

IMPACT

Long-term effects of continued trawling on deep-water muddy grounds

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INRB - Instituto Nacional de recursos Biológicos, I.P.,

LNEG - Laboratório Nacional de Energia e Geologia, I.P....

UA - University of Aveiro,

CSIC - Consejo Superior de Investigaciones Científicas,...

Marine Scotland Science,

Abstract

The interest of this proposal is the effect long periods of bottom trawling on deep, soft sediment bottoms. Otter trawling in the slope of the Southwest and South coast of Portugal (200- 800m) has continued over the last 60 yr. Numerous studies have focused on the effects of trawling on the bottom, most of them directed at the effects on hard bottoms where the disturbance to the biogenic structures (i.e. corals) is more dramatic. Few studies are dedicated to changes induced on muddy bottoms and even fewer to the effects on muddy, deep water grounds. Systems where natural disturbances are less frequent (such as deep muddy bottoms) tend to be more susceptible to changes and take longer to recover, than shallower and/or sandy.

Persistent trawling has effects on the sediment structure, oxygenation, POM, as well as on diversity and abundance of bottom communities. Bottom crustacean trawling produces a diverse catch of fish and invertebrate species, from which only a few are of commercial interest, producing very high levels of by-catch (50-90% of total weight caught). Most of these organisms fall on the bottom in the general area where they were caught. The food subsidies provided by rejections at sea influence the dynamics of small bottom scavengers, the main organism involved in the quick consumption of this unnatural food supply. The main objective of this proposal is to evaluate the effects of continued trawling on deep muddy grounds, by studying indicators of the direct impact of the trawling activity (geochemical properties of the sediment, endo and sessile epifauna). The hypothesis that trawling favours scavengers will also be tested.

These objectives will be reached by comparing towed and untowed stations in the following aspects: a)

Bottom structure (physical + bio structures);

b) Sediment properties (grain size, OC, calcium carbonate, OM - biomarkers); c) Species diversity + biomass (microfossils, epif + endofauna (macro meio + micro), small scavengers

IMPACT**Further particulars**

Main scientific discipline(s)	Physical Oceanography Sedimentology Fisheries research Biological Oceanography New technologies Training
Agreement	Yes
Ship	Garcia del Cid
2nd choice	Ramon Margalef
Optional large equipment needed	
Working Area	South coast of Portugal
Which Exclusive Economic Zone(s) will be affected?	Portugal
Working days	9
Number of cruise participants	12
When should the cruise take place?	Spring-early summer
Preferred Port of mobilisation	Portimão
Preferred Port of demobilisation	Portimão
Ships onboard equipment needed	Doppler Current Profiler (VM-ADCP) CTD profiler Mutibeam echosounder (frequencies, 50 kHz (3000 m) and 180kHz (600 m))
Ships mobile equipment needed	Box corer Multinet plankton sampler
Own equipment provided	Video camera and lander Trap lines for scavenger capture Box corer with 2 boxes
Total travel budget:	1730
Total shipment budget:	900

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1. Scientific objectives of the proposed work

a) General scientific background

Otter trawling in the slope of the Southwest and South coast of Portugal (depths from 200 to 800 meters), targeting Norway lobster (*Nephrops norvegicus*), has been occurring on a continuous base since long. Systematic catch statistics started in 1938¹, reporting 40 tons of *Nephrops* caught during that year. By the end of the 1960's besides the Portuguese trawlers, boats based on Andalusia and Galician ports were also actively fishing on the same *Nephrops* grounds. The renewal of the trawling fleet led to the use of larger and more powerful vessels since the 1990's, and to this day this activity has continued on a regular basis (with the exception of the month of January when all the trawling for crustaceans stops). Although nowadays trawling extends to deeper waters (targeting several species of shrimps), *Nephrops* grounds will be the focus of this work because they have been the ones continuously fished over the last 60 years. Simultaneously, these grounds are mostly free of fixed gears, which tend to concentrate their activity within 6 miles from the shoreline (red line in Figure 1), where trawling is forbidden.

Numerous studies have focused on the effects of trawling on the bottom^{2,3}, most of them directed at the effects on hard bottoms where the disturbance to the biogenic structures (i.e. corals) is more dramatic⁴. Few studies are dedicated to changes induced on muddy bottoms^{5 to 12} and even fewer to the effects on muddy, deep water grounds^{13 to 16}. The reason for this is that most trawling activity occurs on continental shelves at depths that rarely go below a couple hundred meters. An exception to this is deep water trawling for crustaceans, usually occurring at the edge of the continental shelf or on the slope¹⁷. The review of the literature concentrated on the effects of trawling on muddy deep water grounds, although comprising existing studies on shallower *Nephrops* grounds, and covering aspects related with changes on bottom structures (geological and biological), sediments (structure and chemistry), and community structure of the endo- and epi-fauna, leaving outside effects on coral bottoms and the impacts of dredges.

Systems where natural disturbances are less frequent (such as deep muddy bottoms) tend to be more susceptible to changes and take longer to recover, than shallower and/or sandy bottoms^{3,18,19,26}. The effects of persistent trawling include: lower abundances of epifaunal species^{4to8,13,14,20,25,26}; decreased epifaunal biodiversity^{4,6,7,14,26} and endofaunal assemblages^{8,23,26}; smaller size ranges of endofauna species⁵; damage to invertebrates²²; switch towards community dynamics regulated by fishing disturbance²¹, with higher abundance and diversity of scavenger species^{4,6,18}. With respect to the sediments, gear otter doors cause greater impact than the footrope, and the use of tickler chains increases sediment resuspension, generating clouds of particles (e.g. 3–6 m high and 70–200 m wide¹¹), possibly affecting sedimentation rates at the base of the canyons due to the occurrence of sediment gravity flows, an influence that may extend to bathyal depths¹⁶. The sediment load in these fluxes is heavier in finer sediments (reaching $800 \text{ g m}^{-2} \text{ s}^{-1}$)¹¹, possibly constituting a major source of suspended sediment over the outer shelf, (where storm-related bottom stresses are generally weak)²⁸ and contributing to the maintenance of the nepheloid layer²⁹. Deep water trawling may also affect the geochemical properties of the sediment, reducing the oxygenation by negatively impacting burrowing species and releasing pore water¹¹. A study in the Mediterranean showed a significant increase in suspended POM³⁰ with consequences similar to the effect of storms in shallower waters, although this may be a short term effect, with overall OM decreasing with continued trawling activity³¹.

Bottom crustacean trawling produces a diverse catch of fish and invertebrate species^{34,35,36}, from which only a few are of commercial interest, producing very high levels of by-catch (50 to 90% of the total weight caught^{34,37}). Most of these organisms fall on the bottom in the general area where they were caught³⁸. Earlier work developed in the area of interest, or in similar grounds in the NW Mediterranean, suggests that the food subsidies provided by rejections at sea influence the dynamics of small bottom scavengers, the main organism involved in the quick consumption of this unnatural food supply^{38,39}.

These small scavengers, mostly isopods and amphipods, that have great capacity for profiting from occasional food supplies, are themselves a favourite prey for some of the species composing the commercial catch³⁸.

b) Specific aims of the project

The main objective of the current proposal is to evaluate the effects of continued trawling on deep muddy grounds, by studying indicators of the direct impact of the trawling activity, namely changes in the geochemical properties of the sediment, endofauna and sessile epifauna. In addition, the hypothesis that trawling favours scavengers will also be tested. These objectives will be reached by comparing towed and untowed stations in the following aspects:

- a) Bottom structure (physical and biological structures)
- b) Sediment properties
 - Grain size
 - Organic carbon content
 - Calcium carbonate content
 - Organic matter components (biomarkers)
- c) Species diversity and biomass
 - Microfossil assemblages
 - Endofauna
 - Macrofauna
 - Meiofauna
 - Microfauna
 - Epifauna
 - Small scavengers

As referred before, most studies dealing with the impacts of trawling on muddy grounds are done at less than 100 meters depth. Exceptions are studies done in the Mediterranean: Greek (200 meters)^{13,15,22} and Spanish waters (up to 1750 m)¹⁶, New Zealand (200-600 m)¹⁴, Oregon coast (150 m)⁷, and two studies off the Algarve coast^{23,25}. The methodologies involved varied from direct observation with video^{7,13,25}, sediment profile imagery¹⁵, pre and post trawl observations¹⁴ and sediment analysis²³. The only study combining several methodologies²² (seafloor mapping, collection of sediment samples and direct observations) used experimental trawls to evaluate the impacts and was directed at testing methodologies. The approach proposed here is multidisciplinary combining biological, geological, physical and chemical oceanography. The capacity of the vessel and equipments available will allow the observations at 500 meters.

Deep water trawling is under pressure due its direct impacts on the sea floor and high by-catch rates, affecting both the abundance and diversity of bottom assemblage. For the application of the EU guidelines for management of fisheries (less gear impact and more protected areas), an evaluation of long term effects of trawling on deep muddy grounds is fundamental. In addition, some insight into the disturbances caused by trawling to regular sedimentation processes may be important to interpret microfossil assemblages in micropaleontological studies.

2. Work programme

Preliminary methodological considerations and choice of the study site

The traditional methodological approach to study trawling effects consists of “before and after studies”: an area where little or no trawling occurred is studied before and after experimental trawling is conducted^{4,6,8,9,12,13,24,27}. This methodology has the advantage of controlling confounding factors but cannot be used to evaluate long term effects. In the case of the areas of interest for this study, an additional problem exists: areas adequate for such pre and post trawling studies are not available. All

trawlable areas are exploited and a control site cannot be found. The next best approach would be to compare areas that are towed regularly with neighbouring areas that are untouched by trawling^{7,20,22,25}. This is possible in the area of interest because, in the middle of the fishing grounds, there are areas where morphological structures impede trawling^{17,32}. Such zones have large boulders surfacing out of the surrounding muddy grounds and are avoided during trawling. Thus, it is possible to find unfished areas between heavily fished zones, with the same depth and soft sediment type. For control of extraneous variables the chosen untowed areas need to have similar depth ranges and sediment type than the neighbouring towed areas and need to be large enough to allow the assumption that they are not directly disturbed by commercial trawling. Therefore, sampling strategies requiring the use of towed equipment on the bottom had to be avoided in order to maintain the same methodologies in towed and untowed areas..

