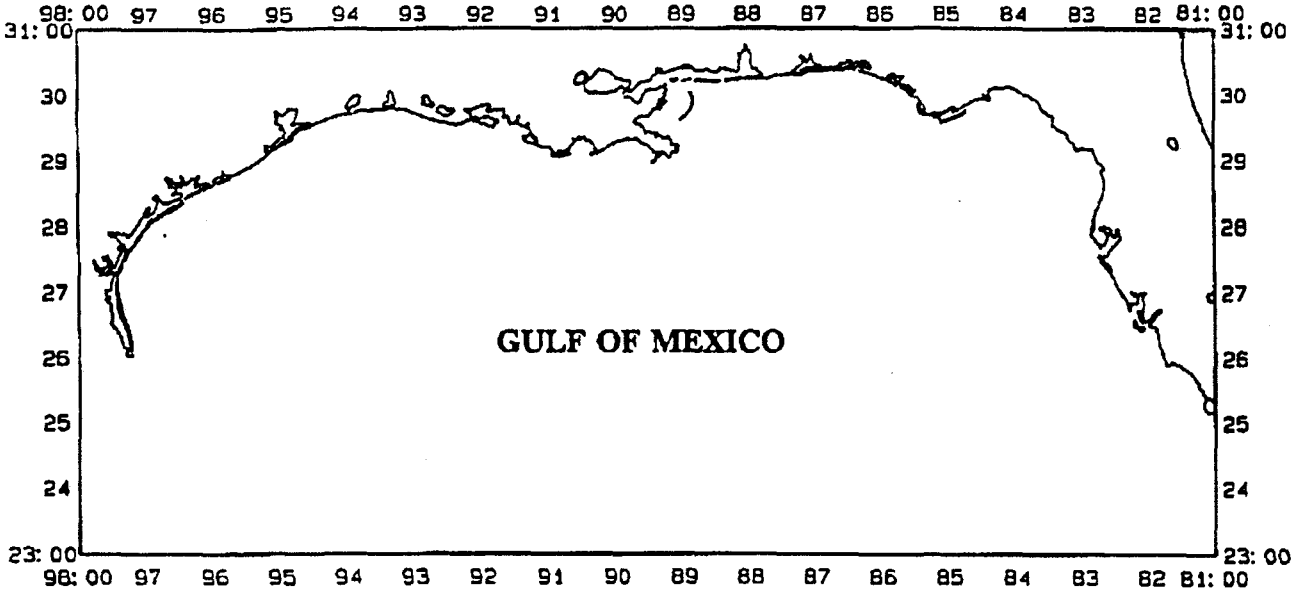
CRUISE RESULTS

Small Pelagics Survey

NOAA Ship *Chapman* Cruise 92-06 (51)

10/08 - 11/20/92



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
Mississippi Laboratories
Pascagoula Facility
P.O. Drawer 1207
Pascagoula, MS 39568-1207

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INTRODUCTION

The NOAA Ship CHAPMAN departed Pascagoula, Mississippi on October, 8 1992 to conduct a hydroacoustic-trawl survey for coastal herrings and associated species in the northeastern Gulf of Mexico, and to conduct a plankton survey around the Mississippi River Plume. The survey area extended from 94° 00′ W longitude to 86° 00′ W longitude and covered a depth range of 20 to 150 fathoms. Personnel from the National Marine Fisheries Service participated. The cruise was divided into 3 legs with a total of 37 sea days. The small pelagics survey was conducted during the first and third Legs and the plankton work was conducted during the second Leg.

OBJECTIVES

1. Determine the distribution and abundance of coastal herrings using trawls and a hydroacoustic system.

2. Collect length frequency data and biological samples of coastal herrings.

3. Collect environmental data at all trawl locations.

4. Estimate the average Target Strength of targets using the dual beam mode of the echo signal processor.

5. Determine diel differences in acoustic targets.

6. Collect coastal herring specimens.

7. Rendezvous with the R/V Longhorn off Southwest Pass of the Mississippi River, conducting physical oceanography studies supporting NOAA NECOP.

8. Obtain samples of larval fish, zooplankton and hydrographic data from the same water mass and plankton assemblages through time. These samples will allow a cohort specific approach to studying larval fish diet, feeding, growth, and mortality. The samples should also provide estimates of larval retention time. Specific

objectives were:

a. To collect a time-series of larval fish and zooplankton;

b. Collect chlorophyll samples and environmental data around radio tracked surface drifters deployed by the R/V Longhorn.

