

Article

Observations on the Benthic Heterobranch “Sea Slugs” (Mollusca: Gastropoda) of Lampedusa, the Southernmost Island of Italy (MPA Isole Pelagie)

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Abstract

Thanks to their striking shapes and colors, heterobranch “sea slugs” are probably the most sought-after group of marine critters by scuba divers around the world. Nevertheless, for many of the islands and coasts of Sicily, there are no specific studies on the fauna of this group (formerly known as opisthobranchs). Even Lampedusa, one of the most famous islands in the Mediterranean, is no exception to this. To fill this knowledge gap, the authors conducted a faunal study dedicated to this group in July 2025. Data collection, carried out using the photographic-capture technique both during scuba diving and snorkeling, led to the finding of 22 species of heterobranch “sea slugs”. A comparison of the heterobranch “sea slugs” of Lampedusa with that of other Sicilian islands revealed a low diversity of these mollusks on this island. This scarcity of fauna is probably due to the lack of favorable environments and the considerable environmental homogeneity that characterizes the seabed and coastal areas of Lampedusa. Nevertheless, the discovery of some species of considerable biogeographical importance, together with the island’s unique geographical position, make it an important location to monitor for the study of the distribution patterns of allochthonous marine Heterobranchia species that enter into the Mediterranean Sea.

**Keywords:** biodiversity; sea slugs; Heterobranchia; allochthonous species; Sicily

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1. Introduction

The Pelagic islands archipelago (consisting of the islands of Lampedusa, Linosa, and Lampione) forms the southernmost and more distant island group of Italy [1]. The name “Pelagic” comes from the ancient Greek word “pèlagos”, which means “open sea” [2] and was given to these islands to distinguish them from the others located between Sicily and Africa (i.e., Pantelleria, Kerkennah Islands, and Maltese archipelago). Indeed, these islands are located more distant from both the Sicilian and African coasts [1]. In this archipelago, there are a MPA (Marine Protected Area) “Isole Pelagie” (which covers 46.28 km of coast plus 4.136 ha of sea) and a SAC (Special Area of Conservation) “Fondali delle Isole Pelagie” (4085 ha) [3–7].

Despite the presumed naturalistic value of the seabed around Lampedusa, there have not been many malacological studies focusing on this island. Specifically, the mollusk fauna of Lampedusa was first examined by Spada et al. [8] during the summers of 1968 and 1970. After this initial work, it took almost 30 years for two further studies on the island’s mollusk fauna to be published. These latter regarded the mollusk fauna found

among photophilic algae [9] and in detritic bottoms [10]. Subsequently, no further studies on the mollusks of Lampedusa were published. From this, in addition to the scarcity (and oldness) of studies on Lampedusa's mollusks, there is a total absence of studies on specific groups of these animals.

Faunal information concerning the heterobranch “sea slugs” (formerly known as Opisthobranchia) is no exception. This group of 13 gastropod mollusk taxa (Acteonoidea, Cephalaspidea, Runcinida, Aplysiida, Pteropoda, Umbraculida, Ringiculimorpha, Pleurobranchida, Doridida, Nudibranchia, Acochlidiiomorpha, Sacoglossa, and Rhodopoidea) is characterized by a strong evolutionary trend towards the reduction/disappearance of the shell and bodies with very differentiated shapes and colors. These features, together with their ecological peculiarities and the difficulty in finding them due to their general small sizes, have made these gastropod mollusks famous among researchers, divers, and marine critter enthusiasts around the world, especially since the advent of underwater photography [11]. For Lampedusa, the only information available on this informal group comes from the three faunal works mentioned above [8–10] and four reports of single species [12–14]. Through the analysis of these works, the presence of 28 species of heterobranch “sea slugs” (1 Acteonoidea, 14 Cephalaspidea, 1 Runcinida, 2 Aplysiida, 1 Pteropoda, 2 Ringiculimorpha, 2 Pleurobranchida, 1 Doridida, and 4 Sacoglossa) (Table 1) was documented along the island's seabeds.

Table 1. Heterobranch “sea slugs” species documented for Lampedusa in the literature. Each species is associated with the studies that cited it for the island.

Taxa	References
Acteonoidea	
Family Acteonidae A. d'Orbigny, 1842	
<i>Acteon tornatilis</i> (Linnaeus, 1758)	[8]
Ringiculimorpha	
Family Ringiculidae R. A. Philippi, 1853	
<i>Ringicula auriculata</i> (Ménard de la Groye, 1811)	[8,10]
<i>Ringicula conformis</i> Monterosato, 1877	[10]
Pleurobranchida	
Family Pleurobranchidae Gray, 1827	
<i>Berthella plumula</i> (Montagu, 1803)	[10]
<i>Pleurobranchus testudinarius</i> Cantraine, 1835	[14]
Doridida	
Family Goniodorididae H. Adams & A. Adams, 1854	
<i>Goniodoridella picoensis</i> (Paz-Sedano, Ortigosa & Pola, 2017)	[13]
Cephalaspidea	
Family Retusidae Thiele, 1925	
<i>Pyrunculus hoernesii</i> (Weinkauff, 1866)	[10]
<i>Retusa truncatula</i> (Bruguière, 1792)	[8,10]
<i>Retusa umbilicata</i> (Montagu, 1803)	[10]
Family Rhizoridae Dell, 1952	
<i>Volvulella acuminata</i> (Bruguière, 1792)	[10]

Table 1. Cont.

