Trends in relative abundance of reef fishes in waters off the SE US based on fishery-independent surveys.

Summary of Nominal and Delta-GLM Standardized CPUE Based on SAB Reef Fish Surveys Using Chevron Trap (1990-2011), Short Bottom Longline (1996-2011) and Long Bottom Longline (1996-2011) Conducted by MARMAP, SEAMAP-SA, and SEFIS.

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Introduction

Fishery-Independent Monitoring

Fishery-independent measures of catch and effort with standard gear types and deployment strategies 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 managed under the South Atlantic Fisheries Management Council's (SAFMC) snapper-grouper Fishery Management Plan (FMP). Inevitably, tighter management regulations result in fishery-dependent catches reflecting the demographics of a restricted subset of the population. This affects the utility of fishery-dependent data when assessing the current status of the entire population. When fisheries are highly regulated, fishery-independent surveys are often the only method available to adequately characterize population size, age and length composition, and reproductive parameter distributions, all of which are needed to assess the status of the stocks. The lack of adequate fishery-independent survey observations can create several issues when considering both the consequences of management actions, such as large closed areas and harvest moratoria, and the ability to evaluate such actions. If fishery-independent data are lacking, the potential impacts on stock assessments include: an increase in assessment uncertainty, which is often used to challenge the need for management actions, a greater dependence on fishery-dependent measures of abundance that are in turn affected by management actions (e.g. large-scaled closed areas that drastically alter effort patterns), an inability to separate a population level response from changes in fishery behavior, and an inability to evaluate if management actions are eliciting the desired population response (Williams and Carmichael 2009).

The Marine Resources Monitoring, Assessment and Prediction (MARMAP) program has conducted fishery-independent research, on ground fish, reef fish, ichthyoplankton, and coastal pelagic fishes of the continental shelf and shelf edge between Cape Hatteras, North Carolina, and St. Lucie, Florida, to provide the necessary information for reliable stock assessments and evaluation of management plans for the South Atlantic Bight (SAB) for 40 years. Housed at the Marine Resources Research Institute (MRRI) at the South Carolina Department of Natural Resources (SCDNR), the overall mission of the MARMAP program has been to determine the distribution, relative abundance, and critical habitat of economically and ecologically important fishes of the SAB, and to relate these features to environmental factors and exploitation activities. Research has been undertaken toward fulfilling these goals using a variety of techniques. These have included the use of trawl (6-350 m depth) and ichthyoplankton surveys, the use of fathometers and underwater television to locate and map reef habitat, and the use of various trap and hook gears to sample hard and soft bottom habitats throughout the SAB. In addition, MARMAP has taken biological samples from priority species to conduct life history and population studies, tagged economically important species to answer questions regarding movement and population structure, and conducted special studies directed at specific management problems in the region. A major component of MARMAP has always been monitoring work, which allows for the standardized sampling of fish populations over time and the development of a historical base for future comparisons of long-term trends in abundance and size distributions.

Although the MARMAP program has used various gear types and methods of deployment since its inception, the program has strived to use consistent gears and sampling methodologies throughout extended time periods to allow for an analysis of long-term changes in relative abundance and length frequencies. Among other gears, the MARMAP program currently deploys the chevron trap (CHV; 1990-present), short bottom longline (SBLL, previously called vertical bottom longline or VLL; 1996-present), and the long bottom longline (LBLL, previously called horizontal bottom longline or HLL; 1996-present) using standard deployment and retrieval methods for monitoring purposes. From these collections, MARMAP collects biological data to monitor life history parameters on many species included in the SAFMC snapper-grouper FMP. In addition, the MARMAP program deploys a conductivity, depth, and temperature recorder (CTD) to profile water conditions (e.g. temperature, salinity, etc.) at locations of capture gear deployment. Specifically, MARMAP's current main objectives are to:

1) sample fishes in the SAFMC snapper-grouper complex using a variety of gears in live bottom, rocky outcrop, high relief, and mud bottom habitats,
2) collect data for time series descriptions of reef fish species for the development of annual length and age compositions and the development of relative abundance indices,
3) investigate population characteristics on fish species of interest through life history analysis, including age, growth, sex ratio, size/age of sexual maturation/transition, spawning season, fecundity, and diet,
4) collect hydrographic data for comparison to and inclusion in the development of relative abundance indices , and
5) expand the geographical extent of sampling coverage of live bottom habitats, particularly in areas off North Carolina and elsewhere and waters deeper and shallower than traditionally sampled, by identifying new live bottom areas using underwater video, trap cameras, and fathometers.

Until recently, the MARMAP program was the only long-term fishery-independent program targeting species in the SAFMC snapper-grouper complex that collected the necessary data needed to develop indices of relative abundance. Beginning in 2008, with a first field season occurring in 2009, the Southeast Area Monitoring and Assessment Program, South Atlantic Region (SEAMAP- SA) began providing additional funding for a SEAMAP-SA Reef Fish survey to complement the traditional MARMAP program. As is the case with MARMAP, this program is housed at the MRRI at the SCDNR. A particular goal of the SEAMAP-SA Reef Fish survey is to assist with the expansion of the geographical extent of sampling coverage in the current MARMAP program (Objective 5, above), by providing funding for additional sea days used to locate and identify previously un-sampled live bottom habitat. This funding has been instrumental in expanding the traditional MARMAP geographic sampling range, particularly allowing for documentation of new sampling sites in the northern most, southern most, deepest, and shallowest sampling areas. Upon the identification of appropriate live bottom habitat, we add these areas to the list of available monitoring stations used in the development of annual relative abundance indices (Figure 1 and Figure 2). In addition, the SEAMAP -SA Reef Fish survey funding allows us to investigate issues relative to specific species (e.g. juvenile gag ingress and diet studies of gray triggerfish, red porgy, and vermilion snapper, etc.), sample marine protected areas (MPAs), and sample monitoring stations with additional sea days each year. In 2009 and 2010, we concentrated most of the new SEAMAP-SA Reef Fish survey efforts on surveying new bottom and sampling MPA's. In 2011, we increasingly concentrated SEAMAP-SA Reef Fish survey efforts on sampling monitoring stations identified in previous years as containing live bottom habitat. This increased monitoring station sampling effort contributes to the expanded range of monitoring station sampling in 2011 (Figure 1 vs. Figure 2).

Beginning in 2010, the National Oceanographic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) made funding available for a significant increase in the fishery-independent monitoring of snapper-grouper species in the southeast region. The resulting program, called the Southeast Fisheries Independent Survey (SEFIS) program, is housed out of the Southeast Fishery Science Center (SEFSC) laboratory in Beaufort, NC. This fishery-independent survey was designed to complement the historical MARMAP / SEAMAP -SA reef fish surveys, with MARMAP staff training SEFIS personnel and participating on SEFIS monitoring cruises. In particular, this funding has been pivotal in the identification and sampling of previously un-sampled live bottom habitat off the coast of Florida and Georgia. As is the case with the SEAMAP -SA Reef Fish survey, SEFIS personnel add appropriate live bottom habitat identified to a master database of monitoring station locations compiled by the MARMAP / SEAMAP -SA program. In future years, any of the three fishery-independent sampling programs can sample stations added to the known live bottom habitat monitoring station database and use collected data in the development of relative abundance indices. In 2010, SEFIS program sampling was almost exclusively designed to identify previously un-sampled live bottom areas off the coast of Florida and Georgia. In 2011, for logistical and cost savings reasons and since all programs were using identical sampling methods, it was decided that the SEFIS program would concentrate sampling efforts in waters off Georgia and Florida, while the MARMAP/SEAMAP-SA Reef Fish survey would concentrate its efforts off South Carolina and North Carolina. Each program also would continue efforts to investigate new live bottom habitat. In combination, the addition of the SEAMAP-SA Reef Fish survey and the SEFIS program allowed for the expanded range and increase in monitoring station samples observed in 2011 (Figure 1 vs. Figure 2).

The South Atlantic Bight

The southeastern U.S. Atlantic continental shelf, which varies in width from 5 km at its narrowest point (Palm Beach, FL) to 200 km at its widest (off Georgia and South Carolina) extends from West Palm Beach, FL to Cape Hatteras, NC, comprising a total area of approximately 90,600 km^2 (Menzel 1993; Fautin et al. 2010). It exists within the large scale geographical feature of the southeastern U.S., the SAB. Hydrographically, the dominant feature of the region is the Gulf Stream, which has a major influence on the fauna with a high diversity of cold-temperate, warm-temperate and tropical species being found (Fautin et al. 2010). On average, it has a subtle slope of approximately 1 $m*km^{-1}$, though irregularities, such as ridges and depressions, often lead to locally higher relief (Menzel 1993; Fautin et al. 2010). Traditionally, the shelf has been divided into several zones: the inner shelf (0-20 m), the mid-shelf (21-40 m) the outer shelf (41-75 m) and the shelf break, which generally occurs at about 75 m depth though it becomes shallower southward (Menzel 1993). Just inshore of the shelf break, a warm band of relatively constant temperature (18-22°C) and salinity (36.0-36.2 psu) water is observed near the bottom year round, bounded by seasonally variable waters on the inshore side and by fluctuating waters subject to cool-water upwelling events and warm Gulf Stream intrusions on the offshore side (Fautin et al. 2010).

Geologically, the dominant feature of the SAB continental shelf is extensive areas of relatively fine sediments, such as mud and sand, that is underlain at depths of less than a meter by carbonate sandstone (Henry et al. 1981; Riggs et al. 1996). Surface morphologies of these extensive areas differ due to varying current regime, storm direction, and the occurrence of multiple storm events (Henry et al. 1981), with flat plains of fine sediments, small ripples (wave lengths < 0.5 m) with crests generally oriented north-south, and megaripples (wavelength 0.5 – 1 m) being all relatively common (Glasgow 2010). Evidence suggests an absence of shear stress on bottom sediments in many areas, thus we expect no migration of bed forms (i.e. sand waves) except during storm events (periods of high shear stress; Henry et al. 1981). Bed forms occurring offshore in deeper waters are less frequent, suggesting the possibility they are relict features of major storms or bed forms stranded due to rising sea level (Henry et al. 1981). While these sand- and mud-bottom areas of the continental shelf and slope support less biomass and a lower diversity of species than other habitats, they do sustain a few important fishery species (Fautin et al. 2010), such as tilefish (*Lopholatilus chamaeleonticeps*) which are discussed in this report.

In addition to these extensive areas of sand and mud plains, another major feature of the SAB continental shelf are patchy areas of sand-veneered and rocky outcrop hard bottom areas (Powles and Barans 1980; Sedberry and Vandolah 1984). The term “hard bottom” refers to the hard surface of the seafloor and includes all hard grounds, reefs and rock outcroppings (Riggs et al. 1996). These are particularly prominent along the shelf break in depths from 45 to 60 m (Fautin et al. 2010). Such hard bottom areas provide substrate for persistent and dependent biological communities, such that hard bottom habitats are often thought to be synonymous with so called “live bottom” habitats (Riggs et al. 1996). The term “live bottom” was first used by Cummins et al. (1962) to describe the most productive trawling areas of hard bottom between Cape Lookout, NC, to Cape Canaveral, FL. These areas were so called because the habitat was composed of many species of invertebrates, including cnidarians, poriferans, bryozoans and ascidians, attached to naturally occurring hard or rocky formations of varying relief (Struhsaker 1969; Wenner et al. 1983; Barans and Henry 1984; Sedberry and Vandolah 1984; Thompson et al. 1999).

As such, these so-called “live bottom” areas provide habitat for many species of fish (Grimes et al. 1982; Barans and Henry 1984; Collins and Sedberry 1991) as these areas are shown to be ecologically important resources that provide habitats necessary to the life history of many ecologically and economically important fish species (Powles and Barans 1980; Sedberry et al. 2001; Sedberry et al. 2006). Along the SAB continental shelf between Cape Hatteras, NC, and Cape Canaveral, FL, these fish communities are dominated by warm-temperate to tropical fauna, owing to the proximity of warm Gulf Stream waters (Fautin et al. 2010). These include reef fish assemblages of economically valuable snappers (Lutjanidae), groupers (Serranidae), grunts (Haemulidae), porgies (Sparidae) as well as a diverse array of tropical fish families such as wrasses (Labridae), damselfishes (Pomacentridae), and others (Fautin et al. 2010). Managed as the snapper-grouper complex (SAFMC 1991), many of these species are or have been subjected to intense fishing pressure. Examples of such species are red snapper, black sea bass, red porgy, vermilion snapper, and gag. Though the true percentage of area covered by live bottom along the southeastern U.S. Atlantic continental shelf is unknown, various authors have estimated its extent ranges from 4 to 30% of the total shelf area (Fautin et al. 2010).

Researchers have conducted many studies to locate live bottom areas and delineate habitats on varying scales along the SAB continental shelf. Struhsaker (1969) developed an early classification scheme of SAB continental shelf habitats based on depth, bottom type, and types of demersal fish species found. Based upon this information, he divided the continental shelf and upper slope into five habitat types: 1) coastal areas, 2) open shelf, 3) live bottom, 4) shelf edge, and 5) lower shelf. Of all the habitats described by Struhsaker (1969), the live bottom and shelf (shelf edge and lower shelf) habitats support the majority of the commercially and recreationally important reef fishes, with the most productive areas occurring at depths from 24 to 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 Vandolah 1984; McGovern et al. 1999; Stratton 2011). In addition, numerous studies have analyzed the available data to describe abundance trends and various aspects of the life history of reef fish species (e.g. Low et al. 1985; Huntsman and Willis 1989; Huntsman et al. 1993; Vaughan et al. 1994; Harris and McGovern 1997; Harris and Collins 2000; Harris et al. 2002; Harris et al. 2004; Harris et al. 2007; Schobernd and Sedberry 2009; Bubley and Pashuk 2010).

The coastal area habitat extends from the coast, including estuarine areas, out to water depths of 18 m and is dominated by bottom substrates that consist of smooth or sandy mud (Struhsaker 1969). Due to the close proximity to the coast, the local waters are dominated by tidal currents, river runoff, local wind forcing, and seasonal temperature changes (Fautin et al. 2010), resulting in extreme seasonal fluctuations in water temperature and salinity (Struhsaker 1969). Dominant fish species of the coastal area include members of the family Scianidae such as red drum (Struhsaker 1969).

The open shelf habitat extends from water depths of 18 to 55 m with a bottom type that consists primarily of sand (Struhsaker 1969). This corresponds roughly to the middle shelf area defined by Fautin et al. (2010), though it does extend into their outer shelf area. Fautin et al. (2010) suggest that the waters of the middle shelf area are dominated by winds, though there is some influence of the Gulf Stream, particularly as depth increases, with the degree of stratification of the water column changing seasonally. According to Struhsaker (1969), the open shelf habitat contains few fish species of significant economic importance.

The live bottom habitat area defined by Struhsaker (1969) is found in similar water depths (19-44 m) that open shelf habitats are found, though it differs based on the dominant bottom substrate. Instead of primarily sand, the bottom in these areas consist of isolated areas of rock outcrops that are heavily encrusted with sessile invertebrates (Struhsaker 1969). However, as in open shelf habitats, waters continue to be dominated by winds, with increasing influence of the Gulf Stream as depth increases with the degree of stratification of the water column changing seasonally (Fautin et al. 2010). In contrast to open shelf habitats, live bottom habitats support high biomasses of commercially and recreationally important demersal fish taxa, including members of the families Lutjanidae (snappers), Serranidae (sea basses and groupers), Sparidae (porgies), and Haemulidae (Sedberry and Vandolah 1984; Cuellar et al. 1996).

The shelf edge habitat defined by Struhsaker (1969) is found at depths of 45 to 109 m. This roughly corresponds to the outer shelf area defined by Fautin et al. (2010), and as such it is dominated by the Gulf Stream. Struhsaker (1969) suggests this habitat area exhibits a wide range of bottom substrates, ranging from smooth mud to rocky high relief areas with very heavy encrustations of coral, sponge and other warm-water invertebrates. These rocky reef habitats at the shelf edge support large populations of reef fishes, including members of the families Serranidae, Lutjanidae, and Sparidae (Struhsaker 1969; Sedberry and Vandolah 1984; Cuellar et al. 1996).

Finally, the lower shelf habitat extends from water depths of 110 to 183 m and deeper (Struhsaker (1969). It includes smooth hard bottom with areas of rocky outcrops (Struhsaker 1969), with some deep water reef fish species such as members of the family Lutjanidae and Serranidae utilizing the rugged habitats (Cuellar et al. 1996). Other members of the snapper-grouper species complex, particularly members of the family Malacanthidae (tilefishes), utilize the smooth mud bottoms that characterize portions of the lower shelf habitat. As is the case with the shelf edge habitat, its waters are dominated by the Gulf Stream (Fautin et al. 2010).

Objective

This report presents a summary of the fishery-independent monitoring of 24 species (see Table 1) from the snapper-grouper management complex in the region and includes data from the three monitoring programs (MARMAP, SEAMAP-SA, and SEFIS). Specifically, it presents annual catch per unit effort (CPUE) and mean length of captured fish for three monitoring gears currently in use (chevron trap, short bottom longline, and long bottom longline). Included here are nominal CPUE and mean length estimates for all gears over the range of years in which each specific gear was employed for monitoring purposes. In addition, standardized CPUE estimates were developed by a delta-GLM model for species captured via our current monitoring gears in sufficient numbers. The delta-GLM models accounted for the effects of potential covariates, other than year of capture, on annual CPUE estimates.

This report also provides summaries of bottom and surface temperature in the SAB as measured during fishery-independent monitoring of reef fish habitats sampling efforts. Data presented in this report are based on the combined MARMAP / SEAMAP-SA / SEFIS database accessed in April, 2012.

Methods

Sample Collection

As outlined above, current reef fish monitoring in the SAB is accomplished via the combined efforts of three different fishery-independent survey programs, those being the MARMAP program, the SEAMAP-SA Reef Fish survey, and the SEFIS program. Henceforth, we will refer to the combined efforts of these three different fishery-independent survey programs as the SAB Reef Fish Survey.

The MARMAP program is the first and longest running of these efforts, first conducting sampling of demersal fish assemblages of the SAB in 1972. Early on, the sampling strategy changed such that research efforts became more focused on economically important reef fishes (e.g. sea basses, snappers, groupers, porgies, tilefishes, and grunts), which are most commonly found in live/hard bottom habitats of the continental shelf and shelf edge. To target these economically important reef fishes, the MARMAP program used a variety of gears in the early years (MARMAP 2009), though since 1990 it has primarily used chevron traps for monitoring purposes, which catch a diverse array of sizes and species of fish. Further, beginning in 1996, the MARMAP program introduced the use of two additional hook gears, the short bottom longline and long bottom longline, for monitoring purposes on high vertical relief live bottom and soft bottom, respectively. The SEAMAP-SA Reef Fish survey and the SEFIS program have adopted sampling methodologies identical to those established by MARMAP. However, cruises on board MARMAP / SEAMAP-SA vessels currently are the only ones deploying short and long bottom longlines. Given the close coordination and consistent sampling methodology used by each of the fishery-independent sampling programs, it is possible to combine catch, effort, and length data collected by each program for chevron traps for the analyses presented in this report (see Table 2 for gear deployment summary).

The standard SAB Reef Fish Survey sampling area includes waters of the continental shelf and shelf edge between Cape Hatteras, NC, and St. Lucie Inlet, FL, though over the years, the majority of sampling has occurred between Cape Lookout, NC, and Ft. Pierce, FL (Figure 1 and Figure 2). Throughout this range, we sample monitoring stations from May through September each year, though we have conducted some additional surveys prior to and after these months in certain years.

In conjunction with reef fish sampling, the MARMAP program has collected data on oceanographic variables in the water column using a CTD. As standard protocol, all CTD casts have collected data regarding geographic location, water depth, temperature and salinity. At times, additional water quality variables have also been measured, including the concentrations of dissolved oxygen, chlorophyll-A, phosphate ($P0_4$), nitrite ($N0_2$) and nitrate ($N0_3$). When a CTD cast was associated with a specific monitoring gear set, in general a single CTD deployment was made, with its water column variables then being associated with all monitoring gear deployed during that given set. A set is composed of one to six (generally six) chevron traps or short bottom longlines deployed at the same time in the same geographic area. For traps and short bottom longlines, we made the single CTD cast to be associated with the set of monitoring gear during the period of time between the deployment of the last piece of gear in the set and retrieval of the first piece of gear. For long bottom longlines, a set consists of one or two long bottom longlines deployed at the same time in the same geographic area. In the case of long bottom longlines, the single CTD cast is made prior to deployment of the set.

Both of the additional funding sources made available to enhance the fishery-independent monitoring of reef fish in the SAB have funded programs designed to complement the traditional MARMAP survey program as currently designed. Thus, both the SEAMAP-SA Reef Fish survey and the SEFIS program have sampling methodologies for monitoring stations that mirror those employed by MARMAP since 1990. As such, the SEAMAP-SA Reef Fish survey and the SEFIS program are only sampling monitoring stations for inclusion in CPUE and additional analyses in this report using chevron traps and short bottom longlines. The MARMAP program continues to be the only fishery-independent program in the US South Atlantic Region using long bottom longlines as a reef fish monitoring gear. Given the close coordination between and consistent sampling methodology used by each of the fishery-independent sampling programs, it is possible to combine catch, effort, and length data collected by each program for the analyses presented in this report. We present a summary of the number of gear deployments for each of the five gears used for analysis in this report made by the SAB Reef Fish Survey in Table 2.

Chevron Traps

The MARMAP program began using chevron traps in 1988 after a commercial fisherman introduced the use of this trap design in the SAB (Collins 1990). Subsequently, in 1988 and 1989, chevron traps were used simultaneously with blackfish and Florida traps to compare the efficiency of the three different trap designs at capturing reef fishes on live/hard bottom habitats (Collins 1990). During this study, each trap design was deployed simultaneously on reef habitat while anchoring all traps to the research vessel. Results indicated that the chevron trap was most effective overall and for species of commercial and recreational interest in terms of both total weight and numbers of individuals (Collins 1990).

Thus, beginning in 1990, the MARMAP program has used chevron traps for reef fish monitoring purposes in the SAB, using this single gear to replace the previously used blackfish and Florida Antillean traps. Since then, the MARMAP program has routinely used chevron traps for monitoring purposes in the SAB every year, randomly selecting between 500 and 700 stations yearly from a database of approximately 2200 known live/hard bottom areas identified for monitoring via fish traps. We chose the randomly selected stations in a manner such that no station sampled in a given year is closer than 200 m to any other selected station, though on average the minimum difference between stations sampled annually is closer to 400 m. Traditionally, the MARMAP program has deployed chevron traps at depths between 13 and 218 m, although the depth of usage generally is restricted to less than 100 m. The vast majority of the deeper deployments occurred in 1997. Since 1989, the MARMAP program primarily has deployed chevron traps from the *R/V Palmetto*.

Given the history of MARMAP's use of the chevron trap for reef fish monitoring purposes in the SAB and its proven efficiency in capturing a wide range of species and fish sizes, the South Atlantic Fishery Independent Monitoring Workshop final report suggested the chevron trap should continue to be used for monitoring purposes in the US South Atlantic region (Williams and Carmichael 2009). As as funding became available for the SEAMAP-SA Reef Fish survey and the SEFIS program, each of these fishery-independent programs continued to use the chevron trap as a primary monitoring gear for reef fish species. Currently, all three fishery-independent monitoring programs continue to utilize the chevron trap as their primary monitoring gear, with the SEAMAP-SA Reef Fish survey and SEFIS program utilizing the research vessels *R/V Palmetto* and *R/V Savannah*, respectively, as primary research platforms from 2009 through 2011.

Gear Description

A schematic of a standard chevron trap is provided in Figure 3 and a picture of a baited trap ready for deployment is provided in Figure 4. These traps are arrowhead shaped, with a total interior volume of 0.91 m^3 (Collins 1990). Each trap is constructed using 35 x 35 mm square mesh plastic-coated wire (MARMAP 2009). Each trap possesses a single entrance funnel ("horse neck") and release panel to remove the catch (Collins 1990; MARMAP 2009).

Prior to deployment, MARMAP program staff bait chevron traps with a combination of whole or cut clupeids (*Brevoortia* or *Alosa* spp., family Clupeidae), with menhaden most often used. To bait, we suspend four whole clupeids on each of four stringers suspended within the trap, while placing approximately 8 additional loose menhaden, with their abdomen sliced open, anterior to the funnel exit in the trap (Collins 1990; MARMAP 2009). Subsequently, using a brommel hook we attach an individual trap to an appropriate length of 8 mm (5/16 in) polypropylene line buoyed to the surface using a polyball buoy. Once again using a brommel hook, we attach a 10 m trailer line to this polyball buoy, with the end of the trailer line being clipped to a Hi-Flyer buoy. Traps are deployed generally in sets of six with a minimum distance between sampling stations of 200 (MARMAP 2009). Traps are retrieved in chronological order of deployment, using a hydraulic pot hauler, after approximately a 90 minute soak time.

During different periods, while using chevron traps in the SAB for monitoring purposes, the SAB Reef Fish Survey has mounted cameras (still and video) on top of chevron traps to document bottom habitat, trap behavior, and to observe reef fish species. The MARMAP program first used still cameras mounted on the top of each trap from 1990 through 1993. During this period, each camera took one picture during each deployment while the trap was on the seafloor. Cameras were mounted above the funnel opening (position A in Figure 5) and facing away from the funnel opening. This provides a visual record of the bottom type in the immediate area surrounding the funnel opening. Starting in 2007, the MARMAP program began outfitting chevron traps with digital still cameras (Nikon Coolpix S210 and S220 in Ikelite or similar Plexiglas underwater housing) set to take one image per five minutes during deployment using the camera's time elapse photo feature. This resulted in approximately 17-21 pictures per deployment. In 2007 some traps had a time-lapse camera, in 2008 roughly 50% of the traps had a time-lapse camera, and from 2009-2010 all traps had a time-lapse camera attached. In 2009 and 2010, all SEAMAP-SA Reef Fish survey deployments of chevron traps also contained the same time-lapse cameras. As was the case from 1990 to 1993, all cameras were mounted above the funnel opening (position A in Figure 5), with the series of pictures providing a record of habitat type, of bottom conditions (e.g. visibility), of trap behavior (e.g. movement of traps, species selectivity), and of numbers of individual reef fish species found in the immediate proximity of the trap.

The 2009 South Atlantic Fishery Independent Monitoring Workshop also suggested the potential use of video cameras in the US South Atlantic Region to develop a visual estimate of relative abundance for reef fish species found on live/hard bottom habitats (Williams and Carmichael 2009). To this end, the SEFIS program began using digital video cameras on all traps during their initial sampling season in 2010. During this year, they utilized two different types of digital video cameras, one being a Canon Vixia HFS200 in a Gates metal underwater housing and the other being a GoPro HD Hero in a polycarbonate housing. Both cameras were mounted above the funnel opening (position A in Figure 5). In 2011, the SEFIS program continued using both digital video cameras, but now placing two cameras on every trap, placing a Canon Vixia HFS200 above the funnel opening (position A in Figure 5) and a GoPro HD Hero on the "nose" of the trap to face roughly in the opposite direction (position B in Figure 5). Both the MARMAP program and the SEAMAP-SA Reef Fish survey installed digital video cameras on all chevron traps deployed in 2011, mounting a Canon Vixia HFS200 above the funnel opening (position A in Figure 5) and moving the digital still camera to the position occupied by GoPro cameras in SEFIS program sampling (position B in Figure 5).

Longlines

In 1996, the MARMAP program began using two types of longline gear to monitor the snapper-grouper complex in areas chevron traps cannot adequately sample, such as depths greater than 90 m. Each type of longline gear is intended to sample one of two unique bottom types: hard bottom habitat with significant relief or smooth, muddy tilefish grounds. In areas of high relief, the short bottom longline is used to follow the bottom profile, and in the tilefish grounds, the long bottom longline is deployed.

Short Bottom Longline

Although there were some trial deployments in 1979 and 1987, the MARMAP program initiated the short bottom longline (SBLL) survey in its current configuration in 1996, with an initial goal of sampling snapper-grouper species inhabiting areas with considerable vertical relief in areas deeper than 90 m. Additionally, the MARMAP program has also sampled some inshore areas (depths < 90 m) with considerable vertical relief using short bottom longlines. As such, this gear replaced the previously used Kali pole longline gear (see Russell et al. 1988) for sampling reef fishes in these habitats. In previous reports, the MARMAP program referred to this gear as a “vertical longline” since it was commonly draped over vertical relief. This name was changed to SBLL in 2009, following the Southeast Area Fisheries Independent Survey Workshop (Williams and Carmichael 2009) in Beaufort, NC, to avoid confusion with “true” vertical longlines that fish with hooks off the bottom in the water column.

Annually, short bottom longline stations more than 200 m apart are chosen for sampling randomly from a database of approximately 300 previously identified short bottom longline monitoring stations. Although the majority of short bottom longline gear deployments have been made via the MARMAP/SEAMAP-SA Reef Fish program using the *R/V Palmetto*, in 2010, the SEFIS program deployed a handful of short bottom longlines aboard the *R/V Savannah*.

Gear Description

The SBLL consists of 25.6 m (~84 ft) of 6.4-mm diameter treated solid braid Dacron (polyester) ground line dipped in green copper naphthenate. Twenty gangions with non-offset circle hooks (almost exclusively #5 Eagle claw size, but in some years some #7 were used) are placed 1.2 m (~4 ft) apart on the ground line, which is tethered to the surface using an 8-mm (5/16 in) polypropylene line attached to a polyball buoy. The polyball buoy is subsequently attached to a Hi-Flyer buoy using a 10-m trailer line composed of 8-mm (5/16 in) polypropylene line. 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 (double hooked) with a whole squid (*Illex* sp. or *Loligo* sp.). Soak time is approximately 90 minutes, and the gear is retrieved utilizing a pot hauler. Up to six SBLLs are deployed at one time, with a minimum distance between sampling stations of 200 meters.

Long Bottom Longline

The long bottom longline (LBLL) 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 longline” by MARMAP, to contrast the “vertical longline” that was used by the program. We recently adjusted the name of this gear to LBLL to better capture the nature of this gear, and distinguish it from the SBLL. It has been used during two distinct periods of time, the first being from 1982-1986 and the second being from 1996 to the present.

Potential longline sampling areas were identified based on information from commercial and recreational fishermen, fathometer data, previous exploratory surveys (Low et al., 1983), and Kali pole surveys conducted during 1985 and 1986. Subsequently, sampling locations identified were divided into sampling blocks based on the LORAN grid. In 2009, we converted the original LORAN numbers to GPS coordinates due to the imminent shutdown of the LORAN system. Since 1996, the goal has been to deploy the gear at two locations within each block.

LBLL sampling is generally conducted from August through October, with MARMAP staff currently using the *R/V Lady Lisa* as the primary research platform. 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 of the gear, as well as catchability. Sampling is generally halted if current speeds meet or exceed 2 knots.

Low et al. (1983) reported that tilefish catch rates generally were low at temperatures below 9.5^{o}C during exploratory cruises to identify suitable habitat off South Carolina and Georgia. However, they caught tilefish when bottom temperature ranged from 7.5 to 16.0^{o}C. Other researchers had found similar effects of bottom temperature on tilefish catchability in other areas. Bigelow and Schroeder (1953) reported northern tilefish were generally caught within a bottom temperature range of 8.3-11.7^{o}C, while Nelson and Carpenter (1968) caught tilefish in the Gulf of Mexico when bottom temperatures ranged from 10.0-17.2^{o}C, with highest catch rates between 12.8 and 13.9^{o}C. Thus, during initial fishery-independent surveys of SAB tilefish grounds, a decision was made that no LBLL sampling would be made if the bottom temperature was below 9°C. To accomplish this, CTD casts were made prior to each longline deployment, rather than during deployment as with other gear types. 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. Based on the previous research, it was assumed that below this temperature tilefish would not demonstrate sufficient feeding activity for consistent sampling.

In 2006, this assumption was revisited by MARMAP staff because of low or no catches in 2004 and 2005. Beginning in 2006, MARMAP started sampling tilefish habitat even if the temperature was below 9°C. These efforts indicated that golden tilefish could be collected even below this temperature, as long as the appropriate habitat (soft bottom) and depth range (150 - 250 m) was targeted. Highest catches generally occurred between depths of 200 and 230 m. Nevertheless, in the development of CPUE estimates of tilefish, it is prudent to take into account bottom temperature given the early literature suggesting bottom temperature affects tilefish catchability.

Gear Description

The LBLL has been used during two distinct periods (1982-1986 and 1996-present), with the gear configuration differing slightly during the two periods. During the first period, 1982-1986, the gear called a LBLL consisted of a 1,000 ft (approximately 305 m) Dacron (polyester) line for the ground line. This gear was deployed from galvanized tubs. During the second period, 1996-present, LBLLs are constructed of 3.2-mm galvanized cable (1,525 m long; approximately 5003 ft), deployed from a longline reel with 1,220 m (~4003 ft) of cable used as ground line and the remaining 305 m (~1000 ft) buoyed to the surface.

During both periods, when setting the gear, a 10-11 kg weight is attached to the groundline, dropped into the water, and 100 gangions (comprised of an AK snap, approximately 0.5 m of 90 kg monofilament and a tuna circle hook) are subsequently attached to the groundline. After the attachment of all 100 gangions another 10-11 kg weight is then attached at the terminal end of the ground line (buoy end) with the ground line being subsequently buoyed to the surface. In the case of the most recent period, the buoy line is composed of the remaining 305 m of cable, which is buoyed to the surface with 1 or 2 polyball buoys and a Hi-Flyer buoy attached to a 10 m Dacron (polyester) trailer line. LBLLs are generally deployed while running with the current at a speed of 4-5 knots, with each line being soaked for 90 minutes and subsequently retrieved using a hydraulic pot hauler. In both periods, gangion hooks were baited (double hooked) with whole squid (*Illex* sp. or *Loligo* sp.).

Two additional differences between LBLLs deployed during the different periods are associated with gangion spacing and hook size. First, due to the difference in lengths of the ground line during the two periods, the gangion spacing along the ground line differs. During the early period (1982-1986), gangions were placed approximately every 10 ft (approximately 3 m). The spacing increases in the later periods, such that the gangions are attached in 12 m (~39 ft) intervals to the ground line. Regarding hook size, from 1982 through 1986 hook sizes used were #5, #7 or #9; after 1996 the hook size was almost exclusively #5.

Due to these differences in the LBLL gear deployed during 1982-1986 and 1996-present, we only used data from the years 1996-present (Table 2) in the development of annual CPUE and mean length analyses, as this is the only period when we used a standardized sampling protocol.

Oceanographic Data

Prior to deploying long bottom longlines or while traps or short bottom longlines are soaking, oceanographic variables (mainly temperature and salinity) 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 (2011), we used Sea-Bird models SBE-19 or SBE-25. The SBE-19 measured 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 each deployment (set) of traps or longlines, and exact latitude, longitude, and depths are recorded for each cast.

Nominal CPUE Estimation

After collection, all fishes are sorted to species, weighed (total weight in grams, per species, per trap or longline), and all individual fish measured to the nearest cm. Fish lengths are measured in either total length (TL) or fork length (FL). Estimates of relative abundance or catch per unit effort (CPUE) included only the randomly selected stations that were fished between 45 and 150 minutes. No data from reconnaissance collections were included, and if a gear malfunctioned or the catch was mixed among collections, that collection was not included either. As such, only trap collections with catch codes of 0 (no catch), 1 (catch with finfish), 2 (catch with no finfish), and 8 (sub-sampled finfish catch) were used. CPUE and length summaries are further delineated by subsets of the available data based on the depth distribution of the species. The depth distribution was determined by the depth range at which 100% of individuals were collected (Table 3). This was done to reduce the number of zero catches from locations outside the normal depth range of the species in question. The collections under these constraints/criteria were included in the analyses and referred to as "included traps" below. Annual nominal mean CPUE for each species in the included traps was calculated by determining the numbers of individuals caught per trap per hour soak time, divided by the total number of traps deployed for that year within a species' depth range (Equation 1).

Equation 1.

$$\text{Annual CPUE}= \sum \frac{\#\, fish\ caught * 60\ minutes}{deployment\ duration\ (minutes)} / \#\ gear\ deployments$$

Annual nominal mean CPUE's for short and long bottom longlines were calculated in a similar manner, but standardized for either 20 hooks (short bottom longline) or 100 hooks (long bottom longline).

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 to the current length measurement (TL or FL, depending on species) based on FL/TL conversion equations compiled from the MARMAP database (Table 4).

CPUE Standardization

CPUE was standardized among years using the "delta-GLM" technique described in Dick (2004). Briefly, the standardized CPUE is the product of fitted values from two generalized linear models (GLMs). The first model examines the effects of factors or "covariates" on the presence or absence of a species using the binomial error distribution. As we assume each gear deployment is independent and identical to all other gear deployments, each gear deployment in effect represents a binomial trial with a sample size of one (n=1). In such cases, we refer to the distribution as a Bernoulli distribution, thus our reference to the Bernoulli sub-model or Bernoulli GLM of the delta-GLM in the remainder of this report. By modeling this presence/absence data using the Bernoulli distribution, we assume that the presence/absence data conform to the Bernoulli distribution density function

$$f(y;\pi) = \binom{1}{y} * \pi^{y} * (1-\pi)^{1-y}.$$

The mean and variance of the Bernoulli distribution are given by

$$E(Y) = \pi \qquad\qquad \mathrm{var}(Y) = \pi * (1-\pi).$$

The second model examines the effects of covariates on the CPUE of positive observations using a second assumed error distribution (e.g. gamma distribution, Gaussian distribution, lognormal distribution, etc.). We refer to this model as the positive GLM, and generally will name the sub-model for the positive GLM based upon the error distribution identified as "best" modeling the positive data (e.g. gamma sub-model and lognormal sub-model).

In the current report, we only investigated the use of the gamma and lognormal distributions to model the positive data in the delta-GLM model. The gamma distribution is appropriate for use with a continuous response variable *Y* that has positive values (*Y* > 0), and is represented by the probability density function

$$f(y;\mu,\nu) = \frac{1}{\Gamma(\nu)} * \left(\frac{\nu}{\mu}\right)^{\nu} * y^{\nu-1} * e^{\frac{y*\nu}{\mu}} \qquad y > 0 \text{ (Zuur et al. 2009).}$$

Under the gamma distribution, the mean and variance of *Y* are

$$E(Y) = \mu \qquad\qquad \mathrm{var}(Y) = \frac{\mu^2}{\nu}.$$

The lognormal distribution is a continuous probability distribution of a response variable *Y* whose logarithm is normally distributed, and is represented by the probability density function

$$f(y; \mu, \sigma) = \frac{1}{x\sigma\sqrt{2\pi}} * e^{-\frac{(\ln y - \mu)^2}{2\sigma^2}} \qquad\qquad y > 0.$$

Under the lognormal distribution, the mean and variance of *Y* are

$$E(Y) = e^{\mu + \frac{1}{2}\sigma^2} \qquad\qquad \mathrm{var}(Y) = \left(e^{\sigma^2} - 1\right) * e^{2\mu + \sigma^2}.$$

Regardless of distribution, the response variable considered in this report is CPUE.

Selection of the covariates included in the final model (both Bernoulli GLM and positive GLM) and the error distribution for the positive model was done based on Akaike's information criterion (AIC; Akaike 1973). We include year as a covariate in both models regardless of the selection outcome based on AIC. Further, we allowed the possibility that different covariates may appear in the Bernoulli GLM and positive GLM. The final delta-GLM standardized CPUE index is the product of the year effects and any selected covariates from the two models. Coefficients of variation, standard error, and standard deviations for each delta-GLM analysis were determined by a jackknifing approach.

One of the drawbacks of modeling annual CPUE using delta-GLM techniques is that, as currently implemented, this requires the removal of any years for which there were less than two positive collections for a given species. This is because the jackknifing technique to estimate annual coefficients of variations requires that two or more positive collections occur for that species in that year. Unfortunately, this constraint has the effect of further limiting the data used in CPUE analysis for those species that are least commonly caught in a given gear. If a year was removed from analysis due to less than two positive gear collections, the discussions below highlight this removal and what percentage of collections were removed from the analysis.

Another drawback of modeling annual CPUE for a given species using delta-GLM techniques is that as currently implemented it removes from analysis any collection for which we are missing data on included covariates. For example, chevron trap standardization initially included depth, latitude, bottom temperature, and season as covariates. If data regarding any of these covariates was missing for a given collection, that collection was removed from analysis. For chevron trap collections, latitudes were missing on 9 collections made in 1994, which resulted in 0.1% or less of all chevron trap collections being removed from analysis and 2.6% or less of total chevron trap collections made in 1994.

In combination, the exclusion of years due to less than two positive gear deployments and individual collections due to missing covariate data can limit the data that is used in formal delta-GLM standardization of CPUE for a given species. While this restriction likely is not a problem for the species captured in high volume for a given gear, it can severely limit the data on those species for which we already have sparse data due to their relative infrequency of capture or limits in the number of gear deployments each year (i.e. LBLL). In individual species discussions below we discuss whether these removals are likely to have a significant impact for a given species. Other standardization techniques that can accommodate missing explanatory variable data are being investigated.

Although we standardized CPUE estimates using delta-GLM models for most species, at this point we have not attempted to standardize annual mean length estimates.

Results

Gear Summary

Chevron Trap

The 1988 and 1989 data (first two years of the survey) were eliminated from the chevron trap summaries due to low sample size, restrictive area coverage, and non-standard deployment strategy (tied off to vessel; Table 2). In addition, note that 1990 was the first year after hurricane Hugo struck the area. During that year, the spatial coverage and sampling season was limited as a logistical consequence of this storm.

From 1990 to 2011, 10,161 chevron trap gear deployments were made (Table 2 and Table 6), averaging 462 (range: 286 – 1051) collections per year. Of these collections, we have included catch data from monitoring stations for 8,068 (79.4% of total) collections, representing an average of 367 (range: 218 – 657) collections per year that were used in the development of annual CPUE estimates (Table 6, Figure 1 and Figure 2). Of the remaining collections not used in the development of annual CPUE estimates, the majority (n = 1,652 or 16.3%) were reconnaissance trap deployments used to investigate potential new live bottom habitats. In addition, we removed 441 collections (4.3%) from CPUE calculations due to excluded soak times (<45 or >150 minutes, n = 341; 3.4%) or damage or loss of the gear (n = 100, 1.0%).

Traditionally, we conducted all fishery-independent chevron trap collections for monitoring purposes under the MARMAP project, thus all included collections from 1990-2008 were MARMAP collections. Beginning in 2009, data included SEAMAP-SA Reef Fish survey program collections, and data collected by SEFIS were included in the 2010 and 2011 data. The addition of these two new funding sources has resulted in a significant increase in annual chevron trap gear deployments, particularly in the years 2010 and 2011 (Table 6). In 2010 and 2011, the number of chevron trap deployments was more than double the series average, 1051 and 1010, respectively (Table 6).

As the emphasis of these new programs initially was to identify previously un-sampled reef fish habitats, particularly expanding the geographic and depth range coverage, in 2009 and 2010 the increase in total chevron trap deployments was not proportionally reflected in the number of included collections made annually (Table 6). The number of included collections in 2009 and 2010 were only slightly larger than the overall time series average of 384 collections a year, though they did represent the largest number of included collections since the mid- to late-1990s. However, in 2011 the new sampling stations identified off Georgia and Florida by SEFIS in previous years were added to the monitoring station universe (Figure 2). This resulted in a significant increase in included chevron trap collections in 2011, with 657 included collections made (Table 6 and Figure 2). This represents approximately a 71% increase in sampling of chevron trap monitoring stations in 2011.

In the 8,068 included collections, we caught 110 species representing 37 families and 68 genera (Table 7). Individuals of 27 species, representing 20 genera and 11 families, were captured every year (Table 7).

Of the 24 species considered in this report, we caught 18 in numbers sufficient to attempt the development of annual CPUE and mean length estimates (Table 1). We provide individual CPUE and mean length summaries for each of these species below. In addition to providing nominal CPUEs, we have attempted to standardize chevron trap CPUE data for a given species using delta-GLM techniques. Covariates in the initial development of the delta-GLM CPUE estimates include latitude, depth, bottom temperature (^{o}C) and season. Table 8 provides a list of the covariates and covariate bins for each species that we developed a chevron trap delta-GLM standardized CPUE estimate. Discussion of individual covariates included in the final delta-GLM model, as well as number of collections removed from analysis due to missing data (i.e. missing latitude, depth or bottom temperature data) are found in individual species summaries below.

The need for delta-GLM standardization is highlighted by the addition of newly identified live bottom habitat monitoring stations in areas markedly under sampled historically. In particular, the 2011 addition of new stations off the coasts of Georgia and Florida identified by the SEFIS program impacted nominal CPUE estimates for 11 species of commercial and recreational fisheries importance. Eight exhibited decreased nominal CPUEs in 2011 when the newly added SEFIS stations are included in the analysis compared to an analysis only calculating nominal CPUE based on traditional MARMAP and SEAMAP-SA Reef Fish survey monitoring stations. Decreases ranged from 5.75% (gray triggerfish) to 56.5% (snowy grouper; Table 9). This negative effect was most pronounced for three species that tend to be found in highest abundances in the northern portions of the SAB (white grunt, red grouper, and snowy grouper; Table 9). Conversely, the addition of new SEFIS stations increased nominal CPUEs in 2011 compared to nominal CPUEs calculated using only traditional monitoring stations for three species, gag (6.60%), red snapper (79.3%), and speckled hind (100%; Table 9). The assumed center of abundance of red snapper in the SAB is off the coasts of Georgia and northern Florida, which is where SEFIS added the majority of the new monitoring stations. The effect of adding the new SEFIS stations to the sampling universe on delta-GLM standardized CPUE estimates for most species is marginal. We account for the effect of increasing sampling in areas (e.g. depths or latitudes) traditionally under-represented by MARMAP and SEAMAP-SA Reef Fish survey monitoring stations in the delta-GLM model.

One concern arising from the delta-GLM standardization was the removal of chevron trap collections due to missing bottom temperature data, mostly resulting from malfunctions of the CTD. While overall this resulted in the removal of less than 15% of all chevron trap collections considered for a given species, it did result in greater than 20% of the available chevron trap collections being removed for a given year (Table 10).

Longlines

Short Bottom Longline

The 1996 and 1997 data were included in the CPUE and mean length analyses because the differences in deployment strategy were not sufficient to warrant non-inclusion. However, the short bottom longline data collected in 1996 and 1997 (first two years of the survey) should be considered with caution. This is due to sparse geographic coverage and slight differences in the deployment strategy in those years.

From 1996 to 2011, we made 968 short bottom longline gear deployments (Table 2 and Table 11), averaging 60 (range: 20 – 142) collections a year. Of these collections, we have included catch data from monitoring stations for 729 (75.3%) collections that we can use in the development of annual CPUE estimates (Table 11, Figure 1 and Figure 2), or on average from 45 (range: 15 – 91) collections a year. Of the remaining not used in the development of annual CPUE estimates, the majority (n = 183 or 18.9%) were reconnaissance short bottom longline deployments used to investigate potential new hard bottom habitats. In addition, we removed an additional 56 collections (5.7%) from CPUE calculations due to either their deployment duration time falling outside the 45-150 minute window (n = 16; 1.6%) or damage/loss of the gear (n = 40, 4.1%) resulting in loss or mixing of the catch.

Traditionally, we conducted all fishery-independent short bottom longline collections for monitoring purposes under the MARMAP project, thus all included collections from 1996-2008 were MARMAP collections (Table 11). Beginning in 2009, we acquired some additional fishery-independent reef fish survey funding through the SEAMAP-SA Reef Fish Survey program. In 2010 additional funding to survey reef fish habitat for monitoring purposes in the US South Atlantic region was provided to the SEFIS program, further increasing the potential number of sea days available to acquire data from monitoring stations used to develop annual CPUE estimates. The addition of these two new funding sources has resulted in an increase in annual short bottom longline gear deployments, particularly in 2010 and 2011 (Table 11). In 2010 and 2011, the number of short bottom longline deployments was more than double the series average, at 135 and 142, respectively (Table 11).

The addition of these new funding sources for fishery-independent monitoring of reef fish in the US South Atlantic region has allowed for more overall sea days in 2010 and 2011, thus allowing for more effort to be expended on conducting short bottom longline collections at monitoring stations. Particularly, the ability of the SEFIS program to conduct all chevron trap sampling at monitoring stations south of approximately 32^{o}N latitude in 2011 created additional time for MARMAP to conduct additional short bottom longline sampling. Thus, in both 2010 and 2011 the number of included collections was above the series average of 45 per year. In 2010 and 2011 we had 71 and 91 included collections, respectively (Table 11, Figure 1 and Figure 2), representing an approximately 58 and 102% increase in short bottom longline survey effort over the series average.

In the 729 included collections, we collected specimens representing 18 families, 27 genera, and 48 species (Table 12). Of these 48 species, we captured individuals of one species, snowy grouper (*Epinephelus niveatus*) in every year (Table 12). In addition, we collected scamp (*Mycteroperca phenax*) in every year for which we had included short bottom longline collections made in the depth range they are expected to occur (Table 3).

Of the 24 species considered in this report, we caught 11 in sufficient numbers to attempt the development of annual CPUE and mean length estimates (Table 1). We provide individual CPUE and mean length summaries for each of these species below. Please note, if possible we have attempted to standardize short bottom longline CPUE data for a given species using delta-GLM techniques to determine if year significantly affects annual CPUE estimates. Covariates in the initial development of the delta-GLM CPUE estimates included latitude, depth, bottom temperature (^{o}C) and season. Table 13 provides a list of the covariates and covariate bins for each species that we developed a short bottom longline delta-GLM standardized CPUE estimate. Discussion of individual covariates included in the final delta-GLM model, as well as number of collections removed from analysis due to missing data (i.e. missing latitude, depth or bottom temperature data) are found in individual species summaries below.

Missing data for any given covariate in a SBLL collection resulted in the removal of less than 21% of all collections considered for a given species, but resulted in greater than 55% of the available short bottom longline collections being removed for a given year (Table 14).

Long Bottom Longline

Although some trial deployments of long bottom longlines began in 1982 (Table 2), from 1982-1986 the deployment strategy was substantially different from the currently employed strategy. Thus, we did not use the years 1982-1986 in the development of CPUE and mean length estimates in this report. Subsequent to 1986, there was a hiatus in the use of the long bottom longlines until 1996 (Table 2).

Since 1996, we have undertaken annual sampling efforts using the long bottom longline gear, resulting in a total of 496 long bottom longline gear deployments (Table 2), averaging 19 (range: 0 – 40) collections a year. Sampling efforts have mostly been concentrated off the South Carolina and Georgia coast. In 2008, we were unable to deploy any long bottom longlines due to consistent bad weather because of several storms during the sampling season. This sampling has occurred exclusively through the MARMAP program, as the new fishery-independent programs (SEAMAP-SA Reef Fish Survey and SEFIS) provided no additional support to expand upon MARMAP long bottom longline sampling.

Of these 496 collections, we have included catch data from monitoring stations for 478 (96.8%) collections that we can use in the development of annual CPUE estimates (Figure 1 and Figure 2), or on average from 18 (range: 0 – 40) collections a year. Of the remaining not used in the development of annual CPUE estimates, the majority (n = 14; 2.8%) were not used due to their deployment duration time falling outside the 45-150 minute window. We did not use an additional two (0.4%) samples in analyses because they were reconnaissance long bottom longline deployments used to investigate potential new habitat. Finally, we exclude two (0.4%) additional samples because of damage/loss of the gear resulting in loss or mixing of the catch. In 2009, 2010, and 2011 we made a total of 36, 40 and 27 included long bottom longline collections, respectively. Each of these efforts were a considerable increase from the average of 18 included long bottom longline deployments over the time series, representing a 100%, 122%, and 50% increase in long bottom longline survey effort, respectively, over the series average.

Unlike the other monitoring gears that have been traditionally used to monitor changes in relative abundance of a suite of snapper-grouper species complex species (e.g. chevron traps and short bottom longlines), long bottom longlines are used in specific habitats where one expects to find golden tilefish. Thus, this gear was tailored to catch a single species, instead of being a species generalist. Being such, golden tilefish were captured in all years, except 2004, we had included long bottom longline collections. However, in addition to golden tilefish, we captured an additional 32 species, representing 20 genera and 17 families, in included long bottom longline collections (Table 15).

Of the 24 species considered in this report, we caught 3 in sufficient numbers to attempt the development of annual CPUE and mean length estimates for long bottom longline (Table 1). We provide individual CPUE and mean length summaries for each of these species below. We were able to standardize long bottom longline CPUE with the delta-GLM model for golden tilefish only. Covariates in the initial development of the delta-GLM CPUE estimates included depth and bottom temperature (^{o}C). Table 16 provides a list of the covariates and covariate bins used to standardize golden tilefish CPUE. Discussion of individual covariates included in the final delta-GLM model, as well as number of collections removed from analysis due to missing data (i.e. missing depth or bottom temperature data) are found in individual species summaries below.

Species

For each of the 24 species included in this report, we outline results below for any gear types in which that species was collected in sufficient numbers to develop annual nominal CPUE estimates and, in many cases, delta-GLM standardized CPUE estimates.

Balistidae

Gray Triggerfish

Chevron Trap

The gray triggerfish depth constraint (Table 3) resulted in the exclusion of 32 chevron trap collections, resulting in the use of 8,036 included traps for estimating nominal CPUE. Nominal CPUE of gray triggerfish showed a high degree of year-to-year variability (0.122-0.963 fish*trap^{-1}*hr^{-1}), with relatively high annual coefficients of variations (1.73-4.27), which are suggestive of a high degree of variability in individual trap catches (Table 18 and Figure 6A).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 994 chevron trap collections, respectively, or 0.1% and 12.4% of the data included in the nominal CPUE analysis. This resulted in a total of 7,033 included collections retained in the delta-GLM analysis, ranging from 184 to 458 per year (Table 19). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). Because of the high encounter rate of gray triggerfish in the chevron traps (7 of 24 species in number of individuals captured), exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested that we retain all covariates in both the Bernoulli and positive components (Table 8) and model the positive component with a lognormal error distribution. Thus, our best-fit delta-GLM model contained all possible covariates considered and modeled the positive component using a lognormal error distribution. All variables, including year, were highly significant in the analysis of deviance of both the Bernoulli and lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.12 in 1997 to a high of 0.23 in 2003 (Table 19). Compared to the nominal CPUE, the delta-GLM tended to reduce the annual variability in CPUE, particularly over the period 2004-2011 (Figure 6B). Please note the low estimate of CPUE in 1990 may have been influenced by both the direct effect that hurricane Hugo had on the reef fish communities of the SAB, as well as the effect it had on the temporal and spatial extent of samples collected as part of the MARMAP sampling season in 1990. Standardized CPUE estimates normalized to the series average indicates that CPUE was somewhat variable through the mid to late 1990's, before exhibiting a general decreasing trend through 2011 (Table 19 and Figure 6B), with an almost linear decline in annual CPUE from 2004-2011 (Figure 6B).

As gray triggerfish are of commercial and recreational importance, they are currently scheduled for their first benchmark stock assessment through the SEDAR process in 2013. In preparation for this, the effect of the addition of new monitoring stations by the SEFIS program in 2011 on both nominal and delta-GLM standardized CPUE estimates was investigated. Because the delta-GLM model works to obtain parameter estimates of the effects of all covariates using all available data, the inclusion of 2011 SEFIS monitoring station data (predominately stations located off the coast of Georgia and Florida) could affect standardized CPUE estimates for all years. Exclusion of SEFIS stations resulted in the removal of an additional 202 or 2.5% of 8,036 monitoring chevron trap collections used during development of nominal CPUEs and delta-GLM standardized CPUE estimates (Table 20). The exclusion of SEFIS stations resulted in a slightly higher nominal CPUE point estimate and larger standard error about this estimate in 2011 (Table 9 and Figure 7). However, as expected, exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 20 and Figure 7).

Mean lengths of gray triggerfish were highest in 2005 and lowest in 1991 (Table 18 and Figure 6A).

Carangidae

Almaco Jack

Short Bottom Longline

The Almaco jack depth constraint (Table 3) resulted in the exclusion of 11 (1.5%) short bottom longline collections when calculating annual CPUE. Almaco jack were relatively uncommon, with no fish collected in 1996-2000 and 2005, so caution must be applied to both the nominal and standardized CPUE estimates. Almaco jack nominal CPUE was highest in 2007 at 0.521 fish*20 $hooks^{-1}$*hr^{-1} (Table 21 and Figure 8A). Annual coefficients of variations ranged from 2.37 to 6.40 (Table 21).

In the delta-GLM model we took into account the effect of year on CPUE but also investigated the effects of depth and temperature on CPUE (Table 13). We did not include latitude in this analysis because the range of latitudes at which Almaco jack were collected limited the data set to a greater extent than other covariates. Missing temperature data caused the additional removal of 95 (13.0%) collections included in the calculation of nominal CPUE. This resulted in a total of 623 SBLL collections, ranging from 12 to 84 per year, being retained for the delta-GLM analysis.

AIC selection removed the covariate temperature from both the Bernoulli and positive sub-model (Table 13) and suggested the lognormal error distribution should be use for the positive model. Thus, our best-fit delta-GLM model contained only the additional covariate depth in both the Bernoulli and positive sub-model, and modeled the positive sub-model assuming a lognormal error distribution. However, based on analysis of deviance tables, both year and depth were highly significant for the Bernoulli sub-model while only year was significant in the lognormal sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM decreased the annual coefficient of variation estimates, with annual estimates ranging from a high of 0.81 in 2001 to a low of 0.55 in 2007 (Table 22). Standardized CPUE estimates normalized to the series average demonstrated no trend for Almaco jack across the survey period (Figure 8B). CPUE remained anomalously high in 2007 compared to all other years but not to the extent as in the nominal data.

Almaco jack lengths were highest in 2002 (FL=847 mm, n=3) and lowest in 2006 (FL=699 mm, n=7; Figure 8A). Almaco jack nominal CPUE appeared to increase during the survey period but this was merely due to no catches in the first 5 years of the time series and unusually high catches in 2007 (Figure 8A).

Greater Amberjack

Short Bottom Longline

The greater amberjack depth constraint (Table 3) resulted in the exclusion of 41 (5.6%) short bottom longline collections prior to estimation of annual CPUE. Greater amberjack nominal CPUE ranged from a high of 0.299 fish*20 $hooks^{-1}$*hr^{-1} in 2005 to a low of 0 fish*20 $hooks^{-1}$*hr^{-1} in 1996-1998 and 2008 (Table 23 and Figure 9A). Annual coefficients of variations ranged from 2.21 to 8.43 (Table 23). Greater amberjack nominal CPUE did not follow any pattern during the survey period (Figure 9A).

The delta-GLM model accounted for the effect of year, depth, and temperature on greater amberjack CPUE (Table 13). We did not include latitude in this analysis because the range of latitudes at which greater amberjack were collected limited the data set to a greater extent than other covariates. Missing temperature data caused the additional removal of 65 (8.9%) collections included in the calculation of nominal CPUE. This resulted in a total of 623 SBLL collections, ranging from 12 to 84 per year, being retained for the delta-GLM analysis (Table 24).

AIC selection removed the covariate temperature from both the Bernoulli and positive sub-model (Table 13) and suggested the lognormal error distribution should be use for the positive model. Thus, our best-fit delta-GLM model contained only the additional covariate depth in both the Bernoulli and positive sub-model, and modeled the positive sub-model assuming a lognormal error distribution. However, based on analysis of deviance tables, while both year and depth were significant for the Bernoulli sub-model neither was significant in the lognormal sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM decreased the annual coefficient of variation estimates, with annual estimates ranging from a high of 0.80 in 2002 to a low of 0.43 in 2005 (Table 24). Standardized CPUE estimates normalized to the series average shows no trend in CPUE over time for greater amberjack (Figure 9B). Standardization reduced interannual variability; however, there was no clear pattern in CPUE across the survey period. Standardization also minimized evidence of unusually high catches in 2005, 2007, and 2009, suggesting that high nominal CPUE in those years was a function of sampling rather than a change in the population.

Greater amberjack lengths were highest in 2001 (FL=1020 mm, n=5) and lowest in 2010 (FL=550, n=1; Figure 9A).

Haemulidae

Tomtate

Chevron Trap

The tomtate depth constraint (Table 3) resulted in the exclusion of 225 chevron trap collections, leaving 7,843 chevron trap collections to be used for estimating nominal CPUE. Nominal CPUE ($fish*trap^{-1}*hr^{-1}$) of tomtate in the SAB, though exhibiting a general decreasing pattern over the series with continuously below average CPUE since 2003 (Figure 10A), is fraught with relatively high annual coefficients of variations (1.61-3.46; Table 25). These coefficients of variation are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 977 chevron trap collections, respectively, or 0.1% and 12.5% of the data included in the nominal CPUE analysis. This resulted in a total of 6,857 collections being retained in the delta-GLM analysis, ranging from 180 to 436 per year (Table 26). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As tomtate are one of the more common species (2 of 24 species in individuals captured) investigated in this report captured by chevron traps, exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested the removal of the covariate season from the Bernoulli sub-model (Table 8) and that we model the positive sub-model assuming a lognormal error distribution. Thus, our best delta-GLM model contained the covariates depth, latitude and temperature for the Bernoulli sub-model and all covariates using a lognormal error distribution for the positive sub-model. Based on analysis of deviance tables, all variables, including year, were highly significant in both the Bernoulli and lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.14 in 1998 to a high of 0.21 in 2003 and 2006 (Table 26). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach explained a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average indicates that CPUE exhibited a general decreasing trend through 2011, although we observed a slight recovery in annual CPUE from 1998-2002 (Table 26 and Figure 10B). Of concern is the continuously low annual CPUE estimates from 2003-2011 (Figure 10B), being less than or equal to 75% (range: 25%-75%) of the series average for all years (Table 26).

Tomtate mean lengths were highest in 2006 (190 mm FL) and lowest in 1995 (172 mm FL; Table 25). While there may have been a decrease in mean lengths from 1990 to 1995, mean length estimates rapidly increased, such that there is no pattern in mean lengths since at least the early 2000s (Figure 10A).

<u>White Grunt</u>

Chevron Trap

The white grunt depth constraint (Table 3) resulted in the exclusion of 444 chevron trap collections, resulting in the use of 7,624 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of white grunt showed a high degree of year-to-year variability (0.102 to 1.075 fish*trap^{-1}*hr^{-1} in 2010 and 1992, respectively; a 10-fold change from minimum to maximum over the series), with high annual coefficients of variations (3.18-6.38; Table 27 and Figure 11A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 957 chevron trap collections, respectively, or 0.1% and 12.6% of the data included in the nominal CPUE analysis. This resulted in a total of 6,658 collections being retained in the delta-GLM analysis, ranging from 180 to 424 per year (Table 28). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As white grunt are one of the more common species (9 of 24 species in individuals captured) investigated in this report captured by chevron traps, exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested the removal of the covariate season from the Bernoulli sub-model (Table 8). AIC selection suggested that we remove the covariates depth and season from the positive sub-model (Table 8) and that we model the positive sub-model assuming a lognormal error distribution. Thus, our best delta-GLM model suggested the Bernoulli sub-model contain the covariates depth, latitude and temperature while the positive sub-model contain the covariates latitude and temperature and model the error in positive CPUE using a lognormal distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in both the Bernoulli and lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.22 in 1996 to a high of 0.35 in 1999 (Table 28). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average shows CPUE was variable but generally decreasing over the survey period (Table 28 and Figure 11B). This decrease is most pronounced since 2002-2004, with standardized CPUE being below average in all years since 2004 and less than 50% of the series average from 2006-2010. A slight increase in CPUE in 2011 compared to 2006-2010 (Figure 11B), although still near the historical low, may indicate a change in this decreasing trend.

