FINAL CRUISE INSTRUCTIONS
FOCI

Miller Freeman, MF-01-10
2-19 September 2001

Matt Wilson, Chief Scientist
Alaska Fisheries Science Center
Seattle, WA 98115

ENDORSEMENTS:

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RADM Nicholas Prahl, Director
Marine Operations Center-Pacific
Seattle, WA 98102

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Seattle, WA 98115

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Seattle, WA 98115

Date: 26 July, 2001

FINAL CRUISE INSTRUCTIONS
NOAA Ship MILLER FREEMAN

Cruise No: MF-01-10
FOCI No: 4MF01

Applicability: These instructions, with "FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN" present complete information for this cruise.

Area:
Western Gulf of Alaska (between Shumagin Islands and Kodiak Island)

Itinerary:
Depart 2 September 2001 from Kodiak
Arrive 19 September 2001 to Kodiak

Participating organizations:
NOAA - Alaska Fisheries Science Center (AFSC)
NOAA - Pacific Marine Environmental Laboratory (PMEL)

CRUISE DESCRIPTION:
Fisheries-Oceanography Coordinated Investigations (FOCI) is an effort by NOAA and associated academic scientists. At present, FOCI consists of a Shelikof Strait (western Gulf of Alaska) walleye pollock project, and a NOAA Coastal Ocean Program project: Southeast Bering Sea Carrying Capacity. FOCI also supports associated projects, such as the Arctic Research Initiative, U.S. GLOBEC and North Pacific Marine Research Program, that address scientific issues related to FOCI's mission. FOCI's goal is to understand the effects of abiotic and biotic variability on ecosystems of the North Pacific Ocean and Bering Sea in order to discern the physical and biological processes that determine recruitment variability of commercially valuable finfish and shellfish stocks in Alaskan waters.

CRUISE OBJECTIVES:
The late-summer FOCI cruise is designed to address biological and methodological questions regarding age-0 walleye pollock in the western Gulf of Alaska. The primary cruise objective is to map age-0 pollock density over an area of high environmental heterogeneity, and to relate variations in fish density with environmental variability to provide some insight regarding pollock nursery suitability. Preliminary findings indicate that age-0 pollock are best sampled in the midwater at night. Therefore, to accomplish the primary objective, nighttime samples of age-0 pollock, their prey, temperature, and salinity will be collected at 39 "grid" stations between Shelikof Strait and the Shumagin Islands (Figure 1, Table 1). These stations, many of which were sampled during September 2000, are situated along ten acoustic transects and form a grid from nearshore to the outer shelf. Transits between stations will emphasize the collection of acoustic data along these transects; acoustic data will be collected continuously throughout the cruise.

Secondary cruise objectives, from highest to lowest priority, are as follows.

1) Occupy ten "sea lion" stations, at day or night, which are near sea lion rookeries on Atkins, Chowiet, and Chirikof Islands (Figure 1, Table 1).

2) Occupy any transect segments that were missed at night, and re-occupy some or all transect segments and grid stations for day-night comparison of acoustic and trawl-catch data.

3) Opportunistically sample (net and acoustic) at two or more locations deemed suitable for studying the diel vertical movements (DVM) of age-1 and age-2 pollock.

4) Conduct neuston tows at each of the 39 grid stations (daytime collections primarily, nighttime

collections if time permits) for assessment of ichthyoplankton species assemblage composition/structure. If possible, conduct an additional series (4-5) of neuston samples en route to and /or from Kodiak, AK, for data comparison.

5) Conduct Methot tows at five grid stations for comparison to the anchovy trawl in terms of age-0 size composition.

6) Opportunistically sample with trawls (Tucker and anchovy) at locations along the ten transects where the acoustic back-scatter is relatively high.

7) Geographically map small-scale variation in acoustic backscatter, may include net sampling.

8) Opportunistically collect piscivorous fishes for preliminary indication of predation on age-0 pollock.

1.0. PERSONNEL

1.1. Chief Scientist:
Matt Wilson, M/AFSC
206-526-6522
Matt.Wilson@NOAA.gov

The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not: (1) jeopardize the safety of personnel or the ship; (2) exceed the overall time allotted for the project; (3) result in undue additional expenses; (4) alter the general intent of these project instructions.

