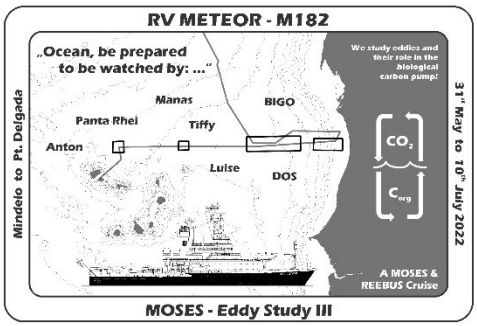
RV METEOR – M182

31.05. – 10.07.2022, Mindelo – Pt. Delgada



5. Weekly report

27.06. – 03.07.2022

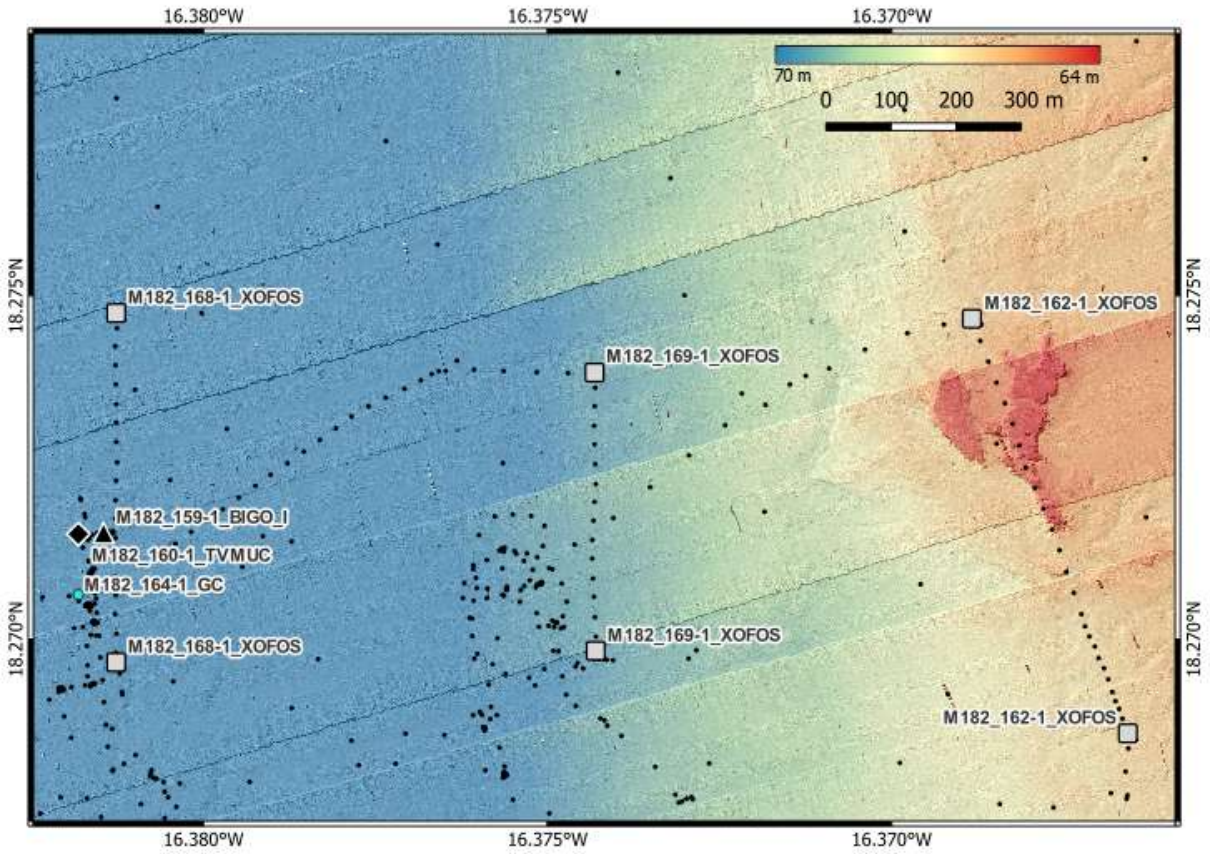
The station plan for the 5th outing week was fully planned and it is slowly becoming more and more difficult to fit all the stations into the time we have left. When the station plan was finally in place, it was also messed up by bad weather and equipment going on strike. Fortunately, we have enough equipment with us so we can reschedule on the fly and have virtually no unused ship time.

