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# The order Aplysiida (Gastropoda Heterobranchia) along the central-eastern coast of Sicily (Ionian Sea, Mediterranean)

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**ABSTRACT** In the present study, the species belonging to the order Aplysiida found from 2017 to 2021 along the central-eastern coast of Sicily are shown. For each species, data on morphology, abundance, location and depth, substrates and habitats, seasonality and further remarks are here provided. Through the present study, it appeared that a total of 9 species is present along the surveyed area. Of these, 2 species (*Aplysia* sp. 1, *Aplysia* sp. 2) are probably new findings for the Mediterranean Basin, while 1 species (*Petalifera* cf. *petalifera*) represents a new record for the investigated area. Through this study, it was also highlighted that along the central-eastern coast of Sicily, the most common species is *Aplysia dactylomela*, an allochthonous invasive species. Finally, the predatory activity of the polychaete *Hermodice carunculata* against the two aplysiid species, *A. dactylomela* and *A. fasciata*, was documented.

**KEY WORDS** Anaspidea; Aplysiomorpha; Ionian sea; Opisthobranchia; Sicily.

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## INTRODUCTION

The order Aplysiida (=Anaspidea, =Aplysiomorpha) is probably one of the most known groups of marine heterobranchs worldwide both by the scientific community and non-specialists. This is because these molluscs, usually living in the intertidal zone, are generally large-sized, abundant, and ubiquitous (Willan, 1998). These animals are known since ancient times, indeed, the first writers who mentioned them were Nicander, Dioscorides and Plinius, which gave them the name of sea hares (Mazzarelli, 1893). This name was probably given because the body shape of these animals remembers that of a sitting hare (Linton, 1966; Beeman, 1968). Historically, these molluscs (absolutely harmless to humans) were considered poisonous and with magical properties (Mazzarelli, 1893).

This order presents two superfamilies (Bouchet et al., 2017): Aplysioidea Lamarck, 1809 and Akeroidea Mazzarelli, 1891. The members of the first superfamily (commonly referred to as sea hares) are characterized by: presence or absence of internal shell; head bringing anteriorly a couple of oral tentacles and dorsally a couple of rhinophores, smaller than the previous ones; body which extends posteriorly in an evident visceral mass; presence of parapodia (that according to their morphology can be or not natatorial), which overall enclose the mantle that in turn covers the pallial cavity; a plicate gill; an evident seminal groove, externally visible

on the right side of the body, from the common genital opening to the anterior part of the body; the presence (usually) of two particular glands within the pallial cavity, the opaline gland (that secretes a colourless repugnant substance) and the purple gland (which secretes the famous "ink" produced by these animals) (Beeman, 1968; Willan & Morton, 1984).

The members of the superfamily Akeroidea are characterized by the presence of: a cephalic shield without oral tentacles or rhinophores; external bulloid shell; (natatorial) parapodia which partially cover the shell; presence of opaline and purple glands (Beeman, 1968; Thompson & Seaward, 1989; Willan, 1998).

Although a huge number of scientific papers on the anatomical, taxonomical, behavioural and physiological aspects of this order of marine heterobranchs have been published (Willan, 1998), there are still few information on this group of animals along the central-eastern Sicily. Indeed, the scarce data on these molluscs along this area are based on: a note (Cantone, 2000), a single report (Scuderi & Russo, 2005) and a faunistic list published in the last years (Lombardo & Marletta, 2020). Through the latter, it was highlighted that along this area there is a total of 7 species belonging to the order Aplysiida. Nevertheless, Lombardo & Marletta (2020) only provided information on the presence/absence and the bathymetric range of each species in the examined sites. Therefore, the knowledge regarding this group of marine heterobranchs along this area is still scarce and fragmentary. Consequently, the aim of the present study is to give information on the biology and ecology of the species of the order Aplysiida present along the central-eastern coast of Sicily, which beyond to filling knowledge gaps, could be useful for future studies in this area of the Ionian Sea.

## MATERIAL AND METHODS

The present study was carried out from 2017 and 2021 in 5 areas located along the central-eastern coast of Sicily (Italy, Ionian Sea). The southernmost sites, Ognina (37°31'50.4" N – 15°07'10.8" E) and Bellatrix (37°32'03.2" N – 15°07'35.2" E), are both situated within the municipality of Catania. Both sites exhibit the most anthropized conditions among the study areas, due to the high presence along the coast of apartment buildings and bathing establishments. Moreover, in their immediate vicinity, there are a marina and a collector. Due to their closeness (about 540 m) and their similarity of environmental conditions, these two areas were considered as a unique site called Catania. The northernmost sites, Scalo Pennisi (37°38'23.2" N – 15°11'04.6" E) and Acque Fredde (37°38'15.7" N – 15°10'52.1" E), are both located in the hamlet of Santa Tecla in the municipality of Acireale. Both areas present the most natural environmental conditions among the examined sites. Since they are located nearby (about 390 m) and show similar environmental conditions, they were considered as a single site called Santa Tecla. The last investigated site, Santa Maria La Scala (37°36'46.5" N – 15°10'31.4" E), located in the municipality of Acireale, is midway between the other study areas. This site shows intermediate environmental conditions between the southernmost and the northernmost areas.

Throughout this study, a total of 376 scuba dives (146 in Catania, 115 in Santa Maria La Scala and 115 in Santa Tecla) was carried out. All dives were conducted during the morning (between 9:00 and 11:30 a.m.), at least twice a week (sea-weather conditions allowing). For each site, during the dives, the same pathway was always followed (between 0 and 45 m of depth, according to the seabed morphology). All the encountered aplysiid specimens were photographed through an Olympus Tg–4 underwater camera and for each of them the depth was registered. Subsequently, the photos were analysed on the computer in order to obtain data on the species, number of specimens, substrate, period of the year and further observations. The species were identified through the checking of the scientific literature (Rang, 1828; Mazzarelli, 1893; Grigg, 1949; Eales, 1960; Thompson, 1976; Trainito & Doneddu, 2014; Golestani et al., 2019; Smith, 2021) and of the reference sitography (Rudman, 1998; Ballesteros et al., 2012–2022). The phytobenthos was identified through the identification keys of Cormaci et al. (2012; 2014; 2017; 2020). Moreover, for the identification of the remaining of zoobenthos, the text principally used was Trainito & Baldacconi (2014). Instead for the sponge identification, it was consulted Baldacconi

