

A REVISION OF THE PLIOCENE NATICIDS OF NORTHERN AND CENTRAL ITALY. III. THE SUBFAMILIES POLINICEINAE AND SININAE

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Abstract. The present paper is the third in the series and concludes the revision of the Pliocene naticids of northern and central Italy. It expands to 31 the total number of species and subspecies of this family recovered so far from the Pliocene deposits of the investigated area. Of the thirteen taxa covered in this study, eight (*bononiensis*, *exturbinoides*, *grossularia*, *guillemini*, *helicina helicina*, *magenesi*, *notabilis* and *pulchella*) belong to the genus *Euspira* Agassiz in J. Sowerby, 1837, one (*olla*) belongs to the genus *Neverita* Risso, 1826, two others (*fasciolata* and *intricata*) are members of *Payraudeautia* Bucquoy, Dautzenberg & Dollfus, 1883, and the last two (*perregulare* and *striatum*) belong to the genus *Sinum* Röding, 1798. All thirteen taxa considered in this paper are described and commented on in the systematic account. Since species herein recorded under *Euspira* were often assigned to *Polinices* Montfort, 1810 by earlier workers, both genera are discussed and their characters are defined on the basis of their respective type species. A significant output is that the tropical genus *Polinices*, well represented in Late Oligocene and Miocene naticid assemblages of Europe, disappeared from that area and there are no reliable records of it subsequent to the Tortonian. Also the relations between *Polinices* and *Neverita* are discussed and their respective distinguishing characters are pointed out.

This study demonstrates that the taxonomic relevance of a particular character may change greatly depending on the subfamily considered, and cannot be extended to Naticidae as a whole. Naticine species are confidently identifiable primarily by characters of their opercula. These latter can be combined with protoconch characters and color patterns, umbilical callus and umbilical characters in descending order of importance. Poliniceine and sinine species are readily and univocally distinguished by a combination of protoconch and umbilical characters, the larval shell being the most important element. In the case of *Neverita*, *Payraudeautia* and *Sinum* species, the teleoconch shape, the aperture and the umbilical callus also may have diagnostic value. The teleoconch shape appears to have been overrated by most workers.

Riassunto. Il presente lavoro è il terzo di una serie e completa la revisione dei naticidi pliocenici dell'Italia settentrionale e centrale. Esso amplia a 31 il numero totale di specie e sottospecie appartenenti a questa famiglia, rinvenute finora nei depositi pliocenici dell'area investigata. Dei tredici taxa considerati in questa ricerca, otto (*bononiensis*, *exturbinoides*, *grossularia*, *guillemini*, *helicina helicina*, *magenesi*, *notabilis* e *pulchella*) hanno caratteri che coincidono perfettamente con quelli del genere *Euspira* Agassiz in J. Sowerby, 1837, uno (*olla*) appartiene al genere *Neverita* Risso, 1826, altri due (*fasciolata* and *intricata*) sono membri di *Payraudeautia* Bucquoy, Dautzenberg & Dollfus, 1883 e i due ultimi (*perregulare* and *striatum*) corrispondono alla descrizione del genere *Sinum* Röding, 1798. Tutti i tredici taxa considerati in questo lavoro vengono descritti e commentati nella enumerazione sistematica. Dal momento che le specie qui incluse in *Euspira* erano state attribuite al genere *Polinices* Montfort, 1810 da vari autori precedenti, è emersa la necessità di discutere entrambi i generi, definendone quindi i caratteri sulla base delle rispettive specie tipo. Si è anche rilevato che il genere tropicale *Polinices*, presente con numerose specie nelle associazioni di naticidi dell'Oligocene superiore e Miocene europei, risulta scomparso da quell'area verso la fine del Miocene dal momento che non vi sono suoi ritrovamenti sicuri successivamente al Tortoniano. Inoltre, vengono discussi i rapporti tra *Polinices* e *Neverita*, mettendo in rilievo le differenze tra i due generi, consistenti principalmente nella differente transizione tra callo ombelicale e callo parietale. Questo studio dimostra che il valore tassonomico di un determinato carattere può variare anche molto a seconda della sottofamiglia presa in esame e che nessuna generalizzazione può essere fatta a livello della totalità dei Naticidae. La ricerca su questo gruppo sistematico mostra che le specie appartenenti ai Naticinae sono identificabili con sicurezza sulla base dei rispettivi opercoli. All'opercolo possono essere associati i caratteri della protoconca e la colorazione, il callo ombelicale e gli aspetti ombelicali in ordine discendente di importanza. Le specie riferibili a Poliniceinae e Sininae sono univocamente distinguibili tramite la combinazione di caratteri della protoconca e caratteri dell'ombelico, essendo il primo elemento quello con maggior valore diagnostico e certamente più significativo che non nel caso dei Naticinae. Limitatamente alle specie di *Neverita*, *Payraudeautia* e *Sinum*, anche la forma della conchiglia, l'apertura e il callo ombelicale possono assumere valore diagnostico. Da

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questa indagine emerge che l'importanza della forma della conchiglia è stata sovrastimata dalla maggior parte degli autori precedenti.

Introduction

The present paper is the third and final one in a series (see Pedriali & Robba 2005, 2008a) that attempts to revise the Pliocene naticids of northern and central Italy. It examines thirteen previously proposed taxa, two of which are ranked at a different taxonomic level, and further expands the number of Pliocene naticid taxa (eighteen were treated by Pedriali & Robba 2005, 2008a) to 31 in total. Four species having a Pleistocene to Recent range in the Mediterranean Basin, i.e. *Cochlea catena* da Costa, 1778, *Natica fusca* Blainville, 1825 (regarded below as a subspecies of *Nerita helicina* Brocchi, 1814), *Natica macilenta* Philippi, 1844 and *Neverita josephinia* Risso, 1826, were considered for comparison; the examined material is listed in Appendix 1.

This study is based on about 11,000 specimens. Of these, over 3,500 were personally recovered from 38 Pliocene localities, mostly in northern and central Italy (Fig. 1). Additional material relevant to the research, from the Miocene of Italy, France and The Netherlands, the Pliocene of Sicily and Spain, and the Pleistocene of Emilia, Calabria and Sicily, along with modern Mediterranean and eastern Atlantic shells, was incorporated. Pertinent naticids in the vast Bellardi-Sacco collection (Museo di Geologia e Paleontologia dell'Università di Torino) and in other public and private collections were also examined. Brief information on the collecting localities and on some Miocene and Pleistocene sites is appended (Appendix 2). The preservation of most of the studied shells is fair, and some are excellent, and the large size of the collection has allowed us to obtain several specimens with well preserved apical whorls and/or still retaining the color. Consequently, the shell characters of each species could be observed and analyzed in terms of range of variation and diagnostic value.

Most of the thirteen taxa covered in this paper were named during the 19th century. The first species to be proposed was *Nerita intricata*, described by Donovan (1803) on the basis of Recent shells from Great Britain. *N. intricata* was selected by Bucquoy, Dautzenberg & Dollfus (1883) as type species of their new genus *Payraudeautia*. Other species introduced during the first half of the century were *Nerita helicina* Brocchi, 1814, *Natica olla* de Serres, 1829 and *Sigaretus striatus* de Serres, 1829, based on Neogene specimens, whereas *Natica pulchella* Risso, 1826 and *Natica guilleminii* (sic) Payraudeau, 1826 were described from modern environments. Subsequent to their creation, a few specimens of the latter two species have been cited from the fossil record. In the last quarter of the 19th century Foresti

(1884) described *Natica bononiensis* from Pliocene deposits of Emilia and one year later Jeffreys (1885) proposed *Natica notabilis*, recovered in the Atlantic by the Porcupine Expedition; *N. notabilis* is quoted for the first time as a fossil herein. Shortly after, Sacco (1890) introduced *Natica hemiclausa* var. *exturbinoidea*, *Natica intricata* var. *fasciolata* and, one year later (1891), *Sigaretus striatus* var. *perregularis*. Later, these three varieties of Sacco have been totally neglected. We resurrect them as genuine species (see discussion in the systematic account). The last species, proposed during the second half of the 20th century, are *Polynices* (sic) *grossularia* Marche-Marchad, 1957 and *Euspira magenesi* Pedriali & Robba, 2001, the former based on Recent shells from off Senegal, the latter on Pliocene specimens from Emilia.

Of the thirteen taxa considered herein, eight (*bononiensis* Foresti, 1884, *exturbinoidea* Sacco, 1890, *grossularia* Marche-Marchad, 1957, *guillemini* Payraudeau, 1826, *helicina* Brocchi, 1814, *magenesi* Pedriali & Robba, 2001, *notabilis* Jeffreys, 1885 and *pulchella* Risso, 1826) are assigned to the genus *Euspira* Agassiz in J. Sowerby, 1837, another (*olla* de Serres, 1829) belongs to *Neverita* Risso, 1826, two (*fasciolata* Sacco, 1890 and *intricata* Donovan, 1803) belong to the genus *Payraudeautia* Bucquoy, Dautzenberg & Dollfus (1883) and two (*perregularis* Sacco, 1891 and *striatum* de Serres, 1829) have the characters of the genus *Sinum* Röding, 1798. As regards the Pleistocene and Recent species considered for comparison, *Cochlea catena* da Costa, 1778, *Natica fusca* Blainville, 1825 and *Natica macilenta* Philippi, 1844 are included in *Euspira*, whereas *Neverita josephinia* Risso, 1826 is the type species of *Neverita*.

Morphology and character analysis

For a review of naticid characters, along with information on the significance accorded to them by different workers, reference should be made to Pedriali & Robba (2005). The terms indicating the parts of the naticid shell as well as standard measurements used here are those adopted by Pedriali & Robba (2005) and shown in their text-fig. 2.

Protoconch

The plots of Figs. 2-5 show the average values of the protoconch characters of the thirteen taxa covered in this paper and of other four (*Euspira catena*, *Euspira helicina fusca*, *Euspira macilenta* and *Neverita josephinia*) included for comparison. The larval shell of taxa considered here is small to medium-sized, whereas the diameter of the first half-whorl ranges from very small to small (Fig. 2). Five species (*Euspira guillemini*, *Payraudeautia intricata*, *Neverita josephinia*, *Euspira maci-*

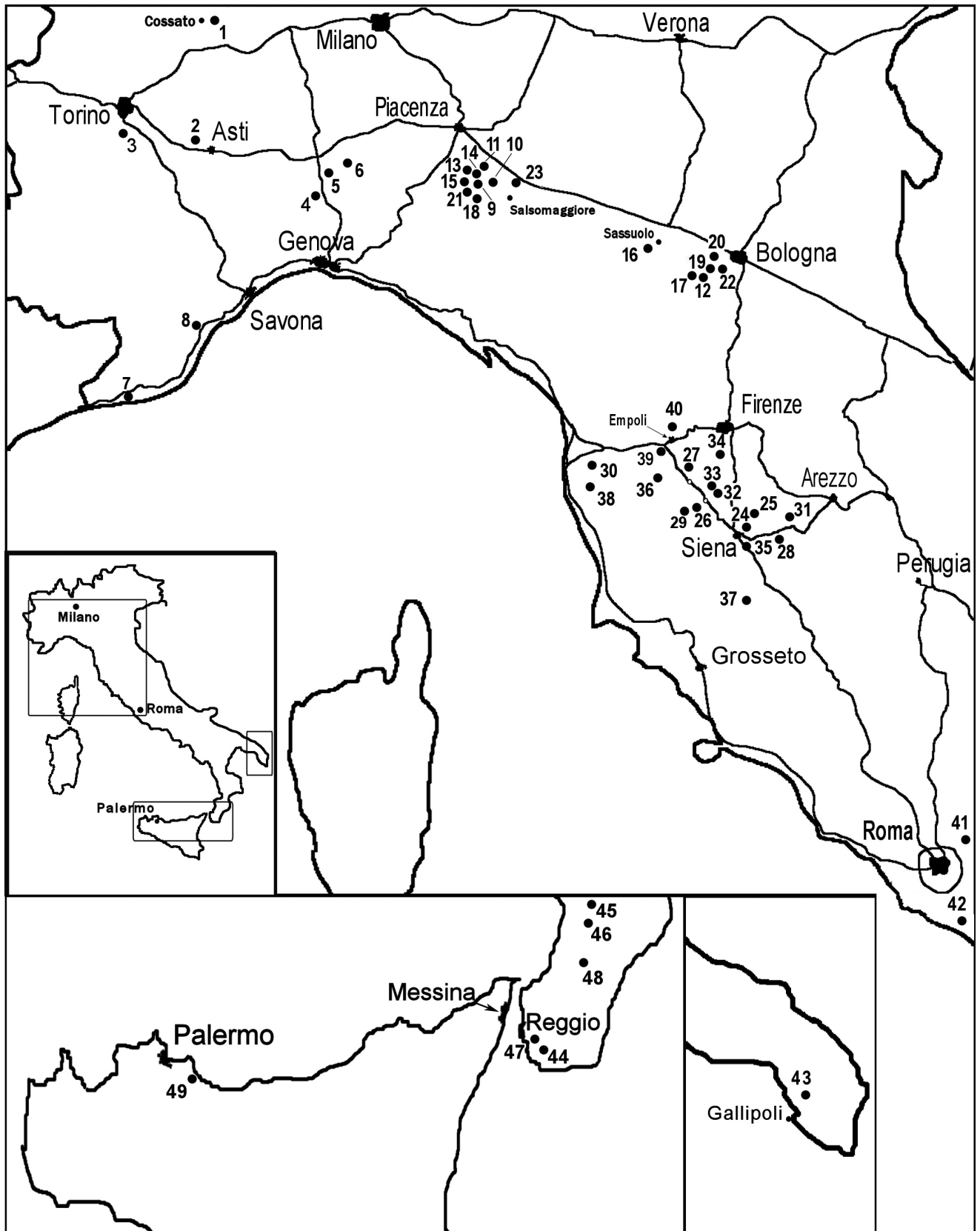


Fig. 1 - Sketch map of naticid localities; locality numbers are those in Appendix 2.

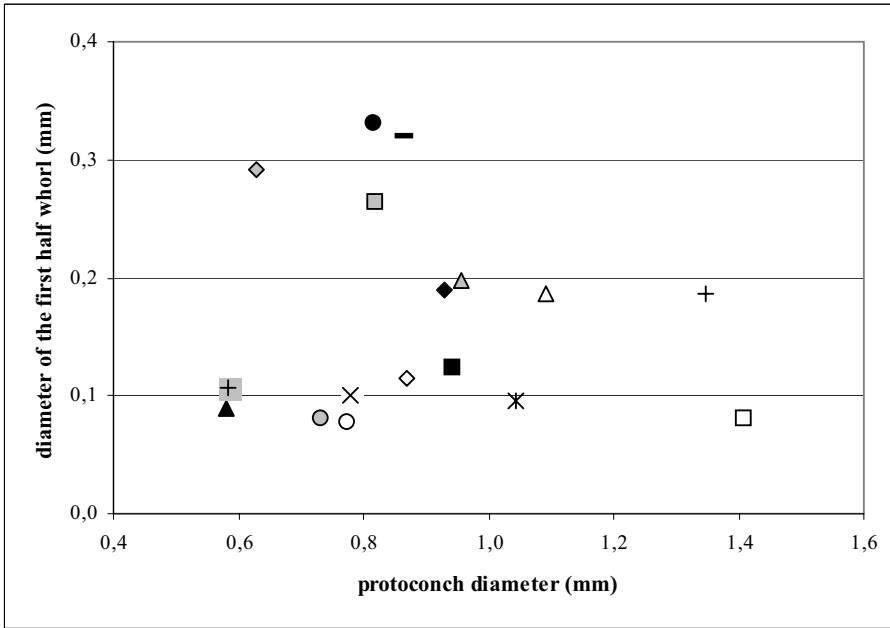


Fig. 2 - Relationship between diameter of the first half whorl of the protoconch and protoconch diameter; open triangle: *Euspira bononiensis*; gray-shaded triangle: *E. catena*; solid triangle: *E. exturbinooides*; open square: *E. grossularia*; gray-shaded square: *E. guillemini*; solid square: *E. helicina helicina*; open diamond: *E. helicina fusca*; gray-shaded diamond: *E. macilenta*; solid diamond: *E. magesesi*; open circle: *E. notabilis*; gray-shaded circle: *Neverita josephina*; multiplication sign: *N. olla*; asterisk: *Payraudeantia fasciolata*; dash: *P. intricata*; cross: *Sinum perregulare*; gray-shaded cross: *S. striatum*.

lenta and *Euspira magesesi*) have paucispiral larval shells reflecting non-planktotrophic larval development; all other taxa possess a multispiral protoconch of 2 to 3 whorls and their larval development is inferred to be planktotrophic (Fig. 3). As already noted for the Naticinae (see Pedriali & Robba 2005, 2008a), the size of the tip changes inversely with relation to the number of protoconch whorls (Fig. 4) and there is a direct correlation between the PD/DHW ratio and the protoconch whorls (Fig. 5).

In discussing the Naticinae, Pedriali & Robba (2005, 2008a) found that the protoconch shows little variation within a species, since the range of whorl numbers varies by no more than 0.25 whorls and the

diameter varies by less than 20%. The measurements effected for the poliniceine and sinine taxa dealt with in the present paper fit in with our earlier records; only one protoconch could be measured in the case of *Sinum striatum*, but that species also likely conforms to the cited rule.

Pedriali & Robba (2005), investigating the diagnostic significance of the larval shell of naticids, concluded that a difference of at least 20-25% in diameter (protoconch and/or initial half-whorl) as well as a half whorl difference in the number of whorls are sufficient to separate species.

The matrices in Tabs. 1-3 consider the same taxa of Figs. 2-5. From these matrices, it appears that the

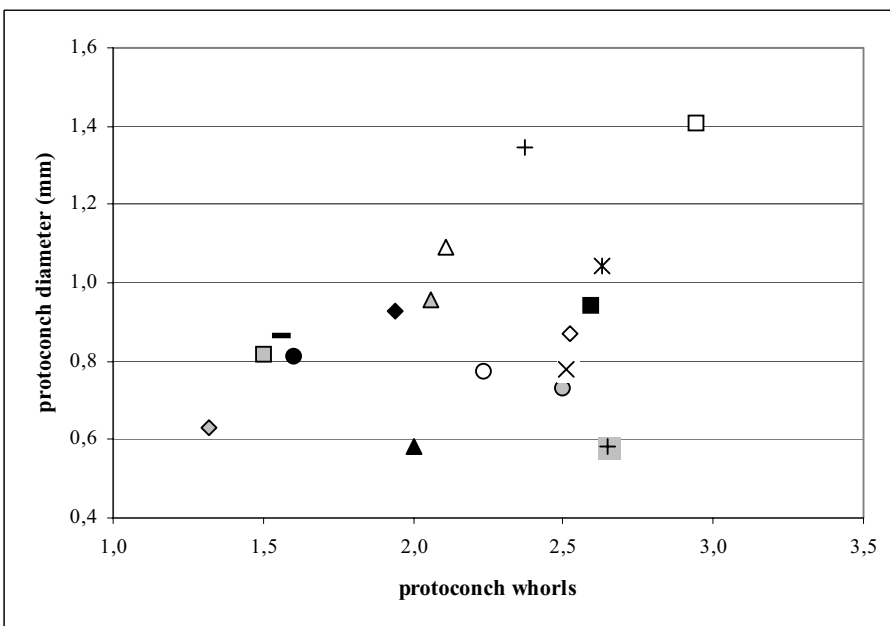
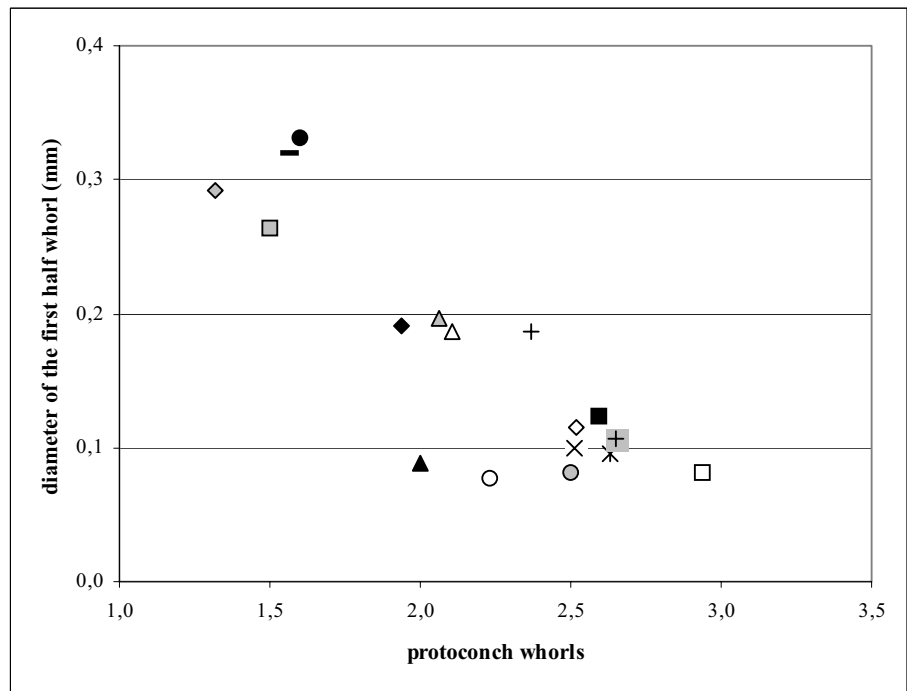


Fig. 3 - Relationship between protoconch diameter and protoconch whorls; symbols as in Fig. 2.

Fig. 4 - Relationship between diameter of the first half whorl of the protoconch and protoconch whorls; symbols as in Fig. 2.

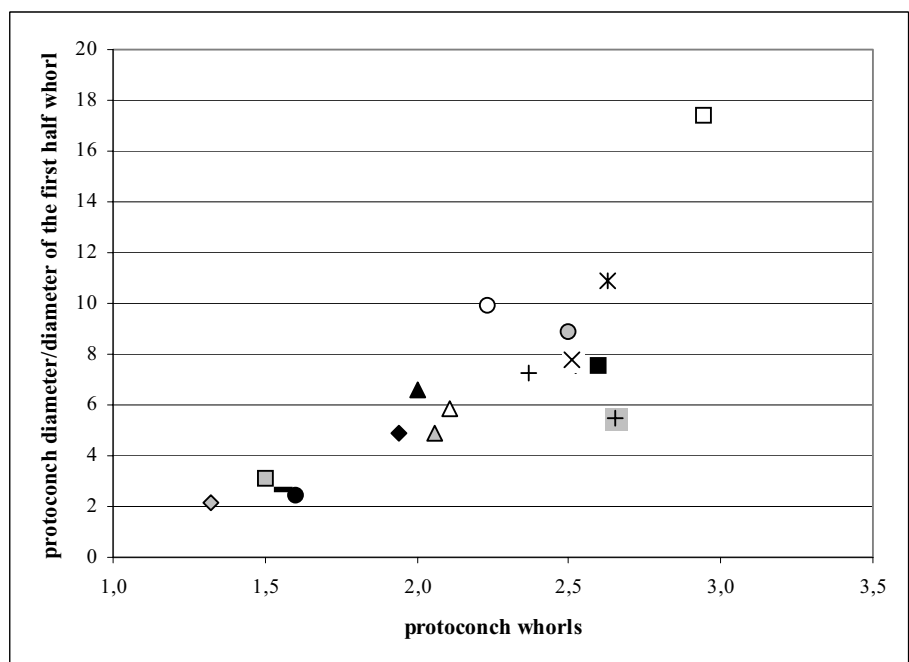


difference in the number of protoconch whorls (Tab. 1) is diagnostic (significant values in bold type) for several species pairs as are the percent difference in protoconch diameter (Tab. 2) and the percent difference in diameter of the first half whorl (Tab. 3). The average values of these characters of the larval shell are diagnostic for most of the *Euspira* taxa considered here. Exceptions are *E. bononiensis* whose average values for protoconch whorls, protoconch diameter and diameter of the first half-whorl are the same as those of *E. catena* and *E. magenesi*; the same happens with the pairs *E. helicina helicina*-*E. helicina fusca* (see discussion in the systema-

tic account) and *E. notabilis*-*E. pulchella*. For species pairs of *Neverita*, *Payraudeuati* and *Sinum*, the examined characters of the larval shell distinguish species adequately.

The protoconch of several poliniceine and sinine species bears spiral microsculpture, which may consist of threads or rows of granules restricted to the apical whorl (*Euspira*, *Sinum*), or of threads present on subsequent whorls, throughout or only over the last whorl (*Sinum*). The microsculpture (Tab. 4) may constitute an additional distinctive character (presence/absence, location on the larval shell, morphological details).

Fig. 5 - Relationship between protoconch diameter/diameter of the first half whorl ratio and protoconch whorls; symbols as in Fig. 2.



	<i>bononiensis</i>	<i>catena</i>	<i>exturbinooides</i>	<i>grossularia</i>	<i>guillemini</i>	<i>helicina helicina</i>	<i>helicina fusca</i>	<i>macilenta</i>	<i>magenesi</i>	<i>notabilis</i>	<i>pulchella</i>	<i>josephinia</i>	<i>olla</i>	<i>fasciolata</i>	<i>intricata</i>	<i>perregulare</i>	<i>striatum</i>	
<i>Euspira</i>																		
<i>bononiensis</i>		0,1	0,1	-0,8	0,6	-0,5	-0,4	0,8	0,2	-0,1	-0,4	0,5	-0,4	-0,5	0,6	-0,8	-0,5	
<i>catena</i>			0,1	-0,9	0,6	-0,5	-0,5	0,7	0,1	-0,2	-0,4	0,5	-0,5	-0,6	0,5	-0,8	0,6	
<i>exturbinooides</i>				-1,0	0,5	-0,6	-0,5	0,7	0,1	-0,2	-0,5	0,4	0,5	-0,6	0,4	-0,9	-0,7	
<i>grossularia</i>					1,5	0,4	0,4	1,6	1,0	0,7	0,5	1,4	0,4	0,3	1,4	0,1	0,3	
<i>guillemini</i>						-1,1	-1,0	0,2	-0,4	-0,7	-1,0	-0,1	-1,0	-1,1	-0,1	-1,4	-1,2	
<i>helicina helicina</i>							0,1	1,3	0,7	0,4	0,1	1,0	0,1	0,0	1,0	-0,3	-0,1	
<i>helicina fusca</i>								1,2	0,6	0,3	0,0	0,9	0,0	-0,1	1,0	-0,4	-0,1	
<i>macilenta</i>									-0,6	-0,9	-1,2	-0,3	-1,2	-1,3	-0,2	-1,6	-1,3	
<i>magenesi</i>										-0,3	-0,6	0,3	-0,6	-0,7	0,4	-0,4	-0,7	
<i>notabilis</i>											-0,3	0,6	-0,3	-0,4	0,7	-0,7	-0,4	
<i>pulchella</i>												0,9	0,0	-0,1	0,9	-0,4	-0,2	
<i>Neverita</i>																		
<i>josephinia</i>													-0,9	-1,0	0,0	-1,3	-1,1	
<i>olla</i>														-0,1	1,0	-0,4	-0,1	
<i>Payraudeautia</i>																		
<i>fasciolata</i>															1,1	-0,3	0,0	
<i>intricata</i>																-1,3	-1,1	
<i>Sinum</i>																		
<i>perregulare</i>																		0,2
<i>striatum</i>																		

Tab. 1 - Matrix showing difference in number of protoconch whorls within species pairs; significant values are boldfaced. Besides taxa found to occur in the Pliocene, also the Pleistocene to Recent *Euspira catena*, *E. helicina fusca*, *E. macilenta* and *Neverita josephinia* are enclosed for comparison.

	<i>bononiensis</i>	<i>catena</i>	<i>exturbinooides</i>	<i>grossularia</i>	<i>guillemini</i>	<i>helicina helicina</i>	<i>helicina fusca</i>	<i>macilenta</i>	<i>magenesi</i>	<i>notabilis</i>	<i>pulchella</i>	<i>josephinia</i>	<i>olla</i>	<i>fasciolata</i>	<i>intricata</i>	<i>perregulare</i>	<i>striatum</i>	
<i>Euspira</i>																		
<i>bononiensis</i>		12	47	-23	25	14	20	42	15	29	33	25	29	4	21	-16	47	
<i>catena</i>			39	-32	15	2	9	34	3	19	24	15	19	-8	10	-26	39	
<i>exturbinooides</i>				-59	-29	-38	-33	-8	-37	-25	-20	-29	-25	-44	-33	-55	0	
<i>grossularia</i>					42	33	38	55	34	45	48	42	45	26	39	8	59	
<i>guillemini</i>						-13	-6	23	-12	6	11	0	5	-22	-5	-37	29	
<i>helicina helicina</i>							7	33	1	18	22	13	17	-10	8	-28	38	
<i>helicina fusca</i>								28	-6	11	16	6	10	-17	1	-33	33	
<i>macilenta</i>									-32	-18	-14	-23	-19	-40	-27	-52	8	
<i>magenesi</i>										17	21	12	16	-11	7	-31	37	
<i>notabilis</i>											-5	-5	-1	-26	-11	-41	25	
<i>pulchella</i>												-10	-6	-30	-15	-44	20	
<i>Neverita</i>																		
<i>josephinia</i>													4	-22	-6	-37	29	
<i>olla</i>														-25	-10	-40	25	
<i>Payraudeautia</i>																		
<i>fasciolata</i>															17	-20	44	
<i>intricata</i>																-33	33	
<i>Sinum</i>																		
<i>perregulare</i>																		55
<i>striatum</i>																		

Tab. 2 - Matrix showing percent difference in diameter of the larval shell within species pairs; significant values are boldfaced. Taxa are those considered in Tab. 1.

	<i>bononiensis</i>	<i>catena</i>	<i>exturbinooides</i>	<i>grossularia</i>	<i>guillemini</i>	<i>helicina helicina</i>	<i>helicina fusca</i>	<i>macilenta</i>	<i>magenesi</i>	<i>notabilis</i>	<i>pulchella</i>	<i>josephinia</i>	<i>olla</i>	<i>fasciolata</i>	<i>intricata</i>	<i>perregulare</i>	<i>striatum</i>
<i>Euspira</i>																	
<i>bononiensis</i>		-5	52	57	-29	34	39	-36	-2	58	56	-44	47	49	-42	44	43
<i>catena</i>			55	59	-25	37	42	-33	4	60	58	-40	49	51	-39	47	45
<i>exturbinooides</i>				10	-66	-28	-23	-70	-53	12	8	-73	-11	-7	-72	-14	-16
<i>grossularia</i>					-70	-35	-30	-73	-57	3	-2	-76	-20	-17	-75	-23	-25
<i>guillemini</i>						53	56	-10	28	70	69	-20	62	64	-18	61	60
<i>helicina helicina</i>							7	-58	-35	37	34	-63	19	23	-61	16	15
<i>helicina fusca</i>								-61	-39	32	29	-65	13	17	-64	10	8
<i>macilenta</i>									35	73	72	-12	66	67	-9	64	64
<i>magenesi</i>										59	57	-43	47	49	-41	2	44
<i>notabilis</i>											-5	-76	-22	-19	-76	-25	-26
<i>pulchella</i>												-75	-18	-15	-74	-21	-23
<i>Neverita</i>																	
<i>josephinia</i>													70	71	3	69	68
<i>olla</i>														4	-69	-4	-6
<i>Payraudeautia</i>																	
<i>fasciolata</i>															-70	-8	-9
<i>intricata</i>																68	67
<i>Sinum</i>																	
<i>perregulare</i>																	-2
<i>striatum</i>																	

Tab. 3 - Matrix showing percent difference in diameter of the first half whorl of the protoconch within species pairs; significant values are boldfaced. Taxa are those considered in Tab. 1.

Tab. 4 - Microsculptural features of the larval shell. Taxa are those considered in Tab. 1.

<i>Euspira</i>	
1. <i>bononiensis</i>	absent
2. <i>catena</i>	initial half whorl with spiral rows of papillae
3. <i>exturbinooides</i>	initial half whorl with distant spiral threads on the abapical one half
4. <i>grossularia</i>	initial whorl with unevenly noded spiral threads occasionally connected by thin, irregular axials
5. <i>guillemini</i>	initial half whorl with distant, oblique spiral threads on the abapical two-thirds
6. <i>helicina helicina</i>	initial whorl with abapical spiral threads
7. <i>helicina fusca</i>	initial whorl with fine, irregularly noded spiral threads on the abapical one third
8. <i>macilenta</i>	
9. <i>magenesi</i>	absent
10. <i>notabilis</i>	absent
11. <i>pulchella</i>	initial whorl with distant, coarsely and irregularly granulated spiral threads over the abapical two-thirds
<i>Neverita</i>	
1. <i>josephinia</i>	absent
2. <i>olla</i>	absent
<i>Payraudeautia</i>	
1. <i>fasciolata</i>	absent
2. <i>intricata</i>	absent
<i>Sinum</i>	
1. <i>perregulare</i>	last half whorl with fine, even spiral threads
2. <i>striatum</i>	initial whorl with spiral rows of uneven, elongated granules

	number of whorls	protoconch diameter	diameter of the initial half whorl	sculpture
<i>Euspira</i>				
1. <i>bononiensis</i>	4, 5, 6, 8	3, 4, 5, 7, 8, 10, 11	3, 4, 5, 6, 7, 8, 10, 11	2, 3, 4, 5, 6, 7, 11
2. <i>catena</i>	4, 5, 6, 7, 8	3, 4, 8, 11	3, 4, 5, 6, 7, 8, 10, 11	1, 3, 4, 5, 6, 7, 9, 10, 11
3. <i>exturbinooides</i>	4, 5, 6, 7, 8, 11	1, 2, 4, 5, 6, 7, 9, 10, 11	1, 2, 5, 6, 7, 8, 9	1, 2, 4, 5, 7, 9, 10, 11
4. <i>grossularia</i>	1, 2, 3, 5, 8, 9, 10, 11	1, 2, 3, 5, 6, 7, 8, 9, 10, 11	1, 2, 5, 6, 7, 8, 9	1, 2, 3, 5, 6, 7, 9, 10, 11
5. <i>guillemini</i>	1, 2, 3, 4, 6, 7, 10, 11	1, 3, 4, 8	1, 2, 3, 4, 6, 7, 9, 10, 11	1, 2, 3, 4, 6, 7, 9, 10, 11
6. <i>helicina helicina</i>	1, 2, 3, 5, 8, 9	3, 4, 8, 11	1, 2, 3, 4, 5, 8, 9, 10, 11	1, 2, 4, 5, 7, 9, 10, 11
7. <i>helicina fusca</i>	2, 3, 5, 8, 9	1, 3, 4, 8	1, 2, 3, 4, 5, 8, 9, 10, 11	1, 2, 3, 4, 5, 6, 9, 10, 11
8. <i>macilenta</i>	1, 2, 3, 4, 6, 7, 9, 10, 11	1, 2, 4, 5, 6, 7, 9	1, 2, 3, 4, 6, 7, 9, 10, 11	??
9. <i>magenesi</i>	4, 6, 7, 8, 11	3, 4, 8, 11	3, 4, 5, 6, 7, 8, 10, 11	2, 3, 4, 5, 6, 7, 11
10. <i>notabilis</i>	4, 5, 8	1, 3, 4	1, 2, 5, 6, 7, 8, 9	2, 3, 4, 5, 6, 7, 11
11. <i>pulchella</i>	3, 4, 5, 8, 9	1, 2, 3, 4, 6, 9	1, 2, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 9, 10
<i>Neverita</i>				
1. <i>josephinia</i>	2	-	2	-
2. <i>olla</i>	1	-	1	-
<i>Payraudeautia</i>				
1. <i>fasciolata</i>	2	-	2	-
2. <i>intricata</i>	1	-	1	-
<i>Sinum</i>				
1. <i>perregulare</i>	-	2	-	2
2. <i>striatum</i>	-	1	-	1

Tab. 5 - Summarized differences in protoconch measurements and microsculptural features. Figures refer to species (left of first column) and denote those species which are distinguished from that on the left of each row, on the basis of the examined protoconch characters (columns 2 through 5). Taxa are those considered in Tab. 1.

From Tab. 5, which summarizes the differences between species on the basis of measurable characters and the microsculpture of the larval shell, it will be seen that 1) the microsculpture enhances the diagnostic significance of the protoconch and 2) most species can be distinguished from one another within each genus (except for *Euspira bononiensis* and *E. magenesi*). The present study shows that the protoconch of poliniceine and sinine taxa is of value even if not constantly species-diagnostic. It is notable that, in the case of the subfamilies considered herein, the larval shell appears to be much more effective for distinguishing species than it was concluded to be for the Naticinae (see Pedriali & Robba 2005, 2008a).

Teleoconch

Comments on the diagnostic value of the teleoconch characters of naticids were provided previously by Pedriali & Robba (2005). In the following, measurable characters suitable for statistical analysis are considered along with other qualitative (unmeasurable) attributes. Since genera have quite distinctive characters (see comments in the systematic account), the statistical treatment of species was carried out separately for each genus; taxa considered for comparison (*Euspira catena*, *Euspira helicina fusca*, *Neverita josephinia* and *Euspira*

macilenta) were also incorporated in the analysis. It is worthy noting that the coefficients of correlation for each considered pair of characters were significant for all studied taxa ($r = 0.70-0.99$). In order not to bore the reader, only the relevant scatters will be presented; pairs or single characters not discussed here are of no relevance in species recognition.

Shell shape. As already stated by Pedriali & Robba (2005), the shell shape can be defined statistically on the basis of the relations between 1) maximum diameter and shell height, 2) spire height and shell height and 3) spire angle.

In *Neverita*, the plot of maximum diameter against the height of the shell shows that the points representing *N. olla* and *N. josephinia* form two elongate scatters (Fig. 6). The regression lines have similar slope, but significantly different elevation. This means that, for a given height of the shell, *N. olla* attains a smaller diameter (or has a comparatively taller shell) than *N. josephinia*. For this same relationship in *Sinum*, it appears that *S. striatum* differs significantly in shell proportions from the small species *S. perregulare*, which is characterized by its less expanded last whorl (Fig. 7).

In *Euspira*, the relation between spire height and shell height fails to distinguish *E. helicina helicina*, *E.*

Fig. 6 - Relationship between maximum diameter and shell height (species of *Neverita*); open circles: *josephinia*; open triangles: *olla*.

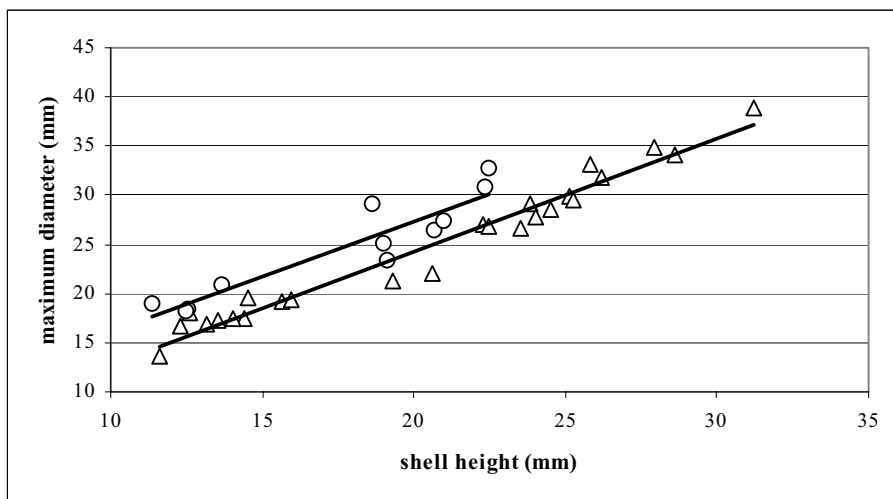


Fig. 7 - Relationship between maximum diameter and shell height (species of *Sinum*); solid circles: *perregulare*; open circles: *striatum*.

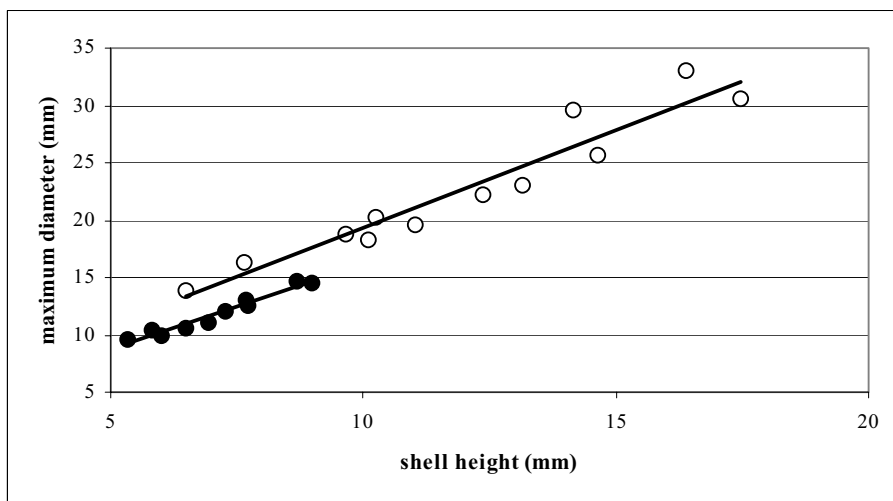
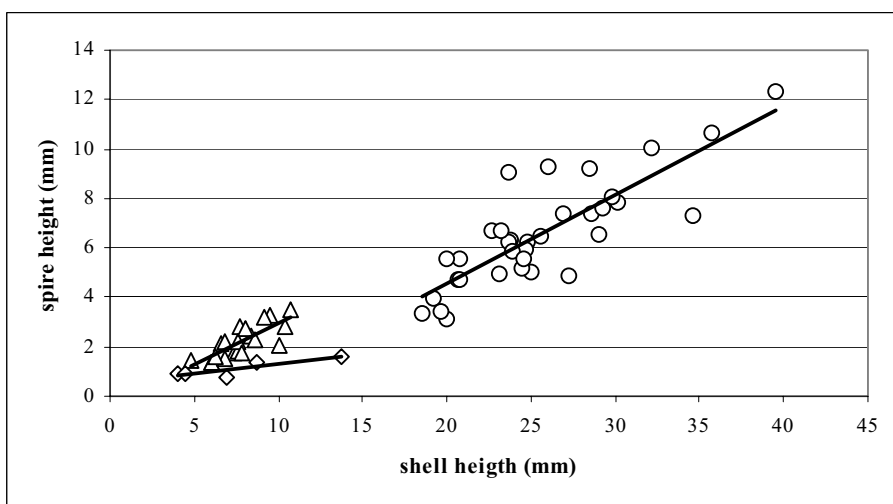


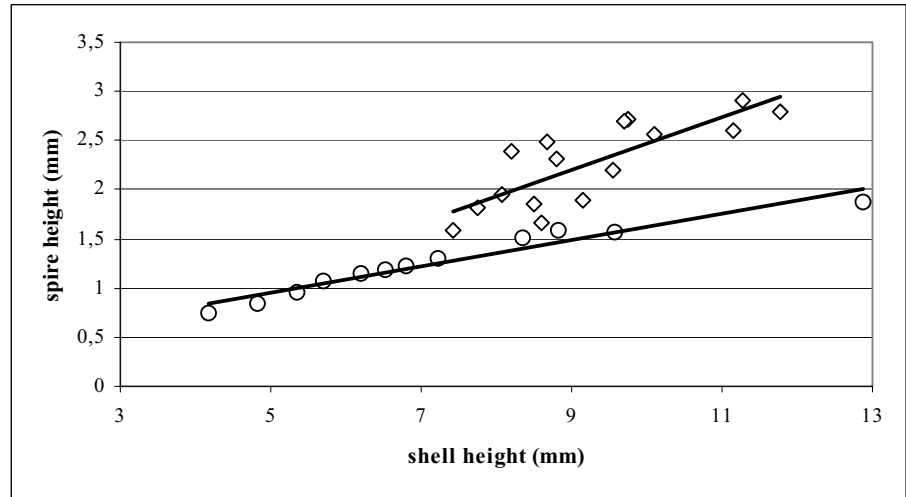
Fig. 8 - Relationship between spire height and shell height (species of *Euspira*); open circles: *catena* and *bononiensis* combined; open triangles: *exturbinoides*; open diamonds: *magenesi*.



helicina fusca, *E. guillemini* and *E. grossularia* from one another, as it does for *E. catena* and *E. bononiensis* and for *E. macilenta*, *E. notabilis* and *E. pulchella*. It appears (Fig. 8) that *E. exturbinoides*, *E. magenesi* as well as *E. catena* and *E. bononiensis* combined have lines with different elevation and/or slope. The small species *E.*

exturbinoides differs from *E. magenesi* (also small) in having a markedly higher spire, which grows much faster with increasing shell height; the comparatively higher spire distinguishes *E. exturbinoides* also from both *E. catena* and *E. bononiensis*. Most of the latter species are larger than *E. exturbinoides* and *E. magenesi*. In *Pay-*

Fig. 9 - Relationship between spire height and shell height (species of *Payraudeautia*); open circles: *fasciolata*; open diamonds: *intricata*.



raudeautia, *P. intricata* can be distinguished from *P. fasciolata* by having a more elevated spire, growing somewhat more rapidly with increasing shell height (Fig. 9).

The spire angle varies a lot in the taxa considered herein. From Tab. 6 it will be seen that the spire angle differentiates *Euspira magenesi* from the other *Euspira* taxa, but not these latter from one another since respec-

tive 95% confidence intervals largely overlap. This character does not help distinguish species of *Neverita*, *Payraudeautia* and *Sinum*.

