



**Sit. Rep. #03**  
**30 January 2008**  
**US AMLR Vessel Survey (*R/V Yuzhmorgeologiya*)**  
**South Shetlands, Antarctica**

After last week's sunny and calm period, we were reminded about how remote it is to sample Antarctica, and that it is not a traditional coastal or nearshore survey. At the beginning of the week a series of low pressure systems hit us every 24 hours causing us to stop sampling for more than 30 hours. Moreover, Poseidon extracted a heavy toll this week and nearly ended our survey for us. We lost an entire net system when the wire broke. This left us with only a single back up frame and two backup nets. Not an enviable position 12,000 miles from the nearest net shop!!! The seas then devoured another net that we sewed back together. That net was lost as well, and another was chewed up by the seas pretty bad. However, perseverance on the part of our zooplankton team and the crew of the *Yuzhmor* allowed us to repair the net. Some 30 hours of combined hand sewing, and calming weather conditions has allowed us to continue our survey!!!

This week also reminded us that we enjoy a great support system in La Jolla, where a number of laboratories and individuals scrambled to ensure that we will be able to restock our sampling gear at the end of the first leg. We are currently at station 03-14 just east of Joinville Island having concluded the Elephant Island portion of the survey early today. Ice conditions were favorable for us to venture farther south than we have in the last six years,; this has ensured that we were able to sample into Weddell Shelf Waters.

### **Acoustics**

Acoustic biomass estimates for the West shelf showed the area to be rich with krill. Our estimates indicate that more than 605 Ktons of krill were present on the West shelf during January. Density of krill exceeded  $1.5 \text{ g m}^{-2}$ . These numbers compare favorably to the numbers from 2007 and 2006. Large patches of krill were visible in the acoustic data many extending thousands of meters in length. We expect that the biomass in Elephant Island should be very high as well. We will have those numbers later in the cruise.

### **Zooplankton**

Due to rough weather conditions and lost or damaged nets the Elephant Island Area survey was limited to 34 quantitatively useful net samples. Krill were present in all but one of these with overall mean and median abundance values of 286 and 22 per 1000  $\text{m}^3$ , respectively. These values are both ca. 3X larger than those of the West Area. The largest catch of 8000 individuals (3600 per 1000  $\text{m}^3$ ) was southwest of Elephant Island adjacent to the deep eastern Bransfield Strait basin. This sample represented almost

half of the total estimated krill catch for the area (15000). Another relatively large catch of 2800 krill (1100 per 1000 m<sup>3</sup>) was located over the northwest Elephant Island shelf break.

Because of the overwhelming dominance of the largest catch it is excluded from considerations of overall krill demography in the Elephant Island Area. Lengths ranged from 15 to 57 mm but most (85%) were <45 mm and centered around strong modes of 27 mm and 42 mm. These modes correspond to one- and two-year-old individuals and reflect strong recruitment success of the 2005/06 and 2006/07 year classes. This marks the third successive year of good recruitment in the South Shetland Island area. The paucity of individuals of the successful 2004/05 year class (i.e., >50 mm) is possibly due to a more offshore distribution during the survey.

Juveniles comprised 52% of the catch while immature stages made up 16% and mature stages 33%. The immature stages were largely two-year old males while small two-year old females were mostly mature and reproductive. Overall 25% of the mature females were in advanced reproductive stages (with spermatophore packets, developing ovaries and gravid). However, since the temporal progression from recently mated to gravid individuals appeared to coincide with the survey period it is likely that the major seasonal spawning event here is in late January and early February.

Larval krill occurred in 24 of the 34 (71%) samples with overall mean and median abundance values of 23 and 5 per 1000 m<sup>3</sup>. Virtually all of these were early calyptopis stages resulting from spawning two to three weeks earlier (i.e., early to mid-January). Greatest concentrations were located over deep basins northeast of Elephant Island and in eastern Bransfield Strait. The increased incidence and abundance of these larvae across the survey period supports the suggested late-January/early February spawning peak here.

The zooplankton assemblage in the Elephant Island Area was relatively simple, strongly dominated by just a few taxa and conforming to the quintessential South Shetland Island assemblage described in the Discovery Expedition reports. Copepods were the most abundant group with overall mean and median abundance values of 1300 and 910 per 1000 m<sup>3</sup>. *Metridia gerlachei*, small unidentified species and *Calanoides acutus* were the dominant forms. Postlarvae of the coastal euphausiid *Thysanoessa macrura* ranked second in mean and median abundance (310 and 203 per 1000 m<sup>3</sup>) followed by post larval krill. Although the salp *Salpa thompsoni* was present in 25 samples (74%) it was comparatively rare, with mean and median abundance values of 8 and 3 per 1000 m<sup>3</sup>. Largest concentrations (24-46 per 1000 m<sup>3</sup>) were offshore in Drake Passage adjacent to and in the lee of the Shackleton Fracture Zone. Small numbers of the high latitude salp species *Ihlea racovitzai* were found in five samples reflecting the minimal influence of Weddell Sea shelf water in the area.

