

Marine Record

Cite this article: Boughamou N, Ladoul S (2022). First documented observation of the Portuguese man-of-war, *Physalia physalis* (Linnaeus, 1758) (Physaliidae) on the west coast of Algeria. *Journal of the Marine Biological Association of the United Kingdom* **102**, 420–424. <https://doi.org/10.1017/S0025315422000674>

Received: 19 January 2022

Revised: 3 June 2022

Accepted: 6 July 2022

First published online: 8 September 2022

Key words:

Algeria; cnidarian; hydrozoan; Mediterranean Sea; *Physalia physalis*; Siphonophorae

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First documented observation of the Portuguese man-of-war, *Physalia physalis* (Linnaeus, 1758) (Physaliidae) on the west coast of Algeria

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Abstract

The pleustonic siphonophore *Physalia physalis* (Linnaeus, 1758) reported in the present study were collected in May 2018 on the north-western coast of Algeria. Two specimens of *P. physalis* have been observed, photographed and measured for the first time on the Al-Wardania beach, in Ain Temouchent city. Their size is between 34.8 and 42 cm total length (TL). Morphometrics, meristics and diagnostic characteristics of the species are presented.

Introduction

Physalia physalis (Linnaeus, 1758) (phylum: Cnidaria, class: Hydrozoa, order: Siphonophora, family: Physaliidae), also known as the Portuguese man-of-war or blue bottle, is a colony formed by numerous organisms called polyps (or zooids) that are so specialized that they cannot live without each other (Mapstone, 2014). These colonies are typical of tropical and subtropical warm waters (Ferrer & Pastor, 2017). *Physalia physalis* colonies are commonly found in Florida, USA, the Gulf Stream, the Gulf of Mexico, the Caribbean Sea and the Sargasso Sea (Ferrer & Pastor, 2017), although they are a native species of the Pacific and Indian Oceans (Kirkpatrick & Pugh, 1984). The appearance of this species in the Mediterranean Sea is due to temporary meteorological/oceanographic changes, such as the El Niño phenomenon in the Pacific Ocean, which modify the direction and speed of the winds (Prieto *et al.*, 2015).

This species is clearly venomous; its tentacles (dactylozooids) are capable of discharging thousands of cnidae, which depend on mechanical and chemical stimuli, producing acute envenoming in humans and even death caused by vasomotor dysfunction and collapse (Lane & Dodge, 1958). The stings from their nematocysts are powerful enough to penetrate tough surgical gloves and they can remain active even when air-dried (Lane, 1960; Pierce, 2006; Haddad *et al.*, 2013).

This study presents stranding records and a description of *P. physalis* along the Algerian Mediterranean Sea.

Materials and methods

Two specimens of *P. physalis* were collected on Al-Wardania beach. It is located on the north-western coast of Algeria in Ain Temouchent city, at 35°14'12.4"N 1°35'16.1"W (Figure 1).

These specimens were transported to the laboratory and the following parameters were recorded for each colony: length, diameter and thickness of the pneumatophore, length and diameter of the gastrozooid, length and diameter of the dactylozooid, length of gonopals, diameter of gonophores, diameter of nectophores, diameter of gonodendron, length of tentacular palpon, number of wrinkles of the pneumatophore, total length and weight. The description of this species is based on morphology and morphometry. Measurements were taken using a stereomicroscope with an ocular micrometer, ichthyometer and calliper.

Results

Physalia physalis is a pelagic colonial hydroid, with triangular, asymmetric pneumatophore, a sail-shaped, bluish-pinkish structure filled with gas produced by a gas gland and a longitudinal wrinkled crest, of bluish-green and carmine colour at upper region constitutes the emerged part of the colonies (Figure 2). It measures in examined specimens between 175–187 mm, 71–87 mm and 66–89 mm in length, diameter and thickness, respectively. Number of wrinkles at upper region of the pneumatophore was 17 and 21 for two individuals. The total length and total weight of two colonies were 348–420 mm and 145.8–207.23 g, respectively.

