

**Rapid Communication****First record of *Aplysia dactylomela* Rang, 1828 (Mollusca: Gastropoda) in Libyan coastal waters**Jamila Rizgalla<sup>1\*</sup>, James E. Bron<sup>2</sup>, Fabio Crocetta<sup>3</sup>, Andrew P. Shinn<sup>2,4</sup> and Sara A.A. Almabruk<sup>5</sup><sup>1</sup>Aquaculture Department, Tripoli University, Tripoli, Libya<sup>2</sup>Institute of Aquaculture, University of Stirling, UK<sup>3</sup>Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Villa Comunale, I-80121 Napoli, Italy<sup>4</sup>Fish Vet Group Asia Limited, Saensook, Chonburi, 20130, Thailand<sup>5</sup>Zoology Department, Faculty of Science, Omar Al-Mokhtar University, El Bayda, LibyaAuthor e-mails: [jamiliarizgalla@gmail.com](mailto:jamiliarizgalla@gmail.com) (JR), [sara.almabruk@omu.edu.ly](mailto:sara.almabruk@omu.edu.ly) (SA), [jeb1@stir.ac.uk](mailto:jeb1@stir.ac.uk) (JEB), [fabio.crocetta@szn.it](mailto:fabio.crocetta@szn.it) (FC), [andy.shinn@fishvetgroup.com](mailto:andy.shinn@fishvetgroup.com) (APS)

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**OPEN ACCESS****Abstract**

The spotted sea hare *Aplysia dactylomela* Rang, 1828 is reported from four locations in Libyan coastal waters. The direct observation reported here resulted from a field survey of sea snails in the coastal environs of Tripoli, to the west of the country, while the remaining records result from postings made on the Facebook™ social media website, made by recreational spear-fishermen who took images and filmed specimens at Abo Fatma beach and Misrata, to the west of the country, and also at sites close to Benghazi and Al Hamamah, to the east of the country. This is the first record of *A. dactylomela* in Libyan waters.

**Key words:** Mediterranean Sea, Heterobranchia, invasive species, citizen science, social media**Introduction**

The herbivorous spotted sea hare *Aplysia dactylomela* Rang, 1828 is a conspicuous heterobranch sea slug readily distinguished by its yellowish colouration with large black rings. Spotted sea hares have recently colonised most of the Mediterranean Sea from the Atlantic Ocean by entering through the Strait of Gibraltar (Valdés et al. 2013). Trainito (2003) first recorded *A. dactylomela* in the Mediterranean from coastal waters surrounding the Island of Lampedusa (Italy). Established populations have subsequently been reported from throughout the Mediterranean basin, including Spain, Monaco, Italy, Croatia, Montenegro, Greece, Malta, Turkey, Cyprus, Syria, Lebanon and Israel (Trainito 2003; Cooke 2005; Rudman 2005; Çınar et al. 2006; Yokes 2006; Schembri 2008; Valdés et al. 2013; Katsanevakis et al. 2014; Karachle et al. 2016; Moles et al. 2017). Most recently, this species was also recorded in Tunisian waters on the southern Mediterranean coastline (Aissi et al. 2018). The absence of earlier records

along the Libyan coastline might be a reflection of the general lack of field studies in the area. In fact, with the exception of some papers published at the beginning of the 20<sup>th</sup> Century (e.g. Monterosato 1917, 1923; Coen 1925) and a few recent papers (e.g. Abushaala et al. 2014; Hera and Haris 2015; Shakman et al. 2017; Crocetta 2018; Rizgalla et al. 2018), there is an overall scarcity of knowledge on the marine molluscan fauna of Libya, and in particular on sea slugs.

In the present study, we report for the first time the occurrence of the cryptogenic sea slug *A. dactylomela* from both the eastern and western reaches of the Libyan coast, using data drawn from one direct observation obtained through snorkelling surveys and from information posted on the Facebook™ social media website.

