

# Late Cenomanian and Turonian ammonites from Ardennes, Aube and Yonne, eastern Paris Basin (France)

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With 6 figures in the text

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**Abstract:** New collections from the late Cenomanian and Turonian chalks of Ardennes, Aube and Yonne in the eastern Paris Basin include stratigraphically important ammonites of the *Metoicoceras geslinianum* Zone (Upper Cenomanian), of the *Neocardioceras juddii* Zone (Upper Cenomanian) and from successive horizons in the Turonian. *Cibolaites* cf. *molenaari* COBBAN & HOOK, 1983 and *Tropitoides obesus* (STOLICZKA, 1863), from the *juddii* and *neptuni* Zones respectively, are recorded for the first time from western Europe, while specimens of *Collignoniceras woollgari* (MANTELL, 1822) are shown for the first time to co-occur, successively, with both *R. (R.) deverianum* and *Subprionocyclus neptuni* (GEINITZ, 1850).

**Key words:** Ammonoidea, Cenomanian-Turonian; Paris Basin.

**Zusammenfassung:** Neue Aufsammlungen aus den Kreidekalken des oberen Cenomans und des Turons im östlichen Pariser Becken (Ardennen, Aube, Yonne) umfassen stratigraphisch wichtige Ammoniten der *Metoicoceras geslinianum*-Zone (oberes Cenoman), der *Neocardioceras juddii*-Zone (oberes Cenoman) und der nachfolgenden Horizonte des Turons. *Cibolaites* cf. *molenaari* COBBAN & HOOK, 1983 und *Tropitoides obesus* (STOLICZKA, 1863) von der *juddii*-resp. der *neptuni*-Zone werden zum ersten Mal aus Westeuropa erwähnt. Ebenso ist neu, daß Vertreter von *Collignoniceras woollgari* (MANTELL, 1822) gleichzeitig sowohl mit *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY, 1841) als auch mit *Subprionocyclus neptuni* (GEINITZ, 1850) vorkommen.

## Introduction

Recent field work on the cliffs of the Channel coast of both England and France have provided the basis for a refined scheme of ammonite zonation

of the late Cenomanian and Turonian (e. g. AMÉDRO et al. (1978), AMÉDRO, BADILLET & DEVALQUE (1983); KENNEDY (1984); ROBASZYNSKI & AMÉDRO (eds) (1980) KENNEDY, WRIGHT & HANCOCK (1983), WRIGHT & KENNEDY (1981)), elements of which can be recognised throughout much of western Europe. The extensive chalk outcrops of the eastern Paris basin have yielded little in the way of ammonite records, although there are passing references to "*Ammonites peramplus*" and "*A. woollgari*" from the *Inoceramus labiatus* Zone of the Yonne in LAMBERT (1882) and "*Scaphites geinitzi*" from the *Micraster breviporus* Zone (= *Sternotaxis planus* Zone) of the Ardennes, Aube and Yonne in BARROIS (1875, 1878), LAMBERT (1882) and PERON (1887) while BARROIS & GUERNE (1878) described a number of minute pyritic forms. More recently, AMÉDRO, COLLETÉ, PIETRESSON DE SAINT AUBIN & ROBASZYNSKI (1982) described a number of examples of *Romaniceras* (*Romaniceras*) *deverianum* (D'ORBIGNY, 1841) from the upper part of the "*Terebratulina gracilis*" Zone of authors in the environs of Troyes (Aube) and also drew attention to the presence of a diverse Upper Turonian *Subprionocyclus neptuni* Zone fauna at the base of the *Micraster breviporus* Zone of BARROIS (1878) in the same region, recording *Scaphites* sp., *Metaptychoceras smithi* (WOODS 1896), *Sciponoceras* group of *bohemicum* (FRITSCH, 1872), *Didymoceras* cf. *saxonicum* (SCHLÜTER, 1875), *Lewesiceras mantelli* WRIGHT & WRIGHT, 1951, *Collignoniceras woollgari* (MANTELL, 1822) and *Subprionocyclus neptuni* (GEINITZ, 1850), *S. hitchinensis* (BILLINGHURST, 1927) and *S. branneri* (ANDERSON, 1902) the assemblage closely recalling that of the English Chalk Rock (WRIGHT 1979).

Subsequent work has revealed the presence of several additional taxa in this assemblage, including *Sciponoceras* sp. and *Tropitoides obesus* (STOLICZKA, 1863) as well as the first evidence for the Upper Cenomanian *Neocardioceras juddii* Zone with *Neocardioceras juddii juddii* (BARROIS & GUERNE, 1878), *N. juddii barroisi* (WRIGHT & KENNEDY, 1981), *Thomelites serotinus* WRIGHT & KENNEDY, 1981, *Cibolaites* cf. *molenaari* COBBAN & HOOK, 1983 (first published record of the genus outside the United States Western Interior), *Hamites* cf. *simplex* D'ORBIGNY, 1842, *Puebloites* cf. *spiralis* COBBAN & SCOTT, 1972, *Sciponoceras bohemicum anterius* WRIGHT & KENNEDY, 1981 and *Scaphites equalis* J. SOWERBY, 1813. The previously unrecognised Lower Turonian *Watinoceras coloradoense* Zone is recognised on the basis of the presence of *Watinoceras coloradoense praecursor* WRIGHT & KENNEDY, 1981. All these new records are described in the systematic part of the paper below, where we also illustrate and comment on two rare ammonites from the BARROIS Collection, housed in the Musée Gosselet at Lille, the holotype of *Benueites corneti* BARROIS & GUERNE, 1978) and the earliest described specimen of *Romaniceras* (*Romaniceras*) *deverianum* (D'ORBIGNY, 1841) from the "*Terebratulina gracilis*" Zone of Montholon (Yonne). A specimen of *Benueites* cf. *reymenti* COLLIGNON, 1967 from the "*Inoceramus labiatus* Zone" of Lavau (Aube) provides the second record of the genus from western

Europe. A specimen of *Tropitoides obesus* (STOLICZKA, 1863) from the *Subprionocyclus neptuni* Zone of Bucey-en-Othe (Aube) is the first record of this genus from Europe. Two specimens of *Collignoniceras woollgari* (MANTELL, 1822) from the same horizon at Le Hamelet (Aube) are the youngest known specimens of this index species in Europe.

Figure 1 shows the localities mentioned in the text, while Figure 2 shows the lithological divisions currently in use in the Troyes region that is the source of most of the material described in the present account. This is based on the work of BARROIS (1875, 1878), PERON (1887) and PIETRESSON DE SAINT-AUBIN (1943), although we expect work in progress to lead to a more detailed lithostratigraphic sequence than that currently recognised.

#### Repositories of specimens

- C = COLLETÉ Collection, Sainte-Savine
- F = FRICOT Collection, Esclavolles-Lurey.
- H = Association Géologique Aubeoise Collection, Troyes.
- JPS = PIETRESSON DE SAINT-AUBIN Collection, Bar-sur-Seine.
- OUM = University Museum, Oxford, Geological Collections
- CH = CHAUMARD Collection, Romilly-sur-Seine

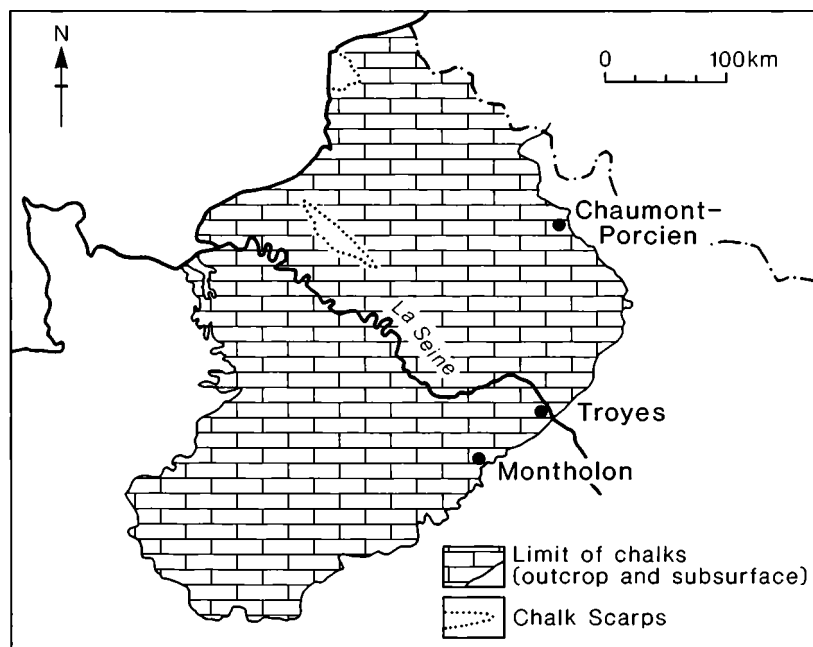


Fig. 1a. Outline map of the Paris Basin showing the more important localities mentioned in the text.

