

THE OLILOCENE MOLLUSC FAUNA OF THE PIEDMONT BASIN (NORTH-WESTERN ITALY) I. SCAPHOPODA AND ARCHAEOGASTROPODA

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Riassunto. Scopo di questo lavoro è lo studio degli Scaphopoda e degli Archaeogastropoda oligocenici del Bacino Terziario Piemontese (B.T.P.), quale primo contributo alla revisione generale della malacofauna oligocenica di questo Bacino. Sono stati studiati cinque taxa di Scaphopoda e ventotto di Archaeogastropoda; tra questi ultimi viene proposta una nuova specie di *Nerita* (*Theliostyla*).

Abstract. The aim of the present work is to study the Oligocene Scaphopoda and Archaeogastropoda of the Tertiary Piedmont Basin (T.P.B.), aiming towards an overall revision of the Oligocene mollusc fauna of this Basin. Five taxa of Scaphopoda and twenty-eight taxa of Archaeogastropoda have been analysed; among these a new species of *Nerita* (*Theliostyla*) is proposed.

Introduction.

The Oligocene mollusc fauna of the Tertiary Piedmont Basin (here afterwards abbreviated to T.P.B.) as a whole has not been the subject of a systematic study since the monographs of Bellardi & Sacco (1872-1904) and Rovereto (1897-98, 1900, 1914). This paper on Scaphopoda and Archaeogastropoda is the first of a new series. The present revision of the mollusc fauna started as an attempt to recover the types and illustrated specimens in the collections of the Dipartimento per lo Studio del Territorio e delle sue Risorse of the University of Genoa. The research was then extended to other public and private collections, including the Bellardi-Sacco Collection at Turin, for which there was information on the certain or possible presence of Oligocene specimens from the T.P.B. It has been possible to recover and examine almost all the taxa studied by Sacco and Rovereto, with a few exceptions, such as the specimens in the Michelotti Collection at Rome which very probably were lost in the bombing of the Second World War.

The Scaphopoda are represented by four species. The Archaeogastropoda are represented by twenty-five species: one is described as new, one is defined as at comparison level and three are at a non-specific level due to their bad preservation; two specimens have been defined simply as family and two others have remained indeterminate. For four other species reported by Sacco and Rovereto from the Oligocene of the T.P.B. only Miocene examples were found for the Piedmont area (three Archaeogastropoda and one Scaphopoda).

The Tertiary Piedmont Basin: geological framework.

Unfortunately the exact stratigraphic location of the studied material is generally unknown; it can only be confirmed that the specimens have been recovered from Oligocene (Upper Rupelian-Lower Chattian = "Tongrian" sensu Sacco and Rovereto) sediments in various areas of the T.P.B. (Fig. 1), the sedimentary successions of which have been the subject of numerous geological and palaeontological studies since the nineteenth century. The basin, which is characterised by an essentially terrigenous succession of Oligo-Miocene age, began to emerge in the early Oligocene when the transgression started from the north-east of the Padano Sea, overlapping on the internal margin of the Alpine chain and the Ligurian domain. Over the arc of the Oligocene a wide gulf was thus formed, gradually aggrading on the more southern sectors of the Penninic and Ligurian Units, until it reached the present shores of the Ligurian Sea in the south-west, as evidenced by the Celle-Varazze and Cogoleto Conglomerates (Gnaccolini, 1970; Cortesogno et al., 1977). This basin must then have been linked to the sea in which the Arenarie di Ranzano (Ranzano

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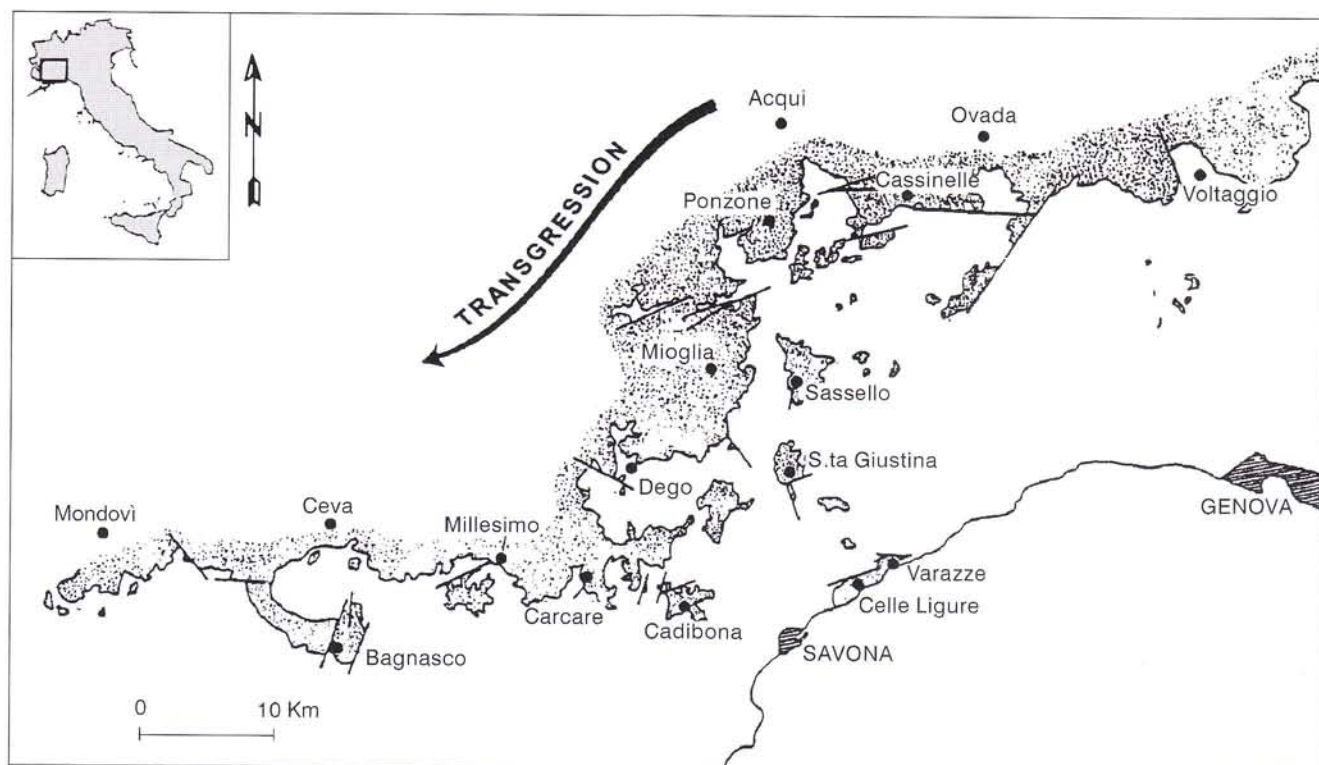


Fig. 1 - Location of the Oligocene of the Tertiary Piedmont Basin (from Lorenz, 1984).

Sandstones) Formation was deposited. Therefore, while marine sedimentation was already taking place in the northern sectors, in the south-western area continental and lagoon basins like those of Bagnasco and Cadibona (Lorenz, 1968) were being formed, to eventually be succeeded by platform environments with a rather complex morphology (Piazza, 1989).

The sedimentary succession on the southern margin has both Alpine and Apenninic tectonic units as its pre-Cenozoic substratum; on the north-eastern margin it is abruptly cut off by the Villalvernia-Varzi line coming into contact with the units of the Voghera Apennine. In the northern and western sectors the T.P.B. sediments are covered by the Plio-Pleistocene deposits of the Asti-Alessandria Basin, re-emerging further north to form the up-thrust front of the "Monferrato Arch" (Bernini & Zecca, 1990). For a more detailed picture of the geodynamic and geological events which characterised the T.P.B. in general, refer to Gelati & Gnaccolini (1982, 1987/88), Giammarino (1984), Biella et al. (1987), Gnaccolini et al. (1990), Miletto & Polino (1992), Falletti et al. (1995).

The here studied mollusc fauna is associated with terrigenous deposits related to the Molare (Oligocene) and Rocchetta (Late Oligocene-Aquitani) Formations. The Molare Formation is composed of continental and marginal-marine deposits, characterised by a considerable variation of facies (conglomeratic, arenaceous, arenaceous-pelitic) which are evidence of both

the varied and complex morphology of the basin's margins and of its gradual deepening during the sedimentation of this formation. The overlying Rocchetta Formation is composed of hemipelagic marls with alternating turbiditic bodies which are evidence of the further basin deepening.

The collections studied.

The collections, from which the material examined in this work comes, belong in part to public institutions and in part to private persons, all found in the Regions of Liguria and Piedmont (North-western Italy). The localities of origin are Carcare, Carpenaro, Carpeneto, Deigo, Giusvalla, Mioglia, Pontinvrea, Stella Santa Giustina, Sassello (all in the Province of Savona), Bandita di Cassinelle, Belforte, Casa di Valla, Cassinelle, Costa di Ovada, Lerma, Merana, Mornese, Squaneto (all in the Province of Alessandria) and Baldissero, Cellamonte Casalese, Colli Torinesi (all in the Province of Turin).

The majority of specimens come from the collections of the Museo Regionale di Scienze Naturali of Turin (587 specimens) and the Dipartimento per lo Studio del Territorio e delle sue Risorse of the University of Genoa (113 specimens); much smaller numbers come from the Museo di Paleontologia of the University of Milan (62 specimens), the Museo Ighina of the Calasanzio Institute of Genoa (14 specimens), the Civico Museo di Storia Naturale of Savona (2 specimens), the Museo Perrando of Sassello (Province of Savona) (12 specimens) and from a private collection (1 specimen).

Collections of the Museo Regionale di Scienze Naturali of the University of Turin. Most of the specimens forming the subject matter of this research come from the Bellardi-Sacco Collection, which is probably the largest collection of Tertiary molluscs in Italy. Thanks to an agreement between the University and the Region of

Piedmont, this collection will be housed in the Museo Regionale di Scienze Naturali of Turin (at present it is housed in premises of the University Museum of Geology and Palaeontology). Its origins go back to the gift of the palaeontological collection of Abbot S. Borson to the University Museum of Natural History; subsequently other collections, such as that of Bonelli, and material collected by a number of research workers, such as A. Sismonda, G. Michelotti, L. Bellardi and B. Gastaldi, were added. Bellardi and Sacco worked on these collections, supplementing them with personal material and various donations, while devising their well-known and impressive monograph "I molluschi dei terreni terziari del Piemonte e della Liguria" (1872-1904).

The Turin collection also holds specimens added after the study of Bellardi and Sacco, and from doctoral research work, for which the provenance is unfortunately unknown.

Collections of the Dipartimento per lo Studio del Territorio e delle sue Risorse of the University of Genoa. Most of the mollusc specimens preserved in this collection, including those of the Oligocene of the T.P.B., are the fruit of the long and enthusiastic research activity of Don Deogratias Perrando, parish priest of S. Giustina, in the hinterland of Savona, from 1857 to 1889. Following an appeal by the Ministry of Education and the City and Province of Genoa, he sold his rich collection to the Regio Museo di Geologia e di Mineralogia of the University of Genoa, in 1886. After his death, other material, which he had collected after the above-mentioned transfer, was donated by his heirs, Giacomo and Giovanni Perrando. In the course of the following years, other specimens, collected by G. Rovereto, were added and, in fairly recent years, further specimens have been received from research workers of the University of Genoa. Unfortunately, all the collections, besides having suffered the consequences of several moves, have been repeatedly and seriously damaged by various floods, which have affected the different premises in which they were housed. Many specimens have disappeared and a considerable number of the original labels which stated the classification and locality have been lost, so that it is not always possible to establish with certainty whether they came from the original Perrando Collection or from the subsequent additions.

Collections of the Dipartimento di Scienze della Terra (Museo di Paleontologia) of the University of Milan. The material includes specimens from recent doctoral research works in the Dipartimento di Scienze della Terra of these University.

Collections of the Museo Ighina of the Calasanzio Institute, Genoa Cornigliano. The collections of this Museum, like that of Perrando at the University, are the result of the collecting activity of a self-taught enthusiast, Father Ighina of the Order of the Scolopi Fathers. He founded the Museum in the College of the Scolopi, at Carcare (Province of Savona), where he was a teacher, probably in 1843. In 1970 the collection was transferred to the new premises of the Calasanzio College at Genoa Cornigliano and the salvaging of the various items began in order to exhibit them. The collections include palaeontological, geological, mineralogical, botanical, zoological, palaeoethnological and archaeological material as well as an important collection of Tertiary mollusc-fauna, some specimens of which undoubtedly come from the Oligocene of the T.P.B., although they are generally unclassified and often of unknown provenance.

Collections of the Civico Museo di Storia Naturale, Savona. The Museum was established between 1851 and 1860 as the teaching Museum of the College of Lazarist Missionaries of Savona, as a result of the work of the naturalist Father A. David. In 1889, the collection, which also included a small palaeontological collection (mainly fossils of the Oligocene and Pliocene of the Savona area), was donated to the City of Savona by Father David. Over the years, various private donations have enriched the collection; particular is that of Count E. Piccone, which included some rich palaeontological material consisting of

Oligocene and Pliocene fossils from the Savona area. In 1901 the Museum was officially inaugurated with the name of "Civico Museo Ornitologico"; since then other palaeontological collections (for example that of Pacini-Candelo and the material of the Savona Alpine Club Museum) have been added to those already existing. Unfortunately, the Museum, the Pozzobonelli Palace, was hit by bombs during the Second World War and, for all practical purposes, it has ceased to exist as a place of exhibition. For the most part, the palaeontological material was saved, but while the Ligurian Pliocene mollusc fauna has been reorganized, that of the Oligocene remains largely unclassified and of uncertain provenance.

Collections of the Museo Perrando, Sassello (Province of Savona). The collections include specimens collected by the above mentioned Don Perrando and by other individuals. This material is also often unclassified and/or of unknown or uncertain provenance. However, the here studied specimens are certainly from the Oligocene of the T.P.B., principally from the Sassello - S. Giustina area.

A search was also conducted at the Museo di Paleontologia of the Dipartimento di Scienze della Terra of the University of Rome, as Sacco referred to some specimens of the Michelotti Collection. Unfortunately the Michelotti Collection was severely damaged during the last War and our search came to nothing.

Systematic palaeontology.

The general classification outline follows that of Ponder & Warén (1988) and Haszprunar (1988) for the Gastropoda and that of the Treatise on Invertebrate Palaeontology, Part I; Mollusca 1 (Moore R. C., Ed., 1960) for the Scaphopoda, with some modifications according to recently proposed changes (for the Gastropoda: Beu & Ponder, 1979; Hickman & McLean, 1990; for the Scaphopoda: Emerson, 1962; 1978; Palmer, 1974).

The material studied is housed in the Museo Regionale di Scienze Naturali of Turin (Dipartimento di Scienze della Terra of the University of Turin) (MRSN, BS for the Bellardi-Sacco Collection), the Dipartimento per lo Studio del Territorio e delle sue Risorse of the University of Genoa (DSTRG), the Museo di Paleontologia del Dipartimento di Scienze della Terra of the University of Milan (MPUM), the Museo Ighina of the Calasanzio Institute of Genoa (MICG), the Civico Museo di Storia Naturale of Savona (MSNS), the Museo Perrando of Sassello (MPS), a private collection.

The following symbols have been used for the shell dimensions:

- a) Gastropoda: NW, number of whorls; PD, protoconch diameter; H, height of shell; hs, height of spire; hw, height of body whorl; D, maximum diameter; MSA, mean spire angle;
- b) Scaphopoda: l, length; ha, height of arch; D1, anterior diameter; D2, posterior diameter.

The partial dimensions of incomplete shells are indicated by an asterisk. The dimensions of the holotypes, lectotypes, illustrated specimens and new species have been reported.

Class Scaphopoda Bronn, 1862
 Family Dentaliidae Gray J. E., 1834
 Genus *Dentalium* Linnaeus, 1758
 Subgenus *Dentalium* s. str.

***Dentalium (Dentalium) novemcinctum* Sacco, 1897**

Pl. 1, Fig. 1

- 1897 *Dentalium (Dentalium ?) novemcinctum* Sacco, pt. 22, pp. 97-98, pl. 7, fig. 97 (2 figs.).
 1984 *Dentalium novemcinctum* Sacco - Ferrero Mortara et al., p. 303, pl. 56, fig. 1.

Material. Sassello (SV): the holotype of *Dentalium novemcinctum* (Sacco, 1897, pt. 22, pl. 7, figs. 97', 97''), MRSN BS.106.01.045 (shell without aperture and apex).

Description. The specimen in hand is a short, linear fragment of a tubular shell. The sculpture consists of nine strong, rounded, longitudinal and well spaced ribs, almost all alternating with weaker riblets. The growth lines are not visible.

Dimensions (mm):	l	ha	D1	D2
MRSN BS.106.01.045	12.45*	-	5.6*	4.5*

Remarks. Sacco (1897) observed that this form could be likened, due to the number of ribs, to *Antale novemcostatum* (= *Antalis novemcostata* (Lamarck, 1818), actually living in Atlantic) and, due to the other characteristics, to *Antale kickxii* (= *Antalis kickxii* (Nyst, 1843)) (see original illustration), but stated that for a certain attribution better specimens would be necessary (he worked on a single specimen). The species of Sacco differs from *Antalis kickxii* (see good illustrations in Baldi, 1963, 1973) in that the primary ribs are less numerous and are rounded and stronger. *Antalis novemcostata* has nine strong ribs, but no alternating riblets. Some resemblances to *Fissidentalium mutabile* (Hörnès, 1856) from Middle-Upper Miocene of Parathethys and Mediterranean (primary ribs and presence of secondary riblets) are noted, but the shell in hand does not have the typical fine reticulation on the surface. *Antalis inaequicostata* (Bucquoy, Dautzenberg & Dollfus, 1886), a Mediterranean Pliocene-Recent species, is also very similar to the present form in having nine or ten strong ribs alternating with weaker riblets, but its surface is characterised by a longitudinal thread. On the basis of these observations we maintain the validity of the Sacco species.

The species is assigned to the genus *Dentalium* subgenus *Dentalium* s. str. on the basis of: shell polygonal in section, decidedly ribbed with rounded ribs.

Occurrence. *Dentalium novemcinctum* is known only in the Oligocene of the T.P.B. (Sacco, 1897).

Genus *Antalis* H & A. Adams, 1854

***Antalis acuta* Hèbert, 1849**

Pl. 1, Fig. 4

- 1849 *Dentalium acutum* Hèbert, p. 469.
 1857 *Dentalium grande* Deshayes - Sismonda, p. 6.
 1849 *Dentalium acutum* Hèbert, 6, p. 469.
 1865 *Dentalium acutum* Hèbert - von Könen, p. 514.
 1877 *Dentalium* cfr. *grande* Deshayes - Hörnès, p. 369.
 1893 *Dentalium acutum* Hèbert - van den Broek, p. 275.
 1892 *Dentalium acutum* Hèbert - von Könen, 10 (4), pp. 977-978, pl. 59, figs. 1a-c.
 1897 *Dentalium (Entalis)* cfr. *acuta* Hèbert var. *apenninica* p. Sacco - Sacco, pt. 22, p. 106-107, pl. 9, figs. 14-16.
 1900 *Dentalium* (sect. *Fustiaria*) *apenninicum* (Sacco) Rovereto - Rovereto, p. 128, pl. 9, fig. 15.
 1904 *Entalis apenninicus* Sacco - Sacco, pt. 30, p. 134.
 1908 *Entalis apenninicus* Sacco - Canestrelli, p. 63.
 1909 *Dentalium (?Entalis) acutum* Hèbert - Bellini, pp. 227-228.
 1920 *Entalis* cfr. *acuta* var. *apenninica* Sacco - Lombardini, p. 32.
 1936 *Dentalium acuta* Hèbert var. *apenninica* Sacco - Noszky, p. 83
 1950a *Dentalium acutum* Hèbert - Malaroda, p. 190, pl. 5, fig. 22; pl. 7, fig. 18.
 1967 *Dentalium apenninicum* Sacco - Lorenz, p. A105, pl. 36, fig. 5.
 1973 *Dentalium apenninicum* (Sacco) - Baldi, p. 337, pl. 50, fig. 8.
 1984 *Entalis ?* cfr. *acuta* (Hèbert) var. *apenninica* Sacco - Ferrero Mortara et al., p. 307, pl. 55, fig. 10.
 1986 *Dentalium acutum* Hèbert - Piccoli et al., p. 214, tab. 1.
 1987 *Dentalium acutum* Hèbert - Piccoli, Sartori & Franchino, p. 362.
 1990 *Dentalium (Antalis) acutum* Hèbert - Baglioni Mavros, p. 249.
 1997 *Dentalium (Antalis) acutum* Hèbert - Bonci et al., pp. 57-58, pl. 2, figs. 6a, b.

