

PALEONTOLOGICAL DESCRIPTIONS OF SOME RUDISTS
FROM THE UPPER CRETACEOUS OF OSTUNI
(BR - ITALY)*

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Key-words: Rudists, Taxonomy, Stratigraphy, Upper Cretaceous, Murgian area (Apulia).

Riassunto. A completamento di uno studio precedente (Laviano, 1984) vengono descritte alcune Rudiste raccolte nel Cretaceo superiore di Ostuni (BR). La maggior parte delle specie studiate è nuova per la Puglia; particolare attenzione è stata rivolta alla specie *Biradiolites monopterus* (Pirone), il cui grande numero di esemplari e l'ottimo stato di conservazione hanno consentito di determinare il campo di variabilità morfologica.

Summary. Systematic study of Rudists collected from the Upper Cretaceous of Ostuni (Apulia) led to the identification of species, some recorded for the first time in this area. Special attention has been paid to *Biradiolites monopterus* (Pirone), found in very large number. The conspicuous number of specimens and their excellent preservation allowed us to conduct a series of observations in order to ascertain the range of morphological variability of these species.

Introduction.

The mesozoic calcareous outcrops of the Ostuni area were the subject of a previous stratigraphical and paleoecological study (Laviano, 1984). This research made possible to collect numerous interesting rudists, and some of these will be described in this paper. Some are new species for Apulia whereas others, though already well-known, are represented in the assemblage by an unusually large number of specimens and their description may give new contribution to the taxonomy of the rudist species.

The species which have already been abundantly described and illustrated in previous papers (Campobasso, 1972; Campobasso & Morolla, 1975; Laviano, 1982) are not dealt with here.

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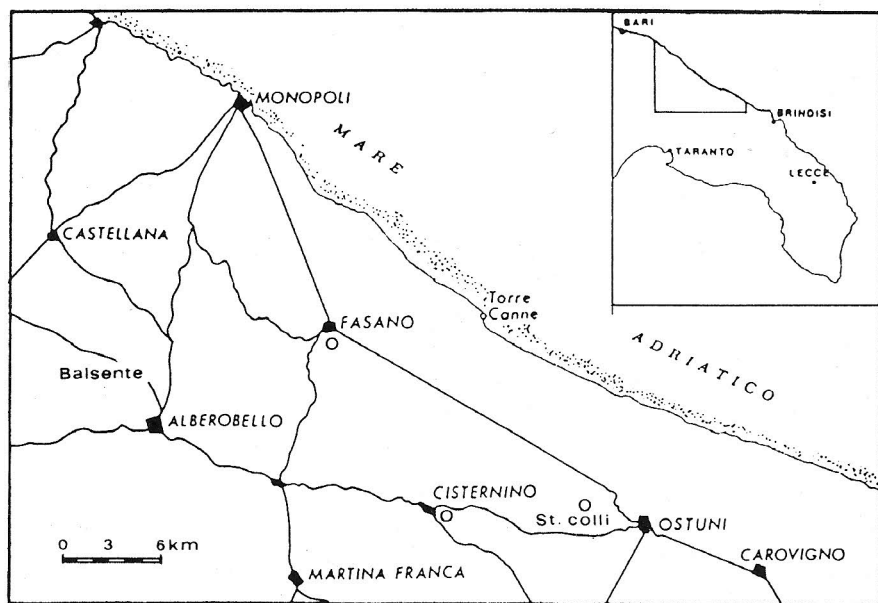


Fig. 1 — Geographical setting of the fossiliferous localities, indicated by a circle (◦) in the map.

The taxa examined are as follows: *Hippurites colliciatius* Woodward, *H. cf. heritschi* Kühn, *H. nabresinensis* Futterer, *Biradiolites angulosus* d'Orbigny, *B. cf. martellii* (Parona), *B. monopterus* (Pirone), *Gorjanovicia costata* Polsak, *G. cf. lipparinii* Polsak, *G. cf. polsaki* Lupu, *Joufia cf. reticulata* Boehm, *Sauvagesia cf. raricostata* Polsak, *S. tenuicostata* Polsak.

In particular, *B. monopterus*, *B. angulosus*, *B. cf. martellii*, *G. costata* and *G. cf. polsaki* were found near the railway of Ostuni and Mass.ia Airoldi (F. 191, III NE) from limestone levels referred to the lower part of the «Calcare di Altamura» (Coniacian—Lower Santonian) (Ricchetti, 1975; Laviano, 1984); *H. colliciatius*, *H. nabresinensis*, *G. cf. lipparinii*, *S. cf. raricostata*, *S. tenuicostata*, were found near the natural exposures along the «Strada dei Colli» (F. 191, III SO), from levels attributed to the middle part of the «Calcare di Altamura» (Santonian—Lower Campanian) (Ricchetti, 1975; Laviano, 1984), and finally *H. cf. heritschi* and *Joufia cf. reticulata* were found near the natural exposures along the «Strada dei Colli» (F. 191, III SO), near the town of Ostuni (F. 191, III SE) and near the coastal belt, at Mass.ia Gorgognolo (F. 191, III NE), from levels attributed to the upper part of the «Calcare di Altamura» (Upper Campanian—Maastrichtian?) (Ricchetti, 1975; Laviano, 1984).

Paleontological descriptions

Classis BIVALVIA

Ordo Hippuritoida

Superfamilia *Hippuritacea*Familia *Hippuritidae* Gray, 1848Genus *Hippurites* Lamarck, 1801***Hippurites colliciatius*** Woodward, 1855

Pl. 12, fig. 4

1855 *Hippurites colliciatius* Woodward, p. 58, pl. 4, fig. 5 (non vidi).1932 *Hippurites* (*Orbignya*) *colliciatius*—Kühn, p. 42 (*cum syn.*).1960 *Hippurites* (*Orbignya*) *colliciatius*—Lupu & Lupu, p. 250, pl. 4, fig. 48, 49; text—fig. 18, 19.1976 *Hippurites colliciatius*—Lupu, p. 121, pl. 12, fig. 1, 2; pl. 38, fig. 16, 17.1977 *Hippurites* (*Orbignya*) cf. *colliciatius*—Pons p. 58, pl. 9, fig. 4.1978 *Hippurites colliciatius*—Sladic Trifunovic, p. 436, fig. 8.1979–80 *Hippurites colliciatius*—Sladic—Trifunovic, pl. 5, fig. 1.1980 *Hippurites colliciatius*—Carbone et al., pl. 5, fig. a.1981 *Hippurites colliciatius*—Pamouktchiev, p. 157, pl. 77, fig. 1, 1a.1982 *Hippurites colliciatius*—Accordi et al., p. 770, pl. 4, fig. 4, 7.1982 *Hippurites colliciatius*—Czabalay, p. 80, pl. 10, fig. 6, 7.

Material. Several right valves embedded in the limestone; from the Upper Cretaceous (Santonian—Lower Campanian) of the town of Ostuni (BR).

Description. The specimens are close to one another in vertical living position. The valves are subcylindrical in shape and their diameter is about 4 cm. All the specimens show a well-developed ornamentation consisting of about 13 projecting sharp ribs separated by round intercostal spaces. The ligamental ridge is represented only by a slight indentation of the inner border of the shell wall. The S and E pillars are round; E is longer while S is slightly curved inward. Moreover, the E pillar has a small narrowing at its base.

Occurrence. Upper Cretaceous of western Alps (Pons, 1977), of Gosau, Austria (Pamouktchiev, 1981), of Sumeg, Hungary (Czabalay, 1982); Santonian—Campanian of west central Latium (Carbone et al., 1980; Carbone & Sirna, 1981) and Campanian of Matese (Accordi et al., 1982); Santonian—Lower Campanian of Murge (Laviano, 1984) and Maastrichtian of Salento (Sladic—Trifunovic & Campobasso, 1979–80); Upper Cretaceous of the island of Hvar (Herak et al., 1976; Sladic—Trifunovic, 1979–80), of western Bosnia (Sliskovic, 1974), of eastern Serbia (Sladic—Trifunovic, 1978), of Rumania (Lupu & Lupu, 1960; Lupu, 1976).