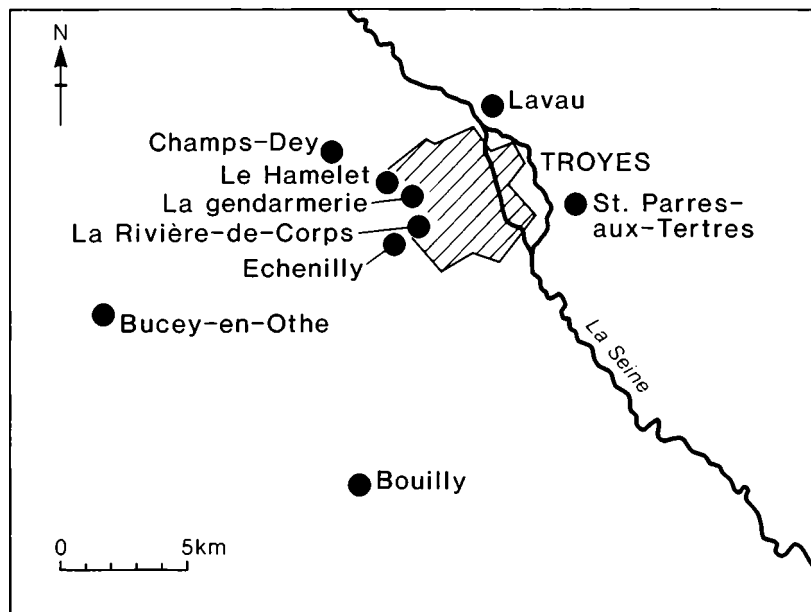


Fig. 1 b. Localities in the Troyes region mentioned in the text.

### Systematic Palaeontology

Order Ammonoidea ZITTEL, 1884

Suborder Ammonitina HYATT, 1889

Superfamily Haplocerataceae ZITTEL, 1884

Family Oppeliidae BONARELLI, 1894

Subfamily Aconeceratinae SPATH, 1923

Genus *Tropitoides* SPATH, 1925 b

Type species: By original designation: *Ammonites obesus* STOLICZKA, 1863 p. 55, pl. 32, fig. 1.

Diagnosis: Medium-sized, involute, compressed, high-whorled with fastigiate-carinate venter. Flanks ornamented by weak, flexuous prorsiradial ribs, markedly concave on outer flank, strongly projected forwards to feeble ventral clavi. Suture with narrow lobes and saddles.  $L/U_2$  almost as large as, and taller than  $E/L$ .

Discussion: The affinities of *Ammonites obesus* have presented considerable problems. STOLICZKA placed it in the *Cristati*, between *Ammonites subtricarinatus* and *Ootatoorensis* (that is to say *Peroniceras* and *Hysterocheras*)

STAGES	ZONES (Barrois 1878)	Lithostratigraphic units	
TURONIAN	<i>Micraster breviporus</i>	soft, white chalk	>10m
		chalk with flints	10m
		⊙ chalk with hardgrounds	2m
	<i>Terebratulina gracilis</i>	soft, white chalk	20m
		<i>Inoceramus labiatus</i>	chalk rich in <i>Inoceramus</i>
	⊙ nodular chalk		10m
CENOMANIAN	<i>B. plenus</i>	<i>Plenus</i> Marls	1.5m

Fig. 2. Classic zones and lithological divisions in a part of the chalk of the Troyes region (after BARROIS 1878, PERON 1887 and PIETRESSON DE SAINT-AUBIN 1943).

and compared it to D'ORBIGNY's *Ammonites goupilianus* (type species of *Prohauericeras* NOWAK, 1913). KOSSMAT regarded it as lying between *Sonneratia* BAYLE, 1878 and *Schloenbachia* NEUMAYR, 1875 while NOWAK (1913) linked it with *Ammonites goupilianus* D'ORBIGNY, 1841 in his genus *Prohauericeras* NOWAK, 1913. SPATH (1925 b p. 102) made it type species of *Tropitoides* SPATH, 1925 b, without commenting on its affinities, while WRIGHT referred it successively to Forbesiceratinae (1952) and Schloenbachiidae (1957). KENNEDY, CHAHIDA & DJAFARIAN (1979 p. 28) suggested that the family Schloenbachiidae was a polyphyletic assemblage of keeled Cenomanian-Turonian forms, and subsequent work has confirmed this, showing *Euhystriocheras* SPATH, 1923 and *Algericeras* SPATH, 1925 a (= *Prionocycloides* SPATH, 1925 a) to be Mortoniceratinae, *Pseudacompsoceras* SPATH, 1925 a to be a synonym of *Acompsoceras* HYATT, 1903 of Acanthoceratinae and *Prohauericeras* NOWAK, 1913 to belong to Acanthoceratinae. WRIGHT (1981 p. 164) finally suggested that *Tropitoides* "might be a relict Oppeliid", that is a member of the Haplocerataceae, on the basis of the suture line. KOSSMAT's illustrations (1895 pl. 22 (8) figs. 3 c, 3 d) show a distinctive pattern with a series of narrow saddles and lobes, with L/U<sub>2</sub> taller than E/L, and several auxiliaries. This is strikingly similar to Cretaceous Haplocerataceae, in particular the Oppeliidae (see illustrations in ARKELL, KUMMEL & WRIGHT, 1957). The oxycone form is one that typifies the Aconeceratinae, where similar sutural patterns are shown by *Aconecerases* HYATT, 1903, *Sanmartinoceras* BONARELLI, 1921 and *Gyaloceras* WHITEHOUSE, 1927 (see e. g. illustrations in CASEY 1961).

Occurrence: *Ammonites obesus* is described as coming from "N. E. of Odium" (STOLICZKA 1863 p. 56). Most subsequent authors regard it as Cenomanian, although the only other ammonites STOLICZKA records from N. E. of Odium are *Neoptychites cephalotus* (COURTILLER, 1860) (= *Ammonites xetra* STOLICZKA, 1865 (p. 125) and *Ammonites telinga* STOLICZKA, 1865 (p. 125)) and *Pachydesmoceras denisonianum* (STOLICZKA, 1865) (p. 134). These are Turonian species, with the former suggesting a top Lower or Middle Turonian horizon. The French specimen described below is from low in the Upper Turonian *Subprionocyclus neptuni* Zone.

*Tropitoides obesus* (STOLICZKA, 1863)

Fig. 5 a-d

- 1863 *Ammonites obesus* STOLICZKA, p. 55, pl. 32, fig. 1.  
 1895 *Sonneratia obesa* STOLICZKA sp.; KOSSMAT, p. 182 (86), pl. 22 (8), fig. 3.  
 1913 *Ammonites obesus* STOLICZKA; NOWAK, p. 369.  
 non 1920 *Sonneratia* BAYLE nov. spec. TAUBENHAUS ex aff *obesa* STOL.; TAUBENHAUS, p. 26, pl. 3, fig. 3.  
 1925 b *Sonneratia obesa* (STOLICZKA) KOSSMAT; SPATH, p. 102.  
 1957 *Tropitoides obesus* (STOLICZKA); WRIGHT, p. L401, fig. 519, 1.

Material: C14, from the lower part of the Craie à *Micraster breviporus*, Upper Turonian, *Subprionocyclus neptuni* Zone of Bucey-en-Othe (Aube).

Dimensions:	D	Wb	Wh	Wb:Wh	U
at	34.5(100)	9.7 (28.1)	18.2 (52.8)	0.53	- (-)

Description: Coiling is very involute with a tiny umbilicus. The whorl section is compressed, with a whorl breadth to height ratio of 0.53 (approximately). The greatest breadth is just outside the umbilical shoulder, the inner flanks are rounded, the mid-outer flanks flattened and convergent, the venter fastigiate with angular shoulders and a rounded siphonal keel, flanked by distinct sulci. Ornament consists of numerous flexuous prorsiradiate ribs. These are mere lirae on the inner flank, but strengthen and are markedly prorsiradiate on the mid-outer flank where they are concave, projecting strongly forwards to small ventral clavi, of which there are an estimated 55 on the outer whorl. A distinct if faint groove separates these from the blunt siphonal keel. This is slightly irregular, being crossed by growth striae and low undulations, but is not serrate.

The sutures are not visible.

Discussion: The French specimen resembles the larger specimen figured by KOSSMAT (1895 pl. 22 (8) fig. 3) in every respect of proportions and ornament, and in turn is linked by this specimen to the much larger holotype. This is just over 120 mm in diameter, and to judge from a cast before us (OUM P KY 1007), is rather poorly preserved, although flexuous ribs and clavi are visible at several points. Over most of the cast the keel is

blunt, as in the present specimen and KOSSMAT's mould. At one point, however, there is a much stronger keel, where shell is present, as in other Aconeceratidae.

Occurrence: As for genus and material.

Superfamily Acanthocerataceae DE GROSSOUVRE, 1894

Family Acanthoceratidae DE GROSSOUVRE, 1894

Subfamily Acanthoceratinae DE GROSSOUVRE, 1894

Genus *Neocardioceras* SPATH, 1926 a

Type species: By original designation: *Ammonites juddii* BARROIS & GUERNE, 1878 p. 46, pl. 1, figs. 1, 2, from the Upper Cenomanian marls of Novy Chevrières, Ardennes.

*Neocardioceras juddii juddii* (BARROIS & GUERNE, 1878)

Fig. 5 m, p

1878 *Ammonites juddii* BARROIS & GUERNE, p. 46, pl. 1, figs. 1, 2.

1981 *Neocardioceras juddii* (BARROIS & GUERNE); WRIGHT & KENNEDY, p. 50, pl. 9, figs. 1-3, 5-11; text-figs. 17, 1, 2; 19 h, i (with full synonymy).

1981 *Neocardioceras juddii* (BARROIS & GUERNE); HOOK & COBBAN, pl. 1, figs. 6-8.

Material: We have two specimens referable to this subspecies, recently revised by WRIGHT & KENNEDY (1981). Both are from the base of the Craie Noduleuse of Bouilly (Aube). Example C 6 (Figure 5 p) is a well-preserved composite internal mould of an individual 12 mm in diameter. F2 is an external mould of a much larger individual (Fig. 5 m).