## Materials and methods

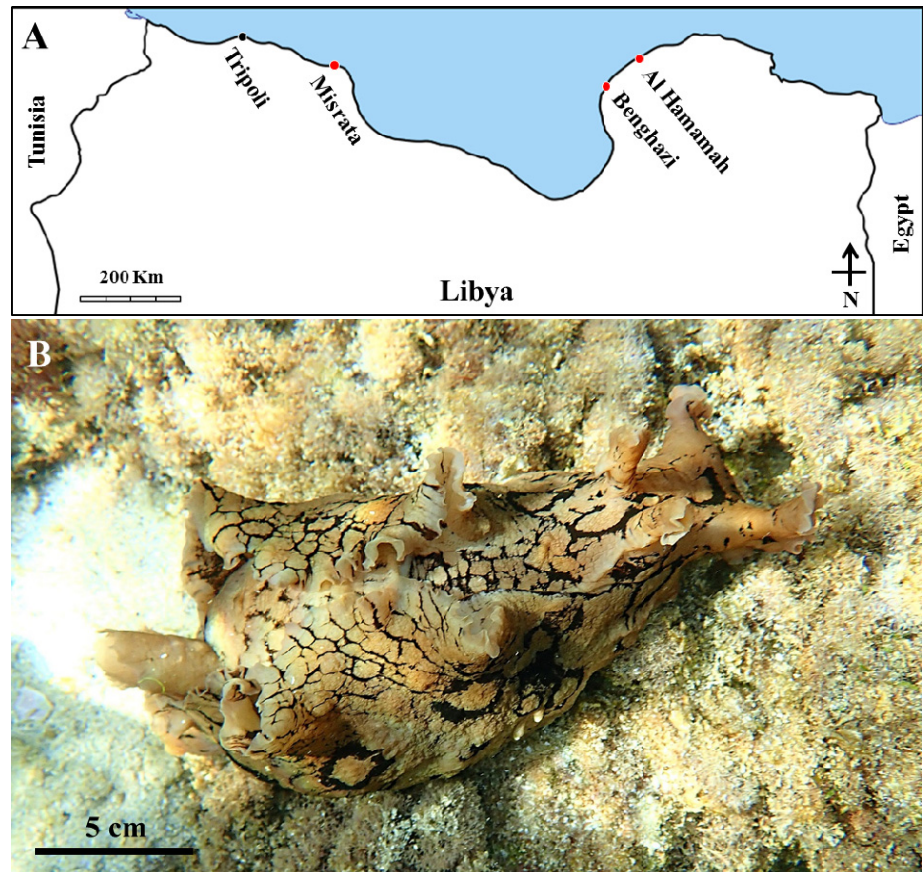
The work reported in this paper forms part of a wider ongoing study of the poorly studied gastropod fauna found in Libyan waters. This study integrates information gained from a variety of sources including snorkelling surveys of specimens collected from the marine environment; at the same time, the project also investigates citizen science records by mining Facebook™ postings.

### *Field survey*

A series of daily (weather permitting), shallow water, snorkelling trips were conducted in a natural bay called “Regatta” (32.854028; 13.054639; Figure 1A, Supplementary material Table S1) situated 10 km west of Tripoli Harbour between 23<sup>rd</sup> June 2018–18<sup>th</sup> September 2018. A single spotted sea hare was photographed in situ using a Tough TG-4 Olympus underwater camera, and then subsequently was collected and placed in 90% ethanol for archiving and further study in a private collection.

### *Facebook™*

Six Facebook™ groups with an interest in spearfishing were monitored daily throughout the period 23<sup>rd</sup> June 2018–18<sup>th</sup> September 2018. Relevant posts prior to these dates extending back to 2012 were identified using a series of search terms in Arabic, including general questions such as “who knows what this fish is?”, “do you know what this is?” and “creature”. Posts showing sea slugs were recorded and the owners of the posts were subsequently contacted for further information including methods, time, location, and water depth in which the sea slugs were found. Permission was then sought and obtained from the owners to use the images and the data posted on Facebook™ as well as from the moderators of the screened groups.