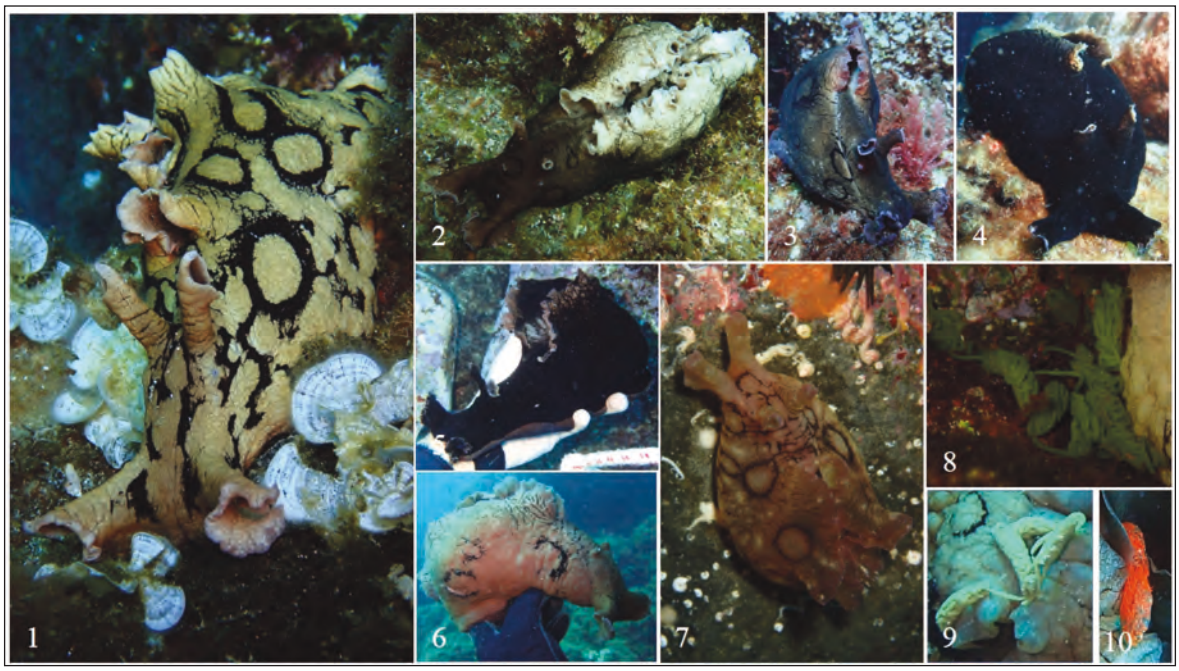
& Trainito (2013). For each aplysiid species included in this study, the following information are provided: Morphology, Abundance, Location and depth, Substrates and habitats, Seasonality, Remarks.

## RESULTS

Ordo APLYSIIDA
Familia APLYSIIDAE Lamarck, 1809
Genus *Aplysia* Linnaeus, 1767

***Aplysia dactylomela*** Rang, 1828 (Figs. 1–10)

Morphology. Generally about 220–230 mm in length, this species presents a cream-coloured body. It is covered with black coloured rings (that can be more or less thick). These are mostly present along the flanks. The tegument, as well as having such rings, possesses several black lines-spots which tend to anastomose with each other. Also these latter are more or less present depending on the observed specimen. The ends of rhinophores, oral tentacles and edges of parapodia may have the same body colouration or present pink nuances or be almost transparent. Rarely, the animals may have a large part of the body with pink nuances. Instead, the smaller specimens (about 35–40 mm) (rarely encountered) possess bright white dots on the extremities. Generally, the tegument has a rough appearance. During this study, it was noted that the colouration of this species presents some variations. Indeed, several specimens documented in this study had the body coloured with various shades of dark brown or even almost fully black. In the latter case only a small portion of the parapodia had the classic cream colouration with black rings and spots typical of this species. Consequently, there is a considerable variation in the tegument's chromatic gradation: cream coloured body with clearly visible scattered black rings and spots (common colouration); dark cream coloured body with visible scattered black rings and spots (uncommon colouration); brown almost black coloured body with poorly visible scattered black rings and spots, and a wide portion of the parapodia coloured with the common colouration (rare colouration); black




Figures 1–10: *Aplysia dactylomela*. Fig. 1: a specimen with the common colouration. Fig. 2: an individual with the rare colouration. Fig. 3: a specimen with the uncommon colouration. Fig. 4: animal with the very rare colouration. Fig. 5: another specimen with the very rare colouration. Fig. 6: a big individual with pink nuances. Fig. 7: a small specimen. Fig. 8: the green faecal pellets. Fig. 9: the same grey coloured. Fig. 10: faecal pellets in the form of red threads (photos by A. Lombardo).

coloured body with a little portion of the parapodia coloured with the common colouration (very rare colouration).

ABUNDANCE. Through this study 141 specimens were found: 25 at Santa Maria La Scala, 32 at Santa Tecla and 84 at Catania. Overall, this species can be considered as common in the examined sites.

LOCATION AND DEPTH. This mollusc was found in all the examined sites from below the water surface to 27.9 m of depth.

SUBSTRATES AND HABITATS. Overall, *A. dactylomela* is found both in photophilous environments [characterized by: turf forming species; *Halopteris scoparia* (Linnaeus) Sauvageau; *Dictyota* spp.; *Padina pavonica* (Linnaeus) Thivy; *Ellisolandia elongata* (J. Ellis & Solander) K. R. Hind & G. W. Saunders; *Jania* sp; *Asparagopsis armata* Harvey; *Pterocladiella capillacea* (S.G. Gmelin) Santelices & Hommersand; *Caulerpa cylindracea* Sonder and on bare rocks] and in sciophilous ones [characterized by: *Peyssonnelia* spp.; *Zonaria tournefortii* (J.V. Lamouroux) Montagne; *Palmophyllum crassum* (Naccari) Rabenhorst; *Crambe crambe* (Schmidt, 1862); *Bugula* sp.; crevices with sand and detritus; beneath rocks]. Almost all the specimens were observed in shallow waters (upper infralittoral).

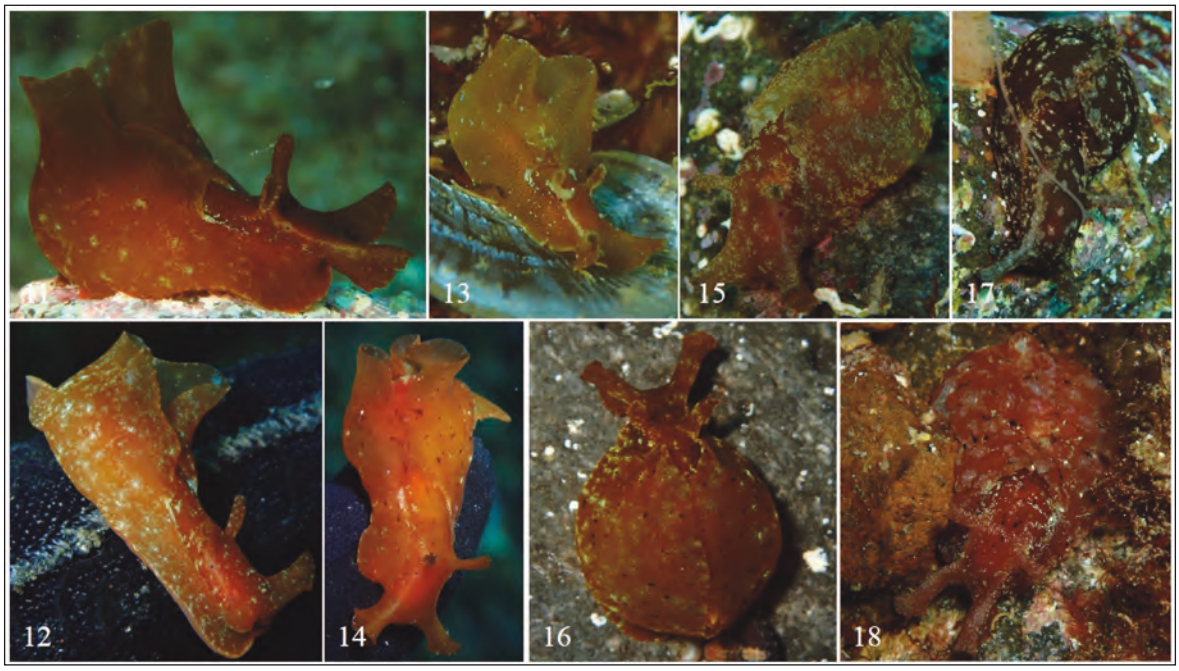
SEASONALITY. Generally, this aplysiid may be present all year round. The huge assemblages of *A. dactylomela* were observed in summer, particularly during July, August and September. The breeding activities were registered in January, June, August, September, November and December. The egg masses were never found during this study.

