Data Summary Report:

Nekton of Sarasota Bay and a Comparison of Nekton Community Structure in Adjacent Southwest Florida Estuaries

for

Year Four
(June 2012 – April 2013)

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May 30, 2014

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ACKNOWLEDGEMENTS

We thank all the Fisheries-Independent Monitoring program personnel, too numerous to mention, who were involved in collecting and processing the many samples that make up this study. We also thank the Sarasota Bay Estuary Program for funding the study, providing a unique opportunity to collect data from a coastal lagoonal type system situated between Tampa Bay and Charlotte Harbor. Fisheries-Independent Monitoring program collections from Tampa Bay and Charlotte Harbor, which were analyzed for interbay species abundance and mercury concentration comparisons, were funded by State of Florida Recreational Saltwater Fishing License and the Department of the Interior, U.S. Fish and Wildlife Service, Federal Aid for Sportfish Restoration Project Number F-43 to the Florida Fish and Wildlife Conservation Commission (FWC).

SUMMARY (Year 4: June 2014 – April 2013)

The Sarasota Bay Estuary Program's (SBEP) Comprehensive Conservation Management Plan stresses the importance of restoring and protecting juvenile fish habitats. Sarasota Bay's estuarine habitats have been subjected to increased urbanization since the 1950's. Understanding the distribution, abundance and habitat use of nekton (fish and macroinvertebrates) within these habitats is critical to protecting and restoring these estuarine areas.

The Florida Fish and Wildlife Conservation Commission's (FWCC) Fisheries-Independent Monitoring (FIM) program has been monitoring nekton assemblages in Tampa Bay and Charlotte Harbor, estuaries that are adjacent to Sarasota Bay, since 1989. The goal of the FIM program is to provide timely, accurate, and consistent fisheries-independent data and analyses to fisheries managers for the conservation and protection of Florida's fisheries. The sampling design and data collected are intended not only to assess fishery stocks, but to also describe habitat utilization, biodiversity, nekton communities, and to document changes within Florida's estuarine systems.

The general objectives of this study were to describe the nekton habitat utilization and community structure within Sarasota Bay, to compare nekton community structure between three adjacent estuaries (Tampa Bay, Sarasota Bay and Charlotte Harbor), and to assess mercury concentrations in edible fish tissues. Specifically, this study was designed to: 1) provide a database of fish and selected invertebrate species that inhabit Sarasota Bay; 2) examine spatial differences in species composition and relative abundance within Sarasota Bay; 3) examine spatial differences in species composition and relative abundance between three estuaries along Florida's Southwest Coast; and

4) develop baseline data on mercury content in fish from Sarasota Bay and to compare those data to adjacent estuaries.

The FIM program used a stratified-random sampling design to select sampling sites within each of the five Sarasota Bay embayments as defined by the Sarasota Bay Estuary Program. Bi-monthly samples were collected between June 2009 and April 2013 with 21.3-m seines, 183-m haul seines, and 6.1-m otter trawls. Water chemistry parameters (salinity, water temperature, dissolved oxygen and pH) and habitat assessments (bottom type, presence of submerged aquatic vegetation, shore habitat) were taken in association with each net deployment. The gear-specific nekton catch summary portion of this report has been limited to the fourth year of sampling (June 2012 to April 2013), while the analysis portions (meteorological patterns, community structure, species profiles, and total mercury concentrations) include data from all four years of the study.

Meteorological patterns during the four years of this study generally followed the 30-year trend from 1979 to 2008, but monthly average temperatures and total rainfall tended to deviate from the average. Monthly average air temperature from December 2009 to March 2010 and from December 2010 to January 2011 were lower than the 30-year averages, with the extreme lows of winter 2010 resulting in cold kills of many nekton species. Average air temperatures during all but six months between May 2010 and April 2013 were higher than the 30-year averages. Total rainfall rarely approximated the long-term monthly totals during this study, with spring periods either wetter (May 2009, March to May 2010, and March to May 2011) or drier (March to May 2012) than normal. Similarly, the normally rainy period (June – September) had months that were both drier (September 2009, 2010, and 2011) and wetter (July 2009, August 2010 and 2011, and June 2012) than average.

Between June 2012 and April 2013 102,114 animals were collected in 245 net hauls collected with three sampling gear types, 21.3-m seines, 183-m haul seines and 6.1-m otter trawls. The majority (n=86,335) of the nekton were captured in 21.3-m seines. *Lagodon rhomboides* (Pinfish), *Eucinostomus* spp. (Eucinostomus Mojarra), and *Anchoa mitchilli* (Bay Anchovy) represented 70% of the total catch in the 21.3-m seine and almost 60% of the total catch from all gear types. *Lagodon rhomboides* (Pinfish) were the dominant taxon collected in the 183-m haul seine (61.7%) and *Eucinostomus* spp. (Eucinostomus Mojarra) were the dominat taxa in the 6.1-m otter trawl hauls (39.5%). Other estuarine dependent species such as Eucinostomus Mojarra (*Eucinostomus* spp.), Bay Anchovy (*Anchoa mitchilli*), Silver Jenny (*Eucinostomus gula*), and Pink Shrimp (*Farfantepenaeus duorarum*) were relatively abundant and commonly collected in the Sarasota Bay estuary as well.

Analysis (ANOVA) of overall abundance in Tampa Bay, Sarasota Bay and Charlotte Harbor indicated that the bay segment with the highest abundance was located in the Sarasota Bay estuary regardless of gear type. Little Sarasota Bay had the highest abundance for two of the gear types (21.3-m seine, shoreline and offshore methods, and 6.1-m otter trawl). For the larger bodied nekton typically collected with the 183-m haul seine, Sarasota Bay proper had higher abundance than any of the bay segments analyzed.

Nekton community structure in three adjacent Southwest Florida estuaries (Tampa Bay, Sarasota Bay, and Charlotte Harbor) tended to differentiate into three bay-segment groupings regardless of gear type: 1) upper Tampa Bay and Charlotte Harbor grouping, 2) lower bay grouping, and 3) a “Little Sarasota Bay” grouping. The majority of the top 25 pseudo-species (species/size combinations) that defined the dissimilarity between bay-segment groupings had higher abundance in the group that included Little Sarasota Bay. The most obvious geophysical features of the bay segments in the “Little Sarasota Bay” grouping are 1) relatively small surface area; 2) freshwater inflow from Phillippi and South creeks; and 3) proximity, but no direct connection, to the Gulf of Mexico.

Mercury is a toxic element that bio-accumulates in animal tissues, with concentrations tending to increase with size, age and trophic level. Tissue samples from nekton for total mercury content analysis in Sarasota Bay were taken from 792 individuals representing 29 taxa. To date, 83% (n=661) of the tissue samples collected from the Sarasota Bay estuary have been analyzed for total mercury concentration. Sample sizes and the size range sampled are not yet adequate to analyze mercury concentrations for individual taxa within the Sarasota Bay estuary. Combining the Sarasota Bay estuary specimens with data from adjacent estuaries (Tampa Bay and Charlotte Harbor), however, provided an adequate sample size and size range for several taxa (n=9) with some opportunity for interbay comparisons. The results of the mercury content analysis indicated that fish from Sarasota Bay had similar concentrations and accumulation rates to fish collected in Tampa Bay and Charlotte Harbor.

INTRODUCTION

Sarasota Bay is an urbanized coastal lagoon system located on Florida's Southwest Coast. Since the early 1900s, dredge and fill activities have resulted in significant losses of ecologically important habitats, and historically semi-isolated tidal current regimes within embayments have been joined through the construction of an Intracoastal Waterway (ICW) channel that hydrologically links the embayments. Intense development occurred throughout the system starting in the late 1950's resulting in much of the natural shoreline being replaced by seawalls to retain dredge-and-fill material for housing sites and other construction projects. Mosquito ditching and significant channelization of tidal creeks has altered historical patterns of surface water runoff to the bay and further exacerbated the problem of wetland habitat loss (*Sarasota Bay National Estuary Program 2003*). A thorough understanding of the ecology of local nekton assemblages is imperative if the consequences of further anthropogenic or environmental changes are to be determined (*Poulakis et. al. 2004*). In addition, the development of a baseline database documenting habitat use, recruitment and biodiversity can provide a broader understanding of the status of fish populations found within an estuary and help to guide the protection of estuarine-based fisheries and associated habitats (*Paperno et. al. 2001*).

The Sarasota Bay Estuary Program (SBEP) Comprehensive Conservation Management Plan (CCMP) stressed the importance of restoring and protecting juvenile fish habitat as well as the need to maintain fish populations while pursuing restoration efforts (*Sarasota Bay National Estuary Program 1995*). The objectives of this study are to: 1) provide a database of fish and selected invertebrate species that inhabit Sarasota

Bay; 2) examine spatial differences in species composition and relative abundance within Sarasota Bay; 3) examine spatial differences in species composition and relative abundance between three estuaries along Florida's Southwest Coast; and 4) develop baseline data on mercury content in fish from Sarasota Bay and compare those data to adjacent estuaries.

METHODS

Study Area

Sarasota Bay is a coastal lagoon, located on the southwest coast of Florida, which stretches from Anna Maria Sound to the Venice Inlet. The bay is comprised of five embayments (Palma Sola, Sarasota, Roberts, Little Sarasota and Blackburn bays) which were formed behind a barrier island complex. This system is connected to the Gulf of Mexico through five inlets; Anna Maria Sound, Longboat Pass, New Pass, Big Sarasota Pass and Venice Inlet. Freshwater inflow enters the estuary through a series of creeks, bayous, and unnamed drainage ditches (*Roat and Alderson 1990*). The main tributaries and receiving water bodies are Bowlees Creek and Whitaker and Hudson bayous (Sarasota Bay proper), Phillippi Creek (Roberts Bay), Clower and Catfish creeks (Little Sarasota Bay) and South Creek (Blackburn Bay). Shoreline vegetation consists largely of mangroves and marsh grasses, and bottom substrates are typically characterized as sand, mud, oysters, or a combination thereof (*Flannery 1989*). Seagrass meadows are the dominant, submerged vegetative cover in Sarasota Bay and are widely distributed throughout the estuary (*Haddad 1989*).

Sampling Design

The FIM program utilized a stratified-random sampling (SRS) design and a multi-gear approach to collect data on nekton (fish and select invertebrates) from a wide range of habitats and life history stages. This sampling design provides comprehensive data on size-specific, spatial and temporal patterns of abundance for individual species and for the entire nekton community. Specimens collected during this sampling are used for various assessments, such as fish health, mercury content, diet, age/growth, and reproduction. Three sampling gears (*Table 1*) were used: 1) 21.3-m seines (shoreline and offshore deployment methods); 2) 183-m haul seines; and 3) 6.1-m otter trawls. The data gathered from seine hauls document habitat use by shallow-water organisms (≤1.5m deep for 21.3-m seine and ≤2.5-m deep for 183-m seine) whereas the data collected from trawls document habitat use in deeper areas (1.8 to 7.6m deep). The 21.3 m seine is deployed in two different methods; 1) offshore set, where net is at least 5m from the shoreline; and 2) shoreline set, where one seine wing is against shore. The dominant catch for the 21.3-m seine and 6.1-m otter trawl is juvenile nekton, although subadults and adults of smaller-bodied nekton species are also commonly collected. The 183-m haul seine typically catches larger sub-adult and adult nekton.

The FIM program sampling design divided the Sarasota Bay estuary into zones representing the five embayments designated by the Sarasota Bay Estuary Program (Zone A - Palma Sola Bay, Zone B - Sarasota Bay proper, Zone C - Roberts Bay, Zone D - Little Sarasota Bay, and Zone E - Blackburn Bay; *Figure 1*). Each zone was further subdivided into 1-nm^2 grids. Within each grid, habitat and depth strata were identified, thereby designating the gear types that could be deployed in each. The number of samples designated for collection in each zone with each gear was proportional to the number of grids in the zone that could be sampled with a particular gear. Randomly selected locations within randomly selected grids were designated as sampling sites to be visited during each sampling event. A single deployment with the designated gear was made at each selected site. Thirty primary samples consisting of six 183-m haul seines, eight 6.1-m otter trawls and sixteen 21.3-m seines were collected during each sampling event. Nine to 12 additional 21.3-m seine samples were collected at randomly selected sites during each sampling event as time allowed.

Sampling events were completed with a bi-monthly periodicity in the Sarasota Bay estuary. Sampling began in June 2009 and is ongoing. This report summarizes the data collected during year four of the study (June 2012 to April 2013), and analyses species distributions and abundance, and community structure from all four years (June 2009 to April 2013).

Table 1. Description of sampling gears used during the Sarasota Bay stratified random sampling, June 2012 – April 2013. A more detailed description of each gear can be found in the FIM program's Procedure Manual.

Gear	Mesh Size (mm)	Area Sampled Estimate (m^2)	Description of use
21.3-m seine	3.2	140	used in areas ≤ 1.5-m deep
183-m haul seine	38.1	4,120	used along shorelines ≤ 2.5-m deep
6.1-m otter trawl	38.1 (3.2-mm bag liner)	1,440	used in areas from 1.8-m to 7.6-m deep

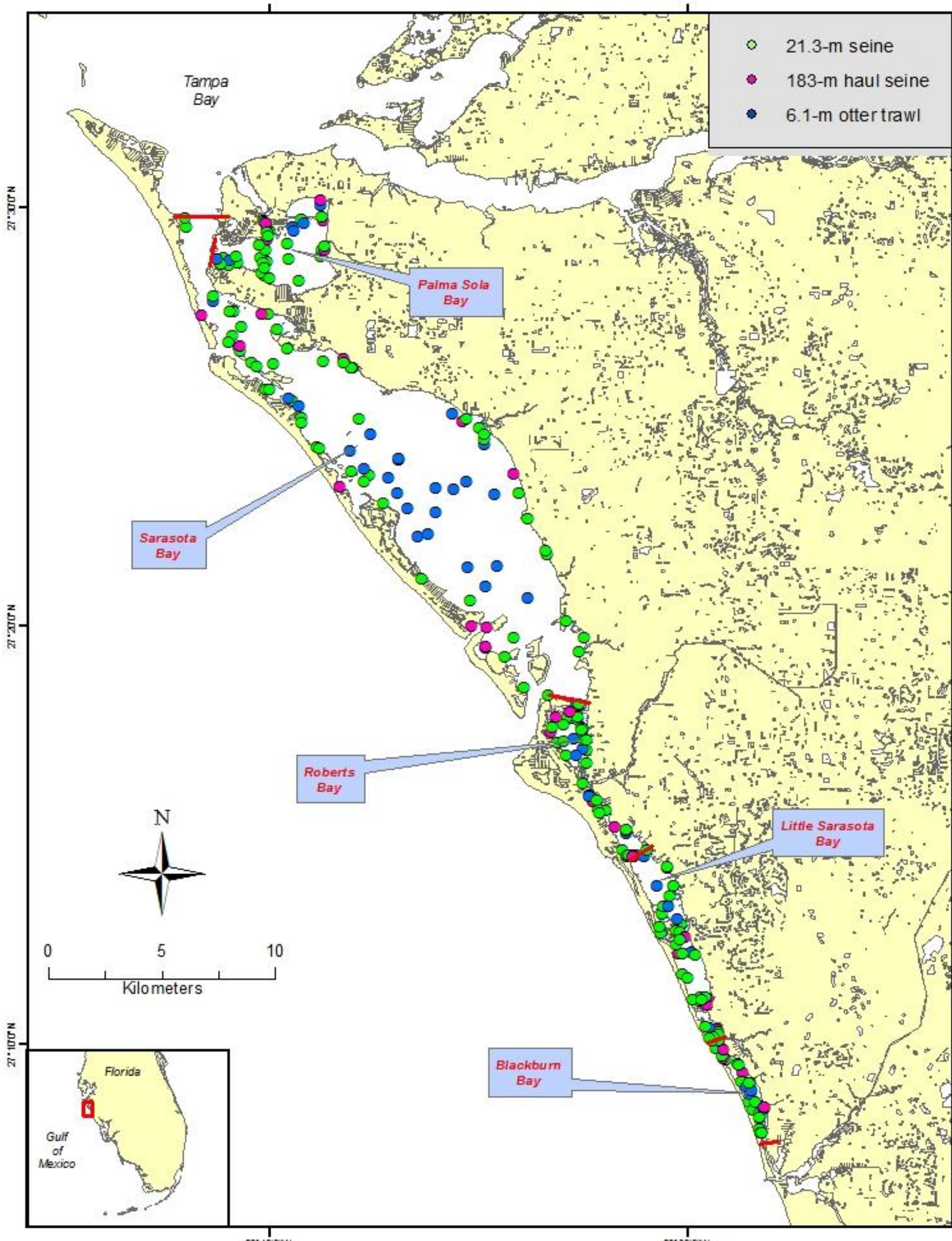

Figure 1. Stations sampled (dots) between June 2012 and April 2013 (Year 4), and geographic strata (solid lines) in Sarasota Bay.

Gear Specifications and Deployment

The gear type used to collect smaller nekton associated with shorelines and on offshore flats (>5 m from shore) was a 21.3-m center-bag seine with 3.2-mm mesh and leads spaced every 150 mm. The 21.3-m seine was pulled, with a crewmember on each wing, for a distance of 9.1 m with the net wings separated by 15.5 m. The seine was deployed into the current and was landed by collapsing the seine around a pivot pole to close the wings and force the catch into the center bag. Each 21.3-m seine deployment sampled an estimated 140 m^2. Sampling sites for the 21.3-m seine were pre-stratified into one of three categories: 1) >5-m from the shore and bottom vegetation present, 2) >5-m from the shore and bottom vegetation absent, and 3) against a shoreline.

The 183-m haul seine targeted larger sub-adult and adult nekton associated with relatively shallow (≤2.5-m), nearshore habitats. Deployment of this gear occurred from the back of a boat in a standardized rectangular shape. Both net wings were simultaneously hauled along the shoreline, keeping the lead lines close to the bottom, forcing the catch into the center bag portion of the gear. Each 183-m haul seine set enclosed an area of approximately 4,120 m^2. In Sarasota Bay proper, where two 183-m haul seine sets were collected during each sampling event, sites were pre-stratified by the presence or absence of overhanging shoreline vegetation (i.e., mangroves). The number of 183-m haul seine hauls collected in Palma Sola, Roberts, Little Sarasota and Blackburn bays during each sampling event were too small to pre-stratify by the presence or absence of overhanging shoreline vegetation.

Juvenile and adult nekton that inhabit relatively deeper waters (1.0 – 7.6-m) were collected in the 6.1-m otter trawl which had a 38-mm stretch mesh with a 3.2-mm mesh cod-end liner. The trawl was towed from the back of a boat for 10 minutes. Tow speeds averaged 0.6-m/s; start and end locations for each trawl were marked using a global positioning system (GPS) so that the distance fished could be estimated. Each trawl deployment sampled an area of approximately 1,440 m^2.

Salinity, temperature, pH, and dissolved oxygen were measured at the surface and at 1-m intervals to the bottom in association with each gear deployment. A variety of qualitative habitat assessments were also made, such as characteristics of the shoreline (e.g., vegetation type, inundation), substrate (e.g., sediment type, presence of submerged aquatic vegetation), and bycatch (i.e., total volume, type, and composition). All sampling was conducted during daylight hours (one hour after sunrise to one hour before sunset). Additional sampling details and habitat assessment procedures are described in the FIM program's Procedure Manual (*FWC-FWRI 2012*).

Sample Processing

Sample work-up was similar for all gear deployments. All fish and selected invertebrate species captured were identified to the lowest practical taxonomic level, generally species. Representative samples (three individuals of each species from the 21.3-m seines and 6.1-m otter trawls on each sampling trip) were brought back to the FWC-FWRI laboratory to confirm field identification. Species for which field identification was uncertain were also brought back to the laboratory. A maximum of 20 measurements (mm) were made per taxon, unless distinct cohorts were identifiable, in which case a maximum of 20 measurements were taken from each cohort; for certain economically valuable fish species (Selected Taxa, *Appendix A*), 40 individuals were measured. Standard length (SL) was recorded for teleost fish, total length (TL) for seahorses, precaudal length for sharks (PL), disk width (DW) for rays, post-orbital head length (POHL) for shrimp, and carapace width (CW) for crabs. Animals that were not measured were identified and counted. When large numbers of individuals (>1,000) were captured, the total number was estimated by fractional expansion of a sub-sampled portion of the total catch that had been split with a modified Motoda box splitter (*Winner and McMichael 1997*). Animals that did not require further laboratory examination were returned to the water. Additional details concerning sample work-up are described in the FIM program's Procedure Manual (*FWC-FWRI 2012*).

Due to frequent hybridization and/or extreme difficulty in the identification of smaller individuals, members of several abundant species complexes were not identified to species. Species of Menhaden (*Brevoortia* spp.) were not identified to species. *Brevoortia patronus* and *B. smithi* frequently hybridize and juveniles of the hybrids and the parent species are difficult to identify (*Dahlberg 1970*). Two abundant Silverside species (*Menidia beryllina* and *M. peninsulae*) tend to hybridize, form all-female clones, and occur in great abundance that renders identification to species impractical due to the nature of the diagnostic characters (*Duggins et al. 1986*; *Echelle and Echelle 1997*; Chernoff, personal communication), so they are represented in this report as *Menidia* spp. Species-level identification of Mojarras (genus *Eucinostomus*) was limited to individuals ≥40 mm SL due to great difficulty in separating *E. gula* and *E. harengulus* below this size (Matheson, personal observation). The term "Eucinostomus Mojarras" is used for these small specimens. Species-level identification of gobies of the genus *Gobiosoma* (i.e., *G. robustum* and *G. bosc*) was limited to individuals ≥20 mm SL for the same reason; smaller individuals are hereafter referred to as "Gobiosoma

Gobies". Similarly, Needlefishes (*Strongylura* spp.), other than *Strongylura notata*, were only identified to species at lengths ≥100 mm SL.

Gear-specific data summary tables for the numerically dominant and economically important taxa (Selected Taxa, *Appendix A*) were prepared with data from the fourth year of this study (June 2012 to April 2013). Summaries of all taxa collected by sampling event, gear and habitat, and embayment (sampling zone) were prepared using just the fourth year of the study period (*Appendices B*, *C*, and *D*, respectively). *Appendices E*, *F* and *G* contain catch summaries for all taxa collected with 21.3-m seines, 183-m haul seines, and 6.1-m otter trawls during all four years of the study (June 2009 – April 2013). Gear-specific catch overview plots (*Appendices H*, *I*, and *J*) for relatively abundant (≥ 200 animals collected) and commonly collected (≥ 10% occurrence) taxa, and species profiles for specific taxa were prepared using the four completed years of the study (June 2009 to April 2013).

Nekton Community Analysis

Overall abundance

Overall nekton abundance between bay segments and sampling years for Sarasota Bay and two adjactent estuaries (Tampa Bay and Charlotte Harbor) were investigated separately for each gear deployment method with Analysis of Variance (ANOVA). Prior to analysis abundance from each net set was natural log transformed after the addition of a constant (1). Bay segment, sampling year, and the interaction between these two categorical variables were included in the model. Analyses were completed using the GLM procedure within SAS software (*SAS Institute 2006*). Geometric means and 95% confidence intervals are presented.

Multivariate analysis

Nekton community structure was investigated using nonparametric multivariate analyses in PRIMER v6 software (Plymouth Routines in Multivariate Ecological Research; *Clarke and Warwick 2001*). Analyses pooled samples by averaging over zones (embayments and bay segments) to investigate spatial patterns. Data from each gear and deployment method (21.3-m shoreline seines, 21.3-m offshore seines, 183-m haul seines, and 6.1-m otter trawl) were treated separately. A broad-scale geographic analyses approach was conducted to compare nekton assemblages in adjacent bay systems along the southwest coast of Florida (Tampa Bay, Sarasota Bay and Charlotte Harbor; *Figure 2*). All nekton taxa collected, including species complexes (e.g., *Eucinostomus* spp. and *Menidia* spp.) and invertebrates were included in the community analyses. Taxa were subdivided into distinct size classes ('pseudo-species') to address ontogenetic habitat shifts, immigration/emigration and mortality.

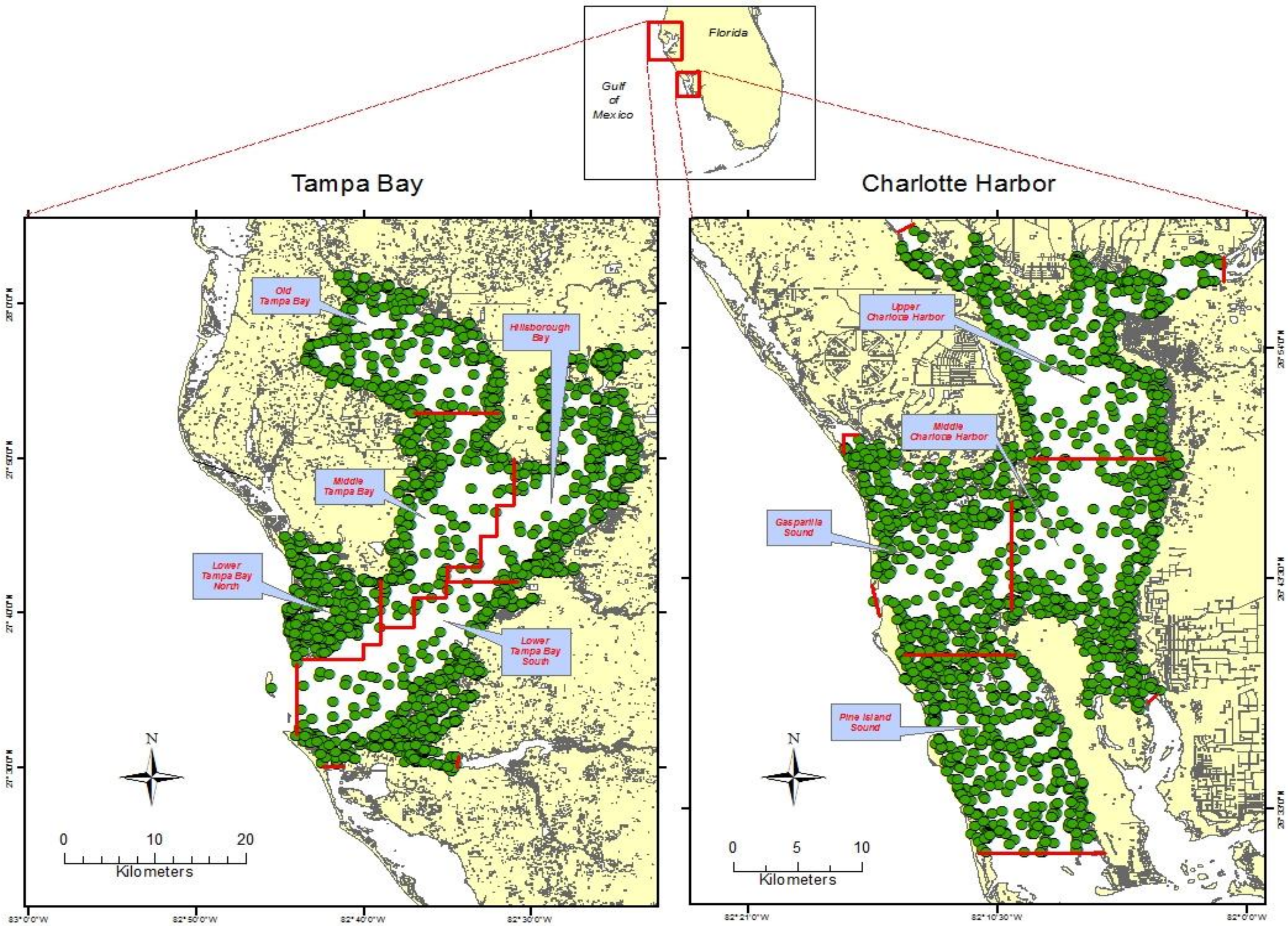

Figure 2. Stations sampled (dots) between June 2009 and April 2013, and geographic strata (solid lines) in Tampa Bay and Charlotte Harbor.

Bray-Curtis similarity calculation

The basis of the multivariate analyses was an assessment of similarity in nekton community structure, calculated according to the method of *Bray and Curtis (1957)*:

$$S_{jk} = 100\left\{1 - \frac{\sum_{i=1}^{p}\left|y_{ij} - y_{ik}\right|}{\sum_{i=1}^{p}\left(y_{ij} + y_{ik}\right)}\right\}$$

where S_{jk} is the Bray-Curtis similarity coefficient, y_{ij} is the abundance of the *i*th species in the *j*th sample and y_{ik} is the abundance of the same *i*th species in the *k*th sample. Abundance was standardized to number•haul^{-1} for both seine types, and to number•100m^{-2} to account for varying tow lengths. Abundance data were square root-transformed prior to analysis to reduce the influence of highly abundant taxa.

Non-metric multidimensional scaling (MDS) and Similarity Percentage Analysis (SIMPER)

In order to provide a visual depiction of differences in nekton community structure non-metric multidimensional scaling (MDS) of the initial Bray-Curtis similarity matrices was conducted. This technique generates two-dimensional plots of 'distances' between samples on the basis of their similarity in community structure (*Clarke 1993*). The MDS analysis uses an iterative procedure to attempt to map similarity of samples as closely as possible to the rank order of similarities from the input Bray-Curtis similarity matrix. The adequacy of this representation is judged by a 'stress' value, for which zero is perfect representation, and values below ~0.2 offer appropriate results for interpretation (*Clarke and Warwick 2001*). MDS-plot axes do not have units, so the important information in these plots is the relative distances between samples; samples close together on the plots are more similar in community structure than samples that are further apart. The MDS plots included ‘samples’ that were averages of all data collected by embayment or bay segment. Similarity percentage analysis (SIMPER; *Clarke and Warwick 2001*) was used to identify pseudo-species representative of dissimilarities between groups determined from MDS.

Mercury Content Analysis

Fish for mercury content analysis were placed directly on ice and returned to the laboratory, where standard length (SL) and sex were recorded. A clean stainless-steel knife was used to remove axial muscle tissue samples from the left dorsal area above the lateral line and anterior to the origin of the first dorsal fin for each fish. White muscle tissue taken from this region is representative of the portion of fish consumed by humans (*Adams and McMichael 2001*). Care was taken to assure that the sample did not contact the outer layer of the specimen, blood, scales, or other surrounding surfaces during the extraction process. Tissue samples were immediately placed in sterile polyethylene vials and frozen at -20° C until analyzed.

Total mercury concentration (THg) of each tissue sample was determined by EPA Method 7473 (*Direct Mercury Analysis by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrometry* [DMA], *USEPA 2007*). Frozen tissue samples were thawed until ice crystals were no longer present on or within the sample, and approximately 0.20 g of clean unexposed muscle tissue was then excised with sterilized stainless steel instruments from the interior portion of the sample. The tissue sample was placed directly into a clean quartz sampling vessel, weighed to 0.0001 g, and analyzed for total mercury by FWC-FWRI with a calibrated DMA-80 Direct Mercury Analyzer (Milestone Inc., Shelton, CT). Quality control included analysis of laboratory method blanks, duplicate or triplicate tissue samples, and certified fish-tissue reference material (CRM; TORT-2, DOLT-4, obtained from the National Research Council of Canada) for each group of 10 or fewer fish samples analyzed. Matrix spike samples were processed for every 40 samples analyzed in a group. If CRM results were not within 10% of their certified value, all samples run subsequent to the last acceptable CRM result were re-analyzed. All total mercury levels were measured and reported as milligrams per kilogram (mg/kg) wet weight, rounded to three decimal points (0.001).

Linear regression was used to describe the relationship between fish length and total mercury concentration. There were not enough animals for individual species collected for total mercury analyses were from the Sarasota Bay estuary to do an estuary-specific analysis, so data from Sarasota Bay, Tampa Bay and Charlotte Harbor were combined. Total mercury concentrations, from Tampa Bay and Charlotte Harbor, prior to 2006 were analyzed by EPA Method 245.6 (*Determination of Mercury in Tissues by Cold Vapor Atomic Absorption Spectrometry* [CVAAS]; *USEPA 1991*), which provides similar but not identical results to the DMA method. Therefore, THg values for all DMA-analyzed fish were converted into CVAAS values using equations developed by FWC from 1,566 split samples that were analyzed by both methods. Total mercury data were log transformed to approximate normality and homoscedasticity requirements prior to regression analysis. Only species with at least 100 total animals collected, and at least 10 from Sarasota Bay, were analyzed using linear regression.

RESULTS and DISCUSSION

Physiochemical conditions

Monthly average air temperature and total rainfall measured at Tampa International Airport during this four-year study period (June 2009 – April 2013) and during a 30-year historical period (January 1979 to December 2008) were compared. Generally, the monthly average temperature during this study period followed the 30-year historical trend, but with extreme cold and warm values during some months (*Figure 3*). The monthly average temperature was higher than normal for 30 of the 36 months between May 2010 and April 2013, with six months (April 2011, December 2011, January 2012, February 2012, January 2013, and April 2013) being over 2°C warmer than the the 30-year historical period (*Figure 3*). The average temperature was lower than the historic record from December 2009 to March 2010 and from December 2010 to January 2011. Differences from the 30-year historic record for rainfall were also apparent (*Figure 3*). Rainfall totals in the spring were either higher than historic totals (May 2009, March 2010, and March 2011) or much lower (May 2011 and March 2012). Totals during the summer and fall tended to follow the long-term trend, but with both very wet (July 2009, August 2010, August 2011, June 2012, and August 2012) and dry (August 2009, September 2009 and 2010) months. June 2012 had over 30 cm more precipitation than normal as Tropical Storm Debby passed over Florida on June 26 and 27.

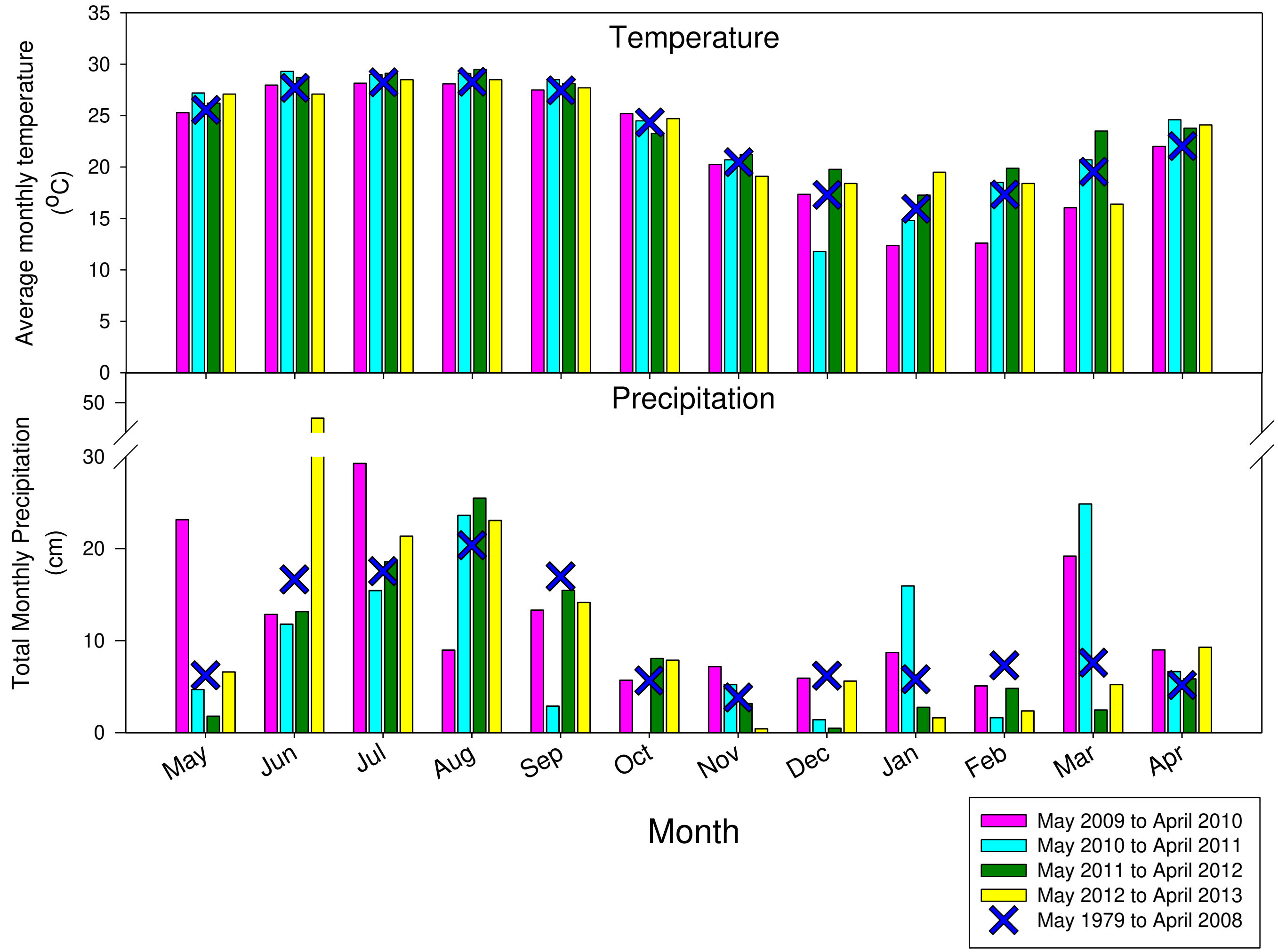

Figure 3. Temperature and total rainfall during the four years of the study (2009 - 2013) and during a thirty-year historical reference period (January 1979 to December 2008). Data are from Tampa International Airport (GHCND:USW00012842) and were downloaded from the National Climatic Data Center ((*http://www.ncdc.noaa.gov/cdo-web/search* accessed on 05/09/2014).

Throughout the four years of this study, average monthly water temperature in each of the five embayments showed very similar trends with little difference between embayments (*Figure 4*). Water temperature followed the typical Florida pattern, with the warmest temperatures during the summer months, decreasing temperatures during the fall and winter, and rising temperatures in the spring. Water temperatures in the February 2012 and 2013 were noticeably warmer (4-6º C) on average than the two preceding Feburay's (2010 and 2011).

Each of the five embayments had similar salinity trends (*Figure 4*) but Little Sarasota and Roberts bays had a more obvious freshwater influence during each of the four years than the other three embayments. Salinity maxima occurred in April (2012) or June (2009, 2010 and 2011) in each of the embayments with average salinity values around 36 ppt. During 2010 and 2011, salinity was lowest in each embayment during April, with two of the embayments (Roberts and Little Sarasota bays) having lower average salinity (<29 ppt) than the other three embayments (>31 ppt). In 2012, salinity minima occurred between August and December in each of the embayments. Salinity minima occurring in April is not typical of Southwest Florida estuaries, in which salinity usually reaches its maximum annual values toward the end of the dry season (April – May). Rainfall totals, however, were unseasonably high in March of both 2010 and 2011 (*Figure 3*), with more than double the long-term average rainfall occurring each year. This unseasonably high rainfall is responsible for this atypical salinity pattern. In March 2012, rainfall totals were unseasonably low, seven to ten times lower than March 2010 and 2011 respectively and three times lower than the long-term average rainfall. These low rainfall totals resulted in higher salinity values during April 2012.

Water column average dissolved oxygen was above 5 mg/l in each of the embayments during the sampling period (*Figure 4*), except for Palma Sola Bay in August 2009 (3.3 mg/l), June 2012 (4.5), and August 2012 (4.9) and Blackburn Bay in Aguust 2012 (4.5). The highest average dissolved oxygen concentration (10.0 mg/l) occurred in Little Sarasota Bay in June 2009.

The climatic and physiochemical conditions experienced during this four-year study of Sarasota Bay were not typical compared to the longer-term average condition for Southwest Florida. January, February, and December 2010 had colder than average temperatures, with fish kills reported throughout Florida in January 2010. Unseasonably heavy winter/spring precipitation was experienced during both 2010 and 2011, resulting in lower than average salinity values in the study area during April of 2010 and 2011.

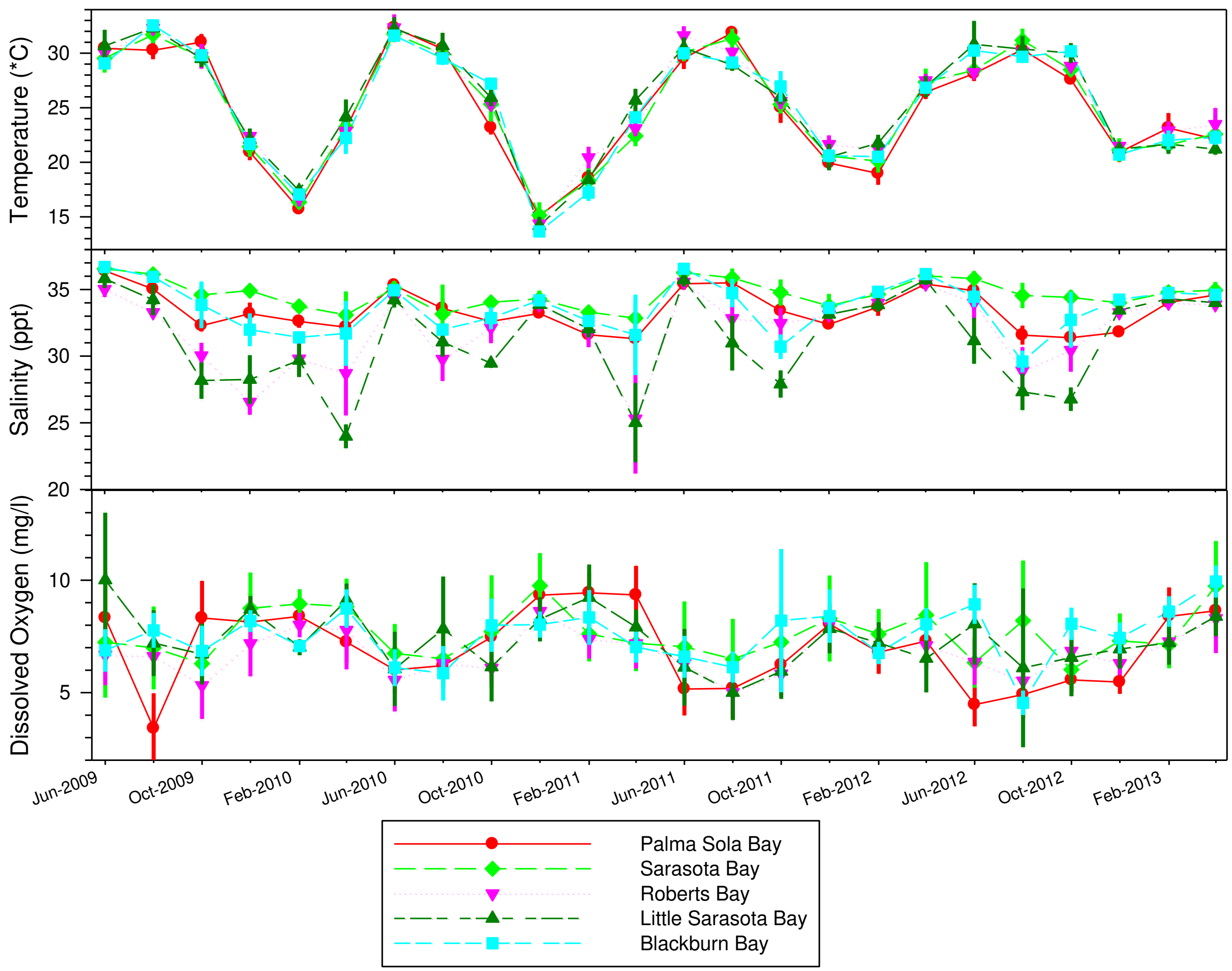

Figure 4. Mean (±standard deviation) water temperature, salinity, and dissolved oxygen (water column average) by embayment, from the nekton sampling in Sarasota Bay, June 2009-April 2013.

Composition of overall nekton community

A total of 102,114 fishes (104 taxa) and selected invertebrates (9 taxa) were collected from 245 samples collected during the fourth year of this study (June 2012 and April 2013; *Table 2*). Species lists with the number of animals collected during year four of this study are provided by sampling event, gear and habitat strata, and embayment in *Appendices B*, *C*, and *D*, respectively. Sarasota Bay proper, in which 33% of the gear sets were made, accounted for 29% of the total animals collected during the study period (*Table 2*). The fewest number of animals (n=14,162, 14% of total catch) were collected in Palma Sola Bay. The three remaining bays had similar percent catches for the fourth year of the study, Robert's Bay (18%), Blackburn Bay (19%), and Little Sarasota Bay (20%).

Table 2. Summary of catch and effort for Sarasota Bay nekton sampling, June 2012 to April 2013.

Bay Segment (Zone)	*21.3-m bay seine*		*183-m haul seine*		*6.1-m otter trawl*		*Totals*	
	Animals	*Hauls*	*Animals*	*Hauls*	*Animals*	*Hauls*	*Animals*	*Hauls*
Palma Sola Bay (A)	*11,879*	*30*	*2,172*	*6*	*111*	*6*	*14,162*	*42*
Sarasota Bay (B)	*23,761*	*46*	*4,237*	*12*	*1,311*	*24*	*29,309*	*82*
Roberts Bay (C)	*15,550*	*29*	*2,605*	*6*	*202*	*6*	*18,357*	*41*
Little Sarasota Bay (D)	*17,514*	*29*	*1,703*	*6*	*1,393*	*6*	*20,610*	*41*
Blackburn Bay (E)	*17,631*	*27*	*1,402*	*6*	*643*	*6*	*19,676*	*39*
Totals	*86,335*	*161*	*12,119*	*36*	*3,660*	*48*	*102,114*	*245*

Pinfish (*Lagodon rhomboides*, n=31,829) was the most numerous taxon collected, representing 31% of the total catch (*Appendices B*, *C*, and *D*). Eucinostomus Mojarra (*Eucinostomus* spp., n=22,355) was the second most abundant taxon collected, accounting for an additional 22% of the total catch. These two taxa accounted for 53% of the total catch in Sarasota Bay. The 25 Selected Taxa (n=4,457 animals) that were collected comprised 4.4% of the total catch. Pink Shrimp (*Farfantepenaeus duorarum,* n=1,591, 1.6% of total catch) and Spot (*Leiostomus xanthurus*, 0.7% of total catch) were the two most abundant Selected Taxa collected.

Shallow water habitats sampled with 21.3-m seines

Eighty-five percent (n= 86,335) of all nekton collected in year four of sampling the Sarasota Bay estuary were captured with 21.3-m seines (n=161 hauls; *Table 2*). Pinfish (*L. rhomboids*, n=23,405) was the most abundant taxon collected, accounting for 27.1% of the 21.3-m seine catch (*Table 3*). The two taxa most frequently collected with 21.3-m seines were Eucinostomus Mojarra (*Eucinostomus* spp.*,* 80.7% occurrence) and Pinfish (*L. rhomboides*, 78.3% occurrence). Animals collected by 21.3-m seines tended to be relatively small, ranging in length from 3mm to 177 mm, with the mean length for each of the 10 dominant taxa ranging from 9mm to 56 mm.

A total of 2,814 animals from 20 Selected Taxa were collected with 21.3-m seines (*Table 4*). Pink Shrimp (*F. duorarum,* n=1,545) was the most abundant (1.8% of 21.3-m seine catch) and commonly collected (6.15% occurrence) Selected Taxon collected by this gear.

Table 3. Catch statistics for 10 dominant taxa collected in 161 21.3-m bay seine samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean density.

Species	Number		%	Catch-Per-Unit-Effort (animals•100m^2)				Standard Length (mm)			
	No.	%	Occur	Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
Lagodon rhomboides	23,405	27.1	78.3	103.84	19.65	240.14	1,751.43	34	0.09	10	177
Eucinostomus spp.	20,911	24.2	80.7	92.77	9.77	133.60	692.86	25	0.04	9	40
Anchoa mitchilli	16,311	18.9	23.0	72.36	19.87	348.49	2,250.00	33	0.05	20	53
Lucania parva	5,673	6.6	28.0	25.17	9.75	491.78	1,129.29	22	0.05	9	34
Anchoa spp.	3,776	4.4	0.6	16.75	16.75	1,268.86	2,697.14	36	0.08	30	50
Harengula jaguana	2,864	3.3	18.0	12.71	7.10	709.20	1,097.14	43	0.14	19	95
Eucinostomus gula	1,803	2.1	59.0	8.00	1.47	232.83	125.71	56	0.23	40	90
Farfantepenaeus duorarum	1,545	1.8	61.5	6.85	1.32	244.82	125.71	9	0.10	3	25
Menidia spp.	1,432	1.7	13.7	6.35	4.18	834.73	651.43	42	0.19	16	85
Anchoa cubana	1,127	1.3	3.1	5.00	2.86	724.52	388.57	43	0.13	29	54
Subtotal	78,847	91.3	.	.	.	.	.	.	.	3	177
Totals	**86,335**	**100.0**	**.**	**383.03**	**40.64**	**134.64**	**3,532.14**	**.**	**.**	**3**	**760**

Table 4. Catch statistics for Selected Taxa collected in 161 21.3-m bay seine samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean density.

Species	Number		%	Catch-Per-Unit-Effort (animals•100m^2)				Standard Length (mm)			
	No.	%	Occur	Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
Farfantepenaeus duorarum	1,545	1.8	61.5	6.85	1.32	244.82	125.71	9	0.10	3	25
Leiostomus xanthurus	450	0.5	14.9	2.00	0.80	510.09	86.43	32	0.47	16	90
Lutjanus griseus	282	0.3	24.2	1.25	0.30	303.25	22.86	45	2.00	14	241
Cynoscion nebulosus	142	0.2	22.4	0.63	0.19	383.94	26.43	40	2.81	19	350
Archosargus probatocephalus	98	0.1	17.4	0.43	0.14	402.91	17.86	57	6.83	16	253
Lutjanus synagris	82	0.1	14.3	0.36	0.09	330.82	9.29	38	1.59	21	82
Mugil cephalus	69	0.1	4.3	0.31	0.27	1,104.86	42.86	25	2.38	18	142
Callinectes sapidus	60	0.1	17.4	0.27	0.08	365.98	7.86	20	1.88	6	75
Sciaenops ocellatus	25	0.0	6.2	0.11	0.04	511.96	5.00	28	2.89	13	69
Centropomus undecimalis	15	0.0	2.5	0.07	0.05	950.99	7.86	105	30.56	32	375
Paralichthys albigutta	13	0.0	6.8	0.06	0.02	391.03	1.43	69	23.00	15	295
Mugil trichodon	9	0.0	3.7	0.04	0.02	538.47	1.43	52	13.29	13	112
Cynoscion arenarius	9	0.0	1.2	0.04	0.04	1,135.78	5.71	42	3.92	20	51
Pogonias cromis	5	0.0	2.5	0.02	0.01	666.00	1.43	250	24.37	198	337
Mugil curema	3	0.0	1.9	0.01	0.01	727.98	0.71	63	19.55	24	85
Menippe spp.	2	0.0	1.2	0.01	0.01	894.41	0.71	8	4.50	3	12

Table 4. (Continued)

Species	Number No.	Number %	% Occur	Catch-Per-Unit-Effort (animals•100m^2) Mean	Stderr	CV	Max	Standard Length (mm) Mean	Stderr	Min	Max
Scomberomorus maculatus	2	0.0	1.2	0.01	0.01	894.41	0.71	78	32.50	45	110
Elops saurus	1	0.0	0.6	0.00	0.00	1,268.86	0.71	290		290	290
Trachinotus falcatus	1	0.0	0.6	0.00	0.00	1,268.86	0.71	19		19	19
Menticirrhus saxatilis	1	0.0	0.6	0.00	0.00	1,268.86	0.71	33		33	33
Totals	**2,814**	**3.3**	**.**	**12.48**	**1.86**	**188.80**	**147.14**	**.**	**.**	**3**	**375**

Nearshore habitats sampled with 183-m haul seines

A total of 12,119 animals were collected with 183-m haul seines (n=36 hauls), representing 12% of the overall catch (*Table 2*), during the fourth year of sampling the Sarasota Bay estuary. Pinfish (*L. rhomboides*, n=7,479) was the most abundant taxon collected, accounting for almost 62% of the total catch (*Table 5*). Pinfish were also the most frequently collected taxon, occurring in 91.7% of 183-m haul seine sets. Animals collected with 183-m haul seines tended to be larger (*Table 5*) than those collected with either 21.3-m seines (*Table 3*) or 6.1-m otter trawls (*Table 7*).

A total of 1,310 animals from 19 Selected Taxa were collected, representing just over 10% of the 183-m haul seine catch (*Table 6*). Sheepshead (*Archosargus probatocephalus,* n=281) was the most abundant Selected Taxon, accounting for 26.2% of the Selected Taxa collected by this gear. Common Snook (*C. undecimalis*) was the most frequently collected Selected Taxa (77.8%) followed by Sheepshead (*A. probatocephalus*) and Striped Mullet (*Mugil cephalus*), which occurred in 72.2% and 55.6% of the hauls respectively.

Table 5. Catch statistics for 10 dominant taxa collected in 36 183-m haul seine samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean catch-per-unit-effort.

Species	Number		%	Catch-per-unit-effort (animals/set)				Standard Length (mm)			
	No.	%	Occur	Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
Lagodon rhomboides	7,479	61.7	91.7	207.75	54.69	157.95	1,568.00	121	0.37	41	295
Bairdiella chrysoura	717	5.9	30.6	19.92	15.20	457.87	543.00	125	0.75	60	173
Orthopristis chrysoptera	657	5.4	44.4	18.25	7.90	259.82	229.00	141	1.21	68	225
Ariopsis felis	582	4.8	55.6	16.17	12.13	450.36	437.00	246	1.49	144	352
Eucinostomus gula	566	4.7	75.0	15.72	5.20	198.46	173.00	76	0.38	50	111
Archosargus probatocephalus	343	2.8	72.2	9.53	2.40	151.26	52.00	225	3.04	23	361
Leiostomus xanthurus	209	1.7	25.0	5.81	4.42	456.80	158.00	170	1.53	65	235
Harengula jaguana	185	1.5	25.0	5.14	3.97	463.59	143.00	88	0.60	59	118
Centropomus undecimalis	161	1.3	77.8	4.47	0.88	117.41	17.00	377	8.45	182	792
Strongylura notata	135	1.1	66.7	3.75	0.76	120.84	18.00	338	2.56	192	447
Subtotal	11,034	91.0	.	.	.	.	.	.	.	23	792
Totals	**12,119**	**100.0**	**.**	**336.64**	**76.12**	**135.67**	**2,026.00**	**.**	**.**	**23**	**792**

Table 6. Catch statistics for Selected Taxa collected in 36 183-m haul seine samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean catch-per-unit-effort.

Species	**Number**		**%**	**Catch-per-unit-effort (animals/set)**				**Standard Length (mm)**			
	No.	**%**	**Occur**	**Mean**	**Stderr**	**CV**	**Max**	**Mean**	**Stderr**	**Min**	**Max**
Archosargus probatocephalus	343	2.8	72.2	9.53	2.40	151.26	52.00	225	3.04	23	361
Leiostomus xanthurus	209	1.7	25.0	5.81	4.42	456.80	158.00	170	1.53	65	235
Centropomus undecimalis	161	1.3	77.8	4.47	0.88	117.41	17.00	377	8.45	182	792
Mugil cephalus	125	1.0	55.6	3.47	0.93	160.79	26.00	330	3.94	174	485
Elops saurus	115	1.0	50.0	3.19	1.12	209.91	37.00	288	4.13	212	480
Mugil curema	78	0.6	50.0	2.17	0.67	184.45	20.00	233	6.60	114	402
Lutjanus griseus	60	0.5	38.9	1.67	0.63	227.23	20.00	144	4.41	79	238
Pogonias cromis	59	0.5	33.3	1.64	1.01	369.04	36.00	250	6.34	185	416
Lutjanus synagris	38	0.3	11.1	1.06	0.94	536.36	34.00	96	1.85	79	120
Sciaenops ocellatus	32	0.3	41.7	0.89	0.27	183.93	8.00	403	16.39	125	576
Cynoscion nebulosus	28	0.2	30.6	0.78	0.25	189.74	6.00	284	23.60	110	476
Paralichthys albigutta	20	0.2	30.6	0.56	0.17	184.79	4.00	216	17.32	72	368
Mugil trichodon	14	0.1	13.9	0.39	0.22	332.60	7.00	193	9.46	160	297
Scomberomorus maculatus	12	0.1	8.3	0.33	0.23	418.16	8.00	224	21.29	105	380
Micropogonias undulatus	6	0.1	8.3	0.17	0.10	365.67	3.00	256	22.16	188	310
Trachinotus falcatus	4	0.0	5.6	0.11	0.09	470.26	3.00	62	7.88	50	83
Mycteroperca microlepis	4	0.0	2.8	0.11	0.11	600.00	4.00	315	49.23	230	403
Callinectes sapidus	1	0.0	2.8	0.03	0.03	600.00	1.00	145		145	145
Cynoscion arenarius	1	0.0	2.8	0.03	0.03	600.00	1.00	243		243	243
Totals	**1,310**	**10.8**	**.**	**36.39**	**6.75**	**111.31**	**200.00**	**.**	**.**	**23**	**792**

Deeper-water habitats sampled with 6.1-m otter trawls

During the fourth year of sampling the Sarasota Bay estuary, 3,660 animals were collected in 6.1-m otter trawls (n=48 hauls), representing 4% of the overall catch (*Table 2*). Eucinostomus Mojarra (*Eucinostomus* spp, n=1,144, 39.5% of total catch) was the most abundant taxon collected (*Table 7*). The taxon most frequently collected with 6.1-m otter trawls was Pinfish (*L. rhomboides*), which occurred in over 72.9% of the trawl samples. Trawl collected animals tended to be similar in size to those collected with 21.3-m seines (Table 3) and smaller than those collected with 183-m haul seines (Table 5).

Thirteen Selected Taxa (333 animals, 9.1% of the trawl catch) were collected with 6.1-m otter trawls (*Table 8*). The most abundant selected taxa, Blue Crab (*Callinectes sapidus,* n = 68), accounted for 1.9% of the 6.1-m otter trawl catch. Sand Seatrout (*Cynoscion arenarius*, n=65, 4.2% occurrence) was the second most abundant taxon. The Selected Taxon most frequently collected was Gulf Flounder (*Paralichthys albigutta*) which occurred in over 37% of the trawl collections.

Table 7. Catch statistics for 10 dominant taxa collected in 48 bay 6.1-m otter trawl samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean density.

Species	Number		%	Catch-per-unit-effort (animals•100m^{-2})				Standard Length (mm)			
	No.	%	Occur	Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
Eucinostomus spp.	1,444	39.5	37.5	2.19	1.15	362.86	39.58	19	0.16	9	39
Lagodon rhomboides	945	25.8	72.9	1.43	0.62	303.42	29.89	62	1.18	9	196
Orthopristis chrysoptera	269	7.4	52.1	0.40	0.10	172.19	3.34	88	3.38	12	207
Anchoa mitchilli	200	5.5	2.1	0.31	0.31	692.82	14.99	27	0.22	21	32
Callinectes sapidus	68	1.9	18.8	0.12	0.07	418.99	3.10	34	3.34	12	140
Cynoscion arenarius	65	1.8	4.2	0.10	0.10	673.44	4.72	20	0.93	12	58
Portunus spp.	47	1.3	31.3	0.08	0.03	230.28	0.90	37	2.47	11	81
Stephanolepis hispidus	54	1.5	22.9	0.08	0.06	504.95	2.77	69	2.62	40	168
Eucinostomus gula	50	1.4	31.3	0.07	0.02	204.78	0.71	76	2.59	41	106
Farfantepenaeus duorarum	46	1.3	35.4	0.07	0.03	264.82	1.20	13	0.79	4	26
Subtotal	3,188	87.1	.	.	.	.	.	.	.	4	207
Totals	**3,660**	**100.0**	**.**	**5.59**	**1.78**	**220.03**	**65.28**	**.**	**.**	**4**	**434**

Table 8. Catch statistics for Selected Taxa collected in 48 bay 6.1-m otter trawl samples during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Percent (%) is the percent of the total catch represented by that taxon; percent occurrence (% Occur) is the percentage of samples in which that taxon was collected; CV is the coefficient of variation of the mean. Taxa are ranked in order of decreasing mean density.

Species	Number		% Occur	Catch-per-unit-effort (animals•100m^{-2})				Standard Length (mm)			
	No.	%		Mean	Stderr	CV	Max	Mean	Stderr	Min	Max
Callinectes sapidus	68	1.9	18.8	0.12	0.07	418.99	3.10	34	3.34	12	140
Cynoscion arenarius	65	1.8	4.2	0.10	0.10	673.44	4.72	20	0.93	12	58
Farfantepenaeus duorarum	46	1.3	35.4	0.07	0.03	264.82	1.20	13	0.79	4	26
Menippe spp.	32	0.9	25.0	0.05	0.02	234.91	0.54	26	3.81	6	95
Lutjanus synagris	30	0.8	16.7	0.05	0.03	438.94	1.35	68	6.03	25	118
Sciaenops ocellatus	26	0.7	2.1	0.04	0.04	692.82	1.95	14	0.29	11	17
Paralichthys albigutta	23	0.6	37.5	0.04	0.01	147.28	0.22	224	19.52	14	370
Archosargus probatocephalus	18	0.5	14.6	0.03	0.01	336.56	0.52	182	13.73	65	270
Lutjanus griseus	12	0.3	12.5	0.02	0.01	354.56	0.37	109	16.40	39	205
Menticirrhus americanus	6	0.2	8.3	0.01	0.01	398.90	0.22	151	58.57	18	308
Cynoscion nebulosus	4	0.1	6.3	0.01	0.00	416.67	0.13	209	83.12	33	434
Leiostomus xanthurus	2	0.1	4.2	0.00	0.00	484.82	0.07	108	81.00	27	189
Albula vulpes	1	0.0	2.1	0.00	0.00	692.82	0.07	31		31	31
Totals	**333**	**9.1**	**.**	**0.53**	**0.19**	**246.61**	**8.17**	**.**	**.**	**4**	**434**

Species Profiles

The following sections provide profiles on various abundant and frequently occurring species in terms of annual and seasonal abundance, sizes collected, spatial distribution, and bottom habitat preference. Species included in these profiles are numerically dominant or economically important (*Appendix A*). Summary statistics of catch for the four completed years of this study are included in *Appendices E*, *F* and *G* for the 21.3-m seines, 183-m haul seines and 6.1-m otter trawls, respectively. Gear-specific summary graphs for all taxa that were identified to species, occurred in at least 10% of the hauls, and for which 200 or more individuals were collected during bi-monthly sampling in Sarasota Bay between June 2009 and April 2013 are provided in *Appendices H*, *I*, *J*, and *K*. The abundance and size distribution results presented in these appendices and in the following species profiles are based on a limited time series (four years of bi-monthly sampling) with a relatively small sample size, so there is considerable variability in the data.

Pink Shrimp, *Farfantepenaeus duorarum*

Pink Shrimp range from the Chesapeake Bay to the Yucatan Peninsula and are of great commercial importance, especially in the Gulf of Mexico (*Carpenter 2002*). Catches in Florida were valued at nearly $21M in 2005 (FWRI, unpublished data). Pink Shrimp spawn offshore and enter estuaries as postlarvae (*Allen et al. 1980*). They probably use selective tidal stream transport (i.e., ascend into the water column on flood tides and descend towards the substrate on ebb tides [*Hughes 1969*]) to recruit to nursery grounds. Different life stages of Pink Shrimp exhibit a broad range of salinity tolerance, although salinities from approximately 12 to 45 ppt seem to be preferred (*Pattillo et al. 1997*).

Although occasionally collected in 183-m haul seines, Pink Shrimp did not comprise a large proportion of the catch (*Appendix F*). Pink Shrimp were, however, commonly collected in 21.3-m seines (57.8% of the hauls, *Appendix E*) and 6.1-m otter trawls (37.0%, *Appendix G*). Pink Shrimp collected in 21.3-m shoreline and offshore seines tended to be smaller (mean post-orbital head length [POH] <10 mm; *Figure 5* and Figure 6, respectively) than those collected in 6.1-m otter trawls (13.7 mm POH; *Figure 7*). In the shallow water habitats sampled with the 21.3-m seine, abundance of Pink Shrimp was typically higher along shoreline (Figure 6) than offshore (Figure 5) habitats. In both offshore and shoreline habitats, abundance was higher over vegetated bottoms and in Little Sarasota and Blackburn bays. Although there was considerable variability in abundance for the deeper water sampled with 6.1-m otter trawls, Pink Shrimp abundance in Little Sarasota Bay was higher than in the other four bay segments (*Figure 7*). Annual trends in Pink Shrimp abundance were not evident for any of the gear types during the four-year period of this study.

