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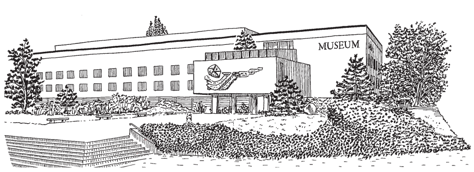

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The Oppeliidae of the *Acanthicum* Zone (Upper Kimmeridgian) from Mount Crussol (Ardèche, France): ontogeny, variability and dimorphism of the genera *Taramelliceras* and *Streblites* (Ammonoidea)

Cyril BAUDOUIN[1*], Patrick BOSELLI[2*] & Didier BERT[3*]

Abstract

The Kimmeridgian outcrops of the Mount Crussol (in Ardèche), already long known for their abundant ammonites, contain many Oppeliidae. The study of the Acanthicum Zone (Upper Kimmeridgian) enables us to conclude that the microconchs of *Taramelliceras compsum* (OPPEL) and *Streblites weinlandi* (OPPEL) correspond to forms previously described by the authors as *Glochiceras* (*Lingulaticeras*) *crenosum* QUENSTEDT and *Creniceras dentatum* (REINECKE). The study of a significant sample from a precise horizon leads to treat both *T. compsum* (OPPEL) and *T. pseudoflexuosum* (FAVRE) as two morphological elements from the same paleobiological species. This is the same for *S. weinlandi* (OPPEL) and *S. levipictus* (FONTANNES), which are morphologically very close. Finally, studying the genera's variability highlights mechanisms underlying it (heterochrony of the development and "laws" of covariation).

Keywords

Ammonoidea; Oppeliidae; *Taramelliceras*; *Streblites*; *Ochetoceras*; Upper Kimmeridgian (Upper Jurassic); Crussol, Ardèche (France).

Résumé

Les Oppeliidae de la zone à Acanthicum (Kimméridgien supérieur) de la montagne de Crussol (Ardèche, France): ontogenèse, variabilité et dimorphisme des genres *Taramelliceras* et *Streblites* (Ammonoidea).- Les affleurements du Kimméridgien de la montagne de Crussol (Ardèche), bien connus pour leur richesse en ammonites depuis longtemps, contiennent en particulier une abondante faune d'Oppeliidae. Leur étude pour la zone à Acanthicum (Kimméridgien supérieur) permet d'établir que les microconques de *Taramelliceras compsum* (OPPEL) et *Streblites weinlandi* (OPPEL) correspondent à des formes décrites précédemment par les auteurs comme des représentants respectifs de *Glochiceras* (*Lingulaticeras*) *crenosum* QUENSTEDT et *Creniceras dentatum* (REINECKE). L'étude d'un échantillon important provenant d'un horizon restreint conduit également à considérer *T. compsum* (OPPEL) et *T. pseudoflexuosum* (FAVRE) comme deux expressions morphologiques de la même espèce paléobiologique. Il en est de même pour *S. weinlandi* (OPPEL) et *S. levipictus* (FONTANNES), qui sont de morphologies très proches. Enfin, l'étude de la variabilité de ces genres permet de mettre en évidence les mécanismes qui la sous-tendent (hétérochronies du développement, et « lois » de covariation).

Mots-clés

Ammonoidea ; Oppeliidae ; *Taramelliceras* ; *Streblites* ; *Ochetoceras* ; Kimméridgien supérieur (Jurassique supérieur) ; Crussol, Ardèche (France).

I. INTRODUCTION

The historical site of the Mount Crussol (Fig. 1 and 2) has provided many Kimmeridgian ammonites to the previous authors, with a significant part constituted by the representatives of the family Oppeliidae DOUVILLÉ, 1890. This family was particularly studied by DUMORTIER & FONTANNES (1876) and then FONTANNES (1879). Many species of the genera *Taramelliceras* DEL CAMPANA, 1904, *Streblites* HYATT, 1900, *Creniceras* MUNIER-CHALMAS, 1892, *Glochiceras* HYATT, 1900 and *Ochetoceras* HAUG, 1855 were described in their monographs, but in a very typological way and without a very accurate stratigraphic calibration because of their ancient collection (no bed-by-bed tracking). Since then, several works have highlighted the importance of the intraspecific variability within the Oppeliidae from various ages (HÖLDER, 1955; PALFRAMAN, 1966), and the existence of a probably sexual dimorphism for that family (PALFRAMAN, 1966; MAKOWSKI, 1962; ZIEGLER, 1974; QUEREILHAC, 2009; KEUPP & RIEDEL, 2009). In the main case of *Taramelliceras*, HÖLDER (1955) brought together different species in large morphological and stratigraphic groups illustrating the polymorphism of this

[1] *79, rue Pierre Julien, F-26200 Montélimar, France; cyril.baudouin@gmail.com*
[2] *57 bis, avenue des Patriotes, F-26300 Bourg-de-Péage, France; pboselli@wanadoo.fr*
[3] *Université de Bourgogne, Laboratoire Biogéosciences, UMR CNRS 5561, 6 bd Gabriel, F-21000 Dijon, France; paleo-db@orange.fr.*
[*] *Groupe d'étude en Paléobiologie et biostratigraphie des Ammonites (G.P.A), F-04170 La Mure-Argens, France.*

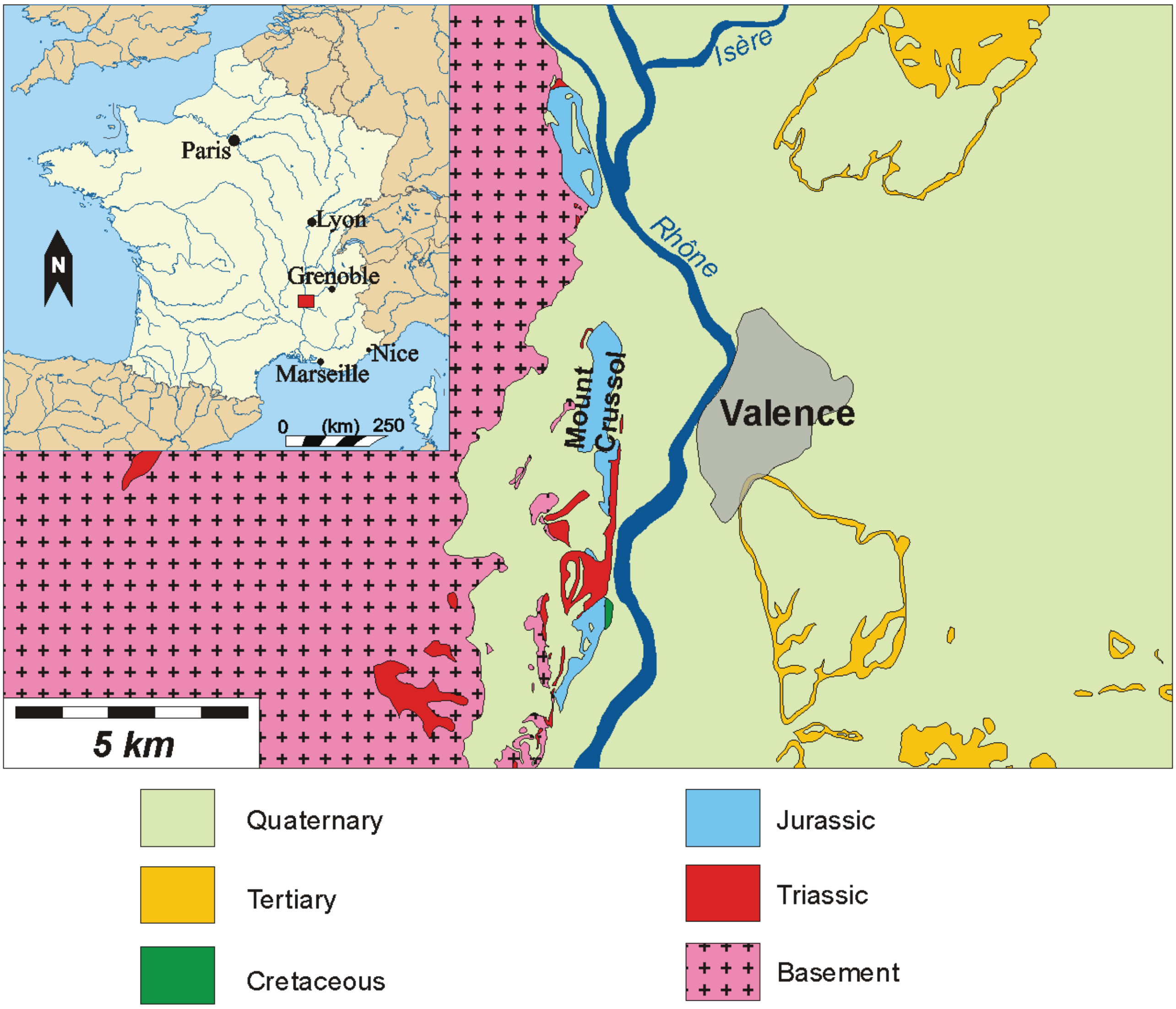


Fig. 1: Geographic setting and simplified geological map of the Crussol area.

genus. This applies to the broad group of *Taramelliceras compsum* (OPPEL, 1863) at the Upper Kimmeridgian. In genus *Streblites*, ZIEGLER (1974) recognized some microconchs corresponding to forms assigned to the species "*Creniceras dentatum*" (REINECKE, 1818); he noted that the stratigraphic range of genus *Streblites* coincides exactly with that of "*C. dentatum*" (REINECKE).

The recent harvest (C.B. & P.B.) of many Oppeliidae, done with a good stratigraphic tracking in the lower part of the Upper Kimmeridgian in Mount Crussol, now allows us to consider their paleontological review for a specific level of the Acanthicum Zone (Upper Kimmeridgian) taking into account the intraspecific variability and modern concept of the species in paleontology. The biostratigraphic framework used in this work (Fig. 3) resumes the Kimmeridgian standard zonation of the Submediterranean realm developed by the *French Group for the Study of the Jurassic* (HANTZPERGUES *et al.*, 1997), completed and updated with the works of SCHWEIGERT (1999) and BAIER & SCHWEIGERT (2001).

II. GEOLOGICAL AND BIOSTRATIGRAPHICAL SETTING

The historic area of Mount Crussol is located in Ardèche, on the western flank of the Rhône Valley down south of the Rhône-Isère confluence, just across Valence city (Drôme, France). This mount, rising up to 380 m hight is a small calcareous massif surrounded by Quaternary alluvium of the great plain of Valence (Fig. 1). This site has long been known for its fossils abundance, and numerous Jurassic outcrops dating from Toarcian to

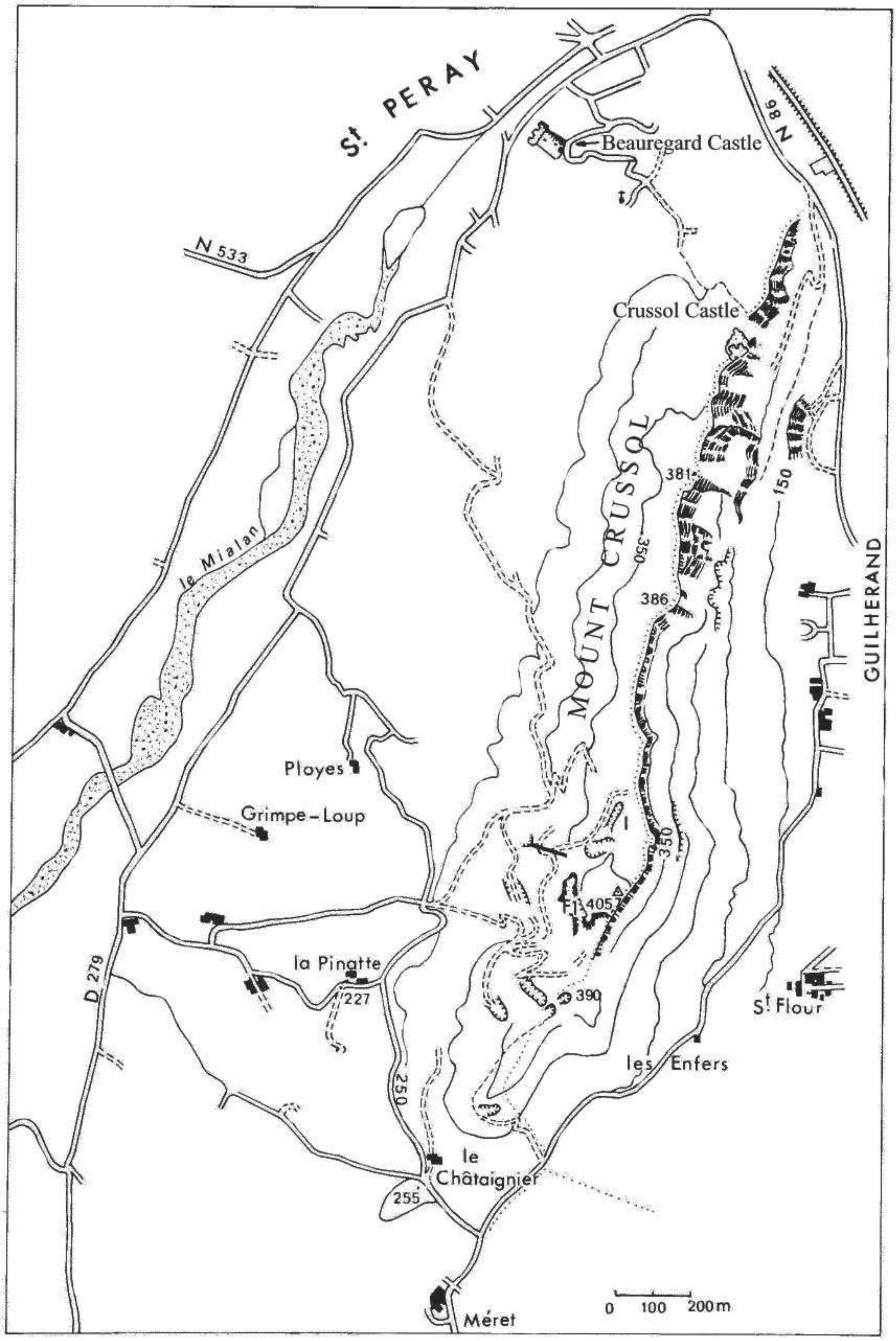


Fig. 2: Localisation of the outcrop sections of Mount Crussol (from ATROPS, 1982, p. 276). The Mallet quarry is F1.

Substages	Mediterranean province (Southern Spain, NE Italy)		Submediterranean province (Northern Spain, SE France, Swabia-Franconia)		
	Zones	**Subzones and horizons**	**Zones**	**Subzones**	**Horizons**
Upper Kimmeridgian	Beckeri/ Pressulum		Beckeri	Ulmense	Rebouletianum Hoelderi Zio-Wepferi
				Setatum	- Ornatum - Minutum
				Subeumela	- Kiderleni Pedinopleura
	Cavouri	?	Pseudomutabilis		
	Compsum/ Acanthicum	Heimi	Acanthicum		
		Loryi			
		Longispinum			
Lower Kimmeridgian	Divisum/ Herbichi	Uhlandi	Divisum	Uhlandi	Balderum
		Divisum		Divisum	
	Strombecki	Stenonis	Hypselocyclum	Lothari	Perayensis Semistriatum Hypselocyclum Discoidale
		Raschii		Hippolytense	Hippolytense Lussasense
	Platynota (Desmoides) Silenum	Trenerites	Platynota	Guilherandense	Guilherandense Thieuloyi
				Desmoides	Desmoides Enayi
				Polygyratus	Amoeboceras

Fig. 3: Zonation of the Kimmeridgian (from HANTZPERGUES *et al.*, 1997).

Tithonian can be observed. However the massif bulk is made of limestones and marls from the Oxfordian and the Kimmeridgian stages. Thanks to many old quarries as well as natural outcrops, the sequence of these levels can be observed (Fig. 2). The Jurassic of Mount Crussol has been the subject of numerous works done a long time ago (SAUTIER, 1854; LORY, 1860; OPPEL, 1865; HUGUENIN, 1874; DUMORTIER & FONTANNES, 1876; FONTANNES, 1879; RICHE & ROMAN, 1921; ROMAN, 1950 - see HÖLDER & ZIEGLER, 1959 for a complete biography) and more recently by ATROPS (1982) who focused his research on the Lower Kimmeridgian.
The log sections given by ATROPS (1982, p. 275-291, table 46-47) are a valuable and indispensable basis in the study of the Kimmeridgian of the Mount Crussol. However, the sections he published do not exceed the top of the Divisum Zone. In our work, the most recent levels of those sections were completed using the same numbering (Fig. 4 and 5). According to ATROPS, the Acanthicum Zone (and thus the base of Upper Kimmeridgian) starts from bed No. 175, but beds No. 175 to 178 form a very thick and currently inaccessible set that cannot be studied in our work. The Acanthicum Zone continues at least to the bed No. 197, but its upper limit still has to be clarified.

The Oppeliidae studied in this work are mainly from the orderly working of beds No. 193 and 195 which form a thin and easily accessible bundle containing abundant fauna. These levels are particularly visible around spot

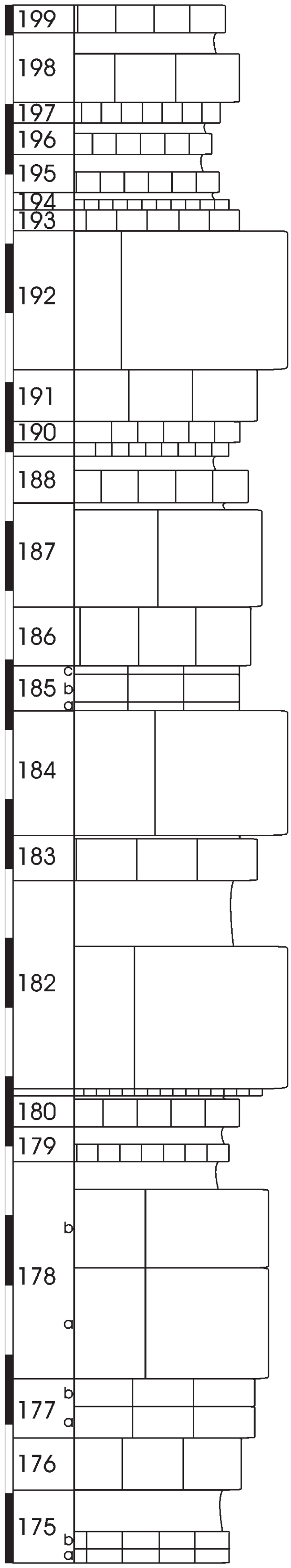


Fig. 4: Section of the Acanthicum Zone of Mount Crussol.

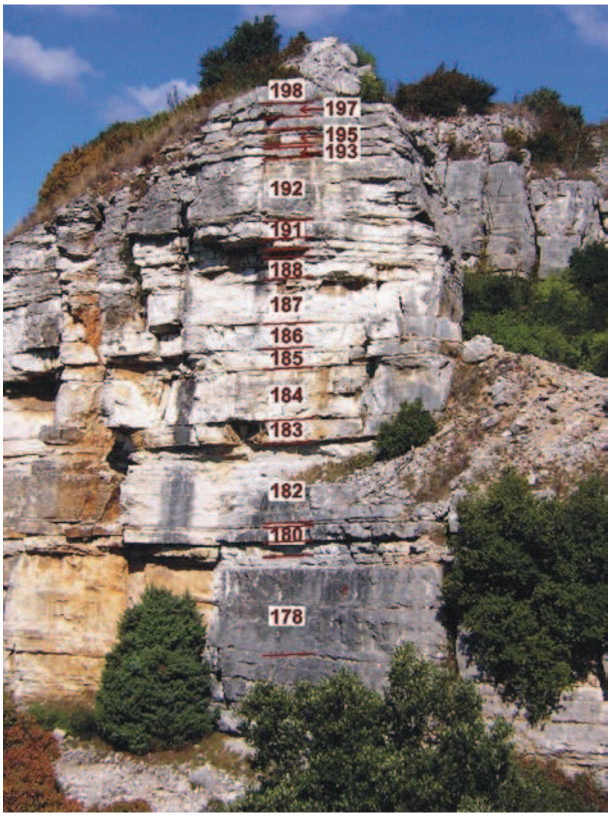


Fig. 5: Outcrop section of the Acanthicum Zone of the Mallet quarry.

No. 405 and at the top of the great Mallet quarry (Fig. 2, 4-5). Oppeliidae and Aspidoceratidae are predominant in the ammonite fauna of those beds (Fig. 6 and 7): Oppeliidae such as *Taramelliceras compsum* (OPPEL, 1863) ([M] & [m]), *Streblites weinlandi* (OPPEL, 1863) ([M] & [m]), *Ochetoceras canaliferum* (OPPEL, 1863), and Aspidoceratidae: *Aspidoceras acanthicum* (OPPEL, 1863) (Pl. XI, fig. 6), *Orthaspidoceras lallierianum* (D'ORBIGNY, 1849) (Pl. XII, fig 8), *Sutneria cyclodorsata* (MOESCH, 1867) (Pl. XII, fig. 2). There are also *Nebrodites hospes* (NEUMAYR, 1873) (Pl. XI, fig. 8), *Nebrodites* gr. *agrigentinus* (GEMMELLARO, 1872) (Pl. XII, fig. 1), representatives of the genus *Discosphinctoides* OLORIZ, 1978 (Pl. XI, fig. 4, 5; Pl. XII, fig. 5), and rarely *Aulacostephanus phorcus* (FONTANNES, 1876) (Pl. XII, fig. 3), *Phylloceras praeposterium* (FONTANNES, 1875) (Pl. XI, fig. 7), *P.* aff. *saxonicum* NEUMAYR, 1871 (Pl. XI, fig. 9), *Holcophylloceras polyolcum* (BENECKE, 1866) (Pl. XII, fig. 7), *Ptychophylloceras ptychoicum* (QUENSTEDT, 1845) (Pl. XI, fig. 11), *Lytoceras polycyclum* NEUMAYR, 1873 (Pl. XII, fig. 6), and there are also some nautilus with sinuous septa [*Pseudaganides* cf. *pseudaganiticus* (SCHLOTHEIM, 1820)] (Pl. XI, fig. 10). A few belemnites, gastropods and bivalves complete the fauna.

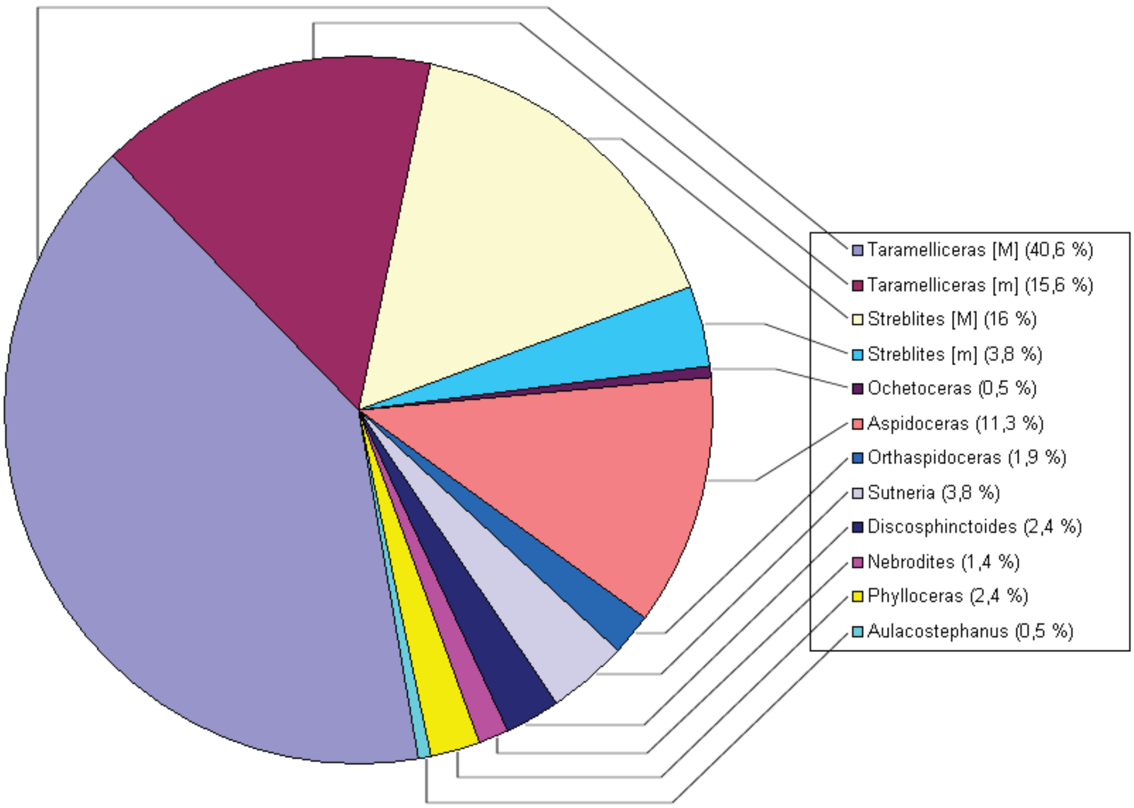


Fig. 6: The ammonites' genera in bed No. 193 (N=212).

III. GOALS AND METHODS

The choice of a "paleobiological" approach

Species concept in paleontology has undergone significant changes since the first part of the twentieth century when the "typological species" was still largely used. Since the 1950s, this concept has been gradually supplanted by other approaches incorporating more biological and evolutionary criteria (eg TINTANT, 1952, 1963, 1965, 1966, 1969, 1980; CALLOMON, 1963; WESTERMANN, 1966; MAYR, 1974, 1982; KENNEDY & COBBAN, 1976; MAHÉ & DEVILLERS, 1983; CHALINE & MARCHAND, 2002; MARCHAND & DOMMERGUES, 2008; CHANDLER & CALLOMON, 2009; BERT, 2009). As the interfertility criterion is inaccessible in paleontology, a researcher wishing to study a sample of ammonites in a way "as biologically as possible" (here "paleobiological") must base his study on a large-scaled sample in an isochronously and geographically restricted area.

In case of an interbreeding population the variability is not at random and it is often close to a Gaussian distribution. When a sample shows this kind of continuity, it can be reasonably considered (parsimonious hypothesis) as part of a population of individuals belonging to the same specific entity (and thus a single taxon) rather than a multitude of taxa in which every slightly different individual begins the designation of a new "species" name. This approach is particularly convenient if the intermediaries between various possible morphotypes are recognized (intraspecific polymorphism). Thus, even if at first glance the paleobiological approach seems to be an apparent loss of signal in the morphological information, it actually has more benefits than a strictly typological approach: it can provide a coherent explanation for the strong variability observed within some fossil samples (disparity), especially within the ammonites (TINTANT, 1976; KENNEDY & COBBAN, 1976; MORARD & GUEX, 2003; COURVILLE & CRÔNIER, 2003, 2005; CHANDLER & CALLOMON, 2009; BERT, 2004, 2009), it can provide credible models explaining their evolutionary trends (WESTERMANN, 1966; DOMMERGUES *et al.*, 1986; CHALINE & MARCHAND, 2002; GOULD, 2002; MARCHAND & DOMMERGUES, 2008), or it can identify morphological features that can be used as biochronologic markers (eg MARCHAND, 1986; BONNOT, 1995; BERT, 2004; BERT & DELANOY, 2009; BERT *et al.*, 2009) and which may otherwise be entirely unnoticed (BERSAC & BERT, work in progress).

Applied here, the paleobiological approach enables a new understanding of the intraspecific variability mechanisms and their extent for the Oppeliidae at the base of the Upper Kimmeridgian.

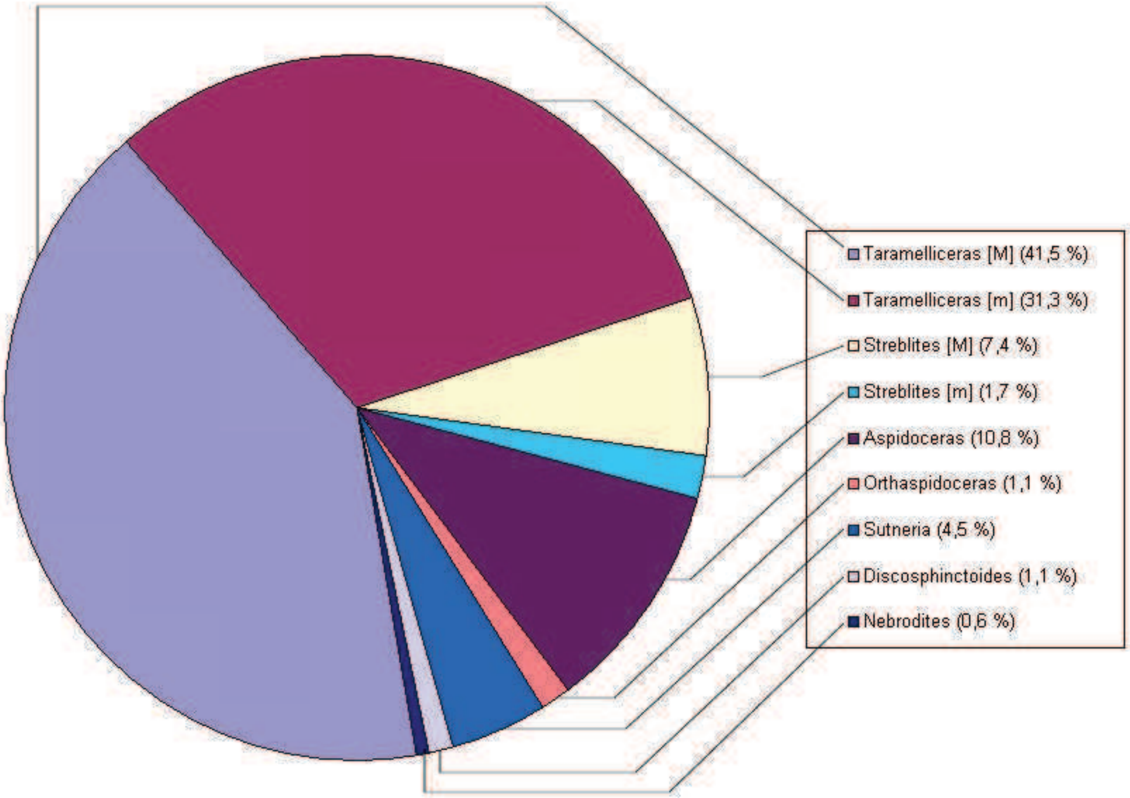


Fig. 7: The ammonites' genera in bed No. 195 (N=176).

