

## Campanian and Maastrichtian ammonites from the Mons Basin and adjacent areas (Belgium).

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### Abstract

Upper Cretaceous chalks of the Mons Basin and adjacent areas in Belgium have yielded small but stratigraphically significant ammonite assemblages, as has the reworked basal conglomerate of the succeeding Palaeocene Tuffeau de Ciply. Twenty two species are described on the basis of specimens housed in the collections of the Institut Royal des Sciences Naturelles de Belgique, Brussels. They indicate Campanian and Lower Maastrichtian ages that are compatible with the belemnite and foraminiferal evidence of ROBASZYNSKI & CHRISTENSEN (1989). Of great interest is the presence of three *Baculites* species previously known only from the United States Western Interior, where they are upper Lower Campanian and Lower Maastrichtian zonal indicators.

**Key-words:** Cephalopods: Ammonites, Taxonomy; Upper Cretaceous; Belgium.

### Résumé

En Belgique, dans la Bassin de Mons et les régions avoisinantes, les craies du Crétacé Supérieur ainsi que le conglomérat basal remanié du Tuffeau de Ciply sus-jacent ont livré des assemblages pauvres en espèces, mais à valeur stratigraphique importante.

Vingt et une espèce sont décrites sur base de spécimens conservés dans les collections de l'Institut Royal des Sciences Naturelles de Belgique à Bruxelles. Elles indiquent des âges Campanien et Maastrichtien inférieur, en accord avec les conclusions de ROBASZYNSKI & CHRISTENSEN (1989).

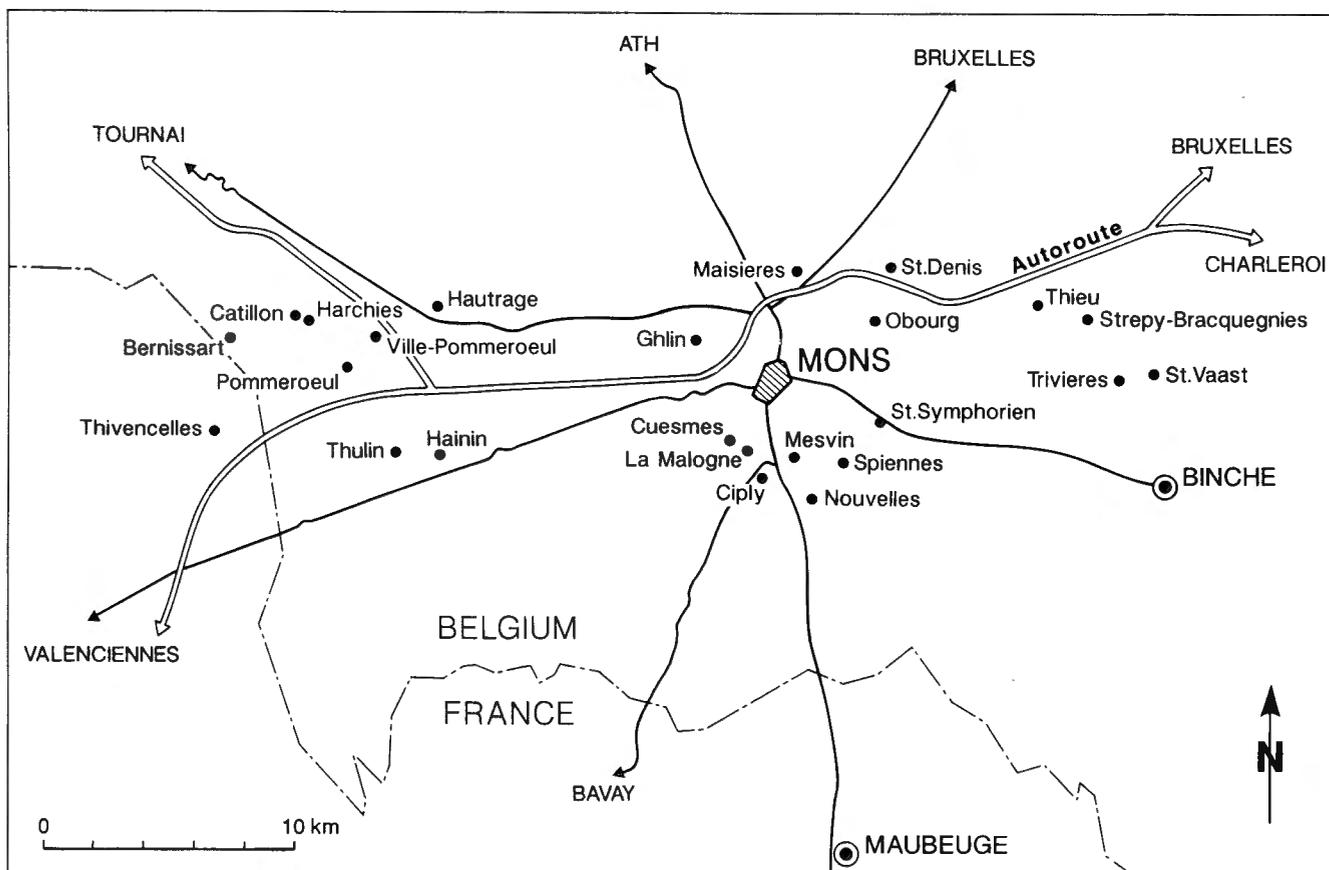


Fig. 1 — Locality map for the Mons Basin.

SEN (1989) basées sur l'étude des bélemnites et des foraminifères. La présence de trois espèces de *Baculites* est d'un grand intérêt car celles-ci n'étaient jusqu'à présent connues que dans le "Western Interior" des Etats-Unis où elles caractérisent la partie supérieure du Campanien inférieur et le Maastrichtien inférieur.

**Mots-clefs:** Céphalopodes; Ammonites; Taxinomie; Crétacé supérieur; Belgique.

### Introduction

The Upper Cretaceous chalks of the Mons Basin (Text - Figs 1, 2) have long been famous, both for the occurrence of phosphatic units within the succession, as well as for their fossil content. The chief reviews of the stratigraphy of the sequence were those of MARLIÈRE (1954, 1957), MARLIÈRE & ROBASYNSKI (1975) and, most recently, ROBASYNSKI & CHRISTENSEN (1989) who provided a succinct summary as follows:

"The Campanian-Maastrichtian chalks exposed at the borders of the basin have been subdivided into several 'formations' listed below (top to bottom):

*Tuffeau de Saint-Symphorien* (RUTOT & VAN DEN BROECK, 1885): a yellowish, loose, calcarenite with several flint bands. A phosphatic conglomerate is present at the base and a hardground at the top. The inarticulate brachiopod *Thecidea papillata* is common.

*Craie Phosphatée de Cibly* ('craie grise' = grey chalk of CORNET & BRIART, 1866 or 'craie brune' = brownish chalk of CORNET & BRIART, 1874): a grey to brownish calcarenite consisting of many phosphatic grains in a chalky matrix and generally with flint bands. On the southern border of the basin the Conglomérat de Cuesmes (BRIART & CORNET, 1880) forms the base of the 'formation'. The top is capped by a prominent hardground, which is about one metre thick.

*Craie de Spiennes* (CORNET & BRIART, 1870): a white, rather coarse-grained chalk which becomes calcarenitic towards the top. It has many thick black flint bands which were used by neolithic man to produce tools. There may be a thin layer of phosphatized pebbles at the base and a burrowed level at the top.

*Craie de Nouvelles* (CORNET & BRIART, 1870): a pure, massive, fine-grained, white chalk without flints except for three thin bands at the top. At the border of the basin, a prominent hardground is present in the topmost part of the 'formation'. There is a gradual transition to the subjacent Craie d'Obourg. The brachiopod *Magas chitoniformis* (= *Magas pumilus* of authors) occurs commonly.

*Craie de Trivières* (BRIART & CORNET, 1880): a white to greyish chalk without flint-layers. There is a phosphatic conglomerate with sponges at the base and a hardground at the top. In the eastern part of the Mons Basin several hardgrounds are distributed through the 'formation'."

ROBASYNSKI & CHRISTENSEN (1989) also provided biostratigraphic dating of the Craie de Trivières to Craie de Cibly based on belemnites and foraminifera; a modified version of their conclusions is shown in Text - Fig. 2.

### Ammonite faunas

There is little previous work on the ammonites from the Mons Basin, the most notable exception being that of de GROSSOUVRE (1908), who illustrated, as *Scaphites* cf. *spiniger* SCHLÜTER and *Scaphites* cf. *monasteriensis* SCHLÜTER, two nuclei that he believed to be from the Craie de Spiennes. These specimens survive in the collection of the Institut Royal des Sciences Naturelles de Belgique (Pl. 7, figs 1-6), and, as shown below, are juvenile *Hoploscaphites constrictus* (J. SOWERBY, 1817) from the Craie phosphatée de Cibly.

*Craie de Trivières*. Oyster attachment scars provide the chief evidence for the ammonite fauna of this unit, with *Scaphites* (*Scaphites*) *gibbus* SCHLÜTER, 1872, *Glyptoxoceras* sp., *Rugaptychus rugosus* (SHARPE, 1857) and a single scaphitid jaw apparatus. *S.(S.) gibbus* has a known range from the upper Lower Campanian to lower Upper Campanian (SCHMID & ERNST 1975), and its presence is compatible with the dating of ROBASYNSKI & CHRISTENSEN (1989).

*Craie d'Obourg*. Composite moulds of the following species are present: *Pachydiscus* (*Pachydiscus*) cf. *subrobustus* SEUNES, 1892, *P. (P.)* cf. *oldhami* (SHARPE, 1855), *P. (P.)* sp., *Parapuzosia* (*Parapuzosia*) *stobaei* (NILSSON, 1827), *Scaphites* (*S.*) *gibbus* '*Aptychus*' *portlockii* SHARPE, 1857, and a scaphitid jaw apparatus. There are lightly phosphatized *Glyptoxoceras retrorsum* (SCHLÜTER, 1872) and *Baculites* sp. (smooth) of COBBAN, 1962, and a heavily phosphatized *Baculites aquilaensis* REESIDE, 1927. The unphosphatized fauna indicates the lower Upper Campanian according to the records of SCHULZ et al. (1984), and is again compatible with the results of ROBASYNSKI & CHRISTENSEN (1989). Of considerable interest is the presence of the two United States Western Interior *Baculites* species; the heavily phosphatized *B. aquilaensis* is a species that characterizes the Lower Campanian zone of *Scaphites hippocrepis* III in that region, and the *Baculites* sp. (smooth), is the index fossil of the succeeding zone. Neither have been previously recorded outside the Western Interior.

*Craie de Nouvelles*. Phosphatized and specifically indeterminate *Baculites* are the commonest ammonites, but there is a single unphosphatized *Trachyscaphites spiniger* (SCHLÜTER, 1872). In north Germany, the records of SCHMID & ERNST (1975) show this species to be recorded from the top of their *conica/mucronata* Subzone to *minor/polyplocum* Subzone, a dating that is again compatible with the results of ROBASYNSKI & CHRISTENSEN (1989).

*Craie de Spiennes*. This has yielded only specifically indeterminate and phosphatized *Baculites* and a flint cast of an indeterminate desmoceratacean.

*Craie phosphatée de Cibly*. This has yielded numerous phosphatized ammonites, mostly specifically indeterminate *Baculites*. Also present as phosphatic moulds are *Pachydiscus* (*Pachydiscus*) cf. *neubergicus* (HAUER, 1858), *P.(P.)* sp. indet., *Nostoceras* sp. juv., *Diplomo-*

Sub-stages	Zones in NW Germany	Standard belemnite zones, NW Europe	Mons Basin Harmignies & Ciplý (Robaszynski & Christensen, 1989)	
UPPER MAASTRICHTIAN	upper part	<i>baltica/danica</i>		
				lower part
	<i>argenta/junior</i>			
		<i>tegulatus/junior</i>		
	LOWER MAASTRICHTIAN	upper part		<i>fastigata</i>
<i>cimbrica</i>			<i>Belemnella cimbrica</i>	
<i>sumensis</i>			<i>Belemnella sumensis</i>	
lower part		<i>obtusa</i>	<i>Belemnella obtusa</i>	Craie de Ciplý
		<i>pseudobtusa</i>	<i>Belemnella pseudobtusa</i>	hiatus
		<i>lanceolata</i>	<i>Belemnella lanceolata</i>	
UPPER CAMPANIAN	upper part	<i>grimmensis/granulosus</i>	<i>Belemnella "langei"</i>	Craie de Spiennes
		<i>langei</i>		
		<i>polyplocum/B. "minor"</i>	<i>Belemnella "minor"</i>	hiatus
	lower part	<i>roemeri</i>	<i>Belemnella mucronata</i>	Craie de Nouvelles
		<i>basiplana/spiniger</i>		Craie d'Obourg
		<i>conica/mucronata</i>		
LOWER CAMPANIAN	upper part	<i>gracilis/mucronata</i>	<i>G.q.gracilis / B.mucronata</i>	Craie de Trivières
		<i>conica/gracilis</i>	<i>G. quadr. gracilis</i>	
		<i>papillosa</i>	<i>Goniot euthis quadrata quadrata</i>	
		<i>senonensis</i>		
		<i>pilula/senonensis</i>		
	lower part	<i>pilula</i>	<i>Goniot euthis granulataquadrata</i>	Craie de Trivières
		<i>lingua/quadrata</i>		
		<i>granulataquadrata</i>		

Fig. 2 — Lithostratigraphic divisions of the Campanian and Maastrichtian chalks of the Mons Basin, and their correlation with the standard north-west European belemnite zones and the zonal succession recognised in north-west Germany (modified after ROBASZYNSKI & CHRISTENSEN 1989).