Interviews to several experienced skippers were conducted, in order to identify areas of no fishing pressure adjacent to areas of intense fishing. Areas with no fishing were identified in 3 different zones (Figure 1):

- Area 5 on the Southwest coast
- Area 1 off Cape São Vicente
- Area 3 on the South coast

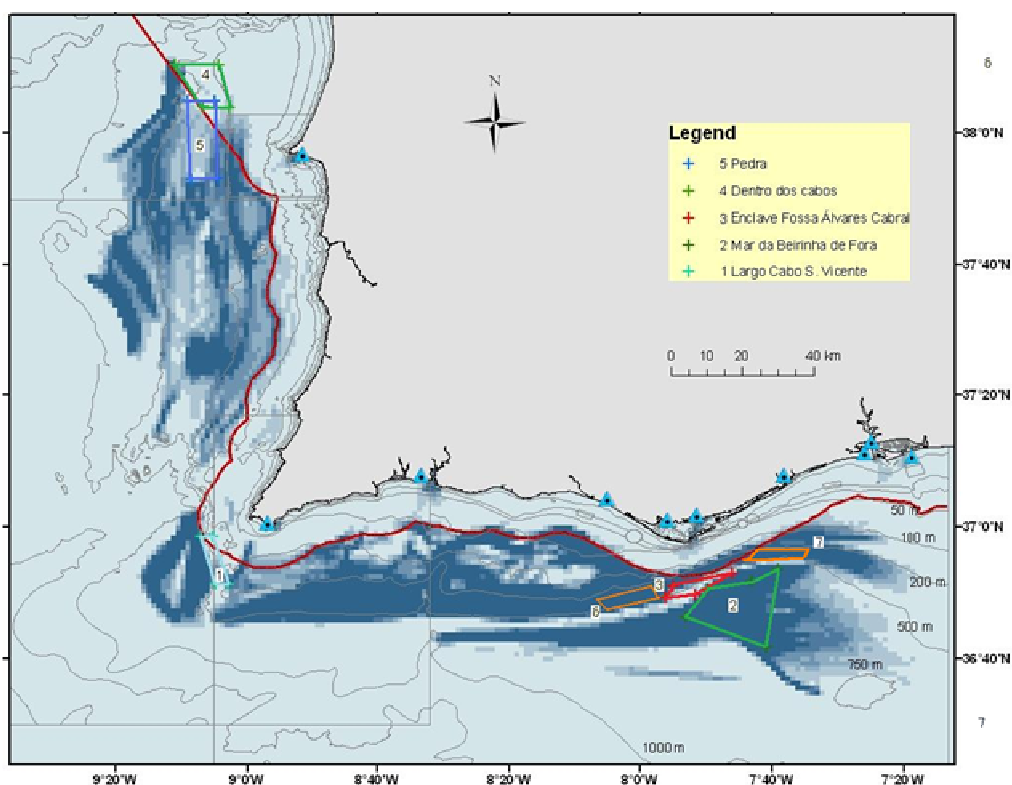


Figure 1 Identification of crustacean fishing grounds by plotting positions of vessel obtained via the VMS database (blue shades) and with commercial vessel skippers (coloured polygons). Darkness of the blue is positively correlated with fishing intensity. Codes for the polygons are: 1 – Area of no fishing but not a Nephrops ground; 2 – Area of intense fishing (Faro plaueau); 3 and 5 – no fishing areas (rocks) and 4 – no trawling (legally forbidden); 6 and 7 area of intense fishing with a bathymetric range identical to area 3. In the zone between the red line and the coastline, trawling is legally forbidden.

A second step consisted in crossing the information obtained from the skippers with the VMS (Vessel Monitoring System) database available at the General Directorate for Fisheries. Figure 1 shows the entire

coast with the blue areas corresponding to trawling positions, alternating with areas where no trawling occurs.

Areas 5 and 1 were rejected (the first one to avoid interaction with area 4, exploited with fixed gears, while area 1 has sandy bottom and is not a *Nephrops* ground). Area 3 was therefore chosen. This area has sediment properties similar to adjacent exploited areas and is avoided by trawlers because of large boulders surfacing out of the sediment. Here, it is easier to find a transect starting in a heavily fishing zone, continuing to a no fishing zone and going again through heavily fished grounds, maintaining all other conditions similar: northern edge of a marine canyon with depths around 500 meters. On the South coast, the contrast between no fishing and high fishing areas is also greater, because the South stocks are more intensively fished due to better weather conditions year-round and the proximity of rich rose shrimp grounds. Adjacent areas to the chosen unfished control zone are marked with numbers 6 and 7 in Figure 1. The chosen sampling areas (6-3-7 in Figure 1), are found along the Northern edge of the “Fossa Álvares Cabral” having below steep slopes off limits to fishing. At the South of the “Fossa Álvares Cabral” there is a wide plateau (Faro plateau identified as area number 2 in Figure 1), an area of intense fishing, known as “Mar da Beirinha de Fora”, with depths similar to the areas 6-3-7.

Sampling sites were defined along a transect running West-East from Olhos-de-Água to Tavira ($08^{\circ}05'$ and $07^{\circ}37'$) following the 500 meters bathymetry, starting in a heavily fished area, going across an area of no fishing and continuing to a second zone of intense fishing. A detailed map is presented in Figure 2. Along this transect, 7 sampling sites were defined (green markers in Figure 2): 2 sites on the West portion, 3 in the centre (no fishing zone) and 2 more at the East. Exact position of the stations is indicated in Table 1.

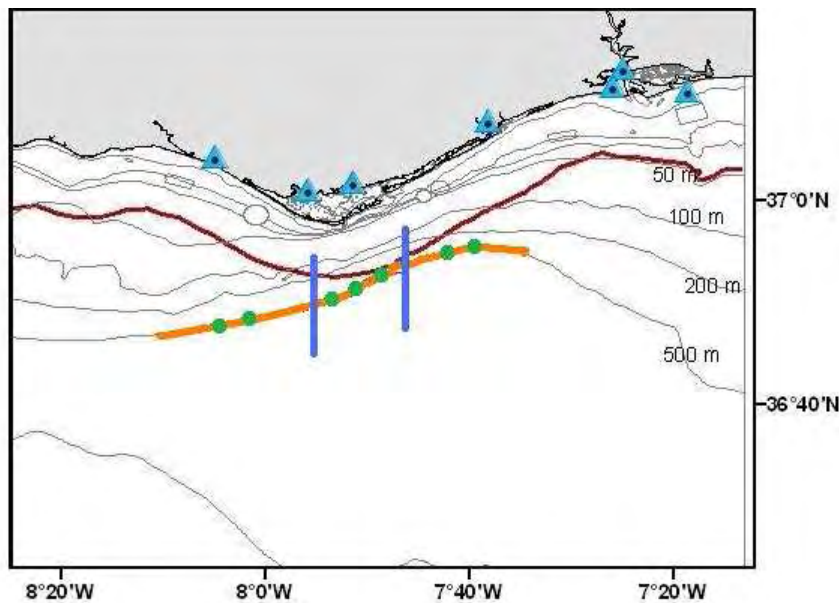


Figure 2. Location of transect (orange line) and main sampling sites (green markers). The central area between the blue vertical lines is an area of no fishing; the outside portions of the line correspond to areas of intense fishing.

Table 1. Position of the 7 stations along the 500 meter bathymetry.

Station	Treatment	Latitude	Longitude
1	Trawling	36°48.300	08°02.500
2	Trawling	36°48.800	07°59.000
3	No trawling	36°50.250	07°54.000
4	No trawling	36°51.600	07°51.500
5	No trawling	36°52.900	07°49.000
6	Trawling	36°54.700	07°43.000
7	Trawling	36.55.100	07°40.500

Work to be done on boars includes sampling in specific sites and the seafloor mapping of the general area of interest, and was organized in the following tasks:

- a) Seafloor mapping
- b) Video recordings
- c) CTD profiling
- d) Current profiling
- e) Plankton sampling
- f) Sediment sampling
- g) Trap fishing

The work on board will be distributed along 9 working days (8 nights). The day hours (06:00-20:00) will be dedicated to sampling with various equipments, the night hours to seafloor mapping (20:00-06:00). Two days will be dedicated to the capture of images with video. The need to bring up the camera to verify its correct functioning and the high likelihood of the need of numerous adjustments makes the timings associated with this task unpredictable. These two days will be the maximum time allocated to the image acquisition. They should be as early as possible (preferably during the first two working days), leaving open the possibility of moving them to later if the weather conditions prevent the launching of the camera. The remaining 7 days will be dedicated to sampling each one of the main 7 sites identified in Figure 2. The sequence of procedures is shown in Table 2.

Table 2 – Scheme of organization of work on board.

Day	Task	Hour		Station	Depth (m)
		beginning	ending		
1	Seafloor mapping	20:00	06:00		
1	Video recordings	06:00	20:00	1 to 3	500
2	Seafloor mapping	20:00	06:00		
2	Video recordings	06:00	20:00	4 to 7	500
3	Seafloor mapping	20:00	06:00		
3	Lauching trap line	06:00	07:00	1	530
3	Lauching CTD profiler	07:00	08:00	1	water column
3	Plankton sampling	08:00	10:00	1	water column
3	Retrieving trap line	10:00	11:00	1	
3	Box corer sample 1	11:00	12:00	1	500
3	Box corer sample 2	12:00	13:00	1	500
3	Box corer sample 3	13:00	14:00	1	500
3	Box corer sample 4	14:00	15:00	1	500
3	Box corer sample 5	15:00	16:00	1	500
3	Box corer sample 6	16:00	17:00	1	500
3	Time for adjustments	17:00	20:00	1	

days 4 to 9, repeat the planning for day 3 for other stations, starting from west to east

The daily working schedule occupies 11 of the 14 hours of day, leaving a margin to deal with delays without compromising the objectives of the cruise. The sequence of sampling procedures will be kept the same in order to guarantee that a specific type of data collection is done at the same hours of the day. It is expected that the sediment sampling with box corers will be the longest task. A box corer with replaceable boxes will be used, so that the sampling can proceed while the previous corer is being processed on the deck.

Short description of the methodologies associated with each task

a) Seafloor mapping

To accomplish the accuracy requirements, the mapping of the study area will result from a seabed remote surveying methodology based on the multibeam ecosounder fit in the vessel. In this process, data acquisition will result from the acoustically seabed sensing along a series of parallel transects to produce consecutive swaths covering all the working area. The global multibeam imagery will result from integrating the previously obtained swaths, allowing the production of global depth contour and depth morphology layers readily exported to ArcGIS maps. The area to be surveyed by multibeam sounder totals about 550km², in a zone limited by the longitudes 7° 30.0' and 8° 05.0' W and depths ranging from 200 up to 600m in the slope. The survey will be carried out along 12 transects totaling about 160nm, with direction to W-E and parallel to depth contours, using a nominal velocity of 6 knots.

