MERIAN MSM41

Weekly report 3 (13.04. to 19.04.2015)

A research team from the Universities of Bremen (BreMarE) and Madeira as well as the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven investigates the productivity, the food web and predator-prey relationships in the Sargasso Sea, which ultimately also determine growth and developmental success of the eel larvae.

Due to the high sea surface temperatures of 22°C in the North and 26°C in the South of our investigation area, there is a pronounced permanent thermocline separating the surface waters from colder water masses with higher densities at greater depth. This barrier prevents the transport of nutrients necessary for algal growth from deeper layers into the surface layer with high solar radiation.

This nutrient deficit strongly limits the primary production of microscopically small unicellular algae (phytoplankton, e.g. diatoms, dinoflagellates, Figs. 1-3), which results in a very limited food supply for the zooplankton. Maximum densities of the algae are not - as usually - concentrated at the surface, but occur in 120 to 140 m depth. There is still sufficient light down there due to the extremely clear water of the Sargasso Sea and more nutrients are available in this depth layer than near the surface. Very small algae with a size of 0.02 mm and smaller play a crucial role in this layer.

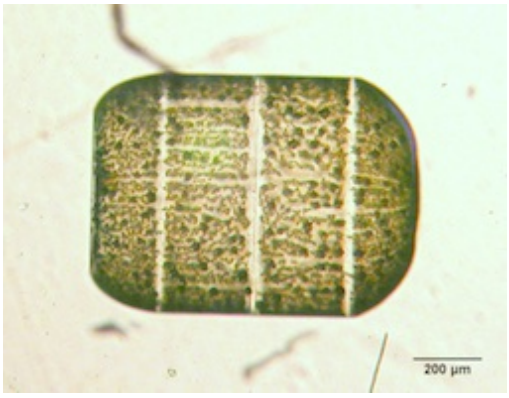

Fig. 1: Diatom *Ethmodiscus gazellae* (Photo M. Kaufmann).

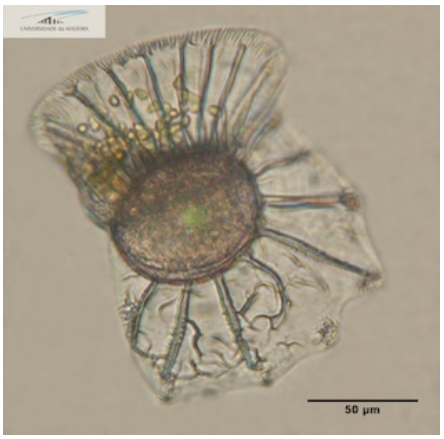

Fig. 2: Dinoflagellate *Ornithocercus* sp. (Photo M. Kaufmann).

Fig. 3: Dinoflagellate *Ceratium* sp. (Photo M. Kaufmann).

Water samples are collected from different depths by the rosette sampler to investigate the phyto-plankton. Several litres of seawater are filtered through very fine filters, which are later analysed for various pigments to elucidate the composition of the phytoplankton community (Fig. 4).

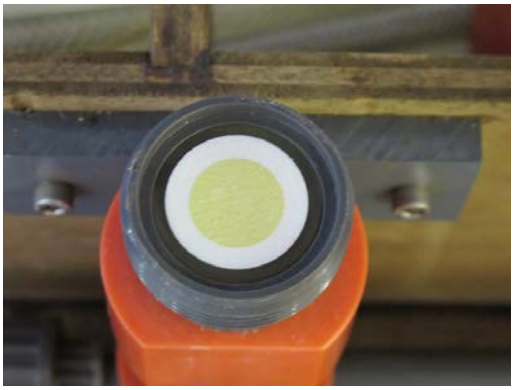

Fig. 4: Green-coloured filter after filtration of several litres of seawater (Photo M. Kaufmann).

Cyanobacteria dominated the surface phytoplankton at the southernmost stations between 24° and 22.5°N. These microorganisms have the unusual ability to utilize molecular nitrogen from the atmosphere as fertilizer for growth instead of nitrate, a successful strategy to cope with the general nutrient deficit in the “blue desert” of the Sargasso Sea.

Owing to the extremely limited food supply, zooplankton stocks are also very low compared to other regions. In particular copepods, which generally prevail in plankton communities with 50 to 80% of biomass globally, are rarely found in the Sargasso Sea. At the surface there are only minute copepods <1 mm. Biomass of our net catches is dominated by deep-sea shrimp (decapods, Fig. 5), myctophids and other deep-sea fish.

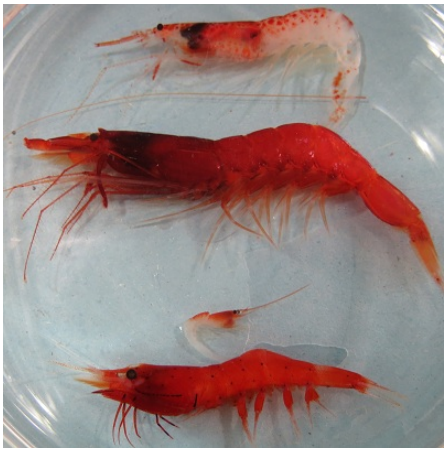

Fig. 5: Various decapod species, bottom: red deep-sea shrimp *Acanthephyra pelagica*, ca. 35 mm (Photo H. Auel).

Similar to the copepods, euphausiids (Fig. 6), often called krill, are found in much lower densities in the Sargasso Sea than in other regions of the Atlantic, but with higher species numbers. The catches comprise often less than a dozen individuals, but each animal may belong to a different species. However, at night several krill species concentrate in higher densities near the thermocline, where food accumulates, to "graze" and hunt for prey. Hence, the omnivorous krill may be a competitor for food but also a predator of the eel larvae.

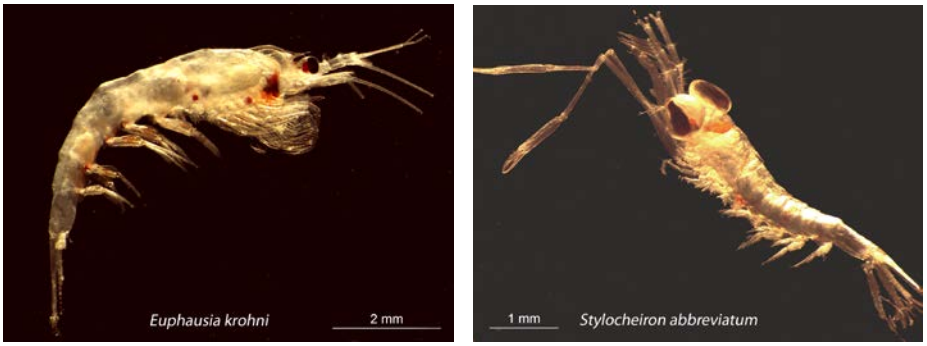

Fig. 6: Two of the 18 krill species with different feeding strategies encountered during MSM41 in the Sargasso Sea. *Euphausia krohni* filters the water for all kinds of particles, such as bacteria, phyto-plankton or small crustacean larvae, with a filtering basket formed by its thoracopods. *Stylocheiron abbreviatum* is equipped with two long thoracopods bearing chelae that are perfectly suited to catching prey organisms (Photo C. Buchholz).

The crew of the Maria S. Merian wishes a good start into the new week!