Farfantepenaeus duorarum (Pink Shrimp)

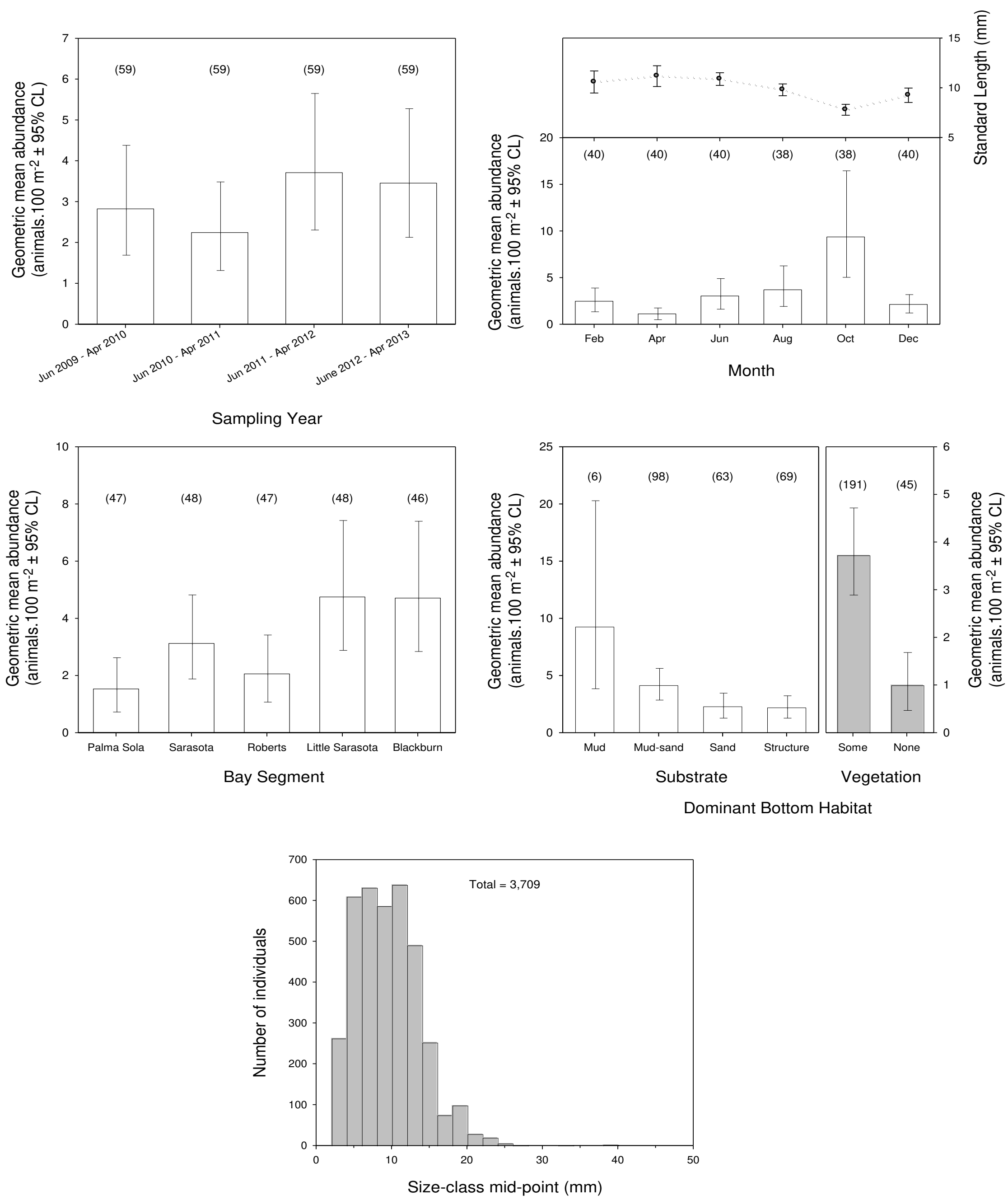

Figure 5. Relative abundance and length-frequency distribution of Pink Shrimp collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Farfantepenaeus duorarum (Pink Shrimp)

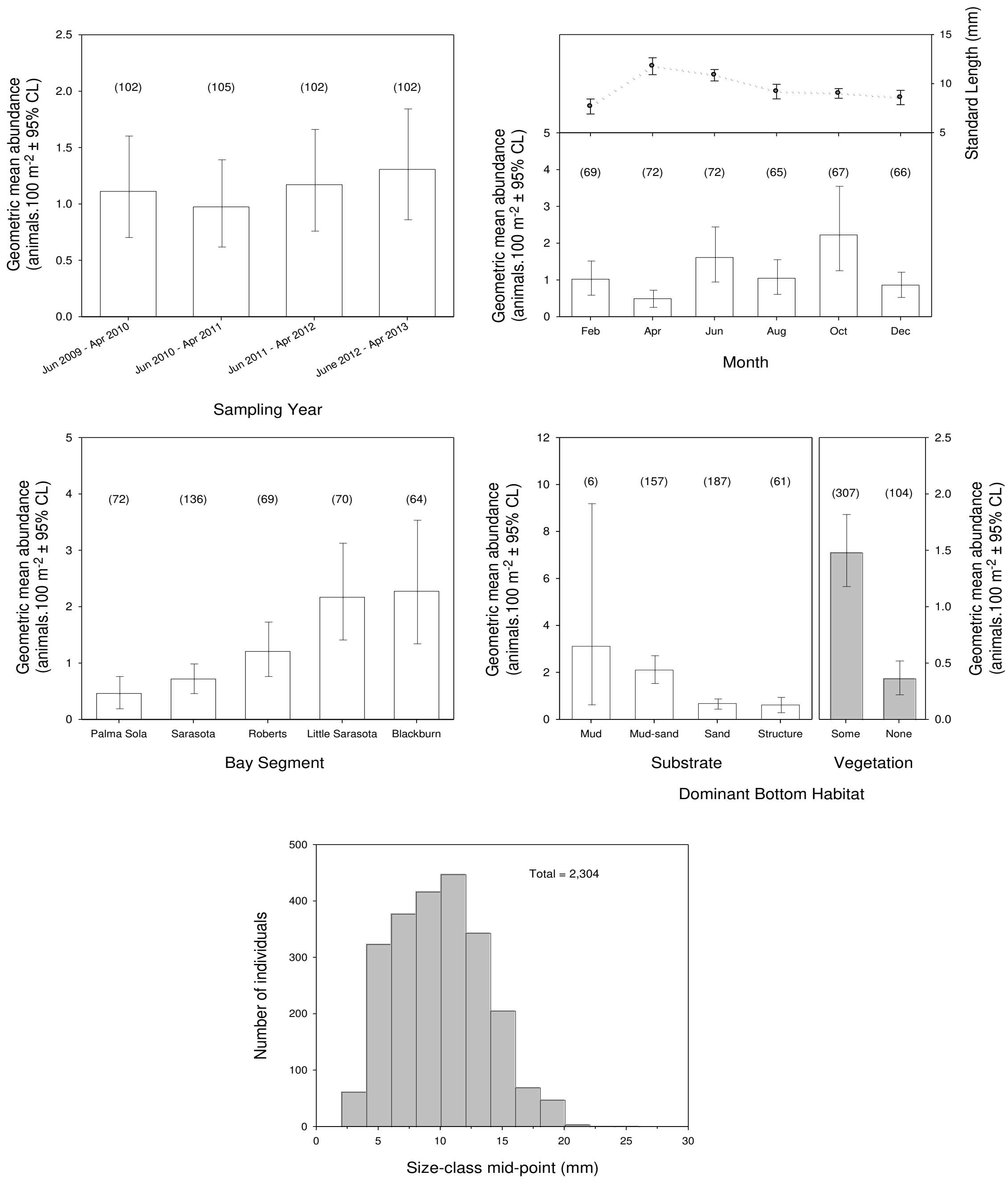

Figure 6. Relative abundance and length-frequency distribution of Pink Shrimp collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Farfantepenaeus duorarum (Pink Shrimp)

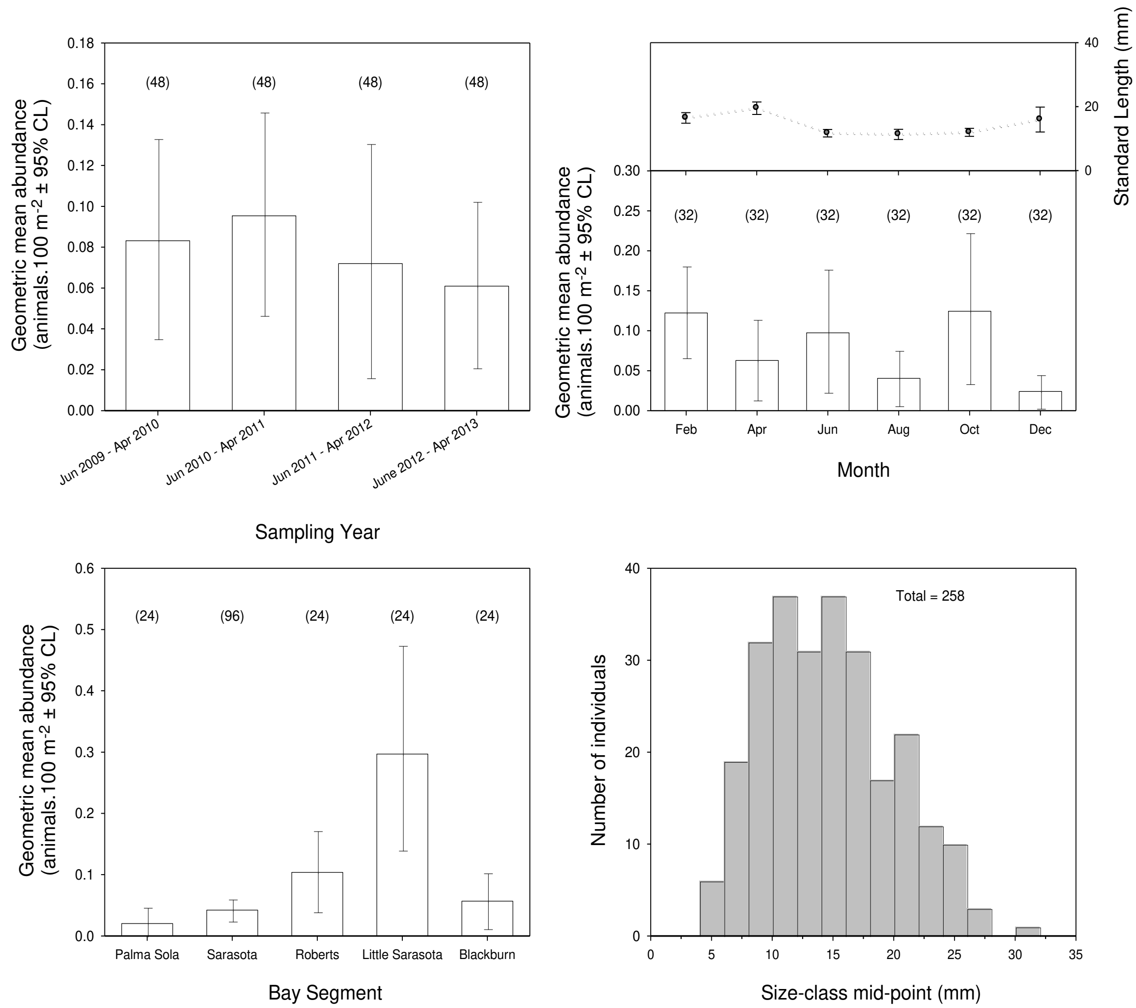

Figure 7. Relative abundance and length-frequency distribution of Pink Shrimp collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Blue crab, *Callinectes sapidus*

Blue Crabs occur in the western Atlantic from Canada to Argentina, including Bermuda and the Antilles, and have been successfully introduced in Europe and Japan (*Carpenter 2002*). This species supports large commercial fisheries in Florida, valued at nearly $12M in 2005 (FWRI, unpublished data), and is an important predator and prey species in inshore waters (*Steele and Bert 1994*). Blue Crabs are transients in estuaries: spawning and larval development occur in marine waters, but juveniles and adults spend most of their time in estuaries (*Steele and Bert 1994*). Larval Blue Crabs recruiting into the estuary and adult females leaving the estuary to spawn use selective tidal stream transport (*Olmi 1994*; *Tankersley et al. 1998*). Chemical cues emanating from estuarine and freshwater watersheds promote settlement by triggering metamorphosis in larvae (*Wolcott and De Vries 1994*; *Forward et al. 1994* and *1997*). Blue Crabs tolerate salinities from freshwater to at least 50 ppt. Optimal salinities differ among life-history stages: 12–36 ppt for larvae, 2–21 ppt for juveniles, less than 10 ppt for adult males, and 23–33 ppt for egg-bearing females (*Pattillo et al. 1997*).

Blue Crabs were collected in all three gear types deployed during this study (*Appendices E*, *F*, and *G*), but were only commonly collected and abundant in hauls made with the 6.1-m otter trawls (*Appendix G*). In deeper-water habitats sampled with 6.1-m otter trawls, Blue Crabs were most abundant in February (*Figure 8*). Blue Crabs were collected from each of the embayments sampled with the 6.1-m otter trawl but were more abundant in Little Sarasota Bay and least abundant in Sarasota Bay proper. Sizes captured with 6.1-m otter trawls ranged from 8 mm to 198 mm carapace width

(CW) with a mean of 59.4 mm CW. Although variable, annual abundance of Blue Crab peaked during the second year of the study (June 2010 – April 2011) and declined during the third and fourth years.

Callinectes sapidus (Blue Crab)

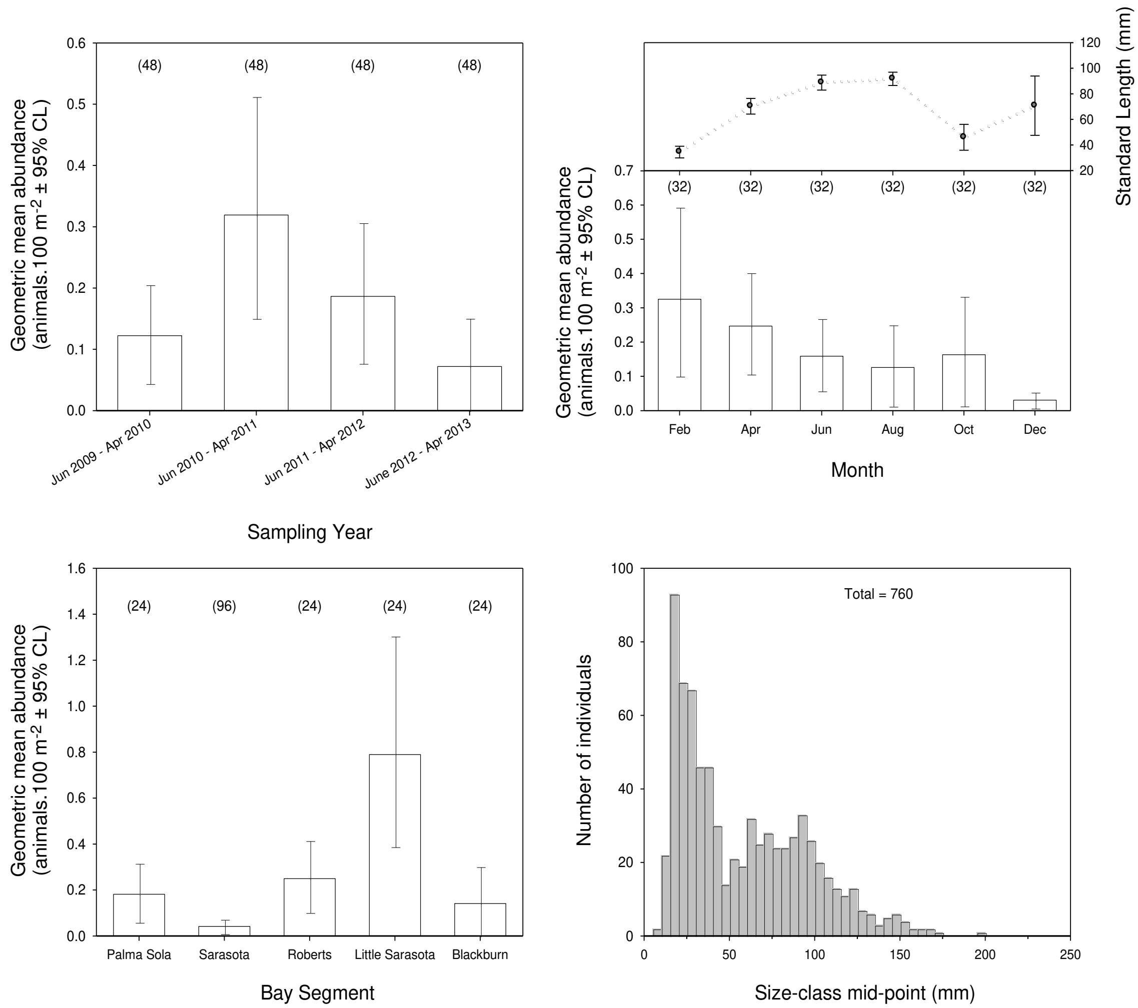

Figure 8. Relative abundance and length-frequency distribution of Blue Crab collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Ladyfish, *Elops saurus*

Ladyfish inhabit estuarine and nearshore waters throughout Florida. Larval and juvenile ladyfish can be found in a variety of nearshore habitats, including coastal beaches, canals, rivers, and mosquito impoundments (*Gilmore et al. 1982*; *McBride et al. 2001*). Length-frequency analysis suggests that Ladyfish grow to 200 – 300 mm standard length by age 1. Their diet consists mainly of fish with decapod crustaceans being of secondary importance (*Darnell 1958*; *Sekavec 1974*). Florida landings were just over 1 million pounds in 2007 with over 75% landed by the commercial fishery (*FWC-FWRI 2008*).

Ladyfish were captured with 21.3-m and 183-m haul seines during this study (*Appendices E* and *F*, respectively). They were only common and abundant, however, in the larger seine where they comprised 0.98% of the total catch (n=489) and occurred in 44.2% of the hauls (*Appendix F*). The majority of captured Ladyfish (61%) were between 225 and 275 mm SL (mean of 271.3 mm SL; *Figure 9*), with the largest Ladyfish collected measuring 480 mm SL. Variability in abundance data was too high to discern spatial or temporal patterns.

Elops saurus (Ladyfish)

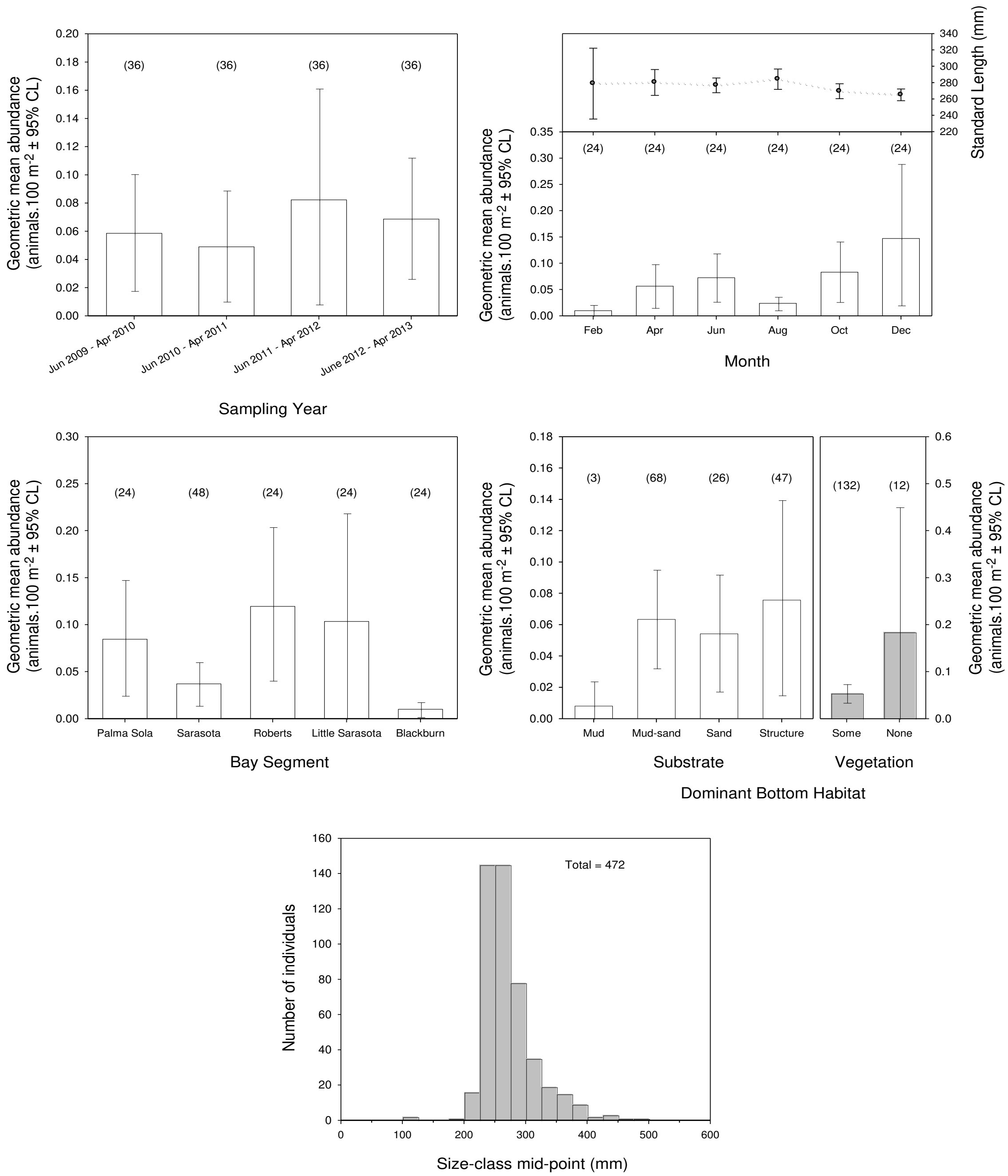

Figure 9. Relative abundance and length-frequency distribution of Ladyfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Bay anchovy, ***Anchoa mitchilli***

Bay Anchovy range from Maine to the Yucatan Peninsula and are of great importance in estuarine food chains due to their trophic position, small size, and extreme abundance (*Pattillo et al. 1997*; *Carpenter 2002*). They spawn in nearshore marine waters and estuaries (*Peebles et al. 1996*; *Pattillo et al. 1997*). Larvae use selective tidal stream transport to travel to upstream nursery areas (*Schultz et al. 2003*). Although each life stage of the Bay Anchovy exhibits a broad range of salinity tolerance (*Pattillo et al. 1997*), each tends to distribute differently in relation to salinity: spawning adults, eggs, and newly hatched larvae are found at higher salinities than are later-stage larvae and juveniles (*Peebles et al. 1991*).

Bay Anchovy were collected in 21.3-m seine and 6.1-m otter trawl hauls (*Appendices E* and *G*, respectively), but not in 183-m haul seines (*Appendix F*). They were only abundant and frequently collected in 21.3-m seine hauls in which they comprised 36.5% (n= 132,610) of the total catch and were present in 27.7% of hauls (*Appendix E*). Bay Anchovy were more abundant along shoreline habitats (Figure 10) than offshore habitats (Figure 11). Although the average size between shoreline and offshore habitats was similar (31.1 and 30.9 mm SL, respectively), the monthly size frequency distribution between these two habitats differed; the largest mean size occurred in December and February for shoreline and offshore habitats, respectively. For both shoreline and offshore habitats, Bay Anchovy were most abundant over vegetated habitats in Roberts and Little Sarasota bays. No annual trends were descernable in the four years of data collected for this study.

Anchoa mitchilli (Bay Anchovy)

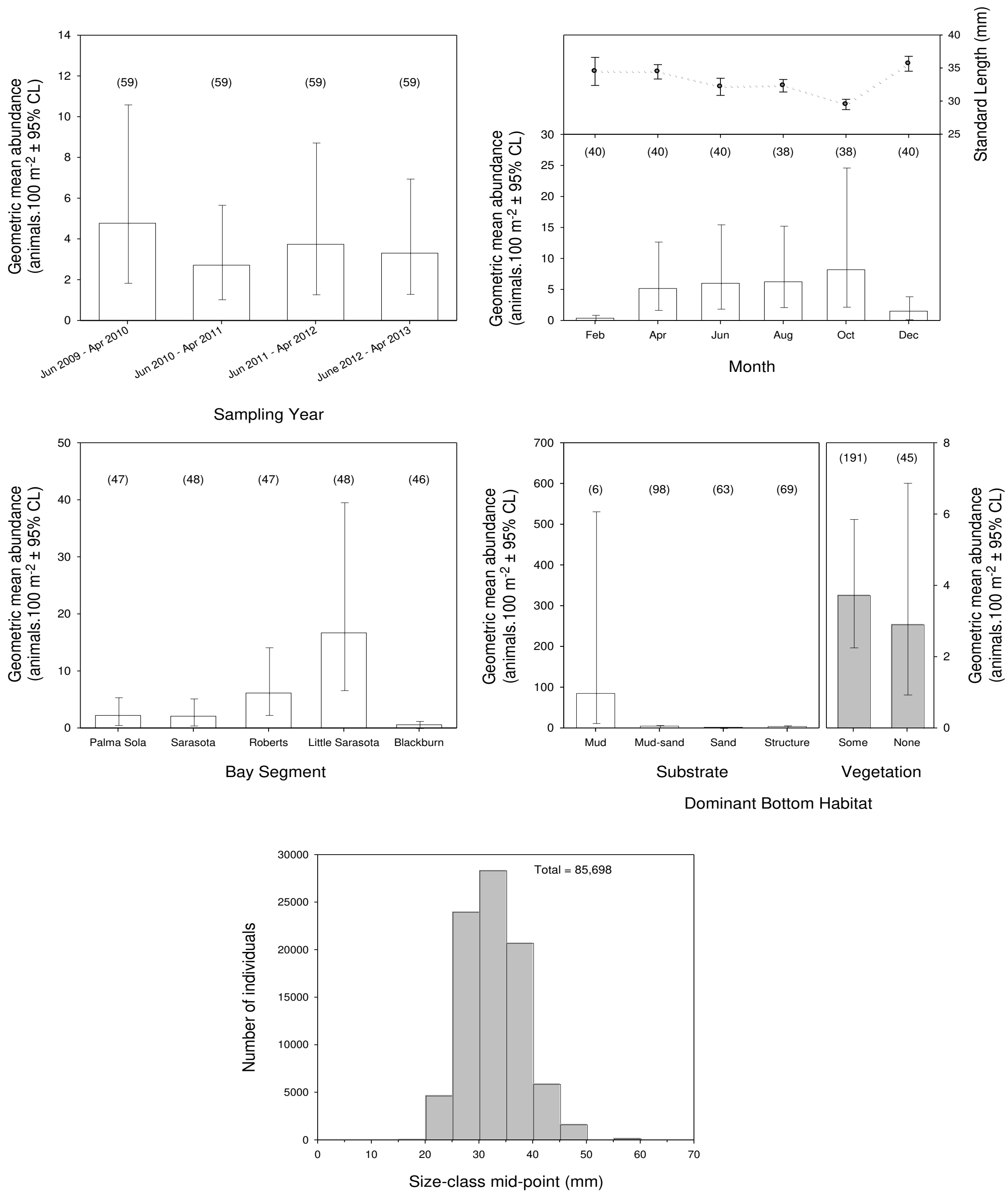

Figure 10. Relative abundance and length-frequency distribution of Bay Anchovy collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Anchoa mitchilli (Bay Anchovy)

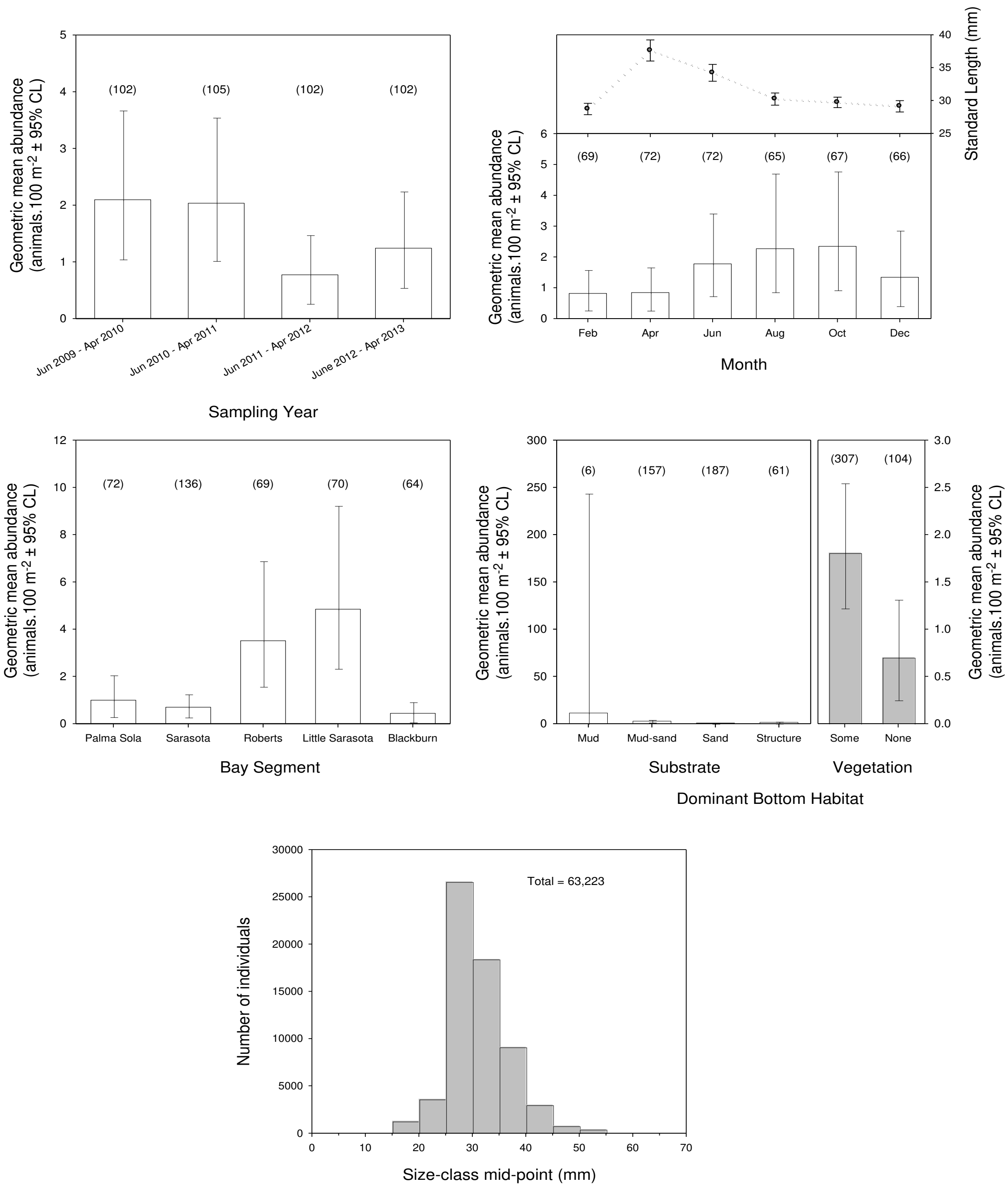

Figure 11. Relative abundance and length-frequency distribution of Bay Anchovy collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Common Snook, *Centropomus undecimalis*

Common Snook occur in tropical and subtropical estuarine systems of the western Atlantic (*Rivas 1986*). In Florida, they occur principally from Cape Canaveral on the Atlantic coast southward around the peninsula to Cedar Key on the Gulf of Mexico coast (*Taylor et al. 2000*). Common Snook are popular sport fish that support a large recreational fishery throughout much of coastal south and central Florida (*Muller and Taylor 2002*). Spawning occurs primarily in ocean passes and secondary embayments (*Taylor et al. 1998*). Small juveniles are found in quiet shallow-water creeks, canals, and lagoons in both low-salinity (riverine) and high-salinity (mangrove and saltmarsh) environments (*McMichael et al. 1989*; *Peters et al. 1998*). As juvenile Common Snook grow to about 150 mm SL, marked changes in their tolerance of high temperature and low dissolved oxygen occur (*Peterson and Gilmore 1991*), and juveniles are no longer abundant at the sites described above. Larger juveniles and adult Common Snook are found in a wide variety of estuarine habitats.

Common Snook were not collected in 6.1-m otter trawls (*Appendix G*), were rarely collected in 21.3-m seines (*Appendix E*), but were encountered in 58.3% of the 183-m haul seine sets (*Appendix F*). Common Snook were most abundant from April to October and least abundant in February and December (*Figure 12*). Common Snook were most abundant during the third year of the study (June 2011 – April 2012) and were more abundant in Little Sarasota and Blackburn bays than in the other three bay segments. The sizes of Common Snook collected in 183-m haul seines ranged from 138 to 882 mm SL with a mean at 406.6 mm SL.

Centropomus undecimalis (Common Snook)

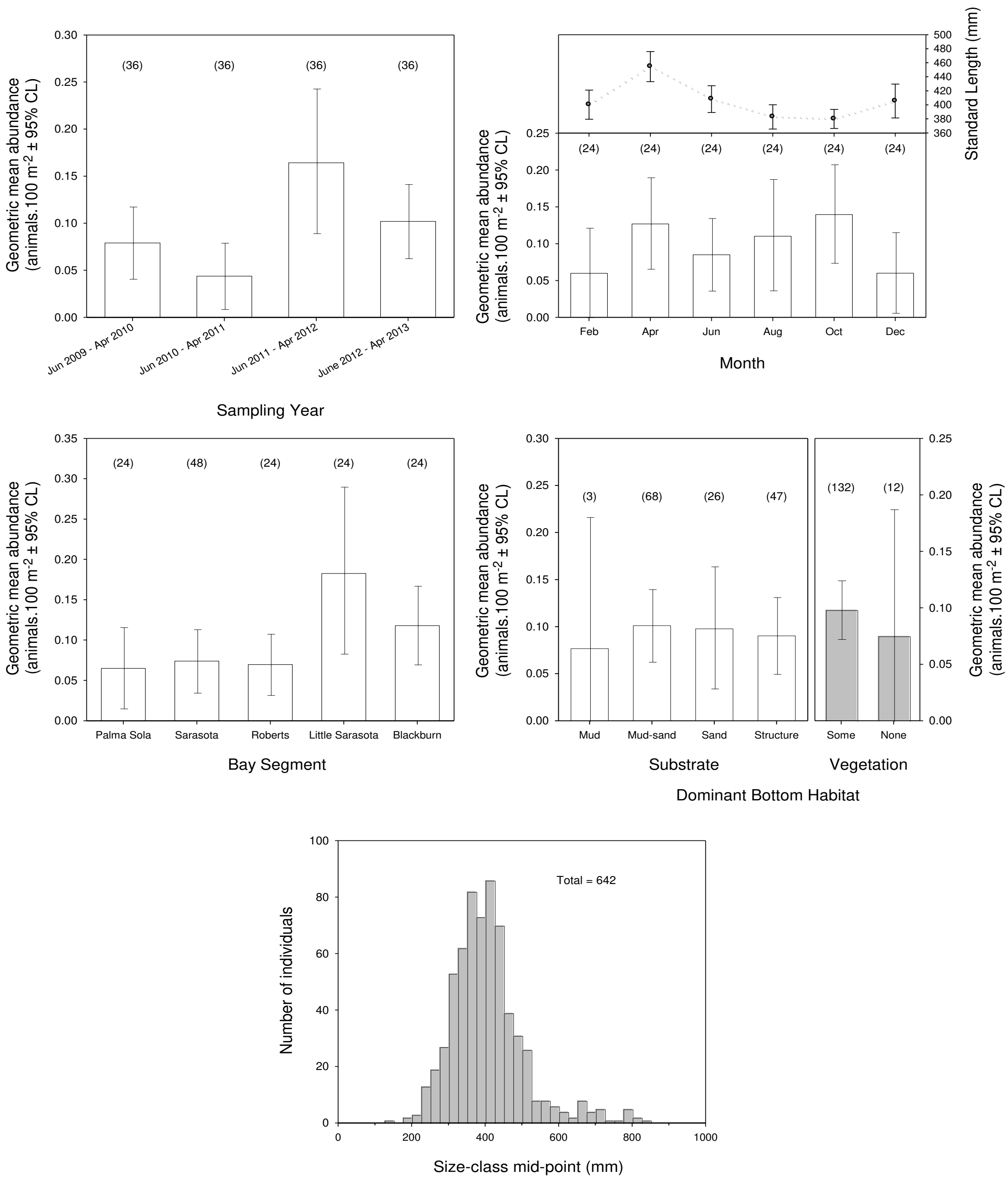

Figure 12. Relative abundance and length-frequency distribution of Common Snook collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Gray Snapper, *Lutjanus griseus*

Gray Snapper are a reef species found along the western Atlantic from Massachusetts south to Rio de Janeiro, Brazil. Adults spawn during summer (June–September) near areas of bottom structure in offshore waters (*Stark 1971*; *Domeier and Colin 1997*). Juvenile Gray Snapper recruit to estuarine areas including seagrass beds and mangrove shorelines (*Nagelkerken et al. 2000*; *Cocheret de la Moriniere et al. 2002*; *Serafy et al. 2003*; *Whaley et al. 2007*; *Faunce and Serafy 2008*) where they typically spend the first year or two of their lives. Juvenile Gray Snapper feed primarily on penaeid shrimp and crabs (*Rutherford et al.1989*) and adults feed on fish, shrimp, and crabs (*Harrigan et al. 1989; Hettler 1989*). Gray Snapper are an economically important species with Florida landings totaling 2,230,737 pounds in 2007 (*FWC-FWRI 2008*).

Gray Snapper were collected in all three gear types deployed in Sarasota Bay, but were more frequently collected by 21.3-m (19.9%; *Appendix E*) and 183-m (37.2%; *Appendix F*) seines than with the 6.1-m otter trawl (9.1%; *Appendix G*). The 21.3-m shoreline seine tended to collect smaller Gray Snapper (mean at 46.2 mm SL; *Figure 13*) than did the 21.3-m offshore seine (53.3 mm SL; Figure 14). The 183-m haul seine, however, collected much larger Gray Snapper (mean at 153 mm SL; *Figure 15*) than did the 21.3-m seines in either habitat. Regardless of seine type, Gray Snapper were most abundant in October and least abundant in April; less abundant in Palma Sola Bay than the other bay segments; and had higher abundance in collections at sites with some bottom vegetation.

Lutjanus griseus (Gray Snapper)

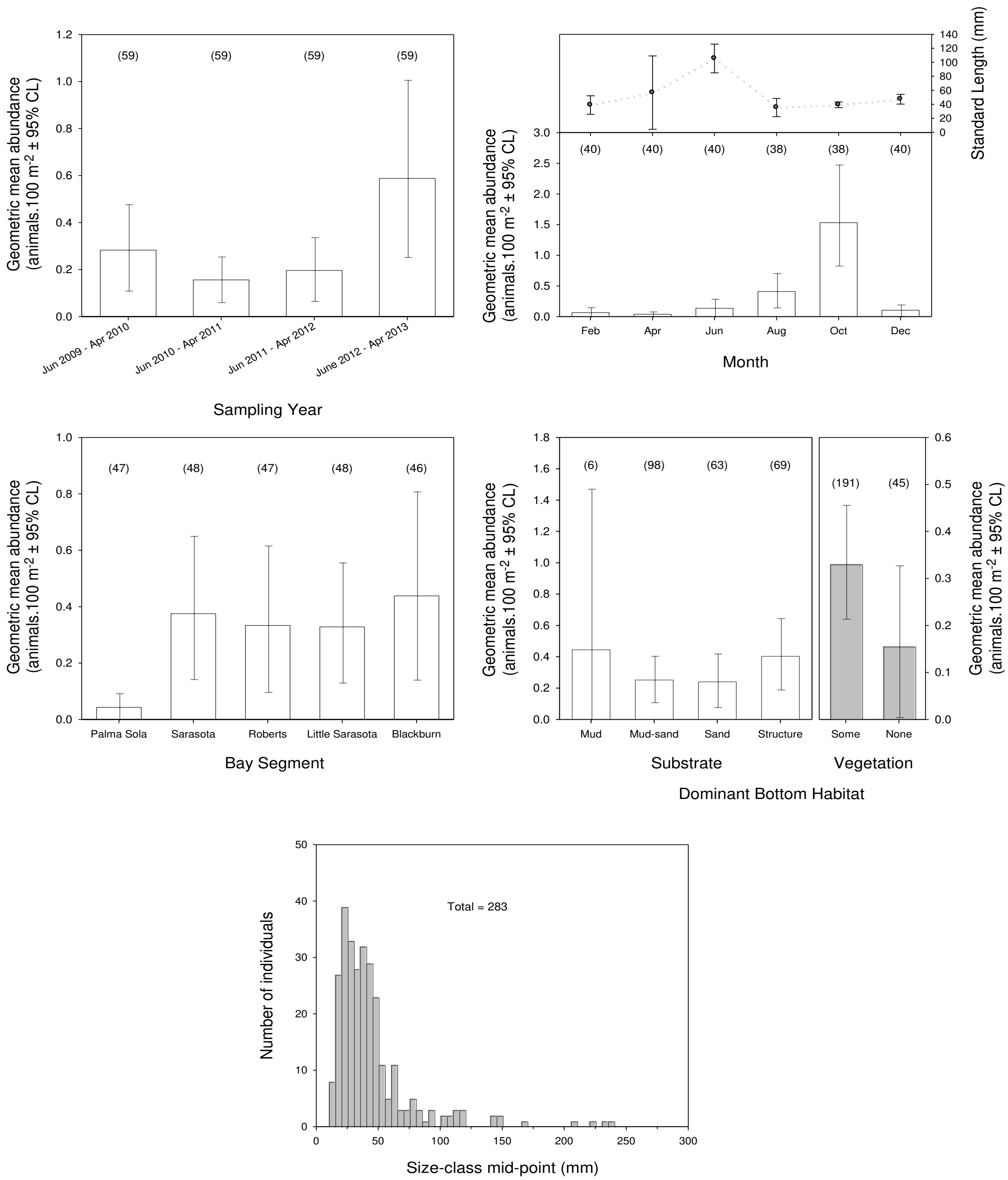

Figure 13. Relative abundance and length-frequency distribution of Gray Snapper collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lutjanus griseus (Gray Snapper)

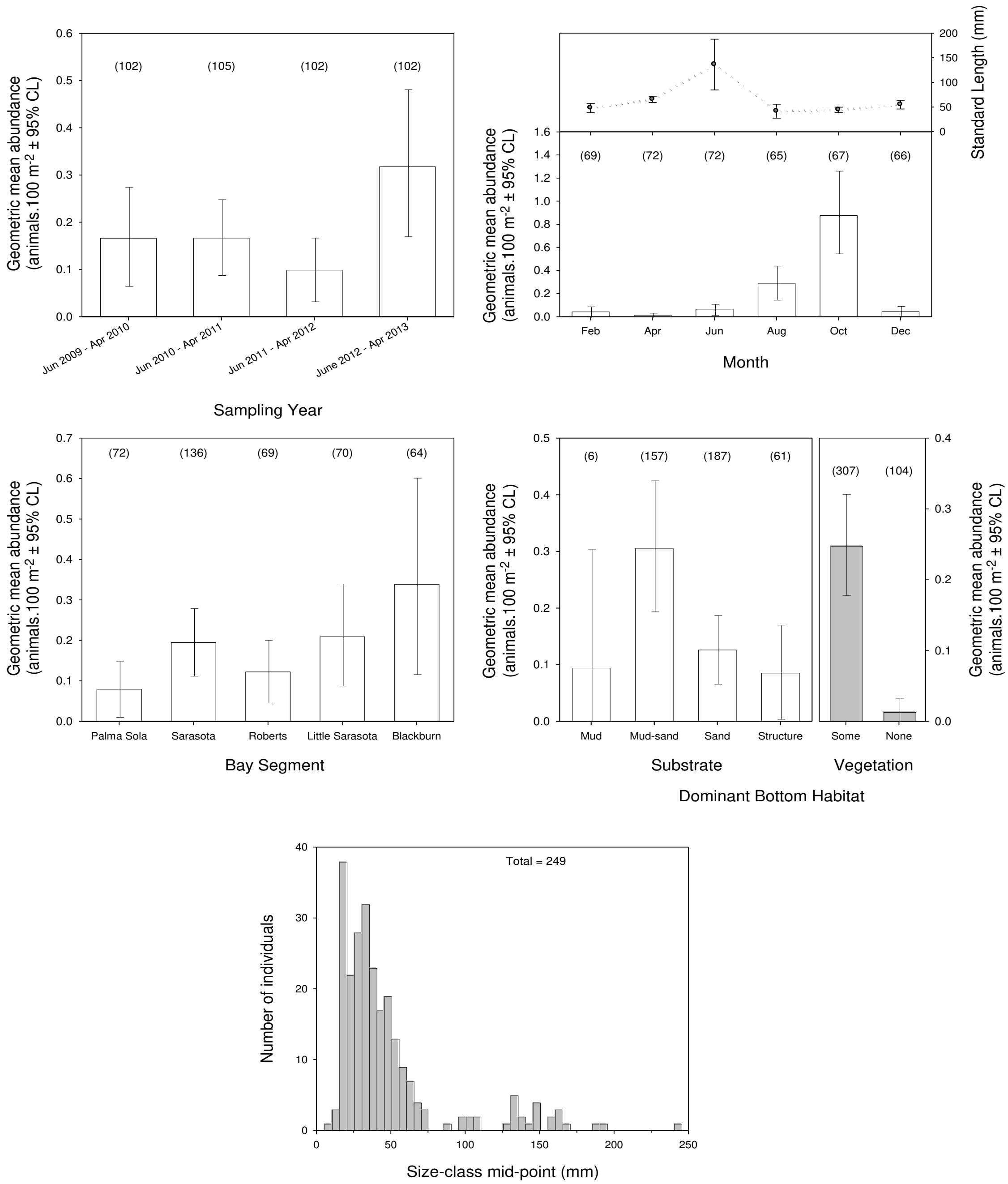

Figure 14. Relative abundance and length-frequency distribution of Gray Snapper collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lutjanus griseus (Gray Snapper)

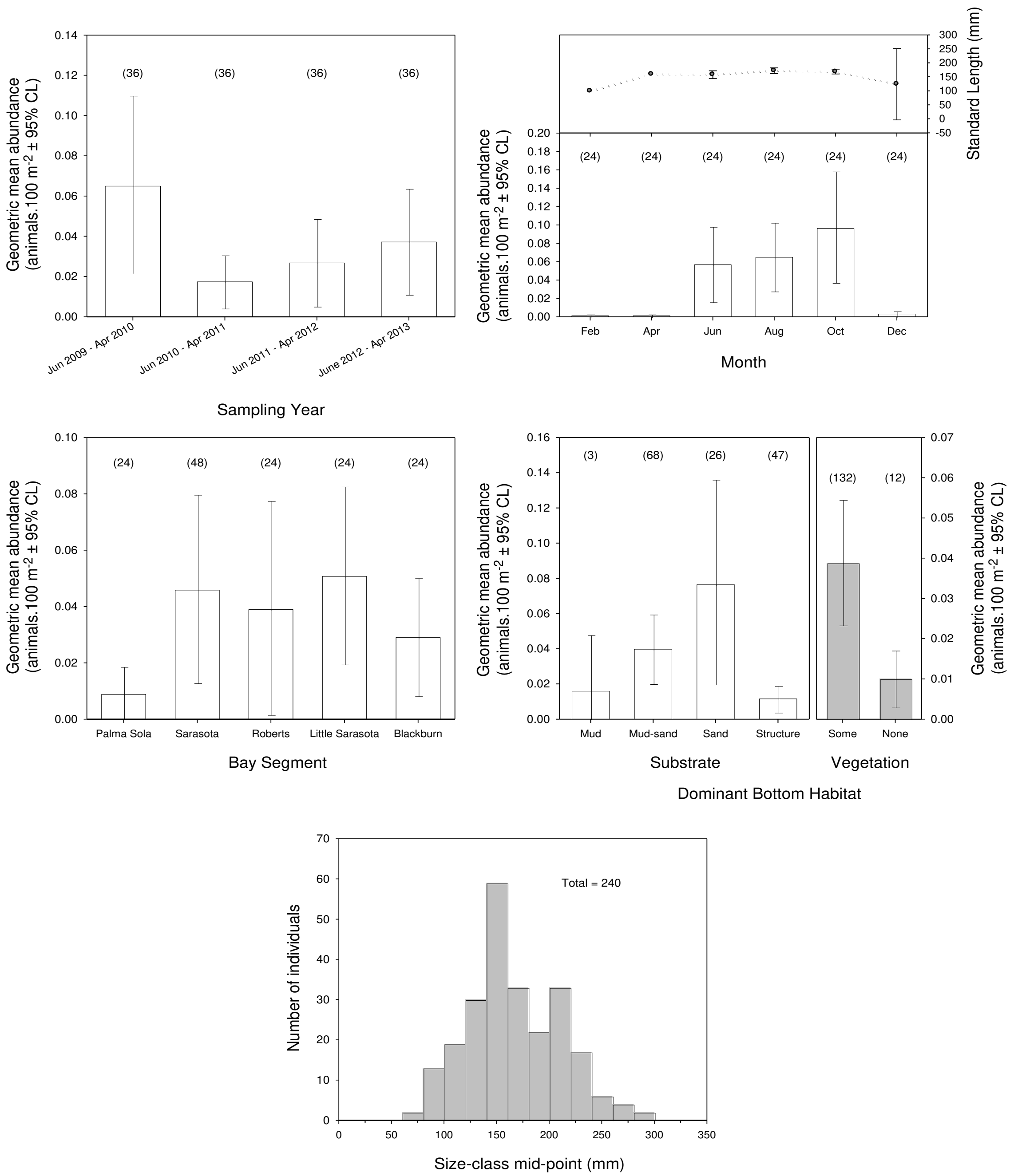

Figure 15. Relative abundance and length-frequency distribution of Gray Snapper collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Pinfish, *Lagodon rhomboides*

Pinfish range from Cape Cod to the Yucatan Peninsula, including Bermuda and northern Cuba. They are most abundant from Cape Hatteras through the northern Gulf of Mexico (*Pattillo et al. 1997*; *Carpenter 2002*). Florida's pinfish landings in 2007 totaled 2,022,492 pound with 96% being landed by recreational fisherman and 83% coming from the gulf coast (FWRI-FWC 2008). Their high abundance in estuaries and their trophic placement have led some to suggest that they play a more important role in structuring epibenthic communities (*Pattillo et al. 1997*) than they do in the fishery. Spawning occurs offshore and larvae use selective tidal stream transport to travel to nursery areas (*Pattillo et al. 1997*; *Forward et al. 1998*). Pinfish have been recorded in salinities ranging from 0 to >40 ppt, but may avoid the lower end of this range (*Pattillo et al. 1997*).

Pinfish were one of the two most abundant taxa collected in each of the three gear types, comprising 20.1% (21.3-m seine) to 58.0% (183-m haul seine) of the total catch in each gear during the four years of this study (*Appendices E*, *F*, and *G*, respectively). Pinfish were also one of the most commonly collected taxa, occurring in over 73% of the samples collected with each gear type. The means sizes of Pinfish collected in 21.3-m shoreline (*Figure 16*) and offshore (Figure 17) seines were similar (35.4 and 32.8 mm SL, respectively), while those collected in 6.1-m otter trawls (*Figure 19*) and 183-m haul seines (*Figure 18*) were larger (51.8 mm and 106.9 mm SL, respectively).

Pinfish were most abundant during late winter and spring (February and April) in collections with 21.3-m shoreline and offshore seines (*Figure 16* and Figure 17). For

6.1-m otter trawl collections, Pinfish were most abundant late winter through early summer (February, April and June; *Figure 19*). The larger and older Pinfish collected with 183-m haul seines were most abundant during August and October (*Figure 18*). Pinfish did not show any strong distributional or annual trends that were consistant between gear types. Pinfish were more abundant in 21.3-m seine collections that sampled some seagrass (*Figure 16* and Figure 17), whereas Pinfish collected in 183-m haul seines did not show an abundance trend related to bottom vegetation (*Figure 18*).

Lagodon rhomboides (Pinfish)

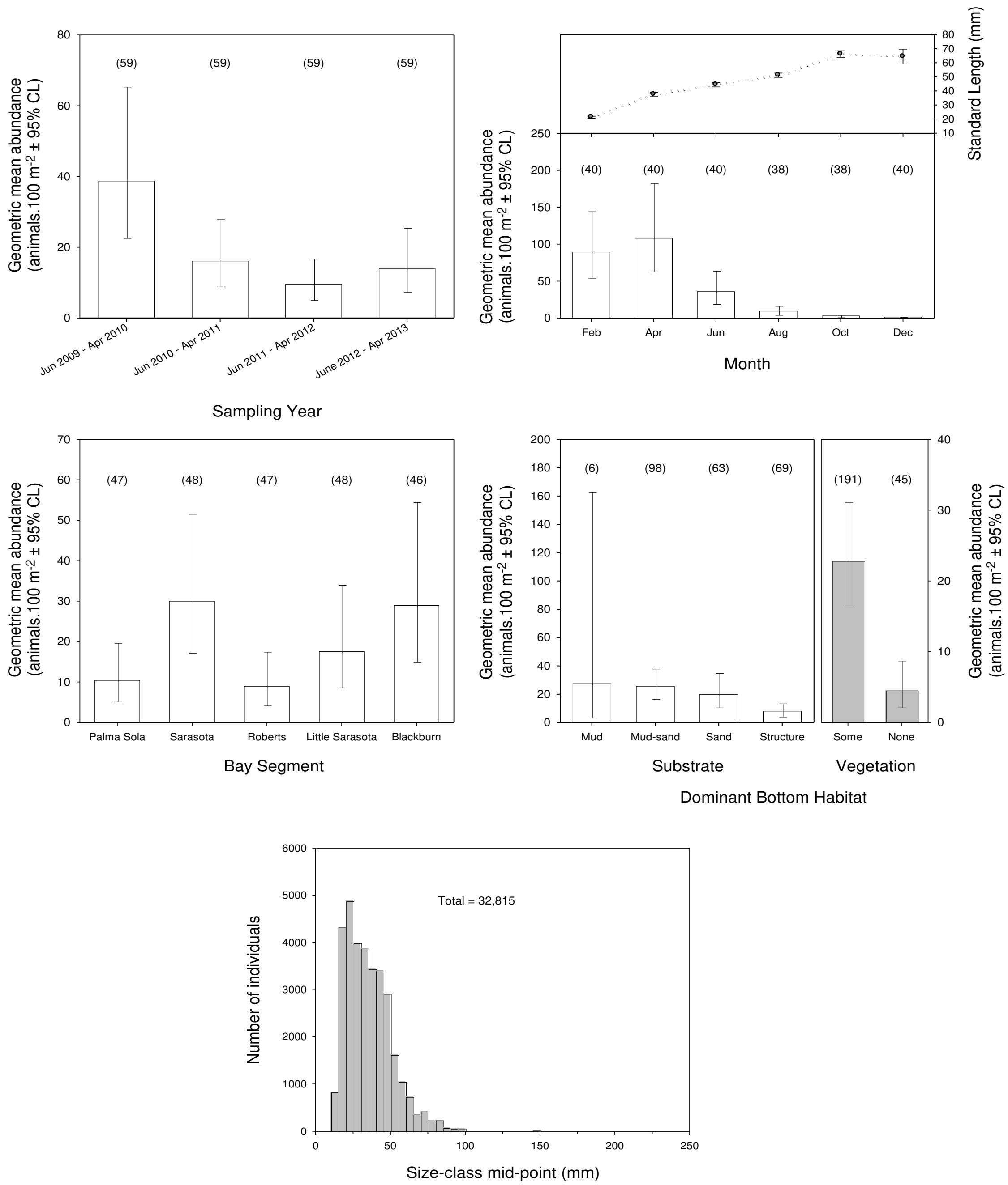

Figure 16. Relative abundance and length-frequency distribution of Pinfish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

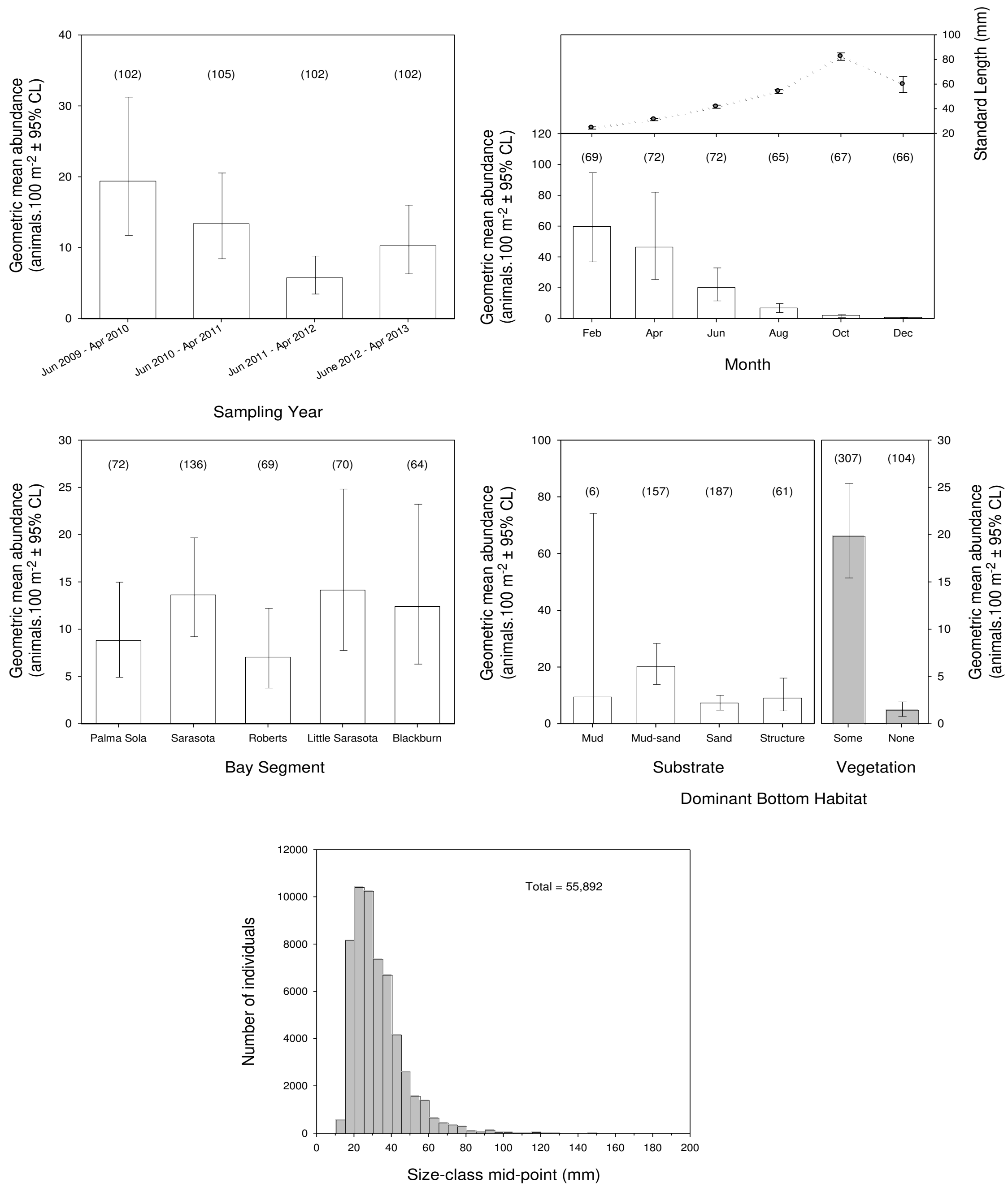

Figure 17. Relative abundance and length-frequency distribution of Pinfish collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

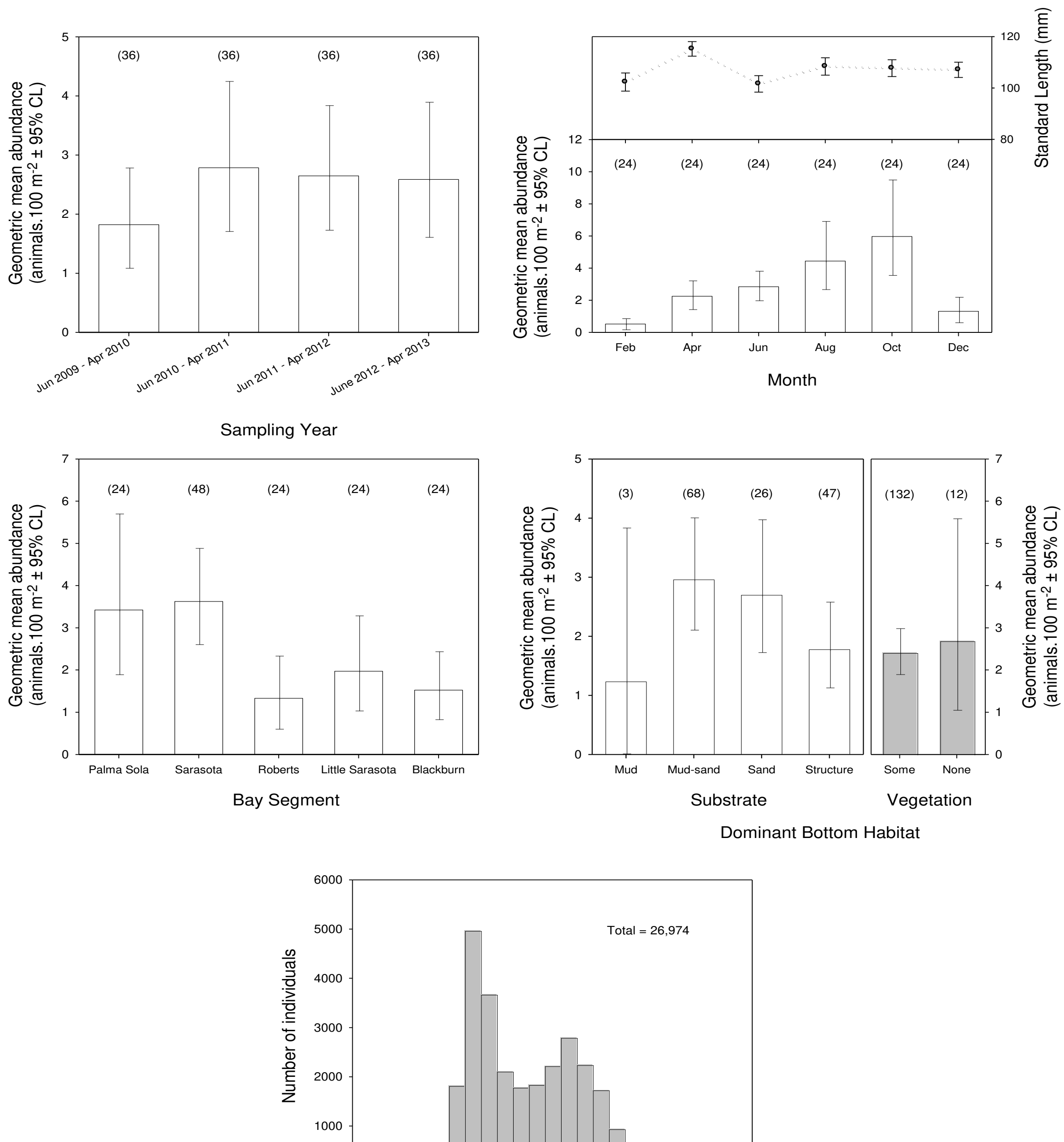

Figure 18. Relative abundance and length-frequency distribution of Pinfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

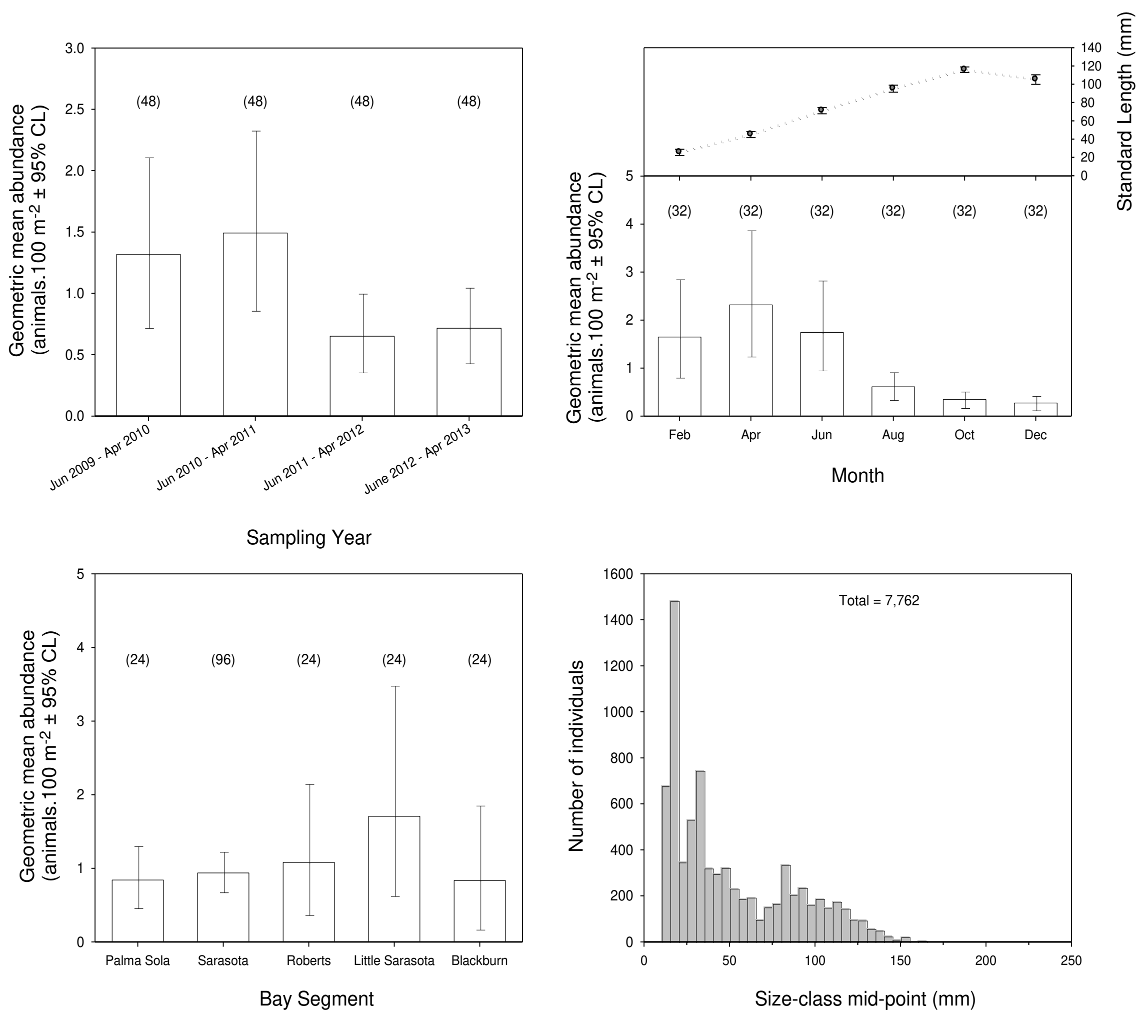

Figure 19. Relative abundance and length-frequency distribution of Pinfish collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Sheepshead, *Archosargus probatocephalus*

Sheepshead, *Archosargus probatocephalus*, are found in coastal estuarine and inner- to mid-shelf waters from Cape Cod to Brazil (*Jennings 1985*). Larval Sheepshead are pelagic and metamorphose into juveniles at about 8 mm (*Parsons and Peters 1989*; *Tucker and Alshuth 1997*). Juvenile Sheepshead are most abundant in grass flats and over mud bottoms (*Springer and Woodburn 1960*, *Odum and Heald 1972*, *Jennings 1985*). In late summer, juvenile Sheepshead begin to congregate with adults around stone jetties, breakwaters, piers, wrecks, and bulkheads (*Jennings 1985*). Recreational and commercial fishermen commonly harvest Sheepshead, with the recreational fishery accounting for almost 90% of the total pounds landed in recent years (*Munyandorero et al. 2006*).

Sheepshead were commonly collected in 183-m haul seines (67.3% occurrence; *Appendix F*) and 6.1-m otter trawls (13.9%; *Appendix G*). Sheepshead collected in 21.3-m shoreline and offshore seines did not meet the abundance criteria for inclusion (n<200 and <10% occurrence) in this section. More than 85% of the Sheepshead collected by 183-m haul seine were less than 300 mm SL (mean of 223.5 mm SL; *Figure 20*). Sheepshead collected with 6.1-m otter trawls tended to by smaller than those collected with 183-m haul seines, with just over 70% being less than 200 mm SL (mean = 169.7 mm SL; Figure 21). There were no obvious seasonal trends for Sheepshead collected with 183-m haul seines (*Figure 20*). Abundance of Sheepshead was highest in Little Sarasota (183-m haul seines; *Figure 20*) and Blackburn (6.1-m otter trawl; Figure 21) bays.

Archosargus probatocephalus (Sheepshead)

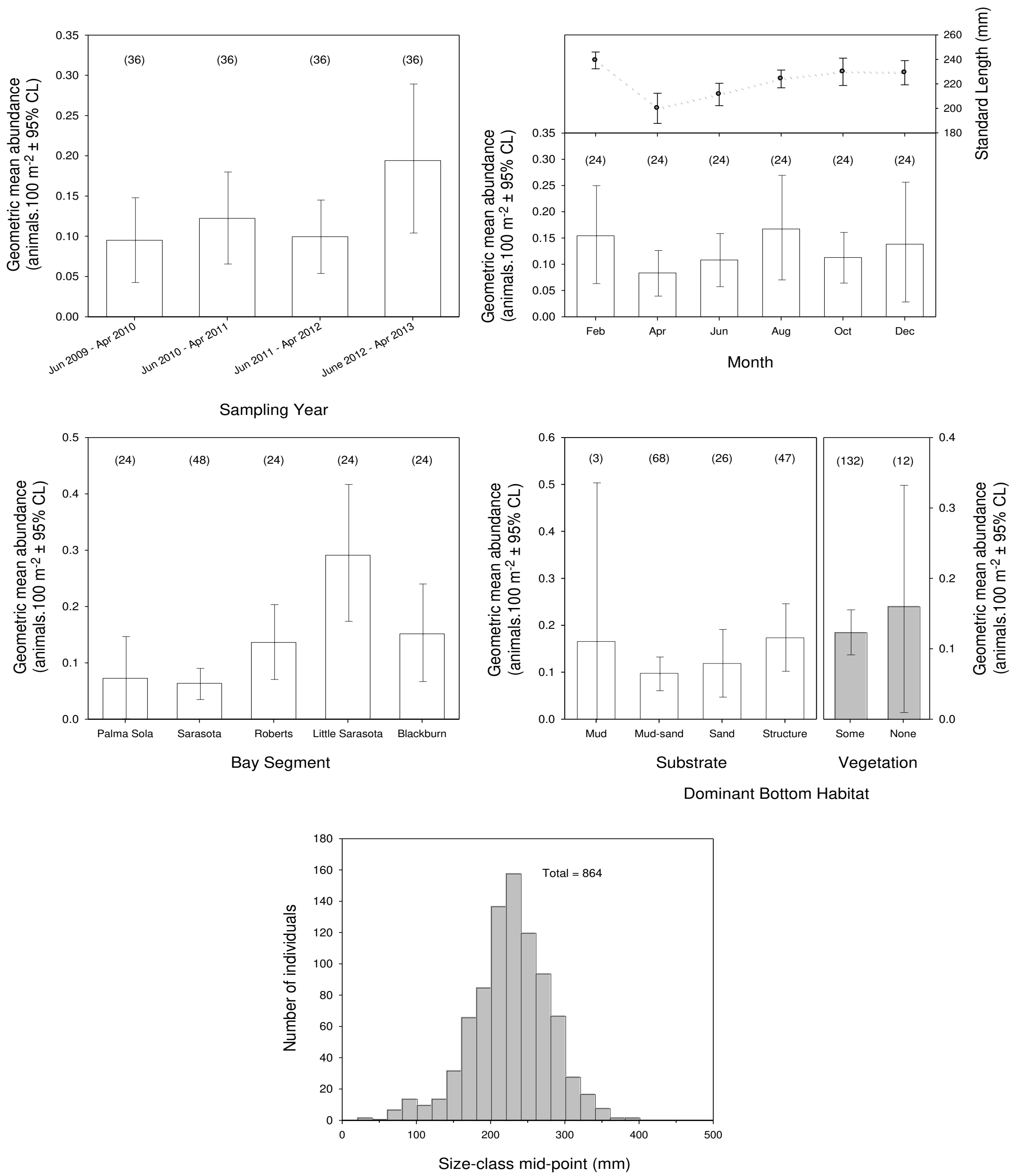

Figure 20. Relative abundance and length-frequency distribution of Sheepshead collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Archosargus probatocephalus (Sheepshead)

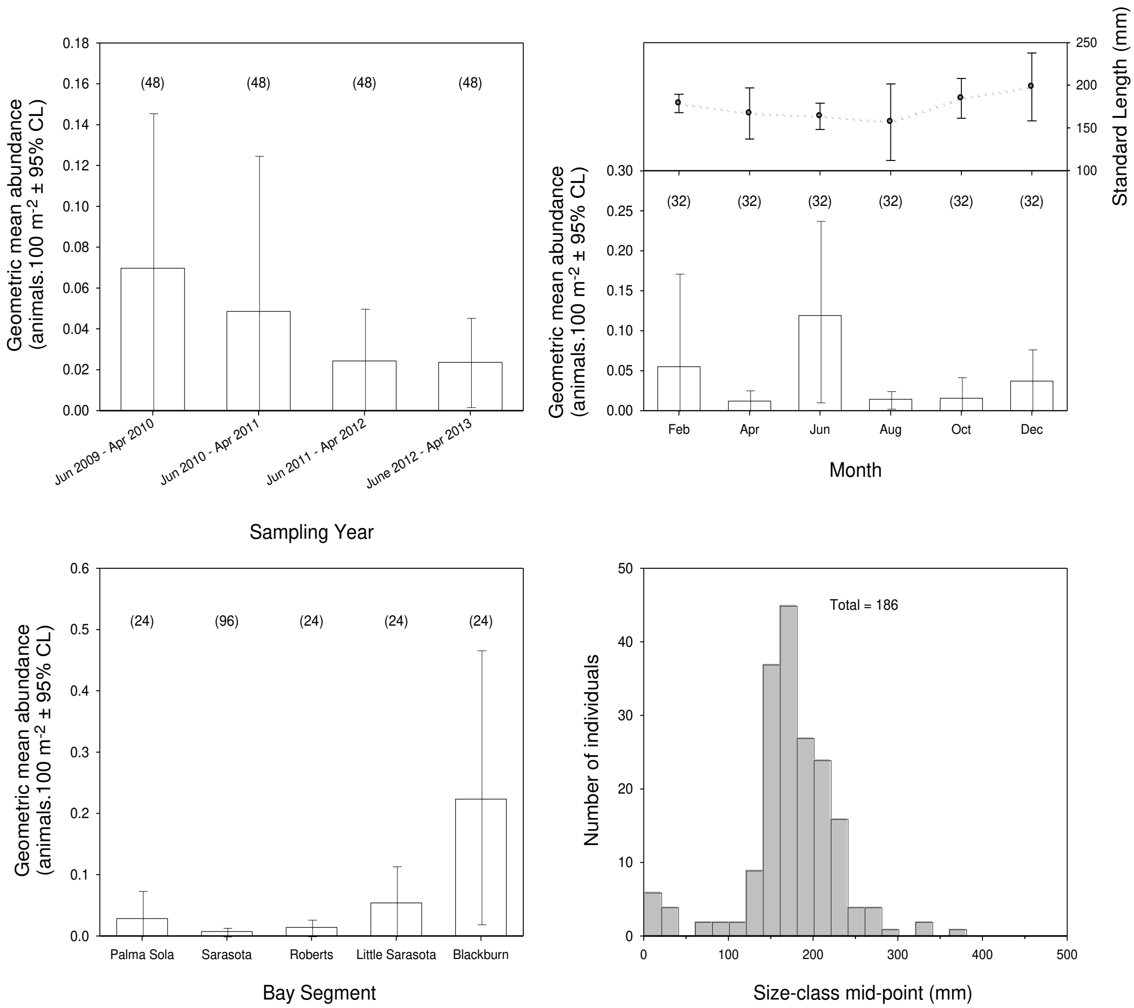

Figure 21. Relative abundance and length-frequency distribution of Sheepshead collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Spotted Seatrout, *Cynoscion nebulosus*

Spotted Seatrout occur along the U.S. east coast from New York south to Florida and in the Gulf of Mexico from Florida to Laguna Madre (*Carpenter 2002*). Over much of its range, Spotted Seatrout are the target of important recreational and commercial fisheries (*Bortone 2003*). Spawning occurs within estuaries or near passes into estuaries (*Brown-Peterson, 2003*). Spotted Seatrout have been collected at salinities ranging from 0 to 75 ppt, but juveniles may prefer 8-25 ppt, with 20-25 ppt possibly representing the physiological optimum for larger juveniles and adults (*Pattillo et al. 1997*).