Taxa	References
Family Bullidae Gray, 1827	
<i>Bulla striata</i> Bruguière, 1792	[8]
Family Haminoeidae Pilsbry, 1895	
<i>Haminoea hydatis</i> (Linnaeus, 1758)	[8,9]
<i>Haminoea navicula</i> (da Costa, 1778)	[10]
<i>Roxaniella jeffreysi</i> (Weinkauff, 1866)	[10]
<i>Weinkauffia turgidula</i> (Forbes, 1844)	[10]
Family Scaphandridae G. O. Sars, 1878	
<i>Scaphander lignarius</i> (Linnaeus, 1758)	[10]
Family Philinidae J. E. Gray, 1850 (1815)	
<i>Hermania scabra</i> (O. F. Müller, 1784)	[8]
<i>Philine catena</i> (Montagu, 1803)	[10]
<i>Philine quadripartita</i> Ascanius, 1772	[8]
Family Laonidae Pruvot-Fol, 1954	
<i>Laona pruinosa</i> (W. Clark, 1827)	[10]
Runcinida	
Family Runcinidae H. Adams & A. Adams, 1854	
<i>Runcina</i> sp.	[9]
Pteropoda	
Euthecosomata	
Family Creseidae Rampal, 1973	
<i>Creseis acicula</i> (Rang, 1828)	[10]
Aplysiida	
Family Aplysiidae Lamarck, 1809	
<i>Aplysia dactylomela</i> Rang, 1828	[12]
<i>Aplysia fasciata</i> Poiret, 1789	[9]
Sacoglossa	
Family Plakobrachidae Gray, 1840	
<i>Elysia timida</i> (Risso, 1818)	[9]
<i>Elysia viridis</i> (Montagu, 1804)	[9]
<i>Thuridilla hopei</i> (Vérany, 1853)	[9]
Family Hermaeidae H. Adams & A. Adams, 1854	
<i>Aplysiopsis elegans</i> Deshayes, 1853	[9]

Given that there is no specific study on heterobranch “sea slug” fauna of Lampedusa, this study aims to explore and document the marine heterobranch “sea slugs” currently present in the waters of Lampedusa, making comparisons with other Sicilian islands. In this way, the data presented could contribute to building a knowledge base for future studies about heterobranch “sea slugs” for Lampedusa.

2. Materials and Methods

2.1. Study Area

Lampedusa, with its 20,1974 km² of surface and 33 km of coastline, is the most extensive and largest island of the Pelagie archipelago [6,7] (Figure 1). This island, which geologically belongs to the African platform (it is a horst), is entirely composed of limestone, dolomite, and sandstone [6]. It presents a general tongue-like shape (elongated in the west–east direction) and an almost horizontal profile. Morphologically, the island's coasts present two different features. The northern and western sectors have high and steep cliffs overlooking the sea. Instead, the southern and eastern ones are characterized by deep incisions forming inlets (called “cale” in Italian) [7]. This coastal morphology affects the seabed and the seawater in the respective sectors. Indeed, in very general terms, the southern and eastern sectors host shallow bottoms compared to the northern and western ones. In addition, these latter sectors present colder seawater [8].



Figure 1. Studied area. (A) Location of Sicily and its groups of islands. (B) Location of the Pelagie Islands in the Sicily Channel. (C) Location of Lampedusa in the Pelagie archipelago. (D) Lampedusa: the examined dive sites and coastal stretches are indicated, respectively, by white rhombuses and lines (abbreviations are reported in Table 2); MPA (Marine Protected Area) borders are indicated in blue (C zone), yellow (B zone), and red (A zone). The names of the localities are reported in the map with the following abbreviations: Grotta dell’Acqua (GA), Grotta Santa (GS), Baia di Taccio Vecchio (BTV), Muro Vecchio (MV), Scoglio Pignata (SP), Baia di Capo Ponente (BCP), Capo Grecale (CG), Fortino (F), Costa Sud di Capo Grecale (CSCG), Panettone (P), Madonnina (M), Tabaccara (T), Punta Parrino (PP), Punta Iavuta (PI), Baia di Punta Sottile (BPS), Cala Spugne (CS), Cala Maluk (CM), Cala Francese (CF).

2.2. Sampling and Data Analysis

The present study was carried out from 7 July 2025 to 12 July 2025 through an examination of several dive sites and coastal stretches of Lampedusa (Figure 1A–C). The dive sites were surveyed through scuba diving, while the coastal stretches were explored through snorkeling. In both cases, surveys were conducted during the morning. In total, 18 localities (10 dive sites and 8 coastal stretches) were examined.

The scuba dives, lasting about 60 min, were conducted following the bottom morphology of each dive site, looking at all habitats present in the latter. The 10 examined dive sites were the following (Table 2).

Table 2. List of the dive sites and coastal stretches (with their abbreviations) examined during this study. For each location, the date, coordinates, activity, protection zone, depth range, and bottom type are indicated.

