

Weekly report no. 1 GLOBEC II (ANT XXI/4) RV „Polarstern“ 31 March 2004

FS Polarstern left Cape Town in time on Saturday evening of the 27 March 2004. 38 scientists from 7 nations were accompanied by 43 members of the crew. The last days were busy with loading and equipping the ship for its next survey. At the evening of a sunny autumn day with a starry night, we steamed south passing the spectacular view of Table Mountain illuminated with huge flashlights. The following days were busy in unpacking equipment and shuffling around instruments to their appropriate place in the many laboratories and experimental containers on board ship. Some newcomers however had to adapt to the long, constant, 5m high swell, before they could start setting up their laboratories that are now ready awaiting the first station work.

Our cruise is part of the international science programme "Global Ocean Ecosystem Dynamics" (GLOBEC), that was started 4 years ago "to advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the response of the marine ecosystem to global change". In the Southern Ocean the target organism is krill (*Euphausia superba*), its fluctuations in biomass standing stock in relation to ocean circulation and sea ice dynamics, krill physiology and its role in the Antarctic ecosystem. One of the mysteries still to be explained is how krill survives the long periods of the Antarctic winter where food is sparse. The sea ice has already started to form near the Antarctic shelf ice coast and we will soon approach these areas and look for krill that likes to hide in between the rafted ice flows to get protection from its predators, the seals, whales, penguins and flying birds.

Warm-blooded animals are observed during daylight hours by two teams. The ornithologists from The Netherlands occupy two topless wooden cabins on the high deck above the bridge facing the strong winds and count birds and mammals systematically between sunrise and sunset. The Australian whale watching team from the International Whaling Commission (IWC) stand on the bridge and plug their sightings into electronic spreadsheets used worldwide for this purpose.

Part of our work also will contribute to another big international monitoring and management programme run by the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Founded in 1982 CCAMLR nations including Germany carry out research in Antarctica to advance the scientific knowledge for protection and fishery management in the Southern Ocean. The scientific council advises the nations in research strategies and the Commission is the political arm of CCAMLR in which decisions have to be univocal.

Before we can start our krill research in the area of the Lazarev Sea between 64°-70° South and 8°- 0° West, we will perform 4 geochemical stations in different water masses on our way south. In autumn organic mate-

ri-al accumulates and gets redistributed on the 4000 m deep sea floor that previously sank out of the productive surface layers. Eventually the organic material gets incorporated into the bottom sediments and will change the geochemical properties of the water-sediment interface. Rich loads of organic matter e.g. as derived from a sinking plankton bloom will cause strong gradients in geochemical properties like in oxygen, nitrate, phosphate and silicate and organic carbon. After further diagenesis the remains will get buried in deeper layers of the sediment leaving behind trace signals of the productivity of the surface ocean. In reverse the geochemical tracers found in distinct sediment layers can provide insight how in earth history warm and cold periods were characterized in terms of ocean productivity.

During the previous cruise of Polarstern – the European Iron Fertilization Experiment (EIFEX) – scientists fertilized a 10 km<sup>2</sup> wide patch in the centre of an ocean eddy with iron and stimulated a considerable phytoplankton bloom composed mainly of diatoms. During the experiment biomass and productivity of bacteria and zooplankton also increased. There is much more to tell about this experiment but you had better read the cruise reports from ANT XXI\_3 written by Victor Smetacek. At the end of EIFEX, some diatom species sank out of the productive surface layer to water depths close to the sea floor. Now two weeks later, we steam through the geographical area of EIFEX and use the opportunity to stop over and take some additional samples to prove the fate of the fertilized bloom. Especially the geo-chemists are eager to learn whether the bloom had sunken to the sea floor and if so, to what degree this input of fresh organic carbon has changed geochemical profiles in the sediments.

If zooplankton is still enriched in the EIFEX eddy, it will be determined by using acoustic backscattering signals received from the steaming ship. In addition we tow a continuous plankton recorder in about 10 m water depth behind the ship. The torpedo like instrument has an inlet in its nose, behind which water gets filtered through plankton gauze. This double layer of gauze is gently rolled up like a film in a cassette and is preserved until final analysis in home laboratory. There the zooplankton species caught in the film are examined, classified and grouped to the appropriate geographical position of its catch. For more than 60 year this technique has been successfully used from cruising vessels in the North Sea and the North Atlantic and climatic driven shifts in zooplankton composition can be identified. On Polarstern the CPR was deployed for the first time but we plan to use it routinely from now on, in the transit between Cape Town and the German Antarctic station Neumayer to contribute to an international registration grid all around Antarctica.

Some groups on board eagerly await their first station work in the main investigation area – the Lazarev Sea. We will have to steam for several more days to come until we can experience the cold temperatures of the high Antarctic in autumn. By then the high wind speed of Beaufort 8 and the sea swell above 6 meters that we experience at the moment should have di-

min----ished. Meanwhile the crew on board again does its utmost best to make us feel at home. The large selection of different food during the meals that are prepared are exceptionally delicious, show a whole variety of veg-eta---bles and fruits, and are served with style and charm. But we shall not forget that we cross one of the furious oceans and enter one of the coldest oceans worldwide. Soon we will cross the Antarctic Circle. With all the best wishes from the cruise participants,  
Uli Bathmann