Palaeontological study of Middle Oxfordian-
Early Kimmeridgian (Late Jurassic) ammonites
from the Rosso Ammonitico of Monte Inici
(north-western Sicily, Italy)

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ABSTRACT
This paper deals with the palaeontological study of ammonites collected in strata of Middle Oxfordian-Lower Kimmeridgian pro parte Rosso Ammonitico of two sections of Monte Inici (western Sicily, Italy), namely Monte Inici East and Castello Inici. The complete faunal list of ammonites collected in the Middle Oxfordian-Lower Kimmeridgian fossiliferous beds of Monte Inici succession is here presented for the first time. Thirty-two species have been described in the palaeontological study. As a result, the formerly published biozonation of the two successions exposed at Monte Inici has been refined. The biostratigraphical dating of the onset in the middle Oxfordian of both the radiolarite sedimentation at Castello Inici and the nodular facies of the Rosso Ammonitico at Monte Inici East is not coeval, as tentatively suggested in previous papers. On the basis of the vertical distribution of the species of the genus Gregoryceras Spath, 1924 the onset of cherty limestones in section Castello Inici slightly predates the onset of Rosso Ammonitico nodular facies observed in section Monte Inici East.

KEY WORDS
Ammonites, Late Jurassic, Rosso Ammonitico, Tethys, Italy, Sicily; biostratigraphy.
INTRODUCTION

Since the famous Gemmellaro’s (1872-1882) monograph, the Middle and Late Jurassic ammonite species described from Rosso Ammonitico successions of western Sicily are considered “classical” of the Tethyan Mediterranean faunas. Further studies were carried out in this area by Warman & Arkell (1954), Christ (1960), Wendt (1963), De Wever et al. (1986), Fözy (1995) and Cecca & Pochettino (2000). The Rosso Ammonitico is the most common ammonite-rich facies in western Sicily. The abundance of fossils allows detailed biozonations in some stratigraphic intervals, although the recognition of detailed phylogenetic lineages and the precise setting of zonal boundaries are prevented by both time-averaging and discontinuous sedimentation (Marques et al. 1991; Olóriz et al. 1993, 1998).

The present work has been carried out in the framework of an extensive survey of Jurassic pelagic sediments of the western Trapanese palaeogeographic domain (Catalano & D’Argenio 1982 = Zone de Vicari of Mascle 1970) aimed at both the revision of the Gemmellaro Collection of Jurassic ammonites (Pavia & Cresta 2002) and the organisation of the Sixth International Congress on Jurassic System (Pavia 2004).

The aim of this paper is the palaeontological description of Late Jurassic ammonites collected in two sections of the Monte Inici area, namely Monte Inici East and Castello Inici (Fig. 1), whose stratigraphical and sedimentological data have already been published by Cecca et al. (2001) and Savary et al. (2003). Bed-by-bed sampling of ammonites was carried out for the first time in this area and it enabled us to identify several ammonite zones between the Middle Oxfordian Plicatilis Zone and the Upper Tithonian Transitorius Zone. The results of the present study lead to the improvement of previous zonations, although we should stress that the accuracy of the biostratigraphic interpretations depends on the quality of the fossil preservation, which is far from satisfactory in most cases. Short descriptions of both sections, with the complete bed-by-bed faunal lists, are reported.
below. The updated zonations are presented in Figures 2 and 3.

Palaeontological descriptions have been limited to ammonite taxa of the interval from the Middle Oxfordian Plicatilis Zone to the earliest Kimmeridgian Platynota Zone that have never been reported before from this area, and also to some Gemmellaro’s species whose precise stratigraphical position was unknown in Sicily. Younger Kimmeridgian species have not been treated here, as they are comparable with coeval ammonites described in recent monographs (Olóriz 1978; Checa 1985; Sarti 1993). The rare Tithonian forms are not described, as further sampling is needed.

In the following discussion we refer to the zonal scheme of Cariou et al. (1997) with more recent changes proposed by Bert (2004) for the Oxfordian, Olóriz (1978) for the Kimmeridgian and Geyssant (1997) for the Tithonian. As far as the lower boundary of the Kimmeridgian is concerned, we have provisionally maintained in this paper the base of the Platynota Zone as the base of the Mediterranean Kimmeridgian following the recommendations of the Working Group on the Oxfordian-Kimmeridgian Boundary of the International Subcommission on Jurassic Stratigraphy (Wierzowski 2001). Recent researches have demonstrated that this boundary does not correlate with the base of the Kimmeridgian as defined in the type areas of southern England (Schweigert & Callomon 1997; Maryja & Wierzbowski 1997; Wierzowski et al. 2006).

SECTION STUDIED

The outcrops of Monte Inici show the Mesozoic evolution of the Trapanese palaeogeographic domain. After the drowning of a peritidal Upper Triassic-Middle Liassic carbonate platform (Inici Formation), relatively condensed pelagic limestones (Rosso Ammonitico) were deposited on a pelagic plateau. Radiolarites and/or cherty limestones can be found between an underlying Lower Rosso Ammonitico and an overlying Upper Rosso Ammonitico.

The studied sections, Monte Inici East and Castello Inici, respectively located in the eastern and southern sectors of Monte Inici, materialise two distinct stratigraphic successions. The sedimentary succession of Monte Inici East is entirely represented by Rosso Ammonitico and it is devoided of radiolarites (Fig. 1). In the southern sector of Monte Inici cherty limestones are sandwiched by Rosso Ammonitico (Warman & Arkell 1954; Christ 1960; Wendt 1963; Savary 2000). Radiolarites have also been observed in the northern (Seno di Guidaloca [Fözy 1995]) and western (Balata di Baida [Warman & Arkell 1954; Christ 1960]) sectors around Monte Inici. In the section Castello Inici we have sampled the Lower Rosso Ammonitico and the overlying cherty limestones but the Upper Rosso Ammonitico does not crop out.

The Rosso Ammonitico of the Trapanese Zone forms part of the “calcareous Ammonitico Rosso” defined by Aubouin (1964) in the Mediterranean
area (Cecca et al. 1992, 2001). It is worth mentioning that three subfacies have been recognized in the Rosso Ammonitico of Monte Inici (Savary 2000; Cecca et al. 2001) on the basis of the relative abundance of three major sedimentological components such as early diagenetic nodules (sensu Clari et al. 1984), mineralised intraclasts and matrix: 1) a nodular subfacies (Clari et al. 1984) matrix-supported, with early diagenetic nodules but no mineralised intraclasts; 2) a pseudo-nodular subfacies (Martire 1996) relatively matrix-poor with early diagenetic nodules and mineralised intraclasts; and 3) an intraclastic nodular subfacies (Savary 2000) matrix-supported and containing both early diagenetic nodules and mineralised intraclasts. Evidence of hydrodynamic erosion, such as erosional surfaces, truncation and reworking of ammonite internal moulds, is recorded in both the intraclastic nodular and pseudo-nodular subfacies.

**SECTION MONTE INICI EAST**

Quarrying in the northern and western sides of a natural exposure obliged us to combine observations in a single, composite, stratigraphic log (Cecca et al. 2001). A few normal faults affect the outcrop, but do not preclude the establishment of the vertical succession. Above the Inici Formation, a 34 m thick Rosso Ammonitico succession crops out: it has been subdivided into 59 intervals. Our sampling has been stopped at interval 60 which marks the beginning of the Lattimusa Formation.

The base of this succession has not been accurately dated as no ammonites have been recovered from intervals 1 to 5. These form a small cliff, partly inaccessible, consisting of extremely hard light coloured non-nodular micritic limestones. However we assign the very base of the pelagic succession to the Lower Callovian on the basis of the data of Warman & Arkell (1954), Christ (1960) and Wendt (1963) from nearby outcrops, also confirmed by our personal observations in other outcrops of Monte Inici.

The list of the ammonites collected in Oxfordian to early Kimmeridgian fossiliferous beds is presented from bottom to top together with the number of recovered specimens. These are indicated in brackets after the name of the author of the species, which is indicated in the text only when it occurs for the first time. The vertical distribution of the identified taxa is represented in Figure 2. Note that the Transversarium Zone is here used following Bert (2004). As regards the complete distribution of Oxfordian to Berriasian ammonites in this section, we refer the reader to Cecca et al. (2001). The sedimentological and stratigraphical descriptions have already been presented in the latter paper and in Savary et al. (2003).

**Middle Oxfordian, Transversarium Zone**

Bed 6a: Sowerbyceras tortisulcatum (d’Orbigny, 1841) (4), Gregoryceras aff. devauxi Bert & Enay, 2004 (1).

**Middle Oxfordian, Transversarium Zone, Schilli Subzone**

Bed 6c: Sowerbyceras tortisulcatum (11), Holophylloceras sp. (2), Lytoceras sp. (1), Euaspidoceras cf. fontannesi (Gemmelaro, 1878) (1), Gregoryceras cf. devauxi (1), Passendorferia (P) sp. (1), Sequiroasia (S.) boconii (Gemmelaro, 1871) (1), Perisphinctes (Dichotomosphinctes) sp. (2).

Bed 6d: Euaspidoceras cf. oegir (Oppel, 1863) (1).

Bed 6e: Phylloceras sp. (2), Holophylloceras cf. polyolcum (Benecke, 1866) (1), Sowerbyceras tortisulcatum (8), Lytoceras cf. orsini Gemmelaro, 1872 (1), Lytoceras sp. (1), Euaspidoceras cf. fontannesi (1), E. cf. douvillei (Collot, 1917 in Dorn, 1931) (1), Euaspidoceras sp. (1), Perisphinctes (Dichotomosphinctes) sp. (2).

Bed 6f: Sowerbyceras tortisulcatum (1), Aspidoceras gr. binodum (Oppel, 1863) (1).

Bed 8a: Sowerbyceras sp. (9), Gregoryceras devauxi (2).

**Upper Oxfordian, Bimammatum Zone**

Bed 8b: Phylloceras sp. (1), Calliphylloceras benacense (Catullo, 1847) (1), Holophylloceras sp. (1), Sowerbyceras tortisulcatum (4), Sowerbyceras sp. (1), Streblites frotho (Oppel, 1863) (1).

**Upper Oxfordian, Bimammatum Zone, Hauffianum Subzone(?)**

Bed 6c: Calliphylloceras cf. benacense (1), Holophylloceras polyolcum (1), Tanamelliceras cf. hauffianum (Oppel, 1863) (1), Phystodoceras cf. wulf (Neumayr, 1873) (1).


**Upper Oxfordian, Planula Zone**


**Lower Kimmeridgian, Platynota Zone**


**Lower Kimmeridgian, Divisum Zone (Uhlandi Sub-Zone)**


**Biostratigraphic remarks**

The biostratigraphic assignments of Oxfordian layers to the subzones of the Middle Oxfordian Transversarum Zone and also to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone deserve to be commented. The distributions of the species of the genus *Gregoryceras* Spath, 1924 according to Bert (2004) have been taken into account for the biostratigraphic assignment to the Schilli Subzone of beds 6c to 8a, which contain specimens identified as *G. devauxii*. The uncertain identification of the specimen found in bed 6a with the latter species only allows the dating to the Transversarum Zone. The sedimentary change observed in layer 6 from non-nodular to nodular facies occurs therefore within the Transversarum Zone sensu Bert (2004). The Hauffianum Subzone is recognized with doubt due to the uncertain identification of the index species in bed 8c. The faunal content of bed 8d is consistent with the Hauffianum Subzone or even the Planula Zone. However, the specimen identified as *Orthosphinctes (O.) aff. fontannesi* could suggest
the occurrence of reworked ammonites in this bed because *O. fontannesi* sensu stricto is typical of the lower part of the Bimmammatum Zone (Oloriz et al. 1999; Caracuel et al. 2000). As stressed in the palaeontological description, our specimen belong to a different taxon that only bears some morphological similarities with *O. (O.) fontannesi*.

