extend over nearly fifty years until his unexpected death in April 2023. At that time, Cretaceous ammonites were not his speciality, but they soon became one, and he was the leading Austrian authority on the group. Our collaboration began with revisions of classic faunas from the Austro-Hungarian Empire housed in the Naturhistorisches Museum in Vienna, described by Franz Ritter von Hauer between 1847 and 1866, Anton Redtenbacher in 1873, and Jaroslav Jahn between 1892 and 1896. Maastrichtian faunas from Neuberg in Steiermark included classic marker fossils including *Pachydiscus (P.) neubergicus* and *P. (P.) epiplectus*, whilst collections from Nahoryany in Ukraine included giant scaphites (*Acanthoscaphites*). The Gschliefgraben window yielded diverse Campanian faunas, whilst the revision of the Upper Turo-

nian, Coniacian and Santonian faunas of the Gosau Group revealed rich and diverse assemblages. Herbert worked with, and published with local collectors, including Peter Skoumal, Heinz Seidel, Norbert Schwaighoffer, Alfred Leiblfinger and others, who did all the hard work, whereas my contribution was from the office chair. The present contribution began in the 1970s with a study of the Coniacian ammonites from what is now the Czech Republic in the Vienna collections, described by Jahn, followed by visits to localities in the Bohemian Cretaceous Basin under the guidance of Stan Čech of the Czech Geological Survey, and museum studies in Prague and elsewhere. My last conversations with Herbert were devoted to completing this long-delayed project, which is now presented to the reader, almost fifty years after its inception.

My memories of Herbert, science apart, are of a kind and generous man, who took me around Austria and visited Oxford on a number of occasions, accompanied by a sturdy aluminum case full of bottles of Austrian wine... (a full obituary of Herbert is given in *Annalen des Naturhistorischen Museum, Wien*, series A, **124**, 5–26).



## INTRODUCTION

In this contribution we describe and illustrate selected ammonite species from the Upper Turonian and Lower Coniacian of the Czech Republic. The earliest account of these ammonites was that of Reuss in his *Die Versteinerungen der Böhmisches Kreideformation*, published in Stuttgart in 1845. Amongst species described there, one, *Ammonites germari* Reuss, 1845 (p. 22, pl. 7, fig. 10), from the “Pyropensande von Trziblitz” is now recognised as a species of the genus *Prionocyclus* Meek, 1876, and an Upper Turonian zonal index with a geographic distribution that extends from the United States Western Interior to Europe and central India. Reuss’ material has not been traced. The major 19<sup>th</sup> century contributions on mid-Cretaceous ammonites from Bohemia are those of Anton Johann Fritsch (1830–1913) (Anton Fritsch was the spelling he used when writing in German; when writing in Czech, it was Antonín Jan Frič). His collections survive in the National Museum (Národní Muzeum), Prague, and many of them are described and illustrated below. Fritsch’s output was enormous, with some contributions published in both German and Czech editions, and dealing with not only ammonites, but also groups from vertebrates to plants to what we now interpret as trace fossils. The principal contribution on ammonites and other cephalopods was published in 1872: *Cephalopoden der böhmischen Kreideformation*, Unter Mitwirkung des † Dr. Urb. Schlönbach. Some subsequent authors have referred to this work as by Fritsch and Schlönbach, but in the text, the majority of the new species are attributed to Fritsch alone, and this authorship is followed here. For clarity, we also retain the German Fritsch, as this was used in this key paper, but indicate in the bibliography the alternative spellings used in some publications.

Subsequent contributions relevant to the present study are those of: Jahn (1892, 1896), whose collections survive in the Naturhistorisches Museum in Vienna and are described below; Houša (1967) who described the abundant material belonging to the genus *Lewesiceras* Spath, 1922; Vašíček (1992); Svobodová *et al.* (2014), and Košťák *et al.* (2024).

## LITHOSTRATIGRAPHY

The lithostratigraphic terms used by 19<sup>th</sup> century authors such as Fritsch and Jahn, whose collections provided the bulk of the material described below, differs in many respects from the current standard terminology adopted by the Czech Geological Survey

(Čech *et al.* 1980; Čech 2011). The correlation of 19<sup>th</sup> century and current nomenclature is set out below in stratigraphic order:

19 <sup>th</sup> century terminology	Current nomenclature
Chlomecker Schichten	Merboltice Formation
Priesener Schichten	Březno Formation Rohatce Member
Teplitzer Schichten	Tepllice Formation
Iser Schichten	Jizera Formation
Malnizer Schichten	
Weissenberger Schichten	Bílá Hora Formation

A key interval in the sequence is the Priesener Schichten of early workers: the Rohatce Member and the Březno Formation of current nomenclature. Fritsch and other workers recognised a sequence of marker beds, well-illustrated and described in Fritsch (1893, p. 12, text-fig. 2). The sequence is as follows:

(youngest)

5. Krabbenschichten.
4. Sphaerosiderite mit *Am. dentatocarinatus*.
3. Gastropodenschichten.
2. Radiolarienschichten.
1. Geodiaschichten, glauconitisch.
0. Nuculaschichten.

(oldest)

The Rohatce Member corresponds to units 0, 1 and 2 of Fritsch (1893).

The Baculilitentonon of authors – literally baculite clay – corresponds to the interval with abundant *Sciponoceras bohemicum bohemicum* in the Březno Formation [Priesener Schichten].

## BIOSTRATIGRAPHY

The zonal and substage divisions of the Upper Turonian and Coniacian based on ammonites used here is set out below:

The subdivision of the Upper Turonian is that recognised in Münsterland Basin, Westphalia, Germany (Kennedy and Kaplan 2019).

The base of the Coniacian Stage is drawn at the first occurrence of the inoceramid bivalve *Cremnoceramus deformis erectus* (Meek, 1877) in bed 46 of the Salzgitter-Salder section in north Germany (Walaszczyk *et al.* 2022). The occurrence of the ammonite *Forresteria (Harleites) petrocariensis* (Coquand, 1859) in the Upper Turonian *Mytiloides scupini* Zone, below the first occurrence of *C. deformis erectus* in

the Słupia Nadbrzeżana section in central Poland (Kennedy and Walaszczyk 2004) demonstrates that the base of the stage lies within the *petrocoriensis* Zone.

Kennedy (1984) proposed the following divisions of the Coniacian in the type area of northern Aquitaine:

Substage	Zone
Upper Coniacian	<i>Paratexanites serratomarginatus</i> <i>Gauthiericeras margae</i>
Middle Coniacian	<i>Peroniceras tridorsatum</i>
Lower Coniacian	<i>Forresteria (Harleites) petrocoriensis</i>

That the *petrocoriensis* Zone spans the Turonian/Coniacian boundary as now defined is noted above. Coniacian substages have not been formally defined, but the Working Party on the Coniacian Stage (Kauffman *et al.* 1996) proposed inoceramid based definitions, the base of the Middle Coniacian defined by the first occurrence of *Volviceras* Stoliczka, 1871, the base of the Upper Coniacian by the first occurrence of *Magadiceramus subquadratus* (Schlüter, 1877). On this basis the substage/ammonite zonation of current usage is set out below (from Kennedy and Walaszczyk 2023):

Substage	Ammonite zone
Upper Coniacian	<i>Texanites pseudotexanus</i> <i>Paratexanites serratomarginatus</i>
Middle Coniacian	<i>Gauthiericeras margae</i>
Lower Coniacian	<i>Peroniceras tridorsatum</i> <i>Forresteria (Harleites) petrocoriensis</i> (upper part)

## THE AMMONITE FAUNAS

The zonal faunas listed below are based on detailed records in Fritsch (1872–1898), Čech (1987), Vašíček (1982), Wiese *et al.* (2004), Svobodová *et al.* (2014), and our own observations.

### Upper Turonian

#### *Subprionocyclus neptuni* Zone

We have not studied this assemblage. The presence of the zonal fauna was discussed in detail by Wiese *et al.* (2004), who recognised elements of the upper part of the *Hyphantoceras* Event (Kaplan and Kennedy 1996, p. 323) in the lower part of the Teplice Formation (their bed 4) of the Úpohlavy working quarry in the Litoměřice District in the Ústí nad Labem region of

northern Bohemia. They noted that *Subprionocyclus* Shimizu, 1932 was rare, recording the following: *Lewesiceras mantelli* Wright and Wright, 1951 (common), *Subprionocyclus* cf. *branneri* (Anderson, 1902), *Allocrioceras strangulatum* Wright, 1979 (a junior synonym of *Allocrioceras nodiger* (Roemer, 1870), *Hyphantoceras (Hyphantoceras) reussianum* (d'Orbigny, 1850), *Eubostriochoceras (Eubostriochoceras) saxonicum* (Schlüter, 1875), *Sciponoceras bohemicum* (Fritsch, 1872), *Scaphites geinitzii* d'Orbigny, 1850, and *Yezoites bladenensis* (Schlüter, 1871).

Fritsch (1872, p. 30, pl. 3, fig. 4) recorded “Ammonites Neptuni Gein. Aus dem grauen Kalke der Malnitzer Schichten am rechten Egerufer unterhalb der Zucker Fabrik in Laun.” The original figure is reversed, and the specimen, NMP03136 (Pl. 2, Figs 1–3), is a pathological juvenile *Collignonicer* Breistroffer, 1947.

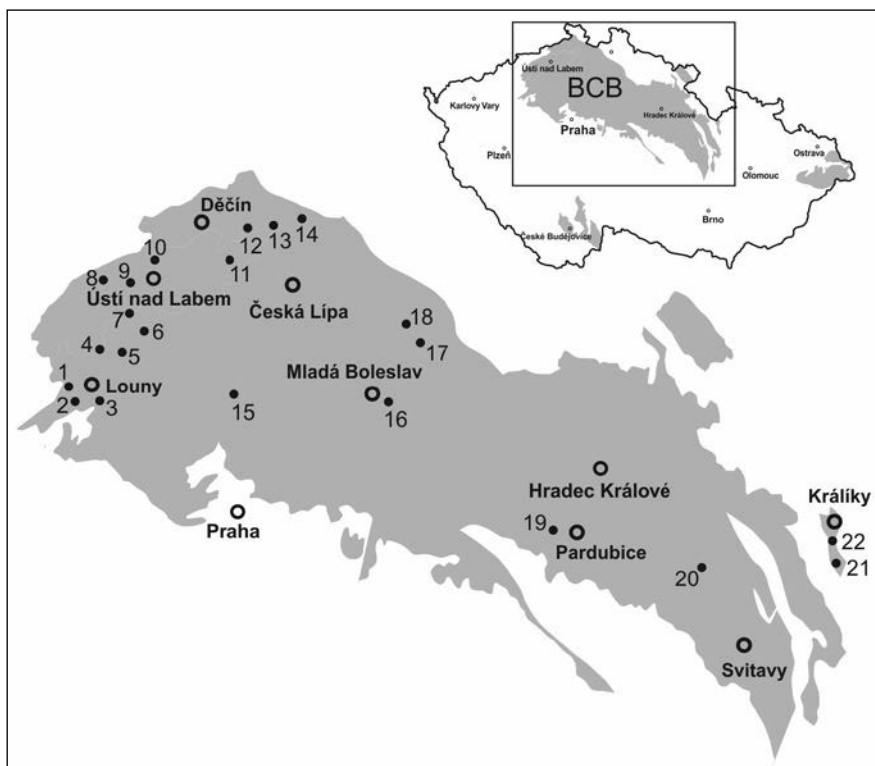
#### *Prionocyclus germari* Zone

The position of the *germari* Zone in relation to the Úpohlavy *Hyphantoceras* Event was clearly established by Wiese *et al.* (2004) on the basis of a record in the Le-6 borehole core from Sedlec, 3 km west of Úpohlavy, and there are numerous records in borehole cores in the lower part of Member Xc of the Teplice Formation, the material preserved as crushed individuals and unstable pyritic nuclei. The association is as follows: *Phylloceras (Hypophylloceras) bizonatum* (Fritsch, 1872), *Lewesiceras mantelli*, *Placenticer* orbignyanum (Geinitz, 1849), *Prionocyclus germari*, *Allocrioceras* spp., *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872), *Sciponoceras bohemicum bohemicum*, *Yezoites bladenensis*, and *Scaphites geinitzii*. The key marker, the *Didymotis* I event (Wood *et al.* 1984; Čech 1989), falls within the *germari* Zone.

### Lower Coniacian

#### *Forresteria (Harleites) petrocoriensis* Zone (upper part)

There is a gap in the ammonite record of the Teplice Formation above the last occurrence of *Prionocyclus germari*. The first occurrence of *Forresteria (Harleites) petrocoriensis* (Coquand, 1859) is in the upper part of unit Xc of Čech (1989, text-fig. 4). The highest occurrence according to Čech (1989) is in the lower part of the Rohatce Member (unit Xd). There are, however, records (as *Ammonites dentato-carinatus*) and specimens labelled as from as high as the sphaerosiderite level in the Březno Formation. Some



Text-fig. 1. Locality map of the key localities (current Czech names and old German names of Fritsch): 1 – Lenešice [Leneschitz bei Laun]; 2 – Březno [Priesen]; 3 – sugar works Louny [Zuckerfabrik in Laun]; 4 – Měřunice [pyropen konglomerat von Meronitz]; 5 – Úpohlavy; 6 – Keblice [Kebnitz]; 7 – Prackovice; 8 – Hudecov [Hundorf]; 9 – GŮ 25 borehole Tuchomyšl; 10 – Malé Chvojno [Klein Kahn]; 11 – Podlesí (formerly Valdek) [Waldek]; 12 – Česká Kamenice [Böhmischen Kamnitz]; 13 – Kytlice (formely Falknov) [Falkenau]; 14 – Jedlová [Tannenber]; 15 – Vehlovice; 16 – Vinařice u Mladé Boleslavi; 17 – Dneboh; 18 – Dolánky u Turnova; 19 – Srnojedy; 20 – Choceň; 21 – Štítý; 22 – KP-1 borehole Bořkovic. BCB – Bohemian Cretaceous Basin.

are *Metatissotia*? (Fritsch 1872, pl. 16, fig. 1; Pl. 4, Figs 1–4, 7–9 herein), other *Forresteria* (*Forresteria alluadi* (Boule, Lemoine and Thévenin, 1907) (Fritsch 1872, pl. 16, fig. 3; Text-fig. 3 herein), and yet others *F. (H.) petrocoriensis* (Pl. 4, Figs 10–13; Pl. 5, Figs 1–12, 16–20). If accurately localised, they suggest that the species extend into the Lower Coniacian *tridorsatum* Zone. The following taxa are present in addition to the index species: *Placenticerias orbignyanum*, *Hyphantoceras flexuosum*, *Scalarites?* *bohemicus* (Fritsch, 1872), *Sciponoceras bohemicum bohemicum*, *Yezoites fritschi*, *Scaphites geinitzii*, and *Scaphites kieslingswaldensis* Langenhan and Grundey, 1891.

#### *Peroniceras* (*Peroniceras*) *tridorsatum* Zone

The zonal assemblage first appears in upper part of the Rohatce Member (Xd), and extends into the lower part of the Březno Formation (Xe): *Gaudryceras* sp., *Forresteria* (*Forresteria*) *alluadi*, *Forresteria* (*Harleites*) *petrocoriensis*, *Peroniceras* (*Peroniceras*)

*tridorsatum* (Schlüter, 1867), *P. (P.) subtricarinarum* (d'Orbigny, 1850), *Peroniceras* (*Zuluiceras*) *bajuvaricum* (Redtenbacher, 1873), *Metatissotia?* *nanclasi* (de Grossouvre, 1894), *Hyphantoceras flexuosum*, *Scalarites* (?) *turonense*, *Sciponoceras bohemicum bohemicum*, *Yezoites fritschi*, *Scaphites geinitzii*, and *Scaphites kieslingswaldensis*.

#### Middle Coniacian

##### *Gauthiericeras margae* Zone

The presence of *Gauthiericeras margae* (Schlüter, 1867) in the Březno Formation of Štítý was documented by Vašíček (1992, p. 175, pl. 4, figs 2, 3; Text-fig. 7) on the basis of material collected *ex situ* by Josef Soukup between 1932 and 1970 from an interval of more than 15 m (Vašíček 1992, text-fig. 1). Other *ex situ* specimens showed the material to come from an interval that extended down into the Lower Coniacian *Peroniceras tridorsatum* Zone; the follow-

ing additional species were recorded: *Mesopuzosia indopacifica* (Kossmat, 1898), *Eupachydiscus isculensis* (Redtenbacher, 1873), *Placenticerias* cf. *semior-natum* (d'Orbigny, 1850), *Peroniceras* (*Peroniceras*) *tridorsatum*, *Phlycticrioceras trinodosum* (Geinitz, 1850), *Tridenticerias soukupi* Vašíček, 1992, *Baculites incurvatus* Dujardin, 1837, *Baculites* cf. *undulatus* d'Orbigny, 1850, and *Scaphites kieslingswaldensis*.

## Upper Coniacian

### *Paratexanites serratomarginatus* Zone

The only record for this zone is the specimen of the index species, NMP 03147/Cl. 6651, the original of *Ammonites Texanus* Röm. of Fritsch (1872, p. 28, pl. 6, fig. 5), refigured in Fritsch (1893, text-fig. 49), from the Březno Formation of Vinařice [Priesener Schichten von Winařitz bei Jungbunzlau], and NMP 03147/Cl.6652, a small fragment. The third fragment mentioned by Fritsch has not been recognised. The specimen figured by Fritsch was revised by Svobodová *et al.* (2014, p. 579, text-fig. 3.1, 3.2).

### *Texanites* (*Texanites*) *pseudotexanus* Zone

Svobodová *et al.* (2014, p. 581, text-fig. 3, 4–6) revised the specimen of *Mortoniceras texanus* of Hibsich (1917, 1929), subsequently referred to *Mortoniceras pseudotexanus* by Storm (1931) and Soukup (1956) from the Březno Formation of Prackovice nad Labem, and confirmed its identity as *pseudotexanus*; it is the only ammonite evidence for the zone in the Czech Republic.

## A NOTE ON PLACE NAMES

In the text that follows, we give present-day Czech names, along with the German (in square brackets) and Czech names (in regular brackets) used by 19<sup>th</sup> century authors for the fossil-bearing localities. Their location is shown in Text-fig. 1 (kindly provided by Dr Stanislav Čech).

## REPOSITORIES OF SPECIMENS

GBA: Geologische Bundesanstalt, Wien, Austria.  
MNHN: Laboratoire de Paléontologie of the Muséum National d'Histoire Naturelle, Paris, France.  
MUNL: Muzeum Ústí nad Labem, Trmice, Czech Republic.

NHMW: Naturhistorisches Museum, Wien, Austria.  
NMP: Národní Muzeum, Praha, Czech Republic.  
UUG: Ústřední ústav geologický (Czech Geological Survey; now Česká geologická služba), Praha, Czech Republic.

## SYSTEMATIC PALAEOLOGY

### Conventions

Dimensions are given in millimetres: D = diameter; Wb = whorl breadth; Wh = whorl height; U = umbilicus. The suture terminology is that of Korn *et al.* (2003); E = external lobe; A = adventive lobe; U = umbilical lobe; I = internal lobe. Specimens were coated with ammonium chloride prior to photography unless indicated otherwise.

Order Ammonoidea Zittel, 1884  
Suborder Phylloceratina Arkell, 1950  
Superfamily Phylloceratoidea Zittel, 1884  
Family Phylloceratidae Zittel, 1884  
Subfamily Phylloceratinae Zittel, 1884  
Genus *Phylloceras* Suess, 1865

TYPE SPECIES: *Ammonites heterophyllus* J. Sowerby, 1820, p. 119, pl. 266, by monotypy.

Subgenus *Hypophylloceras* Salfeld, 1924

TYPE SPECIES: *Phylloceras onoense* Stanton, 1895, p. 74, by monotypy.

*Phylloceras* (*Hypophylloceras*) *bizonatum* (Fritsch, 1872)  
(Pl. 1, Figs 1–3, 11–14)

1872. *Ammonites bizonatus* Fritsch, p. 40, pl. 14, fig. 7.  
1893. *Ammonites* (*Phylloceras*) *bizonatus* Fr.; Fritsch. p. 76; text-fig. 55 (copy of Fritsch 1872, pl. 14, fig. 7).  
1895. *Ammonites* (*Phylloceras*) *bizonatus* Fr.; Fritsch, p. 74, text-fig. 55 (copy of Fritsch 1872, pl. 14, fig. 7).  
1896. *Phylloceras bizonatum* Fritsch sp.; Jahn, p. 130.  
2009. *Hyporbulites bizonatus* (Fritsch, 1872); Klein *et al.*, pp. 90, 91 (with synonymy).  
?2019. *Phylloceras* (*Hypophylloceras*) cf. *bizonatum* (Fritsch, 1872); Kennedy and Kaplan, p. 30, pl. 1, figs 1–3.

TYPE: The lectotype, by the subsequent designation of Joly (1993, p. 60) is NMP 03196, the original of Fritsch (1872, p. 14, fig. 7), from the Březno

Formation of Lenešice near Louny [Priesener Schichten von Leneschitz bei Lauen].

DESCRIPTION: The lectotype (Pl. 1, Figs 1–3, 11–14) is an incomplete pyritic nucleus 24.3 mm in diameter, the whorl height is 12 mm, the whorl breadth to height ratio is 0.53. It has been partially reconstructed in wax. Coiling is very involute, with a tiny umbilicus, the umbilical wall broadly rounded, the whorl section compressed, with flattened flanks, broadly rounded ventrolateral shoulders and venter. Ornament consists of dense, fine lirae, all of which extend to the umbilical shoulder. They are very weak across most of the flanks, but coarsen markedly on the outermost flanks, ventrolateral shoulders and venter. Flexuous, they are feebly concave on the inner flank, feebly convex across the middle flank, feebly concave on the outer flank, and transverse on the venter.

DISCUSSION: See Joly (1993, p. 60), and Kennedy and Kaplan (2019, p. 30).

OCCURRENCE: Upper Turonian to Lower Coniacian in the Czech Republic. Lower Coniacian of Madagascar and, possibly, the Upper Turonian *neptuni* Zone of Westphalia, Germany.

Suborder Lytoceratina Hyatt, 1889  
 Superfamily Tetragnostoidea Hyatt, 1900  
 Family Gaudryceratidae Spath, 1927  
 Genus *Gaudryceras* de Grossouvre, 1894

TYPE SPECIES: *Ammonites mitis* Hauer, 1866, p. 305, pl. 2, figs 3, 4, by the subsequent designation of Boule *et al.* [1906, p. 183 (11)].

