

Rapid Communication

Alien facelinid nudibranchs in the Eastern Mediterranean: first report of *Phidiana militaris* (Alder and Hancock, 1864) and report of *Caloria indica* (Bergh, 1896) 30 years after its previous sighting

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Abstract

Two conspicuously-colored facelinid nudibranchs, wide spread in the Indo-West Pacific Ocean, were recently sighted off the Israeli Mediterranean coastline. We report the occurrence of *Phidiana militaris* (Alder and Hancock, 1864) off a sunken submarine in Haifa Bay – the first record of the species in the Mediterranean Sea. A recent sighting of *Caloria indica* (Bergh, 1896) off northern Israel, previously known from two individuals recorded in the late 1980s, may indicate a separate introduction or the spread of a cryptic, local, self-propagating population.

Key words: Erythraean invasion, Mediterranean, Suez Canal, Red Sea, non-indigenous species

Introduction

At 756, the number of recorded metazoan alien species in the Mediterranean Sea is far higher than in other European Seas. Of these, two thirds are considered Erythraean aliens, species introduced into the sea through the Suez Canal, the balance are mostly ship and culture introductions (Galil et al. 2016). Though mollusks contribute the largest number of aliens, only three alien facelinid nudibranchs have been recorded in the Mediterranean Sea: *Godiva quadricolor* (Barnard, 1927), originally described from South Africa, was first recorded in Lake Fusaro, Italy, in 1985 (misidentified as *Facelina coronata*, *vide* Cervera 2002) and in the Tyrrhenian, Ligurian, and northern Adriatic Seas, as well as Algeciras Bay, Spain (Macali et al. 2013; Betti et al. 2015); *Caloria indica* (Bergh, 1896), widely distributed in the Indo-West Pacific, was recorded in the late 1980s from Israel (Gat 1993); and *Favorinus ghanensis* Edmunds, 1968, known from Ghana and the Atlantic coast of Morocco, was recorded from the port of Rades,

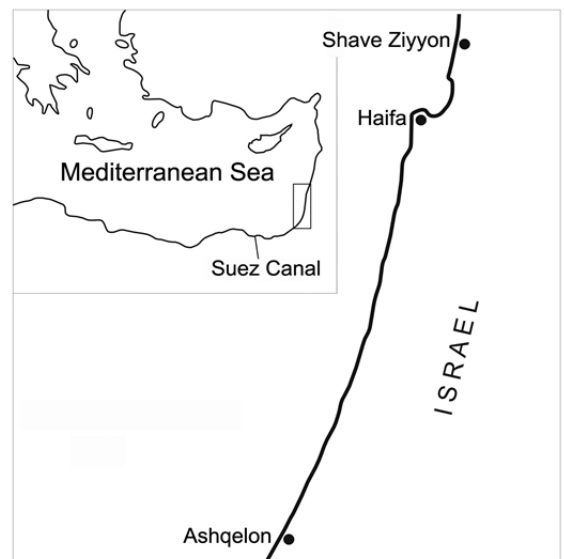


Figure 1. Map of the Mediterranean coast of Israel, with the sites where *Caloria indica* (Bergh, 1896) and *Phidiana militaris* (Alder and Hancock, 1864) were recorded.

Tunisia, in 2003 (Ben Souissi et al. 2004). *Godiva quadricolor* and *F. ghanensis* are considered to have been introduced with shipping, whereas *C. indica* to have entered through the Suez Canal.

With the increasing popularity of diving and underwater photography, the gaily colored facelinid nudibranch mollusks have been increasingly documented, despite their minute size.

Material and methods

The present account comprises photographs taken by the senior author using a Sony DSC-RX100 II camera in Nauticam housing.

We follow the accepted names as listed in the World Register of Marine Species (WoRMS) and MolluscaBase.

Results

Systematics

Aeolidioidea Gray, 1827

Facelinidae Bergh, 1889

Caloria Trinchese, 1888

Caloria indica (Bergh, 1896) (Figures 2, 3)

Phidiana indica: Gat, 1993:120.

