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The d'Orbigny Palaeontological Collection of the National Museum of Natural History and Science, Lisbon, Portugal: Historical perspective and revision of Cretaceous Cephalopoda

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ABSTRACT

The study in course of the materials rescued from the fire that in 1978, destroyed much of the palaeontological collections of the current National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência) of Lisbon, has allowed the rediscovery of several Cretaceous cephalopods (and the corresponding original labels) that the renowned palaeontologist Alcide d'Orbigny, according to the wishes of the emperor Napoleon III, offered to the king Pedro V in 1855, in order to re-establish the good relationships between France and Portugal. These historical specimens correspond to nautiloids: *Angulithes triangularis* de Montfort, 1808; ammonoids: *Phylloceras (Hypophylloceras) tethys* (d'Orbigny, 1840), *Ptychophylloceras (Semisulcatoceras) semisulcatum* (d'Orbigny, 1840), *Neolissoceras gracianum* (d'Orbigny, 1840), *Pleurohoplites (Pleurohoplites) renauxianus* (d'Orbigny, 1840), *Acanthoceras rhomagensis* (Brongniart, 1822), *Coilopoceras requienianus* (d'Orbigny, 1840) and *Turrilites (Turrilites) costatus* Lamarck, 1801; and belemnoids: *Duvalia dilatata* (de Blainville, 1827), *Hibolithes subfusiformis* (Raspail, 1829) and *Belemnitella mucronata* (von Schlotheim, 1813). All of them come from outcrops relevant for the French stratigraphy, and they seem to have been selected by d'Orbigny with a representative criterion.

RÉSUMÉ

La Collection paléontologique de d'Orbigny du Muséum national d'Histoire naturelle et de la Science, Lisbonne, Portugal: Perspective historique et révision des céphalopodes du Crétacé.

L'étude en cours des matériaux récupérés après l'incendie qui a détruit, en 1978, une grande partie des collections paléontologiques du Muséum national d'Histoire naturelle et de la Science (Museu Nacional de História Natural e da Ciência) de Lisbonne, a permis la redécouverte de plusieurs céphalopodes du Crétacé (et de ses étiquettes originales associées) que le célèbre paléontologue Alcide d'Orbigny a offert au roi Pedro V, en 1855, selon les souhaits de l'empereur Napoléon III, pour rétablir les bonnes relations entre la France et le Portugal. Ces spécimens historiques correspondent à des nautiloïdes : *Angulithes triangularis* de Montfort, 1808 ; à des ammonoïdes : *Phylloceras (Hypophylloceras) tethys* (d'Orbigny, 1840), *Ptychophylloceras (Semisulcatoceras) semisulcatum* (d'Orbigny, 1840), *Neolissoceras gracianum* (d'Orbigny, 1840), *Pleurohoplites (Pleurohoplites) renauxianus* (d'Orbigny, 1840), *Acanthoceras rhomagensis* (Brongniart, 1822), *Coilopoceras requienianus* (d'Orbigny, 1840) et *Turrilites (Turrilites) costatus* Lamarck, 1801 ; et à des belemnoïdes : *Duvalia dilatata* (de Blainville, 1827), *Hibolithes subfusiformis* (Raspail, 1829) et *Belemnitella mucronata* (von Schlotheim, 1813). Tous proviennent d'affleurements importants pour la stratigraphie française, et semblent avoir été sélectionnées par d'Orbigny avec un critère représentatif.

KEY WORDS

Alcide d'Orbigny,
historical types,
Nautiloidea,
Ammonoidea,
Belemnitida,
Cretaceous.

MOTS CLÉS

Alcide d'Orbigny,
types historiques,
Nautiloidea,
Ammonoidea,
Belemnitida,
Crétacé.

INTRODUCTION

The young king Dom Pedro V of Portugal (born in Lisbon, 1837; proclaimed in 1853; died in Lisbon, 1861) was an enthusiastic for Science, with a marked passion for Natural History, and a connoisseur in Ornithology and Conchology, who was also acquainted with Palaeontology (Fig. 1A). His memoirs, and especially the included comments about his voyages in Europe in 1854 and 1855, show a critical but constructive attitude, and they report (among others) his state visits to the British Museum (Natural History) in London, the UK, and especially to the National Museum of Natural History (Muséum National d'Histoire Naturelle: MNHN) in Paris, France (Antunes & Taquet 2002).

During his stay in the French capital in 1855, under the auspices of the emperor Napoleon III (1808-1873), Pedro V met several professors and naturalists of the MNHN, among which Alcide Dessalines d'Orbigny (1802-1857), one of the world's greater and renowned palaeontologists, and author of the encyclopaedic work *Paleontologie Française*, published between 1840 and 1860 (Fig. 1B). These visits, and the interest

revealed by the king, represented an appropriate occasion for France to compensate the war requisitions of several hundred specimens of Brazilian mammals, birds, reptiles and fishes held at the Royal Museum of Ajuda, in Lisbon, Portugal, made during the Napoleonic invasion of 1807-1808 (Daget & Saldanha 1989; Almaça 1996).

