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## Article

# New Records of Marine Mollusca from the Culuccia Peninsula (NW Sardinia, Italy)

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## Abstract

The aim of this work is to update the checklist of the marine malacofauna of the Culuccia Peninsula (NW Sardinia, Italy), based on research carried out over two years by SCUBA and free diving in all the main marine habitats of the peninsula. We provide here new records, all accompanied by in situ images of living animals or photographs of shells. In some cases, ecological and systematic notes are provided. With the new records of 39 species (27 gastropods and 12 bivalves), a total of 295 taxa belonging to the classes Bivalvia (84), Gastropoda (199), Polyplacophora (11), and Scaphopoda (1) have been listed from this Sardinian high-biodiversity spot. Two alien species already reported, *Pinctada radiata* (Leach, 1814) and *Bursatella leachii* Blainville, 1817, can now be considered to be well established.

**Keywords:** molluscan fauna; inventory; Sardinia; biodiversity; wildlife conservation

## 1. Introduction

The study of Mediterranean marine Mollusca is an interesting field of research that has gained more and more attention in recent decades due to the increased effort to describe and protect the biodiversity of marine environments and monitor the presence of Non-Native Species (NNS, acronym according to [1]), especially nowadays when the alteration of marine biodiversity in the Mediterranean Sea is a major concern [2,3].

The Phylum Mollusca comprises ca. 100,000 recent species, predominantly marine, and represents one of the most diverse and species-rich phyla of the animal kingdom [4–10]. It is classified into eight classes (Solenogastres, Caudofoveata, Polyplacophora, Monoplacophora, Cephalopoda, Gastropoda, Scaphopoda and Bivalvia) with an extraordinary degree of diversification of the body-plan, as well as of life strategies and ecological niche colonisation [9,10]. Of the eight molluscan classes, gastropods constitute more than 80% of the species, while bivalves represent a major part of the rest (15%) [4]. The marine molluscs of the Mediterranean Sea are commonly regarded as the best-known malacofauna in the world [2]; in spite of that, every year dozens of species are described that are new to science [5,11], and an increasing number of NIS have been continuously observed colonising and establishing stable populations in the Mediterranean basin, often with the previous cooperation of citizen scientists [12,13]. Due to their ubiquitous distribution and vast species number, molluscan communities play a crucial role in the dynamics of benthic ecosystems [14]. Furthermore, molluscs contribute to huge amounts of the biomass on the different trophic levels in ecosystems and provide valuable macroecological indicators for



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ecosystem health, water quality, marine pollution, and litter decomposition [4,15]. Filter-feeding bivalves (e.g., Mytilidae, Pteriidae, Ostreidae, etc.) and grazing gastropods (e.g., Patellidae, Neritidae, Trochidae, etc.) are considered primary consumers, since they play a crucial role in filtering suspended particles and removing benthic algae, contributing to ecological stability by controlling primary biomass [15,16]. In contrast, predators (e.g., Conidae, Muricidae, Naticidae, etc.) and scavengers (e.g., Muricidae, Nassariidae, Olividae, etc.), which are generally less abundant, represent secondary consumers [15].

Culuccia is a small peninsula of < ca. 3 Km<sup>2</sup>, situated in northwestern Sardinia (Italy) at the margin of the Maddalena Archipelago [17]. The marine area surrounding this peninsula is a Special Area of Conservation, included in the European Natura 2000 Ecological Network of protected areas. In 2021, a research project to study both the terrestrial and marine diversity of Culuccia was started [17–21]. Mariottini et al. [17] produced the first checklist of the marine malacofauna occurring in this peninsula, which proved to be a remarkable biodiversity spot.

The 295 species belonging to the classes Bivalvia, Gastropoda, Polyplacophora and Scaphopoda, were sampled in 15 sites around the peninsula, at 0–25 m depth. The aim of the present work is to update the checklist of Mariottini et al. [17], reporting newly recorded taxa concerning only the classes gastropods and bivalves, since no further new records have been observed for polyplacophorans and scaphopods, all of them accompanied by in situ images of living animals or shell photographs. Additionally, for some particular species, notes on their systematics and ecology are presented, with the goal of better describing the molluscan diversity occurring in this Special Area of Conservation and monitoring the presence of NNS [1].

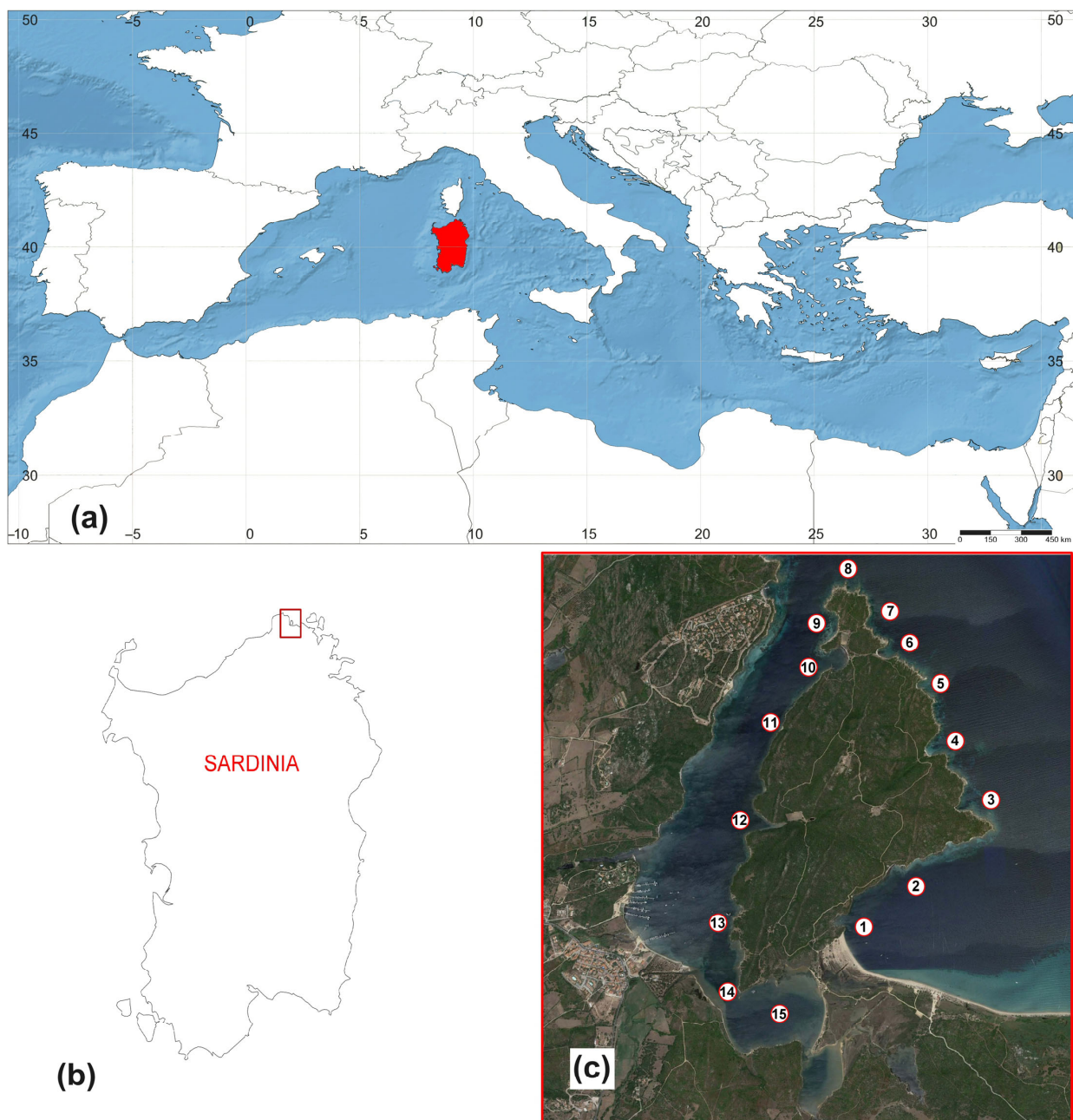
## 2. Materials and Methods

The geographical spot under investigation, the Culuccia Peninsula, is located along the northwestern coastline of Sardinia, within the Santa Teresa di Gallura territory, facing the “Conca Verde” to the west and the “Isola dei Gabbiani” to the east. It is characterised by rocky coasts, with a few small embedded sandy beaches. The western coast faces a narrow fjord, which hosts the small marina of Porto Pozzo, small stream mouths and a suspended oyster aquaculture plant, while the northeastern coast faces the open sea. The southernmost part of the peninsula encloses a small, shallow-water, and brackish lagoon, which is connected to internal salt marshes (Figure 1a–c).

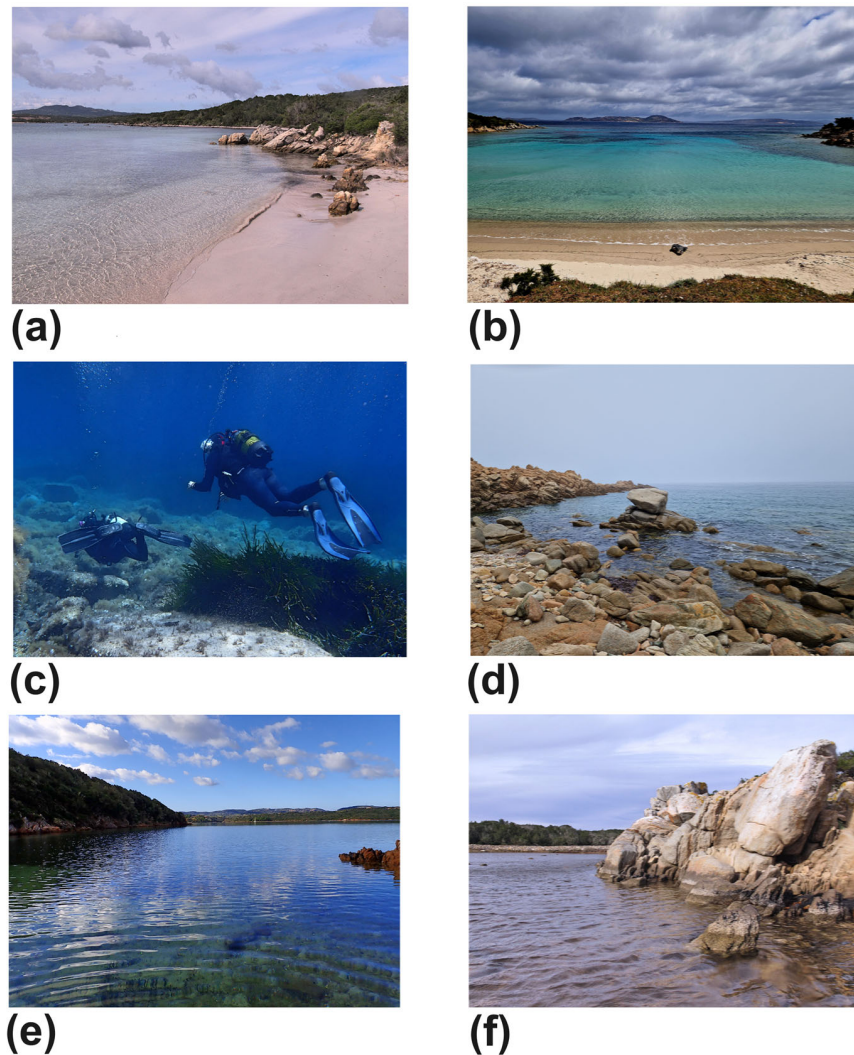
Fifteen sampling sites (SS#1–15, Figure 1c), described in Mariottini et al. [17], were monitored regularly (from 10 to 20 dives per month, over the years 2024 and 2025), through SCUBA and free diving, by using the same sampling methods adopted in the former study. In particular, molluscs were collected by hand-picking and using an air-lift suction sampler during diving, carried out mainly in benthic infralittoral environments. The explored habitats include *Posidonia oceanica* (Linnaeus) Delile, 1813 meadows; infralittoral assemblages; and soft- and hard-bottom substrates, particularly on/under rocks, rubbles, and algal biocoenoses (Figure 2a–f). Dives (1 h each) were carried out at depths ranging from 0 to 25 m. The intertidal zone was also regularly monitored on the rocky shore of the Culuccia Peninsula, especially with the aim of confirming the presence of the endangered limpet *Patella ferruginea* Gmelin, 1791, previously recorded in SS#4 and SS#8.

