Job Report

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Project Name: Analysis of Populations of Sports and Commercial Fin-Fish and of the Factors Which Affect These Populations in the Coastal Bays of Texas.

Period Covered: January 1, 1964 to December 31, 1964 Job No. 11

Survey of the Fishes Found in the Inshore Gulf of Mexico and of Post-Larval Fishes in Aransas, Port Mansfield, and Port Isabel Ship Channels

Abstract: Most abundant scrap fish caught in the standard shrimp trawl in the Gulf were the croaker, Micropogon undulatus; the two sand trout, Cynoscion nothus and arenarius; and the hard-head catfish, Galeichthys felis. The first three, along with the larger of other species less abundant, would be suitable for some form of scrap fish utilization.

In both the Gulf off Port Aransas and that off the Port Mansfield/Port Isabel area, October was the month of greatest abundance of scrap fish.

The most abundant species in the post-larval channel samples were menhaden, Brevoortia patronus; croaker, Micropogon undulatus; and redfish, Sciaenops ocellatus.

Greatest numbers of post-larval fish were entering the passes in March and in December.

Gulf salinity and temperature remained very constant and similar to that of previous years; channel salinity varied little, but temperature ranged from a low in February of 11.4 degrees C. to a high in August of 30.6 degrees C. to a later low in December of 11.5 degrees C. on the 30th.

Objectives: To determine the fishes present in the inshore Gulf of Mexico and their relative abundance, distribution, and size. To determine the seasonal types, abundance, and size of post-larval fin-fishes present in the Port Aransas, Port Mansfield, and Port Isabel ship channels. To record and evaluate hydrographic factors at time of sampling.

Procedure: Regular stations were set up for weekly samples in the inshore Gulf off Port Aransas, Texas, in depths of 2 to 15 fathoms; in the inshore Gulf off Port Mansfield and Port Isabel, Texas, for monthly samples in 2 to 20 fathoms; and in the inshore Gulf off Galveston for samples under 10 fathoms in January.

Daytime sampling was accomplished from the 38-foot shrimp boat Goby using a standard 42-foot flat otter trawl of 2-inch stretch mesh spread by 6-foot doors. Duration of each trawl sample was 30 minutes.

Weekly sampling stations were established in the Aransas Ship Channel and monthly ones in both Port Mansfield and Port Isabel Ship Channels using two collecting devices.

A one-meter diameter hoop net of millimeter square mesh netting with an effective sample opening of .6640 square meters with a flow meter mounted in the center of the opening was used to sample the near-bottom, mid-depth, and surface levels of the channels, for two minutes at each level. The flow meter, previously calibrated, was figured on a volume of .09 cubic meters strained per revolution. An average 6-minute sample of 328.70 cubic meters of water strained was derived from 54 samples.

A beam trawl with a sample opening of .2038 square meters and a bag of millimeter square mesh netting protected by canvas was used for 6-minute bottom channel samples. The beam trawl was pulled in conjunction with the hoop net and, since this device had no flow meter attached, the revolution figure gained in the hoop sample was arbitrarily also given to the beam trawl sample. An average 6-minute sample of 99.77 cubic meters of water strained was derived from 45 samples.

Detailed information sheets were kept on all organisms. Hydrographic data at time of sampling were obtained with a Kemmerer water bottle. Water temperature was taken on board with a centigrade thermometer calibrated in tenths of degrees; salinity was determined in the laboratory with hydrometers.

Findings and Discussion:

Adult Scrap Fish -- Inshore Gulf

For reporting purposes, the sampling was set up in such a manner as to attempt to reflect the ecology of certain depth zones; 0-5, 6-10, and 11-15 or 11-20. In the northern zone off Port Aransas, the sampled area from 11 to 15 fathoms in depth was noticeably most productive. South off Port Mansfield/Port Isabel, the 0-5 fathom zone and the 11-20 fathom zones were about equal and each was more productive than the 6-10 fathom area.

Croaker, Micropogon undulatus, and the two sand trout, Cynoscion nothus and C. arenarius, were the most abundant fish taken in the northern area, followed by the Gulf whiff, Syacium gunteri. Hardhead catfish, Galeichthys felis, were very abundant in December south; less so off Port Aransas.

Those fish only caught in the southern area were the sand drum, Umbrina coroides, and the Spanish sardine, Sardinella anchovia. Since this occurred in previous samples as well, it is a fair indication of north-south zonation. Other species may have been caught only in one area or the other; however, the numbers are too small for accurate analysis.

Table 1 shows the species caught off Port Aransas, broken into three parts by depth. The year's catch for 0-15 fathoms was comprised of 78 species for a poundage of 2,546 pounds, estimated, in 42 trawl samples. The sampled depth zone of 11-15 fathoms was the most productive, producing 7,071 organisms or an average of 442 per trawl for the year, as compared to 147 per trawl for the 0-5 fathom depth and 269 per trawl for the 6-10 fathom zone.

Table 2 shows the species caught south off Port Mansfield/Port Isabel. The year's catch for 0-20 fathoms was comprised of 84 species with an estimated weight of 1,293 pounds in 31 trawl samples. The 0-5 fathom depth zone produced 3,230 organisms, or 323 per trawl for the year; the 11-20 fathom zone produced 306 organisms per trawl; and the 6-10 fathom area was low with 174 per trawl. Within this table are also noted the fishes caught in seven trawls off Galveston/Freeport area in January

None of the fishes caught, with the exception of the sharks and rays, could be considered large. Most measured from 50 to 300 millimeters in length.

The temperature and salinity data are given in Table 3.

Post-Larval Fish -- Port Aransas, Port Mansfield, and Port Isabel Ship Channels

In those 71 samples for the year which produced fish, 36 species, including Amphioxus, were taken, plus some unidentified specimens. Table 4 gives a breakdown of the fish caught by date, numbers, size, location, and net type.

The dates of entry of some of the more common and abundant species can be stated roughly. Menhaden entered throughout the year with a definite peak in March and a less definite one in November. Pinfish were most abundant in February, but were caught throughout the year. A few pigfish were taken in May and June.

Drum were in the samples in June. Redfish were caught from September through December, and croaker from November through December. In June, post-larvae of one of the mackerals were taken.

