RV METEOR – M185 “ASSOCIATE”

29.10. - 26.11.2022, Hamburg - Lisbon

4th Weekly Report (21. - 26.11.2022)

From our southernmost station at the Moroccan continental slope off the city of Kenitra, we turned north again towards the western entrance of the Strait of Gibraltar, the bottleneck for larval eels to enter the Mediterranean Sea.

Here Europe and Africa are only separated by an 11 km wide strait. Since evaporation in the Mediterranean is very high, but there is hardly any river input, the water level in the Mediterranean would drop continuously to the point of drying out, if there was no inflow from the adjacent Atlantic through the Strait of Gibraltar into the Mediterranean. Therefore, the current is very strong here. At the sea surface, low-salinity Atlantic water flows eastwards into the Mediterranean Sea. Below about 100 m depth, on the other hand, there is an outflow of salty Mediterranean water westwards into the Atlantic. We are interested in how the countercurrent affects the transport of zooplankton and nekton. However, for the use of our large plankton nets, the strong countercurrents are a challenge, as we have to adjust the trawling speed and change it at different fishing depths depending on the direction and speed of the current.

Figure 1: The Strait of Gibraltar and Gibraltar rock on November 24 during the passage of RV METEOR out of the Alboran Sea.

A 24-hour IKMT-S station started at 20th of November in the centre of the Strait and revealed these unique oceanographic conditions and corresponding leptocephalus behaviour with obvious current- and light-triggered waves of immigration events.

From 20 November (starting at 16:11 GMT) until 21 November 2022, the shipboard ADCP was used to obtain current velocities in the water column in the middle of the Strait of Gibraltar (around 35.94º N, 5.62º W) to analyse the evolution of these current velocities with the low and high tides. The times of high and low tides are given in Table 1. The maximum working depth of the ADCP was about 600 m. The 1-minute averaged currents at the different level depths (i.e. ensembles) are shown in Figure 2. The first low and high tides were around ensemble 61 and 441, respectively. The second low tide occurred around ensemble 777. It can be observed that after the first low tide, the inflow of water from the Atlantic was reduced and the outflow of water from the Mediterranean played an important role. The opposite occurred after the first high tide, with the Atlantic inflow predominating over the Mediterranean outflow (since ensemble 441 until ensemble 777). The same circulation pattern was repeated from the second low tide onwards.

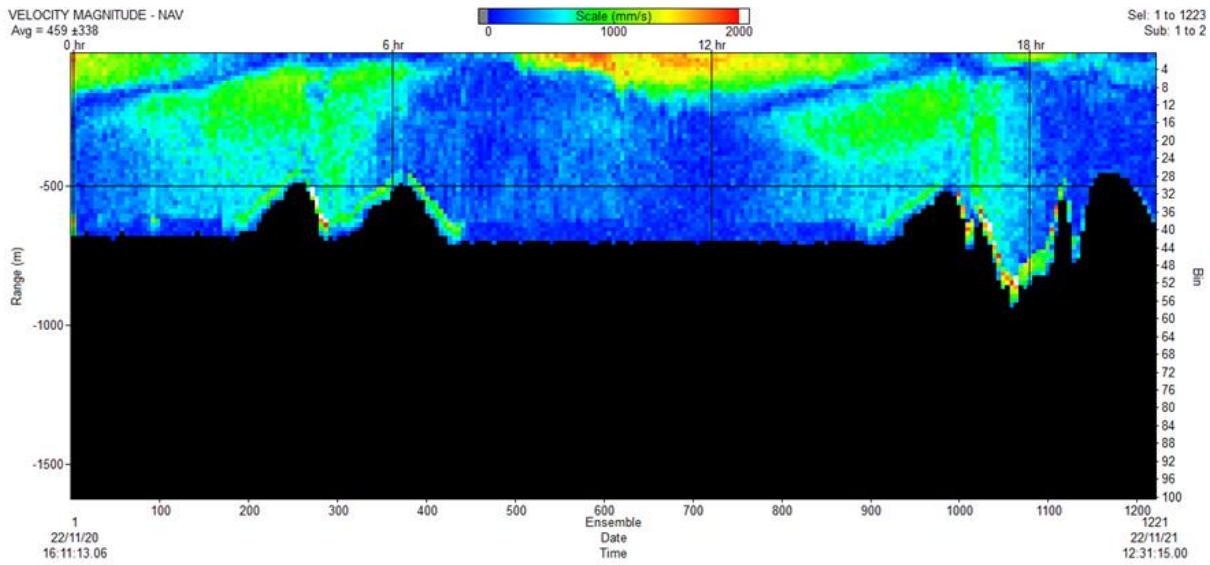

Figure 2. Time series of velocity magnitude profile measured by the ADCP in the Strait of Gibraltar from 20 November (at 16:11 GMT) to 21 November 2022 (at 12:31 GMT).

Tide	Date (day/month/year) and time (UTC)	Height (m)
Low	20/11/2022 04:32	-0.31
High	20/11/2022 11:03	0.44
Low	20/11/2022 17:11	-0.39
High	20/11/2022 23:31	0.45
Low	21/11/2022 05:07	-0.38
High	21/11/2022 11:44	0.52
Low	21/11/2022 17:40	-0.48

Table 1: Tides at the Tarifa tide gauge (36.01º N, 5.6º W) during the ADCP sampling in the Strait of Gibraltar. The height is referenced to the local mean sea level. Source: Puertos del Estado.

From the 21st to the 23rd of November we continued our CTD and net sampling along the northern Moroccan coast east to the city of Nador, where our Moroccan observer said goodbye and was picked up by tugboat “Oriental”.

Spotted lantern fishes (*Myctophum punctatum*) were found as one of the most frequent mesopelagic fish species in the Strait of Gibraltar and the Mediterranean Sea. We frequently observed specimens infested with parasitic copepods and sampled them for lipid composition and oxidative stress assessment.

Figure 3: A parasitic copepod on a Spotted lantern fish (Myctophum punctatum).

With only two more stations left in Spanish waters of the western Alboran Sea, we sampled our last station in the night from 23rd to 24th November, before heading west through Gibraltar Strait and turning north to Lisbon. The remaining steaming time was used for demobilization of the equipment and data consolidation. In the morning of Saturday, the 26th of November the Meteor berthed in the port of Lisbon, terminating cruise M185.

The international scientific crew of M185 gratefully acknowledges the very friendly and most effective cooperation with Captain Detlef Korte and his entire crew. Their great flexibility and their perfect assistance substantially contributed to making this cruise a scientific success. We also appreciate the valuable support of the German Research Fleet Coordination Centre (Leitstelle Deutsche Forschungsschiffe, Universität Hamburg). The expedition was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG).

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