*ceras cylindraceum* (DEFRANCE, 1816), *Neancyloceras bipunctatum* (SCHLÜTER, 1872), *Pseudoxybeloceras* (*Parasolenoceras*) *interruptum* (SCHLÜTER, 1872), *Baculites baculus* MEEK & HAYDEN, 1861, *Baculites* sp. and *Hoploscaphites constrictus* (J. SOWERBY, 1817). Also present are large, partially phosphatized *Baculites knorrianius* DESMAREST, 1817.

A few ammonites are localised more precisely as being from the Poudingue de Cuesmes, but are all specifically indeterminate phosphatic moulds, mostly *Baculites*, with three *Pachydiscus*, a *Hoploscaphites?* and a diplomoceratid.

This is a mixed assemblage. The co-occurrence of *P.(P.) interruptum* and *N. bipunctatum* suggests the presence of material derived from the Upper Campanian, if the attribution to the Craie phosphatée de Ciply is correct. The other elements of the ammonite fauna is Lower Maastrichtian; the association of *Baculites knorrianius* and *P.(P.) cf. neubergicus* matching that seen at Nagoryany in the Ukraine (KENNEDY & SUMMESBERGER, 1987), which is dated as *lanceolata* to *sumensis* Zone (*sensu* SCHULZ, 1979), a conclusion compatible with the results of ROBASZYNSKI & CHRISTENSEN (1989), although these species range higher, to the base of the Upper Maastrichtian in Denmark. The presence of *Baculites baculus* is of great interest, as this species was previously known only from the United States Western Interior, where it is the index fossil of a zone low in the Maastrichtian.

*Tuffeau de Ciply*. This Palaeocene unit has yielded derived phosphatic ammonite fragments from the basal Poudingue de la Malogne: *Hauericeras cf. sulcatum* (KNER, 1848), *Pachydiscus* spp. indet., *Nostoceras* (*Nostoceras*) *hyatti* STEPHENSON, 1941, *N.(N.)* sp., *Solenoceras* sp. and *Baculites* sp. indet. This is again a mixed assemblage. The occurrence of *N.(N.) hyatti* indicates the presence of material derived from the uppermost Campanian, for this species occurs in the Vistula Valley, Poland, where some of the material referred to *Nostoceras pozaryskii* by BLASZKIEWICZ (1980) is clearly to be placed in this species. The *pozaryskii* Zone of BLASZKIEWICZ should be renamed the *hyatti* Zone; it is equivalent to the higher part of the *Belemnitella langei* zone of what ROBASZYNSKI & CHRISTENSEN (1989) termed the standard NW European sequence (see Text-fig. 2). *Hauericeras sulcatum*, in contrast, is a Lower Maastrichtian indicator (KENNEDY & SUMMESBERGER, 1987).

## Discussion

The limited ammonite faunas from the Mons Basin recognised here confirm the dating of the sequence proposed by ROBASZYNSKI & CHRISTENSEN (1989), while the presence of Upper Campanian forms at the base of the Craie phosphatée de Ciply, if correctly localised, indicates the reworking of this level into the Poudingue de la Malogne at the base of the Palaeocene Tuffeau

de Ciply, where both reworked uppermost Campanian and reworked Lower Maastrichtian forms are present.

## Systematic palaeontology

### Phylum Mollusca

Class	Cephalopoda	
Order	Ammonoidea	ZITTEL, 1884
Suborder	Ammonitina	HYATT, 1889
Superfamily	DESMOCERATAEAE	ZITTEL, 1884
Family	Desmoceratidae	ZITTEL, 1884
Subfamily	Hauericeratinae	MATSUMOTO, 1938
Genus	<i>Hauericeras</i>	DE GROSSOUVRE, 1894

### TYPE SPECIES

*Ammonites gardeni* BAILY, 1855, p. 450, pl. 3, fig. 3, by original designation by de GROSSOUVRE, 1894, p. 219.

### *Hauericeras cf. sulcatum* (KNER, 1848)

Pl. 1, Figs 4, 5

Compare:

1848 *Ammonites sulcatus*, KNER, p. 8, pl. 1, fig. 3

1987 *Hauericeras sulcatum* (Kner, 1848) - KENNEDY & SUMMESBERGER p. 27, pl. 1, figs 1-7; pl. 13, fig. 2 (with full synonymy).

### TYPES

These have not been traced. See KENNEDY & SUMMESBERGER, 1987, p. 27.

### MATERIAL

IRSNB 10435 (IG 2738) ex NYST Collection, from the Poudingue de la Malogne at the base of the Tuffeau de Ciply. Dessailly Collection, Ciply-Malogne.

### DESCRIPTION

The specimen is a phosphatic internal mould of less than half a whorl of phragmocone with a maximum preserved whorl height of 18.5 mm and a whorl breadth of height ratio of 0.51, the greatest breadth low on the flanks, which are subparallel to mid flank, the outer flanks and ventrolateral shoulders converging to a narrowly rounded, subacute venter. No ornament is preserved.

### DISCUSSION

Whorl section and coiling show this fragment to be a *Hauericeras*, the very compressed whorls suggesting comparison with *H. sulcatum* (KNER, 1848), recently revised by KENNEDY & SUMMESBERGER (1987), who discuss differences from other species referred to the genus.

### OCCURRENCE

Where precisely dated *Hauericeras sulcatum* is a lower Lower Maastrichtian species, known from Nagoryany

in the Ukraine, the Donbass, Russia, Kopet-Dag, Turkmenia, Bulgaria and the Vistula Valley, Poland.

Family Pachydiscidae SPATH, 1922

Genus and Subgenus *Pachydiscus* ZITTEL, 1884

#### TYPE SPECIES

*Ammonites neubergicus* HAUER, 1858, p. 12, pl. 2, figs 1-3; pl. 3, figs 1, 2, by the subsequent designation of DE GROSSOUVRE, 1894, p. 177.

*Pachydiscus (Pachydiscus) cf. neubergicus* (HAUER, 1858)

Pl. 1, Figs 2, 3

Compare:

1858 *Ammonites neubergicus*, HAUER, p. 12 (*pars*), pl. 2, figs 1-3 only, *non* pl. 3, figs 1, 2.

1986 *Pachydiscus (Pachydiscus) neubergicus* (Hauer, 1858) - KENNEDY & SUMMESBERGER, p. 188, pl. 2, figs 1, 2; pl. 3, figs 1-3; pl. 4, figs 1-5; plate 5, figs 1, 4, 5; pl. 6, figs 1, 2, 5; pl. 15, figs 7, 8; text-figs 5a, b (with full synonymy).

#### TYPES

Lectotype, by the subsequent designation of de GROSSOUVRE, 1894, p. 209, is the original of HAUER, 1858, p. 12, pl. 2, figs 1, 2, no. 1858.01.6 in the collection of the Geologisches Bundesanstalt, Vienna, from the Lower Maastrichtian of Neuberg, Steiermark, Austria. There are three paralectotypes (see KENNEDY & SUMMESBERGER, 1986, p. 189 for details).

#### MATERIAL

IRSNB 10451 (IG 6081), from the 'Craie brune phosphatée enrichie par alteration' (that is to say the Craie Phosphatée de Cibly), Bernard Collection, Mesvin-Cibly.

#### DESCRIPTION

The specimen is a phosphatic fragment of phragmocone with a maximum preserved whorl height of 42 mm, part of the innermost flank being missing. The whorl section was compressed, with flattened, convergent flanks, broadly rounded ventrolateral shoulders and a flattened venter; the estimated whorl breadth to height ratio is 0.75 approximately. The fragment is 52 mm long, and preserves a single straight prorsiradiate primary rib that is strong on the inner flank, weakens across the outer flank and is strong across the ventrolateral shoulder. Traces of seven shorter ribs are preserved; they also strengthen across the ventrolateral shoulder. All ribs are interrupted by a shallow groove on the siphonal region. Traces of a deeply and intricately incised suture are preserved, with narrow-stemmed L/U2.

#### DISCUSSION

Although a fragment only, the specimen shows the ribbing style characteristic of *Pachydiscus (P.) neubergicus*, and matches well with more complete topotype

specimens. See KENNEDY & SUMMESBERGER, 1986 for a discussion of differences from other species of the subgenus.

#### OCCURRENCE

Where well-dated, *Pachydiscus (P.) neubergicus* is generally a Lower Maastrichtian species, first appearing a little above the base of the *Belemnella lanceolata* Zone. It ranges into the lower Upper Maastrichtian *Belemnitella junior* Zone in Denmark. Its geographic distribution extends from the Biscay region of France and Spain to north Germany, Denmark, Austria, Poland, the Ukraine, European Russia, Nigeria, Zululand (South Africa), Madagascar and south India.

*Pachydiscus (Pachydiscus) cf. subrobustus* SEUNES, 1892

Pl. 1, Figs 1, 8, 9; Pl. 2, Figs 13, 14

Compare:

1892 *Pachydiscus subrobustus*, SEUNES, p. 15, pl. 13(4), fig. 1.

1984 *Pachydiscus cf. subrobustus* Seunes, 1891 - KENNEDY & SUMMESBERGER, p. 161, pl. 8, fig. 4 (with full synonymy).

#### TYPE

Lectotype, by the subsequent designation of KENNEDY & SUMMESBERGER, 1984, p. 161, is the original of SEUNES, 1892, pl. 13(4), fig. 1, from the Upper Campanian of Tercis (Landes, France).

#### MATERIAL

IRSNB 10419 and 10423 (IG 6435), *ex* Willot Collection, from the Craie d'Obourg of Harmignies. IRNSB 10424 (IG 6312), from the Craie d'Obourg, Rutot-Wérihasse Collection, Harmignies.

#### DESCRIPTION

IRSNB 10419 is the best preserved juvenile, showing a part of one flank, and with an estimated original diameter of 58.5 mm. The umbilicus comprises 26% of the diameter and is of moderate depth, with a flattened, outward-inclined umbilical wall. There are ten primary ribs per half whorl; they arise at the umbilical seam and strengthen across the umbilical wall, developing into a bulla perched on the umbilical shoulder. These give rise to strong, distant, slightly prorsiradiate primary ribs that are straight on the inner and middle flank, thereafter flexing forwards and concave on the outer flank and crossing the venter in a broad convexity. They alternate with single intercalated ribs that arise below mid-flank and strengthen to match the primaries on the outer flank and venter.

The three other fragments compared to the species are all poorly preserved.

#### DISCUSSION

GIERS (1964) illustrated (pl. 5, fig. 3) a specimen in the SCHLÜTER Collection from near Vorhelm, Germany

that agrees closely with present material. The species is discussed by KENNEDY & SUMMESBERGER (1984), to which reference should be made.

#### OCCURRENCE

Upper Campanian of Tercis (Landes, France), the Mons Basin (Belgium), Poland, Gschliefgraben (Austria), the Ukraine and Donbass (Russia)

*Pachydiscus (Pachydiscus) cf. oldhami* (SHARPE, 1855)  
Pl. 1, Figs 6, 7; Pl. 2, Figs 18, 19

1855 *Ammonites oldhami* SHARPE, p. 32, pl. 14, fig. 2.  
1986a *Pachydiscus (Pachydiscus) oldhami* (Sharpe, 1855) - KENNEDY, p. 40, pl. 3; pl. 4, figs 4, 5; pl. 5, figs 1-3; text-figs 4a, 15, 16, 18 (with full synonymy).

#### TYPE

Holotype by monotypy is the original of SHARPE, 1855, p. 32, pl. 14, fig. 2, from the Upper Campanian White Limestone of Dungivan, Northern Ireland (KENNEDY, 1986a, text fig. 16).

#### MATERIAL

IRSNB 10428 (IG 5496), ex Cornet Collection, 10430 (IG 6435), ex Willot Collection, and 10429 (IG 8261), ex de Jaer Collection, from the Craie d'Obourg of Harmignies.

#### DESCRIPTION

The best preserved specimen, IRSNB 10428 (Pl. 2, Figs 18, 19) is a slightly crushed composite internal mould 73 mm in diameter. Coiling is moderately involute, the umbilicus comprising 26% approximately of the diameter, shallow, with a narrowly rounded umbilical shoulder. The whorl section, modified by *post mortem* crushing, has very broadly rounded flanks and more narrowly rounded ventrolateral shoulders and venter. Ornament consists of numerous delicate primary and secondary ribs that are straight and prorsiradiate on the inner and middle flanks, flexing forwards and concave on the outer flank to cross the venter in a broad convexity.

#### DISCUSSION

Coiling and ornament suggest that these specimens are best compared with *P (P.) oldhami*, recently revised by KENNEDY (1986a), to which reference should be made. IRSNB 10429 (Pl. 1, Figs 10, 11) has an ornament of delicate lirae only at an estimated diameter of 45 mm, and may belong to some different species, although some specimens of *oldhami* may show this type of ornament (KENNEDY, 1986a, pl. 5, figs 1-3).

#### OCCURRENCE

Upper Campanian of Aquitaine (France), Northern Ireland and Norfolk (England), the Mons Basin (Belgium), Poland and European Russia.

*Pachydiscus (Pachydiscus) sp.*

Pl. 1, Fig. 12

#### MATERIAL

IRSNB 10421, 10424, 10427 and 4 other specimens from the Craie d'Obourg, Rutot-Wérihasse Collection, Harmignies (IG 6312).