The acoustic survey is scheduled to be conducted during the night period, from 20h to 06h, every day over the cruise time. The mapping of the collected information, both on depth and on backscattering texture discrimination of superficial seabed attributes, will form the framework for subsequent characterization of the study area. and will be a key component of the integrative interpretation desired in this project.

b) Video Observations

We propose to deploy a lander equipped with a self-contained low-light intensity SIT camera (Kongsberg-Simrad OE1324) and a 75W light focus along the surveyed transept to obtain video footages and/or still images. The system is programmed onboard according to the duration, frequency and nature (continuous or frame by frame) of records; footage visualization can only be made onboard after download of the video/image files. We expect that the information thus obtained will add to the extremely restricted existing data on these deepwater habitats. This methodological approach, although more time-consuming when compared to the set-up of the video system on a trawlable sledge, is a safer option when also surveying non-trawlable bottoms, as will be the case. Video stations will be carried out within the neighborhood of each of the 7 sampling sites. The lander will be lowered by the vessel's winch to the seafloor and left at that specific spot for 5 to 10 minutes. It is expected that a minimum of two and a maximum of three video stations will be carried out at each site (one at the exact site and the remaining 100 m apart from that point, keeping the same depth). The exact number of deployments will depend on the quality of video (or still images) acquired and the specific features of each site observed after the completion of individual track deployments, but mainly on time available. At such depths, at least one hour should be allowed for each deployment, recording, recovering and brief analysis of footage quality.

c) CTD profiling and Plankton sampling

The properties of the water column and water samples to characterize the plankton will be done with CTD and plankton nets. A multinet system composed by five plankton nets with a 100µm mesh will be used, these will open and close selectively at different water depths and its content stored in individual

cylinders. It is operated through an external, onboard, control system, thus allowing the collection of a significant plankton sample. Furthermore this system is equipped with a flow meter, enabling the calculation of the volume of filtered water and finally obtains a qualitative and a quantitative result. The study of the plankton at different depths is relevant for the interpretation of the microfauna in the sediments.

d) Current profiling

The hull mounted RDI 75 kHz ADCP will be used to profile the current along the ship track. Due to the mean depths of the sampling region and the relatively low frequency of the ADCP, we expect to carry out a bottom track calibration and to process the data with the manufacturer standard software (WINADCP). Alternatively, the CODAS (Common Ocean Data Access System) software will be used to process the ADCP data, since CCMAR has expertise on working with it. A light conventional current meter will be used to infer the current near the bottom at the main stations, providing data to allow the extrapolation of the ADCP measurements into the bottom boundary layer not resolved by the onboard ADCP, and extend the near bottom current estimates to the entire ship track. Current measurements (intensity and direction) are needed to estimate scavenger abundances and to evaluate the magnitude of sediment resuspension.

e) Sediment sampling

Sediment sampling will be undertaken by using a box corer. The procedure to be used for each corer will be the following:

- photographs of the surface are taken to describe the surface sediment (color, grain size, structures, disturbance, presence of biogenics or minerals, etc).
- half of each boxcore will be reserved for macrofaunal sampling; the sediment will be slice in different layers (0-1cm, 1-3cm, 3-5cm, 5-10cm, 10-20cm). The first layer will be kept entirely and the remaining will be sieved onboard (300µm mesh); all samples will be kept in 96% ethanol
- the surface sediment (first centimeter) of the remaining half of the boxcore will be sampled by using frames with different volumes to collect samples of microbenthics, planktonic foraminifera, grain size, total organic carbon, biomarker concentrations and fauna abundance and diversity. 7 subsamples of the core are obtained by using cylinder tubes, 4 with 10 cm diameters (full depth of the corer) and 3 with 3 cm diameter (top 10 cm of the corer)
 - 1 (10 cm) archive and will be frozen.
 - 1 (10 cm) microfossil communities (microbenthics and planktonic foraminifera);
 - 1 (10 cm) grain size and total organic carbon;
 - 1 (10 cm) biomarker concentrations;
 - 3 (3 cm) meiofauna

f) Trap fishing

A trap line with 50 traps modified to catch small scavengers will be deployed at each station. These are small octopus traps, covered with fine mesh (mosquito type net) and with the opening adapted with a spiral tube to avoid escaping of the individuals trapped. The line is completed with weights, buoys, signaling poles and cables. The traps will be numbered and baited with a standard, weighed amount of bait and a current meter will be coupled to the line. Using fixed amounts of bait and an estimation of the volume of water affected by the bait (direction and speed of the current) a comparative abundance index can be used to evaluate scavenger densities between trawled and non-trawled stations. The trap lines are available at CCMAR and will be transported to the vessel. Since we know from previous experience that the arrival of small scavenges happens almost immediately after the bait is available and after 4 hours most of the bait is consumed, the scheduling of work on board was planned so the traps stay in the water around 3 hours. A subsample of scavengers will be set aside and frozen so that the stomach contents may be analyzed for stable isotopes (trophic level signature of the diet)³³.

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3. Principal investigator and user group

Table 3 indicated the involvement of each member of the team in the different tasks, the degree of responsibility and the participation on the research cruise. The team is composed by specialists with different backgrounds that as a team have the competence to undertake de tasks. This proposal has a very critical point which is the need to be absolutely sure sampling is taking place in or out of trawled grounds. We therefore intend to invite an experienced skipper to be onboard during the cruise.

Table 3. Composition of the research team. Apart from these, the party going onboard will include an experienced skipper and 2 technicians to be hired specifically for the processing and sorting of the samples in the lab. The teams analyzing the samples and organizing the information derived from the obtained data (data bases, and papers) are expected to include numerous students that may use the work towards M.Sc. or Ph.D. thesis.

Institution	Participant	Going on board	Task description										
			Coord. team	Database setup	Sediments geo-chem	Sediments microbenthos	Sediments meiobenthos	Sediments macrobenthos	Plankton sampling	Obs.with video	Trap fishing	Current profiling	Seafloor mapping
CCMAR-UALG													
	M Castro (PI)	x	x	x							x		
	P Relvas											x	
	M Cristo	x							x		x		
	M Machado								x		x		
INRB/L-IPIMAR													
	A Campos	x	x	x						x			
	P Fonseca	x								x			x
	V Henriques	x									x		x
	T Fonseca	x		x									
MSS – Marie Scotland - Science													
	A Weetman	x								x			
ICM-CSIC													
	F Sardà		x						x				
	J Company						x				x		
	J Aguzzi									x			
	A Mechó	x							x		x		
	E Ramirez-Llodra								x				
LNEG/INETI													
	F Abrantes	x	x			x							
	M Rufino			x							x		
	A Aranda ¹						x						
	E Salgueiro						x			x			
	T Rodrigues				x								
CESAM-UA													
	M Cunha	x	x						x		x		

1 Also CESAM-UA

4. Technical capability to carry out the research cruise and data exploitation

Equipment onboard Garcia del Cid:

- Doppler Current Profiler (VM-ADCP)
- CTD profiler
- Mutibeam echosounder (frequencies, 50 kHz (3000 m) and 180kHz (600 m))

Mobile scientific equipment requested to the Garcia de Cid.

- Box corer
- Multinet plankton sampler

Equipment to be taken by the team

- Video camera and lander (IPIMAR)
- Trap lines for scavenger capture (CCMAR)
- Box corer with 2 boxes (LNEG)

Other materials needed that will be guaranteed by the team:

- Current meter
- All consumables, sampling material,

A proposal to cover insurance costs, consumables and labor contracts, was presented to the Foundation for Science and Technology and awaits evaluation. If funded, the proposal will cover insurance costs for the equipment (video, lander and a spare box corer) and researchers and fishing captain participating in the cruise, two grants for technicians to process the samples at LNEG and CCMAR (one year each) and funds for consumables associated with the sample and data collection on board and storage, and analytical procedures. This funding will only make the laboratory labor intensive tasks faster and more efficient, and will provide a margin in terms of insurance and consumable requirements, that can eventually be covered by the institutions involved.

Dissemination of the results will be done according to regular publication procedures including, scientific journals and presentations in conferences. Dissemination of results for the general public will be made, when results are available, through press releases and by posting results in web pages of the research centres and institutions involved.

Data set containing oceanographic information such as water properties, current profiles and seafloor maps will be made available upon request and will be sent to the site www.seadatanet.org.

The seabed physical and biological information obtained will contribute towards the European Commission objectives to promote the multidimensional mapping of Member State waters (Blue Book October 2007) and to launch a European Atlas of the Seas in which, a broad-scale habitat map covering the whole Atlantic Area, will be one of the major components. The outputs on seabed mapping obtained in this project will contribute to the ongoing Interreg Mesh-Atlantic project (www.meshatlantic.eu), aiming to collate seabed data and produce a broad-scale seabed habitat mapping of the southern Atlantic area regions (Portugal, Spain, France and Ireland).

5. National and International collaboration

The data collected on board (images, bathymetry, CTD and current profiling) and all the information extracted from the samples (sediments and plankton including physico-chemical properties, and biodiversity data) will be integrated in a database coupled to GIS coordinates with the necessary layers and metadata. This database will be freely used by all member of the team integrating this proposal, and will be made available to colleagues in research institutions that request it.

Although not formally integrated in other projects, the outputs from this project will integrate results from other projects. Examples are: Project MeshAtlantic, INTERREG AA, 2010-2013 – Mapping Atlantic Area Seabed Habitats for Better Marine Management (A. Campos, P Fonseca and V. Henriques); IMPROVE- Inner shelf hydrographic and biological processes controlling invertebrate population in the Portuguese coast, using decapods as models", 2011-2014 (P. Relvas); BIODIVERSITY AND ECOSYSTEM FUNCTIONING IN CONTRASTING SOUTHERN EUROPEAN DEEP-SEA ENVIRONMENTS (BIOFUN), Census of Marine Life. 2007-2011, EuroDEEP program, European Science Foundations (F. Sardá).

6. Training of young scientists/public outreach

Apart from the team identified previously, students will join this team. At present two PhD student (Teresa Fonseca and Arianda Mechó) are already participating (VMS data and identification of fishing grounds, and deep sea ecology). Other students, especially Master's students, will be involved and will use the samples and data produced as M.Sc. thesis projects.

7. Travelling and shipment costs

Travelling of people and equipments:

2 trips of 2 days with rented truck to move equipment Lisbon-Portimão (port of mobilization and demobilization) and Portimão Lisbon (including rental, fee for different pickup and drop points, insurance and gasoline)	900€
1 round trip (airplane) Aberdeen – Faro – Aberdeen (A Weetman)	400€
1 round trip (airplane) Barcelona – Faro – Barcelona (A Mechó)	280€
1 round trip (car) Aveiro – Faro – Aveiro (M Cunha)	450€
2 round trip (car) Lisboa – Portimão - Lisboa (LNEG nad IPIMAR)	600€
TOTAL	2 630€

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Born at	22/05/1957	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

1990 onwards	University of Algarve, associate professor in fisheries science since 1999
1983-1990	University of Rhode Island, graduate student: M.Sc in Experimental Statistic and Computer Science and Ph.D. in Biological Oceanography.
1978-1983	National Institute for Fisheries research (Lisbon): Training (2 years) and working contract (2 years), part of the Stock Assessment Group, with specific tasks dealing with the assessment and management of the Norway lobster.
1975-1980	University of Lisbon, B.Sc in Biology (5 years)

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Research interests:

Impacts of trawl fishing. Biology and ecology of crustaceans.

Advising of students in Marine Biology and Fisheries (completed degrees):

Supervision of 5 Ph.D. and 16 M.Sc thesis and 23 honor's thesis (5 years pre-Bolonha B.Sc.)

Main Research projects related with the EUROLLEETS proposal - coordination (C) or coordination of institutional participation (CIP):

1999-2001 - IRMAR - Impact of discards on the abundance of bottom crustacean resources, PRAXIS XXI 2/2.1/MAR/1734/95 (CIP).

1997-1999 – FATES - Methodologies to Study the Impact of Discards in Trawl Fisheries, DG-XIV/C/1/96-064 (C).

1993-1996 – NEMED - Nephrops norvegicus: Compared biology and fisheries, CE DGXIV, MED/92/008 (CIP).

Sea-going experience

MRV PROFESOR SIEDLCKI	8 (1987/88). South Georgia Demersal Resources - AMLR Program, NOAA (EUA) – 5 weeks
N/E NORUEGA (1982)	– Nephrops Research Cruise 020360282 - INIP, Lisboa – 4 weeks
N/I MESTRE COSTEIRO (1981)	– Crustacean Research Cruise 010650881- INIP, Lisboa – 4 weeks
B/O CORNIDE DE SAAVEDRA (1979)	– Survey of Norway lobster fishing grounds in ICES area IXa- IEO, Vigo – 5 weeks
N/E NORUEGA (1979)	– Pelagic Research Cruise - INIP, Lisboa – 4 weeks
Numerous 2 days to 1 week trips in fishing vessels chartered for research work.	

