

FINAL CRUISE INSTRUCTIONS

ECO-FOCI

NOAA Ship *MILLER FREEMAN*, Cruise MF-09-04
5 – 19 September 2009
Chief Scientist – Matt Wilson, NOAA/AFSC

1.0 FINAL CRUISE INSTRUCTIONS

1.1 **Cruise Title** – Ecosystem and Fisheries-Oceanography Coordinated Investigations (Eco-FOCI).

1.2 **Cruise Numbers:**

1.2.1 **Cruise Number** – MF-09-04.

1.2.2 **Eco-FOCI Number** – 1MF09.

1.3 **Cruise Dates:** 5 – 19 September 2009

1.3.1 **Departure** – 5 September 2009, 1500, Kodiak, AK

1.3.2 **Arrival** – 19 September 2009, 0800, Dutch Harbor, AK

1.4 **Operating Area** - Gulf of Alaska.

2.0 CRUISE OVERVIEW

2.1 **Cruise Objectives** - We will conduct fieldwork to continue a study designed to compare age-0 pollock and their prey field between three separate pollock nursery regions in the western Gulf of Alaska (GOA). Data resulting from the work will also be used to extend a 5-yr time series (2000, 2001, 2003, 2005, 2007) of age-0 walleye pollock abundance in one of the nurseries. This work is needed to more rigorously evaluate food-related merits of three important pollock nurseries, and to evaluate age-0 abundance in the western GOA during late summer (September) as a recruitment predictor.

2.2 **Applicability** - These instructions, with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN**, dated March 2007, present complete information for this cruise.

2.3 **Participating Organizations**

NOAA - Alaska Fisheries Science Center (AFSC)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

2.4 Personnel

2.4.1 Chief Scientist

Name	Gender	Nationality	Affiliation	E-mail Address
Matt Wilson	Male	USA	AFSC	Matt.Wilson@noaa.gov

2.4.2 Other Participating Scientists

Name	Gender	Nationality	Affiliation	E-mail Address
Kimberly Bahl	Female	USA	AFSC	Kimberly.Bahl@noaa.gov
Dennis Benjamin	Male	USA	AFSC	Dennis.Benjamin@noaa.gov
Annette Dougherty	Female	USA	AFSC	Annette.Dougherty@noaa.gov
Susan Picquelle	Female	USA	AFSC	Susan.Picquelle@noaa.gov
Stacy Remple	Female	USA	AFSC	Stacy.Remple@noaa.gov
Ingrid Spies	Female	USA	AFSC	Ingrid.Spies@noaa.gov

2.5 Administration

2.5.1 Ship Operations

Marine Operations Center, Pacific
1801 Fairview Avenue East, Seattle, Washington 98102-3767
Telephone: (206) 553-4548
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LCDR Demian Bailey, NOAA
Chief, Operations Division, Pacific (MOP1)
Telephone: (206) 553-8705
Cellular: (206) 390-7527
E-mail: ChiefOps.MOP@noaa.gov

2.5.2 Scientific Operations

Dr. Phyllis J. Stabeno, PMEL
Telephone: (206) 526-6453
E-mail: Phyllis.Stabeno@noaa.gov

Dr. Jeffrey Napp, AFSC
Telephone: (206) 526-4148
E-mail: Jeff.Napp@noaa.gov

3.0 OPERATIONS

3.1 Data To Be Collected

3.1.1 Plankton Net – The Tucker trawl will be deployed to a depth of 200 meters, or 10 meters off the bottom, whichever is shallowest. On the downcast, the drogue net will be equipped with a Clarke-Bumpus net (150 micron-mesh net) to collect small zooplankton. At deep sites (>80 m bottom depth), samples will be collected sequentially during the tow using Tucker Nets 1 and 2. Once the Tucker is at depth,

the first messenger will be sent down the wire to open Net 2. The second messenger closes Net 2 and opens Net 1; it will be sent when the net is at 40 meters. At shallower sites (≤ 80 m bottom depth), only one sample will be collected (Net 2). The Sea-Cat profiler will be used to position the net in real time and to obtain profiles of water temperature and salinity. Three MOA buttons are needed to mark:

- 1) Net 2 open,
- 2) Net 1 open, and
- 3) Surface

(e.g., 12-1 Net 2 open, etc.) In this example, 12-1 refers to Station 12 Haul 1. All consecutive operations within 0.5 nautical miles of a pre-designated point are assigned the same station number. Haul number indicates operation sequence at each station. Occasionally, the trawl may be used to target specific depths. Samples will be preserved in a 5% formalin-seawater solution buffered with sodium borate (2%). Thus, depending on depth, 2 or 3 samples will be preserved from each tow.