Hippurites cf. heritschi Kühn, 1947

Pl. 9, fig. 1, 2

Material. An incomplete right valve lacking the apex, embedded in the limestone and with a perfectly preserved wall structure; from Campanian—Maastrichtian near Ostuni (BR).

Description. The diameter of the right valve, measured along a cross section at an unknown distance from the commissure, is 7 cm. The thickness of the outer layer of the shell wall is 1 cm. The marks of the «Spuren der Mantelretraktoren» (Pejovic & Kühn, 1960) are clearly visible on it. The ornamentation consists of 12 well-marked longitudinal ribs. The longitudinal depression which corresponds to the E pillar is almost absent, while the depression corresponding to the S pillar is quite distinct.

The S pillar is less developed than the E pillar; both have rounded tips. The myocardial elements do not present clearly marked outlines.

Remarks. *Hippurites heritschi* was discovered by Kühn (1947, p. 187) from Gosau beds (Lower Santonian) in Kalchberg area (Kainach Basin, west of Graz); reference to it has been made during various conference, but nothing was published. The species was formally established by Pejovic and Kühn (1960, pp. 137–138, fig. 1) who gave both description and illustration, in the framework of a revision of rudists from Pivov (Yugoslavia) previously referred to as *H. (Orbignya) nabresinensis* by Pejovic (1951, p. 94, pl. 1, fig. 2; pl. 2, fig. 2; pl. 3, fig. 2).

According to Pejovic and Kühn, the new species differs from *H. nabresinensis* in having: 1) a relatively thicker shell wall; 2) a larger shell nearly twice as much in size; 3) clear traces of the «Spuren der Mantelretraktoren»; 4) narrower siphonal pillars; 5) a cylindrical and not conic right valve. The Ostuni specimen perfectly agrees with these features. The Authors complete the description of the new species with references to myocardial elements but unfortunately these are not observable in the specimen from Apulia and therefore will not be discussed here.

Later, still from Gosau beds in the Kainach Basin (Austria), the species has been described and illustrated by Kaumanns (1962, p. 305, pl. 2, fig. 4) who collected some specimens along the road connecting St. Bartholomä to Stallhofen.

Detailed descriptions, concerning growth stages as well, were offered by Sladic—Trifunovic (1978, pp. 422–428, pl. 7), and are based on many specimens from Maastrichtian deposits in the isle of Brac (loc. Tesica Zaliv) and near Bacevica respectively; a shell from this latter locality is unusually well preserved and exhibits both valves.

She wrote about the incredible resemblance between the right valves of *H. heritschi* and those of *Yvaniella* Milovanovic species (*Y. maestrichtiensis* Milovanovic and *Y. alpani* Karakabey). She also pointed out that it was necessary to examine the left valves in order to distinguish the three species.

Subsequently, in a work on the rudist fauna from the Maastrichtian of west Bulgaria, A. Pamouktchiev (1979, p. 220, pl. 7, fig. 1, 3; pl. 9, fig. 2) described two specimens as belonging to *Hippuritella heritschi* (Kühn). Although the Author described the two specimens accurately, he did not mention the reasons supporting the assignment to the genus *Hippuritella*; on the other hand, the brief description and the hazy photograph of the left valve do not allow this attribution to be verified. Indeed, the Author speaks of «escrescences» (a translation from Bulgarian) on the central part of the left valves of the considered specimens and this would recall the genus *Yvaniella* Milovanovic (1957, p. 143, pl. 1), whose two species have right valves which are almost identical to those of the *H. heritschi*.

The Ostuni specimens, in particular, have been ascribed with some doubt to *H. heritschi* Kühn after a comparison with the specimens of the this species from the island of Brac (1) and Bacevica, and a comparison with the holotype of *Yvaniella maestrichtiensis* Milovanovic, all kept in the Museum of Belgrado.

Occurrence. Cited in the Santonian—Lower Campanian in Austria and Yugoslavia by Pejovic (1951), Pejovic and Kühn (1960), Kaumanns (1962), Polsak and Mamuzic (1969), Polsak (1970) and Sliskovic (1971); ? Middle Maastrichtian of the Breznik region (western Bulgaria) (Pamouktchiev, 1979); Maastrichtian of eastern Serbia, of the island of Brac (Sladic—Trifunovic, 1978).

In the light of a comprehensive study of the stratigraphic range of the species carried out by Sladic—Trifunovic (1978), the Author has reached the conclusion that the St. Bartholomä sediments containing *H. heritschi*, which Kühn (op. cit.) referred to the Santonian—Lower Campanian, should really be attributed to the Maastrichtian.

***Hippurites nabresinensis* Futterer, 1893**

Pl. 7, fig. 2, 4; Pl. 14, fig. 1

1893 *Hippurites nabresinensis* Futterer, p. 48, pl. 22, fig. 3; pl. 33, fig. 1, 2.

1932 *Hippurites (Orbignya) nabresinensis*—Kühn, p. 57 (*cum. syn.*).

1967 *Hippurites (Hippurites) nabresinensis*—Schiftah, p. 51, pl. 4, fig. 2; text—fig. 7.

1975 *Hippurites (Orbignya) nabresinensis*—Plenicar, p. 8, pl. 1, fig. 2, 3; text—fig. 3 (*cum syn.*).

(1) The specimen shown in Pl. 9, fig. 2, is from the island of Brac, and was kindly given to me by Prof. Mileva Sladic—Trifunovic. I would like to take the opportunity to thank all the members of the Belgrade Institute of regional Geology and Paleontology and in particular Prof. Sladic—Trifunovic, for the hospitality which I received during the scientific workshop which took place in May 1984.

- 1976 *Hippurites nabresinensis*—Lupu, p. 120, pl. 11, fig. 4; pl. 38, fig. 14.
 1981 *Hippurites nabresinensis*—Pamouktchiev, p. 156, pl. 76, fig. 2, 3.
 1981 *Hippurites nabresinensis*—Polsak, p. 454, text—fig. 7g.
 1982 *Hippurites nabresinensis*—Accordi et al., p. 770, pl. 4, fig. 8, 10.
 1982 *Hippurites nabresinensis*—Czabalay, p. 80, pl. 10, fig. 5.

Material. Numerous AV valves, from Santonian—Lower Campanian of Strada dei Colli, Ostuni (BR).

Description. AV cylindrical in shape, the diameter is about 3 cm and the length is about 5–6 cm. The ligamental ridge is absent and not even indicated by a slight indentation on the inner edge. Pillars S and E are short and rounded, and E is less rounded than S. The myocardial elements are not visible.

Remarks. *H. nabresinensis* is very similar to *H. lapeirousei* Goldfuss. Lupu (1976, p. 122) observed that *H. lapeirousei* is different from the *H. nabresinensis* in that its pillars are of the same size and its shell is thicker. Sladic—Trifunovic (1972) pointed out the taxonomic problem, repeating in 1978 (p. 440) that: “the holotype of *H. lapeirousei* differs from the holotype of *H. nabresinensis* by a small conical lower valve (in *H. nabresinensis* this valve is cylindrical) and by its Maastrichtian stratigraphic adherence”. She however observes that specimens of *H. lapeirousei* with cylindrical AV have been reported from the Maastrichtian sediments of Vasiljev Kamen by K. Petkovic (1938, in Sladic—Trifunovic, 1978). The Author concluded that: “a satisfactory solution of the taxonomic problem concerning the species *H. nabresinensis* will be possible only after a complex paleontological and biostratigraphic study of both species carried out on abundant fossil material from a larger number of localities with Senonian rudist sediments. In case these two species be found identical, *H. nabresinensis* will lose its status of species, in conformity with the priority law”. Accordi et al. (1982) observed that the pillars of some specimens from S. Polo Matese are not of the same size, but they do not mention the form of the shell. For the present, Ostuni specimens have been attributed to *H. nabresinensis* because their shells have a cylindrical shape and their pillars are not of the same size.