In our most easterly working area E5 we were involuntarily slowed down. The coast of Mauritania is considered a very fish-rich sea area and Mauritania earns money from the sale of fishing licenses to foreign fishing vessels. We witnessed this first hand when a fishing trawler trawled directly over the BIGO lander position at night. Fortunately, the fishing here is mainly pelagic and the BIGO was not caught on the seabed by the nets. But after this experience, we took the precaution of not moving far from the BIGO position. In the meantime, up to 10 large fishing trawlers passed around us. Also increased requests by the METEOR navigators to keep 2 miles distance to us were followed only conditionally and rather reluctantly. As a result, we were only able to work within a direct radius (< 1 NM) of the BIGO. Another surprising contact at sea occurred when our small GIRONA-500 AUV Luise lost contact while retrieving and drifted without us being able to locate it.

During the search, METEOR was hailed by the Mauritanian Coast Guard and it turned out that the Mauritanian navigator was trained in Flensburg, speaks perfect German and was very happy to talk to the 1st officer of METEOR. When he learned that we were looking for a small yellow AUV, they were even able to point us in the right direction because they had seen it by chance on the way. Thus, the search did not take long and Luise was safely recovered. After the Coast Guard's appearance, we were still surrounded by fishing trawlers, but at least they kept a little more distance now and we could even venture an AUV dive and two short XOFOS transects.

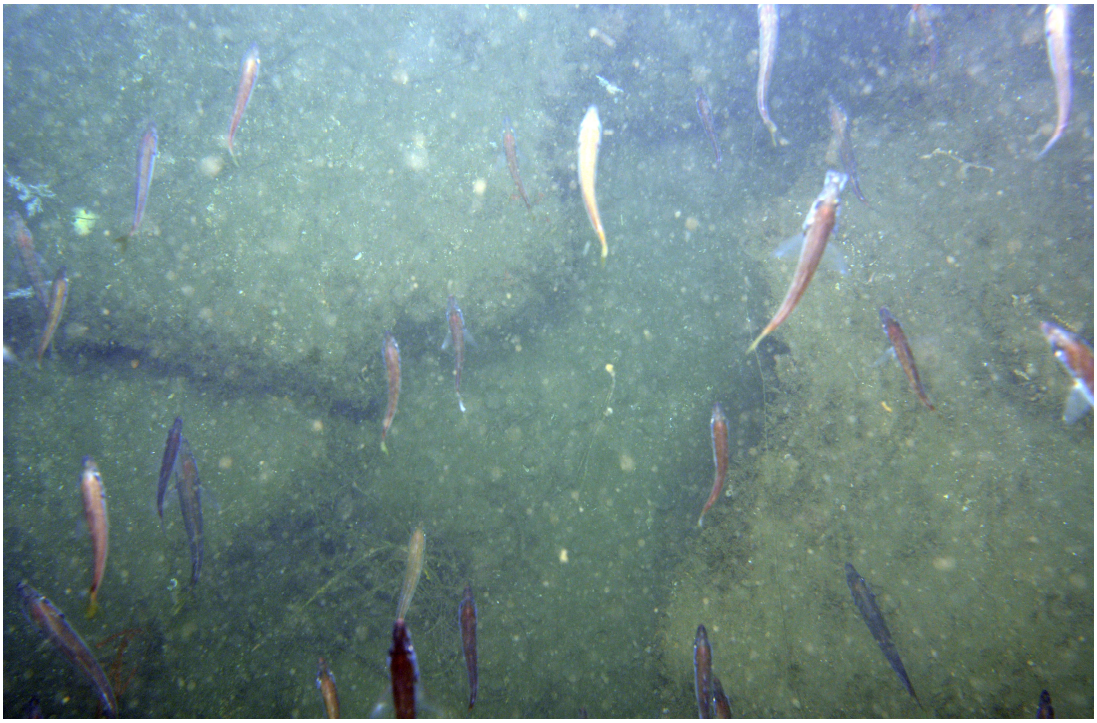
Work of the last week

In E4 we continued our program and made an XOFOS video transect over the southern slope of a diapir structure. There are a striking number of filigree glass sponges living there, and they seem to find good flow conditions on the slope. Supplementing the previous MUCs, another was taken on the hill to sample as many different habitats as possible. The AUV was sent on several missions, but some of them were aborted due to various technical problems. In the end, a sidescan and multibeam data set over the BIGO and rover positions was obtained, along with a shallow channel system.



Bathymetric map of the E5 work area. The black dots show the ship position every 2 minutes.

The original plan was to recover the deep-sea rover before heading further east. But since the weather freshened up again, we had to postpone the recovery to the way back to be on the safe side. On 28.06. we temporarily left the deep sea and headed for our easternmost working area E5. The water depth decreases very fast towards the east and 13 NM off the Mauritanian coast it is only 60m. As a result, station times were extremely shortened and lander deployment took only about 20 minutes compared to the 3 hours in the deep sea. To find a suitable location for the BIGO lander, the area first had to be mapped with the multibeam. Here, however, the shallow water depth means that we could only cover a tenth of the area on the seafloor with one profile (compared to the deep sea) and we needed more dense profile lines to get an area-wide map of the area.



