Data Summary of Gray Triggerfish (*Balistes capriscus*), Vermilion Snapper (*Rhomboplites aurorubens*), and Greater Amberjack (*Seriola dumerili*) Collected During Small Pelagic Trawl Surveys, 1988 – 1996

G. Walter Ingram, Jr.
NOAA Fisheries, Southeast Fisheries Science Center, Mississippi Laboratories
Pascagoula, Mississippi

Introduction and Methods

In the early 1980s, the National Marine Fisheries Service (NMFS) initiated a program to investigate the abundance and distribution of the Gulf of Mexico (GOM) coastal pelagics species complex. Early efforts centered around the development of fishing gear effective at capturing pelagic species, since the use of standard groundfish trawling gear and techniques was believed to be inappropriate for capturing the schooling, fast-swimming pelagics (Link et al. 2000). By the late 1980s, it was determined that large, high-opening trawls offered the best potential for capturing these fishes in deeper waters (Gledhill 1989, Reese 1993).

A previous study (Link et al. 2000) provided an initial analysis of these data that included information on the distribution, abundance, geographic range, catch frequency, and size composition of the most common pelagic species collected during these surveys. The object of this document was to likewise summarize the distribution, abundance, catch frequency, and size composition of GOM gray triggerfish (*Balistes capriscus*), vermilion snapper (*Rhomboplites aurorubens*), and greater amberjack (*Seriola dumerili*), which were collected during this study. This was done to ascertain the efficacy of this database to provide useful information for stock assessment.

Trawling was done with a 27.5 m small pelagics trawl and a 37.5 m Shuman trawl from the NOAA vessel *Chapman.* Sampling designs were either stratified random, two dimensional systematic or systematic random, spanned the entire Gulf of Mexico (Link et al. 2000, Gledhill 1989, Reese 1993; Table 1), including depths from 10 to 420 m (6 to 233 fathoms). Bottom trawls were conducted for approximately 30 minute at each station, and total catch per unit effort was standardized to one hour. Cruises associated with the pelagics program that were related to gear development or that were directed sampling were also omitted from this analysis (Link et al. 2000). A comparison between the two types of gear mentioned above was conducted with paired trawls in 1991 indicated that the two gears exhibited no significant differences in catch rates (Gledhill, unpubl. data), and we do not distinguish between gear types in this analysis.

Once onboard, the entire trawl catch was weighed and then subsampled if the catch was greater than 150 kg. Subsamples (or the entire catch if less than 150 kg) were sorted, identified, enumerated, weighed, and measured to the nearest mm following standard NMFS and Southeast Area Monitoring and Assessment Program (SEAMAP) protocols (Link et al. 2000).

A total of 15 cruises were conducted from 1988 to 1996, primarily during spring and fall (Table 1). These data are highly imbalanced both spatially and temporally (Table 1) due to varying cruise objectives, temporal constraints, mechanical difficulties, and similar logistical considerations. I present results of analyses in which annual means (+/- standard error) of catch per unit effort (CPUE, number trawlhour^{-1}) were derived by Pennington's (1983, 1996) Δ-method.

Results

All three species occurred throughout the GOM primarily in waters of less than 100 fathoms in depth (Figure 1). Due to effort being only in the De Soto Canyon area during 1991 (Figure 2), data collected during this sampling year were dropped from subsequent analyses. The many charts of Figure 2 illustrate the highly imbalanced nature, both spatially and temporally, of effort during this study. Trends in CPUE are represented in Figures 3 – 5. Due to the zero-inflated nature of the catch data, Pennington's (1983, 1996) Δ-method was deemed most appropriate in deriving unbiased estimates of mean CPUE. However, for a mean to be derived by the Δ-method, a species must occur at least twice within each combination of strata. Therefore, for those years with only one occurrence, an arithmetic mean was derived. In order to not introduce extra variability, I only included stations in the depth range that each species occurred during this study. Yearly catch indices for vermilion snapper were only calculated for stations in less than 100 fathoms. Three out of the 29 occurrences of greater amberjack occurred at stations of depths greater than 50 fathoms. Therefore, greater amberjack indices were computed with data from stations of depths less than 50 fathoms. Yearly catch indices for gray triggerfish were computed with data from stations of depths less than 50 fathoms. The length frequency distributions of each species are shown in Figures 6 – 8. The median and mean (± standard error) fork length are included in each figure.

Due to the aforementioned highly imbalanced nature of trawling effort and relatively low catch rates of each of the species in question during this study, catch trends (Figures 3 – 5) may not be truly representative of changes in yearly abundances. Therefore, the use of this data for abundance indices is not recommended.

Literature Cited

Gledhill, C. T. 1989. 1989 Annual Report: Latent Resources (Butterfish, Coastal Herrings, and Associated Species). NMFS, SEFSC, ML. Pascagoula, MS. 316 p.

Grace, M. A. and K. M. Mitchell. 2002. Cruise Results, 07/31 – 09/21/2002, Longline Survey, Coastal Sharks – Red Snapper, NOAA Ship *Oregon II*, Cruise OT-02-04(251). USDOC, NOAA, NMFS, SEFSC, Mississippi Laboratories. 20 p.

Link, J.S., T.A. Henwood and C.T. Gledhill. 2000. Small pelagics in the Gulf of Mexico: A description of the abundance, geographic distribution, size and depth distribution of major pelagic species. *Proceedings: Gulf of Mexico Fish and Fisheries: Bringing Together New and Recent Research*. OCS Study, MMS 2002-004.