Spotted Seatrout were collected in each of the gear types (*Appendices E*, *F*, and *G*), but were only abundant and frequently collected in 21.3-m shoreline and offshore seine hauls. The 21.3-m shoreline (*Figure 22*) and offshore (Figure 23) seines tended to collect small-sized Spotted Seatrout (mean of 42.6 and 40.7 mm SL, respectively), which represent early young-of-the-year animals. Abundance was higher during summer and fall months (June, August and October; *Figure 22*) than during other months (February, April and December). Spotted Seatrout were most abundant in collections that sampled some bottom vegetation, with this trend especially pronounced for 21.3-m offshore seine sets (Figure 23). Although present in all bay segments, mean abundance was higher in Roberts and Little Sarasota bays than in the other segments with the difference between bay segments most obvious for the 21.3-m shoreline seines (*Figure 22*).

Cynoscion nebulosus (Spotted Seatrout)

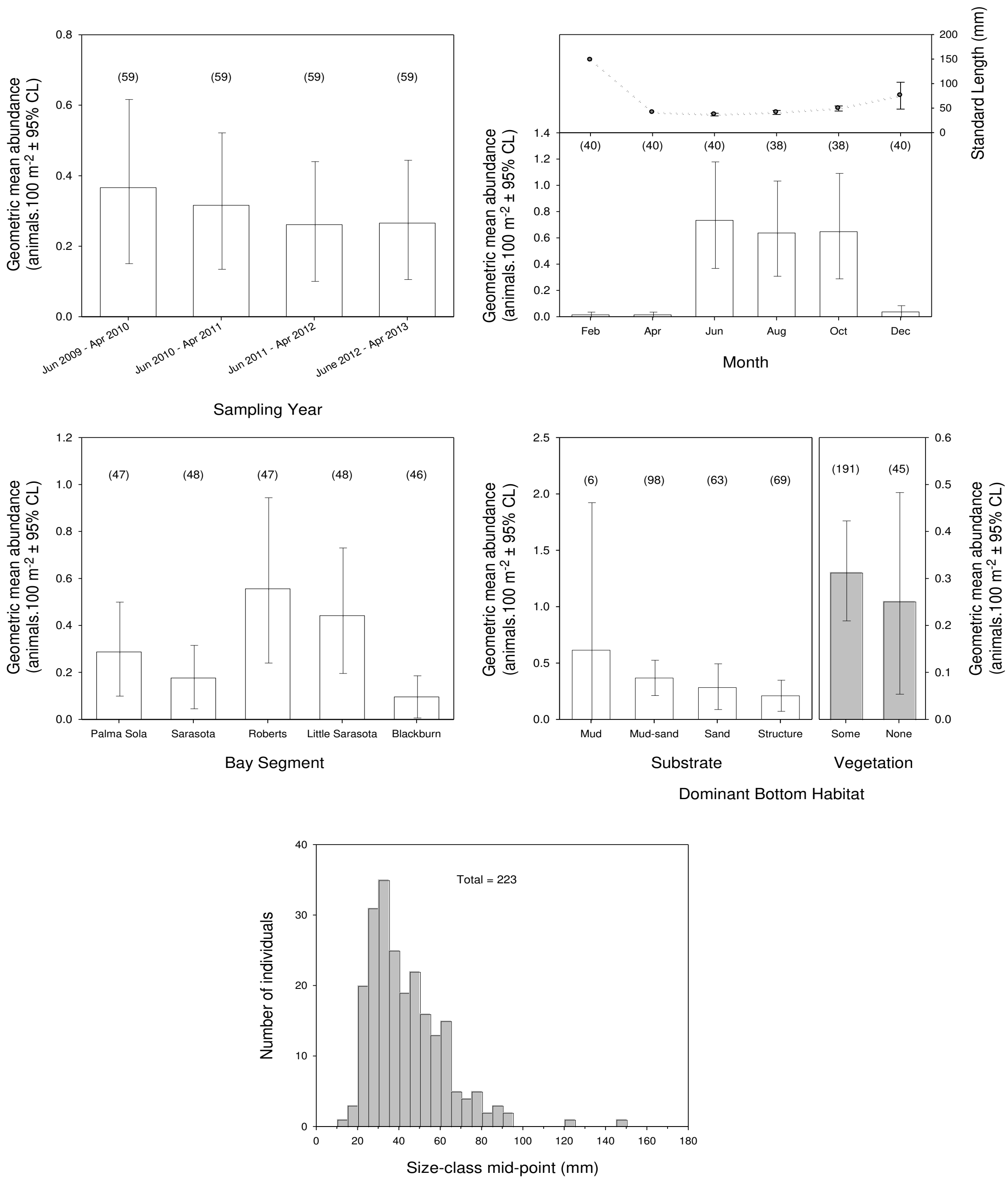

Figure 22. Relative abundance and length-frequency distribution of Spotted Seatrout collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Cynoscion nebulosus (Spotted Seatrout)

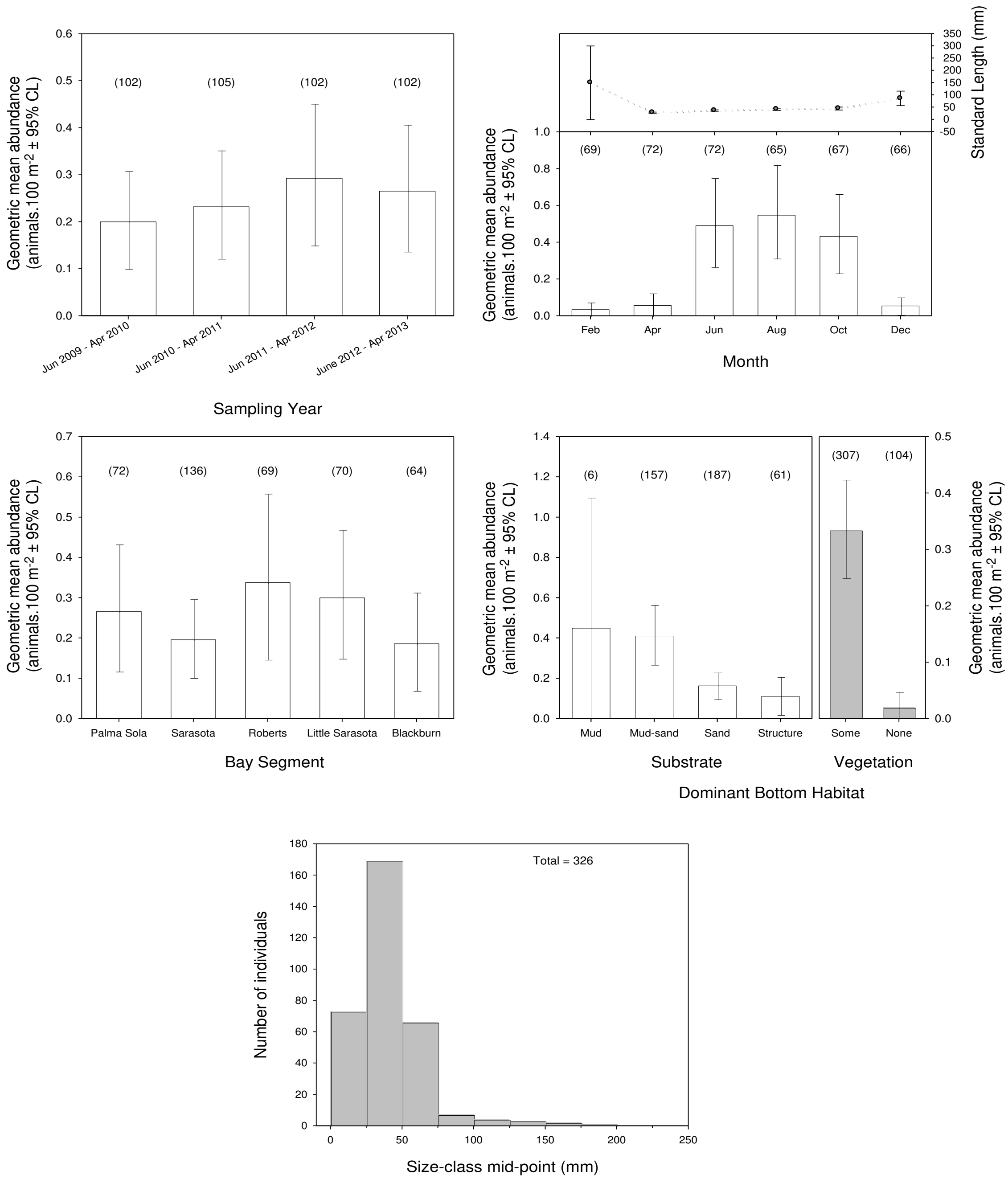

Figure 23. Relative abundance and length-frequency distribution of Spotted Seatrout collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Striped Mullet, *Mugil cephalus*

Striped Mullet are a cosmopolitan species; in the Western Atlantic, they range from Nova Scotia to Argentina (*Carpenter 2002*). This species supports large fisheries in many areas, including Florida. Landings in Florida were valued at over $5M in 2005; this value was less than half of the value in 1994 (FWRI, unpublished data), the year before the constitutional restriction on entangling nets was initiated. Striped Mullet are a major prey item for many fishes and birds (*Pattillo et al. 1997*; *Withers and Brooks 2004*; *Bacheler et al. 2005*; *Blewett et al. 2006*). They spawn on the continental shelf and recruit to estuaries as slender, silvery pelagic juveniles (*Pattillo et al. 1997*; *McDonough and Wenner 2003*). Recruiting juveniles are strong swimmers capable of traversing long distances to locate nursery habitats, perhaps aided by olfactory cues (*Etnier and Starnes 1993*; Peters and Matheson, pers. obs.). Juvenile and adult Striped Mullet exhibit a broad range of salinity tolerance and can be extremely abundant in tidal rivers (*Pattillo et al. 1997*; *Paperno and Brodie 2004*; *Idelberger and Greenwood 2005*). Adults sometimes move hundreds of miles inland in major river systems such as the Mississippi, but juveniles are most common at salinities higher than freshwater (*Etnier and Starnes 1993*; *Boschung and Mayden 2004*).

Striped Mullet were not collected in 6.1-m otter trawls (*Appendix G*), but were relatively abundant in 21.3-m seines (*Appendix E*) and 183-m haul seines (*Appendix F*). Frequency of occurrence and number of animals collected, however, was only high enough to assess trends from 21.3-m shoreline and 183-m haul seine collections. Striped Mullet collected with 21.3-m shoreline seines were typically small (mean = 28.0 mm SL; Figure 24), newly recruited, young-of-the-year animals. Abundance of these smaller animals peaked in February and abundance during the first two years of the study was higher than in the later two years. Striped Mullet collected in 183-m seines tended to be much larger than in 21.3-m shoreline seines (mean = 317.8; Figure 25). Seasonally, these larger Striped Mullet were most abundant during the winter (December and February) and least abundant during the early summer (June). Abundance of Striped Mullet in 183-m haul seines was lowest in Roberts Bay and there appears to be an increasing trend in annual abundance throughout the study period (Figure 25).

Mugil cephalus (Striped Mullet)

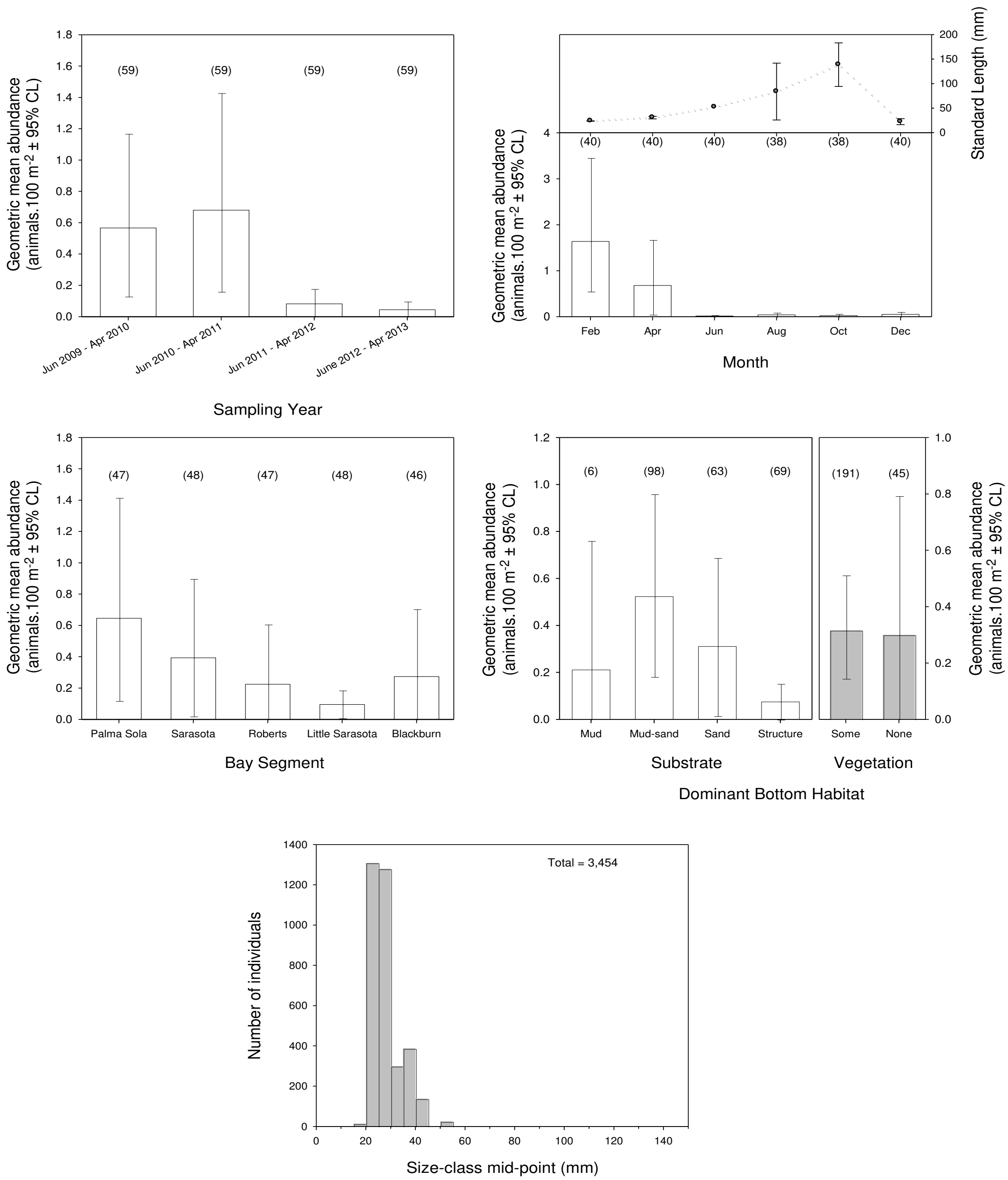

Figure 24. Relative abundance and length-frequency distribution of Striped Mullet collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Mugil cephalus (Striped Mullet)

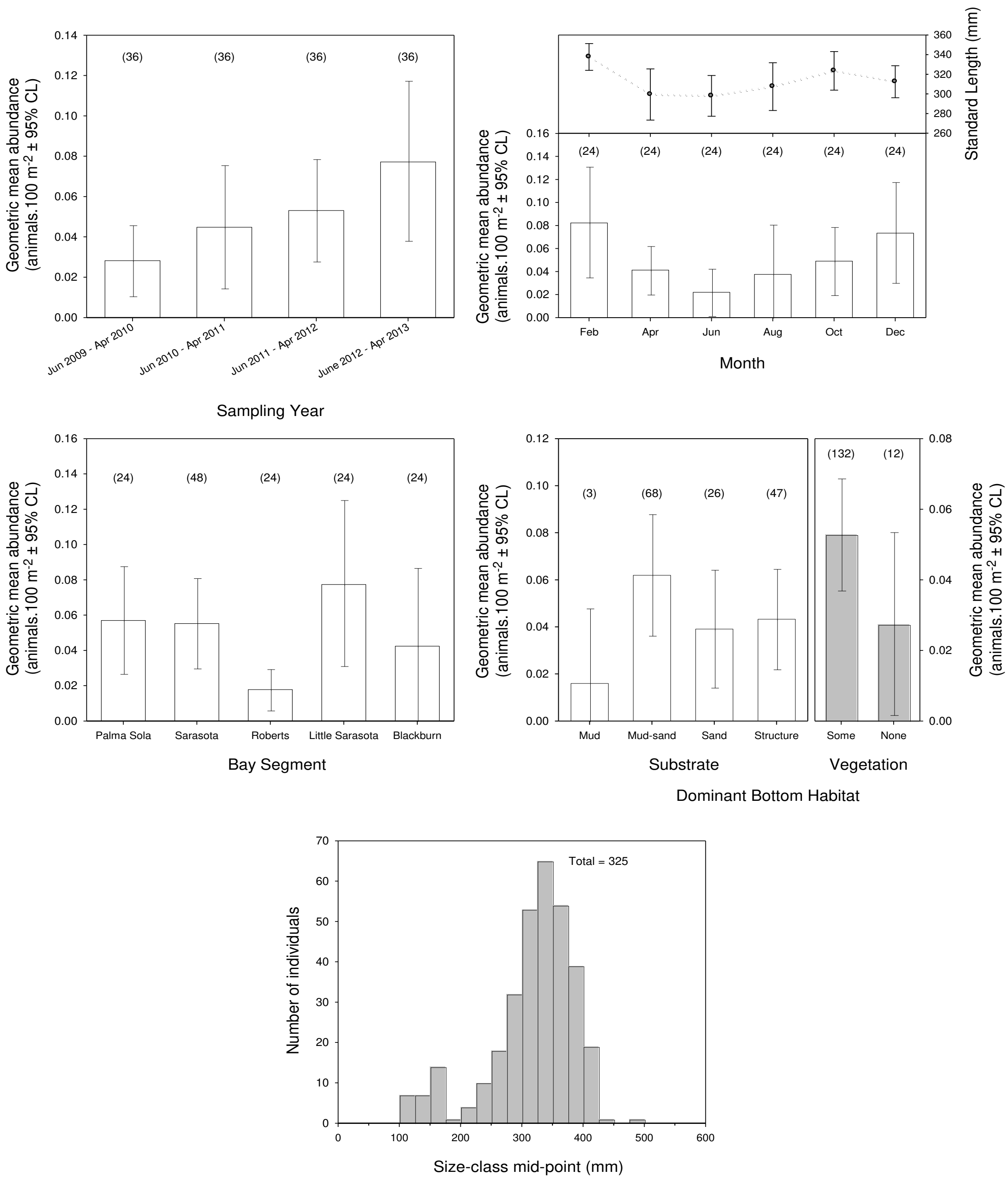

Figure 25. Relative abundance and length-frequency distribution of Striped Mullet collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Nekton Community Structure

Analysis of variance (ANOVA) identified significant abundance differences (P<0.0001) between bay segments and sampling years with each of the four gears used (*Table 9*). Regardless of gear type, the bay segment with the highest abundance was located in the Sarasota Bay estuary: Little Sarasota Bay for both 21.3-m seine methods (shoreline and offshore) and 6.1-m otter trawl, and Sarasota Bay proper for the 183-m haul seine (*Figure 26*). The geometric mean abundance was 1.8 (6.1-m otter trawl) to 2.5 (21.3-m shoreline seine) times higher in Little Sarasota Bay than the highest geometric mean abundance from any bay segment in Charlotte Harbor or Tampa Bay. Even the lowest geometric mean abundance from 21.3-m shoreline seines in the Sarasota Bay estuary (166.33 individuals•100m^{-2}, Roberts Bay) was greater than the maximum geometric mean abundance from any bay segment in Charlotte Harbor (157.2 individuals•100m^{-2}, Pine Island Sound). With the exception of 6.1-m otter trawls in years three (June 2011 to April 2012) and four (June 2012 to April 2013), the Sarasota Bay estuary had a higher geometric mean abundance than Tampa Bay and Charlotte Harbor (Figure 27) for all sampling years and gear types.

Table 9. Analysis of Variance comparing nekton abundance between bay segments of the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Results of Tukey post-hoc test to determine bay segments and sampling years that were significantly different (*P*<0.05) from each other can be found in *Appendix L* and *Appendix M*, respectively.

	Model			
Gear	*df*	*Sum of Squares*	*F Value*	*P*
21.3-m shoreline seine				
Bay Segment	13	294.230	9.55	<0.0001
Sampling Year	3	50.540	7.11	0.0001
Bay Segment x Sampling Year	39	118.401	1.28	0.1181
Error	923	2,186.4235		
21.3-m offshore seine				
Bay Segment	13	540.439	11.18	<.0001
Sampling Year	3	83.602	7.5	<.0001
Bay Segment x Sampling Year	39	101.291	0.7	0.9195
Error	1244	4,624.639		
183-m haul seine				
Bay Segment	13	146.165	14.43	<.0001
Sampling Year	3	15.2175	6.51	0.0002
Bay Segment x Sampling Year	39	35.533	1.17	0.2222
Error	976	760.343		
6.1-m otter trawl				
Bay Segment	13	125.820	9.86	<.0001
Sampling Year	3	10.288	3.49	0.0152
Bay Segment x Sampling Year	39	42.631	1.11	0.2925
Error	1072	1,052.082		

** Tukey Post-hoc Test (P<0.05) can be found in Appendix L (Bay Segment) and Appendix M (SamplingYear)*

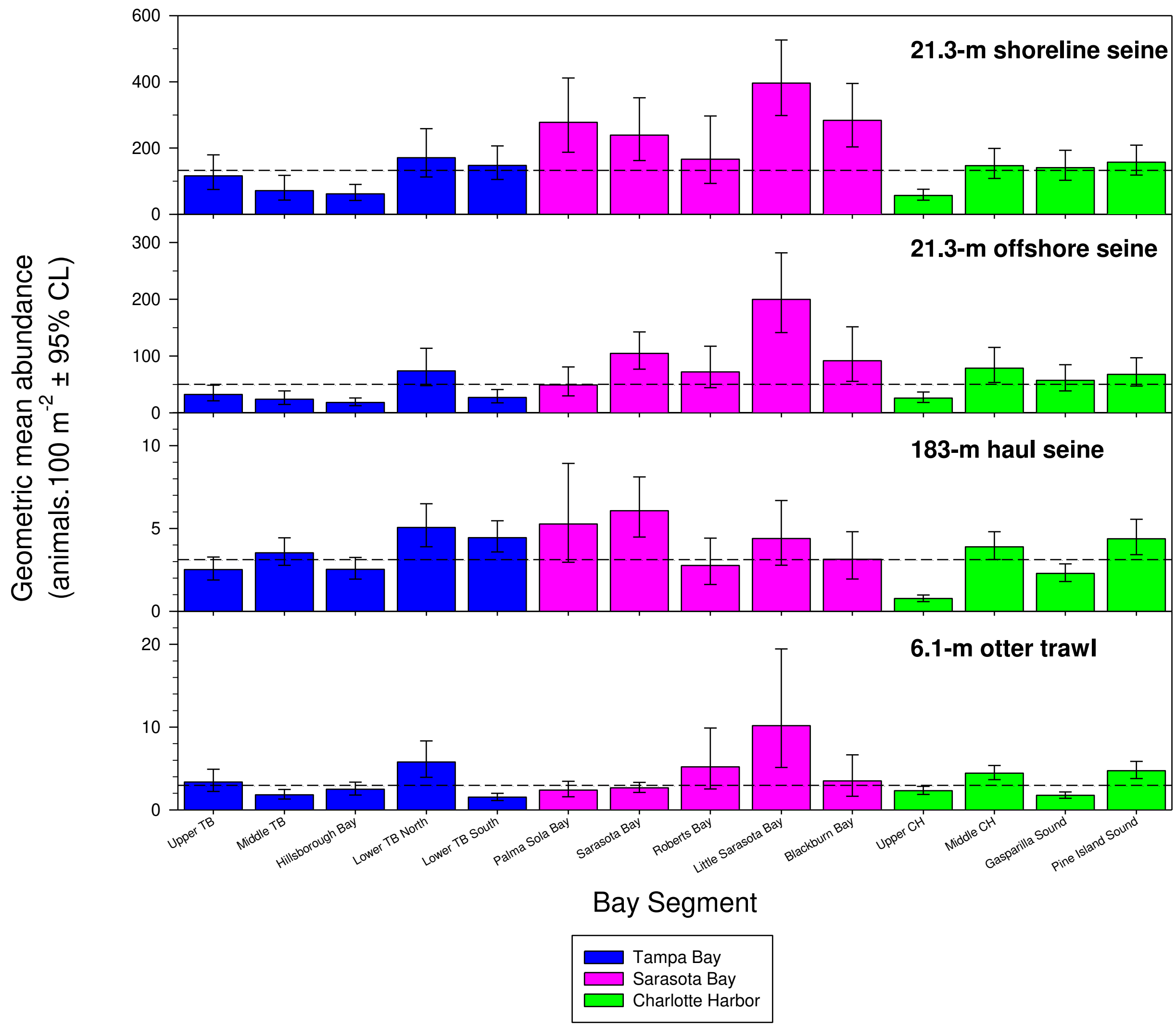

Figure 26. Geometric mean abundance by gear type and bay segment, for nekton collected from each estuary (Tampa Bay, Sarasota Bay and Charlotte Harbor) between June 2009 and April 2013. Embayments, within each estuary, are generally presented from North to South and East to West starting on the left. Significant differences (P<0.05) between embayments, identified by ANOVA with Tukey post-hoc test, can be found in *Appendix L*. Dashed horizontal lines depict the overall average abundance for each gear type. Maps depicting bay segments can be found in *Figure 1* for the Sarasosta Bay estuary and in *Figure 2* for Tampa Bay and Charlotte Harbor estuaries.

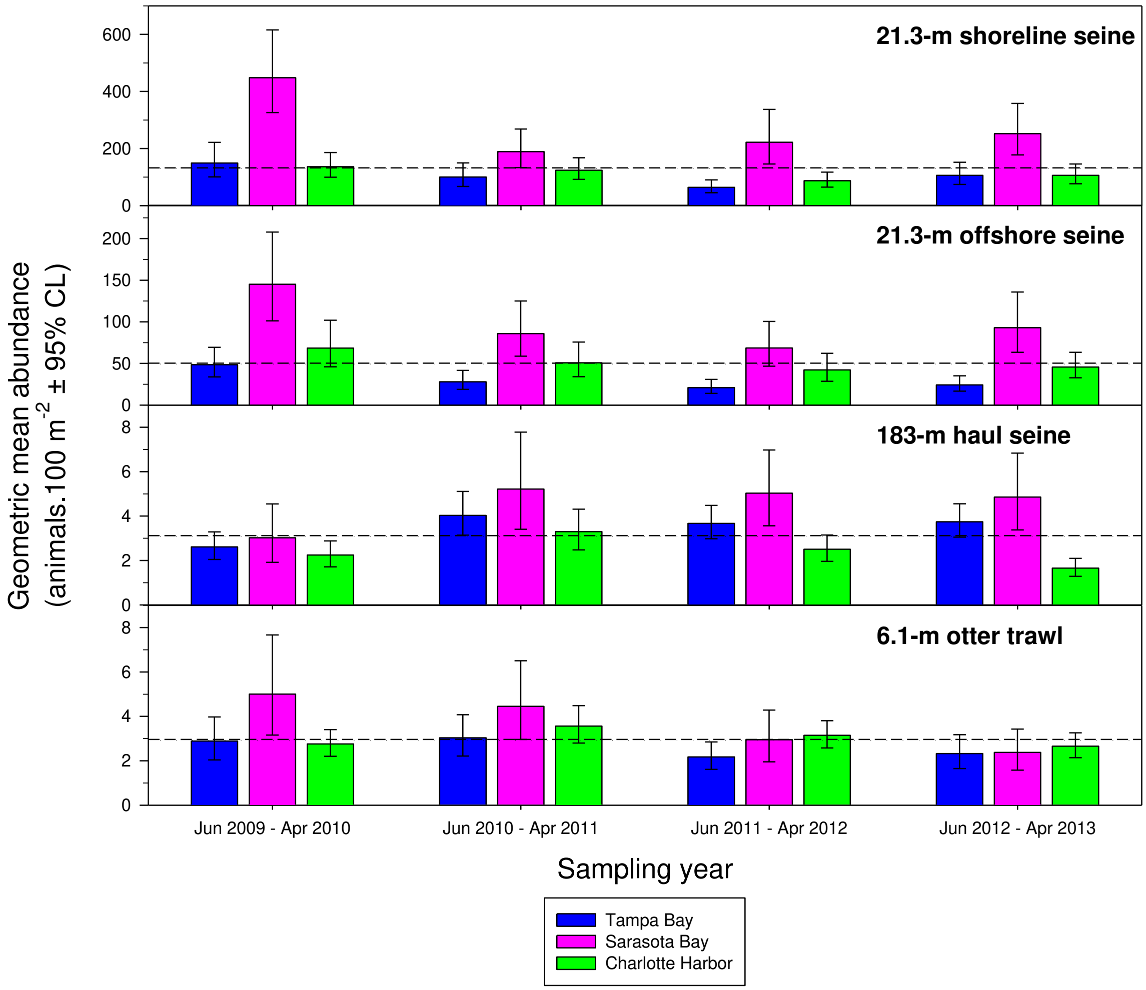

Figure 27. Geometric mean abundance by gear type and sampling year, for nekton collected from each estuary (Tampa Bay, Sarasota Bay and Charlotte Harbor) between June 2009 and April 2013. Significant differences (P<0.05) between sampling years, identified by ANOVA with Tukey post-hoc test, can be found in *Appendix M*. Dashed horizontal lines depict the overall average abundance for each gear type.

Analysis of nekton community structure in Sarasota Bay, Tampa Bay and Charlotte Harbor produced similar groupings of bay segments regardless of the gear type (*Figure 28*). Little Sarasota and Roberts bays grouped together (Group C) for three of the four gear deployment methods (21.3-m shorleine seine, 183-m haul seine, and 6.1-m otter trawls). Although Old Tampa Bay, Hillsborough Bay and Upper Charlotte Harbor grouped together (Group A) for three of the four gear deployment methods (21.3-m shoreline seine, 21.3-m offshore seine, and 6.1-m otter trawl), Upper Charlotte Harbor (Group D) did not group with any other bay segments for the 183-m haul seine. With the exception of Lower Tampa Bay South (21.3-m offshore seine and 6.1-m otter trawl), the larger bay segments with passes to the Gulf of Mexico (Gasparilla Sound, Pine Island Sound, Sarasota Bay proper and Lower Tampa Bay North; Group B) consistently grouped together. The nekton assemblage in Lower Tampa Bay South grouped with the middle bay segments (Middle Charlotte Harbor and Middle Tampa Bay; Group B) for 6.1-m otter trawls and did not group with any other bay segment (Group C) for 21.3-m offshore seine collections. Palma Sola Bay grouped with the lower Tampa Bay and Charlotte Harbor bay segments (Group B) for the 21.3-m shoreline seine, 183-m haul seine, and 6.1-m otter trawl but with Roberts Bay for the 21.3-m offshore seine. Blackburn Bay demonstrated no consistent pattern between gear types, grouping with the lower bay segments (Group B) for 21.3-m shoreline seine, joining with Little Sarasota Bay for 21.3-m offshore seine (Group F), Little Sarasota and Roberts bays for the 183-m haul seine (Group C), and forming its own group for 6.1-m otter trawls (Group E).

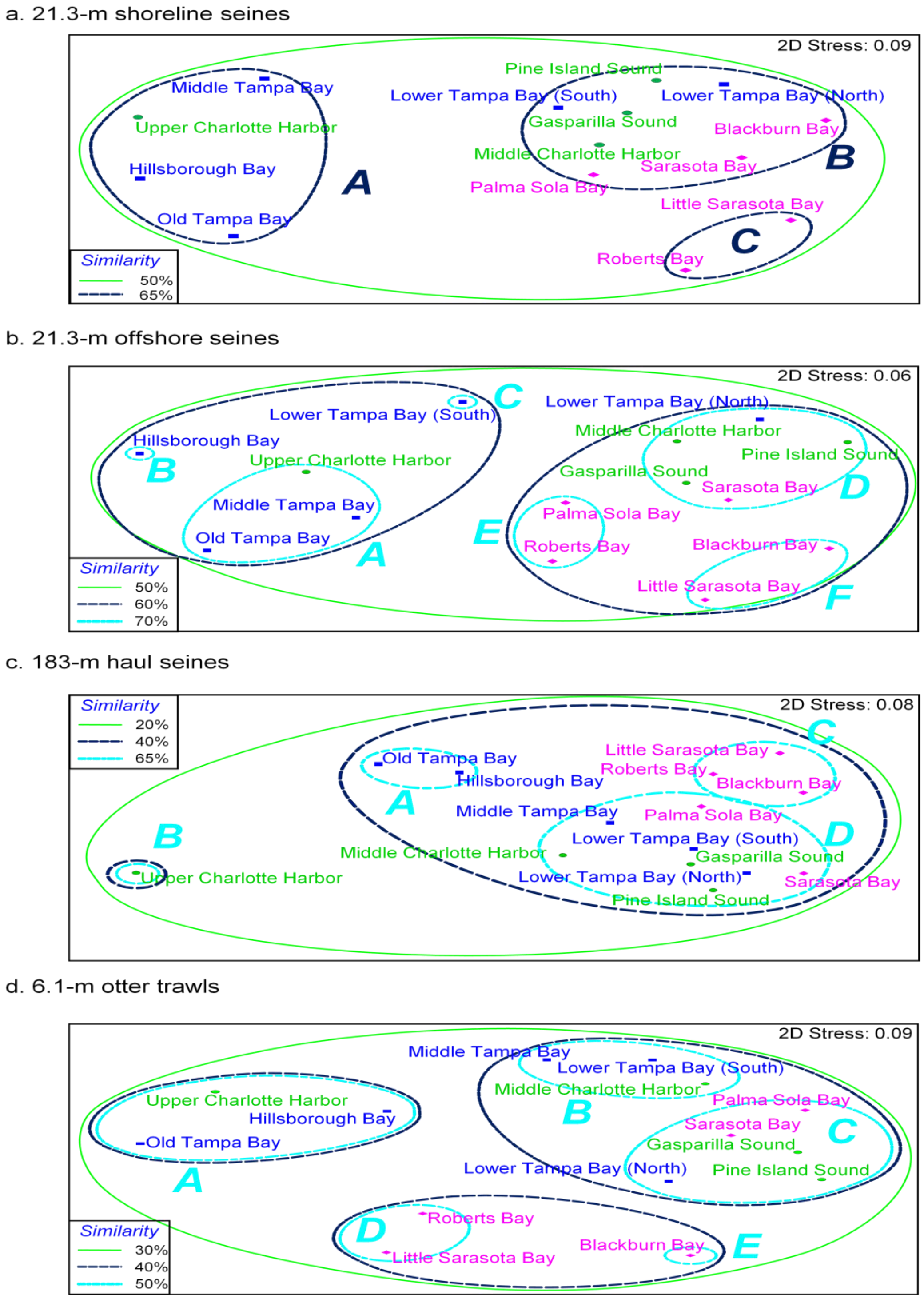

Figure 28. Non-metric Multidimensional Scaling (MDS) ordination plot of nekton community structure in bay segments of three eastern Gulf of Mexico estuaries (Tampa Bay, Sarasota Bay and Charlotte Harbor) for each of gear type deployed during nekton sampling, June 2009 – April 2012. Blue ellipses are designated with capital letters (A, B, C, etc.) used in Similarity Percentage (SIMPER) analysis to determine taxonomic differences between embayment groupings. Maps depicting bay segments can be found in *Figure 1* for the Sarasosta Bay estuary and in *Figure 2* for Tampa Bay and Charlotte Harbor estuaries.

Each of the top 25 pseudo-species that determined community structure differences between groupings (SIMPER analysis; *Table 10*) for the 21.3-m shoreline seine were collected in each of the bay-segment groupings, indicating that groupings were determined by differences in abundance rather than by taxonomic differences. The top two pseudo-species *A. mitchilli* (Bay Anchovy, 20-29 mm SL and 30-39 mm SL) where most abundant in Group C (Figure 29). *Lagodon rhomboides* (Pinfish), a commonly collected taxon with several size classes in the top 25, was most abundant in groups B and C (Figure 30) at all sizes.

Seventeen of the top 25 pseudo-species were more abundant in Group C (Little Sarasota and Roberts bays) than in the other two bay-segment groupings. Another five were more abundant in Group B (Gasparilla Sound, Middle Charlotte Harbor, Pine Island Sound, Sarasota Bay proper, Palma Sola Bay, Blackburn Bay, Lower Tampa Bay North and Lower Tampa Bay South) and two pseudo-species were more abundant in Group A (Roberts and Little Sarasota bays). Four of the top 25 pseudo-species were Selected Taxa, with each having their highest abundance in bay-segment Group C (*F. duorarum* [Pink Shrimp], 0-9mm POH and 10-19mm POH; *L. xanthurus* [Spot], 10-19mm SL and 20-29mm SL).

Table 10. Similarity percentage (SIMPER) analysis for Tampa Bay, Sarasota Bay, and Charlotte Harbor segment groupings identified in the MDS ordination for 21.3-m shoreline seine collections (*Figure 28*). Mean abundance (Group Abundance) for the top 25 pseudo-species that distinguished bay-segment groupings are listed in order of decreasing relative contribution to overall differences between groups. Group A included Upper Charlotte Harbor, Hillsborough Bay, Old Tampa Bay and Middle Tampa Bay; Group B included Gasparilla Sound, Middle Charlotte Harbor, Pine Island Sound, Sarasota Bay proper, Palma Sola Bay, Blackburn Bay and Lower Tampa Bay (North and South); and Group C consisted of Roberts and Little Sarasota bays.

Scientific name	Common name	Size Class (mm)	Group Abundance (animals•100m^{-2})$^{1/2}$		
			A	B	C
Anchoa mitchilli	Bay Anchovy	30 - 39	1.88	1.59	5.88
Anchoa mitchilli	Bay Anchovy	20 - 29	1.77	1.16	5.38
Eucinostomus spp.	Eucinostomus	20 - 29	1.51	3.19	4.74
Eucinostomus spp.	Eucinostomus	30 - 39	1.48	2.82	4.46
Lagodon rhomboides	Pinfish	40 - 59	0.71	2.70	3.15
Lagodon rhomboides	Pinfish	30 - 39	0.52	2.29	2.32
Lagodon rhomboides	Pinfish	20 - 29	0.59	2.24	1.69
Lucania parva	Rainwater Killifish	20 - 29	0.64	2.11	1.06
Anchoa mitchilli	Bay Anchovy	40 - 59	0.81	0.63	1.59
Eucinostomus spp.	Eucinostomus	10 - 19	0.73	1.40	1.38
Lagodon rhomboides	Pinfish	60 - 79	0.42	1.13	1.26
Farfantepenaeus duorarum [1]	Pink Shrimp	0 to 9	0.41	0.80	1.57
Lagodon rhomboides	Pinfish	10 - 19	0.43	1.21	1.21
Harengula jaguana	Scaled Sardine	40 - 59	0.25	0.34	1.28
Menidia spp.	Menidia Silversides	40 - 59	1.56	1.16	0.73
Farfantepenaeus duorarum [1]	Pink Shrimp	10 - 19	0.31	0.86	1.27
Eucinostomus gula	Silver Jenny	40 - 59	0.92	1.63	2.07
Lucania parva	Rainwater Killifish	30 - 39	0.26	0.92	0.22
Menidia spp.	Menidia Silversides	30 - 39	1.04	0.89	0.54
Leiostomus xanthurus [1]	Spot	10 - 19	0.46	0.52	0.70
Leiostomus xanthurus [1]	Spot	20 - 29	0.68	0.82	1.00
Eucinostomus harengulus	Tidewater Mojarra	40 - 59	0.63	0.55	1.06
Bairdiella chrysoura	Silver Perch	40 - 59	0.18	0.25	0.83
Eucinostomus harengulus	Tidewater Mojarra	60 - 79	0.40	0.21	0.68
Floridichthys carpio	Goldspotted Killifish	20 - 29	0.30	0.34	0.19

[1] Species of direct economic importance (Selected Taxa).

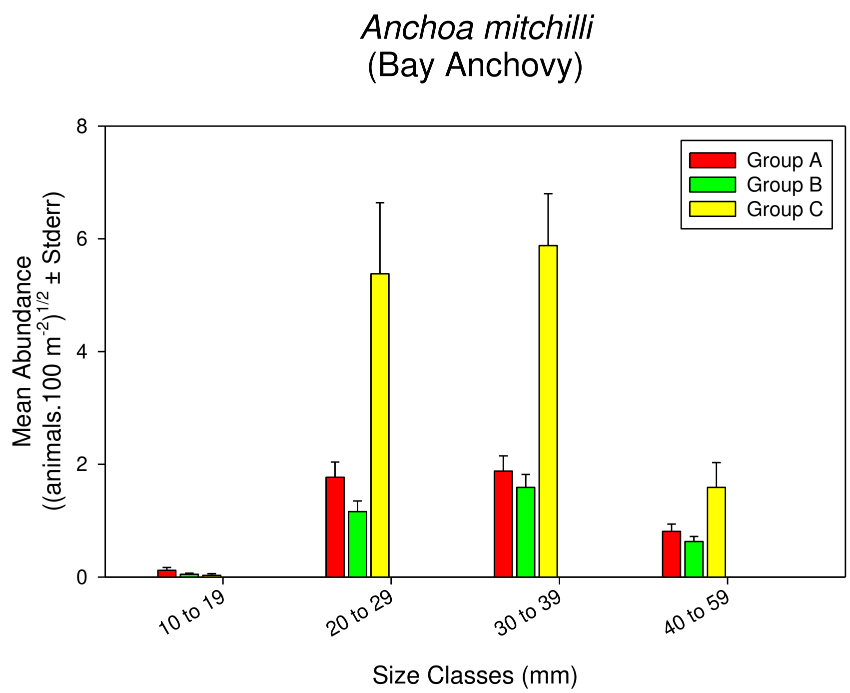

Figure 29. Mean abundance for Bay Anchovy pseudo-species collected with 21.3-m shoreline seines. Plots show all pseudo-species of Bay Anchovy captured, not just the top 25 pseudo-species in the Simper analysis.

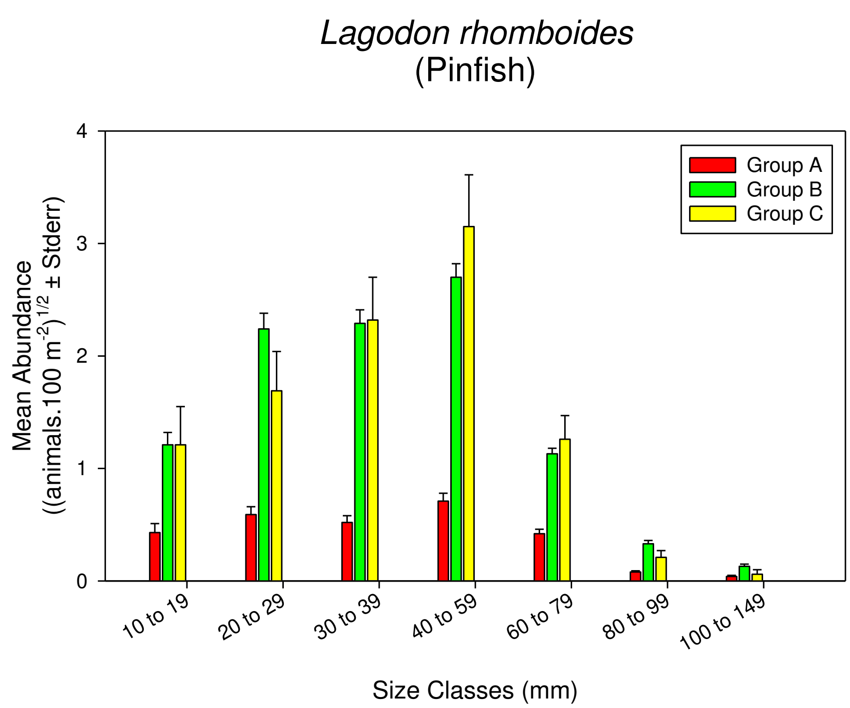

Figure 30. Mean abundance for Pinfish pseudo-species collected with 21.3-m shoreline seines. Plots show all pseudo-species of Pinfish captured, not just the top 25 pseudo-species in the Simper analysis.

Differences in abundance of similar pseudo-species defined bay-segment groupings for the 21.3-m offshore seine collections (SIMPER analysis; Table 11). None of the pseudo-species in the top 25 pseudo-species that determined community structure differences between bay-segment groupings was unique to any single grouping for this deployment method. Abundance of several species, such as *F. duorarum,* Pink Shrimp (*Figure 31*) and *Microgobius gulosus*, Clown Goby (Figure 32), were two times greater in bay-segment Group F (Little Sarasota and Blackburn bays) than in the bay-segment grouping with the second highest abundance.

Sixteen of the top 25 psuedo-species had higher abundance in Group F than in the other five bay-segment groupings. None of the top 25 psuedo-species had their highest abundance in Group A (Upper Charlotte Harbor, Old Tampa Bay and Middle Tampa Bay), B (Hillsborough Bay) or Group C (Lower Tampa Bay South). Each of the four Selected Taxa in the top 25 (*F. duorarum* [Pink Shrimp], 0-9mm POH and 10-19mm POH; *L. xanthurus* [Spot], 10-19mm SL and 20-29mm SL) had their highest abundance in Group F.

Table 11. Similarity percentage (SIMPER) analysis for Tampa Bay, Sarasota Bay, and Charlotte Harbor segment groupings identified in the MDS ordination for 21.3-m offshore seine collections (*Figure 28*). Mean abundance (Group Abundance) for the top 25 pseudo-species that distinguished bay-segment groupings are listed in order of decreasing relative contribution to overall differences between groups. Group A included Upper Charlotte Harbor, Old Tampa Bay, and Middle Tampa Bay; Groups B (Hillsborough Bay) and C (Lower Tampa Bay South) did not group with any other bay segments; Group D included Gasparilla Sound, Middle Charlotte Harbor, Pine Island Sound, Sarasota Bay proper, and Lower Tampa Bay North; Group E consisted of Palma Sola and Roberts bays; and Group F consisted of Little Sarasota and Blackburn bays.

Scientific name	***Common name***	***Size Class (mm)***	***Group Abundance (animals•100m^{-2})$^{1/2}$***					
			A	***B***	***C***	***D***	***E***	***F***
Eucinostomus spp.	Eucinostomus	20 - 29	0.91	0.55	1.23	2.12	2.73	4.15
Lagodon rhomboides	Pinfish	40 - 59	0.74	0.49	1.84	2.60	1.54	2.54
Lagodon rhomboides	Pinfish	20 - 29	1.26	0.72	1.61	2.80	1.87	3.03
Lagodon rhomboides	Pinfish	30 - 39	0.84	0.62	1.36	2.62	1.56	2.63
Anchoa mitchilli	Bay Anchovy	30 - 39	1.26	0.88	1.00	0.71	2.77	2.83
Anchoa mitchilli	Bay Anchovy	20 - 29	1.44	0.98	1.04	0.49	2.01	2.17
Eucinostomus spp.	Eucinostomus	30 - 39	0.78	0.47	0.98	1.62	1.68	2.98
Eucinostomus spp.	Eucinostomus	10 - 19	0.50	0.40	0.63	1.00	1.20	2.08
Lucania parva	Rainwater Killifish	20 - 29	0.40	0.16	0.88	1.43	0.81	0.46
Lagodon rhomboides	Pinfish	10 - 19	0.90	0.60	0.96	1.62	1.39	1.36
Lagodon rhomboides	Pinfish	60 - 79	0.46	0.28	0.68	1.09	0.78	0.79
Anchoa mitchilli	Bay Anchovy	40 - 59	0.46	0.34	0.37	0.32	0.85	1.57
Lucania parva	Rainwater Killifish	30 - 39	0.13	0.05	0.39	0.57	0.08	0.07
Eucinostomus gula	Silver Jenny	40 - 59	0.54	0.28	0.63	0.92	0.89	1.05
Leiostomus xanthurus [1]	Spot	20 - 29	0.29	0.22	0.36	0.18	0.48	0.93
Farfantepenaeus duorarum [1]	Pink Shrimp	0 - 9	0.52	0.44	0.36	0.37	0.60	1.20
Lucania parva	Rainwater Killifish	10 - 19	0.13	0.04	0.18	0.38	0.50	0.30
Farfantepenaeus duorarum [1]	Pink Shrimp	10 - 19	0.41	0.27	0.25	0.45	0.49	0.93
Leiostomus xanthurus [1]	Spot	10 - 19	0.24	0.22	0.17	0.23	0.56	1.04
Bairdiella chrysoura	Silver Perch	40 - 59	0.45	0.31	0.29	0.43	0.54	1.06
Microgobius gulosus	Clown Goby	20 - 29	0.49	0.40	0.33	0.25	0.36	0.90
Microgobius gulosus	Clown Goby	30 - 39	0.40	0.35	0.28	0.23	0.32	0.88
Bairdiella chrysoura	Silver Perch	60 - 79	0.25	0.16	0.13	0.26	0.41	0.83
Harengula jaguana	Scaled Sardine	40 - 59	0.19	0.27	0.38	0.40	0.50	0.58
Lagodon rhomboides	Pinfish	80 - 99	0.14	0.08	0.21	0.40	0.30	0.37

[1] Species of direct economic importance (Selected Taxa).

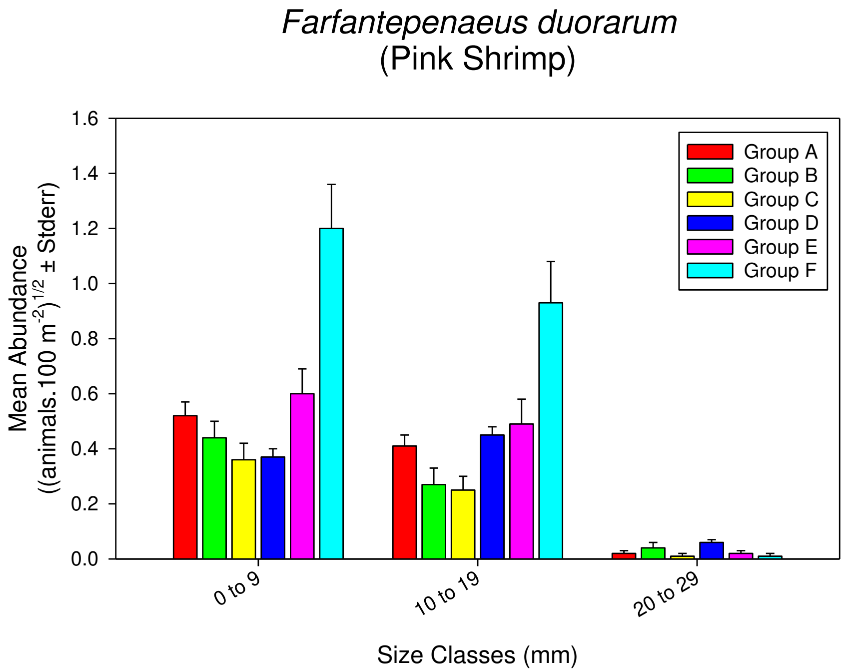

Figure 31. Mean abundance for Pink Shrimp pseudo-species collected with 21.3-m offshore seines. Plots show all pseudo-species of Pink Shrimp captured, not just the top 25 pseudo-species in the Simper analysis.

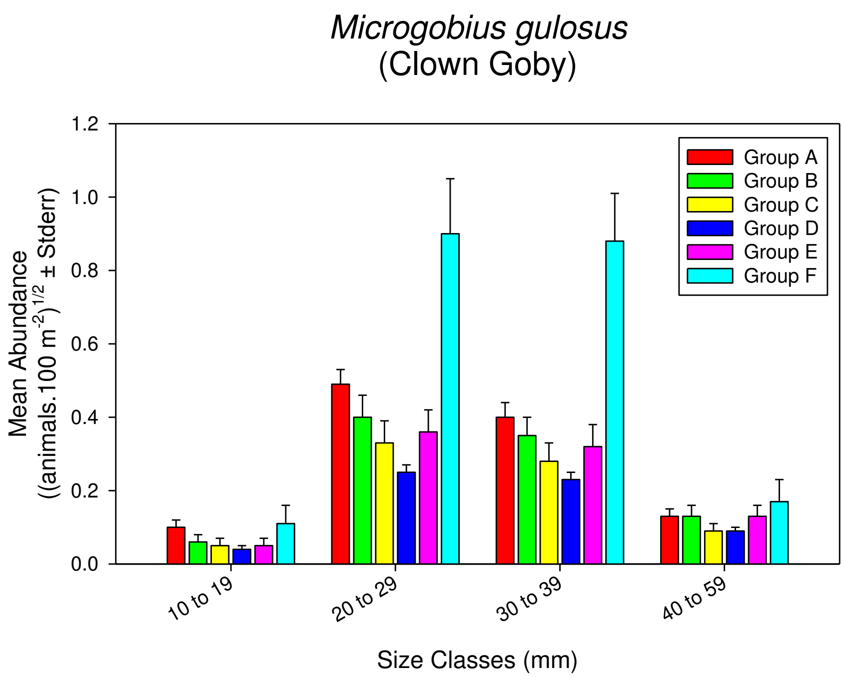

Figure 32. Mean abundance for Clown Goby pseudo-species collected with 21.3-m offshore seines. Plots show all pseudo-species of Clown Goby captured, not just the top 25 pseudo-species in the Simper analysis.

Each of the top 25 pseudo-species that determined community structure differences between bay-segment groupings for the 183-m haul seine occurred in all four bay-segment groupings (Table 12). Fifteen of the top 25 pseudo-species were more abundant in Group C (Little Sarasota, Roberts and Blackburn bays) than in the other three bay-segment groupings. Groups A (Hillsborough Bay and Old Tampa Bay) and D (Gasparilla Sound, Middle Charlotte Harbor, Pine Island Sound, Sarasota Bay proper, Palma Sola Bay, Middle Tampa Bay and Lower Tampa Bay [North and South]) had four and six pseudo-species, respectively, with higher abundance than the other three bay-segment groupings. Selected taxa accounted for ten of the top 25 pseudo-species with each occuring in all four bay-segment groupings.

Several taxa demonstrated habitat shifts with growth or bay-segment differences in mortality rates. At small sizes (<150mm SL), *A. probatocephalus* (Sheepshead) were most abundant in bay-segment Group A, while at larger sizes they were far more abundant in Group C (*Figure 33*). *Leisotomus xanthurus* (Spot, *Figure 34*) displayed a similar trend. Other species, such as *Orthopristis chrysoptera* (Pigfish, *Figure 35*) and *L. rhomboides* (Pinfish, *Figure 36*) tended to have their highest abundance in one or two bay-segment groups during the entire time they are available to this gear type.

Table 12. Similarity percentage (SIMPER) analysis for Tampa Bay, Sarasota Bay, and Charlotte Harbor segment groupings identified in the MDS ordination for 183-m haul seine collections (*Figure 28*). Mean abundance (Group Abundance) for the top 25 pseudo-species that distinguished bay-segment groupings are listed in order of decreasing relative contribution to overall differences between groups. Group A included Hillsborough Bay and Old Tampa Bay; Upper Charlotte Harbor (Group B) did not group with any other bay segment; Group C consisted of Roberts, Little Sarasota, and Blackburn bays; Group D included Gasparilla Sound, Middle Charlotte Harbor, Pine Island Sound, Sarasota Bay proper, Palma Sola Bay, Middle Tampa Bay and Lower Tampa Bay (North and South).

Scientific name	**Common name**	**Size Class (mm)**	**Group Abundance (animals•100m^{-2})$^{1/2}$**			
			A	**B**	**C**	**D**
Lagodon rhomboides	Pinfish	100 - 149	0.38	0.12	0.67	0.93
Lagodon rhomboides	Pinfish	80 - 99	0.32	0.15	0.45	0.82
Lagodon rhomboides	Pinfish	60 - 79	0.34	0.18	0.50	0.82
Lagodon rhomboides	Pinfish	150 - 199	0.08	0.03	0.53	0.22
Archosargus probatocephalus [1]	Sheepshead	200 - 249	0.01	0.01	0.25	0.06
Leiostomus xanthurus [1]	Spot	80 - 99	0.15	0.01	0.05	0.07
Eucinostomus gula	Silver Jenny	60 - 79	0.13	0.03	0.20	0.15
Orthopristis chrysoptera	Pigfish	100 - 149	0.03	0.01	0.18	0.12
Eucinostomus gula	Silver Jenny	80 - 99	0.10	0.02	0.17	0.13
Leiostomus xanthurus [1]	Spot	100 - 149	0.14	0.02	0.05	0.05
Archosargus probatocephalus [1]	Sheepshead	250 - 299	0.01	0.01	0.16	0.05
Archosargus probatocephalus [1]	Sheepshead	150 - 199	0.03	0.02	0.13	0.06
Eucinostomus harengulus	Tidewater Mojarra	80 - 99	0.19	0.08	0.04	0.07
Orthopristis chrysoptera	Pigfish	150 - 199	0.02	0.01	0.11	0.08
Orthopristis chrysoptera	Pigfish	80 - 99	0.03	0.01	0.14	0.12
Elops saurus [1]	Ladyfish	250 - 299	0.14	0.08	0.11	0.08
Centropomus undecimalis [1]	Common Snook	350 - 399	0.02	0.01	0.13	0.04
Bairdiella chrysoura	Silver Perch	100 - 149	0.09	0.02	0.10	0.15
Ariopsis felis	Hardhead Catfish	300 - 349	0.11	0.04	0.12	0.04
Centropomus undecimalis [1]	Common Snook	400 - 499	0.03	0.03	0.13	0.08
Ariopsis felis	Hardhead Catfish	250 - 299	0.11	0.07	0.15	0.04
Elops saurus [1]	Ladyfish	200 - 249	0.13	0.09	0.07	0.06
Ariopsis felis	Hardhead Catfish	200 - 249	0.07	0.04	0.15	0.04
Centropomus undecimalis [1]	Common Snook	300 - 349	0.01	0.01	0.11	0.03
Harengula jaguana	Scaled Sardine	100 - 149	0.10	0.03	0.05	0.08

[1] Species of direct economic importance (Selected Taxa).

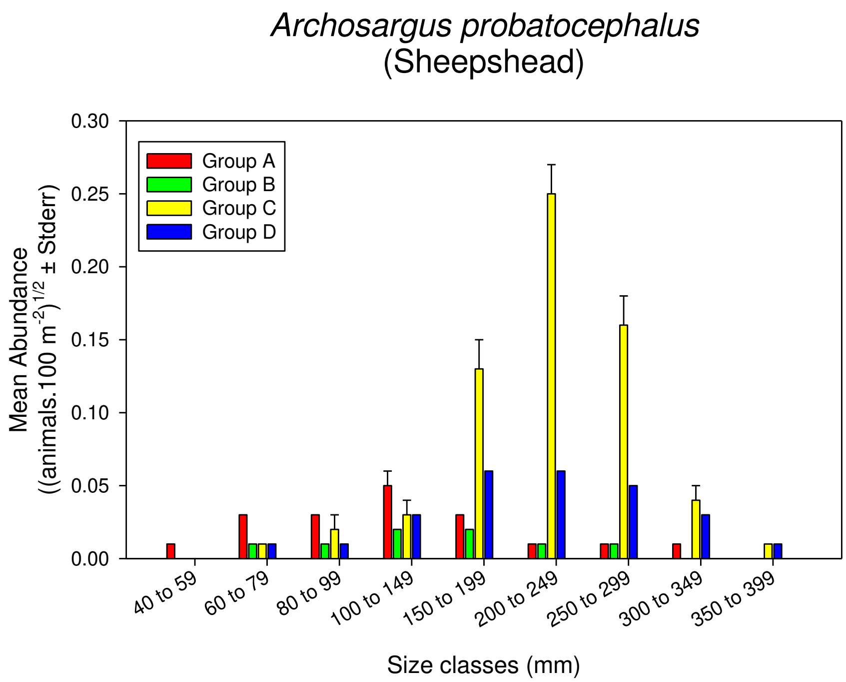

Figure 33. Mean abundance for Sheepshead pseudo-species collected with 183-m haul seines. Plots show all pseudo-species of Sheepshead captured, not just the top 25 pseudo-species in the Simper analysis.

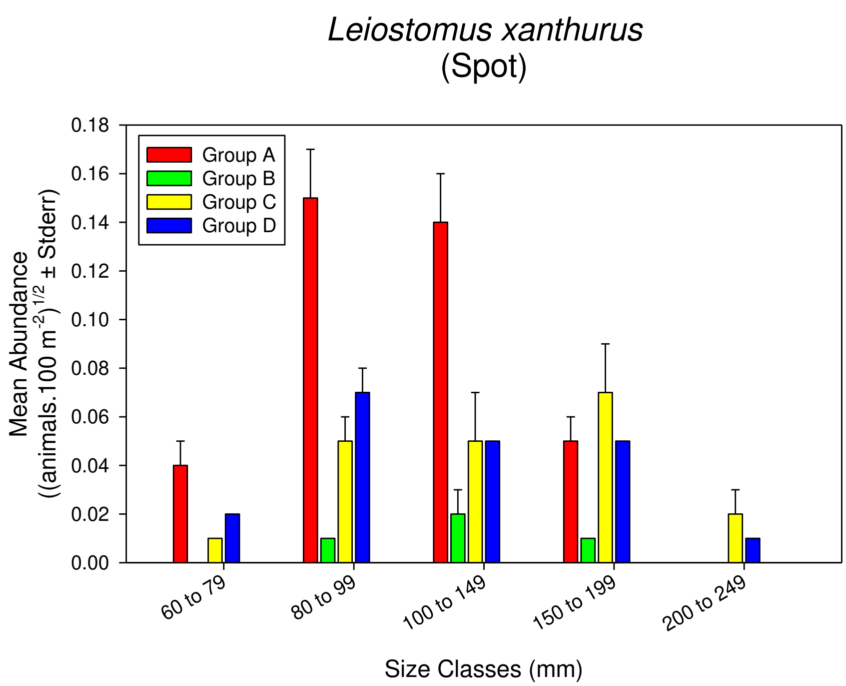

Figure 34. Mean abundance for Spot pseudo-species collected with 183-m haul seines. Plots show all pseudo-species of Spot captured, not just the top 25 pseudo-species in the Simper analysis.

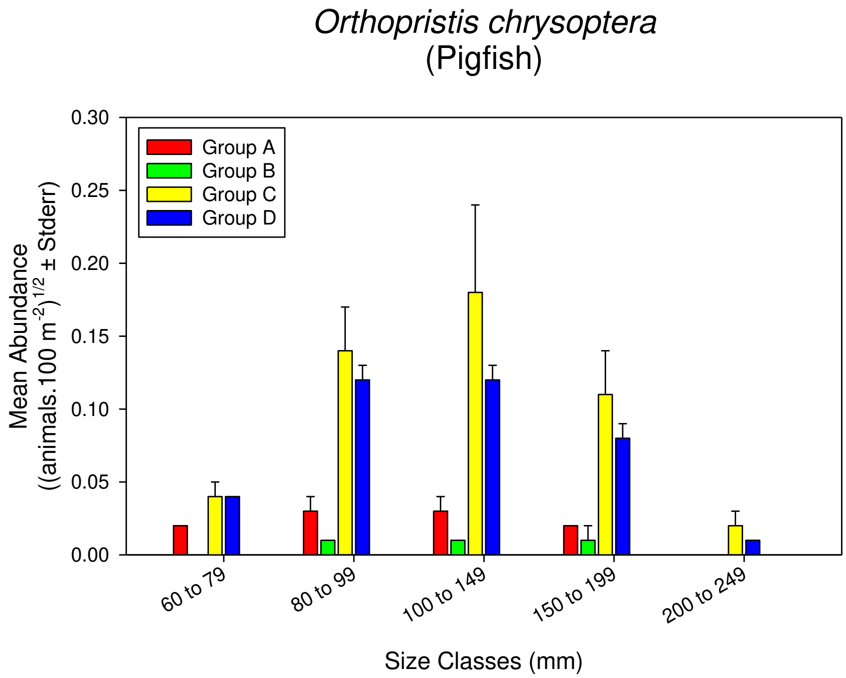

Figure 35. Mean abundance for Pigfish pseudo-species collected with 183-m haul seines. Plots show all pseudo-species of Pigfish captured, not just the top 25 pseudo-species in the Simper analysis.

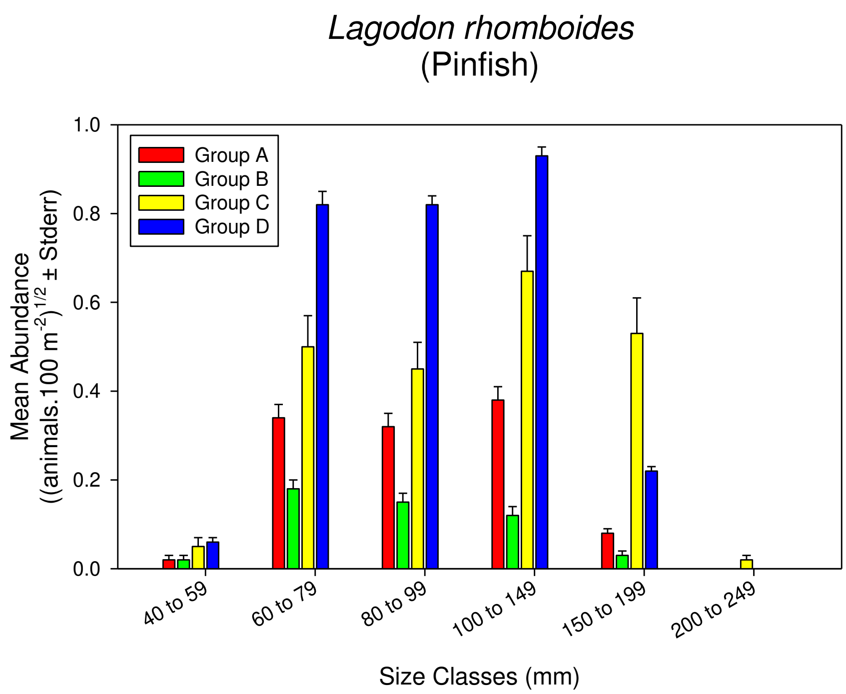

Figure 36. Mean abundance for Pinfish pseudo-species collected with 183-m haul seines. Plots show all pseudo-species of Pinfish captured, not just the top 25 pseudo-species in the Simper analysis.

