

On the finding of *Brachycarpus biunguiculatus* (Lucas, 1846) from Sifnos Island, Cyclades, Aegean Sea. Rare or overlooked?

(Crustacea, Decapoda, Palaemonidae)

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Family Palaemonidae Rafinesque, 1815 is very diverse, with more than 1400 known shrimp species occurring globally. *Brachycarpus biunguiculatus* (Lucas, 1846), though that it has a cosmopolitan distribution, is the only species of the genus that inhabits Mediterranean Sea. In Hellenic waters, the species is known only known from the south Aegean Sea. The present study reports the second occurrence of the rare *B. biunguiculatus* from the region of Cyclades, from Sifnos Island. Also, it aims to discuss the status of the species based on the recent findings provided within.

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Introduction

Family Palaemonidae Rafinesque, 1815 is very diverse with more than 1400 known shrimp species occurring globally. However, in some degree, there is a controversy among scientists on the actual number of genera, species, and subspecies within the family (WoRMS 2022). The genus *Brachycarpus* Spence Bate, 1888 consists of three species of which *Brachycarpus biunguiculatus* (Lucas, 1846), though it has a cosmopolitan distribution, is the only species inhabiting Mediterranean Sea (d'Udekem d'Acoz 1999). It is known only by a handful of records; mainly due to its preferences, meaning that it is mainly nocturnal, and it seems preferring to inhabit not well-illuminated habitats such as crevices and submerged caves (Bianchi et al. 2022). To the best

of our knowledge, the most recent records from SE Mediterranean basin are from Libya (Rizgalla 2021). In Hellenic waters, the species is known only known from the south Aegean Sea, being present in Saronikos Gulf, Santorini Island (Kampouris et al. 2018), Rhodes Island (Kondylatos et al. 2020), and Nisyros Island, Dodecanese (Batjakas & Kampouris 2020). Table 1 summarizes all published occurrences till November 2022.

The present study reports the second occurrence of *B. biunguiculatus* from the region of Cyclades, from Sifnos Island. Also, it aims to discuss the status of the species based on the recent findings provided within. Finally, raises some concerns on the potential threat to the species by the ornamental trade of live animals, that affects other shrimp species.



Fig. 1. The *Brachycarpus biunguiculatus* specimen from Sifnos Island, Cyclades, Greece. Photo: Petros Triantafyllis.

Material and methods

The *B. biunguiculatus* individual in view, was photographed in situ (9th, September 2020) by a recreational diver. The specimen was identified by the first author via social media platform (Facebook group: Underwater photography in Greece), based on the species' external morphological features as described by Okuno & Osawa

(1994), meaning (a) the subcylindrical body, (b) the glabrous carapace and abdomen, (c) the presence of the long (as much as carapace) straight rostrum and (d) the overall coloration of brownish-orange and the dark blue-purple blotches at the side of the abdomen. Furthermore, a written permission to use the digital material for publication was provided by the photographer and citizen-scientist.

Results

The specimen was an ovigerous female, photographed during night dive and inside a small cave (Fig. 1), from the coasts of Sifnos Island, Cyclades, Aegean Sea, Greece. The animal's size was estimated at 4–5 cm, which is typical for the species (Kampouris et al. 2018). It is worth to mention that based on other testimonies from local divers it seems that they encounter the species every year, only during night dives. Unfortunately, no further digital material or other evidence was provided to support positive species identification.

Discussion

Marine shrimps (infraorder Caridea) are amongst the organisms with important ecological significance and at the same time they are very attractive to SCUBA divers and known to the general public (Bianchi et al. 2022). However, some of them – mainly due to their behaviour – are not frequently encountered either by recreational divers or by scientists. *B. biunguiculatus* is a characteristic example of the above statement. The study of Rizgalla (2021), reported that the species occurring along with other shrimp species such as bumblebee shrimp *Gnathophyllum elegans* (Risso, 1816) and *Lysmata seticaudata* (Risso, 1816), both of

Table 1. A summary of the published occurrences of *B. biunguiculatus* in Hellenic waters; in chronological order, based on publication date.

Location and year of observation	Description	Reference
Santorini Island, 2011	1 individual. Hard bottom, Mavro Vouno inside small cave.	Kampouris et al. (2018)
Saronikos Gulf, 2016	2 individuals. Hard bottoms, Legrena inside small caves/ crevices.	Kampouris et al. (2018)
Rhodes Island, 2020	1 individual. Sand and rocks with algal cover, Karakonero. 1 individual. On hard substrate with photophilic algae.	Kondylatos et al. (2020)
Nisyros Island, 2020	1 individual. At the stomach content of the invasive <i>Pterois miles</i> (Bennett, 1828). The lionfish was caught by professional fisherman at Pachia Ammos.	Batjakas & Kampouris (2020)
Sifnos Island, 2020	1 individual. Hard bottom inside small cave, Fasolou Bay west coasts of Sifnos Island.	Present study

which are listed among the most frequent shrimp species inhabiting marine caves in Mediterranean waters (Bianchi et al. 2022).

As mentioned earlier, it seems that the species is chiefly a nocturnal animal which prefers dark habitats. In Greece, all known individuals were reported from shallow areas and mainly from rocky bottoms, with the exemption of the individual from Karakonero, Rhodes Island, reported off mixed bottoms with sand and turf-covered rocks (Kondylatos et al. 2020). The same observations, regarding the substrate type, were reported from Libyan coasts (Rizgalla 2021). Moreover, most individuals were reported being inside small caves or crevices. However, the very recent study of Bianchi et al. (2022) does not list the species among the frequent inhabitants of such-like systems. On the other hand, two individuals off Libyan waters were caught and photographed along with shrimp species like *G. elegans* and *L. seticaudata*, that are frequent dwellers of marine caves (Bianchi et al. 2022). A hypothesis that can be made, is that *B. biunguiculatus* uses these dark habitats during the day; perhaps for predator avoidance. Moreover, the current individual was bearing eggs (Fig. 1); it could be hypothesized that it utilizes these dark habitats during the hatching period, but stronger evidence is needed to support this argument. The testimonies form the local divers (Sifnos Island), meaning the probable encounter with the species at least once per year, could suggest that the species is not rare in Aegean Sea but overlooked. In support of the above, Kondylatos et al. (2020) stated that according to recreational divers from Rhodes Island, the species was present from 2010, ten years earlier than the first confirmed record. Nonetheless, systematic surveys (e.g., scientific diving) during night-time, that will provide solid data are required. It goes without saying, that the species is understudied. Moreover, though that there are very limited data; the invasive lionfish *Pterois miles* could be threatening the species, by acting as a predator (Batjakas & Kampouris 2020). Lastly, a potential threat for *B. biunguiculatus* could be linked with the aquarium trade of ornamental shrimps since these animals are amongst the most popular fauna in the industry (Calado et al. 2005) and particularly the genus *Lysmata* Risso, 1816. For instance, the *Lysmata* genus was the most dominant among the 20 invertebrate species imported to the USA and Europe (Rhyne et al. 2017). The similar colouration of *B. biunguiculatus* and *L. seticaudata*, their similar body size, along with the common habitat use and the behavioural similarities that both species exhibit, may lead to misidentifications. It is a fact that the actual number of species involved at the above industry is practically unknown (Rhyne et al. 2017).

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