Occurrence. Santonian—Campanian of Austria (Kühn, 1947); Santonian—Lower Campanian of outer Dinarids (Polsak, 1979); Senonian of western Serbia (Pejovic, 1957); Campanian—Santonian of Slovenia (Plenicar, 1975); Upper Cretaceous of west and north Afghanistan (Vogel, 1971); Upper Cretaceous of north—Turkey (Schiftah, 1967); Upper Santonian—Lower Campanian of Alps (Futterer, 1893); Santonian—Campanian of Apennines (Accordi et al., 1982); Santonian—Lower Campanian of Murgian area (Laviano, 1984).

Familia *Radiolitidae* Gray, 1848Genus *Biradiolites* d'Orbigny, 1850***Biradiolites angulosus* d'Orbigny, 1850**

Pl. 12, fig. 2, 3; Pl. 14, fig. 2

1850 *Biradiolites angulosa* d'Orbigny, p. 233, pl. 574, fig. 7–11.1932 *Biradiolites angulosus*—Kühn, p. 83 (*cum syn.*).1972 *Biradiolites angulosus*—Campobasso, p. 441, pl. 3.

Material. Some right valves, not perfectly preserved; from the Coniacian of the railway station of Ostuni (BR).

Description. Conical, small, elongated shells in living position. The quadrangular—cell structure of the shell wall is not visible in thin section, due to the complete re—crystallization. Cross section shows prominent ribs forming the ornamentation of the shell.

It is possible to observe specimens with less numerous and less protruding ribs than in the specimens of the same species illustrated by Toucas (1909). The siphonal bands are not very protruding and are flat and very often hollow in the center. The E band is always wider than the S band. The interband is always decorated by a more or less prominent rib (Pl. 12, fig. 3).

Remarks. Along with *B. monopterus* this species is abundant and frequently found in the Lower Senonian of the Murgian area (Apulia). It was mentioned by Parona (1900) for the first time, then by Torre (1966) in the Turonian—Senonian of western Murge and by Campobasso (1972) in the Turonian—Lower Senonian of eastern Murge.

Occurrence. Cenomanian—Turonian of Afghanistan (de Lapparent et al., 1974); Upper Turonian of Yugoslavia (Parona, 1926; Kühn, 1932; Polsak, 1968; Polsak & Mamuzic, 1969), of France (d'Orbigny, 1847), of Italy (Parona, 1923; Torre, 1966; Campobasso, 1972).

***Biradiolites* cf. *martellii* (Parona, 1910–11)**

Pl. 13, fig. 1 a, b

Material. 1 incomplete right valve, from the Coniacian of railway station of Ostuni.

Description. The only specimen available is a right valve which is partially isolated from limestone and incomplete. It has a subcylindrical, elongated shape, and the ornamentation consists of very prominent ribs (7), longitudinal and flat. The siphonal bands are slightly concave and marked by several small

ribs running through them. The E band is wider (almost twice) than S. The interband consists of two ribs similar to the ones on the rest of the valve. There is no ligamental ridge. The shell is very thick and unfortunately it is completely re-crystallized so that the typical quadrangular mesh structure of the shell wall is not visible.

Remarks. This species was established by Parona (1910–1911, p. 10, fig. 1, 2) for the presence of very prominent ribs in the ornamentation of the shell and was attributed by the Author to the genus *Durania* for the absence of the ligamental ridge and the presence of several small longitudinal ribs in the siphonal bands. Pejovic (1972, p. 119) observed a quadrangular mesh structure of the outer layer of the shell wall in a specimen from the island of Vis. The structure, the protruding ribs and the absence of the ligamental ridge led the Author to attribute this species to the genus *Biradiolites*. The only incomplete and re-crystallized specimen available, though very much like the specimens of Parona and Pejovic, has been insufficient for a sure taxonomic attribution.

Occurrence. Senonian of Dalmatia (Parona, 1911), of western Serbia (Pejovic, 1972), of Apulia (Parona, 1900; Zuffardi Comerci, 1930; Tavani, 1958; Torre, 1966); Upper Cretaceous of Friuli (Klinghardt, 1921 b).

***Biradiolites monopterus* (Pirona, 1869)**

Pl. 7, fig. 1,3a, b, 5, 6; Pl. 8, fig. 1a, b, 3; Pl. 10, fig. 2a, b; Pl. 11, fig. 1, 2, 5

1869 *Radiolites monopterus* Pirona, p. 33, pl. 6, fig. 7–10.

1972 *Biradiolites monopterus*—Campobasso, p. 440, pl. 3, fig. 3 (*cum. syn.*).

Material. 50 incomplete right valves, and numerous fragments, many of which are re-crystallized and embedded in the limestone; from the Lower Senonian of Ostuni Fasano and Cisternino (BR).

Description. The length of the right valves varies from about 3 cm to 5 cm (without apex); the siphonal bands do not protrude much and are flat. The E band is always wider than S and in some cases it is hollow in the middle. In only one specimen S consists of two small ridges separated by a slight depression. The interband consists of a well-developed crest-shaped rib always clearly visible between the bands. The ornamentation consists of two longitudinal ribs mostly well developed and sharp-edged; they are situated at opposite sides of the bands. Their variability depends on the extent to which they project above the shell edge and whether they are at a long or short distance from the bands. Numerous growth-rings are found running through the shell.

Occurrence. Apart from Pirona's finding at Colle Medea in Friuli, this species has only been found in Apulia (Campobasso, 1972; Laviano, 1984) where

it is quite plentiful, particularly around Ostuni, Fasano and Cisternino (Fig. 1). From a chronological point of view, this species has been attributed to a generic Upper Cretaceous. On the basis of geological—stratigraphical considerations and of the associated fauna in the area where it was found (Laviano, 1984), this species can be attributed to the Coniacian—Lower Santonian.

Biradiolites sp.

Pl. 11, fig. 4; Pl. 16, fig. 2a, b

Material. A specimen with both valves perfectly preserved; from the Lower Senonian of Ostuni.

Observations. Among the specimens of *B. monopterus* from Ostuni a single individual with both valves, quadrangular in shape (Pl. 11, fig. 4; Pl. 16, fig. 2a, b) has been found. The specimen is small sized, and its diameter at the commissure is about 1 cm, while its length is about 4 cm. The siphonal bands are large and separated by prominent ribs. This specimen resembles very much to *B. quadratus* d'Orbigny; but at the moment a certain taxonomic attribution is not possible.

Genus *Gorjanovicia* Polsak, 1967

***Gorjanovicia costata* Polsak, 1964**

Pl. 16, fig. 1

1967 *Gorjanovicia costata* Polsak, p. 103, pl. 61–66; pl. 69; pl. 70, fig. 1, 2; text-fig. 28.

1973 *Gorjanovicia costata*—Plenicar, p. 222, pl. 7, fig. 1, 2.

1976 *Gorjanovicia costata*—Herak et al., pl. 1, fig. 2, 3.

Material. A completely isolated right valve; from Coniacian of the railway station of Ostuni (BR).

Description. A cylindrical right valve 6 cm in length. The ornamentation consists of clearly marked sharp ribs separated by not very deep intercostal spaces. The ligamental ridge is thin and short and has a round border. The siphonal E band is wide and rounded, and it makes on the inner layer of the shell wall a slight projection which looks like a pseudopillar. The siphonal S band is not distinguishable among the ornamentation ribs. The shell has a lamellar structure which shows no trace of prismatic structures, perhaps due to a re-crystallization process.

Occurrence. Santonian—Campanian of Yugoslavia (Polsak, 1967; Plenicar, 1973; Herak et al., 1976); Lower Campanian—Santonian of Carseolani Mountains (Mariotti, 1982); Coniacian of Apulia (Laviano, 1984).

Gorjanovicia cf. lipparinii Polsak, 1967

Pl. 15, fig. 2

Material. Only AV valves embedded in the limestone from Campanian of the Strada dei Colli, Ostuni (BR).

Description. The diameter of AV is about 4 cm. The ornamentation consists of several very protruding and sharp ribs. The ligamental ridge is short. The siphonal E band is very concave while the siphonal S band is protruding and marked by small ribs (3). The interband space is concave.

Remarks. The Ostuni specimen is very similar to *G. lipparinii* Polsak (1967, p. 107, pl. 67, fig. 1; text—fig. 31) for both its ornamentation and its siphonal bands. Its specific attribution, however, is uncertain, mainly because it was impossible to clear the specimen from the limestone and examine it carefully.