A specimen, 25 mm in length, of *C. indica* was photographed during a night dive; it was crawling on the pocilosclerid sponge *Phorbas* sp. near the scuttled navy vessel “Kidon”, which is used as a wreck-diving site off Shave Ziyon (33.004033°N; 35.048417°E) (Figure 1), 18 June 2016, 26 m depth. The specimen was not collected.

Color in life: Head orange-red; white stripe, slightly widened medially, running from the base of each rhinophore to basal part of oral tentacle. Oral tentacles successively banded orange, pale yellow, translucent white; tips pale yellow. Rhinophores with translucent base, successively banded orange, white, yellow. A white stripe centrally on dorsum. Foot translucent, edged with yellow stripe anteriorly. Cerata banded orange, dark blue, pale yellow, tip translucent. Tail dorsally bright white (Figure 2). The color pattern is similar to specimens photographed in the Gulf of Elat (Figure 3).

Caloria indica has been recorded throughout the tropical Indo-West Pacific, from the Red Sea, Oman, Tanzania and South Africa, to the Solomon Islands, New Caledonia and Fiji (Yonow 2008, <http://www.seaslugforum.net/factsheet/phidindi>, viewed 30 August 2016). It was photographed in Marsa Shagra, on the Red Sea coast of Egypt (<http://www.alamy.com/stock-photo/sea-slug-nudibranch-caloria-indica.html>,



Figure 2. *Caloria indica* (Bergh, 1896). Off Shave Ziyon, Mediterranean coast of Israel, 18 June 2016, photo by Shevy B-S. Rothman.



Figure 3. *Caloria indica* (Bergh, 1896). Off Almog Beach, Elat, Gulf of Aqaba, Israel, July 2015, photo by Rafi Amar.



Figure 4. *Phidiana militaris* (Alder and Hancock, 1864). Haifa Bay, Mediterranean coast of Israel, 5 October 2016, photo by Shevy B-S. Rothman.

viewed 30 August 2016) and Elat, on the Israeli coast of the Gulf of Aqaba (http://www.dafni.com/molusca/spec_12.htm, viewed 7 March 2017). In 1986, and again in 1987, single specimens (13–15 mm in length) were collected on a rocky outcrop off Ashqelon, Israel, at depth of 12 m (Gat 1993). No additional observations were recorded from the Mediterranean Sea.

Caloria indica inhabits natural hard substrates (coral reefs, rocks), but, like the present record, is frequently found on man-made substrates (wrecks, buoys, pipelines) (Adams 2001; Picton 2001; Rudman 2002; Harasti 2002). The species is considered “rare” in the Gulf of Aqaba and is known from single specimens in the Red Sea and Tanzania (Rudman 1980). Its relatively small size (up to 40 mm, usually smaller) and nocturnal habits may have contributed to the paucity of records, despite its eye-catching coloring. It is known to feed on hydroids (Baba 1969; Rudman 1980), and it is likely to use their nematocysts for protection.

This recent sighting may indicate the spread of a cryptic, local, self-propagating population off the Israeli coast, now recorded a distance of 180 kms northward from its earlier occurrence, or a separate introduction that has taken hold off the northern Israeli coastline.

As thermophilic Atlantic seaslug have been reported from the Mediterranean, it may be useful to differentiate *C. indica* from the morphologically similar *Phidiana lynceus* Bergh, 1867, recorded from the tropical western Atlantic and Ghana. Both species have a characteristic Y-shaped white stripe running from the base of each rhinophore to basal part of oral tentacle, continuing centrally on dorsum. But whereas the rhinophores of *C. indica* are banded orange, white, yellow, and the cerata are banded orange, dark blue, pale yellow, rhinophores of *P. lynceus* bear a single orange band and the cerata are dunn colored (Rudman 2000).

Phidiana Gray, 1850

Phidiana militaris (Alder and Hancock, 1864)
(Figure 4)

Three specimens, 30–40 mm in length, of *P. militaris* were observed crawling and apparently consuming an unidentified hydroid near the sunken Italian submarine “Scirè” in Haifa Bay (32.92°N; 34.966667°E) (Figure 1), 5 October 2016, 30 m depth. The specimens were photographed but not collected.

