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Biodiversity in seamounts: The Madeira-Tore and Great Meteor. BIOMETORE 5 cruise report **

With 11 figures and 2 tables

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ABSTRACT: In the present paper a research cruise done in March, 2017, at the Seine and Unicorn Seamounts in the NE Atlantic Ocean, is described. Collecting methods, vessel and area surveyed are described and illustrated. The list of stations is presented, as well as a preliminary list of the species collected.

Keywords: deep-sea, seamounts, biodiversity, fish, crustaceans, Seine, Unicorn, NE Atlantic.

RESUMO: No presente trabalho é descrita uma missão científica realizada em Março de 2017 nos montes submarinos Seine e Unicórnio, Oceano Atlântico nordeste. São descritos e ilustrados os métodos de colheita, o navio e as áreas prospectadas. É apresentada a lista de estações bem como a lista preliminar das espécies colhidas.

Palavras-chave: mar profundo, montes submarinos, biodiversidade, peixes, crustáceos, Seine, Unicórnio, Atlântico NE.

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INTRODUCTION

The interest in the conservation and sustainable exploration of seamounts and associated biological communities boosted the need for a better understanding of these ecosystems and the threats to which they are subject. In this context, in the framework of the BIOMETORE project (SANTOS *et al.*, 2016), two seamount complexes located in Portuguese waters, the Madeira-Tore and the Great Meteor, were studied in some detail. These seamount complexes are especially interesting, since Portugal plans to classify them as Marine Protected Areas in the coming years under the framework of the European Marine Strategy Framework Directive (EU-MSFD).

Among the research cruises done in the framework of this project, the BIOMEORE 5 cruise was part of the Task 2.4 – Benthopelagic species characterization, Work package 2 – Benthic habitats characterization – whose main objectives were, among others, to collect and process abiotic and biotic data suitable for: addressing knowledge gaps regarding MSFD biodiversity descriptors; obtaining / improving knowledge on Vulnerable Marine Ecosystems (VME) indicator and taxa distribution to develop habitat suitability models; characterising benthopelagic fish species composition and assemblage structure; addressing trophic interactions; testing the proof of concept of seamounts endemism and their role as “stepping stones” and providing voucher specimens for museum collections.

It is expected that the results of the project will contribute to providing baseline information for sustainable use and management measures of the Portuguese marine environment and to the development of the strategies for the continuous assessment of the environmental status of Portuguese marine waters towards the achievement and maintenance of their good environmental status (GES).

METHODOLOGY

Study area

The area surveyed during BIOMETORE 5 cruise covers the Seine and Unicorn seamounts (Fig. 1). Sampling took place between the top of the seamounts and 1500 m of depth. The cruise took place between 8 and 23 March, 2017.

Research vessel

For this cruise the F/V *Ponta Calhau* (Fig. 2) was chartered. This vessel is one of the units of the tuna fishing fleet from Madeira, operating since 2015. She is 26 m long and 6,41 m beam. It is equipped with a 600 HP diesel engine, and a power generator, attaining 10 knots. It possesses two hydraulic winches, the largest operating at starboard. It has a storage capacity of 20 tons of fish at 0°C and sea water tanks for keeping live bait. It is also equipped with standard navigation, communications and echo sounding equipment (down to 1700 m). Two additional GPS navigation and logging systems were installed for the cruise. All operations and ship positions were recorded in real time.

For the purpose of this research, the vessel was equipped with specific collecting gear and a minimum crew of 9, including the master, was used. The remaining berth capacity (8) was used by the scientific team.

Collecting gear

Four different collecting gear – bottom long-line, mid-water drifting long-line, benthic baited traps and semi-floating baited traps – were used in this cruise.

The bottom long-line used, locally called “aparelho pedra-boia” (Figs. 3 and 4) was built at Horta, Azores and has been thoroughly used by the Department of Oceanography and Fisheries of the University of Azores in their demersal fish surveys (MENEZES *et al.*, 2006, 2009). A set of 3600 hooks (LLA) was used for shallower depths (less than 300 m) with a soaking time of 3.5 hours. For deeper depths (more than 500 m), a set of 1200 hooks (LLB) was used with a soaking time of 8 hours.