3.1.2 Midwater Trawl – The Stauffer (a.k.a., anchovy) trawl (see Appendix 9.2 for Stauffer trawl diagram) will be deployed to a depth of 200 meters, or 10 meters, off the bottom, whichever is shallowest. Net depth will be monitored using the ship's Furuno echosounder. Standard trawl operations will be used for deployment. Once equilibrium is achieved, as determined by the fishing officer or scientist, ***the trawl will be retrieved at a wire rate of about 10 meters per minute.*** Thus, the trawl will usually be fished over a double-oblique path. Occasionally, the trawl may be used to target a specific depth. In this case, standard trawl deployment and retrieval is desired. Four MOA buttons are required:

- 1) Doors out,
- 2) EQ,
- 3) HB, and
- 4) Doors in.

Note that the third button (HB) will be used only if targeting a depth layer.

Catches will be processed by sorting walleye pollock, capelin, and eulachon from the remainder of the catch, which will be sorted into coarse taxonomic groups (e.g., jellyfish, cottidae). It is sometimes necessary to further sort walleye pollock into ca. ≤ 120 mm SL and ca. ≥ 12 cm FL to ensure adequate representation of age-0 and age-1+ components, respectively, in the catch and length data. Approximately 100 age-0 and 100 age-1+ walleye pollock, 50 capelin, and 50 eulachon will be measured for body length. Standard length (SL) will be the body-length metric for capelin and age-0 walleye pollock. Fork length (FL) will be the body-length metric for eulachon and age-1+ walleye pollock. Subsampling may be necessary prior to enumerating and measuring individuals. Only age-0 walleye pollock will be preserved. These will be flash frozen in the -80 °C freezer and then moved to the blast freezer in the slime lab or to the walk-in freezer across from the machine shop.

3.1.3 Bottom Trawl – Samples may be collected with the high-opening shrimp trawl (see Appendix 9.3 for shrimp trawl diagram). It will be deployed opportunistically to sample fishes otherwise too close to the sea floor to sample with the midwater trawl. Standard trawl operations will be used for deployment and retrieval. Once

equilibrium is achieved, as determined by the fishing officer or scientist, the trawl will be fished on the sea floor for 15 minutes. Four MOA buttons are required:

- 1) Doors out,
- 2) EQ,
- 3) HB, and
- 4) Doors in.

Catch processing will be as for midwater-trawl catches, except that only walleye pollock, capelin, and eulachon will be sorted from the catch. No other portion of the catch will be quantified.

- 3.1.4 Acoustic backscatter** – We anticipate running the SIMRAD EK-60 Scientific Echosounder Monitoring system to collect ancillary data on fish aggregations during the entire cruise.
- 3.1.5 Conductivity and Temperature at Depth** –CTD casts will be conducted to ensure that the Sea-Cat profiler is operating correctly. A MOA button should be set up to mark the at-depth position, date, time, and bottom depth (e.g., 1-1, CTD at depth, etc).
- 3.1.6 Scientific Computer System (SCS)** - The ship's SCS shall operate throughout the cruise, acquiring and logging data from navigation, meteorological, oceanographic, and fisheries sensors. See *FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN* (SOI 5.2) for specific requirements.
- 3.2 Staging Plan** - The majority of the equipment necessary for the cruise will be loaded during 25 (Tuesday) - 31 (Monday) August 2009 onto **NOAA Ship MILLER FREEMAN** before the ship's departure from Seattle, Washington. We will use the chemistry lab, the rough lab, and the slime lab for sample and equipment preparation and request as much counter and cabinet space as possible. We will also be using DataPlot for CTD and SEACAT operations. The scientific party will be responsible for arranging vehicles for moving their equipment from the airport and/or docks. Please note that we will be loading the MOCNESS frame and cradle onto the ship in Kodiak for transport to Seattle.
- 3.3 De-staging Plan** –Samples and gear will remain on board until the ship arrives Seattle in late October 2009. The scientific party will be responsible for arranging vehicles for moving their equipment to the airport and/or docks and any equipment that will be left on the vessel for upcoming cruises.
- 3.4 Cruise Plan** - The cruise will begin upon departure from Kodiak, Alaska at 15:00 ADT on Saturday, September 5, 2009. Sampling will occur at 105 pre-determined stations that form three sampling grids (Section 9.3 Figure of MF-09-04 collection-site locations and Section 9.4 Table of MF-09-04 collection-site coordinates): 1) east Kodiak Island grid (n = 36 sites), 2) Semidi Islands grid (n = 36 sites), and 3) Sanak grid (n = 33 sites). The east Kodiak grid includes nearshore areas previously shown to be rich pollock nurseries. Occupation of the Semidi grid will extend a 5-year time series, which began September 2000. The Sanak grid has been newly added to extend survey coverage to where age-0 walleye pollock have been historically abundant. At each grid location, small midwater fishes will be sampled using a small-mesh midwater trawl (Stauffer/anchovy trawl) and potential prey will be sampled using a 1-m² Tucker net. Sampling may occasionally occur opportunistically to collect zooplankton

and/or fish to identify sound scatterers, and to verify the absence of zooplankton and/or fish at locations devoid of sound scatterers. Opportunistic sampling may occur by fishing the sampling gear obliquely through the water column or targeting specific depth intervals. The bottom trawl may be used opportunistically to collect fishes close to the sea floor. The CTD will be deployed near the start, middle, and end of sampling operations, for a total of three casts, to verify Sea-Cat performance. The cruise will end upon arrival at Dutch Harbor, Alaska at 08:00 ADT on Saturday, September 19, 2009.