METHODS

Gear - Acoustic data were collected with a Fisheries Acoustic System (FAS), which included a scientific echo sounder, two dual-beam transducers (38 kHz, 120 kHz) mounted in a V-fin towed body, tow and deck cable, two chart recorders, two tape interfaces, two Digital Audio Tape decks (DATs) and an Echo Signal Processor(ESP). The survey was conducted using only the 38 kHz frequency, with the transmit power set at 0 decibels (dB) at a ping rate of 1 per second. The receiver gain was set at 0 dB.

Two trawls were used during the survey. All bottom trawls were conducted with a Shuman bottom trawl (123-ft headrope), and fished with 4-m^2 Super-V doors. The Shuman trawl mesh size ranged from 31.5 inches at the fishing circle to 1.25 inches at the cod end. The trawl was also fitted with a funnel constructed of webbing and attached at intermediate net. The funnel tapered into the tailpiece of the trawl. The Shuman trawl was rigged with a 9-ft by 3-ft center headrope kite and eight 11-inch floats attached to each wing. Ground gear was constructed of 3.5-inch rubber disks hung on 12-inch drops.

The second net was a Shuman 68 x 354-cm semipelagic trawl that measured 137 ft on the headrope and footrope and had a 790-ft circumference at the fishing circle. Mesh size reduced from 12-ft at the fishing circle to 5-ft ahead of the cod end. A 0.25-inch liner was attached inside the cod end. The trawl was fished with the 4-m^2 Super-V doors and rigged with 240-ft split bridles and 40-ft backstraps. A 97-ft^2 flexible four-panel kite attached to the headrope and four 160-lb tom weights attached at each end of the footrope provided vertical opening force.

Sample design - A hydroacoustic and trawl survey was conducted for coastal herrings in the area from 86° 00′ W longitude to 94° 00′ W longitude, and between the 20 fathom and 150 fathom isobaths. Acoustic transects followed lines of longitude, and were selected systematically using a random start and an interval of 30 minutes of longitude. Transects were surveyed once during daylight and once at night using the FAS. Echo Integration and dual-beam processing were performed in real time. Raw echos were also recorded on Digital Audio Tape.

Bottom trawl stations were sampled during daylight and at

night, and were located at random points on each acoustic transect. Each bottom trawl was 30-min in duration. Midwater trawl sites were chosen purposefully to fish on acoustic targets at night, and were 15-min in duration. On several occasions, the Shuman bottom trawl was fished in midwater at night because the water depth was too shallow for the Shuman semipelagic trawl.

For Echo Integration, the squared voltages from target echos were summed over a 5-min report period for various depth strata. Dual-beam processing was performed along with echo integration to estimate target strengths of single targets.

A sample unit was defined as the relative density measured for the 5 minute report period in a stratum. Relative density for each 5-minute report in the i-th stratum was estimated as:

$$RD_i = \{ \Sigma_i V^2_i M_i \} / \{ (PP_i N_i) - MS_i \}$$

where RD is relative density in mean square Volts, V is volts, M is a multiplier to correct for a non-ideal TVG, PP is the number of processed pings during the time between reports, N is the number of digital samples per ping in the range covered by the i-th stratum, and MS is the number of missing samples during the time between reports.

Acoustic calibration of the FAS with a standard target was performed in a large tank (12 m deep) located at the Stennis Space Center, Bay St Louis, Mississippi, both before and after the survey.