REMARKS. Through this study, it was noted a clear seasonal differentiation in the specimens' activities. In the course of summer, the individuals were found moving in well-lit environments or in a contracted position in crevices. Instead, during the other seasons of the year, all the specimens were documented almost exclusively in a contracted position inside crevices and cavities. These animals assumed a body shape similar to that showed in Willan and Morton (1984), referred by them as "resting position". In particular, these specimens had also the head and its extremities strongly contracted. No individual has ever been seen swimming. Generally, when the animals were disturbed by the authors, not all of them emitted the purple "ink", and usually they tended to move away from the threat. If the individuals were removed from the substrate and handled by the authors, they tended to extend the body and to assume an arched shape [as shown in Willan and Morton (1984)]. During this study several attacks carried out by the polychaete *Hermodice carunculata* (Pallas, 1766) against this mollusc were documented. Indeed, various *A. dactylomela* specimens had attached to the body the bristles (notochaetae) of this annelid and some individual presented circular scars caused by the bites of this polychaete. Usually, the attacked individuals were followed and disturbed by groups of *H. carunculata*. In one particular case, it was found an alive *A. dactylomela* specimen which presented an individual of *H. carunculata* within the parapodia. All the documented dead specimens of *A. dactylomela* were always accompanied by several *H. carunculata* individuals.

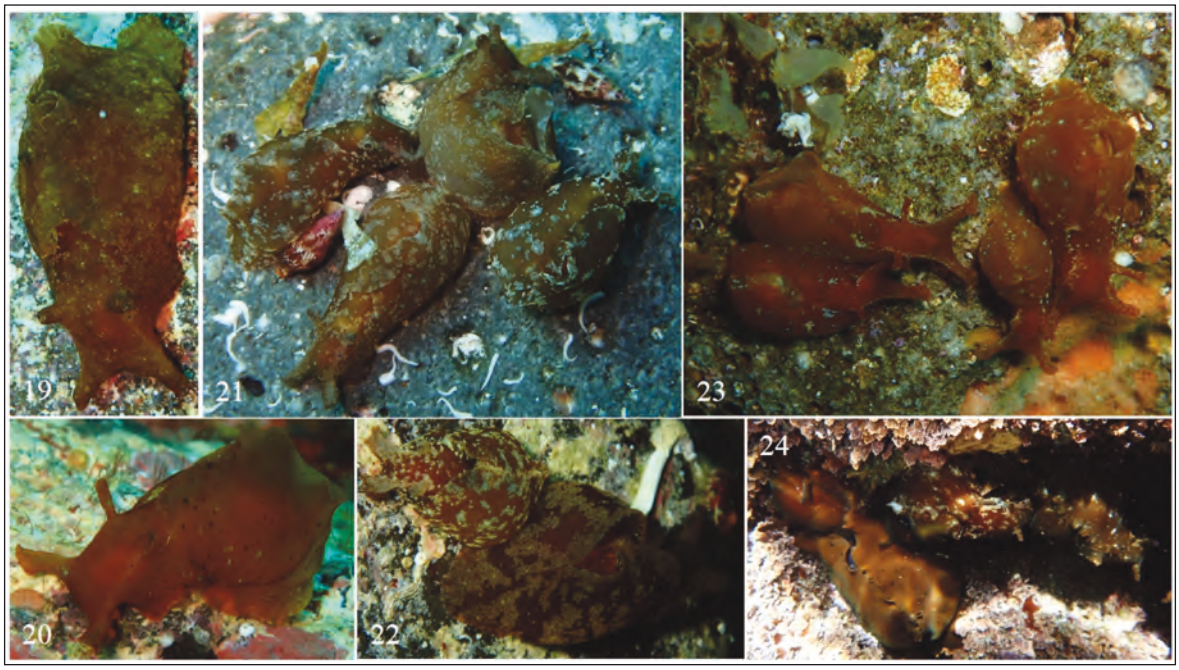
Throughout this study, it was possible to document the faecal pellets of this mollusc. Generally, they were filiform with interweaving at regular intervals. Sometimes they were green coloured with scattered bright dots and red coloured inclusions (only in the interweaving). Other times, they were whitish with red coloured inclusions in the interweaving. Commonly, the pellets presented only the intertwining, with red coloured threads between them with a general frayed appearance.

***Aplysia depilans*** Gmelin, 1791 (Figs. 11–24)

MORPHOLOGY. This species presents a general body colouration from orange to dark brown with a very variable pattern of dots and spots. These latter are mostly white-grey coloured and may be isolated and scattered or clustered between them, forming several types of patterns. On the surface of the body, black scattered dots-spots can also be present. The latter are almost always fewer in number than the former. On each side of the head there is a white-grey line that goes from each eye to a large part of the correspondent oral tentacle. Almost all the encountered specimens were always of small sizes (about 30–60 mm in length). Larger individuals (about 150–200 mm) were rarely




Figures 11–18: *Aplysia depilans*. Fig. 11: specimen in right lateral view. Fig. 12: individual with numerous scattered white dots. Fig. 13: specimen in right antero-lateral view. Fig. 14: dorsal view of an individual. Fig. 15: orange specimen with clustered spots. Fig. 16: an individual with the typical stubby aspect. Fig. 17: a dark specimen with clustered spots. Fig. 18: reddish individual (photos by A. Lombardo).




Figures 19–24: *Aplysia depilans*. Fig. 19: another specimen with clustered spots. Fig. 20: individual in left latero-dorsal view. Fig. 21: four specimens with the clustered pattern. Fig. 22: two individuals with different size and colouration. Fig. 23: a group of four orange specimens. Fig. 24: three large individuals (photos by A. Lombardo).

observed. Overall, this species presents a characteristic stubby aspect that is not present in the other species of the genus *Aplysia,* encountered during this study.

ABUNDANCE. Through this study a total of 86 specimens were found: 30 at Santa Maria La Scala, 8 at Santa Tecla and 48 at Catania.

LOCATION AND DEPTH. This aplysiid was encountered in all the examined sites from below the water surface to 10.6 m of depth.

SUBSTRATES AND HABITATS. *A. depilans* is exclusively present in shallow water environments (upper infralittoral). Almost all the small-sized individuals were observed beneath rocks and pebbles, which were bare or covered by *Peyssonnelia* spp., *Feldmannophycus rayssiae* (Feldmann & G. Feldmann) H. Augier & Boudouresque, *Contarinia squamariae* (Meneghini) Denizot, *Halopteris* sp., encrusting bryozoan, serpulids and detritus. Seldom, few specimens were documented on *P. pavonica* and among *Gongolaria montagnei* (J. Agardh) Kuntze. The rare larger individuals were observed just below the water surface in rocky inlets covered by turfs of *H. scoparia* and *E. elongata* (J. Ellis & Solander).

SEASONALITY. This species was found from March to August. The huge assemblages of specimens were documented from May to July. The egg masses, salmon-pink or light yellow with a tangled thread-shape, were documented in May, June and August.

REMARKS. It is interesting to note that almost all the encountered small-sized specimens were almost always observed beneath rocks and pebbles. Instead, the larger individuals were exclusively documented just below the water surface. Consequently, in this species, a change of habitat occurs as it reaches a larger size. Moreover, it was noted that the egg masses were laid not only by the larger-sized animals but also by the smaller-sized ones. Generally, the small-sized specimens were found with a rounded shaped body. In no case, even if the animals were handled by the authors, it was documented the emission of purple "ink" or the swimming activity. Instead, the specimens tended to creep on the authors' hands looking for shady areas.

