U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Center
Pascagoula Laboratory
P.O. Drawer 1207
Pascagoula, MS 39567-0112

FRS OREGON II CRUISE 132
1/6/83 - 2/11/83

INTRODUCTION

In cooperation with the Caribbean Fishery Management Council, a pelagic fishery assessment survey was conducted from the FRS/OREGON II on the south and west coasts of Puerto Rico and the U.S. Virgin Islands (Figure 1). Target coastal and oceanic fish species were identified by the management council prior to the cruise as possible marine resources to increase fishery landings in their area.

The vessel departed Pascagoula on January 6 with port calls at Key West, Florida on January 8, Mayaquez, Puerto Rico on January 12, 16, 19, Ponce, Puerto Rico on January 24, Charlotte Amalie, St. Thomas on January 25, Frederiksted, St. Croix on February 2 and San Juan, Puerto Rico on February 4. The port call in Key West, Florida, was to embark cruise personnel and load six fish attractant devices, manufactured by McIntosh Marine, Inc. The devices had been purchased by the Virgin Island Government and were delivered to St. Thomas and St. Croix. At Mayaquez, the port call was made to embark cruise participants from Puerto Rico and review the cruise plan with local and U.S. Virgin Island representatives. Other port calls at Mayaquez were for the purposes of embarking interested fishermen, representatives from fishery organizations, and the press to demonstrate longlining operations and fish attractant devices. An unscheduled port call had to be made at Mayaquez to deliver a fishing vessel which had been encountered offshore without power. The port call at Ponce was to pick up longline gear which had been lost and later found by two Puerto Rican fishermen, and port entry at San Juan provided the opportunity to deliver chlorophyll samples to University of Puerto Rico scientists.

OBJECTIVES

1) Determine the availability of oceanic fish species utilizing pelagic longline gear on the south and west coast of Puerto Rico and the U.S. Virgin Islands.

2) Deploy and test the effectiveness of aggregating structures for surveys of coastal and oceanic pelagic fish species on the south and west coasts of Puerto Rico and the U.S. Virgin Islands.

3) Collect biological samples for bio-profiles task personnel from pelagic fish species that are harvested (near the aggregating