As an important contribution to re-establish the good relationships and the fruitful cooperation between France and Portugal, and according to the wishes of Napoleon III, the MNHN gave to Pedro V an important collection of 312 taxidermy birds, and d'Orbigny offered him a large collection of fossils, mainly Mesozoic invertebrates selected from his personal study material. This precious gift, composed of 1722 palaeontological specimens, belonging to 586 Palaeozoic and Mesozoic species, and accompanied by a handwritten catalogue, arrived to Lisbon in 1856, where it was held at the Royal Museum (d'Almeida 1868; Costa 1938) (Fig. 1C). Soon after the premature death of Pedro V, both the d'Orbigny Collection and the remaining valuable mineralogical, zoological and botanical specimens of the Royal Museum, were donated in 1863 to the recently created National Museum,

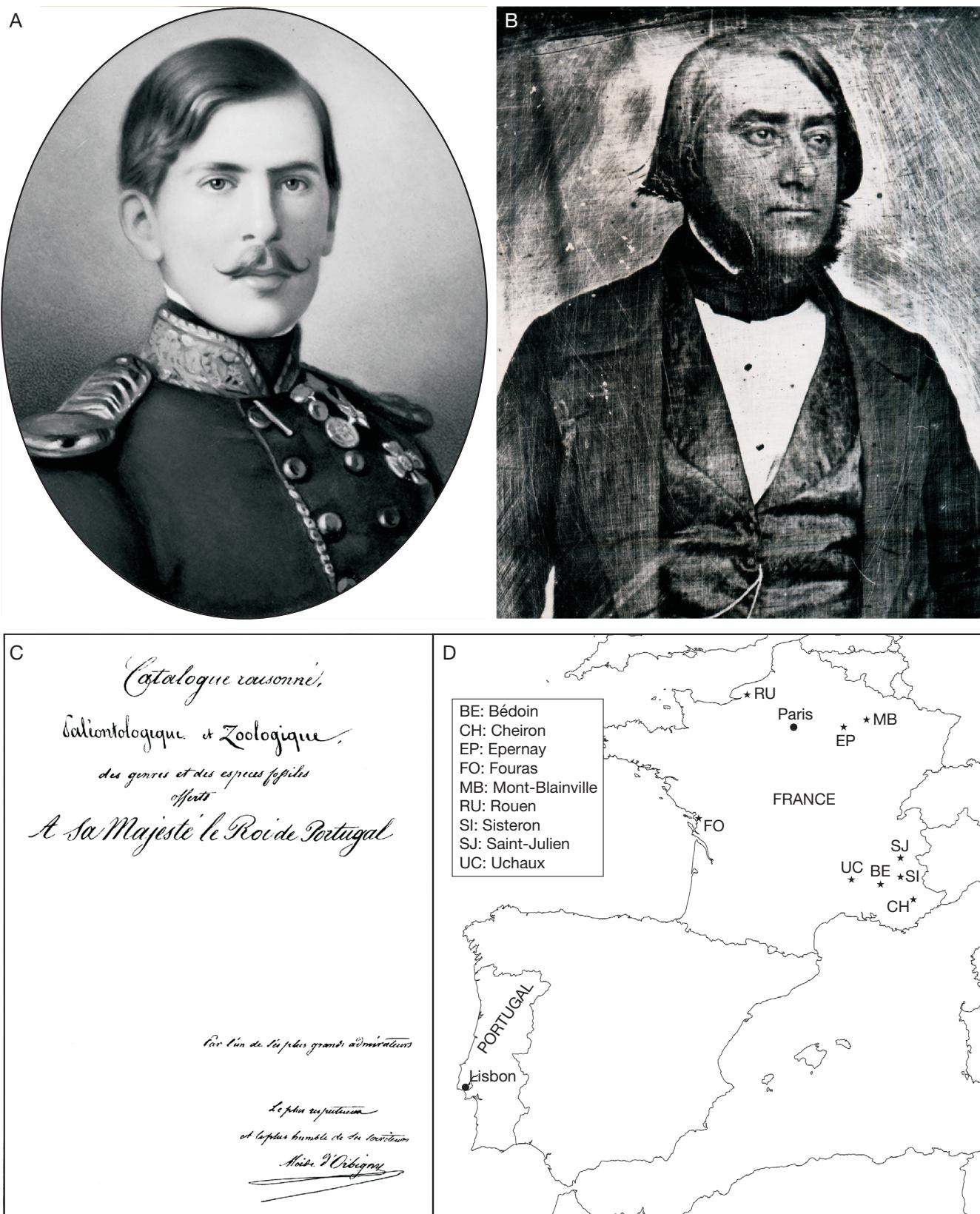


FIG. 1. — **A**, The king Dom Pedro V of Portugal (1837-1861), in a c. 1861 enamel on copper (modified), Royal Collection Trust, London, UK; **B**, the famous French palaeontologist Alcide d'Orbigny, in a 1843 daguerreotype, Muséum national d'Histoire naturelle, Paris; **C**, cover page of the original handwritten catalogue of the collection offered by d'Orbigny to Pedro V (Costa 1938); **D**, geographic location of the sections where the here studied types of Cretaceous cephalopods of the d'Orbigny Palaeontological Collection of the National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência) were collected and other cited outcrops.

housed at the Polytechnic School of Lisbon, being definitively incorporated into its rich scientific heritage (Choffat 1885; Felismino 2014).

The National Museum, called at that time as National Museum of Natural History and currently as National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência: MUHNAC), suffered on March 18, 1978 a devastating fire that destroyed much of the historical building, mostly affecting the Zoological and Mineralogical exhibition and storage rooms, with the loss of most scientific and historical collections. As usual in this kind of sinister, the water used to extinguish the fire was as harmful as the fire itself to the contents of the affected areas. That dramatic night unique items disappeared, including many inherited from the former 18th and 19th centuries royal collections. These losses included all the bird specimens offered by Pedro V to the Royal Museum and, seemingly, the original handwritten catalogue of the fossil invertebrates selected and donated by d'Orbigny. Fortunately, a great part of specimens of this palaeontological collection, including many of the original labels, were rescued from the disaster (Antunes & Taquet 2002).