1.2 Participating Scientists:

Matt Wilson	M/AFSC
Annette Brown	F/AFSC
Rachel Cartwright	F/AFSC
Jay Clark	M/AFSC
Bill Floering	M/AFSC
Jennifer Lanksbury	F/AFSC
Frank Morado	M/AFSC
Steve Porter	M/AFSC
Maria Ruud	F/University of Washington

1.3 NOAA Marine Operations Center- Pacific Contact:
Larry Mordock
NOAA/MOC-Pacific (MOP1)
1801 Fairview Ave. East
Seattle, WA 98102-3767
(206) 553 - 4764
Larry.Mordock@noaa.gov

1.4 Program Contacts:

Dr. Phyllis Stabeno
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7600 Sand Point Way NE
Seattle, WA 98115
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AFSC
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Seattle, WA 98115
(206) 526-4148
Jeff.Napp@noaa.gov

2.0. OPERATIONS

A standard oceanographic watch will be utilized which consists of a winch operator, a scientific staff of four and a Survey Tech on deck. Because this cruise involves much fishing with otter trawls, a fishing crew will also be necessary. Operations will be conducted 24 hours a day.

2.1. SUMMARY OF ACTIVITIES:

The activities to be conducted during this cruise are day-night sensitive. In the study area during September, each day consists of about 9 hours of night, 11 hours of day, and 4 hours of twilight (dawn and dusk). Nighttime activities will focus mainly on occupation of a grid of stations over the shelf and nearshore areas between Kodiak and the Shumagin Islands (Figure 1). About 760 nm of acoustic tracklines (plus 150 nm between lines) and 39 predetermined trawl stations will be occupied. Daytime activities will focus on completing the secondary cruise objectives. Sampling will commence at the southwestern part of the study area, which is approximately 1.25 d from Kodiak. Enroute to the study area, a **CTD** cast will be conducted to calibrate the **Sea-Cat**, micro-bathythermographs (**MBT**), and **Scanmar** (or NetMind) depth sensor. A couple more calibrations may be conducted during the cruise.

Night will mostly be used to accomplish the primary cruise objective as follows. Upon arrival at each of the 39 stations, the first operation will always be to collect a plankton sample. This will be accomplished with a 1-m **Tucker** trawl fished with the **Sea-Cat** for real-time depth, temperature, and salinity (a second Tucker and 60-cm bongo net will be aboard as back-up). Second, age-0 pollock will be collected with a double-oblique tow (surface to near bottom to surface) of the **anchovy trawl** equipped with a **Furuno** netsonde for real-time depth, and an **MBT** to record the net path and temperature. **Scanmar** net mensuration equipment will sometimes be fixed onto the net to measure the vertical and horizontal spread of the trawl mouth. Backscatter and target strength data will be collected continuously for the cruise duration using the MACE group's **EK-500** echo sounder (38 and 120 kHz). Some nighttime will be used to collect samples for Secondary Objective 3, the DVM study, and possibly for other secondary objectives.

Daytime will be used to accomplish one or more of the secondary cruise objectives as briefly described below.

1) Occupation of the ten "sea lion" stations will be accomplished with the same gear and procedures used at grid stations. These stations are situated along acoustic transects (Transects 0, 7, 8, and 9) but the acoustic data may be collected day or night.

2) Occupy any transect segments that were missed at night, and re-occupy some or all transect segments and grid stations for day-night comparison of acoustic and trawl-catch data using the same gear and procedures as at night plus the neuston net (see #4 below).

3) At each of two locations deemed suitable for the age-1 and age-2 pollock DVM study, one night and one day suite of samples will be collected. Each suite consists of one vertically targeted anchovy trawl tow (midwater), one **shrimp trawl** tow (on bottom), one Tucker trawl tow, and possibly two **Methot** tows. The shrimp trawl, instead of the anchovy trawl, may be used to fish midwater if this would reduce gear-changeover time. Additional locations may be sampled at day only.

4) Fish the neuston net at each grid station to collect ichthyoplankton for preliminary analyses of distribution, abundance, and assemblage structure.

5) One **Methot** sample at each of five grid stations will be collected for comparison to the anchovy trawl in terms of age-0 size composition. The Methot trawl will be fished over a double-oblique tow. Stations will be chosen based upon a relatively high age-0 density.

6) Opportunistically sample, following the same procedure used at grid stations, at locations along acoustic transects where the acoustic back-scatter is relatively high.

7) Geographically map small-scale variation in acoustic backscatter in off-transect areas with possible net sampling as at grid stations.

8) Fish the shrimp trawl on bottom to opportunistically collect piscivorous fishes for preliminary indication of predation on age-0 pollock.

