RV SONNE

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

8. Weekly report

4th – 10th of October 2021

Concentrations of dissolved oxygen in sea water affect species composition and marine ecosystem functioning, and are decreasing in many areas of the ocean due to global warming. Knowledge about the response of marine ecosystems to changing oxygen concentrations is thus a key to better understand impacts of global change on marine ecosystems. Although there are distinct oxygen minimum zones (OMZs) in the northern and southern Benguela Upwelling Systems (see Figure 1), the differences in dissolved oxygen dynamics between these regions are vast. As mentioned in the previous report, off South Africa in the south, there are essentially local processes leading to the formation of the oxygen minimum layer. In the northern Benguela Upwelling System, these local processes also exist, but in addition, there is an influx of oxygen-depleted water masses from the Angola Basin in the north of Benguela Upwelling System. This inflow largely shapes the intensity of the oxygen minimum layer in the northern Benguela Upwelling System.

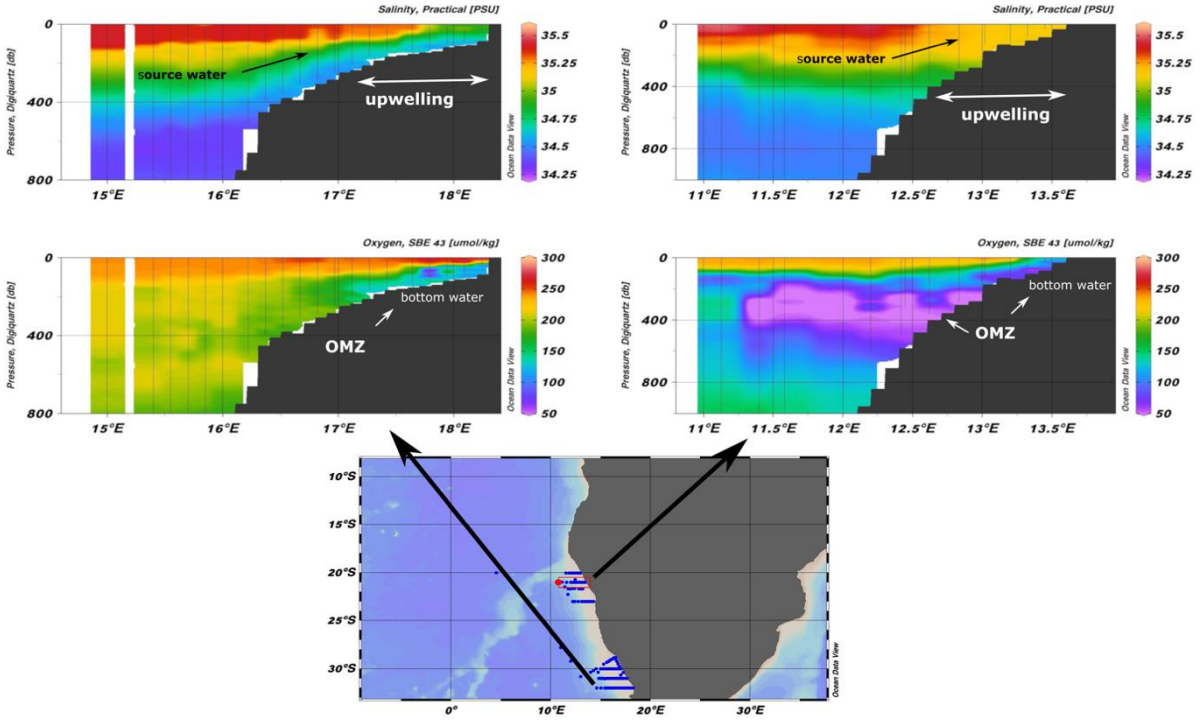

Figure 1: Distribution of salinity and dissolved oxygen in the southern (left) and northern (right) Benguela Upwelling System. The blue dots on the map symbolize the positions of our stations. The double arrows mark the part of the upwelling zone, where deep water masses penetrate to the ocean surface; "OMZ": oxygen minimum zone.

This week, we have been mapping the spread of this low-oxygen water mass from the Angola Basin while also conducting net sampling to see how this oxygen-poor water mass affects the species composition and behavior of zooplankton and fish.
The comparison of vertical sections from the northern and southern Benguela Upwelling System clearly shows how the oxygen-poor water from the Angola Basin intrudes along the Namibian continental slope into the northern Benguela Upwelling System at depths between 100 and 500 m (see Figure 1 - right). On the shelf, however, the bottom water oxygen minimum layer (bottom water OMZ) was found, similar to the southern Benguela Upwelling System. Because oxygen-depleted water is typically enriched with greenhouse gases such as CO_2 and nitrous oxide (N_2O), Claire Siddiqui and her group recorded this week the highest concentration of CO_2 in surface water so far on this cruise. Whether this is also reflected in the concentration of N_2O is of particular interest to Sina Wallschuss, who will analyze the N_2O samples in Cape Town after the cruise. The evaluation of the net samples will also require some time.

Figure 2: Water sampling and capture of jellyfish with the RMT.

Pictures: Solvin Zankl and Sina Wallschuss

In the meantime, Sabrina Duncan and Matt Horton, who drive the large trawled nets, were also able to take note of the differences in species composition between the two upwelling systems. The salps that appeared in masses at some places in the south could not be found in the north, but this does not mean there were no salps. Hanna Stegemann and her colleagues found salps in their smaller net, which is pulled vertically through the water column. However, this was a different species, which, as mentioned, did not occur in masses. Things got really exciting last night, when the largest of the towed nets, the RMT, came back on deck not filled with fish but overflowing with giant jellyfish (see Figure 2).
To study effects of ecosystem changes on the transport of carbon into the deep ocean, Luisa Meiritz uses sediment traps, which are funnels or tubes hanging in the water column, vertically attached to a rope one above each other. The traps collect sinking particles and also capture vertically migrating plankton. This week, Luisa deployed two free-drifting sediment trap systems and recovered two systems, which were anchored to the seafloor. These systems were deployed this year in May by RV Sonne cruise SO283.

We now have four more stations to go before we will arrive in Walvis Bay, Namibia, on Sunday, where our field research in the Benguela Upwelling System will end. This marks the beginning of a new exciting and also the last part of our voyage, which we will report on in the coming week.

RV SONNE, at sea, 23°S / 13°W, 9th of October 2021
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