Pennington, M. 1983. Efficient Estimators of Abundance, for Fish and Plankton Surveys. *Biometrics* 39:281-286.

Pennington, M. 1996. Estimating the mean and variance from highly skewed marine data. *Fish. Bull*. 94:498-505.

Reese, G.B. (ed.) 1993. 1992 Annual MARFIN report: Small Pelagics, TED Technology Transfer, Reef Fish. NMFS, SEFSC, ML. Pascagoula, MS. 225 p.

Table 1. Summary of trawling effort for this study (from Link et al. 2000). Latitudes and longitudes are in degrees and minutes North and West respectively. Gear size is the headrope length, in meters, of the trawl. SysRdm=systematic random, 2DSys=two-dimensional systematic, StratRdm=stratified random.

Year	88	89	90	91	92	93	94	95	96
Cruise	88-03	89-04	90-02,90-03	91-01	92-01	93-03	94-02	95-07	96-06
Months	3,4	8,9	3,4,5	1,2	3,4	3,4	3,4	10,11	10,11
Survey Design	SysRdm	StratRdm	SysRdm,2DSys	StratRdm	SysRdm	SysRdm	SysRdm	StratRdm	StratRdm
Cruise	88-08	89-05	90-08	--	92-06	93-07	--	--	--
Months	10,11	10,11	10,11	--	10,11	10,11	--	--	--
Survey Design	2DSys	SysRdm	SysRdm	--	SysRdm	SysRdm	--	--	--
Total # Stations	154	65	118	53	123	158	81	67	92
Max Latitude	30°59.46'	29°58.48'	30°59.90'	29°59.48'	30°59.84'	29°59.79'	30°59.60'	30°58.12'	29°59.48'
Min Latitude	27°00.09'	27°00.92'	27°00.15'	29°35.44'	27°00.45'	26°00.01'	27°00.00'	27°00.97'	26°00.41'
Max Longitude	96°59.95'	91°59.48'	94°58.92'	87°48.58'	93°56.85'	97°59.90'	91°58.50'	97°57.79'	97°59.11'
Min Longitude	83°00.09'	85°02.69'	85°01.73'	86°19.54'	82°00.30'	88°01.00'	83°00.40'	84°01.83'	84°00.26'
Gear Size	37.5	37.5	37.5	37.5,27.5	27.5,37.5	27.5,37.5	27.5	27.5	27.5

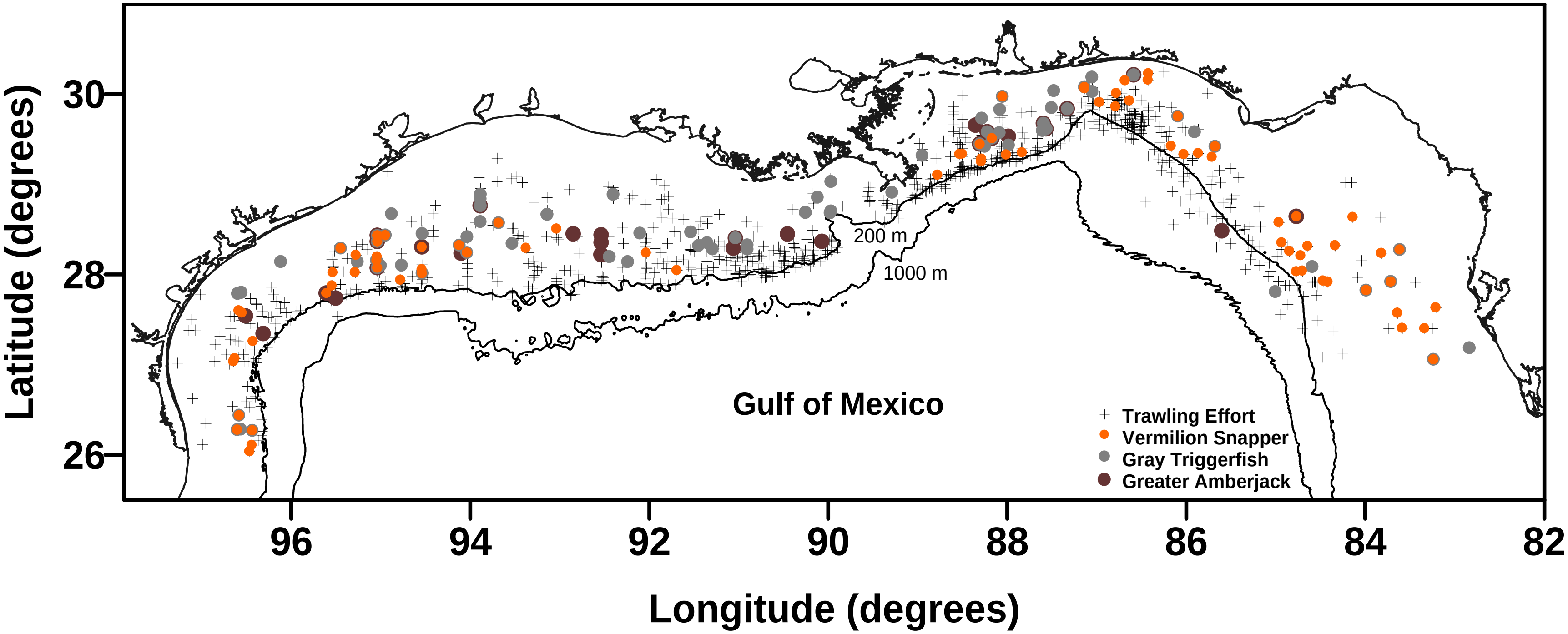


Figure 1. Trawling effort and occurrences of vermilion snapper, gray triggerfish and greater amberjack in this study.