Relevant Publications (max. 5)

1	Castro, M, A Araújo and P Monteiro. 2005. Fate of the discards from the crustacean trawl fishery off the south coast of Portugal . N. Zeal. J. Mar. Fresh. Res. 39: 437-446.
2	Monteiro, P A, A Araujo, K Erzini and M Castro. 2001. Discards of the Algarve (southern Portugal) crustacean trawl fishery. Hydrobiologia 449: 267-277.
3	Erzini, K, P Monteiro, A Araújo and M Castro. 2003. Limited mid-water scavenging of trawl discards. J.Mar. Biol. Ass. U.K. 83: 731-734.

<i>Paulo José Relvas de Almeida</i>			
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Born at	04/06/1958	Gender	Male

Degrees + Scientific Career (please extent/delete as appropriate)

1987-1999	Teaching Assistant at University of Algarve
1999-present	Assistant Professor at University of Algarve
1998-2009	Researcher at Centre for Marine and Environmental Research, Univ. Algarve
2009-present	Researcher at Centre for Marine Sciences, Univ. Algarve
1985	B.Sc. in Physics (5 years, Bolonha eq. M.Sc.), University of Lisbon
1999	PhD in Physical Oceanography, University of Wales, UK

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Research interests: Eastern Boundary Current Systems. Dynamical processes in the Coastal Transition Zone. Coastal and shelf oceanography. Coastal upwelling. Variability of upwelling systems. Structure and dynamics of upwelling filaments. Inner shelf circulation. Sea level variations. Applied remote sensing.

Training and teaching oceanography: Faculty of Sciences and Technology, University of Algarve: Meteorology and Climatology, Physical Oceanography, Dynamical Oceanography (Degree in Marine Sciences); Coastal and shelf oceanography (Masters in Oceanography).
University of Cape Vert, Mindelo: Oceanography in the Masters in Marine Resources and Coastal Management.

Relevant research projects: Acoustic Tomography Monitoring System (**ATOMS**), 2001-2004 (coordination of the CIMA/UAlg partnership); -Physical and Biogeochemical Dynamics of Coastal Countercurrents: A Study Case in Algarve Luff (**DYNOCOSTAL**), 2006-2009 (coordination of the CIMA/UAlg partnership); -Long Term Variability of the Canary Current Upwelling System (**LongUp**). 2010-2013 (coordination); **IMPROVE**- Inner shelf hydrographic and biological processes controlling invertebrate population in the Portuguese coast, using decapods as models", 2011-2014 (coordination of the CCMAR/UAlg partnership)

Sea-going experience

Main cruises:
ATOMS Cruise. Vessel NRP D.Carlos I, from IH, Portuguese Navy, 22-26 Oct. 2004 - Cape St. Vincent, SW Iberia (chief scientist); CIMA Cruise. Vessel NRP D.Carlos I, from IH, Portuguese Navy, 1-5 Oct. 2006 – Northern margin of the Gulf of Cadiz (chief scientist); P3A2 Cruise (Producción Pelágica en la Plataforma Atlántico-Andaluza). Vessel: Hespérides, Spanish Navy, 4-14 Oct. 2008 – Gulf of Cadiz (member of team).

Relevant Publications (max. 5)

1	Relvas, P., and E.D. Barton, Mesoscale patterns in the Cape São Vicente (Iberian Peninsula) upwelling region, <i>Journal of Geophysical Research</i> , 107(C10), 3164, doi:10.1029/2000JC000456, 2002.
2	Relvas, P., and E. D. Barton, A separated jet and coastal counterflow during upwelling relaxation off Cape São Vicente (Iberian Peninsula), <i>Continental Shelf Research</i> , 25, 29-49, 2005.
3	Sánchez, R., E. Mason, P. Relvas, A. J. da Silva, and Á. J. Peliz. On the inshore circulation in the northern Gulf of Cádiz, southern Portuguese shelf. <i>Deep-Sea Res. II</i> , 53, 1198–1218, 2006.
4	Relvas, P., E. D. Barton, J. Dubert, P. B. Oliveira, Á. J. Peliz, J. C. da Silva and A. M. P. Santos, Physical oceanography of the Western Iberia Ecosystem: latest views and challenges, <i>Progress in Oceanography</i> , 74, 149-173, 2007.
5	Relvas, P., J. Luís, and A. M. P. Santos, Importance of the mesoscale in the decadal changes observed in the northern Canary upwelling system, <i>Geophys.Res. Lett.</i> , 36, L22601, doi:10.1029/2009GL040504, 2009.

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Born at	11/12/1956	Gender	Female

Degrees + Scientific Career

2001 onwards	University of Algarve - Assistente Professor
1991-2001	University of Algarve – Teaching Assistant
1989-1991	University of Lisbon – Teaching Assistant
1978-1984	Fisheries research Institute of Mozambique – Research Assistant
2001	PHD in Ecology, Community Ecology
1978	B.Sc in Biology (5 years, Bolonha equivalent of M.Sc.)

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Area of scientific activity:

Fisheries biology and ecology of decapod crustaceans.
Feeding ecology of crustaceans.
macro-invertebrate community studies

Major contribution to this project:

Collection and processing of benthic samples and analysis of stomach contents of crustaceans.

Sea-going experience

Participation in 2 cruises off the coast of Mozambique on the R/V Dr Fridjof Nansen

Relevant Publications (max. 5)

1	Cristo, M., M. Castro - 2005. Field estimation of daily ration of Norway lobster <i>Nephrops norvegicus</i> (L.) - in the south of Portugal. New Zealand Journal of Marine and Freshwater Research , 39(3): 485-491.
2	Cristo, M. – 2001. Gut evacuation rates in <i>Nephrops norvegicus</i> (L.): laboratory and field estimates. Scientia Marina , 65 (4): 341-346.
3	Cristo, M and P. Encarnação - 2000. Laboratory estimates of the daily ration of the Norway lobster <i>Nephrops norvegicus</i> (L.) (Decapoda) from the southern coast of Portugal. Crustacean Issues , 12: 689-695.
4	Cancela da Fonseca, L., A. M. Costa, F. Magalhães e M. Cristo – 1999. Macroinvertebrate Community of “Lagoa da Sancha” Lagoonal System (SW Portugal). Limnética , 16: 39-48.
5	Cristo, M. and J. E. Cartes - 1998. A comparative study of the feeding ecology of <i>Nephrops norvegicus</i> (L.), (Decapoda: Nephropidae) in the Bathyal Mediterranean and the adjacent Atlantic. Scientia Marina , 62 (Suppl.): 81-90.

Maria Margarida de Oliveira Maló Machado			
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Born at	17/April/1956	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

1991-onwards	University of Algarve - Technician in Ecology (senior position since 2009)
1980– 1991	University of Aveiro - Teaching Assistant
1979	University of Lisbon - B.Sc in Biology (5 years, Bolonha equivalent of M.Sc)

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Area of scientific activity:

Biodiversity, biology and ecology of aquatic systems: 1) marine and lagoonal/estuarine ecosystems; 2) freshwater temporary ponds.

Coordination of 2 research projects; participation in 14 others; major contribution, in 9 of these projects, towards the identification of benthic macroinvertebrate fauna, namely gastropods, bivalves, echinoderms, bryozoans, ascidians. Particular experience with the taxonomy of polychaetes and leptostracan and peracaridan crustaceans.

Major contribution to this project:

Sampling analysis and sorting of macrobenthos. Taxonomi of macroinvertebrates.

Sea-going experience

Not relevant.

Relevant Publications (max. 5)

1	TAVARES, P. C., M. MACHADO & L. CANCELA DA FONSECA, 2008. Colonization process in soft-bottom macrofauna communities using azoic sediments: comparison of two wetland systems with different organic loads. <i>Fundamental and Applied Limnology/Archiv für Hydrobiologie</i> , 171 (3), 219-132.
2	SPRUNG, M. & M. MACHADO, 2000. Distinct life histories of peracarid crustaceans in a Ria Formosa salt marsh (S. Portugal). <i>Wetlands Ecology and Management</i> , 8, 105-115.
3	MACHADO, M. M. & A. M. COSTA, 1994. Enzymatic and morphological criteria for distinguishing between <i>Cardium edule</i> and <i>C. glaucum</i> of the Portuguese coast. <i>Marine Biology</i> , 120, 535-544.
4	MOREIRA, M. H., H. QUEIROGA, M. M. MACHADO & M. R. CUNHA, 1993. Environmental gradients in a southern europe estuarine system: Ria de Aveiro, Portugal. Implications for soft bottom macrofauna colonization. <i>Netherlands Journal of Aquatic Ecology</i> , 27 (2-4), 465-482.
5	COSTA, A. M. & MACHADO, M. M., 1984. Estudo do ciclo sexual de <i>Mytilus galloprovincialis</i> Lmk do Estuário do Tejo (Study of the sexual cicle of <i>Mytilus galloprovincialis</i> Lmk from Tagus estuary). <i>Actas del III Simposio Iberico de Estudios del Benthos Marinho</i> (Pontevedra, Out. 1982). <i>Cuad. Marisq. Publ. Téc.</i> , 7, 177-191.

<i>Maria Aida Viana da Silva Campos</i>			
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Born at	16/01/1961	Gender	Female

Degrees + Scientific Career

1985	First degree in Biology (Univ. Lisbon)
1992	Post-graduate degree in Business Management. ISCTE, Lisbon
2004	Ph.D. in Fisheries Science and Technology, Univ. of Algarve (UAlg), Centre for Marine Sciences
1985-2011	Researcher at IPIMAR
1994-2011	1994 to present-Teaching (MSc courses) at the Univ. of Algarve (UAlg) and Porto (ICBAS).

Research Topics

Fishing Technology / Selectivity. Management of by-catch and discards. Contract Study TE 1.126. IPIMAR/DIFTA 1990-1993 (**Coordinator**); **Contract Study 1992/11.** Codend selectivity, IPIMAR; **Project BIOECO/93/02.** Gill-net selectivity, IPIMAR 1992-1993; **Study Contract 94/118.** Methods for Gill-net Selectivity Research, CONSTAT/DIFTA/IPIMAR 1995-1997; **FAIR 96-98.** SELDAT–Selectivity database 1996-1998; **TRASEL Study Contract 96/61** TRAWL SElectivity studies, IPIMAR/IEO/IFREMER 1998-2000; **BYDISCARDS** 1999-2000. Study project 99/058, CCMAR/Tromso University/IPIMAR (**Coordinator by IPIMAR**); **EFIMAS**, Evaluation Tools for Fisheries Management OptionS (2006-2007). SSP8-CT 2003-502516. **NECESSITY** SSP8-CT-2003-501605, Nephrops and CEtecean Species Selection Information and Technology. SSP8-CT-2003-501605 2004-2007.

Unaccounted mortality in fisheries. Gear-induced mortality. Project SURVIVAL - Survival of Nephrops escaping from trawl codends, 2006-2009 IPIMAR/CCMAR. Funded by FCT. PDCT/MAR/59366/2004 (**Coordination**).

Analysis and integration of Vessel Monitoring System (VMS) data with landing records and data from sampling programmes to improve scientific advice to fisheries management. Fisheries Technologies MARE, FEDER (QCA III)22-05-01-FDR-00014, 2000-2007.

Sea-going experience

Since 1985, participation, at the scope of research projects, in more than 20 sea surveys with variable duration (from days to 1 ½ month) onboard research and fishing vessels.

