

Antarctic Ecosystem Research Division  
 Southwest Fisheries Science Center  
 8604 La Jolla Shores Drive  
 La Jolla, California, USA

**AMLR 2007 CRUISE PLAN**

**VESSEL:** *R/V Yuzhmorgeologiya*  
**OPERATING AREA:** South Shetland Islands, Antarctica

<b>ITINERARY:</b>		<b>Sea Days</b>	<b>Port Days</b>
Port call in Punta Arenas	03 Jan - 05 Jan 2007		3
Leg I	06 Jan - 04 Feb	30	
Port call in Punta Arenas	05 Feb - 06 Feb		2
Total Days		30	5

**SCHEDULE OF EVENTS:**

**LEG I:**

Transit to Cape Shirreff	3	06 - 08 Jan
Transfer personnel to Cape Shirreff	1	09-Jan
Transfer personnel to Copacabana, calibrate in Admiralty Bay	1	10-Jan
Conduct large-area survey	15	11 Jan- 25 Jan
Transfer personnel to Cape Shirreff, deploy buoys, conduct inshore survey	6	26 Jan-31 Feb
Transfer personnel from Cape Shirreff, recover buoys	1	01-Feb
Transit to Punta Arenas	3	02 - 04 Feb
Total days	30	

**OVERVIEW:** One of the goals of the U.S. AMLR field research program is to describe the functional relationships between krill, their predators, and key environmental variables. For the last several years, the U.S. AMLR field program has been conducted in the vicinity of the South Shetland Islands. Shipboard mapping of these waters indicate that several water masses converge in the area, forming a hydrographic front along the shelf break north of the archipelago. High densities of phytoplankton and Antarctic krill are associated with the position of the frontal zone, although seasonal timing of their appearance can vary by several weeks. The U.S. AMLR Program has also documented large year-to-year variability in the reproductive success of krill and associated this variability with multi-year trends in the physical environment.

In the austral summer of 2006/2007, the U.S. AMLR Program will conduct an oceanographic and acoustic survey of the pelagic ecosystem in the vicinity of the South Shetland Islands during January (Figure 1). This survey is in keeping with an 18-year time series of surveys conducted by the U.S. AMLR Program. Acoustic sensors will be calibrated in Admiralty Bay at the beginning of the large area survey.

The U.S. AMLR Program also monitors reproductive performance and foraging ecology of land-breeding krill predators at field camps at Admiralty Bay (Copacabana), on the south side of King George Island and at Cape Shirreff, on the north side of Livingston Island (Figure 1). Personnel will occupy field camps at Cape Shirreff and Admiralty Bay from October/November 2006 through mid-March 2007. Ship support for the Cape Shirreff field camp will be provided at the beginning and end of the large area survey. Both field camps will be closed and personnel recovered at the end of the season by an NSF vessel.

Table 1 lists shipboard personnel for the cruise. Table 2 lists personnel for both field camps and the method of transport in and out of camp.

## **OBJECTIVES:**

1. Conduct a survey of the South Shetland Islands in order to map meso-scale features of water mass structure, phytoplankton biomass and productivity, zooplankton constituents and the dispersion and population demography of krill.
2. Conduct a high-resolution near shore oceanographic survey in the vicinity of Cape Shirreff using two specially equipped coastal vessels for the nearshore areas and the ship for the offshore areas.
3. Deploy two instrumented buoys with acoustical sensors and buoy-to-shore telemetry in the vicinity of Cape Shirreff at the beginning of the Cape Shirreff nearshore survey and recover them at the end of the nearshore survey.
4. Collect continuous measurements of ship's position, sea surface temperature, salinity, turbidity, fluorescence, air temperature, barometric pressure, relative humidity, and wind speed and direction.

5. Collect underway observations of seabirds and marine mammals.
6. Deploy XBT probes to collect data on physical properties of the ocean such as temperature, sound velocity to depths of up to 800 meters.
7. Deploy 15 oceanographic drifter buoys during the course of the AMLR cruise.
8. Provide logistical support to field camps at Cape Shirreff, Livingston Island and Admiralty Bay (Copacabana), King George Island. Support will include transfer of personnel, equipment, building materials, other supplies, and provisions.