The morphological features that can be discerned from the photographs are in agreement with the detailed description by Rudman (1980), though the tail seems longer than depicted by Rudman (1980, fig. 1E) and extends further behind the last cerata –

in common with pictured specimens (<http://www.sea slugforum.net/factsheet/phidmili>), viewed 15 October 2016).

Color in life: Body translucent white, tail palest yellow. A bright orange line runs along the external margin of the body, from midlength oral tentacle to the anterior part of the tail. A similar line runs along the anterior median line of the body to the front, dividing into two lines running midlength along the interior margin of the oral tentacle, forming the characteristic Y-shaped mark. The distal half of the oral tentacles is pale yellow whereas the proximal half is translucent white. Rhinophores successively banded translucent white, pale brown, yellow. Foot translucent white, anterolateral regions elongate, distally bright yellow. Cerata banded orange, blue, dark brown, pale yellow, tip translucent (Figure 3).

Phidiana militaris inhabits natural hard substrates (coral reefs, rocks), but, like the present record, may be found on man-made substrates (wrecks, oil platform) (MacDonald 2007; Van Belle 2007). It is known to feed on hydroids (Bhave 2009).

Phidiana militaris was originally described and illustrated by Alder and Hancock (1864) from a single specimen collected in 1853-4, in the Bay of Bengal, off Visakhapatnam, Andhra Pradesh, India (then Presidency of Madras). It has been recorded throughout the tropical Indo-West Pacific, from the South China Sea to the Arabian Sea and Oman, intertidal to 30 m depth (<http://www.seaslugforum.net/factsheet/phidmili>, viewed 15 October, 2016). It is possible, indeed likely, that *P. militaris* occurs in the Red Sea. As a matter of fact, several nudibranch species were described from the Red Sea many decades after they had been described elsewhere in the Indo-West Pacific (e.g. *Platydoris inframaculata* (Abraham, 1877), *Chelidonura fulvipunctata* Baba, 1938), and the Indo-West Pacific tethydid nudibranch *Melibe viridis* (Kelaart, 1858) was recorded in the Red Sea (Yonow 2015) after it was known from the Mediterranean Sea (Greece, 1970 *vide* Mooseleitner 1986). The present sighting is the first record of *P. militaris* in the Mediterranean Sea.

Discussion

The sediments transported from the Nile delta northwards by the prevailing inner shelf and wave-induced longshore currents produce a sandy-muddy shelf with few rocky outcrops at the south-eastern corner of the Mediterranean Sea (Emery and Neev 1960), whereas the northernmost part of the Israeli coastline (Acre to Rosh Hanikra) forms a sedimentologically isolated region with abraded rocky platforms and low relief rocky ridges. The list of facelinid

nudibranchs recorded off the Israeli coast comprises 7 species in 4 genera, including the two Erythraean aliens (*Caloria elegans* (Alder and Hancock, 1845), *C. indica* (Bergh, 1896), *Cratena peregrina* (Gmelin, 1791), *Facelina annulicornis* (Chamisso and Eisenhart, 1821), *F. bostoniensis* (Couthouy, 1838), *F. rubrovittata* (A. Costa, 1866), *Phidinia militaris* (Alder and Hancock, 1864)), as compared to 20 species in 12 genera recorded in the Mediterranean Sea (http://www.societaitalianadimalacologia.it/index.php?option=com_content&view=article&id=868:facelinae&catid=108:mediterranea&Itemid=191, viewed 13 March 2017). It is suggested that the lack of suitable hard bottom habitats along the Israeli coast may have impeded the establishment of some species requiring such habitats. Wrecks function as key habitats, nurseries, and refugia for hard substrate biota in regions dominated by soft bottoms (Ruiz et al. 2009; Gittenberger et al. 2010). The wrecks' enhanced marine biodiversity attracts recreational divers, and thus their biota is likely to be better documented. The availability of marine man-made hard structures together with the continuing enlargement of the Suez Canal, the main pathway for introduction of thermophilic species into the Mediterranean Sea, may provide the increasing cohorts of propagules of some species with additional suitable habitats to settle and to survive.

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