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ORIGINAL PAPER

Didemnum bentarti (Chordata: Tunicata) a new species from the Bellingshausen Sea, Antarctica

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Abstract A new Antarctic species belonging to the genus *Didemnum* is described. The material was collected during the BENTART-03 cruise through the Bellingshausen Sea. The geographic and bathymetric distribution of the known *Didemnum* species from Antarctic and Subantarctic regions and a tabular key for the identification of these species are summarized.

Keywords Taxonomy · Tunicates · Didemnidae · Didemnum · Tabular key · Bellingshausen Sea · Antarctica

Introduction

The Bellingshausen Sea, although being one of the three great frozen seas of Antarctica (the other two being the Ross and the Weddell Seas), is largely inaccessible and remains undersampled; its benthic communities have still not been completely investigated.

The "Belgica" Expedition (1897–1899) collected the first few specimens from this sea. Only 12 species of ascidians have been reported from this area (Monniot and Monniot 1983) plus four new records (Varela 2007), in a total of 58 species in the Antarctic continent (Ramos-Esplá et al. 2005).

The ascidians of the Bellingshausen Sea and Peter I Island were studied as part of the BENTART-03 Programme carried out from January to March 2003, on the shelf of Bellingshausen Sea, Peter I Island, and the Antarctic Peninsula.

The main objective of the survey was the study of benthic ecosystem biodiversity in these zones, attempting to integrate data of all different benthic compartments with the environmental conditions.

After we studied the ascidians collected (Ramos-Esplá et al. 2005), we found some colonies that could not be assigned to any known *Didemnum* species. They are described below as *Didemnum bentarti* sp. nov.

Materials and methods

The Spanish Antarctic expedition "BENTART-03" was undertaken during the austral summer 2002–2003. Indirect sampling was carried out for quantification of the benthos. A total of 25 stations (Margarite Harbor to Thurston Island) were sampled up (Fig. 1).

Ascidians were collected by Agassiz trawl, at depths from 46 to 2,043 m (Ramos and Moya 2003). Collected ascidians were placed in seawater with menthol for relaxation for several hours prior to fixation in buffered formaldehyde 5% in seawater. Animals were analyzed under binocular microscope at the Department of Marine Science and Applied Biology, Universidad de Alicante, Spain.

One colony designated as holotype was deposited in the Museo Nacional de Ciencias Naturales (MNCN), Madrid; the registration number is indicated by MNCN Reg. and a number. A second colony, designated as paratype, was deposited at the Department of Marine Science and Applied Biology, Universidad de Alicante, Spain.

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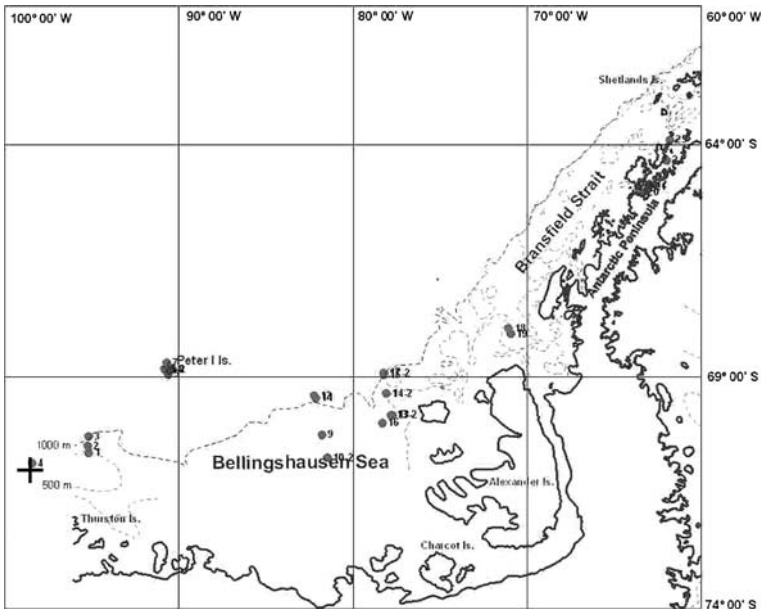

Fig. 1 Position of stations during BENTART-03 survey (+) position where *Didemnum bentarti* nov. sp was found

Results and discussion

Species description

Family DIDEMNIDAE Giard, 1872
Genus *Didemnum* Savigny, 1816
Didemnum bentarti sp. nov. (Figs. 2, 3, 4, 5).

Material examined

B03/4A (material type) two colonies: Holotype MNCN Reg. 31.01/79. Sta. 04A, 02-02-2003, 70°51′96″S; 98°26′29″W (Thurston Island-Amundsen/Bellingshausen Sea), 426 m (Fig. 1).

