

## MIDDLE JURASSIC NAUTILOIDEA FROM WESTERN FRANCE

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*Abstract.* The Middle Jurassic shelf margin limestones and marly limestones of Western France yield quite numerous Nautilida. This record is here described for the first time in detail, nine genera and more than forty species, whose range rarely exceeds one or two ammonite biozones, constitute a rather precise tool to date Middle Jurassic beds. Each taxon is placed in an accurate biostratigraphical chart; a new genus, *Pictonautilus* nov. gen., is described. The stratigraphical range of *Cenoceras*, *Digonioceras* and Gen. B n. ? (sensu Chirat 1997) is extended up to the Middle Callovian. In the Jurassic successions of Poitou, Nautilida always represent a minor part of the fossil record and they are more abundant in four levels: Middle Aalenian, base of Upper Bajocian, Lower Bathonian and top of Middle Bathonian. Dwarf Nautilida (*Paracenoceras*) and species showing more folded septa and a subventral siphuncle (*Pseudaganides*) or strongly ribbed specimens (*Cymatonautilus*) are characteristic of stable open-shelf environments (Callovian), whereas large shelled nautilus would be mostly present during deepening episodes. The geographical extension of many taxa indicates a provincialism that fits with that of ammonites of the same period.

*Riassunto.* I calcari e le marne calcaree del margine di piattaforma del Giurassico medio della Francia occidentale hanno fornito Nautilida abbastanza numerosi. Questa documentazione è qui descritta in dettaglio per la prima volta, nove generi e più di quaranta specie, la cui distribuzione raramente supera una o due biozone ad ammoniti, e costituisce uno strumento piuttosto preciso per datare gli strati del Giurassico medio. Ogni taxon è posto in un accurato diagramma biostratigrafico; viene descritto un nuovo genere, *Pictonautilus* nov. gen. La distribuzione stratigrafica di *Cenoceras*, *Digonioceras* e Gen. B n. ? (sensu Chirat) viene esteso fino al Calloviano medio. Nelle successioni giurassiche del Poitou, i Nautilida rappresentano sempre una parte minore della documentazione fossile, e sono più abbondanti in quattro livelli: Aaleniano medio, base del Bajociano superiore, Bathoniano inferiore e sommità del Bathoniano medio. I Nautilida nani (*Paracenoceras*), le specie che mostrano setti più piegati ed un sifone subventrale (*Pseudaganides*), e gli esemplari fortemente costati (*Cymatonautilus*) sono caratteristici di ambienti stabili di piattaforma aperta (Calloviano), mentre i nautili con grandi conchiglie sono maggiormente presenti durante gli episodi di approfondimento. L'estensione geografica di molti taxa indica un provincialismo che coincide con quello degli ammoniti durante lo stesso periodo.

### Introduction

Well known for its rich ammonite fauna, the Middle Jurassic shelf margin limestones and marly limestones from the Seuil du Poitou (Western France) were intensively studied during the last forty years. In spite of frequent discontinuities throughout the succession, most biozones recognised elsewhere in Western Europe have been found, except for the Middle Bathonian, where the *Tulites subcontractus* and *Morrisiceras morrissi* Zones are missing (Mangold et al. 1971). Many biohorizons and subzones of large extension (Gabilly 1964; Gabilly et al. 1971; Cariou 1974; 1984) have been defined here. From Aalenian to Callovian, these levels also yield quite numerous Nautilida that have never been studied by these authors. Only few of these fossils were described by Tintant (1969; 1980; 1987; 1994). For the last twenty years, beside the other fossils, I carefully collected and identified more than forty species of Nautilida, mostly on the North Aquitaine border of the Seuil du Poitou. This paper presents the first results of such a research.