2.2 PROCEDURES FOR OPERATIONS:
The following operations will be conducted on this cruise. Supplementary instructions for these operations are listed in the FOCI Standard Operating Instructions (SOI):

CTD/Water samples (SOI 2.2.1)
MARMAP bongo tow (SOI 2.2.2)
Methot trawl (SOI 2.2.7)
Midwater trawl (SOI 2.2.8)
Tucker trawl (SOI 2.2.9)
EK500 monitoring (SOI 2.2.12)

Tucker Trawl

The Tucker trawl will be fished obliquely from 200 m or 10 m off bottom, whichever is shallowest, to the surface, but note DVM sampling variation detailed below. Real time depth of the trawl will be determined using the Sea-Cat, which will also be used to record temperature and salinity profiles. Nets 1 and 2 will be 333-um mesh. Net 1 will be fished from the maximum depth to the lower edge of the thermocline as determined during the downcast; if no thermocline, Net 1 will be closed at 40 m from the surface. Net 2 will be fished to the surface. Adding the catch in Net 1 and 2 will provide a quantitative estimate of zooplankton from the surface to near bottom. Except for large jellyfish, the entire catch will be preserved in 5% formalin, large jellyfish will be counted, weighed (as a group) and discarded. A second Tucker trawl will be aboard as backup.

Methot Trawl

The Methot trawl will be fished obliquely to the same depth as the anchovy trawl, but note DVM sampling variation detailed below. Following standard procedures, an MBT, flowmeter, and Scanmar depth sensor will all be fixed to the Methot frame. All age-0 pollock, or a representative subsample, will be counted and their standard lengths measured.

Anchovy Trawl

The anchovy trawl will be fished obliquely from 200 m or 10 m off bottom, whichever is shallowest, to the surface, but note DVM sampling variation detailed below. This allows station-to-station comparison without the additional complication of depth-targeted sampling. It will be fished with 5x7' steel-V doors and will have 1/8" (3mm) codend liner. Deployment will follow standard trawling procedures, but the net will be retrieved at a rate of 9 m/min. The remainder of this paragraph describes how the catch is to be processed. Age-0 pollock are the highest priority for catch processing but data on other taxa will also be collected. Invertebrates will be sorted to broad taxonomic categories: jellyfish (count and weigh), invertebrate plankton (weigh only), and shrimps (count and weigh). Non-gadid fishes will be sorted to the lowest taxonomic level that is easily possible. Cottids, agonids, salmonids, and myctophids need no further identification. Smelts and flatfishes must all be to species except for northern and southern rocksole, which can be grouped as rocksole, and arrowtooth flounder, Kamchatka flounder, and Greenland turbot, which can be grouped as AKG complex. It may be necessary to separately process the larvae and adults of smelt, sand lance, and ***Lumpenus*** spp.. All individuals of each group must be weighed. Individuals within each group, or a representative subsample, must also be counted and their lengths measured. Gadid fishes must be counted and weighed by species. It may be necessary to treat juvenile individuals of a species separate from the adults. All individuals, or a representative subsample, of each group must be lengthed. For age-0 pollock, about 200 fish is the desired number of fish to measure. High priority is placed on getting two randomly selected subsamples of age-0 pollock preserved as quickly as possible after the catch has been dumped onto the sorting table. One subsample of about 50 fish is to be frozen (-20^{o} F, slime lab freezer) (length-weight, otolith), the other will be preserved in 10% formalin (individuals larger than about 60 mm SL must have the body cavity carefully punctured – DO

NOT PIERCE THE GUT) (length-weight, diet). The number of fish comprising each subsample must be accurately recorded (eg., 49 fish froz.; 63 fish form.). If fewer than 100 fish are collected, freeze up to 50, and preserve the remainder in formalin.

Shrimp Trawl

The shrimp trawl will be fished on bottom using the 5x7' steel-V doors, it too will have a 1/8" (3mm) codend liner. Deployment will follow standard trawling procedures. Catch processing will be as for the anchovy trawl with the possible addition of stomach scans for potential age-0 pollock predators, but note DVM sampling variation detailed below.