**SECTION CASTELLO INICI**

This section is located 3 km north-west of section Monte Inici East and exposed along the track of the southern slope of the mountain (Fig. 1). Savary et al. (2003) have discussed sedimentological and micropalaeontological characteristics of the succession. The contact between the Inici Formation and the Rosso Ammonitico is not well exposed and probably affected by faulting. However, Middle Callovian ammonites have been found at the top of bed 3, i.e. 1.60 m above the base of the pelagic succession. Bed 9 marks the end of the Rosso Ammonitico, which is overlain by layers 10 to 11d that correspond to cherty limestones. The total thickness of the cherty succession is unknown because the base is affected by faulting and the upper part is not exposed (Fig. 3). Noteworthy is the presence of ammonites (intervals 10 and 11a) that date the lower part of the cherty limestones to the Plicatilis Zone, Antecedens subzone.

The complete list of ammonites collected in each bed is presented from bottom to top together with the number of recovered specimens. Their vertical distribution is represented in Figure 3.

**Middle Callovian**

Bed 3 top: *Reineckeia* sp. (1), *Paroxycerites* sp. (1).

**Upper Callovian, Athleta Zone**


**Middle Oxfordian, Plicatilis Zone, Vertebrale and Antecedens subzones**

Bed 8 top: *Euaspidoceras paucituberculatum* (Arkell, 1927) (1).


**Middle Oxfordian, Plicatilis Zone, Antecedens Subzone**

Interval 10 (0.45 m from the base): *Sowerbyceras* sp. (1).

Interval 10 (0.80 m from the base): *Gregoryceras* (*G.*) *riasi* (de Grossouvre, 1917) (1).

**Middle Oxfordian, Plicatilis Zone, Parandieri Subzone**

Interval 11a: *Sowerbyceras* sp. (4 sp.), *Gregoryceras* (*G.*) *ferchaudi* Bert, 2004 (1), *Perisphinctes* sp. (1).

**Biostratigraphic remarks**

The fossiliferous layer recognized at the top surface of bed 9 likely marks condensation. In fact, on the basis of the biostratigraphic distributions defined by Bert (2004) for the species of the genus *Gregoryceras*, bed 9 contains ammonites of two distinct subzones of the Plicatilis Zone, namely the Vertebrale and the Antecedens subzones. The onset of cherty limestones in bed 10 occurs within the Antecedens Subzone.

On the basis of provisional ammonite identifications, and before the publication of Bert’s (2004) revision of the genus *Gregoryceras*, the onset of cherty limestones was tentatively suggested (Cecca et al. 2001; Savary et al. 2003) to be coeval of the abrupt sedimentary change observed in layer 6 of the Monte Inici East section from pelagic non-nodular limestones to the nodular facies. Therefore, the beginning of the silica-rich sedimentation observed in Castello Inici section slightly predates the onset of the nodular limestones in Monte Inici East section, which seems to occur within the Transversarium Zone sensu Bert (2004) on the basis of the occurrence of *Gregoryceras* aff. *devauxii*.

**SYSTEMATICS (BY FC)**

All the material studied is housed in the Museum “G. G. Gemmellaro” of the Palermo University (MGUP). The specimens studied have been numbered in three distinct series, indicated by letters corresponding, to the sections studied: series M14N (Monte Inici East, northern flank), series M14W
Late Jurassic ammonites from northwestern Sicily

Paroxycerites sp.
Orionoides cf. termieri
Euaspidoceras cf. paucituber culatum
Sowerbyceras cf. tortisulcatum
Euaspidoceras cf. douvillei
Euaspidoceras cf. lytoceroides?
Euaspidoceras sp.
Tornquistes cf. romani
Gregoryceras cf. defayi
Gregoryceras sp.
Perisphinctes (Dichotomosphinctes) gr. antecedens
Perisphinctes (Dichotomosphinctes) sp. indet.
Sowerbyceras sp.
Gregoryceras riazi
Gregoryceras ferchaudi
Perisphinctes sp.

Fig. 3. — Section Castello Inici: lithology and vertical distribution of the identified ammonite taxa.
(Monte Inici East, western flank) and MI3 (Castello Inici). The bed number is indicated after the letters that designate the sections and is followed by a slash; a progressive number refers to the specimens collected in each bed. For example, specimen MI4N 8d/2 designates the second specimen collected in bed 8d of the section logged in the northern flank of Monte Inici East. It is worth noting that the bed numbering mentioned in the section “Material examined” could not correspond to the final bed numbering indicated in the logs (Figs 2; 3) and in the section “Stratigraphic distribution”. As an example, specimen MI4n 8 “top”/12 has been collected in bed 8d of section Monte Inici East.

Measurement tables 1 to 25 are in the Appendix.

Order AMMONOIDEA Zittel, 1884
Suborder PHYLLOCERATINA Arkell, 1950
Superfamily PHYLLOCERATOIDEA Zittel, 1884
Family PHYLLOCERATIDAE Zittel, 1884
Subfamily CALLYPHILLOCERATINAE Spath, 1927

Genus Calliphylloceras Spath, 1927

**Type Species.** — *Phylloceras disputabile* Zittel, 1869.

**Calliphylloceras benacense** (Catullo, 1847) (Fig. 4A)

*Ammonites benacensis* Catullo, 1847: 9, pl. 13, fig. 1.

*Phylloceras benacense* — Neumayr 1871: 336, pl. 15, fig. 3. — Gemmellaro 1878: 165, pl. 1, fig. 1, pl. 3, fig. 1; 1882: 180, pl. 15, figs 1, 2, pl. 17, fig. 1.

**Calliphylloceras benacense** — Joly 1977: 192, pl. 10, fig. 1, pl. 44, fig. 1, synonymy list. — Cecca 2002: 44, fig. 13.

Material examined. — MI4N 8b/2, MI4W 8b/c/2 (C. cf. *benacense*).

Stratigraphic distribution. — Beds 8b and 8c of section Monte Inici East, which have been assigned to the Late Oxfordian Bimammatum Zone. The species is commonly reported from Oxfordian-Kimmeridgian strata.

Description

Inner mold of an involute shell with elliptical whorl section, rounded flanks and a relatively wide and strongly convex venter. The last whorl bears five to six furrows, which are shallow and rectiradiate in the upper half of the flank, gently prorsiradiate and deeper in the lower half of the flank. No test remains are preserved. The poor preservation of the suture lines does not allow the observation of their details. Measurements: see Table 1.

Discussion

The studied specimens are rather similar to those identified by Gemmellaro (1878, 1882) with *C. benacense*.

Genus *Sowerbyceras* Parona & Bonarelli, 1895

**Type Species.** — *Ammonites tortisulcatus* d’Orbigny, 1841.

**Sowerbyceras tortisulcatum** (d’Orbigny, 1841) (Fig. 4B)

*Ammonites tortisulcatus* d’Orbigny, 1841: 162, pl. 51, figs 4-6.

Non *Phylloceras tortisulcatum* — Gemmellaro 1871: 149, pl. 10, fig. 1; 1876: 49, pl. 10, fig. 1.

**Sowerbyceras tortisulcatum** — Joly 2000: 113, text-figs 236-242, pl. 28, figs 4-6, synonymy list.

Material examined. — MI4N 6c/1, MI4N 6e/4, MI4N 6e/5, MI4N 6e/6, MI4N 6e/7, MI4N 6f/1, MI4N 8a/1, MI4N 8a/3, MI4N 8a/1, MI4W 6e/2, MI4W 8a/1, MI4W 8c/2. Specimens determined (as *S. cf. tortisulcatum* due to insufficient preservation): MI3 9/6, MI4W 6e/3, MI4W 6e/4, MI4W 8c/1, MI4W 8d/2, MI4N 9/1, MI4W 9/1, MI4W 9top/1.

Stratigraphic distribution. — The different specimens collected come from beds ascribed to the Middle Oxfordian Plicatilis and Transversarium zones and the Late Oxfordian Bimammatum Zone.

Description

Phylloceratids with a relatively evolute coiling. The whorl section is rectangular with a large, slightly rounded venter and almost flat flanks, rounded ventrolateral margins and rounded umbilical edge. The inner molds collected in the studied sections show four to five deep furrows on the last whorl:
these are prorsiradiate, from the umbilical edge up to mid-flank or slightly below, and from mid-flank they abruptly take a rursiradiate direction. The furrows further change their direction around the ventrolateral margin; on the venter they show a clear adoral convexity. The adoral side of the furrow is steep and its edge is very sharp, thus forming ventral ridges. Measurements: see Table 2.

DISCUSSION
This is the most common species at Monte Inici. The preservation of the numerous collected specimens
is far from satisfactory but clearly allows the identification of the d’Orbigny’s species. We refer the reader to Sarti (1993) for the clear definition of the limits of *S. tortisulcatum* and the similar, younger, species *S. silenum* (Fontannes, 1876) and *S. loryi* (Munier Chalmas in Pillet & De Fromentel, 1875) (but see Joly 2000 for further information about the creation of the latter species) and also for the detailed information on their biostratigraphic distribution. Sarti (2002) has also shown that the specimens ascribed by Gemmellaro (1871, 1876) to *S. tortisulcatum* actually belong to *S. loryi*.

Genus *Holcophylloceras* Spath, 1927

**Type species.** — *Phylloceras mediterraneum* Neumayr, 1871.

*Holcophylloceras polyolcum* (Benecke, 1866) (Fig. 4C)

Ammonites polyolcus Benecke, 1866: 182, pl. 8, figs 1, 2.

*Phylloceras zignodianum* — Gemmellaro 1871: 251; 1876: 47, pl. 9, figs 1, 2 (non *Phylloceras zignodianum* d’Orbigny, 1847).

*Holcophylloceras polyolcum* — Joly 2000: 101, text-fig. 208, pl. 25, fig. 4, synonymy list. — Pavia 2002: 57, fig. 24c, 4.

**Material examined.** — MI4N 8d/1, MI4N 8c/2, MI4W 8b/c/1, MI4W 8top/1. Specimens determined as *H. cf. polyolcum* due to insufficient preservation: MI4N 6e/1, MI4N 8 “top”/4.

**Stratigraphic distribution.** — This species is rather common from bed 8c to 8d of section Monte Inici East, which have been assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone. The species probably appears in a layer because a specimen identified as *H. cf. polyolcum* has been found in bed 6e, which has been assigned to the Transversarium Zone. This species is commonly reported from Lower Kimmeridgian to Tithonian strata (Sarti 1993). The studied material suggests for this species an earlier appearance than previously thought.

**Description.** Compressed, involute shell with elliptical whorl section. The umbilicus of this species is relatively wide when compared with the general phylloceratid morphology. Seven to nine furrows per whorl spring from the inner (dorsal) part of the umbilical margin. These furrows are radiate or prorsiradiate in the lower half of the flank but in a point roughly located slightly above the mid flank, they become shallower and larger; in the upper third of the flank the furrows are deeply excavated and rursiradiate. A ridge is developed on the adoral edge from the upper fourth of the flank and on the venter, where the furrows are adically convex. No shell remains are preserved. Measurements: see Table 3.