Apical pore in the aboral region of the colony. Oral and main zones of colony separated by basal internode, a gap region with no polyps. Main zone more developed than oral zone. Polymorphic organisms organized in cormidia, budding off from basal/inferior region of pneumatophore. Oral zone with up to five cormidia and protozooid. Main zone with up to seven cormidia. The cormidia of the main zone is formed by zooid groups with different



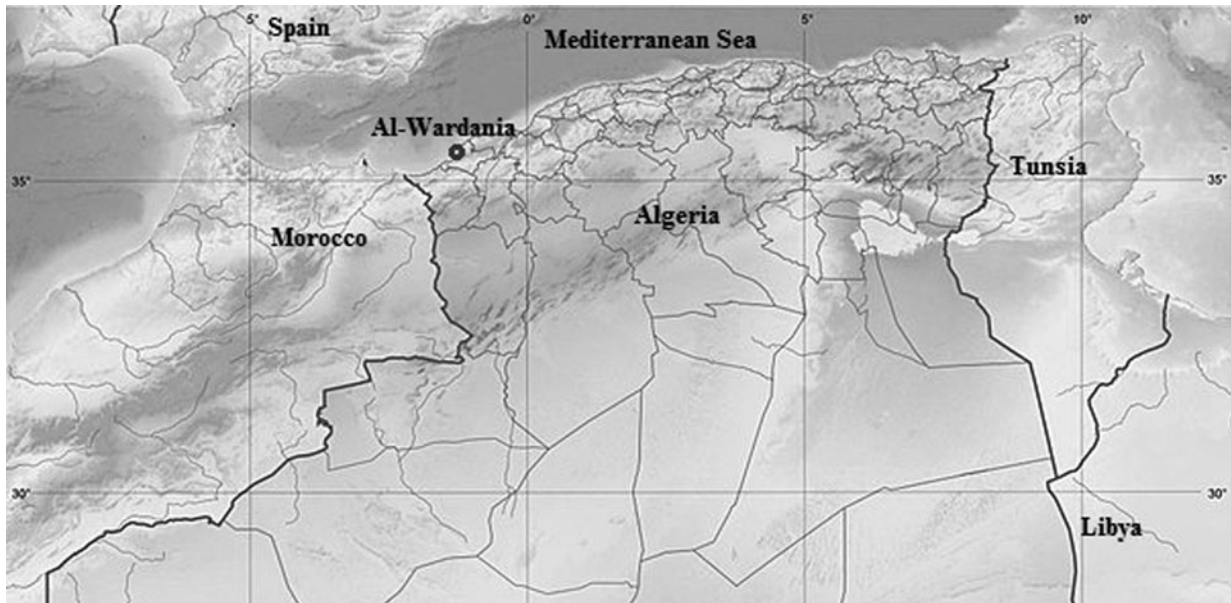


Fig. 1. Map represents the location of the species *Physalia physalis* stranded on the north-western coast of Algeria.

composition and development in different organisms; with a reduced group consisting of gastrozooids (Figure 3A); a primary tripartite group consisting of gastrozoid, tentacle with dactylozoid (Figure 3C) and gonodendron (Figure 4); a lateral group trifid, budding off from branches of the primary tripartite group; and secondary basal buds, trifid, budding off from base of reduced primary-tripartite or lateral groups. The cormidia of oral zone without primary tripartite group. The gonophores are ovoid (Figure 4). The nectophores are elongated with widened distal end, bell-shaped (Figure 4). The gonopalpons concentrated at distal ends of the sub-terminal and terminal branches (Figure 4). The gastrozooids are elongated, distally widening from median

region, with sub-terminal constriction and mouth at distal end, either free or associated with dactylozoid. The dactylozoid are elongated, with thinner distal end. Larger dactylozooids linked to tentacles along its whole length, smaller ones partially and basally linked to tentacles. Tentacles compressed, with smaller tentacles sinuous along its length; larger tentacles curly from median to distal region.

Results of the morphometric parameters measured on the two specimens of *P. physalis* are shown in Table 1. The mean values for gonodendron main branch were 2.20 ± 0.67 mm and 2.79 ± 0.55 mm for the two individuals.