Occurrence. Upper Cretaceous of Yugoslavia (Polsak, 1967; Polsak et al., 1982) and Italy (Laviano, 1984).

Gorjanovicia cf. polsaki Lupu, 1973

Pl. 12, fig. 1

Material. A right valve embedded in the limestone from the Lower Senonian of Mass.ia Airoldi.

Description. The right valve has a surface ornamentation characterized by irregular protruding ribs with wide concave intercostal spaces. The ribs do not have a round outline and they seem cut off. The siphonal bands are concave with E wider than S. The interband has the shape of a protruding rib. The ligamental ridge is small and triangular. The shell structure is completely obliterated by the re-crystallization process.

Remarks. This species is not well-known except by Lupu (1973) who established it on specimens from the Apuseni Mounts. The presence of only one specimen and the poor photographic documentation make a sure taxonomic determination impossible.

Occurrence. Upper Santonian of Rumania (Lupu, 1973); Lower Senonian of Apulia (Laviano, 1984).

Genus *Joufia* Boehm, 1897**Joufia cf. reticulata** Boehm, 1897

Pl. 15, fig. 1

Material. Some specimens more or less incomplete, embedded in the limestone; from Upper Campanian—Maastrichtian of Strada dei Colli (BR).

Description. Large-sized incomplete specimens consisting only of right valves. The largest specimens have a diameter of about 20 cm and a shell wall thickness of about 5 cm (without the external layer of the shell wall which is not distinguishable). The ligamental ridge is broken. The middle layer of the shell wall, the so called «hollow prismatic layer of Snethlage (1905) and Klinghardt (1921), with a typically prismatic-cellular structure in cross-section and with a quadrangular network, is clearly observable. On the contrary the very thin inner layer of the shell wall is feebly distinguishable, while the outermost is not observable.

Remarks. This species is well-known thoroughly and described (e.g. Snethlage, 1905; Klinghardt, 1921; Tavani, 1958) especially by Campobasso & Morolla (1975). Its taxonomic attribution, however, is still uncertain the shell being not completely preserved.

Occurrence. Upper Cenomanian–Lower Turonian (Snethlage, 1905) and Maastrichtian of Alps (Klinghardt, 1921); Maastrichtian of Apulia (Tavani, 1958; Campobasso & Morolla, 1975; Laviano, 1984) and Sicily (Matteucci et al., 1982; Camoin et al., 1983; Camoin, 1985); Maastrichtian of Serbia (Milovanovic, 1933), of Croatia (Polsak, 1965) and Bosnia (Polsak, 1965; Sladic–Trifunovic, 1972), of Montenegro (Pejovic, 1969); Maastrichtian of Turkey (Karakabey, 1959, 1972), Rumania (Lupu, 1967), Bulgaria (Pamouktchiev, 1965).

Genus *Sauvagesia* Bayle, 1887

Sauvagesia cf. *raricostata* Polsak, 1967

Pl. 14, fig. 3

Material. A right valve embedded in the limestone from Santonian–Campanian of the Strada dei Colli, Ostuni (BR).

Description. The diameter of AV is about 5–6 cm. The shell wall structure is clearly prismatic. The ornamentation consists of several sharp ribs whose number, however, cannot be evaluated. The siphonal E band is flat whereas the S band is concave and about four times larger than S. The ligamental ridge is short and triangular.

Remarks. This species was established by Polsak (1967, p. 188, pl. 23, fig. 1; pl. 47, fig. 4, 4a, 4b; pl. 48, fig. 1, 1a, 1b, 2, 2a) for the presence of few prominent ribs in the ornamentation and of the E band four times larger than S. The Ostuni specimen even if very similar to Polsak's species has been assigned to it with some doubt because of its bad preservation.

Occurrence. Santonian–Lower Campanian of Yugoslavia (Polsak, 1967, 1979); Santonian of Rocca di Cave (Carbone et al., 1980); Santonian–Lower Campanian of Apulia (Laviano, 1984).

Sauvagesia tenuicostata Polsak, 1967

Pl. 8, fig. 2; Pl. 10, fig. 1, 3; Pl. 11, fig. 3; Pl. 16, fig. 3, 4

1967 *Sauvagesia tenuicostata* Polsak, p. 189, pl. 50–53.1973 *Sauvagesia tenuicostata* – Plenicar, p. 192, pl. 13, fig. 1.1975 *Sauvagesia tenuicostata* – Civitelli & Mariotti, p. 97, fig. 9.1977 *Sauvagesia tenuicostata* – Pons, p. 75, pl. 73, fig. 1–4.

Material. Four right valves and some fragments, from Santonian–Campanian of Strada dei Colli, Ostuni (BR).

Description. The right valve has a conical–cylindrical shape. The diameter of the larger specimen is about 4.5 cm. The ornamentation consists of continuous small narrow longitudinal costae which are not very wide and, in some specimens, seem to be divided into extremely narrow secondary ribs. No growth laminae are evident. The siphonal bands are hardly perceptible because of the very fine ornamentation present all over the shell. The siphonal E band is flat and more easily identifiable than S which is rib–shaped, but not always distinguishable.

Remarks. The specimens from Ostuni were compared directly with the holotype and the paratypes of *Sauvagesia tenuicostata* preserved in the Institute of Geology of the University of Zagreb. They were found to fit in with the 2nd variety described by Polsak (1967, pl. 53, fig. 1–11), which is characterized by a very fine ornamentation. This ornamentation makes difficult to detect the anterior band and the interband as well as narrow posterior band.

Occurrence. Santonian–Lower Campanian of Istria and of the external Dinarids (Polsak, 1967; Polsak & Mamuzic, 1969); Upper Cretaceous of Slovenia (Plenicar, 1973); Santonian–Lower Campanian of Central Apennines (Civitelli & Mariotti, 1975); Middle–Upper Santonian of the Lerida province, in particular of northern part of the «Conca de Tremps» (Pons, 1977).

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PLATE 7

- Fig. 1 – *Biradiolites monoapterus* (Pirona). Fragment of right valve; it is possible to recognize the characteristic interband in the form of a crest on the left of the siphonal band E. Railway station of Ostuni; x 2.
- Fig. 2 – *Hippurites nabresinensis* Futterer. Internal mould showing the two pillars. Strada dei Colli; x 1.
- Fig. 3a, b – *Biradiolites monoapterus* (Pirona). Longitudinal view of a specimen of conical shape, seen from the siphonal side: it is possible to observe that the siphonal band E (a) is wider than S (b). Railway station of Ostuni; x 1.5.
- Fig. 4 – *Hippurites nabresinensis* Futterer. Natural cross section. Strada dei Colli; x 1.
- Fig. 5 – *Biradiolites monoapterus* (Pirona). Transverse section showing the protruding interband. Neighbourhood of Ostuni town; x 1.
- Fig. 6 – *Biradiolites monoapterus* (Pirona). Longitudinal view of a cylindrical specimen. Fasano; x 1.

