

## Late Valanginian ammonites from Monte Catria (Umbria-Marche Apennines, Italy)

### *Ammoniti del Valanginiano superiore del Monte Catria (Appennino Umbro-Marchigiano, Italia)*

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IGCP Projects  
343: Stratigraphic Correlations Basins of Peritethyan  
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**ABSTRACT** - Late Valanginian ammonite species from Umbria-Marche Apennines have been discovered in the Maiolica formation at three outcrops on the group of mountains called Monte Catria: the Monte Alto outcrop and two outcrops already mentioned as "Corno di Catria and Monte Catria" in a previous work. Due to poor exposure the Monte Alto outcrop cannot be logged. However, *Valanginites bachelardi*, *Olcostephanus* gr. *nicklesi* and a rich lycoceratid fauna were found. Neocomitinae are extremely rare. On the southern slope of Monte Acuto, along the road from the top of Monte Catria s. str. to the village of Chiaserna a Late Valanginian fauna of the *S. verrucosum* and *N. pachydricranus* zones was discovered: *Oosterella* sp. aff. *stevenini*, *O. garciae*, *Olcostephanus* aff. *detonii* and *Neocomites* (*N.*) sp. gr. *neocomiensis sensu* COMPANY, 1987 have been identified. NW of Corno di Catria an Upper Valanginian section crops out and provides a rich ammonite fauna of the *S. verrucosum* zone characterized by *Saynoceras contestanum*, *S. verrucosum*, *Paquiericeras* (*Julianites*) *undulatum*, *P. (J.) mourrei*, *Olcostephanus astieri sensu* COMPANY, 1987, *O. guebhardi* mor. *querolensis* and *Haploceras* (*Neolissoceras*) *extracornutum* sp. n. Some metres above, *Oosterella* gr. *cultrata* indicates the *N. pachydricranus* zone.

**KEY WORDS:** Ammonites, Lower Cretaceous, Valanginian, Biostratigraphy, Palaeontology, Umbria - Marche Apennines.

**RIASSUNTO** - Nel presente lavoro sono descritte ammoniti del Valanginiano superiore dell'area umbro-marchigiana, raccolte nella Maiolica affiorante in tre località del gruppo montuoso del Catria: gli affioramenti di Monte Alto più quelli già menzionati in un precedente lavoro come "affioramento di Corno di Catria" e "affioramento di Monte Catria". A causa dell'intensa copertura non è stato possibile rilevare la sezione stratigrafica di Monte Alto, dove sono stati rinvenuti *Valanginites bachelardi*, *Olcostephanus* gr. *nicklesi* ed una ricca fauna a lycoceratidi. Le Neocomitinae sono estremamente rare. Nel versante meridionale di Monte Acuto è stata riconosciuta una fauna delle zone a *S. verrucosum* e a *N. pachydricranus*: *Oosterella* sp. aff. *stevenini*, *O. garciae*, *Olcostephanus* aff. *detonii* and *Neocomites* (*N.*) sp. gr. *neocomiensis sensu* COMPANY, 1987. A NW di Corno di Catria è stata campionata una sezione caratterizzata da una ricca fauna della zona a *S. verrucosum* composta da: *Saynoceras contestanum*, *S. verrucosum*, *Paquiericeras* (*Julianites*) *undulatum*, *P. (J.) mourrei*, *Olcostephanus astieri sensu* COMPANY, 1987, *O. guebhardi* mor. *querolensis* e *Haploceras* (*Neolissoceras*) *extracornutum* sp. n. Nella stessa sezione la zona a *N. pachydricranus* è indicata da *Oosterella* gr. *cultrata*.

**PAROLE CHIAVE:** Ammoniti, Cretaceo inferiore, Valanginiano, Biostratigrafia, Paleontologia, Appennino umbro-marchigiano.

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## 1. - INTRODUCTION

In the Umbria-Marche Apennines the Upper Tithonian-Early Aptian interval is represented by the Maiolica formation. This consists of white, micritic limestones with cherts and represents a very widespread facies in the Tethyan Domain (FOURCADE *et alii*, 1991). Apart a Barremian pulchellid cited by ZITTEL (1869) and a Hauterivian *Pseudothurmannia* figured by RAMACCIONI (1939), only the occurrence of aptychi was cited in the literature on the Umbria-Marche Apennines. Valanginian ammonites from the Maiolica outcropping in this region were figured for the first time by CECCA (1985). Recently, numerous Upper Hauterivian - Barremian ammonite levels have been discovered (CECCA *et alii*, 1994a, b; CECCA & PALLINI, in press) and also the occurrence of bivalves and gastropods is now demonstrated (CECCA & PALLINI, in press).

However, except the uppermost Hauterivian Faraoni Level (CECCA *et alii*, 1994a), ammonites remain very rare in this facies and furthermore their preservation is very bad. In fact they occur as crushed internal moulds and very often these are merely fragments unidentifiable at the specific level.

New localities and faunas of Valanginian age have been discovered during recent research in Umbria-Marche. The aim of this paper is to illustrate the most important elements of these new faunas.

The ammonites have been collected at three localities (Fig. 1):

- 1) M. Alto, near Monte Tenetra;
- 2) the road from Monte Catria to Chiaserna on the southern slope of Monte Acuto;
- 3) the outcrop in the locality named "la Valle" close to Fosso del Fibbio at a height of 1050 metres, NW of Corno di Catria.

Localities 2 and 3 were cited by CECCA (1985) and the results of new research are presented here.

The zonal scheme used in this work is that defined by the Lower Cretaceous Cephalopod Team (HOEDE-MAEKER & COMPANY, 1993).