### Systematics and stratigraphic distribution

Most of the Middle Jurassic fossiliferous beds of Poitou contain Nautilida. Fig. 1 indicates the biostratigraphical range for each genus and species, in a detailed biostratigraphical chart based on ammonites. Most Nautilida are adults and always associated with ammonites. Their frequency increases throughout four levels: Lower and Middle Aalenian, base of Upper Bajocian, Lower Bathonian and top of Middle Bathonian, which correspond to transgressive units (Gonnin et al. 1992; 1993). Till now, the *Graphoceras concavum* (Late Aalenian), *Hyperlioce-*

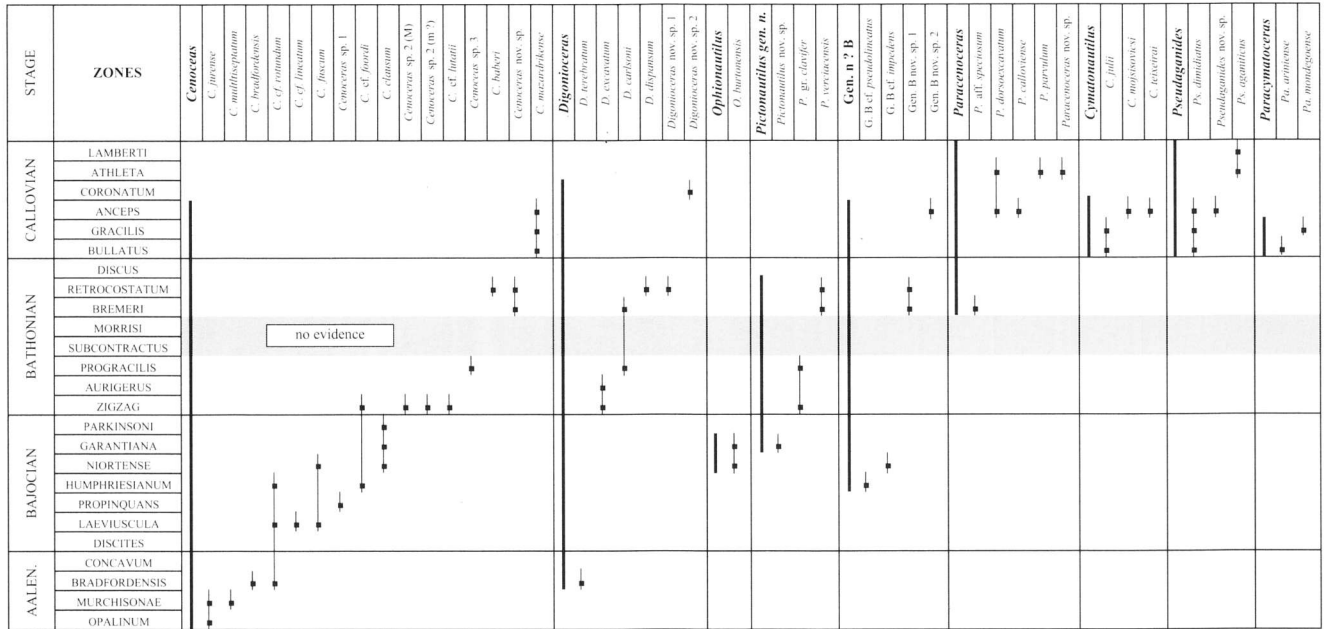


Fig. 1 - Stratigraphic distribution of the Nautilida within the Middle Jurassic of Western France, according to the biozonal scheme proposed by the Groupe Français d'Etudes du Jurassique (1997).

*ras discites* (Early Bajocian) and *Clydonoceras discus* (Late Bathonian) Zones have not yielded any specimen. The adopted classification is that proposed by Tintant & Kabamba (1983).

Cenoceratidae Tintant & Kabamba, 1983

*Cenoceras* Hyatt, 1883

*Cenoceras*, a world-wide taxon which appears in the Upper Triassic from New-Zealand (Kummel 1956), is here restricted to shells with rounded section, usually wider than high; their suture line shows shallow ventral and lateral lobes. The body chamber section often widens and its ventral part flattens in the adult stage.

show the characteristic sulcate venter and their ventral lobe is not deep enough. Inner whorls are involute, showing their close relationship with other *Cenoceras*. The last whorl becomes very evolute. The closest species for these fossils is *Cenoceras mazardrikense* (Sarkar, 1964) from Baluchistan. Another interesting aspect of such specimens is their perfect similarity with contemporary *Procymatoceras pictonicum* Tintant (1969), the only difference being the ribbing that is missing on *Cenoceras mazardrikense* (Sarkar); at most *P. pictonicum* could be kept as a subspecies of Sarkar's taxon. *Cenoceras* survived at least until Middle Callovian (*Reineckeia anceps* Zone) (Fig. 1).