New molluscan records were illustrated; the systematics adopted were in accordance with MolluscaBase WoRMS [11]. An ethical approach was adopted in this research, complying with local, regional, national and international rules and regulations for access to biodiversity, sustainable use and benefit sharing (Convention on Biological Diversity and its Nagoya Protocol, and national regulations). Species identification was initially performed by each collector, but all specimens were then cross-checked by all authors, who are

experienced malacological taxonomists. Live animals were photographed in situ or in the Culuccia laboratory (Osservatorio Naturalistico) with digital cameras (Canon Powershot G11 and Olympus TG-6), equipped with housing for marine photographs. Sorting and identification of the micro material were performed by using stereomicroscopes. Representative specimens were photographed by using a ZEISS Axio Zoom V16 stereomicroscope, equipped with a ZEISS AxioCam 503 camera. Specimens of particular interest were anaesthetised with 7.5% magnesium chloride ( $MgCl_2$ ) and preserved in 95% ethanol as reference material for future molecular studies. All shells of gastropods, bivalves, polyplacophorans (Tables S1–S3) and the scaphopod *Antalis vulgaris* (da Costa, 1778) sampled in this study were catalogued with a voucher number. The material was deposited in the Malacology Collection of the Department of Biology and Biotechnologies Charles Darwin, Sapienza University of Rome (Rome, Italy).



**Figure 1.** (a,b) Geographic map of the Culuccia Peninsula. (c) Localisation of the sampling sites. Description of the sites in Mariottini et al. [1].



**Figure 2.** Sampling sites of the Culuccia peninsula from the land and underwater: (a) SS#2; (b) SS#4; (c) SS#4, scuba divers monitoring *Posidonia oceanica* meadow and rocky substrate, 5–20 m depth; (d) SS#8; (e) SS#12; (f) SS#15.

### 3. Results

#### 3.1. New Records

New records [39 species (27 gastropods and 12 bivalves) in bold in Tables 1 and 2] have produced a comprehensive inventory of 295 taxa belonging to the four classes: Gastropoda (199), Bivalvia (84), Polyplacophora (11) and Scaphopoda (1). Taxonomic corrections to the previous checklist are listed here:

- (1) The removal of *Leptochiton asellus* (Gmelin, 1791) from the inventory—valves of *Leptochiton scabridus* (Jeffreys, 1880) were misidentified;
- (2) Substitution of *Vermetus granulatus* (Gravenhorst, 1831) with *Thylacodes arenarius* (Linnaeus, 1758);
- (3) Substitution of *Ebenomitra granum* (Forbes, 1844) with *Ebenomitra saignyi* (Payraudeau, 1826);
- (4) Substitution of *Parthenina alesii* Micali, Nofroni & Perna, 2012 with *Parthenina* cf. *suturalis* (R. A. Philippi, 1844).

The new records are reported in bold font in Table 1 (Gastropoda) and Table 2 (Bivalvia), together with data on sampling sites and collecting status (shell/alive) and illustrated with in situ or shell photographs (Figures 3–9). For polyplacophorans and scaphopods, no new records have been observed.

**Table 1.** Gastropoda occurring in the Culuccia Peninsula, with sampling sites and collection status. New records shown in bold.

| Family   | Species  | Sampling Site                | Shell/Alive |
|--|--|------------------------------|-------------|
| Patellidae   | <i>Patella caerulea</i> Linnaeus, 1758                             | #2,#3,#4,#5,#7,#8,#9,#10,#11 | alive       |
|  | <i>Patella ferruginea</i> Gmelin, 1791                             | #4,#5,#8                     | alive       |
|  | <i>Patella rustica</i> Linnaeus, 1758                              | #4,#5,#6,#7                  | alive       |
|  | <i>Patella ulyssiponensis</i> Gmelin, 1791                         | #1,#2,#3#,#7                 | alive       |
| Lottiidae  | <i>Tectura virginea</i> (Mueller O.F., 1776)                       | #8                           | shell       |
| Scissurellidae   | <i>Scissurella costata</i> d'Orbigny, 1824                         | #8                           | shell       |
| Haliotidae   | <i>Haliotis tuberculata</i> Linnaeus, 1758                         | #4,#5,#8,#12,#13             | alive       |
| Fissurellidae  | <i>Emarginula adriatica</i> OG Costa, 1830                         | #12                          | alive       |
|  | <i>Emarginula huzardii</i> Payraudeau, 1826                        | #14                          | alive       |
|  | <i>Emarginula pustula</i> Thiele in Küster, 1913                   | #8                           | shell       |
|  | <i>Emarginula sicula</i> JE Gray, 1825                             | #8                           | shell       |
|  | <b><i>Diodora dorsata</i> (Monterosato, 1878)</b> (Figure 3a)      | #9                           | alive       |
|  | <i>Diodora gibberula</i> (Lamarck, 1822)                           | #8                           | shell       |
|  | <b><i>Diodora graeca</i> (Linnaeus, 1758)</b> (Figure 3b)          | #1,#13                       | alive       |
|  | <i>Diodora italica</i> (Defrance, 1820)                            | #4                           | alive       |
| <b><i>Fissurella nubecula</i> (Linnaeus, 1758)</b> (Figure 3c) | #9   | alive                        |             |
| Trochidae  | <i>Phorcus articulatus</i> (Lamarck, 1822)                         | #13                          | alive       |
|  | <i>Phorcus turbinatus</i> (Born, 1778)                             | #4,#5,#9                     | alive       |
|  | <i>Gibbula ardens</i> (Salis Marschlins, 1793)                     | #6                           | alive       |
|  | <i>Gibbula fanulum</i> (Gmelin, 1791)                              | #8                           | alive       |
|  | <i>Gibbula guttadauri</i> (Philippi, 1836)                         | #8                           | shell       |
|  | <i>Gibbula turbinoides</i> (Deshayes, 1835)                        | #8                           | shell       |
|  | <b><i>Steromphala adansonii</i> (Payraudeau, 1826)</b> (Figure 3d) | #10                          | shell       |
|  | <b><i>Steromphala divaricata</i> (Linnaeus, 1758)</b> (Figure 3e)  | #1,#2                        | alive       |
|  | <i>Steromphala umbilicaris</i> (Linnaeus, 1758)                    | #4,#9,#10                    | alive       |
|  | <b><i>Steromphala varia</i> (Linnaeus, 1758)</b> (Figure 3f)       | #10                          | alive       |
|  | <i>Jujubinus baudoni</i> (Monterosato, 1891)                       | #8                           | shell       |
|  | <i>Jujubinus depictus</i> (Deshayes, 1835)                         | #8                           | shell       |
|  | <i>Jujubinus exasperatus</i> (Pennant, 1777) (Figure 12a,b)        | #4,#5,#8                     | alive       |
|  | <i>Jujubinus striatus</i> (Linnaeus, 1758)                         | #8                           | shell       |
|  | <i>Jujubinus vulgaris</i> (Risso, 1826) (Figure 12c,d)             | #4,#8,#12                    | alive       |
|  | <i>Clanculus corallinus</i> (Gmelin, 1791)                         | #8                           | shell       |
| <i>Clanculus cruciatus</i> (Linnaeus, 1758)                    | #4,#5,#10  | alive                        |             |
| <i>Clanculus jussieui</i> (Payraudeau, 1826)                   | #4,#5,#9,#10   | alive                        |             |

Table 1. Cont.

| Family           | Species   | Sampling Site      | Shell/Alive |
|------------------|---|--------------------|-------------|
| Calliostomatidae | <i>Calliostoma laugieri</i> (Payraudeau, 1826)                | #8                 | alive       |
|                  | <i>Calliostoma conulus</i> (Linnaeus, 1758)                   | #8                 | alive       |
| Skeneidae        | <i>Skenea serpuloides</i> (Montagu, 1808)                     | #8                 | shell       |
| Turbinidae       | <i>Bolma rugosa</i> (Linnaeus 1767)                           | #3,#4,#7           | alive       |
|                  | <i>Homalopoma sanguineum</i> (Linnaeus, 1758)                 | #8                 | shell       |
| Phasianellidae   | <i>Tricolia pullus</i> (Linnaeus, 1758)                       | #8                 | shell       |
|                  | <i>Tricolia speciosa</i> (Von Muhelfeldt, 1824)               | #8,#12             | alive       |
| Neritidae        | <i>Smaragdia viridis</i> (Linnaeus, 1758)                     | #9,#10,#12         | alive       |
| Cerithiidae      | <i>Bittium reticulatum</i> (da Costa, 1778)                   | #4,#5,#6           | alive       |
|                  | <i>Cerithium renovatum</i> Monterosato, 1884                  | #4,#5#8,12,#13,#14 | alive       |
|                  | <i>Cerithium vulgatum</i> Bruguiere, 1792                     | #2,#4,#5,#6        | alive       |
| Potamididae      | <i>Pirenella conica</i> (Blainville, 1826)                    | #15                | alive       |
| Turritellidae    | <i>Turritella turbona</i> Monterosato, 1887                   | #8                 | shell       |
| Triphoridae      | <i>Marshallora adversa</i> (Montagu, 1803)                    | #8                 | shell       |
|                  | <i>Monophorus perversus</i> (Linnaeus, 1758)                  | #8                 | shell       |
|                  | <i>Metaxia metaxa</i> (Delle Chiaje, 1828)                    | #8                 | shell       |
| Cerithiopsidae   | <b><i>Dizoniopsis coppolae</i> (Aradas, 1870) (Figure 4a)</b> | #8                 | shell       |
|                  | <i>Cerithiopsis tubercularis</i> (Montagu, 1803)              | #8                 | shell       |
| Epitoniidae      | <i>Epitonium clathrus</i> (Linnaeus, 1758)                    | #8                 | shell       |
| Eulimidae        | <i>Eulima glabra</i> (da Costa, 1778)                         | #8                 | shell       |
|                  | <i>Eulima</i> sp.   | #8                 | shell       |
|                  | <i>Melanella polita</i> (Linnaeus, 1758)                      | #8                 | shell       |
|                  | <i>Parvioris ibizenca</i> (F. Nordsieck, 1968)                | #8                 | shell       |
| Vanikoridae      | <i>Megalomphalus azoneus</i> (Brusina, 1865)                  | #8                 | shell       |
| Rissooidae       | <i>Pusillina inconspicua</i> (Alder, 1844)                    | #8                 | shell       |
|                  | <i>Pusillina marginata</i> (Michaud, 1830)                    | #8                 | shell       |
|                  | <i>Pusillina radiata</i> (Philippi, 1836)                     | #8                 | shell       |
|                  | <i>Rissoa auriscalpium</i> (Linnaeus, 1758) (Figure 4b)       | #8                 | shell       |
|                  | <i>Rissoa lia</i> (Monterosato, 1884)                         | #8                 | shell       |
|                  | <i>Rissoa membranacea</i> (J. Adams, 1800) (Figure 4c)        | #8                 | shell       |
|                  | <i>Rissoa variabilis</i> (Megerle von Mühlfeld, 1824)         | #8                 | shell       |
|                  | <i>Rissoa ventricosa</i> Desmarest, 1814                      | #8                 | shell       |
|                  | <i>Rissoa violacea</i> Desmarest, 1814                        | #8                 | shell       |