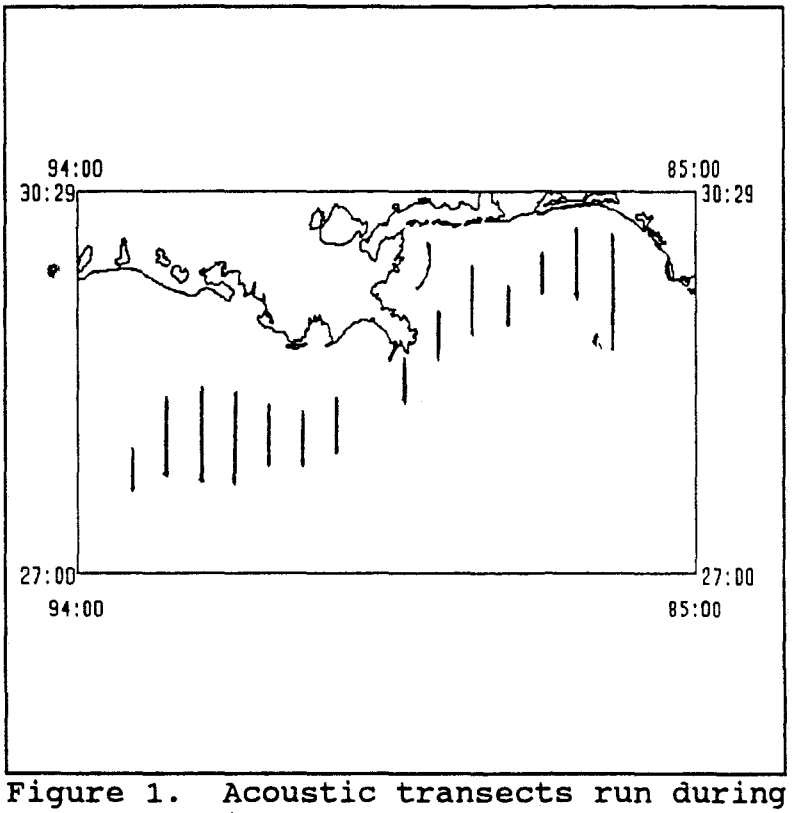

Figure 1. Acoustic transects run during CHAPMAN cruise 92-06(51).

Temperature profiles were taken at each trawl location using either a CTD or a STD. Nisskin bottle casts were also conducted to collect mid and bottom water samples for measurement of dissolved oxygen. Samples of water were collected from a surface bucket and from the Nisskin bottles at least once each day to measure salinity

with an autosal back at the laboratory. Surface chlorophyll samples were also taken. For midwater trawls conducted at different depths but at the same location, only one temperature profile and bottle cast was conducted.

RESULTS

A total of 14 acoustic transects were completed during the survey (Figure 1). Transects 11 (91°47′ W longitude) and 14 (93°17′ W longitude) were run only during daylight. Transects covered a total linear distance of 900 nautical miles, 490 nautical miles at during daylight and 410 nautical miles at night. The northern halves of transects 10, 12 and 13 were run more than once during daylight. The repeated runs were made since severe weather prevented trawling operations during initial runs. Both echo integration and dual-beam processing were performed in real time. A total of 6 working days were lost during the cruise due to weather.

Temperature profiles were made at 50 locations using either a CTD or STD. The CTD was used during the first Leg and the STD during the third Leg. The STD also measured DO. No DO's were measured during the first Leg because of defective oxygen meters. Nisskin bottle casts were made at 20 locations, and 48 surface chlorophyll samples were taken.

A total of 63 trawl stations were completed, 39 bottom trawls and 24 midwater trawls (Table 1). One trawl tow was aborted due to a problem with the Power-Take-Off clutch, and the codend was not tied during another tow. Data from these two trawls were not used to estimate mean catches.

The catch rates (kg/h for bottom trawls and for midwater trawls), mean lengths (weighted by numbers per tow) and length distributions of the most abundant species captured are given in Tables 2 and 3). Rough scad (Trachurus lathami), gulf butterfish (Peprilus burti), round herring (Etrumeus teres) and longspine porgy (Stenotomus caprinus), Atlantic cutlassfish (Trichiurus lepturus), and harvestfish (Peprilus alepidotus) dominated the catches.

During the plankton leg, the NOAA Ship Chapman rendezvoused with the R/V Longhorn as planned. The R/V Longhorn deployed a patch of surface drifting radio tracked oceanographic buoys. A patch consisted of three to six buoys. The NOAA Ship Chapman began repeat sampling nearby the drifting buoys using LORAN locations provided by the R/V Longhorn. The frequency of sampling was determined by the time required to collect a series of samples at a buoy, the rate of buoy drift and the length of time the buoys were deployed.

Larval fish were collected obliquely, maximum depth to mid

depth and from mid depth to surface using a standard 1 x 1m Tucker trawl outfitted with three 0.335mm mesh nets. Surface ichthyoplankton collections were taken with a 1 x 2m neuston frame outfitted with a 0.947mm mesh net. Surface water samples for chlorophyll determinations were taken. STD environmental profiles and Niskin bottle sub-surface water samples were taken until the STD stopped working properly. Tucker trawl and neuston tow samples were preserved in accordance with standard SEAMAP protocol, i.e., 10% formalin for 48 hrs. then 95% ETOH for final preservation.

