SHORT COMMUNICATION

D. JOÃO DE CASTRO BANK, A SHALLOW WATER HYDROTHERMAL-VENT IN THE AZORES: CHECKLIST OF THE MARINE MOLLUSCS

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D. João de Castro Bank (DJC) is a shallow seamount with hydrothermal activity located between the islands of Terceira and São Miguel, Azores (Portugal). Due to its remote location, few investigators have worked in the area. Thirty-three species of marine molluscs are recorded as new for DJC which brings the total number of species to 42 for this specific area. Common micro-mollusc species known for the Azores (e.g.: the sublittoral species Alvania poucheti and Setia subvaricosus) are not present, and possible reasons for this are discussed.

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INTRODUCTION

D. João de Castro Bank (DJC) (Latitude: 38°13.3'N; Longitude: 26°36.2'W) is an isolated seamount located between Terceira and São Miguel Island, Azores (Fig. 1a), 36 nautical miles from Terceira island and 40 miles away from São Miguel. The shallower part of the bank is probably the result of several submarine eruptions occurred during two weeks in December 1720. These eruptions took place at 100 m depth and projected ashes and steam visible from São Miguel and Terceira Islands. The ashes accumulated, forming a small island which the winter storms completely destroyed two years later (Agostinho, 1934, 1960; Weston, 1964; Machado, 1967).

DJC is the upper part of a volcanic cone, like those present in most of the Azorean Islands. The cone has a base at 50 m depth, the shallowest part being at 13 m. Inside the cone, the depth is 45 m. In the North-South direction the cone is 300 m long and 600 m in the East-West direction (Fig. 1B).

Fig. 1. a) Geographic location of D. João de Castro Bank; b) Topography of D. João de Castro Bank (©ImagDOP and ISR/IST).
DJC is rare in the Atlantic Ocean, due to the presence of hydrothermal activity at shallow depths (Santos et al. 1996; photos in Cardigos et al. 2000). A small area of the bottom (100x50 m), between 16 and 45 m depth, in the western part, exhibit release of gases, mainly CO₂ (Victor Hugo Forjaz, pers. comm.). This gas has its source in a magmatic chamber located between 1 and 5 km under the seafloor (Machado & Lemos 1998). Recently, a second area with hydrothermal activity was discovered, at around 200 m depth, southeast of the shallowest part of the bank (Pascual et al. 2000).

Ávila (2000a) compiled a complete checklist of known shallow water marine molluscs from the archipelago of the Azores. Additional species were added by Ávila et al. (2000a & b), Ávila & Albergaria (2002); Segers (2002). Ávila (1997) based only in macro-species observation reported 9 species from DJC. The present work is the first analysis of directed sampling for molluscs in DJC. A new list of molluscs was compiled based in previous publication (Ávila 1997; Wirtz & D’Udeken D’Acoz 1999) and this study.

**MATERIALS AND METHODS**

Visual macro species identification were made by SCUBA diving during Expeditions made by the DOP-UAç in 1996 (27th July) and ASIMOV Project Expeditions in 2000 (11 days between 22 August and 19 September).

Samples were collected at DJC bank, between the 22 and 25 of July 2000 at Stations labeled DBUA 811 to 817 (See Table 1). Four quadrates 25x25 cm were scrapped off with a chisel (Table 1) during SCUBA dives. The samples (including the attached algae and associated organisms) were sieved by pouring water through a 1mm mesh size sieve. The molluscs were then removed from the algae, sorted by species, labeled and preserved in 70% ethanol. All the samples were numbered and deposited in the reference collection of the Department of Biology of the University of the Azores (DBUA). Species determination, synonymy and the ordination of families follow the CLEMAM database (Le Renard 2003).

### Table 1

<table>
<thead>
<tr>
<th>DBUA stations</th>
<th>Date</th>
<th>Depth (m)</th>
<th>Hydrothermal activity</th>
<th>Distance to Vents (m)</th>
<th>Type of bottom</th>
<th>Short description of the sampling area</th>
<th>Most common algae</th>
</tr>
</thead>
<tbody>
<tr>
<td>811</td>
<td>22/07/2000</td>
<td>20.5</td>
<td>very low</td>
<td>0.5</td>
<td>rocky</td>
<td>NW top of a seamount.</td>
<td>Acrosorium venulosum, Cladophora prolifera, Corallina elongata</td>
</tr>
<tr>
<td>812</td>
<td>25/07/2000</td>
<td>16.9</td>
<td>very high</td>
<td>0.3</td>
<td>rocky</td>
<td>Idem</td>
<td>Corallina elongata</td>
</tr>
<tr>
<td>813</td>
<td>25/07/2000</td>
<td>17.0</td>
<td>high</td>
<td>1.0</td>
<td>rocky</td>
<td>Idem</td>
<td>Sargassum sp., Corallina elongata</td>
</tr>
<tr>
<td>814</td>
<td>25/07/2000</td>
<td>16.0</td>
<td>high</td>
<td>1.3</td>
<td>rocky</td>
<td>Idem</td>
<td>Sargassum sp.</td>
</tr>
<tr>
<td>815</td>
<td>25/07/2000</td>
<td>16.0-20.0</td>
<td>rocky</td>
<td></td>
<td></td>
<td></td>
<td>Sargassum sp., Corallina elongata</td>
</tr>
<tr>
<td>816</td>
<td>25/07/2000</td>
<td>41.9</td>
<td>gravel</td>
<td></td>
<td></td>
<td></td>
<td>No algae collected</td>
</tr>
<tr>
<td>817</td>
<td>25/07/2000</td>
<td>19.0</td>
<td>rocky</td>
<td></td>
<td></td>
<td></td>
<td>Sargassum sp.</td>
</tr>
</tbody>
</table>

**ABBREVIATIONS USED IN TEXT**

DJC – Dom João Castro Bank
ASIMOV - Advance system integration for managing the coordinated operation of robotic ocean vehicles
DBUA - Department of Biology of the University of the Azores, Ponta Delgada.
RESULTS

Thirty three species of marine molluscs were recorded as new for DJC, (25 gastropods, 7 bivalves and 1 cephalopoda), which brings the total number of species to 42 known for this specific area.