3.5 Station Locations - See Section 9.4 Table of MF-09-04 collection-site coordinates.

3.6 Station Operations - The following are operations to be conducted on this cruise. The procedures for these operations are listed in the **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN** (SOI). Operations not addressed in the SOI and changes to standard procedures are addressed below.

- CTD/Water Sample Operations (SOI 3.2.1)
- Midwater Trawls (SOI 3.2.9)
- Tucker Trawls (SOI 3.2.11)
- MARMAP Bongo Tows (SOI 3.2.2)

3.7 Underway Operations - The following are underway operations to be conducted on this cruise. The procedures for these operations are listed in the **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN** (SOI). Operations not addressed in the SOI and changes to standard procedures are addressed below.

- Acoustic Doppler Current Profiler (ADCP) Operations (SOI 3.2.16),
- Scientific Computer System (SCS) data acquisition (SOI 5.2),
- Thermosalinograph monitoring (SOI 5.3).

3.8 Applicable Restrictions – None.

3.9 Small Boat Operations – None.

4.0 FACILITIES

4.1 Equipment and Capabilities Provided by Ship

- Oceanographic winch with slip rings and 3-conductor cable terminated for CTD,
- Manual wire-angle indicator,
- Oceanographic winch with slip rings and 3-conductor cable terminated for the SBE SEACAT, for net tow operations,
- Sea-Bird Electronics' SBE 911*plus* CTD system with stand, each CTD system should include underwater CTD, weights, and pinger. There should be a deck unit for the system,
- 10-liter Niskin sampling bottles for use with rosette (whatever necessary for CTD calibration – no scientific samples will be collected),
- Conductivity and temperature sensor package to provide dual sensors on the CTD (primary),

- One complete Sea-Bird Electronics' SBE-19 SEACAT system to be used as the primary system during plankton tows,
- Two complete Furuno netsonde systems,
- Meter block for plankton tows,
- Wire speed indicators and readout for quarterdeck, Rowe, Marco, and both trawl (Rapp-Hydema) 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 [-80°C freezer in rough lab, blast freezer in slime lab, and, perhaps, walk-in freezer may be needed as a backup in case the blast freezer fails or additional freezer space is needed. In the past, we put up to 5 wax boxes (~1'x2'x3') in the freezer opposite the machine shop.],
- Sorting table for processing trawl catches,
- SIMRAD ER-60 echosounder,
- RD Instruments' ADCP written to disk,
- Bench space in DataPlot for PCs, monitor, and printer,
- Use of Pentium PC in DataPlot for data analysis,
- Scientific Computer System (SCS),
- Minimum of 2 computers with internet and e-mail access,
- Removable stern platform (removed),
- 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,
- Ship's crane(s) used for loading and/or deploying.

4.2 Equipment and Capabilities Provided by Scientists– See [Section 9.1 Equipment Inventory](#) for weights and dimensions.

- Fish collecting gear:
 - Two small-mesh midwater trawls (Stauffer, a.k.a. anchovy) equipped with 3-mm (1/8") mesh codend liner,
 - One bottom trawl (high-opening shrimp) with height regulator, tickler chain, and 3-mm (1/8") mesh codend liner,
 - Two pair steel-v trawl doors (each door: 5'x7', 1250 lbs),
 - All accessories to make trawls fishable (e.g., dandyines, pucker strings), and
 - Spare web if available.
- Plankton collecting gear:
 - Two complete 1-m² Tucker trawl plankton sampling systems (333-micron mesh net and all necessary accessories),
 - Two complete Clarke-Bumpus ring net systems (150-micron mesh net and all necessary accessories),
 - One 60-cm bongo sampling array (333-micron mesh net and all necessary accessories) as backup in case both Tucker Trawls fail,
 - One 20-cm bongo sampling array (150-micron mesh net and all necessary accessories) as backup in case both Tucker/Clarke-Bumpus fail, and

- Hardware to assemble 20-60 cm bongo array.
- Miscellaneous scientific sampling, gear mending, and catch processing equipment:
 - 5 flowmeters, calibration data, hardware for attaching and maintaining them,
 - Fish baskets (15), dishpans (15), 5-gal buckets (4), and wading pool,
 - Two length board and strips for adult fish,
 - Three length boards for small fish,
 - Mechanical (RACE) and Marel platform (MACE) scales for catch weights,
 - Marel specimen scale (MACE),
 - Triple-beam balance for small fish weights,
 - Sieves, jar holder, funnels, squirt bottles,
 - 31 cases of 32-oz jars, closures, and labels,
 - 1000 Zip-loc bags (12”),
 - Preservative-dispenser equipment,
 - Hazardous materials spill kit, and
 - Spare wire angle indicator.
- Bookkeeping:
 - Binders and folders,
 - 3-ring hole punch,
 - Pencils, pens, paper,
 - Computer data backup media (e.g., CD, flash drive),
 - Computer (w/CD read/writer) and printer, and
 - Forms (paper and electronic versions): COD, haul, catch, and length.
- Software:
 - Excel 97 (lap-top),
 - Cruise Operations Database (COD).
- Electronics:
 - Sea-Bird Electronics’ SBE-19 SEACAT system,