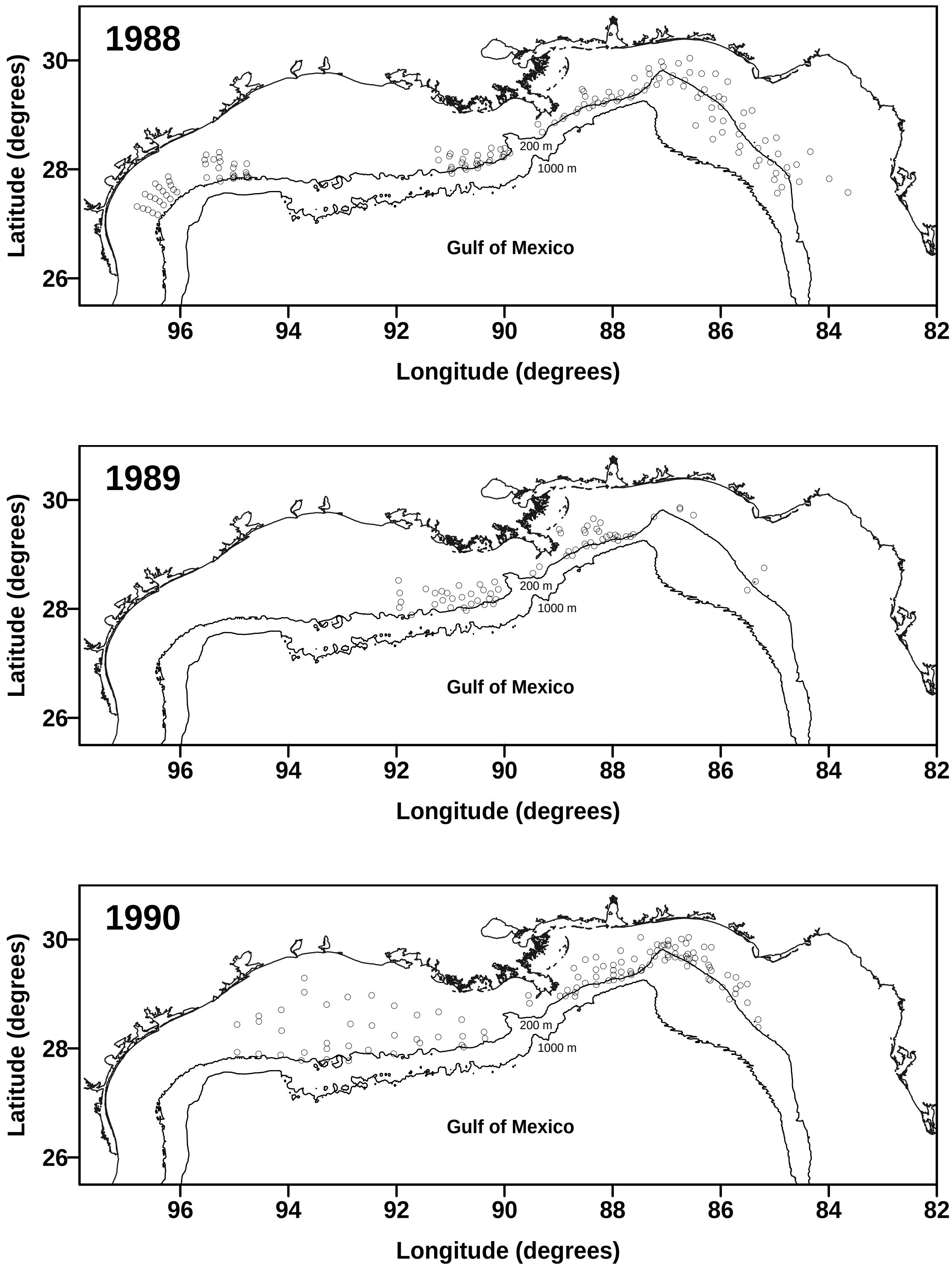


Figure 2. This figure consists of eight charts each depicting trawling effort (open circles) for each year of this study.

