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The departure of POLARSTERN for its 19-month journey to the south made a memorable event. In beautiful sunny weather we enjoyed the farewell party with music in the northern Sluice. Colourful paper streamers linking us to our friends and relatives on the mainland were torn when the sluice door opened and POLARSTERN left her hometown with 40 scientists and 43 crewmembers on board. A final farewell was offered by tug boats with magnificent water fountains.

In favourable calm weather we started to unpack the containers, transfer our boxes to the labs and mount our equipment. While some groups could start right away with their measurements, most were still working on their installations while we sailed through the southern Bight of the North Sea. Here we were visited by increasing numbers of migratory birds. Wrens and robins got lost in the interior of the ship and we tried to help them find their way out of our labs again to allow them to continue their migration.

After we had passed Dover Strait around midnight, station work started in the Channel with a biooptics programme. I will write more about that programme in a later report. In the Bay of Biscay our activities focused on the acoustic programme. Sound waves are an essential tool for geoscientists to study the deep and shallow structure of the marine subsurface and the topography of the ocean floor. However, discussions on the potential impact of acoustic waves on marine life, particularly marine mammals, led to technical developments for scientific sonar systems that allow to reduce the source level in order to minimize the sound energy emitted into the ocean. The scientific sonar systems used during this study are the hull-mounted HYDROSWEEP and PARASOUND systems. HYDROSWEEP is a multi-beam sonar, which emits and receives acoustic waves of 15.5 kHz frequency within a fan of 90° or 120° athwart ship. The travel times of the reflections of these acoustic waves from the sea floor are used to produce detailed high-resolution bathymetric maps of the ocean floor. Such maps sometimes reveal a very mountainous landscape below us, and are essential to mapping and understanding e.g. the development of the ocean floor, the pathways and circulation of ocean currents, sediment mass movements or tectonic structures on the ocean floor. They have become an essential guide for every sampling operation in deep waters. The PARASOUND system is a sediment echosounder, which emits and receives acoustic waves of 4 kHz within a narrow cone of 4° opening angle. Due to the lower frequency (lower “tone”) these waves penetrate the upper about 20 - 100 m of the sediment coverage, are reflected at layer interfaces with different acoustic properties above and below it, and thus allow us to image the subsurface layering of these sediments. Recordings with the PARASOUND system are used to profile sedimentary structures along the ship's track and to guide us where to take the sediment cores that we use to unravel the history of the Earth’s climate.

The objective of the acoustic program during this cruise is to test in

detail if some new options for the HYDROSWEEP system, updated during the last shipyard time and allowing to reduce the source level manually or automatically, work correctly and enable us to produce bathymetric maps without loss of information and data quality. To meet this objective we have revisited three sites in the Bay of Biscay where detailed bathymetric data had already been collected with former system versions of HYDROSWEEP during previous cruises with POLARSTERN. We have now conducted repetitive surveys of these well-known sites with different settings of the new HYDROSWEEP version. A detailed analysis of this data set will show if the data quality of the maps has been affected by the reduction in sound intensity. For PARASOUND our objective was to collect a reference data set which in the future allows comparisons with a new system version which will then also include options to reduce the sound intensity.

Related to this study is the test we have made with a SONAR system that may be used to detect whales around the ship. When POLARSTERN works in Antarctic waters, our government asks us to switch off acoustic systems as soon as a whale is observed around the ship. But whales can only be observed from the observation deck if they come to the surface to breathe. If it were possible to detect whales around the ship with an active SONAR system, this procedure might be made more efficient. To this purpose we have deployed a buoy with a reflector hanging below it, and sailed around this “whale” to find out under what circumstances it could be observed. We found that the SONAR system is able to detect the reflector at a distance between 200 and 1000 m. During daytime we lost the barely visible buoy completely and we decided to continue our further programme and try to relocate the buoy in the following night. We hoped that the flashlight mounted on it would make it easier to find it back in the dark. We were very happy when the chief mate sighted the buoy at a distance of 3.5 miles and we could safely recover it with all its instrumentation.

We have been extremely lucky so far with the weather. Most of us know the Bay of Biscay as an area of stormy autumn weather. Some of us have experienced on earlier occasions that heavy weather damaged equipment when packed in containers on deck while the ship passed this part of the ocean. The weather has up to now been fine with very moderate waves, and only few people were seen with patches behind their ears.

We are now performing the first large tracer station, and we will then head to Vigo for our visit to this hometown of our former Spanish crewmembers. For some of us Vigo will be the destination of a very short expedition, whereas some new cruise participants will join us there. All on board are well, and on behalf of them I send you our best wishes.

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