Expedition Meteor 48 leg1
Short cruise report

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Introduction

The study during leg 1 was mainly targeted at surveying of changes in species composition along a transect of about 700 km in the abyssal Angola Basin. Analysis of the large scale spatial variability of such benthic communities leads to conclusions about the distribution area of individual species and thus contributes to a realistic picture of order of magnitude of the biodiversity of the world ocean. For this purpose it is essential to work in large and homogeneously structured deep sea basins in order to avoid the obscuring of results by small scale ecologically driven variability, whose effect has not realistically been taken into account in former studies. The present study was expected also to produce results on zoogeographic patterns and their constancy within a deep sea basin usually referred to as a homogeneous region. Differentiation processes, including speciation, will be examined with morphological and genetic methods. As a result, we expect to reach a better understanding of the role of geographic distance in speciation as well as in regionalisation processes and to distinguish these from ecologically driven differentiation. This study therefore aims to test critically the paradigm that all differentiation processes in the marine realm are ecologically driven.

Sampling methods and subsequent analysing

The deep sea benthos was examined with reference to all size classes (Nano-, Meio-, Macro-, and megabenthos). For this purpose the following gear was used: Box corer (USNEL spade corer, 50 x 50 cm) for macrofauna; multicorer (12 cores of 10 cm diameter) for nano- and meiofauna; epibenthic sledge for meio- and macrofauna; Agassiz-trawl for megafauna.

The macrofauna was sieved from sediment taken from the box-corers (minimum mesh site 0.3 mm), preserved on board the vessel and is now sorted in the home laboratories. Some of the macro- and megafauna samples are used to take quantitative data (abundance and biomass).

The epibenthic sledge has been constructed with a few modifications according to the model described by Brandt & Barthel (1995) [Ophelia, **43**: 15-23]. Two samples were taken at every station and preserved mainly in alcohol (not in formalin in order to allow for DNA-extraction). Some of the sorting was already done on board by specialists and continues in the home laboratories.

The megafauna was be sampled with a 4m Agassiz-Trawl, known as a very efficient piece of gear. A weight of 500 kg was inserted into the trawling cable after 200m so as to minimise the angle of the cable. This saved significant time, as a cable length of only 1.8 times depth was required to reach the sea bottom. As a rule two samples were taken per station with minimum 2 hours of trawling on the sea bed.

Meio- and Nanofauna (Protozoa) were collected from the multicorer samples. The meiobenthic animals were preserved in 4 % formalin. Benthic foraminiferans were sampled from the overlaying water and by slicing the sediment cores and preserving the sediment slices in 99% alcohol and Bengalrosa. For the examination of other protozoans the upper 5-10 mm of every sample were examined under the microscope and an intensive photographic and video-documentation were built up.

Sediment samples were taken from the box-corer and multi-corer in order to measure the following parameters: TOC [= Total Organic Carbon] and Chlorophyll content of the sediments. TOC relates to the introduction of organic material through sedimentation and lateral displacement. The C/N ratio gives a first insight into the terrestrial or marine origin of the material. Chlorophyll content gives an insight into the deposition of fresh organic matter in the sediments and so complements the TOC-measurements. To measure these parameters, one core of the multi-corer and a subsample from the box-corer were taken. These were split into 2 cm layers and deep frozen at -20°C for subsequent analysis and transported to Hamburg by a commercial vessel from where it was picked and transported to the home laboratory Wilhelmshaven.

Hydrographic data (temperature and salinity) of bottom water were measured with a self registering CTD-probe that could be attached to the frame of the box-corer or multi-corer. In every one of the working areas a full t/s profile from the surface to the bottom could be measured.

Working areas and sampling

The general working area was the Angola Basin with depths of > 5000m. Six specific working areas of about equal distance to each other were selected. The position of these areas can be seen in fig. 1. Due to weather and bottom conditions and to time restrictions a full sampling scheme could not be performed in every one of the working areas. At all areas first a mapping with hydrosweep took place, also t/s profiling (once in every area) and surface plancton sampling during towed gear deployments were performed regularely. The following description gives a short information on the sampling.

METEOR left Walvis Bay on July 6, 2000 and headed towards working area I which was situated at a distance of 624 nm. The operations in area 1 took 4 days: July 8-11, 2000. The following gear was used: Agassiz trawl (2 deployments) epibenthic sledge (2 deployments), box-corer (unsuccesful), multi-corer (unseccessful).

Work in area II took 5 days (July 12-16, 2000). The following gear was successfully used: Box-corer (7 replicates), multi-corer (7 replicates), Agassiz trawl (2 deployments), epibenthic sledge (2 deployments).

Work in area III took 4 days (July 17-20, 2000). The following gear was successfully used: Box-corer (8 replicates), multi-corer (2 replicates), Agassiz trawl (2 deployments), epibenthic sledge (2 deployments).

Work in area IV took 4 days (July 20-23, 2000). The following gear was successfully used: Box-corer (1 deployment), Agassiz trawl (2 deployments), epibenthic sledge (2 deployments).

Work in area V took 3 days (July 23-25, 2000). The following gear was successfully used: Box-corer (5 replicates), multi-corer (2 replicates), Agassiz trawl (1 deployment), epibenthic sledge (1 deployment).

Work in area VI took 5 days (July 26-30, 2000). The following gear was successfully used: Box-corer (8 replicates), multi-corer (8 replicates), Agassiz trawl (3 deployments), epibenthic sledge (2 deployments).