The research in course over the palaeontological historical collections held at the Science Museum of the University of Coimbra, Portugal (Callapez *et al.* 2015), and at the MUHNAC, has already allowed the rediscovery of the holotypes of the significant Upper Cretaceous ammonite species *Vascoceras gamai* Choffat, 1898 (type of the genus) and *Vascoceras barcoicense* (Choffat, 1898) (Barroso-Barcenilla *et al.* 2015), which have been considered lost for many years. With this paper, the authors revise part of the d'Orbigny Collection, presenting the recovered Cretaceous cephalopods with their original labels, most of them figured here for the first time, and analysing these historical specimens in detail from a systematic and biostratigraphic point of view.

HISTORICAL PERSPECTIVE

After an auspicious beginning at the second half of the 18th century, when the Royal Museum of Ajuda (Museu Real da Ajuda), in Lisbon (1769), the Cabinet of Natural History of the University of Coimbra (Gabinete de História Natural da Universidade de Coimbra), in Coimbra (1772), and the Royal Academy of Sciences (Academia Real das Ciências), in Lisbon (1779) were created for the advances on collecting and experimental studies of Natural History in Portugal, these institutions were considerably affected by more than three decades of political instability and intermittent conflicts. During the Peninsular War, the country was invaded for several times by the Napoleonic army, and permanently occupied between 1807 and 1808. The rich Natural History collections of the Royal Museum of Ajuda lost many of their valuable specimens, which were wisely selected and sent to Paris, under orientation of Geoffroy Saint-Hilaire (1772–1844), a predecessor of d'Orbigny at the MNHN (Sequeira 1949; Antunes 1986, 2000).

The next two decades were also marked by the rising of Liberalism against the instituted Absolutist monarchy, a process that culminated with a civil war (1828–1834) that left the country exhausted and bankrupted. Most scientific activities were ceased at that time, and for their renewal it was necessary to wait for the year of 1837, when a new liberal government promulgated innovative laws destined to modernize the education, encouraging the regeneration of collecting and experimental studies. The Polytechnic School of Lisbon (Escola Politécnica de Lisboa) (1837) was created within this spirit, and supplied with a museum and a botanic garden to support the study of geological and biological sciences, as a modern alternative to the University of Coimbra (Universidade de Coimbra).

By this time, most remaining collections of the Royal Museum of Ajuda were transferred to the Royal Academy of Sciences. Later on, in 1858, the lead teacher and naturalist José Barboza du Bocage (1823–1907) was able to demonstrate that the Polytechnic School of Lisbon was the obvious place to house all these collections of Natural History, as the bulk of a true National Museum (Museu Nacional) with large exhibition rooms and capability for research, experimental and teaching activities. By royal decree of March 9 of 1858, Pedro V ordered the incorporation of the collections to this institution, having the idea to stimulate the birth of a large and modern museum inspired in those of Paris and other European capitals.

By the year of 1863, the d'Orbigny Collection was incorporated in the Mineralogical Section (Secção Mineralógica) of the Museum, together with other royal collections donated by the king Dom Luís I (1838–1889), after the premature death of his brother Pedro V, for many known as the "King Naturalist" (Ferreira 1893). The specimens of d'Orbigny were already mentioned in early catalogues of the collections (d'Almeida 1868; Ferreira 1893), and by Costa (1938) in the centenary of the Polytechnic School of Lisbon. António Sousa Torres (1876–1958), keeper of collections between 1919 and 1946, also paid special attention to this historical legacy. With the purpose of a review accordingly to an updated taxonomic classification, this naturalist requested a government scholarship to visit the MNHN, a work carried out between December 1931 and January 1932, under supervision of the French palaeontologist Marcellin Boule (1861–1942). However, due to the priority given to other issues, Sousa Torres never published the results of his researches in Paris, and the current whereabouts of his work notes is unknown (Brandão 2011).

Almost 40 years after the devastating fire of 1978, and bearing in mind that additional specimens and labels are being recovered, and that the curation of this collection is still being improved, an estimated number of 1150 specimens from the 1722 original samples has been rescued and remain carefully stored at the MUHNAC. Despite the absence of the handwritten catalogue of 1856, the observation of specimens and labels, and their comparison with the partial listing available from d'Almeida (1868), allow to infer the original purpose of systematic and biostratigraphic representativeness of the collection.

Most of specimens are Jurassic and Cretaceous invertebrates from France described in the *Paléontologie Française* (d'Orbigny 1840–1860) and the *Prodrome de Paléontologie Stratigraphique Universelle* (d'Orbigny 1850), and organised accordingly to the Mesozoic stages recognized by the palaeontologists of that time (Fischer 2002; Lauriat-Rage 2002). By this way, the d'Orbigny Collection of the MUHNAC stand out as a large biostratigraphic sample with doubles of the original one housed in the MNHN (Costa 1938), being especially useful to compare with correlative fossil assemblages of Portugal. For this purpose, the Swiss geologist Paul Léon Choffat (1849–1919) that undertook for the Geological Services (Serviços Geológicos) of Portugal the detailed study of the Mesozoic of this country, has frequently used specimens of the d'Orbigny Collection, including its cephalopods.

This taxonomic group was undoubtedly one of the most representatives of the original collection. D'Almeida (1868) referred to 116 species of non-heteromorph ammonites ("genero *Ammonites*"), including several of colossal size ("grandeza colossal"). Specifically, the Cretaceous stages were recorded by 54 ammonite species (Neocomian [including the Urgonian]: 24; Aptian: 9; Albian: 14; Cenomanian: 6; Turonian: 1). There was also a set of 5 nautiloids (Neocomian: 2; Albian: 1; Cenomanian: 2) and 4 belemnitids (Neocomian: 2; Aptian: 1; Senonian: 1), thus totalizing 63 species of Cretaceous Cephalopoda.