The differences between the five bay-segment groupings identified for the 6.1-m otter trawl nekton community were characterized more by differences in taxa and pseudo-species that were present than any of the other deployment methods (*Table 13*). Small *L. xanthurus* (Spot, <60mm SL, Figure 37) and *O. chrysoptera* (Pigfish, <40 mm SL; Figure 38) were absent or present in very low abundance from most bay-segment groups but were abundant in groups D and E, respectively. Similiarly, *Cynoscion arenarius* (Sand Seatrout, <30mm SL; Figure 39) were abundant in Group A but present in very low numbers in each of the other bay-segment groupings.

Three species in the top 25 pseudo-species were of direct economic importance. Two pseudo-species of *L. xanthurus* (Spot, 10-19mm SL and 20-29mm SL; Table 13 and Figure 37) had higher abundance in bay-segment Group D (Roberts and Little Sarasota bays) than any of the other bay-segment grouping. These small sizes of Spot tend to occur in lower salinity habitats (i.e., tidal tributaries) in Tampa Bay and Charlotte Harbor, bay-segments that were not included in this analysis because Sarasota Bay estuary has no analgous tidal tributary bay-segments. Between February and April when these sizes of Spot are most abundant, Roberts and Little Sarasota bays tend to have the lowest salinity available in any bay-segment sampled in the Sarasota Bay estuary (Figure 4). *Farfantepenaeus duorarum* (Pink Shrimp, 10-19mm POH; Table 13) were also most abundant in bay-segment Group D. The final Selected Species, *C. arenarius* (Sand Seatrout, 20-20mm SL; Table 13 and Figure 39) was most abundant in bay-segment Group A (Upper Charlotte Harbor, Hillsborough Bay, and Old Tampa Bay).

Table 13. Similarity percentage (SIMPER) analysis for Tampa Bay, Sarasota Bay, and Charlotte Harbor segment groupings identified in the MDS ordination for 6.1-m otter trawls (*Figure 28*). Mean abundance (Group Abundance) for the top 25 pseudo-species that distinguished bay-segment groupings are listed in order of decreasing relative contribution to overall differences between groups. Group A included Upper Charlotte Harbor, Hillsborough Bay, and Old Tampa Bay; Group B consisted of Middle Tampa Bay, Middle Charlotte Harbor, and Lower Tampa Bay South; Group C included Gasparilla Sound, Pine Island Sound, Sarasota Bay proper, Palma Sola Bay, and Lower Tampa Bay North; Group D consisted of Roberts and Little Sarasota bays; and Blackburn Bay (Group E) did not group with any other bay-segment.

Scientific name	***Common name***	***Size Class (mm)***	***Group Abundance (animals•100m^{-2})$^{1/2}$***				
			A	***B***	***C***	***D***	***E***
Lagodon rhomboides	Pinfish	100 - 149	0.07	0.24	0.58	0.28	0.14
Lagodon rhomboides	Pinfish	80 - 99	0.13	0.23	0.66	0.12	0.12
Lagodon rhomboides	Pinfish	30 - 39	0.03	0.04	0.11	0.25	0.40
Lagodon rhomboides	Pinfish	20 - 29	0.05	0.09	0.11	0.28	0.35
Eucinostomus spp.	Eucinostomus	20 - 29	0.04	0.02	0.09	0.39	0.94
Lagodon rhomboides	Pinfish	40 - 59	0.03	0.04	0.16	0.25	0.26
Leiostomus xanthurus [1]	Spot	10 - 19	0.03	0.00	0.00	0.55	0.02
Lagodon rhomboides	Pinfish	10 - 19	0.04	0.05	0.06	0.56	0.05
Anchoa mitchilli	Bay Anchovy	30 - 39	0.21	0.07	0.02	0.29	0.01
Eucinostomus spp.	Eucinostomus	10 - 19	0.03	0.01	0.06	0.35	0.40
Leiostomus xanthurus [1]	Spot	20 - 29	0.03	0.00	0.00	0.34	0.00
Lagodon rhomboides	Pinfish	60 - 79	0.07	0.08	0.35	0.14	0.15
Orthopristis chrysoptera	Pigfish	100 - 149	0.05	0.13	0.37	0.24	0.14
Eucinostomus gula	Silver Jenny	60 - 79	0.10	0.06	0.18	0.37	0.08
Anchoa mitchilli	Bay Anchovy	20 - 29	0.14	0.06	0.03	0.21	0.01
Eucinostomus gula	Silver Jenny	80 - 99	0.08	0.07	0.24	0.28	0.07
Orthopristis chrysoptera	Pigfish	30 - 39	0.00	0.01	0.03	0.04	0.16
Prionotus scitulus	Leopard Searobin	100 - 149	0.11	0.23	0.21	0.04	0.04
Eucinostomus spp.	Eucinostomus	30 - 39	0.03	0.02	0.08	0.26	0.30
Farfantepenaeus duorarum [1]	Pink Shrimp	10 - 19	0.22	0.04	0.04	0.23	0.09
Orthopristis chrysoptera	Pigfish	80 - 99	0.01	0.04	0.22	0.11	0.01
Orthopristis chrysoptera	Pigfish	20 - 29	0.01	0.02	0.03	0.06	0.22
Cynoscion arenarius [1]	Sand Seatrout	20 - 29	0.14	0.01	0.01	0.07	0.00
Anchoa mitchilli	Bay Anchovy	40 - 59	0.23	0.03	0.01	0.10	0.00
Orthopristis chrysoptera	Pigfish	10 - 19	0.01	0.01	0.01	0.04	0.16

[1] Species of direct economic importance (Selected Taxa).

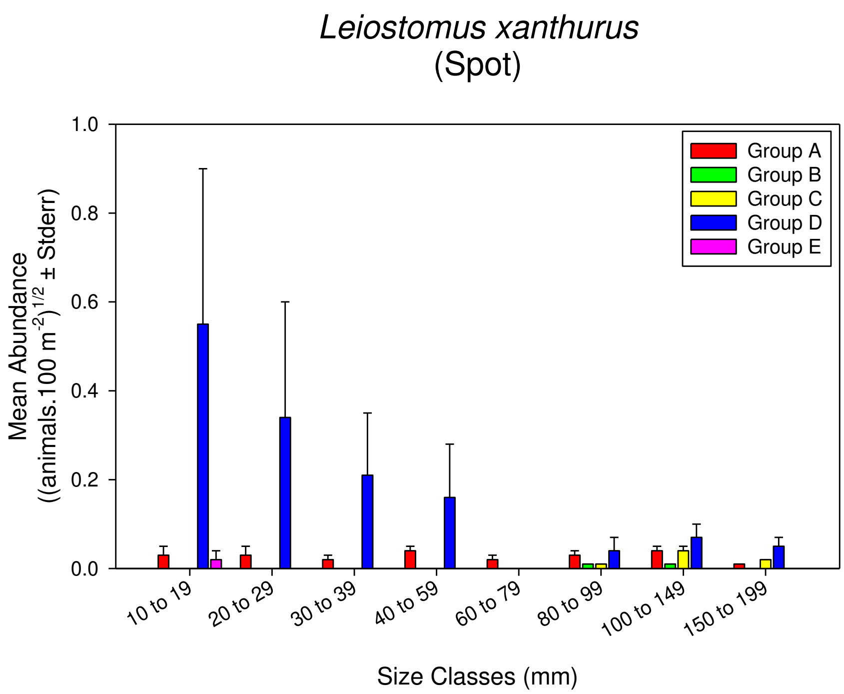

Figure 37. Mean abundance for Spot pseudo-species collected with 6.1-m otter trawls. Plots show all pseudo-species of Spot captured, not just the top 25 pseudo-species in the Simper analysis.

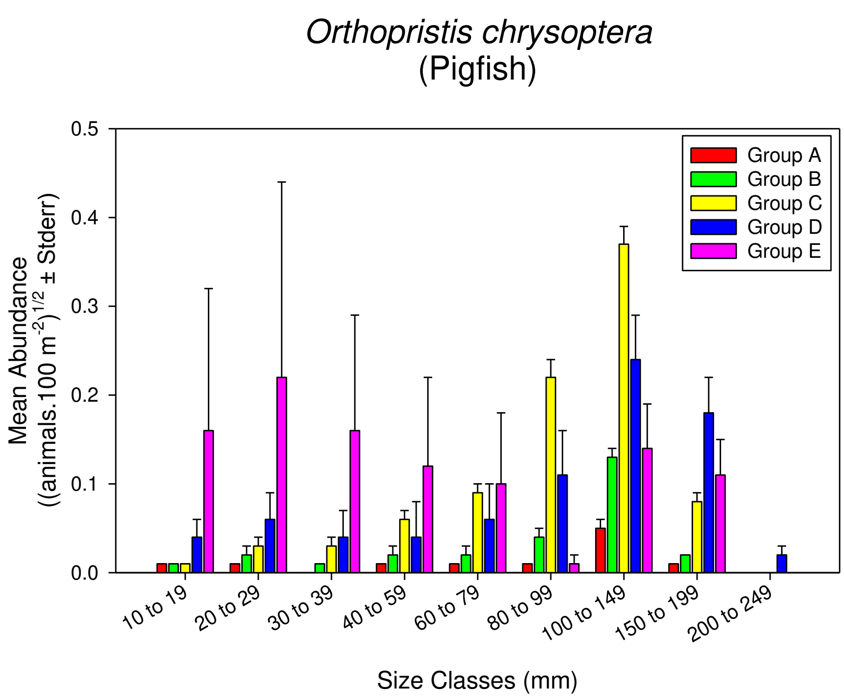

Figure 38. Mean abundance for Pigfish pseudo-species collected with 6.1-m otter trawls. Plots show all pseudo-species of Pigfish captured, not just the top 25 pseudo-species in the Simper analysis.

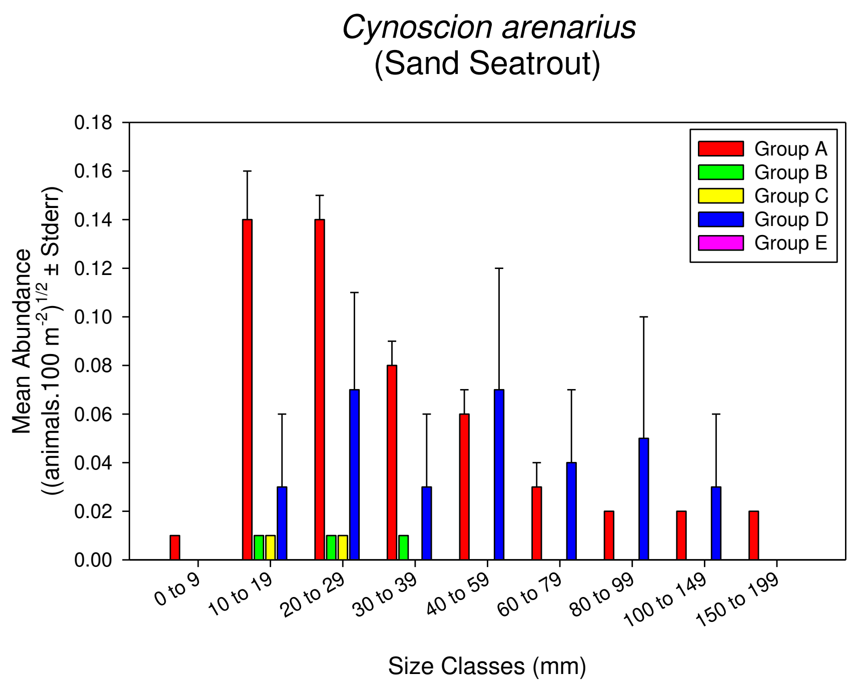

Figure 39. Mean abundance for Sand Seatrout pseudo-species collected with 6.1-m otter trawls. Plots show all pseudo-species of Sand Seatrout captured, not just the top 25 pseudo-species in the Simper analysis.

Nekton community analyses that included the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries identified three main bay-segment groupings for each gear deployment method. Although the bay segments included in each grouping occasionally differed with gear type, for the most part there was an upper bay grouping, a lower bay grouping, and a “Little Sarasota Bay” grouping. The upper bay grouping included bay segments in Tampa Bay and Charlotte Harbor that did not have direct linkages to the Gulf of Mexico and that received freshwater inflow from riverine sources. The lower bay grouping typically included bay segments with little riverine freshwater inflow and that tended to be directly linked to the Gulf of Mexico through passes. The “Little Sarasota Bay” grouping invariably included Little Sarasosta Bay and, depending upon gear type and deployment method, included Roberts and/or Blackburn bays. While other groupings identified by the analysis included bay-segments from all three estuaries, groupings that included Little Sarasota Bay did not included bay segments outside of the Sarasota Bay estuary. A majority of the top 25 pseudo-species that defined the dissimilarity between bay-segment groupings, tended to have higher abundance in the group that included Little Sarasota Bay. Little Sarasota, Roberts, and Blackburn bays are the smallest embayments in the study, are relatively close to the Gulf of Mexico but lack direct linkages to the gulf, and receive some freshwater inflow, either directly or indirectly, from Phillippi and South creeks.

Mercury Content Analysis

Tissue samples for mercury content analysis were collected from 792 individuals representing 29 taxa (*Table 14*). Nekton collected for mercury analysis ranged in size from 63 to 860 mm SL. To date, almost 83% (n = 661) of the tissue samples (n=792) collected from Sarasota Bay have been analyzed for total mercury concentrations. Of the samples analyzed, 82 individual animals (12.4%), representing nine taxa (*Caranx hippos,* Crevalle Jack [n=4]; *Centropomus undecimalis*, Common Snook [n=46]; *Chaetodipterus faber*, Atlantic Spadefish [n=1]; *Cynoscion nebulosus*, Spotted Seatrout [n=11]; *Elops saurus*, Ladyfish [n=7]; *Menticirrhus americanus*, Southern Kingfish [n=3]; *Scomberomorus maculatus*, Spanish Mackerel [n=4]; *Selene vomer*, Lookdown [n=1]; and *Strongylura marina*, Atlantic Needlefish [n=5]), had mercury concentrations above 0.3 mg/kg, a guidance level adopted by the U.S. EPA to protect public health (*USEPA 2001*). Regression analyses were run on nine taxa (*E. saurus*, Ladyfish; *C. undecimalis*, Common Snook; *Mycteroperca microlepis*, Gag; *Lutjanus griseus*, Gray Snapper; *A. probatocephalus*, Sheepshead; *C. nebulosus*, Spotted Seatrout; *Pogonias cromis*, Black Drum; *S. ocellatus*, Red Drum; and *Paralichthys albigutta*, Gulf Flounder) which had a large enough sample size in each estuary (≥15) and from the gulf coast of Florida between Tampa Bay and Charlotte Harbor (≥60). Interbay comparisons of lengths and mercury concentrations were completed on these same nine taxa.

Table 14. Summary of the number of fish, sizes, and mercury levels for fish tissue samples analyzed from the fisheries-independent sampling of Sarasota Bay. Min = minimum, Max = maximum, Analyzed = number of fish that have been processed for mercury concentration, and Total = total number of fish collected for mercury content analysis. Linear regressions of Hg concentration against length were conducted for animals with at least 60 individuals analyzed from Charlotte Harbor, Tampa Bay, and Sarasota Bay combined and a minimum of 15 individuals from anyone field lab ("*" in Anal). Species are listed in alphabetical order.

Species	***Sizes (mm) Collected***			***Hg Concentration (mg/kg)***			***Number of Samples***		
	Avg	***Min***	***Max***	***Avg***	***Min***	***Max***	***Analzed***	***Total***	**Anal.**
Ancylopsetta quadrocellata	153.5	149	158	0.056	0.052	0.060	2	2	
Archosargus probatocephalus	239.0	131	358	0.100	0.032	0.211	103	109	*
Caranx hippos	241.9	211	303	0.365	0.225	0.601	6	14	
Centropomus undecimalis	397.7	183	860	0.238	0.022	0.952	161	199	*
Chaetodipterus faber	278.5	252	312	0.205	0.114	0.340	4	4	
Cynoscion nebulosus	315.0	118	476	0.222	0.024	0.520	34	37	*
Elops saurus	264.4	209	480	0.188	0.041	0.748	57	66	*
Epinephelus morio	101.0	101	101	0.027	0.027	0.027	1	1	
Eugerres plumieri	222.8	203	235	0.185	0.063	0.269	5	5	
Lachnolaimus maximus	163.5	139	188	0.034	0.027	0.041	2	2	
Lagodon rhomboides	110.3	63	151	0.058	0.023	0.160	59	59	
Lutjanus griseus	186.1	115	240	0.073	0.030	0.168	53	69	*
Lutjanus synagris	125.3	120	133	0.059	0.051	0.070	3	3	
Menticirrhus americanus	262.4	204	308	0.210	0.040	0.360	8	8	
Micropogonias undulatus	271.0	271	271	0.034	0.034	0.034	1	1	
Mugil cephalus	262.5	135	379	0.006	0.005	0.008	10	10	
Mugil curema	125.7	112	135	0.011	0.007	0.016	3	3	
Mycteroperca microlepis	235.4	153	403	0.087	0.052	0.159	17	17	*
Orthopristis chrysoptera	95.0	91	99	0.045	0.038	0.053	2	2	
Paralichthys albigutta	257.9	166	368	0.110	0.038	0.270	22	37	*
Pogonias cromis	258.7	171	416	0.080	0.018	0.291	19	26	*
Sciaenops ocellatus	418.8	224	592	0.100	0.019	0.215	66	75	*
Scomberomorus maculatus	344.5	242	456	0.378	0.202	0.515	6	10	
Selene vomer	200.0	200	200	0.510	0.510	0.510	1	1	
Sphyraena barracuda	363.5	257	477	0.130	0.130	0.130	1	16	
Strongylura marina	414.0	324	480	0.541	0.210	0.763	6	6	
Synodus foetens	175.0	128	222	0.083	0.048	0.118	2	2	
Trachinotus carolinus	251.6	215	321	0.136	0.048	0.282	5	5	
Trachinotus falcatus	278.3	264	301	0.067	0.060	0.073	2	3	
Total	292.9	63	860	0.151	0.005	0.952	661	792	

Ladyfish, *Elops saurus*

Ladyfish collected in Sarasota Bay for mercury analysis ranged in size from 209 to 480 mm SL (*Table 14*). The fifty-seven Ladyfish processed from Sarasota Bay had a mean total mercury concentration of 0.188 mg/kg, ranging from 0.041 to 0.748 mg/kg. There was a significant (P<0.0001), positive linear relationship between total mercury concentration and standard length for Ladyfish collected from Tampa Bay, Sarasota Bay and Charlotte Harbor (*Figure 40*), indicating a tendency for mercury concentrations to increase as Ladyfish grew. Ladyfish processed for mercury analysis from Sarasota Bay were slightly smaller on average (261.9 mm SL) than those collected in the Tampa Bay and Charlotte Harbor estuaries (285.6 and 283.6 mm SL, respectively; *Figure 41*). Average total mercury concentrations were lower for the Ladyfish analyzed from Sarasota Bay (0.188 mg/kg) than for Ladyfish from either the Tampa Bay (0.262) or Charlotte Harbor (0.234) estuaries.

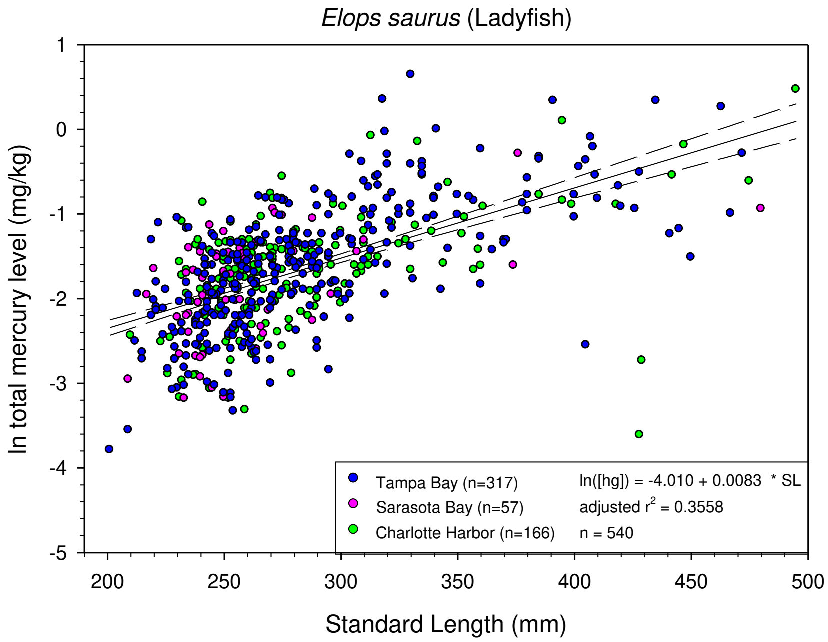

Figure 40. Relationship between natural log transformed (ln) total mercury concentration (mg/kg) and standard length (mm) for Ladyfish collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

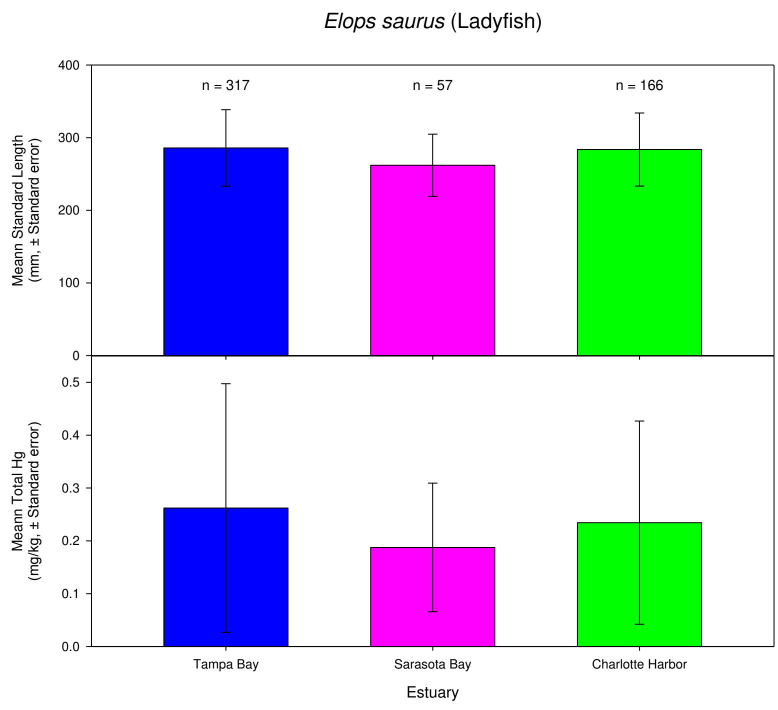

Figure 41. Comparison of sizes and total mercury concentration for Ladyfish processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Common Snook, *Centropomus undecimalis*

One hundred and sixty-one of the 199 Common Snook collected for mercury analysis from Sarasota Bay have been processed (*Table 14*). Common Snook collected for mercury analysis from Sarasota Bay range in size from 183 to 860 mm SL. The mean total mercury concentration for Common Snook in Sarasota Bay was 0.238 mg/kg with a range of values from 0.022 to 0.952 mg/kg.

Common Snook from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries had a significant (P<0.0001) positive linear relationship between total mercury concentration and standard length (*Figure 42*). On average, Common Snook processed for mercury analysis from Sarasota Bay were smaller and had lower mercury concentration (386.2 mm SL, 0.238 mg/kg, n=161) than those analyzed from either the Tampa Bay (451.7 mm SL, 0.326 mg/kg, n=1,458) or Charlotte Harbor (493.8 mm SL, 0.325 mg/kg, n=604) estuaries (*Figure 43*).

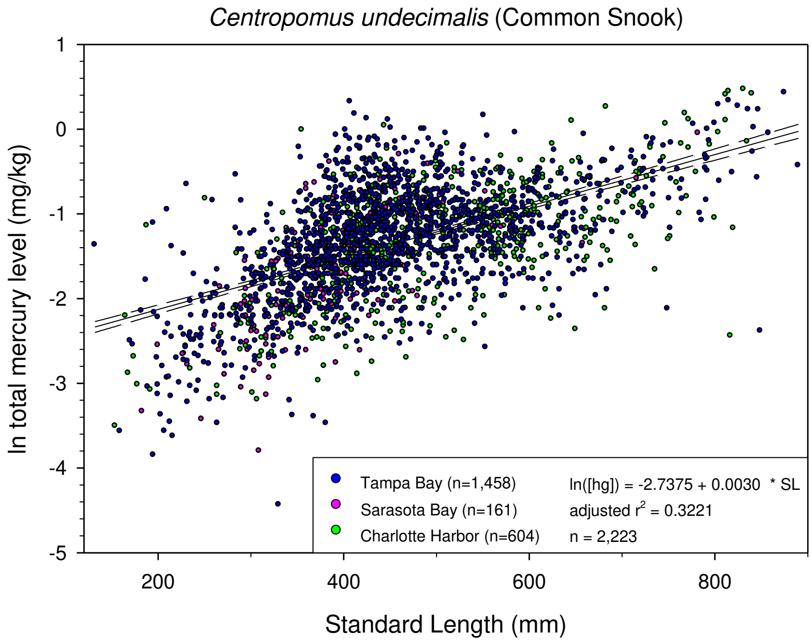

Figure 42. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Common Snook collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

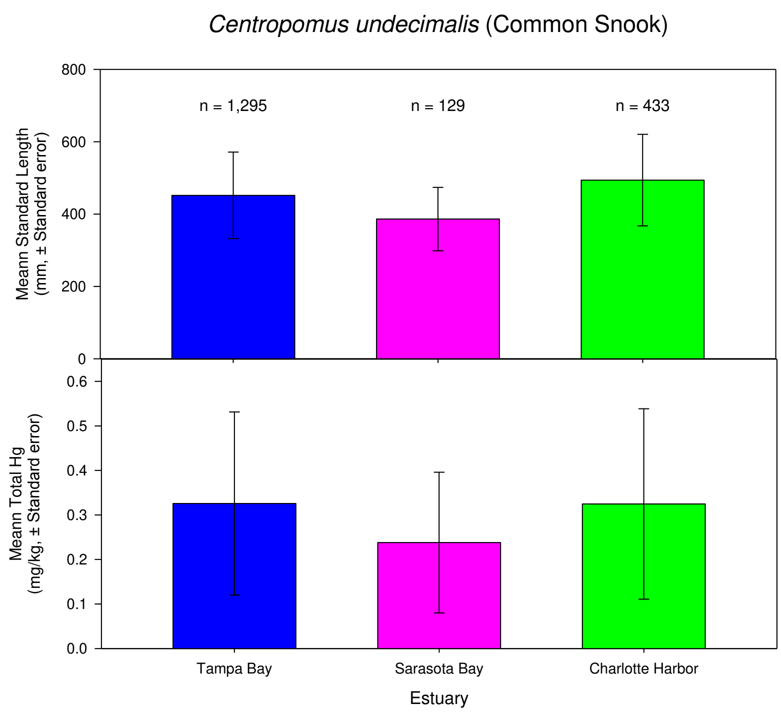

Figure 43. Comparison of sizes and total mercury concentration for Common Snook processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Gag, ***Mycteroperca microlepis***

Seventeen Gag, ranging in size from 153 to 403 mm SL, have been collected and analyzed for total mercury concentrations from Sarasota Bay (*Table 14*). The mean total mercury level for Gag collected from Sarasota Bay was 0.087 mg/kg (range 0.052 to 0.159 mg/kg). Gag from estuarine waters between Tampa Bay and Charlotte Harbor had a significant (P<0.0001) and positive linear relationship between size and total mercury concentration, such that total mercury increased as Gag grew and aged (*Figure 44*). Although Gag over 450mm SL were only processed for mercury analysis from the Tampa Bay estuary, the average sizes processed for mercury analysis in all three estuaries were very similar (218.2 to 235.4 mm SL; *Figure 45*). Average total mercury concentrations were slightly lower for Gag processed from Sarasota Bay (0.087 mg/kg) than those from either the Tampa Bay (0.117 mg/kg) or Charlotte Harbor (0.138 mg/kg) estuaries.

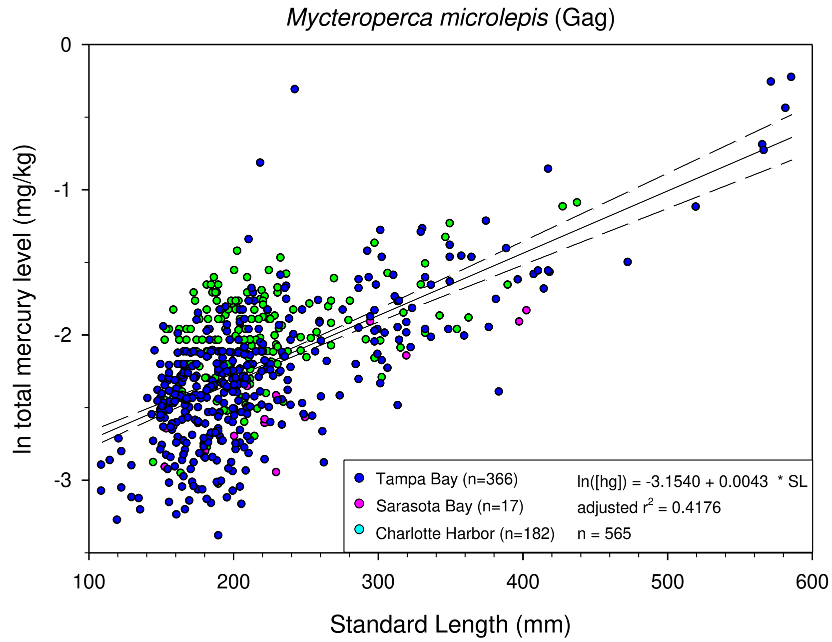

Figure 44. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Gag collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

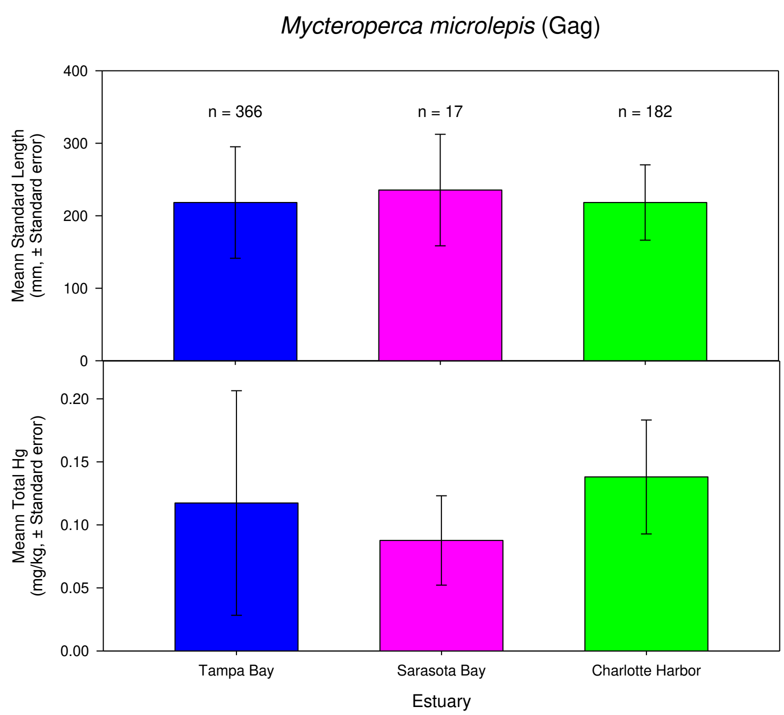

Figure 45. Comparison of average sizes and total mercury concentration for Gag processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Gray Snapper, *Lutjanus griseus*

Seventy-seven percent (n= 53) of the Gray Snapper collected for mercury analysis (n=69) from Sarasota Bay have been processed (*Table 14*). Gray Snapper collected for mercury analysis from Sarasota Bay ranged in size from 115 to 240 mm SL. The average total mercury level for gray snapper in Sarasota Bay was 0.073 mg/kg (range 0.030 to 0.168 mg/kg).

Total mercury concentration for Gray Snapper from estuarine waters along the gulf coast of Florida between Tampa Bay and Charlotte Harbor had a significant (P<0.0001) positive linear relationship with size, indicating that mercury concentrations increased as Gray Snapper grew (*Figure 46*). The average sizes of Gray Snapper processed for mercury analysis in Tampa Bay and Sarasota Bay estuaries were very similar (185.4 and 186.3 mm SL, respectively) while Gray Snapper processed from Charlotte Harbor tended to be slightly larger (203.3 mm SL; *Figure 47*). Average total mercury concentrations for Gray Snapper were lower in Sarasota Bay (0.073 mg/kg, n=53) than in either the Tampa Bay (0.103 mg/kg, n=354) or Charlotte Harbor (0.119 mg/kg, n=458) estuaries (*Figure 47*).

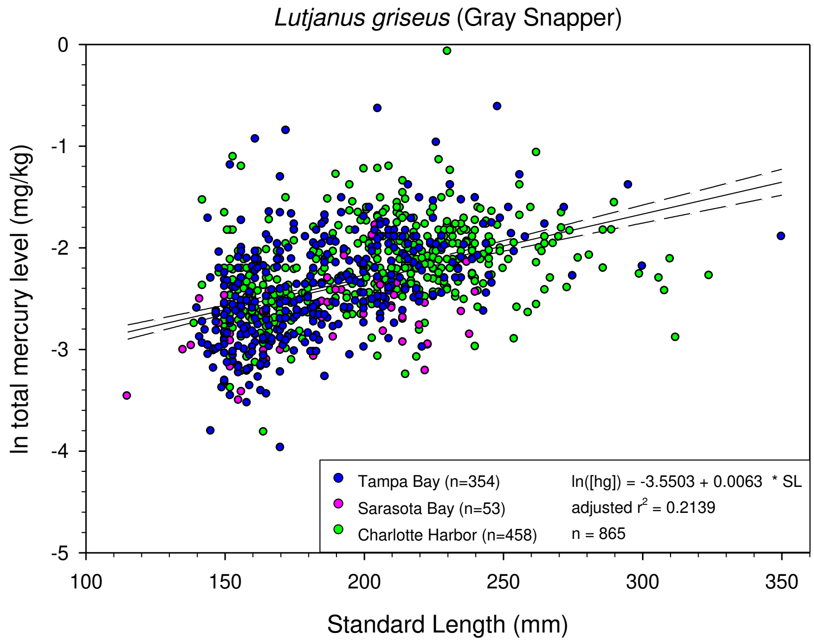

Figure 46. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Gray Snapper collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

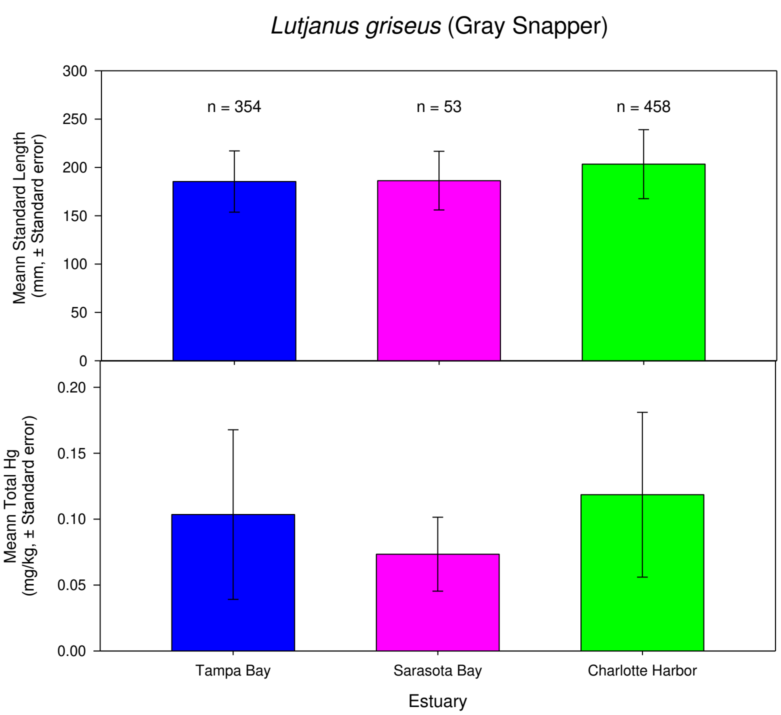

Figure 47. Comparison of sizes and total mercury concentration for Gray Snapper processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Sheepshead, *Archosargus probatocephalus*

Within Sarasota Bay, 109 Sheepshead have been collected for mercury analysis (*Table 14*). Mercury concentrations for the 103 Sheepshead analyzed (131 to 358 mm SL) have ranged from 0.032 to 0.211 mg/kg (mean of 0.100 mg/kg). Linear regression indicates that total mercury concentration had a significant (P<0.0001) positive relationship with standard length for Sheepshead processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries (*Figure 48*). Average sizes of Sheepshead processed for mercury concentrations were smallest in Sarasota Bay (239.8 mm SL, n=103) and larger in both the Charlotte Harbor (248.2 mm SL, n=179) and Tampa Bay (252.9 mm SL, n=222; *Figure 49*) estuaries. Average total mercury concentration was also lowest in Sarasota Bay (0.100 mg/kg) and higher in the Tampa Bay and Charlotte Harbor estuaries (0.130 and 0.128 mg/kg, respectively).

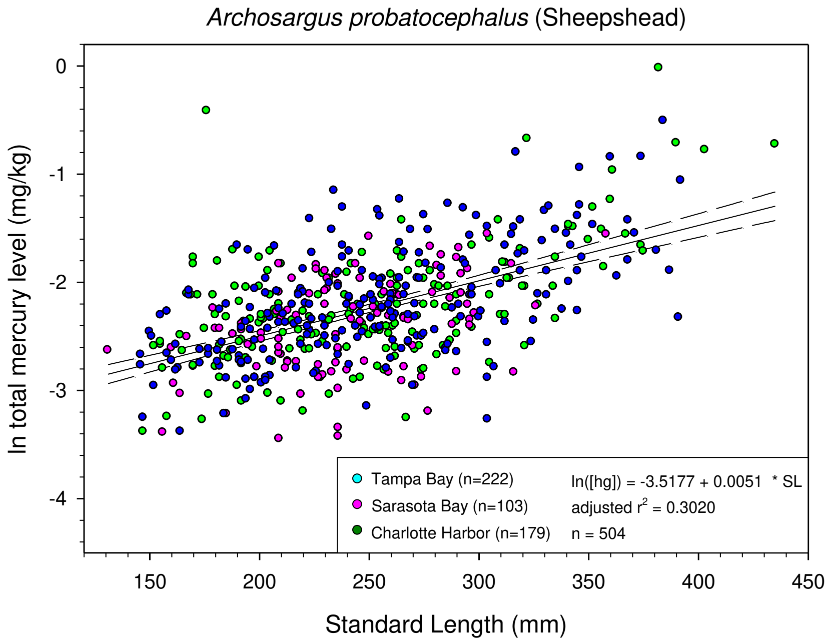

Figure 48. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Sheepshead collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

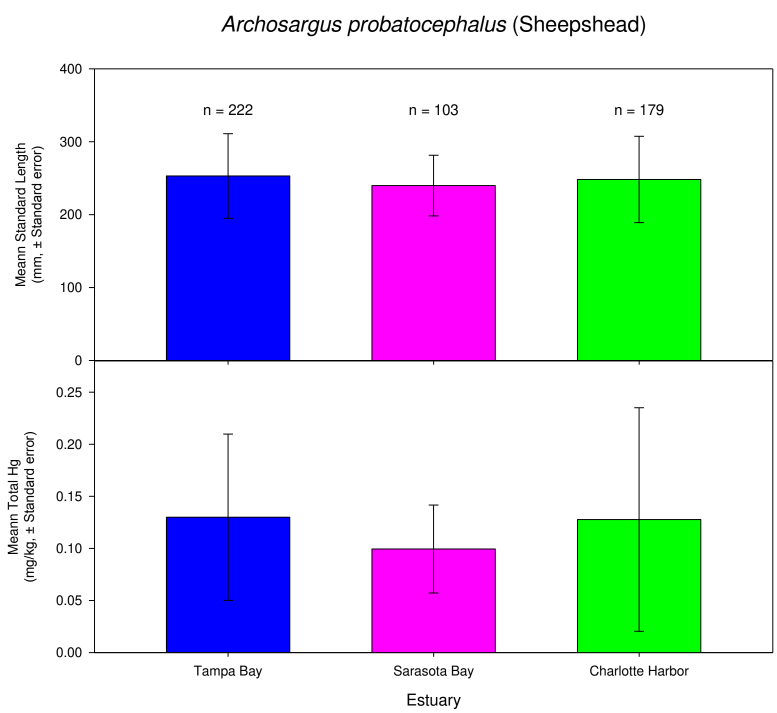

Figure 49. Comparison of sizes and total mercury concentration for Sheepshead processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Spotted Seatrout, *Cynoscion nebulosus*

Thirty-four of the 37 Spotted Seatrout that have been collected for mercury concentration analysis from Sarasota Bay have been analyzed (*Table 14*). The collected Spotted Seatrout ranged in size from 118 to 476 mm SL. The total mercury concentration for Spotted Seatrout collected from Sarasota Bay ranged from 0.024 to 0.520 mg/kg (mean of 0.222 mg/kg). Total mercury concentrations for Spotted Seatrout from the estuarine waters of Tampa Bay, Sarasota Bay and Charlotte Harbor had a significant (P<0.0001) and positive linear relationship with size (*Figure 50*). The average size of Spotted Seatrout analyzed for mercury concentrations was smallest from Sarasota Bay (306.2 mm SL, n=34) and largest from the Charlotte Harbor estuary (330.3 mm SL, n=161; *Figure 51*). Similarly, the mean total mercury concentration was higher in the Charlotte Harbor estuary (0.382 mg/kg) than either the Tampa Bay (0.319 mg/kg) or Sarasota Bay (0.222 mg/kg) estuaries.

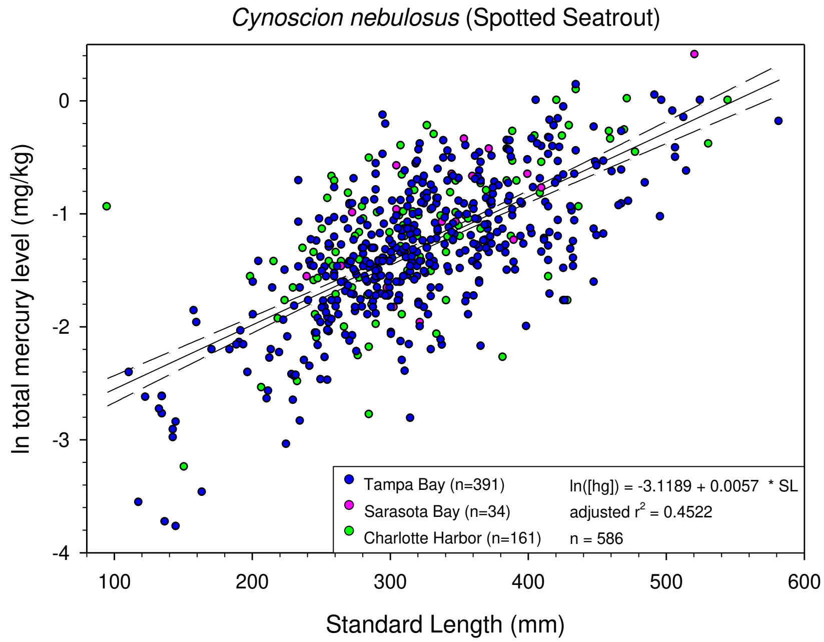

Figure 50. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Spotted Seatrout collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

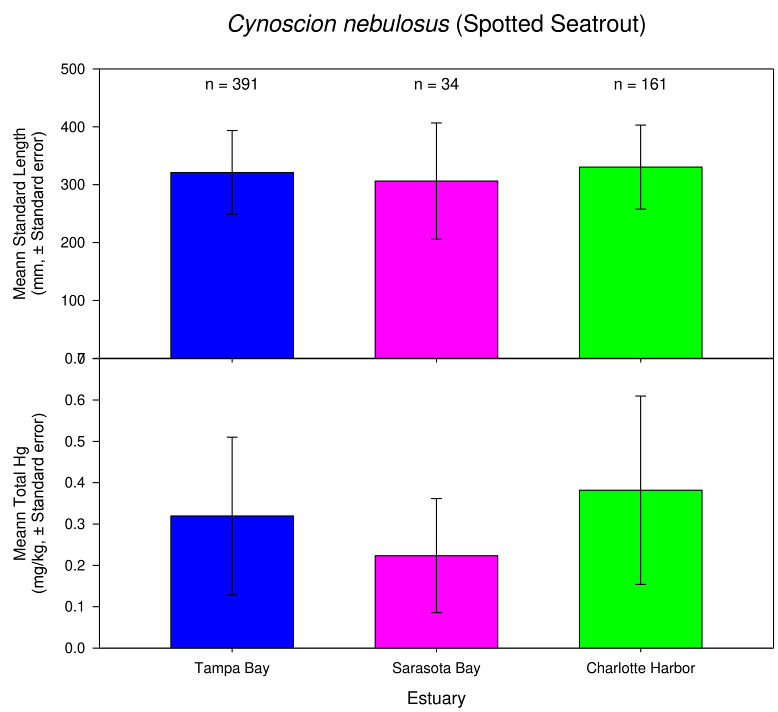

Figure 51. Comparison of average sizes and total mercury concentration for Spotted Seatrout processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Black Drum, *Pogonias cromis*

Twenty-six Black Drum have been collected from the Sarasota Bay estuary for mercury analysis and nineteen of them have been processed (*Table 14*). Black Drum collected for mercury analysis from Sarasota Bay ranged in size from 171 to 416 mm SL. The mean total mercury concentration for Black Drum in Sarasota Bay was 0.080 mg/kg (range 0.018 to 0.291 mg/kg). Black Drum processed for mercury concentrations from Charlotte Harbor (n=30), Sarasota Bay (n=19), and Tampa Bay (n=29) estuaries had a significant (P<0.0001) positive linear relationship between total mercury concentration and size, indicating that mercury concentrations increase as Black Drum increased in size (*Figure 52*). The average size of Black Drum analyzed for mercury concentrations was smaller, by at least 60-mm, in Sarasota Bay (263.2 mm SL, n=34) than either Charlotte Harbor (332.2 mm SL, n=30; Figure 53) or Tampa Bay (323.3, n=29). Similarly, the mean total mercury concentration was higher in the Tampa Bay (0.100 mg/kg) and Charlotte Harbor (0.088 mg/kg) estuaries than in the Sarasota Bay estuary (0.080 mg/kg).

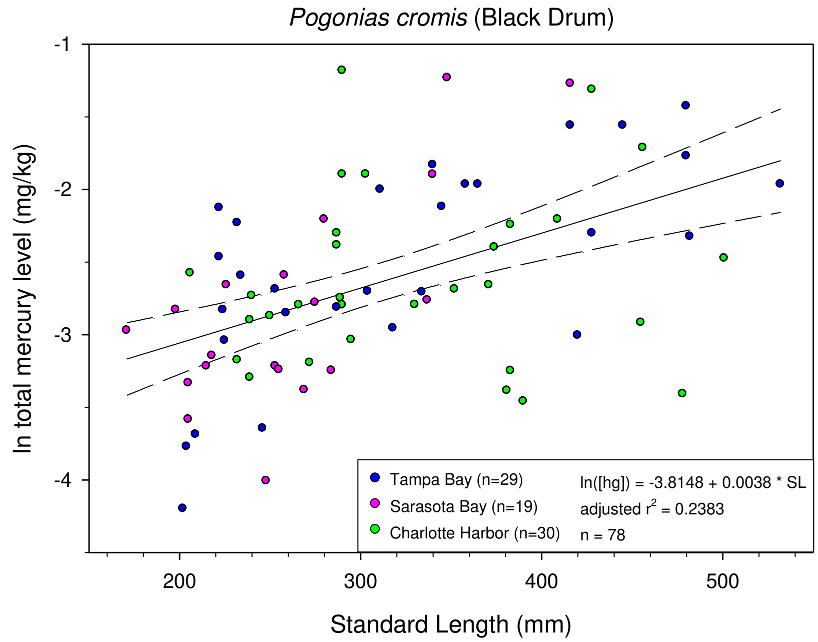

Figure 52. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Black Drum collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

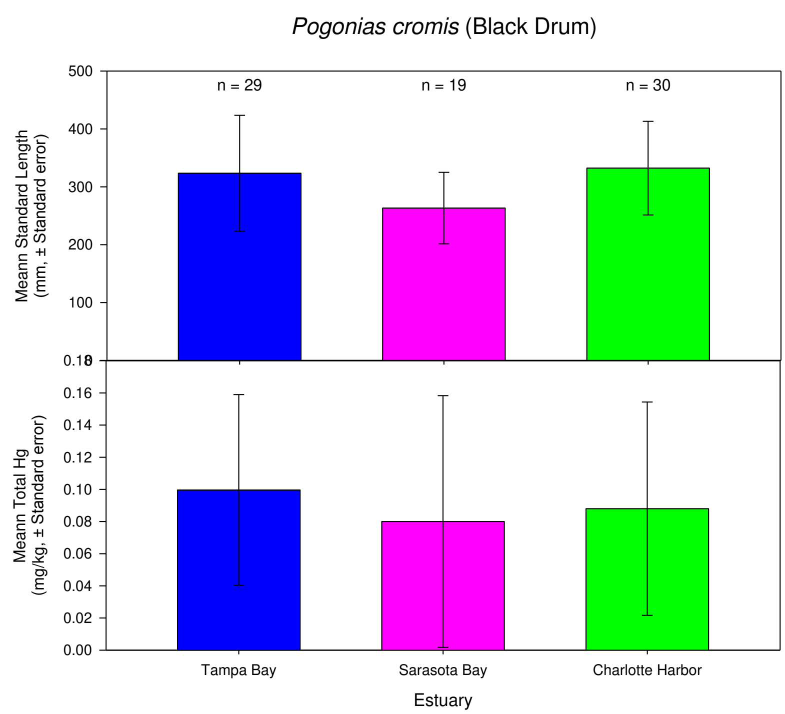

Figure 53. Comparison of average sizes and total mercury concentration for Black Drum processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Red Drum, *Sciaenops ocellatus*

Sixty-six of the 75 Red Drum collected for total mercury concentrations from Sarasota Bay have been analyzed (*Table 14*). The collected Red Drum ranged in size from 224 to 592 mm SL. The mean total mercury concentration for Red Drum collected from Sarasota Bay was 0.100 mg/kg (range: 0.019 to 0.215 mg/kg). Red Drum from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries had a significant (P<0.0001) and positive linear relationship between size and total mercury concentration (*Figure 54*). The average size Red Drum analyzed for mercury concentrations were smaller in Sarasota Bay (413.2 mm SL, n=66) and Tampa Bay (413.7 mm SL) estuaries than in the Charlotte Harbor estuary (442.6 mm SL; *Figure 55*). The mean total mercury concentration was highest in the Charlotte Harbor estuary (0.156 mg/kg) and lowest in Sarasota Bay (0.100 mg/kg; *Figure 55*).

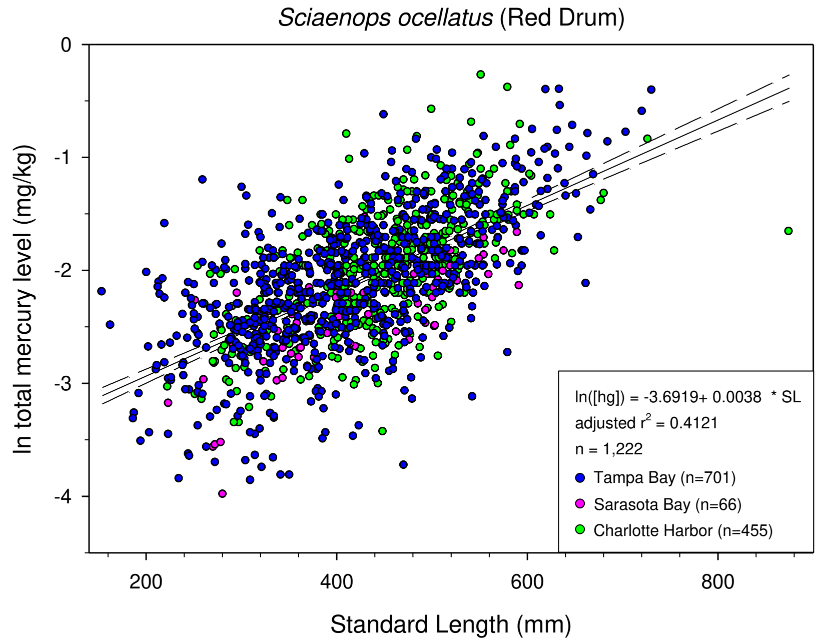

Figure 54. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Red Drum collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

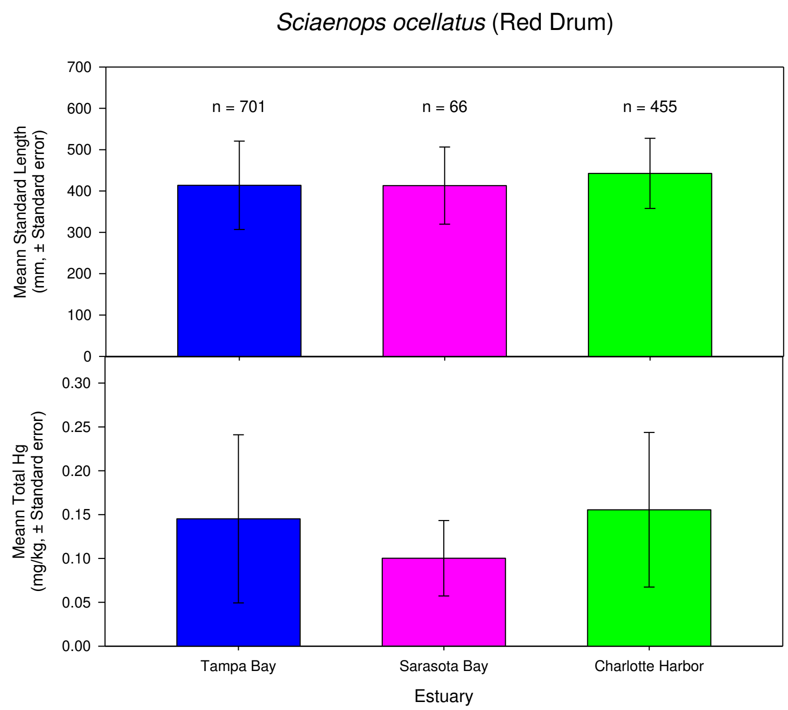

Figure 55. Comparison of average sizes and total mercury concentration for Red Drum processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

Gulf Flounder, *Paralichthys albigutta*

Twenty-two of the 37 Gulf Flounder collected for total mercury concentrations from Sarasota Bay have been analyzed (*Table 14*). The collected Gulf Flounder ranged in size from 166 to 368 mm SL. The mean total mercury concentration for Gulf Flounder collected from Sarasota Bay was 0.110 mg/kg (range: 0.038 to 0.270 mg/kg). Gulf Flounder from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries had a significant (P<0.0001) and positive linear relationship between size and total mercury concentration (*Figure 56*). The average size Gulf Flounder analyzed for mercury concentrations was smaller in the Sarasota Bay (248.3 mm SL, n=22) than in the Tampa Bay (274.5 mm SL, n=259) and Charlotte Harbor estuaries (272.8 mm SL, n=401; *Figure 57*). The mean total mercury concentration was also lower in the Sarasota Bay estuary (0.110 mg/kg) than in either the Tampa Bay or Charlotte Harbor estuaries (0.154 and 0.160 mg/kg, respectively; *Figure 57*).

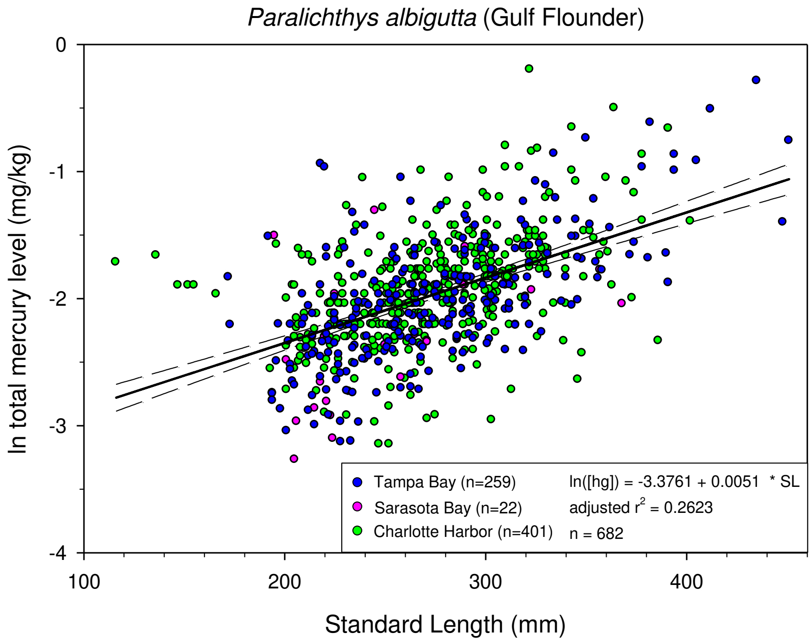

Figure 56. Relationship between natural log transformed (ln) total mercury level (mg/kg) and standard length (mm) for Gulf Flounder collected in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

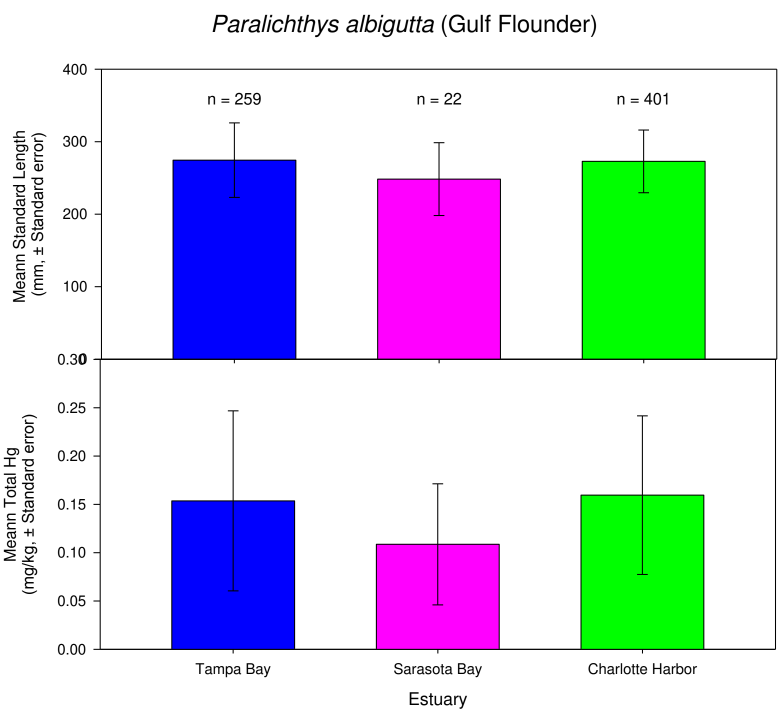

Figure 57. Comparison of average sizes and total mercury concentration for Gulf Flounder processed from the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries. Error bars represent one standard error.

CONCLUSIONS (Year 4: June 2014 – April 2013)

Physiochemical conditions

The meteorological conditions during the four years of this study followed the 30-year trend (1979 – 2008) but both temperature and rainfall deviated from the normal average condition during several months. Monthly average temperatures from December 2009 to March 2010 and December 2010 to January 2011 were well below normal, with the extreme lows of winter 2010 resulting in cold kills of many nekton species. Air temperatures during all but six months between May 2010 and April 2013 were higher than the 30-year average. Monthly precipitation in the normally dry months of January to May was unseasonably high during both 2010 and 2011, while in 2012 percipation was lower than the historical average. Undoubtedly, these conditions influenced the physiochemical makeup of Sarasota Bay and potentially the composition of the nekton community as well.

Composition of overall nekton community

The nekton community in Sarasota Bay from June 2011 to April 2012 was typical of Florida estuaries. Almost 85% of the total nekton catch during the fourth year of this study were collected in 21.3-m seine hauls. The Pinfish (*Lagodon rhomboides*), comprising over 30% of the total catch in all gears, was the most frequently occurring taxa in all three gear types (>70% occurrence) during year four of this study. Other estuarine dependent species such as Eucinostomus Mojarra (*Eucinostomus* spp.), Bay Anchovy (*Anchoa mitchilli*), Silver Jenny (*Eucinostomus gula*), and Pink Shrimp

(*Farfantepenaeus duorarum*) were relatively abundant and commonly collected in the Sarasota Bay estuary as well.

Nekton Community Structure

Overall nekton abundance was significantly different between bay segments in three adjacent Southwest Florida estuaries (Tampa Bay, Sarasota Bay, and Charlotte Harbor) and between sampling years (ANOVA) for each gear type and deployment method. Nekton abundance was higher in Little Sarasota Bay, for the 21.3-m shoreline and offshore seines and the 6.1-m otter trawls, and Sarasota Bay proper for the 183-m haul seine. With the exception of 6.1-m otter trawls in years three (June 2011 to April 2012) and four (June 2012 to April 2013), the Sarasota Bay estuary had a higher geometric mean abundance than Tampa Bay and Charlotte Harbor for all sampling years and gear deployment methods.

Analysis of nekton assemblages in Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries suggested three main bay-segment groupings regardless of gear deployment method. Although the bay segments included in each grouping occasionally differed with deployment mthod, groupings included an upper bay grouping, a lower bay grouping, and a “Little Sarastota Bay” grouping. The upper bay group included segments without direct linkages to the Gulf of Mexico that received freshwater inflow from riverine sources. The lower bay group tended to included bay segments with little riverine freshwater inflow and that had passes to the Gulf of Mexico. The “Little Sarasota Bay” grouping invariably included Little Sarasosta Bay and, depending upon gear type and deployment method, included Roberts and/or Blackburn bays. The dissimilarity between bay-segment groups was largely defined by difference in abundance of similar taxa. The “Little Sarasota Bay” group most often had higher abundance of the pseudo-species (species/size class combinations) that differentiated bay-segment groups. The most obvious geophysical features of the “Little Sarasota Bay” grouping are that the embayments have small surface area, receive freshwater inflow from Phillippi and South creeks, and are located close, but do not have direct passes to the Gulf of Mexico.

Mercury Content Analysis

Sample sizes were not large enough to run linear regressions on any of the taxa collected for total mercury concentration analysis from Sarasota Bay without combining data with adjacent estuaries (Tampa Bay and Charlotte Harbor). Preliminary results of total mercury concentration analysis provides no reason to suspect that fish from Sarasota Bay have different concentrations of mercury than those found in adjacent estuaries and suggest that accumulation rates for Sarasota Bay are similar to those found in Tampa Bay and Charlotte Harbor.

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APPENDICES

Appendix A. Animals designated as Selected Taxa because of their commercial or recreational importance.

Scientific Name	Common Name
Albula vulpes	*Bonefish*
Archosargus probatocephalus	*Sheepshead*
Callinectes sapidus	*Blue Crab*
Centropomus undecimalis	*Common Snook*
Cynoscion arenarius	*sand Seatrout*
Cynoscion nebulosus	Spotted Seatrout
Cynoscion nothus	Silver Seatrout
Cynoscion regalis	Weakfish
Cynoscion complex	Seatrout
Elops saurus	Ladyfish
Epinephelus adscensionis	Rock hind
Epinephelus afer	Mutton Hamlet
Epinephelus cruentatus	Graysby
Epinephelus drummondhayi	Speckled Hind
Epinephelus flavolimbatus	Yellowedge Grouper
Epinephelus fulvus	Coney
Epinephelus guttatus	Red hind
Epinephelus inermis	Marbled Grouper
Epinephelus itajara	Goliath Grouper
Epinephelus morio	Red Grouper
Epinephelus mystacinus	Misty Grouper
Epinephelus nigritus	Warsaw Grouper
Epinephelus niveatus	Snowy Grouper
Epinephelus striatus	Nassau Grouper
Farfantepenaeus aztecus	Brown Shrimp
Farfantepenaeus duorarum	Pink Shrimp
Farfantepenaeus brasiliensis	Pinkspotted Shrimp
Farfantepenaeus spp.	Penaeid Shrimps
Leiostomus xanthurus	Spot
Litopenaeus setiferus	White Shrimp
Lutjanus analis	Mutton Snapper
Lutjanus apodus	Schoolmaster
Lutjanus buccanella	Blackfin Snapper
Lutjanus campechanus	Red Snapper
Lutjanus cyanopterus	Cubera Snapper
Lutjanus griseus	Gray Snapper
Lutjanus jocu	Dog Snapper
Lutjanus mahogoni	Mahogany Snapper
Lutjanus synagris	Lane Snapper
Lutjanus vivanus	Silk Snapper
Megalops atlanticus	Tarpon
Menippe spp.	Stone Crab
Menticirrhus americanus	Southern Kingfish
Menticirrhus littoralis	Gulf Kingfish
Menticirrhus saxatillis	Northern Kingfish
Micropogonias undulatus	Atlantic Croaker
Mugil cephalus	Striped Mullet
Mugil curema	White Mullet
Mugil gaimardianus	Redeye Mullet
Mugil gyrans	Whirligig Mullet
Mugil liza	Liza
Mycteroperca bonaci	Black Grouper
Mycteroperca microlepis	Gag
Mycteroperca phenax	Scamp
Mycteroperca tigris	Tiger Grouper
Mycteroperca venenosa	Yellowfin Grouper
Panulirus argus	Spiny Lobster
Paralichthys albigutta	Gulf Flounder
Paralichthys dentatus	Summer Flounder
Paralichthys lethostigma	Southern Flounder
Paralichthys oblongus	Fourspot Flounder
Paralichthys squamilentus	Broad Flounder
Penaeidae spp.	Shrimps
Pogonias cromis	Black Drum
Pomatomus saltatrix	Bluefish
Rachycentron canadum	Cobia
Sciaenops ocellatus	Red Drum
Scomberomorus cavalla	King Mackerel
Scomberomorus maculatus	Spanish Mackerel
Scomberomorus regalis	Cero
Trachinotus carolinus	Pompano
Trachinotus falcatus	Permit
Trachinotus goodei	Palometa

Appendix B. Summary of species collected, by sampling event (bi-monthly), during Sarasota Bay nekton sampling, June 2012 to April 2013. Effort, or total number of hauls, is labeled 'E'. Taxa are arranged alphabetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name.

Scientific Name	Common Name	Month						Totals
		Jun 2012	Aug 2012	Oct 2012	Dec 2014	Feb 2013	Apr 2013	
		E=42	E=42	E=42	E=35	E=42	E=42	E=245
Acanthostracion quadricornis	Scrawled Cowfish	2	13	21	8	2	3	49
Achirus lineatus	Lined Sole	3	8	11	2	3	2	29
Albula vulpes *	Bonefish	1	.	.	.	.	.	1
Aluterus schoepfii	Orange Filefish	3	.	.	1	.	.	4
Anarchopterus criniger	Fringed Pipefish	.	.	.	3	1	.	4
Anchoa cubana	Cuban Anchovy	304	.	36	133	544	110	1,127
Anchoa hepsetus	Striped Anchovy	647	92	14	.	29	.	782
Anchoa lyolepis	Dusky Anchovy	.	.	.	66	.	.	66
Anchoa mitchilli	Bay Anchovy	4,258	2,000	3,318	1,423	4,540	972	16,511
Anchoa spp.	Anchovies	.	.	3,776	.	.	.	3,776
Archosargus probatocephalus *	Sheepshead	101	96	40	119	73	30	459
Ariopsis felis	Hardhead Catfish	455	79	25	2	10	27	598
Bairdiella chrysoura	Silver Perch	376	447	730	35	.	89	1,677
Brevoortia spp.	Menhadens	.	60	32	6	17	25	140
Calamus arctifrons	Grass Porgy	.	2	1	.	.	1	4
Calamus penna	Sheepshead Porgy	3	.	.	.	.	.	3
Calamus spp.		.	.	.	1	2	.	3
Callinectes ornatus	Shelligs	.	2	.	1	.	.	3
Callinectes sapidus *	Blue Crab	2	4	2	11	87	23	129
Callinectes spp.		.	.	1	.	.	.	1
Caranx hippos	Crevalle Jack	2	20	5	1	.	17	45
Caranx latus	Horse-eye Jack	.	.	1	.	.	.	1
Centropomus undecimalis *	Common Snook	12	43	48	8	25	40	176
Centropristis striata	Black Sea Bass	3	.	.	.	.	.	3
Chaetodipterus faber	Atlantic Spadefish	2	.	14	.	.	.	16
Chasmodes saburrae	Florida Blenny	3	7	6	4	.	.	20
Chilomycterus schoepfii	Striped Burrfish	13	10	11	18	3	6	61
Chloroscombrus chrysurus	Atlantic Bumper	.	.	1	.	.	.	1

Appendix B. (Continued).

