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FIRST RECORD OF THE MARINE HETEROBRANCH *SPINOAGLAJA WILDPRETII* (ORTEA, BACALLADO & MORO, 2003) (CEPHALASPIDEA: AGLAJIDAE) IN SICILY (IONIAN SEA) WITH NOTES ON ITS BIOLOGY AND ECOLOGY

Andrea LOMBARDO

University of Catania, Department of Biological, Geological and Environmental Sciences, Via Androne 81, 95124 Catania, Italy
e-mail: andylombardo94@gmail.com

Giuliana MARLETTA

Polytechnic University of Marche, Department of Life and Environmental Sciences, Via Brecce Bianche, 60131 Ancona, Italy
e-mail: giulianamarletta93@gmail.com

ABSTRACT

The present note documents the first report of the Aglajidae Spinoaglaja wildpretii along the central-eastern coast of Sicily, a coastal stretch which has been recently examined regarding marine heterobranchia fauna. This rare sea slug was found discontinuously in its distribution range by both enthusiasts and specialists (Canary Islands and Mediterranean Sea) from the time of its description until today. In this short note, all the available biological and ecological information about S. wildpretii is here reviewed and discussed. From resumed and new data about this species, it can be hypothesized that S. wildpretii can be a generalist marine heterobranch species, having been found in very ubiquitous habitats during most of the months of the year and in a large range of temperatures.

Key words: Head-shield marine slugs, Heterobranchia, Ionian Sea, Philinoidea, sea slugs

PRIMA SEGNALEZIONE DELL'ETEROBRANCO MARINO *SPINOAGLAJA WILDPRETII* (ORTEA, BACALLADO & MORO, 2003) (CEPHALASPIDEA: AGLAJIDAE) IN SICILIA (MAR IONIO) CON CENNI SULLA SUA BIOLOGIA ED ECOLOGIA

SINTESI

La presente nota documenta il primo ritrovamento di Spinoaglaja wildpretii (Aglajidae) lungo la costa centro-orientale della Sicilia, un tratto costiero che è stato recentemente esaminato per quanto riguarda la fauna a eterobranchi marini. Questa rara specie è stata rinvenuta sia da appassionati che specialisti in maniera discontinua nel suo areale di distribuzione (Isole Canarie e mar Mediterraneo) da quando è stata descritta. In questa breve nota vengono riviste e discusse tutte le informazioni disponibili riguardanti la biologia ed ecologia di S. wildpretii. Dai nuovi dati e da quelli raccolti su questa specie, può essere ipotizzato che S. wildpretii sia una specie di eterobranco marino generalista, essendo stata rinvenuta in diverse tipologie di ambienti, durante la maggior parte dei mesi dell'anno e a un ampio range di temperature.

Parole chiave: cefalaspidei, Heterobranchia, mar Ionio, Philinoidea, lumache di mare

INTRODUCTION

Spinoaglaja Ortea, Moro & Espinosa, 2007 is one of the 16 genera belonging to the family Aglajidae Pilsbry, 1895 (1847) (MolluscaBase, 2023a), the second richest in species family of the order Cephalaspidea (Zamora-Silva & Malaquias, 2018).

Members of this genus are mainly characterized by: a cephalic shield narrower than the shell region and with its posterior edge following horizontally the body level; a fully calcified internal shield-shaped shell with a variable number of spiniform processes attached to the protoconch; caudal lobes of the body similar in shape and size; and a head devoid of sensory whiskers (Ortea *et al.*, 2007). Nowadays this genus is represented by a total of five species: *Spinoaglaja aeci* (Ortea & Espinosa, 2001); *S. navia* Ortea, 2022; *S. orientalis* (Baba, 1949); *S. petra* (Ev. Marcus, 1976) and *S. wildpretii* (Ortea, Bacallado & Moro, 2003) (MolluscaBase, 2023b). Every species of this genus shows a characteristic chromatic pattern that makes them easily distinguishable. This genus seems to be prevalently distributed in the western part of the Atlantic

[Costa Rica, Bahamas and Cuba for *S. aeci* (Ortea & Espinosa, 2001; Ortea *et al.*, 2007); French Guiana for *S. navia* (Ortea, 2022); Bahamas, Tobago, Martinique and north of Brazil for *S. petra* (Ornelas-Gatdula & Valdés, 2012)]. However, two species of this genus, *S. orientalis* and *S. wildpretii*, are distributed in other areas of the world: the former in the Indo-Pacific (Gosliner *et al.*, 2018; Nakano, 2019), while the latter in the Mediterranean Sea and the Canary Islands.