***Aplysia fasciata*** Poiret, 1789 (Figs. 25–35)

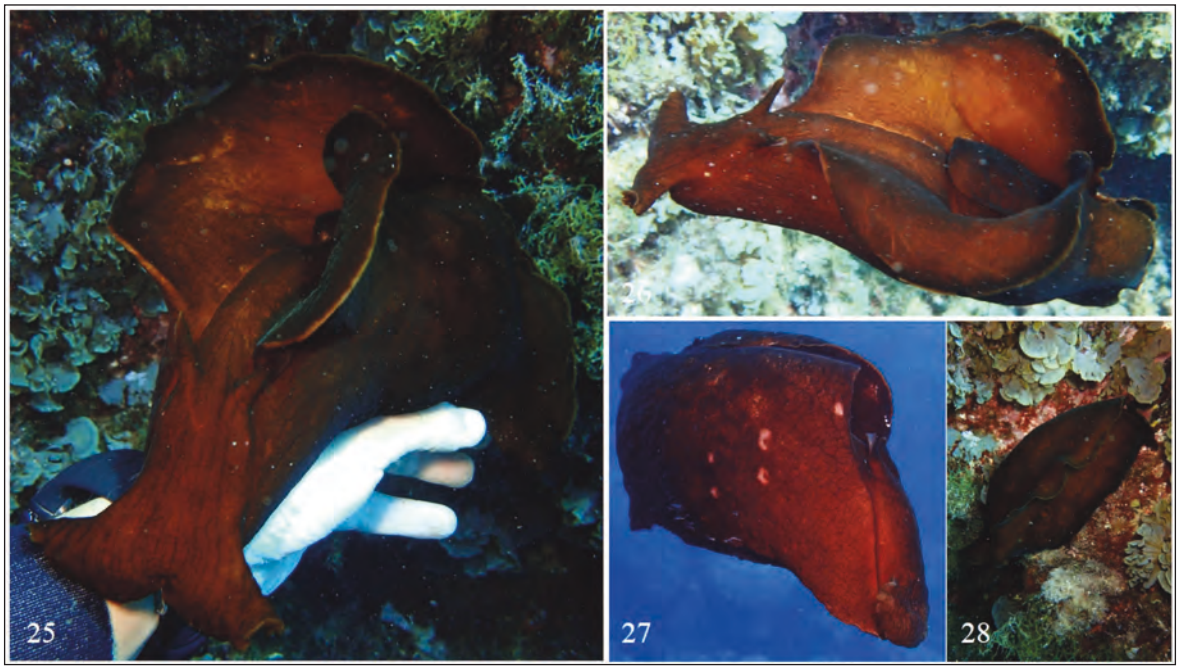
MORPHOLOGY. About 80–270 mm in length, this species presents two different morphotypes in the examined areas. In one, the rarest, the body is massive and coloured with different shades of brown. These individuals tended to swim nervously and compulsively when disturbed. They carry out an agile and elegant swim. The second morphotype, the most common, possesses the body slightly smaller than the previous one and with a black colouration. Generally, the body's extremities (including the parapodia' borders) are red-violet coloured. Rarely, these latter may have the same black colouration of the body. A particular specimen, beyond the red-violet extremities, had white-yellowish scattered dots along the body surface. The second morphotype, if disturbed, immediately emits the purple "ink" (almost always) and not swim nervously in response. Both the morphotypes have in common completely free parapodia. This allows to this species to swim excellently.

ABUNDANCE. During this study a total of 45 *A. fasciata* specimens was found: 12 at Santa Maria La Scala, 6 at Santa Tecla and 27 at Catania.

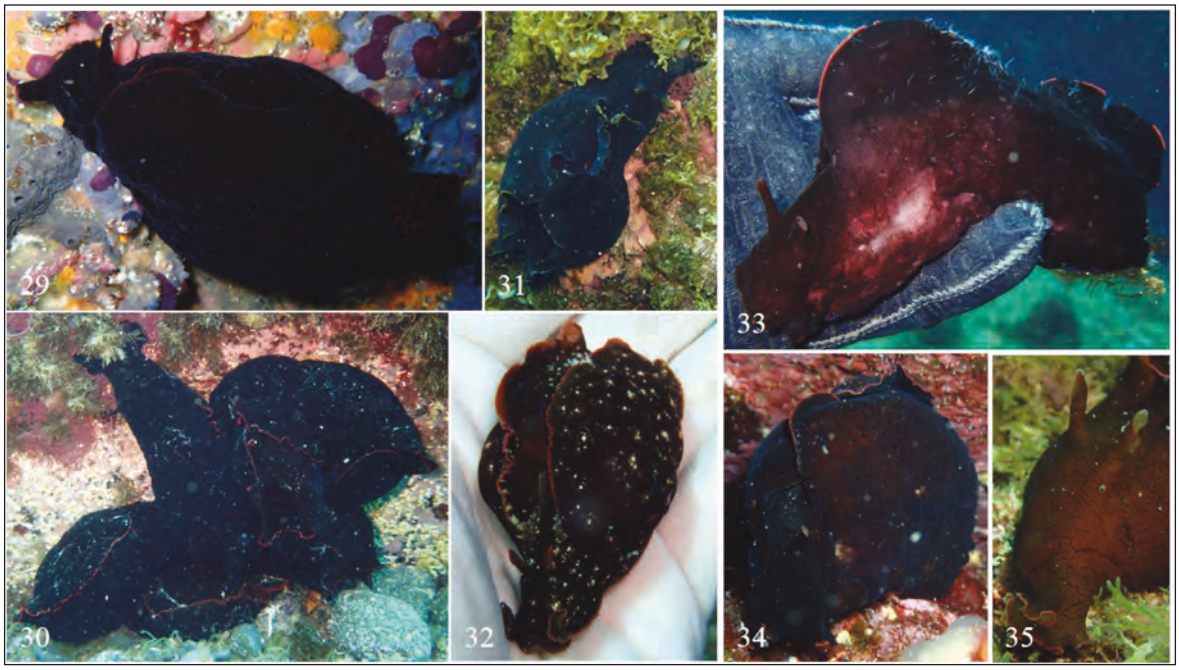
LOCATION AND DEPTH. This mollusc was documented in all the examined areas from below the water level to 25.3 m of depth.

SUBSTRATES AND HABITATS. *A. fasciata* was observed almost always both in photophilous environments [among *H. scoparia*, *Dictyota* spp., *E. elongata, Jania* sp. and *P. capillacea* and detritus] and in sciaphilous ones [in crevices with sand and detritus; between pebbles and rocks; on rocky walls with sponges (e.g. *Oscarella* sp. and *Scalarispongia* sp.) and *Astroides calycularis* (Pallas, 1766); among *Z. tournefortii* and on *P. crassum*]. Rarely, solitary specimens were encountered while swimming in the water column.

SEASONALITY. This aplysiid was found from February to September and in December. The huge assemblages of specimens were documented during summer. The breeding activities were observed in February, June and July. The egg masses, with a characteristic threadlike appearance and purple coloured, were found in May, June and July.




Figures 25–28. The massive morphotype of *Aplysia fasciata*. Fig. 25: specimen in left antero-dorsal view. Fig. 26: an individual during swimming. Fig. 27: another specimen during swimming with scars on the right flank of the body (probably inflicted by the bites of *H. carunculata*). Fig. 28: a resting individual (photos by A. Lombardo).




Figures 29–35. The common morphotype of *Aplysia fasciata*. Fig. 29: a specimen in dorsal view. Fig. 30: an assemblage of individuals during breeding. Fig. 31: a total black specimen. Fig. 32: an individual with yellowish scattered dots-spots. Fig. 33: a specimen with wounds on the snout and on the left flank, and with numerous bristles of *H. carunculata* attached to the body. Fig. 34: an individual with a circular wound on the left flank and cut portions of the oral tentacles. Fig. 35: a specimen without the right oral tentacle (photos by A. Lombardo).