#### DESCRIPTION

The largest specimen is 330 mm in diameter. Coiling is involute, with the umbilicus comprising 18% of the diameter, small and deep, with a subvertical wall and broadly rounded umbilical shoulder. The whorl section is slightly compressed, with a whorl breadth to height ratio of 0.8, and broadly rounded inner flanks, convergent outer flanks and a broadly rounded venter. Ornament consists of rather distant, narrow ribs on composite moulds, visible on the inner flanks of one specimen at a diameter of 130 mm. What may be juveniles of this species (IRSNB 10424, 10427) are as little as 48 mm in diameter; they show the same very distant, narrow ventral ribbing of the larger specimens.

#### DISCUSSION

This distinctive assemblage of indifferently preserved specimens can be compared with the poorly illustrated *Pachydiscus amvroisensis* MIKHAILOV 1951 (p. 72, pl. 8, fig. 40; pl. 9, figs 41, 42) (see also NAIDIN, 1974, p. 185, pl. 63, fig. 5), which has very distant ribs on the early whorls. This species closely resembles the specimen from Coesfeld figured by SCHLÜTER (1872, pl. 18, figs 10, 11) as *Ammonites cf. stobaei* Nilsson.

#### OCCURRENCE

Craie d'Obourg, Harmignies.

Family	Desmoceratidae	ZITTEL, 1895
Subfamily	Puzosiinae	SPATH, 1922
Genus and subgenus	<i>Parapuzosia (Parapuzosia)</i>	NOWAK, 1913

#### TYPE SPECIES

*Sonneratia daubreei* de GROSSOUVRE, 1894, p. 154, pl. 28, by original designation by NOWAK, 1913, p. 350.

*Parapuzosia (Parapuzosia) stobaei* (NILSSON, 1827),

1827 *Ammonites stobaei* NILSSON, p. 5, pl. 1, figs 1, 2.  
1964 *Pachydiscus stobaei* (Nilss.) - GIERS, p. 258, pl. 4, figs 1-4; text - fig 4 (with synonymy).  
1974 *Pachydiscus stobaei* (Nilsson, 1827) - NAIDIN, p. 154, pl. 67, fig. 2, pl. 68, fig. 2.  
1988 *Pachydiscus stobaei sensu* Giers - JAGT, pl. 1, b; pl. 2, a, b.

#### TYPE

GIERS (1964, p. 258) referred to the original of NILSSON 1827, pl. 1, fig. 1 as the holotype, but I am unclear as to the status of this specimen. It was from the lower Upper Campanian of Köpinge, Sweden.

## MATERIAL

IRSNB IG 6312, 7 large specimens from the Craie d'Obourg, Rutot-Wérihasse Collection, Harmignies.

## DESCRIPTION

A series of large composite moulds, up to 480 mm in diameter, with whorl heights of up to 200 mm are referred to this species. Coiling is moderately involute, with 50% of the previous whorl being covered. The umbilicus comprises 27% of the diameter, and is shallow with a low subvertical wall and broadly rounded umbilical shoulder. Specimens of around 300 mm diameter have poorly preserved surfaces and show no obvious ornament. In contrast, the largest individuals seen develop very coarse primary ribs, 8-9 per half whorl. These are strong, straight and slightly prorsiradiate on the inner to mid-flank, but decline markedly on the outer flank and efface over the venter.

## DISCUSSION

These large specimens closely resemble those figured by MÖBERG (1885, pl. 2, fig. 1) and GIERS (1964, pl. 4, fig. 1). Both of these authors associate these large individuals with juveniles with around eight prominent constrictions per whorl (e.g. MÖBERG, 1885, pl. 2, fig. 5; GIERS, 1964, pl. 4, fig. 3). These constrictions, the compressed whorl section, and adult growth stage with distant primary ribs are not features that characterise *Pachydiscus* (*Pachydiscus*), but suggest rather *Parapuzosia* (*Parapuzosia*), with early growth stages as represented by *P. (P.) griffithii* (SHARPE, 1855) (p. 28, pl. 9, fig. 3) from the Campanian of Northern Ireland and adults as represented by *P. (P.) leptophylla* (SHARPE, 1857) (p. 48, pl. 21, fig. 2, pl. 22, fig. 1) from the Campanian of southern England.

## OCCURRENCE

Lower Upper Campanian of southern Sweden, the Mons Basin, Liège and Limburg (Belgium), Limburg, (The Netherlands) and Germany.

Suborder	Ancycloceratina	WIEDMANN, 1966
Superfamily	Turrilitaceae	GILL, 1871
Family	Nostoceratidae	HYATT, 1894
Genus and subgenus	<i>Nostoceras</i>	HYATT, 1894

## TYPE SPECIES

*Nostoceras stantoni* HYATT, 1894, p. 569, by original designation.

*Nostoceras (Nostoceras) cf. hyatti* STEPHENSON, 1941 Pl. 2, Figs 7-9, 15-17

1941 *Nostoceras hyatti* STEPHENSON, p. 410, pl. 81, Figs 9-12.

1974a *Nostoceras hyatti* Stephenson - COBBAN, p. 10, pl. 5, figs 1-21; pl. 6, figs 1-12; pl. 7, figs 1-10;

pl. 8, figs 1-30; text - fig 8 (with full synonymy).

1980 *Nostoceras pozaryskii* BLASZKIEWICZ, p. 26 (*pars*), pl. 10, figs 8, 9, 12 only.

1986a *Nostoceras (Nostoceras) hyatti* Stephenson, 1941 - KENNEDY, p. 90, pl. 20, figs 7-9.

1986a *Nostoceras (Nostoceras) pozaryskii* Blaszkiewicz - KENNEDY, p. 92, text - fig. 31a.

## TYPES

The holotype is no. 77258 in the collections of the U.S. National Museum of National History in Washington, D.C., from the Nacatoch Sand on Postoak Creek on the north edge of Corsicana, Navarro County, Texas. There are four paratypes.

## MATERIAL

IRSNB 10449-10450 (IG 5796), from the Poudingue de la Malogne at the base of the Tuffeau de Cibly, Cibly, ex De Gossely Collection.

## DESCRIPTION

IRSNB 10449 is a 34 mm long phosphatic internal mould of part of a body chamber with a maximum preserved whorl height of 24 mm. The whorl section is depressed oval, with a whorl breadth to height ratio of 1.13. Parts of seven ribs are preserved. They are weak, narrow, and feebly convex on the dorsum, but are straight and strengthen progressively across the flanks and link to weak ventrolateral clavi that are in turn linked across the venter by a coarse, straight transverse rib. Ornament weakens towards the adapical end of the fragment, which is from the final sector of an adult shell before the terminal aperture. IRSNB 10450 is a larger body chamber fragment, 48 mm long and preserves traces of the final septum at its adapical end. It is very worn, but shows strong, straight flank ribs that are weaker on one flank, and irregular ventrolateral clavi that are alternate rather than opposite, and linked by looped and zig-zag ribs.

## DISCUSSION

These poor fragments compare well with the abundant material from New Jersey described by Cobban (1974a). A recent examination of the figured material of *Nostoceras pozaryskii* BLASZKIEWICZ, 1980, shows that this is in part *N. (N.) hyatti*, as mentioned in the synonymy.

## OCCURRENCE

Where well dated, *N. (N.) hyatti* is upper Upper Campanian. There are records from the Nacatoch Sand of northeast Texas, the Coon Creek Tongue of the Ripley Formation in Western Mississippi, the Saratoga Chalk in Arkansas, Navesink Formation of New Jersey, *Baculites jenseni* Zone Pierre Shale at Walsenburg, Huerfano County, Colorado, all in the U.S.A.; Angola, Madagascar, ?Israel, Zumaya (Guipuzcoa, NW Spain), Tercis (Landes), and northern Aquitaine (France), the Mons Basin (Belgium) and the Vistula Valley (Poland).

*Nostoceras (Nostoceras) cf. pauper* (WHITFIELD, 1892)  
Pl. 2, Figs 4-6

Compare:

1892 *Turrilites pauper* WHITFIELD, p. 268, pl. 45, figs 1-5.

1974a *Nostoceras pauper* (Whitfield) - COBBAN, p. 12, Pl. 9, figs 1-22; text-fig. 10.

#### MATERIAL

IRSNB 10433 (IG 9144), from the "Craie phosphatée de Cibly" of Les Waleffes [Waleffe], west of Noville, near Liège, ex WOOT DE TRIXHE Collection.

#### DESCRIPTION

The specimen is a phosphatized internal mould of half a whorl of the spire, septate throughout, and with a diameter of 16.5 mm. The upper whorl face is markedly concave, the juncture between upper and outer whorl faces narrowly rounded, the outer and lower whorl faces broadly rounded. Narrow crowded ribs are prorsiradiate on the upper whorl face. They strengthen and sweep forwards across the outer whorl face, where they are prorsiradiate and feebly sinuous. Pairs of ribs link at a row of small tubercles situated some distance above the middle of the outer whorl face, or are intercalated between. A second row of tubercles lie at the juncture of the outer and lower faces and are linked to the tubercles in the upper row by one or two ribs, while ribs that are intercalated between the tubercles of the upper row may link to the tubercles in the lower row. One or two ribs extend from the lower row of tubercles onto the lower whorl face. There is a single strong, deep constriction associated with flared collar-ribs.

#### DISCUSSION

The pattern of ribs and tubercles, combined with the strong distant constrictions suggest this fragment to be comparable to *N. (N.) pauper*, as revised by COBBAN (1974a), who described a series of specimens from New Jersey and discussed differences from other species referred to the genus.

#### OCCURRENCE

The present specimens are said to be from the Maastrichtian Craie phosphatée de Cibly of Les Waleffes [Waleffe], west of Noville, near Liège. The species is best known from the Upper Campanian of New Jersey and Arkansas in the United States.

*Nostoceras (Nostoceras) sp.*

Pl. 2, Figs 1-3

#### MATERIAL

IRSNB 10441 (IG 8261), ex De Jaer Collection, from the Poudingue de la Malogne, base of the Tuffeau de Cibly, Cibly.

#### DESCRIPTION

The specimen is a phosphatic fragment of a small curved

section of body chamber, 33 mm long, with a circular whorl section and maximum preserved intercostal whorl height of 13.5 mm. There are three pairs of strong slightly offset ventral clavi, which are linked across the venter by a low broad rib. Coarse flank ribs link to the tubercles either singly or in pairs.

#### DISCUSSION

The fragment represents a third *Nostoceras (Nostoceras)* species, characterized by its very coarse ornament, but is specifically indeterminate.

Family	Diplomoceratidae	SPATH, 1926
Subfamily	Diplomoceratinae	SPATH, 1926
Genus	<i>Diplomoceras</i>	HYATT, 1900

#### TYPE SPECIES

*Baculites cylindracea* DEFRANCE, 1816, p. 160, by original designation by HYATT, 1900, p. 571.

*Diplomoceras cylindraceum* (DEFRANCE, 1816)

Pl. 2, Fig. 20

1816 *Baculites cylindracea* DEFRANCE, p. 160

1992 *Diplomoceras cylindraceum* (DeFrance, 1816) - HENDERSON, KENNEDY & McNAMARA, p. 140, Figs 5, 6a-e, h-k, 7 (with synonymy).

#### TYPE

Neotype, designated by KENNEDY, 1987, p. 183 is IRSNB 10293, from the Upper Maastrichtian Meerssen Chalk of St Pietersberg, Maastricht, The Netherlands.

#### MATERIAL

IRSNB 10453 (IG 8261) ex De Jaer Collection from the Craie phosphatée de Cibly of Cibly.

#### DESCRIPTION

The specimen is a wholly septate composite mould 60 mm long, with a maximum preserved whorl height of 34 mm. Only one flank is preserved, so that the whorl section cannot be determined. Ornament is of low, blunt, straight, even prorsiradiate ribs; the rib index is between 12 and 14. The suture is deeply and intricately incised as is characteristic of the genus.

#### DISCUSSION

This poor fragment is referred to *D. cylindraceum* on the basis of size and ornament. The species is fully discussed by KENNEDY (1986b, 1987), KENNEDY & HENDERSON 1992 and HENDERSON, KENNEDY & McNAMARA 1992.

#### OCCURRENCE

*Diplomoceras cylindraceum* ranges throughout the whole of the Maastrichtian, and may appear in the Upper Campanian. The geographic range is extensive: northern and south-west France, northern Spain, Italy, the Mons Basin (Belgium), the Netherlands, Germany,

Denmark, Poland, Austria, the Ukraine, Bulgaria, Zululand (South Africa), Madagascar, south India, Western Australia, the Antarctic Peninsula, Chile, Argentina, Brazil, California, British Columbia, Alaska, Japan, and, perhaps, Greenland and New Zealand.

Genus *Neancyloceras* SPATH, 1926

TYPE SPECIES

*Ancyloceras bipunctatus* SCHLÜTER, 1872, p. 98, pl. 29, Figs 1-3, by original designation by SPATH, 1926, p. 80.

*Neancyloceras bipunctatum* (SCHLÜTER, 1872)

Pl. 3, Figs 11-16, 20, 21; Text-Figure 3

1872 *Ancyloceras bipunctatum* SCHLÜTER, p. 98, pl. 29, Figs 1-3.

1982 *Ancyloceras bipunctatum* Schlüter, 1872 - KLINGER, p. 22, Figs 1, 1-3, 2-8a-e, 9 (with full synonymy).