Biometrics

To provide the basis for a paleobiological study, biometric measurements found in Tables 1-5 (cf. Annex) were performed using a specific protocol (Fig. 8). Traditional measurements of diameter (*D*), size of umbilicus (*U*), height (*H*) and width (*W*) of the whorls were generally made at three or four different diameters. The angle α is measured between the largest diameter and the studied diameter, when in bold it locates the beginning of the adult body chamber if it is present and if the last suture lines are visible. Adults *Taramelliceras* are recognized as secondary ribs that were fading and then disappeared, and adults *Streblites* are recognized as a tabular ventral area that was appearing.

For *Taramelliceras* macroconchs (ribbed and tuberculate) and *Ochetoceras* (ribbed only), the parameters *Npr/2*, *Nsr/2* and *Nt/2* respectively indicate the number of primary ribs, secondary ribs and of tubercles at half turn in function of diameter. In contrast, the weakly developed and very thin ribs of *Streblites* macroconchs and of microconchs (of *Taramelliceras* and *Streblites*) can hardly ever be seen, and could not be counted.

The ammonite material is actually housed in the collections of the members of the *Groupe de recherche en Paléontologie et biostratigraphie des Ammonites* (*G.P.A* – head office at *F-04170 La Mure-Argens, France*) and it is actually available for consultation to its collectors.

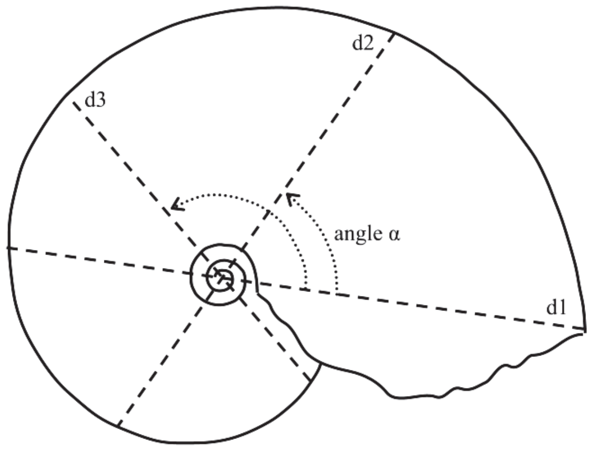


Fig. 8: Explanatory diagram of measurements on the specimens studied.

IV. PALAEONTOLOGICAL AND SYSTEMATIC STUDY

Suborder Ammonitina Hyatt, 1889
Superfamily Haploceratoidea Zittel, 1884
Family Oppeliidae Douvillé, 1890
Subfamily Taramelliceratinae Spath, 1928

Genus *Taramelliceras* DEL CAMPANA, 1904
Type species : *Ammonites trachinotus* OPPEL, 1863

Taramelliceras compsum (OPPEL, 1863)
Pl. I, fig. 1-4, 7; Pl. II, fig. 3-10; Pl. III, fig. 1-7; Pl. IV, fig. 1-8; Pl. V, fig. 1-6; Pl. VI, fig. 1-6; Pl. VII, fig. 1-11; Pl. VIII, fig. 1-10

Synonymy
Morph *compsum* [M] (= macroconch)

1849. *Ammonites flexuosus costatus* nov. ssp. - QUENSTEDT, pl. 9, fig. 1, 4.
* 1863. *Ammonites compsus* nov. sp. - OPPEL, p. 215, pl. 57, fig. 1.
1863. *Ammonites holbeini* nov. sp. - OPPEL, p. 213.
1873. *Oppelia holbeini* (OPPEL, 1863). - NEUMAYR, p. 166, pl. 33, fig. 1.
? 1875. *Ammonites flexuosus* MÜNSTER, 1830. - FAVRE, pl. 1, fig. 13, 14.
? 1876. *Ammonites* (*Oppelia*) *flexuosus* MÜNSTER, 1830. - FAVRE, pl. 3, fig. 6.
1876. *Ammonites* (*Oppelia*) *holbeini* OPPEL, 1863. - LORIOL, p. 37, pl. 3, fig. 6, 7.
pars 1877. *Ammonites* (*Oppelia*) *greenackeri* MOESCH, 1865. - LORIOL, p. 44, pl. 5, fig. 3 ; *non* pl. 5, fig. 2.
1877. *Ammonites* (*Oppelia*) *holbeini* OPPEL, 1863. - FAVRE, p. 31, pl. 2, fig. 11-12.
1877. *Ammonites* (*Oppelia*) *pseudoflexuosus* nov. sp. - FAVRE, p. 29, pl. 2, fig. 9, 10 ; pl. 3, fig. 1.
1878. *Oppelia compsa* (OPPEL, 1863). - HERBICH, p. 150, pl. 5.
? 1878. *Oppelia kochi* nov. sp. - HERBICH, p. 151, pl. 6, fig. 1, 2.
1879. *Oppelia compsa* (OPPEL, 1863). - FONTANNES, p. 34, pl. 5, fig. 1.
? 879. *Oppelia franciscana* nov. sp. - FONTANNES, p. 41, pl. 6, fig. 1.
1879. *Oppelia holbeini* (OPPEL, 1863). - FONTANNES, p. 37, pl. 5, fig. 3.
1887. *Ammonites flexuosus gigas* QUENSTEDT, 1849. QUENSTEDT, p. 909, pl. 98, fig. 8-12.
pars 1887. *Ammonites flexuosus crassatus* nov. ssp. - QUENSTEDT, p. 912, pl. 99, fig. 1?, 2, 3?, 5?, *non* pl. 99, fig. 4 *nec* fig. 6-8.
? 1893. *Neumayria pseudoflexuosa* (FAVRE, 1877). - CHOFFAT, p. 23, pl. 16, fig. 15-17.
1896. *Oppelia compsa* (OPPEL, 1863). - CANAVARI, p. 44, pl. 5, fig. 2.
pars 1905. *Taramelliceras pseudoflexuosus* (FAVRE, 1877). - DEL CAMPANA, p. 49, pl. 1, fig. 12, 13, *non* pl. 6, fig. 2, 3.
non 1928. *Taramelliceras* aff. *holbeini* (OPPEL, 1863). - SPATH, pl. 14, fig. 14.
? 1927-1933. *Taramelliceras* cf. *compsum* (OPPEL, 1863). - SPATH, pl. 18, fig. 10.
1934. *Oppelia* (*Taramelliceras*) *holbeini* (OPPEL, 1863). - DACQUÉ, pl. 32, fig. 11.
1938. *Oppelia holbeini* (OPPEL, 1863). - TRAUTH, pl. 11, fig. 23.
1941. *Oppelia holbeini* (OPPEL, 1863). - DISLER, pl. 14, fig. 4.
1955. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - HÖLDER, p. 110, pl. 19, fig. 22.
1955. *Taramelliceras* (*Taramelliceras*) *pseudoflexuosus* (FAVRE, 1877). - HÖLDER, p. 117, pl. 19, fig. 23.
? 1955. *Taramelliceras* (*Taramelliceras*) *pseudoflexuosum gracile* nov. ssp. - HÖLDER, p. 110, pl. 19, fig. 24.
? 1966. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - ANDELKOVIC, p. 27, pl. 6, fig. 1, 2, pl. 7, fig. 4, pl. 10, fig. 3, 7, pl. 24, fig. 1, pl. 26, fig. 1.
? 1966. *Taramelliceras* (*Taramelliceras*) *pseudoflexuosum* (FAVRE, 1877). - ANDELKOVIC, p. 28, pl. 3, fig. 2, pl. 6, fig. 3, 4.
? 1970. *Taramelliceras compsum* (OPPEL, 1863). - BANTZ, p. 28, pl. 1, fig. 2.
? 1978. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - OLORIZ, p. 83, pl. 6, fig. 1-4.
non 1979. *Taramelliceras* (*Taramelliceras*) *compsum compsum* (OPPEL, 1863). - SAPUNOV, p. 48, pl. 9, fig. 1, 2.
? 1979. *Taramelliceras* (*Taramelliceras*) *compsum holbeini* (OPPEL, 1863). - SAPUNOV, p. 49, pl. 9, fig. 3, 4.
1979. *Taramelliceras* (*Taramelliceras*) *franciscanum* (FONTANNES, 1879). - SAPUNOV, p. 50, pl. 10, fig. 1 a, b; 2 a, b, 3.
? 1986. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - SARTI, p. 496, pl. 2, fig. 1.
non 1992. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - FINKEL, p. 230, fig. 82.
? 1993. *Taramelliceras* (*Taramelliceras*) *compsum compsum* (OPPEL, 1863) *kochi* morphotype (HERBICH, 1878). - SARTI, p. 60, pl. 3, fig. 2.
1993. *Taramelliceras* (*Taramelliceras*) *pseudoflexuosum* (FAVRE, 1877). - SARTI, p. 63, pl. 4, fig. 3.
1994. *Taramelliceras* (*Taramelliceras*) *compsum* (OPPEL, 1863). - SCHLEGELMILCH, p. 36, pl. 10, fig. 1, pl. 15, fig. 7.
1994. *Taramelliceras* (*Taramelliceras*) *pseudoflexuosus* (FAVRE, 1877). - SCHLEGELMILCH, p. 36, pl. 9, fig. 5.
2002. *Taramelliceras* (*Taramelliceras*) *compsum compsum* (OPPEL, 1863). - PAVIA & CRESTA, p. 215, fig. 146.
2002. *Taramelliceras* (*Taramelliceras*) *compsum holbeini* (OPPEL, 1863). - PAVIA & CRESTA, p. 217, fig. 147, 148.
? 2002. *Taramelliceras* (*Taramelliceras*) *compsum kochi* (OPPEL, 1863). - PAVIA & CRESTA, p. 219, fig. 146.

Morph *crenosum* [m] (= microconch)

* 1887. *Glochiceras crenosum* nov. sp. - QUENSTEDT, p. 847, pl.92, fig. 32.
pars 1958. *Glochiceras* (*Lingulaticeras*) *crenosum* (QUENSTEDT, 1958). - ZIEGLER, p. 136, pl. 13, fig. 10-11, 13-14, *non* fig. 12, 15.
1994. *Glochiceras* (*Lingulaticeras*) *crenosum* (QUENSTEDT, 1958). - SCHLEGELMILCH, p. 54, pl. 16, fig. 11.

Remark: for a complete synonymies' list of the GEMMELLARO's work, refer to the revision of PAVIA & CRESTA (2002).
Lectotype: original figuration by OPPEL (1863), pl. 57, fig. 1a, b; lectotype deposited in the *Bayerische Staatssammlung für Paläontologie und historische Geologie*, Munich (cf. SARTI, 1986). A lectotype cast, seen by one of us (D.B.), from the *National Natural of History Museum* in Paris, is figured Pl. I, fig. 2.
Type locality: Swabian Jura (Württemberg), Germany.
Type stratum: "Malm formation, Weissjura Delta".
Geographic distribution: *Taramelliceras compsum* (OPPEL, 1863), as considered in this work, is a species from the Mediterranean and Sub-Mediterranean realm: it was reported in Spain (OLORIZ, 1978), Italy (SARTI, 1986, 1993), Germany (Swabia and Franconia - HÖLDER, 1955), Switzerland (FAVRE, 1877), in Southeastern France (FONTANNES 1979; FAVRE, 1877; this work), and probably in Yugoslavia (ANDELKOVIC, 1966) and Bulgaria (SAPUNOV, 1979). It may also be found in Portugal (CHOFFAT, 1893) and India (Kachchh - SPATH, 1928).
Stratigraphic distribution: *Taramelliceras compsum* (OPPEL, 1863) appears in the lower part of the Acanthicum Zone in the Mount Crussol. The specimens studied in this work are exclusively from beds No. 193 and 195.
HÖLDER (1955), HANTZPERGUES *et al.* (1997) and SARTI (1993) also agreed *Taramelliceras compsum* (OPPEL, 1863) appears in the Acanthicum Zone, but its extension into the Upper Kimmeridgian varies according to the authors. In the sub-Mediterranean realm, HANTZPERGUES *et al.* indicated that this species can only be found in the lower part of the Pseudomutabilis Zone, while for HÖLDER it can be found in that whole zone in Germany. For SCHERZINGER (personal communication), the species is still present in the uppermost part of the Pseudomutabilis Zone in Swabia (SW Germany). In Italy (Mediterranean realm), it even spreads in the Beckeri Zone according to SARTI.
OLORIZ (1978) gives a much larger-scaled distribution for *Taramelliceras compsum* (OPPEL, 1863) in Spain, from the top of the Divisum Zone (Uhlandi Subzone) to the Lower Tithonian (Hybonotum Zone). However, such extension seems exaggerated related to the questionable membership to *T. compsum* (OPPEL) of the specimens figured by this author (1978, pl. VI, fig. 1-4) because of their poor preservation.

Material and dimensions (macroconchs [M], N=155; microconchs [m], N=41): see Tables 1 and 2 for macroconchs and microconchs respectively.

Ontogenesis
The macroconchs [M]
The specimens studied here show a subrectangular section of the whorls (Fig. 9), with a generally involute shell (*U/D* between 0.09 and 0.31, average of 0.16), which is relatively compressed (*W/D* between 0.24 and 0.38, average of 0.31) and with relatively high whorls (*H/D* between 0.42 and 0.62, average of 0.53; *W/H* between 0.45 and 0.78, average of 0.58). Adult specimens which can be recognized as their second ribs and sometimes their tubercles disappeared, have complete diameters ranging from 90 to 187 mm (maximum size observed in the specimen No. cru088a, Pl. XII, fig. 1). When complete, the living body chamber approximately occupies the last half whorl. Bivariate diagrams for the dimensional parameters growth of the shell (*H*, *W* and *U* in function of diameter - Fig. 10, 11 and 12) show in all cases homogeneous scatters around the mean curve (with R^2 still very high >0.9) in every case. The growth of those parameters is isometric and harmonic, and corresponds to the relationship *Y=bD*.
The ornamentation consists of main ribs; they regularly polyfurcate inward the mid-flank at an inflection point, of peri-ventral clavis, and of small siphonal tubercles. The average number of ribs (Fig. 13 and 14) steadily increases to about 80 mm in diameter, and then decreases beyond that diameter. The number of tubercles increases more quickly and reaches its maximum at an average of *D*=70 mm (Fig. 15). Four stages can be described during the ontogenesis depending on the ornamentation:
- Stage 1 smooth: up to *D*=15 mm; macroconch and

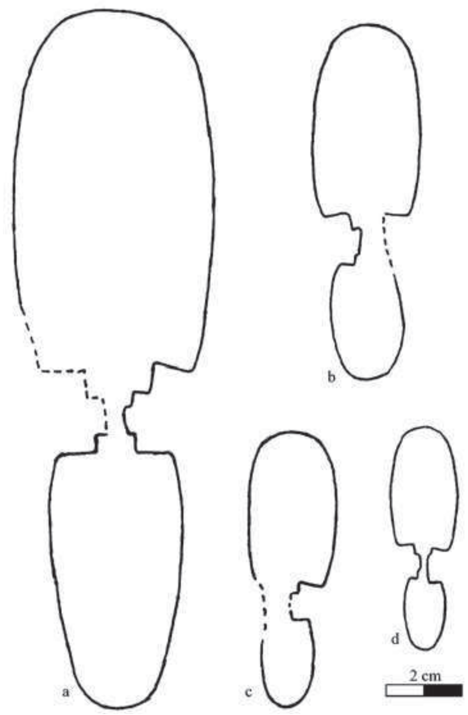


Fig. 9: *Taramelliceras compsum* (OPPEL, 1863) [M], whorl sections, × 1; a: specimen No. cru088, coll. BOSELLI; b: specimen No. crl026, coll. BAUDOUIN; c: specimen No. crl135, coll. BAUDOUIN; d: specimen No. crl136, coll. BAUDOUIN.

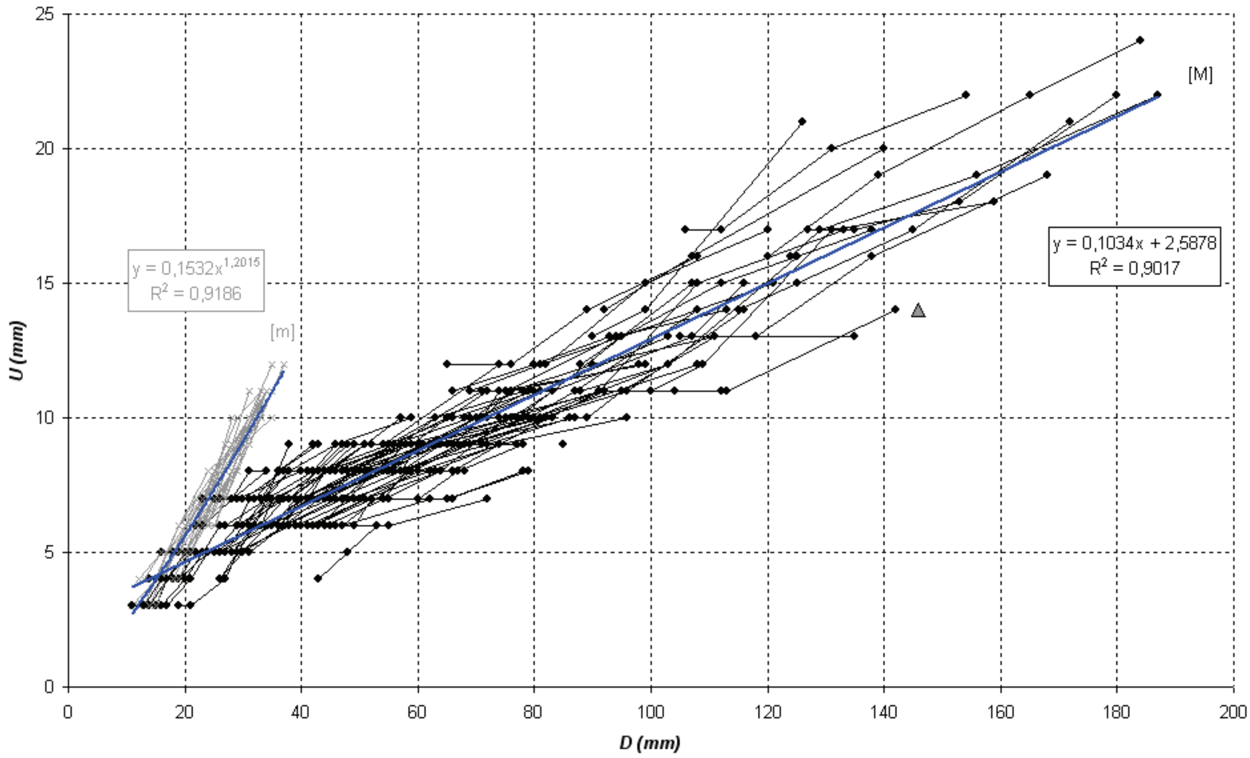


Fig. 10: *U=f(D)* for *Taramelliceras compsum* (OPPEL, 1863); macroconchs are in black, microconchs are in grey. The triangle is for the lectotype.

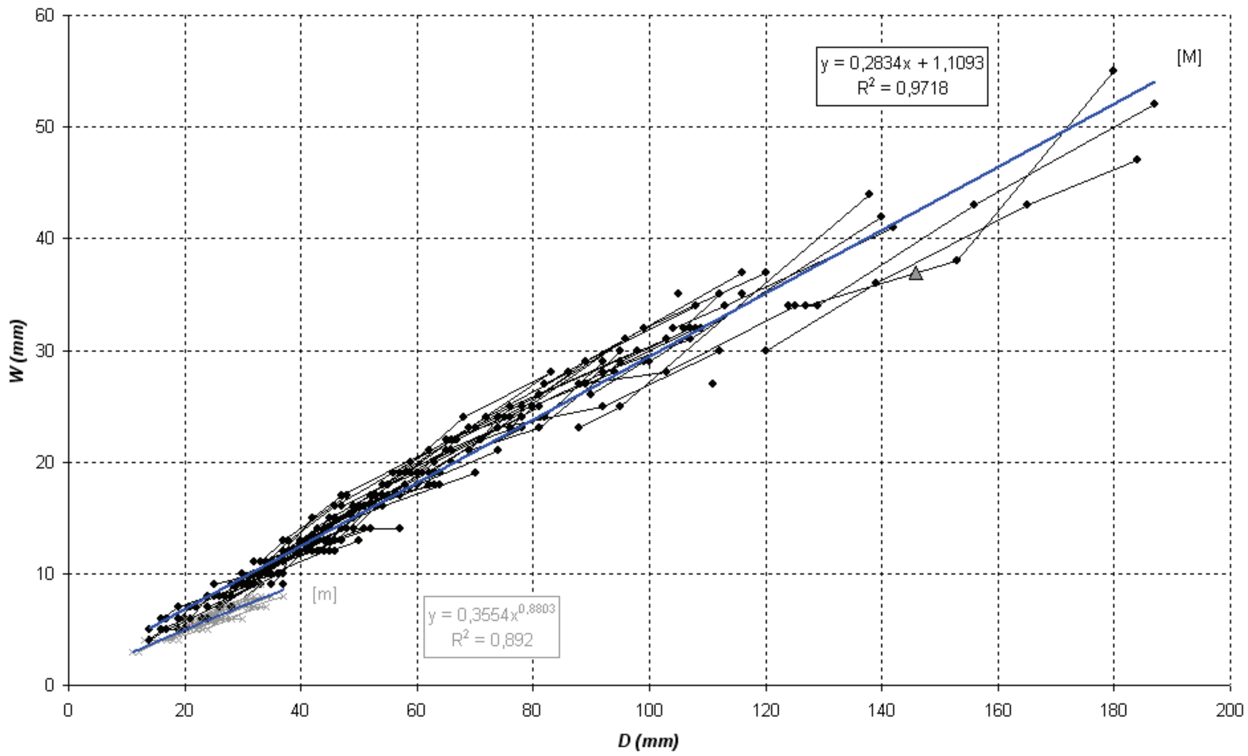


Fig. 11: *W=f(D)* for *Taramelliceras compsum* (OPPEL, 1863).

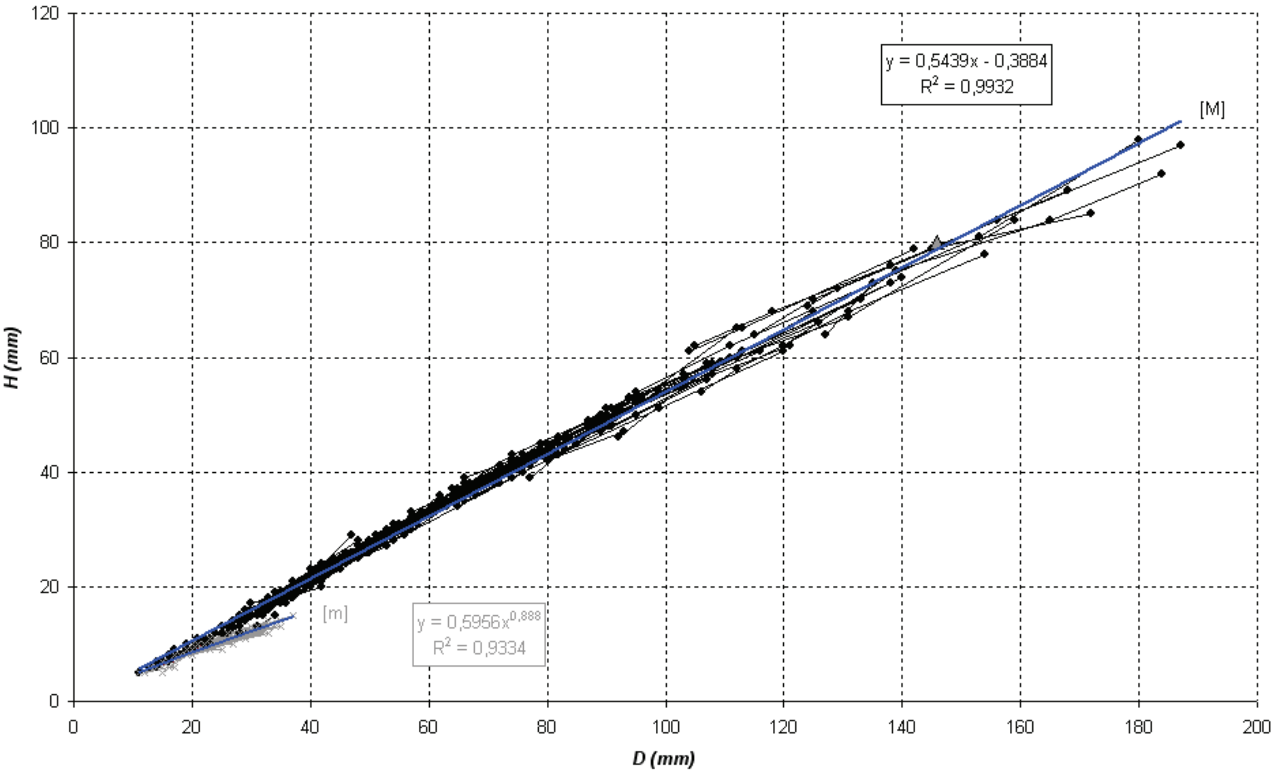


Fig. 12: *H=f(D)* for *Taramelliceras compsum* (OPPEL, 1863).

microconch individuals are indistinguishable and neither shows any ornamentations [both clouds of points merge on bivariate diagrams of *H*, *W* and *U=f (D)*]. The coiling is relatively evolute at this stage (*U*/*D* between 0.25 and 0.35, *H*/*D* generally between 0.35 and 0.50); the whorl section is oval, high and relatively compressed with slightly rounded flanks. The umbilical wall is low, vertical, with a rounded edge.

- Stage 2 "pichleri" so named by its strong analogy with the *Taramelliceras pichleri* (OPPEL, 1863) ornamentation (Bimammatum Zone, Upper Oxfordian). From about *D*=15 mm the secondary ribs first appear (Fig. 13). They are all identical and first located near the latero-ventral edge of the shell, but they are gradually spreading toward the upper half of the flanks. The ribs are interrupted at the latero-ventral shoulder in a slight bulge but it is not a real tubercle. In parallel, small siphonal tubercles appear on the ventral rounded area; they are roughly equivalent to the number to secondary ribs. A smooth band separates that siphonal tubercles line from the latero-ventral bulged termination of the secondary ribs. Then, at *D*=20 mm, primary ribs appear near the umbilical edge on the lower half of the flanks (Fig. 14) and they are quite bulged and slightly flexuous. On the upper half of the flanks, primary and secondary ribs cannot be differentiated. Between two primary ribs the number of secondary ribs varies from 2 to 8, and generally the number of secondary ribs inserted between two primary ribs decreases as ammonites are growing. At *D*=20 mm, there are generally between 15 and 25 ribs per half-whorl in the upper half of flanks.

- Stage 3 "pseudoflexuosum": from 30 to 40 mm in diameter, tubercles indistinctly replace some primary or secondary ribs thickened terminations on the latero-ventral edge. Their strength and numbers are highly variable and there are between 4 and 15 tubercles per half-whorl at *D*=50 mm (Fig. 15). Those tubercles are first small, round or slightly and radially elongated. They may either keep this bulliforme aspect (*pseudoflexuosum* morph), or they may grow in strength (sometimes very strongly in other specimens) and become elongated (claviform) in the coiling up direction and absorb the termination of 2 to 3 ribs bundles (morph *compsum*). The primary ribs are relatively flexuous and inclined forward in the flanks' lower half, and then sometimes they sharply bend at mid-flanks, where they may show a slight bulge before becoming radial or slightly concave on the flanks' upper half. Their number varies between 5 and 15 per half-whorl, or even more depending on the specimens (Fig. 14). In comparison with stage 2, the ribbing is generally thinner and denser. At *D*=40 mm there are generally between 25 and 35 ribs in the flanks' upper half, and between 30 and 50 at *D*=60 mm (Fig. 13).