5.0 DISPOSITION OF DATA AND REPORTS

5.1 The following data products will be included in the cruise data package:

- **NOAA Form 77-13d - Deck Log - Weather Observation Sheets,**
- Electronic Marine Operations Abstracts,
- SCS backup,
- Calibration Sheets for all ship's instruments used,
- CTD Cast Information/Rosette Log,
- ADCP Log Sheets,
- ADCP CD (CD-RW),
- Ultra-cold Freezer Temperature Daily Log (SOI 5.4).

5.2 **Pre- and Post-cruise Meetings** - Cruise meetings may be held in accordance with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN** (SOI 5.5).

6.0 ADDITIONAL PROJECTS

- 6.1 **Definition** - Ancillary and piggyback projects are secondary to the objectives of the cruise and should be treated as additional investigations. The difference between the two types of secondary projects is that an ancillary project does not have representation aboard and is accomplished by the ship's force.
- 6.2 **Ancillary Projects** - Any ancillary work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not-to-interfere basis with the programs described in these instructions and in accordance with the **NOAA Fleet Standing Ancillary Instructions**.
- 6.3 **Piggyback Projects** – None.

7.0 HAZARDOUS MATERIALS The field party chief shall be responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements of Visiting Scientists. July 2002

7.1 Inventory

Chemical	CAS Number	Respondee	Org	Qty	H	F	R	Storage Color Code	Hazard Class	Packing Group Number	UN	Reportable Quantity	Response Indices
Formaldehyde	50-00-0	M. Wilson	AFSC	40-L	3	2	2	Flammable	3 & 8	III	1198	100 LBS	1
Sodium Borate	1330-43-4	M. Wilson	AFSC	20-L	1	0	0	General	Not regulated				2
<p>Spill Response 1: Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, or earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. U.S. Regulations (CERCLA) requires reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.</p>													
<p>Spill Response 2: Ventilate area of leak or spill. Wear appropriate personal protective equipment. Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.</p>													

7.2 Material Safety Data Sheet (MSDS) – Submitted separately.

8.0 MISCELLANEOUS

8.1 **Communications** - Specific information on how to contact the **NOAA Ship MILLER FREEMAN** and all other fleet vessels can be found at:

<http://www.moc.noaa.gov/phone.htm>

8.2 **Important Telephone and Facsimile Numbers and E-mail Addresses**

8.2.1 **Pacific Marine Environmental Laboratory (PMEL):**

FOCI - Ocean Environmental Research Division (OERD2):

- (206) 526-4700 (voice)
- (206) 526-6485 (fax)

Administration:

- (206) 526-6810 (voice)
- (206) 526-6815 (fax)

E-Mail: FirstName.LastName@noaa.gov

8.2.2 **Alaska Fisheries Science Center (AFSC):**

FOCI - Resource Assessment and Conservation Engineering (RACE):

- (206) 526-4171 (voice)
- (206) 526-6723 (fax)

E-Mail: FirstName.LastName@noaa.gov

8.2.3 **NOAA Ship MILLER FREEMAN** - Telephone methods listed in order of increasing expense:

Homeport - Seattle, Washington:

- (206) 553-4589
- (206) 553-4581
- (206) 553-8344

United States Coast Guard - Kodiak, Alaska

- (907) 487-9752
- (907) 487-9753
- (907) 487-4397
- (907) 487-4398

Cellular:

- (206) 790-7594

Iridium:

- (808) 659-5684

INMARSAT Mini-M

- 011-872-761-267-346 (voice/PBX)
- 011-872-761-267-347 (voice)
- 011-872-761-267-348 (fax)

INMARSAT B

- 011-872-330-394-120 (voice)
- 011-872-330-394-121 (fax)

E-Mail: FirstName.LastName@noaa.gov

8.2.4 Marine Operations Center, Pacific (MOP):

Operations Division (MOP1)

- (206) 553-4548 (voice)
- (206) 553-1109 (facsimile)

