

ANT XXIII/6 Weekly Report No. 5 (Cape Town - Cape Town)
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Diving under the sea-ice was a big success. On Wednesday 19th July by 10 a.m. the two igloos were the last pieces of equipment that were flown back to the ship by helicopter. For six days and nights, five divers and many supporters had been active around the ice camp to collect, document and film krill and zooplankton directly under the greenish-brown sea-ice. Igloos and tents protected personal and equipment from the ice-cold winds that reached force 7 at times, and the ships engineers and crew helped around the clock supporting and repairing instruments like the electric generators that sometimes could not stand Antarctic conditions.

During their investigations the divers documented that krill was gently floating directly under the ice, whereby reacting like the organisms in a freshwater creek. Every bump in the ice, any topographical elevation is used to hide from the currents. The view of the under-ice world might also be of interest to ice physicists who might learn more about ice growth and micro-turbulence by applying their instrumentation from underneath the ice flows. Especially during darkness, adult krill surfaces from the deeper ocean also feed under the ice and on the copepods that are part of the active under-ice community.

In between ctenophores hunt krill and copepods by using their poisoned stinging weapons. The view for the divers and for the camera is spectacular as the clear water allows more than 50 m visibility. Krill and its larvae are attracted by the headlamp of the diver. Swarms of krill larvae approach into the light beam and can easily be collected by means of MASMA. MASMA stands for "Mangera submarina" (sub-aquatic tube) and is the newly developed pump system from our Argentinean colleague to pump water into a closed system very gently through a plankton sieve. The larvae are in excellent conditions and show a threefold higher survival rate in lab experiments compared to conventionally collected animals. This challenges the previous results of the various fitness parameters that tell us how krill manage to survive during the winter.

The nice weather and all the activities on the ice attracted visitors from the ship and from elsewhere. It was a good feeling to leave the ship for a strait walk on the solid ice after having been on board for about a month. With its illuminated windows and steel covered warmth Polarstern looked rather isolated in the white wilderness that stretches 1000 km in each direction. As we experienced in person the Antarctic environment, some of the original inhabitants came to visit the alien big vessel. Emperor and Adelie penguins were as curious for us as we were for them. Carefully both groups approached each other - the red coated paparazzi with cameras laid on the ice in front but not too close to black-and-white dressed birds that interestingly watched the strangers with their odd habits. The last evening on the ice was celebrated with a hot drink to thank for all the help the divers received from the ship's crew during the previous days and weeks. It

was a clear and very cold night again with no moonlight. Imagine the situation of a person standing on a thin ice layer on top of a 5000 m deep, dark ocean looking into the absolutely clear sky with trillions of stars. One feels rather small in such a situation, but also proud of being able to sustain the remote loneliness and the extreme environmental conditions.

Back on track in sampling our grid we also discuss the first results. During the daily seminar hour scientists present their preliminary findings to inform the other groups and thereby help to adapt the sampling strategy according to the actual situation that we experience. In my second weekly report I briefly explained one of the backbone instruments for our research, the CTD that provides data of the physical structure of the water masses investigated. On the entire first north to south transect the surface ocean layer was well mixed down to 120 m water depth with salinities between 34.1 and 34.5 PSU. A strong density gradient separated this layer from the waters below in the most northern and southern parts of this transect, a feature not so pronounced in the vicinity of Maud Rise. This sub-ocean mountain evaluates 4000 m above the surrounding deep ocean sea floor so that the water depth over that mountain is as shallow as 1280 m.

Polarstern's sensor for ocean currents and their velocities is the vessel mounted Acoustic Doppler Current Profiler (ADCP). This instrument uses the returning Doppler Effect by transmitting sound of a fixed frequency (i.e. 135 kHz) and listens to echoes returning from sound scattering in the water below the ship. These scatters mainly consist of plankton that moves on average at the same horizontal velocity as the water. While most of the emitted sound pulses travel undisturbed by the scatterers, a small amount reflects back and is Doppler shifted. The depth range of the ADCP is mostly determined by abundance of scatterers and the presence of air bubbles under the transducer and varies between 250 and 400 meters. Ocean currents become visible by plotting the current velocities along the track line of the ship.

Strong westward-directed currents were recorded north of Maud Rise at 63°S and on the Antarctic shelf close to the coast. Krill catches were highest in that current north of Maud Rise. According to results from previous cruises, this current is expected to circum-flow the seamount so we might hit it again at 64°S on the Prime meridian. The current system around Maud Rise is indeed an outstanding feature in the hydrography of the Lazarev Sea and plankton organisms obviously find this spot very attractive for overwintering. We do not quite understand all reasons for these findings.

As we now have a better comprehension of the ice conditions in the Lazarev Sea between 60° S and 70°S, we have reconsidered our sampling strategy. Due to heavy ice in the south and some storms we have to scarify some sampling stations to save the overall sampling grid. It was decided by the entire group that the two northernmost stations on each line will not been oc--

cu---pied, so that our grid starts at 61°S on all transects. The ice is becoming thicker by the day and therefore it seems wise to go south again as soon as possible. The advantage to turn south now is obvious as we will realise how far south we can go, given the development of the sea ice, and we make our way to the north while sampling the last line of stations. If we gain time, we can add more stations in the north, and it will be much easier to determine the actual date for our return to Cape Town.

Today the satellite picture shows clear sky for the entire investigation area, and so is the day. A beautiful sunrise started a bright sunny day at 9 a.m. with low winds but minus 25°C. Sunset will be at 3 p.m. Today we intend to celebrate our mid-term party, while the ship will be steaming between the stations. Flags from all nations represented on board decorate the walls, dancing music is assembled and a cold buffet is in preparation. We will also have a barbecue and roasted vegetables, meat and fish on coal-fires on deck. Let's hope that the upper side of the meat will not freeze while the underside will still being roasted.

I am sure some people in Europe enjoy the summer in similar ways while others suffer the great heat you have up in the north. We can wear warm clothing against the cold, and you...

...enjoy the summer as we enjoy the winter!

Uli Bathmann