Material. Carcare (SV): paralectotypes of *Dentalium* cfr. *acuta* var. *apenninica*, 9 spms., MRSN BS.106.03.009/02; 1 spm., DSTRG 2168/CM-VII-C78. Carpenaro (SV): 1 spm., MPUM 8403. Carpeneto (SV): paralectotypes of *Dentalium* cfr. *acuta* var. *apenninica*, 15 spms., MRSN BS.106.03.009/03. Cassinelle (AL): paralectotypes of *Dentalium* cfr. *acuta* var. *apenninica*, 4 spms., MRSN BS.106.03.009/04. Deago (SV): the lectotype (herein designated) of *Dentalium* cfr. *acuta* var. *apenninica* (Sacco, 1897, pt. 22, pl. 9, fig. 15), MRSN BS.106.03.008; the illustrated paralectotype of *Dentalium* cfr. *acuta* var. *apenninica*, (Sacco, 1897, pt. 22, pl. 9, fig. 16), MRSN BS.106.03.009; paralectotypes of *Dentalium* cfr. *acuta* var. *apenninica*, 5 spms., MRSN BS.106.03.009/01. Sassello (SV): the illustrated paralectotype of *Dentalium* cfr. *acuta* var. *apenninica*, (Sacco, 1897, pt. 22, pl. 9, fig. 14), DSTRG 1173/Sa-II-S10, Perrando Collection; the specimen of *Dentalium apenninicum* illustrated by Rovereto (Rovereto, 1900, pl. 9, fig. 15), DSTRG 2105/Sa-II-S48; 12 spms., DSTRG 2019/Sa-II-S115. T.P.B., locality unknown: 1 spm., MPS 1314. All the material consists of shells which are usually deformed and with large lacunae; only the illustrated types from Deago are in a fairly good state of preservation.

Dimensions (mm)	l	ha	D1	D2
MRSN BS.106.03.008 (lectotype)	27*	0	6.7 min 7.65 max	4 min 4.3 max
MRSN BS.106.03.009	32.7*	0	5.5 min 8 max	4
DSTRG 1173/Sa-II-S10	42.6*	0	8.1* min 10.2* max	3.15* min 3.75* max
DSTRG 2105/Sa-II-S48	37.3*	1	6* min 8.4* max	3.7*

Remarks. The tubular shells are generally linear or only slightly curved. The sculpture consists of fine, closely spaced longitudinal ribs, frequently but irregularly alternating with weaker riblets.

Sacco (1897), when designating the variety *apenninica*, left the attribution to *Dentalium acutum* in doubt because of the poor state of preservation, common to all the Oligocene specimens. Rovereto (1900) examined the Sacco (1897) variety again and raised it to the status of a species. In his 1904 revision Sacco accepted Rovereto's new definition. In later references it can be found either as a variety of *Antalis acuta* (Noszky, 1936; Lombardini, 1920; Martinis, 1955) or as a valid species (Canestrelli, 1908; Lorenz, 1967; Baldi, 1973). Instead, other authors (Piccoli et al., 1986, 1987; Baglioni Mavros, 1990) consider it as simply synonymous with the Hèbert species. We concur with these last authors because the analysis of the numerous specimens in hand shows that the diagnostic characteristic of the var. *apenninica* ("in regione media costicillae costis plerumque alternae") has a high variability and consequently it is not sufficient for a distinction from the nominal species.

As the specimens in hand lack the apex, it is impossible to observe the presence of an apical notch (see genus *Antalis*) or a slit (see genus *Fissidentalium*). We therefore assign this species to the genus *Antalis* on the basis of: the absence on the surface of granulation or fine reticulation (see Pavia, 1991).

Occurrence. *Antalis acuta* is known in the Oligocene of the T.P.B. (Sacco, 1897; Rovereto, 1900; Lorenz, 1967), and in the Early to Middle Oligocene of the Triveneto (Hörnes, 1877; Martinis, 1955; Piccoli et al., 1986). It is also known in the Late Eocene to Middle Oligocene of the Paris Basin, in the Late Eocene to Early Oligocene of the Transcaspian area (Baglioni Mavros, 1990), in the Early Oligocene of Belgium, Northern Germany (Malaroda, 1950a), and the Upper Danube Basin (Baglioni Mavros, 1990) and in the Late Oligocene of Hungary (Baldi, 1973).

***Antalis kickxii* (Nyst, 1843)**

Pl. 1, Fig. 2

- 1843 *Dentalium Kickxii* Nyst, pp. 342-343, pl. 9, fig. 1.
 1865 *Dentalium Kickxi* Nyst - von Schauroth, p. 221.
 1867 *Dentalium Kickxi* Nyst - von Könen, pp. 67-68, n. 105.
 1877 *Dentalium Kickxi* Nyst - Hèbert, p. 352.
 1878 *Dentalium Kickxi* Nyst - Credner, p. 648.
 1893 *Dentalium Kickxi* Nyst - van den Broek, p. 286.
 1900 *Dentalium* (sect. *Fustiaria*) *Kickxi* Nyst - Rovereto, p. 129.
 1904 *Dentalium* (*Fustiaria*) *Kickxi* Nyst - Sacco, pt. 30, p. 134.
 1949 *Dentalium Kickxi* Nyst - Gillet, p. 68.
 1963 *Dentalium Kickxi* Nyst - Baldi, p. 83, pl. 7, fig. 13.
 1970 *Dentalium Kickxi* Nyst - Mandruzzato, p. 270.
 1973 *Dentalium Kickxi* Nyst - Baldi, p. 336, pl. 50, figs. 6-7.
 1975 *Dentalium* (s. s.) *Kickxi* Nyst - van den Bosch et al., pl. 2, fig. 6.

Material. T.P.B. locality unknown: 2 spms., MPS 458-459 (small fragments slightly crushed). The specimen mentioned in the Upper Rupelian of Sassello by Rovereto (1900) has not been found.

Remarks. We attribute the two fragments from the Museo Perrando collection to the species on the basis of the type of sculpture: dense and rather flat ribbing, with stronger and narrower, irregularly alternating ribs.

Rovereto (1900) pointed out that this species was clearly different from *Dentalium appenninicum* (now *Antalis acuta*) in that it exhibits stronger and less numerous ribs. We concur with this opinion, because in *Antalis kickxi* the ribs are stronger, wider, less numerous and dense. The comparison with the closely related European and North-African Miocene *Fissidentalium badense* (Parsch in Hörnes, 1856) confirms Baldi's (1973) observations on the distinction from these species: in *Antalis kickxii* the strong growth lines typical of *Fissidentalium badense* are absent.

As regards the assignment to the genus *Antalis* the same observations made for *Antalis acuta* are applied.

Occurrence. *Antalis kickxii* is a species known from North European Oligocene, sporadically present in the Mediterranean Province; it arrived in the Paratethys in the Oligocene and also, with a subspecies, in the most ancient Miocene (Baldi, 1973).

Family Laevidentaliidae Palmer, 1974

Genus *Laevidentalium* Cossmann, 1888

***Laevidentalium simplex* (Michelotti, 1861)**

Pl. 1, Fig. 3

- 1861 *Dentalium simplex* Michelotti, p. 136, pl. 13, figs. 12, 13.
 1897 *Dentalium* (*Antalis*) *simplex* (Michelotti) - Sacco, pt. 22, p. 106, pl. 9, figs. 1-6.
 1900 *Dentalium* (sect. *Fustiaria*) *simplex* Michelotti - Rovereto, pp. 128-129.
 1904 *Entalis simplex* (Michelotti) - Sacco, pt. 30, p. 134.
 1909 *Entalis simplex* (Michelotti) - Bellini, p. 228.
 1915 *Dentalium simplex* Michelotti - Fabiani, p. 268.
 1936 *Dentalium simplex* Michelotti - Noszky, p. 83.
 1940 *Entalis simplex* Michelotti - Noszky, p. 51.
 1967 *Dentalium simplex* Michelotti - Lorenz, p. A105, pl. 36, figs. 6a, b.
 1973 *Dentalium simplex* Michelotti - Baldi, p. 338, pl. 51, fig. 3.
 1984 *Entalis simplex* (Michelotti) - Ferrero et al., p. 306.
 1990 *Dentalium simplex* Michelotti - Baglioni Mavros, p. 249.
 1997 *Dentalium* (*Antalis*) *simplex* Michelotti - Bonci et al., p. 58, pl. 2, figs. 7a, b.

Material. Belforte (AL): 7 spms., DSTRG 2365/Po-VIII-C41 (locality Ciapin). Carcare (SV): the specimen illustrated by Sacco (1897, pt. 22, pl. 9, fig. 2), MRSN BS.106.03.002; 1 spm., MRSN BS.106.03.002/02; 2 spms., MRSN BS.106.03.002/03; 4 spms., MRSN BS.106.03.002/04; 1 spm., MRSN BS.106.03.002/05 (spm. on matrix). Casa di Valla (AL), locality Cascina Cardinali: 28 spms, MPUM 8404. Cassinelle (AL): the specimen of *Dentalium simplex* illustrated by Sacco (1897, pt. 22, pl. 9, fig. 3), MRSN BS.106.03.002bis; 7 spms., MRSN BS.106.03.002/06; 1 spm. MRSN BS.106.03.002/07. Deگو

(SV): the specimen of *Dentalium simplex* illustrated by Sacco (1897, pt. 22, pl. 9, fig. 1), MRSN BS.106.03.001; 5 spms., MRSN BS.106.03.002/01; Giusvalla (SV): 20 spms., DSTRG 2104/M-VII-G1. Merana (AL), locality Rio dei Mori: 9 spms, MPUM 8405. Mioglia (SV): the specimen illustrated by Sacco (1897, pt. 22, pl. 9, fig. 6), DSTRG 1899/M-III-M13a; 1 spm. DSTRG 1899/M-III-M13b. Sassello (SV): the specimen of *Dentalium simplex* illustrated by Sacco (1897, pt. 22, pl. 9, fig. 4), DSTRG 1174/Sa-II-S11; 43 spms., DSTRG 2018/Sa-II-S114; 1 spm., MRSN BS. 106.03.002/08. Sassello (SV), locality Maddalena: 6 spms, MPS 893-898. Squaneto (AL): the specimen of *Dentalium simplex* illustrated by Sacco (1897, pt. 22, pl. 9, fig. 5), DSTRG 2103/M-I-S1, Perrando Collection. T.P.B. locality unknown: 4 spms., MRSN BS.106.03.002/09. All the material consists of shells which are more or less lacunose and, at times, deformed and fractured; in other cases they are moulds.

Other locality of the T.P.B. mentioned by Michelotti (1861) and Sacco (1897): Pareto (SV).

Dimensions (mm):	l	ha	D1	D2
DSTRG 1174/Sa-II-S11	38.6	*1*	6*min 6.65*max	4*
DSTRG 1899/M-III-M13a	22.5*	2*	5*	3*
DSTRG 2103/M-I-S1	19.7*	0.8*	5.55*	4.2*
MRSN BS.106.03.001	21.8*	1*	5*	3
MRSN BS.106.03.002	25.2*	1*	5.5*	4*

Remarks. The present species is well known, clearly defined and does not require further descriptive remarks. The specimens in hand were identified without problems on the basis of these diagnostic characteristics: slightly curved tubular shell, thick walled and circular in section shell, with smooth surface. It is not possible to verify whether the depressed riblets, mentioned by Sacco (1897) and Bellini (1909), are present in the apical region, as all known specimens lack apex.

We assign this species to the genus *Laevidentalium* on the basis of: 1) shell circular in section, slightly curved; 2) smooth surface with growth lines only; 3) apex with a short concave apical notch.

Occurrence. *Laevidentalium simplex* is common in the Oligocene of the T.P.B. (Sacco, 1897; Rovereto, 1900) and Veneto (Fabiani, 1915). The species is well known in the Oligocene of the Mediterranean area and in the Late Oligocene of the Paratethys (Hungary) (Baldi, 1973).

Class Gastropoda Cuvier, 1797
Subclass Prosobranchia Milne Edwards, 1848
Superorder Archaeogastropoda Thiele, 1925
Order Docoglossa Troschel, 1861
Superfamily Patelloidea Rafinesque, 1815
Family Acmaeidae Carpenter, 1857
Genus *Patelloida* Quoy & Gaimard, 1834
Patelloida pyramidalis (Rovereto in Sacco, 1897)

Pl. 1, Fig. 6

1897 *Patella pyramidalis* Rovereto in Sacco, pt. 22, pp. 22-23, pl. 2, figs. 83-84.

1897 *Patella pyramidalis* Rovereto in Sacco var. *gracilicosta* Sacco, pt. 22, p. 23, pl. 2, figs. 85-86.

Material. Mornese (AL), locality Cascina Mezza Monta: 2 spms., MPUM 8406-8407 (shells in a rather good state of preservation).

Description. Shell small, patelliform, rather high, slightly subpolygonal; apex eccentric toward the anterior margin. Surface radially ribbed with an irregular alternation of thicker and tinner ribs. Inner surface not visible.

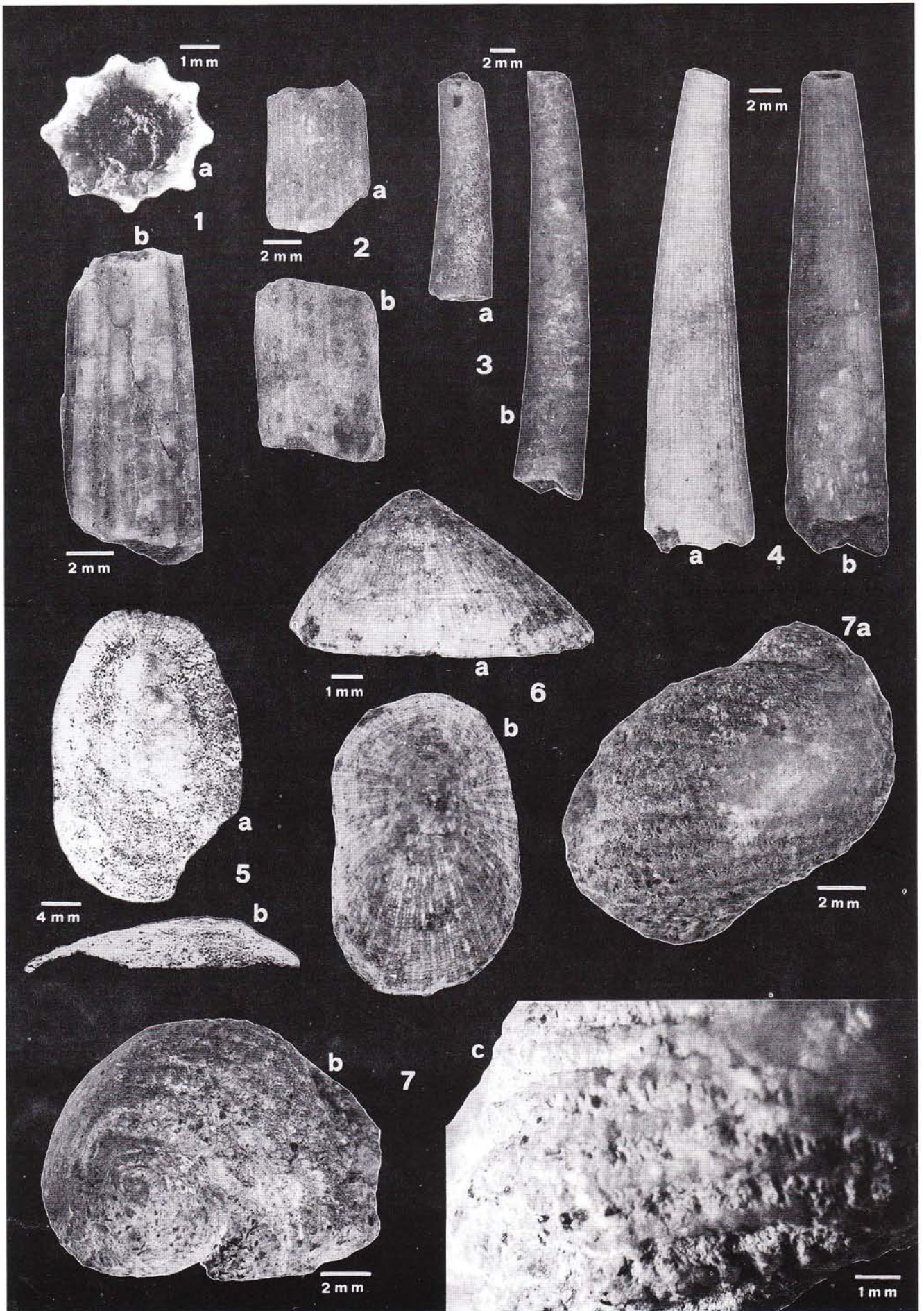
Remarks. The specimens in hand are allocated in the genus *Patelloida* on the basis of: 1) small size; 2) sculptural features; 3) anterior position of the apex. However, this assignment is made with some reservation, the diagnostic characters of the Patelloidea largely resting on the soft parts. The Eocene shell from Colli Berici (Vicenza province) figured by Fabiani (1908) and referred to as *Patella boreau* Bayan, 1870 has approximately the same size as the present material and seems to be closely related in having quite similar shape and sculpture.

Occurrence. *Patelloida pyramidalis* was hitherto reported from Early Miocene deposits of Colli Torinesi (Sacco, 1897).

Family Patellidae Rafinesque, 1815
Genus *Patella* Linnaeus, 1758
Subgenus *Cymbula* H. & A. Adams, 1854

PLATE 1

- Fig. 1 - *Dentalium (Dentalium) novemcinctum* Sacco, 1897. Holotype. Sassello (SV). MRSN BS.106.01.045; a) reproduced from Ferrero et al. (1984, pl. 56, fig. 1).
Fig. 2 - *Antalis kickxii* (Nyst, 1843). T.P.B. locality unknown. MPS 259-260.
Fig. 3 - *Laevidentalium simplex* (Michelotti, 1861). a) Illustrated specimen in Sacco (1897, pt. 22, pl. 9, fig. 5). Squaneto (AL). DSTRG 2103/M-I-S1. b) Illustrated specimen in Sacco (1897, pt. 22, pl. 9, fig. 4). Sassello (SV). DSTRG 1174/Sa-II-S11.
Fig. 4 - *Antalis acuta* Hébert, 1849. a) Paralectotype of the var. *apenninica* Sacco, 1897 illustrated in Rovereto (1900, pl. 9, fig. 15). Sassello (SV). DSTRG 1173/Sa-II-S10. b) Lectotype of the var. *apenninica* Sacco, 1897. Dego (SV). MRSN BS.106.03.008.
Fig. 5 - *Patella (Cymbula?) excrenata* (Sacco, 1897). Lectotype. Dego (SV). MRSN BS.085.02.001; a) top view, b) side view. Reproduced from Ferrero et al. (1984, pl. 52, fig. 2).
Fig. 6 - *Patelloida pyramidalis* (Rovereto in Sacco, 1897). Mornese (AL) loc. Cascina Mezza Monta. MPUM 8406; a) side view, b) top view.
Fig. 7 - *Neritopsis radula* (Linnaeus, 1758) subsp. *subpustulosa* Sacco, 1896. Lectotype. Sassello (SV). MRSN BS. 071.01.001; a) abapertural side, b) top view, c) detail of the sculpture.