**Discussion.** The first report of this species from beds older than the basal Kimmeridgian (Cecca *et al.* 2001) can cast doubts on the identification of the studied specimens. They have been assigned to *H. polyolcum* because of their more numerous furrows, with a less sharply falcoid aspect than *H. zignodianum* (d’Orbigny, 1848) and *H. mediterraneum* (Neumayr, 1871) (the latter can be considered a synonym of the former as summarised by Pavia 2002).

Suborder AMMONITINA Hyatt, 1889

Superfamily STEPHANOCERATOIDEA

Neumayr, 1875

Family PACHYGERATIDAE Buckman, 1918

Genus *Tornquistes* Lemoine, 1910

**Type species.** — *Macrocephalites helvetiae* Tornquist, 1894.

*Tornquistes* (*Tornquistes*) *cf. romani* (Douvillé, 1912) (Fig. 4D)

**Material examined.** — MI3 9/7.

**Stratigraphic distribution.** — Bed 9 of section Castello Inici, which has been assigned to the Middle Oxfordian Plicatilis Zone.

**Description.** Incomplete specimen corresponding to the body chamber of an individual that reached a diameter of about 60 mm. The shell is globular and rather
involute. The whorl section is ovate, with convex flanks converging towards the narrow venter. The umbilical edge is rounded and no umbilical wall is visible. Bundles of two strong, radiate ribs spring from radial umbilical bullae. Single ribs are intercalated between the bundles.

**DISCUSSION**

The poor preservation of our specimen prevents its precise identification. The morphologically closer species is *Tornquistes* (*T.* ) *romani*. It is impossible to state if the specimen studied corresponds to an adult or to an immature individual but its rib density and, apparently, its umbilical width can be compared to immature specimens of similar diameter described by Thierry & Charpy (1982). The preservation does not allow observing whether the umbilical wall is really not developed or if it is simply not observable. *Tornquistes* (*T.*) *multicostatum* Thierry & Charpy, 1982 and *T.* (*T.*) *helvetiae* (Tornquist, 1896) have more evolute shells.

### Superfamily HAPLOCERATOIDEA Zittel, 1884

**Family HAPLOCERATIDAE Zittel, 1884**

**Genus Lissoceras Bayle, 1879**

**Type species.** — *Ammonites psilodiscus* Schloenbach, 1879.

**Subgenus Lissoceratoides Spath, 1923**

**Type species.** — *Ammonites erato* d’Orbigny, 1850.

*Lissoceras* (*Lissoceratoides*) *cf. erato* (d’Orbigny, 1850)

**Material examined.** — MI4N 8 “top”/12.

**Stratigraphic distribution.** — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone.

**Description**

Smooth, evolute and compressed shell with a high, ovate whorl section. Flanks are slightly convex and converge towards a narrow, rounded venter. Due to the poor preservation both the umbilical edge and wall cannot be observed. Measurements: see Table 4.

**DISCUSSION**

The absence of sculpture and the structure of the shell correspond to haploceratid or lissoceratid characters. Both whorl section and shell dimensions of the studied specimen correspond to those of the species *L. (L.) erato*, but the preservation of the umbilical area does not allow a firm specific assignment.

**Family OPPELIIDAE Douvillé, 1890**

**Subfamily TARAMELLICERATINA Spath, 1928**

**Genus Tarameliceras Del Campana, 1904**

**Type species.** — *Ammonites trachinotus* Oppel, 1863.

*Tarameliceras* *cf. hauffianum*? (Oppel, 1863) (Fig. 5A, B)

**Material examined.** — MI4W 8b/c/3.

**Stratigraphic distribution.** — The specimen has been collected in bed 8c of section Monte Inici West. It must be stressed that the tentative identification of this specimen also makes tentative the assignment of this bed to the Hauffianum Subzone.

**Description**

The specimen is a fragment of an inner mold. It shows the venter and the upper third of the flank of a portion of the shell that corresponds to the last part of the phragmocone and the beginning of the body chamber. The venter is large and rounded; it gradually passes to the flanks due to the lack of clear ventrolateral shoulders. Rounded tubercles are visible at the transition between the venter and the flanks. One or two ribs spring from the tubercles; three to four simple ribs are intercalated between two tubercles.

**Subfamily STREBLITINAE Spath, 1925**

**Genus Streblites Hyatt, 1900**

**Type species.** — *Ammonites tenuilobatus* Oppel, 1862.
**Streblites frotho** (Oppel, 1863)  
(Fig. 4E)

*Ammonites tenuilobatus* Oppel, 1862: 160, pl. 50, fig. 1.

*Ammonites frotho* Oppel, 1863: 199.

non *Oppelia frotho* — Gemmellaro 1872: 39, pl. 6, fig. 6.

*Ammonites (Oppelia) frotho* — Favre 1877: 28, pl. 2, figs 7, 8.

*Oppelia frotho* — Fontannes 1879: 24, pl. 3, fig. 7.

*Oppelia frotho* var. *mediogranosa* Fontannes, 1879: 24, pl. 3, fig. 8.

*Streblites frotho* — Wegele 1929: 106, pl. 25, fig. 10. — Christ 1960: 88, pl. 5, fig. 5.

*Streblites* sp. gr. *frotho* — Olóriz 1978: 50.

Material examined. — MI4N 8b/1.

Occurrence. — The specimen has been collected in bed 8b of section Monte Inici East, which has been assigned to the Bimammatum Zone. The species is reported from the Bimammatum up to the Planula Zone (Olóriz 1978, 2002).

Description

Involute, compressed shell. The whorl section shows slightly convex sides up to mid-flank where they converge towards a fastigate ventral area whose margins correspond to sharp ventrolateral shoulders. The venter is partly preserved: it bears a high crenulated keel that is visible up to the first half of the body chamber. Due to poor preservation, the ornamentation is incompletely visible. Some small tubercles corresponding to the ventrolateral tips of secondary ribs are visible in the last portion of the phragmocone. In the body chamber, the lower side of the flank only shows weak traces of ribs that give rise to radial bullae at mid-flank. In the upper side of the flank, adorally concave ribs spring from bullae: between two of these concave ribs, finer secondary ribs of different length are visible. Some of the secondary ribs seem to spring from the lateral bullae. All ribs stop at the ventrolateral shoulders. Complex suture with E as long as half of L and S1 higher than the external saddle. Measurements: see Table 5.

Discussion

The ornamentation of the phragmocone of the specimen from Monte Inici is almost invisible, thus making the comparison with the specimens figured in the literature (which are mostly phragmocones or seem to correspond to phragmocones) difficult. Our specimen has the closest morphological similarities with the one figured by Wegele (1929), which shows a weak sculpture in the last third of the last whorl and a comparable ontogenetical evolution of the ornamentation. As already observed by Christ (1960) and Olóriz (1978), it is not always easy to distinguish *S. frotho* from congeneric species like *S. tenuilobatus* (Oppel, 1863) and *S. folgariacus* (Oppel, 1863). The weakness of the ornamentation of our specimen is not entirely due to preservation failure and reflects a morphological transition towards *S. tenuilobatus*, from which it differs by the lower number of primary ribs.

Superfamily **Perisphinctoidea**  
Steinmann, 1890

Family **Perisphinctidae** Steinmann, 1890

Subfamily **Perisphinctinae** Steinmann, 1890

Genus **Perisphinctes** Waagen, 1869

Type species. — *Ammonites variocostatus* Buckland, 1836.

Subgenus **Dichotomosphinctes** Buckman, 1926

Type species. — *Perisphinctes antecedens* Salfeld, 1914.

Perisphinctes (*Dichotomosphinctes*)  
gr. *antecedens* Salfeld, 1914  
(Fig. 5C)

Material examined. — MI3 9/3, MI3 9/10.

Stratigraphic distribution. — Bed 9 of section Castello Inici, which has been assigned to the Middle Oxfordian Plicatilis Zone.

Description

The two incomplete specimens correspond to evolute shells; the largest one probably reached the
Late Jurassic ammonites from northwestern Sicily

Fig. 5. — **A, B.** *Taramellliceras cf. hauffianum*? (Oppel, 1863), specimen MI4W 8b/c/3 from bed 8c of section Monte Inici East: **A**, lateral (slightly oblique) view; **B**, ventral view; **C.** *Perisphinctes (Dichotomosphinctes) gr. antecedens*? Salfeld, 1914, specimen MI3 9/10 from bed 9 of section Castello Inici; **D.** *Subdiscosphinctes* sp., specimen MI4N 9/4 from bed 9 of section Monte Inici East. All figures natural size. Arrows indicate the beginning of the body chamber.
Cecca F. & Savary B.

Diameter of 12 cm. The whorl section is rectangular to subtrapezoidal, characterized by a relatively large venter, flat to gently round flanks, a well-developed rounded umbilical margin and a flat to oblique umbilical wall. Ribs are strong and gently prospirradiate. The two fragments only show biplicate ribs whose point of branching is located on the upper fourth of the flank.

**Discussion**

The preservation of the studied specimens is too poor to allow a reliable identification. The ribbing and the general features of the shell suggest affinities with the group of *P. antecedens*. The specimens from Castello Inici bear a wider whorl section than the one developed by the type specimens studied by Arkell (1937) and by specimens from the Jura Mountains and from Beauvoisin (France), respectively described by Enay (1966) and Bourseau (1977). However, Enay (1966: 473) mentions that some specimens have flanks that converge towards the venter.

**Genus Subdiscosphinctes Malinowska, 1972**

**Type Species.** — *Perisphinctes kreutzi* Siemiradzki, 1891.

**Subdiscosphinctes** sp. (Fig. 5D)

**Material Examined.** — MI4N 9/4.

**Stratigraphical Distribution.** — The specimen has been collected in bed 9 of section Monte Inici East, which has been assigned to the Planula Zone. The specimens figured by Choffat (1893) were collected in layer 12 of Cabanas de Torres (Portugal), together with species of the genus *Subnebrodites*, which indicate the Planula Zone.

**Description**

Compressed, evolute shell. The whorl section is subtrapezoidal, with flat flanks converging towards a narrow, gently rounded (almost flat) venter. Due to insufficient preservation, both the umbilical edge and the umbilical wall are not clearly visible. The ornamentation consists of numerous fine, prospirradiate ribs. These spring from the umbilical edge and bifurcate at the upper third of the flank. Some ribs remain simple. Two ribs may be united on the umbilical edge to form rib bundles, which may be composed either by two bifurcate ribs or by a simple rib together with a bifurcate rib. According to Atrops (1982), these combinations are respectively called subpolyplocoid and incomplete subpolyplocoid ribs. At least in the first third of the body chamber a narrow smooth band interrupts ribs on the venter.

**Measurements:** see Table 6.

**Discussion**

This specimen shows some resemblances (coiling, whorl section) with some of the specimens figured by Choffat (1893). It has been provisionally identified in Cecca et al. (2001) as *Perisphinctes* sp. nov. aff. *dybowskii* Siemiradzki in Choffat (1893: pl. 10, fig. 1), from which our specimen differs because of its denser ribbing and the development of subpolyplocoid ribs. The latter are developed in *S. castroi* (Choffat, 1893) (see Choffat 1893: pl. 10, figs 5, 6), which is clearly more involute.