The mid-water drifting long-line, locally called “aparelho de espada” (Figs. 5 and 6), is identical to the ones used

by the Madeiran black scabbard fish commercial fishery (GORDO, 2009). Sets of 480 squid baited hooks were used, with a mean soaking time of 7 hours.

Baited trap sets were made of 10 benthic (BISCOITO, 1993) and 10 semi-floating traps (GONZÁLEZ *et al.*, 1992), placed alternately (Figs. 7 and 8), all baited with salted sardines. Soaking times averaged 24 hours.

Whenever possible, a TDR (temperature and depth recorder) was attached to the collecting gear to validate depth of collection and obtaining temperature data.

Biological sampling

All specimens caught were identified to the lowest taxonomic rank (usually species). Invertebrates were labelled and deep-frozen on board for later study in the laboratory (Fig. 9). Some crabs caught in large numbers were measured and weighed on board, before being discarded (Fig. 10). Fishes were all counted, measured and weighed. From the more common teleost species, at least four voucher specimens were preserved frozen on board for museum collections. Specimens from all other species were all frozen, in order to be further studied in detail at the laboratory. All specimens collected were photographed before being preserved (Fig. 11). Due to rough weather conditions and lack of appropriate laboratory space on board, tissue samples were not taken from the specimens caught. This was later done on the laboratory on shore.