Patella (Cymbula?) excrenata (Sacco, 1897)

Pl. 1, Fig. 5

- 1861 *Patella crenata* Michelotti, p. 135, pl. 13, figs. 14-15.
 1889 *Patella crenata* Michelotti - Sacco, N° 1746.
 1897 *Patella (Cymbula ?) excrenata* Sacco, pt. 22, pp. 23-24, pl. 2, figs. 91-92 (2 figs.).
 1940 *Cymbula* aff. *excrenata* Sacco - Noszky, p. 9.
 1984 *Cymbula ? excrenata* Sacco - Ferrero Mortara et al., p. 281, pl. 52, figs. 2a, b.

Material. Costa (AL), locality Case Meriadda: 4 spms., DSTRG 2351/Ov-VI-CM7. Dego (SV): the lectotype (herein designated) of *Patella excrenata* (Sacco, 1897, pt. 22, pl. 2, fig. 91), MRSN BS. 085.02.001 (shell in a poor state of preservation, lacunose). The specimens in the Rome collection (the locality "Colli Torinesi" in the legend of pl. 2, fig. 92 is wrong, and should be "Mornese" or "Dego") have not been found.

Other locality of the T.P.B. mentioned by Sacco (1897): Mornese (AL).

Description. Shell patelliform, depressed, suboval, lightly compressed at the sides; apex eccentric toward the anterior margin; surface sculptured with dense, fine, radial ribs and concentric marked growth lines; inner surface not visible.

Dimensions (mm)	H	Dmax	Dmin
MRSN BS. 085.02.001	3.57	20.5	14.3

Remarks. Sacco (1897) dubiously assigned this species to the genus *Patella* subgenus *Cymbula*. He noted that the specimens in hand did not have the characteristics of a typical *Patella*, but were similar to a *Cymbula*, even if the diagnostic strong lateral compression was not present. In his opinion there were also resemblances to the genus *Acmaea* Eschscholtz, 1833 but he left the question open, because the inner shell surface was not visible. We propose to maintain the Sacco attribution.

Occurrence. *Patella excrenata* is noted in the Oligocene of the T.P.B. (Sacco, 1897) and with a similar form in the Rupelian of Hungary (Noszky, 1940).

Order Neritimorpha Golikov & Starobogatov, 1975

Superfamily Neritoidea Rafinesque, 1815

Family Neritopsidae Gray, 1847

Subfamily Neritopsinae Gray, 1847

Genus *Neritopsis* Grateloup, 1832

Neritopsis radula (Linnaeus, 1758) subsp. *subpustulosa*

Sacco, 1896

Pl. 1, Fig. 7

- 1896a *Neritopsis* cfr. *radula* (Linnaeus) var. *subpustulosa* Sacco, pt. 20, p. 55, pl. 5, figs. 71, 72.
 1916 *Neritopsis radula* var. *subpustulosa* Sacco - Cossmann & Peyrot, p. 243.

- 1925 *Neritopsis radula* var. *subpustulosa* Sacco - Cossmann, 13, p. 96.
 1984 *Neritopsis radula* (L.) var. *subpustulosa* Sacco - Ferrero Mortara et al., p. 256.

Material. Sassello (SV): the lectotype (herein designated) of *Neritopsis* cfr. *radula* var. *subpustulosa* (Sacco, 1896a, pt. 20, pl. 5, fig. 71), MRSN BS.071.01.001 (shell abraded and slightly deformed, the external lip of the aperture is missing). The specimen from Carcare in the Michelotti Collection of the University of Rome has not been found.

Other locality of the T.P.B. mentioned by Sacco (1896): Carcare (SV).

Description. Shell obliquely ovate, with a moderately protruding, obtuse spire. Body whorl globose, averaging about 94% of the shell height. Base convex, without umbilicus. Aperture large and suborbicular. The sculpture consists of dense, regular, pustulate spiral cords.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.071.01.001	2	-	14.6	4	13.7	14.7*	78

Remarks. Sacco (1896a) proposed this form as a new variety of *Neritopsis radula* (Linnaeus, 1758) on the basis of: 1) whorls less rounded, 2) spire higher, 3) pustules less accentuated. He also noticed some resemblances with the Eocene *Neritopsis pustulosa* Bellardi, 1840 from Veneto Region and observed that this variety could be the link between the Eocene species and the Indian Ocean living *Neritopsis radula*. Later Cossmann & Peyrot (1916), noting the very poor quality of the Sacco illustrations, left open the question of whether these specimens can be a distinct form. The var. *subpustulosa* differs from the *Neritopsis pustulosa* in that the spire is markedly higher and the pustules are more accentuated. Some resemblances (shape of the spire and pustulated spiral cords) to *Neritopsis moniliformis* Grateloup, 1832, a Miocene species of the Aquitanian Basin, are noted, but in the Oligocene form the whorls are less globose and the pustulate cords on the body whorl are less numerous (only 13, not 16-20) (see Cossmann & Peyrot, 1916). In our opinion the Sacco variety is linked to *Neritopsis radula* more than to *Neritopsis pustulosa* on the basis of the more evident pustules. On the other hand, we note that, with respect to the Linnaeus species, in the Oligocene form the pustules are less distinct and the body whorl is less globose. We propose the var. *subpustulosa* as a Oligocene subspecies of *Neritopsis radula*.

Occurrence. *Neritopsis radula subpustulosa* is only known in the Oligocene of the T.P.B. (Carcare) (Sacco, 1896a).

Family Neritidae Rafinesque, 1815

Subfamily Neritinae Rafinesque, 1815

Genus *Nerita* Linnaeus, 1758

Subgenus *Ritena* Gray, 1858

***Nerita (Ritena) cfr. plicata* Linnaeus, 1758**

Pl. 2, Fig. 1

- 1758 *Nerita plicata* Linnaeus, p. 779, n. 642.
 1789 *Nerita plicata* Linnaeus, - Linnaeus, p. 3681.
 1822 *Nerita plicata* Linnaeus - Lamarck, v. 6(2), p. 194 (*cum syn.*).
 1839 *Nerita plicata* Linnaeus Lamarck, 3, pp. 486-487, n. 15.
 1896a *Nerita ? caronis* Brongniart - Sacco, pt. 20, p. 50, pl. 5, fig. 51.
 1973 *Nerita plicata* Linné - Turco, p. 13, pl. 3, figs. 8-9.
 1986 *Nerita plicata* Linné - Abbott & Dance, p. 54.
 1986 *Nerita (Ritena) plicata* Linné - Springsteen & Leobrera, p. 50, pl. 10, fig. 13.

Material. Lerma (AL), locality Rio delle Lavine: 1 spm., MPUM 8408 (shell very lacunous and lacking the aperture). Mioglia (SV): the specimen of *Nerita ? caronis* Brongniart illustrated by Sacco (Sacco, 1896a, pt. 20, pl. 5, fig. 51), DSTRG 1900/M-III-M14 (shell with the terminal part of the body whorl missing).

Other localities of the T.P.B. mentioned by Sacco (1896a): Cassinelle (AL), Dego (SV).

Description of the Sacco specimen. Shell small, ovate, with a moderately elevated conical spire. Protoconch approximately of two whorls with surface details not observable. Teleoconch consisting of two convex whorls. Sutures very impressed. Body whorl globose, about 7/8 of the shell height, rapidly expanding. Base convex, partially missing. The teleoconch is sculptured with strong spiral cords, subquadrangular in section, regularly spaced and alternating with deep grooves. Growth lines prosocline, particularly visible on the grooves.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
DSTRG 1900/M-III-M14	3	-	16.7*	6.7	16*	15.8*	-

Remarks. Sacco (1896a) dubiously assigned the specimen in his hand to *Nerita (Ritena) caronis* Brongniart, 1823 (species noted in the Middle Eocene to Middle Miocene of Venetian Region, in the Upper Rupelian-Lower Chattian of T.P.B. and in Middle Miocene of Colli Torinesi) because of the poor state of preservation, but the sculpture is clearly different from that of the Brongniart species. Brongniart (1823) described his species as "multisulcata, sulcis laevibus". Later Oppenheim (1896; 1900) observed that *Nerita caronis* is characterised by the regular alternation of stronger and weaker spiral cords (see illustration in Oppenheim, 1896). In our opinion the Sacco specimen is, on the contrary, very similar to the living *Nerita plicata*, 1758 (type species of *Ritena*), especially on the basis of the shape of the shell and the teleoconch sculpture. Also the other specimen studied here has the spiral sculpture similar to that of Linnaeus species. As the two specimens lack the aperture we cannot assign them to *Nerita plicata* with certainty.

Occurrence. *Nerita plicata* is a species actually living in the Indo-Pacific Region (Springsteen & Leobrera, 1986).

Subgenus *Theliostyla* Mörch, 1852

***Nerita (Theliostyla) alternans* n. sp.**

Pl. 2, Fig. 2

Derivation of name: from the ornamentation of the body whorl with spiral cords, which are alternately pronounced and tenuous.
Holotype. Sassello-S. Giustina Basin: DSTRG 2100/Sa-V-SG95; Pl. 2, fig. 2.

State of preservation. One shell very well preserved.

Type-locality. S. Giustina (SV), Western Liguria.

Horizon. Molare Formation, Oligocene (Upper Rupelian-Lower Chattian).

Diagnosis. Shell obliquely ovate, with few whorls and a very low spire. Body whorl angulated, with shoulder marked by a large cord and a flattened, almost horizontal sutural ramp. Base convex without umbilicus. Aperture subcircular, prosocline. Sculpture of strong spiral cords in the body whorl alternating with thinner cords.

Description. Shell small, obliquely ovate, with a very depressed, almost flat, spire. Protoconch almost flat; approximately of two whorls; surface details not observable. Teleoconch consisting only of two angulated whorls with a shoulder bending at the abapical 1/3; sutural ramp flat, nearly perpendicular to the axis. Sutures incised, adpressed. Body whorl, which averages the shell height, rapidly expanding, angulated, with a flat, slightly inclined sutural ramp. Base convex, without umbilicus. Aperture semicircular. Outer lip prosocline, thickened, regularly dentate within, with a small gap at middle height. Inner lip with granulate labial area.

The spire ornamentation consists of four spiral cords, present also on the sutural ramp of the body whorl, increasing in strength during growth. The abapical one is wider and marks the shoulder. Eight regularly spaced, spiral cords lie on the base. Secondary, thinner spirals intervene between the primary ones on the body whorl. Prosocline markings growth are evident, especially in the last part of the body whorl.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
DSTRG 2100/Sa-V-SG95	2	1	16.4	2.6	16.4	19.3	112°

Remarks. The new species described here is distinguished by the presence of thin spiral cords, which alternate regularly with the stronger primary ones, in the ornamentation of the body whorl. Among the species of *Nerita* noted in the Tertiary of the European Basins, *Nerita (Theliostyla) plutonis* Basterot, 1895 has a conch morphology very similar to this new species and seems to be connected with it, but its ornamentation can be

clearly differentiated due to the absence of the alternate secondary riblets. A similar alternation is also present in *Nerita caronis* (see Oppenheim, 1896, 1900), but the Brongniart species has a clearly higher spire.

The new species is assigned to the subgenus *The-liostyla* on the basis of: 1) low spire, 2) outer lip regularly dentate within, 3) labial area granulate.

Nerita (Theliostyla) martiniana Matheron, 1842

Pl. 3, Figs. 1, 2

- 1842 *Nerita martiniana* Matheron, p. 300, 38, figs 13-14.
 1842 *Nerita Plutonis* Basterot - Sismonda, p. 27.
 1847 *Nerita Grateloupeana* Férussac - Michelotti, p. 153.
 1847 *Nerita Plutonis* Basterot - Michelotti, p. 154.
 1847 *Nerita Plutonis* Basterot - Sismonda, p. 50.
 1847 *Nerita proteus* Bonelli - Sismonda, p. 50.
 1852 *Nerita proteus* Bonelli & Sismonda - D'Orbigny, p. 41.
 1856 *Nerita Plutonis* Basterot - Hörnes, p. 531, pl. 47, fig. 11.
 1856 *Nerita proteus* Bonelli - Hörnes, p. 533, pl. 47, fig. 9 (*juv.*), pl. 47, fig. 9.
 1861 *Nerita Grateloupeana* Férussac - Michelotti, p. 89 (pars).
 1861 *Nerita Plutonis* Basterot - Michelotti, p. 89.
 1889 *Nerita Plutonis* Basterot - Sacco, N° 1828.
 1889 *Nerita proteus* Bonelli - Sacco, N° 1834.
 1896a *Nerita martiniana* Matheron - Sacco, pt. 20, p. 48, pl. 5, figs. 41a-f.
 1896a *Nerita martiniana* var. *albofasciata* Sacco, pt. 20, p. 48, pl. 5, fig. 42.
 1896a *Nerita martiniana* var. *maculatellata* Sacco, pt. 20, p. 48 pl. 5, fig. 43.
 1896a *Nerita martiniana* var. *variemaculata* Sacco, pt. 20, p. 48, pl. 5, figs. 44 a-f.
 1896 *Nerita martiniana* var. *satana* Bonelli - Sacco, pt. 20, pp. 48-49, pl. 5, figs. 45 a-d.
 1900 *Nerita Marthiniana* Matheron - Rovereto, p. 133.
 1900 *Nerita Marthiniana* Matheron var. *Satana* (Borson) Sacco - Rovereto, p. 133.
 1904 *Nerita marthiniana* Matheron - Sacco, pt. 30, p. 129.
 1904 *Nerita marthiniana* Matheron var. *satana* Bonelli - Sacco, pt. 30, p. 129.
 1925 *Nerita Martiniana* Matheron - Cossmann, 13, p. 211.
 1962 *Nerita (Theliostyla) satana* Bonelli - Glibert, p. 100.
 1984 *Nerita martiniana* Matheron var. *albofasciata*, Sacco, var. *maculatellata* Sacco, var. *variemaculata* Sacco - Ferrero Mortara et al., p. 253.
 1984 *Nerita martiniana* Matheron var. *satana* Sacco, Bonelli m. s. - Ferrero Mortara et al., p. 253, pl. 44, figs. 4-5.

Material. Mioglia (SV): 1 spm., DSTRG 2101/M-III-M40 (shell in a very good preservation, on the matrix; aperture not visible). T.P.B. locality unknown: 1 spm., MRSN BS.070.01.008/01 (shell in a good state of preservation); 2 spms., MRSN BS.070.01.008/02 (shell in a good state of preservation); 1 spm., MICG PI 49 (shell in a very poor state of preservation, lacunose on the body whorl, the entire final part of which is missing).

Other localities of the T.P.B. mentioned by Michelotti (1861), Sacco (1896a, 1904) e Rovereto (1900): Carcare (SV), Cassinelle (AL), Dego (SV), Cosseria (SV), Pareto (AL).

Specimens of the Middle Miocene of the Colli Torinesi (TO).

The specimens of *Nerita martiniana* illustrated by Sacco (Sacco, 1896a, pl. 5, figg. 41 a, b, c, d), 4 spms., MRSN BS.070.01.005, .006, .007, .008; 3 spms. (Termò Fòrà), MRSN BS.070.01.008/03; 2 spms. (Villa Forzano), MRSN BS.070.01.008/04; 12 spms., MRSN BS.070.01.008/05; 62 spms., MRSN BS.070.01.008/06; 1 spm., MRSN BS.070.01.008/07. The specimens of var. *satana* illustrated by Sacco (Sacco, 1896a pl. 5, figg. 45a, b), 2 spms., MRSN BS 070.01.016, .017; 2 spms. (var. *satana*), MRSN BS 070.01.017/01 (Villa Forzano), .017/02. The holotype of var. *albofasciata* (Sacco, 1896a, pt. 22, pl. 5, fig. 42), MRSN BS.070.01.009; the holotype of var. *maculatellata* (Sacco, 1896a, pt. 22, pl. 5, fig. 43), MRSN BS.070.01.010; the lectotype (herein designated) of var. *variemaculata* (Sacco, 1896a, pl. 5, fig. 44c), MRSN BS.070.01.013.; the illustrated paralectotypes of var. *variemaculata* (Sacco, 1896a, pl. 5, fig. 44a, b, d, e) 4 spms., MRSN BS.070.01.011, .012, .014, .015; other paralectotype of var. *variemaculata*, 1 spm., MRSN BS.070.01.015/01 (Villa Forzano), 2 spms., /02 (Villa Forzano), 13 spms., /03. Shells in a good state of preservation.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.070.01.005	2	-	14.2	1	14.2	16	93°
MRSN BS.070.01.006	2	-	17	1	17	20.7	105°
MRSN BS.070.01.007	2	-	15.25	3	14.25	17	73°
MRSN BS.070.01.008	2	-	7.1	1	6.1	9	78°
MRSN BS 070.01.016	2	-	16.7	2	15.7	19.4	85°
MRSN BS 070.01.017	1	-	11.7	1	10.7	12.65	84°
MRSN BS.070.01.009	1	-	15.7	0	15.71	17.7	89°
MRSN BS.070.01.010	2	-	16.45	0	16.45	20.5	88°
MRSN BS.070.01.013	1	-	14.5	0	14.5	17	82°
MRSN BS.070.01.011	1	-	9.2	0	9.2	11.5	88°
MRSN BS.070.01.012	1	-	10.3	0	10.3	11	89°
MRSN BS.070.01.014	1	-	14.2	0	14.2	15	86°
MRSN BS.070.01.015	2	-	6.6	0	6.6	6	99°

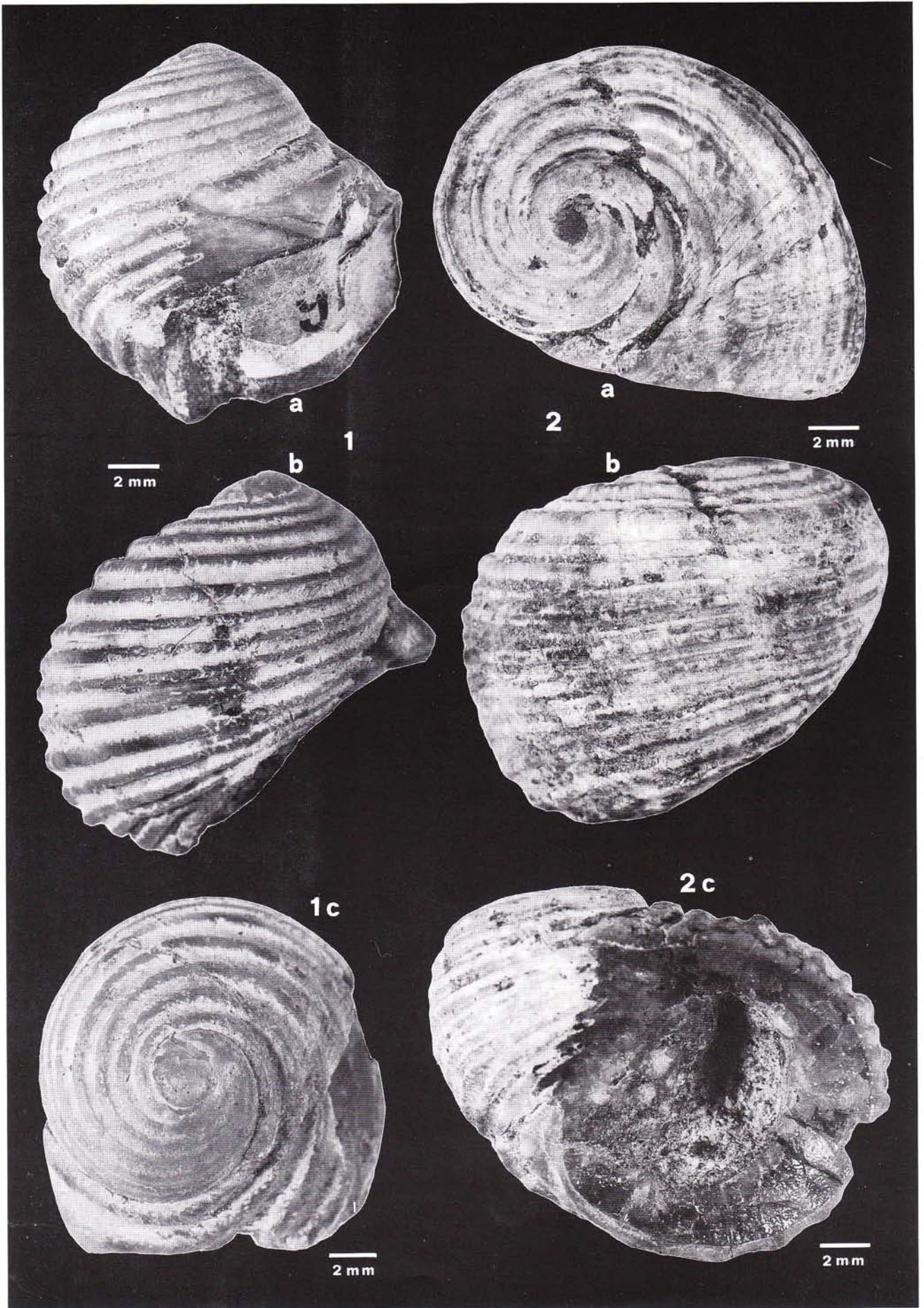
Remarks. The species is well known, clearly defined, and does not require further descriptive remarks.