E-Mail: see NOAA locator at <https://nsd.rdc.noaa.gov/nsd/moreinfo>

E-Mail to Radio Room: Radio.Room@noaa.gov

9.0 APPENDICES

9.1 Equipment Inventory

Equipment	Quantity	Unit Dimension	Unit Weight	Total Weight
Trawl door	4	5'x7'	1250 lbs	5000 lbs
Stauffer trawls (midwater)	2	4'x6'x6'	1000 lbs	2000 lbs
Shrimp trawl, (bottom)	1	4'x6'x6'	1000 lbs	1000 lbs
1-m ² Tucker trawl frame	2	2'x2'x5'	100 lbs	200 lbs
60-cm bongo frame	1	8"x26"x60"	25 lbs	25 lbs
20-cm bongo frame	1	8"x14"x16"	10 lbs	10 lbs
Formaldehyde containers	2	20-L	40 lbs	80 lbs
Sodium borate containers	1	20-L	40 lbs	40 lbs
Cases, Glass Jars, 32-oz	30	8"x12"x15"	50 lbs	1,500 lbs
Miscellaneous Gear Trunks	4	20"x22"x36"	80 lbs	320 lbs
Misc. gear bundle (baskets, etc)	1	5'x5'x5'	200 lbs	200 lbs
TOTAL:			10,375 lbs	

9.2 Diagram of Stauffer trawl (from Echeverria et al. 1990. NOAA Tech. Memo. NOAA-TM-NMFS-SWFC-147). The trawl bridle consists of two 180' top wires and two 192' bottom wires, which includes a 2-fathom chain extension on each bottom wire.

WINGS:

Use 6" #54
Trawl is constructed from 4 panels (top, bottom, and 2 sides cut to this plan.

WEBBING:

Knotted filament nylon, chaff resistant treated.
Color: black
All mesh sizes stretched measured.

HANGING:

50% (4 meshes to 12 inches of mouth rope at bosom).

MOUTH AND RIBLINES:

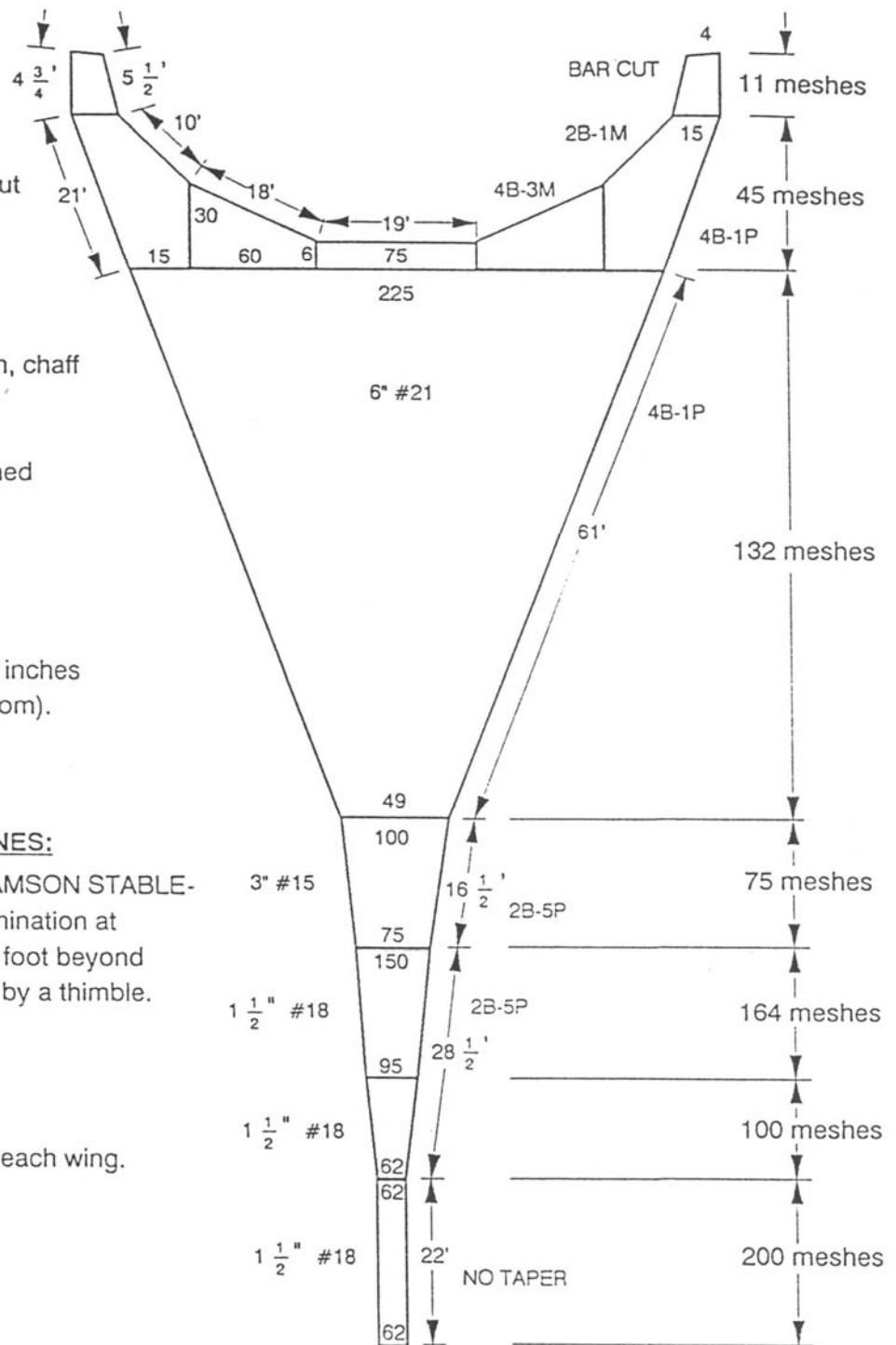
Use 5/8" diameter SAMSON STABLE-BRAID or equal. Termination at wing tips to extend 1 foot beyond trawl and terminated by a thimble.