*Gaudryceras alexandri* (Fritsch, 1872)  
 (Text-fig. 2)

1872. *Ammonites Alexandri* Fritsch, p. 39, pl. 16, fig. 6.

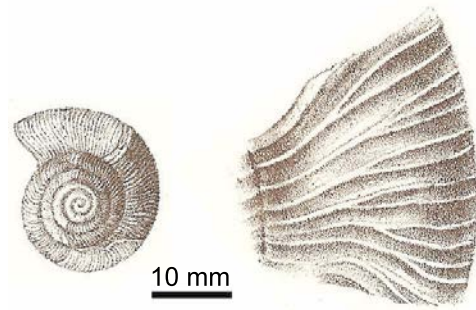
?1893. *Ammonites (Lytoceras) Alexandri* Frič; Fritsch, p. 76, text-fig. 54.

?1895. *Ammonites (Lytoceras) Alexandri* Frič.; Fritsch, p. 73, text-fig. 54.

1896. *Ammonites Alexandri* Fritsch; Jahn, p. 130.

2009. *Gaudryceras alexandri* (Fritsch, 1872); Klein *et al.*, pp. 171, 174 (with additional synonymy).

TYPE: The holotype, by monotypy, is NMP 03209, the original of Fritsch (1872, p. 39, pl. 16, fig. 6; the original figures are reproduced here as Text-fig. 2), from the Lower Coniacian part of the Březno Formation of Březno near Louny [Priesener Schichten von Priesen



Text-fig. 2. *Gaudryceras alexandri* (Fritsch, 1872), the holotype, NMP 03209, copies of Fritsch (1872, p. 39, pl. 16, fig. 6a, b), from the Březno Formation of Březno near Louny [Priesener Schichten von Priesen bei Laun] (Schichte 3, the Gastropodenschichten; *vide* Fritsch 1893, pp. 19, 76). The scale applies to the left hand figure only.

bei Laun] (Schichte 3, the Gastropodenschichten; *vide* Fritsch 1893, pp. 19, 76).

DESCRIPTION: The holotype (Text-fig. 2) is a fragmentary pyritic individual with a maximum preserved diameter of 14 mm. Coiling is very evolute, serpenticone, with a broad, shallow umbilicus. Ornament consists of dense, wiry prorsiradiate lirae, slightly flexuous, convex at mid-flank and feebly concave on the outer flank; they increase by bi- and trifurcating on the outer flank.

DISCUSSION: The tiny, incomplete holotype is clearly a *Gaudryceras*; it differs in no significant respects from juveniles assigned to a number of *Gaudryceras* species, and may even be a synonym of *Gaudryceras mite* (Hauer, 1866) (see Kennedy and Summesberger 1979; Summesberger, Kennedy and Skoumal 2017). It is best regarded as a *nomen dubium*, being based on inadequate type material. Fritsch (1893, p. 76, text-fig. 54; 1895, p. 73, text-fig. 54) figured a second specimen that he assigned to *alexandri* from the Březno Formation of Srnojedy u Pardubic [Priesener Schichten von Srnojed]. The illustration appears to be restored and idealised; the lirae are single and do not branch, a character that sets it apart from the holotype of *alexandri*. We have not seen the original, and in consequence cannot comment further.

OCCURRENCE: As for type.

Suborder Ammonitina Hyatt, 1889  
 Superfamily Desmoceratoidea Zittel, 1895

Family Desmoceratidae Zittel, 1895  
 Subfamily Puzosiinae Spath, 1922  
 Genus *Kitchinites* Spath, 1922

TYPE SPECIES: *Holcodiscus pondicherryanus* Kossmat, 1897, p. 40 (147), pl. 6 (170), fig. 6, by original designation.

*Kitchinites* sp.  
 (Pl. 1, Fig. 15)

MATERIAL: UUG GU25, a fragment from the Upper Coniacian of the of the GU 25 borehole, Tuchomyšl, associated with *Magadiceramus subquadratus* (Schlüter, 1887).

DESCRIPTION: The material consists of a crushed external mould and a crushed 120° internal mould of a body chamber fragment. The latter is ornamented by feeble flexuous prorsiradiate primary ribs, some of which are incipiently bullate, convex on the inner flank, convex on the outer flank, and sweeping forwards on the ventrolateral shoulder. Three interspaces are deepened into constrictions, most conspicuous on the ventrolateral shoulder. They are flanked by collar-ribs, strongest on the ventrolateral shoulder and venter, the adapical stronger than the adapertural.

DISCUSSION: The style of ribbing, constrictions and collar ribs find a match in those of *Kitchinites scheeri* Kennedy and Kaplan, 2000 (p. 54, pl. 12, figs 3, 4; pl. 19, fig. 5; text-fig 21) from the Middle or Upper Coniacian of the Münsterland Basin, Westphalia, Germany, and provide the basis for the generic assignment.

OCCURRENCE: As for material.

Family Pachydiscidae Spath, 1922  
 Genus *Pseudojacobites* Spath, 1922

TYPE SPECIES: *Pachydiscus farmeryi* Crick, 1910, p. 345, pl. 27, figs 1, 2, by the original designation of Spath (1922, p. 121).

*Pseudojacobites* sp.  
 (Pl. 1, Figs 9, 10)

MATERIAL: A specimen in the UUG collections from the Coniacian part of the Březno Formation of the KP-1 borehole, Dolní Bořkovice (Králíky) in the Králiky Graben.

DESCRIPTION: A crushed fragment of a 180° whorl sector of two successive whorls (Pl. 1, Figs 9, 10) has a maximum preserved whorl height of 25.5 mm. Coiling appears to have been fairly involute, with a small umbilicus, the umbilical wall flattened and outward-inclined. On the penultimate whorl fragment, small bullae give rise to widely separated concave ribs that project forwards on the outer flank and link to subequal, markedly prorsiradiate ventrolateral bullae. There are five small umbilical bullae on the outer whorl fragment, displaced outwards a little from the umbilical shoulder. Each gives rise to a narrow, feebly concave rib, which terminates in a strong prorsiradiate ventrolateral bulla. These ribs are followed by a shallow constriction on the adapical part of the outer whorl fragment, followed in turn by a weak, narrow, nontuberculate collar rib. There are feeble riblets and striae between successive primary ribs, most conspicuous on the adapertural part of the outer whorl, where constrictions are absent.

DISCUSSION: The ornament of this specimen corresponds to that of juvenile *Pseudojacobites*, as for example *P. ankobensis* Collignon, 1965a (p. 10, pl. 380, fig. 1643), refigured by Kennedy (2019, text-fig. 27c–e), from the Coniacian of Madagascar.

OCCURRENCE: As for material; the specimen is assigned to the Upper Coniacian on the basis of co-occurrence with *Inoceramus subquadratus*.

Superfamily Desmoceratoidea Zittel, 1895  
 Family Desmoceratidae Zittel, 1895  
 Family Pachydiscidae Spath, 1922  
 Genus *Lewesiceras* Spath, 1939

TYPE SPECIES: *Ammonites peramplus* Mantell, 1822, p. 200, by original designation by Spath (1939b, p. 296).

*Lewesiceras mantelli* Wright and Wright, 1951

pars 1853. *Ammonites peramplus* Mantell; Sharpe, p. 26, pl. 10, figs 2, 3 only.

1951. *Lewesiceras mantelli* Wright and Wright, p. 20.

2019. *Lewesiceras mantelli* Wright and Wright; Kennedy, p. 57, pl. 13, figs 8–15, 18–26; pl. 14, figs 1–13; pl. 15, figs 1–5; pl. 16, figs 1–5; pl. 26, figs 3–5; text-figs 29–33; 34d–f (with synonymy).

2019. *Lewesiceras mantelli* Wright and Wright, 1951; Kennedy and Kaplan, p. 39, pl. 6, figs 1–18; pl.

7, figs 1, 2, 4–7, 11–16; pl. 12; text-fig. 17a–c (with synonymy).

2023. *Lewesiceras mantelli* Wright and Wright, 1951; Kennedy in Kennedy and Walaszczyk, p. 641, text-fig. 5a–k.

TYPE: *Lewesiceras mantelli* was introduced by Wright and Wright (1951, p. 20) as *nomen novum* for *Pachydiscus cricki* Spath, 1926 (p. 82) non Kossmat, 1898 [p. 105 (170), pl. 15 (21), fig. 3], of which the holotype by monotypy is BMNH 88587, the original of Sharpe (1853, pl. 10, fig. 3), from Oldbury Hill, Wiltshire. It was recently refigured by Kennedy (2019, pl. 13, figs 18–20) and Kennedy and Kaplan (2019, text-fig. 17a–c).

DISCUSSION: *Lewesiceras* from the Czech Republic were comprehensively described by Houša (1967). Subsequent revisions by Wright (1979), Kennedy (2019) and Kennedy and Kaplan (2019) led to the conclusion that *Lewesiceras lenesicense* Houša, 1967 (p. 35, pl. 8, figs 1–7) and *Lewesiceras plicatum* Houša, 1967 (p. 32, pl. 7, figs 1–4) were synonyms of a variable *mantelli* on the basis of large collections from the Upper Turonian *neptuni* Zone fauna of the Chalk Rock of southern England.

OCCURRENCE: Upper Turonian, *Subprionocyclus neptuni* and *Prionocyclus germari* zones. In the Czech Republic there are numerous records from the Upper Turonian Teplice Formation. Elsewhere, the geographic distribution extends from Northern Ireland to southern and eastern England, France, Germany, Poland, Ukraine (Crimea), European Russia, Kazakhstan, and, possibly, Austria.

Superfamily Hoplitoidea H. Douvillé, 1890

Family Placenticeratidae Hyatt, 1900

Genus *Placenticeras* Meek, 1976

TYPE SPECIES: *Ammonites placenta* DeKay, 1828, p. 278, pl. 5, fig. 3, by the original designation of Meek (1876, p. 426).

*Placenticeras orbignyanum* (Geinitz, 1849)

(Pl. 1, Figs 4–8; Pl. 3, Figs 1–8)

1843. *Ammonites Vibrayeanus* d'Orbigny; Geinitz, p. 8, pl. 1, fig. 8.

1849. *Ammonites Orbignyanus* Geinitz, p. 114, pl. 41, fig. 1.

1863. *Ammonites orbignyanus* Geinitz; Drescher, p. 330, pl. 8, fig. 1.

1872. *Ammonites Orbignyanus* Geinitz; Geinitz, p. 188, pl. 36, fig. 5.

pars 1872 *Ammonites Orbignyanus* Gein.; Fritsch, p. 36, pl. 10, fig. 4, ?5; non pl. 11, fig. 2 (= *Placenticeras memoriaschloenbachi* Laube and Bruder, 1887).

1874. *Ammonites Orbignyanus* Gein.; Geinitz, p. 188, pl. 36, fig. 5.

1893. *Ammonites (Placenticeras) D'Orbignyanus* Gein.; Fritsch, p. 75, text-fig. 53.

1895. *Ammonites (Placenticeras) D'Orbignyanus* Gein.; Fritsch, p. 73, text-fig. 53.

non 1897. *Ammonites (Placenticeras) d'Orbignyanus* Gein.; Fritsch, p. 36, text-fig. 18 (= *Placenticeras memoriaschloenbachi* Laube and Bruder, 1887).

1925. *Placenticeras Orbignyanum* Geinitz; Diener, p. 187 (with additional synonymy).

1899. *Placenticeras orbignyanum* (Geinitz, 1849); Klinger and Kennedy, p. 387.

2014. *Placenticeras orbignyanum* (Geinitz, 1849); Wilmsen and Nagm, p. 208, text-fig. 5d, e.

TYPE: The holotype, according to Wilmsen and Nagm (2014, p. 208; explanation of text-fig. 5d) is the original of Geinitz (1849, pl. 4, fig. 1), from the Coniacian of Idzików, Poland [Kieslingswalde], no. PnK7 in the collections of the Senckenberg Naturhistorisches Sammlungen Dresden, Museum für Mineralogie und Geologie, Dresden. It was refigured by Wilmsen and Nagm (2014, text-fig. 5d).

DESCRIPTION: Coiling is very involute, the umbilicus comprising as little as 11% of the diameter, shallow, with a flattened, outward-inclined wall and narrowly rounded umbilical shoulder. The whorl section is very compressed, the greatest breadth just outside the umbilical shoulder, the inner flanks feebly convex, the outer flanks flattened and convergent, the venter narrow, feebly concave, with sharp edges. Internal moulds of some juveniles are near-smooth, but for delicate prorsiradiate umbilical bullae. There are also individuals with falcoid ribs, weak, straight and prorsiradiate on the inner flank, but strengthening, low, broad and concave on the outer flank. Details of individual specimens examined are as follows:

NMP 03157 (Pl. 1, Fig. 8) is the original of Fritsch (1872, pl. 10, fig. 4), said by Fritsch to be from the Březno Formation of Lenešice near Louny [Priesener Schichten von Leneschitz bei Lauen], a small pyritic specimen 10.3 mm in diameter.

NMP 04784 (Pl. 3, Figs 4–7) is a pyritic nucleus from the Březno Formation of Březno, with the following dimensions:



	D	Wb	Wh	Wb:Wh	U
NMP 04784	54.0 (100)	14.0 (25.9)	26.5 (49.1)	0.53	9.0 (16.7)

The umbilical region is poorly preserved, but there are indications of the possible presence of tiny bullae. Crescentic ribs are well-developed on the outer flank, and number seven or eight per half whorl.

NMP 04785, from the Březno Formation of Březno, has the following dimensions:

	D	Wb	Wh	Wb:Wh	U
NMP 04785	28.2 (100)	12.3 (43.6)	15.6 (55.3)	0.79	4.0 (14.2)

NMP 04211 (Pl. 3, Figs 1–3) is the original of Fritsch (1893, fig. 53b, c), from the Březno Formation of Lenešice near Louny [Priesener Schichten von Leneschitz bei Lauen]. The whorl height is 15.7 mm; the whorl breadth 8.3 mm, the whorl breadth to height ratio 0.5. The specimen has tiny umbilical bullae and sickle-shaped ribs with weak to obsolete ‘shafts’, and stronger ‘blades’ on the outer flank. The venter is narrow, concave, with sharp edges and no tubercles.

DISCUSSION: The earliest name available for *Placenticerias* from the Upper Turonian–Coniacian of Western and Central Europe is *orbignyanum* of Geinitz (1849, p. 114, pl. 4, fig. 1). The original figure shows well-developed low, falcoid ribs, the ‘shafts’ straight and rursiradiate on the inner flanks, the ‘blades’ low, broad, and concave on the outer flank, the inner flank ornament apparently effacing on the adapertural half of the outer whorl. Given the somewhat idealised nature of Geinitz’ figure, the specimen finds a match in NMP 04784. However, photographs of the holotype (Wilmsen and Nagm 2014, text-fig. 5d) show a specimen that lacks the adapical 120° sector of the outer whorl and apparently lacks well-developed concave ribs on the outer flank.

Diener (1925, p. 187) gives an extensive synonymy for *orbignyanum*, but many of the citations lack illustrations, and their status is uncertain.

The second species of *Placenticerias* described from Central Europe is *Placenticerias memoriaschloenbachi* Laube and Bruder, 1887 (p. 221, pl. 23, fig. 1), from the “turonen Grobkalk des Weissen Berges bei Prag.” The relationship between it and the present species is discussed further below.

OCCURRENCE: In the Czech Republic there are records from the Upper Turonian and Lower Coniacian. Elsewhere, there are records from the Lower Coniacian of Poland.

*Placenticerias cf. memoriaschloenbachi* Laube and Bruder, 1887  
(Pl. 1, Fig. 16)

compare:

1887. *Placenticerias Memoria–Schloenbachi* Laube and Bruder, p. 221, pl. 23, fig. 1.

1925. *Placenticerias memoria Schloenbachi* Laube et Bruder; Diener, p. 186 (with additional synonymy).

2014. *Placenticerias memoriaschloenbachi* Laube and Bruder; Wilmsen and Nagm, p. 209, text-fig. 5f (with additional synonymy).

DESCRIPTION: NMP 03159 is the original of *Ammonites (Placenticerias) d’Orbignyanus* Geinitz of Fritsch (1872, pl. 11, fig. 2, refigured 1897, text-fig. 18), from the grey sandstones of the Merboltice Formation at Jedlová near Česká Kamenice [grauen Sandstein der Chlomeker Schichten vom Tannenberg bei Böhmisches-Kamnitz]. Ammonites listed from the Chlomeker Schichten by Fritsch (1872, p. 7; 1897, p. 29) include *Peroniceras (P.) subtricarinarum* of the Lower Coniacian. One flank is preserved, most of it restored in plaster. The maximum preserved diameter is 113 mm, the whorl height is 56 mm. The tiny umbilicus comprises 11% of the diameter, and is shallow, with a sharp umbilical shoulder. The only ornament is minute prorsiradiate umbilical bullae, an estimate 10 per half whorl. The concave venter has sharp shoulders; there is no trace of ventral clavi.

DISCUSSION: The holotype of *Placenticerias memoriaschloenbachi* is 198 mm in diameter according to its authors; the figure shows a very compressed shell with a narrow concave venter with sharp edges, the only ornament tiny bullae aligned parallel to the umbilical shoulder; given the idealised nature of the figure, it is likely that Fritsch’s specimen is the same species, but what is not clear is if a single species, i.e., *orbignyanum*, or two species, i.e., *orbignyanum* and *memoriaschloenbachi*, are represented in the present material, hence the conservative approach, recognising both species, adopted here.

It would now appear that the holotype of *Placenticerias fritschi* de Grossouvre, 1894 (p. 124, pl. 5, figs 1, 2; text-fig. 52; see Kennedy 1984, p. 38, pl. 2, fig. 1; pl. 3, figs 4, 5; text-figs 13, 14c–e, 15; see also Kaplan and Kennedy 1994, p. 40, pl. 2, figs 2–4; pl. 7, figs 2, 4, 5; pl. 8) can be differentiated from *orbignyanum* and *memoriaschloenbachi* on the basis of the stouter whorl section and widely separated conical umbilicolateral bullae on the late phragmocone. The difference between all these specimens and species is slight, and trivial when compared to the wide

range of morphological variation seen in co-occurring assemblages of the Coniacian *Placenticerus kaffrarium* Etheridge, 1904 (see Klinger and Kennedy 1989; Bardhan *et al.* 2002, and Gangopadhyay and Bardhan 2007) in KwaZulu-Natal in South Africa, and India.

**OCCURRENCE:** The holotype of *Placenticerus memoriaeschloenbachi* is from the upper Lower to Middle Turonian Weissenberger Schichten of Bílá Hora near Prague in the Czech Republic. There are also records from the Upper Cenomanian *geslinianum* Zone of Sarthe and Maine et Loire in France, and Saxony, Germany. The variety *ambiloensis* Collignon, 1965b (p. 14, pl. 381; pl. 382, figs 1646, 1647, 1648), from the Upper Turonian of Madagascar is regarded as a junior synonym of *Placenticerus kaffrarium* Etheridge, 1904 (Klinger and Kennedy 1989, p. 344).

Superfamily Acanthoceratoidea de Grossouvre, 1894  
 Family Collignoniceratidae Wright and Wright, 1951  
 Subfamily Collignoniceratinae Wright and Wright,  
 1951

Genus *Prionocyclus* Meek, 1876

**TYPE SPECIES:** *Ammonites serratocarinatus* Meek, 1871, p. 298, non Stoliczka 1865, p. 57, pl. 32, fig. 3; = *Prionocyclus wyomingensis* Meek, 1876, p. 452.

*Prionocyclus germari* (Reuss, 1845)

(Pl. 2, Figs 4–12; Pl. 3, Figs 11–18)

1845. *Ammonites Germari* Reuss, p. 22, pl. 7, fig. 10.  
 1872. *Ammonites Germari* Reuss; Fritsch, p. 29, pl. 14, figs 1, 2; pl. 16, fig. 7.  
 1872. *Ammonites Schlönbachi* Fritsch, p. 33, pl. 16, fig. 5.  
 1893. *Ammonites (Schlönbachia) Germari* Reuss; Fritsch, p. 74, fig. 50.  
 1893. *Ammonites (Cosmoceras) Schlönbachi* Fric; Fritsch, p. 75, text-fig. 52.  
 1895. *Ammonites (Schlönbachia) Germari* Reuss; Fritsch, p. 72, text-fig. 50.  
 1895. *Ammonites (Cosmoceras) Schlönbachi* Frič; Fritsch, p. 73, text-fig. 52.  
 2001. *Prionocyclus germari* (Reuss, 1845); Kennedy, Cobban and Landman, p. 123, text-figs 108a, b, d–f; 109–119.  
 2019. *Prionocyclus germari* (Reuss, 1845); Kennedy and Kaplan, p. 67, pl. 36, figs 9, 10; pl. 37, figs 2–5, 7 (with full synonymy).  
 2024. *Prionocyclus germari* (Reuss, 1845); Košťák *et al.*, p. 88, text-figs 4, 5.

**TYPE:** The lectotype, by the subsequent designation of Kennedy *et al.* (2001, p. 124) is the original of Reuss (1845, p. 22, pl. 7, fig. 10), from the the Pläner Marl of Vršovice, Louny District [Planermergel von Werschowitz]. It has not been traced. The original figure was reproduced by Kennedy *et al.* (2001, text-fig. 109k).

**DESCRIPTION:** A series of 18 pyritic fragments in the NMP collections, R192a–r from the Teplice Formation of Lenešice have whorl heights of up to 9.5 mm (Pl. 3, Figs 9–18). Coiling is fairly evolute, the umbilicus of moderate width, fairly shallow, with a flattened, subvertical wall, notched to accommodate the inner ventrolateral tubercles of the previous whorl. Whorl sections vary from slightly compressed to slightly depressed, with the greatest breadth just outside the umbilical bullae, or at the bullae. The inner flanks are broadly rounded in costal section, the outer flanks flattened and convergent, the venter broad, flattened, with a strong siphonal keel that is flanked by smooth grooves. As is common in *Prionocyclus*, nuclei are highly variable. At one extreme are fragments with coarse, distant primary ribs only. The ribs are narrow and prorsiradiate, with a feeble umbilical bulla, a small but stronger inner lateral/lateral tubercle, and a stronger conical inner ventrolateral tubercle, from which a progressively weakening rib sweeps forwards to a weaker outer ventrolateral clavus. The keel is minutely serrated. Co-occurring finely ribbed individuals have approximately twice as many ribs per whorl in some; in others, every fourth rib is strengthened markedly. The coarsely ornamented variant corresponds to the specimen figured by Fritsch (1872) as his pl. 14, figs 2; the finely and evenly ribbed variants correspond to his pl. 14, fig. 1; that with differentiated ribs to his pl. 16, fig. 7.