In Table 5, the total numbers of fish per 100 cubic meters of water sampled is given by sample dates. This information is graphed in Figure 1 by month, and in Figure 2 by individual samples. February, March, and April, July, and December were apparently months of immigration peaks for post-larvae. The greatest number for one sample occurred in March, being due to a large abundance of menhaden at this time.

Temperature and salinity data are given in Table 5. In February, bottom temperature was at its lowest, 11.4°C. Six specimens were caught; however, compared with larger catches at higher temperatures, some indication exists that temperature may have an affect on the entrance of these post-larvae. Such temperature-catch correlation needs much more work and is only barely indicated in these samples.

General: For the Gulf, this report finishes the third full year's work and should form a fair basis for future work in this area, as a background ecological study.

In the coming year, emphasis is planned on the use of gill nets, mid-water trawls, and roller nets to sample those fish not obtainable with the standard otter trawl. Of particular interest should be the rough bottom and reefs of the southern area.

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Table 1 - Scrap Fish Catch

Gulf off Port Aransas: 0-5 Fathom Samples - Number of Specimens Per Month

Number of Trawl Samples:	3	1	0	0	2	1	1	2	2	0
ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Rhinobatus lentiginosus								1		
Narcine brasiliensis					2				2	
Raja texana					1				3	
Dasyatis americana									1	
D. sabina	4	1							3	
Brevoortia patronus	3	3			1		2		1	
Harengula pensacolae	1					1				
Anchoa hepsetus	12	16				6			11	
A. mitchilli	212							1		
Synodus foetens					4			2	6	
Bagre marinus					1				6	
Galeichthys felis	21	3			2			3	31	
Hippocampus obtusus							1	1		
Centropristes philadelphicus					1				5	
Chloroscombrus chrysurus						2			18	
Hemicaranx amblyrhynchus									1	
Vomer setapinnis		1						12	16	
Orthopristis chrysopterus	4	2						1		
Cynoscion arenarius								101	150	
C. nothus	60				13		2	3	280	
C. nebulosus	5									
Larimus fasciatus		20						2		
Leiostomus xanthurus	25								21	
Menticirrhus americanus		6							6	
M. littoralis	22	3			6		1	30	20	
Micropogon undulatus									161	
Stellifer lanceolatus	52								40	
Lagodon rhomboides	8	30							2	
Chaetodipterus faber					1					

Table 1 - (Continued)

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Trichiurus lepturus	34	24			2				3	
Prionotus rubio									1	
P. tribulus	2	4				1				
P. martis					1	1				
Astroscopus y-graecum		1			1					
Kathetostoma albigutta	2									
Peprilus alepidotus	4				1				5	
Poronotus triacanthus		17			6				27	
Ancylopsetta quadrocellata						2		7	11	
Citharichthys macrops									2	
Etropus crossotus		7						2		
Paralichthys lethostigma	1					1				
Syacium gunteri								9	50	
Achirus lineatus					1			3		
Trinectes maculatus						1			3	
Symphurus plagiusa	1									
Balistes capriscus								6		
Sphaeroides nephelus	13								1	
Chilomycterus schoepfii	4							1		
Porichthys porosissimus					2					
Halieutichthys aculeatus									1	
TOTAL:	490	138			46	15	6	185	888	

Gulf off Port Aransas: 6-10 fathom samples - number of specimens per month:

Number of trawl samples:	3	0	0	1	4	1	1	2	2	0

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Narcine brasiliensis									2	
Raja texana				1					2	
Brevoortia patronus				4		3	3			

Table 1 - (Continued)

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Harengula pensacolae	1				1			1	2	
Anchoa hepsetus	14				3	17	3		3	
Synodus foetens				45	43	11	6	9		
S. poeyi						4				
Bagre marinus									3	
Galeichthys felis	7				12	3		2		
Urophycis floridanus	13									
Centropristes philadelphicus				6	10	2			3	
Serraniculus pumilio	1									
Lutjanus blackfordi								7		
Caranx bartholomaei								1		
Chloroscombrus chrysurus				1		3				
Selene vomer								2		
Trachurus lathami						1				
Vomer setapinnis					31			11		
Eucinostomus gula								12		
Orthopristis chrysopterus	10							2	2	
Cynoscion arenarius	94				8	2	40	32	107	
C. nothus	53			4	334	50	500	36	250	
Larimus fasciatus									11	
Leiostomus xanthurus	9				600		80	80	14	
Menticirrhus americanus									9	
M. littoralis	31				30	7	7	5	68	
M. saxitilis							1			
Micropogon undulatus					501	300	500	280	250	
Stellifer lanceolatus	94								95	
Lagodon rhomboides	3				80				3	
Chaetodipterus faber									3	
Trichiurus lepturus	10					12	20	9		
Prionotus rubio					1	2	1		2	
P. tribulus									3	
P. martis					1				8	
Ophidion welshi	3								1	

Table 1 (Continued)

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Peprilus alepidotus	4			1	19		4	1	2	
Poronotus triacanthus	7			36	3	2	2	3	54	
Polydactylus octonemus								150		
Ancylopsetta quadrocellata				2	24	6	3	5	5	
Citharichthys macrops				30	6					
Cyclopsetta chittendeni				1						
Etropus crossotus	14					40			54	
Paralichthys lethostigma	6									
P. albigutta	1			1	1			1	1	
Syacium gunteri				30	45	100			15	
Achirus lineatus					1					
Gymnachirus nudus				1					2	
Trinectes maculatus									3	
Symphurus plagiusa	12				3			3	107	
Balistes capriscus								13		
Lagocephalus laevigatus						7				
Sphaeroides nephelus	20								4	
Chilomycterus schoepfii	6						1			
Porichthys porosissimus				2						
TOTAL:	413			165	757	572	171	665	1029	

Gulf off Port Aransas: 11-15 fathom samples - number of specimens per month:

Number of trawl samples:

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Sphyrna zygaena									1	
Raja texana		3	6						3	1
Dasyatis americana									1	
D. sabina	15									
Brevoortia patronus					3	1	2			

Table 1 (Continued)