For white grunt we compared nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program as in gray triggerfish. The exclusion of new SEFIS monitoring collections resulted in the removal of an additional 195 (2.6%) chevron trap collections used in the development of the original nominal and delta-GLM standardized CPUE estimates presented above (Table 29). Exclusion of SEFIS stations resulted in a large increase in the nominal CPUE point estimate and a larger standard error about this estimate in 2011 (Table 9 and Figure 12). Because the center of abundance of white grunt in the SAB is near the northern extent of the SAB, we expected the inclusion of SEFIS monitoring stations that are predominately off the coast of Georgia and Florida to decrease the nominal CPUE estimate. However, as expected, exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 29 and Figure 12).

Annual mean length estimates of white grunt were highly variable with no clearly discernible trend (Figure 11A). Annual mean length was lowest in 2004 and tied for the highest in 2007 and 2010 (Table 27 and Figure 6A).

Lutjanidae

Red Snapper

Chevron Trap

The red snapper depth constraint (Table 3) resulted in 7,597 chevron trap collections being included in the estimation of nominal CPUE. Nominal CPUE of red snapper showed a high degree of year-to-year variability (0.007 to 0.086 fish*trap^{-1}*hr^{-1} in 1996 and 2011, respectively; a greater than 10-fold change from minimum to maximum over the series) with high annual coefficients of variations (4.43-14.56;

Table **30** and Figure 13A). Due to the year to year variability and high annual coefficients of variation, it was difficult to visually discern any trend in nominal CPUE estimates. No formal statistical test was used to test for a trend in nominal CPUE over the time series.

For the delta-GLM analysis (see covariates and bins in Table 8), we removed the years 1999 and 2003 from analysis because we had less than two positive chevron trap collections for red snapper in these years. This resulted in the removal of an additional 471 (6.2%) chevron trap collections from the delta-GLM analysis. Furthermore, missing latitude and temperature data resulted in the removal of 9 and 906 chevron trap collections, respectively, or 0.1% and 11.9% of the data included in the nominal CPUE analysis. This resulted in a total of 6,510 included chevron trap collections being retained for delta-GLM analysis, ranging from 200 to 449 per year (Table 31). Due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and

2011 (Table 10). As red snapper have occurred relatively infrequently in historical chevron trap collections, exclusion of this data could affect annual standardized CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that we remove the covariates temperature and season from the Bernoulli sub-model (Table 8). Furthermore, AIC selection suggested that we remove the covariate depth from the positive sub-model (Table 8) and model the positive sub-model assuming a lognormal error distribution. Thus, our best-fit delta-GLM model contained the covariates depth and latitude in the Bernoulli sub-model and the covariates latitude, temperature, and season in the positive sub-model and modeled the positive CPUE error using a lognormal distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in the Bernoulli sub-model of the final delta-GLM. Conversely, the only variables significant in the lognormal sub-model were season and latitude, and these were only marginally significant. Note that year was not an important factor in explaining the CPUE of traps that were positive for red snapper. This suggests that sampling year helps determine whether a chevron trap will catch a red snapper, but does not explain how many red snapper will be captured if a trap caught red snapper. The general inability of covariates to explain the number of red snapper captured if a trap catch is positive, probably stems from the observation that we captured only a single red snapper in 115 of 192 positive chevron traps (59.9%) and fewer than three red snapper in 153 of 192 (79.7%). Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.26 in 2011 to a high of 0.64 in 2004 (Table 31). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average were variable (Table 31) with no clear directional trend throughout the time series (Figure 13B). Many factors are likely working in concert to produce this variability, but one possible factor is that dominant year classes in the population are driving CPUE to some extent. Periodic dominant year classes have been suggested in recent red snapper stock assessments, with the most recent benchmark assessment of red snapper in the U.S. South Atlantic region suggesting above average age-1 recruitment of red snapper in 1987, 1999-2000, and 2006-2007, while near average recruitment was observed in 1991 and 2003 (SEDAR 2010). However, other factors likely exist (including changes in management regulations), and as currently formulated we are unable to determine the relative magnitude of different factors on the observed CPUE. Nevertheless, recent years demonstrate an increasing pattern of CPUE since 2004 (Figure 13). 2011 CPUE estimates were similar to the peak CPUEs observed in 1991-1992 and 2000-2002.

For red snapper we compared nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 202 (2.7%) monitoring station collections used for development of nominal and delta-GLM standardized CPUE estimates (Table 32). When developing the delta-GLM model using this abbreviated data set (excluding new SEFIS live/hard bottom stations), we performed two analyses: 1) an analysis using the same model selection criteria (i.e. selection based on AIC scores) used in the original delta-GLM formulation, and 2) an analysis assuming the exact same model structure (i.e. same error distribution and covariates included in both sub-models) as in the original delta-GLM. In the first analysis, in addition to depth, AIC selection criteria suggested that the covariate season should be removed from the lognormal sub-model. Both analyses provided virtually the same results, and we only present the results from the 1st additional analysis (Table 9 and Figure 14A).

The exclusion of the new SEFIS monitoring stations resulted in a decrease in the nominal CPUE point estimate and a smaller standard error in 2011 (Table 9 and Figure 14A). The exclusion of the SEFIS monitoring stations from the delta-GLM standardized CPUE estimates resulted in a decrease in CPUE in 2011 as well (Table 32 and Figure 14). Because both additional delta-GLM analyses resulted in the same observed change in predicted annual CPUE of red snapper, we suspect that it is not a difference in model formulation driving the changes in CPUE estimates. Rather, the most likely hypothesis is that the inclusion of new SEFIS monitoring station data in 2011 resulted in substantial changes in parameter estimates for the effect of the different covariates thereby changing the effect these had on annual CPUE estimates. Historically, fishery landings (not scaled to effort) in Florida constitute the majority of red snapper catches in the South Atlantic Bight, suggesting that a relatively high proportion of the population occurs in northeast Florida (SEDAR 24). Since SEFIS efforts have largely occurred in high landings areas, it is likely that the new sampling effort is, at least partially, responsible for the observed increase in red snapper CPUE.

Red snapper mean lengths were very variable during the time series, with means ranging from 558 mm FL (1996) to 220 mm FL (2003; Table 31).

<u>Vermilion Snapper</u>

Chevron Trap

The vermilion snapper depth constraint (Table 3) resulted in the exclusion of 22 chevron trap collections, resulting in the use of 8,046 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of vermilion snapper showed a high degree of variability (0.414 to 6.967 fish*trap^{-1}*hr^{-1} in 2003 and 1992, respectively; a 17 fold change from minimum to maximum over the series), with high annual coefficients of variations (2.11-4.99; Table 33 and Figure 15A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches. Despite these coefficients of variation, there was a decreasing pattern in CPUE of vermilion snapper based on nominal CPUE.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 996 chevron trap collections, respectively, or 0.1% and 12.4% of the data included in the nominal CPUE analysis. This resulted in a total of 7,041 collections being retained in the delta-GLM analysis, ranging from 184 to 458 per year (Table 34). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As vermilion snapper are one of the more common species captured by chevron traps (4 of 24 species in individuals captured), exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested that all covariates be retained for the Bernoulli sub-model (Table 8). For the positive sub-model, AIC selection suggested we remove the covariate season (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Thus, our best-fit delta-GLM model suggested the Bernoulli sub-model contain all considered covariates while the positive sub-model contain the covariates depth, latitude and temperature and model the error in positive CPUE using a lognormal distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in both the Bernoulli and lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.16 in 1993 and 1994 to a high of 0.26 in 2003 (Table 34). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average shows that CPUE remained variable, but generally decreased over the survey period (Table 34 and Figure 15B). As such, annual CPUE estimates have been below the series average since 2003, with CPUE in 2011 being only 37% of the series average (Table 34). Again, the low estimate of CPUE in 1990 may have been influenced by both the direct effect that hurricane Hugo had on the reef fish communities of the SAB, as well as the effect it had on the geographical extent of samples and sampling season for MARMAP in 1990 as this estimate is low in both the nominal and standardized estimates.

For vermilion snapper we compared nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 202 (2.5% of 8,046 monitoring stations used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 35). For vermilion snapper, the exclusion of new SEFIS stations resulted in an increase in the nominal CPUE point estimate and a larger standard error about this estimate in 2011 (Table 9 and Figure 16). Exclusion of the SEFIS monitoring stations had no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 35 and Figure 16).

Vermilion snapper mean lengths were highest in 2010 and 2011 (275 mm FL) and lowest in 1992 (210 mm FL; Table 34). There was a clear increasing pattern in mean length of captured vermilion snapper over the survey period (Figure 15A), with an increase of approximately 65 mm (~2.56 inches) from the series low (Table 34).

Malacanthidae

Blueline Tilefish

Short Bottom Longline

Application of the depth constraint for blueline tilefish (Table 3) resulted in the exclusion of 19 (2.6%) short bottom longline collections. Blueline tilefish catches on the short bottom longline are low relative to several other species included in this report, with 0 catches in many years (1996, 2002, 2004, and 2007; Table 36). Highest blueline tilefish nominal CPUE occurred in 1997 (0.212 fish*20 hooks^{-1}*hr^{-1}; Figure 17A). Annual coefficients of variations ranged from 1.82 to 6.32 (Table 36). There was no clear pattern in nominal CPUE (Figure 17A), likely due to the limitations of the data set.

For the delta-GLM analysis, we standardized the annual CPUE taking into account the effect of year, depth, and bottom temperature on CPUE. For blueline tilefish, we did not include latitude as a covariate because the range of latitudes at which blueline tilefish were collected limited the data set to a greater extent than other covariates. A list of covariates and covariate bins considered in the blueline tilefish analysis can be found in Table 13. In the analysis, missing temperature data resulted in the removal of 94 (12.95) SBLL collections. This resulted in a total of 616 collections being retained in the delta-GLM analysis, ranging from 11 to 80 per year (Table 37). Because of the low sample sizes, caution should be applied to conclusions drawn for blueline tilefish CPUE.

During the model selection process for the final delta-GLM model, AIC selection suggested that only depth be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model be modeled assuming a lognormal error distribution. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model but neither was significant in the lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a high of 0.71 in 2009 to a low of 0.42 in 1997 (Table 37). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual short bottom longline catches. Nevertheless, there was no clear pattern in standardized CPUE over time for blueline tilefish, although CPUE did increase in 2011 relative to 2008-2010. There also was no trend in variability across the survey period standardized CPUE estimates normalized to the series average (Figure 17B).

With the exception of 1998, blueline tilefish lengths have remained relatively consistent throughout the survey period (Figure 17A). Blueline tilefish lengths were highest in 2009 (FL=645 mm, n=2) and lowest in 1998 (FL=430 mm, n=1).

<u>Golden Tilefish</u>

Short Bottom Longline

Application of the depth constraint for golden tilefish (Table 3) resulted in the exclusion of 407 (55.8%) short bottom longline collections. Golden tilefish catches on the short bottom longline were variable ranging from a high nominal CPUE of 0.749 fish*20 hooks $^{-1}$*hr^{-1} in 2009 to a low of 0 fish*20 hooks $^{-1}$*hr^{-1} in 2004 and 2007 (Table 38 and Figure 18A). Annual coefficients of variations ranged from 0.60 to 4.47 (Table 38). Golden tilefish nominal CPUE did not follow any pattern during the survey period (Figure 18A).

Annual CPUE was standardized using the delta-GLM model accounting for the effect of year and depth. Neither latitude nor temperature were included in this analysis because the range of latitudes at which golden tilefish were collected was limited and the number of collections with positive catches and associated temperature data limited the data set to an extent inappropriate for the delta-GLM technique. A list of the depth covariate bins considered in the golden tilefish analysis can be found in Table 13. A total of 322 short bottom longline collections, ranging from 6 to 46 per year, were retained for the delta-GLM analysis.

AIC selection suggested that the lognormal error distribution best fit the positive CPUE for golden tilefish in the best-fit final delta-GLM model. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model. However, only year was significant in the lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a high of 0.81 in 1999 to a low of 0.23 in 2009 (Table 39). This suggested that the inclusion of the extra covariate depth and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual short bottom longline catches. Despite this, standardized CPUE estimates based on the final model normalized to the series average showed no trend in CPUE over time for golden tilefish (Figure 18B). Intra-annual variability tended to increase with CPUE.

Golden tilefish lengths were highest in 2008 (FL=790 mm, n=1) and lowest in 2000 (FL=600 mm, n=8; Figure 18A).

Long Bottom Longline

Application of the depth constraint for golden tilefish (Table 3) resulted in the exclusion of 57 (19.6%) long bottom longline collections. Golden tilefish nominal CPUE ranged from a high of 3.72 fish*100 $hooks^{-1}$*hr^{-1} in 2009 to a low of 0 fish*100 $hooks^{-1}$*hr^{-1} in 2004 (Table 40 and Figure 19A). There was no pattern in nominal CPUE over time. Annual coefficients of variations ranged from 1.27 to 2.89 (Table 40).

For the delta-GLM analysis, annual CPUE was standardized using the delta-GLM model accounting for the effect of year, depth and bottom temperature. The depth and temperature covariate bins considered for golden tilefish can be found in Table 16. Latitude was not considered in the delta-GLM analysis because the range of latitudes over which LBLL sampling was conducted is limited relative to other gear types and the extent of the survey area. In the analysis, missing temperature data resulted in the removal of 46 (15.8%) LBLL collections. This resulted in a total of 188 collections being retained in the delta-GLM analysis, ranging from 4 to 40 per year (Table 41).

During the model selection process for the final delta-GLM model, AIC selection suggested that only temperature be retained in both the Bernoulli and positive sub-model (Table 16) and that the positive sub-model be modeled assuming a gamma error distribution. Although the inclusion of temperature greatly limited the number of included collections, there was no evidence that depth affected CPUE even with no selection based on temperature availability, so we chose to retain temperature in the analysis. Thus, our final delta-GLM model contained year and temperature and modeled the positive component using a gamma error distribution. Based on analysis of deviance tables, neither year nor temperature was significant in the Bernoulli sub-model but both were significant in the gamma sub-model of the delta-GLM. Year and temperature, therefore, could not predict if golden tilefish were present but rather, if present, how many would be captured. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.55 in 1998 to a low of 0.21 in 2010 (Table 41). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual long bottom longline catches. Standardized CPUE estimates normalized to the series average was higher 1997-2001 than 2007-2011 and variability also was higher in 1997-2001 than in 2007-2011 (Figure 19B). High variability and low catches may have been driven at least partially by the advent of sampling at temperatures below 9°C beginning in 2006. Although standardization reduced interannual variability, there was no clear pattern in CPUE over time for golden tilefish. One item of note is the similarity in catch patterns of golden tilefish on both longline gears (e.g. high CPUE in 2009 and low CPUE in 2004). This agreement may be useful in the future development of abundance indices as both gears are limited in sample size and scope relative to the chevron traps but may provide complimentary information.

Golden tilefish lengths were highest in 2011 (FL=774 mm, n=125) and lowest in 1996 (FL=463 mm, n=30), with an increasing pattern over the survey period (Figure 19A). Increasing lengths suggests that tilefish may be recovering from growth overfishing which likely occurred prior to the implementation of catch limits were first enacted in 1994 (SEDAR 2011).

Sebastidae

Blackbelly Rosefish

Short Bottom Longline

The blackbelly rosefish depth constraint (Table 3) resulted in the exclusion of 411 (56.4%) short bottom longline collections. Blackbelly rosefish nominal CPUE was highly variable ranging from a high of 1.845 fish*20 hooks^{-1}*hr^{-1} in 1996 to a low of 0 fish*20 hooks^{-1}*hr^{-1} in 2002 and 2004-2005 (Table 42 and Figure 20A). Annual coefficients of variations ranged from 1.04 to 8.43 (Table 42). Blackbelly rosefish nominal CPUE did not follow any pattern during the survey period.

For the delta-GLM analysis, annual CPUE was standardized using the delta-GLM model initially considering year, depth, and bottom temperature as additional covariates. We did not include latitude in this analysis because the range of latitudes at which blackbelly rosefish were collected limited the data set to a greater extent than other covariates making analysis implausible. A list of covariates and covariate bins considered in the blackbelly rosefish analysis can be found in Table 13. In the analysis, missing temperature data resulted in the removal of 60 (8.2%) SBLL collections. This resulted in a total of 258 collections being retained in the delta-GLM analysis, ranging from 2 to 36 per year (Table 43).

During the model selection process for the final delta-GLM model, AIC selection suggested both depth and temperature should be retained as covariates in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model but neither was significant in the lognormal sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a high of 0.57 in 1996 to a low of 0.24 in 2003 (Table 43). Annual variability was similar across the survey period except in 1996 when variability and CPUE were high. Standardized CPUE estimates normalized to the series average did not follow a clear trend over time for blackbelly rosefish (Figure 20B). CPUE did increase in 2011 relative to 2008, but catches were still low relative to 1996 when CPUE was highest.

Blackbelly rosefish lengths were highest in 2010 (TL=320 mm, n=1) and lowest in 2006 (TL=275 mm, n=35), with no clear pattern during the survey period (Figure 20A).

Long Bottom Longline

Although blackbelly rosefish were collected on the long bottom longline in higher numbers than the short bottom longline, those collected were concentrated in only a few years and relatively few deployments in the data series. This made it unfeasible to standardize CPUE, so only nominal CPUE is presented here. All long bottom longline collections occurred within the depth range for blackbelly rosefish (Table 3). Blackbelly rosefish nominal CPUE ranged from a high of 0.437 fish*100 hooks^{-1}*hr^{-1} in 1996 to a low of 0 fish*100 hooks^{-1}*hr^{-1} in 1998 and 2000-2007, with no pattern during the survey period (Table 44 and Figure 21). Annual coefficients of variations ranged from 3.25-6.00 (Table 44).

Blackbelly rosefish lengths were highest in 2011 (TL=340 mm, n=1) and lowest in 1999 (TL=262 mm, n=5; Figure 21).

Serranidae

Bank Sea Bass

Chevron Trap

The bank sea bass depth constraint (Table 3) resulted in the exclusion of 22 chevron trap collections, resulting in the use of 8,046 included chevron trap collections for estimating nominal CPUE. Nominal CPUE (fish*trap^{-1}*hr^{-1}) of bank sea bass decreased through the early 2000s, followed by a relatively stable period through 2008, after which CPUE has increased to the levels observed in the early 1990s (Figure 22A). Annual coefficients of variations were relatively high (1.95-3.53; Table 45), which are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 996 chevron trap collections, respectively, or 0.1% and 12.4% of the data included in the nominal CPUE analysis. This resulted in a total of 7,041 collections being retained in the delta-GLM analysis, ranging from 184 to 458 per year (Table 46). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As bank sea bass are one of the more common species (6 of 24 species in individuals captured) investigated in this report captured by chevron traps, exclusion of these collections likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested that all covariates be retained for both the Bernoulli and positive sub-model (Table 8) and a lognormal error distribution be applied to the positive sub-model. Based on analysis of deviance tables, year, depth, latitude and temperature were highly significant both the Bernoulli and lognormal sub-models. Season, while being highly significant in the lognormal sub-model, was not significant in the Bernoulli sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.12 in 1994 to a high of 0.21 in 1999 (Table 46). Year-to-year variability in standardized CPUE estimates remained relatively high over the period 1990-2004, although variability was reduced for the years 2004-2011 compared to the nominal model (Figure 22B). Standardized CPUE estimates normalized to the series average was relatively stable through 1997, declined through the mid- 2000s, then rapidly increased from 2008 to 2011 (Figure 22B). As such, standardized CPUE in 2011 was as high or greater than standardized CPUE in the early to mid-1990s.

Bank sea bass mean lengths were highest in 1990 (235 mm TL) and lowest in 2011 (212 mm TL; Table 45). Due to year-to-year variability, there was no pattern in mean length estimates over the survey period (Figure 22A).

Black Sea Bass

Chevron Trap

The black sea bass depth constraint (Table 3) resulted in the removal of 225 chevron trap collections and the use of 7,843 collections for estimating nominal CPUE. Nominal CPUE of black sea bass showed a high degree of year-to-year variability, but with relatively small annual CVs, likely because black sea bass were one of the most common species caught in chevron traps (Table 47 and Figure 23A).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 977 chevron trap collections, respectively, or 0.1%

and 12.4% of the collections included in the nominal CPUE analysis. This resulted in a total of 6,857 collections being retained in the delta-GLM analysis, ranging from 180 to 436 per year (Table 48). As black sea bass are the most common species captured by chevron traps, exclusion of this data likely does not affect annual CPUE significantly.

AIC selection removed no covariates from the Bernoulli sub-model (Table 8). AIC selection removed the covariate season from the positive sub-model and determined that the gamma distribution best fit the positive sub-model (Table 8). Based on analysis of deviance tables, all variables, including year, were highly significant in both the Bernoulli and gamma sub-models. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.13 in 2011 to a high of 0.25 in 2006 (Table 48). Standardized CPUE estimates normalized to the series average decreased through the mid-1990s, increased through the late 1990s, remained relatively constant through 2004, then decreased through 2009 (Figure 23B). Since 2009, CPUE has increased, such that the CPUE was roughly 3.7 times the series average in 2011 (Table 48 and Figure 23B) and approximately 11 times greater than the minimum CPUE estimate in the time series.

Because the final delta-GLM model predicted a terminal year CPUE in significantly higher compared to the observed nominal CPUE, we further investigated the cause of this discrepancy. We employed the methods of Bentley et al. (2012) to explore the impact that the addition of each extra explanatory variable (i.e. the covariates depth, latitude, bottom temperature, and season) had on the predicted annual values for both the Bernoulli and gamma sub-models of the delta-GLM. As suggested by Bishop et al. (2008), we began by plotting the index including only the explanatory variable "year", than sequentially adding the other explanatory variables to the model, creating so-called "step plots". This was done to investigate how the index changes with each additional variable. These step plots provide a measure of the contribution of covariates to the difference between standardized and nominal annual CPUE estimates. While providing some indications, it does not provide a measure of the relative influence of each covariate in the final model (Bentley et al. 2012). To determine this relative annual influence of each covariate in the final model, we used the *annual influence measure* proposed by Bentley et al. (2012). With this measure, if the *annual influence measure* of variable *X* in year *y* is >1, it implies that variable increased the nominal CPUE in that year irrespective of population abundance. Delta-GLM techniques remove this effect in standardization; therefore, adding this variable to the model results in the standardized CPUE value being less than the nominal CPUE value. If the *annual influence measure* of a covariate is <1, then the opposite is true, and adding this variable to the model will result in the standardized CPUE value being greater than the nominal CPUE value. If the *annual influence measure* of a covariate equals 1, then that variable would have no influence on CPUE in that particular year (see Bentley et al. (2012) for further details). We refer to Bentley et al. (2012) for a full discussion of this method.

The analysis indicated that the addition of covariates did influence the standardized CPUE estimates. Step plots based on the Bernoulli and gamma sub-models suggest that the extra explanatory variable "depth" has a major influence on predicted annual values of CPUE in the final delta-GLM. This is supported by the *annual influence measure* calculated for each covariate, as depth has the greatest overall influence on standardized CPUE estimates. The magnitude of this effect is much greater in the Bernoulli sub-model, with an overall influence of 33.5%, than the gamma sub-model. Comparatively, the overall influence of depth in the gamma sub-model is 6.6%. After depth, the order of overall influence of the covariates in the Bernoulli sub-model is latitude (9.5%), temperature (5.0%), and season (5.9%). In the gamma sub-model, the order of overall influence after depth is latitude (4.6%) and temperature (4.2%). Given the high influence of depth on final annual CPUE estimates, changes in relative effort among different depths affected the pattern of nominal CPUE independent of abundance. Sampling depth, independent of abundance, appeared to have more effect on the predicted proportion of traps positive for black sea bass (i.e. Bernoulli sub-model) than on predicting the number of black sea bass captured per trap (i.e. gamma sub-model). In short, the influence of the covariate depth seems to best explain why the 2011 delta-GLM predicted CPUE exceeded the observed nominal CPUE. Thus, when accounting for depth in the delta-GLM, the standardized CPUE was greater than nominal CPUE. On average, we sampled deeper depths in 2011 than in previous years. Not accounting for this relative shift in effort between sampling depths resulted in a lower than expected nominal CPUE estimate, irrespective of changes in population abundance. Conversely, in the Bernoulli and the gamma sub-models, the *annual influence measure* of latitude, temperature, and season (for Bernoulli only) were all approximately 1 for 2011. Tables and graphs associated with this analysis, though not shown here, can be found as part of a separate Appendix to this report upon request.

For black sea bass, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 199 (2.5% of original 7,843 monitoring stations used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 49). Exclusion of SEFIS stations resulted in a small decrease in the nominal CPUE point estimate and increased the standard error about this estimate in 2011 (Table 9 and Figure 24). Exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 49 and Figure 24).

Black sea bass mean lengths were highest in 2010 (262 mm TL) and lowest in 1995 (215 mm FL; Table 48). The nominal mean length of harvested black sea bass was relatively constant through the early 2000s with mean length subsequently steadily increasing through to the present (Figure 23A). This is likely the result of stricter management measures on the commercial and recreational fisheries targeting black sea bass, particularly the implementation of higher minimum length limits (increased 2/24/1999) and strict commercial and recreational quotas (SEDAR 2011; see page 6). The rapid increase in mean lengths of BSB captured via fishery-independent surveys may be indicative of past growth overfishing on the population.

<u>Gag</u>

Chevron Trap

The gag depth constraint (Table 3) resulted in the exclusion of 37 chevron trap collections, resulting in the use of 8,031 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of gag showed a high degree of variability over the time series (0.042 to 0 fish*trap^{-1}*hr^{-1} in 1990 and 2003, respectively), with high annual coefficients of variations (4.53-17.20; Table 50 and Figure 25A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches. Despite these high coefficients of variation, nominal CPUE of gag decreased markedly from 1990 to the early 2000s (Figure 25A). Since then annual nominal CPUE has been relatively constant.

For the delta-GLM analysis (see covariates and bins in Table 8), we removed the years 2003, 2006, and 2008 from analysis because we had less than two positive chevron trap collections for gag in these years. This resulted in the removal of an additional 817 (10.2%) chevron trap collections from the delta-GLM analysis. Furthermore, missing latitude and temperature data resulted in the removal of 9 and 906 chevron trap collections, respectively, or 0.1% and 12.0% of the data included in the nominal CPUE analysis. These omissions resulted in a total of 6,244 chevron trap collections being retained for delta-GLM analysis, ranging from 184 to 458 per year (Table 51). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As gag are one of the more rare species (17 of 24 species in individuals captured) investigated in this report captured by chevron traps, exclusion of this data could affect annual CPUE significantly (Figure 25B).

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariates temperature and season be removed from the Bernoulli sub-model (Table 8). For the positive sub-model, AIC selection suggested we remove the covariates depth and latitude (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Based on analysis of deviance tables, all included variables, including year, were highly significant in the Bernoulli sub-model of the final delta-GLM. Conversely, no variable, including year, was significant in the lognormal sub-model of the final delta-GLM. Thus, the final delta-GLM model suggests that the effect of sampling year helps determine whether a chevron trap will catch a gag, but does not explain how many gag we will capture. These results suggest that perhaps rather than a full delta-GLM model, a simple presence-absence model may be adequate to model gag CPUE in chevron traps. The general inability of covariates to explain the number of gag captured if a trap catch is positive probably stems from the observation that we captured only a single gag in 85 of 100 (85.0%) positive chevron traps and more than two in only 1 of 100 (1.0%). Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.33 in 1990 to a high of 0.76 in 1997 (Table 51). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average decreased steadily from 1990 through the mid- to late-1990's (Figure 25B). Subsequent to this, standardized CPUE of gag has remained at near constant historic low levels except for a three-year period from 1999 through 2001 (Figure 25B). Of particular note, standardized CPUE has been below average each year since 2002 (Table 51). Please note that caution must be exercised when interpreting the estimated annual CPUE from 1990 as CPUE in 1990 may have been influenced by both the direct effect that hurricane Hugo had on the reef fish communities of the SAB, as well as the effect it had on the geographic extent of samples and sampling season for MARMAP in 1990. Standardized CPUE followed similar patterns to nominal CPUE, suggesting that elimination of data by the delta-GLM method did not affect CPUE estimates to a great extent.

For gag, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 202 (2.5% of 8,031 monitoring stations used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 52). For gag, the exclusion of new SEFIS stations resulted in a small decrease in the nominal CPUE point estimate and a larger standard error about this estimate in 2011 (Table 9 and Figure 26). Exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 52 and Figure 26).

Gag mean lengths were highest in 2006 (1110 mm TL, n=1) and lowest in 1990 (350 mm TL; Table 50). Annual estimates of mean length were highly variable with large standard errors and no discernible trend owing to the low number of gag captured via chevron traps at included monitoring stations annually (Figure 25A).

Short Bottom Longline

The gag depth constraint (Table 3) resulted in the exclusion of 360 (49.4%) short bottom longline collections. Gag were collected by short bottom longline inconsistently, with 0 catches in 1996, 2000-2001, and 2004. Gag nominal CPUE peaked in 2007 at 0.111 fish*20 hooks $^{-1}$*hr^{-1} (Table 53 and Figure 27A). Gag nominal CPUE did not follow any pattern during the survey period (Figure 27A).

For the delta-GLM analysis, annual CPUE was standardized using the delta-GLM model initially considering year, latitude, and depth. Temperature was not included in this analysis because the number of included collections containing gag was small and the lack of temperature data in many of these limited the data set to a greater extent compared to other covariates. A list of covariates and covariate bins considered in the gag analysis can be found in Table 13. This resulted in a total of 369 collections being retained in the delta-GLM analysis, ranging from 5 to 51 per year (Table 54).

During the model selection process for the final delta-GLM model, AIC selection suggested that depth should be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, neither year nor depth was significant in the Bernoulli sub-model or the lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.72 in 2008 to a low of 043 in 2005 and 2007 (Table 54). There was no trend in variability across the survey period (Figure 27B). Standardized CPUE estimates normalized to the series average followed no clear trend over time for gag.

Gag lengths were greatest in 2009 (TL= 1030 mm, n=2) and lowest in 2011 (TL= 730 mm, n=2; Figure 27A).

<u>Red Grouper</u>

Chevron Trap

The red grouper depth constraint (Table 3) resulted in the exclusion of 835 chevron trap collections, resulting in the use of 7,233 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of red grouper showed a high degree of year-to-year variability (a 25-fold change from minimum to maximum over the series: 0.005 to 0.126 fish*trap^{-1}*hr^{-1} in 1990 and 2002, respectively), with high annual coefficients of variations (3.59-10.30; Table 55 and Figure 28A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 8 and 748 chevron trap collections, respectively, or 0.1% and 10.3% of the data included in the nominal CPUE analysis. These omissions resulted in a total of 6,477 chevron trap collections being retained for delta-GLM analysis, ranging from 174 to 444 per year (Table 56). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As red grouper are one of the more rare species (15 of 24 species in this report, less than 1000 individuals captured) captured by chevron traps, exclusion of this data may affect annual CPUE.

During the model selection process for the final delta-GLM model, AIC selection suggested that all covariates be retained in the Bernoulli sub-model. For the positive sub-model, AIC selection suggested we remove the covariate depth (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in the Bernoulli sub-model of the final delta-GLM. Conversely, only the variables year and latitude were significant in the lognormal sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.30 in 2005 and 2007 to a high of 0.74 in 1990 (Table 56). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average increased over the initial survey period from 1990 to 2003-2005 (Figure 28B). CPUE was above average in 8 of 9 years between 1999 and 2007 (Table 56). CPUE decreased to near all-time lows in 2011, has been below average since 2008, and has been less than 50% of average in 2009 and 2011. Although there was some concern over the removal of collections due to missing data, the delta-GLM standardized CPUE tracks well with the nominal CPUE (Figure 28B) suggesting this concern may be minor. Red grouper are a relatively long-lived, late-maturing species while Amendment 17B of the Snapper-Grouper FMP, which instigated annual catch limits for red grouper, was only enacted on January 31, 2011. Together, these characteristics are expected to require several years with management regulations to be in place and recruitment to occur before any substantial increase in CPUE due to reduced fishing pressure may be observed.

For red grouper, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 203 (2.8% of 7,233 monitoring stations used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 57). For red grouper, the exclusion of new SEFIS stations resulted in a large increase in the nominal CPUE point estimate and a larger standard error about this estimate in 2011 (Table 9 and Figure 29). Because the center of abundance of red grouper in the SAB is near the northern extent of the SAB, we expected the inclusion of SEFIS monitoring stations that are predominately off the coast of Georgia and Florida to decrease the nominal CPUE estimate. However, as expected, the exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 57 and Figure 29).

Red grouper mean lengths were highest in 2000 (651 mm TL) and lowest in 1993 (424 mm TL; Table 55). Annual estimates of mean length were highly variable there was no discernible trend in nominal mean length estimates through time (Figure 28A).

Short Bottom Longline

The red grouper depth constraint (Table 3) resulted in the exclusion of 359 (49.2%) short bottom longline collections from nominal CPUE estimates. Red grouper catches were highly variable, with fish absent in these surveys in 1996, 1998, 2001-2003, 2008, and 2010 (Table 58). Red grouper nominal CPUE peaked at 0.388 fish*20 hooks^{-1}*hr^{-1} in 2000 (Table 58). Red grouper nominal CPUE did not follow any pattern during the survey period (Figure 30A). Annual coefficients of variations ranged from 2.08 to 4.06.

For the delta-GLM analysis, annual CPUE was standardized, initially including the effects of latitude, depth, and temperature as covariates. A list of covariates and covariate bins considered in the red grouper analysis can be found in Table 13. Because of missing temperature data, 31 (4.3%) SBLL collections were removed from the delta-GLM analysis. After these omissions, this resulted in a total of 339 SBLL collections being retained for the delta-GLM analysis, ranging from 5 to 51 per year (Table 59).

During the model selection process for the final delta-GLM model, AIC selection suggested that only the covariate latitude be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, both year and latitude were significant in the Bernoulli sub-model but neither was significant in the lognormal sub-model of the final delta-GLM. Thus, the final delta-GLM model suggests that the effect of sampling year helps determine whether a short bottom longline will catch a red grouper, but does not explain how many red grouper we will capture. These results suggest that perhaps rather than a full delta-GLM model, a simple presence-absence model may be adequate to model red grouper CPUE on SBLLs. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.79 in 2000 to a low of 0.27 in 2007 (Table 59). There was no trend in variability across the survey period (Figure 30B). Standardized CPUE estimates normalized to the series average followed no trend across the survey period either.

Red grouper mean lengths were highest in 2011 (TL=740mm, n=14) and lowest in 1999 (TL=632 mm, n=6; Figure 30A). With few or no individuals collected in many years, no pattern in length was observed.

<u>Sand Perch</u>

Chevron Trap

The sand perch depth constraint (Table 3) resulted in the exclusion of 242 chevron trap collections, resulting in the use of 7,826 included chevron trap collections for estimating nominal CPUE. Nominal CPUE (fish*trap^{-1}*hr^{-1}) of sand perch, aside from a one to two year spike in 1991-1992, has been variable but constant through time (Figure 31A). Annual coefficients of variations were relatively high (1.84-3.53; Table 60), which are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 974 chevron trap collections, respectively, or 0.1% and 12.4% of the data included in the nominal CPUE analysis. This resulted in a total of 6,843 included collections being retained in the delta-GLM analysis, ranging from 180 to 436 per year (Table 61). Please note that due to missing bottom temperature data, we removed greater than 20% of available collections for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As sand perch are one of the more common species captured by chevron traps (8 of 24 species in this report in individuals captured), exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariate season be removed from both components of the delta-GLM model (Table 8). Furthermore, AIC selection removed the covariate temperature from the positive sub-model (Table 8) and chose the lognormal error distribution for the positive sub-model. Based on analysis of deviance tables, all remaining variables, including year, were highly significant in the analyses of deviance of both the Bernoulli and lognormal sub-models of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.21 (5 different years) to a high of 0.29 in 2002 (Table 61). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average showed a high degree of year-to-year variability without exhibiting any clear trend throughout the survey period (Figure 31B). Sand perch are not as tightly coupled to live/hard bottom habitats as other species and are considered more associated with sandy bottom habitats. As such, the high degree of year-to-year variability could be less a reflection of true population abundance, but rather a reflection of the percentage of chevron trap collections made on less than optimum live/hard bottom habitats in a given year. Prior to the most recent years, we had no consistent visual record of sampled bottom habitat for a given chevron trap collection.

Sand perch mean lengths were highest in 2011 (238 mm FL) and lowest in 1995 (216 mm FL; Table 60). There was a high degree of annual variation in mean length estimates, but there is a general increasing pattern in mean length estimates throughout the survey period (Figure 31A).

Scamp

Chevron Trap

The scamp depth constraint (Table 3) resulted in the exclusion of 37 chevron trap collections, resulting in the use of 8,031 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of scamp showed a high degree of variability (0.023 to 0.221 fish*trap^{-1}*hr^{-1} in 2010 and 1997, respectively; approximately a 10-fold change from minimum to maximum over the series), with high annual coefficients of variations (2.76-6.60; Table 62 and Figure 32A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 993 chevron trap collections, respectively, or 0.1% and 12.4% of the data included in the nominal CPUE analysis. These omissions resulted in a total of 7,029 chevron trap collections being retained for delta-GLM analysis, ranging from 184 to 458 per year (Table 63). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As scamp are the most common *Epinephelus* or *Mycteroperca* grouper species we capture in chevron traps (Table 3), although only the 13th most common species encountered in chevron traps of 24 considered species, it is not known whether exclusion of this data may affect annual CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariate season be removed from the Bernoulli sub-model. For the positive sub-model, AIC selection suggested that the covariates depth, latitude and season be removed (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Based on analysis of deviance tables, all retained variables, including year, were highly significant in the Bernoulli sub-model. For the lognormal sub-model, although year (p=0.0001) and temperature (p=0.0230) were still significant, temperature was only marginally significant. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.17 in 1994 and 1997 to a high of 0.37 in 2008 (Table 63). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average initially increased over the period 1990 to 1995-1997 (Figure 32B). Subsequent to this initial increase, CPUE steadily declined through 2011 (Figure 32B), being below average every year since 2005 and less than 35% of average in 5 of 6 years since 2006 (Table 63).

For scamp, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 202 (2.5% of 8,031 monitoring station collections used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 64). For scamp, the exclusion of new SEFIS stations resulted in a moderate increase in the nominal CPUE point estimate and a larger standard error about this estimate in 2011 (Table 9 and Figure 33). Exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 64 and Figure 33).

Scamp mean lengths were highest in 2011 (564 mm FL) and lowest in 2003 (431 mm FL; Table 62). Estimates of mean length were highly variable making it difficult to find any discernible trend in nominal mean length estimates through time (Figure 32A).

Short Bottom Longline

The scamp depth constraint (Table 3) resulted in the exclusion of 348 (47.7%) short bottom longline collections prior to determination of nominal CPUE. Scamp were relatively common on this gear with highest CPUE in 2001 (1.915 fish*20 hooks^{-1}*hr^{-1}) and only 2 years with zero catches (1997-1998; Table 65 and Figure 34A). Scamp nominal CPUE did not follow any pattern during the survey period, particularly because catches were very high in only one year (2001) of the time series. Annual coefficients of variations ranged from 1.62 to 6.00 (Table 65).

For the delta-GLM analysis, annual CPUE was standardized, initially accounting for the effects of depth, and temperature as covariates. We did not include latitude in this analysis because the range of latitudes at which scamp were collected limited the data set to a greater extent than other covariates. A list of covariates and covariate bins considered in the scamp analysis can be found in Table 13. Missing temperature data caused the removal of 34 (4.6% of nominal CPUE collections) SBLL collections from the delta-GLM analysis. After these omissions, this resulted in a total of 347 SBLL collections being retained for the delta-GLM analysis, ranging from 5 to 51 per year (Table 66).

During the model selection process for the final delta-GLM model, AIC selection suggested that only the covariate depth be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model but only year was significant in the lognormal sub-model of the delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.56 in 2004 to a low of 0.23 in 2001 (Table 66). There was no clear pattern in variability across the survey period. Standardized CPUE normalized to the series average showed no trend over time for scamp (Figure 34B). CPUE remained anomalously high in 2001 compared to all other years. Scamp CPUE in chevron traps in 2001 were similar to other years in the early 2000's, suggesting that catches on the SBLL were unusual in that year.

Scamp lengths were highest in 2011 (FL=662 mm, n=12) and lowest in 2004 (FL=382 mm, n=14), with a decreasing trend during the survey period except in 2011 (Figure 34A).

Snowy Grouper

Chevron Trap

The snowy grouper depth constraint (Table 3) resulted in the exclusion of 4,275 (53.0%) chevron trap collections, resulting in the use of 3,793 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of snowy grouper showed a high degree of variability (0.000 in 1992 and 1995 to 0.187 fish*trap^{-1}*hr^{-1} in 2001), with high annual coefficients of variations (3.46-11.27; Table 67 and Figure 35A).

For the delta-GLM analysis (see covariates and bins in Table 8), we removed the years 1991, 1992, 1995, and 2000 from analysis because there were fewer than two positive chevron traps collections for snowy grouper in these years. This resulted in the removal of an additional 574 (15.1% of nominal CPUE collections) chevron trap collections from the delta-GLM analysis. Furthermore, missing temperature data resulted in the removal of 292 collections (7.7% of nominal CPUE collections). These omissions resulted in a total of 2,927 chevron trap collections being retained for the delta-GLM analysis, ranging from 77 to 282 per year (Table 68). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1996, 1999 and 2011 (Table 10). As snowy grouper are one of the more rare species (16 of 25 species considered) encountered in chevron trap catches, exclusion of this data could affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariate season be removed from the Bernoulli sub-model (Table 8). For the positive sub-model, AIC selection suggested that the covariates latitude and temperature be removed (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Thus, our best delta-GLM model suggested the Bernoulli sub-model contain the covariates depth, latitude, and temperature while the positive sub-model contain the covariates depth and season and model the error in positive CPUE using a lognormal distribution. Based on analysis of deviance tables, all variables, including year ($p = 0.0223$), were significant in the analysis of deviance of the Bernoulli sub-model of the final delta-GLM. For the lognormal sub-model, the variables year ($p<0.0001$) and latitude ($p = 0.0001$) were both highly significant, while the variable season ($p = 0.1803$) was not significant. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.50 in 1997 to a high of 1.05 in 1999 (Table 68). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized snowy grouper CPUE from 1996 to 1999 normalized to the series average was near to or below average (Figure 35B). No conclusions can be drawn for the period 1990-1995 as three of the six years were excluded from delta-GLM analysis (Table 68). After a distinct spike in CPUE in 2001, CPUE decreased rapidly once again until 2003. Since then, a slow steady decline has continued (Figure 35B). Annual CPUE estimates have been below 50% of the series average in 7 of 9 years since 2003 (Table 68).

For snowy grouper, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 144 chevron trap collections from 2011 (3.8% of 3,793 monitoring station collections used in original nominal CPUE development) chevron trap collections from 2011 when developing nominal and delta-GLM standardized CPUE estimates (Table 69). For snowy grouper, the exclusion of new SEFIS stations resulted in a large increase in the nominal CPUE point estimate and the standard error about this estimate in 2011 (Table 9 and Figure 36). Exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates, even in 2011 (Table 69 and Figure 36).

Snowy grouper mean lengths were highest in 2006 (564 mm TL) and lowest in 2008 (330 mm TL; Table 67). Annual estimates of mean length were highly variable making it difficult to find any discernible trend in nominal mean length estimates through time (Figure 35A). This is likely due to the low annual number of snowy grouper captured in chevron traps.

Short Bottom Longline

The snowy grouper depth constraint (Table 3) resulted in the exclusion of 14 (1.9%) short bottom longline collections prior to determination of nominal CPUE. Snowy grouper are commonly collected with this gear and no years demonstrated zero catches (Table 70). Snowy grouper nominal CPUE peaked at 0.867 fish*20 hooks^{-1}*hr^{-1} in 2001 and was lowest in 2007 at 0.148 fish*20 hooks^{-1}*hr^{-1} (Figure 37A). Variability was low to moderate relative to other species and annual coefficients of variations ranged from 1.19 to 3.55 (Table 70). There was no discernible pattern in snowy grouper nominal CPUE during the survey period.

For the delta-GLM analysis, annual CPUE was standardized, initially accounting for the effects of depth and temperature as covariates. We did not include latitude in this analysis because the range of latitudes at which snowy grouper were collected limited the data set to a greater extent compared to other covariates. A list of covariates and covariate bins considered in the snowy grouper analysis can be found in Table 13. Missing temperature data caused the removal of 95 (13.0% of nominal CPUE collections) SBLL collections from the delta-GLM analysis. After these omissions, this resulted in a total of 620 SBLL collections being retained for the delta-GLM analysis, ranging from 12 to 81 per year (Table 68).

During the model selection process for the final delta-GLM model, AIC selection suggested that only the covariate depth be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model but neither was significant in the lognormal sub-model. Thus, the final delta-GLM model suggests that the effect of sampling year helps determine whether a short bottom longline will catch a snowy grouper, but does not explain how many snowy grouper we will capture. These results suggest that perhaps rather than a full delta-GLM model, a simple presence-absence model may be adequate to model red grouper CPUE on SBLLs. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.69 in 1996 to a low of 0.18 in 2010 (Table 68). Variability was similar across the survey period except in 1996, 2004, and 2007 (Figure 37B). Standardized CPUE normalized to the series average was higher in 2002 and 2008 compared to all other years. Standardized CPUE was lower than nominal CPUE in 2011. There was no clear pattern in CPUE over time for snowy grouper.

Snowy grouper lengths were highest in 2011 (TL=715 mm, n=125) and lowest in 1996 (TL=517 mm, n=7) with an increasing trend in the last seven years of the survey period (Figure 37A).

Speckled Hind

Chevron Trap

The speckled hind depth constraint (Table 3) resulted in the exclusion of 1,531 chevron trap collections, resulting in the use of 6,537 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of speckled hind showed a high degree of variability (0.000 in 1995, 2006 and 2009 to 0.041 fish*trap^{-1}*hr^{-1} in 2000 and 2002), with high annual coefficients of variations (4.61-18.22; Table 72 and Figure 38A). These high coefficients of variations are suggestive of a high degree of variability in individual trap catches.

Speckled hind are the least common species (18 of 24 species considered in report; Table 3) captured in chevron traps for which delta-GLM standardization was attempted. Because of the relative rarity of speckled hind in chevron traps, there was some difficulty in developing a delta-GLM standardized CPUE series due to low sample sizes. For the delta-GLM analysis (see covariates and bins in Table 8), we removed the years 1991, 1995, 2005, 2006, and 2008-2010 from analysis because there were fewer than two positive chevron traps collections for speckled hind in these years. Data from only 15 of the 22 years of chevron traps surveys were used in the analysis. Furthermore, missing temperature data resulted in the removal of 544 collections (8.3% of nominal CPUE collections). These omissions resulted in a total of 4,003 chevron trap collections being retained for the delta-GLM analysis, ranging from 148 to 406 per year (Table 73). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1996, 1999, 2000 and 2011 (Table 10). As speckled hind are one of the more rare species encountered in chevron trap catches (18 of 24 species considered), the exclusion of such a large percentage of trap catches due to the inclusion of temperature as a covariate could significantly affect the resulting standardized CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that all covariates be retained in the Bernoulli sub-model (Table 8). For the positive sub-model, AIC selection suggest that the covariates depth and temperature be removed (Table 8) from the analysis and model the error distribution assuming a lognormal error distribution. Based on analysis of deviance tables, the covariates year ($p = 0.0027$), depth ($p = 0.00900$), latitude ($p < 0.0001$), and temperature ($p = 0.0073$) were significant while the variable season ($p = 0.0991$) was not significant in the Bernoulli sub-model. For the lognormal sub-model, the only significant variable was season ($p = 0.0199$). Year was not a significant factor in explaining the positive CPUE of speckled hind. Thus, year helps predict how likely a chevron trap is to catch a speckled hind, but does not predict how many speckled hind will be captured. The general inability of covariates to explain the number of speckled hind captured if a trap catch is positive probably stems from the observation that we captured only a single speckled hind in 44 of 63 (69.8%) positive chevron traps and less than three speckled hind in 57 of 63 (90.5%). Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by delta-GLM model decreased annual coefficient of variation estimates, ranging from a low of 0.46 in 2002 to a high of 0.85 in 1992 (Table 73). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average were extremely low from 1990-1998, above average from 1999-2003, then below average in all available years from 2004-2011 (Table 73 and Figure 38B). Since 2004, for the three years we have delta-GLM standardized CPUE estimates available, three of those suggested annual CPUE was less than 50% of the series average (Table 73). The overall trend corresponded with the general pattern seen in nominal CPUE estimates, regardless of the years for which standardized CPUE estimates were unavailable (Figure 38B).

For speckled hind, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 144 chevron trap collections from analysis and all of 2011 because the only positive chevron trap collection for speckled hind occurred at a newly identified SEFIS monitoring station. The resulting delta-GLM standardized time series contained data from 1990-2007 only (Table 74). Exclusion of SEFIS stations resulted in the 2011 estimate of nominal CPUE being 0 compared to 0.00239 when SEFIS monitoring stations are included (Table 9 and Figure 39). Exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates or the overall CPUE pattern for the truncated time series (Table 74 and Figure 39).

Speckled hind mean lengths were highest in 2010 (580 mm TL, n = 1) and lowest in 1994 (288 mm TL; Table 72). Estimates of mean length were highly variable making it difficult to find any discernible trend in nominal mean length estimates through time (Figure 38A). This is likely due to the low annual number of speckled hind captured in chevron traps.

Short Bottom Longline

The speckled hind depth constraint (Table 3) resulted in the exclusion of 344 (47.1%) short bottom longline collections prior to the determination of nominal CPUE. Speckled hind nominal CPUE appeared to decrease during the survey period (Figure 40A), although variability was high and overall catches were low. Annual coefficients of variations ranged from 2.11 to 6.08 (Table 75). Nominal CPUE ranged peaked at 0.241 fish*20 hooks $^{-1}$*hr^{-1} in 2000 and no fish were collected in 1996, 2002-2003, 2008, or 2010 (Table 75 and Figure 40A).

For the delta-GLM analysis, annual CPUE was standardized, initially accounting for the effects of latitude and depth as covariates. A list of covariates and covariate bins considered in the speckled hind analysis can be found in Table 13. No collections were lost from analysis due to missing data, leaving 385 included collections, ranging from 5 to 51 per year, for the delta-GLM analysis. Temperature was not considered as a covariate because its inclusion eliminated 4 of 7 years in the time series that could be standardized by this approach.

During the model selection process for the final delta-GLM model, AIC selection suggested that only the covariate depth be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, year was not significant in either the Bernoulli or the lognormal sub-models. Depth was not significant in the Bernoulli sub-model but was significant in the lognormal sub-model. Full model diagnostics are available as part of a separate Appendix to this report upon request. These results suggest that there was no trend through time with regards to speckled hind CPUE. This is likely a result of the rarity of speckled hind in SBLL collections throughout the time series. As such, caution is warranted when interpreting the CPUE time series of speckled hind in SBLL collections.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.77 in 2000 and 2001 to a low of 0.38 in 2005 (Table 76). Variability was higher in 2000 and 2001 than in 1999 and 2004-2007 (Figure 40B). Standardized CPUE estimates normalized to the series average were higher than average in 2000 and 2001 and lower than average in 1999 and 2004-2007. Overall, there was no clear pattern in CPUE over time for speckled hind but this is likely due to the few years and positive samples available for this species.

Speckled hind lengths were highest in 2011 (TL=640 mm, n=1) and 2006 and lowest in 2009 (TL=420 mm, n=1; Figure 40A).

Sparidae

Knobbed Porgy

Chevron Trap

The knobbed porgy depth constraint (Table 3) resulted in the exclusion of 957 (11.9%) chevron trap collections, resulting in the use of 7,111 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of knobbed porgy generally decreased from 1991 to 2011 and was continuously below average since 2002 (Figure 41A). High annual coefficients of variations (2.55-5.63; Table 77) suggest of a high degree of variability in individual trap catches.

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 8 and 738 chevron trap collections, respectively, or 0.1% and 10.4% of the data included in the nominal CPUE analysis. This resulted in a total of 6,365 included collections being retained in the delta-GLM analysis, ranging from 174 to 438 per year (Table 78. Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As knobbed porgy are moderately common (12 of 24 species in individuals captured) in chevron trap catches, it is difficult to assess how the exclusion of this data likely affects annual CPUE estimates at this time.

During the model selection process for the final delta-GLM model, AIC selection suggested that no covariates should be removed from the Bernoulli sub-model (Table 8). For the positive sub-model, AIC selection suggested that the covariate temperature should be removed (Table 8) from the analysis and that a lognormal error distribution should be assumed for the mode errors. Based on analysis of deviance table, all covariates, including year, were highly significant in both the Bernoulli and lognormal sub-models. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.25 in 1993 to a high of 0.77 in 2011 (Table 78). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average exhibited a linear decreasing trend from 1991 through 2011 (Table 78 and Figure 41B). Annual CPUE has decreased year-to-year in 15 of 20 year pairs since 1990 (Table 78 and Figure 41B). This linear decreasing trend has shown no indication of slowing in recent years and the 2006-2011 CPUE has been below 30% of the series average in 5 of 6 years reaching the series low of 9% of the series average in 2011 (Table 78). The low estimate of CPUE in 1990 has been discounted as CPUE in this year was likely influenced by the direct effect that hurricane Hugo had on the reef fish communities of the SAB and the effect hurricane Hugo had on the geographical extent of sample collections for MARMAP in 1990.

Knobbed porgy mean lengths were highest in 2011 (333 mm FL) and lowest in 1992 (273 mm FL), supporting an increase in mean length over the time series (Table 77 and Figure 41A). However, standard errors were high making it difficult to assess this pattern without further analysis (Table 77).

Pinfish

Chevron Trap

The pinfish depth constraint (Table 3) resulted in the exclusion of 1,638 collections (20.3% of all included chevron trap collections), resulting in the use of 6,430 included chevron trap collections for estimating nominal CPUE. Nominal CPUE (fish*trap^{-1}*hr^{-1}) of pinfish exhibited a high degree of year-to-year variability (Figure 42A), with high annual coefficients of variations (3.96-11.62; Table 79).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 862 chevron trap collections, respectively, or 0.1% and 13.4% of the data included in the nominal CPUE analysis. This resulted in a total of 5,559 included collections being retained in the delta-GLM analysis, ranging from 160 to 333 per year (Table 80). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As pinfish are relatively common in chevron trap catches (10 of 24 species in individuals captured), it is likely that exclusion of this data has a minimal effect on annual delta-GLM standardized CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariate season be removed from the Bernoulli sub-model (Table 8). Conversely, AIC selection suggested that no covariates should be removed from the positive sub-model (Table 8) prior to analysis, and that we should fit the positive sub-model assuming a lognormal error distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in the Bernoulli sub-model of the delta-GLM. For the positive sub-model, only the variables year ($p < 0.0001$), depth ($p = 0.0024$), and latitude ($p < 0.0001$) were significant. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.25 in 1998 to a high of 0.54 in 1994 and 2009 (Table 80). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average increased from low values in the early 1990s until approximately 1998 (Figure 42B). Subsequent to 1998, pinfish CPUE decreased through at least 2007, before a slight rebound in the most recent years (Figure 42B). Annual CPUE has remained below average for every year since 2005, with the point estimate of CPUE in 2011 only being 70% of the series average, despite the increase in CPUE in recent years (Table 80).

Pinfish mean lengths followed no discernible pattern over the survey period and were relatively variable annually (Table 79 and Figure 42A). Mean lengths were highest in 2006 (188 mm FL) and lowest in 1995 (153 mm FL; Table 79).

Red Porgy

Chevron Trap

The red porgy depth constraint (Table 3) resulted in the exclusion of 835 chevron trap collections, resulting in the use of 7,233 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of red porgy showed moderate variability (0.743 to 2.386 fish*trap^{-1}*hr^{-1} in 1997 and 2007, respectively; a 3-fold change from minimum to maximum over the series), with relatively high annual coefficients of variations (1.49-2.43; Table 81 and Figure 43A).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 8 and 748 chevron trap collections, respectively, or 0.1% and 10.3% of the data included in the nominal CPUE analysis. These omissions resulted in a total of 6,477 chevron trap collections being retained for delta-GLM analysis, ranging from 174 to 444 per year (Table 82). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As red porgy are one of the more common species captured by chevron traps (5 of 24 species in this report), exclusion of this data likely does not affect annual CPUE significantly.

During the model selection process for the final delta-GLM model, AIC selection suggested the removal of no covariates from the Bernoulli sub-model, the removal of the covariate season from the positive sub-model and that we model the positive sub-model assuming a lognormal error distribution (Table 8). Based on analysis of deviance tables, all variables, including year, were significant both the Bernoulli and lognormal sub-models. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.10 in 2005 to a high of 0.15 in 2003 (Table 82). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized red porgy CPUE estimates normalized to the series average appeared to exhibit a cyclical pattern, with CPUE decreasing from 1990 through 1997-1998, increasing through 2004-2006, and then decreasing once again through at least 2009 (Figure 43B). CPUE has been below average since 2008 (Table 82), despite the implementation of Snapper-Grouper FMP Amendments 13C (effective October 23, 2006) and 15B (effective March 14, 2008), management measures intended to rebuild this stock. The recent increase in CPUE in 2010 and 2011 from the local minimum in 2008 (Table 82 and Figure 43B) was encouraging, although additional years of data are needed to determine if this is a long-term trend.

For red porgy, nominal and delta-GLM standardized CPUE with and without new monitoring stations established by the SEFIS program were compared as in gray triggerfish. The exclusion of new SEFIS monitoring station collections resulted in the removal of an additional 202 (2.8% of 7,233 monitoring station collections used in original nominal CPUE development) chevron trap collections from when developing nominal and delta-GLM standardized CPUE estimates (Table 83). For red porgy, the exclusion of SEFIS stations increased the nominal CPUE point estimate and the standard error about this estimate in 2011 (Table 9 and Figure 44). The exclusion of the SEFIS monitoring stations had virtually no effect on the delta-GLM standardized CPUE estimates in all years except 2011 (Table 35 and Figure 16). Exclusion increased the 2011 standardized CPUE estimate for red porgy (Table 83 and Figure 44). The magnitude of this difference in relation to standard error estimates about the 2011 point estimates suggests the differences are not likely statistically significant.

Red porgy mean lengths were highest in 2011 (302 mm FL) and lowest in 1992 (235 mm FL; Table 81). There was a clear increase in mean length of captured red porgy over the survey period (Figure 43A), with an increase of approximately 67 mm (~2.64 inches) from the series low (Table 81).

Short Bottom Longline

The red porgy depth constraint (Table 3) resulted in the exclusion of 340 short bottom longline collections prior to the determination of nominal CPUE. Red porgy collections of this gear were highly variable (annual coefficients of variations ranged from 1.62 to 6.08; Table 84) and in several years red porgy were absent (1996, 2001, 2007, and 2011; Figure 45A). Red porgy nominal CPUE was highest in 2003 (0.196 fish*20 hooks $^{-1}$*hr^{-1}) but followed no clear pattern over the survey period.

For the delta-GLM analysis, annual CPUE was standardized, initially accounting for the effects of latitude and depth as covariates. Temperature was not considered for red porgy because its inclusion greatly limited the number of included collections available for analysis and eliminated most years from the analysis. A list of covariates and covariate bins considered in the red porgy analysis can be found in Table 13. A total of 389 included collections were retained for the delta-GLM analysis, ranging from 5 to 53 per year (Table 85).

During the model selection process for the final delta-GLM model, AIC selection suggested that only the covariate depth be retained in both the Bernoulli and positive sub-model (Table 13) and that the positive sub-model should assume a lognormal error distribution. Based on analysis of deviance tables, both year and depth were significant in the Bernoulli sub-model, but neither year nor depth was significant in the lognormal sub-model. Thus, the final delta-GLM model suggests that the effect of sampling year helps determine whether a short bottom longline will catch a red porgy, but does not explain how many red porgy we will capture. These results suggest that perhaps rather than a full delta-GLM model, a simple presence-absence model may be adequate to model red grouper CPUE on SBLLs. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased the annual coefficient of variation estimates, with annual CVs ranging from a high of 0.76 in 2002 to a low of 0.46 in 2003 (Table 85). Red porgy standardized CPUE estimates normalized to the series average was higher in 2000 and 2002-2004 than in 1999, 2005-2006, and 2008 (Figure 45B), however, there was no clear pattern in CPUE over time for red porgy.

Red porgy total lengths were highest in 2006 (FL=455 mm, n=2) and lowest in 2004 (FL=350, n=7; Table 84 and Figure 45A).

<u>Spottail Pinfish</u>

Chevron Trap

The spottail pinfish depth constraint (Table 3) resulted in the exclusion of 427 collections (5.3% of all included chevron trap collections), resulting in the use of 7,641 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of spottail pinfish in the SAB exhibited a high degree of variability (annual coefficients of variations of 4.92-16.40; Table 86; Figure 46A).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 960 chevron trap collections, respectively, or 0.1% and 12.6% of the data included in the nominal CPUE analysis. This resulted in a total of 6,672 included collections being retained in the delta-GLM analysis, ranging from 180 to 424 per year (Table 87). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As spottail pinfish are relatively common in chevron trap catches (11 of 24 species in individuals captured), it is likely that exclusion of this data has a minimal effect on annual delta-GLM standardized CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that all covariates be retained in the Bernoulli sub-model, that the covariates latitude, temperature, and season be removed from the positive sub-model, and that we should fit the positive sub-model assuming a lognormal error distribution (Table 8). Based on analysis of deviance tables, all variables, including year, were highly significant in the Bernoulli sub-model of the delta-GLM. Conversely, only the variable depth (p = 0.0064) was significant in the lognormal sub-model. Year was not significant in the lognormal sub-model, suggesting that year was important in determining whether or not a trap caught spottail pinfish but was not in determining how many spottail pinfish were caught in positive traps. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.25 in 1998 to a high of 0.54 in 1994 and 2009 (Table 87). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches. Standardized CPUE estimates normalized to the series average decreased from 1990 through 1993-1994 before slowly increasing through 1995-2001 (Figure 46B). Subsequent to this, CPUE decreased once again through 2009 (Figure 46B). There was a slight increase in CPUE in 2010 and 2011 (Figure 46B). Additional years of data are needed to determine if this uptick will continue in the long term. CPUE has been below average in 9 of 10 years since 2002, with a series low being 7% of the series average CPUE in 2006 (Table 87).