## **OPERATIONS:**

1. **South Shetland Survey:** The surveys will consist of 108 CTD and net-sampling stations, along approximately 2,400 nautical miles of acoustic transects. Each station will include the following operations: CTD profiles, phytoplankton measurements and net sampling. Operations will be conducted 24 hours per day; desired transect speed between stations will be 6-10 knots, depending on sea state. The survey will be conducted in the following order: the South Area, the West Area, followed by the Elephant Island and Joinville Island Areas, if ice conditions permit five stations in northwest Weddell Sea, will also be occupied (Figure 1).

**A) Acoustic transects:** Active acoustic data will be collected continuously using a Simrad ES60 and EK500 echosounders and hull-mounted transducers (70, 38, 120 and 200 kHz). Data will be logged and processed by computers located in the Computer Room. Continuous supply of vessel position and speed data from the ship's GPS receiver will be required in the Computer Room.

**B) CTD operations:** CTD casts will be conducted to 750m. The scientific party will supply a Seabird SBE-9 CTD instrument, dissolved oxygen sensor, carousel, altimeter, fluorometers, transmissometers, light sensors, Niskin bottles and stand. A computer, also supplied by the scientific party, will be located in the Computer Room to log CTD data. The ship will supply a winch, conducting cable with strain relief and electrical termination, slip rings, a deck cable terminating in the Computer Room, and a method for monitoring the amount of wire out and the rate of recovery. Water samples (10 per cast) will be obtained at a series of standard depths. Assistance from ship's personnel will be required in collecting water samples from the Niskin bottles for salinity and dissolved oxygen measurements and phytoplankton analyses. Ship's personnel will determine the salinity of the water samples using a Guildline PortaSal salinometer provided by the scientific party.

**C) Net sampling operations:** During the survey, a standard 2m IKMT fitted with 505-micron mesh net, supplied by the scientific party, will be used to sample zooplankton and micronekton (including krill). The ship will supply a second winch, conducting cable with strain relief and electrical termination, slip rings, a deck cable terminating in the

Computer Room, and a method for monitoring the amount of wire out and the rate of recovery.

Primary sample processing will be conducted in the 20-foot laboratory van and/or the Chemical Analytical Laboratory. Antarctic krill (*Euphausia superba*) will be separated from the catch and enumerated; salps (*Salpa thompsoni*) will be separated, counted and morphometric measurements collected from a sub-sample of the catch; other adult and larval euphausiids, ichthyoplankton, and zooplankton material will be identified, counted and preserved. Sub-samples of *E. superba* from each tow will be processed in the Chemical Analytical Laboratory to determine distributions of krill length, weight, maturity stage, molt stage, sex ratio, reproductive condition, and gut fullness.

**D) Phytoplankton operations:** At every CTD station, water will be sampled for chlorophyll concentrations at all depths, in which Niskin bottles are fired, between 5 and 200 meters. Water samples from 4 four random depths will be used for dissolved oxygen determination. At a chosen mid-day station two different profiled instruments will be deployed. A free-fall radiometer (PRR-800) will be deployed from the stern simultaneously with the CTD profile. A optics package (IOP) will be deployed once per day either just before or just after the CTD station to provide further information relating to primary production and phytoplankton distribution and composition. A deck cell for the collection of PAR will be installed on the ship super structure. Assistance will be required from ship's personnel in collecting water samples and deploying instrumentation at the special mid-day station.

**E) XBT operations:** XBT probes will be deployed to collect data on physical properties of the ocean such as temperature, and sound velocity to depths of up to 800 meters. The expendable probes are launched from the stern of the ship while underway along a high density line, every 15km, from the polar front (58 degrees South) to the South Shetland Islands during southward transits. On northward transits of the Drake Passage, we will repeat similar deployments. Opportunistic sampling will be conducted between the Shackleton Ridge and Elephant Island, across the Bransfield Strait and along certain AMLR transects at 4km intervals.

