Short communication

No longer so common: findings of *Calliopaea bellula* d'Orbigny 1837 (Gastropoda: Sacoglossa) and *Tayuva lilacina* (A. Gould 1852) (Gastropoda: Nudibranchia) along the central-eastern coast of Sicily (Ionian Sea)

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Abstract - The present note documents the finding of two species of marine heterobranch seaslugs along the central-eastern coast of Sicily (Italy, central Mediterranean): the sacoglossan *Calliopaea bellula* and the nudibranch *Tayuva lilacina*. These two species show a wide geographical range (*C. bellula* is present from Norway to the Black Sea, while *T. lilacina* is a cosmopolitan species) and in the literature were considered common species. However, in the last years, the number of findings of these species is decreasing, at least in the Western Ionian Sea, an area where these species seem to be currently rare. As documented for other Mediterranean areas, the reason for this decline in the number of marine heterobranch species might be attributable to a change in the current regime or to an increase in anthropogenic impacts around the coastal areas.

Keywords: Discodorididae, Limapontiidae, marine Heterobranchia, Mediterranean Sea, rare species.

Riassunto - Non più così comuni: ritrovamenti di *Calliopaea bellula* d'Orbigny 1837 (Gastropoda: Sacoglossa) e *Tayuva lilacina* (A. Gould 1852) (Gastropoda: Nudibranchia) lungo la costa centro-orientale della Sicilia (Mar Ionio).

La presente nota documenta il ritrovamento di due specie di eterobranchi marini lungo la costa centro-orientale della Sicilia (Italia, Mediterraneo Centrale): il sacoglosso *Calliopaea bellula* e il nudibranco *Tayuva lilacina*. Queste due specie presentano un'ampia distribuzione geografica (*C. bellula* si trova dalla Norvegia al Mar Nero, mentre *T. lilacina* è una specie cosmopolita) e in letteratura sono state considerate specie comuni. Tuttavia, negli ultimi anni il numero di ritrovamenti di queste specie è diminuito, almeno nel Mar Ionio occidentale, un'area dove queste specie sembrerebbero essere attualmente rare. Come documentato per altre aree Mediterranee, la ragione di questo declino nel numero di specie di eterobranchi marini potrebbe essere attribuibile al cambiamento nel regime idrodinamico delle correnti o a un incremento degli impatti antropici lungo le aree costiere.

Parole chiave: Discodorididae, Eterobranchi marini, Limapontiidae, Mar Mediterraneo, specie rare.

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During two scuba dives carried out in 2021 along the central-eastern coast of Sicily (Italy, central Mediterranean), two species of marine heterobranch seaslugs *Calliopaea bellula* d'Orbigny 1837 and *Tayuva lilacina* (A. Gould 1852), were found.

C. bellula is a small sacoglossan belonging to the family Limapontiidae Gray 1847 that, differently to most Sacoglossa [which feed almost exclusively on cellular fluids of macroalgae (Marín & Ros, 1989)], feeds on the eggs of other marine heterobranchs (Todd, 1982; Schmekel & Portmann, 1982; Coelho *et al.*, 2006). This species, previously considered as rare (Gascoigne & Todd, 1977), is nowadays rather ubiquitous (Todd, 1982; Schmekel & Portmann, 1982; Marín & Ros, 1988; Coelho *et al.*, 2006). *C. bellula* presents a wide geographical distribution along the European coasts. Indeed, the range of this species includes both the north-eastern Atlantic and the Mediterranean coasts (from Norway to the Black Sea) (Rudman, 2009; Trainito & Doneddu, 2014). Regarding the Italian waters, *C. bellula* was documented in: Trieste (Friuli-Venezia Giulia) as *Stiliger mariae* by Bergh (1885); Livorno (Tuscany) by Sordi & Majidi (1957); Gulf of Naples (Campania) as *Stiliger vesiculosus* by Schmekel (1968) and, later, as *C. bellula* by Schmekel & Portmann (1982); Taranto and Gallipoli (Apulia) as *Stiliger vesciculosus* by Perrone (1983) and then as S. *bellulus* by Perrone (1986); and, finally, in the Ligurian Sea (Liguria) as *Calliopoea bellula* by Cattaneo Vietti (1986) (Fig. 1).