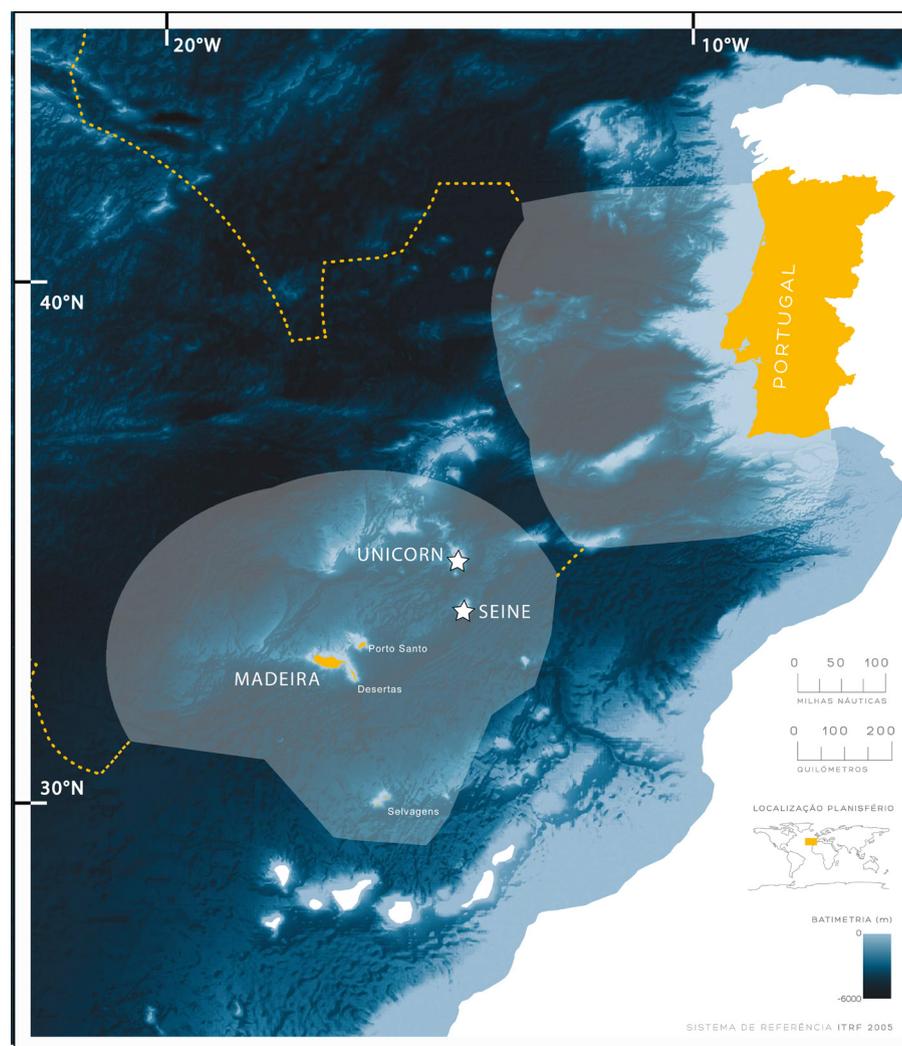


Fig. 1 – Location of the Seine and Unicorn Seamounts, surveyed during the BIOMETORE 5 cruise. (Shaded areas show the EEZ and dotted yellow lines the limits of the extended platform). (Base map from EMEPC).



Fig. 2 – The F/V *Ponta Calhau* at Caniçal harbour.

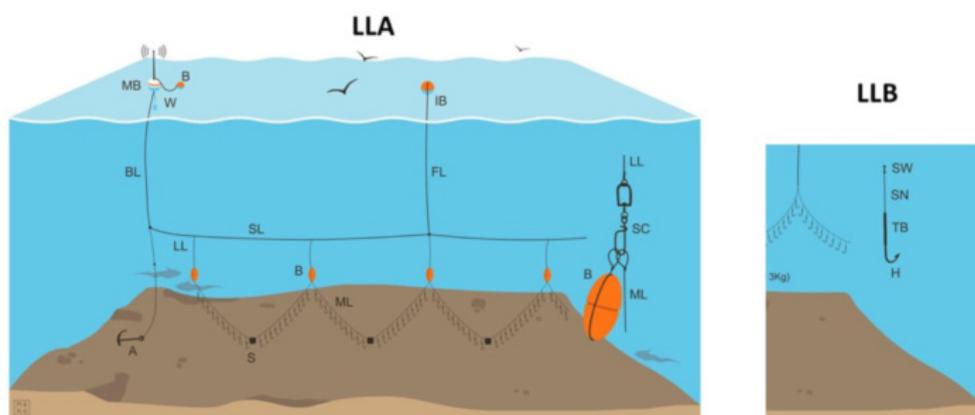


Fig. 3 – Schematic drawing of the bottom long-line (*aparelho pedra-boia*) (LLA) with “safety-line” (“retenida”) with alternate floats and sinkers and a branch line or snood detail of the longline (LLB) used in the deeper sets. Common labelling: marker buoy (MB); buoy (B); weight (W); mainline (ML); sinker (S); anchor (A); safety line or “retenida” (SL); buoy line (BL); free line (FL); snood (SN); hook (H); intermediate buoy (IB); Link line (LL); Snap swivel or clip (SC); swivel (SW); Twisted brass (TB). (Drawings: Nuno Brito©ImagDOP).



Fig. 4 – Deployment of the long-line at stern of the ship. A metallic table was built in order to allow a safe operation of the long-line.

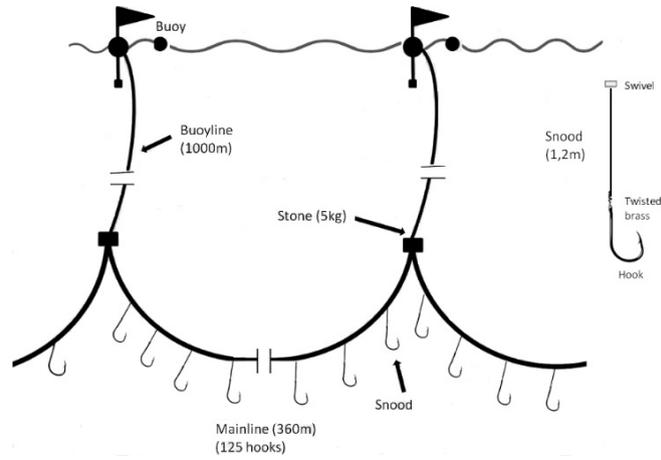


Fig. 5 – Schematic drawing of the mid-water drifting long-line (*aparelho de espada*).