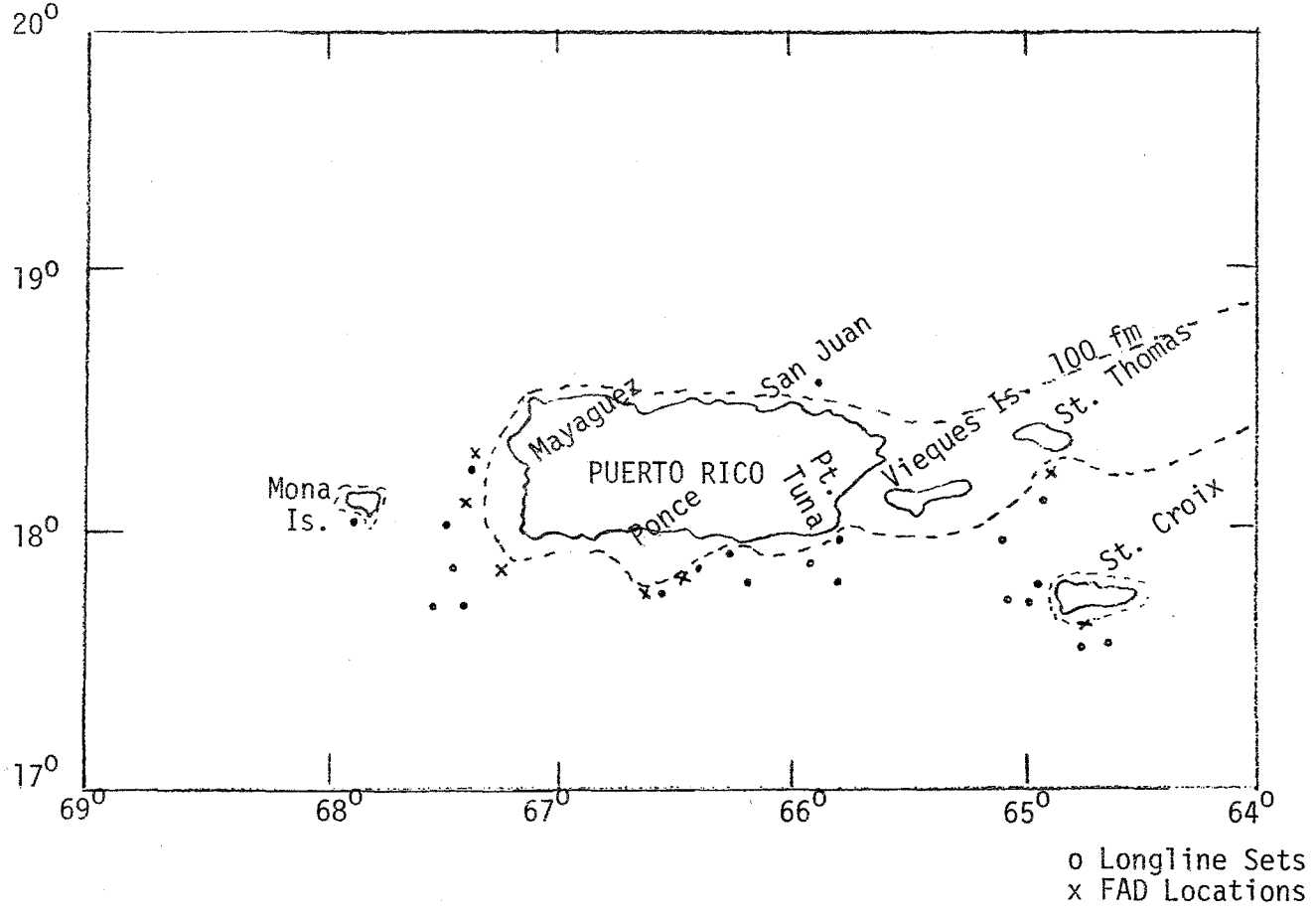

Figure 1. Cruise survey area, OREGON II Cruise 132.

structures) by sport fishing vessels and/or commercial fishing vessels.

4) Collect ichthyoplankton and neuston samples at longline station sites.

5) Collect Meteorological and physical data at each longline and fish attractant structure site.

6) Collect chlorophyll samples for the University of Puerto Rico.

7) Collect biological samples from tuna species to determine if histamine producing bacteria are present.

During the cruise planning, harvesting strategies and techniques were established to determine the availability of pelagic fish stocks in the cruise area. Pelagic longlining and fish attractant devices (FAD's) were considered as appropriate techniques for harvesting local fish species once deployed at locations where some measure of fishing success was available. A review of historical catch records, previous fishery surveys, seasonal weather conditions and interviews with local fishermen provided a general information base for directing the survey.

Survey activities included pelagic longline sets, fish attractant device deployments, bongo and neuston net tows, environmental data collections, and collecting chlorophyll samples.

On two different occasions vessels were encountered in distress. The first vessel was encountered near Great Inagna Island; the second was located off southwest Puerto Rico. Both vessels were towed to the nearest ports.

DESCRIPTION OF FISHING GEAR AND TACTICS

A pelagic longline was utilized to assess available oceanic fish species offshore (beyond the 100 fathom depth contour) and the stationery fish attractant devices (Figure 2) were deployed inshore (100 fathom depth contour) to determine their effectiveness for attracting coastal fish species.

Pelagic longline gear and fish attractant devices were fabricated by laboratory personnel before departing Pascagoula. The longline gear (Figure 3) consisted of 1200 fathoms of mainline, which when set out, provided over one mile of fish sampling coverage. Along the mainline, 120 hooks were spaced 60 feet apart. Gangion lengths were a standard 20 feet.