A school of fish is attracted by the light of the XOFOS lamp and accompanies us during the dive. Visibility is much lower in shallow water than in the deep sea.

Area E5 turns out to be a flat area with a central reef-like structure over which we ran an XOFOS transect. In the water column, one sees almost nothing but jellyfish, which disappeared just above the bottom and were replaced by schools of Atlantic bonito. The fish were attracted by the light of the XOFOS and one had the impression of being immersed in an aquarium. The reef-like structure turned out to be a hard substrate on which soft corals grow. In crevices and gaps we often saw torn lines and remains of fishing nets. Due to the fishermen, this was our furthest station from the BIGO and the next AUV dives were conducted in close proximity to the BIGOS so that we could keep all our equipment in view as much as possible. On 01.07. the lander was recovered again and we took another MUC in a 500 m deep canyon. After that we went back west to collect the deep sea rover.

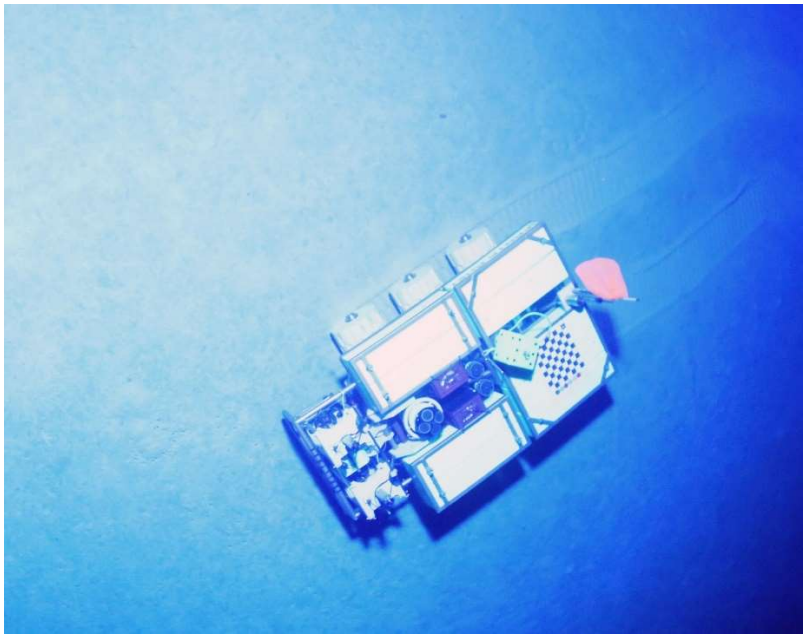
Water column biogeochemistry and microbiology: In the last week we continued the planned sampling of the water column in the working area E4 and E5. We sampled stations S9 and S10 to depths of 2600 and 2000 m, respectively, and the nearshore station S11 with a water depth of just 176 m. Thus, in addition to characterizing the eddy, we were able to conduct all stations that had already been sampled during the two Meteor trips, M156 and M160.

After completing the planned sampling in work area E5, we headed back to work area E3. After re-analyzing satellite imagery indicating sea surface elevation and the location of potential eddies, we decided during transit to insert another CTD station (S12) between S10 and S9 on our way west. In addition, on 02.07 we loaded the sediment trap of the BBL lander with 20 sample bottles (see figure),

The BBL lander is equipped with a photo camera, current meter, and sink trap, and is designed to collect data on the seafloor for 6 months.

which is expected to be deployed on 03.07 in work area E2 together with the deep-sea rover for six months. During this time on the seafloor, each bottle, for a duration of two weeks, will collect sinking particles sinking from the surface to the deep sea and give us information about the composition and export flux of particulate material. Before we begin our transit to Cape Blanc station, we will conduct another CTD in E2 to characterize the water column on the day of the DOS/BBL lander deployment. On 05.07, the CTD will be launched for the last time, bringing water column sampling for biogeochemical and microbiological analyses during the M182 cruise to a successful conclusion.

AUV - another dive is on the horizon: We have reported on our three AUVs, Tiffy, Anton, and Luise, and what they can be used for. Tomorrow is the last dive for this cruise, conducted by Tiffy, with the goal of imaging the BBL lander and rover at their six-month observation site at Station E2. We already had a camera and sidescan survey at this location (Station M182_100-1_Abyss-3), but unfortunately the camera was not working at the time. We solved the problem by updating and improving the software and conducted another test dive in area E5 in 70 m water depth at two different heights of 7 and 4 m above the seafloor. This night dive was very successful despite the many fishing vessels near our position. We are therefore very confident that Tiffy's upcoming tenth dive will also be successful. We plan to conduct a high-resolution sidescan survey over Panta Rhei and the BBL after the camera survey; both missions will be conducted from 7 m altitude. …. and it worked!