Discussion: Both specimens show an ornament of narrow flexuous ribs arising in irregular groups from small umbilical tubercles, with well-developed ventral and siphonal clavi associated with all the ribs. Both

Fig. 3 a, b. *Collignonicerus woollgari* (MANTELL, 1822), H1 from Le Hamelet, Aube. c, d *Euomphaloceras septemseriatum* (CRAGIN, 1893) C50, from St.-Parres-aux-Tertres, Aube; e, f *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY, 1841) unregistered ex BARROIS Collection, Musée GOSSELET, Lille from Montholon (Yonne).

All figures are natural size.

Fig. 4. a, b, c, d, n. *Sciponoceras bohemicum anterius* WRIGHT & KENNEDY, 1981. a, b, C21; c, d, C20, both from St-Parres-aux-Tertres (Aube); n is C4, from Echenilly (Aube); DR. J. SORNAY identifies the associated *Inoceramus* as *I. pictus bannewitzensis* TRÖGER. e, f *Sciponoceras* sp. C16, from Bucey-en-Othe (Aube). g *Hamites* cf. *simplex* D'ORBIGNY, 1842 from Bouilly (Aube). h, i, j, m *Puebloites* cf. *spiralis* COBBAN & SCOTT, 1972 h is C10, i is C11, j is C12, m is C13, all from Bouilly (Aube). k, l *Scaphites equalis* J. SOWERBY, 1813, F1 from Bouilly (Aube). o *Collignonicerus woollgari* (MANTELL, 1822) H2 from Clos du Hamelet, Saint-Savine (Aube).

All figures are natural size.

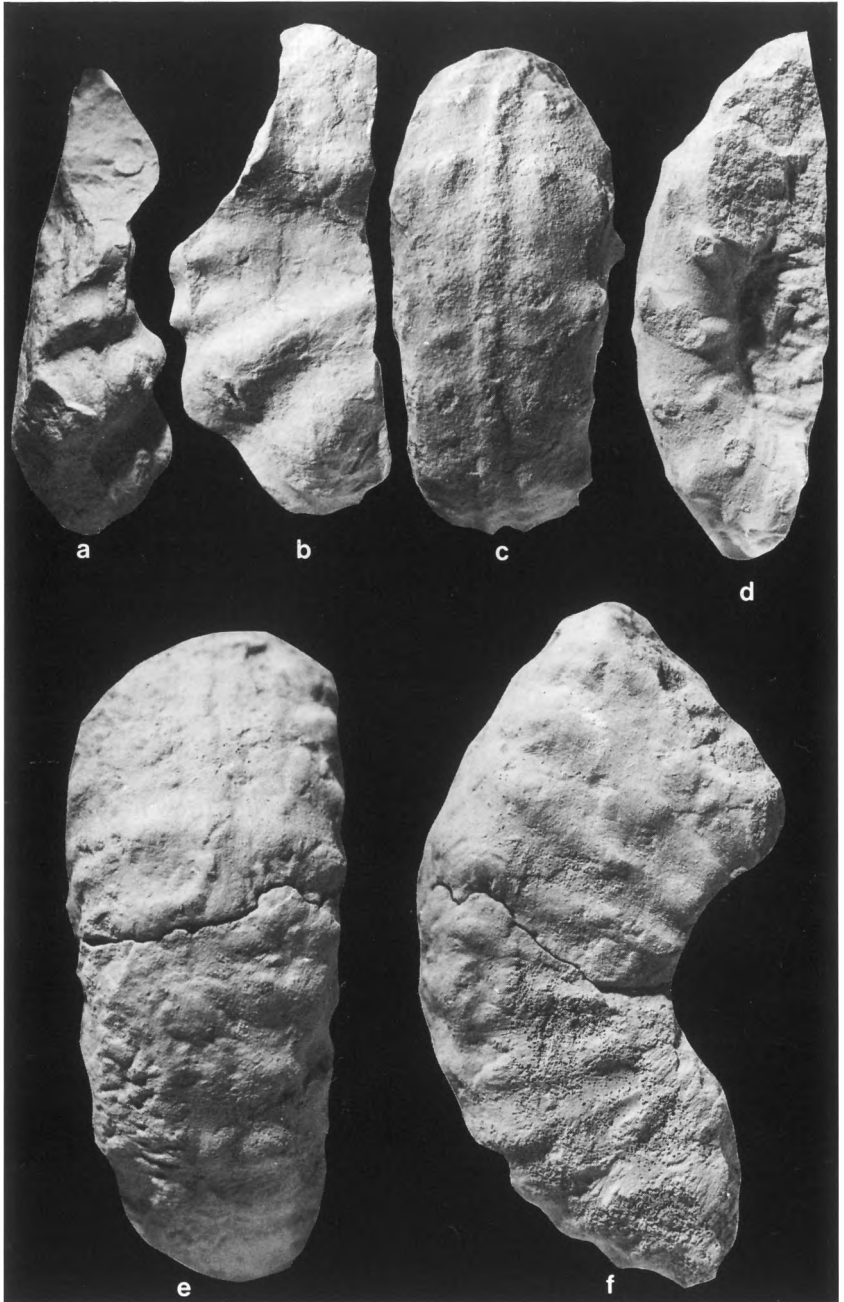


Fig. 3 (Leg. see p. 199)



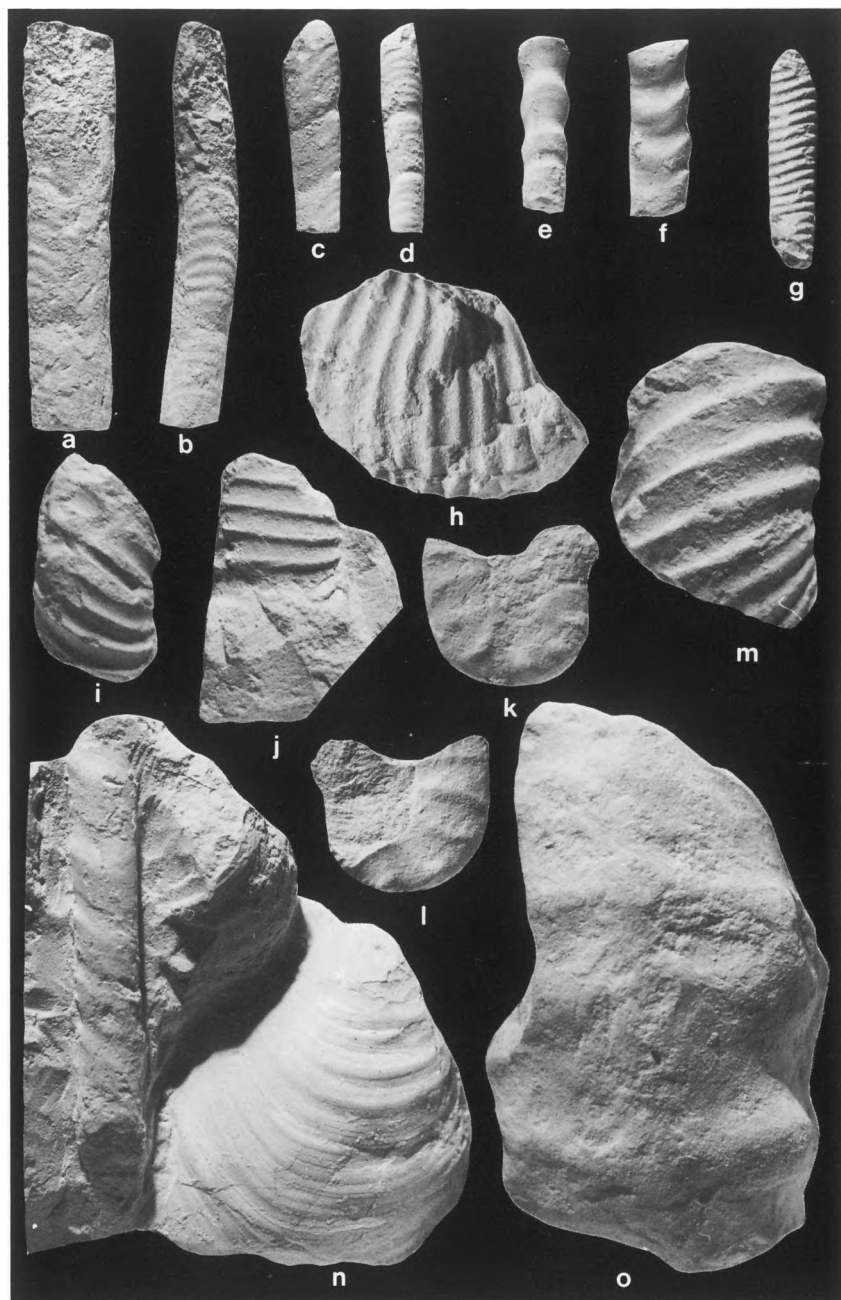


Fig. 4 (Leg. see p. 199)