2. **Cape Shirreff Nearshore Survey:** Two high-resolution surveys for krill will be conducted in the vicinity of Cape Shirreff using specially equipped Zodiacs. The ship will be responsible for launching and recovering the instrumented Zodiacs and will be available to assist the Zodiacs if problems occur (Figure 2).

One Zodiac, *Ernest II*, is outfitted with an echosounder, GPS, WeatherPak and underwater video camera. The day-to-day operations of the *Ernest II* will be based from the field camp at Cape Shirreff. S. Sessions and J. Warren will go ashore at Cape Shirreff for 5 days, in order to conduct the acoustic survey transects of the waters around Cape Shirreff. Deployment of a video system will provide ground truth to identify plankton species associated with scattering layers visible on the *Ernest II* echosounder. In addition, a second zodiac, *Roald*, operated by M. Van Den Berg and M. Cox will be based at the Cape Shirreff field camp at this time to survey with a multi-beam sonar for 3-D imaging

of predator-prey interactions, and high-resolution bathymetric mapping of the canyon and nearshore areas to the north east of Cape Shirreff.

The *Ernest II* survey will be conducted from west to east with the Zodiac working the inshore transect lines and stations indicated on Figure 2 between 0800 and 1500 each day. During this time the R/V *Yuzhmorgeologiya* will conduct a complementary survey of the shelf break in the western and eastern canyon areas (Figure 2). The ship will be ready to offer assistance by picking up the Zodiac if located offshore. The ship will remain in the vicinity of Zodiacs (0800 - 1500 local time) until the Zodiacs and crew have safely finished transects for the day and fetched the anchorage at Cape Shirreff. The ship will then conduct an offshore acoustic transect during the night turning and conducting CTD, and IKMT net sampling stations on a returning transect toward shore and making contact with the Zodiac on the following morning. This routine will be repeated for the duration of the Cape Shirreff survey. Weather and ice safety considerations will determine how best to coordinate the Zodiac and ship survey efforts. The general plan outlined above may have to be modified in consultation between the ship's Master, the Cruise Leader and the *Ernest II* and *Roald* crew.

3. **Buoy deployment and recovery:** Two instrumented buoys will be deployed at selected locations near Cape Shirreff at the beginning of the Cape Shirreff nearshore survey. Buoys and their anchoring systems will be lowered into a Zodiac from the ship and then deployed by personnel on the small boat. Buoy instrumentation will be monitored from a telemetering station located at the Cape Shirreff field camp. At the end of the nearshore survey, the buoys will be recovered using a Zodiac and the ship's aft winch.
4. **Acoustic system calibration:** At the beginning and the end of the krill survey, the ship will anchor in approximately 25 fathoms of water in Admiralty Bay for the purpose of calibrating the acoustic system. Ship's personnel will be required to run a transfer line under the hull before deploying the anchor. The scientific party will supply all additional hardware and cables required for calibration.
5. **Continuous environmental data collection:** Continuous measurements of position from ship's GPS receiver, heading from ship's gyro compass, sea surface temperature and salinity, air temperature, barometric pressure, relative humidity, wind speed, wind direction, scalar and cosine PAR will be collected. Continuous data will be logged on a computer located in the Computer Room. The ship will provide data feeds from the ship's GPS receiver and gyro compass.

A meteorological instrument package will be mounted on the ship's forward mast and a coax cable led to the data-logging computer located in the Computer Room. The scientific party will supply the instrument package and the cable; however, ship's personnel will be required to assist in mounting the instrument on a forward mast and running the coax cable to the Computer Room. The ship will provide a continuous salt water supply to the thermosalinograph, supplied by the scientific party.

6. **Seabird and marine mammal observation:** Seabird and marine mammal observations will be made from the ship's observation platform located above the ship's bridge along transects between stations and during the transits to and from Punta Arenas. Access to GPS position data and electrical power inside observation platform will be required for a laptop computer.
  