Site	Date	Coordinates	Activity	Protection Zone	Depth Range	Bottom Type
Grotta dell'Acqua (GA)	7 July 2025	35°31'20.0'' N 12°37'06.7'' E	Dive	B	Up to 25 m	Rocky wall on a sandy bottom
Grotta Santa (GS)	7 July 2025	35°31'19.7'' N 12°35'39.6'' E	Dive	B	Up to 20 m	Massive promontory
Baia di Taccio Vecchio (BTV)	7 July 2025	from 35°31'18.6'' N 12°35'41.6'' E to 35°31'18.1'' N 12°35'46.8'' E	Snorkeling	B	0–1 m	Rocky escarpment
Muro Vecchio (MV)	8 July 2025	35°31'33.9'' N 12°33'35.2'' E	Dive	C	Up to 30 m	Huge promontory
Scoglio Pignata (SP)	8 July 2025	35°31'37.9'' N 12°–31'24.3'' E	Dive	C	Up to 30 m	Rocky outcrops and boulders
Baia di Capo Ponente (BCP)	8 July 2025	from 35°31'22.5'' N 12°31'13.0'' E to 35°31'18.3'' N 12°31'07.2'' E	Snorkeling	C	0–1 m	Large rocks
Capo Grecale (CG)	9 July 2025	35°30'55.6'' N 12°37'58.6'' E	Dive	B	Up to 35 m	Rocky slope on a sandy bottom
Fortino (F)	9 July 2025	35°30'50.3'' N 12°37'44.3'' E	Dive	B	Up to 25 m	Rocky walls and canyons on a sandy bottom
Costa Sud di Capo Grecale (CSCG)	9 July 2025	from 35°30'55.5'' N 12°37'55.0'' E to 35°30'53.8'' N 12°37'43.8'' E	Snorkeling	B	0–1 m	Rocky vertical wall
Panettone (P)	10 July 2025	35°30'26.0'' N 12°33'33.2'' E	Dive	B	Up to 20 m	Rocky outcrop on a sandy bottom
Madonnina (M)	10 July 2025	35°30'28.1'' N 12°33'24.2'' E	Dive	B	Up to 18 m	Large rocky outcrop with a cave
Tabaccara (T)	10 July 2025	from 35°30'39.8'' N 12°34'07.3'' E to 35°30'27.6'' N 12°34'11.5'' E	Snorkeling	C	0–1 m	Vertical rocky wall intermingled with large, medium, and small rocks
Punta Parrino (PP)	11 July 2025	35°30'02.6'' N 12°38'04.5'' E	Dive	Non-protected	Up to 40 m	Rocky outcrops on a sand bed
Punta Iavuta (PI)	11 July 2025	35°29'49.0'' N 12°38'02.2'' E	Dive	Non-protected	Up to 20 m	Rocky outcrops on a sand bed
Baia di Punta Sottile (BPS)	11 July 2025	from 35°29'50.0'' N 12°37'58.2'' E to 35°29'46.2'' N 12°37'51.6'' E	Snorkeling	Non-protected	0–1 m	Continuous horizontal crevice

Table 2. Cont.

Site	Date	Coordinates	Activity	Protection Zone	Depth Range	Bottom Type
Cala Spugne (CS)	12 July 2025	from 35°29'35.3" N 12°36'29.9" E to 35°29'43.5" N 12°36'38.3" E	Snorkeling	Non-protected	0–1 m	Cove with many jagged inlets forming small grottos
Cala Maluk (CM)	12 July 2025	from 35°29'41.2" N 12°36'42.5" E to 35°29'36.1" N 12°36'52.0" E	Snorkeling	Non-protected	0–1 m	Cove with many jagged inlets forming small grottos
Cala Francese (CF)	12 July 2025	from 35°29'40.6" N 12°37'26.6" E to 35°29'43.6" N 12°37'30.7" E	Snorkeling	Non-protected	0–1 m	Cove characterized by two inlets

The snorkeling activities, lasting about 45–60 min, were carried out following the line of the given coastal stretch. Also in this activity, all habitats found along the various stretches of coastline were examined. The 8 coastal stretches were the following (Table 2).

The data were obtained through the use of the photographic-capture technique already used by authors in the study of heterobranch “sea slug” fauna on other islands and stretches of coastline in Sicily [15–18]: during the scuba dives and snorkeling activities, all the heterobranch “sea slug” specimens (and any egg masses) encountered were photographed with an Olympus TG-6 underwater camera. Moreover, when possible, during the dives and snorkeling activities, the undersides of mobile surfaces (stones, anthropogenic objects, etc.) were observed. In addition, the depth of each specimen and egg mass was recorded using a SUUNTO D6i underwater computer. Subsequently, these photographs were examined on the computer to identify specimens and count them. A list was compiled of the heterobranch “sea slugs” currently present in Lampedusa, along with information on the presence/absence, abundance, and bathymetric range for each species found (Table 3). The identification of the species was undertaken through the consultation of the scientific literature and identification books [11,19–21].

3. Results

Through the present study, a total of 22 heterobranch “sea slug” species (subdivided into 5 groups) were found (Table 3). The encountered species are shown through photographic plates (Figures 2–4).



Figure 2. *Rhodope* sp., (A) dorsal view. *Berthella* sp., (B) egg mass. *Berthellina* cf. *edwardsii*, (C) the specimen in resting position; (D) right dorso-lateral view. *Caloria quatrefagesi*, (E) right antero-dorsal view. *Edmundsella pedata*, (F) right dorso-lateral view; (G) egg mass. *Paraflabellina ischitana*, (H) a specimen on the hydrozoan *Eudendrium* sp. *Tenellia* sp., (I) right dorso-lateral view. *Tenellia genovae*, (J) dorsal view. *Felimare picta*, (K) right antero-dorsal view. *Felimare tricolor*, (L) dorsal view.