- Stage 4: this stage approximately corresponds to the living body chamber of adult specimens (*D*>80 mm). Secondary ribs are getting strongly attenuated and then they disappear (Fig. 13), primary ribs (Fig. 14), and

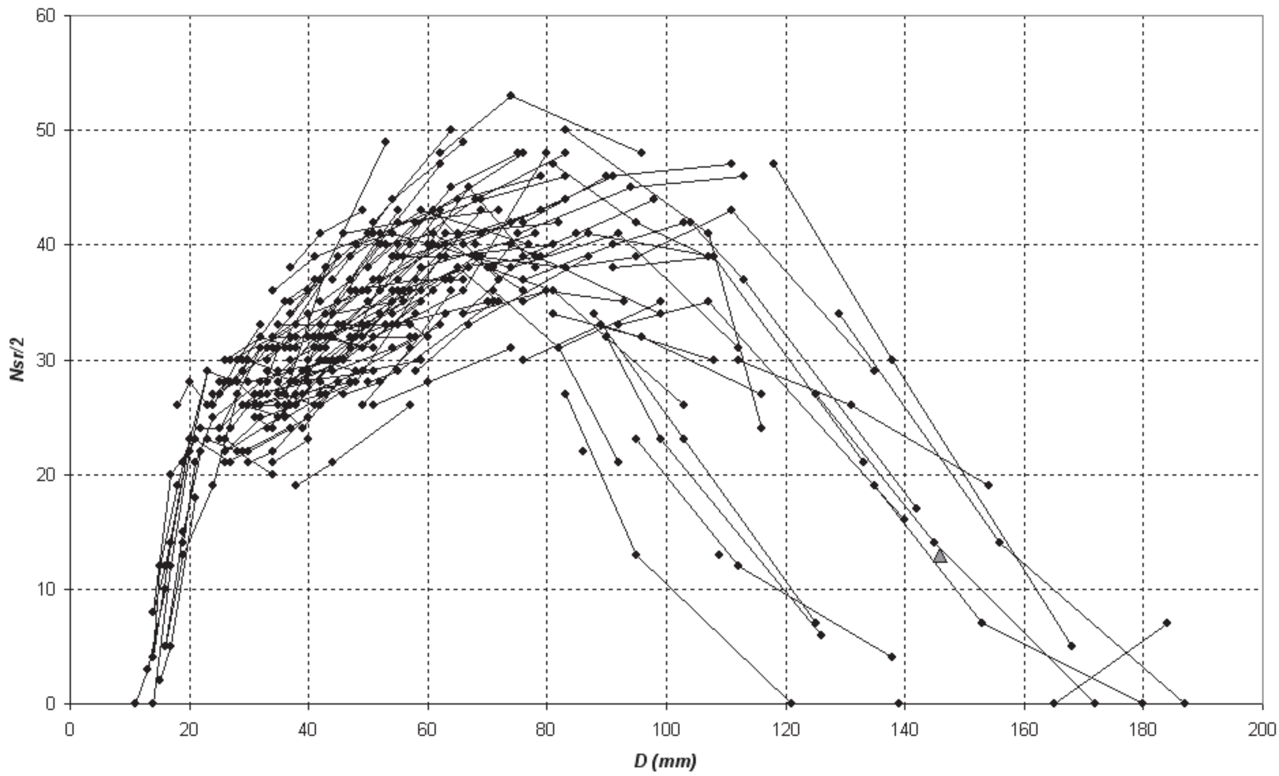


Fig. 13: Number of secondary ribs in function of *D* for *Taramelliceras compsum* (OPPEL, 1863) [M].

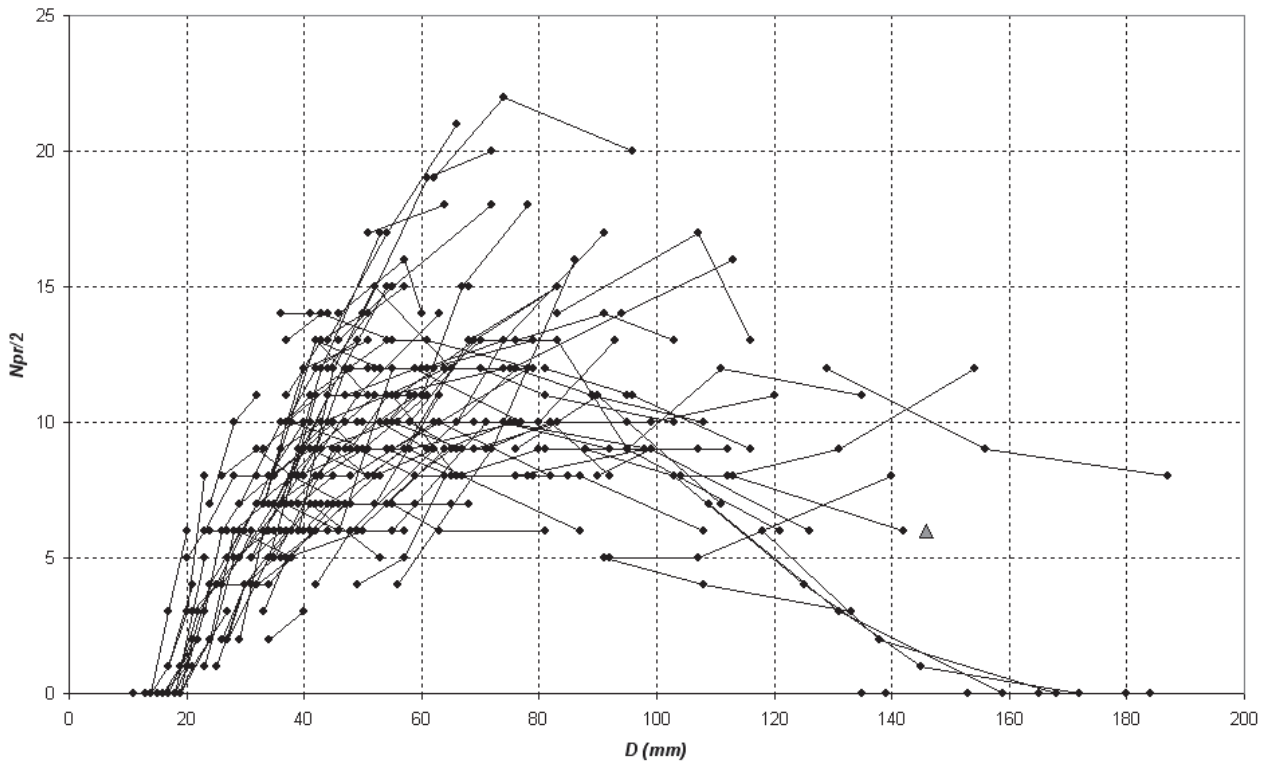


Fig. 14: Number of primary ribs in function of *D* for *Taramelliceras compsum* (OPPEL, 1863) [M].

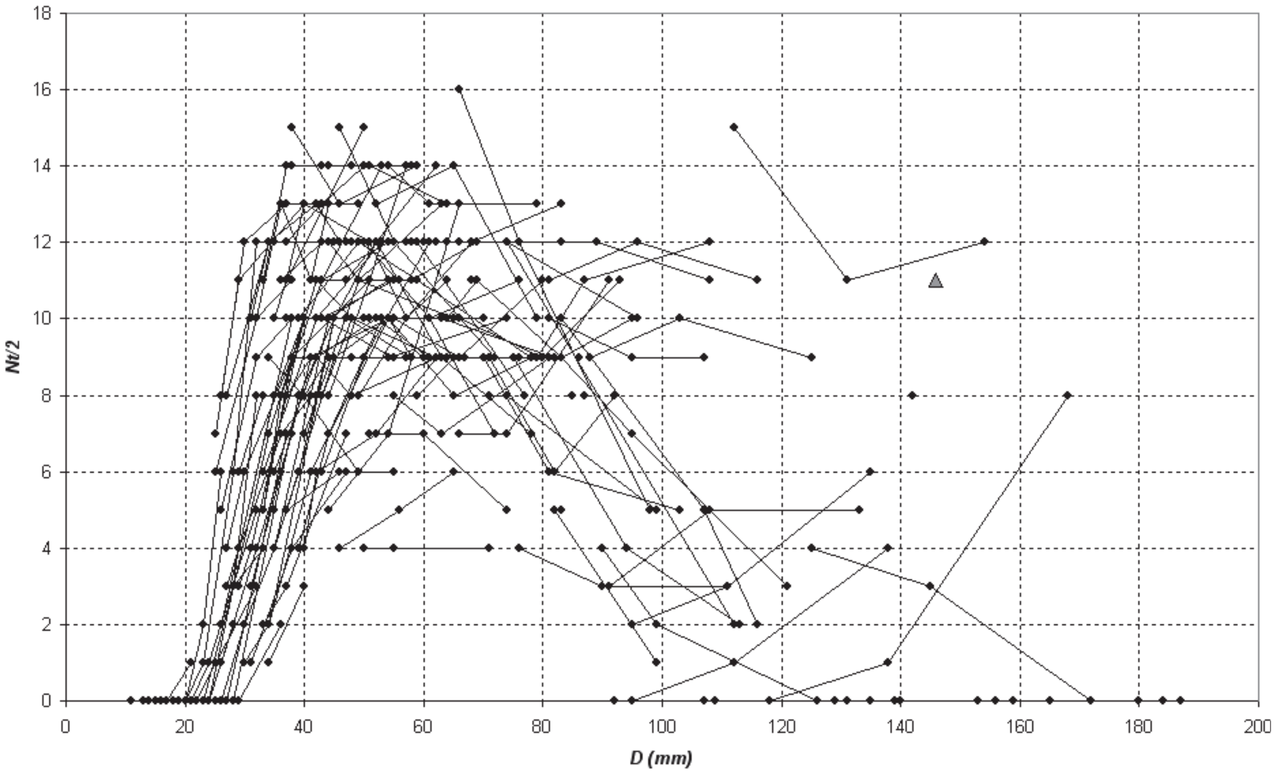


Fig. 15: Number of tubercles in function of *D* for *Taramelliceras compsum* (Oppel, 1863) [M].

tubercles (Fig. 15) frequently (but not systematically) get attenuated as well. This stage is, in fact, quite variable: with specimens that become completely smooth at large diameters (specimens No. cru015, Pl. V, fig. 3, No. cru088a, Pl. VII, fig. 1), there are specimens whose tuberculation remains particularly strong (specimen No. cru076, Pl. VI, fig. 3).

The peristome, rarely preserved in macroconch specimens is sinuous with a slight ventral beak (specimen No. cru088a, Pl. VII, fig. 1).

The microconchs [m]

Every *Taramelliceras compsum* (Oppel, 1863) microconch shows a "Glochiceras" type morphology with a small sized ornate shell (maximum size observed: D=37 mm, specimen No. cru060, Pl. VII, fig. 9). If the inner whorls of both dimorphs are identical up to *D*=15 mm, the microconchs adult stage is always more evolute than the macroconchs' (Fig. 10) with a ratio *U*/*D* which grow from 0.25 to 0.35. In complete specimens, the adult stage is distinguished by the relative contraction of the living body chamber and the presence of jugal apophysis. As in macroconchs, the living body chamber is approximately half a whorl.

Bivariate diagrams drawn from the shell parameters (Fig. 10, 11 and 12) show that the average microconchs curves follows the allometric relationship of $Y=bD^a$ type.

- Stage 1 smooth: up to about *D*=15 mm, macroconchs and microconchs show no discernible difference (see above).
- Stage 2 "crenosum": beyond *D*=15 mm, microconch specimens can strongly be differentiated from their macroconchs. The coil is getting much more evolute (Fig. 10), while the whorl's height and thickness growth is decreasing, with *H*/*D* between 0.37 and 0.43 and *W*/*D* between 0.20 and 0.26 for *D*=35 mm. The umbilical wall is vertical, low, with a slightly rounded or angular edge. The whorls section is oval (*W*/*H* between 0.50 and 0.75) with slightly rounded flanks and a convex ventral area. The ornamentation is absent or hardly noticeable, and it can almost exclusively be found only on the adult body chamber. When the ornamentation is visible, there are crenulations on the ventral area, often more strongly marked near the peristome, while on the flanks sometimes there are small falciform striations. Those striations are first inclined forward, next they form a bulge in the flanks' lower third part, and then they become strongly retroverted and concave in the flanks' upper part. At the first third of the flanks, the striations sometimes become bulges arranged along a very slightly marked furrow, and they determine a series of slightly marked depressions near the peristome.

The peristome shows well developed spatulate apophysis. They are often dug by a marked furrow in their first half. The furrow is located in the extension of the one which is sometimes visible on the body chamber. That furrow is bordered by a large rim on the inner side. Apophysies are often curved inward, and they sometimes slightly cover the preceding whorl.

Variability

Besides the distinction in two dimorphic macro- and microconchs, the variability in this sample focuses on the diameter of different appearing stages, the adult size, as well as on the ribbing and tubercles (macroconchs). Macroconchs show the greatest variations between individuals. All dimensional parameters also show some variations, especially regarding the global ornamentation strength, the umbilicus widening, and the whorl section relative thickness.

In macroconch dimorphs, stage 2 "pichleri" which precedes the appearance of latero-ventral tubercles, disappears from *D*=20 mm in some specimens (specimen No. crl018, Pl. II, fig. 10), while it may continue up to about *D*=35 mm (specimen No. crl020, Pl. II, fig. 4). The ribbing strength is also quite variable: secondary ribs are usually relatively spaced, large and thickened near the latero-ventral edge (No. crl020, Pl. II, fig. 4), but it can be thinner and denser in the slender forms (No. crl014, Pl. II, fig. 9). Stage 3 "pseudoflexuosum" shows an even greater variability, and its most striking effect is focused on the tubercles' density and persistence. In some slender specimens (morph *pseudoflexuosum*), the tubercles remain discrete, round or slightly elongated in the ribs' direction, before early disappearance (specimens No. crl026, Pl. III, fig. 1 at *D*=70 mm, No. cru024, Pl. V, fig. 1 at *D*=73 mm and No. cru078, Pl. VIII, fig. 1 at *D*=88 mm). Instead, other more robust specimens (morph *compsum*) show strongly enhanced tubercles which widen in the coiling direction. In those specimens the tuberculation process continues during ontogenesis (specimen No. crl024, Pl. II, fig. 6), and it can even be seen in stage 4 on the entire adult living body chamber (specimens No. cru030, Pl. V, fig. 5, No. cru076, Pl. VI, fig. 3, No. cru045, Pl. VI, fig. 6, and No. cru056, Pl. VIII, fig. 3). Many intermediaries connect these two extreme morphologies (eg the specimen No. crl024, Pl. II, fig. 6). The ornamentation strength and the coil aspect (more or less widening of the umbilicus) are directly related to the tubercles' strength. So, slender morphologies with weak and quickly decreasing tubercles have dense and weak ribs associated with a more involute coiling (*U/D* relatively low between 0.10 and 0.12 for *D*>60 mm). In contrast, robust morphologies with strong and persistent tubercles have more pronounced and spaced ribs that last longer during ontogeny, they are also associated with a more evolute coiling (*U/D* greater between 0.15 and 0.16 for *D*> 60 mm).

On the other hand, the high variability in tubercles' density is directly related to primary ribs' density, without any apparent links with the ornamentation strength. A parallel can be drawn between that phenomenon and a greater length in stage 2 and a less individualized stage 3, in that case the separation between both stages being very gradual and less obvious (specimen No. crl020, Pl. II, fig. 4).

When stage 4 is appearing, its diameter is generally linked to the more or less important extension of stage 3. Finally, slender specimens have an earlier and a longer stage 4 (the adult body chamber may even become smooth), and they have a larger adult size (*D*=187 mm for specimen No. cru088a, Pl. VII, fig. 1; *D*=168 mm for specimen No. cru035a, and *D*=180 mm for specimen No. cru027) than the most robust specimens (*D*=154 mm for specimen No. cru076, Pl. VI, fig. 3).

Microconch dimorphs are much less variable than the previous macroconchs because of their very discreet ornamentation and their few ontogenetic stages. The ornamentation is only visible on the adult body chamber and its variability mainly rests upon either the ventral crenulations' strength or its complete absence. Moreover, the tightening size of the adult body chamber depends on the specimens (*H/D* from 0.36 to 0.45 at *D*>20 mm). The shape of the apophysis terminal expansion may also change widely.

Differential diagnosis

Taramelliceras compsum (OPPEL, 1863) is different from *T. trachinotum* (OPPEL, 1863), a species from the Divisum Zone (top of Lower Kimmeridgian): its subrectangular whorl section is much more compressed, its venter is much less rounded, and its tubercles are always much less strong and radially elongated (at equal diameter within the macroconchs).

Taramelliceras intersistens HÖLDER, 1955 is a species that can be found from the top of the Acanthicum Zone to the base of the Beckeri Zone (Upper Kimmeridgian). It was reported to the *T. compsum* (OPPEL) [M] group by HÖLDER (1955), though *T. intersistens* HÖLDER is different from the latter group as in its ornamentation, there are secondary ribs, that are thinner and much more forwardly inclined, and its tubercles are weaker.

Taramelliceras klettgovianum (WÜRTTEMBERG, 1866) is from the the Pseudomutabilis Zone (Upper Kimmeridgian), and it differs from *T. compsum* (OPPEL) [M] as there are more primary ribs and its secondary ribs are forwardly more inclined with weaker tubercles.

Taramelliceras platyconcha (GEMMELLARO, 1872) is different from *T. compsum* (OPPEL) [M] with its numerous and tight tubercles, its strong and dense primary ribs, and its much greater thickness (*W/D* close to 0.35 at *D*>100 mm). The species is found from the Divisum Zone (Lower Kimmeridgian) to the Cavouri Zone (= Pseudomutabilis Zone) (Upper Kimmeridgian) (cf. PAVIA & CRESTA, 2002).

Taramelliceras kochi (HERBICH, 1878), whose original figure (HERBICH, 1878, pl. 6, fig. 1, 2) is difficult to interpret, is a species with a status which had to be clarified (PAVIA & CRESTA, 2002); in literature, it is frequently read as a morphotype of *T. compsum* (OPPEL)

[M]. Compared with the specimens figured by SARTI (1993, pl. 3, fig. 2) and PAVIA & CRESTA (2002, fig. 149), none of the specimens here shows such an increasing density of the primary ribs and the tubercles on the adult body chamber. From our current knowledge, *T. kochi* (HERBICH) can not be integrated in the *T. compsum* (OPPEL) [M] variability field, and this species might rather be close to *T. platyconcha* (GEMMELLARO). The *T. kochi* (HERBICH) stratigraphic range is identical to *T. compsum* (OPPEL) [M] one (cf. PAVIA & CRESTA, 2002).

Taramelliceras erycinum (GEMMELLARO, 1871), whose holotype was refigured by PAVIA & CRESTA (2002), mainly differs from *T. compsum* (OPPEL) [M] with its more oval-shaped whorls section and the lack of true tubercles on the ventral area: the secondary ribs only show a slight thickening on the shell's latero-ventral edge. *T. erycinum* (GEMMELLARO) is reported from the upper part of the Divisum Zone (Lower Kimmeridgian) to the Acanthicum Zone (Upper Kimmeridgian), or up to the Pseudomutabilis Zone according to PAVIA & CRESTA (2002).

Taramelliceras subcallicerum (GEMMELLARO, 1872), whose holotype was refigured by PAVIA & CRESTA (2002, fig. 153), is different from *T. compsum* (OPPEL) [M] as its secondary ribs are systematically ending with a small tubercle; consequently those tubercles' number is much more important than in *T. compsum* (OPPEL) [M]. *T. subcallicerum* (GEMMELLARO) is usually considered as a probable major synonym of *T. oculatiforme* (DE ZIGNO, 1905) (SARTI, 1993; PAVIA & CRESTA, 2002), and it can be found from the Divisum Zone (Lower Kimmeridgian) up to the Acanthicum Zone (Upper Kimmeridgian).

Taramelliceras pugile (NEUMAYR, 1871) can be distinguished from *T. compsum* (OPPEL) [M] as its umbilicus is wider and the large siphonal and latero-ventral tubercles rapidly emerged forming a rectangular whorl section. *Taramelliceras* of the *pugile* (NEUMAYR) group can be found from the Acanthicum Zone up to the Beckeri Zone, Subeumela Subzone (Upper Kimmeridgian).

Species, linked to the subgenus *Metahaploceras* SPATH, 1925 and which do not exceed the Divisum Zone (Lower Kimmeridgian) [*Taramelliceras* (*M.*) *subnereus* (WEGELE, 1929), *T.* (*M.?*) *kobyi* (CHOFFAT, 1893), *T.* (*M.*) *rigidum* (WEGELE, 1929), *T.* (*M.*) *strombecki* (OPPEL, 1857), *T.* (*M.*) *nodosiusculum* (FONTANNES, 1879), *T.* (*M.*) *semibarbarum* HÖLDER, 1955], can easily be distinguished from *Taramelliceras compsum* (OPPEL) [M] with their thinner ribbing and their fewer and weaker tubercles.

Discussion

Studying over 150 macroconch specimens from beds 193 and 195 in Mount Crussol enables us to assume that *Taramelliceras pseudoflexuosum* (FAVRE, 1877) is a junior synonym of *Taramelliceras compsum* (OPPEL, 1863). Indeed, both "morphospecies" show strictly identical inner whorls, the same ontogenetic stages, and they have the same stratigraphic range. *T. compsum* (OPPEL) [M] is mainly different from *T. pseudoflexuosum* (FAVRE) as it is larger and its tubercles are more developed and tangentially elongated. The studied sample shows that the appearing of this tangential elongation of the tubercles, when present, occurs at many varying diameters and it never occurs before *D*=70 mm. In the Acanthicum Zone of the Mount Crussol, in fact *T. pseudoflexuosum* (FAVRE) represents juvenile or small sized specimens of *T. compsum* (OPPEL) [M].

Moreover, according to HÖLDER (1955) *Taramelliceras greenackeri* (MOESCH, 1865) is a distinct species whose lectotype is the specimen DE LORIOL figured (1877, pl. V, fig. 2), while the specimen shown in fig. 3 is a clearly inner whorled of *T. compsum* (OPPEL) [M]. Our own observations have led us to the same statement: if many *T. compsum* (OPPEL) [M] specimens do show a relatively developed stage that is identical to DE LORIOL's in fig. 3 (1877) in the inner whorls (stage 2 "pichleri"), none of the specimen from Mount Crussol is close enough to the one in fig. 2, that latter having a very peculiar morphology.

Similarly, the subspecies *T. pseudoflexuosum gracile* HÖLDER, 1955 is very different from the morphotype *pseudoflexuosum* (FAVRE, 1877) of *T. compsum* (OPPEL) [M]. Once again, no specimen from the No. 193 and 195 bed's sample in Crussol shows such a dense and slender ribbing. However, in present day knowledge, no one can assume whether it is a distinct species or an extremely uncommon dense-ribbed morphotype.

Moreover, the study of many *Glochiceras* (*Lingulaticeras*) *crenosum* (QUENSTEDT, 1887) specimens (here [m] of *T. compsum*) shows that this taxon's inner whorls are identical to *T. compsum* (OPPEL) [M] ones up to *D*=15-20 mm. Under that diameter, neither form shows any ornamentation and both dimensional parameters are perfectly comparable: *W*/*D* between 0.25 and 0.35, *H*/*D* between 0.40 and 0.50 and *U*/*D* between 0.20 and 0.33. Figures 16, 17 and 18 also show that the parameters *U*, *W* and *H*, in function of *D*, get different in microconchs over 20 mm or so. Thus they follow an allometric relationship, while the macroconchs parameters follow an isometric one. Furthermore, from that diameter, the very subtile *G.* (*L.*) *crenosum* (QUENSTEDT) ornamentation sometimes shows thin and falciform striations bearing a bulge in the lower third of the flanks, its shape and its line are strongly reminiscent of the *T. compsum* (OPPEL) [M] ornamentation. These observations suggest that *G.* (*L.*) *crenosum* (QUENSTEDT) probably represents the microconch equivalent to the many contemporaries *T. compsum* (OPPEL) [M].

However, OLORIZ (1978) reported *G.* (*L.*) *crenosum* (QUENSTEDT) can be found from the Divisum Zone (Lower Kimmeridgian) and it still can be seen in the Beckeri Zone (Upper Kimmeridgian), which does not correspond to the *T. compsum* (OPPEL) [M] distribution

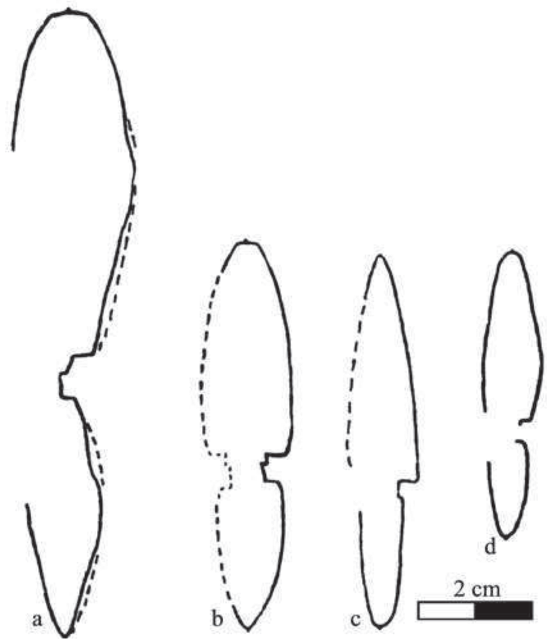


Fig. 16: *Streblites weinlandi* (OPPEL, 1863) [M], whorl sections, ×1; a: specimen No. crl126, coll. BAUDOUIN; b: specimen No. crl055, coll. BAUDOUIN; c: specimen No. crl060, coll. BAUDOUIN; d: specimen No. crl072, coll. BAUDOUIN.

(Acanthicum and Pseudomutabilis Zone - Kimmeridgian strictly). But we should note that, in general, the distinction between different "species" might get problematic because of the slightly expressed ornamentation in Oppeliidae microconchs. Thus, the specimens OLORIZ (1978) reported, which have a different stratigraphic position from *T. compsum* (OPPEL), could be the very similar microconch equivalents of closely related species, species such as *Taramelliceras trachinotum* (OPPEL, 1863) in the Divisum Zone or *Taramelliceras intersistens* HÖLDER, 1955 and *Taramelliceras klettgovianum* (WÜRTTEMBERG, 1866) in Pseudomutabilis and Beckeri zones.

Subfamily *Streblitinae* SPATH, 1925
Genus *Streblites* HYATT, 1900
Type-species: *Ammonites tenuilobatus* OPPEL, 1863

***Streblites weinlandi* (OPPEL, 1863)**
Pl. I, fig. 5, 6, 8; Pl. II, fig. 1; Pl. IX, fig. 1-8; Pl. X, fig. 1-14

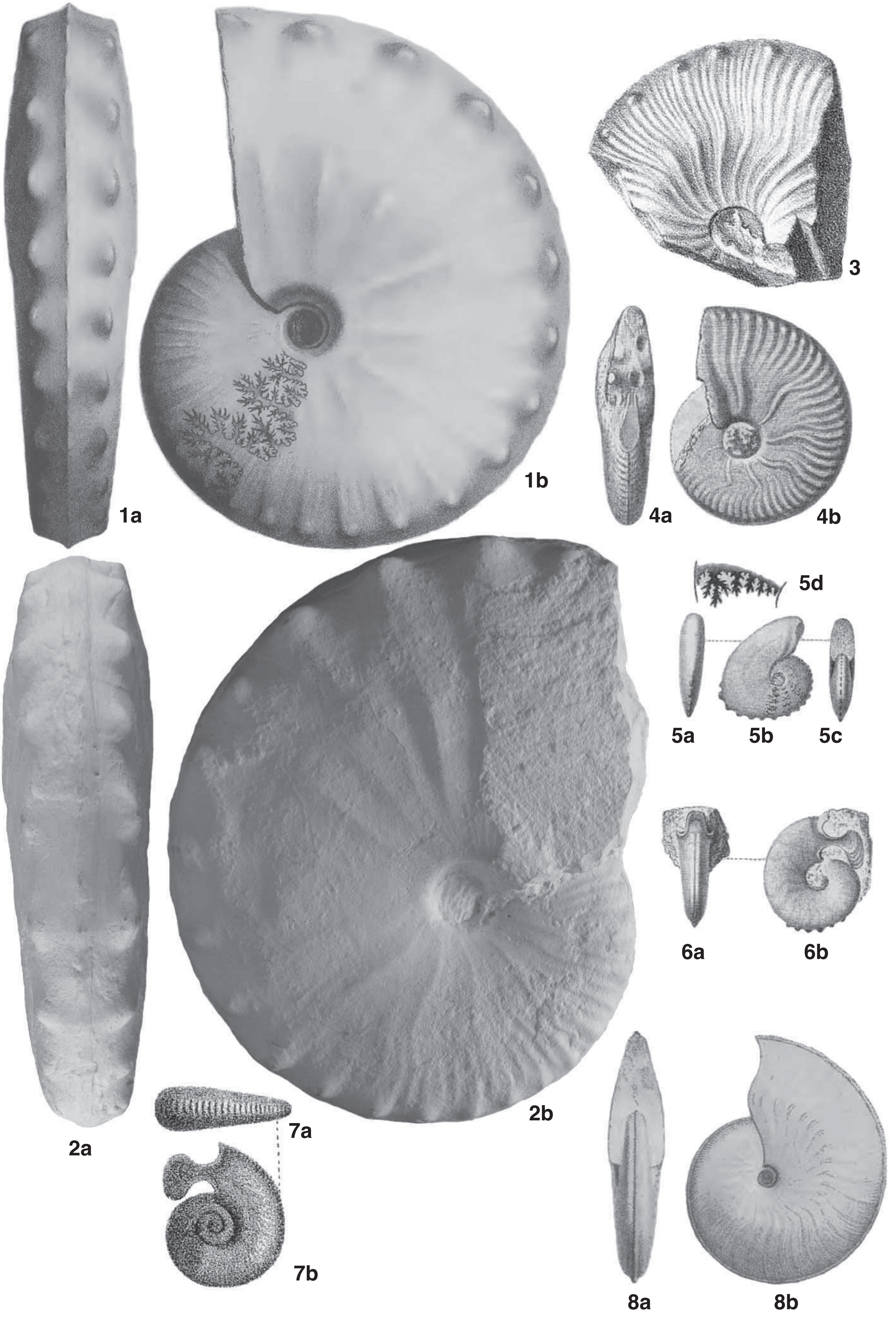
Synonymy
Morph weinlandi [M] (= macroconch)

* 1863. *Ammonites weinlandi* nov. sp. - OPPEL, p. 198, pl. 53, fig. 1.
1876. *Ammonites levipictus* nov. sp. - DUMORTIER & FONTANNES, p. 55, pl. 7, fig. 3, 5.
pars 1876. *Ammonites tenuilobatus* OPPEL, 1863. - DUMORTIER & FONTANNES, p. 52, pl. 7, fig. 1, *non* pl. 7, fig. 2.
1876. *Ammonites weinlandi* OPPEL, 1863. - DUMORTIER & FONTANNES, p. 57, pl. 7, fig. 4.
1876. *Oppelia weinlandi* (OPPEL, 1863). - LORIOL, p. 34, pl. 3, fig. 3, 4.
? 1877. *Ammonites weinlandi* OPPEL, 1863. - FAVRE, p. 27, pl. 2, fig. 6.
1879. *Oppelia levipicta* (FONTANNES, 1875). - FONTANNES, p. 22, pl. 3, fig. 3, 4.
? 1879. *Oppelia tenuilobata* (OPPEL, 1863). - FONTANNES, p. 21, pl. 3, fig. 5, *non* fig. 6.
? 1879. *Oppelia weinlandi* (OPPEL, 1863). - FONTANNES, p. 21, pl. 3, fig. 2.
1929. *Streblites levipictus* (FONTANNES, 1875). - WEGELE, p. 13, pl. 25, fig.13.
1929. *Streblites weinlandi* (OPPEL, 1863). - WEGELE, p. 13, pl. 25, fig.12.

