RV SONNE

Cruise SO285 "TRAFFIC 2"
Emden – Emden,
20th August – 2nd November 2021

2. Weekly report

23nd – 29th August 2021

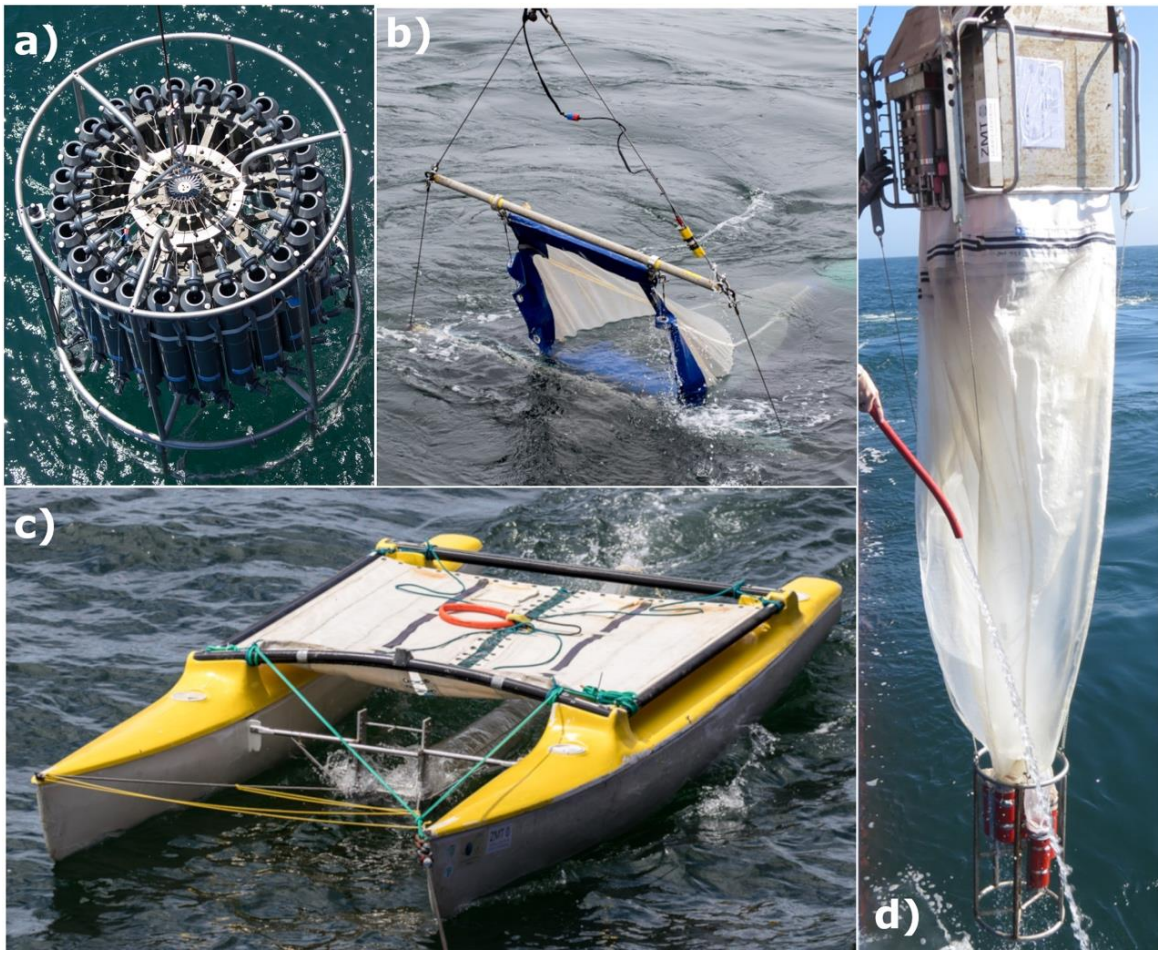
If it were not for the 5000 nautical miles that lay between us and the Benguela Upwelling System off the coast of Namibia and South Africa, we would be ready to start our research! We will arrive at our study site in about 14 to 16 days, which is both a blessing and a curse. A curse in so far as the great distance that lies between us and the Benguela Upwelling System seems to hardly shrink. For example, in order to see on our digital maps how far we are away from our sampling stations off Namibia and South Africa, we must zoom out to a size that covers almost the entire Atlantic Ocean! On a scale as large as this, the distance we cover each day seems infinitely small and our target region appears to be located on the other side of the earth. On the bright side, this time at sea can also be seen as an opportunity to prepare for a busy and hectic sampling period ahead. After unpacking the shipping containers and setting up the labs during the previous week, most of the last days were spent testing equipment. Which equipment was this?

The aims of our project is clear: to investigate climate change impacts on the marine ecosystem of the Benguela Upwelling System in terms of the effects on fisheries and the storage of CO_2. In this context productivity is a key issue. It results from nutrients being brought to the sunlit surface through physical processes from deep waters and nutrient recycling within the pelagic ecosystem. In order to research the interplay between input and recycling, we need expertise from various disciplines.