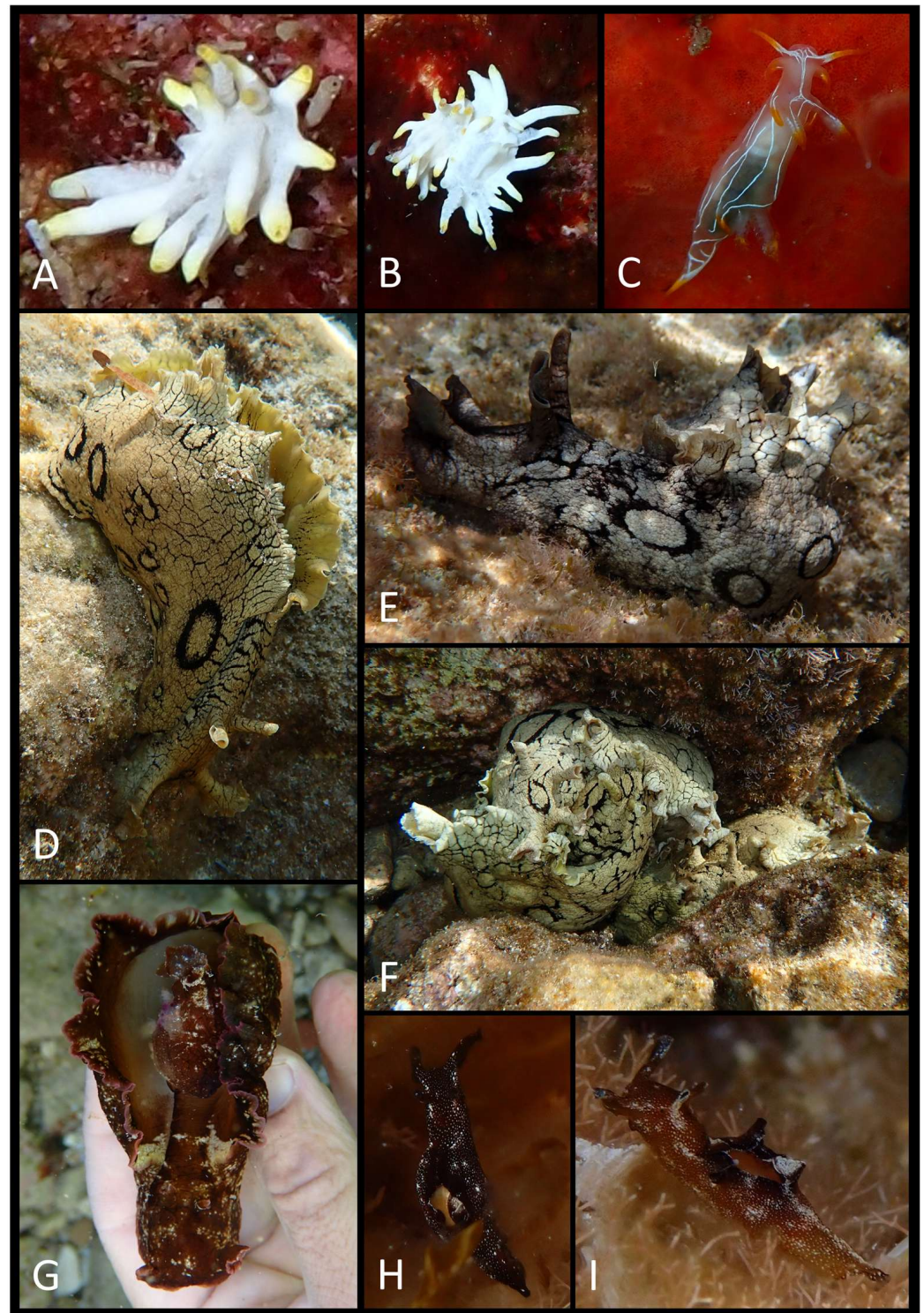


Figure 3. *Goniodoridella picoensis*, (A) a specimen feeding on the bryozoans *Nolella* sp., (B) two individuals during mating. *Trapania lineata*, (C) left dorso-lateral view. *Aplysia dactylomela*, (D) right antero-dorsal view; (E) a specimen with some melanistic part of the body; (F) mating activity. *Aplysia* cf. *fasciata*, (G) dorsal view of a dead individual. *Aplysia punctata*, (H) dorsal view; (I) left lateral view.