Plate I

Fig. 1a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Reproduction of the original figuration by OPPEL, 1863, pl. 57, fig. 1. ×0.75.
Fig. 2a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Cast of the lectotype. ×0.75.
Fig. 3: *Taramelliceras compsum* (OPPEL, 1863) [M]. Reproduction of the lectotype original figuration of *Taramelliceras pseudoflexuosum* (FAVRE, 1877) [FAVRE, 1877, pl. 3, fig. 1].
Fig. 4a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Reproduction of the specimen figured by DE LORIOL (1877, pl. V, fig. 2) as *Taramelliceras greenackeri* (MOESCH, 1865), but corresponding to inner whorls of *T. Compsum*, stade 2 "pichleri". ×1.
Fig. 5a-d, 6a, b: *Streblites weinlandi* (OPPEL, 1863) [m]. Reproduction of the specimens figured by DE LORIOL (1877) (*Ammonites dentatus*, pl. 5, fig. 4-5). ×1.
Fig. 7a, b: *Taramelliceras compsum* (OPPEL, 1863) [m]. Reproduction of the original figuration of the holotype of *Glochiceras crenosum* QUENSTEDT, 1887 (QUENSTEDT, 1887, pl. 92, fig. 32).
Fig. 8a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Reproduction of the original figuration by OPPEL, 1863, pl. 53, fig. 1. ×1.

Plate I



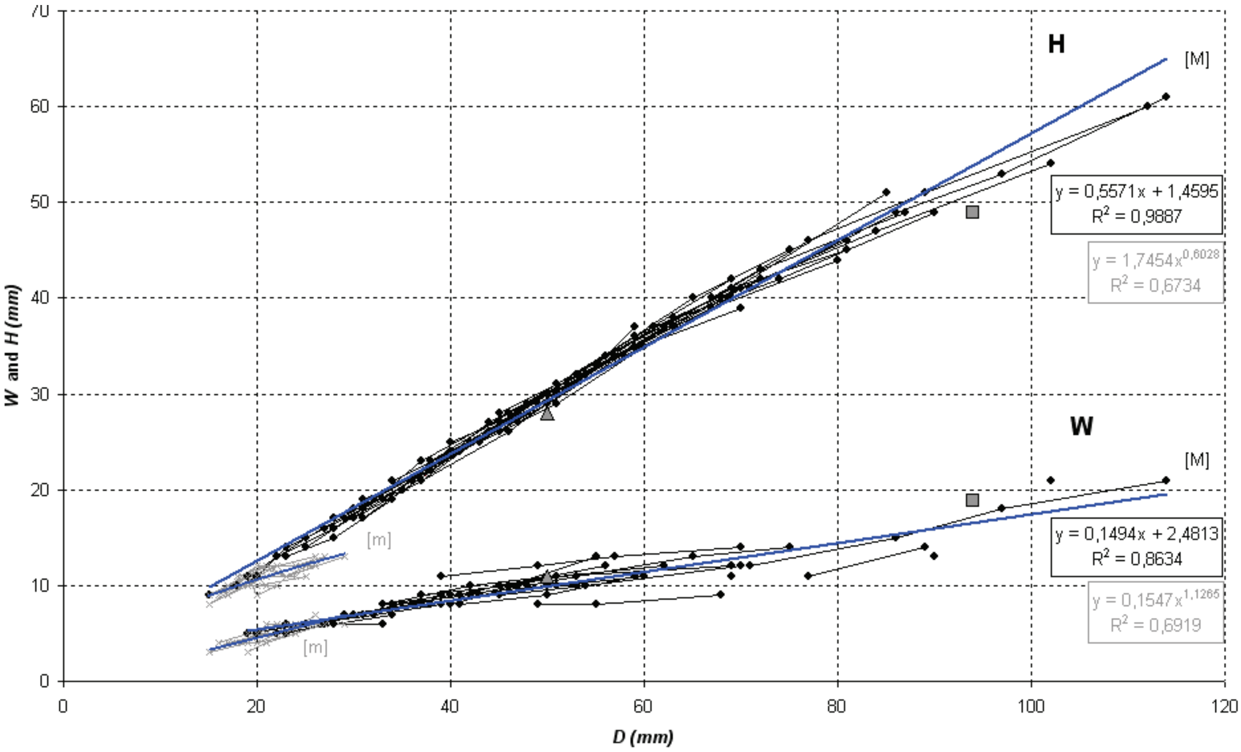


Fig. 17: *W* and *H=f(D)* for *Streblites weinlandi* (OPPEL, 1863); macroconchs are in black and microconchs are in grey. The triangle is for the holotype of *Streblites weinlandi* (OPPEL, 1863) and the square is for the holotype of *Streblites levipictus* (FONTANNES, 1875).

Plate II

Except Fig. 1 & 2, all the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Reproduction of the original figuration of the holotype of *Streblites levipictus* (FONTANNES, 1875) (FONTANNES, 1875, pl. 7, fig. 3, *in* DUMORTIER & FONTANNES). ×0.75.

Fig. 2a, b: *Ochetoceras canaliferum* (OPPEL, 1863) [M]. Reproduction of the original figuration of the holotype (OPPEL, 1863, pl. 52, fig. 4). ×0.75.

Fig. 3a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl002, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 4a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl020, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 5a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl017, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl024, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

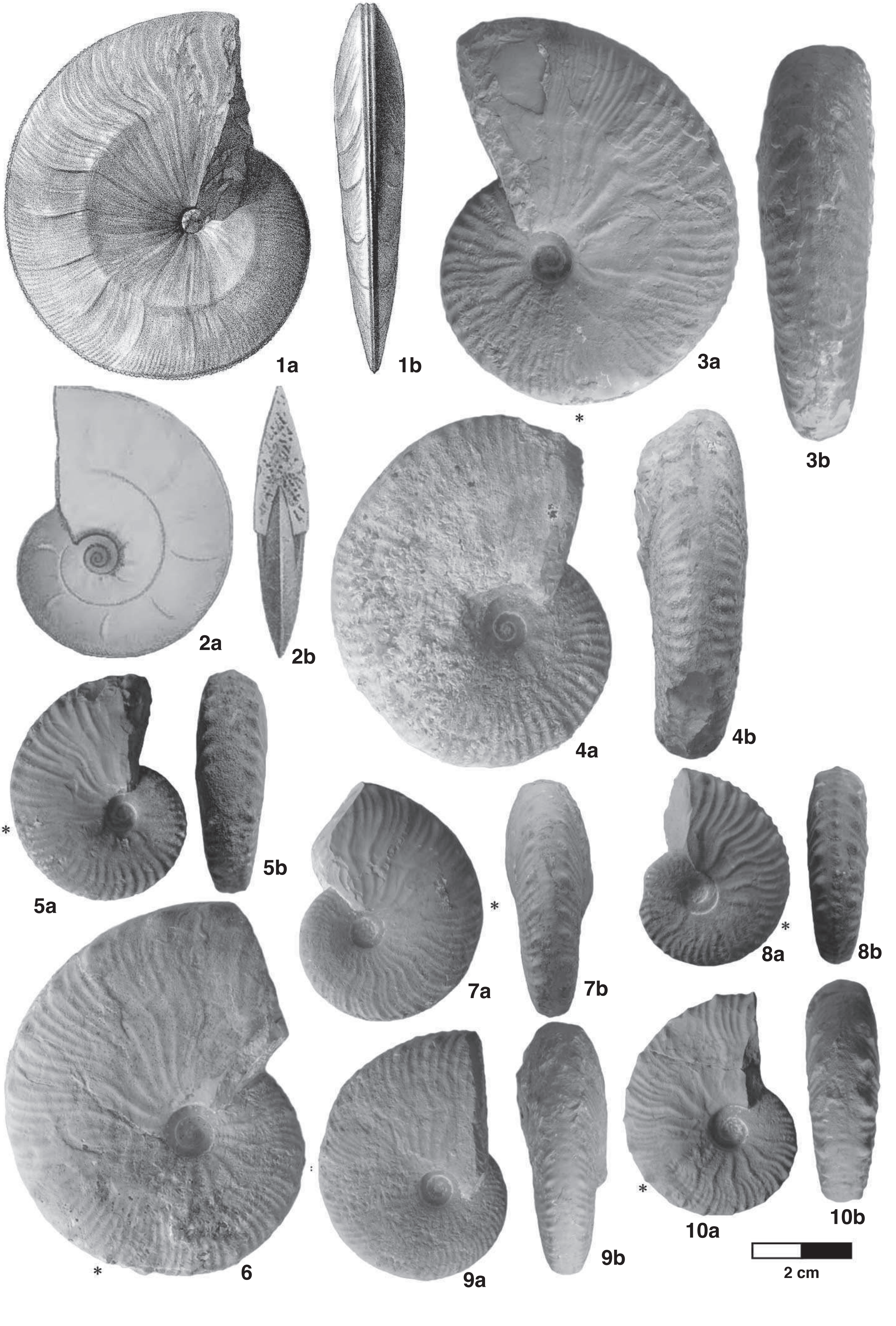
Fig. 7a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl007, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 8a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl041, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 9a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl014, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 10a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl018, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate II



1964. *Streblites levipictus* (FONTANNES, 1875). - HÖROLDT, p. 27, pl. 2, fig. 2-4.
? 1964. *Streblites tenuilobatus weinlandi* (OPPEL, 1863). - HÖROLDT, p. 27, pl. 1, fig. 7, pl. 2, fig. 1.
? 1978. *Streblites weinlandi (*OPPEL, 1863). - OLORIZ, p. 47, pl. 4, fig. 1.
1994. *Streblites levipictus* (FONTANNES, 1875). - SCHLEGELMILCH, p. 43, pl. 13, fig. 2.
1994. *Streblites weinlandi* (OPPEL, 1863). - SCHLEGELMILCH, p. 43, pl. 13, fig. 1.

Morph dentatum [m] (= microconch)
* 1818. *Nautilus dentatus* nov. sp. - REINECKE, p. 73, pl. 4, fig. 43, 44.
pars 1849. *Ammonites dentatus* (REINECKE, 1818). - QUENSTEDT, p. 131, pl. 9, fig. 14, *non* fig. 15.
pars 1858. *Ammonites dentatus* (REINECKE, 1818). - QUENSTEDT, p. 615, pl. 76, fig. 7, *non* fig. 6, 8.
? 1877. *Ammonites* (*Oppelia*) *dentatus* (REINECKE, 1818). - FAVRE, p. 37, pl. 2, fig. 4.
1877. *Ammonites* (*Oppelia*) *dentatus* (REINECKE, 1818). - LORIOL, p. 46, pl. 5, fig. 4, 5.
1879. *Oppelia dentata* (REINECKE, 1818). - FONTANNES, p. 52, pl. 7, fig. 10.
pars 1888. *Ammonites dentatus* (REINECKE, 1818). - QUENSTEDT, p. 845, pl. 92, fig. 19?, 20?, 22-24, 26, 27, *non* fig. 21, 25.
pars 1956. *Creniceras dentatus* (REINECKE, 1818). - ZIEGLER, p. 555, fig.1 a-d, *non* fig. 1 e, f, *nec* fig. 13 a-b.
1994. *Creniceras dentatum* (REINECKE, 1818). - SCHLEGELMILCH, p. 42, pl. 12, fig. 10.

Holotype: original figuration in OPPEL, 1863, pl. 53, fig. 1a, b, WAAGEN collection. The holotype is considered lost (HÖROLDT, 1964).
Type locality: Bad Boll area (Württemberg), Germany.
Type stratum: «*Ammonites tenuilobatus* Zone».
Stratigraphic distribution: in the Mount Crussol outcrops, the oldest specimens were collected from bed No. 171 (Divisum Zone, Lower Kimmeridgian), where they coexist with *S. tenuilobatus* (OPPEL, 1863). *S. weinlandi* (OPPEL) is particularly abundant in the Acanthicum Zone (Upper Kimmeridgian), particularly in beds No. 193 and 195. It could however be found from the Hypselocylum Zone to the Acanthicum Zone according to OLORIZ (1978) and in the Pseudomutabilis Zone lower part as well according to HANTZPERGUES *et al*. (1997).
Geographic distribution: *Streblites weinlandi* (OPPEL, 1863) can be found in Germany (OPPEL, 1863), in Switzerland (DE LORIOL, 1877), in Southeastern France (DUMORTIER & FONTANNES, 1876; FAVRE, 1877; FONTANNES, 1879; this work) and perhaps in Spain (OLORIZ, 1978).

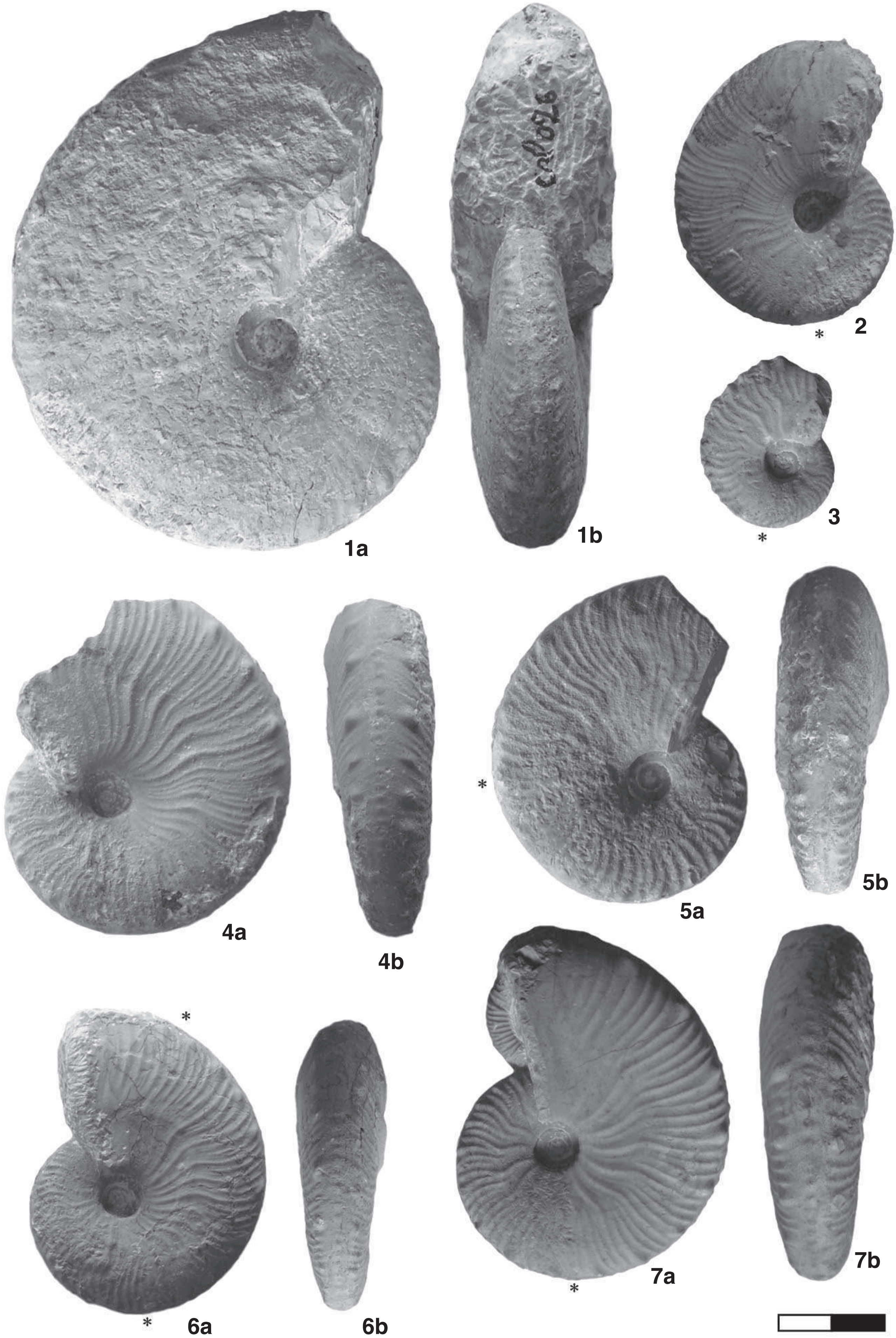
Material and dimensions (macroconchs [M], N=45; microconchs [m], N=14): see Tables 3 and 4 for macroconchs and microconchs respectively.

Ontogenesis
The macroconchs [M]
Macroconchs specimens have a very involute discoid shell (Fig. 16) (*U/D* generally between 0.05 and 0.10 for an average of 0.07) which is fairly thin (*W/D* between 0.13 and 0.28 for an average of 0.21) and with high whorls (*H/D* between 0.55 and 0.60, for an average of 0.59, *W/H* generally between 0.25 and 0.46, for an average of 0.36). The shell growth is isometric (relationship of $Y=bD$ type - Fig. 17) but a discrete break in its growth happens at the adult stage. The adult size varies between 70 and 114 mm (maximum observed in the specimen No. crl126, Pl. IX, fig. 8), and an appearing tabular ventral area and a slight widening umbilicus characterize mature specimens. The adult body chamber is slightly over half a whorl large. We can recognize three successive stages during ontogenesis:

Plate III

All the specimens are ×1. Stars points out the beginning of the body-chamber.
Fig. 1a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl026, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 2: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl114, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 3: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl117a, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 4a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl028, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 5a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl037, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl038, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 7a, b: *Taramelliceras compsum* (OPPEL, 1863) [M], with *Nebrodites* sp. Specimen No. crl111, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate III



- Stage 1: up to *D*=15-20 mm the microconchs and macroconchs are identical. The whorl section is compressed, oxycon, with a narrow and rounded venter that bears a conspicuous and finely indented keel on the best-preserved specimens. The flanks are slightly rounded; the narrow umbilicus is almost punctiform. The umbilical wall is vertical, low, with a sharp and slightly rounded edge. There is no visible ornamentation.
- Stage 2 "levipictus": from *D*=20 mm the ornamentation is becoming visible but it still remains very discreet or absent in some specimens (No. crl062, Pl. IX, fig 5): first numerous secondary ribs are appearing. They are poorly expressed in the upper third of the flanks and they become concave and forwardly inclined near the venter. At about *D*=40 mm, a highly variable number of flexuous primary ribs appear, but they are often much attenuated and slightly discernible, or they are even absent. Those ribs are inclined forward in the lower half of the flanks and they show a sudden backward inflexion to the mid-flank, and then again the ribs became concave and forwardly inclined near the ventral edge. In many cases, the main ribs are only visible as slight bulges on the outside umbilical boundary and near the ventral edge. On some specimens (No. crl055, Pl. IX, fig. 1; No.crl065, Pl. 10, fig. 3), we can observe a very slight bulge or flattened area in the coiling direction, that forms a longitudinal line at mid-flanks at the ribs' inflection point. The shell's proportions and morphology are quite similar to the ones observed in the previous stage: a compressed whorl section, slightly rounded flanks, and a narrow rounded venter with a keel. However, the coil becomes more evolute and the whorl section a bit more compressed.
- Stage 3 "weinlandi": this stage can only seen in adults from 60 mm in diameter where the ventral aspect of the body chamber changes. It widens and becomes subtabulate flattened or slightly rounded with a progressive latero-ventral shoulder. The keel can still be seen with a sharper denticulation than in both previous stages. At this stage, a discrete break in its growth happens and as a consequence, the whorls' height growth decreases slightly (Fig. 17). We also notice changes in the ornamentation: the secondary ribs have disappeared and only the main ribs persist as large bulges in the upper half of the flanks. The section is still more compressed than the one in the previous stage.

The peristome, that is rarely preserved in macroconchs, is slightly sinuous with a small ventral protrusion (specimen No. cru062, Pl. X, fig. 1).

The microconchs [m]

The microconch specimens are small and discoid. Adults (between 22 mm and 29 mm in diameter - maximum observed in the specimen No. crl099, Pl. X, fig. 11) are characterized by a distinctly different body chamber with a tabular venter appearing, a significant reduction in the whorl's height, and the presence of lateral apophysis. The living body chamber is about half a turn long. Only two expressed ontogenetic growing stages are expressed:
- Stage 1: up to *D*=15-20 mm, the shell's characteristics are identical to the macroconchs' (see above), and in ventral region sight is precisely as acute and keeled.
- Stage 2 "dentatum": the height growth of the adult body chamber reduces greatly while the coiling becomes much more evolute, thus determining a scaphitoïde type

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Plate IV

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl136, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 2 a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl043, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 3 a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl116, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

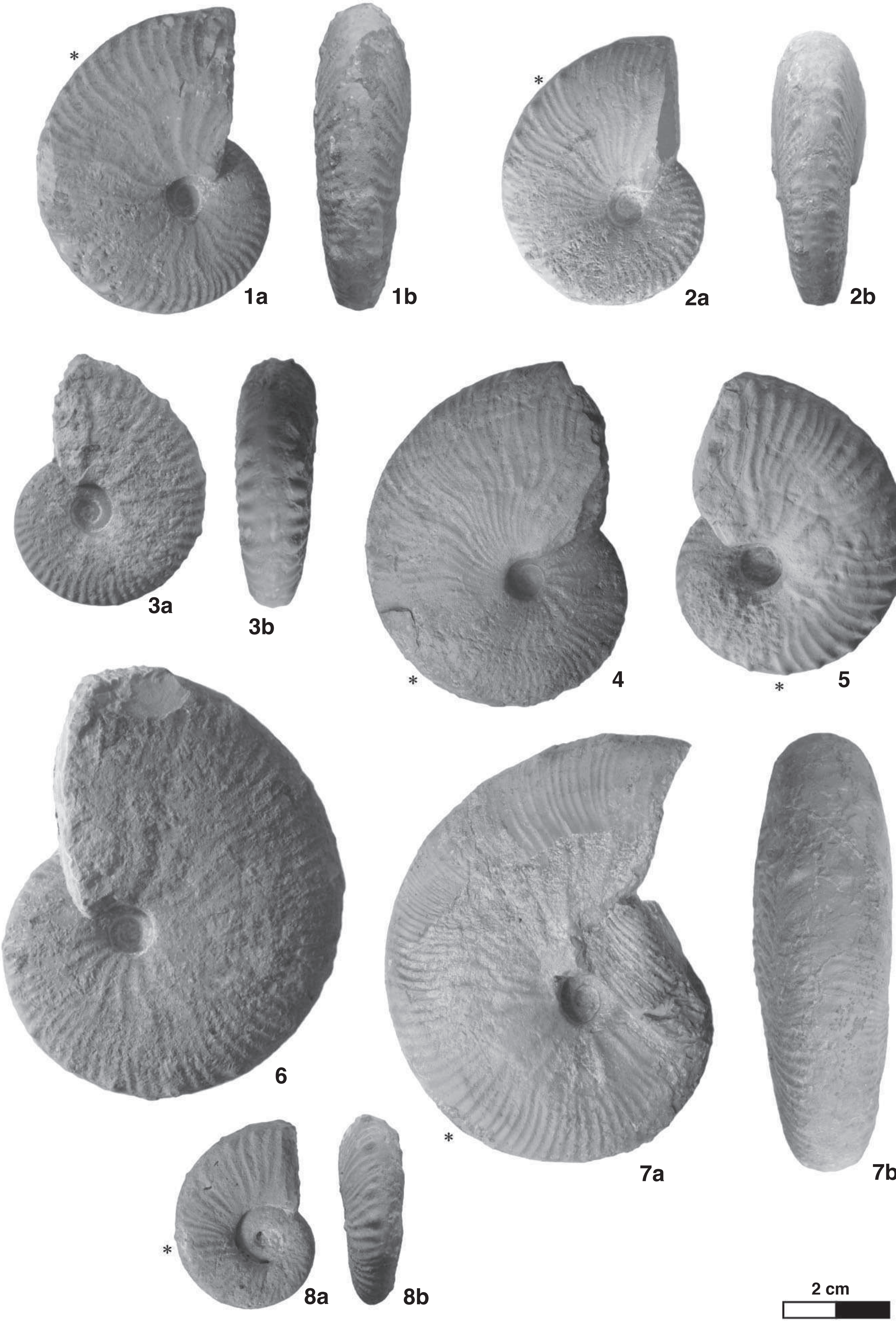
Fig. 4: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru003, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Fig. 5: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl140a, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl135, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 7a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. The Aptychus near the peristome may belong to the same specimen. Specimen No. cru014, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 8a, b: *Taramelliceras compsum* (OPPEL, 1863) [M], pathologic specimen with a very evolute and unssymmetrical coil. Specimen No. crl044, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.


*
1a
1b
*
2a
2b
3a
3b
*
4
*
5
6
*
7a
7b
*
8a
8b
2 cm

shell. The ventral area aspect changes abruptly from the previous stage: the so far unbroken keel is replaced by fine denticulations in the first part of the adult body chamber. Those denticulations then disappear when the venter stretches and becomes subtabulate or slightly concave with a more or less rounded latero-ventral edge. Except for the keel, the shell is completely smooth.

When visible (specimens No. crl099, Pl. X, fig. 11, No. crl133, Pl. X, fig. 10, No. cru068, Pl. X, fig. 9), the peristome shows large spatulate lateral apophysis with a narrow base, and a rostrum, in front of which a deep and narrow ventral furrow can be seen. It is completed by a slight bulge shaped as a chevron (specimen No. crl090a, Pl. X, fig. 13). DE LORIOL's figuration (1877, pl. V, fig. 4, reproduced here Pl. I, fig. 6) shows the peristome's characteristic shape.

Variability

The variability in Mount Crussol's *Streblites* sample focuses on the appearing stages' diameter, on the ornamentation's strength and on the section's thickness. These features seem to be correlated. As in *Taramelliceras* that variability is more pronounced in dimorphic macroconchs than in microconchs. In macroconchs, stage 2 "levipictus" usually appears at *D*=20 mm, but it may also appear later on some slender specimens (about *D*=35 mm in the No. crl091, Pl. IX, fig. 7) which have a weaker ornamentation and a narrower section. The variability relates to the ornamentation's aspect: in some slender specimens, secondary ribs are very tenuous whereas primary ribs usually absent (features usually associated with a compressed whorl section, and a late appearing ornamentation). In the most robust specimens, secondary ribs are strongly marked in the upper third of flanks and they are often associated with very distinct primary ribs (which can sometimes be more dense) in the upper flanks and near the umbilicus. *Streblites weinlandi* (OPPEL, 1863) robust individuals can sometimes have slight bulges at mid-flank evoking some lateral tubercles' traces (specimen No. crl065, Pl. X, fig. 3). This feature can be found in the older *Streblites tenuilobatus* (OPPEL, 1863) species presuming to be the *S. weinlandi* (OPPEL) ancestor (see HÖROLDT, 1964). The *S. weinlandi* (OPPEL) robust morphology has also a larger section of the whorls, a larger ventral area and the umbilicus is slightly more widened (specimen No. crl055, Pl. IX, fig. 1). That observation sustains the classical "laws" of characters' covariation (WESTERMANN, 1966) that demonstrate a link between the section's shape, the ornamentation's robustness and then the umbilicus's widening.

Stage 3 "weinlandi" is also variable in its appearing diameter: from *D*=60 mm with the most robust specimens (No. crl055, Pl. IX, fig. 1; No. cru066, Pl. X, fig. 2) while it may appear after *D*=100 mm in the most slender specimens (specimen No. crl126, Pl. IX, fig. 8). Those specimens often reach a more important diameter than robust adults (eg *D*=114 mm for the slender specimen No. crl126, Pl. IX, fig. 8 *versus* *D*=70 mm for the robust specimen No. crl055, Pl. IX, fig. 1). As might be expected, every intermediaries abundantly interconnect the extreme morphologies.

In microconchs, variability mainly focuses on relative marked crenulations which are visible on the early adult body chamber, but it also focuses on the relative contraction's strength of the body chamber and on the maximum adult size (from 22 to 29 mm). In addition, some specimens show a slightly thicker whorls' section on the body chamber, a phenomenon that seems to be related to a strongly pronounced concavity of the ventral area (specimen No. crl090b, Pl. X, fig. 13).