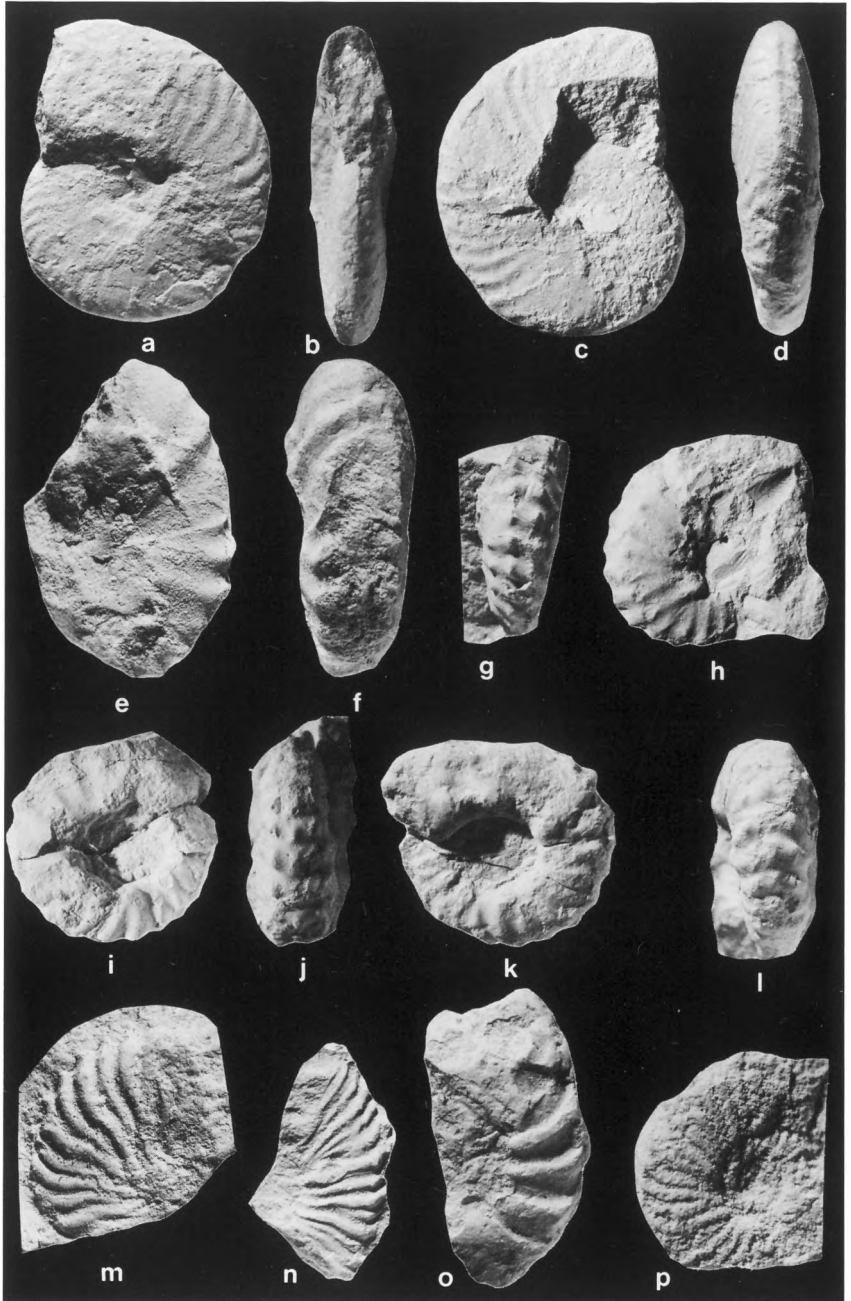


Fig. 5 (Leg. see p. 203)

specimens find a precise match in specimens figured recently by WRIGHT & KENNEDY (1981) and HOOK & COBBAN (1981) (see synonymy for details).

Occurrence: *Neocardioceras juddii* Zone, Bouilly (Aube). Also known from the same horizon at Novy Chevrières (Ardennes), St. Calais (Sarthe) and Seine-Maritime in France, Devon in England, the Germanies, Czechoslovakia, and Texas, New Mexico and Montana in the U.S.A.

*Neocardioceras juddii barroisi* WRIGHT & KENNEDY, 1981

not figured

1981 *Neocardioceras juddii barroisi* WRIGHT & KENNEDY, p. 50, pl. 8, fig. 1; pl. 9, figs. 4, 12-20; text-figs. 19 j, l.

Discussion: A fragment from the base of the Craie Noduleuse of Bouilly (Aube) compares well with *Neocardioceras juddii barroisi* in both whorl section and coarseness of ribs. The subspecies appears to be restricted to the *Neocardioceras juddii* Zone and is also known from Devon, England.

Genus *Watinoceras* WARREN, 1930

Type species: By original designation: *Watinoceras reesidei* WARREN, 1930, p. 67, pl. 3, fig. 2; pl. 4, figs. 9-12, from the Lower Turonian of Alberta, Canada.

*Watinoceras coloradoense praecursor* WRIGHT & KENNEDY, 1981

Fig. 5 g, h

1981 *Watinoceras coloradoense praecursor* WRIGHT & KENNEDY, p. 53, pl. 10, figs. 4, 8, 9, 11, 15, 17, 18; text-fig. 19 g, k.

Discussion: A single specimen, C3 is referred to this form. It is somewhat crushed, and only 23.5 mm in diameter. Umbilical bullae give rise to pairs of prorsiradial straight primary ribs, while shorter ribs intercalate on the flank. All ribs bear rounded inner and clavate outer ventrolateral tubercles. The latter are linked across the venter by a feeble, broad rib.

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Fig. 5. a-d *Tropitoides obesus* (STOLICZKA, 1863) C14, from Bucey-en-Othe (Aube). e, f *Thomelites serotinus* WRIGHT & KENNEDY, 1981 C5 from St-Parres-aux-Tertres (Aube). g, h *Watinoceras coloradoense praecursor* WRIGHT & KENNEDY, 1981, C3 from La-Rivière-de-Corps, Troyes (Aube). i-l *Cibolaites* cf. *molenaar* COBBAN & HOOK, 1983, CHAUMARD Collection no. CH2 from La Gendarmerie, Troyes (Aube). m, p *Neocardioceras juddii juddii* (BARROIS & GUERNE, 1878), m is F2, p is C6, both from Bouilly (Aube). n is *Benueites* cf. *reymenti* COLLIGNON, 1967, JPS3 from Lavau (Aube); o *Collignonicer* *woollgari* (MANTELL, 1822), JPS2 from the Carrière des Champs-Dey near Troyes (Aube).

All figures are natural size.

This specimen is much better-preserved than the English type material, comparing well with specimens such as the paratype from Humble Point, Devon, figured by WRIGHT & KENNEDY 1981, pl. 10, fig. 4.

Occurrence: *Watinoceras coloradoense* Zone, lower part of Craie Noduleuse, La Rivière-de-Corps, Troyes (Aube). The types are from the Devon coast, England.

### Genus *Benueites* REYMENT, 1954

Type species: By original designation: *Benueites benueensis* REYMENT, 1954 p. 153, pl. 3, fig. 1; text-fig. 2.



Fig. 6. *Benueites corneti* (BARROIS & GUERNE, 1878) the holotype, an unregistered specimen in the Musée GOSSELET, Lille, from Chaumont-Porcien (Ardennes). Magnified X 4.

### *Benueites corneti* (BARROIS & GUERNE, 1878)

Fig. 6

1878 *Ammonites corneti* BARROIS & GUERNE, p. 50, pl. 1, figs. 5 a-c.

1981 *Benueites corneti* (BARROIS & GUERNE, 1878); WRIGHT & KENNEDY, p. 43, text-fig. 17, 5 a-c (copy of BARROIS & GUERNE 1878).

Holotype: By monotypy, the original of BARROIS & GUERNE 1878, p. 50, pl. 1, figs. 5 a-c from the "Dieves" à *Terebratulina gracilis* of Chaumont-Porcien (Ardennes), an unregistered specimen in the Musée GOSSELET, Lille.

Dimensions:	D	Wb	Wh	Wb:Wh	U
	5.5 (100)	1.8 (32.7)	2.6 (47.0)	0.69	1.6 (29.0)

Description: The specimen is a minute limonitic cast. Coiling is moderately evolute, the umbilicus comprising 29% of the diameter, shallow, and with a low rounded umbilical wall. The whorls are slowly expanding, compressed (whorl breadth to height ratio 0.69 approximately) with the greatest breadth below mid-flank. The inner flanks are rounded, the mid-flank area flattened, the outer flanks convergent. The ventrolateral shoulders are narrowly rounded, with a tabulate venter. The early part of the outer

whorl is virtually smooth. Definite ribs appear  $270^\circ$  from the aperture and there is a total of 25–30 on the last half whorl. These are at first mere low folds on the flank, but eventually strengthen and develop distinct ventral clavi, with most ribs restricted to the outer flank and only occasional strong primaries extending to the umbilicus.

The clavi on either side of the venter alternate, with a faint riblet extending to the mid-ventral line, producing a chevron pattern.

The sutures are indecipherable.

Discussion: This tiny specimen shows the same style of ornament as finely-ribbed *Benueites* such as the type species, *B. benueensis* REYMENT, 1954 (see especially the fine illustrations in REYMENT 1971). Until now this genus has been known only from Cameroon, Nigeria, Morocco, Trinidad, Venezuela, Colombia and NE Brasil. The type specimen of *B. corneti* is so small that it is not possible to make useful detailed comparisons with other species.

Occurrence: As for type.

*Benueites cf. reymenti* COLLIGNON, 1967

Fig. 5 n

compare:

1967 *Benueites reymenti* COLLIGNON, p. 38, pl. 20, figs. 8, 9.

1971 *Benueites reymenti* COLLIGNON; REYMENT, p. 10, pl. 8, figs. 1–4.

1982 *Benueites reymenti* RENZ, p. 92, pl. 28, figs. 15–21; text-figs. 70 b, d–e.

Material: JPS 3, from the top of the *Inoceramus labiatus* Zone of Lavau, near Troyes (Aube).