The original of *Ammonites Schloenbachi* Fritsch, 1872 (p. 33, pl. 16, fig. 5), an adult or subadult individual from the Březno Formation of Vršovice near Louny [Priesener Schichten von Werschowitz bei Laun], is in two parts: a crushed internal composite mould NMP 04823 (Pl. 2, Fig. 12), and a crushed external composite mould, NMP 03207. NMP 03206 (Pl. 2, Fig. 11) is a plaster cast made from NMP 03207, and the basis of Fritsch's figure. Coiling appears to have been quite evolute, but original proportions and whorl section cannot be established. To a diameter of 32.5 mm ornament consists of equal, quite widely spaced narrow, prorsiradiate primary ribs that arise at the umbilical seam and may or may not develop into a feeble umbilical bulla. The ribs are straight to

mid-flank, then flex slightly forwards and are feebly concave on the outer flank. The outer whorl is very poorly preserved, with a diameter of 110 mm approximately. Primary ribs of variable strength arise at the umbilical seam, and as on the inner whorls, may or may not develop into an umbilical bulla. They are straight and prorsiradiate to mid-flank, where then flex back and are feebly convex, and straight and prorsiradiate on the outer flank. One, sometimes two ribs are linked to a strong inner ventrolateral tubercle, a few of which bear traces of a long, septate horn. Between are ribs lacking or with only a weak inner ventrolateral tubercle. The ribs sweep forwards from the inner ventrolateral tubercles.

DISCUSSION: See Kennedy *et al.* (2001, p. 94), and Kennedy and Kaplan (2019, p. 67). Košťák *et al.* (2024) have described the co-occurrence of *in situ* jaws (*Praestriptychus*) in association with the present species.

OCCURRENCE: Upper Turonian, index of the *germari* Zone, with records from the Czech Republic, the Münsterland Basin and Lower Saxony in Germany, south-eastern France, northern Spain, central Tunisia, Angola, Brazil, Madagascar, central India, Texas and Wyoming in the United States, and Alberta in Canada.

*Prionocyclus albinus* (Fritsch, 1872)  
(Text-fig. 3)

1872. *Ammonites Albinus* Fritsch, p. 28, pl. 6, fig. 4.

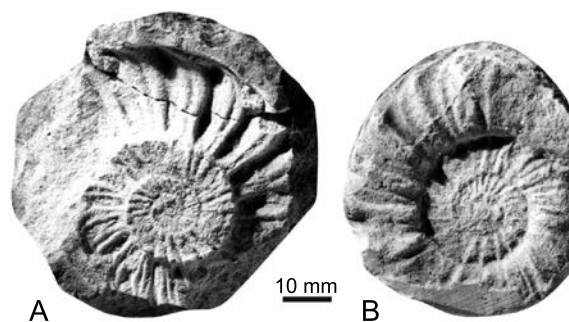
1925. *Ammonites albinus* Fritsch; Diener, p. 23.

pars 1988. *Prionocyclus hyatti* (Stanton, 1894); Kennedy, p. 75, pl. 15, figs 3–5; text-fig. 25h–l only.

2001. *Prionocyclus albinus* (Fritsch, 1872); Kennedy *et al.*, p. 93, text-figs 62, 108c.

TYPE: The lectotype, by the subsequent designation of Kennedy *et al.* (2001, p. 93) is NMP 03144, the original of Fritsch (1872, p. 28, pl. 6, fig. 4), from the Middle Turonian Jizera Formation of Vehlovice near Mělník [Malnitzer Schichten von Wehlovice bei Melnick].

DESCRIPTION: The lectotype is an external mould (Text-fig. 3A); a cast taken from it is shown in Text-fig. 3B. The maximum preserved diameter is 41 mm. Coiling is evolute, the umbilicus comprising 42% of the diameter, shallow, the low umbilical wall feebly convex, the umbilical shoulder is more narrowly rounded. On the adapertural half of the outer whorl,



Text-fig. 3. *Prionocyclus albinus* (Fritsch, 1872). A – the lectotype, an external mould; B – a plaster cast taken from the external mould, NMP 03144, the original of Fritsch (1872, p. 28, pl. 6, fig. 4), from part of the Jizera Formation of Wehlovice near Mělník [Mallnitzer Schichten von Wehlovice bei Melnick].

six or seven primary ribs arise on the umbilical wall, and strengthen into feeble bullae, perched on the umbilical shoulder. The major primary ribs are coarse, straight, and prorsiradiate on the flanks, with inner and outer ventrolateral clavi; the venter is not preserved. They are separated by single much weaker ribs that lack umbilical bullae and inner ventrolateral tubercles. The poorly preserved inner whorls are much more finely ribbed.

DISCUSSION: See Kennedy *et al.* (2001, p. 94), who interpret the species as a pedomorphic offshoot, possibly of *Prionocyclus hyatti* (Stanton, 1894) (p. 176, pl. 42, figs 5–8; see revision in Kennedy *et al.* 2001, p. 83, text-figs 50–60).

OCCURRENCE: Upper Middle Turonian of the Czech Republic, also recorded from Kansas, Utah, New Mexico and Dallas County, Texas, in the United States.

Subfamily Barroisiceratinae Basse, 1947  
Genus and Subgenus *Forresteria* Reeside, 1932

TYPE SPECIES: *Barroisicerias (Forresteria) forresteri* Reeside, 1932 (p. 17, pl. 5, figs 2–7), by the subsequent designation of Wright (1957a, p. L432), = *Acanthoceras (Prionotropis) alluaudi* Boule, Lemoine and Thévenin, 1907 [p. 32 (12), pl. 8 (1), figs 6, 7; text-fig. 17].

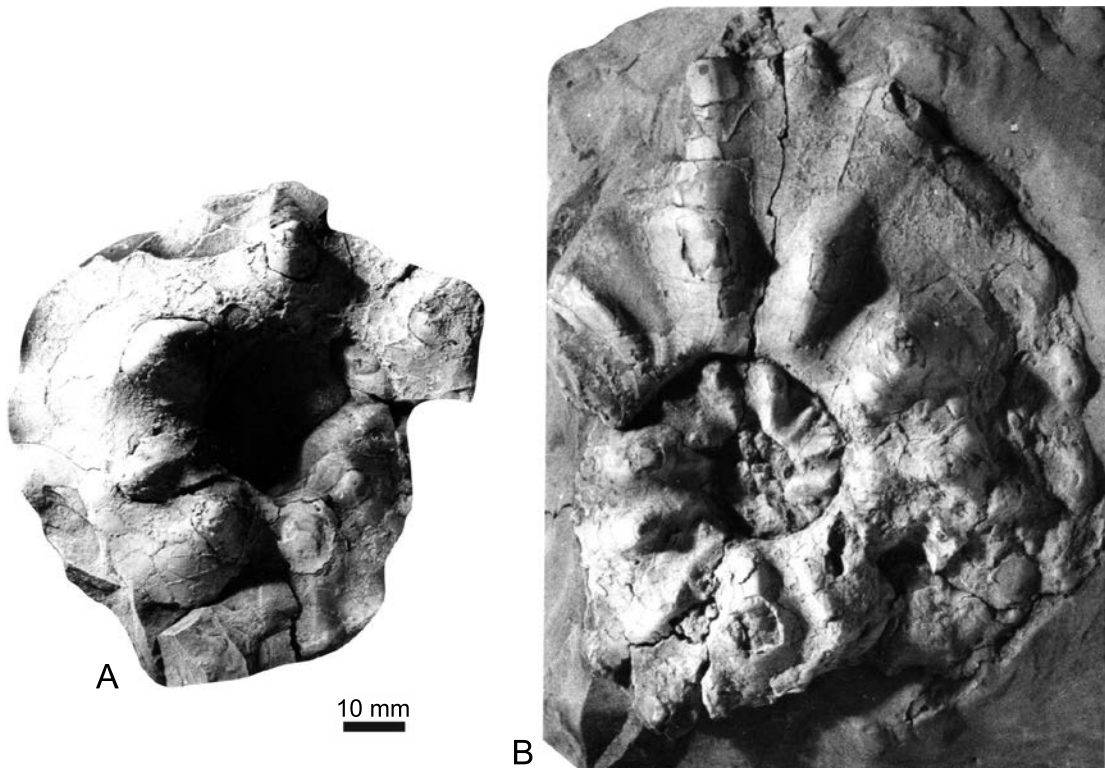
*Forresteria (Forresteria) alluaudi* Boule, Lemoine  
and Thévenin, 1907  
(Text-fig. 4A, B)

- pars 1872. *Ammonites dentato-carinatus* Römm.; Fritsch, p. 32, pl. 16, fig. 3 only, non fig. 1 [= *Metatisso-tia? nanclasi* (de Grossouvre, 1894)]; non fig. 2 [= *Forresteria (Harleites) petrocoriensis* (Coquand, 1859)].
- pars 1893. *Ammonites (Acanthoceras) dentatocarinatus* F. Römm.; Fritsch, p. 74, text-fig. 51b.
- pars 1895. *Ammonites (Acanthoceras) dentatocarinatus* F. Römm.; Fritsch, p. 72, text-figs 51b.
- pars 1896. *Acanthoceras dentatocarinatum* Fritsch; Jahn, p. 128.
1907. *Acanthoceras (Prionotropis) alluaudi* Boule, Lemoine and Thévenin, p. 32 (12), pl. 8 (1), figs 6, 7.
1983. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Kennedy, Wright and Klinger, p. 267, text-figs 5–9, 10a, b, e–f, 11–14, 16–31, 33–34, 35c–e, 40d–e (with synonymy).
1984. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Kennedy, p. 46, pl. 8, figs 4–9 (with additional synonymy).
1991. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Kennedy and Cobban, p. 24, pl. 4, figs 1–11; text-fig. 4b (with additional synonymy).

- 2000a. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Wiese, p. 131, pl. 2, figs 3, 4.
2019. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Ifrim, Muzqiz and Stinnisbeck, p. 178, text-figs 8a–h, 9 (with additional synonymy).
2022. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907); Summesberger *et al.*, p. 27, pl. 4, figs 8–10; pl. 5, figs 1–8; pl. 6, figs 1–11; text-fig. 11 (with additional synonymy).

TYPES: The lectotype, by the subsequent designation of Kennedy *et al.* (1983, p. 268), is the original of Boule *et al.* [1907, pl. 8 (1), fig. 7], the paralectotype is the original of Boule *et al.* [1907, pl. 8 (1), fig. 6], both from Mont Carré, Madagascar.

DESCRIPTION: NMP 04210 is the original of *Ammonites (Acanthoceras) dentatocarinatus* F. Römm. of Fritsch 1893 (fig. 51b; 1895, fig. 51b), from the sphaerosiderite layer of the Březno Formation at Březno [Sphaerosideritschichten, Priesen]. It is a fragment 45 mm long, with four primary ribs preserved. They bear weak umbilical bullae, massive lateral



Text-fig. 4. *Forresteria (Forresteria) alluaudi* (Boule, Lemoine and Thévenin, 1907). A – NMP 03203, the original of Fritsch (1872, pl. 16, fig. 3), from the sphaerosiderite level in the Březno Formation at Březno near Louny [Priesener Schichten von Priesen bei Laun]. B – NMP 29557, from the gastropod layer in the Březno Formation at Březno.

spines, strong ventral and slightly weaker siphonal clavi. Successive primaries are separated by single short intercalated ribs with ventral and siphonal clavi. NMP 03203 (Text-fig. 4A), the original of Fritsch (1872, p. 16, fig. 3), is also from the sphaerosideritic layer at Březno, with an estimated original diameter of over 80 mm, continues the ontogeny. The specimen is crushed; it bears massive umbilicolateral tubercles, eight per whorl, that give rise to pairs of low, broad swellings that decline across the flanks. Long ventral clavi are twice as numerous, while corresponding to each is a strong siphonal clavus. At a few points there are traces of a feeble swelling on the umbilical shoulder. MNP 29557 (Text-fig. 4B), from the gastropod layer at Březno, has a maximum preserved diameter of 86.5 mm, the umbilicus comprising 27% of the diameter. Coiling is quite involute, with notches in the umbilical wall to house the lateral tubercles of the succeeding whorl. There are 12 broad, coarse, distant prorsiradiate primary ribs per whorl. All bear a weak umbilical bulla, connected by a strong rib to a massive, subspinose lateral tubercle, from which a low, broad rib extends to a strong, clavate ventrolateral tubercle. Single clavi intercalate between the clavi of successive primary ribs, and may be linked to a very short intercalated rib. The final, adapertural rib on the specimen lacks a well-differentiated umbilical bulla and lateral tubercle. Because of the crushing, details of the venter are not determinable.

DISCUSSION: *Forresteria (F.) alluaudi* was extensively described and discussed by Kennedy *et al.* (1983). The present material is referred to *alluaudi* on the basis of the coarse ribbing, massive lateral tubercles and persistent siphonal clavi, features that separate larger specimens from *Forresteria (Harleites) petrocoriensis*, described below.

OCCURRENCE: Lower Coniacian, the Czech Republic, south-eastern France, Spain, Austria, KwaZulu-Natal in South Africa, Madagascar, Japan, Peru, Colombia, Utah and Wyoming in the United States Western Interior, and northern Coahuila, Mexico. Upper Coniacian, *Paratexanites serratomarginatus* Zone, Austria.

Subgenus *Forresteria (Harleites)* Reeside, 1932

TYPE SPECIES: *Barroisiceras haberfellneri* var. *harlei* de Grossouvre, 1894 (p. 56, pl. 2, figs 2, 8), by original designation; = *Ammonites petrocoriensis* Coquand, 1859 (p. 995).

*Forresteria (Harleites) petrocoriensis* (Coquand, 1859)

(Pl. 4, Figs 10–13; Pl. 5, Figs 1–20)

1859. *Ammonites petrocoriensis* Coquand, p. 995.  
 pars 1872. *Ammonites Neptuni* Gein.; Fritsch, p. 30, pl. 14, fig. 3 only.  
 pars 1872. *Ammonites dentatocarinatus* Röm.; Fritsch, p. 32, pl. 16, fig. 2, non fig. 1 [= *Metatissotia? nanclasi* (de Grossouvre, 1894)], non fig. 3 [= *F. (F.) alluaudi* (Boule *et al.*, 1907)].  
 pars 1893. *Ammonites (Acanthoceras) dentatocarinatus* F. Röm.; Fritsch, p. 74, text-fig. 51a.  
 pars 1895. *Ammonites (Acanthoceras) dentatocarinatus* F. Röm.; Fritsch, p. 72, text-figs 51a.  
 pars 1896. *Acanthoceras dentatocarinatum* Fritsch (non F. Römer); Jahn, p. 128.  
 1984. *Forresteria (Harleites) petrocoriensis* (Coquand, 1862); Kennedy, p. 49, pl. 4, figs 1, 2; pl. 5, figs 1–11; pl. 6, figs 1–9; pl. 7, figs 1–20; pl. 9, figs 1–4; pl. 21, figs 2, 4; text-figs 13d–f, h, 16, 18a, b, g (with synonymy).  
 1988. *Forresteria (Harleites) petrocoriensis* (Coquand); Szász and Ion, pl. 6, fig. 9.  
 1994. *Forresteria (Harleites) petrocoriensis* (Coquand, 1862); Kaplan and Kennedy, p. 43, pl. 9, figs 1–7.  
 1995. *Forresteria (Harleites) petrocoriensis* (Coquand, 1862); Kennedy *et al.*, p. 412.  
 2004. *Forresteria (Harleites) petrocoriensis* (Coquand, 1862); Kennedy and Walaszczyk, p. 55 *et seq.*; text-fig. 2a–f.

TYPE: The holotype, by monotypy, is the original of Coquand (1859, p. 995) (Pl. 5, Figs 13–15 herein), refigured by de Grossouvre (1894, pl. 2, fig. 5) and Kennedy (1984, pl. 5, figs 2–4), in the collections of the École des Mines, currently housed in the collections of the Université Claud Bernard Lyon 1, Villeurbanne. It is from Montignac, Dordogne, France.

DESCRIPTION: There are numerous specimens from the Březno Formation of Březno [Priesener Schichten von Priesen]. NHMW 1890/XIII/184b (Pl. 5, Fig. 6), the original of Kennedy (1984, pl. 6, fig. 5), labelled *Ammonites cf. dentatocarinata* Röm., “Priesener Schichten in Böhmen”, is a typical, well-preserved if slightly crushed individual, with a 180° sector of body chamber, and retains limonitised shell. Ribs are crowded on the phragmocone, prorsiradiate on the inner flank, and linking to a tiny lateral bulla, where the ribs flex back and are concave on the outer flank and ventrolateral shoulder. Some of

the bullae give rise to single ribs, others give rise to pairs of ribs, all of which link to small ventrolateral clavi, from which the ribs sweep forwards to well-developed siphonal clavi. On the body chamber, the lateral bullae strengthen markedly, and the primary ribs alternate with shorter ribs that intercalate around mid-flank, and may be tenuously linked to the lateral bullae. NHMW 1890.XIII.185 (Pl. 5, Figs 3–5 herein) from Priesen, labelled *Am. dentatocarinatus* was figured previously (Kennedy 1984, pl. 6, figs 3, 4), and is a 180° whorl fragment with a maximum preserved whorl height of 15 mm, and a costal whorl breadth to height ratio of 1.13. There are five massive conical lateral tubercles (two are damaged) corresponding to nine coarse, opposite ventral clavi, the strong siphonal clavi displaced only slightly adaperturally. NHMW 1890.XIII.182 (Pl. 5, Fig. 16 herein), labelled “*Ammonites neptuni* Geinitz, Priesener Schichten, Priesen”, is the original of Kennedy (1984, pl. 9, fig. 1; note that fig. 2 is the ventral view of a different specimen: NHMW 1894.XII.28; Pl. 5, Figs 17, 18 herein). It retains extensive areas of original aragonitic shell, is septate to a diameter of 35.3 mm and has a maximum preserved diameter of 45.9 mm. Seven incipient bullae perch on the umbilical shoulder and give rise to single prorsiradiate straight, narrow ribs that link to a small, sharp lateral bulla. The bullae give rise to pairs of ribs while additional short ribs intercalate. The ribs broaden across the outer flanks, and terminate in small, sharp ventrolateral clavi. The siphonal clavi are displaced adaperturally from the ventrolateral. Ornament of this type extends onto the adapical part of the body chamber, beyond which the umbilical bullae and inner flank ribs efface, and the lateral tubercles are eventually lost. The specimen is interpreted as an incomplete microconch. NHMW 1892.II.13 (Pl. 5, Figs 19, 20), from the Březno Formation of Priezen [Priesener Schichten von Priesen], retains extensive areas of recrystallised shell. The maximum preserved diameter is 61.3 mm, with the last septum at a whorl height of 21 mm approximately, and a 240° sector of body chamber; it is a near-complete microconch. The phragmocone, although crushed, has massive conical lateral tubercles that give rise to pairs of coarse ribs, linking to strong ventrolateral clavi. The ornament declines and effaces rapidly on the body chamber, and on the adapertural 90° sector, where the lateral tubercle is lost, the flanks are ornamented by crowded growth lines and striae, together with ribs of variable strength. Strong, widely separated clavi alternate in position on either side of the venter.

What may be a macroconch is represented by

a specimen in the Národní Muzeum, *ex* Meyer Collection, a crushed individual over 90 mm in diameter, showing loss of flank ornament on the body chamber (Pl. 4, Figs 11, 12).

DISCUSSION: See Kennedy (1984, p. 52).

OCCURRENCE: Index of the *petrocoriensis* Zone, which spans the Upper Turonian–Lower Coniacian boundary, as demonstrated by the occurrence of the species in the *Mytiloides scupini* Zone of Słupia Nadbrzeźna, Poland, and associated with *Cremnoceramus deformis erectus* in the Březno Formation (Pl. 4, Fig. 13). Elsewhere, there are records from the Lower Coniacian of the Aquitaine Basin, western France, the Münsterland Basin, Westphalia, Germany, and Romania.

Subfamily Peroniceratinae Hyatt, 1900

Genus and Subgenus *Peroniceras* de Grossouvre, 1894

TYPE SPECIES: *Peroniceras moureti* de Grossouvre, 1894 (p. 100, pl. 11, fig. 4), by original designation; = *Ammonites tridorsatus* Schlüter, 1867 (p. 26, pl. 5, fig. 1).

*Peroniceras (Peroniceras) subtricarinatum*  
(d’Orbigny, 1850)

(Pl. 6, Figs 2–4; Pl. 7; Text-figs 5, 6)

1841. *Ammonites tricarinatus* d’Orbigny, p. 307, pl. 91, figs 1, 2.
1850. *Ammonites subtricarinatus* d’Orbigny, p. 212.
1872. *Ammonites subtricarinatus* d’Orb.; Fritsch, p. 26, pl. 1, figs 1–3; pl. 10, figs 1, 3, non 2 [= *Peroniceras (Zuluiceras) bajuvaricum* (Redtenbacher, 1873)].
1893. *Ammonites (Schlönbachia) subtricarinatus* D’Orb.; Fritsch, p. 74, text-fig. 48.
1895. *Ammonites (Schlönbachia) subtricarinatus* D’Orb.; Fritsch, p. 72, text-fig. 48.
1984. *Peroniceras (Peroniceras) subtricarinatum* (d’Orbigny, 1850); Klinger and Kennedy, p. 157, text-figs 19a, b, d, e, 20–23.
1984. *Peroniceras (Peroniceras) subtricarinatum* (d’Orbigny, 1850); Kennedy, p. 71, pl. 14, fig. 5; pl. 15, figs 1–3; 6, 7 (with synonymy).
1995. *Peroniceras (Peroniceras) subtricarinatum* (d’Orbigny, 1850); Kennedy, Bilotte and Melchior, p. 415, pl. 20, figs 3–5, 9, 11, 12; text-fig. 23 (with additional synonymy).
- 2000a. *Peroniceras (Peroniceras) subtricarinatum* (d’Orbi-



Text-fig. 5. *Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850), NMP CL6650, the original of Fritsch (1893, p. 74, text-fig. 48), from bed 3 (sphaerosiderite layer) of the Březno Formation at Březno [Schichte 3 des Priesener Profils].

gny, 1850); Wiese, p. 134, pl. 3, fig. 1 (with additional synonymy).

