

New ecological and taxonomical data on some Ptenoglossa (Mollusca, Caenogastropoda) from the Gulf of Catania (Ionian Sea)

Danilo Scuderi & Francesco Criscione

Dipartimento di Biologia Animale, Università di Catania, Via Androne, 81, 95124 Catania, Italy. Corresponding author: Danilo Scuderi, danscu@tin.it

ABSTRACT Ptenoglossans, well known as parasites of marine invertebrates, are one of the less common and less studied groups of caenogastropods. Most of the α -taxonomy of their Mediterranean representatives is still source of debate and very few data are known on their ecology. A considerable amount of fresh and living material of several ptenoglossan from the Gulf of Catania was available for study. Based on this material we here provide information on the distribution and ecology (e.g. habitat and host preference) of some relevant ptenoglossan species. In particular the distribution of *Similiphora similior* (Bouchet & Guillemot, 1978), *Pogonodon pseudocanarica* (Bouchet, 1985), *Cerithiopsis ladae* Prkic & Buzzurro, 2007, *Epitonium pseudonanum* Bouchet & Warén, 1986, *Melanella lubrica* Monterosato, 1890, and *Pelseneeria minor* Koehler & Vaney, 1908 were extended to the Ionian Sea and the host is reported for: two triphorids, one cerithiopsid, one epitoniid, three *Melanella* Bowdich, 1822 and other two eulimids. The particularly good conditions of the material studied also allowed some novel and important observations on the morphology to be made and provided the opportunity to discuss the taxonomy of some groups. Descriptions of the head-foot colour pattern were provided for one triphorid, three species of *Cerithiopsis* Forbes & Hanley, 1851, one epitoniid and three eulimids.

KEY WORDS Ptenoglossa, Mollusca Gastropoda, Gulf of Catania, host-parasite relationships.

Received 15.03.2011; accepted 26.03.2011; printed 30.03.2011

INTRODUCTION

The term Ptenoglossa has been traditionally used to indicate a group of mainly marine molluscs possessing a “comb-like” (ptenoglossate) radula (Gray, 1853). The taxonomical rank of Ptenoglossa has changed throughout the past decades and so has the number of families included (for an historical account see Warén, 1999; Giannuzzi-Savelli et al., 1999). Today no evidence support a ptenoglossan clade and data coming from both morphology (see Ponder & Lindberg, 1997 and references therein) and DNA sequences (e.g. Colgan et al., 2007; Ponder et al., 2008) reveal the paraphyly or polyphyly of the group.

According to the currently accepted classification (Bouchet et al., 2005), Ptenoglossa are an informal group within the Caenogastropoda composed by eight families. Among ptenoglossan families,

only six (Epitoniidae, Janthinidae, Eulimidae, Aclididae, Triphoridae, Cerithiopsidae) have Mediterranean representatives.

In Europe there are 329 species of Ptenoglossa divided into 85 genera of 7 families (data from CLEMAM, Check List of European Marine Mollusca Database, <http://www.somali.asso.fr/clemam/index.clemam.html> searched on March 2011): Aclididae (10 species, 3 genera), Cerithiopsidae (44 species, 11 genera), Epitonidae (73 species, 19 genera), Eulimidae (169 species, 40 genera), Janthinidae (4 species, 1 genus), Triforidae (10 species, 1 genus), Triphoridae (19 species, 10 genera). Ptenoglossan are present in Italian waters with 112 species divided into 40 genera of 6 families: Aclididae (8 species, 3 genera), Cerithiopsidae (18 species, 4 genera), Epitonidae (24 species, 10 genera), Eulimidae (38 species, 16 genera), Janthinidae (3 species, 1 genus), Triphoridae (11 species, 8

genera) (Oliverio, 2008). It should be noted here that the supra-familiar classifications adopted by the above mentioned checklists have not been updated according to the current taxonomy of Gastropoda (Bouchet et al., 2005)

Some ptenoglossan families have been studied in some detail and a few revisions are available based almost exclusively on shell characters. (e.g. Fretter & Graham, 1982; Warén, 1983, 1988; Bouchet, 1984; Bouchet & Warén, 1986, 1993). Studies on other morphological characters are scarce and detailed anatomical accounts to date are lacking (for a discussion see Ponder & Lindberg, 1997).

Ptenoglossan families are particularly rich in species and their shells characters often show a high degree of convergence. For these reasons, their identification is very difficult and their α -taxonomy has often been source of great debate. Due to their beautiful shells, epitoniid species are probably best known and easier to identify. Eulimid shells have often very small dimensions and unreliable sculptural features. Similar reasons have led some authors to hypothesize a species complex status for some cerithiopsid and triphorid taxa, although these views are not universally accepted (Warén, 1999).

Based on some field observations and the gross anatomy of their alimentary systems, ptenoglossans are commonly considered as parasites (Fretter & Graham, 1962). Epitoniids feed mainly on Anthozoa (but also Zoantharia, Scleractinia, and Ceriantharia (Den Hartog, 1987), cerithiopsids and triphoriids are usually associated with sponges. The host-parasite relationship is best studied in eulimids whose genera seem to have a strict preference for individual classes of echinoderms (Warén, 1983).

Fresh specimens of several Mediterranean ptenoglossans species are hard to find and there are only few field observations for most taxa. For these reasons, the data presently available on the biology and ecology of Mediterranean ptenoglossans are based on observations of only a few common species.

In the present study we had access to a considerable amount of fresh and living specimens of Ptenoglossa, collected in several localities and from various biocenoses and substrates along the Gulf of Catania (Mediterranean, Ionian Sea).

Based on this material we here provide relevant information on the biology and the ecology of some species of Ptenoglossa, which contribute to the general understanding of this enigmatic group of caenogastropods in Mediterranean.

Thanks to the particular good conditions of our material, we were also able to perform several important observations on shell and external soft parts of some ptenoglossan species and their implications with respect to the taxonomical status of these species are here discussed.

MATERIALS AND METHODS

The source of the material here under study is twofold, being mostly obtained during an extensive sampling campaign (Scuderi et al., 2005) and partly collected in separate occasions by one of the authors (D.S.).

The area of the sampling campaign was the whole Gulf of Catania (Ionian Sea), extending from Capo Mulini southwards to Capo Campolato. Samples were performed, along 21 transects orthogonal to the coastline (Fig. 1), on five stations each transect (at depths of 3, 10, 20, 30, 50 m), totalling 105 stations.

Hard substrates were sampled by SCUBA diving with the technique of scraping (Bellan-Santini, 1969). A 1 mm mesh net was used to prevent the loss of microbenthic fraction. Sampling on soft substrates was performed by a 15 l Van Veen grab (Castelli et al., 2003) and sieved on a 1 mm mesh sieve to remove the finest substrate fraction.

Among the collected samples, a fraction composed by material larger than 1 mm (containing most of the ptenoglossans collected) plus several macroinvertebrates (e.g. echinoderms) were kept alive and the rest immediately fixed and preserved in 4% formaldehyde in seawater. All material was transferred to the laboratory, where under a stereomicroscope, fresh specimens of benthic fauna were isolated from the rest of the samples and sorted into major taxonomical groups. Ptenoglossan specimens were separated and identified at species level. Number of specimens (abundance) and species (diversity) was recorded for each ptenoglossan family.

Each sample was assigned to its original biocenosis (according to Pérès & Picard, 1964), which was inferred based on observation of the substrate and benthic fauna collected.