1986a *Neancyloceras* cf. *bipunctatum* (Schlüter, 1872a) - KENNEDY, p. 104, p. 16, fig. 5.

TYPES

Lectotype, by the subsequent designation of BLASZKIEWICZ, 1980, p. 29, is the original of SCHLÜTER, 1872, p. 29, fig. 2 (refigured by KLINGER, 1982, Figs 3 and 4a), from the Upper Campanian of Ahlten, Germany, no 65-10 in the collections of the Museum der Georg-August Universität, Göttingen.

MATERIAL

IRSNB 10407, (IG 9144), ex Woot de Trixhe Collection from the 'Craie phosphatée de Ciplly' of Les Waleffes [Waleffe], west of Noville, near Liège. IRSNB 10437 and 10439 (IG 7009), ex Rolland Collection, from the same unit at Cuesmes.

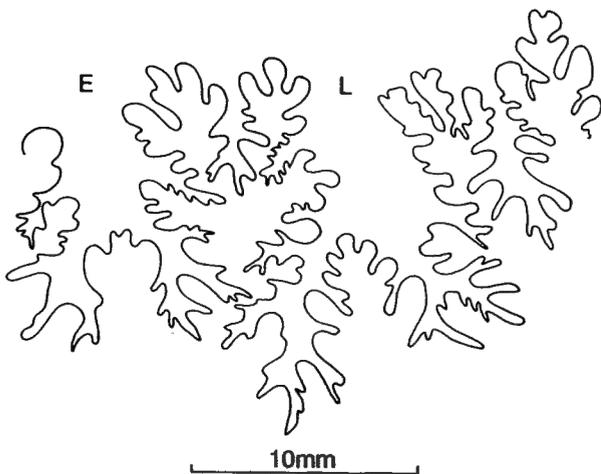


Fig. 3 — Partial suture of *Neancyloceras bipunctatum* (SCHLÜTER, 1872) IRSNB 10407.

DESCRIPTION

All specimens are slightly curved fragments of phragmocone, preserved as phosphatic internal moulds. IRSNB 10437 has a maximum preserved whorl height of 15 mm., and a whorl breadth to height ratio of 1.0, with a circular intercostal section. The rib index is five. Ribs are effaced over the mid-dorsum, but strengthen across the dorsolateral region and are short, blunt, straight and rursiradiate on the flanks, and narrower than the interspaces. Nine ribs are preserved on the fragment and all bear blunt ventrolateral bullae that may have been the bases of short spines. They are a little wider than the adjacent rib, and are linked across the venter by a low, weak, transverse rib. IRSNB 10439 has a maximum preserved whorl height of 17.5 mm, and a whorl breadth to height ratio of 1.06; the costal whorl section is subcircular, and the rib index is 7. Ornament is effaced on the dorsum, but strengthens across the dorsolateral region. The ribs are straight and recti- to feebly prorsiradiate on the flanks, blunt, rounded and separated by somewhat wider interspaces. They are initially of equal strength, but differentiate into weaker, nontuberculate ribs that are narrow and effaced on the venter, and weak and strong tuberculate ribs. There are from one to four weak ribs between the stronger ones. Tubercles are bullate, flat-topped, and clearly the bases of septate spines; a low, broad, transverse, weak rib links them across the venter. IRSNB 10454a has a maximum preserved whorl height of 19.5 mm, and a whorl breadth to height ratio of 1.05. Ornament is coarser than on the two smaller specimens, with a rib index of 4. The ribs are markedly rursiradiate on the flanks, coarse and blunt, and strongly developed across the venter, with flattened ventrolateral areas that mark the bases of septate spines. The suture is deeply and intricately incised, with a narrow-stemmed bifid e/1, and large, deeply splayed L (Text-Fig. 3).

DISCUSSION

KLINGER (1982) redescribed the variable but crushed type material of this species in detail. The present well-preserved fragments show the true whorl proportion and details of the suture. Although limited, they demonstrate a comparable variation to that shown by the type material.

OCCURRENCE

Upper Campanian of Germany, Poland, European Russia, and possibly, northern Aquitaine in France. The specimens from the Mons Basin (Belgium) are said to be from the Maastrichtian Craie de Ciplly.

Genus *Solenoceras* CONRAD, 1860

TYPE SPECIES

*Hamites annulifer* MORTON, 1842, p. 213, by original designation by CONRAD, 1860, p. 284.

*Solenoceras* sp.

Pl. 2, Figs 10-12

## MATERIAL

IRSNB 10448 (IG 5496) *ex* Cornet Collection, from the Poudingue de la Malogne at the base of the Tuffeau de Ciply, Dessailly Collection, Ciply-Malogne.

## DESCRIPTION

The specimen is a phosphatic internal mould of a body chamber 29 mm long, consisting of the final shaft and a part of the curved sector. The whorl section is depressed, with a whorl breadth to height ratio of 1.1. The dorsum is concave to accommodate the dorsum of the initial shaft; the flanks and venter are broadly and evenly rounded. Ornament is of coarse, even, straight, rectiradiate ribs on the flank that are straight and transverse on the venter; the rib index is 2.5.

## DISCUSSION

The shell of this specimen consisted of two tightly adpressed shafts without an opening inside the curved section that joined the shafts, showing it to be a *Solenoceras* rather than an *Oxybeloceras* HYATT, 1900. The large size, coarseness of ribbing and lack of tubercles distinguish the specimen from nearly all previously described species, which generally have tubercles. *Solenoceras nitidum* COBBAN, 1974b (p. 83, figs 1a-k, 2) lacks tubercles but is a much smaller form.

Genus *Glyptoxoceras* SPATH, 1925

## TYPE SPECIES

*Hamites rugatus* FORBES, 1846, p. 117, by original designation.

*Glyptoxoceras retrorsum* (SCHLÜTER, 1872)

Pl. 4, Figs 1-9, 11-19, 25, 26; Text-Figure 4

1872 *Ancylloceras retrorsum* SCHLÜTER, p. 97, pl. 30, figs 5-10.

1986a *Neoglyptoxoceras* (?) *retrorsum* (Schlüter, 1872a) - KENNEDY, p. 106, pl. 16, figs 1-4, 6, 7; pl. 17, figs 1, 2; text-fig. 38 (with full synonymy).

1988 *Neoglyptoxoceras retrorsum* (Schlüter), 1872 - Thomel, p. 21, pl. 1, fig. 2; pl. 4, fig. 4; pl. 21, fig. 2; text-figs 7-10.

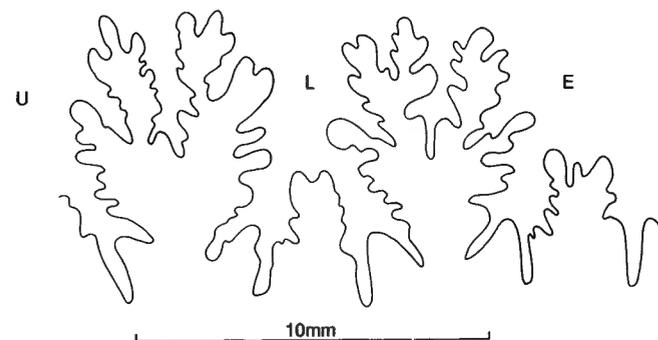


Fig. 4 — Partial suture of *Glyptoxoceras retrorsum* (SCHLÜTER, 1872), IRSNB 10416.

## TYPES

Lectotype, by the subsequent designation of SPATH, 1925, p. 31 (footnote) is no 67 in the Collections of the Geologisches und Paläontologisches Institut of Bonn University, the original of SCHLÜTER 1872, pl. 30, figs 5-7; paralectotype no 67b is the original of his pl. 30, fig. 8. Both are from the Upper Campanian of Coesfeld, Westphalia, Germany (Kennedy 1986a, text-fig. 38a-d).

## MATERIAL

IRSNB 10411-10417 (IG 6435) *ex* Willot collection, from the Craie d'Obourg of Harmignies.

## DESCRIPTION

All specimens are internal moulds, some slightly phosphatized, with whorl heights of 5-18 mm, the whorl section compressed ovoid, with a somewhat flattened dorsum, broadly rounded flanks and more narrowly rounded venter; the whorl breadth to height ratio varies around 0.8. Ornament is of uniform single ribs; most specimens have a rib index of 5.5-6; a few have a rib index of 7. The ribs are effaced markedly on the dorsum, but strengthen across the dorsolateral area and are strong, sharp and narrower than the interspaces on the flank, where they are straight and markedly ruriradiate. They reach their maximum development on the venter, where they are straight and transverse. The septa are widely separated, the sutures moderately incised, with narrow-stemmed, bifid E/L and L/U, with deeply splayed, bifid L (Text-Fig. 4).

## DISCUSSION

The well-preserved specimens from the Mons Basin differ in no significant respect from the German types, figured by KENNEDY (1986a, text-fig. 38). I previously suggested that *retrorsum* might belong to the Madagascan genus *Neoglyptoxoceras* COLLIGNON, 1969 (type species *Neoglyptoxoceras magnificum* COLLIGNON, 1969, p. 35, pl. 526, Figs 2074, 2075; pl. 527, fig. 2077), but subsequent work has shown that *Glyptoxoceras* grow to a comparable size (HENDERSON, KENNEDY & McNAMARA, 1992), while the present specimens have a typical *Glyptoxoceras* suture and lack the large auxiliary lobe said to characterise *Neoglyptoxoceras*.

## OCCURRENCE

Upper and Lower Campanian of northern Aquitaine (France), Upper Santonian and Lower Campanian of southeastern France, Upper Campanian of northern Spain, Westphalia, Germany, the Mons Basin (Belgium), Gschlifgraben (Austria), European Russia, the Ukraine, Armenia, Kopet Dag (Turkmenia), and possibly Sweden; Lower Campanian of Poland.

## Subfamily Polytychoceratinae MATSUMOTO, 1938

Genus *Pseudoxybeloceras* WRIGHT & MATSUMOTO, 1954.

## TYPE SPECIES

*Hamites quadrispinosus* JIMBO, 1894, p. 185 (39), pl. 23 (7), figs 3, 4, by original designation.

Subgenus *Parasolenoceras* COLLIGNON, 1969.

## TYPE SPECIES

*Parasolenoceras splendens* COLLIGNON, 1969, p. 44, pl. 530, figs 2087-2088, by original description.

*Pseudoxybeloceras* (*Parasolenoceras*) *interruptum* (SCHLÜTER, 1872)

Pl. 3, figs 1-10, 17-19, 22, 23

1872 *Hamites interruptus* SCHLÜTER, p. 105, pl. 32, figs 8, 9.

1982 *Pseudoxybeloceras* (*Parasolenoceras*) *interruptus* (SCHLÜTER, 1872) - KLINGER, p. 237, text-fig. 8 f, g (with full synonymy).

1984 *Pseudoxybeloceras* (*Parasolenoceras*) *interruptum* (Schlüter, 1872) - KENNEDY & SUMMESBERGER, p. 167, pl. 9, figs 5, 10-11.

1986a *Pseudoxybeloceras* (*Parasolenoceras*) cf. *interruptum* (Schlüter, 1872a) - KENNEDY, pl. 108, pl. 16, figs 10, 11.

## TYPE

Holotype, by monotypy, is the original of SCHLÜTER, 1872, p. 105, pl. 32, figs 8, 9, from the Upper Campanian of Ahlten, Germany, no. 65-13 in the collection of the Georg-August Universität, Göttingen.

## MATERIAL

IRSNB 10440 (IG 7009), ex Rolland collection, from the Craie phosphatée de Cibly of Cuesmes. IRSNB 10455 (IG 14107), from the same unit at Noville, près Mommalle, near Liège. IRSNB 10454b, c, d, f, g and h (IG 9144) ex Woot de Trixhe collection, from the same unit at Les Waleffes [Waleffe], west of Noville, near Liège.

## DESCRIPTION

Specimens are phosphatic internal moulds with whorl heights of between 5 and 18 mm. All are straight shafts, with a depressed oval whorl section and whorl breadth to height ratios of up to 1.25. Ornament is effaced on the dorsum, but strengthens abruptly on the dorsolateral margin into narrow, high, oblique straight flank ribs, with a rib index of 3 in small specimens and 5 in the largest fragment. The ribs are prorsiradiate on small fragments and rursiradiate on large ones. All ribs bear small, sharp ventral tubercles on body chamber; on phragmocone fragments there are flat-topped tubercles, originally associated with septate spines. A narrow transverse rib, weaker than on the flanks, links these tubercles or spines across the venter. The sutures were not seen.

## DISCUSSION

KENNEDY & SUMMESBERGER (1984, p. 167) provide a

discussion of this species, and KLINGER (1982, figure 8f, g) reillustrates the holotype, which the present material closely resembles.

## OCCURRENCE

Upper Campanian of North Germany, the Mons Basin, the Gschliefgraben (Austria), Northern Ireland, Donbass (Russia) and southern Ukraine. Specimens from the Mons Basin and Les Waleffes, near Liège, are said to be from the Lower Maastrichtian Craie de Cibly.

Family

Baculitidae

GILL, 1871

Genus

*Baculites*

LAMARCK, 1799

## TYPE SPECIES

*Baculites vertebralis* LAMARCK, 1801, p. 103, by subsequent designation by MEEK, 1876, p. 391.

*Baculites knorrianus* DESMAREST, 1817

Pl. 5, Figs 13-22, Pl. 6, Figs 11-13, 18-23; Text-Figure 5A-C

1817 *Baculites knorrianus* DESMAREST, p. 48, pl. 1, fig. 3.

