

First record of *Holothuria (Roweothuria) arguinensis* (Echinodermata: Holothuroidea: Aspidochirotida: Holothuriidae) from the Algerian coastal waters

KARIM MEZALI¹ AND AHMED S. THANDAR²

¹Department of Marine Sciences and Aquaculture, Faculty of Natural Science and Life, Abdelhamid Ibn Badis University of Mostaganem, 27000, PO Box 300, Algeria, ²School of Life Sciences, University of KwaZulu-Natal, P/Bag X54001, Durban 4000, South Africa

*This paper reports for the first time the presence of *Holothuria (Roweothuria) arguinensis* in the Algerian coastal waters. Individuals of this species were taken from the Tamentefoust area (Bay of Algiers, Algeria, 3°13'E 36°48'N) at 4.5 m depth and examined, using traditional morphological and endoskeletal characters. The general body form and the ossicles are in accordance with the descriptions of the species obtained in the literature.*

Keywords: new record, sea cucumbers, *Holothuria (Roweothuria) arguinensis*, alien, invasion, expansion, ossicle, morphology, Tamentefoust, Algerian Basin

Submitted 7 March 2014; accepted 24 March 2014

INTRODUCTION

Climate change and the introduction of alien species throughout the world appear to be increasing the rate of change in species distribution boundaries. The Mediterranean Sea, being a semi-enclosed area, is being affected by climate change at a faster rate than many other marine areas (Por, 1978; Calvo *et al.*, 2011). The faunal structure of the Algerian Basin is highly unstable due to such alien invasions, mainly from the North Atlantic region via the Strait of Gibraltar. This is the case for the aspidochirotid holothuroid *Holothuria (Roweothuria) arguinensis* (Koehler & Vaney, 1906), originally described from the north-east African coast (Massin, 1993). This species had been considered a north-eastern Atlantic species and appears to be pretty widespread on the Atlantic coast of Portugal, in the Berlengas Islands (Rodrigues, 2012). Hérouard (1929) and Panning (1929) recorded the species from Morocco and Mauritania, Pérez-Ruzafa *et al.* (1992) from the Canary Islands, Massin (1993) from Mauritania and more recently González-Wangüemert *et al.* (2013) from Ria Formosa (south coast of Portugal). More pertinent are the reports of the species from two localities from the Spanish Mediterranean coast (Granada, southern Spain (Ocaña & Pérez-Ruzafa, 2004) and El Mojon in the Alboran Sea (south-eastern Spain) (González-Wangüemert & Borrero-Pérez, 2012)).

Hence, the occurrence of this species, now in the Algerian coastal waters, is evidence of its further extension into the

western part of the Mediterranean Sea. This extension is perhaps linked to the new environmental conditions currently prevailing in the Mediterranean Basin.

MATERIALS AND METHODS

Materials used in this investigation represent three specimens collected from the coastal waters of Algiers Bay near the Tamentefoust area (3°13'E–36°48'N) (Figure 1).

The specimens were collected by SCUBA diving at 4.5 m depth, initially fixed in 10% formalin, but later washed and preserved in 90% ethanol. Digital photographs of live specimens were taken using a Canon EOS 1100 camera. The ossicles were photographed under a polarized light Leica DMLP microscope, equipped with a Nikon ME600 camera with DIC (differential interference contrast). The morphology, including the endoskeleton (ossicles), was studied according to conventional methods outlined by Mezali & Francour (2012). For recognition and correct identification, descriptions of the species by Koehler & Vaney (1906) and Hérouard (1929) and the illustration given by Massin (1993) were considered. The identification was verified by Dr F.W.E. Rowe. Measurements were made of each type of ossicles (tables, buttons and perforated elongated plates) from the dorsal and ventral body wall and rods from the tube feet.

