

# D. João de Castro Bank

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## Introduction

D. João de Castro is a shallow-water bank 40 miles away from Terceira and São Miguel islands. It has the particular feature to have hydrothermal vents at only 20 meters depth. Department of Oceanography and Fisheries (DOP) of the University of the Azores conducted two expeditions to study this shallow water vents. These were first opportunities to photograph and film it. The second expedition was directed mainly to volcanological objectives. Nevertheless, biological and ecological data was collected.

## Geological description

This shallow water bank is localised by the co-ordinates 38°14'N and 26°38'W. The submarine apparatus is basically made of pillow lavas with roots at 1500m depth and with the top made of basaltic hyaloclastitus. The crater, slightly elliptic, measures close to 300 meters diameter and is bordered by an arc, which is round or acute in some parts. Lava or hyaloclastitus composes parts of this arch.

D. João de Castro has several and important faults NW-SE and WNW-SSE, some active and others potentially active. At least, ten seism have the focus in these faults each year. From these faults there are released large amounts of gases. This gas was sampled in 1996 and it was determined that they composed by carbon dioxide (90%), H<sub>2</sub>S, helium, methane, etc.

The strong release of gas in the under water crater, as well as the seismic energy and the number of events that take place in D. João de Castro establishes it as a "Potential Active Volcano".

## History

The first record of volcanic activity on this bank was in 1720. This activity was preceded by seismic activity in the islands of São Miguel and Terceira. In December 1720 the ash emission completely stopped and the emission of vapour began. Then a third phase started with the emission of bombs and rocks. In 1721, there was an out-of-water crater with 1.5 km diameter. The sea destroyed this crater. As a curiosity, there was one priest who draws the crater and after wards was able to sell the new island in Brasil. The left seamount was mapped in 1940's. There are signals of oscillations in the depth. At present time the lowest point is 10 m, but there are occasional records of 8 meters.



Figure 1 - The vents photographed in the DOP Expedition 1 to D. João de Castro Bank.

## DOP Expedition 1

In July of 1995 DOP conducted a first expedition to D. João Castro bank on board of L/I "Águas-Vivas". The search for a shallow place to dive was based in a GPS position given by the Portuguese Navy. Around this place 3 dives were performed in order to find hydrothermal active sites: 8 August, 18 h, 27 m, 45 min; 9 August, 10 h, 43 m, 37 min; 9 August, 17 h, 29 m, 25 min. Hydrothermal active sites were found in all dives, but the presence of bacterial mats was found only in the two last dives. Maximum temperature of 121°C was measured in one very active site with bacterial mats on last dive. Samples of these bacterial mats were collected and preserved (5% glutalalderhyde) for further taxonomic studies. During these dives, photo and video images were recorded. The faunal species observed were also recorded qualitatively.

The main aim of this expedition: to find hydrothermal sites with bacterial mats was accomplished successfully.

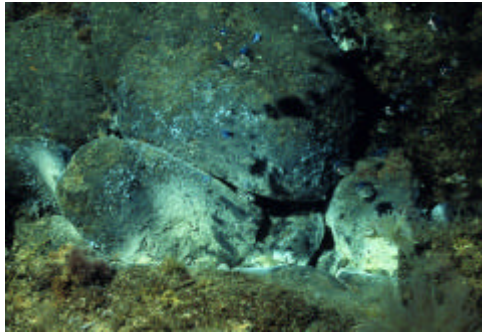


Figure 2 - Aspect of the vents in DOP Expedition 2 to D. João de Castro bank.

## DOP Expedition 2

This second expedition was made on the July 27<sup>th</sup> 1996. As a consequence of the first expedition, the Department of Volcanology of the University of the Azores became very interested in collecting some gas samples. This was the main objective of the second expedition. The remaining objectives were: 1) to make qualitative census of species, 2) to determine biodiversity, 3) to map the bank, 4) to collect more warm water bacteria samples, and 5) to film and photograph the vents.

## Results

Two dives were made in D. João de Castro Bank. The first dive occurred at 14h00 and the second at 16h30. There were 80 species identified. The complete list is as follows (common and dominant species are in bold).

### Algae

#### Chlorophyta

*Ulva* sp.; ***Codium adhaerens***; *Codium bursa*.

#### Phaeophyta

*Dictyopteris membranacea*; *Dictyota dichotoma*; ***Padina pavonina***; *Cutleria multifida*; ***Halopteris scoparia***; *Colpomenia sinuosa*; ***Sargassum vulgare***; ***Cladostephus hirsutus***.