## **Oceanography**

Four steep peak and troughs of the barometer across the week resulted in grey skies and Northwesterlies, almost continuously above 20 knots with Monday to Wednesday

producing sustained periods of 30 to 40 knots, gusting to 45 knots. The accompanying 3 to 6m sea swell height resulted in two stations on the eastern line of the West Area, having to be abandoned, but to date, all other stations have been successfully occupied in the Elephant Island Area.

This brings the successful CTD dip total to 67. The CTD data has been processed and verified with the water bottle samples and the Autosal salinometer and field water-typing analysis done. Routine maintenance, and the usual running repairs on the CTD system (mainly underwater connectors), were limited to the transits between stations, resulting in no time being lost due to CTD technical problems. Various arrangements of the two PAR sensors on the CTD frame were installed for calibration purposes.

### **Phytoplankton**

The remaining portion of the West Area was completed, with 5 m chlorophyll-a being 0.49 - 0.52 mg m<sup>-3</sup>. Highest biomass was found at station A1509, with 1.6 mg chlorophyll-a m<sup>-3</sup> at 5m; in profile, this station had ~1.5 mg chlorophyll m<sup>-3</sup> from the surface to the pycnocline at ~35 m, steadily declining to ~0.1 mg chlorophyll-a m<sup>-3</sup> at 200 m. Fifty percent of the Elephant Island Area now completed (32 stations), with 5 m chlorophyll-a concentrations of 0.69 - 0.60 mg m<sup>-3</sup>. Highest biomass was located at Station A1107 (2.4 mg chlorophyll-a m<sup>-3</sup>), and stations A0806 and A0508 also exhibited high biomass (~1.8 mg chlorophyll-a m<sup>-3</sup>). In the western Elephant Island Area, the blue water zone was found at ~61°S and west of ~57°W. Along the eastern side of this front (Stations A0402, A0503, and A0504) chlorophyll-a concentrations were ~1 mg m<sup>-3</sup>, while along the western side of this front (Stations A0702, A0703 A0704), chlorophyll-a concentrations averaged 0.127 mg m<sup>-3</sup> and had a deep chlorophyll-a maximum at 75-100 m. Nineteen stations have been sampled for nitrate, phosphate and silicate, with 12 of these at 10, 30, 50, 75, 100, and 200 m depths.

The Integrated Optics Package (IOP) and the Profiling Reflectance Radiometer system (PRR) have been deployed at 7 mid day CTD stations. Water samples have been collected at 8 mid day CTD stations. To date 16 PvsE experiments have been run and analyzed, ap, ad, and as samples from 40 depths have been analyzed, 40 sample have been run on the Coulter Counter, and particulate CHN samples have been collected for 40 depths. HPLC pigments samples from 57 stations have been collected at surface and subsurface chlorophyll maximum. The surface PRR 810 continues to record surface irradiance at 19 spectral channels. Updated composite satellite images of chl-a and sea surface temperature, and recently added a sea ice composite that will allow us to examine the plan for the second leg of the survey.

### **Birds and Marine Mammal Observations**

Data on the distribution, abundance and behavior of seabirds and mammals were collected during underway ship operations in the Elephant Island stratum. Thirty-two transects were collected covering approximately 585 nautical miles of survey effort. The seabird community consisted of the following species: Cape Petrel, Chinstrap Penguin, Black-bellied Storm Petrel, Wilson's Storm Petrel, Black-browed Albatross, Southern

Fulmar, Antarctic Prion, Southern Giant Petrel, Blue Petrel, White-chinned Petrel, Gray-headed Albatross, and Wandering Albatross. Feeding activity by Cape Petrels was frequently observed (~520) throughout the Elephant Island stratum; primarily along transects E2-E4 and E6. However, feeding aggregations were very patchy and were located along the western shelf break region and in offshore waters coinciding with the southern ACC front. Antarctic fur seals were highly conspicuous in the Elephant Island stratum. We observed a total of 114 seals, and on average group size was 3 animals. Additionally, a total of 17 Humpback Whales were observed.

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Report submitted by AMLR researchers aboard the *R/V Yuzhmorgeologiya*, conducting surveys of the pelagic ecosystem in the peninsula region of the Antarctic. These reports are posted at <http://swfsc.noaa.gov/aerd-field.aspx>.