



Sit. Rep. #2
US AMLR Program
R/V Yuzhmorgeologiya
15 January 2007

1. Our current position is approximately 60 nautical miles northwest of Livingston Island where we are conducting a survey of bio-oceanographic conditions in the vicinity of the South Shetland Islands. The survey is divided into four strata: the West Area north of King George and Livingston Islands; the Elephant Island Area encompassing the northern portion of the South Shetland archipelago; the Joinville Island Area in the western portion of Bransfield Strait; and the South Area in the central portion of Bransfield Strait south of King George and Livingston Islands. Survey operations in the South Area were completed this past week. Agreeable weather and sea conditions enhanced progress during the week.

2. Krill, salps and other zooplankton. Close to 7300 krill were collected in 17 of the 20 South Area survey samples. Largest catches containing 2300-2600 individuals (1000-1200 per 1000 m³ water filtered) were located between the Antarctic Peninsula and deep basin of western Bransfield Strait while moderately large catches (300-400 per 1000 m³) were distributed across Bransfield Strait south of Livingston Island. Krill lengths ranged from 19-54 mm but 88% were <35 mm and comprised predominantly juvenile and young immature stages. Juveniles contributed 82% of the total krill sampled and reflected substantial recruitment of the 2005/06 year class. Good recruitment success was anticipated based on the massive and seasonally optimal spawning activity observed last year. Overall mean krill concentrations of 160 per 1000 m³ in the South Area are similar to those during the January 1996 and 2003 large area surveys that monitored the highly successful 1994/95 and 2001/02 year classes.

Overall copepods numerically dominated the South Area catches with a mean of 950 per 1000 m³. Greatest copepod concentrations were over the southern shelves of the South Shetland Islands likely resulting from retention with coastal gyres. Post larvae of the coastal euphausiid species *Thysanoessa macrura* were second in abundance with 220 per 1000 m³. Krill ranked third in overall abundance in this area. With abundance means of 20-35 per 1000 m³ the pteropod *Limacina helicina*, chaetognaths and ice krill *Euphausia cyrstorophias* (a marker for Gerlache Strait water) were also relatively abundant components of the South Area zooplankton assemblage. The salp *Salpa thompsoni* was notably absent and *Ihleia racovitzai*, a marker for Weddell Sea water, quite rare in the samples. These results suggest reduced faunal input from eastern vs. western source areas this field season.

3. Krill biomass and dispersion. The primary analysis for the mean density of *Euphausia superba* for the Southern area in the Bransfield Strait is 25.75 g/m². This estimate is using the SDWBA method and the krill length delineation, a different method than last year. This is also using day and night data; final analysis will only include day time krill estimates due to diurnal migration.

4. Phytoplankton. As of midnight, 1/13/07, 19 stations were sampled for chlorophyll (5-200 m); 10 stations were sampled for macronutrient profiles (10-200 m), plus 10 other stations at 30 m; four stations were sampled for trace elements (including dissolved and particulate Fe). 12 of the

19 stations were finished with processing of chlorophyll (24 hour extraction time required). Of these, phaeopigments concentrations were ~20% those of chlorophyll ($r^2 = 0.86$). The lowest chl concentrations were found at Stations A07-11 and A08-12 (near the Antarctic Sound) that averaged $0.68 \pm .03$ mg chl-a m⁻² for 5 meter depths, and occurred in waters having low surface stratification. The other 10 stations had chlorophyll concentrations of 1.33 ± 0.27 at 5 meters depths, displaying log-linear decreases in concentration with depth ($R^2 = 0.7482$). These stations were from waters having strong stratification to ~50 m wind mixed layer with surface salinities ~34.1 psu.

Bio-Optical Sampling, represented by Mattias Cape and Brian Seegers. Their sampling plan is designed to enhance spatial and temporal resolution of phytoplankton biomass, physiology and primary production using optical technology. Ship sampling has consisted of daily deployments of bio-optical instruments and water sample collection and analyses from the mid-day CTD cast. To date, the Integrated Optics Package (IOP) and the Profiling Reflectance Radiometer system (PRR) have been deployed at 3 mid day CTD stations. Water samples have been collected from various CTD depths for photosynthesis vs. irradiance (PvsE) experiments, analyses of particulate absorption (ap/ad) and dissolved material absorption (as), HPLC pigments, and particulate CHN. This week 6 PvsE experiments have been run and analyzed, 15 ap/ad, and as samples have been analyzed, and HPLC pigments and particulate CHN samples have been collected for 15 depths.

5. Oceanography and meteorology. A slowly falling barometer, and winds gradually undulating back and forth between west and east, saw calm seas, mild weather and some sunny days during the Drake crossing and the survey of the South Area. The convergence's northern edge was poorly defined and crossed at latitude 57.8° S, on the southbound transit.

A few periods of winds peaking to thirty knots were experienced, but the average was around 12knts. Light snow and rain were also encountered on occasions. An extra transmissometer (blue) and a second 2PI PAR sensor were installed and interfaced to the CTD system and 23 casts were successfully completed, during the acoustic calibrations and the stations of the South Area. Initial field analysis of the CTD data showed that the majority of the stations occupied in the South Area were Water Zone 4 (Bransfield Strait) types with only the three stations closest to the Antarctic Sound, showing Water Zone 5 (Weddell Sea) influence.

6. Ocean acidification – As we enter the west shelf area of the AMLR grid, we will begin sampling for dissolved inorganic carbon. Two stations in ACC waters will be sampled within the West shelf region, and the remaining samples will be collected in the Elephant island area, along two transects. Ten percent of the bottles will be used as replicates. We have preserved pteropods from all areas of the Bransfield Strait and we will continue to collect and preserve samples from both the West Shelf and Elephant Island areas.

7. Predator diet studies. Predator diet studies have been initiated examining the diet of Antarctic fur seals (*Arctocephalus gazella*). Lipids have been extracted from 20 milk samples using the FOLCH method. A total of 10 scats have been processed all from week one (12/21/2006). Week one scats only contained Antarctic krill (*Euphausia superba*). The scats are dominated by large krill ranging from 38-54 mm in length, with the majority between 44-50 mm. No myctophid otoliths or squid beaks have been seen to date.

8. Bird and marine mammal observations. Data on the distribution, abundance and behavior of seabirds and mammals was collected during underway ship operations in the South area. Sixteen transects were collected totaling approximately 400 nautical miles of survey effort. Seabird community composition was concordant with previous AMLR surveys in the Bransfield Strait region. The community consisted primarily of Southern Fulmars, Cape Petrels, Giant Petrels, Gentoo Penguins, Chinstrap Penguins, Wilson Storm Petrels, South Polar Skuas and Antarctic Terns. Southern Fulmars were the most conspicuous avian predator. On transit to station 14.14 there were continuous sightings of numerous feeding aggregations of Southern Fulmars numbering in the thousands. Birds were observed sitting in large rafts averaging in size of approximately 500 birds. In addition, Cape Petrels were also observed in feeding aggregations within the waters of the Southern Bransfield Strait. Humpback Whales were the most common cetaceans in the South Area. We collected 95 sightings of Humpback Whales. Group size was typically 2 to 3 whales, but on a few occasions we observed groups that were 5 and 6 in size. These numbers of Humpbacks are the largest estimated since AMLR 2003. In addition, 7 Minke Whales and one Crab eater Seal were observed.

Report submitted by AMLR researchers currently onboard the *R/V Yuzhmorgeologiya*. These reports are also posted at <http://swfsc.noaa.gov/aerd-field.aspx>.