Acoustic System (EK-500)

The EK-500 (38 and 120 kHz) acoustic system will be continuously monitored in the study area as well as enroute to and from the area. Continuous monitoring of the acoustic system will require the dedication of one person per shift. Each of the nine transects will be run at 12 kts. Slower speed may be necessary for safe navigation near shallows. Most transects are 15 nm apart and each varies in length from about 60 to 90 nm long. Markers will be placed on the echograms and in the acoustic data using the Bergen Integrator, and entered in the EK-500 logbook (eg., Start transect, Break transect (at station #, or transit to next transect), Begin net tow (Tucker, =surface; Trawl, =doors away), At depth, End net tow (Tucker, =surface; Trawl, =doors back), Resume transect). The echo sounder will not be calibrated during this cruise, but a calibration will be done just prior to it.

Neuston net

The neuston net samples the upper few centimeters of the water column. It is designed to fish half in, half out of the water column. The net will be fished slowly, about 1.5 - 2 knots (exact speed may vary with sea conditions). The net will be lowered to the sea surface, with 10-15 m of wire payed out. It may be necessary to adjust the ship's speed to maintain proper skimming action. The tow will last 10 minutes. The winch operator will be advised when it is time to retrieve. The entire sample, excluding large jellyfish, will be preserved in 5% formalin. Jellyfish will be weighed and discarded.

DVM Sampling Variations

1) The Tucker Net 1 will target the path of the shrimp trawl as close to bottom as safely possible, and Net 2 will target the depth layer targeted by the anchovy trawl. Net 1 will be closed (and Net 2 opened) when the net leaves the near-bottom layer.
2) The anchovy trawl, or shrimp trawl, will target the most prominent midwater echo-layer that appears to be age-1 or age-2 pollock. Sort the entire catch, but size compositions are needed only for pollock. Be sure to freeze 50-100 age-1 (100-250 mm) and 50-100 age-2 (250-400 mm) pollock. Age-0 pollock need not be preserved, but do get catch number, weight, and lengths.
3) The shrimp trawl will be fished on bottom for approximately 15 min. The catch will be processed as for the anchovy trawl.
4) The Methot trawl tow #1 will target the shrimp trawl's path, and #2 will target the anchovy trawl's path.

3.0. FACILITIES AND EQUIPMENT

The following systems and their associated support services are essential to the cruise. Sufficient consumables, back-up units, and on-site spares and technical support must be in place to assure that operational interruptions are minimal. All measurement instruments are expected to have current calibrations, and all pertinent calibration information shall be included in the data package. The acoustic equipment, sorting table, and some catch processing gear will be left aboard from the preceding cruise. Most of the remaining equipment to be provided by the project (trawls, disposable supplies) will be loaded aboard during the 29 July – 3 August Seattle inport. Some gear, namely the Scanmar equipment, will be loaded in Kodiak on about 2 September.

3.1 Equipment and Capabilities to be Provided by the Ship

Oceanographic winch with slip rings and 3-conductor cable terminated for CTD

Wire-angle indicator and readout for oceanographic winch

Oceanographic winch for Tucker net (and other nets when used) with slip rings and 3-conductor cable terminated for the SeaCat

Sea-Bird 911 plus CTD system to be used with PMEL stand
(The underwater CTD unit should have mounts compatible with the PMEL CTD stand)

Sea-Bird 911 plus CTD system with stand (back up system, incomplete set of back-up sensors)
(Each CTD system should include underwater CTD, weights, and pinger and there should be one deck unit and tape recorder for the two systems)

For CTD field corrections: AUTOSAL salinometer

Sea-Bird SBE-19 Seacat system (primary system, no back up)

Meter block for plankton tows

Wire speed indicators and readout for the quarterdeck and Marco winches

For meteorological observations: 2 anemometers (one R. M. Young system interfaced to the SCS) calibrated air thermometer (wet-and dry-bulb) and a calibrated barometer and/or barograph

Freezer space for storage of biological and chemical samples (blast and storage freezers)

Furuno or other to indicate gear depth of otter trawls

Simrad EQ-50 echo sounder

JRC JFV-200R color sounder recorder

RDI ADCP written to Iomega Zip drive

Use of Pentium PC in DataPlot for data analysis

SCS (Scientific Computer System)

Stern platform removed for trawl and Methot tows

Laboratory space with exhaust hood, sink, lab tables and storage space

Sea-water hoses and nozzles to wash nets (quarterdeck and aft deck)

Adequate deck lighting for night-time operations

Navigational equipment including GPS and radar

Safety harnesses for working on quarterdeck and fantail

Sorting table for fish catch

Dynanomometer

3.2 Equipment to be Provided by the Project

Physical Samplers

Micro-bathythermograph (four MBTs)