## 2. - THE SECTIONS STUDIED

### 2.1. - M. ALTO, NEAR MONTE TENETRA

The Maiolica Formation crops out along the road from Acquaviva to Monte Catria. The outcrops are mainly Barremian in age (CECCA *et alii*, this volume). Because of the dip of the beds from the top of Monte Tenetra, where a Barremian section has been studied by CECCA & PALLINI (in press), to Monte Alto Hauterivian to Valanginian levels crop out. The succession is not completely visible because of the vegetation; furthermore the erosion of the Maiolica limestone produces an abundant detritus of calcareous fragments which almost cover the outcrops. Hence, only some small portions of the succession can be logged.

Along the road, below the top of Monte Alto, a rich Valanginian ammonite fauna has been found. Its interest is only palaeontological because the detritus cover and the presence of minor faults prevent the complete logging of the succession and thus a biostratigraphic study. The fauna has been collected in a 1 m thick level. Lytoceratids are the most abundant ammonites. Among the remainder, it is particularly interesting to cite, for the first time from this region, *Valanginites bachelardi* (SAYN) (pl. 1, fig. 5). The vertical range of this species spans the uppermost *B. campylotoxus* zone (BULOT *et alii*, 1993) to the basal *N. pachydicranus* zone (COMPANY, 1987), although its acme is recorded at the base of the *S. verrucosum* zone - the *verrucosum* biohorizon (BULOT *et alii*, 1993). An interesting microconch of the genus *Olcostephanus* has been found in the same level. It is characterized by a wide umbilicus and shows affinities with the group of *O. nicklesi* WIEDMANN & DIENI/*O. sanctifirminensis* THIEULOUY (pl. 1, fig. 7). This group characterizes a biohorizon at the base of the *N. pachydicranus* zone, i. e. the *nicklesi* biohorizon (BULOT *et alii*, 1993). A second *Olcostephanus*, possibly another microconch, is figured in pl. 1, fig. 25. This specimen can be identified as *O. astieri* (D'ORBIGNY) *sensu* COMPANY, 1987, which is limited to the *S. verrucosum* zone (COMPANY, 1987). This author also stressed that the distinction between the microconchs of this species and the microconchs of *O.*

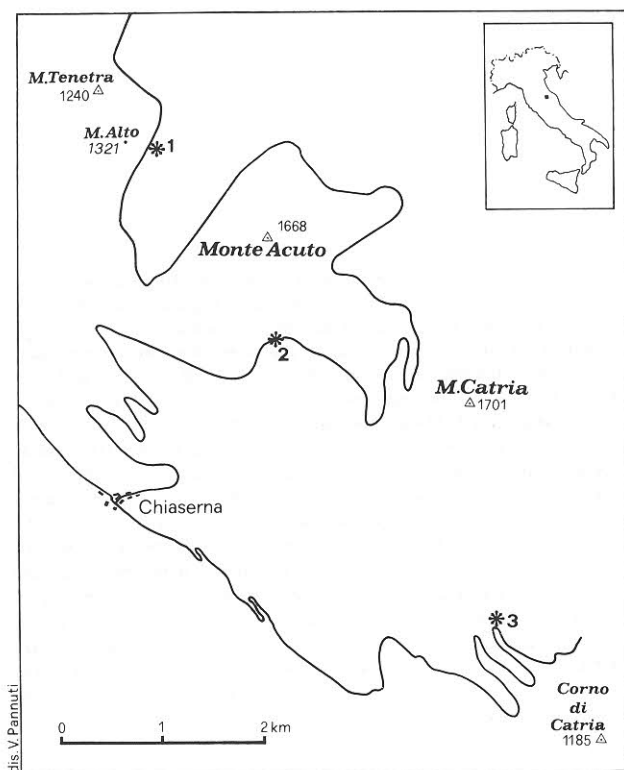


Fig. 1 - Localities where Late Valanginian ammonite faunas have been discovered.

- Ubicazione delle località fossilifere.

*balestrai* (RODIGHERO), which is limited to the *N. pachydiceranus* zone, is particularly hard, especially on single specimens.

The age of this ammonitiferous level spans the *S. verrucosum* zone to the *niclesi* biohorizon at the base of the *N. pachydiceranus* zone.

## 2.2. - THE ROAD FROM MONTE CATRIA TO CHIASERNA ON THE SOUTHERN SLOPE OF MONTE ACUTO

A complete Jurassic basin-type succession is exposed along the road from Monte Catria to Chiaserna (Southern slope of Monte Acuto). It is overlain by Maiolica and the Upper Tithonian-Upper Hauterivian interval is exposed, the Barremian being covered by detritus.

Rare Valanginian ammonites were found by CECCA (1985, p. 140) but the most interesting levels have been discovered recently in the Upper Valanginian - Upper Hauterivian interval. This section is 87 metres thick and has been sampled for magnetostratigraphy by J. E. T. CHANNELL. The magnetic signal is reliable and the results will be published in a subsequent paper, together with the correlation with ammonites and calcareous nannofossils (studied by E. ERBA).

Ammonites are rare in this section (section A) but the Upper Hauterivian ammonites *Crioceratites* gr. *duvali* (LÉVEILLÉ) and *Subsaynella* sp. have been found at metres 22 and 23, thus indicating the *S. sayni* zone. From metre 23 down to metre 87 no ammonites were found. Nevertheless beds corresponding to the interval from metres 78 to 87 are exposed in an outcrop (section B) located only 10 metres away from the basal part of section A through poor exposure and a minor fault. Here some Upper Valanginian ammonitiferous levels have been recognized (Fig. 2). The bed-by-bed correlation between these two sections has been established easily on the basis of the lithologic characters of the chert levels and by means of the occurrence of a characteristic shaly interbed. Thus, the biostratigraphic information can be used for correlation with section A. Section B shows an additional 1.5 metres of section that correspond with a level immediately below the base of section A.