CHAINS:

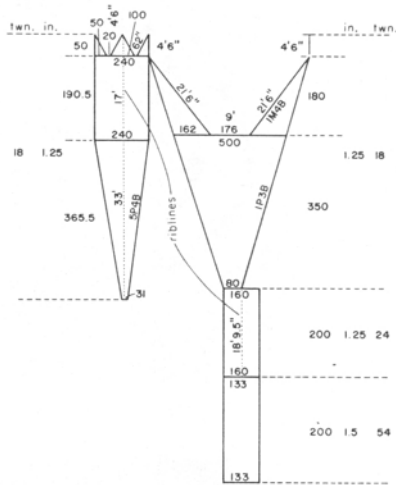
145 lb. 5/8" chain on each wing.

FLOATS:

42 each 10" floats.

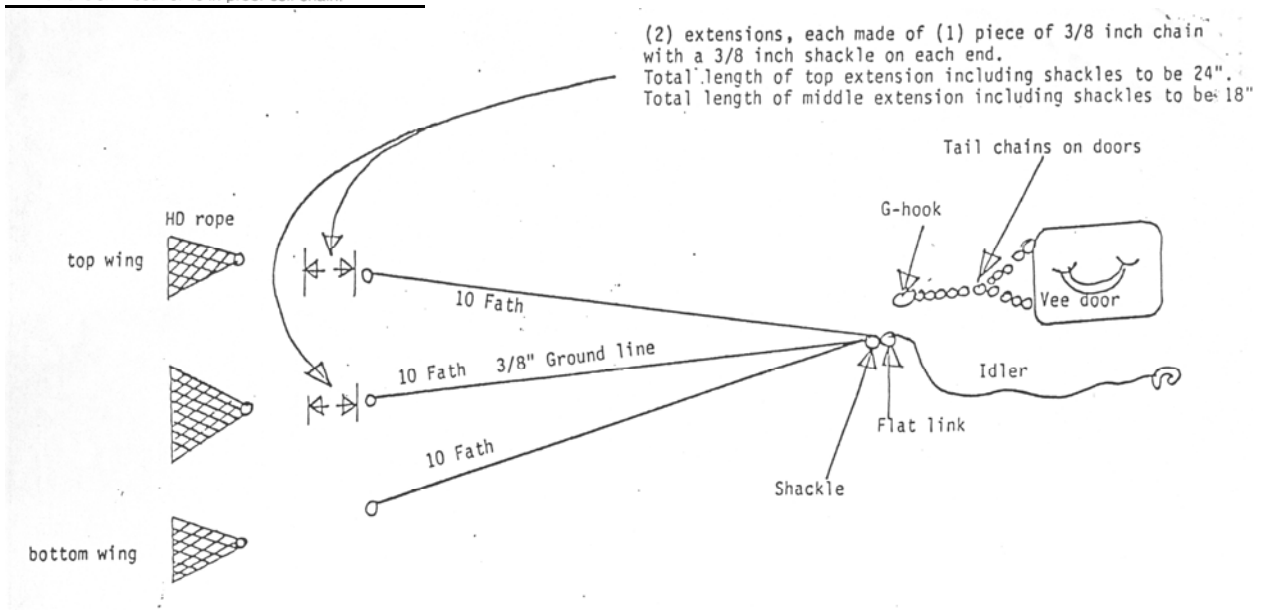


9.3 Diagram of shrimp trawl net (top) and bridle rigging (lower) (from Wathne 1977. Marine Fisheries Review, June 1977).

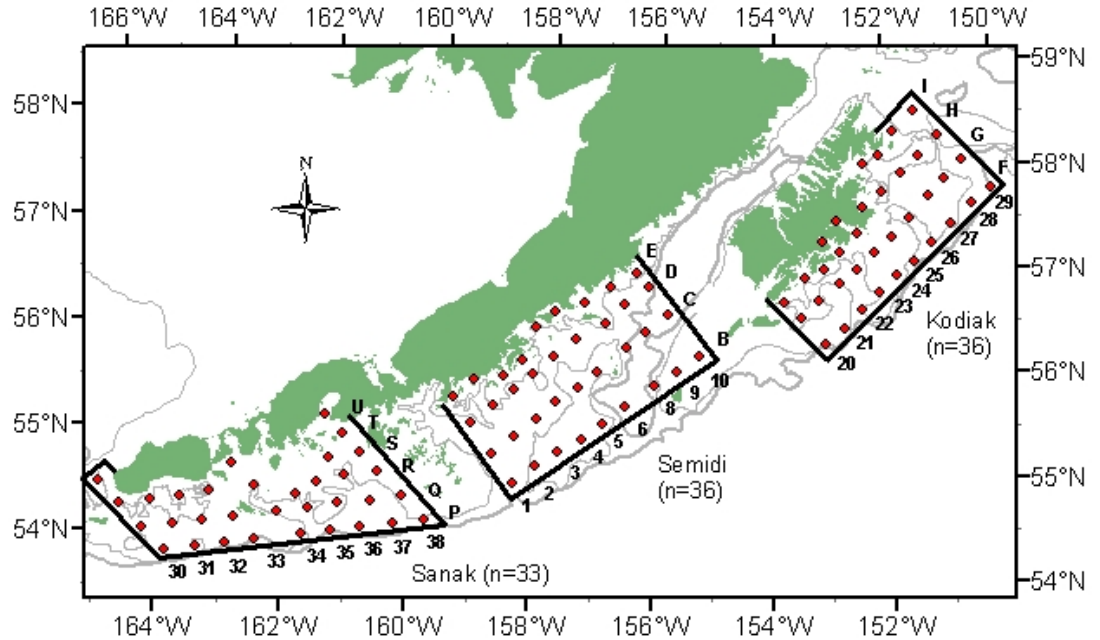


61' SHRIMP SAMPLING TRAWL

- Netting—nylon, preshrunk.
- Headrope—61 ft of $\frac{3}{8}$ in 6×19 galvanized wire rope, tight wrapped with $\frac{5}{16}$ in polypropylene rope.
- Footrope—61 ft of $\frac{1}{2}$ in, 6×19 galvanized wire rope, tight wrapped with $\frac{1}{2}$ in polypropylene rope.
- Breastlines—20 ft of $\frac{1}{2}$ in braided nylon (Stablebraided).
- Sidepanel riblines—73 ft $3\frac{1}{2}$ in of $\frac{3}{8}$ in braided nylon (Stablebraided).
- Flotation—29 pieces, 8 in diameter (5.5 lb buoyancy each).
- Footrope chain—60 ft of $\frac{3}{8}$ in suspended with six 12-in chain droppers ($\frac{3}{8}$ in diameter).
- Tickler chain—55 ft of $\frac{3}{8}$ in secured at wing tips.
- Otterboards—5 \times 7 ft V-doors, 815 lb.