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Harengula pensacolae							2	1	2	
Anchoa hepsetus					90	50	45	39	21	
Synodus foetens			16	10	40	20	39	25	44	24
S. poeyi			5		15	40	50			2
Bagre marinus									6	
Galeichthys felis	2							2		
Gymnothorax nigromarginatus					2					
Mystriophis intertinctus					1					
Urophycis floridanus			25				1			
U. regius							3			
Centropristes philadelphicus	50	15	31	12	36	3	13	1	2	3
Diplectrum formosum			14							
Caranx crysos									3	
Chloroscombrus chrysurus						1			7	19
Selene vomer				2	1					
Trachurus lathami			45		7					
Vomer setapinnis					2	6	21	88	1	
Orthopristis chrysopterus	5									
Cynoscion arenarius	28		7	10	4	3		34		
C. nothus	240	150	150	27	350	50	75	100	450	22
Larimus fasciatus	9				14			9	3	
Leiostomus xanthurus	19					1				
Menticirrhus littoralis	46	10		4	26	15			4	
Micropogon undulatus	7				18	18	1	103	750	40
Stellifer lanceolatus		60								
Upeneus parvus						1				
Lagodon rhomboides	11									
Stenotomus caprinus							3	12		
Chaetodipterus faber		1							1	1
Trichiurus lepturus	1	1	11		225	20	8	37	4	2
Bollmania communis			8		3	4				
Prionotus ophryas	1									
P. rubio	3	1		2	4	8	1	6	3	
P. tribulus	1									
Peprilus alepidotus					6					

Table 1 (Continued)

ORGANISM	JAN.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.
Poronotus triacanthus	6	1	40	4	129		115	80	118	6
Polydactylus octonemus								3		
Ancylopsetta quadrocellata	2			1	2	1	8		7	6
Citharichthys macrops	20	50	50	30	30					
Cyclopsetta chittendeni						1				
Etropus crossotus	55	100								
Paralichthys lethostigma	10	1							1	
P. albigutta	8				1		2	1	2	
Syacium gunteri	350	80	300	50	170	50	47	39	160	18
Gymnachirus nudus					1	3	1			
Symphurus plagiusa		300		2	6	7			3	
Lagocephalus laevigatus					31	6	20	1		
Sphaeroides nephelus	6	1				2				
Porichthys porosissimus	1				3	1	1	1	4	1
Antennarius ocellatus		16	200							
Halieutichthys aculeatus		1								
Ogcocephalus nasutus	1	1	1		1					
TOTAL:	897	792	909	154	1221	312	458	582	1601	145
TOTAL 0-15 FATHOMS:	1800	930	909	319	2024	899	635	1432	3518	145
Number of trawl samples;	8	2	1	2	9	3	4	6	6	1
Average number of specimens per trawl:	225	465	909	160	225	300	159	239	586	145
TOTAL POUNDS PER MONTH:	216	84	180	50	859	194	295	168	490	10

Table 2 - Scrap Fish Catch

Gulf off Port Mansfield/Port Isabel and off Galveston:

0—5 Fathom Samples - Number per Month

	PORT MANSFIELD/PORT ISABEL						GALVESTON
Number of trawl samples:	1	2	1	1	2	3	4
ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.	JANUARY
Rhinobatus lentiginosus		1	1			1	
Narcine brasiliensis		6			3	48	
Raja texana		1			1	3	
Dasyatis sabina	2				1	10	
Brevoortia patronus	1					7	
Anchoa mitchilli		6	30		10		430
Synodus foetens					2		
S. poeyi		1					
Galeichthys felis	6	2	50	3		900	1
Hippocampus obtusus			1		1		
Syngnathus louisianae							2
Urophycis floridanus							10
Centropristes philadelphicus				1		2	
Lutjanus blackfordi		4					
Caranx hippos			3				
Chloroscombrus chrysurus			1		218		
Trachurus lathami		20					
Vomer setapinnis	40		60		25		
Eucinostomus gula					17		
Conodon nobilis		20					
Orthopristis chrysopterus	3	17			7		
Bairdiella chrysura							3
Cynoscion arenarius	6	50		10			
C. nothus	20	200		50	43		
Larimus fasciatus		50			80		
Leiostomus xanthurus		40		17	27		14
Menticirrhus americanus						1	4
M. littoralis	4	40	2	9	1	3	7

Table 2 - (Continued)

ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.	JANUARY
Micropogon undulatus		150			16		4
Umbrina coroides					12		
Lagodon rhomboides	1	30	3				4
Chaetodipterus faber		3	3		3	4	
Trichiurus lepturus		2		20		15	
Scomberomorus cavalla			6				
S. maculatus		1					
Prionotus rubio	1			2			
P. tribulus		1					6
P. martis		1	1				4
Astroscopus y-graecum							25
Lepophidium brevibarbe		2					
Ophidion welshi							1
Peprilus alepidotus					1		
Poronotus triacanthus				3	24		
Sphyraena guachancho			2				
Polydactylus octonemus					45		
Ancylopsetta quadrocellata		1	3	2		5	
Paralichthys lethostigma					1		2
P. albigutta	4	2					
Syacium gunteri	50	15	4				
Achirus lineatus	10						
Trinectes maculatus							5
Symphurus plagiusa							20
Sphaeroides nephelus		2			6	10	10
Chilomycterus schoepfii						18	
Porichthys porosissimus		1			1		
Halieutichthys aculeatus	1						
Ogcocephalus nasutus		1					
TOTAL:	149	670	170	117	545	1027	552

Table 2 - (Continued)

Gulf off Port Mansfield/Port Isabel and off Galveston:

6-10 Fathom Samples - Number per month

	PORT MANSFIELD/PORT ISABEL						GALVESTON
Number of trawl samples:	1	2	1	2	2	2	3
ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.	JANUARY
Rhinobatus lentiginosus						1	
Narcine brasiliensis		1			24	4	
Raja texana					5	1	
Dasyatis sabina						6	
Gymnura micrura					1		2
Brevoortia patronus				6			
Harengula pensacolae					19		
Sardinella anchovia					4		
Anchoa hepsetus		3		54	46		
A. mitchilli							100
Synodus foetens		8	4	50	30		
S. poeyi		2	10	6			
Trachinocephalus myops			7				
Bagre marinus					3		
Galeichthys felis					3		
Urophycis floridanus							5
Hippocampus obtusus			1	1			
Syngnathus louisianae							1
Centropristes philadelphicus	1	1	22	17	9	1	
Diplectrum formosum			8	4	4		
Lutjanus blackfordi					17		
Caranx crysos					7		
Chloroscombrus chrysurus					21		
Selene vomer				2			
Trachurus lathami		9			1		
Vomer setapinnis	50				14	30	
Conodon nobilis					1		
Orthopristis chrysopterus		5	2	1	7	8	1

Table 2 - (Continued)

ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.	JANUARY
Bairdiella chrysura							16
Cynoscion arenarius					10		10
C. nothus	6			57	58	41	80
Larimus fasciatus					7	4	61
Leiostomus xanthurus		3			1		14
Menticirrhus americanus	6					15	3
M. littoralis	1				17	3	13
Micropogon undulatus		1		3	80	2	1
Stellifer lanceolatus					1		
Upeneus parvus					*1*		
Lagodon rhomboides		21			1	3	9
Stenotomus caprinus		1	30	1			
Chaetodipterus faber					4	1	
Trichiurus lepturus	4			2	8	2	
Prionotus rubio	2	5			3		
P. tribulus		1					4
P. martis		1					2
Lepophidium brevibarbe	1						
Ophidion welshi							3
Peprilus alepidotus					1		
Poronotus triacanthus				20	59	18	
Polydactylus octonemus					2		
Ancylopsetta quadrocellata	4	12	4	11	11	4	4
Citharichthys macrops	25	11	1				
Etropus crossotus					7	1	11
Paralichthys albigutta	1	1					
Syacium gunteri	50	29	40	50	30		3
Gymnachirus nudus					1		
Trinectes maculatus		1					4
Symphurus plagiusa							30
Balistes capriscus					2		
Sphaeroides nephelus		1			2	3	5
S. spengleri					2		
Chilomycterus schoepfii						2	
Porichthys porosissimus	1				1		
TOTAL:	152	117	129	285	525	152	380

Table 2 - (Continued)

Gulf off Port Mansfield/Port Isabel:

11-20 Fathom Samples - Number per Month

Number of trawl samples:	0	4	3	1	2	1
ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.
Sphyrna zygaena		1				
Rhinobatus lentiginosus		1				
Narcine brasiliensis		2			15	1
Raja texana		3	2	2	3	3
Brevoortia patronus		6		7		
Harengula pensacolae		11	33		6	
Anchoa hepsetus			13	20	4	
Synodus foetens		95	50	8	45	
S. poeyi		48	16		11	
Bagre marinus		1				
Galeichthys felis		4	1			
Gymnothorax nigromarginatus		1				
Urophycis floridanus		20	4			
U. regius		7				
Hippocampus obtusus		1	1	1		
Centropristes philadelphicus		57	6	11	21	37
Diplectrum formosum		27	20		24	
Serraniculus pumilio		2				
Lutjanus blackfordi		12	2		26	
Priacanthus arenatus		2	1			
Caulolatilus cyanops			7			
Chloroscombrus chrysurus		20			40	
Selene vomer		1				
Trachurus lathami		10	31		2	
Vomer setapinnis			10	80	7	
Eucinostomus gula				17		
Conodon nobilis				2		
Orthopristis chrysopterus		2				1

Table 2 - (Continued)

ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.
Cynoscion arenarius					4	
C. nothus			12	25	400	50
Larimus fasciatus					21	
Leiostomus xanthurus		8	50	16	40	
Menticirrhus americanus						15
M. littoralis		30	6		8	11
Micropogon undulatus		15		50	150	
Upeneus parvus		2	22		19	
Lagodon rhomboides		4				
Stenotomus caprinus		50	103	3	24	
Chaetodipterus faber					1	
Trichiurus lepturus		4	1	14	1	
Scomberomorus cavalla		3				
Scorpaena calcarata					2	
Prionotus rubio		14	19	6	7	
P. martis		6				
Peprilus alepidotus			6			
Poronotus triacanthus			20	30	10	
Sphyraena guachancho		11				
Polydactylus octonemus			500			
Ancylopsetta quadrocellata		24	3	2	1	2
Citharichthys macrops		116				1
Cyclopsetta chittendeni					6	
Etropus crossotus		10				
Syacium gunteri		147	130	40	100	30
Symphurus plagiusa		4		3		
Balistes capriscus					1	
Monocanthus hispidus			1			
Lactophrys quadricornis		1				
Lagocephalus laevigatus		20	2	3		

Table 2 - (Continued)

ORGANISM	MAY	JUL.	AUG.	SEP.	OCT.	DEC.	JANUARY
Sphaeroides nephelus					1	6	
Antennarius ocellatus		2					
Ogcocephalus nasutus		2					
TOTAL:		807	1072	340	1000	157	
TOTAL 0-20 FATHOMS:	301	1694	1371	742	2070	436	932
Number of trawl samples:	2	8	5	4	6	6	7
Average number of specimens per trawl:	151	212	274	186	345	73	133
TOTAL POUNDS PER MONTH:	40	532	288	66	305	82	33

Table 3 - Hydrography

Temperature and Salinity - Gulf off Port Aransas

DATE	FATHOMS	DEGREES C. SURFACE	DEGREES C. DEPTH	SALINITY P.P.T SURFACE	SALINITY P.P.T DEPTH
January					
2	5	12.2	12.9	31.82	31.81
2	7	12.5	12.9	31.62	31.47
7	3	12.5	12.6	31.49	31.92
7	6	12.7	12.8	32.06	31.67
19	6	14.5	14.1	31.63	31.97
19	12	14.3	14.0	31.06	30.91
27	4	11.7	12.0	31.91	32.63
27	11	12.7	12.3	32.9	31.91
March					
31	4	18.4	17.8	34.82	34.91
31	11	17.0	17.2	35.67	35.90
April					
15	15	19.5	18.7	34.71	34.09
May					
25	6	26.7	26.4	36.04	36.31
25	11	25.4	26.7	35.61	35.97
June					
4	6	26.7	26.7	35.21	35.68
4	11	25.6	26.1	35.91	36.0
6	3	27.1	27.3	35.81	35.77
6	6	27.0	27.0	35.82	35.61
26	3	28.7	28.7	36.1	36.16
26	8	28.6	28.6	36.1	36.1
26	14	28.0	27.2	35.67	35.89
30	6	29.8	28.6	36.02	36.8
30	13	29.4	27.0	36.71	36.91
July					
21	13	28.3	26.4	35.61	36.8
27	10	29.5	27.0	36.0	36.47
27	5	29.8	27.2	36.07	36.37
August					
3	3	31.0	31.2	35.67	35.6
3	8	30.1	29.4	35.91	36.17
3	12	30.3	28.3	36.01	36.01
4	15	29.5	27.2	36.42	36.6