Aperture. In order to define the aperture quantitatively, Pedriali & Robba (2005) used the relationship between 1) aperture width and aperture height, 2) aperture height and height of the shell, 3) aperture width and maximum diameter, and 4) the inner lip slope.

In *Sinum*, the relationship between aperture width and aperture height readily distinguishes *S. perregulare* from *S. striatum* since their regression lines have significantly different elevations (Fig. 10). For a given height, the width of the aperture is clearly greater in *S. striatum* than in *S. perregulare*, because of the difference in expansion of their respective last whorls (cf. Fig. 7).

The inner lip slope (inclination of the inner lip to the shell axis) also varies according to species. In most taxa, the 95% confidence intervals (Tab. 7) overlap one another and do not allow any reliable separation. The *Neverita* and *Sinum* species are exceptions. In fact, the confidence interval of *N. josephinia* only slightly overlaps that of *N. olla*, most specimens of which have values of the inner lip slope greater than those of *N. josephinia*. The difference is more marked in the case of *S. perregulare* and *S. striatum* since the inclination of the inner lip of *S. perregulare* is nearly twice that of *S. striatum*.

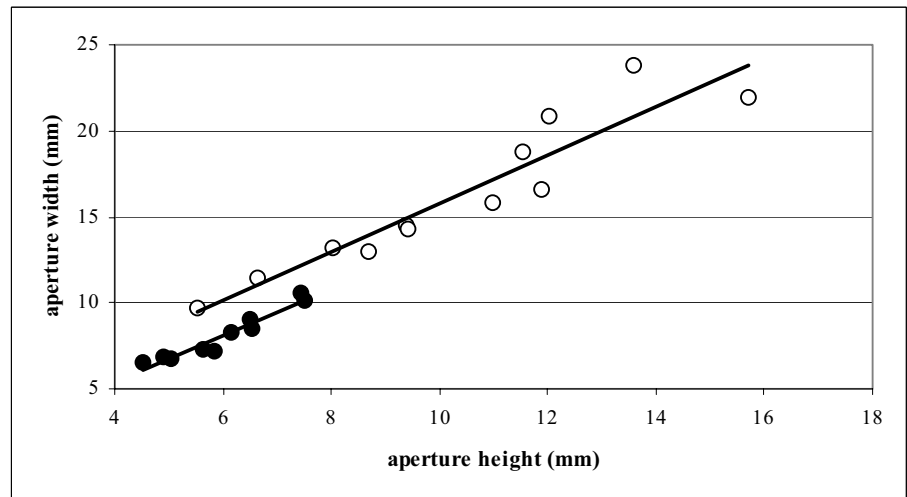
Umbilical characters. The statistical analysis focused on the relationship between 1) umbilicus width and maximum diameter and 2) width of the umbilical callus and maximum diameter.

When the umbilicus width is regressed against maximum diameter in species of *Euspira*, it appears that the regression lines for *E. bononiensis*, *E. exturbinoides*, *E. helicina fusca* and *E. macilenta* are not significantly

	mean	standard deviation	95% confidence interval
<i>Euspira</i>			
<i>bononiensis</i>	126°	7	112°-140°
<i>catena</i>	119°	7	105°-133°
<i>exturbinoides</i>	102°	9	84°-120°
<i>grossularia</i>	120°	10	100°-140°
<i>guillemini</i>	111°	8	95°-127°
<i>helicina helicina</i>	108°	7	94°-122°
<i>helicina fusca</i>	113°	9	95°-131°
<i>macilenta</i>	102°	11	80°-124°
<i>magenesi</i>	143°	8	127°-159°
<i>notabilis</i>	107°	6	95°-119°
<i>pulchella</i>	98°	12	74°-122°
<i>Neverita</i>			
<i>josephinia</i>	142°	3	136°-148°
<i>olla</i>	132°	7	118°-146°
<i>Payraudeautia</i>			
<i>fasciolata</i>	122°	7	108°-136°
<i>intricata</i>	114°	8	98°-130°
<i>Sinum</i>			
<i>perregulare</i>	148°	3	142°-154°
<i>striatum</i>	143°	6	131°-155°

Tab. 6 - Spire angle of species involved in the statistical analysis. Taxa are those considered in Tab. 1.

Fig. 10 - Relationships between aperture width and aperture height (species of *Sinum*); symbols as in Fig. 7.



different from one another as are those for *E. grossularia*, *E. guillemini*, *E. notabilis* and *E. pulchella*. After elimination of the latter group of taxa, the graph (Fig. 11) shows that the line for *E. bononiensis*, *E. exturbinoidea*, *E. helicina fusca* and *E. macilenta* combined and that for *E. helicina helicina* have similar slope, but significantly different elevation, i.e. that most specimens of

the former taxa, for a given size of shell, have a broader umbilicus than *E. helicina helicina*. As regards *E. catena* and *E. magesi*, again the lines have similar slope, but different elevation. This means that the small species *E. magesi* has a significantly wider umbilicus than the definitely large species *E. catena*.

The plot of width of umbilical callus against maximum diameter in species of *Neverita* shows that *N. olla* can be distinguished from *N. josephinia* by the greater elevation of the regression line (Fig. 12). For a given size of shell, the umbilical callus of *N. olla* is significantly broader than that of *N. josephinia*.

The inner umbilical characters are summarized in Tab. 8. In the case of *Euspira*, none of these characters is species-specific by itself. However, their combination appears to be relevant in identifying *E. bononiensis*, *E. catena*, *E. grossularia*, *E. helicina helicina*, *E. helicina fusca*, *E. magesi* and *E. pulchella*. The inner umbilical characters combined fail to separate *E. exturbinoidea* from *E. guillemini* and *E. macilenta* from *E. notabilis*, but distinguish these species pairs from one another and from the other *Euspira* taxa. In *Payraudeautia* species, the inner umbilical characters are strongly distinctive and readily separate *P. fasciolata* from *P. intricata*.

The more or less thick umbilical callus of *Euspira* species exhibits little difference in shape between species, being triangular or subtriangular in most, semicircular in a few; its adaxial outline can be straight, reverse J-shaped or reverse S-shaped (Tab. 9). As can be noted from Tab. 9, a particular adaxial outline of the umbilical callus is never species-specific, being shared by at least three to four *Euspira* taxa. Accordingly, this attribute bears a moderate importance since it may serve to distinguish one taxon only from many, but not from all the others of the genus (e.g. *E. bononiensis* from *E. catena*, *E. grossularia*, *E. guillemini*, *E. helicina helicina*, *E. helicina fusca*, *E. macilenta*, *E. magesi* and *E. pulchella*, but not from

	mean	standard deviation	95% confidence interval
<i>Euspira</i>			
<i>bononiensis</i>	18°	4	10°-26°
<i>catena</i>	21°	3	15°-27°
<i>exturbinoidea</i>	17°	4	9°-25°
<i>grossularia</i>	26°	5	16°-36°
<i>guillemini</i>	23°	4	15°-31°
<i>helicina helicina</i>	26°	5	16°-36°
<i>helicina fusca</i>	22°	3	16°-28°
<i>macilenta</i>	20°	3	14°-26°
<i>magesi</i>	23°	4	15°-31°
<i>notabilis</i>	19°	4	11°-27°
<i>pulchella</i>	18°	3	12°-24°
<i>Neverita</i>			
<i>josephinia</i>	8°	1	6°-10°
<i>olla</i>	17°	4	9°-25°
<i>Payraudeautia</i>			
<i>fasciolata</i>	16°	2	11°-20°
<i>intricata</i>	17°	3	11°-23°
<i>Sinum</i>			
<i>perregulare</i>	51°	2	47°-55°
<i>striatum</i>	19°	4	11°-27°

Tab. 7 - Slope of inner lip of species involved in the statistical analysis. Taxa are those considered in Tab. 1.

Fig. 11 - Relationship between umbilicus width and maximum diameter (species of *Euspira*); open squares: *bononiensis*, *exturbinoides*, *helicina fusca* and *macilenta* combined; solid triangles: *catena*; gray-shaded circles: *helicina helicina*; solid circles: *magenesi*.

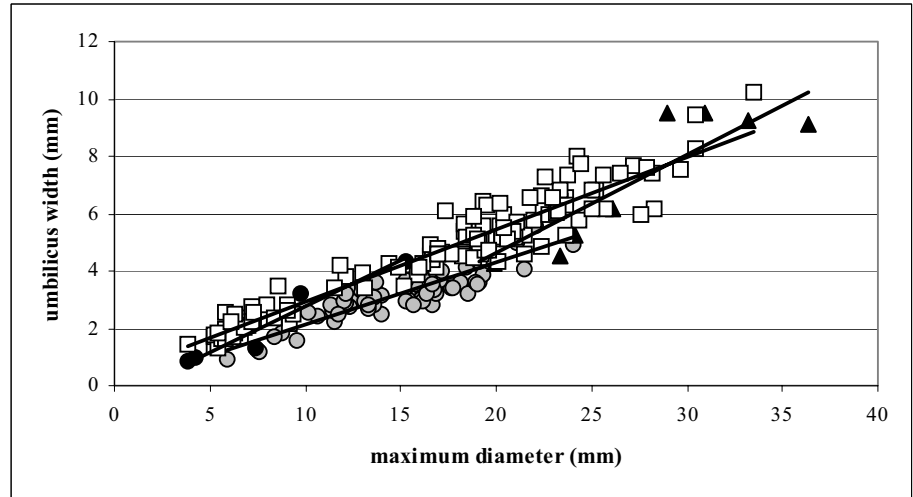
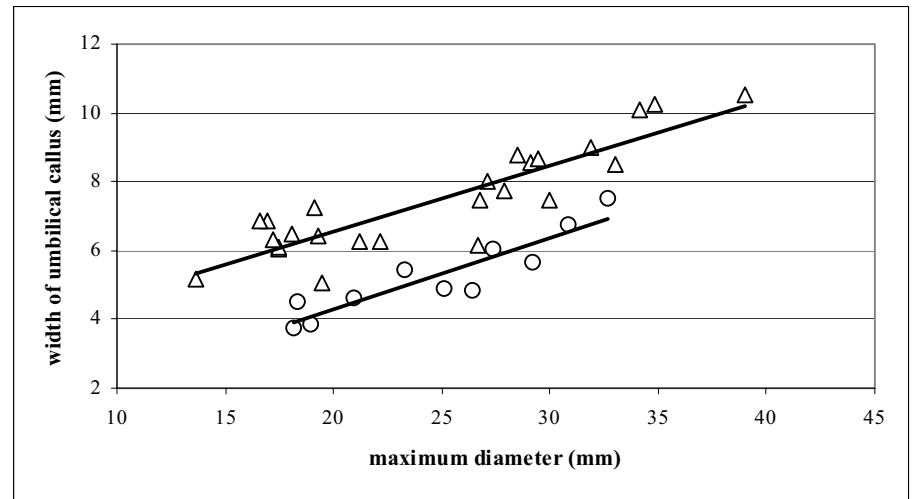


Fig. 12 - Relationship between width of the umbilical callus and maximum diameter (species of *Neverita*); symbols as in Fig. 6.



E. exturbinoides and *E. notabilis*). Conversely, the characters of the umbilical callus appear to be diagnostic in the case of the two *Payraudeautia* species.

Outer surface. Taxa belonging to *Euspira*, *Neverita* and *Payraudeautia* have smooth outer surface bearing only growth lines. Most species of *Sinum* are spirally sculptured, and differences in ornamentation details proved to be relevant in species recognition (see comments in the systematic account).

Several specimens were recovered that still retain the background color and color pattern. This character of the shell surface was defined whenever possible (except for *Payraudeautia fasciolata*, *Sinum perregulare* and *S. striatum*) and is presented in Tab. 10. Five *Euspira* species (*E. catena*, *E. grossularia*, *E. helicina helicina*, *E. helicina fusca* and *E. magenesi*) have distinctive color patterns; *E. pulchella* shares pattern 7 with *E. notabilis*, but is readily recognized when shells with pattern 8 are recovered. Also *Neverita josephinia* and *N. olla* can be safely identified on the basis of their color patterns.

Concluding remarks on characters of the Pliocene Naticidae

The specific value of the various characters of the poliniceine and sinine species covered in this paper is shown in Tab. 11. It will be briefly discussed in the following, and compared to that concluded about naticine taxa (Tab. 12) by Pedriali & Robba (2005, 2008a).

The characters of the larval shell combined, even if not constantly species-specific, constitute the primary character to distinguish poliniceine and sinine taxa (Tabs. 5 and 11). As already remarked, the protoconch of Poliniceinae and Sininae appears to be much more effective in species recognition than it is in the case of Naticinae (Tab. 12). This is because of the common occurrence of microsculpture in species of *Euspira* and *Sinum*, an additional distinctive element that is absent from the larval shells of Naticinae. The study of the Pliocene Naticidae (Pedriali & Robba 2005, 2008a; present paper) clearly demonstrates that the protoconch is a valuable character, often species-diagnostic, in some

Tab. 8 - Inner umbilical characters. Taxa are those considered in Tab. 1.

	funicle	inner ridge	inner furrow	inner spiral sculpture
<i>Euspira</i>				
<i>bononiensis</i>	broad, markedly depressed	—	more or less deep, usually narrow	occasional
<i>catena</i>	absent	—	absent	present
<i>exturbinoides</i>	broad, markedly depressed	—	rather shallow, of variable breadth	absent
<i>grossularia</i>	broad, very slightly prominent, absent in larger shells	—	absent	absent
<i>guillemini</i>	broad, markedly depressed	—	shallow, of variable breadth	absent
<i>helicina helicina</i>	obsolescent	—	moderately deep to deep, of variable breadth	absent
<i>helicina fusca</i>	obsolescent	—	shallow and broad	present
<i>macilenta</i>	broad, markedly depressed	—	moderately deep and narrow	absent
<i>magenesi</i>	absent	—	shallow and narrow	present
<i>notabilis</i>	broad, depressed	—	moderately deep and narrow	absent
<i>pulchella</i>	obsolete	—	shallow, rather wide	absent
<i>Neverita</i>				
<i>josephinia</i>	a thick, prominent cord	—	—	—
<i>olla</i>	a thick, prominent cord	—	—	—
<i>Payraudeautia</i>				
<i>fasciolata</i>	broad, rather depressed	nearly flat-topped, overhanging the interior of the umbilicus	abaxial side ascending to form a sharp angle with the top of the ridge	—
<i>intricata</i>	moderately narrow, rather depressed	narrowly round-topped, prostrate over the interior of the umbilicus	abaxial side strongly overhanging	—
<i>Sinum</i>				
<i>perregulare</i>	absent	—	—	—
<i>striatum</i>	absent	—	—	—

instances the unique character that is really useful to separate species that are otherwise hardly distinguishable (e.g. *Neverita josephinia* and *Neverita olla*). The simple larval shell of naticids may be worn or not preserved at all (especially in fossil specimens) and, in this event, its use in taxonomy could be difficult or even impossible. Likely, this is the reason why some major revisions of fossil naticids (Marinchovich 1977; Majima

1989) have accorded little attention to the protoconch. A final note: the protoconch has diagnostic value only at the species level, but does not distinguish genera since basically identical larval shells occur in species belonging to different genera, e.g. to *Natica*, *Cochlis* and *Tectonatica* as well as to *Neverita* and *Payraudeautia* (cf. Pedriali & Robba 2005, 2008a; see also Tabs. 1-3, 5 of present paper).

<i>Euspira</i>	
<i>bononiensis</i>	subtriangular to semicircular, with attenuated reverse S-shaped outline
<i>catena</i>	narrowly triangular, with straight outline
<i>exturbinooides</i>	subtriangular, with straight or attenuated reverse S-shaped outline
<i>grossularia</i>	subtriangular, with straight outline
<i>guillemini</i>	narrowly subtriangular, with straight outline
<i>helicina helicina</i>	narrowly subtriangular, with oblique reverse J-shaped outline
<i>helicina fusca</i>	narrowly subtriangular, with oblique reverse J-shaped outline
<i>macilenta</i>	narrowly subtriangular, with oblique reverse J-shaped outline
<i>magenesi</i>	subtriangular to semicircular, smoothly merging into the anterior lobe of the parietal callus
<i>notabilis</i>	subtriangular to semicircular, with reverse S-shaped outline
<i>pulchella</i>	narrowly subtriangular, with oblique reverse J-shaped outline
<i>Neverita</i>	
<i>josephinia</i>	massive, subcircular
<i>olla</i>	massive, semicircular
<i>Payraudeautia</i>	
<i>fasciolata</i>	subtriangular, demarcated from the anterior lobe of the parietal callus by a distinct transverse groove
<i>intricata</i>	subtriangular to semicircular, with reverse S-shaped outline
<i>Sinum</i>	
<i>perregulare</i>	absent
<i>striatum</i>	absent

Tab. 9 - Characters of the umbilical callus. Taxa are those considered in Tab. 1.

	background	color pattern
<i>Euspira</i>		
<i>bononiensis</i>	uniform pale brown	1. whitish, uneven collabral stripes
<i>catena</i>	uniform pale yellowish-brown	2. brown dashes and/or chevron markings arranged into a subsutural row
<i>exturbinooides</i>	uniform pale brown	1. whitish, uneven collabral stripes
<i>grossularia</i>	pale yellowish-brown shaded light violet-gray on spire whorls	3. reddish-brown, sparse, uneven spots arranged into five spiral rows
<i>guillemini</i>	light gray; mid adapical part of parietal callus reddish-brown	4. reddish-brown, uneven mottles and/or collabral stripes darker subsuturally and on lower base
<i>helicina helicina</i>	pale brown, darker on lowermost base	5. reddish-brown subsutural band
<i>helicina fusca</i>	pale chestnut-brown	unpatterned
<i>macilenta</i>	pale brown or orange	4. reddish-brown, uneven, undulating collabral stripes
<i>magenesi</i>	yellowish	6. reddish, distant collabral lines, restricted to part of the body whorl in some shells; sutural channel reddish-brown with adaxial blackish band
<i>notabilis</i>	uniform pale brown	7. two brown bands, respectively on subsutural shelf and on lowermost base
<i>pulchella</i>	more or less pale buff, yellowish-gray or orange; umbilical wall and inner lip calluses chestnut-brown in some shells	8. chestnut-brown chevron markings arranged into spiral rows, one on spire whorls, five over the body whorl 7. fossil specimens exhibit remnants of two brown bands, respectively subsutural and on lowermost base
<i>Neverita</i>		
<i>josephinia</i>	pale brown; umbilical callus reddish-brown	whitish, basal spiral band in some shells
<i>olla</i>	vestige of uniform pale brown	brown suprasutural stripe
<i>Payraudeautia</i>		
<i>fasciolata</i>		not preserved
<i>intricata</i>	more or less pale gray or buff with whitish mottles; apical whorls violet-gray; parietal callus, basal fasciole and inner umbilical ridge usually uniform reddish-brown	reddish-brown irregular chevron or flammulate markings arranged into four or five spiral rows, the subsutural one wider
<i>Sinum</i>		
<i>perregulare</i>		not preserved
<i>striatum</i>		not preserved

Tab. 10 - Background color and color patterns; different patterns are numbered only for *Euspira* species and subspecies. Taxa are those considered in Tab. 1.

Tab. 11 - Summary of distinguishing features of Poliniceinae and Sininae. Solid circle: species-diagnostic character; open circle: character useful to distinguish a species from others of the genus, but not from all; figures in the last column denote color patterns (cf. Tab. 10). Taxa are those considered in Tab. 1.

	PROTOCONCH (NW, PD, DHW and sculpture combined)	SHELL SHAPE			SUTURE	APERTURE			UMBILICUS (all features)	UMBILICAL CALLUS (all features)	SCULPTURE	COLOR	OPERCULUM
		proportions	spire height	spire angle		proportions	inner lip slope	parietal callus					
<i>Euspira</i>													
1. <i>bononiensis</i>	● (exc. 9)		○						●	○		○	
2. <i>catena</i>	●		○						●	○		●	
3. <i>exturbinooides</i>	●		○						○	○		○	
4. <i>grossularia</i>	●								●	○		●	
5. <i>guillemini</i>	●								○	○		○	
6. <i>helicina helicina</i>	●								●	○		●	
7. <i>helicina fusca</i>	●								●	○		●	
8. <i>macilenta</i>	●								○	○		○	
9. <i>magenesi</i>	● (exc. 1)		○	●	●				●	○		●	
10. <i>notabilis</i>	●								○	○		○	
11. <i>pulchella</i>	●								●	○		● (8) ○ (7)	
<i>Neverita</i>													
1. <i>josephinia</i>	●	●					●		●			●	
2. <i>olla</i>	●	●					●		●			●	
<i>Payraudeautia</i>													
1. <i>fasciolata</i>	●		●						●	●			
2. <i>intricata</i>	●		●						●	●			
<i>Sinum</i>													
1. <i>perregulare</i>	●	●				●	●		●		●		
2. <i>striatum</i>	●	●				●	●		●		●		

Statistical analysis has shown that the relevance of the shell shape is moderate as regards Poliniceinae and Sininae. This character proved to be useful in distinguishing species of *Neverita*, *Payraudeautia* and *Sinum*, but is much less efficient in separating species of *Euspira* (Tab. 11). The shell shape is scarcely significant in the case of species of Naticinae (Tab. 12). On the basis of our quantitative results (Pedriali & Robba 2005, 2008a; present paper), we cannot concur with the many workers who relied largely upon mere observation of the shell shape to define species (Sacco 1891; Marinchovich 1977; Majima 1989). This qualitative and highly subjective approach has led to the lumping of forms that exhibit quite similar shell morphologies, regardless of other significantly different characters. Conversely, some species were split on the basis of small, statistically insignificant shell differences. A good example is provided by *Cochlis pseudoepiglottina* (Sacco, 1890) and *Cochlis strictiumbilicata* (Sacco, 1891), which have basically identical teleoconchs, but different protoconchs and opercula; both were lumped by Sacco (1891) under *Natica epiglottina* Lamarck, 1804 (see Pedriali & Robba 2005). In conclusion, shell morphology helps to distinguish a few species, provided that the statistical method followed by the present authors is adopted.

The suture of most naticids is flush or adpressed, but is channeled in a few species. Each type is shared by several species and is of little use in species recognition. In fact, of the studied Pliocene species, only two can be distinguished from the other species of their genus by their suture. One is *Cochlis fulgurata* (Meneghini in Pecchioli, 1864), which is the unique species of *Cochlis* (Tab. 12) with deeply channeled suture; the other is *Euspira magenesi* (Tab. 11), also because of its channeled suture.

The aperture proved to be useful for recognising only a few species, with slight differences in utility between the considered subfamilies. In particular, the apertural proportions and the inner lip slope are not useful in the Naticinae nor is the parietal callus useful in the Poliniceinae and Sininae (Tabs. 11 and 12).

Umbilical characters have been regarded by other authors as of diagnostic value. In particular, Kilburn (1976) largely used umbilical characters in the keys to species he dealt with, and Marinchovich (1977, p. 174) ranked the umbilical area as the most useful element in terms of taxonomic value. From Tabs. 11 and 12, it appears that the umbilical characters (width of the umbilicus in relation to the maximum diameter of the shell, presence/absence and strength of the funicle, other in-

	PROTOCONCH (NW, PD, DHW and sculpture combined)	SHELL SHAPE			APERTURE			UMBILICUS (all features)	UMBILICAL CALLUS (all features)	SCULPTURE	COLOR	OPERCULUM	
		proportions	spire height	spire angle	SUTURE	proportions	inner lip slope						parietal callus
<i>Natica</i>													
<i>virguloides</i>							●	●	●		●	●	
<i>Cochlis</i>													
<i>depressofuniculata</i>											○	●	
<i>epigloafuniculata</i>	●					○		○			●	●	
<i>fredianii</i>	●					○		○				●	
<i>fulgurata</i>	●				●			●			○	●	
<i>plicatula</i>										●	●	●	
<i>propinqua</i>												●	
<i>pseudoepiglottina</i>	●										○	●	
<i>raropunctata</i>												●	
<i>raropunctata obliquicallosa</i>			●						●				
<i>strictiumbilicata</i>												●	
<i>sulcogradata</i>	○							○				●	
<i>undata</i>	●								●		○	●	
<i>vittata</i>	●		○				●				●	●	
<i>Tanea</i>													
<i>koeneni</i>	●									●			
<i>Tectonatica</i>													
<i>astensis</i>			○				●				●	●	
<i>prietoi</i>	●		○								●	●	
<i>tectula</i>			○						●		●	●	

Tab. 12 - Summary of distinguishing features of Pliocene Naticinae. Solid circle: species-diagnostic character; open circle: character useful to distinguish a species from others of the genus, but not from all. Taxa are those treated by Pedriali & Robba (2005, 2008a).

ner spiral structures) are of considerable utility in identifying poliniceine species (apart from species of *Payraudeantia*), but are much less so in the case of naticine taxa. The umbilicus of the Sininae, consisting of a narrow chink that may be either visible or hindered by the narrow parietal callus, is of quite low utility. However, the two *Sinum* species considered herein can be distinguished from one another, since *S. perregulare* possesses an open umbilical chink, whereas *S. striatum* lacks this opening.

According to Marinchovich (1977) “the shape of the umbilical callus and the degree to which it conceals the umbilicus is of critical generic and specific value”. We concur with this author in according considerable generic value to the umbilical callus (presence/absence, shape, size, transition to the parietal callus). In fact, it contributes to defining many genera, e.g. *Natica*, *Tectonatica*, *Neverita*, *Polinices* and *Sinum*. However, our results (Tabs. 11, 12) show that umbilical callus can be used diagnostically for only a limited number of Pliocene species, i.e., those of *Neverita* and *Payraudeantia* among the Poliniceinae and a couple of *Cochlis* taxa among the Naticinae.

The exterior sculpture of the teleoconch is diagnostic in the few species of Naticinae and Poliniceinae in which it occurs, and is present and diagnostic in all

Sininae. The background color and/or the color patterns (when preserved) are also diagnostic. Some *Cochlis* species as well as several *Euspira* species exhibit distinctive color patterns and can be readily separated from one another on this basis.

Pedriali & Robba (2005, 2008a) demonstrated that the calcareous operculum of the Naticinae is constantly species-specific and stands as the primary distinguishing element. This solid accessory to the shell is also of great relevance in distinguishing genera, as several genera exhibit quite different opercular details and sculpture, e.g. *Cochlis*, *Naticarius*, *Tanea*, *Tectonatica* and *Cryptonatica* (see Pedriali & Robba 2005, 2008a). Poliniceine and sinine species possess uncalcified opercula that decay after death and are not preserved in the fossil record. However, workers who have dealt with modern Poliniceinae and Sininae (Cernohorsky 1971, Kilburn 1976 and Bouchet & Waren 1993 among others) have not accorded taxonomic importance to these very simple corneous opercula.

In summary, Naticinae species are confidently identifiable primarily by opercular characters. These latter can be combined with protoconch characters and color patterns, umbilical callus and other umbilical characters in descending order of importance; other properties are diagnostic only in a few instances or are

additional secondary elements (Tab. 12). In Poliniceinae and Sininae (Tab. 11), *Euspira* species are readily and unequivocally distinguished by a combination of protoconch and umbilical characters, the larval shell being the most useful. Shell shape, apertural and the umbilical callus characters have diagnostic value in the case of *Neverita*, *Payraudeautia* and *Sinum* species. The taxonomic relevance of a particular character (e.g. the characters of the umbilical area) varies greatly depending on the subfamily considered, and cannot be extended to the whole Naticidae. Our conclusions disagree with those of some major accounts of naticids (Cernohorsky 1971; Kilburn 1976; Marinovich 1977; Majima 1989) because of the primary value we have accorded to the operculum (Naticinae) and to the larval shell (all subfamilies). Moreover, we think that the importance of the shell shape has been overrated by most workers.

Systematic account

Again in this third paper we follow a traditional (non-cladistic) classification. The suprageneric arrangement is that adopted in major accounts of naticids published during recent decades (Cernohorsky 1971; Kilburn 1976; Marinovich 1977; Majima 1989; Kabat 1991).

The collected specimens are partly deposited in the following institutions: Museo di Paleontologia dell'Università, Milano, Italy (MPUM); Museo G. Cortesi, Castell'Arquato, Italy (MGC); Museo di Ecologia e Storia Naturale di Marano sul Panaro, Modena, Italy (GF); Museo di Geologia e Paleontologia G. Capellini, Bologna, Italy (MGGC); Museo di Zoologia, Università di Bologna, Italy (MZB). The remainder is kept as reference material in the authors' collection (NP), Università di Milano-Bicocca, Dipartimento di Scienze Geologiche e Geotecnologie, Milano, Italy. Other abbreviations for institutions cited in the text as repositories of material are as follows: MCZR, Museo Civico di Zoologia, Roma, Italy; MGPT, Bellardi-Sacco collection (Museo di Geologia e Paleontologia dell'Università di Torino) presently curated by Museo Regionale di Scienze Naturali, Torino, Italy; MNHN, Muséum National d'Histoire Naturelle, Paris, France; MSNM, Museo Civico di Storia Naturale, Milano, Italy; NHML, Natural History Museum, London, Great Britain. Valuable additional material was lent by Museo di Zoologia, Università di Bologna, Italy (MZB), Crovato collection, Napoli, Italy (PCM) and Magenes collection, Milano, Italy (PPMM).

Most synonymies refer only to Pliocene records. Citations that are verifiable in that they include adequate descriptions and/or illustrations of species, and other quotations referring to material that has been di-

rectly examined by the present authors, are included in the synonymies. Other citations, poorly documented or not documented at all, are listed too as uncertain references in order to provide a more complete framework of species. In the sections listing the examined material, only ages other than Pliocene are indicated. As regards the varieties created by Sacco (1890, 1891), a lectotype is selected here. When a variety was explicitly said to be rare or very rare by Sacco and is represented in MGPT by a unique specimen, that specimen is deemed to be the holotype.

Symbols for shell dimensions (see Fig. 2 of Pedriali & Robba 2005) are: DHW, diameter of the first half whorl of the protoconch; PD, diameter of the protoconch; PW, number of protoconch whorls; H, height of the shell; D, maximum diameter; SH, height of the spire; AH, height of the aperture; AW, width of the aperture; UW, width of the umbilicus; WUC, width of the umbilical callus; IS, inner lip slope; SA, spire angle. For each dimension, unless otherwise stated, ranges in the upper row are 95% confidence intervals, figures in the lower row are average values.

Family Naticidae Forbes, 1838

Subfamily Poliniceinae Finlay & Marwick, 1937

Genus *Euspira* Agassiz in J. Sowerby, 1837

The species recorded here under *Euspira* Agassiz in J. Sowerby, 1837 were assigned to the genus *Natica* Scopoli, 1777 by earlier authors and later to *Polinices* Montfort, 1810, *Lunatia* Gray, 1847 (either regarded as a distinct genus or as a subgenus of *Polinices*) or *Euspira* Agassiz in J. Sowerby, 1837. The allocation to *Natica* is untenable as species of *Natica* have a calcareous operculum. As reported below, *Lunatia* is a junior synonym of *Euspira*; therefore, the discussion will focus on *Polinices* and *Euspira*.

The type species of *Polinices* is *Polinices albus* Montfort, 1810 (by original designation) = *Nerita mammilla* Linnaeus, 1758 (see Kabat 1990, 1991 and Bouchet & Waren 1993). Kabat (1990) selected the lectotype of *N. mammilla*, designated it as the neotype of *P. albus*, and redescribed Linnaeus' species. According to Kabat (1991), *Albula* Röding, 1798, *Mamma* Blainville, 1823, *Eucaryorum* Ehrenberg, 1831, *Naticina* Guilding, 1834, *Naticella* Swainson, 1840, *Uber* Gray, 1847 and *Mamma* Mörch, 1852 are synonyms of *Polinices*. Kabat (1991) treated *Pseudopolinices* Golikov & Sirenko, 1983 as a synonym of *Euspira* Agassiz in J. Sowerby, 1837. However, *Natica nana* Möller, 1842, type species of *Pseudopolinices*, has the umbilicus completely filled by a rather broad umbilical callus fused with the parietal callus (cf. Golikov & Sirenko 1983, fig. 1: 20), a character that is

distinctive of *N. mammilla*. Consequently, we regard *Pseudopolinices* as another synonym of *Polinices*.

A review of the most relevant literature (Kilburn 1976; Marincovich 1977; Majima 1989; Bouchet & Waren 1993) shows that *Polinices* has been used to accommodate species with obviously different characters. Major discrepancies are seen in 1) shell shape (globose to pyriform), 2) width of the umbilical opening (wide to narrow or completely filled by the umbilical callus), 3) strength of the umbilical callus (poorly developed to broad) and 4) juncture of the umbilical and parietal calluses (distinctly divided to smoothly merging).

On the basis of the characters of the type species and of others that are closely related to it (e.g. *Albula aurantium* Röding, 1798, *Natica flemingiana* Récluz, 1844 and *Polinices vavaosi* Le Guillou in Reeve, 1855), the characters of *Polinices* can be summarized as follows: 1) shell usually thick, pyriform to slightly globular; 2) spire moderately elevated to low, sutures almost flush; 3) parietal callus thick and broad; 4) umbilicus completely plugged or a narrow and deep abapical groove; 5) umbilical callus thick, broad in most species, fused with the parietal callus. The umbilical callus completely filling the umbilicus or nearly so, and its smooth merging with the parietal callus constitute the main distinguishing characters of *Polinices*. It follows that the application of *Polinices* is not acceptable for species having the umbilical callus poorly developed or broad, but clearly demarcated from the parietal callus, e.g. species in groups A, B and D of Majima (1989, p. 43) as well as those assigned to *Polinices* by Bouchet & Waren (1993); these species deserve a different generic assignment. The same conclusion appears to be incontestable for all the species considered here; they cannot be assigned to *Polinices* as they have an open umbilicus and a poorly developed umbilical callus.

Several species of the tropical genus *Polinices* occur in Late Oligocene and Miocene naticid assemblages of Europe, being particularly abundant in Burdigalian to Tortonian deposits of Italy. The genus disappeared from that area (and from the Mediterranean Basin) toward the end of the Miocene and there are no reliable records of it after the Tortonian.

The Eocene species *Natica glaucinoides* J. Sowerby, 1812 is the type-species of *Euspira* by subsequent designation (Bucquoy, Dautzenberg & Dollfus 1883, p. 143). The synonymy of *N. glaucinoides* with *Natica labellata* Lamarck, 1804, stated by Cox (1930) and accepted later by several authors, was rejected by Wrigley (1949), who regarded the two species as distinct and redescribed *N. glaucinoides*. According to Kabat (1991), *Laguncula* Benson, 1842, *Bensonia* Gray, 1847, *Lunatia* Gray, 1847, *Ampullonatica* Sacco, 1890, *Labelinacca* Cossmann, 1918, *Dallitesta* Mansfield, 1930, *Scarlatia* Schileyko, 1977 and *Pseudopolinices* Golikov

& Sirenko, 1983 are synonyms of *Euspira*. As regards *Pseudopolinices*, we do not concur with Kabat and, as noted above, we include it in the synonymy of *Polinices*.

The diagnostic characters of *Euspira* were already stated by the present authors (Pedriali & Robba 2001). Examination of *Natica glaucinoides* and of species closely related to it allowed us to refine the diagnostic characters as follows: 1) shell thin to moderately thick, globose or globose-elongate; 2) protoconch low-turbiniform, of 1.25-3 convex whorls, first half-whorl with spiral microsculpture in some species; 3) spire depressed to moderately elevated, somewhat stepped in some species, 4) suture almost flush to adpressed, channeled in a few species; 5) parietal callus moderately thick, slender, with more-or-less distinct anterior lobe that overhangs the adapical part of the umbilicus slightly in some species; 6) umbilicus open and deep, narrow to wide, with an inner spiral furrow in most species, spirally sculptured in some species; 7) funicle markedly depressed to absent; 8) umbilical callus moderately developed (indistinct in a few species), merging into the anterior lobe of the parietal callus or demarcated from it by a weak groove. *Euspira* appears to be a distinctive cosmopolitan genus useful to accommodate poliniceine species with an open (not slit-like) umbilicus virtually devoid of a funicle and with a strongly reduced to absent umbilical callus. The species described below fully agree with the characters of *Euspira*.

***Euspira bononiensis* (Foresti, 1884)**

Pl. 1, figs 1-3; Pl. 3, figs 1, 2, 21, 22

1848 *Natica varians* - Wood, p. 143, pl. 16, fig. 6 (not Dujardin, 1837).

1884 *Natica bononiensis* Foresti, p. 312, pl. 1, figs. 8-9.

1890 *Natica (Naticina) catena* var. *helicina* subvar. *dilatata* Sacco, p. 30 (*nomen nudum*).

1890 *Natica (Naticina) catena* var. *helicina* subvar. *latoastensis* Sacco, p. 30 (*nomen nudum*).

1890 *Natica (Naticina) catena* var. *bononiensis* - Sacco, p. 30.

1890 *Natica (Payraudeautia) intricata* var. *miocenica* Sacco, p. 33.

1891 *Natica (Naticina) catena* var. *exvarians* Sacco, p. 70.

1891 *Natica (Naticina) catena* var. *dilatata* Sacco, p. 73 (pars).

1891 *Natica (Naticina) catena* var. *latoastensis* Sacco, p. 73, pl. 2, fig. 44.

1891 *Natica (Naticina) catena* var. *bononiensis* - Sacco, p. 76, pl. 2, fig. 47.

1891 *Natica (Payraudeautia) intricata* var. *miocenica* - Sacco, p. 80, pl. 2, fig. 51.

1904 *Natica (Naticina) catena* var. *dilatata* - Sacco, p. 103, pl. 22, fig. 33.

1921 *Natica (Lunatia) exvarians* - Harmer, p. 689, pl. 54, fig. 15,? 16.

1963 *Euspira helicina* var. *bononiensis* - Glibert, p. 90.

1984 *Naticina catena* var. *dilatata* - Ferrero Mortara et al., p. 33.

1984 *Naticina catena* var. *latoastensis* - Ferrero Mortara et al., p. 33.

1984 *Naticina catena* var. *bononiensis* - Ferrero Mortara et al., p. 34.

1984 *Payraudeautia intricata* var. *miocenica* - Ferrero Mortara et al., p. 35.

1996 *Euspira fusca* - Pedriali, pag. 12 (pars), pl.3, figs. 9-10 (not Blainville, 1825).

1997 *Euspira exvarians* - Marquet, p. 77, pl. 2, fig. 10 (*cum syn.*).

Uncertain references

Euspira cf. *bononiensis* - Brunetti & Vecchi, 2005: p. 3.

Natica bononiensis - Cavara, 1886a: p. 17; - Cavara 1886b: p. 274.

Type material. Not seen. Foresti's collection is curated at present partly in MGGC, and partly in Museo di San Domenico (Musei Civici), Imola. The original material of *Natica bononiensis* was not found in these institutions and is possibly lost.

Other type material. Syntype of *Natica (Naticina) catena* var. *dilatata* Sacco figured by Sacco (1904, pl. 22, fig. 33) and illustrated herein (Pl. 1, fig. 2), MGPT BS.029.02.012, Colli Astesi; the other syntypes of var. *dilatata* present in MGPT proved to belong to other taxa (see remarks below). Lectotype of *Natica (Naticina) catena* var. *latoastensis* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 44) and refigured herein (Pl. 1, fig. 3), MGPT BS.029.02.013, Colli Astesi; 1 paralectotype, MGPT BS.029.02.013/01, Savona (another syntype from the same locality, also numbered BS.029.02.013/01, belongs to *Natica virguloides* Sacco, 1890); 1 paralectotype, MGPT BS.029.02.013/02, Borzoli; 1 paralectotype, MGPT BS.029.02.013/03, Castelnuovo d'Asti; 2 paralectotypes, MGPT BS.029.02.013/04, Colli Astesi. Holotype of *Natica (Payraudeautia) intricata* var. *miocenica* Sacco: the shell figured by Sacco (1891, pl. 2, fig. 51), MGPT BS.029.03.001, Stazzano, Tortonian.

Material referred to as *Natica (Naticina) catena* var. *bononiensis* Foresti, 1884 in MGPT. Colli Astesi: 1 spm. figured by Sacco (1891, pl. 2, fig. 47), MGPT BS.029.02.029.

Material erroneously referred to as *Natica (Natica) millepunctata* var. *epigloafuniculata* Sacco, 1890 in MGPT. Stazzano, Tortonian: 1 syntype, MGPT BS.029.01.012/01.

Material from the collecting localities. Arda: 2 spms., NP 9628; Badagnano: 1 spm., NP 9626; Balzo del Musico: 24 spms., NP 9632; Diolo: 1 spm., MGC 1362; Lugagnano: 1 spm., MGC 1363; Pradalbino I: 25 spms., NP 9634, 1 spm., MPUM 9736, 1 spm., MPUM 9737; San Lorenzo in Collina: 3 spms., NP 9635; Barca: 2 spms., NP 9636, 1 spm., MPUM 9738, 1 spm., MPUM 9739; Calanchi di San Martino: 15 spms., NP 9627, 1 spm., MPUM 9740, 1 spm., MGGC 23413, 1 spm., MGC 1364, 1 spm., MZB 31660, 1 spm., GF 1162; Ciuciano: 10 spms., NP 9629; Linari: 1 spm., NP 9630; Montaione: 1 spm., NP 9631; Orciano Pisano: 2 spms., NP 9633.

Other material examined. Belveglio: 1 spm., MZB 29914, 1 spm., MZB 41907; Buttigliera d'Asti: 1 spm., MZB 15713, 1 spm., MZB 41483; Cava Caudana: 1 spm., MZB 41913; Pino d'Asti: 1 spm., MZB 41929, 1 spm., MZB 42081; Primeglio di Passerano: 1 spm., MZB 30131; Viale: 1 spm., MZB 29736; Rio Torsero: 1 spm., MZB 41625; Marano sul Panaro: 3 spms., private collection; Monteveglio: 1 spm., GF 1154; Pradalbino I: 1 spm., GF 1153; Cava di Castelfiorentino: 1 spm., MZB15751; Guistrigona: 2 spms., MZB 15712; Orciano Pisano: 1 spm., MZB 44017, 1 spm., private collection; Orvieto: 1 spm., private collection; Altavilla Milicia: 1 spm., private collection; Bonares, Huelva, Spain: 20 spms., NP 9637.

Description. Protoconch medium-sized, depressed turbiniform of 2-2.20 convex, smooth whorls, tip small. Teleoconch slender-globose, varying in thickness. Spire conical, moderately elevated (more so in fully grown specimens), whorls convex. Suture fine, almost flush, located below periphery on later whorls.

Last whorl inflated, somewhat depressed, moderately produced but not expanded toward the aperture; sub-sutural shelf rather steep, obscurely defined abapically by a slight impression. Aperture D-shaped in a gently prosocline plane, height about twice width; inner lip markedly thickened basally. Parietal callus subquadrangular, rather wide, thick, ending at level of basal fasciole; anterior lobe small, subrounded. Umbilicus deep, medium-sized, separated from base by rounded margin; umbilical wall overhanging inner surface that bears coarse growth markings occasionally crossed by few spiral cords. Funicle submedian, broad, markedly depressed, separated from umbilical wall by a usually narrow, more or less deep spiral furrow forming a distinct notch on abapical part of inner lip. Umbilical callus moderate, subtriangular to semicircular, obliquely merging into anterior lobe of parietal callus following attenuated reverse S-shaped outline. Basal fasciole nearly indistinct. Surface with prosocline growth lines slightly hooked subsuturally. Color uniform pale brown, with uneven whitish collabral stripes.

Dimensions (mm):

DHW	PD	H	D	SH
0.169-0.205	0.954-1.226	16.511-32.587	16.831-31.111	2.456-9.956
0.187	1.090	24.549	23.971	6.206
AH	AW	UW	IS	SA
13.515-23.491	7.404-13.724	4.343-9.071	10°-26°	112°-140°
18.503	10.564	6.707	18°	126°

Remarks. Sacco (1890) validly introduced the variety *miocenica* of *Natica (Payraudeautia) intricata* Donovan, 1803. Examination of the original material in MGPT showed that var. *miocenica* is quite unlike Donovan's species because its umbilicus lacks any inner spiral ridge abapical to the funicle. Instead, var. *miocenica* perfectly matches the characters of the present species and is included here in the synonymy of it. Sacco (1891) briefly described his varieties *latoastensis* and *dilatata* of *Natica catena*. We have examined the respective original specimens in MGPT and can state that var. *latoastensis* displays the distinguishing characters of *Euspira bononiensis*; accordingly, we include this variety in the present synonymy. As regards the variety *dilatata*, it is a mixed assortment of at least four different taxa. In fact, of the 37 syntypes present in MGPT, 1 illustrated herein (Pl. 1, fig. 2) matches the characters of *Euspira bononiensis*, 1 belongs to *Cochlis strictumbilicata* (Sacco, 1891), 2 to *Euspira notabilis* (Jeffreys, 1885), 31 to *Euspira helicina* (Brocchi, 1814) and the other 2 cannot be assigned to species because of their poor preservation. We consider the var. *dilatata* to be a *nomen dubium*. Finally, we assign to *Euspira bononiensis* a Late Miocene shell in MGPT, grouped within the material referred to as *Natica (Natica) millepunctata* var. *epigloafuniculata* Sacco, 1890 and originally mistaken for the latter.

