

Antarctic Ecosystem Research Division
 Southwest Fisheries Science Center
 8604 La Jolla Shores Drive
 La Jolla, California 92037 USA

AMLR 2008 CRUISE PLAN

VESSEL: R/V *Yuzhmorgeologiya*

OPERATING AREA: South Shetland & South Orkney Islands, Antarctica

ITINERARY:		Sea-days	Port-days
Port call in Punta Arenas	08 Jan- 10 Jan		3
Leg I	11 Jan- 10 Feb	31	
Port call in Punta Arenas	11 Feb- 12 Feb		2
Leg II	13 Feb- 15 Mar	32	
Port call in Punta Arenas	16 Mar- 17 Mar		2
Total Days		63	7

SCHEDULE OF EVENTS:

LEG I:

Transit to Copacabana	3	11 - 13 Jan
Transfer personnel to Copacabana, calibrate in Admiralty Bay	1	14 Jan
Transfer personnel to Cape Shirreff	1	15 Jan
Reduced SSI Fur Seal survey, Part 1	3	16-18 Jan
Conduct large-area survey	16	19 Jan – 3 Feb
Transfer personnel from Cape Shirreff,	1	4 Feb
Reduced SSI Fur Seal survey, Part 2	2	5-6 Feb
Transfer personnel from Copacabana	1	7 Feb
Transit to Punta Arenas	3	8-10 Feb
Total days	31	

LEG II:

Transit to Cape Shirreff	3	13-15 Feb
Transfer CS & Transit to EI eastern most station (02-01)	2	16-17 Feb
Sample en route to South Orkney Islands	3	18-20 Feb
Conduct five transect survey in South Orkney Islands	8	21-28 Feb
Transit to EI Grid stations 02-09	4	29 Feb-3 Mar
Conduct EI survey	7	4-10 Mar
Transfer personnel from Copacabana/Calibrate	1	11 Mar
Transfer personnel from Cape Shirreff	1	12 Mar
Transit to Punta Arenas	3	13-15 Mar
Total Days	32	

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 2007/2008, the U.S. AMLR Program will conduct two descriptive surveys of the pelagic ecosystem in the vicinity of the South Shetland (Leg I) and South Orkney Islands (Leg II) (Figures 1 and 2). The surveys in the South Shetland Islands will be similar to the 16-year time series of surveys conducted by the U.S. AMLR Program. The survey of the South Orkney Islands will cover the same area as the Elephant Island grid, but represents the first attempt to estimate krill biomass in this area since 2000. This second leg represents part of the U.S. International Polar Year contribution, as part of the Census of Antarctic Marine Life (CAML) project.

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 2007 through mid-March 2008. Ship support for the Cape Shirreff field camp will be provided at the beginning of Leg I and support for Copacabana will be provided at the beginning & end of Leg I. Both camps field camps will be closed and personnel recovered at the end of Leg II.

Table 1. List of shipboard personnel for both legs. Table 2. List of personnel for both field camps and the method of transport in and out of camp. Table 3. Station locations for the 2008 AMLR/IPY survey in the South Orkney Islands.

OBJECTIVES:

1. Conduct two surveys in the vicinity of the South Shetland Islands (Leg I) and South Orkney Islands (Leg II) 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. Calibrate shipboard acoustic system at Admiralty Bay the beginning of Leg I and again near the end of Leg II.
3. Collect continuous measurements of ship's position, sea surface temperature, salinity, turbidity, fluorescence, air temperature, barometric pressure, relative humidity, and wind speed and direction. Deploy Continuous Plankton Recorder (CPR) for transits while crossing the Drake Passage (3 north-south transits).
4. Conduct a reduced fur seal census within the Livingston Island area targeting known breeding sites. A team of six counters will be deployed from the ship and supported by a zodiac with driver and bowman.
5. Collect underway observations of seabirds and marine mammals.
6. Deploy 50 drifter buoys.
7. 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.
8. Prepare fur seal milk for lipid analysis, process shore-based collections of fur seal diet samples, collect fur seal and penguin prey (krill, squid and fish) for lipid analysis, bomb calorimetry, and measure krill for validation of krill carapace to total length relationship.