**Subfamily Passendorferiinae Meléndez, 1989**

**Genus Sequeirosia Meléndez, 1989**

**Type Species.** — *Passendorferi brochwiczi* Sequeiros, 1977.

**Sequeirosia bocconii** (Gemmellaro, 1871) (Fig. 6)

**Material Examined.** — MI4W 6c/3.

**Stratigraphical Distribution.** — The specimen has been collected in bed 6c of section Monte Inici East, which has been assigned to the Middle Oxfordian Transversarium Zone. D’Arpa & Meléndez (2002) assumed that the
vertical distribution of this species could correspond to an intermediate horizon between the Antecedens and Luciaeformis subzones, most probably the base of the Transversarium Zone. However, the precise stratigraphic position of Gemmellaro’s specimens remains unknown.

**Description**
Large evolute, serpenticone shell, which is represented by an incomplete whorl that seems to belong to the body chamber. The whorl section is subrectangular from a diameter of about 190 mm. The umbilical wall is not visible due to poor preservation; the venter and the umbilical margin are rounded, flanks are flat and almost parallel in the first half of the last whorl to become convergent towards its end. Primary ribs are strong, long, rounded, slightly prorsiradiate, irregularly spaced. The bifurcation of the ribs is not clearly visible because of the bad preservation. Ribs seemingly weakened on the venter and become more spaced towards the very last portion of the whorl. Measurements: see Table 7.

**Discussion**
The lack of inner whorls makes the identification of this single specimen quite difficult. However, the general characteristics of both the shell and its sculpture strongly suggest its identification with *S. bocconii*. Similar forms already assigned by Gemmellaro to *S. bocconii* (1877: pl. 4bis, fig. 15) have been excluded from this species by Cecca *et al.* (2001) and then by D’Arpa & Meléndez (2002) who assigned them to *Passendorferia* pl. sp. indet. Our specimen resembles more the one from Ciacati Roccapalumba selected by D’Arpa & Meléndez (2002) as the lectotype of the species than the specimen collected in the locality “Chiusa e Palazzo-Adriano” figured by Gemmellaro in 1874. However, it is more evolute than the lectotype. There are also morphological resemblances with the specimen that Meléndez (1989: pl. 16, fig. 1) has figured with the name *Sequeirosia* (*S.* n. sp. A.

Genus *Passendorferia* Brochwick-Lewinski, 1973


**Subgenus Enayites**
Brochwick-Lewinski & Rozak, 1976

**Type species.** — *Ammonites birmensdorfensis* Moesch, 1867.

*Passendorferia (Enayites) cf. rozaki*
Meléndez, 1989
(Fig. 7F)

**Material examined.** — MI4N 8c/1.

**Stratigraphic distribution.** — The specimen has been collected in bed 8d top of section Monte Inici East, which has been assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone. The species has been reported from older levels of the Bimammatum Zone, namely the Hypselum Subzone or the lower part of the Bimammatum Subzone (Atrops & Benest 1986; Meléndez 1989).

**Description**
Evolute shell with rounded, subcircular whorls. Up to the last quarter of the last whorl the whorl breadth is larger than the whorl height. The ventral area is large and rounded. The ribbing is dense, radiate to slightly prorsiradiate in the second half of the last whorl. Ribs generally bifurcate at the ventrolateral margin and at the upper quarter of the flank towards the mouth; simple ribs are rare. Up to a diameter of at least 53 mm secondary ribs are almost symmetrical with respect to the primary rib from which they spring but they are clearly projected forward in the last part of last whorl. Three oblique constrictions per whorl have been observed: one of them is adorally bounded by a swollen rib and is deeper than the others. The peristome is partly preserved: the venter shows a ridge whereas a broken lappet is visible on the flank after the final constriction. Measurements: see Table 8.

**Discussion**
The specimen from Monte Inici is rather similar to the holotype of the species but shows a higher number of primary ribs. Furthermore parabolic nodes have not been observed (because of insufficient preservation?). However, Atrops & Benest (1986) have figured two specimens of this species
Fig. 6. — *Sequeirosia bocconii* (Gemmellaro, 1871), specimen M4W 6c/3 from bed 6c of section Monte Inici East. Scale bar: 5 cm.
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Meléndez (1989) has created the species *P. (E.) rozaki* on the basis of a specimen that Brochwicz-Lewinski & Rozak (1976) originally included with doubts by in the species *P. (E.) gygii*. The latter is less evolute and more finely ribbed than *P. (E.) rozaki*. The separation between these two species may be questionable because of scarce morphological differences. *P. (E.) sanpedroi* Meléndez, 1989 has a rib density similar to that of the specimen here described but it is less evolute and its secondary ribs are not projected forward.

**Passendorferia (Enayites) aff. gygii**
Brochwicz-Lewinski & Rozak, 1976
(Fig. 7E)

**Material examined.** — M14N 8 “top”/6.

**Stratigraphical distribution.** — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone. *P. (E.) gygii* has been reported from older levels of the Bimammatum Zone, namely from the Hypselum Subzone or the lower part of the Bimammatum Subzone (Meléndez 1989).

**Description**
Evolute shell with subcircular whorls. The flanks are flat or gently rounded, the ventral area is large and rounded. No umbilical wall is developed. Dense, radial to gently prorsiradiate ribbing which is characterized by simple and biplicate ribs. The latter bifurcate at the ventrolateral margin. Two constrictions per whorl have been observed. No parabolic nodes have been observed. Due to the lack of any traces of suture line the diameter of the beginning of the body chamber cannot be observed. Measurements: see Table 9.

**Discussion**
The studied specimen shows some morphological affinities with *P. (E.) gygii*. However, the whorl shape, the fine, dense ribbing, the presence of parabolic nodes and also the prorsiradiate direction of the secondary ribs suggest keeping it distinct from *P. (E.) gygii* sensu stricto.

?"Passendorferia" aff. teresiformis
Brochwicz-Lewinski, 1973
(Fig. 8E)

**Material examined.** — M14N 8 “top”/5.

**Stratigraphical distribution.** — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone. *P. (P.) teresiformis* has been reported from older horizons, namely from the Bifurcatus Zone up to lower part of the Bimammatum Zone (Meléndez 1989).

**Description**
Evolute shell with subquadrate whorls that do not develop any umbilical wall. The last third of the last whorl, which belongs to the body chamber, shows a subrectangular whorl section with distinctly flat flanks and a rounded large venter. The ornamentation consists of prorsiradiate, sharp biplicate ribs, whose point of branching coincides with the ventrolateral margin. Rib interspaces are as broad as two ribs. The point of branching is elevated and thickened but no real tubercles are developed. Simple ribs are rare. Ribs cross the venter without interruption and develop a gentle adoral convexity. A relatively deep constriction per whorl is visible, though the incomplete preservation prevents the observation of the real number of constrictions. Measurements: see Table 10.

**Discussion**
The specimen described probably belongs to a new species and its generic position is also uncertain. It resembles to *Presimoceras teres* (Neumayr, 1873), which develops only rare biplicate ribs and bears a wider umbilicus, but our specimen is regarded here as a morphologically intermediate form between *Passendorferia* and *Trenerites* more than a form close to *Presimoceras* Sarti, 1990. It has been compared with *P. (P.) teresiformis* because of its flat-sided whorls and the sharp ribs that are raised at the ventro-lateral margin. However *P. (P.) teresiformis* sensu stricto is characterized by a wider umbilicus and less prorsiradiate ribbing. The genus *Trenerites* Sarti, 1993 includes species of the Platynota Zone (for example *T. evolutus* (Gemmellaro, 1876) and *T. nov. sp. indet.* or *T. enayi* Sarti [in Sarti 1993:...
Genus *Geyssantia* Meléndez, 1989


*Geyssantia geyssanti* Meléndez, 1989 (Fig. 7B)

*Geyssantia geyssanti* Meléndez, 1989: 203, pl. 19, figs 2-7, text-fig. 42.

**Material examined.** — MI4N 8-9/1.

**Stratigraphic distribution.** — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone. Meléndez (1989) reported this species from both the Bimammatum and the Hauffianum subzones.

**Description**

Small, compressed, evolute shell with subrectangular whorl section, rounded venter. Whorl flanks are almost flat in the last whorl and gently rounded in the internal ones. No umbilical wall is developed. Ribs are simple, sharp, distant and generally rectiradiate. There are three deep constrictions per whorl, which are adorally bounded by a prominent rib. Due to the lack of any traces of suture line the diameter of the beginning of the body chamber cannot be observed. Measurements: see Table 11.

**Discussion**

The specimen described is easily comparable with the type specimens. However, it has been impossible to confirm the presence of biplicate ribs as the last portion of the last whorl is eroded. This species is reported for the first time from Sicily.

**Genus Nebrodites** Burckhardt, 1910

*Type species.* — *Simoceras agrigentinum* Gemmellaro, 1872.

**Remarks**

Several authors (Brochwicz-Lewinski 1973; Meléndez 1989; Sarti 1990, 1993) have discussed the systematic position of this genus within the subfamily Idoceratinae Spath, 1924 and its relationships with the genus *Passendorferia*. Caracuel *et al.* (1999) have included *Nebrodites* within the subfamily Passendorferiinae instead of Idoceratinae. The appearance of the genus *Nebrodites* has long been dated to the Early Kimmeridgian Strombecki Zone (Olóriz 1978). Benzaggagh & Atrops (1997) and Caracuel *et al.* (1999) have recently figured earlier forms of the Platynota Zone. However, Schweigert & Callovon (1997) lowered to the Bimammatum Zone, Hauffianum Subzone, the age of the type level of the species *Nebrodites macerrimus* (Quenstedt, 1888). These authors (1997: 35) seem to question (because of the unusually early occurrence of a *Nebrodites*-like morphology?) the systematic position of the species *macerrimus* within *Nebrodites* because they used this generic name between inverted commas and consider it the microconch of the species *Presimoceras nodulatum* (Quenstedt, 1888). A *Nebrodites*-like morphology described below as *Nebrodites aff. contortus* (Neumayr, 1871) has been found at Monte Inici in a bed assigned with doubt to the Hauffianum Subzone. Careful investigations in the distal areas of the Mediterranean Tethys are needed to improve our knowledge of the phyletic relationships between the typical *Nebrodites* and the forms included in the subfamily Passendorferiinae, a point already stressed by Caracuel *et al.* (1999).
One can ask whether the subfamilies Passendorferiinae and Idoceratinae are actually two distinct taxa or just a single lineage. Finally, Villaseñor & Olóriz (2006) have demonstrated that the Mexican forms of *Idoceras* originally described by Burckhardt (1906) do belong to the family Ataxioceratidae, making the use of the subfamily Idoceratinae unnecessary.

*Nebrodites* aff. *contortus* (Neumayr, 1871)  
(Fig. 8A, B)

**Material examined.** — MI4N 8d/2.

**Stratigraphic distribution.** — The specimen has been collected in bed 8d top of section Monte Inici East, which has been assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone.

**Description**

Evolute, serpentine, shell. Only the last whorl is preserved. The whorl section is elliptical, with flat to slightly rounded flanks and rounded venter. The umbilical edge is rounded and no umbilical wall is developed. The ornamentation consists of numerous radial to slightly prorsiradiate single and biplicate ribs which branch in the upper third of the flank. The ribs are attenuated on the venter. Two deep and oblique constrictions are visible in the last whorl: they are adorally bounded by strong, swollen, ribs. A third, final constriction precedes the mouth, which is marked by an abrupt lateral expansion of the whorl that acquires a subcircular section. Measurements: see Table 12.

