

30.12.2018 8° 30'S 081° 00'W ca. 120 nautical miles to the west of the Peruvian coast

MSM80 CUSCO

Second weekly report covering the period from 23.12. to 30.12.2018

An eventful week is nearing completion. In the late afternoon of 23.12.2018 we entered the locks on the Caribbean side of the Panama Canal, accompanied by pelicans and frigate birds. In three steps, the locks lift ships by a total of 26 m from sea level up to the level of the Gatún Lake, which provides freshwater for the Panama Canal and the locks. Inside the locks, vessels are lead by four so-called mulis, small trains, which control the distance between the vessels and the walls of the locks. The passage through the canal took eight hours well into the night. The first part of the voyage passed small islands covered by tropical rain forest in the wide Gatún Lake, whereas the final part of the passage lead through the narrow canal. Via three more locks close to Panama City, we finally reached the Pacific Ocean at midnight.

Christmas Eve we celebrated with a barbecue on deck. Many thanks to the kitchen staff for the excellent food. On the evening of Christmas Day we crossed the equator. Regularly, we encounter swarms of flying fish, which try to escape from the bow wave with giant leaps of almost 100 metres. Over the Christmas days, we also saw the blow of a single whale and met a school of twenty or thirty dolphins, which completely jumped out of the water, when they passed us during sunset.

On 27.12. at 2 p.m. we reached our study area in the coastal upwelling system of the Humboldt Current off Peru and started with station work at 8° 30'S 081° 00'W. Most stations begin with physical measurements of water temperature, salinity, oxygen concentration, light intensity and turbulence in relation to water depth. We also collect water samples from different depths in order to study nutrient concentrations and phytoplankton composition (microscopic algae). After that, we deploy different kinds of nets to catch zooplankton (mainly small crustaceans, but also jellyfish, fish larvae and many other animals). The nets are either hauled vertically through the water besides the vessel or towed at slow speed behind the vessel. The first station was located at more than 6,000 m water depth above a deep-sea trench. Accordingly, the catches contained spectacular animals including black anglerfish, other deep-sea fishes with giant teeth and scarlet-red, spiny deep-sea crustaceans.

During the following days, we sampled a total of 14 stations, all along a section at 8° 30'S towards the Peruvian coast. The final station on this transect was completed yesterday afternoon at only 65 m water depth in sighting distance to the coast. Thereafter, we deployed a so-called Scan Fish. This is a measuring device for salinity, temperature and other parameters in high spatial resolution, which is towed behind the vessel at six knots speed and continuously undulates between the surface and greater depth.

With the San Fish in tow, we returned along the entire section at 8° 30'S back to the first station and completed our first transect after about 2.5 days in the study area.

As already announced in the first weekly report, the different teams on board will introduce their research. To begin with, the GEOMAR team from Kiel is studying primary production (= algal growth) and biogeochemistry of the coastal upwelling system.

The team consists of seven researchers, divided across three labs. They cover nutrients, phytoplankton, primary productivity, particle distribution in the ocean and many other parameters to better understand why the Peruvian system is so productive in terms of the base of the food web and nutrient turnover. Per station they collect 150 samples. This requires a good coordination with a

clear work plan, a system of colour codes and coordinated sample labeling as well as carefully kept lab books to keep some kind of overview.

During an expedition cruise, research ideas often develop further. Besides the standard programme, the GEOMAR team discovered its interest in sea birds.

Attracted and irritated by the strong lights on board, each night small storm petrels (seabirds related to albatrosses, but with the size of blackbirds) land on deck. We keep them in a 'bird hotel' (modified cardboard boxes) over night and release them the following morning. At daylight, they again find their own way.

Many new questions for the GEOMAR team: What role do these plentiful sea birds play in the productive marine ecosystem of the Humboldt Current? Do bird faeces as guano contribute to the recycling of nutrients?

At the shallow stations close to the coast, the water has a murky brown colour, like chocolate, compared to the clear blue waters further off-shore. Is this related to highly productive algae or bottom sediment stirred up to the surface? The analyses by the GEOMAR team here on board and later in the home lab will provide answers to these and many more questions.

The creativity of the scientists on board is not only restricted to their professional work. Made from scraps from lab consumables, they created Christmas decorations for the Christmas tree in the hangar.

The weather is still very calm and warm, providing ideal conditions for our research. All scientific instruments and nets work properly so that all scientists on board enjoy work-intensive and successful days.

On behalf of all cruise participants, we wish you a Happy New Year and best regards from R/V Maria S. Merian,

Allanah Paul (for the GEOMAR Team) und Holger Auel



Fig. 1: Entry into the Gatún locks of the Panama Canal; vessel lead by mulis. (Foto: H. Auel)



Fig. 2: In the Miraflores locks on the Pacific side of the Panama Canal (Foto: H. Auel)



Fig. 3: Feliz Navidad at Sea (Foto: M. Fernandez)



Fig. 4: GEOMAR Team during MSM80 (Foto: M. Fernandez)