TAXONOMIC LIST OF MOLLUSCS FROM D. JOÃO DE CASTRO BANK

GASTROPODA

**Family Patellidae**

*Patella aspera* Gmelin, 1791
- *Patella aspera* Gmelin, 1791. DBUA 812, 813, 816.

**Family Scissurellidae**

*Sinezona cingulata* (Costa O. G., 1861) DBUA 812, 813, 816.

**Family Haliotidae**

*Haliotis tuberculata coccinea* Reeve, 1846

**Family Trochidae**

*Calliostoma* sp.
- *Calliostoma* cf. *zizyphinum* (Linnaeus, 1758).
- *Calliostoma* sp. DBUA 813, 814.

*Jujubinus pseudogravinae* Nordsieck, 1973 DBUA 814.
Family Ranellidae

Charonia lampas lampas (Linnaeus, 1758)

Cymatium parthenopeum parthenopeum (von Salis, 1793)
ÁVILA (1997)

Family Bursidae

Bursa scrobilator (Linnaeus, 1758)
ÁVILA (1997)

Family Muricidae

Ocinebrina aciculata (Lamarck, 1822)
DBUA 813.

Stramonita haemastoma haemastoma (Linnaeus, 1766)
DBUA 813, 815.

Family Coralliophilidae

Coralliophila meyendorffi (Calçara, 1845)
DBUA 815.

Family Nassariidae

Nassarius incrassatus (Ström, 1768)
DBUA 815.

Family Columbellidae

Columbella adansonii Menke, 1853
ASIMOV Expedition 2000. DBUA 811, 813, 815, 816.

Family Mitridae

Mitra cornea Lamarck, 1811
DBUA 815.

Family Conidae

Anachis avaroides Nordsieck, 1975
DBUA 811, 813, 814, 815.

Mitromorpha crenipicta (Dautzenberg, 1889)
DBUA 816.

Raphitoma linearis (Montagu, 1803)
DBUA 816.

Family Omalogyridae

Omalogyra atomus (Philippi, 1841)
DBUA 811, 813.

Family Cavoliniiidae

Cavolinia inflexa (Lesueur, 1813)
DBUA 815.

Family Limacinidae

Limacina inflata (d’Orbigny, 1836)
DBUA 816.

Family Discodorididae

Discodoris atromaculata (Bergh, 1880)
DOP Expedition 1996.

BIVALVIA

Family Arcidae

Arca tetragona Poli, 1795
DBUA 811, 812, 815.

Family Mytilidae

Trichomusculus semigranatus (Reeve, 1858)
DBUA 811, 812, 813, 814, 815, 816.

Family Pinnidae

Pinna rudis Linnaeus, 1758

Family Pectinidae

Palliolum incomparabile (Risso, 1826)
DBUA 812.

Crassadoma pusio (Linnaeus, 1758)
DBUA 811, 812, 813, 814, 815.

Family Anomiidae

Anomia ephippium Linnaeus, 1758
Family Limidae

Limaria hians (Gmelin, 1791)  
DBUA 814.

Family Chamidae

Pseudochama gryphina (Lamarck, 1819)  
DBUA 813, 815.

Family Semelidae

Ervilia castanea (Montagu, 1803)  
DOP Expedition 1996. DBUA 816.

CEPHALOPODA

Family Octopodidae

Octopus vulgaris Cuvier, 1797  

DISCUSSION

A revision of the Patellidae was recently undertaken by Titselaar (1998), who classified two species occurring in the Azores as Patella gomesi Drouët, 1858 and P. ulyssiponensis Gmelin, 1791. Ávila et al. (2000a) followed Renard 2003 using the names Patella candei d’Orbigny, 1840 (=P. gomesi sensu Titselaar) and Patella ulyssiponensis Gmelin, 1791. However, Koupanou et al. (1999), based on partial sequences of the 12S and 16S mitochondrial genes, and Hawkins et al. (2000), suggested that the Atlantic island and European mainland forms of P. aspera s. l. (= P. ulyssiponensis) may be separate species. According to these authors, P. ulyssiponensis should be applied to the European species, whereas this species of Patella ulyssiponensis s.l. in the Azores belong to a single species, P. aspera s. s. An integration of the morphological and genetic data is needed prior to a taxonomical decision is made.

None of the recorded species are considered rare or endangered. However, limpets are commercially endangered at a regional level and the harvests are regulated by regional laws (Decreto Regulamentar Regional no. 14/93/A). National law regulates Octopus vulgaris, for stock management reasons (Portaria no. 281-C/97).

At depths comparable to those found at D. João de Castro Bank, the most abundant gastropods found in the rocky shores of the Azorean islands, are Bittium lateriellii, Tricolia pullus azorica, Alvania sleurpi, Anachis avaroides and Jujubinus pseudogravinae (Ávila 2003), These also occur at DJC although T. pullus azorica was found only as dead fragments.

However, common Azorean infralittoral species as Alvania poucheti and Setia subvaricosa, are not present at DJC bank. The lack of these mollusc species in DJC, might be a result of the young geological age of this area (only 280 years), the reduced size of shallow water area (above 50 m depth only 600 m x 300 m), its high exposition to strong currents and wave action, the relative isolation of the seamount (36 miles apart from the nearest island), the presence of hydrothermal vents or a combinations of these factors.

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REFERENCES


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