1987 *Baculites knorrianus* Desmarest, 1817 - KENNEDY & SUMMESBERGER, p. 32, pl. 4, figs 4-6; pl. 5, figs 1-14; text-fig. 2.

## TYPE

Neotype, by the subsequent designation of KENNEDY & SUMMESBERGER, 1987, p. 33, is no 7459a in the collections of the Naturhistorisches Museum, Wien (KENNEDY & SUMMESBERGER, 1987, p. 5, figs 5, 7, 8), from the Lower Maastrichtian of Nagoryany near Lvov in the Ukraine.

## MATERIAL

IRSNB 10436 (IG 5129), from the Craie phosphatée de Cibly, exploitation Houzeau, Spiennes, and IRSNB 10461 a-f (IG 6040) from the same unit, Usine Solvay, Spiennes.

## DESCRIPTION

All specimens are phosphatized fragments of phragmocone with whorl heights of 25-38 mm. The expansion rate is low, and the fragments near parallel-sided. The whorl section is compressed, with a whorl breadth to height ratio of 0.65. The dorsum is broad and flattened, the dorsolateral margins narrowly rounded, the dorsal two thirds of the flanks subparallel, the ventral third converging to a venter that is more narrowly rounded than the dorsum. Specimens are smooth or show traces of growth lines and weak riblets and shallow grooves. These follow a broad convex course on the dorsum, sweep back across the dorsolateral margin and are markedly concave on the dorsal flank, projecting forwards on the ventral flank, and strengthening and crossing the venter in a broad convexity. The ornament indicates an apertural margin with a short dorsal and long ventral

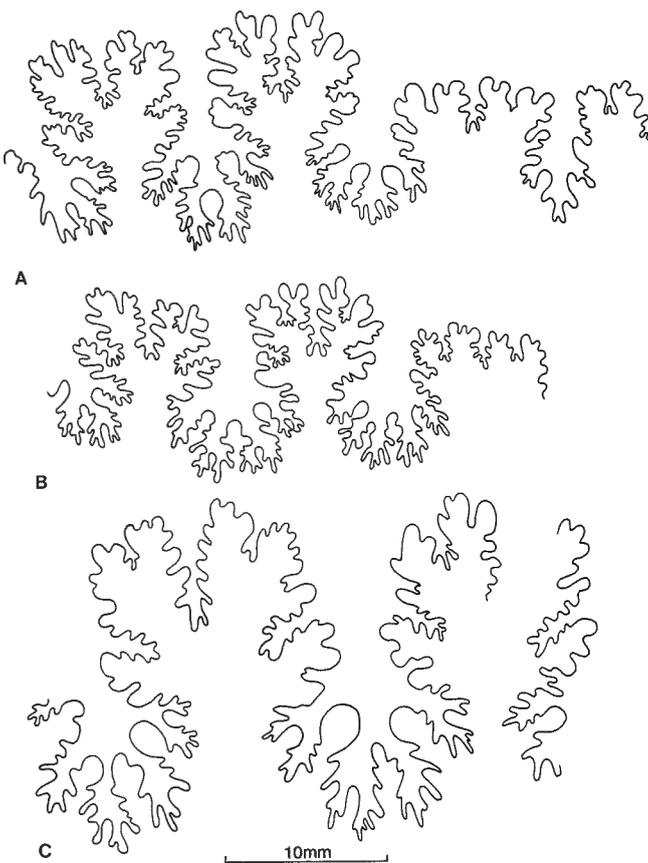


Fig. 5 — Partial sutures of *Baculites knorrianus* DESMAREST, 1817. A, IRSNB 10461a; B, IRSNB 10461c; C, IRSNB 10461e.

rostrum. The suture is complex with broad lobes and saddles (Text-Fig. 5A-C).

#### DISCUSSION

Large size, low expansion rate, whorl section, shape of growth lines and sutural complexity are the characteristic features of *Baculites knorrianus*. A full revision of the species is given by KENNEDY & SUMMESBERGER (1987).

#### OCCURRENCE

Lower Maastrichtian of the Ukraine and the Mons Basin (Belgium). In Denmark the species spans the Lower-Upper Maastrichtian boundary.

#### *Baculites baculus* MEEK & HAYDEN, 1861

Pl. 4, Figs 10, 20, 21

1861 *Baculites baculus* MEEK & HAYDEN, p. 445.

1876 *Baculites ovatus* var. *baculus* MEEK & HAYDEN - MEEK, p. 397, text-figs 52, 53.

1973 *Baculites baculus* MEEK & HAYDEN - GILL & COBBAN, p. 10, text-figs 3d, 7a.

#### TYPE

The holotype is from the 'Fox Hills Sandstone near

Glenrock, Wyoming', and is the original of MEEK, 1876, text-figs 51, 52.

#### MATERIAL

IRSNB 10434 (IG 5181) from the Craie phosphatée de Cipluy of Cuesmes.

#### DESCRIPTION

The specimen is a phosphatic internal mould of two camerae of a large baculite with a whorl height of 40 mm approximately, and an estimated costal whorl breadth to height ratio of 0.88. The whorl section is ovoid, with the dorsum very broadly rounded and the venter more narrowly so. The dorsum is near-smooth, but for growth lines that define a broad shallow convexity. The flanks are ornamented by two low, broad, concave crescentic ribs that efface on the ventral flanks. The venter is not preserved. The suture is moderately incised with broad, rectangular lobes and saddles.

#### DISCUSSION

Although only a fragment, large size, whorl section and ornament plus a suture in which L has a wide opening show this specimen to belong to the *Baculites baculus-grandis-clinolobatus* group of the U.S. Western Interior, reviewed by GILL & COBBAN (1973). It is referred to *B. baculus* rather than *B. grandis* HALL & MEEK, 1856 on the basis of the whorl section, which is more compressed and ovate in the latter. *B. clinolobatus* ELIAS, 1933, has a slender elliptical section that becomes trigonal at maturity (see GILL & COBBAN, 1973, p. 10, text-fig. 7).

#### OCCURRENCE

*Baculites baculus* was previously known only from the Lower Maastrichtian of the northern United States Western Interior, where it defines a zone between that of *B. eliasi* below and *B. grandis* above.

#### *Baculites aquilaensis* REESIDE, 1927

Pl. 4, Figs 22-24

1927 *Baculites aquilaensis* var. *separatus* REESIDE, p. 12, pl. 8, figs 15-21; pl. 9, figs 6-15; pl. 45, figs 5, 6.

1927 *Baculites aquilaensis* var. *obesus* REESIDE, p. 12, pl. 10, figs 1-8.

#### TYPE

Holotype by original designation is no. 37298 in the collections of the U.S. National Museum of Natural History in Washington, D.C., from the Steele Shale, 274.3 m (900 ft) below the top, 3.3 km (2 miles) northwest of Slack, Sheridan County, Wyoming.

#### MATERIAL

IRSNB 10456 (IG 4919), from the base of the Craie d'Obourg north of the Gare d'Harmignies.

## DESCRIPTION

The specimen is a phosphatic fragment 83.5 mm long, from the adapical end of the body chamber, where the whorl height is 25.5 mm. The expansion rate is low, with a compressed ovoid whorl section with a whorl breadth to height ratio of 0.65, a broadly rounded dorsum and more narrowly rounded venter. Ornament consists of crescentic ribs on the dorsal two-thirds of the flank, where the rib index is 3. The ribs are feebly concave, and weaken markedly on the dorsum; they project strongly forwards on the ventral third of the flanks, decline markedly, and are accompanied by numerous delicate parallel riblets. The suture is too worn for description.

## DISCUSSION

The holotype of *Baculites aquilaensis* has an intercostal whorl breadth to height ratio of 0.6 and a rib index of 3 according to REESIDE's figure, the style of ornament being identical to that of the present specimen. *Baculites taylorensis* ADKINS, 1929 (p. 204, pl. 5, figs 9-11) has strong, node-like bullae lying close to the dorsum, quite unlike the ribs of the present specimen. *Baculites taylorensis* also has numerous narrow prorsiradiate ribs on the ventral half of the flanks that cross the venter in a broad convexity. *Baculites reduncus* COBBAN, 1977 (p. 459, figs 2-6) has a high expansion rate, stoutly ovate whorl section, crescentic ribs on the dorsal half of the flanks, but no or very weak ornament on the venter. *Baculites haresi* REESIDE, 1927 (= *B. ovatus* var. *haresi* REESIDE, 1927, p. 10, pl. 6, figs 5-10; pl. 7, figs 9, 10) generally has coarse ventral and ventrolateral ribbing only, although a few variants have low, broad, concave crescentic flank ribs with an index of 2 or 3. *Baculites ovatus* SAY, 1820 (see revision in COBBAN, 1974a, p. 3, pl. 1, figs 1-32; pl. 2, figs 1-14; pl. 3, figs 1-6, 9-11; text fig. 4) has an oval whorl section rather than the ovoid one of the present material. Dorsolateral ribs are sparse and distant, whereas ventrolateral and ventral ribs are much more numerous.

## OCCURRENCE

The present specimen represents the first record of *B. aquilaensis* outside the United States Western Interior, where it occurs at the top of the Lower Campanian associated with the late form of the *hippocrepis* lineage, *Scaphites* (*S.*) *hippocrepis* III.

*Baculites* sp. (smooth)

Pl. 5, Figs 1-12; Pl. 6, Figs 5-10; Text-Figure 6

1962 *Baculites* smooth species COBBAN, p. 714, pl. 108, figs 1-4; text-fig. 1i, j.

## MATERIAL

IRSNB 10457a-g (IG 6774) from the base of the Craie d'Obourg, Carrière DENUIT, Obourg.

## DESCRIPTION

Specimens are phosphatic internal moulds of body

chamber and phragmocone fragments with whorl heights of 16.5 - 22 mm. The expansion rate is very low, so that the fragments appear parallel-sided, the whorl section compressed with whorl breadth to height ratios of around 0.68. The dorsum is only a little broader than the venter and the flanks very feebly inflated and sub-parallel. Specimens are smooth or may have weak growth lines and riblets that are feebly convex on the dorsum, concave on the dorsal flanks, projected forwards on the ventral third of the flanks, and strengthened on the venter, which they cross in a broad convexity. They define an apertural margin with a short dorsal and long ventral rostrum. The suture is of moderate complexity with rectangular, moderately incised lobes and saddles (Text-Fig. 6).

## DISCUSSION

These generalised *Baculites* fragments differ in no significant respects from the smooth species of *Baculites* described by COBBAN (1962), who indicated differences from other species of the genus; the whorl section is particularly distinctive.

## OCCURRENCE

This species was previously known only from the northern Western Interior of the United States, where it defines a zone between that of *Baculites asperiformis* below and *Baculites perplexus* above, in the middle of the Campanian.

*Baculites* sp.

Pl. 6, Figs 14-17, ? 24, 25; Text-Figure 7

1987 *Baculites* sp. KENNEDY, p. 191, pl. 28, figs 4, 5, 6 (with synonymy).

## MATERIAL

IRSNB 10444-10445 (IG 6040), from the Craie phosphatée de Ciplly of the Usine Solvay, Spiennes. IRSNB 10452 (IG 6744), said to be from the Assise de Nouvelles (Craie Blanche à *Magas*), Grez-Doiceau, may also belong here.

## DESCRIPTION

IRSNB 10445 is a septate fragment 38.5 mm long with

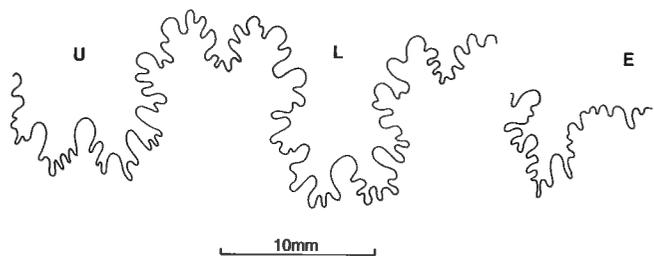


Fig. 6 — Partial suture of *Baculites* sp. (smooth), IRSNB 10457f.

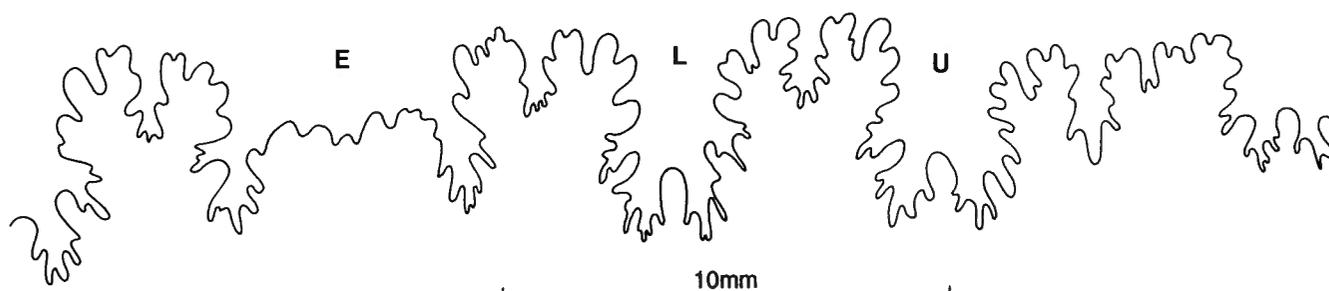


Fig. 7 — Suture of *Baculites* sp., IRSNB 10445b.

a maximum whorl height of 12.8 mm, and a whorl breadth to height ratio of 0.7. IRSNB 10444 is a body chamber 37 mm long with a maximum whorl height of 14.8 mm and a whorl breadth to height ratio of 0.68. The expansion rate is moderate, the whorl section pyriform, with a flattened dorsum, broadly rounded inner flanks, flattened, convergent outer flanks and subacute venter, flanked by shallow grooves. Ornament consists of delicate growth lines only that define a short blunt dorsal rostrum, are concave on the dorsal flank, and project forwards and are straight on the outer flank, defining a very long ventral rostrum at the aperture. The suture (Text-Fig. 7) is moderately incised with rectangular bifid lobes and saddles.