Relevant Publications

1	Campos, A., Fonseca, P., 2004. The use of separator panels and square mesh windows for by-catch reduction in the crustacean trawl fishery off the Algarve (South Portugal). <i>Fish. Res.</i> 69: 147-156.
2	Fonseca, P., Campos, A., Larsen, R.B., Borges, T.C. and Erzini, K., 2005. Using a modified Nordmore grid for by-catch reduction in the Portuguese crustacean trawl fishery. <i>Fish. Res.</i> 71: 223-239.
3	Campos, A., Fonseca, P., Fonseca, T., Parente, J., 2007. Definition of fleet components in the Portuguese bottom trawl fishery. <i>Fish. Res.</i> 83: 185-191.
4	Fonseca, T., Campos, A., Afonso-Dias, M., Fonseca, P., Pereira, J., 2008. Trawling for cephalopods off the Portuguese coast – fleet dynamics and landings composition. <i>Fish. Res.</i> 92:180-188.

<i>Paulo Jorge Menano Ribeiro da Fonseca</i>			
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Born at	04/05/1961	Gender	Male

Degrees + Scientific Career (please extent/delete as appropriate)

November 2008 onward	Auxiliary researcher at INRB IP/L-IPIMAR
May 1998-September 2008	Assistant researcher at former INIAP/IPIMAR (currently INRB IP/IPIMAR)
May 1990-April 1998	Junior researcher at former IPIMAR (currently INRB IP/IPIMAR)
October 1985 – April 1990	Contractee at the former INIP (currently INRB IP/IPIMAR)
1986 (April-May)	Course in fishing gear development at the former Danish Institute of Fishing Technology and aquaculture (DIFTA), Hirsthals, Denmark
1985	Licentiate degree (5-year degree)

Research Topics

Twenty five years of experience in the area of fishing technology (selectivity of mobile and passive gears, including development and testing of by-catch reduction devices; by-catch and discard reduction; survival of escaping fish, fuel-saving trawl gears; use of video techniques for habitat classification and evaluation of the impact on the gears in the ecosystem). He has participated in a number of EU and nationally funded projects as co-ordinator, Study contracts [91/010](#), [92/011](#) and [96/061](#) (TRASEL); as responsible at IPIMAR: Study contract [94/118](#), FAIR programme [CT96-1452](#) (MESH), [CT96-1531](#) (SELDAT1), [CT98-4044](#) (SELDAT2), FP6 programme SSP8-CT-2003-501605 (NECESSITY) and SSP8-CT-2003-502516 (EFIMAS)”; or as a team member, FAR programme [TE-2-408](#) and [FAR TE-1-126](#). [BIOECO 093/02](#), Study project [99/058](#) (BY-DISCARDS), FCT (national) POCTI/MAR/59366/2004 (SURVIVAL), LIFE programme [PTCON0010](#) (BIOMARES), Projecto MeshAtlantic, INTERREG AA, 2010-2013 – Mapping Atlantic Area Seabed Habitats for Better Marine Management.

Member of the Working Group on Fishing Technology and Fish Behaviour of the International Committee for the Exploration of the Sea (ICES)

Sea-going experience

Extensive experience of working onboard research and commercial vessels within the scope of research projects and support to the fishing industry.

Relevant Publications (max. 5)

1	Fonseca, P., Correia, P.L., Campos, A., Lau, P.Y., Henriques, V., 2008. Fishery-independent estimation of benthic species density – a novel approach applied to the Norway lobster (<i>Nephrops norvegicus</i>). <i>Mar. Ecol. Prog. Ser.</i> 369, 267-271.
2	Lau, P.Y., Correia, P.L., Fonseca, P., Campos, A., 2011. Automatic detection and tracking of Norway lobsters and their burrows from deep-water videos. <i>IET Image Processing XX</i> , XXX-XXX. (accepted for publication).

<i>Victor Manuel Leitão Henriques</i>			
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		E-mail	victorh@ipimar.pt
Born at	07/07/1955	Gender	Male

Degrees + Scientific Career (please extent/delete as appropriate)

Since 2005	Auxiliary researcher at the INRB IP/L-IPIMAR
1998/2005	Assistant researcher at former INIAP/IPIMAR (currently INRB IP/IPIMAR)
1986/1998	Contractee at the former INIP (currently INRB IP/IPIMAR) A two weeks course in 1987 about Fishing technology at IFREMER(reduce scaled gears test techniques at the flume tanks in Lorient and Boulogne-sur-Mer).
1986	3 month course on Fishing Gear Technology at the former Danish Institute of Fishing Technology and aquaculture (DIFTA), Hirsthals, Denmark
1984	Degree in Electronic engineering (5 years) at the Technical University of Lisbon

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

<p>Expertise in fishing technology (Design of commercial fishing gears and testing at sea using full scale gears and at flume tanks using reduced models for optimise working processes and/or reduce fuel saving), and acoustics (surveys for fish and crustacean species assessment and survey of seabed physical characteristics for mapping deep-water fishing areas along the Portuguese continental slope. Habitat mapping using remote sensing processes).</p> <p>Participation as coordinator or team member in a range of national founded projects and programs as well as in international projects, namely in the Study contracts <u>91/010</u>, <u>92/011</u>; FAR programme <u>FAR TE-1-126</u>; LIFE programme <u>PTCON0010 (BIOMARES)</u>, <u>Projecto MeshAtlantic</u>, <u>INTERREG AA, 2010-2013 – Mapping Atlantic Area Seabed Habitats for Better Marine Management</u>.</p> <p>Member of the Working Groups of the ICES</p> <ul style="list-style-type: none"> - Marine Habitat Mapping Working Group - Fishing Technology and Fish Behaviour Working Group
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Sea-going experience

Twenty years experience of working at sea onboard research and commercial vessels under the framework of research projects and technological support to the fishing industry.

Relevant Publications (max. 5)

1	Henriques, V., 2005. Cartografia do Relevo Submarino e Pesca Experimental na Vertente Continental Portuguesa. IPIMAR, 236pp. Thesis.
2	Henriques, V.; Guerra, M.; Gaudêncio, M.J., Campos, A., Fonseca, P., 2010. Biomares: Marine habitat Characterization – Action A4 Final Report. IPIMAR, Lisboa. 42 pp.
3	Henriques, V.; Quintans, M.; Parente, J.; Fonseca, P., 2008. Cartografia de fundos de pesca de profundidade do Mar de S. Vicente, Planalto de Sagres. <i>Relat. Cient. Téc. IPIMAR, Série digital</i> (http://ipimarinipimar.pt) nº45, 22pp.
4	Fonseca, P., Correia, P.L., Campos, A., Lau, P.Y., Henriques, V., 2008. Fishery-independent estimation of benthic species density – a novel approach applied to the Norway lobster (<i>Nephrops norvegicus</i>). <i>Mar. Ecol. Prog. Ser.</i> 369, 267-271.

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Born at	11/01/1974	Gender	Female

Degrees + Scientific Career

2003	First degree (Licenciatura) in Marine Biology and Fisheries . University of the Algarve (UAlg.), Portugal.
2006	Post-graduate in Applied Statistics in Biology and Health Sciences . University of Lisbon, Portugal.
Since 2009	PhD fellowship in Fisheries Science and Technology, UAlg. Thesis entitled "Analysis of the Portuguese coastal trawlers fleet dynamics based on landings composition and vessel monitoring system data." Funded by the Portuguese FCT (Science and Technology Foundation). Supervisors: Dr.Aida Campos/Prof. M. Afonso-Dias
2004-2008	Fellowship of Scientific Research (Level 3). 2007 - 2008 Project BIOMARES (Restoration and Management of Biodiversity in the Marine Park Site Arrábida- Espichel). 2004 - 2007 . Project "Tecnologias da pesca" (Fisheries Technologies) – Programme MARE, IPIMAR.
2001-2002	Fellowship (Level 2). Project "Programa Nacional de Recolha de Dados da Pesca" and "SAMFISH". Olhão, IPIMAR.

Research Topics

PhD. study involves analyses of fleet segmentation using fishery-dependent data (landings and geo-referenced information from the vessel monitoring system, VMS). The objective is to estimate, among others, species-directed effort and abundance indices for commercial species. VMS information will be processed to identify and map fishing grounds.

Statistical data analysis experience includes spatial, generalized linear modelling and multivariate techniques. Experience with the following statistical softwares: R, SPSS, SAS and STATISTICA. Experience with database and Geographical Information Systems: MS ACCESS, ArcGis, and QuantumGIS. Attended various courses including in Pos-graduate (update) course SIGAIA 2011 (GIS applied in Earth Sciences). Feb. 2011. FCUL, University of Lisbon.

Main research interests include: fleet dynamics and segmentation in multispecies fisheries namely the estimation of species-directed effort and fishery-based abundance indices; data management and statistical analysis.

Sea-going experience

Participated in research campaigns onboard research and fishing vessels (projects MARE, BIOMARES and SURVIVAL), within the scope of selectivity, bottom topography, experimental fishing and survival of fishing escaping from gear.

Worked as a fishery observer in 1999, for the Azores Fishery Observer Program, and as a European Union observer in the NAFO area, 2002-2003.

Relevant Publications

1	Campos, A., Fonseca, P., <u>Fonseca, T.</u> , Parente, J., 2007. Definition of fleet components in the Portuguese bottom trawl fishery. Fish. Res. 83: 185-191.
2	<u>Fonseca, T.</u> , Campos, A., Afonso-Dias, M., Fonseca, P., Pereira, J., 2008. Trawling for cephalopods off the Portuguese coast – fleet dynamics and landings composition. Fish. Res. 92:180-188.
3	Mendes, B., Campos, A., Fonseca, P., Afonso-Dias, M., <u>Pilar-Fonseca, T.</u> 2009. Fleet spatial dynamics in Portuguese fish trawlers - modelling the individual decision to return to previous fishing grounds areas. ICES CM 2009/O:27.

Francisco A. Sardà			
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Born at		Gender	male

Degrees + Scientific Career (please extent/delete as appropriate)

1980	PHD Biology. University of Barcelona
1983-1984	Chief of Department
2006	Rerserach Professor

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Specialist on crustaceans, ecology and fisheries. During last times was specialized in deep-sea ecology, mainly on the Mediterranean area. Publisher more than 100 scientific papers and IP of more than 10 competitive research projects and have been director of 7 PhD thesis.

Recent projects as IP

- **INFLUENCIA DEL COMPORTAMIENTO RITMICO DE LA CIGALA (*Nephrops norvegicus* L.). SOBRE SU CAPTURABILIDAD POR LA PESQUERIA DE ARRASTRE EN EL MEDITERRANEO OCCIDENTAL (NERIT)**.

1998-2001 (CICYT- MAR98-0935). (PI) National project

- **INCIDENCIA DE LOS RITMOS DE EMERGENCIA DE LA CIGALA (*Nephrops norvegicus*) EN LA VALUACIÓN DE SUS POBLACIONES (NORIT)**. CTM2005-02034/MAR. 2005-2008 (PI) National project

- **NEPHROPS AND CETACEAN SPECIES SELECTIVITY, INFORMATION AND TECHNOLOGY (NECESSITY)**

2004-2007 (FP6-2002-SSP/STREP. nº 501605), (CIP) CE project

- **BIODIVERSITY AND ECOSYSTEM FUNCTIONING IN CONTRASTING SOUTHERN EUROPEAN DEEP-SEA ENVIRONMENTS (BIOFUN)**. Proyecto afiliado al *European Census of Marine Life*. 2007-2011 (EuroDEEP program). European Science Fundations (ESF) Eurocores. Acción Complementaria (MYCIT)

CTM2007/28739-E/MAR. (C).