REVISION OF CRETACEOUS CEPHALOPODA

To date, 31 specimens and 11 original labels, corresponding to 11 genera and 11 species of Cretaceous cephalopods, have been recovered and identified as belonging to the d'Orbigny Collection. All of them come from classical outcrops relevant for the French stratigraphy, as well as for the faunal characterization of the Cretaceous stages defined by d'Orbigny. They seem to have been selected with a systematically and biostratigraphically representative criterion, corresponding 9 of these 11 species to genotypes or subgenotypes (Fig. 1D).

CONVENTIONS

The supraspecific classification used here for the recovered specimens follows that proposed by Kummel (1956) for Nautilida Agassiz, 1847, by Fischer & Gauthier (2006) for Phylloceratina Arkell, 1950 and Belemnitida von Zittel, 1895, and by Wright (1996) for Ammonitina Hyatt, 1889 and Ancyloceratina Wiedmann, 1966. The terminology used for the descriptions of nautiloids and ammonoids is based on the glossary of morphological terms proposed by Barroso-Barcenilla (2008).

All the recovered original labels were glued over a green cardboard (corresponding to the Cretaceous) and are headlined by the title: "D'Orbigny Collection belonging to H. M. THE KING (*Collecção d'Orbigny pertencente a S. M. EL-REI*)". They include several data of the related specimen, specifically its number (*Nº*), classification, stratigraphic level (*Andar*), period (*Terreno*) and locality (*Localidade*).

ABBREVIATIONS

MHNA	Museum of Natural History of Avignon (Muséum d'Histoire naturelle d'Avignon), Avignon;
MNHN	National Museum of Natural History (Muséum national d'Histoire naturelle), Paris;
MUHNAC	National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência), Lisbon;
HUB	Museum of Natural History of the Humboldt University (Museum für Naturkunde der Humboldt-Universität), Berlin.

SYSTEMATIC PALAEONTOLOGY

Class CEPHALOPODA Cuvier, 1797
 Subclass NAUTILOIDEA Agassiz, 1847
 Order NAUTILIDA Agassiz, 1847
 Family NAUTILIDAE de Blainville, 1825
 Genus *Angulithes* de Montfort, 1808

Angulithes triangularis de Montfort, 1808
 (Fig. 2A, B)

MATERIAL. — An internal mould without written or glued indications. Original label: *Nº 459/Nautilus triangularis* (Montf), *Andar 20º Cenomanense, Terreno Cretaceo, Localidade Fouras* (Charente inf.^{re}). See Figs 1D; 2C.

DESCRIPTION

A medium-sized, compressed and involute nautiloid with a markedly subtriangular whorl section. Angular to arched venter, formed by strongly converging flanks, and extremely narrow umbilicus. Suture line with a pointed ventral saddle, a broad and shallow lateral lobe, and a moderately high saddle on the umbilical margin. Siphuncle unobservable, and ornamentation inexistent.

DISCUSSION

According to d'Orbigny (1840: 80), specimens of this species are relatively abundant in the "grès verts" of Fouras (France), where they were collected by him and by d'Archiac. The morphologically closest form to this middle-upper Cenomanian species, type of the genus, is *Angulithes mermetti* (Coquand, 1862), considered as a mere subspecies of *A. triangularis* by Wiedmann (1960). Nevertheless, *A. mermetti* shows a more compressed section, a more sinuous suture line and a smaller range, seemingly limited to the upper Cenomanian *Neolobites vibrayneanus* zone (Wiese & Schulze 2005; Barroso-Barcenilla *et al.* 2011; Nagm & Wilmsen 2012; Segura *et al.* 2014; Meister & Piuz 2015; Benyoucef *et al.* 2016). *Angulithes vascogoticus* Wiedmann, 1960, exhibits a more depressed section and a more sinuous suture line, being to date only reported from the upper Cenomanian and lowermost Turonian of Spain (Wilmsen 2000; Barroso-Barcenilla 2006). *Angulithes fleuriausianus* (d'Orbigny, 1840) has a narrowly rounded venter and a less compressed subtrigonal whorl section, being known from the lower Cenomanian (Cobban & Kennedy 1994). In the last years, *A. triangularis* has been studied by Wilmsen (2000), Fischer & Gauthier (2006) and Frank *et al.* (2013), among others.

Subclass AMMONOIDEA von Zittel, 1884
 Order AMMONITIDA Agassiz, 1847
 Suborder PHYLLOCERATINA Arkell, 1950
 Family PHYLLOCERATIDAE von Zittel, 1884
 Genus *Phylloceras* Suess, 1865
 Subgenus *Phylloceras (Hypophylloceras)* Salfeld, 1924

***Phylloceras (Hypophylloceras) tethys* (d'Orbigny, 1840)
 (Fig. 2D-F)**

MATERIAL. — Three pyritized (and partially limonitized) internal moulds without written or glued indications. Original label: № 360/*Ammonites Tethys* (d'Orb), *Andar 17° Neocomiense, Terreno Cretaceo, Localidade Arredores de [environs of] Sisteron (Basses Alpes)*. See Figs 1D; 2G.

DESCRIPTION

Small-sized, compressed and involute phylloceratid ammonites with suboval whorl sections. Arched venters and flanks with the maximum width located at their middle part, and narrow and deep umbilici with abrupt walls. Very tenuous ornamentation reduced to small and weak ventrolateral ribs. Notably complex and slightly proverse suture lines, with large folds in the external saddles showing a tetraphyllitic tendency.

DISCUSSION

This Berriasian(?)–Hauterivian species was initially presented as *tethys* by d'Orbigny (1840: 174, pl. 53, figs 7–9), and already named *tethys* by d'Orbigny (1850: 64) by the Titan daughter of Uranus and Gaia in the Greek mythology. As highlighted by Joly (1993), the morphologically closest species is *Phylloceras (Hypophylloceras) serum* (Oppel, 1865), but this Tithonian-lower Hauterivian form exhibits flatter flanks and more complex suture lines. In the last years, *P. (H.) tethys* has been studied by some authors, such as Joly (1993, 2000), Reboulet (1996), Fischer & Gauthier (2006) and Joly & Mercier (2012).