Spottail pinfish mean lengths were relatively variable annually, with no discernible trend in mean lengths over the survey period (Table 86 and Figure 46A). Mean lengths were highest in 2003 (201 mm FL) and lowest in 1994 (142 mm FL; Table 86).

Stenotomus spp.

Chevron Trap

The genus *Stenotomus* depth constraint (Table 3) resulted in the exclusion of 1,638 collections, resulting in the use of 6,430 included chevron trap collections for estimating nominal CPUE. Nominal CPUE of members of the genus *Stenotomus* exhibited a high degree of variability (coefficients of variation range 1.90-4.24; Table 88; Figure 47).

For the delta-GLM analysis (see covariates and bins in Table 8), missing latitude and temperature data resulted in the removal of 9 and 862 chevron trap collections, respectively, or 0.1% and 13.4% of the data included in the nominal CPUE analysis. This resulted in a total of 5,559 included collections being retained in the delta-GLM analysis, ranging from 160 to 333 per year (Table 89). Please note that due to missing bottom temperature data, greater than 20% of available collections were removed for the years 1995, 1996, 1999, 2000, and 2011 (Table 10). As members of the genus *Stenotomus* are extremely common in chevron trap catches (3 of 24 species in individuals captured; Table 3), it is likely that exclusion of this data has a minimal effect on annual delta-GLM standardized CPUE estimates.

During the model selection process for the final delta-GLM model, AIC selection suggested that the covariate season should be removed from both the Bernoulli and positive sub-models (Table 8) and that we should fit the positive sub-model assuming a gamma error distribution. Based on analysis of deviance tables, all variables, including year, were highly significant in both the Bernoulli and gamma sub-models of the final delta-GLM. Full model diagnostics are available as part of a separate Appendix to this report upon request.

Standardization by the delta-GLM model decreased annual coefficient of variation estimates, with annual CVs ranging from a low of 0.13 in 1998 to a high of 0.22 in 2009 (Table 89). This suggested that the inclusion of these extra covariates and the formal statistical modeling of CPUE using the delta-GLM approach was able to explain a large proportion of the variation in individual trap catches.

Standardized CPUE estimates normalized to the series average increased from the start of the survey period through the mid-1990s, remained relatively constant from 1996-2005, and rapidly decreased to near-series lows from 2006 to 2011 (Figure 47B). CPUE has been below average every year from 2006 to 2011, while only being below average one year from 1996 to 2005 (Table 89).

Mean lengths of members of the genus *Stenotomus* were highest in 2005 (171 mm FL) and lowest in 1995 (141 mm FL; Table 88). There was an increasing pattern in mean length of captured members of the genus *Stenotomus* over the survey period (Figure 47A), with an increase of approximately 30 mm (~1.18 inches) from the series low in 1995 (Table 88).

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Tables

Table 1: Species included in this report and the gears for which we estimated an annual CPUE for the species. CHV = chevron trap, SBLL = short bottom longline, and LBLL = long bottom longline.

		Gear		
Common Name	**Scientific Name**	**CHV**	**SBLL**	**LBLL**
	Balistidae			
Gray Triggerfish	*Balistes capriscus*	X		
	Carangidae			
Almaco Jack	*Seriola rivoliana*		X	
Greater Amberjack	*Seriola dumerili*		X	
	Haemulidae			
Tomtate	*Haemulon aurolineatum*	X		
White Grunt	*Haemulon plumieri*	X		
	Lutjanidae			
Red Snapper	*Lutjanus campechanus*	X		
Vermilion Snapper	*Rhomboplites aurorubens*	X		
	Malacanthidae			
Blueline Tilefish	*Caulolatilus microps*		X	
Golden Tilefish	*Lopholatilus chamaeleonticeps*		X	X
	Sebastidae			
Blackbelly Rosefish*	*Helicolenus dactylopterus*		X	X
	Serranidae			
Bank Sea Bass	*Centropristis ocyurus*	X		
Black Sea Bass	*Centropristis striata*	X		
Gag	*Mycteroperca microlepis*	X	X	
Red Grouper	*Epinephelus morio*	X	X	
Sand Perch*	*Diplectrum formosum*	X		
Scamp	*Mycteroperca phenax*	X	X	
Snowy Grouper	*Epinephelus niveatus*	X	X	
Speckled Hind	*Epinephelus drummondhayi*	X	X	
Warsaw Grouper	*Epinephelus nigritus*			
	Sparidae			
Knobbed Porgy	*Calamus nodosus*	X		
Pinfish*	*Lagodon rhomboides*	X		
Red Porgy	*Pagrus pagrus*	X	X	
Spottail Pinfish*	*Diplodus holbrookii*	X		
Stenotomus spp.	*Stenotomus spp.*	X		

* - species not currently included in the SAFMC snapper-grouper management complex

Table 2: Number of gear deployments, by year and gear type, during fishery-independent sampling of live/hard bottom areas. This includes both randomly selected monitoring stations ("included" collections) and reconnaissance stations.

Year	Chevron Trap	Short Bottom Longline	Long Bottom Longline
1979	–	8*	–
1980	–	–	–
1981	–	–	–
1982	–	–	34*
1983	–	–	34*
1984	–	–	57*
1985	–	–	45*
1986	–	–	21*
1987	–	2*	–
1988	105*	–	–
1989	80*	–	–
1990	354	–	–
1991	305	–	–
1992	324	–	–
1993	542	–	–
1994	468	–	–
1995	545	–	–
1996	642	20	17
1997	532	34	21
1998	523	34	10
1999	347	44	30
2000	383	40	11
2001	325	36	14
2002	336	22	20
2003	286	55	16
2004	319	48	5
2005	357	58	16
2006	333	96	7
2007	361	74	25
2008	354	58	–
2009	464	71	38
2010	1051	135	40
2011	1010	143	30

* – years were not included in summaries, as the MARMAP program did not use a consistent gear deployment strategy

Table 3: Depth range over which we find 100% of all individuals of a given species (data through 2011). We used these ranges for the calculation of CPUE and length summaries in this report. Please note that the depth range for a species may have changed since the 2010 report. Current depth ranges were based upon the depths we captured a given species using data from all fishery-independent studies, all gears, and all catch codes (includes data from reconnaissance gear deployments). n = the number of individuals captured via the given gear, irrespective of the use of the deployment in calculation of CPUE and length summaries (i.e. includes catch from reconnaissance gear deployments, non-standardized years, etc.).

			2010		**2011**
Common Name	**n**	**Gear**	**Depth Range (m)**	**% of Fish**	**Depth Range (m)**
			Balistidae		
Gray Triggerfish	8874	Chevron Trap	0-59	97.88%	10-94
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
			Carangidae		
Almaco Jack	–	Chevron Trap	–	–	–
	125	Short Bottom Longline	–	–	20-234
	6	Long Bottom Longline	–	–	20-234
Greater Amberjack	53	Chevron Trap	All Depths	100.00%	15-239
	101	Short Bottom Longline	All Depths	100.00%	15-239
	50	Long Bottom Longline	–	–	15-239
			Haemulidae		
Tomtate	103456	Chevron Trap	0-49	90.20%	10-69
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
White Grunt	5752	Chevron Trap	20-59	99.78%	15-59
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
			Lutjanidae		
Red Snapper	695	Chevron Trap	0-59	95.54%	15-74
	2	Short Bottom Longline	–	10–	15-74
	–	Long Bottom Longline	–	–	–
Vermilion Snapper	36470	Chevron Trap	20-59	98.38%	10-104
	5	Short Bottom Longline	–	–	10-104
	–	Long Bottom Longline	–	–	–
			Malacanthidae		
Blueline Tilefish	46	Chevron Trap	–	–	45-214
	74	Short Bottom Longline	–	–	45-214
	31	Long Bottom Longline	–	–	45-214
Golden Tilefish	–	Chevron Trap	–	–	–
	97	Short Bottom Longline	–	–	170-269
	1305	Long Bottom Longline	All Depths	100.00%	170-269
			Sebastidae		
Blackbelly Rosefish	2	Chevron Trap	–	–	175-244
	303	Short Bottom Longline	All Depths	100.00%	175-244
	500	Long Bottom Longline	All Depths	100.00%	175-244
			Serranidae		
Bank Sea Bass	15862	Chevron Trap	0-59	96.93%	10-104
	3	Short Bottom Longline	–	–	10-104
	–	Long Bottom Longline	–	–	–

Table 3: (continued)

			2010		2011
Common Name	**n**	**Gear**	**Depth Range (m)**	**% of Fish**	**Depth Range (m)**
Black Sea Bass	114908	Chevron Trap	0-39	94.40%	10-69
	2	Short Bottom Longline	–	–	10-69
	–	Long Bottom Longline	–	–	–
Gag	163	Chevron Trap	0-69	98.16%	15-109
	32	Short Bottom Longline	–	–	15-109
	–	Long Bottom Longline	–	–	–
Red Grouper	665	Chevron Trap	All Depths	100.00%	20-109
	81	Short Bottom Longline	All Depths	100.00%	20-109
	–	Long Bottom Longline	–	–	–
Sand Perch	6594	Chevron Trap	0-49	99.79%	15-69
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
Scamp	1614	Chevron Trap	All Depths	100.00%	15-114
	196	Short Bottom Longline	All Depths	100.00%	15-114
	–	Long Bottom Longline	–	–	–
Snowy Grouper	417	Chevron Trap	50-199	96.78%	35-229
	678	Short Bottom Longline	50-199	91.42%	35-229
	45	Long Bottom Longline	50-199	46.67%	35-229
Speckled Hind	112	Chevron Trap	40-109	100.00%	25-114
	43	Short Bottom Longline	40-109	95.35%	25-114
	–	Long Bottom Longline	–	–	–
Warsaw Grouper	11	Chevron Trap	–	–	–
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
		Sparidae			
Knobbed Porgy	2221	Chevron Trap	0-59	99.14%	20-79
	5	Short Bottom Longline	–	–	20-79
	–	Long Bottom Longline	–	–	–
Pinfish	3073	Chevron Trap	0-39	92.55%	10-49
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
Red Porgy	19334	Chevron Trap	20-79	96.34%	20-124
	49	Short Bottom Longline	–	–	20-124
	–	Long Bottom Longline	–	–	–
Spottail Pinfish	2618	Chevron Trap	0-39	98.17%	10-59
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–
Stenotomus spp.	83663	Chevron Trap	Oct-39	97.10%	10-49
	–	Short Bottom Longline	–	–	–
	–	Long Bottom Longline	–	–	–

Table 4: Length-length conversion equations by species. All conversions are based on information from the MARMAP database (1973-2011). TL = total length (mm), FL = fork length (mm), AL = analysis length, indicating the type of length (TL or FL) that was used in this report.

Species	AL	Equation	n	r^2
		Balistidae		
Gray Triggerfish	FL	FL = 0.8005*TL + 24.6419	8552	0.9655
		Carangidae		
Almaco Jack	FL	FL = 0.8725*TL - 5.5716	5	0.9998
Greater Amberjack	FL	FL = 0.8886*TL - 17.1746	1877	0.9744
		Haemulidae		
Tomtate	FL	FL = 0.8869*TL - 3.7919	4093	0.9829
White Grunt	FL	FL = 0.8933*TL - 1.7268	5954	0.9939
		Lutjanidae		
Red Snapper	FL	FL = 0.9348*TL - 0.3440	1784	0.9981
Vermilion Snapper	FL	FL = 0.8953*TL + 1.2070	20271	0.9959
		Malacanthidae		
Blueline Tilefish	FL	FL = 0.9372*TL + 1.9341	915	0.9952
Golden Tilefish	FL	FL = 0.9231*TL + 14.2487	3826	0.9980
		Sebastidae		
Blackbelly Rosefish	TL	TL = 1.0292*FL + 1.4135	2240	0.9958
		Serranidae		
Bank Sea Bass	TL	–	–	–
Black Sea Bass	TL	–	–	–
Gag	TL	TL = 1.0356*FL - 0.5878	3696	0.9974
Red Grouper	TL	TL = 1.0547*FL - 8.0553	1567	0.9967
Sand Perch	FL	FL = 0.8783*TL - 0.7358	1346	0.9721
Scamp	FL	FL = 0.8788*TL + 23.1993	4402	0.9901
Snowy Grouper	TL	TL = 1.0075*FL + 0.5229	818	0.9952
Speckled Hind	TL	TL = 1.0175*FL + 2.1453	1014	0.9979
Warsaw Grouper	TL	–	–	–
		Sparidae		
Knobbed Porgy	FL	FL = 0.9040*TL - 11.7886	1571	0.9830
Pinfish	FL	–	–	–
Red Porgy	FL	FL = 0.8744*TL - 3.4449	25789	0.9927
Spottail Pinfish	FL	FL = 0.9007*TL - 4.9961	21	0.9870
Stenotomus spp.	FL	FL = 0.8384*TL + 5.6285	149	0.9886

Table 5: Number of CTD gear deployments made annually. Please note that not all CTD deployments may be used in the development of annual delta-GLM standardized CPUE estimates, as they may not be associated with gears used in this report or have been excluded due to deployment times, catch codes, or locations.

Year	n	Depth	Temperature	Salinity	Oxygen	Chlorophyll-A	$P0_4$	$N0_2$	$N0_3$
1979	95	95	95	94	93	–	93	92	93
1980	90	90	90	89	89	–	90	80	80
1981	65	65	65	65	65	–	65	60	60
1982	17	17	17	17	17	–	17	–	–
1983	30	30	30	29	30	–	–	–	–
1984	44	44	44	44	44	–	–	–	–
1985	127	127	127	127	40	–	–	–	–
1986	37	37	37	37	37	–	–	–	–
1987	50	50	50	49	49	–	–	–	–
1988	97	97	97	97	97	–	–	–	–
1989	38	38	38	38	38	–	–	–	–
1990	78	78	78	78	78	–	–	–	–
1991	62	62	62	62	62	–	–	–	–
1992	58	58	58	58	58	–	–	–	–
1993	99	99	99	99	–	–	–	–	–
1994	72	72	72	72	–	–	–	–	–
1995	70	70	70	70	–	–	–	–	–
1996	106	106	106	106	–	–	–	–	–
1997	103	103	103	103	–	–	–	–	–
1998	106	106	106	106	–	–	–	–	–
1999	82	82	82	82	–	–	–	–	–
2000	81	81	81	81	–	–	–	–	–
2001	65	65	65	65	–	–	–	–	–
2002	58	58	58	58	–	–	–	–	–
2003	58	58	58	58	–	–	–	–	–
2004	69	69	69	69	66	66	–	–	–
2005	77	77	77	77	77	77	–	–	–
2006	88	88	88	88	88	88	–	–	–
2007	114	114	114	114	51	51	–	–	–
2008	71	71	71	71	71	71	–	–	–
2009	114	114	114	114	92	92	–	–	–
2010	195	195	195	195	173	173	–	–	–
2011	200	178	178	178	112	112	–	–	–

Table 6: Annual total number of chevron trap collections made by fishery-independent survey, and the number of included collections made at randomly selected monitoring stations. We only considered those collections that were made at randomly selected monitoring stations using standard sampling techniques that had a soak time of between 45 and 150 minutes and a catch code of 0 (no catch), 1 (catch with finfish), or 2 (catch without finfish) as included collections. Please note that the SEAMAP-SA Reef Fish and SEFIS fishery-independent research projects did not begin until 2009 and 2010, respectively.

	MARMAP		**SEAMAP-SA Reef Fish**		**SEFIS**		**Total**	
Year	**All**	**Included**	**All**	**Included**	**All**	**Included**	**All**	**Included**
1988	105	0	–	–	–	–	105	0
1989	80	0	–	–	–	–	80	0
1990	354	350	–	–	–	–	354	350
1991	305	299	–	–	–	–	305	299
1992	324	315	–	–	–	–	324	315
1993	542	410	–	–	–	–	542	410
1994	468	454	–	–	–	–	468	454
1995	545	523	–	–	–	–	545	523
1996	642	467	–	–	–	–	642	467
1997	532	446	–	–	–	–	532	446
1998	523	518	–	–	–	–	523	518
1999	347	253	–	–	–	–	347	253
2000	383	325	–	–	–	–	383	325
2001	325	249	–	–	–	–	325	249
2002	336	240	–	–	–	–	336	240
2003	286	218	–	–	–	–	286	218
2004	319	271	–	–	–	–	319	271
2005	357	325	–	–	–	–	357	325
2006	333	296	–	–	–	–	333	296
2007	361	325	–	–	–	–	361	325
2008	354	303	–	–	–	–	354	303
2009	452	402	12	0	–	–	464	402
2010	459	369	108	2	484	51	1051	422
2011	396	306	68	6	546	345	1010	657

Table 7: Species captured from 1990-2011 in included monitoring station chevron trap collections. List is arranged alphabetically by family, by genus within family, and by species within genus.

Common Name	Family	Genus	Scientific Name	Every Year
Ocellated Frogfish	Antennariidae	Antennarius	*Antennarius ocellatus*	–
Atlantic Trumpetfish	Aulostomidae	Aulostomus	*Aulostomus maculatus*	–
Gray Triggerfish	Balistidae	Balistes	*Balistes capriscus*	X
Queen Triggerfish	Balistidae	Balistes	*Balistes vetula*	–
Leopard Toadfish	Batrachoididae	Opsanus	*Opsanus pardus*	–
Oyster Toadfish	Batrachoididae	Opsanus	*Opsanus tau*	–
Eyed Flounder	Bothidae	Bothus	*Bothus ocellatus*	–
Yellow Jack	Carangidae	Caranx	*Caranx bartholomaei*	–
Blue Runner	Carangidae	Caranx	*Caranx crysos*	–
Round Scad	Carangidae	Decapterus	*Decapterus punctatus*	–
Greater Amberjack	Carangidae	Seriola	*Seriola dumerili*	–
Lesser Amberjack	Carangidae	Seriola	*Seriola fasciata*	–
Almaco Jack	Carangidae	Seriola	*Seriola rivoliana*	–
Banded Rudderfish	Carangidae	Seriola	*Seriola zonata*	–
Atlantic Sharpnose Shark	Carcharhinidae	Rhizoprionodon	*Rhizoprionodon terraenovae*	–
Spotfin Butterflyfish	Chaetodontidae	Chaetodon	*Chaetodon ocellatus*	–
Reef Butterflyfish	Chaetodontidae	Chaetodon	*Chaetodon sedentarius*	–
Banded Butterflyfish	Chaetodontidae	Chaetodon	*Chaetodon striatus*	–
Bank Butterflyfish	Chaetodontidae	Prognathodes	*Prognathodes aya*	–
Conger Eel	Congridae	Conger	*Conger oceanicus*	–
Web Burrfish	Diodontidae	Chilomycterus	*Chilomycterus antillarum*	–
Striped Burrfish	Diodontidae	Chilomycterus	*Chilomycterus schoepfii*	–
Balloonfish	Diodontidae	Diodon	*Diodon holocanthus*	–
Sharksucker	Echeneidae	Echeneis	*Echeneis naucrates*	–
Whitefin Sharksucker	Echeneidae	Echeneis	*Echeneis neucratoides*	–
Remora	Echeneidae	Remora	*Remora remora*	–
Atlantic Spadefish	Ephippidae	Chaetodipterus	*Chaetodipterus faber*	–
Nurse Shark	Ginglymostomatidae	Ginglymostoma	*Ginglymostoma cirratum*	–
Tomtate	Haemulidae	Haemulon	*Haemulon aurolineatum*	X
White Grunt	Haemulidae	Haemulon	*Haemulon plumieri*	X
Bluestriped Grunt	Haemulidae	Haemulon	*Haemulon sciurus*	–
Striped Grunt	Haemulidae	Haemulon	*Haemulon striatum*	–
Pigfish	Haemulidae	Orthopristis	*Orthopristis chrysoptera*	–
Squirrelfish	Holocentridae	Holocentrus	*Holocentrus adscensionis*	–
Longspine Squirrelfish	Holocentridae	Holocentrus	*Holocentrus rufus*	–
Spotfin Hogfish	Labridae	Bodianus	*Bodianus pulchellus*	–
Spanish Hogfish	Labridae	Bodianus	*Bodianus rufus*	–
Slippery Dick	Labridae	Halichoeres	*Halichoeres bivittatus*	–
Yellowcheek Wrasse	Labridae	Halichoeres	*Halichoeres cyanocephalus*	–
Hogfish	Labridae	Lachnolaimus	*Lachnolaimus maximus*	–
Mutton Snapper	Lutjanidae	Lutjanus	*Lutjanus analis*	–
Red Snapper	Lutjanidae	Lutjanus	*Lutjanus campechanus*	X
Cubera Snapper	Lutjanidae	Lutjanus	*Lutjanus cyanopterus*	–
Gray Snapper	Lutjanidae	Lutjanus	*Lutjanus griseus*	–
Lane Snapper	Lutjanidae	Lutjanus	*Lutjanus synagris*	–
Silk Snapper	Lutjanidae	Lutjanus	*Lutjanus vivanus*	–
Yellowtail Snapper	Lutjanidae	Ocyurus	*Ocyurus chrysurus*	–
Vermilion Snapper	Lutjanidae	Rhomboplites	*Rhomboplites aurorubens*	X
Blueline Tilefish	Malacanthidae	Caulolatilus	*Caulolatilus microps*	–

Table 7: continued

Common Name	Family	Genus	Scientific Name	Every Year
Planehead Filefish	Monacanthidae	Stephanolepis	*Stephanolepis hispidus*	X
Red Goatfish	Mullidae	Mullus	*Mullus auratus*	–
Spotted Goatfish	Mullidae	Pseudupeneus	*Pseudupeneus maculatus*	–
Spotted Moray	Muraenidae	Gymnothorax	*Gymnothorax moringa*	X
Polygon Moray	Muraenidae	Gymnothorax	*Gymnothorax polygonius*	–
Honeycomb Moray	Muraenidae	Gymnothorax	*Gymnothorax saxicola*	–
Purplemouth Moray	Muraenidae	Gymnothorax	*Gymnothorax vicinus*	–
Reticulate Moray	Muraenidae	Muraena	*Muraena retifera*	–
Silver Driftfish	Nomeidae	Psenes	*Psenes maculatus*	–
Gulf Flounder	Paralichthyidae	Paralichthys	*Paralichthys albigutta*	–
Summer Flounder	Paralichthyidae	Paralichthys	*Paralichthys dentatus*	–
Southern Flounder	Paralichthyidae	Paralichthys	*Paralichthys lethostigma*	–
Dusky Flounder	Paralichthyidae	Syacium	*Syacium papillosum*	–
Blue Angelfish	Pomacanthidae	Holacanthus	*Holacanthus bermudensis*	–
Queen Angelfish	Pomacanthidae	Holacanthus	*Holacanthus ciliaris*	–
Gray Angelfish	Pomacanthidae	Pomacanthus	*Pomacanthus arcuatus*	–
Yellowtail Reeffish	Pomacentridae	Chromis	*Chromis enchrysura*	–
Beaugregory	Pomacentridae	Stegastes	*Stegastes leucostictus*	–
Bluefish	Pomatomidae	Pomatomus	*Pomatomus saltatrix*	–
Bigeye	Priacanthidae	Priacanthus	*Priacanthus arenatus*	–
Short Bigeye	Priacanthidae	Pristigenys	*Pristigenys alta*	–
Cobia	Rachycentridae	Rachycentron	*Rachycentron canadum*	–
Jacknife Fish	Sciaenidae	Equetus	*Equetus lanceolatus*	–
Atlantic Croaker	Sciaenidae	Micropogonias	*Micropogonias undulatus*	–
Cubbyu	Sciaenidae	Pareques	*Pareques umbrosus*	–
Spinycheek Scorpionfish	Scorpaenidae	Neomerinthe	*Neomerinthe hemingwayi*	–
Red lionfish	Scorpaenidae	Pterois	*Pterois volitans*	–
Spotted Scorpionfish	Scorpaenidae	Scorpaena	*Scorpaena plumieri*	–
Blackbelly Rosefish	Sebastidae	Helicolenus	*Helicolenus dactylopterus*	–
Bank Sea Bass	Serranidae	Centropristis	*Centropristis ocyurus*	X
Rock Sea Bass	Serranidae	Centropristis	*Centropristis philadelphica*	–
Black Sea Bass	Serranidae	Centropristis	*Centropristis striata*	X
Graysby	Serranidae	Cephalopholis	*Cephalopholis cruentata*	–
Coney	Serranidae	Cephalopholis	*Cephalopholis fulva*	–
Sand Perch	Serranidae	Diplectrum	*Diplectrum formosum*	X
Rock Hind	Serranidae	Epinephelus	*Epinephelus adscensionis*	–
Speckled Hind	Serranidae	Epinephelus	*Epinephelus drummondhayi*	–
Red Hind	Serranidae	Epinephelus	*Epinephelus guttatus*	–
Red Grouper	Serranidae	Epinephelus	*Epinephelus morio*	X
Warsaw Grouper	Serranidae	Epinephelus	*Epinephelus nigritus*	–
Snowy Grouper	Serranidae	Epinephelus	*Epinephelus niveatus*	–
Gag	Serranidae	Mycteroperca	*Mycteroperca microlepis*	–
Scamp	Serranidae	Mycteroperca	*Mycteroperca phenax*	X
Atlantic Creolefish	Serranidae	Paranthias	*Paranthias furcifer*	–
Whitespotted Soapfish	Serranidae	Rypticus	*Rypticus maculatus*	–
Greater Soapfish	Serranidae	Rypticus	*Rypticus saponaceus*	–
Spotted Soapfish	Serranidae	Rypticus	*Rypticus subbifrenatus*	–
Tattler	Serranidae	Serranus	*Serranus phoebe*	–
Whitebone Porgy	Sparidae	Calamus	*Calamus leucosteus*	–

Table 7: continued

Common Name	Family	Genus	Scientific Name	Every Year
Knobbed Porgy	Sparidae	Calamus	*Calamus nodosus*	X
Littlehead Porgy	Sparidae	Calamus	*Calamus proridens*	–
Spottail Pinfish	Sparidae	Diplodus	*Diplodus holbrookii*	X
Pinfish	Sparidae	Lagodon	*Lagodon rhomboides*	X
Red Porgy	Sparidae	Pagrus	*Pagrus pagrus*	X
Longspine Porgy	Sparidae	Stenotomus	*Stenotomus caprinus*	–
Scup	Sparidae	Stenotomus	*Stenotomus chrysops*	X
Great Barracuda	Sphyraenidae	Sphyraena	*Sphyraena barracuda*	–
Inshore Lizardfish	Synodontidae	Synodus	*Synodus foetens*	–
Sand Diver	Synodontidae	Synodus	*Synodus intermedius*	–
Northern Puffer	Tetraodontidae	Sphoeroides	*Sphoeroides maculatus*	–
Striped Searobin	Triglidae	Prionotus	*Prionotus evolans*	–

Table 8: Delta-GLM covariates (and bins used) used in the development of standardized chevron trap CPUE indices. Only species for which delta-GLM standardized CPUE indices based on chevron trap catches are included.

	Bin #										
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
					Latitude (°N)						
Gray Triggerfish	<=29	30	31	32	33	>=34					
Tomtate	<=29	30	31	32	33	>=34					
White Grunt	<=31	32	33	>=34							
Red Snapper	<=29	30	31	32	33	>=34					
Vermilion Snapper	<=29	30	31	32	33	>=34					
Bank Sea Bass	<=29	30	31	32	33	>=34					
Black Sea Bass	<=29	30	31	32	33	>=34					
Gag[b]	<=30	31	32	33	>=34						
Red Grouper	<=29	30	31	32	33	>=34					
Sand Perch	<=29	30	31	32	33	>=34					
Scamp[b]	<=29	30	31	32	33	>=34					
Snowy Grouper[b]	<=31	32	>=33								
Speckled Hind	<=30	31	32	>=33							
Knobbed Porgy	<=30	31	32	33	>=34						
Pinfish	<=30	31	32	33	>=34						
Red Porgy	<=29	30	31	32	33	>=34					
Spottail Pinfish[b]	<=31	32	33	>=34							
Stenotomus sp.	<=31	32	33	>=34							
					Depth (m)						
Gray Triggerfish	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	>=70
Tomtate	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>=60	
White Grunt[b]	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	>=55		
Red Snapper[b]	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>= 60		
Vermilion Snapper	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	>=70
Bank Sea Bass	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	>=70
Black Sea Bass	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>= 60	
Gagb	<20	20-24	25-29	30-35	34-39	40-49	50-59	60-69	>=70		
Red Grouper[b]	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>= 60		
Sand Perch	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	>= 55		
Scamp[b]	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	>=70	
Snowy Grouper	<40	40-49	50-59	60-69	>=70						
Speckled Hind[b]	<50	50-54	55-59	60-69	>=70						
Knobbed Porgy	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>=60		
Pinfish	<20	20-24	25-29	30-34	35-39	>40					
Red Porgy	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69	70-84	>=85
Spottail Pinfish	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	>=55		
Stenotomus sp.	<20	20-24	25-29	30-34	35-39	>=40					
					Bottom Temperature (°C)						
Gray Triggerfish	<=20	21-25	>25								
Tomtate	<=20	21-25	>25								
White Grunt	<=20	21-25	>25								
Red Snapper[a]	<=20	21-25	>25								
Vermilion Snapper	<=20	21-25	>25								
Bank Sea Bass	<=20	21-25	>25								
Black Sea Bass	<=20	21-25	>25								
Gag[a]	<=20	21-25	>25								

Table 8: continued

Species	1	2	3	4	5	6	7	8	9	10	11
	Bin #										
Red Grouper	<=20	21-25	>25								
Sand Perch[b]	<=20	21-25	>25								
Scamp	<=20	21-25	>25								
Snowy Grouper[b]	<=17	18-19	20	21	22	23	>=24				
Speckled Hind[b]	<=17	18-19	20	21	22	23	24-25	>=26			
Knobbed Porgy[b]	<=20	21-25	>25								
Pinfish	<=20	21-25	>25								
Red Porgy	<=20	21-25	>25								
Spottail Pinfish[b]	<=20	21-25	>25								
Stenotomus sp.	<=20	21-25	>25								
					Season						
Gray Triggerfish	Spring	Summer									
Tomtate[a]	Spring	Summer									
White Grunt[ab]	Spring	Summer									
Red Snapper	Spring	Summer									
Vermilion Snapper[b]	Spring	Summer									
Bank Sea Bass	Spring	Summer									
Black Sea Bass[b]	Spring	Summer									
Gag[a]	Spring	Summer									
Red Grouper	Spring	Summer									
Sand Perch[ab]	Spring	Summer									
Scamp[ab]	Spring	Summer									
Snowy Grouper[a]	Spring	Summer									
Speckled Hind	Spring	Summer									
Knobbed Porgy	Spring	Summer									
Pinfish[a]	Spring	Summer									
Red Porgy[b]	Spring	Summer									
Spottail Pinfish[b]	Spring	Summer									
Stenotomus sp.[ab]	Spring	Summer									

a – Model selection AIC scores indicated that the covariate should not be included in the final Bernoulli component of the delta-GLM

b – Model selection AIC scores indicated that the covariate should not be included in the final positive component of the delta-GLM

Table 9: Comparison of terminal year (2011) nominal CPUEs when SEFIS live/hard bottom monitoring stations are included versus estimates based only on collections made at traditional MARMAP and SEAMAP-SA Reef Fish Survey live/hard bottom monitoring stations. 2011 represents the first year any reconnaissance stations sampled by the SEFIS program that upon video and catch inspection were deemed to be located on live/hard bottom habitat, and thus made into chevron trap monitoring stations, were sampled as part of the SAB Reef Fish Survey monitoring program. In this analysis, we only looked at the terminal year CPUE estimates for the 11 species (of the 18 that we have chevron trap CPUE estimates) of greatest commercial and recreational fisheries importance, as based on recent landings, the stock assessment schedule, and other factors. No attempt has been made to look at the effect that inclusion of SEFIS monitoring stations has on the terminal year nominal CPUE for the remaining 7 species. Nominal CPUE (#s) = nominal CPUE in fish*trap^{-1}*hr^{-1}. All = nominal 2011 CPUE when we include SEFIS monitoring stations. No SEFIS = nominal 2011 CPUE when we exclude SEFIS monitoring stations. Diff. = All – No SEFIS. % Diff. = (Diff./All)*100.

	Nominal CPUE (#s)			
Species	**All**	**No SEFIS**	**Diff.**	**% Diff.**
Gray Triggerfish	0.299	0.316	-0.0172	-5.75%
White Grunt	0.109	0.160	-0.0511	-46.7%
Red Snapper	0.0863	0.0178	0.0684	79.3%
Vermilion Snapper	1.20	1.34	-0.136	-11.3%
Black Sea Bass	11.8	12.6	-0.778	-6.57%
Gag	0.00492	0.00460	0.000325	6.60%
Red Grouper	0.00872	0.0125	-0.00377	-43.2%
Scamp	0.0246	0.0289	-0.00428	-17.4%
Snowy Grouper	0.0290	0.0454	-0.01640	-56.5%
Speckled Hind[a]	0.00239	0.000	0.00239	100%
Red Porgy	1.21	1.46	-0.249	-20.5%

a – Speckled hind are an extremely rare catch in chevron trap catches, with the only individuals (n=2) captured in 2011 occuring at newly included SEFIS monitoring stations. On average, we have only captured 4 individuals annually, thus little inference can be made about the effect of including SEFIS monitoring stations on nominal CPUE estimates.

Table 10: Annual and total exclusion of included chevron trap monitoring station collections from delta-GLM analysis due to missing bottom temperature data. Red = ≥30% exclusion, Orange = ≥25% and <30%, Yellow = ≥20% and <25%, Light Green = ≥15% and <20%, Green = ≥10% and <15%, and Blue = ≥5% and <10%.

	Year																						
Species	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**Total**
	Bottom Temperature																						
Gray Triggerfish	12%	10%	9%	0%	13%	31%	22%	11%	12%	27%	20%	8%	14%	3%	0%	10%	5%	2%	3%	1%	1%	30%	12%
Tomtate	12%	10%	9%	0%	13%	31%	21%	12%	13%	28%	20%	8%	14%	3%	0%	10%	6%	2%	3%	2%	1%	30%	13%
White Grunt	13%	10%	9%	0%	13%	31%	21%	11%	13%	28%	20%	8%	15%	2%	0%	10%	6%	2%	3%	2%	1%	30%	13%
Red Snapper	12%	10%	9%	0%	13%	31%	22%	11%	13%	27%	20%	8%	15%	3%	0%	10%	6%	2%	3%	2%	1%	30%	13%
Vermilion Snapper	12%	10%	9%	0%	13%	31%	21%	11%	12%	27%	21%	8%	14%	3%	0%	10%	5%	2%	3%	1%	1%	30%	12%
Bank Sea Bass	12%	10%	9%	0%	13%	31%	21%	11%	12%	27%	21%	8%	14%	3%	0%	10%	5%	2%	3%	1%	1%	30%	12%
Black Sea Bass	12%	10%	9%	0%	13%	31%	21%	12%	13%	28%	20%	8%	14%	3%	0%	10%	6%	2%	3%	2%	1%	30%	13%
Gag	12%	10%	9%	0%	13%	31%	21%	11%	12%	27%	21%	7%	14%	3%	0%	10%	5%	2%	3%	1%	1%	30%	12%
Red Grouper	14%	11%	7%	0%	6%	23%	22%	10%	11%	21%	19%	5%	3%	3%	0%	8%	2%	2%	3%	0%	1%	29%	10%
Sand Perch	12%	10%	9%	0%	13%	31%	21%	12%	13%	28%	20%	8%	15%	3%	0%	10%	6%	2%	3%	2%	1%	30%	13%
Scamp	12%	10%	9%	0%	13%	31%	21%	11%	12%	27%	21%	7%	14%	3%	0%	10%	5%	2%	3%	1%	1%	30%	12%
Snowy Grouper	13%	20%	8%	0%	1%	22%	21%	12%	11%	24%	18%	8%	0%	5%	0%	15%	4%	4%	4%	0%	0%	24%	10%
Speckled Hind	14%	12%	7%	0%	2%	20%	24%	11%	11%	19%	20%	5%	4%	3%	0%	9%	2%	2%	4%	0%	0%	30%	10%
Knobbed Porgy	14%	11%	7%	0%	6%	23%	22%	11%	11%	21%	18%	5%	3%	3%	0%	8%	2%	2%	4%	0%	1%	29%	10%
Pinfish	13%	6%	10%	0%	17%	35%	24%	10%	15%	28%	22%	7%	16%	0%	0%	10%	6%	2%	4%	2%	1%	37%	14%
Red Porgy	14%	11%	7%	0%	6%	23%	22%	10%	11%	21%	19%	5%	3%	3%	0%	8%	2%	2%	3%	0%	1%	29%	10%
Spottail Pinfish	13%	10%	9%	0%	13%	31%	21%	11%	13%	28%	20%	8%	15%	2%	0%	10%	6%	2%	3%	2%	1%	30%	13%
Stenotomus sp.	13%	6%	10%	0%	17%	35%	24%	10%	15%	28%	22%	7%	16%	0%	0%	10%	6%	2%	4%	2%	1%	37%	14%

Table 11: Annual total number of short bottom longline collections made by fishery-independent survey, and the number of included collections made at randomly selected monitoring stations. We only considered those collections that were made at randomly selected monitoring stations using standard sampling techniques that had a soak time of between 45 and 150 minutes and a catch code of 0 (no catch), 1 (catch with finfish), or 2 (catch without finfish) as included collections. Please note that the SEAMAP-SA Reef Fish and SEFIS fishery-independent research projects did not begin until 2009 and 2010, respectively.

	MARMAP		**SEAMAP-SA Reef Fish**		**SEFIS**		**Total**	
Year	**All**	**Included**	**All**	**Included**	**All**	**Included**	**All**	**Included**
1996	20	15	–	–	–	–	20	15
1997	34	33	–	–	–	–	34	33
1998	34	32	–	–	–	–	34	32
1999	44	39	–	–	–	–	44	39
2000	40	34	–	–	–	–	40	34
2001	36	29	–	–	–	–	36	29
2002	22	19	–	–	–	–	22	19
2003	54	54	–	–	–	–	52	52
2004	48	34	–	–	–	–	48	34
2005	58	55	–	–	–	–	58	55
2006	96	84	–	–	–	–	96	84
2007	74	55	–	–	–	–	74	55
2008	58	41	–	–	–	–	58	41
2009	59	40	12	1	–	–	71	41
2010	109	70	15	0	11	1	135	71
2011	108	86	35	6	0	0	143	92

Table 12: Species captured from 1996-2011 in included monitoring station short bottom longline collections. List is arranged alphabetically by family, by genus within family, and by species within genus.

Common Name	Family	Genus	Scientific Name	Every Year
Leopard Toadfish	Batrachoididae	Opsanus	*Opsanus pardus*	–
Oyster Toadfish	Batrachoididae	Opsanus	*Opsanus tau*	–
Greater Amberjack	Carangidae	Seriola	*Seriola dumerili*	–
Lesser Amberjack	Carangidae	Seriola	*Seriola fasciata*	–
Almaco Jack	Carangidae	Seriola	*Seriola rivoliana*	–
Banded Rudderfish	Carangidae	Seriola	*Seriola zonata*	–
Silky Shark	Carcharhinidae	Carcharhinus	*Carcharhinus falciformis*	–
Dusky Shark	Carcharhinidae	Carcharhinus	*Carcharhinus obscurus*	–
Tiger Shark	Carcharhinidae	Galeocerdo	*Galeocerdo cuvier*	–
Conger Eel	Congridae	Conger	*Conger oceanicus*	–
Dolphinfish	Coryphaenidae	Coryphaena	*Coryphaena hippurus*	–
Mutton Snapper	Lutjanidae	Lutjanus	*Lutjanus analis*	–
Red Snapper	Lutjanidae	Lutjanus	*Lutjanus campechanus*	–
Silk Snapper	Lutjanidae	Lutjanus	*Lutjanus vivanus*	–
Vermilion Snapper	Lutjanidae	Rhomboplites	*Rhomboplites aurorubens*	–
Goldface Tilefish	Malacanthidae	Caulolatilus	*Caulolatilus chrysops*	–
Blueline Tilefish	Malacanthidae	Caulolatilus	*Caulolatilus microps*	–
Tilefish	Malacanthidae	Lopholatilus	*Lopholatilus chamaeleonticeps*	–
Spotted Moray	Muraenidae	Gymnothorax	*Gymnothorax moringa*	–
Polygon Moray	Muraenidae	Gymnothorax	*Gymnothorax polygonius*	–
Honeycomb Moray	Muraenidae	Gymnothorax	*Gymnothorax saxicola*	–
Reticulate Moray	Muraenidae	Muraena	*Muraena retifera*	–
Carolina Hake	Phycidae	Urophycis	*Urophycis earllii*	–
Southern Hake	Phycidae	Urophycis	*Urophycis floridana*	–
Cobia	Rachycentridae	Rachycentron	*Rachycentron canadum*	–
Spotted Scorpionfish	Scorpaenidae	Scorpaena	*Scorpaena plumieri*	–
Chain Dogfish	Scyliorhinidae	Scyliorhinus	*Scyliorhinus retifer*	–
Blackbelly Rosefish	Sebastidae	Helicolenus	*Helicolenus dactylopterus*	–
Bank Sea Bass	Serranidae	Centropristis	*Centropristis ocyurus*	–
Black Sea Bass	Serranidae	Centropristis	*Centropristis striata*	–
Graysby	Serranidae	Cephalopholis	*Cephalopholis cruentata*	–
Coney	Serranidae	Cephalopholis	*Cephalopholis fulva*	–
Rock Hind	Serranidae	Epinephelus	*Epinephelus adscensionis*	–
Speckled Hind	Serranidae	Epinephelus	*Epinephelus drummondhayi*	–
Yellowedge Grouper	Serranidae	Epinephelus	*Epinephelus flavolimbatus*	–
Red Grouper	Serranidae	Epinephelus	*Epinephelus morio*	–
Snowy Grouper	Serranidae	Epinephelus	*Epinephelus niveatus*	X
Yellowmouth Grouper	Serranidae	Mycteroperca	*Mycteroperca interstitialis*	–
Gag	Serranidae	Mycteroperca	*Mycteroperca microlepis*	–
Scamp	Serranidae	Mycteroperca	*Mycteroperca phenax*	–
Whitebone Porgy	Sparidae	Calamus	*Calamus leucosteus*	–
Knobbed Porgy	Sparidae	Calamus	*Calamus nodosus*	–
Red Porgy	Sparidae	Pagrus	*Pagrus pagrus*	–
Great Hammerhead	Sphyrnidae	Sphyrna	*Sphyrna mokarran*	–
Roughskin Dogfish	Squalidae	Cirrhigaleus	*Cirrhigaleus asper*	–
Spiny Dogfish	Squalidae	Squalus	*Squalus acanthias*	–
Shortspine Dogfish	Squalidae	Squalus	*Squalus mitsukurii*	–
Smooth Dogfish	Triakidae	Mustelus	*Mustelus canis*	–

Table 13: Delta-GLM covariates (and bins used) used in the development of standardized short bottom longline CPUE indices. Only species for which delta-GLM standardized CPUE indices based on short bottom longline catches are included.

	Bin #	
Species	**1**	**2**
	Latitude (°N)	
Gag [a,b]	≤ 33	> 33
Red Grouper	< 34	≥ 34
Speckled Hind [a,b]	≤ 33	> 33
Red Porgy a,b	≤ 33	> 33
	Depth (m)	
Almaco Jack[b]	≤ 150	> 150
Greater Amberjack	≤ 125	> 125
Blueline Tilefish	≤ 150	> 150
Golden Tilefish [b]	≤ 200	> 200
Blackbelly Rosefish	≤ 190	> 190
Gag	≤ 90	> 90
Red Grouper [b]	≤ 80	> 80
Scamp [a,b]	≤ 80	> 80
Snowy Grouper [b]	≤ 150	> 150
Speckled Hind	≤ 90	> 90
Red Porgy	≤ 100	> 100
	Bottom Temperature (°C)	
Almaco Jack [a,b]	≤ 17	> 17
Greater Amberjack [a,b]	≤ 17	> 17
Blueline Tilefish [b]	≤ 17	> 17
Golden Tilefish [a,b]	≤ 17	> 17
Blackbelly Rosefish	≤ 15	> 15
Red Grouper [b]	≤ 20	> 20
Scamp [b]	≤ 20	> 20
Snowy Grouper [a]	≤ 17	> 17

a – Model selection AIC scores indicated that the covariate should not be included in the final Bernoulli component of the delta-GLM

b – Model selection AIC scores indicated that the covariate should not be included in the final positive component of the delta-GLM

Table 14: Annual and total exclusion of included short bottom longline monitoring station collections from delta-GLM analysis due to missing bottom temperature data. Red = ≥30% exclusion, Orange = ≥25% and <30%, Yellow = ≥20% and <25%, Light Green = ≥15% and <20%, Green = ≥10% and <15%, and Blue = ≥5% and <10%.

	Year																
Species	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total**
Almaco jack	20	0	23	15	12	34	0	0	38	0	0	11	0	0	8	54	14
Greater amberjack	20	0	23	15	12	34	0	0	38	0	0	11	0	0	8	54	14
Blueline tilefish	15	0	23	15	12	34	0	0	39	0	0	11	0	0	8	54	14
Blackbelly rosefish	30	0	23	0	0	32	-	0	0	0	0	75	0	0	18	74	20
Red grouper	0	-	-	22	17	40	0	0	52	0	0	0	0	0	0	32	10
Scamp	0	-	-	21	38	40	0	0	52	0	0	0	0	0	0	35	11
Snowy grouper	20	0	23	15	12	34	0	0	38	0	0	11	0	0	8	54	14

Table 15: Species captured from 1996-2011 in included monitoring station long bottom longline collections. Included collections were made in every year except 2008. No species were collected in all survey years. List is arranged alphabetically by family, by genus within family, and by species within genus.

Common Name	Family	Genus	Scientific Name
Greater Amberjack	Carangidae	Seriola	*Seriola dumerili*
Almaco Jack	Carangidae	Seriola	*Seriola rivoliana*
Bignose Shark	Carcharhinidae	Carcharhinus	*Carcharhinus altimus*
Spinner Shark	Carcharhinidae	Carcharhinus	*Carcharhinus brevipinna*
Dusky Shark	Carcharhinidae	Carcharhinus	*Carcharhinus obscurus*
Sandbar Shark	Carcharhinidae	Carcharhinus	*Carcharhinus plumbeus*
Night Shark	Carcharhinidae	Carcharhinus	*Carcharhinus signatus*
Conger Eel	Congridae	Conger	*Conger oceanicus*
Dolphinfish	Coryphaenidae	Coryphaena	*Coryphaena hippurus*
Whalesucker	Echeneidae	Remora	*Remora australis*
White Shark	Lamnidae	Caracharodon	*Carcharodon carcharias*
Blueline Tilefish	Malacanthidae	Caulolatilus	*Caulolatilus microps*
Tilefish	Malacanthidae	Lopholatilus	*Lopholatilus chamaeleonticeps*
Saddled Moray	Muraenidae	Gymnothorax	*Gymnothorax conspersus*
Blacktail Moray	Muraenidae	Gymnothorax	*Gymnothorax kolpos*
Blackpored Eel	Ophichthidae	Ophichthus	*Ophichthus melanoporus*
Palespotted Eel	Ophichthidae	Ophichthus	*Ophichthus ocellatus*
Dottedline Snake Eel	Ophichthidae	Ophichthus	*Ophichthus omorgmus*
Southern Hake	Phycidae	Urophycis	*Urophycis floridana*
Spotted Hake	Phycidae	Urophycis	*Urophycis regia*
Little Tunny	Scombridae	Euthynnus	*Euthynnus alletteratus*
Blackfin Tuna	Scombridae	Thunnus	*Thunnus atlanticus*
Chain Dogfish	Scyliorhinidae	Scyliorhinus	*Scyliorhinus retifer*
Blackbelly Rosefish	Sebastidae	Helicolenus	*Helicolenus dactylopterus*
Yellowedge Grouper	Serranidae	Epinephelus	*Epinephelus flavolimbatus*
Snowy Grouper	Serranidae	Epinephelus	*Epinephelus niveatus*
Great Barracuda	Sphyraenidae	Sphyraena	*Sphyraena barracuda*
Scalloped Hammerhead	Sphyrnidae	Sphyrna	*Sphyrna lewini*
Great Hammerhead	Sphyrnidae	Sphyrna	*Sphyrna mokarran*
Roughskin Dogfish	Squalidae	Cirrhigaleus	*Cirrhigaleus asper*
Spiny Dogfish	Squalidae	Squalus	*Squalus acanthias*
Cuban Dogfish	Squalidae	Squalus	*Squalus cubensis*
Shortspine Dogfish	Squalidae	Squalus	*Squalus mitsukurii*

Table 16: Delta-GLM covariates (and bins used) used in the development of standardized long bottom longline CPUE indices. Only species for which delta-GLM standardized CPUE indices based on long bottom longline catches are included.

	Bin #	
Species	**1**	**2**
Depth (m)		
Golden Tilefish [a,b]	≤ 220	> 220
Bottom Temperature (°C)		
Golden Tilefish	≤ 12	> 12

a – Model selection AIC scores indicated that the covariate should not be included in the final Bernoulli component of the delta-GLM

b – Model selection AIC scores indicated that the covariate should not be included in the final positive component of the delta-GLM

Table 17: Annual and total exclusion of included long bottom longline monitoring station collections from delta-GLM analysis due to missing bottom temperature data. Red = ≥30% exclusion, Orange = ≥25% and <30%, Yellow = ≥20% and <25%, Light Green = ≥15% and <20%, Green = ≥10% and <15%, and Blue = ≥5% and <10%.

	Year															
Species	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Golden tilefish	64	42	25	18	22	7	78	100	100	100	100	17	-	11	0	0

Gray Triggerfish

Table 18: Chevron trap nominal CPUE and mean lengths for gray triggerfish. Included Collections = number of collections in selected depth range with a duration of 45-150 minutes and catch code of 0 (nothing caught in trap), 1 (catch with finfish, but not necessarily selected species), 2 (catch without finfish), and 8 (species catch sub-sampled, but expanded using total weight to approximate total n), Avg. Depth = average sampling depth (m) of all traps deployed within the species-specific depth range (irrespective of catching the species in question), n = number of individuals captured, Normalized = CPUE normalized to its mean value over the time series, and Nominal CPUE (#s) = mean number of individual fish*trap^{-1}*hr^{-1}. Length refers to the analysis length (in mm) for the given species, as given in Table 4.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	350	34	75	0.122	3.94	0.25	295	30.83
1991	298	35	394	0.893	1.73	1.85	247	11.24
1992	315	34	196	0.387	2.60	0.80	309	19.91
1993	410	35	298	0.443	2.32	0.92	280	14.63
1994	454	37	446	0.603	2.29	1.25	321	13.71
1995	523	32	668	0.798	3.04	1.65	326	11.38
1996	451	38	682	0.893	3.26	1.85	305	10.51
1997	438	39	714	0.963	2.54	2.00	318	10.74
1998	518	41	519	0.610	3.07	1.26	328	12.96
1999	253	34	168	0.404	3.03	0.84	311	21.65
2000	319	36	245	0.466	4.04	0.97	335	19.33
2001	248	38	195	0.511	2.03	1.06	313	20.25
2002	240	33	279	0.675	2.04	1.40	303	16.36
2003	218	40	53	0.147	2.99	0.31	338	42.16
2004	271	39	184	0.405	2.45	0.84	303	20.14
2005	325	37	331	0.588	2.70	1.22	352	17.46
2006	296	38	146	0.317	2.81	0.66	320	23.90
2007	325	38	304	0.605	3.22	1.25	331	17.10
2008	303	38	323	0.668	3.31	1.38	340	17.07
2009	402	36	257	0.388	3.30	0.80	324	18.21
2010	422	37	176	0.261	3.58	0.54	339	23.06
2011	657	40	311	0.299	4.27	0.62	346	17.40

Table 19: Chevron trap delta-GLM standardized CPUE for gray triggerfish and information associated with chevron trap sets included in standardized CPUE calculation. Calculations are based upon the species-specific depth range, as calculated in Table 3. Included collections = defined as in Table 6 plus the removal of any collections for which an included covariate in the final delta-GLM model is missing data, Positive = proportion of included collections positive for the species of interest, n = number of individuals captured, and Normalized = delta-GLM standardized CPUE (number of fish*trap-1*hr-1) normalized to its mean value over the time series. All covariates and bins are defined as in Table 8.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23 - 8/9	11.07%	34	0.063	0.22	0.25
1991	267	33.3	17 - 93	25.0	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11 - 9/24	45.32%	121	0.392	0.14	1.53
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31 - 8/13	28.82%	83	0.252	0.15	0.98
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	28.78%	118	0.220	0.14	0.86
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	37.72%	149	0.270	0.13	1.05
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	40.67%	146	0.403	0.13	1.57
1996	354	38.3	14 - 94	21.8	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29 - 9/16	35.88%	127	0.465	0.14	1.81
1997	389	39.0	15 - 93	22.6	16.8 - 28.0	31.99	27.87 - 34.59	7/8	4/21 - 9/29	38.82%	151	0.425	0.12	1.66
1998	454	41.6	14 - 92	20.7	9.5 - 28.6	32.11	27.44 - 34.59	6/26	3/31 - 8/18	24.67%	112	0.352	0.14	1.37
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2 - 9/28	24.46%	45	0.186	0.21	0.73
2000	254	36.6	15 - 92	24.1	18.0 - 28.5	32.17	28.95 - 34.28	7/19	5/16 - 10/19	26.38%	67	0.137	0.18	0.53
2001	229	38.7	14 - 91	23.4	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23 - 10/24	31.44%	72	0.226	0.16	0.88
2002	206	36.0	13 - 94	24.4	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17 - 9/24	37.86%	78	0.343	0.17	1.34
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3 - 9/22	13.21%	28	0.182	0.23	0.71
2004	271	39.1	14 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5 - 10/28	27.31%	74	0.330	0.15	1.29
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3 - 10/19	29.90%	87	0.307	0.15	1.20
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6 - 9/28	22.50%	63	0.163	0.17	0.64
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21 - 9/24	30.72%	98	0.250	0.15	0.97
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5 - 9/30	21.84%	64	0.220	0.18	0.86
2009	396	36.4	14 - 91	22.5	15.4 - 27.2	32.25	27.27 - 34.60	7/19	5/6 - 10/8	20.20%	80	0.182	0.16	0.71
2010	417	37.6	14 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/15	5/4 - 10/13	18.71%	78	0.148	0.17	0.58
2011	458	42.0	15 - 93	21.3	14.8 - 28.8	30.93	27.23 - 34.32	7/23	5/20 - 10/25	15.07%	69	0.123	0.16	0.48

Table 20: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for gray triggerfish and information associated with chevron trap sets included in standardized CPUE calculation. All covariates and bins are defined as in Table 8.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	11.07%	34	0.063	0.22	0.25
1991	267	33.3	17 - 93	25.0	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	45.32%	121	0.388	0.14	1.53
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	28.82%	83	0.249	0.15	0.98
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	28.78%	118	0.217	0.14	0.85
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	37.72%	149	0.266	0.13	1.05
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	40.67%	146	0.402	0.13	1.58
1996	354	38.3	14 - 94	21.8	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29	-	9/16	35.88%	127	0.461	0.14	1.82
1997	390	39.0	15 - 93	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	38.72%	151	0.420	0.12	1.65
1998	454	41.6	14 - 92	20.7	9.5 - 28.6	32.11	27.44 - 34.59	6/26	3/31	-	8/18	24.67%	112	0.351	0.14	1.38
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	24.46%	45	0.183	0.21	0.72
2000	254	36.6	15 - 92	24.1	18.0 - 28.5	32.17	28.95 - 34.28	7/19	5/16	-	10/19	26.38%	67	0.137	0.18	0.54
2001	229	38.7	14 - 91	23.4	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	31.44%	72	0.225	0.17	0.89
2002	206	36.0	13 - 94	24.4	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17	-	9/24	37.86%	78	0.346	0.17	1.36
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3	-	9/22	13.21%	28	0.183	0.23	0.72
2004	271	39.1	14 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	27.31%	74	0.329	0.15	1.30
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	29.90%	87	0.306	0.15	1.20
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	22.50%	63	0.161	0.18	0.64
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	30.72%	98	0.248	0.15	0.98
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5	-	9/30	21.84%	64	0.219	0.18	0.86
2009	396	36.4	14 - 91	22.5	15.4 - 27.2	32.25	27.27 - 34.60	7/19	5/6	-	10/8	20.20%	80	0.182	0.17	0.72
2010	416	37.6	14 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/15	5/4	-	10/13	18.51%	77	0.143	0.17	0.56
2011	256	40.6	15 - 93	21.8	15.0 - 28.8	31.80	27.23 - 34.32	7/24	5/20	-	10/25	14.06%	36	0.107	0.21	0.42

Almaco Jack

Table 21: Short bottom longline nominal CPUE and mean lengths for Almaco jack. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18 except that CPUE is measured in fish*20 $hooks^{-1}$*hr^{-1}.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	15	167	0	0.000	0.00	–	–	–
1997	33	193	0	0.000	0.00	–	–	–
1998	31	191	0	0.000	0.00	–	–	–
1999	39	115	0	0.000	0.00	–	–	–
2000	34	160	0	0.000	0.00	–	–	–
2001	29	158	3	0.074	0.97	4.16	837	44.1
2002	19	86	3	0.100	1.30	2.37	847	43.7
2003	54	161	3	0.033	0.44	5.48	777	33.8
2004	34	119	4	0.078	1.02	2.79	708	52.0
2005	55	102	0	0.000	0.00	–	–	–
2006	84	112	7	0.048	0.63	4.18	699	33.6
2007	55	99	46	0.521	6.80	2.40	841	11.3
2008	41	122	2	0.031	0.41	6.40	800	100.0
2009	40	96	7	0.111	1.45	2.54	726	49.8
2010	71	136	11	0.083	1.08	2.99	843	25.3
2011	84	141	21	0.146	1.90	3.01	728	19.4

Table 22: Short bottom longline delta-GLM standardized CPUE for Almaco jack and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 13 and Table 19 except that CPUE is measured in fish*20 hooks^{-1}*hr^{-1}.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996*	12	155.6	73-220	14.2	7.9-20.8	32.41	32.08-32.73	0.00	0	–	–	–
1997*	33	193.2	181-209	15.6	14.3-16.3	32.64	32.54-32.74	0.00	0	–	–	–
1998*	24	190.5	174-205	11.3	8.9-15.4	32.68	32.54-32.87	0.00	0	–	–	–
1999*	33	121.3	73-198	18.2	14.5-21.2	33.36	32.54-34.19	0.00	0	–	–	–
2000*	30	166.6	70-198	15.6	12.8-23.7	32.92	32.54-33.91	0.00	0	–	–	–
2001	19	162.1	88-200	15.0	11.2-18.5	33.16	32.54-34.24	10.53	2	0.096	0.81	1.56
2002	19	85.8	71-113	17.4	16.4-18.6	32.90	32.08-33.36	15.79	3	0.034	0.75	0.55
2003	54	161.3	88-210	12.8	10.8-17.2	32.73	32.25-33.21	3.70	2	0.026	0.79	0.42
2004*	21	131.6	72-215	15.5	11.6-18.4	32.15	32.08-32.26	0.00	0	–	–	–
2005*	55	102.5	46-208	18.3	13.6-28.0	32.78	30.04-33.85	0.00	0	–	–	–
2006	84	112.3	25-219	15.7	9.8-21.4	32.38	27.86-34.20	5.95	5	0.023	0.60	0.37
2007	49	88.0	45-201	20.2	12.5-24.1	33.13	30.04-33.86	28.57	14	0.169	0.55	2.74
2008*	41	122.1	45-198	19.4	15.1-25.8	32.46	32.07-32.74	2.44	1	–	–	–
2009	40	90.9	48-200	18.6	12.9-24.5	32.64	31.24-34.16	17.78	8	0.054	0.56	0.88
2010	65	130.6	45-205	14.5	10.2-18.9	32.68	30.43-33.83	13.85	9	0.052	0.57	0.84
2011	39	116.6	45-227	14.8	8.6-19.9	32.94	32.07-34.19	10.26	4	0.039	0.66	0.64

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for Almaco jack

Greater Amberjack

Table 23: Short bottom longline nominal CPUE and mean lengths for greater amberjack. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

				Nominal CPUE (#s)			Length	
Year	Included Collections	Avg. Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	15	167	0	0.000	0.00	–	–	–
1997	33	193	0	0.000	0.00	–	–	–
1998	31	191	0	0.000	0.00	–	–	–
1999	39	115	9	0.147	2.01	3.23	757	56.2
2000	34	160	9	0.131	1.79	4.01	816	31.6
2001	29	158	5	0.086	1.18	3.18	1020	51.7
2002	19	86	2	0.056	0.76	3.04	975	235.0
2003	54	161	2	0.019	0.26	5.20	700	20.0
2004	34	119	3	0.056	0.77	4.26	920	36.1
2005	55	102	28	0.299	4.09	2.64	774	22.1
2006	84	112	5	0.038	0.52	5.41	802	97.5
2007	55	99	13	0.143	1.96	3.15	914	30.2
2008	41	122	0	0.000	0.00	–	–	–
2009	40	96	11	0.172	2.35	2.21	946	84.2
2010	71	136	1	0.008	0.11	8.43	550	–
2011	84	141	2	0.014	0.20	6.44	835	35.0

Table 24: Short bottom longline delta-GLM standardized CPUE for greater amberjack and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

		Depth (m)		Temperature (°C)		Delta-GLM Standardized CPUE				
Year	Included Collections	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996*	12	155.6	73-220	14.2	7.9-20.8	0.00	0	–	–	–
1997*	33	193.2	181-209	15.6	14.3-16.3	0.00	0	–	–	–
1998*	24	190.5	174-205	11.3	8.9-15.4	0.00	0	–	–	–
1999	33	121.3	73-198	18.2	14.5-21.2	12.12	4	0.120	0.69	1.26
2000	30	166.6	70-198	15.6	12.8-23.7	13.33	4	0.144	0.58	1.51
2001*	19	162.1	88-200	15.0	11.2-18.5	0.00	0	–	–	–
2002	19	85.8	71-113	17.4	16.4-18.6	10.53	2	0.037	0.80	0.38
2003	54	161.3	88-210	12.8	10.8-17.2	3.70	2	0.028	0.78	0.29
2004*	21	131.6	72-215	15.5	11.6-18.4	0.00	0	–	–	–
2005	55	102.5	46-208	18.3	13.6-28.0	18.18	10	0.192	0.43	2.01
2006	84	112.3	25-219	15.7	9.8-21.4	3.57	3	0.031	0.64	0.33
2007	49	88.0	45-201	20.2	12.5-24.1	14.29	7	0.095	0.54	0.99
2008*	41	122.1	45-198	19.4	15.1-25.8	0.00	0	–	–	–
2009	40	90.9	18-200	18.6	12.9-24.5	20.00	9	0.118	0.45	1.23
2010*	65	130.6	45-205	14.5	10.2-18.9	1.54	1	–	–	–
2011*	39	116.6	45-227	14.8	8.6-19.9	2.56	1	–	–	–