Table 1. Cont.

| Family         | Species  | Sampling Site       | Shell/Alive    |
|----------------|--|---------------------|----------------|
| Rissoiidae     | <i>Alvania beanii</i> (Hanley, 1844)                                       | #8                  | shell          |
|                | <i>Alvania carinata</i> (da Costa, 1778)                                   | #8                  | shell          |
|                | <i>Alvania lactea</i> (Michaud, 1830)                                      | #8                  | shell          |
|                | <i>Alvania lineata</i> Risso, 1826   | #8                  | shell          |
|                | <i>Alvania mamillata</i> Risso, 1826                                       | #8                  | shell          |
|                | <i>Alvania scabra</i> (Philippi, 1844)                                     | #8                  | shell          |
|                | <i>Rissoina bruguieri</i> (Payraudeau, 1826)                               | #8                  | shell          |
|                | <i>Crisilla semistriata</i> (Montagu, 1808)                                | #8                  | shell          |
|                | <i>Manzonina crassa</i> (Kanmacher, 1798)                                  | #8                  | shell          |
| Caecidae       | <i>Caecum subannulatum</i> de Folin, 1870                                  | #8                  | shell          |
|                | <i>Caecum trachea</i> (Montagu, 1803)                                      | #8                  | shell          |
| Truncatellidae | <i>Truncatella subcylindrica</i> (Linnaeus, 1767)                          | #8                  | shell          |
| Calyptraeidae  | <i>Calyptraea chinensis</i> (Linnaeus, 1758)                               | #8                  | shell          |
|                | <i>Crepidula unguiformis</i> Lamarck, 1822                                 | #8                  | shell          |
| Triviidae      | <i>Trivia arctica</i> (Pulteney, 1799)                                     | #8                  | shell          |
|                | <i>Trivia mediterranea</i> (Risso, 1826)                                   | #8                  | shell          |
| Vermetidae     | <i>Thylacodes arenarius</i> (Linnaeus, 1758)                               | #2,#4,#5            | alive          |
|                | <b><i>Vermetus triquetrus</i> Bivona e Bernardi, 1832</b> (Figure 4d)      | #6                  | alive          |
| Cypreaidae     | <i>Luria lurida</i> (Linnaeus, 1758)                                       | #4,#8,#9            | alive          |
|                | <i>Naria spurca</i> (Linnaeus, 1758)                                       | #4,#8               | alive          |
| Naticidae      | <i>Euspira intricata</i> (Donovan, 1804)                                   | #8                  | shell          |
|                | <b><i>Euspira macilenta</i> (Philippi, 1844)</b> (Figure 4e)               | #2                  | shell          |
|                | <i>Euspira nitida</i> (Donovan, 1803)                                      | #8                  | shell          |
|                | <i>Naticarius hebraeus</i> (Martyn, 1786)                                  | #1                  | shell          |
|                | <b><i>Notocochlis dillwynii</i> (Payraudeau, 1826)</b> (Figure 4f)         | #2                  | shell          |
|                | <i>Neverita josephinia</i> Risso, 1826                                     | #1,#2               | alive          |
| Cassidae       | <i>Semicassis granulata</i> (Born, 1778)                                   | #1                  | shell          |
| Bursidae       | <i>Talisman scrobilator</i> (Linnaeus, 1758)                               | #8                  | shell          |
| Cymatiidae     | <b><i>Cabestana cutacea</i> (Linnaeus, 1767)</b> (Figure 5a)               | #8                  | alive          |
|                | <b><i>Monoplex parthenopeus</i> (Salis-Marschlins, 1793)</b> (Figure 5b,c) | #8                  | shell, crabbed |
| Muricidae      | <i>Bolinus brandaris</i> (Linnaeus, 1758)                                  | #14                 | alive          |
|                | <i>Hexaplex trunculus</i> (Linnaeus, 1758)                                 | #1,#4,#5,#9,#14,#15 | alive          |
|                | <i>Dermomurex scalaroides</i> (de Blainville, 1829)                        | #8                  | shell          |

Table 1. Cont.

| Family         | Species   | Sampling Site          | Shell/Alive |
|----------------|---|------------------------|-------------|
| Muricidae      | <i>Ocenebra edwardsii</i> (Payraudeau, 1826)                    | #8                     | shell       |
|                | <i>Ocenebrina corallina</i> Scacchi, 1836                       | #8                     | shell       |
|                | <i>Muricopsis cristata</i> (Brocchi, 1814)                      | #1,#2,#4,#6,#8,#10,#13 | alive       |
|                | <i>Typhinellus labiatus</i> (de Cristofori & Jan, 1832)         | #8                     | shell       |
|                | <i>Stramonita haemastoma</i> (Linnaeus, 1767)                   | #2,#5,#6,#8            | alive       |
|                | <i>Coralliophila meyendorffii</i> (Calcara, 1845)               | #5                     | alive       |
| Cystiscidae    | <i>Granulina marginata</i> (Bivona, 1832)                       | #8                     | shell       |
| Marginellidae  | <b><i>Gibberula caelata</i> (Monterosato, 1877)</b> (Figure 5d) | #8                     | shell       |
|                | <i>Gibberula miliaria</i> (Linnaeus, 1758)                      | #8                     | shell       |
|                | <i>Gibberula philippii</i> (Monterosato, 1878)                  | #8                     | shell       |
| Costellaridae  | <i>Ebenomitra ebenus</i> (Lamarck, 1811)                        | #9,#10                 | shell       |
|                | <i>Ebenomitra savignyi</i> (Payraudeau, 1826)                   | #8                     | shell       |
|                | <i>Ebenomitra tricolor</i> (Gmelin, 1790)                       | #8                     | shell       |
| Chauvetiidae   | <i>Chauvetia mamillata</i> (Risso, 1826)                        | #8                     | shell       |
|                | <i>Chauvetia turritellata</i> (Deshayes, 1835)                  | #8                     | shell       |
| Pisaniidae     | <i>Pisania striata</i> (Gmelin, 1791)                           | #4,#5,#7,#10,#12       | alive       |
|                | <i>Aplus dorbigny</i> (Payraudeau, 1826)                        | #4,#10,#12             | alive       |
|                | <i>Aplus scaber</i> (Locard, 1891)                              | #8                     | shell       |
| Nassariidae    | <i>Tritia corniculum</i> (Olivi, 1792)                          | #1,#2                  | alive       |
|                | <i>Tritia incrassata</i> (Strøm, 1768)                          | #8                     | alive       |
|                | <b><i>Tritia grana</i> (Lamarck, 1822)</b> (Figure 5e)          | #8                     | shell       |
|                | <i>Tritia mutabilis</i> (Linnaeus, 1758)                        | #1,#2                  | shell       |
|                | <i>Tritia neritea</i> (Linnaeus, 1758)                          | #15                    | alive       |
|                | <i>Tritia pellucida</i> (Risso, 1827)                           | #1,#4                  | shell       |
| Tudicidae      | <i>Euthria cornea</i> (Linnaeus, 1758)                          | #2,#4,#9               | alive       |
| Columbellidae  | <i>Columbella rustica</i> (Linnaeus, 1758)                      | #1,#2,#3,#8            | alive       |
|                | <i>Mitrella minor</i> (Scacchi, 1836)                           | #8                     | shell       |
|                | <i>Mitrella scripta</i> (Linnaeus, 1758)                        | #12                    | alive       |
| Mitridae       | <i>Episcomitra cornicula</i> (Linnaeus, 1758)                   | #4,#7                  | alive       |
| Fascioliariide | <i>Tarantinaea lignaria</i> (Linnaeus, 1758)                    | #4,#5,#8,#10,#12       | alive       |
|                | <i>Pseudofusus pulchellus</i> (R. A. Philippi, 1844)            | #8                     | shell       |
|                | <i>Aptyxis syracusana</i> (Linnaeus, 1758)                      | #1,#2                  | shell       |
| Horaiclavidae  | <i>Haedropleura septangularis</i> (Montagu, 1803)               | #8                     | shell       |

Table 1. Cont.