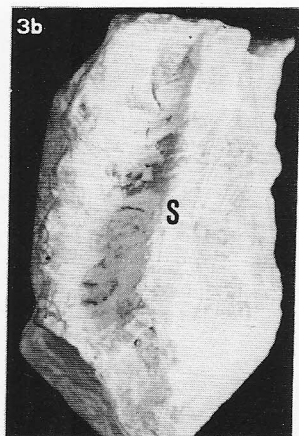
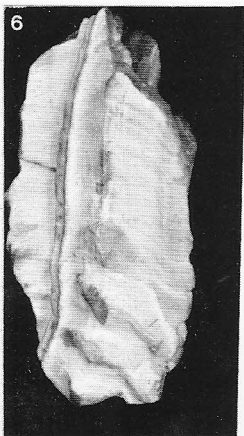
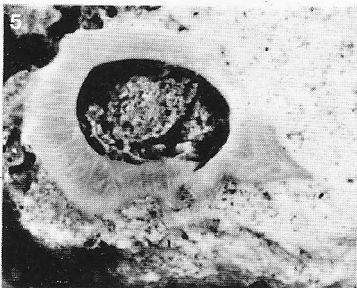
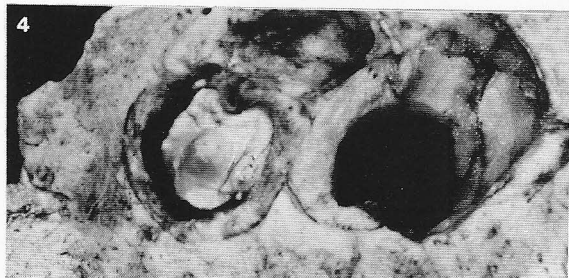
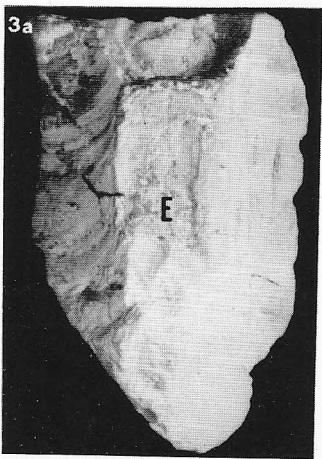
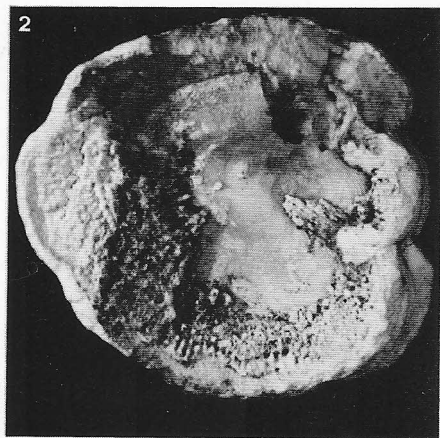
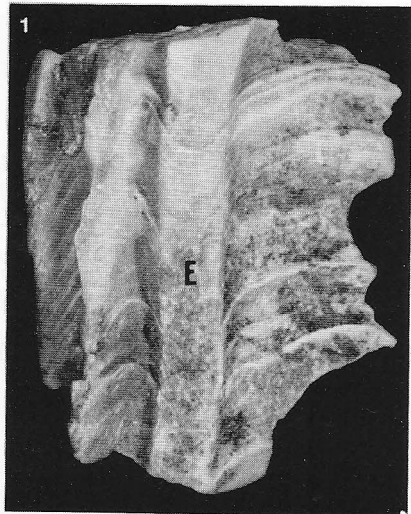


PLATE 8

- Fig. 1a, b — *Biradiolites monoapterus* (Pirona). A conical specimen seen from the siphonal side: a) the siphonal band E with the interband on the left; b) the siphonal band S. Fasano; x 2.
- Fig. 2 — *Sauvagesia tenuicostata* Polsak. Longitudinal view of a right valve showing the siphonal side. Strada dei Colli; x 2.
- Fig. 3 — *Biradiolites monoapterus* (Pirona). A cylindrical specimen seen from the siphonal side. Cisternino; x 1,5.

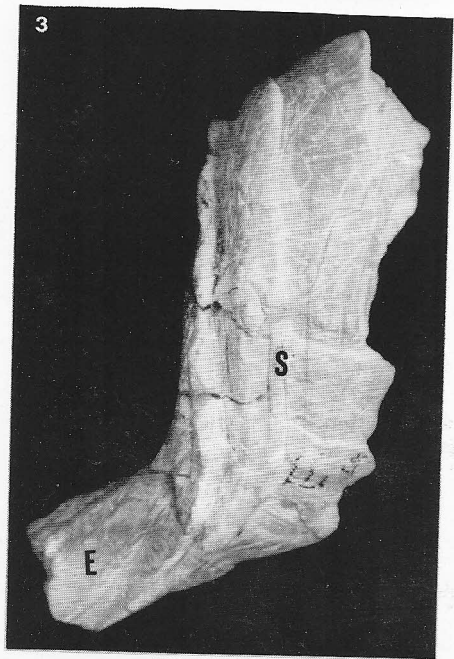
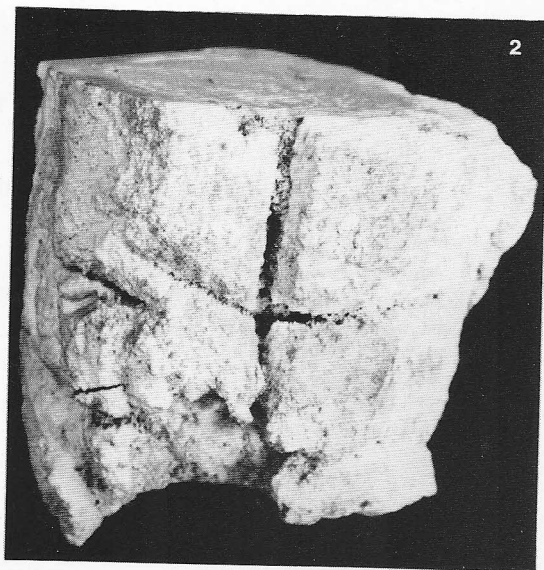
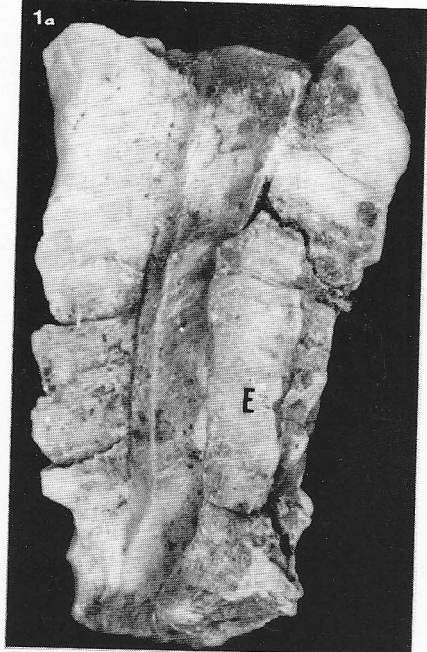


PLATE 9

- Fig. 1 — *Hippurites* cf. *heritschi* Kühn. Cross section of the right valve. Distance from commissure unknown. Ostuni town; x 1.
- Fig. 2 — *Hippurites heritschi* Kühn. Cross section of the right valve. The obliqueness of the section leads to an exaggerated impression of the shell thickness. Tesisca Zaliv, the island of Brac; x 1,5.