Differential diagnosis

Streblites tenuilobatus (OPPEL, 1863) [M] is only known in the Lower Kimmeridgian (upper part of the Hypselocyclum Zone and Divisum Zone) and it differs from *Streblites weinlandi* (OPPEL, 1863) [M] as

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Plate V

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru024, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 2: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru038, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 3: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru015, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 4: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru023, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 5: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru030, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru039, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Plate V

its ornamentation is more strongly marked. The main ribs of *S. tenuilobatus* (OPPEL) [M] are stronger on the umbilical edge, whereas they are only a few remaining traces or they can even be absent in *S. weinlandi* (OPPEL) [M]. Moreover, *S. tenuilobatus* (OPPEL) [M] shows clear lateral and latero-ventral tubercles which can't be found in *S. weinlandi* (OPPEL) [M].

Streblites frotho (OPPEL, 1863) [M] is so close to *S. tenuilobatus* (OPPEL) that it is sometimes considered as a subspecies (HÖROLDT, 1964). It can be seen in the Lower Kimmeridgian [Platynota Zone and base of the Hypselocyclum Zone; and from the Upper Oxfordian Bimmamatum Zone according to OLORIZ (1978)]. Like *S. tenuilobatus* (OPPEL), *S. frotho* (OPPEL) similarly differs from *S. weinlandi* (OPPEL) as lateral and latero-ventral tubercles can be found and its main ribs are strongly marked on the umbilical edge.

Streblites folgariacus (OPPEL, 1863) [M] (Beckeri Zone of Uppermost Kimmeridgian and Hybonotum Zone of Lower Tithonian) differs from *S. weinlandi* (OPPEL) [M] with its wider whorls' section, its wider and tabular ventral area, and its spaced tubercles along the phragmocone's ventral edge.

Discussion

Streblites weinlandi (OPPEL, 1863) is mainly different from the *Streblites levipictus* (FONTANNES, 1875) taxon with an early wider and subtabulate ventral area. However, studying both Mount Crussol's sample and its variability shows that these two morphologies are perfectly getting into the intraspecific variability of one single palaeospecies. Indeed, as in *S. weinlandi* (OPPEL), specimens whose morphology is strictly identical to the *S. levipictus* (FONTANNES) type (which are much more numerous quantitatively), always show a modified venter at large diameters (stage 3 "weinlandi" at *D*>100 mm). In fact, *S. levipictus* (FONTANNES) may be considered as the slender morphology of *S. weinlandi* (OPPEL), in which the tabular venter stage appears later in ontogeny. Consequently, *S. levipictus* (FONTANNES) is considered here as a junior synonym of *S. weinlandi* (OPPEL).

In literature, much confusion seems to exist between the different taxa of the genus *Streblites* HYATT, 1900. That can be explained as some authors (eg DUMORTIER & FONTANNES, 1876) have interpreted, in a very broad sense, the only Kimmeridgian *S. tenuilobatus* species (OPPEL, 1863) (upper part of the Hypselocyclum Zone and Divisum Zone - HÖROLDT, 1964; HANTZPERGUE *et al.*, 1997). Finally, that species has often been confused with *S. frotho* (OPPEL, 1863) (present only at the Kimmeridgian base) and *S. weinlandi* (OPPEL, 1863). For example, the specimen DUMORTIER & FONTANNES figured (1876, pl. VII, fig. 1) as *S. tenuilobatus* (OPPEL) is actually a robust *S. weinlandi* (OPPEL) variant [this work] with a very dense costulation. It also should be noted that originally the Tenuilobatus Zone of OPPEL, used in many 19th century works (DE LORIOL, 1876, 1877; DUMORTIER & FONTANNES, 1876; FONTANNES, 1879), included the whole Kimmeridgian part where other *Streblites* HYATT, 1900 species can be found. Those species are morphologically close to *S. tenuilobatus* (OPPEL), as are *S. frotho* (OPPEL) and *S. weinlandi* (OPPEL).

More recently, HÖROLDT (1964) and, later on, ENAY (2009) consider that *Streblites weinlandi* (OPPEL) is a *S. tenuilobatus* (OPPEL) subspecies. The *S. weinlandi* (OPPEL) type specimen's age is too vague to allow any accurate identifications of its original stratigraphic position ("Tenuilobatus Zone" of OPPEL). However, its indisputable presence in the Acanthicum levels in Mount Crussol, where *S. tenuilobatus* (OPPEL) disappeared, can provide some precisions. *Streblites weinlandi* (OPPEL) would be more recent than *S. tenuilobatus* (OPPEL), whose ornamentation is very different, and it does not belong to the same taxon of "species-group" though both forms probably have close phylogenic relationships.

On the other hand, studing numerous "*Creniceras dentatum*" (REINECKE, 1818) specimens (here [m]) in the

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Plate VI

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru082, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Fig. 2: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru055, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 3: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru076, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 4a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru085, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 5a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru084, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru045, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Plate VI

same levels as *Streblites weinlandi* (OPPEL, 1863) [M] shows that the two "species" are identical until *D*=20 mm (stage 1 smooth). As in the *Taramelliceras compsum* (OPPEL, 1863) microconchs case (see above), we observe that the values of *U*, *W* and *H* in function of *D* only become different over about 20 mm in diameter (Fig. 17) and they become allometric in "*Creniceras dentatum*" (REINECKE), while the parameters' growth is still isometric (but with a small break in slope) in *Streblites* [M]. In addition, the ventral area shape is very convergent between both forms on the adult body chamber. From those facts usual in the ammonites' dimorphism frame (MAKOWSKI, 1962; CALLOMON, 1963) "*Creniceras dentatum*" (REINECKE, 1818) and *Streblites weinlandi* (OPPEL, 1863) are both regarded here as two dimorphs of a single paleobiological species.

Following ZIEGLER (1974), who noticed the same stratigraphic range between the whole genus *Streblites* HYATT, 1900 and "*Creniceras dentatum*" (REINECKE, 1818), the latter taxon's representatives are most probably the dimorphic microconchs of several *Streblites* successive species. Indeed, Oppeliidae's microconchs offer fewer morphological possibilities (and as a consequence evolutionary ones) than their macroconch correspondents, mainly because of their nearly-absent ornamentation and their very stable morphology. Apart from a precise stratigraphic context, it may therefore be very difficult, even impossible, to differentiate them. A similar phenomenon occurs for the Callovian Strigoceratidae where the taxon *Oecoptychius refractus* (REINECKE, 1818) could correspond to the microconchs of several *Phlycticeras* HYATT, 1893 successive species (SCHWEIGERT & DIETZE, 1998). So even though "*Creniceras dentatum*" (REINECKE, 1818) should have a taxonomical seniority over *Streblites weinlandi* (OPPEL, 1863) (by the principle of priority), that option is not suitable because it may lead to confusion. The use of *Streblites weinlandi* (OPPEL), which is based on a macroconch specimen with easily recognizable specific features, is much more suitable to maintain a good definition of that species.

Subfamily *Ochetoceratinae* SPATH 1928
Genus *Ochetoceras* HAUG, 1855

Type-species: *Ammonites canaliculatus* VON BUCH, 1831

Ochetoceras canaliferum (OPPEL, 1863)
Pl. II, fig. 2; Pl. XI, fig. 1-3

Synonymy

* 1863. *Ammonites canaliferum* nov. sp. - OPPEL, p. 195, pl. 52, fig. 4.

Plate VII

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Taramelliceras compsum* (OPPEL, 1863) [M], with *Streblites weinlandi* (OPPEL, 1863) [m] and *Sutneria cyclodorsata* (Moesch, 1867). Specimen No. cru088, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Fig. 2: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl054, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 3a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru086, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 4: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru002a, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Fig. 5: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl117c, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl082b, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 7a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl097, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 8a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl096, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 9a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl120, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 10a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl122, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 11: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. crl080, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate VII

? 1876. *Ammonites canaliferus* OPPEL, 1863. - LORIOL, p. 48, pl. 3, fig. 5.
1959. *Ochetoceras canaliferum* (OPPEL, 1863). - BERCKHEMER & HÖLDER, p. 102, pl. 25, fig. 129, 133.
1964. *Ochetoceras* (*Ochetoceras*) *canaliferum* (OPPEL, 1863). - HÖROLDT, p. 68, pl. 4, fig. 4-6.
1972. *Ochetoceras* (*Ochetoceras*) *canaliferum* (OPPEL, 1863). - SCHAIRER, p.53, pl. 2, fig. 3.
1984. *Ochetoceras* (*Ochetoceras*) *canaliferum* (OPPEL, 1863). - SCHAIRER, p. 34, pl. 2, fig. 1-3.
1992. *Ochetoceras* (*Ochetoceras*) *canaliferum* (OPPEL, 1863). - FINKEL, p. 231, fig. 71.
1994. *Ochetoceras* (*Ochetoceras*) *canaliferum* (OPPEL, 1863). - SCHLEGELMILCH, p. 48, pl. 15, fig. 1.
2009. *Ochetoceras canaliferum* (OPPEL, 1863). - MOOR, pl. 8, fig. 3, pl. 9, fig. 4.

Holotype: original figuration by OPPEL (1863, pl. 52, fig. 4a, b); holotype preserved at Munich under the No. As VIII 87. We must note that the description given by OPPEL (1863, p. 195) is partially based on other specimens than the type (HÖROLDT, 1964).
Type locality: probably the Bad Boll area (Württemberg) in Germany.
Type stratum: "*Ammonites tenuilobatus* Zone".
Stratigraphic distribution: *Ochetoceras canaliferum* (OPPEL, 1863) seems very uncommon. The three specimens studied in this work come from the bed No. 193 in Mount Crussol and are dated from the Acanthicum Zone. However, according to BERCKHEMER & HÖLDER (1959) the species can be found throughout the Lower Kimmeridgian.

Geographic distribution: *Ochetoceras canaliferum* (OPPEL, 1863) is mainly known in Germany (OPPEL, 1863; BERCKHEMER & HÖLDER, 1955; SCHAIRER, 1972; MOOR, 2009), but also in Spain (FINKEL, 1992) and in Southeastern France (this work).

Material and dimensions (N=3): see Table 5.

Description
Among the three studied specimens, a single one has its living body chamber (specimen No. cru089, Pl. XI, fig. 3). They show a narrow lanceolate whorls' section (Fig. 18), with rounded flanks that converge toward the ventral area. The latter is first slightly rounded first, then it gradually becomes sharper as it grows. The venter has a continuous keel, which is high and acute. The umbilical wall is relatively high, slightly inclined and rounded, and its edge is sharp. The coiling of the shell is very involute with an average ratio U/D=0.13.
From about D=40 mm (specimen No. cru089, Pl. XI, fig. 3) the ornamentation consists in falcate main ribs which are weak and broad. They appear near the umbilical edge and they are inclined forward in the flanks' first half and then they bend sharply backwards at mid-flank. The main ribs are then concave in the upper flanks before fading near the ventral area. In the flanks's upper third, there are numerous secondary ribs which are strongly inclined forward and slightly concave. They are variable in shape: almost imperceptible on the specimen No. crl001 (Pl. XI, fig. 1), they are more strongly marked on the specimens

Plate VIII

All the specimens are ×1. Stars points out the beginning of the body-chamber.
Fig. 1: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru078, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.
Fig. 2a, b: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru083, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.
Fig. 3: *Taramelliceras compsum* (OPPEL, 1863) [M]. Specimen No. cru056, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 4: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. crl123, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 5: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. crl119, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 6: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. cru058, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 7: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. cru059, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 8: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. cru007, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.
Fig. 9: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. cru060, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 10: *Taramelliceras compsum* (OPPEL, 1863) [m]. Specimen No. cru037b, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Plate VIII

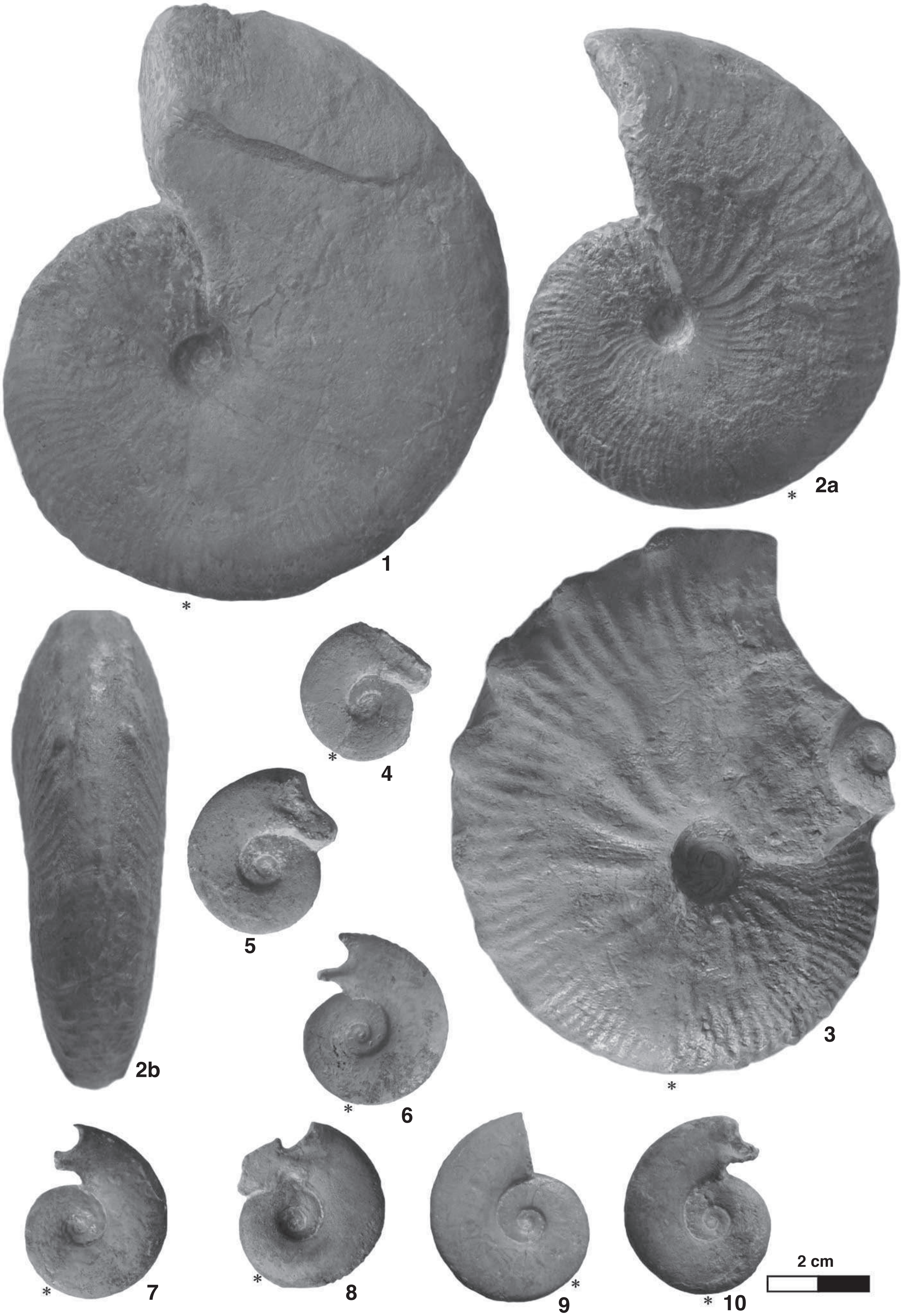

Fig. 18: *Ochetoceras canaliferum* (OPPEL, 1863), whorl sections, ×1. Specimen No. crl001, coll. BAUDOUIN.

No. cru033 (Pl. XI, fig. 2) and cru089 (Pl. XI, fig. 3). No significant change seems to appear in the ornamentation on the living body chamber. No peristome can be found on all the studied specimens.

Differential diagnosis

Ochetoceras canaliferum (OPPEL, 1863) is a fairly easily-recognizable species with its ornamentation that is very weak, maily in the flanks' lower half. *O. hispidiforme* (FONTANNES, 1879), is from the Upper Oxfordian and it can still be seen at the Kimmeridgian base; it differs from *O. canaliferum* (OPPEL) since it has many well marked ribs, especially in the flanks' lower part, and its spiral furrow is more strongly marked.

Ochetoceras irregulare BERCKHEMER & HÖLDER, 1959 is very close to *O. canaliferum* (OPPEL), but it is different with its ornamentation that is more pronounced with a distinct spiral furrow at mid-flank and a less developed keel. *O. irregulare* BERCKHEMER & HÖLDER can be found in the Upper Kimmeridgian (Beckeri Zone, Setatum and Ulmense Subzones), but OLORIZ (1978) puts it in the *O. canaliferum* (OPPEL) group as there are intermediate specimens (considering ornamentation and stratigraphic position). We should note that BERCKHEMER & HÖLDER (1959) consider the Kimmeridgian ("Tenuilobatus Zone") species *O. palissyanum* (FONTANNES, 1879) as a possible *O. irregulare* BERCKHEMER & HÖLDER synonym.

Ochetoceras zio (OPPEL, 1863) is different from *O. canaliferum* (OPPEL) as its primary ribs are very strong, especially in the flanks' lower half. *O. zio* (OPPEL) is reported from the Acanthicum Zone (Upper Kimmeridgian) to the Beckeri Zone, Ulmense Subzone. It should also still be seen into the early Tithonian (BERCKHEMER & HÖLDER, 1959; HÖROLDT, 1964).

Species linked to the subgenus *Granulochetoceras* GEYER, 1960 [*Ochetoceras* (*G.*) *ornatum* BERCKHEMER & HÖLDER, 1959, *O.* (*G.*) *cristatum* DIETERICH, 1940, *O.* (*G.*) *argonautoides* (MAYER, 1871), *O.* (*G.*) *undulatum* HÖROLDT, 1964] can be found from the top of the Oxfordian up to the Beckeri Zone (Upper Kimmeridgian), and can be easily distinguished from *O. canaliferum* (OPPEL) by a spiral furrow at mid-flank bearing a well-marqued denticulation.

Remarks

The three specimens studied in this work show similar dimensional parameters (Fig. 19) and very close ornamental traits that only differ from another by the variable strength of the secondary ribs. While expecting

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Plate IX

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl055, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 2a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl056, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 3a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl060, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 4a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl061, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

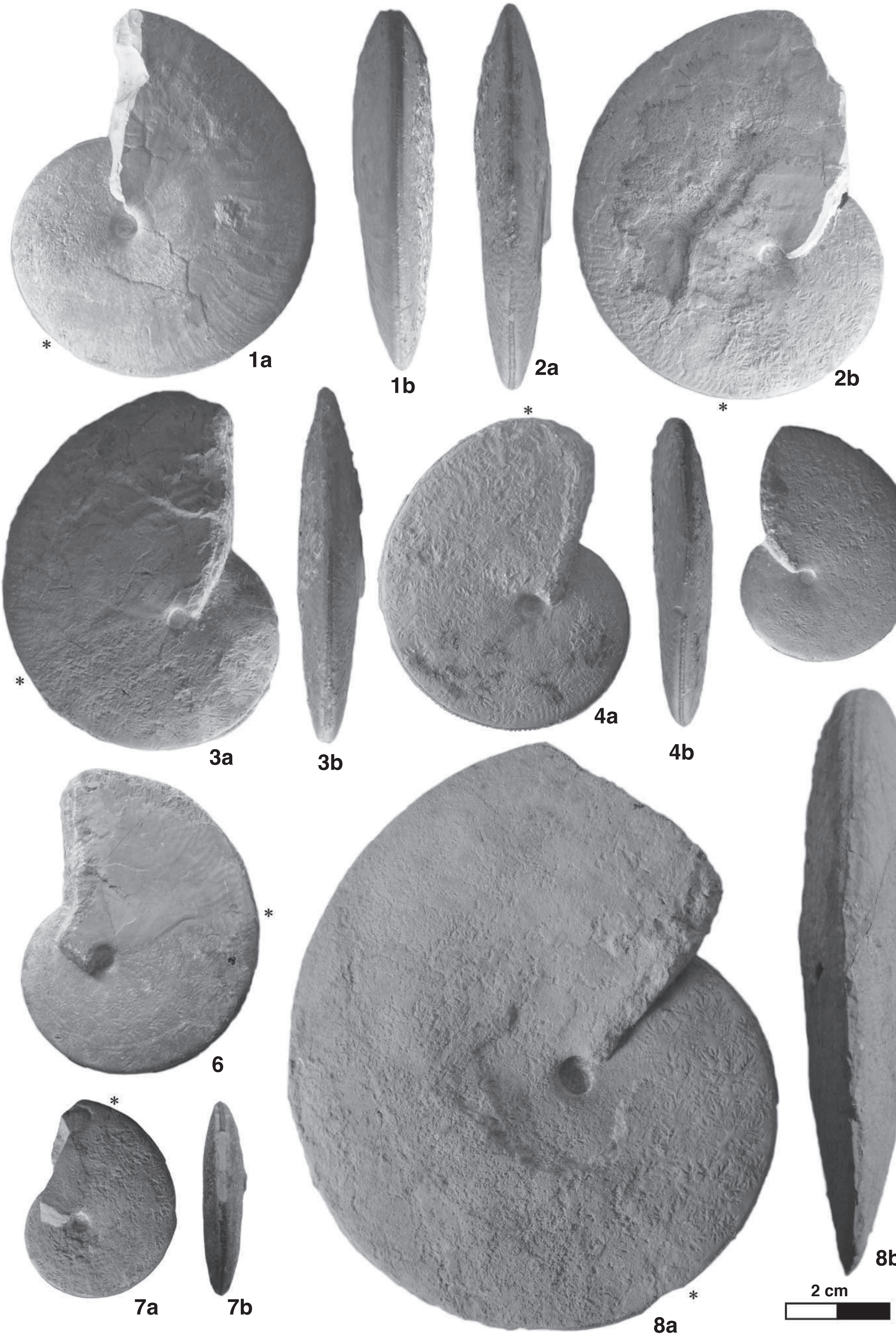
Fig. 5: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl062, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 6: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl067, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 7a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl091, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 8a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl126, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate IX



future new data about the variability of this group, they are regarded here as the possible expression of different morphological poles of one single species. No microconchs were found, probably due to their scarcity in the beds studied.

V. CONCLUSIONS

Fossiliferous levels of the Kimmeridgian Acanthicum Zone in Mount Crussol highly contribute to the understanding of the Oppeliidae faunas dating back to that period, and to the understanding of their variability in light of the species' modern conceptions in paleontology. The ontogenetic studies often show a strong relationship between morphological variation and variability in the appearance and the duration of the different stages recognized during growth (alteration of the ontogeny of heterochronic type), particularly in the case of *Taramelliceras compsum* (OPPEL, 1863). Thus, in this species the most slender specimens are also the most peramorphic (accelerated development of stage 4). The report is reversed in *Streblites weinlandi* (HÖROLDT, 1964) as the most slender specimens are the most paedomorphic (retarded appearance of stage 2). Another factor significantly determines the morphological variability, too: the coil's widening and/or the section's thickness *versus* the more or less robust ornamentation. In *Streblites weinlandi* (OPPEL), this phenomenon occurs with the strengthening of the ornamentation for wider section specimens. This observation is consistent with the covariation laws of the characters (WESTERMANN, 1966) mainly based on the relationship between the section shape and the ornamentation strength. In *Taramelliceras compsum* (OPPEL) the phenomenon also exists, but it seems more influenced by the umbilicus's widening: a wider umbilicus corresponds to forms with stronger ornamentation.

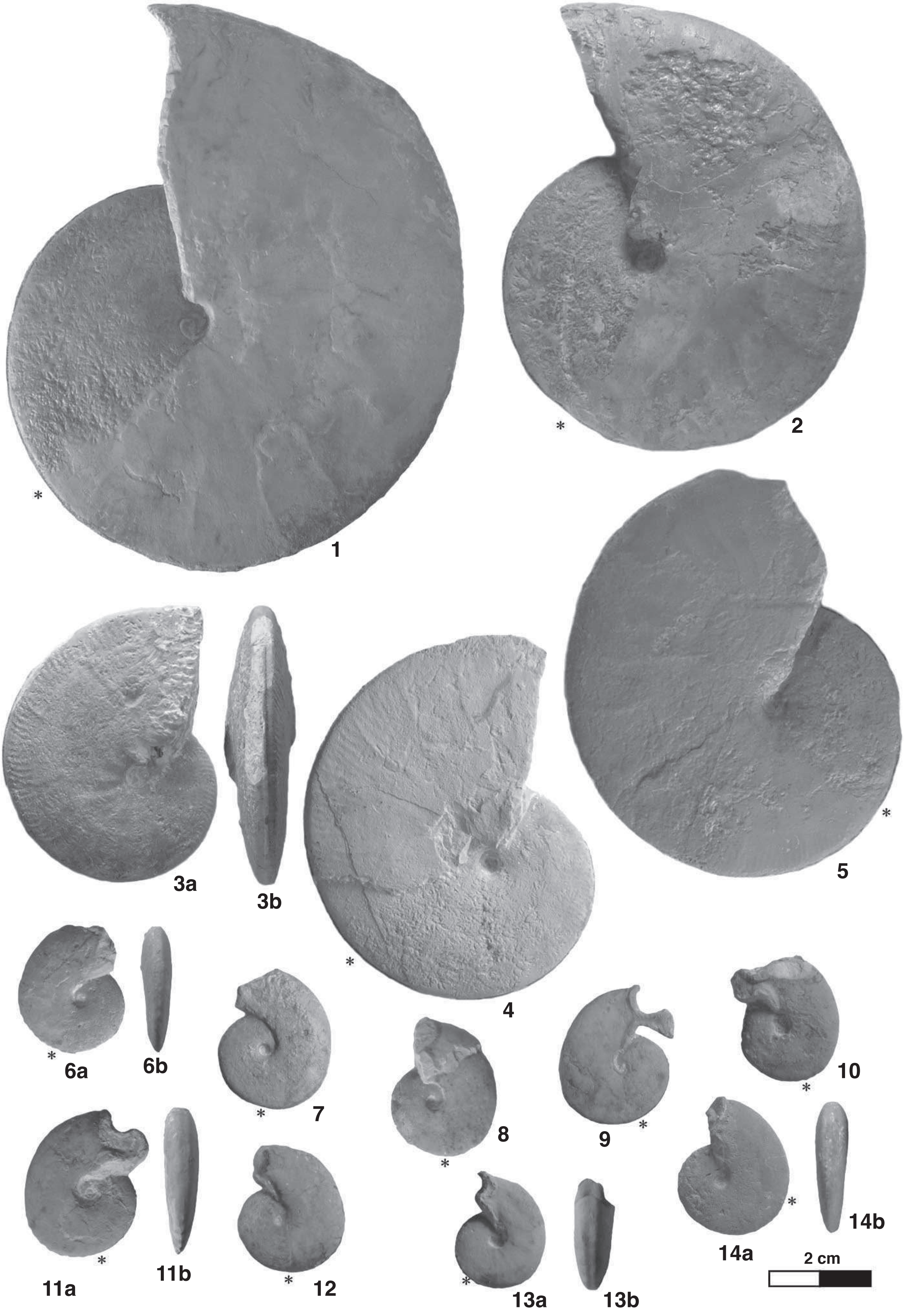
On the other hand, the hypothesis of an existing sexual dimorphism in Ammonoidea has long been known and was mentioned on numerous occasions (eg BRINKMANN, 1929; MAKOWSKI, 1962; CALLOMON, 1963; KENNEDY

Plate X

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. cru062, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 2: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. cru066, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 3a, b: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl065, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 4: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. crl068, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 5: *Streblites weinlandi* (OPPEL, 1863) [M]. Specimen No. cru065, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 6a, b: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl100, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 7: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. cru004, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.
Fig. 8: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl132, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 9: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. cru068, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 10: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl133, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 11a, b: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl099, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 12: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. cru069, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.
Fig. 13a, b: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl090b, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.
Fig. 14a, b: *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. crl134, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate X



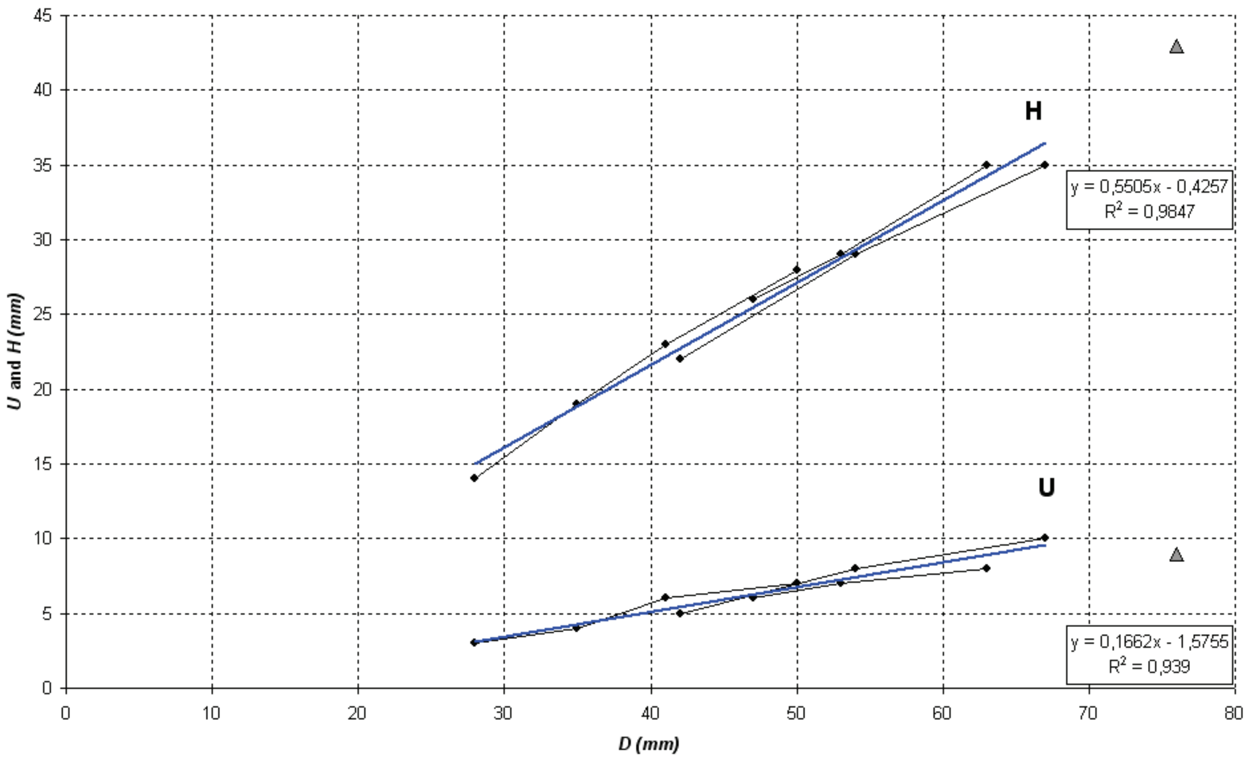


Fig. 19: *U* and *H=f(D)* for *Ochetoceras canaliferum* (OPPEL, 1863). The triangle is for the holotype.