| Family           | Species   | Sampling Site   | Shell/Alive |
|------------------|---|-----------------|-------------|
| Mitromorphidae   | <i>Mitromorpha columbellaria</i> (Scacchi, 1836)                      | #8              | shell       |
| Conidae          | <i>Conus ventricosus</i> Gmelin, 1791                                 | #1,#2,#4,#14    | alive       |
| Raphitomidae     | <i>Cyrellia linearis</i> (Montagu, 1803)                              | #8,#10          | alive       |
|                  | <i>Leufroyia concinna</i> (Scacchi, 1836)                             | #8              | shell       |
|                  | <i>Leufroyia leufroyi</i> (Michaud, 1828)                             | #8              | shell       |
|                  | <i>Raphitoma bicolor</i> (Risso, 1826)                                | #8              | shell       |
|                  | <i>Raphitoma densa</i> (Monterosato, 1884)                            | #8              | shell       |
|                  | <i>Raphitoma horrida</i> (Monterosato, 1884)                          | #8              | shell       |
|                  | <i>Raphitoma lineolata</i> (Bucquoy, Dautzenberg & Dollfus, 1883)     | #8              | shell       |
|                  | <i>Raphitoma locardi</i> Pusateri, Giannuzzi-Savelli & Oliverio, 2013 | #8              | shell       |
|                  | <i>Raphitoma philberti</i> (Michaud, 1829)                            | #8              | shell       |
| Mangeliidae      | <i>Lyromangelia taeniata</i> (Deshayes, 1835)                         | #8              | shell       |
|                  | <i>Mangelia multilineolata</i> (Deshayes, 1835)                       | #8              | shell       |
|                  | <i>Mangelia unifasciata</i> (Deshayes, 1835)                          | #8              | shell       |
|                  | <i>Pseudomangelia vauquelini</i> (Payraudeau, 1827)                   | #8              | shell       |
|                  | <i>Pyrgocythara stosiciana</i> (Brusina, 1869)                        | #8              | shell       |
|                  | <b><i>Smithiella costulata</i> (Risso, 1826)</b> (Figure 5f)          | #8              | shell       |
| Pleurobranchidae | <i>Berthella plumula</i> (Montagu, 1803)                              | #12,#13,#14     | alive       |
|                  | <i>Berthella aurantiaca</i> (Risso, 1818)                             | #4,#5,#8,#9,#10 | alive       |
| Chromodorididae  | <i>Felimida elegantula</i> (R. A. Philippi, 1844)                     | #12             | alive       |
|                  | <i>Felimida krohni</i> (Vérany, 1846)                                 | #9,#10          | alive       |
|                  | <i>Felimida luteorosa</i> (Rapp, 1827)                                | #1,#2           | alive       |
|                  | <i>Felimida purpurea</i> (Risso, 1831)                                | #5,#8           | alive       |
|                  | <i>Felimare orsinii</i> (Vérany, 1846)                                | #5              | alive       |
|                  | <i>Felimare picta</i> (Schultz in Philippi, 1836)                     | #1              | alive       |
|                  | <i>Felimare villafranca</i> (Risso, 1818)                             | #5,#12          | alive       |
| Phyllidiidae     | <i>Phyllidia flava</i> Aradas, 1847                                   | #8              | alive       |
| Dendrodorididae  | <i>Dendrodoris grandiflora</i> (Rapp, 1827)                           | #8,#10          | alive       |
|                  | <i>Dendrodoris limbata</i> (Cuvier, 1804)                             | #8,#12,#13,#14  | alive       |
|                  | <b><i>Doriopsilla rarispinosa</i> Pruvot-Fol, 1951</b> (Figure 6a)    | #12             | alive       |
|                  | <i>Taringa armata</i> Swennen, 1961                                   | #4,#12          | alive       |
| Discodorididae   | <b><i>Paradoris indecora</i> (Bergh, 1881)</b> (Figure 6b)            | #13             | alive       |
|                  | <b><i>Peltodoris atromaculata</i> Bergh, 1880</b> (Figure 6c)         | #7,#8           | alive       |
|                  | <b><i>Platydoris argo</i> (Linnaeus, 1767)</b> (Figure 6d)            | #4              | alive       |
|                  | <b><i>Tayuva lilacina</i> (A. Gould, 1852)</b> (Figure 6e)            | #4              | alive       |

Table 1. Cont.

| Family          | Species  | Sampling Site    | Shell/Alive |
|-----------------|--|------------------|-------------|
| Calycidorididae | <i>Diaphorodoris alba</i> Portmann & Sandmeier, 1960 (Figure 6f)       | #2               | alive       |
|                 | <i>Diaphorodoris papillata</i> Portmann & Sandmeier, 1960 (Figure 7a)  | #2               | alive       |
| Janolidae       | <i>Antiopella cristata</i> (Delle Chiaje, 1841)                        | #8               | alive       |
| Aeolidiidae     | <i>Aeolidiella alderi</i> (Cocks, 1852)                                | #12,#14          | alive       |
|                 | <i>Spurilla neapolitana</i> (Delle Chiaje, 1841)                       | #1,#2,#9,#12     | alive       |
| Facelinidae     | <i>Caloria elegans</i> (Alder & Hancock, 1845) (Figure 7b)             | #8               | alive       |
|                 | <i>Caloria quatrefagesi</i> (Vayssière, 1888) (Figure 7c)              | #2               | alive       |
|                 | <i>Cratena peregrina</i> (Gmelin, 1791)                                | #1,#13,#14       | alive       |
| Tylodidae       | <i>Tylodina perversa</i> (Gmelin, 1791)                                | #8               | shell       |
| Umbraculidae    | <i>Umbraculum umbraculum</i> ([Lighfoot], 1786)                        | #10              | alive       |
| Cylichnidae     | <i>Cylichna cylindracea</i> (Pennant, 1777)                            | #8               | shell       |
| Haminoeidae     | <i>Haminoea hydatis</i> (Linnaeus, 1758)                               | #1,#14           | shell       |
|                 | <i>Lamprohaminoea cyanomarginata</i> (Heller & T. E. Thompson, 1983) * | #9               | alive       |
| Philinidae      | <i>Philina catena</i> (Montagu, 1803)                                  | #8               | shell       |
| Aplysidae       | <i>Aplysia depilans</i> Gmelin, 1791                                   | #10,#12          | alive       |
|                 | <i>Aplysia fasciata</i> Poiret, 1789 (Figure 7d)                       | #1               | alive       |
|                 | <i>Aplysia punctata</i> (Cuvier, 1803) (Figure 7e)                     | #12              | alive       |
|                 | <i>Bursatella leachii</i> Blainville, 1817 * (Figure 11a,b)            | #12              | alive       |
|                 | <i>Petalifera petalifera</i> (Rang, 1828)                              | #9               | alive       |
| Caliphylidae    | <i>Cyerce cristallina</i> (Trinchese, 1881) (Figure 7f)                | #12              | alive       |
| Plakobranchidae | <i>Elysia timida</i> (Risso, 1818)                                     | #2,#4,#9,#12,#13 | alive       |
|                 | <i>Thuridilla hopei</i> (Vérany, 1853)                                 | #9,#12           | alive       |
| Siphonariidae   | <i>Williamia gussoni</i> (O. G. Costa, 1829)                           | #8               | shell       |
| Pyramidellidae  | <i>Euparthenia humboldti</i> (Risso, 1826)                             | #8               | shell       |
|                 | <i>Folinella excavata</i> (Philippi, 1836)                             | #8               | shell       |
|                 | <i>Parthenina</i> cf. <i>suturalis</i> (R. A. Philippi, 1844)          | #8               | shell       |
|                 | <i>Parthenina angulosa</i> (Monterosato, 1889)                         | #8               | shell       |
|                 | <i>Parthenina monozona</i> (Brusina, 1869)                             | #8               | shell       |
|                 | <i>Pyrgiscus jeffreysii</i> (Forbes & Hanley, 1850)                    | #8               | shell       |
|                 | <i>Megastomia conoidea</i> (Brocchi, 1814)                             | #8               | shell       |
|                 | <i>Turbonilla gradata</i> Bucquoy, Dautzenberg & Dollfus, 1883         | #8               | shell       |

NIS are labelled with \*.

**Table 2.** Bivalvia occurring in the Culuccia Peninsula, with sampling sites and collection status. New records shown in bold.

| Family       | Species  | Sampling Site         | Shell/Alive |
|--------------|--|-----------------------|-------------|
| Nuculidae    | <b><i>Nucula nitidosa</i> Winckworth, 1930</b> (Figure 8a)   | #8                    | shell       |
| Arcidae      | <i>Arca noae</i> Linnaeus, 1758                              | #12,                  | alive       |
|              | <i>Barbatia barbata</i> (Linnaeus, 1758)                     | #4,#12,#13,#14,#15    | alive       |
| Noetiidae    | <i>Striarca lactea</i> (Linnaeus, 1758)                      | #1,#2,#11,#14         | alive       |
| Mytilidae    | <i>Litophaga lithophaga</i> (Linnaeus, 1758)                 | #1,#2                 | alive       |
|              | <b><i>Modiolus barbatus</i> (Linnaeus, 1758)</b> (Figure 8b) | #1,#2                 | alive       |
|              | <i>Mytilaster marioni</i> (Locard, 1889)                     | #13                   | alive       |
|              | <i>Mytilus galloprovincialis</i> Lamarck, 1819               | #1,#2,#15             | alive       |
|              | <i>Musculus subpictus</i> (Cantraine 1835)                   | #8                    | shell       |
|              | <i>Gregariella semigranata</i> (Reeve, 1858)                 | #8                    | shell       |
| Spondylidae  | <i>Spondylus gaederopus</i> Linnaeus, 1758                   | #2,#8                 | alive       |
| Pectinidae   | <i>Flexopecten hyalinus</i> (Poli, 1795) (Figure 8c)         | #8                    | shell       |
|              |  | #12                   | alive (1)   |
|              | <b><i>Flexopecten flexuosus</i> (Poli, 1795)</b> (Figure 8d) | #8                    | alive       |
|              | <i>Mimachlamys varia</i> (Linnaeus, 1758)                    | #10,#14,#15           | alive       |
|              | <i>Manupecten pesfelis</i> (Linnaeus, 1758)                  | #8                    | alive       |
|              | <i>Talochlamys multistriata</i> (Poli, 1795)                 | #8,#14                | shell       |
|              | <i>Palliolum incomparabile</i> (Risso, 1826)                 | #8                    | shell       |
|              | <b><i>Pecten jacobaeus</i> (Linnaeus, 1758)</b> (Figure 8e)  | #1                    | shell       |
| Anomiidae    | <i>Anomia ephippium</i> Linnaeus, 1758                       | #1,#2                 | alive       |
|              | <i>Heteranomia squamula</i> Linnaeus, 1759                   | #8                    | shell       |
|              | <b><i>Pododesmus squama</i> (Gmelin, 1791)</b> (Figure 8f)   | #10                   | alive       |
| Limidae      | <i>Lima lima</i> (Linnaeus, 1758)                            | #4,#9                 | alive       |
|              | <i>Limaria hians</i> (Gmelin, 1791)                          | #5,                   | alive       |
|              | <i>Limaria tuberculata</i> (Olivieri, 1792)                  | #2,#12,#13,#14,#15    | alive       |
| Ostreidae    | <i>Ostrea edulis</i> Linnaeus, 1758                          | #1,#2,#10,#11,#13,#14 | alive       |
|              | <i>Ostrea stentina</i> Payraudeau, 1826                      | #2,#13,#14            | alive       |
|              | <i>Magallana gigas</i> (Thunberg, 1793) *                    | #12,#14               | shell       |
| Pinnidae     | <i>Pinna nobilis</i> Linnaeus, 1758                          | #10,#11               | shell       |
|              | <b><i>Pinna rudis</i> Linnaeus, 1758</b> (Figure 9a)         | #8                    | alive       |
| Margaritidae | <i>Pinctada radiata</i> (Leach, 1814) * (Figure 11c,d)       | #2                    | alive (2)   |
|              |  | #10                   | shell       |