Specimens	D	H	h	W	w	U	U	W/H
<i>C. mazardrikense</i> (PB49)	440 mm	180 mm	0.40	240 mm	0.54	110 mm	0.25	1.33
	200	95	0.47	120	0.60	40	0.20	1.26
" <i>P. pictonicum</i> " (PB65)	380	175	0.46	200	0.52	80	0.21	1.14
	280	140	0.50	170	0.60	55	0.19	1.21

D = diameter, H = height, h = H/D, W = width, w = W/D, U = umbilicus width, u = U/D  
PB = collections of Patrick Branger.

In this taxon I also include large specimens up to 45 cm in diameter, that are often found in the Lower and Middle Callovian and probably already in the Upper Bathonian. These Nautilida cannot belong to the *Paraceno-* *noceras* group because, even at a large size, they never

*Digonoceras* Hyatt, 1894

Recently rehabilitated by Chirat (1997), the genus *Digonoceras* corresponds to Jurassic Nautilida (Toarcian to Bathonian) which section is usually wider than high

and with a wide umbilicus. Characteristic of this genus is the existence of an angular margin that borders the umbilical wedge and appears more or less early during the ontogenesis. At present, *Digoniceras* has not yet been recorded outside Europe and Arabia. The most interesting specimen from Poitou (Pl. 1, fig. 6) comes from the lower part of the *Erymnoceras coronatum* Zone (Middle Callovian) of Exoudun; it is very evolute ( $U/W = 0.29$ ) and densely septated (20 to 24 in the inner whorls). This new species represents a still unnamed species and is the first record of this genus within the Callovian (Fig. 1).

#### *Ophionutilus* Spath, 1927

*Ophionutilus* represents a minor part of the Nautilida found in the Seuil du Poitou area. These large and evolute shells are here represented by the single species *Ophionutilus burtonensis* (Foord & Crick, 1890) from the Upper Bajocian layers (*Strenoceras niortense* and *Garantiana garantiana* Zones) (Fig. 1).

#### *Pictonutilus* gen. n.

**Type species.** 1923 *Nautilus verciacensis* Lissajous, p. 48, pl. II, fig. 1, 1a.

**Origin of the name.** From pictonicus, latin word for Poitou.

The type species has only been figured by Lissajous (1923) and cited by Tintant (1984b; 1987). *Pictonutilus* extends from Upper Bajocian to Late Bathonian.

**Discussion.** Most of the Nautilida here considered as a new genus were previously ranged into the genus *Paracenoceras* (Tintant 1984b; 1987, p. 92) from which they differ significantly for their venter that is never grooved and is bordered by sharp angular margins. The shape of the venter is quite similar to the one of *Somalinautilus* Spath, 1927, which is probably the closest genus. Nevertheless the latter differs mostly in the feature of the suture line that shows a lateral saddle according to the type species described by Dacqué (1905, pl. III, fig. 3a). Only known by the type species, *Somalinautilus* is also separated from *Pictonutilus* by an important stratigraphic gap (Kimmeridgian) (Fig. 1).

#### Species recognised as *Pictonutilus*

- *Pictonutilus verciacense* (Lissajous), Middle and Upper Bathonian (*Cadomites bremeri* and *Proberticoceras retrocostatum*) Zones: Pl. 1, figs. 1, 2, 3.

- *Pictonutilus* gr. *clavifer* (Tintant), Lower and ? Middle Bathonian (*Zigzagiceras zigzag* and *Procerites progracilis* Zones): Pl. 1, figs. 4, 5.

- *Pictonutilus* nov. sp., Upper Bajocian (*Garantiana garantiana* Zone): Pl. 1, fig. 6.