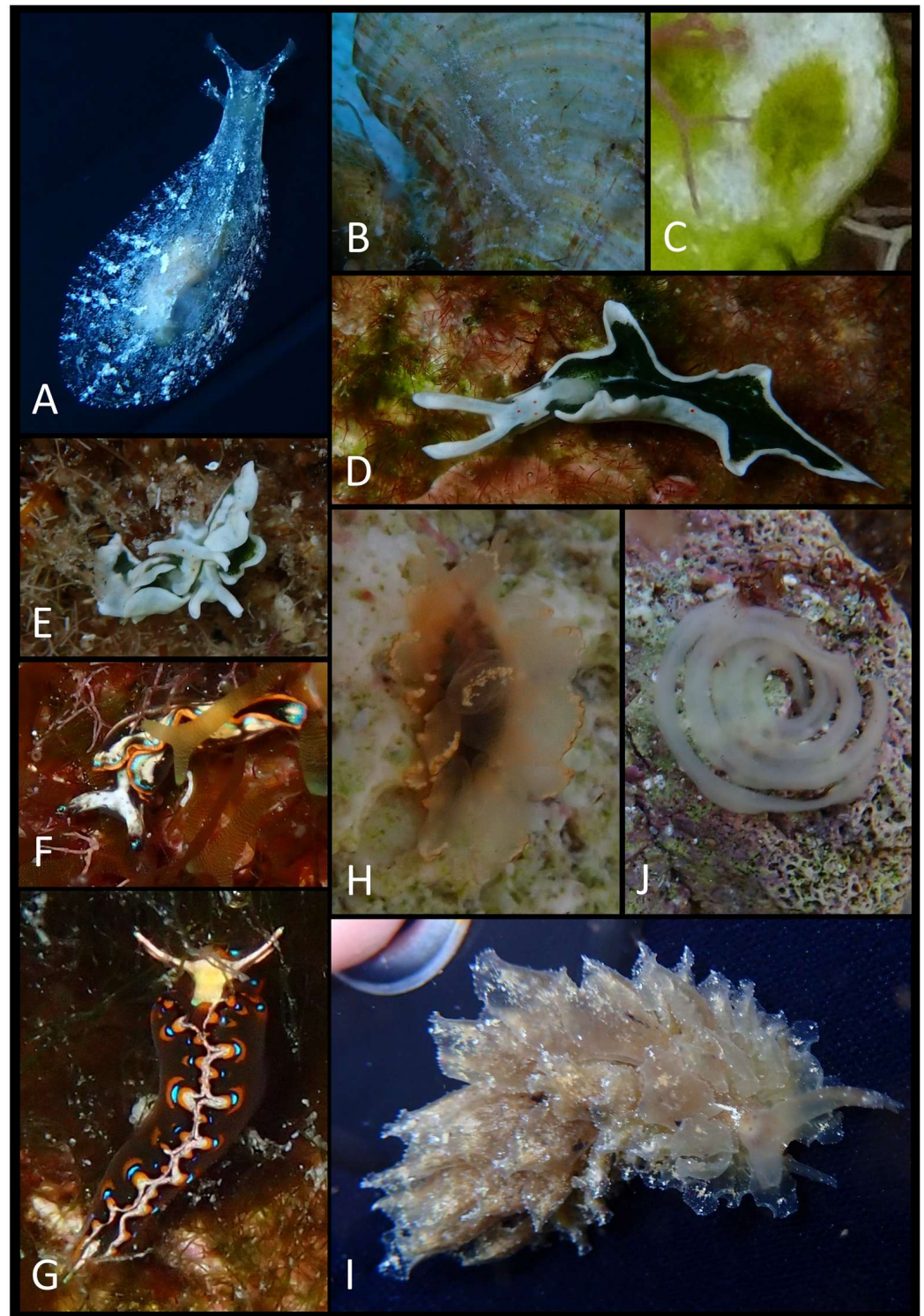


Figure 4. *Petalifera petalifera*, (A) dorsal view; (B) the specimen on the alga *Padina* sp. *Bosellia mimetica*, (C) a small individual on the green alga *Halimeda tuna*. *Elysia timida*, (D) dorsal view; (E) a couple during mating. *Thuridilla hopei*, (F) dorsal view. *Thuridilla mazda*, (G) dorsal view. *Cyerce graeca*, (H) left dorso-lateral view. *Polybranchia* sp., (J) an egg mass; (I) dorsal view.

The most species-rich group was Sacoglossa with 6 species (2 families), followed by Nudibranchia with 5 species (3 families), Doridida with 4 species (2 families), Aplysiida with 4 species (1 family), Pleurobranchida with 2 species (1 family), and Rhodopoidea with 1 species (1 family).

Considering the 10 examined dive sites, the most species-rich were “Scoglio Pignata” and “Panettone” with 5 species each. “Capo Grecale”, “Faraglione”, and “Punta Iavuta” follow with 4 species, while “Grotta dell’Acqua” presented 3 species. The dive sites with the lowest number of species (3) were “Muro Vecchio”, “Grotta Santa”, and “Punta Parrino”. In the site of “Madonnina,” no species was reported (Figure 5A). Concerning the richness at the family level, the dive sites presented almost the same trend documented for the species (Figure 5B). Specifically, “Scoglio Pignata” had the highest number of families (5) among the examined dive sites. “Capo Grecale”, “Faraglione”, and “Punta Iavuta” presented 4 families each. Instead, “Grotta dell’Acqua” and “Panettone” had 3 families. The lowest number of families (1) was presented by “Muro Vecchio”, “Grotta Santa”, and “Punta Parrino”.

