Weekly report 2 ***12 December 2007***

New methods of seafloor sampling for Antarctic marine life

During the voyage of *Polarstern* 24-2 to Antarctica, my weekly reports will follow a theme of how modern shipboard techniques are drawing together our studies of biodiversity. The current voyage integrates three projects on Antarctic ecosystems and their physical environment. The Census of Antarctic Marine Life (CAML) studies the biodiversity, abundance and distribution of marine species, from microbes to whales. SYSTCO studies life on the abyssal seafloor, linking it to productivity in the waters above. The Synoptic Circum-Antarctic Climate and Ecosystem Study (SCACE) connects the oceanography and climate to the ecosystem, for comparison with future changes.

In Antarctica, biodiversity studies pose some special challenges: sampling under ice, in remote locations and in habitats with extremely low temperatures. Shipboard gear needs special materials to cope with the extreme environment. All research vessels are expensive but research vessels with icebreaking capacity cost even more.

Our sampling equipment includes some bizarre contraptions, such as a net that scrapes up the animals under pack ice. This Surface and Under-Ice Trawl (SUIT) is the brainchild of a Netherlands team, committed to understanding the coupling between predators and their prey. Close cooperation between a metalworker and a scientist, modifying the prototype trawl at sea, made this idea a reality.

Shearing out to starboard behind the ship, the SUIT has a one-tonne weight on its towing cable, to sink it beneath the ice. Wheels help it to traverse the uneven ridges under the ice and an overflow ejects any iceblocks that get into the net. The catch includes krill, amphipods, squid and fish. Divers have confirmed that these animals hang under the ice floes. It is not a surprise that these are the same species that we find in the stomachs of predators. The productive under-ice habitat, only recently explored, is vulnerable to climate change.

The Alfred Wegener Institute for Polar and Marine research coordinates polar research in Germany and provides infrastructure such as the *Polarstern* and the Antarctic and Arctic stations. Our mission includes transporting materials for a new building at the Antarctic base, *Neumayer*. A helicopter will transport the containers from ship to shore. The scientists onboard have been quick to piggyback the test flights for predator surveys. Along with hours of observations from the freezing deck, they measure the changing populations of predators such as birds and seals.

Biodiversity studies in Antarctic waters include up to 7,000 species of invertebrates and mammals. These are the species described already – there are another 4,000 species on the workbench. And we have just started on assessing the diversity of microbes! The CAML is coordinating biodiversity studies on 18 research vessels

during the International Polar Year (IPY). Scientists send their geo-referenced species data to the

Antarctic dataportal www.scarmarbin.be so that everyone can share their results. The dataportal has facilities for analysis and visualisation of data trends, to encourage the integration of various collections during the IPY. To bring the results to a wide audience, Equipe Cousteau works on Education and Outreach for the projects.

On 3 December we saw the first iceberg, unexpectedly early at 47° South. Wedged between two significant storms of Beaufort 9-10, the onboard weather guys selected reasonable conditions for our first sampling station on 5 December at about 52° South and 0° West in water depth of 3,000 meters. Daylight hours have increased noticeably; hauling gear on the deck at 4 am enjoyed plenty of natural light. An impressive array of sampling gear was utilised: the Conductivity Temperature Depth recorder; underway acoustics and measurements of inorganic carbon, total alkalinity, oxygen and nutrients in the seawater; bottom water sampler; amphipod trap; five different types of trawl; epibenthic sledge; underwater camera; geochemical sediment profiler; sediment multicorer; plus a box corer to sample the seafloor. In the coming reports there will be more news about the samplers and results.

We found a variety of animals on the seafloor and in the water: copepods, krill, holothurians, ophiuroids, asteroids, anemones, isopods, amphipods, squid and fish. The seafloor was a fine sediment, sticky with organic ooze. Microscopic inspection of the mud revealed many foraminiferans; the same species found in an earlier bloom of phytoplankton at the water surface. Discoveries like this are the stuff of understanding the coupling of processes on the seafloor and in the ocean above – the rationale for our expedition.

Victoria Wadley
Census of Antarctic Marine Life and Australian Antarctic Division

This is the second of nine CAML reports at weekly intervals during the Polarstern voyage ANT-XXIV/2. The following reports will focus on different aspects of the marine life in Antarctica and how the organisms are collected for studies of biodiversity.

Suggested photos:
Polarstern_ANT-24-2_SUIT-logo
20071206_Agassizdeck_CWadley
20071206_Wadley_CFeij
20071206_Ophiuroid_CBrandt