**Discussion**

This single specimen shows the typical characters of the genus *Nebrodites* (i.e. evolute coiling, biplicate ribs branching in the upper third of the flank, deep constrictions and attenuated ribbing on the venter), whose first appearance is generally recorded at the beginning of the Kimmeridgian. The morphological characters of this specimen are clear-cut and certainly do not allow its assignment to the genus *Passendorferia*, thus suggesting the appearance of the genus *Nebrodites* since the upper part of the Bimammatum Zone. This supports the recent reappraisal of the age of the type level of the species *Nebrodites macerrimus* by Schweigert & Callomon (1997).

Neumayr (1871: 369, pl. 21, fig. 1) described the species *Simoceras contortum*, which shows *Nebrodites* characters, from limestones of an unknown Oxfordian horizon. The specimen found at Monte Inici differs from this species because of its narrower whorls, the higher position of the point of bifurcation (upper third of the flank instead of mid flank) and, probably, the lower number of constrictions.

*Nebrodites* passendorferiiforme  
Caracuel, Olóriz & Rodriguez-Tovar, 1999  
(Fig. 8C)

*Nebrodites* (Nebrodites) *macerrimus* (Quenstedt, 1888) — Geyssant 1966: 108, pl. 1, fig. 6.

Non *Ammonites* *macerrimus* Quenstedt, 1888.


**Material examined.** — MI4W 10top/2.

**Stratigraphic distribution.** — Top of bed 10 of section Monte Inici East, which has been assigned to the Early Kimmeridgian Platynota Zone, associated with *Orthosphinctes* (Ardesica) *beticus* Caracuel, Olóriz & Rodriguez-Tovar, which has been reported from the middle part of the Platynota Zone whereas the type specimens of *N. passendorferiiforme* have been reported from the upper part of the Platynota Zone (Caracuel *et al.* 1999: fig. 2).

**Description**

Small, evolute shell with subcircular whorls. The ornamentation mostly consists of an alternation of simple and biplicate ribs. These are radial in the inner whorls, becoming slightly prorsiradiate in the last third of the last whorl. Bifurcate ribs branch at the upper third of the flank and are slightly projected forward. Ribs form an adoral convex trend on the venter. Two deep, oblique, constrictions and a weaker one occur on the last whorl. Due to the incomplete preservation, it is impossible to know whether other constrictions occurred or not. Measurements: see Table 13.
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Fig. 8. — Nebrodites aff. contortus (Neumayr, 1871), specimen MI4N 8d/2 of bed 8d top of section Monte Inici East; A, lateral view; B, ventral view; C, Nebrodites passendorferiiforme Caracuel, Olóriz & Rodríguez-Tovar, 1999, specimen MI4W 10top/2 from bed 10 of section Monte Inici East; D, Nebrodites cf. hospes (Neumayr, 1873), specimen MI4W 10top/3 from bed 10 of section Monte Inici East; E, ?"Passendorferia" aff. teresiformis Brochwicz-Lewinski, 1973, specimen MI4N 8 "top"/5 from bed 8d of section Monte Inici East. All figures natural size. Arrows indicate the beginning of the body chamber.
DISCUSSION
The described specimen bears a clear *macerrimus*-like aspect. It is almost identical to the specimen figured by Geyssant (1966: pl. 1, fig. 6). The latter has been implicitly considered different from *N. macerrimus* because Caracuel *et al.* (1999) acknowledged that it is possibly conspecific with *N. passendorferiiforme*, although they did not include it in the synonymy of the latter species. Due to Schweigert & Callomon's (1997) data about the Late Oxfordian age of the type level of *N. macerrimus*, a new appraisal of the Early Kimmeridgian specimens ascribed to this species is needed (Caracuel *et al.* 1999). The specimen from Monte Inici differs from the type specimens of *N. passendorferiiforme* for the less numerous constrictions (but note that the shell of our specimen is incompletely preserved).

*Nebrodites cf. hospes* (Neumayr, 1873)  
(Fig. 8D)

**Material examined.** — MI4W 10top/3, MI4W 10top/4.

**Stratigraphic distribution.** — Bed 10 of section Monte Inici East, which has been assigned to the Early Kimmeridgian Platynota Zone.

**Description**
Evolute shell. Only the lower third of the flank of the final part of the last whorl is preserved in specimen MI4W 10top/3 on which the description is based. The whorl section is subelliptical, with gently rounded flanks and venter. The ribbing is rectiradiate to slightly prorsiradiate with an almost regular alternance of simple and bifurcate ribs. These branch at the upper third of the flank and become slightly projected on the venter, where they stop along a smoothed band. The incomplete preservation prevents the observation of the real number of constrictions: three constrictions per whorl have been observed on the preserved portions. The body chamber is not preserved, except for the final part of the last whorl. A small fragment (MI4W 10 top/4) of the body chamber of an individual, which probably reached the diameter of 90 mm, shows the same ornamental characters. Sculpture did probably not undergo significant ontogenetic changes. Measurements: see Table 14.

DISCUSSION
The form described above bear morphologic affinities with the specimen figured by Benzaggagh & Atrops (1997: pl. 1, fig. 6) as *N. hospes sueti* Geyssant, 1966, which is a morphotype originally considered as a subspecies that groups evolute and densely ribbed specimens of *N. hospes*. Sarti (1993) has questioned the use of this subspecies which he includes within *N. hospes* sensu stricto. The preservation of our specimens is too incomplete to reach a reliable determination. Nevertheless, their finding in association with *Orthosphinctes (Ardescia) beticus* Caracuel, Olóriz & Rodríguez-Tovar, 1999 further confirms the occurrence of typical *Nebrodites* in the Platynota Zone.

**Family ASPIDOCERATIDAE** Zittel, 1895  
**Subfamily PELTOCERATINAE** Spath, 1924  
**Genus Gregoryceras** Spath, 1924

**Type species.** — *Ammonites transversarius* Quenstedt, 1847.

**Remarks**
The Sicilian specimens of the genus *Gregoryceras* originally described by Gemmellaro (1877) have been recently revised by D’Arpa & Meléndez (2002). These authors have proposed a *Gregoryceras*-based biostratigraphic scale on the basis of the Sicilian specimens and on the revision of the literature (D’Arpa & Meléndez 2004), focusing on the species *G. riazi* (de Grossouvre, 1917), *G. transversarium* (Quenstedt, 1847) and *G. fouquei* (Kilian, 1889). More recently, the systematics of the genus *Gregoryceras* has been almost entirely revised (with the exception of the *fouquei* group) by Bert (2004) on the basis of material collected in SE France. This author also proposes an accurate biostratigraphical correlation of the vertical succession of *Gregoryceras* species with the Submediterranean zonation. It is worth noting that Bert’s biostratigraphical conclusions are based on the co-occurrence of *Gregoryceras*
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representatives together with Submediterranean perisphinctids in SE France. This author distinguishes different chronospecies, corresponding to segments of a substantially anagenetic line within the genus *Gregoryceras*. The limits between these species are not easy to recognize and the stratophenetic succession proposed by Bert cannot be tested in the Mediterranean regions because a succession of species as complete as the one available in SE France has not been discovered yet.

The systematic and biostratigraphic conclusions of Bert (2004) are accepted in this paper and the proposed chronospecies succession from *G. iteni* Jeannet, 1951 up to *G. devauxi* is adopted. The conclusions of D’Arpa & Meléndez (2002, 2004) about the group of *G. fouquei* are also taken into account here.

*Gregoryceras cf. defayi*
Bert, Marchand, Gygi & Delanoy, 2003
(Fig. 9D)

**Material examined.** — MI3 9/8.

**Stratigraphic distribution.** — Bed 9 of section Castello Inici, which has been assigned to the Middle Oxfordian Plicatilis Zone. According to Bert (2004), the distribution of *G. defayi* is limited to the Middle Oxfordian Plicatilis Zone and in particular to the lower part of the Vertebräe Subzone.

**Description**
The fragment collected at Castello Inici shows a large, subcircular whorl section. The flanks are rounded; the umbilical wall is large and oblique, passing to a rounded umbilical margin. No traces of sculpture are visible up to 20 mm. The preserved fragment of the last whorl shows strongly rursiradiate ribs. No sculpture is visible on the umbilical wall of the last whorl.

**Discussion**
Despite the strongly incomplete preservation, this specimen can be compared with *G. defayi*. *G. tenuisculptum* Gygi, 1977 differs because of its shorter smooth initial stage. *Gregoryceras iteni* (Jeannet, 1951) bears ventrolateral thickenings which are not visible in our specimen.

*Gregoryceras riazi* (de Grossouvre, 1917)
(Fig. 9E)

*Peltoceras transversarium* – Gemmellaro 1877: 92, pl. 4bis, fig. 17 (non *Peltoceras transversarium* Quenstedt, 1847) [fig. 16 is a different species].

*Peltoceras riazi* de Grossouvre, 1917: 63, pl. 9, figs 10-12, pl. 10, figs 15, 16.

*Gregoryceras riazi* – Bert 2004: 57, 62, pl. 7, figs 1-5, pl. 8, figs 1-4, pl. 9, figs 1-4, text-fig. 10, synonymy list.

**Material examined.** — MI3 10/1.

**Stratigraphic distribution.** — Interval 10 of Castello Inici section. According to Bert (2004) *G. riazi* is limited to the Middle Oxfordian Plicatilis Zone, lower part of the Antecedens Subzone.

**Description**
Deformed specimen showing an evolute shell with subtrapezoidal whorl section. Large, slightly rounded umbilical wall, which is connected to the flank through a rounded umbilical margin. Flanks are almost flat in the last whorl; venter is almost flat. Sculpture is characterized by strong ribs, springing, simple or in pairs, from primary ribs that, at their turn, originate from umbilical tubercles or bullae. From the inner third of the flank, ribs are strongly rursiradiate. Rib branching is observed at the outer third of the flank. Ribbing is already developed from a diameter of 15 mm and probably (but preservation is insufficient) starts towards 12 mm. All ribs slightly thicken at the ventrolateral margin and then cross the venter without interruption. No traces of peristome are visible. Suture lines are not visible. Measurements: see Table 15.

**Discussion**
The preservation of this specimen is far from satisfactory but observable characters allow the assignment to *G. riazi*. The species *G. riaziiformis* Bert, 2004 differs from *G. riazi* on the basis of its larger adult size, the earlier development of the sculpture (10.5 instead of 12 mm), the less rursiradiate and flexuous ribbing, and finally its slightly younger age (upper part of the Antecedens Subzone). The distinction between *G. riazi* and *G. riaziiformis* is however very difficult.
**Gregoryceras ferchaudi** Bert, 2004  
(Fig. 9C)

*Gregoryceras ferchaudi* Bert, 2004: 72, 76, pl. 12, figs 2-4, pl. 13, figs 1-5, pl. 14, figs 1, 2, text-fig. 14, synonymy list.

**Material examined.** — MI3 11a/1.

**Stratigraphic distribution.** — Interval 11 of Castello Inici section. According to Bert (2004) *G. ferchaudi* is limited to the Middle Oxfordian Plicatilis Zone, Parandier Subzone.