The specimens in hand are assigned to this species on the basis of: 1) shell obliquely ovate, with a low spire, 2) teleoconch whorls convex, 3) teleoconch sculpture consisting of dense, regular spiral cords.

Sacco (1896a) described four new varieties: *albofasciata*, *maculatellata*, *variemaculata*, *percrassa*; the var. *satana* was defined by Bonelli in 1827, but without any description and illustration. Later, Rovereto (1900) considered the first three synonymous with the nominal species. In our opinion the characteristics of the varieties *albofasciata*, *maculatellata*, *variemaculata* and *satana*

PLATE 2

- Fig. 1 - *Nerita (Ritena) cfr. plicata* Linnaeus, 1758. Illustrated specimen in Sacco (1896, pt. 21, pl. 5, fig. 51) of *Nerita ? caronis* Brongniart, 1823. Mioglia (SV). DSTRG 1900/M-III-M14; a) apertural side, b) abapertural side, c) top view.
 Fig. 2 - *Nerita (Theliostyla) alternans* n. sp. Holotype. S. Giustina (SV). DSTRG 2100/Sa-V-SG95; a) top view, b) abapertural side, c) apertural side.



are not sufficient for a distinction from the species. With regard to the var. *percrassa*, the question remains unresolved as the specimen illustrated by Sacco (1896a) and other specimens are apparently lost.

This species is assigned to the subgenus *Theliostyla* on the basis of the very low spire.

Occurrence. *Nerita martiniana* is noted in the Oligocene of the T.P.B. (Michelotti, 1861; Sacco, 1896a, 1904; Rovereto, 1900), in the Middle Miocene of the Colli Torinesi (Michelotti, 1861; Sacco, 1896a), of Tortona (Michelotti, 1861), of Provence (Cossmann, 1925) and of the Vienna Basin (Michelotti, 1861).

***Nerita (Theliostyla) plutonis* Basterot, 1825**

Pl. 3, Fig. 3

- 1825 *Nerita Plutonis* Basterot, p. 39, pl. 2, fig. 14.
 1839 *Nerita Plutonis* Basterot - Lamarck, 3, p. 490, n. 10.
 1840 *Nerita Plutonis* Basterot - Grateloup, pl. 5, figs. 29-30.
 1840 *Nerita intermedia* Grateloup, Ibid., pl. 5, figs. 31-32 (non Sowerby).
 1852 *Nerita Plutonis* Basterot - D'Orbigny, p. 40, 26e ét., n° 612.
 1852 *Nerita subintermedia* D'Orbigny, Ibid., n° 613.
 1896 *Nerita Plutonis* Basterot var. *bicrassecincta* Sacco, pt. 20a, p. 50, pl. 5, fig. 49b.
 1900 *Nerita Plutonis* Basterot var. *bicrassecincta* Sacco - Rovereto, p. 133.
 1904 *Nerita Plutonis* Basterot var. *bicrassecincta* Sacco - Sacco, pt. 30, p. 129.
 1916 *Nerita Plutonis* Basterot - Cossmann & Peyrot, pp. 246-247, pl. 7, figs. 72-76.
 1925 *Nerita Plutonis* Basterot - Cossmann, 13, p. 209, pl. 6, figs. 32-33.

Material. S. Giustina (SV): the lectotype (herein designated) of *Nerita Plutonis* var. *bicrassecincta* (Sacco, 1896a, pt. 20, pl. 5, fig. 49b), DSTRG 1120/Sa-V-SG51a (shell in a quite good state of preservation, almost complete); 2 spms., DSTRG 1120/Sa-V-SG51b (shells in a poor state of preservation, with the final part of the body whorl and the protoconch missing). Sassello (SV): 1 spm., MPS 1 (shell in quite a good state of preservation, slightly abraded).

Dimensions (mm): NW PD H hs hw D MSA
 DSTRG 1120/Sa-V-SG 51a 2 - 14.3 1.7 14.3 14.4 109°

Remarks. The species is well known and clearly defined. We assign the specimen in hand to this species on the basis of: 1) shell obliquely ovate with a very low spire, 2) spire almost flat, 3) body whorl subangular at 1/4 adapical, 4) sculpture consisting of strong spiral

cords, 5) shoulder marked by a stronger and wider cord, 6) evident, clearly prosocline growth lines. Sacco (1896a) described the specimen studied here as the new var. *bicrassecincta* on the basis of the presence of two stronger spiral cords in the upper part of the base. In our opinion this characteristic is not so clearly evident as to identify a form different from the species.

This species is assigned to the subgenus *Theliostyla* on the basis of the low spire.

Occurrence. *Nerita plutonis* is noted above all as a species of the Early to Middle Miocene of the Aquitanian Basin (Cossmann & Peyrot, 1916). The S. Giustina and Sassello specimens are the first indication in the Oligocene of the T.P.B. This species is also mentioned by Sacco (1896a) from the Middle Miocene of Vicoforte (Province of Cuneo).

Genus *Velates* De Montfort, 1810

***Velates perversus* (Gmelin, 1789)**

Pl. 3, Fig. 4

- 1786 *Nerita Schmideliana sinistrorsa, fossilis*, Chemnitz in Martini & Chemnitz, v. 9, p. 130, pl. 114, figs. 975-976 (vidi in Mellini, 1992).
 1789 *Nerita perversa* Gmelin - Linnaeus, p. 3686, n. 72.
 1992 *Velates perversus* (Gmelin) - Mellini, 16, pp. 407-439 (cum syn.).

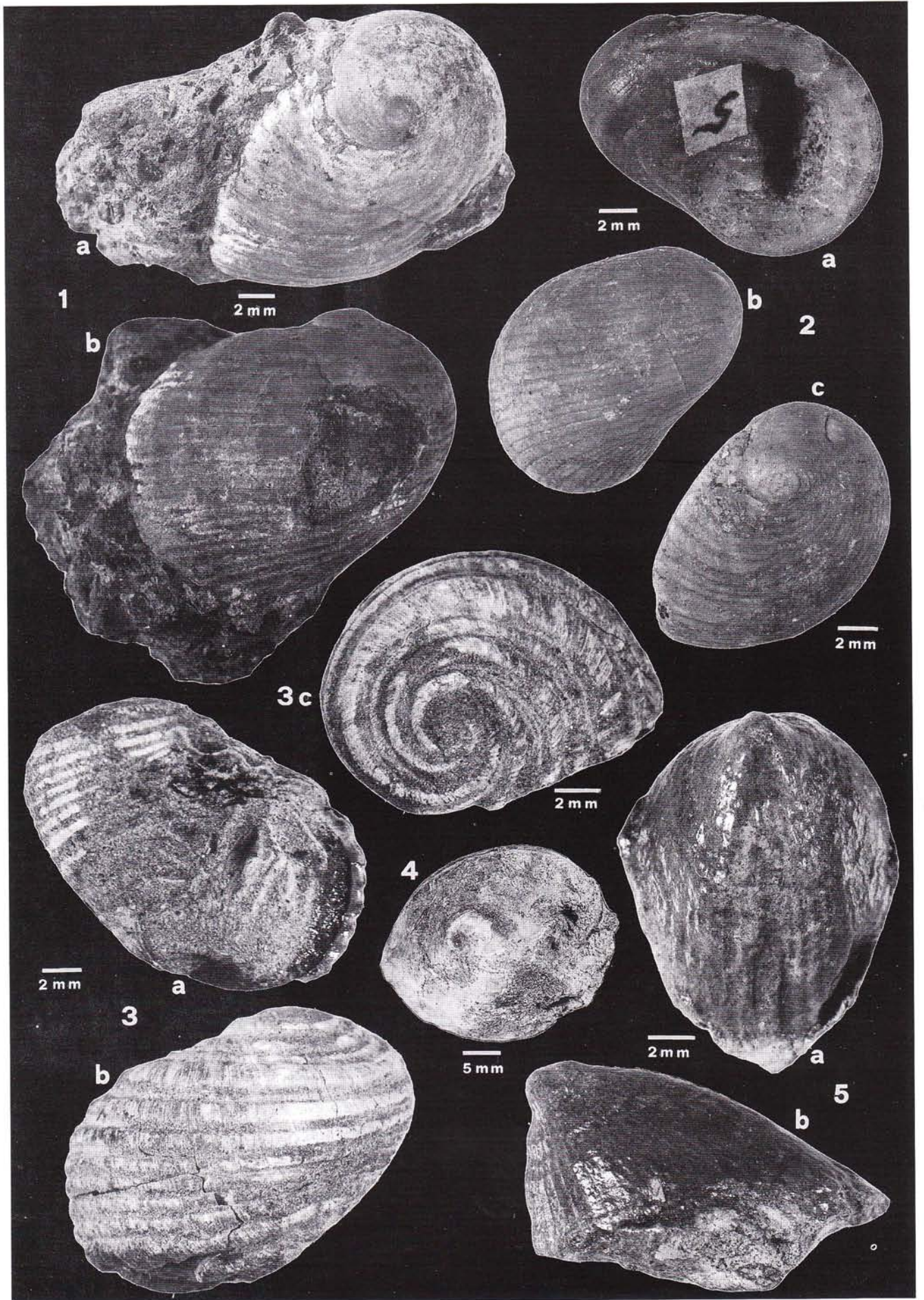
Material. Deگو (SV): 1 spm., DSTRG 475/De-VIII-CL1 (shell extensively encrusted, with the final part of the body whorl missing).

Remarks. The species is well known and clearly defined. The unique specimen in hand is assigned to this species, despite its poor state of preservation, on the basis of: 1) shell capuliform with a concealed spire, 2) apex eccentric, 3) wide and slightly convex labial area. This species being never mentioned in the Oligocene of the T.P.B., its identification (Bonci et al., 1991) is very interesting.

Occurrence. *Velates perversus* is a very widespread species in the Tethys area (Europe, including the eastern, Black Sea and Mediterranean areas; various parts of Africa, Asia and North America) from the Early Eocene to the Early Oligocene (Mellini, 1992). Earliest occurrence is in the Late Cretaceous (Merle, 1984 in Mellini, 1992), last occurrence in the Middle Oligocene (Mandruzzato, 1970).

PLATE 3

- Fig. 1 - *Nerita (Theliostyla) martiniana* Matheron, 1842. Mioglia (SV). DSTRG 2101/M-III-M40; a) top view, b) abapertural side.
 Fig. 2 - *Nerita (Theliostyla) martiniana* Matheron, 1842. Illustrated specimen in Sacco (1896, pt. 20, pl. 5, fig. 41a). Colli Torinesi (TO). MRSN BS.070.01.005; a) apertural side, b) abapertural side, c) top view.
 Fig. 3 - *Nerita (Theliostyla) plutonis* Basterot, 1825. Lectotype of the var. *bicrassecincta* Sacco, 1896. S. Giustina (SV). DSTRG 1120/Sa-V-SG51a; a) apertural side, b) abapertural side, c) top view.
 Fig. 4 - *Velates perversus* (Gmelin, 1789). Deگو (SV). DSTRG 475/De-VIII-CL1; top view.
 Fig. 5 - *Emarginula* sp. Bandita di Cassinelle (AL), locality Case Belvedere. Private Collection N. 1496; a) top view, b) side view.



Order Vetigastropoda Salvini-Plawen, 1980
 Superfamily Fissurelloidea Fleming, 1822
 Family Fissurellidae Fleming, 1822
 Subfamily Emarginulinae J. E. Gray, 1834
 Genus *Emarginula* Lamarck, 1801
 Subgenus *Emarginula* s. s.

Emarginula sp.

Pl. 3, Fig. 5

Material. Bandita di Cassinelle (AL), locality Case Belvedere: 1 spm., Private collection N. 1496 (shell lacunose on the edges, in a poor state of preservation); Housed in DSTRG.

Remarks. The specimen is badly preserved, also due to erroneous solidification operations, and lacunose on the edges, for which reason the area where the slit was positioned is missing. However, it seems to be referable to the genus *Emarginula* on the basis of the following features: shell short-ovate, elevated; selenizone depressed to form a groove; radial threads. The state of preservation bars any assignment to species. It is the first report for the Oligocene in the T.P.B.

Superfamily Pleurotomarioidea Swainson, 1840

Family Pleurotomariidae Swainson, 1840

Genus *Perotrochus* (Fisher, 1885)

Perotrochus isseli (Rovereto, 1900)

Pl. 4, Figs. 1, 2

- 1900 *Pleurotomaria* (sect. *Perotrochus*) *Isseli* Rovereto, p. 129-131, pl. 8, figs. 1-1a.
 1904 *Pleurotomaria* (*Perotrochus*) *Isseli* Rovereto - Sacco, pt. 30, p. 132, pl. 26, figs. 22a, b (reproduction of the original figure from Rovereto, 1900).
 1933 *Pleurotomaria* cfr. *Isseli* Rov. - Venzo, p. 9.
 1934 *Pleurotomaria gigas* Borson - Venzo, p. 156.
 1938 *Pleurotomaria gigas* Borson - Venzo, p. 181.
 1950b *Pleurotomaria dalpiazi* Malaroda (non var. *costozzensis*), pp. 183-185, pl. 5, figs. 1-7.
 1955 *Pleurotomaria dalpiazi* Malaroda - Accordi, pp. 29-30, pl. 2, figs. 8-9.
 1973 *Pleurotomaria dalpiazi* Malaroda - Coletti et al., p. 8, tab. 3.
 1973 *Pleurotomaria dalpiazi* Malaroda - Turco, pl. 3, figs. 18-19.
 1991 *Perotrochus isseli* (Rovereto) - Bonci et al., pp. 147-148, pl. 1, fig. 1.

Material. Dego (SV): the holotype of *Pleurotomaria isseli* (Rovereto, 1900, pl. 8, figs. 1-1a), DSTRG 509/De-VIII-CL39 (inter-

nal mould, slightly deformed, with parts of the shell; the first whorls of the spire and the aperture are missing). Probably T.P.B., but locality unknown: 2 spms., MICG PI 51 (one internal mould with sporadic remains of the shell along the suture; one shell, in parts abraded and lacunose; both specimens deformed and with the protoconch, the first whorls of the teleoconch and the aperture missing; they could be those mentioned by Rovereto in 1900).

Description. Shell large, turbiniform, wider than high, with a conical spire. Teleoconch whorls (six) convex. Body whorl about 3/4 of the shell height, subangular at the periphery. Trace of the selenizone just below mid whorl. Base only gently convex, without umbilicus. The sculpture consists of dense spiral threads.

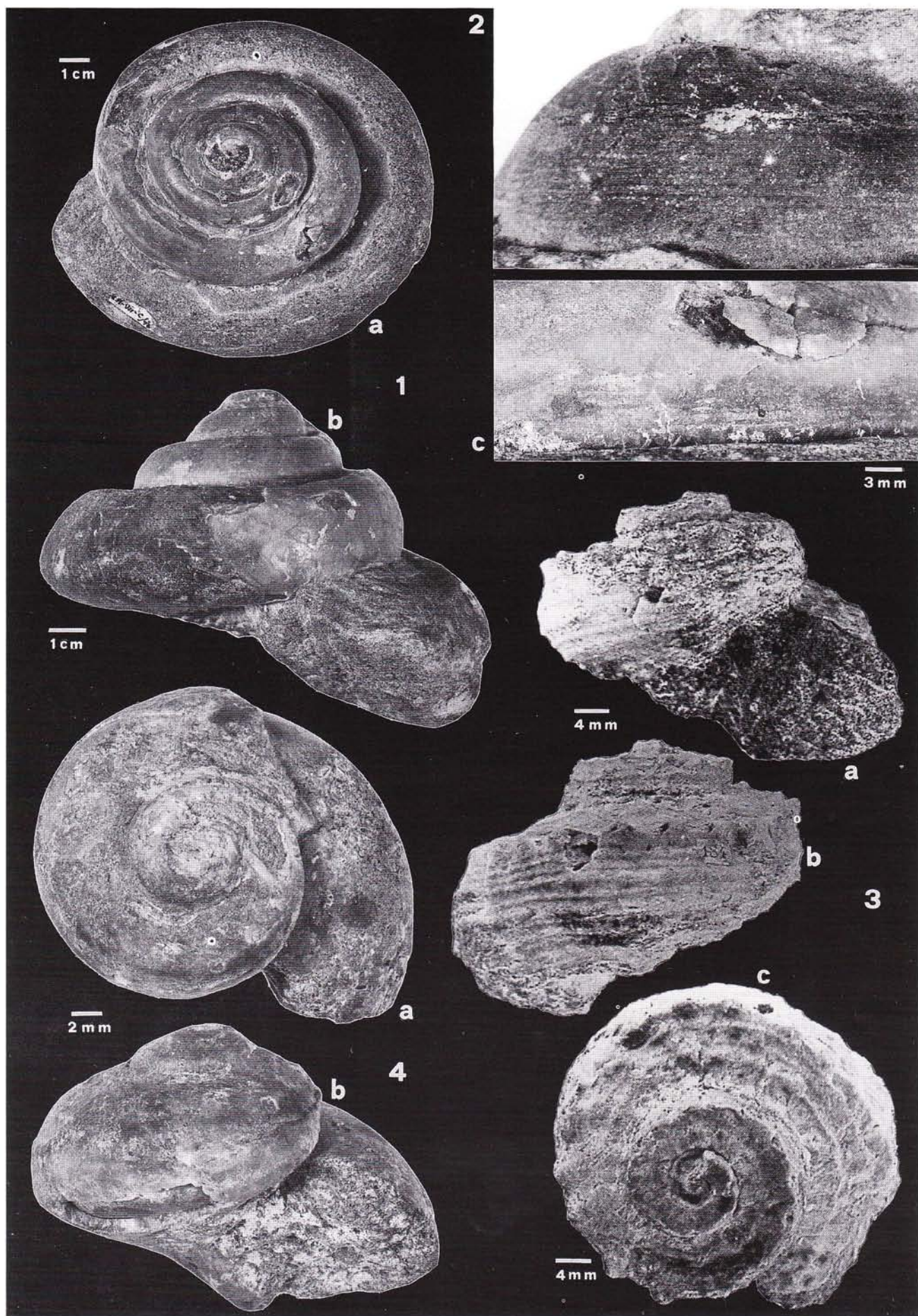
Dimensions (mm): NW PD H hs hw D MSA
 DSTRG 509/De-VIII-CL39 4.5 - 82.4* 39.3* 63* 12.36* -

Remarks on the holotype. The angular profile of the final part of the body whorl, indicated by Rovereto (1900) as one of the distinctive characteristics of the species, is simply a consequence of the deformation which has affected the specimen as indicated by Malaroda (1950b). The shell appears on the whole to be smooth, but in some parts, particularly near the suture, a spiral ornamentation composed of embedded threads is visible, as already mentioned by Rovereto. It can therefore be confirmed that the shell was ornamented in this way and that the diagenesis has caused a large part of the external strata to disappear, thus suggesting an absence of ornamentation. Malaroda (1950b), though noting the strong coincidences as regards the position of the selenizone and the profile of the whorls, was unable to attribute the specimens he had studied to Rovereto's species; instead he designated the new species *Pleurotomaria dalpiazi* for his specimens from Venetian Upper Eocene-Middle Miocene. The author justified his choice by stating that "certain data on the type of ornamentation of *Pleurotomaria isseli* are not known"; it is necessary to state however that he only examined a plaster cast of the Rovereto type and not the original and so he was unable to observe the residue of the ornamentation referred to above.