Plate XI

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Ochetoceras canaliferum* (OPPEL, 1863). Specimen No. crl001, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 2: *Ochetoceras canaliferum* (OPPEL, 1863). Specimen No. cru033, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 ?. P. BOSELLI's collection.

Fig. 3: *Ochetoceras canaliferum* (OPPEL, 1863). Specimen n° cru089, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 4: *Discosphinctoides* sp. Specimen No. crl084, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 5: *Discosphinctoides praenuntians* (FONTANNES, 1879). Specimen No. crl083, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 6: *Aspidoceras acanthicum* (OPPEL, 1863). Specimen No. crl088, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 7: *Phylloceras praeposterium* (FONTANNES, 1875). Specimen No. crl086, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

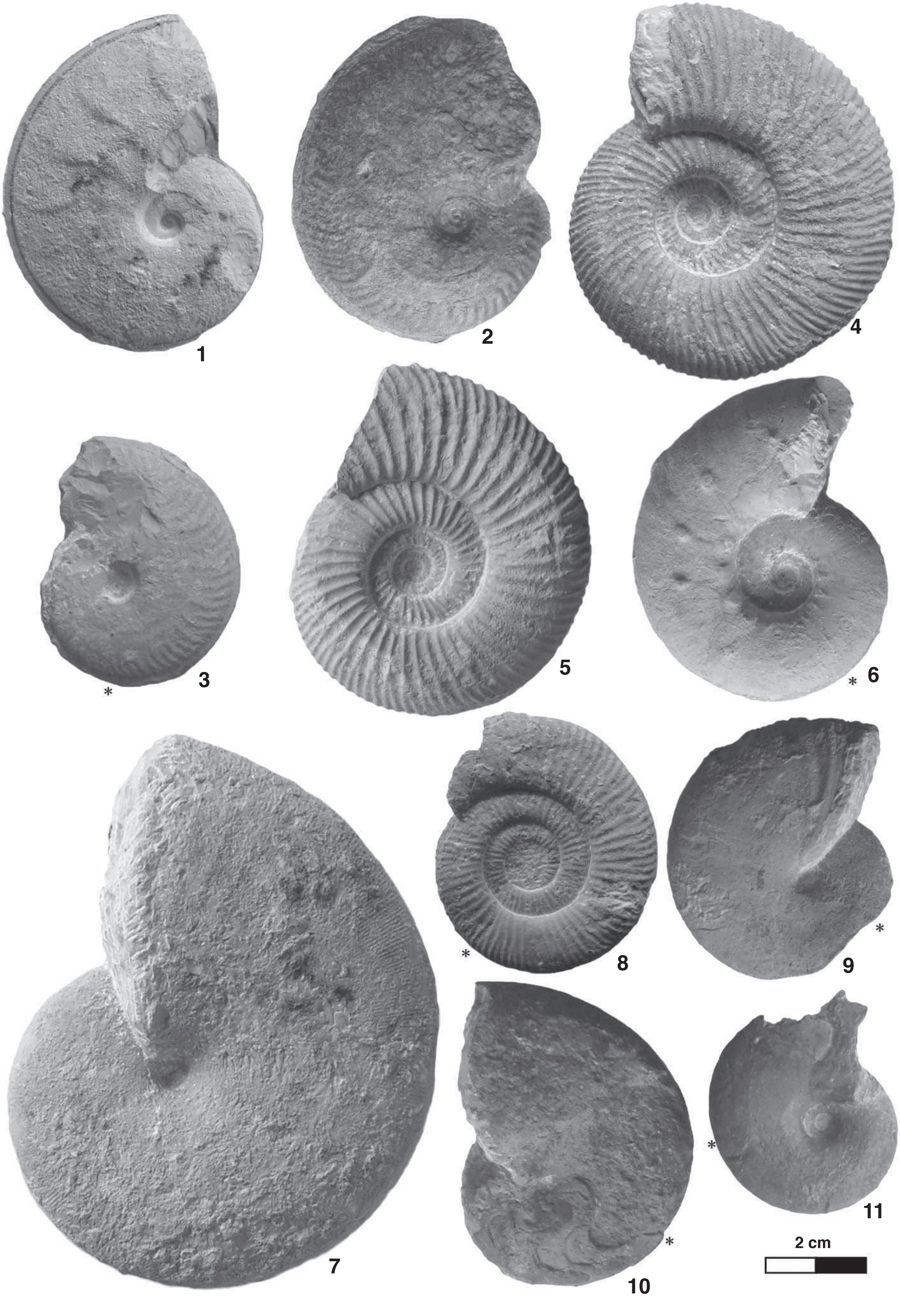
Fig. 8: *Nebrodites hospes* (NEUMAYR, 1873). Specimen No. crl143, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 9: *Phylloceras* aff. *saxonicum* NEUMAYR, 1871. Specimen No. crl146, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Fig. 10: *Pseudaganides* cf. *pseudaganiticus* (SCHLOTHEIM, 1820). Specimen No. cru095, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. P. BOSELLI's collection.

Fig. 11: *Ptychophylloceras ptychoicum* (QUENSTEDT, 1845). Specimen No. cru092, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Plate XI



& COBBAN, 1976; DAVIS *et al*., 1996), and the study of the Oppeliidae of the Mount Crussol thus reinforces the observations made by ZIEGLER (1974). The author recognized the taxon "*Creniceras dentatum*" (REINECKE, 1818) as microconch of the different successive species of the genus *Streblites* HYATT, 1900, and he proposed to consider some species of the genus *Glochiceras* HYATT, 1900 as *Taramelliceras*'s microconchs. Thus, it appears that the subfamily Glochiceratinae HYATT, 1900 has not any real biological values, since it is currently only used to indiscriminately aggregate microconchs of various Oppeliidae mainly belonging to Ochetoceratinae SPATH, 1928 and to Taramelliceratinae SPATH, 1928.

Further research is now required to identify or confirm the existence of a dimorphism and a similar intraspecific morphological variability in other Oppeliidae, especially in the Kimmeridgian species *Taramelliceras trachinotum* (OPPEL, 1863) and *Streblites tenuilobatus* (OPPEL, 1863). Studying the ontogeny and variability in older and more recent Oppeliidae's species (of *Taramelliceras* and *Streblites*) may also allow the distinction between factors that are within the intraspecific variability and those that evolve as time goes by. It will thus enable a better understanding of the evolution of that group.

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Plate XII

All the specimens are ×1. Stars points out the beginning of the body-chamber.

Fig. 1: *Nebrodites* gr. *agrigentinus* (GEMMELLARO, 1872). Specimen No. cru096, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 2: *Sutneria cyclodorsata* (MOESCH, 1867). Specimen No. cru091, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 3: *Aulacostephanus phorcus* (FONTANNES, 1876). Specimen No. cru090, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 4: *Aspidoceras* gr. *acanthicum* (OPPEL, 1863). Specimen No. cru098, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 5: *Discosphinctoides praenuntians* (FONTANNES, 1879). Specimen No. cru100, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 6: *Lytoceras polycyclum* NEUMAYR, 1873. Specimen No. cru104, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 7: *Holcophylloceras polyolcum* (BENECKE, 1866). Specimen No. cru094, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 8: *Orthaspidoceras lallierianum* (D'ORBIGNY, 1849). Specimen No. cru080b, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 195. P. BOSELLI's collection.

Plate XII

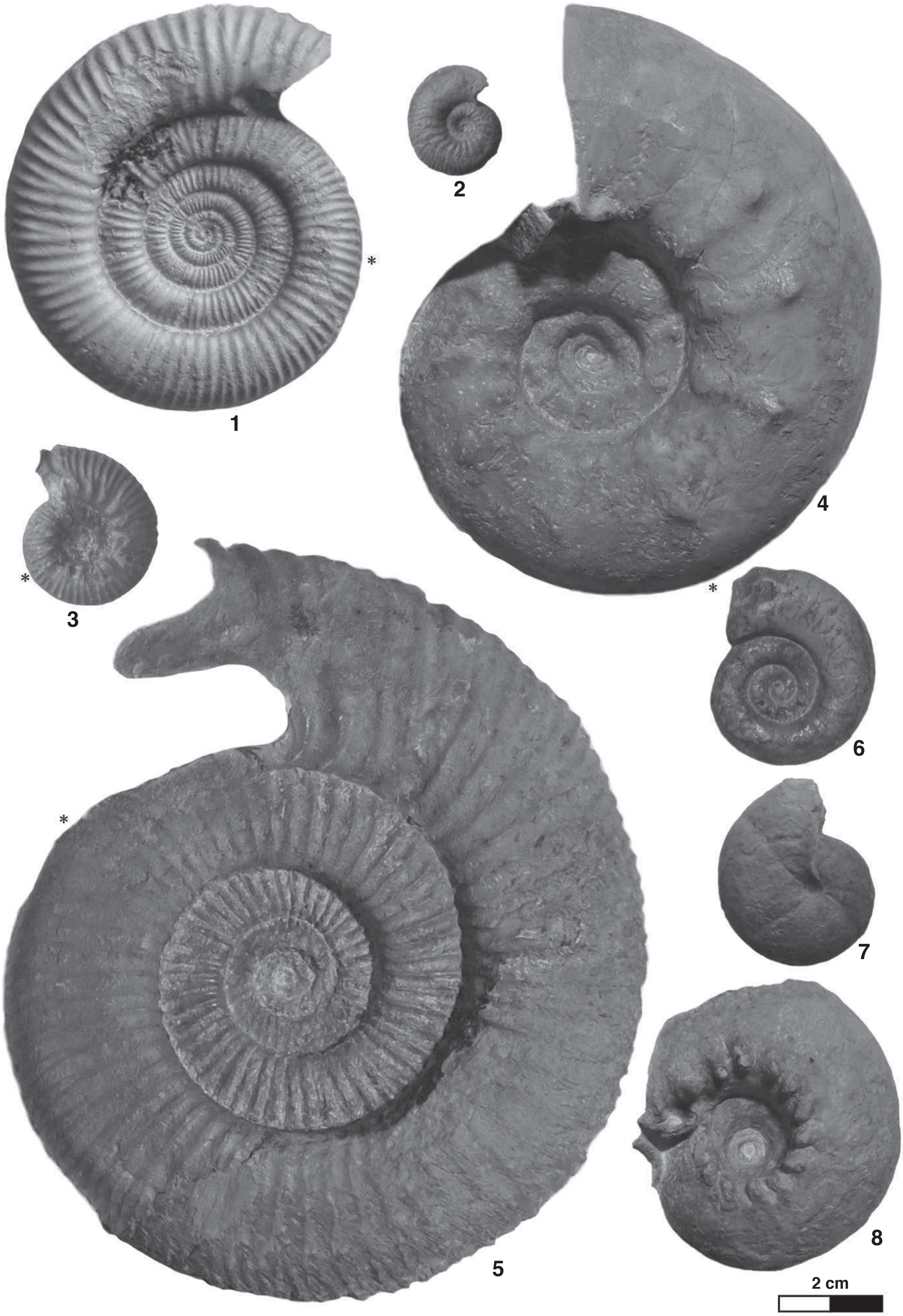

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Plate XIII

All the specimens are ×0.5.

Fig. 1: Pile of *Taramelliceras compsum* (OPPEL, 1863) [M] & [m], *Streblites weinlandi* (OPPEL, 1863) [M], *Aspidoceras acanthicum* (OPPEL, 1863) and *Discosphinctoides praenuntians* (Fontannes, 1879). Specimen No. cru103, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 2: Pile of *Taramelliceras compsum* (OPPEL, 1863) [M] & [m], *Aspidoceras acanthicum* (OPPEL, 1863), *Discosphinctoides praenuntians* (FONTANNES, 1879) and *Phylloceras praeposterium* (FONTANNES, 1875). Specimen No. crl101, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193. C. BAUDOUIN's collection.

Plate XIII

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Plate XIV

All the specimens are ×0.5.

Fig. 1: Pile of *Taramelliceras compsum* (OPPEL, 1863) [M] & [m] and *Streblites weinlandi* (OPPEL, 1863) [m]. Specimen No. cru101, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

Fig. 2: Pile of *Taramelliceras compsum* (OPPEL, 1863) [M] & [m], *Streblites weinlandi* (OPPEL, 1863) [M] and *Aspidoceras acanthicum* (OPPEL, 1863). Specimen No. cru101, Acanthicum Zone, Mount Crussol (Ardèche, France), bed No. 193 or 195. P. BOSELLI's collection.

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Table 1: measurements of *Taramelliceras compsum* (OPPEL, 1863) [M].

