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Report On Trends of Some Reef Fish Stocks

off the Southeast United States,

1983-2010

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Contents

1. Introduction

Along the continental shelf of the southeastern United States, areas of live bottom (sponge, soft coral, and algal growth; Sedberry and Van Dolah, 1984) and rocky outcrops provide habitats for many species of fishes (Grimes et al., 1982; Barans and Henry, 1984; Collins and Sedberry, 1991). Managed as the snapper-grouper complex (SAFMC, 1991), many of these species are subjected to intense fishing pressure with black sea bass (*Centropristis striata*), red porgy (*Pagrus pagrus*), and vermilion snapper, (*Rhomboplites aurorubens*) constituting a substantial portion of the commercial and recreational landings (see: http://www.st.nmfs.noaa.gov/st1/index.html).

Using depth, bottom type and types of demersal fishes, Struhsaker (1969) divided the continental shelf and upper slope off the southeastern United States into five habitat types: 1) coastal areas; 2) open shelf; 3) live bottom; 4) shelf edge; and 5) lower shelf. The coastal habitat extends out to depths of 18 m and includes estuarine areas. Bottom type consists of smooth or sandy mud and bottom temperature is subject to extreme seasonal fluctuations. Fishes in this habitat are dominated by sciaenids. Open shelf habitat extends from 18 to 55 m with a bottom type that consists primarily of sand. This habitat harbors few fish species of economic importance. Live-bottom habitat (19-44 m) consists of isolated areas of rock outcrops that are heavily encrusted with sessile invertebrates interspersed in vast expanses of sand (open shelf habitat). This habitat supports many taxa of commercial and recreational importance including lutjanids, serranids, sparids and haemulids (Sedberry and Van Dolah, 1984; Cuellar et al., 1996a). The shelf edge habitat (45-109 m) is characterized as having a bottom type that varies from smooth mud to rocky high relief with very heavy encrustations of coral, sponge and other warm-water invertebrates supporting serranids, lutjanids, and sparids (Cuellar et al., 1996a). Lower shelf habitat (110-183 m) includes smooth hard bottom with areas of rock outcrops that support deep-water lutjanids and serranids. Of all the habitats described by Strushaker (1969) the live bottom and shelf habitat support most of the commercially important reef fishes with the most productive areas at depths from 24-42 m (Miller and Richards, 1980). Several studies have investigated the reef fish community of the continental shelf and shelf-edge of the southeast United States (Miller and Richards, 1980; Grimes et al., 1982; Sedberry and Van Dolah, 1984; McGovern et al. 1999) and analyzed fishery-dependent data to describe abundance of reef species (Low et al., 1985; Huntsman and Willis, 1989; Huntsman et al., 1993; Schobernd and Sedberry, 2009; Vaughan et al., 1994, Wieber and G.R. Sedberry, in review).

For 39 years, the Marine Resources Research Institute (MRRI) at the South Carolina Department of Natural Resources (SCDNR), through the Marine Resources Monitoring, Assessment and Prediction (MARMAP) program, has conducted fisheries-independent research on groundfish, reef fish, ichthyoplankton, and coastal pelagic fishes within the region between Cape Hatteras, North Carolina, and St. Lucie area, Florida. Since 2008, the SA-SEAMAP program has provided additional funding for a SEAMAP Reef Fish survey to address spatial coverage and issues relative to specific species (e.g. gag and red snapper). In particular, SEAMAP funding allowed for surveys of new live bottom habitat that can be added to the MARMAP/SEAMAP reef fish sampling stations, in particular in northernmost, southernmost, deeper, and shallower sampling areas. It also allowed MARMAP to sample MPA's and expand sampling of existing stations in the northern and southern ranges by adding sea days. In 2009 and 2010, most of the new (SEAMAP

Reef Fish) efforts were aimed at surveying new bottom, sampling MPA's, and adding sea days to sample more existing northern and southern stations. In 2010, MARMAP/ SEAMAP also started collaborating with the South East Fisheries Independent Survey (SEFIS) program that was established by the South East Fisheries Science Center (SEFSC) lab in Beaufort, NC.

The overall mission of the MARMAP program has been to determine distribution, relative abundance, and critical habitat of economically and ecologically important fishes of the South Atlantic Bight (SAB), and to relate these features to environmental factors and exploitation activities. Research toward fulfilling these goals has included trawl surveys (from 6-350 m depth), ichthyoplankton surveys, locating and mapping of reef habitat, sampling of reefs throughout the SAB, life history and population studies of priority species, tagging studies of commercially important species, and special studies directed at specific management problems in the region. Survey work has also provided a monitoring program that has allowed the standardized sampling of fish populations over time and the development of a historical base for future comparisons of long-term trends.

Since the inception of the MARMAP program various gear types and methods of deployment have been used. In recent years MARMAP has mostly used the chevron trap (CHV), short bottom long-line (previously called vertical bottom long-line, VLL), and the long bottom long-line (previously called horizontal bottom long-line, HLL) using standard deployment and retrieval methods. At each sampling site, CTD profiles are taken to record water conditions (e.g. temperature, salinity, etc.). The gears and methodology has been consistent over the years to allow for long term analysis and comparisons. Currently, MARMAP cruises assess the relative abundance of reef fishes in the sponge-coral and shelf edge (live bottom) habitats of the SAB. MARMAP's main current objectives are to:

1) Sample reef fishes in the snapper-grouper complex using a variety of gears in live bottom, rocky outcrop, high relief, and mud bottom habitats,

2) Collected detailed data for time series descriptions of species for annual composition and relative abundance,

3) Obtain population characteristics on fish species of interest through life history information analysis, including age, growth, sex ratio, size and age of sexual maturation and transition, spawning season, fecundity, and diet,

4) Collect hydrographic data for comparison to fish abundances and composition indices,

5) Collect DNA samples from selected species for stock identification, and

6) Expand sampling in North Carolina and south Florida waters, as well as reconnoiter new live bottom areas with underwater video and trap cameras.

Fishery-independent measures of catch and effort with standard gear types are valuable for monitoring the status of stocks, interpreting fisheries landings data, providing data for stock assessments, and developing regulations for managing fish resources. These data are particularly valuable in light of the minimum sizes and quotas imposed on many species, which results in catches reflecting the demographics of a restricted subset of the population. Fishery-independent surveys are needed to assess the status of the stocks of fishes in highly restricted fisheries. This report presents the results of fishery-independent monitoring of relative fish abundance and size of 21 species (see Table 1) from the snapper-grouper management complex in the region. It also provides summaries of bottom and surface water temperature as measured during MARMAP sampling efforts.

Table 1. Species included in this report by family, common, and scientific name.
*: species not included in the SAFMC snapper grouper management complex.

Family /Common name	Scientific name
Serranidae	
Bank sea bass	*Centropristis ocyurus*
Black sea bass	*Centropristis striata*
Sand perch *	*Diplectrum formosum*
Speckled hind	*Epinephelus drummondhayi*
Red grouper	*Epinephelus morio*
Snowy grouper	*Epinephelus niveatus*
Gag	*Mycteroperca microlepis*
Scamp	*Mycteroperca phenax*
Lutjanidae	
Red snapper	*Lutjanus campechanus*
Vermilion snapper	*Rhomboplites aurorubens*
Haemulidae	
Tomtate	*Haemulon aurolineatum*
White grunt	*Haemulon plumieri*
Sparidae	
Knobbed porgy	*Calamus nodosus*
Spottail pinfish *	*Diplodus holbrookii*
Pinfish *	*Lagodon rhomboides*
Red porgy	*Pagrus pagrus*
Scup	*Stenotomus chrysops*
Balistidae	
Gray triggerfish	*Balistes capriscus*
Malacanthidae	
Golden tilefish	*Lopholatilus chamaeleonticeps*
Carangidae	
Greater amberjack	*Seriola dumerili*
Scorpaenidae	
Blackbelly rosefish *	*Helicolenus dactylopterus*

2. Methods

2.1. Collection of samples

Fish collections by MARMAP have been made using a variety of gear (MARMAP 2009), but in recent years three main gears were used to collect fish for the data summarized in this report; the chevron traps, and the short bottom long-line, and the long bottom long-line (Table 2). The chevron trap has been used for monitoring consistently since 1990. In 1988 and 1998, the chevron trap was used simultaneously with the blackfish and Florida trap (see below), and in 1990, use of the blackfish and Florida trap was ceased. MARMAP has collected oceanographic variables such as the temperature and salinity in the water column using a CTD while fish sampling gear was soaking. Sampling occurs from May through September of each year, with some additional surveys conducted in prior to and after these months The latter collections are not included in CPUE or temperature data. The sampling area is Cape Hatteras, North Carolina, to the St. Lucie area, Florida, but over the years, most sampling has occurred between Cape Lookout, NC, and Ft. Pierce, FL. In the first year of SEFIS sampling (2010), this program mostly concentrated on surveying new (red snapper) live bottom habitat off Georgia and Florida, and no SEFIS data are included in this report.

Table 2.
Number of gears deployments each year for each gear type during MARMAP sampling. This includes both randomly selected and reconnaissance stations. *: Years were not included in analyses as a consistent gear deployment strategy was not established yet. This table includes reconnaissance stations.

Year	Short bottom long-lines	Long bottom long-lines	Chevron traps	Florida Antillean traps	Blackfish traps
1977					21*
1978					90*
1979	8				312
1980				7	298
1981				121	348
1982		34		130	259
1983		34		165	432
1984		57		260	530
1985		45		260	372
1986		21		228	252
1987	2			354	180
1988			105*	105	105
1989			80*	80	80
1990			354		
1991			305		
1992			324		
1993			542		
1994			468		
1995			545		
1996	20	17	642		
1997	34	21	532		
1998	33	10	523		
1999	44	30	347		
2000	40	11	383		
2001	36	14	325		
2002	22	20	336		
2003	54	16	286		
2004	48	5	319		
2005	58	16	327		
2006	96	7	333		
2007	74	25	361		
2008	58		354		
2009	59	38	452		
2010	109	40	459		

2.1.1. Blackfish trap and Florida trap

Background

Blackfish and Florida traps were used by MARMAP from 1981 to 1989 (Collins 1990). In 1988 and 1989 the blackfish and Florida traps were use simultaneously with the chevron trap. During these two years, deployment was such that all traps were anchored to the vessel. Blackfish and Florida snapper traps were baited with cut clupeids and soaked for approximately two hours during daylight at 13 inshore study areas with known live-bottom and/or rocky ridges. In addition, four shelf edge areas off SC (~50 m depth) were also sampled with Florida traps. These traps have not been used for monitoring purposes since 1987. Data of these traps have been reported previously and were not included in the current analyses, but the descriptions of the gear are included as a reference.

Gear descriptions

Blackfish trap

Blackfish traps (Figure 1) are nearly cubic (0.6 m x 0.6 m x 0.5 m; 0.16 m^3 volume) and constructed of 38-mm (1.5-inch) octagonal mesh ("chicken wire") (Collins 1990, MARMAP 2009, SEFSC 2010). Each trap consisted of two entrances (0.13 m diameter, 0.09 m length) and one bait well (0.10 m diameter, 0.25 m length). Blackfish traps were used from 1977 to 1989, and later in 2004-2007 for a trap comparison study. Blackfish traps were baited with cut herrings (*Brevoortia* or *Alosa* spp., family Clupeidae), placed in the bait wells. Traps were deployed on buoyed lines (2 to a buoy or individually) usually separated by 30.5-m line, or tied off to an anchored vessel (1988 – 1989). Traps were generally set on live-bottom reef areas at depths < 50 m. Each trap soaked for approximately 90 minutes and was retrieved using a hydraulic pot hauler. During 1981-1987, blackfish traps baited with cut clupeids were soaked for approximately two hours during daylight at 13 inshore study areas with known live-bottom and/or rocky ridges.

Florida traps

Florida traps (Figure 1) are rectangular (0.9 m x 1.1 m x 0.6 m; 0.59 m^3 volume) and constructed of 38 x 51 mm (1.5 x 2.0 inch) plastic-coated wire mesh (Collins 1990, MARMAP 2009, SEFSC 2010). Each trap has one entrance and one bait well (0.13-m diameter, 0.6-m length). Florida Traps were used from 1980 through 1989, and later in 2004-2007 for a trap comparison study. They were baited with cut herrings (*Brevoortia* or *Alosa* spp., family Clupeidae) placed in the bait wells. Traps were deployed individually with 8-mm (5/16-inch) polypropylene line attached to a Hi-Flyer buoy (0980-1987) or tied off to an anchored vessel (1988-1989). Traps were generally set on live-bottom reef areas on the continental shelf and upper slope. Each trap soaked between 90 and 120 minutes and retrieved with a hydraulic pot hauler. During 1981 to 1987, Florida traps baited with cut clupeids were soaked for approximately two hours during daylight at 13 inshore study areas with known live-bottom and/or rocky ridges. Four shelf edge areas off SC (50-60 m depth) were also sampled with Florida traps.

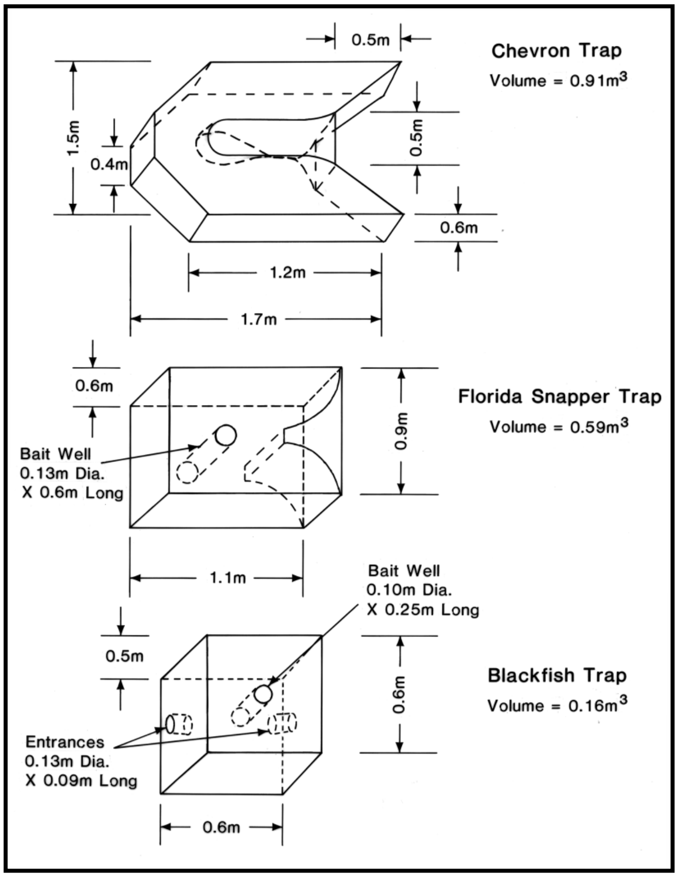


Figure 1. Diagrams of the three most frequently used traps by MARMAP (From Collins, 1990).

Figure 2. Chevron trap with camera mounted above trap opening.

2.1.2. Chevron traps

Background

MARMAP started using the chevron traps (Figure 1 and 2) in 1988. In 1988 and 1989, the chevron trap was used simultaneously with the blackfish and Florida trap (see above) and fished while anchored (tied) to the research vessel. In 1990, MARMAP started deploying the chevron traps in sets of up to six traps, each individually tethered to a buoy, while each trap was deployed no closer than 200m from another one. Since 1990, the Chevron trap is the only trap gear that has been deployed by MARMAP for routine monitoring of reef fish populations in the region. Chevron traps have been deployed at depths between 13 and 218m, but are generally used to a depth of about 100m. The vast majority of the deeper deployments were done in 1997. Each year, between 500 and 700 stations are randomly selected from over 2200 chevron trap stations currently in the MARMAP data base (Figure 3). Stations are selected for sampling each year such that no station is closer than 200 m to any other selected station. Depending on available sea days and weather constraints, MARMAP deploys 250 to 650 traps annually (Table 2). In recent years this gear has mostly been deployed from the *R/V Palmetto*.

Gear description

Chevron traps are arrowhead shaped (maximum dimensions of 1.5 m x 1.7 m x 0.6 m.; 0.91 m^3 volume) and constructed of 35 mm x 35 mm square mesh plastic-coated wire. Chevron traps had one entrance funnel ("horseneck"), and one release panel to remove the catch (Figures 1 and 2). Chevron traps have been used by MARMAP since 1988, with a consistent method of deployment since 1990. Due to the changes in deployment, the data from 1988 and 1989 are not used in the analyses presented in this report.

Chevron traps are baited with a combination of whole or cut clupeids, mostly menhaden (*Brevoortia* or *Alosa* spp., family Clupeidae). Bait is suspended on 4 stringers (approximately 4 menhaden per string) within the trap, and also placed loosely in the trap (approximately 8 additional menhaden). The traps are tethered individually using 8-mm (5/16 inch) polypropylene line to a polyball buoy and a Hi-Flyer buoy attached to a 10-m trailer line. Traps are generally set on live-bottom reef areas on the continental shelf and upper slope. The soak time is approximately 90 minutes. In general, up to six traps are fished at the same time and all are retrieved using a hydraulic pot-hauler.

Traps had still cameras attached (taking 1 picture per deployment) from 1990 through 1993. Each camera took to one picture (using film) while the trap was on the sea floor during each deployment. Starting in 2007, traps were outfitted with digital cameras taking one image per 5 minutes during deployment. In 2007 some traps had a camera, in 2008 roughly 50% of the traps had a camera, and starting in 2009, all traps had a camera attached. The cameras are mounted above the trap opening facing away from the trap opening (Figure 2). The cameras have provided information on habitat type, bottom conditions (e.g. visibility), trap behavior (e.g. movement of traps), and data for the development of additional indices of relative abundance. An example of the latter is the recent estimates of relative abundance for lionfish. Based on trap photos, MARMAP estimates an increase of CPUE (lionfish/trap photo series) from 0.067 in 2006-08, to 0.083 in 2009, and 0.189 in 2010. MARMAP will continue the development of indices based on still and video cameras in close cooperation with the SEFIS program.