Table 3 - (Continued)

DATE	FATHOMS	DEGREES C. SURFACE	DEGREES C. DEPTH	SALINITY P.P.T. SURFACE	SALINITY P.P.T. DEPTH
September					
2	7	29.1	28.7	34.17	34.8
2	11	29.0	28.2	35.61	35.23
3	3	28.7	28.7	34.01	34.17
9	8	29.3	29.0	35.61	35.43
9	14	29.8	27.6	35.91	36.09
10	4	30.7	29.4	34.03	34.11
October					
22	*3*	*26.6*	*26.0*	*33.68*	*33.24*
22	8	25.3	25.1	32.43	33.62
22	12	23.6	24.1	31.61	32.59
29	6	25.1	26.0	32.9	34.63
29	12	24.1	24.6	33.78	34.32
30	5	23.1	23.6	34.08	34.62
November					
2	14	24.0	24.6	34.12	34.6

Temperature and Salinity - Gulf off Port Mansfield and Port Isabel

May					
9	4	24.1	23.7	35.61	36.31
10	6	23.0	23.1	36.41	36.07
July					
7	3	27.3	27.4	35.81	36.2
7	8	27.3	27.0	36.71	36.81
7	16	27.8	24.1	36.87	36.91
8	12	27.8	26.1	35.63	36.46
8	15	27.4	25.3	35.97	36.34
9	3	27.3	27.1	35.62	35.89
9	11	27.4	26.2	35.83	36.97
10	6	27.8	27.1	35.61	36.01
August					
7	3	31.6	31.6	36.01	36.09
7	9	31.1	30.2	36.07	36.31
7	15	30.6	29.7	36.81	35.92
9	12	31.4	30.0	35.92	35.74
9	18	30.6	29.0	36.63	36.87
September					
16	6	27.9	26.8	35.91	34.87
16	12	26.4	25.6	35.48	35.61
17	4	27.4	27.4	35.62	35.84
18	8	27.1	27.1	35.43	35.79

Table 3 - (Continued)

DATE	FATHOMS	DEGREES C. SURFACE	DEGREES C. DEPTH	SALINITY P.P.T. SURFACE	SALINITY P.P.T. DEPTH
October					
17	3	25.6	25.6	34.37	35.1
17	12	24.1	24.4	35.63	35.63
18	8	24.6	25.4	34.83	35.6
18	14	25.0	25.3	35.9	35.62
19	3	24.6	24.6	34.82	34.79
19	6	23.7	22.7	35.06	35.1
December					
15	12	15.1	15.3	35.71	35.03
15	4	16.7	16.4	36.1	36.1
16	3	16.3	16.3	35.92	36.1
16	6.5	15.6	15.6	36.34	35.92
16	9	15.9	15.9	36.06	35.92
17	4	15.0	15.4	35.92	36.73

Temperature and Salinity - Gulf off Galveston

January					
20	3	9.1	9.0	30.47	30.68
20	6	9.0	8.9	31.62	31.98
21	5	10.0	9.5	30.54	30.36
21	7	9.7	9.2	30.74	31.69
21	9	10.1	9.9	30.53	30.27
22	4	9.7	9.2	30.67	30.19
23	4	9.8	10.7	31.42	31.8

TABLE 4

Post-Larval Fishes Entering the Passes From the Gulf of Mexico

DATE	FISH	NO.	SIZE	CHANNEL	NET
Jan. 1	L. xanthurus	1	8 mm.	Aransas	Hoop
Feb. 17	P. triacanthus	1	20 mm.	Aransas	Hoop
	Leptocephalus	9	60 mm.		
20	Menhaden	180	11-30 mm.	Aransas	Hoop
	Anchoa sp.	4	25-30 mm.		
	S. lanceolatus	2	11 mm.		
	L. rhomboides	90	10-13 mm.		
	P. triacanthus	2	20-25 mm.		
	Syngnathus sp.	1	90 mm.		
	Paralichthys sp.	1	8 mm.		
	Leptocephalus sp.	7	45-60 mm.		
28	Menhaden	2	19 mm.	Aransas	Hoop
	L. rhomboides	1	12 mm.		
	Flatfish	1	8 mm.		
	Leptocephalus sp.	2	60 mm.		
Mar. 6	Menhaden	1	25 mm.	Aransas	Beam
	M. undulatus	3	8 mm.		
	L. rhomboides	3	15 mm.		
6	Atherinidae	1	60 mm.	Aransas	Hoop
	A. mitchilli	5	50 mm.		
	M. cephalus	6	30 mm.		
	S. pelagicus	1	130 mm.		
	M. punctatus	2	80-130 mm.		
	Leptocephalus sp.	2	70 mm.		
11	Atherinidae	1	50 mm.	Aransas	Hoop
	Brevoortia sp.	43	20 mm.		
	B. gunteri	1	35 mm.		
	A. mitchilli	3	30-50 mm.		
	S. lanceolatus	18	10 mm.		
	L. rhomboides	13	12 mm.		
	Flatfish	2	11 mm.		
19	L. rhomboides	2	15 mm.	Aransas	Beam
19	Menhaden	47	9-20 mm.	Aransas	Hoop
	L. rhomboides	3	12 mm.		
	Flatfish	4	10 mm.		