7. **Field camp logistical support:** The scientific party will provide two Zodiac Mark V's and four outboard motors for the following operations:
  - Near the beginning of the krill survey, R. Holt, R. Haner and two Chilean scientist, provisions, and mail will be transported ashore at Cape Shirreff. Trash will also be recovered to the ship.
  - Near the beginning of the krill survey, M. Goebel and three Chilean scientist will be transported from Cape Shirreff to the Chilean Fildes Base at Maxwell Bay, King George Island.
  - Near the beginning of the krill survey, W. Trivelpiece, S. Woods and provisions will be brought ashore at the Copacabana field camp. The ship's acoustic system will also be calibrated while in Admiralty Bay.
  - After the large area survey has been completed, J. Warren, S. Sessions, M. Cox, M. Van Den Berg will be transported ashore at Cape Shirreff. J. Warren and S. Sessions, M. Cox and M. Van Den Berg will conduct two separate 5-day nearshore surveys using two instrumented zodiacs while the ship is conducting offshore operations in the vicinity of Cape Shirreff.
  - After the nearshore survey has been completed, R. Holt, C. Champagne, J. Warren, S. Sessions, M. Cox, M. Van Den Berg will be brought aboard the ship. Ancillary equipment, supplies and trash will be recovered from Cape Shirreff. R. Driscoll and A. Miller will be transported ashore to Cape Shirreff.
  - Near the end of the krill survey, N. Bargmann will be picked up from Copacabana and brought aboard the ship and trash will be recovered to the ship.
  - The acoustic system will also be re-calibrated at the end of the krill survey.
  - Daily radio communications will be maintained between the various field sites and the ship. The Cruise Leader will provide instructions for these radio communications.

## **MAJOR EQUIPMENT AND SUPPLIES TO BE LOADED ABOARD SHIP:**

1. 20-foot laboratory van
2. 12-foot laboratory van
3. 13-foot SPG radioisotope/filtration laboratory van
4. Two 19-foot Zodiac inflatable boats
5. Four 55hp outboard motors
6. Two instrumented buoys and ancillary supplies
7. Approximately 45 1-m<sup>3</sup> fish boxes containing food, other supplies and equipment
8. Approximately 20 0.5-m<sup>3</sup> clam shells containing electronics and other equipment
9. 10 foot Zodiac
10. Navigation inserts for Zodiacs
11. Seven 55-gallon drums of gasoline for outboard motors
12. 10-20 propane cylinders
13. 1 tank of nitrogen gas
14. 1-180 liter tank of liquid nitrogen
15. 15-drifter buoys
16. Various chemicals to be stored in the Geological Laboratory (designated for phytoplankton work) and in the port aft lab adjacent to the storage hold. MSDS forms will accompany all chemicals used by the phytoplankton/pinniped groups.

## **EQUIPMENT AND CAPABILITIES TO BE SUPPLIED BY THE SHIP:**

1. INMARSAT telephone line and modem port supplied to the Computer Room.
2. Global Positioning Systems (GPS) with NEMA 0183 output in RS232 format, supplied to the Computer Room.
3. GPS repeater supplied to the Chemical Analytical Laboratory and the Geological Laboratory.
4. Heading output from gyrocompass to be supplied to a data-logging computer (supplied by scientific party) in Computer Room.
5. Location on forward mast to mount portable WeatherPak instrument (supplied by scientific party).
6. 110v, 60 cycle, 45 amp regulated electrical power supplied to the Computer Room and Microbiological Laboratory.
7. 220v, 15 amp electrical power, fresh and salt water supplied to the 20-ft lab van.
8. 110v, 15 amp electrical power supplied to the 12-ft lab van.
9. 110v, 15 amp electrical power supplied to the Chemical Analytical Laboratory, Geological Laboratory, and the Map Preparation Room.
10. Winch with conducting cable, slip rings, and meter for deployment of the large CTD stand. The sea cable will be fairlead through the central A-frame and the deck cable will be terminated in the Computer Room.
11. Winch with conducting cable, slip rings and meter for deployment of the IKMT net. The sea cable will be fairlead through the central A-frame and the deck cable will be terminated in the Computer Room.