OPERATIONS:

1. **South Shetland and South Orkney Surveys, Leg I (Figure 1) and Leg II (Figure 2):**
The first surveys will consist of 108 CTD and net-sampling stations, separated by approximately 2400 n. miles of acoustic transects. The second survey will consist of 39 stations within the South Orkneys, and during transits too and from the Island area (Table 3). Additionally, at least 5 transects within the Elephant Island grid will be conducted, and time permitting additional stations within the traditional AMLR area will be added. 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 10 knots, depending on sea state. Both 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 South Area. During the second leg, the ship will transit to Cape Shirreff to pick up samples from M. Goebel, and then transit to the northeastern station at Elephant

Island, before transiting to the South Orkney Islands. Five transects within the South Orkney Islands will be used to estimate krill biomass. The survey will then sample the Elephant Island grid, and other areas as time permits.

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 both salinity 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 surveys, a standard 2 m 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. 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, sound velocity, conductivity, and current velocity to depths of up to 750 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.

F) CPR operations: The continuous Plankton Recorder will be deployed on the southbound transit on Leg 1, and will be deployed at 58 S, until the shelf is reached. It will also be deployed on the North bound transits in February and in March.

2. **Acoustic system calibration, Legs I and II:** At the beginning of Leg I and again at the end of Leg II, the ship will anchor in approximately 25 fathoms of water in Admiralty Bay (either Ezcurra or Martel Inlet, depending on ice and wind conditions) 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.
3. **Continuous environmental data collection, Legs I and II.** During Legs I and II a meteorological instrument package will be mounted on the ship's forward mast and a coax cable led to computers located in the Computer Room. The ship will provide a continuous salt water supply to the thermosalinograph, supplied by the scientific party. Continuous measurements of, sea surface temperature and salinity, air temperature, barometric pressure, relative humidity, wind speed, wind direction, scalar and cosine PAR will be collected and logged on data-logging computers located in the Computer Room . The ship will provide data feeds from the ship's GPS receiver and gyro compass to computer room for this navigational data logging.
4. **Deploying drifters:** 52 drifters will be deployed from the ship. 45 of these are standard drifters, 7 are new Iridium drifters. Drifters will be released on three of the four transits between the SSI region and Punta Arenas, south of 58°S. Additional drifters will be deployed in the Elephant Island region, in the Weddell, and along transits to the South Orkney Islands.
5. **Seabird and marine mammal observation:** Seabird and marine mammal observations will be made from one of the bridge wings (or inside the pilot house during inclement weather) along transects between stations and during the transits to and from Punta Arenas. Access to GPS position data and electrical power inside the pilot house will be required for a laptop computer.
6. **Fur Seal Survey:** At the beginning of Leg I, the ship will conduct a 3-day Fur seal census along Livingston Island targeting known breeding sites. A team of counters will

be deployed from the ship and supported by a zodiac with driver and bowman. At the end of Leg I Large Area Survey, a survey of Desolation Island will be conducted while offloading garbage from Cape Shirreff.

7. **Field camp logistical support, Legs I and II:** The scientific party will provide two Zodiac Mark V's and four outboard motors for the following operations:
- Near the beginning of Leg I, personnel W. Trivelpiece, S. Woods, provisions and mail will be brought ashore at the Copacabana field camp. The ship's acoustic system will also be calibrated while in Admiralty Bay.
 - Near the beginning of Leg I personnel, M. Goebel, A. Miller, and D. Costa, provisions and mail will be transported ashore at Cape Shirreff. Trash will also be recovered to the ship.
 - Near the end of Leg I, S. Woods will be picked up from Copacabana field camp and brought aboard the ship and trash will be recovered to the ship.
 - At the beginning of Leg II, a brief stop will be made at Cape Shirreff to load samples for processing.
 - Near the end of Leg II, personnel W. Trivelpiece, , equipment and trash will be recovered from the Copacabana field camp in effect closing the field camp for the season.
 - The acoustic system will also be re-calibrated in Admiralty Bay at the end of Leg II.
 - Near the end of Leg II, personnel (3M,2F: R. Haner, K. Pietrzak, S. Freeman, A. Miller, and S. Chisholm), equipment and trash will be recovered from Cape Shirreff in effect closing the field camp for the season.
 - 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. Two Zodiac inflatable boats
4. Four outboard motors
5. Approximately 45 1-m³ fish boxes containing food, other supplies and equipment
6. Approximately 20 0.5-m³ clam shells containing electronic instruments and other equipment
7. Small amount of lumber and building supplies for field camps
8. Four 55-gallon drums of gasoline for outboard motors
9. 10-20 propane cylinders
10. 1 tank of nitrogen gas
11. 1 x 180 liter pressurized liquid nitrogen cylinder
12. 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 group.