The longline configuration was designed to sample four different depths (50, 80, 120 and 150 feet) at each fishing site. Thirty gangions with hooks were attached (AK-SNAPS) to the mainline at each depth interval. Sections of line, without gangions, reflecting the depth interval were incorporated into the mainline to ensure reaching the proper fishing

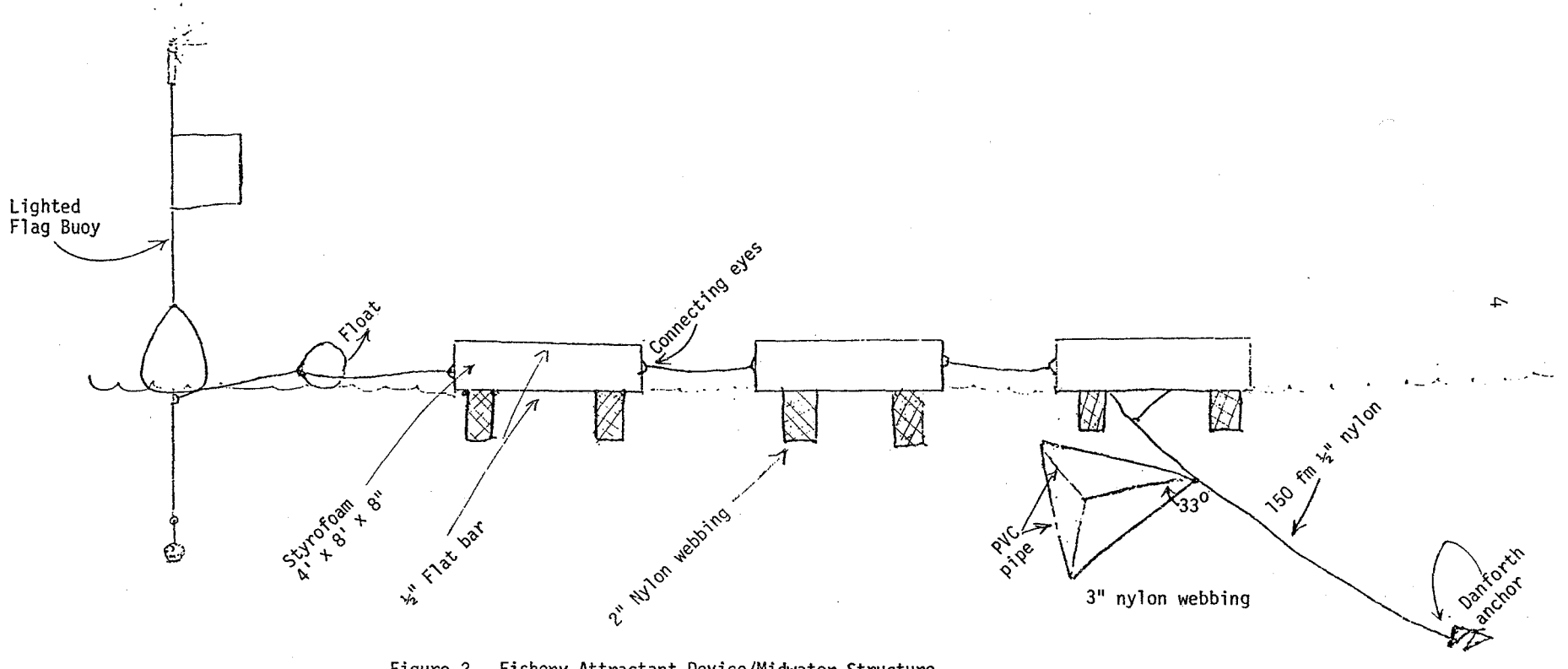

Figure 2. Fishery Attractant Device/Midwater Structure

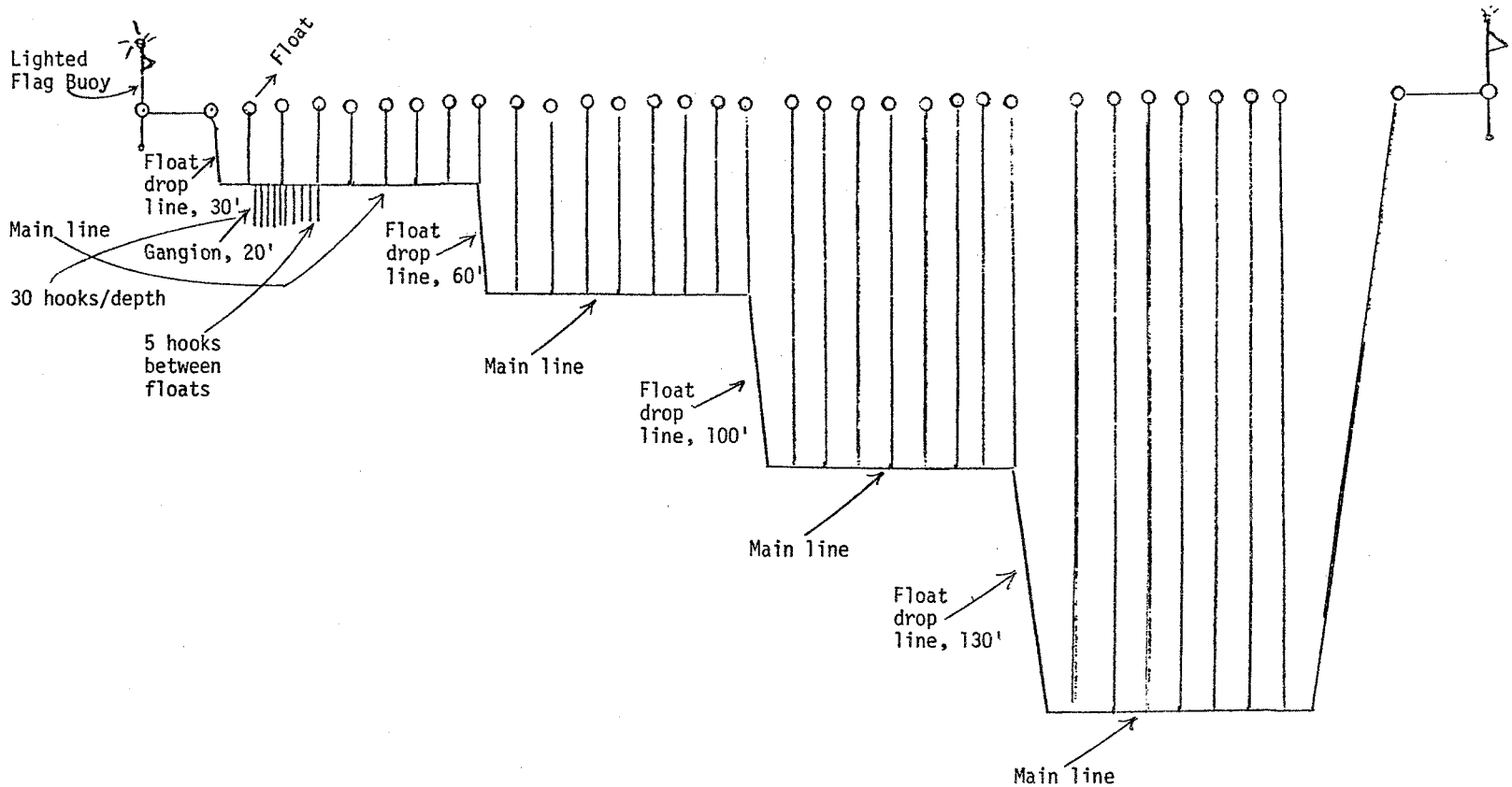

Figure 3. Diagram of pelagic longline, 1,200 fathoms of main line, 120 hooks.

depth. Two types of hooks (3½-0 shark and 8-0 Japanese tuna) were used alternately at all longline sites, except for the first and second sets, at which shark hooks were used exclusively.

Longline bait consisted of squid and northern mackerel. Tuna hooks were baited with squid while only mackerel was used on the shark hooks.

A majority of the longline sets were made during the evening hours, however, daytime sets were conducted for comparative purposes. Expendable bathythermograph probes were used to document water temperatures and for detection of significant temperature changes (thermocline) within the water column. Historical fishing reports indicated pelagic fish stocks tend to occupy depths just below the thermocline.

Tubs of longline gear (30 hooks per tub) were deployed from the stern of the OREGON II. The gear was retrieved by a power block located on the ship's bow. The longline remained overboard 10 to 12 hours and was retrieved either at daylight or sunset.