#### DISCUSSION

These fragments are identical with the *Baculites* sp. of KENNEDY, 1987, the *Baculites carinatus* of BINKHORST, 1861, p. 43, pl. 5d, figs 2a-d, *non* MORTON, 1834. What may be a further fragment is said to be from the "Craie de Nouvelles" (Craie Blanche à *Magas*) IRSNB 10452 (IG 6744) of Grez-Doiceau.

#### OCCURRENCE

Lower Maastrichtian of the Mons Basin, Upper Maastrichtian Valkenburg Chalk, Cadier en Keer, Blankenburg, Limburg (The Netherlands).

Superfamily	Scaphitaceae	GILL, 1871
Family	Scaphitidae	GILL, 1871
Subfamily	Scaphitinae	GILL, 1871
Genus and subgenus	<i>Scaphites</i>	PARKINSON, 1811

#### TYPE SPECIES

*Scaphites equalis* J. SOWERBY, 1813, p. 53, pl. 18, figs 1-3, by subsequent designation by MEEK, 1876, p. 413.

*Scaphites (Scaphites) gibbus* SCHLÜTER, 1872  
Pl. 6, Figs 1-4; Pl. 7, Figs 12, 17

1872 *Scaphites gibbus* Schlüter, p. 87, pl. 26, figs 6-9.  
1986a *Scaphites (Scaphites) gibbus* Schlüter, 1872a - KENNEDY, p. 125, pl. 22, figs 1, 4, 5-8; text-fig. 4l (with full synonymy).

#### TYPES

Lectotype, by subsequent designation of KENNEDY, 1986a, p. 126, in no 63 in the collections of the Geologisches und Paläontologisches Institut, Bonn University, the original of SCHLÜTER, 1872, pl. 26, figs 7-9, from the Upper Campanian of Baumberg between Coesfeld and Billerbeck, Westphalia, Germany. There are numerous paralectotypes.

#### MATERIAL

IRSNB 10418a-b (IG 5496) *ex* Cornet collection, from the Craie d'Obourg of Harmignies. IRSNB 10405-6 (IG 6312) from the Craie de Trivières of Harmignies. IRSNB 10425 (IG 9452), from the Craie d'Obourg of Havré.

#### DESCRIPTION

IRSNB 10405-6 are oyster casts, IRSNB 10418a-b external moulds of phragmocones with whorl heights of up to 28 mm. Coiling appears to have been very involute with a tiny, deep umbilicus, flattened flanks and broadly rounded venter. Ornament is of fine pro-radiate primary ribs that increase by branching and intercalation, with occasional feeble tubercles at the point of branching. IRSNB 10425 (Pl. 7, Fig. 17) preserves part of the adult aperture with an estimated whorl height of 28 mm. There are traces of at least three rows of tubercles on the flank; the venter is ornamented by numerous fine, even ribs.

#### DISCUSSION

Although fragmentary, the phragmocones and apertural section show these specimens to belong to *S. (S.) gibbus*, which is discussed at length by SCHMID & ERNST (1975) and KENNEDY (1986a); the latter refigures the lectotype, which is significantly larger than the present specimens.

#### OCCURRENCE

*S. (S.) gibbus* ranges from upper Lower to lower Upper Campanian, and is known from northern Aquitaine, France, the Mons Basin, Belgium, north Germany, Poland, Donbass, Transcaspiya and the Ukraine.

Genus *Trachyscaphites* COBBAN & SCOTT, 1964

#### TYPE SPECIES

*Trachyscaphites redbirdensis* COBBAN & SCOTT, 1964,

p. E7, pl. 1, figs 1-7; text-fig. 3, by original designation.

*Trachyscaphites* cf. *spiniger* (SCHLÜTER, 1872)

Pl. 7, Fig. 13

1872 *Scaphites spiniger* SCHLÜTER, p. 82, pl. 25, figs 1-7.

1980 *Trachyscaphites spiniger spiniger* (Schlüter) - BLASZKIEWICZ, p. 30, pl. 13, figs 1-3, 5, 7 (with synonymy).

1986a *Trachyscaphites spiniger* (Schlüter, 1872a) - KENNEDY, p. 130, pl. 22, fig. 4; text-fig. 42 (with additional synonymy).

TYPES

Lectotype, by the subsequent designation of BLASZKIEWICZ, 1980, p. 31, is the original of SCHLÜTER, 1872, pl. 25, figs 1-3, an unregistered specimen in the collections of the Paläontologisches Institut of Bonn University, from the Upper Campanian of Darup, Westphalia, Germany.

MATERIAL

IRSNB 10426 (IG 6206), from the Craie de Nouvelles of Cuesmes.

DESCRIPTION

The specimen is part of the venter and flanks of a phragmocone an estimated 27 mm in diameter. The whorl section is compressed, with narrowly rounded ventrolateral shoulders and a narrow, flattened venter. Ornament is of delicate radial ribs, and outer lateral, inner and outer ventrolateral tubercles are present.

DISCUSSION

Although small and incomplete, this *Trachyscaphites* juvenile is compared to *T. spiniger* on the basis of the absence of a siphonal tubercle, a character of the younger *Trachyscaphites pulcherrimus* (ROEMER, 1841) (KENNEDY & SUMMESBERGER 1984; KENNEDY 1986a). The *Scaphites* cf. *spiniger* of de GROSSOUVRE (1908, p. 38, pl. 10, fig. 6) and said by him to be from the Craie de Spiennes, is a juvenile *Hoploscaphites constrictus* (J. SOWERBY, 1817).

OCCURRENCE

*Trachyscaphites spiniger* is a lower Upper Campanian species, known from the Aquitaine Basin in France, north Germany, the Netherlands, Sweden, Poland, European Russia, Armenia and Kopet Dag (Turkmenia). Subspecies are known from Israel, Texas, Montana, South Dakota, Wyoming, Colorado and Utah in the U.S.A.

Genus *Hoploscaphites* NOWAK, 1911

TYPE SPECIES

*Ammonites constrictus* J. SOWERBY, 1817, p. 189, pl. A, fig. 1, by original designation.

*Hoploscaphites constrictus* (J. SOWERBY, 1817)

Pl. 7, Figs 1-11, 14-16

1817 *Ammonites constrictus* J. SOWERBY, p. 189, pl. A, fig. 1.

1908 *Scaphites* cf. *spiniger* Schlüt; de GROSSOUVRE, p. 38, pl. 10, fig. 6.

1908 *Scaphites* cf. *monasteriensis* Schlüt; de GROSSOUVRE, p. 38, pl. 11, fig. 8.

1986b *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY, p. 64, pl. 13, figs 1-13, 16-24; pl. 14, figs 1-38; pl. 15, figs 1-31; text-figs 9, 11a-h (with full synonymy).

1986c *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY, P. 1019, pl. 3, figs 1, 9-12; pl. 4, figs 1-19; pl. 5, figs 1-17, 24-26.

1986d *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY, fig. 10g, h, k, l.

1987 *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY, p. 197, pl. 31, figs 1, 8-26; pl. 32, figs 1-12, 18-21 (with full synonymy).

1987 *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY & SUMMESBERGER, p. 34, pl. 6, figs 6-24.

1987 *Hoploscaphites constrictus* (Sowerby, 1818); VAN DER TUUK, p. 64.

1987 *Hoploscaphites constrictus constrictus* (Sowerby, 1818); VAN DER TUUK, p. 76, figs 5, 6, 7, 11, 20a-c, 21a-c, 23a-c.

1987 *Hoploscaphites constrictus niedzwiedzki* (Uhlig, 1894); VAN DER TUUK, p. 76, figs 9, 10, 24a-c.

1987 *Hoploscaphites constrictus* ssp. indet; VAN DER TUUK, p. 77, figs 8, 25.

1987 *Hoploscaphites* sp. VAN DER TUUK, p. 77, figs 4, 17a-c.

1987 *Hoploscaphites constrictus* (J. Sowerby, 1817); JAGT, p. 1, figs 1-6.

1988 *Hoploscaphites constrictus* (J. Sowerby, 1817); MACHALSKI & WALASZCZYK, p. 67, figs 2a, b.

1989 *Hoploscaphites constrictus* (J. Sowerby, 1817); KENNEDY, figs 9a-9e.

TYPES

Lectotype, by the subsequent designation of KENNEDY, 1986b, p. 68, is no C36733 in the collections of the Natural History Museum, London, the original of J. SOWERBY, 1817, pl. A, fig 1; paralectotypes are C70645-C70647, all from the Upper Maastrichtian Calcaire à *Baculites* of the Cotentin Peninsula, Manche (France).

MATERIAL

IRSNB 10431a-b (IG 6040), from the Craie phosphatée de Cibly, Usine Solvay, Spiennes. IRSNB 10432 (IG 11683), from the same unit, ancienne exploitation Bernard, Cibly. IRSNB 10442 (IG 10511) and IRSNB 10422 (IG 6876), ex de Lœe collection, from the same unit at St. Symphorien.

## DISCUSSION

*Hoploscaphites constrictus* from the type locality in the Calcaire à *Baculites* of Manche, France, are described by KENNEDY (1986b), those from the Petites-Pyrénées by KENNEDY (1986c), those from the Maastricht area by KENNEDY (1987), VAN DER TUUK (1987) and JAGT (1987), and those from Nagoryany in the Ukraine by KENNEDY & SUMMESBERGER (1987). The material from the Mons Basin consists of phosphatic phragmocones only, 18.5-27 mm in diameter, but they differ in no significant respects from the material from Maastricht and the Cotentin Peninsula, which are equally well-preserved, and they are confidently assigned to the species. The present material includes the specimens described and illustrated by DE GROSSOUVRE (1908, pl. 10, fig. 6, pl. 11, fig. 8) as *Scaphites* cf. *spiniger* and *Scaphites* cf. *monasteriensis*. I see no reason to vary conclusions reached previously (1987b) that the lectotype of *H. constrictus* is a macroconch, and the form described as *Scaphites niedzwiedzki* UHLIG, 1894 (p. 220, fig. 2) is the microconch of *constrictus*, and see no support whatsoever for the views of VAN DER TUUK (1987) that they represent subspecies in which both macro- and microconchs occur. Equally I believe it more rational to treat *H. tenuistriatus* (KNER, 1848) (see revision in KENNEDY, 1987b) as a distinct short-lived species rather than a subspecies of *constrictus*. The *Hoploscaphites* sp. of VAN DER TUUK (1987, p. 77, figs 4, 17a, b) with siphonal tubercles from the Upper Maastrichtian of Limburg, the Netherlands, was thought by VAN DER TUUK to be possibly transitional between *Hoploscaphites* and *Acanthoscaphites*. It is no more than a malformed *H. constrictus* and even if this were not the case, could hardly be transitional between these genera as *Acanthoscaphites* appears low in the Lower Maastrichtian.

## OCCURRENCE

*Hoploscaphites constrictus* ranges throughout almost all the Maastrichtian. At Krons Moor in north Germany, the first specimen appears 3.5 to 5.0 m above the base of the *Belemnella lanceolata* Zone, while at Stevns Klint in Denmark it is common in the topmost hardground of the Maastrichtian White Chalk that is immediately over-

lain by the Palaeocene Fish Clay. It is known from the Biscay region of France and Spain, Petites Pyrénées (Haute Garonne), Tercis (Landes) and the Calcaire à *Baculites* of the Cotentin Peninsula (Manche) (all in France), the Nekum and Meerssen Chalks of the Maastricht region in Belgium and The Netherlands, Germany, Denmark, southern Sweden, Poland, Austria (Styria), Czechoslovakia, Bulgaria, the Ukraine, Donbass (Russia), Carpathians, Transcaspiya, Kazakhstan, and Kopet Dag (Turkmenia).

## Aptychi

Pl. 7, Figs 18-25

## DISCUSSION

There are six aptychi (ammonite jaws) in the present collections.

IRSNB 10409 (IG 6312) from the Craie de Trivières, Harmignies (Pl. 7, Fig. 25), is a 33 mm long *Rugaptychus rugosus* (SHARPE, 1857) (see revision in KENNEDY, 1987, p. 192, pl. 16, figs 1-22), a type known to be associated with *Baculites* (SCHLÜTER, 1876, pl. 39, fig. 16).

IRSNB 10443a-b (IG 8261) (Pl. 7, Figs 18, 19, 22) ex De Jaer Collection, and IRSNB 10446-10447 (IG 5496) (Pl. 7, Figs 20, 21, 23, 24) ex Cornet Collection, from the Craie d'Obourg of Harmignies are '*Aptychus portlockii* SHARPE, 1857 (p. 56, pl. 24, figs 2-4), a type known to be associated with scaphites (e.g. SCHLÜTER, 1876, pl. 25, figs 5, 6; KENNEDY, 1986a, text-figs 40h, 42c, f). IRSNB 10408 (IG 5496) ex Cornet collection, from the Craie de Trivières at Trivières, is of similar type, but only 8 mm. long.