Sea-going experience

Marine biology and ecology, biodiversity, deep-sea exploration. Fisheries and technology.

Relevant Publications (max. 5)

1	1. Sardà, F., J.B. Company; N. Bahamon, G. Rotllant, M.M. Flexas, J.D. Sánchez, D. Zúñiga, J. Coenjaerts, D. Orellana, G. Jordà, J. Puigdefàbregas, A. Sánchez-Vidal, A. Calafat, D. Martin, M. Espino. (2009). Relationship between environment and the occurrence of the deep-water rose shrimp <i>Aristeus antennatus</i> (Risso, 1816) in the Blanes submarine canyon (NW Mediterranean). <i>Progr. in Oceanography</i> , 82(4): 227-238. (doi:10.1016/j.pocean.2009.07.001).
2	2. Coll, M., N. Bahamón, F. Sardà, I. Palomera, S. Tudela and P. Suuronen (2008). Improved trawl selectivity: effects on ecosystems in the South Catalan Sea (NW Mediterranean). <i>Marine Ecology. P.S.</i> 355: 131-147.
3	3. Suuronen, P. and Sardà, F. (2007) The role of technical measures in European fisheries management and how to make them work better. <i>ICES Journal of Marine Science</i> 64: 751-756.
4	4. Sardà, F., N. Bahamón, B. Molí, and F. Sardà-Palomera (2006). The use of a square mesh codend and sorting grids to reduce catches of young fish and improve sustainability in a multispecies bottom trawl fishery in the Mediterranean Sea. <i>Scientia Marina</i> . 70(3): 347-353.
5	5. Sardà, F., (Editor Jefe, 2004). G. D'Onghia, C.Y. Politou and A. Tselepides (Co-editores) Mediterranean Deep-sea Biology . <i>Scientia Marina</i> , 68(Supl. 3): 204 pp.

Joan B. Company			
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Affiliation	Marine Renewable Resources Department Psg. Marítim Barceloneta 37-49 08003 Barcelona, Spain	Fax	+34 932309555
		E-mail	batista@icm.csic.es
Born at	02/08/1965	Gender	Male

Degrees + Scientific Career (please extent/delete as appropriate)

1990	Degree in Biology, University of Barcelona, Spain
1995	PhD in Ecology, University of Barcelona, Spain. Supervisor: Prof. F. Sardà
1996-1999	Post-doctoral stay at the University of California at Santa Barbara, Santa Barbara, CA, USA. Functional physiology of deep-sea decapod crustaceans.
2000-2008	Tenure track scientist position in the Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain.
2008	Permanent Position at the Marine Science Institute (ICM-CSIC), Barcelona, Spain.

Research Topics

Ecological dynamics of the deep continental margins, reproductive strategies of deep-sea animals, population dynamics and functional physiology of benthic organisms. Author of 69 papers, books chapters and short notes, of which 56 in journals included in the JCR of the ISI. Member of the editorial committee of the ISI journal <i>Scientia Marina</i> . Principal Investigator of 3 national and 2 European scientific projects.

Sea-going experience

30 oceanographic cruises with approx. 600 days at sea (12 as Chief Scientist), 1 dive in the submersible ALVIN at 2850 m depth and 2 ROV cruises (<i>MaxiRover</i> , GR & <i>LIROPUS</i> , Spain). Studied areas (400-3000 m depth): continental margin of the Mediterranean, Pacific midwater and benthic deep ecosystems, Antarctic continental margins, Pacific hydrothermal and Mediterranean canyons.

Relevant Publications (max. 5)

1	Company, J.B., P. Puig, F. Sardà, A. Palanques, M. Latasa and R. Shaerek (2008). Climate influence on deep-sea populations. <i>PLoS ONE</i> (3)1: e1431(doi:10.1371/journal.pone.0001431).
2	Ramirez-Llodra, E., Company, J.B., Sardà, F. & Rotllant, R. (2010). Megabenthic diversity patterns and community structure of the Blanes submarine canyon and adjacent slope in the Northwestern Mediterranean: a human overprint? <i>Marine Ecology</i> , 31: 167-182.
3	Company, J.B., E.V. Thuesen, J.J. Childress, G. Rotllant and F. Zal (2008). Effects of food deprivation on the enzymatic activities of the deep-sea crab <i>Geryon longipes</i> (Decapoda; NW Mediterranean) and <i>Bytograea thermidron</i> (Decapoda; Pacific Hydrothermal vent). <i>Crustaceana</i> , 81(1): 67-85.
4	Danavaro, R., J.B. Company, C. Corinaldesi, G. D'Onghia, B. Gallil, C. Gambi, A.J. Gooday, N. Lampadariou, G.M. Luna, C. Morigi, V. Polymenakou, E. Ramírez-Llodra, A. Sabbatini, F. Sardà, M. Sibuet and A. Tselepides (2010). Deep-sea biodiversity in the Mediterranean Sea: the known, the unknown, and the unknowable. <i>PLoS ONE</i> , 5 (8): e11832.
5	Company, J.B., P. Maiorano, A. Tselepides, CH-Y Politou, W. Plaity, G. Rotllant and F. Sardà (2004). Deep-sea decapod crustaceans in the western and central Mediterranean Sea: preliminary aspects of species distribution, biomass and population structure. <i>Scientia Marina</i> , 68(3): 73-86.

<i>Jacopo Aguzzi</i>			
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Born at	10/03/1972	Gender	Male

Degrees + Scientific Career

1991-1998	B.Sc. Biological Sciences - Tor Vergata University (Rome, Italy)
1999-2002	M.Sc. and Ph.D. in Marine Sciences - Polytechnique University (Barcelona)
2002-2003	Postdoctoral Period Tor Vergata
2003-2005	Research Scholar Neuroscience Institute. Morehouse School of Medicine (MSM) Atlanta (Georgia, EEUU)- National Space Biomedical Research Institute (NSBRI-NASA)
2005 to present	Postdoctoral contracts Juan de la Cierva; JAE (CISIC); Ramon y Cajal

Research Topics

Behavioral activity in marine organisms. Influence of biological rhythms in demersal communities. Rhythmic variations in intra- and interspecific interactions (for the vertical, along bottom or within the sediment displacement) and geophysical controlling cycles (day-night, internal tides, and inertial currents of atmospheric origin).

1) Identification of molecular and physiological markers of diel and seasonal rhythmicity in deep water species: Identification of markers at a molecular level (clock genes controlling rhythmic behavior) and a physiological level (hormones). Characterization of rhythmic patterns of expression in such markers hence clarifying the connection between the mechanism of functioning of the biological clock, the rhythmic behavior, and the catchability.

2) Technology for the monitoring of behavioral rhythms: The development of technology for the real-time remote monitoring and processing of behavioral data through the implementation of infrared actography, telemetry, and video image analysis both in the laboratory and in the field at different depths, including the deep-sea, below the influence of light.

Sea-going experience

B/O "García del Cid", Catalan Sea: **a**-NERIT I. 1999; **b**-NERIT II. 2000; PROMETEO I. 2008; **d**-PROMETEO II. 2009; **e**-PROMETEO III. 2009.

B/O "Sarmiento de Gamboa", Western, Central, Eastern Mediterranean; **f**-BIOFUN I. 2009.

Relevant Publications (max. 5)

1	AGUZZI J., et al. 2011. Biorhythms challenge to stock and biodiversity assessments: cabled observatories video-solutions. <i>Oceanog. and Mar. Biol. An. Rev.</i> (accepted)
2	CHIESA J.J., AGUZZI J. , GARCÍA J.A., SARDÀ F., DE LA IGLESIA H. 2010. Light intensity determines temporal niche switching of behavioral activity in deep water <i>Nephrops norvegicus</i> (Crustacea: Decapoda). <i>Journal of Biological Rhythms</i> . 25: 277-287.
3	AGUZZI J. , COMPANY J.B. 2010. Chronobiology of deep-water decapod crustaceans on continental margins. <i>Advances in Marine Biology, an Annual Review</i> . 58: 155-225.
4	COLL M. <i>et al.</i> 2010. Biodiversity of the Mediterranean Sea: status, patterns & threats. <i>PlosOne</i> . Volume 5: e11842
5	AGUZZI J. et al. 2010. Behavioural rhythms of hydrocarbon seep fauna in relation to internal tides. <i>Marine Ecology Progress Series</i> . 418: 47-56

<i>Ariadna Mecho Lausac</i>			
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Born at	27/12/1981	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

2009 to present	PhD in taxonomy and distribution of deep-sea non crustacean invertebrates in the ICM (CSIC) Department of Marine Removable Resource.
2009-2011	Master in Marine Science in the University of Barcelona.
2000	Training at the National Oceanography Centre, Southampton (NOCS)
2011	Training at the the Hellenic Center of Marine Research (HCMR)
Year/Periode	University of Valencia (Spain), graduation in Biology

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Taxonomy and distribution of deep-sea non crustacean invertebrates

Sea-going experience

June 2007 MPOCAT project. *B/O García del Cid*. 15 days onboard. Plankton analysis.
 June 2008 MPOCAT project. *B/O García del Cid*. 15 days onboard. Plankton analysis.
 October 2008 PROMETEO project. *B/O García del Cid*. 7 days onboard. Deep-sea fisheries.
 February 2009 PROMETEO project. *B/O García del Cid*. 10 days onboard. Deep-sea fisheries.
 May 2009 PROMETEO project. *B/O García del Cid*. 10 days onboard. Deep-sea fisheries.
 June 2009 BIOFUN project. *B/O Sarmiento de Gamboa*. 30 days onboard. Deep-sea fisheries.
 September 2009 PROMETEO project. *B/O García del Cid*. 10 days onboard. Deep-sea fisheries.
 November 2009 PROMETEO project. *B/O García del Cid*. 10 days onboard. Deep-sea fisheries.

Eva Ramirez-Llodra			
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		E-mail	eZR@icm.csic.es
Born at	29/01/1973	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

1992-97	Degree in Biology, University of Barcelona, Spain
1998-01	PhD in Marine Biology, University of Southampton, UK. Supervisors: Prof Tyler and Dr Billett.
2002-05	Post-doc as Project Manager of the Census of Marine Life project ChEss: Biogeography of deep-water chemosynthetic ecosystems. NOCS, UK. PIs: Prof Paul A. Tyler and Prof Christopher German
2005-09	Post-doc as Project Manager of the Census of Marine Life project ChEss: Biogeography of deep-water chemosynthetic ecosystems. NOCS, UK & ICM-CSIC. PIs: Profs Tyler and German.
2010-12	Post-doc in deep-sea biology at the ICM-CSIC, Barcelona, Spain, in the group of Prof. Francesc Sardà.