REMARKS. Many of the encountered specimens presented, on the body, marks and wounds due to the attacks of the annelid *H. carunculata*. Usually, the most common types of wounds observed in *A. fasciata* were whitish circular scars, probably, caused by the bites of *H. carunculata*. Some specimens presented lacerations of the tegument. Usually, these animals were lacking an oral tentacle, both of them or most of the muzzle. Others presented lacerations on the parapodia. All these animals had the bristles of *H. carunculata* scattered on their bodies. Several times, single specimens of *A. fasciata* were observed surrounded by *H. carunculata* individuals, which tended to climb on them. All the dead bodies of *A. fasciata* documented in this study were always accompanied by groups of *H. carunculata*. The faecal pellets of this aplysiid had an aspect similar to those of *A. dactylomela*. Nevertheless, compared to the latters, those of *A. fasciata* were exclusively in form of small, intertwined masses pale green in colouration.

***Aplysia*** cf. ***fasciata*** Poiret, 1789 (Figs. 36–40)

MORPHOLOGY. About 110 mm in length, the specimen presented the body light-brown coloured. On each side of the body there were white longitudinally elongated spots, each of which was composed by smaller and various shaped spots. Similar blotches were present (though fewer in number than the previous ones) dorsally behind the head, on the internal surface of the parapodia and on the mantle. The ocular areas had a clearer colouration and were accompanied by small isolated white dots. On the anterior part of the head there was a small longitudinally elongated grey line. This latter was formed by the approximation of smaller dots. The parapodia were fully free between them and joined at the tip of the tail.

ABUNDANCE. Only an individual was found during this study.

LOCATION AND DEPTH. Santa Tecla, at 7 m of depth.

SUBSTRATES AND HABITATS. The animal was beneath a rock.

SEASONALITY. July.

REMARKS. The specimen, after being handled by


Figures 36–40: *Aplysia* cf. *fasciata*. Fig. 36: the animal in dorsal view. Fig. 37: the same in right latero-dorsal view. Fig. 38: the animal handled by one of the authors. Fig. 39: the same during swimming. Fig. 40: left lateral view of the animal (photos by A. Lombardo).

one of the authors, started to swim rhythmically trying to escape.

***Aplysia punctata*** (Cuvier, 1803) (Figs. 41–49)

Morphology. About 3–20 mm in length, this small species presents a general reddish body colouration. Overall on the body surface, there are small bright white dots that are present in variable number. These latter can join together forming small spots or stripes. The edges of the parapodia (and sometimes all the body extremities) are black coloured. Most of the shell is easily visible between parapodia.

Abundance. Through this study a total of 33 specimens was observed: 12 at Santa Maria La Scala, 7 at Santa Tecla and 14 at Catania.

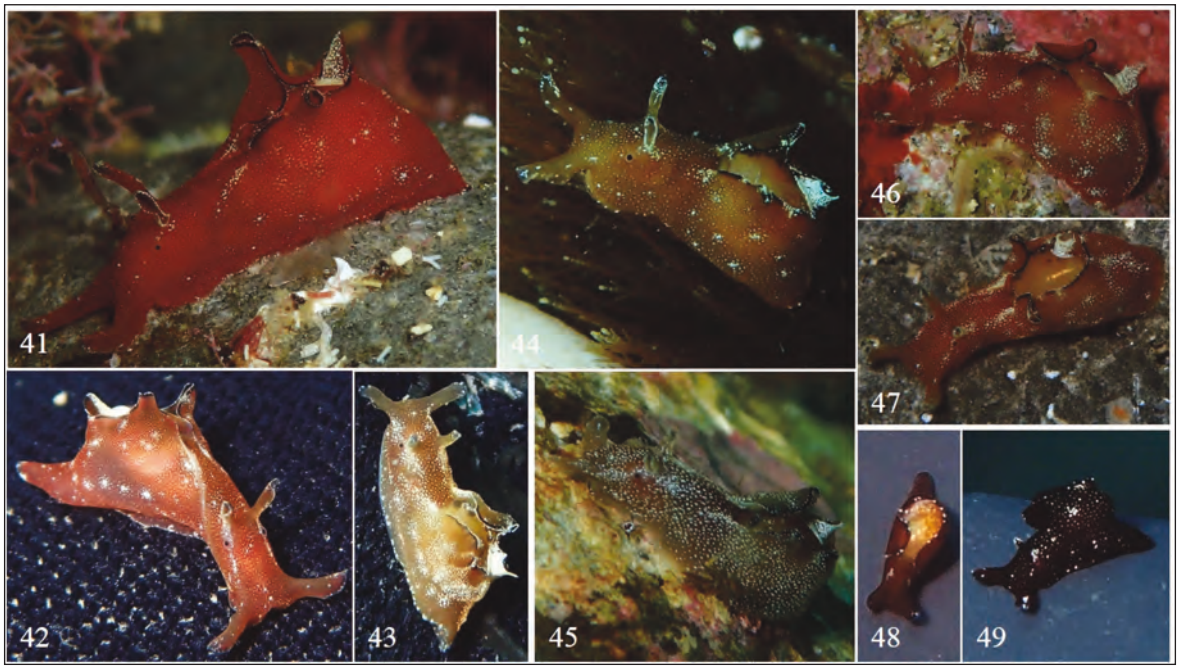
Location and depth. This species was found in all the examined sites from 3 to 25.5 m of depth.

Substrates and habitats. The majority of *A. punctata s*pecimens were documented in shallow water beneath rocks and pebbles, whose lower surface were covered by serpulids, bryozoans, sponge and detritus with *Jania* sp., *Peyssonnelia* spp., *Ceramium* sp. and calcareous red algae. Single individuals were found on *Halimeda tuna* (J. Ellis & Solander) J.V. Lamouroux, turfs of *Ceramium* sp., among *H. scoparia* and filamentous red algae.

Seasonality. This aplysiid was observed from February to September and in December.

Remarks. Almost all the encountered specimens presented, posteriorly, in the space between parapodia, a well visible white grey particulate-mucous substance. Given its position, it is probable that this substance is originated by the processes of excretion or agglutination of unwanted particles that are thrown out of the mantle cavity through mucus.

Note on *Aplysia parvula* Mörch, 1863. Lombardo & Marletta (2020) included among the aplysiids present along the central-eastern coast of Sicily also *A. parvula*, a not native species of the Mediterranean which has an external morphology identical to that of small *A. punctata* specimens (Golestani et al., 2019). Golestani et al. (2019) highlighted that all Mediterranean records of *A. parvula* are, in reality, attributable to *A. punctata*.




Figures 41–49: *Aplysia punctata*. Fig. 41: left lateral view. Fig. 42: right antero-dorsal view. Fig. 43: specimen with a clear colouration. Fig. 44: left lateral view. Fig. 45: a specimen with numerous dots. Fig. 46: individual in left lateral view. Fig. 47: left dorso-lateral view. Fig. 48: a small individual. Fig. 49: a small black specimen with scattered dots (photos by A. Lombardo).

Consequently *A. parvula* is not present along the central-eastern coast of Sicily.

***Aplysia*** sp. 1 (Figs. 50–54)

MORPHOLOGY. About 30 mm in length, the animals had a red-pink body colouration. Along all the body surface there were (in variable number) bright white small dots and dark-red-black dots. The former, in almost all the observed specimens, together formed an obvious pattern of spots. The smaller individuals, although had both types of dots, did not present a real pattern, having the dots very scattered and spaced between them. The interior surface of parapodia presented bright white lines and purple nuances. All the specimens had always the parapodia strongly folded outwards. These latter looked like a pair of small wings. The animals tended to direct the parapodia folds upwards.

ABUNDANCE. During this study a total of 5 individuals was found.

LOCATION AND DEPTH. The animals were documented as follows: 1 in Santa Maria La Scala and 4 in Catania, from 5 to 7 m of depth.