**Description**

Evolute shell with subtrapezoidal whorl section, large and flat umbilical wall. Flanks are almost flat in the last whorl and slightly rounded in the internal whorls. Venter is slightly rounded. Sculpture is characterized by strong rursiradiate ribs, springing, simple or in pairs, from primary ribs which, at their turn, originate from umbilical tubercles or bullae. Ribs are already developed from a diameter of 7 mm. All ribs slightly thicken at the ventrolateral margin and then cross the venter without interruption. No traces of peristome are visible. Due to the lack of any traces of suture line the diameter of the beginning of the body chamber cannot be observed. Measurements: see Table 16.

**Discussion**

The studied specimen is poorly preserved thus making sculpture details not accurately visible. It shows however strong morphological similarities with one of the specimens figured by Gygi (1977: pl. 2, fig. 2) as “mittlerere Variante” of the species *G. riazi*.

**Gregoryceras devauxi** Bert & Enay, 2004  
(Figs 9A, B; 10)

*Gregoryceras devauxi* Bert, Marchand, Gygi, Delanoy, 2003: 9/8 from bed 9 of section Castello Inici. According to Bert (2004), the range of *G. devauxi* coincides with the range of the Schilli Subzone that is the second Subzone of the Middle Oxfordian Transversarium Zone.

**Description**

Evolute shell with a subtrapezoidal whorl section characterized by flat flanks and a relatively large, almost flat, venter. Strong sculpture made of rursiradiate ribs which spring, single or in pairs, from strong, prominent, umbilical tubercles and/or bullae. The latter clearly originate from the base of the umbilical wall. Ribs slightly thicken in the upper part of the flank giving rise to small, rounded ventrolateral tubercles. Simple ribs, which do not reach the umbilical margin, are intercalated between the ribs originating from the umbilical tubercles. No bifucations are observed. All ribs cross the venter without interruption forming a gentle adapical convexity, although in the last quarter of the last whorl they tend to become straight. It is impossible to know whether the studied specimens bear the body chamber or not, as no sutures are visible.

The three specimens found at Monte Inici are not morphologically identical. Specimen MI4N 8a/2 shows umbilical bullae (or thickened primary ribs), whereas MI4N 8a/3 has a steep umbilical wall, a more spaced ribbing and thicker bullae that mimic prominent tubercles.

A fragment of a larger individual (specimen MI4W 6c/2 determined as *G. cf. devauxi*) is still septated at a
Cecca F. & Savary B.

diameter of about 100-110 mm. Ribs have lost their adapical convexity but are still gently rursiradiate and form a ventrolateral tubercle (Fig. 10).

Measurements: see Table 17.

**Discus**
The described specimens correspond to three morphologies that can be ascribed to *G. devauxi*. Specimen MI4N 8a/2 (Fig. 9A) recalls, at similar diameters, some specimens already figured in the literature:

– the specimen figured by Bert (2004: pl. 22, fig. 4), which differs in the presence of bifurcate ribs from the umbilical margin;

– the specimen figured by Gygi (1990: fig. 7) with the name *G. fouquei*;

– the specimen figured by Gemmellaro (1874: pl. 1, fig. 1) with the name *G. fouquei* (identification confirmed by D’Arpa & Meléndez 2002), although at the same diameter (i.e. up to the first third of the last whorl) our specimen is more evolute.

At a comparable diameter, specimen MI4N 8a/3 (Fig. 9B), which is characterized by definitely rursiradiate ribs, strongly resembles the one figured by Bert (2004) in pl. 21, fig. 2. It also shows some morphological similarities with other specimens figured by Bert (2004: pl. 20, fig. 1; pl. 22, fig. 1) and also to the inner whorls of the holotype (Bert 2004: pl. 17, fig. 1c) but it differs because of its wider umbilicus.

Specimen MI4W 6c/2 (Fig. 10) resembles the specimen figured by Bert (2004) in pl. 17, fig. 1. It also may recall forms ascribed to *G. fouquei* or *G. aff. fouquei* (see D’Arpa & Meléndez 2004). However, no splitting of the ventrolateral tubercle occurs and its ribs are gently rursiradiate.

The differences between *G. devauxi* and the forms ascribed to both *G. aff. fouquei* and *G. fouquei* have been described by Bert (2004), to whose paper we refer the reader.

**Gregoryceras aff. devauxi** Bert & Enay, 2004 (Fig. 9F)

**Material examined.** — MI4W 6a/1.

**Stratigraphic distribution.** — The specimen has been collected in bed 6a of section Monte Inici East. According to Bert (2004) *G. transversarium* is limited to the base of the middle Oxfordian Transversarium Zone, Luciaeformis Subzone whilst *G. devauxi* has a vertical range coinciding with that of the Schilli Subzone. The specimen described can be assigned to the middle or upper part of the Transversarium Zone.

**Description**
Evolute shell with a subtrapezoidal whorl section. Flanks are gently rounded in the first half of the last whorl and then almost flat in the second half; they converge towards a relatively narrow, gently rounded venter. The umbilical edge is rounded; the umbilical wall is oblique and well developed in the last whorl. The sculpture is not visible up to a diameter of almost 34 mm. Rursiradiate ribs spring, single or in pairs, from rounded umbilical bullae. In the last quarter of the last whorl ribs spring from strong, elevated umbilical bullae and tend to become rectiradiate. Due to the poor preservation of the umbilical wall it seems that ribs originate from the umbilical margin, except the four last preserved bullae that start from the upper part of the umbilical wall. No rib branching above the inner third of the flank is observed in the last two thirds of the last whorl (the first third is insufficiently preserved). Ribs thicken on the ventrolateral margin where they tend to form extremely weak tubercles. Ribs cross the venter strengthened and without interruption; they are here gently convex adapically, although in the last quarter of the last whorl they tend to become almost straight. As weak traces of sutures are visible up to a diameter of almost 45 mm only, it is impossible to know whether this specimen bears the body chamber or not. Measurements: see Table 18.

**Discussion**
The ribbing of *G. (G.) transversarium* is strongly rursiradiate and often shows biplicate ribs in the outer third of the flank. The ribbing of the specimen described recalls *G. (G.) fouquei*, which differs because of its less evolute coiling and its vertical umbilical wall. *Gregoryceras devauxi*, the species that follows *G. transversarium* in the anagenetic succession of chronospecies proposed by Bert (2004), differs because of its clearly developed tubercles on the ventrolateral margin. The described specimen likely corresponds to an immature individual of...
Fig. 10. — Entirely septated specimen identified as *Gregoryceras* cf. *devauxi* Bert & Enay, 2004, specimen M14W 6c/2 from bed 6c of section Monte Inici East: **A, B**, lateral views; **C**, ventral view. All figures natural size.
G. devauxi as suggested by the comparison, at the same diameter, with some of the specimens figured by Bert (2004: pl. 19, figs 1, 2).

Subfamily *Euaspidoceratinae* Spath, 1931

Genus *Euaspidoceras* Spath, 1931

**Type species.** — *Ammonites perarmatus* J. Sowerby, 1822.

*Euaspidoceras cf. lytoceroide?*  
(Gemmellaro, 1876)  
(Fig. 7D)

**Material examined.** — MI3 9/9.

**Stratigraphic distribution.** — Bed 9 of section Castello Inici, which has been assigned to the Middle Oxfordian Plicatilis Zone.

**Description.**
The specimen is an eroded internal mold of an aspidoceratid whose size is approximately 85 mm. The inner whorls are dissolved but traces of ventrolateral tubercles are visible from a diameter of 7 mm. Eight tubercles per whorl exist at a diameter of approximately 21 mm. No traces of umbilical tubercles and ribs are visible. The preserved portion of the last whorl shows traces of ventrolateral tubercles and corroded folds that likely are rib remains. Because any traces of suture lines are visible it is impossible to state whether this specimen bears the body chamber or not.

Due to the incomplete preservation, measurements cannot be taken.

**Discussion.**
The preservation of the specimen is extremely poor but the tubercles of the inner whorls and the coiling aspect suggest a tentative comparison with *E. lytoceroide*.

*Euaspidoceras cf. oegir* (Oppel, 1863)  
(Fig. 7C)

**Material examined.** — MI4N 6d/1.

*Euaspidoceras paucituberculatum* (Arkell, 1927)  
(Fig. 11)

**Aspidoceras paucituberculatum** Arkell, 1927: pl. 2, fig. 2.  
*Aspidoceras (Euaspidoceras) paucituberculatum* – Arkell 1940: 210, pl. 45, figs 2-5, pl. 46, figs 1-4, pl. 47, figs 1, 2, text-fig. 74, synonymy list.  
*Euaspidoceras paucituberculatum* – Bonnot & Gygi 2001: 431, pl. 1, fig. 4.
Fig. 11. — *Euaspiloceras paucituberculatum* (Arkell, 1927), specimen MI3 8 top-9/1 from the boundary between beds 8 and 9 of Castello Inici section. The two asterisks indicate two laevaptychi. The arrow indicates the beginning of the body chamber. Scale bar: 5 cm.
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Material examined. — MI3 8 top-9/1.

Stratigraphic distribution. — The specimen has been collected at the boundary between beds 8 and 9 of Castello Inici section and possibly it belongs to the very base of bed 9. This species is reported from the Middle Oxfordian Plicatilis Zone.

Description
Incomplete specimen of a large individual characterized by an evolute shell whose diameter could have reached almost 210 mm. The visible inner whorls are preserved as a cast while the last whorl is an inner mould. Up to a diameter of almost 22 mm the sole sculptural elements preserved are external tubercles (these corresponded to spines almost perpendicular to the flank as demonstrated by their impression on the sediment) located on the ventrolateral edge. An umbilical row of tubercles is visible at 30 mm but probably appears around 22-24 mm. The two rows of tubercles correspond to extremities of shallow ribs. The interspaces between two ribs bear fine, radial growth-lines. Between 80 and 115 mm the sculptural characteristics are poorly visible, with the exception of growth-lines that appear to be rursi-radiate on the wide, oblique, umbilical wall. The second half of the last whorl belongs to the body chamber and is characterized by spaced ribs that bear umbilical and ventrolateral tubercles.

Discussion
The preservation of the studied specimen does not allow a firm identification. The succession of ornamental stages is similar to the one described by Arkell (1940: 212, 213) but in our specimen the onset of the two rows of tubercles is recorded at lower diameters. Two laevaptychi are visible at the end of the last whorl but it is difficult to state whether they belonged to this individual or not.

Euaspidoceras cf. radisense (d’Orbigny, 1850)  
(Fig. 12C)

Material examined. — MI4N 8 “top”/8.

Subfamily Aspidoceratinæ Zittel, 1895
Genus Aspidoceras Zittel, 1868
Type species. — Ammonites rogoznicensis Zeuschner, 1846.

?Aspidoceras gr. binodum (Oppel, 1863)  
(Fig. 7A)

Material examined. — MI4N 6F/2.

Stratigraphic distribution. — The specimen has been collected in bed 6f of section Monte Inici, which is assigned to the upper part of the Transversarium Zone, Schilli Subzone, because of the occurrence of G. devauxi in beds 6c and 8a. This specimen could therefore represent the oldest record of the genus Aspidoceras. Olóriz et al. (1999: 91) stress the FAD of Aspidoceras gr. binodum at the bottom of the Bimammatum Zone or even in the Hypselum Subzone. In the Subbetic Zone the genus of the late Oxfordian Bimammatum Zone. The holotype of E. radisense comes from of the Bimammatum Zone, probably the lower part (Hantzpergue 1994).