Etymology

The specific name *bentarti* has been taken from BENTART, the Spanish team of Antarctic benthic research.

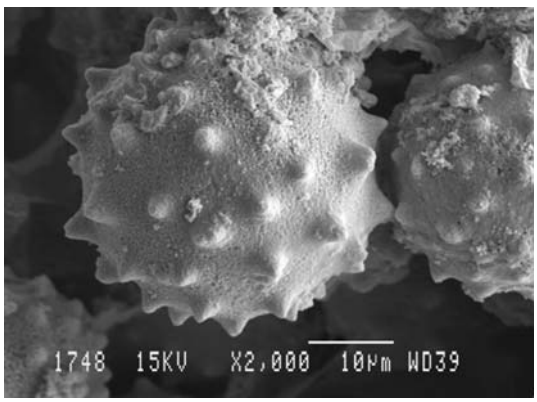

Fig. 2 *Didemnum bentarti* sp. nov., spicules (*scale bar* = 10 μm)

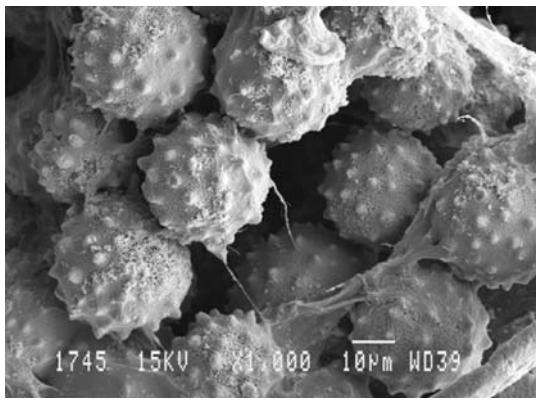

Fig. 3 *Didemnum bentarti* sp. nov., disposition of the spicules around the zooid (*scale bar* = 10 μm)

Diagnosis

Encrusting colonies. The tunic is thin, with an average thickness of 2 mm. Spicules are unique, rounded in shape with short rays evenly distributed. The lateral thoracic organs on each side are situated at the level of the first row of stigmata. The testis is undivided: the vas deferens describes three to four spiral turns around it.

Description

Colony Encrusting irregular colonies adhere to small rocks. The tunic is very thin, with a smooth surface. The maximum length is 3 cm and average thickness 2 mm. The test is transparent but shows white color because of the spicules, which are dense throughout the test and around the zooids, leaving a hollow in which the zooid is located. The spicules, up to 0.04 mm in diameter, have a spherical

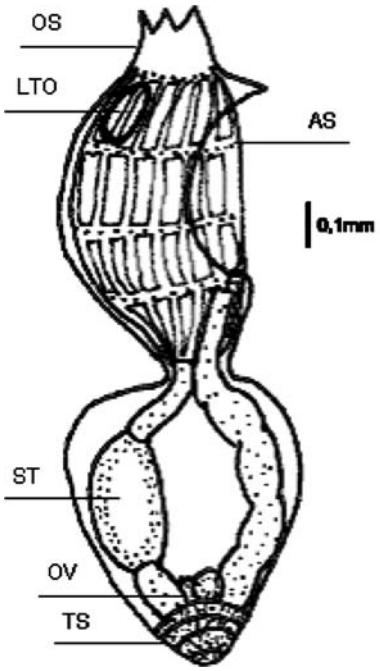

Fig. 4 *Didemnum bentarti* sp. nov., whole zooid; *OS* oral siphon, *AO* atrial opening, *LTO* lateral thoracic organ, *ST* stomach, *OV* ovary, *TS* testis (*scale bar* = 0.1 mm)

Fig. 5 *Didemnum bentarti* sp. nov., testis

shape; small short rays project uniformly from the body, in number from about 25 to 30 in optical section per spicule (Figs. 2, 3). Cloacal systems are not apparent.

Zooids The zooids are small, reaching a total length of about 1.4 mm. The branchial aperture is six-lobed. The atrial opening is wide: its aperture exposing most of the thorax and fully extending the upper border may form a small lip. The branchial sac has four rows of 12 narrow stigmata, six per side. The lateral thoracic organs on each side are situated at the level of the first row of stigmata (Fig. 4).

The abdomen is smaller than the thorax. The stomach is smooth and rounded. The testis is undivided and the vas deferens makes three or four spiral turns around it (Fig. 5). The ovary is located in the intestinal loop.