Specimens	D	H	h	W	w	U	U	W/H
Holotype	123mm	72	0.58	55	0.44	10	0.08	0.76
PB50	110	58	0.52	64	0.58	7	0.06	1.10
	88	53	0.60	50	0.56	6	0.06	0.94
	77	44	0.57	43	0.55	5	0.06	0.97
PB51	99	56	0.56	52	0.52	6	0.06	0.92
	67	36	0.53	39	0.58	6	0.08	1.08
PB52	120	64	0.53	60	0.50	12	0.10	0.93
	52	33	0.63	34	0.65	3	0.05	1.03
PB53	120	64	0.53	59	0.49	6	0.05	0.92
	88	50	0.56	47	0.53	5	0.05	0.94
	77	45	0.58	35	0.45	5	0.06	0.77

**Description.** Small to middle size Nautilida whose whorls are generally higher than wide. Juvenile whorls are rounded; the section becomes rapidly trapezoidal. The narrow and flat or slightly rounded venter is bordered by sharp angular margins sometimes carinate. Sides are slightly rounded with maximum section width near the umbilical edge. The umbilicus, very narrow, is probably closed when the shell is completely preserved. The septa show a wide, shallow, lateral lobe and a rather deep ventral lobe. The body chamber of the adult widens.

Gen. n.? B (sensu Chirat 1997).

**Discussion.** This unnamed genus corresponds to middle to large size Nautilida with compressed section ( $W/H < 1$ ) and oval shaped except at the nepionic stage where the shells are rounded, suggesting a close phyletic link with *Cenoceras*. The umbilicus is mostly closed. A broad lateral lobe spreads on their flanks whereas the ventral lobe is shallow or non-existent. These cephalopods probably belong to the "groupe de *Nautilus aravis* Dumortier" (Tintant 1984a) called Gen. nov. ? B *aravis*

(Dumortier) by Chirat (1997, p. 274). This latter author did not give any name to the Nautilida of this group, because he suggested that they could be related to the genus *Grypoceras* from the Upper Triassic.

In Poitou, the first representatives of Gen. nov. ? B have been recorded from Lower Bajocian (*Stephanoceras humphriesianum* Zone, *Dorsetensia romani* Subzone). They are specially abundant in the Middle Bathonian (*Cadomites bremeri* Zone) and extend up to the Middle Callovian (*Reineckeia anceps* Zone).

#### Species recognised as Gen. n.? B

Gen. B cf. *pseudolineatus* (Foord & Crick), Lower Bajocian (*Stephanoceras humphriesianum* Zone): Pl. 3, fig. 3.

Gen. B cf. *impedens* (Crick), Upper Bajocian (*Strenoceras niortense* Zone).

Gen. B nov. sp. 1, Middle and Upper Bathonian (*Cadomites bremeri* and *Probehticoceras retrocostatum* Zones): Pl. 1, fig. 7, Pl. 2, fig. 1.

Gen. B nov. sp. 2, Middle Callovian (*Reineckeia anceps* Zone): Pl. 2, fig. 2.

#### *Paracnoceras* Spath, 1927

In spite of its probably polyphyletic origin (Tintant & Kabamba 1983, p. 572), I refer to this group all the Nautilida that show a true sulcate venter. Most of the specimens collected from the Dogger beds of Western France are dwarf species showing this sulcate venter at an early stage (Pl. 3, figs. 4, 5, 6). These *Paracnoceras* are rare, the oldest one has been collected within the Middle Bathonian layers (*Cadomites bremeri* Zone) from Niort. Callovian species of *Paracnoceras* are more numerous but ever dwarf (Fig. 1).

#### *Cymatonautilus* Spath, 1927

These strongly ribbed nautiloids studied by Tintant (1969) are never abundant: only the Callovian beds provide such forms (Fig. 1). *Cymatonautilus julii* (d'Orbigny, 1850) characterises the *Bullatimorphites bullatus* and *Macrocephalites gracilis* Zones while *C. mojsisovicsi* (Neumayr, 1870) and *C. teixeirai* Tintant, 1980 are typical of the *Reineckeia anceps* Zone.

#### Pseudonautilidae Shimansky & Erlanger, 1955

This family groups Nautilida with sinuous sutures. *Pseudaganides* is ribless whereas *Paracymatoceras* is ribbed.

#### *Pseudaganides* Spath, 1927

*Pseudaganides* is a quite frequent genus in Callovian beds and has been well documented by Marchand & Tintant (1971). *Pseudaganides dimidiatus* Marchand & Tintant is older (Lower and Middle Callovian) than *Ps. aganiticus* (Schlothheim) (Upper Callovian, *Peltoceras athleta* and *Quendstedtoceras lamberti* Zones) (Fig. 1).

