

On some interesting records of sea slugs (Mollusca: Gastropoda: Heterobranchia) from the Balearic Islands

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We report on the presence of four species of sea slugs (Mollusca: Gastropoda: Heterobranchia) from the Balearic Islands. The exotic sea hare *Bursatella leachii* Blainville, 1817 was extremely common in the shallow sandy bottoms of Alcúdia Bay (Mallorca) in October 2022. The nudibranch *Martadoris mediterranea* (Domínguez, Pola & Ramon, 2015) was observed in the rocky habitats dominated by the seaweed *Osmundaria volubilis* (Linnaeus) R.E.Norris in Na Foradada (Arxipèlag de Cabrera) in September 2020. The sacoglossans *Aplysiopsis elegans* Deshayes, 1853 and *Caliphylla mediterranea* A. Costa, 1867 were recorded living inside the fronds of an unidentified species of the green alga *Bryopsis* in Cala en Blanes (Menorca) in October 2022.

Keywords: *Bursatella*, *Martadoris*, *Aplysiopsis*, *Caliphylla*, Balearic Islands, Mediterranean Sea.

SOBRE ALGUNES CITACIONS INTERESSANTS DE LLIMACS MARINS (MOL·LUSCS GASTERÒPODES HETEROBRANQUIS) A BALEARS. Es dona a conèixer la presència de quatre espècies de llimacs marins (Mol·luscs Gasteròpodes) a les Illes Balears. L'espècie exòtica de llebre de mar *Bursatella leachii* Blainville, 1817 era extraordinàriament comuna als fons sorrencs poc profunds de la badia d'Alcúdia (Mallorca) el mes d'octubre de 2022. El nudibranqui *Martadoris mediterranea* (Domínguez, Pola & Ramon, 2015) fou observat en l'hàbitat de fons rocosos dominat per l'alga *Osmundaria volubilis* (Linnaeus) R.E.Norris a Na Foradada (Arxipèlag de Cabrera) el mes de setembre de 2020. Els sacoglossos *Aplysiopsis elegans* Deshayes, 1853 i *Caliphylla mediterranea* A. Costa, 1867 foren trobats vivents entre els tal·lus d'una espècie d'alga verda no identificada pertanyent al gènere *Bryopsis* a Cala en Blanes (Menorca) el mes d'octubre de 2022.

Paraules clau: *Bursatella*, *Martadoris*, *Aplysiopsis*, *Caliphylla*, Illes Balears, Mediterrània.

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Introduction

The marine fauna of benthic invertebrates from the Balearic Islands is far from being well known as the studies addressed to their identification are uncommon, with the exceptions of some early lists and records (Ballesteros, 1982; Ballesteros *et al.*, 1986, 1987; Dantart *et al.*, 1990; Ballesteros *et al.*, 1993), and mostly refer to the Archipelago of Cabrera National Park (references in Alcover *et al.*, 1993 and Grau *et al.*, 2020; Ballesteros, 1998) or other well studied areas such as the Menorca Channel (Grinyó *et al.*, 2016, 2018a, 2018b, 2020; Santín *et al.*, 2018) or some seamounts (Massutí *et al.*, 2021). Sea slugs (Heterobranch molluscs) are hardly to be reported in most of these studies, whether because of its small size or because they usually lack of calcareous skeletons that protect them from being crushed in trawl samples. Even if there is a book on the Balearic Islands' sea slugs (Darder, 2011) there is not a team of SCUBA divers that are also experts in this group of organisms as it happens in Catalonia (GROC; <https://opistobranquis.org/es/home>) and that can easily provide long checklists of sea slugs (Ballesteros *et al.*, 2016), even when focusing in small areas (e.g. Parera *et al.*, 2020). Here we want to make a small contribution on the knowledge of the heterobranchs fauna from the Balearic Islands by reporting some interesting specimens detected during several exploratory dives devoted to the detection of exotic species.

Material and Methods

The species reported in this study have been observed while free diving or SCUBA diving in different spots of the

Balearic Islands, usually by looking for invasive species of macroalgae. In some cases, the species were directly seen in situ and photographed, but in others, the species were only spotted after a careful survey of the samples collected during the dive and concerning macroalgal species. Pictures were obtained with an Olympus TG3 camera inside a RecSea housing when used underwater or whether the camera was adapted to a Leica EZ4W dissecting stereo microscope.