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
19	Menhaden	41	10-20 mm.	Aransas	Hoop
19	Menhaden	64	10-15 mm.	Aransas	Beam
	Anchoa sp.	1	35 mm.		
20	Menhaden	3	21 mm.	Aransas	Hoop
20	Flatfish	1	14 mm.	Aransas	Beam
31	Menhaden	80	5-20 mm.	Aransas	Beam
	M. cephalus	1	20 mm.		
	S. lanceolatus	1	9 mm.		
	L. rhomboides	25	4-9 mm.		
31	Menhaden	600	10-20 mm.	Aransas	hoop
	L. rhomboides				
Apr.					
7	Harengula sp.	1	20 mm.	Aransas	Beam
	Flatfish	2	12 mm.		
7	Harengula sp.	4	8-18 mm.	Aransas	Hoop
	P. cromis	2	2-3 mm.		
	L. rhomboides	2	5-10 mm.		
10	Harengula sp.	54	5-18 mm.	Isabel	Beam
	Serranids	27	8-10 mm.		
	?	2	5-10 mm.		
	Goby	1	5 mm.		
10	Harengula sp.	150	5-20 mm.	Isabel	Hoop
	S. lanceolatus	2	12 mm.		
	Syngnathus sp.	1	12 mm.		
	Serranids	64	2-10 mm.		
	?	1	3 mm.		
11	Harengula sp.	11	5-10 mm.	Isabel	Hoop
	P. triacanthus	1	5 mm.		
11	Serranid	1	8 mm.	Isabel	Beam
11	Harengula sp.	1	20 mm.	Mansfield	Beam
	P. cromis	5	2-4 mm.		
	L. rhomboides	2	10-12 mm.		
	S. lanceolatus	1	9 mm.		
	Syngnathus sp.	1	15 mm.		
	Gobies	2	8-9 mm.		

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
Apr. 11	Harengula sp.	35	9-25 mm.	Mansfield	Hoop
	L. rhomboides	4	6-15 mm.		
	Chilomycterus sp.	1	5 mm.		
	?	1	2 mm.		
12	Harengula sp.	17	3-18 mm.	Mansfield	Beam
	P. cromis	7	3-10 mm.		
	L. rhomboides	11	8-10 mm.		
	Syngnathus sp.	1	20 mm.		
	Gobies	9	10 mm.		
	?	2	8-12 mm.		
12	Harengula sp.	120	14-25 mm.	Mansfield	Hoop
	L. rhomboides	2	12 mm.		
16	Harengula sp.	13	5-13 mm.	Aransas	Beam
	S. lanceolatus	1	7 mm.		
	?	8	3-4 mm.		
	?	12	5-12 mm.		
16	Harengula sp.	34	3-15 mm.	Aransas	Hoop
	Menticirrhus sp.	11	2-6 mm.		
	P. cromis	40	2-6 mm.		
	L. rhomboides	18	5-10 mm.		
20	Harengula sp.	32	5-25 mm.	Aransas	Beam
	M. undulatus	1	20 mm.		
	P. cromis	2	4 mm.		
	S. lanceolatus	3	5 mm.		
	L. rhomboides	5	6-10 mm.		
	Gobiesox sp.	3	8 mm.		
	?	2	4 mm.		
20	Harengula sp.	70	5-20 mm.	Aransas	Hoop
	P. cromis	1	3 mm.		
	L. rhomboides	2	4-8 mm.		
	Prionotus sp.	1	2-5 mm.		
	?	5	4 mm.		
28	Harengula sp.	11	7 mm.	Aransas	Hoop
	Menticirrhus sp.	21	2-8 mm.		
	S. lanceolatus	24	2-10 mm.		
	L. rhomboides	2	6-12 mm.		
28	Harengula sp.	1	10 mm.	Aransas	Beam
	Menticirrhus sp.	1	20 mm.		
	Scienaeds	10	8-12 mm.		
	?	3	4 mm.		

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
May					
4	Harengula sp.	3	10-15 mm.	Aransas	Beam
	Menticirrhus sp.	3	2 mm.		
	P. cromis	3	2 mm.		
9	O. chrysopterus	6	12 mm.	Isabel	Beam
9	Menhaden	1	10 mm.	Isabel	Hoop
	P. cromis	4	4 mm.		
	L. rhomboides	2	10 mm.		
	Chilomycturus sp.	1	6 mm.		
	Goby	1	10 mm.		
11	Goby	1	6 mm.	Mansfield	Hoop
13	Menhaden	8	10-15 mm.	Aransas	Beam
	A. mitchilli	1	20 mm.		
	P. cromis	3	3 mm.		
13	Harengula sp.	16	5-15 mm.	Aransas	Hoop
	P. cromis	13	2 mm.		
	Symphurus sp.	1	7 mm.		
June					
4	Achirus sp.	1	20 mm.	Aransas	Hoop
9	P. cromis	1	6 mm.	Aransas	Hoop
	P. triacanthus	1	10 mm.		
16	Menhaden	4	10-12 mm.	Aransas	Hoop
	O. chrysopterus	2	10 mm.		
	Flatfish	1	3 mm.		
16	O. chrysopterus	4	15 mm.	Aransas	Beam
26	Menhaden	1	10 mm.	Aransas	Hoop
	O. Chrysopterus	1	10 mm.		
	L. quadricornis	1	4 mm.		
	Scomberomorus sp.	1	7 mm.		
	?	3	2 mm.		
	?	1	7 mm.		
26	Menhaden	1	10 mm.	Aransas	Beam
July					
9	Menhaden	41	5-11 mm.	Mansfield	Hoop
	L. rhomboides	2	8 mm.		
	?	1	2 mm.		