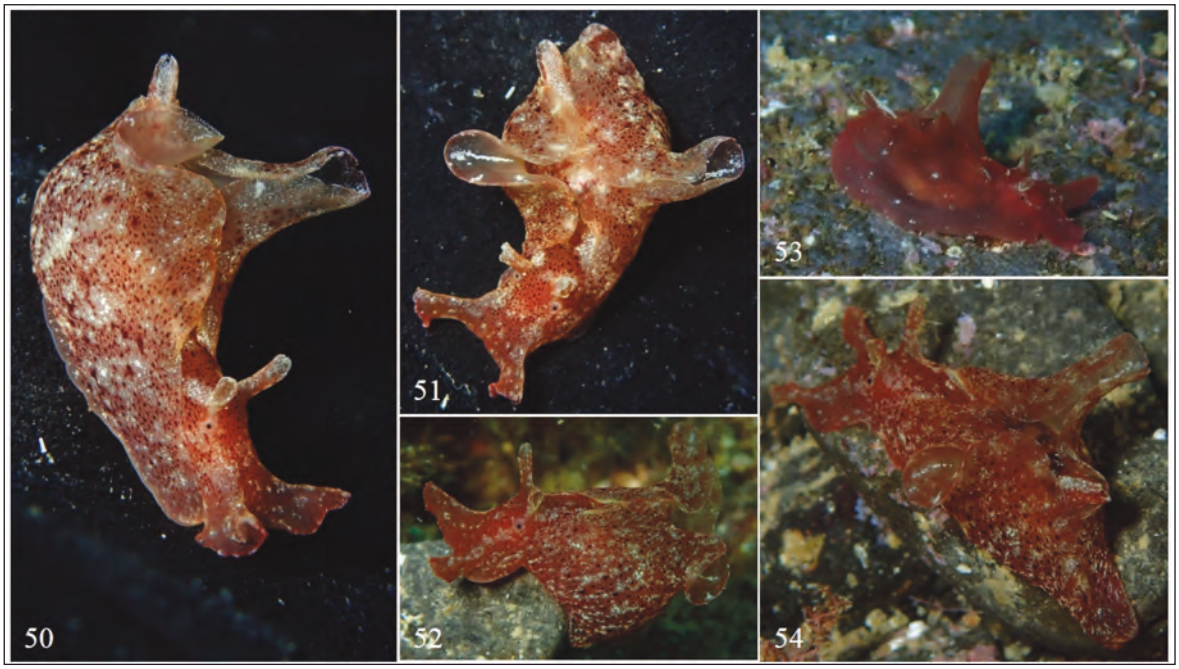
SUBSTRATES AND HABITATS. Almost all the specimens were observed in shallow water (upper infralittoral) beneath rocks and pebbles. Only an individual was found on a turf of filamentous red algae.

SEASONALITY. January, February, November and December.

REMARKS. The animals, even if handled, never emitted the purple "ink". Moreover, *Aplysia* sp. 1 seemed to be unable to swim (also due to the parapodia conformation). Almost all the specimens had, posteriorly between parapodia, a white grey particulate-mucous substance, similar to that observed in *A. punctata* (see above).

***Aplysia*** sp. 2 (Figs. 55–60)

MORPHOLOGY. About 50–90 mm in length, the animals presented a dark brown coloured body. Along the body surface there were numerous bright white-grey spots and opalescent dots. The spots tended to join together forming larger ones. The parapodia were completely free between them and




Figures 50–54: *Aplysia* sp. 1. Fig. 50: a specimen in right latero-dorsal view. Fig. 51: the same in dorsal view. Fig. 52: an individual in left lateral view. Fig. 53: a small specimen. Fig. 54: an individual in posterior view (photos by A. Lombardo).

they joined in proximity of the tail. The parapodia edges had purple nuances and their interior surface was brown coloured with white-grey spots and opalescent dots. The edges presented a wavy aspect. In a single case, it was observed an individual which had the middle section of each parapodia rolled and outwardly directed. This specimen, unlike the others, possessed also dark coloured dots.

Abundance. During this study a total of 6 specimens was found.

Location and depth. The animals were documented as follows: 2 in Santa Tecla and 4 in Catania, from 5 to 7 m of depth.

Substrates and habitats. *Aplysia* sp. 2 was always observed in shallow waters (upper infralittoral) among entanglements of filamentous red algae and *H. scoparia* (on the latter it was found also an egg mass) or between rocks and pebbles with some algae [usually *P. capillacea* and *H. scoparia*].

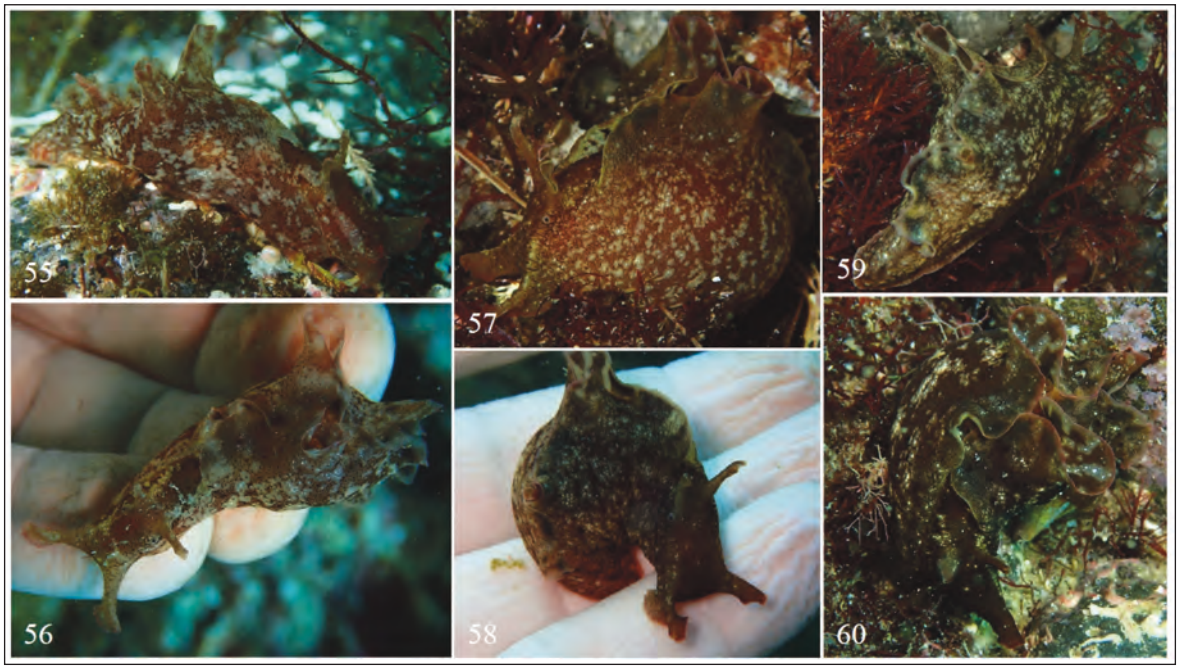
Seasonality. This species was found in July and August. During this latter, it was documented an individual alongside a small egg mass, that was of the classical thread-like shape and pink coloured.

Remarks. Although *Aplysia* sp. 2 has the paropodia completely free between them, this species was never seen swimming, even if handled or disturbed by the authors. The same is valid for the emission of the purple "ink".