Sacco (1891, p. 70) noted that the Pliocene shell material from Great Britain referred to as *Natica varians* Dujardin, 1837 by Wood (1848) did not match the characters of Dujardin's species. Consequently, he validly proposed (ICZN 1999, Article 12 b of the Code) the new name *exvariens* to designate that material and regarded *exvariens* as a variety of *Cochlea catena* da Costa, 1778. Later workers considered Sacco's taxon to be a distinct species and assigned it to the genus *Euspira*. *Euspira exvariens* seems to be indistinguishable from *Euspira bononiensis* (Foresti, 1884) since it shares the characters of *E. bononiensis*. Accordingly, we place *E. exvariens* in the synonymy of *E. bononiensis*. Marquet (1997) included *Natica (Lunatia) cavellii* and *Natica (Lunatia) assimilis*, both of Harmer, 1921, in the synonymy of *E. exvariens*.

Euspira catena (da Costa, 1778) is closely similar in terms of larval shell and teleoconch shape, but can be easily distinguished from *Euspira bononiensis* because of its sculptured protoconch tip, its markedly adpressed sutures, its inner lip lacking any basal thickening, its umbilicus devoid of both funicle and peripheral furrow, its umbilical bottom with spiral cordlets, its smaller umbilical callus with a straight, oblique outline, and its orange-brown color with a paler subsutural band bearing uneven, oblique brown dashes. *Euspira bononiensis* differs from the closely related species *Euspira helicina* (Brocchi, 1814) in having the protoconch of 0.5 fewer whorls and with a significantly larger, unsculptured initial half-whorl, the inner lip markedly more thickened basally, the umbilicus broader in most specimens, with a better developed funicle and a comparatively narrower inner spiral furrow forming a more distinct notch on the inner lip, and the umbilical callus with reverse S-shaped instead of reverse J-shaped outline. The larval shell provides the most useful distinguishing character.

Stratigraphic occurrence. *Euspira bononiensis* (Foresti, 1884) occurs in Tortonian deposits of Piedmont and in the Pliocene of the North Sea Basin (under the names *Natica varians* or *Euspira exvariens*) and Spain. Subsequent to its creation, *E. bononiensis* has rarely been quoted from Pliocene units of Italy, likely because of its infrequency and its close similarity to the most widespread species *Euspira helicina* (Brocchi, 1814) with which it has been confused. *E. bononiensis* was noted to occur at several Pliocene localities of Piedmont, Liguria, Emilia, Tuscany and Sicily. There are no Quaternary records. The species appears to have become extinct during the Late Pliocene.

***Euspira exturbinoidea* (Sacco, 1890) stat. n., comb. n.**

Pl. 1, figs 5, 6; Pl. 3, figs 4, 24; Pl. 4, fig. 1

1890 *Natica (Naticina) hemiclausa* var. *exturbinoidea* Sacco, p.

1891 *Natica (Naticina) hemiclausa* var. *exturbinoidea* - Sacco, p. 77, pl. 2, fig. 49.

1984 *Naticina hemiclausa* var. *exturbinoidea* - Ferrero Mortara et al., p. 34.

1992 *Euspira macilenta* - Cavallo & Repetto, text-fig. 128 (not Philippi, 1844).

1997 *Polinices macilenta* - Lacroce, p. 30, pl. 2, fig. 10 (not Philippi, 1844).

Uncertain references

Euspira macilenta - Tabanelli & Segurini, 1995: p. 9; - Repetto, 1997: p. 60, n. 128; - Mancini, 2003: p. 10.

Lunatia macilenta - Gonzales Delgado, 1987: p. 92, 96, 97, 100, 104, 105, 110.

Natica macilenta - Foresti, 1868: p. 74, n. 173; - Manzoni, 1868: p. 54; - Appellius, 1871: p. 46; - Foresti, 1874: p. 81; - De Stefani, 1874: p. 64, n. 192; - Coppi, 1880: p. 11, n. 136; - Seguenza, 1880: p. 264, n. 249; - Coppi, 1881a: p. 18, n. 235; Coppi, 1881b: p. 62, n. 532; - Pantanelli, 1881: p. 67; - Clerici, 1888: p. 109; - Antonelli, 1890: p. 106, n. 40.

Polinices macilentus - Ruggieri, 1957a: p. 50; - Ruggieri, 1957b: p. 86 (pars).

Type material. Lectotype of *Natica (Naticina) hemiclausa* var. *exturbinoidea* Sacco (here designated): shell figured by Sacco (1891, pl. 2, fig. 49) and refigured herein (Pl. 1, fig. 5), MGPT BS.029.02.032, Colli Astesi; 3 paralectotypes, MGPT BS.029.02.032/02, Masserano (5 other syntypes from the same locality, also numbered BS.029.02.032/02, are *Natica pulchella* var. *astensis* Sacco, 1890); 2 paralectotypes, MGPT BS.029.02.032/03, Castelnuovo d'Asti; 11 paralectotypes, MGPT BS.029.02.032/04, Colli Astesi (another syntype from the same locality, also numbered BS.029.02.032/04, is *Natica prietoi* Hidalgo, 1873).

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Colli Astesi: 3 syntypes, MGPT BS.029.02.034/01; 5 syntypes, MGPT BS.029.02.034/05.

Material erroneously referred to as *Natica (Tectonatica) tectula* Sacco, 1890 in MGPT. Colli Astesi: 1 syntype, MGPT BS.029.04.001/06.

Material from the collecting localities. Villalvernia: 12 spms., NP 9654; Volpedo: 15 spms., NP 9655, 1 spm., MPUM 9741; Badagnano: 5 spms., NP 9639; Balzo del Musico: 40 spms., NP 9646; Diolo: 1 spm., NP 9825; Montezago: 6 spms., NP 9647; Pradalbino I: 4 spms., NP 9648; Pradalbino II: 1 spm., NP 9649, 1 spm., MPUM 9742; Rio Rosello: 15 spms., NP 9650, 1 spm., MPUM 9743, 1 spm., MGGC 23414, 1 spm., MGC 1365, 1 spm., MZB 31661, 1 spm., GF 1163; San Lorenzo in Collina: 4 spms., NP 9651; Bibbiano: 7 spms., NP 9640; Calanchi di San Martino: 1 spm., NP 9641; Ciuciano: 1 spm., NP 9643, 1 spm., MPUM 9745; Il Campino: 9 spms., NP 9653; Linari: 1 spm., NP 9644; Montaione: 1 spm., NP 9645; Ponte a Elsa: 1 spm., NP 9787; Spicchio: 24 spms., NP 9642; Altavilla Milicia: 1 spm., NP 9638.

Other material examined. Villalvernia: 12 spms., private collection; Badagnano: 5 spms., MZB 000033, 1 spm., MZB 000042; La Valle: 2 spms., MZB 15617, 1 spm., MZB 15671; Marano sul Panaro: 1 spm., private collection; Pradalbino: 2 spms., MZB 15642, 1 spm., MZB 15660; Colle Val d'Elsa: 1 spm., private collection; Altavilla Milicia: 1 spm., private collection.

Description. Protoconch small, turbiniform, markedly depressed, of 2 slightly convex whorls, smooth except for very small tip bearing distant spiral threads on abapical half. Teleoconch globose-elongate, rather thick. Spire broadly conical, moderately elevated, whorls slightly to very slightly convex. Suture fine, flush. Last whorl pyriform-globose, moderately pro-

duced but not expanded toward aperture; subsutural shelf flat, gently sloping, barely defined abapically; periphery distinctly above midline. Aperture D-shaped in gently prosocline plane, height about twice width; outer lip arising high on the last whorl. Parietal callus subquadrangular, very thick, ending at level of basal fasciole; anterior lobe small to indistinct. Umbilicus deep, medium-sized, constricted adapically and rather widely opening abapically, demarcated from base by rounded angulation; umbilical wall concave, gently sloping; inner surface with uneven growth markings. Funicle submedian, broad and markedly depressed, separated from umbilical wall by rather shallow spiral furrow of variable breadth producing slight notch on inner lip; abaxial side of groove subvertical, forming sharp angle with umbilical wall. Umbilical callus thick, subtriangular, with straight or attenuated reverse S-shaped outline, obliquely merging into parietal callus. Basal fasciole narrow, poorly differentiated. Surface with prosocline growth lines slightly arched subsuturally. Color uniform pale brown, with uneven whitish collabral stripes.

Dimensions (mm):

DHW	PD	H	D	SH
0.079-0.099	0.532-0.632	4.639-10.991	3.895-8.867	0.905-3.521
0.089	0.582	7.815	6.381	2.213
AH	AW	UW	IS	SA
3.299-7.907	1.824-5.096	1.155-2.655	9°-25°	84°-120°
5.603	3.460	1.905	17°	102

Remarks. From the synonymy reported by Sacco (1891, p. 77), it appears that the new name *exturbinoidea* was introduced by the same author (1890) to apply to Pliocene shell material from Piedmont erroneously referred to as *Natica turbinoidea* Grateloup, 1827 by Sismonda (1847, p. 51). We have examined a lot of Burdigalian specimens from Saucats that fully conform to the figures of *Natica turbinoidea* published by Grateloup (1847) and Cossmann & Peyrot (1919), and note that Grateloup's taxon differs markedly from *exturbinoidea* by its more slender shell with more elevated spire, its protoconch of 2.75 whorls with significantly smaller tip, its umbilicus devoid of both funicle and inner spiral furrow, and the strongly reduced umbilical callus which is merely a slight abapical extension of the parietal callus.

Euspira exturbinoidea was originally established as a variety of *Natica hemi-clausa* Sowerby, 1825, which it seems to resemble. However, since Sowerby's short description and figure (p. 125, pl. 479, fig. 2) are scarcely informative, *N. hemi-clausa* was variously interpreted later on (cf. Wood 1848, Harmer 1921 and Marquet 1997) and its actual relationships with *E. exturbinoidea* remain unclear. We tried to examine the syntypes of *N. hemi-clausa* supposed to be housed in NHML, but no

answer was received from the curator there. In these circumstances, we treat *E. exturbinoidea* as a distinct species and note that, should it result conspecific with *N. hemi-clausa*, the latter name bears priority.

In the course of consultation of the material in MGPT, we noticed that 8 specimens originally assigned to *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 and 1 referred to as *Natica (Tectonatica) tectula* by Sacco (1890) actually agree with the characters of *Euspira exturbinoidea* and are herein assigned to it.

Euspira exturbinoidea exhibits teleoconch characters strikingly similar to those of the Pleistocene and Recent species *Euspira macilenta* (Philippi, 1844). The two taxa can be distinguished from one another primarily on the basis of larval shells: that of *E. exturbinoidea* has 2 whorls (over half a whorl more than that of *E. macilenta*) and has a significantly smaller diameter of the first half-whorl.

Stratigraphic occurrence. *Euspira exturbinoidea* (Sacco, 1890) seems to have appeared in the Tortonian of northern Italy (Montegibbio). We recovered it from Early to Late Pliocene deposits of Piedmont, Emilia, Tuscany and Sicily. On the basis of our data, *E. exturbinoidea* was replaced by *Euspira macilenta* (Philippi, 1844) by the very early Pleistocene and the Pliocene quotations of *E. macilenta* actually refer to *E. exturbinoidea* (see remarks above).

Euspira grossularia (Marche-Marchad, 1957)

Pl. 1, figs 8, 9; Pl. 3, fig. 6; Pl. 4, figs 4-6

1957 *Polinices grossularia* Marche-Marchad, p. 201, pl. 1, fig. 3.

1980 *Lunatia grossularia* - Piani, p. 143.

1986 *Polinices (Euspira) grossularia* - Dixon & Ryall, p. 8.

1986 *Euspira grossularia* - Villa, p. 16.

1993 *Euspira grossularia* - Bouchet & Waren, pag. 768, text-figs. 1796, 1826, 1844, 1881, 1897, 1910.

1995 *Euspira grossularia* - Bodon et al., p. 31.

1997 *Euspira grossularia* - Giannuzzi-Savelli et al., figs. 789, 823.

1998 *Euspira grossularia* - Lacroce & Repetto, p. 147, 148, 150, text-figs. 2-7.

2000 *Euspira grossularia* - Lacroce, p. 32, text-fig. 1.

Type material. Holotype of *Polinices grossularia* Marche-Marchad; the shell figured by Marche-Marchad (1957, pl. 1, fig. 3), MNHN Moll 5327, south of Cape Verde Islands.

Material erroneously referred to as *Natica (Naticina) catena* var. *depressiuscula* Sacco, 1891 in MGPT. Castelnuovo d'Asti: 1 syntype, MGPT BS.029.02.022/08.

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Zinola: 1 syntype, MGPT BS.029.02.034/03.

Material erroneously referred to as *Natica (Tectonatica) tectula* Sacco, 1890 in MGPT. Colli Astesi: 1 syntype, MGPT BS.029.04.001/06.

Material erroneously referred to as *Natica (Naticina) hemi-clausa* var. *exturbinoidea* Sacco, 1890 in MGPT. Tetti Borelli, Late Miocene: 1 syntype, MGPT BS.029.02.032/01.

Material from the collecting localities. Cossato: 1 spm., NP 9663; Rio di Bocca d'Asino, Tortonian: 2 spms., NP 9671; Volpedo: 1 spm., NP 9675; Bussana Vecchia: 2 spms., NP 9658; Ceriale: 5 spms., NP 9661; Rio Torsero: 4 spms., NP 9672, 1 spm., MPUM 9746, 1 spm., MPUM 9747, 1 spm., MGC 1366; Arda: 1 spm., NP 9659; Badagnano: 3 spms., NP 9657; Diolo: 4 spms., NP 9664, 1 spm., MGC 1367; Montegibbio, Tortonian: 2 spms., NP 9667; Pradalbino I: 1 spm., NP 9669; Pradalbino II: 1 spm., NP 9670; San Lorenzo in Collina: 1 spm., NP 9673; Barca: 3 spms., NP 9824, 1 spm., MPUM 9748, 1 spm., MGGC 23415, 1 spm., MZB 31662; Cava I Sodi: 1 spm., NP 9660; Ciuciano: 6 spms., NP 9662; Il Treppié: 2 spms., NP 9674; Monsindoli: 2 spms., NP 9666; Orciano Pisano: 6 spms., NP 9668, 1 spm., MPUM 9749, 1 spm., MPUM 9750, 1 spm., GF 1164; Guidonia: 1 spm., NP 9665; Altavilla Milicia: 1 spm., NP 9656.

Other material examined. Castello di Annone: 2 spms., MZB 30218, 2 spms., MZB 41955; Cervere: 4 spms., MZB 42019; Rio di Bocca d'Asino, Tortonian: 4 spms., private collection; Tetti Borelli, Messinian: 7 spms., private collection; Bussana Vecchia: 13 spms., private collection; Caranchi: 22 spms., private collection; Rio Torsero: 1 spm., MZB 15698, 1 spm., MZB 41950, 15 spms., private collection; Arda: 1 spm., MZB 15658; Badagnano: 1 spm., MZB 000042, 1 spm., MZB 004614; Buco del Diavolo: 2 spms., PPMM 54008; Campore: 1 spm., MZB 008423; Diolo: 3 spms., PPMM 54007; Rio Rosello: 2 spms., PPMM 54010; Barca: 10 spms., PPMM 54009; Colle Val d'Elsa: 1 spm., private collection; Guistrigona: 1 spm., MZB 15739; Orciano Pisano: 5 spms., private collection; Guidonia: 4 spms., private collection; Pomezia, Pleistocene: 1 spm., private collection; Pecoraro, Pleistocene: 1 spm., private collection, 1 spm., MPUM 9751; Alboran Sea, Chufarinas Isles, Spain, Recent: 3 spms., PCM 46; Malaga, Spain, Recent: 1 spm., NP 9676; Greece, Recent: 1 spm., NP 9677, 1 spm., MPUM 9752; Morocco, Recent: 1 spm., MPUM 9753.

Description. Protoconch medium-sized, depressed-turbiniform, of 2.85-3 convex whorls, smooth except for very small tip bearing unevenly noded spiral threads occasionally connected by thin, irregular axials. Teleoconch globose, rather thin. Spire broadly conical, moderately elevated, whorls convex. Suture fine, adpressed. Last whorl globose, moderately extended, very slightly expanded abapically toward aperture; subsutural shelf indistinct; periphery about at midline. Aperture D-shaped in nearly orthocone plane, height about 1.9 times the width. Parietal callus rather thin, narrow, with markedly concave abapertural outline, reaching basal fasciole; anterior lobe roundly angular, slightly extending over adapical part of umbilicus. Umbilicus deep, small, distinctly angular or subangular adapically, margin broadly rounded, hence demarcation from base poorly defined; umbilical wall steeply sloping; inner surface with fine growth markings. Funicle submedian, broad and exceedingly slight swelling, absent in larger shells. Umbilical callus moderately thick, subtriangular, obliquely merging into anterior lobe of parietal callus. Basal fasciole poorly differentiated. Surface with fine, uneven growth lines slightly arched subsuturally; a faint spiral microstriation occurs on last whorl. Color pale yellowish-brown background shaded light violet-gray on spire whorls with reddish-brown pattern of sparse, uneven spots arranged into 5 spiral rows.

Dimensions (mm):

DHW	PD	H	D	SH
0.070-0.090	1.324-1.496	2.532-22.896	2.669-20.977	0.521-6.707
0.080	1.410	12.714	11.823	3.093
AH	AW	UW	IS	SA
2.887-16.399	1.261-11.413	0.413-5.273	16°-36°	100°-140°
9.643	6.337	2.843	26°	120°

Remarks. Four shells in MGPT, respectively referred to as *Natica (Naticina) catena* var. *depressiuscula*, *Natica (Naticina) pulchella* var. *astensis*, *Natica (Tectonatica) tectula* and *Natica (Naticina) hemiclausula* var. *exturbinoides* by Sacco (1891), proved to belong to *Euspira grossularia*.

The present species differs from the related Late Miocene species *Natica problema* Seguenza, 1880 (topotypes from Benestare examined) primarily in having a significantly greater protoconch diameter, a smaller umbilicus without any inner spiral furrow, and a different outline of the umbilical callus.

Stratigraphic occurrence. Oldest records of *Euspira grossularia* (Marche-Marchad, 1957) are from Late Miocene deposits of Piedmont and Emilia. The species was found to occur uncommonly at several Pliocene localities of Piedmont, Liguria, Emilia, Tuscany and Latium. Pleistocene records are scanty and refer to a few sites in central and southern Italy. The species is still living in the western Mediterranean and eastern Atlantic as far south as Angola.

Euspira guillemini (Payraudeau, 1826)

Pl. 1, figs 10, 11; Pl. 3, fig. 7; Pl. 4, figs 7-9

1826 *Natica guillemini* Payraudeau, p. 119 (n. 251), pl. 5, figs. 25, 26.

1980 *Lunatia guillemini* - Piani, p. 143.

1986 *Euspira guillemini* - Villa, p. 16.

1995 *Polynices guillemini* - Bodon et al., p. 31.

1997 *Euspira guillemini* - Giannuzzi-Savelli et al., figs. 786-788, 822.

2005 *Euspira guillemini* - Repetto et al., text-fig. 468.

Uncertain references

Euspira guillemini - Öztürk et al., 2004: p. 56; - Trono, 2007: p. 63.

Lunatia guillemini - Barsotti et al., 1974: p. 432, 437, 445; - Ruggieri, 1975: p. 160; - Monegatti & Raineri, 1987: p. 303.

Natica guillemini - Philippi, 1836: p. 162, 163; - Philippi, 1844: p. 140, 141; - Bronn, 1848: p. 783; - Manzoni, 1868: p. 54; - Seguenza, 1876: p. 12, n. 495; - Seguenza, 1880: p. 264, n. 250; 354, n. 112; - Parona, 1883a: p. 8; - Fucini, 1891: p. 70; - Malatesta, 1943: p. 171, 175; - Monegatti & Raineri, 1987: p. 300.

Polynices guillemini - Ruggieri, 1962: p. 27; - Francaviglia, 1941: p. 67.

Type material. Not seen. Payraudeau's type material apparently in MNHN, but not yet authenticated and hence unavailable for consultation (Virginie Héros, personal communication 2007).

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Colli Astesi: 5 syntypes,

MGPT BS.029.02.034/01; Villalvernia: 2 syntypes, MGPT BS.029.02.034/04; Albenga: 1 syntype, MGPT BS.029.02.034/02.

Material erroneously referred to as *Natica (Tectonatica) tectula* Sacco, 1890 in MGPT. Colli Astesi: 1 syntype, MGPT BS.029.04.001/06.

Material from the collecting localities. La Loggia: 2 spms., NP 9679; Bibbiano: 49 spms., NP 9678, 1 spm., MPUM 9754, 1 spm., MPUM 9755, 1 spm., MPUM 9756; Il Campino: 1 spm., NP 9682; Linari: 6 spms., NP 9680; Montaione: 60 spms., NP 9681, 2 spms., MPUM 9757, 1 spm., MGGC 23416, 1 spm., MGC 1368, 1 spm., MZB 31663, 1 spm., GF 1165; Cutrofiano, Pleistocene: 2 spms., NP 9683; Bovetto, Pleistocene: 1 spm., MPUM 9759; Porcaro, Pleistocene: 7 spms., NP 9687, 1 spm., MPUM 9758.

Other material examined. Cervere: 1 spm., MZB 40432; Colle Val d'Elsa: 1 spm., private collection; Archi, Pleistocene: 4 spms., private collection; Pecoraro, Pleistocene: 2 spms., private collection; Bovetto, Pleistocene: 2 spms., MZB 005335, 3 spms., private collection; Estepona, Spain, Recent: 11 spms., PCM 507; Malaga, Spain, Recent: 2 spms., NP 9685; Manilva, Spain, Recent: 14 spms., private collection; Livorno, Recent: 1 spm., MZB 15667; Procida Island, Recent: 2 spms., MZB 15669; Aeroporto, Reggio Calabria, Recent: 1 spm., private collection; Oliveri, Messina, Recent: 2 spms., NP 9684, 1 spm., MPUM 9760; Adriatic Sea, Recent: 1 spm., MZB 15637; Porto Cesareo, Lecce, Recent: 1 spm., PCM 1167; off Torre San Giovanni, Gallipoli, Recent: 1 spm., MZB 006703; Katerini, Greece, Recent: 1 spm., NP 9686; Thessaloniki, Greece, Recent: 1 spm., MZB 15668.

Description. Protoconch small, depressed-turbiform, of 1.35-1.60 gently convex whorls, smooth except for the small tip bearing rather distant, oblique spiral threads on the abapical two-thirds. Teleoconch globose, rather thin. Spire broadly conical, moderately elevated, whorls flatly-convex. Suture fine, almost flush to flush. Last whorl globose, moderately extended, very slightly expanded abapically toward aperture; subsutural shelf flat to scarcely concave, poorly defined; periphery above midline.

Aperture D-shaped in gently prosocline plane, height about 1.8 times the width; outer lip arising high on last whorl. Parietal callus rather thin, narrowly subquadrangular, with slightly concave abapertural outline, ending at level of umbilical border; anterior lobe small and roundly angular to indistinct. Umbilicus deep, small, irregularly drop-shaped, margin broadly rounded, hence demarcation from base poorly defined; umbilical wall gently concave, moderately sloping; inner surface with fine growth markings. Funicle broad, markedly depressed, separated from umbilical wall by shallow spiral furrow of variable breadth, forming slight notch on abapical part of inner lip. Umbilical callus moderately thick, narrowly subtriangular, obliquely merging into anterior lobe of parietal callus and slightly covering adapical part of umbilicus. Basal fasciole narrow, barely prominent, mostly suggested by bending of growth lines. Surface with very fine, uneven growth lines slightly arched subsuturally; a faint spiral microstriation occurs on last whorl. Color light gray background with reddish-brown pattern of uneven mottles and/or collabral stripes darker subsuturally and on low-

er base; mid adapical part of parietal callus reddish-brown.

Dimensions (mm):

DHW	PD	H	D	SH
0.246-0.282	0.736-0.900	0.811-19.487	1.341-16.669	0.000-6.292
0.264	0.818	10.149	9.005	2.706
AH	AW	UW	IS	SA
1.491-13.395	0.897-8.729	0.142-4.094	15°-31°	95°-127°
7.443	4.813	2.118	23°	111°

Remarks. Eight shells erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 and 1 specimen originally included in *Natica (Tectonatica) tectula* Sacco, 1890, all in MGPT, proved to match the distinguishing characters of *Euspira guillemini* and are here assigned to it.

Euspira grossularia (Marche-Marchad, 1957) appears to be closely similar in terms of shell shape. However, it can easily be differentiated from *Euspira guillemini* primarily on account of its significantly larger, multispiral protoconch with diameter of the first half-whorl three times smaller, its more convex spire whorls meeting at distinctly adpressed instead of flush sutures, its better developed anterior lobe of the parietal callus, its umbilicus devoid of an inner spiral furrow, and its different color pattern.

Seguenza (1880), in proposing the new species *Natica problema*, remarked its affinity with the present species. We have examined several topotypes from the Tortonian deposits of Benestare and can state that Seguenza's species differs from *Euspira guillemini* in having: protoconch of 3 whorls (1.35-1.60 whorls in *E. guillemini*) with significantly smaller tip, somewhat more inflated last whorl, broader umbilicus with more prominent funicle and deeper inner spiral furrow, and thicker, roundly outlined umbilical callus. The larval shell is the most relevant distinguishing character.

Stratigraphic occurrence. Previous quotations of *Euspira guillemini* (Payraudeau, 1826) from Pliocene deposits of Italy are scanty and mostly uncertain (see references above). Reliable Pliocene records are from Piedmont and Tuscany. The species appears to be uncommon in Pleistocene localities of southern Italy. It is reported to live in the Mediterranean and the eastern Atlantic, from Great Britain to Canary Islands.

Euspira helicina helicina (Brocchi, 1814)

Pl. 1, figs 12, 13, 16-18; Pl. 3, fig. 8; Pl. 4, fig. 10

1814 *Nerita helicina* Brocchi, p. 297, pl. 1, fig. 10.

1880 *Natica helicina* - Fontannes, p. 115, pl. 7, fig. 11.

1890 *Natica (Naticina) catena* var. *helicina* - Sacco, p. 30.

1890 *Natica (Naticina) catena* var. *helicina* subvar. *subopturata* Sacco, p. 30 (*nomen nudum*).

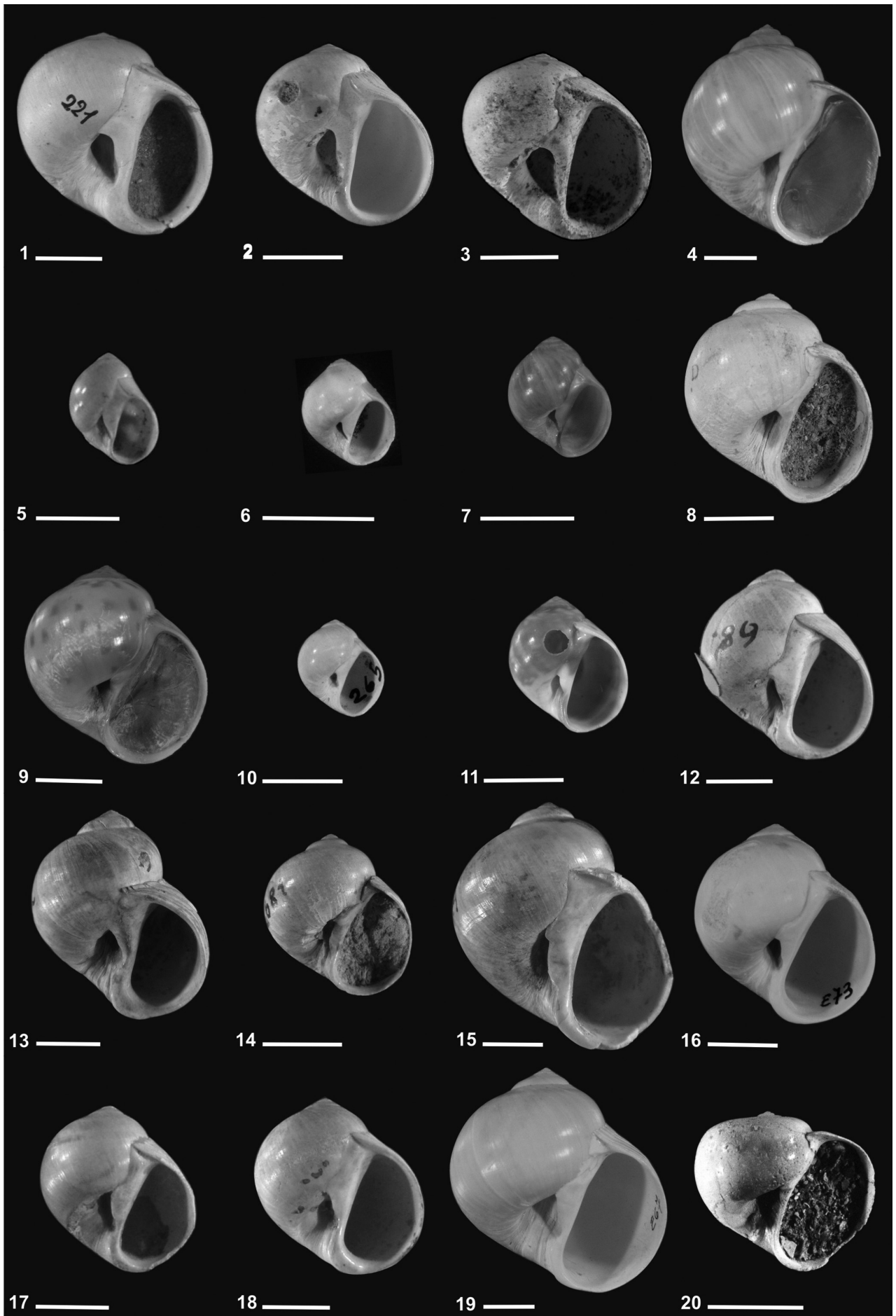
1890 *Natica (Naticina) catena* var. *helicina* subvar. *ovatoconica* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *pseudofuniculosa* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *perconica* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *elatuscula* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *depressiuscula* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *lineofasciolata* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *basibrunneata* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *pseudorufa* Sacco, p. 30 (*nomen nudum*).
 1890 *Natica (Naticina) catena* var. *helicina* subvar. *pseudocinerea* Sacco, p. 30 (*nomen nudum*).
 1891 *Natica (Naticina) catena* var. *helicina* - Sacco, p. 70, pl. 2, fig. 43.
 1891 *Natica (Naticina) catena* var. *subobturata* Sacco, p. 72.
 1891 *Natica (Naticina) catena* var. *ovatoconica* Sacco, p. 73.
 1891 *Natica (Naticina) catena* var. *pseudofuniculosa* Sacco, p. 74.
 1891 *Natica (Naticina) catena* var. *perconica* Sacco, p. 74.
 1891 *Natica (Naticina) catena* var. *elatuscula* Sacco, p. 74.
 1891 *Natica (Naticina) catena* var. *depressiuscula* Sacco, p. 74.
 1891 *Natica (Naticina) catena* var. *lineofasciolata* Sacco, p. 75.
 1891 *Natica (Naticina) catena* var. *basibrunneata* Sacco, p. 75.
 1891 *Natica (Naticina) catena* var. *pseudorufa* Sacco, p. 75.
 1891 *Natica (Naticina) catena* var. *pseudocinerea* Sacco, p. 75.
 1904 *Natica (Naticina) catena* var. *subobturata* - Sacco, p. 103, pl. 22, figs. 31, 32.
 1904 *Natica (Naticina) catena* var. *ovatoconica* - Sacco, p. 103, pl. 22, fig. 34.
 1904 *Natica (Naticina) catena* var. *pseudofuniculosa* - Sacco, p. 103, pl. 22, fig. 35.
 1904 *Natica (Naticina) catena* var. *perconica* - Sacco, p. 103, pl. 22, fig. 36.
 1904 *Natica (Naticina) catena* var. *elatuscula* - Sacco, p. 103, pl. 22, figs. 37-39.
 1904 *Natica (Naticina) catena* var. *depressiuscula* - Sacco, p. 103, pl. 22, fig. 40.
 1904 *Natica (Naticina) catena* var. *basibrunneata* - Sacco, p. 103, pl. 22, fig. 41.
 1904 *Natica (Naticina) catena* var. *pseudocinerea* - Sacco, p. 103, pl. 22, fig. 42.
 1919 *Natica (Lunatia) helicina* - Cossmann & Peyrot, p. 432, n. 254, pl. 11, figs. 39-41; pl. 12, figs. 29, 54.
 not 1955 *Polynices (Lunatia) helicina* - Rossi Ronchetti, p. 161, text-fig. 82 (= *Natica prietoi* Hidalgo, 1873).
 1967 *Lunatia catena* - Palla, p. 962, pl. 72, fig. 4;
 1967 *Lunatia catena* f. *helicina* - Pelosio, p. 125, pl. 37, figs. 6-7.
 1969 *Polinices (Euspira) heliginus heliginus* - Janssen, p. 163, pl. 4, figs. 18-21 (not fig. 17 = *Natica prietoi* Hidalgo, 1873); pl. 5, figs. 1-3.
 1969 *Lunatia catena helicina* - Mastroianni, p. 118, pl. 6, figs. 12, 13, 16.
 1974 *Euspira catena helicina* - Malatesta, p. 238, pl. 18, fig. 6.
 1976 *Lunatia catena helicina* - Caprotti: p. 9, pl. 12, fig. 4;
 not 1978 *Nerita helicina* - Pinna & Spezia, p. 156, pl. 42, fig. 3 (= *Natica prietoi* Hidalgo, 1873).
 1981 *Lunatia catena helicina* - Robba, p. 102, 129, 151, 154, tab. 5.
 1984 *Naticina catena* var. *helicina* - Ferrero Mortara et al., p. 32.
 1984 *Naticina catena* var. *subobturata* - Ferrero Mortara et al., p. 32.

1984 *Naticina catena* var. *ovatoconica* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *pseudofuniculosa* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *perconica* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *elatuscula* - Ferrero Mortara et al., p. 33.

PLATE 1

- Fig. 1 - *Euspira bononiensis* (Foresti, 1884). Pradalbino I. MPUM 9736; apertural side.
 Fig. 2 - *Euspira bononiensis* (Foresti, 1884). Syntype of *Natica (Naticina) catena* var. *dilatata* Sacco, 1891. Colli Astesi. MGPT BS.029.02.012; apertural side.
 Fig. 3 - *Euspira bononiensis* (Foresti, 1884). Lectotype (here designated) of *Natica (Naticina) catena* var. *latoastensis* Sacco, 1891. Colli Astesi. MGPT BS.029.02.013; apertural side.
 Fig. 4 - *Euspira catena* (da Costa, 1778). Granville, France. MPUM 9782; apertural side.
 Fig. 5 - *Euspira exturbinooides* (Sacco, 1890). Lectotype (here designated) of *Natica (Naticina) hemiclausa* var. *exturbinooides* Sacco, 1890. Colli Astesi. MGPT BS.029.02.032; apertural side.
 Fig. 6 - *Euspira exturbinooides* (Sacco, 1890). Volpedo. MPUM 9741; apertural side.
 Fig. 7 - *Euspira macilenta* (Philippi, 1844). Lido degli Estensi, Comacchio. MPUM 9744; apertural side.
 Fig. 8 - *Euspira grossularia* (Marche-Marchad, 1957). Diolo. MGC 1367; apertural side.
 Fig. 9 - *Euspira grossularia* (Marche-Marchad, 1957). Greece. MPUM 9752; apertural side.
 Fig. 10 - *Euspira guillemini* (Payraudeau, 1826). Bibbiano. MPUM 9754; apertural side.
 Fig. 11 - *Euspira guillemini* (Payraudeau, 1826). Oliveri, Messina. MPUM 9760; apertural side.
 Fig. 12 - *Euspira helicina helicina* (Brocchi, 1814). Neotype (designated by Pedriali & Robba, 2008b) of *Nerita helicina* Brocchi, 1814. Piacentino. MSNM i 4680; apertural side.
 Fig. 13 - *Euspira helicina helicina* (Brocchi, 1814). Piacentino. MSNM i 4682; apertural side.
 Fig. 14 - *Tectonatica prietoi* (Hidalgo, 1873). Piacentino. MSNM i 4681; apertural side.
 Fig. 15 - *Tectonatica prietoi* (Hidalgo, 1873). The shell figured by Rossi Ronchetti (1955) as "holotype" of *Nerita helicina* Brocchi, 1814. Piacentino. MSNM i 4679; apertural side.
 Fig. 16 - *Euspira helicina helicina* (Brocchi, 1814). Orciano Pisano. MPUM 9767; apertural side.
 Fig. 17 - *Euspira helicina helicina* (Brocchi, 1814). Lectotype (here designated) of *Natica (Naticina) catena* var. *lineofasciolata* Sacco, 1891. Savona. MGPT BS.029.02.023; apertural side.
 Fig. 18 - *Euspira helicina helicina* (Brocchi, 1814). Lectotype (here designated) of *Natica (Naticina) catena* var. *pseudorufa* Sacco, 1891. Savona. MGPT BS.029.02.025; apertural side.
 Fig. 19 - *Euspira helicina fusca* (Blainville, 1825). Pecoraro. MPUM 9819; apertural side.
 Fig. 20 - *Euspira magenesi* Pedriali & Robba, 2001. La Valle. MGC 1371; apertural side.

Scale bars = 8 mm.



- 1984 *Naticina catena* var. *depressiuscula* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *lineofasciolata* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *basibrunneata* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *pseudorufa* - Ferrero Mortara et al., p. 33.
 1984 *Naticina catena* var. *pseudocinerea* - Ferrero Mortara et al., p. 33.
 1992 *Euspira catena* - Cavallo & Repetto, fig. 124 (not da Costa, 1778).
 1996 *Euspira catena* f. *helicina* - Pedriali, p. 10, pl. 3, figs. 6-7.
 1996 *Euspira nitida* - Pedriali, p. 14, pl. 3, fig. 8 (not Donovan, 1804).
 1997 *Polinices catena* - Lacroce, p. 28, pl. 2, fig. 8 (not da Costa, 1778).
 1997 *Polinices fusca* - Lacroce, p. 28, pl. 2, fig. 9 (not Blainville, 1825).
 2000 *Polinices fusca* - Lacroce, p. 33 (not Blainville, 1825).
 2004 *Euspira fusca* - Repetto & Lacroce, p. 193, 198, pl. 1, fig. 3 (not Blainville, 1825).

Uncertain references

- Euspira catena* - Moroni & Torre, 1966: p. 30; - Tabanelli, 1994: p. 279; - Lacroce & Repetto, 1998: p. 148, 150; - Brunetti, 2002: p. 48.
Euspira catena helicina - Menesini, 1977: p. 255; - Cauli & Ragaini, 1991: p. 283.
Euspira fusca - Ortoleva, 1992: p. 140.
Euspira helicina - Glibert, 1963: p. 89; - Tabanelli & Segurini, 1995: p. 9; - Ceregato et al., 2002: p. 5; - Brunetti & Vecchi, 2005: p. 3; - Brunetti & Soccio, 2007: p. 107.
Euspira aggr. *helicina* - Wienrich, 2001: p. 425, pl. 68, fig. 9; pl. 85, figs. 5, 6, 8; pl. 86, figs. 1-2.
Lunatia catena - Moroni & Paonita, 1964: p. 39; - Grecchi, 1975: p. 227; - Bernasconi, 1989: p. 58, 75.
Lunatia catena f. *proboniensis* - Aimone & Ferrero Mortara, 1983: p. 295.
Lunatia catena helicina - Pavia, 1976: p. 103, 110, 112, 118; - Aimone & Ferrero Mortara, 1983: p. 295; - Buccheri et al., 1987: p. 225, 230 (pars); - Greco & Buccheri, 1988: p. 399; - Landini et al., 1991: p. 180, 182, 183, 184, 190; Barbarino & Scarselli, 1992: p. 412; Ragaini & Mariani, 1992: p. 8, 20.
Lunatia (Lunatia) catena - Ruggieri, 1962: p. 27 (pars); - Carretto, 1986: p. 48.
Lunatia (Lunatia) catena helicina - Robba, 1968: p. 457, 467, 468, 469, 470, 477, 528; - Caprotti, 1970: p. 163, pl. 5, fig. 4; - Caprotti, 1974: p. 24, n. 45.
Lunatia helicina - Marasti & Raffi, 1976: p. 196; - Marasti & Raffi, 1977: p. 228, 232; - Pavia & Robba, 1979: p. 554; - Montefameglio et al., 1980: p. 176, 178, 182, 189; - Anfossi et al., 1982: p. 92; - Brambilla et al., 1983: p. 18; - Brambilla & Lualdi, 1987: p. 243, 245, 248, 255; - Monegatti & Raineri, 1987: p. 296; - Brambilla & Lualdi, 1988: p. 19, 22; - Pavia et al., 1989: p. 529, 539, 544, 548, 549, 563, 566, 568.
Lunatia fusca - Brambilla et al., 1983: p. 18; - Brambilla & Lualdi, 1987: p. 243, 245, 251, 254, 255, 262.
Natica catena - Seguenza, 1876: p. 10, n. 484; - Seguenza, 1880: p. 264, n. 245; - Pantanelli, 1881: p. 67; - Neviani, 1887: p. 175, 191, 204; - Sangiorgi, 1928: p. 171.
Natica catena var. *elatiuscula* - Arduini, 1895: p. 184, n. 124.
Natica catena var. *helicina* - Arduini, 1895: p. 184, n. 123; - Bongo, 1914: p. 443; - Cowper Reed, 1930: p. 257.
Natica fusca - Appellius, 1871: p. 81, 117; - Seguenza, 1876: p. 12, n. 492; - Seguenza, 1880: p. 111, n. 176; 264, n. 246; - Neviani, 1887: p. 175, 186, 187, 188, 191, 193, 196, 199, 204; - Dubertret et al., 1937: p. 104; - Ruggieri, 1957b: p. 86 (pars).
Natica helicina - Sismonda, 1842: p. 27; - Calcara, 1845: p. 30; - Michelotti, 1847: p. 155, pl. 6, fig. 4; - Sismonda, 1847: p. 51; - Bronn, 1848: p. 783; - d'Orbigny, 1852: p. 38, n. 574; p. 168, n. 74; - Doderlein, 1862: p. 18; - Foresti, 1868: p. 73, n. 171; - Coppi, 1869: p. 35, n. 394; - Appellius, 1871: p. 23, 46, 84, 117; - Cocconi, 1873: p. 526, n. 6; - Foresti, 1874: p. 81; - De Stefani, 1876: p. 8; - Foresti, 1876: p. 550; - Pantanelli, 1876: p. 5; - Depontailier, 1877: p. 781, n. 107; - Pantanelli, 1877: p. 231; - De Stefani & Pantanelli, 1879: p. 140; Ferretti, 1879: p. 5, 10, 11; - Coppi, 1880: p. 11, n. 135; - Pantanelli, 1880: p. 274; - Coppi, 1881a: p. 18, n. 234; - Coppi, 1881b: p. 61, n. 530; - Parona, 1883a: p. 8; Malagoli, 1884: p. 9; - Parona, 1886: p. 105, 116; - Terrenzi, 1886: p. 333; - Verri, 1886: p. 446; - Pantanelli & Mazzetti, 1887a: p. 3; - Pantanelli & Mazzetti, 1887b: p. 26; - Clerici, 1888: p. 109; - De Stefani, 1888: p. 221; - Trabucco, 1888: p. 26, n. 51; - Arduini, 1895: p. 183, n. 120; - Almera & Bofill, 1898: p. 50, 181; - Simonelli, 1883: p. 265, 282; - Depéret & Caziot, 1903: p. 323; - Bourcart et al., 1923: p. 273; - Moretti, 1938: p. 79; - Fekih, 1975: p. 60, pl. 22, fig. 3.
Natica helycina - Ugolini, 1898; p. 4.
Natica helicina var. *elongata* - Almera & Bofill, 1898: p. 50.
Natica helicina var. *spira elatiore* - Doderlein, 1862: p. 18; - Mazzetti, 1874: p. 164.
Natica monilifera - Sismonda, 1842: p. 27.
Natica sordida - Philippi, 1844: pag. 141.
Natica (Lunatia) fusca - Brugnone, 1880: p. 117.
Natica (Lunatia) helicina - Harmer, 1921: p. 683, pl. 54, figs. 4-5.
Natica (Naticina) fusca - Bevilacqua, 1928: p. 157.
Natica (Naticina) helicina - Bevilacqua, 1928: p. 153, 158; - Malatesta & Nicosia, 1955: p. 180.
Naticina catena - Cerulli-Irelli, 1896: p. 11; - Simonelli, 1896: p. 339; - De Angelis D'Ossat, 1897: p. 116; - Cerulli-Irelli, 1898: p. 89; - Bellini, 1904: p. 377; - Hornung, 1920: p. 88; - Zuffardi Commerci, 1929: p. 3.
Polinices catena - Cuscani Politi, 1978, p. 36, 39, 41.
Polinices fuscus - Ruggieri, 1949b: p. 44; - Ruggieri, 1950a: p. 80, 81, 82; - Ruggieri, 1957a: p. 37, 47, 50 (pars).
Polinices ex. gr. *fuscus* - Ruggieri, 1957a: p. 36, 39.
Polinices helicina - Di Geronimo, 1969: p. 108, 114.
Polinices helicinus - Moroni, 1957: p. 146, 150, 151, 153; - Ruggieri, 1957a: p. 23.
Polinices (Euspira) catena var. *helicina* - Kojumdieva & Strakimirov, 1960: p. 120, pl. 33, figs. 10-11.
Polinices (Euspira) helicina - Glibert, 1952b: p. 243, pl. 1, fig. 4.
Polinices (Lunatia) catena f. *helicina* - Glibert, 1952a: p. 69, pl. 5, fig. 8; - Venzo & Pelosio, 1963: p. 84.
Polinices (Lunatia) catena helicinus - Robba & Ostinelli, 1975: p. 309, 317, 319, 320, 349, pl. 46, fig. 10; - Robba & Ostinelli, 1976: p. 524.
Polinices (Lunatia) catena helicina - Baldi, 1960: p. 65.
Polinices (Lunatia) helicina - Rasmussen, 1956: p. 58, pl. 4, fig. 6.
Polinices (Naticina) helicinus - Ruggieri, 1949a: p. 26.