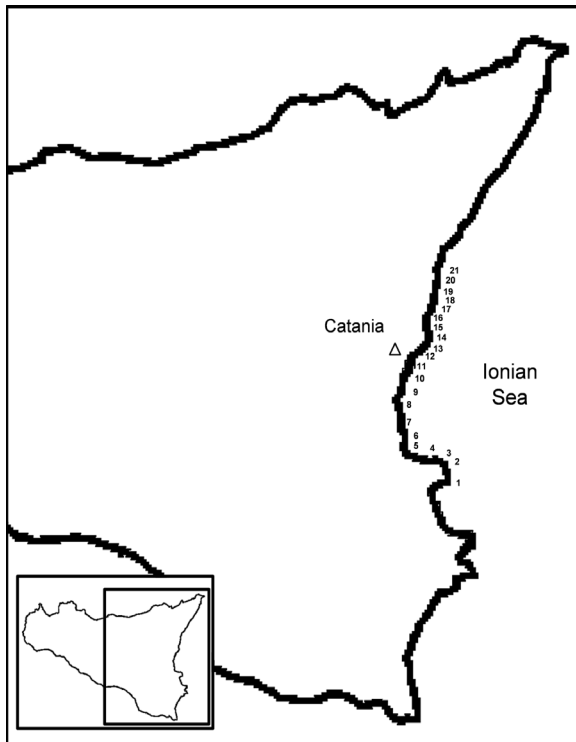


Figure 1. Map of the sampled area and of the BCGC transects. 1: Capo Santa Croce, 2: Capo Campolato, 3: Brucoli, 4: Punta Castelluccio, 5: Agnone, 6: San Leonardo, 7: Simeto, 8: Simeto Nord, 9: Catania Sud "Plaja", 10: Catania, 11: Ognina, 12: Aci Castello, 13: Acitrezza, 14: Capo Molini, 15: Santa Caterina, 16: Santa Maria La Scala, 17: Santa Tecla, 18: Pozzillo, 19: Praiola, 20: Torre Archirafi, 21: Riposto.

Details on the specimens collected separately by D.S. are given case by case in the discussion section below.

Observations on the distribution and ecology of ptenoglossan species (such as habitat preference, host-parasite relationship) were performed based on collected material. Teleoconch and protoconch features were observed under a stereomicroscope and protoconch microsculpture was revealed by treating the specimens with 70% Silver Proteinat. Observations were also performed on external soft parts morphology and colour pattern in live-collected material. Colour drawings of the head-foot were also produced, being published elsewhere (Scuderi, in press). Description of external soft-body parts and redescription of relevant shell features were provided for some species. The implication of these with the taxonomical status of the latter ones was also discussed.

The following abbreviations are used in the text: AP – photophilic algae biocenosis; BCGC – Study for the Biocenotic Characterization of the Gulf of Catania; C – coralligenous biocenosis; Di.S.Te.B.A - Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali, Università del Salento, Italy; DC –

coastal detritic biocenosis; BMNH: British Museum of Natural History; SFBC - biocenosis of fine well-sorted sands; SGCF – biocenosis of coarse sands and fine gravels under bottom currents; VTC – terrigenous muds biocenosis.

Transitional environments between two biocenoses (ecotones) are indicated by two biocenosis abbreviations separated by a forward slash (/).

RESULTS

• BCGC campaign

On a total of 493 mollusc species and over 42000 specimens sampled, *Ptenoglossa* accounted for 36 species and 228 individuals.

Collected samples were assigned to 6 biocenoses and 9 ecotones. Among them, only samples from 4 biocenoses (AP, SFBC, DC and VTC) and 6 ecotones (AP/C, SFBC/DC, SFBC/VTC, SFBC/SGCF, DC/SGCF and DC/VTC) contained ptenoglossan taxa.

The highest abundance of ptenoglossans (Fig. 2) was recorded in AP while the lowest in VTC and in AP/C and SFBC/VTC. The highest diversity (Fig. 2) was found in DC/SCGF, and the lowest in AP/C, SFBC/DC, SFBC/VTC, and VTC.

The five ptenoglossan families here collected never occurred together. However, if Aclididae are excluded, all families were found in AP, SFBC/SCGF, DC, DC/VTC and DC/SGCF. Triphorids only occurred in AP/C and epitoniids only in SFBC/DC, SFBC/VTC and VTC. Epitoniids were the most widespread, occurring in every sample containing ptenoglossans, excluding those from AP/C and SFBC, whereas aclidids were exclusively present in those from SFBC.

AP biocenosis accounted for the highest number of specimens of all ptenoglossan families,

with the exclusion of epitoniids whose highest abundance was found in DC/VTC. This family showed also there the highest diversity, whereas triphorid species were more abundant in AP and those of eulimids and cerithiopsids in DC/SCGF.

Table 1 and Table 2 list the ptenoglossan families and species collected and summarize the data obtained on their abundance, diversity and habitat preference.

Figure 2 shows the occurrence of families relative to individual biocenoses and illustrate their relative abundance and diversity.

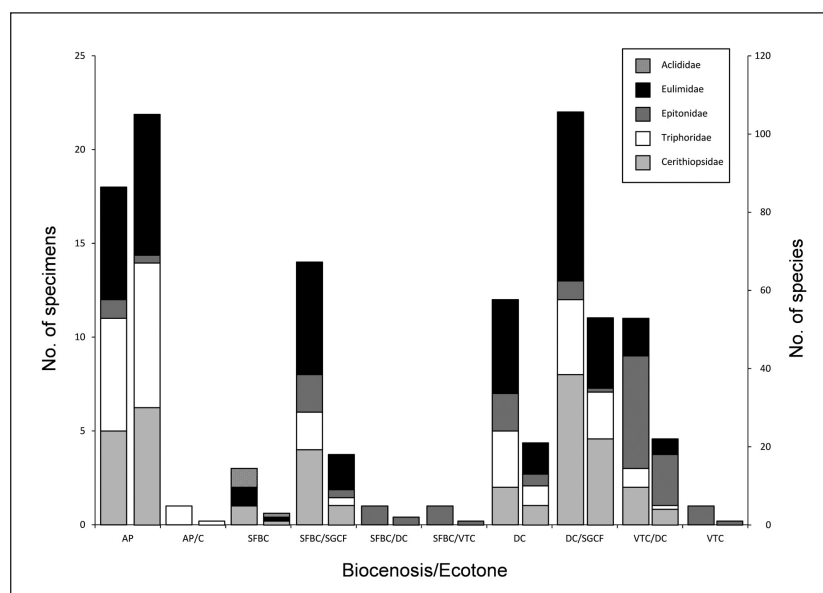


Figure 2. Diversity (left bar) and abundance (right bar) of Ptenoglossa and their families collected in the BCGC sample campaign. Data are shown relative to the original biocenosis of sampling.