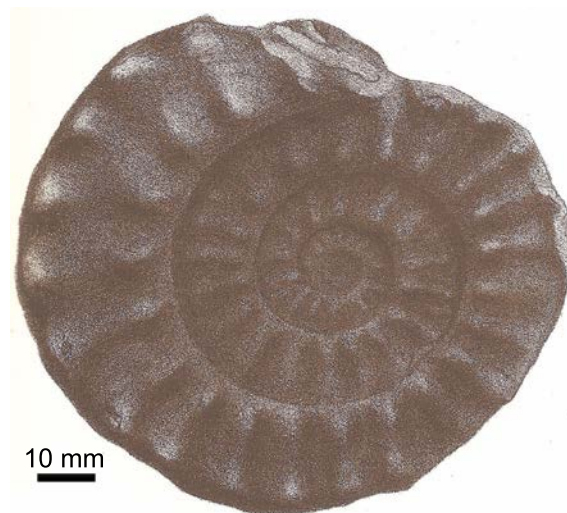
2005. *Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850); Kennedy and Juignet in Gauthier, p. 111, pl. 63, figs 3, 4.

2022. *Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850); Summesberger *et al.*, p. 33, pl. 11, figs 3–5; pl. 12, figs 1–10; text-fig. 15.7.

**TYPES:** The lectotype, by the subsequent designation of Klinger and Kennedy (1984, p. 160) is MNHN. F. R04281, the original of d'Orbigny (1841, pl. 91, figs 1, 2); MNHN. F. R04282 is the paralectotype. Both are from the environs of Sougraine, Aude, France. They were refigured by Kennedy (1984, pl. 12, figs 6–9), Kennedy *et al.* (1995, pl. 20, figs 3–5, 9) and Kennedy and Juignet in Gauthier (2005, pl. 63, figs 3, 4).

**DESCRIPTION:** NMP CL6650 (Text-fig. 5) is the original of Fritsch (1893, p. 74, text-fig. 48), from bed 3, of the Březno Formation [Priesener Schichten], the sphaerosiderite layer, Březno. It is very crushed, and was originally in excess of 100 mm in diameter. Coiling is very evolute, the umbilicus comprising an estimated 50% of the diameter; the original proportions cannot be established. There are approximately

25 primary ribs on the 360° sector comprising the adapertural half of the penultimate whorl and the adapical half of the outer whorl. They arise at the umbilical seam, strengthen across the umbilical wall, develop into small bullae, perched on the umbilical shoulder, and strengthening progressively as size increases. They give rise to straight recti- to feebly rursiradiate ribs, either singly or in pairs, although the precise pattern is difficult to establish because of the near-effacement of the ribs across the middle of the flanks, in part, perhaps, an artefact of the preservation. The ribs strengthen on the outermost flanks, and link to well-developed ventrolateral tubercles, approximately twice as numerous as the umbilical, conical on the adapertural part of the penultimate whorl, but spirally elongated on the outer whorl. They give rise to a prorsiradiate rib that weakens and effaces across the ventrolateral shoulder and venter. NMP 03151, the original of Fritsch (1872, pl. 10, fig. 1; reproduced here as Text-fig. 6) from the iron-bearing sandstones of the Merboltice Formation at Jedlová near Česká Kamenice [eisenschüssigen Sandsteine der Chlomeker Schichten von Tannenberge bei Böhmischem-Kamnitz] is an external mould of a juvenile, distorted into an ellipse with a major diameter of 95 mm approximately. The innermost whorls are restored in Fritsch's original figure. There are 20–21 umbilical bullae and 23–24 ribs at the ventrolateral shoulder of the outer whorl. NMP 03156 (Pl. 6, Figs 3, 4) is a fragment of adult body chamber with a whorl height of 66 mm, corresponding to the outer



Text-fig. 6. *Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850), NMP 03151, copy of Fritsch (1872, pl. 10, fig. 1); the original, an external mould, is from the iron-bearing sandstone of the Merboltice Formation of Jedlová near Česká Kamenice [eisenschüssige Sandstein der Chlomeker Schichten vom Tannenberge bei Böhmischem-Kamnitz].

whorl fragment of the specimen figured in Fritsch (1872, pl. 10, fig. 3a), from the same sandstone as the previous specimen in the Merboltice Formation at Jedlová near Česká Kamenice [Chlomeker Schichten vom Tannenberg bei Böhmischem-Kamnitz]. Maturity is indicated by the migration of the umbilical bulla out to an inner lateral position. The original of Fritsch (1872, pl. 1, figs 1–3), NMP 3132 (Pl. 7) from the Teplice Formation between Vrbičany and Keblice near Losovice [Teplitzer Schichten zwischen Wrbičan and Keblic bei Lobositz] is over 300 mm in diameter, with over 30 primary ribs, predominantly bullate primaries, on the outer whorl.

DISCUSSION: See Klinger and Kennedy (1984), and Kennedy (1984). As noted there, the species is characterised by very evolute coiling, and coarse ornament of ribs arising from bullae that persists to a large diameter.

OCCURRENCE: Lower Coniacian. There are records from the Czech Republic, the Munsterland Basin, Westphalia, Germany, France, Switzerland, Austria, KwaZulu-Natal in South Africa, Madagascar, and northern Mexico. It extends into the Middle Coniacian margae Zone in the Münsterland Basin, Germany.

Subgenus *Peroniceras* (*Zuluiceras*) van Hoepen, 1965

TYPE SPECIES: *Zuluiceras zulu* van Hoepen, 1965 (p. 9, pl. 5, text-figs 1g–i, 2b), by original designation.

*Peroniceras* (*Zuluiceras*) *bajuvaricum*  
(Redtenbacher, 1873)  
(Text-figs 7, 8)

- pars 1872. *Ammonites subtricarinatus* d'Orb; Fritsch, p. 26, pl. 10, fig. 2 only.
1873. *Ammonite bajuvaricus* Redtenbacher, p. 107, pl. 24, fig. 2.
1896. *Schlönbachia* (*Gauthiericeras* *Grossouvre*) *bajuvarica* Redtenb. sp.; Jahn, p. 136, text-figs 1, 2.
1984. *Peroniceras* (*Zuluiceras*) *bajuvaricum* (Redtenbacher, 1873); Kennedy, p. 80, pl. 16, figs 1–3, 6–11; pl. 17, figs 1–3; text-figs 13k, 20b, c, e, 23, 24, 25 (with synonymy).
2022. *Peroniceras* (*Zuluiceras*) *bajuvaricum* (Redtenbacher, 1873); Summesberger *et al.*, p. 35; pl. 13, figs 1–7; text-fig. 16.8 (with additional synonymy).

TYPE: The lectotype, by the subsequent designation of Reyment (1958, p. 43) is GBA 3432, the original of Redtenbacher (1873, pl. 24, fig. 2), from Leiner Alpe, Strobl/Weissenbach, Salzburg, Austria. It was refigured by Reyment (1958, pl. 11) and Summesberger *et al.* (2022, pl. 13, figs 1, 2).

DESCRIPTION: NHMW1890.XIII.186 (Text-fig. 7) is the original of Jahn (1896, p. 126, text-figs 1, 2), from the Březno Formation of Priesen [Priesener Schichten von Priesen]. The specimen is a crushed internal mould with inner whorls 73 mm in diameter and a fragment of the succeeding whorl, preserved to a whorl height of 35 mm, in part septate, in part body chamber. The broad umbilicus comprises 47% approximately of the diameter, the whorl height 34%. Coiling is serpentine, the whorls expanding slowly. Ornament is well-preserved at a whorl height 15.6 mm. Small bullae perch on the umbilical shoulder and give rise to pairs of low, straight, prorsiradiate ribs that weaken at mid-flank and link to small ventrolateral bullae. Short intercalated ribs arise high on the flank and strengthen to match the primaries. Ornament is



Text-fig. 7. *Peroniceras* (*Zuluiceras*) *bajuvaricum* (Redtenbacher, 1873) the original of Jahn (1895, text-fig. 1), from the Březno Formation of Březno [Priesener Schichten von Priesen].



also well-preserved on the succeeding whorl to a diameter of 95 mm, the umbilical bullae well-developed, the ribs stronger and broader than on the previous whorl, with well-developed bullae. The suture is partially exposed, with broad bifid E/A, A with a narrow neck, and A/U2 with a very narrow stem.

NMP 03155 is the original of *Ammonites subtricarinatus* of Fritsch (1872, pl. 10, fig. 2; reproduced here as Text-fig. 8), from the iron-bearing sandstone of the Merboltice Formation at Jedlová near Kytlice (formerly Falknov) near Česká Kamenice [eisenschüssigen Sandsteine der Chlomeker Schichten von Falkenau bei Böhmisches-Kamnitz], an internal mould in sandstone with the inner whorls restored in plaster. The dimensions are as follows:

	D	Wb	Wh	Wb:Wh	U
NMP 03155	98.0 (100)	21.7 (22.1)	35.0 (35.7)	0.62	40.0 (40.8)

Coiling is very evolute, with a broad, shallow umbilicus, the umbilical wall low, flattened, the umbilical shoulder narrowly rounded. The whorl section is compressed, with flattened subparallel flanks, the venter fastigiate-carinate. There are approximately 14 umbilical bullae per whorl. They give rise to feeble prorsiradiate ribs, either singly or in pairs, while occasional shorter ribs intercalate to give a total of approximately 36 ribs per whorl at the ventrolateral shoulder. All ribs bear rounded to feebly clavate ventrolateral tubercles that gives rise to a weak effacing prorsiradiate rib that terminates at a deep groove on either side of an entire siphonal keel.

DISCUSSION: See Kennedy (1984, p. 81).

OCCURRENCE: Lower Coniacian where well-dated. There are records from the Czech Republic, Austria, Touraine and the Aquitaine Basin in France, KwaZulu-Natal in South Africa, and Japan.

*Peroniceras (Zuluiceras) sp.*  
(Pl. 6, Fig. 1)

1872. *Ammonites polyopsis* Duj. (?); Fritsch, p. 35, pl. 6, fig. 3.

1893. *Ammonites polyopsis* Duj.; Fritsch, p. 76, text-fig. 56.

1896. *Ammonites polyopsis* Duj.; Jahn, p. 130.

DESCRIPTION AND DISCUSSION: NMP 93143 (Pl. 6, Fig. 1), the original of *Ammonites polyopsis* Duj. (?) of Fritsch (1872, p. 35, pl. 6, fig. 3), from the Březno Formation of Podlesí (formerly Valdek) near Česká Lipa [Priesener Schichten von Waldek bei



Text-fig. 8. *Peroniceras (Zuluiceras) bajuvaricum* (Redtenbacher, 1873), NMP 03155, copy of Fritsch (1872, pl. 10, fig. 2), from the iron-bearing sandstone of the Merboltice Formation of Jedlová near Kytlice (formerly Falknov) near Česká Kamenice [eisenschüssige Sandstein der Chlomeker Schichten von Falkenau bei Böhmisches-Kamnitz].

Böhmischen-Leipa] is a fragment of a *Peroniceras (Zuluiceras)* with two spirally elongated ventrolateral tubercles and a strong entire siphonal keel. The surface of the shell, excluding the keel, is ornamented by delicate spiral ridges. Ornament of this type is well-developed in species of *Peroniceras (Zuluiceras)* figured by Klinger and Kennedy (1984, text-figs 60a, 66), hence the present assignment.

Family Tissotiidae Hyatt, 1900  
Genus *Metatissotia* Hyatt, 1900

TYPE SPECIES: *Ammonitesourneli* Bayle in Fournel, 1849 (p. 360, pl. 17, figs 1–5), by the subsequent designation of Roman (1938, p. 479).

*Metatissotia? nanclasi* (de Grossouvre, 1894)  
(Pl. 4, Figs 1–9)

pars 1872. *Ammonites dentatocarinatus* Römer. Fritsch, p. 32, pl. 16, fig. 1 only.

1894. *Schlönbachia Nanclasi* de Grossouvre, p. 110, pl. 3, fig. 4.

1984. *Metatissotia? nanclasi* (de Grossouvre, 1894); Kennedy, p. 133, pl. 29, figs 5, 6; text-fig. 40d.

TYPE: The holotype, by monotypy, is MNHN. F. R07828, the original of de Grossouvre (1894, pl. 3, fig. 4; Pl. 4, Figs 5, 6 herein, refigured by Kennedy (1984, pl. 29, figs 5, 6), from the Lower Coniacian on the railway line from Périgueux to Coutras just outside Périgueux, Dordogne, France.

DESCRIPTION: NHMW 1890.XIII.184a (Pl. 4, Fig. 3), labelled "*Ammonites* cf. *dentatocarinatus*, Priesener Schichten, Priesen", is typical. It is an internal mould of a crushed phragmocone 26 mm in diameter, with a 160° sector of relatively well-preserved body chamber. The maximum preserved diameter is 39.8 mm. Coiling is very involute, the tiny umbilicus comprising 14.6% of the diameter, with a low, feebly convex wall and quite narrowly rounded umbilical shoulder. The whorl section is very compressed, with feebly convex inner flanks, convergent outer flanks, narrowly rounded ventrolateral shoulders and an obtusely fastigiata venter. Little of the ornament is preserved on the phragmocone, other than the ventral terminations of the ribs, which bear small ventral clavi. The siphonal region of the fastigiata venter appears to be feebly undulose, without actually developing into clavi. On the body chamber, four weak to incipient bullae perch on the umbilical shoulder, and give rise to narrow, straight, prorsiradiate ribs that link to small, pointed mid-lateral bullae, from which narrow recti- to feebly prorsiradiate ribs arise in pairs. There are occasional long or short intercalated ribs, and all ribs broaden slightly on the outer flanks and ventrolateral shoulder and link to small ventral clavi. The lateral tubercles weaken markedly on the last few ribs, suggesting the specimen to be a near-complete adult. Only fragments of the final sutures survive; E/A is broad, with a minor median incision; A is near-entire, and A/U2 barely incised. The specimen differs from the holotype of *M. nanclasi* (Pl. 4, Figs 5, 6) only in the straightness of the ribs on the outer flank and ventrolateral shoulder. NHMW 1890.XIII.183b (Pl. 4, Fig. 2) a crushed, limonitised individual 29 mm in diameter, and NHMW 1890.XIII.183a, 25.6 mm in diameter, are in similar preservation. NMP 03201 (Pl. 4, Fig. 4) is the original of *Ammonites dentato-carinatus* of Fritsch (1872, pl. 16, fig. 1), from the sphaerosiderite layer in the Březno Formation of Březno [Priesener Schichten von Priesen]. It is a juvenile 16 mm approximately

in diameter. NHMW 1890/XIII/188 (Pl. 4, Figs 7, 8), labelled "*Ammonites* spec. Priesener sc. Priesen in Böhmen" comprises a deformed phragmocone with a well-preserved 180° sector of body chamber, the maximum preserved diameter 23.3 mm, and a whorl breadth to height ratio of 0.58, the flanks very feebly convex, converging to rounded ventrolateral shoulders and a broadly obtuse venter. Blunt, relatively coarse ribs are prorsiradiate on the inner flank, and link to sharp lateral bullae. These give rise to pairs of progressively broadening ribs that flex forwards over the ventrolateral shoulder, where they are concave, and link to small ventrolateral clavi. The venter is sharp at the siphonal line and does not develop into siphonal clavi. The suture has broad, plump saddles that are moderately incised.

DISCUSSION: See Kennedy (1984, p. 133).

OCCURRENCE: Lower Coniacian of the Dordogne, France, and the Czech Republic.

Suborder Ancyloceratina Wiedmann, 1966  
 Superfamily Turrilitoidea Gill, 1871  
 Family Anisoceratidae Hyatt, 1900  
 Genus *Allocrioceras* Spath, 1926

TYPE SPECIES: *Crioceras ellipticum* Woods, 1896 (p. 84, pl. 3, fig. 9) (non *Hamites ellipticus* Mantell, 1822, p. 122), by the original designation of Spath (1926, p. 80), renamed *Allocrioceras woodsi* Spath, 1939 (p. 598, = *Hamites angustus* J. de C. Sowerby, 1850, p. 346, pl. 29, fig. 12).

*Allocrioceras* sp. A  
 (Text-fig. 9)

1872. *Hamites Geinitzii* d'Orb.; Fritsch. p. 46, pl. 16, fig. 16.

1893. *Hamites Geinitzii* d'Orb.; Fritsch, p. 77, text-fig. 60.

1895. *Hamites Geinitzii* d'Orb.; Fritsch, p. 76, text-fig. 60.

DESCRIPTION: NMP 03216 is the original of Fritsch (1872, p. 46, pl. 16, fig. 16), from the Březno Formation near Lenešice [Priesener Schichten bei Lenešic]; the original figure is reproduced here (Text-fig. 9). It is a slightly curved fragment 14.5 mm long, the whorl section compressed, the whorl height 5.8 mm, the whorl breadth to height ratio 0.84. There are 13 ribs on the fragment. They are very weak and transverse on the dorsum, sweep forwards and strengthen progressively across the flanks, where they are markedly



Text-fig. 9. *Allocrioceras* sp. A, copy of *Hamites Geinitzii* d'Orb. of Fritsch (1872, pl. 16, fig. 16a–c), from the Březno Formation of Lenešice [Priesener Schichten von Lenešic].

prorsiradiate. All ribs bear ventral tubercles; most are minute; towards the adapertural end of the fragment a pair of ribs are linked by a much larger tubercle.

DISCUSSION: *Hamites Geinitzii* d'Orbigny, 1850 (p. 215), was introduced for “*Hamites ellipticus*, Geinitz, (non Mantell, 1822). Bohème Wernbola.” The reference is to Geinitz' (1840) *Charakteristik der Schichten und Petrafakten des sächsischen Kreidegebirges*, where *Hamites ellipticus* is cited on p. 41, and briefly described:

“Die Krümmung ist elliptisch, der ganze Körper seitlich zusammengedrückt, die Oberfläche mit glatten, regelmäßig entfernten Erhöhungen bedeckt, deren jede an der äusseren Grenze mit 2 schmalen Tuberkeln geziert ist.

*In Strehlen nicht selten.*”

In the absence of an illustration, the species, although probably an *Allocrioceras*, can only be regarded as a *nomen dubium*, and there is no evidence to support the view that the specimen described by Fritsch is conspecific with *geinitzii* of d'Orbigny. Of described *Allocrioceras* species, the specimen resembles the Upper Turonian *Allocrioceras angustum* (J. de C. Sowerby, 1850) (see revision in Kennedy and Kaplan 2019, p. 79, pl. 44, figs 10, 11; pl. 52, figs 15–18 and Kennedy 2020, p. 113, pl. 38, figs 1–8, 10–17; pl. 39, figs 7, 8, 26, 27; text-fig. 62d, e), which has tubercles on most of the ribs, and *Allocrioceras schlue-teri* (Windmüller, 1882) (see revision in Kennedy and Kaplan 2019, p. 82, pl. 43, figs 4–9), where some ribs link in pairs at ventral tubercles.

OCCURRENCE: As for material.

*Allocrioceras* sp. B  
(Pl. 8, Figs 1–4)

DESCRIPTION: NMP 04221 (Pl. 8, Figs 1–4) is a beautifully preserved internal mould of a phragmocone fragment 28.5 mm long, the whorl section compressed oval, the whorl breadth to height ratio 0.8. The rib index is six, the ribs narrow, distant, blunt, and weakest on the dorsum, which they cross obliquely. Straight and prorsiradiate on the flanks, they strengthen over the venter, which they also cross obliquely. Tuberculate ribs are relatively stronger on the venter, and bear small ventrolateral tubercles, and are separated by three or four nontuberculate ribs.

DISCUSSION: *Allocrioceras* sp. B differs from other European species of *Allocrioceras* in the more numerous nontuberculate ribs separating successive tuberculate ones. The specimen is labelled, apparently in error, as being the original of *Hamites bohemicus* Fritsch 1893 (text-fig. 58d), from Srnojedy, but this has a circular whorl section and lacks ventral tubercles.

OCCURRENCE: Uncertain, as the specimen is clearly mislabelled; probably Coniacian, Březno Formation?

Family Nostoceratidae Hyatt, 1894

Genus and Subgenus *Hyphantoceras* Hyatt, 1900

TYPE SPECIES: *Heteroceras roissyanum* Schlüter, error for *Hamites reussianus* d'Orbigny, 1850 (p. 216), by the original designation of Hyatt (1900, p. 587).

*Hyphantoceras* (*Hyphantoceras*) cf. *reussianum*  
(d'Orbigny, 1850)  
(Text-fig. 10B)

compare:

- 1850. *Hamites Reussianus* d'Orbigny, p. 216.
- pars 1872. *Helicoceras armatus* D'Orb.; Fritsch, p. 47, pl. 13, fig. 16 only.
- 2020. *Hyphantoceras* (*Hyphantoceras*) *reussianum* (d'Orbigny, 1850); Kennedy, p. 126, pl. 40, figs 1–11, 14–18; text-figs 61a, 68a, d–g, 69 a–d (with full synonymy).
- 2023. *Hyphantoceras* (*Hyphantoceras*) *reussianum* (d'Orbigny, 1850); Kennedy in Kennedy and Walaszczyk, p. 646, text-fig. 9j–l.

DESCRIPTION AND DISCUSSION: NMP 03179 (Text-fig. 10B), the original of *Helicoceras armatus*

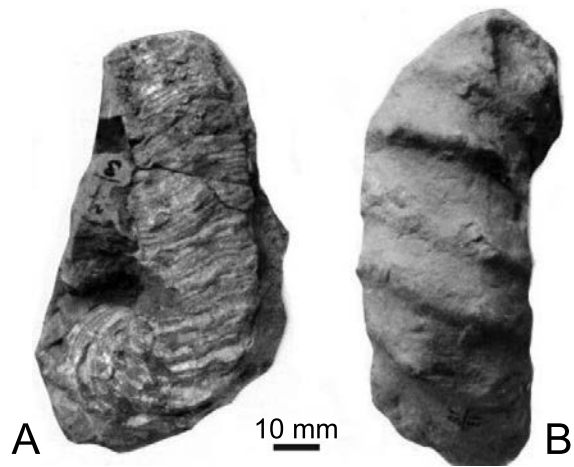
D'Orb. of Fritsch (1872, pl. 13, fig. 16), from the calcareous sandstone of the Jizera Formation at Dolánky near Turnov [kalkigen Sandstein der Ierserschichten von Dolanka bei Turnau] is a 94 mm long, worn body chamber fragment with seven widely separated coarse ribs. The ribs are oblique on the outer whorl face, and bear four rows of coarse tubercles. The coarse, distant tuberculate ribs correspond to those of the macroconch neotype of *H. (H.) reussianum* (Kennedy and Kaplan 2019, pl. 47, figs 6, 7; Kennedy 2020, text-fig. 68e, f), and other large, macroconch specimens (Kaplan and Schmid 1988); it differs, however, in the absence of delicate riblets between the major ribs, a result, perhaps, of the poor preservation.