Results

The sea hare *Bursatella leachii* Blainville, 1817 from Alcudia Bay, Mallorca (WGS84 39.833806°N, 3.123050°E) was very abundant in the sandy bottom at 3-4 meters depth on October 31st, 2022. We did not make any accurate density estimate but 5 to 10 individuals per 100 square meters would be a good approximate guess. The bottom was mainly devoid of any macrophyte cover with the exception of some scattered *Caulerpa prolifera* (Forsskål) J.V.Lamouroux shoots and small patches of the Cyanobacteria *Lyngbya* sp.

The nudibranch *Martadoris mediterranea* (Domínguez, Pola and Ramon, 2015) was observed in Na Foradada (Archipelago of Cabrera; WGS84 39.206566°N, 2.976850°E) at 35 meters depth on September 22th, 2020 (Fig. 1). A single specimen was photographed crawling over a *Osmundaria volubilis* (Linnaeus) R.E.Norris frond on a rocky bottom with a very high algal cover.

The sacoglossans *Aplysiopsis elegans* Deshayes, 1853 and *Caliphylla mediterranea* A. Costa, 1867 were hand collected in Cala en Blanes, Menorca (WGS84 39.995508°N, 3.811564E) at 5 meters depth on October 25th, 2022 (Fig.



Fig. 1. *Martadoris mediterranea* crawling over *Osmundaria volubilis* at 35 meters depth.

Fig. 1. *Martadoris mediterranea* reptant sobre *Osmundaria volubilis* a la fondària de 35 metres.

2). Several specimens were detected in the laboratory when trying to identify a supposedly exotic species of the genus *Bryopsis* J.V. Lamouroux under the dissecting microscope.

Discussion

Bursatella leachii was already reported from Mallorca by Oliver and Terrasa (2004), who found several specimens in Palma Bay. We also recorded this species in 2004 from a *Caulerpa* meadow in Porto Petro (EB unpublished data). The record from Alcudia Bay increases its distribution in Mallorca, with what it seems to be a well-established population. We did not sample waters deeper than 5 meters, where *B. leachii* could be even more abundant since it usually feeds on Cyanobacteria

overgrowing the macroalga *Caulerpa prolifera* (Forsskål) J.V. Lamouroux and the seagrass *Cymodocea nodosa* (Ucria) Ascherson (Paige, 1988), two species that are common offshore the bay. *B. leachii* is an exotic species, first reported from the Mediterranean in 1940 (Israel; O'Donoghue and White, 1940), it was thought to be a lessepsian species (Weitzmann *et al.*, 2007, 2009), but Bazzilacupo *et al.* (2018) provided molecular evidence that Mediterranean specimens are of Atlantic origin.

The doridacean nudibranch *Martadoris mediterranea* is a recently described species (as *Tambja mediterranea* Domínguez, Pola and Ramon, 2015) with specimens collected in Mallorca and Malta (Domínguez *et al.*, 2015). The habitat of the Mallorcan specimens used in the first