While retrieving the longline, catch data were recorded and documented on a standard longline station form according to depth of capture and type of bait. Also, each hook was observed for bait returned or lost. If a shark was captured, it was brought aboard for identification and biological sampling or tagged and released. Tag data were provided to the NMFS Narragansett Laboratory for shark distribution and migration studies. All pertinent data were recorded on the general laboratory station sheet and inlude not only the longline information, but such data parameters as date, time, location (latitude and longitude), fishing gear description, water temperatures, weather conditions, etc.

Fish attractant devices were deployed from the FRS/OREGON II at preselected sites in coastal areas of Puerto Rico and the U.S. Virgin Islands. FAD locations were identified in cooperation with Caribbean Fishery Management Council members, Sea Grant representatives, state agency members, and sport and commercial fishermen. Although FAD's were deployed and retrieved from the OREGON II, sampling of the devices was conducted by local vessels accompanied frequently by a NMFS representative who coordinated sampling from local ports.

Each of the fish attractant devices (Figure 2) was constructed from three sheets of styrofoam (4 ft. x 8 ft. x 8 in.) connected together and framed with one inch by 1/8 inch flat bar for additional strength, durability, connecting eyes, and buoy and anchor attachments. These devices were essentially of the fixed surface/floating type; however, two of the FAD's were modified to include a mid water structure suspended from the anchor line to approximately 40 fathoms below the surface. The midwater structure was made of one inch PVC pipe into a tripod shape (33° leg angles) and covered with three-inch nylon webbing (See Figure 2).

Sampling of the FAD's by small vessels occured on a daily basis by trolling artificial baits or dead natural baits. The only artificial bait used was feather dusters while natural baits included ballyhoo,

small cero mackerel and small lady fish.

A control area, at least 800 yards from the FAD site, was established to evaluate the effectiveness of each structure. Trolling time and catches were recorded in both control and FAD areas.

Bongo nets (0.505 and 0.333 mm) were towed at each longline fishing station, sampling the water column from the surface down to 200 meters. The sample from each net was identified and preserved for the Miami Laboratory. Surface neuston net (1 x 2 m frame, 0.947 mm) tows were also made in conjunction with longline stations for the Miami Laboratory.

Chlorophyll samples were collected during daylight hours while steaming between fishing areas. Measured volumes of water were pumped through filters which were frozen for later analysis. These samples will be used as ground truth evidence for comparison with satellite coastal zone scanner imagery.

Standard environmental data were recorded at all survey stations. Those data included temperatures (air, surface water, midwater at 650 feet), wind speed and direction, sea conditions, water color, barometric pressure, and current flow speed, and direction.

DISCUSSION AND RESULTS

No previous pelagic longline survey or FAD deployments had been made by NMFS on the Puerto Rican and U.S. Virgin Island Coasts. This survey was perhaps more of an exploratory fishing effort in which probable catch expectations, for the most part, were unknown. Fortunately, no formal cruise track design was demanded, providing the needed flexability required in surveying areas where minimal experience existed.

Twenty-one longline sets were made in the survey area (Figure 1). Catch results are shown in Table 1. Of significance was the capture of four swordfish (*Xiphias gladius*); one individual was taken southwest of Mona Island, another, west of St. Croix, and two offshore of Point Tuna, Puerto Rico. Large sharks (up to 11 feet in length) were taken during most longline sets. They caused considerable fouling, requiring two to three hours just to overhaul the entangled longline. On two occasions, the mainline was severed, thus requiring retrieval from the terminal longline buoy.

Tuna species are considered excellent candidates for capture by pelagic longline fishing gear, however, only one tuna was caught during the entire survey period. This was a yellowfin tuna (*Thunnus albacares*), weighing 80 pounds, and captured on the west coast of St. Croix. Biological samples were taken from three areas of the yellowfin for histamine analysis. Those samples included intestinal tract, gill surface, and skin surface. Samples were subjected to culture media for possible growth of histamine producing bacteria. Preliminary observations at sea indicated negative production. The samples were eventually refrigerated and transported to the University of Wisconsin Research Institute for further analysis. Other than sharks and the yellowfin tuna, the only fish species caught were one oilfish (*Ruvettus pretiosus*) and two Barracuda

Table 1.--Pelagic Longline Catch Summary.