Genus *Ptychophylloceras* Spath, 1927

Subgenus *Ptychophylloceras (Semisulcatoceras)* Joly, 2000

***Ptychophylloceras (Semisulcatoceras) semisulcatum*
 (d'Orbigny, 1840)
 (Fig. 2H-J)**

MATERIAL. — Two pyritized (and partially limonitized) internal moulds without written or glued indications. Original label: № 359/*Ammonites semisulcatus* (d'Orb), *Andar 17° Neocomiense, Terreno Cretaceo, Localidade Sisteron (Basses Alpes)*. See Figs 1D; 2K.

DESCRIPTION

Small-sized, compressed and involute ammonites with subrounded whorl sections. Highly bended and continuous venters and flanks, and narrow umbilici with arched walls. Ornamentation formed by five deep and aborally convex perumbilical constrictions per whorl. Notably complex

suture lines with large folds in the external saddles showing a tetraphyllitic tendency.

DISCUSSION

The specimen of d'Orbigny (1840: seemingly pl. 53, figs 4–5), originally collected from the Valanginian of Sisteron (Alpes-de-Haute-Provence), France, and nowadays held at the MNHN with number **MNHN.F.R00489**, has been designated by Joly (2000) as the lectotype. The relatively high morphological variability of *P. (S.) semisulcatum* has allowed the proposal of several subspecies, such as *diphyllum* (d'Orbigny, 1840), without conspicuous perumbilical constrictions and recently studied in detail by Joly & Mercier (2012). The morphologically closest species is *Ptychophylloceras (Semisulcatoceras) ptychoicum* (Quenstedt, 1845), but this Kimmeridgian-lower Berriasian form exhibits conspicuous external varici. In the last years, the Berriasian–Valanginian species *P. (S.) semisulcatum*, type of the subgenus, has been studied by Joly (1993, 2000), Reboulet (1996), Fischer & Gauthier (2006) and Joly & Mercier (2012), among others.

Suborder AMMONITINA Hyatt, 1889

Family HAPLOCERATIDAE von Zittel, 1884

Genus *Neolissoceras* Spath, 1923

***Neolissoceras grasianum* (d'Orbigny, 1840)
 (Fig. 3A-C)**

MATERIAL. — Three internal moulds (two of them pyritized) without written or glued indications. Original label: № 357/*Ammonites grasianus* (d'Orb), *Andar 17° Neocomiense, Terreno Cretaceo, Localidade S.º Julien (Hautes Alpes)*. See Figs 1D; 3D.

DESCRIPTION

Small-sized, markedly compressed and moderately involute ammonites with subrectangular whorl sections, showing the maximum width at their external part. Slightly arched venter, conspicuous ventrolateral margin, nearly flat and divergent flanks, and wide umbilici with bended walls. Relatively complex suture lines showing a phylloid tendency and with wide saddles, being the first lateral one larger than the ventral. Ornamentation nonexistent.

DISCUSSION

This Berriasian–Hauterivian species was firstly reported in Saint-Julien (seemingly, Saint-Julien-en-Beauchêne: Hautes-Alpes), France, by d'Orbigny (1850: 63). As highlighted by Avram & Grădinaru (1993) and Vasicek (2002), the morphologically closest species is *Neolissoceras desmoceratoides* Wiedmann, 1966, but this Valanginian form exhibits less compressed section, arched flanks and wider umbilicus with sloping wall. In the last years, *N. grasianum*, type of the genus, has been studied by some authors, such as Reboulet (1996), Busnardo *et al.* (2003), Wippich (2003), Ettachfini (2004), Lukeneder (2004), Fischer & Gauthier (2006) and Joly & Mercier (2012).



Fig. 2. — Cretaceous nautiloid and ammonites of the d'Orbigny Collection of the National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência): **A-C**, *Angulithes triangularis* de Montfort, 1808 in oral (**A**) and lateral (**B**) views, and original label (**C**): N° 459/*Nautilus triangularis* (Montf), Andar 20° Cenomaniense, Terreno Cretaceo, Localidade Fouras (Charente inf.^{re}); **D-G**, *Phylloceras (Hypophylloceras) tethys* (d'Orbigny, 1840) in ventral (**D**), lateral (**E**) and oral (**F**) views, and original label (**G**): N° 360/*Ammonites Tethys* (d'Orb.), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Arredores de [environs of] Sisteron (Basses Alpes); **H-K**, *Ptychophylloceras (Semisulcatoceras) semisulcatus* (d'Orbigny, 1840) in ventral (**H**), lateral (**I**) and oral (**J**) views, and original label (**K**): N° 359/*Ammonites semisulcatus* (d'Orb.), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Sisteron (Basses Alpes). Scale bar: 2 cm.

Family HOPLITIDAE Douvillé, 1890

Genus *Pleurohoplites* Spath, 1921

Subgenus *Pleurohoplites* (*Pleurohoplites*) Spath, 1921

Pleurohoplites (*Pleurohoplites*) *renauxianus*

(d'Orbigny, 1840)

(Fig. 3E, F)

MATERIAL. — An internal mould with matrix and without written or glued indications. Original label: *Nº 464/Ammonites Renauxianus* (d'Orb), *Andar 20° Cenomaniense, Terreno Cretaceo, Localidade Mont-Blainville (Meuse)*. See Figs 1D; 3G.