2.1.3. Short bottom long-line

Background

With the exception of some trial deployments in 1979 and 1987, the currently used short bottom longline was initiated in 1996 to sample the snapper-grouper species in depths greater than 90 m and areas with considerable vertical relief. This gear replaced the Kali pole long-line gear, and used to be called "vertical long-line" by MARMAP, since it was commonly draped over vertical relief. This name was changed to short bottom long-line in 2009, following the Southeast Area Fisheries Independent Survey workshop (Williams and Carmichael, 2009) in Beaufort, NC, to avoid confusion with "true" vertical long-lines that fish with hooks off the bottom in the water column. Up to six short bottom long-lines are deployed at one time, with a minimum distance between sampling stations of 200 meters. This gear has been deployed in areas with rough bottom contours in order to follow the bottom profile, generally at depths greater than 90m on the outer shelf and continental slope. Annually, approximately 20-100 short bottom long-line stations are randomly sampled from the current 298 sampling stations present in the MARMAP database (Figure 3). In recent years, this gear has mostly been deployed from the *R/V Palmetto*, and the sampling season is the same as for the chevron traps: May through September.

Gear description

The short bottom long-line consists of 25.6 m of 6.4-mm diameter treated solid braid. Dacron (polyester) ground line dipped in green copper naphenate. Twenty gangions with non-offset circle hooks (almost exclusively #5 Eagle claw size, but in some years some

#7 were used) are placed approximately 1.2 m apart on the ground line, which was attached (brommeled) to polypropylene line and buoyed to the surface with polyball buoy and a trailer Hi-Flyer buoy. The line is deployed by stretching the groundline along the vessel's gunwale with 10-11 kg weights attached at each end of the line. The gangions consist of an AK snap, 0.5 m of 90 kg monofilament and a tuna circle hook, and are baited with a whole squid (*Illex* sp. or *Loligo* sp.). Soak time is approximately 90 minutes, and the gear is retrieved utilizing a pot hauler.

2.1.4. Long bottom long-line

Background

The long bottom long-line was initiated in the early 1980's to sample the snapper-grouper species in the tilefish grounds, which are characterized by areas of smooth mud. This gear type was traditionally called "horizontal long-line" by MARMAP, to contrast the "vertical long-line" that was used by the program. We recently adjusted the name of this gear to long bottom long-line to better capture the nature of this gear, and distinguish it from the short bottom long-line. Potential long-line sampling areas were identified from Kali pole surveys conducted during 1985 and 1986, by commercial and recreational fishermen, fathometer data, and previous exploratory surveys (Low et al., 1983). Sampling locations have been divided into sampling blocks based on the LORAN grid. LORAN numbers were converted to GPS coordinates in 2009, when the LORAN system was turned off. The gear is deployed at two locations within each block. Sampling is generally conducted from August through October using the *R/V Lady Lisa*. The number of successful deployments has varied over the years, mostly due to weather conditions and current speeds. Currents exceeding 2 knots can affect safe deployment and retrieval, as well as catchability, and sampling is generally halted at these current speeds. Based on information gathered in the early years of long bottom long-line deployments, a CTD casts was made prior to each long-line deployment. If the bottom temperature was below 9°C, no sampling was conducted and the vessel moved to a location in the appropriate habitat (depth range) with an expected higher bottom temperature. Below this temperature, tilefish was assumed not to demonstrate sufficient feeding activity for efficient sampling. Because of low (no) catches in the 2004 and 2005, in 2006 MARMAP started sampling tilefish habitat, even if the temperature was below 9°C. Incidental sampling indicated that golden tilefish could be collected even below this temperature, as long as the right (soft bottom) habitat at appropriate depths (between 150 and 250) meters was targeted. Best catches occurred generally between 200 and 230 meters. A detailed analysis of the effect of temperature and depth is not part of this report, but should be considered to possibly standardize CPUE for use in stock assessments.

Gear description

From 1982-1986, long bottom long-lines were constructed of 1,000 ft (approximately 305 m) of Dacron (polyester) line deployed from galvanized tubs ("tub trawl" method). From 1996 to current, long bottom longlines were constructed of 3.2-mm galvanized cable (1,525 m long), deployed from a longline reel with 1,220 m of cable used as ground line and the remaining 305 m buoyed to the surface. A 10-11 kg weight is attached to the groundline, dropped into the water, and 100 gangions (comprising of an AK snap, approximately 0.5 m of 90 kg monofilament and a tuna circle hook) are subsequently attached in 12 m intervals to the groundline. Another 10-11 kg weight is then attached at the terminal end of the ground line (buoy end) and the remaining 305 m of cable is buoyed to the surface with 1 or 2 polyball buoys and a Hi-Flyer buoy attached to a 10 m trailer line. From 1982 through 1987 hook sizes used were #5, #7 or #9; after 1996 the hook size was almost exclusively #5 (Eagle claw sizes). Hooks are baited with whole squid (*Illex* sp. or Loligo sp.). Long bottom long-lines are generally deployed while running with the current at a speed of 4-5 knots. Each line soaked for 90 minutes and was retrieved using a hydraulic pot hauler.

2.2. Oceanographic data

Prior to deploying long bottom long-lines or while traps or short bottom long-lines are soaking, oceanographic variables (mainly salinity and temperature) were determined using a CTD. From 1987 through 1992, an Applied Microsystem's STD-12 model CTD was employed which also collected dissolved oxygen values. From 1993 through the current sampling year (2009), Sea-Bird SBE-19 or SBE-25 models were used. The SBE-19 collected pressure, temperature, depth, and salinity, while the SBE-25 model was fitted with additional sensors for detecting dissolved oxygen and chlorophyll A. All CTD's are calibrated by authorized dealers/personnel according to the manufacturer's guidelines. CTD measurements are taken in the general area of a soaking set of gear, and exact latitude, longitude, and depths are recorded for each cast.

2.2. Sample processing and analysis

After collection, all fishes are sorted to species, weighed (total weight in gram, per species, per trap or long line), and all individual fish measured to the nearest mm. Fish lengths are measured in either total length (TL) or fork length (FL). Relative abundance analysis or catch per unit effort (CPUE) is completed using only the randomly selected stations that were fished between 45 and 150 minutes. No data from reconnaissance traps were included, and if a gear malfunctioned or the catch was mixed, that collection was not included either. Relative abundances are further delineated by depth ranges for each species (Table 3). Annual mean CPUE for traps was calculated by determining the number of fish of a specific species caught per trap hour, divided by the total number of traps deployed for that year (Equation 1). CPUE was calculated for each species separately and only “valid” trap collections (those with catch codes 0: no catch, 1: catch with finfish, and 2: catch with no finfish) were used.

Equation 1.

Annual mean CPUE’s for short and long bottom long-lines were calculated in a similar manner, but standardized for either 100 hooks (long bottom long-line) or 20 hooks (short bottom long-line).

Species mean length was calculated for each applicable gear using the same collections used in the CPUE calculations (see above). Historically, the main measurement type (TL or FL) for a species may have changed over time. If this was the case, the lengths were converted based on FL/TL conversion equations compiled from the MARMAP database

(Table 4).

2.3. Species and species specific analyses

CPUE and length analyses were based on subsets of the available data based on the depth distribution of the species. This was done to reduce the number of zero catches from locations outside the normal depth range of the species in question. The depth distribution was determined by the depth range at which the majority of the individuals were found and collected (see Tables 1 and 2).

2.4. Temperature

Mean sea surface and bottom temperature are provided for the entire area and by latitude. Data from the entire sampling season and all depth ranges were pooled. Data for the 2010 sampling season were not available at time of report completion.

Figure 3 (A-B).

A
Map of all MARMAP sampling stations sampled between 2000 and 2009. Note that each symbol may represent multiple sampling events, possible in multiple years.

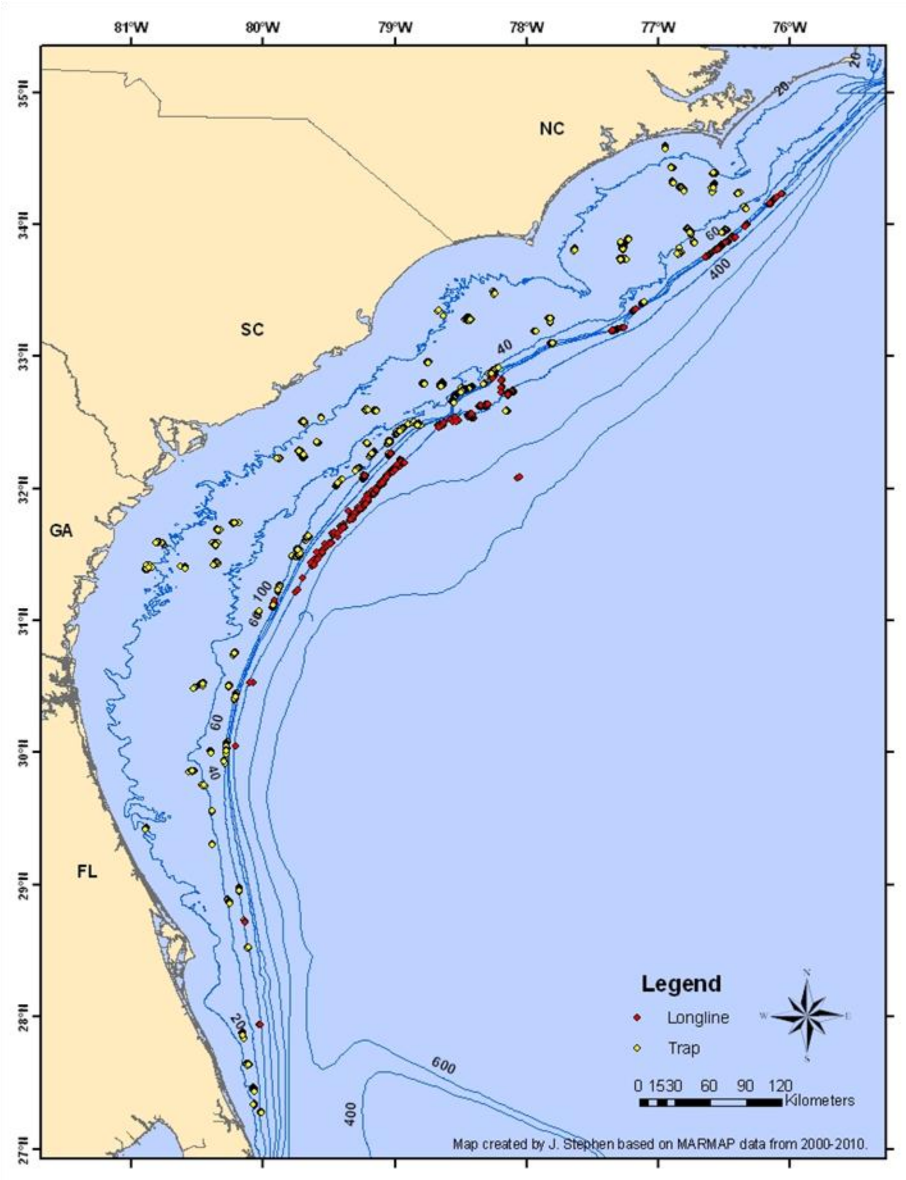
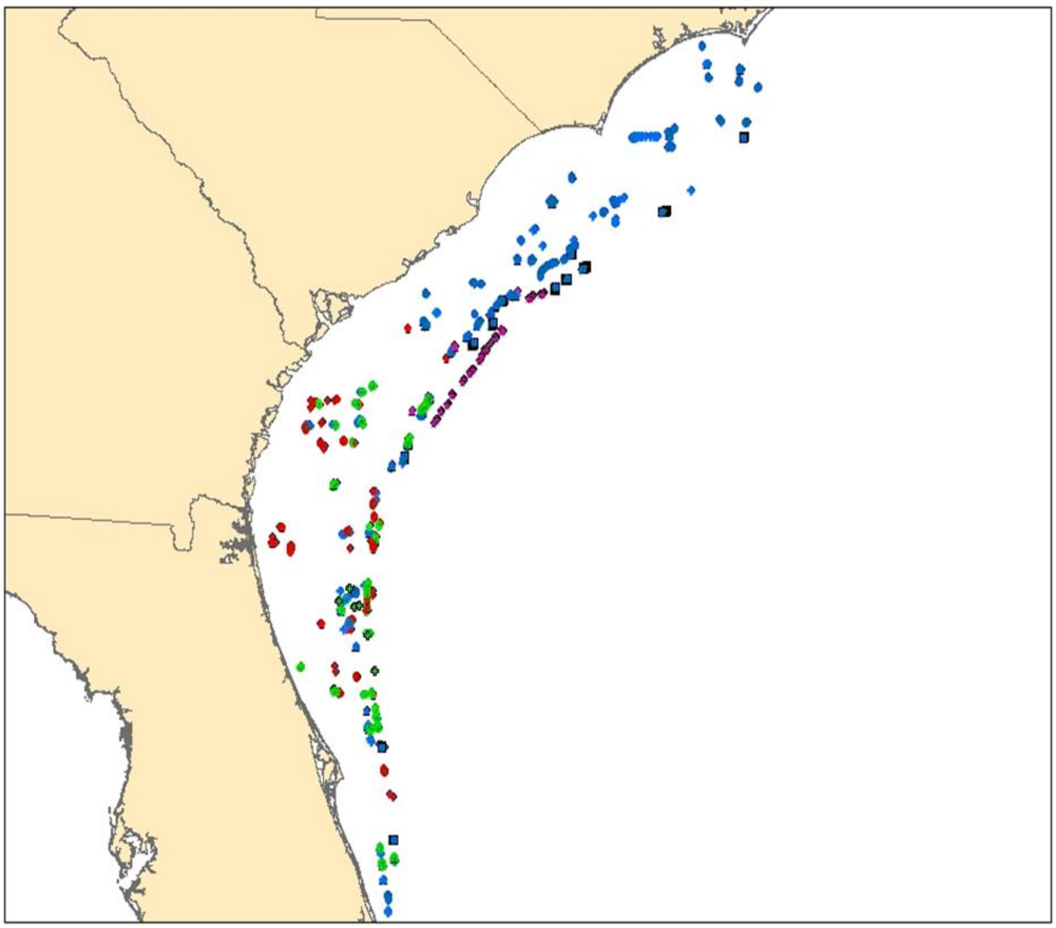


Figure 3, continued.

B

Map of sampling stations sampled in 2010 by MARMAP, SEAMAP Reef Fish and SEFIS programs. Blue symbols are locations sampled by the *R/V Palmetto* (chevron traps and short bottom long –lines), purple symbols are locations sampled by the *R/V Lady Lisa* (long bottom long-lines only), red symbols are locations sampled by the NOAA vessel *Nancy Foster* (chevron traps, and the green symbols represent the locations sampled by the *R/V Savannah* (traps only).



3. RESULTS

3.1. Chevron traps (CHV)

The 1988 and 1989 data (first two years of the survey) were eliminated from the chevron analyses due to low sample size and area coverage, and deployment strategy (anchored to vessel). In addition, note that 1990, the first year presented, was the year after hurricane Hugo struck the area. The spatial coverage and sampling season was limited as a logistical consequence of this storm. In 2009, 452 chevron traps, and in 2010, 459 chevron traps were sampled for monitoring purposes from Cape Lookout, NC, to Fort Pierce, FL. This is a considerable increase of traps deployments over an average of 337 (range 286 – 383) between 1999 and 2008. The chevron trap CPUE and mean length of collected specimens for the selected species (Table 1) are provided (Figure 4 A-P, and Table 5 A-S).

3.2 Short bottom long-line (VLL)

Some caveats to the data are that the 1996 and 1997 (first two years of the survey) were eliminated from the short long-line analyses due to low area coverage, and slight changes in the deployment strategy. In 2009, 59 short bottom long-lines, and in 2010, 109 short bottom long-lines were deployed for monitoring purposes from Cape Lookout, NC to Fort Pierce, FL. The efforts in 2010 represent a considerable increase in the number of long-line deployments from the average of 53 (range 22 – 96) between 1999 and 2009. However, the effort was close to the 96 deployments accomplished in 2006. The short bottom long-line CPUE of speckled hind, red grouper, snowy grouper, scamp, red porgy, greater amberjack, and blackbelly rosefish, the most common species collected with this gear, are provided in and Table 6 A-G, and data for snowy grouper and greater amberjack are also presented in Figure 5 A and B.

3.3. Long bottom long-line (HLL)

Some caveats to the data are that after deployment of the long bottom long-line gear in 1983 through 1986, there was a hiatus until 1996. Since 1996, annual sampling efforts have taken place, but the number of deployments has varied between 0 and 40 per year. As indicated above (gear section), a detailed analysis of the effect of temperature and depth on CPUE should be considered to possible standardize CPUE for use in stock assessments. In 2009, 38 long bottom long-lines, and in 2010, 40 long bottom long-lines were deployed for monitoring purposes (Table 3 and Figure 3). These efforts were a considerable increase from the average of 14 (range 0 – 30) long-lines deployed between 1999 and 2009. Note that in spite of gear deployments in 2004 and 2005, no golden tilefish were collected. Also, in 2008 we were unable to deploy any long bottom long-lines due to consistent bad weather as a result of several storms during the sampling season. In addition to CPUE and length information for golden tilefish (the target species, Table 7 A, and Figure 6), long bottom long-lines catches have also provided data for snowy grouper and black belly rosefish (Table 7 B and C).

3.4. Temperature

The 2010 data were not available at time of report completion. The pooled mean sea surface temperature over the entire MARMAP time series indicates an increase of several degrees since 1973 (Figure 7 A and B). The patterns seem to be the same for each of the latitudes (31°N, 32°N, and 33°N) for which MARMAP has the most consistent data. The sea surface salinity has generally remained the same, but a lower mean surface salinity was noted for 1989 through 1992 (Figure 7 A). We are currently investigating if potential equipment issues could explain lower salinity values. The mean pooled (location and season within each latitude) bottom temperatures in the 31°N, 32°N, and 33°N latitudes showed possibly decrease in mean bottom temperature over time and different patterns by latitude (Figure 7 C). The interannual variability seems to increase with decreasing latitude. The data indicate a very cold summer in the 31°N latitude in 1999, and possibly some other years. Catches may have been affected by temperature, which should be taken into account when interpreting CPUE and other data.

3.5. Species

The remainder of this section is a data summary for 21 species (Table 1) that are either collected in significant numbers in the MARMAP catches, or may be of specific interest due to fishing pressure and management issues (e.g. red snapper, speckled hind, gag). All but three species (sand perch, spottail pinfish, and pinfish) are included in the SAFMC snapper grouper management complex.