The length of the gonopalpons was 3.17–1.75 mm and 3.41–1.75 mm with an average value of 2.34 ± 0.52 and 2.35 ± 0.58 mm for the first and second colony, respectively. The diameter of gonophores was 0.48–0.14 mm (mean value: 0.30 ± 0.13 mm) and 0.53–0.14 mm (0.33 ± 0.14 mm) while the larger diameter of nectophores was 2–0.97 mm and 2.09–0.97 mm for the first and second specimens, respectively.

Largest diameter of gastrozooids was: 15–23 mm and 22–43 mm but the length was 2.09–3.41 mm and 2–4.09 mm for two specimens.

Length of the dactylozoid was 162.16 ± 61.48 and 279.57 ± 66.99 mm, its diameter was 5.2 ± 2.28 mm and 4.16 ± 0.98 mm but length of tentacular palpon (Figure 3B) was 31 ± 2.73 and 33.83 ± 3.67 mm for the two colonies.



Fig. 2. Colony of *Physalia physalis* (Linnaeus, 1758) photographed in the Al-Wardania beach.

Discussion

In this study, two colonies of *Physalia physalis* were found stranded for the first time on the Algerian Mediterranean coast during the year 2018 (May). The second event was recorded on February and March 2021 in the Eastern (Skikda, Jijel, Bejaïa, Tizi Ouzou), Central (Algiers, Tipaza, Boumerdès) and Western (Oran, Aïn Temouchent) beaches of Algeria, according to media reports and Facebook publications. This species is not native to the Mediterranean; it is usually found in the tropical and subtropical areas of the Pacific, Atlantic and Indian Oceans, ranging from 55°N to 40°S (Kirkpatrick & Pugh, 1984). It is most common in the warm waters of the Florida Keys, Gulf Stream, Gulf of Mexico, Caribbean Sea and Sargasso Sea. It is difficult for it to reach higher latitudes (Araya *et al.*, 2016).

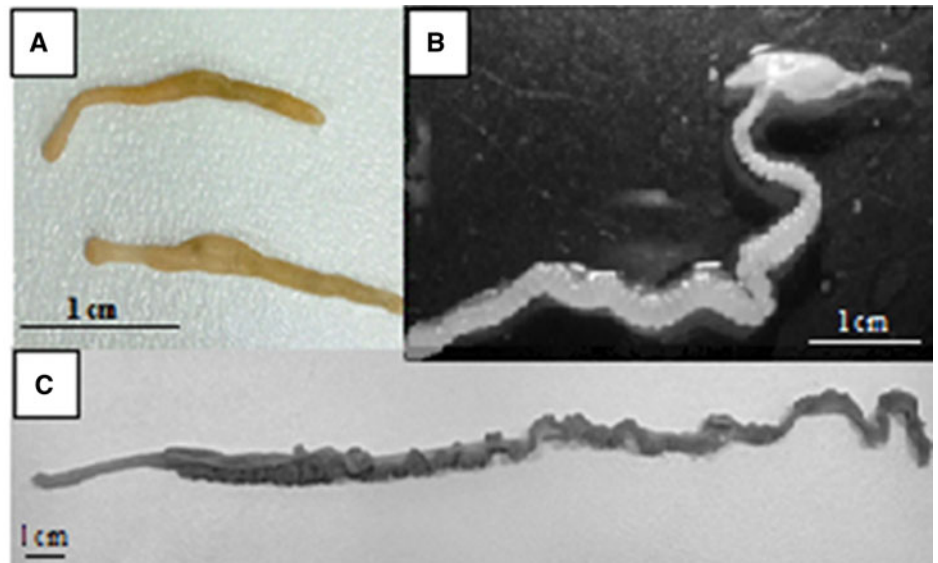


Fig. 3. Gastrozooids (A), tentacular palpon (B) and tentacle (dactylozoid) (C) of the specimens of *Physalia physalis* collected in the north-western coast of Algeria.



Fig. 4. Branch of gonodendron observed by a light microscope (Gr: 4 × 10).