OREGON II Station No.	Date	Position Lat. N.	Position Long. W.	Time Set	Bottom Depth (Fathoms)	Hook Depth (Ft)	Bait	Hook Type	Number Caught - Species/Weight in Pounds - Comments
38403	1/13/83	18° 02'	67° 31'	1900	520	80	mackerel	3½-0 shark	1-mako shark/800
						80	mackerel	3½-0 shark	1-tiger shark/400
38411	1/14/83	17° 58'	67° 58'	1600	700	150	mackerel	3½-0 shark	1-tiger shark/300
						150	mackerel	3½-0 shark	1-swordfish/118
38426	1/15/83	17° 56'	67° 27'	1600	727	50	mackerel	3½-0 shark	1-tiger shark/300
						120	mackerel	3½-0 shark	1-sand shark/150
						150	mackerel	3½-0 shark	1-white tip shark/78
38443	1/17/83	17° 48'	67° 32'	0800	1200				- no catch -
38445	1/17/83	17° 48'	67° 21'	1900	1500	80	squid	8-0 tuna	1-oilfish/1
						370	mackerel	3½-0 shark	1-mako shark/85
38463	1/18/83	18° 14'	67° 21'	1900	382				- lost gear -
38471	1/20/83	17° 47'	66° 30'	2000	520	50	mackerel	3½-0 shark	1-reef shark/150
						80	squid	8-0 tuna	1-barracuda/18
38481	1/21/83	17° 43'	66° 22'	2000	750				- no catch -
38482	1/22/83	17° 48'	66° 18'	0900	540				- no catch -
38484	1/22/83	17° 44'	66° 11'	2000	500	80	squid	8-0 tuna	1-barracuda/19
						80	mackerel	3½-0 shark	1-silky shark/188
38504	1/26/83	17° 36'	64° 38'	1700	675	150	mackerel	3½-0 shark	1-mako shark/250
38506	1/27/83	17° 38'	64° 48'	0900	400				- no catch -
38507	1/27/83	17° 42'	64° 56'	1800	490	120	mackerel	3½-0 shark	1-swordfish/72
						150	mackerel	3½-0 shark	1-tiger shark/200
38509	1/28/83	17° 43'	64° 57'	0900	330	370	squid	8-0 tuna	1-yellowfin tuna/80
38511	1/28/83	18° 05'	64° 59'	2000	1200				- no catch -
38519	1/29/83	17° 56'	65° 51'	1700	1000	120	mackerel	3½-0 shark	1-swordfish/210
						120	mackerel	3½-0 shark	1-tiger shark/350
38521	1/30/83	17° 48'	65° 49'	0900	180				- no catch -
38523	1/30/83	18° 02'	65° 11'	2300	1350				- no catch -
38525	1/31/83	17° 58'	65° 49'	1700	900	80	mackerel	3½-0 shark	1-swordfish/45
						80	mackerel	3½-0 shark	1-tiger shark/350
38534	2/1/83	17° 45'	65° 54'	1700	380	80	mackerel	3½-0 shark	1-reef shark/120
38543	2/3/83	18° 34'	65° 50'	1800	480	150	mackerel	3½-0 shark	2-tiger sharks/600
						150	mackerel	3½-0 shark	1-mako shark/125

(Sphyraena barracuda). At seven of the longline sites, there were no fish caught (See Table 1) and very few of the returned hooks were without bait. Four of these sets were made during the daytime.

An entire longline set was lost on January 19. The gear had been set-out the evening before and as usual, the OREGON II drifted with it all night as bridge personnel recorded drift speed and direction. At 0600 hours on January 19, the OREGON II departed the longline site, leaving the gear adrift, to embark representatives of the fishing industry, fishery organizations and the local press at Mayaquez, Puerto Rico. As scheduled, a demonstration of the pelagic longline operations was to occur with this group aboard, west of Mayaquez. The OREGON II arrived Mayaquez at 0800 hours and departed at 0900 hours with the representatives aboard. Upon returning to the longline gear site at 1115 hours, no gear was found. Immediately the OREGON II initiated a search pattern of the area, anticipating the drift direction which had been recorded early that morning, but without success. A request to the Coast Guard for assistance in locating the longline with helicopters was provided. However, their search from the air did not locate the longline. The longline was given up as lost and the OREGON II returned to Mayaguez to disembark the visiting group.