Biological Samplers

1-m^2 Tucker trawl (and backup) and accessories
60-cm bongo net and accessories
Neuston net and accessories
Methot trawl (and backup)
    ScanMar depth sensor system
    NetMind depth sensor system
Otter trawls
    Anchovy trawl (and backup)
    High-opening shrimp trawl (and backup)
    Two 5'x7' steel-V doors (1,250 lbs each)
    Dandylines and pucker strings for all trawls
    Spare web for all trawls
Simrad EK-500 (38 & 120 kHz) acoustic system (MACE's system)
    Four HP-855C single-sheet printers
    Printer paper
    Printer cartridges (tentatively, 1 color per d and 1 b/w per 2 d)
    Data storage tapes and optical disks

Miscellaneous Sampling and Processing Equipment

9 flowmeters, calibration data, hardware for attaching and maintaining them
Fish baskets, dishpans, 5-gal buckets, and wading pool
Length board and strips for adult fish
Length board for age-0 fish
Mechanical and Marel platform scales for catch weights
Triple-beam balance for individual fish weights
Sieves, jar holder, funnels, squirt bottles
Haul and catch forms for anchovy trawls, and COD for all other operations
450 32-oz jars, closures, and labels
    (grid: anchovy, 86; Methot, 10; Tucker, 172; Neuston, 39; extra, 143)
1000 Zip-loc bags (12")
Scalpel and scalpel blade (for piercing body cavity)
Material Data Safety Sheets (MSDS)
Preservatives and dispenser equipment
Hazardous materials spill kit
Miscellaneous bookkeeping equipment/supplies
Spare wire angle indicator

Bookkeeping

Binders and folders
3-ring hole punch
Pencils, pens, paper
20 3.25" 1.44 MB diskettes
Computer, lap-top and printer
Software
    SeaPlot (MACE cave)
    Sigmaplot 5.0 (lap-top)
    Excel 97 (lap-top)
    Word 97 (lap-top)
Scientific ultra-cold freezer

3.3. Scientific Computer System (SCS)
The ship's Scientific Computer System (SCS) shall operate throughout the cruise, acquiring and logging data from navigation, meteorological, oceanographic, and fisheries sensors. See FOCI Standard Operating Instructions for specific requirements. Need 1 min averaged time, position, T, S, water depth, and insolation in ASCII format.

4.0 DATA AND REPORTS

Data disposition, responsibilities and data requirements are listed in the FOCI Standard Operating Instructions.

5.0 ADDITIONAL INVESTIGATIONS AND PROJECTS

5.3 Piggyback projects:
None at this time.

6.0 MISCELLANEOUS

6.5. Hazardous Materials:
The Chief Scientist shall be responsible for complying with NC Instruction 6280A, Hazardous Waste; policy, guidance, and training, dated February 4, 1991, paragraph 7.g and paragraph 9. By federal law, the ship may not sail without a complete inventory of MSDS, and appropriate neutralizing agents, buffers, and/or absorbents in amounts adequate to address spills of a size equal to the amount aboard.

The following hazardous materials will be provided and controlled by the scientists with the Chief Scientist assuming responsibility for the safe handling of such substances:

15 gallons of 37% Formalin
2 gallons of sodium borate

7.0 COMMUNICATIONS

7.4 Important phone numbers, fax numbers and e-mail addresses:

PMEL
- OERD2 (FOCI):
  - 206-526-4700 (voice)
  - 206-526-6485 (fax)
- Admin:
  - 206-526-6810 (voice)
  - 206-526-6815 (fax)
- E-Mail: LastName@pmel.noaa.gov OR FirstName.LastName@noaa.gov

AFSC
- RACE (FOCI):
  - 206-526-4171 (voice)
  - 206-526-6723 (fax)
- E-Mail: FirstName.LastName@noaa.gov

MILLER FREEMAN (telephone methods listed in order of increasing expense)
- Home port (Seattle, WA):
  - 206-553-4589, 4581, 8344
- Cellular (First dial the roamer, wait for dial tone, then dial cellular number.):
  - Kodiak roamer 907-528-7626
  - Dutch Harbor roamer 907-391-7626
  - Ship's cellular number 206-660-7167

Inmarsat Mini-M
011-872-761-267-346 (voice/pbx)
011-872-761-267-347 (voice)
011-872-761-267-348 (fax)
Inmarsat B
011-872-330-394-113 (voice)
011-872-330-394-114 (fax)
E-Mail: NOAA.Ship.Miller.Freeman@noaa.gov (mention person in SUBJECT field)

Marine Operations Center, Pacific
Voice 206-553-4548
E-Mail: FirstName.LastName@noaa.gov
E-Mail to radio room: Radio.Room@noaa.gov

8.0. APPENDICES

Table 1. Station coordinates for Miller Freeman cruise M-F01-10 (FOCI 4MF01) (see Fig. 1 for station labels).