In the last decade, one of these five species, *S. wildpretii*, has aroused the interest of several marine heterobranch specialists in both the Macaronesian and Mediterranean areas due to its presumed rarity and its discontinuous findings (Ballesteros *et al.*, 2016; Horst *et al.*, 2021) (Fig. 1 and Tab. 1). *Spinoaglaja wildpretii* was documented for the first time in 1998 for the Canary Islands through a photo posted in 2001 on the famous Bill Rudman's website, Sea Slug Forum, by one of its users (Koehler, 2001). This species was officially described only five years later under the name *Melanochlamys wildpretii* by Ortea *et al.* (2003) through the examination of three specimens collected at Sardina del Norte



Fig. 1: Map of the Mediterranean and Macaronesian reports of *Spinoaglaja wildpretii*.

Sl. 1: Zemljevid Sredozemskega morja in Makaronezije z najdbami vrste *Spinoaglaja wildpretii*.

Tab. 1: Available information about *Spinoaglaja wildpretii* from scientific literature, books and websites. The question marks indicate absence of data concerning the mentioned type of information.

Tab. 1: Razpoložljivi podatki o vrsti *Spinoaglaja wildpretii* iz strokovne literature, knjig in spletnih strani. Vprašaj označuje pomanjkanje podatkov v viru.

References	Dates	N° of specimens	Location	Substrates	Depth (m)	Temperature °C
Koehler, 2001	?-?-1998	1	Gran Canaria Island (Canary Islands, Spain)	on alge covered by detritus	1	?
Ortea <i>et al.</i> , 2003	18-06-2003	3	Gáldar (Canary Islands)	on and below muddy sediment covered by rocks	4-15	?
Manousis <i>et al.</i> , 2012	?	2 (shells)	Cape (Epanomi, Greece)	<i>Zostera</i>	0.2	?
Trainito & Doneddu, 2014a; 2014b	27-11-2012	1	Punta Saline (Olbia, Italy)	on a leaf of <i>Posidonia oceanica</i>	3	?
	12-12-2012	1	Punta Saline (Olbia, Italy)	detritus/sediment	3	?
	28-10-2013	2	Lido del Sole Bay (Olbia, Italy)	on a valve of dead <i>Pinna nobilis</i>	5	?
	7-12-2013	1	Porto San Paolo Bay (Loiri Porto San paolo, Italy)	on stolons of <i>Caulerpa cylindracea</i>	5	?
Horst & Juan, 2015	23-07-2012	1	Les Vieilles (Anthéor, France)	on a tile covered by <i>Acetabularia</i> sp. and <i>Liagora</i> sp.	3	?
Romani & Pagli, 2015	?	1 (shell)	Port of Livorno (Livorno, Italy)	muddy bottom	10	?
	?	1 (shell)	Zannone Island (Latina, Italy)	coralligenous bottom	36	?
Ballesteros <i>et al.</i> , 2016	13-12-2011	1	Tossa de Mar (Spain)	among <i>Posidonia oceanica</i> and masses of photophilic algae	?	?
	5-12-2013	1	Sa Tuna (Begur, Spain)	among <i>Posidonia oceanica</i> and masses of photophilic algae	?	?
	3-10-2014	1	Morro del Vedell (Palamós, Spain)	among <i>Posidonia oceanica</i> and masses of photophilic algae	?	?
	31-10-2015	1	Cap de Creus (Spain)	among <i>Posidonia oceanica</i> and masses of photophilic algae	?	?
Prkić <i>et al.</i> , 2018	?	1	Kasjuni (Split, Croatia)	?	25	?
Furfaro <i>et al.</i> , 2020; Salento Sommerso, 2023	?-11-2015	1	Porto Cesareo (Lecce, Italy)	on dead algae	0.2	?
	23-02-2023	1	Porto Badisco (Otranto, Italy)	on a sponge	10	11-12
Horst <i>et al.</i> , 2021	16-05-2016	1	L'Eglise (Cagnes-sur-mer, France)	on and below sand	7	?
	21-09-2017	1	Golfe de Lava (Appietto, France)	above turf of filamentous algae on <i>Posidonia oceanica</i> matte	4	?
Present note	17-07-2023	1	Acque fredde (Santa Tecla, Italy)	on a thallus of <i>Halopteris scoparia</i>	6.2	24-25

(Gáldar, Gran Canaria, Canary Islands). Subsequently, Ortea *et al.* (2007) included this species in the new genus *Spinoaglaja* Ortea, Moro & Espinosa, 2007 due to the presence in the shell of this species of conic spines on the protoconch. For almost a decade, no live specimen of *S. wildpretii* was found. Indeed, the only finding of this species was that of two shells reported for Cape Epanomi in Greece (as *Melanochlamys wildpretii*) (Manousis *et al.*, 2012).