Scientific Name	Common Name	Month						Totals
		Feb	Apr	Jun	Aug	Oct	Dec	
		E=42	E=42	E=42	E=35	E=42	E=42	E=245
Citharichthys macrops	Spotted Whiff	.	1	.	.	1	.	2
Ctenogobius boleosoma	Darter Goby	.	.	.	.	7	7	14
Cynoscion arenarius *	Sand Seatrout	.	10	64	.	.	1	75
Cynoscion nebulosus *	Spotted Seatrout	73	46	35	5	9	6	174
Cyprinodon variegatus	Sheepshead Minnow	6	20	.	1	.	.	27
Dasyatis americana	Southern Stingray	.	.	1	.	.	.	1
Dasyatis sabina	Atlantic Stingray	7	6	6	2	1	1	23
Dasyatis say	Bluntnose Stingray	.	.	4	.	1	.	5
Diapterus auratus	Irish Pompano	7	5	1	.	.	.	13
Diplodus holbrookii	Spottail Pinfish	16	.	1	.	.	1	18
Echeneis neucratoides	Whitefin Sharksucker	.	1	.	.	.	.	1
Echeneis spp.	Sharksuckers	.	.	1	.	.	.	1
Elops saurus *	Ladyfish	22	13	12	61	1	7	116
Etropus crossotus	Fringed Flounder	1	1	3	2	3	.	10
Eucinostomus argenteus	Spotfin Mojarra	.	.	.	1	.	.	1
Eucinostomus gula	Silver Jenny	146	634	870	230	369	170	2,419
Eucinostomus harengulus	Tidewater Mojarra	196	166	187	47	47	45	688
Eucinostomus spp.	Eucinostomus	7,485	2,939	7,851	2,024	1,197	859	22,355
Eugerres plumieri	Striped Mojarra	7	47	7	.	.	3	64
Farfantepenaeus duorarum *	Pink Shrimp	151	398	592	72	265	113	1,591
Floridichthys carpio	Goldspotted Killifish	295	417	60	8	28	42	850
Fundulus grandis	Gulf Killifish	.	83	5	3	.	.	91
Fundulus similis	Longnose Killifish	.	13	1	.	.	.	14
Gobiosoma bosc	Naked Goby	2	.	.	.	.	1	3
Gobiosoma longipala	Twoscale Goby	.	.	.	.	2	.	2
Gobiosoma robustum	Code Goby	49	8	2	36	89	88	272
Gobiosoma spp.	Gobiosoma Gobies	93	2	6	11	13	2	127
Gymnura micrura	Smooth Butterfly Ray	2	1	2	1	.	3	9
Haemulon plumierii	White Grunt	4	9	11	3	.	.	27
Harengula jaguana	Scaled Sardine	549	285	2,169	7	38	2	3,050
Hippocampus erectus	Lined Seahorse	1	.	.	3	1	.	5
Hippocampus zosterae	Dwarf Seahorse	3	1	2	5	2	.	13
Hyporhamphus meeki	False Silver Halfbeak	.	.	1	.	.	.	1
Hyporhamphus spp.	Halfbeaks	1	.	.	.	.	.	1
Lachnolaimus maximus	Hogfish	.	.	1	.	.	.	1

Appendix B. (Continued).

Scientific Name	Common Name	Month						Totals
		Feb	Apr	Jun	Aug	Oct	Dec	
		E=42	E=42	E=42	E=35	E=42	E=42	E=245
Lagodon rhomboides	Pinfish	3,504	2,387	3,351	461	6,961	15,165	31,829
Leiostomus xanthurus *	Spot	6	180	5	.	373	97	661
Limulus polyphemus	Horseshoe Crab	.	.	2	.	2	1	5
Lucania parva	Rainwater Killifish	4,366	329	302	138	40	498	5,673
Lutjanus griseus *	Gray Snapper	28	72	228	6	15	5	354
Lutjanus synagris *	Lane Snapper	3	47	89	9	2	.	150
Membras martinica	Rough Silverside	1	.	3	.	.	.	4
Menidia spp.	Menidia Silversides	245	1,131	3	2	23	28	1,432
Menippe spp. *	Stone Crab	3	5	5	2	9	10	34
Menticirrhus americanus *	Southern Kingfish	.	2	3	.	.	1	6
Menticirrhus saxatilis *	Northern Kingfish	.	.	.	.	1	.	1
Microgobius gulosus	Clown Goby	284	10	58	40	54	116	562
Microgobius thalassinus	Green Goby	.	2	1	.	.	1	4
Micropogonias undulatus *	Atlantic Croaker	2	.	3	.	.	1	6
Monacanthus ciliatus	Fringed Filefish	2	.	1	9	.	.	12
Mugil cephalus *	Striped Mullet	13	33	26	22	82	18	194
Mugil curema *	White Mullet	4	20	8	37	9	3	81
Mugil trichodon *	Fantail Mullet	4	5	3	7	4	.	23
Mycteroperca microlepis *	Gag	.	.	4	.	.	.	4
Myrophis punctatus	Speckled Worm Eel	.	.	.	.	1	1	2
Nicholsina usta	Emerald Parrotfish	15	.	7	35	.	3	60
Ogcocephalus cubifrons	Polka-dot Batfish	2	2	1	1	2	1	9
Oligoplites saurus	Leatherjacket	91	28	13	.	.	.	132
Opisthonema oglinum	Atlantic Thread Herring	5	232	10	.	.	3	250
Opsanus beta	Gulf Toadfish	6	2	5	2	3	3	21
Orthopristis chrysoptera	Pigfish	196	357	302	65	257	201	1,378
Paralichthys albigutta *	Gulf Flounder	11	7	9	4	8	17	56
Poecilia latipinna	Sailfin Molly	.	64	.	2	.	.	66
Pogonias cromis *	Black Drum	5	7	8	1	7	36	64
Portunus spp.	Portunus Crabs	7	4	8	1	16	11	47
Prionotus scitulus	Leopard Searobin	3	3	5	14	15	6	46
Prionotus tribulus	Bighead Searobin	.	.	6	3	10	1	20
Rhinoptera bonasus	Cownose Ray	.	1	3	.	2	1	7
Rimapenaeus constrictus	Roughneck Shrimp	.	1	.	.	1	.	2
Sardinella aurita	Spanish Sardine	.	.	.	1	.	.	1

Appendix B. (Continued).

Scientific Name	Common Name	Month						Totals
		Feb	Apr	Jun	Aug	Oct	Dec	
		E=42	E=42	E=42	E=35	E=42	E=42	E=245
Sciaenops ocellatus *	Red Drum	2	10	41	11	16	3	83
Scomberomorus maculatus *	Spanish Mackerel	1	8	1	2	.	2	14
Scorpaena brasiliensis	Barbfish	.	.	.	3	.	.	3
Selene vomer	Lookdown	.	1	1	1	.	4	7
Serraniculus pumilio	Pygmy Sea Bass	.	.	.	.	1	.	1
Serranus subligarius	Belted Sandfish	.	.	2	1	.	.	3
Sicyonia laevigata	Hardback	.	.	.	.	.	5	5
Sicyonia typica	Kinglet Rock Shrimp	.	.	.	.	1	.	1
Sphoeroides nephelus	Southern Puffer	12	2	9	21	10	9	63
Sphoeroides spengleri	Bandtail Puffer	.	.	.	.	1	.	1
Sphyraena barracuda	Great Barracuda	1	.	12	11	10	16	50
Sphyrna tiburo	Bonnethead	.	.	.	.	.	3	3
Stephanolepis hispidus	Planehead Filefish	78	11	4	129	12	6	240
Strongylura marina	Atlantic Needlefish	6	.	2	4	.	.	12
Strongylura notata	Redfin Needlefish	55	41	50	12	56	17	231
Strongylura spp.	Needlefishes	3	.	.	.	.	.	3
Symphurus plagiusa	Blackcheek Tonguefish	.	3	6	.	1	1	11
Syngnathus floridae	Dusky Pipefish	2	5	1	13	2	2	25
Syngnathus louisianae	Chain Pipefish	6	4	4	4	3	5	26
Syngnathus scovelli	Gulf Pipefish	81	35	20	24	25	36	221
Synodus foetens	Inshore Lizardfish	11	14	46	33	22	29	155
Trachinotus falcatus *	Permit	.	4	1	.	.	.	5
Urophycis floridana	Southern Hake	.	.	.	.	1	1	2
Totals		**24,370**	**13,058**	**24,660**	**5,495**	**15,468**	**19,063**	**102,114**

Appendix C. Summary of species collected, by gear and stratum, during Sarasota Bay nekton sampling, June 2012 to April 2013. Effort, or the total number of hauls, is labeled 'E'. Taxa are arranged alphabetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name.

Scientific Name	Common Name	Gear and Strata						Totals
		21.3-m bay seine			183-m haul seine		6.1-m otter trawl	
		Veg	Unveg	Shore	Over	Nonover		
		E=67	E=35	E=59	E=29	E=7	E=48	E=245
Acanthostracion quadricornis	Scrawled Cowfish	8	.	.	6	23	12	49
Achirus lineatus	Lined Sole	4	.	11	.	.	14	29
Albula vulpes *	Bonefish	.	.	.	.	.	1	1
Aluterus schoepfii	Orange Filefish	.	.	1	.	.	3	4
Anarchopterus criniger	Fringed Pipefish	2	.	.	.	.	2	4
Anchoa cubana	Cuban Anchovy	583	.	544	.	.	.	1,127
Anchoa hepsetus	Striped Anchovy	677	1	104	.	.	.	782
Anchoa lyolepis	Dusky Anchovy	66	.	.	.	.	.	66
Anchoa mitchilli	Bay Anchovy	8,729	126	7,456	.	.	200	16,511
Anchoa spp.	Anchovies	.	.	3,776	.	.	.	3,776
Archosargus probatocephalus *	Sheepshead	60	9	29	283	60	18	459
Ariopsis felis	Hardhead Catfish	2	9	4	529	53	1	598
Bairdiella chrysoura	Silver Perch	627	1	316	646	71	16	1,677
Brevoortia spp.	Menhadens	17	.	.	75	48	.	140
Calamus arctifrons	Grass Porgy	1	.	1	1	.	1	4
Calamus penna	Sheepshead Porgy	.	2	1	.	.	.	3
Calamus spp.		2	.	.	.	.	1	3
Callinectes ornatus	Shelligs	.	.	.	.	.	3	3
Callinectes sapidus *	Blue Crab	23	6	31	1	.	68	129
Callinectes spp.		.	.	.	1	.	.	1
Caranx hippos	Crevalle Jack	.	.	6	15	24	.	45
Caranx latus	Horse-eye Jack	.	.	.	.	1	.	1
Centropomus undecimalis *	Common Snook	.	.	15	155	6	.	176
Centropristis striata	Black Sea Bass	.	.	.	.	.	3	3
Chaetodipterus faber	Atlantic Spadefish	1	.	.	3	12	.	16
Chasmodes saburrae	Florida Blenny	7	.	12	1	.	.	20
Chilomycterus schoepfii	Striped Burrfish	5	.	1	23	2	30	61
Chloroscombrus chrysurus	Atlantic Bumper	.	.	1	.	.	.	1

Appendix C. (Continued).

Scientific Name	Common Name	Gear and Strata						Totals
		21.3-m bay seine			183-m haul seine		6.1-m otter trawl	
		Veg	Unveg	Shore	Over	Nonover		
		E=67	E=35	E=59	E=29	E=7	E=48	E=245
Citharichthys macrops	Spotted Whiff	.	.	.	.	.	2	2
Ctenogobius boleosoma	Darter Goby	10	.	2	.	.	2	14
Cynoscion arenarius *	Sand Seatrout	.	1	8	1	.	65	75
Cynoscion nebulosus *	Spotted Seatrout	91	6	45	23	5	4	174
Cyprinodon variegatus	Sheepshead Minnow	6	.	21	.	.	.	27
Dasyatis americana	Southern Stingray	.	.	.	1	.	.	1
Dasyatis sabina	Atlantic Stingray	2	3	3	10	.	5	23
Dasyatis say	Bluntnose Stingray	.	.	.	.	2	3	5
Diapterus auratus	Irish Pompano	.	.	1	12	.	.	13
Diplodus holbrookii	Spottail Pinfish	1	.	.	16	1	.	18
Echeneis neucratoides	Whitefin Sharksucker	.	.	.	.	1	.	1
Echeneis spp.	Sharksuckers	.	.	.	.	1	.	1
Elops saurus *	Ladyfish	.	.	1	57	58	.	116
Etropus crossotus	Fringed Flounder	.	1	.	.	.	9	10
Eucinostomus argenteus	Spotfin Mojarra	.	1	.	.	.	.	1
Eucinostomus gula	Silver Jenny	521	177	1,105	487	79	50	2,419
Eucinostomus harengulus	Tidewater Mojarra	79	116	469	8	7	9	688
Eucinostomus spp.	Eucinostomus	9,480	1,438	9,993	.	.	1,444	22,355
Eugerres plumieri	Striped Mojarra	.	.	50	14	.	.	64
Farfantepenaeus duorarum *	Pink Shrimp	535	47	963	.	.	46	1,591
Floridichthys carpio	Goldspotted Killifish	236	14	600	.	.	.	850
Fundulus grandis	Gulf Killifish	.	.	91	.	.	.	91
Fundulus similis	Longnose Killifish	.	.	14	.	.	.	14
Gobiosoma bosc	Naked Goby	.	2	1	.	.	.	3
Gobiosoma longipala	Twoscale Goby	.	.	.	.	.	2	2
Gobiosoma robustum	Code Goby	145	12	103	.	.	12	272
Gobiosoma spp.	Gobiosoma Gobies	20	58	31	.	.	18	127
Gymnura micrura	Smooth Butterfly Ray	.	.	.	4	.	5	9
Haemulon plumierii	White Grunt	13	.	.	8	1	5	27
Harengula jaguana	Scaled Sardine	2,033	.	831	185	.	1	3,050
Hippocampus erectus	Lined Seahorse	1	.	1	.	1	2	5
Hippocampus zosterae	Dwarf Seahorse	10	1	2	.	.	.	13
Hyporhamphus meeki	False Silver Halfbeak	.	.	.	1	.	.	1
Hyporhamphus spp.	Halfbeaks	.	1	.	.	.	.	1

Appendix C. (Continued).

Scientific Name	Common Name	Gear and Strata						Totals
		21.3-m bay seine			183-m haul seine		6.1-m otter trawl	
		Veg	Unveg	Shore	Over	Nonover		
		E=67	E=35	E=59	E=29	E=7	E=48	E=245
Lachnolaimus maximus	Hogfish	.	.	.	1	.	.	1
Lagodon rhomboides	Pinfish	14,624	259	8,522	6,364	1,115	945	31,829
Leiostomus xanthurus *	Spot	12	120	318	46	163	2	661
Limulus polyphemus	Horseshoe Crab	.	.	.	3	.	2	5
Lucania parva	Rainwater Killifish	3,426	12	2,235	.	.	.	5,673
Lutjanus griseus *	Gray Snapper	111	4	167	44	16	12	354
Lutjanus synagris *	Lane Snapper	57	.	25	36	2	30	150
Membras martinica	Rough Silverside	1	.	3	.	.	.	4
Menidia spp.	Menidia Silversides	25	11	1,396	.	.	.	1,432
Menippe spp. *	Stone Crab	.	2	.	.	.	32	34
Menticirrhus americanus *	Southern Kingfish	.	.	.	.	.	6	6
Menticirrhus saxatilis *	Northern Kingfish	.	.	1	.	.	.	1
Microgobius gulosus	Clown Goby	173	88	297	.	.	4	562
Microgobius thalassinus	Green Goby	.	.	2	.	.	2	4
Micropogonias undulatus *	Atlantic Croaker	.	.	.	6	.	.	6
Monacanthus ciliatus	Fringed Filefish	5	.	.	7	.	.	12
Mugil cephalus *	Striped Mullet	62	1	6	118	7	.	194
Mugil curema *	White Mullet	.	.	3	46	32	.	81
Mugil trichodon *	Fantail Mullet	1	.	8	14	.	.	23
Mycteroperca microlepis *	Gag	.	.	.	4	.	.	4
Myrophis punctatus	Speckled Worm Eel	1	.	1	.	.	.	2
Nicholsina usta	Emerald Parrotfish	17	.	1	26	1	15	60
Ogcocephalus cubifrons	Polka-dot Batfish	.	.	.	3	.	6	9
Oligoplites saurus	Leatherjacket	10	7	111	3	1	.	132
Opisthonema oglinum	Atlantic Thread Herring	47	.	195	8	.	.	250
Opsanus beta	Gulf Toadfish	1	1	2	7	3	7	21
Orthopristis chrysoptera	Pigfish	308	4	140	359	298	269	1,378
Paralichthys albigutta *	Gulf Flounder	2	6	5	13	7	23	56
Poecilia latipinna	Sailfin Molly	.	.	66	.	.	.	66
Pogonias cromis *	Black Drum	1	2	2	58	1	.	64
Portunus spp.	Portunus Crabs	.	.	.	.	.	47	47
Prionotus scitulus	Leopard Searobin	3	9	2	.	.	32	46
Prionotus tribulus	Bighead Searobin	1	1	2	.	.	16	20
Rhinoptera bonasus	Cownose Ray	1	.	.	4	2	.	7

Appendix C. (Continued).

Scientific Name	Common Name	Gear and Strata						Totals
		21.3-m bay seine			183-m haul seine		6.1-m otter trawl	
		Veg	Unveg	Shore	Over	Nonover		
		E=67	E=35	E=59	E=29	E=7	E=48	E=245
Rimapenaeus constrictus	Roughneck Shrimp	.	.	.	.	.	2	2
Sardinella aurita	Spanish Sardine	.	.	.	.	1	.	1
Sciaenops ocellatus *	Red Drum	8	2	15	32	.	26	83
Scomberomorus maculatus *	Spanish Mackerel	2	.	.	2	10	.	14
Scorpaena brasiliensis	Barbfish	.	.	.	2	1	.	3
Selene vomer	Lookdown	.	.	.	6	1	.	7
Serraniculus pumilio	Pygmy Sea Bass	.	.	.	.	.	1	1
Serranus subligarius	Belted Sandfish	3	.	.	.	.	.	3
Sicyonia laevigata	Hardback	.	.	.	.	.	5	5
Sicyonia typica	Kinglet Rock Shrimp	.	.	.	.	.	1	1
Sphoeroides nephelus	Southern Puffer	20	4	22	7	4	6	63
Sphoeroides spengleri	Bandtail Puffer	.	.	1	.	.	.	1
Sphyraena barracuda	Great Barracuda	.	.	3	43	4	.	50
Sphyrna tiburo	Bonnethead	.	.	.	3	.	.	3
Stephanolepis hispidus	Planehead Filefish	142	2	35	7	.	54	240
Strongylura marina	Atlantic Needlefish	.	1	5	6	.	.	12
Strongylura notata	Redfin Needlefish	16	2	78	127	8	.	231
Strongylura spp.	Needlefishes	.	.	3	.	.	.	3
Symphurus plagiusa	Blackcheek Tonguefish	.	1	2	.	.	8	11
Syngnathus floridae	Dusky Pipefish	21	.	1	.	.	3	25
Syngnathus louisianae	Chain Pipefish	6	1	11	.	.	8	26
Syngnathus scovelli	Gulf Pipefish	141	4	70	.	.	6	221
Synodus foetens	Inshore Lizardfish	31	40	42	7	4	31	155
Trachinotus falcatus *	Permit	1	.	.	1	3	.	5
Urophycis floridana	Southern Hake	.	.	.	.	.	2	2
Totals		**43,277**	**2,616**	**40,442**	**9,979**	**2,140**	**3,660**	**102,114**

Appendix D. Summary of species collected, by embayment, during Sarasota Bay stratified-random sampling, June 2012 to April 2013. Effort, or the total number of hauls, is labeled 'E'. Taxa are arranged alphabetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name

Scientific Name	Common Name	Zone					Totals
		Palma Sola Bay (A)	Sarasota Bay (B)	Roberts Bay (C)	Little Sarasota Bay (D)	Blackburn Bay (E)	
		E=42	E=82	E=41	E=41	E=39	E=245
Acanthostracion quadricornis	Scrawled Cowfish	6	33	4	.	6	49
Achirus lineatus	Lined Sole	4	5	3	14	3	29
Albula vulpes *	Bonefish	.	.	.	1	.	1
Aluterus schoepfii	Orange Filefish	.	3	.	.	1	4
Anarchopterus criniger	Fringed Pipefish	.	4	.	.	.	4
Anchoa cubana	Cuban Anchovy	.	787	36	.	304	1,127
Anchoa hepsetus	Striped Anchovy	.	240	91	400	51	782
Anchoa lyolepis	Dusky Anchovy	.	66	.	.	.	66
Anchoa mitchilli	Bay Anchovy	134	6,270	2,481	6,240	1,386	16,511
Anchoa spp.	Anchovies	.	.	3,776	.	.	3,776
Archosargus probatocephalus *	Sheepshead	62	54	88	130	125	459
Ariopsis felis	Hardhead Catfish	78	8	30	446	36	598
Bairdiella chrysoura	Silver Perch	150	201	736	501	89	1,677
Brevoortia spp.	Menhadens	57	43	4	36	.	140
Calamus arctifrons	Grass Porgy	1	2	1	.	.	4
Calamus penna	Sheepshead Porgy	.	2	1	.	.	3
Calamus spp.		2	.	.	1	.	3
Callinectes ornatus	Shelligs	.	1	.	1	1	3
Callinectes sapidus *	Blue Crab	9	18	13	74	15	129
Callinectes spp.		.	.	1	.	.	1
Caranx hippos	Crevalle Jack	14	4	4	19	4	45
Caranx latus	Horse-eye Jack	.	1	.	.	.	1
*Centropomus undecimalis**	Common Snook	41	39	22	41	33	176
Centropristis striata	Black Sea Bass	.	3	.	.	.	3
Chaetodipterus faber	Atlantic Spadefish	.	14	.	.	2	16
Chasmodes saburrae	Florida Blenny	4	7	4	2	3	20
Chilomycterus schoepfii	Striped Burrfish	6	37	9	2	7	61

Appendix D. (Continued).

Scientific Name	Common Name	Zone					Totals
		Palma Sola Bay (A)	Sarasota Bay (B)	Roberts Bay (C)	Little Sarasota Bay (D)	Blackburn Bay (E)	
		E=42	E=82	E=41	E=41	E=39	E=245
Chloroscombrus chrysurus	Atlantic Bumper	.	.	1	.	.	1
Citharichthys macrops	Spotted Whiff	1	.	.	.	1	2
Ctenogobius boleosoma	Darter Goby	.	1	4	.	9	14
Cynoscion arenarius *	Sand Seatrout	1	.	3	71	.	75
Cynoscion nebulosus *	Spotted Seatrout	24	65	42	28	15	174
Cyprinodon variegatus	Sheepshead Minnow	21	6	.	.	.	27
Dasyatis americana	Southern Stingray	.	1	.	.	.	1
Dasyatis sabina	Atlantic Stingray	1	1	10	6	5	23
Dasyatis say	Bluntnose Stingray	.	2	1	.	2	5
Diapterus auratus	Irish Pompano	.	.	7	.	6	13
Diplodus holbrookii	Spottail Pinfish	.	18	.	.	.	18
Echeneis neucratoides	Whitefin Sharksucker	1	.	.	.	.	1
Echeneis spp.	Sharksuckers	.	1	.	.	.	1
Elops saurus *	Ladyfish	29	14	46	24	3	116
Etropus crossotus	Fringed Flounder	.	3	5	1	1	10
Eucinostomus argenteus	Spotfin Mojarra	.	.	.	.	1	1
Eucinostomus gula	Silver Jenny	353	761	464	411	430	2,419
Eucinostomus harengulus	Tidewater Mojarra	158	76	157	290	7	688
Eucinostomus spp.	Eucinostomus	2,492	5,622	3,067	5,622	5,552	22,355
Eugerres plumieri	Striped Mojarra	7	.	2	48	7	64
Farfantepenaeus duorarum *	Pink Shrimp	80	400	271	250	590	1,591
Floridichthys carpio	Goldspotted Killifish	428	368	1	28	25	850
Fundulus grandis	Gulf Killifish	90	1	.	.	.	91
Fundulus similis	Longnose Killifish	10	3	1	.	.	14
Gobiosoma bosc	Naked Goby	.	.	2	1	.	3
Gobiosoma longipala	Twoscale Goby	.	1	.	.	1	2
Gobiosoma robustum	Code Goby	27	84	21	51	89	272
Gobiosoma spp.	Gobiosoma Gobies	16	12	4	79	16	127
Gymnura micrura	Smooth Butterfly Ray	2	2	1	4	.	9
Haemulon plumierii	White Grunt	7	12	6	1	1	27
Harengula jaguana	Scaled Sardine	12	242	2,297	425	74	3,050
Hippocampus erectus	Lined Seahorse	.	2	1	1	1	5
Hippocampus zosterae	Dwarf Seahorse	3	5	1	1	3	13
Hyporhamphus meeki	False Silver Halfbeak	.	1	.	.	.	1

Appendix D. (Continued).

Scientific Name	Common Name	Zone					Totals
		Palma Sola Bay (A)	Sarasota Bay (B)	Roberts Bay (C)	Little Sarasota Bay (D)	Blackburn Bay (E)	
		E=42	E=82	E=41	E=41	E=39	E=245
Hyporhamphus spp.	Halfbeaks	.	.	.	.	1	1
Lachnolaimus maximus	Hogfish	.	.	1	.	.	1
Lagodon rhomboides	Pinfish	4,762	10,255	3,577	3,981	9,254	31,829
Leiostomus xanthurus *	Spot	372	209	10	39	31	661
Limulus polyphemus	Horseshoe Crab	2	1	.	1	1	5
Lucania parva	Rainwater Killifish	2,820	1,846	9	322	676	5,673
Lutjanus griseus *	Gray Snapper	17	96	70	57	114	354
Lutjanus synagris *	Lane Snapper	10	34	51	1	54	150
Membras martinica	Rough Silverside	2	1	.	1	.	4
Menidia spp.	Menidia Silversides	930	31	12	295	164	1,432
Menippe spp. *	Stone Crab	.	23	8	1	2	34
Menticirrhus americanus *	Southern Kingfish	1	.	1	3	1	6
Menticirrhus saxatilis *	Northern Kingfish	1	.	.	.	.	1
Microgobius gulosus	Clown Goby	53	146	38	235	90	562
Microgobius thalassinus	Green Goby	.	.	.	4	.	4
Micropogonias undulatus *	Atlantic Croaker	1	.	3	2	.	6
Monacanthus ciliatus	Fringed Filefish	.	8	1	1	2	12
Mugil cephalus *	Striped Mullet	18	113	6	23	34	194
Mugil curema *	White Mullet	29	17	5	14	16	81
Mugil trichodon *	Fantail Mullet	3	3	5	12	.	23
Mycteroperca microlepis *	Gag	.	.	4	.	.	4
Myrophis punctatus	Speckled Worm Eel	.	1	.	1	.	2
Nicholsina usta	Emerald Parrotfish	2	51	6	.	1	60
Ogcocephalus cubifrons	Polka-dot Batfish	.	4	3	.	2	9
Oligoplites saurus	Leatherjacket	32	55	12	29	4	132
Opisthonema oglinum	Atlantic Thread Herring	1	4	228	11	6	250
Opsanus beta	Gulf Toadfish	1	13	2	4	1	21
Orthopristis chrysoptera	Pigfish	473	354	355	141	55	1,378
Paralichthys albigutta *	Gulf Flounder	8	28	9	4	7	56
Poecilia latipinna	Sailfin Molly	64	.	.	2	.	66
Pogonias cromis *	Black Drum	37	1	13	3	10	64
Portunus spp.	Portunus Crabs	7	15	9	1	15	47
Prionotus scitulus	Leopard Searobin	9	12	12	1	12	46
Prionotus tribulus	Bighead Searobin	2	4	5	9	.	20

Appendix D. (Continued).

Scientific Name	Common Name	Zone					Totals
		Palma Sola Bay (A)	Sarasota Bay (B)	Roberts Bay (C)	Little Sarasota Bay (D)	Blackburn Bay (E)	
		E=42	E=82	E=41	E=41	E=39	E=245
Rhinoptera bonasus	Cownose Ray	4	1	1	1	.	7
Rimapenaeus constrictus	Roughneck Shrimp	.	1	.	1	.	2
Sardinella aurita	Spanish Sardine	.	1	.	.	.	1
Sciaenops ocellatus *	Red Drum	9	5	4	52	13	83
Scomberomorus maculatus *	Spanish Mackerel	10	.	3	.	1	14
Scorpaena brasiliensis	Barbfish	.	3	.	.	.	3
Selene vomer	Lookdown	5	1	.	1	.	7
Serraniculus pumilio	Pygmy Sea Bass	.	.	1	.	.	1
Serranus subligarius	Belted Sandfish	3	.	.	.	.	3
Sicyonia laevigata	Hardback	.	.	.	.	5	5
Sicyonia typica	Kinglet Rock Shrimp	.	.	.	.	1	1
Sphoeroides nephelus	Southern Puffer	9	31	13	3	7	63
Sphoeroides spengleri	Bandtail Puffer	.	1	.	.	.	1
Sphyraena barracuda	Great Barracuda	1	24	17	1	7	50
Sphyrna tiburo	Bonnethead	3	.	.	.	.	3
Stephanolepis hispidus	Planehead Filefish	8	186	10	1	35	240
Strongylura marina	Atlantic Needlefish	.	9	2	1	.	12
Strongylura notata	Redfin Needlefish	18	53	60	58	42	231
Strongylura spp.	Needlefishes	.	2	.	1	.	3
Symphurus plagiusa	Blackcheek Tonguefish	.	.	3	5	3	11
Syngnathus floridae	Dusky Pipefish	3	18	3	.	1	25
Syngnathus louisianae	Chain Pipefish	2	14	3	3	4	26
Syngnathus scovelli	Gulf Pipefish	78	51	22	17	53	221
Synodus foetens	Inshore Lizardfish	17	34	41	17	46	155
Trachinotus falcatus *	Permit	4	1	.	.	.	5
Urophycis floridana	Southern Hake	.	2	.	.	.	2
Totals		**14,162**	**29,309**	**18,357**	**20,610**	**19,676**	**102,114**

Appendix E. Catch summary for taxa collected during four years, June 2009 to April 2013, of nekton sampling in Sarasota Bay with 21.3-m seines. S_u is the density-weighted average salinity (salinity at each sampling site weighted by the number of animals collected). Taxa are arranged phylogenetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name.

Scientific Name	*Common Name*	*Number Collected*	*Collection Frequency*	S_u *(psu)*	CPUE (Animals •100m2) *Average*	CPUE (Animals •100m2) *Maximum*
Argopecten spp.	Scallops	5	0.6	35.29	0.0051	1.4286
Limulus polyphemus	Horseshoe Crab	3	0.4	34.78	0.0030	0.7143
Farfantepenaeus duorarum *	Pink Shrimp	6,692	57.8	32.17	6.7994	459.2857
Sicyonia laevigata	Hardback	3	0.4	33.92	0.0030	0.7143
Callinectes sapidus *	Blue Crab	215	14.9	32.51	0.2185	7.8571
Callinectes ornatus	Shelligs	1	0.1	33.00	0.0010	0.7143
Portunus spp.	Portunus Crabs	6	0.7	33.56	0.0061	1.4286
Menippe spp. *	Stone Crab	3	0.4	31.32	0.0030	0.7143
Dasyatis sabina	Atlantic Stingray	9	1.3	31.02	0.0091	0.7143
Dasyatis say	Bluntnose Stingray	2	0.3	29.40	0.0020	0.7143
Gymnura micrura	Smooth Butterfly Ray	1	0.1	27.20	0.0010	0.7143
Rhinoptera bonasus	Cownose Ray	4	0.4	33.84	0.0041	1.4286
Elops saurus *	Ladyfish	6	0.9	32.10	0.0061	0.7143
Myrophis punctatus	Speckled Worm Eel	2	0.3	34.38	0.0020	0.7143
Brevoortia spp.	Menhadens	92	1.8	28.98	0.0935	11.4286
Opisthonema oglinum	Atlantic Thread Herring	1,378	5.7	31.37	1.4001	443.5714
Harengula jaguana	Scaled Sardine	16,435	16.4	32.64	16.6988	1757.8571
Sardinella aurita	Spanish Sardine	6	0.3	35.09	0.0061	3.5714
Anchoa spp.	Anchovies	3,776	0.1	29.25	3.8366	2697.1429
Anchoa hepsetus	Striped Anchovy	1,162	4.4	32.76	1.1807	280.7143
Anchoa mitchilli	Bay Anchovy	168,290	27.7	31.95	170.9917	15405.7143
Anchoa cubana	Cuban Anchovy	4,549	2.4	32.17	4.6220	1135.7143
Anchoa lyolepis	Dusky Anchovy	140	0.3	33.19	0.1422	52.8571
Synodus foetens	Inshore Lizardfish	320	23.9	32.71	0.3251	5.7143
Ariopsis felis	Hardhead Catfish	56	3.3	32.53	0.0569	10.0000
Opsanus beta	Gulf Toadfish	23	2.4	32.61	0.0234	2.8571
Urophycis floridana	Southern Hake	7	0.9	33.36	0.0071	1.4286
Hyporhamphus spp.	Halfbeaks	91	1.1	33.92	0.0925	49.2857
Hyporhamphus unifasciatus	Halfbeak	1	0.1	30.60	0.0010	0.7143
Hyporhamphus meeki	False Silver Halfbeak	53	2.1	34.13	0.0539	7.1429

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2) Average	Maximum
Strongylura spp.	Needlefishes	13	1.4	32.53	0.0132	1.4286
Strongylura marina	Atlantic Needlefish	63	2.6	35.58	0.0640	15.7143
Strongylura notata	Redfin Needlefish	421	21.1	32.77	0.4278	18.5714
Strongylura timucu	Timucu	2	0.3	34.43	0.0020	0.7143
Cyprinodon variegatus	Sheepshead Minnow	411	4.4	34.09	0.4176	125.7143
Fundulus confluentus	Marsh Killifish	1	0.1	31.30	0.0010	0.7143
Fundulus grandis	Gulf Killifish	184	2.8	31.07	0.1870	59.2857
Fundulus similis	Longnose Killifish	157	2.6	33.57	0.1595	25.0000
Lucania parva	Rainwater Killifish	21,697	31.2	34.12	22.0453	1689.2857
Adinia xenica	Diamond Killifish	9	0.3	32.54	0.0091	3.5714
Floridichthys carpio	Goldspotted Killifish	3,183	17.4	33.26	3.2341	219.2857
Poecilia latipinna	Sailfin Molly	180	1.6	32.05	0.1829	45.7143
Membras martinica	Rough Silverside	81	2.1	33.74	0.0823	24.2857
Menidia spp.	Menidia Silversides	11,942	21.2	33.83	12.1337	1334.2857
Syngnathus floridae	Dusky Pipefish	73	6.5	33.85	0.0742	5.7143
Syngnathus louisianae	Chain Pipefish	74	7.8	33.46	0.0752	4.2857
Syngnathus scovelli	Gulf Pipefish	978	43.1	33.63	0.9937	28.5714
Hippocampus erectus	Lined Seahorse	8	1.1	33.56	0.0081	0.7143
Hippocampus zosterae	Dwarf Seahorse	63	7.3	33.13	0.0640	5.0000
Anarchopterus criniger	Fringed Pipefish	2	0.1	34.30	0.0020	1.4286
Scorpaena brasiliensis	Barbfish	3	0.1	34.90	0.0030	2.1429
Prionotus scitulus	Leopard Searobin	26	3.0	33.05	0.0264	2.8571
Prionotus tribulus	Bighead Searobin	24	3.0	32.33	0.0244	2.1429
Centropomus undecimalis *	Common Snook	36	2.1	29.71	0.0366	7.8571
Centropristis striata	Black Sea Bass	8	0.7	33.56	0.0081	2.1429
Mycteroperca microlepis *	Gag	5	0.7	33.70	0.0051	0.7143
Serraniculus pumilio	Pygmy Sea Bass	2	0.3	34.55	0.0020	0.7143
Serranus subligarius	Belted Sandfish	4	0.4	32.35	0.0041	1.4286
Caranx hippos	Crevalle Jack	13	1.1	32.18	0.0132	3.5714
Caranx latus	Horse-eye Jack	1	0.1	31.50	0.0010	0.7143
Chloroscombrus chrysurus	Atlantic Bumper	2	0.3	31.53	0.0020	0.7143
Oligoplites saurus	Leatherjacket	453	20.5	31.86	0.4603	34.2857
Trachinotus falcatus *	Permit	10	0.7	33.56	0.0102	2.1429
Lutjanus griseus *	Gray Snapper	568	19.9	32.13	0.5771	24.2857
Lutjanus synagris *	Lane Snapper	228	8.3	33.12	0.2317	17.1429
Eucinostomus spp.	Eucinostomus	72,458	73.1	32.65	73.6212	3285.7143
Eucinostomus argenteus	Spotfin Mojarra	3	0.3	34.43	0.0030	1.4286
Eucinostomus gula	Silver Jenny	6,803	54.6	32.12	6.9122	377.1429
Eucinostomus harengulus	Tidewater Mojarra	2,549	26.2	32.64	2.5899	97.1429

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2) Average	Maximum
Eugerres plumieri	Striped Mojarra	111	1.7	29.53	0.1128	27.8571
Diapterus auratus	Irish Pompano	2	0.3	27.93	0.0020	0.7143
Haemulon plumierii	White Grunt	104	2.1	33.09	0.1057	17.1429
Orthopristis chrysoptera	Pigfish	2,643	28.2	33.81	2.6854	152.8571
Lagodon rhomboides	Pinfish	92,890	79.1	33.18	94.3812	1751.4286
Archosargus probatocephalus *	Sheepshead	272	14.1	33.08	0.2764	17.8571
Diplodus holbrookii	Spottail Pinfish	37	2.3	35.05	0.0376	5.7143
Calamus spp.		4	0.4	32.76	0.0041	1.4286
Calamus arctifrons	Grass Porgy	3	0.4	34.13	0.0030	0.7143
Calamus penna	Sheepshead Porgy	7	0.4	32.80	0.0071	2.8571
Cynoscion nebulosus *	Spotted Seatrout	670	23.2	32.26	0.6808	26.4286
Cynoscion arenarius *	Sand Seatrout	27	0.7	31.75	0.0274	11.4286
Bairdiella chrysoura	Silver Perch	6,833	26.3	33.04	6.9427	460.0000
Leiostomus xanthurus *	Spot	23,014	22.5	31.67	23.3835	965.0000
Menticirrhus saxatilis *	Northern Kingfish	1	0.1	34.20	0.0010	0.7143
Pogonias cromis *	Black Drum	5	0.6	32.25	0.0051	1.4286
Sciaenops ocellatus *	Red Drum	299	6.0	33.03	0.3038	40.7143
Chaetodipterus faber	Atlantic Spadefish	9	1.1	33.79	0.0091	1.4286
Mugil cephalus *	Striped Mullet	3,570	8.0	30.85	3.6273	650.0000
Mugil curema *	White Mullet	23	1.0	31.90	0.0234	6.4286
Mugil trichodon *	Fantail Mullet	132	2.4	34.89	0.1341	67.1429
Sphyraenidae spp.		1	0.1	32.30	0.0010	0.7143
Sphyraena borealis	Sennet	9	0.4	34.60	0.0091	4.2857
Sphyraena barracuda	Great Barracuda	11	1.3	34.00	0.0112	1.4286
Nicholsina usta	Emerald Parrotfish	52	2.7	34.21	0.0528	8.5714
Astroscopus y-graecum	Southern Stargazer	1	0.1	33.50	0.0010	0.7143
Hypsoblennius hentz	Feather Blenny	2	0.1	34.70	0.0020	1.4286
Chasmodes saburrae	Florida Blenny	65	5.3	32.76	0.0660	7.8571
Ctenogobius boleosoma	Darter Goby	26	1.8	32.71	0.0264	5.0000
Gobiosoma spp.	Gobiosoma Gobies	423	19.1	31.19	0.4298	37.1429
Gobiosoma bosc	Naked Goby	6	0.7	30.91	0.0061	1.4286
Gobiosoma robustum	Code Goby	1,042	29.3	32.61	1.0587	30.7143
Gobiosoma longipala	Twoscale Goby	1	0.1	28.20	0.0010	0.7143
Microgobius gulosus	Clown Goby	2,587	38.0	31.02	2.6285	135.0000
Microgobius thalassinus	Green Goby	2	0.1	27.97	0.0020	1.4286
Microgobius microlepis	Banner Goby	1	0.1	33.15	0.0010	0.7143
Bathygobius soporator	Frillfin Goby	5	0.4	33.91	0.0051	1.4286
Scomberomorus maculatus *	Spanish Mackerel	2	0.3	31.88	0.0020	0.7143
Etropus crossotus	Fringed Flounder	4	0.3	31.29	0.0041	2.1429

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2)	
					Average	*Maximum*
Paralichthys albigutta *	Gulf Flounder	83	7.8	33.27	0.0843	8.5714
Symphurus plagiusa	Blackcheek Tonguefish	24	2.7	31.68	0.0244	2.8571
Achirus lineatus	Lined Sole	63	5.8	29.95	0.0640	6.4286
Aluterus schoepfii	Orange Filefish	1	0.1	34.40	0.0010	0.7143
Monacanthus ciliatus	Fringed Filefish	12	1.1	33.66	0.0122	2.8571
Stephanolepis hispidus	Planehead Filefish	336	9.7	34.02	0.3414	68.5714
Ostraciidae spp.	Boxfishes	1	0.1	34.70	0.0010	0.7143
Lactophrys spp.	Trunkfishes	1	0.1	33.15	0.0010	0.7143
Acanthostracion quadricornis	Scrawled Cowfish	23	2.0	33.33	0.0234	2.8571
Sphoeroides nephelus	Southern Puffer	171	16.1	33.64	0.1737	5.0000
Sphoeroides spengleri	Bandtail Puffer	1	0.1	34.40	0.0010	0.7143
Chilomycterus schoepfii	Striped Burrfish	42	4.4	33.61	0.0427	2.8571
Diodon holocanthus	Balloonfish	1	0.1	33.15	0.0010	0.7143

Appendix F. Catch summary for taxa collected during four years, June 2009 to April 2013, of nekton sampling in Sarasota Bay with 183-m haul seines. S_u is the density-weighted average salinity (salinity at each sampling site weighted by the number of animals collected). Taxa are arranged phylogenetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name.

Scientific Name	*Common Name*	*Number Collected*	*Collection Frequency*	S_u *(psu)*	CPUE (Animals •100m2) *Average*	*Maximum*
Argopecten spp.	Scallops	2	1.3	36.71	0.0003	0.0243
Limulus polyphemus	Horseshoe Crab	5	2.6	31.63	0.0008	0.0485
Farfantepenaeus duorarum *	Pink Shrimp	5	2.6	31.75	0.0008	0.0485
Callinectes spp.		1	0.6	33.53	0.0002	0.0243
Callinectes sapidus *	Blue Crab	86	22.4	33.24	0.0134	0.2427
Callinectes similis	Lesser Blue Crab	1	0.6	35.00	0.0002	0.0243
Callinectes ornatus	Shelligs	2	0.6	35.10	0.0003	0.0485
Portunus spp.	Portunus Crabs	3	1.9	31.14	0.0005	0.0243
Menippe spp. *	Stone Crab	1	0.6	29.73	0.0002	0.0243
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark	1	0.6	36.03	0.0002	0.0243
Sphyrna tiburo	Bonnethead	8	2.6	35.05	0.0012	0.0728
Dasyatis spp.	Whiptail Stingrays	1	0.6	33.75	0.0002	0.0243
Dasyatis americana	Southern Stingray	3	1.9	35.28	0.0005	0.0243
Dasyatis sabina	Atlantic Stingray	44	13.5	31.34	0.0068	0.2427
Dasyatis say	Bluntnose Stingray	8	3.2	34.88	0.0012	0.0728
Gymnura micrura	Smooth Butterfly Ray	14	4.5	32.05	0.0022	0.0971
Rhinoptera bonasus	Cownose Ray	48	13.5	33.52	0.0075	0.2427
Elops saurus *	Ladyfish	489	44.2	32.91	0.0761	2.4029
Brevoortia spp.	Menhadens	2,456	19.9	32.84	0.3821	44.3689
Opisthonema oglinum	Atlantic Thread Herring	635	9.0	34.15	0.0988	7.3544
Harengula jaguana	Scaled Sardine	2,274	21.8	33.31	0.3538	25.3398
Sardinella aurita	Spanish Sardine	1	0.6	34.40	0.0002	0.0243
Synodus foetens	Inshore Lizardfish	69	20.5	33.41	0.0107	0.3398
Bagre marinus	Gafftopsail Catfish	14	5.1	31.94	0.0022	0.1214
Ariopsis felis	Hardhead Catfish	1,199	41.7	31.60	0.1866	10.6068
Opsanus beta	Gulf Toadfish	40	16.0	33.29	0.0062	0.1214
Ogcocephalus cubifrons	Polka-dot Batfish	10	3.8	33.50	0.0016	0.1214
Hyporhamphus meeki	False Silver Halfbeak	11	3.8	34.59	0.0017	0.0971
Strongylura marina	Atlantic Needlefish	25	5.8	34.20	0.0039	0.1456
Strongylura notata	Redfin Needlefish	584	49.4	33.82	0.0909	4.2718

Scientific Name	*Common Name*	*Number Collected*	*Collection Frequency*	S_u *(psu)*	CPUE (Animals •100m2) *Average*	*Maximum*
Tylosurus crocodilus	Houndfish	1	0.6	36.45	0.0002	0.0243
Cyprinodon variegatus	Sheepshead Minnow	1	0.6	31.95	0.0002	0.0243
Fundulus grandis	Gulf Killifish	4	1.9	32.66	0.0006	0.0485
Fundulus similis	Longnose Killifish	10	1.9	35.60	0.0016	0.1456
Floridichthys carpio	Goldspotted Killifish	1	0.6	32.80	0.0002	0.0243
Hippocampus erectus	Lined Seahorse	5	3.2	35.21	0.0008	0.0243
Scorpaena brasiliensis	Barbfish	12	3.2	33.98	0.0019	0.1456
Prionotus scitulus	Leopard Searobin	13	3.8	34.59	0.0020	0.1214
Prionotus tribulus	Bighead Searobin	5	3.2	31.15	0.0008	0.0243
Centropomus undecimalis *	Common Snook	672	58.3	33.15	0.1046	0.9951
Centropristis striata	Black Sea Bass	24	3.8	34.50	0.0037	0.2184
Mycteroperca microlepis *	Gag	76	9.6	34.47	0.0118	0.4369
Diplectrum formosum	Sand Perch	1	0.6	34.53	0.0002	0.0243
Echeneis spp.	Sharksuckers	1	0.6	34.50	0.0002	0.0243
Echeneis neucratoides	Whitefin Sharksucker	1	0.6	31.57	0.0002	0.0243
Caranx hippos	Crevalle Jack	100	19.9	32.59	0.0156	0.3398
Caranx latus	Horse-eye Jack	1	0.6	34.50	0.0002	0.0243
Caranx crysos	Blue Runner	68	1.3	34.99	0.0106	1.6262
Oligoplites saurus	Leatherjacket	48	14.7	32.97	0.0075	0.2427
Selene vomer	Lookdown	57	10.3	31.62	0.0089	0.5825
Trachinotus carolinus *	Florida Pompano	5	1.9	34.47	0.0008	0.0485
Trachinotus falcatus *	Permit	13	4.5	32.72	0.0020	0.0971
Hemicaranx amblyrhynchus	Bluntnose Jack	1	0.6	29.30	0.0002	0.0243
Lutjanus griseus *	Gray Snapper	283	37.2	33.33	0.0440	0.7039
Lutjanus synagris *	Lane Snapper	81	5.8	33.33	0.0126	0.8252
Eucinostomus gula	Silver Jenny	1,312	64.1	33.84	0.2041	4.1990
Eucinostomus harengulus	Tidewater Mojarra	143	17.9	35.06	0.0222	0.5825
Diapterus spp.		7	0.6	35.25	0.0011	0.1699
Eugerres plumieri	Striped Mojarra	105	16.7	30.78	0.0163	0.8738
Diapterus auratus	Irish Pompano	16	2.6	32.49	0.0025	0.1699
Haemulon plumierii	White Grunt	34	6.4	35.02	0.0053	0.1699
Orthopristis chrysoptera	Pigfish	3,095	51.9	33.32	0.4815	20.2427
Lagodon rhomboides	Pinfish	28,782	95.5	33.35	4.4782	38.0583
Archosargus probatocephalus *	Sheepshead	954	67.3	32.32	0.1484	1.2621
Diplodus holbrookii	Spottail Pinfish	469	10.3	35.34	0.0730	4.5146
Calamus arctifrons	Grass Porgy	1	0.6	33.53	0.0002	0.0243
Cynoscion nebulosus *	Spotted Seatrout	153	29.5	32.49	0.0238	0.5097
Cynoscion arenarius *	Sand Seatrout	2	1.3	35.37	0.0003	0.0243
Bairdiella chrysoura	Silver Perch	2,185	32.7	34.57	0.3400	13.1796

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2) Average	Maximum
Leiostomus xanthurus *	Spot	802	35.3	32.95	0.1248	3.8350
Menticirrhus americanus *	Southern Kingfish	9	1.9	31.91	0.0014	0.0971
Menticirrhus littoralis *	Gulf Kingfish	1	0.6	35.00	0.0002	0.0243
Micropogonias undulatus *	Atlantic Croaker	25	5.8	34.03	0.0039	0.1699
Pogonias cromis *	Black Drum	122	17.3	33.08	0.0190	0.8738
Sciaenops ocellatus *	Red Drum	129	31.4	32.11	0.0201	0.4612
Chaetodipterus faber	Atlantic Spadefish	64	14.7	34.22	0.0100	0.2913
Sarotherodon melanotheron	Blackchin Tilapia	2	1.3	35.23	0.0003	0.0243
Oreochromis niloticus	Nile Tilapia	1	0.6	28.17	0.0002	0.0243
Mugil spp.	Mullets	10	0.6	31.70	0.0016	0.2427
Mugil cephalus *	Striped Mullet	350	46.8	32.58	0.0545	0.6311
Mugil curema *	White Mullet	344	40.4	33.34	0.0535	0.7039
Mugil trichodon *	Fantail Mullet	111	19.2	33.17	0.0173	0.7039
Sphyraena barracuda	Great Barracuda	92	19.2	33.73	0.0143	0.2670
Lachnolaimus maximus	Hogfish	2	1.3	34.53	0.0003	0.0243
Nicholsina usta	Emerald Parrotfish	243	12.2	35.11	0.0378	2.0146
Chasmodes saburrae	Florida Blenny	1	0.6	34.40	0.0002	0.0243
Scomberomorus maculatus *	Spanish Mackerel	31	10.3	32.61	0.0048	0.1942
Etropus crossotus	Fringed Flounder	6	1.9	33.83	0.0009	0.0971
Paralichthys albigutta *	Gulf Flounder	138	37.2	33.12	0.0215	0.3155
Ancylopsetta quadrocellata	Ocellated Flounder	3	1.9	32.38	0.0005	0.0243
Achirus lineatus	Lined Sole	2	1.3	35.60	0.0003	0.0243
Aluterus schoepfii	Orange Filefish	3	1.9	35.35	0.0005	0.0243
Monacanthus ciliatus	Fringed Filefish	23	4.5	34.61	0.0036	0.1699
Stephanolepis hispidus	Planehead Filefish	157	14.1	35.05	0.0244	1.0680
Acanthostracion quadricornis	Scrawled Cowfish	61	12.8	34.30	0.0095	0.3155
Sphoeroides nephelus	Southern Puffer	53	16.0	33.86	0.0082	0.1942
Sphoeroides spengleri	Bandtail Puffer	1	0.6	35.53	0.0002	0.0243
Chilomycterus schoepfii	Striped Burrfish	94	23.7	34.07	0.0146	0.2913

Appendix G. Catch summary for taxa collected during four years, June 2009 to April 2013, of nekton sampling in Sarasota Bay with 6.1-m otter trawls. S_u is the density-weighted average salinity (salinity at each sampling site weighted by the number of animals collected). Taxa are arranged phylogenetically. Species of commercial or recreational importance (Selected Taxa) are denoted with an asterisk (*) after the species name.

Scientific Name	*Common Name*	*Number Collected*	*Collection Frequency*	S_u *(psu)*	CPUE (Animals •100m2) *Average*	*Maximum*
Argopecten spp.	Scallops	2	1.0	35.23	0.0007	0.0750
Limulus polyphemus	Horseshoe Crab	14	4.8	32.46	0.0053	0.2698
Farfantepenaeus duorarum *	Pink Shrimp	281	37.0	32.07	0.0942	1.7539
Rimapenaeus constrictus	Roughneck Shrimp	2	1.0	32.26	0.0009	0.1124
Sicyonia typica	Kinglet Rock Shrimp	1	0.5	34.73	0.0003	0.0710
Sicyonia laevigata	Hardback	7	1.4	34.54	0.0061	1.1243
Callinectes sapidus *	Blue Crab	820	38.5	31.71	0.2817	9.3092
Callinectes ornatus	Shelligs	28	4.8	32.95	0.0091	1.0119
Portunus spp.	Portunus Crabs	480	43.3	33.89	0.1639	6.4760
Menippe spp. *	Stone Crab	550	44.7	34.10	0.1886	5.4641
Dasyatis americana	Southern Stingray	1	0.5	34.68	0.0003	0.0675
Dasyatis sabina	Atlantic Stingray	22	8.2	32.81	0.0076	0.3550
Dasyatis say	Bluntnose Stingray	14	4.3	33.72	0.0047	0.2130
Gymnura micrura	Smooth Butterfly Ray	11	4.3	30.34	0.0037	0.1499
Albula vulpes *	Bonefish	1	0.5	32.33	0.0003	0.0675
Opisthonema oglinum	Atlantic Thread Herring	5	2.4	34.01	0.0017	0.0750
Harengula jaguana	Scaled Sardine	7	2.4	31.72	0.0023	0.1349
Anchoa hepsetus	Striped Anchovy	16	2.4	32.39	0.0052	0.5397
Anchoa mitchilli	Bay Anchovy	2,213	6.7	31.19	0.7315	80.2078
Anchoa cubana	Cuban Anchovy	61	1.9	28.35	0.0198	3.5078
Synodus foetens	Inshore Lizardfish	173	38.5	33.57	0.0583	0.6746
Ariopsis felis	Hardhead Catfish	79	14.9	32.69	0.0260	0.7101
Opsanus beta	Gulf Toadfish	96	21.6	33.62	0.0321	0.5782
Gobiesox strumosus	Skilletfish	1	0.5	36.63	0.0004	0.0794
Ogcocephalus parvus	Roughback Batfish	2	0.5	35.78	0.0006	0.1349
Ogcocephalus cubifrons	Polka-dot Batfish	33	9.6	34.64	0.0114	0.4047
Urophycis floridana	Southern Hake	33	6.7	32.99	0.0114	0.5397
Lucania parva	Rainwater Killifish	2	1.0	35.26	0.0006	0.0675
Floridichthys carpio	Goldspotted Killifish	1	0.5	36.60	0.0004	0.0794
Syngnathus floridae	Dusky Pipefish	10	3.4	35.66	0.0034	0.1587

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2) Average	Maximum
Syngnathus louisianae	Chain Pipefish	53	19.2	34.15	0.0176	0.2249
Syngnathus scovelli	Gulf Pipefish	77	11.1	33.58	0.0256	1.3492
Hippocampus erectus	Lined Seahorse	28	10.1	33.89	0.0093	0.1420
Hippocampus zosterae	Dwarf Seahorse	5	1.4	33.09	0.0017	0.2024
Anarchopterus criniger	Fringed Pipefish	2	1.0	34.71	0.0009	0.1124
Scorpaena brasiliensis	Barbfish	7	2.4	33.54	0.0023	0.2130
Prionotus scitulus	Leopard Searobin	188	41.3	34.01	0.0634	0.7710
Prionotus tribulus	Bighead Searobin	58	14.9	32.16	0.0197	0.4497
Centropristis striata	Black Sea Bass	9	2.9	35.46	0.0031	0.2130
Epinephelus morio *	Red Grouper	1	0.5	36.00	0.0003	0.0710
Mycteroperca microlepis *	Gag	2	1.0	34.32	0.0007	0.0710
Diplectrum formosum	Sand Perch	6	2.9	34.83	0.0021	0.0750
Serraniculus pumilio	Pygmy Sea Bass	4	1.9	34.04	0.0016	0.1349
Serranus subligarius	Belted Sandfish	8	2.9	35.04	0.0027	0.1499
Echeneis neucratoides	Whitefin Sharksucker	1	0.5	36.60	0.0003	0.0675
Chloroscombrus chrysurus	Atlantic Bumper	1	0.5	34.85	0.0003	0.0675
Lutjanus griseus *	Gray Snapper	56	9.1	33.42	0.0188	0.7101
Lutjanus synagris *	Lane Snapper	79	15.9	33.98	0.0269	1.3492
Eucinostomus spp.	Eucinostomus	5,543	36.5	32.89	1.9017	103.4359
Eucinostomus argenteus	Spotfin Mojarra	1	0.5	35.18	0.0006	0.1349
Eucinostomus gula	Silver Jenny	969	42.8	32.29	0.3258	8.2974
Eucinostomus harengulus	Tidewater Mojarra	96	10.6	31.98	0.0323	1.1993
Haemulon plumierii	White Grunt	16	4.3	35.59	0.0054	0.2840
Orthopristis chrysoptera	Pigfish	2,558	53.4	34.00	0.8566	62.5337
Lagodon rhomboides	Pinfish	8,312	73.6	32.76	2.8101	66.6487
Archosargus probatocephalus *	Sheepshead	202	13.9	34.22	0.0709	4.5446
Diplodus holbrookii	Spottail Pinfish	26	2.4	35.39	0.0085	1.3492
Calamus spp.		1	0.5	34.07	0.0003	0.0675
Calamus arctifrons	Grass Porgy	4	1.4	35.37	0.0013	0.1285
Cynoscion nebulosus *	Spotted Seatrout	28	6.7	34.77	0.0092	0.8095
Cynoscion arenarius *	Sand Seatrout	431	4.8	27.70	0.1422	23.8802
Bairdiella chrysoura	Silver Perch	787	10.1	35.94	0.2575	44.3200
Leiostomus xanthurus *	Spot	8,953	13.0	29.95	2.9902	314.1421
Menticirrhus americanus *	Southern Kingfish	18	5.8	30.94	0.0061	0.2840
Sciaenops ocellatus *	Red Drum	27	1.0	26.84	0.0097	1.9488
Chaetodipterus faber	Atlantic Spadefish	11	3.4	32.79	0.0036	0.2698
Halichoeres bivittatus	Slippery Dick	1	0.5	35.90	0.0004	0.0750
Nicholsina usta	Emerald Parrotfish	51	5.8	35.26	0.0171	1.4166
Hypsoblennius hentz	Feather Blenny	2	1.0	35.13	0.0009	0.1124

Scientific Name	Common Name	Number Collected	Collection Frequency	S_u (psu)	CPUE (Animals •100m2)	
					Average	Maximum
Chasmodes saburrae	Florida Blenny	4	1.9	33.94	0.0014	0.0750
Hypleurochilus caudovittatus	Zebratail Blenny	20	6.3	34.67	0.0069	0.4047
Ctenogobius boleosoma	Darter Goby	4	1.0	33.60	0.0028	0.4497
Gobiosoma spp.	Gobiosoma Gobies	191	14.4	34.18	0.0630	3.2380
Gobiosoma robustum	Code Goby	174	17.8	33.93	0.0609	2.9007
Gobiosoma longipala	Twoscale Goby	23	8.2	33.60	0.0081	0.2698
Microgobius gulosus	Clown Goby	44	4.8	31.83	0.0153	1.1468
Microgobius thalassinus	Green Goby	14	1.4	29.16	0.0046	0.8095
Citharichthys macrops	Spotted Whiff	13	4.3	34.16	0.0044	0.2840
Etropus crossotus	Fringed Flounder	47	15.9	33.29	0.0159	0.2249
Paralichthys albigutta *	Gulf Flounder	180	41.8	33.61	0.0624	1.1361
Ancylopsetta quadrocellata	Ocellated Flounder	25	8.7	33.48	0.0081	0.1349
Symphurus plagiusa	Blackcheek Tonguefish	68	11.1	29.58	0.0225	1.8214
Trinectes maculatus	Hogchoker	7	1.4	34.17	0.0024	0.2249
Achirus lineatus	Lined Sole	79	21.2	32.46	0.0270	0.7495
Aluterus schoepfii	Orange Filefish	9	3.4	34.73	0.0030	0.1349
Monacanthus ciliatus	Fringed Filefish	5	2.4	34.08	0.0017	0.0710
Stephanolepis hispidus	Planehead Filefish	195	23.6	35.36	0.0659	2.7693
Lactophrys trigonus	Trunkfish	1	0.5	28.97	0.0003	0.0710
Acanthostracion quadricornis	Scrawled Cowfish	103	27.9	34.39	0.0349	0.3373
Sphoeroides nephelus	Southern Puffer	35	9.6	34.85	0.0119	0.5397
Sphoeroides spengleri	Bandtail Puffer	2	1.0	34.69	0.0007	0.0710
Chilomycterus schoepfii	Striped Burrfish	159	37.0	34.20	0.0537	0.4971

Appendix H. Species overview plots for dominant taxa (≥200 animals collected and ≥10 occurrence in a gear type) collected in 21.3-m shoreline seines in Sarasota Bay, June 2009 to April 2013. Taxa are arranged phylogenetically.