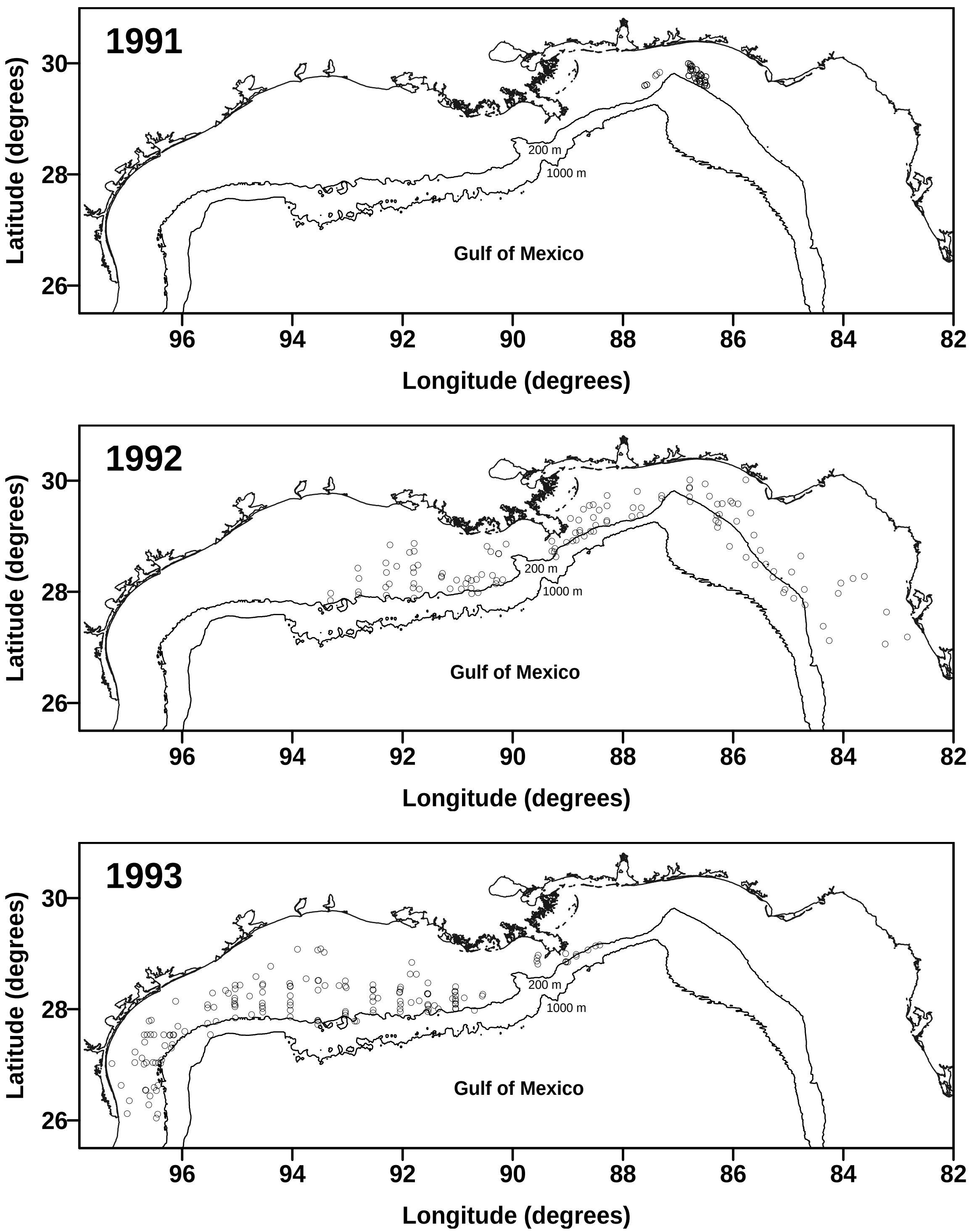


Figure 2 continued.