However, after the publication of this Greek report, the first Mediterranean record of a living *S. wildpretii* specimen was published by Horst and Juan (2015) for the waters of Les Vieilles (Anthéor, France). Almost in the same period, Trainito and Doneddu (2014a; 2014b) reported the finding of five specimens for the areas of Olbia and Loiri Porto San Paolo (Sardinia, Italy), while Romani and Pagli (2015) documented two shells of this species at Livorno (Italy) and Zannone island (Italy). Subsequently, four specimens of this Aglajidae were found in four locations along the Catalan coast (Spain) (Ballesteros *et al.*, 2016) and one in the area of Kasjuni (Split, Croatia) (Prkić *et al.*, 2018). Other additional findings of this mollusc were documented from 2015 to 2023 by Furfaro *et al.* (2020) and Salento Sommerso (2023) for Italy (two specimens reported for Apulia) and by Horst *et al.* (2021) for France (one for the French Riviera and the other one for western Corsica).

Recently, during a scuba dive a specimen of *S. wildpretii* was found in a site of the central-eastern coast of Sicily (Ionian Sea). Consequently, the present note here documents the first report for Sicily of this rare species with a brief review of all the information available from scientific articles, books and websites about this marine heterobranch.

MATERIAL AND METHODS

The specimen of *Spinoaglaja wildpretii* was found during a morning dive carried out on 17 July 2023 at Acque fredde (37°38'15.5"N, 15°10'51.1"E), a site located within the hamlet of Santa Tecla (Municipality of Acireale). Acque fredde is one of the only three sites along the central-eastern coast of Sicily in which there is a stable and healthy population of *Ericaria zosteroides* (C. Agardh) Molinari & Guiry (Marletta & Lombardo, 2023) and thus it presents general good environmental conditions. The encountered specimen was not collected but was documented photographically through an Olympus TG-4 underwater camera. Through the examination of the photos and the pertinent literature (see reference) it was possible to identify the individual as *S. wildpretii*. In addition, through the observation of the photos, it was possible to determine even the

substrates in which the specimen was found. The depth and temperature were registered at the moment of the finding via a Suunto D6i dive computer. Moreover, to measure the specimen and obtain the best photographic output, the specimen was put on a black plastic board.

RESULTS

The specimen of *Spinoaglaja wildpretii* (Fig. 2 A-G) was found in a turf composed of several thalli of the brown algae *Halopteris scoparia* (Linnaeus) Sauvageau (6.2 m of depth, 24–25°C). In particular, the individual was found at the base of a thallus of *H. scoparia* among/above a mix of detritus/sand, filamentous and laminar small algae. Overall, the animal presented a rest/contract position that gave him a general stubby aspect. Once removed from the substrate and placed above a plastic board, the animal became immediately active (crawling rapidly) and regained its normal body shape (about 13 mm in length).

DISCUSSION

With the present note the cephalaspidean *Spinoaglaja wildpretii* is reported for the first time along the coasts of Sicily, specifically for the central-eastern coast of this island, a coastal stretch that has been recently studied regarding the marine Heterobranchia fauna (Lombardo & Marletta, 2020). Due to the scant findings and its inconspicuous lifestyle, this species is generally considered rare (Trainito & Doneddu, 2014a; Horst *et al.*, 2021). Moreover, as can be seen through the documented findings of this species, *S. wildpretii*'s preferential habitats are, almost always, those with a soft substrate (sand, mud, detritus), a coverage (more or less dense) of different types of marine plants (seagrasses and algae) or rocks and pebbles. In these habitats, the finding of sea slugs is often difficult and it is possible only either when they move to less shaded areas [e. g. on the upper part of plants (Koehler, 2001; Trainito & Doneddu, 2014a; Ballesteros *et al.*, 2016; Horst *et al.*, 2021) or on uncovered areas (Ortea *et al.*, 2003; Trainito & Doneddu, 2014a; Horst *et al.*, 2021) or on conspicuous substrates (Trainito & Doneddu, 2014a; Horst & Juan, 2015; Furfaro *et al.*, 2020; Salento Sommerso, 2023)]. Consequently, the life habitat of this species plays an important role in its inconspicuousness and presumed rarity.