	AP	AP/C	SFBC	SFBC/ SGCF	SFBC/ DC	SFBC/ VTC	DC	DC/ SGCF	VTC/ DC	VTC	Total
Abundance											
Cerithiopsidae	30	-	1	5	-	-	5	22	4	-	67
Triphoridae	37	1	-	2	-	-	5	12	1	-	58
Epitonidae	2	-	-	2	2	1	3	1	13	1	25
Eulimidae	36	-	1	9	-	-	8	18	4	-	76
Aclididae	1	-	1	-	-	-	-	-	-	-	2
Total abundance	106	1	3	18	2	1	21	53	22	1	228
Diversity											
Cerithiopsidae	5	-	1	4	-	-	2	8	2	-	10
Triphoridae	6	1	-	2	-	-	3	4	1	-	7
Epitonidae	1	-	-	2	1	1	2	1	6	1	6
Eulimidae	6	-	1	6	-	-	5	9	2	-	12
Aclididae	1	-	1	-	-	-	-	-	-	-	1
Total diversity	19	1	3	14	1	1	12	22	11	1	36

Table 1. Abundance, diversity and distribution in the samples of collected ptenoglossan families

	AP	AP/ C	SFBC	SFBC/ SGCF	SFBC/ DC	SFBC/ VTC	DC	DC/ SGCF	DC/ VTC	VTC	Total
Cerithiopsidae											
<i>Cerithiopsis diadema</i> Monterosato, 1874 ex Watson ms.	-	-	-	-	-	-	2	-	-	-	2
<i>Cerithiopsis fayalensis</i> Watson, 1886	-	-	-	-	-	-	-	1	-	-	1
<i>Cerithiopsis jeffreysi</i> Watson, 1885	-	-	-	1	-	-	-	1	-	-	2
<i>Cerithiopsis minima</i> (Brusina, 1865)	1	-	-	1	-	-	-	3	-	-	5
<i>Cerithiopsis nana</i> Jeffreys, 1867	14	-	-	2	-	-	-	3	-	-	19
<i>Cerithiopsis tubercularis</i> (Montagu, 1803)	12	-	1	1	-	-	3	5	2	-	24
<i>Krachia cylindrata</i> (Jeffreys, 1885)	-	-	-	-	-	-	-	2	2	-	4
<i>Dizoniopsis coppolae</i> (Aradas, 1870)	2	-	-	-	-	-	-	6	-	-	8
<i>Dizoniopsis micalii</i> Cecalupo & Villari, 1997	1	-	-	-	-	-	-	-	-	-	1
<i>Seila trilineata</i> (Philippi, 1836)	-	-	-	-	-	-	-	1	-	-	1
Triphoridae											
<i>Cheirodonta pallescens</i> (Jeffreys, 1867)	2	-	-	-	-	-	1	-	-	-	3
<i>Monophorus erythrosoma</i> (Bouchet & Guillemot, 1978)	1	-	-	-	-	-	-	-	-	-	1
<i>Monophorus perversus</i> (Linné, 1758)	-	-	-	-	-	-	2	1	-	-	3
<i>Monophorus thiriota</i> Bouchet, 1984	11	-	-	1	-	-	-	-	-	-	12
<i>Marshallora adversa</i> (Montagu, 1803)	16	1	-	1	-	-	-	6	-	-	24
<i>Similiphora similior</i> (Bouchet & Guillemot, 1978)	4	-	-	-	-	-	-	2	-	-	6
<i>Metaxia metaxa</i> (Delle Chiaje, 1828)	3	-	-	-	-	-	2	3	1	-	9
Epitoniidae											
<i>Epitonium aculeatum</i> (Allan, 1818)	-	-	-	-	-	1	1	-	2	-	4
<i>Epitonium algerianum</i> (Weinkauff, 1866)	-	-	-	-	-	-	-	-	1	-	1
<i>Epitonium clathratulum</i> (Kanmacher, 1798)	-	-	-	1	-	-	-	-	3	-	4
<i>Epitonium commune</i> (Lamarck, 1822)	2	-	-	1	-	-	-	-	4	1	8
<i>Epitonium tiberii</i> (De Boury, 1890)	-	-	-	-	2	-	2	-	2	-	6
<i>Opalia (Nodiscalia) hellenica</i> (Forbes, 1844)	-	-	-	-	-	-	-	1	1	-	2
Eulimidae											
<i>Melanella alba</i> (Da Costa, 1778)	-	-	-	-	-	-	4	-	-	-	4
<i>Melanella boscii</i> (Payraudeau, 1827)	1	-	-	1	-	-	-	2	-	-	4
<i>Melanella frielei</i> (Jordan, 1895)	-	-	-	-	-	-	1	1	-	-	2
<i>Melanella cf. monterosatoi</i> (Mtrs., 1890 ex De Boury ms.)	-	-	-	-	-	-	-	1	-	-	1
<i>Melanella petitiana</i> (Brusina, 1869)	6	-	-	3	-	-	1	7	-	-	17
<i>Melanella polita</i> (Linné, 1758)	-	-	1	1	-	-	-	1	2	-	5
<i>Melanella cf. praecurta</i> (Pallary, 1904)	-	-	-	-	-	-	-	1	-	-	1
<i>Parvioris ibizenca</i> (Nordsieck, 1968)	5	-	-	2	-	-	1	1	-	-	9
<i>Vitreolina curva</i> (Monterosato, 1874 ex Jeffreys ms.)	1	-	-	-	-	-	1	2	-	-	4
<i>Vitreolina philippi</i> (Rayneval & Ponzi, 1854)	17	-	-	1	-	-	-	-	-	-	18
<i>Vitreolina perminima</i> (Jeffreys, 1883)	6	-	-	-	-	-	-	2	2	-	10
<i>Crinophtheiros comatulicula</i> (Graff, 1875)	-	-	-	1	-	-	-	-	-	-	1
Aclididae											
<i>Aclis ascaris</i> (Turton, 1819)	-	-	1	-	-	-	-	-	-	-	1
Total specimens	105	1	3	18	2	1	21	53	22	1	227
Total species	18	1	3	14	1	1	12	22	11	1	36

Table 2. List of ptenoglossan species collected and their distribution in samples

DISCUSSION

• Ecology

The distribution of ptenoglossan families with respect to biocenoses reflected the predictable distribution of their hosts. In other words, these molluscs occurred in environments where their hosts were more likely to occur. Their diversity and abundance was also consistent with this rule.

Triphoridae

Our data revealed a marked preference of triphorids for shallow rocky bottoms where these spongivorous snails presumably are able to find higher abundance of their host.

Along with the BCGC specimens of *Similiphora similior* (Bouchet & Guillemot, 1978), several others were also hand-collected by D.S. at S. Giovanni Li Cuti, by SCUBA diving in

shady environments on shallow rocky bottoms, with the presence of the red sponge *Spirastrella cunctatrix* Schmidt, 1868.

Two living specimens of *Metaxia metaxa* (Delle Chiaje, 1828) were collected in the same occasion.

Cerithiopsidae

Some species of Cerithiopsidae revealed marked preferences for certain biocenoses: *Cerithiopsis ladae* Prkic & Buzzurro, 2007 (Figs. 7, 7a), for example, was only found under the same conditions reported in the original description: it is probably linked to a specific, currently unknown host. Other species were, however, more ubiquitous and showed higher flexibility at colonizing different environments and probably are less specifically connected to a specific host.

In additions to those collected during the BCGC campaign (Table 2), some living specimens of *Cerithiopsis minima* (Brusina, 1865) were hand-collected by D.S. by SCUBA diving at S. Giovanni Li Cuti, in shady environments on shallow rocky bottoms, with the presence of the red sponge *S. cunctatrix*. It is not unlikely that in the area of study, this sponge is a suitable host for a considerable number of cerithiopsid and triphorid species (see above).

Epitoniidae

One living specimen of *Epitonium dendrophylliae* Bouchet & Warén, 1986 (Figs. 21-21a) was found by D.S. in Acitrezza. The snail was attached to a large colony of *Dendrophyllia ramea* (Linnaeus, 1758) accidentally collected by fishing nets. This rare epitoniid is known as an ectoparasite of species of the genera of scleractinian corals *Dendrophyllia* (Linnaeus, 1758) and *Balanophyllia* Wood, 1844 (Bouchet & Warén, 1986), the former usually occurring at considerable depth. Richter & Luque (2004) reported the species also for the shallow waters of Punta de la Mona (Granada province, SE Spain) in association with a different species of scleractinian, *Astroides calycularis* (Pallas, 1766), and provided a redescription of the taxon (with details of head-foot and the radula) along with a detailed iconography.