RESULTS

SYSTEMATICS

Class HOLOTHUROIDEA de Blainville, 1834
Order ASPIDochirotida Grube, 1840

Corresponding author:

K. Mezali

Emails: karimmezali@univ-mosta.dz; mezalikarim@yahoo.fr

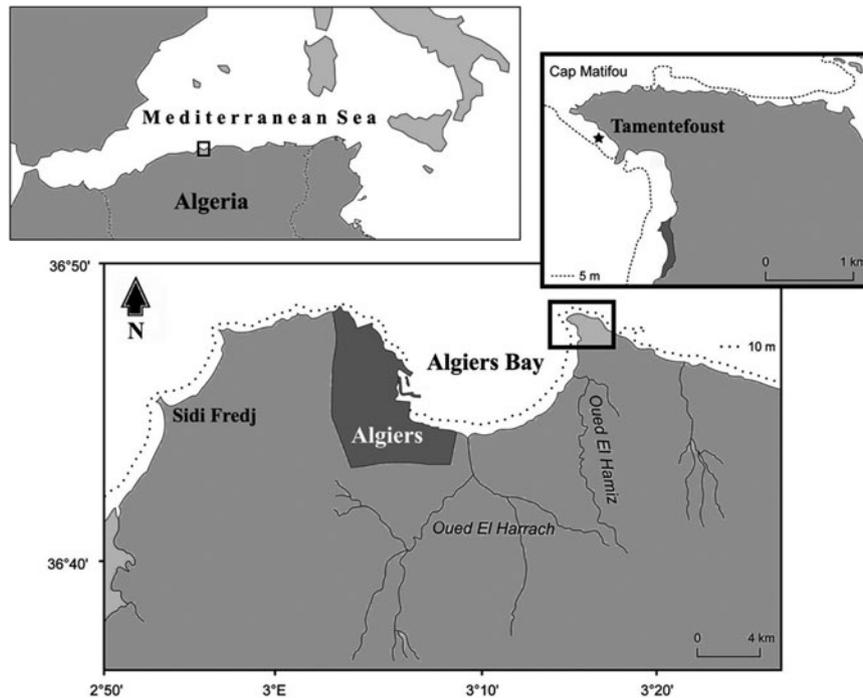


Fig. 1. Geographical location of the Tamentefoust area from where specimens of *Holothuria (Roweothuria) arguinensis* were collected (★).

Family HOLOTHURIIDAE Ludwig, 1894

Genus *Holothuria* Linnaeus, 1767

Sub-genus *Roweothuria* Thandar, 1988

Holothuria (Roweothuria) arguinensis Koehler & Vaney, 1906
(Figures 2–3)

Holothuria arguinensis Koehler & Vaney, 1906: 62–65, pl. 5, figures 5–13, pl. 6, figures 14–21; Gruvel, 1909: 1018; Hérouard, 1925: 7, figure 6; 1929: 48–52, figures 3A–K, pl. 1, figure 5; Cherbonnier, 1950: 106–108, figure 3d.

Holothuria (Holothuria) arguinensis Panning, 1935: 49, figure 44.

Holothuria (Lessonothuria) arguinensis Rowe, 1969: 149–150.

Holothuria (Roweothuria) arguinensis Thandar, 1988: 48, 53; Massin, 1993: 400, figure 1.

Specimens sub-cylindrical, with tough, leathery body wall, rough to the touch. Length of live animal about 350 mm, wet body weight 270 g. Dorsal and ventral surfaces well demarcated, the former arched, dark brown in coloration. Dorsal surface bears regularly arranged conical protuberances/warts, in two double rows, constituting an almost continuous border with 16 on the left and 15 on the right, each terminating in a white papilla. Other papillae, also white in colour, but borne on much smaller warts. Ventral surface, light brown in coloration, flattened, sole-like with numerous scattered tube feet (Figure 2). Mouth ventral, tentacles 20, lemon yellow. Anus also ventral, anal papillae present, few.

Calcareous ring well-developed. Polian vesicles 3–4; stone canals also multiple, six on right and five on left of dorsal mesentery. Cuvierian tubules absent.

Ossicles (tables and buttons) of dorsal surface different from those of ventral surface (Figure 3). Dorsal tables more numerous with mostly a large, flat, spinose disc, sometimes appearing rectangular from lateral aspect (Figure 3A, a), diameter of disc $21.17 \mu\text{m}$, spire of four straight to slightly

curved pillars with a single, low cross-bar, ending in a crown resembling a ‘Maltese Cross’ when viewed from above, pillars not fusing apically, average height of spire $21.36 \mu\text{m}$, teeth of crown unequal (two at end of each pillar). Ventral tables rare (Figure 3B, a).