In our opinion, following a comparison with the specimens studied and illustrated by Malaroda (1950b) for *Pleurotomaria dalpiazi*, there are no reasons to keep the two species distinct, the priority belonging to *Pleu-*

PLATE 4

- Fig. 1 - *Perotrochus isseli* (Rovereto, 1900). Holotype. Dego (SV). DSTRG 509/De-VIII-CL39; a) top view, b) apertural side, c) traces of sculpture.
 Fig. 2 - *Perotrochus isseli* (Rovereto, 1900). T. P. B. locality unknown. MICG PI51; detail of the sculpture.
 Fig. 3 - *Angaria* (*Angaria*) *scobina* (Brongniart, 1823). Lectotype of the var. *appenninica* Sacco, 1896. Carcare (SV). MRSN BS.077.01.011; a) apertural side, b) abapertural side, c) top view. Reproduced from Ferrero et al. (1984, pl. 50, fig. 5).
 Fig. 4 - *Turbo* (*Ninella*) *desidiosus* Rovereto, 1914. Holotype. Dego (SV). DSTRG 476/De-VIII-CL2; a) top view, b) apertural side.



rotomaria isseli. It is however necessary to exclude the variety *costozzensis* Malaroda from the proposed synonymy, as this variety presents decidedly different characteristics from the Rovereto species.

Rovereto (1900), comparing his species with other southern Tertiary forms, noted the similarity to *Pleurotomaria morenae* Sacco, 1899 (in Morena, 1899) from Eocene of Marche Region due to the "position of the slit and the overall form" so as not to exclude the possibility that this might be the same species; in effect, in his opinion, any difference would consist only in the form of the final whorl towards the aperture. As regards what might be deduced from the illustration presented by Morena (1899), the specimen would definitely seem to be deformed, so that the "form of the final whorl" characteristic, as already stated, is in no way significant. Unfortunately the illustration is of very poor quality and it has not been possible, despite the research undertaken, to find the specimen classified by Sacco. It is therefore not possible to establish the relationship between the two species. *Pleurotomaria morenae* should rules as a *nomen oblitum*, and the validity of *Pleurotomaria isseli* cannot be questioned.

The species is assigned to the genus *Perotrochus* on the basis of: 1) shell turbiniform, broader than high; 2) whorls convex; 3) selenizone below mid-whorl; 4) base without umbilicus; 5) sculpture of dense spiral threads.

Occurrence. *Perotrochus isseli* is known in the Oligocene of the T.P.B. (Rovereto, 1900) and in the Early Oligocene to Middle Miocene of the Venetian Region (Malaroda, 1950b; Coletti et al., 1973).

Perotrochus sp.

Material. T.P.B., locality unknown: 2 spms., MSNS (internal moulds with traces of ornamentation).

Remarks. The specimens in hand are turbiniform, without umbilicus, broader than high, with convex teleoconch whorls and the body whorl subangular at the periphery. The traces of ornamentation consist of fine spiral threads. These features point towards the assignment to the genus *Perotrochus*. However, the poor preservation hinders any assignment to species.

Suborder Trochina Cox & Knight, 1960
Superfamily Trochoidea Rafinesque, 1815
Family Turbinidae Rafinesque, 1815
Subfamily Angariinae Thiele, 1921
Genus *Angaria* Röding, 1798
Subgenus *Angaria* s. str.

Angaria (Angaria) scobina (Brongniart, 1823)

Pl. 4, Fig. 3

- 1823 *Turbo scobinus* Brongniart, p. 53, pl. 2, fig. 7.
1825 *Delphinula scobina* Brongniart - Basterot, p. 27.
1839 *Delphinula scobina* Brongniart - Lamarck, 3, p. 555, n. 9.
1840 *Delphinula scobina* Brongniart - Grateloup, pl. 11, figs. 12, 14.
1847 *Delphinula scobina* Brongniart - Michelotti, p. 165.
1847 *Delphinula scobina* Brongniart - Sismonda, p. 48.
1852 *Turbo subscobinus* D'Orbigny - D'Orbigny, p. 8, n. 121.
1857 *Delphinula scobina* Brongniart - Sismonda, p. 5.
1861 *Turbo scobinus* D'Orbigny - Michelotti, p. 93.
1871 *Delphinula scobina* Michelotti - Fuchs, p. 161.
1889 *Turbo scobinus* Brongniart - Sacco, n°1771.
1895 *Delphinula scobina* Brongniart - Raulin, p. 552.
1896b *Delphinula scobina* var. *appenninica* Sacco - Sacco, pt. 21, p. 51, pl. 4, figs. 62a-b.
1900 *Delphinula scobina* Brongniart - Oppenheim, p. 283.
1900 *Delphinula scobina* Brongniart - Rovereto, p. 131.
1904 *Delphinula scobina* (Brongniart) var. *appenninica* Sacco - Sacco, pt. 30, p. 131.
1905 *Delphinula* cfr. *scobina* Brongniart - Dainelli, pp. 5-6.
1915 *Delphinula scobina* Brongniart - Cossmann, 10, p. 218.
1915 *Delphinula scobina* Brongniart - Fabiani, pp. 267, 269.
1940 *Delphinula scobina* Brongniart var. *appenninica* Sacco - Noszky, p. 4.
1962 *Angaria scobina* Brongniart - Glibert, p. 65.
1968 *Delphinula scobina* Brongniart - Piccoli & Massari Degasperri, p. 249.
1973 *Delphinula scobina* (Brongniart) - Coletti et al., p. 8, tab. 3, pl. 3, fig. 1.
1973 *Angaria scobina* (Brongniart) - Turco, pp. 5-6, pl. 1, figs. 1-2.
1984 *Delphinula scobina* Brongniart var. *appenninica* Sacco - Ferrero Mortara, et al., p. 274, pl. 50, figs. 5a, b, c.
1993 *Angaria scobina* (Brongniart) - Brogiato, p. 243.

Material. Carcare (SV): the lectotype (herein designated) of *Delphinula scobina* var. *appenninica* (Sacco, 1896b pt. 21, pl. 4, fig. 62a), MRSN BS.077.01.001 (shell with aperture and protoconch missing, in a poor state of preservation). The other type from Carcare, the variety *appenninica* illustrated by Sacco (1896b, pt. 21, pl. 4, fig. 62b) in the Museum of Rome, has not been found. Dego (SV): 1 spm., MRSN TO.TG.002, Rovasenda Collection. Mioglia (SV): 2 spms., DSTRG 1952/M-III-M36 (one shell with only the half axial preserved; one internal mould with slight traces of ornamentation). T.P.B., locality unknown: 1 spm. (*Angaria* cfr. *scobina*), MRSN TO.TG.003.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.077.01.001	3	-	42 [±]	17.5 [±]	36.6	46.45	84°

Remarks. Shell low-spined, with a well developed body whorl, a convex base and a wide umbilicus. Whorls convex or more or less subangular. Surface sculptured with strong, irregular, rough, spiral cords. The periphery of the two last whorls is marked by one row of strong spines. These characteristics are consistent with the assignment to the species *Angaria scobina*.

The variety *appenninica* is differentiated from the Brongniart type, above all because it has less rounded whorls; the other differences stressed by Sacco (flattened spire, cords more embedded but less furrowed-imbricated) would seem to be less clear and to diminish gradually in the characteristics of the type. In 1905 Dainelli observed that this variety is very close to the type. In our opinion the characteristics of the variety *appenninica* do

not seem to be such as to justify a distinction from the nominal species, which shows a strong variability.

Turco (1973), on the basis of a biometric study, placed the Brongniart species in synonymy with the Eocene *Angaria calcar* (Lamarck, 1805) of Venetian Region and Paris Basin, and also observed that the differences in the development of the spines, on which the distinction between the two species was based, are a function of the different states of preservation.

We do not concur with the author on this: compared to the descriptions and illustrations of *Angaria calcar* (Lamarck, 1804, 1859; Deshayes, 1842) and to various specimens from the Paris Basin, the Oligocene form assigned to *Angaria scobina* appears to have more numerous spiral cords on the whorls and the spines on the carina much less developed. In our opinion the different development of the spines is not related to the conditions of the state of preservation.

Occurrence. *Angaria scobina* is known in the Oligocene of the T.P.B. (Michelotti, 1861; Sacco, 1896b, 1904; Rovereto, 1900), in the Middle Eocene to Middle Oligocene of the Venetian Region (Turco, 1973), in the Oligocene of the Aquitanian Basin (Cossmann, 1915) and in the Rupelian of Hungary (Noszky, 1940).

Subfamily Turbininae Rafinesque, 1815

Genus *Turbo* Linnaeus, 1758

Subgenus *Ninella* Gray, 1850

Turbo (Ninella) desidiosus Rovereto, 1914

Pl. 4, Fig. 4

- 1914 *Turbo (Ninella?) desidiosus* Rovereto, p. 144, pl. 3, fig. 8.
 1937 *Turbo (Ninella)* cfr. *desidiosus* Rovereto - Venzo, p. 70.
 1991 *Turbo (Ninella?) desidiosus* Rovereto - Bonci et al., pp. 148-149, pl. 1, fig. 2.

Material. Dego (SV): the holotype of *Turbo desidiosus* (Rovereto, 1914, pl. 3, fig. 8), DSTRG 476/De-VIII-CL2. (Rovereto Collection) (the first whorls and part of the body whorl are missing; shell only partially preserved with the body whorl mostly in the form of an internal mould).

Description. Shell turbiniform, low-spined. The only partially preserved whorl of the spire is convex and slightly subangular in the adapical part. Body whorl rapidly expanding in height, reaching 90% of the shell height, convex but subangular at the periphery. Base only slightly convex. The body whorl ornamentation consists of three regularly spaced spiral cords: the lowermost placed on the periphery, the adapical equidistant from the suture and periphery. Growth lines dense and prosocline.

Dimensions (mm): NW PD H hs hw D MSA
 DSTRG 476/De-VIII-CL2 2.5 - 25.2* 10.5* 22.8* 30.2* -

Remarks. Rovereto (1914) dubiously assigned the species to the subgenus *Ninella*. In our opinion the specimen in hand corresponds sufficiently to Gray's taxon on the basis of: 1) shell turbiniform, large and depressed, 2) body whorl large, subangular at the periphery, 3) base gently convex. The species of the subgenus *Ninella* are generally more sculptured, but the very poor state of preservation of the studied specimen hinders a good comparison of this feature.

Occurrence. *Turbo desidiosus* is a rare species known with certainty only in the Oligocene of the T.P.B. (Rovereto, 1914). Venzo (1937) assigned a specimen from Chatian Glauconie Bellunesi (Belluno and Feltre regions) to it, identified, however, only by comparison and unfortunately not retraced in the collection of the Museum of the University of Padua.

Turbo (Ninella) multicinctus Sacco, 1896

Pl. 5, Figs. 1, 2

- 1861 *Turbo Asmodei* Brongniart - Michelotti, p. 94.
 1889 *Turbo Asmodei* Brongniart - Sacco, N° 1772.
 1889 *Turbo Parkinsoni* Basterot - Sacco, N° 1779.
 1896b *Turbo (Ninella?) multicincta* Sacco, pt. 21, p. 6, pl. 1, figs. 8a, b, c.
 1896b *Eumargarita* cfr. *Kickxii* (Nyst) - Sacco, pt. 21, p. 40.
 1900 *Turbo* (sect. *Ninella?*) *multicinctus* Sacco - Rovereto, p. 132.
 1904 *Ninella?* *multicincta* Sacco - Sacco, pt. 30, p. 130.
 1918 *Turbo (Ninella) multicincta* Sacco - Cossmann, 11, p. 124.
 1984 *Ninella multicincta* Sacco - Ferrero Mortara et al., p. 257, pl. 45, figs. 4, 5.

Material. Belforte (AL): 1 spm., DSTRG 2093/Ov-VII-S1, Rovereto Collection; (the final part of the body whorl is missing). Dego (SV): the lectotype (herein designated) of *Turbo multicinctus* (Sacco, 1896b, pt. 21, pl. 1, fig. 8), MRSN BS.075.02.001; the illustrated paralectotype of *Turbo multicinctus* (Sacco, 1896b, pt. 21, pl. 1, fig. 8b), MRSN BS.075.02.002; paralectotype of *Turbo multicinctus* Sacco, MRSN BS. 075.02.002/01. Shells in a poor state of preservation, lacunose and lacking the aperture. Giusvalla (SV), locality Pian Frecioso (Bric dei Dogli): 2 spms., MPUM 8409; 4 spms., MPUM 8410 (shells mostly juvenile, poorly preserved). Lerma (AL), locality Rio delle Lavine: 1 spm., MPUM 8411 (shell mostly juvenile, poorly preserved). Merana (AL), locality Rio dei Mori: 1 spm., MPUM 8412 (shell mostly juvenile, poorly preserved). Mioglia (SV), locality Sciriti: 1 spm., MPUM 8413 (shell mostly juvenile, poorly preserved). Mornese (AL): 2 spms., DSTRG 2094/Le-II-M1 (internal moulds deformed, with residue of shell). Squaneto (AL): 1 spm., MPUM 8414 (shell mostly juvenile, poorly preserved). T.P.B. locality unknown: 2 spms., DSTRG 2095/T.P.B.1 (shells slightly deformed, one with the first whorls missing and the other with considerable lacunae in the body whorl); 1 spm., MRSN (shell deformed, lacunose and abraded). The type from Belforte (Sacco, 1896b, pt. 21, pl. 1, fig. 8c) in the Museum of the University of Rome has not been found. The specimens from Tagliolo and Colla assigned by Sacco (1896b) to *Eumargarita* cfr. *kickxii* (Nyst) and regarded by Rovereto (1900) as corroded shells of *Turbo multicinctus* are no longer present in the DSTRG collection.

Other locality of the T.P.B. mentioned by Rovereto (1900): Tagliolo (AL).

Description. Shell turbiniform, with a conical spire. Teleoconch whorls subangular at the abapical 1/3 and

convex adapically to the periphery. Sutures linear, incised. Body whorl about 80% of the shell height. Basal angulation weak. Base gently convex, without umbilicus. The sculpture consists of dense, gently nodose, spiral cords, of nearly equal length, weaker on the spire and stronger on the body whorl. The periphery of the base is marked by a large cord.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.075.02.001 (lectotype)	4	-	34.55*	21.7*	24.85	31.6*	68°
MRSN BS.075.02.002	2	-	28.8*	14.8*	23.8	39.55	-

Remarks. Sacco (1896b) stated that the dubious assignment to the subgenus *Ninella* of *Turbo* is due to the poor state of preservation of the examples. The specimens examined here can be attributed to this taxon without any uncertainty on the basis of: 1) shell turbinata with teleoconch whorls subangular abapically, 2) well incised sutures, 3) body whorl large, subangular at the periphery, 4) base slightly convex, omphalous, 5) spire and body whorl sculptured with gently beaded, spiral cords.

Turbo bellunensis Vinassa de Regny, 1896 from the Chattian of Belluno province is a closely related species differing in that has narrower umbilicus and granular spirals.

Occurrence. *Turbo multinctus* is only known in the Oligocene of the T.P.B.

Genus *Bolma* Risso, 1826

Bolma carinata (Borson, 1821)

Pl. 5, Fig. 3

- 1821 *Trochus carinatus* Borson, p. 330 (84), pl. 6 (2), fig. 2.
 1823 *Trochus carinatus* Borson - Brongniart, p. 56, pl. 4, figg. 5a, b.
 1839 *Trochus carinatus* Borson - Lamarck, 3, p. 560, n. 12.
 1840 *Trochus carinatus* Borson - Bellardi & Michelotti, p. 68, pl. 7, figs. 10-11.
 1840 *Trochus labiosus* Grateloup, pl. 13, figs. 5.-6
 1842 *Trochus carinatus* Borson - Sismonda, p. 30.
 1847 *Turbo carinatus* Borson - Michelotti, p. 175.
 1847 *Turbo carinatus* Borson - Sismonda, p. 48.
 1852 *Trochus carinatus* Borson - D'Orbigny, p. 43, 26° èt., n° 679.
 1855 *Turbo carinatus* Borson - Hörnes, p. 435, pl. 44, fig. 6.
 1896b *Astraliium (Ormastraliium) carinatum* (Borson) - Sacco, pt. 21, pp. 17-18, pl. 2, figs. 15a-g.

- 1896b *Astraliium (Ormastraliium) carinatum* (Borson) var. *scalarata* Sacco, pt. 21, p. 18, pl. 2, fig. 17.
 1896b *Astraliium (Ormastraliium) carinatum* (Borson) var. *elatissima* Sacco, pt. 21, p. 18, pl. 2, fig. 18.
 1896b *Astraliium (Ormastraliium) carinatum* (Borson) var. *bolmoides* Sacco, pt. 21, p. 18, pl. 2, fig. 22.
 1916 *Bolma (Ormastraliium) carinata* (Borson) - Cossmann & Peyrot, 49 (3), pp. 186-187, pl. 6, figs. 5-8.
 1918 *Bolma (Ormastraliium) carinatum* (Borson) - Cossmann, 11, p. 155.
 1962 *Astraea (Ormastraliium) carinata* Borson - Glibert, p. 87.
 1976 *Astraea (Ormastraliium) carinata* (Borson) - Pavia, p. 152, pl. 1, figs. 1, 3.
 1984 *Ormastraliium carinatum* (Borson) - Ferrero Mortara et al., p. 262.

Material. T.P.B. locality unknown: 1 spm., MICG PI 41 (shell very worn with the body whorl extremely lacunose).