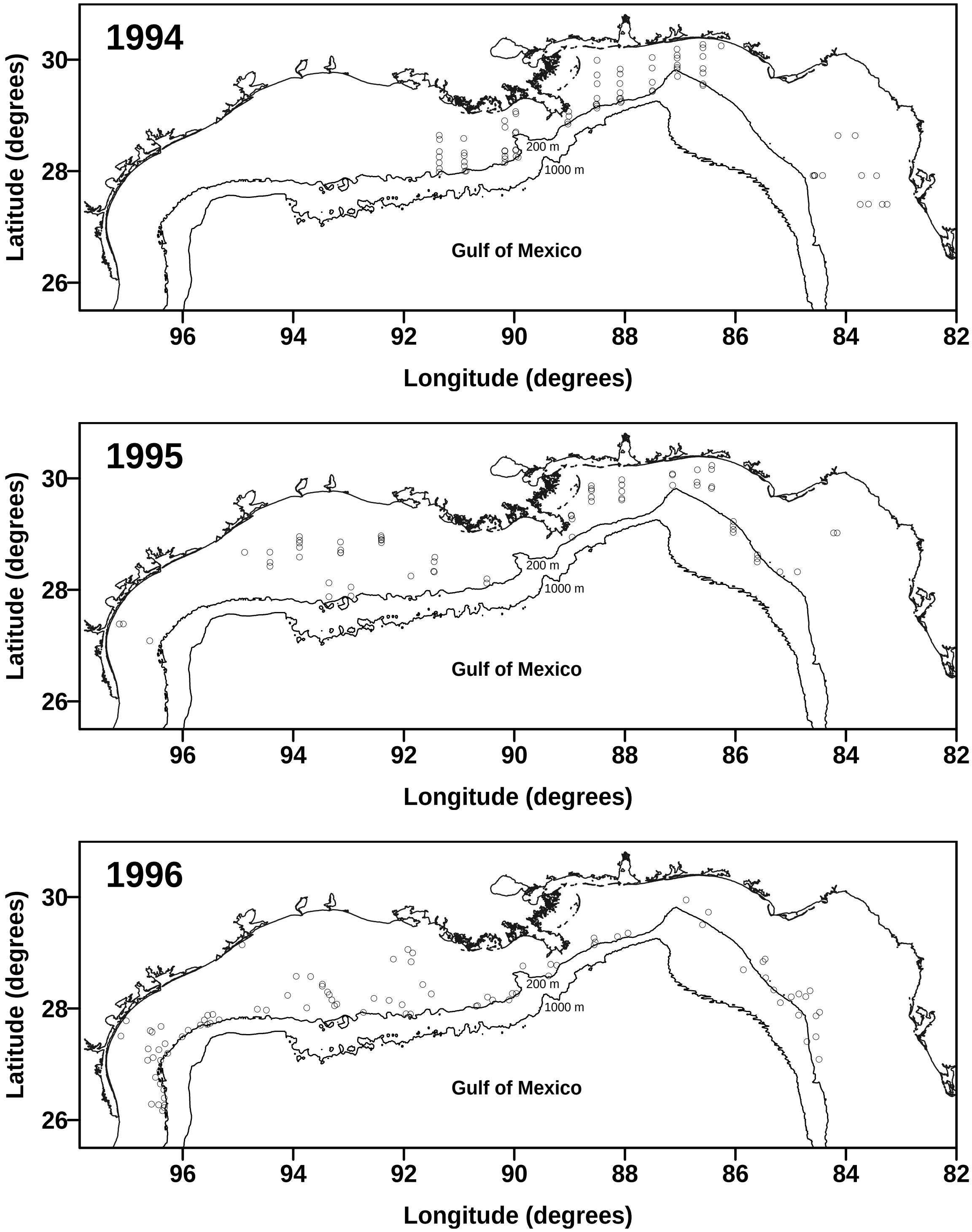
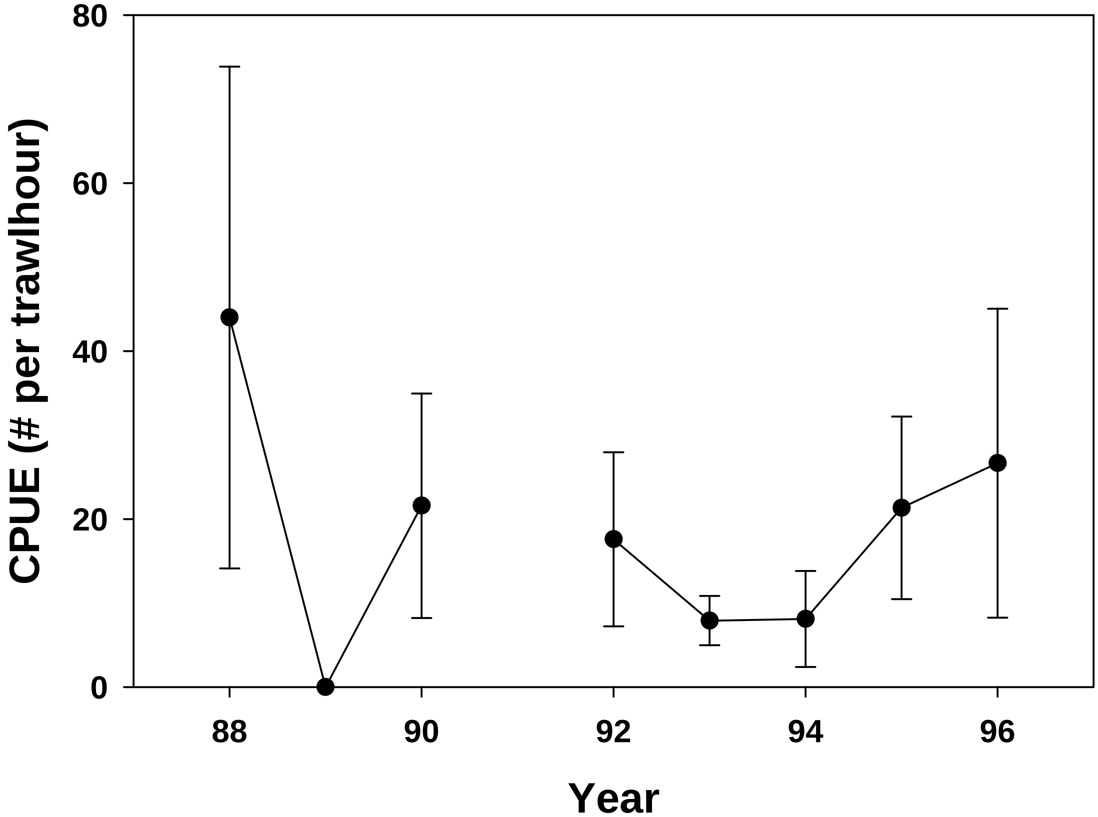
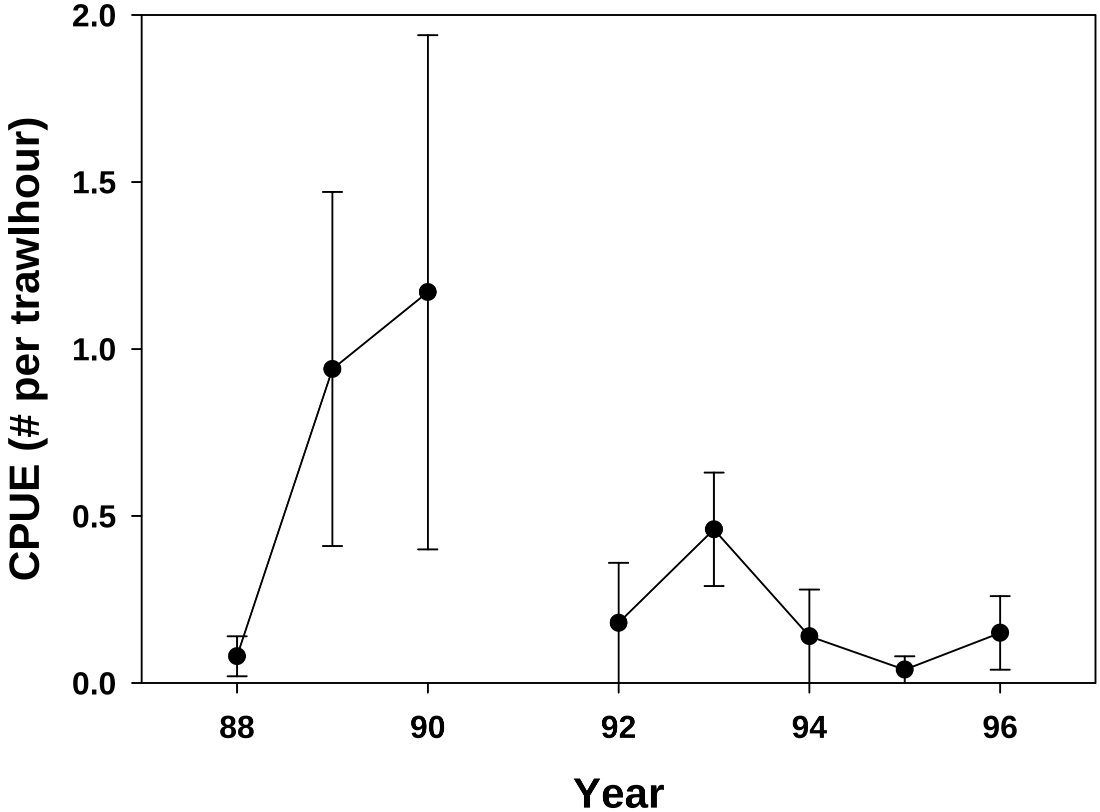