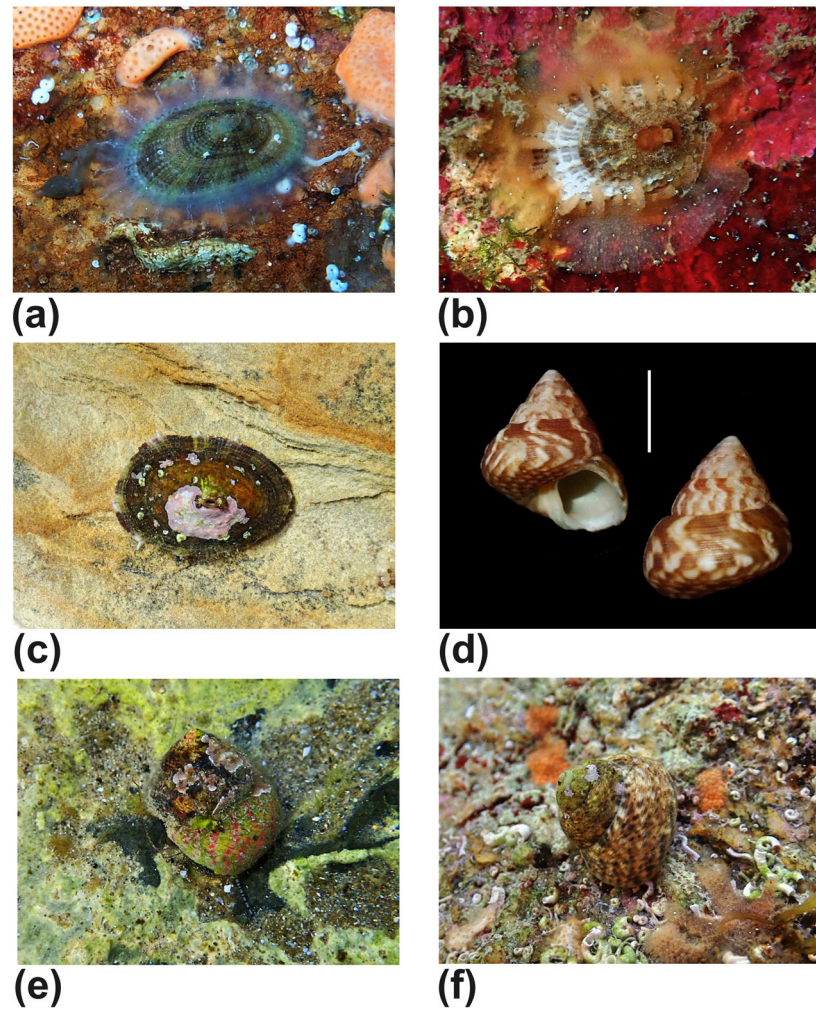
Table 2. Cont.

| Family                                    | Species  | Sampling Site | Shell/Alive |
|---|--|---------------|-------------|
| Lucinidae                                 | <i>Ctena decussata</i> (O. G. Costa, 1829)                       | #8            | shell       |
|   | <i>Loripes orbiculatus</i> Poli, 1791                            | #4            | shell       |
| Galeommatidae                             | <i>Galeomma turtoni</i> W. Turton, 1825                          | #9            | shell       |
| Carditidae                                | <i>Glans trapezia</i> (Linnaeus, 1767)                           | #8            | shell       |
|   | <i>Cardites antiquatus</i> (Linnaeus, 1758)                      | #1,#2         | shell       |
|   | <i>Cardita calyculata</i> (Linnaeus, 1758)                       | #15           | alive       |
| Cardiidae                                 | <i>Acanthocardia paucicostata</i> (G. B. Sowerby II, 1834)       | #1,#2         | shell       |
|   | <i>Acanthocardia tuberculata</i> (Linnaeus, 1758)                | #1,#2,#4      | alive       |
|   | <i>Cerastoderma glaucum</i> (Bruguière, 1789)                    | #14,#15       | alive       |
|   | <i>Parvicardium exiguum</i> (Gmelin, 1791)                       | #1            | shell       |
|   | <i>Papillicardium papillosum</i> (Poli, 1791)                    | #1            | shell       |
| Tellinidae                                | <i>Bosemprella incarnata</i> (Linnaeus, 1758) (Figure 12e)       | #4            | shell       |
|   | <b><i>Bosemprella daniliana</i> (Brusina, 1866)</b> (Figure 12f) | #1            | beached     |
|   | <i>Fabulina fabula</i> (Gmelin, 1791)                            | #4            | shell       |
|   | <i>Moerella donacina</i> (Linnaeus, 1758)                        | #1,#4,#8      | alive       |
|   | <i>Moerella pulchella</i> (Lamarck, 1818)                        | #1,#2         | shell       |
|   | <i>Peronaea planata</i> (Linnaeus, 1758)                         | #1,#2,#4      | alive       |
|   | <i>Peronidia albicans</i> (Gmelin, 1791)                         | #1, #2        | alive       |
|   | <i>Arcopella balaustina</i> (Linnaeus, 1758)                     | #8            | alive       |
| <i>Gastrana fragilis</i> (Linnaeus, 1758) | #1,#2,#3,#4  | alive         |             |
| Solecurtidae                              | <i>Solecurtus strigilatus</i> (Linnaeus, 1758)                   | #4            | shell       |
| Donacidae                                 | <i>Donax trunculus</i> Linnaeus, 1758                            | #1,#2         | shell       |
|   | <i>Donax variegatus</i> (Gmelin, 1791)                           | #1,#2,#8      | shell       |
|   | <b><i>Donax venustus</i> Poli, 1795</b> (Figure 9b)              | #2            | shell       |
| Psammobiidae                              | <i>Gari costulata</i> (W. Turton, 1822)                          | #8            | shell       |
|   | <i>Gari depressa</i> (Pennant, 1777)                             | #1,#2         | alive       |
| Chamidae                                  | <i>Chama circinata</i> Monterosato, 1878                         | #4,           | alive       |
|   | <i>Chama gryphoides</i> (Linnaeus, 1758)                         | #2,#4,#9      | alive       |
|   | <i>Pseudochama gryphina</i> (Lamarck, 1819)                      | #1,#2,#5      | alive       |
| Neoleptonidae                             | <i>Neolepton sulcatulum</i> (Jeffreys, 1859)                     | #8            | shell       |
| Lasaeidae                                 | <b><i>Bornia sebetia</i> (O. G. Costa, 1830)</b> (Figure 9c)     | #1            | alive       |

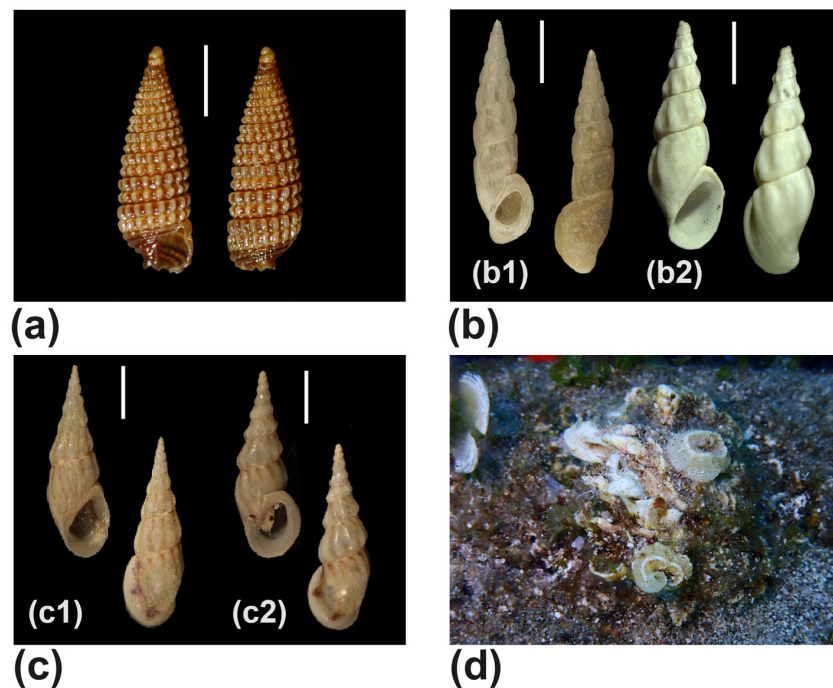
Table 2. Cont.

| Family         | Species  | Sampling Site | Shell/Alive |
|----------------|--|---------------|-------------|
| Mactridae      | <i>Eastonia rugosa</i> (Helbling, 1779) (Figure 9d)          | #1,#2         | shell       |
|                | <i>Mactra stultorum</i> (Linnaeus, 1758)                     | #1,#2         | shell       |
|                | <i>Spisula subtruncata</i> (da Costa, 1778)                  | #1            | shell       |
|                | <i>Lutraria oblonga</i> (Gmelin, 1791)                       | #1            | shell       |
| Mesodesmatidae | <i>Donacilla cornea</i> (Poli, 1795)                         | #1,#15        | alive       |
| Veneridae      | <i>Venus verrucosa</i> Linnaeus, 1758                        | #1            | alive       |
|                | <i>Dosinia exoleta</i> (Linnaeus, 1758)                      | #1,#2         | alive       |
|                | <i>Dosinia lupinus</i> (Linnaeus, 1758)                      | #1            | alive       |
|                | <i>Irus irus</i> (Linnaeus, 1758)                            | #1            | shell       |
|                | <i>Pitar rudis</i> (Poli, 1795) (Figure 9e)                  | #1,#2         | shell       |
|                | <i>Lajonkairialajonkairii</i> (Payraudeau, 1826) (Figure 9f) | #1,#2         | shell       |
|                | <i>Polititapes aureus</i> (Gmelin, 1791)                     | #1,#2         | shell       |
|                | <i>Polititapes lucens</i> (Locard, 1886)                     | #8            | shell       |
| Trapezidae     | <i>Ruditapes decussatus</i> (Linnaeus, 1758)                 | #1            | shell       |
|                | <i>Callista chione</i> (Linnaeus, 1758)                      | #1            | shell       |
| Trapezidae     | <i>Coralliophaga lithophagella</i> (Lamarck, 1819)           | #8            | shell       |
| Ungulinidae    | <i>Microstagon trigonum</i> (Scacchi, 1835)                  | #8            | shell       |
| Solenidae      | <i>Solen marginatus</i> Pulteney, 1799                       | #1            | shell       |
| Pharidae       | <i>Ensis minor</i> (Chenu, 1843)                             | #1            | shell       |
| Myidae         | <i>Sphenia binghami</i> W. Turton, 1822                      | #8            | shell       |
| Thraciidae     | <i>Thracia convexa</i> (W. Wood, 1815)                       | #1,#2         | shell       |
|                | <i>Thracia phaseolina</i> (Lamarck, 1818)                    | #1,#2         | shell       |
|                | <i>Thracia villosiuscula</i> (MacGillivray, 1827)            | #1,#2         | shell       |

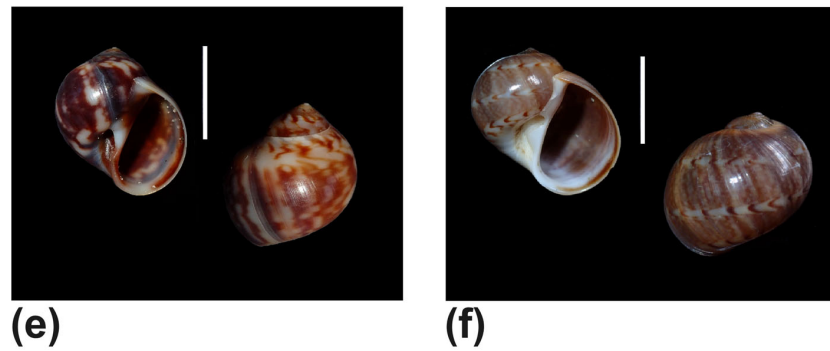
NIS are labelled with \*.