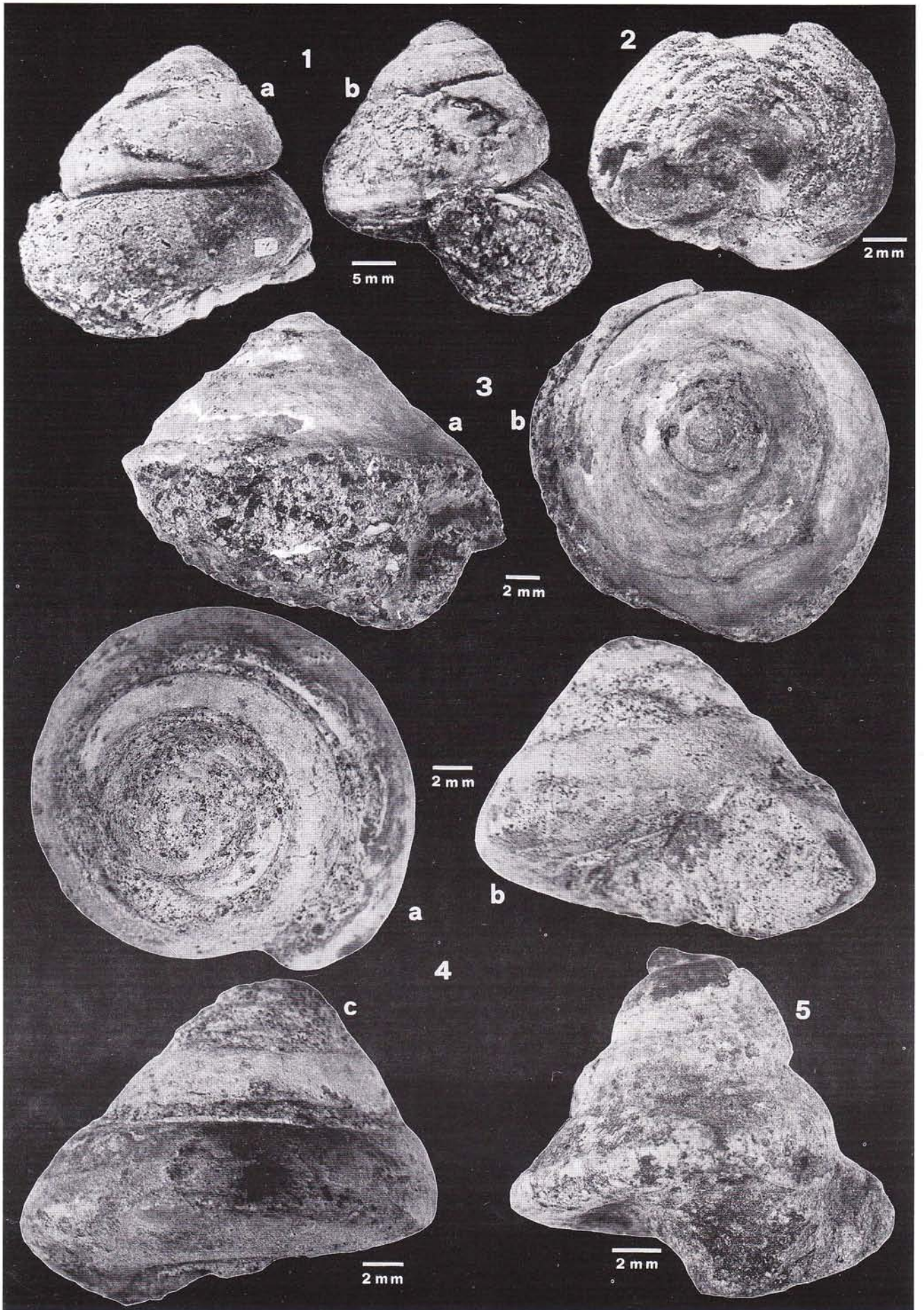
The poorly preserved specimens of *Ormastraliium* from the Upper Rupelian-Lower Chattian of Dego, related dubiously by Sacco (1896b) to these species, are no longer present in the DSTRG collection.

Specimens of Miocene of the Colli Torinesi (TO): The lectotype of *Astraea carinata* illustrated by Sacco (1896b, pt. 21, pl. 2, fig. 15a?) and Pavia (1976, pl. 1, fig. 1a-d), MRSN BS.075.09.022 bis (Borson Collection); the paralectotype of *Astraea carinata* illustrated by Sacco (1896b, pt. 21, pl. 2, fig. without number; Pavia erroneously referred this figure to the lectotype) and Pavia (1976, pl. 1, fig. 3), MRSN BS.075.09.022 ter (Borson Collection); another specimen illustrated by Sacco (1896b), MRSN BS.075.09.022 (fig. 15c of Sacco). Shells in a good state of preservation. 4 spms. (*opercula*) illustrated by Sacco, MRSN BS.075.09.023, 024, 025, 026 (Sacco, 1896b, pt. 21, pl. 2, figs. 15d, e, f, g) (excellent state of preservation). The lectotype of var. *scalarata*, MRSN BS.075.09.031 (Sacco, 1896b, pt. 21, pl. 2, fig. 17); the paralectotypes of var. *scalarata*, 5 spms., MRSN BS.075.09.031/01; the lectotype of var. *elatissima*, MRSN BS.075.09.032 (Sacco, 1896b, pt. 21, pl. 2, fig. 18); the paralectotypes of the var. *elatissima*, 4 spms., MRSN BS.075.09.032/01; the holotype of var. *bolmoides* Sacco, BS.075.09.033 (Sacco, 1896b, pt. 21, pl. 2., fig. 22); the lectotype of var. *perrotunda*, Rovasenda Collection, MRSN BS.075.09.032bis (Sacco, 1896b, pt. 21, p. 18, pl. 2., fig. 20); the paralectotype of var. *perrotunda*, Rovasenda Collection, MRSN BS.075.09.032bis /01. Shells in a good state of preservation. 1 spm., MRSN BS.075.09.026/01; 87 spms., MRSN BS.075.09.026/02-05 (shells generally abraded and lacunose), 71 spms. (*opercula*), MRSN BS.075.09.026/06.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.075.09.022 bis (lectotype)	4	2	28.5	15	22.5	36.2	84°
MRSN BS.075.09.022 ter	4	3	24.6	10	19.6	36	82°
MRSN BS.075.09.022	4	-	27.2*	13.75*	22	34	90°
MRSN BS.075.09.031	4	-	34.1	21.1	13	36.9	84°
MRSN BS.075.09.032	4	1.6	37.1	22.5	14.6	38.1	66°
MRSN BS.075.09.033	3	-	16.4*	7.3*	9.1	26.9	89°
MRSN BS.075.09.032bis	4	1.5	16.8*	9.9*	6.9	26.5	82°

PLATE 5

- Fig. 1 - *Turbo (Ninella) multinctus* Sacco, 1896. Lectotype. Dego (SV), MRSN BS.075.02.001; a) abapertural side, b) apertural side. Reproduced from Ferrero et al. (1984, pl. 45, fig. 4).
 Fig. 2 - *Turbo (Ninella) multinctus* Sacco, 1896. Paralectotype. Dego (SV), MRSN BS.075.02.002; base. Reproduced from Ferrero et al. (1984, pl. 45, fig. 5).
 Fig. 3 - *Bolma carinata* (Borson, 1821). T. P. B. locality unknown. MICG PI41; a) abapertural side, b) top view.
 Fig. 4 - *Turbinidae* ind. T. P. B. locality unknown. MICG PI42; a) top view, b) apertural side, c) abapertural side.
 Fig. 5 - *Trochidae* ind. Carcare (SV). MICG PI48; apertural side.



Dimensions (mm): thickness D max D min
MRSN BS.075.09.023-026 3-3.75 12.3-14 9.7-11.7

Remarks. The species is well known, clearly defined, and does not require further descriptive remarks.

The specimen from the Calasanzio collection is assigned to this species on the basis of: 1) shell turbate with a conical spire, 2) spire whorls carinate abapically, flat near the periphery and gently convex near the adapical suture, 3) carina with small spines.

The varieties *scalarata*, *elatissima*, *bolmoides* and *perrotunda* established by Sacco (1896b), all with identical stratigraphic (Middle Miocene) and geographic (Colli Torinesi) distribution, represent nothing more than the normal range of variability of the species. With regard to the varieties *intercincta* and *rotundornata* (all established by Sacco), as it has not been possible to find the specimens studied by Sacco the question remains unresolved.

Sacco (1896b) assigned the Borson species to the genus *Astraliium* Link, 1807 subgenus *Ormastraliium* Sacco, 1896. Cossmann (1918) ranks *Ormastraliium* as a subgenus of *Bolma*, Beu & Ponder (1979) do not recognize the validity of this subgenus and place all species of *Ormastraliium* in the genus *Bolma*.

The species studied is clearly assigned to the genus *Bolma* on the basis of: 1) shell turbate, 2) two angulations that bear spines on the last whorl (and one on the spire whorls), 3) a simple columellar callus which spreads over much of the base.

A subspecies of *Bolma carinata* is discussed later in this paper.

Occurrence. *Bolma carinata* is known almost exclusively from the Miocene of Piedmont (Cossmann, 1918; Pavia, 1976). Its presence in the Oligocene of the T.P.B. indicated by Sacco (1896b), even if with some uncertainty, is now confirmed by the Ighina Collection specimen.

Turbinidae ind.

Pl. 5, Fig. 4

Material. T.P.B. locality unknown: 1 spm. MICG PI 42 (internal mould with traces of the inside stratum of the shell).

Description. Shell turbate with a wide spiral angle and a conical spire of three whorls. Protoconch not preserved. Spire whorls only slightly convex. Body whorl averaging 2/3 of the shell height, angular at the periphery. Base almost flat.

Remarks. No attempt has been made to assign the present specimen to a species because of its quite poor state of preservation.

Family Trochidae Rafinesque, 1815

Subfamily Trochinae Rafinesque, 1815

Tribe Trochini Rafinesque, 1815

Genus *Tectus* Montfort, 1810

Tectus plicatoides (Sacco, 1896)

Pl. 6, Fig. 3

- 1896b *Trochus* (*Tectus*) *lucasianus* Brongniart var. *plicatoides* Sacco, pt. 21, p. 20, pl. 2, fig. 28.
1900 *Trochus* (sect. *Tectus*) *lucasianus* Brongniart var. *plicatoides* Sacco - Rovereto, p. 131.
1904 *Tectus lucasianus* (Brongniart) var. *plicatoides* Sacco - Sacco, pt. 30, p. 131.
1918 *Tectus plicatoides* Sacco - Cossmann, 11, p. 183.

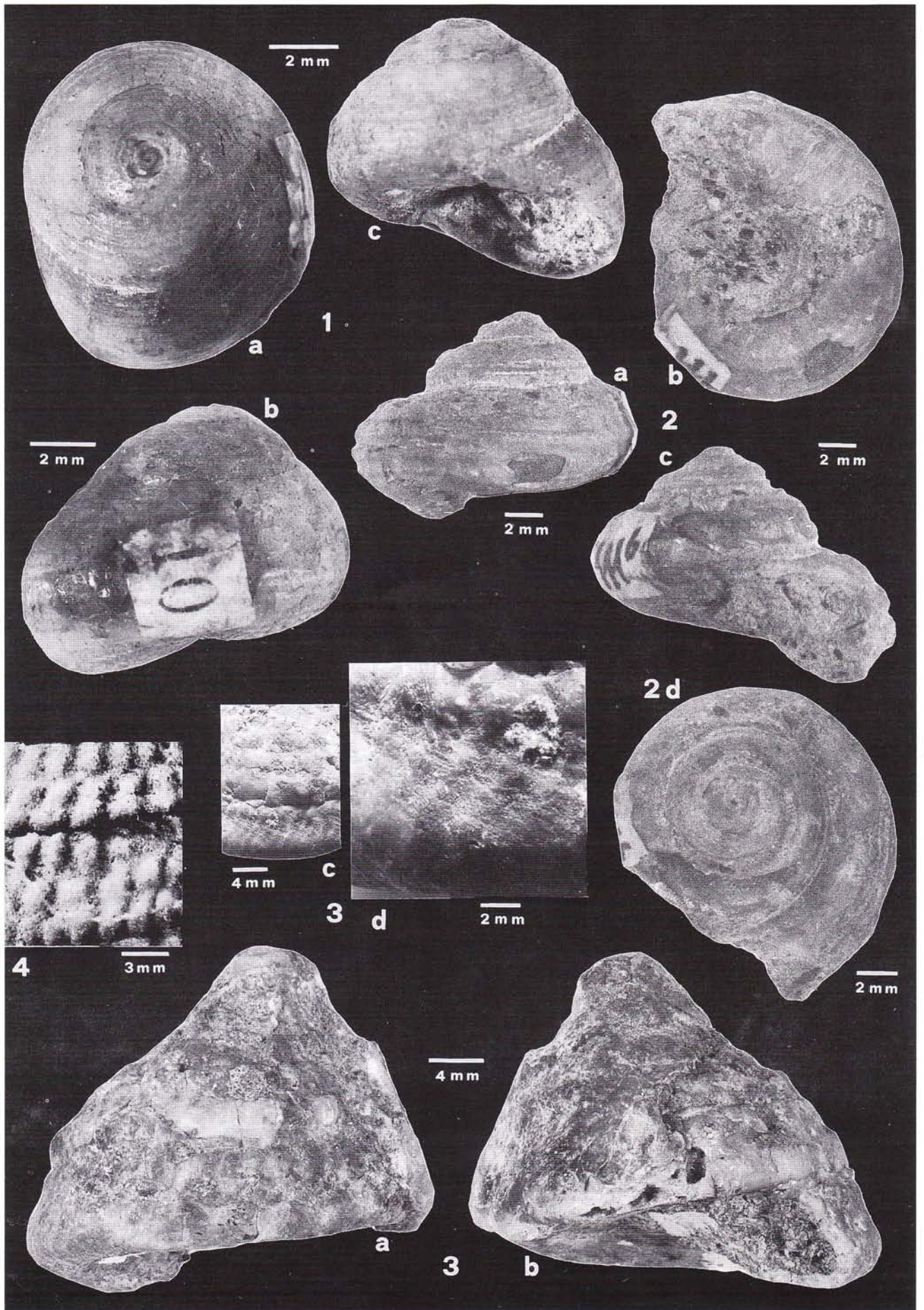
Material. Dego (SV): 2 spms., MICG PI 43 (the protoconch and aperture are missing; shells with some signs of abrasion and dissolution, but in general in quite a good state of preservation; one of the two specimens is deformed). Mioglia (SV): the lectotype (herein designated) of *Trochus lucasianus* var. *plicatoides* = *Tectus plicatoides* (Sacco) (Sacco, 1896b, pt. 21, pl. 2, fig. 28), DSTRG 1895/M-III-M9 (the protoconch and aperture are missing; shell slightly deformed, with the first whorls of the spire in a poor state of preservation); 1 spm., DSTRG 2096/M-III-M37 (shell extremely deformed and lacunose; we cannot determine whether this specimen belongs to the original material studied by Sacco). Sacco (1896b) quoted the var. *plicatoides* from several localities.

Dimensions (mm): NW PD H hs hw D MSA
DSTRG 1895/M-III-M/9 4.5 - 28* 18.2* 2.7 26.7 -

Remarks. The variety *plicatoides* designated by Sacco (1896b), and noted only in the Oligocene of the T.P.B., can be differentiated from the Brongniart species as the sculpture consists of an abapical spiral row of little pronounced knots and subnodose oblique plicatures in the adapical part of the whorls. On the contrary in

PLATE 6

- Fig. 1 - *Clanculus cerberi* (Brongniart, 1823). Holotype of *Leptothyra prosanguinea* Sacco, 1896. Sassello (SV). MRSN BS. 075.03.002; a) top view, b) side, c) apertural side.
Fig. 2 - *Gibbula* (*Gibbula*) *neglecta* (Michelotti, 1861). Illustrated specimen in Sacco (1896, pt. 21, pl. 3, fig. 40b''). Dego (SV). MRSN BS. 076.09.011; a) abapertural side, b) base, c) apertural side, d) top view.
Fig. 3 - *Tectus plicatoides* (Sacco, 1896). Lectotype. Mioglia (SV). DSTRG 1895/M-III-M9; a) abapertural side, b) apertural side, c)-d) details of the sculpture.
Fig. 4 - *Tectus lucasianus* (Brongniart, 1823). Veneto Region, Province of Vicenza. Museum of the University of Padoa, Catullo Collection 7543; detail of the sculpture. Photo by Mr. S. Castelli.



Tectus lucasianus (species noted in the Middle-Upper Eocene of Savoia and Bavarian and in the Upper Eocene-Oligocene of Venetian Region and Aquitanian Basin) the whorls are sculptured with spiral rows of oval tubercles (Pl. 6, Fig. 4).

In view of the peculiar ornamentation and of the diverse geographical distribution, we propose the Oligocene form as a valid species. *Tectus* is now considered a valid genus (see Hickman & MacLean, 1990).

Occurrence. *Tectus plicatoides* is known only in the Oligocene of the T.P.B. (Sacco, 1896b; Rovereto, 1900).

Tectus insignis (Michelotti, 1861)

Pl. 7, Fig. 1

- 1861 *Trochus insignis* Michelotti, pp. 90-91, pl. 10, figs. 6-7.
 1889 *Trochus insignis* Michelotti - Sacco, N. 1792.
 1896b *Trochus (Tectus) insignis* (Michelotti) - Sacco, pt. 21, p. 21, pl. 2, fig. 31.
 1918 *Tectus insignis* Michelotti - Cossmann, 11, p. 183

Material. T.P.B. locality unknown: 1 spm., MICG PI 44 (the first whorls are missing. Internal mould, slightly deformed, with marked traces of the sculpture). It is of note that the type of Michelotti in the Rome collection material being apparently lost, this specimen stands as the unique available representative of *Tectus insignis*.

Remarks. The poorly preserved specimen in hand seems to conform to the description of *Tectus insignis* in that it exhibits: 1) conical shape, 2) flat whorls sculptured with dense, almost equal spiral grooves, 3) base with a wide, deep, funnel-shaped umbilicus. Sacco (1896b) observed that this form, of which he had found only one incomplete specimen, is reminiscent of the living *Tectus obeliscus* Gmelin 1789 (= *Tectus pyramis* Born, 1778) from the Indo-Pacific, but the living species has a marked collabral sculpture, not spiral grooves.

Occurrence. *Tectus insignis* is only known in the Oligocene of the T.P.B. (Sacco, 1896b; Cossmann, 1918).

Genus *Clanculus* Montfort, 1810

Clanculus cerberi (Brongniart, 1823)

Pl. 6, Fig. 1

- 1823 *Monodonta Cerberi* Brongniart, pp. 53-54, pl. 2, figs. 5a-b.
 1865 *Trochus Cerberi* Brongniart - von Schaubroth, p. 223.
 1896b *Leptothyra prosanguinea* Sacco, pt. 21, p. 7, pl. 1, fig. 10 (2 figs.).
 1900 *Turbo (Leptothyra) prosanguineus* Sacco (an *T. Cerberi* Brongniart) - Rovereto, pp. 132-133.
 1900 *Clanculus Cerberi* Brongniart - Oppenheim, p. 283.
 1904 *Leptothyra prosanguinea* Sacco - Sacco, pt. 30, p. 130.
 1914 *Clanculus Cerberi* Brongniart - Rovereto, p. 144.
 1918 *Leptothyra prosanguinea* Sacco - Cossmann, 11, p. 129.
 1990 *Clanculus cerberi* (Brongniart) - Baglioni Mavros, p. 232.

Material. Pontinvrea-Mioglia area (SV): 1 spm., MPS 790 (the protoconch and the aperture are missing). Sassello (SV): the holotype

of *Leptothyra prosanguinea* = *Clanculus cerberi* (Sacco, 1896b, pt. 21, p. 7, pl. 1, fig. 10), MRSN BS.075.03.002 (the protoconch is missing). T.P.B. locality unknown: 1 spm., MPS 586 (shell almost complete). The specimens studied by Rovereto in the Museum of Genoa are lost.

Description. Shell small, rounded-conical; spire whorls convex, meeting at linear incised sutures. Body whorl about 4/5 of the shell height, rounded at the periphery. Base lightly convex. Aperture elliptical, oblique. Outer lip prosocline; inner lip poorly preserved. Umbilical area covered by sediment. All the whorls are sculptured with dense, regular, fine spiral cords.

Dimensions (mm): NW PD H hs hw D MSA
 MRSN BS.075.03.002 3* - 8* 4.65* 6.55 9 79°

Remarks. Sacco (1896b) established the new species *Leptothyra prosanguinea* on the basis of a single specimen, which was, by his own admission, incomplete. He assumed that this could be the ancestral form of Pliocene-Recent *Leptothyra sanguinea* Linnaeus, 1766 from West France and Mediterranean or even a variety of the same. At the same time, the author did not exclude the possibility of comparing it to *Monodonta cerberi* admitting that the incompleteness of the specimen did not allow "a certain comparison". Rovereto (1900), indicating the frequent occurrence of this form at S. Giustina, and though still defining it as *Leptothyra prosanguinea*, considered that in reality it was probably the Brongniart species. Later, in 1914, he opted definitively for the assignment to *Clanculus cerberi* (*Monodonta cerberi* = *Clanculus cerberi*, as already assumed by Oppenheim, 1900). The author concurred with Oppenheim's opinion on the basis of the presence of a typical columellat tooth. Unfortunately the poor state of preservation of the inner lip of the only specimen in hand hinders the observation of these feature, but the strongly oblique aperture and the base excavated in the middle are typical of the genus *Clanculus*. However in our opinion this form can be assigned to the Brongniart species on the basis of: 1) shape of the shell, 2) elliptical oblique aperture, 3) sharp, prosocline outer lip.