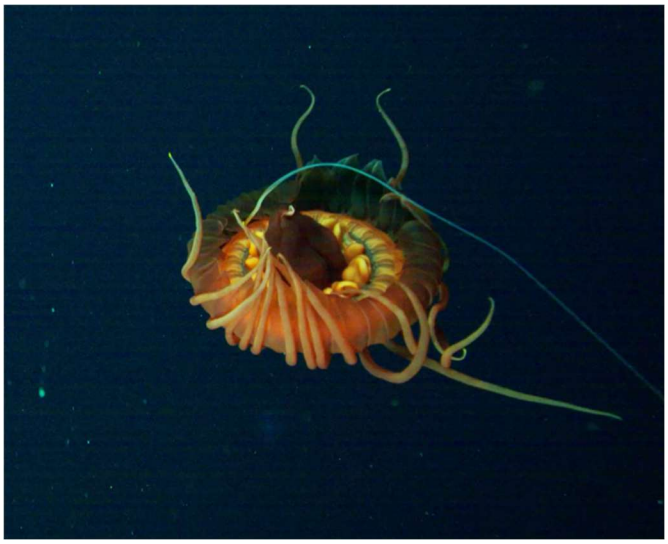


The DSR Rover at 3200m water depth at the start of its 6 months data acquisition tour. Wheel tracks are visible to the right of the image.

Biologie: During M182, we have now successfully collected a range of data and samples from the mesopelagic zone in the eastern tropical Atlantic between Cabo Verde and Mauritania. Acoustic data from the upper 300 m show us aggregations and biomass. Additionally, we have filtered eDNA from CTD water to apply molecular genetic protocols in the institute's laboratory to detect organisms that we don't capture in the nets or observe on the video transects. For examples, cephalopods are abundant in the ocean and consumed by many predators, but they are difficult to observe. We also collected sediment from the upper cm of the MUC which we will analyze to detect eDNA from pelagic organisms, and to investigate the flux of biological material from the water column to the seafloor. The multinet has provided us with physical samples that we will identify and quantify in the GEOMAR laboratories. The pelagic video transects with OFOS have given us a perspective from inside the mesopelagic habitat and will allow us to establish faunal distribution in detail, and also to measure and quantify taxa that are not captured by the multinet. Some gelatinous species, however, do occur in both the multinet and are also seen during the video transects. This is very helpful since we can then compare the size measurements from the stereo camera with the size of the same species we capture in the nets. One such species that we capture in the net and see on the camera is the crown jellyfish *Atolla wyvillei*. Although *Atolla* is among the most abundant jellyfish at mesopelagic layers in different oceans, very little is known about the basic biology of the genus. Therefore, we present below a summary of available information on *Atolla* from the literature.

Atolla wyvillei (Haeckel, 1880)

Phylum	Cnidaria
Order	Coronatae
Family	Atollidae
Distribution	Cosmopolitan, > 500m depth
Size	4-15 cm bell diameter
Colour	**Bell:** brownish-red, translucent **Stomach:** red, brown **Gonads:** orange **Muscles:** orange



Atolla wyvillei oral view. The crown-shaped bell is bright red and translucent. The bright yellow gonads are auricle-shaped and encircle the dark brown stomach and manubrium. One longer (hypertrophied) tentacle is probably used for feeding.

Ecology *Atolla wyvillei* is a common cosmopolitan species, usually found below 500 m water depth. The distinct crown-like shaped bell of the coronate medusae make them easy to identify in our pelagic video transects with the XOFOS frame. Its body is sturdy and thus it is often caught intact in net trawls, also in our Multinet samples. Although *Atolla* is a cosmopolitan genus, almost nothing is known about its reproductive and feeding behavior. Information about its reproductive cycle is also still lacking, but *A. wyvillei* is likely a holopelagic medusae without a polyp, ephyra and planula stage, similar to other coronate medusae. Adult medusae have separated sexes with external fertilization. The purpose of the longer (hypertrophied) tentacle is not fully understood but is probably involved in feeding. There are reports of *A. wyvillei* feeding upon siphonophores and pelagic crustaceans with its long tentacle. An alternative hypothesis is that the long tentacle is used to feed upon detritus (dead particulate organic matter in the water column such as marine snow and discarded mucous nets), analogous to the retractile filament of *Vampyroteuthis infernalis*. Specimens release a bioluminescent blue light at the umbrella rim as a predator avoidance behavior. Amphipods and shrimps are known predators of *A. wyvillei*.

Soon, the last stations of the cruise will be undertaken and in the afternoon of the 5th July we will start our transit to Pt Delgada, our final destination. From 5th onward we will pack boxes, organize boxes on pallets for a quick an correct loading into containers, we will clean the labs write a first draft of the cruise report and will make sure that all digital data are backed up. With best wished from Meteor at 19°42.3'N and 21°42.29'W

Mareike Kampmeier & Jens Greinert

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