Description: The specimen is a fragment only, with a maximum preserved whorl height of 13.5 mm. Slightly flexuous primary ribs arise at the umbilical seam, while occasional short intercalated ribs arise high on the flank. All ribs bear a feeble clavate inner ventrolateral tubercle, from which ribs sweep forwards to a more markedly clavate outer ventrolateral. The ribs sweep strongly forwards from these, declining in strength towards the siphonal line at the larger end of the fragment. Ribs and tubercles weaken and crowd towards the end of the fragment, which seems to be part of an adult body chamber.

Discussion: The ribbing style and tuberculation of this fragment closely resemble those of the holotype of *Benueites reymenti* COLLIGNON, 1967 (pl. 20, fig. 8) and well-preserved specimens from Venezuela illustrated by RENZ (1982 pl. 28, figs. 15–21), in particular the adult specimen shown in his pl. 28 fig. 16 a–b. In view of the poor preservation of our fragment we can do no more than compare it with *B. reymenti*.

Occurrence: Upper Lower Turonian of Aube, France, Morocco, Trinidad and Venezuela.

## Subfamily Acanthoceratinae DE GROSSOUVRE, 1894

Genus *Thomelites* WRIGHT & KENNEDY, 1973

Type species: By original designation: *Jeanrogericeras sornayi* THOMEL, 1966 p. 431, pl. 11, figs. 1-3.

*Thomelites serotinus* WRIGHT & KENNEDY, 1981

Fig. 5 e, f

1978 *Watinoceras coloradoense* HENDERSON; KENNEDY & HANCOCK, pl. 15, fig. 4.

1981 *Thomelites serotinus* WRIGHT & KENNEDY, p. 40, pl. 8, figs. 7, 9-16; pl. 10, fig. 19; text-figs. 19 m, o, r.

Material: C5, a fragment from 90 cm above the base of the Craie noduleuse of Saint-Parres-aux-Tertres (Aube).

Description: The fragment has a maximum whorl height of 16 mm. The whorl section is compressed, with convergent flanks, rounded shoulders and a broad, flattened venter. Primary ribs bear inner and outer ventrolateral clavi, scarcely separable at the end of the fragment, where they merge into the strengthened termination of the rib. The ribs are effaced over the siphonal line which appears to have borne a slight ridge, although poor preservation precludes the recognition of siphonal clavi.

Occurrence: *T. serotinus* is restricted to the *Neocardioceras juddii* Zone of the Upper Cenomanian and was previously known only from the *Neocardioceras* Pebble Bed at the base of the Middle Chalk on the Devon Coast and inland.

## Subfamily Euomphaloceratinae COOPER, 1978

Genus *Euomphaloceras* SPATH, 1923

Type species: By monotypy: *Ammonites euomphalus* SHARPE, 1855 p. 31, pl. 13, fig. 4.

*Euomphaloceras septemseriatum* (CRAGIN, 1893)

Fig. 3 c, d

1893 *Scaphites septem-seriatus* CRAGIN, p. 240.

1981 *Euomphaloceras septemseriatum* (CRAGIN, 1893); WRIGHT & KENNEDY p. 55, pl. 12, figs. 1-8; pl. 13, figs. 1-6; pl. 14, figs. 5-9 (with synonymy).

1981 *Euomphaloceras septemseriatum* (CRAGIN, 1893); KENNEDY & JUIGNET, p. 38, figs. 9 b-d (with synonymy).

1984 *Euomphaloceras septemseriatum* (CRAGIN, 1893); KENNEDY, AMÉDRO, BADILLET, HANCOCK & WRIGHT, p. 36, fig. 3 k, l.

Material: C50 from 40 cm above the top of the Plenus Marls, St. Parres-aux-Tertres (Aube).

**Discussion:** The fragment is highly deformed but shows primary ribs and striae on the umbilical wall, strong umbilical spines (all broken), effaced flank ribs, strong inner ventrolateral tubercles, weaker, more numerous, irregularly-developed outer ventrolateral tubercles linked by a feeble ridge and a coarse siphonal keel bearing numerous tubercles. It closely resembles specimens from the Plenus Marls of southern England (e. g. WRIGHT & KENNEDY 1981, pl. 13, fig. 2.).

**Occurrence:** This species occurs in the upper part of the Upper Cenomanian *Metoicoceras geslinianum* Zone and its correlatives. In western Europe it is generally restricted to the upper part of the Plenus Marls, but sometimes occurs at the base of the succeeding nodular chalks in south-eastern England (WRIGHT & KENNEDY 1981) and in Aube (the present occurrence). These latter occurrences may indicate the extension of the species range above the *geslinianum* Zone. Its geographic range extends from western Europe to Nigeria, Angola, Japan, Mexico, and Texas, Colorado, Arizona, Montana, Kansas, Utah and California in the U.S.A.

### Genus *Romaniceras* SPATH, 1923

#### Subgenus *Romaniceras* SPATH, 1923

**Type species:** By original designation: *Ammonites deverianus* D'ORBIGNY, 1841 p. 356, pl. 110, figs. 1, 2.

#### *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY, 1841)

##### Fig. 3 e, f

- 1841 *Ammonites deverianus* D'ORBIGNY, p. 356, pl. 110, figs. 1, 2.  
 1857 *Ammonites deverianus* D'ORBIGNY; SHARPE, p. 43, pl. 19, fig. 5.  
 1980 *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY); KENNEDY, WRIGHT & HANCOCK, p. 332, pl. 39, figs. 7-10; pl. 41, figs. 1-6; pl. 42, figs. 1-7; pl. 43, figs. 1-3; text-figs. 3 d, 4, 5.  
 1981 *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY); WRIGHT & KENNEDY, p. 58, pl. 15, figs. 3, 5; pl. 43, figs. 1-3; text-fig. 19 f. (with full synonymy).  
 1982 *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY); AMÉDRO, COLLETÉ, PIETRESON DE SAINT-AUBIN & ROBASZYNSKI, p. 30, pl. 1, fig. 1.

**Material:** An unregistered specimen in the BARROIS Collection, preserved in the Musée GOSSELET, Lille, from the Craie à *Terebratulina gracilis* of Montholon (Yonne).

**Description:** The fragment is wholly septate, with a maximum preserved whorl height of 37 mm and an estimated diameter of 100 mm. The whorls are slightly depressed (whorl breadth to height ratio of 1.05), with a polygonal section, the maximum breadth just below mid-flank. On the third of a whorl preserved there are 12 ribs, each bearing umbilical, lateral, inner and outer ventrolateral and siphonal tubercles.

**Discussion:** Although fragmentary, the specimen is of some interest as

the first specimen of *R. (R.) deverianum* described from the chalks of the Paris Basin, by BARROIS (1875). The polygonal section, straight ribs and rounded tubercles are typical of *R. (R.) deverianum*, especially the example from the English Chalk illustrated by SHARPE 1857 pl. 19, figs. 5 (see WRIGHT & KENNEDY 1981 pl. 15, fig. 5 for a photograph of this specimen).

This is only the twelfth specimen of *R. (R.) deverianum* described from the chalks of the Anglo-Paris Basin.

Occurrence: *Terebratulina gracilis* Zone of Montholon (Yonne).

#### Family Collignoniceratidae WRIGHT & WRIGHT, 1951

#### Subfamily Collignoniceratinae WRIGHT & WRIGHT, 1951

#### Genus *Collignoniceras* BREISTROFFER, 1947

Type species: By the original designation of MEEK, 1876 p. 453: *Ammonites woollgari* MANTELL, 1822 p. 197, pl. 21, fig. 16; pl. 22, fig. 7, proposed as type species of *Prionotropis* MEEK, 1876 (non FIEBER, 1853) for which BREISTROFFER (1947) proposed *Collignoniceras* as *nomen novum*.

#### *Collignoniceras woollgari* (MANTELL, 1822)

Fig. 3 a, b; 4 o; 5 o

- 1822 *Ammonites woollgari* MANTELL, p. 197, pl. 21, fig. 16; pl. 22, fig. 7.  
 1981 *Collignoniceras woollgari* (MANTELL, 1822); WRIGHT & KENNEDY p. 103, pl. 28, figs. 1-3; pl. 29, figs. 1-7; pl. 30, figs. 1-3 (with full synonymy).  
 1982 *Collignoniceras woollgari* (MANTELL); AMÉDRO, COLLETÉ, PIETRESSON DE SAINT-AUBIN & ROBASZYNSKI, p. 30, pl. 1, figs. 5, 6, 7.

Material: JPS 1, 2 from the upper part of the Craie à *Terebratulina gracilis* of the Carrière des Champs-Dey, near Troyes (Aube). H 1, 2 from the lower part of the Craie à *Micraster breviporus*, lotissement Clôs du Hamelet at Sainte-Savine, west of Troyes (Aube).

Discussion: The fragments from the Carrière des Champs-Dey are typical juveniles of the species (Fig. 5 o) and match well with the juvenile paralectotypes illustrated by WRIGHT & KENNEDY (1981 pl. 29, figs. 6, 7). The two larger fragments match the lectotype (WRIGHT & KENNEDY 1981 pl. 28, fig. 3; pl. 29, fig. 5), H 1 (Fig. 3 a, b) showing two primary ribs separated by two secondaries, H 2 (Fig. 4 o) showing looped ventral ribbing.

The specimens from the upper part of the Craie à *Terebratulina gracilis* are associated with four specimens of *Romaniceras (Romaniceras) deverianum* (D'ORBIGNY, 1841) described by AMÉDRO et al. 1982. Since a *Subprionocyclus neptuni* fauna first appears some meters above this level, the present specimens show, for the first time, that *deverianum* is a top *woollgari* Zone species.