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for greater amberjack

Tomtate

Table 25: Chevron trap nominal CPUE and mean lengths for tomtate. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	345	33	6099	10.335	1.93	1.30	184	2.12
1991	296	34	8059	17.848	1.61	2.24	180	1.80
1992	315	34	4829	9.366	1.86	1.17	177	2.30
1993	406	35	5510	8.373	1.98	1.05	179	2.17
1994	446	36	6881	9.324	2.24	1.17	181	1.97
1995	523	32	4402	5.194	2.43	0.65	172	2.34
1996	436	37	4429	6.167	2.51	0.77	174	2.35
1997	417	37	4440	6.427	2.21	0.81	184	2.48
1998	492	39	4941	6.161	2.29	0.77	178	2.29
1999	249	34	4054	10.300	2.33	1.29	177	2.50
2000	308	34	5048	10.110	2.14	1.27	178	2.26
2001	242	37	4452	11.828	1.87	1.48	185	2.49
2002	236	33	3881	9.960	1.90	1.25	186	2.69
2003	212	39	894	2.471	2.59	0.31	188	5.66
2004	257	37	2313	5.257	3.22	0.66	179	3.35
2005	325	37	1930	3.525	3.46	0.44	187	3.83
2006	290	37	1129	2.536	3.09	0.32	190	5.10
2007	316	37	2561	5.195	2.69	0.65	184	3.27
2008	296	37	2656	5.625	2.39	0.71	183	3.20
2009	395	35	2504	3.944	2.66	0.49	181	3.26
2010	414	36	1758	2.705	3.12	0.34	185	3.98
2011	627	38	3723	3.742	3.08	0.47	186	2.75

Table 26: Chevron trap delta-GLM standardized CPUE for tomtate and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	48.34%	146	4.823	0.18	1.31
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	60.38%	160	7.041	0.17	1.91
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	57.99%	167	5.446	0.16	1.48
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	51.97%	211	4.989	0.16	1.35
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	56.33%	218	5.034	0.15	1.37
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	51.53%	185	3.088	0.16	0.84
1996	345	36.9	14 - 62	21.9	14.2 - 27.0	32.19	27.92 - 34.32	7/6	4/29	-	9/16	53.62%	185	3.869	0.16	1.05
1997	368	36.7	15 - 67	22.8	18.8 - 28.0	32.04	27.87 - 34.59	7/7	4/21	-	9/29	39.95%	147	2.899	0.17	0.79
1998	428	39.4	14 - 69	20.9	9.5 - 28.6	32.10	27.44 - 34.59	6/25	3/31	-	8/18	42.06%	180	4.223	0.14	1.15
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	55.00%	99	5.965	0.19	1.62
2000	246	35.2	15 - 60	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16	-	10/19	53.25%	131	4.314	0.18	1.17
2001	223	37.3	14 - 67	23.6	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	53.36%	119	6.518	0.17	1.77
2002	202	35.0	13 - 69	24.5	15.2 - 28.3	32.04	27.86 - 33.94	7/27	6/17	-	9/24	56.93%	115	5.413	0.18	1.47
2003	206	38.0	16 - 61	18.9	13.4 - 25.1	32.04	27.43 - 34.33	7/21	6/3	-	9/22	36.41%	75	2.770	0.21	0.75
2004	257	36.9	14 - 69	21.3	16.8 - 25.8	32.32	29.99 - 33.97	6/25	5/5	-	10/28	34.24%	88	2.426	0.20	0.66
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	34.71%	101	1.849	0.18	0.50
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	29.20%	80	0.931	0.21	0.25
2007	310	36.9	15 - 69	23.4	15.3 - 28.9	32.16	27.33 - 34.33	7/19	5/21	-	9/24	36.45%	113	1.931	0.19	0.52
2008	286	36.8	15 - 66	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5	-	9/29	37.41%	107	2.136	0.19	0.58
2009	389	35.5	14 - 69	22.6	15.4 - 27.2	32.25	27.27 - 34.60	7/18	5/6	-	10/8	31.36%	122	1.848	0.19	0.50
2010	409	36.7	14 - 69	21.2	12.4 - 29.4	32.20	27.34 - 34.59	7/14	5/4	-	10/13	35.21%	144	1.401	0.16	0.38
2011	436	40.2	15 - 69	21.3	14.8 - 28.8	30.88	27.23 - 34.32	7/24	5/20	-	10/25	35.55%	155	2.176	0.15	0.59

White Grunt

Table 27: Chevron trap nominal CPUE and mean lengths for white grunt. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	344	33	438	0.740	5.16	1.73	254	10.96
1991	296	34	454	0.953	4.62	2.23	268	11.34
1992	313	34	542	1.075	3.54	2.51	258	9.97
1993	405	35	424	0.671	5.25	1.57	256	11.23
1994	445	36	293	0.393	6.04	0.92	275	14.47
1995	522	32	216	0.256	5.68	0.60	252	15.46
1996	431	37	252	0.354	3.88	0.83	270	15.34
1997	411	37	147	0.216	4.92	0.51	294	21.93
1998	448	37	369	0.505	3.93	1.18	276	12.95
1999	249	34	101	0.248	4.49	0.58	280	25.19
2000	307	34	309	0.583	4.83	1.36	246	12.64
2001	230	36	199	0.524	4.50	1.22	284	18.18
2002	231	32	296	0.810	3.18	1.89	252	13.19
2003	209	38	89	0.251	3.65	0.59	253	24.29
2004	245	36	391	1.032	4.29	2.41	237	10.81
2005	305	35	136	0.270	3.45	0.63	287	22.26
2006	274	35	104	0.239	3.85	0.56	275	24.38
2007	300	35	121	0.256	4.84	0.60	301	24.71
2008	290	36	102	0.218	5.07	0.51	293	26.28
2009	370	33	153	0.268	5.42	0.63	277	20.20
2010	391	35	64	0.102	5.74	0.24	301	34.14
2011	608	38	106	0.109	6.38	0.26	297	30.27

Table 28: Chevron trap delta-GLM standardized CPUE for white grunt and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Positive	n	CPUE	CV	Normalized
1990	301	32.7	17 - 59	22.0	18.4 - 27.8	32.53	30.42 - 33.82	5/26	4/23 - 8/9	12.62%	38	0.139	0.28	1.47
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11 - 9/24	21.13%	56	0.103	0.29	1.08
1992	286	33.8	17 - 59	21.3	15.3 - 24.5	32.78	30.42 - 34.32	6/2	3/31 - 8/13	28.67%	82	0.210	0.24	2.22
1993	405	34.6	16 - 58	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	14.57%	59	0.164	0.27	1.73
1994	386	38.0	16 - 59	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	11.14%	43	0.086	0.27	0.91
1995	358	34.0	16 - 59	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	13.69%	49	0.139	0.27	1.47
1996	341	36.8	15 - 59	21.9	14.2 - 27.0	32.21	27.92 - 34.32	7/7	4/29 - 9/16	19.35%	66	0.161	0.22	1.70
1997	364	36.4	15 - 58	22.9	18.8 - 28.0	32.06	27.87 - 34.59	7/7	4/21 - 9/29	13.46%	49	0.081	0.26	0.86
1998	390	37.7	15 - 59	21.1	9.5 - 28.6	32.08	27.44 - 34.59	6/23	3/31 - 8/18	17.18%	67	0.094	0.26	0.99
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2 - 9/28	12.78%	23	0.068	0.35	0.71
2000	245	35.1	15 - 57	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16 - 10/19	11.02%	27	0.055	0.32	0.59
2001	212	36.3	15 - 57	23.7	16.0 - 29.2	32.34	27.87 - 34.28	7/24	5/23 - 10/24	16.51%	35	0.082	0.30	0.87
2002	197	34.7	15 - 58	24.5	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17 - 9/24	21.32%	42	0.184	0.27	1.95
2003	204	37.8	16 - 55	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/21	6/3 - 9/22	15.20%	31	0.081	0.29	0.86
2004	245	35.7	15 - 58	21.5	17.1 - 25.8	32.36	29.99 - 33.97	6/26	5/5 - 10/28	15.10%	37	0.145	0.28	1.53
2005	273	35.1	15 - 58	23.0	18.0 - 28.5	32.12	27.33 - 34.32	7/11	5/3 - 10/19	14.29%	39	0.082	0.26	0.87
2006	258	35.5	15 - 59	22.8	15.0 - 26.7	32.24	27.27 - 34.39	7/21	6/6 - 9/28	12.79%	33	0.040	0.28	0.42
2007	294	35.3	15 - 59	23.4	15.3 - 28.9	32.19	27.33 - 34.33	7/21	5/21 - 9/24	10.54%	31	0.036	0.29	0.38
2008	280	36.2	15 - 58	21.8	15.2 - 27.2	32.14	27.27 - 34.59	7/8	5/5 - 9/29	9.29%	26	0.029	0.30	0.31
2009	364	33.6	15 - 57	22.8	17.1 - 27.2	32.29	27.27 - 34.60	7/18	5/6 - 10/8	10.99%	40	0.028	0.29	0.29
2010	386	35.2	15 - 59	21.4	12.4 - 29.4	32.25	27.34 - 34.59	7/16	5/4 - 10/13	5.44%	21	0.024	0.31	0.26
2011	424	39.4	15 - 59	21.3	14.8 - 28.8	30.88	27.23 - 34.32	7/24	5/20 - 10/25	6.60%	28	0.049	0.32	0.51

Table 29: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for white grunt and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	301	32.7	17 - 59	22.0	18.4 - 27.8	32.53	30.42 - 33.82	5/26	4/23	-	8/9	12.62%	38	0.135	0.29	1.47
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	21.13%	56	0.101	0.29	1.09
1992	286	33.8	17 - 59	21.3	15.3 - 24.5	32.78	30.42 - 34.32	6/2	3/31	-	8/13	28.67%	82	0.204	0.25	2.21
1993	405	34.6	16 - 58	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	14.57%	59	0.159	0.28	1.73
1994	386	38.0	16 - 59	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	11.14%	43	0.084	0.28	0.92
1995	358	34.0	16 - 59	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	13.69%	49	0.136	0.28	1.48
1996	341	36.8	15 - 59	21.9	14.2 - 27.0	32.21	27.92 - 34.32	7/7	4/29	-	9/16	19.35%	66	0.157	0.23	1.71
1997	365	36.4	15 - 58	22.9	18.8 - 28.0	32.06	27.87 - 34.59	7/7	4/21	-	9/29	13.42%	49	0.079	0.27	0.86
1998	390	37.7	15 - 59	21.1	9.5 - 28.6	32.08	27.44 - 34.59	6/23	3/31	-	8/18	17.18%	67	0.092	0.27	1.00
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	12.78%	23	0.066	0.36	0.72
2000	245	35.1	15 - 57	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16	-	10/19	11.02%	27	0.054	0.33	0.59
2001	212	36.3	15 - 57	23.7	16.0 - 29.2	32.34	27.87 - 34.28	7/24	5/23	-	10/24	16.51%	35	0.080	0.30	0.87
2002	197	34.7	15 - 58	24.5	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17	-	9/24	21.32%	42	0.182	0.28	1.98
2003	204	37.8	16 - 55	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/21	6/3	-	9/22	15.20%	31	0.079	0.30	0.86
2004	245	35.7	15 - 58	21.5	17.1 - 25.8	32.36	29.99 - 33.97	6/26	5/5	-	10/28	15.10%	37	0.141	0.29	1.53
2005	273	35.1	15 - 58	23.0	18.0 - 28.5	32.12	27.33 - 34.32	7/11	5/3	-	10/19	14.29%	39	0.080	0.27	0.87
2006	258	35.5	15 - 59	22.8	15.0 - 26.7	32.24	27.27 - 34.39	7/21	6/6	-	9/28	12.79%	33	0.039	0.29	0.43
2007	294	35.3	15 - 59	23.4	15.3 - 28.9	32.19	27.33 - 34.33	7/21	5/21	-	9/24	10.54%	31	0.035	0.30	0.38
2008	280	36.2	15 - 58	21.8	15.2 - 27.2	32.14	27.27 - 34.59	7/8	5/5	-	9/29	9.29%	26	0.029	0.31	0.31
2009	364	33.6	15 - 57	22.8	17.1 - 27.2	32.29	27.27 - 34.60	7/18	5/6	-	10/8	10.99%	40	0.027	0.30	0.29
2010	385	35.2	15 - 59	21.4	12.4 - 29.4	32.24	27.34 - 34.59	7/16	5/4	-	10/13	5.19%	20	0.023	0.32	0.25
2011	229	36.5	15 - 59	22.0	15.0 - 28.8	31.80	27.23 - 34.32	7/25	5/20	-	10/25	10.92%	25	0.042	0.35	0.45

Red Snapper

Table 30: Chevron trap nominal CPUE and mean lengths for red snapper. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	345	33	24	0.045	12.22	1.00	381	71.47
1991	296	34	17	0.052	9.98	1.15	252	56.78
1992	315	34	21	0.043	7.17	0.96	422	84.94
1993	406	35	31	0.049	7.61	1.10	457	75.07
1994	446	36	45	0.064	9.38	1.43	475	64.48
1995	523	32	13	0.014	9.52	0.32	512	132.92
1996	439	37	5	0.007	9.36	0.15	558	251.13
1997	428	38	24	0.035	12.02	0.78	323	60.73
1998	500	40	25	0.029	12.95	0.64	404	74.32
1999	252	34	22	0.052	9.01	1.15	310	60.98
2000	312	35	17	0.032	7.23	0.71	416	93.58
2001	239	37	9	0.025	6.12	0.55	420	133.66
2002	234	33	22	0.063	7.15	1.40	313	61.46
2003	212	39	7	0.017	14.56	0.38	220	80.84
2004	261	38	4	0.009	9.88	0.20	493	256.04
2005	325	37	12	0.022	7.68	0.50	530	143.85
2006	290	37	5	0.011	9.12	0.25	292	117.46
2007	319	37	28	0.056	12.75	1.24	375	64.95
2008	297	37	19	0.040	8.73	0.90	391	82.98
2009	395	35	10	0.016	7.40	0.35	494	148.26
2010	414	37	17	0.025	6.27	0.55	548	123.28
2011	641	39	88	0.086	4.43	1.93	511	49.00

Table 31: Chevron trap delta-GLM standardized CPUE for red snapper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23 - 8/9	2.32%	7	0.017	0.53	0.65
1991	265		17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11 - 9/24	2.26%	6	0.049	0.53	1.84
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31 - 8/13	2.78%	8	0.039	0.48	1.48
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	2.96%	12	0.032	0.40	1.19
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	4.91%	19	0.028	0.37	1.06
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	1.95%	7	0.014	0.49	0.55
1996	344	37.0	15 - 62	21.9	14.2 – 27.0	32.19	27.92 - 34.32	7/7	4/29 - 9/16	1.45%	5	0.006	0.51	0.24
1997	379	37.7	15 - 74	22.7	17.8 – 28.0	31.99	27.87 - 34.59	7/8	4/21 - 9/29	1.58%	6	0.016	0.57	0.61
1998	436	40.6	15 - 74	20.7	9.5 - 28.6	32.07	27.44 - 34.59	6/26	3/31 - 8/18	1.83%	8	0.014	0.51	0.52
1999	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2000	250	35.8	15 - 73	24.2	18.0 - 28.5	32.14	28.95 - 34.28	7/19	5/16 - 10/19	3.20%	8	0.040	0.44	1.50
2001	221	37.5	15 - 67	23.5	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23 - 10/24	3.17%	7	0.033	0.45	1.24
2002	200	35.2	15 - 69	24.5	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17 - 9/24	5.00%	10	0.056	0.41	2.13
2003	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2004	261	37.6	15 - 74	21.2	16.8 - 25.8	32.32	29.99 - 33.97	6/24	5/5 - 10/28	1.15%	3	0.011	0.64	0.40
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3 - 10/19	1.72%	5	0.013	0.49	0.50
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6 - 9/28	1.46%	4	0.010	0.57	0.37
2007	313	37.2	15 - 73	23.3	15.3 - 28.9	32.15	27.33 - 34.33	7/19	5/21 - 9/24	2.24%	7	0.035	0.51	1.33
2008	287	36.9	15 - 70	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5 - 9/29	2.44%	7	0.025	0.51	0.94
2009	389	35.7	15 - 70	22.6	15.4 - 27.2	32.24	27.27 - 34.60	7/18	5/6 - 10/8	2.06%	8	0.017	0.40	0.64
2010	409	36.9	15 - 71	21.1	12.4 - 29.4	32.21	27.34 - 34.59	7/13	5/4 - 10/13	3.18%	13	0.032	0.38	1.23
2011	449	41.1	15 - 73	21.3	14.8 - 28.8	30.90	27.23 - 34.32	7/24	5/20 - 10/25	9.35%	42	0.042	0.26	1.57

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for red snapper

Table 32: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for red snapper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^oC)		Latitude (^oN)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	2.32%	7	0.014	0.56	0.73
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	2.26%	6	0.031	0.55	1.61
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	2.78%	8	0.035	0.57	1.80
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	2.96%	12	0.024	0.44	1.25
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	4.91%	19	0.022	0.41	1.11
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	1.95%	7	0.011	0.51	0.56
1996	344	37.0	15 - 62	21.9	14.2 - 27.0	32.19	27.92 - 34.32	7/7	4/29	-	9/16	1.45%	5	0.006	0.54	0.29
1997	380	37.7	15 - 74	22.7	17.8 - 28.0	31.99	27.87 - 34.59	7/8	4/21	-	9/29	1.58%	6	0.012	0.58	0.59
1998	436	40.6	15 - 74	20.7	9.5 - 28.6	32.07	27.44 - 34.59	6/26	3/31	-	8/18	1.83%	8	0.012	0.54	0.60
1999*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2000	250	35.8	15 - 73	24.2	18.0 - 28.5	32.14	28.95 - 34.28	7/19	5/16	-	10/19	3.20%	8	0.030	0.47	1.53
2001	221	37.5	15 - 67	23.5	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23	-	10/24	3.17%	7	0.022	0.48	1.11
2002	200	35.2	15 - 69	24.5	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17	-	9/24	5.00%	10	0.045	0.44	2.30
2003*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2004	261	37.6	15 - 74	21.2	16.8 - 25.8	32.32	29.99 - 33.97	6/24	5/5	-	10/28	1.15%	3	0.009	0.67	0.48
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	1.72%	5	0.012	0.50	0.60
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	1.46%	4	0.007	0.59	0.35
2007	313	37.2	15 - 73	23.3	15.3 - 28.9	32.15	27.33 - 34.33	7/19	5/21	-	9/24	2.24%	7	0.025	0.53	1.27
2008	287	36.9	15 - 70	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5	-	9/29	2.44%	7	0.023	0.53	1.19
2009	389	35.7	15 - 70	22.6	15.4 - 27.2	32.24	27.27 - 34.60	7/18	5/6	-	10/8	2.06%	8	0.014	0.42	0.73
2010	408	37.0	15 - 71	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/13	5/4	-	10/13	2.94%	12	0.022	0.39	1.12
2011	247	38.9	15 - 73	21.9	15.0 - 28.8	31.78	27.23 - 34.32	7/26	5/20	-	10/25	3.24%	8	0.016	0.44	0.80

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for red snapper

Vermilion Snapper

Table 33: Chevron trap nominal CPUE and mean lengths for vermilion snapper. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	350	34	811	1.376	3.26	0.44	215	6.80
1991	299	35	3063	6.967	2.11	2.22	210	3.42
1992	315	34	1514	3.027	3.53	0.96	212	4.90
1993	410	35	1326	1.985	2.39	0.63	212	5.25
1994	454	37	3350	4.421	2.39	1.41	221	3.43
1995	523	32	1786	2.058	2.97	0.66	216	4.60
1996	454	39	2081	2.811	4.99	0.90	232	4.57
1997	440	39	1456	1.993	4.33	0.63	235	5.54
1998	518	41	1249	1.452	3.97	0.46	244	6.22
1999	253	34	697	1.678	3.00	0.53	236	8.05
2000	323	37	1589	3.062	2.97	0.98	264	5.97
2001	248	38	1323	3.407	2.89	1.09	263	6.50
2002	240	33	1290	3.263	2.44	1.04	245	6.13
2003	218	40	152	0.414	4.05	0.13	257	18.82
2004	271	39	332	0.743	3.12	0.24	251	12.43
2005	325	37	745	1.370	3.58	0.44	262	8.63
2006	296	38	332	0.735	4.04	0.23	259	12.80
2007	325	38	1207	2.412	3.42	0.77	265	6.86
2008	303	38	1046	2.173	3.09	0.69	259	7.20
2009	402	36	1489	2.335	3.59	0.74	253	5.91
2010	422	37	685	1.032	4.61	0.33	275	9.45
2011	657	40	1279	1.200	4.51	0.38	275	6.97

Table 34: Chevron trap delta-GLM standardized CPUE for vermilion snapper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date				Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**			**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	26.38%	81	0.528	0.20	0.51
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	51.12%	137	3.133	0.17	3.05
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	36.46%	105	1.115	0.19	1.09
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	31.22%	128	1.089	0.16	1.06
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	44.05%	174	2.096	0.16	2.04
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	37.33%	134	1.342	0.17	1.31
1996	357	38.8	14 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/4	4/29	-	9/16	31.09%	111	0.881	0.19	0.86
1997	391	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	21.99%	86	0.524	0.20	0.51
1998	454	41.6	14 - 92	20.7	9.5 - 28.6	32.11	27.44 - 34.59	6/26	3/31	-	8/18	22.91%	104	0.539	0.17	0.53
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	33.15%	61	1.050	0.22	1.02
2000	256	37.1	15 - 103	24.0	18.0 - 28.5	32.18	28.95 - 34.28	7/19	5/16	-	10/19	35.16%	90	1.431	0.21	1.39
2001	229	38.7	14 - 91	23.4	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	35.81%	82	1.431	0.19	1.39
2002	206	36.0	13 - 94	24.4	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17	-	9/24	37.86%	78	1.660	0.20	1.62
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3	-	9/22	13.68%	29	0.507	0.26	0.49
2004	271	39.1	14 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	21.77%	59	0.587	0.20	0.57
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	25.77%	75	0.666	0.20	0.65
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	17.50%	49	0.347	0.23	0.34
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	24.76%	79	0.960	0.20	0.94
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5	-	9/30	24.57%	72	0.904	0.21	0.88
2009	396	36.4	14 - 91	22.5	15.4 - 27.2	32.25	27.27 - 34.60	7/19	5/6	-	10/8	24.49%	97	0.973	0.19	0.95
2010	417	37.6	14 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/15	5/4	-	10/13	18.94%	79	0.423	0.20	0.41
2011	458	42.0	15 - 93	21.3	14.8 - 28.8	30.93	27.23 - 34.32	7/23	5/20	-	10/25	17.69%	81	0.383	0.21	0.37

Table 35: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for vermilion snapper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	26.38%	81	0.521	0.20	0.51
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	51.12%	137	3.122	0.17	3.07
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	36.46%	105	1.093	0.19	1.08
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	31.22%	128	1.062	0.16	1.04
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	44.05%	174	2.065	0.16	2.03
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	37.33%	134	1.335	0.17	1.31
1996	357	38.8	14 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/4	4/29	-	9/16	31.09%	111	0.870	0.19	0.86
1997	392	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	21.94%	86	0.516	0.20	0.51
1998	454	41.6	14 - 92	20.7	9.5 - 28.6	32.11	27.44 - 34.59	6/26	3/31	-	8/18	22.91%	104	0.536	0.17	0.53
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	33.15%	61	1.040	0.22	1.02
2000	256	37.1	15 - 103	24.0	18.0 - 28.5	32.18	28.95 - 34.28	7/19	5/16	-	10/19	35.16%	90	1.421	0.21	1.40
2001	229	38.7	14 - 91	23.4	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	35.81%	82	1.423	0.19	1.40
2002	206	36.0	13 - 94	24.4	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17	-	9/24	37.86%	78	1.666	0.20	1.64
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3	-	9/22	13.68%	29	0.501	0.27	0.49
2004	271	39.1	14 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	21.77%	59	0.575	0.20	0.57
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	25.77%	75	0.662	0.20	0.65
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	17.50%	49	0.345	0.23	0.34
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	24.76%	79	0.952	0.20	0.94
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5	-	9/30	24.57%	72	0.889	0.22	0.87
2009	396	36.4	14 - 91	22.5	15.4 - 27.2	32.25	27.27 - 34.60	7/19	5/6	-	10/8	24.49%	97	0.964	0.19	0.95
2010	416	37.6	14 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/15	5/4	-	10/13	18.99%	79	0.420	0.20	0.41
2011	256	40.6	15 - 93	21.8	15.0 - 28.8	31.80	27.23 - 34.32	7/24	5/20	-	10/25	16.02%	41	0.389	0.30	0.38

Blueline Tilefish

Table 36: Short bottom longline nominal CPUE and mean lengths for blueline tilefish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	13	159	0	0.000	0.00	–	–	–
1997	33	193	12	0.212	4.10	1.82	547	17.4
1998	31	191	1	0.018	0.35	5.57	430	–
1999	39	115	1	0.013	0.26	6.24	550	–
2000	34	160	8	0.124	2.40	2.11	540	16.0
2001	29	158	4	0.071	1.37	3.20	570	16.0
2002	19	86	0	0.000	0.00	–	–	–
2003	54	161	9	0.082	1.59	3.22	560	17.0
2004	33	116	0	0.000	0.00	–	–	–
2005	55	102	5	0.050	0.97	3.91	530	24.0
2006	80	114	4	0.029	0.56	5.61	533	25.3
2007	55	99	0	0.000	0.00	–	–	–
2008	41	122	4	0.059	1.14	3.80	553	19.3
2009	40	96	2	0.031	0.60	4.42	645	65.0
2010	71	136	7	0.053	1.02	3.07	613	26.3
2011	83	140	12	0.085	1.65	3.95	579	14.7

Table 37: Short bottom longline delta-GLM standardized CPUE for blueline tilefish and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

		Depth (m)		Temperature (°C)		Delta-GLM Standardized CPUE				
Year	**Included Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**% Positive**	**n**	**CPUE**	**CV**	**Normalized**
1996*	11	149.7	73-214	14.4	7.9-20.8	0.00	0	–	–	–
1997	33	193.2	181-209	15.6	14.3-16.3	27.27	9	0.098	0.42	1.68
1998*	24	190.5	174-205	11.3	8.9-15.4	4.17	1	–	–	–
1999*	33	121.3	73-198	18.2	14.5-21.2	3.03	1	–	–	–
2000	30	166.6	70-198	15.6	12.8-23.7	20.00	6	0.070	0.46	1.20
2001*	19	162.1	88-200	15.0	11.2-18.5	5.26	1	–	–	–
2002*	19	85.8	71-113	17.4	16.4-18.6	0.00	0	–	–	–
2003	54	161.3	88-210	12.8	10.8-17.2	11.11	6	0.047	0.49	0.81
2004*	20	127.5	72-208	15.7	11.6-18.4	0.00	0	–	–	–
2005	55	102.5	46-208	18.3	13.6-28.0	7.27	4	0.063	0.50	1.08
2006	80	114.2	46-209	15.6	9.8-21.4	3.75	3	0.024	0.63	0.42
2007*	49	88.0	45-201	20.2	12.5-24.1	0.00	0	–	–	–
2008	41	122.1	45-198	19.4	15.1-25.8	7.32	3	0.043	0.60	0.74
2009	40	90.9	48-200	18.6	12.9-24.5	4.44	2	0.044	0.71	0.76
2010	65	130.6	45-205	14.5	10.2-18.9	9.23	6	0.045	0.48	0.78
2011	38	113.7	45-199	15.0	8.6-19.9	7.89	3	0.090	0.64	1.54

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for blueline tilefish

Golden Tilefish

Table 38: Short bottom longline nominal CPUE and mean lengths for golden tilefish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	10	208	2	0.126	0.69	2.13	625	33.9
1997	33	193	6	0.099	0.54	2.48	655	58.4
1998	31	191	5	0.098	0.53	2.84	636	39.7
1999	10	188	5	0.271	1.48	2.57	696	32.3
2000	23	188	8	0.181	0.99	1.88	600	34.9
2001	19	194	17	0.453	2.46	1.41	692	36.7
2002	0	–	–	–	–	–	–	–
2003	36	192	6	0.086	0.47	2.64	650	30.7
2004	9	197	0	0.000	0.00	–	–	–
2005	6	199	1	0.083	0.45	2.45	696	–
2006	31	193	18	0.345	1.88	1.60	721	36.4
2007	8	188	0	0.000	0.00	–	–	–
2008	20	188	1	0.027	0.15	4.47	790	–
2009	6	197	9	0.749	4.08	0.60	767	41.5
2010	34	191	8	0.141	0.77	2.42	646	46.6
2011	46	191	8	0.096	0.52	2.23	744	29.5

Table 39: Short bottom longline delta-GLM standardized CPUE for golden tilefish and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

		Depth (m)		Delta-GLM Standardized CPUE				
Year	Included Collections	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996	10	208.1	194-220	20.00	2	0.077	0.77	0.25
1997	33	193.2	181-209	15.15	5	0.133	0.43	0.43
1998	31	191.2	174-212	12.90	4	0.127	0.52	0.41
1999	10	188.4	176-198	20.00	2	0.406	0.81	1.30
2000	23	187.9	181-198	26.09	6	0.310	0.36	0.99
2001	19	194.1	179-212	36.84	7	0.611	0.29	1.96
2002*	0	–	–	–	–	–	–	–
2003	36	192.2	177-210	13.89	5	0.121	0.45	0.39
2004*	9	197.1	178-215	0.00	0	–	–	–
2005*	6	199.0	181-208	16.67	1	–	–	–
2006	31	192.9	179-219	35.48	11	0.405	0.29	1.30
2007*	8	187.5	176-201	0.00	0	–	–	–
2008*	20	187.9	177-198	5.00	1	–	–	–
2009	6	197.2	192-200	83.33	5	0.902	0.23	2.89
2010	34	190.9	177-211	17.65	6	0.209	0.41	0.67
2011	46	190.5	170-227	17.39	8	0.137	0.31	0.44

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for golden tilefish

Table 40: Long bottom longline nominal CPUE and mean lengths for golden tilefish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18 except that CPUE is measured in fish*100 hooks^{-1}*hr^{-1}.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**Normalized**	**CV**	**Avg.**	**SE**
1996	14	201	30	1.103	0.68	2.89	463	13.3
1997	19	208	98	3.185	1.96	1.45	535	10.0
1998	8	198	25	2.155	1.33	1.36	512	13.0
1999	28	210	153	3.172	1.95	1.32	537	7.3
2000	9	205	19	1.163	0.72	1.43	509	21.9
2001	14	207	48	2.048	1.26	1.33	573	13.6
2002	18	223	18	0.604	0.37	1.65	618	46.5
2003	12	220	5	0.288	0.18	2.03	604	42.6
2004	5	194	0	0.000	0.00	–	–	–
2005	16	212	41	1.411	0.87	1.46	585	21.6
2006	7	201	5	0.450	0.28	2.12	580	66.3
2007	24	213	34	0.849	0.52	2.04	669	18.7
2008	0	–	–	–	–	–	–	–
2009	36	216	208	3.724	2.29	1.46	729	83.2
2010	40	228	131	2.048	1.26	1.27	724	96.2
2011	27	234	125	2.194	1.35	1.32	774	10.0

Table 41: Long bottom longline delta-GLM standardized CPUE for golden tilefish and information associated with long bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 16 and Table 19 except that CPUE is measured in fish*100 hooks^{-1}*hr^{-1}.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**% Positive**	**n**	**CPUE**	**CV**	**Normalized**
1996*	5	196.4	178-221	11.0	9.0-14.6	32.32	32.05-32.56	0.00	0	–	–	–
1997	11	207.6	185-227	13.1	11.6-14.8	31.99	31.84-32.16	54.55	6	4.806	0.44	1.70
1998	6	203.2	179-234	13.8	11.0-14.9	32.12	31.91-32.50	66.67	4	2.861	0.55	1.01
1999	23	209.8	181-258	9.7	8.2-14.2	31.96	31.94-32.51	65.22	15	4.842	0.29	1.71
2000	7	204.3	177-228	14.5	12.5-15.8	31.92	31.85-32.02	57.14	4	1.191	0.48	0.42
2001	13	208.1	181-234	11.2	9.1-12.6	31.87	31.21-32.03	61.54	8	2.572	0.39	0.91
2002	4	202.0	184-232	11.4	10.4-12.4	32.15	32.08-32.21	25.00	1	–	–	–
2003*	0	–	–	–	–	–	–	–	–	–	–	–
2004*	0	–	–	–	–	–	–	–	–	–	–	–
2005*	0	–	–	–	–	–	–	–	–	–	–	–
2006*	0	–	–	–	–	–	–	–	–	–	–	–
2007	20	214.6	180-240	11.6	8.3-15.3	31.98	31.24-32.21	25.00	5	0.737	0.48	0.26
2008*	0	–	–	–	–	–	–	–	–	–	–	–
2009	32	216.9	179-244	13.0	8.4-16.8	31.88	31.42-32.55	59.38	19	4.047	0.24	1.43
2010	40	228.3	183-261	13.3	8.5-17.1	32.01	31.42-32.55	60.00	24	1.668	0.21	0.59
2011	27	233.7	216-265	9.2	8.2-10.9	31.95	31.42-32.54	59.26	16	2.748	0.31	0.97

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for golden tilefish

Blackbelly Rosefish

Table 42: Short bottom longline nominal CPUE and mean lengths for blackbelly rosefish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

Year	Included Collections	Avg. Depth	n	Nominal CPUE (#s) CPUE	Normalized	CV	Length Avg.	SE
1996	10	208	28	1.845	3.98	0.61	304	8.33
1997	33	193	21	0.358	0.77	1.55	292	8.50
1998	30	192	44	0.815	1.76	1.35	280	4.30
1999	10	188	5	0.263	0.57	1.38	282	16.25
2000	23	188	29	0.661	1.43	1.45	292	5.72
2001	19	194	20	0.597	1.29	0.91	294	8.19
2002	0	–	–	–	–	–	–	–
2003	36	192	57	0.853	1.84	0.93	286	3.52
2004	9	197	0	0.000	0.00	–	–	–
2005	6	199	0	0.000	0.00	–	–	–
2006	31	193	35	0.691	1.49	1.26	275	4.94
2007	8	188	4	0.304	0.66	1.07	290	17.80
2008	20	188	5	0.132	0.28	2.23	290	15.81
2009	6	197	1	0.068	0.15	2.45	310	–
2010	34	191	1	0.014	0.03	5.83	320	–
2011	43	192	27	0.358	0.77	1.33	282	7.77

Table 43: Short bottom longline delta-GLM standardized CPUE for blackbelly rosefish and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996	7	205.9	194-220	10.4	7.9-12.6	32.56	32.51-32.73	85.71	6	1.187	0.57	2.19
1997	33	193.2	181-209	15.6	14.3-16.3	32.64	32.54-32.74	36.36	12	0.357	0.29	0.66
1998	23	191.2	176-205	11.4	8.9-15.4	32.67	32.54-32.87	43.48	10	0.499	0.38	0.92
1999	10	188.4	176-198	15.0	14.5-15.3	32.64	32.54-32.73	40.00	4	0.321	0.55	0.59
2000	23	187.9	181-198	13.3	12.8-14.5	32.62	32.54-32.73	60.87	14	0.550	0.33	1.01
2001	13	191.5	179-200	13.4	11.2-15.1	32.66	32.54-32.74	76.92	10	0.663	0.31	1.22
2002*	0	–	–	–	–	–	–	–	–	–	–	–
2003	36	192.2	177-210	11.5	10.8-12.1	32.65	32.54-32.74	75.00	27	0.652	0.24	1.20
2004*	9	197.1	178-215	11.8	11.6-12.1	32.11	32.08-32.15	0.00	0	–	–	–
2005*	6	199.0	181-208	13.6	12.6-13.6	32.73	32.72-32.74	0.00	0	–	–	–
2006	31	192.9	179-219	10.9	9.8-11.9	32.59	32.54-32.64	58.06	18	0.469	0.33	0.86
2007*	2	195.5	190-201	12.5	11.5-12.5	32.73	32.73-32.74	50.00	1	–	–	–
2008	20	187.9	177-198	15.2	15.1-15.4	32.68	32.55-32.74	20.00	4	0.216	0.50	0.40
2009*	6	197.2	192-200	12.9	12.9-13.1	32.55	32.54-32.56	16.67	1	–	–	–
2010*	28	190.5	177-205	12.0	10.2-14.2	32.61	32.54-32.73	3.57	1	–	–	–
2011	11	195.2	177-227	9.4	8.6-14.5	32.58	32.54-32.84	81.82	9	0.510	0.35	0.94

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for blackbelly rosefish

Table 44: Long bottom longline nominal CPUE and mean lengths for blackbelly rosefish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 22.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	13	203	9	0.437	6.73	3.61	273	14.9
1997	19	208	8	0.250	3.85	4.36	295	15.4
1998	7	201	0	0.000	0.00	–	–	–
1999	27	208	5	0.094	1.44	4.20	262	25.8
2000	9	205	0	0.000	0.00	–	–	–
2001	14	207	0	0.000	0.00	–	–	–
2002	17	222	0	0.000	0.00	–	–	–
2003	10	222	0	0.000	0.00	–	–	–
2004	5	194	0	0.000	0.00	–	–	–
2005	15	209	0	0.000	0.00	–	–	–
2006	7	201	0	0.000	0.00	–	–	–
2007	24	213	0	0.000	0.00	–	–	–
2008	0	–	–	–	–	–	–	–
2009	36	216	3	0.055	0.85	6.00	275	6.7
2010	37	226	7	0.121	1.86	3.25	322	8.9
2011	24	231	1	0.018	0.27	4.90	340	–

Bank Sea Bass

Table 45: Chevron trap nominal CPUE and mean lengths for bank sea bass. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	350	34	933	1.519	2.43	1.67	235	6.94
1991	299	35	582	1.420	1.95	1.56	219	8.17
1992	315	34	449	0.913	2.15	1.00	225	9.59
1993	410	35	681	1.014	2.44	1.11	220	7.59
1994	454	37	814	1.088	2.20	1.20	224	7.07
1995	523	32	556	0.664	2.85	0.73	214	8.19
1996	454	39	950	1.286	2.75	1.41	224	6.55
1997	440	39	764	1.048	2.18	1.15	225	7.34
1998	518	41	506	0.621	3.40	0.68	217	8.71
1999	253	34	315	0.790	2.35	0.87	221	11.23
2000	323	37	383	0.704	2.45	0.77	215	9.90
2001	248	38	242	0.624	2.69	0.69	229	13.29
2002	240	33	133	0.355	2.48	0.39	223	17.49
2003	218	40	303	0.833	2.53	0.92	226	11.69
2004	271	39	208	0.467	2.41	0.51	232	14.50
2005	325	37	275	0.526	2.81	0.58	223	12.14
2006	296	38	351	0.756	3.39	0.83	230	11.06
2007	325	38	216	0.433	2.72	0.48	224	13.76
2008	303	38	224	0.479	3.00	0.53	217	13.07
2009	402	36	532	0.852	2.71	0.94	222	8.67
2010	422	37	745	1.110	3.53	1.22	232	7.67
2011	657	40	1278	1.222	2.49	1.34	212	5.94

Table 46: Chevron trap delta-GLM standardized CPUE for bank sea bass and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Positive	n	CPUE	CV	Normalized
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23 - 8/9	42.67%	131	0.466	0.17	1.16
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11 - 9/24	47.76%	128	0.524	0.15	1.30
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31 - 8/13	42.01%	121	0.332	0.16	0.83
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	37.80%	155	0.389	0.13	0.97
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	42.78%	169	0.592	0.12	1.47
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	31.48%	113	0.378	0.15	0.94
1996	357	38.8	14 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/4	4/29 - 9/16	42.30%	151	0.655	0.13	1.63
1997	391	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21 - 9/29	35.81%	140	0.545	0.13	1.36
1998	454	41.6	14 - 92	20.7	9.5 - 28.6	32.11	27.44 - 34.59	6/26	3/31 - 8/18	25.55%	116	0.314	0.14	0.78
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2 - 9/28	33.70%	62	0.334	0.21	0.83
2000	256	37.1	15 - 103	24.0	18.0 - 28.5	32.18	28.95 - 34.28	7/19	5/16 - 10/19	30.86%	79	0.543	0.16	1.35
2001	229	38.7	14 - 91	23.4	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23 - 10/24	27.51%	63	0.338	0.18	0.84
2002	206	36.0	13 - 94	24.4	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17 - 9/24	21.84%	45	0.188	0.20	0.47
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3 - 9/22	27.36%	58	0.452	0.19	1.12
2004	271	39.1	14 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5 - 10/28	25.83%	70	0.276	0.17	0.69
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3 - 10/19	26.12%	76	0.288	0.17	0.72
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6 - 9/28	27.50%	77	0.277	0.19	0.69
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21 - 9/24	19.12%	61	0.224	0.17	0.56
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5 - 9/30	24.23%	71	0.207	0.17	0.51
2009	396	36.4	14 - 91	22.5	15.4 - 27.2	32.25	27.27 - 34.60	7/19	5/6 - 10/8	28.54%	113	0.341	0.14	0.85
2010	417	37.6	14 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/15	5/4 - 10/13	34.53%	144	0.501	0.14	1.25
2011	458	42.0	15 - 93	21.3	14.8 - 28.8	30.93	27.23 - 34.32	7/23	5/20 - 10/25	34.50%	158	0.674	0.13	1.68

Black Sea Bass

Table 47: Chevron trap nominal CPUE and mean lengths for black sea bass. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	345	33	6659	11.560	1.38	1.49	229	2.53
1991	296	34	4105	9.379	1.50	1.21	223	3.14
1992	315	34	4575	9.169	1.60	1.18	232	3.09
1993	406	35	3260	4.883	1.69	0.63	228	3.59
1994	446	36	3462	4.640	2.16	0.60	232	3.55
1995	523	32	3407	4.023	2.11	0.52	215	3.31
1996	436	37	3381	4.803	2.15	0.62	235	3.63
1997	417	37	4103	5.909	2.07	0.76	232	3.26
1998	492	39	4324	5.789	2.08	0.75	226	3.09
1999	249	34	4399	10.775	1.96	1.39	230	3.13
2000	308	34	4507	8.734	2.14	1.13	235	3.15
2001	242	37	3811	9.793	2.21	1.26	233	3.40
2002	236	33	2521	6.331	2.00	0.82	230	4.12
2003	212	39	1775	5.183	2.26	0.67	240	5.13
2004	257	37	4749	11.257	2.15	1.45	247	3.23
2005	325	37	5424	10.088	2.30	1.30	242	2.96
2006	290	37	4246	9.302	2.36	1.20	244	3.37
2007	316	37	3065	6.406	2.39	0.83	238	3.87
2008	296	37	2614	5.705	2.08	0.74	240	4.22
2009	395	35	3771	5.826	2.34	0.75	251	3.67
2010	414	36	5006	7.658	2.13	0.99	262	3.34
2011	627	38	11909	11.843	2.01	1.53	261	2.16

Table 48: Chevron trap delta-GLM standardized CPUE for black sea bass and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	64.24%	194	1.831	0.20	1.42
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	58.87%	156	1.552	0.19	1.21
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	62.15%	179	1.757	0.17	1.36
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	49.26%	200	0.661	0.19	0.51
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	40.31%	156	0.776	0.19	0.60
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	45.40%	163	0.443	0.20	0.34
1996	345	36.9	14 - 62	21.9	14.2 - 27.0	32.19	27.92 - 34.32	7/6	4/29	-	9/16	46.67%	161	1.018	0.20	0.79
1997	368	36.7	15 - 67	22.8	18.8 - 28.0	32.04	27.87 - 34.59	7/7	4/21	-	9/29	39.40%	145	0.853	0.20	0.66
1998	428	39.4	14 - 69	20.9	9.5 - 28.6	32.10	27.44 - 34.59	6/25	3/31	-	8/18	37.38%	160	1.104	0.17	0.86
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	47.78%	86	1.541	0.22	1.20
2000	246	35.2	15 - 60	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16	-	10/19	42.68%	105	1.187	0.22	0.92
2001	223	37.3	14 - 67	23.6	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	37.22%	83	1.572	0.23	1.22
2002	202	35.0	13 - 69	24.5	15.2 - 28.3	32.04	27.86 - 33.94	7/27	6/17	-	9/24	39.60%	80	0.754	0.21	0.59
2003	206	38.0	16 - 61	18.9	13.4 - 25.1	32.04	27.43 - 34.33	7/21	6/3	-	9/22	31.55%	65	0.999	0.22	0.78
2004	257	36.9	14 - 69	21.3	16.8 - 25.8	32.32	29.99 - 33.97	6/25	5/5	-	10/28	39.30%	101	1.440	0.21	1.12
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	40.55%	118	1.084	0.20	0.84
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	40.51%	111	1.011	0.25	0.78
2007	310	36.9	15 - 69	23.4	15.3 - 28.9	32.16	27.33 - 34.33	7/19	5/21	-	9/24	37.74%	117	0.765	0.20	0.59
2008	286	36.8	15 - 66	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5	-	9/29	39.16%	112	0.850	0.21	0.66
2009	389	35.5	14 - 69	22.6	15.4 - 27.2	32.25	27.27 - 34.60	7/18	5/6	-	10/8	40.10%	156	0.842	0.20	0.65
2010	409	36.7	14 - 69	21.2	12.4 - 29.4	32.20	27.34 - 34.59	7/14	5/4	-	10/13	46.70%	191	1.522	0.16	1.18
2011	436	40.2	15 - 69	21.3	14.8 - 28.8	30.88	27.23 - 34.32	7/24	5/20	-	10/25	53.67%	234	4.765	0.13	3.70

Table 49: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for black sea bass and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	64.24%	194	1.036	0.29	1.50
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	58.87%	156	0.839	0.27	1.22
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	62.15%	179	1.002	0.25	1.45
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	49.26%	200	0.348	0.27	0.50
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	40.31%	156	0.408	0.27	0.59
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	45.40%	163	0.225	0.28	0.33
1996	345	36.9	14 - 62	21.9	14.2 - 27.0	32.19	27.92 - 34.32	7/6	4/29	-	9/16	46.67%	161	0.546	0.28	0.79
1997	369	36.7	15 - 67	22.8	18.8 - 28.0	32.04	27.87 - 34.59	7/7	4/21	-	9/29	39.57%	146	0.481	0.28	0.70
1998	428	39.4	14 - 69	20.9	9.5 - 28.6	32.10	27.44 - 34.59	6/25	3/31	-	8/18	37.38%	160	0.624	0.25	0.91
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	47.78%	86	0.857	0.29	1.24
2000	246	35.2	15 - 60	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16	-	10/19	42.68%	105	0.616	0.30	0.89
2001	223	37.3	14 - 67	23.6	16.0 - 29.2	32.30	27.87 - 34.28	7/23	5/23	-	10/24	37.22%	83	0.867	0.30	1.26
2002	202	35.0	13 - 69	24.5	15.2 - 28.3	32.04	27.86 - 33.94	7/27	6/17	-	9/24	39.60%	80	0.403	0.28	0.58
2003	206	38.0	16 - 61	18.9	13.4 - 25.1	32.04	27.43 - 34.33	7/21	6/3	-	9/22	31.55%	65	0.561	0.29	0.81
2004	257	36.9	14 - 69	21.3	16.8 - 25.8	32.32	29.99 - 33.97	6/25	5/5	-	10/28	39.30%	101	0.751	0.29	1.09
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	40.55%	118	0.584	0.28	0.85
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	40.51%	111	0.537	0.31	0.78
2007	310	36.9	15 - 69	23.4	15.3 - 28.9	32.16	27.33 - 34.33	7/19	5/21	-	9/24	37.74%	117	0.406	0.27	0.59
2008	286	36.8	15 - 66	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5	-	9/29	39.16%	112	0.461	0.28	0.67
2009	389	35.5	14 - 69	22.6	15.4 - 27.2	32.25	27.27 - 34.60	7/18	5/6	-	10/8	40.10%	156	0.448	0.28	0.65
2010	408	36.7	14 - 69	21.2	12.4 - 29.4	32.20	27.34 - 34.59	7/14	5/4	-	10/13	46.57%	190	0.854	0.24	1.24
2011	237	37.5	15 - 69	22.0	15.0 - 28.8	31.79	27.23 - 34.32	7/25	5/20	-	10/25	52.74%	125	2.301	0.25	3.34

Gag

Table 50: Chevron trap nominal CPUE and mean lengths for gag. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Nominal CPUE (g)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	CPUE	CV	Normalized	Avg.	SE
1990	350	34	25	0.042	4.53	4.43	45.10	7.17	1.09	350	64.40
1991	299	35	8	0.017	6.12	1.74	31.22	10.45	0.75	439	149.45
1992	315	34	10	0.020	7.63	2.06	42.44	8.12	1.02	524	157.28
1993	410	35	9	0.014	7.93	1.46	67.98	8.68	1.64	696	221.37
1994	454	37	10	0.014	8.64	1.42	55.51	11.06	1.34	635	190.61
1995	523	32	5	0.006	10.21	0.62	37.20	10.41	0.90	792	356.41
1996	453	39	8	0.011	9.07	1.12	76.67	10.08	1.85	804	273.46
1997	440	39	5	0.007	11.07	0.73	52.64	13.41	1.27	926	416.74
1998	513	41	4	0.004	11.40	0.47	30.62	12.95	0.74	785	408.02
1999	253	34	4	0.011	7.92	1.13	13.80	13.31	0.33	388	201.66
2000	325	37	8	0.015	6.88	1.54	51.33	11.55	1.24	578	196.67
2001	245	39	4	0.011	7.78	1.15	31.21	10.46	0.75	588	305.40
2002	238	34	2	0.005	10.91	0.50	5.61	11.57	0.13	430	387.10
2003	218	40	0	0.000	–	0.00	0.00	–	0.00	–	–
2004	270	39	2	0.004	11.60	0.47	8.62	14.60	0.21	510	459.31
2005	325	37	5	0.010	9.53	1.05	52.63	11.95	1.27	708	318.83
2006	296	38	1	0.002	17.20	0.23	32.38	17.20	0.78	1110	–
2007	325	38	3	0.006	10.41	0.58	37.05	13.18	0.89	443	282.84
2008	303	38	1	0.002	17.41	0.20	4.22	17.41	0.10	590	–
2009	401	36	2	0.003	14.14	0.35	10.87	15.06	0.26	615	553.60
2010	420	38	8	0.012	7.22	1.24	207.04	14.35	4.98	726	247.21
2011	655	40	5	0.005	11.42	0.52	19.27	13.07	0.46	646	290.75

Table 51: Chevron trap delta-GLM standardized CPUE for gag and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	5.21%	16	0.0322	0.33	3.70
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	2.61%	7	0.0106	0.45	1.21
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	2.08%	6	0.0106	0.48	1.21
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	1.71%	7	0.0106	0.44	1.22
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	1.77%	7	0.0099	0.48	1.13
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	1.39%	5	0.0066	0.55	0.76
1996	356	38.8	15 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29	-	9/16	1.69%	6	0.0088	0.47	1.01
1997	391	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	0.51%	2	0.0019	0.76	0.22
1998	449	41.9	15 - 92	20.7	9.5 - 28.6	32.08	27.44 - 34.59	6/26	3/31	-	8/18	0.89%	4	0.0031	0.52	0.35
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	2.17%	4	0.0100	0.56	1.15
2000	258	37.6	15 - 109	24.0	18.0 - 28.5	32.19	28.95 - 34.28	7/19	5/16	-	10/19	2.71%	7	0.0179	0.43	2.06
2001	227	38.9	15 - 91	23.4	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23	-	10/24	1.76%	4	0.0097	0.53	1.11
2002	204	36.3	15 - 94	24.3	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17	-	9/24	0.98%	2	0.0048	0.73	0.56
2003*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2004	270	39.2	15 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	0.74%	2	0.0033	0.73	0.38
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	1.03%	3	0.0060	0.61	0.69
2006*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	0.94%	3	0.0037	0.62	0.43
2008*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2009	395	36.5	15 - 91	22.5	15.4 - 27.2	32.24	27.27 - 34.60	7/19	5/6	-	10/8	0.51%	2	0.0022	0.73	0.25
2010	415	37.7	15 - 92	21.1	12.4 - 29.4	32.21	27.34 - 34.59	7/14	5/4	-	10/13	1.93%	8	0.0079	0.44	0.91
2011	458	42.0	15 - 93	21.3	14.8 - 28.8	30.93	27.23 - 34.32	7/23	5/20	-	10/25	1.09%	5	0.0055	0.49	0.63

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for gag

Table 52: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for gag and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**			**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	5.21%	16	0.031	0.34	3.66
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	2.61%	7	0.010	0.46	1.21
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	2.08%	6	0.010	0.48	1.21
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	1.71%	7	0.010	0.44	1.22
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	1.77%	7	0.010	0.48	1.13
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	1.39%	5	0.006	0.55	0.76
1996	356	38.8	15 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29	-	9/16	1.69%	6	0.009	0.48	1.02
1997	392	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	0.51%	2	0.002	0.77	0.22
1998	449	41.9	15 - 92	20.7	9.5 - 28.6	32.08	27.44 - 34.59	6/26	3/31	-	8/18	0.89%	4	0.003	0.52	0.36
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	2.17%	4	0.010	0.57	1.15
2000	258	37.6	15 - 109	24.0	18.0 - 28.5	32.19	28.95 - 34.28	7/19	5/16	-	10/19	2.71%	7	0.018	0.44	2.07
2001	227	38.9	15 - 91	23.4	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23	-	10/24	1.76%	4	0.009	0.53	1.11
2002	204	36.3	15 - 94	24.3	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17	-	9/24	0.98%	2	0.005	0.73	0.56
2003*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2004	270	39.2	15 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	0.74%	2	0.003	0.73	0.38
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	1.03%	3	0.006	0.61	0.69
2006*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	0.94%	3	0.004	0.62	0.43
2008*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2009	395	36.5	15 - 91	22.5	15.4 - 27.2	32.24	27.27 - 34.60	7/19	5/6	-	10/8	0.51%	2	0.002	0.73	0.25
2010	414	37.7	15 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/14	5/4	-	10/13	1.93%	8	0.008	0.44	0.92
2011	256	40.6	15 - 93	21.8	15.0 - 28.8	31.80	27.23 - 34.32	7/24	5/20	-	10/25	1.17%	3	0.005	0.62	0.64

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for gag

Table 53: Short bottom longline nominal CPUE and mean lengths for gag. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	5	85	0	0.000	0.00	–	–	–
1997	0	–	–	–	–	–	–	–
1998	0	–	–	–	–	–	–	–
1999	27	87	3	0.063	1.67	2.89	849	31.8
2000	6	86	0	0.000	0.00	–	–	–
2001	10	89	0	0.000	0.00	–	–	–
2002	17	83	2	0.073	1.93	2.82	968	57.0
2003	16	97	1	0.038	1.01	4.00	828	–
2004	25	91	0	0.000	0.00	–	–	–
2005	43	82	5	0.069	1.81	2.80	837	61.0
2006	51	63	1	0.012	0.32	7.14	850	–
2007	47	83	8	0.111	2.91	3.23	831	113.8
2008	21	60	2	0.059	1.54	3.16	930	60.0
2009	34	78	2	0.037	0.96	4.06	1030	40.0
2010	33	82	2	0.035	0.91	4.01	1010	100.0
2011	34	76	2	0.036	0.95	4.06	730	40.0

Table 54: Short bottom longline delta-GLM standardized CPUE for gag and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

	Included	Depth (m)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996	5	85.2	73-94	32.19	32.08-32.26	0.00	0	–	–	–
1997*	–	–	–	–	–	–	–	–	–	–
1998*	–	–	–	–	–	–	–	–	–	–
1999	27	87.2	59-108	33.34	29.91-34.19	11.11	3	0.067	0.56	0.98
2000*	6	86.2	70-99	33.79	33.20-33.91	0.00	0	–	–	–
2001*	10	89.4	75-109	33.88	33.34-34.24	0.00	0	–	–	–
2002	17	82.6	71-108	32.86	32.08-33.36	11.76	2	0.085	0.71	1.24
2003*	16	97.4	88-109	32.84	32.25-33.21	6.25	1	–	–	–
2004*	25	90.9	72-108	33.05	32.08-34.00	0.00	0	–	–	–
2005	43	82.2	46-109	32.78	30.04-33.85	11.63	5	0.074	0.43	1.09
2006*	51	63.1	25-109	32.21	27.86-34.20	1.96	1	–	–	–
2007	47	83.4	45-106	33.14	30.04-33.86	12.77	6	0.104	0.43	1.52
2008	21	59.5	45-79	32.26	32.07-32.45	9.52	2	0.071	0.72	1.03
2009	39	74.6	48-107	32.65	31.24-34.16	10.26	4	0.068	0.48	0.99
2010	32	82.8	45-107	32.74	32.07-33.83	6.25	2	0.037	0.71	0.54
2011	34	76.4	45-109	33.34	32.07-34.19	5.88	2	0.041	0.71	0.60

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for gag

Red Grouper

Table 55: Chevron trap nominal CPUE and mean lengths for red grouper. Calculations are based upon the species-specific depth range, as calculated in Table 3**.** Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	318	35	3	0.005	10.30	0.10	567	360.71
1991	274	36	4	0.009	8.32	0.18	440	228.76
1992	293	35	18	0.035	8.52	0.69	442	96.46
1993	344	39	20	0.037	8.95	0.74	424	87.57
1994	381	40	30	0.047	7.09	0.93	488	81.56
1995	395	36	9	0.014	9.28	0.27	591	188.10
1996	443	39	9	0.012	7.65	0.24	566	180.04
1997	410	41	21	0.032	6.45	0.63	507	102.09
1998	478	43	78	0.098	5.06	1.95	507	52.01
1999	220	37	27	0.073	4.11	1.45	582	102.78
2000	277	41	36	0.067	4.45	1.33	651	99.02
2001	212	42	32	0.091	4.45	1.81	506	81.82
2002	188	38	36	0.126	3.59	2.51	510	77.60
2003	214	40	29	0.077	3.94	1.53	496	84.31
2004	246	41	40	0.101	4.27	2.01	438	63.19
2005	295	39	27	0.057	3.64	1.12	541	95.47
2006	276	39	44	0.101	5.78	2.02	524	71.98
2007	298	40	41	0.091	5.21	1.81	541	76.97
2008	288	39	23	0.052	5.97	1.03	634	121.73
2009	361	38	17	0.029	4.73	0.58	635	142.83
2010	395	39	22	0.036	5.27	0.71	550	108.15
2011	627	41	9	0.009	8.34	0.17	614	195.56

Table 56: Chevron trap delta-GLM standardized CPUE for red grouper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	275	35.5	22 - 93	22.3	18.2 - 27.8	32.52	30.42 - 33.82	5/31	4/23	-	8/9	0.73%	2	0.005	0.74	0.23
1991	243	35.1	20 - 95	24.9	15.9 - 27.7	32.66	30.75 - 34.61	8/8	6/12	-	9/24	1.65%	4	0.002	0.60	0.08
1992	272	34.9	22 - 62	21.6	16.2 - 24.5	32.79	30.42 - 34.32	6/5	4/1	-	8/13	2.21%	6	0.014	0.50	0.63
1993	344	38.6	20 - 94	22.3	17.7 - 28.2	32.50	30.43 - 34.32	6/23	5/11	-	8/13	2.33%	8	0.020	0.45	0.88
1994	358	41.3	20 - 93	22.7	18.1 - 26.9	32.36	30.74 - 33.82	6/22	5/10	-	10/24	2.79%	10	0.017	0.41	0.76
1995	303	37.1	20 - 60	24.5	20.2 - 27.9	32.36	29.94 - 33.75	7/10	5/4	-	10/26	1.98%	6	0.016	0.49	0.72
1996	346	39.5	21 - 100	21.8	14.2 - 27.0	32.18	27.92 - 34.32	7/6	4/29	-	9/16	2.31%	8	0.016	0.46	0.72
1997	367	40.7	21 - 96	22.3	16.8 - 27.5	31.97	27.87 - 34.42	7/5	4/21	-	8/27	3.27%	12	0.017	0.38	0.78
1998	425	43.4	20 - 92	20.6	9.5 - 28.6	32.07	27.44 - 34.32	6/27	3/31	-	8/18	5.88%	25	0.013	0.31	0.58
1999	174	36.6	20 - 75	22.6	19.5 - 27.3	31.94	27.27 - 34.41	7/18	6/2	-	9/28	6.90%	12	0.032	0.36	1.44
2000	224	40.9	20 - 109	23.9	18.0 - 28.1	32.26	28.95 - 34.28	7/12	5/16	-	10/17	4.91%	11	0.015	0.33	0.67
2001	202	41.7	24 - 91	23.0	16.0 - 26.7	32.39	27.87 - 34.28	7/18	5/23	-	9/20	7.43%	15	0.036	0.32	1.60
2002	182	38.7	22 - 94	24.0	15.2 - 28.3	32.06	27.86 - 33.94	7/28	6/18	-	9/24	10.99%	20	0.034	0.33	1.53
2003	208	40.0	20 - 92	18.8	13.4 - 21.8	32.04	27.43 - 34.33	7/21	6/3	-	8/28	7.21%	15	0.045	0.38	2.03
2004	246	41.5	21 - 91	20.9	16.8 - 25.8	32.36	29.99 - 33.97	6/20	5/5	-	8/4	8.54%	21	0.036	0.35	1.59
2005	272	38.4	21 - 69	22.9	18.0 - 28.5	32.10	27.33 - 34.32	7/10	5/3	-	9/29	8.46%	23	0.044	0.30	1.98
2006	271	39.2	20 - 94	22.3	15.0 - 26.7	32.19	27.27 - 34.39	7/22	6/6	-	9/28	6.27%	17	0.040	0.34	1.81
2007	292	40.3	21 - 92	22.9	15.3 - 28.1	32.18	27.33 - 34.33	7/19	5/22	-	9/24	6.51%	19	0.034	0.30	1.55
2008	278	39.2	20 - 92	21.9	15.2 - 27.2	32.09	27.27 - 34.33	7/13	5/5	-	9/30	3.96%	11	0.022	0.41	0.98
2009	361	38.5	21 - 91	22.5	15.4 - 27.2	32.18	27.27 - 34.39	7/21	5/6	-	10/1	4.43%	16	0.007	0.35	0.31
2010	390	39.1	20 - 92	21.0	12.4 - 29.4	32.16	27.34 - 34.32	7/15	5/4	-	9/24	4.62%	18	0.022	0.33	0.98
2011	444	42.8	21 - 93	21.2	14.8 - 28.8	30.89	27.23 - 34.32	7/23	5/20	-	10/4	0.68%	3	0.003	0.63	0.14