#### PLATE 1

- Fig. 1,2 - *Pictonautilus verciacensis* (Lissajous, 1923). PB50, adult, D = 110 mm (X 0,7). Upper Bathonian (*Probehticoceras retrocostatum* Zone), Saint-Maixent (Deux-Sèvres). 2: ventral view of the same specimen showing the narrow and flat venter (X 0,6).
- Fig. 3 - ? *Pictonautilus verciacensis* (Lissajous, 1923). PB66, adult, D = 38 mm (X 1,6). Possible microconch. Upper Bathonian (*Probehticoceras retrocostatum* Zone), Saint-Maixent (Deux-Sèvres).
- Fig. 4 - *Pictonautilus* gr. *clavifer* (Tintant, 1994). PB54, adult, D = 50 mm (X1,6). Lower Bathonian (*Zigzagiceras zigzag* Zone), Tauché (Deux-Sèvres)
- Fig. 5 - *Pictonautilus* gr. *clavifer* (Tintant, 1994). PB55, adult, D = 45 mm (X1,25). Lower Bathonian (*Zigzagiceras zigzag* Zone), la Crèche (Deux-Sèvres), ventral view.
- Fig. 6 - *Pictonautilus* nov. sp. PB30, adult, D = 160 mm (X 0,42). Upper Bajocian (*Garantiana garantiana* Zone, *Garantiana subgaranti* Subzone), Chauray (Deux-Sèvres). The typical flat ventral part bordered by angular margins appears only on the last half whorl.
- Fig. 7 - Gen. B nov. sp. 1, PB57, adult, D = 440 mm (X 0,3). Middle Bathonian (*Cadomites bremeri* Zone), Niort (Deux-Sèvres). PB = Branger collection.

#### PLATE 2

- Fig. 1 - Gen. B nov. sp. 1. PB68, phragmocone and beginning of the body chamber of an adult, D = 280 mm (X 0,38). Middle Bathonian (*Cadomites bremeri* Zone), Niort (Deux-Sèvres). The sides of this specimen wear fine ribs at any stage of its growth.
- Fig. 2 - Gen. B nov. sp. 2. PB44, adult, D = 225 mm (X 0,42). Middle Callovian (*Reineckeia anceps* Zone), Pamproux (Deux-Sèvres).
- Fig. 3 - *Cenoceras baberi* (Morris & Lycett, 1850). PB27, adult, D = 97 mm (X 0,62). Upper Bathonian (*Probehticoceras retrocostatum* Zone), Niort. Both sides show a shallow groove on their external part, may be of teratological origin.
- Fig. 4 - *Digoniceras dispansum* (Morris & Lycett, 1850). PB28, phragmocone of an adult, D = 135 mm (X0,6). Upper Bathonian (*Probehticoceras retrocostatum* Zone), Saint-Maixent (Deux-Sèvres).
- Fig. 5 - *Digoniceras* nov. sp. 1. PB38, adult, D = 135 mm (X 0,58). Upper Bathonian (*Probehticoceras retrocostatum* Zone), Saint-Maixent (Deux-Sèvres).
- Fig. 6 - *Digoniceras* nov. sp. 2. PB35, phragmocone, D = 210 mm (X 0,45). Middle Callovian (*Erymnoceras coronatum* Zone, *Erymnoceras baylei* Subzone), Exoudun (Deux-Sèvres). PB = Branger collection.