Regarding the geographical origin of this species, in the last years two possible hypotheses were assumed. The first one is by Trainito and Doneddu (2014a) and Ballesteros *et al.* (2016), who stated

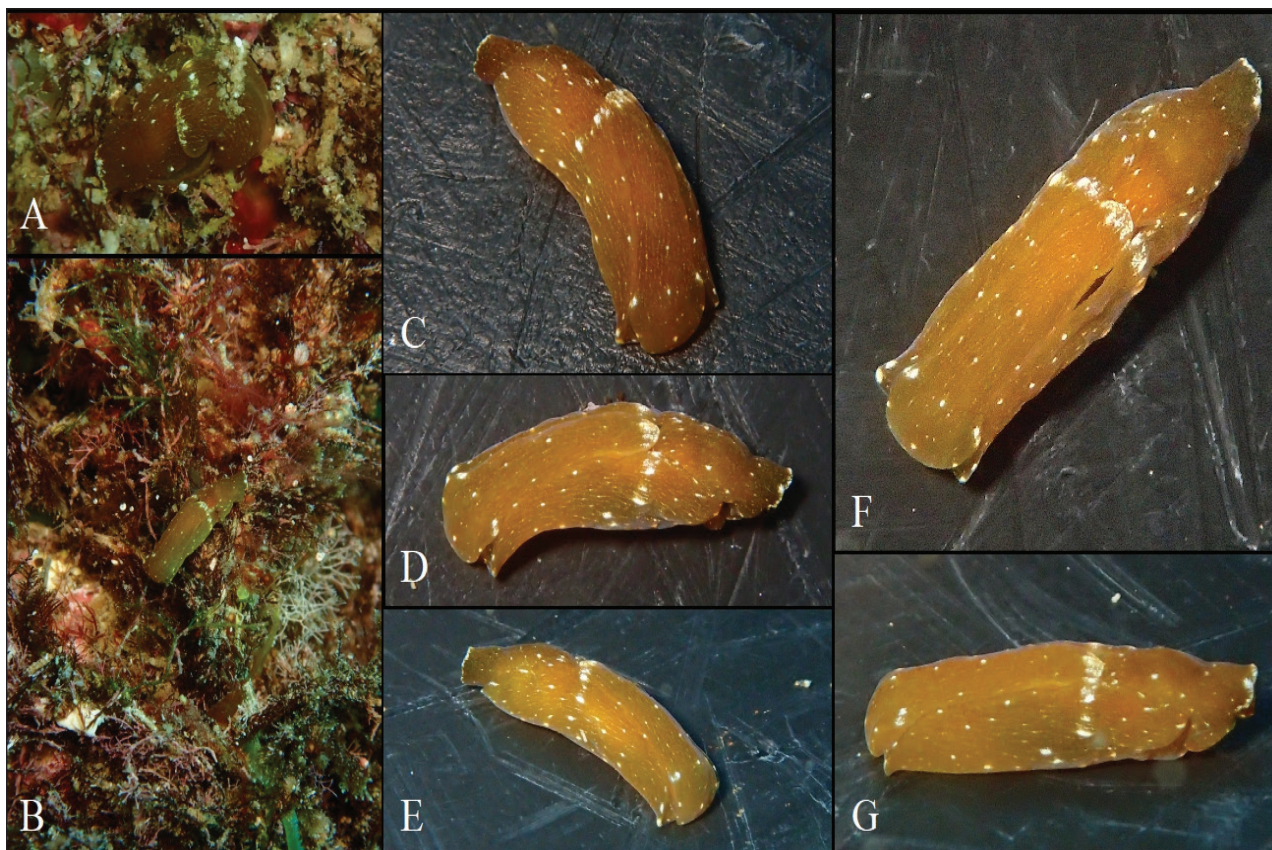


Fig. 2: The specimen of *Spinoaglaja wildpretii* found at Acque fredde. A) the individual, with a stubby aspect, at the moment of the finding; B) the specimen relocated on its substrate; C) anterodorsal view of the animal; D) left dorsolateral view; E) right dorsolateral view; F) dorsal view; G) left lateral view (photos by A. Lombardo).

Sl. 2: Primerek vrste *Spinoaglaja wildpretii*, najden na lokaliteti Acque fredde. A) čokat primerek v trenutku najdbe; B) primerek v njegovem okolju; C) anterodorsalni pogled na žival; D) levi dorzolateralni pogled; E) desni dorzolateralni pogled; F) hrbtni pogled; G) pogled z levega boka (fotografije: A. Lombardo).

that due to the location of the reports documented at the time, *S. wildpretii* might be an Atlanto-Mediterranean species. The second hypothesis was stated also by Ballesteros *et al.* (2016) who, following the information reported in a study of another *Spinoaglaja* species (*S. petra*) (Ornelas-Gatdula & Valdés, 2012), suggested that the distribution of *S. wildpretii* may indicate the existence of two sympatric-cryptic species, a Canarian and a Mediterranean one.