The presence of *P. physalis* in the Mediterranean has been documented in the Strait of Messina in 1980 (Berdar & Cavallaro, 1980). Over the last decade, studies conducted in the Mediterranean basin have shown an increase in the numbers of *P. physalis* colonies. In 2001, this species was reported in Maltese waters (Calleja, 2009). Other studies have indicated the presence of *P. physalis* in Malta in 2008, in summer 2009 and from March–June 2010 (Calleja, 2009; Deidun, 2010). In 2009, 57 colonies were recorded in the north-west territories of the western Mediterranean basin along the Spanish coast (Prieto *et al.*, 2015) and were also reported in the Strait of Messina in the same year (Mare Nostrum Italia, 2013). In 2010, the invasion of *P. physalis* was reported in many areas of the western Mediterranean including the Spanish coast and observations in Corsica, Sardinia, Tyrrhenian Sea, Strait of Messina and Strait of Sicily (Focus, 2010). Recently, Prieto *et al.* (2015) recorded 17 and 2 colonies in 2011 and 2012, respectively, in the same Spanish sites. Two colonies of *P. physalis* were stranded on the Strait of Messina in March 2009 and another in March 2014, another colony was stranded in the Strait of Sicily in April 2009 (Castrìota *et al.*, 2017). In recent times, Mghili *et al.* (2020)

were recorded 223 colonies as stranded in the north-west of Morocco.

The appearance of *Physalia physalis* in the Mediterranean is favoured by specific climatic and oceanographic conditions in the North Atlantic, which transport this jellyfish into the Mediterranean (Prieto *et al.*, 2015; Lopes *et al.*, 2016). These factors work together to push Atlantic colonies through the Strait of Gibraltar and into the Mediterranean basin. Ferrer & Pastor (2017) simulated the drift of *P. physalis* in the Spanish Basque region and showed that the probable origin of these colonies was the northern part of the subtropical eddy of the North Atlantic. In addition, the occurrence of *P. physalis* in the Mediterranean may be influenced by warming ocean temperatures due to climate change, which could benefit some species of jellyfish to settle in the Mediterranean Sea (Gili *et al.*, 2010; Calvo *et al.*, 2011; Brotz & Pauly, 2012; Pinsky *et al.*, 2020; Tanaka & Van Houtan, 2022).

Physalia physalis, a pleustonic colony of polypoid and medusoid organisms, is equipped with a particularly potent toxin that is potentially deadly to humans (Edwards & Hessinger, 2000; Burnett, 2001). In the waters off the Italian island of Sardinia in

Table 1. Results of the morphometrical parameters measured on the two individuals of *Physalia physalis* stranded in the north-western coast of Algeria

Parameters	Individual 1				Individual 2			
	Means (mm)	SD	max	min	Means (mm)	SD	max	min
Length of the gastrozoid,	18.6	3.04	23	15	31.5	6.67	43	22
Diameter of the gastrozoid	2.80	0.47	3.41	2.09	2.99	0.73	4.09	2
Length of the dactylozoid	162.16	61.48	270	105	279.57	66.99	360	150
Diameter of the dactylozoid	5.2	2.28	9	3	4.16	0.98	5	3
Length of gonopodons	2.34	0.52	3.17	1.75	2.35	0.58	3.41	1.75
Diameter of gonophores	0.30	0.13	0.48	0.14	0.33	0.14	0.53	0.14
Diameter of nectophores	1.37	0.45	2	0.97	1.49	0.45	2.09	0.97
Diameter of gonodendron	2.20	0.67	3.17	1.60	2.79	0.55	3.41	2.19
Length of tentacular palpon	31	2.73	34	27	33.83	3.67	40	25
Number of wrinkles of the pneumatophore	17				21			
Length of the pneumatophore	175				187			
Diameter of the pneumatophore	71				87			
Pneumatophore thickness	66				89			
Total length (mm)	348				420			
Weight (g)	145.82				207.23			

SD, standard deviation; Max, maximum; Min, minimum.

August 2010, a woman suffered an allergic reaction and died after being stung by a Portuguese man-of-war (*Physalia physalis*) (Boero, 2013; Prieto *et al.*, 2015).

The entry of this species into the Mediterranean constitutes a risk of danger not only for swimmers but also for fishermen and species endemic to the Mediterranean.

Acknowledgements. We want to thank all the people who helped to make these results possible: Hemida F., Mahdid S., Ailane F., and director of the Superior National School of Marine Sciences and Coastal Planning, Algiers, Algeria (ENSSMAL).

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