Occurrence. *Clanculus cerberi* is known in the Oligocene of the T.P.B. (Sacco, 1896b; Rovereto, 1900, 1914) and in the Middle Eocene to Middle Oligocene of the Venetian Region (Baglioni Mavros, 1990).

Tribe Gibbulini Stoliczka, 1868

Genus *Gibbula* Risso, 1826

Subgenus *Gibbula* s. str.

Gibbula (Gibbula) neglecta (Michelotti, 1861)

Pl. 6, Fig. 2

- 1861 *Turbo neglectus* Michelotti, p. 94, pl. 10, figs 17-19.
 1889 *Turbo neglectus* Michelotti - Sacco, N. 1773.

- 1896b *Gibbula (Gibbula) neglecta* Michelotti - Sacco, pt. 21, p. 31, pl. 3, figs. 40 (3 figs.)-40b (3 figs.).
 1918 *Gibbula (Gibbula) neglecta* (Michelotti) - Cossmann, 11, p. 230.
 1940 *Gibbula neglecta* Michelotti - Noszky, p. 7.
 1984 *Gibbula neglecta* (Michelotti) - Ferrero Mortara et al., p. 267.

Material. Carcare (SV): 2 spms., MICG PI 45 (shells in a poor state of preservation, with the final part of the body whorl missing). Deگو (SV): the specimens of *Gibbula neglecta* illustrated by Sacco (Sacco, 1896b, pt. 21, pl. 3, figs. 40b', 40b'', 40b'''), 3 spms., MRSN BS. 076.09.010, .011, .012; 9 spms., MRSN BS. 076.09.012/01. Shells in a poor state of preservation. Deگو (SV), locality Costa Lupara: 1 spm., MRSN 21717/01, Ricci thesis (shell in a poor state of preservation). Deگو (SV), locality Costa Lupara (Case Ciappeiroli): 4 spms., MPUM 8415 (shells in a poor state of preservation). T.P.B. locality unknown: 1 spm, MRSN TO.TG.001; (protoconch and aperture are missing; shell deformed and with some lacunae).

The syntypes from Deگو, illustrated by Sacco (1896b, pt. 21, pl. 3, figs. 40) and belonging to the Museum of Rome, are missing; the available relevant material is represented by the topotypes in the MRSN collection.

Other localities of the T.P.B. mentioned by Sacco (1896b): Pareto (AL), Cassinelle (AL), Mornese (AL).

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS. 076.09.010	5	2.2	12.35	7	8.75	16.6	84°
MRSN BS. 076.09.011	4	-	11.7*	6.3*	8.7	15.4	79°
MRSN BS. 076.09.012	3	-	8.3*	3.85*	6.3	11.8	81°

Remarks. The present species is well known, clearly defined, and does not requires further descriptive remarks. The specimens in hand were identified, without problems, on the basis of these diagnostic characteristics: 1) shell turbiniform with conical spire; 2) spire whorls angulate, with a narrow subhorizontal subsutural shelf; 3) whorls sculptured on the shoulder with a spiral row of tubercles and on the abapical part, on the periphery and on the base with regular spiral cords; 4) umbilicus margin strongly marked by a carina.

Gibbula neglecta is closely related to the Late Miocene to Recent *Gibbula (G.) magus* (Linnaeus, 1758) from Mediterranean and Red Sea, the type species of the genus *Gibbula* and differs from it in that lacks the basal angulation.

Occurrence. *Gibbula neglecta* is only noted in the Oligocene of the T.P.B. (Sacco, 1896b) and in the Rupelian of Hungary (Noszky, 1940).

Subgenus *Colliculus* Monterosato, 1888

***Gibbula (Colliculus) apenninica* Sacco, 1896**

Pl. 7, Fig. 2

- 1896b *Gibbula (Phorcullellus) apenninicus* Sacco, pt. 21, pp. 35-36, pl. 4, figs. 9a-e.
 1984 *Phorcullellus apenninicum* Sacco - Ferrero Mortara et al., p. 269, pl. 47, figs. 7-8.

Material. Cassinelle (AL): the lectotype (herein designated) of *Gibbula apenninica* (Sacco, 1896b, pt. 21, pl. 4, fig. 9c) MRSN BS. 076.13.003; the illustrated paralectotypes of *Gibbula apenninica*

(Sacco, 1896b, pt. 21, pl. 4, figs. 9a, b) 2 spms., MRSN BS. 076.13.001, 002. The apertures are missing; shells in a poor state of preservation, with some lacunae and abrasions. Giusvalla (SV), locality Pian Freccioso (Bric dei Dogli): 2 spms. MPUM 8416 (only one shell is relatively well preserved).

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS. 076.13.003 (lectotype)	5	2	9	6	5.7	10	74°
MRSN BS. 076.13.001	4	2.6	10.9	7.8	5.9	10.65	61°
MRSN BS. 076.13.002	4	2	9	5.8	5.8	10	72°

Remarks. The present species is clearly defined on the basis of: 1) shell small, turbinate, with a conical spire; 2) spire whorls only slightly convex, meeting along not very impressed sutures; 3) body whorl subangular at the periphery, about 2/3 of the shell height; 4) base nearly flat with a narrow, deep funnel-shaped umbilicus; 5) aperture oblique, subquadrangular; 6) outer lip markedly prosocline; 7) teleoconch and base sculpture consisting of spiral, slightly beaded cords (four-five on the whorls; six-seven on the base).

Sacco (1896b) linked this species to the group of *Phorcullellus philberti* Recluz, 1843 (ex *Phorcullellus villicus* (Philippi)) from Pleistocene-Recent of the Mediterranean and compared it also to *Phorcullellus rhenanus* (Mérian, 1853) a species from the Rupelian-Chatian of Mainz Basin (Germany). In our opinion Sacco's species differs from *Phorcullellus philberti* (= *Gibbula (Phorcus) philberti*) in that the shell is more depressed, the whorls are slightly convex (not flat in the subsutural zone) and the aperture is longer and more oblique. It can also be distinguished from *Phorcullellus rhenanus* (= *Jujubinus (Strigosella) rhenana*) by the lower spire, the deep and well developed umbilicus and the longer and more oblique aperture.

Sacco (1896b) assigned this species to the subgenus *Phorcullellus* now considered synonymous with the genus *Phorcus* Risso, 1826. We assign the species to the subgenus *Colliculus* on the basis of: 1) small shell, 2) whorls not shouldered near the suture, 3) outer lip inclined at 45° on the suture.

Occurrence. *Gibbula apenninica* is noted only in the Oligocene of the T.P.B. (Sacco, 1896b).

Subgenus *Phorcus* Risso, 1826

Gibbula (Phorcus) sp.

Pl. 7, Fig. 3

Material. Giusvalla (SV), locality Pian Freccioso (Bric dei Dogli): 4 spms., MPUM 8417-8418 (shells in a poor state of preservation). Mornese (AL), locality Cascina Mezza Monta: 1 spm., MPUM 8419 (shells in a poor state of preservation).

Description. Shell small, turbiniform, rather wider than high. Spire whorls convex, meeting along

impressed sutures. Body whorl about 3/4 of the shell height, convex at the periphery. Sculpture, visible only on the body whorl, consisting of fine, dense, spiral threads. Base with a small umbilicus.

Remarks. The turbiniform phaneromphalous shell is clearly gibbuline. The small umbilical cavity along with the low but distinct spirals point toward the assignment to the subgenus *Phorcus* of *Gibbula*. The shells in hand seem not fit in satisfactorily with the characters of any *Gibbula*'s species dealt with in the available literature. The Pliocene *Gibbula* (*Phorcus*) *distefanoi* Crema, 1903 from Calabria region appears to be the most closely related taxon differing mainly in that has a subangular periphery of the body whorl. The Early Miocene *Gibbula* (*Phorcus*) *taurolaevis* Sacco, 1896b from Colli Torinesi is similar too, but has a smooth shell with a wider, deep umbilicus.

Subfamily Calliostomatinae Thiele, 1924

Genus *Calliostoma* Swainson, 1840

Calliostoma boscianum (Brongniart, 1823)

Pl. 7, Fig. 5

- 1823 *Trochus boscianus* Brongniart, p. 56, pl. 2, fig. 11.
 1825 *Trochus boscianus* Brongniart - Basterot, p. 33.
 1839 *Trochus Boscianus* Brongniart - Lamarck, v. 3, p. 560, n. 13.
 1842 *Trochus Boscianus* Brongniart - Sismonda, p. 29.
 1861 *Trochus Noe* (non D'Orbigny) - Michelotti, p. 90.
 1865 *Trochus Boscianus* Brongniart - von Schauroth, p. 224.
 1889 *Trochus Noe* D'Orbigny - Sacco, N° 1791.
 1895 *Trochus boscianus* Brongniart - Raulin, p. 552.
 1896b *Calliostoma* (*Ampullotrochus*) cfr. *boscianus* (Brongniart) - Sacco, pt. 21, p. 45.
 1900 *Trochus boscianus* Brongniart - Oppenheim, p. 282.
 1900 *Calliostoma Bosciana* Brongniart - Rovereto, p. 132.
 1904 *Ampullotrochus boscianus* (Brongniart) - Sacco, pt. 30, p. 131.
 1910 *Trochus Boscianus* Brongniart - Kranz, p. 228.
 1918 *Tectus* (*Tectus*) *boscianus* (Brongniart) - Cossmann, 11, p. 183, pl. 11, fig. 3.
 1973 *Calliostoma boscianus* (Brongniart) - Coletti et al., p. 8, tab. 3.
 1973 *Calliostoma boscianum* (Brongniart) - Turco, p. 7, pl. 1, figs. 17-18.

Material. Carcare (SV): 1 spm., DSTRG 2098/CM-VII-C1 (shell deformed due to lateral crushing of part of the body whorl; the aperture is missing; it could be the specimen studied by Rovereto in 1900). Mioglia (SV): 1 spm., DSTRG 2099/M-III-M39 (the first whorls of the spire and the aperture are missing; the shell is corroded

and encrusted with sediment). T.P.B. locality unknown: 1 spm., MICG PI 47 (shell poorly preserved, lacunose in the body whorl).

Other localities of the T.P.B. mentioned by Sacco (1896b): Cassinelle (AL), Giusvalla (SV).

Description. Shell conical. Spire whorls angular, flat adapically to the periphery and with the periphery placed at the abapical 1/3. Body whorl about 1/3 of the shell height, with a strong basal angulation. Base almost flat, without umbilicus. Teleoconch sculpture consisting of spiral cords: the two adapical ones beaded and the abapical one at the periphery nodose. The periphery is marked by a stronger nodose spiral cord. On the body whorl the two adapical beaded spiral cords are stronger and the periphery is marked by a double nodose spiral cord. Base sculpture not preserved.

Remarks. On the basis of these characteristics the specimens in hand can be assigned to the Brongniart species, despite the poor state of preservation. The sculpture features are consistent with the assignment to the genus *Calliostoma* Swainson.

Rovereto (1900), referring to the specimen he collected, confirmed the presence of this species in the Upper Rupelian-Lower Chattian and mentioned that Grateloup (1840) illustrated a form similar to *Calliostoma boscianum* in the Oligocene of Gaas (pl. 13, figg. 10-11).

Occurrence. *Calliostoma boscianum* is noted in the Oligocene of the T.P.B. (Sacco, 1896b; Rovereto, 1900), in the Early Oligocene of the Venetian Region (Castelgomberto, Sangonini) (Coletti et al., 1973), and in the Oligocene of the Aquitanian Basin (Gaas) (Grateloup, 1840; Raulin, 1895).

Trochidae ind.

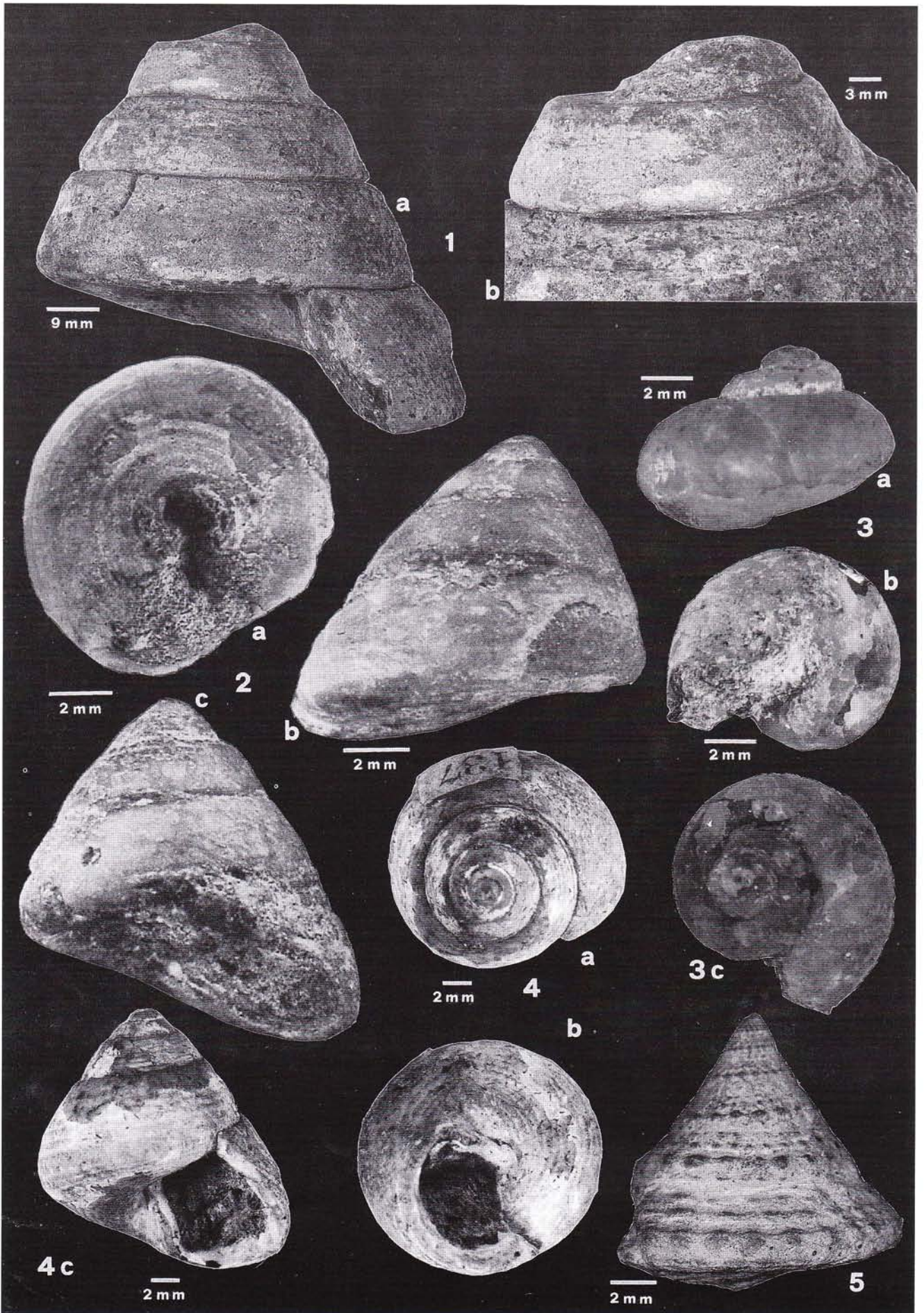
Pl. 5, Fig. 5

Material. Carcare (SV): 1 spm., MICG PI 48 (the apical whorls and aperture are missing; shell slightly deformed and corroded).

Description. Shell trochiform, slightly crushed laterally, consisting of three half whorls of the spire and the body whorl. The spire whorls are sculptured in the adapical half by three spiral cords, the central one of which is more pronounced and clearly nodose. Sculpture of the body whorl scarcely visible, consisting of four

PLATE 7

- Fig. 1 - *Tectus insignis* (Michelotti, 1861). T. P. B. locality unknown. MICG PI44; a) apertural side, b) detail of the spire.
 Fig. 2 - *Gibbula* (*Colliculus*) *apenninica* Sacco, 1896. Paralectotypes. Cassinelle (AL). MRSN BS.076.13.003; a) base. MRSN BS.076.13.001; b) abapertural side, c) apertural side. Reproduced from Ferrero et al. (1894, pl. 47, figs. 7-8).
 Fig. 3 - *Gibbula* (*Phorcus*) sp. Giusvalla (SV) locality Pian Freccioso, Bric dei Dogli. MPUM 8417; a) abapertural side, b) base, c) top view.
 Fig. 4 - *Gibbula* (*Colliculus*) *adansoni* (Payraudeau, 1826). Paralectotype of the var. *taurinensis* Sacco, 1896. Colli Torinesi (TO). MRSN BS.076.14.002; a) top view; b) base, c) apertural side.
 Fig. 5 - *Calliostoma* (*Ampullotrochus*) *boscianum* (Brongniart, 1823). Carcare (SV). DSTRG 2098/CM-VII-C1; abapertural side.



equidistant spiral cords, the second and fourth being nodose. Base slightly convex with faint traces of spiral cords.

Remarks. The ornamentation resembles that of *Calliostoma boscianum*, but the convex-angled form of the whorls, which does not seem due to deformation, does not allow us identification with this species. The shell in hand may belong to an undescribed species but any decision in this respect must await the examination of other, better-preserved specimens.

Archaeogastropoda ind.

Material. T.P.B. location unknown: 2 spms., MICG PI 50 (internal moulds with traces of shell; specimens extremely crushed, fractured and lacunose).

Remarks. Shells turbiniform with angular whorls. Ornamentation not visible. The aperture and part of the last whorl are missing. The very poor state of preservation hinders any assignment.

Middle Miocene taxa from Colli Torinesi.

In the following are considered four taxa mentioned and described by Sacco (1896b) in the Oligocene of various localities of the T.P.B but no longer found in the Oligocene collections examined in the course of this revision. These taxa (*Bolma carinata prohenica* Sacco, 1896, *Gibbula (Colliculus) adansoni* (Payraudeau, 1826), *Gibbula affinis protumida* Sacco, 1896 and *Antalis bouei* Deshayes, 1825) have been found in the Middle Miocene ("Helvetian") material from the Colli Torinesi (Province of Turin). Sacco (1896b, 1897) mentioned other two taxa (*Calliostoma oligocenicum* Sacco, 1896 and *Fissidentalium* cfr. *catulloi* Vinassa de Regny, 1896) but no specimens have been found.

SCAPHOPODA

Antalis bouei (Deshayes, 1825)

Pl. 8, Fig. 4

- 1825 *Dentalium Bouei* Deshayes, p. 355-56, pl. 18, fig. 8.
 1847 *Dentalium Bouei* Deshayes - Sismonda, p. 24 (pars).
 1847 *Dentalium Bouei* Deshayes - Michelotti, p. 141, 142 (pars).
 1852 *Dentalium Bouei* Deshayes - D'Orbigny, p. 94 (pars), 26° ét., n° 1750.
 1856 *Dentalium Bouei* Deshayes - Hörnes, p. 653, pl. 50, fig. 31.
 1861 *Dentalium Bouei* Deshayes - Michelotti, p. 136 (pars).
 1869 *Dentalium Bouei* Deshayes - Manzoni, p. 25.
 1889 *Dentalium Bouei* Deshayes - Sacco, N° 1721 (pars).
 1897 *Dentalium (Antale) Bouei* Deshayes - Sacco, pt. 22, p. 98-99, pl. 8, figs. 6-12.
 1897 *Dentalium (Antale) Bouei* Deshayes var. *tauraspera*, *perlaevis*, *taurogracilis* Sacco - Sacco, pt. 22, p. 99, pl. 8, figs. 14-21.
 1907 *Antale Bouei* Deshayes - Sacco, p. 9.