A total of fifteen stations around the drifting buoys were occupied. The data collected with environmental and larval fish gear, is presented in the following table.

Table 1. Summary of NECOP Ichthyoplankton effort.

SAMPLE TYPE	NUMBER
Chlorophylls	15
STD Profiles	4
Reference Salinity Surface	4
Tucker Trawls	15
Neuston Tows	15

Samples from the Tucker trawls and neuston tows were deposited with NMFS Panama City, Fla. for sorting, identification and analysis. Chlorophyll and reference salinity samples were deposited with NMFS Mississippi Laboratories Pascagoula, MS for analysis. Profile data from the STD casts were returned to NMFS Mississippi for processing.

10. CRUISE PARTICIPANTS (NOAA only):

LEG 1 (10/08/92 - 10/23/92):

Chris Gledhill	Field Party Chief	NMFS, Pascagoula, MS
Mark Grace	Fishery Biologist	NMFS, Pascagoula, MS
Cliff Harper	Electronics Tech.	NMFS, Stennis
Lisa Mills	Fishery Biologist	NMFS, Pascagoula, MS
J. Jeff Govoni	Fishery Biologist	NMFS, Beaufort, NC

LEG 2 (10/26/92 - 10/30/92):

Alonzo Hamilton,Jr.	Field Party Chief	NMFS, Pascagoula, MS
Churchill Grimes	Chief Scientist	NMFS, Panama City
Douglas DeVries	Fishery Biologist	NMFS, Panama City
Andrew David	Fishery Biologist	NMFS, Panama City
Robert Almand	Fishery Biologist	NMFS, Panama City
Kathy L. Tew	Coop Student	NMFS, Panama City

LEG 3 (11/05/92 - 11/20/92):

Chris Gledhill	Field Party Chief	NMFS, Pascagoula, MS
Jim Harris	Biological Tech.	NMFS, Pascagoula, MS
Ken Wilkerson	Electronics Tech.	NMFS, Stennis
Charles Roithmayr	Fishery Biologist	NMFS, Pascagoula, MS

SUBMITTED BY:

Christopher Gledhill
Field Party Chief

APPROVED BY:

Scott Nichols, Director
Mississippi Laboratories

Brad Brown
Director SEFC

DATE: 4/5/93

Table 1. Trawl stations and dominant species captured during CHAPMAN Cruise 90-08. (BT=bottom trawl, 30-min tow; MT=midwater trawl, 15-min tow).

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
01	BT	29° 34.30′	86° 17.12′	119	0	-	[1/]
02	BT	29° 34.42′	86° 16.87′	119	818	Gulf butterfish	0.35
						Round herring	0.24
03	MT	29° 46.05′	86° 16.98′	80	16	Round herring	0.98
04	BT	29° 21.94′	86° 17.36′	210	50	Longfin squid	0.53
05	MT	29° 22.55′	86° 16.28′	198	0	-	
06	BT	29° 9.39′	86° 16.69′	300	1	Shortfin squid	0.99
07	MT	29° 11.30′	86° 16.19′	179	1	Gulf butterfish	0.33
						Round herring	0.49
08	BT	29° 42.27′	86° 47.17′	187	147	Longfin squid	0.25
						Gulf butterfish	0.79
09	BT	29° 36.99′	86° 46.49′	227	53	Jellyfish	0.53
						Angleshark	0.19
10	MT	29° 43.20′	86° 49.20′	188	13	Round herring	0.91
11	BT	30° 1.17′	86° 47.41′	110	0	-	[2/]

[1/] Trawl tow aborted due to problem with power-take-off clutch.
[2/] Trawl codend untied.

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
12	BT	30° 0.45′	86° 46.86′	112	515	Gulf butterfish	0.38
						Longspine porgy	0.27
						Rough scad	0.11
13	BT	29° 51.55′	86° 47.32′	150	370	Gulf butterfish	0.67
						Rough scad	0.13
14	MT	29° 58.92′	86° 47.05′	49	12	Longfin squid	0.15
						Round herring	0.63
15	MT	30° 3.00′	86° 45.60′	95	24	Gulf butterfish	0.73
						Rough scad	0.11
16	BT	29° 43.60′	87° 17.56′	151	975	Longspine porgy	0.15
						Round herring	0.66
17	BT	29° 40.34′	87° 17.60′	181	80	Gulf butterfish	0.20
						Rough scad	0.51
18	MT	29° 35.40′	87° 17.40′	197	10	Rough scad	0.23
						Round herring	0.63
19	MT	29° 44.40′	87° 17.80′	142	15	Gulf butterfish	0.14
						Shortfin searobin	0.19
						Largescale lizardfish	0.31
						Codlet	0.17
						Round herring	0.12
20	BT	29° 30.60′	87° 48.60′	51	23	Jellyfish	0.63
						King mackerel	0.35