In particular, the case of *S. wildpretii* seems to be halfway between that of *O. picoensis*, with few reports in the Macaronesia versus a huge quantity of findings in the Mediterranean (Lombardo & Marletta, 2021; Trainito *et al.*, 2022); and that of *T. mazda*, with a single record for the Macaronesia and two for the Mediterranean basin (Lombardo, 2023). Although the difference in the number of reports, the geographical pathway made by these

species from the Atlantic Ocean and Mediterranean Sea is very similar. Moreover, due to the presumed similarity in the pattern of findings of these three species, understanding one of them could permit us to assume that of the other two.

Regarding the biology of this species, there is very little and scattered information among literature and websites (Tab. 1). In general, *S. wildpretii* is a burrowing animal that lives in sandy and muddy environments with half-buried stones (Ortea *et al.*, 2003; Ballesteros *et al.*, 2016). However, through the examination of published data, *S. wildpretii* does not seem a complete burrower animal. Indeed, in many reports, it was documented above different solid substrates. Consequently, although this species has probably burrowing habits, it can easily adapt to several types of substrates, but always in proximity of covered areas. As concerns this, meadows of seagrass, turfs of macroalgae and

rocks fit perfectly in this category. Overall, this species was found: once in February (Furfaro *et al.*, 2020; Salento Sommerso, 2023), once in May (Horst *et al.*, 2021), once in June (Ortea *et al.*, 2003), twice in July (Horst & Juan, 2015; present note), once in September (Horst *et al.*, 2021), three times in October (Trainito & Doneddu, 2014a; Ballesteros *et al.*, 2016), twice in November (Trainito & Doneddu, 2014a; Furfaro *et al.*, 2020; Salento Sommerso, 2023) and four times in December (Trainito & Doneddu, 2014a; Ballesteros *et al.*, 2016). Therefore, most reports were documented during autumn months. Moreover, although temperature data were registered only twice (Salento

Sommerso, 2023; present note), it can be assumed that *S. wildpretii* is a eurytherm species, having been found both at 11-12 °C (Salento Sommerso, 2023) and 24-25 °C (present note). As regards the bathymetric range of *S. wildpretii* (considering live specimen records), this species was found from under the level of seawater to 25 m of depth (Salento Sommerso, 2023; Prkić *et al.*, 2018). To conclude, from the sum of the new data reported here and those taken from the literature, it would appear that *S. wildpretii* can be found in various marine habitats, for most months of the year and over a wide range of temperatures.

PRVI ZAPIS O POJAVLJANJU MORSKEGA ZAŠKRGARJA VRSTE *SPINOAGLAJA WILDPRETII* (ORTEA, BACALLADO & MORO, 2003) (CEPHALASPIDEA: AGLAJIDAE) NA SICILIJ (JONSKO MORJE) Z ZAPISKI O NJENI BIOLOGIJI IN EKOLOGIJI

Andrea LOMBARDO

University of Catania, Department of Biological, Geological and Environmental Sciences, 95124 Catania, Italy
e-mail: andylombardo94@gmail.com

Giuliana MARLETTA

Polytechnic University of Marche, Department of Life and Environmental Sciences, Via Brecce Bianche, 60131 Ancona, Italy
e-mail: giulianamarletta93@gmail.com

POVZETEK

Avtorja poročata o prvem zapisu o pojavljanju vrste *Spinoaglaja wildpretii* iz družine *Aglajidae* na obalnem odseku vzdolž srednjevzhodne obale Sicilije, kjer sta raziskovala polže zaškrjarje. Tega redkega morskega polža so od njegovega opisa tako strokovnjaki kot navdušenci do danes v njegovem arealu le občasno našli (Kanarsko otočje in Sredozemsko morje). V tej beležki avtorja podajata vse razpoložljive biološke in ekološke podatke o vrsti *S. wildpretii*. Na podlagi razpoložljivih in novih podatkov domnevata, da je *S. wildpretii* med zaškrjarji vrsta generalista, ki jo najdemo v zelo različnih habitatih večino mesecev v letu in v velikem razponu temperatur.

Ključne besede: Cephalaspidea, Heterobranchia, Jonsko morje, Philinoidea, polži zaškrjarji

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