Ecology and distribution *Didemnum bentarti* sp. nov. seems to be a slope species, it was found at 426 m. Its geographical distribution is restricted to the west side of Antarctica, at the Bellingshausen Sea, where it was found (70°51′96″S; 98°26′29″W) (Fig. 1; Table 1).

Remarks This species has some features that differentiate it from other *Didemnum* species (Table 2).

The shape, length and distribution of spicules, are characteristic and very different from other *Didemnum* species. The combination of spicule shape, ray length and distribution are unique.

Didemnum biglans has stellate spicules in a semitransparent tunic, disposed in white masses in the surface layer but absent or sparse in the inner test (Kott 1969; Monniot and Monniot 1983). Other differences include 4–5 stigmata per side and usually a bilobed testis.

Didemnum studeri has a multilobed testis and stellate spicules with about 8–12 short blunt rays in optical section. Spicules are often more sparsely distributed; however, they may be dense (Kott 1969; Monniot and Monniot 1983).

The species *D. tenue* has stellate and spicules, up to 0.03 mm, but 9–10 spirals of the sperm duct (Kott 1969; Monniot and Monniot 1983). Also, *D. tenue* has the thoracic organs in the posterior part of the thorax and there are 3–4 stigmata per half row.

Didemnum subflavum has spicules, which exhibited an irregular form: discoid (similar to *Cystodytes*), ellipsoidal, lobed or stellate. Spicules attain up to 0.03 mm in diameter. This species has specific thoracic organs with ear form. There are 3–4 stigmata per half row and the testis is divided. The vas deferens coils nine times (Herdman 1886; Vasseur 1974).

Some geographic and bathymetric considerations

Although there are now five known species of *Didemnum* from the Antarctic and Subantarctic regions, none is distributed in both regions. The new species *D. bentarti* has at the moment a restricted distribution in Bellingshausen Sea (Fig. 1). *D. biglans* is an Antarctic endemism too, but its distribution is wider, being circumantarctic including the Scotia Ridge (Kott 1969; Monniot and Monniot 1983; Ramos-Esplá et al. 2005).

The other three species have never been found in Antarctica: *D. subflavum* is subantarctic distributed in Kerguelen Islands (Vasseur 1974) and Magellan area (Monniot and Monniot 1983); *D. tenue* has been found at

Table 1 Bathymetric distribution of the known Antarctic and Subantarctic species of *Didemnum* Savigny, 1816 in the different depth ranges: (1) 0–200 m; (2) 201–500 m; (3) 501–1,000; (4) >1,000 m

	1	2	3	4
***D. biglans* (Sluiter, 1906)**	———	———	———	———
***D.* nov. sp.**		———		
***D. studeri* Hartmeyer, 1911**	———	———	———	———
***Didemnum subflavum* (Herdman, 1886)**	———			
***D. tenue* (Herdman, 1886)**		———	———	———

Table 2 Tabular key to the Antarctic and Subantarctic species of *Didemnum*

1	2	3	4	5	6	Species	Distribution
S	5–6	M	2(3)	4–6	Spicules in evident masses	*D. biglans* (Sluiter 1906)	Scotia Arc, Antarctic Peninsula, Ross Sea and Wilkes land
O	6	A	1	3–4	Specific spicules	*D.* nov. sp.	Bellingshausen Sea
S	<5	P	2(3)	4		*D. studeri* Hartmeyer (1911)	Subantarctic Island, Magellan and Scotia Arc
I	3–4	A	2(3)	9	Thoracic organs with ear form	*Didemnum subflavum* (Herdman 1886)	Subantarctic Island and Magellan
S	3–4	P	1	9		*D. tenue* (Herdman 1886)	South Georgia Island and Magellan

Magellan area, South Georgia (Monniot and Monniot 1983) and New Zealand (Kott 1969); *D. studeri* has a wide distribution in Subantarctic islands, along Magellan, Scotia Ridge (Ramos-Esplá et al. 2005), Tasmania, South New Zealand Region and Tristan da Cunha (Primo 2006).

As shown in Table 1, most of the Antarctic and Subantarctic species of *Didemnum* have a wide bathymetric distribution; only *D. subflavum* has a shallow distribution, up to 100-m depth (Vasseur 1974, Monniot and Monniot 1983).

Tabular Key to the Antarctic and Subantarctic species of *Didemnum* (Table 2).

1. Spicules' shape:
   - S. Stellate.
   - O. Spherical.
   - I. Irregular.
2. Number of stigmata in each half row: 1,…*n*.
3. Position of thoracic organs:
   - A. Anterior of the thorax.
   - M. Middle of the thorax.
   - P. Posterior of the thorax.
4. Number of testes: 1,2,3.
5. Number of vas deferens coils: 2…*n*.
6. Other features.

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