As last operation of the cruise it was decided to tow the Agassiz-trawl pelagically along the echo scattering layer at its highest density at 360m during the day. The net was equipped with a fish-finder in order to hit the right depth exactly and keep the net in that depth. After 2 hours in the right depth the net was recovered with a good sample July 30, 2000.

The way back to Walvis Bay started after recovery of the pelagic trawl. On August 2, 2000 at 05.00 UTC *METEOR* reached the pilot station. The vessel was moored at 08.30 UTC at Walvis Bay port.

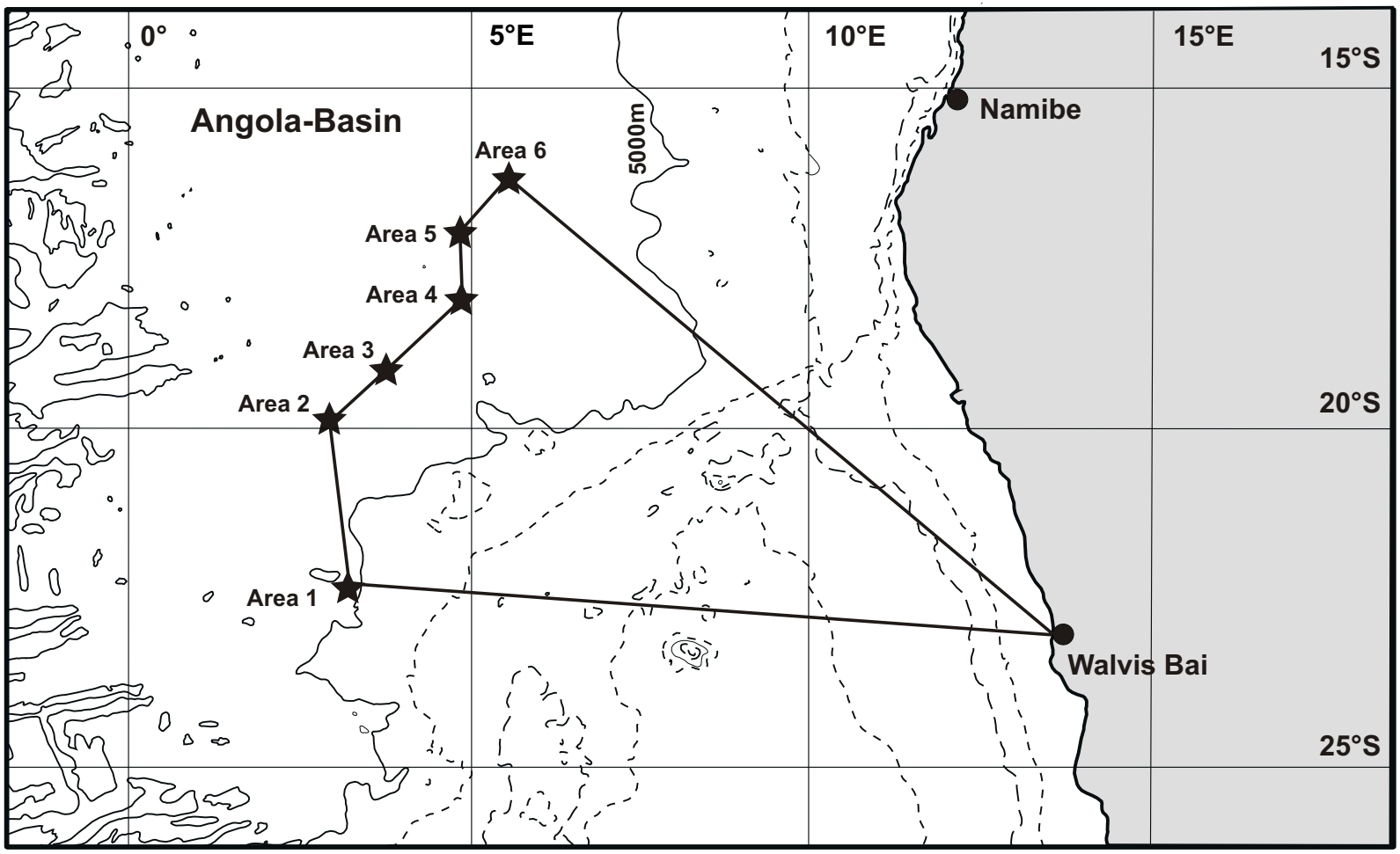
Preliminary results and observations

Measurements of bottom near temperature and salinity did not reveal any sensible difference between the working areas (see table 1). Sediments are still under examination so that nothing can be said presently on their characteristics.

Station	Depth	T [°C]	S [‰]
325	5591,8	2,5025	34,7779
330	5563,2	2,4941	34,8145
336	5530,9	2,4819	34,8359
341	5558,7	2,4637	34,8462
345	5526	2,4797	34,8389

Table 1. The maximal depth reached by the CTD-probe attached to the gear at sampled stations with corresponding temperature and salinity values. The depth values correspond to measurements of the probe on the basis of pressure.

The fauna sorted and observed on board was quite diverse with few specimens of every species. Particularly diverse were the small sized animals, both in the epi- and endobenthos. Evidently coal and slags of old steamers form an environment of a secondary hard bottom type that houses a very diverse fauna. The full results will be available after sorting and identification in the home laboratories, which is in full course now.


0°
5°E
10°E
15°E
15°S
20°S
25°S
Angola-Basin
5000m
Namibe
Walvis Bai
Area 6
Area 5
Area 4
Area 3
Area 2
Area 1