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.
16. **12 mm wire for deployment of the CPR off of a stern winch, port or starboard side of the ship.**

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Tel: (Region code) 764 815 861 - 24 Hours
Fax: (Region code) 764 815 862 - 24 Hours (in AUTO Mode)

Region codes:
871-Atlantic Ocean region (East)
872-Pacific Ocean region
873-Indian Ocean region
874- Atlantic Ocean region (West)
870-UNIVERSAL

Table 1. Shipboard personnel
Table 2. Field Camp Personnel
Table 3. Station locations for South Orkney survey locations
Figure 1. AMLR 2008 station plan
Figure 2. Leg II South Orkneys Survey plan

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

Table 1. Shipboard personnel

Leg I	Leg II
Christian Reiss (cruise leader)	Christian Reiss (cruise leader)
Tony Cossio (acoustics)	Tony Cossio (acoustics)
Derek Needham (oceanography)	Marcel Van Den Berg (oceanography)
Marcel Van Den Berg (oceanography)	TBD (oceanography)
Chris Hewes (phytoplankton)	Chris Hewes (phytoplankton)
TBD (phytoplankton)	TBD (phytoplankton)
TBD (phytoplankton)	TBD (phytoplankton)
Murat Van Ardelan (Fe studies)	Murat Van Ardelan (Fe studies)
Brian Seegers (phytoplankton)	Cassandra Brooks (zooplankton)
Haili Wang (phytoplankton)	Mark Stevens (zooplankton)
Valerie Loeb (zooplankton)	Valerie Loeb (zooplankton)
Ryan Driscoll (zooplankton)	Ryan Driscoll (zooplankton)
Nicolas Sanchez (zooplankton)	Nicolas Sanchez (zooplankton)
Kyla Zaret (zooplankton)	Kyla Zaret (zooplankton)
Kimberly Dietrich (zooplankton)	Kimberly Dietrich (zooplankton)
Darci Lombard (zooplankton)	Darci Lombard (zooplankton)
Kelly Norton (zooplankton)	Kelly Norton (zooplankton)
Jarrold Santora (seabirds/marine mammals)	Jarrold Santora (seabirds/marine mammals)
Mike Force (seabirds/marine mammals)	Mike Force (seabirds/marine mammals)
Natalie Spear (lipid analysis, FS diet)	Natalie Spear (lipid analysis, FS diet)
Plus 6 on southbound transit	Plus 0 on southbound transit
Plus 6 on northbound transit	Plus 9 on northbound transit

Table 2. Field camp personnel

Cape Shirreff	In to camp via	Out of camp via
Russell Haner (camp leader)	<i>LM Gould</i> , Nov 2007	<i>Yuzhмор</i> , Mar 2008
Birgitte McDonald	<i>LM Gould</i> , Nov 2007	<i>Yuzhмор</i> , Feb 2008
Scott Freeman	<i>LM Gould</i> , Nov 2007	<i>Yuzhмор</i> , Feb 2008
Sarah Chisholm	<i>LM Gould</i> , Nov 2007	<i>Yuzhмор</i> , Mar 2008
Kevin Pietrzak	<i>LM Gould</i> , Nov 2007	<i>Yuzhмор</i> , Mar 2008
Mike Goebel	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Feb 2008
Aileen Miller	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Mar 2008
Dan Costa	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Feb 2008
Copacabana		
Sue Trivelpiece (camp leader)	<i>LM Gould</i> , Oct 2007	<i>LM Gould</i> , Nov 2007
Jefferson Hinke	<i>LM Gould</i> , Oct 2007	<i>NordNorsk</i> 2008
Stefan Kropidowski	<i>LM Gould</i> , Oct 2007	<i>Yuzhмор</i> , Mar 2008
Harry Snyder	<i>LM Gould</i> , Oct 2007	<i>Yuzhмор</i> , Mar 2008
Malgorzata "Gosia" Korczak	<i>LM Gould</i> , Oct 2007	<i>Yuzhмор</i> , Mar 2008
Angela Kaufman	<i>LM Gould</i> , Oct 2007	<i>Yuzhмор</i> , Mar 2008
Rachael Orben	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Mar 2008
Susan Woods	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Feb 2008
Wayne Trivelpiece	<i>Yuzhмор</i> , Jan 2008	<i>Yuzhмор</i> , Feb 2008