The occurrence at Clôs du Hamelet is also of great interest as it is associated with typical elements of the *Subprionocyclus neptuni* zone (see list in AMÉDRO, COLLETÉ, PIETRESSON DE SAINT-AUBIN & ROBASZYNSKI, 1982). The



presence of intercalated ribs in the specimens indicates them to be the typical form of the species, and not the subspecies *regulare* that succeeds *C. woollgari* in the U. S. Western Interior (see discussion in COBBAN & HOOK 1979). Either the *regulare* form of this species is later than European *woollgari*, or, if contemporary, represents a true geographic subspecies.

Occurrence: Widespread in the Middle Turonian of Europe, the USSR east to Transcaspia, Japan, California and Oregon, the U. S. Western Interior, Texas, Mexico and northern Australia. Upper Turonian *Subprionocyclus neptuni* Zone of the Troyes region.

### Genus *Cibolaites* COBBAN & HOOK, 1983

Type species: By original designation: *Cibolaites molenaari* COBBAN & HOOK, 1983 p. 16, pl. 2, figs. 1-9; pl. 3, figs. 3-8; pl. 8, figs. 6-8; pl. 13, figs. 1-5; pl. 14; text-figs. 13, 14.

### *Cibolaites* cf. *molenaari* COBBAN & HOOK, 1983

Fig. 5 i, j, k, l

compare:

1981 *Collignoniceras* sp. WRIGHT & KENNEDY, p. 107, pl. 8, fig. 17.

1983 *Cibolaites molenaari* COBBAN & HOOK, p. 16, pl. 2, figs. 1-9; pl. 3, figs. 3-8; pl. 8, figs. 6-8; pl. 13, figs. 1-5; pl. 14; text-figs. 13, 14.

Material: CHAUMARD Collection, no. CH2 from the base of the Craie noduleuse, Upper Cenomanian, *Neocardioceras juddii* Zone la Gendarmerie, Troyes (Aube).

Description: The specimen is distorted into an ellipse, with a maximum diameter of 26 mm. Coiling is evolute, with  $U = 38\%$ . The whorl section is depressed, with the greatest breadth at the prominent umbilical bullae. The whorl section is trapezoidal. There are ten strong conical umbilical bullae on the outer whorl; these give rise to pairs of coarse, straight prorsiradiate ribs with occasional additional intercalated ribs inserted on the flank. All bear well-developed ventrolateral clavi, linked across the venter by a broad transverse rib bearing a stronger siphonal clavus.

The sutures are not exposed.

Discussion: Although poor, our specimen agrees well with inflated variants of *Cibolaites molenaari* from New Mexico, e. g. COBBAN & HOOK 1983 pl. 14, figs. 7-9, differing only in its very wide umbilicus, which may in part reflect the post-mortem deformation. The type material of *C. molenaari* came from the upper Lower / lower Middle Turonian of New Mexico, where it is associated with *Neoptychites cephalotus* and *Fagesia superstes*; the present specimen is significantly older, and may even represent a new form. It resembles a small fragment from the *N. juddii* Zone in southern England figured as *Collignoniceras* sp. by WRIGHT & KENNEDY (1981 p. 107, pl. 8, fig. 17). COBBAN & HOOK referred *Cibolaites* to the Barroisiceratinae, but this subfamily originated in *Reesideites* of the Upper Turonian-Coniacian; resem-

blance is mere homoeomorphy. *Cibolaites* is clearly a primitive member of Collignoniceratinae.

Occurrence: Upper Cenomanian, *Neocardioceras juddii* Zone, Troyes (Aube).

Suborder Ancyloceratina WIEDMANN, 1966

Superfamily Turrilitaceae GILL, 1871

Family Hamitidae GILL, 1871

Genus *Hamites* PARKINSON, 1811

Type species: By the subsequent designation of DIENER, 1925: *Hamites attenuatus* J. SOWERBY, 1814, p. 137, pl. 61, figs. 4, 5.

*Hamites cf. simplex* D'ORBIGNY, 1842

Fig. 4 g

compare:

1842 *Hamites simplex* D'ORBIGNY, p. 550, pl. 134, figs. 12-14.

1972 *Stomohamites cf. simplex* (D'ORBIGNY); COBBAN & SCOTT, p. 44, pl. 13, figs. 5-10; pl. 17, figs. 3, 4.

1983 *Hamites simplex* D'ORBIGNY; KENNEDY & JUIGNET, p. 13, figs. 15 a-d; 17 a-w; 36 j; 37 v, w.

Material: C7 from the Upper Cenomanian *Neocardioceras juddii* Zone, base of the Craie noduleuse of Bouilly (Aube). C22 and 23 from the same horizon, 0.8 and 1.2 m above the top of the Plenus Marls at Saint-Parres-aux Terres (Aube).

Description: The best preserved specimen, C7, is a composite internal mould 27.5 mm long with a maximum whorl height of 6 mm. The whorl section is deformed into a compressed oval. The ornament consists of strong, annular prorsiradiate ribs; the rib index is 5.

Discussion: The fragment closely matches topotypes from the Middle Cenomanian Rouen Fossil Bed before us. It is of some interest as the first record from the *juddii* Zone, although *H. cf. simplex* occurs widely in the underlying *Metoicoceras geslinianum* Zone of the United States (see discussion in WRIGHT & KENNEDY 1981, p. 110).

Occurrence: The species ranges throughout most of the Cenomanian stage, although most occurrences are Middle Cenomanian. It has a wide geographic distribution in western Europe, Iran, Tunisia, Madagascar, Australia, and Colorado in the U.S. Western Interior.

Genus *Puebloites* COBBAN & SCOTT, 1972

Type species: By original designation: *Helicoceras? corrugatum* STANTON, 1894 p. 165, pl. 35, fig. 5.

*Puebloites cf. spiralis* COBBAN & SCOTT, 1972

Fig. 4 h, i, j, m

compare:

1972 *Puebloites spiralis* COBBAN & SCOTT, p. 46, pl. 18, figs. 1-5; pl. 19, figs. 1-6.

Material: C 1, from the Gendarmerie at Sainte-Savine (Aube); C 10-13, from Bouilly (Aube), all from the base of the Craie noduleuse, Upper Cenomanian *Neocardioceras juddii* Zone.

Discussion: These fragments are all distorted, but appear to have had an oval or circular whorl section and an ornament of strong oblique ribs, the rib index varying from 5-9. They closely recall the holotype of *Puebloites spiralis* (COBBAN & SCOTT 1972 pl. 18, figs. 4, 5) but are too poor for confident identification.

Occurrence: As for material. *P. spiralis* is otherwise known only from the Lower Turonian of Colorado.

## Family Baculitidae GILL, 1871

Genus *Sciponoceras* HYATT, 1894

Type species: By original designation: *Hamites baculoides* MANTELL, 1822, p. 123, pl. 23, figs. 6, 7.

*Sciponoceras bohemicum anterius* WRIGHT & KENNEDY, 1981

Fig. 4 a-d, n

1981 *Sciponoceras bohemicum anterius* WRIGHT & KENNEDY, p. 115, pl. 31, figs. 4-6, 8, 10, 11, ?7; pl. 32, figs. 9, 10, 12-15 (with synonymy).

Material: CH 2, from the Gendarmerie, Sainte-Savine (Aube); C 8 from Bouilly (Aube); C 4 from Echenilly (Aube) (associated with *Inoceramus pictus bannewitzensis* TRÖGER); C 20-21 from Saint Parres-aux-Tertres, 0.8 and 0.85 m above the base of the Craie noduleuse, a unit which is also the source of the other specimens; Upper Cenomanian, *Neocardioceras juddii* Zone.

Discussion: The fragments show well the diagnostic features of the subspecies in the form and spacing of the constrictions (Fig. 4 c, d, n) and the ribbing, both of which cross the venter transversely or in a broad arch (Fig. 4 b, d) rather than the strongly prorsiradiate course seen in the nominate subspecies where ribs and constrictions cross the venter in a narrow convexity.

Occurrence: This subspecies is restricted to the Upper Cenomanian *Neocardioceras juddii* Zone and is known from southern England, the Boulonnais, Aube and Haute Normandie.

*Sciponoceras* sp.

Fig. 4 e, f

Material: C 16, from the lower part of the Craie à *Micraster breviporus* of Buceyen-Othe (Aube).

Description: The specimen appears to be a body-chamber fragment, 23 mm long. The whorl section is compressed (whorl breadth to height ratio 0.72). There are four broad, deep constrictions in a length of 23 mm. They are concave on the flank and cross the venter in a narrow convexity. The shell between bears faint ribs parallel to the constrictions.

Discussion: The constrictions are almost as wide as the section of shell between, a condition seen in no other *Sciponoceras* known to us. We take the specimen to be an aberrant form of *S. bohemicum* (FRITSCH, 1872) (see WRIGHT 1979 p. 285, pl. 1, figs. 3-5; pl. 7, figs. 10, 12) but leave it in open nomenclature at this time.

## Superfamily Scaphitaceae GILL, 1871

## Family Scaphitidae GILL, 1871

## Subfamily Scaphitinae GILL, 1871

Genus *Scaphites* PARKINSON, 1811

Type species: By the subsequent designation of MEEK, 1876 (p. 413): *Scaphites equalis* J. SOWERBY, 1813, p. 53, pl. 18, figs. 1-3.

*Scaphites equalis* J. SOWERBY, 1813

Fig. 4 k, l

- 1813 *Scaphites equalis* J. SOWERBY, p. 53, pl. 18, figs. 1-3.  
 1965 *Scaphites (Scaphites) equalis* J. SOWERBY; WIEDMANN, p. 417, pl. 56, figs. 1-4; text-figs. 3 a-b (with synonymy).  
 1983 *Scaphites (Scaphites) equalis* J. SOWERBY; KENNEDY & JUIGNET, p. 67, figs. 33 a-d; 34 a-k; 38 q, r (with synonymy).