The oldest level contains a relatively rich fauna. The most characteristic forms are: *Neocomites* (*N.*) sp. gr. *neocomiensis* (D'ORBIGNY) *sensu* COMPANYY (pl. 1, fig. 16), *Oosterella* cf. *begastrensis* COMPANYY (pl. 1, fig. 22) and an interesting olcostephanid, represented by six specimens, identified as *Olcostephanus* aff. *detonii* (RODIGHERO). The latter is discussed in the palaeontological part, below.

According to COMPANYY (1987), the range of *N. neocomiensis* spans the *B. campylotoxus* zone to the base of the *N. pachydiceranus* zone, whilst BULOT (1993, table 11.4) shows a longer range which begins at the top of the *T. pertransiens* zone in the basin sequences of SE

France. BULOT *et alii* (1993) cite this species up to the *pronocostatum* horizon of the *S. verrucosum* zone.

However, the identification of the specimen cited as *N. (N.)* sp. gr. *neocomiensis* is doubtful because of its bad preservation. In any case its taxonomic position is uncertain because it shows some morphologic affinities with the specimens figured by SAYN (1907, pl. 3, fig. 14) and COMPANYY (1987, pl. 10, fig. 2), both from the *S. verrucosum* zone. BULOT *et alii* (1993) refer SAYN's specimen (1907, pl. 3, fig. 14) to *N. subtenuis* SAYN (although SAYN's species was originally based on a different ammonite (SAYN, 1907, pl. 3, fig. 5)) and the specimens figured by COMPANYY (1987) pl. 10, fig. 1-5 to a miniconch morphotype (MATYJA, 1986) of *Varlheidites peregrinus* RAWSON & KEMPER. If our specimens belong to *N. subtenuis*, then according to BULOT *et alii* (1993) it does not reach the *peregrinus* horizon of the *S. verrucosum* zone. In the second case it should indicate the *peregrinus* horizon of the *S. verrucosum* zone or the basal *N. pachydiceranus* zone because BULOT *et alii* (1993) have found the last representatives of *V. peregrinus* associated with the first *Himantoceras trinodosum* and *Olcostephanus niclesi*.

*O. begastrensis* is reported from the *S. verrucosum* zone in Southern Spain (COMPANY, 1987) and in SE France, where it occurs in the *K. pronocostatum* horizon (BULOT *et alii*, 1993).

The level at metre 2. 20 contains *Neolissoceras* and *Bochianites goubechensis* MANDOV (pl. 1, fig. 23) and has been referred to the base of the *N. pachydiceranus* zone. This species is cited at the base of the *N. pachydiceranus* zone from SE France by THIEULOUY *et alii* (1990), who consider it as a morphotype of *B. neocomiensis* (D'ORBIGNY). I follow the palaeontologic interpretation of the French authors. However, *B. goubechensis* has been considered as a synonym of *B. neocomiensis* by COMPANYY (1987). At least two of the specimens figured by this author can be identified as *B. goubechensis*, in particular those on his pl. 1, fig. 12 and 15 (COMPANY, 1987) which were collected in the *N. pachydiceranus* zone and in the *S. verrucosum* zone respectively.

Higher ammonitiferous levels are characterized by species of the genus *Oosterella*, especially levels at metres 5.20 and 8.20 of section B.

In the level at 5. 20 m was found an *Oosterella* (pl. 1, fig. 21) characterized by a keel without clear ventral furrows. The specimen is smooth, although it is slightly corroded by weathering; its diameter is 18 mm. It has been identified as *O.* sp. aff. *stevenini* (NICKLÈS) because the smooth stage persists much later than in the other species described by NICKLÈS (1892).

In the level at 8.20 m I found a half whorl of a *Oosterella* (pl. 1, fig. 20) specimen which is characterized by a keel bordered by clear furrows and by the suture and the sculpture of *O. garciae* (NICKLÈS), especially the specimen figured by NICKLÈS (1892) pl. 7, fig. 9.

Southern slope of Monte Acuto-Section B  
road Monte Catria - Chiaserna, at 1050 m