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
21	BT	29° 20.97′	87° 49.94′	93	22	Bigeye scad	0.74
22	MT	29° 20.00′	87° 45.80′	110	275	Rough scad	0.20
						Chub mackerel	0.65
23	BT	29° 16.67′	88° 17.24′	88	1111	Gulf butterfish	0.42
						Longspine porgy	0.12
						Atlantic cutlassfish	0.15
24	BT	29° 14.99′	88° 17.38′	91	38	Longspine porgy	0.32
						Inshore lizardfish	0.19
						Rough scad	0.13
25	MT	29° 13.58′	88° 17.50′	106	247	Thresher shark	0.91
26	BT	29° 43.70′	88° 16.90′	38	370	Longspine porgy	0.55
						Bluefish	0.15
27	BT	29° 32.53′	88° 17.00′	38	1227	Longspine porgy	0.93
28	MT	29° 33.35′	88° 16.98′	42	5	Jellyfish	0.17
						Scaled sardine	0.37
29	MT	29° 36.20′	88° 17.00′	40	13	Jellyfish	0.76
						Round herring	0.07

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
30	BT	29° 6.09′	88° 46.69′	90	145	Gulf butterfish	0.16
						Longspine porgy	0.11
						Atl. sharpnose shark	0.19
31	BT	29° 17.21′	88° 47.86′	60	175	Atlantic croaker	0.11
						Atlantic cutlassfish	0.54
						Silver seatrout	0.10
32	MT	29° 17.37′	88° 47.54′	59	186	Atlantic cutlassfish	0.15
						Atl. sharpnose shark	0.84
33	MT	29° 18.80′	88° 47.60′	55	40	Atl. sharpnose shark	0.68
						Spinner shark	0.32
34	BT	28° 43.60′	89° 17.04′	143	150	Luminous hake	0.46
						Atlantic cutlassfish	0.46
35	BT	28° 54.34′	89° 17.08′	60	635	Atlantic cutlassfish	0.66
						Atl. sharpnose shark	0.19
36	MT	28° 50.41′	89° 19.10′	77	84	Atlantic cutlassfish	0.39
						Atl. sharpnose shark	0.46
						King mackerel	0.11
37	BT	28° 8.4′	90° 17.90′	188	36	Longfin squid	0.45
						Jellyfish	0.12
						Wenchmen snapper	0.12
						Atlantic cutlassfish	0.15

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
38	BT	28° 11.92′	90° 17.33′	121	1051	Rough scad	0.84
39	MT	28° 10.51′	90° 15.41′	135	17	Gulf butterfish	0.90
40	BT	28° 3.43′	90° 45.09′	154	1347	Rough scad	0.89
41	BT	28° 14.09′	90° 48.55′	73	164	Gulf butterfish	0.13
						Longspine porgy	0.20
						Atlantic cutlassfish	0.22
						Bull shark	0.17
42	MT	28° 11.88′	90° 44.68′	88	28	Gulf butterfish	0.31
						Atlantic cutlassfish	0.51
43	MT	28° 12.50′	90° 40.90′	82	11	Atlantic cutlassfish	0.44
						Atl. sharpnose shark	0.15
44	BT	28° 16.62′	91° 17.35′	73	126	Atlantic cutlassfish	0.52
						Harvestfish	0.32
45	BT	28° 15.48′	91° 17.26′	77	127	Longspine porgy	0.19
						Atlantic cutlassfish	0.35
						Harvestfish	0.13
46	MT	28° 19.60′	91° 16.20′	66	25	Gulf butterfish	0.31
						Little tunny	0.31
						Atl. sharpnose shark	0.13