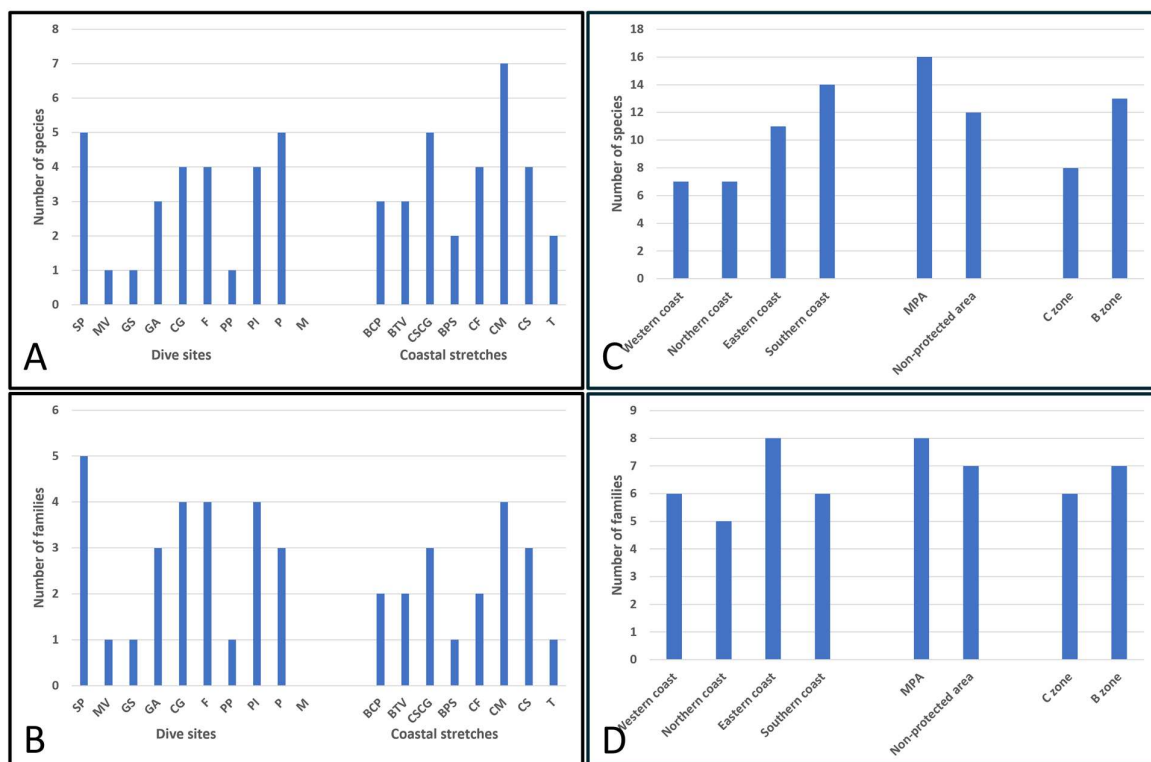


Figure 5. Bar charts, (A) number of species found in the examined dive sites and coastal stretches; (B) number of families found in the examined dive sites and coastal stretches; (C) number of species found in sectors, MPA, non-protected area, C zone and B zone; (D) number of families found in sectors, MPA, non-protected area, C zone and B zone.

Concerning the 8 examined coastal stretches, the most species-rich was “Cala Maluk” with 7 species followed by “Costa Sud di Capo Grecale” (5), “Cala Francese” (4), “Cala Spugne” (4), “Baia di Capo Ponente” (3), and “Baia di Taccio Vecchio” (3) (Figure 5A). The coastal stretches with the lowest number of species were “Baia di Punta Sottile” and “Tabaccara” with 2 species each. Considering coastal stretches’ family richness, a trend can be noted similar to the one seen for species (Figure 5B).

The MPA presented a slightly higher number of species (16) and families (8) compared to the non-protected one (12 and 7) (Figure 5C,D). Considering the diversity difference between the B and C zones of the MPA, it can be seen that there is a slight predominance in both the number of species and families in the B zone (13 and 7) compared to the C zone (8 and 6) (Figure 5C,D).

Most of the species found in Lampedusa were reported only for a single sector and almost always through the report of a single specimen. Examples of these species were

Table 3. Cont.

	Western Coast				Northern Coast						Eastern Coast						Southern Coast				
	C Zone				B Zone						Non-Protected Area						C Zone		B Zone		
Taxa	BCP	SP	MV	GS	BTV	GA	CG	CSCGF	PP	PI	BPS	CF	CM	CS	T	P	M	Depth Range			
Family Goniadorididae H. Adams & A. Adams, 1854																					
<i>Goniadoridella picoensis</i> (Paz-Sedano, Ortigosa & Pola, 2017)		2				2	3		4	1	3 ‡					5		11.6–32.6 m			
<i>Trapania lineata</i> Haefelfinger, 1960																1		11.7 m			
Order Aplysiida																					
Family Aplysiidae Lamarck, 1809																					
<i>Aplysia dactylomela</i> Rang, 1828												9	9	14 ‡				1 < m			
<i>Aplysia</i> cf. <i>fasciata</i> Poiret, 1789													1					1 < m			
<i>Aplysia punctata</i> (Cuvier, 1803)	1				2			2				1						1 < m			
<i>Petalifera petalifera</i> (Rang, 1828)							1											7.5 m			
Superorder Sacoglossa																					
Family Plakobranchidae Gray, 1840																					
<i>Bosellia mimetica</i> Trinchese, 1891															1			1 < m			
<i>Elysia timida</i> (Risso, 1818)	5	2	3				4	9		1	5	24	39 ‡	20 ‡	6	1		1 < –11.9 m			
<i>Thuridilla hopei</i> (Vérany, 1853)	2				6	1		2	1		5		2	3				1 < –20 m			
<i>Thuridilla mazda</i> Ortea & Espinosa, 2000					1			1				1	1					1 < m			
Family Caliphyllidae Tiberi, 1881																					
<i>Cyerce graeca</i> T. E. Thompson, 1988													1					1 < m			
<i>Polybranchia</i> sp.														2 *				1 < m			
Total number of species	22																				
Total number of species per site	3	5	1	1	3	3	4	5	4	1	4	2	4	7	4	2	5	0			
Total number of families	10																				
Total number of families per site	2	5	1	1	2	3	4	3	4	1	4	1	2	4	3	1	3	0			

4. Discussion

Based on the few previous malacological studies on the marine benthic fauna of Lampedusa, it can be assumed that the island's mollusk fauna might represent a crucial link between the mollusk faunas of the different Mediterranean sub-regions (western and eastern) [9,10]. This could be connected to the peculiar geographic position of Lampedusa, which is subject to large water mass exchanges (between the western and eastern basins) and currents [8,9]. Probably, the most important current that laps Lampedusa is the Atlantic Tunisian Current (ATC), which is one of the two branches of the Algerian current (AC), a powerful seawater flux that originates along the westernmost part of the Algerian coast and, running parallel to it, collects a large number of marine larvae (including heterobranch “sea slug” veligers) along its path [22,23]. However, despite that, during this study, 22 species and 10 families were documented, with us investigating 10 dive sites and 8 coastal stretches. If we compare this data with that of other Sicilian islands that have recently been studied using the same techniques (photographic capture) and during the same period of the year (July), it is possible to conclude that, overall, we found a lower number of species at Lampedusa. Indeed, at Pantelleria (the nearby island present in the same archipelago),

33 species and 16 families were found through the examination of 3 dive sites and 5 coastal stretches [16]; in Lipari, 26 species and 13 families were reported through the analysis of only 6 dive sites [17]; at Vulcano, the study of only 4 dive sites led to the finding of 16 species and 9 families [17]; in the island of Marettimo, 43 species and 18 families were documented, with us analyzing 11 dive sites and 7 coastal stretches [18].