- 1909 *Dentalium (Antale) Bouei* Deshayes - Bellini, p. 225.
 1914 *Dentalium Bouei* Deshayes - Gripp, p. 10, pl. 1, figs. 4-5.
 1916 *Dentalium (Antale) Bouei* Deshayes - Cossmann & Peyrot, 3, p. 7; 2, pl. 1, figs. 17-18.
 1915 *Dentalium Bouei* Deshayes - Gripp, p. 21.
 1916 *Dentalium Bouei* Deshayes - Stefanini, p. 103.
 1917 *Dentalium (Antalis) bouei* Deshayes - Dalloni, p. 114.
 1936 *Dentalium (Antalis) bouei* Deshayes - Noszky, p. 82.
 1972 *Dentalium (Antalis) bouei* Deshayes - Robba, p. 492, pl. 58, fig. 7.
 1979 *Dentalium (Antalis) bouei* Deshayes - Caprotti, p. 228, pl. 4, fig. 1.
 1990 *Dentalium (Antalis) bouei* Deshayes - Baglioni Mavros, p. 249.
 1991 *Antalis* cfr. *bouei* (Deshayes) - Pavia, p. 114, pl. 1, figs. 11-12; fig. 3.

Material. The specimens illustrated by Sacco (Sacco, 1897, pt. 22, pl. 8, figs. 7, 8, 9), MRSN BS.106.02.005-006-007; 34 spms. (Villa Forzano), MRSN BS.106.02.007/01; 36 spms., MRSN BS.106.02.007/02; the lectotype (herein designated) of var. *perlaevis* (Sacco, 1897, pl. 8, fig. 18) MRSN BS.106.02.012; 14 spms. (var. *taurogracilis*), MRSN BS.106.02.014/01. Baldissero (AL): the non illustrated paralectotypes of var. *perlaevis*, 25 spms., MRSN BS.106.02.012/01. Cellamonte Casalese (AL): 1 spm., MRSN BS.106.02.007/03. Locality unknown: 28 spms., MRSN BS.106.02.007/04. All the material consists of shells in a poor to quite good state of preservation, often lacunose.

Material of the Middle Miocene (Badenian) from Baden (Austria) - The topotype of *Dentalium bouei* illustrated by Sacco (1897, pt. 22, pl. 8, fig 6) and Pavia (1991, pl. 2, figs. 5a-c), MRSN BS.106.02.004 (shell in a good state of preservation).

Description. Shell elongate, tubular, tapering, only slightly curved. Section subcircular, gently depressed dorsally. Sculpture consisting of dense, regular, fine longitudinal ribs. Growth lines fine and dense.

Dimensions (mm):	l	ha	D1	D2
MRSN BS.106.02.005	54.5*	2	7*	3
MRSN BS.106.02.006	66	4.2	7.9	2.5
MRSN BS.106.02.007	30*	2*	7.7	3.5*
MRSN BS.106.02.012	54.5*	2.2	8*	5.8*
MRSN BS.106.02.004	65	3.9	7.4	2.5

Remarks. We concur with Robba (1972) that the three varieties of Sacco (*tauraspera*, *perlaevis* and *taurogracilis*) are not so clearly distinct as to identify forms different from the species. Robba (1972) points out the differences, already mentioned by Sacco (1897), between these species and *Antalis interrupta* Schröter, 1794 from the Upper Miocene of Northern Italy and Vienna Basin: longitudinal, nearly equal, thin and regular ribs instead of stronger ribs alternating with 1-2 weaker riblets. Sacco (1897) regards *Dentalium intermedium* Hörnes, 1875, from Langhian of Ottwang (Austrian) as a variety of *Antalis bouei*. We concur with Robba (1972) who, on the basis of the analysis of the original illustration and description, affirmed that this species seems very close to the Deshayes taxon.

Occurrence. *Antalis bouei* is noted in the Oligocene of the T.P.B. (Michelotti, 1861; Sacco, 1897; Robba, 1972), in the Oligocene of the Algerian West (Dalloni, 1916) and of Hungary (Noszky, 1936), in the Early Miocene of Czechoslovakia (Robba, 1972), in the Early and Middle Miocene of the Paris Basin, the Vienna Basin (Baglioni Mavros, 1990) and the North Sea (Gripp, 1915), in the Langhian of Veneto (Stefanini, 1916), in the Middle Miocene of Piedmont and the Aquitanian Basin (Robba, 1972), in the Tortonian of Piedmont (Robba, 1972) and the Modena and Piacenza areas (Bellini, 1909), in the Messinian of Borelli (Turin) (Pavia, 1991). Bellini (1909) also mentioned it in the Pliocene of the Emilia region.

ARCHAEOGASTROPODA

Bolma carinata (Borson, 1821)

subsp. *prohenica* Sacco, 1896

Pl. 8, Fig. 2

- 1896b *Astralium* (*Ormastralium*) *carinatum* (Borson) var. *prohenica* Sacco, pt. 21, p. 18, pl. 2, figs. 16a, 16 b (2 figs.), 16c (2 figs.), 16d. (2 figs.).
 1984 *Ormastralium carinatum* (Borson) var. *prohenica* Sacco - Ferrero et al., p. 262.

Material. The lectotype (herein designated) of *Astralium carinatum* var. *prohenica* (Sacco, 1896b, pt. 21, pl. 2, fig. 16c) MRSN BS.075.09.029; the illustrated paralectotypes of *Astralium carinatum* var. *prohenica* (Sacco, 1896b, pt. 21, pl. 2, figs. 16 b', b'', c''), 3 spms., MRSN BS.075.09.027, .028, .030. The protoconchs and the apertures are missing as well as part of the spines of the ornamentation. Other paralectotypes, 20 spms., MRSN BS.075.09.030/01 (shells in a poor state of preservation).

Mention by Sacco (1896b) in the T.P.B.: Dego (SV).

Description. Shell turbate with conical spire about 3/7 of the shell height. Teleoconch whorls flat with a wide abapical carina. Sutures only slightly impressed. Body whorl about 77% of the shell height, angulated, flat adapically to the carinate periphery. Basal angulation prominent. Space between peripheral and basal angulation flat. Base almost flat, without umbilicus. Basal callus narrow, covering about 1/3 of the base. The first teleoconch whorl is sculptured only by dense, fine costella. On the second whorl a sculpture consisting of rows (four and, after, five) of small beaded spirals starts. The abapical carina bears rather long (probably curved) spines and is sculptured with fine and dense cords curved toward the base of the spines. The space between periphery and basal angulation bears one spiral cord, which after 1/3 of the whorl becomes double and beaded. The basal angulation is slightly beaded. Abapically to it six beaded spiral cords are counted (the two near the callus are stronger).

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.075.09.029 (lectotype)	3.5*	-	14*	6*	10.8	19	90°
MRSN BS.075.09.027	4	-	16.2	6.3	13.7	19.55	86°
MRSN BS.075.09.028	3	-	20.75	8.3	16.55	29.8	81°
MRSN BS.075.09.030	4	2.5	10	3.5	8.2	12.65	111°

Remarks. After comparison with many specimens of *Bolma carinata* (species previously discussed in this paper) from the MRSN collection we distinguish this form as a subspecies on the basis of: 1) teleoconch whorls with a wide carina bearing rather long spines, 2) sculpture consisting of beaded spiral cords. This form is very similar to the living *Bolma henica* (Watson, 1885) from deep water off Australia (see also the observation of Sacco, 1896b), but it differs in that it has slightly impressed sutures, spire whorls not angled and only six spirals on the base. On the contrary, the Watson species has sutures strongly channelled, spire whorls angled and up to ten spirals on the base (see description and illustrations in Beu & Ponder, 1979).

Occurrence. *Bolma carinata* subsp. *prohenica* is mentioned only in the Oligocene of the T.P.B. (a single incomplete specimen, never found again) and in the Middle Miocene of Piedmont (Sacco, 1896b).

Gibbula (*Colliculus*) *adansoni* (Payraudeau, 1826)

Pl. 7, Fig. 4; Pl. 8, Fig. 1

- 1826 *Trochus Adansoni* Payraudeau, p. 127, pl. 6, figs. 7-8.
 1847 *Trochus Bucklandi* Basterot - Michelotti, p. 182.
 1851 *Gibbula Adansonii* Payraudeau - Adams, p. 185.
 1868 *Trochus Adansoni* Payraudeau - Manzoni, p. 66.
 1885 *Trochus Adansoni* (Payraudeau) - Bucquoy et al., pp. 394-396, Atlas, pl. 47, figs. 1-5 (*cum syn.*).
 1896b *Gibbula* (*Colliculus*) *Adansoni* (Payraudeau) var. *taurinensis* Sacco, pt. 21, p. 37, pl. 4, figs. 15a-h.
 1918 *Gibbula* (section *Colliculus*) *Adansoni* Payraudeau - Cossmann, 11, p. 233, fig. 86.
 1918 *Gibbula* (section *Colliculus*) *taurinensis* Sacco - Cossmann, 11, p. 233.
 1960 *Gibbula* (*Colliculus*) *adansoni* Payraudeau - Cox & Keen in Moore, pt. 1 (Mollusca I), p. I256, fig. 164, 9.
 1962 *Gibbula* (*Colliculus*) *adansoni* Payraudeau - Glibert, p. 42.
 1982 *Gibbula adansoni* (Payraudeau) - Torelli, pp. 48-49, fig. 19.
 1984 *Colliculus adansoni* (Payraudeau) var. *taurinensis* Sacco - Ferrero Mortara et al., p. 269.
 1994 *Gibbula* (*Colliculus*) *adansoni* Payraudeau - Giannuzzi-Savelli et al. p. 70, figs. 187b-191b.

Material. The lectotype (herein designated) of *Gibbula Adansoni* var. *taurinensis* (Sacco, 1896b, pt. 21, p. 37, fig. 15d) MRSN BS.076.14.003; the illustrated paralectotypes of *Gibbula Adansoni* var. *taurinensis* (Sacco, 1896b, pt. 21, pl. 4, figs. 15a, c, e-g), 5 spms., MRSN BS.076.14.001, .002, .004, .005, .006; other paralectotypes of var. *taurinensis*, 25 spms., BS.076.14.006/01 Shells in quite a good state of preservation with limited abrasions and lacunae.

Mention by Sacco (1896b) in the T.P.B.: Sassello (SV), a similar form.

Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.076.14.003 (lectotype)	4*	1.3	11.6*	6.55*	8	10.3	63°
MRSN BS.076.14.001	5*	1.7	14.4*	9*	9.75	15	69°
MRSN BS.076.14.002	4.5*	1.7	10.5*	15*	7.8	10.15	67°
MRSN BS.076.14.004	5	-	11	7	7.25	10	65°
MRSN BS.076.14.005	4	-	11	5.75	8.6	11.6	71°
MRSN BS.076.14.006	4	1.6	11	7.3	7.5	10	63°

Remarks. The species is well known and clearly defined and does not require further descriptive remarks. The specimens in hand are assigned to this species on the basis of: 1) high conical spire, 2) body whorl enlarged and subangular at the periphery, 3) umbilicus narrow and deep, 4) aperture subquadrangular, 5) sculpture consisting of many fine spiral threads, 6) growth lines strongly prosocline. In our opinion, after comparison with some specimens of the living *Gibbula adansoni* from the Mediterranean area, the distinction of the var. *taurinensis* Sacco, 1896b is not justified. In fact the diagnostic characteristics of this variety (spiral threads wider and umbilicus less angled) appear to be widely variable.

Occurrence. *Gibbula adansoni* is reported in the Miocene of Touraine (Mayer, 1862 in Bucquoy et al., 1882-1898), the Pliocene of France (Glibert, 1962), the Pleistocene of Sicily (Glibert, 1962) and still living in the Mediterranean (Giannuzzi-Savelli et al., 1994) and the Black Sea (Bucquoy et al., 1882-1898). The form specified as variety *taurinensis* by Sacco is reported as frequent in the Middle Miocene of Piedmont and is also mentioned in the Oligocene of the T.P.B. (Sacco, 1896) (specimen not found).

Gibbula affinis (Eichwald, 1852)

subsp. *protumida* Sacco, 1896

Pl. 8, Fig. 3

- 1896b *Gibbula* (*Phorculellus*) *affinis*, var. *protumida* Sacco, pt. 21, p. 36, pl. 4, figs. 11a-b.
 1973 *Gibbula affinis protumida* Sacco - Baldi, p. 241, pl. 23, fig. 6.
 1984 *Phorculellus affinis* (Eichwald) var. *protumida* Sacco - Ferrero Mortara et al., p. 269.

Material. The lectotype (herein designated) of *Gibbula affinis* var. *protumida* (Sacco, 1896b, pt. 21, pl. 4, fig. 11a), MRSN BS.076.13.004 (shell with the apical whorls missing); the paralectotype of *Gibbula affinis* var. *protumida*, MRSN BS.076.13.004/01 (shell in a poor state of preservation).

Mention by Sacco (1896b) in the T.P.B.: Sassello (quite rare). The specimen in the Rome collection has not been found.

Description. Shell very small, turbate, with a conical spire. Teleoconch whorls almost flat or gently convex, but slightly inflated along the adapical suture. Body whorl clearly angled at the periphery. Base convex. Umbilicus narrow and deep. Aperture subcircular with an oblique outer lip. The ornamentation consists of six-seven regular spiral cords. The periphery is marked by a stronger and wider spiral. Ten nearly equal and regularly spaced cords are counted on the base. Regular and prosocline growth lines are clearly visible in the intervals between the spiral cords.

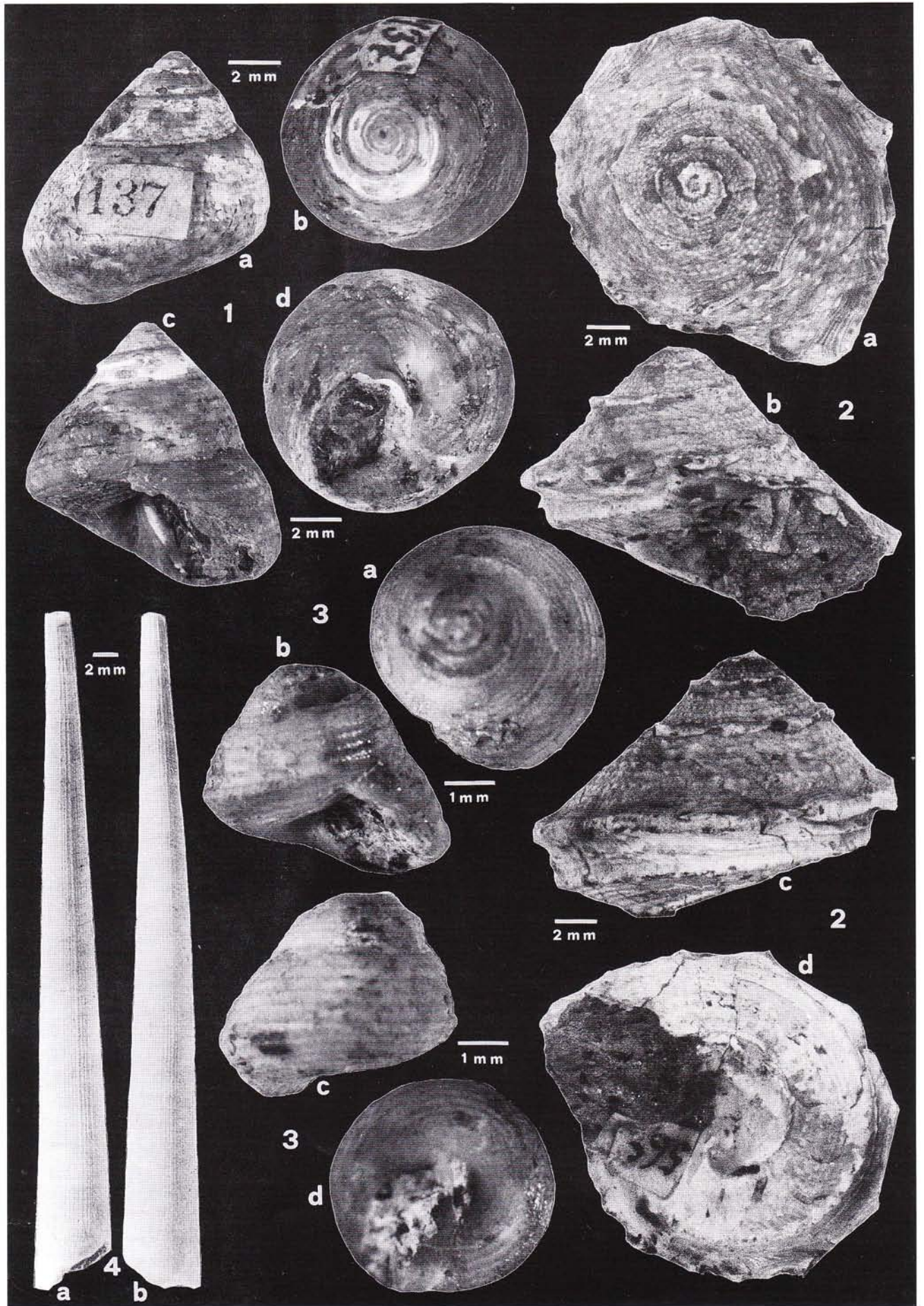
Dimensions (mm):	NW	PD	H	hs	hw	D	MSA
MRSN BS.076.13.004	3	-	5.2	2.65	4.2	5.35	65

Remarks. We concur with Baldi (1973) who observed that this form can be clearly differentiated as a subspecies of *Gibbula affinis* (species noted in the Miocene of the Mediterranean and Paratethys) on the basis of: 1) strong basal angulation (a characteristic already pointed out by Sacco in the definition of the variety), 2) whorls generally flatter and slightly concave. This author doubtfully considered *Gibbula eichwaldi* Cossmann & Peyrot race *avitensis* Cossmann & Peyrot, 1915 from Aquitanian-Burdigalian of the West France synonymous with this subspecies, but in our opinion the shell morphology of the race *avitensis* is quite different for these characteristics: 1) base flat, 2) teleoconch whorl sculpture consisting of six spiral cords alternating with two or three threads, 3) base sculptured with a larger cord around the umbilicus.

In the opinion of Sacco (1896b) the var. *protumida* was very like the living North-European and Mediterranean *Gibbula tumida* (Montagu, 1803) (known from the Miocene). We concur with Sacco because the morphology (described above) of the specimens studied here is almost the same as that of the li-

PLATE 8

- Fig. 1 - *Gibbula* (*Colliculus*) *adansoni* (Payraudeau, 1826). Lectotype of the var. *taurinensis* Sacco, 1896. Colli Torinesi (TO). MRSN BS.076.14.003; a) abapertural side, b) top view, c) apertural side, d) base.
 Fig. 2 - *Bolma carinata* (Borson, 1812) subsp. *probenica* Sacco, 1896. Lectotype. Colli Torinesi (TO). MRSN BS.076.09.029; a) top view, b) apertural side, c) abapertural side, d) base.
 Fig. 3 - *Gibbula affinis* (Eichwald, 1852) subsp. *protumida* Sacco, 1896. Lectotype. Colli Torinesi (TO). MRSN BS. 076.14.003; a) top view, b) apertural side, c) abapertural side, d) base.
 Fig. 4 - *Antalis bouei* (Deshayes, 1818). Topotype. Baden (Austria). MRSN BS.106.02.004; a) dorsal view, b) ventral view. Reproduced from Pavia (1991, pl. 2, fig. 5).



ving species. We do not therefore exclude that *Gibbula affinis protumida* can be ancestral to *Gibbula tumida* or also the same species. The two specimens in hand being lacunose and not well preserved, any decision in this respect must await better preserved specimens.

Sacco (1896b) assigned *Gibbula affinis* to the subgenus *Phorculellus* Sacco, 1896 now considered synonymous with the subgenus *Phorcus* Risso, 1826. We prefer to assign the species to *Gibbula* s.l. because there are enough data to classify this species into subgenera.

Occurrence. *Gibbula affinis protumida* is reported in the Oligocene of the T.P.B. and in the Middle Miocene of the Colli Torinesi (Sacco, 1896b), in the Oligocene and Miocene of the Mediterranean (Baldi, 1973).

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