Genus *Notarchus* Cuvier, 1816

***Notarchus punctatus*** Philippi, 1836 (Figs. 61–67)

Morphology. About 15–20 mm in length. This species has a transparent-orange coloured body. The body surface is scattered with small numerous colourless papillae and a variable number of thorn-shaped tubercles. These latter are slightly inconspicuous in the smaller specimens, while in the larger ones they are more developed. The tubercles are, for most of their length, transparent, while their tips are white coloured. Along all the entire body surface, there are small bright white dots. In the larger individuals, there are also dark spots and small bright white stripes. The parapodia are almost completely fused between them,




Figures 55–60: *Aplysia* sp. 2. Fig. 55: an individual in right latero-dorsal view (note the folding of parapodia). Fig. 56: the same in dorsal view. Fig. 57: specimen in left lateral view. Fig. 58: an individual handled by one of the authors. Fig. 59: specimen in posterior view. Fig. 60: an individual in dorsal view. (photos A. Lombardo).

presenting only a single small opening anteriorly. When this species considerably fills the mantle cavity with water, its body assume an almost spherical shape. In general, the tegument is tough to the touch.

ABUNDANCE. A total of 5 specimens was found during this study.

LOCATION AND DEPTH. *N. punctatus* specimens were found as follows: 2 in Santa Maria La Scala, 2 in Santa Tecla and 1 in Catania, from 6.1 to 21.5 m of depth.

SUBSTRATES AND HABITATS. Almost all the individuals were observed from 6.1 to 8.7 m of depth, beneath rocks with calcareous and filamentous red algae and detritus. The only animal encountered in deeper water was above a thallus of *H. tuna* embedded in an entanglement of algae.

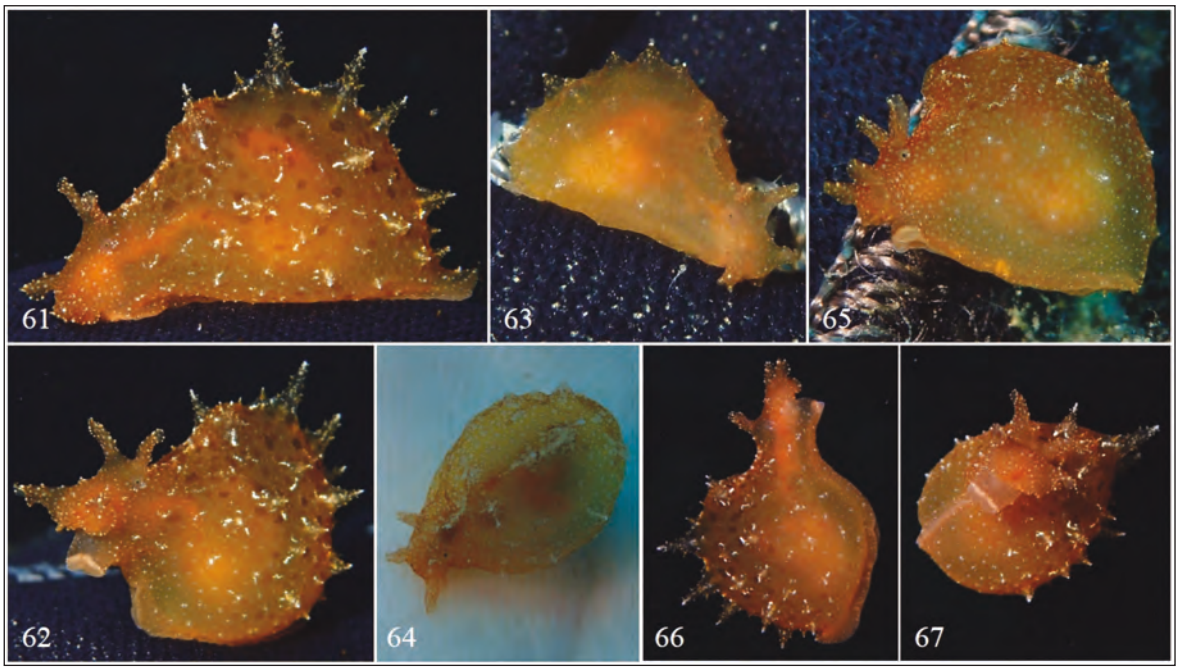
SEASONALITY. February, March and June.

REMARKS. Through this study only one of the observed *N. punctatus* specimens was seen performing the "jet-propulsion" described by Martin (1966) for this species. The animal (the largest of those encountered), after that it was removed from the substrate (the lower surface of a rock), it was put on the hand of one of the authors. Almost immediately the animal did a small (but rapid) leap upwards. In the following moments, this behaviour was not repeated. The series of particular somersaults showed in Martin (1966) was not observed in this case.

Genus *Petalifera* Gray, 1847

***Petalifera*** cf. ***petalifera*** (Rang, 1828) (Figs. 68 – 70)

MORPHOLOGY. About 5–15/20 mm in length, this species presents a greenish-yellowish coloured body. Its surface is scattered with a high number of red-brown spots/dots. Rarely, red-brown small radial stripes can also be present. Moreover, there are always, in variable number and size, bright white dots. The tegument of the rhinophores, of the ocular areas and of the area in which there is the seminal groove, is transparent grey and sometimes it can be accompanied by bright white dots. The seminal groove is signed by a red-brown line. The




Figures 61–67: *Notarchus punctatus*. Fig. 61: a specimen in left lateral view. Fig. 62: the same viewed more anteriorly. Fig. 63: an individual in right lateral view. Fig. 64: a small specimen. Fig. 65: an individual in left lateral view. Fig. 66: a specimen while sinks after doing the "jet propulsion". Fig. 67: the same during sinking (photos by A. Lombardo).

parapodia are almost completely fused between them with the exception of two small apertures, one anterior and one posterior, both easily visible from the exterior. The edge of the body has bright white dots. Generally, this species has a longitudinally elongated and slightly dorso-ventral depressed body aspect.

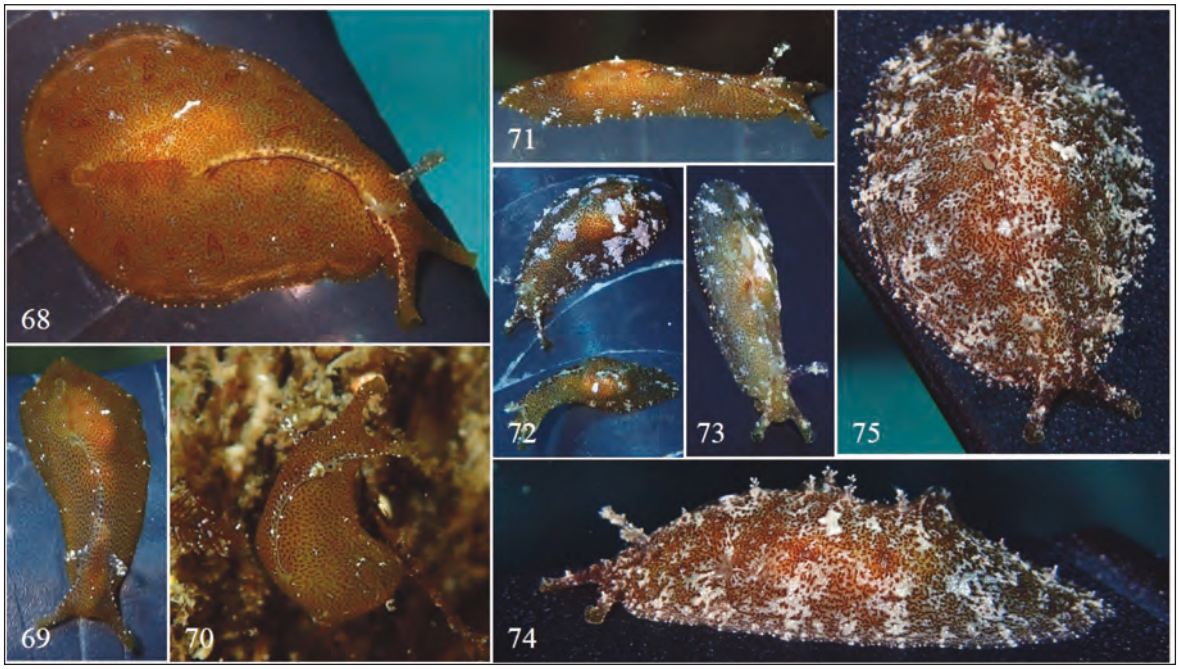
ABUNDANCE. Through this study, a total of 10 specimens was found.