One specimen of *Epitonium pulchellum* Bivona Ant., 1832 (Fig. 22) was hand-collected

by D.S. by SCUBA diving in Acitrezza at depths of 35-38 m, in DC, where it was associated to the actinian *Condilactys aurantiaca* (Delle Chiaje, 1825). As a common condition of this latter species, the column was buried in the sediment and the snail was hiding between the base of the actinian tentacles (probably attached by the proboscis) and the sediment surface, sharing this cryptic environment with some decapods of the genus *Periclimenes* Costa, 1844. Examination of the gut content of *E. pulchellum* revealed the presence of several nematocysts, (some of which unexploded) referable to *C. aurantiaca* (S. Piraino, Di.S.Te.B.A., pers. comm.).

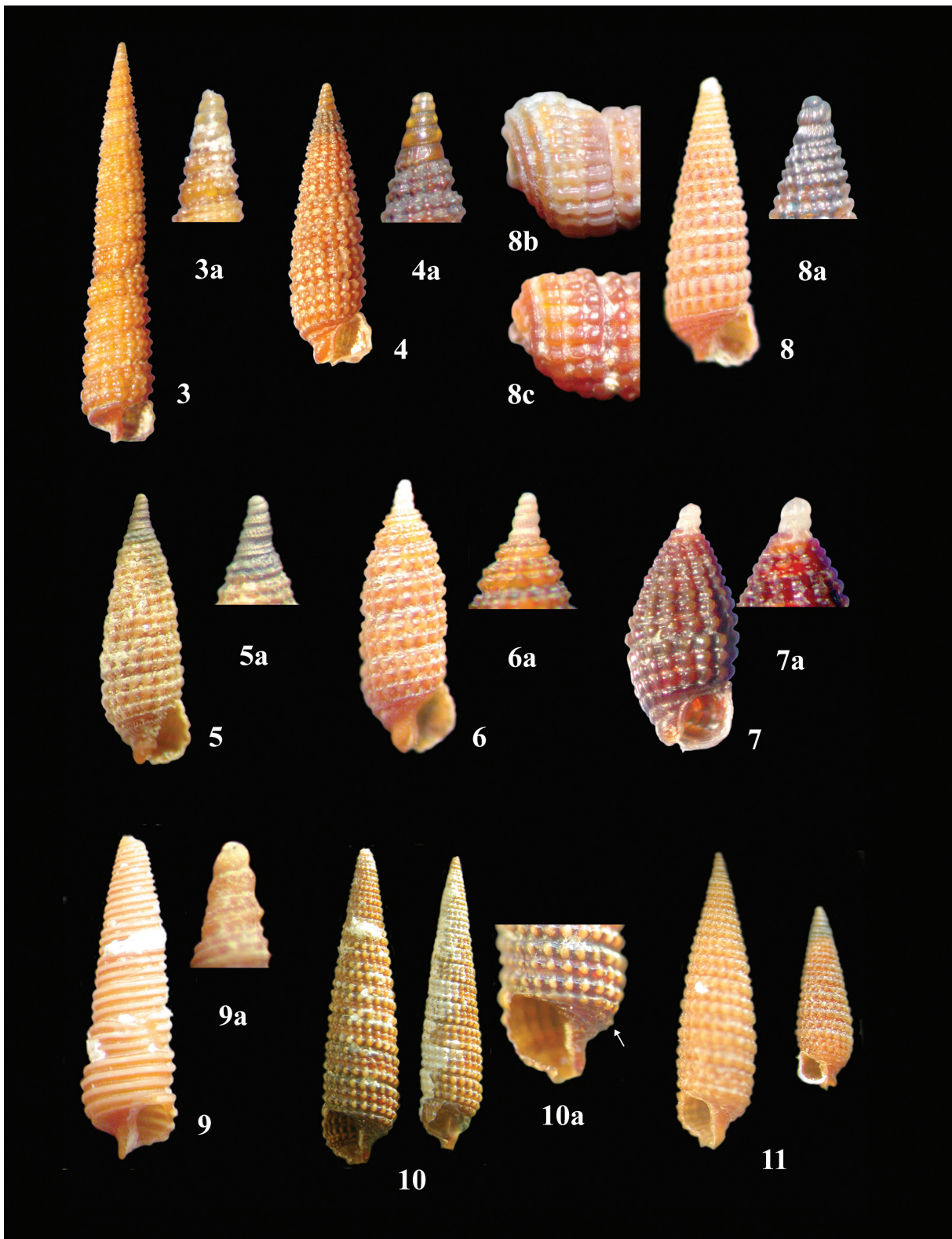
Eulimidae

The host preference of some eulimid genera for classes (or lower taxa) of echinoderms are known in some detail (Warén, 1983). The species of *Parvioris* Warén, 1981 are exclusively associated to Asteroidea, while the species of *Melanella* Bowdich, 1822 parasitize Holothuroidea only. *Vitreolina* Monterosato, 1884 species, however, shows larger flexibility, ranging from Echinoidea to Ophiuroidea and Oloturoidea.

Our BCGC data on eulimid genera and their biocenoses of occurrence seem to agree with the host preferences above outlined. While some species, such as *Vitreolina philippi* (de Rayneval & Ponzi, 1854) (Figs. 19, 19a) and *V. perminima* (Jeffreys, 1883), known to feed on echinoids (Warén & Mifsud, 1990), were more abundant in rocky bottom biocenoses (where most of their hosts thrive), species of *Melanella* were more commonly found on soft bottoms, where their holoturian hosts occurred in great numbers.

Cabioch et al., 1978 report the holoturian *Neopentadactyla mixta* (Östergren, 1848) as the host of *Melanella alba* (da Costa, 1778) in the Atlantic. At that time, however, the taxonomy of *Melanella* was far from being solved and it is not unlikely that the eulimids were misidentified.

Our observation on *M. alba* (Figs. 13, 13a, 13b) are based on four specimens of the BCGC campaign and further 75 specimens (found by D.S. in bycatch material collected by fishing nets in Aci Castello probably on DC at a depth of 80 m). In both occasions hundreds of specimens of the holoturian *Pseudothyone raphanus* (Duben & Koren, 1845) were present, some with living specimens of *M. alba* still attached (Fig. 13b).



Figures 3, 3a. *C. denticulata*, S. Giovanni Li Cuti, 10.5 mm; Fig. 3a, protoconch. - Figures 4, 4a. *C. buzzurroi*, S. Giovanni Li Cuti, 4.2 mm; Fig. 4a, protoconch. - Figures 5, 5a. *C. pulchraesculpta*, Acitrezza, 2.9 mm; Fig. 5a, protoconch. - Figures 6, 6a. *C. micalli*, Capo Molini, 2.6 mm; Fig. 6a, protoconch. - Figures 7, 7a. *C. ladae*, S. Giovanni Li Cuti, 1.8 mm; Fig. 7a, protoconch. - Figures 8, 8a, 8b. *D. coppolae*, Acitrezza, 4.5 mm; Fig. 8a: protoconch; Fig. 8b: detail of sculpture of the last whorl. - Figure. 8c. *D. concatenata*, Catania "Cajto", at depths of 27 m, detail of sculpture of the last whorl. - Figures 9, 9a. *S. trilineata*, Acitrezza, 7.7 mm; Fig. 9a, protoconch. - Figures 10, 10a. *Monophorus thiriota*, S.ta Tecla, 12 and 11 mm; Fig. 10a: detail of sculpture of the last whorl. - Figure 11: *Monophorus erythrosoma*, Is. Linosa (near Agrigento, Sicily), 6.7 and 4.6 mm.