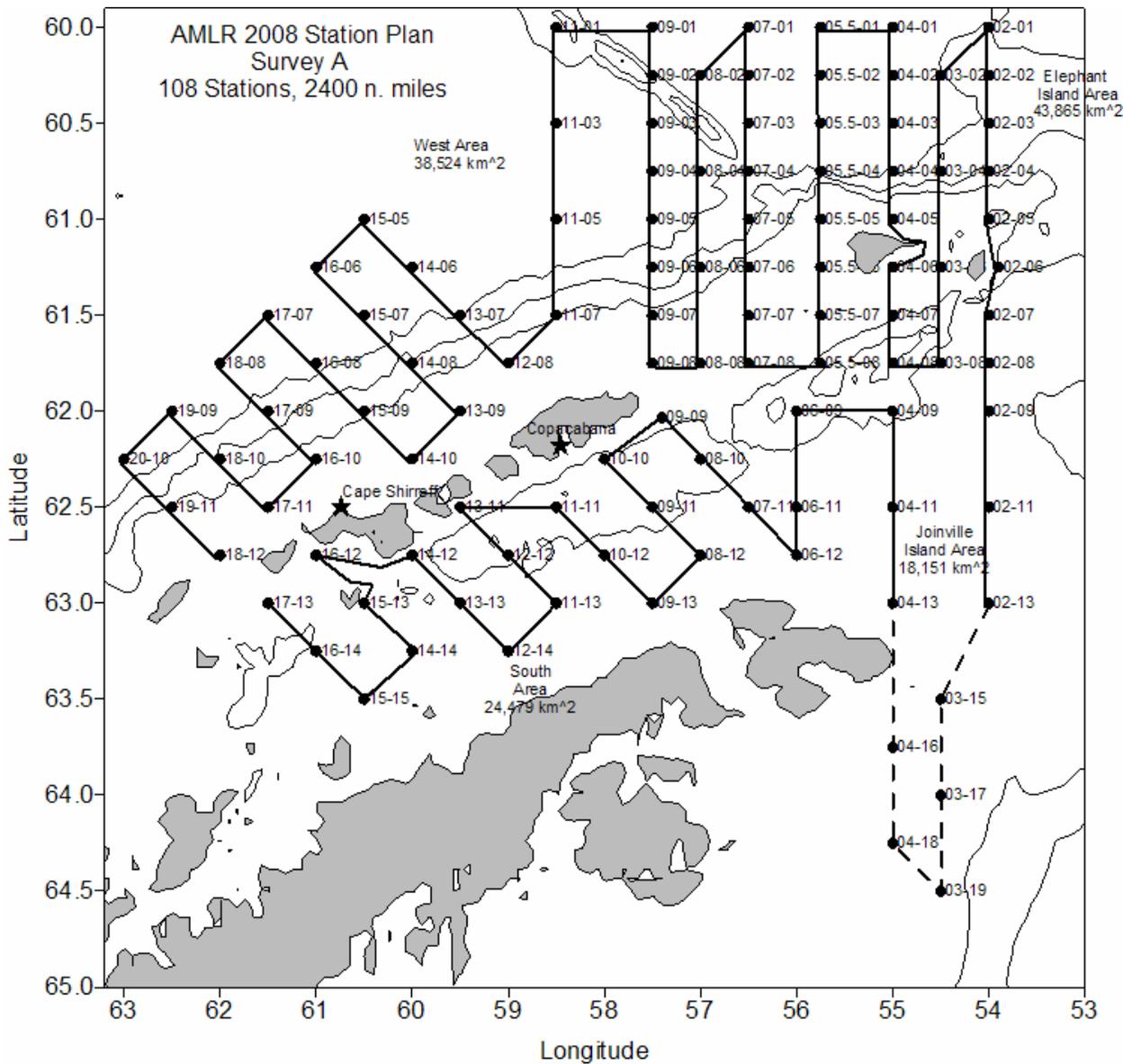


Figure 1. AMLR 2008 Leg I station plan. Black dots indicate station locations; heavy lines indicate transects between stations; thin lines outline stratum; stars indicate locations of Cape Shirreff and Copacabana field camps; depth contours are 500 m and 2000 m. Surveys will be conducted in the following order: West Area, then Elephant Island Area, then Joinville Island Area, then five stations in northwest Weddell Sea (if ice conditions permit), then South Area.