12. Continuous salt water supply to scientific party's flow-through instruments located in Microbiological Laboratory.
13. Assistance in loading scientific equipment, securing it in place, and providing power, water, and drain connections.
14. Four swimmers in dry suits to assist with Zodiac landings at the field camps.
15. Assistance in drawing water samples from the Niskin bottles.

**HAZARDOUS MATERIALS:**

The Cruise Leader shall be responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements for Visiting Scientists, released July 2002.

By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemicals brought aboard and a chemical hygiene plan. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the Cruise Leader.

**SOUTHWEST FISHERIES SCIENCE CENTER CONTACT:**

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INTERNET Email Address:	Jessica.Lipsky@noaa.gov or Adam.Jenkins@noaa.gov

**SHIPBOARD CONTACT:**

INMARSAT Voice/Fax	Ocean code + 327-316-910/911 Where ocean code = 871, 872 or 874
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- Table 1. Shipboard personnel
- Table 2. Field camp personnel
- Figure 1. AMLR 2007 station plan
- Figure 2. Cape Shirreff Survey

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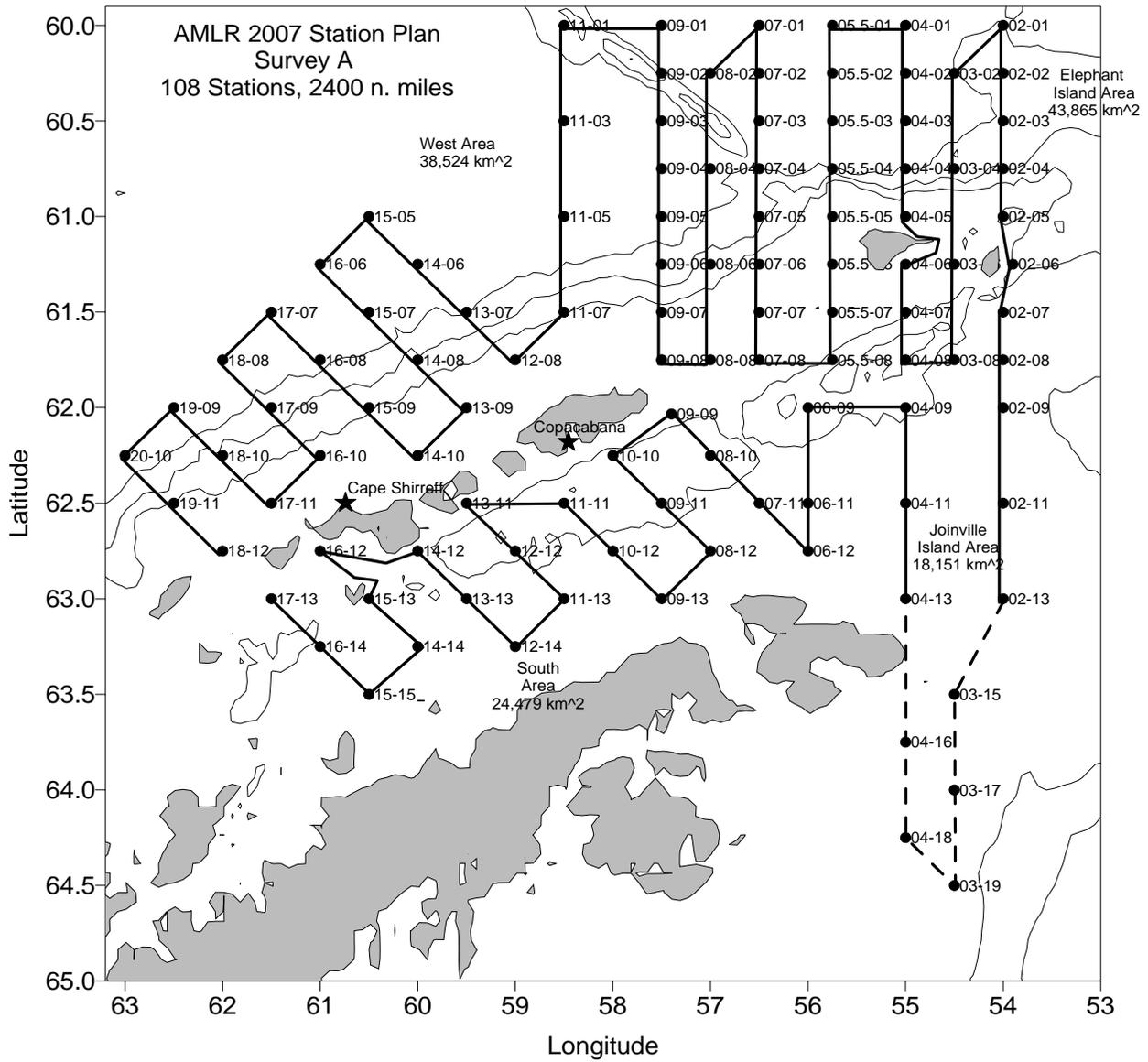
Dr. William Fox  
Science and Research Director  
Southwest Fisheries Science Center