This suggests that *P. raphanus* is the host of *M. alba* in the Mediterranean Sea.

Forty-two specimens of *Melanella lubrica* Monterosato, 1890 (Figs. 12, 12a) were also found by D.S. amongst the above mentioned material where the close similar *M. alba* also occurred. It is likely that in the original environment the two eulimids shared the same host. Unfortunately no pictures of this species were taken.

We were able to divide specimens of both species into two morphological categories, based on their shell morphology. This phenomenon was explained as expression of a marked sexual dimorphism, with males having typical shells (Fig. 12) and females having thinner shells with more rounded whorls (Fig. 12a). Both *Melanella* species occurred in the sample with specimens at different stages of growth.

One living specimen of *Melanella boscii* (Payraudeau, 1826) was hand-collected by D.S. at S. Giovanni Li Cuti (Catania), by SCUBA diving in AP, where it was crawling on the ascidian *Microcosmus sulcatus* (Coquebert, 1797). The host of *M. boscii* is known to be an undescribed holoturian species (Warén, 1999) and we have no evidence that the snail we collected was actually feeding on the ascidian. Although *Melanella* species are able to reattach if experimentally removed from their hosts (Warén, 1983), there is no evidence that they separate spontaneously from their host in order to conduct a free-crawling existence for prolonged periods. Furthermore, some exceptions to the rule of eulimids as strict parasites of echinoderms were reported (Warén, 1983) and we would not be surprised if further data reveal *M. boscii* to be able to parasitize ascidians.

Melanella polita (Linné, 1758) (Fig. 14) was regularly found in BCGC samples from biocenosis of soft substrates as well as in beach detritus samples collected by D.S. at "Plaja" (Catania beach, Fig. 1). The presence in both samples of the spatangid *Brissus unicolor* (Leske 1778) may be the evidence for a strict host-parasite relationship with this eulimid.

Along with those collected during the BCGC campaign, further specimens of *V. philippi* (Figs. 19, 19a) were found by D.S. in several localities along the Gulf of Catania associated to *Paracentrotus lividus* (Lamarck, 1816). This association was first reported by Mifsud (1990).

Over ten years of observations (unpublished data) suggest that this eulimid seems to prefer populations of echinoids occurring in a range of 4-6 m depth, while it is not found on urchins living deeper. Most *V. philippi* specimens were found attached to the aboral zone or periproct of the host from where presumably they are able to reach less protected soft parts.

One living specimen of the rare *Pelseneeria minor* Koehler & Vaney, 1908 (Fig. 17) was found by D.S. in fishing net material collected in Acitrezza at depths of 80-100 m. This species is known to live on *Genocidaris maculata* A. Agassiz 1869 (Bouchet & Warén, 1986). The material here found was instead characterised by the massive presence of the pencil-spine urchin *Cidaris cidaris* (Linnaeus, 1758) that could be an alternative host of *P. minor*. A similar relationship could be hypothesized for the eulimid species *Sticteulima jeffreysiana* (Brusina, 1869), whose abundant living specimens were found among the same material. *Pelseneeria stylifera* (Turton, 1825) is currently distinct from *P. minor*; in the Atlantic it was found (Barel & Kramers, 1977) at different localities on several species of echinoids (*Echinus esculentus* Linnaeus, 1758, *Strongylocentrotus droebachiensis* (O.F. Müller, 1776), "*Echinus pictus*", *P. lividus*, *Psammechinus miliaris* (Gmelin, 1778), "*Echinus saxatilis*", "small sea urchin".

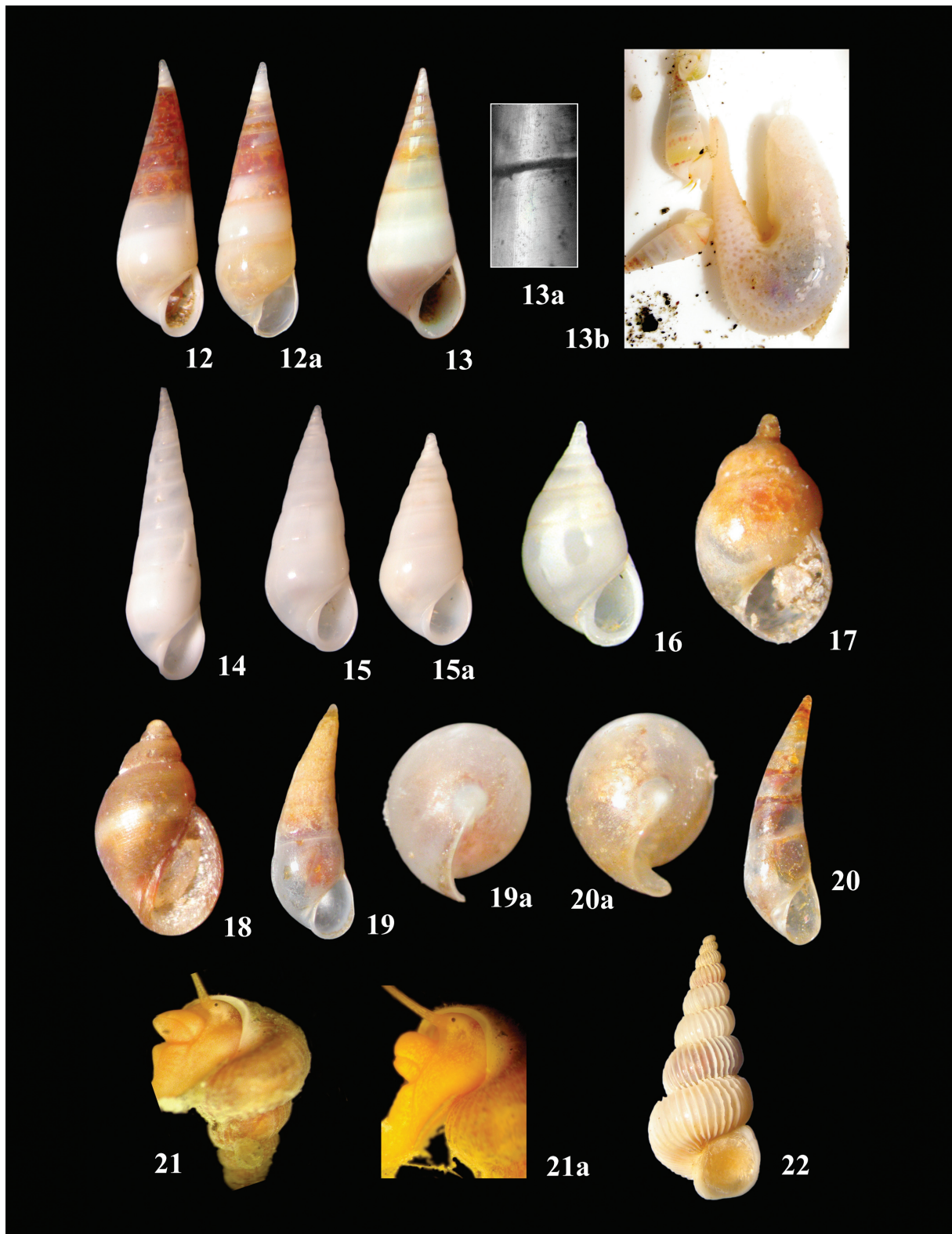
Few shells of *Ersilia mediterranea* (Monterosato 1869) (Fig. 18) were hand collected by D.S. at S. Giovanni Li Cuti associated to *Ophioderma longicauda* (Bruzellius, 1805), which lives under stones in shallow waters.