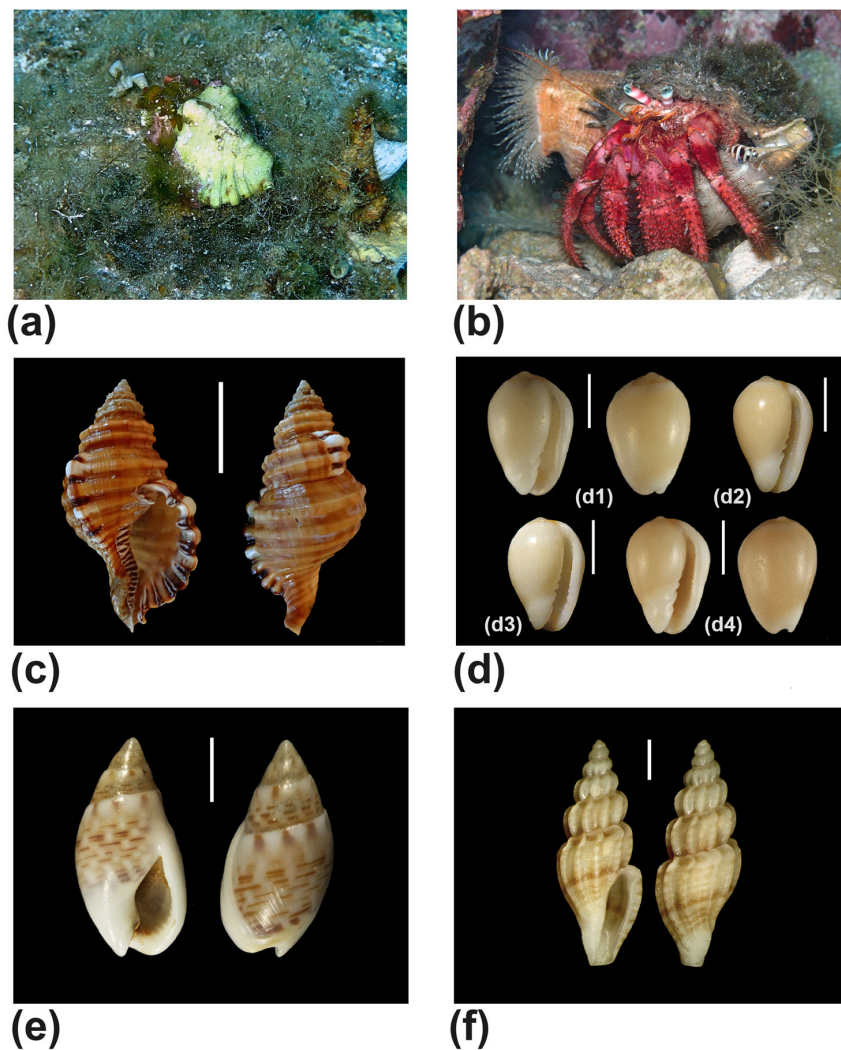
**Figure 3.** (a) *Diodora dorsata*. (b) *Diodora graeca*. (c) *Fissurella nubecula*. (d) *Steromphala adansonii*. (e) *Steromphala divaricata*. (f) *Steromphala varia*. Scale bar (d): 5 mm.



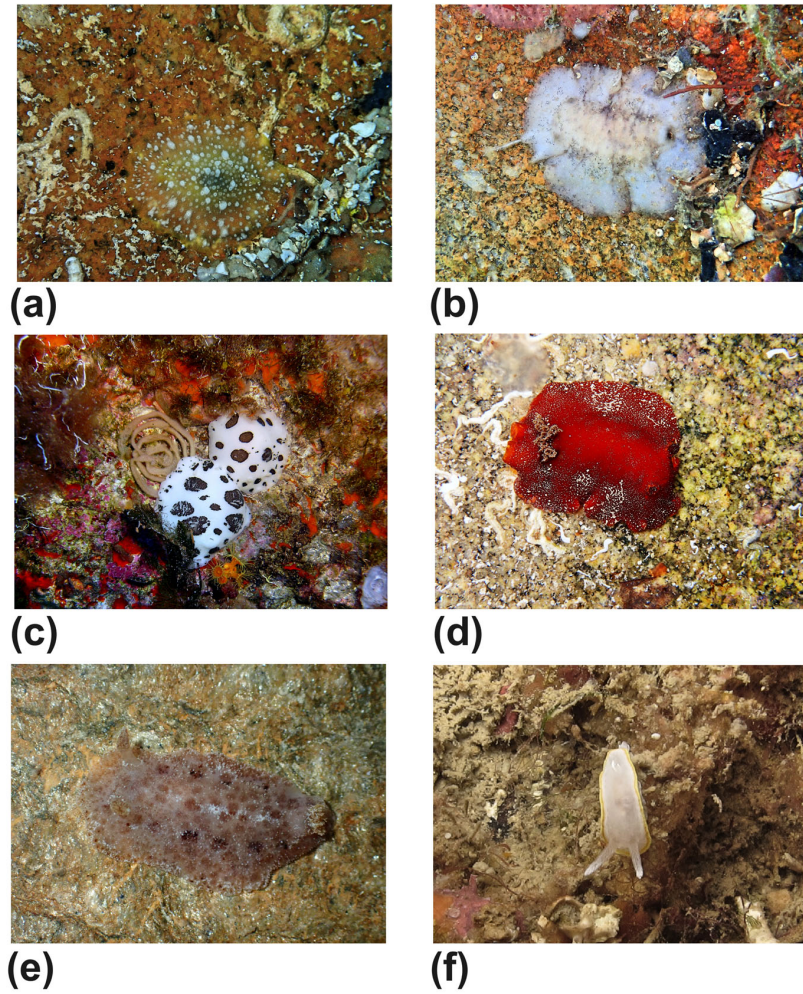
**Figure 4.** *Cont.*



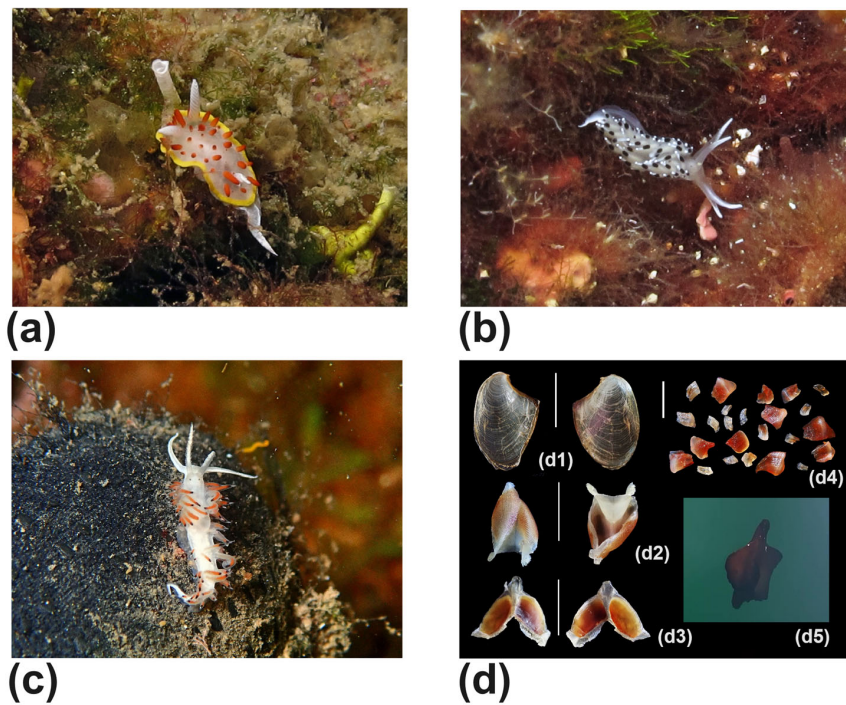
**Figure 4.** (a) *Dizoniopsis coppolae*. (b) *Rissoa auriscalpium*, (b1) Typical form, (b2) “aartseni” form. (c) *Rissoa membranacea*. (c1) Shell with thin outer lip, (c2) shell with thick outer lip. (d) *Vermetus triquetrus*. (e) *Euspira macilenta*. (f) *Notocochlis dillwynii*. Scale bar (a): 1 mm. Scale bars (b1,b2,c1,c2): 2 mm. Scale bars (e,f): 1 cm.



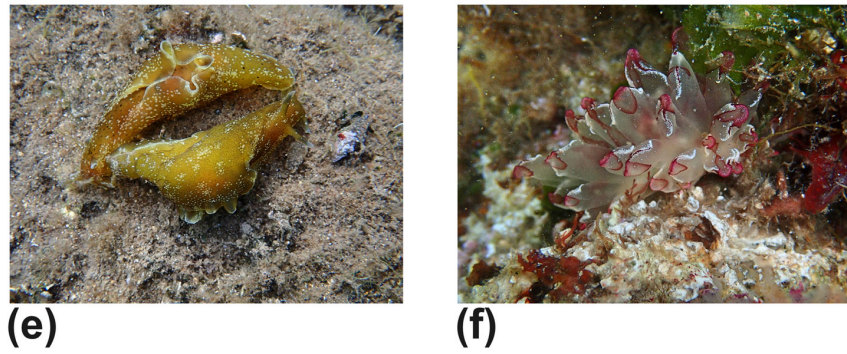
**Figure 5.** (a) *Cabestana cutacea*. (b) *Monoplex parthenopeus*, crabbed. (c) *Monoplex parthenopeus*, shell. (d) *Gibberula caelata*, (d1) from Culuccia, (d2,3) type material from Algeria, (d4) from Malaga (Spain). (e) *Tritia grana*. (f) *Smithiella costulata*. Scale bar (c): 5 cm. Scale bars (d1–d4): 2 mm. Scale bar (e): 3 mm. Scale bar (f): 1 mm.