Type material. Neotype of *Nerita helicina* Brocchi (designated by Pedriali & Robba, 2008b) and figured in Pl. 1, fig. 12, MSNM i 4680, Piacentino; 3 other specimens (see remarks below), MSNM i 4679, i 4681, i 4682, Piacentino.

Other type material. Lectotype of *Natica (Naticina) catena* var. *subobturata* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 32), MGPT BS.029.02.011, Savona; 1 paralectotype, MGPT BS.029.02.010, Colli Torinesi, Miocene; 28 paralectotypes, MGPT BS.029.02.011/04, Savona. Holotype of *Natica (Naticina) catena* var. *ovatoconica* Sacco: the shell figured by Sacco (1904, pl. 22, fig. 34), MGPT BS.029.02.014, Albenga. Lectotype of *Natica (Naticina) catena* var. *pseudofuniculosa* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 35), MGPT BS.029.02.015, Savona; 14 paralectotypes, MGPT BS.029.02.015/01, Savona (other 5 syntypes, also numbered BS.029.02.015/01, actually belong to *Natica epiglottina* var.

strictiumbilicata Sacco, 1891). Lectotype of *Natica (Naticina) catena* var. *perconica* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 36 b), MGPT BS.029.02.017, Savona; 1 paralectotype, MGPT BS.029.02.016, Savona. Lectotype of *Natica (Naticina) catena* var. *elatuscula* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 39), MGPT BS.029.02.021, Albenga; 2 paralectotypes, MGPT BS.029.02.021/01, Colli Torinesi, Miocene; 5 paralectotypes, MGPT BS.029.02.021/03, Savona Fornaci; 5 paralectotypes, MGPT BS.029.02.021/06, Castelnuovo d'Asti; 1 paralectotype, MGPT BS.029.02.018, Colli Torinesi, Miocene; 1 paralectotype, MGPT BS.029.02.019, Colli Torinesi, Miocene. Lectotype of *Natica (Naticina) catena* var. *depressiuscula* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 40), MGPT BS.029.02.022, Mondovì; 8 paralectotypes, MGPT BS.029.02.022/03, Stazzano, Tortonian (other 5 syntypes are *Natica raropunctata* Sasso, 1827 and 1 belongs to *Natica epiglottina* var. *koeneni* Sacco, 1891, all also numbered BS.029.02.022/03); 23 paralectotypes, MGPT BS.029.02.022/04, Savona (other 2 syntypes, also numbered BS.029.02.022/04, respectively belong to *Natica epiglottina* var. *strictiumbilicata* Sacco, 1891 and to *Natica prietoi* Hidalgo, 1873); 2 paralectotypes, MGPT BS.029.02.022/07, Clavesana. Lectotype of *Natica (Naticina) catena* var. *lineofasciolata* Sacco (designated herein and figured in Pl. 1, fig. 17), MGPT BS.029.02.023, Savona. Lectotype of *Natica (Naticina) catena* var. *basibrunneata* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 41), MGPT BS.029.02.024, Castelnuovo d'Asti; 1 paralectotype, MGPT BS.029.02.024/01, Sant'Agata Fossili, Tortonian; 1 paralectotype, MGPT BS.029.02.024/02, Stazzano, Tortonian. Lectotype of *Natica (Naticina) catena* var. *pseudorufa* Sacco (designated herein and figured in Pl. 1, fig. 18), MGPT BS.029.02.025, Savona. Lectotype of *Natica (Naticina) catena* var. *pseudocinerea* Sacco (here designated): the shell figured by Sacco (1904, pl. 22, fig. 42), MGPT BS.029.02.026, Savona; 3 paralectotypes, MGPT BS.029.02.026/01, Savona.

Material referred to as *Natica (Naticina) catena* var. *helicina* (Brocchi, 1814) in MGPT. Albenga: 1 spm. figured by Sacco (1891, pl. 2, fig. 43), MGPT BS.029.02.009; Superga, Early Miocene: 26 spms., MGPT BS.029.02.009/01; Tetti Borelli, Late Miocene: 3 spms., MGPT BS.029.02.009/03.

Material erroneously referred to as *Natica (Naticina) catena* var. *dilatata* Sacco, 1891 in MGPT. Sant'Agata Fossili, Tortonian: 15 syntypes, MGPT BS.029.02.012/01; Stazzano, Tortonian: 11 syntypes, MGPT BS.029.02.012/02; Savona: 3 syntypes, MGPT BS.029.02.012/03; Castelnuovo d'Asti: 2 syntypes, MGPT BS.029.02.012/04.

Material erroneously referred to as *Natica (Natica) epiglottina* var. *pseudoepiglottina* Sismonda, 1847 in MGPT. Bene Vagienna: 2 spms., MGPT BS.029.01.029/10.

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Colli Astesi: 2 syntypes, MGPT BS.029.02.034/05.

Material from the collecting localities. Rio di Bocca d'Asino, Tortonian: 2 spms., NP 9704; Rio Torsero: 35 spms., NP 9706; Bacedasco: 25 spms., NP 9689, 1 spm., MPUM 9761, 1 spm., MGC 1369; Badagnano: 4 spms., NP 9690; Balzo del Musico: 1 spm., NP 9699; Diolo: 8 spms., NP 9694; La Valle: 1 spm., NP 9696; Lugagnano: 16 spms., NP 9697; Pradalbino I: 7 spms., NP 9702; Pradalbino II: 46 spms., NP 9703; Rio Rosello: 4 spms., NP 9705; San Lorenzo in Collina: 85 spms., NP 9707, 3 spms., MPUM 9762; Barca: 5 spms., NP 9708; Bibbiano: 3 spms., NP 9691; Cava I Sodi: 38 spms., MPUM 9763; Ciuciano: 62 spms., NP 9693, 3 spms., MPUM 9764; Guistrigona: 1 spm., MPUM 9765; Monsindoli: 45 spms., NP 9698; Montenero: 7 spms., NP 9700; Orciano Pisano: 544 spms., NP 9701, 72 spms., MPUM 9766, 1 spm., MPUM 9767, 1 spm., MPUM 9768, 187 spms., MPUM 9769, 10 spms., MGGC 23417, 10 spms., MGC 1370, 10 spms., MZB 31664, 10 spms., GF 1166; Guidonia: 38 spms., NP 9695; Altavilla Milicia: 2 spms., NP 9688.

Other material examined. Belveglio: 1 spm., MZB 29905; Cas-sine: 20 spms., MZB 41804, 1 spm., MZB 41936; Cherasco: 1 spm.,

MZB 30139, 10 spms., MZB 42151; Montaldo Roero: 2 spms., MZB 43886, 7 spms., MZB 43908; Pino d'Asti: 2 spms., MZB 41935, 2 spms., MZB 42081; Rio di Bocca d'Asino, Tortonian: 2 spms., MZB 25980, 2 spms., MZB 25947, 1 spm., MZB 29706, 3 spms., MZB 29731, 16 spms., MZB 29739, 24 spms., private collection; Sant'Agata Fossili, Tortonian: 1 spm., MZB 26002, 14 spms., MZB 26974; Schierano, Asti: 1 spm., MZB 30216; Stazzano, Tortonian: 3 spms., MZB 29731; Viale: 2 spms., MZB 29125, 2 spms., MZB 29120; Bussana Vecchia: 14 spms., private collection; Caranchi: 15 spms., private collection; Rio Torsero: 14 spms., MZB 41659, 6 spms., MZB 15654, 1 spm., MZB 15705, 2 spms., MZB 15698, 1 spm., MZB 15800, 1 spm., MZB 41625, 2 spms., MZB 41950, 35 spms., private collection; Zinola, Savona: 1 spm., MZB 29909; Badagnano: 1 spm., MZB 00032, 1 spm., MZB 00033, 1 spm., MZB 004614, 5 spms., PPMM 54014; Bagnolo: 7 spms., MZB 15810; Buco del Diavolo: 1 spm., PPMM 54013; Campore: 2 spms., MZB 15757, 5 spms., MZB 15672, 1 spm., MZB 15701, 8 spms., MZB 008423; Castell'Arquato: 1 spm., MZB 003675; Gessi: 1 spm., MZB 15788; Marano sul Panaro: 26 spms., private collection; Montegibbio, Tortonian: 2 spms., MZB 29109, 1 spm., MZB 29713, 2 spms., MZB 29740, 3 spms., MZB 005723, 34 spms., private collection; Pradalbino: 19 spms., MZB 000747, 1 spm., MZB 000748, 3 spms., MZB 15642, 1 spm., MZB 15652, 4 spms., MZB 15722, 2 spms., MZB 15741, 2 spms., private collection; Pradalbino I: 1 spm., GF 1150, 1 spm., GF 1152; Pradalbino II: 1 spm., GF 1151; Guistrigona: 2 spms., MZB 15739; Monsindoli: 4 spms., MZB 15648; Orciano Pisano: 1 spm., MZB 15677, 2 spms., MZB 29112, 6 spms., MZB 15616, 3 spms., MZB 43913, 24 spms., MZB 44494, 582 spms., PPMM 54011, 2796 spms., private collection; San Gimignano: 1 spm., PPMM 54012; Guidonia: 83 spms., private collection.

Description. Protoconch small, turbinate with nearly flat spire, whorls 2.50-2.75, convex, smooth except for small tip bearing remnants of abapical spiral threads. Teleoconch globose to globose-pyriform, moderately thick. Spire conical, rather elevated in some specimens, whorls convex. Suture fine, adpressed. Last whorl globose-oval, only slightly extended toward aperture; subsutural shelf flat to scarcely concave, poorly defined; periphery at midline. Aperture D-shaped in gently prosocline plane, height about 1.7 times the width. Parietal callus thick, subquadrangular, with concave abapertural outline, ending at level of umbilical border; anterior lobe well developed, rather broad and with roundly truncated edge. Umbilicus deep, small to very small (a narrow chink in some specimens), semicircular to crescentic in outline, margin broadly rounded, hence demarcation from base poorly defined; umbilical wall subvertical; inner surface with coarse growth markings. Funicle obsolescent, separated from umbilical wall by moderately deep to deep spiral furrow of variable breadth, which may form very slight notch on abapical part of inner lip. Umbilical callus moderately thick, narrowly subtriangular, with oblique reverse J-shaped outline, merging into anterior lobe of parietal callus and slightly covering adapical part of umbilicus. Basal fasciole indistinct. Surface with uneven growth lines slightly arched subsuturally; a faint, slightly oblique spiral microstriation occurs on last whorl. Color pale brown background with reddish-brown lower base and subsutural band.

Dimensions (mm):

DHW	PD	H	D	SH
0.112-0.136	0,868-1,012	8.953-26.297	7.947-22.547	1.473-8.517
0.124	0.940	17.625	15.247	4.995
AH	AW	UW	IS	SA
6.772-18.596	3.929-11.321	1.518-5.070	16°-36°	94°-122°
12.684	7.625	3.294	26°	108°

Remarks. *Nerita helicina* was introduced by Brocchi (1814, p. 297) on the basis of Pliocene material from an unspecified locality in the Piacenza area (“Fossile nel Piacentino”). Since the original diagnosis (“*Testa solida subglobosa, anfractibus rotundatis distinctis, umbilico semiclauso, labio adnato, incrassato, calloso*”), the short descriptive notes and the poor figure published by Brocchi (pl. 1, fig. 10) fail to clarify the distinguishing characters of the species, subsequent workers were forced to interpret it. Basically, the species concept, adopted up to now, is that outlined by Sacco (1891, p. 70). The species was quite frequently cited, described and/or figured later, and assigned to *Natica* Scopoli, 1777, *Lunatia* Gray, 1847, *Polinices* Montfort, 1810, and more recently to *Euspira* Agassiz in J. Sowerby, 1837. Rossi Ronchetti (1955), in the frame of a revision of Brocchi’s “types”, dealing with *N. helicina*, described and figured (p. 161, fig. 82) a shell indicated as being the “holotype”. However, Brocchi had several specimens and did not designate the holotype. No mention was made by Rossi Ronchetti as regards any possible selection among original specimens, but the described shell is deemed to be the lectotype.

Brocchi’s material in MSNM consists of one box with four specimens (i 4679 through i 4682); the box also contains the original manuscript label numbered 68. Two distinct species are represented. Two shells (i 4680 and i 4682, figured herein in Pl. 1, figs. 12, 13) conform to the concept of *Nerita helicina* followed for nearly two centuries by all authors and are not discrepant with the short description published by Brocchi. The other two (i 4679 and i 4681, also figured herein in Pl. 1, figs. 14, 15) exhibit all the characters (protoconch and teleoconch) of the naticine *Tectonatica prietoi* (Hidalgo, 1873). One of these latter shells (i 4679) is that indicated as “holotype” of *N. helicina* by Rossi Ronchetti (1955). In these circumstances, the name *N. helicina* would be a matter of considerable confusion. However, considering 1) that the name *N. helicina* remains available (ICZN 1999, Article 17 of the Code) and 2) that the existing name-bearing type of *N. helicina* is not in taxonomic accord with the prevailing usage of the name, in order to conserve nomenclatural stability (ICZN 1999, Article 75.6 of the Code), we think that the existing name-bearing type should be set aside and a neotype be designated. Only two of the four shells in MSNM bear the numeral 68 written by Brocchi (handwriting is identical to that of the original label) and are inferred definitely to have been examined by him. One (i 4679) is that indicated

as “holotype” by Rossi Ronchetti, the other (i 4680) is in accord with the prevailing usage of *N. helicina*. We selected the latter (Pl. 1, fig. 12) as neotype and do not consider the other identical shell (i 4682) as a possible neotype because of doubts that it belongs to the material handled by Brocchi. This conclusion was submitted for decision to the International Commission on Zoological Nomenclature (Pedriali & Robba, 2008b).

Nerita helicina Brocchi, 1814 has been regarded by most authors as either a variety or a form of *Cochlea catena* da Costa, 1778, or as a distinct species. Actually, *N. helicina* is closely related to *C. catena*, but can be distinguished from it because of its larval shell having half a whorl more and a significantly smaller diameter of the first half-whorl, its spire more elevated in most specimens, its smaller umbilicus in most specimens, enlarging less rapidly during growth and possessing a distinct inner spiral furrow; the broader umbilicus of *C. catena* lacks the inner groove and, instead, bears several inner spiral cordlets that we have not observed in *N. helicina*.

Subsequent to its creation, *Neritina protracta* Eichwald, 1830 was considered to be a distinct species, or a subspecies of *Nerita helicina*, or a form of *Natica varians* Dujardin, 1837. We have examined several specimens of *N. protracta* from Hemmorian (Early Miocene) deposits of The Netherlands and note that the teleoconch characters of Eichwald’s species basically conform to those of *N. helicina*. However, the larval shell of *N. protracta* differs in having 0.5 fewer whorls and significantly smaller diameters (protoconch and first half-whorl). On this basis, we think that *N. protracta* is a distinct species. *Natica varians* differs from both *N. helicina* and *N. protracta* because of its umbilicus devoid of an inner spiral furrow and its narrower umbilical callus.

Natica fusca Blainville, 1825 is strikingly similar to the present species and has sometimes been mistaken for it. Actually, the values of the characteristic elements of the protoconch of both taxa are basically identical, as are their shell shape and apertural characters. However, *Natica fusca* attains a larger size, has a more widely open umbilicus (Fig. 9), with a broader and shallower inner spiral furrow and with more or less numerous inner spiral cordlets. These differences are not considered sufficient for consistent separation at the species level. Consequently, we regard *N. fusca* as a subspecies of *Euspira helicina*, which was introduced eleven years earlier.

Sacco (1891) proposed the new varieties *subobturatoria*, *ovatoconica*, *pseudofuniculosa*, *perconica*, *elatuscula*, *depressiuscula*, *lineofasciolata*, *basibrunneata*, *pseudorufa* and *pseudocinerea* of *Natica (Naticina) catena* (da Costa, 1778) and distinguished them from *Nerita helicina* on the basis of trifling differences. We examined the respective original specimens in MGPT and can state that their characters do not warrant any separation from *N. helicina*. We assign to *Euspira helicina helicina* 2 Plio-

cene shells in MGPT erroneously referred to as *Natica* (*Natica*) *epiglottina* var. *pseudoepiglottina* Sismonda, 1847 by Sacco (1891) and another 2, also in MGPT, originally mistaken by Sacco for *Natica* (*Naticina*) *pulchella* var. *astensis* Sacco, 1890. Examination of the material in MGPT on which Sacco (1891) based the new variety *dilatata* of *Natica catena* has shown that the author had confounded shells with different characters; the bulk of the syntypes of var. *dilatata* (31 out of 37) actually belong to *Euspira helicina helicina* (see also remarks to *Euspira bononiensis*).

Stratigraphic occurrence. *Euspira helicina helicina* (Brocchi, 1814) was reliably recorded from Burdigalian deposits of Piedmont, France and of the North Sea Basin. Late Miocene occurrences are from the Tortonian of Italy. A number of Pliocene localities in Piedmont, Liguria, Emilia, Tuscany, Latium and Sicily yielded abundant material of *E. helicina helicina*; other reliable Pliocene citations are from France. *E. helicina helicina* was replaced by *Euspira helicina fusca* (Blainville, 1825) at the end of the Pliocene and there are no records of it in the Pleistocene.

***Euspira magenesi* Pedriali & Robba, 2001**

Pl. 1, fig. 20; Pl. 3, fig. 10

2001 *Euspira magenesi* Pedriali & Robba, p. 486, pl. 1, figs. 1-3.

Type material. Holotype of *Euspira magenesi* Pedriali & Robba (original designation), MGC 567 and 5 paratypes, MGC 568-572, Rio Rosello; 1 paratype, 551/GF, Rio Rosello; 1 paratype, 23957 MC, Rio Rosello; 1 paratype, MZB 18569, Rio Rosello; 1 paratype, MGC 573, Villalvernia.

Material from the collecting localities. La Valle: 1 spm., MGC 1371 (figured in Pl. 1, fig. 20), 1 spm., private collection; Rio Rosello: 1 spm., NP 9709 (figured in Pl. 3, fig. 10).

Other material examined. Rio Rosello: 4 spms., PPM 54006.

Description. Protoconch small, low-turbiniform, of 1.75-2 convex, smooth whorls, tip small. Teleoconch small, depressed-globose, thin. Spire broadly conical, moderately elevated, somewhat stepped, whorls convex. Suture deeply and broadly channeled. Last whorl large, globose, somewhat depressed, rather quickly expanding and produced abapically toward aperture; subsutural shelf indistinct; periphery slightly above midline. Aperture ovately D-shaped in gently prosocline plane, height about twice width. Parietal callus thin to moderately thick, with concave abapertural outline, ending at level of basal fasciole; anterior lobe slender, with pointed edge slightly extending over adapical part of umbilicus. Umbilicus deep, medium to large, exposing earlier whorls, clearly demarcated from base by sharp angulation; umbilical wall descending steeply to narrow and shallow spiral groove, then excavated to form broad spiral depression sculptured with uneven, low spiral cords crossed by coarse growth markings forming an irregular

square-reticulated pattern. Funicle absent. Umbilical callus moderately developed, subtriangular to semicircular, smoothly merging into anterior lobe of parietal callus, separated from the latter either by a faint transverse groove or by shallow notch in some specimens. Basal fasciole poorly differentiated. Surface with dense, thin growth lines, coarser over the basal fasciole; a faint spiral microstriation occurs on lower base. Color yellowish background with reddish pattern of distant collabral lines, restricted to part of last whorl in some shells; sutural channel reddish-brown with adaxial blackish band.

Dimensions (mm):

DHW	PD	H	D	SH
0.188-0.192	0.866-0.994	4.083-18.367	4.761-20.289	1.245-1.725
0.190	0.930	11.225	12.525	1.485
AH	AW	UW	IS	SA
2.838-16.642	2.046-12.114	2.159-5.411	15°-31°	127°-159°
9.740	7.080	3.785	23°	143°

Remarks. The values of the characteristic elements of the protoconch of *Euspira magenesi* do not differ significantly from those measured for *Euspira bononiensis* (Foresti, 1884) and *Euspira catena* (da Costa, 1778), but the teleoconch characters of *E. magenesi* distinguish it easily from both *E. bononiensis* and *E. catena*. In fact, *E. magenesi* differs from *E. bononiensis* primarily by its smaller size, its more depressed, noticeably lower-spined shell, its channelled instead of almost flush suture, its more prominent anterior lobe of the parietal callus, its rounded umbilicus bounded by a sharp angulation, devoid of a funicle and bearing well-developed inner spiral cordlets, and its different color pattern. The markedly smaller size, the unsculptured protoconch tip, the lower, stepped spire, the channelled instead of adpressed suture, the proportionally broader umbilicus (Fig. 9) with a distinct inner spiral furrow (absent in *E. catena*), and the different color pattern separate *E. magenesi* from *E. catena*.

The Oligo-Miocene, north European species *Euspira nysti* (d'Orbigny, 1852) is similarly shaped and also exhibits the inner spiral sculpture of the umbilicus, but attains twice the size of *Euspira magenesi*, has a more prominent spire, a less distinctly channelled suture, a markedly broader aperture and a poorly developed to indistinct umbilical callus. The Miocene, north European species *Euspira gottschei* (Kautsky, 1925) is even more similar as regards the shell shape, but is easily differentiated from *E. magenesi* because of its extremely broad umbilicus devoid of spiral sculpture and somewhat reminiscent of that of *Payraudeantia* species.

Stratigraphic occurrence. The original material of *Euspira magenesi* Pedriali & Robba, 2001 was from Piacenzian deposits of Piedmont and Emilia. Subsequent records from Emilia also refer to the Piacenzian

and confirm that this uncommon species is restricted to that age.

***Euspira notabilis* (Jeffreys, 1885)**

Pl. 2, figs 1, 2; Pl. 3, figs 11, 12; Pl. 4, figs 12-14

1885 *Natica notabilis* Jeffreys, p. 31, pl. 4, figs. 1, 1a.

1996 *Euspira macilenta* - Pedriali, p. 14, pl. 4, fig. 3 (not Philippi, 1844)

1999 *Polinices notabilis* - Gubbioli et al., pp.123,124, figs. 1-4 (3, 4 holotype), 7, 8.

2005 *Euspira notabilis* - Repetto et al., text-fig. 470.

Type material. Holotype in NHML, n° 85.11.5.2342. Not seen (we failed to have any answer from the curator).

Material erroneously referred to as *Natica (Naticina) catena* var. *dilatata* Sacco, 1891 in MGPT. Colli Astesi: 2 syntypes, MGPT BS.029.02.012/05.

Material from the collecting localities. Cossato: 1 spm., NP 9713; Villalvernia: 1 spm., NP 9728; Volpedo: 7 spms., NP 9729; Rio Torsero: 1 spm., NP 9724; Badagnano: 3 spms., NP 9710; Balzo del Musico: 5 spms., NP 9717; Diolo: 2 spms., NP 9714; La Valle: 1 spm., NP 9715; Montegibbio, Tortonian: 1 spm., NP 9716; Montemaggiore: 2 spms., NP 9718; Montezago: 6 spms., NP 9719; Pradalbino I: 8 spms., NP 9721; Pradalbino II: 312 spms., NP 9722, 10 spms., MPUM 9770, 1 spm., MPUM 9771, 1 spm., MPUM 9772, 1 spm., MPUM 9773, 1 spm., MPUM 9774, 5 spms., MGGC 23418, 5 spms., MGC 1372, 5 spms., MZB 31665, 5 spms., GF 1167; Rio Rosello: 20 spms., NP 9723; San Lorenzo in Collina: 3 spms., NP 9725; Torrente Stirone: 2 spms., NP 9727; Barca: 2 spms., NP 9726; Ciuciano: 4 spms., NP 9712; Fauglia, Pleistocene: 5 spms., NP 9731; Orciano Pisano: 7 spms., NP 9720, 1 spm., MPUM 9775; Spicchio: 1 spm., NP 9711; Cutrofiano, Pleistocene: 2 spms., NP 9732; Porcaro, Pleistocene: 49 spms., NP 9733, 1 spm., MPUM 9776.

Other material examined. Castello di Annone: 1 spm., MZB 30218; Cervere: 1 spm., MZB 42053; Rio di Bocca d'Asino, Tortonian: 1 spm., MZB 29738; Tetti Borelli, Messinian: 1 spm., private collection; Bussana Vecchia: 3 spms., private collection; Caranchi: 1 spm., private collection; Rio Torsero: 1 spm., MZB 41659; Arda II, Pleistocene: 2 spms., MZB 15679; Badagnano: 1 spm., MZB 000032, 1 spm., MZB 004614; Bora Val Chero, Pleistocene: 2 spms., MZB 10853; Buco del Diavolo: 11 spms., PPMM 54002; Diolo: 4 spms., PPMM 54001; Marano sul Panaro: 2 spms., private collection; Pradalbino: 24 spms., MZB 000747, 12 spms., MZB 15642, 1 spm., MZB 15660, 2 spms., MZB 15722, 2 spms., MZB 15741, 9 spms., private collection; Pradalbino II: 1 spm., GF 1158; Barca: 3 spms., PPMM 54003; Cava di Castelfiorentino: 1 spm., MZB 15764; Orciano Pisano: 4 spms., PPMM 54004, 7 spms., private collection; San Gimignano: 2 spms., PPMM 54004; Guidonia: 1 spm., private collection; Ravagnese, Pleistocene: 2 spms., private collection; Pecoraro, Pleistocene: 59 spms., private collection; Bovetto, Pleistocene: 5 spms., private collection; Torrente Boscaio, Pleistocene: 6 spms., private collection; Acqua dei Corsari, Ficarazzi, Pleistocene: 2 spms., MZB 11252; Contrada Manicalunga, Trapani, Pleistocene: 16 spms., MZB 15608; Dakhla, West Sahara, Recent: 1 spm., MPUM 9777, 1 spm., NP 9734.

Description. Protoconch small, depressed-turbiniform of 2.12-2.25 convex, smooth whorls, tip very small. Teleoconch globose, moderately thin. Spire conical, rather elevated, whorls very gently convex, less so in some specimens. Suture thin, almost flush. Last whorl globose, somewhat extended toward aperture; subsutural shelf faintly concave, moderately sloping,

obscurely defined by blunt angulation; periphery slightly above midline. Aperture D-shaped in prosocline plane, height about twice width. Parietal callus thick, with concave abapertural outline, ending at level of umbilical border; anterior lobe rather broad and with roundly truncated edge. Umbilicus deep, small, crescentic in outline, margin broadly rounded, hence demarcation from base poorly defined; umbilical wall steeply sloping; inner surface with growth markings. Funicle a broad, depressed cord separated from umbilical wall by moderately deep, narrow furrow forming very slight notch on abapical part of inner lip. Umbilical callus very thick, with reverse S-shaped outline, merging into anterior lobe of parietal callus and covering adapical part of umbilicus. Basal fasciole indistinct. Surface with uneven growth lines slightly arched over subsutural shelf; a faint spiral microstriation occurs on last whorl. Several fossil specimens exhibit a uniform pale brown background with 2 darker bands, respectively on subsutural shelf and on lowermost base.

Dimensions (mm):

DHW	PD	H	D	SH
0.068-0.088	0.724-0.820	7.538-17.490	6.832-16.392	1.167-4.395
0.078	0.772	12.514	11.612	2.781
AH	AW	UW	IS	SA
5.757-13.705	3.745-8.657	1.548-4.028	11°-27°	95°-119°
9.731	6.201	2.788	19°	107°

Remarks. *Euspira notabilis* is closely similar to *Euspira grossularia* (Marche-Marchad, 1957) in shell shape. However, it can be readily distinguished from the latter because of its protoconch with fewer whorls (2.12-2.25 instead of 2.85-3) and significantly smaller diameter, its crescentic umbilicus with distinct inner spiral furrow (absent in *E. grossularia*), and the outline of the umbilical callus being reverse S-shaped instead of straight as in *E. grossularia*. It is also worth noting that *E. notabilis* hardly exceeds 15 mm in height, whereas *E. grossularia* attains a larger size.

The small species *Euspira notabilis* might be confused with young specimens of *Euspira helicina helicina* (Brocchi, 1814). *E. notabilis* can be differentiated from *E. helicina helicina* in having significantly smaller diameter of the first half-whorl of the larval shell, a remarkably lighter shell, a broader umbilicus with a more distinct funicle, and the umbilical callus has a reverse S-shaped outline instead of a reverse J-shaped one as in *E. helicina helicina*.

Quite surprisingly, Bouchet & Waren (1993) included *Natica notabilis* in the synonymy of *Cryptonatica operculata* (Jeffreys, 1885). Actually, the original description of the former species (Jeffreys 1885, p. 31) clearly reads "operculum chitinous" and this implies a poliniceine assignment. The latter species poss-

eses a calcareous operculum and belongs to the Naticinae.

Stratigraphic occurrence. *Euspira notabilis* (Jeffreys, 1885) was hitherto quoted only from modern environments. Specimens from Rio di Bocca d'Asino (Piedmont) and Montegibbio (Emilia) testify that the species had appeared in the Tortonian. We collected it from several Pliocene localities in Piedmont, Liguria, Emilia, Tuscany and Latium. Pleistocene occurrences are mainly from southern Italy. Presently, the species ranges in the western Mediterranean and the eastern Atlantic, from Portugal to Mauritania.

Euspira pulchella (Risso, 1826)

Pl. 2, figs 3, 4; Pl. 3, fig. 13; Pl. 4, figs 15, 16

- 1826 *Natica pulchella* Risso, p. 148, pl. 4, fig. 42.
 1890 *Natica (Naticina) hemiclausa* var. *exturbinoidea* subvar. *subpulchella* Sacco, p. 31 (*nomen nudum*).
 1891 *Natica (Naticina) hemiclausa* var. *subpulchella* Sacco, p. 77.
 1978 *Polinices pulchella* - Arnaud, p. 130, pl. 9, fig. 70 (lectotype).
 1976 *Lunatia alderi* - Pavia, p. 103, 112, 137, pl. 4, figs. 27, 31.
 1980 *Lunatia alderi* - Pavia, p. 257, pl. 7, fig. 14.
 1980 *Lunatia pulchella* - Piani, p. 143.
 1984 *Naticina hemiclausa* var. *subpulchella* - Ferrero Mortara et al., p. 34.
 1986 *Euspira nitida* - Villa, p. 16.
 1992 *Euspira nitida* - Cavallo & Repetto, text-fig. 127.
 1995 *Polinices nitida* - Bodon et al., p. 32.
 1996 *Euspira nitida* - Pedriali, p. 14, pl. 3, fig. 8, pl. 4, fig. 4.
 1997 *Euspira pulchella* - Giannuzzi-Savelli et al., figs. 792-793, 825.
 1997 *Polinices nitida* - Lacroce, p. 30, pl. 2, fig. 11.
 2000 *Polinices nitida* - Lacroce, p. 33.
 2005 *Euspira pulchella* - Repetto et al., text-fig. 471.
 2008 *Euspira nitida* - Huelsen et al., p. 29, text-fig. 9A.

Uncertain references

- Euspira nitida* - Mancini, 1997: p. 41; - Repetto, 1997: p. 60, n. 127; - Bogi & Cauli, 1998: p. 131, 134; - Ferrero et al., 1998: p. 48; - Basso & Brusoni, 2004: p. 40.
Euspira poliana - Glibert, 1963: p. 91.
Euspira pulchella - Malatesta & Zarlenga, 1985: p. 513; - Öztürk et al., 2004: p. 56; - Coppini et al., 2006: p. 3; - Cuneo et al., 2006: p. 7; - Trono, 2007: p. 63.
Lunatia alderi - Barsotti et al., 1974: p. 443, 445; - Montefameglio et al., 1980: p. 189; - Aimassi & Ferrero Mortara, 1983: p. 185; - Aimone & Ferrero Mortara, 1983: p. 295, 311; - Tropeano et al., 1984: p. 58; - Pavia et al., 1989: p. 567; - Barbarino & Scarselli, 1992: p. 412, 419.
Lunatia poliana - Robba, 1981: p. 102, 112, 129, 151, 152, 155, tabella 5; - Benigni & Corselli, 1982: p. 651, 670, 677, 681, 683, 686, 687; Bernasconi, 1989: p. 58, 75.
Lunatia pulchella - Micali & Villari, 1989: p. 79.
Natica alderi - Bronn, 1848: p. 780; - Almera & Bofill, 1898: p. 51; - Depéret & Caziot, 1903: p. 338.
Natica alderi var. *globulosa* - Almera & Bofill, 1898: p. 51.
Natica intermedia - Philippi, 1836: p. 163; - Seguenza, 1876: p. 12, n. 494; - Seguenza, 1880: p. 264, n. 248.
Natica poliana - Scacchi, 1836: p. 16.

- Natica pulchella* - Manzoni, 1868: p. 54; - Appellius, 1871: p. 23, 75; - Malatesta, 1943: p. 164, 178; - Imbesi, 1951: p. 128.
Natica (Lunatia) alderi - Harmer, 1921: p. 687, pl. 55, figs. 4-6.
Natica (Naticina) pulchella - Cerulli-Irelli, 1914: p. 218, pl. 20, figs. 5-6.
Naticina pulchella - Bellini, 1904: p. 377.
Polynices alderi - Ruggieri, 1950a: p. 88; - Ruggieri, 1957a: p. 50; - Ruggieri, 1962: p. 27; - Francaviglia, 1941: p. 67.
Polynices (Lunatia) alderi - Rasmussen, 1956: p. 59, pl. 4, fig. 8.
Polynices (Naticina) alderi - Ruggieri, 1949b: p. 48; - Ruggieri, 1949c: p. 68; - Ruggieri, 1950b: p. 92.
Polynices nitida - Mars, 1956: p. 40.

Type material. Lectotype of *Natica pulchella* Risso (designated by Arnaud 1978, p. 130), MNHN Moll 5399 and 1 paralectotype, MNHN Moll 5400, both unlocalised.

Other type material. Lectotype of *Natica (Naticina) hemiclausa* var. *subpulchella* Sacco (designated herein and figured in Pl. 2, fig. 3), MGPT BS.029.02.033, Colli Astesi.

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Colli Astesi: 9 syntypes, MGPT BS.029.02.034/01, 13 syntypes, MGPT BS.029.02.034/05; Villalvernia: 1 syntype, MGPT BS.029.02.034/04.

Material erroneously referred to as *Natica (Tectonatica) tectula* Sacco, 1890 in MGPT. Colli Astesi: 268 syntypes, MGPT BS.029.04.001/06.

Material erroneously referred to as *Natica (Naticina) hemiclausa* var. *exturbinoidea* Sacco, 1890 in MGPT. Masserano: 1 syntype, MGPT BS.029.02.032/02; Colli Astesi: 40 syntypes, MGPT BS.029.02.032/04.

Material from the collecting localities. La Loggia: 1 spm., NP 9743; Villalvernia: 7 spms., NP 9753; Volpedo: 10 spms., NP 9754; Ceriale: 3 spms., NP 9739; Rio Torsero: 6 spms., NP 9749; Arda: 3 spms., NP 9735; Balzo del Musico: 3 spms., NP 9745; Diolo: 1 spm., NP 9741; Pradalbino II: 25 spms., NP 9747, 1 spm., MPUM 9778, 1 spm., MPUM 9779; Rio Rosello: 61 spms., NP 9748, 3 spms., MPUM 9780, 2 spms., MGGC 23419, 2 spms., MGC 1373, 2 spms., MZB 31666, 2 spms., GF 1168; San Lorenzo in Collina: 32 spms., NP 9750; Torrente Stirone: 11 spms., NP 9752; Balze di Caspreno: 3 spms., NP 9736; Barca: 7 spms., NP 9761; Bibbiano: 7 spms., NP 9737; Calanchi di San Martino: 2 spms., NP 9738; Ciuciano: 19 spms., NP 9740, 1 spm., MPUM 9781; Il Campino: 36 spms., NP 9751; Linari: 2 spms., NP 9744; Orciano Pisano: 3 spms., NP 9746; Guidonia: 2 spms., NP 9742; Pomezia, Pleistocene: 2 spms., NP 9755; Porcaro, Pleistocene: 319 spms., NP 9756, 5 spms., MPUM 9783, 1 spm., MGGC 23420, 1 spm., MGC 1374, 1 spm., MZB 31667, 1 spm., GF 1169.

Other material examined. Santo Stefano Roero: 1 spm., MZB 15651; Villalvernia: 20 spms., private collection; Bussana Vecchia: 206 spms., private collection; Caranchi: 77 spms., private collection; Ceriale: 72 spms., private collection; Rio Torsero: 35 spm., private collection; Arda II, Pleistocene: 73 spms., MZB 15679, 106 spms., MZB 15731, 56 spms., MZB 15747; Badagnano: 11 spms., MZB 000033, 5 spms., MZB 000042; Bora Val Chero, Pleistocene: 2 spms., MZB 10852, 1 spm., MZB 15645, 9 spms., MZB 15639; Marano sul Panaro: 99 spms., private collection; Pradalbino: 3 spms., MZB 000747, 2 spms., MZB 15660; Torrente Stirone, Mille Pioppi, Pleistocene: 13 spms., MZB 7412; Guidonia: 1 spm., private collection; Pomezia, Pleistocene: 20 spms., private collection; Ravagnese, Pleistocene: 1 spm., private collection; Archi, Pleistocene: 4 spms., MZB 005250, 59 spms., private collection; Pecoraro, Pleistocene: 5 spms., MZB 005418, 73 spms., private collection; Bovetto, Pleistocene: 75 spms., private collection; Torrente Boscaino, Pleistocene: 200 spms., private collection; Acqua dei Corsari, Ficarazzi, Pleistocene: 1 spm., MZB 11253; Altavilla Milicia: 1 spm., private collection; Contrada Manicalunga, Trapani, Pleistocene: 9 spms., MZB 15608, 1 spm., MZB 15649; Upper Adriatic Sea (gravity core), Holocene: 4 spms., MZB 15663; Lofoten Isles, Norway, Recent:

1 spm., NP 9760; Mull Isle, Hebrides, Recent: 1 spm., MZB 003522; Normandie, France, Recent: 4 spms., NP 9759; Mediterranean Sea, Recent: 1 spm., MZB 15647; off Bastia, Corsica Isle, Recent: 7 spms., MZB 15646; Anzio, Rome, Recent: 2 spms., NP 9757; Mergellina, Naples, Recent: 1 spm., MZB 15620; Chioggia, Recent: 4 spms., NP 9758, 1 spm., MPUM 9784; Puglia, Recent: 1 spm., MZB 006703; Haifa Bay, Israel, Recent: 1 spm., MZB 006096, 5 spms., MZB 001346.

Description. Protoconch small, depressed-turbiniform, whorls 2.40-2.60, convex, smooth except for very small tip bearing coarsely and irregularly granulated spiral threads over abapical two-thirds. Teleoconch globose, globose-pyriform in a few specimens, moderately thick. Spire conical, low to rather elevated, whorls gently convex. Suture fine, adpressed. Last whorl globose, only slightly extended toward aperture; subsutural shelf flat, more or less sloping, poorly defined; periphery above midline. Aperture D-shaped in slightly prosocline plane, height about 1.6 times width. Parietal callus thick, subquadrangular, with concave abapertural outline, ending at level of umbilical border; anterior lobe barely prominent, subangular abapically. Umbilicus deep, medium-sized, semicircular to crescentic, margin rounded in most specimens, subangular in larger shells; umbilical wall steeply sloping to a blunt angulation bounding a shallow, rather wide spiral furrow; inner surface with growth markings or nearly smooth. Funicle obsolete. Umbilical callus moderately thick, narrowly subtriangular, with oblique reverse J-shaped outline, merging into anterior lobe of parietal callus and slightly covering adapical part of umbilicus. Basal fasciole indistinct. Surface with uneven growth lines slightly arched subsuturally. Color more or less pale buff, yellowish-gray or orange background with chestnut-brown pattern of chevron markings arranged into spiral rows, 1 on spire whorls, 5 on last whorl; umbilical wall and inner lip calluses chestnut-brown in a few specimens; fossil specimens exhibit remnants of 2 brown bands, subsutural and on lowermost base.

Dimensions (mm):

DHW	PD	H	D	SH
0.072-0.092	0.665-0.797	1.794-13.458	1.069-12.293	0.741-3.429
0.082	0.731	7.626	6.681	2.085
AH	AW	UW	IS	SA
0.635-10.447	0.526-6.582	0.370-3.150	12°-24°	74°-122°
5.541	3.554	1.760	18°	98°

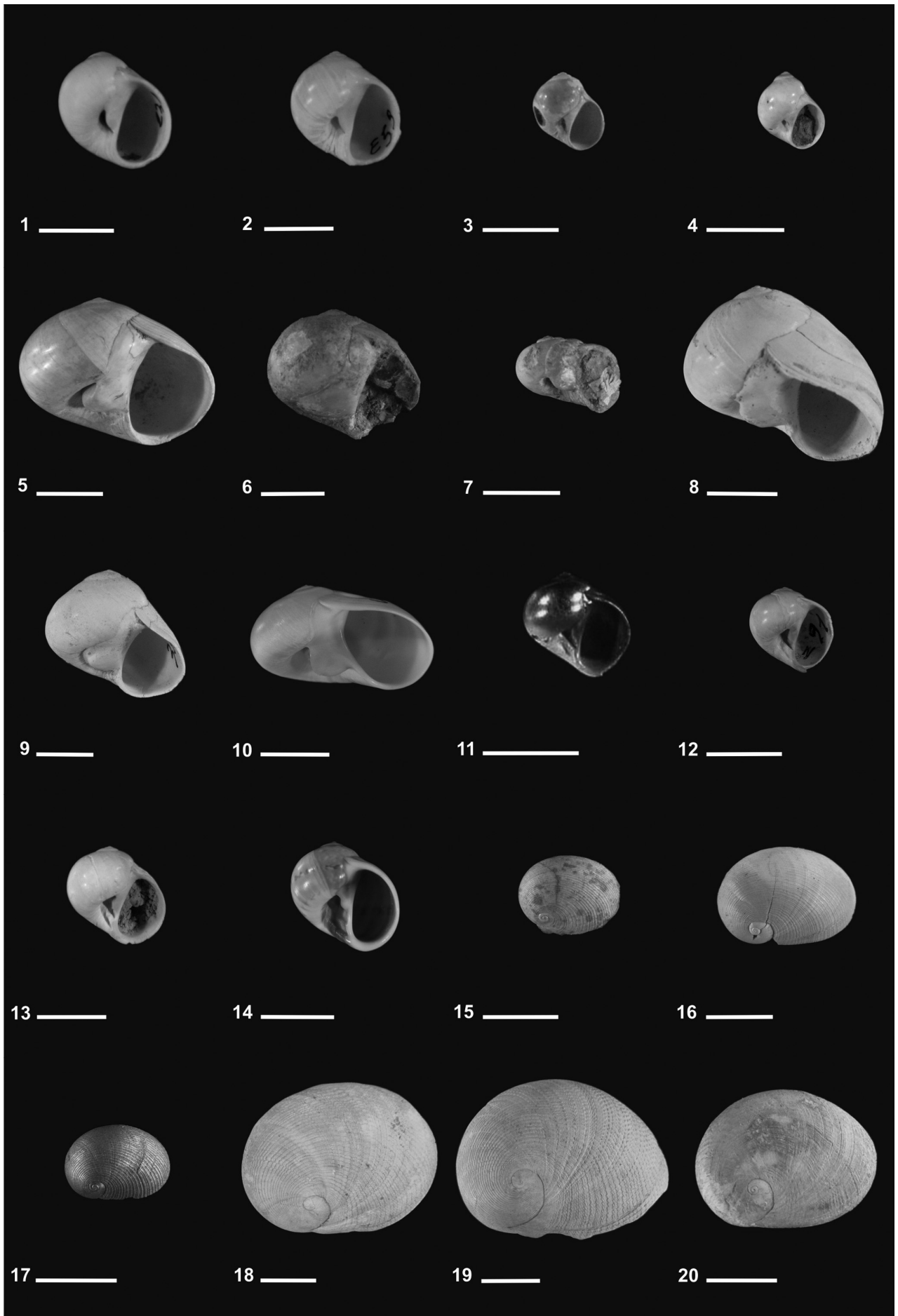
Remarks. The teleoconch of our Pliocene specimens agree with that of the type material of *Natica pulchella* Risso, 1826 in MNHN. No comparison of respective larval shells was possible since both the lectotype and the paralectotype have the protoconch more or less heavily abraded. The species exhibits some variability as regards the elevation of the spire and the inflation of the last whorl.