**Figure 1.** (A) Map of Libya, highlighting the four locations where specimens of *Aplysia dactylomela* were observed (for details see Table S1); (B) *Aplysia dactylomela* in situ on a bed of algae-covered rocks approximately 40 cm below the water surface. Image B original taken by J. Rizgalla.

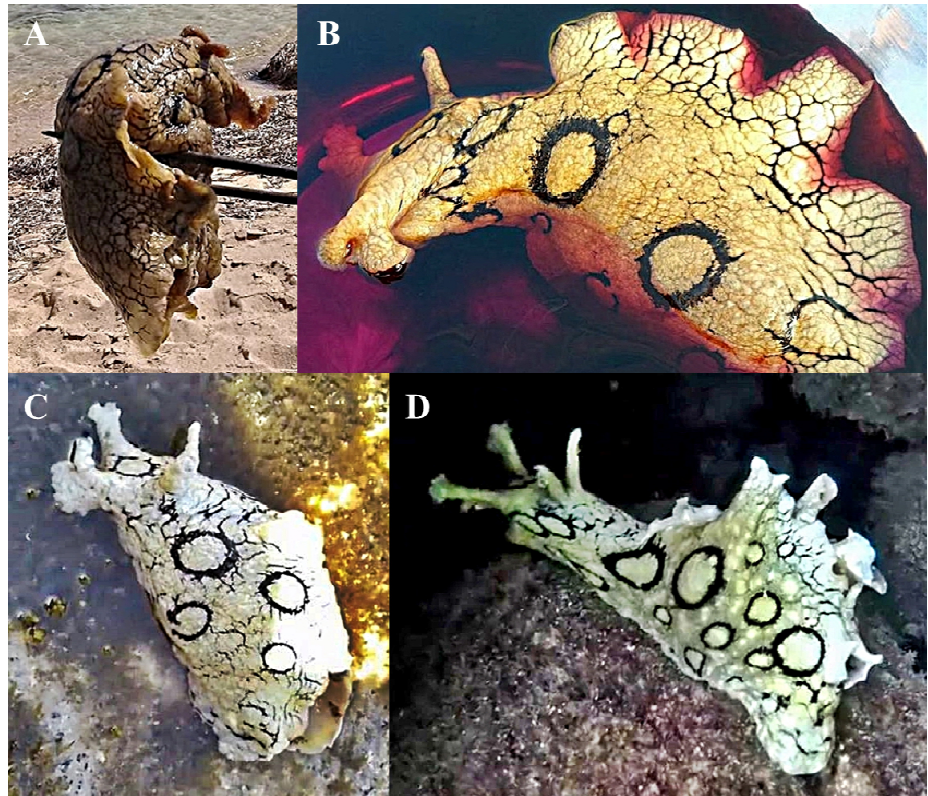
## Results

### *Field survey*

Approximately 51 snorkelling trips were made throughout June to September 2018. During a shallow water snorkelling (around 40 cm deep) made on the 11<sup>th</sup> September 2018 at “Regatta” - 10 km from Tripoli Harbour (32.853333, 13.053833; Figure 1A, Table S1), a single 25 cm-long specimen of *A. dactylomela* (Figure 1B) was found crawling over algae-covered rocks. The specimen released purple ink when handled. Despite a detailed search on multiple, subsequent days, no further specimens were found at this site.

### *Facebook™*

Four recreational fishermen, from three localities (Figure 1A, Table S1), independently posted pictures and videos on Facebook™ showing a marine gastropod readily identified as *A. dactylomela* by its external markings and morphology. The first sighting was posted on the 7<sup>th</sup> of September 2017 from Abo Fatma beach, Misrata (32.439417, 14.875611; Figure 2A, Table S1) at a depth of 1.5 m. The second record was made from a picture posted in