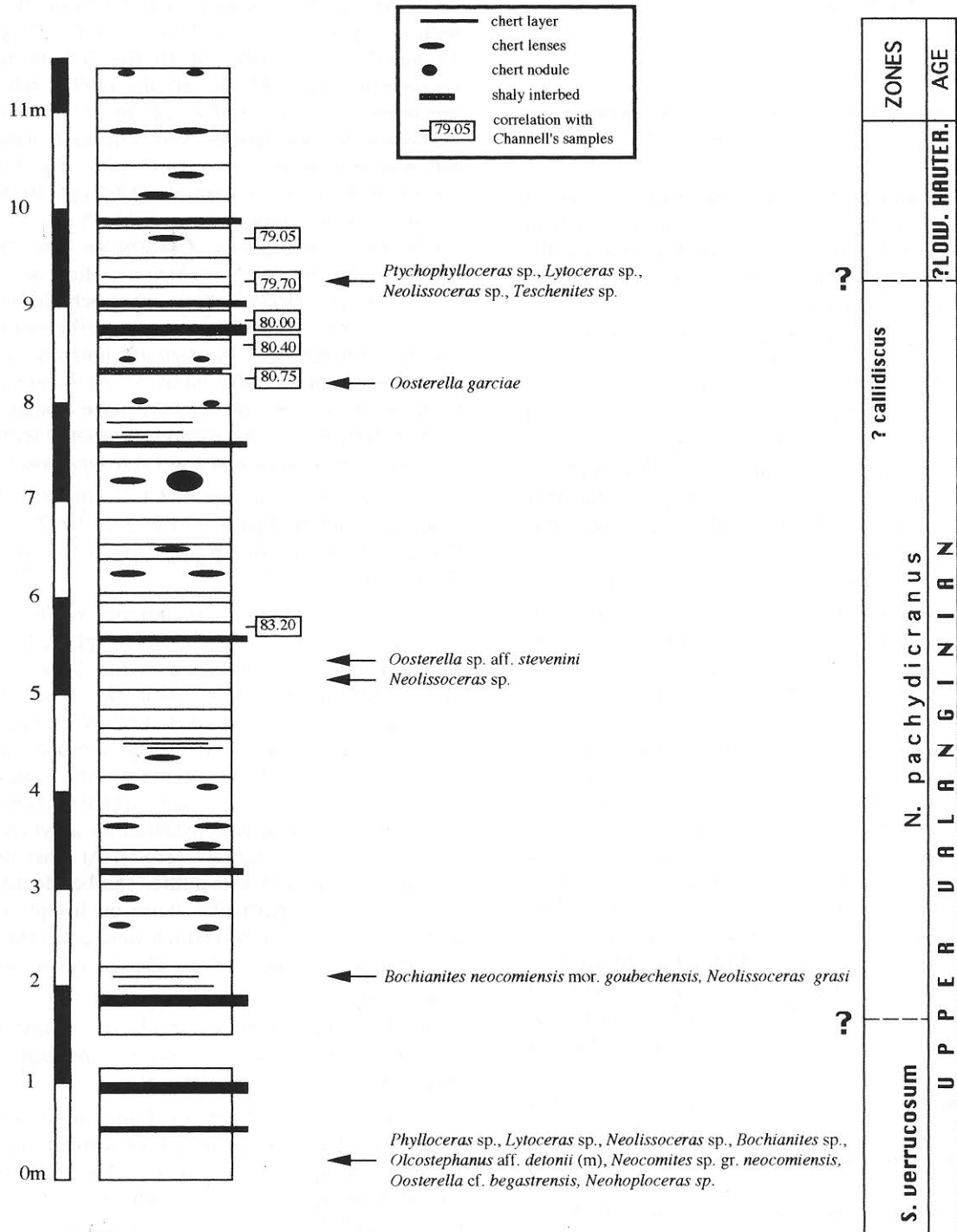


Fig. 2 - Simplified stratigraphic log of the base of the section outcropping along the road from Monte Catria to Chiaserna. The occurrence of Late Valanginian ammonites and the correlation with some of J. CHANNEL's magnetostratigraphic sample levels are shown.

- Colonnina stratigrafica semplificata della base della sezione affiorante lungo la strada che da Monte Catria conduce a Chiaserna. Sono rappresentati i punti di ritrovamento delle faune descritte e la correlazione con alcuni dei campioni prelevati da J. CHANNEL per la magnetostratigrafia.

COMPANY (1987) considered NICKLÈS' species *gaudryi*, *stevenini* and *garciae* as belonging to one species, which should be identified with the name *gaudryi* on the basis of the rules of priority. Nevertheless, for the biostratigraphic purposes of this work I use NICKLÈS' nomenclature, while acknowledging my agreement with COMPANY's opinion. In fact, these records can be compared with those by BULOT *et alii* (1993) who reported from SE France *O. stevenini* in the *nicklesi* horizon and *O. garciae* across the *H. trinodosum* and *T. callidiscus* zones (which correspond with the whole *N. pachydiceranus* zone). COMPANY (1987) observed that *N. (T.) callidiscus* occurs above the LAD of *O. gaudryi* in SE Spain, whilst AUTRAN (1993) figured an *O. stevenini* from a condensed horizon of the *T. callidiscus* and *A. radiatus* (base of the Hauterivian) zones.

In the last ammonitiferous level, at 9.10 m in section B, I found on the surface of the bed an impression of a small neocomitid which surely belongs to the subgenus *Teschenites* (pl. 1, fig. 24). Due to its poor state of preservation it is difficult to reach a reliable determination; some characters of the ribbing recall *N. (T.) flucticulus* THIEULOY whose stratigraphic range crosses the Valanginian-Hauterivian boundary (THIEULOY, 1977; BULOT *et alii*, 1993). The other ammonites found at the same level are unidentified or not significant for biostratigraphic purposes. A fragment of a possible neocomitid macroconch is figured in pl. 1, fig. 26.

### 2.3. - "LA VALLE" OUTCROP NW OF CORNO DI CATRIA, NEAR FOSSO DEL FIBBIO AT A HEIGHT OF 1050 METRES

The outcrop was cited in a previous work (CECCA, 1985, p. 140) with the name "Affioramento di Corno di Catria". The specimens identified as *Saynoceras verrucosum* (D'ORBIGNY) and *Olcostephanus astieri* (D'ORBIGNY) (figured in CECCA, 1985, pl. 5, fig. 2 and pl. 6, fig. 1 respectively) were collected here.

This outcrop has been re-studied during the last year. Unfortunately most of the levels which were visible more than 10 years ago are now covered by Maiolica detritus and vegetation. Nevertheless, ammonites of the *S. verrucosum* zone are quite abundant, though badly preserved.

The section studied is almost 30 metres thick, although it is partly covered (Fig. 3). The most fossiliferous levels are exposed from metre 30 to metre 23. In this part of the section the limestone flakes off in thin layers which often contain well preserved aptychi and crushed ammonites. *S. verrucosum* (D'ORBIGNY) was found in these levels between metres 29 and 24 but it has not been rediscovered during the last study.

The distribution of those ammonites collected bed-by-bed is shown in Fig. 3. At least the interval between metres 29 and 24 can be ascribed to the base of the *S.*

*verrucosum* zone, the *verrucosum* biohorizon (BULOT *et alii*, 1993).

*Olcostephanus astieri* (D'ORBIGNY) *sensu* COMPANY, 1987 is a quite common form in this outcrop, although it is rare to collect complete specimens. A microconch characterized by long lappets (pl. 1, fig. 6) was collected at 28.20 m.