T. lilacina is a doridacean nudibranch, belonging to the family Discodorididae Bergh 1891, which presents a complex taxonomical history. Indeed, the members of the genus *Tayuva* Er. Marcus & Ev. Marcus 1967 are cosmopolitan species that cannot be distinguished anatomically and morphologically from one another (Dayrat,

Fig. 1 - Italian Peninsula's map showing the reports of the two discussed species. The reports of *Calliopaea bellula* are green coloured, while those of *Tayuva lilacina* are pink coloured. Each report is joined with the corresponding reference/s. / Mappa della Penisola Italiana che mostra le segnalazioni delle due specie discusse. I ritrovamenti di *Calliopaea bellula* sono colorati in verde, mentre quelli di *Tayuva lilacina* sono colorati di rosa. Ogni segnalazione è accompagnata dai corrispondenti riferimenti bibliografici.

2010). This last author considers as valid only one of these species, *T. lilacina*, rendering the other species of the genus as synonyms of the latter, which most likely would represent a complex of species, widespread in several parts of the globe: Caribbean Sea, Eastern Pacific, Tropical Indo-West Pacific, Mediterranean, and European Eastern Atlantic. With regard to the last cited areas, this species was given several names throughout the years, (Dayrat, 2010): *Discodoris maculosa*, *D. concinna*, *D. confusa*, *D. fragilis*, *D. lilacina* and *Tayuva maculosa*. The species was generally detected beneath rocks, from the intertidal to 24 m depth (Swennen, 1961; Schmekel & Portmann, 1982; Ballesteros *et al.*, 1985; Wirtz, 1995). According to Dayrat (2010), due to the large number of reports in the literature and on the web, as well as museum specimens, *T. lilacina* would appear to be a common species. In Italy, this species was reported in Naples (Campania) as *Discodoris maculosa* (Bergh, 1884; Schmekel, 1968; Schmekel & Portmann, 1982), in Porto Cesareo (Apulia) as *D. maculosa* (Perrone, 1983), in Lecce and in Taranto (Apulia) (Furfaro *et al*., 2020; Vitale & Colucci, 2022) and at Tavolara-Punta Coda Cavallo (Sardinia) (Trainito & Doneddu, 2015) (Fig. 1). More information on this species can be found in Ballesteros *et al*. (2022).

In Sicily, *C. bellula* was never reported, while *T. lilacina* was only recorded in brackish lagoons such as the Stagnone di Marsala (Marsala, western Sicily) (Cattaneo Vietti & Chemello, 1987) and those in the area of Capo Peloro (Messina, north-eastern Sicily) (Vitale *et al.*, 2016).

The present note reports the first record of *C. bellula* and a new record of *T. lilacina* for Sicily. In addition, the presumed rare status of these two species is here discussed in a regional and local perspective.

Both specimens were documented throughout two-morning scuba dives (between 9:00 and 11:30 a.m.) carried out at two sites located along the central-eastern coast of Sicily: Santa Maria La Scala (37°36'46.5" N - 15°10'31.4" E) and Acque Fredde (37°38'15.7" N - 15°10'52.1" E) (Fig. 1). Both sites show remarkable freshwater flow coming from the Etna Volcano, which arrives directly to the sea, thanks to the high permeability of volcanic rocks (Catra *et al.*, 2006).

The animals were photographed with two underwater cameras (Olympus TG-4 and TG-6). Moreover, data on depth and seawater temperature were registered. The photographs of animals were subsequently examined and their specific identification assessed with the literature and with reference websites. For *C. bellula*, the following works were referred: Gascoigne & Todd (1977), Schmekel & Portmann (1982), Rudman (2009) and Trainito & Doneddu (2014). For *T. lilacina*, the following works were accessed: Dayrat (2010), Tranito & Doneddu (2014) and Smith (2021).