Table 57: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for gag and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	275	35.5	22 - 93	22.3	18.2 - 27.8	32.52	30.42 - 33.82	5/31	4/23	-	8/9	0.73%	2	0.005	0.74	0.23
1991	243	35.1	20 - 95	24.9	15.9 - 27.7	32.66	30.75 - 34.61	8/8	6/12	-	9/24	1.65%	4	0.002	0.60	0.08
1992	272	34.9	22 - 62	21.6	16.2 - 24.5	32.79	30.42 - 34.32	6/5	4/1	-	8/13	2.21%	6	0.014	0.50	0.63
1993	344	38.6	20 - 94	22.3	17.7 - 28.2	32.50	30.43 - 34.32	6/23	5/11	-	8/13	2.33%	8	0.020	0.45	0.88
1994	358	41.3	20 - 93	22.7	18.1 - 26.9	32.36	30.74 - 33.82	6/22	5/10	-	10/24	2.79%	10	0.017	0.41	0.76
1995	303	37.1	20 - 60	24.5	20.2 - 27.9	32.36	29.94 - 33.75	7/10	5/4	-	10/26	1.98%	6	0.016	0.49	0.72
1996	346	39.5	21 - 100	21.8	14.2 - 27.0	32.18	27.92 - 34.32	7/6	4/29	-	9/16	2.31%	8	0.016	0.46	0.72
1997	367	40.7	21 - 96	22.3	16.8 - 27.5	31.97	27.87 - 34.42	7/5	4/21	-	8/27	3.27%	12	0.017	0.38	0.78
1998	425	43.4	20 - 92	20.6	9.5 - 28.6	32.07	27.44 - 34.32	6/27	3/31	-	8/18	5.88%	25	0.013	0.31	0.58
1999	174	36.6	20 - 75	22.6	19.5 - 27.3	31.94	27.27 - 34.41	7/18	6/2	-	9/28	6.90%	12	0.032	0.36	1.44
2000	224	40.9	20 - 109	23.9	18.0 - 28.1	32.26	28.95 - 34.28	7/12	5/16	-	10/17	4.91%	11	0.015	0.33	0.67
2001	202	41.7	24 - 91	23.0	16.0 - 26.7	32.39	27.87 - 34.28	7/18	5/23	-	9/20	7.43%	15	0.036	0.32	1.60
2002	182	38.7	22 - 94	24.0	15.2 - 28.3	32.06	27.86 - 33.94	7/28	6/18	-	9/24	10.99%	20	0.034	0.33	1.53
2003	208	40.0	20 - 92	18.8	13.4 - 21.8	32.04	27.43 - 34.33	7/21	6/3	-	8/28	7.21%	15	0.045	0.38	2.03
2004	246	41.5	21 - 91	20.9	16.8 - 25.8	32.36	29.99 - 33.97	6/20	5/5	-	8/4	8.54%	21	0.036	0.35	1.59
2005	272	38.4	21 - 69	22.9	18.0 - 28.5	32.10	27.33 - 34.32	7/10	5/3	-	9/29	8.46%	23	0.044	0.30	1.98
2006	271	39.2	20 - 94	22.3	15.0 - 26.7	32.19	27.27 - 34.39	7/22	6/6	-	9/28	6.27%	17	0.040	0.34	1.81
2007	292	40.3	21 - 92	22.9	15.3 - 28.1	32.18	27.33 - 34.33	7/19	5/22	-	9/24	6.51%	19	0.034	0.30	1.55
2008	278	39.2	20 - 92	21.9	15.2 - 27.2	32.09	27.27 - 34.33	7/13	5/5	-	9/30	3.96%	11	0.022	0.41	0.98
2009	361	38.5	21 - 91	22.5	15.4 - 27.2	32.18	27.27 - 34.39	7/21	5/6	-	10/1	4.43%	16	0.007	0.35	0.31
2010	390	39.1	20 - 92	21.0	12.4 - 29.4	32.16	27.34 - 34.32	7/15	5/4	-	9/24	4.62%	18	0.022	0.33	0.98
2011	444	42.8	21 - 93	21.2	14.8 - 28.8	30.89	27.23 - 34.32	7/23	5/20	-	10/4	0.68%	3	0.003	0.63	0.14

Table 58: Short bottom longline nominal CPUE and mean lengths for red grouper. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	5	85	0	0.000	0.00	–	–	–
1997	0	–	–	–	–	–	–	–
1998	0	–	–	–	–	–	–	–
1999	27	87	6	0.131	1.24	3.07	632	29.3
2000	6	86	5	0.388	3.67	1.17	666	12.9
2001	10	89	0	0.000	0.00	–	–	–
2002	17	83	0	0.000	0.00	–	–	–
2003	16	97	0	0.000	0.00	–	–	–
2004	25	91	4	0.096	0.91	3.00	685	52.7
2005	43	82	10	0.143	1.35	3.36	650	25.9
2006	51	63	8	0.094	0.89	2.89	664	26.6
2007	47	83	24	0.306	2.90	1.89	663	13.7
2008	21	60	0	0.000	0.00	–	–	–
2009	34	78	4	0.077	0.73	2.78	723	21.7
2010	33	82	0	0.000	0.00	–	–	–
2011	34	76	14	0.243	2.30	2.47	740	7.4

Table 59: Short bottom longline delta-GLM standardized CPUE for red grouper and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

		Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	**Included Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**% Positive**	**n**	**CPUE**	**CV**	**Normalized**
1996	5	85.2	73-94	19.6	17.7-20.8	32.19	32.08-32.26	0.00	0	–	–	–
1997*	0	–	–	–	–	–	–	–	–	–	–	–
1998*	0	–	–	–	–	–	–	–	–	–	–	–
1999	21	89.9	73-108	19.6	18.5-21.2	33.72	33.19-34.19	14.29	3	0.094	0.64	0.74
2000	5	83.6	70-92	23.7	22.7-23.7	33.90	33.90-33.91	60.00	3	0.269	0.79	2.11
2001*	6	98.5	88-109	18.5	18.5-18.5	34.23	34.23-34.24	0.00	0	–	–	–
2002*	17	82.6	71-108	17.3	16.4-18.6	32.86	32.08-33.36	0.00	0	–	–	–
2003*	16	97.4	88-109	15.5	14.1-17.2	32.84	32.25-33.21	0.00	0	–	–	–
2004*	12	82.5	72-91	18.3	18.1-18.4	32.17	32.08-32.26	0.00	0	–	–	–
2005	43	82.2	46-109	19.4	15.2-28.0	32.78	30.04-33.85	11.63	5	0.097	0.51	0.76
2006	51	63.1	25-109	18.6	13.9-21.4	32.21	27.86-34.20	11.76	6	0.101	0.45	0.79
2007	47	83.4	45-106	20.6	16.1-24.1	33.14	30.04-33.86	27.66	13	0.229	0.27	1.79
2008*	21	59.5	45-79	23.5	20.4-25.8	32.26	32.07-32.45	0.00	0	–	–	–
2009	39	74.6	48-107	19.5	16.4-24.5	32.65	31.24-34.16	10.26	4	0.070	0.59	0.55
2010*	33	81.9	45-107	16.7	13.6-18.9	32.67	30.43-33.83	0.00	0	–	–	–
2011	23	71.3	45-109	17.4	15.4-19.9	33.08	32.07-34.19	8.70	2	0.035	0.72	0.28

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for red grouper

Sand Perch

Table 60: Chevron trap nominal CPUE and mean lengths for sand perch. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	345	33	253	0.453	3.09	0.95	217	12.31
1991	296	34	319	0.765	2.42	1.61	224	11.31
1992	315	34	566	1.128	1.84	2.38	224	8.47
1993	406	35	290	0.435	2.52	0.92	225	11.89
1994	446	36	414	0.578	2.32	1.22	228	10.07
1995	523	32	198	0.230	2.98	0.48	216	13.86
1996	435	37	358	0.492	2.74	1.04	228	10.85
1997	417	37	283	0.415	2.45	0.87	231	12.41
1998	487	39	268	0.346	3.53	0.73	232	12.79
1999	249	34	274	0.708	2.95	1.49	226	12.30
2000	308	34	246	0.486	3.11	1.02	228	13.12
2001	239	37	205	0.550	2.72	1.16	234	14.75
2002	234	33	92	0.240	2.84	0.51	225	21.26
2003	212	39	202	0.573	2.77	1.21	232	14.72
2004	256	37	185	0.436	2.75	0.92	228	15.15
2005	325	37	347	0.681	2.72	1.43	234	11.34
2006	290	37	147	0.332	2.49	0.70	234	17.47
2007	316	37	170	0.349	3.40	0.74	231	16.05
2008	296	37	211	0.456	2.82	0.96	232	14.46
2009	394	35	289	0.465	3.04	0.98	228	12.11
2010	412	37	299	0.457	2.83	0.96	234	12.21
2011	625	39	410	0.412	3.10	0.87	238	10.57

Table 61: Chevron trap delta-GLM standardized CPUE for sand perch and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	302	32.8	17 - 62	22.0	18.4 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	20.86%	63	0.048	0.24	0.43
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11	-	9/24	29.81%	79	0.091	0.23	0.82
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	37.85%	109	0.191	0.21	1.71
1993	406	34.6	16 - 60	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	23.65%	96	0.076	0.21	0.69
1994	387	38.0	16 - 64	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	28.17%	109	0.117	0.21	1.05
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	21.17%	76	0.063	0.23	0.57
1996	344	37.0	15 - 62	21.9	14.2 - 27.0	32.19	27.92 - 34.32	7/7	4/29	-	9/16	29.65%	102	0.115	0.21	1.03
1997	368	36.7	15 - 67	22.8	18.8 - 28.0	32.04	27.87 - 34.59	7/7	4/21	-	9/29	24.18%	89	0.088	0.22	0.79
1998	423	39.7	15 - 69	20.8	9.5 - 28.6	32.07	27.44 - 34.59	6/25	3/31	-	8/18	19.86%	84	0.078	0.22	0.70
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	30.00%	54	0.228	0.25	2.05
2000	246	35.2	15 - 60	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16	-	10/19	24.39%	60	0.137	0.25	1.23
2001	221	37.5	15 - 67	23.5	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23	-	10/24	20.36%	45	0.146	0.25	1.31
2002	200	35.2	15 - 69	24.5	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17	-	9/24	16.50%	33	0.043	0.29	0.39
2003	206	38.0	16 - 61	18.9	13.4 - 25.1	32.04	27.43 - 34.33	7/21	6/3	-	9/22	20.87%	43	0.226	0.26	2.03
2004	256	36.9	15 - 69	21.3	16.8 - 25.8	32.32	29.99 - 33.97	6/25	5/5	-	10/28	19.14%	49	0.108	0.25	0.97
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	25.09%	73	0.165	0.22	1.48
2006	274	37.4	15 - 69	22.5	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	20.80%	57	0.080	0.22	0.72
2007	310	36.9	15 - 69	23.4	15.3 - 28.9	32.16	27.33 - 34.33	7/19	5/21	-	9/24	17.10%	53	0.073	0.24	0.66
2008	286	36.8	15 - 66	21.8	15.2 - 27.2	32.13	27.27 - 34.59	7/9	5/5	-	9/29	20.98%	60	0.109	0.24	0.98
2009	388	35.6	15 - 69	22.6	15.4 - 27.2	32.24	27.27 - 34.6	7/18	5/6	-	10/8	20.36%	79	0.116	0.22	1.04
2010	407	36.8	15 - 69	21.1	12.4 - 29.4	32.21	27.34 - 34.59	7/13	5/4	-	10/13	21.13%	86	0.112	0.21	1.01
2011	436	40.2	15 - 69	21.3	14.8 - 28.8	30.88	27.23 - 34.32	7/24	5/20	-	10/25	11.24%	49	0.038	0.26	0.35

Scamp

Table 62: Chevron trap nominal CPUE and mean lengths for scamp. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	350	34	68	0.109	3.42	1.06	488	53.66
1991	299	35	54	0.114	3.16	1.10	520	64.27
1992	315	34	53	0.101	3.46	0.98	513	64.04
1993	410	35	74	0.114	3.52	1.11	467	48.85
1994	454	37	127	0.168	2.76	1.63	498	39.91
1995	523	32	117	0.136	3.49	1.32	498	41.64
1996	453	39	66	0.086	4.05	0.84	471	52.60
1997	440	39	164	0.221	2.86	2.15	469	33.07
1998	513	41	120	0.136	3.65	1.32	490	40.43
1999	253	34	46	0.111	4.02	1.07	485	65.05
2000	325	37	60	0.115	2.93	1.12	517	60.55
2001	245	39	53	0.134	3.08	1.30	482	60.22
2002	238	34	29	0.074	4.08	0.72	483	82.14
2003	218	40	41	0.105	3.38	1.02	431	61.41
2004	270	39	43	0.097	3.11	0.94	458	63.61
2005	325	37	60	0.112	3.49	1.08	499	58.42
2006	296	38	17	0.039	5.66	0.37	446	100.47
2007	325	38	60	0.117	3.14	1.14	537	62.88
2008	303	38	13	0.028	5.78	0.27	533	138.53
2009	401	36	16	0.025	6.60	0.24	551	127.98
2010	420	38	15	0.023	5.88	0.22	496	119.33
2011	655	40	26	0.025	5.55	0.24	564	101.51

Table 63: Chevron trap delta-GLM standardized CPUE for scamp and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23 - 8/9	8.47%	26	0.063	0.24	0.90
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11 - 9/24	9.33%	25	0.085	0.24	1.21
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31 - 8/13	10.07%	29	0.085	0.23	1.21
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	10.49%	43	0.088	0.20	1.26
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	17.97%	71	0.103	0.17	1.47
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	13.09%	47	0.133	0.19	1.89
1996	356	38.8	15 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29 - 9/16	10.39%	37	0.079	0.21	1.13
1997	391	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21 - 9/29	16.37%	64	0.146	0.17	2.07
1998	449	41.9	15 - 92	20.7	9.5 - 28.6	32.08	27.44 - 34.59	6/26	3/31 - 8/18	10.91%	49	0.077	0.20	1.10
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2 - 9/28	9.78%	18	0.078	0.30	1.12
2000	258	37.6	15 - 109	24.0	18.0 - 28.5	32.19	28.95 - 34.28	7/19	5/16 - 10/19	15.12%	39	0.082	0.21	1.17
2001	227	38.9	15 - 91	23.4	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23 - 10/24	13.22%	30	0.065	0.23	0.93
2002	204	36.3	15 - 94	24.3	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17 - 9/24	8.82%	18	0.066	0.30	0.94
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3 - 9/22	11.32%	24	0.093	0.27	1.32
2004	270	39.2	15 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5 - 10/28	11.48%	31	0.082	0.22	1.17
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3 - 10/19	10.31%	30	0.068	0.24	0.97
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6 - 9/28	3.57%	10	0.020	0.36	0.28
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21 - 9/24	11.60%	37	0.062	0.21	0.88
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5 - 9/30	3.07%	9	0.014	0.37	0.21
2009	395	36.5	15 - 91	22.5	15.4 - 27.2	32.24	27.27 - 34.6	7/19	5/6 - 10/8	2.78%	11	0.015	0.34	0.21
2010	415	37.7	15 - 92	21.1	12.4 - 29.4	32.21	27.34 - 34.59	7/14	5/4 - 10/13	3.13%	13	0.016	0.30	0.23
2011	458	42.0	15 - 93	21.3	14.8 - 28.8	30.93	27.23 - 34.32	7/23	5/20 - 10/25	4.15%	19	0.023	0.25	0.33

Table 64: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for scamp and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	307	33.6	17 - 93	21.9	18.2 - 27.8	32.52	30.42 - 33.82	5/27	4/23	-	8/9	8.47%	26	0.062	0.24	0.90
1991	268	33.5	17 - 95	24.9	15.9 - 27.7	32.65	30.75 - 34.61	8/4	6/11	-	9/24	9.33%	25	0.084	0.24	1.20
1992	288	34.0	17 - 62	21.3	15.3 - 24.5	32.77	30.42 - 34.32	6/2	3/31	-	8/13	10.07%	29	0.083	0.23	1.20
1993	410	35.2	16 - 94	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10	-	8/13	10.49%	43	0.087	0.21	1.25
1994	395	39.1	16 - 93	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9	-	10/26	17.97%	71	0.102	0.17	1.46
1995	359	34.1	16 - 60	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3	-	10/26	13.09%	47	0.131	0.19	1.89
1996	356	38.8	15 - 100	21.7	14.2 - 27.0	32.19	27.92 - 34.32	7/5	4/29	-	9/16	10.39%	37	0.078	0.21	1.13
1997	392	39.3	15 - 96	22.6	16.8 - 28.0	32.00	27.87 - 34.59	7/8	4/21	-	9/29	16.33%	64	0.144	0.17	2.07
1998	449	41.9	15 - 92	20.7	9.5 - 28.6	32.08	27.44 - 34.59	6/26	3/31	-	8/18	10.91%	49	0.076	0.20	1.10
1999	184	35.5	15 - 75	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2	-	9/28	9.78%	18	0.077	0.30	1.11
2000	258	37.6	15 - 109	24.0	18.0 - 28.5	32.19	28.95 - 34.28	7/19	5/16	-	10/19	15.12%	39	0.081	0.22	1.17
2001	227	38.9	15 - 91	23.4	16.0 - 29.2	32.31	27.87 - 34.28	7/23	5/23	-	10/24	13.22%	30	0.065	0.23	0.93
2002	204	36.3	15 - 94	24.3	15.2 - 28.3	32.06	27.86 - 33.94	7/27	6/17	-	9/24	8.82%	18	0.065	0.30	0.94
2003	212	39.5	16 - 92	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/22	6/3	-	9/22	11.32%	24	0.092	0.27	1.32
2004	270	39.2	15 - 91	21.1	16.8 - 25.8	32.31	29.99 - 33.97	6/23	5/5	-	10/28	11.48%	31	0.081	0.23	1.16
2005	291	37.0	15 - 69	23.0	18.0 - 28.5	32.09	27.33 - 34.32	7/14	5/3	-	10/19	10.31%	30	0.067	0.24	0.97
2006	280	38.5	15 - 94	22.4	15.0 - 26.7	32.21	27.27 - 34.39	7/21	6/6	-	9/28	3.57%	10	0.019	0.36	0.28
2007	319	38.2	15 - 92	23.2	15.3 - 28.9	32.16	27.33 - 34.33	7/20	5/21	-	9/24	11.60%	37	0.061	0.21	0.88
2008	293	38.0	15 - 92	21.9	15.2 - 27.2	32.13	27.27 - 34.59	7/10	5/5	-	9/30	3.07%	9	0.014	0.37	0.21
2009	395	36.5	15 - 91	22.5	15.4 - 27.2	32.24	27.27 - 34.6	7/19	5/6	-	10/8	2.78%	11	0.014	0.34	0.21
2010	414	37.7	15 - 92	21.1	12.4 - 29.4	32.20	27.34 - 34.59	7/14	5/4	-	10/13	3.14%	13	0.016	0.30	0.23
2011	256	40.6	15 - 93	21.8	15.0 - 28.8	31.80	27.23 - 34.32	7/24	5/20	-	10/25	5.86%	15	0.027	0.29	0.39

Table 65: Short bottom longline nominal CPUE and mean lengths for scamp. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	5	85	1	0.114	0.33	2.24	460	–
1997	0	–	–	–	–	–	–	–
1998	0	–	–	–	–	–	–	–
1999	28	88	22	0.450	1.30	1.37	582	18.9
2000	8	93	2	0.106	0.31	2.83	510	90.0
2001	10	89	32	1.915	5.52	0.70	569	16.2
2002	19	86	9	0.297	0.86	2.24	526	12.3
2003	17	98	8	0.271	0.78	1.92	494	17.9
2004	25	91	14	0.354	1.02	1.47	382	69.4
2005	43	82	10	0.135	0.39	2.26	529	18.0
2006	51	63	22	0.266	0.77	1.90	578	32.0
2007	47	83	28	0.367	1.06	1.45	561	17.9
2008	21	60	5	0.153	0.44	2.28	612	35.1
2009	34	78	9	0.164	0.47	2.33	591	20.6
2010	36	84	5	0.074	0.21	3.01	610	16.1
2011	37	79	12	0.189	0.54	2.13	662	14.5

Table 66: Short bottom longline delta-GLM standardized CPUE for scamp and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

		Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	**Included Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**% Positive**	**n**	**CPUE**	**CV**	**Normalized**
1996	5	85.2	73-94	19.6	17.7-20.8	32.19	32.08-32.26	20.00	1	–	–	–
1997*	0	–	–	–	–	–	–	–	–	–	–	–
1998*	0	–	–	–	–	–	–	–	–	–	–	–
1999	22	90.9	73-112	19.6	18.5-21.2	33.69	33.19-34.19	45.45	10	0.376	0.36	0.90
2000	5	83.6	70-92	23.7	23.7-23.7	33.90	33.90-33.91	20.00	1	–	–	–
2001	6	98.5	88-109	18.5	18.0-19.0	34.23	34.23-34.24	100.00	6	2.456	0.23	5.90
2002	19	85.8	71-113	17.4	16.4-18.6	32.90	32.08-33.36	21.05	4	0.296	0.52	0.71
2003	17	98.4	88-113	15.5	14.1-17.3	32.86	32.25-33.21	29.41	5	0.174	0.51	0.42
2004	12	82.5	72-91	18.3	18.1-18.5	32.17	32.08-32.26	25.00	3	0.178	0.56	0.43
2005	43	82.2	46-109	19.4	15.2-28.1	32.78	30.04-33.85	18.60	8	0.127	0.35	0.30
2006	51	63.1	25-109	18.6	13.9-21.5	32.21	27.86-34.20	25.49	13	0.315	0.26	0.76
2007	47	83.4	45-106	20.6	16.1-24.2	33.14	30.04-33.86	40.43	19	0.328	0.24	0.79
2008	21	59.5	45-79	23.5	20.4-25.9	32.26	32.07-32.45	19.05	4	0.237	0.47	0.57
2009	39	74.6	48-107	19.5	16.4-24.6	32.65	31.24-34.16	17.95	7	0.174	0.38	0.42
2010	36	84.4	45-114	16.5	13.6-18.9	32.72	30.43-33.83	11.11	4	0.066	0.51	0.16
2011	24	73.0	45-112	17.3	15.4-19.9	33.13	32.07-34.19	29.17	7	0.269	0.35	0.65

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for scamp

Snowy Grouper

Table 67: Chevron trap nominal CPUE and mean lengths for snowy grouper. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	124	47	9	0.039	5.88	0.76	398	126.64
1991	127	46	1	0.008	11.27	0.15	410	–
1992	113	45	0	0.000	–	0.00	–	–
1993	195	47	19	0.052	9.03	1.00	447	94.82
1994	236	48	59	0.153	6.07	2.94	443	52.38
1995	186	46	0	0.000	–	0.00	–	–
1996	219	50	46	0.125	4.29	2.40	443	59.49
1997	233	55	47	0.117	5.58	2.24	449	59.65
1998	288	53	22	0.040	6.34	0.76	421	82.70
1999	101	49	3	0.021	5.76	0.41	417	265.24
2000	148	52	4	0.015	9.44	0.28	463	240.34
2001	130	50	39	0.187	3.46	3.59	439	64.07
2002	84	50	18	0.149	4.47	2.85	384	83.93
2003	124	50	18	0.069	4.72	1.32	393	85.87
2004	152	50	17	0.072	4.81	1.38	441	99.17
2005	152	49	4	0.017	7.60	0.32	425	220.88
2006	136	52	10	0.046	4.31	0.88	564	169.24
2007	161	51	11	0.042	5.93	0.81	484	137.69
2008	147	50	2	0.008	8.55	0.16	330	297.06
2009	178	50	6	0.020	6.12	0.39	458	184.49
2010	189	51	13	0.042	5.17	0.81	457	118.73
2011	370	51	18	0.029	6.71	0.56	536	116.91

Table 68: Chevron trap delta-GLM standardized CPUE for snowy grouper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Positive	n	CPUE	CV	Normalized
1990	108	47.7	35 - 93	21.7	18.2 - 24.2	32.37	30.42 - 33.75	6/6	4/23 - 8/6	4.63%	5	0.048	0.69	1.78
1990*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
1991*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
1993	195	46.8	35 - 94	21.0	17.7 - 24.3	32.27	30.43 - 32.87	6/15	5/11 - 8/12	1.54%	3	0.028	0.75	1.02
1994	234	48.2	35 - 93	22.0	18.1 - 24.1	32.26	30.74 - 32.87	6/13	5/10 - 8/10	3.85%	9	0.071	0.62	2.59
1995*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
1996	173	51.4	35 - 100	20.3	14.2 - 26.5	31.65	27.92 - 32.86	7/2	5/2 - 9/12	6.36%	11	0.028	0.67	1.01
1997	204	55.9	35 - 218	21.8	15.3 - 27.3	31.58	28.27 - 34.28	7/15	5/5 - 9/16	7.35%	15	0.011	0.50	0.41
1998	257	53.1	35 - 92	19.0	9.5 - 26.8	31.74	28.28 - 34.23	6/21	3/31 - 8/18	3.11%	8	0.005	0.63	0.19
1999	77	48.9	41 - 75	21.2	19.5 - 25.6	31.64	27.27 - 32.68	7/29	7/13 - 9/28	3.90%	3	0.006	1.05	0.23
2000*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2001	120	50.4	35 - 91	22.4	17.4 - 26.1	32.23	30.52 - 33.97	7/22	5/23 - 9/20	10.00%	12	0.120	0.57	4.40
2002	84	50.3	36 - 94	22.1	15.2 - 27.2	31.58	28.95 - 33.94	7/15	6/18 - 9/24	5.95%	5	0.074	0.59	2.72
2003	118	50.0	35 - 92	18.4	13.4 - 21.8	31.72	28.95 - 32.89	7/23	6/3 - 8/28	5.08%	6	0.021	0.57	0.75
2004	152	50.1	35 - 91	19.1	16.8 - 24.0	31.95	29.99 - 33.96	6/9	5/5 - 7/21	5.92%	9	0.010	0.72	0.37
2005	129	49.9	35 - 69	23.1	18.0 - 28.5	31.82	28.95 - 33.96	7/26	5/4 - 9/29	1.55%	2	0.020	0.89	0.72
2006	131	51.8	36 - 94	19.7	15.0 - 23.5	31.84	27.27 - 32.89	7/13	6/6 - 9/27	6.11%	8	0.012	0.69	0.45
2007	155	51.2	35 - 92	21.9	16.1 - 25.4	31.96	28.95 - 34.28	7/16	5/22 - 9/12	3.87%	6	0.008	0.77	0.28
2008	141	50.0	35 - 92	21.6	15.2 - 27.2	31.76	27.27 - 32.88	7/21	5/6 - 9/30	1.42%	2	0.007	1.01	0.27
2009	178	50.1	35 - 91	21.7	15.4 - 27.2	31.79	27.27 - 33.96	7/21	5/7 - 9/30	2.81%	5	0.005	0.73	0.20
2010	189	51.4	35 - 92	20.5	12.4 - 29.4	31.84	28.95 - 33.97	7/22	5/5 - 9/24	4.76%	9	0.012	0.69	0.45
2011	282	51.7	35 - 93	19.9	14.8 - 28.0	30.65	27.27 - 33.93	7/20	5/21 - 9/22	2.84%	8	0.004	0.52	0.14

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for snowy grouper

Table 69: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for snowy grouper and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	108	47.7	35 - 93	21.7	18.2 - 24.2	32.37	30.42 - 33.75	6/6	4/23	-	8/6	4.63%	5	0.048	0.68	1.73
1991*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
1992*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
1993	195	46.8	35 - 94	21.0	17.7 - 24.3	32.27	30.43 - 32.87	6/15	5/11	-	8/12	1.54%	3	0.028	0.75	1.00
1994	234	48.2	35 - 93	22.0	18.1 - 24.1	32.26	30.74 - 32.87	6/13	5/10	-	8/10	3.85%	9	0.071	0.62	2.56
1995*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
1996	173	51.4	35 - 100	20.3	14.2 - 26.5	31.65	27.92 - 32.86	7/2	5/2	-	9/12	6.36%	11	0.028	0.66	1.00
1997	204	55.9	35 - 218	21.8	15.3 - 27.3	31.58	28.27 - 34.28	7/15	5/5	-	9/16	7.35%	15	0.011	0.50	0.41
1998	257	53.1	35 - 92	19.0	9.5 - 26.8	31.74	28.28 - 34.23	6/21	3/31	-	8/18	3.11%	8	0.005	0.63	0.19
1999	77	48.9	41 - 75	21.2	19.5 - 25.6	31.64	27.27 - 32.68	7/29	7/13	-	9/28	3.90%	3	0.006	1.05	0.23
2000*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2001	120	50.4	35 - 91	22.4	17.4 - 26.1	32.23	30.52 - 33.97	7/22	5/23	-	9/20	10.00%	12	0.125	0.57	4.49
2002	84	50.3	36 - 94	22.1	15.2 - 27.2	31.58	28.95 - 33.94	7/15	6/18	-	9/24	5.95%	5	0.074	0.59	2.67
2003	118	50.0	35 - 92	18.4	13.4 - 21.8	31.72	28.95 - 32.89	7/23	6/3	-	8/28	5.08%	6	0.021	0.57	0.77
2004	152	50.1	35 - 91	19.1	16.8 - 24.0	31.95	29.99 - 33.96	6/9	5/5	-	7/21	5.92%	9	0.010	0.72	0.37
2005	129	49.9	35 - 69	23.1	18.0 - 28.5	31.82	28.95 - 33.96	7/26	5/4	-	9/29	1.55%	2	0.020	0.89	0.73
2006	131	51.8	36 - 94	19.7	15.0 - 23.5	31.84	27.27 - 32.89	7/13	6/6	-	9/27	6.11%	8	0.013	0.69	0.46
2007	155	51.2	35 - 92	21.9	16.1 - 25.4	31.96	28.95 - 34.28	7/16	5/22	-	9/12	3.87%	6	0.007	0.77	0.26
2008	141	50.0	35 - 92	21.6	15.2 - 27.2	31.76	27.27 - 32.88	7/21	5/6	-	9/30	1.42%	2	0.008	1.01	0.28
2009	178	50.1	35 - 91	21.7	15.4 - 27.2	31.79	27.27 - 33.96	7/21	5/7	-	9/30	2.81%	5	0.005	0.72	0.19
2010	189	51.4	35 - 92	20.5	12.4 - 29.4	31.84	28.95 - 33.97	7/22	5/5	-	9/24	4.76%	9	0.013	0.69	0.46
2011	138	53.9	36 - 93	20.4	15.0 - 27.4	31.53	27.27 - 33.93	7/19	5/24	-	9/22	5.80%	8	0.005	0.55	0.18

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for snowy grouper

Table 70: Short bottom longline nominal CPUE and mean lengths for snowy grouper. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	15	167	7	0.297	0.58	1.36	517	46.8
1997	33	193	38	0.664	1.29	1.62	651	19.8
1998	31	191	27	0.519	1.01	1.98	636	24.3
1999	39	115	33	0.469	0.91	1.92	584	19.8
2000	34	160	34	0.564	1.10	1.76	594	27.9
2001	29	158	42	0.866	1.69	1.19	598	20.7
2002	19	86	27	0.775	1.51	1.32	469	14.7
2003	54	161	52	0.500	0.97	1.31	563	18.0
2004	34	119	9	0.178	0.35	2.97	520	16.6
2005	55	102	35	0.368	0.72	2.00	575	21.9
2006	81	115	31	0.230	0.45	2.67	602	24.2
2007	55	99	13	0.148	0.29	3.55	675	22.7
2008	41	122	61	0.847	1.65	1.44	684	13.8
2009	40	96	21	0.290	0.56	3.11	692	25.7
2010	71	136	84	0.675	1.31	1.46	671	14.4
2011	84	141	125	0.833	1.62	1.47	715	12.1

Table 71: Short bottom longline delta-GLM standardized CPUE for snowy grouper and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**% Positive**	**n**	**CPUE**	**CV**	**Normalized**
1996	12	155.6	73-220	14.2	7.9-20.8	32.41	32.08-32.73	33.33	4	0.230	0.69	0.51
1997	33	193.2	181-209	15.6	14.3-16.3	32.64	32.54-32.74	42.42	14	0.395	0.34	0.87
1998	24	190.5	174-205	11.3	8.9-15.4	32.68	32.54-32.87	50.00	12	0.386	0.36	0.85
1999	33	121.3	73-198	18.2	14.5-21.2	33.36	32.54-34.19	39.39	13	0.520	0.32	1.15
2000	30	166.6	70-198	15.6	12.8-23.7	32.92	32.54-33.91	46.67	14	0.361	0.30	0.80
2001	19	162.1	88-200	15.0	11.2-18.5	33.16	32.54-34.24	47.37	9	0.522	0.33	1.15
2002	19	85.8	71-113	17.4	16.4-18.6	32.90	32.08-33.36	52.63	10	0.983	0.26	2.17
2003	54	161.3	88-210	12.8	10.8-17.2	32.73	32.25-33.21	46.30	25	0.459	0.22	1.01
2004	21	131.6	72-215	15.5	11.6-18.4	32.15	32.08-32.26	19.05	4	0.237	0.64	0.52
2005	55	102.5	46-208	18.3	13.6-28.0	32.78	30.04-33.85	32.73	18	0.461	0.22	1.02
2006	81	115.5	46-219	15.5	9.8-21.4	32.54	28.95-34.20	16.05	13	0.239	0.31	0.53
2007	49	88.0	45-201	20.2	12.5-24.1	33.13	30.04-33.86	4.08	2	0.182	0.68	0.40
2008	41	122.1	45-198	19.4	15.1-25.8	32.46	32.07-32.74	48.78	20	0.870	0.21	1.92
2009	45	90.9	48-200	18.6	12.9-24.5	32.64	31.24-34.16	11.11	5	0.410	0.45	0.91
2010	65	130.6	45-205	14.5	10.2-18.9	32.68	30.43-33.83	46.15	30	0.548	0.18	1.21
2011	39	116.6	45-227	14.8	8.6-19.9	32.94	32.07-34.19	25.64	10	0.440	0.34	0.97

Speckled Hind

Table 72: Chevron trap nominal CPUE and mean lengths for speckled hind. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	306	36	5	0.009	7.80	0.87	328	147.74
1991	253	37	1	0.002	15.91	0.21	430	–
1992	283	35	3	0.007	12.40	0.67	473	301.27
1993	330	39	5	0.010	9.44	1.00	292	131.51
1994	356	42	4	0.007	13.41	0.66	288	149.65
1995	350	38	0	0.000	–	0.00	–	–
1996	396	41	5	0.007	10.29	0.75	334	150.32
1997	393	42	9	0.013	8.64	1.34	396	125.88
1998	456	44	5	0.006	9.54	0.65	440	198.06
1999	183	40	5	0.016	6.01	1.65	362	163.02
2000	259	42	16	0.041	6.21	4.06	380	88.31
2001	204	43	7	0.021	6.54	2.09	357	131.29
2002	170	40	13	0.041	4.61	4.08	394	102.33
2003	183	43	6	0.020	7.98	1.98	417	167.74
2004	210	45	3	0.008	10.70	0.85	380	241.90
2005	261	41	2	0.004	16.16	0.43	455	409.50
2006	236	42	0	0.000	–	0.00	–	–
2007	259	43	8	0.020	10.33	2.04	366	124.60
2008	254	41	1	0.003	15.94	0.25	560	–
2009	304	41	0	0.000	–	0.00	–	–
2010	332	42	1	0.002	18.22	0.17	580	–
2011	559	44	2	0.002	16.70	0.24	515	463.51

Table 73: Chevron trap delta-GLM standardized CPUE for speckled hind and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date		Delta-GLM Standardized CPUE				
Year	**Collections**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Avg.**	**Range**	**Positive**	**n**	**CPUE**	**CV**	**Normalized**
1990	263	36.0	25 - 93	22.2	18.2 - 27.5	32.48	30.42 - 33.82	5/31	4/23 - 8/6	1.52%	4	0.006	0.66	0.32
1991*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
1992	262	35.3	25 - 62	21.6	16.2 - 24.5	32.76	30.42 - 34.32	6/4	4/1 - 8/13	0.76%	2	0.010	0.85	0.57
1993	330	39.3	26 - 94	22.1	17.7 - 27.4	32.49	30.43 - 34.32	6/23	5/11 - 8/13	1.21%	4	0.007	0.64	0.36
1994	349	41.8	26 - 93	22.6	18.1 - 26.8	32.35	30.74 - 33.82	6/21	5/10 - 8/11	0.57%	2	0.005	0.80	0.25
1995*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
1996	299	42.0	25 - 100	21.6	14.2 - 27.0	32.02	27.92 - 34.31	7/5	4/29 - 9/16	1.34%	4	0.008	0.66	0.46
1997	350	41.6	25 - 96	22.3	16.8 - 27.5	31.90	27.87 - 34.42	7/6	4/21 - 8/27	1.14%	4	0.007	0.64	0.38
1998	406	44.4	25 - 92	20.4	9.5 - 27.0	32.10	27.44 - 34.32	6/25	3/31 - 8/18	0.99%	4	0.004	0.64	0.20
1999	148	39.0	26 - 75	22.5	19.5 - 27.3	32.34	27.27 - 34.32	7/19	6/2 - 9/28	2.70%	4	0.026	0.60	1.40
2000	206	42.4	25 - 109	23.8	18.0 - 28.1	32.17	28.95 - 34.28	7/6	5/16 - 9/22	4.37%	9	0.055	0.50	3.01
2001	194	42.4	25 - 91	23.0	16.0 - 26.7	32.43	27.87 - 34.28	7/17	5/23 - 9/20	2.58%	5	0.034	0.55	1.88
2002	164	40.4	25 - 94	23.5	15.2 - 27.7	31.92	27.86 - 33.94	7/25	6/18 - 9/24	6.10%	10	0.050	0.46	2.73
2003	177	42.9	25 - 92	18.6	13.4 - 21.8	32.04	27.86 - 34.27	7/23	6/3 - 8/28	2.26%	4	0.037	0.66	2.03
2004	210	44.6	26 - 91	20.5	16.8 - 25.8	32.20	29.99 - 33.97	6/18	5/5 - 8/4	0.95%	2	0.007	0.81	0.36
2005*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2006*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2007	253	42.9	25 - 92	23.1	16.1 - 28.1	32.27	28.95 - 34.3	7/20	5/22 - 9/24	1.19%	3	0.013	0.79	0.71
2008*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2009*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2010*	–	–	–	–	–	–	–	–	– –	–	–	–	–	–
2011	392	45.3	25 - 93	20.9	14.8 - 28.8	30.79	27.27 - 34.31	7/22	5/20 - 10/4	0.51%	2	0.006	0.83	0.33

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for speckled hind

Table 74: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for speckled hind and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	263	36.0	25 - 93	22.2	18.2 - 27.5	32.48	30.42 - 33.82	5/31	4/23	-	8/6	1.52%	4	0.007	0.65	0.29
1991*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
1992	262	35.3	25 - 62	21.6	16.2 - 24.5	32.76	30.42 - 34.32	6/4	4/1	-	8/13	0.76%	2	0.010	0.84	0.42
1993	330	39.3	26 - 94	22.1	17.7 - 27.4	32.49	30.43 - 34.32	6/23	5/11	-	8/13	1.21%	4	0.010	0.62	0.39
1994	349	41.8	26 - 93	22.6	18.1 - 26.8	32.35	30.74 - 33.82	6/21	5/10	-	8/11	0.57%	2	0.006	0.77	0.24
1995*	–	–	–	–	–	–	–	–	–	-	–	–	–	–	–	–
1996	299	42.0	25 - 100	21.6	14.2 - 27.0	32.02	27.92 - 34.31	7/5	4/29	-	9/16	1.34%	4	0.010	0.65	0.40
1997	350	41.6	25 - 96	22.3	16.8 - 27.5	31.90	27.87 - 34.42	7/6	4/21	-	8/27	1.14%	4	0.007	0.64	0.27
1998	406	44.4	25 - 92	20.4	9.5 - 27.0	32.10	27.44 - 34.32	6/25	3/31	-	8/18	0.99%	4	0.005	0.62	0.21
1999	148	39.0	26 - 75	22.5	19.5 - 27.3	32.34	27.27 - 34.32	7/19	6/2	-	9/28	2.70%	4	0.031	0.62	1.25
2000	206	42.4	25 - 109	23.8	18.0 - 28.1	32.17	28.95 - 34.28	7/6	5/16	-	9/22	4.37%	9	0.070	0.46	2.87
2001	194	42.4	25 - 91	23.0	16.0 - 26.7	32.43	27.87 - 34.28	7/17	5/23	-	9/20	2.58%	5	0.055	0.53	2.23
2002	164	40.4	25 - 94	23.5	15.2 - 27.7	31.92	27.86 - 33.94	7/25	6/18	-	9/24	6.10%	10	0.062	0.44	2.54
2003	177	42.9	25 - 92	18.6	13.4 - 21.8	32.04	27.86 - 34.27	7/23	6/3	-	8/28	2.26%	4	0.047	0.70	1.92
2004	210	44.6	26 - 91	20.5	16.8 - 25.8	32.20	29.99 - 33.97	6/18	5/5	-	8/4	0.95%	2	0.007	0.84	0.30
2005*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2006*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2007	253	42.9	25 - 92	23.1	16.1 - 28.1	32.27	28.95 - 34.3	7/20	5/22	-	9/24	1.19%	3	0.017	0.78	0.69
2008*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2009*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2010*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2011*	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for speckled hind

Table 75: Short bottom longline nominal CPUE and mean lengths for speckled hind. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	5	85	0	0.000	0.00	–	–	–
1997	0	–	–	–	–	–	–	–
1998	0	–	–	–	–	–	–	–
1999	28	88	4	0.085	1.27	2.51	558	25.0
2000	8	93	3	0.241	3.57	2.20	430	51.3
2001	10	89	2	0.138	2.05	2.11	530	60.0
2002	19	86	0	0.000	0.00	–	–	–
2003	17	98	0	0.000	0.00	–	–	–
2004	25	91	6	0.159	2.36	2.11	472	11.7
2005	43	82	11	0.144	2.14	2.43	495	21.4
2006	51	63	3	0.034	0.51	5.29	607	63.3
2007	47	83	8	0.107	1.59	3.02	585	19.4
2008	21	60	0	0.000	0.00	–	–	–
2009	39	78	1	0.016	0.24	5.83	420	–
2010	35	84	0	0.000	0.00	–	–	–
2011	37	79	1	0.017	0.26	6.08	640	–

Table 76: Short bottom longline delta-GLM standardized CPUE for speckled hind and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations are based upon the species-specific depth range, as calculated in Table 3. Calculations and variables are defined as in Table 22.

	Included	Depth (m)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996	5	85.2	73-94	32.19	32.08-32.26	0.00	0	–	–	–
1997*	0	–	–	–	–	–	–	–	–	–
1998*	0	–	–	–	–	–	–	–	–	–
1999	28	88.1	59-112	33.34	29.91-34.09	0.14	4	0.088	0.52	0.69
2000	8	93.0	70-114	33.64	33.20-33.91	0.25	2	0.206	0.77	1.61
2001	10	89.4	75-109	33.88	33.34-34.24	0.20	2	0.178	0.77	1.39
2002*	19	85.8	71-113	32.90	32.08-33.36	0.00	0	–	–	–
2003*	17	98.4	88-113	32.86	32.28-33.21	0.00	0			
2004	25	90.9	72-108	33.05	32.08-34.00	0.20	5	0.117	0.44	0.92
2005	43	82.2	46-109	32.78	30.04-33.85	0.16	7	0.148	0.38	1.15
2006	51	63.1	25-109	32.21	27.86-34.20	0.04	2	0.043	0.72	0.34
2007	47	83.4	45-106	33.14	30.04-33.86	0.13	6	0.116	0.42	0.91
2008*	21	59.5	45-79	32.26	32.07-32.45	0.00	0	–	–	–
2009*	39	74.6	48-107	32.65	31.24-34.16	0.03	1	–	–	–
2010*	35	85.3	45-114	32.78	32.07-33.83	0.00	0	–	–	–
2011*	37	79.3	45-113	33.35	32.07-34.19	0.03	1	–	–	–

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for speckled hind

Knobbed Porgy

Table 77: Chevron trap nominal CPUE and mean lengths for knobbed porgy. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	314	35	54	0.099	3.49	0.55	290	35.86
1991	271	36	183	0.440	2.72	2.42	279	18.62
1992	293	35	162	0.339	2.72	1.87	273	19.36
1993	340	38	178	0.328	2.55	1.81	296	20.02
1994	373	39	144	0.230	2.80	1.27	292	22.00
1995	395	36	117	0.181	3.10	1.00	299	24.95
1996	432	38	76	0.102	4.23	0.56	301	31.29
1997	401	40	178	0.263	3.65	1.45	297	20.10
1998	469	42	134	0.169	3.39	0.93	302	23.56
1999	220	37	81	0.216	3.01	1.19	307	30.85
2000	266	39	70	0.155	4.22	0.86	296	32.09
2001	206	41	135	0.406	2.93	2.24	314	24.39
2002	184	37	31	0.099	4.05	0.55	292	47.98
2003	208	39	66	0.175	2.82	0.97	312	34.86
2004	240	40	56	0.143	4.12	0.79	315	38.21
2005	295	39	56	0.111	3.84	0.61	321	38.90
2006	270	38	29	0.070	4.85	0.38	320	54.37
2007	292	39	64	0.142	3.42	0.79	316	35.79
2008	282	38	44	0.104	4.79	0.57	303	41.52
2009	355	38	34	0.061	4.69	0.33	304	47.56
2010	389	38	34	0.056	5.63	0.31	307	48.16
2011	616	41	28	0.029	7.43	0.16	333	57.66

Table 78: Chevron trap delta-GLM standardized CPUE for knobbed porgy and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	271	34.8	22 - 79	22.4	18.2 - 27.8	32.52	30.42 - 33.82	5/31	4/23	-	8/9	8.49%	23	0.022	0.32	0.66
1991	240	34.4	20 - 57	25.0	20.6 - 27.7	32.67	30.75 - 34.61	8/8	6/12	-	9/24	24.17%	58	0.091	0.26	2.68
1992	272	34.9	22 - 62	21.6	16.2 - 24.5	32.79	30.42 - 34.32	6/5	4/1	-	8/13	22.79%	62	0.082	0.26	2.44
1993	340	38.0	20 - 60	22.3	17.7 - 28.2	32.50	30.43 - 34.32	6/23	5/11	-	8/13	23.53%	80	0.081	0.25	2.41
1994	350	40.2	20 - 64	22.7	18.1 - 26.9	32.36	30.74 - 33.82	6/21	5/10	-	10/24	20.86%	73	0.041	0.26	1.22
1995	303	37.1	20 - 60	24.5	20.2 - 27.9	32.36	29.94 - 33.75	7/10	5/4	-	10/26	19.80%	60	0.066	0.26	1.97
1996	335	37.7	21 - 79	22.0	14.2 - 27.0	32.18	27.92 - 34.32	7/8	4/29	-	9/16	11.64%	39	0.030	0.28	0.89
1997	358	39.4	21 - 79	22.5	17.8 - 27.5	31.96	27.87 - 34.42	7/5	4/21	-	8/27	13.69%	49	0.045	0.28	1.34
1998	416	42.4	20 - 79	20.6	9.5 - 28.6	32.06	27.44 - 34.32	6/27	3/31	-	8/18	15.63%	65	0.042	0.26	1.26
1999	174	36.6	20 - 75	22.6	19.5 - 27.3	31.94	27.27 - 34.41	7/18	6/2	-	9/28	14.37%	25	0.033	0.33	0.99
2000	218	39.3	20 - 76	24.1	18.0 - 28.1	32.21	28.95 - 34.28	7/13	5/16	-	10/17	13.30%	29	0.025	0.30	0.73
2001	196	40.2	24 - 67	23.2	16.0 - 26.7	32.39	27.87 - 34.28	7/18	5/23	-	9/20	23.47%	46	0.036	0.29	1.07
2002	178	37.5	22 - 69	24.1	15.2 - 28.3	32.05	27.86 - 33.94	7/28	6/18	-	9/24	7.87%	14	0.023	0.37	0.68
2003	202	38.5	20 - 61	18.8	13.4 - 21.8	32.03	27.43 - 34.33	7/20	6/3	-	8/28	15.35%	31	0.022	0.38	0.65
2004	240	40.2	21 - 75	21.0	16.8 - 25.8	32.36	29.99 - 33.97	6/21	5/5	-	8/4	10.00%	24	0.028	0.35	0.84
2005	272	38.4	21 - 69	22.9	18.0 - 28.5	32.10	27.33 - 34.32	7/10	5/3	-	9/29	12.13%	33	0.019	0.32	0.56
2006	265	38.1	20 - 69	22.4	15.0 - 26.7	32.19	27.27 - 34.39	7/22	6/6	-	9/28	6.42%	17	0.006	0.37	0.17
2007	286	39.2	21 - 73	23.1	15.3 - 28.1	32.18	27.33 - 34.33	7/18	5/22	-	9/24	11.89%	34	0.020	0.29	0.59
2008	272	38.1	20 - 70	21.8	15.2 - 27.2	32.08	27.27 - 34.33	7/11	5/5	-	9/29	7.35%	20	0.010	0.37	0.28
2009	355	37.6	21 - 70	22.6	15.4 - 27.2	32.18	27.27 - 34.39	7/19	5/6	-	10/1	5.92%	21	0.008	0.35	0.25
2010	384	38.3	20 - 71	21.1	12.4 - 29.4	32.16	27.34 - 34.32	7/14	5/4	-	9/24	4.95%	19	0.008	0.36	0.23
2011	438	42.1	21 - 79	21.2	14.8 - 28.8	30.87	27.23 - 34.32	7/23	5/20	-	10/4	0.46%	2	0.003	0.77	0.09

Pinfish

Table 79: Chevron trap nominal CPUE and mean lengths for pinfish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	326	32	170	0.338	11.62	1.52	176	12.20
1991	255	31	36	0.096	6.08	0.43	163	24.76
1992	281	32	175	0.375	5.38	1.68	168	11.44
1993	333	31	23	0.040	5.87	0.18	166	31.79
1994	343	31	10	0.018	8.99	0.08	178	53.40
1995	438	28	61	0.092	4.80	0.41	153	17.83
1996	345	32	179	0.324	10.17	1.46	161	10.84
1997	325	33	485	0.820	6.00	3.69	174	7.11
1998	343	32	434	0.769	3.96	3.45	169	7.33
1999	221	32	62	0.176	4.23	0.79	160	18.42
2000	273	32	119	0.246	4.56	1.11	170	14.09
2001	202	33	170	0.491	3.98	2.20	161	11.13
2002	209	30	80	0.217	6.03	0.97	155	15.64
2003	163	34	18	0.069	4.03	0.31	169	36.87
2004	217	33	85	0.237	4.31	1.06	176	17.27
2005	267	33	139	0.283	6.29	1.27	183	13.99
2006	248	33	81	0.213	6.60	0.96	188	18.95
2007	258	33	8	0.021	7.39	0.10	166	56.55
2008	252	34	22	0.058	8.05	0.26	170	33.39
2009	338	31	107	0.171	6.15	0.77	161	14.07
2010	336	32	33	0.063	5.09	0.28	181	28.79
2011	457	32	118	0.160	9.41	0.72	168	14.03

Table 80: Chevron trap delta-GLM standardized CPUE for pinfish and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (^{o}C)		Latitude (^{o}N)		Date		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Positive	n	CPUE	CV	Normalized
1990	283	31.4	17 - 49	22.1	18.7 - 27.8	32.56	30.74 - 33.82	5/25	4/23 - 8/9	8.13%	23	0.087	0.36	0.80
1991	239	30.7	17 - 49	25.3	20.6 - 27.7	32.69	30.75 - 34.61	8/5	6/11 - 9/24	7.53%	18	0.058	0.39	0.53
1992	254	31.4	17 - 49	21.4	15.3 - 24.5	32.85	30.74 - 34.32	6/4	3/31 - 8/13	11.81%	30	0.250	0.34	2.29
1993	333	30.8	16 - 49	23.3	17.7 - 28.5	32.43	30.74 - 34.32	6/28	5/10 - 8/13	3.90%	13	0.019	0.42	0.17
1994	285	32.8	16 - 49	23.2	18.1 - 26.9	32.35	30.74 - 33.82	6/27	5/9 - 10/26	2.11%	6	0.009	0.54	0.08
1995	285	29.5	16 - 49	24.9	20.2 - 28.3	32.37	31.11 - 33.75	7/21	5/3 - 10/26	8.42%	24	0.028	0.33	0.25
1996	263	31.7	14 - 49	22.8	17.1 - 27.0	32.59	30.74 - 34.32	7/7	4/29 - 9/16	11.03%	29	0.146	0.35	1.34
1997	294	32.6	15 - 49	23.2	18.8 - 28.0	32.22	27.87 - 34.59	7/6	4/21 - 9/29	9.52%	28	0.186	0.35	1.70
1998	292	31.8	14 - 49	22.6	11.5 - 28.6	32.43	27.44 - 34.59	6/25	3/31 - 8/18	15.07%	44	0.397	0.25	3.64
1999	160	32.6	15 - 49	23.2	19.5 - 28.8	31.97	27.27 - 34.41	7/18	6/2 - 9/28	10.63%	17	0.141	0.39	1.29
2000	212	32.6	15 - 49	24.4	20.7 - 28.5	32.28	30.42 - 34.28	7/20	5/16 - 10/19	12.26%	26	0.107	0.34	0.98
2001	188	33.8	14 - 49	24.0	16.0 - 29.2	32.40	27.87 - 34.28	7/24	5/23 - 10/24	11.70%	22	0.189	0.39	1.73
2002	175	32.0	13 - 49	25.0	18.0 - 28.3	32.24	27.86 - 33.94	7/31	6/17 - 9/24	5.71%	10	0.058	0.48	0.53
2003	163	34.5	16 - 49	19.4	13.4 - 25.1	32.35	27.43 - 34.33	7/26	6/3 - 9/22	7.36%	12	0.157	0.37	1.44
2004	217	33.4	14 - 49	21.9	17.3 - 25.8	32.56	30.51 - 33.97	6/26	5/5 - 10/28	11.52%	25	0.163	0.36	1.49
2005	240	32.7	15 - 49	23.3	18.0 - 28.5	32.29	27.33 - 34.32	7/12	5/3 - 10/19	6.67%	16	0.095	0.43	0.87
2006	232	33.6	15 - 49	23.3	15.0 - 26.7	32.36	27.27 - 34.39	7/22	6/6 - 9/28	4.74%	11	0.102	0.44	0.93
2007	252	32.5	15 - 49	23.7	15.3 - 28.9	32.33	27.33 - 34.33	7/23	5/21 - 9/24	2.38%	6	0.016	0.50	0.14
2008	243	33.7	15 - 49	22.2	15.2 - 27.2	32.32	27.27 - 34.59	7/10	5/5 - 9/29	3.70%	9	0.042	0.49	0.39
2009	332	31.7	14 - 49	22.9	17.6 - 27.2	32.45	27.27 - 34.6	7/21	5/6 - 10/8	2.11%	7	0.030	0.54	0.27
2010	331	32.0	14 - 49	21.7	14.8 - 29.4	32.48	27.34 - 34.59	7/13	5/4 - 10/13	5.44%	18	0.044	0.36	0.40
2011	286	32.7	15 - 49	22.3	15.2 - 28.8	31.26	27.23 - 34.32	7/22	5/20 - 10/25	8.74%	25	0.077	0.37	0.70

Red Porgy

Table 81: Chevron trap nominal CPUE and mean lengths for red porgy. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	**Collections**	**Depth**	**n**	**CPUE**	**CV**	**Normalized**	**Avg.**	**SE**
1990	318	35	955	1.791	1.49	1.15	255	7.43
1991	274	36	821	2.056	1.68	1.32	246	7.73
1992	293	35	1107	2.330	1.54	1.50	247	6.70
1993	344	39	722	1.285	1.61	0.83	259	8.69
1994	381	40	1109	1.786	2.02	1.15	267	7.23
1995	395	36	872	1.360	2.10	0.88	235	7.16
1996	443	39	859	1.170	2.01	0.75	269	8.26
1997	410	41	503	0.743	2.27	0.48	281	11.29
1998	478	43	721	0.924	2.24	0.59	267	8.95
1999	220	37	407	1.124	1.83	0.72	274	12.26
2000	277	41	485	1.002	2.05	0.64	289	11.81
2001	212	42	625	1.835	1.82	1.18	290	10.43
2002	188	38	399	1.308	1.94	0.84	275	12.43
2003	214	40	412	1.088	1.91	0.70	292	12.98
2004	246	41	843	2.078	1.68	1.34	285	8.84
2005	295	39	1092	2.294	1.83	1.48	284	7.75
2006	276	39	710	1.654	2.14	1.06	264	8.92
2007	298	40	1111	2.386	1.87	1.53	272	7.36
2008	288	39	520	1.186	2.14	0.76	286	11.30
2009	361	38	511	0.884	2.31	0.57	295	11.76
2010	395	39	686	1.086	1.97	0.70	300	10.32
2011	627	41	1206	1.214	2.43	0.78	302	7.82

Table 82: Chevron trap delta-GLM standardized CPUE for red porgy and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	275	35.5	22 - 93	22.3	18.2 - 27.8	32.52	30.42 - 33.82	5/31	4/23	-	8/9	56.73%	156	1.254	0.12	1.09
1991	243	35.1	20 - 95	24.9	15.9 - 27.7	32.66	30.75 - 34.61	8/8	6/12	-	9/24	53.09%	129	1.528	0.11	1.33
1992	272	34.9	22 - 62	21.6	16.2 - 24.5	32.79	30.42 - 34.32	6/5	4/1	-	8/13	65.44%	178	1.533	0.11	1.33
1993	344	38.6	20 - 94	22.3	17.7 - 28.2	32.50	30.43 - 34.32	6/23	5/11	-	8/13	48.26%	166	0.917	0.11	0.80
1994	358	41.3	20 - 93	22.7	18.1 - 26.9	32.36	30.74 - 33.82	6/22	5/10	-	10/24	45.81%	164	1.016	0.12	0.89
1995	303	37.1	20 - 60	24.5	20.2 - 27.9	32.36	29.94 - 33.75	7/10	5/4	-	10/26	48.18%	146	1.353	0.11	1.18
1996	346	39.5	21 - 100	21.8	14.2 - 27.0	32.18	27.92 - 34.32	7/6	4/29	-	9/16	42.20%	146	1.080	0.12	0.94
1997	367	40.7	21 - 96	22.3	16.8 - 27.5	31.97	27.87 - 34.42	7/5	4/21	-	8/27	30.25%	111	0.504	0.14	0.44
1998	425	43.4	20 - 92	20.6	9.5 - 28.6	32.07	27.44 - 34.32	6/27	3/31	-	8/18	36.00%	153	0.596	0.12	0.52
1999	174	36.6	20 - 75	22.6	19.5 - 27.3	31.94	27.27 - 34.41	7/18	6/2	-	9/28	46.55%	81	1.091	0.14	0.95
2000	224	40.9	20 - 109	23.9	18.0 - 28.1	32.26	28.95 - 34.28	7/12	5/16	-	10/17	37.95%	85	0.789	0.14	0.69
2001	202	41.7	24 - 91	23.0	16.0 - 26.7	32.39	27.87 - 34.28	7/18	5/23	-	9/20	46.53%	94	1.353	0.13	1.18
2002	182	38.7	22 - 94	24.0	15.2 - 28.3	32.06	27.86 - 33.94	7/28	6/18	-	9/24	44.51%	81	1.117	0.14	0.97
2003	208	40.0	20 - 92	18.8	13.4 - 21.8	32.04	27.43 - 34.33	7/21	6/3	-	8/28	40.38%	84	1.133	0.15	0.99
2004	246	41.5	21 - 91	20.9	16.8 - 25.8	32.36	29.99 - 33.97	6/20	5/5	-	8/4	50.41%	124	1.630	0.13	1.42
2005	272	38.4	21 - 69	22.9	18.0 - 28.5	32.10	27.33 - 34.32	7/10	5/3	-	9/29	53.68%	146	1.799	0.10	1.57
2006	271	39.2	20 - 94	22.3	15.0 - 26.7	32.19	27.27 - 34.39	7/22	6/6	-	9/28	42.07%	114	1.287	0.13	1.12
2007	292	40.3	21 - 92	22.9	15.3 - 28.1	32.18	27.33 - 34.33	7/19	5/22	-	9/24	50.68%	148	1.830	0.11	1.59
2008	278	39.2	20 - 92	21.9	15.2 - 27.2	32.09	27.27 - 34.33	7/13	5/5	-	9/30	34.89%	97	1.015	0.14	0.88
2009	361	38.5	21 - 91	22.5	15.4 - 27.2	32.18	27.27 - 34.39	7/21	5/6	-	10/1	30.75%	111	0.662	0.14	0.58
2010	390	39.1	20 - 92	21.0	12.4 - 29.4	32.16	27.34 - 34.32	7/15	5/4	-	9/24	36.92%	144	0.911	0.12	0.79
2011	444	42.8	21 - 93	21.2	14.8 - 28.8	30.89	27.23 - 34.32	7/23	5/20	-	10/4	26.80%	119	0.866	0.14	0.75

Table 83: Excluding SEFIS monitoring stations from analysis, the chevron trap delta-GLM standardized CPUE for red porgy and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	275	35.5	22 - 93	22.3	18.2 - 27.8	32.52	30.42 - 33.82	5/31	4/23	-	8/9	56.73%	156	1.229	0.12	1.08
1991	243	35.1	20 - 95	24.9	15.9 - 27.7	32.66	30.75 - 34.61	8/8	6/12	-	9/24	53.09%	129	1.483	0.12	1.30
1992	272	34.9	22 - 62	21.6	16.2 - 24.5	32.79	30.42 - 34.32	6/5	4/1	-	8/13	65.44%	178	1.505	0.11	1.32
1993	344	38.6	20 - 94	22.3	17.7 - 28.2	32.50	30.43 - 34.32	6/23	5/11	-	8/13	48.26%	166	0.903	0.11	0.79
1994	358	41.3	20 - 93	22.7	18.1 - 26.9	32.36	30.74 - 33.82	6/22	5/10	-	10/24	45.81%	164	0.995	0.12	0.87
1995	303	37.1	20 - 60	24.5	20.2 - 27.9	32.36	29.94 - 33.75	7/10	5/4	-	10/26	48.18%	146	1.326	0.12	1.16
1996	346	39.5	21 - 100	21.8	14.2 - 27.0	32.18	27.92 - 34.32	7/6	4/29	-	9/16	42.20%	146	1.060	0.12	0.93
1997	367	40.7	21 - 96	22.3	16.8 - 27.5	31.97	27.87 - 34.42	7/5	4/21	-	8/27	30.25%	111	0.494	0.14	0.43
1998	425	43.4	20 - 92	20.6	9.5 - 28.6	32.07	27.44 - 34.32	6/27	3/31	-	8/18	36.00%	153	0.593	0.12	0.52
1999	174	36.6	20 - 75	22.6	19.5 - 27.3	31.94	27.27 - 34.41	7/18	6/2	-	9/28	46.55%	81	1.074	0.15	0.94
2000	224	40.9	20 - 109	23.9	18.0 - 28.1	32.26	28.95 - 34.28	7/12	5/16	-	10/17	37.95%	85	0.776	0.14	0.68
2001	202	41.7	24 - 91	23.0	16.0 - 26.7	32.39	27.87 - 34.28	7/18	5/23	-	9/20	46.53%	94	1.346	0.13	1.18
2002	182	38.7	22 - 94	24.0	15.2 - 28.3	32.06	27.86 - 33.94	7/28	6/18	-	9/24	44.51%	81	1.090	0.14	0.96
2003	208	40.0	20 - 92	18.8	13.4 - 21.8	32.04	27.43 - 34.33	7/21	6/3	-	8/28	40.38%	84	1.138	0.15	1.00
2004	246	41.5	21 - 91	20.9	16.8 - 25.8	32.36	29.99 - 33.97	6/20	5/5	-	8/4	50.41%	124	1.605	0.13	1.41
2005	272	38.4	21 - 69	22.9	18.0 - 28.5	32.10	27.33 - 34.32	7/10	5/3	-	9/29	53.68%	146	1.775	0.11	1.56
2006	271	39.2	20 - 94	22.3	15.0 - 26.7	32.19	27.27 - 34.39	7/22	6/6	-	9/28	42.07%	114	1.281	0.13	1.12
2007	292	40.3	21 - 92	22.9	15.3 - 28.1	32.18	27.33 - 34.33	7/19	5/22	-	9/24	50.68%	148	1.822	0.11	1.60
2008	278	39.2	20 - 92	21.9	15.2 - 27.2	32.09	27.27 - 34.33	7/13	5/5	-	9/30	34.89%	97	0.997	0.14	0.88
2009	361	38.5	21 - 91	22.5	15.4 - 27.2	32.18	27.27 - 34.39	7/21	5/6	-	10/1	30.75%	111	0.649	0.14	0.57
2010	389	39.1	20 - 92	21.0	12.4 - 29.4	32.16	27.34 - 34.32	7/15	5/4	-	9/24	37.02%	144	0.903	0.12	0.79
2011	242	42.0	21 - 93	21.6	15.0 - 28.8	31.77	27.23 - 34.32	7/22	5/20	-	10/4	33.06%	80	1.003	0.16	0.88

Table 84: Short bottom longline nominal CPUE and mean lengths for red porgy. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 21.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	Normalized	CV	Avg.	SE
1996	5	85	0	0.000	0.00	–	–	–
1997	0	–	–	–	–	–	–	–
1998	0	–	–	–	–	–	–	–
1999	29	89	4	0.068	1.05	3.20	398	19.7
2000	10	99	3	0.173	2.69	1.62	370	15.3
2001	10	89	0	0.000	0.00	–	–	–
2002	19	86	4	0.123	1.92	2.66	368	15.5
2003	18	99	6	0.196	3.06	1.81	453	21.1
2004	25	91	7	0.191	2.98	2.51	350	18.8
2005	44	83	3	0.039	0.61	3.74	397	17.6
2006	53	65	2	0.024	0.38	5.11	455	35.0
2007	47	83	0	0.000	0.00	–	–	–
2008	21	60	1	0.030	0.47	4.58	360	–
2009	34	78	2	0.040	0.62	4.13	400	30.0
2010	37	85	1	0.013	0.21	6.08	420	–
2011	37	79	0	0.000	0.00	–	–	–

Table 85: Short bottom longline delta-GLM standardized CPUE for red porgy and information associated with short bottom longline sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 22.