The teleoconch of the present species bears some resemblance to that of *Euspira notabilis* (Jeffreys, 1885) and the values of the characteristic elements of the pro-

PLATE 2

- Fig. 1 - *Euspira notabilis* (Jeffreys, 1885). Pradalbino II. MPUM 9771; apertural side.
- Fig. 2 - *Euspira notabilis* (Jeffreys, 1885). Porcaro. MPUM 9776; apertural side.
- Fig. 3 - *Euspira pulchella* (Risso, 1826). Lectotype (here designated) of *Natica (Naticina) hemiclausa* var. *subpulchella* Sacco, 1891. Colli Astesi. MGPT BS.029.02.033; apertural side.
- Fig. 4 - *Euspira pulchella* (Risso, 1826). Pradalbino II. MPUM 9778; apertural side.
- Fig. 5 - *Neverita olla* (de Serres, 1829). Holotype of *Natica (Neverita) josephinia* var. *subphilippiana* Sacco, 1891. Colli Astesi. MGPT BS.029.05.002; apertural side.
- Fig. 6 - *Neverita olla* (de Serres, 1829). Lectotype (here designated) of *Natica (Neverita) josephinia* var. *rotundiformis* Sacco, 1891. Colli Torinesi. MGPT BS.029.05.004 bis; apertural side.
- Fig. 7 - *Neverita olla* (de Serres, 1829). Holotype of *Natica (Neverita) josephinia* var. *planorbiformis* Sacco, 1891. Colli Torinesi. MGPT BS.029.05.004 ter; apertural side.
- Fig. 8 - *Neverita olla* (de Serres, 1829). Holotype of *Natica (Neverita) josephinia* var. *plioconica* Sacco, 1891. Rocca d'Arazzo. MGPT BS.029.05.008 bis; apertural side.
- Fig. 9 - *Neverita olla* (de Serres, 1829). Linari. MPUM 9799; apertural side.
- Fig. 10 - *Neverita josephinia* (Risso, 1826). Feniglia, Orbetello. MPUM 9822; apertural side.
- Fig. 11 - *Payraudeautia fasciolata* (Sacco, 1890). Lectotype (here designated) of *Natica (Payraudeautia) intricata* var. *fasciolata* Sacco, 1890. Castelnuovo d'Asti. MGPT BS.029.03.002; apertural side.
- Fig. 12 - *Payraudeautia fasciolata* (Sacco, 1890). Ciuciano. NP 9788; apertural side.
- Fig. 13 - *Payraudeautia intricata* (Donovan, 1803). Bibbiano. MPUM 9806; apertural side.
- Fig. 14 - *Payraudeautia intricata* (Donovan, 1803). Malaga, Spain. MPUM 9810; apertural side.
- Fig. 15 - *Sinum perregulare* (Sacco, 1891). Holotype of *Sigaretus (Cryptostoma) striatum* var. *irregularis* Sacco, 1891. Colli Astesi. MGPT BS.029.09.003; apertural side.
- Fig. 16 - *Sinum perregulare* (Sacco, 1891). Guidonia. Private collection; apertural side.
- Fig. 17 - *Sinum perregulare* (Sacco, 1891). Pradalbino I. Private collection; apertural side.
- Fig. 18 - *Sinum striatum* (de Serres, 1829). Bibbiano. MZB 41631; apertural side.
- Fig. 19 - *Sinum striatum* (de Serres, 1829). Lectotype (here designated) of *Sigaretus (Cryptostoma) striatum* var. *ornatissima* Sacco, 1891. Colli Astesi. MGPT BS.029.09.005; apertural side.
- Fig. 20 - *Sinum striatum* (de Serres, 1829). Holotype of *Sigaretus (Cryptostoma) striatum* var. *striolattissima* Sacco, 1890. Colli Astesi. MGPT BS.029.09.006; apertural side.

Scale bars = 8 mm.



toconchs of both taxa are basically identical. However, *Euspira pulchella* can be easily distinguished from *E. notabilis* because of its sculptured initial half-whorl of the protoconch (smooth in *E. notabilis*), its umbilicus with an obsolete funicle and a wider inner spiral furrow, its umbilical callus with a reverse J-shaped instead of a reverse S-shaped outline, and its different color pattern.

Nerita nitida auct. (not Donovan, 1804), *Natica poliana* delle Chiaje, 1827, *Natica intermedia* Philippi, 1836 and *Natica alderi* Forbes, 1838 are currently regarded as synonyms of Risso's species (cf. Fretter & Graham 1981, p. 336; Bouchet & Waren 1993, p. 774). The name *N. nitida* Donovan has often been applied incorrectly to Mediterranean and northeastern Atlantic shells that actually belong to *Euspira pulchella*. *N. nitida* was reported to be a white species occurring in the West Indies (cf. d'Orbigny 1853; Jeffreys 1867, 1885; Bouchet & Waren 1993). According to Dixon (1984), *N. nitida* Donovan, 1804 is a *nomen dubium*. Also *Nerita glaucina* Linnaeus, 1758 was regarded as a synonym of the present species and would have priority over it. However, Kabat (1990, p. 21), having examined Linnaeus' original material, convincingly concluded that *N. glaucina* is to be rejected as a *nomen dubium* (see further discussion under *Natica olla* de Serres, 1829).

Natica (Naticina) hemiclausa var. *subpulchella* Sacco, 1891 was said to be closely similar to the present species by its author. Examination of the original material in MGPT has shown no significant differences and, accordingly, the var. *subpulchella* is herein placed in the synonymy of *Euspira pulchella*. We also assign to *E. pulchella* 23 syntypes of *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890, 268 syntypes of *Natica (Tectonatica) tectula* Sacco, 1890 and 41 syntypes of *Natica (Naticina) hemiclausa* var. *exturbinoidea* Sacco, 1890, all in MGPT.

Stratigraphic occurrence. *Euspira pulchella* (Risso, 1826) was already reported to occur in the Italian Pliocene. We recovered it from several Pliocene localities in Piedmont, Liguria, Emilia, Tuscany Latium and Sicily. Pleistocene occurrences are from Emilia, Latium, Calabria and Sicily. The species presently ranges from Iceland and northern Norway southward into the Mediterranean.

Genus *Neverita* Risso, 1826

The type species is the Mediterranean species *Neverita josephina* Risso, 1826 by monotypy (cf. Kabat 1990, 1991). *Mamillaria* Swainson, 1840 and *Poliniciella* Petuch, 1988 were considered to be synonyms of *Neverita* (Cernohorsky 1971; Kilburn 1976; Kabat

1991). *Neverita* was either regarded as a subgenus of *Polinices* Montfort, 1810 (Cernohorsky 1972 and Kilburn 1976), or as a full genus (Marincovich 1977; Majima 1989; Kabat 1990, 1991). We concur with the latter authorities in considering it a distinct genus.

From the literature, it appears that the concept of *Neverita* has not been clearly settled, since some species were either assigned to *Neverita* or to *Polinices* (e.g., *Nerita albumen* Linnaeus, 1758 included in *Neverita* by Cernohorsky 1972, Kilburn 1976 and Kabat 1990, in *Polinices* by Majima 1989 and Saito 2000). Actually, Risso's diagnosis of *Neverita* (1826, p. 149) is scarcely informative, focussing only on the broad characters of this genus. Examination of the type species and of those most closely related to it allowed us to define the diagnostic characters of *Neverita* as follows: 1) shell rather thick to thick, depressed-globose, globose-pyriform in a few species; 2) spire very low to moderately elevated, whorls very slightly convex, suture fine, almost flush; 3) last whorl expanded, depressed in most species; 4) parietal callus rather thick to thick, entering the adapical part of the umbilicus in most species; 5) umbilicus broad, largely or completely filled by the umbilical callus; 6) funicle thick and prominent; 7) umbilical callus massive, semicircular, separated from the parietal callus by a distinct notch. The latter is a stable character readily distinguishing *Neverita* from *Polinices* which, instead, has the umbilical callus fused with the parietal callus without any notch between; the depressed shell of *Neverita* is an additional differentiating element.

***Neverita olla* (de Serres, 1829)**

Pl. 2, figs 5-9; Pl. 3, figs 14, 15; Pl. 4, fig. 17

- 1814 *Nerita glaucina* - Brocchi, p. 296 (not Linnaeus, 1758).
 1827 *Natica glaucina* (sic) - Sasso, p. 478 (not Linnaeus, 1758).
 1829 *Natica olla* de Serres, p. 102, pl. 1, figs. 1, 2.
 1836 *Natica glaucina* - Philippi, p. 163 (not Linnaeus, 1758; not Lamarck, 1822).
 1842 *Natica olla* - Sismonda, p. 27.
 not 1844 *Natica olla* - Philippi, p. 139 (= *Neverita josephina* Risso, 1826)
 1844 *Natica olla* - Philippi, p. 141.
 1847 *Natica glaucinoides* var. A *semiglobosa* Grateloup, pl. 5, figs. 9, 10.
 1847 *Natica glaucinoides* var. B *depressa* Grateloup, pl. 5, figs. 11, 12.
 1847 *Natica olla* - Michelotti, p. 156, pl. 6, figs. 1-2.
 1847 *Natica glaucina* - Sismonda, p. 51 (not Linnaeus, 1758; not Lamarck, 1838)
 1847 *Natica olla* - Sismonda, p. 51.
 1848 *Natica olla* - Bronn, p. 784, 786.
 1861 *Natica josephina* - Michelotti, p. 87 (not Risso, 1826).
 1862 *Natica josephina* - Doderlein, p. 18 (not Risso, 1826).
 1862 *Natica josephina* var. *spira turgidiore* Doderlein, p. 18.
 1868 *Natica olla* - Foresti, p. 73, n. 170.
 1868 *Natica josephina* - Manzoni, p. 54 (not Risso, 1826).
 1869 *Natica josephina* (sic) - Coppi, p. 35, n. 392 (not Risso, 1826).

- 1873 *Natica josephinia* - Cocconi, p. 525, n. 4 (not Risso, 1826).
 1873 *Natica josephinia* 1^a var. Cocconi, p. 525.
 1873 *Natica josephinia* 2^a var. Cocconi, p. 525.
 1873 *Natica subconoidea* - Cocconi, p. 526, n. 5, pl. 3, figs. 5-7.
 1874 *Natica josephina* (sic) - Mazzetti, p. 164 (not Risso, 1826).
 1874 *Natica josephinia* - De Stefani, p. 64, n. 191 (not Risso, 1826).
 1874 *Natica olla* - Foresti, p. 81.
 1875 *Natica josephina* (sic) - Crespellani, p. 19 (not Risso, 1826).
 1876 *Neverita josephinia* - Foresti, p. 550 (not Risso, 1826).
 1876 *Natica olla* - Pantanelli, p. 5.
 1876 *Natica (Neverita) josephinia* - Seguenza, p. 10, n. 487 (not Risso, 1826).
 1876 *Natica (Neverita) josephinia* var. 1 (of Cocconi 1873) - Seguenza, p. 10, n. 487.
 1876 *Natica (Neverita) josephinia* var. 2 (of Cocconi 1873) - Seguenza, p. 10, n. 487.
 1877 *Natica olla* - Depontailier, p. 781, n. 106.
 1878 *Natica josephina* - Pantanelli, p. 15 (not Risso, 1826).
 1879 *Natica josephinia* - De Stefani & Pantanelli, p. 141 (not Risso, 1826).
 1879 *Natica josephinia* var. *aegyptiaca* - De Stefani & Pantanelli, p. 141.
 1880 *Natica (Neverita) josephinia* - Brugnone, p. 118 (not Risso, 1826).
 1880 *Natica (Neverita) josephinia* var. *elata* Brugnone, p. 118.
 1880 *Natica josephinia* - Pantanelli, p. 274 (not Risso, 1826).
 1880 *Natica josephinia* - Seguenza, p. 264, n. 253 (not Risso, 1826).
 1880 *Natica olla* - Tuccimei, p. 11.
 1881a *Natica josephinia* - Coppi, p. 18, n. 236 (not Risso, 1826).
 1881a *Natica josephinia* var. *subconoidea* - Coppi, p. 18, n. 237.
 1881b *Natica josephinia* - Coppi, p. 62, n. 537 (not Risso, 1826).
 1881b *Natica josephinia* var. *subconoidea* - Coppi, p. 62, n. 538.
 1880 *Natica josephinia* - Fontannes, p. 117, pl. 7, fig. 12 (not Risso, 1826).
 1881 *Natica josephinia* - Pantanelli, p. 67 (not Risso, 1826).
 1883a *Neverita josephinia* - Parona, p. 8 (not Risso, 1826).
 1883b *Natica josephinia* - Parona, p. 247 (not Risso, 1826).
 1884 *Natica josephinia* - Malagoli, p. 9 (not Risso, 1826).
 1886a *Neverita josephinia* - Cavara, p. 17 (not Risso, 1826).
 1886a *Neverita josephinia* var. *subconica* - Cavara, p. 17.
 1886b *Neverita josephinia* var. *subconica* - Cavara, p. 274.
 1886 *Natica josephinia* - Parona, p. 118 (not Risso, 1826).
 1886 *Neverita josephinia* - Verri, p. 446 (not Risso, 1826).
 1887 *Natica josephinia* - Neviani, p. 196, 204 (not Risso, 1826).
 1887a *Natica josephinia* - Pantanelli & Mazzetti, p. 3 (not Risso, 1826).
 1887b *Natica josephinia* - Pantanelli & Mazzetti, p. 26 (not Risso, 1826).
 1888 *Natica josephinia* - Clerici, p. 109, 125 (not Risso, 1826).
 1888 *Natica josephinia* - De Stefani, p. 221 (not Risso, 1826).
 1888 *Natica josephinia* var. *aegyptiaca* - De Stefani, p. 221.
 1888 *Natica josephinia* - Trabucco, p. 26, n. 50 (not Risso, 1826).
 1890 *Natica (Neverita) josephinia* - Sacco, p. 34 (not Risso, 1826).
 1890 *Natica (Neverita) josephinia* subvar. *rosea* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* subvar. *subcinerea* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* subvar. *subphilippiana* Sacco, p. 34 (*nomen nudum*).
 ? 1890 *Natica (Neverita) josephinia* var. *antiqua* Sacco, p. 34.
 ? 1890 *Natica (Neverita) josephinia* var. *antiqua* subvar. *subtecta* Sacco, p. 34 (*nomen nudum*).
 ? 1890 *Natica (Neverita) josephinia* var. *priscoidepressa* Sacco, p. 34.
 1890 *Natica (Neverita) josephinia* var. *clausodepressa* Sacco, p. 34.
 1890 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *cinerea* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *rosacea* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *rotundiformis* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *planorbiformis* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *clausoelata* Sacco, p. 34.
 1890 *Natica (Neverita) josephinia* var. *clausoelata* subvar. *subfasciculata* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *clausoelata* subvar. *subtecta* Sacco, p. 34 (*nomen nudum*).
 1890 *Natica (Neverita) josephinia* var. *poliniceoides* Sacco, p. 34.
 1890 *Natica (Neverita) josephinia* var. *pliospiralata* Sacco, p. 35.
 1890 *Natica (Neverita) josephinia* var. *pliospiralata* subvar. *subpliolgaucina* Sacco, p. 35 (*nomen nudum*).
 1891 *Natica josephinia* - Fucini, p. 70 (not Risso, 1826).
 1891 *Natica (Neverita) josephinia* - Sacco, p. 83, pl. 2, fig. 54 (not Risso, 1826).
 1891 *Natica (Neverita) josephinia* subvar. *rosea* Sacco, p. 85.
 1891 *Natica (Neverita) josephinia* subvar. *subcinerea* Sacco, p. 85.
 1891 *Natica (Neverita) josephinia* var. *subphilippiana* Sacco, p. 85.
 ? 1891 *Natica (Neverita) josephinia* var. *antiqua* - Sacco, p. 85, pl. 2, fig. 55.
 ? 1891 *Natica (Neverita) josephinia* var. *subtecta* Sacco, p. 85.
 ? 1891 *Natica (Neverita) josephinia* var. *priscoidepressa* - Sacco, p. 85, pl. 2, fig. 56.
 1891 *Natica (Neverita) josephinia* var. *clausodepressa* - Sacco, p. 86, pl. 2, fig. 57.
 1891 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *cinerea* Sacco, p. 86.
 1891 *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *rosacea* Sacco, p. 86.
 1891 *Natica (Neverita) josephinia* var. *rotundiformis* Sacco, p. 86.
 1891 *Natica (Neverita) josephinia* var. *planorbiformis* Sacco, p. 87.
 1891 *Natica (Neverita) josephinia* var. *clausoelata* - Sacco, p. 87, pl. 2, fig. 58.
 1891 *Natica (Neverita) josephinia* var. *subfasciculata* Sacco, p. 87.
 1891 *Natica (Neverita) josephinia* var. *subdetecta* Sacco, p. 87.
 1891 *Natica (Neverita) josephinia* var. *poliniceoides* - Sacco, p. 87, pl. 2, fig. 59.
 1891 *Natica (Neverita) josephinia* var. *plioconica* Sacco, p. 88.
 1891 *Natica (Neverita) josephinia* var. *pliospiralata* - Sacco, p. 88, pl. 2, fig. 60.
 1891 *Natica (Neverita) josephinia* var. *subpliolgaucina* Sacco, p. 88.
 1895 *Neverita josephinia* - Arduini, p. 185 (not Risso, 1826).
 1896 *Neverita josephinia* - Busacchi, p. 322 (not Risso, 1826).
 1896 *Neverita josephinia* - Cerulli-Irelli, p. 11 (not Risso, 1826).
 1896 *Natica josephinia* - Simonelli, p. 330, 334 (not Risso, 1826).
 1898 *Natica josephinia* - Almera & Bofill, p. 50 (not Risso, 1826).
 1898 *Neverita josephinia* - Cerulli-Irelli, p. 89 (not Risso, 1826).
 1898 *Neverita josephinia* - Ugolini, p. 4 (not Risso, 1826).
 1904 *Natica (Neverita) josephinia* var. *rotundiformis* - Sacco, p. 103, pl. 23, fig. 1.

- 1904 *Natica* (*Neverita*) *josephinia* var. *planorbiformis* - Sacco, p. 103, pl. 23, fig. 2.
- 1904 *Natica* (*Neverita*) *josephinia* var. *subfasciolata* (error for *subfasciculata*) - Sacco, p. 103, pl. 23, fig. 3.
- 1904 *Natica* (*Neverita*) *josephinia* var. *subdetecta* - Sacco, p. 103, pl. 23, fig. 4.
- 1904 *Natica* (*Neverita*) *josephinia* var. *subpliolglauca* - Sacco, p. 103, pl. 23, fig. 5.
- 1914 *Neverita josephinia* var. *clausoelata* - Bongo, p. 443.
- 1914 *Neverita josephinia* var. *clausodepressa* - Bongo, p. 443.
- 1919 *Natica* (*Neverita*) *olla* - Cossmann & Peyrot, p. 419, n. 248, pl. 12, figs. 5-7.
- 1919 *Natica* (*Neverita*) *pliospiralata* - Cossmann & Peyrot, p. 421, pl. 12, figs. 19, 20.
- 1919 *Natica* (*Neverita*) *subglaucinoidea* - Cossmann & Peyrot, p. 421, pl. 11, figs. 53, 54; pl. 12, figs. 11-15.
- 1919 *Natica* (*Neverita*) *subdetecta* - Cossmann & Peyrot, p. 423, pl. 12, fig. 36.
- 1923 *Neverita* (*Natica*) *josephina* - Bourcart et al., p. 273.
- 1928 *Natica josephinia* - Bevilacqua, p. 160 (not Risso, 1826).
- 1929 *Neverita josephinia* - Zuffardi Commercii, p. 3 (not Risso, 1826).
- 1937 *Natica josephinia* - Dubertret et al., p. 104 (not Risso, 1826).
- 1949a *Polynices* (*Neverita*) *iosephinius* - Ruggieri, p. 26 (not Risso, 1826).
- 1949a *Polynices* (*Neverita*) *josephinus* - Bondi & Sandrucci, p. 5 (not Risso, 1826).
- 1950a *Neverita josephinia* - Ruggieri, p. 82 (not Risso, 1826).
- 1952a *Polynices* (*Neverita*) *olla* - Glibert, p. 72, pl. 5, fig. 11.
- 1952b *Polynices* (*Neverita*) *olla* - Glibert, p. 249, pl. 1, fig. 8.
- 1956 *Polynices josephinius* - Moroni, p. 106, pl. 33, fig. 14 (not Risso, 1826).
- 1957 *Polynices josephinius* - Moroni, p. 146, 150 (not Risso, 1826).
- 1957a *Polynices josephinius* - Ruggieri, p. 23, 50 (pars).
- 1957b *Natica josephinia* - Ruggieri, p. 86 (pars).
- 1960 *Polinices* (*Neverita*) *olla* - Kojumdgieva & Strachimirov, p. 121.
- 1961 *Natica josephinia* - Mazzanti, p. 80, 86 (not Risso, 1826).
- 1962 *Polynices* (*Neverita*) *josephinius* - Ruggieri, p. 27 (pars).
- 1963 *Neverita josephina* - Papani & Pelosio, p. 15, 26, pl. 2, fig. 6 (not Risso, 1826).
- 1963 *Natica josephinia* - Caretto, p. 21, pl. 1, fig. 26 (not Risso, 1826).
- 1963 *Neverita* (*s.s.*) *josephinia olla* - Glibert, p. 85.
- 1963 *Polinices* (*Neverita*) *josephinius* - Venzo & Pelosio, p. 85, pl. 34, figs. 43-45 (not Risso, 1826).
- 1964 *Polinices* (*Neverita*) *josephinia* - Compagnoni, p. 256, 260, 271, 273, 275, 276 (not Risso, 1826).
- 1964 *Neverita* (*Neverita*) *josephinia* - Moroni & Paonita, p. 39 (not Risso, 1826).
- 1967 *Neverita josephinia* - Palla, p. 961, pl. 72, fig. 3 (not Risso, 1826).
- 1969 *Polinices* (*Neverita*) *josephinia olla* - Janssen, p. 162, pl. 4, fig. 16.
- 1970 *Neverita* (*Neverita*) *josephinia* - Caprotti, p. 162, pl. 5, fig. 5 (not Risso, 1826).
- 1972 *Natica josephinia* - Caprotti, p. 127 (not Risso, 1826).
- 1974 *Neverita* (*Neverita*) *josephinia* - Caprotti, p. 23, n. 44, pl. 1, fig. 6 (not Risso, 1826).
- 1974 *Neverita josephinia* - Malatesta, p. 241, pl. 18, fig. 9 (not Risso, 1826).
- 1975 *Natica* (*Neverita*) *josephinia* - Fekih, p. 61, pl. 22, fig. 4 (not Risso, 1826).
- 1975 *Natica* (*Neverita*) *pliospirata* - Fekih, p. 61, pl. 22, fig. 8.
- 1976 *Neverita josephinia* - Caprotti, p. 9, pl. 12, fig. 5 (not Risso, 1826).
- 1976 *Neverita josephinia* - Pavia, p. 110, 112 (not Risso, 1826).
- 1979 *Neverita josephinia* - Pavia & Robba, p. 554 (not Risso, 1826).
- 1980 *Neverita josephinia* - Montefameglio et al., p. 177, 182, 189 (not Risso, 1826).
- 1981 *Neverita josephinia* - Caretto, p. 182 (not Risso, 1826).
- 1982 *Neverita josephinia* - Benigni & Corselli, p. 651, 670, 677, 681, 684, 686, 687 (not Risso, 1826).
- 1983 *Neverita josephinia* - Aimassi & Ferrero Mortara, p. 182, 185, 198 (not Risso, 1826).
- 1983 *Neverita josephinia* - Aimone & Ferrero Mortara, p. 284, 295, 303, 309, 311 (not Risso, 1826).
- 1983 *Neverita josephina* - Brambilla et al., p. 8, 18 (not Risso, 1826).
- 1984 *Neverita josephinia olla* - Janssen, p. 198, pl. 56, fig. 3.
- 1984 *Neverita josephinia* var. *subphilippiana* - Ferrero Mortara et al., p. 35.
- ? 1984 *Neverita josephinia* var. *antiqua* - Ferrero Mortara et al., p. 35.
- 1984 *Neverita josephinia* var. *clausodepressa* - Ferrero Mortara et al., p. 35.
- 1984 *Neverita josephinia* var. *clausoelata* - Ferrero Mortara et al., p. 35.
- 1984 *Neverita josephinia* var. *subfasciculata* - Ferrero Mortara et al., p. 35.
- 1984 *Neverita josephinia* var. *subdetecta* - Ferrero Mortara et al., p. 35.
- 1984 *Neverita josephinia* var. *polinicenoides* - Ferrero Mortara et al., p. 36.
- 1984 *Neverita josephinia* var. *pliospiralata* - Ferrero Mortara et al., p. 36.
- 1984 *Neverita josephinia* var. *subpliolglauca* - Ferrero Mortara et al., p. 36.
- 1984 *Neverita josephinia* - Tropeano et al., p. 58 (not Risso, 1826).
- 1986 *Neverita josephinia* - Caretto, p. 42, 48 (not Risso, 1826).
- 1987 *Neverita josephinia* - Brambilla & Lualdi, p. 243, 254, 255, 262 (not Risso, 1826).
- 1987 *Neverita josephinia* - Gonz ales Delgado, p. 92, 96, 97, 98, 99, 102, 105, 108, 110, 112, 115, 117, 118 (not Risso, 1826).
- 1987 *Neverita josephinia* - Monegatti & Raineri, p. 296 (not Risso, 1826).
- 1988 *Neverita josephinia* - Chirli, p. 18, pl. 5, fig. 1 (not Risso, 1826).
- 1989 *Neverita josephinia* - Menesini, p. 215, 216, 217, 219 (not Risso, 1826).
- 1989 *Neverita josephinia* - Pavia et al., p. 567 (not Risso, 1826).
- 1991 *Neverita josephinia* - Landini et al., p. 182 (not Risso, 1826).
- 1992 *Neverita josephinia* - Cavallo & Repetto, text-fig. 129 (not Risso, 1826).
- 1992 *Neverita josephinia* - Ferrero & Merlino, p. 111, 116, 129, 132 (not Risso, 1826).
- 1992 *Neverita josephinia* - Ragaini & Mariani, p. 8, 17 (not Risso, 1826).
- 1995 *Neverita josephinia* - Tabanelli & Segurini, p. 9 (not Risso, 1826).
- 1996 *Neverita josephinia* - Pedriali, p. 14, pl. 4, fig. 1 (not Risso, 1826).
- 1996 *Neverita josephinia* f. *clausodepressa* - Pedriali, p. 16, pl. 4, fig. 2.
- 1997 *Neverita josephinia* - Lacroce, p. 31, pl. 2, figs. 13-14 (not Risso, 1826).

- 1997 *Neverita josephinia* - Repetto, p. 60, n. 129 (not Risso, 1826).
- 1998 *Neverita josephinia* - Ferrero et al., p. 46, 48 (not Risso, 1826).
- 1998 *Neverita josephinia* - Lacroce & Repetto, p. 148 (not Risso, 1826).
- 1999 *Neverita josephinia* - Forli et al., p. 116 (not Risso, 1826).
- 2001 *Neverita josephinia* var. *plioconica* - Merlino & Campanino, p. 30.
- 2001 *Neverita josephinia* - Baroncelli et al., p. 229 (not Risso, 1826).
- 2001 *Neverita semiglobosa* - Lozouet et al., p. 44, pl. 18, fig. 8.
- 2001 *Neverita josephinia olla* - Wienrich, p. 429, pl. 69, fig. 3, pl. 87, fig. 1.
- 2003 *Neverita josephinae* (sic) - Brunetti & Della Bella, p. 15 (not Risso, 1826).
- 2003 *Neverita josephinia* - Forli et al., p. 152 (not Risso, 1826).
- 2003 *Neverita josephinia* - Mancini, p. 10 (not Risso, 1826).
- 2005 *Neverita josephinia* - Brunetti & Vecchi, p. 3 (not Risso, 1826).
- 2007 *Neverita olla* - Brunetti & Della Bella, p. 119.

Type material. Not seen. Enquiries about M. de Serres' original material into MNHN (Paris) and Université C. Bernard (Lyon) have had negative results. It could be in the University of Montpellier 2 (A. Prieur, personal communication 2007), but we failed to have any answer from the curator there.

Other type material. Holotype of *Natica (Neverita) josephinia* var. *subphilippiana* Sacco (figured herein in Pl. 2, fig. 5), MGPT BS.029.05.002, Colli Astesi. Lectotype of *Natica (Neverita) josephinia* var. *antiqua* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 55), MGPT BS.029.05.003, Cassinelle, Early Oligocene; 2 paralectotypes, MGPT BS.029.05.003/01 and BS.029.05.003/02, Dego, Early Oligocene. Lectotype of *Natica (Neverita) josephinia* var. *clausodepressa* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 57), MGPT BS.029.05.004, Sant'Agata Fossili, Tortonian; 5 paralectotypes, MGPT BS.029.05.004/01, Cassinelle, Early Oligocene; 1 paralectotype, MGPT BS.029.05.004/02, Dego, Early Oligocene; 552 paralectotypes, MGPT BS.029.05.004/03, Colli Torinesi, Miocene; 8 paralectotypes, MGPT BS.029.05.004/04, Tetti Borelli, Late Miocene; 4 paralectotypes, MGPT BS.029.05.004/05, Sant'Agata Fossili, Tortonian; 4 paralectotypes, MGPT BS.029.05.004/06, Sant'Agata Fossili, Tortonian; 18 paralectotypes, MGPT BS.029.05.004/07, Stazzano, Tortonian; 3 paralectotypes, MGPT BS.029.05.004/08, Savona Fornaci; 1 paralectotype, MGPT BS.029.05.004/09, Zinola; 4 paralectotypes, MGPT BS.029.05.004/10, Villalvernia; 4 paralectotypes, MGPT BS.029.05.004/11, Veza d'Alba; 19 paralectotypes, MGPT BS.029.05.004/12, Rocca d'Arazzo; 12 paralectotypes, MGPT BS.029.05.004/13, Colli Astesi. Lectotype of *Natica (Neverita) josephinia* var. *rotundiformis* Sacco (here designated): the shell figured by Sacco (1904, pl. 23, fig. 1), MGPT BS.029.05.004 bis, Colli Torinesi, Miocene. Holotype of *Natica (Neverita) josephinia* var. *planorbiformis* Sacco: the shell figured by Sacco (1904, pl. 23, fig. 2), MGPT BS.029.05.004 ter, Colli Torinesi, Miocene. Lectotype of *Natica (Neverita) josephinia* var. *clausoelata* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 58), MGPT BS.029.05.005, Colli Torinesi, Miocene; 7 paralectotypes, MGPT BS.029.05.005/01, Cassinelle, Early Oligocene; 1 paralectotype, MGPT BS.029.05.005/02, Dego, Early Oligocene; 25 paralectotypes, MGPT BS.029.05.005/03, Colli Torinesi, Miocene; 35 paralectotypes, MGPT BS.029.05.005/04, Colli Torinesi, Miocene; 2 paralectotypes, MGPT BS.029.05.005/05, Sant'Agata Fossili, Tortonian; 1 paralectotype, MGPT BS.029.05.005/06, Stazzano, Tortonian; 2 paralectotypes, MGPT BS.029.05.005/07, Stazzano, Tortonian; 4 paralectotypes, MGPT BS.029.05.005/08, Rocca d'Arazzo; 4 paralectotypes, MGPT BS.029.05.005/09, Colli Astesi. Lectotype of *Natica (Neverita) josephinia* var. *subfasciculata* Sacco

(1904, pl. 23, fig. 3), MGPT BS.029.05.006, Stazzano, Tortonian; 1 paralectotype, MGPT BS.029.05.006/01, Stazzano, Tortonian. Lectotype of *Natica (Neverita) josephinia* var. *subdetecta* Sacco (here designated): the shell figured by Sacco (1904, pl. 23, fig. 4), MGPT BS.029.05.007, Colli Torinesi, Miocene; 3 paralectotypes, MGPT BS.029.05.007/01, Colli Torinesi, Miocene. Lectotype of *Natica (Neverita) josephinia* var. *poliniceoides* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 59), MGPT BS.029.05.008, Stazzano, Tortonian; 1 paralectotype, MGPT BS.029.05.008/01, Colli Torinesi, Miocene; 1 paralectotype, MGPT BS.029.05.008/02, Rio di Bocca d'Asino, Tortonian. Holotype of *Natica (Neverita) josephinia* var. *plioconica* Sacco (figured herein in Pl. 2, fig. 8), MGPT BS.029.05.008 bis, Rocca d'Arazzo. Lectotype of *Natica (Neverita) josephinia* var. *pliospiralata* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 60), MGPT BS.029.05.009, Colli Astesi; 13 paralectotypes, MGPT BS.029.05.009/01, Rocca d'Arazzo. Lectotype of *Natica (Neverita) josephinia* var. *subpliolglaucina* Sacco (here designated): the shell figured by Sacco (1904, pl. 23, fig. 5), MGPT BS.029.05.010, Colli Astesi.

Material referred to as *Natica (Neverita) josephinia* (Risso, 1826) in MGPT. Colli Astesi: 1 spm. figured by Sacco (1891, pl. 2, fig. 54), MGPT BS.029.05.001, 8 spms., MGPT BS.029.05.001/15, 26 spms., MGPT BS.029.05.001/16; Villa Forzano, Langhian: 6 spms., MGPT BS.029.05.001/01; Superga, Early Miocene: 9 spms., MGPT BS.029.05.001/02; Colli Torinesi, Miocene: 2 spms., MGPT BS.029.05.001/03, 2 spms., MGPT BS.029.05.001/04; Stazzano, Tortonian: 13 spms., MGPT BS.029.05.001/05; unknown locality: 2 spms., MGPT BS.029.05.001/06; Fossano (Eremo): 15 spms., MGPT BS.029.05.001/07; Fossano (T. Vegli): 2 spms., MGPT BS.029.05.001/08; Villalvernia: 2 spms., MGPT BS.029.05.001/09, 1 spm., MGPT BS.029.05.001/10; Masserano: 1 spm., MGPT BS.029.05.001/11; Verduno: 2 spms., MGPT BS.029.05.001/12; Veza d'Alba: 2 spms., MGPT BS.029.05.001/13; Rocca d'Arazzo: 18 spms., MGPT BS.029.05.001/14; unknown localities: 4 spms., MGPT BS.029.05.001/17, 4 spms., MGPT BS.029.05.001/18, 9 spms., MGPT BS.029.05.001/19.

Material referred to as *Natica (Neverita) josephinia* subvar. *rosea* Sacco, 1891 in MGPT. Colli Astesi: 2 spms., MGPT BS.029.05.001/20.

Material referred to as *Natica (Neverita) josephinia* subvar. *subcinerea* Sacco, 1891 in MGPT. Colli Astesi: 3 spms., MGPT BS.029.05.001/21.

Material referred to as *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *cinerea* Sacco, 1891 in MGPT. Colli Astesi: 2 spms., MGPT BS.029.05.004/14.

Material referred to as *Natica (Neverita) josephinia* var. *clausodepressa* subvar. *rosacea* Sacco, 1891 in MGPT. Colli Astesi: 1 spm., MGPT BS.029.05.004/16; Stazzano, Tortonian: 1 spm., MGPT BS.029.05.004/15.

Material from the collecting localities. Volpedo: 1 spm., NP 9782; Rio Torsero: 1 spm., NP 9778, 1 spm., MPUM 9785; Badagnano: 11 spms., NP 9762; Balzo del Musico: 115 spms., NP 9772; Diolo: 2 spms., NP 9768; La Valle: 2 spms., NP 9769; Montemaggiore: 4 spms., NP 9773, 3 spms., MPUM 9786; Montezago: 22 spms., NP 9774, 28 spms., MPUM 9787; Pradalbino I: 32 spms., NP 9775; Pradalbino II: 5 spms., NP 9776; Rio Rosello: 30 spms., NP 9777, 2 spms., MPUM 9788; San Lorenzo in Collina: 44 spms., NP 9779, 19 spms., MPUM 9789; Balze di Caspreno: 2 spms., NP 9763, 3 spms., MPUM 9790; Barca: 6 spms., NP 9780, 16 spms., MPUM 9791; Bibbiano: 26 spms., NP 9764, 34 spms., MPUM 9792; Calanchi di San Martino: 48 spms., NP 9765, 16 spms., MPUM 9793, 18 spms., MPUM 9794, 5 spms., MGGC 23421, 5 spms., MGC 1375, 5 spms., MZB 31668, 5 spms., GF 1170; Ciuciano: 22 spms., NP 9767, 1 spm., MPUM 9795; Guistrigona: 47 spms., MPUM 9796; Il Campino: 25 spms., NP 9781, 2 spms., MPUM 9797; Linari: 53 spms., NP 9770, 67 spms., MPUM 9798, 1 spm., MPUM 9799, 1 spm., MPUM 9800, 1 spm., MPUM 9801; Marcialla: 8 spms., MPUM 9802; Montaiione: 30 spms., NP

9771; Ponte a Elsa: 18 spms., MPUM 9803; Spicchio: 33 spms., NP 9766.

Other material examined. Belveglio: 23 spms., MZB 41839; Buttigliera d'Asti: 21 spms., MZB 41482, 1 spm., MZB 15710; Castello di Annone: 9 spms., MZB 42063, 1 spm., MZB 42040; Cava Caudana: 7 spms., MZB 42014, 1 spm., MZB 41909; Cervere: 18 spms., MZB 40432, 16 spms., MZB 42026; Cherasco: 12 spms., MZB 29106, 1 spm., MZB 45044; La Loggia: 2 spms., MZB 41951, 5 spms., MZB 43885; Pino d'Asti: 1 spm., MZB 41931; Poggio Forche: 1 spm., MZB 29144; Rio di Bocca d'Asino, Tortonian: 3 spms., MZB 25928, 3 spms., MZB 25973, 2 spms., MZB 25982, 13 spms., MZB 45438; Roboaro, Alessandria: 1 spm., MZB 29763; Sant'Agata Fossili, Tortonian: 5 spms., MZB 25942; Santo Stefano Roero: 6 spms., MZB 15630, 14 spms., MZB unnumbered; Schierano: 1 spm., MZB 42087; Serralunga, Asti: 2 spms., MZB 30029; Stazzano, Tortonian: 9 spms., MZB 29755; Tetti Borelli, Late Miocene: 1 spm., MZB 15615, 2 spms., private collection; Tetti Civera: 2 spms., MZB 15815; Valle Ceppi, Burdigalian: 2 spms., MZB 28555, 7 spms., MZB 28556, 2 spms., MZB 45341; Valle Vergnana: 4 spms., MZB 43270; Villalvernia: 15 spms., MZB 29728, 1 spm., MZB 40384, 2 spms., MZB 45378, 3 spms., private collection; Bussana Vecchia: 3 spms., private collection; Rio Torsero: 1 spm., MZB 15626, 2 spms., MZB 41833; Arda: 1 spm., MZB 003673; Badagnano: 5 spms., MZB 000043, 1 spm., MZB 004653; Balzo del Musico: 1 spm., GF 1156; Buco del Diavolo: 2 spms., PPMM 54020; Castell'Arquato: 1 spm., MZB 15621; Diolo: 1 spm., PPMM 54015; La Valle: 3 spms., MZB 15653; Marano sul Panaro: 6 spms., private collection; Montegibbio, Tortonian: 1 spm., MZB 005047, 25 spms., MZB 25951, 22 spms., private collection; Montefalcone: 2 spms., MZB 44492; Pradalbino: 8 spms., MZB 000746, 1 spm., MZB 15634; Rio Rosello: 2 spms., MZB 30214; San Lorenzo in Collina: 1 spm., GF 1157; Barca: 2 spms., PPMM 54016; Bibbiano: 19 spms., MZB 008454, 3 spms., MZB 010234, 2 spms., MZB 15619, 8 spms., MZB 15640, 6 spms., PPMM 54017, 1 spm., private collection; Caligonzi: 1 spm., MZB 44037; Ceda: 82 spms., PPMM 54019; Colle Val d'Elsa: 59 spms., private collection; Farfalle: 1 spm., MZB 15627; Guistrigona: 8 spms., MZB 15633, 11 spms., MZB 40410; Linari: 151 spms., PPMM 54018; Pietrafitta: 19 spms., MZB 008454; Spicchio: 29 spms., MZB 010352; Cannes, France: 7 spms., MNHN J08926 (Cossmann collection n° 244'a); Cacela, Huelva, Spain: 11 spms., NP 9786; Bonares, Huelva, Spain: 159 spms., NP 9784; Lucena del Puerto, Huelva, Spain: 27 spms., NP 9785; Santa Catalina, Huelva, Spain: 13 spms., NP 9783.

Description. Protoconch small, turbiniform, markedly depressed, of 2.45-2.60 slightly convex, smooth whorls, tip small. Teleoconch depressed-globose to globose-pyriform, rather thick. Spire broadly conical, low to moderately elevated, whorls very slightly convex. Suture fine, almost flush.

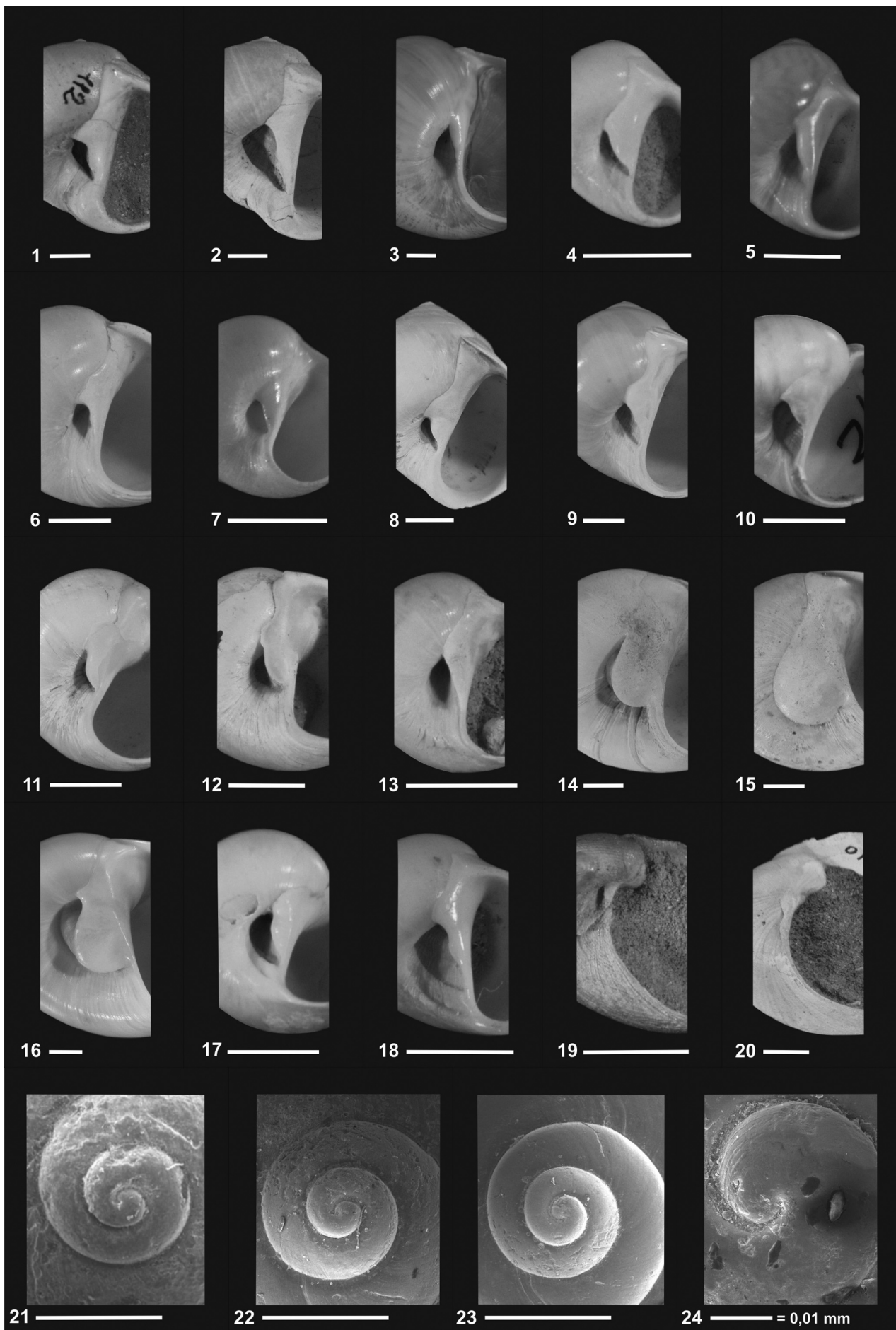
Last whorl expanded, more or less depressed; subsutural shelf indistinct in depressed-globose shells, faintly concave and rather steep in more elevated (globose-pyriform) shells; periphery nearly at midline. Aperture ovately D-shaped in markedly prosocline plane, height about 1.5 times width. Parietal callus thick, widely expanded into posterior apertural angle, entering adapical part of umbilicus in most specimens; anterior lobe small to indistinct. Umbilicus a semicircular groove of variable breadth, or an abapical chink, or completely filled by umbilical callus in some specimens; umbilical border rounded; umbilical wall rather steep. Funicle a thick, prominent cord separated from umbilical wall by very narrow, incised spiral groove. Umbilical

callus massive, semicircular, divided from parietal callus by slight notch. Basal fasciole indistinct. Surface with uneven growth lines broadly arched subsuturally. Some fossil shells retain vestige of uniform pale brown background, with suprasutural darker stripe.