Buttons of dorsal and ventral surfaces different, those of ventral surface more numerous, often smooth, and more

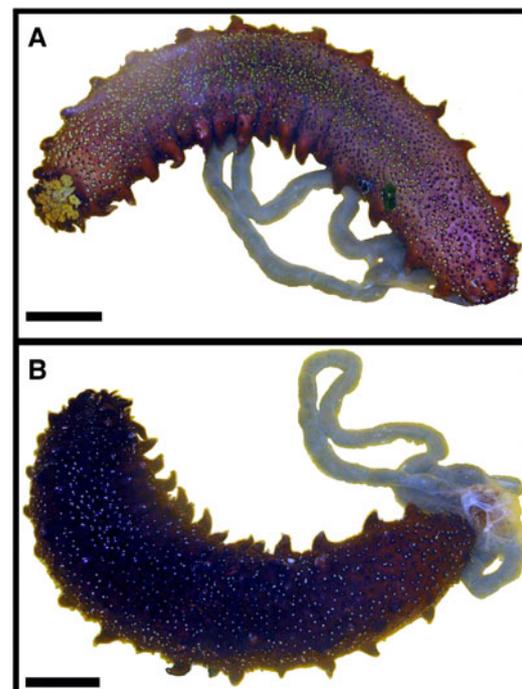


Fig. 2. *Holothuria (Roweothuria) arguinensis* from Algiers Bay: (A) ventral view; (B) dorsal view (photograph: K. Mezali). Scale bar: 50 mm.

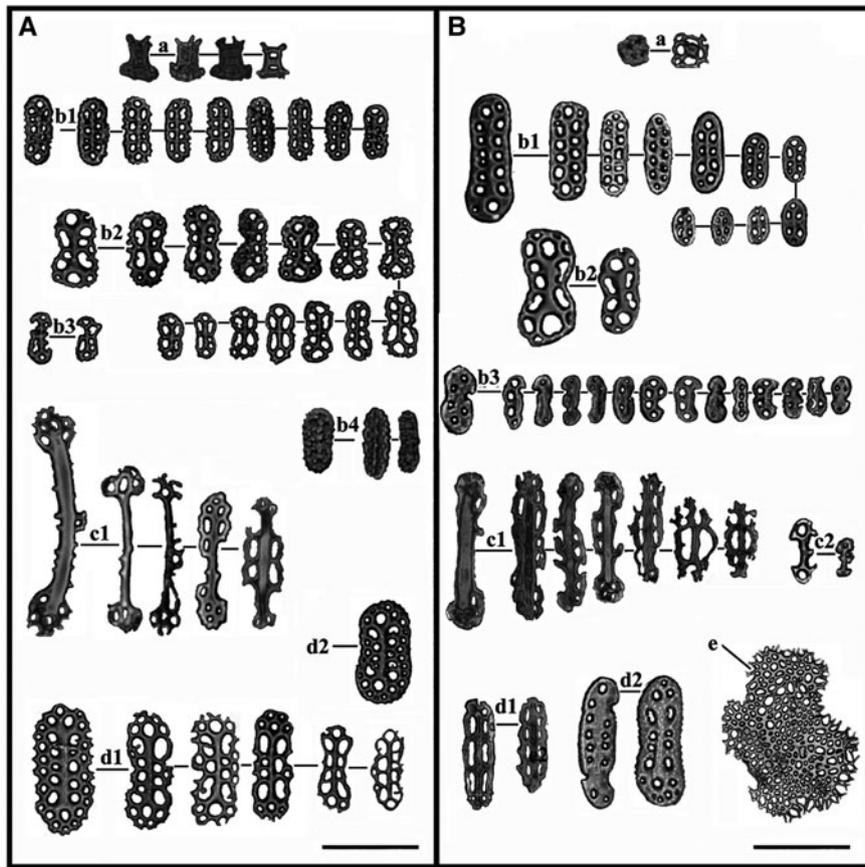


Fig. 3. *Holothuria (Roweothuria) arguinensis* from Algiers Bay. Ossicle assemblage of: (A) dorsal body wall; (B) ventral body wall and podia (light microscopy, scale bar: 50 μm). (a) Tables; (b1) rough, smooth and thorny buttons; (b2) buttons presenting shape of hourglass; (b3) pseudobuttons; (b4) buttons with obliterated holes; (c1) large, straight and curved rods; (c2) smaller rods; (d) perforated elongated plates; (e) reduced tube feet end plate.

densely packed (Figure 3B, b1), and with reduced holes; average length of dorsal buttons about 32 μm , average width about 16 μm , average length of ventral buttons about 34 μm , average width about 16 μm . All dorsal buttons irregular with somewhat crenulate, spiny or rugose margins (Figure 3A, b1); each perforated by an average of about eight rectangular to triangular to hexagonal holes of about 4.3 μm width. Ventral buttons with smaller holes. Some buttons characteristically constricted in the middle, often presenting the shape of the figure '8' or that of an hourglass (Figure 3A, b2, B, b2).