Farfantepenaeus duorarum (Pink Shrimp)

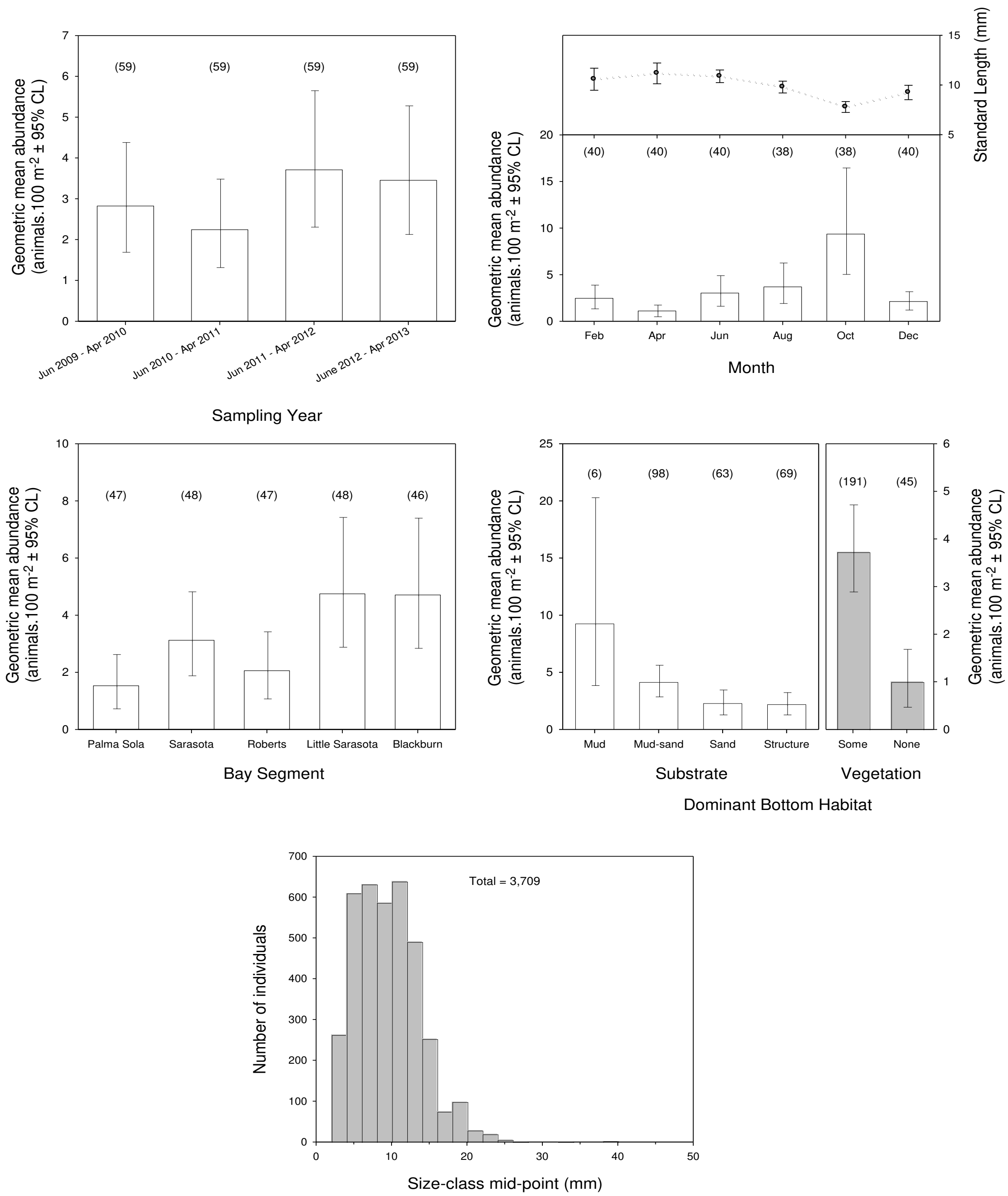

Fig. H1. Relative abundance and length-frequency distribution of Pink Shrimp collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Harengula jaguana (Scaled Sardine)

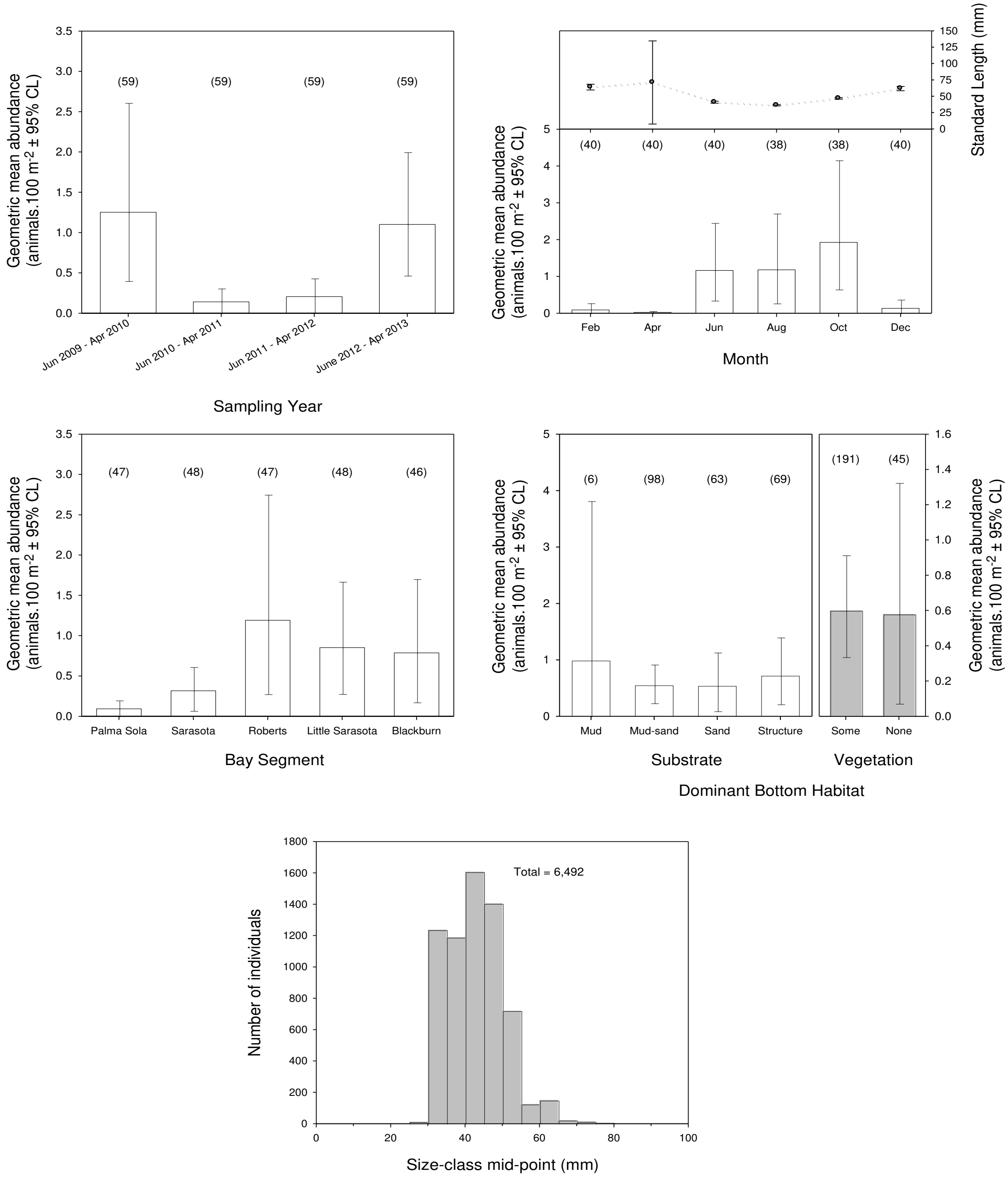

Fig. H2. Relative abundance and length-frequency distribution of Scaled Sardine collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Anchoa mitchilli (Bay Anchovy)

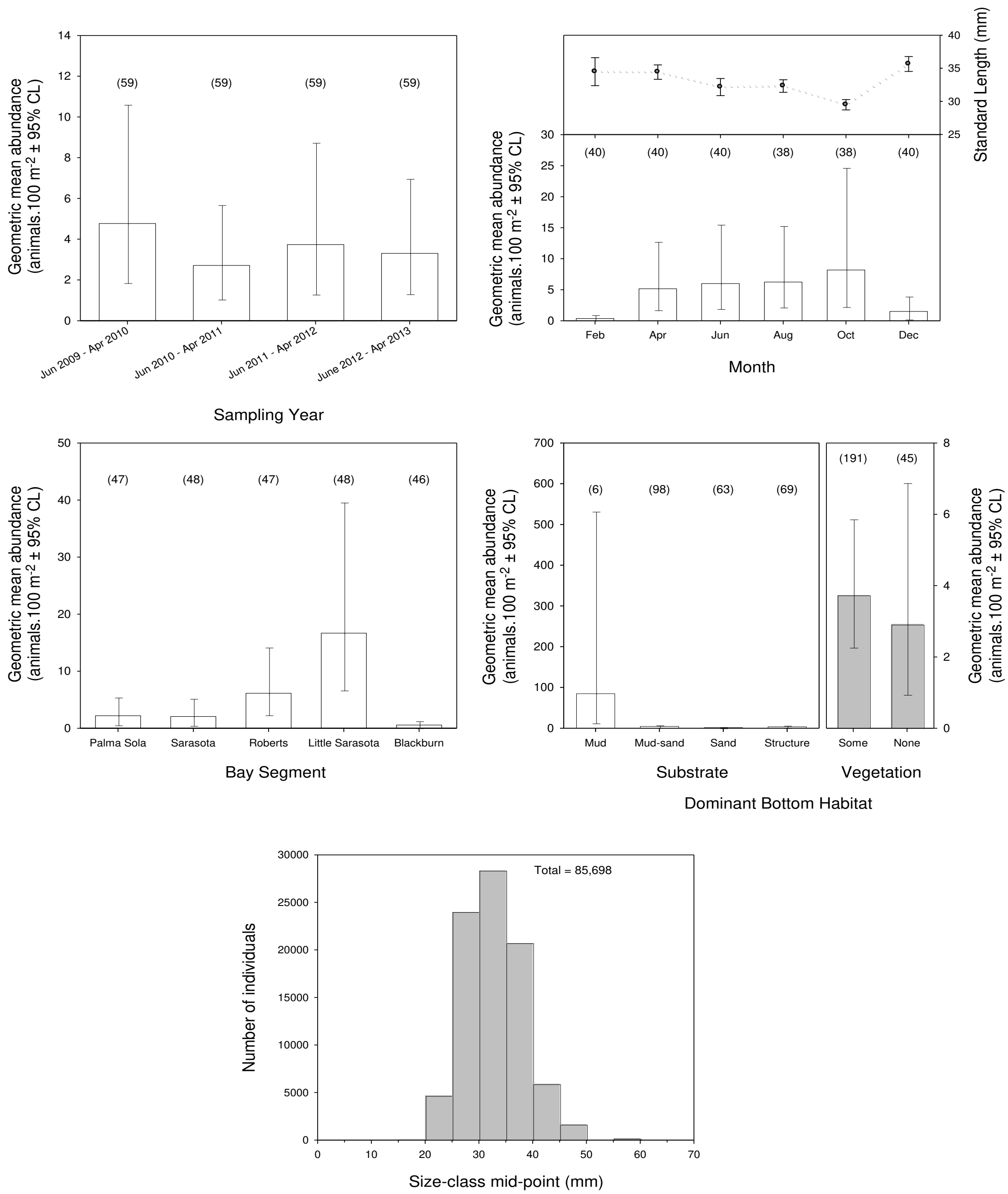

Fig. H3. Relative abundance and length-frequency distribution of Bay Anchovy collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Strongylura notata (Redfin Needlefish)

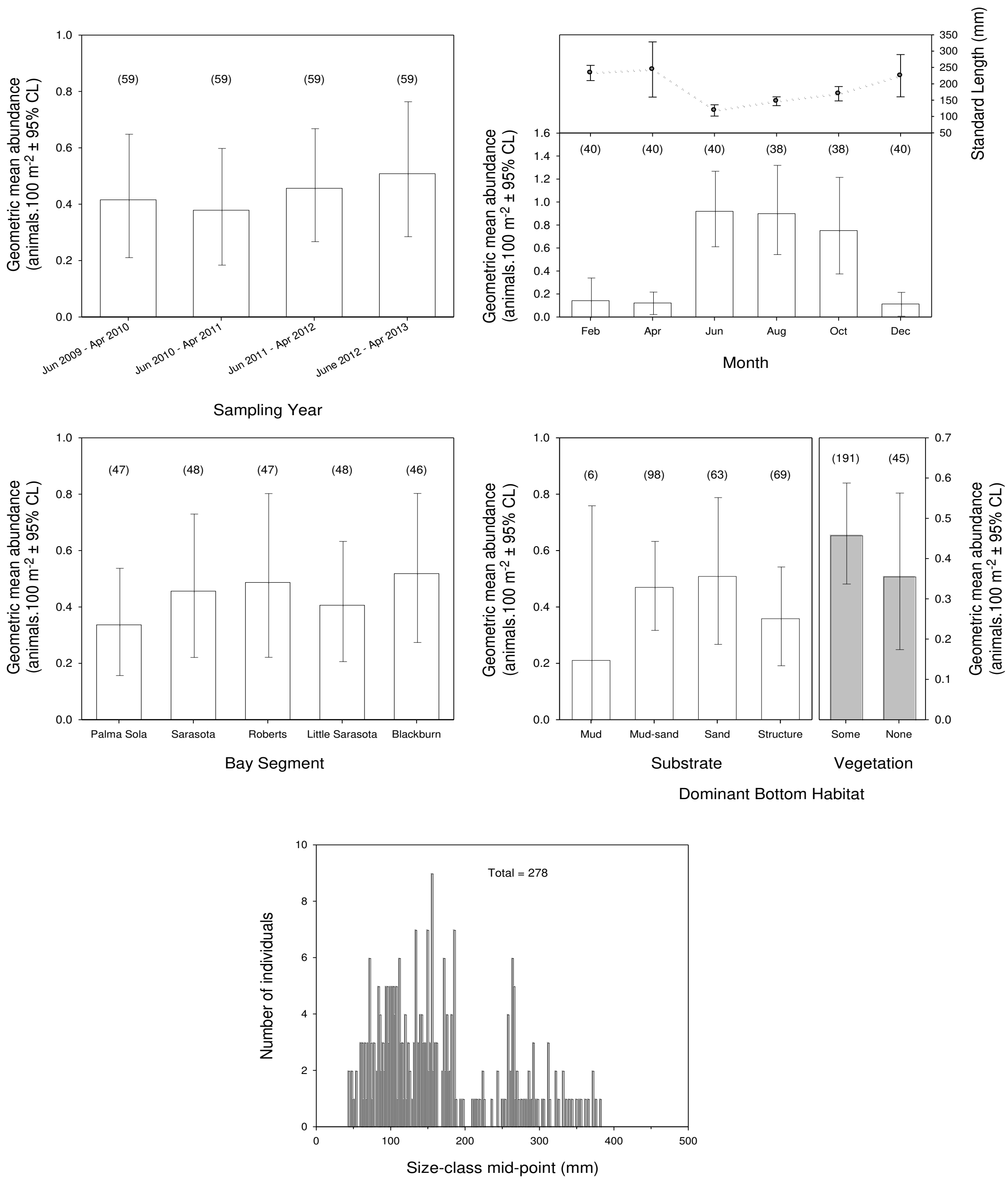

Fig. H4. Relative abundance and length-frequency distribution of Redfin Needlefish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lucania parva (Rainwater Killifish)

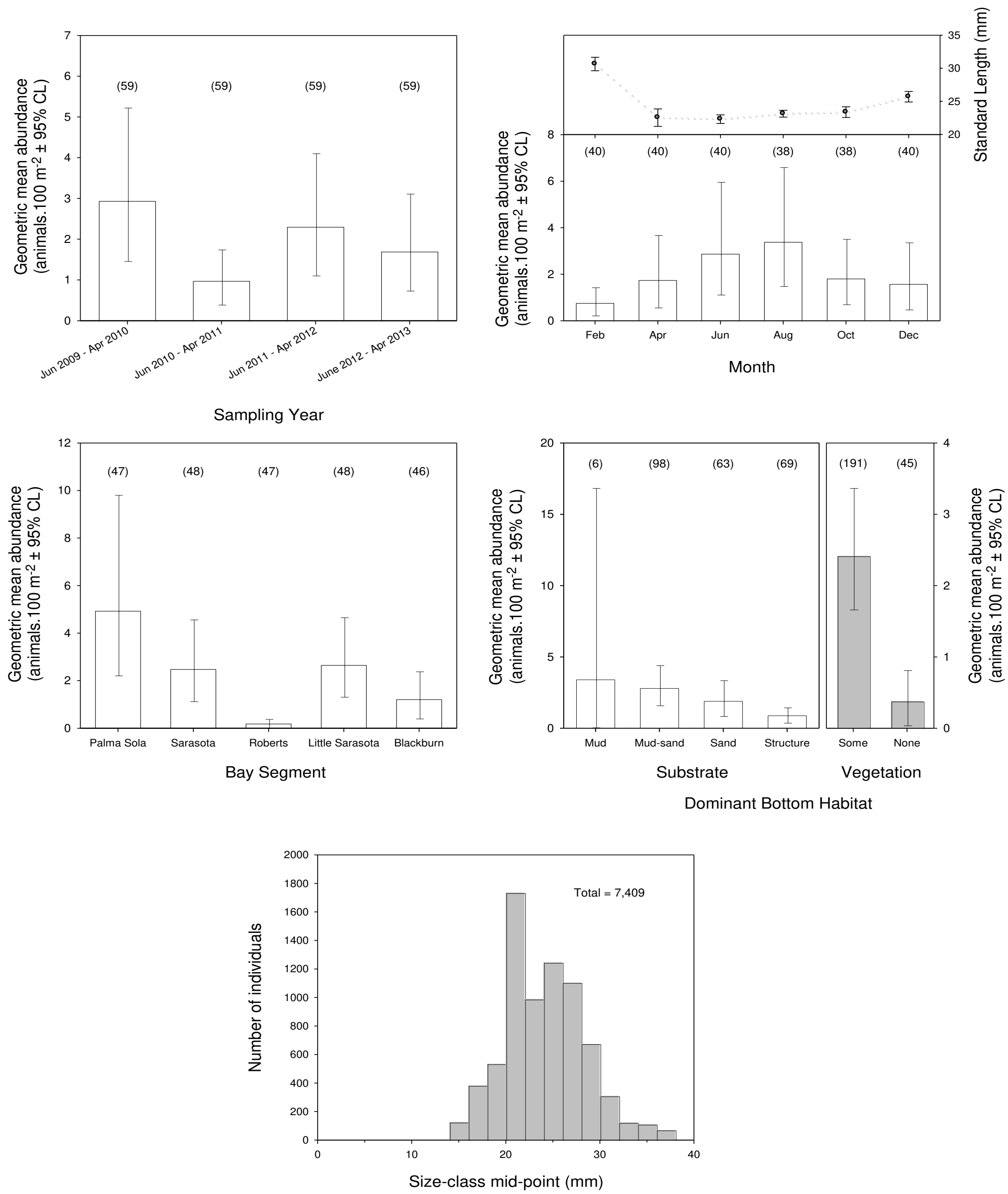

Fig. H5. Relative abundance and length-frequency distribution of Rainwater Killifish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Floridichthys carpio (Goldspotted Killifish)

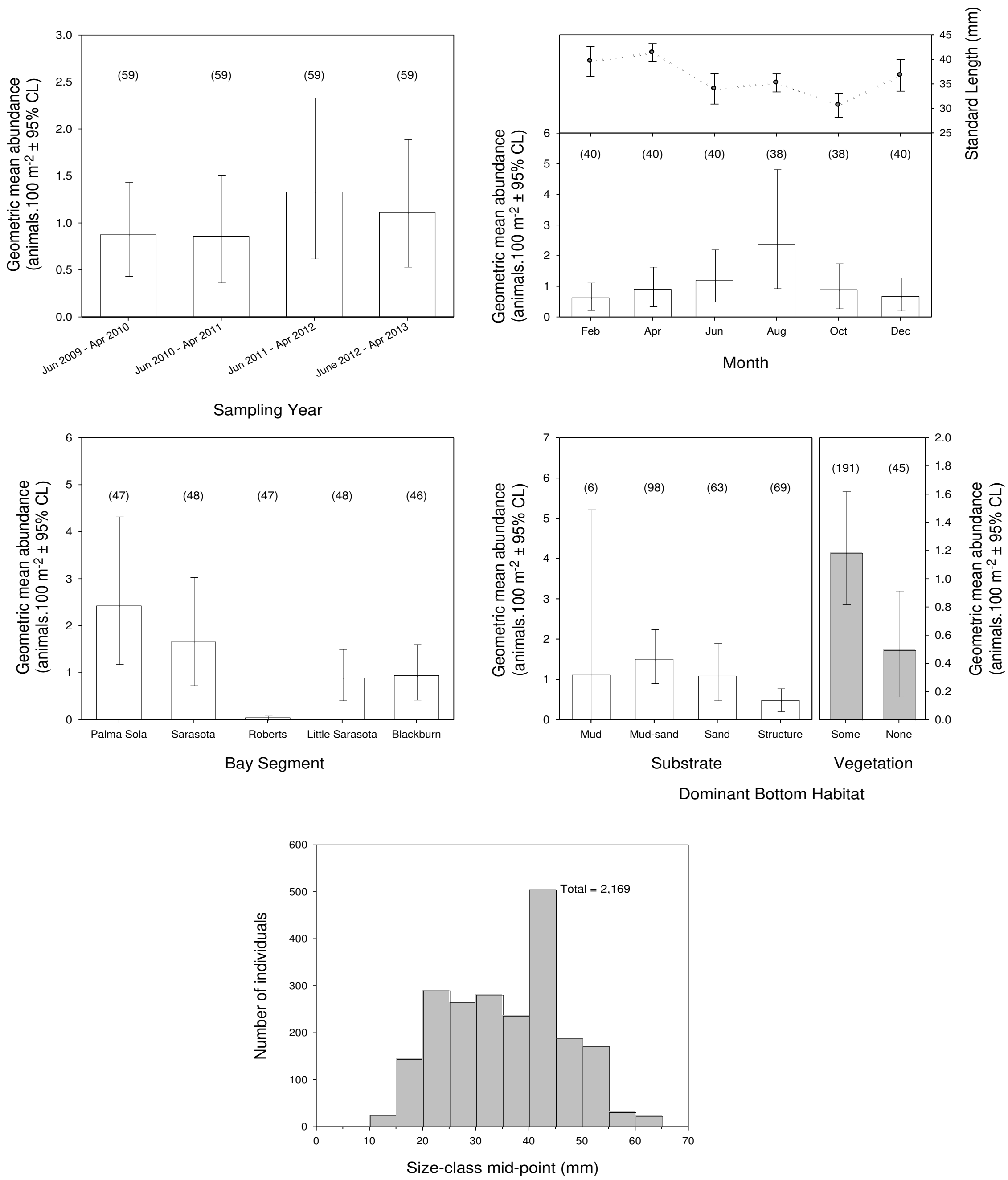

Fig. H6. Relative abundance and length-frequency distribution of Goldspotted Killifish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Syngnathus scovelli (Gulf Pipefish)

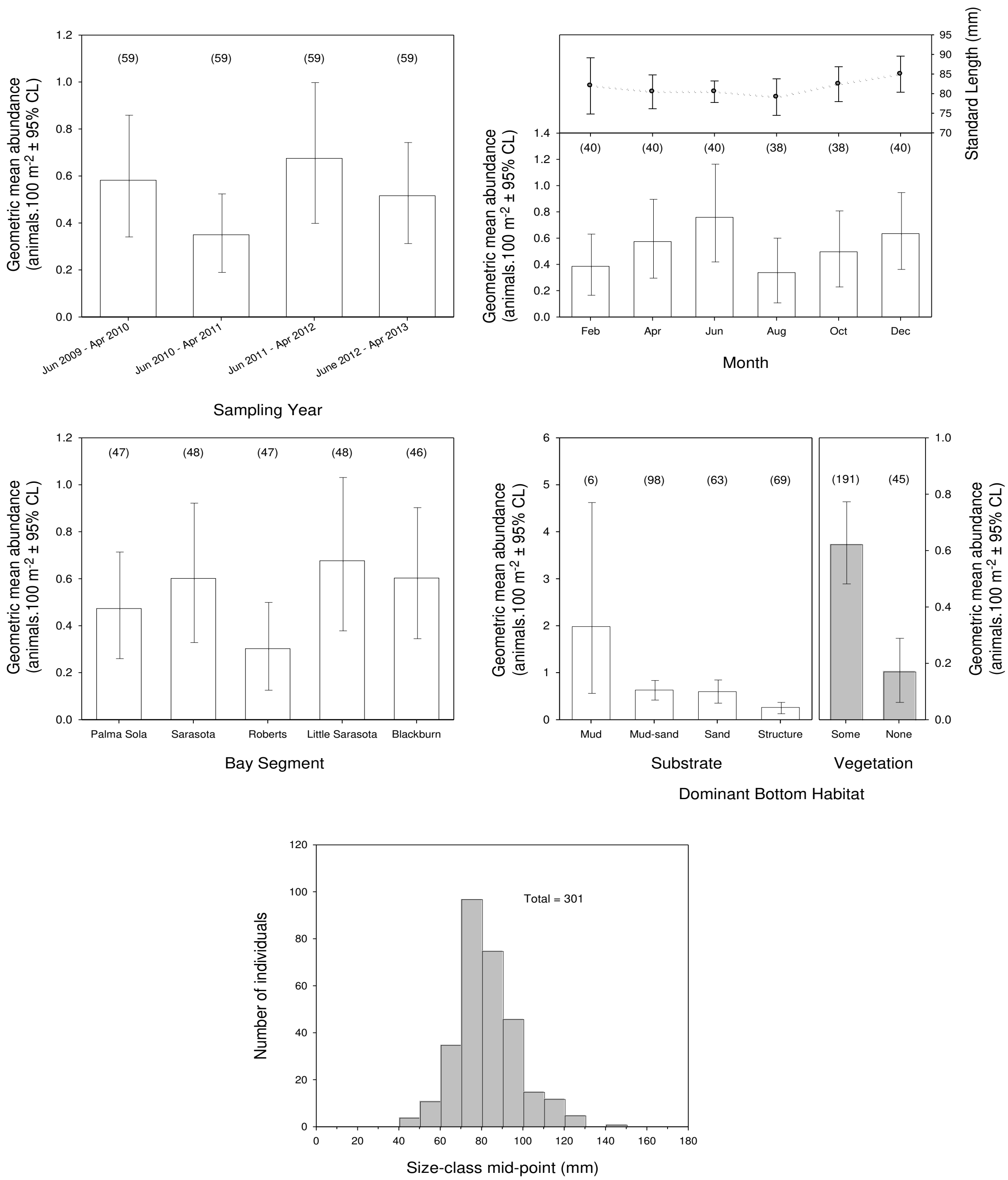

Fig. H7. Relative abundance and length-frequency distribution of Gulf Pipefish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Oligoplites saurus (Leatherjacket)

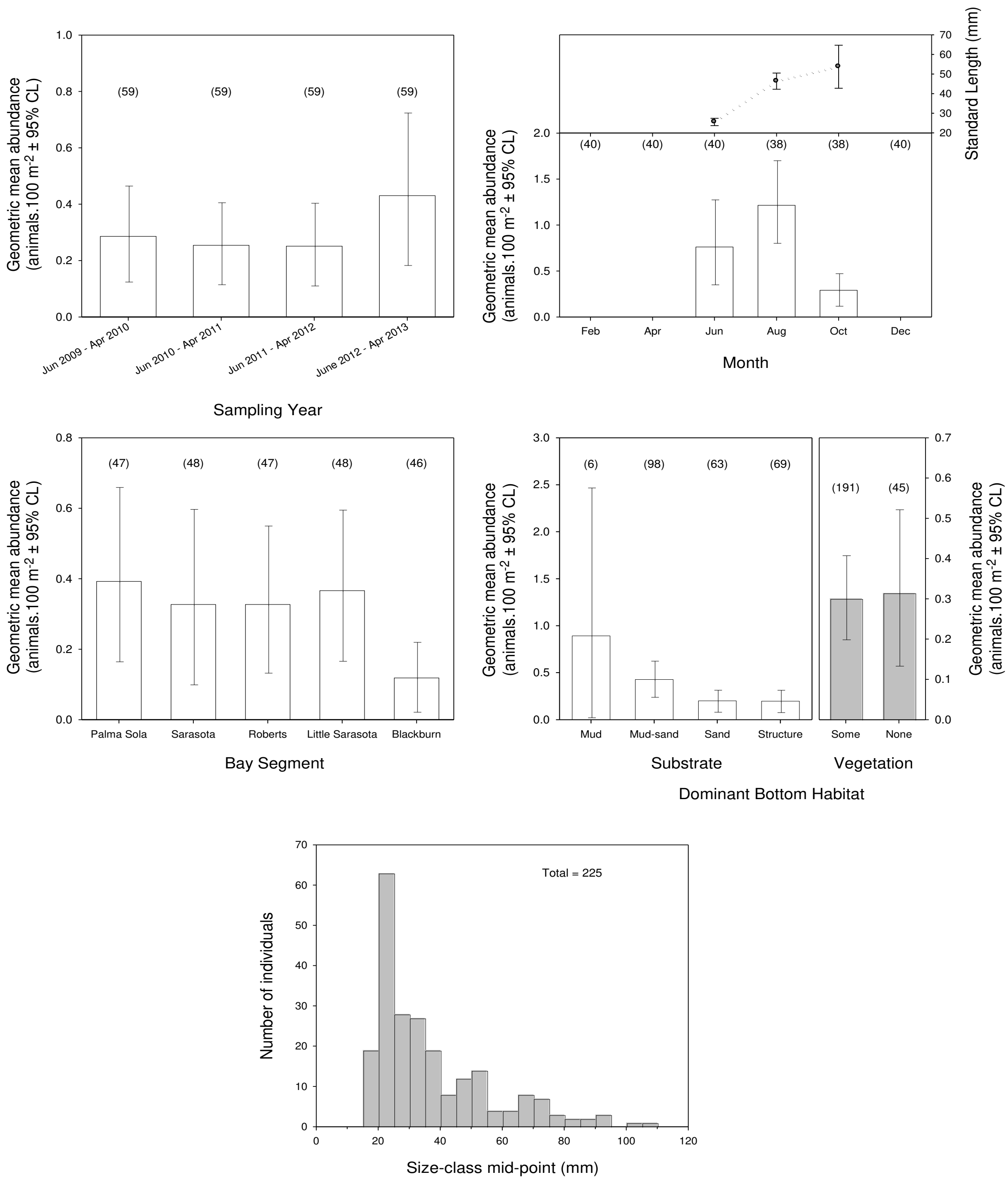

Fig. H8. Relative abundance and length-frequency distribution of Leatherjacket collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lutjanus griseus (Gray Snapper)

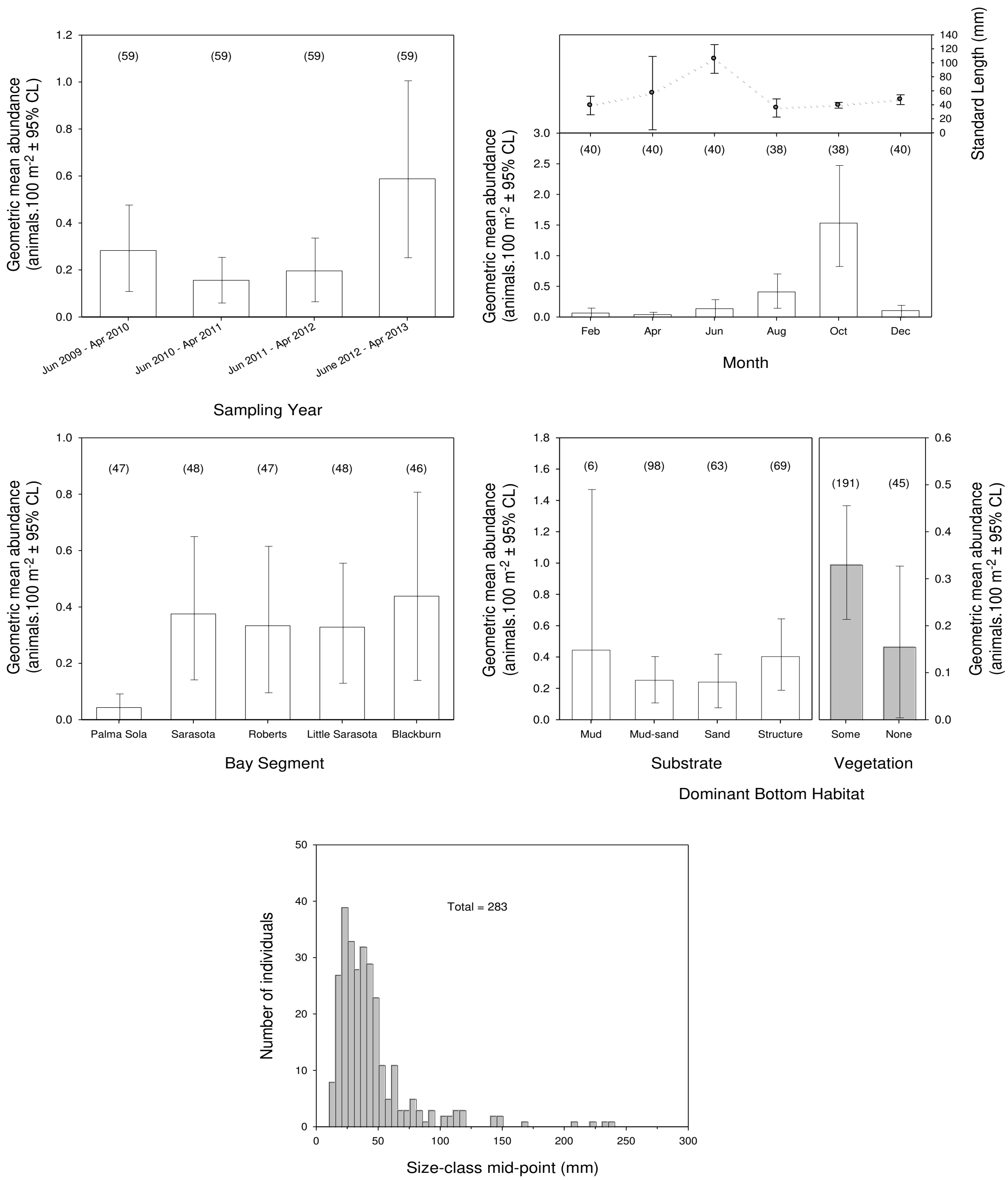

Fig. H9. Relative abundance and length-frequency distribution of Gray Snapper collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus gula (Silver Jenny)

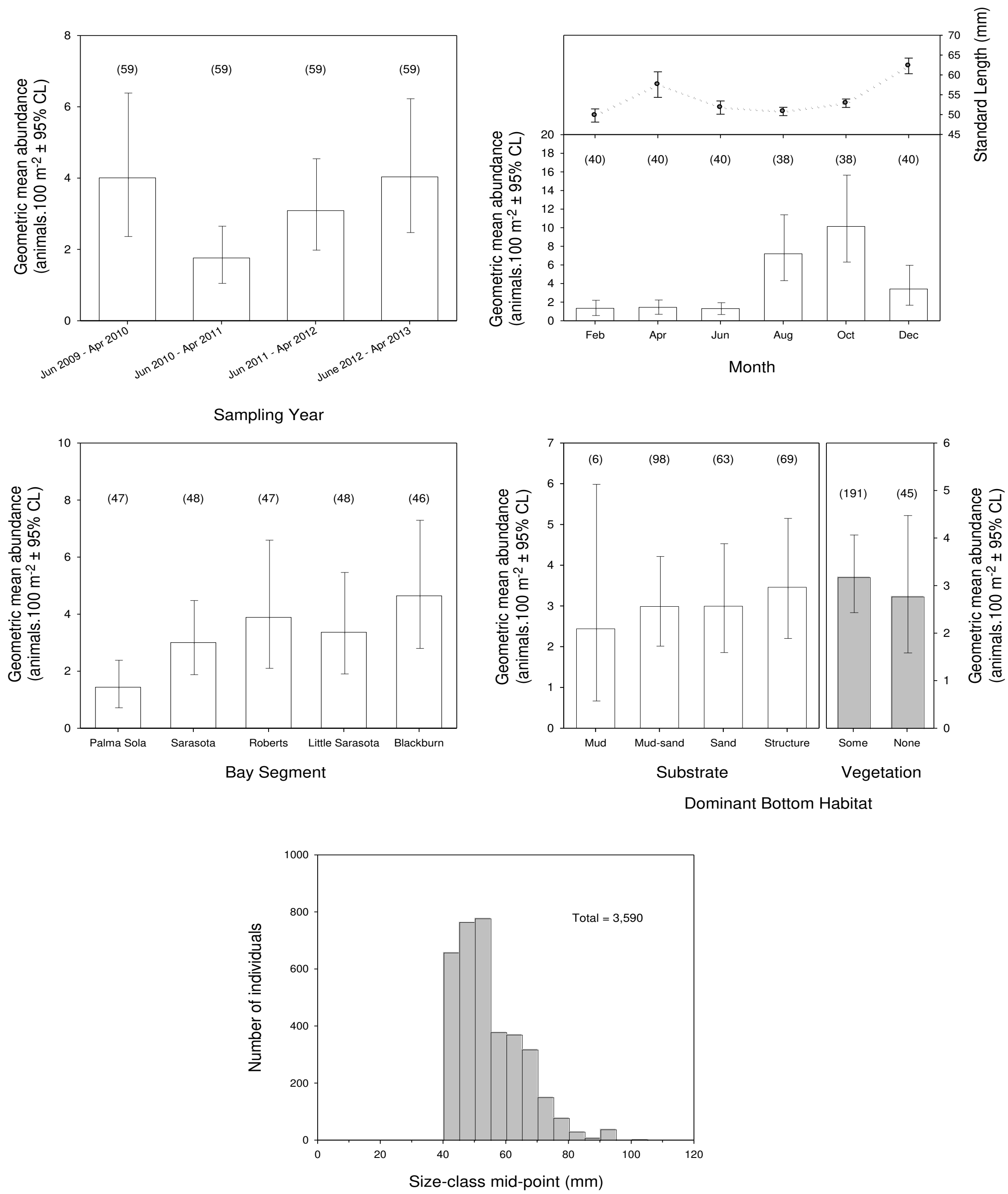

Fig. H10. Relative abundance and length-frequency distribution of Silver Jenny collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus harengulus (Tidewater Mojarra)

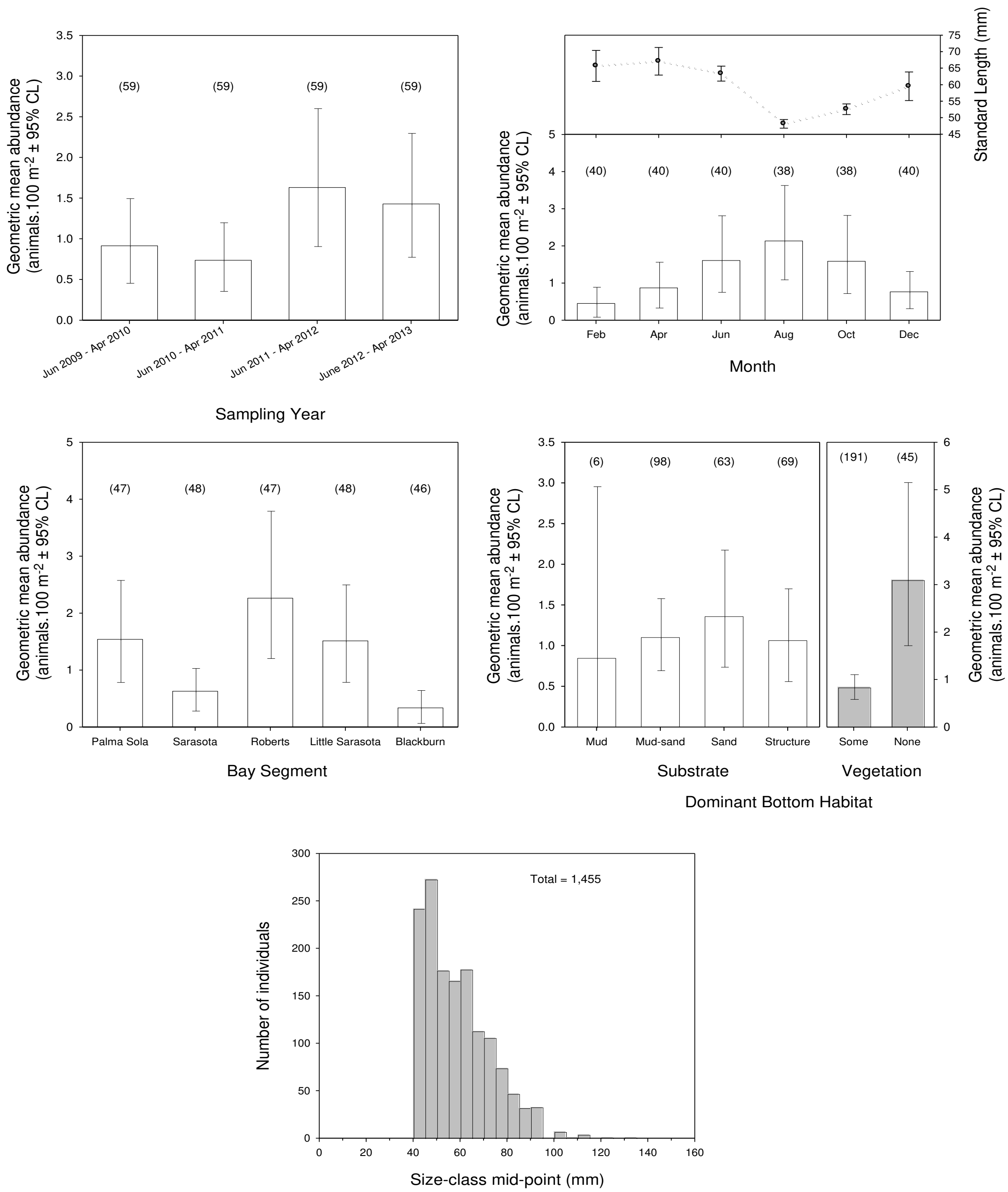

Fig. H11. Relative abundance and length-frequency distribution of Tidewater Mojarra collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Orthopristis chrysoptera (Pigfish)

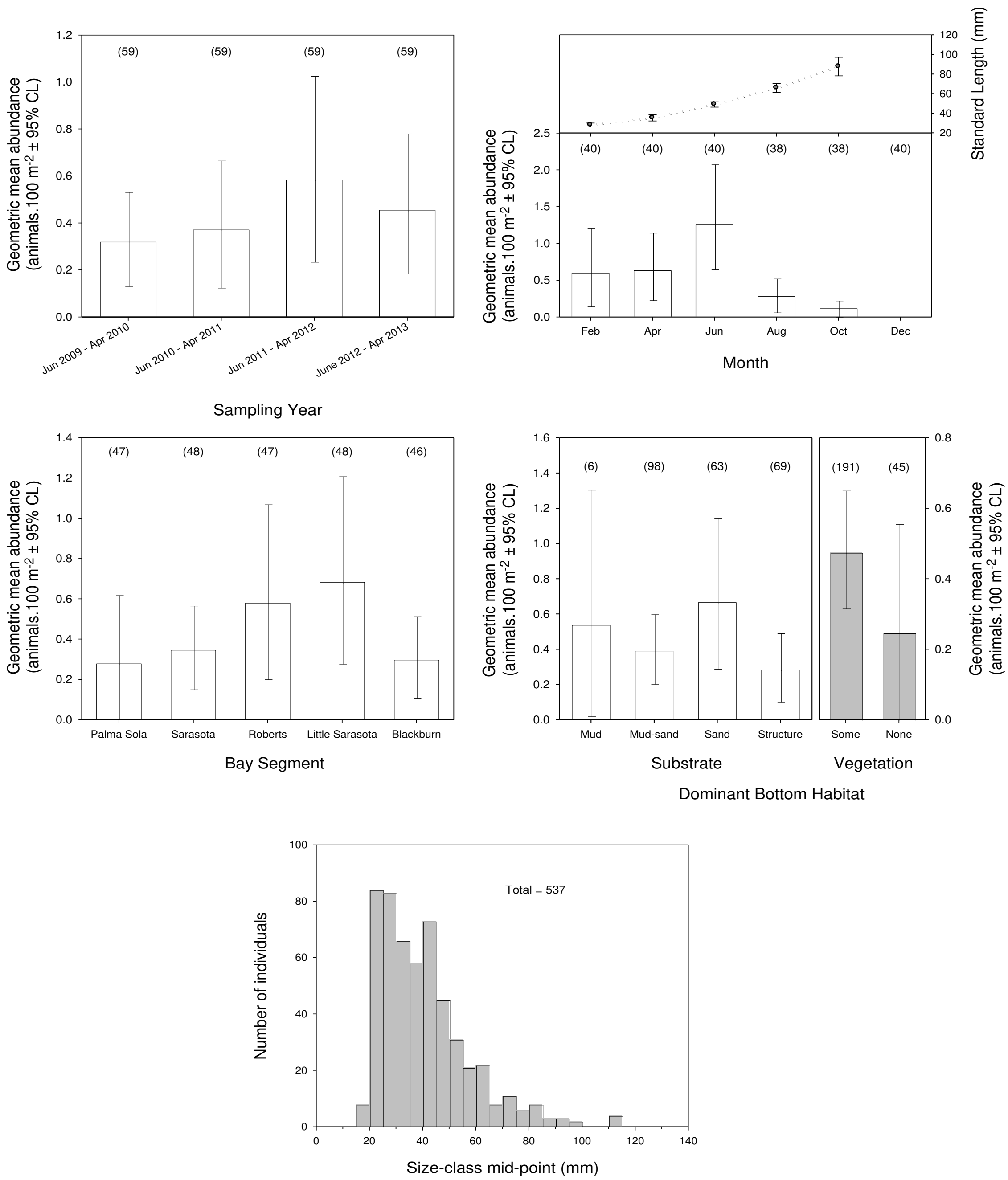

Fig. H12. Relative abundance and length-frequency distribution of Pigfish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

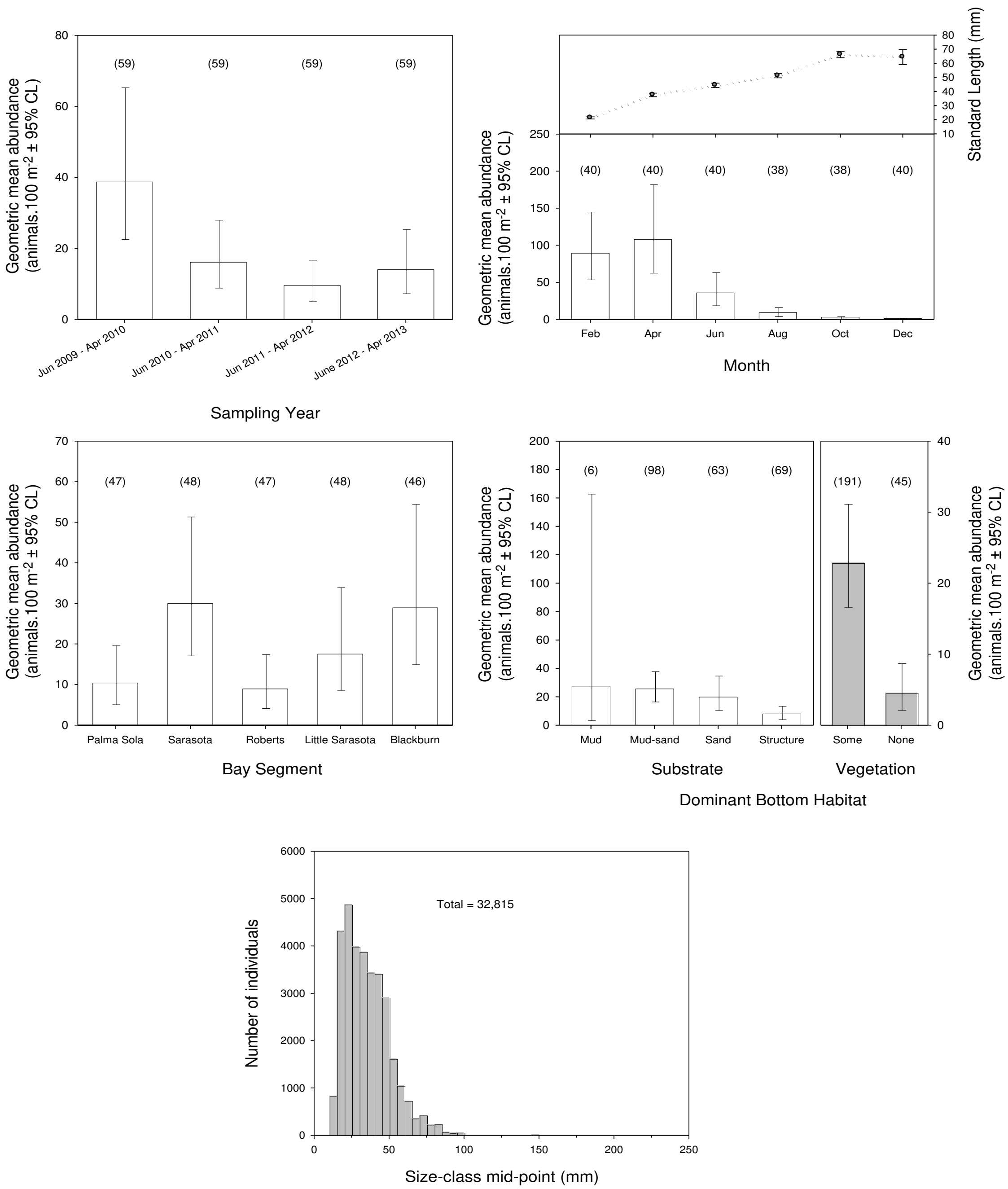

Fig. H13. Relative abundance and length-frequency distribution of Pinfish collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Cynoscion nebulosus (Spotted Seatrout)

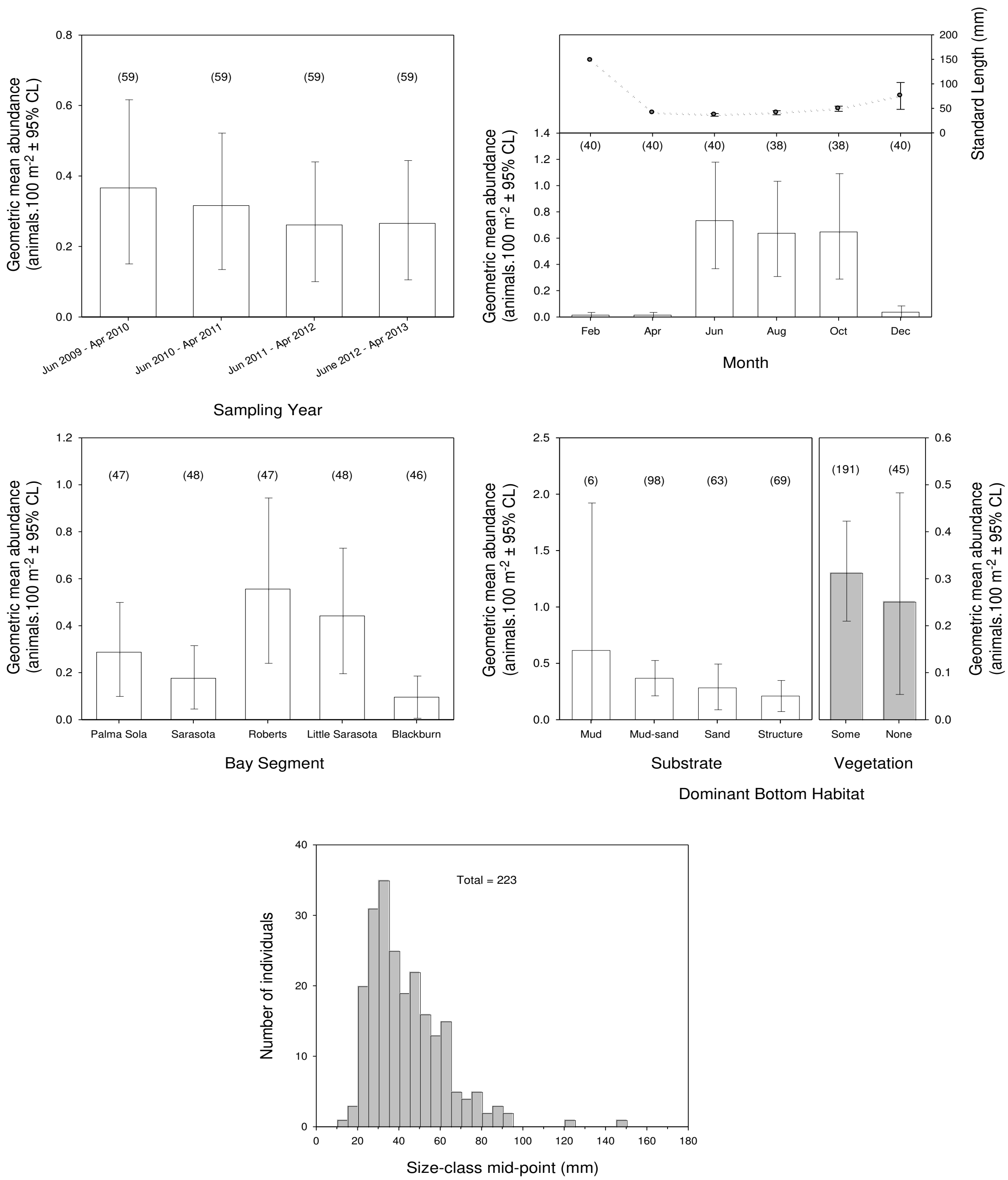

Fig. H14. Relative abundance and length-frequency distribution of Spotted Seatrout collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Bairdiella chrysoura (Silver Perch)

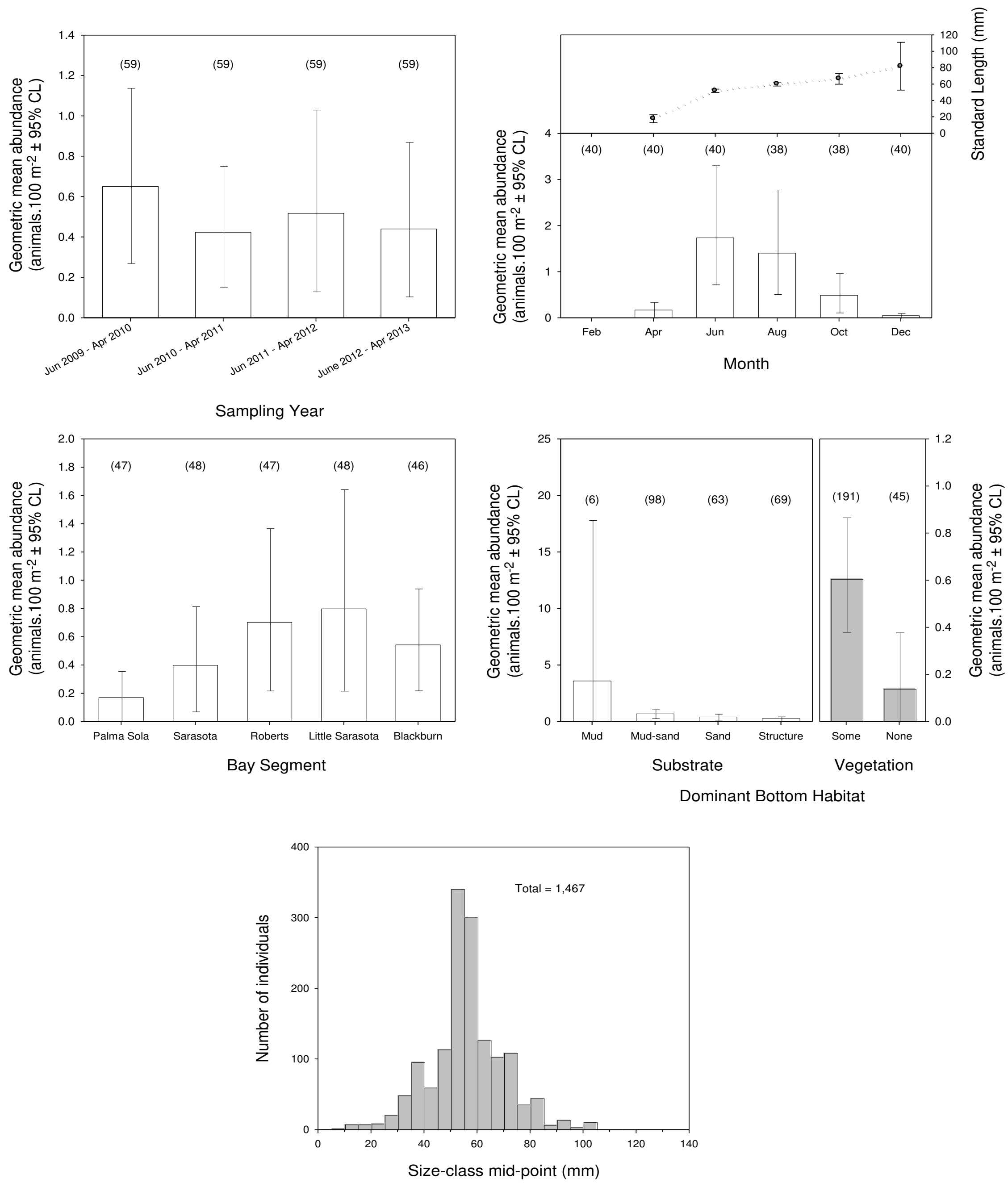

Fig. H15. Relative abundance and length-frequency distribution of Silver Perch collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Leiostomus xanthurus (Spot)

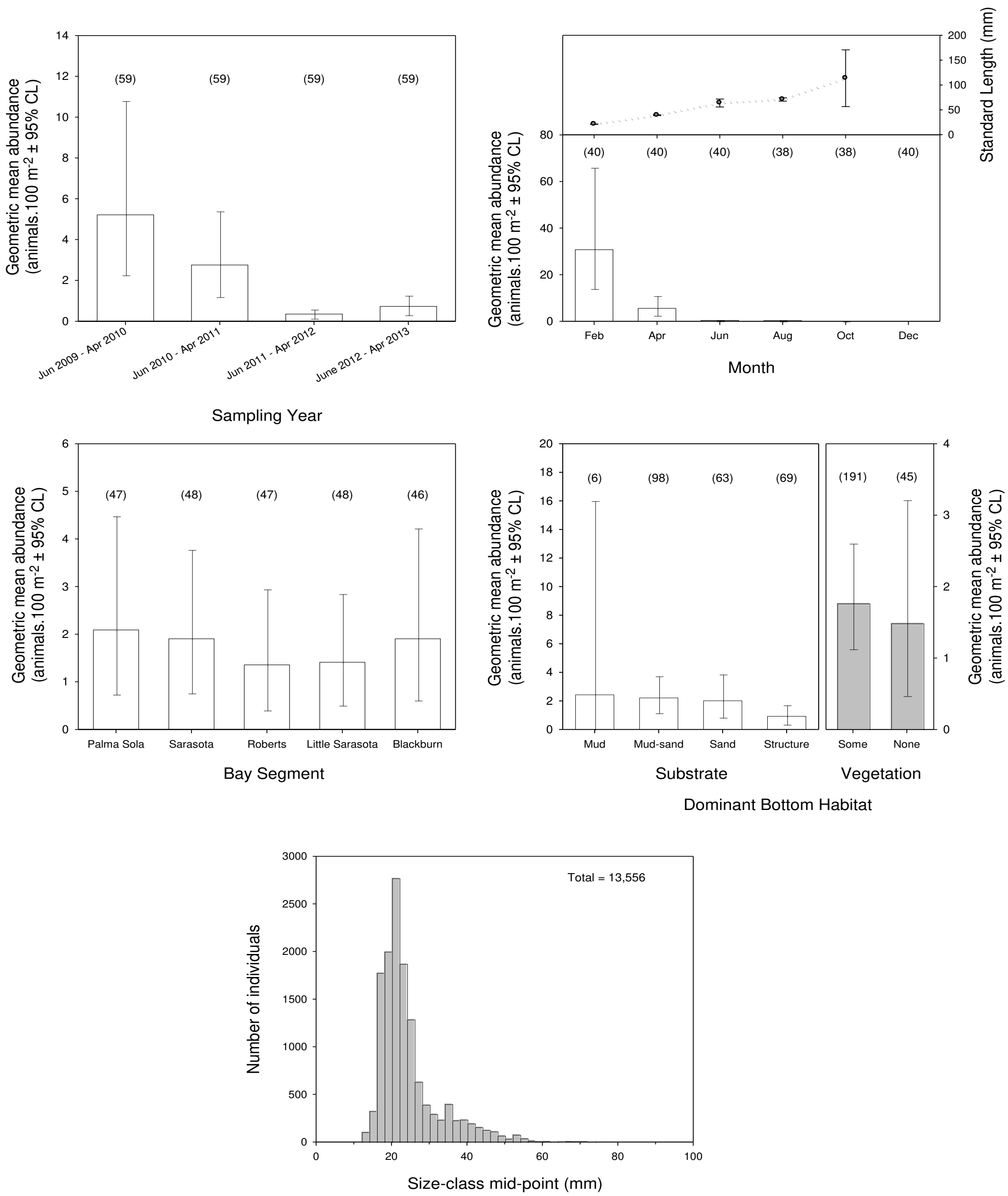

Fig. H16. Relative abundance and length-frequency distribution of Spot collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Sciaenops ocellatus (Red Drum)

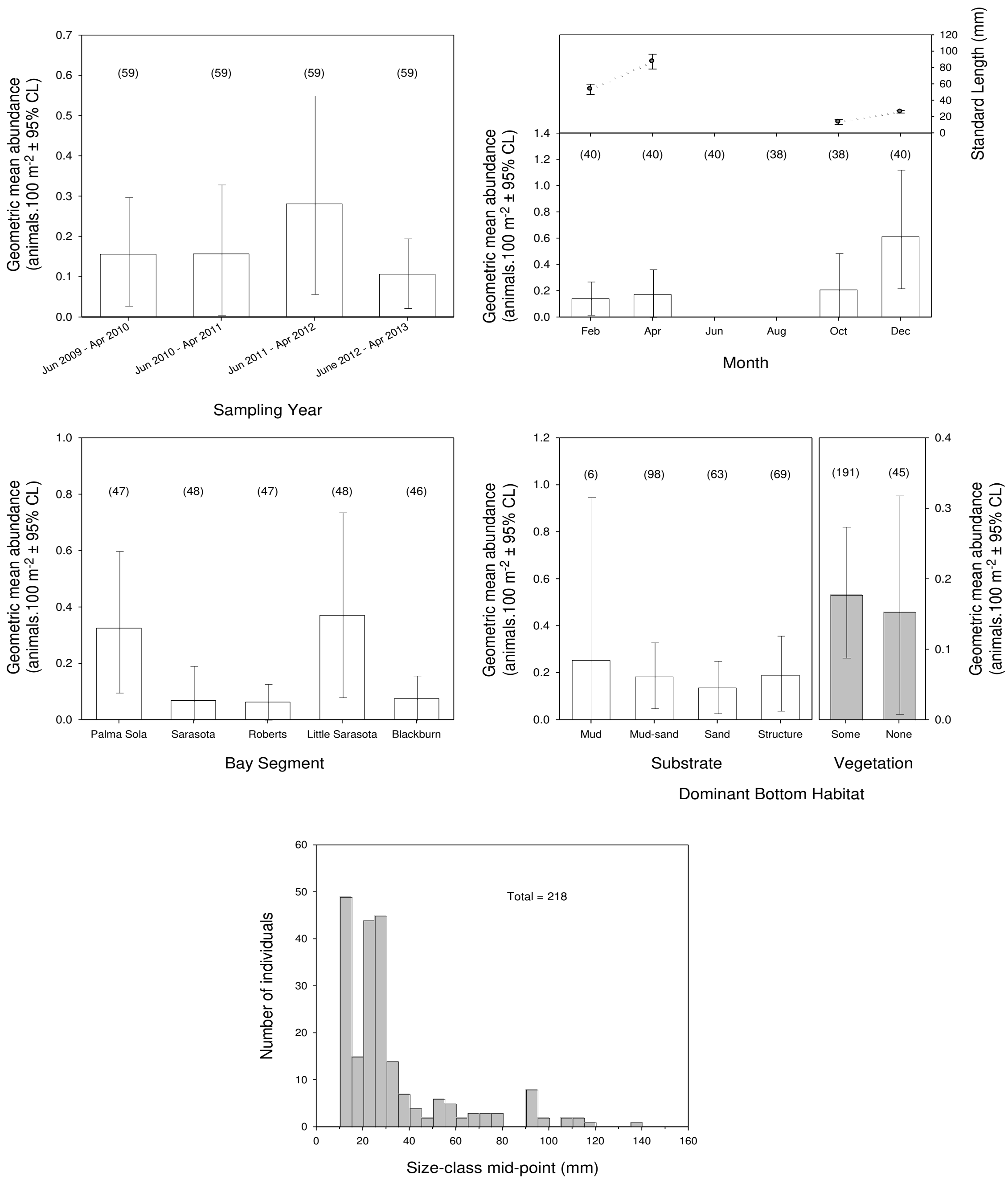

Fig. H17. Relative abundance and length-frequency distribution of Red Drum collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Mugil cephalus (Striped Mullet)

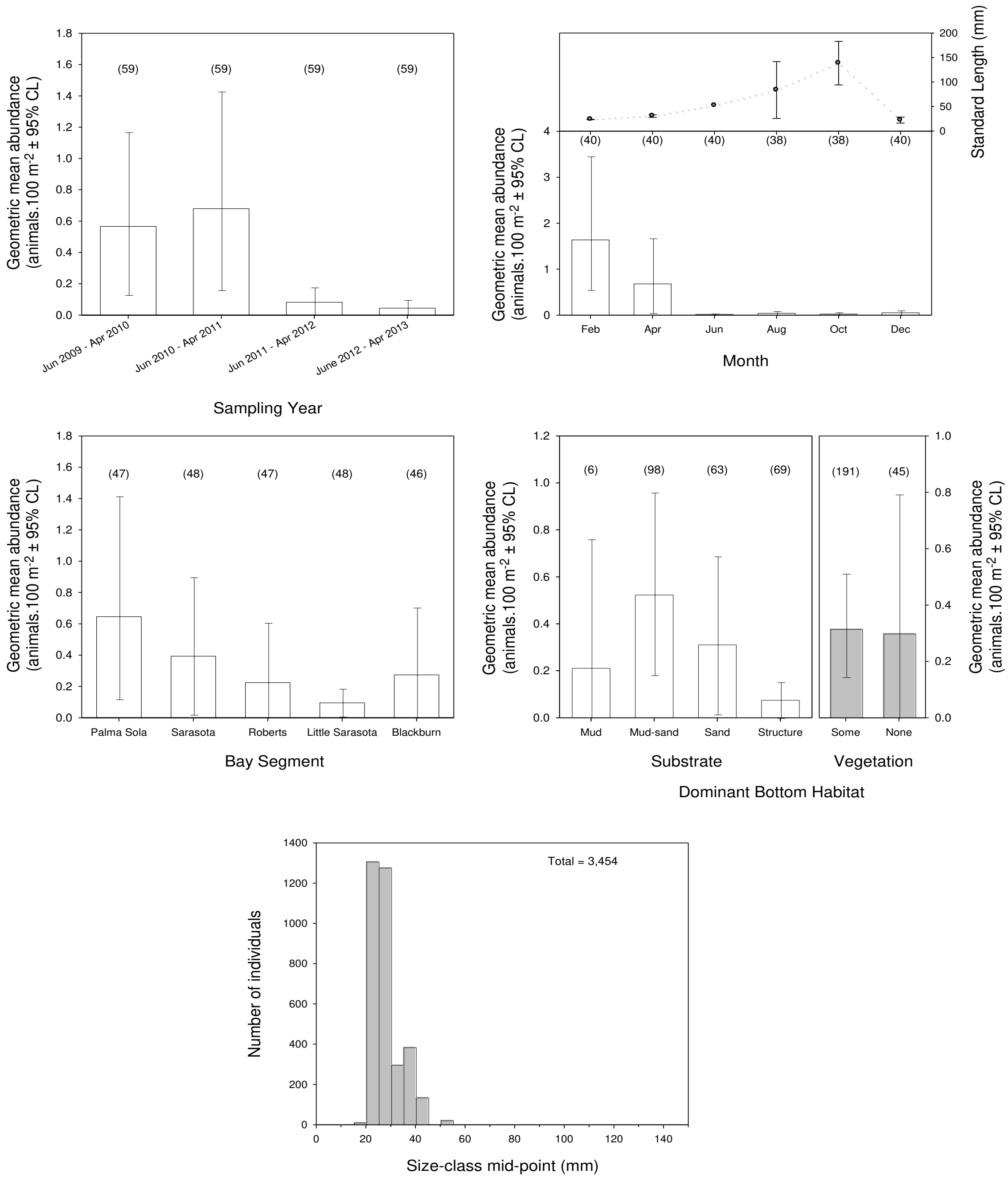

Fig. H18. Relative abundance and length-frequency distribution of Striped Mullet collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Gobiosoma robustum (Code Goby)

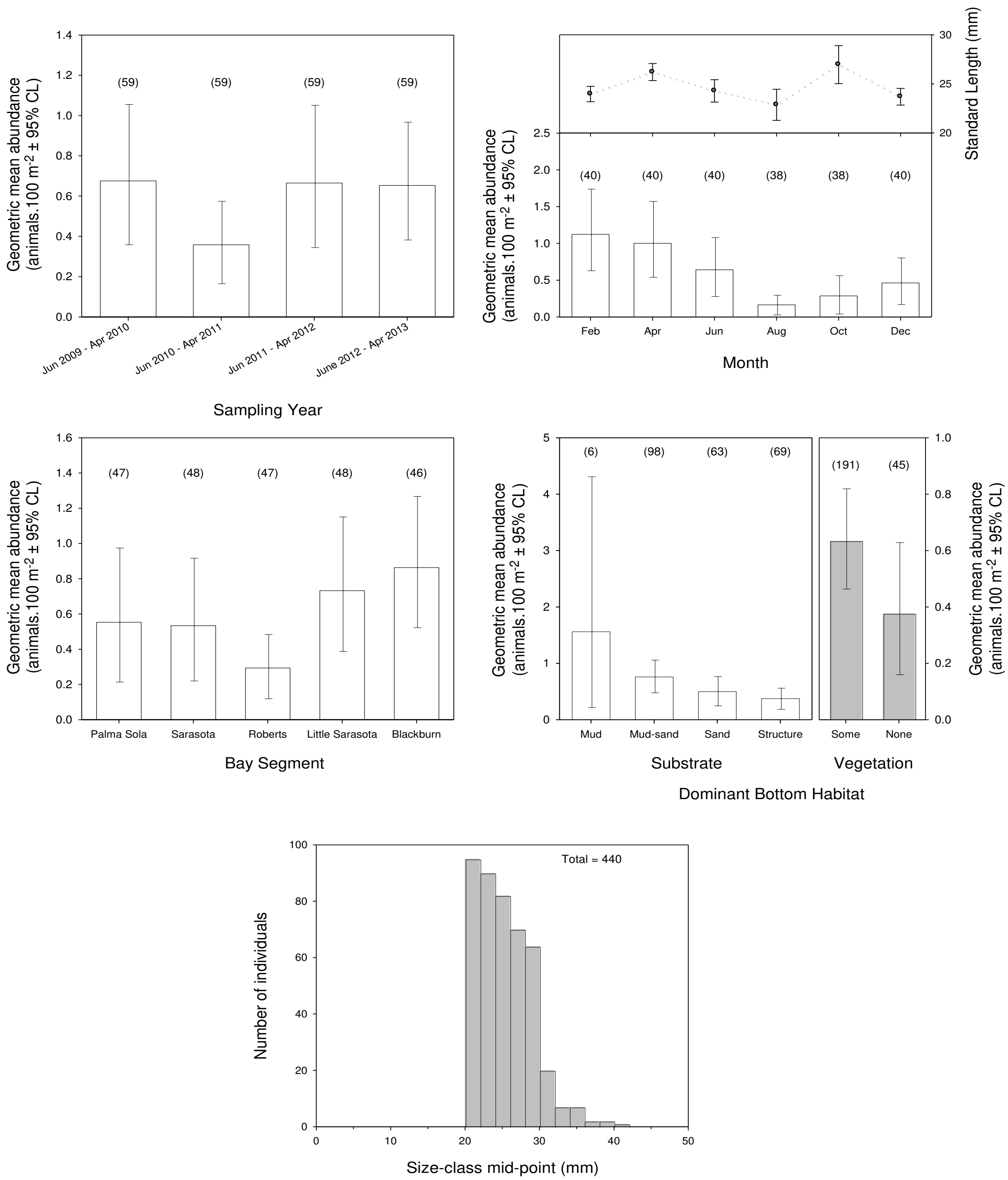

Fig. H19. Relative abundance and length-frequency distribution of Code Goby collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Microgobius gulosus (Clown Goby)

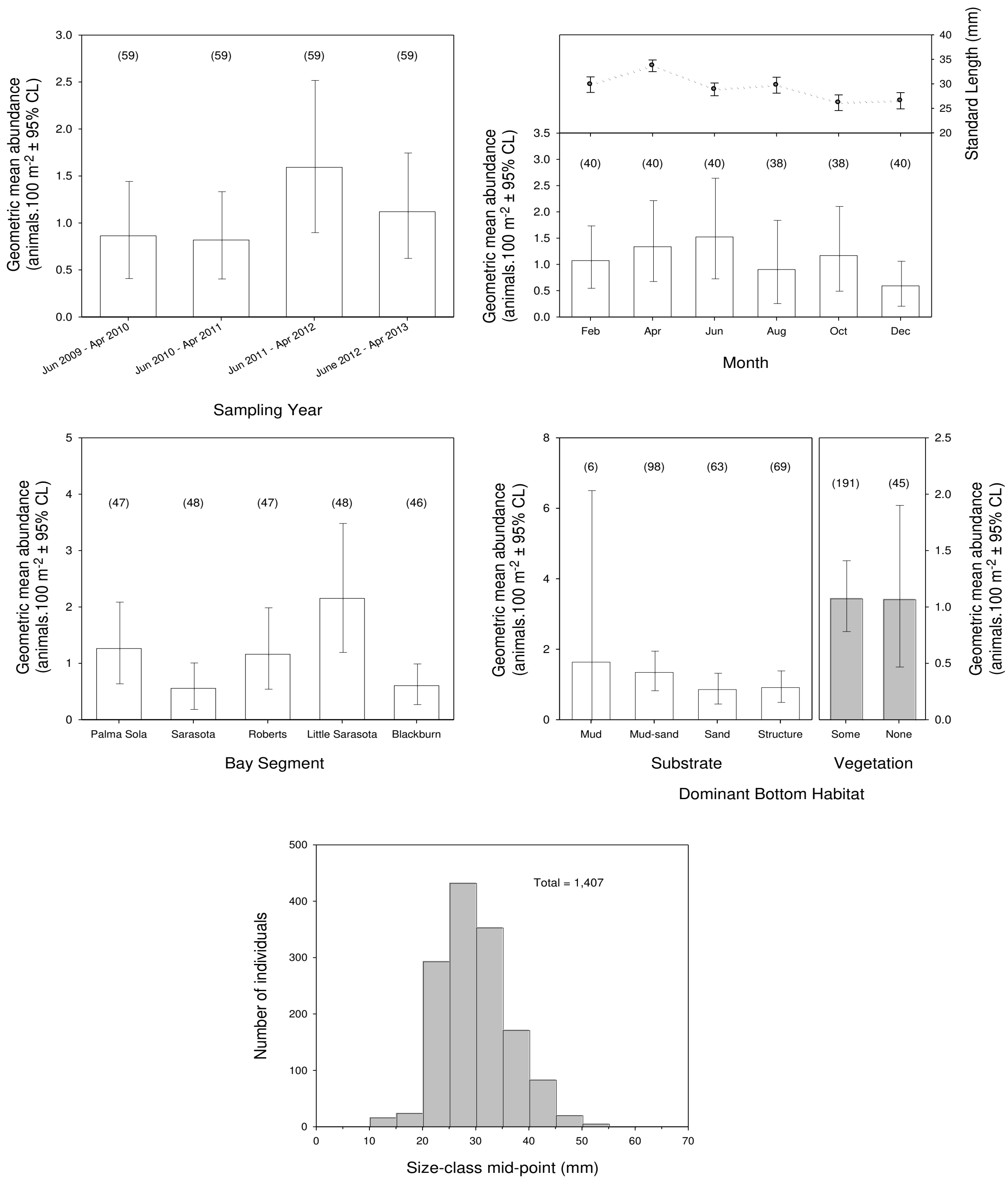

Fig. H20. Relative abundance and length-frequency distribution of Clown Goby collected with 21.3-m shoreline seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Appendix I. Species overview plots for dominant taxa (≥200 animals collected and ≥10 occurrence in a gear type) collected in 21.3-m offshore seines in Sarasota Bay, June 2009 to April 2013. Taxa are arranged phylogenetically.