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl002	0	80	11	-	44	0,138	-	0,550	-	0,250	9	48	11	193
	68	66	10	21	36	0,152	0,318	0,545	0,583	0,278	8	36	9	
	132	55	9	18	30	0,164	0,327	0,545	0,600	0,300	11	33	10	
	163	c51	8	16	27	0,157	0,314	0,529	0,593	0,296	-	-	-	
crl003	0	64	9	-	36	0,141	-	0,563	-	0,250	12	-	12	193
	58	54	8	17	30	0,148	0,315	0,556	0,567	0,267	11	-	12	
	132	43	7	14	24	0,163	0,326	0,558	0,583	0,292	10	-	11	
	180	c38	7	12	20	0,184	0,316	0,526	0,600	0,350	-	-	-	
crl004	0	82	10	-	46	0,122	-	0,561	-	0,217	8	42	9	193
	95	63	9	18	35	0,143	0,286	0,556	0,514	0,257	10	41	10	
	140	55	9	17	30	0,164	0,309	0,545	0,567	0,300	9	37	10	
crl005a	0	108	12	32	58	0,111	0,296	0,537	0,552	0,207	-	-	-	193
	90	80	10	25	45	0,125	0,313	0,563	0,556	0,222	-	36	-	
	111	76	10	23	43	0,132	0,303	0,566	0,535	0,233	-	35	-	
crl005b	0	53	8	17	30	0,151	0,321	0,566	0,567	0,267	5	-	10	193
	90	41	7	-	22	0,171	-	0,537	-	0,318	7	-	6	
	148	34	6	-	18	0,176	-	0,529	-	0,333	5	31	2	
	180	c30	6	c9	16	0,100	0,300	0,533	0,563	0,375	-	-	1	
crl006a	0	79	11	-	43	0,139	-	0,544	-	0,256	13	43	9	193
	90	61	9	-	33	0,148	-	0,541	-	0,273	12	40	9	
	147	52	8	-	29	0,154	-	0,558	-	0,276	12	37	10	
	180	c48	8	-	26	0,167	-	0,542	-	0,308	-	-	-	
crl006b	0	23	7	-	10	0,304	-	0,435	-	0,700	5	29	0	193
	90	18	5	-	8	0,278	-	0,444	-	0,625	0	19	0	
	133	15	4	-	7	0,267	-	0,467	-	0,571	0	12	0	
	180	c14	4	-	6	0,286	-	0,429	-	0,667	0	4	0	
crl007	0	48	7	17	28	0,146	0,354	0,583	0,607	0,250	12	36	14	193
	76	37	7	13	21	0,189	0,351	0,568	0,619	0,333	10	32	14	
	128	33	6	11	17	0,182	0,333	0,515	0,647	0,353	7	30	11	
crl008	0	79	10	-	44	0,127	-	0,557	-	0,227	12	-	c13	193
	90	61	9	19	34	0,148	0,311	0,557	0,559	0,265	13	36	13	
	133	54	8	17	29	0,148	0,315	0,537	0,586	0,276	13	34	14	
crl009a	0	133	17	-	70	0,128	-	0,526	-	0,243	c3	c21	c5	193
	90	108	15	-	59	0,139	-	0,546	-	0,254	c4	c39	5	
	145	91	11	-	51	0,121	-	0,560	-	0,216	c5	38	3	
	180	c80	10	-	45	0,125	-	0,563	-	0,222	-	-	-	
crl009b	0	62	8	-	36	0,129	-	0,581	-	0,222	9	33	9	193
	90	c48	7	14	26	0,146	0,292	0,542	0,538	0,269	c6	29	8	
	110	c42	7	13	24	0,167	0,310	0,571	0,542	0,292	c4	30	c9	
	180	c35	6	9	19	0,171	0,257	0,543	0,474	0,316	-	-	-	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl010a	0	108	14	-	57	0,130	-	0,528	-	0,246	6	c39	12	193
	90	87	11	-	48	0,126	-	0,552	-	0,229	8	41	11	
	123	79	10	-	44	0,127	-	0,557	-	0,227	8	39	9	
	160	c66	9	20	39	0,136	0,303	0,591	0,513	0,231	-	-	-	
crl011	0	142	14	41	79	0,099	0,289	0,556	0,519	0,177	6	17	8	193
	90	113	11	34	65	0,097	0,301	0,575	0,523	0,169	8	37	-	
	117	104	11	32	61	0,106	0,308	0,587	0,525	0,180	8	42	-	
crl012a	0	99	12	-	54	0,121	-	0,545	-	0,222	9	34	5	193
	90	74	11	24	42	0,149	0,324	0,568	0,571	0,262	10	40	8	
	112	71	10	22	39	0,141	0,310	0,549	0,564	0,256	10	38	8	
crl013	0	125	16	34	68	0,128	0,272	0,544	0,500	0,235	4	c7	9	193
	70	103	12	c28	55	0,117	0,272	0,534	0,509	0,218	8	c23	10	
	131	88	11	27	48	0,125	0,307	0,545	0,563	0,229	9	c34	9	
crl014	0	51	8	16	29	0,157	0,314	0,569	0,552	0,276	13	41	12	193
	82	40	7	13	22	0,175	0,325	0,550	0,591	0,318	12	36	13	
	116	37	6	12	20	0,162	0,324	0,541	0,600	0,300	10	35	11	
crl016a	0	91	11	-	48	0,121	-	0,527	-	0,229	17	46	11	193
	90	74	9	23	42	0,122	0,311	0,568	0,548	0,214	13	42	7	
	127	66	8	21	36	0,121	0,318	0,545	0,583	0,222	10	40	7	
	180	c57	8	19	32	0,140	0,333	0,561	0,594	0,250	-	-	-	
crl016b	0	48	9	-	26	0,188	-	0,542	-	0,346	7	28	c12	193
	40	43	8	-	22	0,186	-	0,512	-	0,364	7	27	c12	
	90	c36	7	-	17	0,194	-	0,472	-	0,412	7	25	11	
crl017	0	45	7	14	25	0,156	0,311	0,556	0,560	0,280	7	28	10	193
	90	34	6	10	18	0,176	0,294	0,529	0,556	0,333	4	22	2	
	132	30	5	9	15	0,167	0,300	0,500	0,600	0,333	4	21	1	
crl018	0	45	8	15	23	0,178	0,333	0,511	0,652	0,348	10	39	12	193
	90	35	7	11	17	0,200	0,314	0,486	0,647	0,412	8	31	12	
	117	32	7	11	16	0,219	0,344	0,500	0,688	0,438	8	27	12	
crl019	0	59	10	20	32	0,169	0,339	0,542	0,625	0,313	11	35	14	193
	90	46	9	16	24	0,196	0,348	0,522	0,667	0,375	9	30	13	
	160	38	8	13	19	0,211	0,342	0,500	0,684	0,421	c7	28	15	
crl020	***0***	71	11	c22	38	0,155	0,310	0,535	0,579	0,289	10	35	4	193
	90	55	9	17	30	0,164	0,309	0,545	0,567	0,300	6	29	4	
	120	50	8	16	26	0,160	0,320	0,520	0,615	0,308	6	28	4	
crl021	0	65	9	-	37	0,138	-	0,569	-	0,243	-	38	10	193
	90	49	8	15	27	0,163	0,306	0,551	0,556	0,296	9	31	11	
	122	44	8	13	23	0,182	0,295	0,523	0,565	0,348	10	32	12	
	170	c40	-	12	20	-	0,300	0,500	0,600	-	-	-	-	
crl023a	0	76	10	-	42	0,132	-	0,553	-	0,238	10	48	9	193
	90	58	9	-	32	0,155	-	0,552	-	0,281	9	42	9	
	163	47	8	-	25	0,170	-	0,532	-	0,320	9	37	10	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl024	0	76	10	-	42	0,132	-	0,553	-	0,238	12	36	11	193
	90	61	9	-	33	0,148	-	0,541	-	0,273	9	41	10	
	136	53	8	16	29	0,151	0,302	0,547	0,552	0,276	10	40	10	
	160	49	8	14	26	0,163	0,286	0,531	0,538	0,308	-	-	-	
crl025	0	98	12	30	53	0,122	0,306	0,541	0,566	0,226	9	44	5	193
	90	76	11	25	43	0,145	0,329	0,566	0,581	0,256	8	39	12	
	138	66	9	22	37	0,136	0,333	0,561	0,595	0,243	8	34	16	
crl026	0	103	13	31	57	0,126	0,301	0,553	0,544	0,228	10	26	5	193
	90	81	11	26	45	0,136	0,321	0,556	0,578	0,244	11	36	6	
	139	70	10	23	38	0,143	0,329	0,543	0,605	0,263	12	38	9	
crl027	0	58	9	-	31	0,155	-	0,534	-	0,290	11	34	14	195
	90	44	8	14	23	0,182	0,318	0,523	0,609	0,348	11	30	14	
	140	38	7	12	20	0,184	0,316	0,526	0,600	0,350	8	26	14	
	169	37	7	10	18	0,189	0,270	0,486	0,556	0,389	-	-	-	
crl028	0	64	8	c19	36	0,125	0,297	0,563	0,528	0,222	18	50	13	193
	75	51	7	16	29	0,137	0,314	0,569	0,552	0,241	17	42	14	
	130	43	7	c12	24	0,163	0,279	0,558	0,500	0,292	-	-	14	
crl029	0	72	7	-	41	0,097	-	0,569	-	0,171	18	43	9	193
	90	55	6	c17	31	0,109	0,309	0,564	0,548	0,194	15	42	12	
	150	46	6	15	26	0,130	0,326	0,565	0,577	0,231	13	41	15	
	160	45	6	14	25	0,133	0,311	0,556	0,560	0,240	-	-	-	
crl030	0	54	8	17	30	0,148	0,315	0,556	0,567	0,267	13	36	10	193
	90	41	7	13	23	0,171	0,317	0,561	0,565	0,304	11	31	9	
	122	37	7	12	20	0,189	0,324	0,541	0,600	0,350	10	30	8	
crl031	0	81	10	25	44	0,123	0,309	0,543	0,568	0,227	6	40	9	193
	90	63	9	20	34	0,143	0,317	0,540	0,588	0,265	6	39	7	
	139	55	8	17	30	0,145	0,309	0,545	0,567	0,267	7	39	8	
crl032a	0	57	9	-	31	0,158	-	0,544	-	0,290	9	36	9	193
	90	44	8	-	24	0,182	-	0,545	-	0,333	7	32	9	
	127	40	7	-	21	0,175	-	0,525	-	0,333	6	30	8	
crl032b	0	38	6	-	20	0,158	-	0,526	-	0,300	5	32	10	193
	90	29	5	-	16	0,172	-	0,552	-	0,313	6	29	4	
	110	27	4	-	14	0,148	-	0,519	-	0,286	5	28	3	
crl033	0	112	11	30	65	0,098	0,268	0,580	0,462	0,169	9	31	2	193
	65	92	11	25	50	0,120	0,272	0,543	0,500	0,220	9	41	-	
	143	74	10	23	41	0,135	0,311	0,554	0,561	0,244	10	38	c12	
crl034	0	c126	c21	-	66	0,167	-	0,524	-	0,318	6	6	0	193
	80	99	14	29	54	0,141	0,293	0,545	0,537	0,259	9	23	2	
	121	90	13	26	48	0,144	0,289	0,533	0,542	0,271	8	32	4	
crl035a	0	77	c9	-	c41	0,117	-	0,532	-	0,220	c10	40	8	192 ?
	90	59	9	19	33	0,153	0,322	0,559	0,576	0,273	12	43	12	
	165	47	8	16	26	0,170	0,340	0,553	0,615	0,308	11	39	12	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl035b	0	68	c10	-	36	0,147	-	0,529	-	0,278	15	40	11	192 ?
crl036a	0	50	7	-	27	0,140	-	0,540	-	0,259	6	33	c15	193
	90	37	7	-	19	0,189	-	0,514	-	0,368	5	26	c11	
	112	35	7	-	18	0,200	-	0,514	-	0,389	5	28	c10	
	170	c33	6	-	16	0,182	-	0,485	-	0,375	-	-	-	
crl037	0	62	9	-	34	0,145	-	0,548	-	0,265	10	39	9	193
	95	48	8	14	26	0,167	0,292	0,542	0,538	0,308	8	28	10	
	140	42	8	13	22	0,190	0,310	0,524	0,591	0,364	8	26	11	
crl038	0	55	8	-	30	0,145	-	0,545	-	0,267	13	43	11	193
	90	43	7	13	23	0,163	0,302	0,535	0,565	0,304	14	34	10	
	144	37	6	11	20	0,162	0,297	0,541	0,550	0,300	13	31	10	
	156	c31	5	9	15	0,161	0,290	0,484	0,600	0,333	-	-	-	
crl039	0	50	8	16	27	0,160	0,320	0,540	0,593	0,296	14	41	14	193
	50	43	7	c14	23	0,163	0,326	0,535	0,609	0,304	13	38	13	
	110	37	7	c12	19	0,189	0,324	0,514	0,632	0,368	11	34	12	
crl040	0	62	7	21	35	0,113	0,339	0,565	0,600	0,200	12	47	14	193
	90	47	6	17	26	0,128	0,362	0,553	0,654	0,231	12	37	11	
	125	42	6	15	23	0,143	0,357	0,548	0,652	0,261	9	35	11	
	180	37	-	12	20	-	0,324	0,541	0,600	-	-	-	-	
crl041	0	40	8	12	20	0,200	0,300	0,500	0,600	0,400	9	25	13	193
	101	29	7	9	14	0,241	0,310	0,483	0,643	0,500	7	22	11	
	150	26	7	8	12	0,269	0,308	0,462	0,667	0,583	6	23	8	
crl042	***0***	47	7	14	25	0,149	0,298	0,532	0,560	0,280	7	31	7	193
	90	37	6	11	20	0,162	0,297	0,541	0,550	0,300	5	26	3	
	128	33	6	10	18	0,182	0,303	0,545	0,556	0,333	3	24	2	
crl043	0	52	7	17	29	0,135	0,327	0,558	0,586	0,241	15	40	12	193
	40	45	7	15	25	0,156	0,333	0,556	0,600	0,280	12	35	10	
	90	39	7	12	21	0,179	0,308	0,538	0,571	0,333	6	29	6	
	120	35	6	11	18	0,171	0,314	0,514	0,611	0,333	6	27	4	
crl044	0	36	11	11	16	0,306	0,306	0,444	0,688	0,688	19	22	7	193
	95	27	9	8	12	0,333	0,296	0,444	0,667	0,750	13	20	3	
	122	23	7	7	10	0,304	0,304	0,435	0,700	0,700	9	19	2	
crl045a	0	51	9	-	27	0,176	-	0,529	-	0,333	c9	c29	11	193
	90	38	7	c12	20	0,184	0,316	0,526	0,600	0,350	10	c28	9	
	137	33	7	11	17	0,212	0,333	0,515	0,647	0,412	9	29	5	
crl045b	0	20	4	6	9	0,200	0,300	0,450	0,667	0,444	1	23	0	193
	90	16	3	5	7	0,188	0,313	0,438	0,714	0,429	0	12	0	
	118	14	3	4	7	0,214	0,286	0,500	0,571	0,429	0	8	0	
crl046	0	32	6	10	17	0,188	0,313	0,531	0,588	0,353	7	28	5	193
	90	24	5	8	12	0,208	0,333	0,500	0,667	0,417	4	25	1	
	148	21	4	6	10	0,190	0,286	0,476	0,600	0,400	2	21	0	
	195	19	4	5	9	0,211	0,263	0,474	0,556	0,444	0	14	0	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl047	0	38	8	12	19	0,211	0,316	0,500	0,632	0,421	6	26	9	193
	90	30	6	9	15	0,200	0,300	0,500	0,600	0,400	6	26	6	
	120	27	6	8	13	0,222	0,296	0,481	0,615	0,462	6	24	4	
crl048a	0	72	11	-	39	0,153	-	0,542	-	0,282	9	35	9	193
	43	65	10	-	35	0,154	-	0,538	-	0,286	9	38	9	
	72	59	9	-	32	0,153	-	0,542	-	0,281	8	36	8	
	150	c48	8	-	25	0,167	-	0,521	-	0,320	-	-	-	
crl048b	0	40	7	-	21	0,175	-	0,525	-	0,333	6	28	10	193
	90	31	7	-	16	0,226	-	0,516	-	0,438	6	27	4	
	112	29	6	-	14	0,207	-	0,483	-	0,429	5	26	3	
crl049	0	45	7	14	24	0,156	0,311	0,533	0,583	0,292	9	30	9	193
	90	35	7	11	19	0,200	0,314	0,543	0,579	0,368	5	29	4	
	145	30	6	9	15	0,200	0,300	0,500	0,600	0,400	4	30	2	
	180	27	5	8	13	0,185	0,296	0,481	0,615	0,385	2	c28	0	
crl052a	0	69	10	-	38	0,145	-	0,551	-	0,263	10	43	-	193
	90	56	9	-	29	0,161	-	0,518	-	0,310	10	35	11	
	135	49	9	-	26	0,184	-	0,531	-	0,346	10	33	11	
	156	c44	8	-	24	0,182	-	0,545	-	0,333	-	-	-	
crl053a	0	74	12	-	39	0,162	-	0,527	-	0,308	12	38	10	193
	108	54	9	-	28	0,167	-	0,519	-	0,321	11	41	9	
	144	48	9	-	25	0,188	-	0,521	-	0,360	9	40	9	
crl054	0	26	6	-	13	0,231	-	0,500	-	0,462	6	28	c6	193
	59	23	5	-	11	0,217	-	0,478	-	0,455	3	26	2	
	110	20	4	-	9	0,200	-	0,450	-	0,444	1	28	0	
	151	18	4	-	8	0,222	-	0,444	-	0,500	0	26	0	
crl066a	0	95	13	-	50	0,137	-	0,526	-	0,260	10	39	10	193
	53	83	11	-	45	0,133	-	0,542	-	0,244	10	38	9	
	113	c69	9	-	39	0,130	-	0,565	-	0,231	9	39	11	
	135	c64	9	-	37	0,141	-	0,578	-	0,243	9	37	10	
crl066b	0	61	9	-	33	0,148	-	0,541	-	0,273	11	40	12	193
	68	50	8	13	27	0,160	0,260	0,540	0,481	0,296	9	35	9	
	125	43	8	-	23	0,186	-	0,535	-	0,348	8	32	6	
crl069a	0	32	6	9	16	0,188	0,281	0,500	0,563	0,375	c7	31	3	193
	90	25	5	8	12	0,200	0,320	0,480	0,667	0,417	4	24	1	
	128	22	5	7	11	0,227	0,318	0,500	0,636	0,455	3	24	0	
	180	c19	4	-	10	0,211	-	0,526	-	0,400	1	-	0	
crl076b	0	45	7	-	24	0,156	-	0,533	-	0,292	8	28	10	193
	56	39	7	12	21	0,179	0,308	0,538	0,571	0,333	7	24	8	
	111	35	6	11	18	0,171	0,314	0,514	0,611	0,333	7	26	5	
	180	c28	-	-	15	-	-	0,536	-	-	-	-	0	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl077a	0	52	8	-	29	0,154	-	0,558	-	0,276	11	34	10	193
	87	42	7	-	22	0,167	-	0,524	-	0,318	9	30	9	
	125	38	7	-	19	0,184	-	0,500	-	0,368	8	28	9	
crl078	0	41	7	-	21	0,171	-	0,512	-	0,333	10	37	8	193
	50	36	7	c10	19	0,194	0,278	0,528	0,526	0,368	10	35	7	
	108	29	-	c9	16	-	0,250	0,552	0,474	-	7	30	4	
crl082a	0	37	6	12	20	0,162	0,324	0,541	0,600	0,300	6	24	7	193
	72	30	5	-	15	0,167	-	0,500	-	0,333	4	22	2	
	129	26	4	-	13	0,154	-	0,500	-	0,308	2	21	0	
crl101a	0	172	21	-	85	0,122	-	0,494	-	0,247	0	0	0	193
	90	145	17	-	79	0,117	-	0,545	-	0,215	1	14	3	
	152	125	15	-	70	0,120	-	0,560	-	0,214	4	27	4	
	190	c115	14	-	64	0,122	-	0,557	-	0,219	-	-	-	
crl101b	0	87	10	-	49	0,115	-	0,563	-	0,204	6	39	8	193
	90	67	9	-	38	0,134	-	0,567	-	0,237	8	33	-	
	140	58	8	-	31	0,138	-	0,534	-	0,258	9	29	-	
crl101c	0	85	9	-	45	0,106	-	0,529	-	0,200	8	41	8	193
crl101d	0	21	5	-	10	0,238	-	0,476	-	0,500	2	18	0	193
	90	17	4	-	8	0,235	-	0,471	-	0,500	0	5	0	
	115	15	3	-	7	0,200	-	0,467	-	0,429	0	2	0	
crl102a	0	111	13	27	60	0,117	0,243	0,541	0,450	0,217	7	47	3	193
	75	90	12	-	51	0,133	-	0,567	-	0,235	11	46	3	
	139	76	11	-	42	0,145	-	0,553	-	0,262	9	42	4	
	202	63	9	-	35	0,143	-	0,556	-	0,257	-	-	-	
crl102b	0	103	12	-	56	0,117	-	0,544	-	0,214	13	42	-	193
	44	91	11	-	49	0,121	-	0,538	-	0,224	14	40	-	
	91	76	10	-	42	0,132	-	0,553	-	0,238	13	37	9	
	136	67	9	-	38	0,134	-	0,567	-	0,237	-	-	-	
crl103a	***0***	41	7	-	21	0,171	-	0,512	-	0,333	6	26	9	193
	50	36	7	-	19	0,194	-	0,528	-	0,368	6	27	6	
	110	31	6	-	15	0,194	-	0,484	-	0,400	5	26	3	
crl103b	0	36	7	10	19	0,194	0,278	0,528	0,526	0,368	7	25	2	193
	118	29	6	-	14	0,207	-	0,483	-	0,429	5	26	0	
	132	25	5	-	12	0,200	-	0,480	-	0,417	4	24	0	
	165	21	5	6	11	0,238	0,286	0,524	0,545	0,455	3	-	0	
crl108	0	78	9	25	42	0,115	0,321	0,538	0,595	0,214	18	38	9	193
	65	67	8	22	38	0,119	0,328	0,567	0,579	0,211	15	45	9	
	110	60	7	19	33	0,117	0,317	0,550	0,576	0,212	11	40	9	
	138	55	7	18	31	0,127	0,327	0,564	0,581	0,226	-	-	-	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl109	0	83	10	-	46	0,120	-	0,554	-	0,217	15	44	5	193
	71	69	9	-	39	0,130	-	0,565	-	0,231	13	41	-	
	148	56	9	-	31	0,161	-	0,554	-	0,290	11	39	-	
	180	49	-	16	27	-	0,327	0,551	0,593	-	-	-	-	
crl110	0	57	9	c14	31	0,158	0,246	0,544	0,452	0,290	9	32	10	193
	38	51	9	14	27	0,176	0,275	0,529	0,519	0,333	8	32	12	
	78	45	8	13	24	0,178	0,289	0,533	0,542	0,333	9	33	12	
crl111	0	67	9	-	37	0,134	-	0,552	-	0,243	9	38	9	193
	68	55	9	17	30	0,164	0,309	0,545	0,567	0,300	10	36	9	
	151	43	8	14	23	0,186	0,326	0,535	0,609	0,348	9	32	10	
	170	41	8	13	22	0,195	0,317	0,537	0,591	0,364	-	-	-	
crl112	0	50	8	-	28	0,160	-	0,560	-	0,286	10	36	10	193
	65	40	7	13	22	0,175	0,325	0,550	0,591	0,318	10	34	10	
	133	34	6	10	18	0,176	0,294	0,529	0,556	0,333	8	32	7	
crl113	0	c59	-	-	32	-	-	0,542	-	-	8	30	11	193
	70	49	7	-	27	0,143	-	0,551	-	0,259	9	29	12	
	148	39	6	-	21	0,154	-	0,538	-	0,286	8	27	10	
	188	34	6	-	19	0,176	-	0,559	-	0,316	-	-	-	
crl114	0	53	8	-	29	0,151	-	0,547	-	0,276	17	49	14	193
	60	43	6	14	24	0,140	0,326	0,558	0,583	0,250	12	38	11	
	120	36	6	11	19	0,167	0,306	0,528	0,579	0,316	7	27	8	
	180	c31	6	9	16	0,194	0,290	0,516	0,563	0,375	-	-	-	
crl115	***0***	51	7	-	28	0,137	-	0,549	-	0,250	8	41	-	193
	79	41	6	13	23	0,146	0,317	0,561	0,565	0,261	9	39	-	
	132	34	6	11	19	0,176	0,324	0,559	0,579	0,316	8	36	7	
crl116	0	47	9	-	29	0,191	-	0,617	-	0,310	7	28	6	193
	70	38	7	12	20	0,184	0,316	0,526	0,600	0,350	8	27	4	
	146	31	7	9	16	0,226	0,290	0,516	0,563	0,438	5	26	1	
crl117a	0	32	7	-	16	0,219	-	0,500	-	0,438	8	26	12	193
	60	28	7	-	13	0,250	-	0,464	-	0,538	8	28	6	
	125	23	6	-	10	0,261	-	0,435	-	0,600	6	29	1	
	155	20	5	-	9	0,250	-	0,450	-	0,556	5	-	0	
crl117c	0	16	4	-	7	0,250	-	0,438	-	0,571	0	10	0	193
	75	13	3	-	6	0,231	-	0,462	-	0,500	0	3	0	
	130	11	3	-	5	0,273	-	0,455	-	0,600	0	0	0	
crl118	0	32	6	9	17	0,188	0,281	0,531	0,529	0,353	11	33	8	193
	50	28	5	8	14	0,179	0,286	0,500	0,571	0,357	10	30	3	
	100	24	5	7	12	0,208	0,292	0,500	0,583	0,417	7	26	0	
crl135	0	78	8	24	43	0,103	0,308	0,551	0,558	0,186	8	39	9	193
	56	65	7	21	37	0,108	0,323	0,569	0,568	0,189	8	38	8	
	118	54	7	18	30	0,130	0,333	0,556	0,600	0,233	9	35	10	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
crl136	0	58	8	18	32	0,138	0,310	0,552	0,563	0,250	11	32	9	193
	28	54	7	17	30	0,130	0,315	0,556	0,567	0,233	10	31	10	
	90	44	6	14	25	0,136	0,318	0,568	0,560	0,240	10	29	7	
	148	39	6	12	21	0,154	0,308	0,538	0,571	0,286	9	29	4	
crl137	0	38	6	-	20	0,158	-	0,526	-	0,300	5	26	c7	193
	60	32	6	9	17	0,188	0,281	0,531	0,529	0,353	4	25	4	
	135	26	4	7	13	0,154	0,269	0,500	0,538	0,308	4	22	1	
crl140a	0	57	9	-	30	0,158	-	0,526	-	0,300	6	26	10	193
	87	44	8	-	23	0,182	-	0,523	-	0,348	6	21	10	
	142	38	8	-	19	0,211	-	0,500	-	0,421	6	19	10	
	180	33	7	-	17	0,212	-	0,515	-	0,412	-	-	-	
crl140b	0	42	7	-	23	0,167	-	0,548	-	0,304	9	30	8	193
	80	33	6	-	17	0,182	-	0,515	-	0,353	6	27	8	
	150	29	6	-	14	0,207	-	0,483	-	0,429	2	26	6	
cru001a	0	78	10	-	43	0,128	-	0,551	-	0,233	8	41	9	195
	90	59	8	-	33	0,136	-	0,559	-	0,242	8	38	11	
	150	49	7	-	27	0,143	-	0,551	-	0,259	6	32	11	
	170	47	7	-	25	0,149	-	0,532	-	0,280	-	-	-	
cru001b	0	c40	7	-	21	0,175	-	0,525	-	0,333	3	23	3	195
	70	34	6	11	17	0,176	0,324	0,500	0,647	0,353	2	21	1	
cru002a	0	21	4	6	11	0,190	0,286	0,524	0,545	0,364	4	23	1	195
	85	17	3	5	9	0,176	0,294	0,529	0,556	0,333	1	20	0	
	160	14	3	4	7	0,214	0,286	0,500	0,571	0,429	0	8	0	
cru003	0	66	7	22	38	0,106	0,333	0,576	0,579	0,184	21	49	13	195
	62	54	7	18	30	0,130	0,333	0,556	0,600	0,233	17	44	7	
	135	44	6	14	25	0,136	0,318	0,568	0,560	0,240	13	37	5	
cru006	0	49	8	-	26	0,163	-	0,531	-	0,308	13	43	13	195
	58	42	7	12	23	0,167	0,286	0,548	0,522	0,304	12	41	13	
	105	37	7	11	19	0,189	0,297	0,514	0,579	0,368	10	38	13	
	149	30	6	10	17	0,200	0,333	0,567	0,588	0,353	-	-	-	
cru008	0	83	10	28	46	0,120	0,337	0,554	0,609	0,217	13	46	12	193
	67	69	9	23	38	0,130	0,333	0,551	0,605	0,237	13	44	12	
	131	58	8	19	32	0,138	0,328	0,552	0,594	0,250	10	42	11	
cru009	0	54	8	-	31	0,148	-	0,574	-	0,258	15	35	11	195
	75	44	7	12	24	0,159	0,273	0,545	0,500	0,292	11	34	10	
	158	35	7	10	18	0,200	0,286	0,514	0,556	0,389	7	28	4	
cru010	0	78	11	23	43	0,141	0,295	0,551	0,535	0,256	12	-	7	195
	80	63	10	19	34	0,159	0,302	0,540	0,559	0,294	10	37	9	
	120	57	9	17	31	0,158	0,298	0,544	0,548	0,290	-	-	-	
cru011	0	42	8	13	23	0,190	0,310	0,548	0,565	0,348	11	37	13	195
	77	34	7	10	17	0,206	0,294	0,500	0,588	0,412	5	32	12	
	149	27	6	8	13	0,222	0,296	0,481	0,615	0,462	2	30	8	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
cru012	0	68	8	-	38	0,118	-	0,559	-	0,211	c7	c39	-	195
	55	59	8	-	33	0,136	-	0,559	-	0,242	c7	c36	-	
	140	47	6	13	26	0,128	0,277	0,553	0,500	0,231	c7	32	6	
	180	41	6	12	22	0,146	0,293	0,537	0,545	0,273	-	-	-	
cru013	0	120	17	37	61	0,142	0,308	0,508	0,607	0,279	11	-	-	193/195
	90	99	15	32	51	0,152	0,323	0,515	0,627	0,294	10	35	1	
	157	82	12	27	43	0,146	0,329	0,524	0,628	0,279	10	31	5	
cru014	0	83	10	28	45	0,120	0,337	0,542	0,622	0,222	15	48	13	193
	75	68	9	24	38	0,132	0,353	0,559	0,632	0,237	13	44	12	
	137	57	8	19	33	0,140	0,333	0,579	0,576	0,242	9	40	10	
cru015	0	138	17	44	73	0,123	0,319	0,529	0,603	0,233	-	4	4	193
	90	112	15	-	60	0,134	-	0,536	-	0,250	-	12	1	
	150	95	13	25	53	0,137	0,263	0,558	0,472	0,245	11	23	0	
	180	88	12	23	49	0,136	0,261	0,557	0,469	0,245	-	-	-	
cru016	0	70	10	19	39	0,143	0,271	0,557	0,487	0,256	13	35	10	195
	90	54	8	16	29	0,148	0,296	0,537	0,552	0,276	10	33	10	
	158	45	8	14	23	0,178	0,311	0,511	0,609	0,348	10	33	9	
cru018	0	42	7	c12	22	0,167	0,286	0,524	0,545	0,318	8	33	9	195
	60	35	6	11	18	0,171	0,314	0,514	0,611	0,333	7	33	6	
cru019	0	49	8	-	27	0,163	-	0,551	-	0,296	6	33	6	195
	62	40	7	-	21	0,175	-	0,525	-	0,333	6	32	8	
	128	34	7	10	18	0,206	0,294	0,529	0,556	0,389	7	32	9	
cru020	0	27	4	-	14	0,148	-	0,519	-	0,286	3	21	0	195
	75	21	3	7	11	0,143	0,333	0,524	0,636	0,273	1	23	0	
	120	19	3	6	10	0,158	0,316	0,526	0,600	0,300	0	21	0	
cru021	0	33	6	c9	18	0,182	0,273	0,545	0,500	0,333	7	31	4	195
	61	28	5	c7	14	0,179	0,212	0,500	0,500	0,357	6	28	3	
	120	24	5	6	12	0,208	0,250	0,500	0,500	0,417	6	27	0	
cru022	0	38	6	12	20	0,158	0,316	0,526	0,600	0,300	8	31	10	195
	71	32	6	10	16	0,188	0,313	0,500	0,625	0,375	9	32	9	
	153	26	5	8	13	0,192	0,308	0,500	0,615	0,385	8	30	5	
cru023	0	42	9	-	20	0,214	-	0,476	-	0,450	6	27	11	193
	70	36	8	-	18	0,222	-	0,500	-	0,444	5	26	8	
	100	33	7	-	16	0,212	-	0,485	-	0,438	-	-	5	
cru024	0	86	10	28	46	0,116	0,326	0,535	0,609	0,217	16	22	9	193
	78	72	9	24	40	0,125	0,333	0,556	0,600	0,225	9	-	-	
	158	56	8	19	31	0,143	0,339	0,554	0,613	0,258	4	-	-	
cru026a	0	72	10	-	38	0,139	-	0,528	-	0,263	20	37	7	193
	67	61	9	-	33	0,148	-	0,541	-	0,273	19	43	10	
	138	50	8	13	27	0,160	0,260	0,540	0,481	0,296	14	38	12	
	180	45	8	12	24	0,178	0,267	0,533	0,500	0,333	-	-	-	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
cru026b	0	55	7	-	30	0,127	-	0,545	-	0,233	12	40	6	193
	60	46	7	-	24	0,152	-	0,522	-	0,292	6	30	6	
	129	37	6	9	20	0,162	0,243	0,541	0,450	0,300	7	28	5	
cru027	0	180	22	55	98	0,122	0,306	0,544	0,561	0,224	0	0	0	193
	85	153	18	c38	81	0,118	0,248	0,529	0,469	0,222	0	7	0	
	140	135	17	-	73	0,126	-	0,541	-	0,233	0	19	0	
	197	127	17	34	64	0,134	0,268	0,504	0,531	0,266	-	-	-	
cru030	0	116	14	37	61	0,121	0,319	0,526	0,607	0,230	9	27	11	193 ?
	90	96	11	31	52	0,115	0,323	0,542	0,596	0,212	11	32	12	
	152	81	10	26	45	0,123	0,321	0,556	0,578	0,222	12	34	11	
cru031	0	135	13	-	73	0,096	-	0,541	-	0,178	11	29	6	193
	76	111	13	-	62	0,117	-	0,559	-	0,210	12	43	3	
	134	95	11	30	54	0,116	0,3157895	0,568	0,556	0,204	9	39	2	
	175	89	10	27	50	0,112	0,3033708	0,562	0,540	0,200	-	-	-	
cru035a	0	168	19	-	89	0,113	-	0,530	-	0,213	0	5	8	193
	90	138	16	-	76	0,116	-	0,551	-	0,211	2	30	1	
	150	118	13	-	68	0,110	-	0,576	-	0,191	6	47	0	
	180	105	13	35	62	0,124	0,333	0,590	0,565	0,210	-	-	-	
cru035b	0	22	6	-	10	0,273	-	0,455	-	0,600	2	22	0	193
	55	19	5	-	9	0,263	-	0,474	-	0,556	1	15	0	
	120	16	5	-	7	0,313	-	0,438	-	0,714	0	5	0	
cru036	0	51	7	-	29	0,137	-	0,569	-	0,241	11	31	10	193/195
	70	42	6	-	23	0,143	-	0,548	-	0,261	13	32	10	
	157	33	6	10	18	0,182	0,303	0,545	0,556	0,333	7	28	6	
cru037a	0	23	5	6	11	0,217	0,261	0,478	0,545	0,455	8	29	0	193/195
	55	20	5	5	9	0,250	0,250	0,450	0,556	0,556	3	22	0	
	110	17	4	5	8	0,235	0,294	0,471	0,625	0,500	1	12	0	
	210	14	4	4	6	0,286	0,286	0,429	0,667	0,667	0	0	0	
cru038	0	34	8	-	15	0,235	-	0,441	-	0,533	4	24	12	193/195
	50	31	8	-	13	0,258	-	0,419	-	0,615	4	25	10	
	98	28	7	8	12	0,250	0,286	0,429	0,667	0,583	-	-	-	
cru039	0	74	9	21	41	0,122	0,284	0,554	0,512	0,220	13	31	5	193/195
	74	60	8	18	33	0,133	0,300	0,550	0,545	0,242	12	28	7	
	127	51	7	16	28	0,137	0,314	0,549	0,571	0,250	12	26	7	
cru040	0	113	14	-	61	0,124	-	0,540	-	0,230	16	46	2	193/195
	80	94	13	28	53	0,138	0,298	0,564	0,528	0,245	14	45	4	
	160	75	11	24	42	0,147	0,320	0,560	0,571	0,262	12	41	9	
	190	69	11	21	38	0,159	0,304	0,551	0,553	0,289	-	-	-	
cru041	0	92	11	29	51	0,120	0,315	0,554	0,569	0,216	8	21	8	193/195
	45	82	10	24	45	0,122	0,293	0,549	0,533	0,222	10	31	6	
	99	71	9	22	39	0,127	0,310	0,549	0,564	0,231	9	36	9	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
cru042	0	75	10	-	41	0,133	-	0,547	-	0,244	10	48	9	193/195
	57	64	8	c18	35	0,125	0,281	0,547	0,514	0,229	9	45	9	
	120	54	7	17	29	0,130	0,315	0,537	0,586	0,241	7	39	9	
	180	c44	7	c12	24	0,159	0,273	0,545	0,500	0,292	-	-	-	
cru043	0	64	9	-	35	0,141	-	0,547	-	0,257	8	36	11	193/195
	55	57	8	-	32	0,140	-	0,561	-	0,250	5	31	10	
	105	49	8	15	27	0,163	0,306	0,551	0,556	0,296	4	26	8	
	155	43	7	c12	22	0,163	0,279	0,512	0,545	0,318	-	-	-	
cru044	0	79	8	-	45	0,101	-	0,570	-	0,178	12	46	10	193/195
	74	65	7	-	36	0,108	-	0,554	-	0,194	12	44	14	
	153	52	7	14	29	0,135	0,269	0,558	0,483	0,241	15	41	13	
	180	49	6	14	26	0,122	0,286	0,531	0,538	0,231	-	-	-	
cru045	0	108	16	34	57	0,148	0,315	0,528	0,596	0,281	10	30	11	193/195
	80	89	14	29	47	0,157	0,326	0,528	0,617	0,298	11	33	12	
	140	76	12	24	40	0,158	0,316	0,526	0,600	0,300	12	30	12	
	180	c65	12	22	34	0,185	0,338	0,523	0,647	0,353	-	-	-	
cru046	0	53	8	-	27	0,151	-	0,509	-	0,296	12	33	12	193/195
	80	42	7	-	22	0,167	-	0,524	-	0,318	13	33	10	
cru047	0	140	20	42	74	0,143	0,300	0,529	0,568	0,270	8	16	0	193/195
	105	107	16	31	58	0,150	0,290	0,542	0,534	0,276	5	35	0	
	160	92	14	28	46	0,152	0,304	0,500	0,609	0,304	5	33	0	
cru048	0	63	8	-	35	0,127	-	0,556	-	0,229	14	40	13	193/195
	80	49	8	-	26	0,163	-	0,531	-	0,308	11	36	11	
	154	40	7	-	21	0,175	-	0,525	-	0,333	8	32	7	
cru049	0	43	9	13	22	0,209	0,302	0,512	0,591	0,409	10	31	13	193/195
	75	36	8	11	18	0,222	0,306	0,500	0,611	0,444	9	26	13	
	120	32	7	9	15	0,219	0,281	0,469	0,600	0,467	7	26	10	
cru050	0	62	7	18	35	0,113	0,290	0,565	0,514	0,200	9	43	9	193/195
	60	52	7	16	29	0,135	0,308	0,558	0,552	0,241	8	36	7	
	129	42	6	13	24	0,143	0,310	0,571	0,542	0,250	6	31	6	
	145	40	6	12	23	0,150	0,300	0,575	0,522	0,261	6	30	4	
cru051	0	93	13	-	47	0,140	-	0,505	-	0,277	13	35	11	193/195
	65	80	12	-	42	0,150	-	0,525	-	0,286	10	36	9	
	140	66	11	-	35	0,167	-	0,530	-	0,314	10	34	10	
cru052	0	63	9	-	35	0,143	-	0,556	-	0,257	11	34	9	193/195
	70	52	9	14	28	0,173	0,269	0,538	0,500	0,321	7	28	12	
	116	46	9	13	24	0,196	0,283	0,522	0,542	0,375	7	27	12	
	148	42	8	12	21	0,190	0,286	0,500	0,571	0,381	7	28	13	
cru053a	0	57	10	-	30	0,175	-	0,526	-	0,333	15	40	14	193/195
	50	51	9	-	28	0,176	-	0,549	-	0,321	14	37	11	
	93	44	8	-	24	0,182	-	0,545	-	0,333	12	34	8	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
cru053b	0	38	9	13	19	0,237	0,342	0,500	0,684	0,474	8	33	11	193/195
	65	32	6	10	16	0,188	0,313	0,500	0,625	0,375	7	31	10	
	133	25	5	9	13	0,200	0,360	0,520	0,692	0,385	4	27	6	
cru053c	0	20	4	-	9	0,200	-	0,450	-	0,444	6	23	0	193/195
	58	17	4	c6	8	0,235	0,353	0,471	0,750	0,500	3	14	0	
	131	14	3	5	7	0,214	0,357	0,500	0,714	0,429	0	4	0	
cru053d	0	25	5	-	12	0,200	-	0,480	-	0,417	4	23	1	193/195
cru054	0	44	8	-	23	0,182	-	0,523	-	0,348	14	32	13	193
	29	41	7	-	21	0,171	-	0,512	-	0,333	14	32	11	
	79	36	6	-	19	0,167	-	0,528	-	0,316	14	31	13	
cru055	0	60	9	-	33	0,150	-	0,550	-	0,273	14	32	12	193/195
	23	57	8	-	31	0,140	-	0,544	-	0,258	16	33	12	
	92	46	7	12	25	0,152	0,261	0,543	0,480	0,280	14	33	12	
cru056a	0	107	15	32	56	0,140	0,299	0,523	0,571	0,268	9	39	9	193/195
	52	95	13	29	50	0,137	0,305	0,526	0,580	0,260	9	42	9	
	101	81	12	23	43	0,148	0,284	0,531	0,535	0,279	9	47	10	
	167	c69	11	21	39	0,159	0,304	0,565	0,538	0,282	-	-	-	
cru057a	0	66	9	-	36	0,136	-	0,545	-	0,250	9	37	12	195
	38	58	9	-	32	0,155	-	0,552	-	0,281	10	37	12	
	115	47	7	-	26	0,149	-	0,553	-	0,269	10	36	-	
cru057b	0	65	10	-	35	0,154	-	0,538	-	0,286	c7	41	c6	195
	65	56	9	-	30	0,161	-	0,536	-	0,300	-	36	c5	
	130	46	8	-	24	0,174	-	0,522	-	0,333	-	c30	c4	
cru076a	0	154	22	-	78	0,143	-	0,506	-	0,282	12	19	12	193
	85	131	20	-	68	0,153	-	0,519	-	0,294	9	26	11	
	152	112	17	35	58	0,152	0,313	0,518	0,603	0,293	8	30	15	
	180	106	17	32	54	0,160	0,302	0,509	0,593	0,315	-	-	-	
cru077a	0	184	24	47	92	0,130	0,255	0,500	0,511	0,261	0	7	0	193
	50	165	22	43	84	0,133	0,261	0,509	0,512	0,262	0	0	0	
	110	139	19	36	75	0,137	0,259	0,540	0,480	0,253	0	0	0	
	205	c120	16	c30	62	0,133	0,250	0,517	0,484	0,258	-	-	-	
cru077b	0	53	6	-	29	0,113	-	0,547	-	0,207	8	33	10	193
	50	48	5	-	27	0,104	-	0,563	-	0,185	-	32	10	
	105	43	4	-	24	0,093	-	0,558	-	0,167	-	30	8	
cru078	0	116	15	35	61	0,129	0,302	0,526	0,574	0,246	13	24	2	195
	56	107	13	-	59	0,121	-	0,551	-	0,220	17	41	5	
	149	83	11	-	44	0,133	-	0,530	-	0,250	14	50	10	
	180	77	10	-	39	0,130	-	0,506	-	0,256	-	-	-	
cru079	0	159	18	-	84	0,113	-	0,528	-	0,214	0	-	0	193/195
	90	131	17	-	67	0,130	-	0,511	-	0,254	3	-	0	
	170	109	12	32	59	0,110	0,294	0,541	0,542	0,203	7	13	0	
	205	100	11	29	54	0,110	0,290	0,540	0,537	0,204	-	-	-	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	*Npr/2*	*Nsr/2*	*Nt/2*	Bed n°
cru080	0	121	15	-	62	0,124	-	0,512	-	0,242	6	0	3	195
	91	95	13	-	52	0,137	-	0,547	-	0,250	9	13	7	
	157	83	11	-	45	0,133	-	0,542	-	0,244	13	27	9	
	180	78	11	-	42	0,141	-	0,538	-	0,262	-	-	-	
cru082	0	40	7	-	21	0,175	-	0,525	-	0,333	9	29	10	195
	42	35	6	-	19	0,171	-	0,543	-	0,316	7	25	8	
	158	26	5	-	13	0,192	-	0,500	-	0,385	4	22	2	
cru083	0	96	10	31	53	0,104	0,323	0,552	0,585	0,189	20	48	10	193
	95	74	9	23	43	0,122	0,311	0,581	0,535	0,209	22	53	12	
	155	62	8	19	35	0,129	0,306	0,565	0,543	0,229	19	48	12	
cru084	0	34	8	10	17	0,235	0,294	0,500	0,588	0,471	6	20	7	195
	70	28	7	9	13	0,250	0,321	0,464	0,692	0,538	5	22	3	
	150	23	6	-	10	0,261	-	0,435	-	0,600	1	23	0	
cru085	0	37	8	-	19	0,216	-	0,514	-	0,421	6	29	13	193
	70	30	7	9	15	0,233	0,300	0,500	0,600	0,467	4	28	12	
	140	25	7	8	12	0,280	0,320	0,480	0,667	0,583	1	28	7	
cru086	0	28	5	9	15	0,179	0,321	0,536	0,600	0,333	6	27	2	193
	70	24	5	8	12	0,208	0,333	0,500	0,667	0,417	2	19	0	
	143	19	4	7	9	0,211	0,368	0,474	0,778	0,444	0	13	0	
	180	16	4	6	8	0,250	0,375	0,500	0,750	0,500	0	5	0	
cru088a	0	187	22	52	97	0,118	0,278	0,519	0,536	0,227	8	0	0	193
	95	156	19	43	84	0,122	0,276	0,538	0,512	0,226	9	14	0	
	170	129	17	34	72	0,132	0,264	0,558	0,472	0,236	12	34	0	
	195	124	16	34	69	0,129	0,274	0,556	0,493	0,232	-	-	-	

Table 2: measurements of *Taramelliceras compsum* (OPPEL, 1863) [m].