PLATE 3

- Fig. 1 - *Euspira bononiensis* (Foresti, 1884). Pradalbino I. MPUM 9737; umbilicus.
- Fig. 2 - *Euspira bononiensis* (Foresti, 1884). Lugagnano. MGC 1363; umbilicus.
- Fig. 3 - *Euspira catena* (da Costa, 1778). Granville, France. MPUM 9782; umbilicus of specimen in Pl. 1, fig. 4.
- Fig. 4 - *Euspira exturbinoidea* (Sacco, 1890). Pradalbino II. MPUM 9742; umbilicus.
- Fig. 5 - *Euspira macilenta* (Philippi, 1844). Circeo. MPUM 9817; umbilicus.
- Fig. 6 - *Euspira grossularia* (Marche-Marchad, 1957). Orciano Pisano. MPUM 9749; umbilicus.
- Fig. 7 - *Euspira guillemini* (Payraudeau, 1826). Bibbiano. MPUM 9755; umbilicus.
- Fig. 8 - *Euspira helicina helicina* (Brocchi, 1814). Bacedasco. MGC 1369; umbilicus.
- Fig. 9 - *Euspira helicina fusca* (Blainville, 1825). Pecoraro. MPUM 9820; umbilicus.
- Fig. 10 - *Euspira magenesi* Pedriali & Robba, 2001. Rio Rosello. NP 9709; umbilicus.
- Fig. 11 - *Euspira notabilis* (Jeffreys, 1885). Pradalbino II. MPUM 9772; umbilicus.
- Fig. 12 - *Euspira notabilis* (Jeffreys, 1885). Pradalbino II. MPUM 9773; umbilicus.
- Fig. 13 - *Euspira pulchella* (Risso, 1826). Pradalbino II. MPUM 9779; umbilicus.
- Fig. 14 - *Neverita olla* (de Serres, 1829). Linari. MPUM 9800; umbilicus.
- Fig. 15 - *Neverita olla* (de Serres, 1829). Linari. MPUM 9801; umbilicus.
- Fig. 16 - *Neverita josephina* (Risso, 1826). Feniglia, Orbetello. MPUM 9823; umbilicus.
- Fig. 17 - *Payraudeautia fasciolata* (Sacco, 1890). Orciano Pisano. Private collection; umbilicus.
- Fig. 18 - *Payraudeautia intricata* (Donovan, 1803). Bibbiano. MPUM 9807; umbilicus.
- Fig. 19 - *Sinum perregulare* (Sacco, 1891). Pradalbino I. Private collection; umbilicus of specimen in Pl. 2, fig. 17.
- Fig. 20 - *Sinum striatum* (de Serres, 1829). Ciuciano. MPUM 9813; umbilicus.
- Fig. 21 - *Euspira bononiensis* (Foresti, 1884). Barca. MPUM 9738; protoconch.
- Fig. 22 - *Euspira bononiensis* (Foresti, 1884). Diolo. MGC 1362; protoconch.
- Fig. 23 - *Euspira catena* (da Costa, 1778). Marseille, France. MPUM 9816; protoconch.
- Fig. 24 - *Euspira exturbinoidea* (Sacco, 1890). Ciuciano. MPUM 9745; detail of protoconch.

Unless otherwise indicated in the plate, scale bars = 4 mm.



Dimensions (mm):

DHW	PD	H	D	SH
0.090-0.110	0.713-0.845	8.328-32.352	10.643-38.719	1.294-7.862
0.100	0.779	20.340	24.681	4.578
AH	AW	WUC	IS	SA
6.028-25.532	4.709-18.957	4.410-10.498	9°-25°	118°-146°
15.780	11.833	7.454	17°	132°

Remarks. The validity of *Nerita glaucina* Linnaeus, 1758 was considered above (see p. 404). Subsequent to its introduction, Linnaeus' name *glaucina* was variously interpreted by earlier authors, thus generating considerable confusion. Most workers used it with reference to the Mediterranean species *Neverita josephinia* Risso, 1826 (often confused with *Natica olla* de Serres, 1829). Other authors applied the name *glaucina* to shells actually belonging to the fossil species *Natica olla* (Brocchi 1814; Sasso 1827; Philippi 1836; Sismonda 1847). Pennant (1777) and Philippi (1852) treated under *N. glaucina* specimens referable to *Natica pulchella* Risso, 1826, whereas it is unclear what Risso (1826, p. 147) meant when recording *Natica glaucina* because of the short uninformative description. Finally, Lamarck (1838), in describing his *Natica glaucina* (of 1822), reported that it has the umbilical callus divided by a groove ("callo subdiviso"), a character peculiar to the Recent Indo-West Pacific *Albula didyma* Röding, 1798. This situation provides further ground for Kabat's (1990) conclusion about *glaucina* reported on above.

Neverita olla exhibits moderate variability as regards the elevation of the spire and the extent of the massive umbilical callus; the latter may either completely fill the umbilicus or leave a peripheral groove of variable breadth, separating it from the umbilical border. *N. olla* appears to be scarcely distinguishable from the Recent Mediterranean species *Neverita josephinia* Risso, 1826 if the teleoconch characters are considered. This is the reason why the Neogene fossils were assigned to the latter species by most authors (see the above synonymy) who regarded *N. olla* as a junior synonym of *N. josephinia*. Only a few workers considered *N. olla* as distinct (e.g., Cossmann & Peyrot 1919; Glibert 1952 a, b; Kojumdgieva & Strachimirov 1960), or as a subspecies of *N. josephinia* (e.g., Glibert 1963; Janssen 1969; Wienrich 2001). Actually, de Serres' taxon can be differentiated from *N. josephinia* primarily because of its larval shell having 1 more whorl and a significantly smaller diameter of the first half-whorl (Tabs. 1, 3). Moreover, *N. olla* differs from *N. josephinia* in shell proportions (Glibert 1952 b; Fig. 6 herein) and has a significantly wider umbilical callus (Fig. 10). On the basis of our findings, the Neogene fossils invariably belong to *Neverita olla*, whereas the Pleistocene and Recent specimens belong to *Neverita josephinia*.

Neverita semiglobosa (Grateloup, 1847) was based on Early Miocene specimens from Aquitaine

characterised by their more elevated and less expanded shell with the umbilicus completely filled by the umbilical callus. We have examined a lot of shells (3 in MPUM numbered 9828) from Saucats that agree with Grateloup's species, and can state that their teleoconchs fall within the range of variation of *Neverita olla*. Moreover, the larval shell of *N. semiglobosa* is indistinguishable from that of *N. olla* (whorls = 2.55, d = 0.101, D = 0.806 in *N. semiglobosa*; whorls = 2.51, d = 0.100, D = 0.779 in *N. olla*). We conclude that *N. semiglobosa* is a junior synonym of *Neverita olla*.

Concerning Sacco's varieties of *Natica* (*Neverita*) *josephinia* (see the above synonymy), we have examined the respective original material in MGPT and can state that they cannot be distinguished from *Neverita olla* consistently. We are uncertain as regards the variety *antiqua* since Sacco's Oligocene material is poorly preserved. The original specimens of the varieties *subtecta* and *priscodepressa* are missing from MGPT and we include these subspecific taxa in the synonymy of *Neverita olla* only doubtfully.

Stratigraphic occurrence. *Neverita olla* (de Serres, 1829) is a long-ranging species. It appeared in the Early Oligocene of Piedmont and spread throughout Europe during Miocene times. Reliable Pliocene records are from Piedmont, Liguria, Emilia, Tuscany, Sicily and Spain. Subsequent to the Pliocene, *N. olla* was replaced by the closely related *Neverita josephinia* Risso, 1826.

Genus *Payraudeautia* Bucquoy, Dautzenberg
& Dollfus, 1883

Payraudeautia was originally proposed as a subgenus of *Natica* Adanson, 1757 (= *Natica* Scopoli, 1777). The type species is *Natica intricata* Donovan, 1803 by original designation. Kabat (1991) considered *Payraudeautia* to be a junior subjective synonym of *Natica* Scopoli, 1777. However, Kabat's conclusion is untenable since the type species of *Payraudeautia* possesses a corneous operculum denoting a poliniceine instead of naticine allocation of the genus. *Payraudeautia* is a distinctive taxon characterized by its open umbilicus with an inner spiral ridge abapical to the funicle. Besides the two species dealt with below (*fasciolata* Sacco, 1890 and *intricata* Donovan, 1803), it includes only the Recent *Payraudeautia esterias* Bernard, 1983 (collected off Gabon) and appears to be restricted to the Mediterranean and the eastern Atlantic.

***Payraudeautia fasciolata* (Sacco, 1890) stat. n.**

Pl. 2, figs 11, 12; Pl. 3, fig. 17; Pl. 4, figs 19, 20

1890 *Natica* (*Payraudeautia*) *intricata* var. *fasciolata* Sacco, p. 33.

1891 *Natica (Payraudeautia) intricata* var. *fasciolata* - Sacco, p. 80, pl. 2, fig. 52.

1984 *Payraudeautia intricata* var. *fasciolata* - Ferrero Mortara et al., p. 35.

1996 *Payraudeautia intricata* - Pedriali, p. 14 (pars), pl. 4, figs. 5, 6 (not Donovan, 1803).

Uncertain references

Natica fasciolata - Sismonda, 1842: p. 27; - Sismonda, 1847: p. 51; - d'Orbigny, 1852: p. 38, n. 577.

Type material. Lectotype of *Natica (Payraudeautia) intricata* var. *fasciolata* Sacco (here designated): the shell figured by Sacco (1891, pl. 2, fig. 52) and refigured herein (Pl. 2, fig. 11), MGPT BS.029.03.002, Castelnuovo d'Asti; 1 paralectotype, MGPT BS.029.03.002/01, Albenza; 1 paralectotype, MGPT BS.029.03.002/02, Colli Astesi.

Material from the collecting localities. Rio Torsero: 2 spms., NP 9789, 1 spm., MPUM 9804; Diolo: 1 spm., MGC 1376; Ciuciano: 1 spm., NP 9788.

Other material examined. Diolo: 1 spm., private collection; Montegibbio, Tortonian: 1 spm., private collection; San Lorenzo in Collina: 1 spm., GF 1160; Bibbiano: 1 spm., private collection; Orciano Pisano: 1 spm., private collection.

Description. Protoconch medium-sized, turbinate with nearly flat spire, of 2.60-2.65 convex, smooth whorls, tip very small. Teleoconch globose, moderately depressed, rather solid. Spire low-conical, moderately depressed, whorls gently convex. Suture fine, adpressed. Last whorl inflated, somewhat depressed, expanded toward aperture; subsutural shelf poorly differentiated, gently sloping, very slightly concave and with faint subsutural margining; periphery well above midline. Aperture ovately D-shaped in slightly prosocline plane, height about 1.8 times width. Parietal callus narrow, thickened adapically, with concave abapertural outline; anterior lobe thick and roundly pointed, touching the basal fasciole in most specimens. Umbilicus deep, very large; umbilical border rounded, subangular abapically; umbilical wall concave, with prominent, nearly flat-topped spiral ridge that overhangs the interior of umbilicus and terminates in a subtriangular, asymmetric plug on lowermost part of inner lip. Funicle broad and rather depressed, separated from inner spiral ridge by wide groove whose abaxial side ascends to form a sharp angle with top of ridge.

Umbilical callus rather thick, subtriangular, demarcated from anterior lobe of parietal callus by distinct transverse groove. Basal fasciole poorly differentiated, rather broad and blunt. Surface with very fine growth lines slightly arched subsuturally. Color not preserved.

Dimensions (mm):

DHW	PD	H	D	SH
0.090-0.102	0.955-1.135	2.384-12.020	2,127-12.015	0.590-1.914
0.096	1.045	7.202	7.071	1.252
AH	AW	UW	IS	SA
1.848-10.008	1.361-5.615	0.811-4.847	11°-21°	109°-135°
5.928	3.488	2.829	16°	122°

Remarks. *Natica fasciolata* was created by Bonelli (1826) and simply listed (n. 3482) in the manuscript catalogue of the Zoological Museum of Turin. The name *fasciolata* was merely cited later on by Sismonda (1842, 1847) and d'Orbigny (1852). Sacco (1890) first published a concise diagnosis of *N. fasciolata*, thus making the name available, and is to be considered the author of this species. Sacco (1890, 1891) regarded *N. fasciolata* as a variety of *Payraudeautia intricata* (Donovan, 1803), distinguished from the latter in having "testa plerumque minor, depressior, subalbida; spira depressior". Actually, *N. fasciolata* is morphologically similar to *P. intricata*, but differs from it in that it has: 1) a protoconch with one more whorl and with the diameter of the unsculptured first half-whorl a third of the size, 2) a significantly lower spire (Fig. 9), 3) a less deeply excavated umbilical wall, 4) the inner umbilical ridge with sharply angular inner edge, 5) a broader funicle, 6) an umbilical callus demarcated from the parietal callus by a distinct transverse groove, and 7) a broader basal fasciole. We think that these differences are adequate to warrant specific separation from *P. intricata*.

Stratigraphic occurrence. *Payraudeautia fasciolata* (Sacco, 1890) occurs in Tortonian deposits of Emilia and was reported to be a quite uncommon element in Pliocene deposits of Piedmont and Liguria. We collected it at Pliocene locations in Liguria, Emilia and Tuscany. The species appears to range from Tortonian to early Piacenzian.

Payraudeautia intricata (Donovan, 1803)

Pl. 2, figs 13, 14; Pl. 3, fig. 18; Pl. 4, fig. 21

1803 *Nerita intricata* Donovan, pl. 167 (short description in the explanation to the plate).

1884 *Payraudeautia similis* Monterosato, p. 107.

1980 *Payraudeautia intricata* - Piani, p. 143.

1986 *Payraudeautia intricata* - Villa, p. 16.

1995 *Payraudeautia intricata* - Bodon et al., p. 32.

1996 *Payraudeautia intricata* - Pedriali, p. 14 (pars); not pl. 4, figs. 5-6 (= *Natica (Payraudeautia) intricata* var. *fasciolata* Sacco, 1890).

1997 *Payraudeautia intricata* - Giannuzzi-Savelli et al., figs. 805-808, 828.

1997 *Payraudeautia intricata* - Lacroce, p. 32, pl. 2, fig. 12.

1999 *Payraudeautia intricata* - Forli et al., p. 116.

2000 *Payraudeautia intricata* - Lacroce, p. 33.

2005 *Payraudeautia intricata* - Repetto et al., text-fig. 473.

2008 *Payraudeautia intricata* - Huelsken et al., p. 32, text-fig. 10A.

Uncertain references

Natica intricata - Philippi, 1844: p.140, 141; - Appellius, 1871: p. 88, 94; - Seguenza, 1876: p. 10, n. 486; - Seguenza, 1880: p. 264, n. 251; p. 354, n. 117; - Almera & Bofill, 1898: p. 51; - Tamajo, 1937: p. 462.

Natica marochiensis - Sismonda, 1842: p. 27.

Natica valenciennesi - Sismonda, 1847: p. 51.

Natica valenciennesii - Philippi, 1836: p. 162, 163; Scacchi, 1836: p. 16; - Bronn, 1848: p. 788.

Natica (Payraudeautia) intricata - Simonelli, 1893: p. 555.

Natica (Payraudeautia) intricata var. *miocenica* - Fekih, 1975: p. 61, pl. 22, fig. 10.

Payraudeautia intricata - Cerulli-Irelli, 1898: p. 89; - Ugolini, 1898: p. 4; - Ugolini, 1899: p. 5; Malatesta, 1943: p. 181; - Glibert, 1963: p. 105; Ruggieri & Greco, 1965: p. 53, pl. 6, fig. 13; Ruggieri et al., 1968: p. 2; - Greco, 1970: p. 288; - Ruggieri & Milone, 1975: p. 220; - Pavia & Robba, 1979: p. 554; - Ragaini & Mariani, 1992: p. 8; - Tabanelli & Segurini, 1995: p. 9; - Dell'Angelo & Forli, 1995: p. 242, n. 87, text-fig. 22; - Buzzurro & Greppi, 1996: p. 6 - Öztürk et al., 2004: p. 56.

Polymices intricata - Mars, 1956: p. 40.

Polymices intricatus - Francaviglia, 1941: p. 67.

Type material. Not seen. Location unknown.

Other type material. Holotype of *Payraudeautia similis* Monterosato, MCZR, L18/23337, Sfax, Tunisia.

Material erroneously referred to as *Natica (Naticina) pulchella* var. *astensis* Sacco, 1890 in MGPT. Colli Astesi: 1 syntype, MGPT BS.029.02.034/01.

Material from the collecting localities. Le Grottine: 2 spms., NP 9792; Bibbiano: 34 spms., NP 9790, 2 spms., MPUM 9805, 1 spm., MPUM 9806, 1 spm., MPUM 9807, 1 spm., MPUM 9808, 1 spm., MGGC 23422, 1 spm., MGC 1377, 1 spm., MZB 31670, 1 spm., GF 1171; Fauglia, Pleistocene: 12 spms., NP 9791; Montenero: 30 spms., NP 9793, 1 spm., MPUM 9830.

Other material examined. Badagnano: 3 spms., PPMM 54026; Bibbiano: 1 spm., PPMM 54021, 3 spms., PPMM 54024, 2 spms., private collection; Montenero: 1 spm., MZB 40540; Orciano Pisano: 1 spm., private collection; Archi, Pleistocene: 5 spms., MZB 005250, 85 spms., private collection; Pecoraro, Pleistocene: 1 spm., private collection; Bovetto, Pleistocene: 2 spms., private collection; Torrente Boscaino, Pleistocene: 4 spms., private collection; Manilva, Malaga, Spain, Recent: 27 spms., private collection, 1 spm., MPUM 9810; Mergellina, Naples, Recent: 3 spms., MZB 15740; Punta Pioppeto, Procida, Recent: 1 spm., NP 9794, 1 spm., MPUM 9809, 185 spms., private collection; Aeroporto, Reggio Calabria, Recent: 1 spm., private collection; Torre San Giovanni, Gallipoli, Recent: 2 spms., MZB 006704; Porto Cesareo, Lecce, Recent: 3 spms., private collection; Stagnone di Marsala, Trapani, Recent: 1 spm., MZB 15713; Cala Madonna, Lampedusa Isle, Recent: 2 spms., PCM 1019; Cala Francese, Lampedusa Isle, Recent: 1 spm., PCM 1107; Bounuma, Tunisia, Recent: 1 spm., MZB 001817; Djerba Island, Tunisia, Recent: 1 spm., MZB 000255, 2 spms., MZB 000341, 11 spms., MZB 002909, 1 spm., MZB 000256, 2 spms., MZB 000289, 2 spms., MZB 000319, 1 spm., MZB 000471, 1 spm., MZB 002848; Kerkennah Islands, Tunisia, Recent: 3 spms., MZB 001855, 1 spm., MZB 001918, 8 spms., MZB 001988, 49 spms., MZB 15850.

Description. Protoconch small, turbiniform, of 1.50-1.70 rather convex whorls, tip medium-sized with closely set spiral threads. Teleoconch globose, moderately depressed, solid. Spire low-conical, moderately depressed, whorls gently convex to convex. Suture fine, adpressed to almost flush. Last whorl inflated, somewhat depressed, expanded toward aperture; subsutural shelf poorly differentiated, more or less sloping; periphery above midline. Aperture D-shaped in slightly prosocline plane, peristome rather thick, height about twice width. Parietal callus narrow, thick, with concave abapertural outline; anterior lobe somewhat tongue-shaped, ending close to or at the level of basal fasciole in smaller shells, obtusely angular and shorter in fully grown specimens. Umbilicus deep, very large; umbilical border rounded; umbilical wall markedly excavated, bearing a prominent, narrowly round-topped spiral

ridge prostrate toward interior of umbilicus and terminating in a semielliptical, asymmetric plug on lowermost part of inner lip. Funicle moderately narrow, rather depressed, separated from inner spiral ridge by broad, shallow groove with strongly overhanging abaxial side. Umbilical callus rather thick, with reverse S-shaped outline, merging into anterior lobe of parietal callus. Basal fasciole rather narrow, barely prominent, mostly indicated by the coarsening of growth lines and color. Surface with very fine growth lines faintly arched subsuturally. Color more or less pale gray or buff background with whitish mottles and with reddish-brown pattern of irregular chevron or flammulate markings arranged into 4-5 spiral rows, the subsutural one wider; apical whorls violet-gray; parietal callus, basal fasciole and inner umbilical ridge of uniform reddish-brown color in most specimens. None of the examined fossil shells retains the color.

Dimensions (mm):

DHW	PD	H	D	SH
0.298-0.342	0.796-0.932	6.703-11.855	6.017-11.585	1.414-3.138
0.320	0.864	9.279	8.801	2.276
AH	AW	UW	IS	SA
4.801-9.329	2.729-5.997	2.223-4.875	11°-23°	98°-130°
7.065	4.363	3.549	17°	114°

Remarks. The variety *miocenica* Sacco, 1890 of the present species was already discussed (see remarks on *Euspira bononiensis*). *Natica crassatella* Locard, 1886, *Payraudeautia alleryana* Sullioti, 1889 and *Payraudeautia peloritana* Sullioti, 1889 are currently regarded as synonyms of *Payraudeautia intricata*.

Stratigraphic occurrence. *Payraudeautia intricata* (Donovan, 1803) is known definitely from the Late Miocene (Tortonian) of Piedmont. We record it from Pliocene deposits at a few localities in Piedmont, Emilia, Tuscany and Latium. Pleistocene occurrences are from Tuscany and Calabria. The species occurs nowadays throughout the Mediterranean, being more common in the western part of it.

Subfamily Sininae Woodring, 1928

Genus *Sinum* Röding, 1798

The type species is the Recent, Indo-Pacific species *Helix haliotoidea* Linnaeus, 1758 by subsequent designation (Dall 1915, p. 109). Kabat (1990) provided a short history of the genus, thoroughly discussed the status of *H. haliotoidea*, and designated the lectotype of Linnaeus' species. According to Kabat (1991), *Sigaretus* Lamarck, 1799, *Sigaretarius* Duméril, 1806, *Cryptostomus* Blainville, 1818, *Catinus* Blainville, 1827, *Catinus* Oken, 1835, *Catinus* H. & A. Adams, 1853 and *Ectosinum* Iredale, 1931 are synonyms of *Sinum*; *Raynevallia* Ponzi, 1872 is to be considered "equivalent" to *Sinum*.

Sinum is a distinctive genus, characterized by 1) a depressed-turbiniform to planorbid protoconch of from less than 2 up to 3 whorls, with faint spiral striation; 2) its more or less flattened, auriculate teleoconch; 3) its low to very depressed spire; 4) its broad, strongly prosocline aperture with a markedly arched inner lip; 5) its umbilicus closed or reduced to a small chink; 6) its outer surface spirally sculptured in most species, or smooth in a few species.

***Sinum perregulare* (Sacco, 1891) stat. n.**

Pl. 2, figs 15-17; Pl. 3, fig. 19; Pl. 4, figs 22, 23

1890 *Sigaretus (Cryptostoma) striatum* subvar. *perregularis* Sacco, p. 39 (*nomen nudum*).

1891 *Sigaretus (Cryptostoma) striatum* var. *perregularis* Sacco, p. 103.

1904 *Sinum (Cryptostoma) striatum* var. *perregularis* - Sacco, p. 104, pl. 23, fig. 8.

1984 *Cryptostoma striatum* var. *perregularis* - Ferrero Mortara et al., p. 39.

Uncertain references

Sigaretus concavus - Cocconi, 1873, n. 1: p. 528.

Type material. Holotype of *Sigaretus (Cryptostoma) striatum* var. *perregularis* Sacco: the shell figured by Sacco (1904, pl. 23, fig. 8) and refigured herein (Pl. 2, fig. 15), MGPT BS.029.09.003, Colli Astesi.

Material from the collecting localities. Badagnano: 1 spm., NP 9827, 1 spm., MPUM 9811.

Other material examined. Badagnano: 1 spm., MZB 15721; Pradalbino I: 2 spms., private collection; Ciuciano: 1 spm., private collection; Guidonia: 1 spm., private collection.

Description. Protoconch medium-sized, low-turbiniform, of 2.25-2.50 rather convex whorls, last half whorl with fine, even spiral threads, tip small, apparently smooth. Teleoconch depressed-auriculate, rather thin.

Spire broadly dome-shaped, depressed, whorls gently convex. Suture shallowly channelled. Last whorl lenticular, moderately depressed, expanded toward aperture; subsutural shelf indistinct; periphery rounded, slightly above midline. Aperture large, broadly oval, rather strongly prosocline, wider than tall. Parietal callus rather thin, reflected toward umbilical area, narrowing abapically and merging into inner lip. Umbilicus a deep, small chink. Funicle absent. Umbilical callus absent. Basal fasciole indistinct. Surface sculptured with rather even, spiral ribbons and intervening threads, the latter missing from the peripheral area; base with fine spiral cordlets; dense growth lines occur throughout. None of the examined fossil shells retains the color.

Dimensions (mm):

DHW	PD	H	D	SH
0.178-0.194	1.323-1.371	4.679-9.499	8.174-15.502	0.718-1.410
0.186	1.347	7.089	11.838	1.064
AH	AW	IS	SA	
3.965-8.061	5.233-11.009	47°-55°	142°-154°	
6.013	8.121	51°	148°	

Remarks. Cocconi (1873) cited *Sigaretus concavus* Lamarck, 1843 from Pliocene deposits of Emilia. Lamarck's species, living off western Africa, is relatively similar to *Sinum perregulare* and it is not unlikely that Cocconi actually recovered *S. perregulare*. However, since the author did not publish neither a description or a figure, we refrain from any conclusion and consider that of Cocconi to be an uncertain reference.

Sinum perregulare differs from the similar species *Sinum striatum* (de Serres, 1829) in that it has: 1) the shell smaller in most specimens, with adapical side distinctly more convex, 2) the protoconch more than twice the size of that of *S. striatum*, with the last half whorl spirally sculptured, 3) the presence of a small, deep umbilical opening (absent in *S. striatum*), 4) the absence of an unsculptured subsutural band, 5) more even sculpture of alternating spiral bands and threads, and 6) the presence of finer spirals on the lower base. The larger protoconch is the most useful distinguishing character. *Sinum patulum* (Grateloup, 1847), occurring in Miocene deposits of western and northern Europe and usually quoted as *Sinum aquense* (Récluz, 1851), has a similarly shaped, adapically convex shell. We examined several specimens of *S. patulum* from the Aquitanian of Saucats (2 specimens in MPUM numbered 9829) and noted that this species differs from *S. perregulare* primarily because of its larval shell having a significantly smaller diameter and diameter of the first half-whorl, its more prominent spire, and the absence of an umbilical opening.

An unidentified *Sinum* species recovered from off northwestern Africa appears to be closely similar to *Sinum perregulare* in shell shape, but differs from the latter in having a significantly larger protoconch (also spirally sculptured) and more widely spaced primary spirals with 2-5 fine threads in between.

Stratigraphic occurrence. *Sinum perregulare* (Sacco, 1891) was hitherto quoted only by its author from Pliocene sandy deposits of Piedmont. We recovered it from Pliocene units at a few localities in Emilia, Tuscany and Latium. The species appears to be an uncommon element, with a Late Zanclean-Early Piacenzian time range.

***Sinum striatum* (de Serres, 1829)**

Pl. 2, figs 18-20; Pl. 3, fig. 20; Pl. 4, fig. 24

1829 *Sigaretus striatus* de Serres, p. 127, pl. 3, figs. 13, 14.

1890 *Sigaretus (Cryptostoma) striatum* - Sacco, p. 39.

1890 *Sigaretus (Cryptostoma) striatum* subvar. *plioidepressa* Sacco, p. 39 (*nomen nudum*).

1890 *Sigaretus (Cryptostoma) striatum* subvar. *ornatissima* Sacco, p. 39 (*nomen nudum*).

1890 *Sigaretus (Cryptostoma) striatum* var. *striolatissima* Sacco, p. 39.

- 1890 *Sigaretus (Cryptostoma) striatum* var. *circumdepressa* Sacco, p. 39.
- 1890 *Sigaretus (Cryptostoma) striatum* var. *perelliptica* Sacco, p. 39.
- 1891 *Sigaretus (Cryptostoma) striatum* - Sacco, p. 102, pl. 1, fig. 71.
- 1891 *Sigaretus (Cryptostoma) striatum* var. *pliodepressa* Sacco, p. 103.
- 1891 *Sigaretus (Cryptostoma) striatum* var. *ornatissima* Sacco, p. 103.
- 1891 *Sigaretus (Cryptostoma) striatum* var. *striolatissima* - Sacco, p. 104, pl. 1, fig. 72.
- 1891 *Sigaretus (Cryptostoma) striatum* var. *circumdepressa* - Sacco, p. 104, pl. 1, fig. 73.
- 1891 *Sigaretus (Cryptostoma) striatum* var. *perelliptica* - Sacco, p. 104, pl. 1, fig. 74.
- 1904 *Sinum (Cryptostoma) striatum* var. *pliodepressa* - Sacco, p. 104, pl. 23, fig. 9.
- 1904 *Sinum (Cryptostoma) striatum* var. *ornatissima* - Sacco, p. 104, pl. 23, fig. 10.
- 1919 *Sigaretus striatus* - Cossmann & Peyrot, 1919: p. 440, n. 257, pl. 12, figs. 43-44, 51.
- 1952b *Sigaretus (Sigaretus) striatus* - Glibert: p. 261, pl. 3, fig. 1.
- 1960 *Sinum (Sinum) striatum* - Kojumdgieva & Strakimirov: p. 122, pl. 33, fig. 15.
- 1970 *Sinum (Sinum) striatum* - Caprotti, p. 163, pl. 5, fig. 6.
- 1974 *Sinum (Sinum) haliotoideum* - Malatesta, p. 242, pl. 19, fig. 2 (not Linnaeus, 1758).
- 1976 *Sinum striatum* - Caprotti: p. 9, pl. 12, fig. 6.
- 1984 *Cryptostoma striatum* - Ferrero Mortara et al., p. 39.
- 1984 *Cryptostoma striatum* var. *pliodepressa* - Ferrero Mortara et al., p. 39.
- 1984 *Cryptostoma striatum* var. *ornatissima* - Ferrero Mortara et al., p. 39.
- 1984 *Cryptostoma striatum* var. *striolatissima* - Ferrero Mortara et al., p. 39.
- 1984 *Cryptostoma striatum* var. *circumdepressa* - Ferrero Mortara et al., p. 39.
- 1984 *Cryptostoma striatum* var. *perelliptica* - Ferrero Mortara et al., p. 39.
- 1988 *Sinum haliotoideum* - Chirli, p. 18, pl. 5, fig. 2 (not Linnaeus, 1758).
- 1992 *Sinum striatum* - Cavallo & Repetto, text-fig. 130.
- 1996 *Sinum haliotoideum* - Pedriali, p. 16, pl. 4, fig. 7 (not Linnaeus, 1758).
- 1997 *Sinum haliotoideum* - Lacroce, p. 32, pl. 2, figs. 15-16 (not Linnaeus, 1758).

Uncertain references

- Cryptostoma striatum* - Arduini, 1895: p. 185; - Zuffardi Comerci, 1929: p. 3.
- Sigaretus haliotides* - Sismonda, 1847: p. 51; - Foresti, 1868: p. 74, n. 174; - Foresti, 1874: p. 81; - Coppi, 1881b: p. 62, n. 539; - Verri, 1886: p. 446.
- Sigaretus haliotides* - Pantanelli, 1876: p. 6.
- Sigaretus haliotides* - Fucini, 1891: p. 70.
- Sigaretus striatus* - Appellius, 1871: p. 117; - Cocconi, 1873: p. 527; - De Stefani, 1874: p. 64, n. 193; - De Stefani & Pantanelli, 1879: p. 139; - Fontannes, 1880: p. 118; - De Stefani, 1888: p. 221; - Busacchi, 1896: p. 322; - Almera & Bofill, 1898: p. 52; - Cossmann & Peyrot, 1919: p. 440, n. 257, pl. 12, figs. 43-44, 51; - Mazzanti, 1961: p. 81.
- Sigaretus striatus* var. *circumdepressa* - Fekih, 1975: p. 62, pl. 22, fig. 9.
- Sigaretus (Sigaretus) striatus* - Glibert, 1952a: p. 79.
- Sinum haliotoideum* - Ruggieri, 1982: p. 259; - Barbarino & Scarselli, 1992: p. 412.

- Sinum striatum* - Mancini, 1997: p. 41, 42, 43; - Repetto, 1997: p. 60, n. 130; - Brunetti & Della Bella, 2003: p. 15; - Forli et al., 2003: p. 152.

- Sinum (Sinum) haliotoideum* - Pavia, 1976: p. 112; - Montefameglio et al., 1980: p. 189; - Aimassi et al., 1983: p. 186; - Aimone & Ferrero Mortara, 1983: p. 295; - Tropeano et al., 1984: p. 58; - Gonzales Delgado, 1987: p. 92, 100.

- Sinus haliotides* - Sismonda, 1842: p. 28.

- Sinum (Sinum) striatum* - Moroni & Paonita, 1964: p. 39; - Kojumdgieva & Strakimirov, 1960: p. 122, pl. 33, fig. 15; - Benigni & Corselli, 1982: p. 651, 677.

- Sinum (s.s.) striatum* - Glibert, 1963: p. 97.

Type material. Not seen. Enquiries about M. de Serres' original material into MNHN (Paris) and Université C. Bernard (Lyon) have had negative results. It could be in the University of Montpellier 2 (A. Prieur, personal communication 2007), but we failed to have any answer from the curator there.

Other type material. Holotype of *Sigaretus (Cryptostoma) striatum* var. *pliodepressa* Sacco: the shell figured by Sacco (1904, pl. 23, fig. 9), MGPT BS.029.09.004, Colli Astesi. Lectotype of *Sigaretus (Cryptostoma) striatum* var. *ornatissima* Sacco (here designated): the shell figured by Sacco (1904, pl. 23, fig. 10) and refigured herein (Pl. 2, fig. 19), MGPT BS.029.09.005, Colli Astesi; 2 paralectotypes, MGPT BS.029.09.005/01, Rocca d'Arazzo. Holotype of *Sigaretus (Cryptostoma) striatum* var. *striolatissima* Sacco: the shell figured by Sacco (1891, pl. 1, fig. 72) and refigured herein (Pl. 2, fig. 20), MGPT BS.029.09.006, Colli Astesi. Holotype of *Sigaretus (Cryptostoma) striatum* var. *circumdepressa* Sacco: the shell figured by Sacco (1891, pl. 1, fig. 73), MGPT BS.029.09.007, Colli Astesi. Lectotype of *Sigaretus (Cryptostoma) striatum* var. *perelliptica* Sacco (here designated): the shell figured by Sacco (1891, pl. 1, fig. 74), MGPT BS.029.09.008, Colli Astesi; 2 paralectotypes, MGPT BS.029.09.008/01, unlocalised.

Material referred to as *Sigaretus (Cryptostoma) striatus* de Serres, 1829 in MGPT. Colli Astesi: 1 spm. figured by Sacco (1891, pl. 1, fig. 71), MGPT BS.029.09.002; Rocca d'Arazzo: 5 spms., MGPT BS.029.09.002/01; unknown locality: 1 spm., MGPT BS.029.09.002/02.

Material from the collecting localities. Diolo: 1 spm., NP 9799; Pradalbino I: 2 spms., NP 9802; Rio Rosello: 1 spm., NP 9803; Barca: 1 spm., MZB 31671; Bibbiano: 1 spm., NP 9795, 1 spm., MPUM 9812; Calanchi di San Martino: 4 spms., NP 9796, 1 spm., MGGC 23423, 1 spm., MGC 1378, 1 spm., GF 1172; Ciuciano: 2 spms., NP 9798, 1 spm., MPUM 9813; Il Campino: 1 spm., NP 9804; Il Treppié: 1 spm., NP 9808; Linari: 1 spm., NP 9800; Marcialla: 3 spms., NP 9801; Ponte a Elsa: 1 spm., NP 9826; Spicchio: 3 spms., NP 9797, 1 spm., MPUM 9814, 1 spm., MPUM 9815.

Other material examined. Buttigliera d'Asti: 1 spm., MZB 41600; Cervere: 1 spm., MZB 40483; Montaldo Roero: 1 spm., MZB 43882; Santo Stefano Roero: 3 spms., MZB 15656; Villalvernia: 1 spm., MZB 25117; Badagnano: 4 spms., MZB 000045, 5 spms., MZB 15721, 6 spms., PPMM 54023; Balzo del Musico: 1 spm., GF 1161; Rio Rosello: 10 spms., PPMM 54022; Bibbiano: 2 spms., MZB 010235, 3 spms., MZB 41631, 1 spm., MZB 45245, 1 spm., PPMM 54021; Ciuciano: 1 spm., MZB 45246; Spicchio: 1 spm., MZB 010353; Sallespisse, France, Middle Miocene: 2 spms., MNHN J08928 (Cossmann collection n° 12039a); Ciurana, Spain: 2 spms., MNHN J08927 (Cossmann collection n° 12039b); Bonares, Huelva, Spain: 1 spm., NP 9806; Lucena del Puerto, Huelva, Spain: 1 spm., NP 9807; Santa Catalina, Huelva, Spain: 1 spm., NP 9805.

Description. Protoconch small, depressed-turbiniform, whorls 2.60, earlier ones slightly convex, the last flattened and quickly expanding, smooth except for small tip having spiral rows of uneven, elongated microscopic granules. Teleoconch auriculate, markedly de-

pressed (flattened), rather thin. Spire broadly dome-shaped, very low, whorls faintly convex. Suture fine, adpressed, changing into shallowly channeled during growth. Last whorl lenticular, markedly depressed, quickly expanding toward aperture; subsutural shelf indistinct; periphery narrowly rounded nearly at midline. Aperture large, subcircular, strongly prosocline, distinctly wider than high. Parietal callus rather thin, extended to cover the small, shallow umbilical area, narrowing abapically and merging into inner lip. Umbilicus absent (or a chink hindered by parietal callus). Funicle absent. Umbilical callus absent.

Basal fasciole indistinct. Surface sculptured with uneven spiral bands, most of them bearing 1-2 spiral grooves, intervening furrows also uneven, very shallow and flat-bottomed; the spirals are finer over the periphery and are missing from a moderately wide subsutural band and from the mid-lower base; coarse growth markings occur throughout. None of the examined fossil shells retains the color.

Dimensions (mm):

DHW	PD	H	D	SH
0.106*	0.582*	5.205-18.685	10.611-34.599	0.240-3.072
* 1 protoconch measurable		11.945	22.605	1.656
AH	AW	IS	SA	
4.481-16.097	7.394-24.918	11°-27°	131°-155°	
10.289	16.156	19°	143°	

Remarks. As regards Sacco's varieties of *Sigaretus* (*Cryptostoma*) *striatum* cited in the above synonymy, we examined the original material in MGPT and can state that they do not differ enough from *Sinum striatum* to warrant separation even at the subspecific level. Nothing can be said about the subvar. *rufa* (*nomen nudum*) of *S. striatum*, which was just listed by Sacco (1890, p. 39) since the name *rufa* was mentioned later on neither by Sacco (1891, 1904) nor by Ferrero Mortara et al. (1984) and there are no specimens with that name in MGPT.

The Recent, Indo-Pacific species *Sinum haliotoideum* (Linnaeus, 1758), type species of *Sinum* Röding, 1798, somewhat resembles the present species, but has a larger, planorbid protoconch of less than 2 whorls and a more flattened teleoconch sculptured with closely spaced, rather even spiral bands devoid of longitudinal furrows. The Mediterranean and West African species *Sinum bifasciatum* (Récluz, 1851) has a larger, 3-whorled protoconch with a rapidly expanding last whorl, a more depressed teleoconch and is sculptured with low, more numerous spirals separated by shallow, narrow grooves.

Stratigraphic occurrence. *Sinum striatum* (de Serres, 1829) occurs in Middle Miocene to Pliocene deposits of Europe. We collected it at several Pliocene

localities of Piedmont, Emilia and Tuscany. The species seems to have become extinct toward the end of the Pliocene.

Problematic species and erroneous assignments

Natica minima Sismonda. The simple citation of *Natica minima* Sismonda (without date), made by Coppi (1869) and Crespellani (1875) with reference to Late Miocene and Pliocene deposits of Emilia, is likely due to a mistake since there is no trace of this name in both editions (1842, 1847) of Sismonda's "Synopsis methodica". The name *N. minima* Sismonda, never cited since, is to be considered a *nomen dubium*. The same specific name was validly used by Lea (1833) for his new eastern American species *Natica minima*, so if *N. minima* Sismonda existed, it would be a junior homonym.

Nerita fulminea. La Via (1833) listed *Nerita fulminea* (without authorship and date) among the species occurring in Pliocene deposits near Caltanissetta (Sicily). In the absence of any description and figure, it is difficult to infer what La Via meant when listing this name. His material cannot belong to *Natica fulminea* (Gmelin, 1791), which is a Recent West African species never recorded from the Mediterranean Basin. According to Seguenza (1880), citations of *N. fulminea* could refer to *Natica flammulata* Réquien, 1848; that of Seguenza seems to be the unique citation of this species as a fossil (Pliocene of Gallina, Sicily). *N. flammulata* is presently regarded as a synonym of *Tectonatica filosa* (Philippi, 1845), which ranges in the Mediterranean and West African waters as far south as Angola.

Natica cirriformis J. Sowerby, 1825. This is a distinctive species, characterised by its channeled suture and its extremely broad and deep umbilicus. It was introduced by Sowerby on the basis of specimens from the British Crag, and was later reported to occur uncommonly in Neogene units of the North Sea Basin. Modern workers assign *N. cirriformis* to the genus *Euspira* Agassiz in J. Sowerby, 1837. The unique Italian citation of *N. cirriformis* is that by Seguenza (1876, p. 10, n. 482) from Pliocene deposits of Altavilla (Sicily). Seguenza simply listed *N. cirriformis* and placed in its synonymy his *Natica canaliculata*, a manuscript, hence unavailable name. Seguenza's collection was largely destroyed during the Messina earthquake of 1908, but part of it is stored in the Museo di Storia Naturale, Sezione di Geologia e Paleontologia dell'Università, Firenze. Since there is no trace in this institution of either *N. cirriformis* or *N. canaliculata* (cf. Bertolaso & Palazzi 2000), it is impossible to state what Seguenza meant when citing *N. cirriformis*. Consequently, the presence of *N. cirriformis* in the Italian Pliocene appears to be very doubtful.

Natica proxima Wood, 1848. This species, originally based on material from the British Crag, occurs uncommonly in the Pliocene of the North Sea Basin. As regards Italy, *Natica proxima* was quoted only by Seguenza (1876, p. 10, n. 483) from Pliocene deposits near Altavilla (Sicily). Seguenza just listed *N. proxima* and remarked that the Sicilian specimens are smaller than those of the Crag. It is worth noting that Sacco (1891, p. 71) was inclined to consider *N. proxima* as a synonym of *Natica catena* var. *helicina* (Brocchi, 1814) and that Marquet (1997) placed *N. proxima* in the synonymy of *Euspira helicina hemiclausa* (Sowerby, 1825). However, Seguenza's material being lost, we have no means of ascertaining which form this author actually dealt with.

Natica sordida Swainson, 1821. Philippi (1844, p. 139, pl. 24, fig. 15) briefly described and figured a species erroneously referred to as "*Natica sordida* Swains."; shortly after in the same work (p. 141), Philippi listed *N. sordida* among the fossil naticids and reported it to occur at several localities in Sicily and Calabria. From Philippi's text and figure, it appears that the specimens dealt with by him are quite unlike *N. sordida* Swainson, which actually is an Australian species currently assigned to the subgenus *Conuber* Finlay & Marwick, 1937 of *Polinices* Montfort, 1810. A few years later, Philippi (1852) included his previous citation of *N. sordida* (1844) in the synonymy of the newly proposed species *Natica brocchiana*. *N. sordida* (intended in the sense of Philippi 1844) was later recorded by several workers, who incorrectly attributed its authorship to Philippi (cf. Jeffreys 1867, 1885; Monterosato 1872; Reynell 1910). Seguenza (1880) and most subsequent authors concur in considering both *N. sordida* sensu Philippi and *N. brocchiana* as synonyms of *Natica fusca* Blainville, 1825. The latter taxon is regarded herein as a subspecies of *Nerita helicina* Brocchi, 1814 (see p. 398); it replaces the Neogene nominal subspecies at the very beginning of the Pleistocene (see p. 399). It is difficult to ascertain which taxon actually occurs at the localities mentioned by Philippi since sequences of Plio-Pleistocene age crop out there and Philippi did not provide detailed information about the horizons that yielded the specimens identified as *N. sordida*. However, considering that at most of these localities, together with *N. sordida*, the Pleistocene to Recent species *Arctica islandica* (Linnaeus, 1767) also was quoted by Philippi, *Euspira helicina fusca* likely is the taxon mistaken for *N. sordida*. Should a Pliocene age be correct for the other sites, *Euspira helicina helicina* would be the proper substitute for *N. sordida*.