This lower number of species found at Lampedusa, compared to the other Sicilian islands, might be connected to a scarcity along this island of favorable habitats for these mollusks.

The majority of heterobranch “sea slug” groups feed on benthic suspension feeders, such as sponges, cnidarians, bryozoans, and ascidians, which inhabit crevices, tunnels, caves, and shady walls and are characteristic of the coralligenous biocenosis [18,24]. The latter community is scarcely present and not representative at Lampedusa [4], as confirmed by the observations made in this study. Indeed, through the examination of the dive sites carried out in the four sectors of the island, it was noted that, in general, this type of community is rarely present or poorly structured.

The general similarity in family diversity found among the four different sectors can be due to the general environmental homogeneity found on the island. Indeed, apart from the presence or absence of environments with modest crevices, cavities, and small shaded walls (and areas with calm waters along the coastline), the bottoms and coasts of the island are roughly homogeneous in morphology, being characterized by more or less bare coastlines that develop into shallow reefs (generally promontories) resting on horizontal sandy bottoms rich in *Posidonia oceanica* (the latter can replace the reefs in many places). Consequently, the environments do not vary enough to give rise to differences in the presence of different families of heterobranch “sea slugs” in various areas of the island. This can also be seen in comparing family diversity for the MPA vs. the non-protected area and zone B vs. zone C. Instead, the higher number of species found within the MPA compared to that documented in the non-protected area was probably caused by the higher number of examined areas of the former (eight dive sites and four coastal stretches) compared to the latter (two dive sites and four coastal stretches). The same logic can be applied in the species diversity comparison between the B (six dive sites and two coastal stretches) and C zones (two dive sites and two coastal stretches).

Of the 22 species found in this study, the most interesting ones are certainly the doridid *Goniadoridella picoensis* and the sacoglossans *Thuridilla mazda*, *Polybranchia* sp., and *Cyerce graeca*, while the others are common species widely distributed throughout the Mediterranean Sea.

G. picoensis is a small but flashy goniadoridid doridid that, in the last five years, was suddenly reported through the finding of numerous specimens in different areas of the Mediterranean Sea. The sudden appearance of this species in the Mediterranean (first discovered in the Azores [25]), followed by its rapid spread to various areas of the basin, has sparked a debate in recent years between those who argue that this species is of Atlantic–Mediterranean origin [13] and those who believe that it has only recently entered the Mediterranean [26]. Considering Lampedusa, *G. picoensis* was first documented by Manganelli in July 2021 [13] without giving information about the location, depth, and number of individuals. It is interesting to note that during the present study, this species was found in all the island’s sectors through several specimens (of which two were during mating). Specifically, *G. picoensis* individuals were found in seven dive sites in the bathymetric range of 11.6–32.6 m on the following substrates: entanglements made up of *Dictyota* sp. and filamentous and geniculate red algae; red calcareous algae and orange sponges covered with the bryozoan *Nolella* sp.; turfs of filamentous red and geniculate algae mixed with *Palmophyllum crassum* (Naccari) Rabenhorst and *Nolella* sp.; *Peyssonnelia*

sp. mixed with filamentous red, brown, and green algae; turf of filamentous red algae covered with *Nolella* sp.; *Peyssonnelia* sp. covered with *Nolella* sp.; and *Halopteris filicina* (Grateloup) Kützing.

Another important finding is of the sacoglossan *T. mazda*. This species, originally distributed in the Caribbean region, in the course of 20 years, has managed to expand its distribution eastwards, penetrating the western Mediterranean in 2021 [27] and then reaching the waters of the central–eastern coast of Sicily during 2022 [28] and 2023 [29]. The way (natural or anthropogenic) in which this species succeeds in expanding its geographic range has never been understood with certainty [30]. However, the finding of four *T. mazda* specimens during the present study in four coastal stretches of the island (under the water surface on encrusting calcareous red algae intermingled with geniculate red algae and *Dictyota* sp.; filamentous red, brown, and green algae; Gelidiales algae intermingled with *Cladophora* sp.) could provide a little more clarity on how this species entered the Mediterranean basin. Indeed, the fact that this Caribbean sacoglossan was found right at Lampedusa, the only Italian island directly reached by the Atlantic Tunisian Current (ATC) [23], could indicate that *T. mazda* entered the Mediterranean naturally (i.e., via currents), as hypothesized for the aplysiid *Aplysia dactylomela* by Valdés et al. [22].

It is also worth mentioning the report of two *Polybranchia* sp. specimens (together with an egg mass under a rock) under the water surface in the coastal stretch of “Cala Spugne”. This finding, besides being the second report of this species for the entire Mediterranean Sea [16], is the first to document a pair of individuals together and their egg mass in this basin. This, considering the paucity of biological data about the species of the genus *Polybranchia* Pease, 1860 (they are very difficult to study in the field due to their nocturnal life style and the fact that these heterobranch “sea slugs” hide beneath rocks away from their food algae) [31], represents an important field-data addition to the literature focused on this genus.

The final significant report is that of another sacoglossan, *C. graeca*, which was found at “Cala Maluk” beneath a bare rock (with the body inside a hole and its cerata outside) under the water surface. This finding represents the first record of this species for Sicilian waters [29]. Indeed, until now, in the Mediterranean basin, *C. graeca* has only been reported in Greece, Croatia, France, Mallorca, Catalonia, Malta, Apulia, and Sardinia [32,33].