Bank sea bass ***Centropristis ocyurus*** (Table 5-A and Figure 4-A)

Bank sea bass is commonly collected in chevron traps by MARMAP. Between 1989 and 2008 the CPUE (depth range 0-59m) generally decreased from 1.5 to 0.5 fish/trap/hour, but the two terminal years (2009-2010) have shown an increase to close to 1.3 fish/trap/hour. The mean length was very variable with a slight increasing trend over the time series. A draft of a life history study on this species is being finalized.

Black sea bass ***Centropristis striata*** (Table 5-B and Figure 4-BA)

The black sea bass CPUE (depth range 0-39m) decreased from about 15 fish/trap/hr in 1989 to just above 5 in 1995. After 1995, black sea bass CPUE increased to 17 in 1999. For the next 7 years (2000-2006) black sea bass CPUE fluctuated, but remained above 9 fish/trap/hour. Note that the low CPUE's in 2002 and 2003 may have been temperature related. CPUE subsequently decreased from 16 in 2006 to 9 fish/trap/hour in 2009. The increase in the terminal year may be an encouraging sign for the population. The mean length (TL) gradually increased from just over 22cm to more than 26 cm (13%) over the time series. The increases in mean length may be a result of increased size limits (from 20.3 to 25.4 cm for commercial and recreational fisheries in 1999, (S/G Amendment 9), and to 30.5 cm in June, 2007). A standard stock assessment is (SEDAR 25, 2011) being conducted and a MARMAP data are provided to the Data Workshop and the Assessment Team.

Sand perch ***Diplectrum formosum*** (Table 5-C and Figure 4-C)

Sand perch is the only simultaneous hermaphroditic species included in this report. It is not managed under the SAFMC snapper grouper complex FMP, and the SAB stock has not been assessed. A comprehensive life history study was completed in 2005 (Bubley and Pashuk, 2010). Sand perch is commonly caught in the chevron traps and the CPUE has been somewhat variable, but the over-all levels have remained fairly stable around 0.5 fish/trap/fish over the chevron trap time series. The mean length (FL) gradually increased by 1cm (5%) over time series.

Speckled hind ***Epinephelus drummondhayi*** (Table 5-D and 6-A)

A comprehensive study on speckled hind was completed in 2008 (Ziskin et al., 2011). Speckled hind are collected by MARMAP in chevron traps (depth range 40-109m) and on the short long line in very low numbers, and as a result CPUE trends have a very high level of uncertainty and no figure with CPUE's is provided. The recent efforts to increase fishery independent sampling (SEAMAP Reef Fish and SEFIS) may provide additional data to develop a more reliable index of relative abundance.

Red grouper ***Epinephelus morio*** (Tables 5-E and 6-B, and Figure 4-D)

A red grouper SEDAR (19) stock assessment was completed in 2010 and MARMAP data was provided and included in this assessment. Red grouper relative abundances from chevron trap collections were relatively low for all sampling years (<0.1 fish/trap/hour). CPUE values gradually increased from about 0.01 fish/trap/hr in the early years of the time series to near 0.10 between 2001 and 2006, followed by a steady decline in the years following with a slight increase in the terminal year (2010). Although in very low numbers, red groupers are also collected on the short bottom long line, the general CPUE trend seems consistent with the chevron traps data. Mean length (TL) of red grouper caught in chevron traps has fluctuated since 1990, with a gradual increase of about 8cm or 15%. The variability may be more due to the low annual sample sizes of red grouper (n

= 3 to 78 fish), then any actual fluctuations in the population mean length. The recent efforts to increase fishery independent sampling (SEAMAP Reef Fish and SEFIS) may provide additional data to reduce variability in the relative abundance estimates.

Snowy grouper ***Epinephelus niveatus***

(Tables 5-F, 6-C, and 7-A, and Figures 4-E, and 5-A)

Snowy grouper is one of the few species that is caught regularly, but in low numbers, by all three current MARMAP gears. Relative abundance of snowy grouper in chevron traps (depth range 50-199m) generally has been variable and relatively low (0-0.32 fish/trap/hr). CPUE peaked at 0.53 fish/trap/hr in 2001, and since then declined to levels seen prior to this peak year. A slight increase in the two terminal years may be encouraging. Mean length (TL) for snowy grouper has remained constant, although in the last few years it has become more variable. Some of this variation may be due to the low sample sizes, often less than 20 fish/yr are caught. Snowy grouper is also consistently caught on the short bottom long-line. The general CPUE trend seems to be consistent with the trap catches. However, the high CPUE value in 2008 is contrasted with a relatively low CPUE in the traps. The recent efforts to increase fishery independent sampling (SEAMAP Reef Fish and SEFIS) may provide additional data to reduce the variability in the CPUE estimates. A snowy grouper SEDAR stock assessment is scheduled for 2013, and MARMAP is currently updating the life history information using supplemental fishery dependent specimen collections.

Gag ***Mycteroperca microlepis*** (Table 5-G and Figure 4-F)

Gag are collected in very low numbers in the chevron traps, and occasionally on the short bottom long-line. The CPUE in chevron traps (depth range 0-69m) has seen a steady decline over the length of the time series, with an increase in the two most recent years. The mean length (TL) was extremely variable from year to year (27-110 cm), but there seemed to have been an increase from 1990 through 1997, followed by a drop in mean length. Mean length was only calculated if more than 3 fish were collected in a given year. For both the CPUE and mean length the low number of fish collected each year needs to be taken into account. A standard SEDAR stock assessment is scheduled for 2013. The recent efforts to increase fishery independent sampling (SEAMAP Reef Fish and SEFIS) may provide additional data to develop a more reliable index of relative abundance.

Scamp ***Mycteroperca phenax*** (Tables 5-H and 6-D, and Figure 4-G)

Scamp is one of the groupers encountered the most in MARMAP catches. Scamp relative abundance from chevron trap collections (all depths) show a decreasing trend over time. However, between 1990 and 2007, CPUE was mostly between 0.10 and 0.15 fish/trap/hr, with peaks in 1994 (0.17) and 1997 (0.22), and low values in 1996 (0.09), 2002 (0.07), and 2006 (0.04). Of concern is the consistently low CPUE between 0.02 and 0.03 in the three terminal years of the time series (2008-2010). Scamp are also collected on the short bottom long-long, in particular with the increase in short long line collections since 1999. Long-line CPUE declined since 2001, but the variability in the data is high. Based on chevron trap data, scamp mean length (FL) showed a slowly decreasing trend from 1991 through 2003, but in recent years, mean lengths have increased. Scamp are seen often in the trap photos, and this technique may provide a tool to development an index of relative abundance based on trap photographs and/or video, and may provide additional information for stock assessments. Also, the increase in fishery independent monitoring efforts through SEAMAP Reef fish and SEFIS is expected to significantly increase scamp collections, possibly reducing the variability in the data. A SEDAR benchmark assessment for scamp is scheduled for 2013.

Red snapper ***Lutjanus campechanus*** (Table 5-I)

Red snapper has been collected in very low numbers in MARMAP catches, but is included because of the results of recent SEDAR stock assessments and resulting management regulations. Possible trends in MARMAP data are not very relevant due to the high variability as a result of the low catch numbers, and a figure is not provided in this report. As a result of the low encounter rate, MARMAP CPUE data has not been included in the stock assessments. Based on preliminary results of the 2010 sampling season, the increase in fishery independent monitoring efforts through SEAMAP Reef fish and SEFIS is expected to significantly increase red snapper collections, and reduce variability in the data. A SEDAR update assessment for red snapper is scheduled for 2013.

Vermilion snapper ***Rhomboplites aurorubens*** (Table 5-J and Figure 4-H)

Vermilion snapper is collected frequently and consistently by MARMAP throughout the time series. Since 1991, the CPUE (depth range 20-59m) of vermilion snapper in chevron traps fluctuated, with the highest values in 1991 (7.66 fish/trap /hour) and relatively low CPUE's since 2003. The relatively low CPUE of 1.54 fish/trap/hr in 1990 is probably a result of the limited sampling season and coverage in that year as a result of hurricane Hugo that impacted the Charleston area (MARMAP home base) the year before. It appears that years with lower relative abundances of vermilion snapper (e.g. 1998, 1999, and 2003) coincide with lower bottom temperatures. For instance, CPUE dramatically dropped in 2003, from 4 fish/trap/hr to less than 0.5 fish/trap/hr. Commercial fishermen reported low catches in these years also. Changes in regulations over the years may have affected the CPUE of this species. In 2000, CPUE increased to close to 4 fish/trap/hr, followed by a decline to the lowest CPUE's in the time series in 2003 to 0.43 fish/trap/hr. Since 2003, CPUE gradually increased, with an exception of the terminal year of the time series. The mean length of vermilion snapper showed a considerable increase of 28% over the time series, from less than 22cm FL in the early 1990's, to more than 27cm in 2010. An update assessment for vermilion snapper is scheduled for 2011.

Tomtate ***Haemulon aurolineatum*** (Table 5-K and Figure 4-I)

Tomtate is abundant in the MARMAP chevron traps catches. CPUE (depth rage 0-49m) decreased considerably over the time series. However, between 1999 through 2002, CPUE increased to more than 10 fish/trap/hr. CPUE subsequently decreased to around 5 fish/trap/hr, but the most recent three years show a decreasing trend to 3.30 fish/trap/hr in 2010. Tomtate mean length has varied, but overall increased less than 1cm (<5%) over the time series.

White grunt ***Haemulon plumieri*** (Table 5-L and Figure 4-J)

White grunt CPUE (depth range 20-59m) in the chevron traps decreased from a high of 1.16 fish/trap/hr in the early years of the time series, to 0.23 fish/trap/hr in 1997. In the following years, the abundance increased to return to peak levels of the early 1990's (>1.0 fish/trap/hr). The low CPUE in 2003 is possibly a result of the cold water temperatures in that year. Since 2004, CPUE's dropped to 0.3 fish/trap/hr or less, comparable to levels seen between 1996 and 1999. Note that the CPUE in 2010 (0.12 fish/trap/hr) was the lowest of the time series, and the consistently low CPUE's in the recent 6 years of the time series are of concern. Average lengths in chevron traps showed some fluctuations, and increased slightly over time.

Knobbed porgy ***Calamus nodosus*** (Table 5-M and Figure 4-K)

Knobbed porgy CPUE (depth range 0-59m) in chevron traps appeared to be cyclic, but shows a steady overall decrease over the time series, with lowest values in the terminal years. As with white grunt, the low CPUE in 2003 is possibly a result of the cold water temperatures in that year. The relatively low CPUE of 0.09 fish/trap/hr in 1990 is probably a result of the limited sampling season and coverage in that year as a result of hurricane Hugo that impacted the Charleston area (MARMAP home base) the year before. Mean length of knobbed porgy in chevron traps has been variable, but shows a general increase from 27 to 32 cm (10%). The new fishery independent sampling efforts will probably result in a considerable increase in the data for knobbed porgy.

Spottail pinfish ***Diplodus holbrookii*** (Table 5-N and Figure 4-L)

Annual CPUE (depth range 0-39m) of spottail pinfish in chevron traps started with a peak CPUE of 0.97 fish/trap/hour in 1990, but then decreased to values below 0.5 fish/trap/hr, with relatively high variability for the remaining years. CPUE dropped to an all time low in 2006 (0.05 fish/trap/hr) and has only increased slightly since. Mean length (FL) of spottail pinfish was highly variable during the time series, but showed a 2 cm (10%) increase in length over time.

Pinfish ***Lagodon rhomboides*** (Table 5-O and Figure 4-M)

The CPUE (depth range 0-39m) have been very cyclical with peaks and lows approximately every 4 years. Overall, since 1997, both the peaks and lows have steadily declined with time. There are some indications that there is a correlation between the CPUE and sampling depth and effort. The mean length has been variable over the years with no clear increase or decrease.

Red porgy ***Pagrus pagrus*** (Tables 5-P and 6-E, and Figure 4-N)

Red porgy is collected by both the MARMAP chevron traps and the short bottom long-line, be it in low numbers by the latter. Red porgy is collected frequently in the MARMAP chevron traps, but the trap CPUE (all depths) has varied greatly over the years. Some of this variability is probably explained by management actions, such as the 1999/2000 moratorium. CPUE increased since 1997 to 2007 to about 2.3 fish/trap/hr, in spite of some years (2002, 2003, and 2006) with relatively low CPUE's. The relatively low CPUE values around 1 fish/trap/hr in the three terminal years (2008-2010) may be cause for concern. The CPUE data for the short bottom long line may not be very relevant due to the low catches and resulting high variability in the data. The mean length (FL) of red porgy collected in chevron traps shows an increase in mean size of almost 5 cm (15%) over the times series. Mean red porgy length collected by the short bottom long-line gear was larger than in the traps, as long-lines are often fished in deeper waters. A SEDAR update assessment is scheduled for red porgy for 2011.

Scup ***Stenotomus chrysops*** (Table 5-Q and Figure 4-O)

Scup is one of the most abundant species in the MARMAP catches. Scup CPUE (depth range 10-39m) in chevron traps varied between 3.67 fish/trap/hr in 2009, to 21.04 fish/trap/hr in 2003. From 1993 through 2003, CPUE increased with the exception of low catches in 2002. Since 2003, CPUE declined to the lowest level in the time series in 2009, with a subsequent increase in the terminal year. The mean length of scup in chevron traps has increased by 2cm (13%) over the time series.

Gray triggerfish ***Balistes capriscus*** (Table 5-R and Figure 4-P)

The MARMAP chevron trap CPUE (depth range 0-59m) for gray triggerfish has varied greatly over time, from a low of 0.15 fish/trap/hr in 2003, a year with relatively cold bottom temperatures, to 1.01 fish/trap/hr in 1997. The very low CPUE of 0.12 fish/trap/hr in 1990 is probably a result of the limited sampling season and coverage in that year as a result of hurricane Hugo the year before. In spite of the variability, it seems that there may be a decrease in relative abundance since 1997 (the peak year), with catches in 2010 at one of the lowest levels in the time series. Gray triggerfish average length (FL) is variable, but has increased about 5 cm (15%) since the early 1990's. A SEDAR benchmark assessment is scheduled for 2015 (possible moved to 2011).

Golden tilefish ***Lopholatilus chamaeleonticeps*** (Table 7-B and Figure 6)

Tilefish is predominantly collected on the MARMAP long bottom long-line. Slight changes in the sampling procedure (see text above) may have affected the catchability, and further analysis of depth and temperature on CPUE values is recommended for proper interpretation of the data. Note that the red line in figure 6 is the mean depth the of all lines deployed in a particular year (and not mean length as in the other figures). In the 1980's, tilefish CPUE was around 0.6 and 1.5 fish/100hooks/hr. In the late 1990's, this CPUE increased to just over 3 fish/100hooks/hr in 1997 and 1999, followed by a drop to very low levels in the mid-2000's. In the most recent years, the CPUE reached highest values in the time series. Note that no sampling was conducted in 2008, due to protracted inclement weather as a result of several storms during the sampling season. Tilefish mean length (FL) decreased in the early years (1983-1986), and gradually increased from 47cm in 1996, to the largest sizes in the time series of 72 and 73 cm in 2009 and 2010 respectively.

Greater amberjack ***Seriola dumerili*** (Tables 5-S and 6-F, and Figure 5-B)

MARMAP collects greater amberjack by both chevron trap and short bottom long-line but CPUE (all depths) of greater amberjacks have been consistently low (<0.02 fish/trap/hr or ≤0.17 fish/20 hooks/hr). The variability in the CPUE and length data is high for greater amberjack, probably due to the low sample sizes.

Blackbelly rosefish *Helicolenus dactylopterus* (Tables 6-G and 7-C)

Blackbelly rosefish has been sporadically collected over time on the short and long bottom long-lines. From 2000 to 2007, no blackbelly rosefish were captured on long bottom long-line, but they were encountered on the short bottom long-lines during several of these years.

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Table 3.
Depth ranges at which the vast majority of individuals of various species is found (data through 2009). These ranges were used for CPUE and length analyses in this report.

Species	Gear(s)	Depth Range	% of fish
Black sea bass	Blackfish trap	0 – 39 m	89%
	Florida Antillean trap	0 – 39 m	77%
	Chevron trap	0 – 39 m	96%
Tomtate	Blackfish trap	0 – 49 m	100%
	Florida Antillean trap	0 – 49 m	100%
	Chevron trap	0 – 49 m	100%
Bank sea bass	Blackfish trap	0 – 59 m	100%
	Florida Antillean trap	0 – 59 m	98%
	Chevron trap	0 – 59 m	96%
Scup	Blackfish trap	10 – 39 m	100%
	Florida Antillean trap	10 – 39 m	99%
	Chevron trap	10 – 39 m	97%
Knobbed Porgy	Florida Antillean trap	0 – 59 m	100%
	Chevron trap	0 – 59 m	99%
Vermilion snapper	Blackfish trap	20 – 59 m	100%
	Florida Antillean trap	20 – 59 m	99%
	Chevron trap	20 – 59 m	100%
White grunt	Blackfish trap	20 – 59 m	100%
	Florida Antillean trap	20 – 59 m	100%
	Chevron trap	20 – 59 m	100%
Gray triggerfish	Chevron	0 – 59 m	98%
Gag	Chevron	0 – 69 m	98%
Red snapper	Chevron	0 – 59 m	96%
Red Porgy	Blackfish trap	20 – 79 m	100%
	Florida Antillean trap	20 – 79 m	100%
	Chevron trap	20 – 79 m	96%
Red Grouper	Chevron	All depths	100%
	Short bottom longline	All depths	100%
Scamp	Chevron	All depths	100%
	Short bottom longline	All depths	100%
Greater amberjack	Chevron	All depths	100%
	Short bottom longline	All depths	100%
Snowy grouper	Chevron	50 – 199 m	100%
	Short bottom longline	50 – 199 m	99%
	Long bottom longline	50 – 199 m	88%
Speckled Hind	Chevron	40 – 109 m	100%
	Short bottom longline	40 – 109 m	95%
Tilefish	Long bottom longline	All depths	100%
Blackbelly rosefish	Short bottom longline	All depths	100%
	Long bottom longline	All depths	100%

Table 3. continued

Species	Gear(s)	Depth Range	% of fish
Sand Perch	Blackfish trap	0 – 49 m	100%
	Florida Antillean trap	0 – 49 m	99%
	Chevron trap	0 – 49 m	100%
Spottail pinfish	Blackfish trap	0 – 39 m	100%
	Florida Antillean trap	0 – 39 m	98%
	Chevron trap	0 – 39 m	98%
Pinfish	Blackfish trap	0 – 39 m	99%
	Florida Antillean trap	0 – 39 m	99%
	Chevron trap	0 – 39 m	97%

Table 4.