- Dandylines (sweepelines)—3 pieces, 10 fathoms each, top and middle of $\frac{3}{8}$ in diameter, 6×19 galvanized wire rope, bottom of $\frac{1}{2}$ in diameter; top with 24 in extension and middle with 18 in extension—both of $\frac{3}{8}$ in proof coil chain.



9.4 Figure of MF09-04 collection-site locations.



9.5 Table of MF-09-04 collection-site coordinates.

Grid Stn.	Latitude			Longitude		
	Deg.	Min.	DD.dd	Deg.	Min.	DD.dd
Kodiak grid						
29I	58	33.0	58.55	151	26.40	151.44
29H	58	18.6	58.31	151	0.00	151.00
29G	58	3.6	58.06	150	34.20	150.57
29F	57	46.8	57.78	150	4.20	150.07
28F	57	38.4	57.64	150	25.80	150.43
28G	57	52.8	57.88	150	54.00	150.90
28H	58	7.2	58.12	151	22.20	151.37
28I	58	21.0	58.35	151	48.60	151.81
27I	58	7.2	58.12	152	4.80	152.08
27H	57	57.6	57.96	151	41.40	151.69
27G	57	43.8	57.73	151	12.60	151.21
27F	57	27.6	57.46	150	48.60	150.81
26F	57	16.8	57.28	151	10.20	151.17
26G	57	31.2	57.52	151	34.20	151.57
26H	57	46.8	57.78	152	3.00	152.05
26I	58	2.4	58.04	152	22.20	152.37
25H	57	38.4	57.64	152	24.00	152.40
25G	57	21.0	57.35	151	54.00	151.90