At 25.80 m occur fragments of an *Olcostephanus* form (pl. 1, fig. 11) characterized by fine and dense ribs. These specimens show some similarities with some of the Spanish forms described by COMPANY (1987) as *O. densicostatus* (WEGNER). According to BULOT (1992), these forms have to be referred to the species *guehardi* KILIAN, instead of *densicostatus*, and distinguished as *O. guehardi* morphotype *querolensis*. I refer to this morphotype the specimens collected at 25.80 m and also the ammonite described as *O. astieri* (D'ORBIGNY) (CECCA, 1985, pl. 6, fig. 1), which was collected together with *S. verrucosum* between metres 29 and 24.

Neocomitids are very rare. Only two specimens of *Neocomites* (*N.*) *neocomiensis* (D'ORBIGNY) have been collected in two distinct levels at metres 28 and 25.10 (pl. 1, fig. 17, 18).

*Saynoceras contestanum* COMPANY is represented in two levels: a microconch, with the beginning of the lappet (pl. 1, fig. 3), found at metre 25 and a fragment (pl. 1, fig. 4) found at 24.30 m. This species occurs mainly at the base of the *S. verrucosum* zone although its first appearance is recorded at the top of the *B. campylotoxus* zone (BULOT *et alii*, 1990). At metre 24 *Paquiericeras* (*Julianites*) *undulatum* THIEULOY (pl. 1, fig. 1) and *P. (J.) mourrei* VERMEULEN (pl. 1, fig. 2) are reported for the first time from Italy. Although the specimens are crushed, the distinctive specific characters are visible. On the basis of the biostratigraphic distribution of both species in SE France and SE Spain (THIEULOY, 1977; COMPANY, 1987; BULOT *et alii*, 1993) it is possible to state that metre 24 belong to the *S. verrucosum* zone, *verrucosum* biohorizon.

Above this interval ammonites become extremely rare. *Oosterella* gr. *cultrata* (D'ORBIGNY) has been found at metre 10 (pl. 1, fig. 19) and it indicates a post *verrucosum* Late Valanginian age. In particular, BULOT *et alii* (1993, tabl. VII) reported this species from the *furcillata* horizon of the *N. pachydiceranus* zone.

*Oosterella* sp. was found at metre 4.70 together with a *Teschenites* sp.

At metre 25.05 and 25.15 occurs a very peculiar *Neolissoceras* form. It belongs to the *Haploceras* (*Neolissoceras*) *salinarium* UHLIG group but the dramatic morphologic transformation of the keel into a ventral horn leads to the definition of a new species called *Haploceras* (*Neolissoceras*) *extracornutum* sp. n. which is described below.

### 3- CONCLUSIONS

The Valanginian ammonite fauna of the Apennines is still poorly known. In fact significant Early

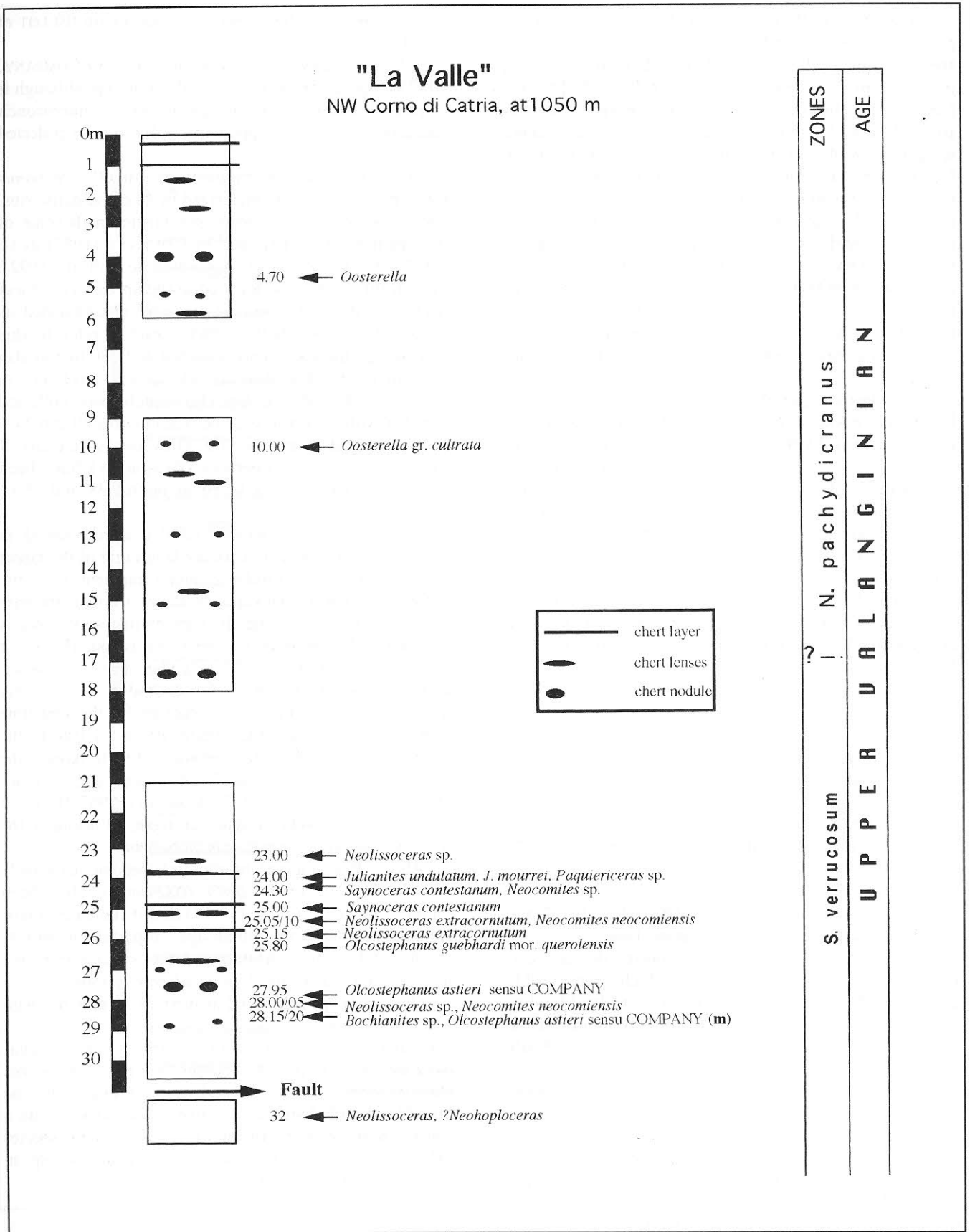


Fig. 3 - Simplified stratigraphic log of section "la Valle", NW Corno di Catria and ammonite occurrences.