Length-length conversion equations by species. All conversions are taken based on information from the MARMAP database (1973-2009). TL: total length (cm). FL: fork length (cm). AL: Analysis Length, indicating the type of length (TL or FL) that was used in analyses in this report. Equation: linear regression with N=number of specimens used in analysis, and r^2 the coefficient of determination.

Species		**AL**	**Equation**	**N**	**r^2**
Blackbelly rosefish	*Helicolenus dactylopterus*	TL	TL = 1.0296*FL + 1.2955	2,201	0.9960
Gag	*Mycteroperca microlepis*	TL	TL = 1.0354*FL - 0.3959	3,630	0.9973
Gray triggerfish	*Balistes capriscus*	FL	FL = 0.8001*TL + 24.493	7,883	0.9662
Greater amberjack	*Seriola dumerili*	FL	FL = 0.8882*TL - 16.678	1,851	0.9738
Knobbed porgy	*Calamus nodosus*	FL	FL = 0.904*TL - 11.7890	1,571	0.9830
Red grouper	*Epinephelus morio*	TL	TL = 1.0545*FL - 7.9845	1,475	0.9967
Red porgy	*Pagrus pagrus*	FL	FL = 0.8740*TL - 3.3694	23,756	0.9930
Red snapper	*Lutjanus campechanus*	FL	FL = 0.9347*TL - 0.1308	1,527	0.9981
Sand perch	*Diplectrum formosum*	FL	FL = 0.8783*TL - 0.7358	1,346	0.9721
Scamp	*Mycteroperca phenax*	FL	FL = 0.8793*TL + 22.919	4,233	0.9899
Scup	*Stenotomus chrysops*	FL	FL = 0.8410*TL + 5.0558	145	0.9895
Snowy grouper	*Epinephelus niveatus*	TL	TL = 1.0111*FL - 3.1989	708	0.9992
Speckled hind	*Epinephelus drummondhayi*	TL	TL = 1.0175*FL + 2.1960	997	0.9980
Spottail pinfish	*Diplodus holbrookii*	FL	FL = 0.9007*TL - 4.9961	21	0.9870
Tilefish	*Lopholatilus chamaeleonticeps*	FL	FL = 0.9206*TL + 15.513	3,526	0.9958
Tomtate	*Haemulon aurolineatum*	FL	FL = 0.8874*TL - 3.9100	4,803	0.9826
Vermilion snapper	*Rhomboplites aurorubens*	FL	FL = 0.8948*TL + 1.2769	18,587	0.9962
White grunt	*Haemulon plumeri*	FL	FL = 0.8928*TL - 1.6509	5,749	0.9940

Table 5 A-S.

Catch per unit effort (CPUE) of Chevron trap (MARMAP gear code 324) catches for various species. CPUE was calculated for traps in a species specific depth range (see text). Depth: Average depth (m) of all traps deployed at the selected depth range (irrespective of catching the species in question). Valid Coll.: Number of collection in selected depth range with a duration of 45 to 150 minutes and catch code of 0 (nothing caught in trap), 1 (catch with finfish, but not necessarily selected species), and 2 (catch without finfish). CPUE: mean number of individual fish of selected species/trap/hr. Biom.CPUE: average total weight (grams) of select species/trap/hr. SD: Standard deviation. SE: Standard error. Length: Mean total length (TL) or fork length (FL) in cm.

Table 5. Cont'd

A Bank sea bass

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1988	34	99	2.08	4.23	0.42	420	950	96	23.5	3.4	0.2
1989	37	76	1.01	1.57	0.18	157	246	28	22.6	3.0	0.3
1990	33	344	1.54	3.72	0.20	256	634	34	23.5	3.4	0.1
1991	34	296	1.34	2.66	0.15	179	366	21	21.7	2.5	0.1
1992	34	313	0.92	1.97	0.11	132	293	17	22.5	2.9	0.1
1993	35	405	1.01	2.48	0.12	165	436	22	21.8	2.5	0.1
1994	36	445	1.03	2.29	0.11	155	352	17	22.0	2.8	0.1
1995	32	522	0.67	1.90	0.08	94	269	12	21.4	2.8	0.1
1996	36	432	1.29	3.59	0.17	197	542	26	22.3	2.7	0.1
1997	37	411	1.11	2.35	0.12	177	375	18	22.4	2.9	0.1
1998	37	453	0.68	2.19	0.10	96	302	14	21.6	2.8	0.1
1999	34	249	0.80	1.87	0.12	139	327	21	22.1	3.1	0.2
2000	34	307	0.74	1.76	0.10	103	240	14	21.5	2.6	0.1
2001	36	233	0.64	1.71	0.11	100	290	19	22.8	2.8	0.2
2002	32	233	0.34	0.87	0.06	50	125	8	22.0	2.5	0.2
2003	38	209	0.84	2.14	0.15	130	316	22	22.3	2.7	0.2
2004	36	246	0.49	1.16	0.07	93	245	16	23.1	3.6	0.3
2005	37	283	0.56	1.51	0.09	89	244	14	22.2	2.6	0.2
2006	35	274	0.48	1.52	0.09	77	250	15	22.4	2.6	0.2
2007	36	301	0.46	1.22	0.07	72	188	11	22.4	3.0	0.2
2008	36	290	0.50	1.47	0.09	74	201	12	21.7	2.7	0.2
2009	33	371	0.92	2.39	0.12	167	421	22	22.2	2.8	0.1
2010	33	343	1.29	4.31	0.23	232	720	39	23.2	3.0	0.1

Table 5. Cont'd

B **Black sea bass**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1988	27	65	13.05	12.69	1.57	2736	2735	339	22.1	4.1	0.1
1989	28	44	13.92	19.76	2.98	2567	3639	549	22.6	4.3	0.2
1990	27	243	15.34	16.78	1.08	2848	2968	190	22.9	4.6	0.1
1991	28	218	12.73	15.07	1.02	2173	2584	175	22.3	4.0	0.1
1992	29	238	11.29	15.37	1.00	2185	2858	185	23.2	4.6	0.1
1993	27	271	6.94	9.02	0.55	1311	1642	100	22.7	4.2	0.1
1994	27	279	7.32	11.87	0.71	1424	2153	129	23.1	4.5	0.1
1995	25	395	5.33	9.43	0.47	919	1606	81	21.5	4.4	0.1
1996	29	275	7.41	12.12	0.73	1547	2459	148	23.5	4.3	0.1
1997	28	240	9.99	14.76	0.95	2101	3035	196	23.2	4.5	0.1
1998	28	270	10.18	14.69	0.89	1871	2621	160	22.5	4.4	0.1
1999	25	152	17.12	24.84	2.01	3321	4643	377	23.0	4.2	0.1
2000	26	187	13.85	22.25	1.63	2506	3856	282	23.4	4.1	0.1
2001	26	127	16.98	26.39	2.34	3335	5111	454	23.2	4.1	0.1
2002	25	160	9.19	14.50	1.15	1766	2802	222	22.9	3.8	0.1
2003	27	96	11.45	15.24	1.56	2496	3403	347	24.0	3.8	0.1
2004	27	138	18.37	28.56	2.43	3494	5653	481	24.5	4.8	0.1
2005	28	164	12.24	19.89	1.55	2636	4380	342	24.3	4.4	0.1
2006	26	161	16.35	27.39	2.16	2269	4274	337	24.3	3.8	0.1
2007	26	172	11.40	19.15	1.46	2011	3955	302	23.8	4.2	0.1
2008	27	161	9.93	14.48	1.14	2098	2995	236	23.9	4.3	0.1
2009	26	245	9.06	16.26	1.04	2279	3974	254	24.9	4.5	0.1
2010	26	225	13.28	20.26	1.35	3798	5429	362	26.2	4.7	0.1

Table 5. Cont'd

C Sand perch

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	31	83	0.06	0.23	0.03	8	35	4	20.4	2.8	1.2
1989	34	64	0.43	0.98	0.12	75	173	22	22.7	0.9	0.2
1990	32	326	0.48	1.44	0.08	79	245	14	21.7	1.2	0.1
1991	31	255	0.89	1.97	0.12	149	343	21	22.4	1.3	0.1
1992	32	281	1.26	2.16	0.13	230	399	24	22.4	1.1	0.0
1993	31	333	0.53	1.19	0.07	105	245	13	22.5	1.3	0.1
1994	31	343	0.75	1.49	0.08	139	283	15	22.8	1.5	0.1
1995	28	438	0.27	0.74	0.04	46	130	6	21.6	1.8	0.1
1996	32	345	0.62	1.49	0.08	119	299	16	22.8	1.8	0.1
1997	33	325	0.52	1.12	0.06	107	231	13	23.2	1.6	0.1
1998	32	343	0.49	1.43	0.08	100	321	17	23.2	1.8	0.1
1999	32	221	0.80	2.20	0.15	159	437	29	22.6	1.6	0.1
2000	32	273	0.55	1.60	0.10	108	317	19	22.8	1.6	0.1
2001	33	202	0.65	1.61	0.11	125	319	22	23.4	1.7	0.1
2002	30	209	0.27	0.72	0.05	55	143	10	22.5	2.2	0.2
2003	34	163	0.74	1.77	0.14	150	376	29	23.2	1.4	0.1
2004	33	217	0.51	1.29	0.09	102	254	17	22.8	1.4	0.1
2005	34	245	0.90	2.09	0.13	188	442	28	23.4	1.4	0.1
2006	33	248	0.39	0.88	0.06	79	180	11	23.4	1.7	0.1
2007	33	259	0.42	1.30	0.08	83	254	16	23.1	1.6	0.1
2008	34	252	0.53	1.38	0.09	106	276	17	23.2	1.5	0.1
2009	31	338	0.54	1.51	0.08	111	305	17	22.8	1.6	0.1
2010	32	317	0.57	1.45	0.08	116	301	17	23.5	1.3	0.1

Table 5. Cont'd

D Speckled hind

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE
1988	49	34	0.00			0		
1989	50	35	0.00			0		
1990	49	107	0.025	0.11	0.01	22	140	14
1991	52	81	0.007	0.06	0.01	10	93	10
1992	50	77	0.025	0.16	0.02	58	359	41
1993	51	139	0.024	0.14	0.01	15	119	10
1994	53	175	0.013	0.13	0.01	11	133	10
1995	51	128	0.000			0		
1996	54	179	0.017	0.11	0.01	14	102	8
1997	53	200	0.026	0.16	0.01	33	200	14
1998	55	248	0.012	0.08	0.01	33	298	19
1999	49	101	0.030	0.13	0.01	35	193	19
2000	53	138	0.076	0.34	0.03	88	435	37
2001	52	121	0.035	0.18	0.02	34	227	21
2002	51	80	0.086	0.27	0.03	105	332	37
2003	51	122	0.030	0.19	0.02	45	370	33
2004	52	133	0.013	0.11	0.01	8	70	6
2005	51	139	0.008	0.10	0.01	15	182	15
2006	52	135	0.000			0		
2007	52	154	0.034	0.27	0.02	30	238	19
2008	50	142	0.004	0.05	0.00	38	450	38
2009	52	157	0.000			0		
2010	52	144	0.000			0		

Table 5. Cont'd.

E Red grouper

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1988	34	99	0.01	0.10	0.01	8	84	8	38.0		
1989	38	79	0.00	0.00	0.00			0			
1990	34	350	0.00	0.05	0.00	15	176	9	56.7	13.8	8.0
1991	35	299	0.01	0.07	0.00	12	125	7	44.0	15.2	7.6
1992	34	315	0.03	0.29	0.02	55	570	32	44.2	12.8	3.0
1993	35	410	0.03	0.31	0.02	43	373	18	42.4	9.3	2.1
1994	37	454	0.04	0.30	0.01	68	498	23	48.8	3.6	0.7
1995	32	523	0.01	0.11	0.00	36	347	15	59.1	5.5	1.8
1996	39	454	0.01	0.09	0.00	47	471	22	56.6	16.2	5.4
1997	42	446	0.03	0.20	0.01	80	576	27	50.7	11.3	2.5
1998	41	518	0.09	0.48	0.02	196	1044	46	50.7	7.7	0.9
1999	34	253	0.06	0.28	0.02	221	910	57	58.2	8.4	1.6
2000	37	325	0.06	0.28	0.02	246	1167	65	65.1	6.7	1.1
2001	38	248	0.08	0.38	0.02	185	927	59	50.6	13.6	2.4
2002	33	240	0.10	0.41	0.03	244	988	64	51.0	10.2	1.7
2003	40	218	0.08	0.30	0.02	177	779	53	49.6	11.7	2.2
2004	39	271	0.09	0.41	0.03	154	780	47	43.8	12.4	2.0
2005	38	303	0.06	0.20	0.01	160	712	41	54.1	12.7	2.4
2006	38	296	0.09	0.57	0.03	242	1446	84	52.4	10.6	1.6
2007	38	326	0.08	0.45	0.03	206	1037	57	54.1	11.0	1.7
2008	38	303	0.05	0.30	0.02	206	1158	67	63.4	7.7	1.6
2009	36	402	0.03	0.13	0.01	115	616	31	63.5	10.9	2.6
2010	36	369	0.04	0.19	0.01	127	771	40	54.1	14.4	3.1

Table 5. Cont'd

F Snowy grouper

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1988	52	16	0.00	0.00	0.00			0			
1989	56	15	0.00	0.00	0.00			0			
1990	59	24	0.14	0.49	0.10	224	829	169	47.3	5.1	2.1
1991	55	44	0.02	0.15	0.02	19	126	19	41.0		
1992	53	34	0.00	0.00	0.00			0			
1993	54	77	0.13	0.74	0.08	199	1161	132	44.7	10.0	2.3
1994	55	111	0.32	1.34	0.13	454	1916	182	44.2	10.6	1.4
1995	52	85	0.00	0.00	0.00			0			
1996	59	109	0.25	0.74	0.07	537	2100	201	45.0	9.6	1.4
1997	60	116	0.23	0.91	0.08	329	1410	131	44.1	10.3	1.5
1998	59	175	0.06	0.32	0.02	81	445	34	44.3	10.0	2.2
1999	54	32	0.07	0.21	0.04	86	337	60	41.7	11.0	6.4
2000	64	52	0.04	0.23	0.03	60	350	48	46.3	5.0	2.5
2001	61	46	0.53	1.01	0.15	749	1744	257	43.9	10.6	1.7
2002	59	31	0.40	1.06	0.19	413	1074	193	38.4	6.3	1.5
2003	56	55	0.16	0.48	0.06	153	508	68	39.3	7.3	1.7
2004	62	54	0.18	0.56	0.08	310	983	134	46.5	8.4	2.2
2005	57	58	0.04	0.20	0.03	54	253	33	42.5	8.8	4.4
2006	62	48	0.13	0.32	0.05	419	1175	170	56.4	11.6	3.7
2007	60	67	0.10	0.38	0.05	214	734	90	48.4	12.2	3.7
2008	59	51	0.02	0.12	0.02	16	91	13	33.0	8.5	6.0
2009	61	64	0.06	0.20	0.03	97	343	43	45.8	5.0	2.0
2010	62	52	0.14	0.40	0.05	259	732	102	46.7	5.6	1.6

Table 5. Cont'd

G **Gag** (Note: TL only calculated if n>3)

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1988	34	99	0.0093	0.09	0.01	84	835	84			
1989	38	79	0.0000	0.00	0.00			0			
1990	33	345	0.0427	0.19	0.01	46	326	18	35.0	18.1	3.6
1991	34	296	0.0167	0.10	0.01	32	328	19	43.9	22.1	7.8
1992	34	315	0.0196	0.15	0.01	42	345	19	52.4	15.6	4.9
1993	35	406	0.0141	0.11	0.01	69	593	29	69.6	13.5	4.5
1994	36	446	0.0137	0.12	0.01	57	619	29	63.5	20.7	6.5
1995	32	523	0.0059	0.06	0.00	37	387	17	79.2	6.8	3.0
1996	37	436	0.0095	0.09	0.00	60	676	32	77.7	12.8	4.8
1997	37	417	0.0073	0.08	0.00	55	725	36	92.6	12.2	5.4
1998	39	492	0.0047	0.05	0.00	32	405	18	78.5	20.3	10.2
1999	34	249	0.0109	0.09	0.01	14	185	12	38.8	22.4	11.2
2000	34	308	0.0155	0.10	0.01	54	609	35	57.8	26.6	9.4
2001	37	242	0.0110	0.09	0.01	32	329	21	58.8	17.5	8.8
2002	33	236	0.0048	0.05	0.00	6	65	4			
2003	39	212	0.0000	0.00	0.00			0			
2004	37	257	0.0046	0.05	0.00	9	129	8			
2005	38	303	0.0107	0.10	0.01	56	651	37	70.8	27.2	12.2
2006	37	290	0.0022	0.04	0.00	33	563	33			
2007	37	317	0.0037	0.05	0.00	27	456	26			
2008	37	296	0.0019	0.03	0.00	4	74	4			
2009	35	395	0.0033	0.05	0.00	11	165	8			
2010	35	361	0.0101	0.08	0.00	56	583	31	66.5	26.6	10.9

Table 5. Cont'd

H **Scamp**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	34	99	0.16	0.62	0.06	429	1500	151	51.3	6.1	1.4
1989	38	79	0.12	0.44	0.05	368	1545	174	54.2	13.3	4.2
1990	34	350	0.11	0.37	0.02	214	798	43	48.7	8.0	1.0
1991	35	299	0.11	0.36	0.02	270	921	53	52.0	9.2	1.3
1992	34	315	0.10	0.35	0.02	281	1209	68	51.2	10.2	1.4
1993	35	410	0.11	0.40	0.02	190	756	37	46.7	9.4	1.1
1994	37	454	0.17	0.46	0.02	349	1015	48	49.7	9.0	0.8
1995	32	523	0.14	0.47	0.02	282	1129	49	49.8	7.6	0.7
1996	39	454	0.09	0.35	0.02	174	833	39	47.1	8.9	1.1
1997	42	446	0.22	0.63	0.03	468	1634	77	46.9	8.0	0.6
1998	41	518	0.14	0.50	0.02	254	1011	44	48.9	6.9	0.6
1999	34	253	0.11	0.44	0.03	193	900	57	48.4	7.1	1.0
2000	37	325	0.12	0.34	0.02	258	822	46	51.6	7.9	1.0
2001	38	248	0.13	0.41	0.03	233	782	50	48.2	6.3	0.9
2002	33	240	0.07	0.30	0.02	156	666	43	48.2	12.3	2.3
2003	40	218	0.10	0.35	0.02	138	480	32	43.1	7.6	1.2
2004	39	271	0.10	0.30	0.02	154	583	35	45.7	9.8	1.5
2005	38	303	0.12	0.40	0.02	227	832	48	50.0	7.4	1.0
2006	38	296	0.04	0.22	0.01	48	294	17	44.6	6.4	1.6
2007	38	326	0.12	0.37	0.02	264	865	48	53.7	10.7	1.4
2008	38	303	0.03	0.16	0.01	68	416	24	53.3	10.4	2.9
2009	36	402	0.02	0.16	0.01	66	435	22	55.1	11.3	2.8
2010	36	369	0.03	0.14	0.01	54	374	19	49.6	9.7	2.5