Figure 2 continued.



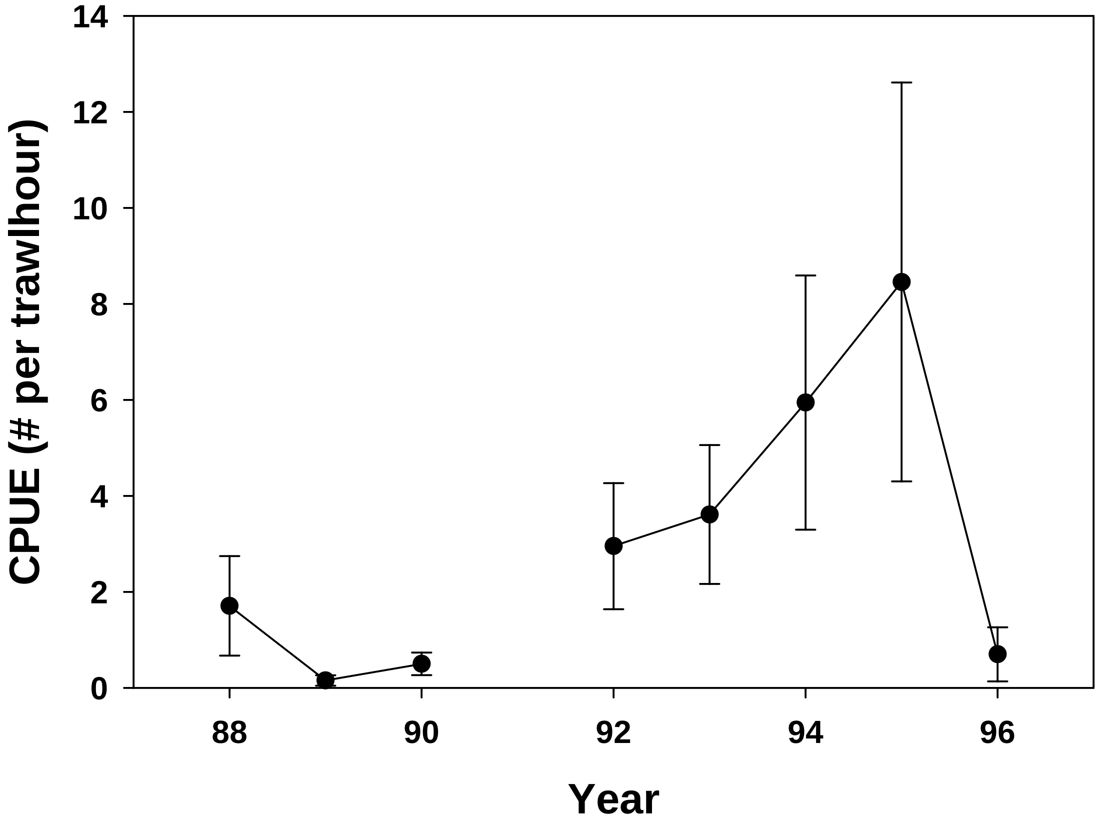
Year	Occurrences	Stations	Mean CPUE	Standard Error	CV
1988	12	97	43.99	29.88	0.68
1989	0	48	0.00		
1990	9	91	21.58	13.36	0.62
1992	16	97	17.59	10.36	0.59
1993	18	140	7.90	2.94	0.37
1994	5	66	8.10	5.71	0.71
1995	6	60	21.33	10.87	0.51
1996	13	72	26.66	18.39	0.69

Figure 3. CPUE of vermilion snapper collected during this study in the U.S. GOM from 1988 to 1996.