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
47	BT	28° 3.94′	91° 48.20′	100	231	Gulf butterfish	0.38
						Longspine porgy	0.14
						Atlantic cutlassfish	0.14
48	BT	27° 52.91′	91° 47.22′	208	23	Longfin squid	0.36
						Wenchman snapper	0.13
49	BT	28° 20.60′	91° 47.70′	64	241	Gulf butterfish	0.39
						Bull shark	0.24
50	BT	28° 25.57′	91° 48.02′	53	383	Gulf butterfish	0.27
						Atlantic cutlassfish	0.20
						Harvestfish	0.24
51	BT	28° 20.56′	92° 17.26′	58	221	Gulf butterfish	0.43
						Atlantic cutlassfish	0.11
						Harvestfish	0.21
						Scalloped hammerhead	0.15
52	BT	28° 30.89′	92° 17.84′	51	81	Gulf butterfish	0.18
						Longspine porgy	0.15
						Pinfish	0.15
						Atl. thread herring	0.15
						Cobia	0.14
53	MT	28° 29.25′	92° 16.22′	53	29	Gulf butterfish	0.14
						Atl. thread herring	0.74

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
54	MT	28° 36.68′	92° 14.87′	42	22	Gulf butterfish	0.23
						Rough scad	0.24
						Atl. thread herring	0.27
55	BT	27° 55.97′	92° 17.39′	208	1191	Rough scad	0.51
						Chub mackerel	0.36
56	BT	28° 4.69′	92° 18.10′	97	160	Gulf butterfish	0.13
						Longspine porgy	0.16
						Rough scad	0.32
						Atlantic cutlassfish	0.16
57	MT	28° 2.29′	92° 15.95′	111	12	Rough scad	0.39
						Atlantic cutlassfish	0.14
						Chub mackerel	0.38
58	BT	27° 59.67′	92° 47.73′	113	410	Gulf butterfish	0.58
						Inshore lizardfish	0.14
59	BT	27° 56.39′	92° 47.61′	161	6	Wenchman snapper	0.39
						Lampfish	0.21
60	MT	27° 58.80′	92° 45.35′	123	3	Gulf butterfish	0.79
						Round herring	0.13
61	BT	28° 25.29′	92° 48.35′	53	40	Gulf butterfish	0.10
						Atlantic cutlassfish	0.13
						Pinfish	0.10
						Scalloped hammerhead	0.60

Table 1. Continued.

STA	GEAR	LATITUDE	LONGITUDE	DEPTH (m)	TOTAL CATCH (kg)	DOMINANT SPECIES	PROPORTION OF TOTAL
62	BT	28° 14.15′	92° 47.15	64	167	Red goatfish	0.10
						Longspine porgy	0.46
						Dwarf goatfish	0.20
63	MT	28° 14.80′	92° 48.07	62	4	Rough scad	0.19
						Round herring	0.61
64	BT	27° 58.08′	93° 17.94	111	435	Gulf butterfish	0.70
						Wenchman snapper	0.10
65	BT	27° 50.27′	93° 18.31	146	80	Wenchman snapper	0.44
						Rough scad	0.14
						Round herring	0.27

Table 2. Mean catch (kg/h) from bottom and midwater trawl tow made during CHAPMAN cruise 92-06(51).

SPECIES	BOTTOM TRAWL (n=39)		MIDWATER TRAWL (n=24)	
	MEAN kg/h	SE	MEAN kg/h	SE
Gulf butterfish	124.712	34.37	16.47	5.23
Rough scad	167.83	80.20	13.37	8.72
Atlantic cutlassfish	58.72	23.21	14.37	7.21
Longspine porgy	113.08	59.55	0.08	0.05
Chub mackerel	29.35	22.37	31.23	29.73
Round herring	45.77	34.37	8.54	3.39
Harvestfish	11.52	5.65	0.13	0.10
Longfin squid	16.49	4.75	24.60	0.68

Table 3. Mean weighted length (mm) of fish captured during CHAPMAN cruise 92-06(51). (cuttlassfish: snout to anus length; squid: mantel length; Others: fork length).

SPECIES	BOTTOM TRAWL			MIDWATER TRAWL		
	n	MEAN	SE	n	MEAN	SE
Gulf butterfish	897	141.85	20.61	474	145.56	7.07
Rough scad	873	200.03	46.10	439	126.74	24.70
Atlantic cutlassfish	742	174.19	88.67	240	183.88	70.06
Longspine porgy	985	102.10	29.64	18	93.44	3.20
Chub mackerel	81	244.84	80.14	125	233.36	29.01
Round herring	245	132.62	67.78	425	133.32	13.80
Harvestfish	212	147.61	16.76	7	162.84	4.74
Longfin squid	576	109.35	25.58	84	36.12	25.21