In addition to the captain, Oliver Meyer, and his experienced crew, our team consists of the oceanographers Bernhard Mayer and Andreas Welsch from the University of Hamburg, biogeochemists and biologists, who we will introduce later, and Julia Wenzel, our on-board meteorologist from German Weather Service (DWD). Julia predicts the weather along our planned itinerary so that we can avoid potential storms, among other hazards. The oceanographers and biogeochemists are here to study the transport of nutrients and carbon into and out of the ecosystem, while the biologists will study the composition and the behavior of individual key organisms in relation to changing environmental conditions.

In order to study plankton, we must catch it first! On the SO285 expedition, plankton and micronekton will be caught using three different types of nets as well as water samples from the rosette of 24 Niskin bottles. Manfred Kaufmann (University of Madeira in Portugal) and his team filter water in order to capture small picoplankton (0.2-2 µm) and nanoplankton (2-20 µm) which will later be analysed. Four further groups, lead by Bettina Martin (University of Hamburg), Matt Horton (University of Cape Town, UCT), Sabrina Duncan (Thünen Institute of Sea Fisheries, TI-SF), and Alix Rommel (University of Bremen, BreMarE) will use nets in order to catch zooplankton as well as fish. The 'rectangular midwater trawl' (RMT 8) will be used to catch fish, decapods, and krill in the mesopelagic layer between 200 and 1000 m. Multiple- Closing-Nets with a mesh width of 55 to 500 µm will capture stratified samples of micro-, meso-, and microzooplankton from 1000 m to the surface. The Apstein net with a mesh size of 20 µm will collect microzooplankton and phytoplankton near the surface and

the catamaran with neuston nets will capture organisms that live directly on the surface layer. The combination of gear and mesh sizes results in six devices that are used on our SO285 trip. Along with the nets is of course the CTD with a rosette of Niskin bottles. The CTD itself contains eight sensors to measure water-depth (pressure), salinity, fluorescence, turbidity, penetration depth of sunlight and the concentration of dissolved oxygen.



Various gear that will be deployedduring SO285: a) CTD with rosette of Niskin bottles, b) Rectangle Midwater Trawl" (RMT 8), c) Neuston-Catamaran, d) Multiple-Closing Net (Photos: Knut Heinatz)

The combined CTD and rosette is especially important for the oceanographers and biogeochemists onboard. CTD data allows us to identify water masses that are present at different water depths. Biologists from Bettina's group and biogeochemists under the leadership of Claire Siddiqui (Leibniz Center for Tropical Marine Research, ZMT) and Sina Wallschuss (UCT) take water samples from the Niskin bottles. Bettina measures the phytoplankton productivity while the biogeochemists measure the abiotic (non-living) substances in the water which include the concentration of dissolved and particulate carbon and nutrients as well as stable isotopes in the nitrate. In order to better quantify the distribution of these components in the water column and thus to be able to characterize water masses more precisely, the CTD was additionally equipped with a particle and nitrate probe. The particle probe is operated by Bernhard Mayer in cooperation with Reiner Kiko from the Laboratoire d'Oceánographie de Villefranche-sur-Mer.

In addition to the devices described so far, which are to be used at each sampling station, Fabian Hüge from the ZMT has installed a special pump system on the ship. This pump sucks in water from under the ship and delivers it directly to the laboratory, where among other parameters, the concentration of CO_2 in the water is continuously measured. Luisa Meiritz from the University of Hamburg uses sediment traps for her work. Sediment traps are a topic in their own that we'll get back to later.
Overall, the CTD with the Niskin bottles and the two additional sensors, as well as six different nets will all be put into action at stations in Namibia and South Africa. Half of the nets are pulled vertically through the water column and the other half are dragged horizontally from the ship in certain water depths. We also refer to the EK60 (hydroacoustics device) when sampling the water column. This is permanently installed on the RV SONNE and continuously gives first indications of the biomass distribution in the water column.
So far, we will limit the use of all devices to a water depth of <1000 m, as this is the depth-range in which most of the biomass is present. At a 1000 m deep station, the ship unwinds and rewinds a total of approx. 6 km of rope in order to bring the equipment to the desired depth and back onboard. Each device must be operated at a certain speed in order to ensure that the samples are intact when they arrive onboard. The duration of a station thus results from the speed at which the winches are released/heaved and the nets are towed.
On August 26th 2021, we prepared all the gear and were able to begin our first test station. Sabrina Duncan and her team from the TI-SI began long before sunrise at 5:30 am with the RMT. Matt Horton (UTC) and Julia Plewka (ZMT) ended the station after the deployment of the catamaran around 14:51 pm. With a total station time of over 9 hours, the deployment of all gear, collection of samples, and analysis in the laboratories required large amounts of energy and concentration from all the crew and scientists. It was and still is very important for us that everything runs smoothly, that the gear works, and that the desired samples could be collected. These samples will now let us put the laboratories into good use and will also let us prepare and optimize our sampling strategy before the many stations we have ahead of us in Namibia and South Africa. This time of optimization and preparation is a great privilege and we are excited for the week ahead! During the next week we will also focus on satellite data and their validation.

FS SONNE, at 21°N / 25°W, the 29th of August, 2021

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