**Table 1. Shipboard personnel**

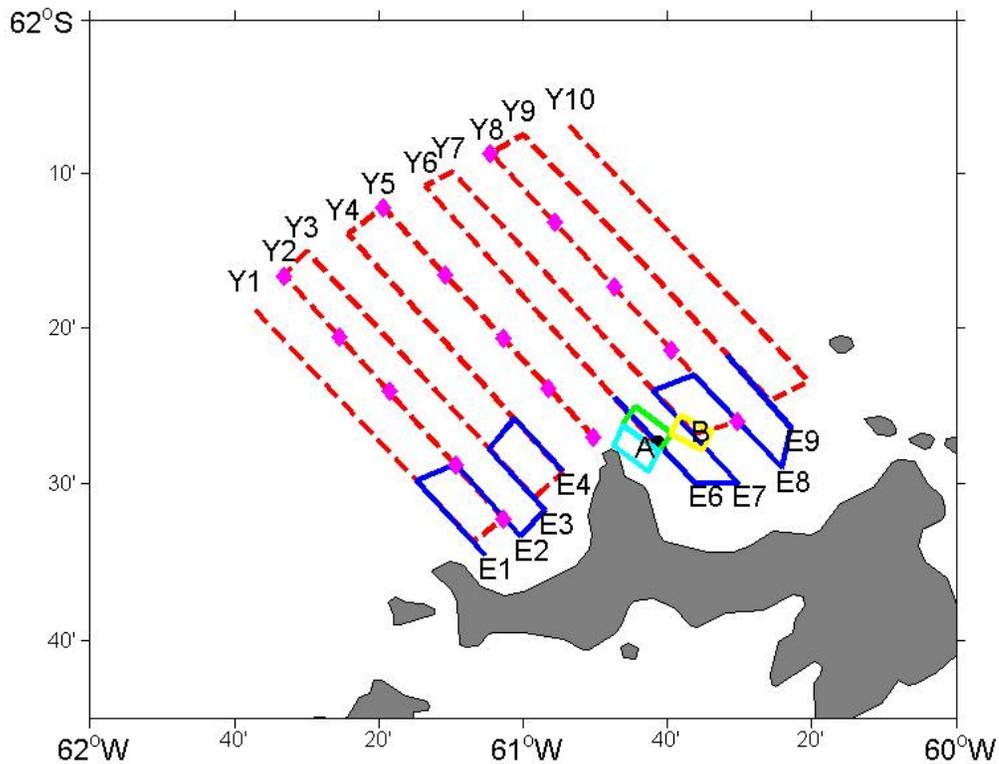
<b>Leg I</b>
Adam Jenkins (cruise leader)
Tony Cossio (acoustics)
Christian Riess ( acoustics)
Derek Needham (oceanography)
Marcel Van Den Berg (oceanography)
Chris Hewes (phytoplankton)
Murat Van Ardelan (phytoplankton)
Lasse Olsen (phytoplankton)
Brian Seegers (phytoplankton)
Mattias Cape (phytoplankton)
Nicolas Sanchez (phytoplankton)
Steve Sessions (nearshore survey)
Joe Warren (nearshore survey)
Martin Cox (nearshore survey)
Valerie Loeb (zooplankton)
Kimberly Dietrich (zooplankton)
Ryan Driscoll (zooplankton)
Kelly Norton (zooplankton)
Kyla Zaret (zooplankton)
Darci Lombard (zooplankton)
Kristen Green (zooplankton)
Letise Houser (zooplankton)
Jessica Lipsky (predator diet studies)
Timothy White (seabirds)
Jarrold Santora (seabirds)
Mike Force (seabirds)
Aileen Miller (seabirds)
Plus 6 on southbound transit
Plus 2 on nouthbound transit