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
July					
14	Menhaden	68	15-20 mm.	Aransas	Hoop
	P. cromis	5	7 mm.		
	L. rhomboides	1	10 mm.		
20	Menhaden	12	6-15 mm.	Aransas	Hoop
	L. rhomboides	5	9 mm.		
20	Menhaden	2	12 mm.	Aransas	Beam
	S. lanceolatus	4	7 mm.		
	L. rhomboides	1	10 mm.		
31	Goby	1	10 mm.	Aransas	Hoop
	?	1	4 mm.		
31	S. lanceolatus	1	2 mm.	Aransas	Beam
	Symphurus sp.	2	4 mm.		
10	Menhaden	5	15 mm.	Isabel	Hoop
	H. amblyrhincus	1	25 mm.		
	Sciaenid	1	2 mm.		
25	Menhaden	3	12 mm.	Aransas	Hoop
	L. rhomboides	3	10 mm.		
26	Menhaden	2	12-20 mm.	Aransas	Beam
	S. lanceolatus	8	7-12 mm.		
	P. triacanthus	1	12 mm.		
	Serranids	2	15 mm.		
	Gobies	2	10-15 mm.		
	Symphurus sp.	1	12 mm.		
	Flatfish	6	10-12 mm.		
Sept.					
9	Symphurus sp.	2	2 mm.	Aransas	Beam
16	C. faber	2	10 mm.	Mansfield	Hoop
	Flatfish	2	3 mm.		
	?	1	12 mm.		
17	Menticirrhus sp.	1	6 mm.	Isabel	Beam
	L. rhomboides	1	8 mm.		
	Flatfish	3	8 mm.		
17	Harengula sp.	1	12 mm.	Isabel	Hoop
	L. rhomboides	5	6 mm.		
	Flatfish	2	8 mm.		
22	Syngnathus sp.	1	3 mm.	Aransas	Hoop

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
Sept. 28	Hippocampus sp.	1	3 mm.	Aransas	Hoop
Oct. 6	Menhaden	2	15-18 mm.	Aransas	Hoop
	S. ocellatus	21	2-11 mm.		
	Syngnathus sp.	1	60 mm.		
6	Menhaden	3	15 mm.	Aransas	Beam
	S. ocellatus	41	2-10 mm.		
	Goby	2	9 mm.		
	Symphurus sp.	2	9 mm.		
	?	2	8-10 mm.		
	Amphioxus	1	20 mm.		
13	Flying fish	1	5 mm.	Aransas	Hoop
	?	1	14 mm.		
	?	1	12 mm.		
17	M. undulatus	13	9-12 mm.	Isabel	Beam
	S. ocellatus	13	9-15 mm.		
	Sciaenids	2	8 mm.		
	Menticirrhus sp.	10	3-5 mm.		
	Goby	15	11 mm.		
	Symphurus sp.	1	13 mm.		
29	Caranx sp.	1	17 mm.	Aransas	Hoop
Nov. 2	Hippocampus sp.	1	8 mm.	Aransas	Beam
	Syngnathus sp.	1	13 mm.		
10	Menhaden	130	10-19 mm.	Aransas	Hoop
	L. rhomboides	3	14 mm.		
10	Menhaden	31	12-18 mm.	Aransas	Beam
Dec. 15	Menhaden	62	12-19 mm.	Isabel	Hoop
	S. ocellatus	1	10 mm.		
	M. undulatus	48	8-17 mm.		
	Goby	3	10-12 mm.		
15	M. undulatus	86	6-22 mm.	Isabel	Beam
	Syngnathus sp.	1	11 mm.		
	Goby	1	12 mm.		
16	Menhaden	30	20 mm.	Isabel	Hoop
	M. undulatus	21	20 mm.		
	Goby	1	11 mm.		

Table 4 - (Continued)

DATE	FISH	NO.	SIZE	CHANNEL	NET
Dec.					
16	M. undulatus	3	15 mm.	Isabel	Beam
30	M. undulatus	9	15-18 mm.	Aransas	Beam
	Goby	1	15 mm.		

Table 5 - Post-Larval Fish
Number of Fish - All Species - Per 100 Cubic Meters
of Water Strained in Sample

DATE	NUMBER	BOTTOM TEMP.	BOTTOM SALINITY	CHANNEL	NET TYPE
Jan.					
3	.28	12.8	34.38	Aransas	Hoop
Feb.					
17	2.6	16.1	36.78	Aransas	Hoop
20	63.56	14.0	35.66	Aransas	Hoop
28	1.56	11.4	35.24	Aransas	Hoop
March					
6	6.5	15.6	35.72	Aransas	Beam
6	4.24	Same		Aransas	Hoop
11	22.81	15.7	35.07	Aransas	Hoop
19	1.98	16.7	34.30	Aransas	Beam
19	16.42	Same		Aransas	Hoop
19	110.94	15.4	34.72	Aransas	Hoop
19	57.44	Same		Aransas	Beam
20	.71	15.6	35.01	Aransas	Hoop
20	.77	Same		Aransas	Beam
31	98.82	18.2	32.40	Aransas	Beam
31	169.47	Same		Aransas	Hoop
April					
7	3.23	21.8	34.61	Aransas	Beam
7	2.64	Same		Aransas	Hoop
10	57.26	19.5	34.51	Mansfield/Isabel	Beam
10	45.57	Same		Mansfield/Isabel	Hoop
11	3.21	20.0	35.47	Mansfield/Isabel	Hoop
11	.87	Same		Mansfield/Isabel	Beam
11	13.82	21.0	35.24	Mansfield/Isabel	Beam
11	14.49	Same		Mansfield/Isabel	Hoop
12	56.39	21.7	35.37	Mansfield/Isabel	Beam
12	44.89	Same		Mansfield/Isabel	Hoop
16	31.43	20.4	34.67	Aransas	Beam
16	29.20	Same		Aransas	Hoop
20	45.53	23.5	34.94	Aransas	Beam
20	22.98	Same		Aransas	Hoop
28	19.35	21.8	35.48	Aransas	Hoop
28	16.32	Same		Aransas	Beam
May					
4	8.59	21.4	36.7	Aransas	Beam
9	5.45	23.6	36.12	Mansfield/Isabel	Beam
9	2.51	Same		Mansfield/Isabel	Hoop
11	.29	27.4	35.91	Mansfield/Isabel	Hoop
13	17.02	26.0	35.62	Aransas	Beam
13	13.05	Same		Aransas	Hoop

Table 5 - (Continued)