#### PLATE 3

- Fig. 1 - *Pseudaganides* nov. sp. PB56, adult, D = 300 mm (X 0,34). Middle Callovian (*Macrocephalites gracilis* Zone, *Indosphinctes patina* Subzone), Salles (Deux-Sèvres).
- Fig. 2 - *Cenoceras* nov. sp. PB60, adult, D = 83 mm (X 1,10). Upper Bathonian (*Probehticoceras retrocostatum* Zone), Niort (Deux-Sèvres). The body chamber wears clavi that probably correspond to old peristomes. Such an ornamentation have been observed in other specimens.
- Fig. 3 - Gen. nov. sp. 1 cf. *pseudolineatus* (Foord & Crick, 1890). PB17, phragmocone, D = 98 mm (X 0,71). Lower Bajocian (*Stephanoceras humphriesianum* Zone, *Dorsetensia romani* Subzone), Celles-Sur-Belle (Deux-Sèvres).
- Fig. 4, 5 - *Paracnoceras* aff. *speciosum* Tintant, 1987. PB67, phragmocone, D = 47 mm (Fig. 4: X 1,38; Fig. 5: X 1,5) Middle Bathonian (*Cadomites bremeri* Zone), Niort.
- Fig. 6 - *Paracnoceras* nov. sp. N11, phragmocone, D = 38 mm (X 1,52). Upper Callovian (*Peltoceras athleta* Zone), Montreuil-Bellay (Maine et Loire). The venter part of this dwarf specimen is grooved on the whole last whorl. N = Rantien collection., PB = Branger collection.

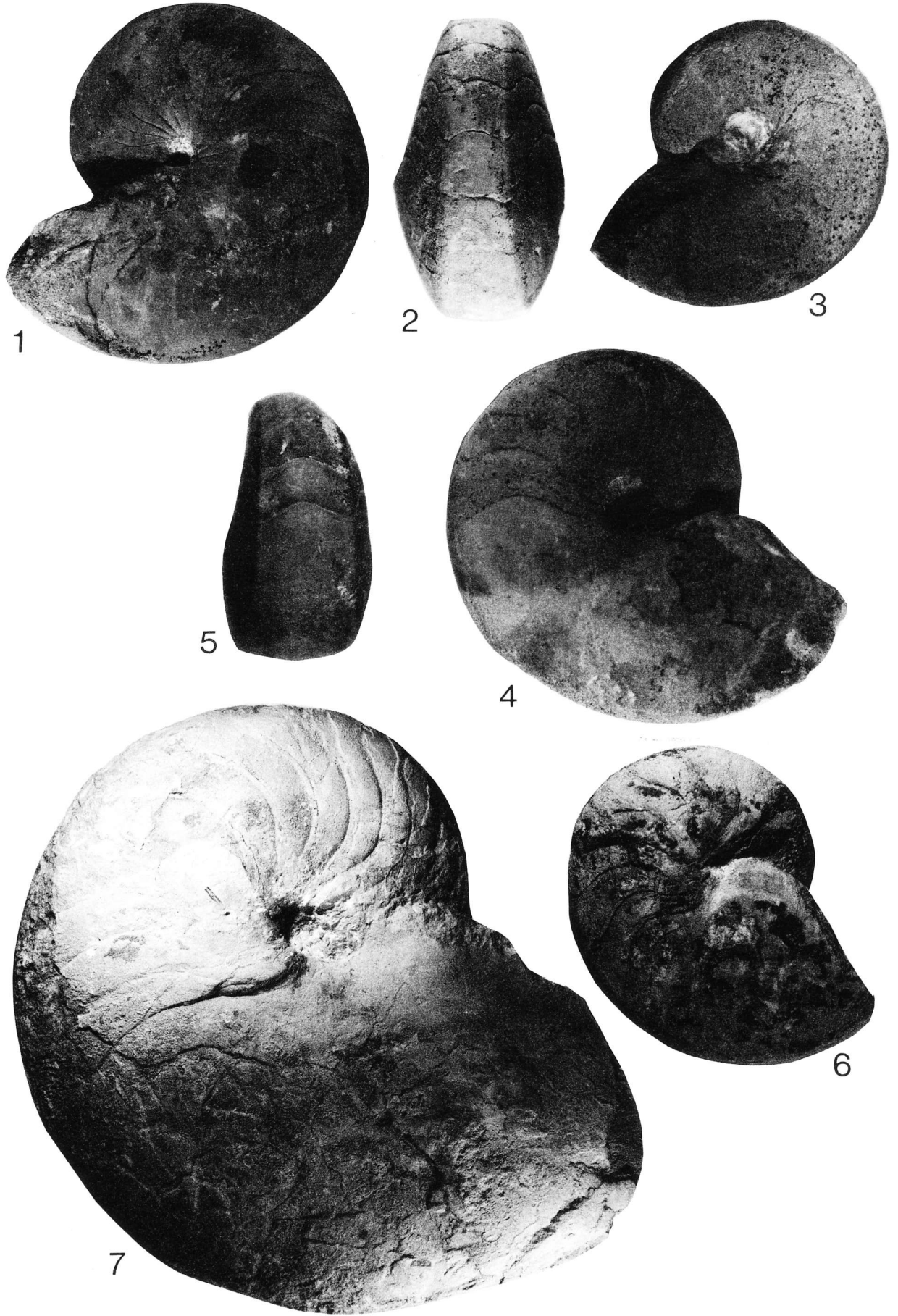
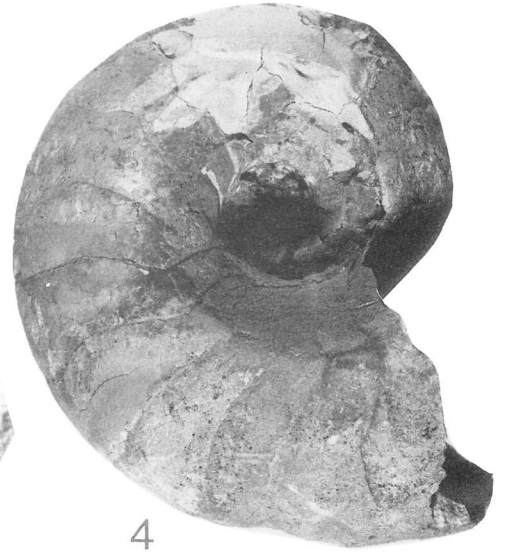