On 29th May 2021 at the site of Santa Maria La Scala, a specimen of *C. bellula* (Fig. 2) was detected at about 20 m depth on a tangle of Sphacelariales and Dictyotales brown algae, and filamentous Rhodophyta (seawater temperature: 16-17 °C). The animal was about 10 mm in length and showed a greyish-transparent general body coloration. The anterior part of the body was provided by three evident brownish stripes. The first one, located dorsally, went from the space between tentacles until the point where the first cerata were raised. This stripe had an obvious width restriction at the level of the eyes, which were not in contact with each other. The stripe enlarged behind the eyes. The other two stripes were located on each side of the anterior part of the body. These three brown stripes were separated by a lack of pigmentation which formed two narrow grey-coloured areas, within which the eyes stand. The cerata,

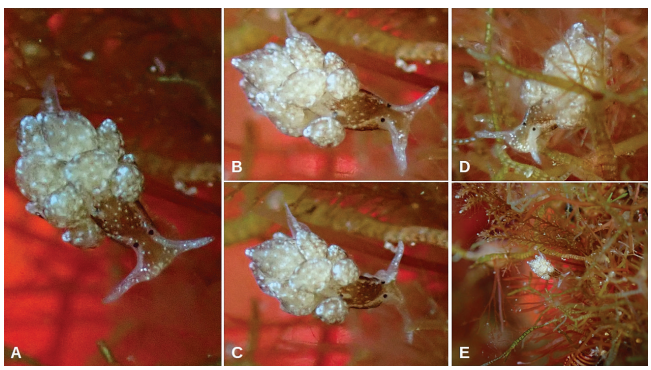

Fig. 2 - A) The *Calliopaea bellula* specimen in anterodorsal view. B) Right laterodorsal view. C) Dorsal view. D) Left laterodorsal view. E) The individual on its substrate. (Photos by G. Marletta). / A) L'esemplare di *Calliopaea bellula* in visione antero-dorsale. B) Visione latero-dorsale destra. C) Visione dorsale. D) Visione laterodorsale sinistra. E) L'individuo sul suo substrato. (Foto di G. Marletta).

with a transparent tegument (through which it was possible to note the cream coloration of the digestive's gland branches), were swollen and pointed at the apices (white-coloured). The tegument of the cerata presented several bright white and brownish dots, the former more evident and numerous than the latter. All the body surface was covered with scattered white dots. A melanin-black vesicle (spotted dark green) in the laterodorsal position, appeared quite pronounced, and it was situated in the only non-pigmented area of the dorsal brown stripe. The tail, posteriorly pointed, showed a dorsal stripe of bright white dots.

On 14th December 2021, at the site of Acque Fredde, a specimen of *Tayuva lilacina* was found under a pebble at 4 m depth (seawater temperature: 16 °C) (Fig. 3). The animal was about 10 mm long and showed a grey general body coloration. The marginal areas of the notum were transparent and displayed a remarkable number of bright white dots. These last were also located along the central area of the notum, even though in a less evident way, in lower quantity, and in smaller sizes. On closer examination, these appeared as eversions of the tegument. Generally, the mantle surface was covered by abundant brown spots of different shapes, sizes, and nuances. The less obvious and clearer ones were very widespread and dense. The most evident and darkest ones were larger and formed by grouped spots. These last gave the animal a pitted appearance. The edges of the sheaths of rhinophores and of the gill had white spiculated, outward-facing tubercles. The lamellate rhinophores were cream-colored and brown spotted. Moreover, they had mucronate apices. The gill tuft presented the same general coloration as the rhinophores. The foot and the ventral surface of the notum presented a grey-bluish coloration with scattered small brown spots. The digitiform oral tentacles had also the same grey-bluish coloration. Once removed the animal from the substrate, the tegument of notum assumed a strongly knurled appearance. Moreover, the specimen presented two pronounced wounds/scars, located on each side of the notum. When the animal was extended, they made it take the shape of an eight.