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

My research expertise is in deep-sea biodiversity and life-history strategies. I have been PI in 6 international projects (or their national component) and participated in 8 projects. The results of my research have been published in 27 peer-reviewed papers and 4 book chapters and presented in over 50 conferences. I have co-edited a ChEss special collection in PLoS ONE and I am co-editor of a special issue for Progr.Oceanogr. I was the Project Manager of the Census of Marine Life project ChEss (Sloan Foundation, 2002-2010, www.noc.soton.ac.uk/chess), gaining expertise in international coordination and establishing strong collaborations with research teams in 14 countries. I also led the synthesis project SYNDEEP for the Census deep-sea projects and I am currently in the Scientific Committee for the Census Beyond 2010 initiative. I am co-PI of the new international initiative INDEEP "International Network for Scientific Investigations of Deep-Sea Ecosystems: bridging the gap between science and society" (Fondation Total, 2010-2013, www.indeep-project.org). Since 2009, I lead the anthropogenic impact theme in HERMIONE (EU-FP7) and I am a member of its Science Management Board. I am active in outreach initiatives, including the publication of a book in 5 languages (Deeper than Light, 2007), participation in a travelling exhibit and public and school seminars.

Sea-going experience

16 oceanographic cruises with approx. **450 days at sea**, **7 dives in submersibles** (*Johnson Sea Link*, USA & *Nautile*, FR) and **2 ROV cruises** (*Isis*, UK & *MaxiRover*, GR). Studied areas (400-5000 m depth): cold seeps Gulf of Mexico, hydrothermal vents on Mid-Atlantic Ridge and East Scotia Arc, Porcupine Abyssal Plain, Bahamas, Antarctic, Mediterranean canyons, bathyal and abyssal seafloor.

Relevant Publications (max. 5)

1	Ramírez-Llodra, E. , Brandt, A., Danovaro, R., De Mol, B., Escobar, et al. (2010). Deep, Diverse and Definitely Different: Unique Attributes of the World's Largest Ecosystem. <i>Biogeosciences</i> , 7: 2851–2899.
2	Ramírez-Llodra, E. , Company, J.B., Sardà, F. & Rotllant, R. (2010). Megabenthic diversity patterns and community structure of the Blanes submarine canyon and adjacent slope in the Northwestern Mediterranean: a human overprint? <i>Marine Ecology</i> , 31: 167-182.
3	Ramírez-Llodra, E. , Ballesteros, M., Company J.B., Dantart, L. & Sardà, F., 2008. Spatio-temporal variations of biomass and abundance in bathyal non-crustacean megafauna in the Catalan Sea (North-western Mediterranean). <i>Marine Biology</i> , 153: 297-309.
4	Ramírez-Llodra, E. , Company J.B., Camps, M. & Rotllant, G., 2007. Spatio-temporal variations in reproductive patterns and population structure of <i>Pasiphaea multidentata</i> (Decapoda: Caridea) in the Blanes canyon and adjacent margin, North-western Mediterranean Sea. <i>Marine Ecology</i> , 28: 470-479.
5	Ramírez-Llodra, E. , 2002. Fecundity: characteristics and role in life-history strategies of marine invertebrates. <i>Advances in Marine Biology</i> , 43: 87-170.

Fatima Filomena Guedes Abrantes			
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Born at	dd/MM/yyyy	Gender	Feale

Degrees + Scientific Career (please extent/delete as appropriate)

1980-to present	Geological Survey of Portugal, Directorate of Geology and Mines and LNEG: Rereserch positions with increasing seniority (at present “investigador principal”)
1985-1990	University of Rhode Island. Ph.D. in Geological Oceanography
1982	Training period fellowship at Lamont-Doherty Geological Observatory, Columbia University
1978-1979	Training period in Marine Geology at the Geological Survey of Portugal.
1975-1979	University of Lisbon – B.Sc in Geological Sciences (5 year degree)

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Research interests:

Oceanic Paleoproductivity; Cenozoic marine diatoms: taxonomy, biostratigraphy, paleoceanography;
Taxonomy and evolution of fossil marine diatoms.;
General sedimentology and geochemistry of marine sediments.

Sea-going experience

OCEANOGRAPHIC CAMPAIGNS 1981 (22-24 April) – “Sedimentos do Estuário do Tejo” - NH Almeida Carvalho. 1981 (16-28 Nov.) - “AC 81/2 - PERSIN” - NH Almeida Carvalho. 1984 (17-30 Set.) - “SAR” – R/V Marion Dufresne. 1986 (9-16 July) - “Cadix” – R/V Garcia del Cid. 1991 (14 Nov. - 1 Dec.) - “SO75” - R/V Sonne. 1992 (14 July - 1 Aug.) - “PALEOCINAT II” - R/V LE SUROIT. 1995 (4-11 July) - “IMAGES I” – R/V Marion Dufresne. 1996 (3-23 Dec.) - “METEOR 37/1” – R/V Meteor 2002 (April-May) – ODP Leg 202 – R/V Joides Resolution

Relevant Publications (max. 5)

1	Abrantes, F. (1988). Diatom assemblages as upwelling indicators in surface sediments in Portugal. <i>Marine Geology</i> 85: 15-39.
2	Mil-Homens, M., R.L. Stevens, I. Cato, F. Abrantes (2007). Regional geochemical baselines for Portuguese shelf sediments. <i>Environmental Pollution</i> , 1-10.
3	Abrantes, F. , Alt-Epping, U., Lebreiro, S., Voelker, A., Schneider, R. (2008) Tsunamis Sedimentological Record on Shallow Shelf areas: The cases of 1969 AD and 1755 AD on the Portuguese Shelf off Lisbon. <i>Marine Geology</i> , 249, 283-293.
4	Salgueiro, E., Voelker, A., Abrantes, F. , Meggers, H., Pflaumann, U., Loncaric, N., González-Álvarez, R., Oliveira, P., Bartels-Jónsdóttir, H. B., Moreno, J., Wefer, G. (2008). Planktonic Foraminifera from Modern Sediments Reflect Upwelling Patterns off Iberia: Insights from a Regional Transfer Function. <i>Marine Micropaleontology</i> , Volume 66, Issues 3-4, 20 February 2008, Pages 135-164
5	Abrantes, F. , Lopes, C., Rodrigues, T., Gil, I., Witt, I., Grimalt, J., Harris, I. (2009). Proxy calibration to instrumental data set: Implications for paleoceanographic reconstructions. <i>Geochem. Geoph. Geosystems</i> 10.9, doi:10.1029/2009GC002604

Marta Mega Rufino			
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		E-mail	marta.m.rufino@gmail.com
Born at	17/08/1976	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

1994-1999	Licenciatura (5 years first degree)
2000-2004	PhD
2004-2009	Pos-doc
2009-	Auxiliary researcher

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

Marta Rufino holds a licentiate in Biology (4 years + 1 year project) and a Ph.D in Marine Biology done between Department of Ocean Sciences in Bangor, University of Wales (UK) and the ICM-CSIC in Barcelona (Spain). She worked as a pos-doc researcher at CripSul, IPIMAR (Olhão) where she belonged to the Invertebrate Coastal Fisheries Group. Marta participated in several workshops on the area of modelling and statistics and it is an expertise in spatial analysis (geostatistics), geometric morphometrics (shape analysis) and statistical modelling, being an R advanced user (R-project). Furthermore, she participated in several stock assessment cruises in all the Mediterranean coasts of Spain (Meditis surveys) and in the Algarve (bivalve surveys), where she was responsible for scientific duties. Since 2008 she is an auxiliary investigator, contracted by CIIMAR (Interdisciplinary Centre for Marine and Environmental Research) and working on LNEG (Marine Geology Unit). She has 22 articles (SCI) and is a referee for several journals. Main research interests include marine biology and ecology, spatial analysis, shape analysis and other modelling tasks.

Sea-going experience

2004 and 2006. Bivalve dredge surveys on the south coast of Portugal, from 3 to 20m depth.. Boat: Tellina. Project: Pescaria de bivalves do litoral oceânico. Duties: Scientific coordinator onboard . Each ~2 weeks duration. 2000, 20001, 2002 and 2003. Bottom trawl oceanographic survey, in all the Spanish Mediterranean coast, from 25 to 800 m depth.. Duration: ~1month each. Boat: Cornide de Saavedra. Project: MEDITS – International bottom trawl survey in the Mediterranean Sea. Funding: CE . Duties: Responsible for the crustaceans (identification, measure, weight, etc.) .

Relevant Publications (max. 5)

1	Rosa, F. M.M. Rufino , Ó. Ferreira, A. M. Matias, A. C. Brito, M. B. Gaspar. Accepted Coastal influence on the sedimentary distribution of inner shelf environments: The Algarve Shelf (Southern Portugal) case study. Acta Geologica
2	Rufino, M.M., Gaspar, M., Maynou, F. & Monteiro, C.C. 2008 Regional and temporal changes in bivalve diversity in the south coast of Portugal. <i>Estuarine, Coastal Shelf Science</i> , 80: 517-528.
3	Rufino, M.M., Abelló, P. and Yule, A.B., 2006. Geographic and gender shape differences in the carapace of <i>Liocarcinus depurator</i> (Brachyura: Portunidae) using geometric morphometrics and the influence of a digitizing method. <i>Journal of Zoology</i> , 269: 458-465.
4	Rufino, M.M., Maynou, F., Abelló, P., Yule, A. and Gil de Sola, L., 2006. Geostatistical analysis of <i>Liocarcinus depurator</i> on the western Mediterranean coast of Spain, from 1994 to 2003. <i>Marine Biology</i> , 149: 855-864.
5	Rufino, M.M., Stelzenmüller, V., Maynou, F. and Zauke, G.-P., 2006. Assessing the performance of linear geostatistical tools applied to artificial fisheries data. <i>Fisheries Research</i> , 82: 262-279.

Ana Aranda da Silva			
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Born at	dd/MM/yyyy	Gender	Female

Degrees + Scientific Career (please extent/delete as appropriate)

PhD from the University of Southampton
MSc (honours) in Coastal Zone Management from Bournemouth University
BSc (honours) in Marine Biology with Ecology from the University of Plymouth

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

<p>Research interests: Protozoan deepsea organisms from high productivity areas. Currently, the work is focused on foraminiferal community attributes in relation to environmental gradients the Portuguese canyon systems:a comparison between within canyon vs adjacent slopes, between canyons and foraminiferal vs metazoan This is done by studying the abundance, taxonomic composition, diversity, vertical distribution and live:dead ratios of foraminiferal from multicore. As many species found are undescribed, taxonomical analysis including morphological, ultrastructural and molecular characterization of species is an essential part of the work prior to biological and ecological characterization. The second main aim is to relate how the above parameters relate to environmental settings, in particular oxygen concentrations and productivity.</p>
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Sea-going experience

2009	Minho 09 Research coastal cruise onboard R.V. Atlantic Leopard between 10 and 16 August 2009. Responsible for sampling programme.
2006	R.R.S. (Royal Research Ship) Charles Darwin cruise 179 from 14.04.2006 to 17.05.2006, part of HERMES, EU network project.
2005	R.R.S. Discovery cruise 297 from 26.07.2005 to 17.08.2005, part of HERMES.
2005	R.S. Discovery cruise 296 from 13.07.2005 to 23.07.2005.
2003	R.R.S. Charles Darwin cruise 145 from 21.03.2002 to 09.04.2002.
2002	R.R.S. Charles Darwin cruise 143 from 01.12.2002 to 21.12.2002.