- Colonnina stratigrafica semplificata della sezione "la Valle" a Nord-Ovest del Corno di Catria con la rappresentazione dei punti di ritrovamento delle ammoniti descritte.

Valanginian faunas have not been discovered so far; only the base of the *S. verrucosum* zone is well represented, whilst the ammonites of the *N. pachydiceranus* zone occur sporadically. The palaeobiogeographic character of the fauna is clearly Mediterranean. It is possible to compare the Apennine fauna with that occurring in the Spanish sections of the basin sectors (Subbetic area) described by COMPANY (1987). In Umbria-Marche area the Neocomitinae are less abundant and Phylloceratina and Lytoceratina are more represented than in the Subbetic area, the percentage of Haploceratidae, Olcostephanidae and Ancyloceratina being similar.

#### 4 - PALAEOONTOLOGICAL DESCRIPTIONS

This chapter is devoted to the description of two forms which have never been reported in the literature.

The dimensions are expressed in millimetres and as percentages of the diameter. The following abbreviations have been used: D = maximum diameter; Uw = umbilical width; Wh = whorl height; Ph = diameter corresponding to the end of the phragmocone.

All the specimens studied are provisionally housed in the author's collections.

GENUS: *Haploceras* ZITTEL, 1870

TYPE SPECIES: *Ammonites carachtheis* ZEUSCHNER, 1846 (see ENAY & CECCA, 1986)

SUBGENUS *Neolissoceras* SPATH, 1923

TYPE SPECIES: *Ammonites Grasianus* D'ORBIGNY, 1841

*Haploceras (Neolissoceras) extracornutum* sp. n.

Pl. 1, fig. 12 - 15

DERIVATIO NOMINIS - The name refers to the ventral horn.

HOLOTYPE - The specimen CC 592.

PARATYPES - The specimens CC 604, CC 644, BT 486, Olof 504.

TYPE LOCALITY - "La Valle", near Fosso del Fibbio, at 1050 m (NW Corno di Catria).

TYPE LEVEL - Upper Valanginian, *Saynoceras verrucosum* zone, *verrucosum* biohorizon.

DIAGNOSIS - *Neolissoceras* with a keel which develops on the adult body chamber a high ventral horn and folds.

DESCRIPTION - Smooth, moderately involute shell, with flat sides and rounded venter which bears a keel up to d~19 mm. At this stage this species is identical to *H. (N.) salinarium* UHLIG. The keel's height dramatically increases at D~21-23 mm and it develops a ventral horn whose height reaches 17 mm on paratype CC 644. The

base of this horn is triangular. This structure is slightly arched in the paratype Olof 504. On the ventro-lateral margin of the shell *Ursiradiata* folds (10 on the holotype) appear approximately at the same diameter as the keel begins to develop the horn. Two or three fine striae run from the folds towards the umbilicus. The folds are connected to the horn development; their aspect gives the impression that this portion of the shell is dragged backwards by the horn development. Between the adoral side of the horn and the aperture the keel disappears. The paratype Olof 504 shows a lappet.

MATERIAL - Five specimens: CC 592, CC 604, CC 644, BT 486, Olof 504.

#### MEASUREMENTS

Specimen	D	Uw	Wh	Ph
CC592-holotype	28	16 (0.11)	3 (0.57)	~17
CC604-paratype	27	~2.5 (0.10)	~15.5 (0.57)	~15
CC644-paratype	~25	-	-	~15
BT486-paratype	22	-	-	~14
Olof504-paratype	23	3.5 (0.15)	12.5 (0.54)	~15

The whorl thickness cannot be measured in the studied specimens.

STRATIGRAPHIC DISTRIBUTION AND PROVENANCE - Upper Valanginian, *Saynoceras verrucosum* zone, *verrucosum* biohorizon. The holotype and the paratype CC 604 have been respectively collected in the "la Valle" section at metre 25.05 and 25.15 of the section (Fig. 3); the paratype CC 644 was collected in 1980, together with the material described by CECCA (1985) at a level between metres 23 and 28. Olof 504 was collected in an isolated outcrop close to the "la Valle" section. BT 486 came from an isolated outcrop near M. Alto.

DISCUSSION - It is important to stress that the complete development of this peculiar ventral structure is not preserved in all the specimens studied. Both in the holotype and the paratype CC 604 only the triangular base of the horn is preserved because the rest of the horn, i. e. its arched portion, is detached from the keel and preserved above the shell (pl. 1, fig. 12). One might suggest that we are dealing with a shell fragment or a trace remaining around the ammonite. However, this situation has been observed on both specimens and it is difficult to invoke a coincidence. Fortunately, on paratypes Olof 504 and CC 644 the horn is not detached from its triangular base and develops for 17 mm in the latter specimen.

On the sediment surrounding the holotype, just above the folded ventral area, it is possible to observe the impression of the ventral area and to distinguish the folds and the striae. This impression might represent the trace of the impact of the shell on the bottom. Probably the arched part of the rostrum was detached when the shell fell on the bottom.

*H. (N.) salinarium* UHLIG also develops a keel but the high horn and the folds are absent. *H. (N.) cristifer* ZITTEL develops keel and folds but the horn is absent.