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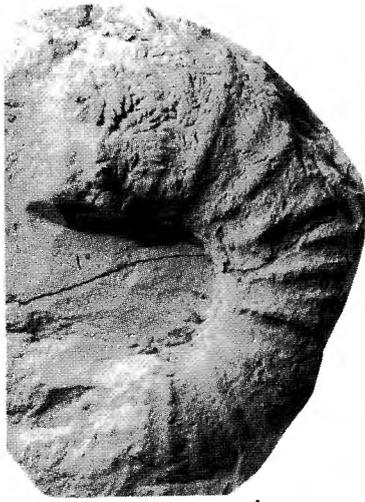
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## PLATE 1

- Figs. 1, 8, 9 — *Pachydiscus (Pachydiscus) cf. subrobustus* SEUNES, 1892. 1, IRSNB 10419, 8, 9, IRSNB 10423 from the Craie d'Obourg of Harmignies.
- Figs. 2, 3 — *Pachydiscus (Pachydiscus) cf. neubergicus* (HAUER, 1858). IRSNB 10451, from the Craie Phosphatée de Cibly of Mesvin-Cibly.
- Figs. 4, 5 — *Hauericeras cf. sulcatum* (KNER, 1848). IRSNB 10435, from the Poudingue de la Malogne at the base of the Tuffeau de St. Symphorien, Cibly - Malogne.
- Figs. 6, 7 — *Pachydiscus (Pachydiscus) oldhami* (SHARPE, 1855). IRSNB 10430, from the Craie d'Obourg of Harmignies.
- Figs. 10, 11 — *Pachydiscus (Pachydiscus) cf. oldhami* (SHARPE, 1855). IRSNB 10429, from the Craie d'Obourg of Harmignies.
- Fig. 12 — *Pachydiscus (Pachydiscus) sp.* IRSNB 10427, from the Craie d'Obourg of Harmignies.

All figures are x 1



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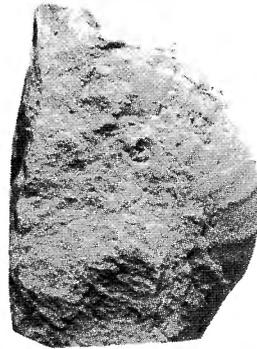
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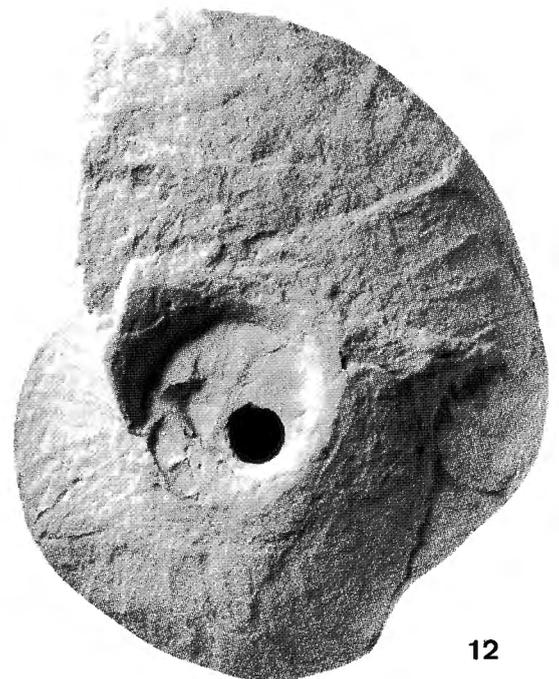
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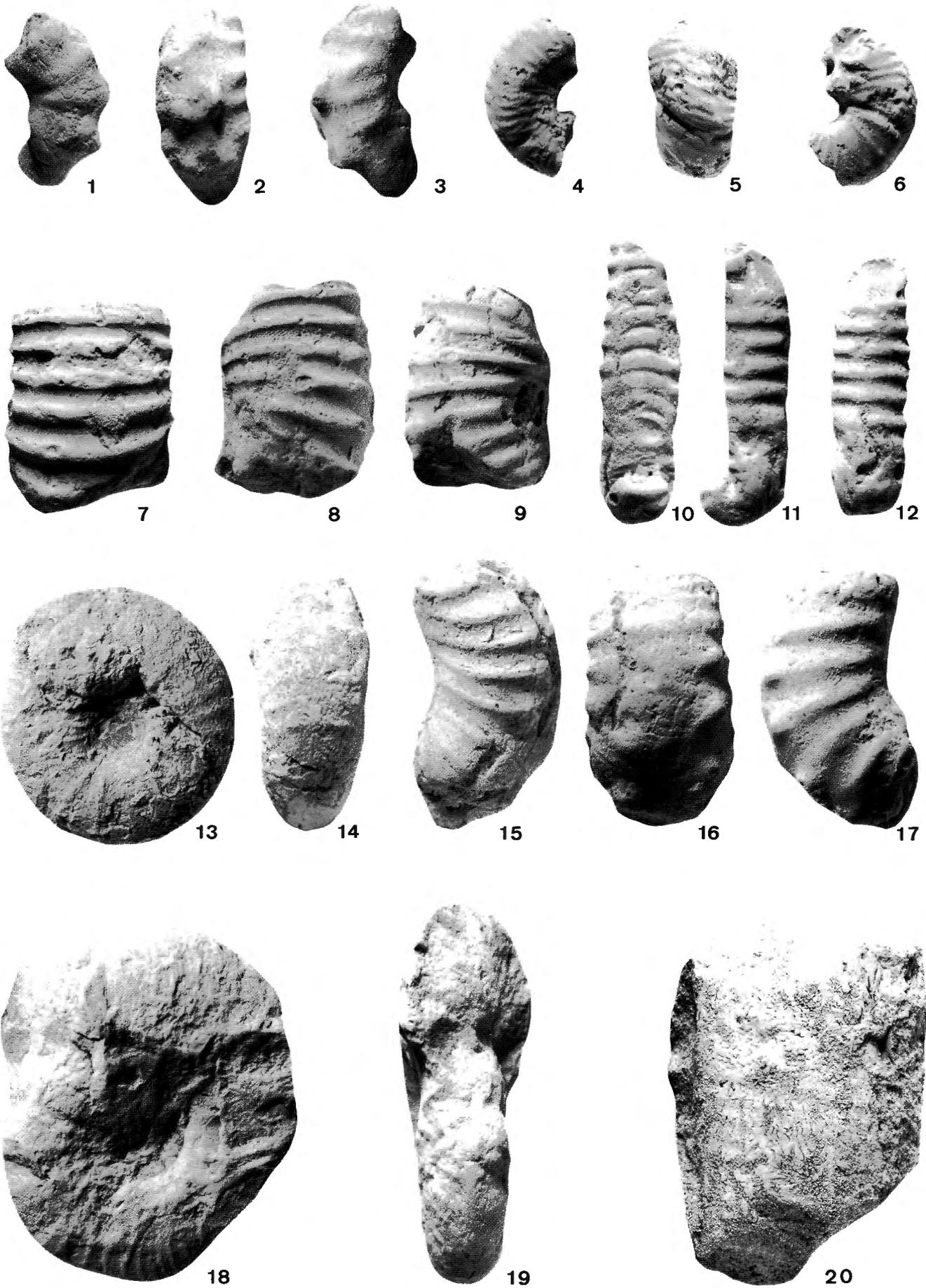


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## PLATE 2

- Figs. 1-3 — *Nostoceras (Nostoceras)* sp. IRSNB 10441, from the Poudingue de la Malogne, at the base of the Tuffeau de Cibly, Cibly.
- Figs. 4-6 — *Nostoceras (Nostoceras)* cf. *pauper* (WHITFIELD, 1892). IRSNB 10433, from the Craie phosphatée de Cibly of Les Waleffes [Waleffe], west of Noville, near Liège.
- Figs. 7-9, 15-17 — *Nostoceras (Nostoceras)* cf. *hyatti* STEPHENSON, 1941. 7-9, IRSNB 10449; 15-17, IRSNB 10450, from the Poudingue de la Malogne at the base of the Tuffeau de Cibly, Cibly.
- Figs. 10-12 — *Solenoceras* sp. IRSNB 10448, from the Poudingue de la Malogne at the base of the Tuffeau de Cibly, Cibly-Malogne.
- Figs. 13, 14 — *Pachydiscus (Pachydiscus)* sp. cf. *subrobustus* SEUNES, 1892. IRSNB 10424, from the Craie d'Orbourg, Harmignies.
- Figs. 18, 19 — *Pachydiscus (Pachydiscus)* *oldhami* (SHARPE, 1855). IRSNB 10428, from the Craie d'Obourg, Harmignies.
- Fig. 20 — *Diplomoceras cylindraceum* (DEFRANCE, 1816). IRSNB 10453, from the Craie phosphatée de Cibly of Cibly.

Figures 4-6, 10-12 are x 2; the remainder are x 1.

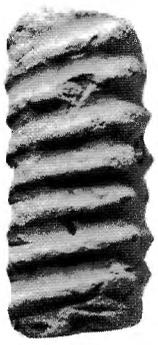


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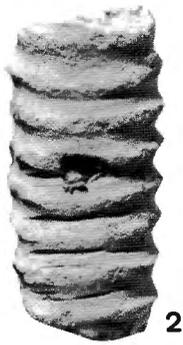
Figs. 1-10, 17-19, 22, 23 — *Pseudoxybeloceras (Parasolenoceras) interruptum* (SCHLÜTER, 1872). 1, 2, 6, 7, IRSNB 10440, from the Craie phosphatée de Ciplly of Cuesmes; 3-5, IRSNB 10455g, from the “Craie phosphatée de Ciplly”, Noville, près Momalle; 8-10, IRSNB 10454b, 17-19, IRSNB 10454c, 22, 23, IRSNB 10454d, all from the “Craie phosphatée de Ciplly” of Les Waleffes [Waleffe], west of Noville, near Liège.

Figs. 11-16, 20, 21 — *Neancyloceras bipunctatum* (SCHLÜTER, 1872). 11-13, IRSNB 10439, 14-16, IRSNB 10437, from the Craie phosphatée de Ciplly, Cuesmes. 20, 21, IRSNB 10407, from the “Craie phosphatée de Ciplly”, Waleffe.

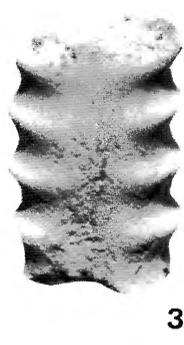
Figures 3-5, 8-10, 17-19, 22, 23 are x 2; the remainder are x 1.



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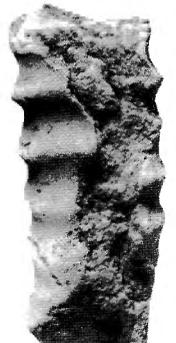
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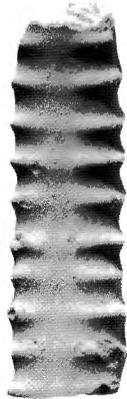
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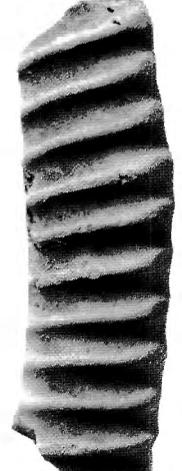
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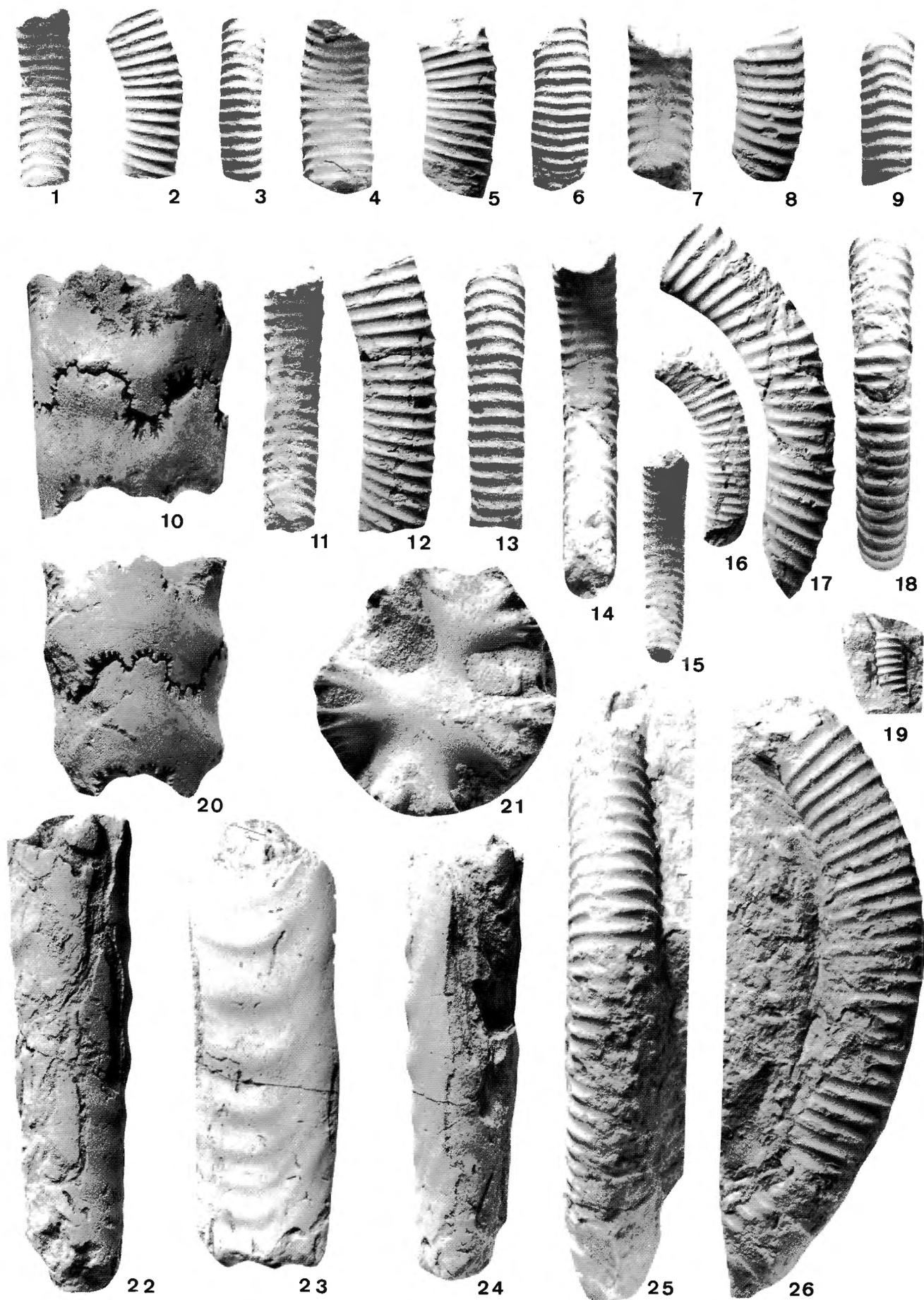