DESCRIPTION

A medium-sized, compressed and moderately involute ammonite with suboval whorl section. Bended venter and flat flanks, and wide umbilici with arched walls. Ornamentation formed by approximately 15 small umbilical bullae per whorl that give rise to pairs of tenuous and proverse ribs. These ribs are straight on the inner flanks and projected on the outer flanks and the venter, thickening on the ventrolateral margins, where they resemble to blunt and oblique nodes. Nearly unobservable suture lines.

DISCUSSION

This upper Albian species was firstly reported in Mont-Blainville (Meuse), France, by d'Orbigny (1850: 145). Some other close species of the genus are *P. subvarians* Spath, 1928, *P. epigonus* Spath, 1928, *P. serpentinus* Spath, 1928, and *P. robusticostatus* Immel & Guoxiong, 2002, usually with stronger ribbing. In the last years, *P. (P.) renauxianus*, type of the genus, has been studied by Latil (1995), Fischer & Gauthier (2006) and Kennedy & Latil (2007), among others.

Family ACANTHOCERATIDAE de Grossouvre, 1894

Genus *Acanthoceras* Neumayr, 1875

Acanthoceras rhotomagense (Brongniart, 1822)

(Fig. 3H-J)

MATERIAL. — Six phosphatised internal moulds, one of them with a glued indication (463). Original label: *Nº 463/Ammonites rhotomagensis* (Lamarck), *Andar 20° Cenomaniense, Terreno Cretaceo, Localidade Rouen (Seine inf.^{re})*. See Figs 1D; 3K.

DESCRIPTION

Relatively large-sized, evolute and ornamented ammonites with subpolygonal whorl section. Tabular venter, conspicuous ventrolateral margins, arched flanks and wide umbilici with bended walls. Ornamentation formed by 24-28 straight ribs per whorl, with umbilical, inner ventrolateral, outer ventrolateral and siphonal tubercles. During ontogeny, whorl section changes from depressed subrounded to compressed subpolygonal. Relatively simple acanthoceratid suture lines.

DISCUSSION

Already cited in the Sainte-Catherine Mountain of Rouen by d'Orbigny (1840: 348), as characteristic of “des craies chloritées, des craies tufau [sic], ou des grès verts supérieurs” of France.

This morphologically highly variable middle Cenomanian species, type of the genus, was attributed to Lamarck by some authors, such as d'Orbigny (1850, p. 146). Wright & Kennedy (1987) included within its synonymy numerous taxa proposed by different authors, as detailed by Barroso-Barcenilla (2004). Among the morphologically closest forms of the genus, the stratigraphically overlaying species *A. jukesbrownei* (Spath, 1926) has less numerous and more distant ribs with strong umbilical bullae, and weak inner ventrolateral tubercles that decline to give a characteristic trapezoidal (rather than polygonal) whorl section. In the last years, *A. rhotomagense* has been studied by some authors, such as Kennedy & Juignet (1993), Kaplan *et al.* (1998), Fischer & Gauthier (2006) and Kennedy *et al.* (2011).

Family COILOPOCERATIDAE Hyatt, 1903

Genus *Coilopoceras* Hyatt, 1903

Coilopoceras requienianum (d'Orbigny, 1840)

(Fig. 4A, B)

MATERIAL. — Two partly silicified internal moulds with glued indications (518). Original label: *Nº 518/Ammonites Requienianus* (d'Orb), *Andar 21° [corrected] Turoniense, Terreno Cretaceo, Localidade Uchaux (Vanduse) [sic]*. See Figs 1D; 4C.

DESCRIPTION

Medium-sized and involute oxycones, with sub lanceolate compressed section, whose maximum width occurs close to the inner third of the flanks. Sharp venter, arched flanks and very narrow umbilici. They have large siphuncle and weak ornamentation, with juvenile whorls showing very tenuous and clavate umbilical tubercles that become feeble and projected falcoid ribs, and adult spires exhibiting smooth surfaces. Suture lines with shallow and dentate external lobes and saddles of similar height, and numerous lateral elements.

DISCUSSION

The specimen of d'Orbigny (1840: pl. 93, figs 1-2), originally collected in Uchaux, and nowadays belonging to the Requier Collection of the MHNA, has been designated by Kennedy & Wright (1984) as the lectotype. This species was firstly reported in Uchaux (Vaucluse), France, by d'Orbigny (1850, p. 189). Cobban & Hook (1980) suggested that many of the forms assigned to the genus *Coilopoceras* must be considered as mere synonyms of *C. requienianum*. In their detailed revision of this upper Turonian species, Kennedy & Wright (1984) included *Coilopoceras? grossouvrei* Hyatt, 1903, within the wide morphological variability of *C. requienianum*, and proposed the existence in the same species of sexual dimorphism formed by smooth and ribbed forms. Some other species of *Coilopoceras* include the type of the genus, *C. colleti* Hyatt, 1903, *C. springeri* Hyatt, 1903, and *C. inflatum* Cobban & Hook, 1980, usually with wider and less deeply incised suture lines. In the last years, *C. requienianum* has been studied by Meister & Rhalmi (2002), Fischer & Gauthier (2006), Nagm *et al.* (2010), Ayoub-Hannaa & Fürschich (2012), Nagm & Wilmsen (2012) and Robaszynski *et al.* (2014), among others.



Fig. 3. — Cretaceous ammonites of the d'Orbigny Collection of the National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência): A-D, *Neoliissoceras grasianum* (d'Orbigny, 1840) in ventral (A), lateral (B) and oral (C) views, and original label (D): N° 357/*Ammonites grasianus* (d'Orb.), Andar 17º Neocomiense, Terreno Cretaceo, Localidade S.º Julien (Hautes Alpes); E-G, *Pleurohoplites renauxianus* (d'Orbigny, 1840) in lateral (E) and ventral (F) views, and original label (G): N° 464/*Ammonites Renauxianus* (d'Orb.), Andar 20º Cenomaniense, Terreno Cretaceo, Localidade Mont-Blainville (Meuse); H-K, *Acantoceras rhottomagensis* (Brongniart, 1822) in oral (H), lateral (I) and ventral (J) views, and original label (K): N° 463/*Ammonites rhottomagensis* (Lamarck), Andar 20º Cenomaniense, Terreno Cretaceo, Localidade Rouen (Seine inf.^{re}). Scale bar: 2 cm.