GENUS: *Olcostephanus* NEUMAYR, 1875  
 TYPE SPECIES: *Ammonites astierianus* D'ORBIGNY,  
 1840

*Olcostephanus* aff. *detonii* (RODIGHERO) m  
 Pl. 1, fig. 8 - 10

DESCRIPTION - Evolute shell with rounded whorls. Strong sculpture characterized by a primary rib at the base of the whorl-side which gives rise to a tubercle. 22 tubercles have been counted on the last whorl. Two secondary ribs branch from the tubercle; an intercalatory rib, starting from the same height as the tubercle, is observed between two pairs of secondary ribs. In some cases the intercalatory rib joins the tubercle thus producing bundles of three ribs. Up to the last half-whorl the ribbing is slightly prorsiradial, then it becomes rectiradial. Three deep constrictions per whorl cut the ribbing abruptly. Two elevated ribs emphasise the constriction. A long lappet, which develops after a constriction, is preserved on specimen MAb 614. The sutures are not visible.

MATERIAL - Six specimens: MAb 614, MAb 650 - 654.

MEASUREMENTS

Specimen	D	Uw	Wh
MAb 614	~33		
	31	14 (0.45)	9 (0.29)

The whorl thickness cannot be measured in the studied specimens. The preservation of the other specimens prevents the measurement of their characters.

STRATIGRAPHIC DISTRIBUTION AND PROVENANCE - Upper Valanginian, probably the upper part of the *Saynoceras verrucosum* zone or the base of the *Neocomites pachydicanus* zone. The six specimens have been collected in the same bed at the base of section B, in the southern slope of Monte Acuto (Fig. 2).

DISCUSSION - This form belongs to the group of *Olcostephanus* characterized by a wide umbilicus such as *O. nicklesi* WIEDMANN & DIENI, *O. mittreanus* (D'ORBIGNY) and *O. detonii* (RODIGHERO). *O. sanctifirminensis* THIEULOY is a synonym of *O. nicklesi* (BULOT in THIEULOY *et alii*, 1990). THIEULOY (1977) created for this group the subgenus *Lemurostephanus*, with *Holcostephanus madagascariensis* LEMOINE as the type-species. COMPANY (1987) proposed to use this name for the perigondwanian forms whilst BULOT (1992) considers it as a synonym of *Olcostephanus*.

The form described here differs from *O. mittreanus* and *O. nicklesi* / *sanctifirminensis* because of its almost rectiradial ribbing, the wider umbilicus and the lower number of secondary ribs. It could be determined as *O. detonii* (RODIGHERO) because of the strong morphologic similarities. However only the internal whorls of *O. detonii* can be compared with the form described. The specimen depicted by RODIGHIERO (1919, pl. 9, fig. 12) is probably a macroconch reaching a diameter of 70

mm. Since the RODIGHIERO's original description *O. detonii* has never been cited again. Thus this species is poorly known. The specimens from the southern slope of Monte Acuto could correspond to the microconch of *O. detonii* but I prefer to designate them as *O. aff. detonii* m because their macroconch is actually unknown.

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## PLATE 1

- Fig. 1 - *Paquiericeras (Julianites) undulatum* THEULOY. "La Valle" section, level at 24 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 588.  
 Fig. 2 - *Paquiericeras (Julianites) mourrei* VERMEULEN. "La Valle" section, level at 24 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 589.  
 Fig. 3 - *Saynoceras contestanum* COMPANYY. "La Valle" section, level at 25 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 595  
 Fig. 4 - *Idem*, level at 24.30 m. Spec. CC 594.  
 Fig. 5 - *Valanginites bachelardi* (SAYN). M. Alto outcrop. Spec. BT 519.  
 Fig. 6 - *Olcostephanus astieri* (D'ORBIGNY). "La Valle" section, level at 28.20 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 620.  
 Fig. 7 - *Olcostephanus* gr. *nicklesi* WIEDMANN & DIENI. M. Alto outcrop. Spec. BT 510.  
 Fig. 8 - *Olcostephanus* aff. *detonii* (RODIGHERO) m. Southern slope of Monte Acuto, section B, bed MAb 0, *S. verrucosum* zone. Spec. MAb 650.  
 Fig. 9 - *Idem*. Specimen MAb 614.  
 Fig. 10 - *Idem*. Specimen MAb 652.  
 Fig. 11 - *Olcostephanus guebhardi* KILIAN, morphotype *querolensis* BULOT. "La Valle" section, level at 25.80 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 587.  
 Fig. 12 - *Haploceras (Neolissoceras) extracornutum* sp. n. Holotype. "La Valle" section, level at 25.05 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 592.  
 Fig. 13 - *Idem*. Paratype. Collected in an isolated outcrop near "La Valle". Spec. Olof 504.  
 Fig. 14 - *Idem*. Paratype. "La Valle" section, level between metres 23 and 28, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 644.  
 Fig. 15 - *Idem*. Paratype. M. Alto outcrop. Spec. BT 486.  
 Fig. 16 - *Neocomites (N.)* gr. *neocomiensis* (D'ORBIGNY) *sensu* COMPANYY. Southern slope of Monte Acuto, section B, bed MAb 0, *S. verrucosum* zone. Spec. MAb 615.  
 Fig. 17 - *Neocomites (N.) neocomiensis* (D'ORBIGNY). "La Valle" section, level at 28.05 m, *S. verrucosum* zone, *verrucosum* biohorizon. Spec. CC 621.  
 Fig. 18 - *Idem*. Level at 25.10 m. Spec. CC 657.  
 Fig. 19 - *Oosterella* gr. *cultrata* (D'ORBIGNY). "La Valle" section, level at 10.00 m, *N. pachydicanus* zone. Spec. CC 599.  
 Fig. 20 - *Oosterella garciae* (NICKLÈS). Southern slope of Monte Acuto, section B, bed MAb 8.20, *N. pachydicanus* zone. Spec. MAb 617.  
 Fig. 21 - *Oosterella* aff. *steveneri* (NICKLÈS). Southern slope of Monte Acuto, section B, bed MAb 5.40, *N. pachydicanus* zone. Spec. MAb 616.  
 Fig. 22 - *Oosterella* cf. *begastrensis* COMPANYY. Note the aperture with a ventral rostrum. Southern slope of Monte Acuto, section B, bed MAb 0, *S. verrucosum* zone. Spec. MAb 658.  
 Fig. 23 - *Bochianites neocomiensis* (D'ORBIGNY) morph. *goubechensis* MANDOV. Southern slope of Monte Acuto, section B, bed MAb 2.20, *N. pachydicanus* zone. Spec. MAb 655.  
 Fig. 24 - *Neocomites (Teschenites)* sp. Impression on the sediment. Southern slope of Monte Acuto, section B, bed MAb 9.10, Valanginian-Hauterivian transition. Spec. MAb 618.  
 Fig. 25 - *Olcostephanus astieri* (D'ORBIGNY). M. Alto outcrop. Specimen BT 514.  
 Fig. 26 - Unidentified neocomitid (?M). Southern slope of M. Acuto, section B, bed MAb 9.10, Valanginian-Hauterivian transition. Spec. MAb 619.