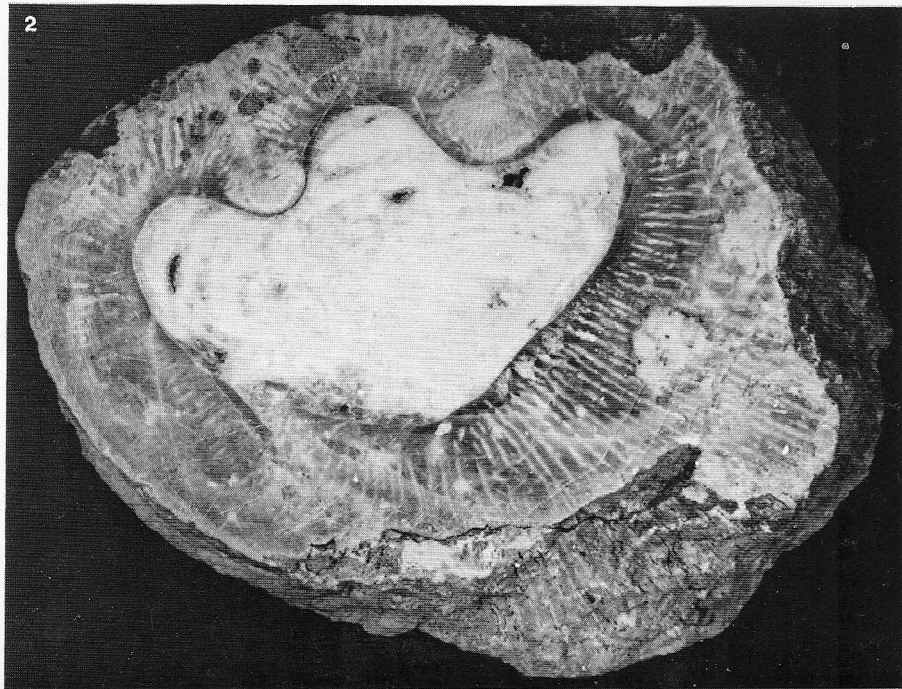
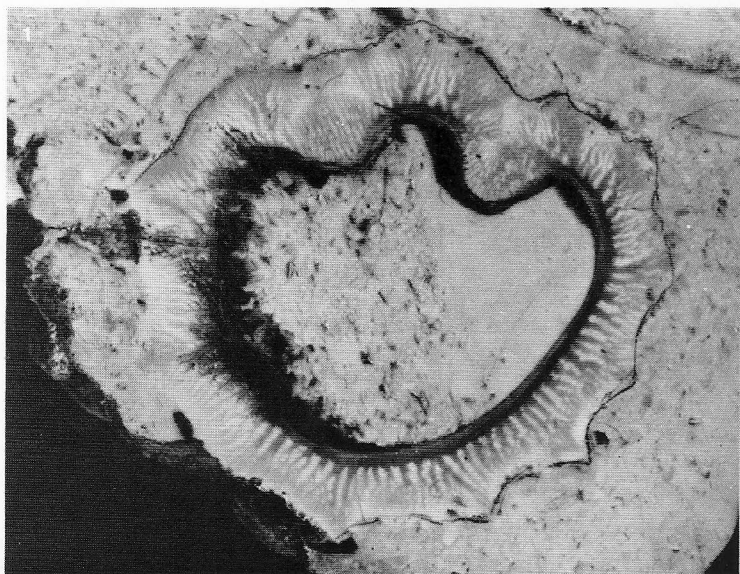
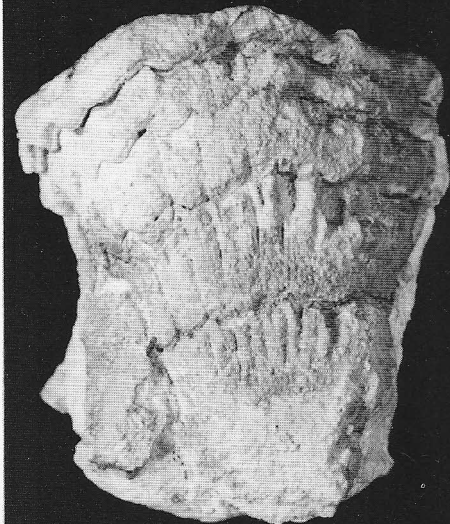


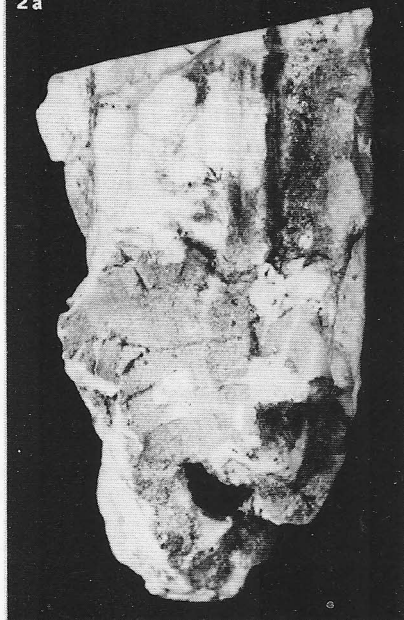
PLATE 10

- Fig. 1 — *Sauvagesia tenuicostata* Polsak. Longitudinal view of a specimen showing the cardinal area. Strada dei Colli; x 1,5.
- Fig. 2a, b — *Biradiolites monopterus* (Pirona). Longitudinal view of a specimen showing the siphonal bands. Cisternino; x 1,5.
- Fig. 3 — *Sauvagesia tenuicostata* Polsak. Transverse section of the right valve of a specimen showing the short, triangular ligamental ridge. Strada dei Colli; x 1,5.

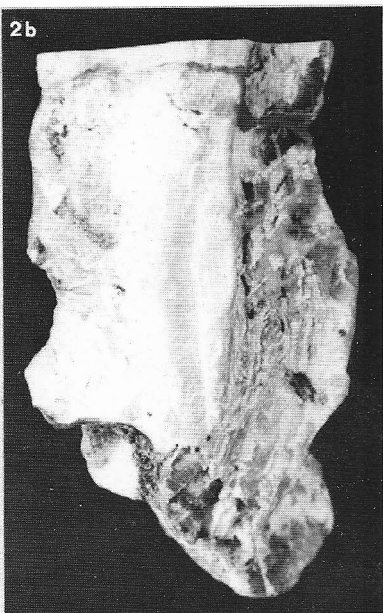
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2a



2b



3

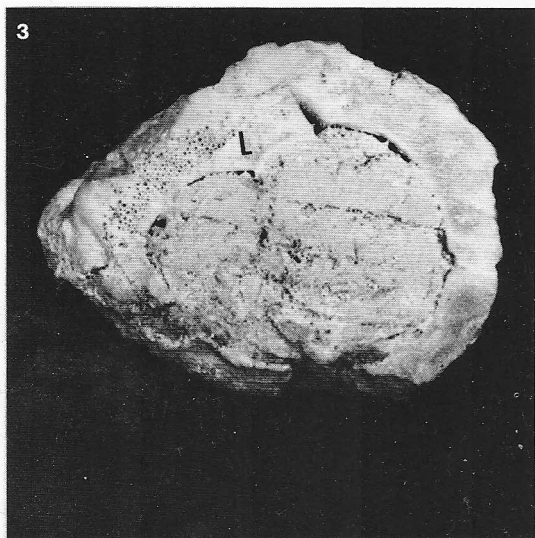


PLATE 11

- Fig. 1 — *Biradiolites monopterus* (Pirona). Longitudinal view of a specimen seen from the posterior side. Railway station of Ostuni; x 2.
- Fig. 2 — *Biradiolites monopterus* (Pirona). A conical specimen which shows the posterior band. Mass.ia Airoidi; x 1,5.
- Fig. 3 — *Sauvagesia tenuicostata* Polsak. Transverse section of a right valve. Strada dei Colli; x 1.
- Fig. 4 — *Biradiolites* sp. A specimen with both valves, seen from the upper side. Mass.ia Airoidi; x 2.
- Fig. 5 — *Biradiolites monopterus* (Pirona). Longitudinal view of a specimen seen from the siphonal band E. Railway station of Ostuni; x 2.