Description
Evolute shell of about 92 mm of diameter. The whorl section is subrectangular, with flat flanks, rounded ventrolateral margins and a large, rounded venter. The umbilical area is badly preserved, but the umbilical margin appears to be rounded and the umbilical wall is seemingly vertical. Small, rounded tubercles are developed on the umbilical margin of the last whorl. Shallow ribs are visible in the last portion of the last whorl. Due to the lack of any traces of suture line the diameter of the beginning of the body chamber cannot be observed. Measurements: see Table 20.

Discussion
Despite its insufficient preservation this specimen shows the characteristics of d’Orbigny’s species. Clambites clambus (Oppel, 1863) shows morphological similarities, namely the shape of the whorl section and the presence of shallow ribs. However, it differs because umbilical tubercles are almost absent.

Subfamily Aspidoceratinæ Zittel, 1895
Genus Aspidoceras Zittel, 1868
Type species. — Ammonites rogoznicensis Zeuschner, 1846.
Aspidoceras appears in the upper part of the Bifurcatus Zone with A. sesquinodosum (Fontannes, 1876) whilst A. binodum appears at the base of the Bimammatum Zone (Olóriz et al. 1998). New findings of better-preserved specimens are needed to confirm this early occurrence of Aspidoceras.

Description
Fragment of the internal mold of an individual that reached a diameter of at least 100 mm. The whorl section is depressed, with rounded venter and flanks. A row of tubercles is developed right below the lower half of the flank. A periumbilical row of tubercles is also developed but poorly visible due to insufficient preservation of the umbilical edge. No sutures are visible.

Discussion
The aspect of the whorl section associated to the rows of tubercles strongly recall A. binodum. Nevertheless, the identification of our specimen is purely tentative because of its incomplete preservation.

Subfamily Physodoceratinae
Schindewolf, 1925

Genus Physodoceras Hyatt, 1900

Type species. — Ammonites circumspinosus Quenstedt, 1849.

Physodoceras cf. wolfi (Neumayr, 1873) (Fig. 12A)

Material examined. — MI4N 8c/3.

Stratigraphic distribution. — The specimen has been collected in bed 8c of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone.

Description
Moderately evolute shell, with a deep umbilicus and a large whorl section. Whorl flanks are almost flat and converge towards a rounded, large venter. The umbilical wall is steep and the umbilical margin is rounded. Due to crushing, the whorl section is not correctly observable in the body chamber. The ornamentation is made of small, rounded, periumbilical tubercles. The suture line is characterized by L as deep as E and S₁ slightly higher than S₂. Measurements: see Table 21.

Discussion
The preservation does not allow a firm identification of this specimen. A similar species is P. insulanum (Gemmellaro, 1874), which has been considered synonym of P. wolfi by Checa (1985). In the recent revision of the Gemmellaro species, D’Arpa & Meléndez (2002) keep the latter distinct from P. wolfi because of the wider whorl-breadth and the stronger tubercles. The characters visible in the phragmocone of our specimen suggest the comparison with P. wolfi.

Genus Benetticeras Checa, 1985

Type species. — Benetticeras benettii Checa, 1985.

Benetticeras cf. benettii Checa, 1985 (Fig. 12B)

Material examined. — MI4W 8c top/1.

Stratigraphic distribution. — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the Late Oxfordian Bimammatum Zone.

Description
Moderately involute shell. Depressed whorl section with convex flanks, large and rounded venter. The umbilical edge is rounded and the umbilical wall is almost vertical. Periumbilical tubercles are large and tend to widen on the flank. The suture line is characterized by L as deep as E and S₁ almost as high as S₂. Measurements: see Table 22.

Discussion
The preservation of this specimen does not allow a more accurate determination. Nevertheless coiling, whorl and tubercle shapes are typical of B. bennettii. The species B. vaill Sarti, 1993 is more evolute.
Family *Ataxioceratidae* Buckman, 1921
Subfamily *Ataxioceratinae* Buckman, 1921
Genus *Orthosphinctes* Schindewolf, 1925

Subgenus *Orthosphinctes* Schindewolf, 1925

Type species. — *Ammonites tiziani* Oppel, 1863.

*Orthosphinctes* (*O.*) *tiziani* (Oppel, 1863) (Fig. 13A)

*Ammonites tiziani* Oppel, 1863: 246.

*Perisphinctes* tiziani – Cheffat 1893: 32, pl. 5, fig. 8.

*Perisphinctes* tiziani var. *occidentalis* Cheffat, 1893: 32, pl. 5, figs 5-7.

*?Perisphinctes* aff. *tiziani* – Cheffat 1893: 33, pl. 7, fig. 1.

*Pars Perisphinctes* tiziani – Wegele 1929: 44, pl. 1, fig. 4a, b, non 5.

*?Perisphinctes* (*Orthosphinctes*) *tiziani* – Geyer 1961: 19, pl. 1, fig. 1, pl. 2, fig. 1, pl. 6, fig. 3.

*Orthosphinctes* (*Orthosphinctes*) *tiziani* – Matyja & Wienerzbowski 1997: pl. 6, fig. 1.

Material examined. — MI4N 8 “top”/11.

Stratigraphic distribution. — The specimen has been collected in bed 8d of section Monte Inici East, assigned with doubt to the Hauffianum Subzone of the late Oxfordian Bimammatum Zone. *O.* (*O.*) *tiziani* has been reported from older layers, namely from the lower part of the Bimammatum Zone by Olóriz *et al.* (1998, 1999) and Caracuel *et al.* (2000).

Description

Evolute shell with an ovate, compressed whorl section. The umbilical wall is low, the umbilical edge is rounded and whorl flanks converge towards the venter. The ornamentation is poorly visible in the details and it mainly consists of bipplicate and intercalatory ribs; simple ribs rarely occur. In the last quarter of the last whorl two constrictions are visible: the adapical one is deep and oblique to the ribbing, the second is shallow and almost parallel to ribbing. The mouth is not preserved and no traces of suture line are visible. It is therefore impossible to recognize whether the specimen is entirely septated or not. Measurements: see Table 24.

Fig. 12. — A, *Physodoceras* cf. *wolff* (Neumayr, 1873), specimen MI4N 8c/3 from bed 8c of section Monte Inici East; B, *Benetticeras* cf. *benetti* Checa, 1985, specimen MI4W 8c top/1 from bed 8d of section Monte Inici East; C, *Euaspidoceras* cf. *radisense* (d’Orbigny, 1850), specimen MI4N 8 “top”/8, from bed 8top of section Monte Inici East. All figures natural size. Arrows indicate the beginning of the body chamber.
DISCUSSION
The identification of this specimen is difficult because of its insufficient preservation. It is impossible to state whether it is a microconch or an immature macroconch because any traces of the suture line are visible. From a pure morphologic point of view it shows some morphological similarities with O. (O.) fontanensis (Choffat 1893: 40, specimens figured in pl. 9, figs 1 and 3 only). However, with respect to our specimen, this species shows finer ribs, a wider umbilicus and a different position of the constrictions in the last whorl. At a comparable diameter O. (O.) mogosensis (Choffat 1893: 50, pl. 12, figs 5-8) has a narrower umbilicus and a slightly narrower ventral area.

Subgenus Ardescia Atrops, 1982

Type species. — Ataxioceras desmoides Wegele, 1929.

Orthosphinctes (Ardescia) beticus
Caracuel, Olóriz & Rodriguez-Tovar, 1999
(Fig. 13C)


Material examined. — M14N top10/1.

Stratigraphic distribution. — Top of bed 10 of section Monte Inici East, Platynota Zone. It has been reported from the middle part of the Platynota Zone (Caracuel et al. 1999: fig. 2).

Description
Evolute, planulate shell. Subelliptical whorl section with slightly rounded flanks that converge towards a rounded venter. The umbilical wall is well developed and the umbilical margin is rounded. The ornamentation is characterized by prorsiradiate ribs, which branch at the outer third of the flank. An intercalatory rib is observed between two bifurcates. At least three constrictions are visible on the last whorl; the deepest one, which is located close to the end of the last whorl, shows a slight adoral convexity. No traces of peristome and sutures are preserved. Measurements: see Table 25.

DISCUSSION
The poor preservation of this specimen does not allow the detailed study of the ornamental characters. It shows strong morphological similarities in both the ornamentation and the shell structure with the specimen studied by Caracuel et al. (1999: figs 3, 4), named O. (Ardescia) beticus. Species of the subgenus Ardescia described by Atrops (1982) from South-East France show different rib characters.

Acknowledgements
We would like to thank Didier Bert (Saint-André-les-Alpes), Alain Bonnot (Dijon) et Raymond Enay (Lyon) for their suggestions about the systematics of some of the ammonites studied in this paper. Criticism and suggestions by Pascal Neige (Dijon) and Philippe Courville (Lille), who acted as referees, improved the manuscript. Claude Abrial and Philippe Loubry (both of CNRS UMR 5143) helped us with photographic work and graphic assistance.

REFERENCES
Fig. 13. — A, Orthosphinctes (Orthosphinctes) tiziani (Oppel, 1863), specimen MI4N 8 “top”/11 from bed 8d of section Monte Inici East; B, Orthosphinctes (Orthosphinctes) aff. fontannesi (Choffat, 1893), specimen MI4N 8 “top”/3, from bed 8d of section Monte Inici East; C, Orthosphinctes (Ardescia) betica Caracuel, Olóriz & Rodríguez-Tovar, 1999, specimen MI4N top10/1 from bed 10 of section Monte Inici East. All figures natural size. Arrows indicate the beginning of the body chamber.
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APPENDIX

Standard dimensions for normally coiled ammonites are given in millimetres and as percentages of the diameter. Abbreviations: \(D\), maximum diameter; \(N/2\), number of primary ribs per half-whorl; \(S/2\), number of secondary ribs per half-whorl; \(Ph\), diameter of the end of the phragmocone ("n" means that the specimen is entirely septate); \(Uw\), umbilical width; \(Wb\), whorl-breadth; \(Wh\), whorl height; \(Wb/Wh\), degree of compression of the whorl.

Table 1. — Measurements of Calliphylloceras benacense (Catullo, 1847).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>(D)</th>
<th>(Wh)</th>
<th>(Wb)</th>
<th>(Uw)</th>
<th>(Wb/Wh)</th>
<th>(Ph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8b/2</td>
<td>(\approx 45)</td>
<td>-</td>
<td>14 (0.33)</td>
<td>2 (0.048)</td>
<td>0.57</td>
<td>37</td>
</tr>
<tr>
<td>at 42</td>
<td>24.5 (0.58)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI4W 8b/c/2</td>
<td>58</td>
<td>35.0 (0.60)</td>
<td>-</td>
<td>2 (0.030)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. — Measurements of Sowerbyceras tortisulcatum (d’Orbigny, 1841).