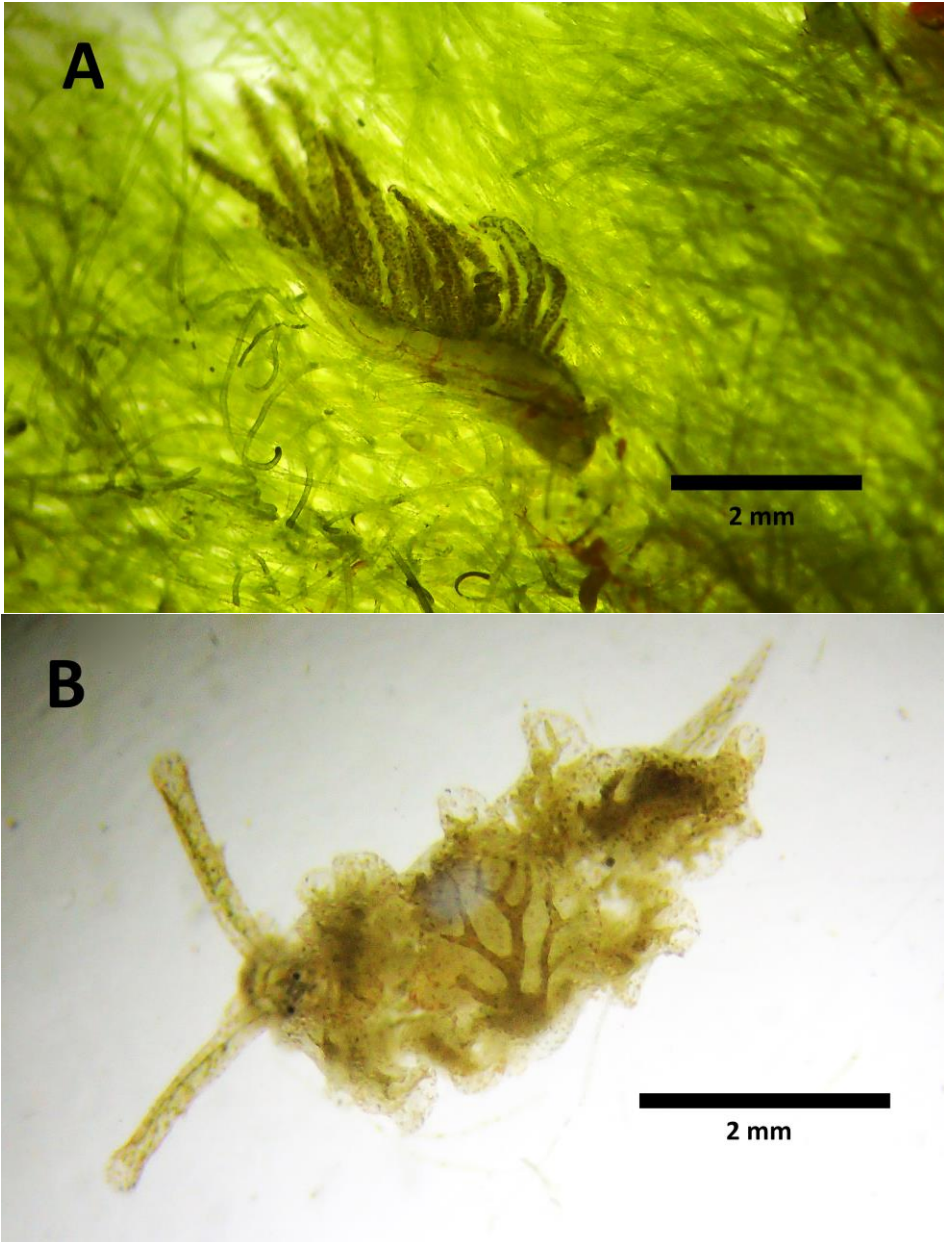


Fig. 2. A: *Aplysiopsis elegans* crawling across the filaments of *Bryopsis* sp.. B: *Caliphylla mediterranea*.

Fig. 2. A: *Aplysiopsis elegans* reptant entre els filaments de *Bryopsis* sp.. B: *Caliphylla mediterranea*.

description was a detritic bottom dominated by the rhodophyta seaweed *Phyllophora crispa* (Hudson) P.S.Dixon, 1964 (Domínguez et al., 2015), a species that usually grows together with the also rhodophyta *Osmundaria volubilis* (Ballesteros and Cebrian, 2015). Thus, circalittoral rocky bottoms and detritic bottoms with *Osmundaria volubilis* and *Phyllophora crispa* seem to be preference habitats for this species in the Balearic Islands. This species is also known from five other Mediterranean sites, two of them located in the Tyrrhenian Sea (Italy), and the others in the Gulf of Lions (Catalonia), the Alboran Sea and Samos Island (Greece)

(<https://opistobranquis.info/ca/guia/nudibranchia/doridina/doridoidei/polyceroidea/martadoris-mediterranea/>, accessed December 2022). Thus, *Martadoris mediterranea* seems to be a geographically widespread species in the Mediterranean, even if it has been discovered recently.

Although reported in the Balearic Islands by Cervera et al. (2004), we do not know of any specific record of *Aplysiopsis elegans* in the region. It is a species considered very rare in the Western Mediterranean (GROC, <https://opistobranquis.org/es/guia/323>, accessed November 2022). *Caliphylla mediterranea* was previously recorded in Cales Fonts, Menorca, by Oscar Garcia Febrero (OPK Opistobranquis, <https://opistobranquis.info/en/guia/sacoglossa/plakobranchoidea/caliphylla-mediterranea/>, accessed November 2022) and it is also considered very rare (<https://opistobranquis.org/es/guia/320>, accessed November 2022). However, because the very small size of both species and its very cryptic shape and coloration among the algae, they should go frequently unnoticed. Our specimens were observed

in the laboratory by using a dissecting microscope, but they were unnoticed in the field. Previous records of *Caliphylla mediterranea* from the city of Barcelona were also associated with the green algal genus *Bryopsis* (Parera et al., 2020).

Our aim with these new reports is to increase the knowledge of this group of molluscs in the Balearic Islands. The Balearic's fauna of heterobranchs is far from being well known. An increase on heterobranchs sampling by specialists, but also the use of pictures provided by amateur divers through citizen science platforms, can allow a more exhaustive knowledge of the biodiversity of the sea slugs from the Balearic Islands.

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