#### Rhodophyta

***Corallina officinalis***; *Falkenbergia rufol*; ***Lithophyllum incrustans***; *Pterocladia capilacea*; *Gellidium* sp.; *Porphyra* sp.; ***Halymenia* sp.**; *Liagora viscida*; *Lithothamnion calcareum*; *Peyssonnelia squamaria*; *Jania rubens*.

### Porifera

*Crambe crambe*.

### Cnidaria

*Corynactis viridis*; ***Aglaophenia tubulifera***; *Obelia* sp.; *Bolinopsis infundibulum*.

### Bryozoa

*Menbranipora membranacea*.

### Echinodermata

*Holothuria tubulosa*; *Holothuria forskkali*; *Ophidiaster ophidianus*; *Sphaerechinus granularis*; *Paracentrotus lividus*; ***Arbacia lixula***.

### Arthropoda

*Xantho* spp.; *Maja squinado*; *Liocarcinus corrugatus*; *Dromia marmorea*.

### Mollusca

*Patella* spp.; *Haliotis tuberculata*; *Charonia lampas*; *Phalium granulatum*; *Peltodoris atromaculata*; *Ervilia castanea*; *Pinna nobilis*; *Octopus vulgaris*.

### Pisces

***Balistes carolinensis***; *Ophioblennius atlanticus atlanticus*; *Parablennius ruber*; *Trachinotus ovatus*; *Seriola dumerili*; *Seriola rivoliana*; ***Dasyatis pastinaca***; *Taeniura grabata*; ***Kyphosus* sp.**; *Centrolabrus trutta*; ***Coris julis***; *Labrus bergylta*; *Symphodus mediterraneus*; ***Thalassoma pavo***;

*Pseudolepilaplois scrofa*; *Muraena helena*; *Muraena augusti*; *Myliobatis aquila*; *Abudefduf luridus*; *Chromis limbata*; *Sparisoma cretense*; *Sarda sarda*; *Scorpaena maderensis*; *Epinephelus marginatus*; *Serranus atricauda*; *Boops boops*; *Pagrus pagrus*; *Sphyrna viridensis*; *Sphoeroides marmoratus*; *Mobula mobular*; *Acanthocybium solandri*; *Katsuwonus pelamis*.

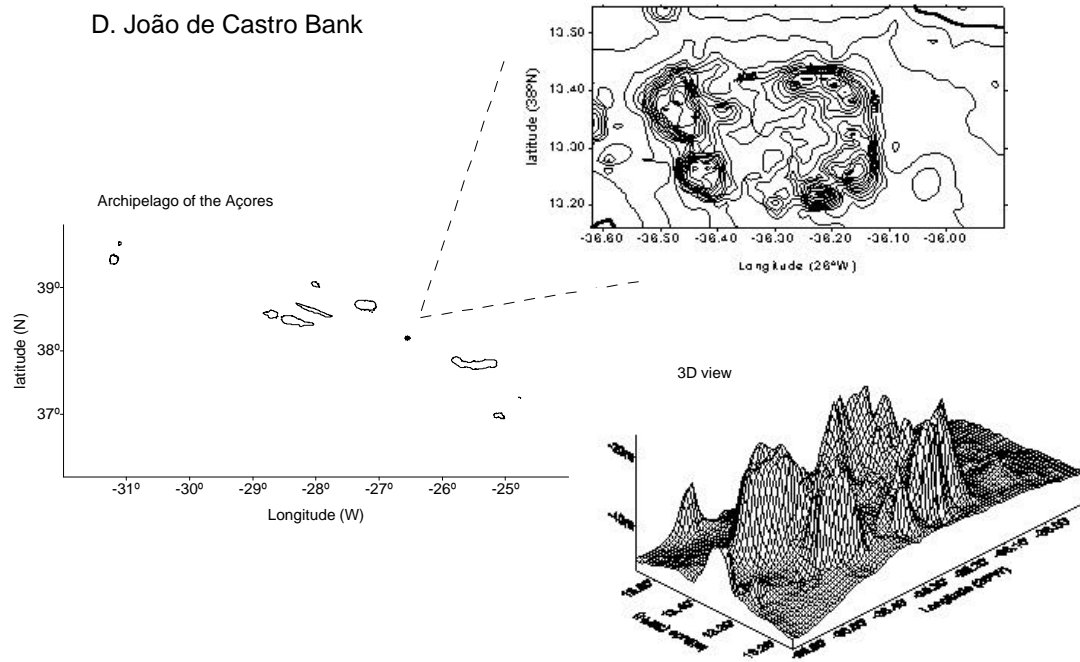


Figure 3 - Location and map of D. João de Castro Bank.



Figure 3 - Several photos were taken on the expedition.

## Bibliography

Forjaz, V.H. (*in prep*). Expedição ao banco D. João de Castro (1996).