Fig. 6 – Deployment of the mid-water drifting long-line (*aparelho de espada*). Each plastic container carries 120 squid baited hooks.

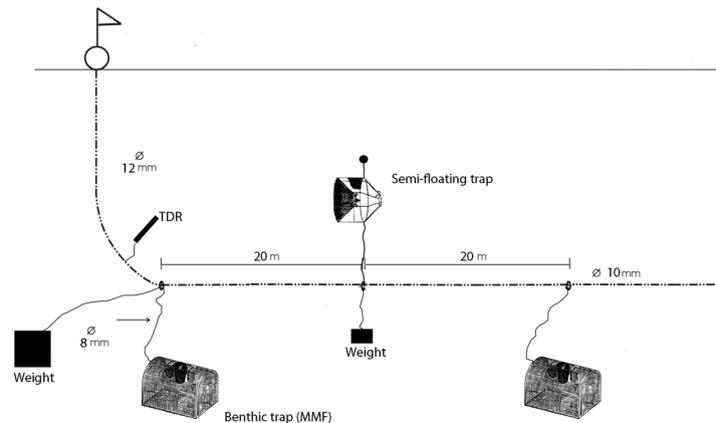


Fig. 7 – Schematic drawing of the baited fish trap set used. Each set had 10 traps of each kind attached alternately. Salted sardines were the bait used and soaking time was 24 hours on average.



Fig. 8 – The two trap models used. A - benthic fish trap MMF model; B - Semi-floating shrimp trap.



Fig. 9 – Packaging of specimens on board prior to freezing.



Fig. 10 – Measuring a specimen of *Chaceon affinis* on board.



Fig. 11 – Photography setting on board. *Heterocarpus grimaldii* caught on a fish trap.

RESULTS

A total of 12 stations were done during the BIOMETORE 5 cruise (Table 1). Of these 8 were at the Seine seamount and 4 at the Unicorn seamount. Seven stations were done with fish traps, 3 with the mid-water drifting long-line and 2 with the bottom long-line. Due to rough weather the cruise had to be interrupted two times and the ship had to call Madeira for shelter. This has prevented the use of the bottom long-line more often.

In the two surveyed seamounts, 42 species were collected (Table 2): 8 decapod crustaceans, 1 anthipatharian, 1 mollusc, 1 echinoderm, 10 chondrichthyan fish and 21 teleost fish species. Thirty-two species were collected at the Seine seamount and 15 at the Unicorn seamount.

A total of 1042 specimens were collected, 649 of which were preserved for museum collections and/or further biological research.

Table 1 – List of stations of BIOMETORE 5 cruise.

Station	Date	Seamount	Latitude	Longitude	Depth (m)	Fishing gear
1	10-03-2017	Seine	33° 40.5'N	014° 26.84'W	1500	Traps
2	10-03-2017	Seine	33° 40.82'N	014° 25.16'W	936	Traps
3	10-03-2017	Seine	33° 43.37'N	014° 25.66'W	198	LLA
4	11-03-2017	Seine	33° 49.12'N	014° 21.36'W	198	traps
5	11-03-2017	Seine	33° 43.44'N	014° 15.77'W	2500	Drifting LL
6	19-03-2017	Unicorn	34° 31.00'N	014° 25.00'W	1715	Traps
7	19-03-2017	Unicorn	34° 40.34'N	014° 27.25'W	831	Traps
8	20-03-2017	Unicorn	34° 28.23'N	014° 25.91'W	662-844	LLB
9	21-03-2017	Unicorn	34° 31.45'N	014° 21.44'W	2500	Drifting LL
10	21-03-2017	Seine	33° 48.75'N	014° 18.26'W	1000	Traps
11	21-03-2017	Seine	33° 49.44'N	014° 19.56'W	500	Traps
12	22-03-2017	Seine	33° 45.56'N	014° 29.06'W	1690	Drifting LL

Table 2 – Preliminary list of species collected at the Seine and Unicorn seamounts during BIOMETORE 5 Cruise.