	Included	Depth (m)		Latitude (°N)		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	% Positive	n	CPUE	CV	Normalized
1996	5	85.2	73-94	32.19	32.08-32.26	0.00	0	–	–	–
1997*	0	–	–	–	–	–	–	–	–	–
1998*	0	–	–	–	–	–	–	–	–	–
1999	29	89.2	59-121	33.33	29.91-34.19	10.34	3	0.079	0.68	0.66
2000	10	98.5	70-124	33.62	33.20-33.91	30.00	3	0.185	0.71	1.55
2001	10	89.4	75-109	33.88	33.34-34.24	0.00	0			
2002	19	85.8	71-113	32.90	32.08-33.36	15.79	3	0.134	0.76	1.13
2003	18	99.3	88-116	32.88	32.25-33.21	27.78	5	0.184	0.46	1.54
2004	25	90.9	72-108	33.05	32.08-34.00	20.00	5	0.233	0.50	1.95
2005	44	83.0	46-115	32.79	30.04-33.85	6.82	3	0.041	0.60	0.34
2006	53	65.1	25-117	32.25	27.86-34.20	3.77	2	0.046	0.70	0.38
2007*	47	83.4	45-106	33.14	30.04-33.86	0.00	0	–	–	–
2008*	21	59.5	45-79	32.26	32.07-32.45	4.76	1	–	–	–
2009	34	74.6	48-107	32.65	31.24-34.16	5.13	2	0.052	0.76	0.44
2010*	37	85.3	45-116	32.73	30.43-33.83	2.70	1	–	–	–
2011*	37	79.3	45-113	33.35	32.07-34.19	0.00	0	–	–	–

* – Year excluded from delta-GLM standardization of annual CPUE due to insufficient positive gear deployments (n <2) for red porgy

Spottail Pinfish

Table 86: Chevron trap nominal CPUE and mean lengths for spottail pinfish. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

	Included	Avg.		Nominal CPUE (#s)			Length	
Year	Collections	Depth	n	CPUE	CV	Normalized	Avg.	SE
1990	344	33	396	0.709	11.07	3.46	167	7.55
1991	296	34	179	0.368	7.27	1.79	184	12.41
1992	313	34	131	0.255	7.86	1.24	175	13.82
1993	405	35	58	0.088	11.00	0.43	187	22.26
1994	445	36	165	0.248	16.40	1.21	142	10.00
1995	522	32	107	0.131	10.60	0.64	151	13.23
1996	432	36	129	0.188	6.29	0.92	161	12.78
1997	411	37	48	0.069	8.14	0.34	188	24.62
1998	453	37	203	0.281	6.75	1.37	156	9.89
1999	249	34	124	0.308	5.76	1.50	176	14.28
2000	307	34	121	0.252	7.91	1.23	182	14.95
2001	233	36	75	0.206	4.92	1.00	189	19.83
2002	233	32	103	0.259	6.30	1.27	170	15.18
2003	209	38	31	0.086	6.28	0.42	201	33.02
2004	246	36	51	0.132	5.31	0.64	178	22.61
2005	305	35	91	0.177	5.19	0.86	200	18.94
2006	274	35	12	0.027	12.65	0.13	179	48.62
2007	300	35	115	0.222	9.52	1.08	177	14.95
2008	290	36	48	0.103	6.81	0.50	200	26.20
2009	371	33	47	0.071	11.88	0.34	151	20.00
2010	393	35	77	0.120	7.17	0.59	198	20.47
2011	610	38	105	0.111	6.51	0.54	181	15.98

Table 87: Chevron trap delta-GLM standardized CPUE for spottail pinfish and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date		Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Positive	n	CPUE	CV	Normalized
1990	301	32.7	17 - 59	22.0	18.4 - 27.8	32.53	30.42 - 33.82	5/26	4/23 - 8/9	6.64%	20	0.130	0.47	2.54
1991	265	32.8	17 - 57	25.0	20.6 - 27.7	32.65	30.75 - 34.61	8/3	6/11 - 9/24	6.04%	16	0.039	0.51	0.76
1992	286	33.8	17 - 59	21.3	15.3 - 24.5	32.78	30.42 - 34.32	6/2	3/31 - 8/13	6.29%	18	0.087	0.43	1.70
1993	405	34.6	16 - 58	22.8	17.7 - 28.5	32.39	30.43 - 34.32	6/24	5/10 - 8/13	3.21%	13	0.027	0.43	0.52
1994	386	38.0	16 - 59	22.8	18.1 - 26.9	32.34	30.74 - 33.82	6/23	5/9 - 10/26	1.81%	7	0.040	0.71	0.78
1995	358	34.0	16 - 59	24.6	20.2 - 28.3	32.29	29.94 - 33.75	7/16	5/3 - 10/26	3.35%	12	0.042	0.54	0.82
1996	342	36.7	14 - 59	21.9	14.2 - 27.0	32.21	27.92 - 34.32	7/6	4/29 - 9/16	6.43%	22	0.073	0.37	1.42
1997	364	36.4	15 - 58	22.9	18.8 - 28.0	32.06	27.87 - 34.59	7/7	4/21 - 9/29	3.57%	13	0.038	0.46	0.75
1998	395	37.4	14 - 59	21.1	9.5 - 28.6	32.11	27.44 - 34.59	6/23	3/31 - 8/18	5.57%	22	0.064	0.36	1.25
1999	180	34.7	15 - 53	22.9	19.5 - 28.8	31.94	27.27 - 34.41	7/19	6/2 - 9/28	5.56%	10	0.104	0.50	2.04
2000	245	35.1	15 - 57	24.3	20.7 - 28.5	32.11	28.95 - 34.28	7/20	5/16 - 10/19	4.90%	12	0.053	0.48	1.04
2001	214	36.1	14 - 57	23.7	16.0 - 29.2	32.33	27.87 - 34.28	7/24	5/23 - 10/24	9.81%	21	0.102	0.35	1.99
2002	199	34.5	13 - 58	24.6	15.2 - 28.3	32.05	27.86 - 33.94	7/27	6/17 - 9/24	7.04%	14	0.049	0.47	0.97
2003	204	37.8	16 - 55	18.9	13.4 - 25.1	32.05	27.43 - 34.33	7/21	6/3 - 9/22	3.92%	8	0.027	0.56	0.52
2004	246	35.6	14 - 58	21.5	17.1 - 25.8	32.36	29.99 - 33.97	6/26	5/5 - 10/28	5.28%	13	0.040	0.43	0.78
2005	273	35.1	15 - 58	23.0	18.0 - 28.5	32.12	27.33 - 34.32	7/11	5/3 - 10/19	5.13%	14	0.070	0.42	1.38
2006	258	35.5	15 - 59	22.8	15.0 - 26.7	32.24	27.27 - 34.39	7/21	6/6 - 9/28	1.55%	4	0.003	0.65	0.07
2007	294	35.3	15 - 59	23.4	15.3 - 28.9	32.19	27.33 - 34.33	7/21	5/21 - 9/24	2.38%	7	0.041	0.67	0.80
2008	280	36.2	15 - 58	21.8	15.2 - 27.2	32.14	27.27 - 34.59	7/8	5/5 - 9/29	3.21%	9	0.018	0.53	0.36
2009	365	33.6	14 - 57	22.8	17.1 - 27.2	32.30	27.27 - 34.6	7/18	5/6 - 10/8	3.84%	14	0.010	0.42	0.19
2010	388	35.1	14 - 59	21.4	12.4 - 29.4	32.24	27.34 - 34.59	7/17	5/4 - 10/13	3.87%	15	0.029	0.41	0.56
2011	424	39.4	15 - 59	21.3	14.8 - 28.8	30.88	27.23 - 34.32	7/24	5/20 - 10/25	4.01%	17	0.038	0.38	0.74

***Stenotomus* spp.**

Table 88: Chevron trap nominal CPUE and mean lengths for members of the genus *Stenotomus*. Calculations are based upon the species-specific depth range, as calculated in Table 3. Variables are defined as in Table 18.

Year	Included Collections	Avg. Depth	n	Nominal CPUE (#s) CPUE	CV	Normalized	Length Avg.	SE
1990	326	32	3961	7.352	2.07	0.92	152	2.17
1991	255	31	3834	10.076	2.13	1.27	148	2.15
1992	281	32	3989	8.785	2.00	1.10	149	2.12
1993	333	31	2128	3.907	2.89	0.49	148	2.88
1994	343	31	3719	6.769	2.86	0.85	154	2.27
1995	438	28	5977	8.300	2.15	1.04	141	1.64
1996	345	32	5582	10.037	2.33	1.26	153	1.85
1997	325	33	5805	11.146	2.28	1.40	158	1.87
1998	343	32	5587	10.450	1.90	1.31	155	1.91
1999	221	32	3238	9.086	2.06	1.14	154	2.44
2000	273	32	4114	9.187	2.31	1.16	155	2.18
2001	202	33	2862	8.839	2.11	1.11	161	2.78
2002	209	30	1702	5.024	2.86	0.63	157	3.49
2003	163	34	3368	12.391	2.56	1.56	160	2.48
2004	217	33	4199	12.030	2.02	1.51	163	2.28
2005	267	33	4197	9.792	2.44	1.23	171	2.38
2006	248	33	1845	5.001	2.99	0.63	170	3.56
2007	258	33	2215	5.630	2.86	0.71	162	3.10
2008	252	34	2794	7.136	2.71	0.90	164	2.79
2009	338	31	1503	2.771	3.45	0.35	163	3.85
2010	336	32	3146	5.915	4.24	0.74	163	2.64
2011	457	32	2476	3.397	2.50	0.43	166	2.72

Table 89: Chevron trap delta-GLM standardized CPUE for members of the genus *Stenotomus* and information associated with chevron trap sets included in standardized CPUE calculation. Calculations and variables are defined as in Table 8 and Table 19.

	Included	Depth (m)		Temperature (°C)		Latitude (°N)		Date				Delta-GLM Standardized CPUE				
Year	Collections	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range			Positive	n	CPUE	CV	Normalized
1990	283	31.4	17 - 49	22.1	18.7 - 27.8	32.56	30.74 - 33.82	5/25	4/23	-	8/9	43.82%	124	4.890	0.15	0.78
1991	239	30.7	17 - 49	25.3	20.6 - 27.7	32.69	30.75 - 34.61	8/5	6/11	-	9/24	41.42%	99	6.035	0.16	0.96
1992	254	31.4	17 - 49	21.4	15.3 - 24.5	32.85	30.74 - 34.32	6/4	3/31	-	8/13	48.43%	123	5.662	0.15	0.90
1993	333	30.8	16 - 49	23.3	17.7 - 28.5	32.43	30.74 - 34.32	6/28	5/10	-	8/13	26.43%	88	1.894	0.17	0.30
1994	285	32.8	16 - 49	23.2	18.1 - 26.9	32.35	30.74 - 33.82	6/27	5/9	-	10/26	32.28%	92	4.976	0.19	0.79
1995	285	29.5	16 - 49	24.9	20.2 - 28.3	32.37	31.11 - 33.75	7/21	5/3	-	10/26	50.53%	144	6.191	0.14	0.98
1996	263	31.7	14 - 49	22.8	17.1 - 27.0	32.59	30.74 - 34.32	7/7	4/29	-	9/16	47.91%	126	8.557	0.15	1.36
1997	294	32.6	15 - 49	23.2	18.8 - 28.0	32.22	27.87 - 34.59	7/6	4/21	-	9/29	33.67%	99	8.811	0.15	1.40
1998	292	31.8	14 - 49	22.6	11.5 - 28.6	32.43	27.44 - 34.59	6/25	3/31	-	8/18	42.81%	125	10.339	0.13	1.64
1999	160	32.6	15 - 49	23.2	19.5 - 28.8	31.97	27.27 - 34.41	7/18	6/2	-	9/28	36.88%	59	9.038	0.19	1.43
2000	212	32.6	15 - 49	24.4	20.7 - 28.5	32.28	30.42 - 34.28	7/20	5/16	-	10/19	37.26%	79	8.649	0.18	1.37
2001	188	33.8	14 - 49	24.0	16.0 - 29.2	32.40	27.87 - 34.28	7/24	5/23	-	10/24	32.98%	62	8.545	0.17	1.36
2002	175	32.0	13 - 49	25.0	18.0 - 28.3	32.24	27.86 - 33.94	7/31	6/17	-	9/24	31.43%	55	3.362	0.24	0.53
2003	163	34.5	16 - 49	19.4	13.4 - 25.1	32.35	27.43 - 34.33	7/26	6/3	-	9/22	23.31%	38	11.700	0.21	1.86
2004	217	33.4	14 - 49	21.9	17.3 - 25.8	32.56	30.51 - 33.97	6/26	5/5	-	10/28	37.33%	81	9.689	0.15	1.54
2005	240	32.7	15 - 49	23.3	18.0 - 28.5	32.29	27.33 - 34.32	7/12	5/3	-	10/19	33.75%	81	8.585	0.17	1.36
2006	232	33.6	15 - 49	23.3	15.0 - 26.7	32.36	27.27 - 34.39	7/22	6/6	-	9/28	25.43%	59	3.667	0.22	0.58
2007	252	32.5	15 - 49	23.7	15.3 - 28.9	32.33	27.33 - 34.33	7/23	5/21	-	9/24	25.40%	64	4.195	0.19	0.67
2008	243	33.7	15 - 49	22.2	15.2 - 27.2	32.32	27.27 - 34.59	7/10	5/5	-	9/29	23.05%	56	4.886	0.19	0.78
2009	332	31.7	14 - 49	22.9	17.6 - 27.2	32.45	27.27 - 34.6	7/21	5/6	-	10/8	18.67%	62	1.812	0.22	0.29
2010	331	32.0	14 - 49	21.7	14.8 - 29.4	32.48	27.34 - 34.59	7/13	5/4	-	10/13	30.51%	101	4.551	0.19	0.72
2011	286	32.7	15 - 49	22.3	15.2 - 28.8	31.26	27.23 - 34.32	7/22	5/20	-	10/25	31.12%	89	2.619	0.18	0.42

Figures

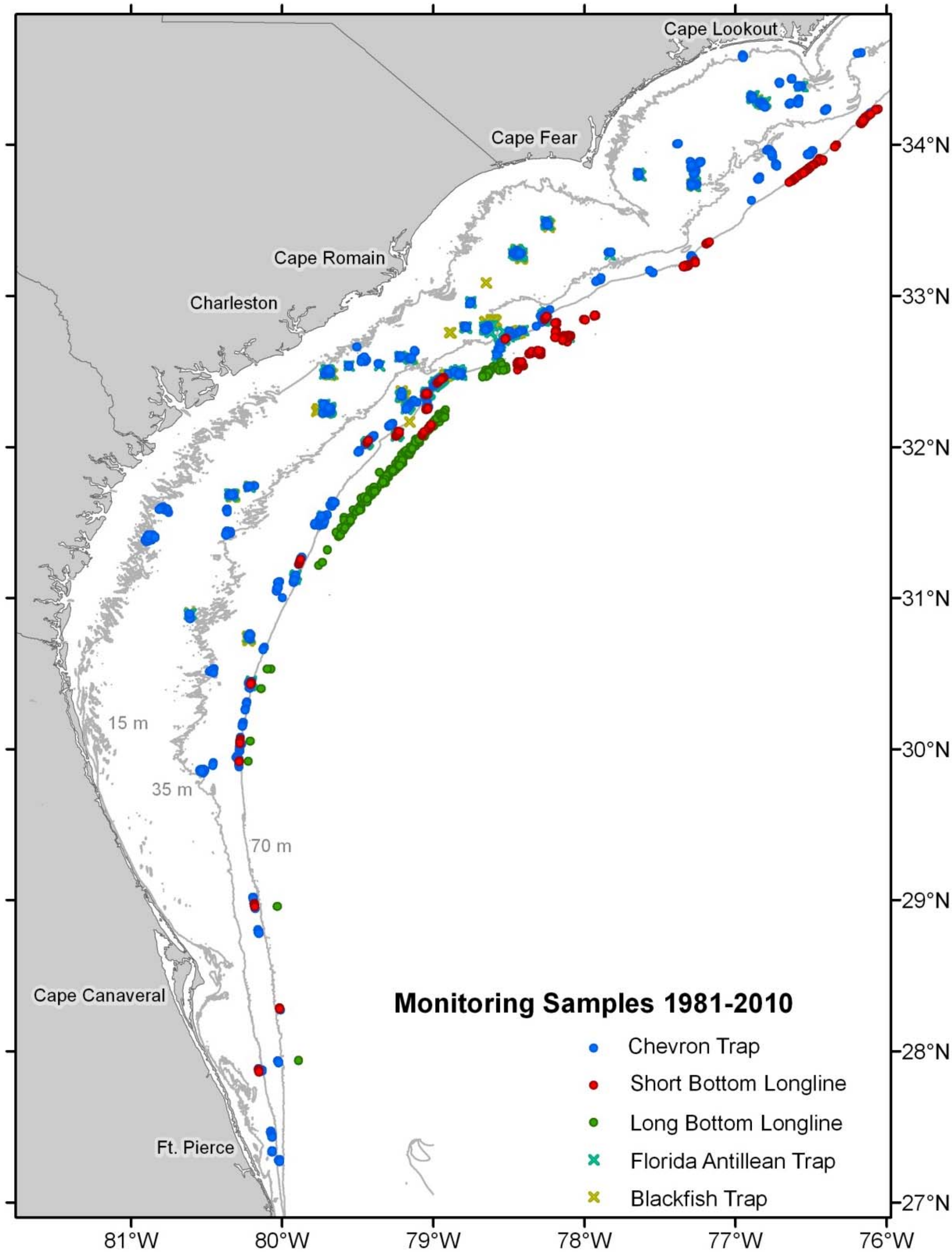

Figure 1: Map of all monitoring stations sampled between 1981 and 2010. Note that each symbol may represent multiple sampling events, possibly within multiple years.

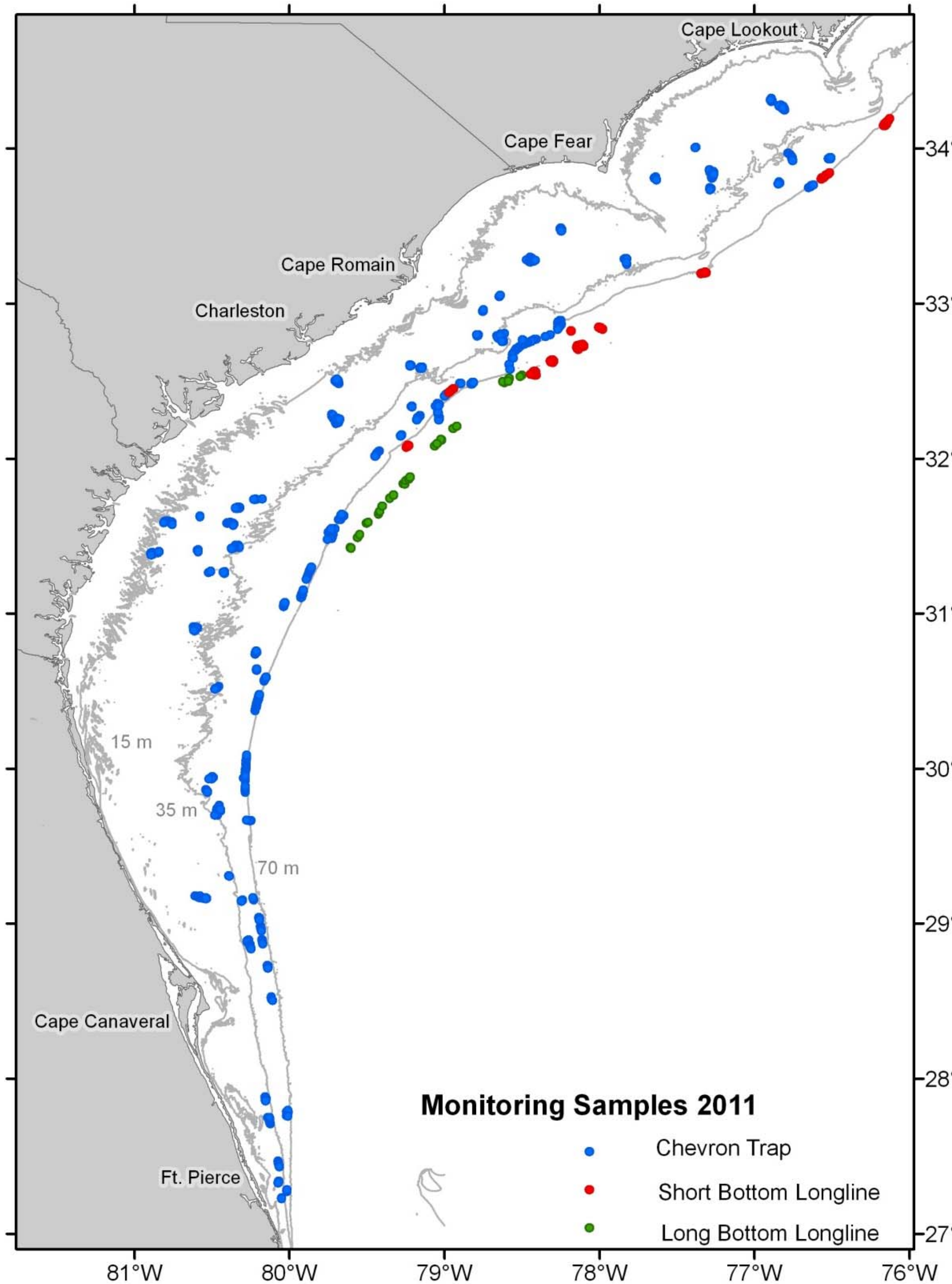

Figure 2: Map of all monitoring stations sampled in 2011, the most recent sampling year. Note that each symbol may represent multiple sampling events.

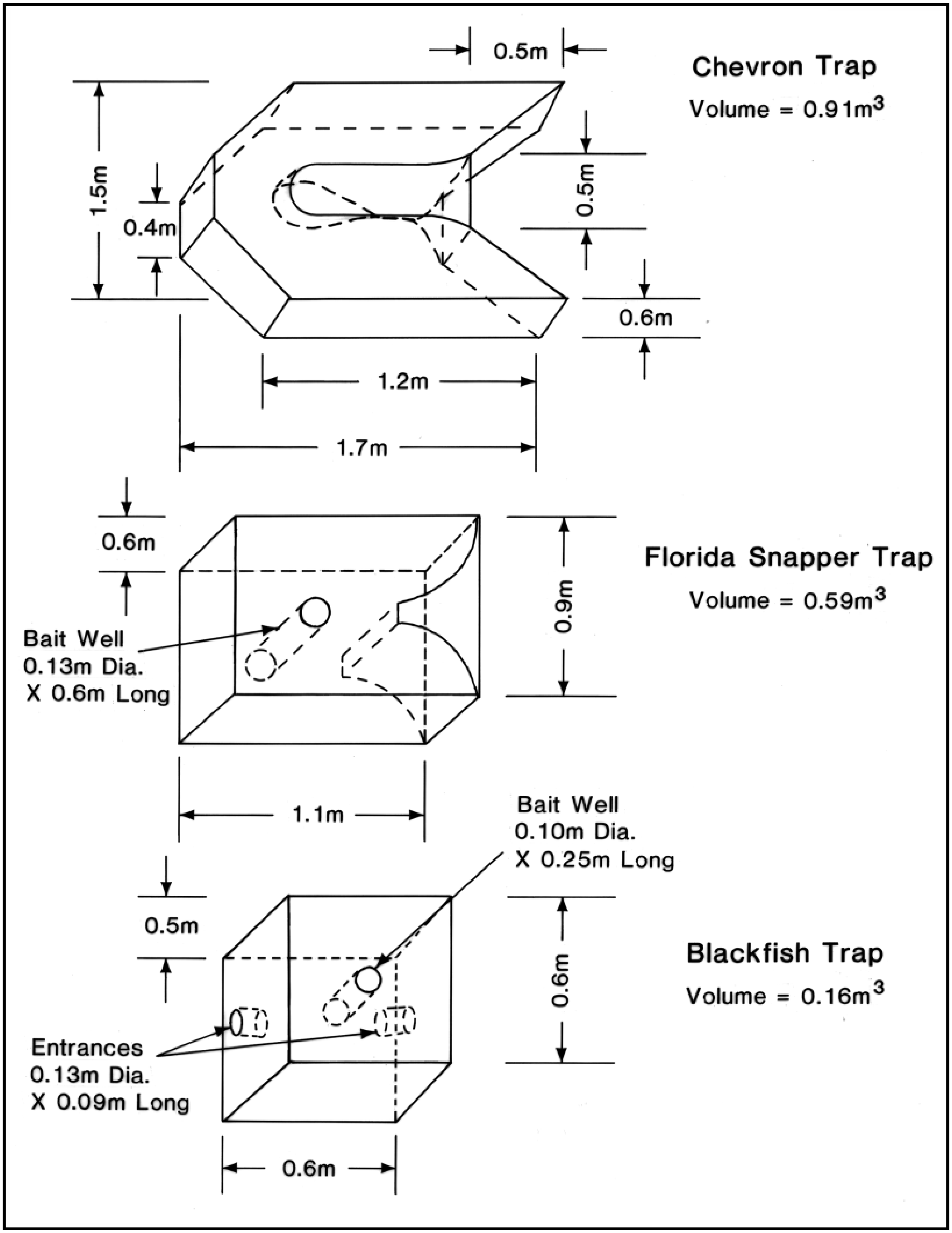

Figure 3: Diagrams of the three trap gears used for monitoring purposes by the SAB Reef Fish Survey from 1981-2011 (from Collins 1990).

Figure 4: Chevron trap baited with menhaden, ready for deployment. Note we use iron sashes to weigh the trap down, thus promoting the proper orientation, and stabilizing the trap, on the bottom.

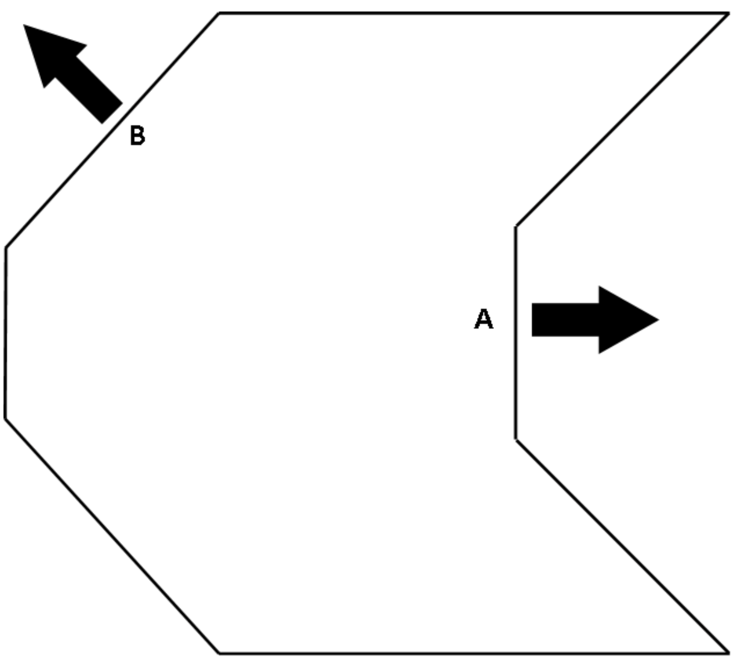

Figure 5: Diagram of a chevron trap, looking down from above, denoting the two possible locations (A and B) of cameras (still and video) placed on the trap. Arrows denote the direction a camera at that position would be facing.

Gray Triggerfish

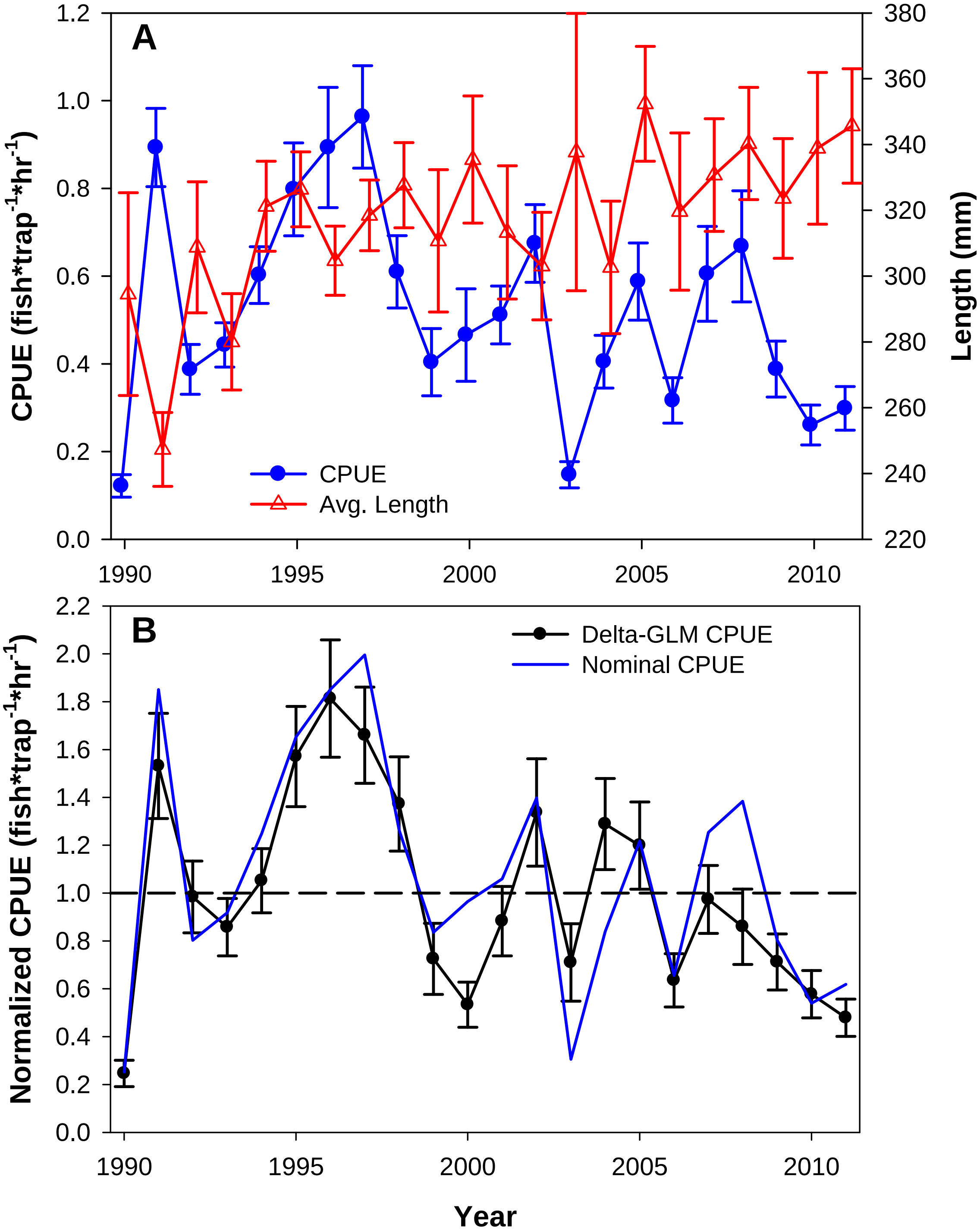

Figure 6: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for gray triggerfish. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for gray triggerfish.

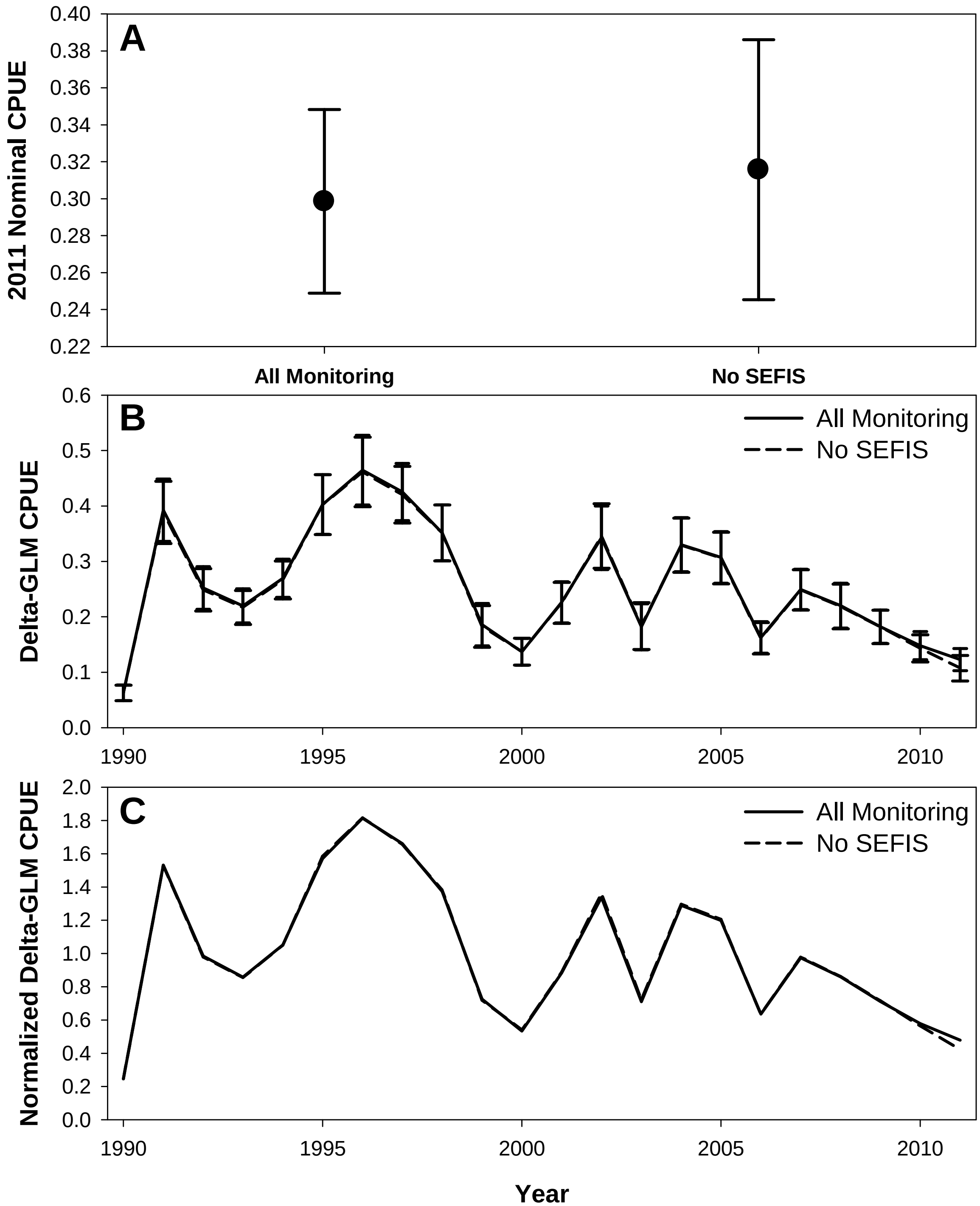

Figure 7: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of gray triggerfish. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

Almaco Jack

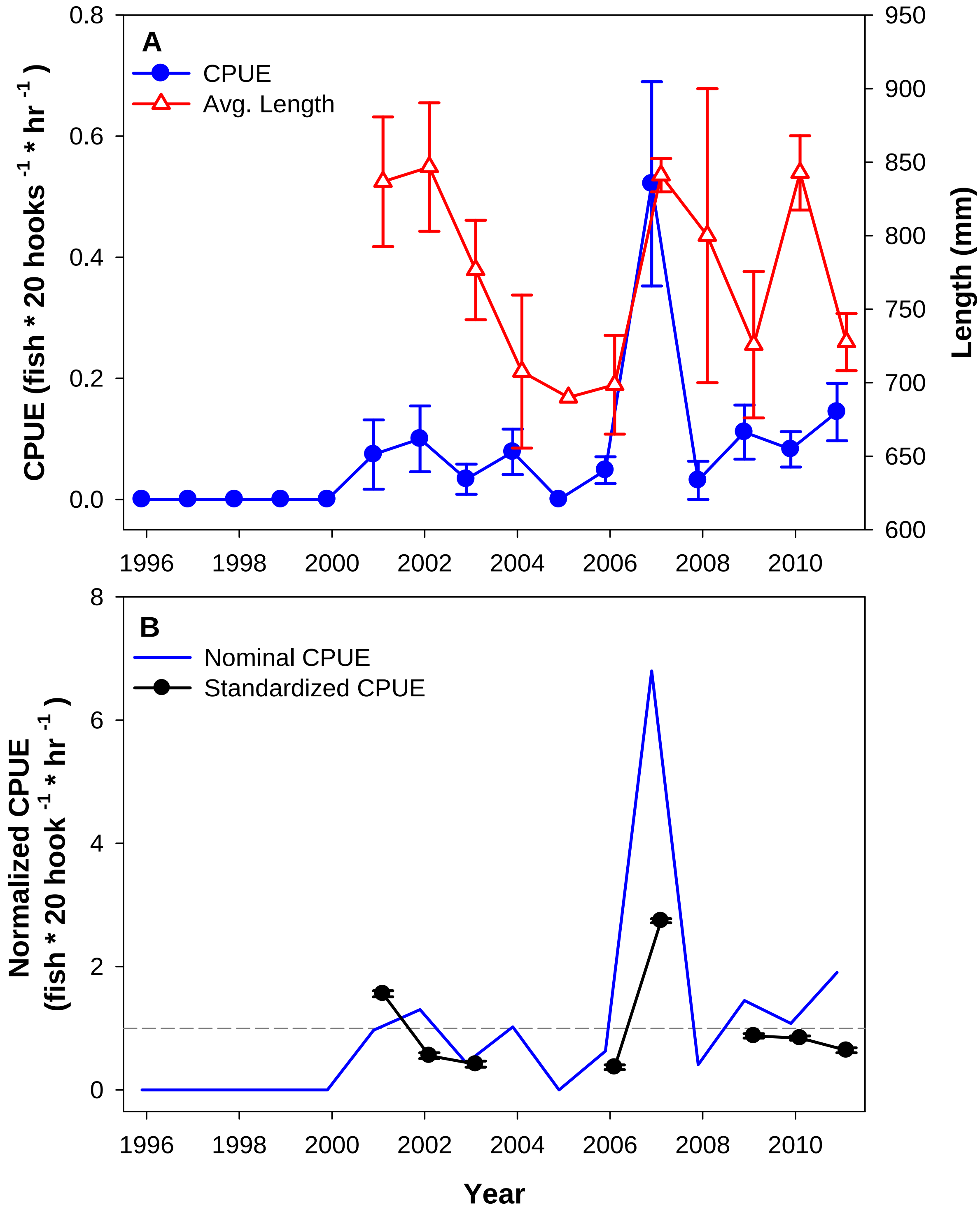

Figure 8: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for Almaco jack. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for Almaco jack.

Greater Amberjack

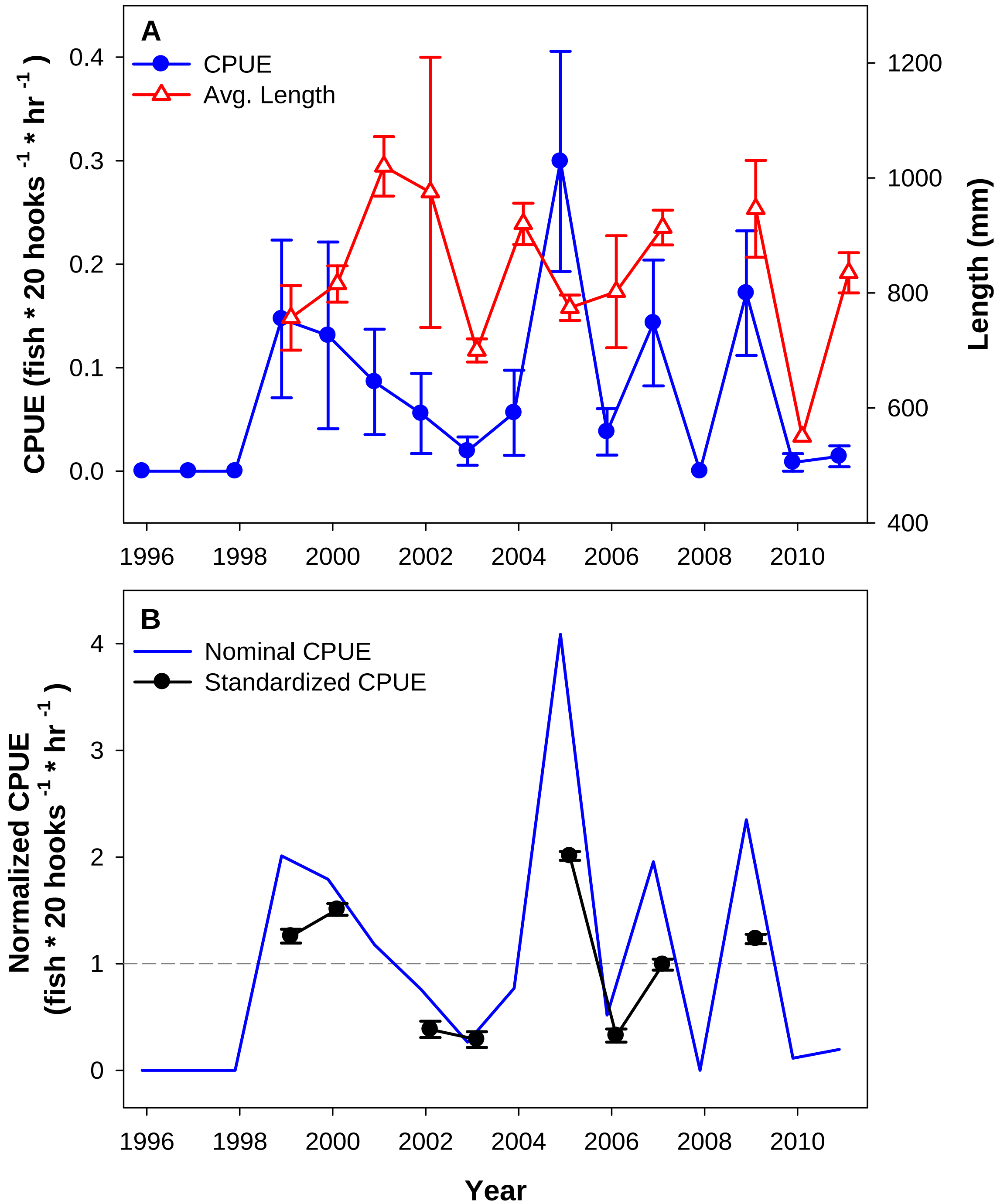

Figure 9: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for greater amberjack. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for greater amberjack.

Tomtate

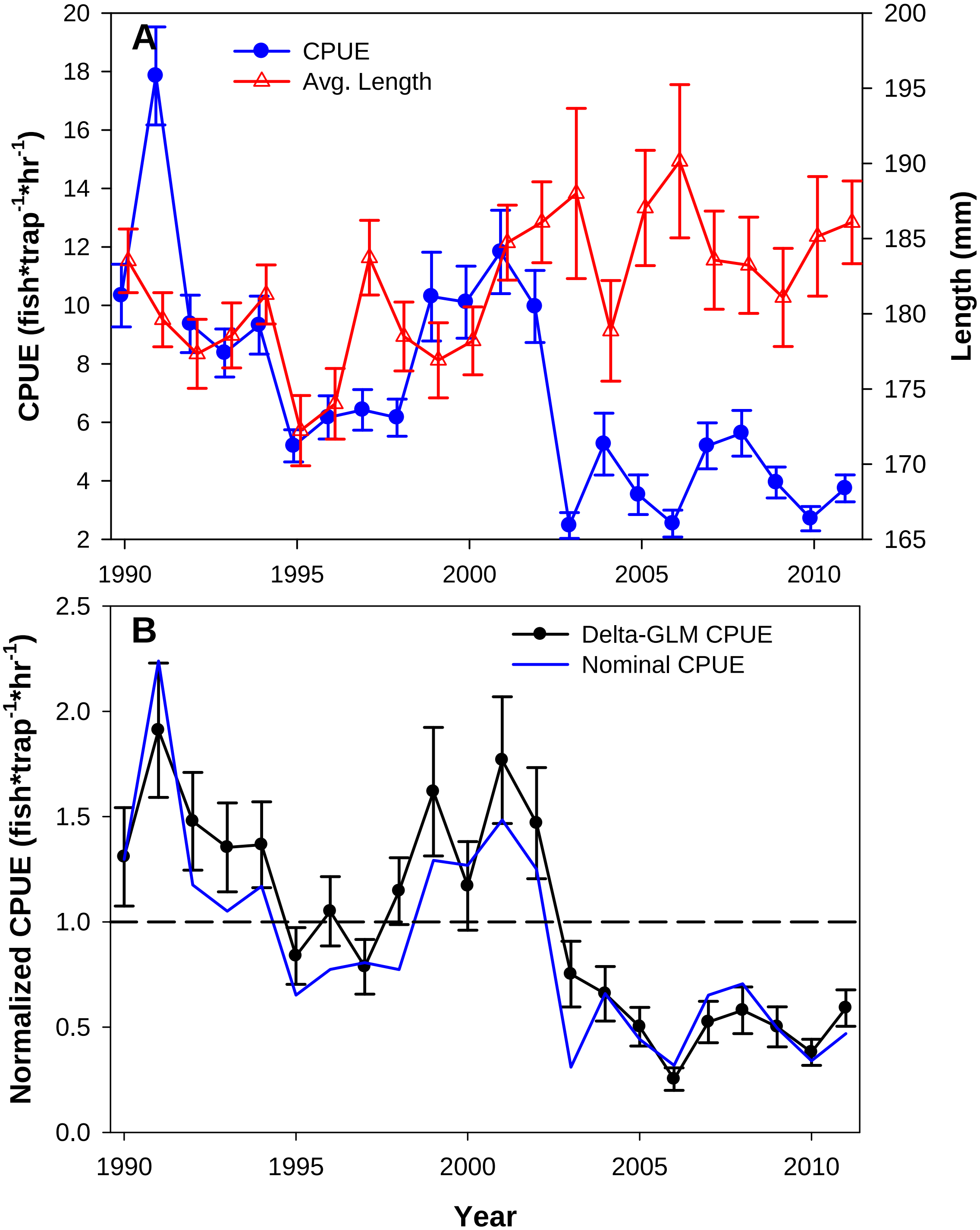

Figure 10: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for tomtate. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for tomtate.

White Grunt

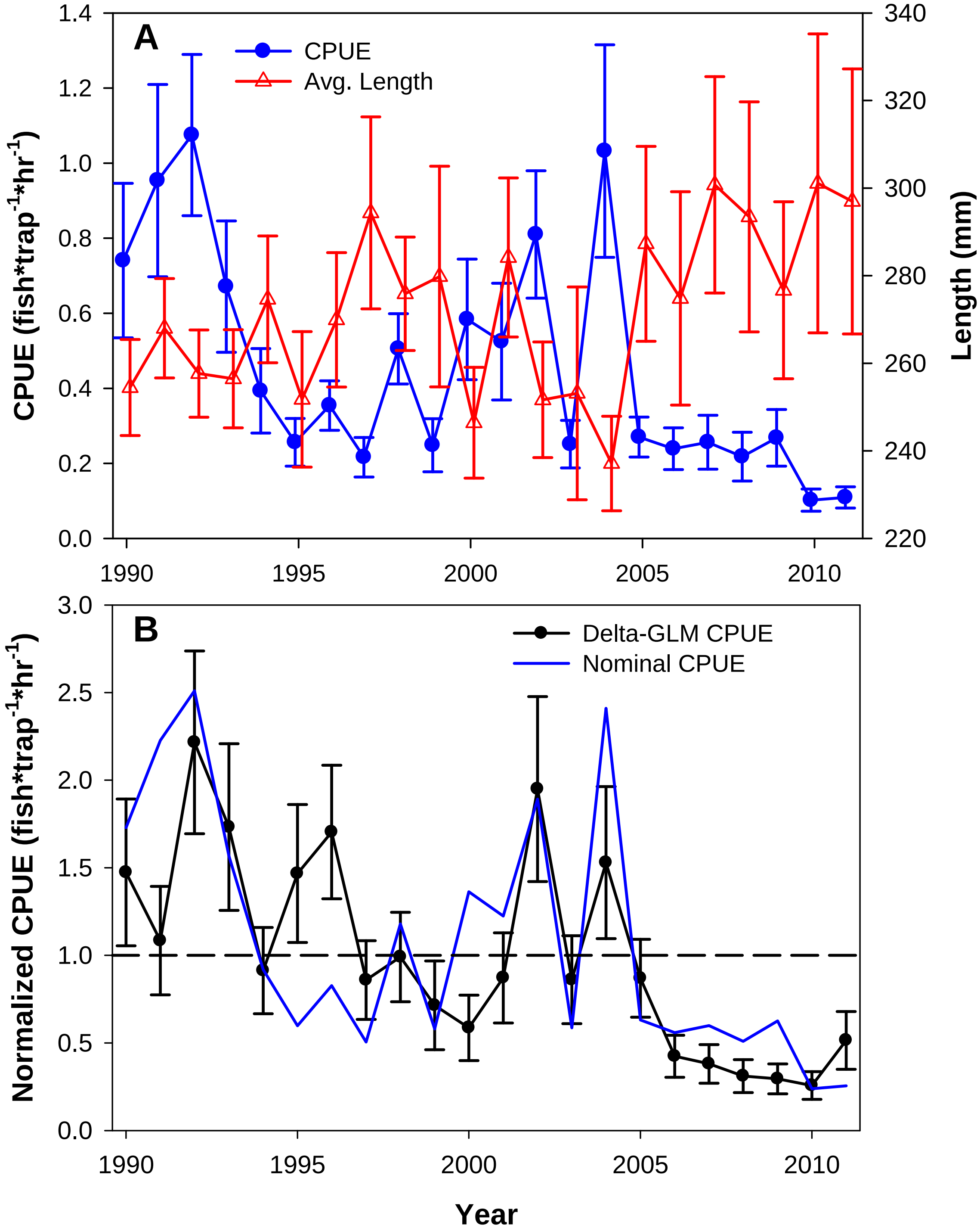

Figure 11: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for white grunt. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for white grunt.

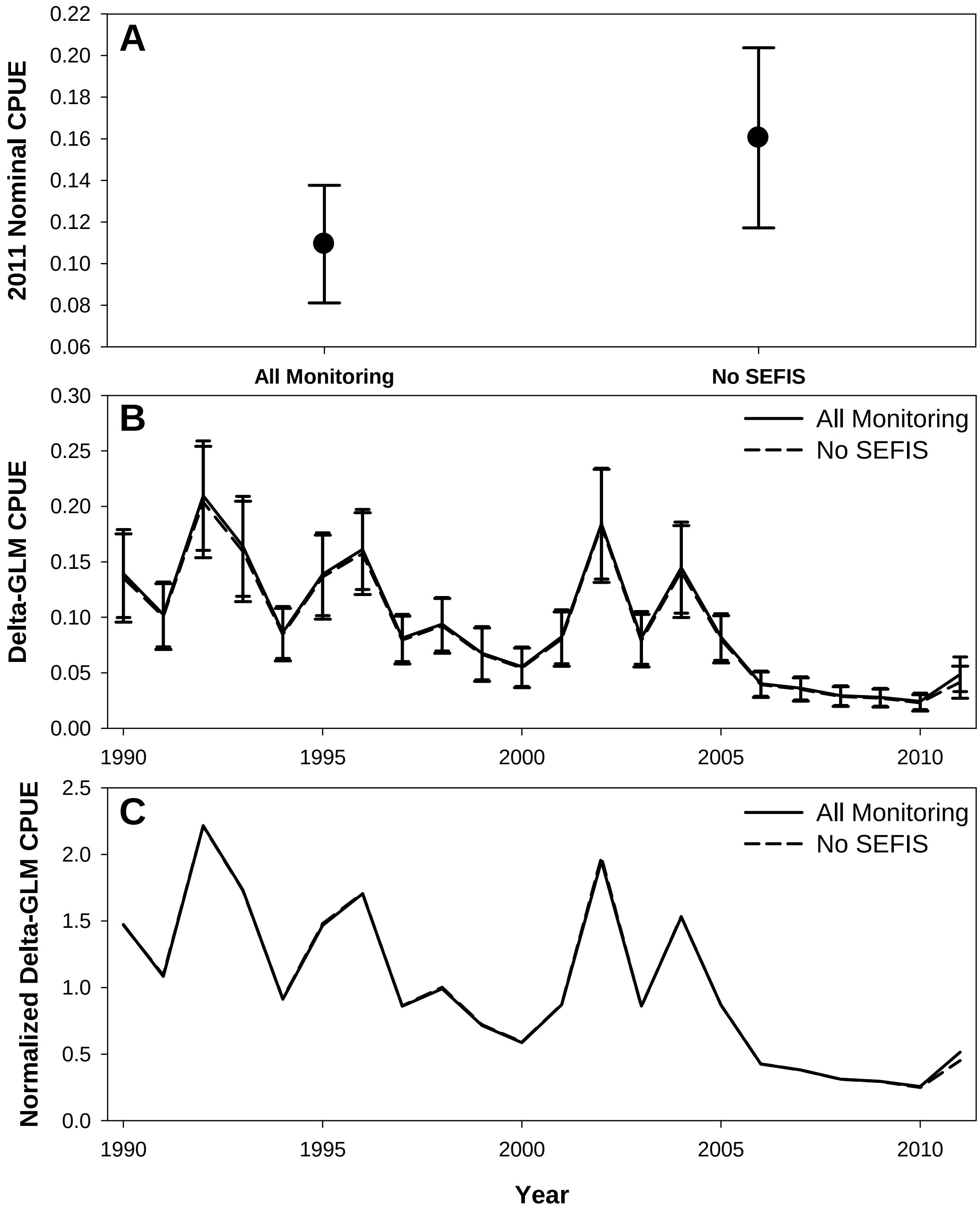

Figure 12: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of white grunt. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

Red Snapper

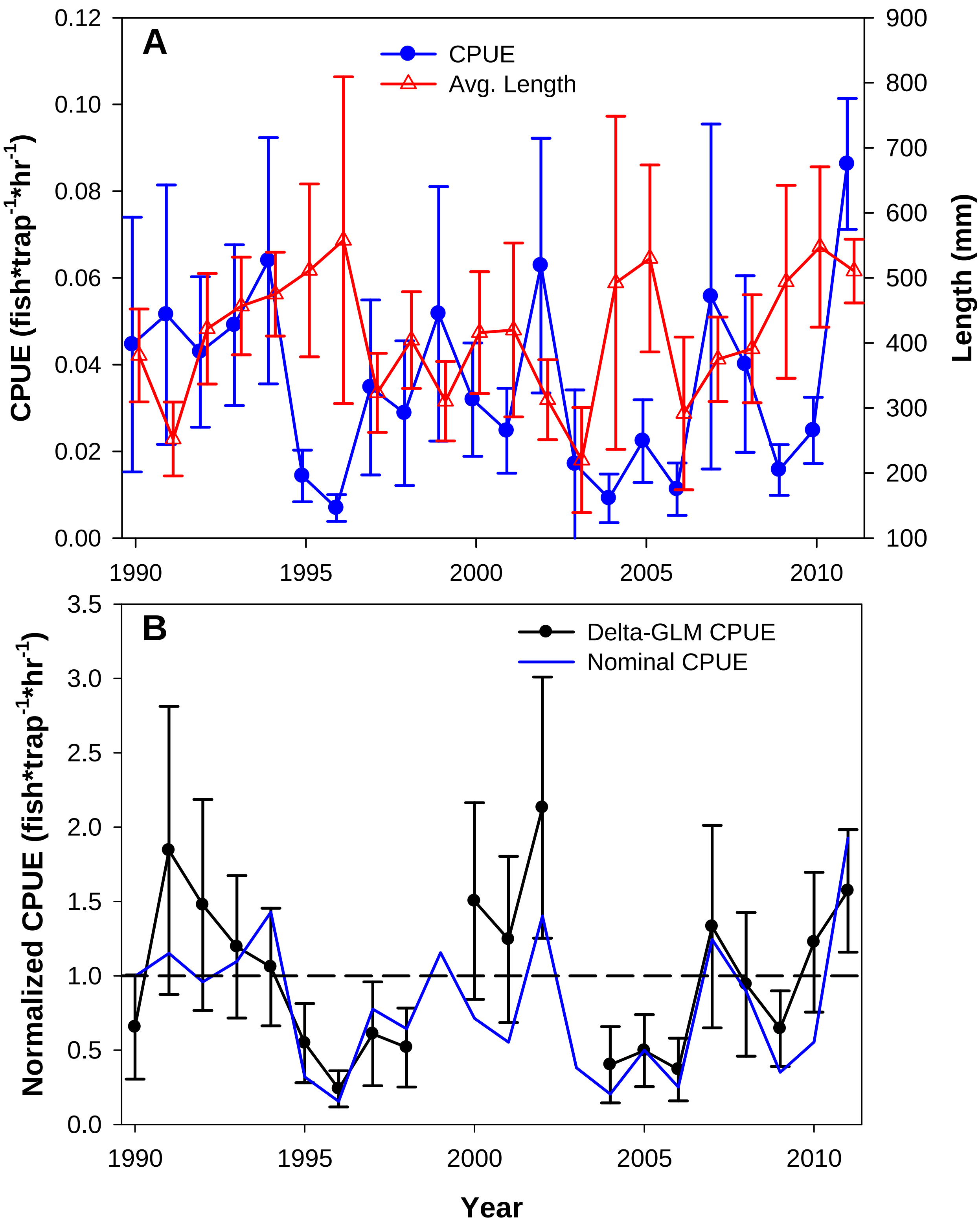

Figure 13: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for red snapper. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for red snapper.