Table 5. Cont'd

I Red snapper

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	34	99	0.24	1.33	0.13	255	1457	146	36.5	4.8	1.0
1989	37	76	0.05	0.27	0.03	121	645	74	50.5	2.5	1.3
1990	33	344	0.045	0.55	0.03	47	528	28	38.1	3.5	0.7
1991	34	296	0.052	0.51	0.03	15	131	8	25.2	3.0	0.7
1992	34	313	0.043	0.31	0.02	78	705	40	42.2	11.5	2.5
1993	35	405	0.049	0.37	0.02	105	749	37	45.7	8.9	1.6
1994	36	445	0.064	0.60	0.03	151	1067	51	47.6	10.7	1.6
1995	32	522	0.014	0.14	0.01	39	383	17	51.2	6.9	1.9
1996	36	432	0.007	0.07	0.00	28	287	14	55.8	8.8	3.9
1997	37	411	0.036	0.43	0.02	56	810	40	32.3	12.7	2.6
1998	37	453	0.028	0.39	0.02	33	394	19	38.4	6.7	1.4
1999	34	249	0.052	0.47	0.03	30	259	16	31.1	4.1	0.9
2000	34	307	0.032	0.23	0.01	49	340	19	41.6	5.6	1.4
2001	36	233	0.014	0.10	0.01	20	151	10	41.4	5.2	2.3
2002	32	233	0.063	0.45	0.03	46	225	15	31.3	10.7	2.3
2003	38	209	0.017	0.25	0.02	4	56	4	22.0	2.9	1.1
2004	36	246	0.008	0.09	0.01	31	344	22	55.3	13.4	7.8
2005	37	283	0.018	0.13	0.01	70	622	37	56.1	10.4	3.7
2006	35	274	0.012	0.11	0.01	8	77	5	29.2	9.6	3.9
2007	36	301	0.059	0.73	0.04	58	679	39	37.5	2.9	0.6
2008	36	290	0.041	0.35	0.02	55	469	28	39.1	8.5	1.9
2009	33	371	0.017	0.12	0.01	44	409	21	49.4	12.9	4.1
2010	33	343	0.016	0.14	0.01	48	450	24	50.3	16.9	5.6

Table 5. Cont'd

J Vermilion snapper

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	36	91	17.23	30.37	3.18	3106	5572	584	21.0	1.8	0.0
1989	38	72	10.51	17.23	2.03	1881	3099	365	21.6	2.2	0.1
1990	35	312	1.54	4.73	0.27	276	829	47	21.5	2.5	0.1
1991	36	271	7.66	15.29	0.93	1227	2380	145	21.1	2.1	0.0
1992	35	291	3.27	11.09	0.65	562	1827	107	21.2	1.9	0.1
1993	38	339	2.39	5.12	0.28	488	1207	66	21.2	2.5	0.1
1994	39	372	5.34	11.43	0.59	1040	2241	116	22.0	2.7	0.0
1995	36	394	2.71	6.91	0.35	519	1433	72	21.6	2.8	0.1
1996	37	421	3.00	14.54	0.71	635	2547	124	23.1	3.4	0.1
1997	38	381	2.24	9.20	0.47	545	1972	101	23.4	2.8	0.1
1998	39	413	1.81	6.40	0.32	486	1863	92	24.4	3.2	0.1
1999	36	216	1.94	5.39	0.37	489	1400	95	23.5	3.0	0.1
2000	38	259	3.82	10.03	0.62	1346	3838	239	26.4	4.5	0.1
2001	40	197	3.85	10.39	0.74	1272	3244	231	26.0	4.4	0.1
2002	37	181	4.28	8.92	0.66	1176	2567	191	24.4	3.4	0.1
2003	39	205	0.43	1.72	0.12	146	636	44	25.7	4.4	0.4
2004	38	221	0.89	2.53	0.17	285	828	56	25.1	4.4	0.2
2005	37	275	1.41	5.14	0.31	437	1460	88	25.6	4.1	0.2
2006	36	254	0.80	3.18	0.20	250	1012	63	25.8	4.0	0.2
2007	37	274	2.83	8.91	0.54	876	2611	158	26.5	4.5	0.1
2008	37	275	2.37	7.00	0.42	776	2398	145	25.9	4.0	0.1
2009	35	330	2.81	9.18	0.51	811	2678	147	25.3	3.7	0.1
2010	35	316	1.10	5.07	0.28	398	2213	124	27.4	4.2	0.2

Table 5. Cont'd

K **Tomtate**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	31	83	17.62	29.08	3.19	2202	3869	425	18.1	1.6	0.0
1989	34	64	16.92	25.98	3.25	2144	3217	402	18.4	1.7	0.1
1990	32	326	10.81	20.35	1.13	1334	2672	148	18.3	1.8	0.0
1991	31	255	18.02	28.35	1.78	2046	3153	197	17.9	1.5	0.0
1992	32	281	9.86	18.16	1.08	1167	2491	149	17.7	1.6	0.0
1993	31	333	8.69	16.45	0.90	1147	2654	145	17.7	1.4	0.0
1994	31	343	9.31	20.61	1.11	1083	2458	133	17.9	1.5	0.0
1995	28	438	4.92	12.19	0.58	529	1377	66	16.8	1.7	0.0
1996	32	345	7.36	17.04	0.92	785	1830	99	17.3	1.6	0.0
1997	33	325	7.87	15.61	0.87	1156	2587	144	18.3	1.5	0.0
1998	32	343	6.83	15.23	0.82	819	1838	99	17.7	1.7	0.0
1999	32	221	10.98	24.88	1.67	1307	2898	195	17.6	1.5	0.0
2000	32	273	11.02	22.65	1.37	1313	2608	158	17.7	1.5	0.0
2001	33	202	13.04	23.18	1.63	1606	2764	194	18.4	1.6	0.0
2002	30	209	10.66	19.29	1.33	1421	2751	190	18.5	1.7	0.0
2003	34	163	2.92	7.04	0.55	393	1068	84	18.6	1.8	0.1
2004	33	217	6.01	18.17	1.23	759	2310	157	17.9	1.4	0.0
2005	34	245	4.36	13.77	0.88	609	1955	125	18.6	1.8	0.0
2006	33	248	2.78	7.94	0.50	397	1250	79	19.0	1.7	0.1
2007	33	259	6.10	15.07	0.94	742	1909	119	18.3	1.7	0.0
2008	34	252	6.07	13.73	0.87	825	1818	115	18.3	1.6	0.0
2009	31	338	4.53	11.18	0.61	580	1374	75	18.1	1.7	0.0
2010	32	317	3.30	9.35	0.53	447	1277	72	18.4	1.5	0.0

Table 5. Cont'd

L White grunt

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	36	91	0.07	0.38	0.04	41	236	25	23.0	11.4	4.3
1989	38	72	0.12	0.44	0.05	61	296	35	27.4	7.3	2.4
1990	35	312	0.82	4.00	0.23	365	1609	91	25.4	6.2	0.3
1991	36	271	1.03	4.60	0.28	510	1705	104	26.8	5.5	0.3
1992	35	291	1.16	3.93	0.23	585	2150	126	25.8	5.8	0.2
1993	38	339	0.80	3.84	0.21	344	1265	69	25.6	5.6	0.3
1994	39	372	0.47	2.59	0.13	229	1099	57	27.5	4.2	0.2
1995	36	394	0.33	1.66	0.08	137	561	28	25.1	5.3	0.4
1996	37	421	0.36	1.39	0.07	190	666	32	27.0	5.2	0.3
1997	38	381	0.23	1.10	0.06	143	656	34	29.4	4.4	0.4
1998	39	413	0.55	2.06	0.10	294	993	49	27.6	4.8	0.3
1999	36	216	0.29	1.19	0.08	174	662	45	28.0	5.2	0.5
2000	38	259	0.69	3.06	0.19	273	968	60	24.6	5.9	0.3
2001	40	197	0.61	2.54	0.18	333	1175	84	28.4	4.6	0.3
2002	37	181	1.03	2.87	0.21	465	1251	93	25.2	6.1	0.4
2003	39	205	0.26	0.92	0.06	110	334	23	25.3	5.3	0.6
2004	38	221	1.14	4.65	0.31	410	1511	102	23.7	4.9	0.2
2005	37	275	0.30	0.98	0.06	172	540	33	28.7	4.1	0.3
2006	36	254	0.25	0.95	0.06	135	505	32	27.4	5.3	0.5
2007	37	274	0.28	1.29	0.08	173	795	48	30.1	3.2	0.3
2008	37	275	0.23	1.13	0.07	145	706	43	29.3	5.2	0.5
2009	35	330	0.30	1.54	0.08	165	686	38	27.7	4.7	0.4
2010	35	316	0.12	0.65	0.04	80	421	24	30.1	3.9	0.5

Table 5. Cont'd

M **Knobbed porgy** FL

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	34	99	0.15	0.46	0.05	144	422	42	31.2	4.7	1.2
1989	37	76	0.26	0.66	0.08	252	713	82	32.1	6.4	1.3
1990	33	344	0.09	0.33	0.02	62	231	12	29.0	5.2	0.7
1991	34	296	0.40	1.15	0.07	233	664	39	27.9	4.6	0.3
1992	34	313	0.32	0.89	0.05	186	544	31	27.2	4.2	0.3
1993	35	405	0.27	0.77	0.04	180	535	27	29.6	4.1	0.3
1994	36	445	0.19	0.59	0.03	124	370	18	29.2	3.7	0.3
1995	32	522	0.14	0.49	0.02	100	404	18	29.9	4.3	0.4
1996	36	432	0.10	0.43	0.02	75	295	14	30.0	3.8	0.4
1997	37	411	0.25	0.95	0.05	209	918	45	29.7	3.1	0.2
1998	37	453	0.16	0.58	0.03	118	389	18	29.9	3.7	0.3
1999	34	249	0.19	0.61	0.04	141	456	29	30.7	2.8	0.3
2000	34	307	0.13	0.61	0.03	95	383	22	29.6	3.9	0.5
2001	36	233	0.36	1.13	0.07	280	901	59	31.4	3.8	0.3
2002	32	233	0.08	0.36	0.02	52	257	17	29.2	5.6	1.0
2003	38	209	0.17	0.49	0.03	144	423	29	31.2	3.7	0.5
2004	36	246	0.14	0.58	0.04	113	477	30	31.5	2.9	0.4
2005	37	283	0.12	0.44	0.03	101	359	21	32.1	3.1	0.4
2006	35	274	0.07	0.33	0.02	58	276	17	31.9	3.0	0.6
2007	36	301	0.14	0.48	0.03	114	395	23	31.6	3.4	0.4
2008	36	290	0.10	0.49	0.03	107	572	34	30.3	4.7	0.7
2009	33	371	0.06	0.28	0.01	52	330	17	30.3	5.6	1.1
2010	33	343	0.06	0.34	0.02	51	260	14	30.7	5.2	0.9

Table 5. Cont'd

N **Spottail pinfish**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	27	65	0.60	3.46	0.43	68	407	50	15.8	2.0	0.3
1989	28	44	0.20	0.90	0.14	28	128	19	17.6	2.1	0.7
1990	27	243	0.97	9.33	0.60	78	490	31	16.5	2.4	0.1
1991	28	218	0.50	3.10	0.21	81	560	38	18.4	2.1	0.2
1992	29	238	0.33	2.29	0.15	53	289	19	17.5	2.2	0.2
1993	27	271	0.13	1.18	0.07	24	235	14	18.7	3.0	0.4
1994	27	279	0.40	5.13	0.31	32	405	24	14.2	1.9	0.1
1995	25	395	0.17	1.59	0.08	19	211	11	15.1	2.9	0.3
1996	29	275	0.29	1.48	0.09	35	175	11	16.0	2.1	0.2
1997	28	240	0.09	0.68	0.04	12	108	7	17.7	2.5	0.4
1998	28	270	0.45	2.44	0.15	51	309	19	15.4	3.2	0.2
1999	25	152	0.50	2.25	0.18	91	408	33	17.6	3.5	0.3
2000	26	187	0.41	2.54	0.19	67	402	29	18.1	1.7	0.2
2001	26	127	0.38	1.35	0.12	74	269	24	18.9	3.1	0.4
2002	25	160	0.38	1.96	0.16	60	331	26	17.0	3.4	0.3
2003	27	96	0.19	0.78	0.08	41	173	18	20.1	1.4	0.3
2004	27	138	0.24	0.92	0.08	41	161	14	17.8	2.8	0.4
2005	28	164	0.31	1.22	0.10	72	295	23	19.8	2.7	0.3
2006	26	161	0.05	0.44	0.03	7	66	5	17.9	1.7	0.5
2007	26	172	0.39	2.79	0.21	59	395	30	17.7	2.5	0.2
2008	27	161	0.18	0.93	0.07	39	204	16	19.7	1.9	0.3
2009	26	245	0.11	1.03	0.07	14	73	5	15.1	4.2	0.6
2010	26	225	0.21	1.13	0.08	52	259	17	19.8	2.3	0.3

Table 5. Cont'd

O **Pinfish**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	27	65	0.04	0.26	0.03	4	23	3	16.0	1.0	0.6
1989	28	44	0.04	0.30	0.04	4	27	4	17.0	0.0	0.0
1990	27	243	0.45	4.54	0.29	53	596	38	17.6	1.9	0.1
1991	28	218	0.11	0.63	0.04	10	53	4	16.3	1.0	0.2
1992	29	238	0.44	2.18	0.14	45	223	14	16.8	1.2	0.1
1993	27	271	0.05	0.26	0.02	5	26	2	16.6	1.0	0.2
1994	27	279	0.02	0.18	0.01	2	18	1	17.8	1.2	0.4
1995	25	395	0.10	0.47	0.02	11	50	3	15.3	1.4	0.2
1996	29	275	0.36	3.62	0.22	30	269	16	15.9	1.4	0.1
1997	28	240	1.05	5.69	0.37	109	620	40	17.3	1.5	0.1
1998	28	270	0.97	3.40	0.21	96	358	22	16.9	1.4	0.1
1999	25	152	0.26	0.89	0.07	27	89	7	16.0	1.6	0.2
2000	26	187	0.36	1.34	0.10	45	175	13	17.0	0.9	0.1
2001	26	127	0.77	2.42	0.21	67	211	19	16.0	1.0	0.1
2002	25	160	0.28	1.49	0.12	24	126	10	15.5	1.2	0.1
2003	27	96	0.12	0.35	0.04	15	48	5	16.9	1.4	0.3
2004	27	138	0.36	1.26	0.11	37	146	12	17.5	1.8	0.2
2005	28	164	0.44	2.26	0.18	53	253	20	18.4	1.2	0.1
2006	26	161	0.33	1.73	0.14	46	279	22	18.8	1.9	0.2
2007	26	172	0.03	0.19	0.01	1	10	1	16.6	1.2	0.4
2008	27	161	0.07	0.55	0.04	8	54	4	16.8	0.9	0.2
2009	26	245	0.24	1.23	0.08	22	115	7	16.1	0.8	0.1
2010	26	225	0.07	0.31	0.02	12	55	4	16.8	1.8	0.3

Table 5. Cont'd

P **Red porgy** FL

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	36	91	2.17	3.57	0.37	880	1525	160	24.7	5.5	0.4
1989	39	75	2.55	5.33	0.62	764	1272	147	23.4	4.7	0.3
1990	35	314	1.81	2.68	0.15	715	1191	67	25.5	4.4	0.1
1991	36	271	2.07	3.47	0.21	728	1160	70	24.6	4.1	0.1
1992	35	293	2.33	3.60	0.21	850	1250	73	24.7	4.1	0.1
1993	38	340	1.26	2.06	0.11	560	952	52	25.9	4.1	0.2
1994	39	373	1.49	2.73	0.14	671	1219	63	26.7	4.4	0.1
1995	36	395	1.36	2.86	0.14	464	939	47	23.5	5.3	0.2
1996	38	432	1.09	2.24	0.11	526	1149	55	26.9	4.1	0.1
1997	40	401	0.71	1.66	0.08	417	1083	54	28.1	4.0	0.2
1998	42	469	0.91	2.06	0.10	411	913	42	26.8	4.1	0.2
1999	37	220	1.12	2.05	0.14	560	1004	68	27.4	3.9	0.2
2000	39	266	0.98	1.95	0.12	531	1003	61	28.5	3.7	0.2
2001	41	206	1.76	3.33	0.23	959	1774	124	29.0	3.9	0.2
2002	37	184	1.24	2.49	0.18	631	1268	93	27.5	4.4	0.2
2003	39	208	1.04	2.07	0.14	618	1256	87	29.2	3.9	0.2
2004	40	240	2.11	3.51	0.23	1154	1898	123	28.5	4.4	0.2
2005	39	295	2.29	4.21	0.25	1198	2076	121	28.4	4.4	0.1
2006	38	270	1.58	3.53	0.21	707	1376	84	26.5	4.3	0.2
2007	39	293	2.31	4.46	0.26	1073	2039	119	27.1	4.3	0.1
2008	38	282	1.18	2.55	0.15	697	1728	103	28.5	3.8	0.2
2009	38	355	0.89	2.06	0.11	557	1218	65	29.5	4.5	0.2
2010	37	336	1.13	2.24	0.12	718	1653	90	29.7	4.3	0.2