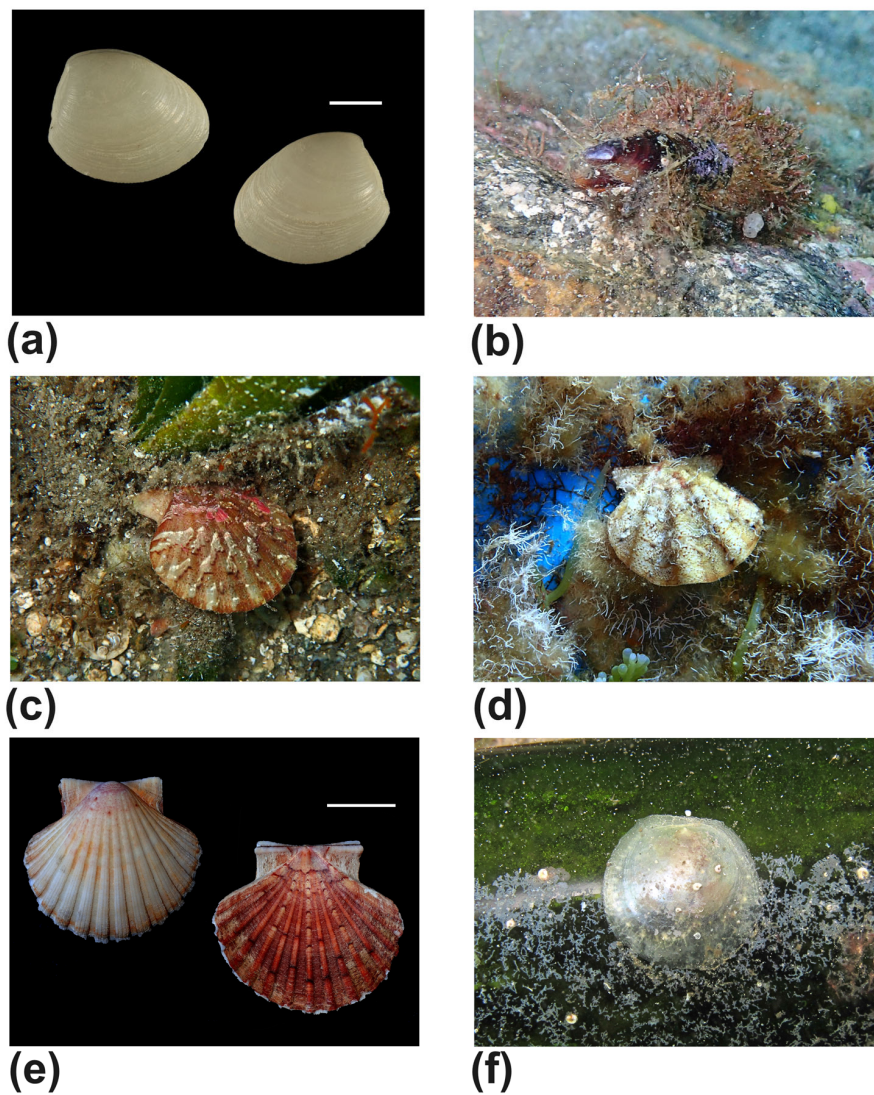
**Figure 6.** (a) *Doriopsilla rarispinosa*. (b) *Paradoris indecora*. (c) *Peltodoris atromaculata*. (d) *Platydoris argo*. (e) *Tayuva lilacina*. (f) *Diaphodoris alba*.



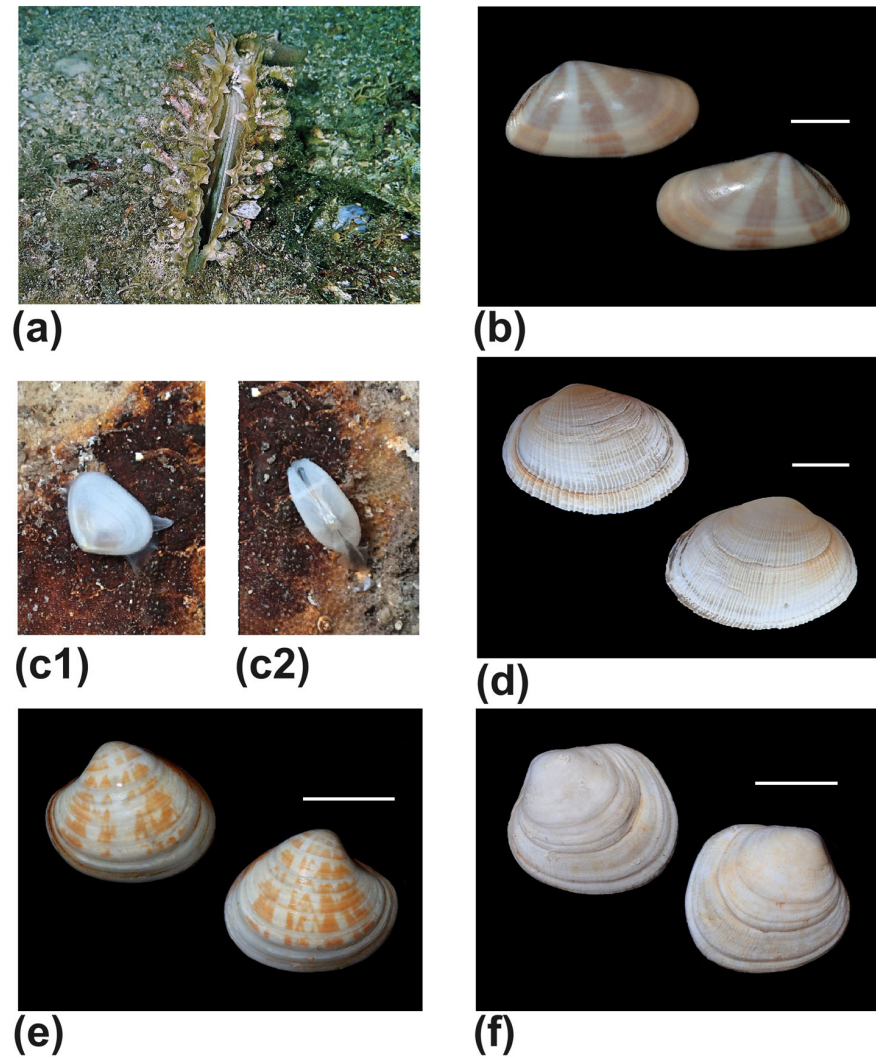
**Figure 7.** Cont.



**Figure 7.** (a) *Diaphodoris papillata*. (b) *Caloria elegans*. (c) *Caloria quatrefagesi*. (d) *Aplysia fasciata*, (d1) internal shell, (d2) radula, (d3) masticatory jaws, (d4) gizzard plates, (d5) swimming animal. (e) *Aplysia punctata*. (f) *Cyerce cristallina*. Scale bar (d1): 2 cm. Scale bars (d2–d4), 1 cm.

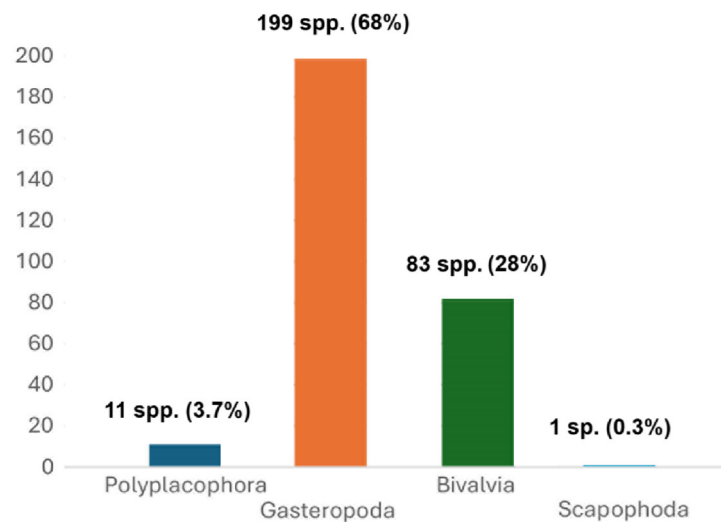


**Figure 8.** (a) *Nucula nitidosa*. (b) *Modiolus barbatus*. (c) *Flexopecten hyalinus*. (d) *Flexopecten flexuosus*. (e) *Pecten jacobaeus*. (f) *Pododesmus squama*. Scale bar (a): 2 mm. Scale bar (e): 2 cm.



**Figure 9.** (a) *Pinna rudis*. (b) *Donax venustus*. (c1,c2) *Bornia sebetia*. (d) *Eastonia rugosa*. (e) *Pitar rudis*. (f) *Lajonkairia lajonkairii*. Line bar (b): 5 mm. Scale bar (d): 2 cm. Scale bars (e,f): 1 cm.

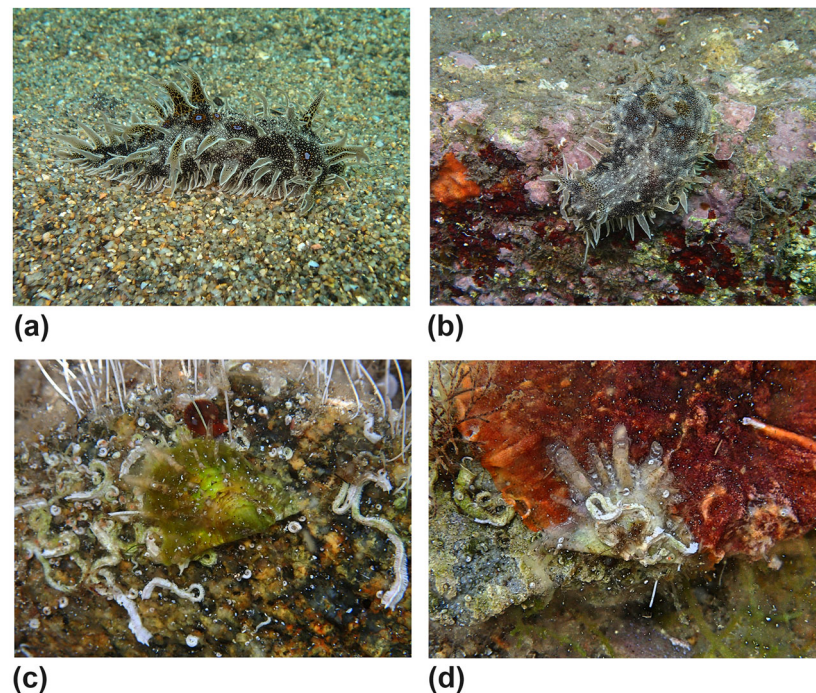
Amongst the four molluscan classes reported, gastropods were the most represented (68% of the total number of species), followed by bivalves (28%), polyplacophorans (3.7%) and scaphopods (0.3%) (Figure 10).



**Figure 10.** Composition of the marine molluscs of the Culuccia Peninsula.

### 3.2. Non-Native Species (NNS)

The four NNS recorded in the previous inventory have been confirmed. The sea hare *Bursatella leachii* Blainville, 1817 can be considered well established along the western coast of the peninsula (SS#9), having been frequently observed (Figure 11a,b). On the contrary, the cephalaspidean *Lamprohaminoea ovalis* (Pease, 1868) has not been recorded again. Many juvenile individuals of the rayed pearl oyster *Pinctada radiata* (Leach, 1814) [22] have been recorded byssed on rocky substrates (Figure 11c,d) at the site SS#2. The oyster *Magallana gigas* (Thunberg, 1793) seems to be confined to the suspended aquaculture plants located in the narrow fjord hosting the small marina of Porto Pozzo and facing the western coast of the peninsula (Figure 1c).