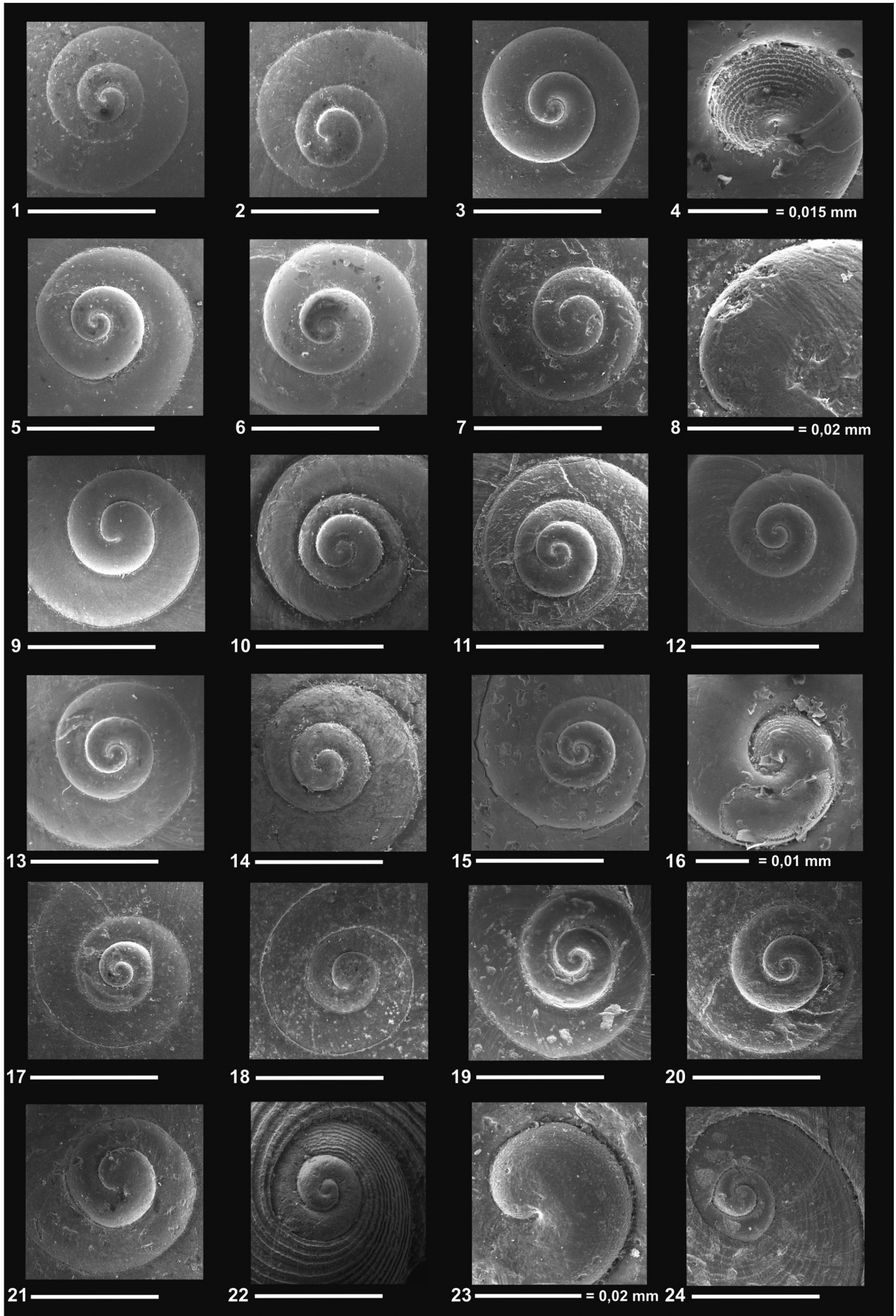
Sigaretus canaliculatus J. Sowerby, 1823. This species was cited by Calcara (1841, 1845) from Pliocene deposits of Altavilla near Palermo. It is quite unlikely that the Sicilian material could be Sowerby's species,

which is a synonym of the Eocene species *Sinum clathratum* (Gmelin, 1791) occurring in the North Sea Basin (Wrigley 1949). Taking into account that the Neogene species *Sigaretus aquensis* Récluz, 1851 (= *Sigaretus patulus* Grateloup, 1847) has often been mistaken for

PLATE 4

- Fig. 1 - *Euspira exturbinoidea* (Sacco, 1890). Ciuciano. MPUM 9745; protoconch of specimen in Pl. 3, fig. 24.
- Fig. 2 - *Euspira macilenta* (Philippi, 1844). Porcaro. MPUM 9818; protoconch.
- Fig. 3 - *Euspira grossularia* (Marche-Marchad, 1957). Rio Torsero. MPUM 9746; protoconch.
- Fig. 4 - *Euspira grossularia* (Marche-Marchad, 1957). Rio Torsero. MPUM 9747; detail of protoconch.
- Fig. 5 - *Euspira grossularia* (Marche-Marchad, 1957). Pecoraro. MPUM 9751; protoconch.
- Fig. 6 - *Euspira grossularia* (Marche-Marchad, 1957). Morocco. MPUM 9753; protoconch.
- Fig. 7 - *Euspira guillemini* (Payraudeau, 1826). Bibbiano. MPUM 9756; protoconch.
- Fig. 8 - *Euspira guillemini* (Payraudeau, 1826). Bibbiano. MPUM 9756; detail of protoconch of specimen in Fig. 7.
- Fig. 9 - *Euspira guillemini* (Payraudeau, 1826). Bovetto. MPUM 9759; protoconch.
- Fig. 10 - *Euspira helicina helicina* (Brocchi, 1814). Orciano Pisano. MPUM 9768; protoconch.
- Fig. 11 - *Euspira helicina fusca* (Blainville, 1825). Pecoraro. MPUM 9821; protoconch.
- Fig. 12 - *Euspira notabilis* (Jeffreys, 1885). Pradalbino II. MPUM 9774; protoconch.
- Fig. 13 - *Euspira notabilis* (Jeffreys, 1885). Orciano Pisano. MPUM 9775; protoconch.
- Fig. 14 - *Euspira notabilis* (Jeffreys, 1885). Dakhla, West Sahara. MPUM 9777; protoconch.
- Fig. 15 - *Euspira pulchella* (Risso, 1826). Ciuciano. MPUM 9781; protoconch.
- Fig. 16 - *Euspira pulchella* (Risso, 1826). Ciuciano. MPUM 9781; detail of protoconch of specimen in Fig. 15.
- Fig. 17 - *Neverita olla* (de Serres, 1829). Rio Torsero. MPUM 9785; protoconch.
- Fig. 18 - *Neverita josephina* (Risso, 1826). Porcaro. MPUM 9824; protoconch.
- Fig. 19 - *Payraudeantia fasciolata* (Sacco, 1890). Castelnuovo d'Asti. MGPT BS.029.03.002; protoconch of lectotype in Pl. 2, fig. 11.
- Fig. 20 - *Payraudeantia fasciolata* (Sacco, 1890). Diolo. MGC 1376; protoconch.
- Fig. 21 - *Payraudeantia intricata* (Donovan, 1803). Bibbiano. MPUM 9808; protoconch.
- Fig. 22 - *Sinum perregulare* (Sacco, 1891). Pradalbino I. Private collection; protoconch of specimen in Pl. 2, fig. 17.
- Fig. 23 - *Sinum perregulare* (Sacco, 1891). Badagnano. MPUM 9811; detail of protoconch.
- Fig. 24 - *Sinum striatum* (de Serres, 1829). Spicchio. MPUM 9814; protoconch.

Unless otherwise indicated in the plate, scale bars = 4 mm.



S. canaliculatus, and that *Sinum patulum* closely resembles *Sinum perregulare* (Sacco, 1891), we assume that *S. perregulare* is the species dealt with by Calcara. However, since Calcara provided neither a description nor a figure of *S. canaliculatus*, nothing can be stated definitely in this respect.

Sigaretus subhaliotideus d'Orbigny, 1847. This species was cited by Seguenza (1876) from Pliocene deposits of Altavilla. Seguenza synonymized *S. subhaliotideus* with *Sigaretus canaliculatus* cited by Calcara (1841, 1845) and with *Sigaretus haliotideus* cited by Sismonda (1842). From a review of the literature, it appears that *S. subhaliotideus* falls in the synonymy of *Sigaretus striatus* de Serres, 1829 as does Sismonda's citation of *S. haliotideus* (Sacco 1891; Cossmann & Peyrot 1919; Glibert 1952b). Taking into account also the remarks on Calcara's citation of *S. canaliculatus* (see above), *S. subhaliotideus* cited by Seguenza could be either *Sinum perregulare* (Sacco, 1891) or *Sinum striatum* (de Serres, 1829). Since Seguenza neither described nor figured *S. subhaliotideus* and related material is lost at present, the actual identification of specimens referred to as *S. subhaliotideus* by Seguenza is unknown.

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REFERENCES

- Aimassi G. & Ferrero Mortara E. (1983) - Osservazioni paleoecologiche e biostratigrafiche su una malacofauna pliocenica dell'Astigiano (Buttigliera d'Asti). *Boll. Malac.*, 19: 177-206, Milano.
- Aimone S. & Ferrero Mortara E. (1983) - Malacofaune plioceniche di Cossato e Candelo (Biellese, Italia NW). *Boll. Mus. Reg. Sci. Nat. Torino*, 1: 279-328, Torino.
- Almera J. & Bofill A. (1898) - Moluscos fósiles recogidos en los terrenos pliocenos de Cataluña. *Bol. Comis. Mapa Geol. Espana*, 4 (1897): 1-223, Madrid.
- Anfossi G., Brambilla G. & Mosna S. (1982) - La fauna del Pliocene di Taino (Varese). *Atti Ist. Geol. Univ. Pavia*, 30: 83-102, Pavia.
- Antonelli G. (1890) - Il Pliocene nei dintorni di Osimo e i suoi fossili caratteristici. *Boll. Soc. Geol. Ital.*, 9: 89-110, Roma.
- Appelius F. L. (1871) - Catalogo delle conchiglie fossili del Livornese desunto dalle collezioni e manoscritti del defunto G. B. Caterini. *Bull. Malac. Ital.*, anno 3 (1870). Reprint of 123 pp., Pisa.
- Arduini V. (1895) - Conchiglie plioceniche del bacino di Albenga. *Atti Soc. Ligust. Sci. Nat. e Geogr.*, 6: 159-209, Genova.
- Arnaud P. M. (1978) - Révision des taxa malacologiques Méditerranéens introduits par Antoine Risso. *Ann. Mus. Hist. Nat. Nice*, 5 (1977): 101-150, Nice.
- Baldi T. (1960) - Tortonische Molluskenfauna von "Badener Tagelfazies" aus Szokolya, Nordungarn. *Ann. Hist. Nat. Musei Nation. Hungar.*, 52: 51-95, Budapest.
- Barbarino P. & Scarselli S. (1992) - Osservazioni paleoecologiche su una malacofauna del Pliocene inferiore di Asti. *Boll. Mus. Reg. Sci. Nat. Torino*, 10: 407-420, Torino.

- Baroncelli M. A., Gallo L. M. & Repetto G. (2001) - Prima segnalazione di *Retusa minutissima* (Monterosato, 1878, H. Martin ms.) nel Pliocene italiano. *Boll. Malac.*, 37: 229-230, Roma.
- Barsotti G., Federici P. R., Giannelli L., Mazzanti R. & Salvatorini G. (1974) - Studio del Quaternario livornese, con particolare riferimento alla stratigrafia ed alle faune delle formazioni del Bacino di carenaggio della Torre del Fanale. *Mem. Soc. Geol. Ital.*, 13: 425-495, Roma.
- Basso D. & Brusoni F. (2004) - The molluscan assemblage of a transitional environment: the Mediterranean *maërl* from off the Elba Island (Tuscan Arcipelago, Tyrrhenian Sea). *Boll. Malac.*, 40: 37-45, Napoli.
- Bellini R. (1904) - L'Elveziano nelle colline di Chivasso presso Torino. *Boll. Soc. Geol. It.*, 23: 371-378, Roma.
- Benigni C. & Corselli C. (1982) - Paleocomunità a Molluschi bentonici del Pliocene di Volpedo (Alessandria). *Riv. It. Paleont. Strat.*, 87 (1981): 637-702, Milano.
- Bernasconi M. P. (1989) - Studi paleoecologici sul Pliocene ligure. V. Il Pliocene di Savona. *Boll. Mus. Reg. Sci. Nat. Torino*, 7: 49-116, Torino.
- Bernasconi M. P. & Robba E. (1994) - Notes on some Pliocene gastropods from Rio Torsero, western Liguria, Italy. *Riv. It. Paleont. Strat.*, 100: 71-102, Milano.
- Bertolaso L. & Palazzi S. (2000) - Note sulla raccolta Seguenza di molluschi plio-pleistocenici della Provincia di Messina conservata presso il Museo di Geologia e Paleontologia dell'Università di Firenze. *Boll. Malac.*, 38 (1999): 3-44, Roma.
- Bevilacqua A. (1928) - Studi sulla fauna fossile marina pliocenica e quaternaria dell'isola di Rodi (Egeo). *Atti Soc. It. Sci. Nat. Mus. Civ. St. Nat. Milano*, 67: 150-178, Milano.
- Bodon M., Favilli L., Giannuzzi Savelli R., Giovine F., Giusti F., Manganelli G., Melone G., Oliverio M., Sabelli B. & Spada G. (1995) - Gastropoda Prosobranchia, Heterobranchia Heterostropha. In: Minelli A., Ruffo S. & La Posta S. (Eds) - Checklist delle specie della fauna italiana. Fasc. 14. V. of 60 pp., Calderini, Bologna.
- Bogi C. & Cauli L. (1998) - La Malacofauna circalitorale del Pliocene Medio di Casa Pagliana (Fauglia, Pisa). *Boll. Malac.*, 33 (1997): 127-134, Roma.
- Bogi C., Cauli L., Pagli L. & Pagli F. (2002) - Le Architectonicidae Gray J. E., 1840 del Pliocene Toscano. *Boll. Malac.*, 38: 31-40, Roma.
- Bondi F. & Sandrucci L. (1949) - Su alcuni Molluschi pliocenici della Val d'Era (Toscana) e su alcune anomalie di sviluppo. *Atti Soc. Tosc. Sci. Nat.*, Mem., ser. A, 56: 1-17, Pisa.
- Bonelli A. (1826) - Catalogo manoscritto del Museo Zoologico di Torino (unpublished).
- Bonfiglio L. (1972) - Il Tirreniano di Bovetto e Ravagnese presso Reggio Calabria. *Quaternaria*, 14: 137-147, Roma.
- Bongiorni D. (1963) - Geologia del settore Bolognese. In Lucchetti L., Albertelli L., Mazzei R., Thieme R., Bongiorni D. & Dondi L. (Eds) - Contributo alle conoscenze geologiche del Pedepennino padano. *Boll. Soc. Geol. Ital.*, 81: 80-112, Roma.
- Bongo F. (1914) - I fossili tortoniani del Rio di Bocca d'Asino presso Stazzano (Serravalle Scrivia). *Boll. Soc. Geol. Ital.*, 33: 395-484, Roma.
- Bouchet P. & Waren A. (1993) - Revision of the Northeast Atlantic bathyal and abyssal Mesogastropoda. *Boll. Malac.*, Suppl. 3: 579-840, Milano.
- Bourcart J., Aubert de la Rüe E. & de Chételat L. (1923) - Le gisement de Pliocène marin du lac de Scutari d'Albanie. *Bull. Soc. Géol. Fr.*, 23(1923-1924): 271-274, Paris.
- Brambilla G. (1976) - I molluschi pliocenici di Villalvernia (Alessandria). I. Lamellibranchi. *Mem. Soc. It. Sci. Nat., Mus. Civico St. nat. Milano*, 21: 82-128, Milano.
- Brambilla G., Cantaluppi G. & Lualdi A. (1983) - Panorama generale del Pliocene nel Bergamasco. *Riv. Mus. Sci. Nat. Bergamo*, 6: 3-25, Bergamo.
- Brambilla G. & Lualdi A. (1987) - Il Pliocene della Provincia di Bergamo (Italia settentrionale). Analisi faunistica ed inquadramento cronologico e paleoambientale. *Boll. Soc. Paleont. Ital.*, 25 (1986): 237-266, Modena.
- Brambilla G. & Lualdi A. (1988) - Il Pliocene della Valle Olona (Varese, Italia NW) nelle collezioni Sordelli 1874-79, Parona 1883 e Nangeroni 1928. *Atti Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*, 129: 5-32, Milano.
- Brocchi G. (1814) - Conchiologia fossile subappennina. V. of 472 pp., Stamperia Reale, Milano.
- Bronn H. G. (1848) - Index Palaeontologicus, oder Übersicht der bis jetzt bekannten fossilen Organismen. V. 2, pp. 778-1379, E. Schweizerbart'sche, Stuttgart.
- Brugnone G. A. (1880) - Le conchiglie plioceniche delle vicinanze di Caltanissetta. *Bull. Soc. Malac. Ital.*, 6: 85-157, Pisa.
- Brunetti M. M. (2002) - A new species of *Coralliophila* H. & A. Adams, 1853 from the Tuscany Pliocene. *La Conchiglia*, 304: 46-49, Roma.
- Brunetti M. M. & Della Bella G. (2003) - Two new Bivalves from the Italian Pliocene. *La Conchiglia*, 306: 15-19, Roma.
- Brunetti M. M. & Della Bella G. (2007) - *Leufroyia ferrierii*: una nuova specie per il Pliocene toscano (Gastropoda: Conidae). *Boll. Malac.*, 42 (2006): 118-120, Napoli.
- Brunetti M. M. & Soccio S. (2007) - Il genere *Papuliscala* (de Boury, 1911) nel Pliocene emiliano con descrizione di una nuova specie. *Boll. Malac.*, 42 (2006): 106-111, Napoli.
- Brunetti M. M. & Vecchi G. (2005) - Nuove specie di Gastropodi del Piacenziano di rio Creviale, Castell'Arquato (Piacenza, Italia). *Boll. Malac.*, 41: 1-22, Napoli.
- Brunetti M. M., Forli M. & Vecchi G. (2008) - Una nuova specie di *Gibbula* (*Forskalea*) per il Pleistocene italiano (Gastropoda: Trochidae). *Boll. Malac.*, 44: 5-9, Napoli.
- Buccheri G., Di Stefano E. & Greco A. (1987) - Paleocomunità a molluschi bentonici nel Pliocene superiore-Pleistocene inferiore di Agrigento (Sicilia sud occidentale). *Boll. Acc. Gioenia Sci. Nat.*, 20: 219-264, Catania.
- Bucquoy E., Dautzenberg P. & Dollfus G. (1882-1886) - Les Mollusques marins du Roussillon. Tome 1. Gastérop-

- podes. V. of 570 pp. (1883: pp. 85-196), Baillièrè & Fils., Paris.
- Busacchi A. (1896) - Molluschi pliocenici del Balzo del Musico (comune di Monte San Pietro) nel Bolognese. *Riv. It. Paleont.*, anno 2: 320-323, Milano.
- Buzzurro G. & Greppi E. (1996) - I Molluschi lessepsiani di Tasucu (Turchia Meridionale). *La Conchiglia*, 279, Suppl.: 3-22, Roma.
- Calcara P. (1841) - Memoria sopra alcune conchiglie fossili rinvenute nella contrada d'Altavilla. V. of 88 pp., Antonio Muratori, Palermo.
- Calcara P. (1845) - Cenno sui Molluschi viventi e fossili della Sicilia da servire di supplimento ed insieme di critiche osservazioni all'opera di R.A. Philippi. V. of 68 pp., Reale Stamperia e Libreria, Palermo.
- Caprotti E. (1970) - Mesogastropoda dello stratotipo Piacenziano (Castell'Arquato, Piacenza). *Natura, Soc. Ital. Sci. Nat., Museo Civ. St. Nat. e Acquario Civ., Milano*, 61: 121-187, Milano.
- Caprotti E. (1972) - Le connessioni paleogeografiche delle malacofaune neogeniche mediterranee. *Conchiglie*, 8: 127-132, Milano.
- Caprotti E. (1974) - Molluschi del Tabianiano (Pliocene inferiore) della Val d'Arda. Loro connessioni temporali e spaziali. *Conchiglie*, 10: 1-47, Milano.
- Caprotti E. (1976) - Malacofauna dello stratotipo piacentino (Pliocene di Castell'Arquato). *Conchiglie*, 12: 1-56, Milano.
- Caretto P.G. (1963) - Nuovi dati sull'estensione della formazione a facies piacentiana a Ovest della città di Asti. *Atti Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*, 102: 5-35, Milano.
- Caretto P.G. (1981) - Notizie preliminari su paleofaune a Molluschi della località "Becchi" di Castelnuovo Don Bosco, Asti (Pliocene medio-superiore). *Natura, Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Acquario Civ., Milano*, 72: 175-184, Milano.
- Caretto P.G. (1986) - Indicazioni su variazioni paleoclimatiche nel Pliocene piemontese. *Atti Soc. Ital. Sci. Nat. Museo Civ. St. Nat. Milano*, 127: 33-64, Milano.
- Caretto P. G. (1989) - Paleoclimatic variations in the Pliocene of Piedmont. *Atti Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*, 130: 161-176, Milano.
- Cauli L. & Ragaini L. (1991) - Studio di una Malacofauna Pliocenica raccolta in loc. Valle S. Giovanni - Suese (Comune di Collesalveti - Li). Nota preliminare. *Atti Soc. Toscana Sci. Nat.*, 98: 281-286, Pisa.
- Cavara F. (1886a) - Sulla flora fossile di Mongardino, studi stratigrafici e paleontologici. *Mem. R. Acc. Sci. Ist. Bologna*, 7: 5-56, Bologna.
- Cavara F. (1886b) - Le sabbie marnose plioceniche di Mongardino e i loro fossili. *Boll. Soc. Geol. Ital.*, 5: 265-277, Roma.
- Cavallo O. & Repetto G. (1992) - Conchiglie fossili del Roero, Atlante Iconografico. *Ass. Natur. Piemont., Amici Mus. "F. Eusebio" Alba*, Mem. 2: 1-251, Alba.
- Ceregato A., Rinaldi E. & Tabanelli C. (2002) - Conferma della presenza di *Personopsis grasi* (D'Ancona, 1872 ex Bellardi ms.) nel Pliocene di Castrocaro. *Quad. Studi Nat. Romagna*, 16: 1-9, Cesena.
- Cernohorsky W. O. (1971) - The family Naticidae (Mollusca: Gastropoda) in the Fiji Islands. *Rec. Auckland Inst. Mus.*, 8: 169-208, Auckland.
- Cernohorsky W. O. (1972) - Marine shells of the Pacific. Vol. 2. V. of 411 pp., Pacific Publ., Sydney.
- Cerulli Irelli S. (1896) - Molluschi fossili del Pliocene nella Provincia di Teramo. *Boll. Soc. Geol. Ital.*, 15: 9-11, Roma.
- Cerulli Irelli S. (1898) - I molluschi fossili pliocenici di Lombardia-Marcellina con osservazioni del dott. G. De Angelis d'Ossat. *Boll. Soc. Geol. Ital.*, 17: 88-93, Roma.
- Cerulli Irelli S. (1914) - Fauna Malacologica Mariana. *Palaontogr. Ital.*, 20: 183-277, Pisa.
- Chirli C. (1988) - Malacofauna pliocenica. Poggibonsi, cava delle Piaggiole. V. of 89 pp., Editore Lalli, Poggibonsi, Tipografia Bertelli s.n.c., Firenze.
- Clerici E. (1888) - Sulla *Corbicula fluminalis* dei dintorni di Roma e sui fossili che l'accompagnano. *Boll. Soc. Geol. Ital.*, 7: 105-128, Roma.
- Cocconi G. (1873) - Enumerazione sistematica dei Molluschi Miocenici e Pliocenici delle provincie di Parma e di Piacenza. *Mem. Acc. Sci. Ist. Bologna*, 3: 409-780, Bologna.
- Compagnoni B. (1964) - I Molluschi pliocenici di Monte San Giovanni Campano (Frosinone). *Geol. Romana*, 3: 251-278, Roma.
- Coppi F. (1869) - Catalogo dei fossili miocenici e pliocenici del Modenese. *Ann. Soc. Natur. Modena*, Anno 4, reprint of 68 pp., Modena.
- Coppi F. (1880) - Del terreno Tabiano modenese e de' suoi fossili. *Boll. R. Comit. Geol. Ital.*, v. 11, reprint of 13 pp., Roma.
- Coppi F. (1881a) - Le Marne turchine ed i loro fossili nel Modenese. *Ann. Soc. Natur. Modena*, Anno 15, reprint of 31 pp., Modena.
- Coppi F. (1881b) - Paleontologia modenese o guida al Paleontologo con nuove specie. V. of 142 pp., Antica Tipografia Soliani, Modena.
- Coppini M., Cuneo F., Margelli A. & Campani E. (2006) - Gastropoda e Scaphopoda del Porto di Livorno. *Boll. Malac.*, 41: 1-8, Napoli.
- Cossmann M. & Peyrot A. (1919) - Conchologie néogénique de l'Aquitaine. *Actes Soc. Linn. Bordeaux*, 3: 385-695, Bordeaux.
- Cowper Reed F. R. (1930) - Contributions to the Geology of Cyprus. *Geol. Mag.*, 67: 241-271, London.
- Cox L. R. (1930) - The Mollusca of the Hangu Shales. *Mem. Geol. Surv. India, Palaeont. Indica*, 15: 129-222, Calcutta.
- Crespellani A. (1875) - Nota geologica sui terreni e sui fossili del Savignanese. *Ann. Soc. Natur. Modena*, Anno 9, reprint of 31 pp., Modena.
- Cuneo F., Margelli A., Campani E. & Coppini M. (2006) - Gastropoda e Scaphopoda dei fanghi litorali di Livorno. *Boll. Malac.*, 42: 5-12, Napoli.
- Cuscani Politi P. (1978) - Aggiunta alla malacofauna delle argille plioceniche a "Rhinoceros (*Dicerorhinus*) etruscus" di Castelnuovo Berardenga Scalo nei pressi di

- Siena (Toscana). *Atti Acc. Fisiocr. Siena*, 10: 33-59, Siena.
- Dall W. H. (1915) - A monograph of the molluscan fauna of the *Orthaulax pugnax* zone of the Oligocene of Tampa, Florida. *Bull. U.S. Nation. Mus.*, 90: 1-173, Washington.
- Davoli F. (1972) - Conidae (Gastropoda). In: E. Montanaro Gallitelli (Ed.) - Studi monografici sulla malacofauna miocenica modenese. Parte I. *Palaeontogr. Ital.*, 68: 51-143, Pisa.
- De Angelis D'Ossat G. (1897) - I dintorni di Rapolano (Siena). *Rend. Acc. Lincei, Cl. Sci. Fis. Mat.*, 6: 113-120, Roma.
- Della Bella G. & Scarponi D. (2001) - Una nuova specie di *Alvania* (Rissoidea) nel Pliocene del Mediterraneo. *Giorn. Geol.*, 62 (2000), Suppl.: 63-68, Bologna.
- Dell'Angelo B. & Forli M. (1995) - I Poliplacofora del Pleistocene inferiore di Riparbella (Pisa), con elenco dei molluschi rinvenuti. *Boll. Malac.*, 30 (1994): 1221-252, Milano.
- Dell'Angelo B., Piccioli Resta G. & Bonfitto A. (2007) - Notes on fossil Chitons. 3. A new species of *Leptochiton* (Mollusca: Polyplacophora) from the pleistocene of South Italy. *Boll. Malac.*, 43: 139-142, Napoli.
- Depéret C. & Caziot L. (1903) - Note sur les gisements pliocènes et quaternaires marins des environs de Nice. *Bull. Soc. Géol. Fr.*, 3: 321-347, Paris.
- Depontailier J. (1877) - Liste des principales espèces du Pliocène des environs de Cannes. *Bull. Soc. Géol. Fr.*, 5 (1876-1877): 778-784, Paris.
- de Serres M. (1829) - Géognosie des terrains tertiaires, ou tableau des principaux animaux invertébrés des terrains marins tertiaires du Midi de la France. V. of 276 pp., Pomathio-Durville, Montpellier.
- De Stefani C. (1874) - Fossili pliocenici dei dintorni di S. Miniato (Toscana). Molluschi bivalvi ed univalvi. *Bull. Malac. Ital.*, 7: 3-86, Pisa.
- De Stefani C. (1876) - Notizie sopra alcuni molluschi pliocenici del Poder Nuovo presso Monterufoli. *Bull. Soc. Malac. Ital.*, 2: 5-16, Pisa.
- De Stefani C. (1888-89) - Iconografia dei nuovi molluschi pliocenici d'intorno Siena. *Bull. Soc. Malac. Ital.*, 13 (1888): 181-208; 14 (1888): 209-235; 15 (1889): pl. 11, Pisa.
- De Stefani C. & Pantanelli D. (1878-80) - Molluschi pliocenici dei dintorni di Siena. *Bull. Soc. Malac. Ital.*, 4: 5-48 (1878), 49-112 (1879), 113-160 (1879), 161-215 (1880), Pisa.
- Di Geronimo I. (1969) - La sezione stratigrafica plio-pleistocenica di Monte Navone (Piazza Armerina, Enna). *Atti Acc. Gioenia Sci. Nat. Catania*, 20: 81-146, Catania.
- Dixon R. M. (1984) - Analytical checklist of Sowerby's species of *Natica*. V. of 14 pp., Luis Pisani Burnay, Lisboa.
- Dixon R. M. & Ryall P. S. (1986) - Naticidae del West Africa. *La Conchiglia*, 202-203: 4-10 (1986), Roma.
- Doderlein P. (1864) - Cenni geologici intorno la giacitura dei terreni miocenici superiori dell'Italia centrale. *Atti X Congresso degli Scienziati Italiani, in Siena, 1862*. Reprint of 28 pp., Siena.
- Dominici S., Mazzanti R. & Nencini C. (1997) - Geologia dei dintorni di San Miniato tra l'Arno, l'Elsa e l'Era. *Quad. Mus. St. Nat. Livorno*, 14 (1995), Suppl. n. 1: 1-27, San Miniato.
- Donovan E. (1803) - The Natural History of British Shells, including Figures and Descriptions of all the Species hitherto discovered in Great Britain, systematically arranged in the Linnean Manner, with scientific and general Observations on each. Vol. 5. V. of 35 pls. (145-180), printed for the author, London.
- d'Orbigny A. (1852) - Prodrome de Paléontologie. III. V. of 189 pp., Masson, Paris.
- d'Orbigny A. (1853) - Mollusques. Tome second. In: Histoire physique, politique et naturelle de l'Île de Cuba par M. Ramon de la Sagra. V. of 380 pp., Arthus Bertrand, Paris.
- Dubertret L., Vautrin H. & Keller A. (1937) - Stratigraphie du Pliocène et du Quaternaire de la région de Lattakuié. Contribution à l'étude géologique de la Côte Libano-Syrienne. *Haut Comm. Rép. Fr. en Syrie et au Liban. Notes et Mem.*, 2: 98-110, Paris.
- Fekih M. (1975) - Paléocologie du Pliocène marin au Nord de la Tunisie. *Ann. Mines Géol.*, 27: 1-194, Tunis.
- Ferrero Mortara E., Montefameglio L., Novelli M., Opesso G., Pavia G. & Tampieri R. (1984) - Catalogo dei tipi e degli esemplari figurati della collezione Bellardi e Sacco. Parte II. *Mus. Reg. Sci. Nat. Torino. Cataloghi*. V. di 484 pp., Torino.
- Ferrero E. & Merlino B. (1992) - Ricostruzione paleoecologica di una malacofauna del bacino pliocenico astigiano (Italia, NW). *Boll. Malac.*, 28: 101-138, Milano.
- Ferrero E., Merlino B. & Provera A. (1998) - Malacofauna Plioceniche astigiane concentrate da eventi ad alta energia. *Boll. Malac.*, 33 (1997): 43-57, Roma.
- Ferretti A. (1879) - Le formazioni plioceniche a Montegibbio (Provincia di Modena). *Boll. R. Com. Geol.*, 5-6, reprint of 12 pp., Roma.
- Fontannes F. (1879-82) - Les Mollusques pliocènes de la vallée du Rhône et du Roussillon. Tome premier. Gastéropodes. V. of 268 pp. (1880: pp. 77-268), F. Savy, Paris.
- Foresti L. (1868) - Catalogo dei Molluschi fossili pliocenici delle colline bolognesi. *Mem. Acc. Sci. Ist. Bologna*, ser. 2, 7, reprint of 99 pp., Bologna.
- Foresti L. (1874) - Catalogo dei Molluschi fossili pliocenici delle colline bolognesi. Parte II. *Mem. Acc. Sci. Ist. Bologna*, ser. 3, 4, reprint of 88 pp., Bologna.
- Foresti L. (1876) - Cenni geologici e paleontologici sul Pliocene antico di Castrocaro. *Mem. Acc. Sci. Ist. Bologna*, ser. 3, 6 (1875): 521-574, Bologna.
- Foresti L. (1884) - Contribuzione alla Conchiologia terziaria italiana, III. *Mem. Acc. Sci. Ist. Bologna*, ser. 4, 5: 301-316, Bologna.
- Forli M. & Dell'Angelo B. (2000) - A new species of *Marginitella* (Mollusca, Gastropoda) from the Italian Pliocene. *Boll. Malac.*, 36: 93-98, Roma.
- Forli M., Dell'Angelo B., Ciappelli F. & Taviani M. (2003) - A new species of Haliotidae (Mollusca, Vetigastropo-

- da) in the Italian Pliocene. *Boll. Malac.*, 38 (2002): 149-154, Roma.
- Forli M., Dell'Angelo B. & Taviani M. (1999) - Molluschi del Pliocene inferiore toscano: la sezione Montenero (Grosseto). *Boll. Malac.*, 34 (1998): 109-122, Roma.
- Franca Viglia A. (1941) - Osservazioni geologiche sulle colline delle Terreforti (Regione Etnea). *Giorn. Geol.*, ser. 2, 14 (1939-40): 55- 81, Bologna.
- Fretter V. & Graham A. (1981) - The prosobranch molluscs of Britain and Denmark. Part 6. *J. Moll. Stud.*, Suppl. 9: 285-363, Reading.
- Fucini A. (1891) - Il Pliocene dei dintorni di Cerreto-Guidi e di Limite ed i suoi molluschi fossili. *Boll. Soc. Geol. Ital.*, 10: 49-87, Roma.
- Ghibaudo G., Clari P. & Perello M. (1985) - Litostratigrafia, sedimentologia ed evoluzione tettonico-sedimentaria dei depositi miocenici del margine sud-orientale del Bacino terziario ligure-piemontese (Valli Borbera, Scrivia e Lemme). *Boll. Soc. Geol. Ital.*, 104: 349-397, Roma.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C. (1997) - Atlante delle conchiglie marine del Mediterraneo. Vol. 2. V. of 258 pp., Edizioni La Conchiglia, Roma.
- Glibert M. (1952a) - Faune malacologique du Miocène de la Belgique. II. Gastropodes. *Mém. Inst. Roy. Sci. Nat. Belgique*, 121: 1-197, Bruxelles.
- Glibert M. (1952b) - Gastropodes du Miocène moyen du Bassin de la Loire. Deuxième Partie. *Mém. Inst. Roy. Sci. Nat. Belgique*, 46: 243-450, Bruxelles.
- Glibert M. (1963) - Les Mesogastropoda fossiles du Cénozoïque étranger des collections de l'Institut Royal des Sciences Naturelles de Belgique. Deuxième Partie: Fossaridae à Ficidae (inclus). *Mém. Inst. Roy. Sci. Nat. Belgique*, 73: 1-154, Bruxelles.
- Golikov A. N. & Sirenko B. I. (1983) - Composition and distribution of Gastropoda (Prosobranchs) of the order Naticiformes in the Seas of the USSR. *Zool. Zh.*, 62: 1334-1342, Moskva.
- González Delgado J. Á. (1987) - Tafonomía y paleoecología en diferentes yacimientos de la Formación arenas de Huelva. In: Universidad de Salamanca (Ed.) - Paleontología del Neógeno de Huelva: 89-125, Salamanca.
- Gratoloup J. P. S. (1847) - Conchyliologie fossile des terrains tertiaires du Bassin de l'Adour. Tome I. Univalves. Atlas. V. of 48 pls. (1840), Imprimerie Lafargue, Bordeaux.
- Grecchi G. (1975) - Ritrovamento di *Cavolinia uncinata* (Rang, 1829) negli affioramenti di Castell'Arquato. *Conchiglie*, 11: 93-96, Milano.
- Greco A. (1970) - La malacofauna pliocenica di Contrada Cerausi presso Serradifalco (Caltanissetta). *Geol. Romana*, 9: 275-314, Roma.
- Greco A. & Buccheri G. (1988) - Considerazioni paleoecologiche e stratigrafiche sulla malacofauna del Pliocene inferiore della foce del Nocella (Partinico, Palermo). In: Robba E. (Ed.) - Atti IV Simposio Ecol. Paleoecol. Comunità Bentoniche, *Mus. Reg. Sci. Nat. Torino*: 397- 427, Torino.
- Gubbioli F., Nofroni I. & Villa R. (1999) - Sulla validità specifica di "*Natica notabilis*" Jeffreys, 1885 e la sua distribuzione geografica (Discopoda: Naticidae). *Boll. Malac.*, 34 (1998): 123-124, Roma.
- Harmer F. W. (1921) - The Pliocene Mollusca of Great Britain. Vol. II. *Monogr. Paleontogr. Soc.*, 1919: 653-704, London.
- Hornung A. (1920) - Gasteropodés fossiles du Rio Torsero (Ceriale). Pliocène inférieur de la Ligurie. *Ann. Mus. Civ. Stor. Nat. Doria*, 9: 70-92, Genova.
- Huelsken T., Marek C., Schreiber S., Schmidt I. & Hollmann M. (2008) - The Naticidae (Mollusca: Gastropoda) of Giglio Island (Tuscany, Italy): Shell characters, live animals, and molecular analysis of egg masses. *Zoo-taxa*, 1770: 1-40, Auckland.
- Imbesi M. (1951) - Nuove osservazioni e ricerche presso i giacimenti fossiliferi di Ravagnese (Reggio Calabria). *Atti Soc. Tosc. Sci. Nat., Mem.*, ser. A, 58: 121-136, Pisa.
- International Trust for Zoological Nomenclature (1999) - International Code of Zoological Nomenclature, 4th edition. V. of XXIX + 306 pp., London.
- Janssen A. W. (1969) - Beiträge zur Kenntnis des Miocäns von Dingden und seiner Mollusken-Fauna 2. *Geol. Palaeont.*, 3: 153-193, Marburg.
- Janssen A. W. (1984) - Mollusken uit het Mioceen van Winterswijk-Miste. Een inventarisatie, met beschrijvingen en afbeeldingen van alle aangetroffen soorten. V. of 451 pp., Amsterdam.
- Jeffreys J. G. (1867) - British Conchology or an account of the Mollusca which now inhabit the British Isles and the surrounding Seas. Vol. IV. Marine shells. V. of 486 pp., John Van Voorst, London.
- Jeffreys J. G. (1885) - On the Mollusca procured during the "Lightning" and "Porcupine" Expeditions, 1868-70. Part IX. *Proc. Zool. Soc. London*, 1885: 274-310, London.
- Kabat A. R. (1990) - Species of Naticidae (Mollusca: Gastropoda) described by Linnaeus in the *Systema Naturae* (1758). *Zool. J. Linn. Soc.*, 100: 1-25, Cambridge.
- Kabat A. R. (1991) - The classification of the Naticidae (Mollusca: Gastropoda): Review and analysis of the supraspecific taxa. *Bull. Mus. Comp. Zool.*, 152: 417-449, Cambridge.
- Kilburn R. N. (1976) - A revision of the Naticidae of Southern Africa and Moçambique (Mollusca). *Ann. Natal Mus.*, 22: 829-884, Pietermaritzburg.
- Kojumdgieva E. M. & Strachimirov B. (1960) - Les fossiles de Bulgarie. VII Tortonien. *Académie des Sciences de Bulgarie*. V. of 317 pp., Sofia.
- Lacroce L. (1997) - La famiglia Naticidae nel Pliocene italiano. *Fossili & Fossili*, 3: 22-37, Roma.
- Lacroce L. (2000) - La famiglia Naticidae nel Pliocene italiano: prima addenda. *Fossili & Fossili*, 6: 32-33, Ancona.
- Lacroce L. & Repetto G. (1998) - Prima segnalazione di *Euspira grossularia* (Marche-Marchad, 1957) per il Pliocene piemontese. *Boll. Malac.*, 33 (1997): 147-150, Roma.

- Laghi G. F. (1984) - Sorprendente densità di *Chiton saenien-*
sis n. sp. in sabbie gialle plioceniche dei dintorni di
Serre di Rapolano (Siena). *Boll. Mus. Reg. Sci. Nat.*
Torino, 2: 555-564, Torino.
- Lamarck J. B. P. A. de (1838) - Histoire Naturelle des Ani-
maux sans Vertèbres, présentant les caractères génér-
aux et particuliers de ces animaux, leur distribution,
leurs classes, leurs familles, leurs genres, et la citation
des principales espèces qui s'y rapportent. Deuxième
édition, revue et augmentée par G. P. Deshayes et H.
Milme Edwards. V. 8, Mollusques. V. of 657 pp., J. B.
Baillièrre, Paris.
- Landini W., Menesini E. & Ragaini L. (1991) - Paleocomu-
nità a Molluschi ed otoliti nel Pliocene di Castelfior-
entino (Firenze, Italia). *Atti Soc. Tosc. Sci. Nat., Mem.*,
ser. A, 97 (1990): 175-202, Pisa.
- La Via G.-B. (1833) - Geognostiche osservazioni fatte ne'
dintorni di Caltanissetta dal P. D. Gregorio-Barnaba
La Via Cassinese. V. of 22 pp., Vincenzo Lipomi, Cal-
tanissetta.
- Lea I. (1833) - Tertiary Formations of Alabama. In Contri-
butions to Geology: 1-208, Carey, Lea & Blanchard,
Philadelphia.
- Lozouet P., Lesport J.-F. & Renard Ph. (2001) - Révision des
Gastropoda (Mollusca) du Stratotype de l'Aquitainien
(Miocène inf.): site de Saucats "Laricy", Gironde,
France. *Cossmanniana*, Hors-Série n° 3: 1-189, Lei-
den.
- Majima R. (1989) - Cenozoic Fossil Naticidae (Mollusca:
Gastropoda) in Japan. *Bull. Amer. Paleont.*, 96 (331):
1-159, Ithaca.
- Malagoli M. (1884) - Tortoniano di Montebanzone. *Atti*
Soc. Natur. Modena - Rendiconti delle Adunanze -
ser. 3, 2: pp. 5-10, Modena.
- Malatesta A. (1943) - Le formazioni pleistoceniche del livor-
nese. *Atti Soc. Tosc. Sci. Nat., Mem.*, 51: 145-206, Pisa.
- Malatesta A. (1974) - Malacofauna pliocenica umbra. *Mem.*
Serv. Geol. Ital., 13: 1-498, Roma.
- Malatesta A. & Nicosia M. L. (1955) - I fossili del Pliocene e
Pleistocene di Agrigento della collezione Lomi. *Boll.*
Serv. Geol. Ital., 77: 173-180, Roma.
- Malatesta A. & Zarlenga F. (1985) - Il Quaternario di Po-
mezia (Roma) e la sua fauna marina. *Boll. Soc. Geol.*
Ital., 104: 503-514, Roma.
- Mancini A. (1997) - Molluschi fossili della cava di Formello
(Guidonia, Roma). Significato paleoecologico di al-
cune specie. *Ann. Ass. Nomentana St. Archeol.*, 3:
35-44, Roma.
- Mancini A. (2003) - Nota malacologica di aggiornamento
sulle specie rinvenute alla cava di Formello (Guido-
nia). *Ann. Ass. Nomentana St. Archeol.*, nuova serie
n.4: 7-21, Roma.
- Manganelli G. & Giusti F. (1997) - A new cochlostomatid
prosobranch (Mollusca, Gastropoda) from the Early
Pliocene of Balze di Caspreno near Siena, Central
Italy. *Boll. Soc. Paleont. Ital.*, 35 (1996): 199-211,
Modena.
- Manganelli G., Spadini V. & Cianfraneli S. (2004) - The
xenophorid gastropods of the Mediterranean Plio-
cene: the record of the Siena Basin. *Boll. Soc. Paleont.*
Ital., 43 (2003): 409-451, Modena.
- Manzoni A. (1868) - Saggio di conchiologia fossile subap-
pennina: fauna delle sabbie gialle. V. of 74 pp., Tip.
D'Ignazio Galeati e Figlio, Imola.
- Marasti R. & Raffi S. (1976) - Osservazioni biostratigrafiche
e paleoecologiche sulla malacofauna del Piacenziano
di Maiatico (Parma, Emilia occidentale). *Boll. Soc. Pa-*
leont. Ital., 15: 189-214, Modena.
- Marasti R. & Raffi S. (1977) - Osservazioni sulla malacofau-
na del Piacenziano di Quattro Castella (Reggio Emi-
lia). *Atti Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*,
118: 226-234, Milano.
- Marche-Marchad I. (1957) - Description de cinq Gastro-
podes marins nouveaux de la Cote occidentale d'Afri-
que. *Bull. Mus. Nat. Hist. Nat.*, 2° Série, 29: 200-206,
Paris.
- Marincovich L. (1977) - Cenozoic Naticidae (Mollusca:
Gastropoda) of the Northeastern Pacific. *Bull. Amer.*
Paleont., 70: 169-494, Ithaca.
- Marquet R. (1997) - Pliocene gastropod faunas from Kallo
(Oost-Vlaanderen, Belgium) - Part 3. Caenogastropo-
da: Aporrhaidae to Muricidae, and Part 4. Buccinidae
to Helicidae. *Contr. Tert. Quatern. Geol.*, 34 (3-4): 69-
149, Leiden.
- Mars P. (1956) - Faunes malacologiques du Pliocène et du
Quaternaire de Milazzo (Sicile). *Bull. Mus. Hist. Nat.*
Marseille, 16: 33-52, Marseille.
- Mastrorilli V. (1969) - I Molluschi del Pliocene ligure nella
Collezione dell'Istituto di Geologia dell'Università di
Genova, e i microfossili delle formazioni che li ricet-
tavano: I° I reperti provenienti dalle marne di Genova.
Atti Ist. Geol. Univ. Genova, 7: 85-228, Genova.
- Mazzanti R. (1961) - Geologia della zona di Montaione tra le
valli dell'Era e dell'Elsa (Toscana). *Boll. Soc. Geol.*
Ital., 80: 37-127, Roma.
- Mazzetti G. (1874) - Catalogo dei Fossili miocenici e plio-
cenici del Modenese e suoi contorni raccolti
dall'Abate Giuseppe Mazzetti. *Ann. Soc. Natur. Mo-*
dena, ser. 2, anno 8: 151-177, Modena.
- Menesini E. (1977) - Studio di una Malacofauna del Pliocene
medio del Bacino della Fine (Toscana Marittima): os-
servazioni paleoambientali. *Atti Soc. Tosc. Sci. Nat.*,
Mem., ser. A, 83 (1976): 251-271, Pisa.
- Menesini E. (1989) - Alcune balanofaune a bassa diversità
specifiche del Pliocene toscano: condizioni ambientali,
competizione o opportunismo? In Di Geronimo S. I.
(Ed.) - Atti 3° Simposio Ecol. Paleoecol. Comunità
Bentoniche (1985): 207-226, Catania.
- Merlino B. & Campanino F. (2001) - Supplemento al "Ca-
talogo dei tipi e degli esemplari figurati della colle-
zione Bellardi e Sacco" - Parte I e II (Cephalopoda,
Gastropoda, Amphineura, Scaphopoda) Aggiunte e
Variazioni. *Boll. Mus. Reg. Sci. Nat. Torino*, 19: 5-
71, Torino.
- Micali P. & Villari A. (1989) - Il deposito fossilifero di Salice
(Messina) con particolare riguardo alle specie istituite
da Giuseppe Seguenza. (Contributo I). *Boll. Malac.*,
25: 77-84, Milano.