All figures natural size. Photos by Andrea BUSSOLETTI.

## TAVOLA I

- Fig. 1 - *Paquiericeras (Julianites) undulatum* THEULOY. Sez. "La Valle", liv. a 24 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 588.  
 Fig. 2 - *Paquiericeras (Julianites) mourrei* VERMEULEN Sezione "La Valle", liv. a 24 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 589.  
 Fig. 3 - *Saynoceras contestanum* COMPANYY. Sezione "La Valle", liv. a 25 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 595  
 Fig. 4 - *Idem*, liv. a 24.30 m. Es. CC 594.  
 Fig. 5 - *Valanginites bachelardi* (SAYN). Affioramento di M. Alto. Esemplare BT 519.  
 Fig. 6 - *Olcostephanus astieri* (D'ORBIGNY). Sezione "La Valle", liv. a 28.20 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 620.  
 Fig. 7 - *Olcostephanus* gr. *nicklesi* WIEDMANN & DIENI. Affioramento di M. Alto. Es. BT 510.  
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 Fig. 9 - *Idem*. Es. MAb 614.  
 Fig. 10 - *Idem*. Es. MAb 652.  
 Fig. 11 - *Olcostephanus guebhardi* KILIAN, morfotipo *querolensis* BULOT. Sezione "La Valle", liv. a 25.80 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 587.  
 Fig. 12 - *Haploceras (Neolissoceras) extracornutum* sp. n. Olotipo. Sezione "La Valle", liv. a 25.05 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 592.  
 Fig. 13 - *Idem*. Paratipo. Raccolto in un affioramento isolato vicino alla sezione "La Valle". Es. Olof 504.  
 Fig. 14 - *Idem*. Paratipo. Sezione "La Valle", livello compreso fra i metri 23 e 28, zona a *S. verrucosum* zone, bio-orizzonte a *verrucosum*. Es. CC 644.  
 Fig. 15 - *Idem*. Paratipo. Affioramento di M. Alto. Es. BT 486.  
 Fig. 16 - *Neocomites (N.)* gr. *neocomiensis* (D'ORBIGNY) *sensu* COMPANYY. Versante meridionale di Monte Acuto, sezione B, strato MAb 0, zona a *S. verrucosum*. Es. MAb 615.  
 Fig. 17 - *Neocomites (N.) neocomiensis* (D'ORBIGNY). Sezione "La Valle", liv. a 28.05 m, zona a *S. verrucosum*, bio-orizzonte a *verrucosum*. Es. CC 621.  
 Fig. 18 - *Idem*. Livello a 25.10 m. Es. CC 657.  
 Fig. 19 - *Oosterella* gr. *cultrata* (D'ORBIGNY). Sezione "La Valle", livello a 10.00 m, zona a *N. pachydicanus*. Esemplare CC 599.  
 Fig. 20 - *Oosterella garciae* (NICKLÈS). Versante meridionale di Monte Acuto, sezione B, strato MAb 8.20, zona a *N. pachydicanus*. Es. MAb 617.  
 Fig. 21 - *Oosterella* aff. *steveneri* (NICKLÈS). Versante meridionale di Monte Acuto, sezione B, strato MAb 5.40, zona a *N. pachydicanus*. Es. MAb 616.  
 Fig. 22 - *Oosterella* cf. *begastrensis* COMPANYY. Si noti l'apertura con il rostro ventrale. Versante meridionale di Monte Acuto, sezione B, strato MAb 0, zona a *S. verrucosum*. Es. MAb 658.  
 Fig. 23 - *Bochianites neocomiensis* (D'ORBIGNY) morfotipo *goubechensis* MANDOV. Versante meridionale di Monte Acuto, sezione B, strato MAb 2.20, zona a *N. pachydicanus*. Esemplare MAb 655.  
 Fig. 24 - *Neocomites (Teschenites)* sp. Impronta sul sedimento. Versante meridionale di Monte Acuto, sezione B, strato MAb 9.10, passaggio Valanginiano-Hauteriviano. Esemplare MAb 618.  
 Fig. 25 - *Olcostephanus astieri* (D'ORBIGNY). Affioramento di M. Alto. Esemplare BT 514.  
 Fig. 26 - *Neocomitide* indeterminato (?M). Versante meridionale di Monte Acuto, sezione B, strato MAb 9.10, passaggio Valanginiano-Hauteriviano. Esemplare MAb 619.

Tutti gli esemplari sono figurati a grandezza naturale. Foto di Andrea BUSSOLETTI.