Table 5. Cont'd

Q **Scup**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	27	65	14.31	17.96	2.23	1158	1671	207	14.5	1.0	0.0
1989	28	44	9.67	14.39	2.17	618	897	135	14.4	1.0	0.0
1990	27	243	9.29	16.31	1.05	700	1227	79	15.1	1.1	0.0
1991	28	218	11.79	22.80	1.54	797	1552	105	14.8	1.2	0.0
1992	29	238	10.33	18.72	1.21	756	1357	88	14.9	1.2	0.0
1993	27	271	4.80	12.36	0.75	337	842	51	14.8	1.1	0.0
1994	27	279	8.32	21.18	1.27	684	1828	109	15.4	1.4	0.0
1995	25	395	9.20	18.59	0.94	626	1339	67	14.1	1.4	0.0
1996	29	275	12.04	25.32	1.53	946	2084	126	15.2	1.6	0.0
1997	28	240	13.94	28.05	1.81	1366	3009	194	15.8	1.5	0.0
1998	28	270	12.71	21.15	1.29	1106	1921	117	15.5	1.7	0.0
1999	25	152	12.39	20.62	1.67	1094	1781	144	15.3	1.6	0.0
2000	26	187	13.14	24.54	1.79	1201	2391	175	15.4	1.6	0.0
2001	26	127	13.47	21.88	1.94	1195	1974	175	16.0	1.7	0.0
2002	25	160	6.55	16.13	1.27	612	1451	115	15.6	1.5	0.0
2003	27	96	21.04	39.16	4.00	2008	3608	368	16.0	1.4	0.0
2004	27	138	18.40	28.32	2.41	1821	2982	254	16.3	1.7	0.0
2005	28	164	15.74	29.00	2.26	1802	3336	260	17.1	1.6	0.0
2006	26	161	7.44	17.99	1.42	830	2313	182	17.0	1.8	0.0
2007	26	172	8.27	19.13	1.46	759	1965	150	16.1	1.9	0.0
2008	27	161	10.64	23.27	1.83	1035	2274	179	16.3	1.5	0.0
2009	26	245	3.67	10.85	0.69	360	1140	73	16.2	1.8	0.0
2010	26	225	8.64	30.25	2.02	867	2753	184	16.3	1.5	0.0

Table 5. Cont'd

R **Gray triggerfish**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm FL	SD Length	SE Length
1988	34	99	0.11	0.36	0.04	132	618	62	32.0	11.8	3.5
1989	37	76	0.03	0.22	0.03	72	468	54	44.7	0.6	0.3
1990	33	344	0.12	0.48	0.03	88	368	20	29.5	8.6	1.0
1991	34	296	0.90	1.54	0.09	425	742	43	24.7	8.2	0.4
1992	34	313	0.39	1.01	0.06	335	1015	57	30.8	8.6	0.6
1993	35	405	0.45	1.03	0.05	293	764	38	28.0	7.2	0.4
1994	36	445	0.60	1.36	0.06	536	1428	68	31.9	7.3	0.4
1995	32	522	0.80	2.43	0.11	787	2836	124	32.6	8.3	0.3
1996	36	432	0.93	2.97	0.14	679	2182	105	30.5	5.8	0.2
1997	37	411	1.01	2.50	0.12	1027	2980	147	31.8	5.7	0.2
1998	37	453	0.65	1.95	0.09	572	1766	83	32.7	5.5	0.2
1999	34	249	0.41	1.23	0.08	330	943	60	31.1	7.1	0.5
2000	34	307	0.48	1.92	0.11	473	1974	113	33.5	5.6	0.4
2001	36	233	0.53	1.06	0.07	434	1007	66	31.2	7.3	0.5
2002	32	233	0.68	1.39	0.09	539	1244	81	30.3	7.6	0.5
2003	38	209	0.15	0.45	0.03	163	484	33	33.8	6.3	0.9
2004	36	246	0.45	1.03	0.07	333	769	49	30.3	6.1	0.4
2005	37	283	0.63	1.66	0.10	685	2077	123	35.2	5.8	0.3
2006	35	274	0.34	0.92	0.06	309	1100	66	32.0	7.6	0.6
2007	36	301	0.64	2.02	0.12	610	2233	129	33.0	6.4	0.4
2008	36	290	0.70	2.25	0.13	782	2691	158	34.0	7.0	0.4
2009	33	371	0.41	1.32	0.07	380	1139	59	32.3	5.1	0.3
2010	33	343	0.26	0.99	0.05	249	974	53	33.3	5.6	0.5

Table 5. Cont'd

S Greater amberjack

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biom. CPUE	SD Biom. CPUE	SE Biom. CPUE
1988	34	99	0.0000			0		
1989	38	79	0.0000			0		
1990	34	350	0.0000			0		
1991	35	299	0.0000			0		
1992	34	315	0.0000			0		
1993	35	410	0.0000			0		
1994	37	454	0.0000			0		
1995	32	523	0.0000			0		
1996	39	454	0.0013	0.0282	0.0013	1	15	1
1997	42	446	0.0097	0.0895	0.0042	17	204	10
1998	41	518	0.0137	0.1144	0.0050	28	327	14
1999	34	253	0.0022	0.0353	0.0022	30	475	30
2000	37	325	0.0072	0.0841	0.0047	44	760	42
2001	38	248	0.0125	0.0873	0.0055	57	445	28
2002	33	240	0.0000			0		
2003	40	218	0.0052	0.0545	0.0037	41	434	29
2004	39	271	0.0023	0.0384	0.0023	7	107	7
2005	38	303	0.0021	0.0367	0.0021	2	28	2
2006	38	296	0.0020	0.0349	0.0020	4	71	4
2007	38	326	0.0091	0.1066	0.0059	75	963	53
2008	38	303	0.0000			0		
2009	36	402	0.0000			0		
2010	36	369	0.0016	0.0312	0.0016	12	224	12

Table 6.
Catch Per Unit Effort (CPUE) of the short bottom long-line (MARMAP gear code 601) for various species. Depth: Average depth (m) of all long-lines deployed at the selected depth range (irrespective of catching the species in question). Valid Coll.: Number of collection in selected depth range with a duration of 45 to 150 minutes and catch code of 0 (nothing caught on line), 1 (catch with finfish, but not necessarily selected species), and 2 (catch without finfish). CPUE: average number of individual fish of selected species/20 hooks/hr. Biom. CPUE: average total weight (grams) of select species/20 hooks/hr. SD: Standard deviation. SE: Standard error.

A Speckled hind

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.10	0.24	0.10	644	1576	644
1980-1986		0						
1987	49	1	0.00					
1988-1995		0						
1996	85	5	0.00					
1997		0						
1998		0						
1999	87	27	0.09	0.22	0.04	321	833	160
2000	86	6	0.07	0.17	0.07	108	264	108
2001	89	10	0.14	0.29	0.09	407	924	292
2002	83	17	0.00					
2003	97	16	0.00					
2004	91	25	0.16	0.34	0.07	267	599	120
2005	82	43	0.14	0.35	0.05	308	764	116
2006	65	48	0.04	0.19	0.03	181	1018	147
2007	83	47	0.11	0.32	0.05	406	1205	176
2008	60	21	0.00					
2009	78	34	0.02	0.10	0.02	21	122	21
2010	83	32	0.00					

Table 6. Cont'd

B **Red grouper**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.00			0		
1980-1986		0						
1987	49	1	0.00			0		
1988-1995		0						
1996	167	15	0.00			0		
1997	193	33	0.00			0		
1998	191	31	0.00			0		
1999	115	39	0.09	0.34	0.05	366	1336	214
2000	160	34	0.07	0.23	0.04	308	1007	173
2001	158	29	0.00			0		
2002	86	19	0.00			0		
2003	161	54	0.00			0		
2004	119	34	0.07	0.25	0.04	336	1351	232
2005	102	55	0.11	0.43	0.06	483	2048	276
2006	112	84	0.06	0.22	0.02	263	1061	116
2007	99	55	0.26	0.55	0.07	1205	2629	355
2008	122	41	0.00			0		
2009	96	40	0.07	0.20	0.03	491	1515	239
2010	137	70	0.00			0		

Table 6. Cont'd

C **Snowy grouper**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.00			0		
1980-1995		0						
1996	103	6	0.51	0.46	0.19	850	749	306
1997	190	26	0.82	1.16	0.23	3675	5596	1098
1998	187	24	0.55	1.15	0.23	2099	4736	967
1999	115	39	0.47	0.90	0.14	1506	2830	453
2000	160	34	0.56	0.99	0.17	2022	2983	512
2001	150	25	0.99	1.07	0.21	3413	5280	1056
2002	86	19	0.78	1.02	0.23	1479	2159	495
2003	154	46	0.46	0.56	0.08	1228	1676	247
2004	107	30	0.20	0.56	0.10	442	1250	228
2005	98	47	0.37	0.76	0.11	964	2212	323
2006	116	62	0.29	0.69	0.09	1023	2528	321
2007	99	52	0.11	0.42	0.06	480	1809	251
2008	144	32	1.09	1.28	0.23	5525	6960	1230
2009	97	36	0.29	0.94	0.16	1590	5269	878
2010	138	62	0.69	0.97	0.12	3380	5886	748

Table 6. Cont'd

D **Scamp**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.00			0		
1980-1986		0						
1987	49	1	0.00			0		
1988-1995		0						
1996	167	15	0.04	0.15	0.04	75	292	75
1997	193	33	0.00			0		
1998	191	31	0.00			0		
1999	115	39	0.32	0.56	0.09	1182	2365	379
2000	160	34	0.03	0.15	0.03	60	351	60
2001	158	29	0.66	1.20	0.22	1919	3591	667
2002	86	19	0.30	0.66	0.15	746	1746	401
2003	161	54	0.09	0.31	0.04	178	683	93
2004	119	34	0.26	0.47	0.08	690	1365	234
2005	102	55	0.11	0.28	0.04	247	647	87
2006	112	84	0.16	0.41	0.05	502	1405	153
2007	99	55	0.31	0.51	0.07	832	1337	180
2008	122	41	0.08	0.26	0.04	249	869	136
2009	96	40	0.14	0.36	0.06	445	1182	187
2010	137	70	0.04	0.16	0.02	122	533	64

Table 6. Cont'd

E Red porgy

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	1.48	1.52	0.62	2183	2247	918
1980-1995		0						
1996	85	5	0.00			0		
1997		0						
1998		0						
1999	88	28	0.05	0.21	0.04	87	333	63
2000	96	9	0.19	0.29	0.10	194	311	104
2001	89	10	0.00			0		
2002	86	19	0.12	0.33	0.08	141	343	79
2003	99	18	0.20	0.35	0.08	378	747	176
2004	91	25	0.19	0.48	0.10	183	452	90
2005	87	40	0.04	0.15	0.02	52	187	30
2006	73	39	0.03	0.14	0.02	64	289	46
2007	85	45	0.00			0		
2008	70	12	0.05	0.18	0.05	53	182	53
2009	81	31	0.04	0.17	0.03	57	220	40
2010	91	32	0.02	0.09	0.02	19	106	19

Table 6. cont'd

F Greater amberjack

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.00			0		
1980-1986		0						
1987	49	1	0.00			0		
1988-1995		0						
1996	167	15	0.00			0		
1997	193	33	0.00			0		
1998	191	31	0.00			0		
1999	115	39	0.15	0.48	0.08	1199	3545	568
2000	160	34	0.13	0.53	0.09	1162	4559	782
2001	158	29	0.09	0.27	0.05	1360	4710	875
2002	86	19	0.06	0.17	0.04	747	2588	594
2003	161	54	0.02	0.10	0.01	94	486	66
2004	119	34	0.06	0.24	0.04	245	1451	249
2005	102	55	0.30	0.79	0.11	2196	5939	801
2006	112	84	0.04	0.21	0.02	278	1459	159
2007	99	55	0.14	0.45	0.06	1613	4838	652
2008	122	41	0.00			0		
2009	96	40	0.17	0.38	0.06	2578	6549	1035
2010	137	70	0.01	0.07	0.01	17	143	17

Table 6. cont'd

G Blackbelly rosefish

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1979	62	6	0.00			0		
1980-1986		0						
1987	49	1	0.00			0		
1988-1995		0						
1996	167	15	1.23	1.27	0.33	809	1169	302
1997	193	33	0.36	0.56	0.10	150	259	45
1998	191	31	0.79	1.09	0.20	304	416	75
1999	115	39	0.07	0.21	0.03	27	94	15
2000	160	34	0.45	0.84	0.14	183	346	59
2001	158	29	0.39	0.52	0.10	198	320	59
2002	86	19	0.00			0		
2003	161	54	0.57	0.76	0.10	231	308	42
2004	119	34	0.00			0		
2005	102	55	0.00			0		
2006	112	84	0.26	0.62	0.07	94	233	25
2007	99	55	0.04	0.16	0.02	20	78	11
2008	122	41	0.06	0.21	0.03	26	100	16
2009	96	40	0.01	0.06	0.01	6	38	6
2010	137	70	0.01	0.06	0.01	5	38	5

Table 7.
Catch Per Unit Effort (CPUE) of the long bottom long-line (MARMAP gear code 087) for various species. Note: no long bottom long-line sampling was done between 1986 and 1996. In 2008, no sampling was conducted due to inclement weather. Depth: Average depth (m) of all long-lines deployed at the selected depth range (irrespective of catching the species in question). Valid Coll.: number of collection in selected depth range with a duration of 45 to 150 minutes and catch code of 0 (nothing caught on line), 1(catch with finfish, but not necessarily selected species), and 2 (catch without finfish). CPUE: average number of individual fish of selected species/100 hooks/hr. Biom. CPUE: average total weight (grams) of select species/100 hooks/hr. SD: Standard deviation. SE: Standard error. Length: Mean total length (TL) or fork length (FL) in cm.

A Snowy grouper

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1983	188	17	0.00			0		
1984	188	20	0.08	0.29	0.07	687	2678.3	598.9
1985	193	9	0.00			0		
1986	191	7	0.00			0		
1987		0						
1996	186	10	0.00			0		
1997	187	7	0.00			0		
1998	184	4	0.00			0		
1999	188	9	0.00			0		
2000	184	4	0.00			0		
2001	192	3	0.00			0		
2002	192	3	0.00			0		
2003	179	4	0.00			0		
2004	190	4	0.00			0		
2005	180	3	0.00			0		
2006	190	4	0.00			0		
2007	192	6	0.00			0		
2008		0						
2009	186	5	0.11	0.25	0.11	292	652.0	291.6
2010	190	2	0.00			0		

Table 7. Cont'd

B Golden tilefish

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE	Length cm TL	SD Length	SE Length
1983	196	32	1.18	1.74	0.31	5105	8396.1	1484.2	66.0	11.7	1.3
1984	208	45	1.52	2.23	0.33	6887	9408.9	1402.6	67.4	12.3	1.0
1985	215	38	0.88	1.40	0.23	2021	3510.8	569.5	52.5	11.7	1.6
1986	214	21	0.56	1.00	0.22	997	1747.9	381.4	50.6	7.5	1.6
1987-1995		0									
1996	198	15	1.03	3.09	0.80	1576	5273.3	1361.6	47.5	7.4	1.3
1997	206	20	3.03	4.56	1.02	7346	11177.5	2499.4	54.8	9.8	1.0
1998	198	8	2.16	2.92	1.03	4120	5258.6	1859.2	52.6	6.3	1.3
1999	212	29	3.06	4.17	0.77	7107	8385.8	1557.2	54.9	8.9	0.7
2000	201	10	1.05	1.61	0.51	1989	3057.6	966.9	52.2	9.6	2.2
2001	208	14	2.05	2.72	0.73	5866	8948.3	2391.5	58.5	9.3	1.3
2002	223	18	0.60	1.00	0.24	2648	4980.0	1173.8	64.1	14.3	3.4
2003	216	13	0.27	0.56	0.16	930	1825.6	506.3	60.4	9.5	4.3
2004	194	5	0.00			0					
2005	212	16	0.00			0					
2006	201	7	0.45	0.95	0.36	614	1559.8	589.5	58.0	14.8	6.6
2007	213	24	0.85	1.73	0.35	3779	7719.8	1575.8	66.9	10.9	1.9
2008		0									
2009	216	36	3.72	5.43	0.90	22966	34502.9	5750.5	72.9	12.0	0.8
2010	228	40	2.00	2.57	0.41	13439	17032.1	2693.0	72.4	11.0	1.0

Table 7. Cont'd

C **Blackbelly rosefish**

Year	Depth	Valid Coll.	CPUE	SD CPUE	SE CPUE	Biomass CPUE	SD Biom. CPUE	SE Biom. CPUE
1983	196	32	1.50	3.00	0.53	695	1619.8	286.3
1984	208	45	2.36	5.24	0.78	1000	2275.9	339.3
1985	215	38	0.00			0		
1986	214	21	0.25	0.81	0.18	93	300.6	65.6
1987-1995		0						
1996	198	15	0.38	1.47	0.38	147	571.2	147.5
1997	206	20	0.24	1.06	0.24	106	472.2	105.6
1998	198	8	0.00			0		
1999	212	29	0.09	0.38	0.07	26	120.4	22.4
2000	201	10	0.00			0		
2001	208	14	0.00			0		
2002	223	18	0.00			0		
2003	216	13	0.00			0		
2004	194	5	0.00			0		
2005	212	16	0.00			0		
2006	201	7	0.00			0		
2007	213	24	0.00			0		
2008		0						
2009	216	36	0.05	0.33	0.05	20	117.6	19.6
2010	228	40	0.11	0.38	0.06	69.25	245.4	38.8

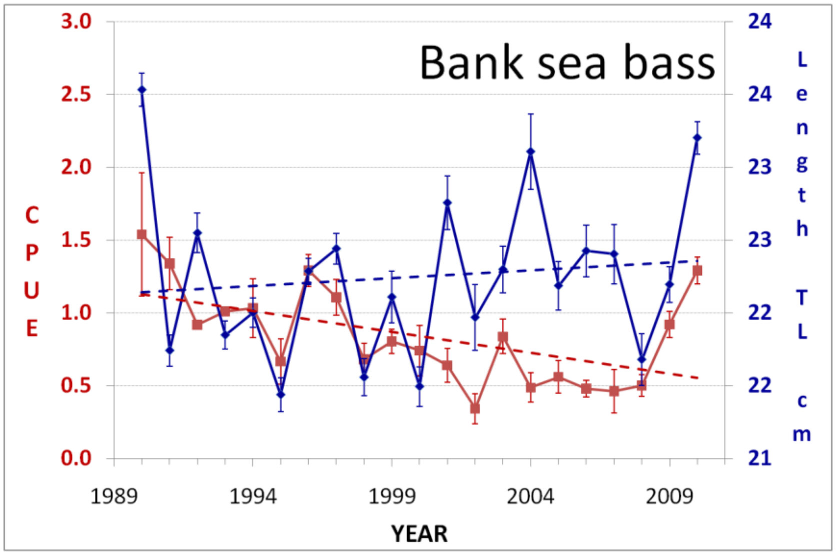
Table 8.
Bottom temperatures (°C) by latitude degree for each year. Samples from 1987 through 1992 were taken using Applied Microsystem's STD-12 CTD profiler. Samples from 1993-2009 were taken using either the Sea-bird SBE-19 or SBE-25 CTD profilers. The numbers in parenthesis are the number of CTD profiles taken. The 2010 data were not available at time of report completion.