Another longline, composed of only 60 hooks was fabricated on the following day while steaming to the next set location. Four longline sets were made with the modified gear (60 hooks) on January 20, 21 and 22. A radio message received from an NMFS representative on January 22 revealed that the longline gear lost on January 19 had been found by two Puerto Rican fishermen. The message also revealed the gear would be delivered to Ponce, Puerto Rico on January 24. At that time, the longline gear was received and the remaining sets were conducted with normal gear configurations.

Scheduled longline sets off the southwest coast of Vieques Island were cancelled. Ongoing United States Navy operations in that area pre-empted any other at sea activities; however, alternate sites east of Vieques Island were selected and longline sets were made.

Abrupt changes in water temperature profiles (thermocline) were not detected from expendable bathythermograph casts at longline station areas. Temperatures varied from 79° F, at the surface to 70° F, at 650 feet below the surface. This gradual temperature change (approximately 1.3^{o} F/100 feet) suggested a remarkable mixing of oceanic waters within that depth range. On four occasions, where recorded temperatures dropped two or three degrees fahrenheit, at the 350 foot depth, float drop lines were prepared and attached to the main line for fishing effort (60 hooks) at 370 feet. The effort produced only one mako shark and one yellowfin tuna. Most likely, the yellowfin tuna was caught near the surface while retrieving the longline since a school of these fish were observed feeding on the surface nearby.

Fish attracting devices were deployed at seven locations along the south coasts of Puerto Rico and the U.S. Virgin Islands (See Figure 1). The devices were anchored along the 100 fathom contour in areas readily accessible to small fishing boats from local ports. Catch and effort

data associated with sampling these structures are shown in Table 2. The second and third FAD's were lost within 42 hours after deployments. Since these FAD's were to be utilized at other locations, a change in the configuration was necessary in order to meet the remaining scheduled deployments. This configuration consisted of only two sections of styrofoam with no midwater device suspended from the anchor line.

A tremendous amount of interest was generated throughout Puerto Rico and the U.S. Virgin Islands regarding the FAD deployments. Cooperating fishermen and local organizations provided their vessels and time to conduct test trolling with artificial and dead natural baits at FAD locations. Trolling effort (Table 3) was sporatic at most locations with most effort conducted at the FAD site west of Mayaquez, Puerto Rico. All trolling was conducted during the daylight hours.

Ichthyoplankton samples and neuston net samples were collected at 24 locations in the survey area. All samples were preserved and provided to the Miami Laboratory for sorting and identification.

A total of 93 chlorophyll samples were delivered to University of Puerto Rico scientists on February 5th, at San Juan. These samples were collected as time permitted while steaming between longline and FAD deployment locations.

Table 2.--Fish Attractant Device Catch Summary

OREGON II Station No.	Position Lat. N.	Position Long. W.	Dates Deployed	Catch Fad	Catch Control	Hours fished Fad	Hours fished Control	Summary/Remarks
38400	18° 14'	67° 24'	1/14 - 18/83	5	33	21½	26½	Four species of fish (2 cero mackerel 28 dolphin, 7 barracuda, 1 wahoo) 16 missed strikes. FAD in water 150 hrs off sponge bank-Mayaquez, P.R.
38401	18° 06'	67° 26'	1/14/83	0	1	0	1½	FAD lost less than 26 hrs after deployment on 1/13/83 off P.R.
38402	17° 52'	67° 07'	1/14/83	0	2	4½	4½	One wahoo, 1 barracuda. FAD lost less than 42 hrs after deployment on 1/13/83. 16 bottomfish (grouper & snapper) caught fishing on bottom within FAD area off La Parquera.
38470	17° 51'	66° 30'	1/22 - 23/83	7	3	12½	11½	Eight barracuda, 2 dolphin Two missed strikes FAD in water 97 hrs off Ponce, P.R.
38480	17° 50'	66° 25'	1/22/83	1	0	2	2	One strike in control FAD in water 75 hrs off Ponce, P.R. One barracuda
38491	18° 12'	64° 56'	1/27 - 31/83	3	4	16	15½	Four barracuda, 2 king mackerel, 1 blackfin tuna, 3 missed strikes FAD in water 194 hrs off St. Thomas.
38502	17° 38'	64° 50'	1/27 - 29/83	0	18	7	15	Yellowfin tuna and flying fish concentrated within 500 yds of FAD. 3 king mackerel, 11 barracuda, 3 dolphin, 1 wahoo, 6 missed strikes. FAD in water 142 hrs off St. Croix, U.S.V.I.
TOTAL			1/14 - 31/83	16	61	63½	76½	Two cero mackerel, 33 dolphin, 31 barracuda, 3 wahoo, 5 king mackerel, 1 blackfin tuna, 27 missed strikes. All FAD's in water approx. 740 hrs.