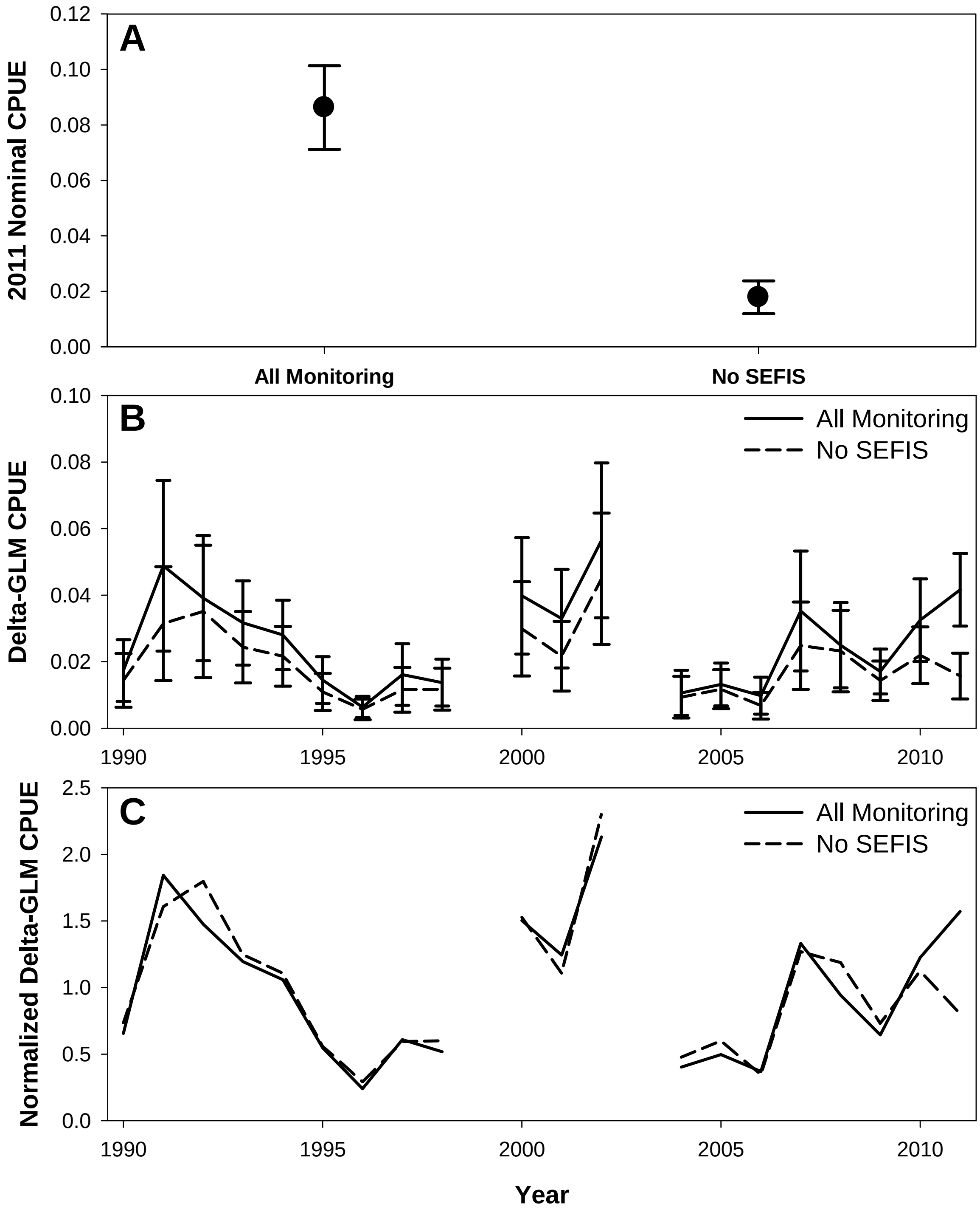

Figure 14: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of red snapper. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

Vermilion Snapper

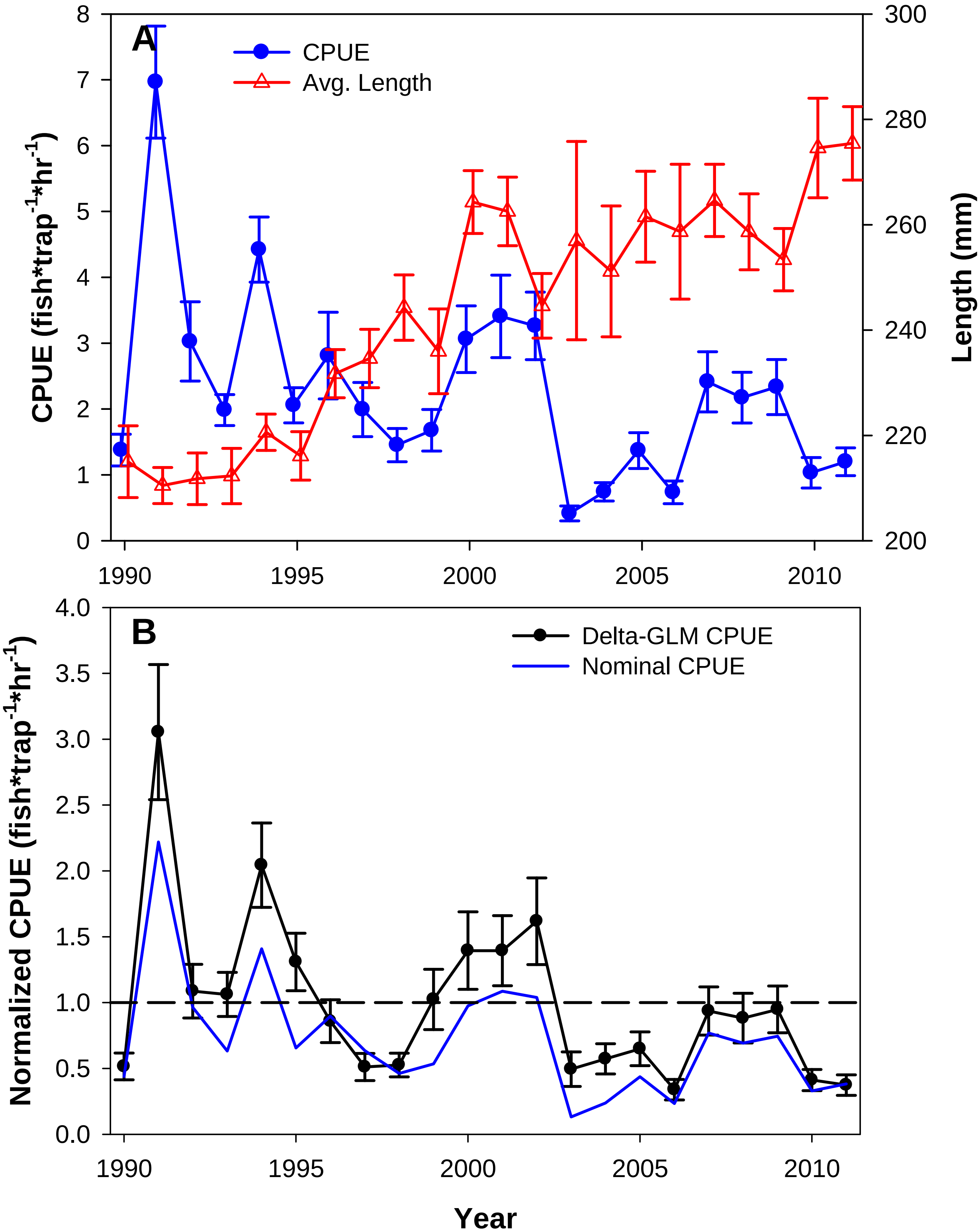

Figure 15: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for vermilion snapper. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for vermilion snapper.

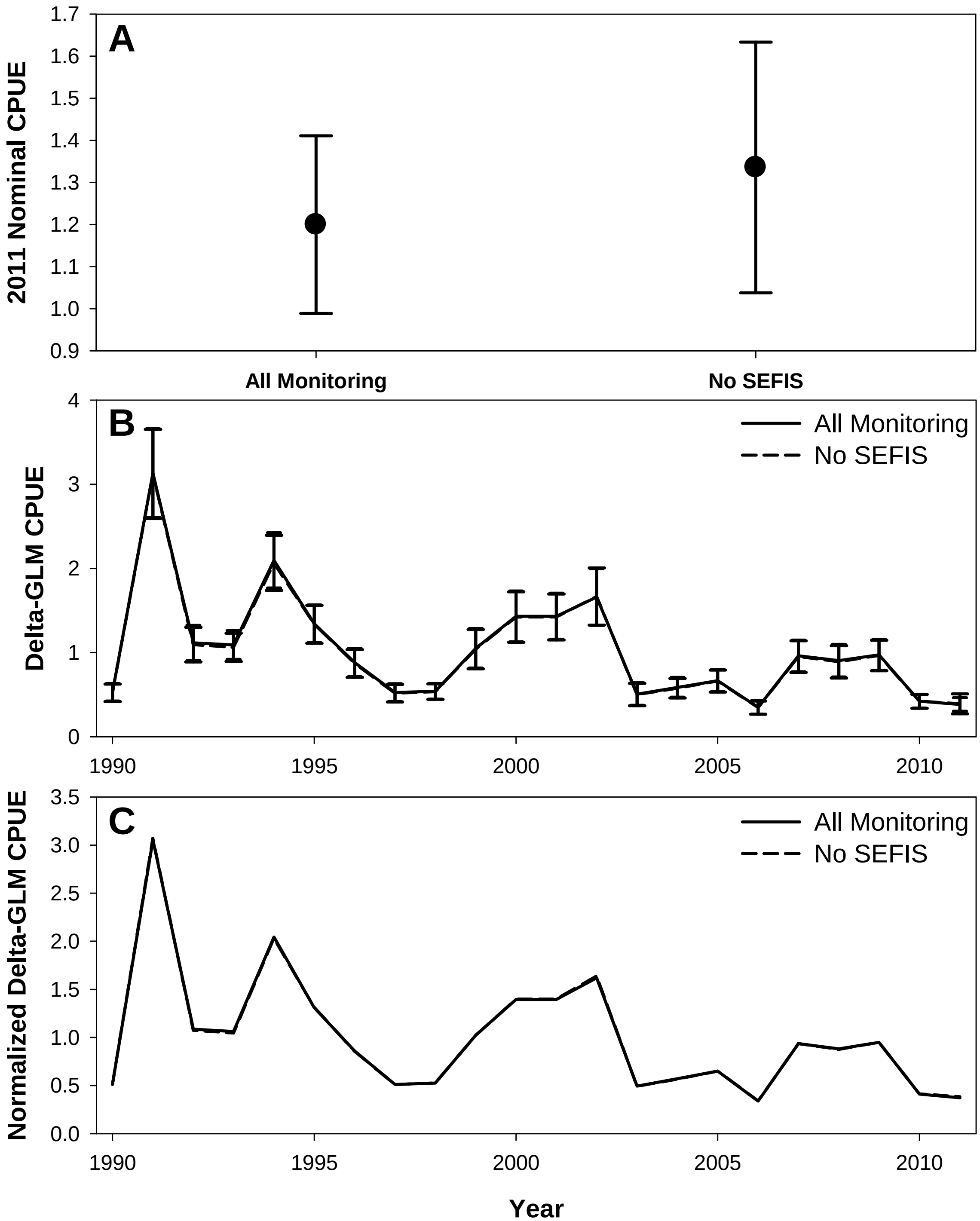

Figure 16: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of vermilion snapper. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

Blueline Tilefish

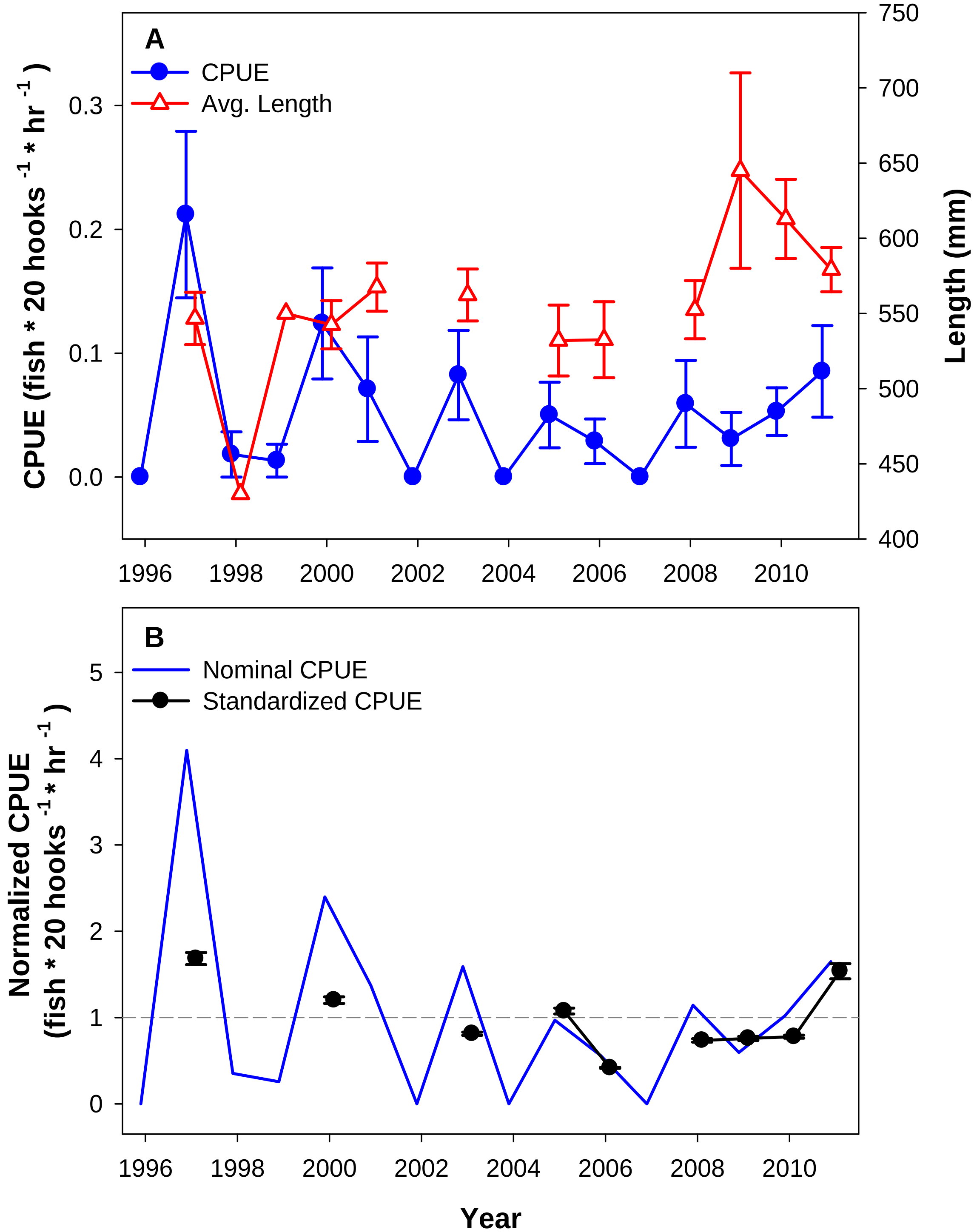

Figure 17: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for blueline tilefish. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for blueline tilefish.

Golden Tilefish

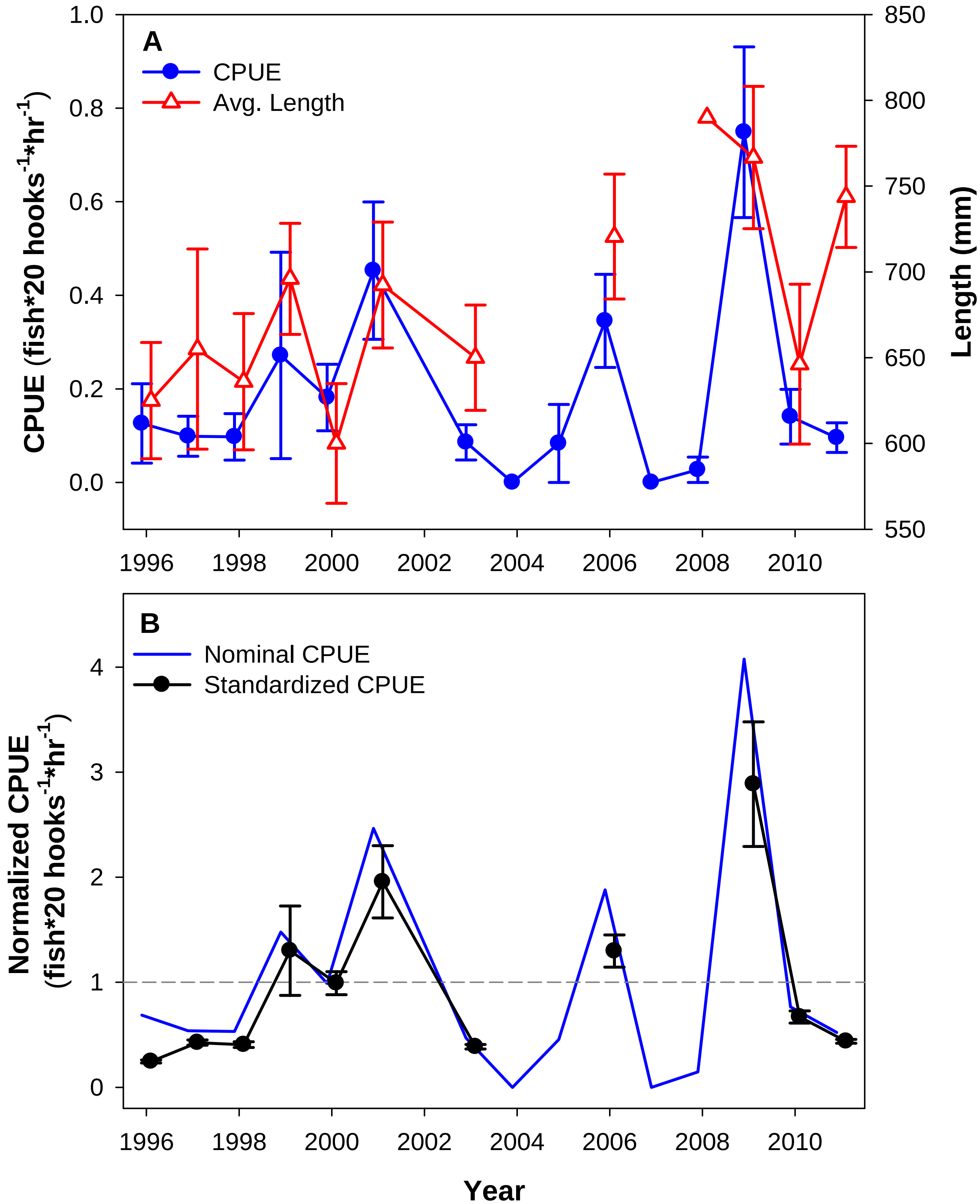

Figure 18: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for golden tilefish. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for golden tilefish.

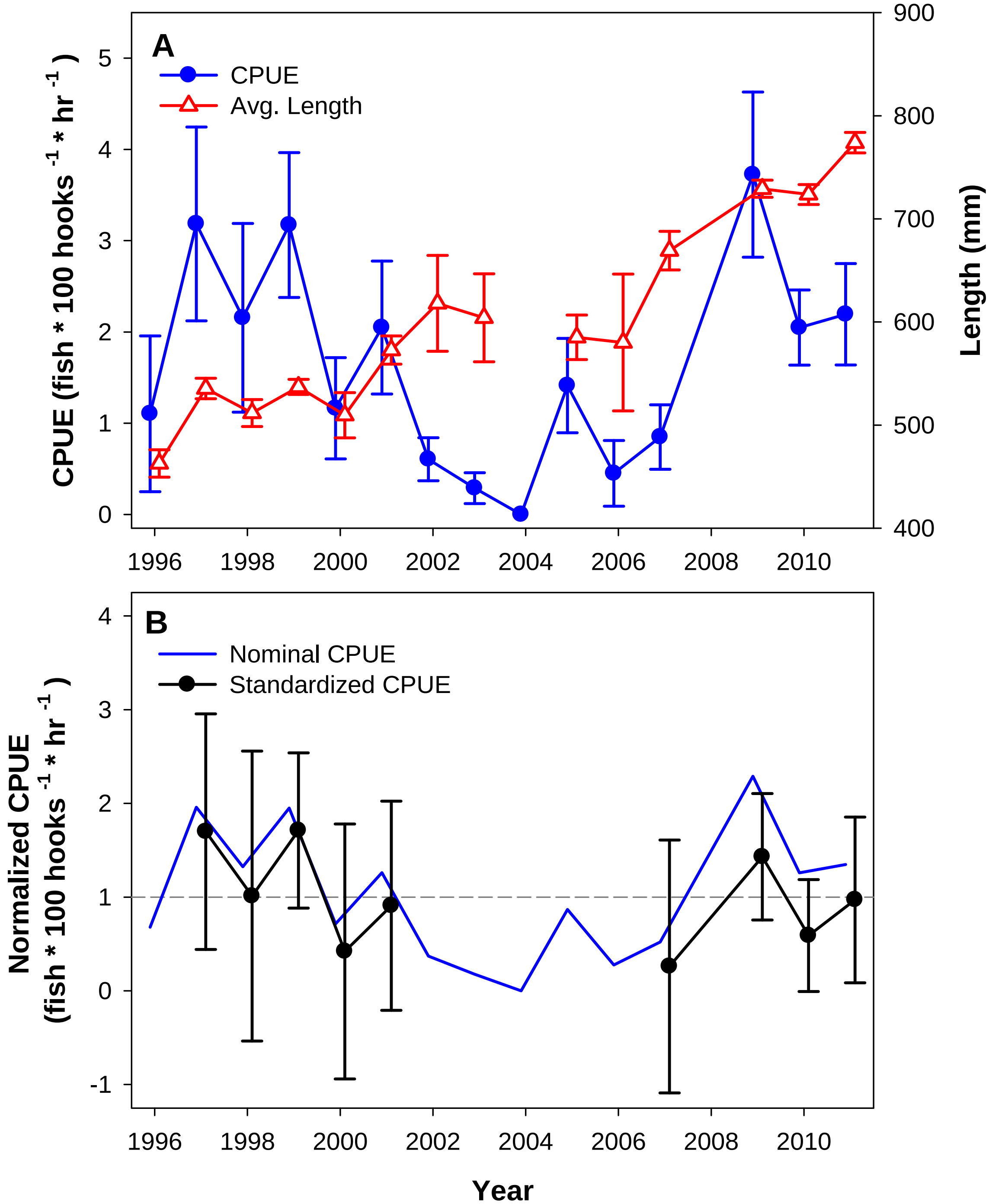

Figure 19: A) Long bottom longline nominal CPUE (±SE) and mean lengths (±SE) for golden tilefish. B) Long bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for golden tilefish.

Blackbelly Rosefish

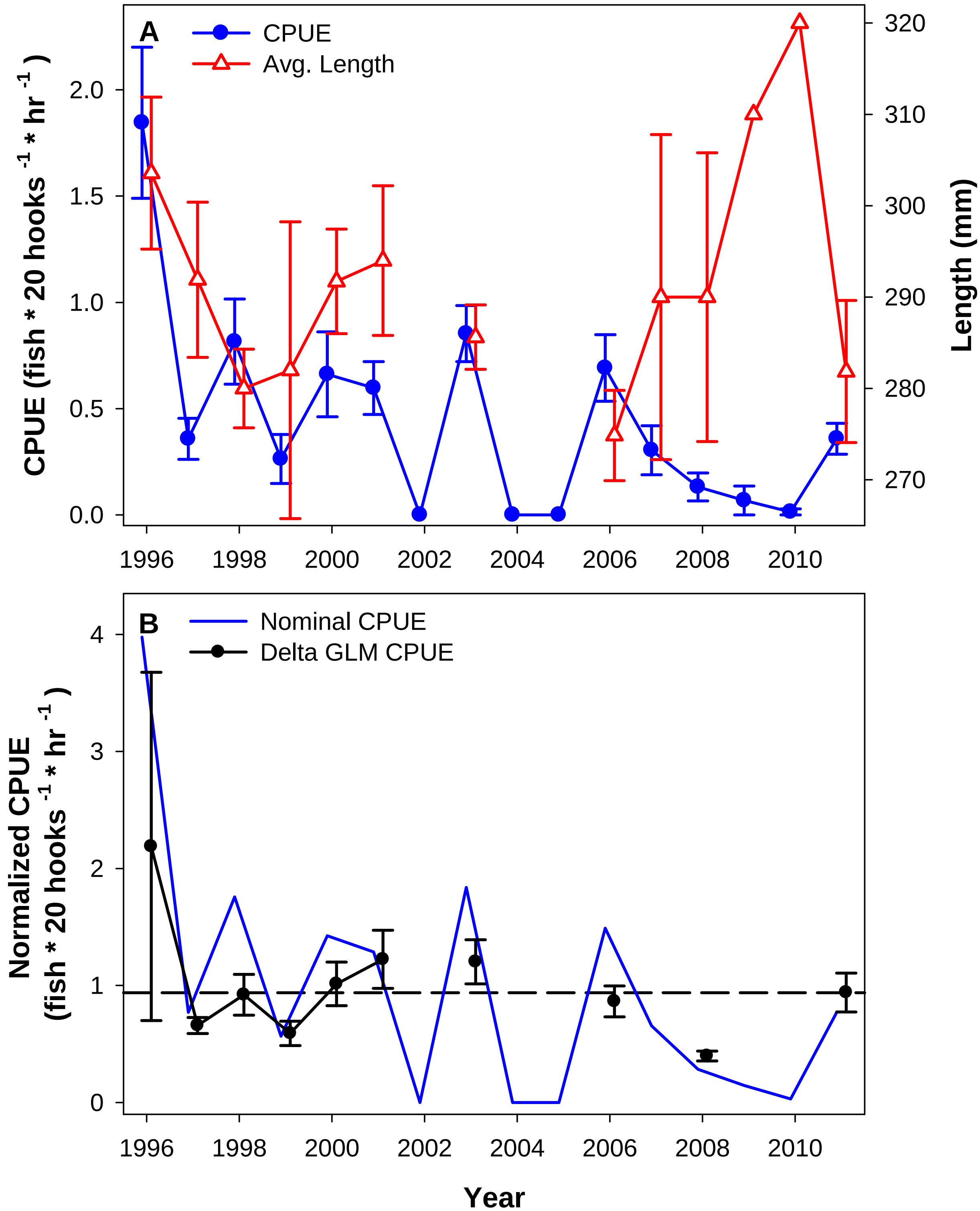

Figure 20: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for blackbelly rosefish. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for blackbelly rosefish.

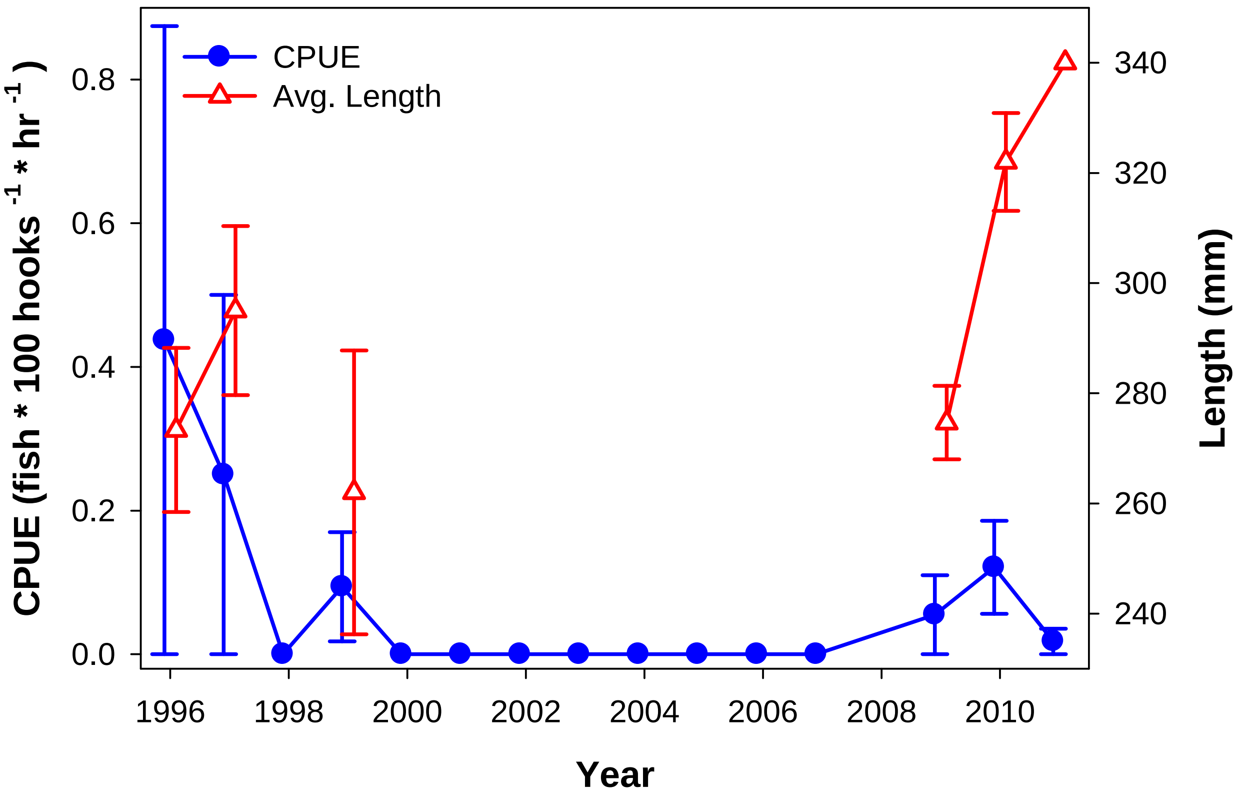

Figure 21: Long bottom longline nominal CPUE (±SE) and mean lengths (±SE) for blackbelly rosefish.

Bank Sea Bass

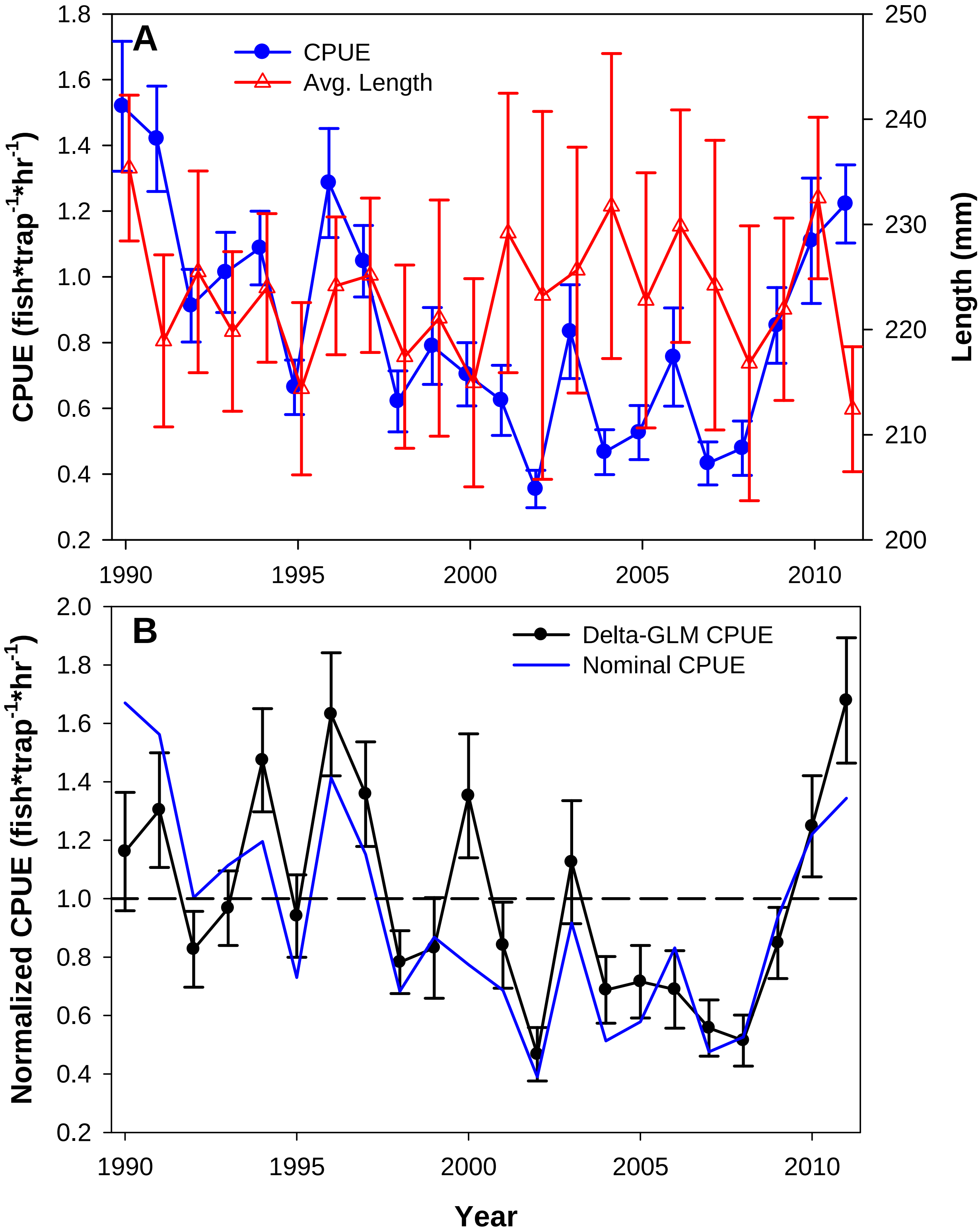

Figure 22: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for bank sea bass. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for bank sea bass.

Black Sea Bass

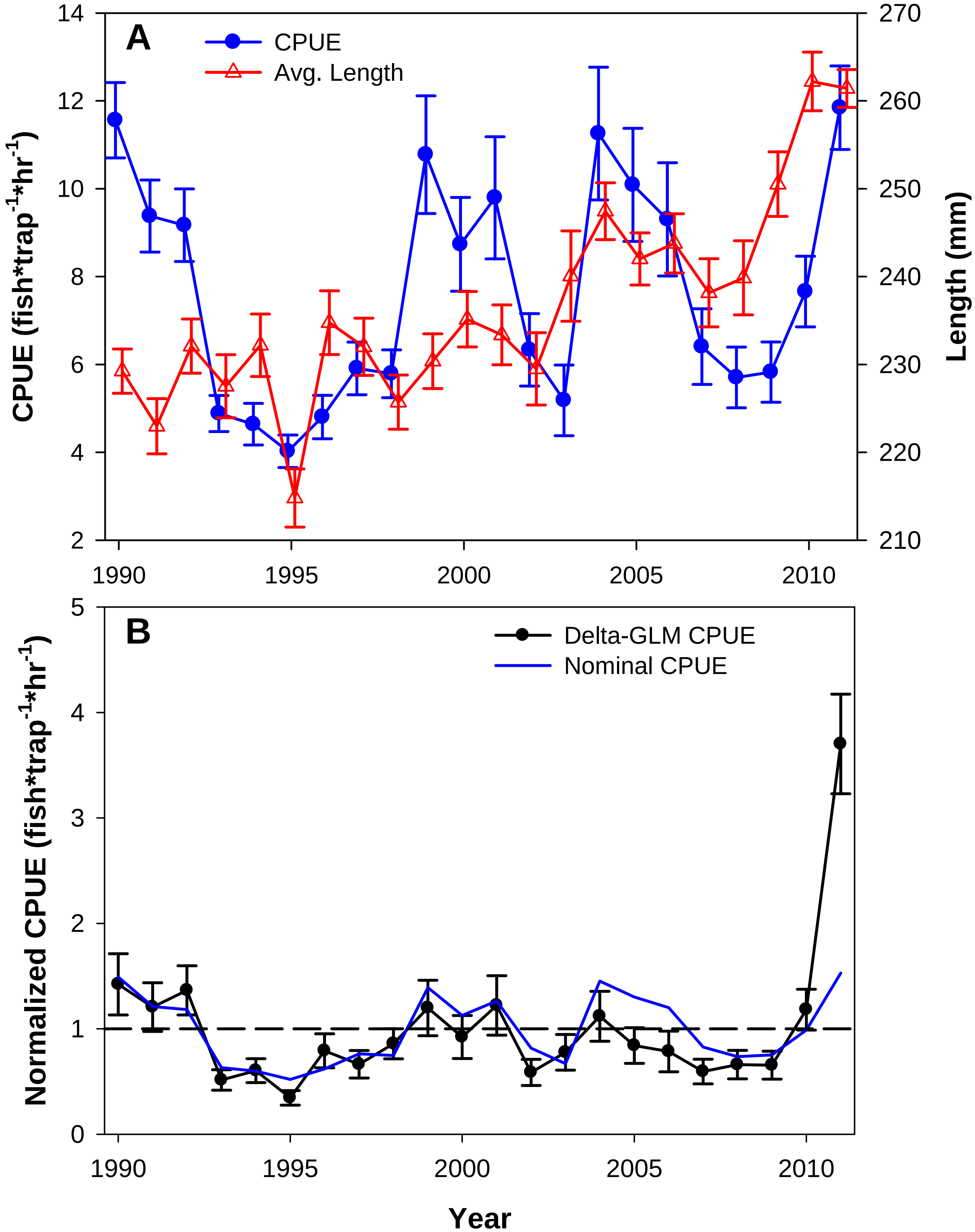

Figure 23: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for black sea bass. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for black sea bass.

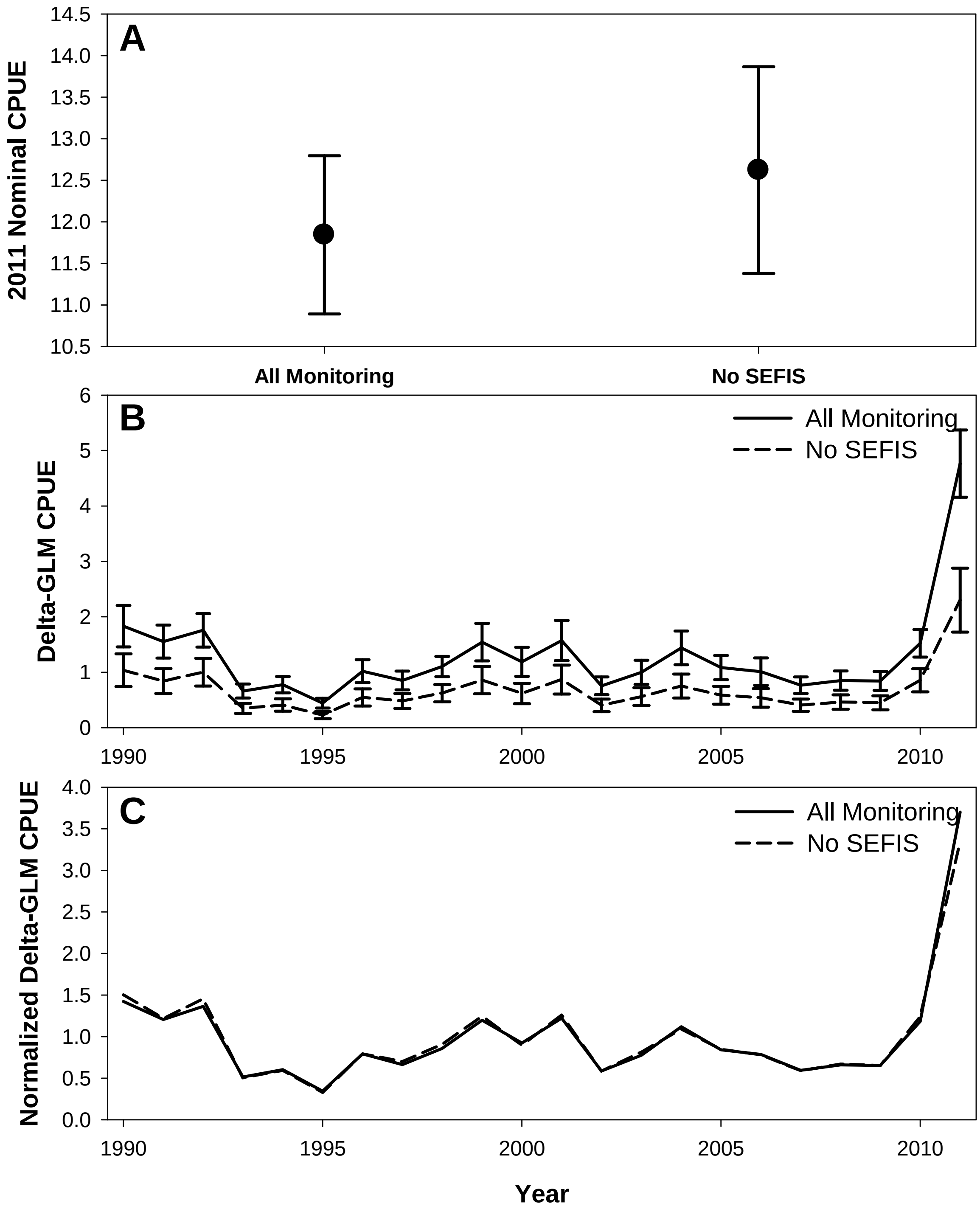

Figure 24: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of black sea bass. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

Gag

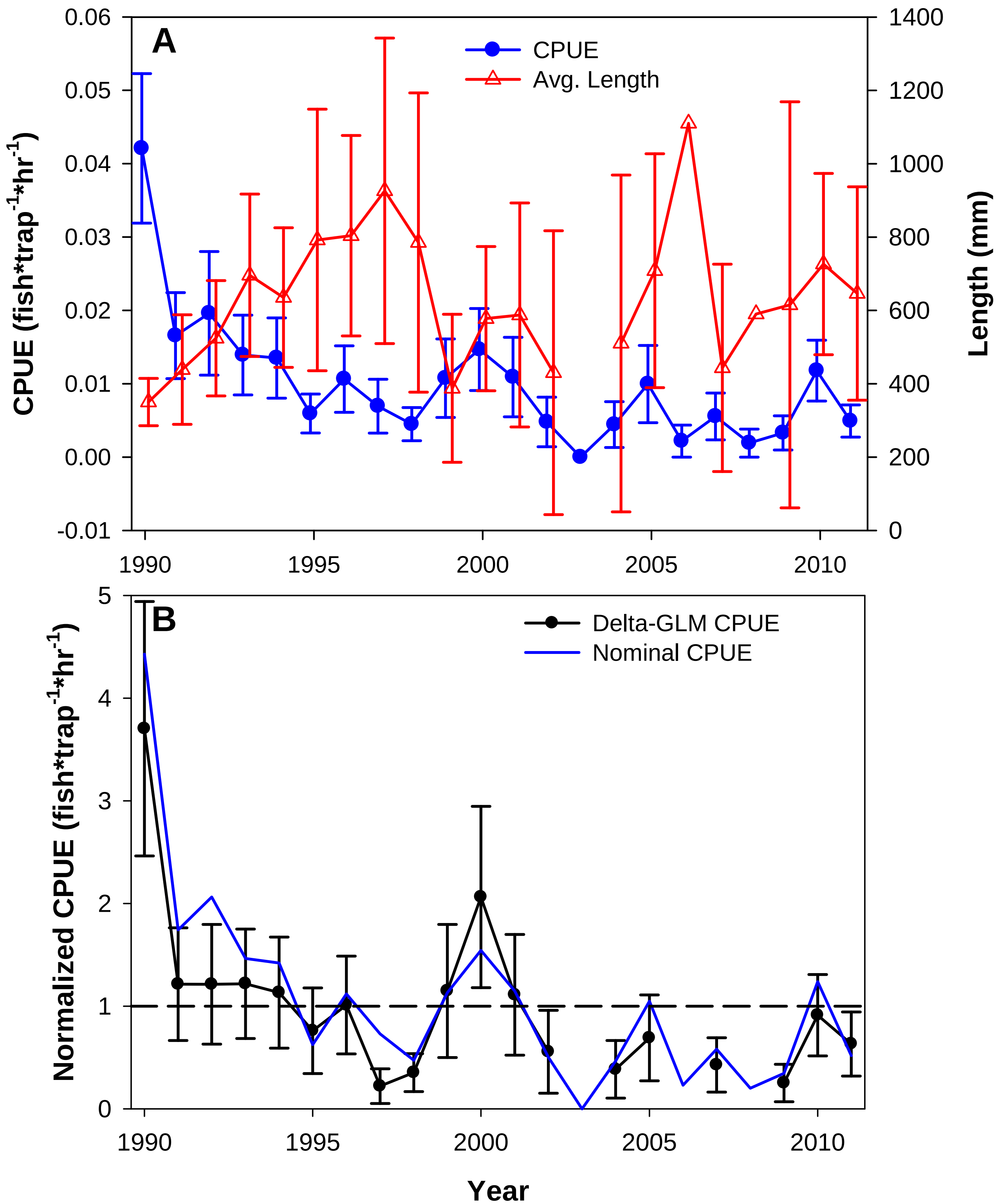

Figure 25: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for gag. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for gag.

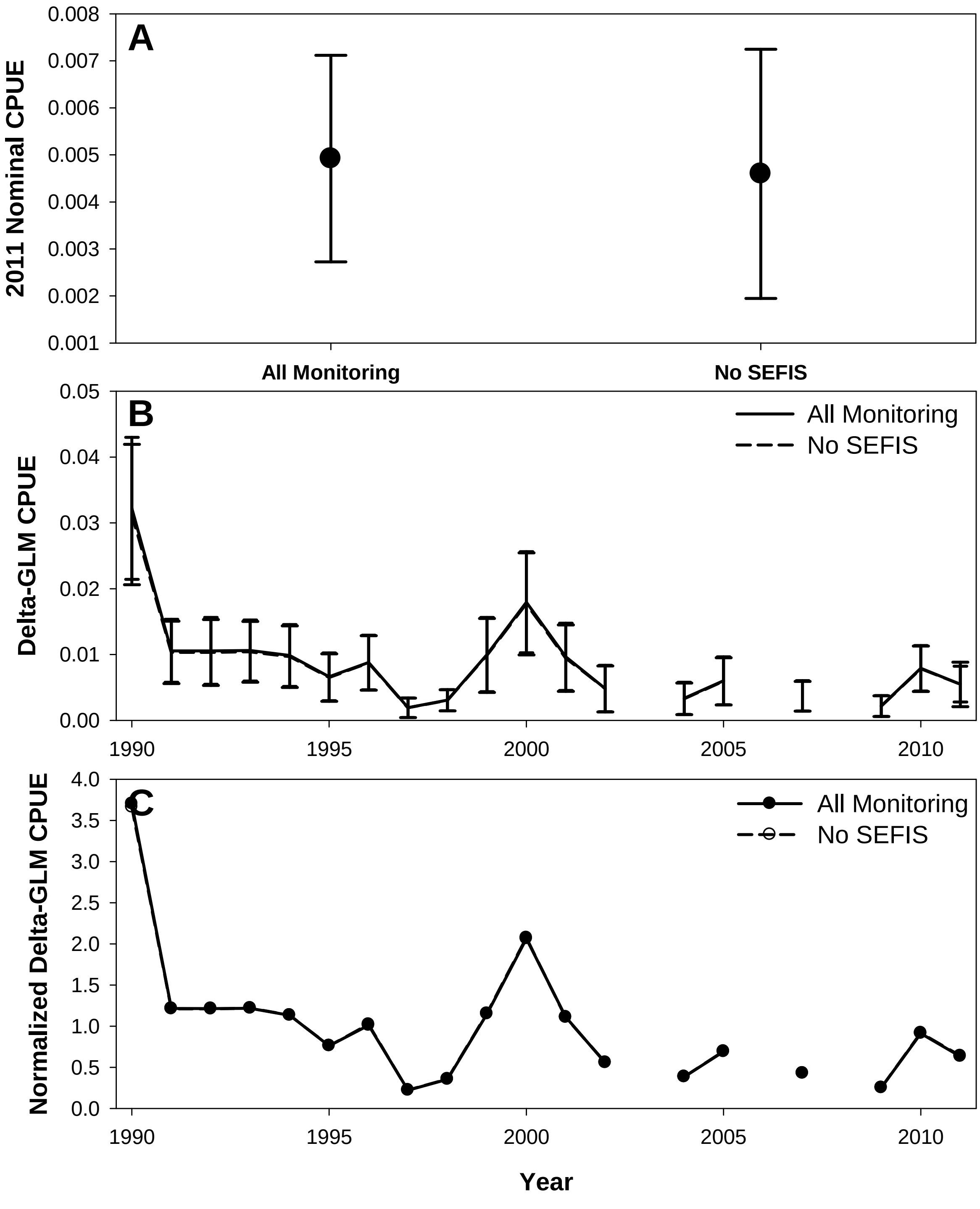

Figure 26: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of gag. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

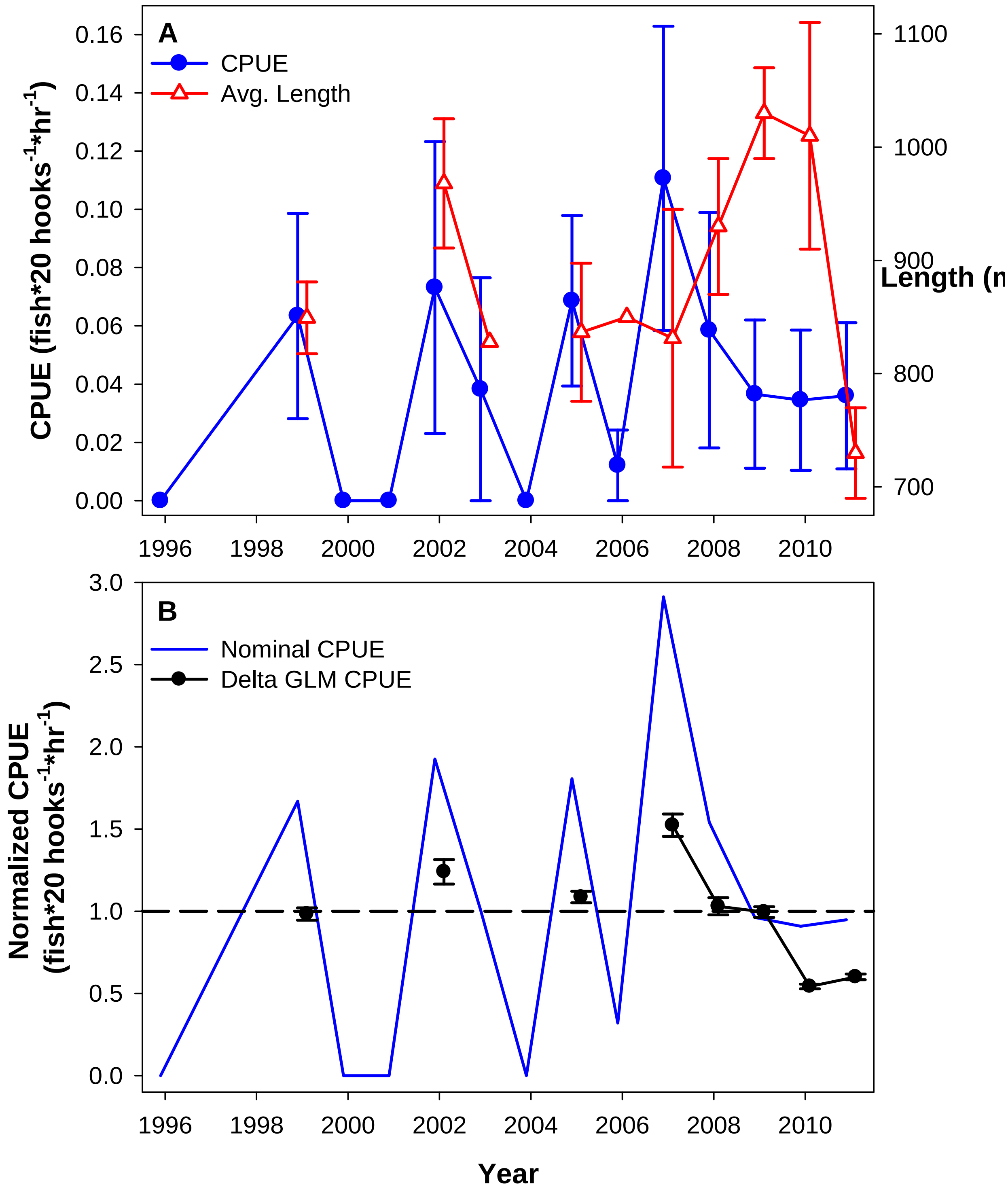

Figure 27: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for gag. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for gag.

Red Grouper

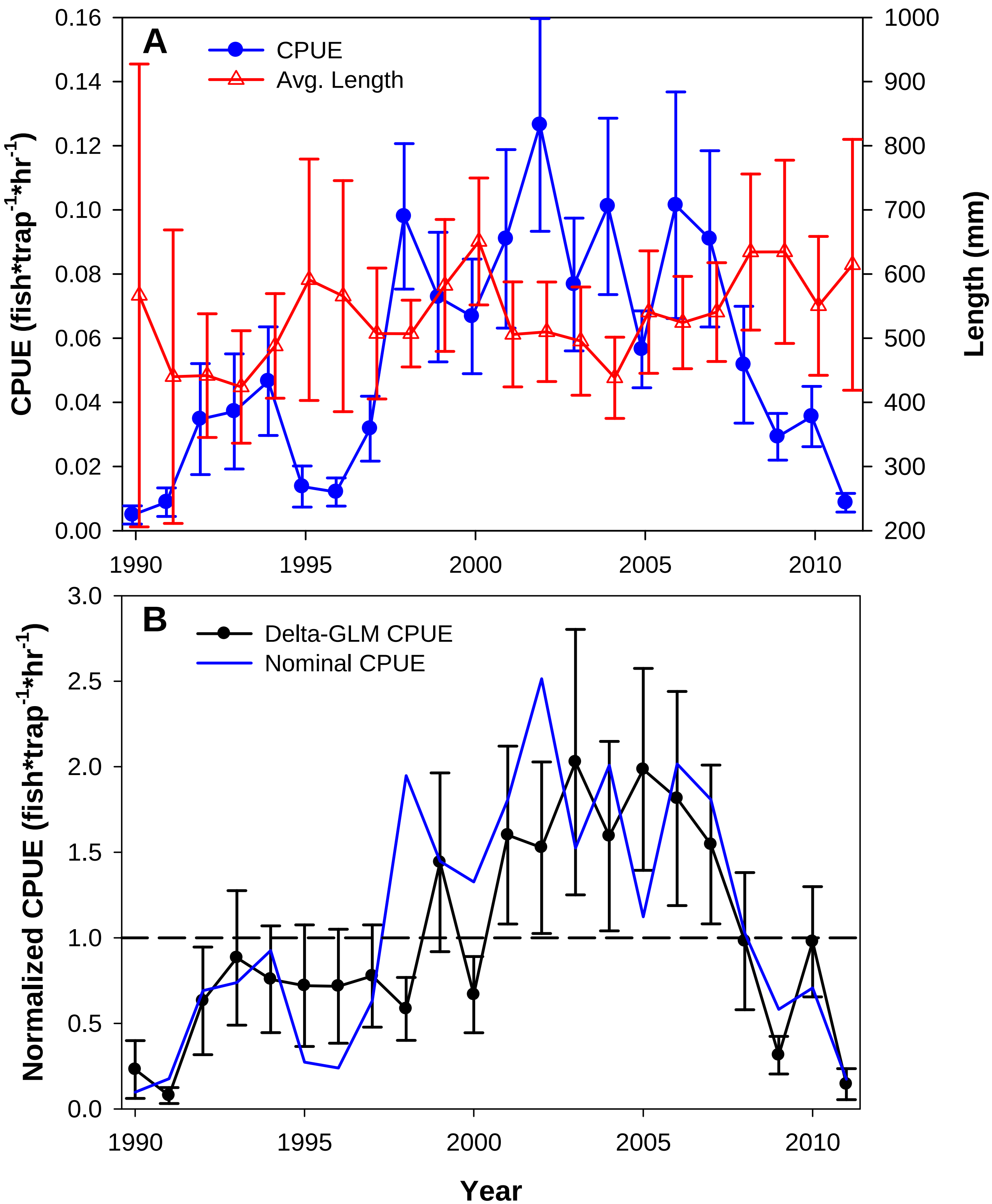

Figure 28: A) <u>Chevron trap</u> nominal CPUE (±SE) and mean lengths (±SE) for <u>red grouper</u>. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for red grouper.

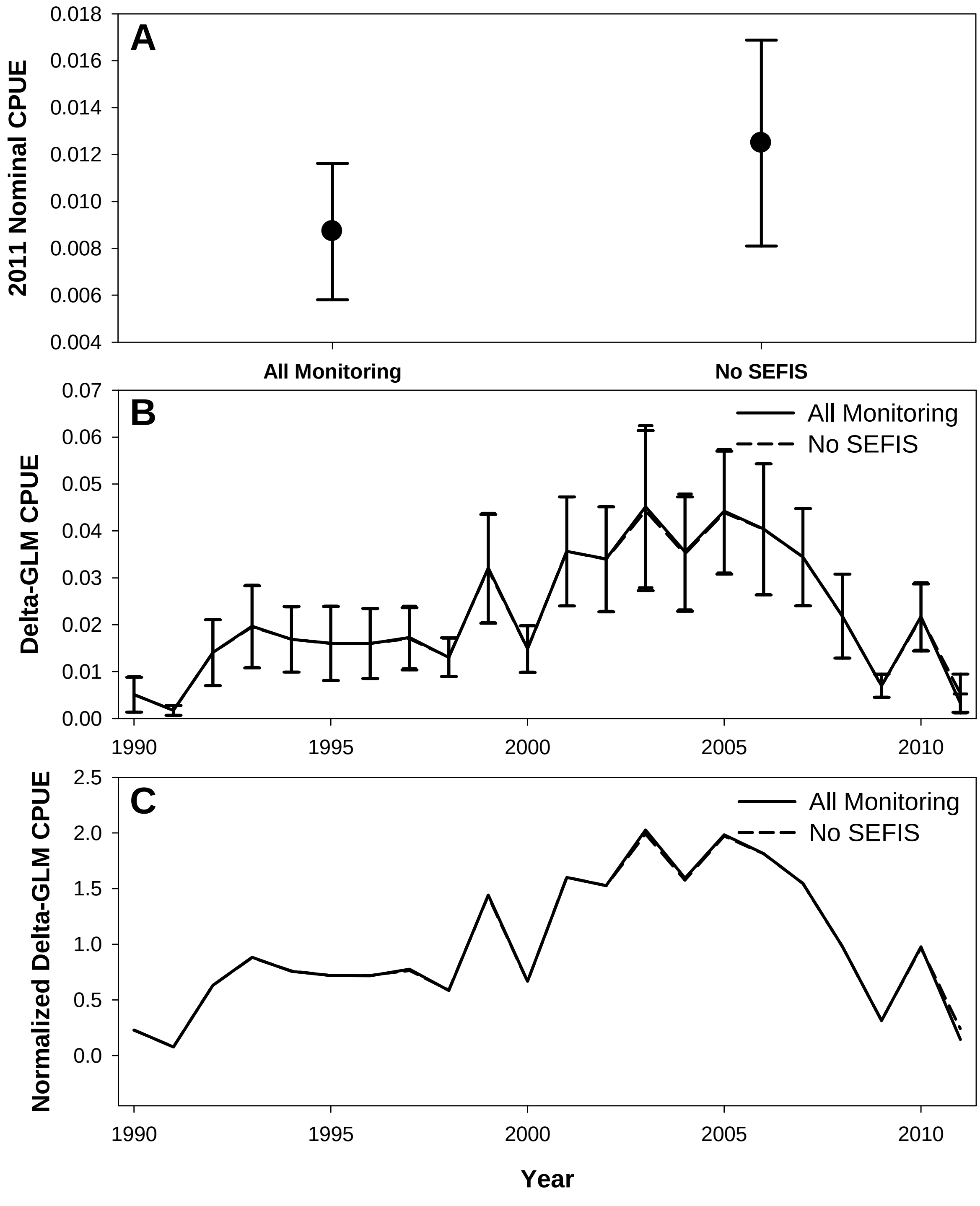

Figure 29: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of red grouper. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

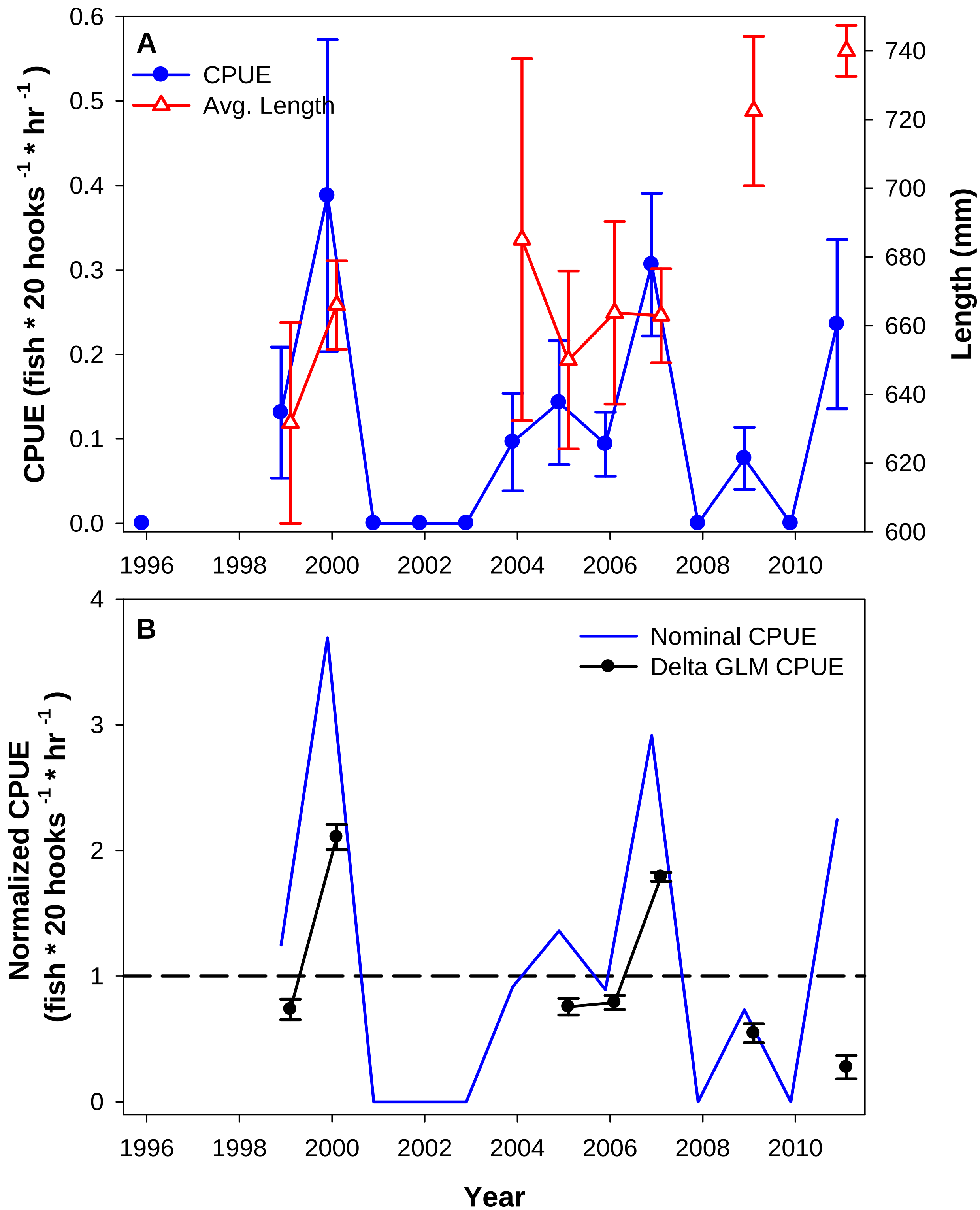

Figure 30: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for red grouper. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for red grouper.

Sand Perch

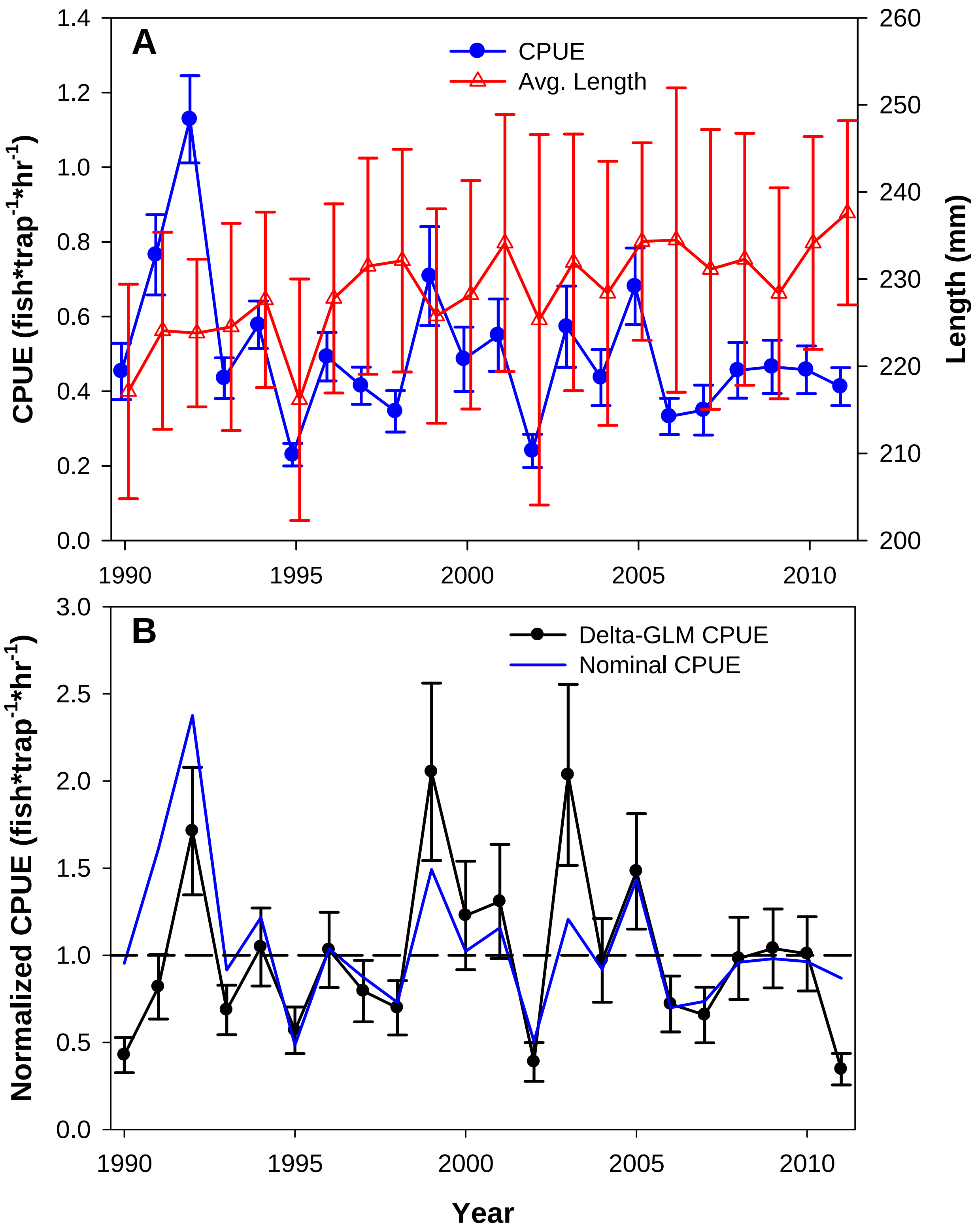

Figure 31: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for sand perch. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for sand perch.