**Figure 2.** Images of *Aplysia dactylomela* from posts shared on Facebook™ groups. (A) *Aplysia dactylomela* posted on the 7<sup>th</sup> of September 2017 from Abo Fatma beach (Misrata). (B) *Aplysia dactylomela* posted on the 30<sup>th</sup> of May 2016 from Al Hamamah beach. (C) Still image from a 131 second-long video posted on the 7<sup>th</sup> of June 2018 showing *A. dactylomela* in a natural rock pool. (D) Image from a 42 second-long underwater video posted on the 4<sup>th</sup> of July 2018 taken in close proximity to Juliyana Port, Benghazi showing a specimen of *A. dactylomela* *in situ* on a bed of algae-covered rocks. Images from Facebook™ were taken by (A) Mohamed Faraj; (B) Hafed Emdawy; (C) Waleed M Yousuf; and, (D) Kalifa Al Fagy.

response to the first post that was taken at Al Hamamah beach (32.918167, 21.623833; Figure 2B, Table S1) on the 30<sup>th</sup> of May 2016 from a depth of 3 m. The third record results from a video posted on the 7<sup>th</sup> of June 2018 showing a specimen of *A. dactylomela* in a natural rock pool, again from Al Hamamah beach (Figure 2C, Table S1). A fourth sighting of a specimen was captured on a video made during a shallow underwater snorkelling dive at a site in close proximity to Juliyana, Port of Benghazi (32.104000, 20.048611; Figure 2D, Table S1), at a depth of 3 m, and subsequently posted on Facebook™ on the 4<sup>th</sup> of July 2018.

### Discussion

The success of *A. dactylomela* in invading the Mediterranean Sea could be attributed to a number of factors, including its broad dispersal potential, fast growth, lack of natural predators, and feeding habits suited to this environment (Yokeş 2006; Valdés et al. 2013; Moles et al. 2017). Within the sixteen years since its first reported sighting in 2002 from the Island of Lampedusa (Trainito 2003), populations of *A. dactylomela* within the Mediterranean Sea appear to have colonised the far reaches of the sea basin

(see references above). The specimens of spotted sea hare observed in the current study fill a gap in the knowledge of its distribution, accounting for the second record from a southern Mediterranean country and the first records of its occurrence from both the western and eastern parts of the Libyan coast.

While the five specimens were observed at four locations separated by distances of up to 1220 km from Tripoli to Al Hamamah, three of the spotted sea hares were found close to busy commercial harbours (Tripoli harbour 10 km away, Misrata approximately 30 km away and Juliana within the confines of Benghazi Harbour). While the occurrence of specimens close to commercial ports might allude to their facilitated spread through ballast-water exchanges from commercial ships, this hypothesis remains to be validated. In consideration of this, Katsanevakis et al. (2013) estimated that 51.9% of the alien species that had been introduced into “European countries” had been via “ballast-water”. *Aplysia dactylomela*, however, is a large species, with an established widespread distribution and large dispersal potential-given that it has already been reported from nearby localities, its extension into Libyan waters may be on the front of its “natural” migration with recruitment from a nearby established population.

Interestingly, spotted sea hares are also recorded from Tunisia (Aissi et al. 2018), where it may have spread from neighbouring localities where it was already present and well-established, such as Sicily, Malta or Crete (Crocetta and Galil 2012; Crocetta et al. 2017; Mannino et al. 2017). In addition to providing new records of the occurrence of *A. dactylomela*, this study underlines the potential of social media in providing new and supporting records on marine fauna and that through consultation, citizen scientists can make a significant contribution to faunal surveys, particularly in understudied or remote areas (Rizgalla et al. 2016; Moles 2017; Mannino and Balistreri 2018; Nimbs and Smith 2017, 2018).

Although the precise routes of *A. dactylomela* introduction into Libyan waters remain to be determined, further ongoing field work may provide further insight on this species and other native and alien taxa in the region.

## Acknowledgements

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### Supplementary material

The following supplementary material is available for this article:

**Table S1.** Records of *Aplysia dactylomela* in Libyan waters.

This material is available as part of online article from:

[http://www.reabic.net/journals/bir/2019/Supplements/BIR\\_2019\\_Rizgalla\\_etal\\_Table\\_S1.xlsx](http://www.reabic.net/journals/bir/2019/Supplements/BIR_2019_Rizgalla_etal_Table_S1.xlsx)