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl010b	0	c34	11	-	13	0,324	-	0,382	-	0,846	193
	90	27	8	-	11	0,296	-	0,407	-	0,727	
	140	24	7	-	10	0,292	-	0,417	-	0,700	
crl012b	0	23	7	-	10	0,304	-	0,435	-	0,700	193
	90	18	5	4	8	0,278	0,222	0,444	0,500	0,625	
	128	16	4	4	7	0,250	0,250	0,438	0,571	0,571	
crl023b	0	29	9	-	11	0,310	-	0,379	-	0,818	193
	90	24	7	-	10	0,292	-	0,417	-	0,700	
	135	21	6	-	9	0,286	-	0,429	-	0,667	
	180	19	5	-	8	0,263	-	0,421	-	0,625	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl053b	0	35	11	-	14	0,314	-	0,400	-	0,786	193
	90	29	8	-	12	0,276	-	0,414	-	0,667	
	132	27	7	-	11	0,259	-	0,407	-	0,636	
	190	23	6	-	10	0,261	-	0,435	-	0,600	
crl080	0	31	11	7	12	0,355	0,226	0,387	0,583	0,917	193
	70	28	9	-	12	0,321	-	0,429	-	0,750	
	160	22	7	-	9	0,318	-	0,409	-	0,778	
	180	20	6	-	8	0,300	-	0,400	-	0,750	
crl082b	0	32	10	7	12	0,313	0,219	0,375	0,583	0,833	193
	51	28	8	6	11	0,286	0,214	0,393	0,545	0,727	
	100	25	6	6	11	0,240	0,240	0,440	0,545	0,545	
	160	21	6	5	9	0,286	0,238	0,429	0,556	0,667	
crl090a	0	20	6	6	8	0,300	0,300	0,400	0,750	0,750	193
	80	18	5	-	8	0,278	-	0,444	-	0,625	
	160	15	3	-	7	0,200	-	0,467	-	0,429	
crl092	0	33	11	8	12	0,333	0,242	0,364	0,667	0,917	193
	72	29	10	7	11	0,345	0,241	0,379	0,636	0,909	
	125	25	8	6	10	0,320	0,240	0,400	0,600	0,800	
	188	22	6	5	9	0,273	0,227	0,409	0,556	0,667	
crl093	0	28	10	7	11	0,357	0,250	0,393	0,636	0,909	193
	76	24	7	6	10	0,292	0,250	0,417	0,600	0,700	
	137	21	6	5	9	0,286	0,238	0,429	0,556	0,667	
	205	17	5	4	7	0,294	0,235	0,412	0,571	0,714	
crl094	0	29	8	7	12	0,276	0,241	0,414	0,583	0,667	193
	71	25	7	6	11	0,280	0,240	0,440	0,545	0,636	
	125	22	6	6	10	0,273	0,273	0,455	0,600	0,600	
	153	20	5	5	9	0,250	0,250	0,450	0,556	0,556	
crl095	0	35	10	8	14	0,286	0,229	0,400	0,571	0,714	193
	60	30	9	7	13	0,300	0,233	0,433	0,538	0,692	
	110	26	7	6	12	0,269	0,231	0,462	0,500	0,583	
	180	22	6	5	10	0,273	0,227	0,455	0,500	0,600	
crl096	0	33	11	8	13	0,333	0,242	0,394	0,615	0,846	193
	56	30	9	7	12	0,300	0,233	0,400	0,583	0,750	
	110	27	8	7	11	0,296	0,259	0,407	0,636	0,727	
	180	22	7	6	10	0,318	0,273	0,455	0,600	0,700	
crl097	0	31	9	8	12	0,290	0,258	0,387	0,667	0,750	193
	52	27	8	7	11	0,296	0,259	0,407	0,636	0,727	
	97	24	6	6	10	0,250	0,250	0,417	0,600	0,600	
	165	20	6	5	9	0,300	0,250	0,450	0,556	0,667	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl098	0	28	9	6	11	0,321	0,214	0,393	0,545	0,818	193
	70	23	7	5	10	0,304	0,217	0,435	0,500	0,700	
	130	20	6	-	9	0,300	-	0,450	-	0,667	
	195	17	5	4	8	0,294	0,235	0,471	0,500	0,625	
crl101e	0	34	11	-	13	0,324	-	0,382	-	0,846	193
	90	25	6	6	11	0,240	0,240	0,440	0,545	0,545	
	138	23	6	-	11	0,261	-	0,478	-	0,545	
crl101f	0	34	11	-	13	0,324	-	0,382	-	0,846	193
	9	29	9	-	11	0,310	-	0,379	-	0,818	
	122	27	8	-	11	0,296	-	0,407	-	0,727	
	260	19	4	4	8	0,211	0,211	0,421	0,500	0,500	
crl101g	0	16	4	4	7	0,250	0,250	0,438	0,571	0,571	193
	90	14	3	-	6	0,214	-	0,429	-	0,500	
	120	12	3	-	5	0,250	-	0,417	-	0,600	
crl101h	0	17	5	-	7	0,294	-	0,412	-	0,714	193
	90	13	3	-	6	0,231	-	0,462	-	0,500	
crl102c	0	26	7	-	11	0,269	-	0,423	-	0,636	193
	60	22	c6	-	10	0,273	-	0,455	-	0,600	
crl103c	0	23	6	-	10	0,261	-	0,435	-	0,600	193
	47	20	5	-	9	0,250	-	0,450	-	0,556	
	90	18	4	-	8	0,222	-	0,444	-	0,500	
	128	16	4	-	7	0,250	-	0,438	-	0,571	
crl103d	0	25	8	-	9	0,320	-	0,360	-	0,889	193
	50	22	7	6	9	0,318	0,273	0,409	0,667	0,778	
	110	19	6	5	8	0,316	0,263	0,421	0,625	0,750	
	180	17	5	4	7	0,294	0,235	0,412	0,571	0,714	
crl104a	0	33	10	8	14	0,303	0,242	0,424	0,571	0,714	193
	90	27	8	7	12	0,296	0,259	0,444	0,583	0,667	
	215	20	6	5	9	0,300	0,250	0,450	0,556	0,667	
crl104b	0	30	9	6	12	0,300	0,200	0,400	0,500	0,750	193
	65	26	7	6	11	0,269	0,231	0,423	0,545	0,636	
	150	21	5	5	9	0,238	0,238	0,429	0,556	0,556	
	180	19	5	5	9	0,263	0,263	0,474	0,556	0,556	
crl119	0	33	10	9	13	0,303	0,273	0,394	0,692	0,769	193
	55	29	9	7	12	0,310	0,241	0,414	0,583	0,750	
	120	25	8	6	10	0,320	0,240	0,400	0,600	0,800	
crl120	0	32	10	-	13	0,313	-	0,406	-	0,769	193
	61	28	9	7	11	0,321	0,250	0,393	0,636	0,818	
	140	23	7	6	9	0,304	0,261	0,391	0,667	0,778	
	180	20	6	5	8	0,300	0,250	0,400	0,625	0,750	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl121	0	31	10	8	13	0,323	0,258	0,419	0,615	0,769	193
	70	26	8	7	11	0,308	0,269	0,423	0,636	0,727	
	150	21	6	5	10	0,286	0,238	0,476	0,500	0,600	
crl122	0	26	8	-	11	0,308	-	0,423	-	0,727	193
	80	22	6	6	9	0,273	0,273	0,409	0,667	0,667	
	138	19	5	5	8	0,263	0,263	0,421	0,625	0,625	
crl123	0	27	9	7	10	0,333	0,259	0,370	0,700	0,900	193
	61	23	7	6	10	0,304	0,261	0,435	0,600	0,700	
	140	19	6	5	8	0,316	0,263	0,421	0,625	0,750	
crl124	0	32	10	8	12	0,313	0,250	0,375	0,667	0,833	193
	64	28	8	7	12	0,286	0,250	0,429	0,583	0,667	
	140	23	6	6	10	0,261	0,261	0,435	0,600	0,600	
	190	21	5	5	9	0,238	0,238	0,429	0,556	0,556	
crl130	0	25	7	6	11	0,280	0,240	0,440	0,545	0,636	193
	83	21	6	5	9	0,286	0,238	0,429	0,556	0,667	
	170	16	4	4	7	0,250	0,250	0,438	0,571	0,571	
crl140c	0	21	6	-	9	0,286	-	0,429	-	0,667	193
	70	18	5	-	8	0,278	-	0,444	-	0,625	
	130	15	4	-	7	0,267	-	0,467	-	0,571	
crl141c	0	19	6	-	8	0,316	-	0,421	-	0,750	193
	120	15	4	-	5	0,267	-	0,333	-	0,800	
crl142	0	16	5	4	7	0,313	0,250	0,438	0,571	0,714	193
	70	13	4	4	6	0,308	0,308	0,462	0,667	0,667	
cru002b	0	29	9	-	11	0,310	-	0,379	-	0,818	195
	70	24	8	-	11	0,333	-	0,458	-	0,727	
	167	19	6	-	9	0,316	-	0,474	-	0,667	
cru007	0	33	10	c7	14	0,303	0,212	0,424	0,500	0,714	195
	90	27	8	6	11	0,296	0,222	0,407	0,545	0,727	
	192	21	5	5	9	0,238	0,238	0,429	0,556	0,556	
cru037b	0	35	12	8	13	0,343	0,229	0,371	0,615	0,923	193/195
	90	29	9	7	12	0,310	0,241	0,414	0,583	0,750	
	180	24	7	5	10	0,292	0,208	0,417	0,500	0,700	
cru056b	0	15	4	-	6	0,267	-	0,400	-	0,667	193/195
	120	11	3	c3	5	0,273	0,273	0,455	0,600	0,600	
cru058	0	34	11	7	13	0,324	0,206	0,382	0,538	0,846	193/195
	90	28	9	7	12	0,321	0,250	0,429	0,583	0,750	
	151	24	7	5	10	0,292	0,208	0,417	0,500	0,700	
	199	21	6	-	9	0,286	-	0,429	-	0,667	
cru059	0	34	11	-	13	0,324	-	0,382	-	0,846	193/195
	90	28	8	6	12	0,286	0,214	0,429	0,500	0,667	
	138	25	7	-	11	0,280	-	0,440	-	0,636	
	201	20	5	-	10	0,250	-	0,500	-	0,500	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
cru060	0	37	12	8	15	0,324	0,216	0,405	0,533	0,800	193/195
	90	31	9	7	13	0,290	0,226	0,419	0,538	0,692	
	160	26	7	7	11	0,269	0,269	0,423	0,636	0,636	
	210	22	6	6	10	0,273	0,273	0,455	0,600	0,600	
cru061	0	17	5	-	6	0,294	-	0,353	-	0,833	195
	40	16	5	4	6	0,313	0,250	0,375	0,667	0,833	
	135	12	4	3	5	0,333	0,250	0,417	0,600	0,800	

Table 3: measurements of *Streblites weinlandi* (OPPEL, 1863) [M].

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl036b	0	59	3	-	37	0,051	-	0,627	-	0,081	193
	20	55	3	-	33	0,055	-	0,600	-	0,091	
	90	44	2	-	27	0,045	-	0,614	-	0,074	
	131	39	2	-	23	0,051	-	0,590	-	0,087	
crl052b	***0***	53	3	-	32	0,057	-	0,604	-	0,094	193
	90	42	2	-	25	0,048	-	0,595	-	0,080	
	139	36	2	-	21	0,056	-	0,583	-	0,095	
crl055	0	70	5	14	39	0,071	0,200	0,557	0,359	0,128	193
	90	57	4	13	34	0,070	0,228	0,596	0,382	0,118	
	146	49	4	12	29	0,082	0,245	0,592	0,414	0,138	
	233	c39	3	11	23	0,077	0,282	0,590	0,478	0,130	
crl056	0	75	4	14	45	0,053	0,187	0,600	0,311	0,089	193
	60	65	4	13	40	0,062	0,200	0,615	0,325	0,100	
	124	53	3	11	32	0,057	0,208	0,604	0,344	0,094	
	164	c48	3	10	29	0,063	0,208	0,604	0,345	0,103	
crl060	0	69	4	12	42	0,058	0,174	0,609	0,286	0,095	193
	101	51	4	11	31	0,078	0,216	0,608	0,355	0,129	
	133	46	3	10	28	0,065	0,217	0,609	0,357	0,107	
crl061	***0***	60	4	11	35	0,067	0,183	0,583	0,314	0,114	193
	58	51	4	10	29	0,078	0,196	0,569	0,345	0,138	
	120	43	3	9	25	0,070	0,209	0,581	0,360	0,120	
crl062	0	46	3	-	28	0,065	-	0,609	-	0,107	193
	60	37	3	8	23	0,081	0,216	0,622	0,348	0,130	
	129	31	2	7	18	0,065	0,226	0,581	0,389	0,111	
crl063	0	51	4	11	31	0,078	0,216	0,608	0,355	0,129	193
	60	42	3	9	25	0,071	0,214	0,595	0,360	0,120	
	131	34	3	8	21	0,088	0,235	0,618	0,381	0,143	

No.	α	*D*	*U*	*W*	*H*	*U*/*D*	*W*/*D*	*H*/*D*	*W*/*H*	*U*/*H*	Bed n°
crl064	0	62	4	c12	37	0,065	0,194	0,597	0,324	0,108	193
	71	51	4	11	30	0,078	0,216	0,588	0,367	0,133	
	111	45	3	10	26	0,067	0,222	0,578	0,385	0,115	
crl065	0	55	4	13	33	0,073	0,236	0,600	0,394	0,121	193
	70	46	4	10	26	0,087	0,217	0,565	0,385	0,154	
	142	37	3	9	21	0,081	0,243	0,568	0,429	0,143	
crl066c	0	63	4	-	37	0,063	-	0,587	-	0,108	193
	76	50	4	-	30	0,080	-	0,600	-	0,133	
	150	41	3	-	24	0,073	-	0,585	-	0,125	
crl066d	0	85	5	-	51	0,059	-	0,600	-	0,098	193
	79	68	4	-	40	0,059	-	0,588	-	0,100	
	167	52	4	-	31	0,077	-	0,596	-	0,129	
crl067	0	59	4	-	36	0,068	-	0,610	-	0,111	193/195
	72	46	3	-	28	0,065	-	0,609	-	0,107	
	138	38	3	-	23	0,079	-	0,605	-	0,130	
crl068	0	72	5	-	42	0,069	-	0,583	-	0,119	193
	60	63	4	-	38	0,063	-	0,603	-	0,105	
	123	51	4	-	31	0,078	-	0,608	-	0,129	
	149	46	3	-	28	0,065	-	0,609	-	0,107	
crl069b	0	69	5	11	40	0,072	0,159	0,580	0,275	0,125	193
	64	58	4	-	34	0,069	-	0,586	-	0,118	
	135	47	4	-	27	0,085	-	0,574	-	0,148	
crl071	0	70	5	c12	41	0,071	0,171	0,586	0,293	0,122	193
	80	54	4	10	32	0,074	0,185	0,593	0,313	0,125	
	150	45	4	9	26	0,089	0,200	0,578	0,346	0,154	
crl072	0	53	4	10	32	0,075	0,189	0,604	0,313	0,125	193
	17	50	4	10	30	0,080	0,200	0,600	0,333	0,133	
	90	40	3	9	24	0,075	0,225	0,600	0,375	0,125	
	161	33	3	8	19	0,091	0,242	0,576	0,421	0,158	
crl073	0	50	4	11	30	0,080	0,220	0,600	0,367	0,133	193
	56	42	3	10	25	0,071	0,238	0,595	0,400	0,120	
	140	33	3	8	19	0,091	0,242	0,576	0,421	0,158	
crl074	0	46	4	-	27	0,087	-	0,587	-	0,148	193
	60	38	3	-	22	0,079	-	0,579	-	0,136	
	118	31	3	-	18	0,097	-	0,581	-	0,167	
crl076a	0	81	4	-	45	0,049	-	0,556	-	0,089	193
	85	69	3	-	41	0,043	-	0,594	-	0,073	
	155	56	3	-	34	0,054	-	0,607	-	0,088	
	239	c42	2	-	25	0,048	-	0,595	-	0,080	
crl077b	0	69	4	-	41	0,058	-	0,594	-	0,098	193
	96	51	4	-	31	0,078	-	0,608	-	0,129	
	140	45	3	-	28	0,067	-	0,622	-	0,107	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl079a	0	38	3	-	22	0,079	-	0,579	-	0,136	193
	72	31	3	-	18	0,097	-	0,581	-	0,167	
	147	25	2	-	15	0,080	-	0,600	-	0,133	
crl079b	***0***	c41	3	9	c24	0,073	0,220	0,585	0,375	0,125	193
	63	35	3	-	20	0,086	-	0,571	-	0,150	
	119	28	2	-	17	0,071	-	0,607	-	0,118	
crl081	0	59	4	11	35	0,068	0,186	0,593	0,314	0,114	193
	60	50	4	9	29	0,080	0,180	0,580	0,310	0,138	
	132	41	3	8	24	0,073	0,195	0,585	0,333	0,125	
crl091	0	38	3	8	23	0,079	0,211	0,605	0,348	0,130	193
	20	36	3	8	21	0,083	0,222	0,583	0,381	0,143	
	80	29	2	7	17	0,069	0,241	0,586	0,412	0,118	
	135	25	2	6	15	0,080	0,240	0,600	0,400	0,133	
crl117b	0	45	4	-	27	0,089	-	0,600	-	0,148	193
	60	38	3	-	22	0,079	-	0,579	-	0,136	
	120	31	3	-	19	0,097	-	0,613	-	0,158	
crl125	0	51	4	-	30	0,078	-	0,588	-	0,133	193
	48	44	3	-	26	0,068	-	0,591	-	0,115	
	102	38	3	-	23	0,079	-	0,605	-	0,130	
crl126	0	114	7	c21	61	0,061	0,184	0,535	0,344	0,115	193
	68	97	6	18	53	0,062	0,186	0,546	0,340	0,113	
	127	86	5	15	49	0,058	0,174	0,570	0,306	0,102	
	205	71	4	12	41	0,056	0,169	0,577	0,293	0,098	
crl127	0	39	3	8	23	0,077	0,205	0,590	0,348	0,130	193
	67	32	3	7	19	0,094	0,219	0,594	0,368	0,158	
	140	25	3	6	15	0,120	0,240	0,600	0,400	0,200	
	210	19	2	5	11	0,105	0,263	0,579	0,455	0,182	
crl128	0	34	3	7	19	0,088	0,206	0,559	0,368	0,158	193
	68	28	3	6	15	0,107	0,214	0,536	0,400	0,200	
	135	23	-	6	13	-	0,261	0,565	0,462	-	
crl129	0	33	3	6	19	0,091	0,182	0,576	0,316	0,158	193
	68	28	3	6	16	0,107	0,214	0,571	0,375	0,188	
	140	22	2	5	13	0,091	0,227	0,591	0,385	0,154	
crl138	0	56	4	12	34	0,071	0,214	0,607	0,353	0,118	193
	67	45	4	10	27	0,089	0,222	0,600	0,370	0,148	
	200	31	3	7	17	0,097	0,226	0,548	0,412	0,176	
crl139	0	27	c2	6	16	0,074	0,222	0,593	0,375	0,125	193
	49	23	c2	5	14	0,087	0,217	0,609	0,357	0,143	
	111	20	-	5	11	-	0,250	0,550	0,455	-	
crl141a	0	50	4	-	30	0,080	-	0,600	-	0,133	193
	90	39	3	9	23	0,077	0,231	0,590	0,391	0,130	
	180	30	2	7	18	0,067	0,233	0,600	0,389	0,111	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
cru017a	0	81	5	-	46	0,062	-	0,568	-	0,109	193
	90	68	4	c9	40	0,059	0,132	0,588	0,225	0,100	
	165	55	4	8	33	0,073	0,145	0,600	0,242	0,121	
	207	49	3	8	29	0,061	0,163	0,592	0,276	0,103	
cru017b	0	37	3	8	23	0,081	0,216	0,622	0,348	0,130	193
	62	31	3	7	18	0,097	0,226	0,581	0,389	0,167	
	140	25	2	6	14	0,080	0,240	0,560	0,429	0,143	
cru057c	0	20	2	-	11	0,100	-	0,550	-	0,182	195
	50	18	2	-	10	0,111	-	0,556	-	0,200	
	95	15	1	-	9	0,067	-	0,600	-	0,111	
cru062	0	112	7	-	60	0,063	-	0,536	-	0,117	193/195
	93	89	5	c14	51	0,056	0,157	0,573	0,275	0,098	
	170	77	4	c11	46	0,052	0,143	0,597	0,239	0,087	
	217	c67	4	-	40	0,060	-	0,597	-	0,100	
cru063	0	102	8	21	54	0,078	0,206	0,529	0,389	0,148	193/195
	90	84	6	-	47	0,071	-	0,560	-	0,128	
	169	70	4	-	41	0,057	-	0,586	-	0,098	
	190	67	4	-	39	0,060	-	0,582	-	0,103	
cru064	0	59	4	-	36	0,068	-	0,610	-	0,111	193/195
	77	47	3	10	28	0,064	0,213	0,596	0,357	0,107	
	120	c40	3	8	25	0,075	0,200	0,625	0,320	0,120	
cru065	0	80	6	-	44	0,075	-	0,550	-	0,136	193/195
	69	67	4	-	39	0,060	-	0,582	-	0,103	
	143	57	4	-	34	0,070	-	0,596	-	0,118	
	209	c46	-	-	28	-	-	0,609	-	-	
cru066	0	90	7	c13	49	0,078	0,144	0,544	0,265	0,143	193/195
	80	74	6	-	42	0,081	-	0,568	-	0,143	
	163	61	5	-	37	0,082	-	0,607	-	0,135	
	198	c54	5	-	32	0,093	-	0,593	-	0,156	
cru076b	0	44	2	-	26	0,045	-	0,591	-	0,077	193
	80	35	2	-	20	0,057	-	0,571	-	0,100	
	150	28	1	-	17	0,036	-	0,607	-	0,059	
cru077c	0	44	3	-	26	0,068	-	0,591	-	0,115	193
	60	37	3	-	21	0,081	-	0,568	-	0,143	
	130	30	2	-	17	0,067	-	0,567	-	0,118	
cru081	0	87	5	-	49	0,057	-	0,563	-	0,102	193
	80	72	4	-	43	0,056	-	0,597	-	0,093	
	158	57	4	-	34	0,070	-	0,596	-	0,118	

Table 4: measurements of *Streblites weinlandi* (OPPEL, 1863) [m].

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
crl090b	0	22	3	6	10	0,136	0,273	0,455	0,600	0,300	193
	60	20	3	5	10	0,150	0,250	0,500	0,500	0,300	
	120	18	2	-	10	0,111	-	0,556	-	0,200	
	200	15	2	-	8	0,133	-	0,533	-	0,250	
crl099	0	29	5	6	13	0,172	0,207	0,448	0,462	0,385	193
	68	23	4	6	11	0,174	0,261	0,478	0,545	0,364	
	130	22	4	5	12	0,182	0,227	0,545	0,417	0,333	
	160	20	-	5	12	-	0,250	0,600	0,417	-	
	200	18	-	4	10	-	0,222	0,556	0,400	-	
crl100	0	25	4	6	12	0,160	0,240	0,480	0,500	0,333	193
	80	22	3	5	12	0,136	0,227	0,545	0,417	0,250	
	120	20	2	4	11	0,100	0,200	0,550	0,364	0,182	
	140	19	2	4	10	0,105	0,211	0,526	0,400	0,200	
crl131	0	22	3	5	10	0,136	0,227	0,455	0,500	0,300	193
	60	20	3	5	9	0,150	0,250	0,450	0,556	0,333	
	126	19	-	4	11	-	0,211	0,579	0,364	-	
	180	15	-	3	9	-	0,200	0,600	0,333	-	
crl132	0	26	5	7	12	0,192	0,269	0,462	0,583	0,417	193
	54	23	4	5	11	0,174	0,217	0,478	0,455	0,364	
	114	21	3	5	12	0,143	0,238	0,571	0,417	0,250	
	160	17	2	4	10	0,118	0,235	0,588	0,400	0,200	
crl133	0	24	5	6	11	0,208	0,250	0,458	0,545	0,455	193
	45	21	3	6	11	0,143	0,286	0,524	0,545	0,273	
	100	20	3	5	11	0,150	0,250	0,550	0,455	0,273	
	132	19	-	4	11	-	0,211	0,579	0,364	-	
crl134	0	26	4	6	13	0,154	0,231	0,500	0,462	0,308	193
	70	22	3	5	12	0,136	0,227	0,545	0,417	0,250	
	145	19	2	5	11	0,105	0,263	0,579	0,455	0,182	
	190	16	2	4	9	0,125	0,250	0,563	0,444	0,222	
crl141b	0	21	4	-	10	0,190	-	0,476	-	0,400	193
	30	20	3	-	11	0,150	-	0,550	-	0,273	
	110	17	2	-	9	0,118	-	0,529	-	0,222	
cru004	0	27	5	6	13	0,185	0,222	0,481	0,462	0,385	195
	55	24	3	5	12	0,125	0,208	0,500	0,417	0,250	
	120	21	2	4	12	0,095	0,190	0,571	0,333	0,167	
	159	19	2	3	11	0,105	0,158	0,579	0,273	0,182	
cru005	0	23	3	-	11	0,130	-	0,478	-	0,273	195
	70	21	3	-	11	0,143	-	0,524	-	0,273	
	132	17	2	-	9	0,118	-	0,529	-	0,222	
	168	15	2	-	8	0,133	-	0,533	-	0,250	

No.	α	*D*	*U*	*W*	*H*	*U/D*	*W/D*	*H/D*	*W/H*	*U/H*	Bed n°
cru068	0	27	4	-	13	0,148	-	0,481	-	0,308	193/195
	70	23	3	-	11	0,130	-	0,478	-	0,273	
	150	20	2	-	12	0,100	-	0,600	-	0,167	
	180	18	2	-	10	0,111	-	0,556	-	0,200	
cru069	0	25	4	-	11	0,160	-	0,440	-	0,364	193/195
	90	20	3	-	10	0,150	-	0,500	-	0,300	
	163	18	2	-	10	0,111	-	0,556	-	0,200	
	180	16	2	-	9	0,125	-	0,563	-	0,222	
cru087	0	26	3	-	12	0,115	-	0,462	-	0,250	193
	100	21	2	-	12	0,095	-	0,571	-	0,167	
	150	18	-	-	11	-	-	0,611	-	-	
cru088b	0	24	3	5	12	0,125	0,208	0,500	0,417	0,250	193
	90	20	2	4	12	0,100	0,200	0,600	0,333	0,167	
	150	17	-	4	10	-	0,235	0,588	0,400	-	
	180	15	-	3	9	-	0,200	0,600	0,333	-	

Table 5: measurements of *Ochetoceras canaliferum* (OPPEL, 1863).

No.	α	*D*	*U*	*W*	*H*	*U/D*	*H/D*	*U/H*	*Npr/2*	*Nsr/2*	Bed n°
crl001	0	67	10	-	35	0,149	0,522	0,286	7	-	193
	90	54	8	-	29	0,148	0,537	0,276	5	-	
	180	42	5	-	22	0,119	0,524	0,227	2	-	
cru033	0	63	8	-	35	0,127	0,556	0,229	7	38	193 ?
	53	53	7	-	29	0,132	0,547	0,241	5	35	
	95	47	6	-	26	0,128	0,553	0,231	7	31	
cru089	0	50	7	-	28	0,140	0,560	0,250	-	30	193
	65	41	6	-	23	0,146	0,561	0,261	2	29	
	142	35	4	-	19	0,114	0,543	0,211	0	-	
	235	c28	3	-	14	0,107	0,500	0,214	0	-	