Material: F1, from the base of the Craie noduleuse of Bouilly (Aube) Upper Cenomanian, *Neocardioceras juddii* Zone.

Discussion: The specimen is a crushed body chamber fragment. It shows the strong, distant flank ribs, strengthened at the ventrolateral shoulder, with weaker intercalated riblets between that typifies this species, previously known from horizons up to the *Metoicoceras geslinianum* Zone of the Anglo-Paris Basin.

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### Literature

- ARKELL, W. J., KUMMEL, B. & WRIGHT, C. W. (1957): Mesozoic Ammonoidea. - In MOORE, R. C. (Ed.): Treatise on Invertebrate Paleontology, Part L, Mollusca 4, Cephalopoda Ammonoidea, L80-L465; New York.
- AMÉDRO, F., BADILLET, G. & DEVALQUE, C. (1983): Biostratigraphie et biozonation des ammonites du Turonien Français. - Mém. Mus. natn. Hist. nat. Paris, Sér. C, **49**: 167-173; Paris.
- AMÉDRO, F., BIDAR, A., DAMOTTE, R., MANIVIT, H., ROBASZYNSKI, F. & SORNAY, J. (1978): Échelles biostratigraphiques dans le Turonien du Cap Blanc Nez (Pas-de-Calais, F.). - Bull. Inf. Géol. Bass. Paris, **15**: 3-20; Paris.
- AMÉDRO, F., COLLETÉ, C., PIETRESSON DE SAINT-AUBIN, J. & ROBASZYNSKI, F. (1982): Le Turonien supérieur à *Romaniceras (Romaniceras) deverianum* de l'Aube (France). - Bull. Inf. Géol. Bass. Paris, **19**: 19-37; Paris.
- ANDERSON, F. M. (1902): Upper Cretaceous of the Pacific Coast. - Proc. Calif. Acad. Sci., (3) Geol., **2**, 1-154; pls. 1-12; San Francisco.
- BARROIS, C. (1875): La zone à *Belemnites plenus*. Étude sur le Cénomanien et le Turonien du bassin de Paris. - Ann. Soc. géol. N., **2**: 146-193; Lille.
- , (1878): Mémoire sur le terrain crétacé des Ardennes et des régions voisines. - Ann. Soc. géol. N., **5**: 227-487.
- BARROIS, C. & GUERNE, J. DE. (1878): Description de quelques espèces nouvelles de la Craie de l'Est du Bassin de Paris. - Ann. Soc. géol. N., **5**: 42-64; Lille.
- BAYLE, E. (1878): Fossiles principaux des terrains. - Explication de la Carte Géologique de France, 4, (1), (Atlas), 158 pls. Service de la Carte Géologique détaillée; Paris.
- BILLINGHURST, S. A. (1927): On some New Ammonoidea from the Chalk Rock. - Geol. Mag., **64**: 511-518; London.
- BONARELLI, G. (1894): Contribuzione alla conoscenza del Giura-Lias lombardo. - Atti. Accad. Sci. Torino, **30**: 63-78; Turin.
- , (1921): In BONARELLI, G. & NAGERA, J. J. (1921): Observaciones geologicas en las inmediaciones del Lago San Martin (Santa Cruz). - Bol. Dir. gen. Minas Geol. Hidrol. B. Aires ser. B. (Géologia) **27**: 1-39; Buenos Aires.
- BREISTROFFER, M. (1947): Notes de nomenclature paléozoologiques. - Proc. verb. mens. Soc. Sci. Dauphiné, **26** (195): 5 pp. (unpaginated); Grenoble.
- CASEY, R. (1960-1966): A monograph of the Ammonoidea of the Lower Greensand. Monogr. Palaeontogr. Soc., i-xxxvi, 1-44 (1960); 45-118 (1961); 119-216 (1961); 217-288 (1962); 289-398 (1964); 399-546 (1965); 547-582 (1966); London.
- COBBAN, W. A. & HOOK, S. C. (1979): *Collignoniceras woollgari woollgari* (MANTELL) ammonite fauna from Upper Cretaceous of Western Interior, United States. - Mem. Inst. Min. Technol. New Mex., **37**: 51 pp.; Socorro.
- , (1983): Mid-Cretaceous (Turonian) ammonite fauna from Fence Lake area, west-Central New Mexico. - Mem. Inst. Min. Technol. New Mex., **41**: 50 pp.; Socorro.
- COBBAN, W. A. & SCOTT, G. R. (1972): Stratigraphy and ammonite fauna of the Graneros Shale and Greenhorn Limestone near Pueblo, Colorado. - Prof. pap. U. S. geol. Surv., **645**; 108 pp.; Washington.
- COLLIGNON, M. (1967): Les céphalopodes crétacés du bassin côtier de Tarfaya. - Notes Mém. Serv. Mines Carte géol. Maroc., **175**, 7-148; Rabat (1966).

- COOPER, M. R. (1978): Uppermost Cenomanian-basal Turonian ammonites from Salinas, Angola. - *Ann. S. Afr. Mus.*, **75**: 51-152; Cape Town.
- COURTILLER, A. (1860): Description de trois nouvelles espèces d'ammonites du terrain crétacé. - *Mém. Soc. Imp. Agric. Sci. Arts Angers*, **3**: 246-252; Angers.
- CRAGIN, F. W. (1893): A contribution to the invertebrate paleontology of the Texas Cretaceous. - *Tex. geol. Surv.*, 4th Annual Report (1892): 139-246; Austin.
- DEVALQUE, C., AMÉDRO, F., PHILIP, J. & ROBASZYNSKI, F. (1983): État des correlations litho et biostratigraphiques dans le Turonien Supérieur des massifs d'Uchaux et de la Cèze. Les zones d'ammonites et de rudistes. - *Mém. Mus. nat. Hist. Nat.*, **C49**: 57-69; Paris.
- DIENER, C. (1925): Ammonoidea neocretacea. - *Fossilium Cat.* (1: Animalia), **29**: 244 pp; Berlin.
- FIEBER, F. X. (1853): Synopsis der europäischen Orthopteren mit besonderer Rücksicht der böhmischen Arten. - *Lotos*, **3**, 90-104; 115-129; 138-154; 168-176; 184-188; 201-207; 232-238; 252-261; Prague.
- FRITSCH, A. (1872): Cephalopoden der böhmischen Kreideformation. - 52 pp; Prague.
- GEINITZ, H. B. (1849-1850): Das Quadersandsteingebirge oder Kreidegebirge in Deutschland. - 293 pp; Freiberg.
- GILL, T. (1871): Arrangement of the Families of Mollusks. - *Smiths. Misc. Coll.*, **227**, xvi + 49 pp; Washington.
- GROSSOUVRE, A. DE. (1894) (mis-dated 1893): Recherches sur la craie supérieure. 2: Paléontologie - Les ammonites de la craie supérieure. - *Mém. Serv. Carte géol. dét. Fr.*: ii + 264 pp; Paris.
- HOOKE, S. C. & COBBAN, W. A. (1981): Late Greenhorn (Mid Cretaceous) discontinuity surfaces, southwest New Mexico. - *Circ. Bur. Min. Technol. New Mex.*, **180**: 5-21; Socorro.
- HYATT, A. (1889): Genesis of Arietidae. - *Smithson. Contr. Knowl.*, **673**: xi + 238 pp; Washington.
- , (1894): Phylogeny of an Acquired Characteristic. - *Proc. Am. Phil. Soc.*, **32**: 349-647; Philadelphia.
- , (1903): Pseudoceratites of the Cretaceous. - *Monogr. U. S. geol. Surv.*, **44**: 351 pp; Washington.
- JAKOWLEW, B. (1875): [Hemiptera and Homoptera of the Russian Fauna. -] *Bull. Soc. Nat. Moscou*, **49**: 248-285; Moscow, [In Russian.]
- KENNEDY, W. J. (1984): Ammonite faunas and the "standard zones" of the Cenomanian to Maastrichtian Stages in their type areas, with some proposals for the definition of stage boundaries by ammonites. - *Bull. geol. Soc. Denmark*, **33**: 147-161; Copenhagen.
- KENNEDY, W. J., AMÉDRO, F., BADILLET, G., HANCOCK, J. M. & WRIGHT, C. W. (1984): Notes on late Cenomanian and Turonian ammonites from Touraine, western France. - *Cret. Res.*, **5**: 29-45; London.
- KENNEDY, W. J., CHAHIDA, M. R. & DJAFARIAN, M. A. (1979): Cenomanian cephalopods from the Glauconitic Limestone southeast of Esfahan. - *Acta palaeont. pol.*, **24**: 3-50; Warsaw.
- KENNEDY, W. J. & HANCOCK, J. M. (1978): The mid-Cretaceous of the United Kingdom. - *Ann. Mus. Hist. nat. Nice*, **4**: V, 1-71; Nice (for 1976).
- KENNEDY, W. J. & JUIGNET, P. (1981): Upper Cenomanian ammonites from the environs of Saumur and the provenance of the types of *Ammonites vibrayeanus* and *Ammonites geslinianus*. - *Cret. Res.*, **2**: 19-49; London.
- , (1983): A revision of the Ammonite Faunas of the Type Cenomanian. I Introduction, Ancyloceratina. - *Cret. Res.*, **4**: 3-83; London.