LOCATION AND DEPTH. This aplysiid was observed at Santa Maria La Scala (3 specimens), at Santa Tecla (1 specimen) and at Catania (6 specimens) from 4.9 to 8.4 m of depth.

SUBSTRATES AND HABITATS. Usually, *P.* cf. *petalifera* was found beneath rocks with encrusting bryozoans and *Eupogodon planus* (C. Agardh) Kützing; among *H. scoparia* and on *H. filicina* with detritus. In an occasion, 5 specimens were documented inside a beverage tumbler at 5.1 m of depth. Specifically, 4 individuals were inside the tumbler, while one specimen was on the internal face of the isolating membrane (ripped).

SEASONALITY. From July to September.

REMARKS. During this study some specimens that presented intermediate characteristics between *P.* cf. *petalifera* and *P.* cf. *lafonti* (P. Fischer, 1870) were found (Figs. 71–73). Specifically, it seems to be a gradient in the number, in the width of the bright white spots and in the presence of tubercles between the two morphotypes (*P.* cf. *petalifera* e *P.* cf. *lafonti*). In the morphotype here called *P.* cf. *petalifera* the body is almost completely smooth and without bright white spots. Instead, in the other one (*P.* cf. *lafonti*), there are generally large and numerous spots and conspicuous tubercles (see description below). It is important to highlight that the presence of the spots and tubercles is not size-dependent. For example, the *P.* cf. *petalifera* specimen showed in Fig. 68 had the same size of the *P.* cf. *lafonti* individual showed in Figs. 74 and 75. All this is complicated by the fact that these two species are not externally easily recognisable between them (Trainito & Doneddu, 2014). Consequently, it is not clear if, in this particular case, there are two different species or only one with a great morphological variability. In order to simplify the description, these animals are here considered as two different entities.




Figures 68–75: *Petalifera* cf. *petalifera* and *Phyllaplysia* cf. *lafonti*. Fig. 68: *P.* cf. *petalifera*. Fig. 69: individual in dorsal view. Fig. 70: right latero-dorsal view. Figs. 71–73: individuals with an intermediate external morphology between *P.* cf. *petalifera* and *P.* cf. *lafonti*. Fig. 74: *P.* cf. *lafonti*. Fig. 75: the same in dorsal viewl (photos by A. Lombardo).

Genus *Phyllaplysia* P. Fischer, 1872

***Phyllaplysia*** cf. ***lafonti*** (P. Fischer, 1870) (Figs. 74–75)

MORPHOLOGY. About 5–20 mm in length, this species has a grey coloured body, largely covered by brown-red dots/spots. The tegument presents several amorphous blotches, that are formed by groups of bright white dots. Particular scattered tubercles arise from the body surface. They, although smaller, can also be present in the cephalic appendages. The parapodia are almost completely joined between them, with the exception of two small apertures, one anterior and one posterior. From the anterior one to the right side of the head, it is possible to note the seminal groove red-brown coloured.

ABUNDANCE. Through this study a total of 12 specimens was found.

LOCATION AND DEPTH. *P.* cf. *lafonti* was documented at Santa Maria La Scala (3 specimens), at Santa Tecla (3 specimens) and at Catania (6 specimens) from 5 to 18 m of depth.

SUBSTRATES AND HABITATS. This species was found on the following substrates: beneath rocks with bryozoans and calcareous red algae; on turfs of *Jania* sp.; on *H. filicina*; among thalli of *H. scoparia*; on *P. pavonica* and on the stolons of *C. cylindracea.* On one occasion, the largest individual of those encountered, was observed inside an upside-down bucket covered by algal film at 6 m of depth.

SEASONALITY. From July to October.

REMARKS. See the remarks section of *P.* cf. *petalifera.*

## DISCUSSION AND CONCLUSIONS

Through the present study it was observed that along the central-eastern coast of Sicily, there are 9 taxa (2 of which not determined at a specific level) belonging to the order Aplysiida. Considering the number of species documented in this study, it can be noted that along this area there is a high level of biodiversity regarding this group of gastropods. Indeed, in the Mediterranean, there are 11 species belonging to this order (Trainito & Doneddu, 2014) [10 not considering *A. parvula* (see the note above)]. Of the 9 total species found in this study, 3 species (*Aplysia* sp. 1, *Aplysia* sp. 2, *Petalifera* cf. *petalifera*) are not present in the list of Lombardo and Marletta (2020). Moreover, the taxa here indicated as *Aplysia* sp. 1 and *Aplysia* sp. 2 seem to be new additions to the Mediterranean fauna. Indeed, among the species depicted in Trainito and Doneddu (2014) there is none that match to them.

It is interesting to note, as the most common species among those reported in this study, *A. dactylomela* (followed by *A. depilans* and *A. fasciata*). This species, native of the Atlantic Ocean (Valdés et al., 2013), was reported for the first time within the Mediterranean Basin in 2002 at Lampedusa (Trainito, 2003). One year later, this aplysiid was found within the marine protected area of the Ciclopi Islands (Scuderi & Russo, 2005) (area located in proximity of the sites examined during this study). Subsequently this mollusc (considered as an invasive species) succeeded to expand in many areas of the central and eastern Mediterranean (Valdés et al., 2013). Specifically, considering the central-eastern coast of Sicily, it can be noted that, throughout 20 years, this species achieved to outclass the most common native species (*A. depilans* and *A. fasciata*), proving its invasiveness.

*A. dactylomela*, *A. depilans* and *A. fasciata* were the only species, among those documented, to have been observed in assemblages (more or less numerous) of specimens, especially during summer. Instead, the other species were almost always documented through single individuals (or pairs) and far less often than the previous ones. This is certainly due to the small dimensions, to the more sciaphilous habits and to the different lifestyle (probably less gregarious) of these latter species.

Regarding to *A. dactylomela* and *A. fasciata,* it is important to highlight that these species are strongly subject to attacks from the polychaete *H. carunculata.* This latter species, considered as a native invader, presents a considerable offensive capacity towards other organisms, also of larger sizes (Righi et al., 2020). In the last years, it was noted that this annelid is able to feed on a wide variety of preys and that it is in expansion within the Mediterranean Basin (Righi et al., 2020).

Consequently, through this study, it appears that *H. carunculata* [very abundant along the central-eastern coast of Sicily, especially in summer (Lombardo & Marletta, 2021; personal observation)] can represent a concrete threat for these two species. By analysing the cases of attacks and wounds caused by this annelid, seems that *A. fasciata* is more susceptible to attacks and wounds with serious consequences compared to *A. dactylomela*. Indeed, *A. dactylomela* specimens, with missing parts of the body, were never observed. On the other hand, *A. fasciata* specimens with these lacking parts were repeatedly documented. This would imply that *A. fasciata* (the autochthonous species) is more vulnerable compared to *A. dactylomela* (a invasive allochthonous species), and thus, it seems to be a real indirect vantage of *A. dactylomela* against *A. fasciata*.

Considering this, it is evident how the continuous monitoring of a certain area is necessary not only to discover the actual fauna and to acquire new faunistic data, but principally to understand the faunistic variations (qualitative and quantitative) that occurr over time, whose knowledge is fundamental in the actual period of climate crisis.

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