DATE	NUMBER	BOTTOM TEMP.	BOTTOM SALINITY	CHANNEL	NET TYPE
June					
4	.26	26.7	36.17	Aransas	Hoop
9	.48	27.9	35.92	Aransas	Hoop
16	1.78	27.8	35.99	Aransas	Hoop
16	3.31	Same		Aransas	Beam
26	2.02	27.3	35.97	Aransas	Hoop
26	.82	Same		Aransas	Beam
July					
9	11.1	27.9	36.92	Mansfield/Isabel	Hoop
14	24.65	26.9	36.84	Aransas	Hoop
20	6.53	28.4	36.18	Aransas	Hoop
20	87.73	Same		Aransas	Beam
31	.83	30.1	37.43	Aransas	Hoop
31	4.07	Same		Aransas	Beam
Aug.					
10	2.58	24.8	36.91	Aransas	Hoop
25	2.37	30.6	36.97	Aransas	Hoop
26	24.76	26.9	36.94	Aransas	Beam
Sept.					
9	2.41	29.8	34.91	Aransas	Beam
16	2.0	27.8	34.17	Mansfield/Isabel	Hoop
17	4.6	26.4	35.16	Mansfield/Isabel	Beam
17	2.26	Same		Mansfield/Isabel	Hoop
22	.28	27.6	34.97	Aransas	Hoop
28	.39	26.7	34.49	Aransas	Beam
Oct.					
6	9.52	27.1	34.8	Aransas	Hoop
6	64.7	Same		Aransas	Beam
13	1.08	26.3	34.9	Aransas	Hoop
17	68.65	25.1	34.2	Mansfield/Isabel	Beam
29	.35	26.8	33.1	Aransas	Hoop
Nov.					
2	2.25	25.6	34.4	Aransas	Beam
10	39.09	23.6	35.7	Aransas	Hoop
10	29.71	Same		Aransas	Beam
Dec.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	35.14	16.4	35.92	Mansfield/Isabel	Hoop
15	88.44	Same		Mansfield/Isabel	Beam
16	17.09	15.2	35.92	Mansfield/Isabel	Hoop
16	3.19	Same		Mansfield/Isabel	Beam
30	11.41	11.5	35.7	Aransas	Beam

Figure 1
Post-Larval Fish - All Species by Month
Average Number Per Month Per 100 Cubic Meters of Water Sampled

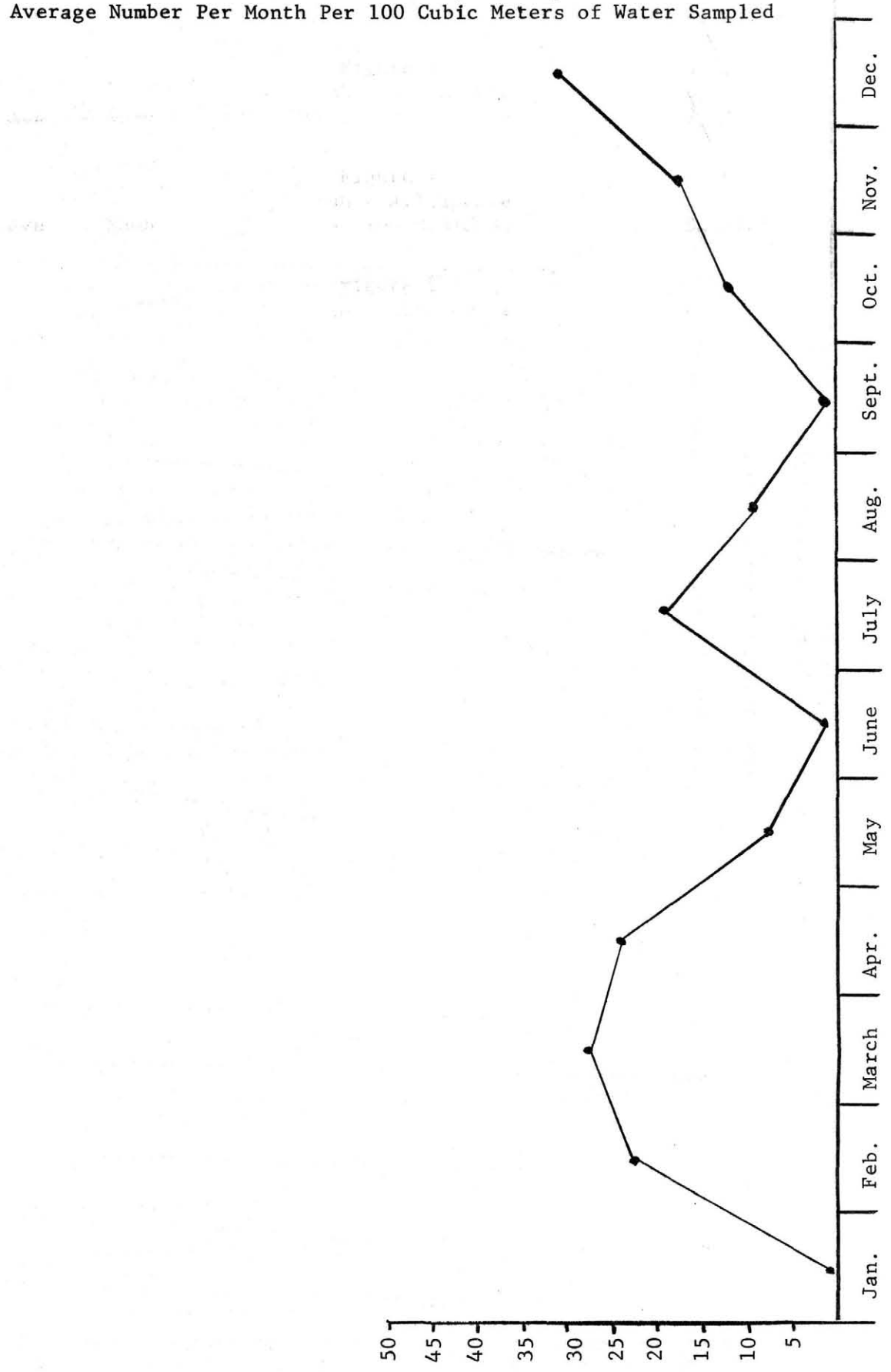

Figure 2
Post-Larval Fish - All Species by Sample