Tube feet deposits include pseudobuttons (Figure 3B, b3) and straight rods (Figure 3B, c1), sometimes smaller (Figure 3B, c2). Straight or curved rods also exist in dorsal papillae, usually perforated at ends and sometimes also the middle (mean length 81.25 μm) (Figure 3A, c1). Perforated, elongated plates also present, accompanying buttons, in both dorsal and ventral body wall, but encountered especially in papillae (Figure 3A, d1, d2) and tube feet (Figure 3B, d1, d2). Such plates present usually an irregular contour (Figure 3AB, d1), average length 69.46 μm , average width 17.40 μm , holes average diameter 02.57 μm . Tube feet end plates reduced (Figure 3B, e).

REMARKS

In life, the species presents obvious warts/protuberances regularly arranged on both dorsal and lateral surfaces and white

papillae as in *Holothuria (R.) poli*. This feature also corroborates with descriptions of *H. (H.) stellati* by Koehler (1921) and Gustato & Villari (1979). Hence, the investigated specimens present similarities with both *H. (H.) stellati* (larger protuberances separating the bivium and the trivium) and *H. (R.) poli* (regularly arranged dorsal conical warts and white papillae) (Mezali, 2008; Mezali & Francour, 2012). At first glance, therefore, the current material was thought to represent *H. (H.) stellati* (see Mezali, 2008).

HABITAT AND DISTRIBUTION

Holothuria (R.) arguinensis is usually found on rocky or sandy substrate. It was formerly thought to be a species restricted to Mauritania, but sometimes extending to North Senegal and South Morocco. However, it is now also known from the Mediterranean Sea (Granada, southern Spain (Ocaña & Pérez-Ruzafa, 2004) and El Mojon in the Alboran Sea (southeastern Spain) (González-Wangüemert & Borrero-Pérez, 2012)) and now from Algiers Bay. The senior author also encountered the species in other localities on the Algerian coast (Figuier-plage (west Boumerdès) and Stidia (west Mostaganem)). The scarcity of its capture in the Mediterranean is perhaps linked to its low abundance, unless it has previously been confused with other species such as *H. (H.) stellati* or considered a hybrid species between *H. (H.) stellati* and *H. (R.) poli* (see Mezali, 2008, 2011).

DISCUSSION

The general body form, colour, the rough, thick, leathery integument, multiple Polian vesicles are in accordance with the descriptions of the species by Koehler & Vaney (1906) and Hérouard (1929). The live measurement of the examined specimen, however, far exceeds that recorded for the species. The abundance of button ossicles in the current specimens is in accordance with those figured by Massin (1993). The medially-constricted buttons which often present the shape of the figure '8' or of an hourglass, are in accordance with the description of such ossicles by Hérouard (1929). Furthermore, the holes of the ventral buttons are also reduced, a character described for the species by various authors.

ACKNOWLEDGEMENTS

We thank Dr Frank W.E. Rowe, Honorary Associate, Division of Invertebrate Zoology, Australian Museum, for his valuable help and expertise in the confirmation of our identification and providing other pertinent information. The authors also thank the two anonymous referees for their helpful comments.