**OCCURRENCE:** Upper Turonian *Subprionocyclus neptuni* Zone. The geographic distribution extends from southern and eastern England to northern and south-eastern France, northern Spain, Germany, Poland, the Czech Republic, Kazakhstan, Sakhalin, Central Tunisia, and the uppermost Turonian or Lower Coniacian of Madagascar.

*Hyphantoceras (Hyphantoceras) flexuosum*  
(Schlüter, 1872)

(Pl. 8, Figs 5, 7–10, 14, 15; Text-figs 10A, 11)

1872. *Helicoceras flexuosum* Schlüter, p. 108, pl. 32, figs 13, 14.
- pars 1872. *Helicoceras armatus* d'Orb.; Fritsch, p. 47; pl. 7, fig. 3, pl. 14, figs 8, 14–19; pl. 16, fig. 9; non pl. 13, fig. 16 [= *H. (H.) cf. reussianum*].
1893. *Helicoceras Reussianum* Gein.; Fritsch, p. 79, text-fig. 52.
1895. *Helicoceras Reussianum* Gein.; Fritsch, p. 77, text-fig. 52.
- 2000b. *Hyphantoceras flexuosum* (Schlüter, 1872); Wiese, p. 409, pl. 2, figs 1–10; pl. 3, figs 13, 14.
- 2000b. *Hyphantoceras ernsti* Wiese, p. 410, pl. 1, figs 1–11; pl. 3, figs 3, 9, 15; text-fig. 3.
2018. *Hyphantoceras flexuosum* (Schlüter, 1872); Diebold *et al.*, p. 152, text-fig. 4m, n.
2018. *Hyphantoceras (Hyphantoceras) ernsti* Wiese, 2000; Baudouin *et al.*, p. 325, pl. 9, figs 2–6.
2018. *Hyphantoceras flexuosum* (Schlüter, 1872); Baudouin *et al.*, p. 324, pl. 9, fig. 1.
2019. *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872); Kennedy and Kaplan, p. 88, pl. 42, fig. 2; pl. 44, fig. 1; pl. 48, figs 1–3, 5–11; pl. 52, fig. 12.
2020. *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872); Kennedy, p. 130, pl. 40, figs 12, 13; text-fig. 70a–g (with synonymy).

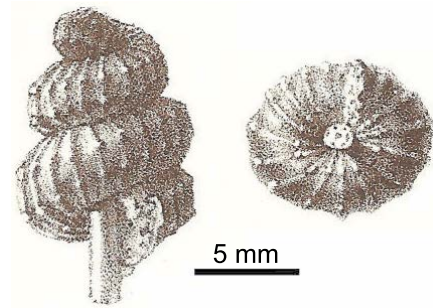


Text-fig. 10. *Hyphantoceras* spp. A – *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872), NMP 03149, the original of Fritsch (1872, pl. 7, fig. 3), an adult body chamber, from the Březno Formation of Dneboh [Priesener Schichten von Dneboh]. B – *Hyphantoceras (Hyphantoceras) reussianum* (d'Orbigny, 1850), NMP 03179, the original of *Helicoceras armatus* D'Orb. of Fritsch (1872, pl. 13, fig. 16), from the calcareous sandstone of the Jizera Formation of Dolánky u Turnova [kalkige Sandstein der Ierserschichten von Dolanka bei Turnau]. Specimens are uncoated.

**TYPE:** The lectotype, by the subsequent designation of Wiese (2000b, p. 409), is no. x5687 in the collections of the Bundesanstalt für Geologie und Rohstoffkunde, Berlin, the original of Schlüter (1872, p. 108, pl. 32, figs 10–12) from the Upper Turonian or Lower Coniacian *cuvieri* Pläner of the Salzgitter area, Germany. It was refigured by Wiese (2000b, pl. 2, figs 1–3).

**DESCRIPTION:** A series of specimens are from the Březno Formation [Priesener Schichten]. NHMW 1890.XIII. 205a (Pl. 8, Figs 8–10), labelled “Priesener Schichten, Priesen”, is a beautifully preserved pyritic internal mould of 1.5 whorls of a tight helix, the whorls in contact, coiled around a fragment of a straight shaft. The maximum diameter of the spire is 7 mm. At this growth stage, strong rounded ribs are separated by wider interspaces. There is a tiny radially elongated bulla on the inner side of the upper whorl face, linked to a delicate rib that extends down the inner side of the whorl, and across the upper whorl face, linking to a much coarser bulla at the junction of the upper and outer whorl face. A feebly rursiradial rib sweeps back across the outer whorl face, and links to a transversely elongated bulla in the middle of the whorl face, and thence to a similar tubercle at the junction of the outer and lower whorl faces. This

tubercle gives rise to a narrow rib that sweeps back, and is feebly concave on the lower whorl face. NMP 03212 from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Lauen] is a comparable individual, the original of *Helicoceras armatus* d'Orbigny of Fritsch (1872, p. 47, pl. 16, fig. 9), the original figures reproduced here as Text-fig. 10. A minute straight, smooth shaft is enclosed by a tight helix of three whorls; the maximum preserved height is 21.5 mm. NHMW1890.XIII.206 (Pl. 8, Fig. 5), labelled "*Helicoceras* sp. ob. kreide (Senon) Priesener Sch. Lenesic bei Laun. Bohmn.," continues the ontogeny. The specimen consists of four whorls in limonitic preservation, forming a tight helix with an acute apical angle, the first whorl linked to a presumably straight shaft, around which the helix coils. The helix is 7.6 mm high. Ornament is poorly preserved. Coarse oblique ribs bear two rows of bullae on the outer, exposed whorl face, with a small number of weaker, nontuberculate ribs between successive tuberculate ribs. The helix is succeeded by a loosely coiled whorl that separated progressively from the helix. Ornament is of crowded ribs. Tuberculate ribs are concave at the junction of upper and outer whorl faces, and feebly prorsiradiate on the outer whorl face. They bear a row of well-developed bullae, but most of the whorl is concealed, so that the total number of rows cannot be established. One or two weaker nontuberculate ribs separate successive tuberculate ribs. NHMW 1890.XIII.205b (Pl. 8, Fig. 14), from the Březno Formation of Březno [Priesener Schichten von Priesen] is a 20 mm long fragment with a maximum preserved whorl height of 6.5 mm. Distant primary ribs bear two rows of transversely elongated tubercles on the outer, exposed whorl face, and a third, weaker row on the outer part of the lower whorl face. There are up to three intercalated ribs between successive tuberculate ribs. NMP 03197 is the original of *Helicoceras armatum* of Fritsch (1872, pl. 14, fig. 8), from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Lauen], a 35 mm long pyritic fragment retaining the original proportions. It is coiled in a low helix, coarse tuberculate ribs separated by several delicate non-tuberculate ribs. NHMW 1890.XIII.207 (Pl. 8, Fig. 15), labelled "*Helicoceras* sp. (Reussianum d'Orb.), Priesener Schichten, Priesen", is a beautifully preserved body chamber fragment with limonitised shell, 66 mm long. There are five coarse primary ribs on the fragment, with four rows of tubercles. The tubercles become progressively larger from the upper row to the lower row, the lowest produced into short spines. Three or four weaker ribs separate successive tuberculate ones. NHMW 189.XIII.204



Text-fig. 11. *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872), NMP 03212, copy of *Helicoceras armatus* D'Orb. of Fritsch (1872, pl. 16, fig. 9), from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Laun].

(Pl. 8, Fig. 7), labelled "*Helicoceras (Heteroceras n. Sow) Reussianum* d'Orb. sp. Ob. Kreide Priesener Sch. Priesen, Böhmen" is an uncrushed body chamber fragment 63 mm long with a maximum preserved whorl height of 24.3 mm. Five prorsiradiate coarse tuberculate ribs are preserved on the fragment. Each bears a coarse bulla on the upper and lower parts of the outer whorl face, with a third row at the junction of outer and lower whorl faces; no other tubercles are visible. The tuberculate ribs are separated by three to five weaker, nontuberculate ribs. NMP 03149 (Text-fig. 10A), from the Březno Formation of Dneboh [Priesener Schichten von Dneboh], the original of *Helicoceras armatus* D'Orb. of Fritsch (1872, pl. 7, fig. 3) is a further crushed body chamber, with aperture preserved.

DISCUSSION: See Kennedy and Kaplan (2019, p. 89), and Kennedy (2020, p. 130).

OCCURRENCE: Upper Turonian and Lower Coniacian, Germany, the Czech Republic, southern England, and south-east France.

Family Diplomoceratidae Spath, 1926  
Subfamily Diplomoceratinae Spath, 1926  
Genus *Scalarites* Wright and Matsumoto, 1954

TYPE SPECIES: *Helicoceras scalare* Yabe, 1904 (p. 9, pl. 3, figs 2, 3), by the original designation of Wright and Matsumoto (1954, p. 115).

DISCUSSION: The Upper Turonian and Coniacian of central Europe are the source of a number of largely fragmentary heteromorphs with more or less regular

open planispiral coiling, and an ornament of simple annular ribs. Species recognised are differentiated on the basis of the rib index and rib direction. Their assignment to currently recognised genera is problematic because of the limited range of morphological characteristics; if Albian or Cenomanian they would be assigned to *Hamites* Parkinson, 1811; if Maastrichtian, to *Glyptoxoceras* Spath, 1925. In the case of the present material they are assigned to *Scalarites* Wright and Matsumoto, 1954, with no great confidence. The original diagnosis of *Scalarites* was as follows (Wright and Matsumoto 1954, p. 115): "A very shallow open helicoid spire in the early stages is sooner or later followed by loose elliptical coiling in nearly one plane. The whorls enlarge very slowly and are more or less circular in section. Ribs simple and annular. Typically there are untuberculated flared ribs or infrequent constrictions. Suture of IULE pattern, all elements bifid except for trifid internal lobe."

The problem with the present material is that it lacks flared ribs and constrictions. Added to this, Fritsch described several species base on short sections of straight or slightly curved shaft that we regard as *nomena dubia*, possibly fragments of the better characterised *Hamites bohemicus* Fritsch, 1872, which as first revising authors we select as the name of the species. A further complication surrounds *Hamites strangulatus* d'Orbigny of Fritsch (1872, p. 45, pl. 13, fig. 22), which he subsequently (1883, p. 137, text-fig. 132) reinterpreted as a species of *Fucoides*? – a trace fossil. We have not seen the specimen.

*Scalarites?* *bohemicus* (Fritsch, 1872)

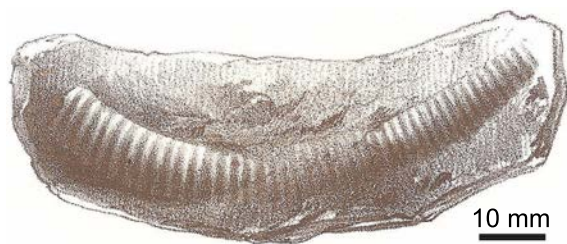
(Pl. 9, Figs 1–11; Text-fig. 12)

1872. *Hamites bohemicus* Fritsch, p. 44, pl. 13, fig. 20.  
 pars 1893. *Hamites bohemicus* Fr.; Fritsch, p. 77, text-fig. 53a, d, e, non b, c? [= *Allocrioceras* sp.].  
 pars 1895. *Hamites bohemicus* Fr.; Fritsch, p. 75, text-fig. 58a, d, e, non b, c? [= *Allocrioceras* sp.].  
 1897. *Hamites bohemicus* Fr.; Fritsch, p. 39, text-fig. 21.  
 1898. *Hamites bohemicus* Fr.; Fritsch, p. 38, fig. 21.  
 1925. *Hamites bohemicus* Fritsch et Schloenbach; Diener, p. 66.

TYPE: The lectotype, here designated, is NMP 03183, the original of Fritsch (1872, pl. 13, fig. 20), the original figure reproduced here as Text-fig. 12, from the yellow sandstone of the Merboltice Formation of Jedlová near Kytlice (formerly Falknov) [gelben Sandstein der Chlomeker Schichten vom Tannenberg bei Falkenau]. Fritsch mentioned two further spec-

imens, which are paralectotypes, one is from the "Baculithone der Priesener Schichten von Böhm. Kamnitz", the other from the "Sphaerosiderit der Priesener Schichten von Priesen bei Laun."

DESCRIPTION: The earliest growth stage seen, NHMW 1890.X111.203 (Pl. 9, Fig. 3 herein), labelled "*Hamites verus*, Frič Baculithonen, Priesener Schichten, Priesen" is an open criocone with a maximum preserved length of 51 mm and a maximum preserved whorl height of 1.9 mm, preserved as an external mould retaining traces of originally nacreous shell. It extends from just beyond the protoconch, which is not preserved. The shell appears to have been initially smooth; crowded straight prorsiradiate ribs are detectable from a whorl height of 1.5 mm. NHMW.194.X11.29 (Pl. 9, Figs 4, 8), labelled "*Crioceras* sp., Baculithone, Priesen", and on a later label "*Hamites bohemicus* Frič". continues the ontogeny. It is a crushed limonitic curved sector 33.6 mm long, with a maximum preserved whorl height of 4.5 mm. The rib index is five, the ribs prorsiradiate, and strengthening slightly across the flanks. NHMW.1890.III.201 (Pl. 9, Figs 1, 2), labelled "*Hamites bohemicus* Frič Priesener" is the best-preserved specimen seen. It is a very slightly curved limonitic fragment with a maximum preserved whorl height of 5.6 mm, and a whorl breadth to height ratio of 0.7; the whorl section is compressed oval. The rib index is five. The ribs are weak on the mid-dorsal region, strengthening across the dorsolateral margin, straight and transverse to feebly prorsiradiate on the flanks, and transverse on the venter. It appears to be a fragment of body chamber. The lectotype (Text-fig. 12) is an external mould of a 70 mm long slightly curved fragment, the median section of which is badly damaged. The expansion rate is low; the original whorl section cannot be established. Ornament is of sharp recti- to feebly prorsiradiate rbs; the rib



Text-fig. 12. The lectotype of *Scalarites?* *bohemicum* (Fritsch, 1872), NMP 03183; copy of Fritsch (1872, pl. 13, fig. 20), from the yellow sandstone of the Merboltice Formation of Jedlová near Kytlice (formerly Falknov) [gelbe Sandstein der Chlomeker Schichten vom Tannenberg bei Böhmischem-Kamnitz].

index is six. Larger still is NHMW.1893.X111.200 (Pl. 9, Fig. 10), labelled “*Hamites bohemicus* Frič, Priesenes Schichten, Priesen”, a crushed limonitised specimen, with traces of original shell, no trace of septa, and probably part of a body chamber. Curved, 79 mm long, with a maximum preserved whorl height of 10.4 mm, the rib index five, the rib direction varying from recti- to feebly rursiradiate.

NHMW 1890.13.202 (Pl. 9, Fig. 6), labelled “*Hamites striatus* Frič, Priesener Schichten, Priesen”, is a body chamber fragment, with only one flank preserved. The maximum preserved whorl height is 26.7 mm, the rib index 6–7. The ribs are narrow, rounded, and narrower than the interspaces, strongly prorsiradiate, and very feebly concave.

DISCUSSION: The relationship between *Scalarites? bohemicus* and *Scalarites turoniense* (Schlüter, 1872) is problematic. The lectotype of *turoniense*, by the subsequent designation of Kaplan and Kennedy (1994, p. 58), is no. 69b in the collections of the Paläontologisches Institut of the Rheinischen Friedrichs-Wilhelms-Universität, Bonn, the original of Schlüter (1872, p. 103, pl. 31, fig. 4), from the *Cuvieri* Pläner of Rothenfelde, Lower Saxony, refigured by Kaplan and Kennedy 1994 (pl. 37, fig. 1). It is a very crushed fragment of a curved sector that overlaps in size with the lectotype of *bohemicus*, the rib index four, the ribs recti- to prorsiradiate. It thus differs from *bohemicus* in its lower rib index.

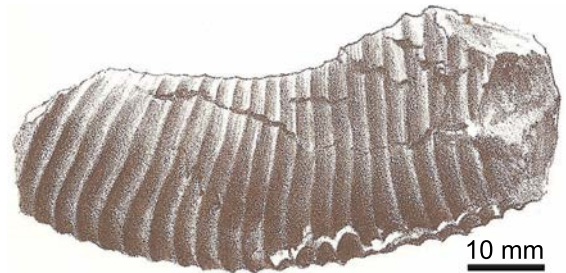
Wiese (2000b) treated *bohemicus* as a junior synonym of *turoniense*, and figured fragments that he assigned to the latter with periodic strengthened ribs (his pl. 3, figs 2, 6) as in the larger fragment that Schlüter referred to *turoniense* with a query (1872, pl. 31, fig. 5; see Kaplan and Kennedy 1994, pl. 39, fig. 9). If these specimens are indeed examples of *turoniense*, then the presence of strengthened ribs is a feature that separates it from *bohemicus*.

OCCURRENCE: Lower Coniacian of the Czech Republic.

*Scalarites? striatus* (Fritsch, 1872)  
(Text-fig. 13)

1872. *Hamites striatus* Fritsch, p. 45, pl. 13, fig. 17.  
1897. *Hamites striatus* Fr.; Fritsch, p. 39, text-fig. 39.  
1898. *Hamites striatus* Fr.; Fritsch, p. 38, text-fig. 22.  
1925. *Hamites striatus* Fritsch et Schloenbach; Diener, p. 69.

TYPE: The holotype, by monotypy, is NMP 03179, the original of Fritsch (1872, p. 45, pl. 13, fig. 17);



Text-fig. 13. The holotype, by monotypy of *Hamites striatus* Fritsch 1872, NMP 03179, copy of Fritsch (1872, pl. 13, fig. 17), from the grey sandstone of the Merboltice Formation of Jedlová near Kytlice (formerly Falkenau) [graue Sandstein der Chlomeker Schichten vom Tannenberg bei Böhmischem-Kamnitz].

the original figure reproduced here as Text-fig. 13, from the grey sandstone of the Merboltice Formation of Jedlová near Kytlice (formerly Falknov) [graue Sandstein der Chlomeker Schichten vom Tannenberg bei Falkenau].

DESCRIPTION AND DISCUSSION: The holotype is an 80 mm long fragment of which one flank with a maximum preserved whorl height of 33 mm is exposed. The original whorl proportions cannot be established. Ornament is of straight feebly rursiradiate ribs; the rib index is eight. As Fritsch (1872, p. 45) notes: “Es wäre nicht unmöglich, dass diese Art als Wohnkammer zu *Hamites bohemicus* ...”. One can only agree; *striatus* is best treated as a *nomen dubium*.

OCCURRENCE: As for type.

*Scalarites? verus* (Fritsch, 1872)  
(Pl. 9, Figs 5, 7)

1845. *H. attenuatus* Sow.; Reuss, p. 23, pl. 7, fig. 19.  
1872. *Hamites verus* Fritsch, p. 45, pl. 13, figs 13, 18, 26; pl. 16, fig. 15.  
1877. *Hamites verus*; Fritsch, p. 103.  
1893. *Hamites verus* Fr.; Fritsch, p. 77, text-fig. 59.  
1895. *Hamites verus* Fr.; Fritsch, p. 75, text-fig. 59.  
1925. *Hamites verus* Fritsch et Schloenbach; Diener, p. 70.  
2000b. *Hamites verus*; Wiese, p. 414.

TYPES: Fritsch referred to the specimen figured by Reuss (1845, pl. 7, fig. 19) from the Pläner Marl from Březno [Plänermergel von Priesen], and figured four specimens. The original of his pl. 13, fig. 13 is from the “Pyropenconglomerat von Meronitz [Měrunice]

(Priesener Schichten) (Sammlung des Forstmeisters v. Unger.)” The original of his pl. 13, fig. 18 is NMP 03180, from the “Priesener Schichten von Priesen bei Postelberg [Březno near Postoloprty].” The original of his pl. 13, fig. 26 is NMP 03194 (Pl. 9, Figs 5, 7), from Březno. The original of his pl. 16, fig. 15 is NMP 03215 (Pl. 8, Fig. 6), from the “Priesener Schichten von Lenešic [Lenešice].”

**DESCRIPTION AND DISCUSSION:** These tiny specimens are straight (NMP 03194, Pl. 9, Figs 5, 7) or slightly curved (NMP 03180) shafts, ornamented by narrow ribs that are straight and prorsiradiate on the flanks, the rib index five. They lack diagnostic features, and may be fragments of material assigned here to *Scalarites? bohemicum*; *verus* is best regarded as a *nomen dubium*.

**OCCURRENCE:** As for types.

Diplomoceratinae sp. juv.  
(Pl. 8, Figs 11–13)

**DESCRIPTION AND DISCUSSION:** Three specimens MUNL G 1560a–c, consist of a slender straight shaft, the longest preserved to 30 mm, that bends and expands rapidly at the adapertural end and is transformed into a tight helix with up to four whorls preserved, the maximum whorl height 6 mm approximately. Ornament is very poorly preserved, and details obscured by crushing, but there appear to have been concave prorsiradiate ribs.

An initial straight shaft followed by a helix is developed in Upper Turonian *Eubostrychoceras (E.) saxonicum* (Schlüter, 1872) (Kennedy and Kaplan 2019, pl. 46, fig. 2; Kennedy 2000, text-fig. 71b), and *Hyphantoceras (H.) flexuosum* (see above; Pl. 8, Figs 8–10; Text-fig. 11), but here, the helix coils around the shaft. These specimens cannot be juveniles of the *Scalarites* in the present faunas, where the post-protoconch shell is a curved and planispiral. Early growth stages of this type are, however, found in the Campanian *Glyptoxoceras aquisgranense* (Schlüter, 1872) (Kennedy *et al.* 1992, pl. 2, figs 5, 11–14), but to which (if any) of the Diplomoceratinae represented by larger individuals in the present material they are related to is unclear.