25F	57	6.6	57.11	151	30.00	151.50
24F	56	58.2	56.97	151	48.60	151.81
24G	57	11.4	57.19	152	12.60	152.21
24H	57	23.4	57.39	152	29.40	152.49
24I	57	30.0	57.50	152	51.60	152.86
23I	57	18.6	57.31	153	6.60	153.11
23H	57	12.0	57.20	152	49.20	152.82
23G	57	2.4	57.04	152	31.20	152.52
23F	56	48.6	56.81	152	7.20	152.12
22F	56	39.6	56.66	152	26.40	152.44
22G	56	54.0	56.90	152	49.20	152.82
22H	57	2.4	57.04	153	6.60	153.11
21H	56	57.6	56.96	153	25.80	153.43
21G	56	44.4	56.74	153	11.40	153.19
21F	56	28.2	56.47	152	45.00	152.75
20F	56	19.2	56.32	153	4.80	153.08
20G	56	34.8	56.58	153	30.60	153.51
20H	56	43.8	56.73	153	48.00	153.80
Semidi grid						
10B	56	13.3	56.22	155	17.10	155.29
10C	56	36.0	56.60	155	49.20	155.82
10D	56	51.6	56.86	156	11.40	156.19
10E	56	58.8	56.98	156	23.40	156.39
9E	56	51.0	56.85	156	51.60	156.86
9D	56	41.4	56.69	156	34.80	156.58
9C	56	25.2	56.42	156	12.60	156.21
9B	56	3.7	56.06	155	38.50	155.64
8B	55	55.2	55.92	156	1.80	156.03
8C	56	16.2	56.27	156	32.40	156.54
8D	56	30.0	56.50	156	54.60	156.91
8E	56	41.4	56.69	157	16.80	157.28
6E	56	35.4	56.59	157	48.00	157.80
6D	56	19.8	56.33	157	25.20	157.42
6C	56	1.8	56.03	157	1.80	157.03
6B	55	42.0	55.70	156	31.80	156.53
5B	55	31.8	55.53	156	54.20	156.90
5C	55	52.2	55.87	157	21.00	157.35
5D	56	9.0	56.15	157	46.20	157.77
5E	56	25.8	56.43	158	7.20	158.12
4E	56	6.6	56.11	158	18.60	158.31
4D	55	58.2	55.97	158	7.20	158.12
4C	55	43.2	55.72	157	42.60	157.71
4B	55	22.2	55.37	157	15.00	157.25
3B	55	14.6	55.24	157	37.90	157.63
3C	55	32.4	55.54	158	1.20	158.02
3D	55	49.2	55.82	158	26.40	158.44
3E	55	56.4	55.94	158	38.40	158.64
2E	55	53.4	55.89	159	6.60	159.11
2D	55	39.0	55.65	158	45.60	158.76
2C	55	22.2	55.37	158	22.20	158.37

2B	55	5.4	55.09	157	59.40	157.99
1B	54	54.5	54.91	158	20.80	158.35
1C	55	11.4	55.19	158	44.40	158.74
1D	55	28.2	55.47	159	7.20	159.12
1E	55	42.0	55.70	159	27.00	159.45
Sanak grid						
38U	55	25.14	55.42	161	35.82	161.60
38T	55	15.42	55.26	161	15.72	161.26
38S	55	5.64	55.09	160	57.12	160.95
38R	54	55.44	54.92	160	36.9	160.62
38Q	54	42.66	54.71	160	10.86	160.18
38P	54	29.7	54.50	159	47.16	159.79
37P	54	26.46	54.44	160	16.56	160.28
37Q	54	38.52	54.64	160	40.98	160.68
37R	54	51.84	54.86	161	9.42	161.16
37S	55	0.12	55.00	161	26.46	161.44
36R	54	45.96	54.77	161	37.2	161.62
36Q	54	34.92	54.58	161	13.26	161.22
36P	54	22.62	54.38	160	48.72	160.81
35P	54	18.72	54.31	161	17.88	161.30
35Q	54	30.6	54.51	161	41.82	161.70
35R	54	36.96	54.62	161	55.74	161.93
34S	54	50.82	54.85	163	2.22	163.04
34R	54	39.18	54.65	162	38.34	162.64
34Q	54	26.4	54.44	162	12.42	162.21
34P	54	14.4	54.24	161	46.26	161.77
33P	54	8.82	54.15	162	30.18	162.50
33Q	54	19.98	54.33	162	54.3	162.91
33R	54	32.58	54.54	163	20.4	163.34
32R	54	27.3	54.46	163	49.2	163.82
32Q	54	15.6	54.26	163	23.22	163.39
32P	54	4.44	54.07	162	59.76	163.00
31P	54	0.12	54.00	163	27.12	163.45
31Q	54	11.4	54.19	163	52.86	163.88
31R	54	23.16	54.39	164	16.92	164.28
30P	53	55.08	53.92	163	57	163.95
30Q	54	6.72	54.11	164	22.26	164.37
30R	54	17.82	54.30	164	47.64	164.79
30S	54	28.62	54.48	165	11.82	165.20

10.3 Biomass Removal Estimates:

Sample	# Hauls	Walleye pollock	Arrowtooth flounder	Pacific cod	Flathead sole	N. rock sole	P. halibut
Tucker	105	<1kg	<1kg	<1kg	<1kg	<1kg	<1kg
anchovy trawl	105	<500kg	<500kg	<500kg	<500kg	<500kg	<500kg

Cruise No: MF09-04
FOCI No: 1MF09

July 15, 2009

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