Year	Occurrences	Stations	Mean CPUE	Standard Error	CV
1988	2	50	0.08	0.06	0.70
1989	4	26	0.94	0.53	0.56
1990	4	47	1.17	0.77	0.65
1992	1	57	0.18	0.18	1.00
1993	9	110	0.46	0.17	0.37
1994	1	43	0.14	0.14	1.00
1995	1	50	0.04	0.04	1.00
1996	2	40	0.15	0.11	0.74

Figure 4. CPUE of greater amberjack collected during this study in the U.S. GOM from 1988 to 1996.



Year	Occurrences	Stations	Mean CPUE	Standard Error	CV
1988	7	50	1.71	1.04	0.61
1989	2	26	0.15	0.11	0.69
1990	6	47	0.50	0.23	0.47
1992	14	57	2.95	1.31	0.45
1993	19	110	3.61	1.45	0.40
1994	13	43	5.94	2.65	0.45
1995	11	50	8.46	4.16	0.49
1996	3	40	0.70	0.56	0.81

Figure 5. CPUE of gray triggerfish collected during this study in the U.S. GOM from 1988 to 1996.

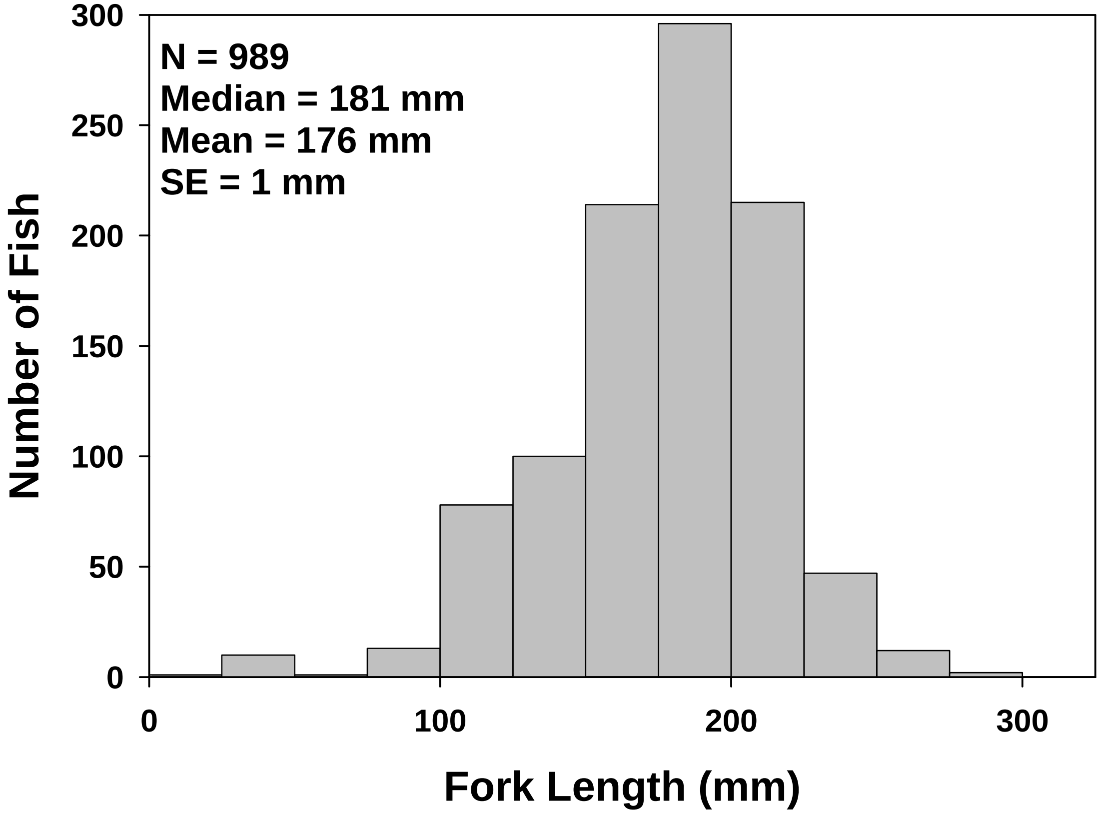


Figure 6. Length frequency of vermilion snapper collected during this study.