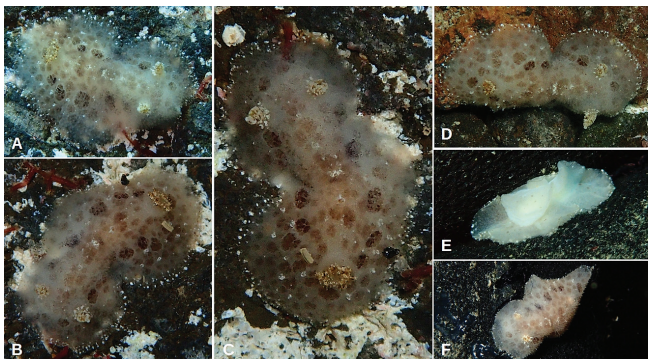

Fig. 3 - A) The *Tayuva lilacina* specimen in dorsal view. B) Right anterodorsal view. C) Dorsal view. D) The individual in extension. E) The ventral part of the body. F) The animal with the knurled appearance. (Photos by A. Lombardo). / A) L'esemplare di *Tayuva lilacina* in visione dorsale. B) Visione antero-dorsale destra. C) Visione dorsale. D) L'individuo in estensione. E) La parte ventrale del corpo. F) L'animale con l'aspetto zigrinato. (Foto di A. Lombardo).

In the literature, *C. bellula* and *T. lilacina* were considered fairly common species (Todd, 1982; Coelho *et al.*, 2006; Dayrat, 2010). Indeed, some authors reported records of numerous individuals of both species. For example, regarding *C. bellula*, Marín & Ros (1988), generically indicated a "large number of specimens" collected in the south-eastern Iberian Peninsula (probably, the number of these specimens was so high that they could not be numbered), while Schmekel & Portmann (1982) collected 42 specimens of this species in the area of the Gulf of Naples.

Regarding *T. lilacina*, as abovementioned, Dayrat (2010) highlighted that this species would seem to be very common. For example, in the Gulf of Naples, Schmekel and Portmann (1982) collected 36 specimens, reporting that this species was present all year round. Furthermore, Vitale *et al.* (2016) stated that this species was established in the area of Capo Peloro Lagoon (however, without indicating the exact number of found specimens). Nevertheless, in the last years, the number of reports of these species has decreased, at least along the western Ionian Sea. Indeed, although Furfaro *et al.* (2020), carried out a total of 600 scuba dives in the Salento Peninsula (Apulia, Italy), no *C. bellula* specimens have ever been found and only a few specimens of *T. lilacina* were observed from 2011 to 2020. Furthermore, Vitale & Colucci (2022) highlighted that the latter species is rather rare in this area. Additionally, even though almost 400 scuba dives were conducted along the central-eastern coast of Sicily from 2017 to date by Lombardo & Marletta (2020, 2021, unpublished authors' data), the only two specimens of these species ever found are those described in the present note. Therefore, these species have been historically considered in the literature as common in their entire geographic range, however they are in reality currently either not present or hardly found in the study area. Even in the western Mediterranean, Ballesteros (personal communication) observed that along the Catalan coast (north-eastern Spain) these species have been reported only a few times in 40 years: *C. bellula*, has been cited only 11 times in 5 locations, while *T. lilacina* has been cited a total of 34 times in 10 locations.

The rarity of these two species may be related to two main causes. First, their larval recruitment may have been subject to a variation in recent years due to a change in the regime of currents, which may fluctuate due to global warming (Valdés *et al.*, 2013). Furthermore, the reduction in the number of findings of the two species could be associated to perturbations in their habitats. Indeed, Cattaneo Vietti (1986) documented a decline along the Ligurian coasts in the number of seaslug species (including *C. bellula*) probably due to anthropogenic modifications. Therefore, *C. bellula* and *T. lilacina* may no longer be as common as previously reported in the literature due to alterations caused by human activities, and thus they might be regarded as sensitive species. Unfortunately, historically, there are no previous detailed studies on the marine heterobranch fauna along the central-eastern coast of Sicily (Lombardo & Marletta, 2020), thus, it is not possible to confirm these hypotheses for this area. However, the rarity of these two species along this stretch of coastline appears to be evident.

In conclusion, this note emphasises the importance of long-term studies in order to have a knowledge base on which long-term qualitative and quantitative comparisons can be made to measure the impact of anthropogenic pressure on the environment.

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