• Systematics

Triphoridae

The teleoconch of *Monophorus thiriota* Bouchet, 1984 (Fig. 10) resembles that of *Similiphora similior* (Bouchet & Guillemot, 1978) from which is distinguishable by the sculpture of the protoconch and the fourth beaded spiral cord of the teleoconch (Fig. 10a). The colour of the external soft parts of this latter species is described by Bouchet & Guillemot (1978).

Specimens of *Monophorus erythrosoma* (Bouchet & Guillemot, 1978) (Fig. 11) were found by D.S. in Acitrezza, among material collected by fishing nets at depths of 80-100 m.



Figures 12, 12a. *Melanella lubrica*, Aci Castello, 6.2 mm, male; Fig. 12a, 6 mm, female. - Figures 13, 13a, 13b. *Melanella alba* (da Costa, 1778), Aci Castello, 9.5 mm; Fig. 13a, detail of sculpture of the last whorl; Fig. 13b, living specimens on *Pseudothyone raphanus*. - Figure 14. *Melanella polita*, Catania "Plaja", 7.2 mm. - Figures 15, 15a. *M. petitiana*, Acitrezza, 3.8 and 3.5 mm. - Figure 16. *Melanella* sp., Aci Castello, 4 mm. Figure 17. *Pelseneeria minor*, Acitrezza, 2.3 mm. - Figure 18. *Ersilia mediterranea*, S. Giovanni Li Cuti, 1.5 mm. - Figures 19, 19a. *Vitreolina philippi*, S. Giovanni Li Cuti (CT, Sicily), 3 mm; Fig. 19a, detail of the last whorl seen from the base. - Figures 20, 20a. *Crinophtheiros comatulicola*, Acitrezza, 3 mm; Fig. 20a, detail of the last whorl seen from the base. - Figures 21, 21a. *Epitonium dendrophylliae*, 1986, Acitrezza, 7 mm; Fig. 21a, living specimen. - Figure 22. *Epitonium pulchellum*, Acitrezza, 11.3 mm.

The head-foot of *M. metaxa* was almost white, with marbled pale greyish areas on the opercular region and just behind the head; no microstructures were present on the cephalic tentacles.

The presence of *S. similior* and *Pogonodon pseudocanarica* (Bouchet, 1985) (collected by D.S. in Acitrezza, among residuals of fishing nets at depths of 80-100 m) in our samples represents the first record for these species in the Ionian Sea, and their distribution is thus extended to this area.

Cerithiopsidae

Species of *Cerithiopsis* Forbes & Hanley, 1850 share similar teleoconch features and can often be distinguished only by slight differences in protoconch size and microsculpture. This has been source of several taxonomical debates (van Aartsen et al., 1984; Palazzi & Villari, 2001; Bouchet et al., 2010). Cecalupo & Robba (2010) described two new genera including species formerly attributed to *Cerithiopsis* based exclusively on differences in protoconch microsculpture. According to them, species of *Prolixodens* Marshall, 1978 have multispiral cylindrical protoconchs with prosocline riblets, protoconchs of species of *Nanopsis* Cecalupo & Robba 2010 have subsutural axial riblets, whereas species of *Cerithiopsis* s.s. have smooth protoconchs. Many other species of *Cerithiopsis*, however, show different protoconchs from those of the genera listed by these authors (see for instance that of *C. ladae* Buzzurro & Prkic, 2007, *C. diadema* Monterosato, 1874 ex Watson ms., *C. atalaya* Watson, 1874, *C. pulchraesculpta* Cachia, Mifsud & Sammut, 2004, and the closely related *C. iudithae* Reitano & Buzzurro, 2006). If the approach of Cecalupo & Robba 2010 was extended to all *Cerithiopsis* species, several new genera should be described. In our opinion such a complex systematic problem would require a more modern approach and more characters (e.g. from the anatomy) should be examined in order to assess generic distinctions. We here prefer to maintain the former interpretation of *Cerithiopsis* until this issue will be more adequately studied.

Five shells of *C. buzzurroi* (Cecalupo & Robba, 2010) (Figs. 4, 4a) and 11 of *C. denticulata* (Cecalupo & Robba, 2010) (Figs. 3, 3a) were collected by D.S. both in shell grit at S.

Giovanni Li Cuti, at depths of 15-22 m at the base of rocks.

Along with the specimens collected during the BCGC campaign, several living specimens of *Cerithiopsis diadema* (Monterosato, 1874 ex Watson ms.) were found by D.S. in material collected by fishing nets at depths of 80-100 m at Ognina. Description of the external soft-body parts are lacking in the literature. The head-foot was whitish, with long, evident and opaque granular material, arranged in two longitudinal rows in the propodium; punctations were present behind the eyes; microstructures were present at the tips of the cephalic tentacles.

Two living specimens of *C. ladae* (Figs. 7, 7a) were hand-collected by D.S. at S. Giovanni Li Cuti, by SCUBA diving in a little and shallow semi-submerged cave at a depth of 2 m. The original description (Prkic & Buzzurro, 2007) contains no data on the colour pattern of the external soft body parts which we here provide. The body was white, translucent, with paler punctations near the operculum; punctations were also present behind the eyes; long, evident and opaque granular material, arranged in two longitudinal rows, was present on the propodium; no microstructures were visible on the tentacles. Our record is the first for the Ionian Sea, therefore the distribution of this species is extended to this area.

Part of the material examined for the institution of *Cerithiopsis micalii* (Cecalupo & Villari, 1997) (Figs. 6, 6a) was collected by D.S. and the data on these specimens are reported in Cecalupo & Villari (1997). We here report the collection of further three specimens at Capo Molini and Acitrezza in the same conditions. Based on the presence of a third granulated spiral cord, Bouchet et al. (2010) suggested the unsuitable position of this species in *Dizoniopsis*. We agree with their idea and provide details on the external soft-body parts: body almost white, with long, evident and opaque granular material, arranged in two longitudinal rows in the propodium; microstructures were present at the tips of the cephalic tentacles.

The general shell shape of *C. minima* recalled that of the other pupoid closely related species, from which *Cerithiopsis minima* is readily distinguished by its smooth and almost white protoconch. The head-foot was entirely white, with yellow lines under the suspensor of the

operculum; no microstructures were visible at the tips of the cephalic tentacles.

As shown by our data, *Cerithiopsis tubercularis* (Montagu, 1803) is particularly common and widespread in the studied area. Prkic & Mariottini (2009), based on observation of living specimens of *C. tubercularis* indistinguishable by shell characters, found three forms distinct by relevant differences in the head-foot colour pattern. These forms were given species rank viz. *C. tubercularis*, *C. oculisfictis* and *C. petanii*. Cecalupo & Robba (2010) did not see any ground for the separation of these two latter species from *C. tubercularis*. Their approach to the taxonomy of *C. tubercularis*, based on a neotype designation, provided better nomenclatural stability. Among our material, we observed not only the same three forms described by these authors but also intermediate forms connecting to each other. We consider the presence of these intermediates as the evidence of the expression of an intraspecific variability in the colour pattern of the head-foot of *C. tubercularis*.

Some specimens of *Cerithiopsis pulchresculpta* Cachia, Mifsud & Sammut, 2004 (Figs. 5, 5a) were collected by D.S. in Acitrezza, among material collected by fishing nets at depths of 80-100 m. Although previously reported for Italian waters (Reitano & Buzzurro, 2006), this species has not been included in the Italian checklist (Oliverio, 2008).