Relevant Publications (max. 5)

1	Gooday, A.J., Aranda da Silva, A., Koho, K., Lecroq, B., Pearce, R. (in press) The 'mica sandwich'; a remarkable new genus of Foraminifera (Protista, Rhizaria) from the Nazare Canyon (Portuguese margin, NE Atlantic). <i>Micropaleontology</i> .
2	Aranda da Silva, A. and Gooday, A.J. (2009) Large organic-walled Protista (<i>Gromia</i>) in the Arabian Sea: density, diversity, distribution and ecology. <i>Deep-sea Research Part II</i> 56:422-433.
3	Gooday, A.J., Levin, L.A., Aranda da Silva, A., Bett, B.J., Cowie, G.L., Gage, J.D., Hughes, D.J., Jeffreys, R., Lamont, P.A., Larkin, K.E., Murty, S.J., Schumacher, S., Whitcraft, C., Woulds, C. (2009) Faunal responses to oxygen gradients on the Pakistan margin: a comparison of foraminifera, macrofauna and megafauna. <i>Deep-sea Research Part II</i> 56:488-502.
4	Aranda da Silva A, Pawlowski J, Gooday A (2006) High diversity of deep-sea <i>Gromia</i> from the Arabian Sea revealed by small subunit rDNA sequence analysis. <i>Marine Biology</i> 148: 769-777.
5	Gooday, A.J., Aranda da Silva, A., Koho, K., Lecroq, B., Pearce, R. (in press) The 'mica sandwich'; a remarkable new genus of Foraminifera (Protista, Rhizaria) from the Nazare Canyon (Portuguese margin, NE Atlantic). <i>Micropaleontology</i> .

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Degrees + Scientific Career (please extent/delete as appropriate)

2009 to present	Postdoctoral fellow at UGM-LNEG
2007-2009	Postdoctoral fellow of FCT at Department of Geophysical Sciences, The University of Chicago
	Ph.D in Natural Sciences from Department of Geosciences, Bremen University, Germany
	Master in Engineering Geology, New University of Lisbon
	B.Sc. in Applied and Environmental Geology., University of Lisbon (5 years with thesis)

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

<p>Research interests</p> <p>Calibrating and applying trace element proxies from planktonic foraminifera off the Portuguese margin PI of a project to calibrate multi-proxy records along the NW Iberian margin, using satellite images and a wide range of materials (such as water column, plankton net, sediment traps, and surface sediments samples), and to validate and reconstruct paleoceanographic conditions from box cores collected in this upwelling region, through the application of the new calibrations.</p> <p>In summary, major research interests include:</p> <p>a) paleotemperature and paleoproductivity reconstructions along the Iberian margin, using multi-proxies (stable isotopes and trace elements in planktonic foraminifera, planktonic foraminifera assemblages, calcium carbonate, organic carbon);</p> <p>b) multi-proxies calibration using water, plankton net, sediment trap, and surface samples;</p> <p>c) transfer functions temperature and productivity equations, applying planktonic foraminifera.</p>
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Sea-going experience

<p>2002: (April - May) – PALEO I cruise.</p> <p>2000: (July - August) - TTR10 cruise.</p> <p>2000: (January) - IBERIA 2000 cruise.</p> <p>1999: (August) - LISIN 99 cruise.</p>

Relevant Publications (max. 5)

1	Salgueiro, E., Voelker, A.; de Abreu, L.; Abrantes, F.; Meggers, H.; Wefer, G.. (2009) Temperature and Productivity Changes off the Western Iberian Margin during the last 150 ky. <i>Quaternary Science Reviews</i> . doi:10.1016/j.quascirev.2009.11.013.
2	Eynaud, F., de Abreu, L., Voelker, A., Schönfeld, J., Salgueiro, E., Turon, J-L, Penaud, A., Toucanne, S., Naughton, F., Sanchez-Goñi, M., Malaizé, B., Cacho, I. (2009). The position of the Polar Front through time (last 45ka) along the western Iberian margin. <i>G3</i> . doi: 10.1029/2009GC002398
3	Salgueiro, E., Voelker, A., Abrantes, F., Meggers, H., Pflaumann, U., Loncaric, N., González-Álvarez, R., Oliveira, P., Bartels-Jonsdottir, H., Moreno, J., and Wefer, G..(2008) Planktonic foraminifera from modern sediments reflect upwelling patterns off Iberia: Insights from a regional transfer function. <i>Mar Mic</i> , 66 (3-4), 135-164
4	Nave, S.; Salgueiro, E.; Abrantes, F.; (2003). "Siliceous sedimentary record of the last 280 ky in the Canary basin (NW Africa)", <i>Marine Geology</i> , vol. 196, pp. 21-35.
5	Abrantes, F.; Meggers, H.; Nave, S.; Bollman, J.; Palma, S.; Sprengel, C.; Henderiks, J.; Salgueiro, E.; Moita, T.; Neuer, S. (2002). "Fluxes of micro-organisms along a productivity gradient in the Canary Islands region (29°N): implications for paleoreconstructions", <i>Deep-Sea Res. II</i> , vol.49, pg.3599-3629.

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Degrees + Scientific Career (please extent/delete as appropriate)

Present position post-doc at LNEG (Marine Geology Unit)
Ph.D in in Marine Sciences & Environmental Technology from Universitat Politècnica da Catalunya, Barcelona, Spain
Master in Geochemistry from University of Aveiro
B.Sc. in Chemical Engineer (3 years Chemical Engineer Tech + 2 year Chemical Engineer), Thecnical University of Lisbon

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

pos-doc at in the project: "COASTAL UPWELLING, SEA SURFACE TEMPERATURE, PRODUCTIVITY, HYDROLOGY AND ATMOSPHERIC pCO ₂ AT PAST EXTREME CLIMATE CONDITIONS". The major aims of this project is to evaluate the importance of coastal upwelling regions to the global carbon cycle and to evaluate hydrological conditions in the hinterland of the upwelling areas during the two most recent climate extremes periods as during past interglacials on the Portuguese margin. Such investigation will be done by using high-resolution biomarkers (alkenones, n-alkane, n-alcohols) records combined with stable isotope ($\delta^{13}C$, δ^2D) measurements on those biomarkers.
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Sea-going experience

2003: (April - May) – Scientific cruise PO304, carried out aboard the German research ship POSEIDON 2001: (July - August) "Training through Research (TTR- 11) Program" on board of the research vessel <i>Professor Logachev</i> 2000: (January) - IBERIA 2000 cruise.

Relevant Publications (max. 5)

1	Teresa Rodrigues , Joan O. Grimalt, Fatima Abrantes, Filipa Naughton, José-Abel Flores The last glacial-interglacial transition (LGIT) in the western mid-latitudes of the North Atlantic: abrupt sea surface temperature change and sea level implications, in press in Quaternary Science Review
2	Teresa Rodrigues , A. H. L. Voelker, Joan O. Grimalt, Fatima Abrantes, Filipa Naughton, Climate off Portugal during Marine Isotope Stages 15-9 (570 to 300 KA): Suborbital Glacial variability and Interglacial stability, in revision (Paleoceanography)
3	T. Rodrigues , J.O. Grimalt, F. Abrantes, J. A. Flores, S. Lebreiro; Interdependences of changes in sea surface temperature, productivity and fluvial inputs in the continental shelf of the Iberian margin (Tagus mud patch) during the Holocene, <i>Geochemistry Geophysics Geosystems</i> , 10, doi: 10.1029/2008GC002367; 2009
4	Antje H. L. Voelker, Teresa Rodrigues , Ruediger Stein, Katharina Billups, Delia Oppo, Jerry McManus, Jens Hefter, Joan O. Grimalt, Variations in mid-latitude North Atlantic surface water properties during the mid-Brunhes: Does Marine Isotope Stage 11 stand out?, in <i>Discussion of Climate of the Past</i> , 5, 2009
5	Abrantes F., Lopes C., Rodrigues T. , Gil I., Witt L., Grimalt J. and Harris I., Proxy calibration to instrumental dataset: Implications for paleoceanographic reconstructions, in press in <i>Geochemistry Geophysics Geosystems</i> , 2009

<i>Maria Marina Pais Ribeiro da Cunha</i>			
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Degrees + Scientific Career (please extent/delete as appropriate)

200 to present	Professor at University of Aveiro
1986-2000	Assintant at University of Aveiro
2000	Pd.D.in Biology

Research Topics (please give a brief overview about expertise, appointments, projects, etc., max. 200 words)

She is curator of the Biological Research Collection of Marine Invertebrates and researcher of the Marine Ecosystems and Modelling group at CESAM in the scientific domains of benthic ecology (analysis and interpretation of community data; biodiversity, community structure and trophic relationships; colonization and succession) and crustacean biology (taxonomy, population dynamics, life history and production). Her early research interests, focused on estuarine and coastal ecosystems, were redirected since 2000 to the study of biodiversity and functioning of bathyal ecosystems. Marina Cunha co-authored 36 SCI papers, contributed to the "Handbook of deep-sea hydrothermal vent fauna", was Guest Editor of two publications, and refereed papers in 14 SCI journals in the field of and marine ecology and biology..

3 Main Research projects related with the EUROLLEETS proposal - coordination (C) or coordination of institutional participation (CIP)

2009 (ongoing) - HERMIONE – Hotspot Ecosystem Research and Man’s Impact on European Seas, EC 7FP, project nº 226354 (CIP).

2005-2009 – HERMES – Hotspot Ecosystem Research on the Margins of European seas, EC 6FP, GOCE-CT-2005-511234-1 (CIP).

2002-2003 – Biodiversity of benthic crustacean assemblages in European margins, Bilateral cooperation programme ICCTI/IFREMER (CIP).

Sea-going experience

Participation in campaigns
 Since 1992 M.R. Cunha participated in 17 campaigns mainly in the bathyal and shelf domains of the Iberian margin and Mid-Atlantic Ridge. Among these are included 8 Training Through Research (IOC-UNESCO) cruises (TTR10, TTR11, TTR12, TTR13, TTR14, TTR15, TTR16, TTR17 onboard RV Prof. Logachev from 2000 to 2008) and 3 HERMES cruises (MSMerian 01-03, onboard RV Marai S Merian, 2006, JC10, onboard RRS James Cook, 2007 and 64PE284 onboard RV Pelagia, 2008). In these campaigns M.R. Cunha participated as a biology scientist responsible for biology logging during video observations with deep-towed camera or ROV, benthic sampling operations from box-core, multicores TV grab or dredge samples and coordination of in situ colonization experiments and collection operations using ROV.

Relevant Publications (max. 5)

1	Subida, MD, MR Cunha, MH Moreira (2005) Life history, reproductive biology, and production of Gammarus chevreuxi (Amphipoda: Gammaridae) in Ria de Aveiro (NW Portugal). Journal of the North American Benthological Society, 24(1): 82
2	Costa, FO, MR Cunha, T Neuparth, CW Theodorakis, MH Costa, LR Shugart (2004) Application of RAPD DNA fingerprinting in taxonomic identification of amphipods: a case
3	Cunha, MR, MH Moreira, JC Sorbe (2000) The amphipod Corophium multisetosum (Corophiidae) in Ria de Aveiro (NW Portugal). II. Abundance, biomass and production. Marine Biology, 137: 651
4	Cunha, MR, JC Sorbe, MH Moreira (1999) Spatial and seasonal changes of brackish peracaridean assemblages and their relation to some environmental variables in two tidal channels of Ria de Aveiro (NW Portugal). Marine Ecology Progress Series, 190: 69
5	Cunha, MR, JC Sorbe, C Bernardes (1997) On the structure of the neritic suprabenthic communities from the Portuguese margin. Marine Ecology Progress Series, 157: 119