Suborder ANCYLOCERATINA Wiedmann, 1966

Family TURRILITIDAE Gill, 1871

Genus *Turrilites* Lamarck, 1801

Subgenus *Turrilites* (*Turrilites*) Lamarck, 1801

Turrilites (*Turrilites*) *costatus* Lamarck, 1801

(Fig. 4D-E)

MATERIAL. — Four phosphatised internal moulds without written or glued indications. Original label: № 466/*Turrilites costatus* (Lamarck), Andar 20° Cenomanien, Terreno Cretaceo, Localidade Rouen (Seine inf.^{re}). See Figs 1D; 4F.

DESCRIPTION

Medium-sized turrilitid ammonites with subpolygonal whorl sections. Deeply incised inter-whorl junction and highly acute apical angle. Ornamentation formed by approximately 20 coarse oblique ribs per whorl, located on the exposed face, and obliterated in their lower part by a wide spiral groove. The ribs exhibit a row of strong and elongated tubercles below the groove, and two rows of tenuous tubercles above it. Nearly unobservable suture lines.

DISCUSSION

According to d'Orbigny (1840: 600), specimens of this species, characteristic of the "craie chlorite moyenne", were collected in Rouen (France) by him and by Brongniart, Passy, d'Archiac, de Vibraye and Largilliert. This middle Cenomanian heteromorph ammonite, type of the genus, has been recently studied by some authors, such as Wright & Kennedy (1996), Matsumoto & Takahashi (2001), Fischer & Gauthier (2006), Wilmsen & Nagm (2014), Robaszynski *et al.* (2014) and Meister & Piuz (2015). Some other morphologically close forms of the genus are *T. scheuchzerianus* Bosc, 1801, with coarse entire ribs at the later growth stages and lack of tubercles, and *T. acutus* Passy, 1832, with more depressed and less ornamented whorls.

Subclass COLEOIDEA Bather, 1888

Order BELEMNITIDA von Zittel, 1895

Suborder PACHYBELEMNOPSEINA

Riegraf in Riegraf, Janssen & Schmitt-Riegraf, 1998

Family Duvaliidae Pavlow, 1914

Genus *Duvalia* Bayle, 1878

Duvalia dilatata (de Blainville, 1827)

(Fig. 4G-I)

MATERIAL. — Five internal moulds (one of them fragmentary) without written or glued indications. Original label: № 351/*Belemnites dilatatus* (Blainville), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Cheiron perto de [near of] Castellanne (Basses Alpes). See Figs 1D; 4J.

DESCRIPTION

Elongated and compressed guards with rounded apex orientated towards the dorsal side. Dorsal and ventral sides bended, nearly parallel flanks and subelliptical cross-section. Apical region usually showing a row bulge at the dorsal side. Nor grooves or alveoli can be observed.

DISCUSSION

According to d'Orbigny (1840: 42), this species characterizes the Neocomian of the surroundings of Castellane, specially the locality of Cheiron (France), where it was already reported in 1825 by Émeric. Its wide morphological variability has allowed the individualization of three subspecies in literature, *D. dilatata dilatata*, *D. dilatata majoriana* Stoyanova-Vergilova, 1970, with a deeper alveolus, and *D. dilatata binervioidea* Stoyanova-Vergilova, 1965, with a more compressed and a smaller adult size. Despite this, as detailed by Combémorel (1973), Janssen (1997) and Fischer & Gauthier (2006), some of the specimens assigned by d'Orbigny (1840) to *D. dilatata* have been subsequently remitted to other forms, such as *Pseudoduvalia polygonalis* (de Blainville, 1827), *Pseudoduvalia trabiformis* (Duval-Jouve, 1841), *Duvalia binervia* (Raspail, 1829) and *Duvalia emericii* (Raspail, 1829). In detail, as already noted by d'Orbigny (1847), *P. polygonalis* and *P. trabiformis* show slenderer shapes with the lower parts of the flanks sharper, giving subquadrate dorso-ventral cross-sections. *D. binervia* reaches a lower compression and a more angular morphology, and *D. emericii* exhibits a wide and deep lateral depression over each side. In the last years, the Hauterivian-lower Barremian species *D. dilatata*, type of the genus, has been studied by Avram & Grădinaru (1993), Janssen (1997, 2009), Janssen & Fözy (2004), Fischer & Gauthier (2006) and Janssen *et al.* (2012), among others.

Family MESOHIBOLITIDAE Nerodenko, 1983

Genus *Hibolithes* de Montfort, 1808

Hibolithes subfusiformis (Raspail, 1829)

(Fig. 4K-M)

MATERIAL. — Three internal moulds without written or glued indications. Original label: № 352/*Belemnites subfusiformis* (Raspail), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Cheiron (Basses Alpes). See Figs 1D; 4N.

DESCRIPTION

Elongated guards with subfusiform outline and very acute apex. Arched dorsal and ventral sides and flanks, and subcircular cross-section. Ventral region showing a groove at the anterior part. No alveoli can be observed.