**OCCURRENCE :** Březno Formation, Březno.

Family Baculitidae Gill, 1871  
Genus *Sciponoceras* Hyatt, 1894

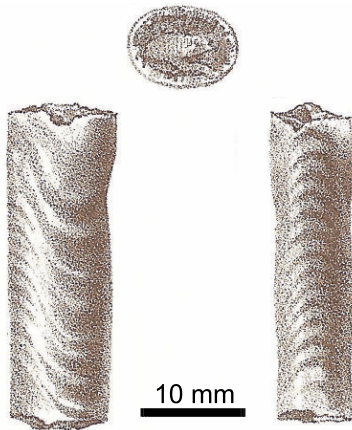
**TYPE SPECIES:** *Hamites baculoides* Mantell, 1822 (p. 123, pl. 23, figs 6, 7), by the original designation of Hyatt (1894, p. 578).

*Sciponoceras bohemicum bohemicum* (Fritsch, 1872)  
(Pl. 10, Figs 1–23; Text-fig. 14)

1872. *Baculites Faujassi* Lamk. var. *bohémica* Fritsch, p. 49, pl. 13, figs 23–25, 29, 30.  
1893. *Baculites faujassi* Lamarck var. *bohémica* Fr.; Fritsch, p. 80, text-fig. 63.  
1893. *Baculites faujassi* Lamarck var. *bohémica* Fr.; Fritsch, p. 77, text-fig. 63.  
1896. *Baculites Faujassi* var. *bohémica* Fritsch; Jahn, p. 136, pl. 8, fig. 7.  
2019. *Sciponoceras bohemicum bohemicum* (Fritsch, 1872); Kennedy and Kaplan, p. 93, pl. 49, figs 1–14, 18, 20; text-fig. 25d, e.  
2020. *Sciponoceras bohemicum bohemicum* (Fritsch, 1872); Kennedy, p. 169, pl. 51, figs 1–7, 9, 14–22, 26–28, pl. 52, figs 1–13 (with full synonymy).  
2023. *Sciponoceras bohemicum bohemicum* (Fritsch, 1872); Kennedy in Kennedy and Walaszczyk, p. 649, text-figs 10a–w, 11a.

**TYPE:** The lectotype, by the subsequent designation of Wright (1979, p. 285), is the original of *Baculites faujassi* Lamk. var. *bohémica* of Fritsch (1872, p. 49, pl. 13, fig. 25; the original figures are reproduced here as Text-fig. 14). Fritsch figured four additional specimens, which are paralectotypes. All are from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Lauen] in the Ústí nad Labem region of the Czech Republic, and are housed in the collections of the Národní Museum, Prague. NMP 03156 is said to be the original of fig. 25, the lectotype, but does not match the figure. The original of fig. 29, a paralectotype, is NMP 03192 (Pl. 10, Figs 13, 14). Fritsch (1872, p. 50) mentioned more than 100 specimens from Lenešice near Louny [Lenešic bei Laun], all of which are paralectotypes, as are other specimens mentioned from Česká Kamenice, Podlesí (formerly Valdek), Dneboh, Březno near Louny, etc. etc. [Böhmisch-Kamnitz, Waldek, Dneboh, Priesen bei Laun, etc. etc.]. All come to what Fritsch (1872) termed the “Baculitenthonen” [Baculite Clay], an interval that included the sphaerosiderite layers, which are intercalated in the upper parts of the Baculites clay [Sphaerosideritknollen, die den obersten Lagen der Baculitenthonen von Priesen bei Laun]. The types are thus from the Lower Coniacan.





Text-fig. 14. *Sciponoceras bohemicum bohemicum* (Fritsch, 1872), the lectotype, a copy of Fritsch (1872, pl. 13, fig. 25a–c); the original was from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Laun].

**DESCRIPTION:** The earliest smooth stages immediately succeeding the protoconch are preserved on NMP 04222, the original of Fritsch (1893, 1895, text-fig. 63a, b), from the Březno Formation of Březno [Priesener Schichten von Priesen] (Pl. 10, Fig. 18); it originally retained the protoconch, since lost. NHMW.1864 XL.131a–c are comparable smooth fragments of the immediately post-protoconch stage.

Amongst larger specimens, weakly and strongly ornamented variants are recognised; both are represented amongst the types. The originals of Fritsch (1872, pl. 13, figs 28 and 31) are very weakly ornamented, with delicate ribs, little more than lirae in some (Fritsch 1872, pl. 13, fig. 28); they are concave on the dorsolateral margin and inner flank, strongly prorsiradiate on the mid-flank, sweeping back and convex on the ventrolateral shoulders and venter. Widely spaced constrictions (Fritsch 1872, pl. 13, fig. 31) are flanked by collar-ribs. The lectotype (Fritsch 1872, pl. 13, fig. 25) has stronger ribbing, concave on the dorsal flank, sweeping forwards and increasing by branching and intercalation, convex and markedly strengthened over the venter. NHMW.1893.III.10, the phragmocone figured by Jahn (1896, pl. fig. 8, figs 7a–d) belongs in this group.

The largest specimen seen, NHMW.1890. XIII.210 (Pl. 10, Figs 20–22), labelled *Baculites faujasi* Lam. var. *bohémica* Frič also belongs in this group. 79 mm long, it has a maximum preserved whorl height 22.8 mm, and a whorl breadth to height ratio of 0.65, the whorl section ovoid. Primary ribs are markedly concave on the dorsal third of the flanks, project strongly

forwards on the outer two thirds, strengthening over the venter, which they cross in a broad convexity and attain their maximum strength. There is poor distinction between primary ribs and the numerous intercalated ribs, which are well-developed on the middle and outer flank, and strengthen markedly on the ventrolateral shoulders and venter, where they are irregular and of variable strength. In several specimens, the interspace adapertural to the primary rib is broad and deep, forming a marked constriction.

Specimens interpreted as strongly ornamented variants of *S. bohemicum bohemicum* include paratype NMP 03192, the original of Fritsch (1872, pl. 13, fig. 29), and NHMW 1890.XIII.209a–e, five fragments labelled “*Baculites faujasi* Lam. var. *bohémica* Frič Prieseners sch[ichten] Priesen” (Pl. 10, Figs 1–12, 15–17). A series of body chamber fragments, retaining traces of aragonitic shell, they have whorl heights that range from 6.5 to 15 mm. The whorl section is oval in the smaller specimens, with whorl breadth to height ratios of 0.69 to 0.86, the dorsum and venter broadly and evenly rounded, the flanks feebly convex. In larger specimens such as NHMW.1890. XIII.209a (Pl. 10, Figs 15–17), the whorl section has become ovoid, the dorsum more broadly rounded than the venter. Ornament consists of primary and intercalated ribs. Primary ribs are weak and near-transverse on the dorsum, strengthening markedly on the dorsolateral margin, concave on the innermost flank, strengthening progressively and projecting strongly forwards on the outer flank and dorsolateral margin, to cross the venter in a broad convexity, where they are at their maximum strength; they are associated with well-developed constrictions. There are up to five intercalated shorter ribs in these small specimens; they are weak on the flanks and strengthen markedly on the ventrolateral shoulders and venter. These ribs vary from weak and irregular (NHMW 1890.XIII.209e, Pl. 10, Fig. 5) to even on the flanks (NHMW 1890.XIII.209b, Pl. 10, Fig. 11) and vary in number between successive ribs, such that the primary rib index varies markedly. NHMW 1890. XIII.209a (Pl. 10, Figs 15–17) has a maximum preserved whorl height of 15.5 mm, the whorl section distinctly ovoid. In this specimen, the differentiation between primary and intercalated ribs is less pronounced, with primaries branching on the outer flank in some cases.

**DISCUSSION:** See Kaplan and Kennedy (2019, p. 95) and Kennedy (2020, p. 169). Upper Turonian *nep-tuni* Zone assemblages are dominated by individuals like the lectotype and other, relatively weakly ribbed

individuals, although coarsely ornamented variants do occur (Woods 1896, pl. 2, fig. 7; Kennedy 2020, pl. 51, fig. 7). In contrast, coarsely ornamented individuals are common in the Lower Coniacian faunas from the Březno Formation.

**OCCURRENCE:** Upper Turonian and Lower Coniacian. There are records from the Czech Republic, southern and eastern England, northern France, northern Spain, Germany, Austria, Poland and Kazakhstan.

Superfamily Scaphitoidea Gill, 1871  
 Family Scaphitidae Gill, 1871  
 Subfamily Otoscapitinae Wright, 1953  
 Genus *Yezoites* Yabe, 1910

**TYPE SPECIES:** *Scaphites perrini* Anderson, 1902 (p. 114, pl. 2, figs 71–73), by the subsequent designation of Diener (1925, p. 213).

*Yezoites fritschi* (de Grossouvre, 1894)  
 (Pl. 11, Figs 1–10, 12–14, 16–18)

1871. *Ammonites* (?) *bladenensis* Schlüter, p. 30, pl. 10, figs 5, 6.  
 pars 1872. *Scaphites auritus* Fritsch, p. 44, pl. 13, figs 14, 15, ?figs 8, 9, non pl. 14, fig. 12.  
 1893. *Scaphites auritus* Fr.; Fritsch, p. 77, text-fig. 57.  
 1895. *Scaphites auritus* Fr.; Fritsch, p. 75, text-fig. 57.  
 1896. *Scaphites fritschi* Grossouvre; Jahn, p. 144, pl. 8, fig. 5.  
 2019. *Yezoites bladenensis* (Schlüter, 1871); Kennedy and Kaplan, p. 97, pl. 50, figs 1–13; pl. 52, figs 5, 6.  
 2020. *Yezoites bladenensis* (Schlüter, 1871); Kennedy, p. 199, pl. 62, figs 1–8, 11–36; text-fig. 67a (with full synonymy).  
 ?2024. *Yezoites bladenensis* (Schlüter, (1871); Košťák *et al.*, text-fig. 5H.

**TYPES:** De Grossouvre (1894, p. 243) listed Fritsch (1872, p. 44, pl. 13, figs 9, 11, 14, 15; pl. 14, fig. 12) in the synonymy of his species *fritschi*, introduced as *nomen novum* for *Scaphites auritus* Fritsch non Schlüter. The lectotype, by the subsequent designation of Wright (1979, p. 306) is the original of *Scaphites auritus* Fr. & Schl. of Fritsch (1872, pl. 13, fig. 14), from the “Priesener Schichten von Böhmischem Kamnitz” [Česká Kamenice], and was in the Schlönbach collection; it has not been traced.

The remaining specimens listed by de Grossouvre are paralectotypes, and are interpreted as follows:

- *Scaphites auritus* Fr & Schl. of Fritsch (1872, pl. 13, fig. 9), from the “Priesener Schichten von Leneschitz bei Laun” [Březno Formation from Lenešice near Louny] is the spire of a *Yezoites fritschi*. It has not been traced.
- *Scaphites auritus* Fr. & Schl. of Fritsch (1872, pl. 13, fig. 11), from the “Priesener Schichten of Leneschitz bei Laun” [Březno Formation from Lenešice near Louny] is indeterminate. It has not been traced.
- *Scaphites auritus* Fr. & Schl. of Fritsch (1872, pl. 13, fig. 15), is presumed to be from “Priesener Schichten of Böhmischem Kamnitz” [Březno Formation from Česká Kamenice], and was in the Schlönbach collection; it is a complete adult microconch *fritschi*, and has not been traced.
- *Scaphites auritus* Fr. & Schl. of Fritsch (1872, pl. 14, fig. 12), from the “Priesener Schichten von Chocen” [Březno Formation from Choceň] is a macroconch of *Yezoites*.

**DESCRIPTION:** There are numerous specimens, including NHMW1890.XIII.189 to 192a–c, 1894, and 1892.II.14a from the Březno Formation of Březno [Priesener Schichten von Priesen]. NHMW 1893. IV.25 is the original of Jahn (1896, pl. 8, fig. 5a–c), from the Březno Formation of Srnojedy near Pardubice [Priesener Schichten von Srnojed bei Pardubitz].

All of the complete or near-complete adult specimens appear to be microconchs; they range from 18 to 23 mm in length. The early phragmocone whorls are evolute, the umbilicus of moderate depth, with a flattened to feebly convex wall and broadly rounded umbilical shoulder. The whorl section is slightly depressed, rounded-trapezoidal, with feebly convex flanks, broadly rounded ventrolateral shoulders, and a broad, very feebly convex venter. There are indications of feeble, distant flank ribs. Ornament becomes conspicuous on the adapical half of the outer phragmocone whorl. Distant primaries are straight and prorsiradiate on the flanks, projecting forwards and concave on the outermost flanks and ventrolateral shoulders, and feebly convex over the venter. The primary ribs branch on the outer flank, where additional ribs intercalate, so that are several times more ribs on the outer flanks, ventrolateral shoulders and venter than on the inner flanks. There are both coarser (NHMW 1890. XIII.189: Pl. 11, Figs 7, 17) and finer (NHMW 1890. XIII.194: Pl. 11, Figs 6, 16) ribbed variants. The shaft of the body chamber is slender, with a concave umbilical wall and very narrowly rounded umbilical shoulder, flattened subparallel flanks, broadly rounded

ventrolateral shoulders, and a feebly convex venter. Feeble to near-effaced primary ribs are present on the innermost flank in some specimens, strengthening on the mid-to outer flank, where they branch, and additional ribs intercalate, such that the outer flanks are ornamented by crowded even, prorsiradiate ribs that are feebly convex over the venter, as in NHMW 1890.III.192a (Pl. 11, Figs 1, 2), an uncrushed individual. Other specimens, such as NHMW 1890.XIII.189 (Pl. 11, Figs 7, 17) have much coarser ribbing on outer flanks and venter. Ornament weakens markedly on the final recurved sector of the body chamber, which may be near-smooth (Fritsch 1872, pl. 13, fig. 15; Pl. 11, Figs 7, 17 herein) or bear delicate concave ribs, as in the lectotype, but barely detectable in the present material (Pl. 11, Figs 9, 18). The whorl height expands markedly immediately before the adult aperture of some specimens (NHMW 1892.II.14b: Pl. 11, Figs 8, 13), with a succeeding constriction, and a large lappet with concave dorsal and ventral sides, the terminal part expanding, with a rounded termination that partially overlaps with the spire. NMP 03177, the original of Fritsch (1872, pl. 13, fig. 8; Pl. 11, Fig. 9 herein), which may belong here, is associated with a large jaw of *Striptychus* type (see also Košťák *et al.*, text-fig. 5H).

DISCUSSION: In contrast to recent views (Kaplan and Kennedy 2019, p. 98, and Kennedy 2020, p.199), the present study supports the view of de Grossouvre (1894), Wright (1979) and others that *Yezoites fritschi* is not a junior synonym of *Yezoites bladenensis* (Schlüter, 1871) (p. 30, pl. 10, figs 5, 6). This Upper Turonian species differs most obviously in the distinctly convex ribs on the body chamber shaft and recurved sector (Kennedy 2020, pl. 62, figs 1–8, 11–36), whereas they are concave in *fritschi*, and markedly so in the lectotype.

OCCURRENCE. Lower Coniacian of the Czech Republic.

*Yezoites* sp.  
(Pl. 11, Figs 11, 15)

DISCUSSION: NHMW 1892.II.18, from the Březno Formation at Březno [Priesener Schichten von Priesen], is a part of a spire and, possibly, the adapicalmost part of the body chamber, the maximum preserved diameter is 19 mm. Delicate primary ribs are concave on the inner flank, increase by branching and intercalation on the outer flank, strengthen and are crowded and concave on the ventrolateral

shoulder. Much larger than the spire of associated *Yezoites fritschi*, it corresponds to specimens figured by Jahn (1896, pl. 8, figs 2, 3), who identified his pl. 8, fig. 2 as: “Übergangsform zwischen *Scaphites* cf. *Geinitzi* var. *Lamberti* Grossouvre und *Scaphites geinitzi* d’Orb.”. And his pl. 8, fig. 3, which he assigned to *Scaphites geinitzii* (it was referred to the Upper Turonian *Scaphites geinitzii laevior* by Wright 1979, p. 302), was regarded as a synonym of *geinitzii sensu stricto* by Kennedy and Kaplan (1979, p. 99) and Kennedy (2000, p. 175). It now seems likely that these specimens may be *Yezoites*. Fritsch (1872, pl. 14, fig. 12) figured a complete lappeted adult with a spire of this type from the Březno Formation of Choceň [Priesener Schichten von Chocen].

OCCURRENCE: As for material.

Subfamily Scaphitinae Gill, 1871  
Genus *Scaphites* Parkinson, 1811

TYPE SPECIES: *Scaphites equalis* J. Sowerby, 1813 (p. 53, pl. 18, figs 1–3), by the subsequent designation of Meek (1876, p. 413).

*Scaphites kieslingswaldensis* Langenhan and Grundey, 1891

(Pl. 12, Figs 3, 4, 7–9, 11–13; Pl. 13, Figs 1–9, 11, 15–17, 20–21)

1872. *Scaphites Geinitzii* var. *binodosus* Röm.; Fritsch, p. 42, pl. 14, fig. 13.
1891. *Scaphites Kieslingswaldensis* Langenhan and Grundey, p. 9, pl. 1, fig. 1.
1892. *Scaphites Geinitzii* d’Orb. var. *binodosus* Röm.; Jahn, p. 179, text-figs 1–5.
1896. *Scaphites* cf. *Geinitzi* var. *Lamberti* Grossouvre; Jahn, p. 133, pl. 8, fig. 1
1896. Uebergangsform zwischen *Scaphites* cf. *Geinitzi* var. *Lamberti* und *Scaphites Geinitzi* d’Orb.; Jahn, p. 131, pl. 8, fig. 6.
1897. *Scaphites binodosus* Röm; Fritsch, p. 37, text-fig. 20.
1898. *Scaphites binodosus* Röm; Fritsch, p. 36, text-fig. 20.
1907. *Scaphites Geinitzi* var. nov. *intermedia* Scupin, p. 696 (*nomen nudum*).
1913. *Scaphites Geinitzi* var. *intermedia* Scupin, p. 98.
- pars 1965. *Sc. (Otoscapites) bladenensis* (Schlüter); Wiedemann, p. 429, pl. 58, fig. 2.
1979. *Scaphites geinitzii intermedius* Scupin; Wright, p. 302.

1992. *Scaphites kieslingswaldensis* Langenhan and Grundey; Vašíček, p. 185, pl. 8, figs 1–3; text-figs 12, 13.
2013. *Scaphites kieslingswaldensis* Langenhan and Grundey 1891; Kennedy and Klinger, p. 529, pl. 1, figs 1–29; pl. 2, figs 1–9, 14–17; pl. 3, figs 1–17; text-fig. 6c (with additional synonymy).
2016. *Scaphites geinitzii intermedius* Scupin, 1913; Klein, pp. 54, 70 (with additional synonymy).
2016. *Scaphites kieslingswaldensis kieslingswaldensis* Langenhan and Grundey 1891; Klein, pp. 54, 80 (with additional synonymy).
2022. *Scaphites kieslingswaldensis* Langenhan and Grundey 1891; Summesberger *et al.*, p. 51, pl. 24, figs 6–25; text-figs 24, 25.
2023. *Scaphites kieslingswaldensis* Langenhan and Grundey 1891; Kennedy in Kennedy and Walaszczyk, p. 653, text-figs 11c, 14a–s, 15a–f.

TYPE: The holotype, by monotypy, is the original of Langenhan and Grundey (1891, pl. 1, fig. 1), from the Coniacian of Idzików [Kieslingswalda], southeast of Kłodzko [Glatz], Poland. It was refigured by Fritsch (1897, fig. 20; 1898, text-fig. 20), Sturm (1901, pl. 3, fig. 6), and a cast was figured by Kaplan *et al.* (1987, pl. 5, fig. 5) and Kaplan and Kennedy (1994, pl. 41, figs 1–3).

DESCRIPTION: There are numerous specimens from the Březno Formation of Březno [Priesener Schichten von Priesen], including NHMW 1890.XIII.190c, 195, 196, 197a–b, 198, 230 and NHMW 1892.II. 14a, b, 15, 16, 17, together with NHMW 1890.XIII.198, the original of Jahn (1892, text-figs 1–5). NHMW1893.IV.5, the original of Jahn (1896, pl. 8, fig. 6), from the Březno Formation of Malé Chvojno near Ústí nad Labem [Priesener Schichten von Klein-Kahn bei Aussig]. NHMW1895.IV.22, the original of Jahn (1896, pl. 8, fig. 1), from the Březno Formation of Srnojedy near Pardubice [Priesener Schichten von Srnojed bei Pardubitz].

NHMW 1893.IV.22 (Pl. 13, Figs 1, 2) is a well-preserved phragmocone, with the following dimensions:

D	Wb	Wh	Wb:Wh	U
18.4	10.8	9.1	1.19	5.6
(1000)	(58.7)	(49.5)		(30.4)

Coiling is involute, with a deep umbilicus. The whorl section is depressed reniform, with a whorl breadth to height ratio of 1.19. Primary ribs arise at the umbilical seam, strengthen across the umbilical wall and shoulder, and are of variable strength, coarse, straight and prorsiradiate across the flanks, with an estimated 18 on the outer whorl. They strengthen into

small ventrolateral bullae that give rise to a pair of prorsiradiate ribs, with additional ribs intercalating to give a total of over 40 on the venter of the outer whorl, where they are coarse and transverse.

Large individuals with coarse ornament such as NHMW.1890.XIII.195 and 196 (Pl. 12, Figs 12, 13), and 1892.II.15 (Pl. 13, Fig. 11), have as few as four or five coarse umbilical bullae on the shaft of the body chamber, linked by a broad, coarse rib to coarse rounded-conical ventrolateral tubercles that give rise to two or three secondary ribs, with a similar number intercalated between. The umbilical bullae weaken abruptly and efface on the final recurved sector, the primary ribs weakened and crowded, becoming flexuous in some specimens, the ventrolateral tubercles weakening progressively, and absent from the final few ribs. In contrast, the ventrolateral and ventral parts of the ribbing are little-modified. Where well-preserved, the aperture is seen to be preceded by a narrow constriction. NMP C16687 (Pl. 13, Figs 15–17) has half of a lower jaw (*Pseudostriaptychus*) preserved in the body chamber.

DISCUSSION: See Kaplan and Kennedy (1994, p. 60) and Kennedy and Klinger (2013, p. 533).