Table 4 reports the taxonomic list of the recorded heterobranch “sea slug” species at Lampedusa to date. A total of 46 species were found along the coasts of this island. The most representative order is that of Cephalaspidea with 14 species, followed by that of Sacoglossa with 8 species. Nudibranchia and Aplysiida are represented by 5 species, Doridida and Pleurobranchida by 4 species, Ringiculimorpha by 2 species, and Rhodopoidea, Actenoidea, Runcinida, and Pteropoda by only 1 species.

Table 4. Taxonomic list of the recorded heterobranch “sea slugs” at Lampedusa to date.

Taxa	
Rhodopoidea	<i>Bulla striata</i> Bruguière, 1792
Family Rhodopidae Ihering, 1876	Family Haminoeidae Pilsbry, 1895
<i>Rhodope</i> sp.	<i>Haminoea hydatis</i> (Linnaeus, 1758)
Acteonoidea	<i>Haminoea navicula</i> (da Costa, 1778)
Family Acteonidae A. d’Orbigny, 1842	<i>Roxaniella jeffreysi</i> (Weinkauff, 1866)
<i>Acteon tornatilis</i> (Linnaeus, 1758)	<i>Weinkauffia turgidula</i> (Forbes, 1844)
Ringiculimorpha	Family Scaphandridae G. O. Sars, 1878
Family Ringiculidae R. A. Philippi, 1853	<i>Scaphander lignarius</i> (Linnaeus, 1758)
<i>Ringicula auriculata</i> (Ménard de la Groye, 1811)	Family Philinidae J. E. Gray, 1850 (1815)

Table 4. Cont.

Taxa	
<i>Ringicula conformis</i> Monterosato, 1877	<i>Hermania scabra</i> (O. F. Müller, 1784)
Pleurobranchida	<i>Philine catena</i> (Montagu, 1803)
Family Pleurobranchidae Gray, 1827	<i>Philine quadripartita</i> Ascanius, 1772
<i>Berthella plumula</i> (Montagu, 1803)	Family Laonidae Pruvot-Fol, 1954
<i>Berthella</i> sp.	<i>Laona pruinosa</i> (W. Clark, 1827)
<i>Berthellina</i> cf. <i>edwardsii</i> (Vayssière, 1897)	Runcinida
<i>Pleurobranchus testudinarius</i> Cantraine, 1835	Family Runcinidae H. Adams & A. Adams, 1854
Nudibranchia	<i>Runcina</i> sp.
Family Facelinidae Bergh, 1889	Pteropoda
<i>Caloria quatrefagesi</i> (Vayssière, 1888)	Euthecosomata
Family Flabellinidae Bergh, 1889	Family Creseidae Rampal, 1973
<i>Edmundsella pedata</i> (Montagu, 1816)	<i>Creseis acicula</i> (Rang, 1828)
<i>Paraflabellina ischitana</i> (Hirano & T. E. Thompson, 1990)	Aplysiida
Family Trinchisiidae F. Nordsieck, 1972	Family Aplysiidae Lamarck, 1809
<i>Tenellia</i> sp.	<i>Aplysia dactylomela</i> Rang, 1828
<i>Tenellia genovae</i> (O'Donoghue, 1926)	<i>Aplysia fasciata</i> Poiret, 1789
Doridida	<i>Aplysia</i> cf. <i>fasciata</i> Poiret, 1789
Family Chromodorididae Bergh, 1891	<i>Aplysia punctata</i> (Cuvier, 1803)
<i>Felimare picta</i> (R. A. Philippi, 1836)	<i>Petalifera petalifera</i> (Rang, 1828)
<i>Felimare tricolor</i> (Cantraine, 1835)	Sacoglossa
Family Goniodorididae H. Adams & A. Adams, 1854	Family Plakobranchidae Gray, 1840
<i>Goniodoridella picoensis</i> (Paz-Sedano, Ortigosa & Pola, 2017)	<i>Bosellia mimetica</i> Trinchese, 1891
<i>Trapania lineata</i> Haefelfinger, 1960	<i>Elysia timida</i> (Risso, 1818)
Cephalaspidea	<i>Elysia viridis</i> (Montagu, 1804)
Family Retusidae Thiele, 1925	<i>Thuridilla hopei</i> (Vérany, 1853)
<i>Pyrunculus hoernesii</i> (Weinkauff, 1866)	<i>Thuridilla mazda</i> Ortea & Espinosa, 2000
<i>Retusa truncatula</i> (Bruguère, 1792)	Family Hermaeidae H. Adams & A. Adams, 1854
<i>Retusa umbilicata</i> (Montagu, 1803)	<i>Aplysiopsis elegans</i> Deshayes, 1853
Family Rhizoridae Dell, 1952	Family Caliphyllidae Tiberi, 1881
<i>Volvulella acuminata</i> (Bruguère, 1792)	<i>Cyerce graeca</i> T. E. Thompson, 1988
Family Bullidae Gray, 1827	<i>Polybranchia</i> sp.

5. Conclusions

A comparison of the data concerning the heterobranch “sea slugs” reported here shows an overall low diversity for the waters of Lampedusa, compared with those documented by the authors in recent years on other Sicilian islands [16–18]. This paucity in heterobranch “sea slug” fauna is probably caused by the scarcity of favorable environments for these mollusks along the seabed and coastline of this island and by the considerable environmental homogeneity of the various areas of Lampedusa.

Nevertheless, some species of significant biogeographical value have been found. Consequently, given the geographical position of the island, which puts it in almost direct influence of the Atlantic waters [22,23], the biogeographical importance of Lampedusa’s heterobranch “sea slugs” requires more in-depth and time-distributed investigations, starting from the data reported here, which can be considered as a new starting point for knowledge on this topic.

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