Higher group	Species	Seine	Unicorn
Crustacea	<i>AcanthePHYra eximia</i> Smith, 1884	X	X
Crustacea	<i>Bathynectes maravigna</i> (Prestandrea, 1839)		X
Crustacea	<i>Cancer bellianus</i> Johnson, 1861	X	
Crustacea	<i>Chaceon affinis</i> (A. Milne Edwards & Bouvier, 1894)		X
Crustacea	<i>Heterocarpus grimaldii</i> A. Milne Edwards & Bouvier, 1900	X	X
Crustacea	<i>Heterocarpus laevigatus</i> Spoenche Bate, 1888	X	
Crustacea	<i>Paromola cuvieri</i> Risso, 1816	X	
Crustacea	<i>Plesionika edwardsii</i> (Brandt, 1851)	X	
Chondrichthyes	<i>Centrophorus granulosus</i> (Bloch & Schneider, 1801)		X
Chondrichthyes	<i>Centroscymnus coelolepis</i> Bocage & Capello, 1864	X	
Chondrichthyes	<i>Centroscymnus owstonii</i> Garman, 1906	X	
Chondrichthyes	<i>Deania profundorum</i> (Smith & Radcliffe, 1912)		X
Chondrichthyes	<i>Etmopterus princeps</i> Collett, 1904		X
Chondrichthyes	<i>Etmopterus pusillus</i> (Lowe, 1839)		X
Chondrichthyes	<i>Etmopterus</i> sp.		X
Chondrichthyes	<i>Prionace glauca</i> (Linnaeus, 1758)		X
Chondrichthyes	<i>Raja maderensis</i> Lowe, 1838	X	
Chondrichthyes	<i>Torpedo</i> sp.	X	
Teleostei	<i>Aphanopus</i> spp.		X
Teleostei	<i>Capros aper</i> (Linnaeus, 1758)	X	
Teleostei	<i>Conger conger</i> (Linnaeus, 1758)	X	
Teleostei	<i>Engraulis encrasicolus</i> (Linnaeus, 1758)	X	
Teleostei	<i>Gadella maraldi</i> (Risso, 1810)	X	
Teleostei	<i>Mora moro</i> (Risso, 1810)		X
Teleostei	<i>Muraena helena</i> Linnaeus, 1758	X	
Teleostei	<i>Pagrus pagrus</i> (Linnaeus, 1758)	X	
Teleostei	<i>Phycis phycis</i> (Linnaeus, 1766)	X	
Teleostei	<i>Polyprion americanus</i> (Bloch & Schneider, 1801)	X	
Teleostei	<i>Pontinus kuhlii</i> (Bowdich, 1825)	X	
Teleostei	<i>Schedophilus ovalis</i> (Cuvier, 1833)	X	
Teleostei	<i>Scomber colias</i> Gmelin, 1789	X	
Teleostei	<i>Scomber scombrus</i> Linnaeus, 1758	X	
Teleostei	<i>Simenchelys parasitica</i> Gill, 1879	X	X
Teleostei	<i>Sphoeroides pachygaster</i> (Müller & Troschel, 1848)	X	
Teleostei	<i>Synaphobranchus affinis</i> Günther, 1877	X	X
Teleostei	<i>Synaphobranchus kaupii</i> Johnson, 1862	X	X
Teleostei	<i>Trachurus picturatus</i> (Bowdich, 1825)	X	
Teleostei	<i>Trigla</i> sp.	X	
Teleostei	<i>Zenopsis conchifer</i> (Lowe, 1852)	X	
Anthipatharia	<i>Viminella flagellum</i> (Johnson, 1863)	X	
Echinodermata	<i>Cidarid</i> sp.	X	
Mollusca	<i>Charonia</i> sp.	X	
	Total	32	15

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