Scamp

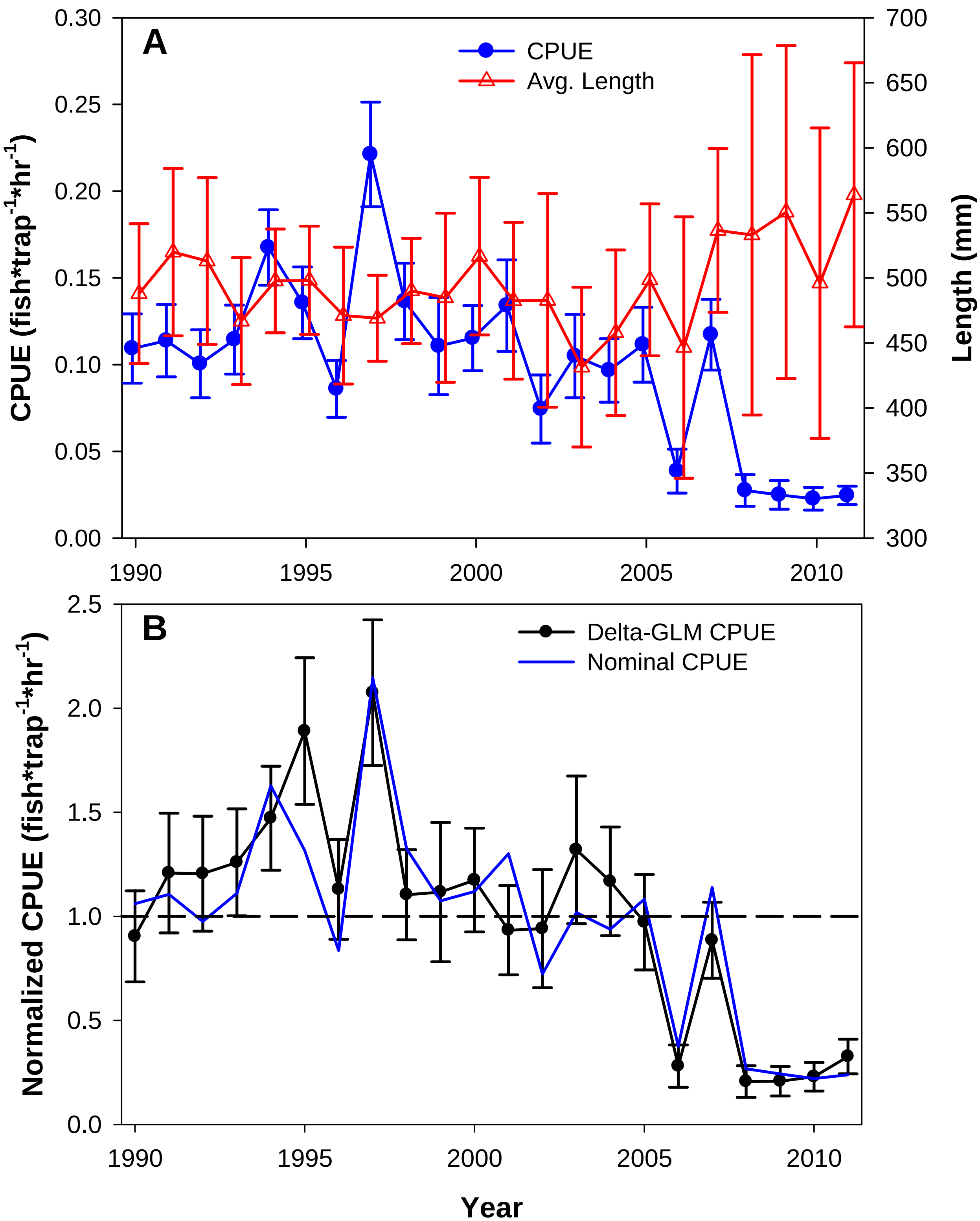

Figure 32: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for scamp. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for scamp.

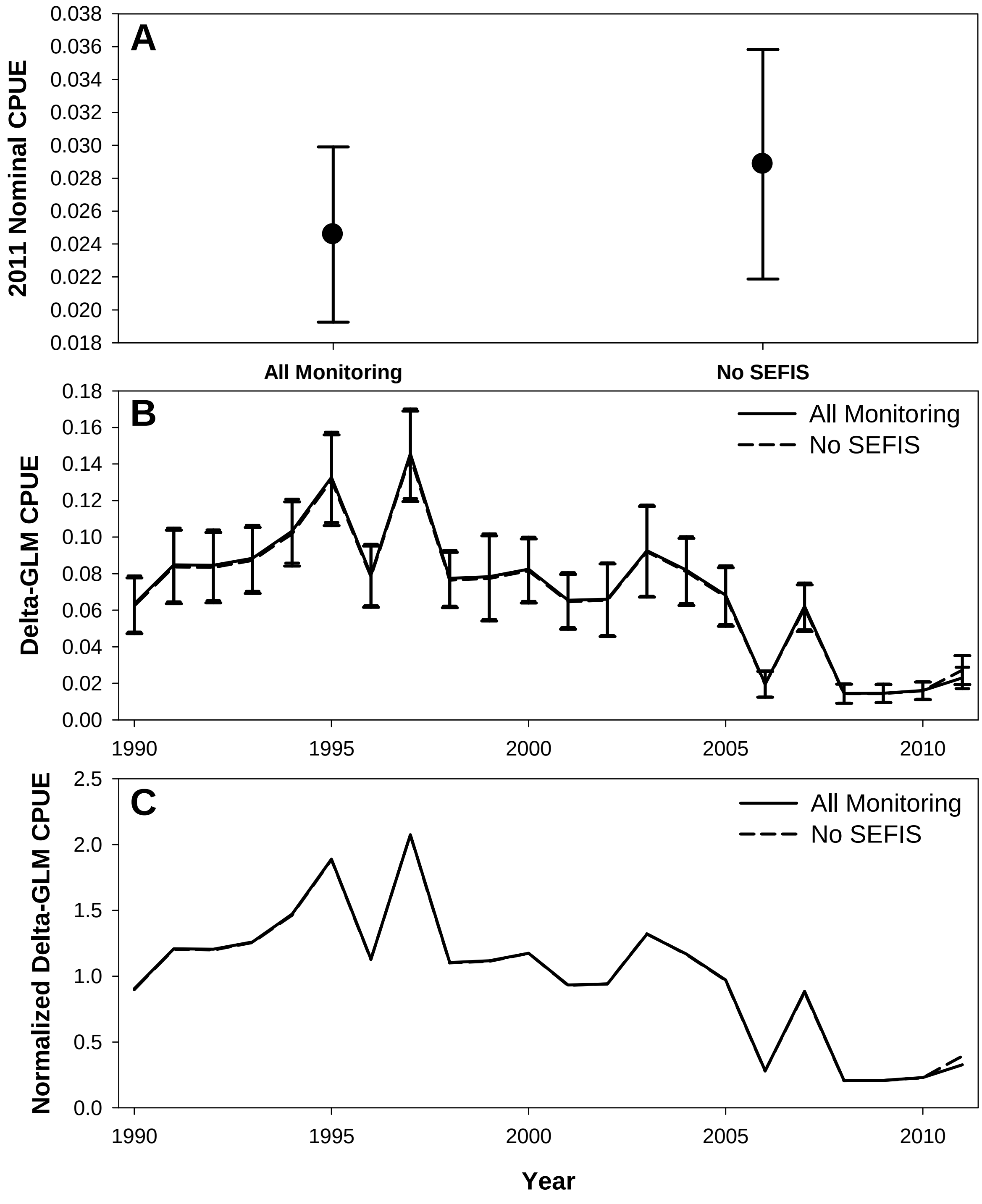

Figure 33: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of scamp. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

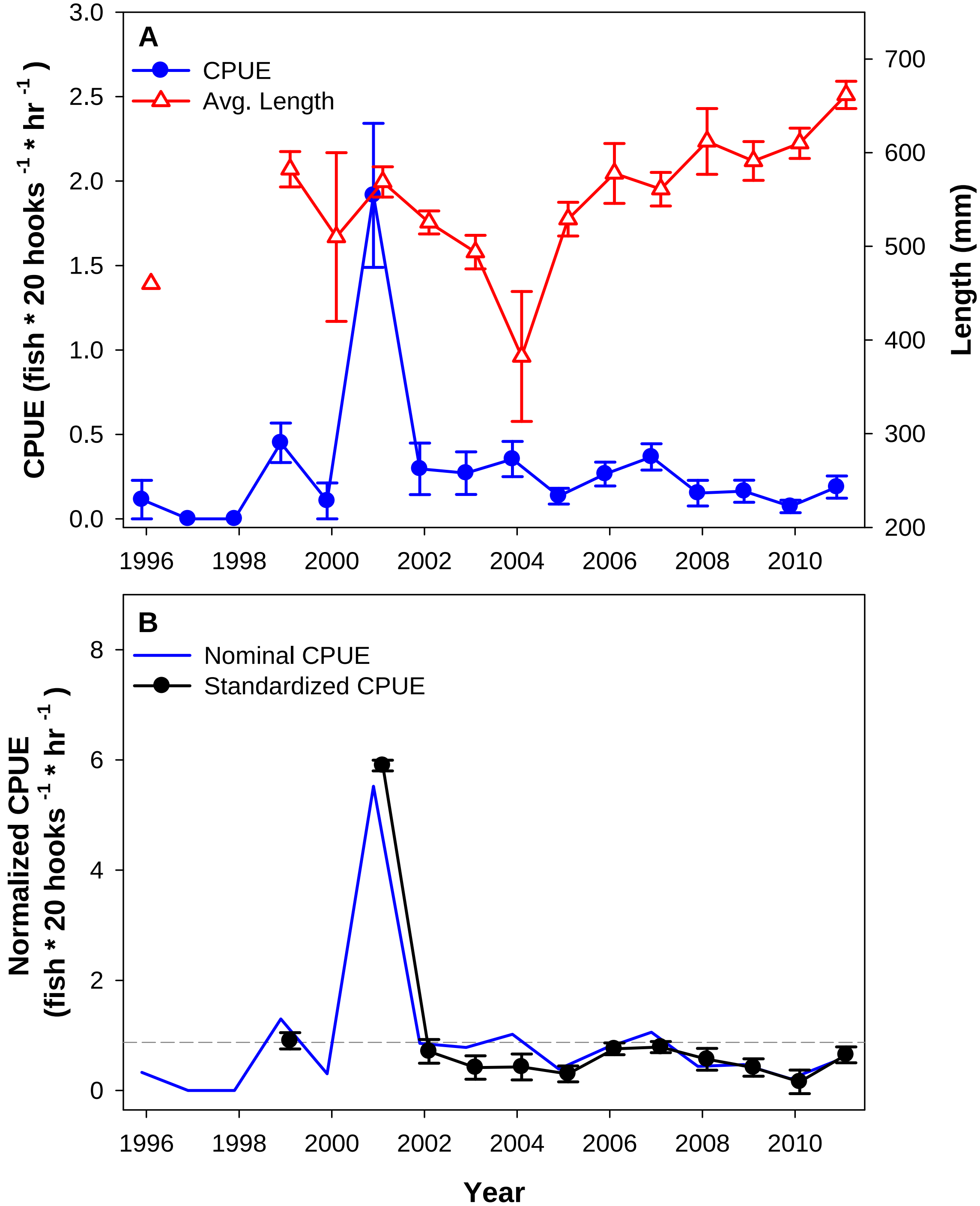

Figure 34: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for scamp. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for scamp.

Snowy Grouper

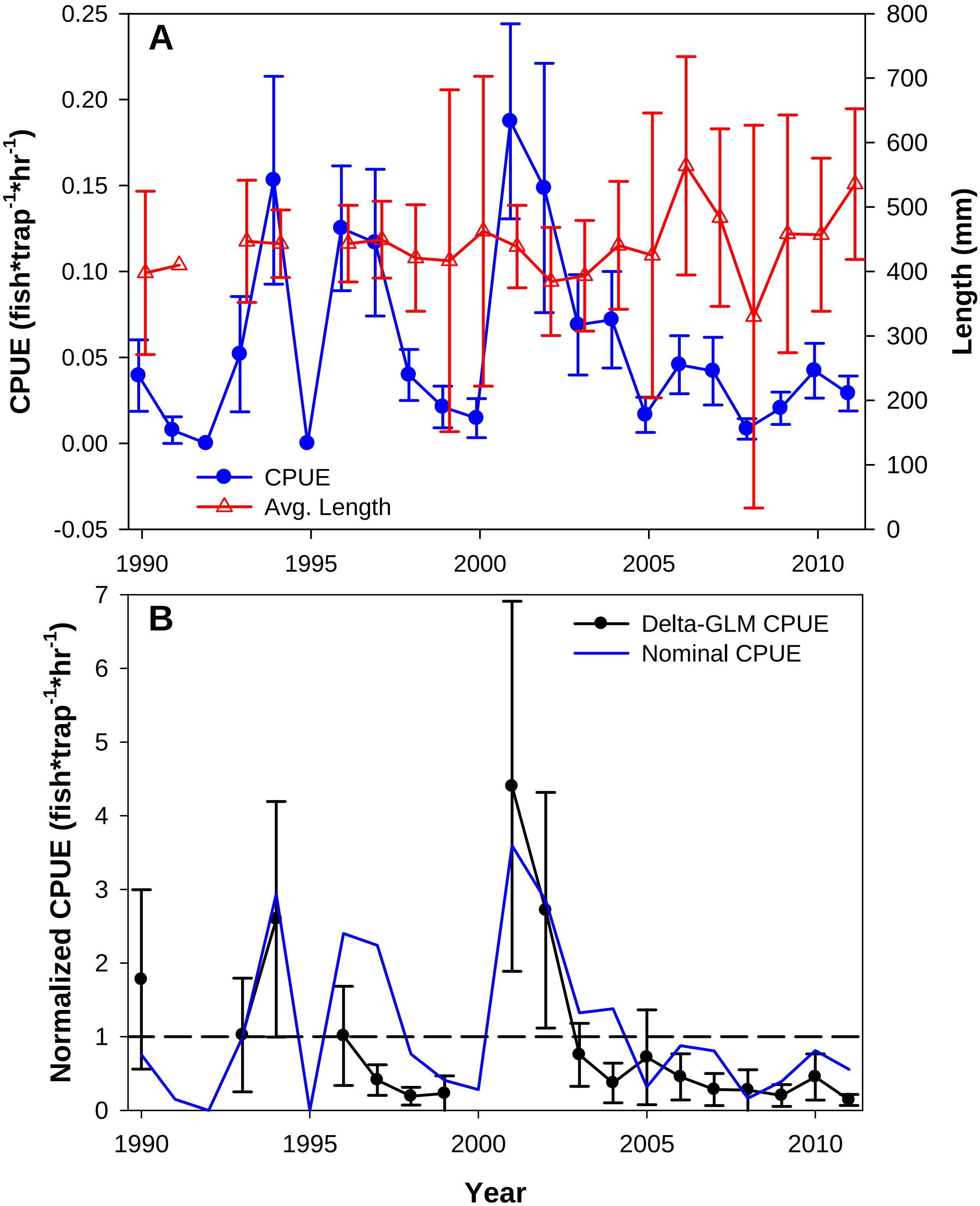

Figure 35: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for snowy grouper. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for snowy grouper.

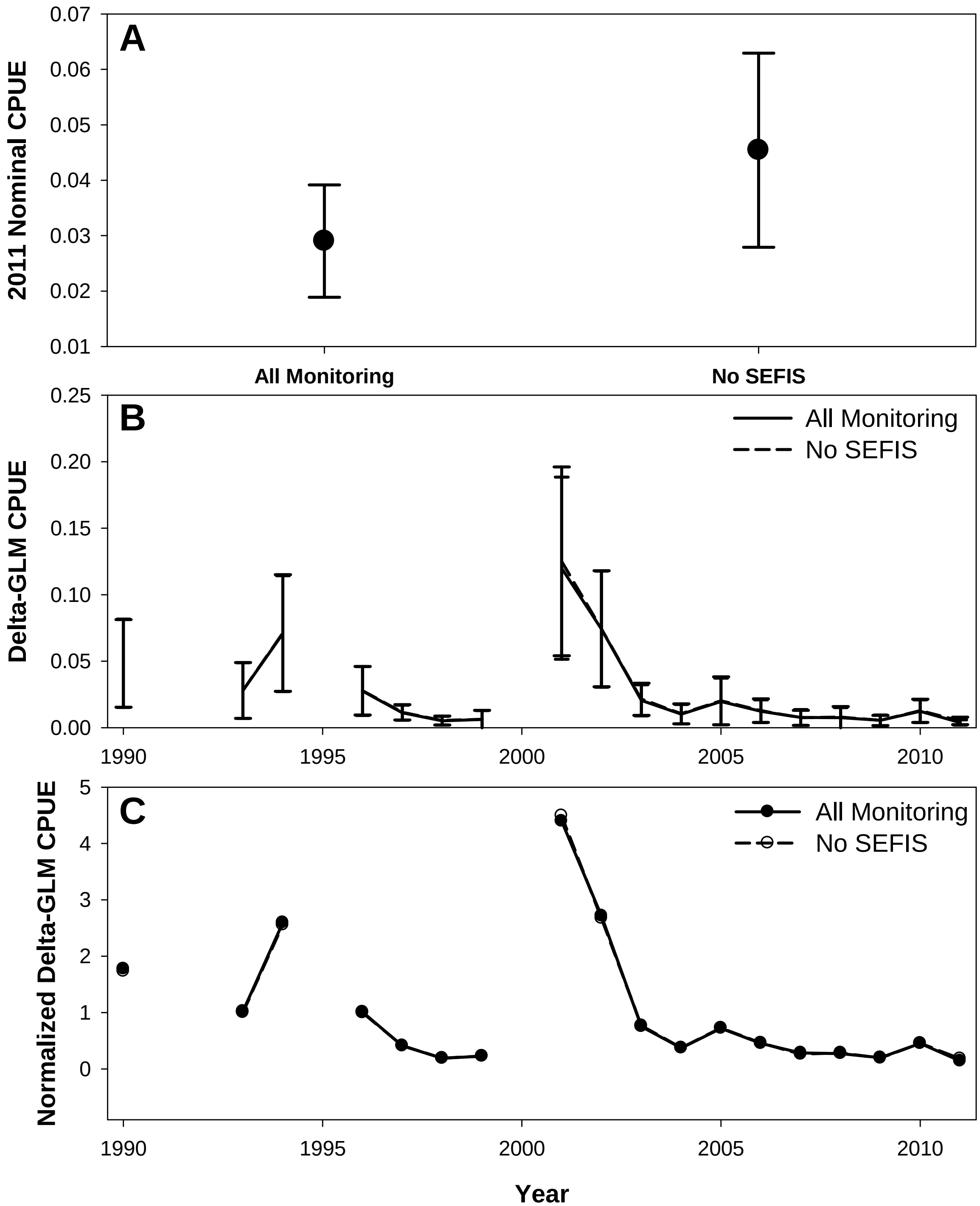

Figure 36: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of snowy grouper. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

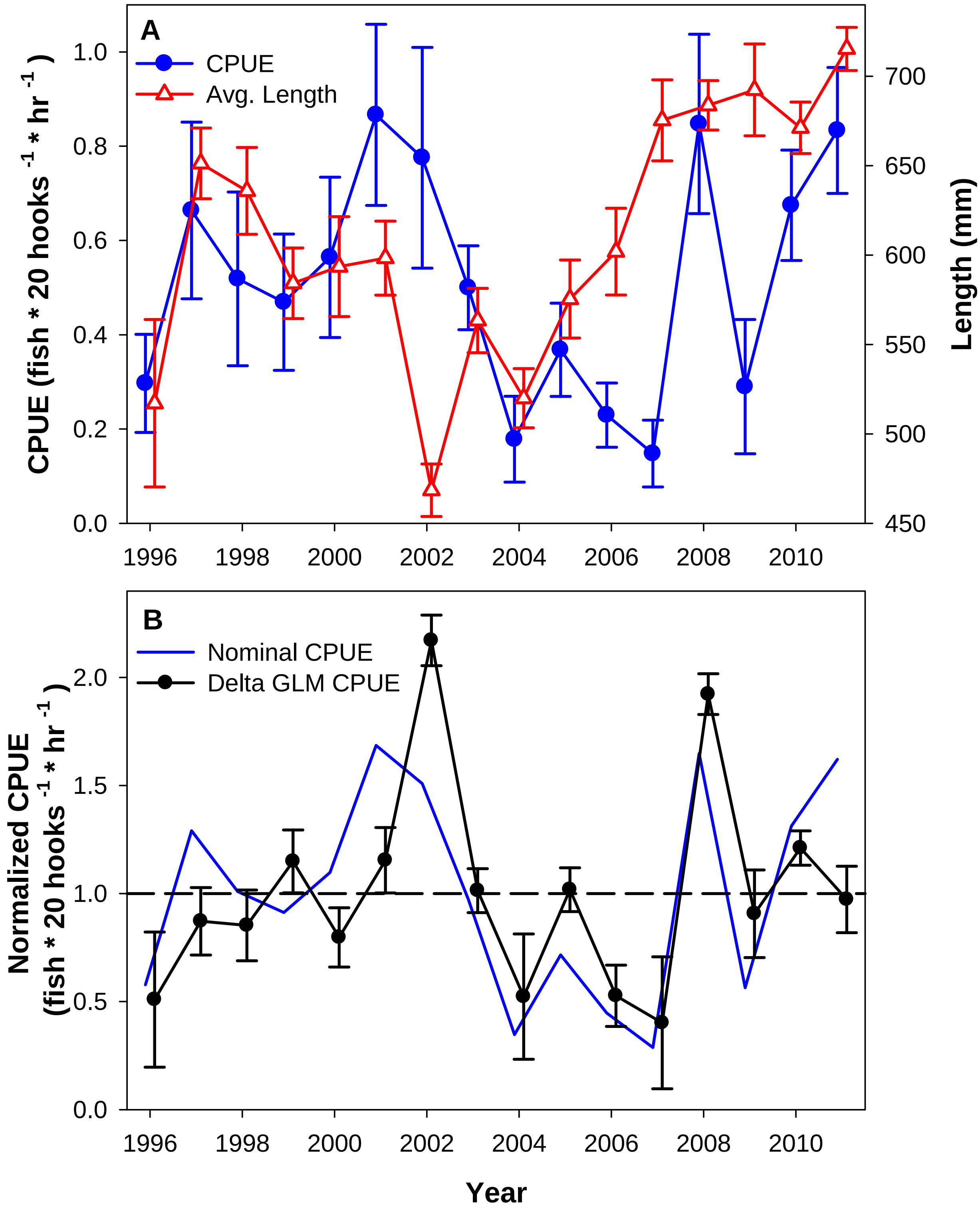

Figure 37: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for snowy grouper. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for snowy grouper.

Speckled Hind

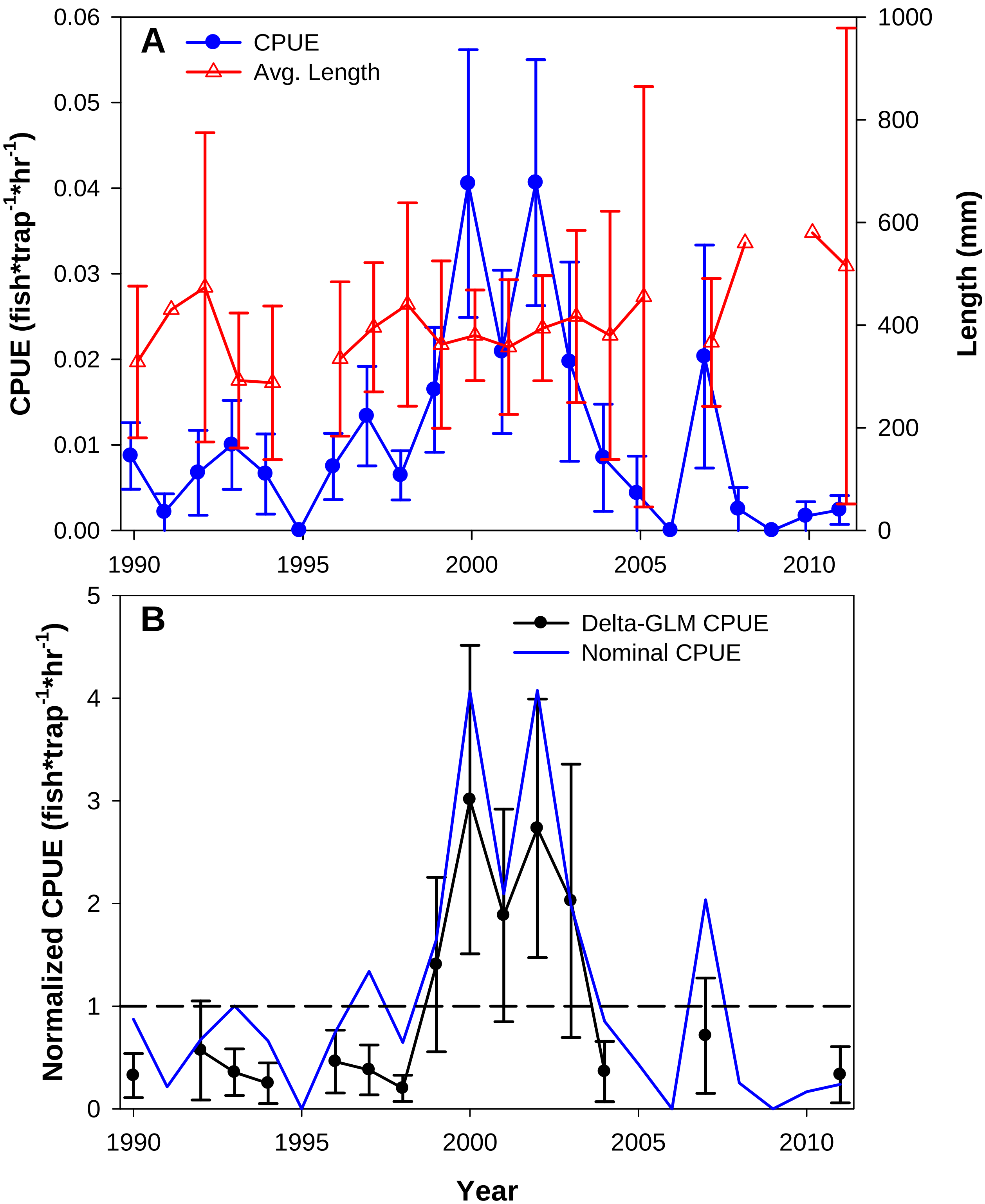

Figure 38: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for speckled hind. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for speckled hind.

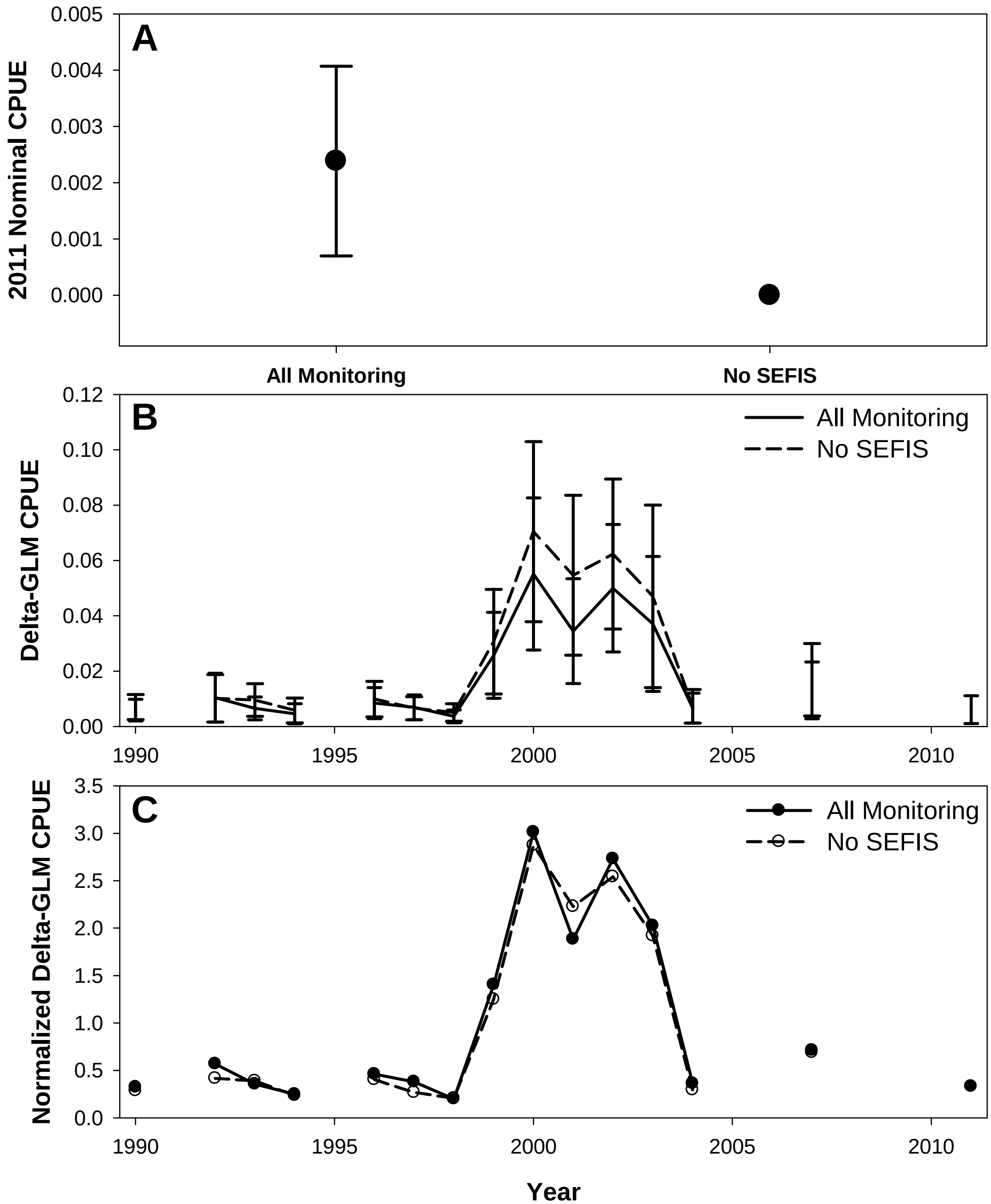

Figure 39: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of speckled hind. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

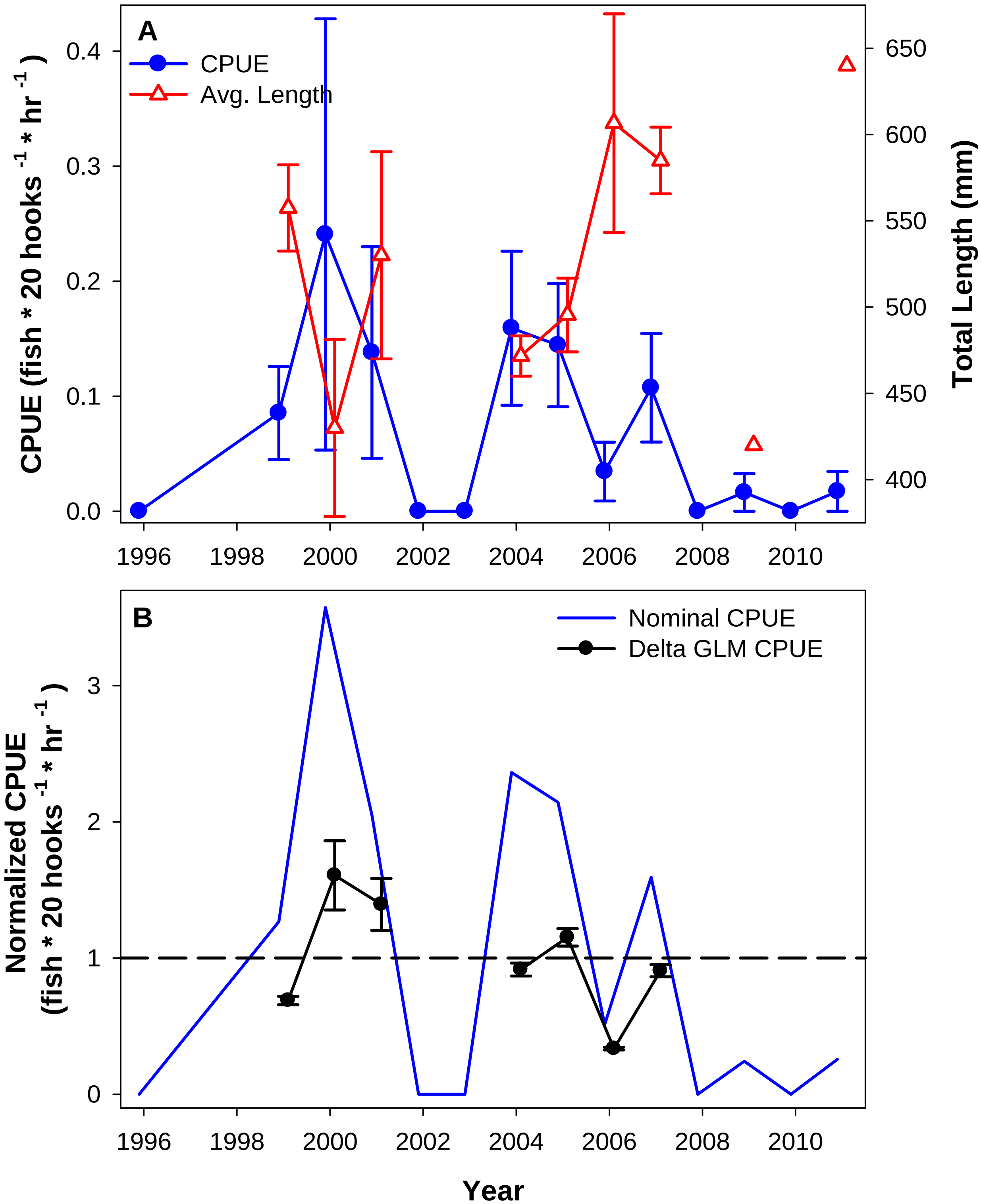

Figure 40: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for speckled hind. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for speckled hind.

Knobbed Porgy

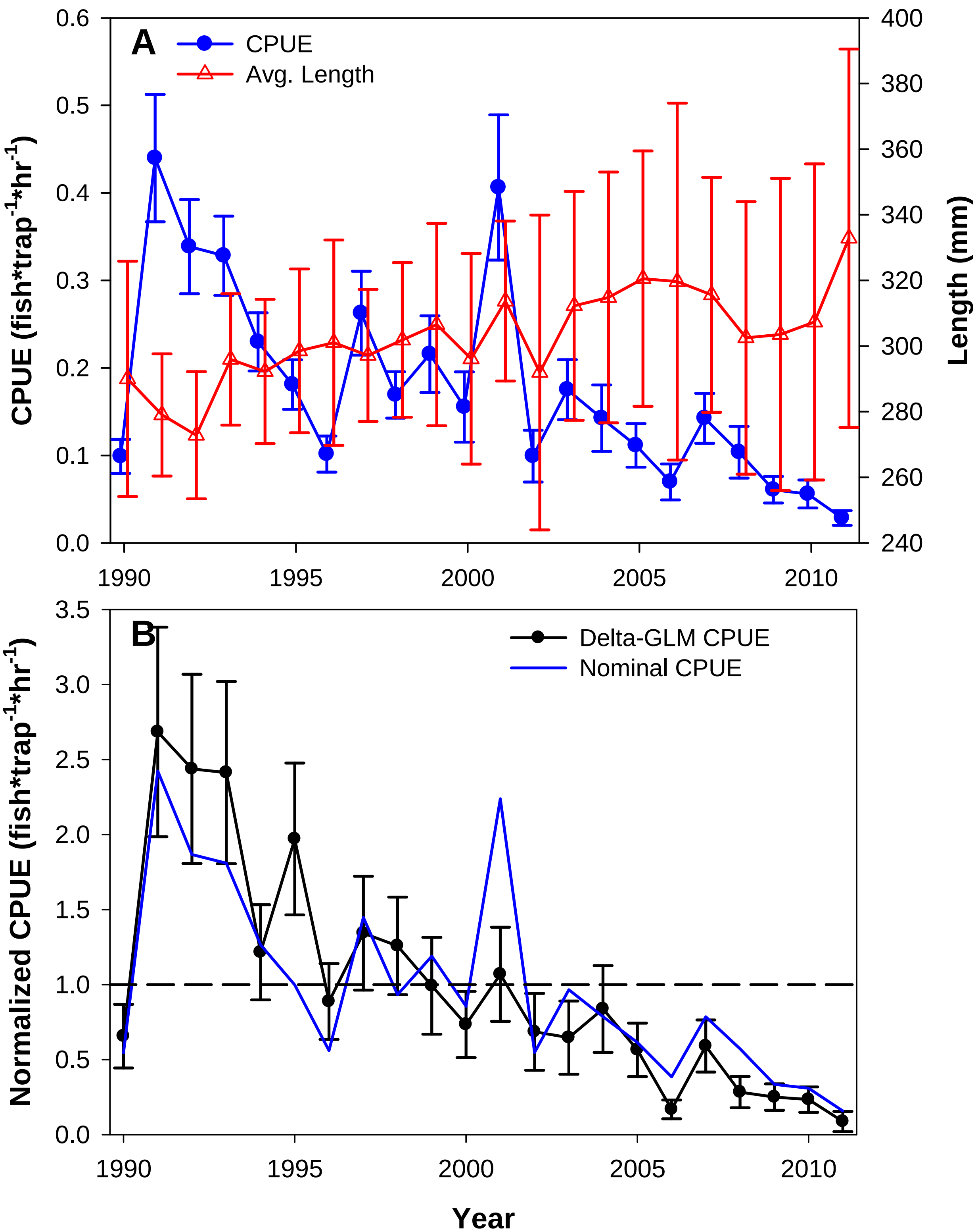

Figure 41: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for knobbed porgy. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for knobbed porgy.

Pinfish

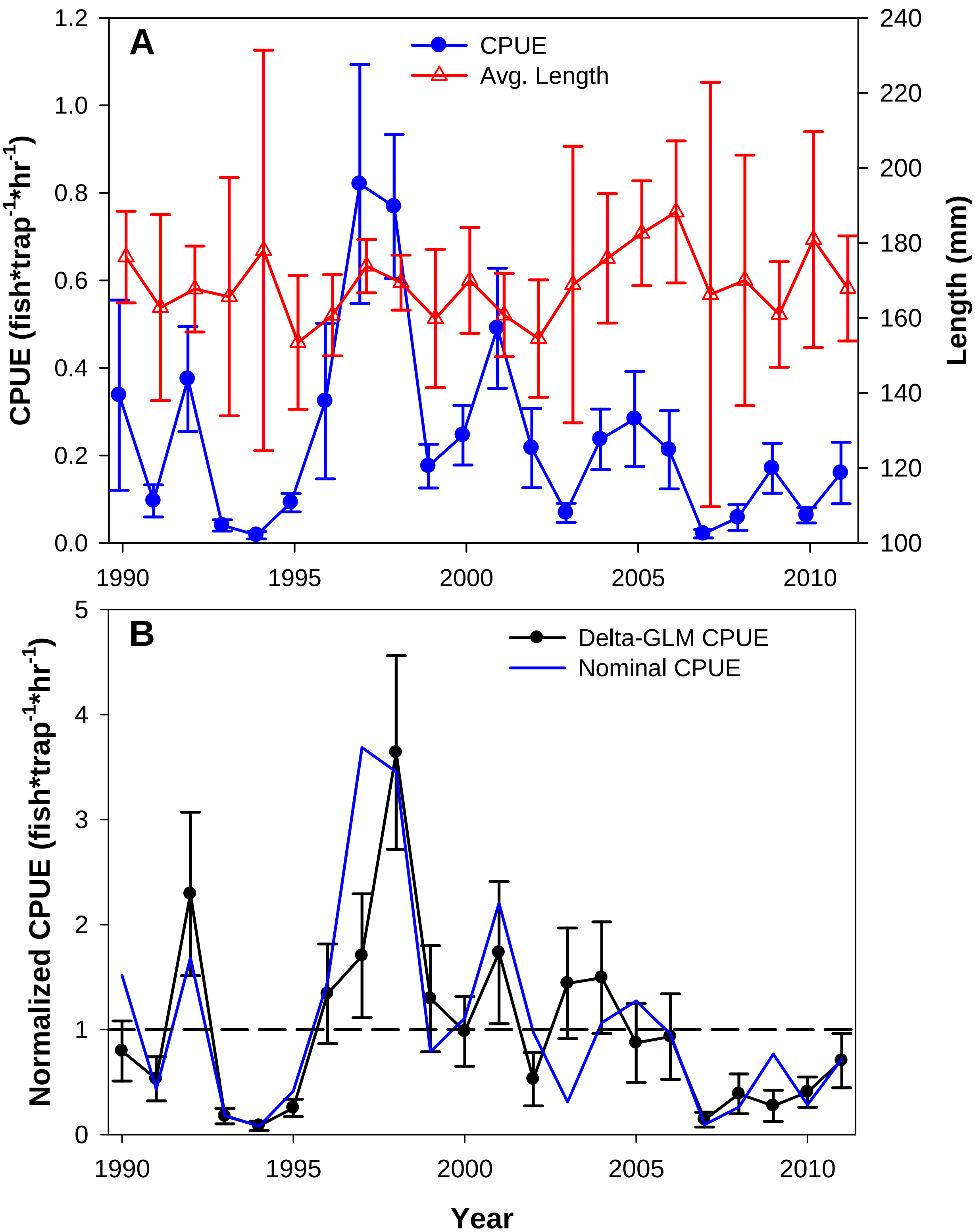

Figure 42: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for pinfish. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for pinfish.

Red Porgy

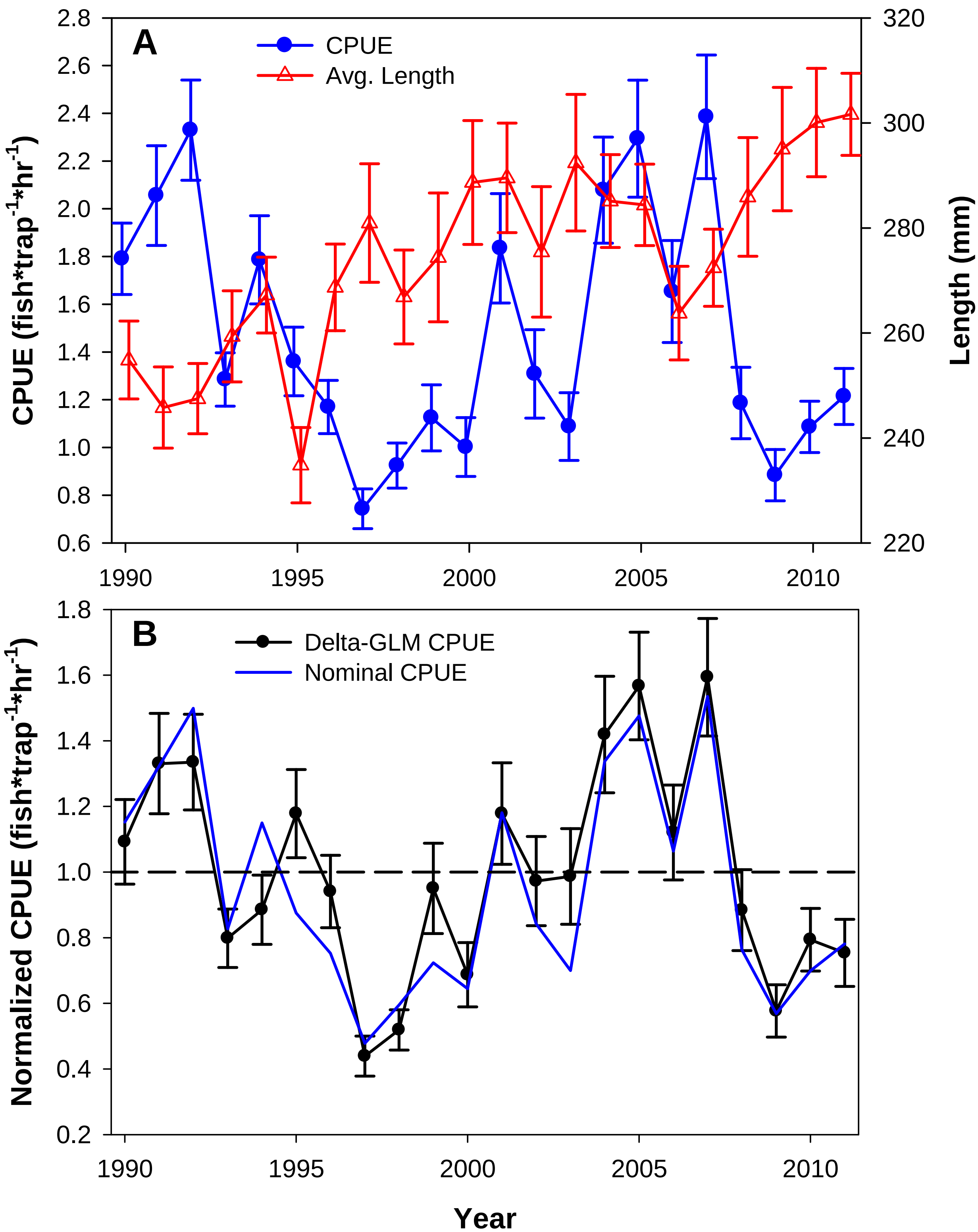

Figure 43: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for red porgy. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for red porgy.

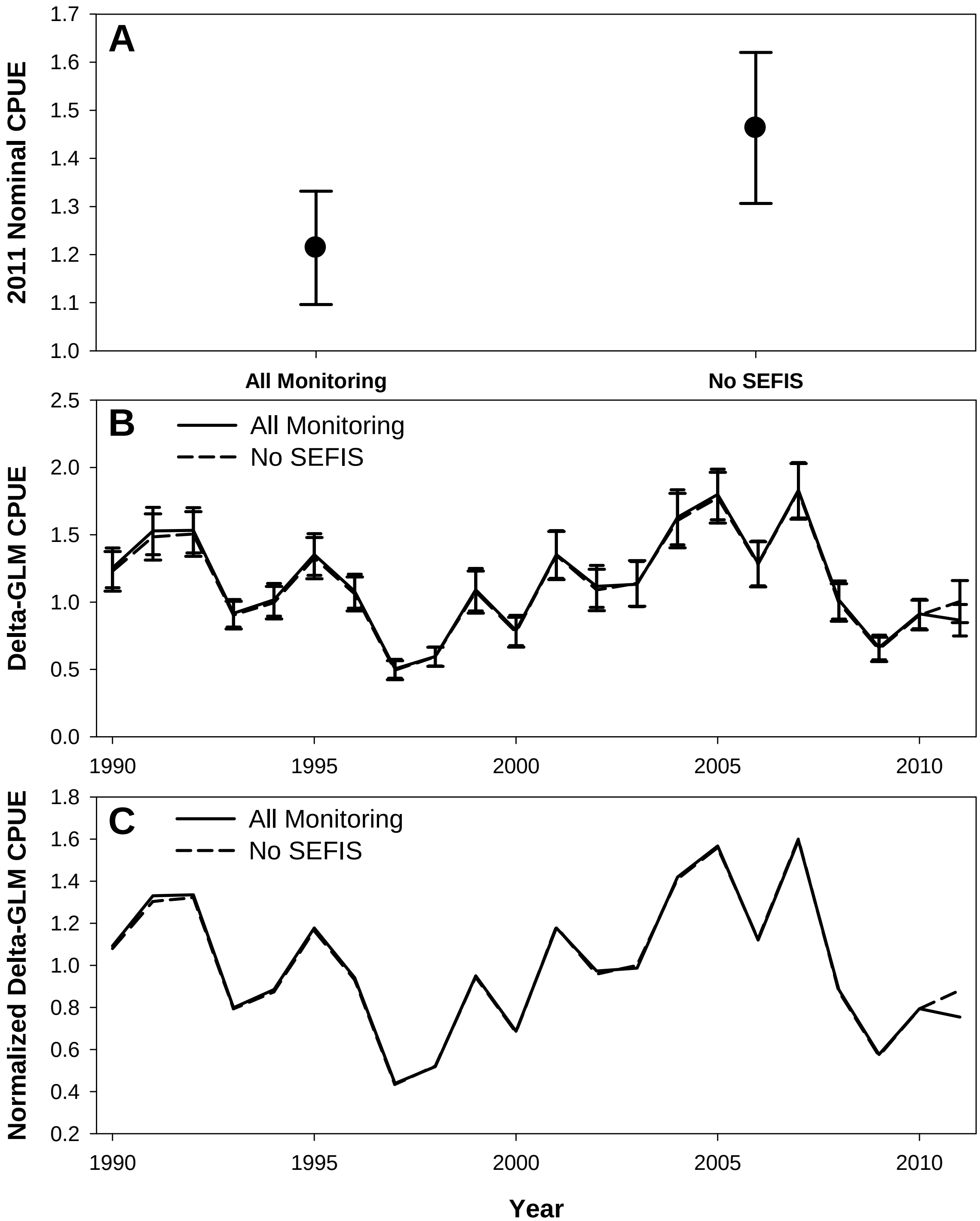

Figure 44: Investigation of the effect of inclusion of newly identified SEFIS monitoring stations on CPUE of red porgy. A) Comparison of nominal CPUE estimates (± SE) in 2011 when we include (All Monitoring; base analysis) and exclude (No SEFIS) SEFIS monitoring stations. B) Delta-GLM standardized CPUE (± SE) when we include and exclude SEFIS monitoring stations. C) Normalized (to the series mean) delta-GLM standardized CPUE when we include and exclude SEFIS monitoring stations.

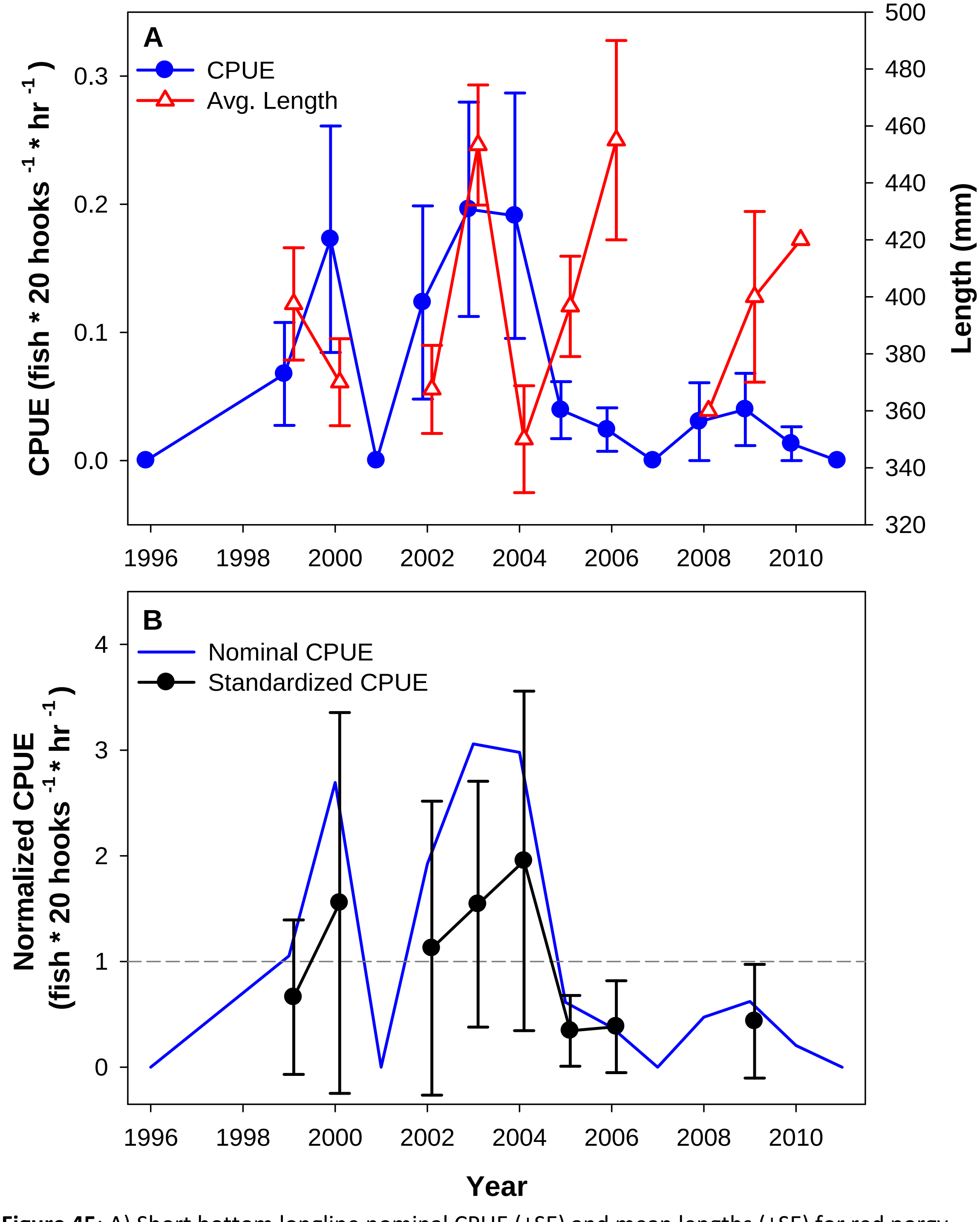

Figure 45: A) Short bottom longline nominal CPUE (±SE) and mean lengths (±SE) for red porgy. B) Short bottom longline normalized nominal CPUE nominal CPUE and standardized CPUE (±SE) for red porgy.

Spottail Pinfish

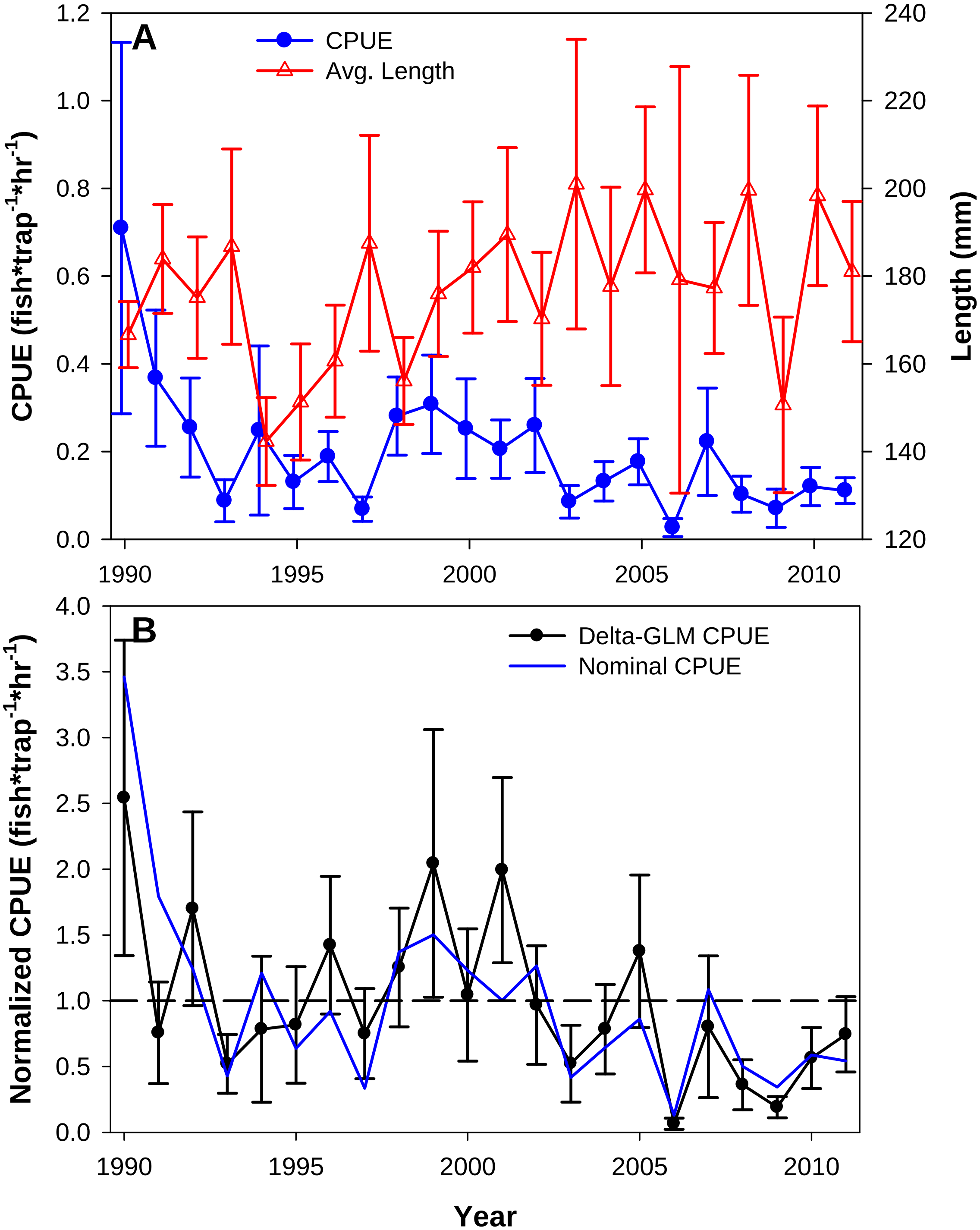

Figure 46: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for spottail pinfish. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for spottail pinfish.

***Stenotomus* spp.**

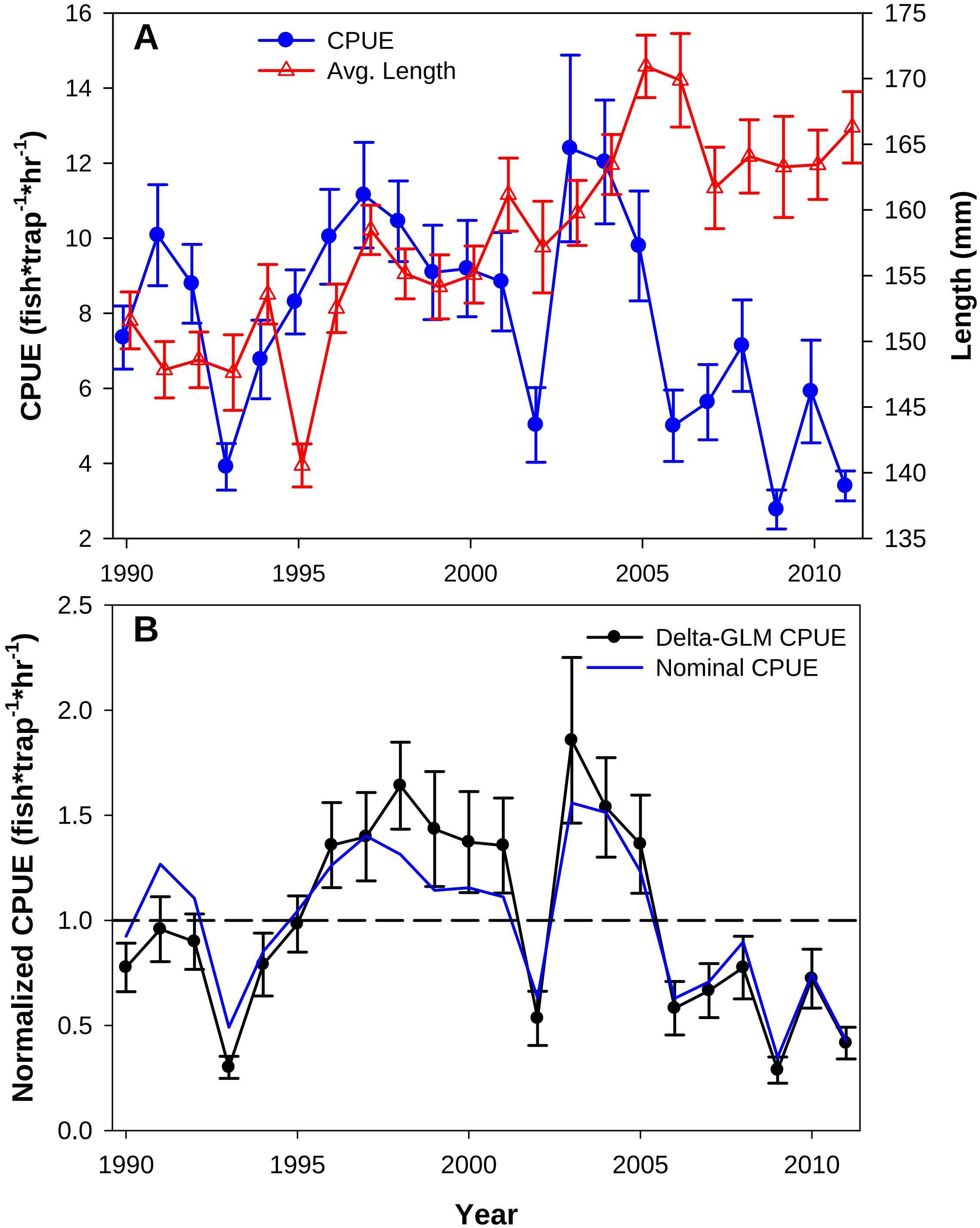

Figure 47: A) Chevron trap nominal CPUE (±SE) and mean lengths (±SE) for members of the genus *Stenotomus*. B) Chevron trap normalized delta-GLM standardized CPUE (±SE) and normalized nominal CPUE for members of the genus *Stenotomus*.