- KENNEDY, W. J., WRIGHT, C. W. & HANCOCK, J. M. (1980): The European species of the Cretaceous ammonite *Romaniceras* with a revision of the genus. – *Palaeontology*, **23**: 325–362; London.
- ,– (1983): Ammonite zonation and correlation of the uppermost Cenomanian and Turonian of southern England and the type areas of Sarthe and Touraine in France. – *Mém. Mus. nat. Hist. Nat. Paris*, **49**: 175–181; Paris.
- KOSSMAT, F. (1895–1898): Untersuchungen über die Südindische Kreideformation. – *Beitr. Paläont. Geol. Öst. – Ung.*, **9** (1895): 97–203 (1–107); **11** (1897): 1–46 (108–153); **11** (1898): 89–152 (154–217); Vienna.
- LAMBERT, J. (1882): Note sur l'étage Turonien du Département de l'Yonne. – *Bull. Soc. Sci. hist. nat. Yonne*, **35**: 1–32; Auxerre.
- MANTELL, G. A. (1822): The fossils of the South Downs; or illustrations of the geology of Sussex. – xvi + 327 pp.; London.
- MEEK, F. B. (1876): A report on the invertebrate Cretaceous and Tertiary fossils of the upper Missouri county. In HAYDEN, F. V. Rep. U. S. geol. geogr. Surv. Territ., **9**: 1 xiv + 629 pp.; Washington.
- NEUMAYR, M. (1875): Die Ammoniten der Kreide und die Systematik der Ammonitiden. – *Z. dt. geol. Ges.*, **27**: 854–942; Berlin.
- NOWAK, J. (1913): Untersuchungen über die Cephalopoden der oberen Kreide in Polen. III Teil. – *Bull. int. Acad. Sci. Lett. Cracovie, Cl. Sci. Math., B.* (1913): 335–415; Cracow.
- ORBIGNY, A. D. (1840–1842): Paléontologie française: Terrains crétacés. 1. Céphalopodes: 1–120 (1840); 121–430 (1841); 431–662 (1842); Paris.
- PARKINSON, J. (1811): *Organic Remains of a Former World.*, **3**: xvi + 479 pp.; London.
- PERON, A. (1887): Note pour servir à l'histoire du terrain de la Craie. – *Bull. Soc. Sci. hist. nat. Yonne*, **40**: 43–61.
- PIETRESSON DE SAINT-AUBIN, J. (1943): Note sur la craie du département de l'Aube. – *Bull. Soc. géol. Fr.*, **13**: 343–349; Paris.
- RENZ, O. (1982): The Cretaceous ammonites of Venezuela: 132 pp.; Basel.
- REYMENT, R. A. (1954): Some new Upper Cretaceous ammonites from Nigeria. – *Colon. geol. Surv. Min. Resour. Div.*, **4**: 248–270; London.
- ,– (1971): Vermuteter Dimorphismus bei der Ammonitengattung *Benueites*. – *Bull. geol. Instn. Univ. Uppsala, N. S.*, **3**, 1: 1–18; Uppsala.
- ROBASZYNSKI, F. & AMÉDRO, F. (1980): Synthèse biostratigraphique de l'Aptien au Santonien du Boulonnais à partir de sept groupes paléontologiques: foraminifères, nannoplancton, dinoflagellés et macrofaunes. – *Révue Micropaléont.*, **22**: 195–321, pls. 1–20.
- SCHLÜTER, C. (1871–1876): Cephalopoden der oberen deutschen Kreide. – *Palaeontographica*, **21**, 1–24 (1871); **21**, 25–120 (1872); **24**, 1–144 (121–264) + x; Cassel.
- SCHLÜTER, C. (1875): Über die Gattung *Turrilites* und die Verbreitung ihrer Arten in der mittleren Kreide Deutschlands. – *Sber. niederrhein. Ges., Nat. u. Heilk.*, **32**: 27–31; Bonn.
- SHARPE, D. (1853–57): Description of the fossil remains of Mollusca found in the Chalk of England. I, Cephalopoda. – *Monogr. Palaeontogr. Soc.*, **68** pp. 1–26, 1853; 27–36, 1855; 37–68, 1857; London.
- SOWERBY, J. (1812–1822): The Mineral Conchology of Great Britain. **1**, pls. 1–9 (1812), pls. 10–14 (1813), pls. 45–78 (1814), pls. 79–102 (1815); **2**, pls. 103–114 (1815), pls. 115–150 (1816), pls. 151–186 (1817), pl. 187–203 (1818); **3**, pls. 204–221 (1818), pls. 222–253 (1819), pls. 254–271 (1820), pls. 272–306 (1821); **4**, pls. 307–318 (1821), pls. 319–383 (1822); London.

- SPATH, L. F. (1923-1943): A monograph of the Ammonoidea of the Gault. - Monogr. Palaeontogr. Soc. 787 pp. 1-72 (1923); 73-110 (1925); 111-146 (1925); 147-186 (1926); 187-206 (1927); 207-266 (1928); 267-311 (1930); 313-378 (1931); 379-410 (1932); 411-442 (1933); 443-496 (1934); 497-540 (1937); 541-608 (1939); 609-668 (1941); 669-720 (1942); 721-787, i-x (1943); London.
- , (1923): On the ammonite horizons of the Gault and contiguous deposits. - Summ. Progr. geol. Surv. Lond., for 1922: 139-149; London.
- , (1925 a): On Upper Albian Ammonoidea from Portuguese East Africa, with an appendix on Upper Cretaceous ammonites from Maputoland. - Ann. Transv. Mus., 11: 179-200; Pretoria.
- , (1925 b): Sur quelques Ammonites du Gault nommées par P. Reynès. - Anns. Mus. Hist. nat. Marseille, 20: 97-106; Marseille.
- , (1926 a): On new ammonites from the English Chalk. - Geol. Mag., 63: 77-83; London.
- , (1926 b): On the zones of the Cenomanian and the uppermost Albian. - Proc. Geol. Ass., 37: 420-432.
- STANTON, T. W. (1894): The Colorado formation and its invertebrate fauna. - Bull. U. S. geol. Surv., 106: 288 pp.; Washington.
- STOLICZKA, F. (1863-1866): The fossil cephalopoda of the Cretaceous rocks of southern India; Ammonitidae, with revision of the Nautilidae. - Mem. geol. Surv. India, Palaeont. indica, 3: 41-56, pls. 26-31 (1863); (2-5), 57-106, pls. 32-54 (1864); (6-9), 107-154, pls. 55-80 (1865); (10-13), 155-216, pls. 81-94 (1866); Calcutta.
- TAUBENHAUS, H. (1920): Die Ammoneen der Kreideformation Palästinas und Syriens. - Zeitschr. des Deutschen Palästina-Vereins, 43: 1-58; Halle.
- THOMEL, G. (1966): In: PORTHAULT, B., THOMEL, G. & VILLOUTREYS, O. DE. (1966): Étude biostratigraphique du Cénomanien du bassin supérieur de l'Estéron (Alpes-Maritimes). Le problème de la limite Cénomanien-Turonien. - Bull. Soc. géol. Fr., 8: 423-439; Paris.
- WARREN, P. S. (1930): Three new ammonites from the Cretaceous of Alberta. - Trans. R. Soc. Can., (3) 24 (4): 21-26; Ottawa.
- WHITEHOUSE, F. W. (1927): Additions to the Cretaceous ammonite fauna of eastern Australia. - Mem. Queensland Mus., 9: 109-120; Brisbane.
- WIEDMANN, J. (1965): Origin, limits and systematic position of *Scaphites*. - Palaeontology, 8: 397-453; London.
- , (1966): Stammesgeschichte und System der posttriadischen Ammonoideen; ein Überblick. - Neues Jb. Geol. Paläont. Abb., 125: 49-79; 127, 13-81; Stuttgart.
- WOODS, H. (1896): The Mollusca of the Chalk Rock; Part 1. - Q. Jl. geol. Soc. Lond. 52: 68-98; London.
- , (1952): A classification of the Cretaceous ammonites. - J. Paleont., 26: 213-222; Tulsa.
- , (1955): Notes on Cretaceous ammonites. II. The phylogeny of the Desmocerataceae and the Hoplitaceae. - Ann. Mag. nat. Hist., (12), 8: 561-575; London.
- , (1957): [Cretaceous Ammonoidea]. In MOORE, R. C. (Ed.): Treatise on Invertebrate Paleontology. Part L, Mollusca 4, Cephalopoda Ammonoidea, xxii + Ll-L490: New York.
- , (1979): The ammonites of the English Chalk Rock (Upper Turonian). - Bull. Brit. Mus. nat. Hist., (Geol.), 31: 281-332; London.
- , (1981): Cretaceous Ammonoidea. - Pp. 157-174. In HOUSE, M. R. & SENIOR, J. (Eds.). The Ammonoidea. Systematics Association Special Volume no. 18; London.
- WRIGHT, C. W. & KENNEDY, W. J. (1973): Paléontologie systematique. In JUIGNET, P., KENNEDY, W. J. & WRIGHT, C. W. (1973): La limite Cénomanien-Turonien dans la région du Mans (Sarthe): stratigraphie et paléontologie. - Ann. Paléont. (Invert.), 59: 207-242; Paris.



- WRIGHT, C. W. & KENNEDY, W. J. (1981): The Ammonoidea of the Plenus Marls and the Middle Chalk. Monogr. Palaeontogr. Soc.: 148 pp.; London.
- WRIGHT, C. W. & WRIGHT, E. V. (1951): A survey of the fossil Cephalopoda of the Chalk of Great Britain. Monogr. Palaeontogr. Soc.: 1-40; London.
- ZITTEL, K. A. (1884): Handbuch der Palaeontologie. Abt. 1, (Lief 3), Cephalopoda: 329-522; Munich & Leipzig.

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