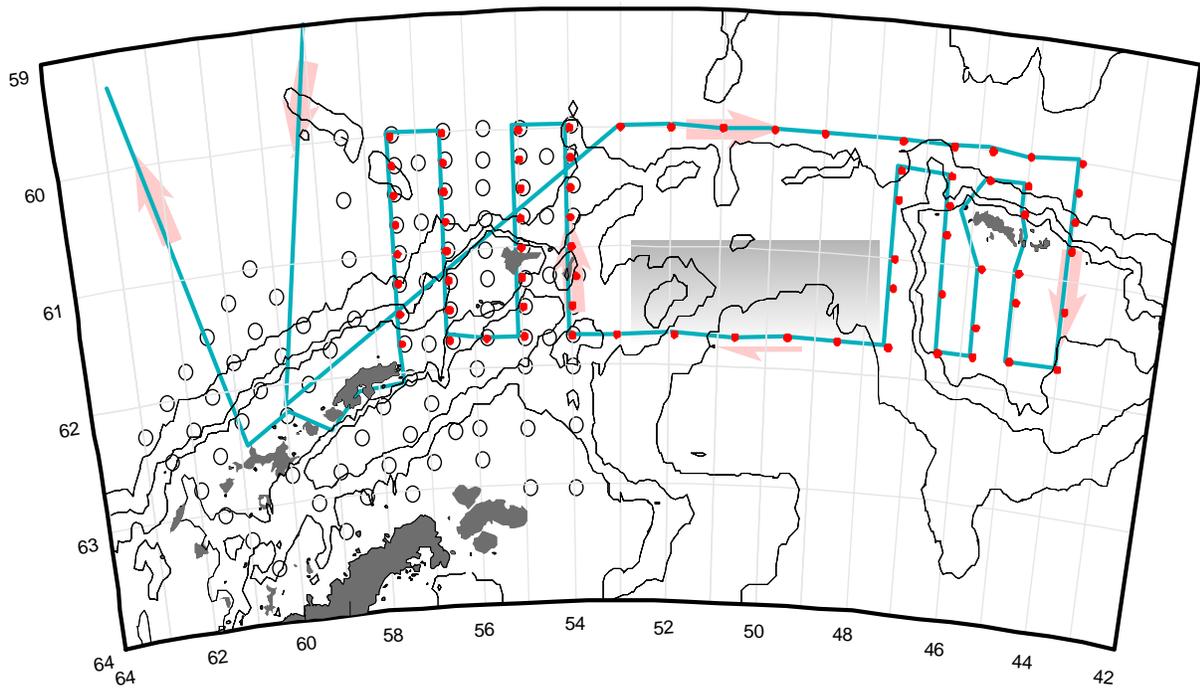


Figure 2. AMLR 2008 Leg II station plan. Red dots indicate station locations; heavy lines indicate transects between stations depth contours are 500, 1000, 1500 and 2000 m. Surveys will be conducted in the following order: Transit to South Orkney Islands, Orkney Islands grid, transit to Elephant Island Area, & then Copacabana for calibration. Light pink shows direction of travel. The South Orkneys will be sampled before the Elephant Island region. The light gray arrow represents the probable diversion around the ice field that we expect within the Weddell Sea. It is likely that transit around the South Orkney Islands will deviate substantially given the uncharted nature of the island region.

Table 3. Station locations for South Orkney Survey (Leg II, 2008)

Station	Longitude	Latitude
SO-1	-53	-60
SO-2	-52	-60
SO-3	-51	-60
SO-4	-50	-60
SO-5	-49	-60
SO-6	-47.5	-60
SO-7	-46.5	-60
SO-8	-45.75	-60
SO-9	-45	-60
SO-10	-44	-60
SO-11	-44	-60.25
SO-12	-44	-60.5
SO-13	-44	-60
SO-14	-44	-60.75
SO-15	-44	-61.25
SO-16	-44	-61.75
SO-17	-45	-61.75
SO-18	-45	-61.25
SO-19	-45	-61
SO-20	-45	-60.5
SO-21	-45	-60.25
SO-22	-45.75	-60.25
SO-23	-45.75	-61
SO-24	-45.75	-61.25
SO-25	-45.75	-61.75
SO-26	-46.5	-61.75
SO-27	-46.5	-61.25
SO-28	-46.5	-60.75
SO-29	-46.5	-60.5
SO-30	-46.5	-60.25
SO-31	-47.5	-60.25
SO-32	-47.5	-60.5
SO-33	-47.5	-61
SO-34	-47.5	-61.75
SO-35	-48.5	-61.75
SO-36	-49.5	-61.75
SO-37	-50	-61.75
SO-38	-52	-61.75
SO-39	-53	-61.75