Table 3. Fishing effort around seven FAD locations on the Puerto Rican and U.S. Virgin Island coasts.

OREGON II FAD Stat. No.	No. Boat Trips	No. Fish Caught	Total Hours Fished	Hours FAD Deployed	Percent Hours Fished
38400	9	38	48	150	32.0
38401	1	1	1½	26	6.0
38402	1	2	9	42	22.0
38470	5	10	24	97	24.7
38480	2	1	4	75	5.3
38491	5	7	31½	194	16.2
38502	7	18	22	142	15.5
Total 7	30	77	141	726	19.4

Cruise Personnel

Shelby Drummond, Field Party Chief, Pascagoula, MS 1/6-2/11/83
Gladys Reese, Fishery Biologist, Pascagoula, MS 1/6-2/11/83
Wendy Taylor, Fishery Methods & Equip. Sp., Pascagoula, MS 1/6-2/11/83
Steve Candileri, Fishery Biologist, Tampa, FL 1/6-2/11/83
Tom Graupmann, Fishery Biologist, Pascagoula, MS 1/6-2/11/83
Julie Nordlee, Microbiologist, Madison, WI 1/6-2/11/83
Harold Brusher, Fishery Biologist, Panama City, FL 1/6-2/11/83
Robert Jenkins, Fishery Methods & Equip. Sp. Miami, FL 1/8-2/11/83
Tom Kisting, Computer Specialist, Miami FL 1/8-2/11/83
Dennis Lee, Fishery Biologist, Miami, FL 1/8-26/83
Luis Mendoza, Captain: R/V Crawford, Mayaquez, P.R. 1/12-23/83
Ivan Colon, Student: Univ. of P.R. San Juan, P.R. 1/12-25/83
Jim Dalmedia, Commercial Fisherman, St. Johns, V.I. 1/26-28/83
Richard Wood, Fishery Biologist, St. Johns, V.I. 1/26-28/83
Mary Lou Pressick, Fishery Biologist, Puerto Real, P.R. 1/25-2/2/83
Omar Munoz, Caribbean Fishery Management Council, San Juan, P.R. 1/19/83
Sam Espinosa, Caribbean Fishery Management Council, St. Croix, V.I. 1/19/83
Nicolas Camorano, CODREMAR, Mayaquez, P.R. 1/19/83
Oliver Serramo, CEER, Mayaquez, P.R. 1/19/83
Jose Lopez, CEER, Mayaquez, P.R. 1/19/83
Maximo Cerame, Sea Grant, Mayaquez, P.R., 1/19/83
Rita Cerame, Sea Grant, Mayaquez, P.R. 1/19/83
Tomas Muniz, Owner, TV/7, San Juan, P.R. 1/19/83
Maria Salon, TV/7, San Juan, P.R. 1/19/83
Raquel Puiz, TV/7, San Juan, P.R., 1/19/83
Alex Santiago, TV/7, San Juan, P.R., 1/19/83
David Enriques, TV/7, San Juan, P.R. 1/19/83
Auguestino Ramos, TV/7, San Juan, P.R. 1/19/83

Submitted by:

Shelby Drummond
Field Party Chief

Approved by:

Andrew J. Kemmerer
Director, Mississippi Laboratories

Richard J. Berry
Center Director