Station Label	Objective	Latitude dd.d	Latitude dd	Latitude mm.m	Longitude dd.d	Longitude dd	Longitude mm.m
"Grid" stations:							
1A	Grid	54.682	54	40.912	-158.055	-158	-3.271
1B	Grid	54.910	54	54.619	-158.351	-158	-21.039
1C	Grid	55.192	55	11.540	-158.724	-158	-43.460
1D	Grid	55.467	55	28.000	-159.117	-159	-6.990
1E	Grid	55.714	55	42.850	-159.437	-159	-26.190
2E	Grid	55.895	55	53.715	-159.071	-159	-4.256
2D	Grid	55.656	55	39.360	-158.757	-158	-45.430
2C	Grid	55.366	55	21.943	-158.365	-158	-21.896
2B	Grid	55.084	55	5.015	-157.988	-157	-59.279
3A	Grid	54.957	54	57.449	-157.268	-157	-16.058
3B	Grid	55.241	55	14.473	-157.633	-157	-37.960
3C	Grid	55.529	55	31.748	-158.046	-158	-2.779
3D	Grid	55.816	55	48.944	-158.444	-158	-26.631
3E	Grid	55.934	55	56.029	-158.602	-158	-36.137
4E	Grid	56.118	56	7.076	-158.289	-158	-17.314
4D	Grid	55.981	55	58.858	-158.095	-158	-5.706
4C	Grid	55.720	55	43.218	-157.684	-157	-41.043
4B	Grid	55.385	55	23.113	-157.259	-157	-15.565
5A	Grid	55.214	55	12.848	-156.500	-156	-30.025
5B	Grid	55.530	55	31.804	-156.902	-156	-54.117
5C	Grid	55.875	55	52.493	-157.348	-157	-20.855
5D	Grid	56.144	56	8.656	-157.750	-157	-45.026
5E	Grid	56.434	56	26.066	-158.132	-158	-7.914
6E	Grid	56.595	56	35.728	-157.789	-157	-47.368
6D	Grid	56.320	56	19.190	-157.401	-157	-24.068
6C	Grid	56.034	56	2.062	-156.993	-156	-59.570
6B	Grid	55.687	55	41.231	-156.521	-156	-31.255
7B	Grid	55.802	55	48.116	-156.274	-156	-16.444
8B	Grid	55.916	55	54.978	-156.011	-156	-0.675
8C	Grid	56.271	56	16.273	-156.536	-156	-32.170
8D	Grid	56.496	56	29.769	-156.895	-156	-53.721
9E	Grid	56.856	56	51.358	-156.856	-156	-51.330
9D	Grid	56.700	56	41.970	-156.593	-156	-35.554
8E	Grid	56.701	56	42.042	-157.258	-157	-15.456
9C	Grid	56.427	56	25.614	-156.195	-156	-11.678
10E	Grid	57.000	57	0.000	-156.388	-156	-23.302
10D	Grid	56.867	56	52.024	-156.188	-156	-11.284
10C	Grid	56.611	56	36.640	-155.810	-155	-48.580
9B	Grid	56.061	56	3.681	-155.640	-155	-38.398
"Sea lion" stations:							
0B	Sea Lion	54.839	54	50.360	-158.804	-158	-48.265
0C	Sea Lion	55.070	55	4.217	-159.130	-159	-7.817
0D	Sea Lion	55.339	55	20.366	-159.510	-159	-30.573
7A	Sea Lion	55.501	55	30.039	-155.834	-155	-50.028
7Cn	Sea Lion	56.225	56	13.480	-156.883	-156	-52.954
7D	Sea Lion	56.416	56	24.965	-157.167	-157	-10.032
7Cs	Sea Lion	56.012	56	0.722	-156.592	-156	-35.521
8A	Sea Lion	55.612	55	36.743	-155.546	-155	-32.780
8Bn	Sea Lion	56.089	56	5.344	-156.264	-156	-15.812
9A	Sea Lion	55.708	55	42.480	-155.147	-155	-8.793

Figure 1. Station and transect locations for Miller Freeman cruise MF-01-10 (FOCI 4MF01).