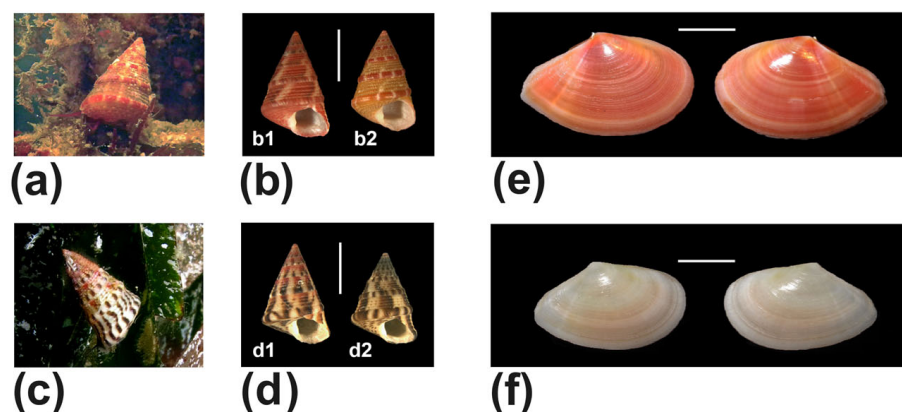
**Figure 11.** (a,b) *Bursatella leachii* grazing on the soft and hard bottoms of the SS#12. (c,d) Juveniles of *Pinctada radiata* byssed to hard substrate in the SS#4.

## 4. Discussion

As also stated by the Marine Strategy Framework Directive (2008/56/EC), molluscs are among the best bioindicators of the effects of human impact on marine ecosystems, of climate change, and of the status of protected areas [4,15]. Therefore, constant monitoring and field observation are needed to improve our understanding of biodiversity changes that can occur in the marine areas of the Mediterranean Sea. This work is part of a project devoted to gaining insight into the local and regional biodiversity of northern Sardinia. Systematics and nomenclature adopted for some of the species reported in the previous inventory [17], as well as for new records, need explanation, together with some ecological notes.

### 4.1. *Jujubinus vulgaris* (Risso, 1826)

*Jujubinus vulgaris* (Risso, 1826), listed in the previous checklist by Mariottini et al. [17], deserves a nomenclatural explanation. This is the oldest name for the Mediterranean species commonly called *Jujubinus exasperatus* (Pennat, 1777), which is a distinct species [23]. Both taxa have been observed syntopically grazing on *Posidonia* leaves at the site SS#4, where they feed on a variety of microalgal food sources, such as diatoms and green algal epiphytes (Figure 12a–d).



**Figure 12.** (a) *Jujubinus vulgaris*, in situ photograph. (b1,b2) *Jujubinus vulgaris*, shells. (c) *Jujubinus exasperatus*, in situ photograph. (d1,d2) *Jujubinus exasperatus*, shells. (e) *Bosemprella incarnata*. (f) *Bosemprella daniliana*. Scale bars (b,d): 5 mm. Scale bars (e,f): 1 cm.

#### 4.2. *Rissoa auriscalpium* (Linnaeus, 1758)

It is still not clear how many species belong to the complex of *Rissoa auriscalpium*, which includes morphotypes with different teleoconchs but also specimens with two distinct protoconch types, i.e., multispiral vs. paucispiral, indicating two different larval developments, planktotrophic vs. non-planktotrophic, respectively [24–26]. We have found specimens with typical *R. auriscalpium* phenotype (Figure 4(b1)) at the site SS#8, along with individuals (Figure 4(b2)), reported as *Rissoa* sp. 1 in the previous checklist, recalling the type material of *Rissoa aartseni* Verduin, 1985, known so far only from the Gulf of Gabès. We keep all those phenotypes within *R. auriscalpium* pending a genetic assessment of the status of the various nominal taxa within this complex.

#### 4.3. *Rissoa membranacea* (J. Adams, 1800)

*Rissoa membranacea* is a rather variable species with a broad range across the Mediterranean and European Atlantic coasts. The specimens collected at the site SS#8 are very peculiar, with a rather slender shell (Figure 4(c1,c2)). Also in this case, a modern genetic assay would help assess the status of the various phenotypes, including the relationships with the sibling *Rissoa labiosa* (Montagu, 1803) [27].

#### 4.4. *Gibberula caelata* (Monterosato, 1877)

*Gibberula caelata* was originally described from Algeria and thereafter recorded from southern Italy, Sicily, Morocco, southern Spain, Portugal and the Canaries ([2,28], p. 39), ([29], p. 320). Specimens (Figure 5(d1)) sorted out from bioclastic sand samples collected at the site SS#8 (15 m depth) matched individuals of the type material (Figure 5(d2,d3)) stored at the Museo Civico di Zoologia, Rome ([30], p. 62, Figure 23c,d), as well as shells from other Mediterranean spots (Figure 5(d4)). This is the first record of this species from Sardinian waters, for Sector 2 of “The New Checklist of the Italian Fauna” [2].

#### 4.5. *Doriopsilla areolata* (Bergh, 1880)

Taxa of the genus *Doriopsilla* Bergh 1880 in the Mediterranean Sea have been discussed by Furfaro et al. [31], who have resurrected the name of *D. rarispinosa* Pruvot-Fol, 1951 for specimens occurring in the Central Mediterranean Sea, confused in the past with *Doriopsilla areolata* Bergh, 1880, which seems to be restricted to the Adriatic Sea. At the site SS#12 (Figure 2e), we collected a specimen of *D. rarispinosa* under a stone in shallow water (Figure 6a). This site is rich in Heterobranchia species that share the same habitat: we observed *Felimare villafranca* (Risso, 1818), *Dendrodoris limbata* (Cuvier, 1804), *Aeolidiella alderi* (Cocks,

1852), *Spurilla neapolitana* (Delle Chiaje, 1841). In open water on muddy bottom with *Cymodocea nodosa* (Ucria) Ascherson, 1870, *Caulerpa prolifera* (Forsskål) J.V. Lamouroux, 1809 and seasonally *Caulerpa cylindracea* Sonder, 1845, we recorded the NNS *Bursatella leachii* Blainville, 1817 (Figure 11a,b) and the three sea hares *Aplysia fasciata* Poiret, 1789 (Figure 7d), *A. depilans* Gmelin, 1791, and *A. punctata* (Cuvier, 1803) (Figure 7e). At the site SS#12, we also confirmed the abundant presence of the sacoglossans *Elysia timida* (Risso, 1818) and *Thuridilla hopei* (Vérany, 1853).

#### 4.6. *Cyerce cristallina* (Trinchese, 1881)

Among the new records, a single specimen of the nocturnal *Cyerce cristallina* (Trinchese, 1881) (Figure 7f) was found beneath a stone at the site SS#12. This species seems to have a large distribution, ranging from the western Atlantic (Florida) to the Mediterranean Sea. Recently, Moreno et al. [32] published an integrative assessment of diversity in Caribbean *Cyerce* Bergh, 1871. Since they did not analyse specimens of *C. cristallina* from the Mediterranean Sea, they could not evaluate whether this species is truly amphiatlantic in distribution or whether the Mediterranean and Caribbean populations are taxonomically distinct.

#### 4.7. *Bosemprella daniliana* (Brusina, 1866)

Two distinct species can be recognised among specimens commonly identified as *Bosemprella incarnata* (Linnaeus, 1758). They occur sympatrically in the Mediterranean Sea and can be easily distinguished morphologically. *Bosemprella incarnata* (Figure 12e) has been traditionally used for Mediterranean specimens that show a brilliant and vivid pink/reddish dominant colour. The second species, almost neglected by Mediterranean specialists, has a yellowish or pale pinkish colour, is smaller in size and more globose, and corresponds to the taxon *Tellina daniliana* Brusina, 1866, currently considered a synonym of *B. incarnata* [11]. Many specimens of *Bosemprella* have been collected beached with soft parts after a strong storm at the site SS#1, and after a careful examination we identified them as *B. daniliana* (Figure 12f), perfectly fitting the original description by Brusina ([33], p. 41), with their yellowish or pale pink shell, more globose and smaller than *B. incarnata*. *Bosemprella daniliana* lives in coarse sandy bottom, generally at 10–20 m depth sympatrically but not in syntopy with *B. incarnata* (personal observation): the latter prefers shallower fine sandy bottom, and shells have been collected at the site SS#4 at 2–5 m depth (Figure 2b).

Molluscs represent the second largest Phylum after arthropods, with approximately 100,000 described species and potentially still 100,000 species to be described [34]. In this respect, the Mediterranean basin is considered a hot spot of marine molluscan diversity, with high levels of endemism and cryptic species, and new species are continually discovered [2,35]. Furthermore, Mollusca represents the marine Phylum with major invasion success in the Mediterranean Sea, since it is the most abundant taxonomic group among NNS, accounting for 225 allochthonous taxa [13,36]. Describing molluscan communities along the Italian coast is an important and ongoing task aimed at monitoring and preserving biodiversity, since molluscs are effective indicators of Good Environmental Status as defined by the Marine Strategy Framework Directive (MSFD; Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008). The updated checklist of the marine malacofauna of the Culuccia Peninsula includes four NNS; two of them, the sea hare *Bursatella leachii* and the rayed pearl oyster *Pinctada radiata*, can now be considered common inhabitants of the water of the peninsula, since their populations are well established. Regarding the occurrence of the fan pen shell *Pinna nobilis* (Linnaeus, 1758), after the Mass Mortality Event [37], in the infralittoral zone of the peninsula, we observed no live individuals during SCUBA and free dive monitoring. Another endangered species present in North Sardinia [38] and listed in the previous checklist is the limpet *Patella ferruginea*

Linnaeus, 1758; in this case, we could confirm the presence of living specimens at the same sites earlier recorded (SS#4 and SS#8) [17].

## 5. Conclusions

To summarise, in this work, 39 species have been reported as new records, and added to the previous malacofaunal inventory of the Culuccia Peninsula, which now comprises a total of 295 taxa belonging to the four classes Gastropoda (199), Bivalvia (84), Polyplacophora (11) and Scaphopoda (1). Within this list, four NNS are present, two of which show stable populations during the two-year monitoring of the infralittoral zone that surrounds the peninsula. The fan pen shell *Pinna nobilis* seems not to have recovered in the area, while we could confirm the occurrence of the limpet *Patella ferruginea* along the rocky coast of the peninsula. The research project devoted to the study of marine diversity of the Culuccia Peninsula will continue in the future with the goal of monitoring, preserving and managing the remarkable biodiversity of this area.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/d17120809/s1>, Table S1. GA-stroPO-da occurring in the peninsula Culuccia, voucher numbers; Table S2. BI-valvia occurring in the peninsula Culuccia, voucher numbers; Table S3. PO-lyplacophora occurring in the peninsula Culuccia, voucher numbers.

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## Abbreviations

The following abbreviations are used in this manuscript:

NNS Non-Native Species  
SS Sampling Site(s)

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