REFERENCES

- Calvo E., Simó R., Coma R., Ribes M. and Pascual J. (2011) Effects of climate change on Mediterranean marine ecosystems: the case of the Catalan Sea. *Climate Research* 50, 1–29.
- Cherbonnier G. (1950) Note sur *Holothuria dakarensis* Panning. *Bulletin du Muséum National d'Histoire Naturelle, Paris, 2 série* 22, 102–108.
- González-Wangüemert M. and Borrero-Pérez G. (2012) A new record of *Holothuria arguinensis* colonizing the Mediterranean Sea. *Marine Biodiversity Records* 5, e105. doi:10.1017/S1755267212000887.
- González-Wangüemert M., Braga T., Silva M., Valente S., Rodrigues F. and Serrao E. (2013) Volunteer programme assesses the *Holothuria arguinensis* populations in Ria Formosa (southern Portugal). *SPC Bêche-de-mer Information Bulletin* 33, 44–48.
- Gruvel A. (1909) Dispersion de quelques espèces appartenant à la faune marine des côtes de Mauritanie. *Comptes Rendus des Séances Hebdomadaires de l'Académie des Sciences de Paris* 149, 1017–1019.
- Gustato G. and Villari A. (1979) About the question of the taxonomic status of *Holothuria stellati* Delle Chiaje. In Jangoux M. (ed.) *Echinoderms present and past: Proceedings of the European Colloquium on Echinoderms, Brussels*. Rotterdam: A.A. Balkema, pp. 107–110.
- Hérouard E. (1925) Sur la stéréométrie des corpuscules calcaires et leurs rapports avec l'état mésomorphe de la matière. *Bulletin de l'Institut Océanographique de Monaco* 464, 1–14.
- Hérouard E. (1929) Holothuries de la côte atlantique du Maroc et de Mauritanie. *Bulletin de la Société Sciences Naturelles du Maroc* 9, 36–70.
- Koehler R. and Vaney C. (1906) Mission des Pêcheries de la Côte occidentale d'Afrique. II. Echinodermes. *Actes de la Société Linnéenne de Bordeaux* 60, 58–66, pls 4–6.
- Koehler R. (1921) Echinodermes. In Lechevalier P. (ed.) *Faune de France*. Paris: Librairie de la Faculté des Sciences, pp. 1–210.
- Massin C. (1993) The Holothuroidea (Echinodermata) collected during the tyro Mauritania-II expedition 1988. *Zoologische Mededelingen* 67, 398–400.
- Mezali K. (2008) *Phylogénie, systématique, dynamique des populations et nutrition de quelques espèces d'holothuries aspidochirotés (Holothuroidea: Echinodermata) inféodées aux herbiers de Posidonies de la côte algéroise*. PhD thesis. University of Science and Technology Houari Boumediene, Algiers, Algeria, 208 pp.
- Mezali K. (2011) Some insights on the phylogeny of Algerian shallow-water sea cucumbers species (Holothuroidea: Aspidochirotida). *SPC Bêche-de-mer Information Bulletin* 11, 45–47.
- Mezali K. and Francour P. (2012) Les holothuries aspidochirotés de quelques sites des côtes algériennes: révision systématique et relations phylogénétiques. *Bulletin de la Société Zoologique de France* 137, 177–192.
- Ocaña A. and Pérez-Ruzafa A. (2004) Los equinodermos de las costas andaluzas. *Acta Granatense* 3, 83–136.
- Panning A. (1929) Die Gattung *Holothuria*. (1. Teil). *Mitteilungen Zoologischen Staatsinstitut Zoologischen Museum, Hamburg* 44, 91–138.
- Panning A. (1935) Die Gattung *Holothuria*. (5 Teil, Schluss). Mit 19 Abbildungen im Text. *Mitteilungen Zoologischen Staatsinstitut Zoologischen Museum* 46, 1–18.
- Pérez-Ruzafa A., Marcos C. and Bacallado J.J. (1992) Holoturias (Echinodermata: Holothuroidea) de las islas Canarias, II. Ordenes Dendrochirotida, Elaspodida, Apodida y Molpadida. *Revista de la Academia Canaria de Ciencias* IV, 163–185.
- Por F. (1978) *Lessepsian migration: the influx of Red Sea biota into the Mediterranean by way of the Suez Canal*. *Ecological Studies, Volume 23*. Berlin: Springer-Verlag, 123 pp.
- Rodrigues N. (2012) New geographic distribution records for north-eastern Atlantic species from Peniche and Berlengas Archipelago. *Arquipelago: Life and Marine Sciences* 29, 1–4.
- Rowe F.W.E. (1969) A review of the family Holothuriidae (Holothuroidea: Aspidochirotida). *Bulletin of the British Museum of Natural History (Zoology)* 18, 119–170.
- and
- Thandar A.S. (1988) A new subgenus of *Holothuria* with a description of a new species from the south-east Atlantic Ocean. *Journal of Zoology* 215, 47–54.

Correspondence should be addressed to:

K. Mezali
 Department of Marine Sciences and Aquaculture
 Faculty of Natural Science and Life
 Abdelhamid Ibn Badis University of Mostaganem
 27000 PO Box 300 Algeria
 email: karimmezali@univ-mosta.dz or mezalikarim@yahoo.fr