**Table 2. Field camp personnel**

<b>Cape Shirreff</b>	In to camp via	Out of camp via
Michael Goebel (camp leader)	<i>LM Gould</i> , Oct 2006	<i>Chilean Navy</i> , Jan 2007
Birgitte McDonald	<i>LM Gould</i> , Nov 2006	<i>LM Gould</i> , Mar 2007
Cory Champagne	<i>LM Gould</i> , Oct 2006	<i>Yuhzmor</i> , Feb 2007
Sarah Chisholm	<i>LM Gould</i> , Oct 2006	<i>LM Gould</i> , Mar 2007
Rachael Orben	<i>LM Gould</i> , Oct 2006	<i>LM Gould</i> , Mar 2007
Rennie Holt	<i>Yuhzmor</i> , Jan 2007	<i>Yuhzmor</i> , Feb 2007
Russell Haner	<i>Yuhzmor</i> , Jan 2007	<i>LM Gould</i> , Mar 2007
Ryan Driscoll	<i>Yuhzmor</i> , Feb 2007	<i>LM Gould</i> , Mar 2007
Aileen Miller	<i>Yuhzmor</i> , Feb 2007	<i>LM Gould</i> , Mar 2007
<b>Copacabana</b>		
Sue Trivelpiece (camp leader)	<i>LM Gould</i> , Oct 2006	<i>LM Gould</i> , Nov 2006
David Loomis	<i>LM Gould</i> , Oct 2006	<i>LM Gould</i> , Mar 2007
Amy Lindsley	<i>LM Gould</i> , Oct 2006	<i>LM Gould</i> , Mar 2007
Naomi Bargmann	<i>LM Gould</i> , Oct 2006	<i>Yuhzmor</i> , Feb 2007
Wayne Trivelpiece	<i>Yuzhmor</i> , Jan 2007	<i>LM Gould</i> , Mar 2007
Susan Woods	<i>Yuzhmor</i> , Jan 2007	<i>LM Gould</i> , Mar 2007



**Figure 1.** AMLR 2007 station plan. Black dots indicate station locations; heavy lines indicate transects between stations; thin lines outline stratum; stars indicate locations of Cape Shirreff and Copacabana field camps; depth contours are 500 m and 2000 m. Surveys will be conducted in the following order: West Area, then Elephant Island Area, then Joinville Island Area, then five stations in northwest Weddell Sea (if ice conditions permit), then the South Area.



**Figure 2.** Intended daytime tracklines for *R/V Yuzhmorgeologiya*, (red dashed) *R/V Ernest II*, (solid blue) *R/V Roald* to survey areas in colored boxes A and B. Dashed lines are continuations of the standard U.S. AMLR survey lines. Solid magenta squares represent station waypoints of nighttime CTD casts and IKMT tows. Weather and ice conditions may result in alterations to these tracklines and stations.