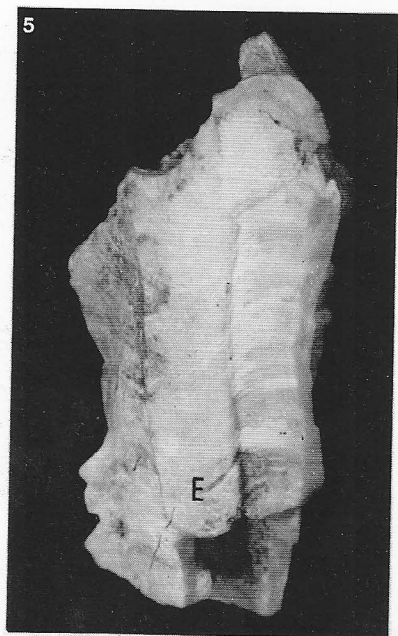
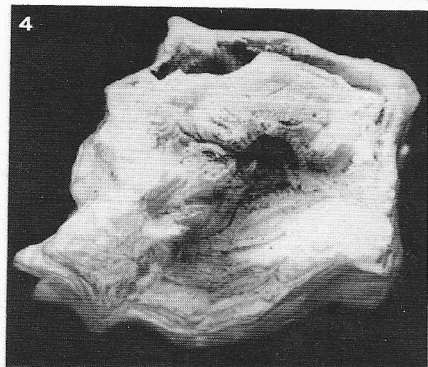
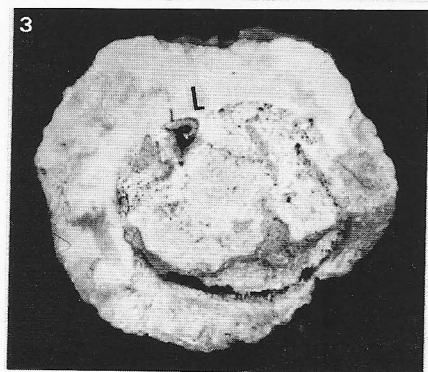
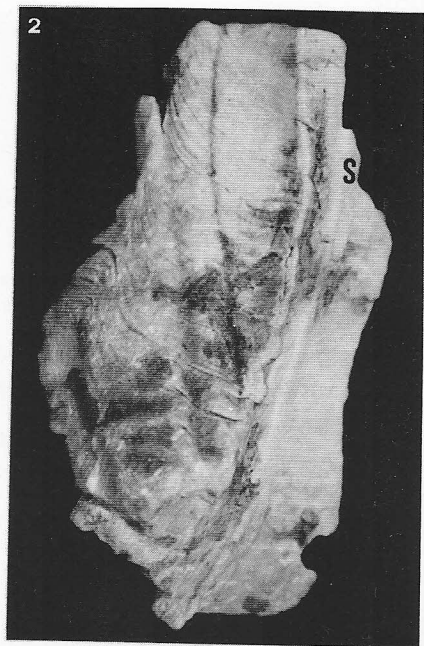
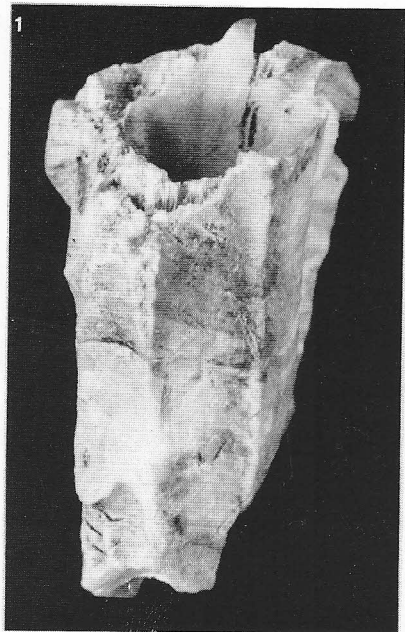


PLATE 12

- Fig. 1 – *Gorjanovicia* cf. *polsaki* Lupu. Natural cross section of the right valve with the shell wall structure completely re-crystallized. Railway station of Ostuni; 1,5.
- Fig. 2 – *Biradiolites angulosus* d'Orbigny. Natural cross section of two right valves showing the ornamentation of the shell. Neighbourhood of Ostuni; x 1.
- Fig. 3 – *Biradiolites angulosus* d'Orbigny. Longitudinal view of a specimen seen from the siphonal side. Cisternino; x 3.
- Fig. 4 – *Hippurites colliciatus* Woodward. Transverse section. Strada dei Colli; x 1,5.

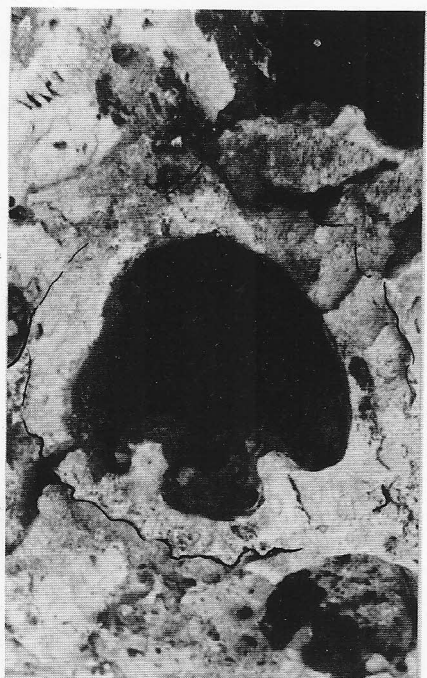
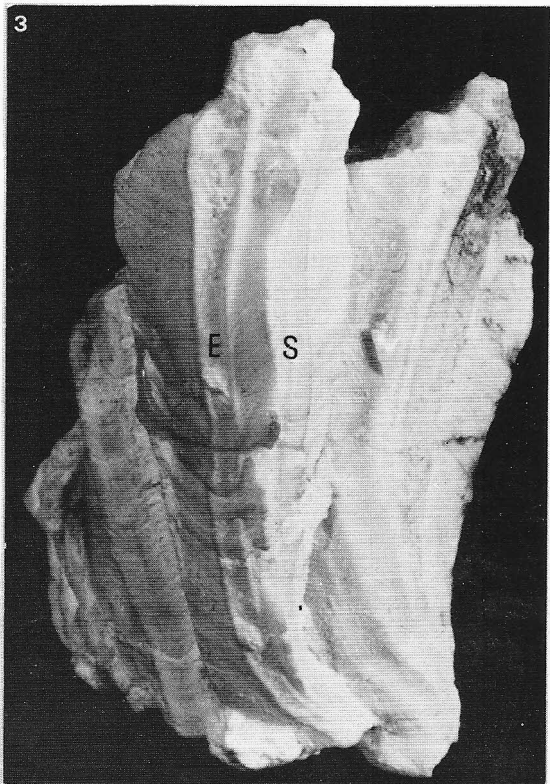
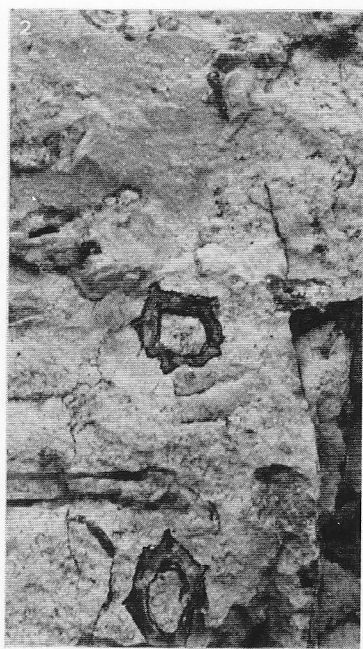


PLATE 13

Fig. 1a, b — *Biradiolites* cf. *martellii* (Parona). Cross sections of the right valve of the same specimen showing the ornamentation consisting of very prominent longitudinal ribs. Railway station of Ostuni; x 2.

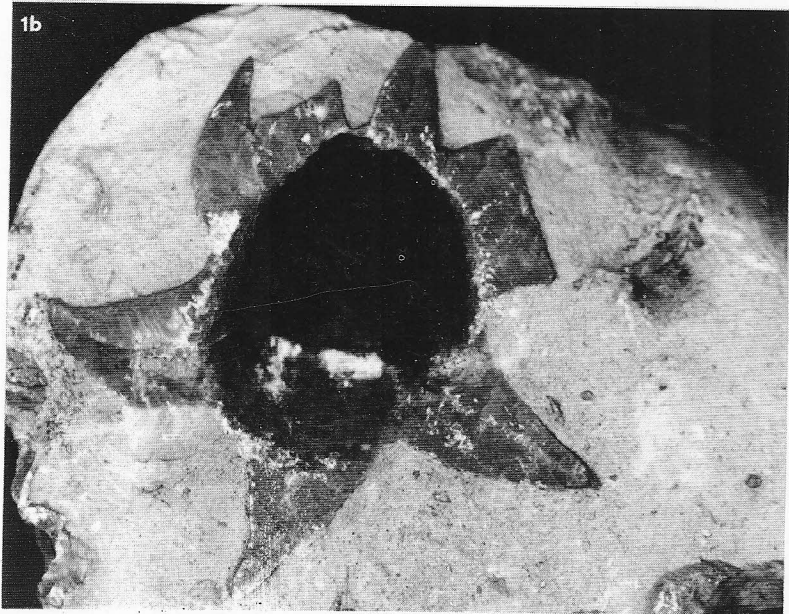
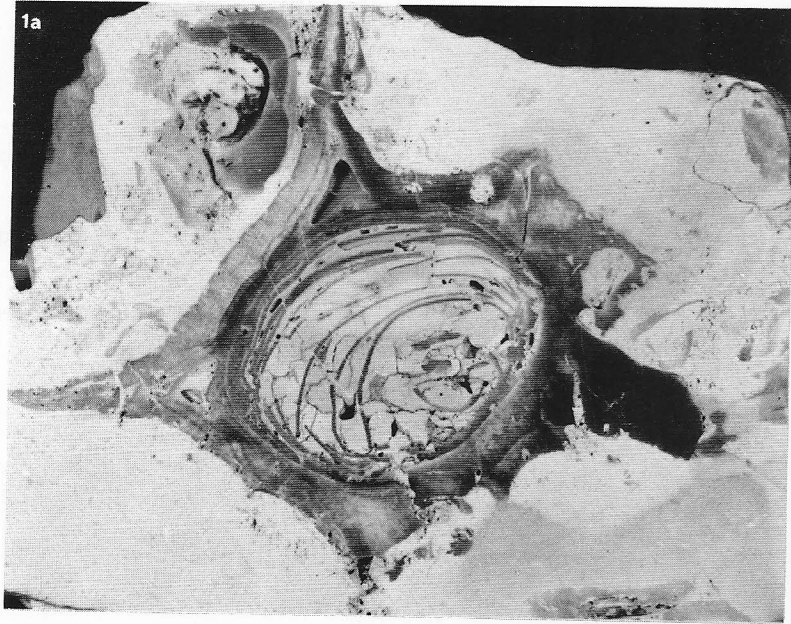