- Michelotti G. (1847) - Description des fossiles des terrains miocènes de l'Italie septentrionale. V. of 408 pp., Société Hollandaise des Sciences, Leide. + 17 planches.
- Michelotti G. (1861). Études sur le Miocène inférieur de l'Italie septentrionale. *Natuurkundige Verhandelingen, van de Hollandsche Maatschappij der Wetenschappen*, XV. V. of 181 pp., De Erven Loosjes, Haarlem.
- Monegatti P. & Raineri G. (1987) - Osservazioni paleoecologiche sulla sezione pliocenica di Rio Stramonte (Piacenza). *Boll. Acc. Gioenia Sci. Nat.*, 20: 287-308, Catania.
- Montefameglio L., Pavia G. & Rosa D.A. (1980) - Associazioni a molluschi del Tabianiano del Basso Monferrato (Alba, Italia NW). *Boll. Soc. Paleont. Ital.*, 18 (1979): 173-199, Modena.
- Monterosato Di Maria T. di (1872) - Notizie intorno alle conchiglie fossili di Monte Pellegrino e Ficarazzi. V. of 44 pp., Michele Amenta, Palermo.
- Monterosato Di Maria T. di (1884) - Nomenclatura generica e specifica di alcune conchiglie mediterranee. V. of 152 pp., Stab. Tipografico Virzi, Palermo.
- Moretti A. (1938) - Fossili pliocenici della Val Coggia (Alto Bacino dell'Ombro). *Riv. It. Paleont.*, 44: 76-81, Milano.
- Moroni M. A. (1956) - La macrofauna saheliana del Messiniano inferiore della Repubblica di San Marino. *Giorn. Geol.*, ser. 2, 25 (1953): 81-162, Bologna.
- Moroni M. A. (1957) - Le malacofaune del Miocene medio di Montebello (Appennino Riminese). *Giorn. Geol.*, ser. 2, 26 (1954-55): 141-154, Bologna.
- Moroni M. A. & Paonita G. (1964) - Nuovi dati sul Pliocene e il Quaternario dei dintorni di Palermo. 3) Una malacofauna delle sabbie gialle plioceniche di Altavilla. *Riv. Min. Sicil.*, 79-81: 27-65, Palermo.
- Moroni M. A. & Torre G. (1966) - Nuovi dati sul Pliocene e il Quaternario dei dintorni di Palermo. 4) Macrofauna dei Trubi (Pliocene inferiore) di Lascari. *Riv. Min. Sicil.*, 91-93 (1965): 27-49, Palermo.
- Neviani A. (1887) - Contribuzioni alla geologia del Catanzarese. *Boll. Soc. Geol. Ital.*, 6: 169-208, Roma.
- Ortoleva B. (1992) - Nota preliminare su una malacofauna pliocenica rinvenuta a sud-ovest di Corleone (Palermo). *Natur. Sicil.*, 16: 137-144, Palermo.
- Öztürk B., Buzzurro G. & Avni Benli H. (2004) - Marine molluscs from Cyprus: new data and checklist. *Boll. Malac.*, 39 (2003): 49-78, Roma.
- Palla P. (1967) - Gasteropodi pliocenici della bassa Val d'Elsa (Toscana occidentale). *Riv. It. Paleont. Strat.*, 73: 931-1020, Milano.
- Pantanelli D. (1876) - Rapporto annuale 1875 della Direzione del Museo di mineralogia e geologia. *Atti Acc. Fisiocr. Siena*, 1, reprint of 11 pp., Siena.
- Pantanelli D. (1877) - Dei terreni terziari intorno a Siena. *Atti Acc. Fisiocr. Siena*, 1: 221-234, Siena.
- Pantanelli D. (1878) - Sul Pliocene dei dintorni di Chianciano (Toscana). *Boll. Serv. Geol. Ital.*, 9: 10-19, Roma.
- Pantanelli D. (1880) - Conchiglie plioceniche di Pietrafitta in provincia di Siena. *Bull. Soc. Malac. Ital.*, 6: 265-276, Siena.
- Pantanelli D. (1881) - Enumerazione dei Molluschi pliocenici della Toscana viventi nel Mediterraneo. *Bull. Soc. Malac. Ital.*, 7: 63-68, Siena.
- Pantanelli D. & Mazzetti G. (1887a) - Cenno monografico intorno alla fauna fossile di Montese. Parte seconda (Nota preventiva). *Atti Soc. Natur. Modena - Rendiconti delle Adunanze - ser. 3, 3*, reprint of 4 pp., Modena.
- Pantanelli D. & Mazzetti G. (1887b) - Cenno monografico intorno alla fauna fossile di Montese. Parte II. *Atti Soc. Natur. Modena - Memorie Originali - ser. 3, 6*, reprint of 37 pp., Modena.
- Pantoli D. & Raffi S. (1981) - Presenza del genere *Tugonia* (Myidae, Bivalvia) nel Pliocene Mediterraneo. *Boll. Soc. Paleont. Ital.*, 20: 73-80, Modena.
- Papani G. & Pelosio G. (1963) - La serie Plio-Pleistocenica del T. Stirone (Parmense occidentale). *Boll. Soc. Geol. Ital.*, 81 (1962), reprint of 45 pp., Roma.
- Parona C. F. (1883a) - Esame comparativo della fauna dei varj lembi pliocenici lombardi. *Rend. R. Ist. Lomb. Sci. Lett.*, ser. 2, 16, reprint of 13 pp., Milano.
- Parona C. F. (1883b) - Sopra i lembi pliocenici situati tra il bacino del lago d'Orta e la Val Sesia e sull'alto-piano di Boca e di Maggiore. *Boll. Soc. Geol. Ital.*, 2: 239-257, Roma.
- Parona C. F. (1886) - Valsesia e Lago d'Orta. Descrizione geologica. *Atti Soc. Ital. Sci. Nat. Mus. Civ. St. Nat. Milano*, 29, reprint of 157 pp., Milano.
- Pavia G. (1976) - I Molluschi del Pliocene inferiore di Monteu Roero (Alba, Italia NW). *Boll. Soc. Paleont. Ital.*, 14 (1975): 99-175, Modena.
- Pavia G. (1980) - Gli opercoli calcarei delle Naticidae (Mollusca, Gastropoda) nel Pliocene norditaliano. *Boll. Malac.*, 16: 225-276, Milano.
- Pavia G., Chiambretto L. & Oreggia G. (1989) - Paleocomunità a Molluschi nel Pliocene inferiore di Breolungi (Mondovì, Italia NW). In: Di Geronimo S. I. (Ed.) - Atti 3° Simposio Ecol. Paleoecol. Comunità Bentoniche (1985): 521-569, Catania.
- Pavia G. & Robba E. (1979) - La località messiniana di Borelli (Collina di Torino) e la sua fauna a Pteropodi. *Riv. It. Paleont. Strat.*, 85: 549-572, Milano.
- Payraudeau B.-C. (1826) - Catalogue descriptif et méthodique des Annelides et des Mollusques de l'Île de Corse. V. of 218 pp., Béchet, Levrault, Paschoud, Treuttel & Wurtz, Paris.
- Pedriali L. (1996) - Naticidae fossili del Pliocene bolognese (*Mollusca, Gastropoda*). *Natura Modenese*, 3 (1993): 3-17, Marano sul Panaro.
- Pedriali L. & Robba E. (2001) - *Euspira magenesi*, a new species of the Naticidae (Gastropoda) from the Pliocene of Italy. *Riv. It. Paleont. Strat.*, 107: 483-487, Milano.
- Pedriali L. & Robba E. (2005) - A revision of the Pliocene naticids of Northern and Central Italy. I. The subfamily Naticinae except *Tectonatica*. *Riv. It. Paleont. Strat.*, 111: 109-179, Milano.
- Pedriali L. & Robba E. (2008a) - A revision of the Pliocene naticids of Northern and Central Italy. II. The sub-

- family Naticinae: additions to *Cochlis*, *Tanea* and *Tectonatica*. *Riv. It. Paleont. Strat.*, 114: 77-117, Milano.
- Pedriali L. & Robba E. (2008b) - Case 3456. *Nerita helicina* Brocchi, 1814 (currently *Euspira helicina*; Mollusca, Gastropoda, Naticidae): proposed conservation of usage of the specific name by designation of a neotype. *Bull. Zool. Nomencl.*, 65(3): 173-177, London.
- Pelosio G. (1967) - La malacofauna dello stratotipo del Tabianiano (Pliocene inferiore) di Tabiano Bagni (Parma). *Boll. Soc. Paleont. Ital.*, 5 (1966): 101-183, Modena.
- Pelosio G. & Raffi S. (1977) - Preliminary remarks on mollusc assemblages of the Stirone river Pleistocene series (Parma Province, Northern Italy). X INQUA Congr., preprint of 19 pp., Parma.
- Pennant T. (1777) - British Zoology. Vol. IV. Crustacea. Mollusca. Testacea. V. of 379 pp., B. White, London.
- Philippi R. A. (1836) - Enumeratio Molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium. V. of 267 pp., Schropp, Berolini (Berlin).
- Philippi R. A. (1844) - Enumeratio Molluscorum Siciliae cum viventium tum in tellure tertiaria fossilium. Vol. Secundum. V. of 303 pp., E. Anton, Halis Saxonum (Halle).
- Philippi R. A. (1849-1853) - Die Gattungen *Natica* und *Amaura*. In: Martini F. H. W. & Chemnitz J. H. - Systematisches Conchylien-Cabinet. V. of 164 pp. (1849: 1-18; 1850: 19-26; 1852: 27-120; 1853: 121-164), Verlag von Bauer und Raspe, Nürnberg.
- Piani P. (1980) - Catalogo dei molluschi conchiferi viventi nel Mediterraneo. *Boll. Malac.*, 16: 113-224, Roma.
- Pinna G. & Spezia L. (1978) - Catalogo dei Tipi del Museo Civico di Storia Naturale di Milano. V. I Tipi dei Gasteropodi fossili. *Atti Soc. Ital. Sci. Nat. Museo Civ. St. Nat. Milano*, 119(2): 125-180, Milano.
- Raffi S. (1982) - Discontinuità stratigrafica nella successione pliocenica ad ovest dello stratotipo del Piacenziano. *Riv. It. Paleont. Strat.*, 88: 487-494, Milano.
- Raffi S., Rio D., Sprovieri R., Valleri G., Monegatti P., Raffi I. & Barrier P. (1989) - New stratigraphic data on the Piacenzian stratotype. *Boll. Soc. Geol. Ital.*, 108: 183-196, Roma.
- Ragaini L. & Mariani R. (1992) - Analisi paleoecologica della malacofauna pliocenica di Camino Tondo (Grosseto, Italia). *Atti Soc. Tosc. Sci. Nat., Mem.*, ser. A, 99: 1-27, Pisa.
- Rasmussen L. B. (1956) - The Marine Upper Miocene of South Jutland and its Molluscan Fauna. *Danm. Geol. Undersög.*, Raekke 2, 81: 1-166, Kobenhavn.
- Repetto G. (1997) - La malacofauna pliocenica di Pocapaglia. *Alba Pompeia*, anno 18: 57-65, Alba.
- Repetto G. & Lacroce L. (2004) - Il contenuto malacologico delle "Argille di Lugagnano" di Montà d'Alba (Cuneo). *Boll. Malac.*, 39 (2003): 191-202, Roma.
- Repetto G., Orlando F. & Arduino G. (2005) - Conchiglie del Mediterraneo. *Amici Mus. "F. Eusebio" Alba*: 1-392, Alba.
- Reynell A. (1910) - The Mollusca collected by the "Huxley" from the North Side of the Bay of Biscay, in August, 1906. *J. Mar. Biol. Ass. UK*, 8: 359-391, Plymouth.
- Rio D., Sprovieri R., Raffi I. & Valleri G. (1988) - Biostratigrafia e paleoecologia della sezione stratotipica del Piacenziano. *Boll. Soc. Paleont. Ital.*, 27 (1987): 213-238, Modena.
- Risso A. (1826) - Histoire Naturelle des principales productions de l'Europe Méridionale et principalement de celles des environs de Nice et des Alpes Maritimes. Tome quatrième. V. of VII+439 pp., F.-G. Levrault, Paris.
- Robba E. (1968) - Molluschi del Tortoniano-tipo (Piemonte). *Riv. It. Paleont. Strat.*, 74: 457-646, Milano.
- Robba E. (1981) - Studi paleoecologici sul Pliocene ligure. IV. Malacofauna batiali della Liguria occidentale. *Riv. It. Paleont. Strat.*, 87: 93-164, Milano.
- Robba E. & Ostinelli F. (1975) - Studi paleoecologici sul Pliocene ligure. I. Testimonianze di predazione sui Molluschi pliocenici di Albenga. *Riv. It. Paleont. Strat.*, 81: 309-372, Milano.
- Robba E. & Ostinelli F. (1976) - Studi paleoecologici sul Pliocene ligure. II. Le tracce degli organismi epibionti sui Molluschi pliocenici di Albenga. *Riv. It. Paleont. Strat.*, 82: 501-578, Milano.
- Rossi Ronchetti C. (1955) - I tipi della "Conchiologia fossile subapennina" di G. Brocchi. II. Gasteropodi, Scafopodi. *Riv. It. Paleont. Strat.*, Mem. V: 91-343, Milano.
- Ruggieri G. (1949a) - Il Pliocene superiore di Capocolle (Forlì). *Giorn. Geol.*, ser. 3, 20 (1948): 19-38, Bologna.
- Ruggieri G. (1949b) - Il terrazzo marino presiciliano della Penisola di Crotona. *Giorn. Geol.*, ser. 3, 20 (1948): 39-62, Bologna.
- Ruggieri G. (1949c) - La malacofauna del Calabriano romagnolo. *Giorn. Geol.*, ser. 3, 20 (1948): 63-110, Bologna.
- Ruggieri G. (1950a) - Contribuzione alla conoscenza della malacofauna del Pliocene e del Quaternario. *Giorn. Geol.*, ser. 2, 21 (1949): 65-90, Bologna.
- Ruggieri G. (1950b) - Una malacofauna siciliana dei dintorni di Imola. *Giorn. Geol.*, ser. 2, 21 (1949): 91-93, Bologna.
- Ruggieri G. (1957a) - Geologia e stratigrafia della sommità del Terziario a Castrocaro (Forlì). *Giorn. Geol.*, ser. 2, 26 (1954), reprint of 52 pp., Bologna.
- Ruggieri G. (1957b) - Nuovi dati sul contatto Pliocene-Calabriano nella sezione del Santerno (Imola). *Giorn. Geol.*, ser. 2, 26 (1954): 81-88, Bologna.
- Ruggieri G. (1962) - La serie Marina Pliocenica e Quaternaria della Romagna. A cura della Camera di Comm. Ind. e Agric. di Forlì. Estratto dai Bollettini Mensili - Gennaio e Marzo - 1962. V. of 79 pp., Tipografia Moderna F.lli Zauli. Castrocaro (Forlì).
- Ruggieri G. (1975) - La malacofauna del Pleistocene inferiore di Casa Schifo presso Gela. *Boll. Soc. Paleont. Ital.*, 12 (1973): 158-165, Modena.
- Ruggieri G. & Milone G. (1975) - La macrofauna del Tirreniano di Tommaso Natale (Palermo). *Boll. Soc. Paleont. Ital.*, 12 (1973): 217-222, Modena.
- Ruggieri G. (1982) - Segnalazione di *Parastrophia* (Gastropoda, Caecidae) nel Pliocene della Sicilia. *Boll. Malac.*, anno 18: 255-262, Milano.
- Ruggieri G., Buccheri G. & Greco A. (1967) - Pliocene superiore trasgressivo nella zona di Altavilla (Palermo).

- mo). *Atti Acc. Gioenia Sci. Nat. Catania*, 18 (Suppl. Sci. Geol.): 333-344, Catania.
- Ruggieri G., Buccheri G. & Rendina M. (1968) - Segnalazione di Tirreniano fossilifero a Trapani. *Riv. Min. Sicil.*, 112-114, reprint of 4 pp., Palermo.
- Ruggieri G. & Greco A. (1965) - Studi geologici e paleontologici su Capo Milazzo con particolare riguardo al Milazziano. *Geol. Romana*, 4: 41-88, Roma.
- Sacco F. (1890) - I Molluschi dei Terreni Terziari del Piemonte e della Liguria. Parte VIII - Galeodoliidae, Doliidae, Ficulidae e Naticidae. Nota preventiva. *Boll. Mus. Zool. Anat. Comp. R. Univ. Torino*, 5: 21-43, Torino.
- Sacco F. (1891) - I Molluschi dei Terreni Terziari del Piemonte e della Liguria. Parte VIII. Galeodoliidae, Doliidae, Ficulidae e Naticidae. V. of 112 pp., C. Clausen, Torino.
- Sacco F. (1904) - I Molluschi dei Terreni Terziari del Piemonte e della Liguria. Parte XXX. Aggiunte, correzioni e considerazioni generali. V. of XXXVI + 203 pp., C. Clausen, Torino.
- Saito H. (2000) - Naticidae. In: Okutani T. (Ed.) - Marine Mollusks in Japan. V. of 1173 pp. (Naticidae, pp. 250-267), Takai University Press, Tokyo.
- Sangiorgi D. (1928) - La fauna Neogenica della Ponticella di Savena presso Bologna. Cenni generali e conclusioni. *Giorn. Geol.*, ser. 2, 3: 156-176, Bologna.
- Sasso A. (1827) - Saggio geologico sopra il Bacino terziario di Alberga. *Giorn. Ligust. Sci. Lett. Arti*, 1: 467-484, Genova.
- Scacchi A. (1836) - Catalogus Conchyliorum Regni Neapolitani quae usque adhuc reperit A. Scacchi. V. of 18 pp, 1 pl., in 8°, Typis Filiatre-Sebetii, Neapoli.
- Seguenza G. (1876) - Studii stratigrafici sulla Formazione pliocenica dell'Italia Meridionale. Elenco dei Cirripei e dei Molluschi della zona superiore dell'antico Pliocene. *Boll. R. Comit. Geol. Ital.*, 7: 7-15, Roma.
- Seguenza G. (1880) - Le formazioni terziarie nella provincia di Reggio (Calabria). *Atti R. Acc. Lincei, Cl. Sci. Fis. Mat. Nat.*, 6 (1879): 1- 446, Roma.
- Simonelli V. (1883) - Il monte della Verna e i suoi fossili. *Boll. Soc. Geol. Ital.*, 2: 235-283, Roma.
- Simonelli V. (1893) - Le sabbie fossilifere di Selenitza in Albania. *Boll. Soc. Geol. Ital.*, 12: 552-558, Roma.
- Simonelli V. (1896) - Appunti sopra la fauna e l'età dei terreni di Vigoleno. (Prov. di Piacenza). *Boll. Soc. Geol. Ital.*, 15: 325-340, Roma.
- Sismonda E. (1842) - Synopsis Methodica Animalium Invertebratorum Pedemontii fossilium. V. of 44 pp., Augustae Taurinorum, Typis Regiis, Torino.
- Sismonda E. (1847) - Synopsis Methodica Animalium Invertebratorum Pedemontii fossilium (exceptis speciebus ineditis). Editio altera et aucta. V. of VIII + 62 pp., Augustae Taurinorum, Typis Regiis, Torino.
- Sowerby J. (1825) - The Mineral Conchology of Great Britain; or coloured figures and descriptions of those remains of testaceous animals or shells which have been preserved at various times and depths in the earth. Vol. 5. V. of 171 pp., Richard Taylor, London.
- Tabanelli C. (1994) - II Contributo alla conoscenza della malacofauna batiale del Pliocene di Romagna: segnalazione del genere *Microstelma* Adams A., 1863 (Gastropoda: Rissoidae). *Boll. Malac.*, 29 (1993): 275-280, Milano.
- Tabanelli C. & Segurini R. (1995) - Nota preliminare alla Malacofauna pliocenica di Rio Albonello (Faenza). *Quad. Studi Nat. Romagna*, 3: 3-22, Cesena.
- Tamajo E. (1937) - Il Piano Siciliano e le sue relazioni paleontologiche col Calabriano in base allo studio di un nuovo giacimento del bacino di Palermo. *Boll. Soc. Geol. Ital.*, 56: 457-466, Roma.
- Terrenzi G. (1886) - Il Pliocene nei dintorni di Narni. *Boll. Soc. Geol. Ital.*, 5: 321-336, Roma.
- Trabucco G. (1888) - Fossili del Bacino pliocenico di Rio Orsecco (Carpeneto). Memoria preliminare. V. of 40 pp., A. Freiburger & C., Como.
- Trono D. (2007) - Nuovi dati sulla malacofauna del Salento (Puglia meridionale). *Boll. Malac.*, 42 (2006): 58-84, Napoli.
- Tropeano D., Arduino L., Bosso C. & Fornaro M. (1984) - Il Pliocene di La Loggia (Torino). *Riv. Piem. St. Nat.*, 5: 55-67, Torino.
- Tuccimei G. A. (1880) - I colli pliocenici di Magliano Sabino. Contribuzione alla storia dei terreni subappennini. *Gli Studi in Italia*, 2, reprint of 21 pp., Roma.
- Ugolini P. R. (1898) - Contribuzione allo studio del Pliocene di una parte del bacino dell'Era. *Boll. Soc. Geol. Ital.*, 17, reprint of 5 pp., Roma.
- Ugolini P. R. (1899) - Molluschi nuovi o poco noti del Pliocene della Val d'Era. *Riv. It. Paleont.*, 5, reprint of 5 pp., Bologna.
- Valleri G., Bertoldi R. & Bertini A. (1990) - Studio delle associazioni a foraminiferi e a pollini del Pliocene di Ponte a Elsa (Valdarno Inferiore, Toscana). *Boll. Soc. Paleont. Ital.*, 29: 321-333, Modena.
- Venzo S. & Pelosio G. (1963) - La Malacofauna Tortoniana del Colle di Vigoleno (Preappennino Piacentino). *Palaentogr. Ital.*, 58: 43-213, Pisa.
- Verri A. (1886) - Azione delle forze nell'assetto delle valli, con appendice sulla distribuzione dei fossili nella Valdichiana e nell'Umbria interna settentrionale. *Boll. Soc. Geol. Ital.*, 5: 416-454, Roma.
- Villa R. (1986) - Revisione sistematica della famiglia Naticidae (Mollusca: Gastropoda) nel Mar Mediterraneo. *Notiz. CISMMA*, 8-9 (1985/86): 15-20, Roma.
- Violanti D. (1987) - Analisi paleoambientali e tassonomiche di associazioni a Foraminiferi del Pliocene ligure (Rio Torsero). *Boll. Mus. Reg. Sci. Nat. Torino*, 5: 239-293, Torino.
- Wienrich G. (2001) - Die Fauna des marinen Miozäns von Kevelaer (Niederrhein). Band 3 Gastropoda bis Cancellariidae: 383-639 pp., Backhuys Publishers BV, Leiden.
- Wood S. V. (1848) - A monograph of the Crag Mollusca, with descriptions of shells from the Upper Tertiaries of the British Isles. Vol. I. Univalves. V. of 208 pp., Palaeontographical Society, London.
- Wrigley A. (1949) - English Eocene and Oligocene Naticidae. *Proc. Malac. Soc.*, 28: 10-30, London.

Zuffardi Comerci R. (1929) - La fauna pliocenica di Masserano-Cossato (Biellese). *Atti R. Acc. Sci. Torino*, 64: reprint of 9 pp., Torino.

APPENDIX 1 (Material of species considered for comparison)

Euspira catena (da Costa, 1778)

Pl. 1, fig. 4; Pl. 3, figs. 3, 23

Pliocene - Doel, Belgium: 1 spm., MZB 41224, 7 spms., NP 9820.

Pleistocene - Arda II: 1 spm., NP 9817, 1 spm., MZB 15715; Pisticci: 2 spms., MZB 004807; Cutrofiano: 3 spms., NP 9818, 1 spm., MPUM 9825.

Recent - Portobello Beach, Edinburgh, Scotland: 2 spms., MZB 003852; Camaret sur Mer, France: 3 spms., MZB 42249, 3 spms., MZB 42299; Granville, France: 1 spm., MPUM 9782; Marseilles, France: 1 spm., NP 9819, 5 spms., PCM 100, 1 spm., MPUM 9816; Sainte Marie de la Mer, France: 1 spm., PCM 905.

Euspira helicina fusca (Blainville, 1825)

Pl. 1, fig. 19; Pl. 3, fig. 9; Pl. 4, fig. 11

Pleistocene - Arda II: 1 spm., MZB 15679, 3 spms., MZB 15658; Bora Val Chero: 13 spms., MZB 10851, 3 spms., MZB 10852, 12 spms., MZB 10853; Pomezia: 5 spms., private collection; Archi: 1 spm., MZB 005249, 2 spms., private collection; Pecoraro: 1135 spms., private collection, 1 spm., MPUM 9819, 1 spm., MPUM 9820, 1 spm., MGGC 23424, 1 spm., MGC 1379, 1 spm., MZB 31672, 1 spm., GF 1173; Bovetto: 5 spms., private collection; Torrente Boscaino: 3 spms., private collection; Acqua dei Corsari, Ficarazzi: 13 spms., MZB 11250, 6 spms., MZB 11252; Tuscan Archipelago, Urania St. ET95-D21: 1 spm., MZB 15738.

Recent - Almeria, Spain: 1 spm., MZB 15628; Spain: 1 spm., PCM 688; Balearic Islands: 1 spm., MZB 15659; western Mediterranean Sea: 1 spm., MZB 15643; Mediterranean Sea: 1 spm., MZB 15657, 1 spm., MZB 15665, 2 spms., NP 9823; Tyrrhenian Sea: 1 spm., MZB 42984; Nettuno, Latina: 1 spm., NP 9821; Acitrezza, Sicily: 1 spm., NP 9822; Siracusa: 8 spms., PCM 475; Adriatic Sea: 1 spm., MZB 15673; Pescara: 2 spms., MZB 15635; Baia del Re, Fano: 1 spm., MZB 15638; Lower Adriatic Sea: 1 spm., MZB 15674; Puglia: 1 spm., MZB 006655; off Bari: 1 spm., MZB 15664; Mola di Bari, Bari: 1 spm., PCM 474; Jugoslavia: 2 spms., MZB 15614.

Euspira macilenta (Philippi, 1844)

Pl. 1, fig. 7; Pl. 3, fig. 5; Pl. 4, fig. 2

Pleistocene - Bora Val Chero: 3 spms., MZB 11839, 143 spms., MZB 15639; Torrente Stirone (Mille Pioppi): 10 spms., MZB 7412; Fauglia: 3 spms., NP 9810; Pomezia: 3 spms., NP 9811, 11 spms., private collection; Ravagnese: 1 spm., private collection; Archi: 10 spms., private collection; Pecoraro: 2 spms., MZB 005418, 60 spms., private collection; Porcaro: 262 spms., NP 9812, 1 spm., MPUM 9818, 10 spms., MPUM 9826; 1 spm., MGGC 23425, 1 spm., MGC 1380, 1 spm., MZB 31673, 1 spm., GF 1174; Bovetto: 3 spms., MZB 005335, 4 spms., MZB 005336, 76 spms., private collection; Torrente Boscaino: 222 spms., private collection; Contrada Manicalunga, Trapani: 30 spms., MZB 15666.

Holocene - Upper Adriatic Sea (gravity core): 2 spms., MZB 15663.

Recent - El Ejido, Almeria, Spain: 1 spm., NP 9814; Manilva, Malaga, Spain: 6 spms., private collection; Circeo: 1 spm., MPUM 9817;

Aeroporto, Reggio Calabria: 4 spms., private collection; Chioggia: 2 spms., NP 9813; Lido degli Estensi, Comacchio: 2 spms., NP 9815, 1 spm., MPUM 9744; Riccione: 1 spm., NP 9816; Kerkennah Island, Tunisia: 2 spms., MZB 15850.

Neverita josephina Risso, 1826

Pl. 2, fig. 10; Pl. 3, fig. 16; Pl. 4, fig. 18

Pleistocene - Arda II: 4 spms., MZB 15631; Bora Val Chero: 1 spm., MZB 10849, 1 spm., MZB 15636, 30 spms., MZB 11840; Ravagnese: 1 spm., private collection; Pecoraro: 3 spms., private collection; Porcaro: 1 spm., MPUM 9824; Bovetto: 1 spm., private collection; Torrente Boscaino: 5 spms., private collection; Ficarazzi: 1 spm., MZB 11251.

Recent - Savona: 1 spm., MZB 30236; Orbetello (Feniglia): 1 spm., MPUM 9822, 1 spm., MPUM 9823; Punta Pioppeto, Procida: 2 spms., private collection; Stagnone di Marsala, Trapani: 1 spm., MZB 15629; Adriatic Sea: 1 spm., MZB 15641; Chioggia: 6 spms., NP 9809, 2 spms., MPUM 9827, 1 spm., MGGC 23426, 1 spm., MGC 1381, 1 spm., MZB 31674, 1 spm., GF 1175; Senigallia: 5 spms., MZB 45483; Bounuma, Tunisia: 1 spm., MZB 001816; Borji Castille, Tunisia: 1 spm., MZB 005929; Djerba Island, Tunisia: 1 spm., MZB 000340, 1 spm., MZB 000357, 8 spms., MZB 000372, 1 spm., MZB 000401, 5 spms., MZB 002910; Kerkennah Island, Tunisia: 4 spms., MZB 001851, 7 spms., MZB 001989.

APPENDIX 2 (Locality data)

Piedmont

1. **Cossato** (Biella Province). Diggings in the village, on the left bank of Torrente Strona, have exposed 0.50 m of fine, gray fine sand of Middle Pliocene age. For additional information, reference to Aimone & Ferrero Mortara (1983).

2. **Le Grottine**, Monale (Asti Province). Excavation at Santa Fiora, along the road connecting Monale to Baldichieri d'Asti. Yellow sand of late Zanclean to early Piacenzian age (cf. Pavia, 1980 and Carretto, 1989).

3. **La Loggia** (Torino Province). Diggings in the bed of Po River, approximately 2 km northeast of La Loggia (south of Turin). Medium to fine, fossiliferous gray sand of late Zanclean to early Piacenzian age. For additional information, reference to Tropeano et al. (1984).

4. **Rio di Bocca d'Asino** (Alessandria Province). Exposures on both banks of the brook named Rio di Bocca d'Asino, upstream of the road connecting Stazzano to Sardigliano, about 1.9 km northeast of the former village. Resedimented sandstones and conglomerates forming lenticular bodies into the lower member of the S. Agata Fossili Formation; the age is Tortonian. For additional information, reference to Bongo (1914) and Ghibaudo et al. (1985).

5. **Villalvernia** (Alessandria Province). Exposure on the right bank of the stream Rio Vaccaruzza, northeast of the village of Villalvernia. Fine sand, more or less clayey, pertaining to the uppermost part of the Argille di Lugagnano; the age is likely Piacenzian. For additional information, reference to Brambilla (1976).

6. **Volpedo** (Alessandria Province). A 30.5 m thick section exposed on the left side of the stream Rio Limbione, between La Cascinetta and Cascina Piani, 2 km east of the village of Volpedo. Silty sand is the dominant lithotype, with minor intercalations of sandy silt and sandstone, likely forming the transition between the Argille di Lugagnano and the Sabbie di Asti (Asti Sand); this section was assigned a general Pliocene age. For additional information, reference to Benigni & Corselli (1982).

Liguria

7. **Bussana Vecchia**, Sanremo (Imperia Province). Active quarry north of Bussana Vecchia, about 200 m beyond the A 10 highway connecting Genova to the state border at Ventimiglia. The quarry exposes a 14 m thick section of gray, unbedded clayey silt belonging to the Argille di Ortovero (Ortovero Clay); the age is late Zanclean to early Piacenzian.

8. **Rio Torsero**, Albenga (Savona Province). The Pliocene deposits crop out on both sides of the stream Rio Torsero, where the A 10 highway bridges the stream, southwest of the village of Ceriale near Albenga. The section exposes 8.50 m of light gray, very sandy clayey silt forming the uppermost part of the Argille di Ortovero. The clayey silt yielded planktonic foraminiferal assemblages pointing toward a MPL3 to MPL4, i.e. a late Zanclean to early Piacenzian age. For additional information, reference to Violanti (1987) and Bernasconi & Robba (1994).

Emilia

9. **Arda**, Castell'Arquato (Piacenza Province). At the foot of gully on the left side of Torrente Arda, along the road connecting Castell'Arquato to Lugagnano, approximately 2 km southwest of the former village. Gray sandy clay belonging to the Argille di Lugagnano (Lugagnano Clay) of Piacenzian age (cf. Rio et al., 1988).

10. **Bacedasco** (Piacenza Province). Gully on the left side of Torrente Ongina, south of Costa Stradivari, about 1.5 km southwest of the village of Bacedasco. Gray sandy clay (Argille di Lugagnano) of Piacenzian age (cf. Rio et al., 1988 and Raffi et al., 1989).

11. **Badagnano** (Piacenza Province). Gully named Rio dei Carbonari, on the right side of Torrente Chero, about 0.5 km southeast of the village of Badagnano. Gray sandy clay belonging to the Formazione di Castell'Arquato (Castell'Arquato Formation); the age is likely Piacenzian (cf. Raffi, 1982).

12. **Balzo del Musico**, Monte S. Pietro (Bologna Province). Slope cut (presently hindered by a wall) for housing project on the left of the road connecting Rivabella to Monte S. Pietro, about 0.35 km southwest of Landa. Gray clayey sand of Late Pliocene age. The locality was dealt with by Busacchi (1896).

13. **Diolo** (Piacenza Province). Cliff on the left side of Torrente Chiavenna, right southwest of the village of Diolo. Gray sandy clay (Argille di Lugagnano) of Piacenzian age (cf. Raffi, 1982).

14. **La Valle** (Piacenza Province). Small gully on the left side of the stream named Torrente Vezzeno, close to the village of La Valle. Gray sand and sandy clay (lower member of the Formazione di Castell'Arquato) of Piacenzian age (cf. Raffi, 1982).

15. **Lugagnano** (Piacenza Province). Large active quarry (R.D.B. brick factory) approximately 1,2 km southeast of Lugagnano. Gray clay (Argille di Lugagnano) of Zanclean age (cf. Rio et al. 1988).

16. **Montegibbio**, Sassuolo (Modena Province). Gully on the right side of the stream named Rio delle Bagole and small exposure about 400 m south of Cà del Chierico, coinciding respectively with collecting sites C₂ and C₃ of Davoli (1972). Gray clayey marl belonging to the Formazione del Termina (Termina Formation); the age is Tortonian.

17. **Montemaggiore** (Bologna Province). Small gully just behind (north) the church of the village of Montemaggiore, 2.5 km north of Monte S. Pietro. Gray sandy clay overlain by yellow, medium to very coarse sand. The naticids were recovered from the clayey layer. According to the Geological Map of Italy (scale 1:100,000, Sheet 87, Bologna), the age is Late Pliocene.

18. **Montezago** (Piacenza Province). Small gully near Chiesa di Montezago. Yellow, medium sand (lower member of the Castell'Arquato Formation) of early Piacenzian age (cf. Raffi, 1982).

19. **Pradalbino I** (Bologna Province). Gully southwest of the ruined church of Pradalbino, 4.5 km south southeast of Crespellano.

Bluish-gray, sandy clay of Late Pliocene age. For additional information, reference to Bongiorno (1963).

20. **Pradalbino II** (Bologna Province). Wide gully northeast of the ruined church of Pradalbino exposing bluish-gray silty clay of Late Pliocene age. For additional information, reference to Bongiorno (1963).

21. **Rio Rosello**, near Sariano (Piacenza Province). Right bank of Rio Rosello, about 280 m southwest of Case Badini di Sopra. Lenticular body of clayey sand belonging to the Monte Zago Unit of Piacenzian age. For additional information, reference to Pedriali & Robba (2001).

22. **San Lorenzo in Collina** (Bologna Province). Wide gully north of the church of the village of San Lorenzo in Collina, east of Pradalbino. According to the Geological Map of Italy (scale 1:100,000, Sheet 87, Bologna), the age of the bluish-gray clay is Late Pliocene.

23. **Torrente Stirone** (Parma Province). A Plio-Pleistocene section crops out on both banks of the stream, southwest of the town of Fidenza. The naticids were recovered northwest of the church named San Nicomede, from the lower part of level 3 of Papani & Pelosio (1962); the clayey lithotype is of Piacenzian age. For additional information, reference to Papani & Pelosio (1963) and Pelosio & Raffi (1977).

Tuscany

24. **Balze di Caspreno** (Siena Province). Gully on the left side of the Arbia River, approximately 0.5 km south of the village of Vico d'Arbia and about 5 km east of Siena. Gray sandy clay of Early Pliocene age. For further information, reference to Manganelli & Giusti (1997).

25. **Barca**, Castelnuovo Berardenga (Siena Province). Excavation near Barca, approximately 4 km west of Castelnuovo Berardenga. Yellow, medium sand presumably of Early Pliocene age.

26. **Bibbiano**, Poggibonsi (Siena Province). Outcrops (Pietrafitta, Fosso di Libbiano, Podere Melograni, Poggio alla Staffa) around the village of Bibbiano, 4 km southwest of Poggibonsi. Yellow medium sand, locally gray sandy clay reported to be of Middle Pliocene age (Bogi et al. 2002).

27. **Calanchi di San Martino**, Castelfiorentino (Firenze Province). Gully along the road connecting San Martino to Pian Grande, approximately 0.7 km west of the former locality. Greenish-yellow coarse sand; the age is Early-Mid Pliocene (cf. Dominici et al. 1997).

28. **Cava I Soddi** (Siena Province). Wide active quarry (brick factory) near the railway station of Castelnuovo Berardenga. Gray clay of Early Pliocene age (Bogi et al. 2002).

29. **Ciuciano** (Siena Province). Deep plowings in the area locally called Uliveta, 0.4 km west of the village of Ciuciano have unearthed yellowish rather fine sand of Early Pliocene age. For additional information, reference to Forli & Dell'Angelo (2000).

30. **Fauglia** (Pisa Province). Quarry named Montalto approximately 1 km east of Fauglia. Gray clay of Early Pleistocene age. For additional information, reference to Brunetti et al. (2008).

31. **Il Campino**, Rapolano Terme (Siena Province). Small outcrop in the area locally named Terre Rosse, along the road connecting Siena to Monte S. Savino, approximately 1.5 km near the junction to road 326. Yellow clayey sand of late Zanclean age. For additional information, reference to Laghi (1984).

32. **Il Treppié**, Poggibonsi (Siena Province). Approximately 2.5 km northwest of Poggibonsi, on the right of the road connecting Poggibonsi to Certaldo, at the level of Linari. A small outcrop exposes about 2 m of unbedded fine to medium, more or less clayey sand of late Zanclean age. For further information, reference to Pantoli & Raffi (1981).

33. **Linari**, Barberino Val d'Elsa (Firenze Province). Deep plowings 0.5 km south of the hamlet of Linari, on the left of the road

leading to state road 429, have unearthed yellow medium sand of Middle Pliocene age (Bogi et al. 2002).

34. **Marcialla**, Barberino Val d'Elsa (Firenze Province). Slope cut west of the village of Marcialla and adjacent to it. Gray clayey sand of Early-Mid Pliocene age (cf. Dominici et al. 1997).

35. **Monsindoli** (Siena Province). Quarry close to the village of Monsindoli. Gray clay of Early Pliocene age (cf. Manganelli et al. 2004).

36. **Montaione** (Firenze Province). Deep plowings in front of the country-house Villa Filicaia, approximately 0.5 km southeast of the village of Montaione, have unearthed gray medium to coarse pebbly sand belonging to the unit named Sabbie di Gambassi (Gambassi Sand). According to Dominici et al. (1997), the age is Early Pliocene. For additional information, reference to Della Bella & Scarponi (2001).

37. **Montenero**, Castel del Piano (Grosseto Province). Decommissioned small quarry approximately 1.7 km southeast of Montenero. The naticids were recovered from a 50 cm thick layer of black to gray clay of Zanclean age. For additional information, reference to Forli et al. (1999).

38. **Orciano Pisano** (Pisa Province). Deep plowings all around an electric power substation, approximately 1.5 km southwest of the village of Orciano Pisano, have unearthed brown-greenish clay of Zanclean age.

39. **Ponte a Elsa**, San Miniato (Pisa Province). Quarry west of Ponte a Elsa and adjacent to it. Grey sandy to silty clay forming the basal part of the exposed section. The age is Late Pliocene. For further information, reference to Valleri et al. (1990).

40. **Spicchio**, Empoli (Firenze Province). Decommissioned quarry of a brick factory in the northern suburbs of Empoli, near the small village of Spicchio. Gray sandy clay of Early-Mid Pliocene age (cf. Dominici et al., 1997).

Latium

41. **Guidonia** (Roma Province). Wide quarry near Guidonia, in the locality named Formello. Dark-gray clay and sandy clay of Zanclean or early Piacenzian age. For further information, reference to Mancini (1997).

42. **Pomezia** (Roma Province). Quarry named Cava Tacconi near I Centro di Campo Selva, some 3 km southwest of Pomezia. The naticids were recovered from the 2 m thick *Arctica* sand of Early Pleistocene age. For further information, reference to Malatesta A. & Zarlenga F. (1985).

Puglia

43. **Cutrofiano** (Lecce Province). A decommissioned quarry named Cava Lustrelle exposes gray silty clay of Early Pleistocene age. For further information, reference to Dell'Angelo et al. (2007).

Calabria

44. **Bovetto**, Croce Valanidi (Reggio di Calabria Province). Small excavations in the area named Trombaca, between Vallone Bovetto and Fiumara d'Arno, about 1 km north-northwest of Croce Valanidi. Gray-brown "*Strombus* sand" with fine gravel and pebbles; the age is Tyrrhenian. For further information, reference to Bonfiglio (1972).

45. **Pecoraro**, Laureana di Borrello (Reggio di Calabria Province). Excavations and deep plowings in the area of the farm named Pecoraro, about 3 km northwest of Laureana di Borrello. Gray silt with thin lenticular intercalations of grayish fine sand that yielded the naticids. The age is Early Pleistocene (P. Crovato, personal communication 2008).

46. **Porcaro**, Feroletto della Chiesa (Reggio di Calabria Province). Excavations in the area named Contrada Porcaro, about 2.25 km northwest of Feroletto della Chiesa. Gray fine sand; the age is Early Pleistocene (P. Frediani, personal communication 2006).

47. **Ravagnese** (Reggio di Calabria Province). Excavations (presently hindered by buildings) in the area named Galluccio, about 700 m east of Ravagnese. Gray-brown "*Strombus* sand" with fine gravel and pebbles; the age is Tyrrhenian. For further information, reference to Bonfiglio (1972).

48. **Torrente Boscaino**, Oppido Mamertina (Reggio di Calabria Province). Cliff on the left bank of the stream (Fiumara Boscaino), about 1.4 km northeast of the hamlet of Castellace. A section, approximately 30 m thick, exposes alternating layers of gray silty clay and fine sand; the age is Early Pleistocene (P. Crovato, personal communication 2008).

Sicily

49. **Altavilla Milicia** (Palermo Province). Cliff on the right bank of Milicia River, close to the northwestern end of Altavilla Milicia, corresponding to collecting site 5 of Moroni & Paonita (1964). Section, over 40 m thick, of yellow sand ("*Altavilla Sand*" of Ruggieri et al. 1967) with abundant fossil mollusks. The reported age is Early Pliocene. For further information, reference to Moroni & Paonita (1964) and Ruggieri et al. (1967).