Farfantepenaeus duorarum (Pink Shrimp)

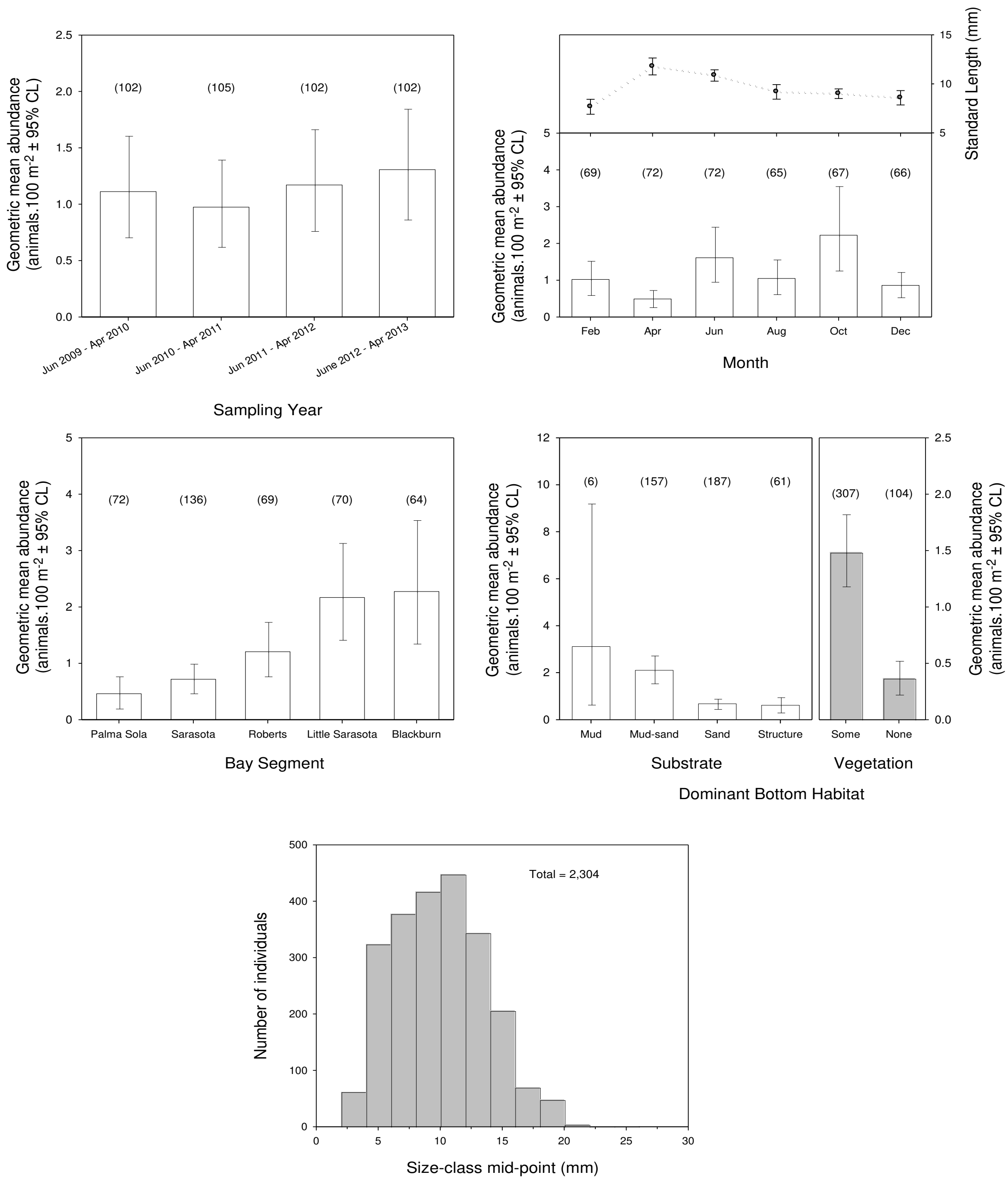

Fig. I1. Relative abundance and length-frequency distribution of Pink Shrimp collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Harengula jaguana (Scaled Sardine)

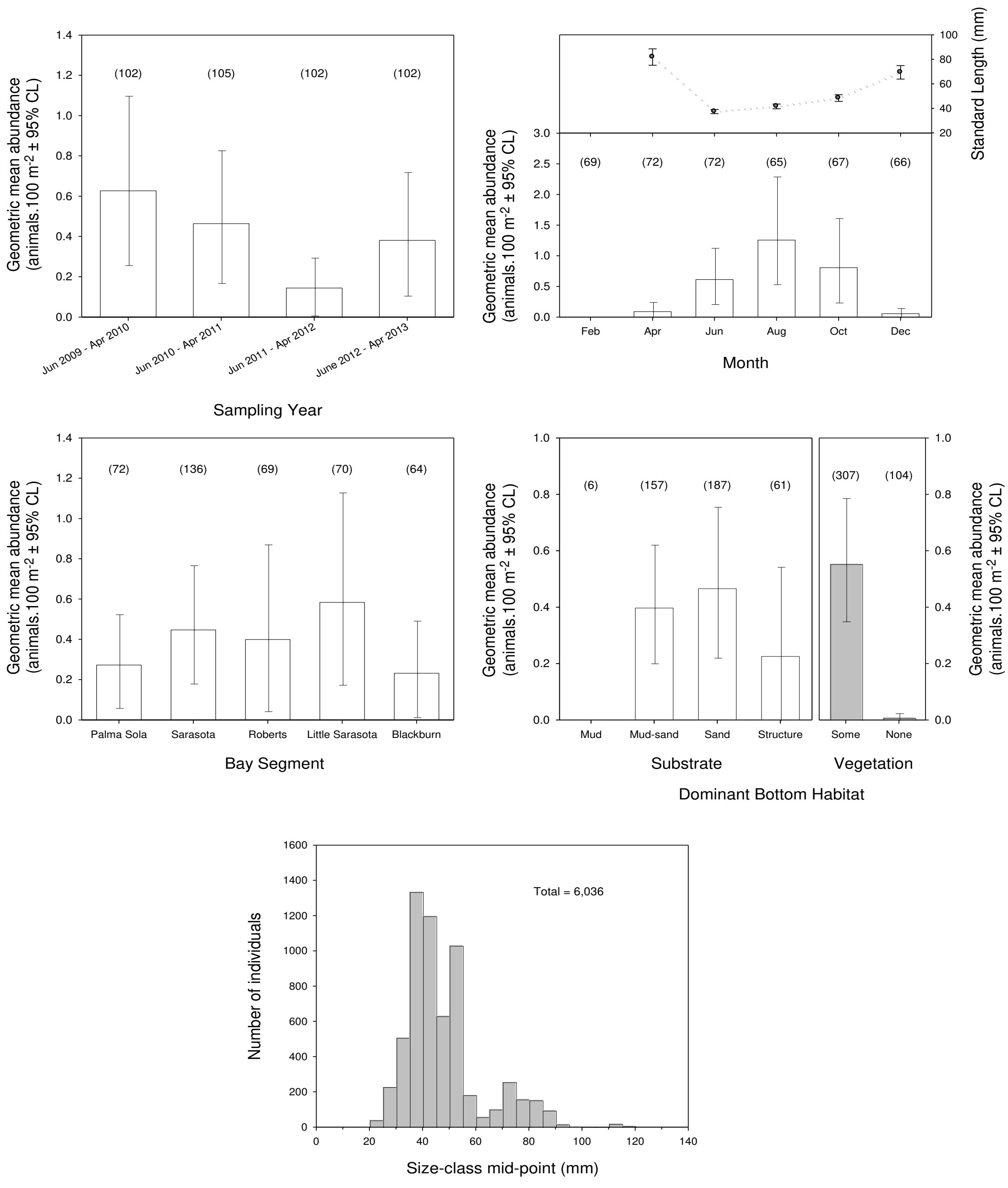

Fig. I2. Relative abundance and length-frequency distribution of Scaled Sardine collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Anchoa mitchilli (Bay Anchovy)

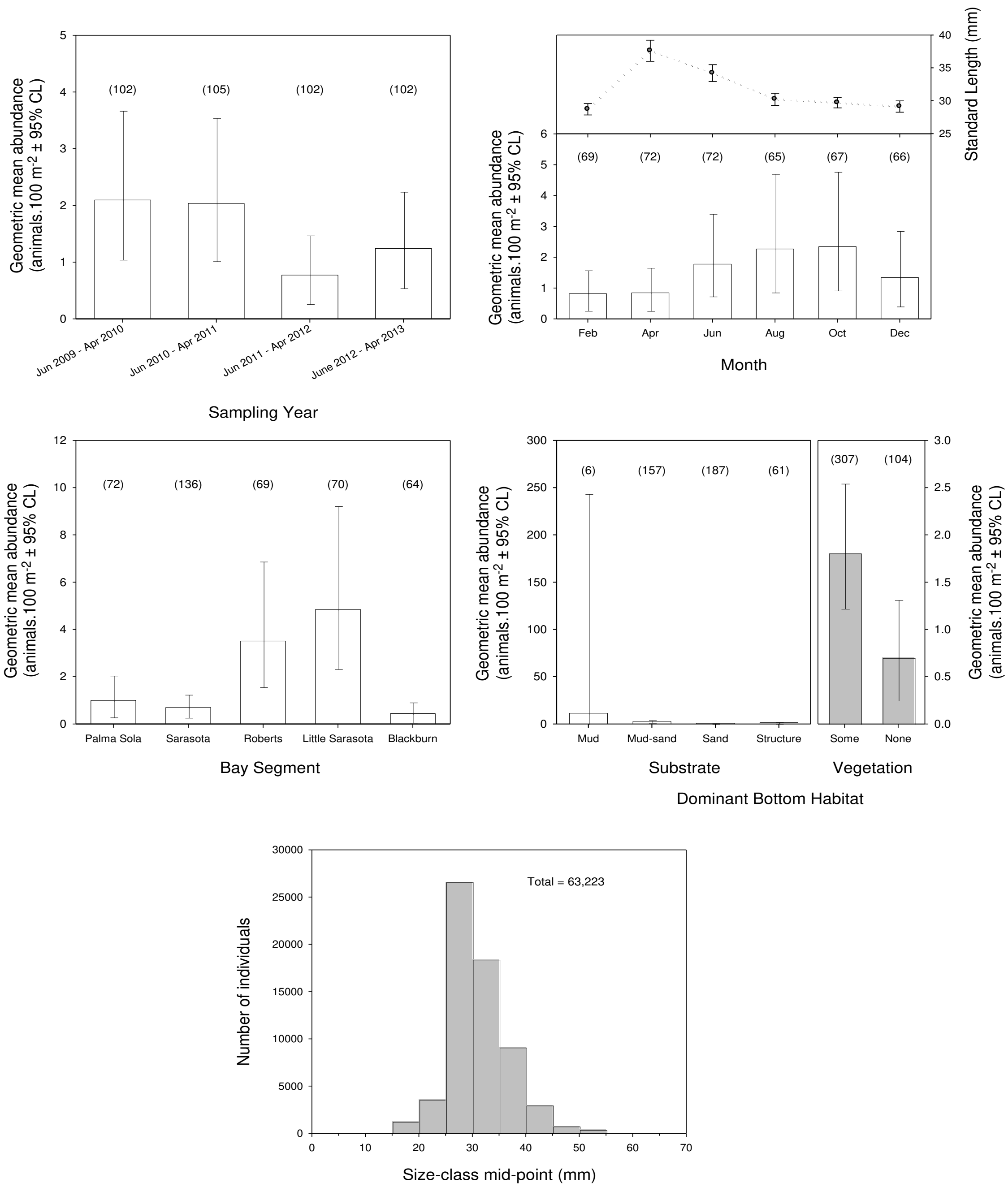

Fig. I3. Relative abundance and length-frequency distribution of Bay Anchovy collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lucania parva (Rainwater Killifish)

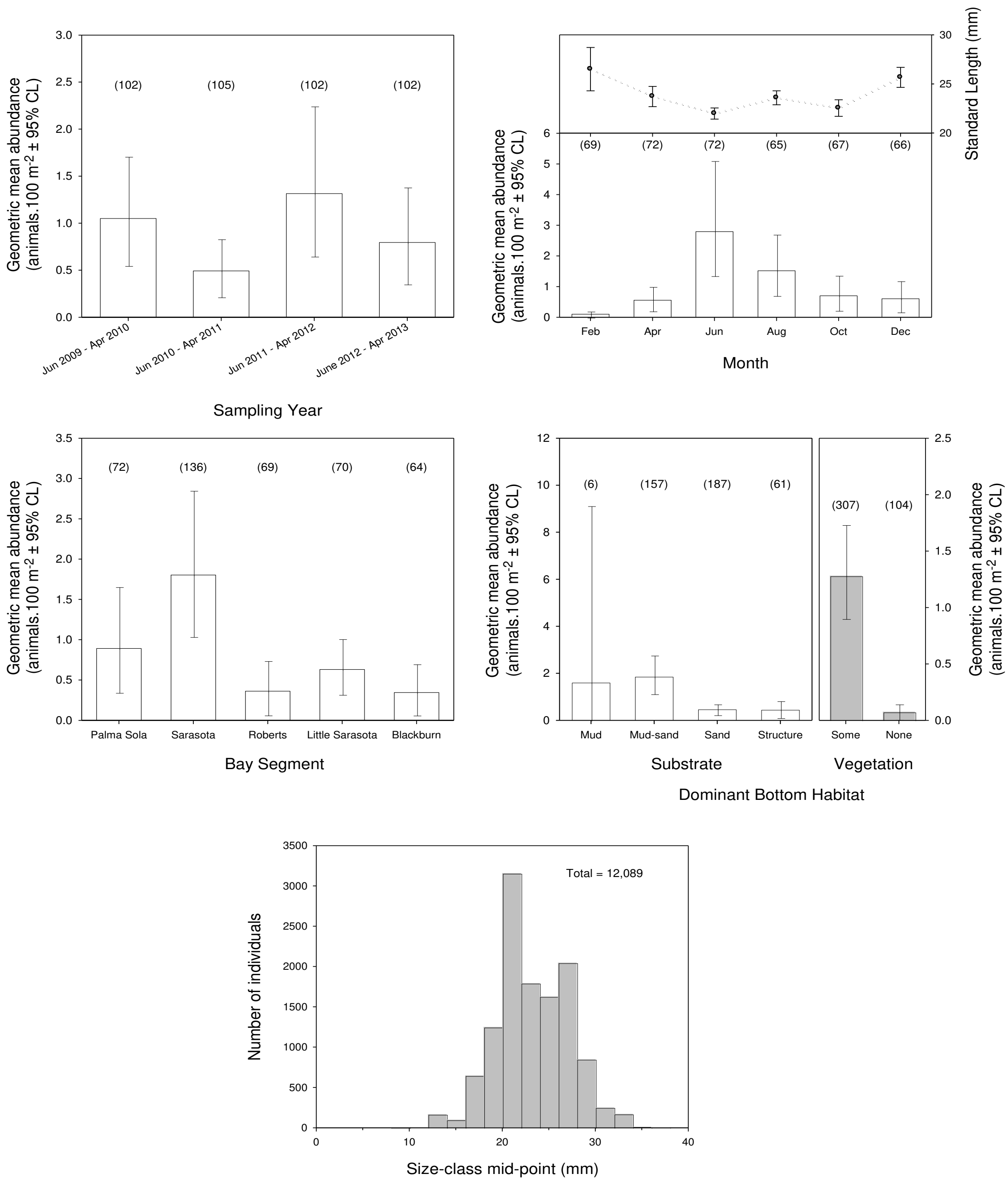

Fig. I4. Relative abundance and length-frequency distribution of Rainwater Killifish collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Syngnathus scovelli (Gulf Pipefish)

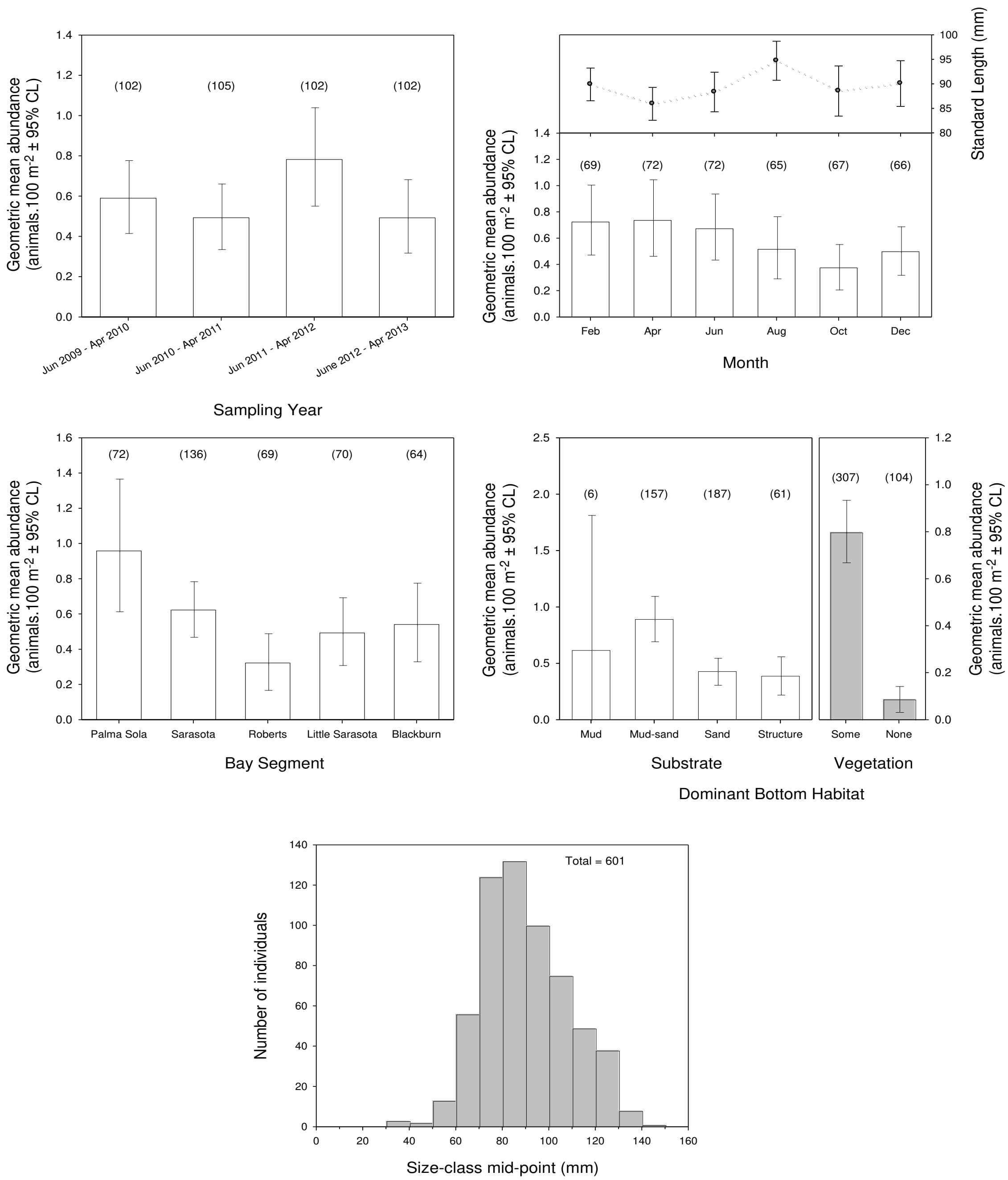

Fig. I5. Relative abundance and length-frequency distribution of Gulf Pipefish collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lutjanus griseus (Gray Snapper)

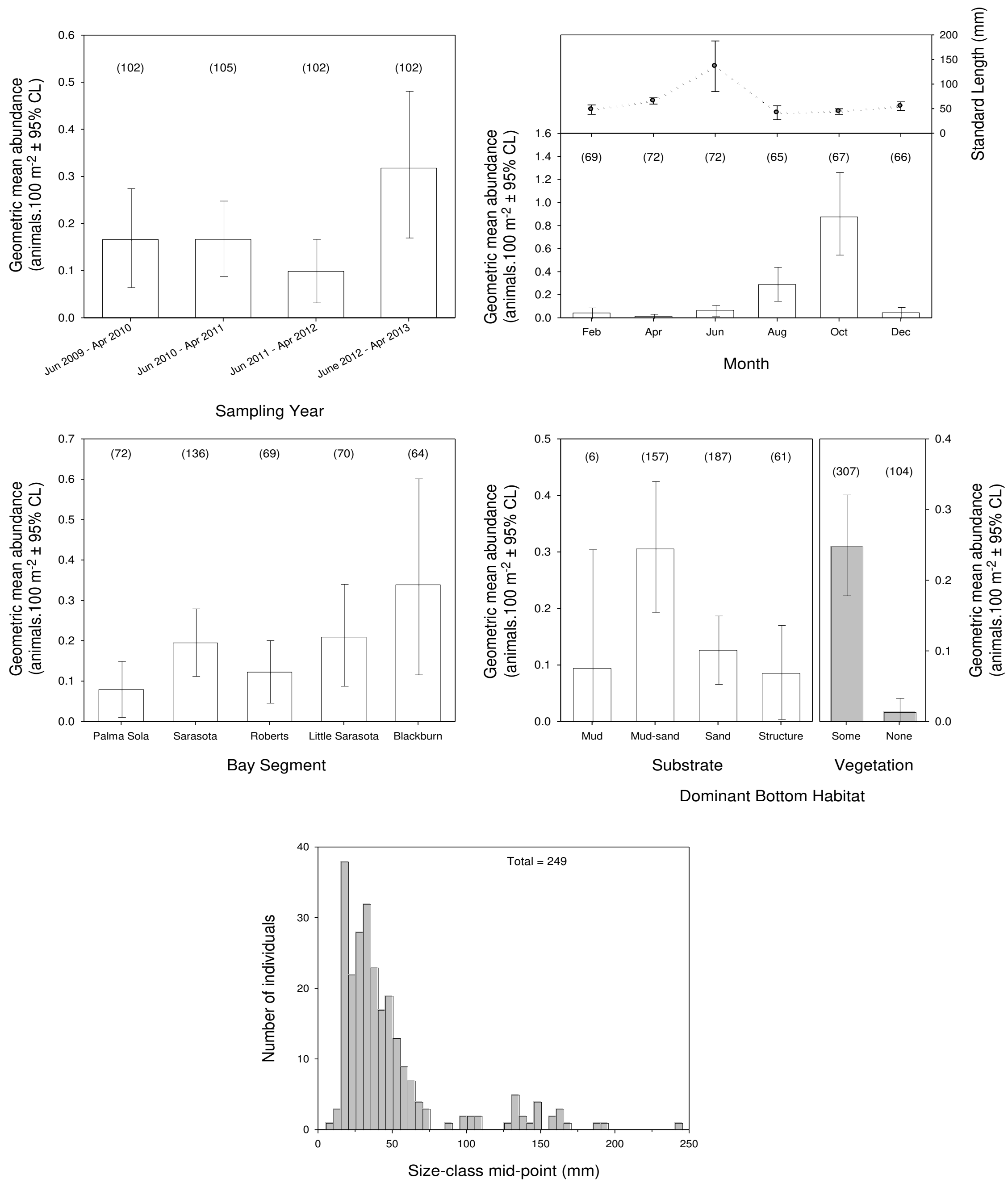

Fig. I6. Relative abundance and length-frequency distribution of Gray Snapper collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus gula (Silver Jenny)

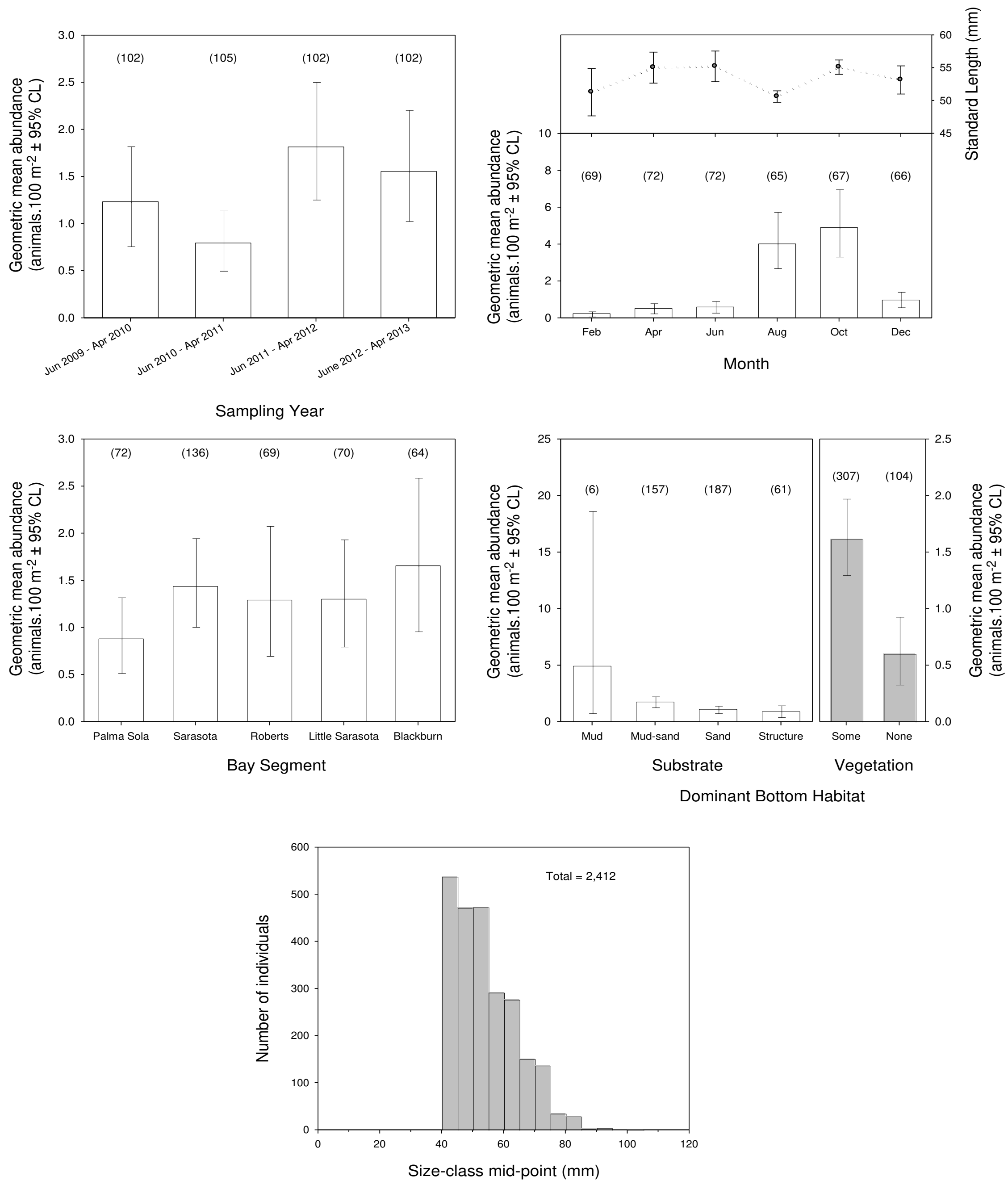

Fig. I7. Relative abundance and length-frequency distribution of Silver Jenny collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus harengulus (Tidewater Mojarra)

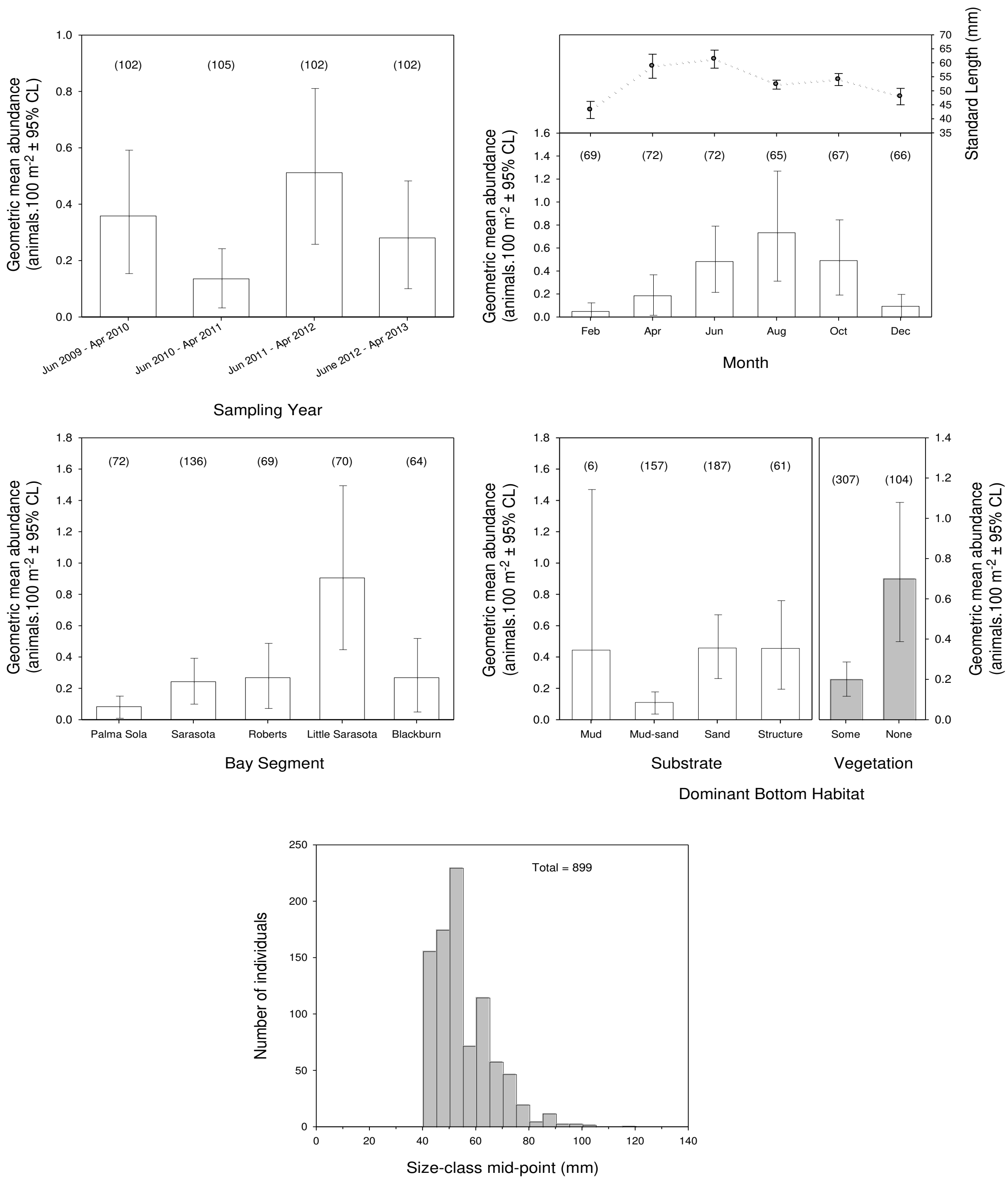

Fig. I8. Relative abundance and length-frequency distribution of Tidewater Mojarra collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Orthopristis chrysoptera (Pigfish)

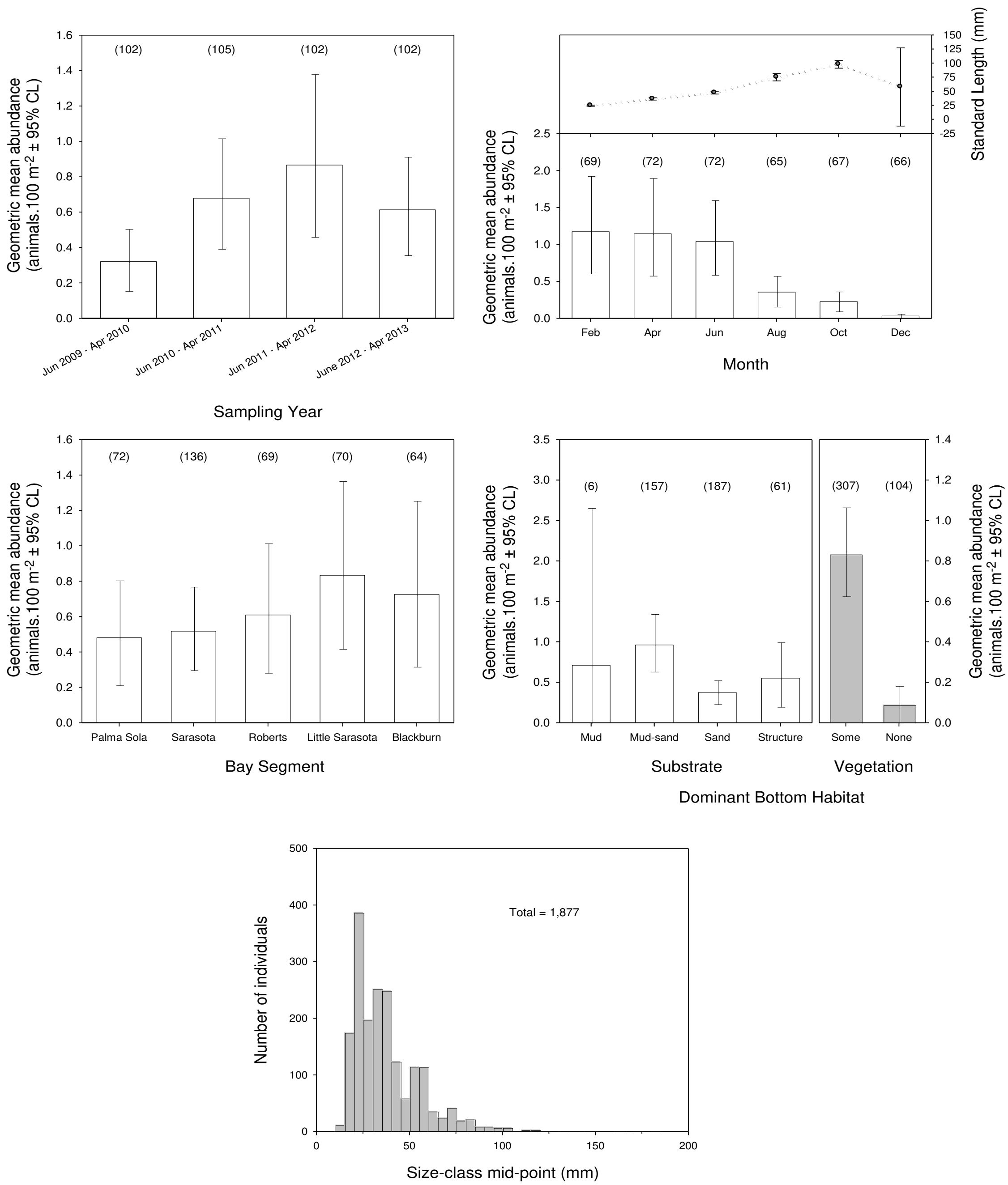

Fig. I9. Relative abundance and length-frequency distribution of Pigfish collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

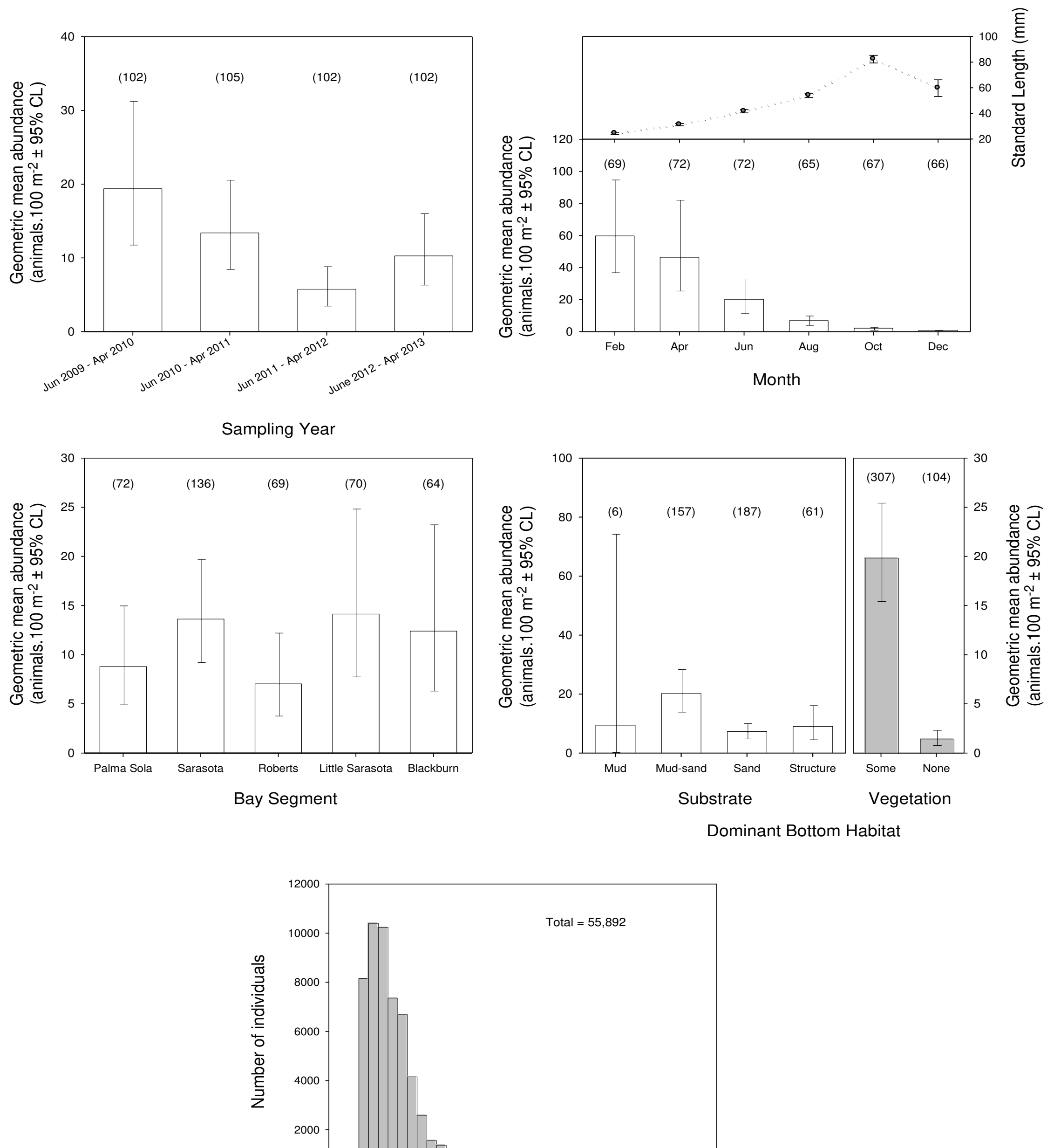

Fig. I10. Relative abundance and length-frequency distribution of Pinfish collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Cynoscion nebulosus (Spotted Seatrout)

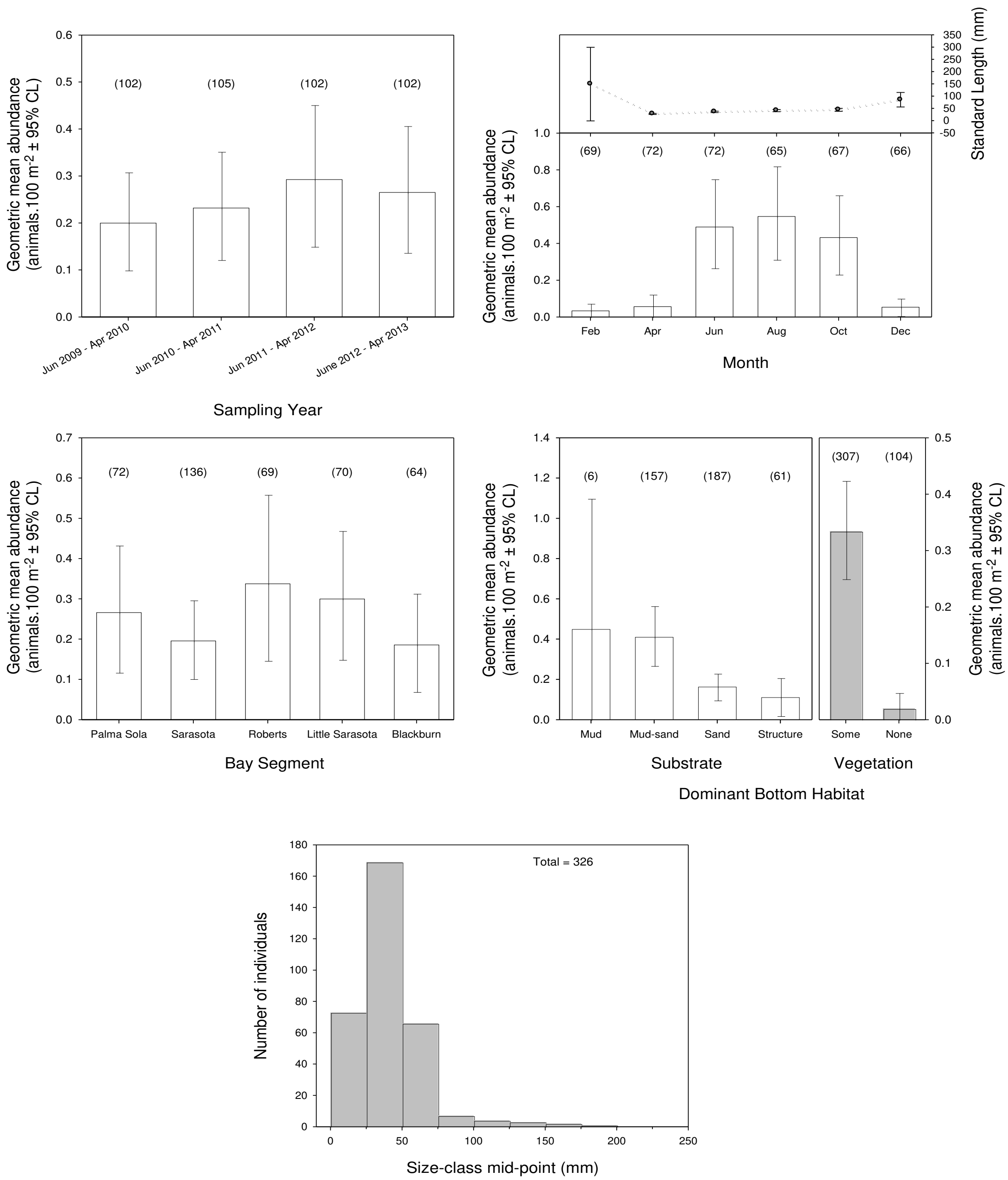

Fig. I11. Relative abundance and length-frequency distribution of Spotted Seatrout collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Bairdiella chrysoura (Silver Perch)

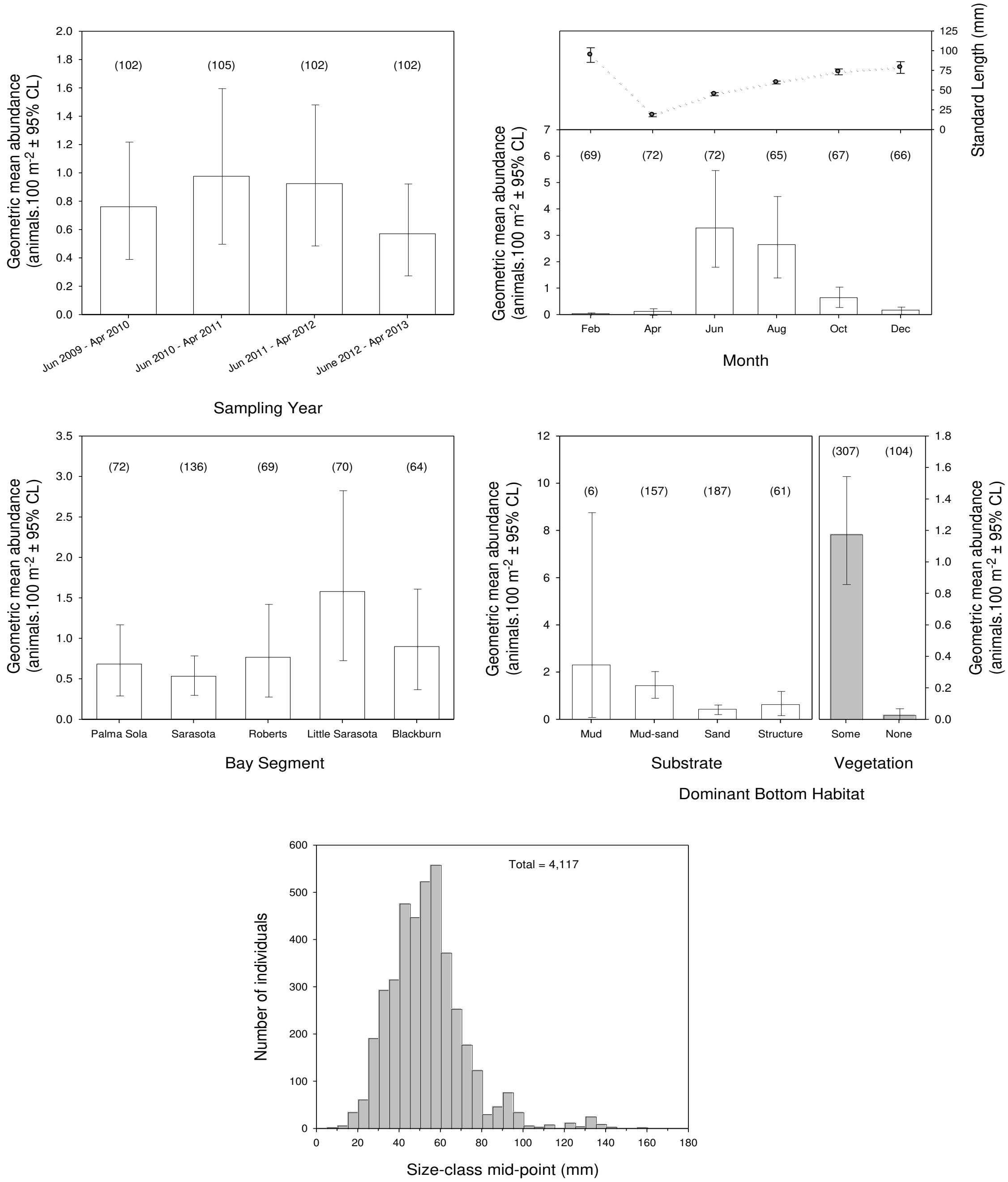

Fig. I12. Relative abundance and length-frequency distribution of Silver Perch collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Leiostomus xanthurus (Spot)

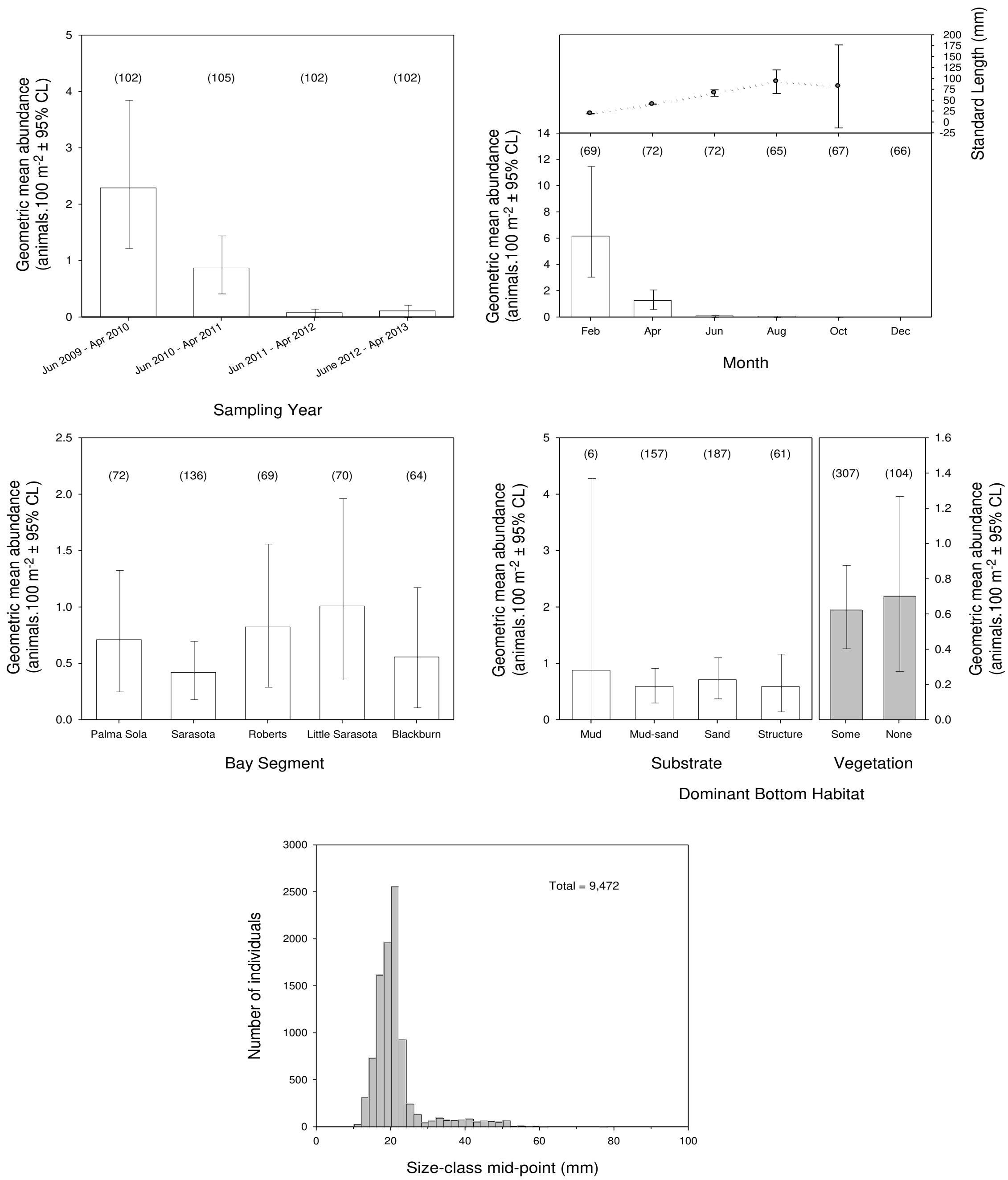

Fig. I13. Relative abundance and length-frequency distribution of Spot collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Gobiosoma robustum (Code Goby)

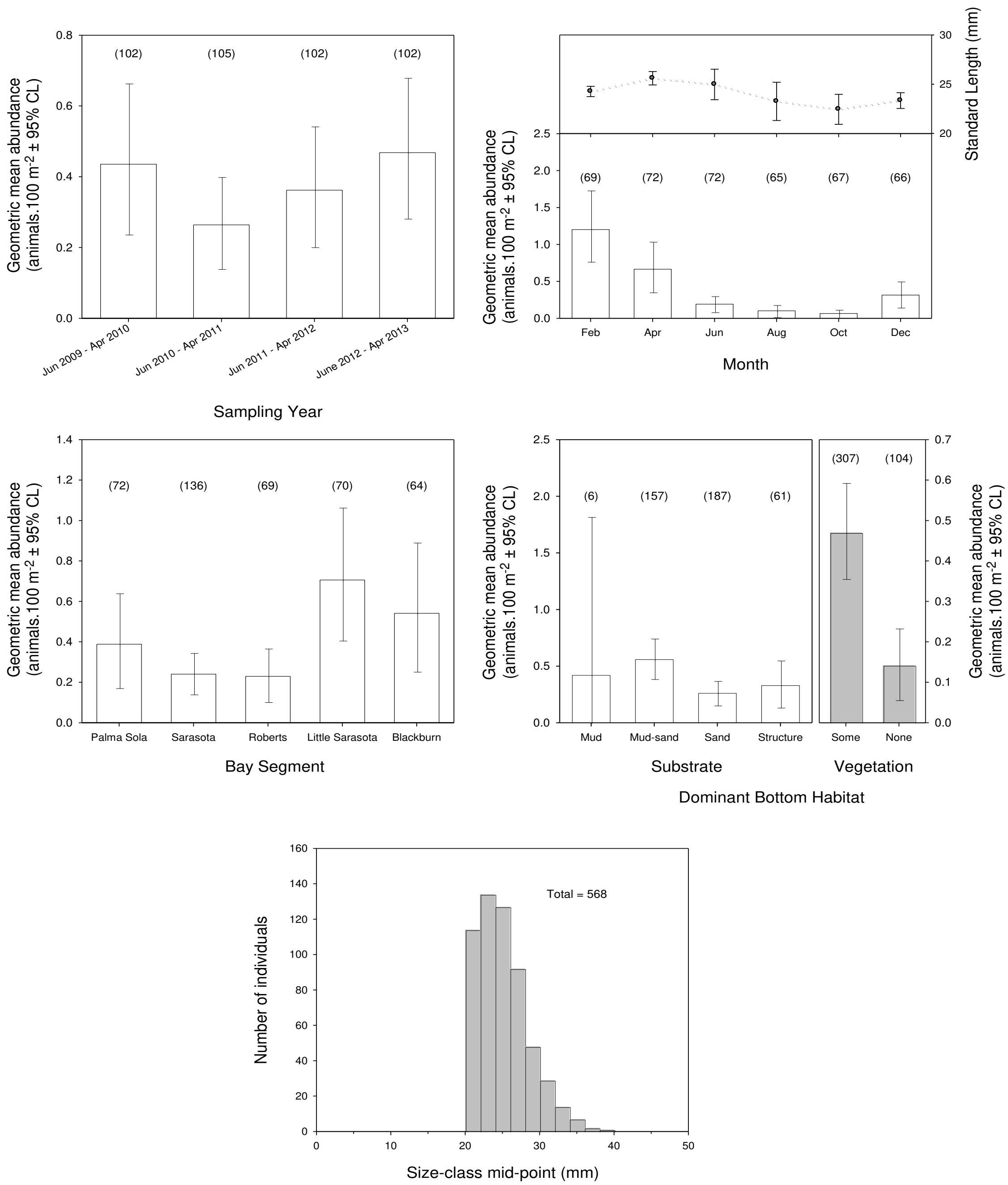

Fig. I14. Relative abundance and length-frequency distribution of Code Goby collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Microgobius gulosus (Clown Goby)

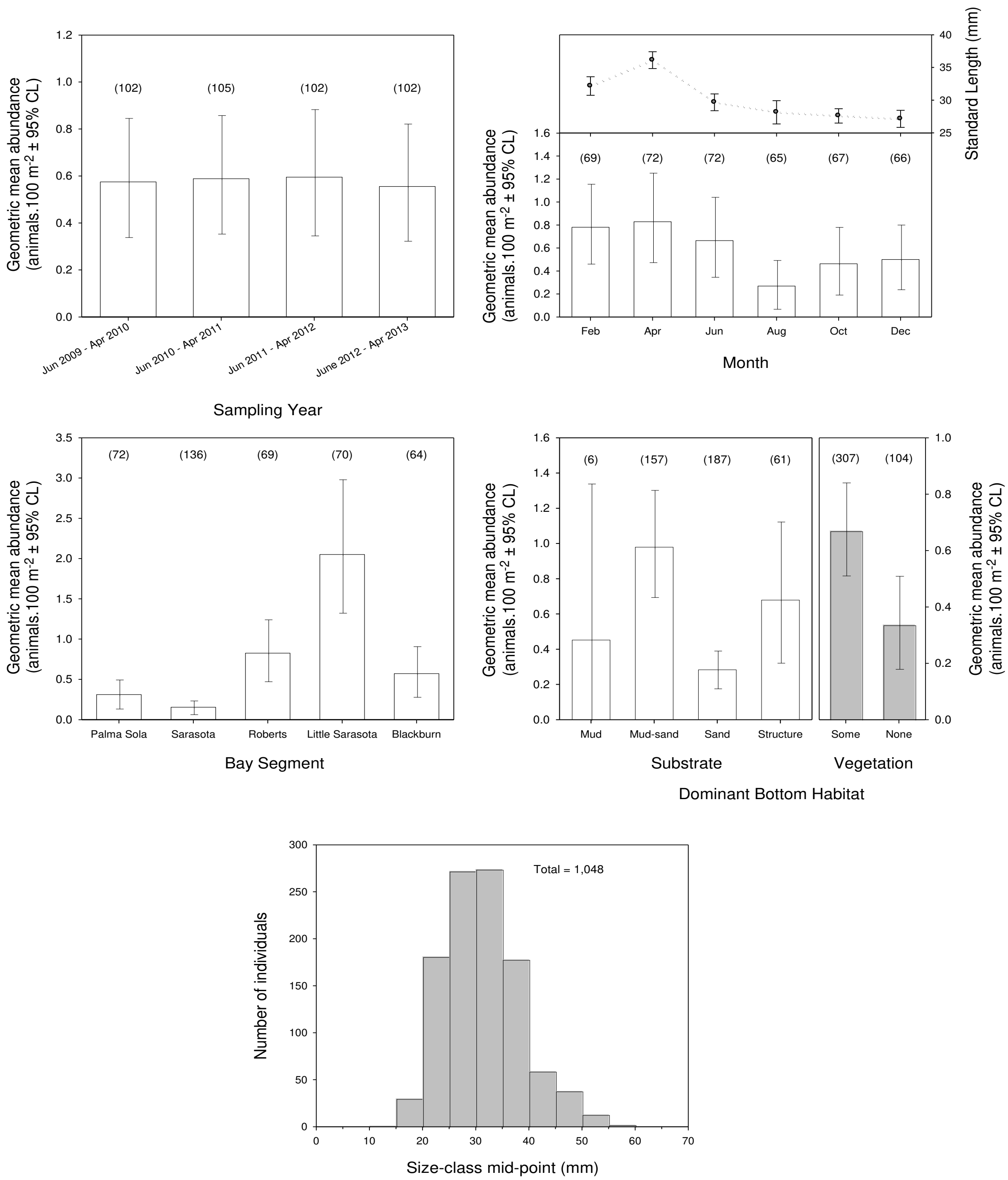

Fig. I15. Relative abundance and length-frequency distribution of Clown Goby collected with 21.3-m offshore seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Appendix J. Species overview plots for dominant taxa (≥200 animals collected and ≥10 occurrence in a gear type) collected in 183-m hauls seines in Sarasota Bay, June 2009 to April 2013. Taxa are arranged phylogenetically.

Elops saurus (Ladyfish)

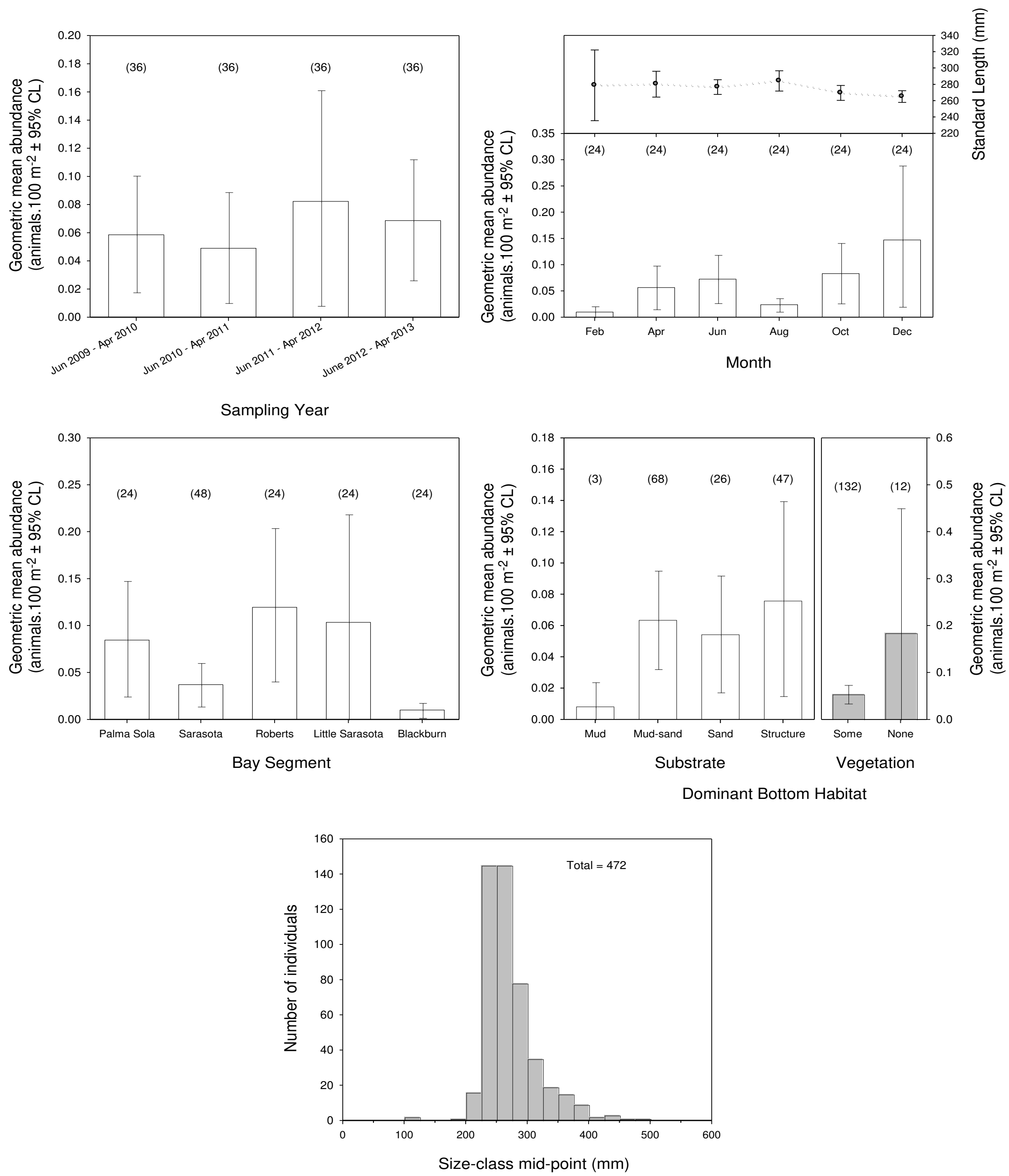

Fig. J1. Relative abundance and length-frequency distribution of Ladyfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Harengula jaguana (Scaled Sardine)

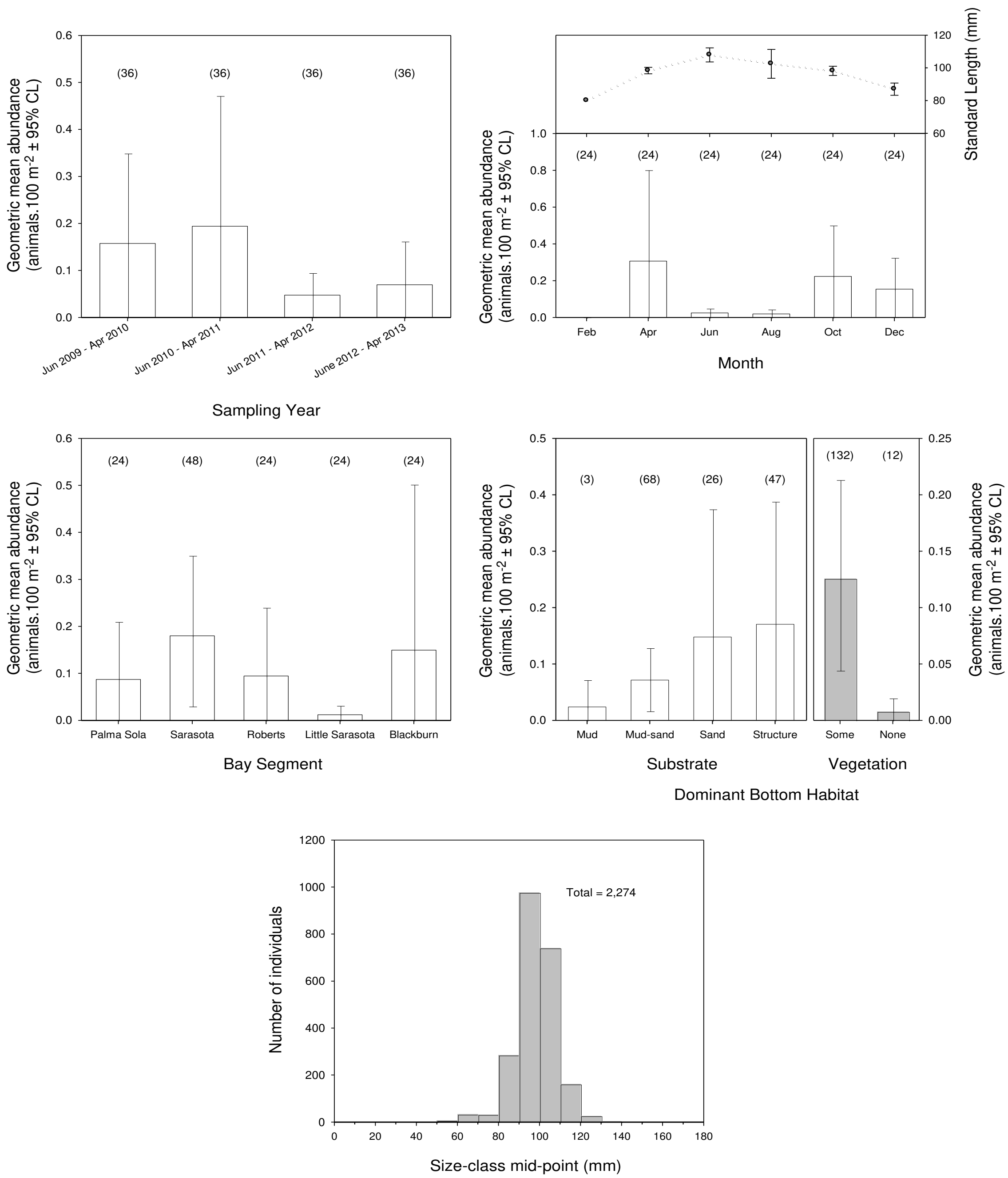

Fig. J2. Relative abundance and length-frequency distribution of Scaled Sardine collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Ariopsis felis (Hardhead Catfish)

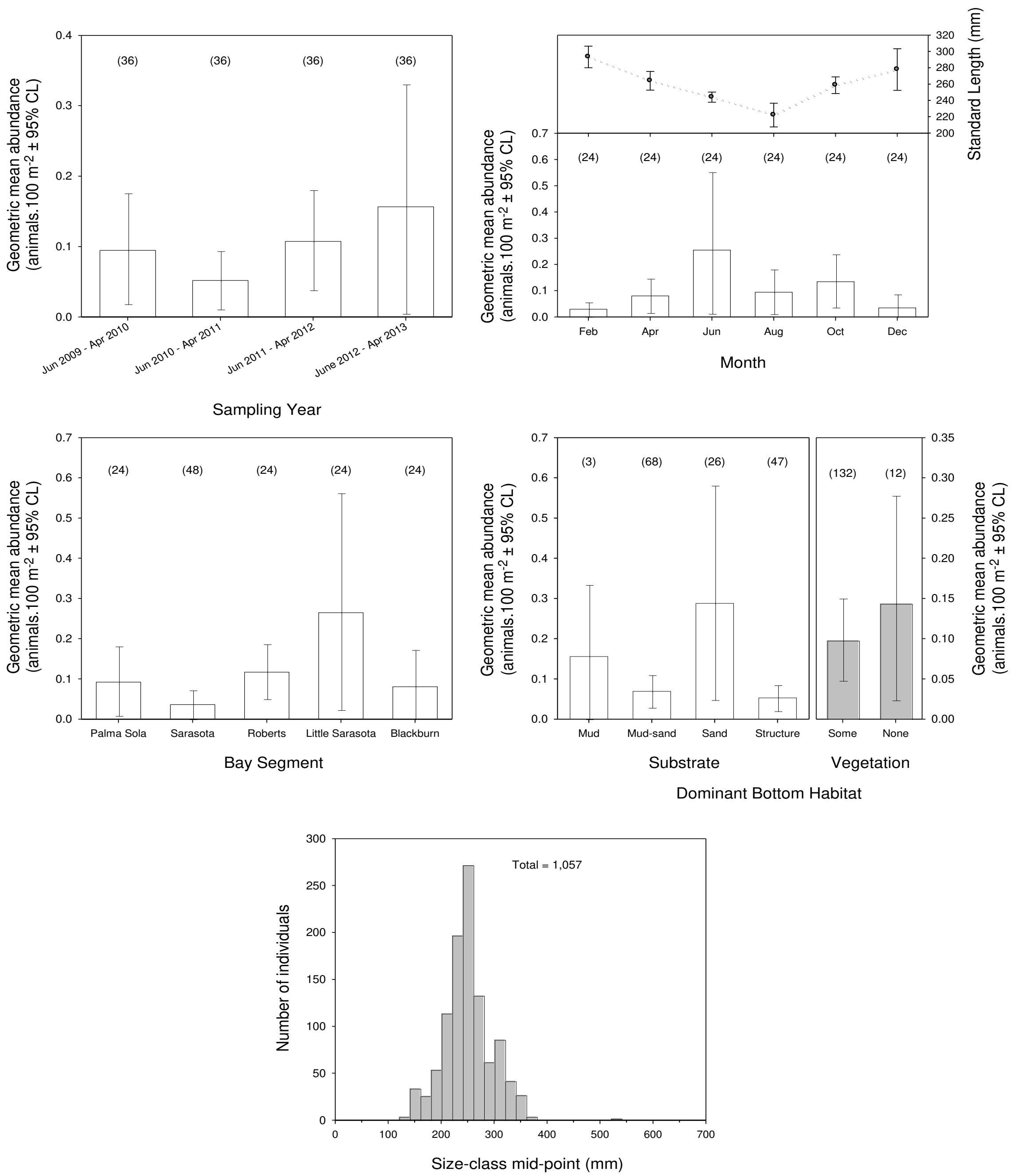

Fig. J3. Relative abundance and length-frequency distribution of Hardhead Catfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Strongylura notata (Redfin Needlefish)