	Latitude Degrees															
Year	**27**		**28**		**29**		**30**		**31**		**32**		**33**		**34**	
1987							16.71	(2)	17.26	(6)	18.18	(42)				
1988									26.49	(7)	22.99	(66)	23.27	(24)		
1989											20.78	(37)	22.5	(1)		
1990							23.34	(7)	22.92	(9)	21.3	(48)	23.59	(15)		
1991							24.24	(3)	24.59	(4)	24.72	(42)	25.79	(6)	26.04	(7)
1992							22.13	(2)	20.56	(1)	20.42	(37)	23.42	(15)	21.25	(3)
1993							19.63	(3)	25.8	(29)	21.23	(57)	24.95	(7)	23.62	(3)
1994							20.89	(1)	23.57	(16)	22.31	(49)	26.13	(6)		
1995					24.98	(1)	22.62	(2)	25.33	(16)	24.71	(37)	24.05	(14)		
1996	14.15	(1)	15.69	(1)			17.73	(7)	22.7	(11)	18.7	(73)	22.47	(9)	25.23	(4)
1997	21.5	(2)	20.57	(3)	21.67	(5)	23.3	(5)	20.99	-(4)	21.29	(58)	22.4	(7)	20.72	(9)
1998	15	(2)	9.66	(4)	10.72	(3)	17.69	(7)	19.25	-(1)	17.86	(50)	25.51	(13)	23.98	(6)
1999	20.24	(6)	14.68	(2)	14.37	(4)	16.97	(7)	11.32	(7)	19.88	(37)	21.14	(10)	21.41	(9)
2000			21.62	(1)	22.95	(1)	18.22	(5)	22.2	(24)	22.78	(30)	22.42	(17)	26.03	(3)
2001	16.01	(1)			18.02	(1)	20.16	(1)	19.94	(20)	21.8	(30)	23.34	(9)	22.17	(3)
2002	21.82	(1)	22.02	(2)	23.89	(3)	21.99	(7)	25.99	(15)	21.57	(19)	23.96	(11)		
2003	16.16	(2	13.4	(1)	19.4	(3)	18.65	(9)	19.96	(2)	17.22	(28)	18.95	(11)	20.7	(2)
2004					17.8	(1)	18.78	(4)	19.88	(15)	20.87	(36)	23.26	(13)		
2005	18.5	(3)	19.62	(1)	19.91	(1)	20.92	(5)	26.08	(13)	22.59	(36)	20.78	(14)	23.64	(4)
2006	21.59	(4)	18.89	(2)			21.66	(3)	20.98	(11)	21.68	(51)	22.4	(10)	21.66	(7)
2007	16.59	(3)	17.06	(1)			19.65	(4)	22.44	(22)	21.69	(63)	22.14	(16)	24.34	(5)
2008	18.65	(5)	16.69	(1)	20.59	(2)	19.19	(3)	24.16	(9)	20.81	(39)	22.4	(9)	23.73	(3)
2009	19.79	(4)	16.48	(4)			22.18	(5)	15.1	(37)	18.49	(34)	21.41	(20)	22.84	(10)

Figure 4 (A – P).
Mean CPUE (fish/trap/hr fished on left axis in red) and mean length (cm TL or FL on right axis in blue) of catches of 16 abundant species in the Chevron trap catches from 1990 through 2010. Dashed lines are the linear long term trends over the time series. The vertical error bars indicate the standard error around the means. The data are presented in table 5.

Figure 4. Cont'd

A



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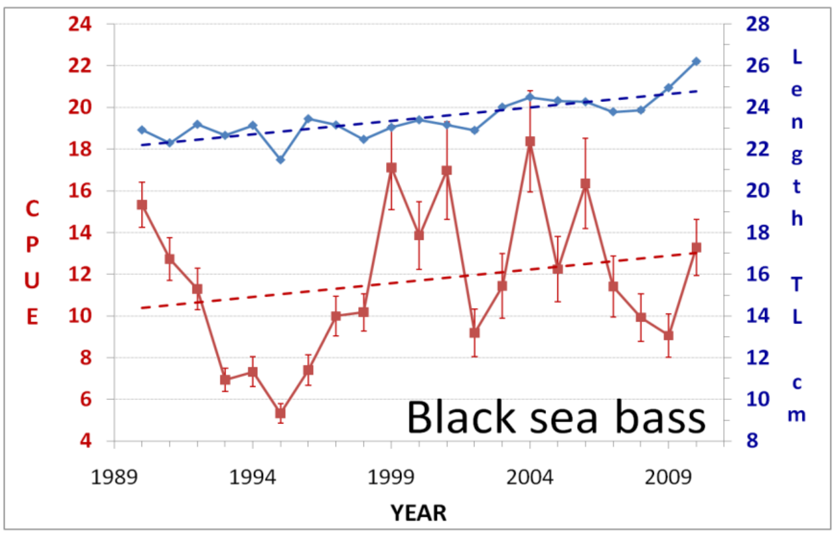

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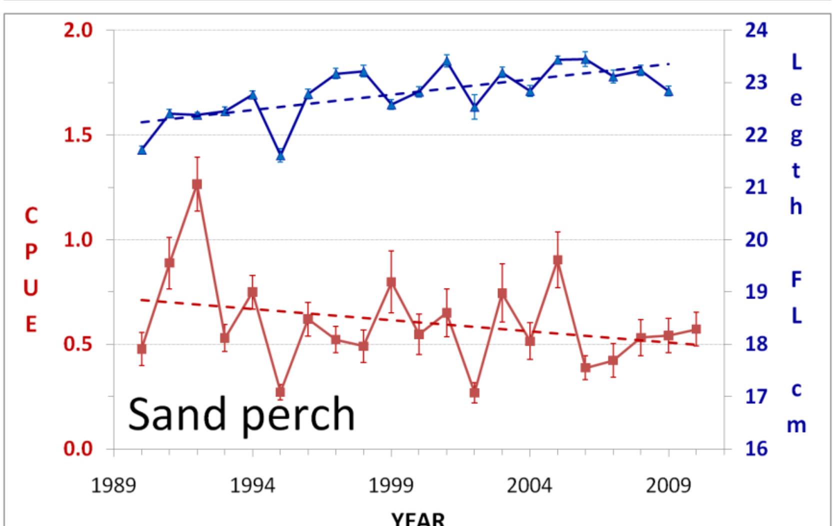
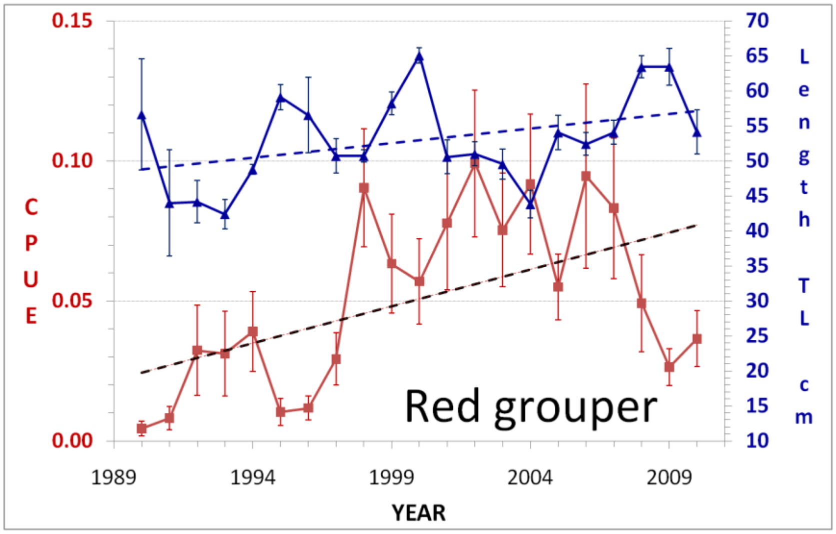


Figure 4. Cont'd

D



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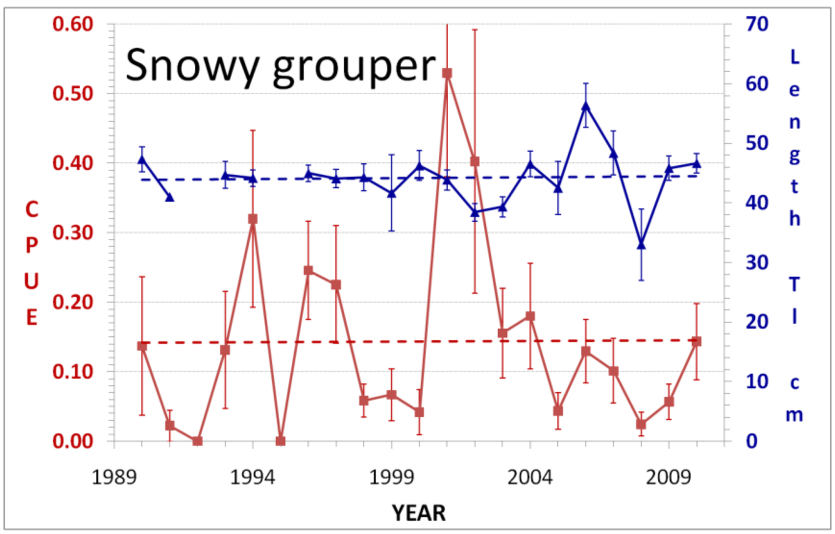

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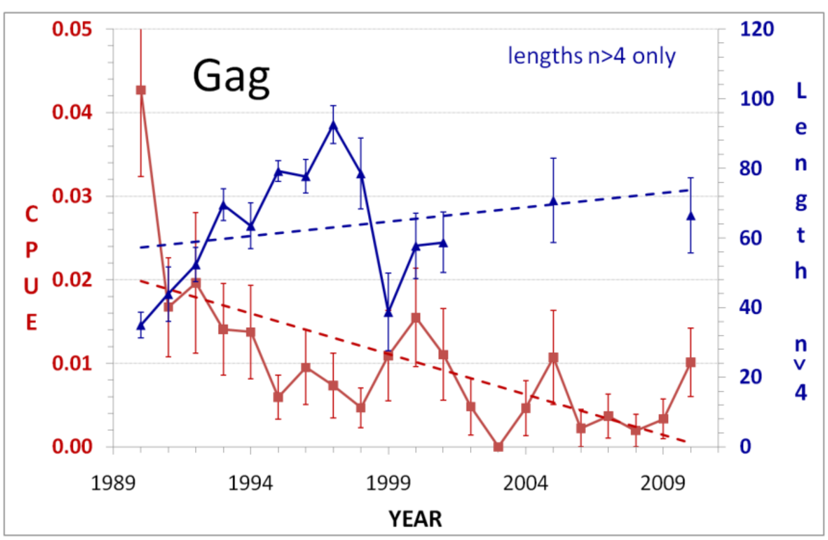
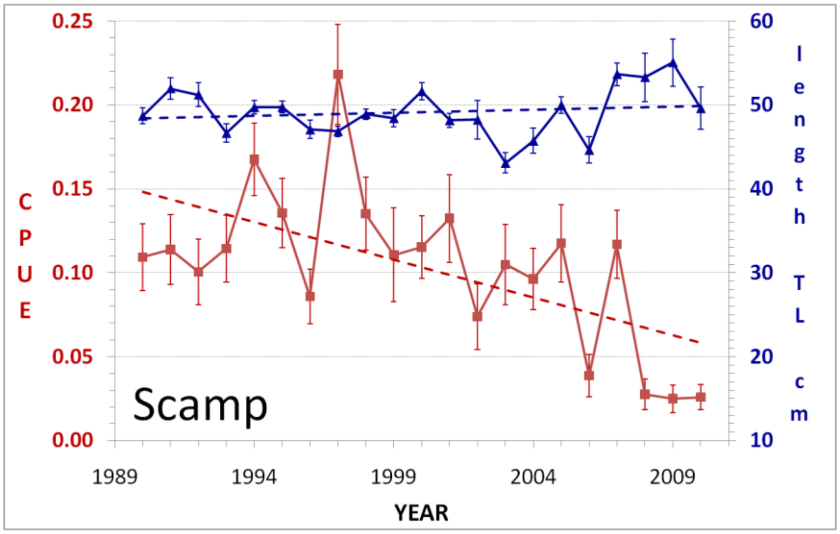


Figure 4. Cont'd

G



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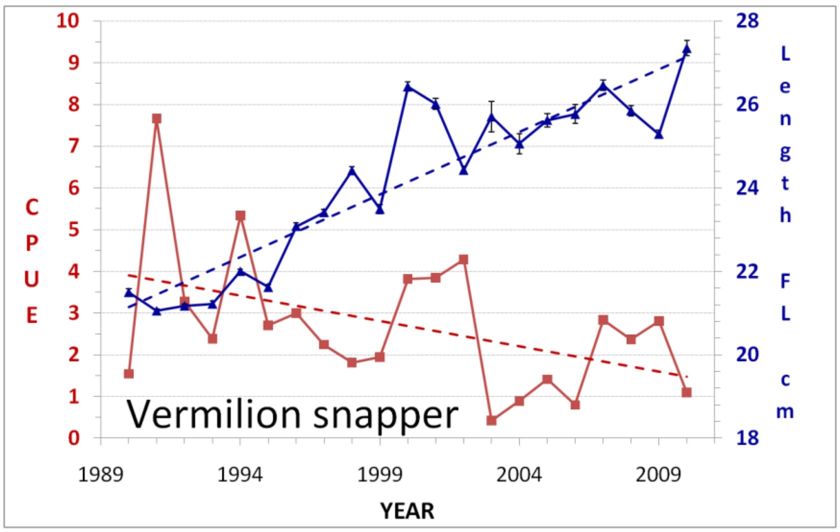


I

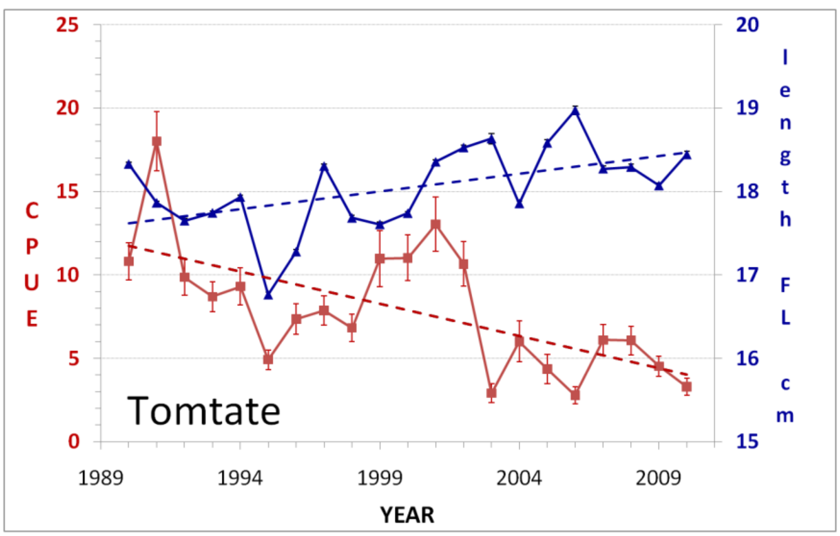
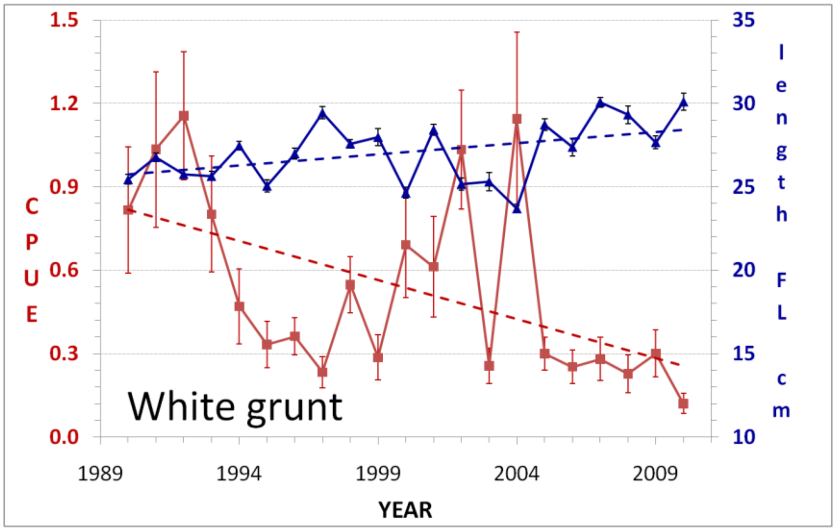


Figure 4. Cont'd

J



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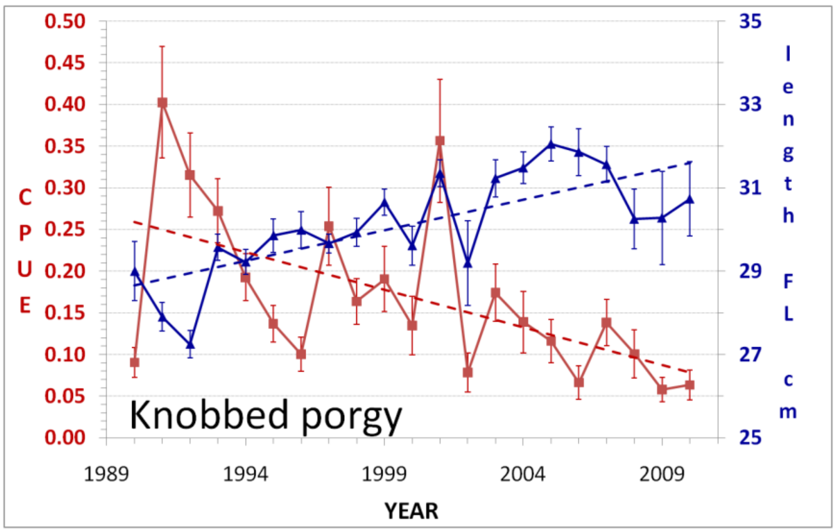

