

OASIS

Oceanic Seamounts: An Integrated Study
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Meteor / Introduction

The RV Meteor cruise M / (November to December Kiel Funchal) aims at physical biogeochemical and biological sampling in the framework of the OASIS project. A total of scientists from European research institutions and universities are on board to measure the physical properties of the water column, to collect water samples and organisms at the two OASIS study sites, and to perform first analyses of the samples.

The first leg of cruise M aims at physical biogeochemical and biological sampling in the framework of the EU project OASIS (OceAnic Seamounts: an Integrated Study). OASIS is an interdisciplinary project and comprises partners from European countries. The project studies the functional characteristics of seamount ecosystems. Based on two case studies, OASIS will yield an advanced mechanistic understanding of the processes characterizing seamount ecosystems and their influence on the surrounding ocean. The scientific knowledge gained condensed in a conceptual ecosystem model will be applied to outline a model management plan as well as site specific management plans for the seamounts investigated.

The primary goal of OASIS to provide a holistic integrated assessment of seamount ecology will be achieved by addressing the following main objectives: a) To identify and describe the physical forcing mechanisms effecting seamount systems b) To assess the origin, quality and dynamics of particulate organic material within the water column and surface sediment at seamounts c) To describe aspects of the biodiversity and the ecology of seamount biota to assess their dynamics and the maintenance of their production d) Modelling the trophic ecology of seamount ecosystems e) Application of scientific knowledge to practical conservation.

A further goal of the cruise will be to test a newly developed hyperbaric laboratory which is designed to study deep sea organisms under in situ pressure.



Photo: D. Elvers

Contact: Dr. Bernd Christiansen bchristiansen@uni-hamburg.de
Universität Hamburg,
Institut für Hydrobiologie und Fischereiwissenschaft
Zeiseweg 9, D-22765 Hamburg, Germany
Tel. +49 40 42838-6670, Fax +49 40 42838-6696

www.rrz.uni-hamburg.de/OASIS

OASIS cruise

Location

The studies will be performed at two seamounts in the northeast Atlantic (see map) with a focus on the Sedlo Seamount north of the Azores. This seamount has a summit depth of ca. 1000 m. Principally all parts of the seamount will be sampled from the base to the summit including the overlying water column. For comparison samples will be taken at a reference station outside the influence of the seamount.

Seine Seamount northeast of Madeira rises up to 1000 m below the sea surface. Here a few selected samples will be taken supplementing material from a former cruise.

Bathymetry and hydrography

In addition to existing maps, hydrosweep and parasound will be used to gain topographic information of the two study sites. Both sites have been poorly studied in this respect. The detailed measurements will focus on the bottom topography in the vicinity of the sampling stations and are a prerequisite for sampling the benthos and the near bottom water layer. Because hydrosweep measurements will generally be made during net tows, a larger area can be covered.

Moored current meters and ADCP as well as CTD profiles of temperature and salinity will be used to measure the flow field, the structure of the benthic mixed layer (BML) and the vertical diffusivity. Current meter moorings deployed in summer 2008 by RV "Archipelago" will be recovered and deployed once more by the end of the cruise to be recovered again in summer 2009 by RRS "Discovery".

Biogeochemistry

Organic particles in the water column will be sampled by means of water bottles (CTD rosette) and stand alone pump systems (SAPS) which pump water through a membrane filter. Water samples from the rosette will also be used to determine primary production, export rates and remineralisation rates. For primary production measurement, water samples will be incubated for 24 h under ambient light conditions representing different depths. A multicorer will be used to sample sediment for the analysis of pigments, lipids, stable isotopes and thorium.

Biology

Seamounts often accommodate enhanced stocks of commercially valuable species. Several hypotheses exist regarding how these stocks are maintained, e.g. by trapping of particles in Taylor columns, by enhanced primary production due to upwelling, or by trapping of the vertically migrating deep scattering layer fauna. This objective will address the major faunistic groups (zooplankton, micronekton, benthos and fish) at seamounts and their interactions with special emphasis on the bottom mixed layer fauna and the deep scattering layer.

Acoustic methods (echo sounder, ADCP, acoustic Doppler current profiler) will be used to monitor the deep scattering layer in order to get a qualitative picture of the daily vertical migrations of zooplankton and micronekton. Targeted catches within and outside the deep scattering layer with multiple opening and closing nets of the MOCNESS type (1 m for macrozooplankton and 0.5 m for micronekton) will yield detailed information of the faunal composition of the deep scattering layer community and specimens for biochemical studies of trophic interactions.

The benthic studies focus on the megafauna (those specimens which can be identified with optical methods). Optical methods will be employed to get information of the abundance and distribution of epibenthic megafauna and larger benthopelagic organisms. The British WASP system (WASP: wide angle seafloor photography) – an altimeter controlled camera sled with downward looking still camera and video camera will be used for photographic and video transects.

A pilot study of hyperbaric experiments on metazoan plankton will be performed using the pressurized experimental chamber "APROACH" (Adaptive Pressurized Ocean Analysis Chamber). Deep sea plankton will be sampled and transferred to the experimental chamber under in situ pressure and temperature conditions by means of a temperature isolated, pressurized sampling chamber which will be attached to a MOCNESS cod end bucket. APROACH offers various possibilities for the observation and manipulation of organisms and allows the application of different probes, e.g. to measure oxygen concentrations. During cruise M 08 / 09 the principal possibility of maintaining deep sea organisms in a pressurized aquarium and their behaviour will be studied and experiments will be performed.