The original of *Scaphites geinitzii* d'Orb. var *binodosus* Röm of Jahn (1892, text-figs 1–5), was designated lectotype of *Scaphites geinitzii intermedius* Scupin, 1913 (p. 98) by Wright (1979, p. 302). It is from the “Sphärosideritknollen nur in einer obersten Bänke der Priesener Baculitenthon”, that is to say the Březno Formation, of Louny [Laun], and Lower Coniacian. It is a clear synonym of *kieslingswaldensis*.

OCCURRENCE: Lower Coniacian. The geographic distribution extends from the Czech Republic to Poland, Germany, Austria, Romania (?), Armenia, Loir-et-Cher, Charente-Maritime, Aude and Var in France, northern Spain, Kazakhstan, Madagascar, and northern KwaZulu-Natal in South Africa.

*Scaphites geinitzii* (d'Orbigny, 1850)

(Pl. 12, Figs 1, 2, 5, 6; Pl. 13, Figs 10, 12–14, 18, 19)

1850. *Scaphites Geinitzii* d'Orbigny, p. 214.
- pars 1872. *Scaphites Geinitzii* d'Orb.; Fritsch, p. 42, pl. 13, non fig. 7 (? = *Yezoites* sp.), figs 10, 12; pl. 14, fig. 11.
- non 1872. *Scaphites Geinitzii* var. *binodosus* Röm.; Fritsch, p. 43, pl. 14, fig. 13 (= *S. kieslingswaldensis*).
1877. *Scaphites Geinitzii* d'Orb.; Fritsch, p. 102 (*pars*).
1883. *Scaphites Geinitzii* d'Orb.; Fritsch, p. 92 (*pars*), text-figs 53a, b.

- pars 1889. *Scaphites Geinitzii* D'Orbigny; Fritsch, p. 71, text-fig. 43.
- pars 1895. *Scaphites Geinitzii* d'Orbigny; Fritsch, p. 74.
2019. *Scaphites geinitzi* d'Orbigny, 1850; Kennedy and Kaplan, p. 99, pl. 50, figs 14–32; pl. 51, figs 1–17; text-fig. 28a–j.
2020. *Scaphites geinitzi* d'Orbigny, 1850; Kennedy, p. 175, pl. 55, figs 3–35; pl. 56, figs 1–19, 28–30; pl. 57, figs 1–31; text-figs 85b–d, 86 d–g (with full synonymy).
2023. *Scaphites geinitzi* d'Orbigny, 1850; Kennedy in Kennedy and Walaszczyk, p. 652, text-figs 11b, 12a–v, 13a–k.

**TYPES:** The lectotype, by the subsequent designation of Wright (1979, p. 299), is MNHP F. R01235, no. 7179 in the d'Orbigny collection, housed in the Muséum National d'Histoire Naturelle, Paris. It was recently figured by Kennedy and Kaplan (2019, pl. 50, figs 15–17), and Kennedy (2000, pl. 55, figs 4, 5; text-fig. 86d–g). Paralectotype 7197a also belongs to the species. A further paralectotype, MNHP F. A25665, d'Orbigny Collection 7197b (Kennedy 2020, pl. 55, figs 1–3; text-fig. 86a–c) belongs to a different species. All are from the mid-Upper Turonian Strehlen Limestone Member of the Strehlen Formation, Dresden, Strehlen, Saxony, Germany.

**DESCRIPTION:** Complete adults, all of which are macroconchs, range from 30 to 51.5 mm in length. NHMW 1890.XIII.230 (Pl. 13, Fig. 10) has seven widely separated primary ribs on the shaft of the body chamber. They arise at the umbilical seam, and strengthen into delicate umbilicolateral bullae, from which single weak, feebly prorsiradiate ribs arise. They weaken at mid-flank before strengthening into small ventrolateral bullae. These give rise to groups of two or three ribs, with two or three ribs intercalating between successive groups; the ribs are fine, equal, and transverse to very feebly convex over the venter. The ribs weaken on the inner flanks of the recurved sector, but strengthen and coarsen on the outer flanks, ventrolateral shoulders and venter.

NMP 04315 (Pl. 12, Figs 1, 2), the original of Fritsch (1889, text-fig. 43), from the Teplice Formation of Bohodusov [Teplitzer Schichten von Bohusudova] is 30 mm long. The damaged spire is very involute, and ornamented by wiry prorsiradiate primary ribs that increase by branching and intercalation on the ventrolateral shoulders. Four strongly prorsiradiate widely separated primary ribs are present on the shaft, some incipiently bullate; they strengthen into ventrolateral bullae that increase progressively in strength.

The bullae give rise to two, occasionally three fine, wiry secondary ribs, and additional ribs intercalate and pass straight across the venter. The primary ribs weaken around the recurved sector, and change from prorsiradiate to rursiradiate. The ventrolateral bullae initially strengthen then weaken and efface; the last few ribs preceding the damaged aperture are wiry and comparable in strength to the ventral ribs.

NMP 03198 (Pl. 12, Fig. 10), the original of Fritsch (1872, pl. 14, fig. 11), from the Březno Formation [Priesener Schichten] of Wunitz bei Libochovic (Vojnice near Libochovice) is 37.5 mm long, and shows the detail of the relationship between ventrolateral tubercles and the secondary and intercalated ribs. NMP Cl. 6427 (Pl. 13, Figs 13, 14), from the Trigoniaschichten of the Jizera Formation of Jizera [Iser Schichten], is the original of Fritsch (1883, text-fig. 53a). It is the largest Czech specimen seen, 51.5 mm long. Ornament is very worn, but it appears to be a feebly ornamented variant of the species; UUG 5414 (Pl. 13, Fig. 12) is a smaller, better preserved example. NHMW.1892.II.18, from Březno [Priesen], is a crushed phragmocone of a finely ribbed variant 18.6 mm in diameter. Coiling is very evolute, with a near-occluded umbilicus. Narrow crowded primary ribs are prorsiradiate and give rise to several secondary ribs on the outer flank, where additional ribs intercalate, the ribs crowded, concave on the ventrolateral shoulder, and feebly convex over the venter. It corresponds to the specimen figured by Fritsch (1872) as his pl. 13, fig. 10, a specimen from the Březno Formation of Postoloprty [Priesener Schichten von Postelberg].

NMP Cl. 6427 is a pathological example of this type, lacking ventrolateral tubercles on one flank, and developing coarse radial folds on the adapertural part of the shaft and adjacent recurved sector.

**DISCUSSION:** See Kennedy and Kaplan (2019, p. 98) and Kennedy (2020, p. 179). The range of variation in the Czech material finds a close match in that from the slightly older *neptuni* Zone fauna of the English Chalk Rock.

**OCCURRENCE:** Middle Turonian, *Collignoniceras woollgari* Zone, rare in England and Germany. Upper Turonian, *Subprionocyclus neptuni* and *Prionocyclus germari* zones. The geographic distribution extends from southern and eastern England to northern France, Germany, Poland, the Czech Republic, northern Spain, Bulgaria, Romania, Ukraine (Crimea, Donbass), Kazakhstan, Turkmenistan, and Greenland. Museum specimens suggest that the species extends into the Lower Coniacian in the Czech Republic.

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PLATES 1-13

## PLATE 1

**1-3, 11-14** – *Phylloceras* (*Hypophylloceras*) *bizonatum* (Fritsch, 1872). The lectotype, NMP 03196, the original of Fritsch (1872, p. 14, fig. 7), from the Březno Formation of Lenešice near Louny [Priesener Schichten von Leneschitz bei Lauen].

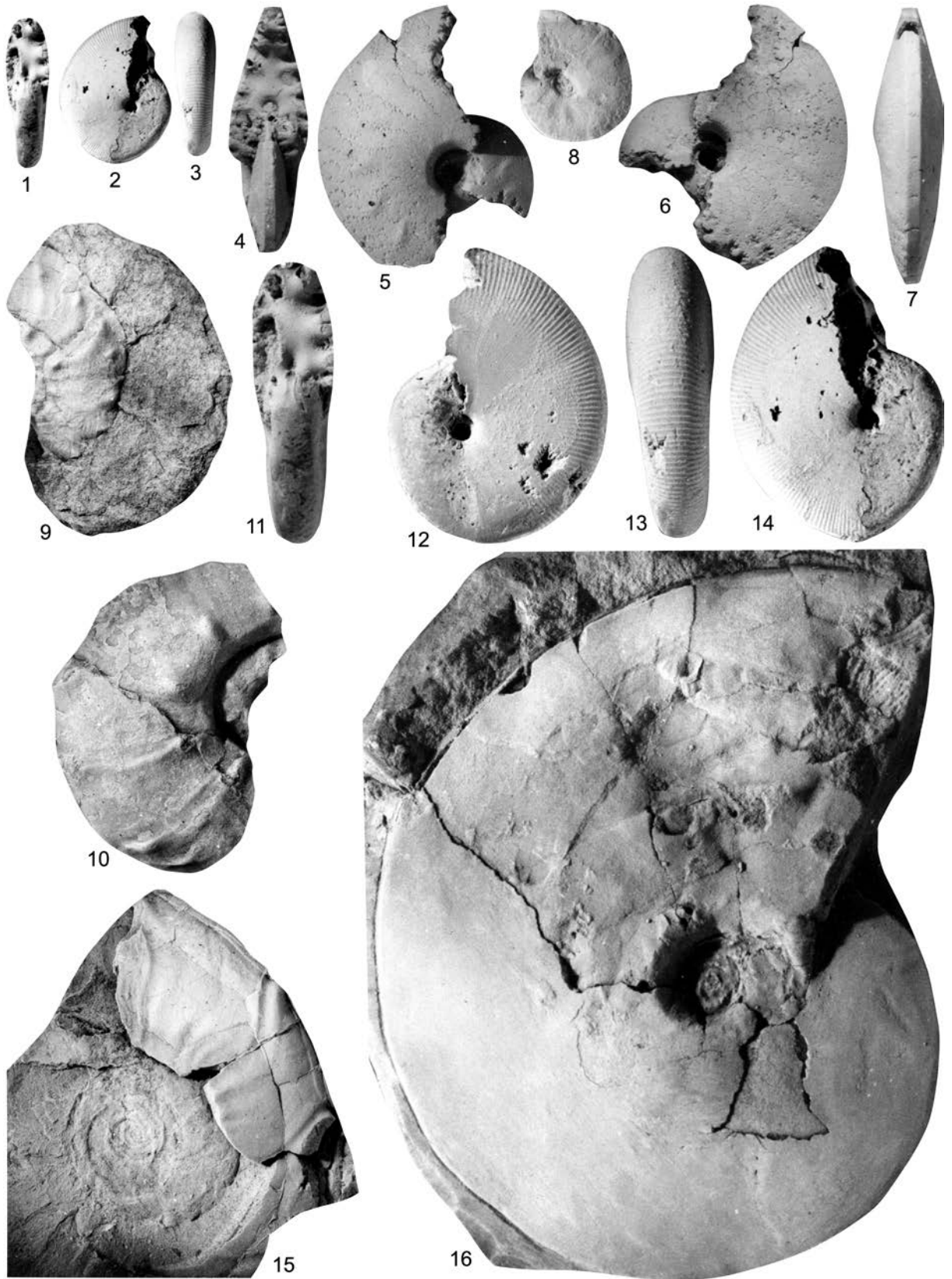
**4-8** – *Placenticerias orbignyianum* (Geinitz, 1849). 4-7 – UUG p5409/1969, from the Březno Formation, Březno; 8 – NMP 03157, the original of Fritsch (1872, pl. 10, fig. 4), from the Březno Formation of Lenešice near Louny [Priesener Schichten von Lenešic bei Lauen].

**9, 10** – *Pseudojacobites* sp. UUG collections, from the Coniacian part of the Březno Formation of the KP-1 borehole, Dolní Bořikovice (Králiky) in the Králiky Graben.

**15** – *Kitchinites* sp. UUG collections, a fragment from the Upper Coniacian Březno Formation of the GU 25 borehole, Tuchomyšl.

**16** – *Placenticerias* cf. *memoriaschloenbachi* Laube and Brüder, 1887, NMP 03159, the original of *Ammonites* (*Placenticerias*) *d'Orbignyianus* Geinitz of Fritsch 1872, pl. 11, fig. 2, from the grey sandstone of the Merboltice Formation of Jedlová near Česká Kamenice [grauen Sandstein der Chlomeker Schichten vom Tannenberge bei Böhmisch-Kamnitz], refigured by Fritsch (1897, text-fig. 18).

Figures 1-7, 9-16 are  $\times 1$ ; figures 8, 11-14 are  $\times 2$ .



## PLATE 2

**1-3** – *Collignoniceras* sp. juv. NMP 03135, a pathological juvenile, the original of *Ammonites neptuni* of Fritsch (1872, pl. 3, fig. 1), from the grey limestone at the right bank of the river Eger (Ohře river) below the sugar factory in Louny [grauen Kalke der Malnitzer Schichten am rechten Egerufer unterhalb der Zucker-fabrik in Laun].

**4-12** – *Prionocyclus germari* (Reuss, 1845). 4 – UUG M-33-52-C, from the Teplice Formation, Lenešice [Leneschitz]; 5, 9 – part and counterpart of NMP C16822, from the Teplice Formation of Lenešice [Teplitzer Schichten von Leneschitz]; 6-8 – UG M-33-52-D, from the Teplice Formation of Lenešice [Teplitzer Schichten von Leneschitz]; 10 – UUG collections, from the Teplice Formation of Vršovice [Teplitzer Schichten von Wrschowitz]; 11, 12 – original of *Acanthoceras schloenbachi* (Fritsch, 1872) (p. 29, pl. 16, fig. 5), an adult or subadult individual from the Březno Formation of Vršovice near Louny [einem Wasserrisse in den Priesener Schichten unweit Wrschowitz, bei Laun]; 11 – NMP 03206 a plaster cast taken from the external mould NMP 03207, and 12 – NMP 04823, the partial internal mould of the same specimen. NMP 04823 is a partial internal mould of the same specimen.

Figures 1-3, 8 and 9 are  $\times 1$ ; figures 4-10 are  $\times 2$ .



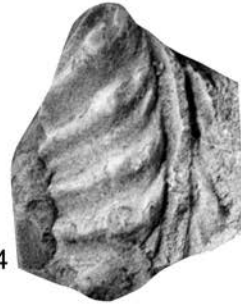
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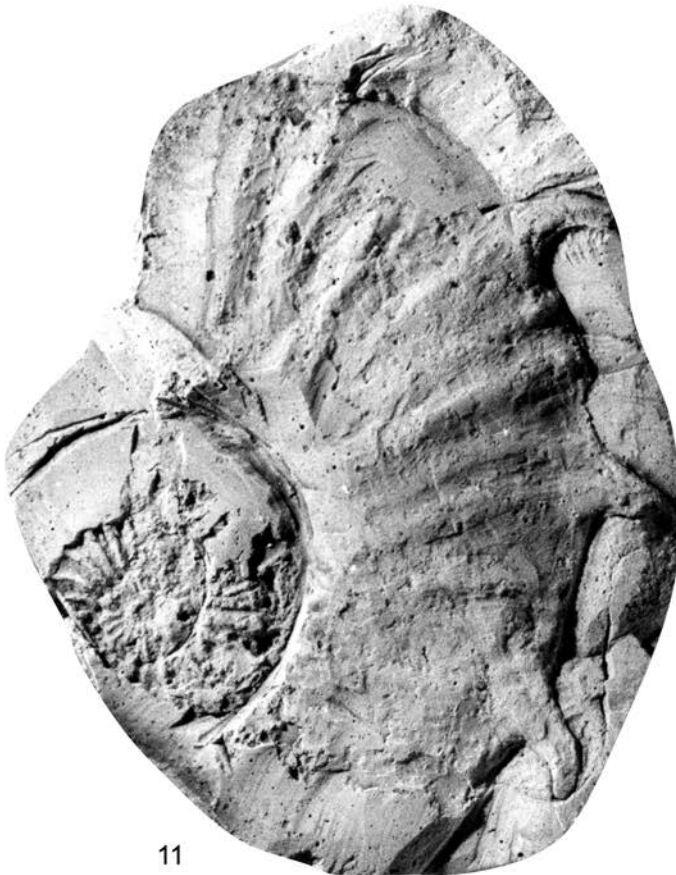
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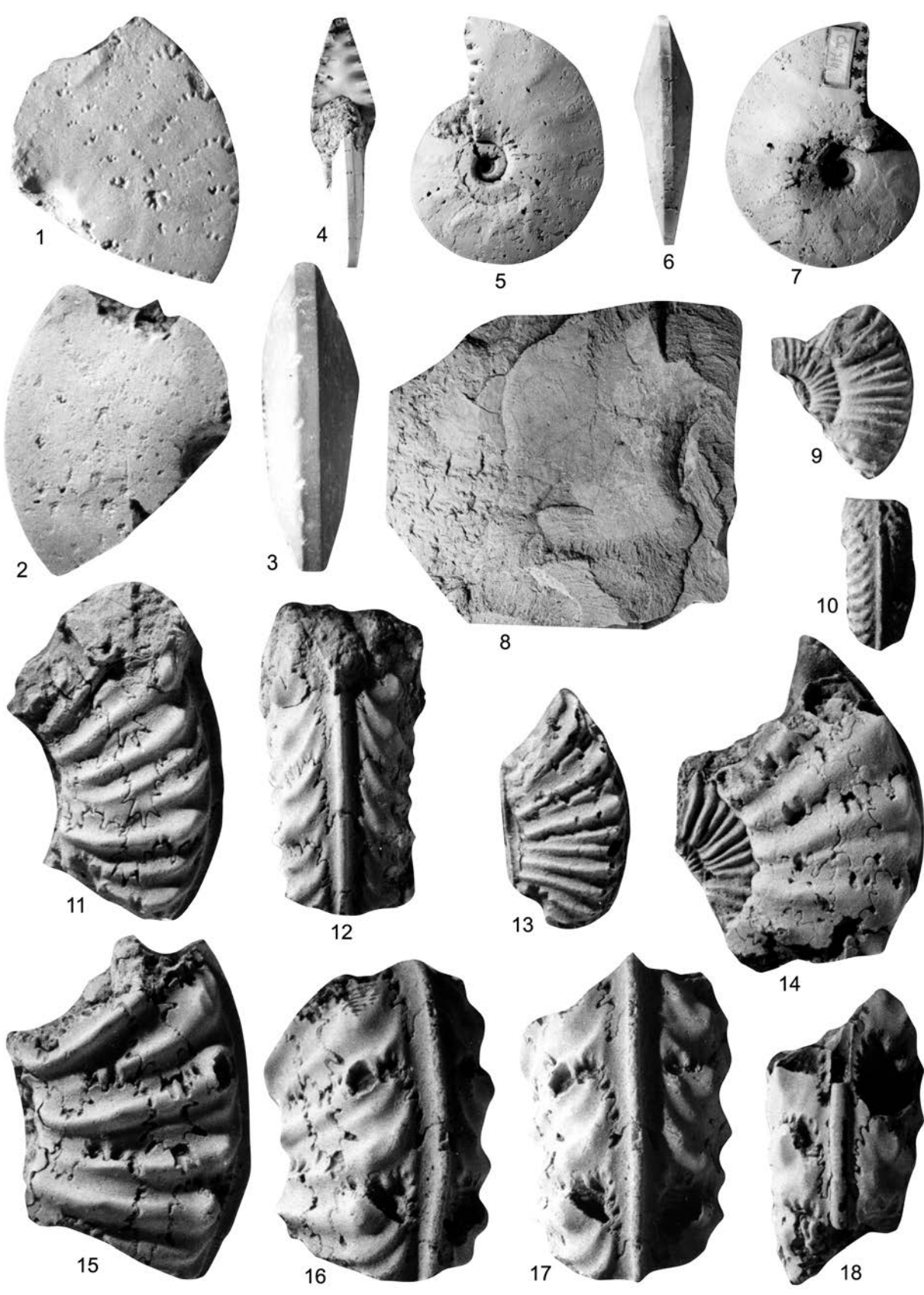
## PLATE 3

**1-8** – *Placenticerias orbignyianum* (Geinitz, 1849). 1-3 – NMP 04211, the original of Fritsch (1893, text-fig. 53; 1895, text-fig. 53), said to be from the Priesener Schichten [Březno Formation] “aus Leneschitz”; 4-7 – NMP 04784, from the Březno Formation of Březno; 8 – NMP 03158, from the Březno Formation from Česká Kamenice [Priesener Schichten von Böhmisch-Kamnitz], the original of Fritsch (1872, pl. 10, fig. 5).

**11-18** – *Prionocyclus germari* (Reuss, 1845) a series of pyritic fragments. 9, 10 – NMP R192a; 11, 12 – NMP R192b; 13 – NMP R192c; 14, 18 – NMP R192d; 15-17 – NMP 192e from the Teplice Formation of Lenešice [Teplitzer Schichten von Leneschitz].

Figures 1-7, 9-18 are  $\times 2$ ; figure 8 is  $\times 1$ .





## PLATE 4

**1-9** – *Metatissotia? nanclasi* (de Grossouvre, 1894). 1 – NMP 25299; 2 – NHMW 1890.XIII.183b; 3 – NHMW 1890.XIII.184a; 4 – NMP 03201, the original of *Ammonites dentatocarinatus* Röm. of Fritsch (1872, pl. 16, fig. 1); 5, 6 – the holotype, MNHN. F. R07828, the original of de Grossouvre (1894, pl. 3, fig. 4); 7, 8 – NHMW 1890.XIII.188; 9 – NMP 182.

**10-13** – *Forresteria (Harleites) petrocoriensis* (Coquand, 1862). 10 – NHMW 1894.XII.27; 11 – NMP C16814, associated with *Cremnoceramus deformis erectus* (Meek, 1877) and *Hemiaster* sp., from the gastropod layer; 11, 12 – NMP, ex Meyer Collection.

1-4 and 7-12 are from the Březno Formation of Březno [Priesener Schichten von Priesen]; 5, 6 are from the Lower Coniacian on the railway line from Périgues to Coutras just outside Périgues, Dordogne, France.

Figures 1-3, 5, 6, 9, 10-13 are  $\times 1$ ; figures 4, 7, 8, are  $\times 2$ .