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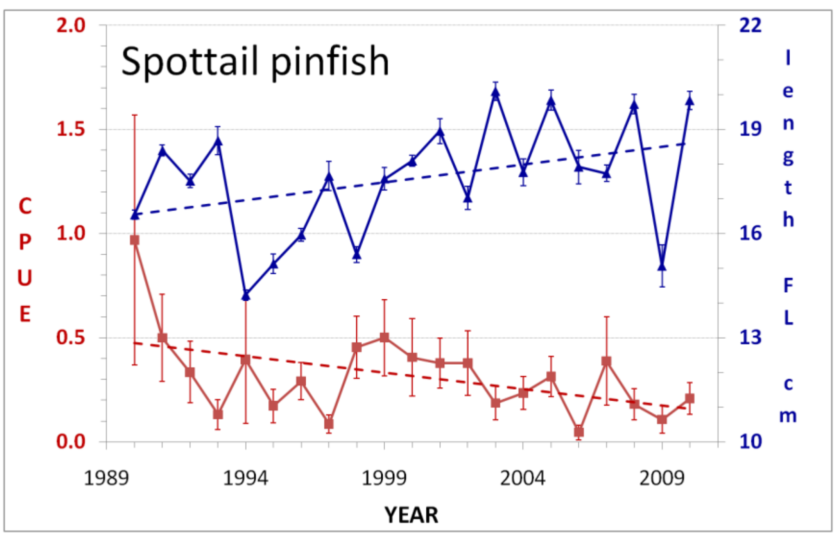

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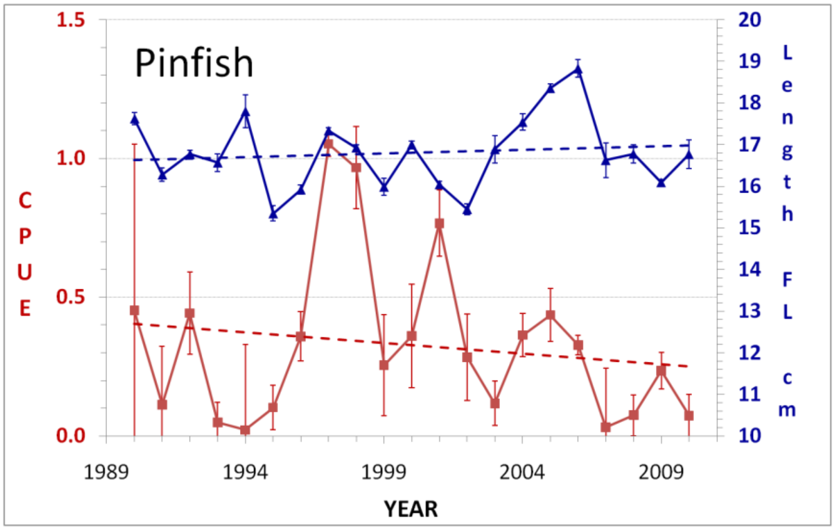
M



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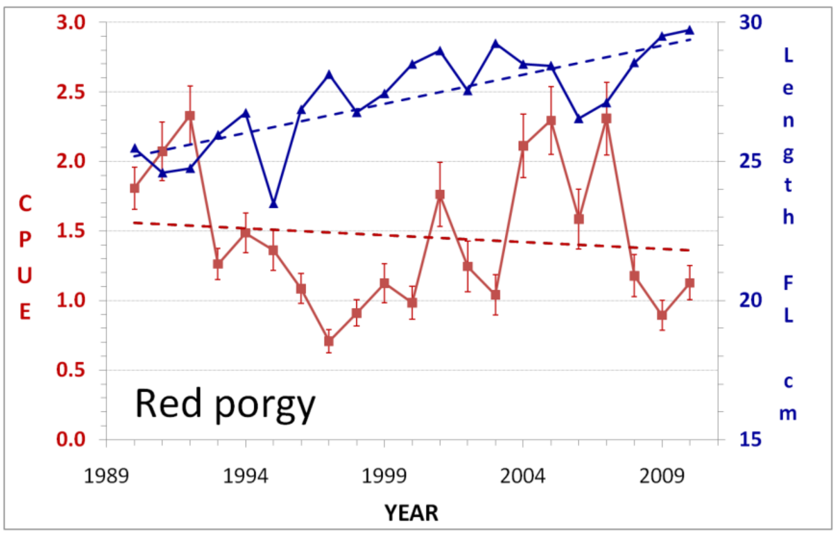

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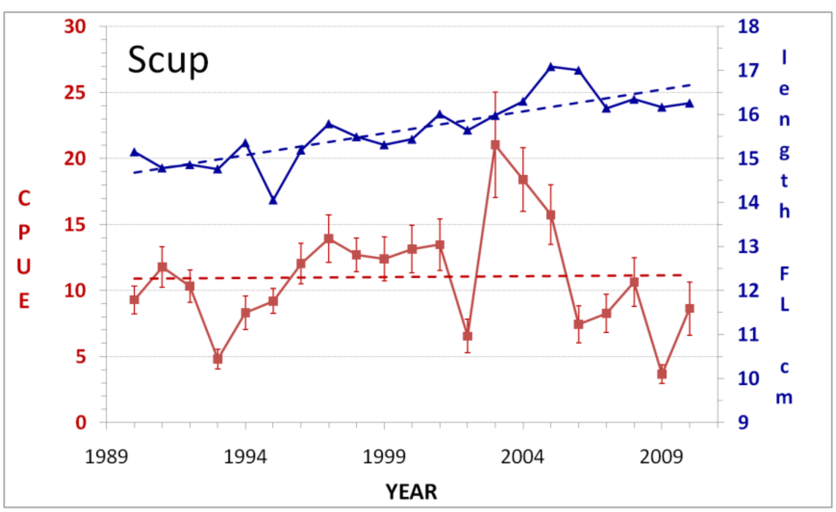


Figure 4. Cont'd

P

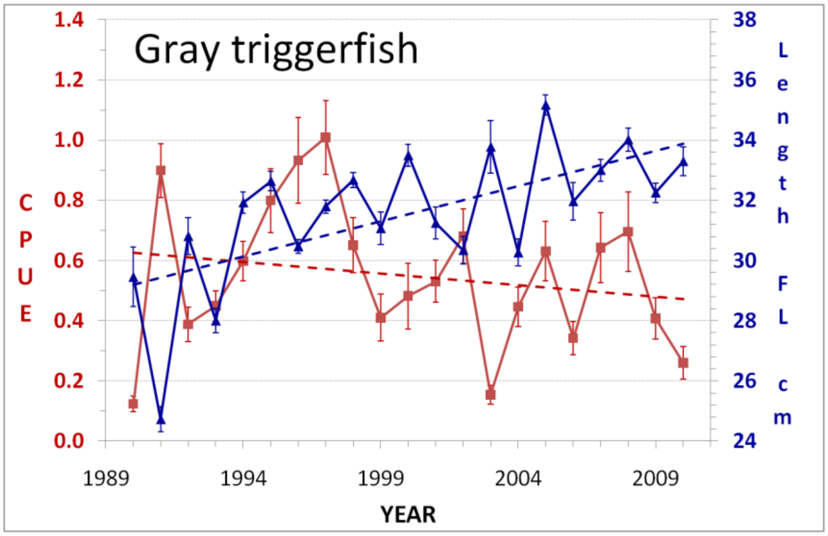
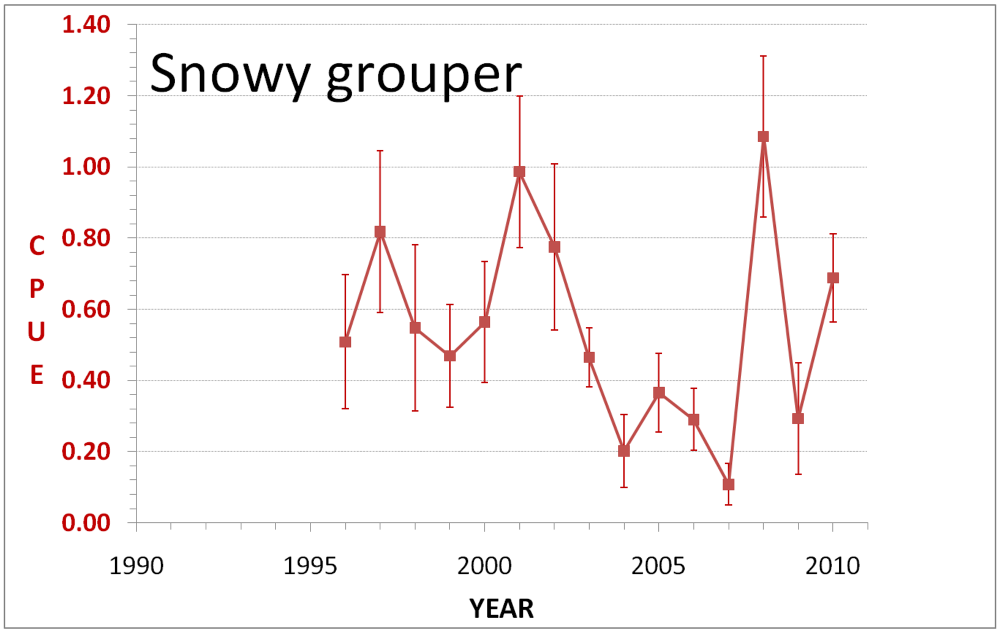


Figure 5 (A-B).
Mean CPUE (left axis in red) in fish/20 hooks/hour, for the short bottom long-line for snowy grouper (A) and greater amberjack (B) from 1996 through 2010. Vertical error bars are ± 1 standard deviation.

A



B

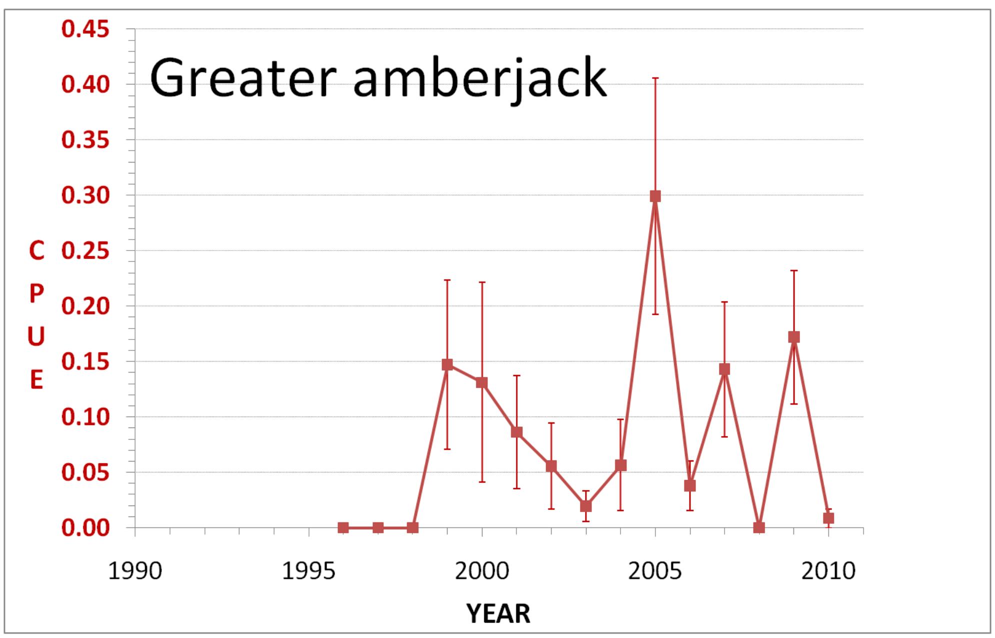


Figure 6.
Mean CPUE (left axis in blue) in fish/100 hooks/hr, and mean depth (m) of long bottom long-line deployment (right axis in red) for golden tilefish from 1983 through 2010. The error bars indicate ± 1 standard deviation.

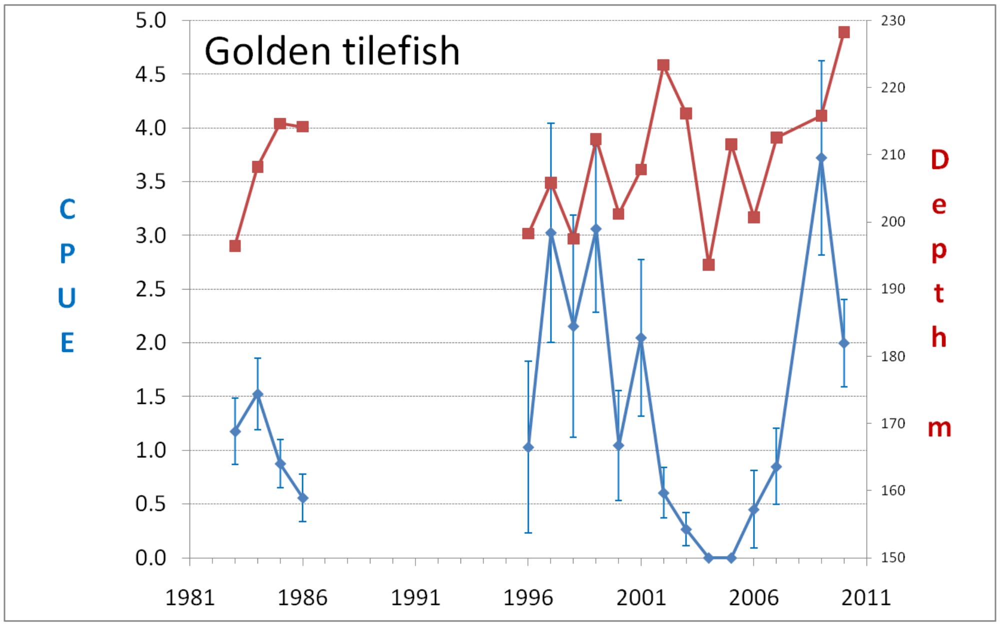
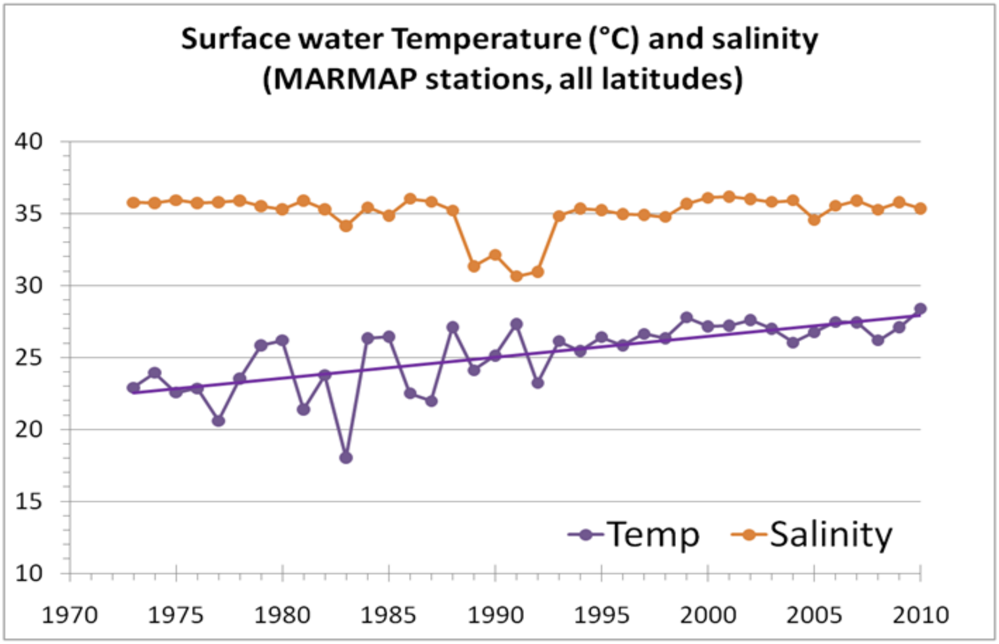


Figure 7 (A-C).
Sea surface temperature (°C), and salinity for the entire MARMAP sampling area (A), and by latitude (B), and bottom temperatures (°C) for latitudes 31°N, 32°N, and 33°N, latitudes with the most consistent data over the years (C). Lines are the long term linear trends over the time series.

A



B

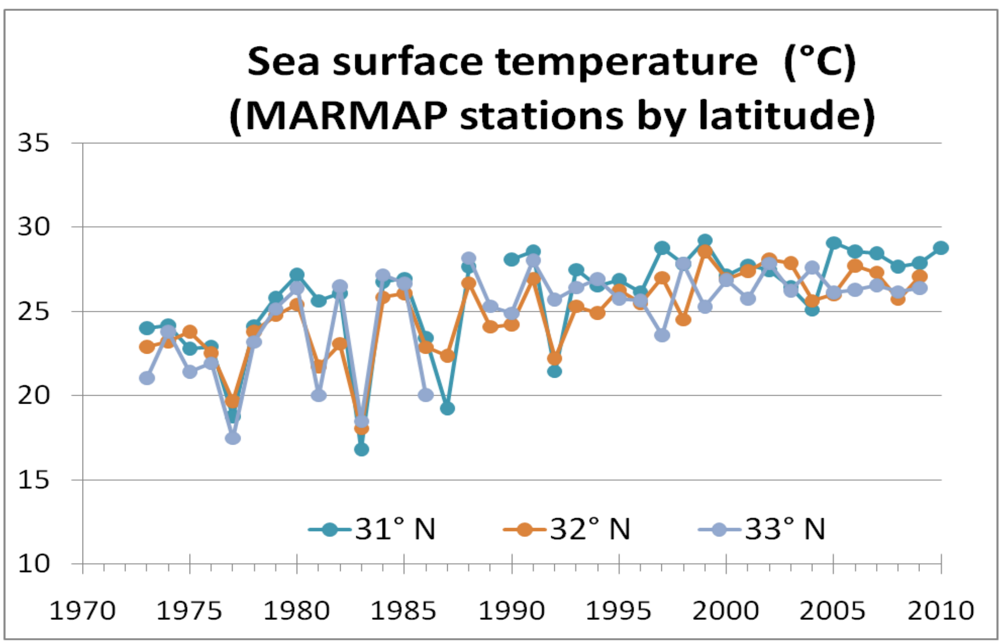


Figure 7 Cont'd

C Bottom Temperatures (°C)