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## PLATE 4

- Figs. 1-9, 11-19, 25, 26 — *Glyptoxoceras retrorsum* (SCHLÜTER, 1872). 1-3, IRSNB 10414; 4-6, IRSNB 10411a; 7-9, IRSNB 10416; 11-13, IRSNB 10415; 14, 17, 18, IRSNB 10412; 15, 16, IRSNB 10413; 19, IRSNB 10411b; 25, 26, IRSNB 10417, from the Craie d'Obourg of Harmignies.
- Figs. 10, 20, 21 — *Baculites baculus* MEEK & HAYDEN, 1861. IRSNB 10434, from the Craie phosphatée de Cibly of Cuesmes.
- Figs. 22-24 — *Baculites aquilaensis* REESIDE, 1927. IRSNB 10456, from the base of the Craie d'Obourg, north of the Gare d'Harmignies.

All figures are x 1.

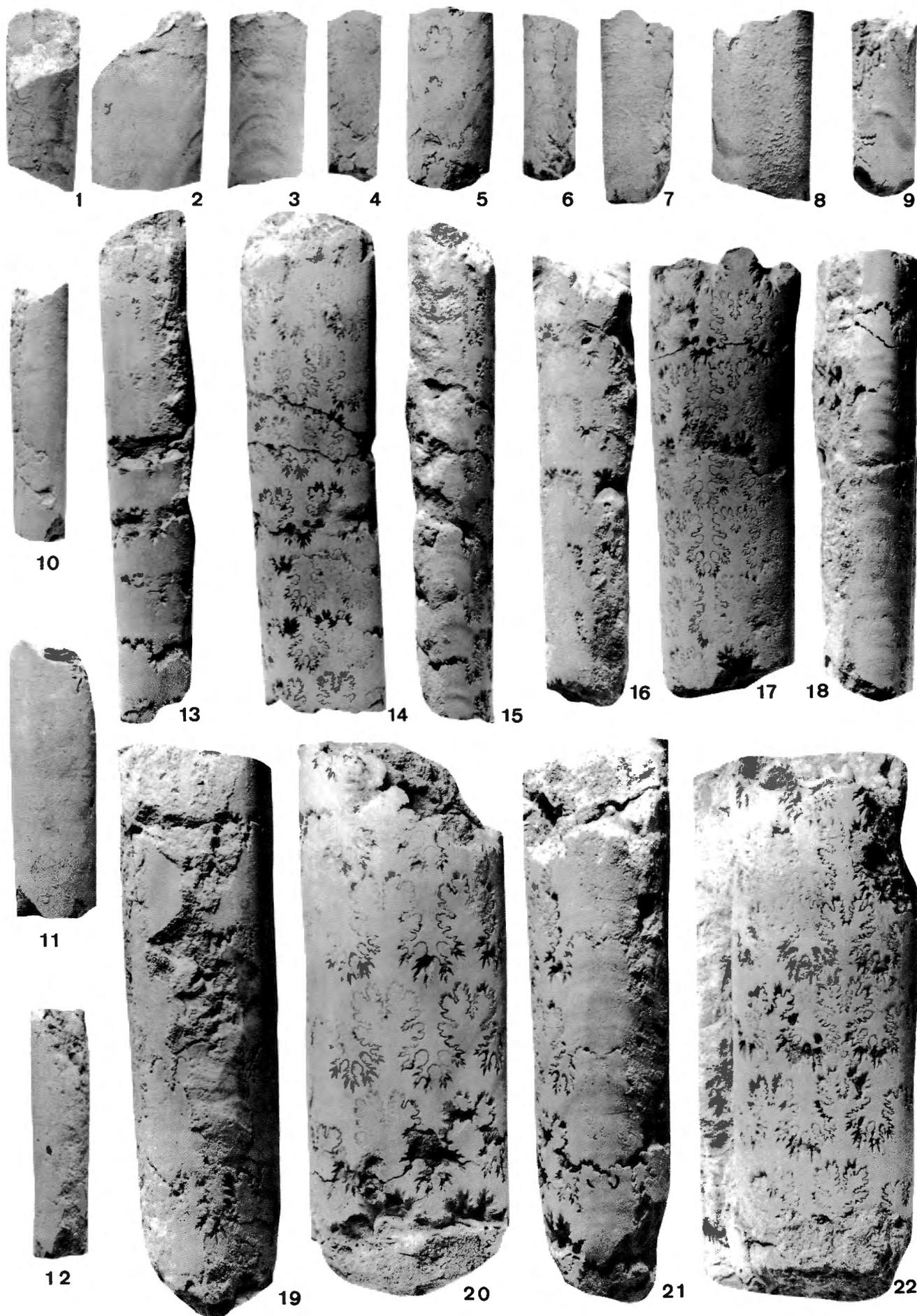


## PLATE 5

Figs. 1-12 — *Baculites* sp. (smooth). 1-3, IRSNB 10457d; 4-6, IRSNB 10457f; 7-9, IRSNB 10457g; 10-12, IRSNB 10457c, all from the base of the Craie d'Obourg, Obourg.

Figs. 13-22 — *Baculites knorrianus* DESMAREST, 1817. 13-15, IRSNB 10461d; 16-18, IRSNB 10461a; 19-21, IRSNB 10461e; 22, IRSNB 10461b. All specimens are from the base of the Craie phosphatée de Ciplu, Spiennes.

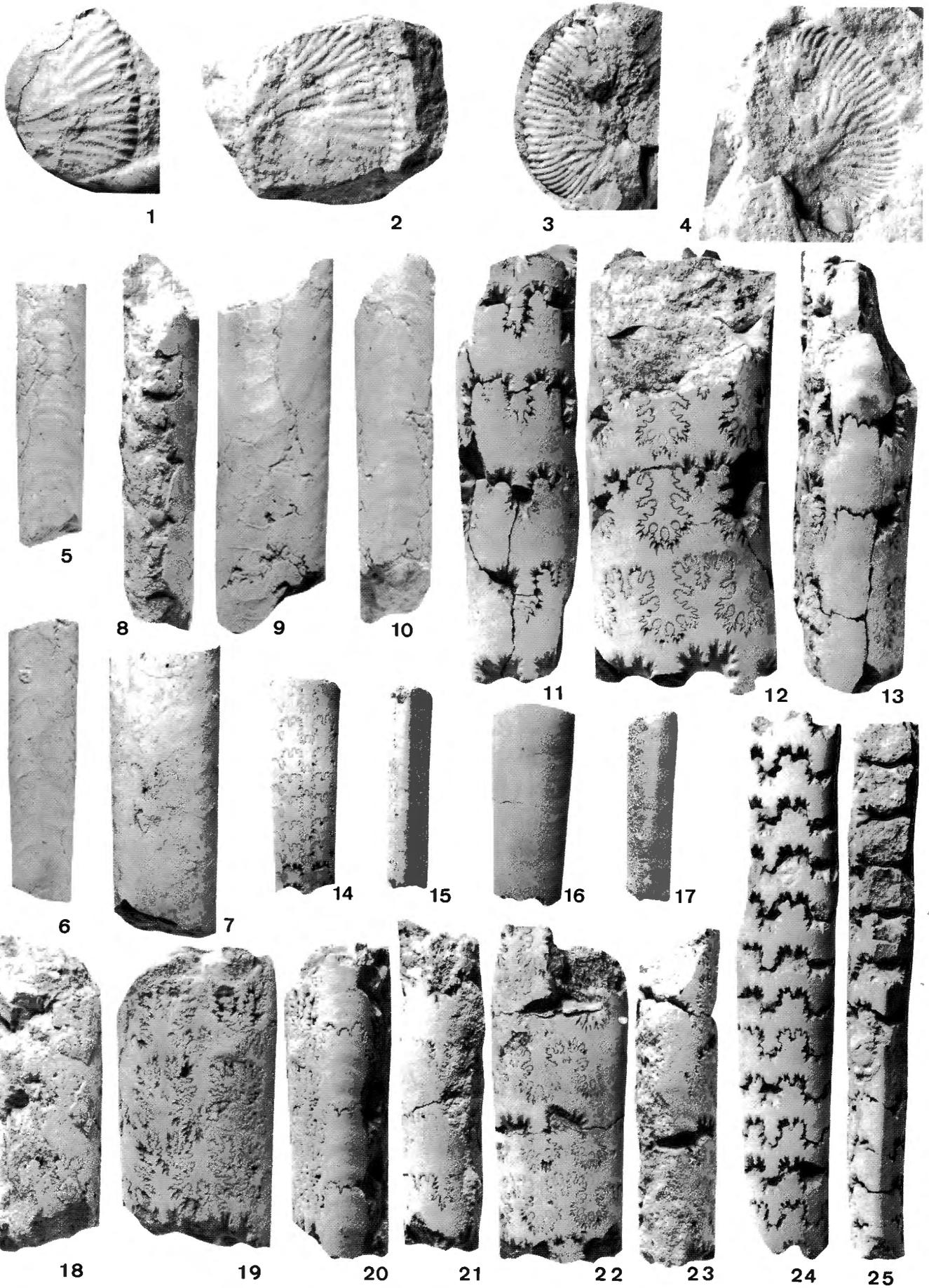
All figures are x 1.



## PLATE 6

- Figs. 1-4 — *Scaphites (Scaphites) gibbus* SCHLÜTER, 1872. 1, 2, IRSNB 10418b; 3, 4, IRSNB 10418a, both from the Craie de Trivières of Harmignies.
- Figs. 5-10 — *Baculites* sp. (Smooth). 5-7, IRSNB 10457b; 8-10, IRSNB 10457a, both from the base of the Craie d'Obourg, Obourg.
- Figs. 11-13, 18-23 — *Baculites knorrianus* DESMAREST, 1817. 11-13, IRSNB 10436; 18-20, IRSNB 101461f; 21-23, IRSNB 10461c, all from the Craie phosphatée de Ciplly of Spiennes.
- Figs. 14-17 — *Baculites* sp. 14, 15, IRSNB 10445; 16, 17, IRSNB 10444, from the Craie phosphatée de Ciplly of Spiennes.
- Figs. 24, 25 — *Baculites* sp. (?) IRSNB 10452, from the "Craie de Nouvelles" of Grez-Doiceau.

All figures are x 1.



## PLATE 7

- Figs. 1-11, 14-16 — *Hoploscaphites constrictus* (J. SOWERBY, 1817). 1-3, IRSNB 10431a, the original of DE GROSSOUVRE, 1908, pl. 10, fig. 6 (as *Scaphites* cf. *spiniger* SCHLÜT.), from the Craie phosphatée de Cibly, Spiennes. 4-6 IRSNB 10431b, the original of DE GROSSOUVRE, 1908, pl. 11, fig. 8 (as *Scaphites* cf. *monasteriensis* SCHLÜT.), from the Craie phosphatée de Cibly, Spiennes. 7-9, IRSNB 10432, from the Craie phosphatée de Cibly, Cibly. 10, 11, IRSNB 10442, 14-16, IRSNB 10422, both from the Craie phosphatée de Cibly, St Symphorien.
- Figs. 12, 17 — *Scaphites* (*Scaphites*) *gibbus* SCHLÜTER, 1872. 12, IRSNB 10405, an oyster cast from the Craie de Trivières of Harmignies. 17, IRSNB 10425, from Havré.
- Fig. 13 — *Trachyscaphites* cf. *spiniger* (SCHLÜTER, 1872). IRSNB 10426, from the Craie de Nouvelles of Cuesmes.
- Figs. 18-24 — '*Aptychus*' *portlocki* SHARPE, 1855. 18, 19, IRSNB 10443b; 22, IRSNB 10443a; 20, 21, 24, IRSNB 10446; 23, IRSNB 10447, all from the Craie d'Obourg of Harmignies.
- Fig. 25 — *Rugaptychus rugosus* (SHARPE, 1857). IRSNB 10409, from the Craie de Trivières of Harmignies.

Figures 1-11, 13-16, 18-25 are x 2; Figures 12 and 17 are x 1.