PLATE 14

- Fig. 1 — *Hippurites nabresinensis* Futterer. Natural longitudinal view of a specimen seen from siphonal side. Strada dei Colli; x 1.
- Fig. 2 — *Biradiolites angulosus* d'Orbigny. Natural cross section of two right valves showing the longitudinal sharp-edged ribs. Railway station of Ostuni; x 1,5.
- Fig. 3 — *Sauvagesia* cf. *raricostata* Polsak. Natural cross section of an incomplete right valve showing the characteristic structure of the shell wall. Strada dei Colli; x 1.



PLATE 15

- Fig. 1 — *Joufia* cf. *reticulata* Boehm. Transverse section of an incomplete specimen showing the large median layer of the shell wall. Strada dei Colli; x 1,5.
- Fig. 2 — *Gorjanovicia* cf. *lipparinii* Polsak. Transverse section of a right valve. It is possible to observe the short and triangular ligamental ridge, and the pseudopillars projecting above the inner shell edge. Strada dei Colli; x 1,5.

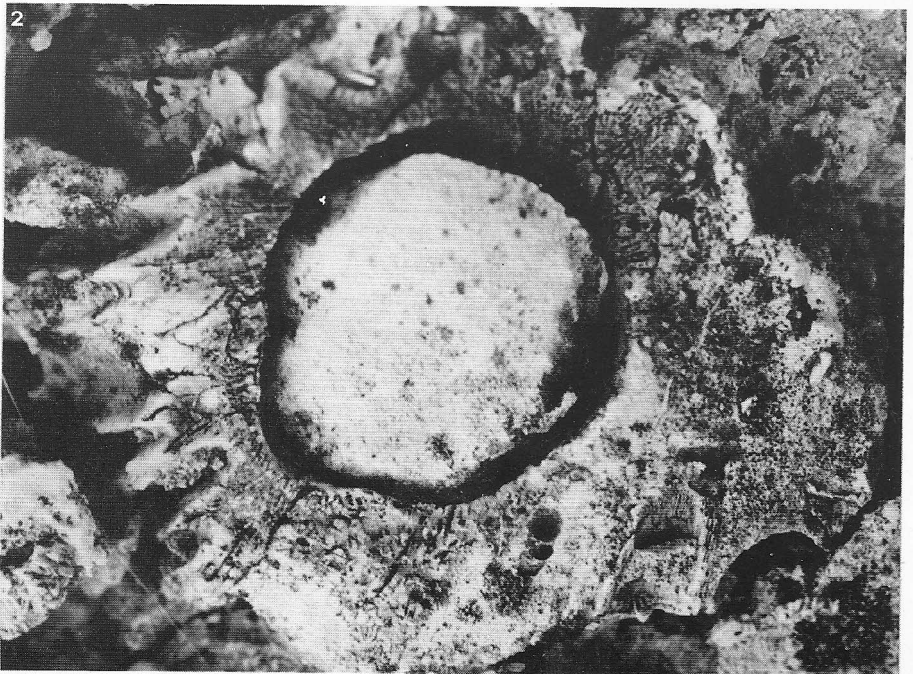
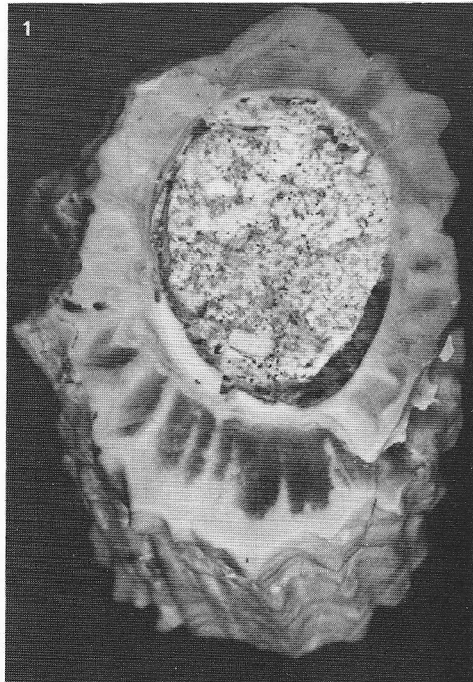


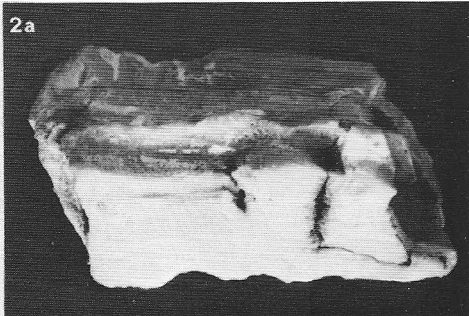
PLATE 16

- Fig. 1 — *Gorjanovicia costata* Polsak. Transverse section of the right valve. Ostuni railway station section; x 1.
- Fig. 2a, b — *Biradiolites* sp. Longitudinal view of the same specimen with both valves. Ostuni railway station section; x 1.
- Fig. 3 — *Sauvagesia tenuicostata* Polsak. Longitudinal view of a right valve showing the cardinal side. Strada dei Colli; x 1.
- Fig. 4 — *Sauvagesia tenuicostata* Polsak. Longitudinal view of a right valve from the siphonal side. Strada dei Colli; x 1.

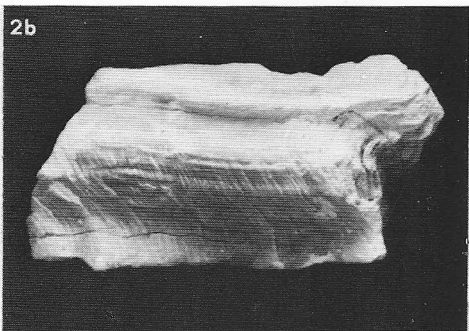
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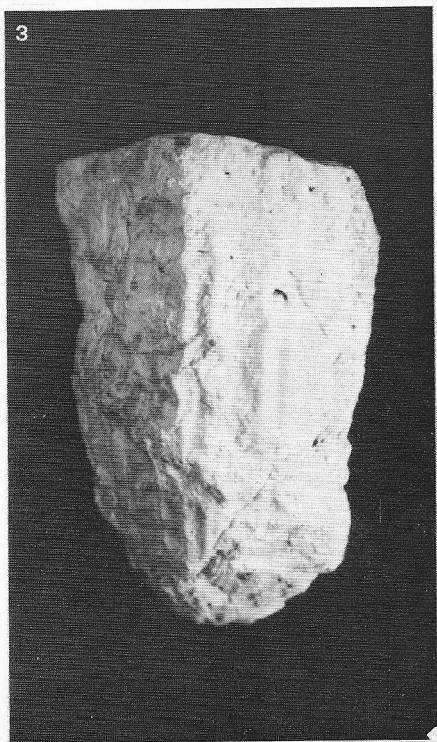
2a



2b



3



4