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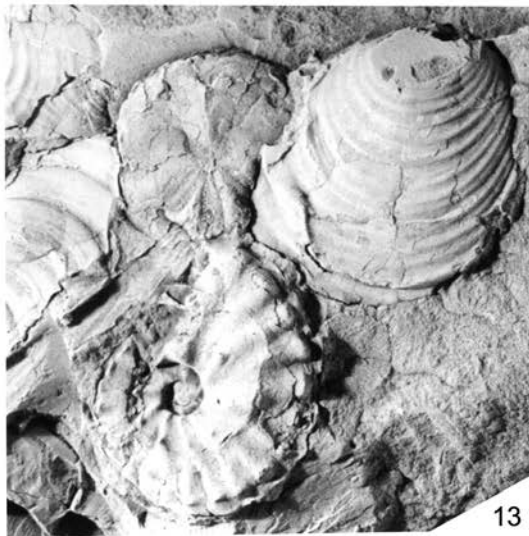
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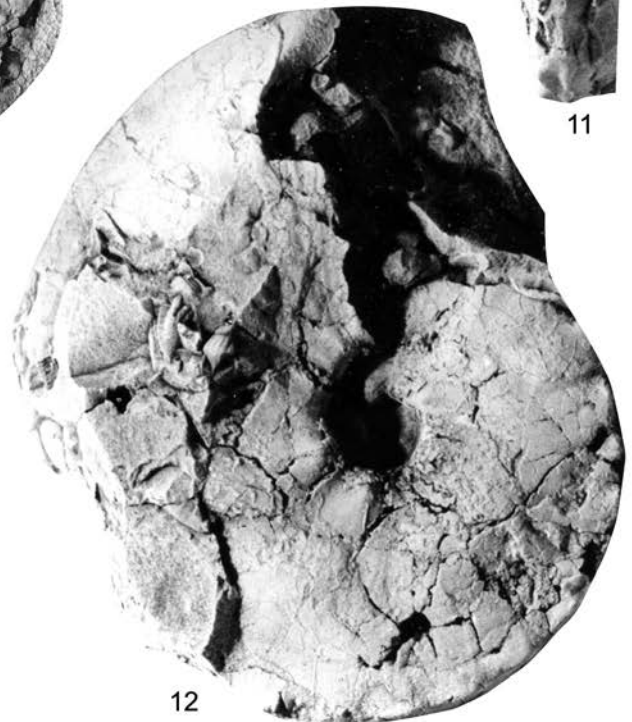
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## PLATE 5

*Forresteria (Harleites) petrocoriensis* (Coquand, 1862)

1, 2 – NMP 25299b; 3-5 – NHMW 1890.XIII.185, figured by Kennedy (1984, pl. 6, figs 3, 4); 6 – NHMW 1890.13.184b; 7, 8 – NMP 03202, the original of *Ammonites dentatocarinatus* Röm. of Fritsch (1872, pl. 16, fig. 2); 9, 10 – NMP25299d; 11 – MUNL G15662, from the sphaerosiderite layer; 12 – NMP25299c; 13-15 – the holotype of *Ammonites petrocoriensis* Coquand, 1859 (p. 995), in the collections of the École des Mines, currently housed in the collections of the Université Claud Bernard Lyon 1, Villeurbanne; 16 – NHMW 1890.XIII.182, figured by Kennedy (1986, pl. 9, fig. 1); 17, 18 – NHMW 1894.XII.28; 19, 20 – NHMW 1892.III.13.

1-12 and 16-20 are from the Březno Formation of Březno [Priesener Schichten von Priesen]; 13-15 is from Montignac, Dordogne, France.

All figures are  $\times 1$ .



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## PLATE 6

**1** – *Peroniceras (Zuluiceras)* sp. NMP 93143, the original of *Ammonites poliopsis*, Dujardin of Fritsch (1872, p. 35, pl. 6, fig. 3), from the Březno Formation of Podlesí (formerly Valdek) near Česká Lípa [Priesener Schichten von Waldek bei Böhmischen-Leipa].

**2-4** – *Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850). **2** – NMP CL6650, the original of Fritsch (1893, p. 74, text-fig. 48), from bed 3, the sphaerosiderite layer of the Březno Formation at Březno [Priesener Schichten von Priesen]; **3, 4** – NMP 03156, the outer whorl fragment of the original of Fritsch (1872, pl. 10, fig. 3a), from the iron-bearing sandstone in the Merboltice Formation of Jedlová near Česká Kamenice [eisenschüssigen Sandsteine in Chlomeker Schichten von Tannenberg bei Böhmisch-Kamniz].

All figures are  $\times 1$ .



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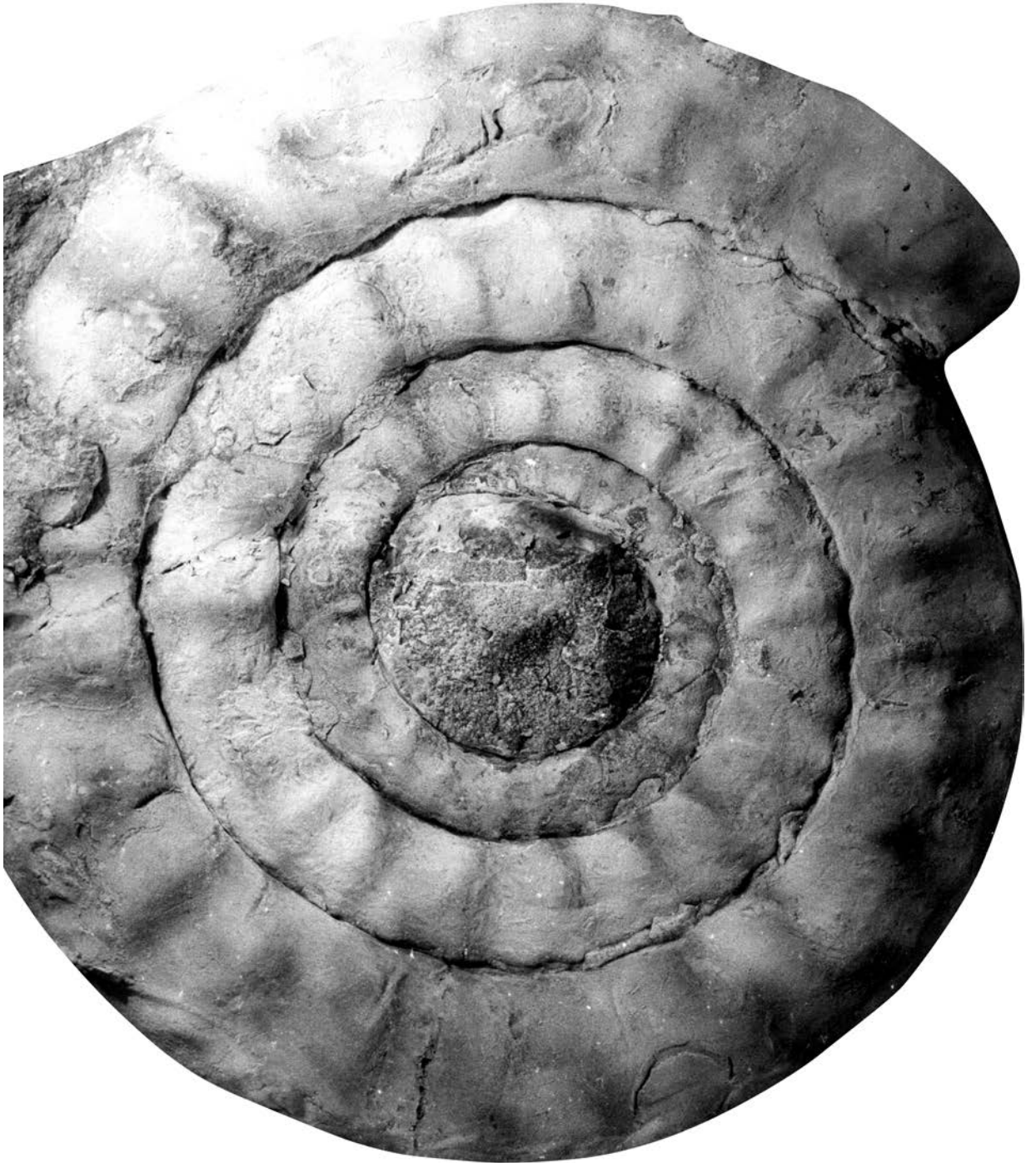
PLATE 7

*Peroniceras (Peroniceras) subtricarinatum* (d'Orbigny, 1850)

NMP 3132, the original of Fritsch (1872, pl. 1, figs 1–3), from the Teplice Formation between Vrbičany and Keblice near Lovosice [Teplitzer Schichten zwischen Vrbičan and Keblitz bei Lobositz].

Reduced  $\times 0.6$  approximately, the original is over 300 mm in diameter.





## PLATE 8

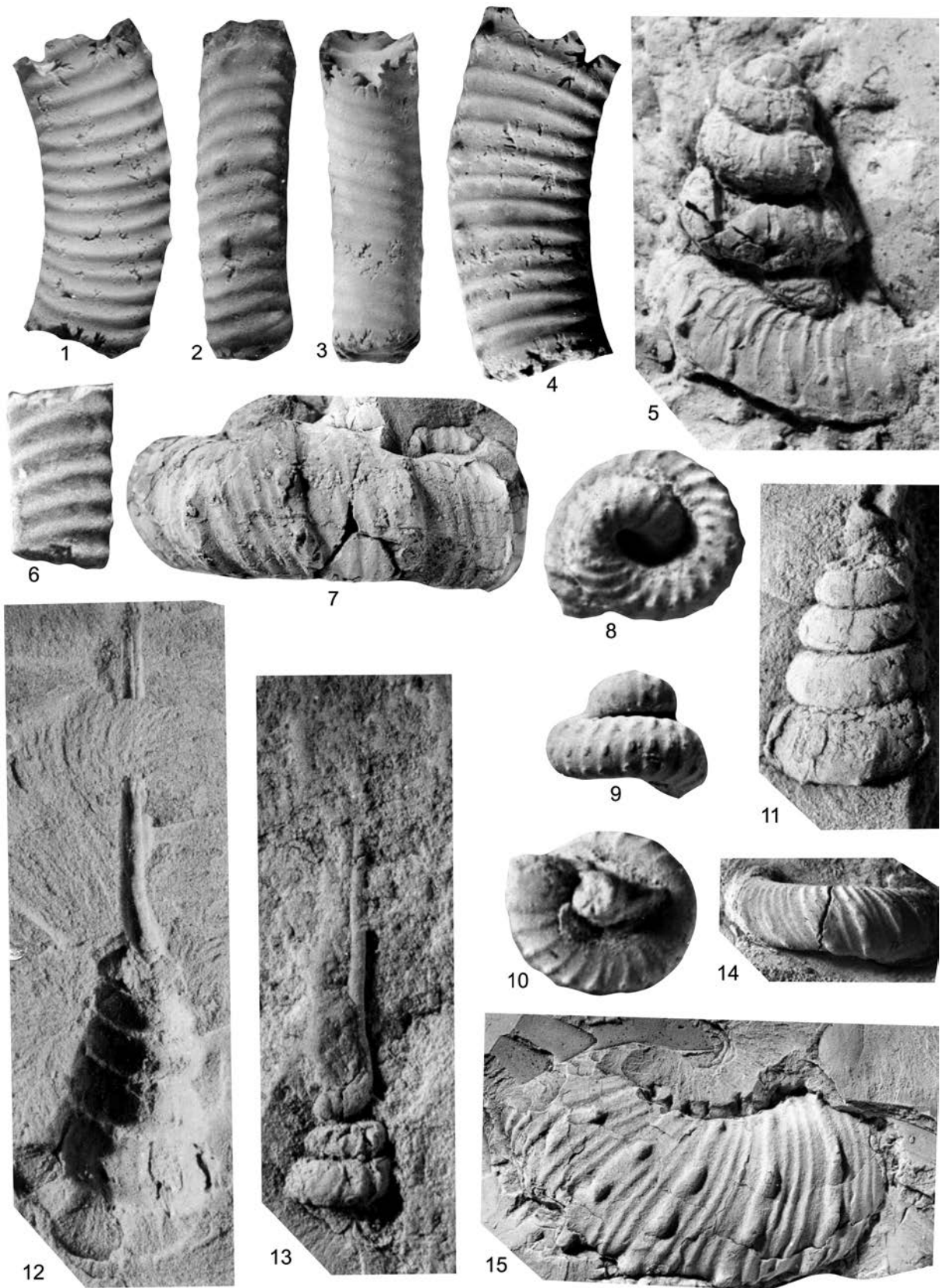
**1-4** – *Allocrioceras* sp. B, NMP04221, said to be the original of *Hamites bohemicus* Fritsch (1893, text-fig. 58d), from Srnojedy [Sernojed], but the figure is of a fragment that has a circular whorl section and lacks ventral tubercles. Location and horizon uncertain, as the specimen is clearly mislabelled; probably Coniacian, Březno Formation?

**5, 7-10, 14, 15** – *Hyphantoceras (Hyphantoceras) flexuosum* (Schlüter, 1872). 5 – NHMW 1890.XIII.206; 7 – NHMW 1896.XIII.204; 8-10 – NHMW 1890.XIII.205a; 14 – NHMW 1890.XIII.205b; 15 – NHMW 1896.XIII.207; all from the Březno Formation at Březno [Priesener Schichten von Priesen].

**6** – *Scalarites* sp. NMP 03215, the original of *Hamites verus* Fritsch (1872, pl. 16, fig. 15), from the Březno Formation of Lenešice [Priesener Schichten von Leneschitz].

**11-13** – Diplomoceratinae sp. juv. 11 – MUNL G15680a; 12 – MUNL G15680b; 13 – MUNL G15680c, from the Březno Formation of Březno [Priesener Schichten von Priesen].

Figures 1-4, 11-13 are  $\times 2$ ; figures 5, 8-10 are  $\times 5$ ; figure 6 is  $\times 6$ ; figures 7, 14 and 15 are  $\times 1$ .



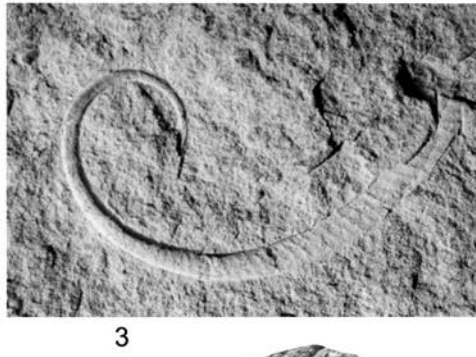
## PLATE 9

*Scalarites? bohemicum* (Fritsch, 1872)

1, 2 – NHMW 1890.XIII.201; 3 – NHMW 1890.XIII.203; 4, 8 – NHMW 1894.XII. 29; 5, 7 – NMP 03194, the original of *Hamites verus* Fritsch (1872, pl. 13, fig. 26); 6 – NHMW 1890.XIII.202; 9 – MUNL G15675, from the gastropod bed; 10 – NHMW 1880.XIII.200. 11 – NMP collections.

All specimens are from the Březno Formation of Březno [Priesener Schichten von Priesen].

Figures 1, 2, 4-6, 9-11 are  $\times 1$ ; figures 3, 7, 8 are  $\times 2$ .



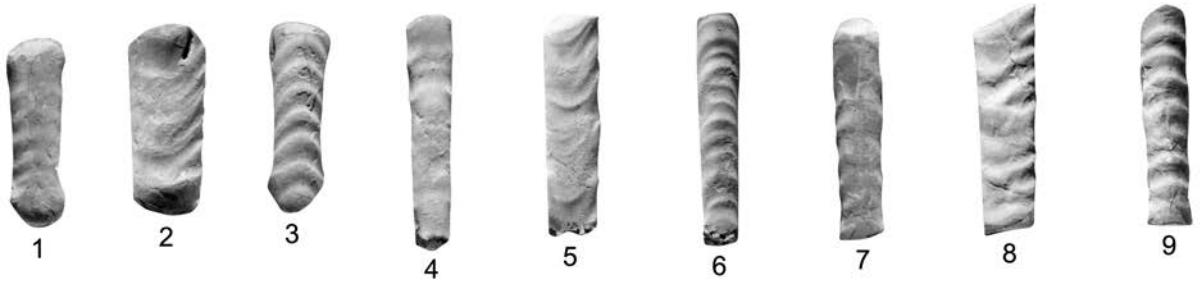
## PLATE 10

*Sciponoceras bohemicum bohemicum* (Fritsch, 1872)

1-3 – NHMW1890.XIII.209c; 4-6 – NHMW 1896.XIII.209b; 7-9 – NHMW 1896.XIII.d; 10-12 – NHMW 1896.XIII.209b; 13, 14 – NMP 03190, a paralectotype, said to be the original of Fritsch (1872, pl. 13, fig. 23), but not resembling the figure; 15-17 – NHMN 1890.XIII.209a; 18 – NMP 04222, the original of Fritsch (1893, text-fig. 63a, b); 19 – NMHW 1890.III.10, the original of Jahn (1896, pl. 8, fig. 8); 20-23 – NHMW 1890.XIII.210.

All specimens are from the Březno Formation [Priesener Schichten]. The originals of figs 1-12, 15-18 and 20-23 are from Březno [Priesen]; 13, 14 is from Lenešice [Leneschitz]; and 19 is from Malé Chvojno near Ústí and Labem [Klein-Kahn bei Aussig].

Figures 1-17, 20-23 are  $\times 1$ ; figures 18 and 19 are  $\times 2$ .



## PLATE 11

**1-10, 12-14, 16-18** – *Yezoites fritschi* (de Grossouvre, 1894). 1, 2 – NHMW 1890.XIII.192a; 3 – NHMW 1890.III.190; 4, 5 – NHMW 1893.IV.25, the original of Jahn 1896, pl. 7, figs 5; 6, 16 – NHMW 1890.XIII.194; 7, 17 – NHMW 1890.XIII.189; 8, 13 – NHMW 1892.II.14b; 9, 18 – NMP collections; 10, 14 – NHMW 1890. XIII.191; 12 – NMP 03177, the original of Fritsch (1872, pl. 13, fig. 8), from the Březno Formation near Česká Kamenice [Priesener Schichten bei Böhmischen Kamnitz].

**11, 15** – *Yezoites* sp. NHMW 1892.2.18.

Unless otherwise indicated, specimens are from the Březno Formation of Březno [Priesener Schichten von Priesen].

Figures 1-5, 12-18 are  $\times 2$ ; figures 6-11 are  $\times 1$ .





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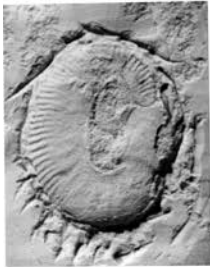
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## PLATE 12

**1, 2, 5, 6, 10** – *Scaphites geinitzii* d'Orbigny, 1850. 1, 2 – the original of Fritsch 1889, text-fig. 43, NMP 04315, from the Teplice Formation of Bohosudov [Teplice Schichten von Mariaschein]; 5, 6 – NMP Cl.6681, from the Teplice Formation of Srnojedy [Teplice Schichten von Srnojed]; 10 – NMP 03198, the original of Fritsch (1872, pl. 14, fig. 11), from the white limestone of the Březno Formation at Wunitz (Vojnice) near Libochovice [aus den weissen Kalken der Priesener Schichten bei Wunitz bei Libochovic].

**3, 4, 7-13** – *Scaphites kieslingswaldensis* Langenhan and Grundey, 1891, from the Březno Formation of Březno [Priesener Schichten von Priesen]. 3, 4 – NMP Cl.6685, from the sphaerosiderite layer; 7, 8 – NMP collections; 9 – NHMW 1892.II.16; 11 – NHMW 1890.XIII.199; 12 – NHMW 1890.XIII.196; 13 – NHMW 1890.XV11. 195.

All figures are  $\times 1$ .



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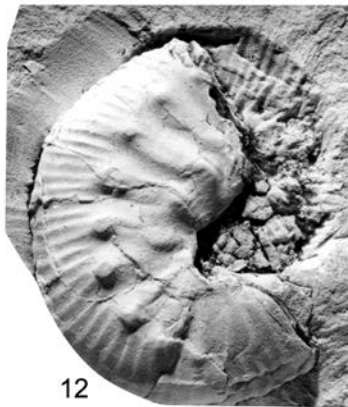
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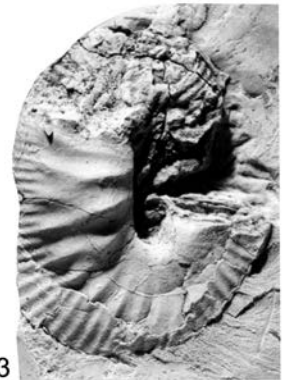
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## PLATE 13

**1-9, 15-17, 20, 21** – *Scaphites kieslingswaldensis* Langenhan and Grundey, 1891, from the Březno Formation [Priesener Schichten]. 1, 2 – NHMW 1893.IV.22, the original of Jahn (1896 pl. 8, fig. 1), from Srnojedy near Pardubice [Srnojed bei Pardubitz]; 3, 4 – NHMW 1893.III.5a, from Březno [Priesen]; 5-7 – NHMW 1893. III.5, the original of Jahn (1896, pl. 8, fig. 6), from Malé Chvojno near Ústí nad Labem [Klein-Kahn bei Aussig]; 8, 9 – NHMW 1890.XIII.193a, from Březno [Priesen]; 11 – NHMW 1892.II.15, from Březno [Priesen]; 15-17 – NMP Cl 6687, from the sphaerosiderite layer, Březno [Priesen]; 16 and 17 are the associated half of a lower jaw (*Pseudostriaptychus*) housed in the body chamber; 20, 21 – NMP 04437, plaster cast of the original of Fritsch (1872, pl. 14, fig. 13), from Lenešice near Launy [Lenešic bei Lauen].

**10, 12-14, 18, 19** – *Scaphites geinitzii* d'Orbigny, 1850. 10 – NHMW 1890.XIII.230, from the Březno Formation of Březno [Priesener Schichten von Priesen]; 12 – UUG 5414/1969, from the Jizera Formation of Solany near Litoměřice [Iser Schichten von Solan bei Leitmeritz], LB-3 at the 47 m level; 13, 14 – NMP Cl. 6427, the original of Fritsch (1883, text-fig. 53a and 1885, text-fig. 53a), from the Jizera Formation of Jizerní Vtelno [Izer Schichten von Jizerni Vtenlo]; 18, 19 – NMP 03775, the original of Fritsch (1872, pl. 13, fig. 7), from the limestone of the Teplice Formation of Poplze near Libochovice [dem kalk der Teplitzer Schichten von Poplz bei Libochovic].

Figures 1-4 are  $\times 2$ ; figures 5-15, 18-21 are  $\times 1$ ; figure 17 is  $\times 3$ .