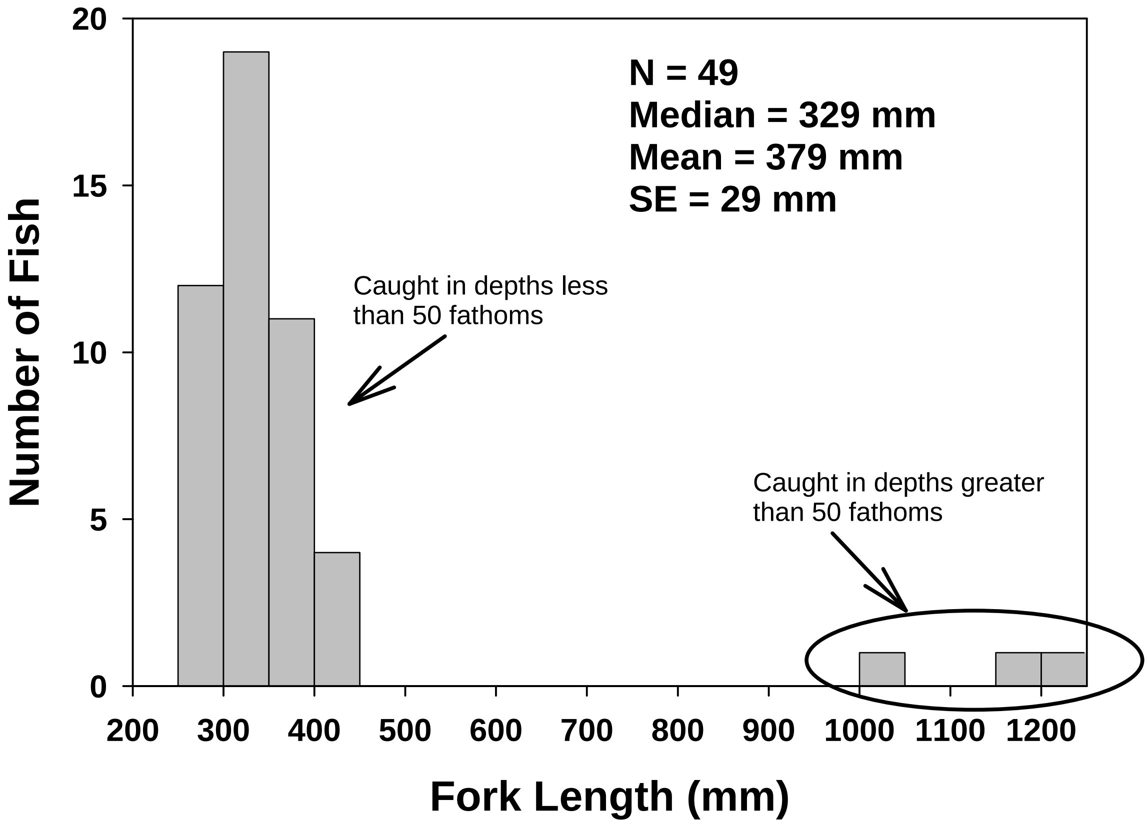


Figure 7. Length frequency of greater amberjack collected during this study.

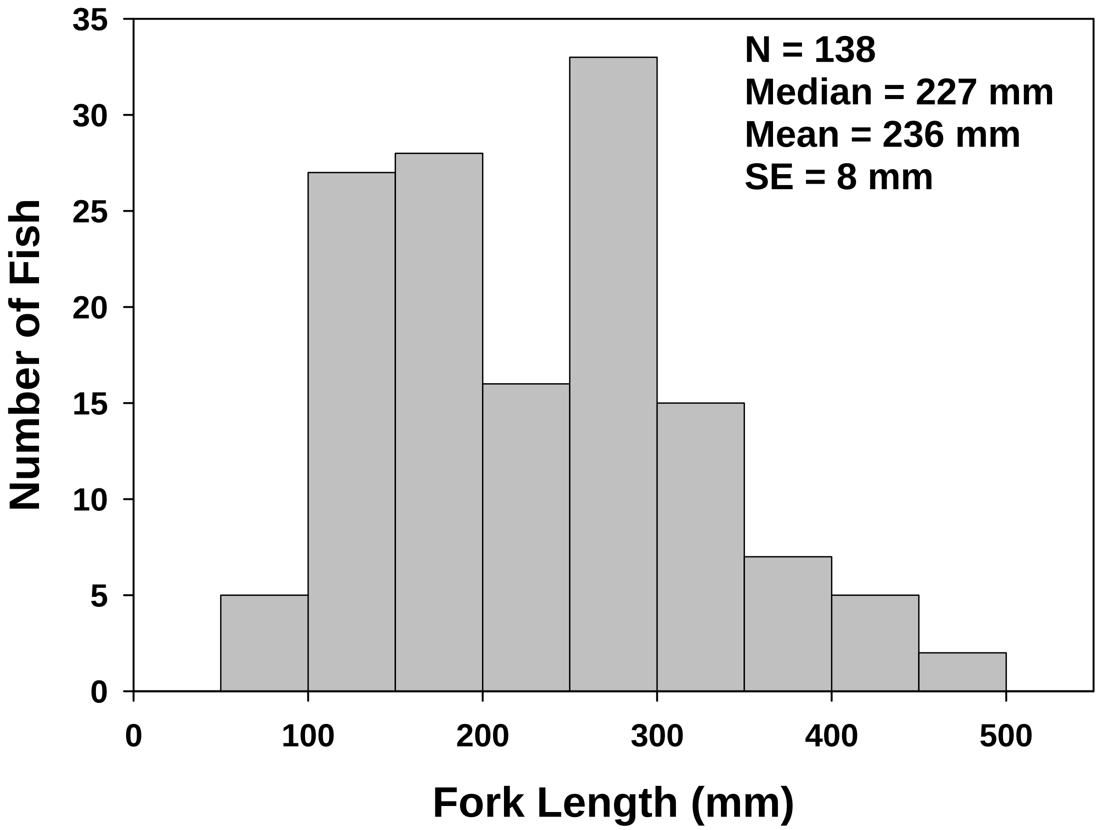


Figure 8. Length frequency of gray triggerfish collected during this study.