Some taxonomical controversies also characterize the genus *Dizoniopsis* Sacco, 1895, for which we refer to a recent review (Bouchet et al., 2010). We follow these last authors in considering inappropriate the recent designation of a lectotype of *D. concatenata* by Landau et al. (2006), being not based on type materials. Here, however, we want to make a taxonomical remark about the correct diagnosis of *D. concatenata* (Conti, 1864), of which species we collected fresh material. This issue (discussed in Bouchet et al., 2010) was previously solved by Palazzi & Villari (2001), who pointed out that the original description (Conti, 1864) was based on a shell with the apex positioned downwards this reflecting on the numbering order of the spiral chords.

Specimens of *Dizoniopsis coppolae* (Aradas, 1870) were found in BCGC samples (Figs. 8, 8a, 8b). The species was dedicated to the Sicilian musician Antonio Pietro Coppola (Fig. 23), who reached a worldwide notoriety.

Both *D. coppolae* and *D. concatenata* have a characteristic “bilineated” sculpture (visible on



Figure 23. Statue of Antonio Coppola, Villa Bellini (Catania).

the body whorl) that is the result of the fusion of two spiral rows. According to Bouchet et al. (2010) in *D. concatenata* the adapical row splits into two rows (Fig. 8c) and this is a feature distinguishing this species from the congeneric *D. coppolae*. We sometimes observed the same phenomenon also on shells of this latter species, with the exception that is the abapical row that splits (Fig. 8b).

The record of one specimen of *Seila trilineata* (Philippi, 1836) and the illustration here proposed (Figs. 9, 9a) are of remarkable importance due to the rarity of this species.

Epitoniidae

Shells of *Epitonium pseudonatum* Bouchet & Warén, 1986 were collected by D.S. in shell grit at Catania “Cajto” (at depths of 25-30 m). As this represents the first record of this species in the Ionian Sea its distribution is extended to this area.

No accounts have been published on the soft-body part colour pattern of *E. pulchellum*, which we here report to be entirely white. As for the other species live-collected in this study we confirm the consistency of our observations with those reported in the literature.

Eulimidae

Before the redescription and the illustration of the most representative species of *Melanella* (Warén, 1988), there was a considerable confusion in the taxonomy of this genus.

Warén (1988) identified two main groups of *Melanella* species: one, with a more slender shell shape, resembling *M. alba sensu* A.A., and another, with more inflated and solid shells, resembling *M. boscii* and including also *M. petitiana* (Brusina, 1869), *M. praecurta* (Pallary, 1904) *M. stalioi* (Brusina, 1869) and *M. doederleini* (Brusina, 1886). *M. alba* (Figs. 13, 13a, 13b), is representative of the former group of species. The taxonomical interpretation of this species has been controversial until the designation of a neotype, the publication of a more detailed redescription and a new iconography (Warén, 1989). It is easily distinguishable from the closely related *Melanella lubrica* (Monterosato, 1890) (Figs. 12, 12a), here found sympatrically, by the larger shell, size and the more conical shape of the teleoconch. A microscopic net of spiral and axial lines (Fig. 13a) was also present on the shell surface of *M. alba*. This is not a true sculpture, but only a product of light refraction. This species shares with its congeneric ones the colour pattern of the external soft parts: head and foot were yellowish and the cephalic tentacles orange; orange and red stripes crossed spirally the animal at the base and just below the suture (Fig. 13b). Many eulimid species have red stains (Monterosato, 1890) whose pattern and shape seem to differ among species (Scuderi, *in press*).

Living specimens of *Crinophtheiros comatulicola* (Graff, 1875) (Figs. 20, 20a) were found on *Antedon mediterranea* Lamarck, 1816 in BCGC samples and by D.S. in Acitrezza among material collected by fishing nets at - 50/60 m, as the host association confirmed that reported in the description of the genus (Bouchet & Warén, 1986) and the species. The young specimens of *C. comatulicola* we collected were morphologically similar to *V. philippi* but the shell of the former ones (Fig. 20) were more slender and showed a more elongated mouth; the inner lip (Fig. 20a) was straight and more prominent than in the shells of the latter (Fig. 19a). The two species shared similar head-foot colour pattern: the body was yellow with red

spots limited to the cephalic tentacles in *C. comatulicola* and extend beyond the eyes and on the foot in *V. philippi*. They also differed in their host preference.

A single specimen of *Melanella* sp. (Fig. 16), belonging to the latter group of species of *Melanella*, was found in Aci Castello at a depth of 30 m in SGCF/DC. First morphological observations (Scuderi et al., 2005) suggested that this could be a morphological variation of *Melanella petitiana* (Brusina, 1869) (Figs. 15, 15a), which is relatively common on hard substrata along the shores of E Sicily. A detailed description of the shell is here reported: "shell glossy, very short, inflated; 5 ½ rounded teleoconch whorls of which the last is 0.62 of the total height of the shell. Basal outline very rounded, suture thin but clearly appreciable. Colour white, with a grayish subsutural area. Protoconch blunt, dagger-like, short, constituted by 3 ½ whorls, 0.4 mm high, 0.25 large. Size: 4 mm high, 1.7 large".

Compared to the sympatric typical *M. petitiana*, this morph is more solid, less slender, shorter and with whorls more rounded; with a higher shell body-whorl/total height ratio (0.55 in *petitiana*). While the suture is indistinguishable in *M. petitiana*, it is well-marked in *M. sp.* and this latter species has an additional protoconch whorl. In order to assess whether these differences are enough to justify a new species description or simply are the evidence of the intraspecific variability of *M. petitiana*, more material and observations on the external soft-body parts characters are required.

M. lubrica and *P. minor* are here reported for the first time for the Ionian Sea, and therefore their distribution is extended to this area.

ACKNOWLEDGMENTS

We would like to express gratitude to Stefano Palazzi (Modena, Italy) for having provided literature and for his precious advice.

We would also thank Prof. Grazia Cantone (University of Catania, Italy) for having given the chance to study BCGC material and data.

We are also grateful to anonymous referees for their comments and suggestions to the improvement of the text.