DISCUSSION

According to d'Orbigny (1840: 51), this species is recorded in the surroundings of Castellane (close to Cheiron, France), from where it was sent to him since 1825 by Émeric, an active collaborator of Raspail (1829). Combémorel & Howlett (1993) proposed to use *Hibolithes* Mayer-Eymar, 1883, non *Hibolithes* de Montfort, 1808, as generic name, on the basis that the original drawing of the latter author does not seem to correspond to the usual interpretation of this genus. D'Orbigny (1847) included this species in the synonymy of *Belemnites pistilliformis* de Blainville, 1827, but, as justified by Combémorel & Gayte (1981), they seem to belong to different genera. In fact, *Vaunagites pistilliformis*



Fig. 4. — Cretaceous ammonites and belemnites of the d'Orbigny Collection of the National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência): A-C, *Coilopoceras requienianus* (d'Orbigny, 1840) in lateral (A) and ventral (B) views, and original label (C): Nº 518/*Ammonites Requienianus* (d'Orb), Andar 21° [corrected] Turoniense, Terreno Cretaceo, Localidade Uchaux (Vanduse); D-F, *Turrilites (Turrilites) costatus* Lamarck, 1801 in lateral (D) and basal (E) views, and original label (F): Nº 466/*Turrilites costatus* (Lamarck), Andar 20° Cenomaniense, Terreno Cretaceo, Localidade Rouen (Seine inf.^{re}); G-J, *Duvalia dilatata* (de Blainville, 1827) in dorsal view (G), section (H), lateral view (I), and original label (J): Nº 351/*Belemnites dilatatus* (Blainville), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Cheiron perto de [near of] Castellanne (Basses Alpes); K-N, *Hibolithes subfusiformis* (Raspail, 1829) in dorsal view (K), section (L), ventral view (M), and original label (N): Nº 352/*Belemnites subfusiformis* (Raspail), Andar 17° Neocomiense, Terreno Cretaceo, Localidade Cheiron (Basses Alpes); O-R, *Belemnitella mucronata* (von Schlotheim, 1813) in dorsal view (O), section (P), ventral view (Q), and original label (R): Nº 556/*Belemnitella mucronata* (d'Orb), Andar 22° Senoniense, Terreno Cretaceo, Localidade Epernay (Marne). Scale bar: 2 cm.

shows a circular posterior cross-section without groove. In the last years, the upper Valanginian-lower Barremian species *H. subfusiformis*, type of the genus, has been studied by some authors, such as Janssen & Fözy (2004), Fischer & Gauthier (2006), Janssen (2009) and Janssen *et al.* (2012).

Suborder BELEMNOPSEINA Jeletzky, 1965
Family BELEMNITELLIDAE Pavlow, 1914
Genus *Belemnitella* d'Orbigny, 1840

Belemnitella mucronata (von Schlotheim, 1813)
(Fig. 4O-Q)

MATERIAL. — Two internal moulds without written or glued indications. Original label: № 556/*Belemnitella mucronata* (d'Orb), *Andar 22º Senonense, Terreno Cretaceo, Localidade Épernay* (Marne). See Figs 1D; 4R.

DESCRIPTION

Large and stout guards of subcylindrical outline and acute or obtuse apex with well-defined mucro. Subcircular cross-section, but with a ventral region slightly flattened and showing a straight fissure at its anterior part. Alveoli with large angle.

DISCUSSION

Belemnitella mucronata was firstly reported in Epernay (Marne), France, by d'Orbigny (1850: 211). Christensen *et al.* (1975) redefined this species and selected a belemnite from the upper Campanian of Misburg (Germany) as neotype, but Riegraf (2000) indicated that an original specimen of the type series was rediscovered in 1996 in the HUB. *Belemnitella mucronata* is usually recorded with the belemnite species *Gonioteuthis quadrata* (de Blainville, 1827), with non-circular alveolar aperture and characteristic granulate surface. In the last years, the lower Campanian-lower Maastrichtian species *B. mucronata*, type of the genus, has been studied by Christensen (1995, 1997, 1998a, b), Riegraf (2000), Fischer & Gauthier (2006) and Jagt (2012), among others.

CONCLUSIONS

The research in course over the palaeontological collections rescued from the remains of the devastating fire that in 1978 destroyed much of the ancient building of the current National Museum of Natural History and Science (Museu Nacional de História Natural e da Ciência) of Lisbon, Portugal, nowadays held at this institution, has allowed the rediscovery of numerous fossils, including many original labels, with high historical and scientific interest. Among them, there are several specimens of the valuable palaeontological collection that d'Orbigny, according to the wishes of Napoleon III, offered in 1855 to Pedro V as an important contribution to re-establish the good relationships and the fruitful cooperation between France and Portugal.

The Cretaceous cephalopods of this historical collection and the corresponding original labels currently recovered are presented here, being most of them figured for the first time in this work, and studied in detail from a systematic and biostratigraphic point of view. These invertebrates correspond to 11 genera and 11 species that include nautiloids: *Angulithes triangularis* de Montfort, 1808; ammonoids: *Phylloceras* (*Hypophylloceras*) *tethys* (d'Orbigny, 1840), *Ptychophylloceras* (*Semisulcatoceras*) *semisulcatum* (d'Orbigny, 1840), *Neolissoceras* *grasianum* (d'Orbigny, 1840), *Pleurohoplites* (*Pleurohoplites*) *renauxianus* (d'Orbigny, 1840), *Acanthoceras* *rhotomagense* (Brongniart, 1822), *Coilopoceras* *requienianus* (d'Orbigny, 1840) and *Turrilites* (*Turrilites*) *costatus* Lamarck, 1801; and belemnoids: *Duvalia dilatata* (de Blainville, 1827), *Hibolithes subfusiformis* (Raspail, 1829) and *Belemnitella mucronata* (von Schlotheim, 1813). All of them come from relevant French outcrops, and they seem to have been selected by d'Orbigny with a systematically and biostratigraphically representative criterion, corresponding 9 of these 11 species to genotypes or subgenotypes.

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