<table>
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<tr>
<th>Specimen</th>
<th>(D)</th>
<th>(Wh)</th>
<th>(Wb)</th>
<th>(Uw)</th>
<th>(Wb/Wh)</th>
<th>(Ph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 6e/5</td>
<td>90</td>
<td>(\approx 42) (0.47)</td>
<td>-</td>
<td>(\approx 18) (0.20)</td>
<td>-</td>
<td>(\approx 55)</td>
</tr>
<tr>
<td>at 68</td>
<td>32 (0.47)</td>
<td></td>
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<td>MI4N 6f/1</td>
<td>(\approx 73)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(\approx 53)</td>
</tr>
<tr>
<td>at 69</td>
<td>(\approx 33) (0.48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>MI4N 6c/1</td>
<td>55</td>
<td>27 (0.49)</td>
<td>-</td>
<td>(\approx 11) (0.20)</td>
<td>-</td>
<td>(\approx 38)</td>
</tr>
<tr>
<td>at 45</td>
<td>(\approx 23) (0.51)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MI4N 8a/1</td>
<td>(\approx 66)</td>
<td>(\approx 33) (0.50)</td>
<td>-</td>
<td>(\approx 13) (0.20)</td>
<td>-</td>
<td>(\approx 42)</td>
</tr>
<tr>
<td>MI4N 8b/3</td>
<td>67</td>
<td>33 (0.49)</td>
<td>-</td>
<td>14 (0.21)</td>
<td>-</td>
<td>(\approx 43)</td>
</tr>
<tr>
<td>at 51</td>
<td>(\approx 25.5) (0.50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI4N 6e/6</td>
<td>59</td>
<td>(\approx 30) (0.51)</td>
<td>-</td>
<td>(\approx 13) (0.22)</td>
<td>-</td>
<td>(\approx 38)</td>
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</table>

Table 3. — Measurements of Holcophylloceras polyolcum (Benecke, 1866).

<table>
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<tr>
<th>Specimen</th>
<th>(D)</th>
<th>(Wh)</th>
<th>(Wb)</th>
<th>(Uw)</th>
<th>(Wb/Wh)</th>
<th>(Ph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8d/1</td>
<td>(\approx 85.5)</td>
<td>46 (0.54)</td>
<td>-</td>
<td>14 (0.16)</td>
<td>-</td>
<td>59</td>
</tr>
<tr>
<td>at 66</td>
<td>33 (0.50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI4N 8c/2</td>
<td>(\approx 97.0)</td>
<td>-</td>
<td>19 (0.29)</td>
<td>12 (0.18)</td>
<td>0.63</td>
<td>-</td>
</tr>
<tr>
<td>at 90</td>
<td>47.5 (0.53)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI4W 8b/c/1</td>
<td>71</td>
<td>(\approx 35) (0.49)</td>
<td>(\approx 20) (0.28)</td>
<td>13 (0.18)</td>
<td>0.57</td>
<td>(\approx 46)</td>
</tr>
<tr>
<td>at 48</td>
<td>24.5 (0.51)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. — Measurements of Lissoceratoides erato (d’Orbigny, 1850).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>(D)</th>
<th>(Wh)</th>
<th>(Wb)</th>
<th>(Uw)</th>
<th>(Wb/Wh)</th>
<th>(Ph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8b/1</td>
<td>(\approx 70)</td>
<td>31 (0.44)</td>
<td>(\approx 17) (0.24)</td>
<td>19 (0.27)</td>
<td>(\approx 0.55)</td>
<td>(\approx 55)</td>
</tr>
</tbody>
</table>

Table 5. — Measurements of Streblites frotho (Oppel, 1863).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>(D)</th>
<th>(Wh)</th>
<th>(Wb)</th>
<th>(Uw)</th>
<th>(Wb/Wh)</th>
<th>(Ph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8b/1</td>
<td>(\approx 95)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(\approx 55)</td>
</tr>
<tr>
<td>at 93</td>
<td>45 (0.48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 74</td>
<td>40 (0.54)</td>
<td>7.0 (0.075)</td>
<td>2.5 (0.034)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 6. — Measurements of Subdiscosphinctes sp.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 9/4</td>
<td>≈ 95</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>≈ 57</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at 82</td>
<td>27.5 (0.335)</td>
<td>33.5 (0.41)</td>
<td>-</td>
<td>≈ 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>at 76</td>
<td>25.0 (0.330)</td>
<td>18.5 (0.24)</td>
<td>29.5 (0.39)</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. — Measurements of Sequeirosia bocconii (Gemmellaro, 1871).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4W 6c/3</td>
<td>≈ 258.5</td>
<td>≈ 65.6 (0.25)</td>
<td>≈ 45 (0.17)</td>
<td>≈ 156.4 (0.605)</td>
<td>≈ 0.69</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 8. — Measurements of Passendorferia (Enayites) cf. rozaki Meléndez, 1989.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8c/1</td>
<td>79</td>
<td>20 (0.25)</td>
<td>20 (0.25)</td>
<td>43 (0.54)</td>
<td>≈ 1.000</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>at 60</td>
<td>16 (0.27)</td>
<td>18 (0.30)</td>
<td>32 (0.53)</td>
<td>≈ 1.125</td>
<td>28</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/6</td>
<td>60</td>
<td>16.0 (0.27)</td>
<td>-</td>
<td>30 (0.50)</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>at 48.5</td>
<td>14.5 (0.30)</td>
<td>-</td>
<td>24 (0.49)</td>
<td>-</td>
<td>≈ 27</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/5</td>
<td>≈ 87</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>≈ 65</td>
</tr>
<tr>
<td></td>
<td>at 78</td>
<td>23 (0.29)</td>
<td>≈ 20 (0.26)</td>
<td>41 (0.525)</td>
<td>0.87</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8-9/1</td>
<td>≈ 39</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>at 32</td>
<td>13.5 (0.42)</td>
<td>≈ 7 (0.22)</td>
<td>18 (0.56)</td>
<td>≈ 0.52</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 12. — Measurements of Nebrodites aff. contortus (Neumayr, 1871).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8d/2</td>
<td>84</td>
<td>18.5 (0.22)</td>
<td>≈ 15 (0.18)</td>
<td>51 (0.60)</td>
<td>0.81</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>at 68</td>
<td>16.0 (0.23)</td>
<td>≈ 13 (0.19)</td>
<td>39 (0.57)</td>
<td>0.81</td>
<td>35</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4W 10top/2</td>
<td>32.5</td>
<td>7 (0.21)</td>
<td>≈ 7 (0.21)</td>
<td>16 (0.49)</td>
<td>≈ 1</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>
### Table 14. — Measurements of *Nebrodites cf. hospes* (Neumayr, 1873).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4W 10top/3</td>
<td>≈ 85</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>≈ 70</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at 59</td>
<td>14.5 (0.245)</td>
<td>≈ 13 (0.22)</td>
<td>≈ 32 (0.54)</td>
<td>≈ 0.90</td>
<td>≈ 27</td>
<td></td>
</tr>
</tbody>
</table>

### Table 15. — Measurements of *Gregoryceras riazi* (de Grossouvre, 1917). All measures have been taken between the ribs.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI3 10/1</td>
<td>85</td>
<td>29 (0.34)</td>
<td>≈ 24.5 (0.29)</td>
<td>38 (0.45)</td>
<td>0.84</td>
<td>≈ 55</td>
<td></td>
</tr>
</tbody>
</table>

### Table 16. — Measurements of *Gregoryceras ferchaudi* Bert, 2004. All measures have been taken between the ribs.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 3 11a/1</td>
<td>67</td>
<td>23.5 (0.35)</td>
<td>≈ 23 (0.34)</td>
<td>30.5 (0.45)</td>
<td>≈ (0.98)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 17. — Measurements of *Gregoryceras devauxi* Bert & Enay, 2004. All measures have been taken between the ribs.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8a/2</td>
<td>≈ 72</td>
<td>25.5 (0.35)</td>
<td>-</td>
<td>≈ 31 (0.43)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>MI4N 8a/3</td>
<td>≈ 73</td>
<td>≈ 24.0 (0.33)</td>
<td>-</td>
<td>31 (0.42)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

### Table 18. — Measurements of *Gregoryceras aff. devauxi* Bert & Enay, 2004. All measures have been taken between the ribs.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4W 6a/1</td>
<td>71</td>
<td>23.5 (0.33)</td>
<td>-</td>
<td>31.5 (0.440)</td>
<td>-</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>at 53</td>
<td>19.0 (0.36)</td>
<td>≈ 18 (0.34)</td>
<td>22.0 (0.415)</td>
<td>≈ 0.95</td>
<td></td>
</tr>
</tbody>
</table>

### Table 19. — Measurements of *Euaspidoceras cf. oegir* (Oppel, 1863).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/8</td>
<td>≈ 59</td>
<td>≈ 18 (0.305)</td>
<td>-</td>
<td>28 (0.47)</td>
<td>-</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>at 50</td>
<td>16 (0.320)</td>
<td>-</td>
<td>23 (0.46)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 20. — Measurements of *Euaspidoceras cf. radisense* (d’Orbigny, 1850).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/8</td>
<td>at ≈ 84</td>
<td>33 (0.390)</td>
<td>≈ 29 (0.345)</td>
<td>-</td>
<td>≈ (0.88)</td>
</tr>
<tr>
<td></td>
<td>at 74</td>
<td>30 (0.405)</td>
<td>25.0 (0.34)</td>
<td>19.5 (0.31)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 21. — Measurements of *Physodoceras cf. wolfi* (Neumayr, 1873).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8c/3</td>
<td>≈ 119</td>
<td>≈ 56 (0.47)</td>
<td>-</td>
<td>30.0 (0.25)</td>
<td>-</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>at 84</td>
<td>42 (0.50)</td>
<td>39.5 (0.47)</td>
<td>18.5 (0.22)</td>
<td>0.94</td>
<td></td>
</tr>
</tbody>
</table>
### Table 22. — Measurements of *Benetticeras* cf. *benettii* Checa, 1985.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/9</td>
<td>79</td>
<td>41 (0.52)</td>
<td>-</td>
<td>17 (0.215)</td>
<td>-</td>
<td>n</td>
</tr>
</tbody>
</table>

### Table 23. — Measurements of *Orthosphinctes* (*O.*) *tiziani* (Oppel, 1863).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
<th>S/2</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/11</td>
<td>96</td>
<td>27 (0.28)</td>
<td>-</td>
<td>57 (0.59)</td>
<td>-</td>
<td>20</td>
<td>50</td>
<td>? 59</td>
</tr>
<tr>
<td>at 77</td>
<td>23 (0.30)</td>
<td>21.5 (0.28)</td>
<td>40 (0.52)</td>
<td>0.93</td>
<td>25</td>
<td>52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 24. — Measurements of *Orthosphinctes* (*O.*) aff. *fontannesi* (Choffat, 1893).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
<th>Wb/Wh</th>
<th>N/2</th>
<th>S/2</th>
<th>Ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 “top”/3</td>
<td>≈ 100</td>
<td>≈ 33.0 (0.33)</td>
<td>-</td>
<td>44 (0.44)</td>
<td>-</td>
<td>23</td>
<td>≈ 60</td>
<td></td>
</tr>
<tr>
<td>at ≈ 78</td>
<td>23.5 (0.30)</td>
<td>19 (0.24)</td>
<td>≈ 36 (0.46)</td>
<td>0.81</td>
<td>≈ 26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 25. — Measurements of *Orthosphinctes* (*Ardescia*) *beticus* Caracuel, Olóriz & Rodriguez-Tovar, 1999.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>Wh</th>
<th>Wb</th>
<th>Uw</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI4N 8 top10/1</td>
<td>65</td>
<td>20.5 (0.31)</td>
<td>-</td>
<td>29 (0.45)</td>
</tr>
<tr>
<td>at 54</td>
<td>18.5 (0.34)</td>
<td>-</td>
<td>22 (0.41)</td>
<td></td>
</tr>
</tbody>
</table>