REFERENCES

- Aartsen J. J. van., Menkhorst H.P.M.G. & Gittenberger, E. 1984. The marine Mollusca of the Bay of Algeciras, Spain, with general notes on *Mitrella*, Marginellidae and Turridae. *Basteria*, suppl. 2: 1-135.
- Barel C.D.N. & Kramers P.G.N., 1977. A survey of the Echinoderm associates of the North-East Atlantic area. *Zoologische Verhandelingen*, 156: 3-159.
- Bellan-Santini D., 1969. Contribution à l'études des peuplements infralittoraux sur substrats rocheux (Étude qualitative et quantitative de la frange supérieure). *Recueil des Travaux de la Station Marine d'Endoume*, 63: 5-294.
- Bouchet P. & Guillenot H., 1978. The *Triphora perversa*-complex in Western Europe. *Journal of Molluscan Studies*, 44: 344-356.
- Bouchet P., 1984. Les Triphoridae de Méditerranée et du proche Atlantique. *Lavori della Società Italiana di Malacologia*, 21: 5-58.
- Bouchet P. & Warén A., 1986. Revision of the northeast Atlantic bathyal and abyssal Aclididae, Eulimidae and Epitoniidae (Mollusca, Gastropoda). *Bollettino Malacologico*. Suppl. 2: 297-576.
- Bouchet P. & Warén A., 1993. Revision of the northeast Atlantic bathyal and abyssal Mesogastropoda. *Bollettino Malacologico*. Suppl. 3: 579-840.
- Bouchet P., Gofas S. & Warén A., 2010. Notes on Mediterranean *Dizoniopsis* (Gastropoda: Cerithiopsidae), with the description of two new species. *Iberus*, 28: 51-62.
- Bouchet P., Rocroi J.P., Frýda J., Hausdorf B., Ponder W., Valdés Á. & Warén A., 2005. Classification and nomenclator of gastropod families. *Malacologia*, 47: 1-397.
- Cabioch L., Grainger J.R.N., Keegan B.F. & Könecker G., 1978. *Balcis alba* a temporary ectoparasite on *Neopentadactyla mixta* Östergren. In: D.S. McLusky & J.A. Berry (eds.), *Physiology and behaviour of marine organisms*. Proceedings of the 12th European Symposium on Marine Biology, Stirling, Scotland, September 1977. Pergamon Press, Oxford, 237-241.
- Castelli A., Lardicci C. & Tagliapietra D., 2003. Il macrobenthos di fondo molle. In: Gambi, M.C. & Dappiano, M. (eds.). *Manuale di metodologie di campionamento e studio del benthos marino mediterraneo*. *Biologia Marina Mediterranea*, 10 (Suppl): 109-144.
- Cecalupo A. & Robba E., 2010. The identity of *Murex tubercularis* Montagu, 1803 and description of one new genus and two new species of Cerithiopsidae (Gastropoda: Triphoroidea). *Bollettino Malacologico*, 46: 45-64.
- Cecalupo A. & Villari A., 1997. *Dizoniopsis micalii*. Una nuova specie per il Mediterraneo (Mesogastropoda: Cerithiopsidae). *Bollettino Malacologico*, 32: 41-44.
- Colgan D. J., Ponder W. F., Beacham E. & Macaranas J., 2007. Molecular phylogenetics of Caenogastropoda (Gastropoda: Mollusca). *Molecular Phylogenetics and Evolution*, 42: 717-737.
- Conti A., 1864. *Il Monte Mario ed i suoi fossili subappennini*. Roma, Tip. Cesaretti, 57 pp.
- Den Hartog J. C., 1987. Observations on the wentletrap *Epitonium chlathratulum* (Kahnmacher, 1797) (Prosobranchia, Epitoniidae) and the sea anemone *Bunodosoma biscayensis* (Fischer, 1874) (Actiniaria, Actiniidae). *Basteria*, 51: 95-108.
- Fretter V. & Graham A., 1962. *British Prosobranch Molluscs: their functional anatomy and ecology*. Ray Society, London, 755 pp.
- Fretter V. & Graham A., 1982. The prosobranch molluscs of Britain and Denmark. Part 7: Cerithiopsacea, Triforcea and Eulimacea. *Journal of Molluscan Studies*, Suppl. 2: 363-434.
- Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1999. *Atlante delle conchiglie marine del Mediterraneo*, vol. 3. Evolver, Rome, 128 pp.
- Gray J.E., 1853. On the division of ctenobranchous gasteropodous Mollusca into larger groups and families. *Proceedings of the Zoological Society of London*, 21: 32-44.
- Landau B., La Perna R. & Marquet R., 2006. The early Pliocene Gastropoda (Mollusca) of Estepona, Southern Spain. Part 6: Triphoroidea, Epitonioida, Eulimoidea. *Palaeontos*, 10: 1-96.
- Mifsud C., 1990. *Vitreolina philippi* (Ponzi, De Rayneval & Van Den Heck, 1854) (Eulimidae) found living on the echinoid *Paracentrotus lividus* (Lamarck) in infralittoral maltese waters. *Bollettino Malacologico*, 26: 165-168.
- Monterosato, T. di Maria di, 1890. Conchiglie delle profondità del mare di Palermo. *Il Naturalista siciliano*, 9: 157-156.
- Oliverio M., 2008. Gastropoda Prosobranchia. In: Relini G. (ed.), 2008. *Checklist della flora e della fauna dei mari italiani*. *Biologia Marina Mediterranea*, 15 (suppl. 1): 235-278.
- Palazzi S. & Villari A., 2001. Molluschi e Brachiopodi delle grotte sottomarine del taorminese. *La Conchiglia*, 32 (Suppl. 297): 1-56.
- Pérès J. M. & Picard J., 1964. *Nouveau manuel de Bionomie benthique de la Mer Méditerranée*. *Recueil des Travaux de la Station Marine d'Endoume*, 47: 3-137.
- Ponder W. F. & Lindberg D. R., 1997. Towards a phylogeny of gastropod molluscs: Analysis using morphological characters. *Zoological Journal of the Linnean Society*, 119: 83-265.
- Ponder W. F., Colgan D. J., Healy J. M., Nützel A., Simone L.R.L. & Strong E.E., 2008. Caenogastropoda. In Ponder, W.F. & Lindberg, D.R. (Eds.), *Evolution and Phylogeny of the Mollusca*, University of California Press, 331-383.
- Prkic J. & Buzzurro G., 2007. A new species of *Cerithiopsis* (Gastropoda: Cerithiopsidae) from Croatia coast. *Triton*, 15: 1-4.
- Prkic J. & Mariottini P., 2009. Description of two new *Cerithiopsis* from the Croatian coast, with comments on the *Cerithiopsis tubercularis* complex (Gastropoda: Cerithiopsidae). *Aldrovandia*, 5: 3-27.
- Priolo O., 1959. Nuova revisione delle conchiglie marine di Sicilia. *Atti dell'Accademia Gioenia di Scienze Naturali*, (6) 12: 183-223.
- Reitano A. & Buzzurro G., 2006. Descrizione di una nuova specie di Cerithiopsidae per le coste della Sicilia orientale. *Il Naturalista siciliano*, 30: 549-554.

- Richter A. & Luque A.A., 2004. *Epitonium dendrophylliae* (Gastropoda: Epitoniidae) feeding on *Astroides calycularis* (Anthozoa, Scleractinia). *Journal of Molluscan Studies*, 70: 99-101.
- Sacco F., 1895. I Molluschi dei terreni terziarii del Piemonte e della Liguria. Parte 17: (Cerithiidae, Triforidae, Cerithiopsidae e Diastomidae). Clausen, Torino, 86 pp.
- Scuderi D., in press. Atlante dei molluschi vivi del Mediterraneo. Vol I. Edizioni Danaus, Palermo, 100 pp.
- Scuderi D., Cantone G., Criscione F., Iraci Sareri D. & Fassari G., G. 2005. New biological and taxonomical data on some Ptenoglossa of the Gulf of Catania (Sicily, Italy). In: IV International Congress of the European Malacological Societies: abstracts of oral communications and posters. *Notiziario S.I.M.* Anno 23: 88.
- Warén A., 1983. A generic revision of the family Eulimidae (Gastropoda, Prosobranchia). *Journal of Molluscan Studies*, Supplement 13: 1-96.
- Warén A., 1988. The identity of *Turbo politus*, Linnè 1758 (Prosobranchia, Eulimidae). *Bollettino Malacologico*, 24: 17-24.
- Warén A., 1989. Designation of neotypes of *Melanella alba* (Da Costa, 1778) and *Eulima glabra* (Da Costa, 1778) (Prosobranchia). *Journal of Conchology*, 33: 219-224.
- Warén A., 1999. Introduction. In: Giannuzzi-Savelli R., Pusateri F., Palmeri A. & Ebreo C., 1999. Atlante delle conchiglie marine del Mediterraneo, vol. 3. Evolver, Rome, 7-9.
- Warén A. & Mifsud C., 1990. *Nanobalcis* a new eulimid genus (Prosobranchia) parasitic on *Cidaris* sea urchins, with two new species, and comments on *Sabinella bonifaciae* (Nordsieck). *Bollettino Malacologico*, 26: 10-12.