PLATE 1



1



4



2



6



3



5

PLATE 2



1

4



5



3



2



6

These rare Nautilida are represented in the Lower Callovian beds by two species (Fig. 1): *Paracymatoceras ariniense* Tintant from the *Bullatimorphites bullatus* Zone and *Paracymatoceras mondegoense* Tintant from the *Macrocephalites gracilis* Zone. Comparing my specimens with this latter and *Nautilus clerici* described by Petitclerc (1915, pl. XII, fig. 1) from the Callovian of Pamproux, *Paracymatoceras mondegoense* Tintant could be regarded as a junior synonym of *Nautilus clerici* because their shells present the same shape and the same ribbing. Nevertheless more studies are needed before reaching any definitive statement on the species of *Paracymatoceras*.

#### Affinities of nautiloid assemblages

Most of the Nautilida collected from the Aalenian, Bajocian and Bathonian of West-Central France show many affinities with contemporary faunas from England (Morris & Lycett 1850; Foord & Crick 1890; Crick 1898), Normandy (Chirat 1997) and South-Eastern France (Tintant 1984 b). Within the Lower and Middle Callovian, *Paracenoceras calloviense*, *P. dorsoexcavatum*, *Cymatonautilus*, *Pseudaganides*, *Cenoceras mazardrikense* (= *Paracenoceras noetlingi* Halder, pers. comm. from K. Halder) and *C. marzardrikense pictonicum* are also represented in Kutch, India (Halder 2000); in fact, these Callovian forms seem to be characteristic of the Submediterranean and Indo-East African provinces, fol-

lowing the schemes known for ammonites at the same time (Cariou et al. 1990).

#### Conclusion

In West-Central France, the first general approach of this scantily studied group improves our knowledge about Nautilida and shows their great diversity during the Middle Jurassic. More than forty species whose range rarely exceeds one or two ammonite biozones constitute a rather precise tool for chronostratigraphical interpretations. The geographical extension of many nautiloids indicates a provincialism that fits with these of ammonites. From a paleontological point of view, the new genus *Pictonautilus* clarifies the systematic of Bathonian nautiloids. The stratigraphical range of *Cenoceras*, *Digonoceras* and Gen. B n. ? is extended up to the Middle Callovian and we have a better knowledge of the succession of the different species of *Cymatonautilus*. Dwarf Nautilida (*Paracenoceras*), showing more folded septa and a subventral siphuncle (*Pseudaganides*), strongly ribbed specimens (*Cymatonautilus* and *Paracymatoceras*), seem to be characteristic of the stable open shelves environments of the Callovian. But more studies will be necessary before considering this group as a tool to understand paleoenvironmental changes.

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