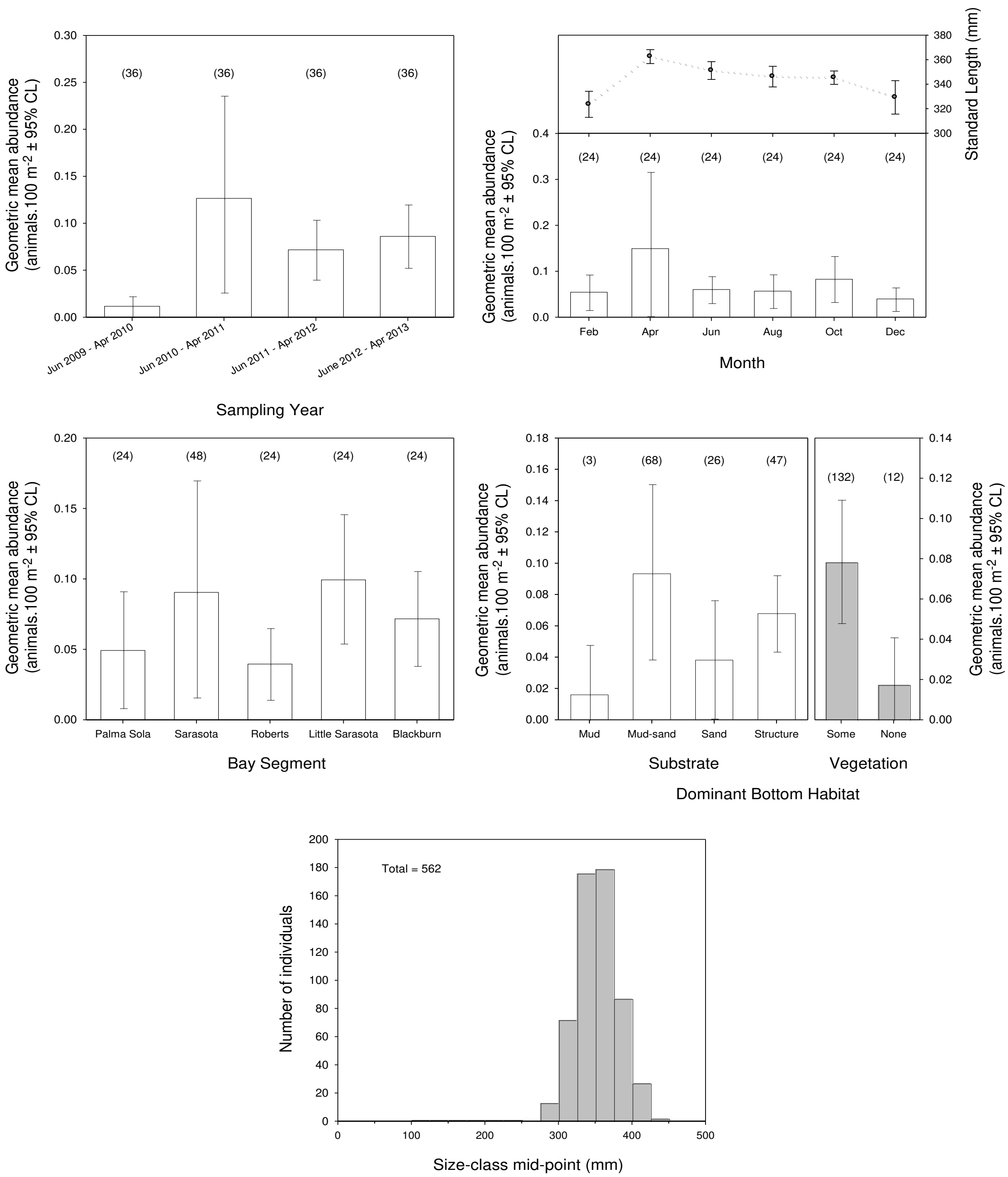

Fig. J4. Relative abundance and length-frequency distribution of Redfin Needlefish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Centropomus undecimalis (Common Snook)

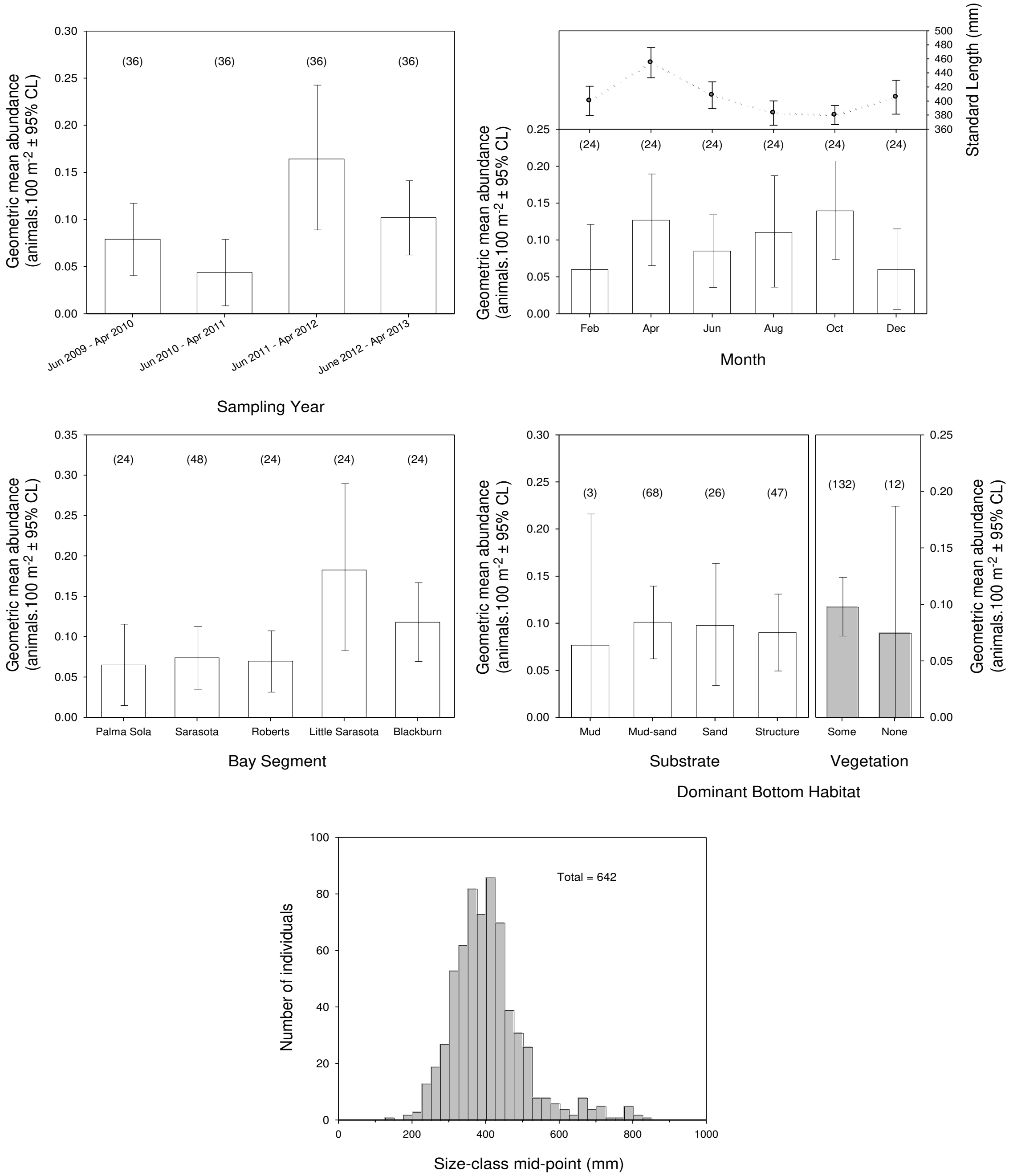

Fig. J5. Relative abundance and length-frequency distribution of Common Snook collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lutjanus griseus (Gray Snapper)

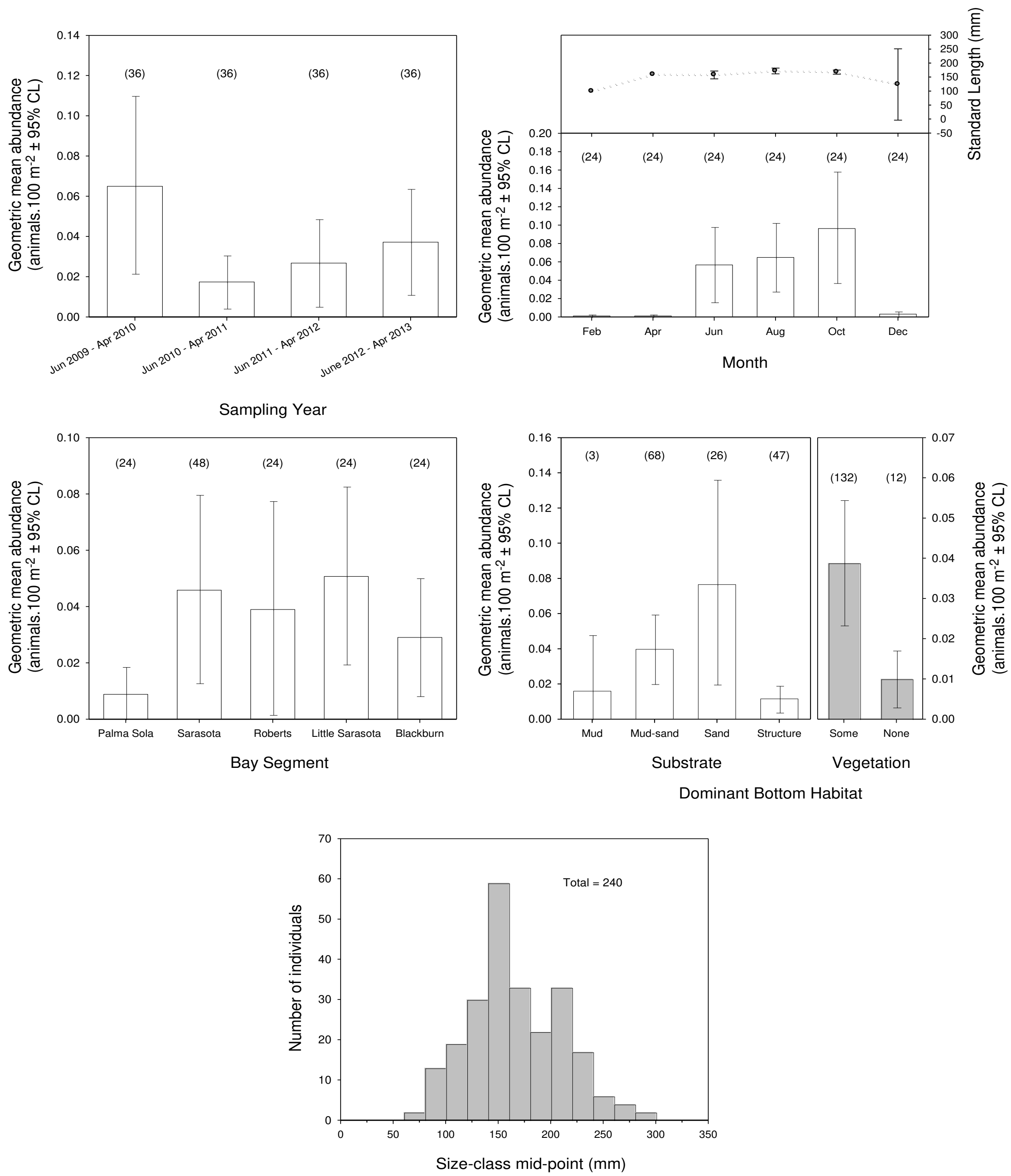

Fig. J6. Relative abundance and length-frequency distribution of Gray Snapper collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus gula (Silver Jenny)

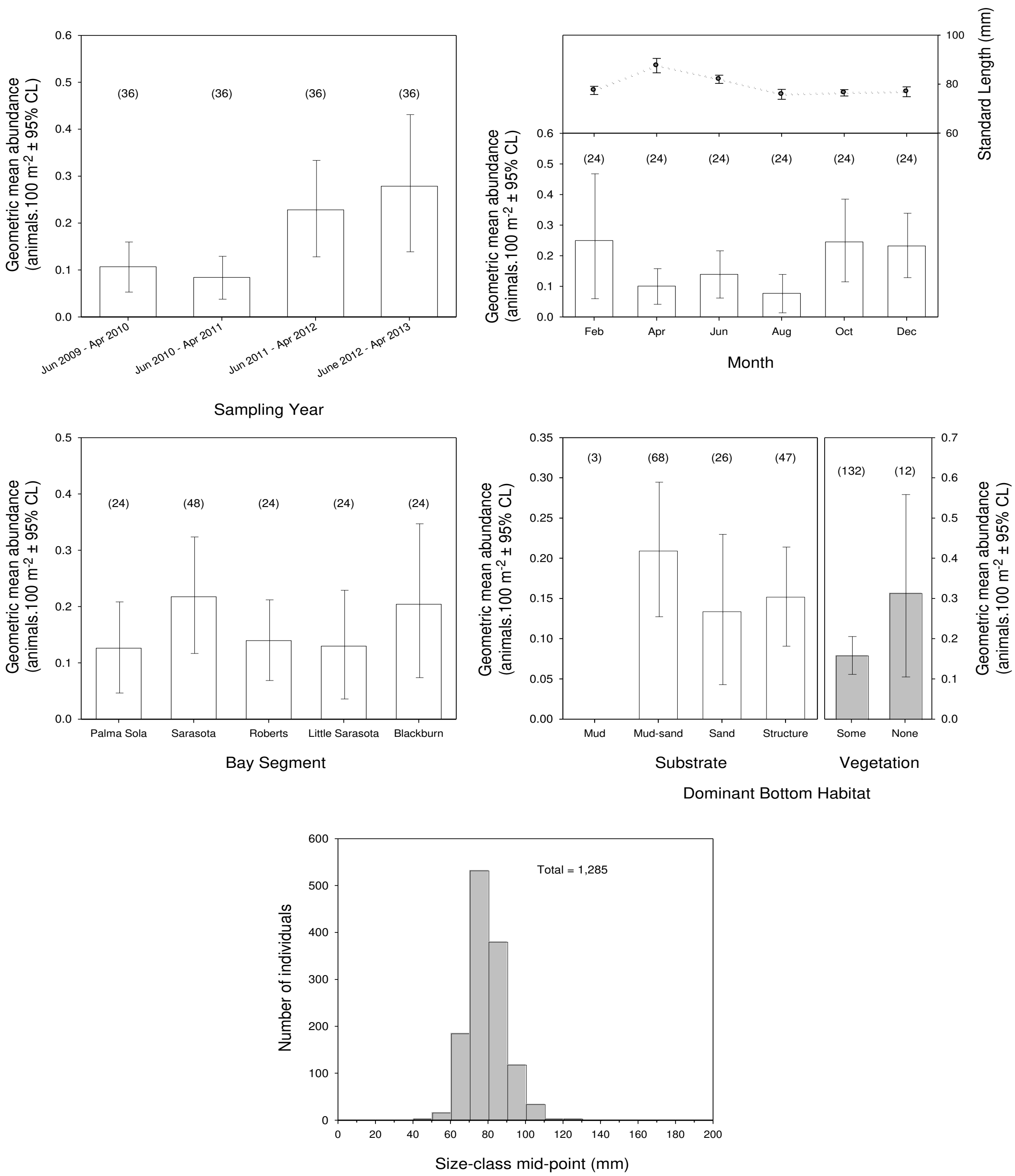

Fig. J7. Relative abundance and length-frequency distribution of Silver Jenny collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Orthopristis chrysoptera (Pigfish)

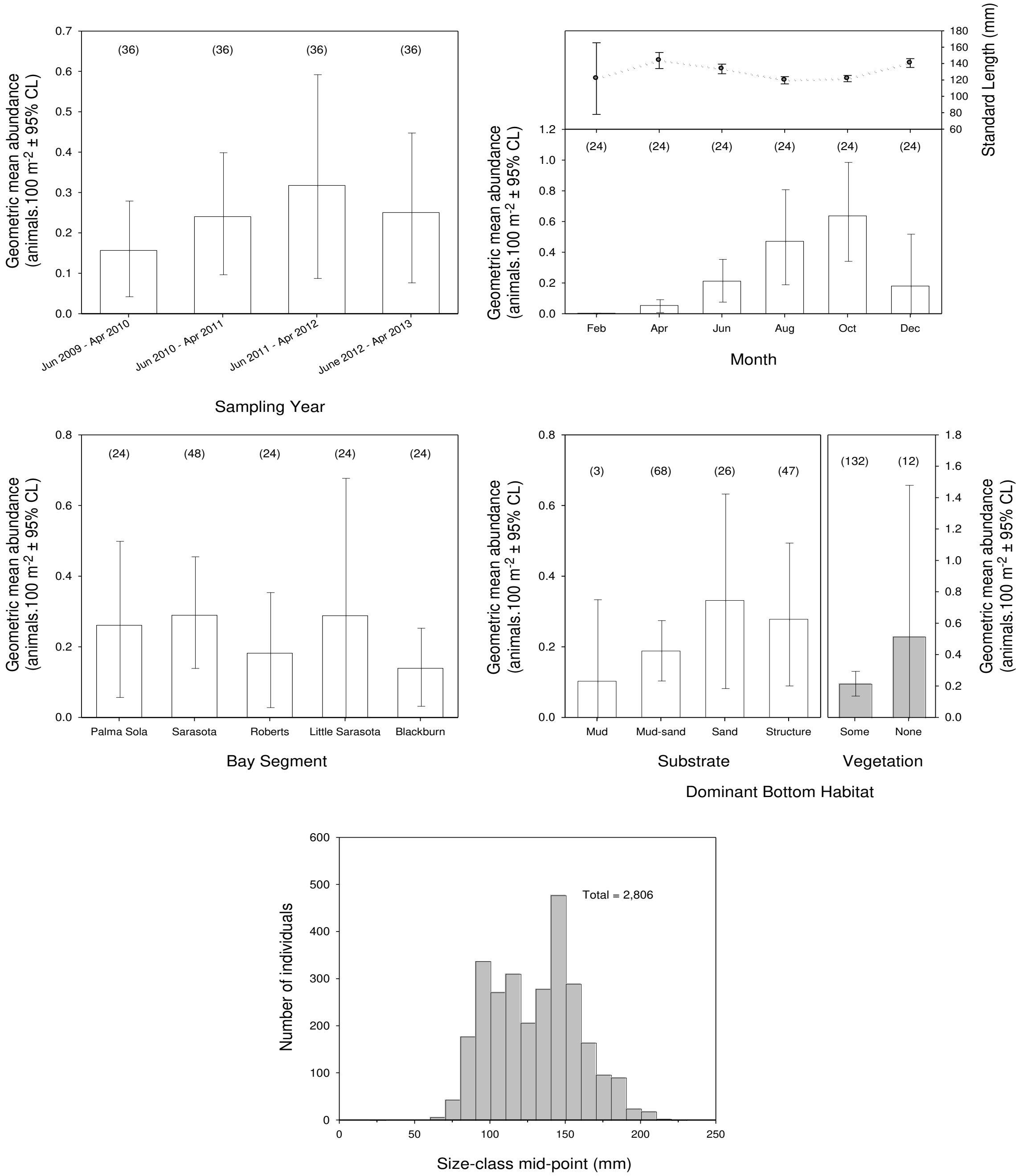

Fig. J8. Relative abundance and length-frequency distribution of Pigfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

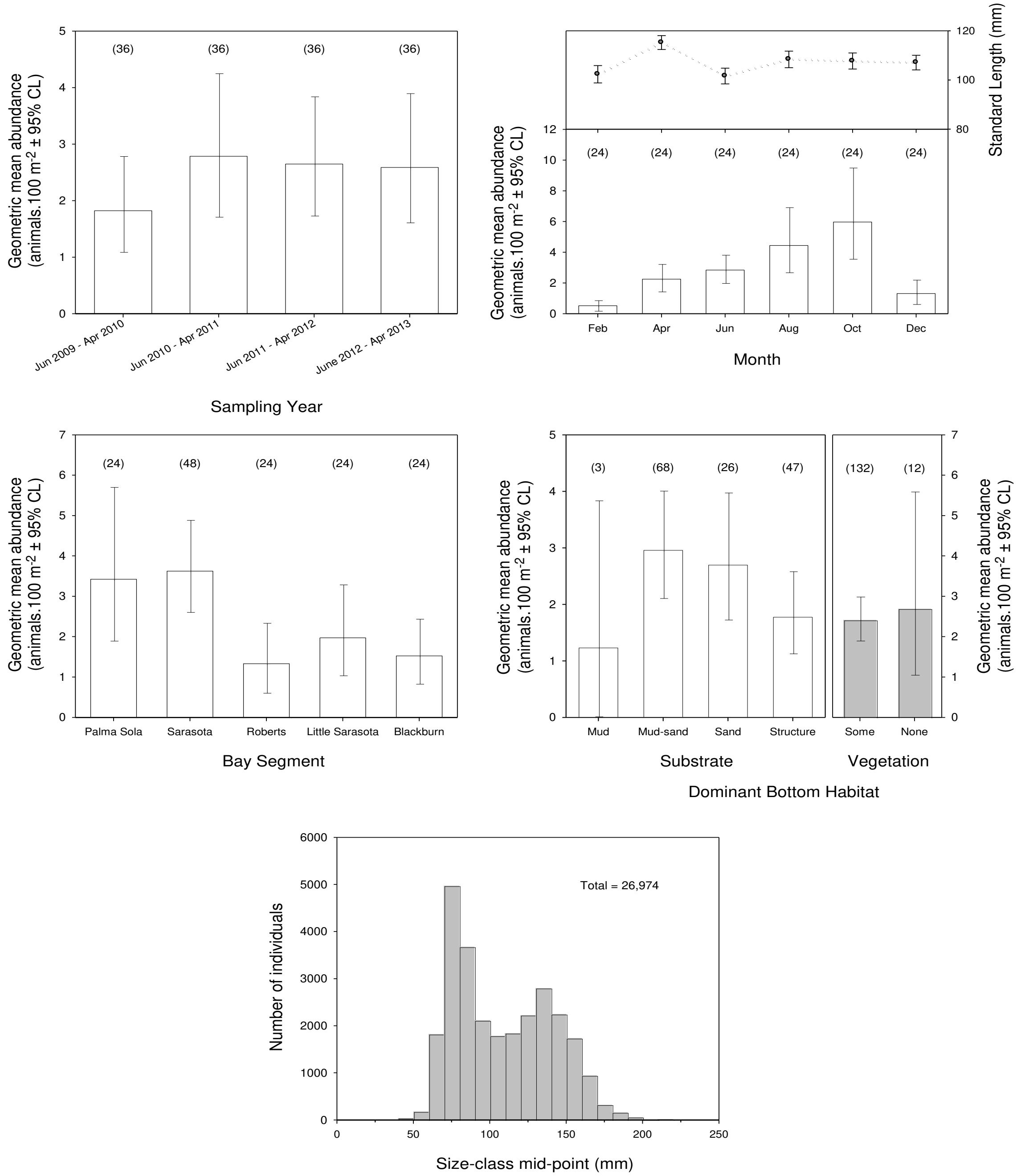

Fig. J9. Relative abundance and length-frequency distribution of Pinfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Archosargus probatocephalus (Sheepshead)

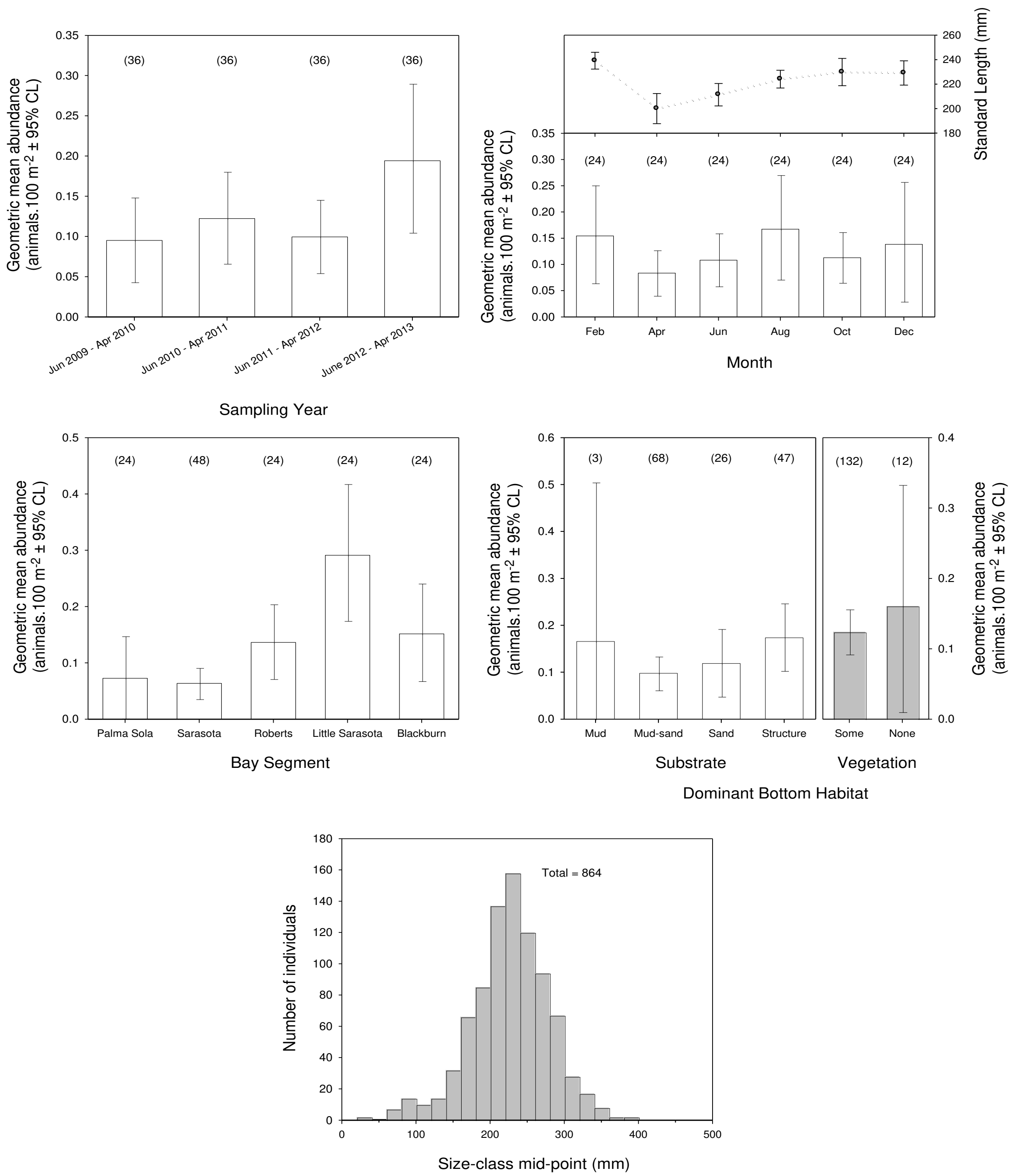

Fig. J10. Relative abundance and length-frequency distribution of Sheepshead collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Diplodus holbrookii (Spottail Pinfish)

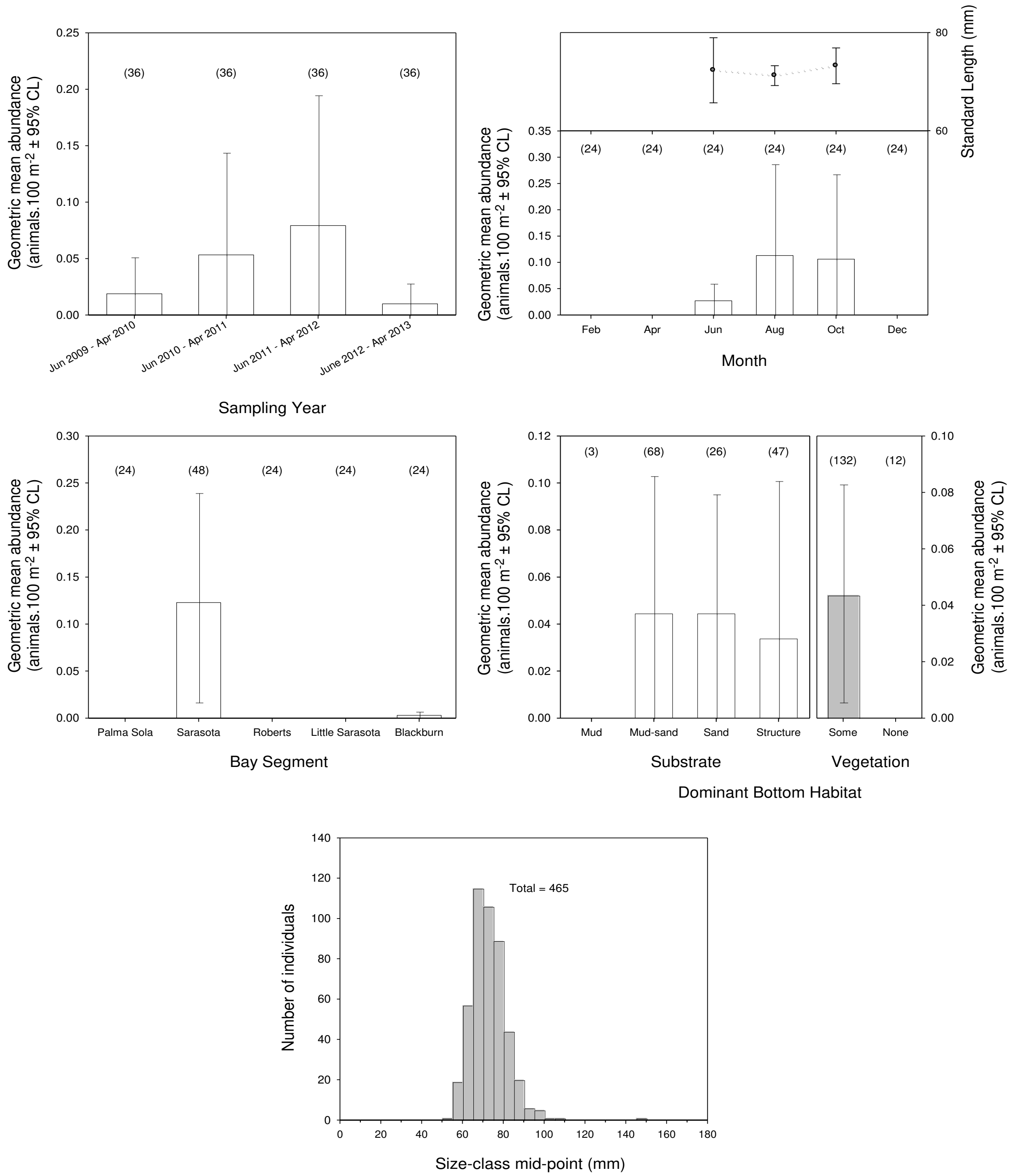

Fig. J11. Relative abundance and length-frequency distribution of Spottail Pinfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Bairdiella chrysoura (Silver Perch)

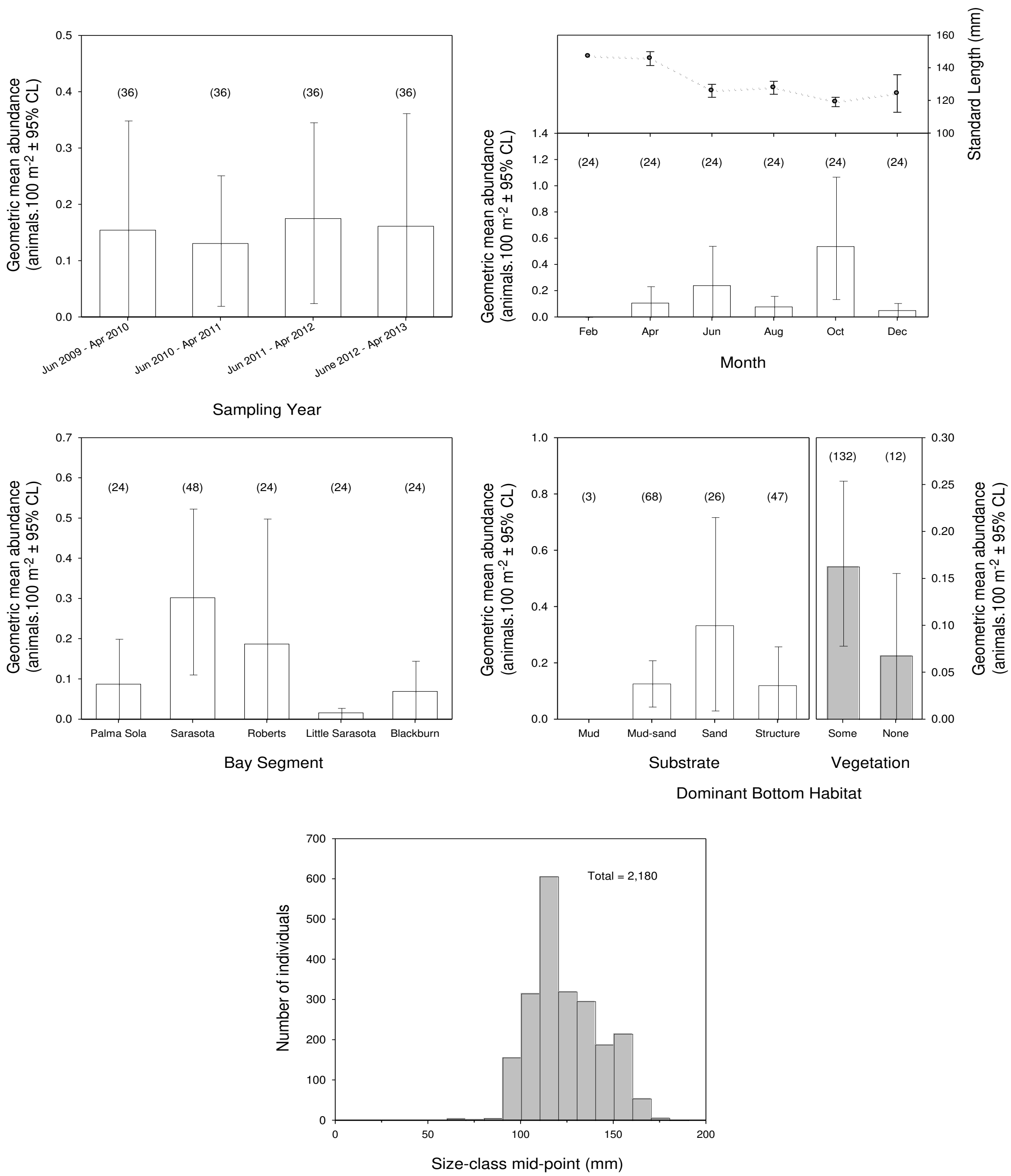

Fig. J12. Relative abundance and length-frequency distribution of Silver Perch collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Leiostomus xanthurus (Spot)

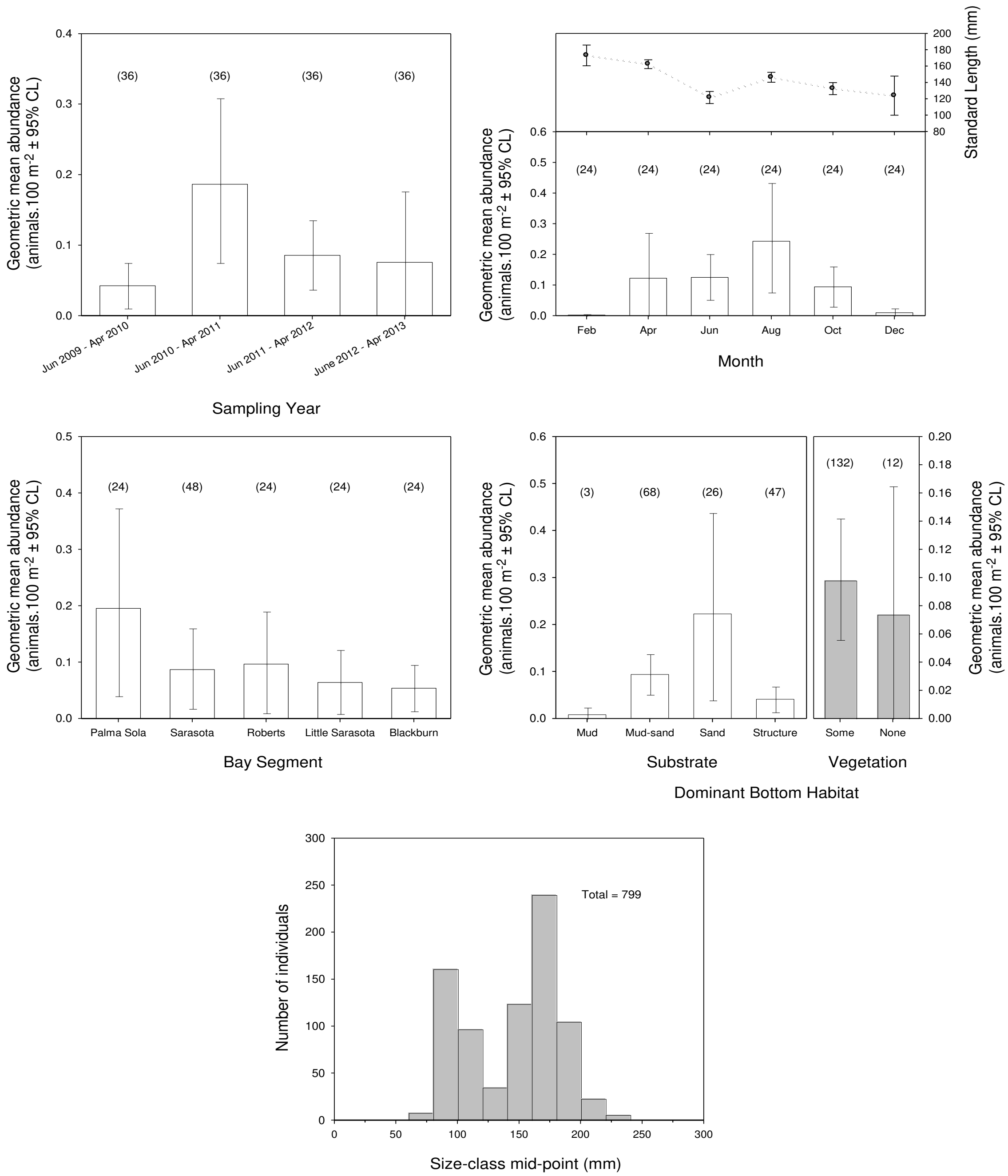

Fig. J13. Relative abundance and length-frequency distribution of Spot collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Mugil cephalus (Striped Mullet)

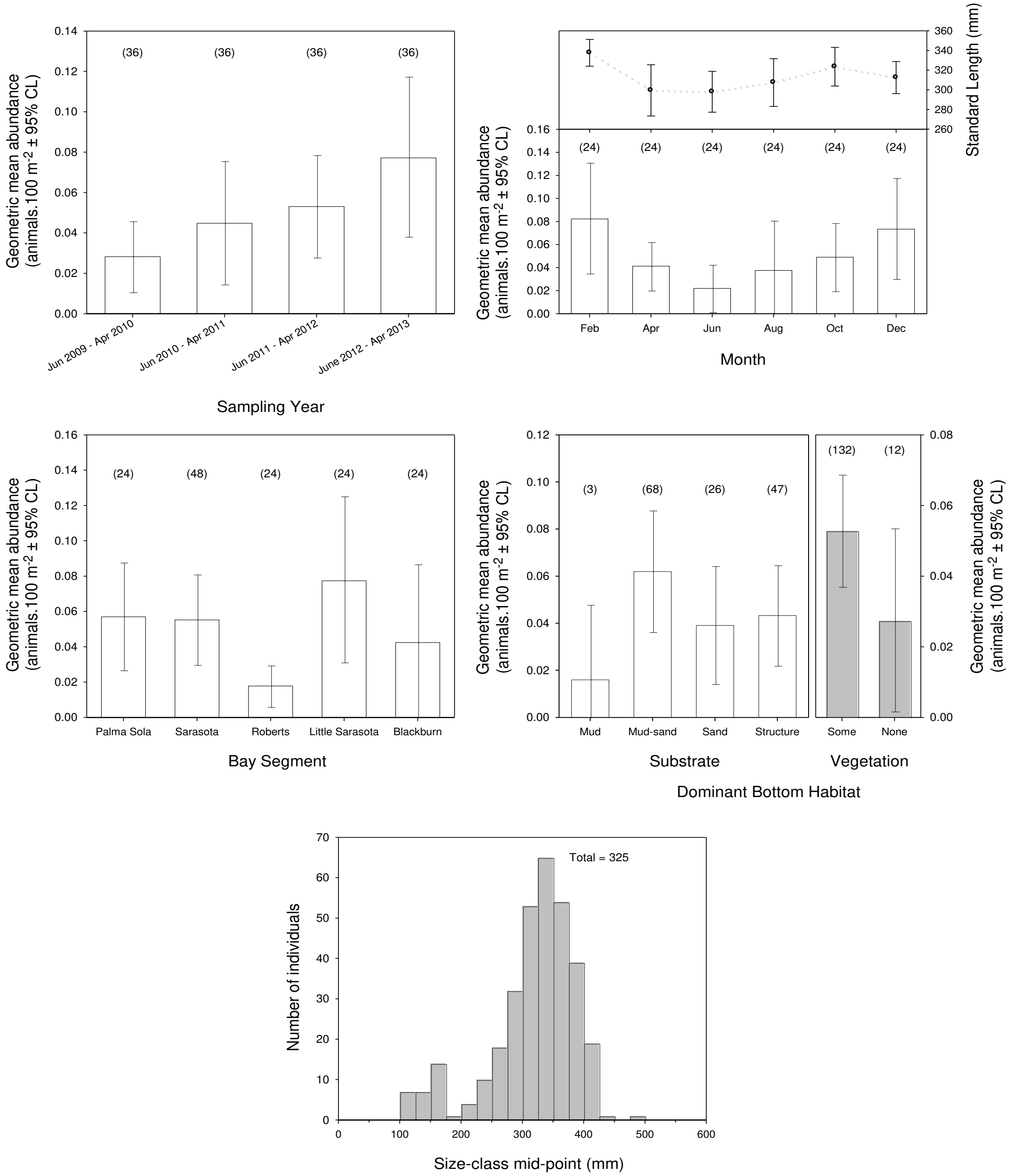

Fig. J14. Relative abundance and length-frequency distribution of Striped Mullet collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Mugil curema (White Mullet)

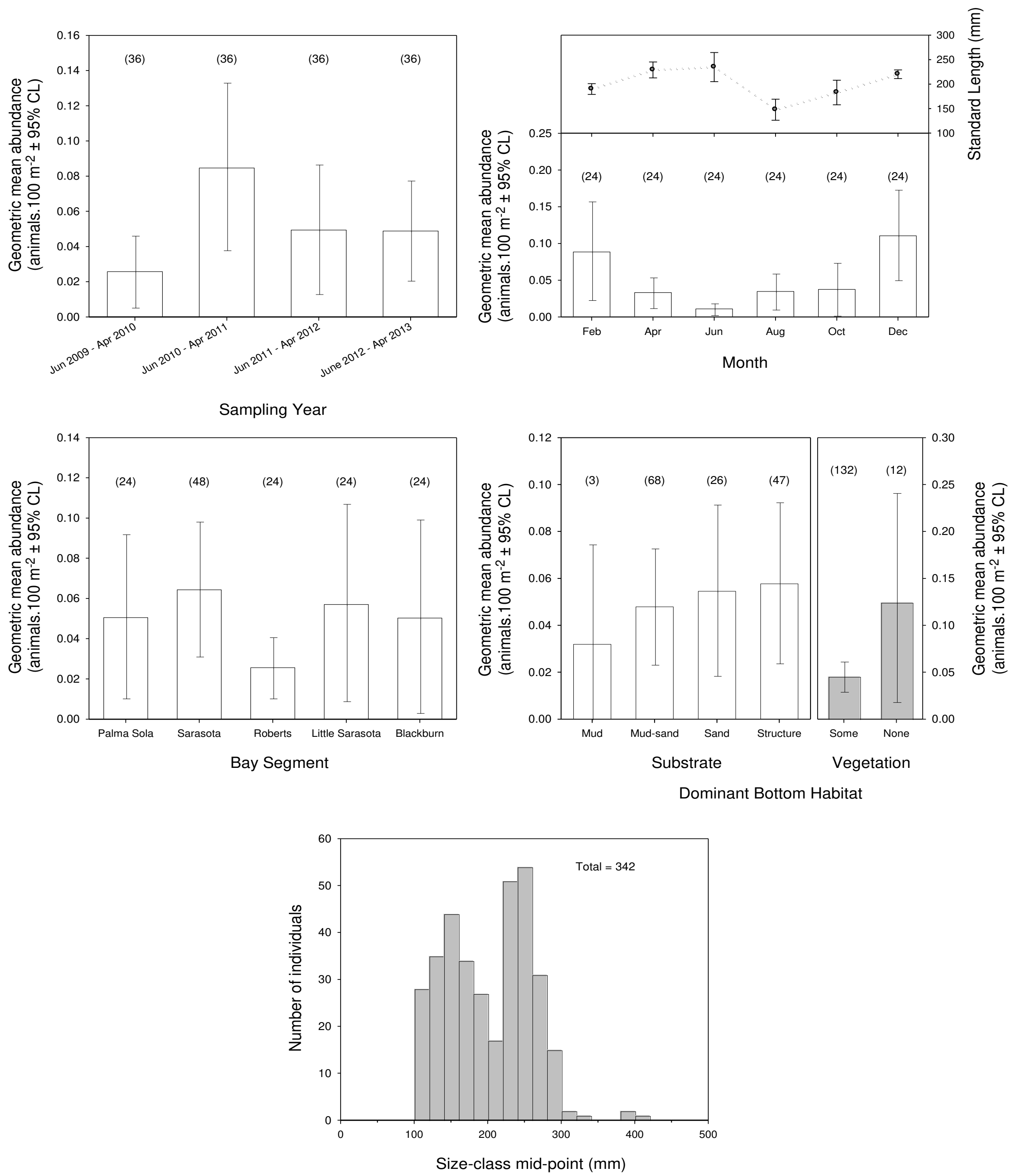

Fig. J15. Relative abundance and length-frequency distribution of White Mullet collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Nicholsina usta (Emerald Parrotfish)

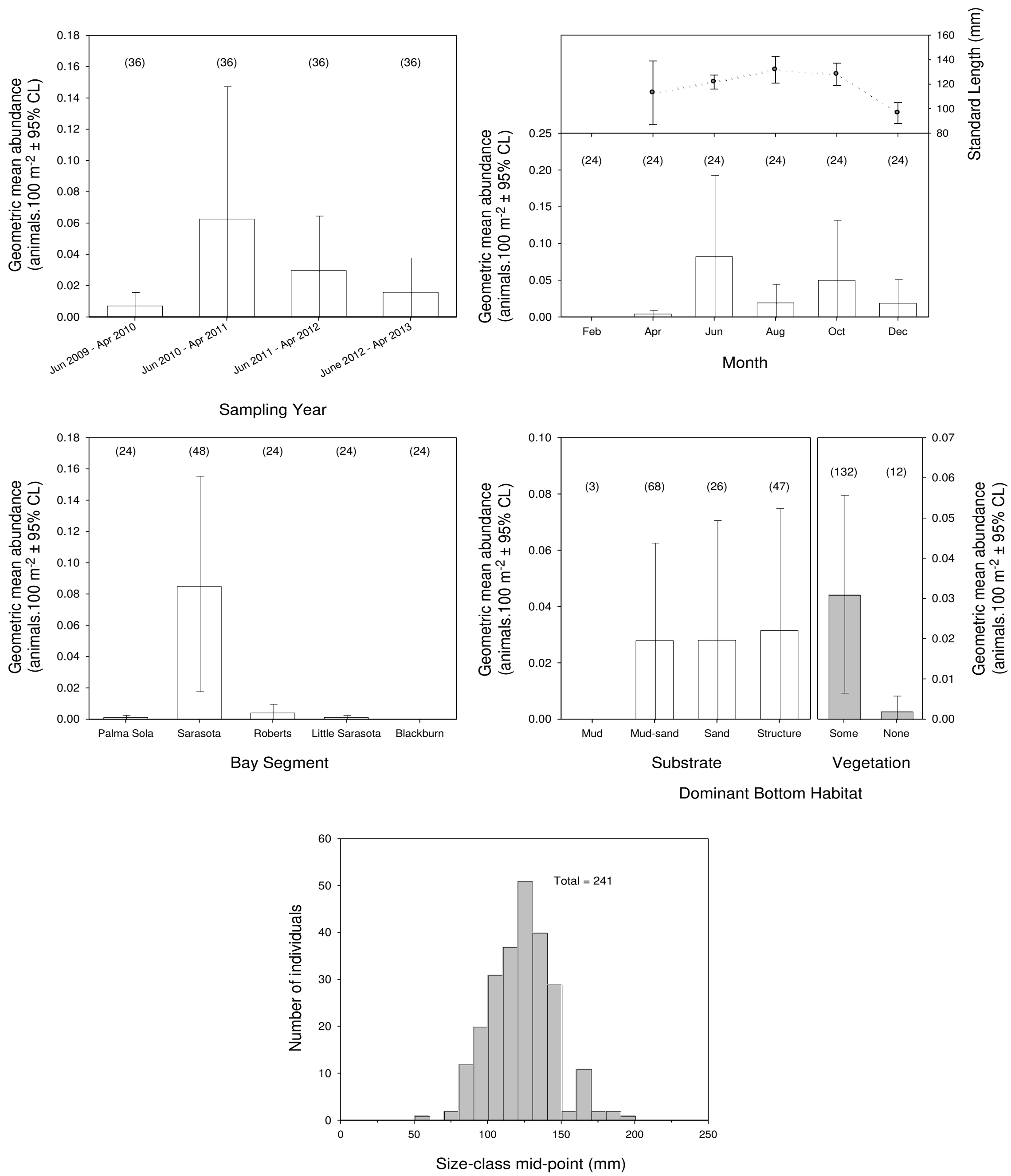

Fig. J16. Relative abundance and length-frequency distribution of Emerald Parrotfish collected with 183-m haul seines in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Appendix K. Species overview plots for dominant taxa (≥200 animals collected and ≥10 occurrence in a gear type) collected in 6.1-m otter trawls in Sarasota Bay, June 2009 to April 2013. Taxa are arranged phylogenetically.

Farfantepenaeus duorarum (Pink Shrimp)

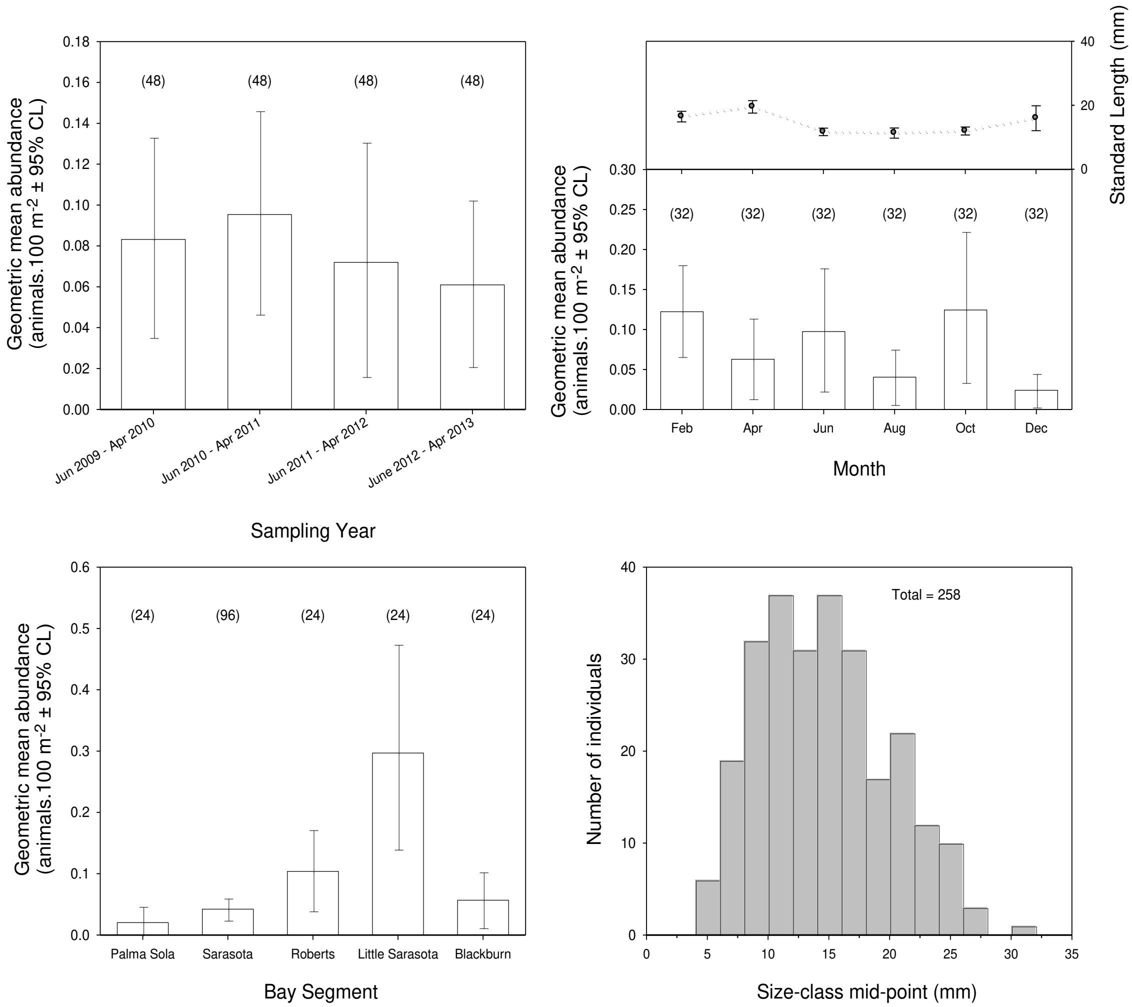

Fig. K1. Relative abundance and length-frequency distribution of Pink Shrimp collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Callinectes sapidus (Blue Crab)

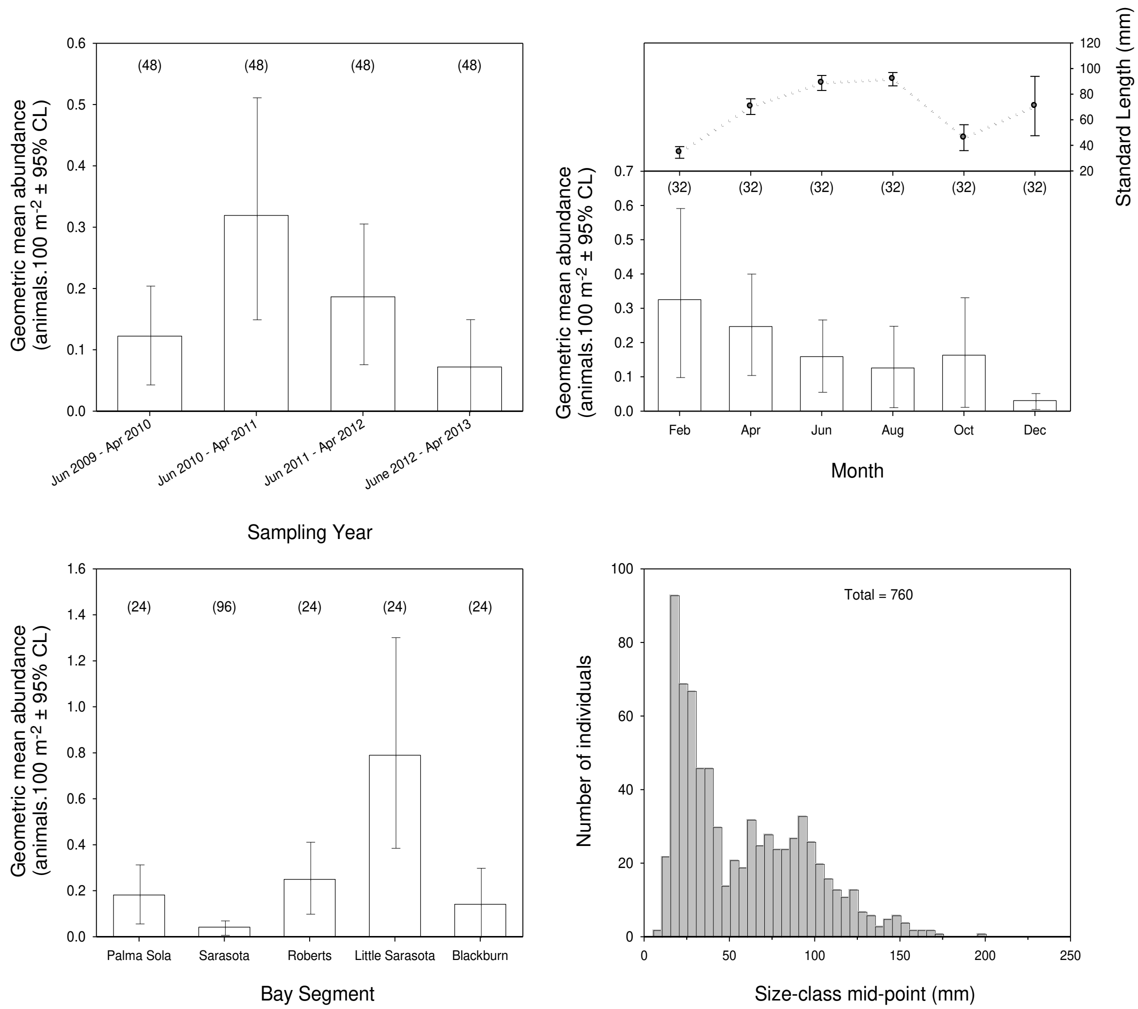

Fig. K2. Relative abundance and length-frequency distribution of Blue Crab collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Portunus spp (Portunus Crabs)

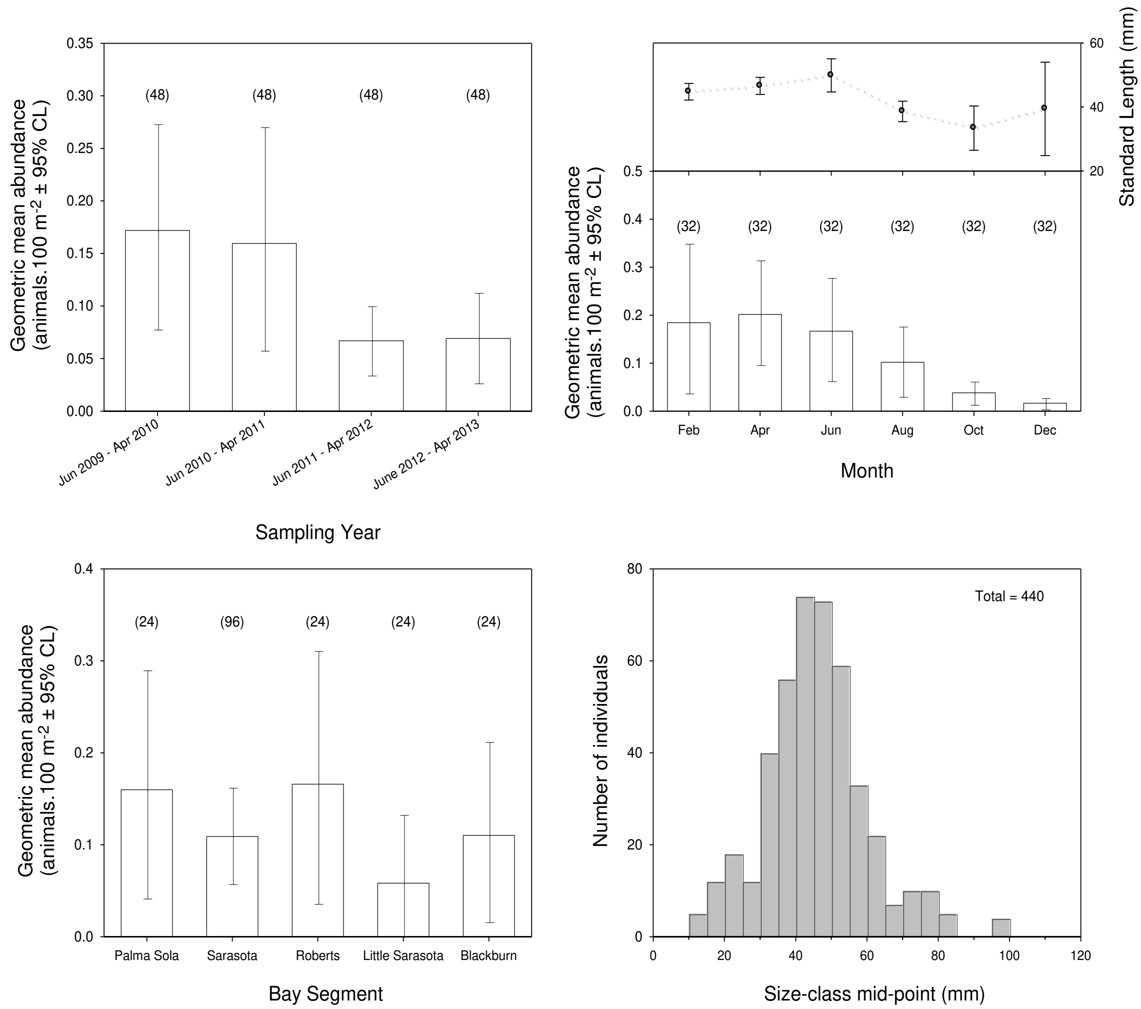

Fig. K3. Relative abundance and length-frequency distribution of Portunus Crabs collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Menippe spp (Stone Crab)

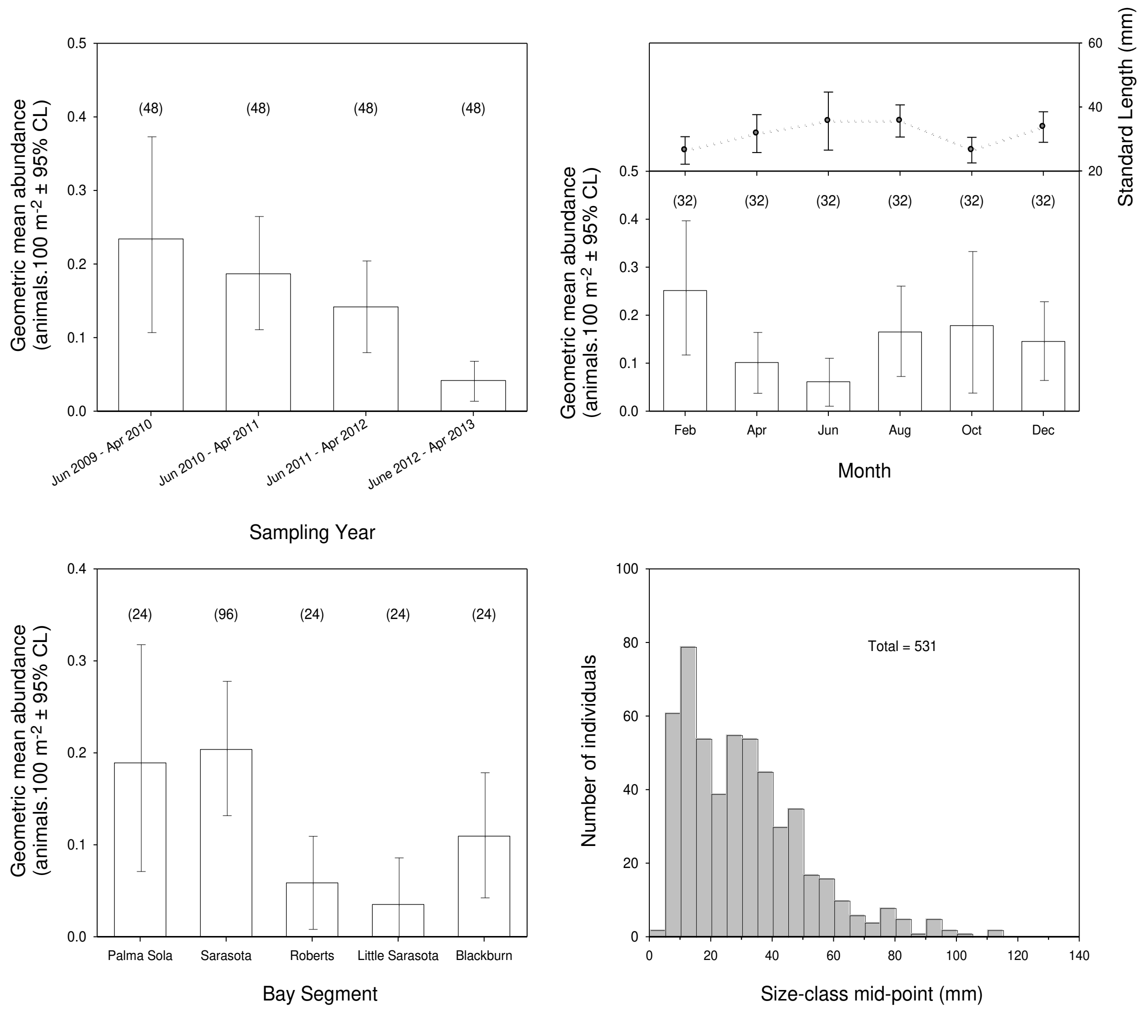

Fig. K4. Relative abundance and length-frequency distribution of Stone Crab collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Eucinostomus gula (Silver Jenny)

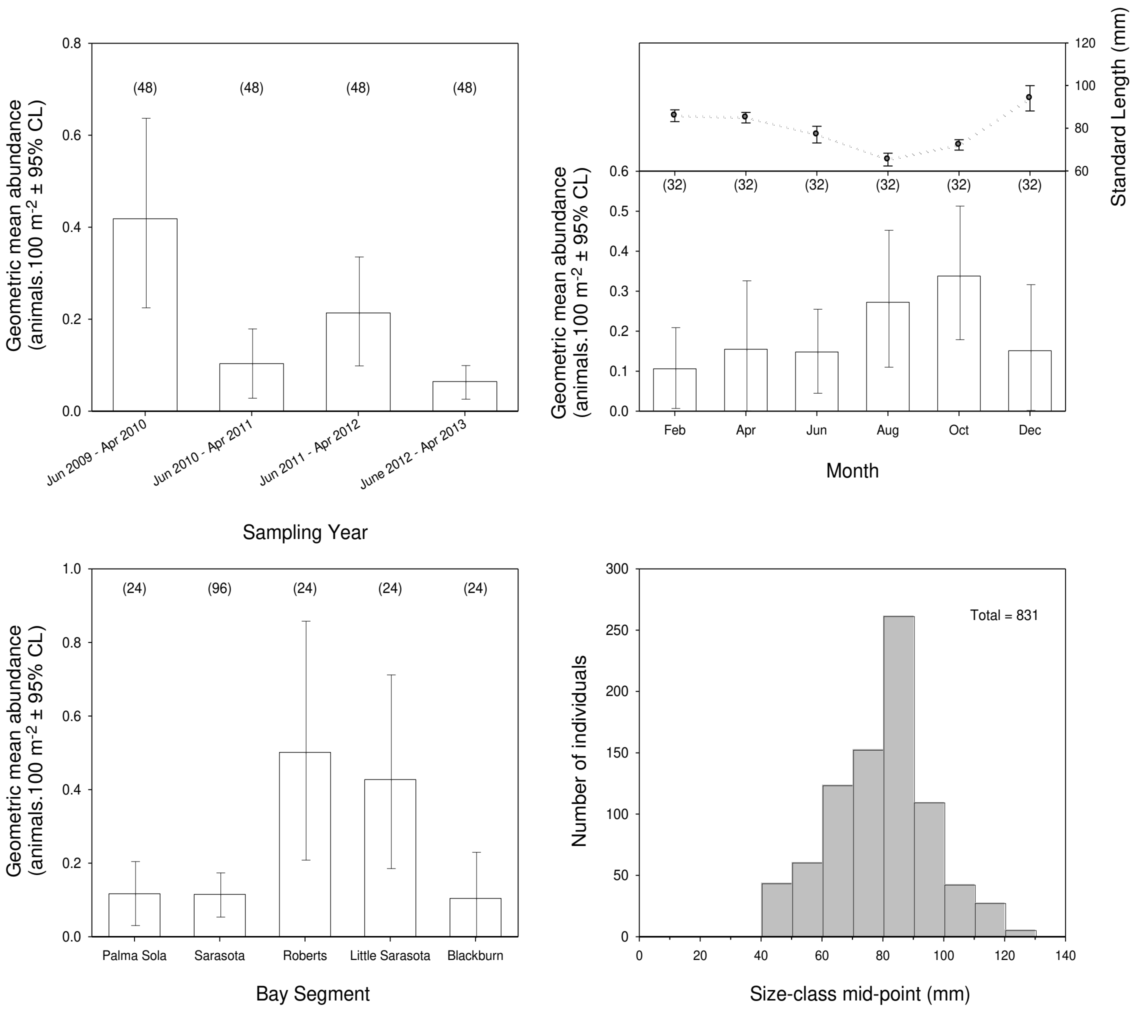

Fig. K5. Relative abundance and length-frequency distribution of Silver Jenny collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Orthopristis chrysoptera (Pigfish)

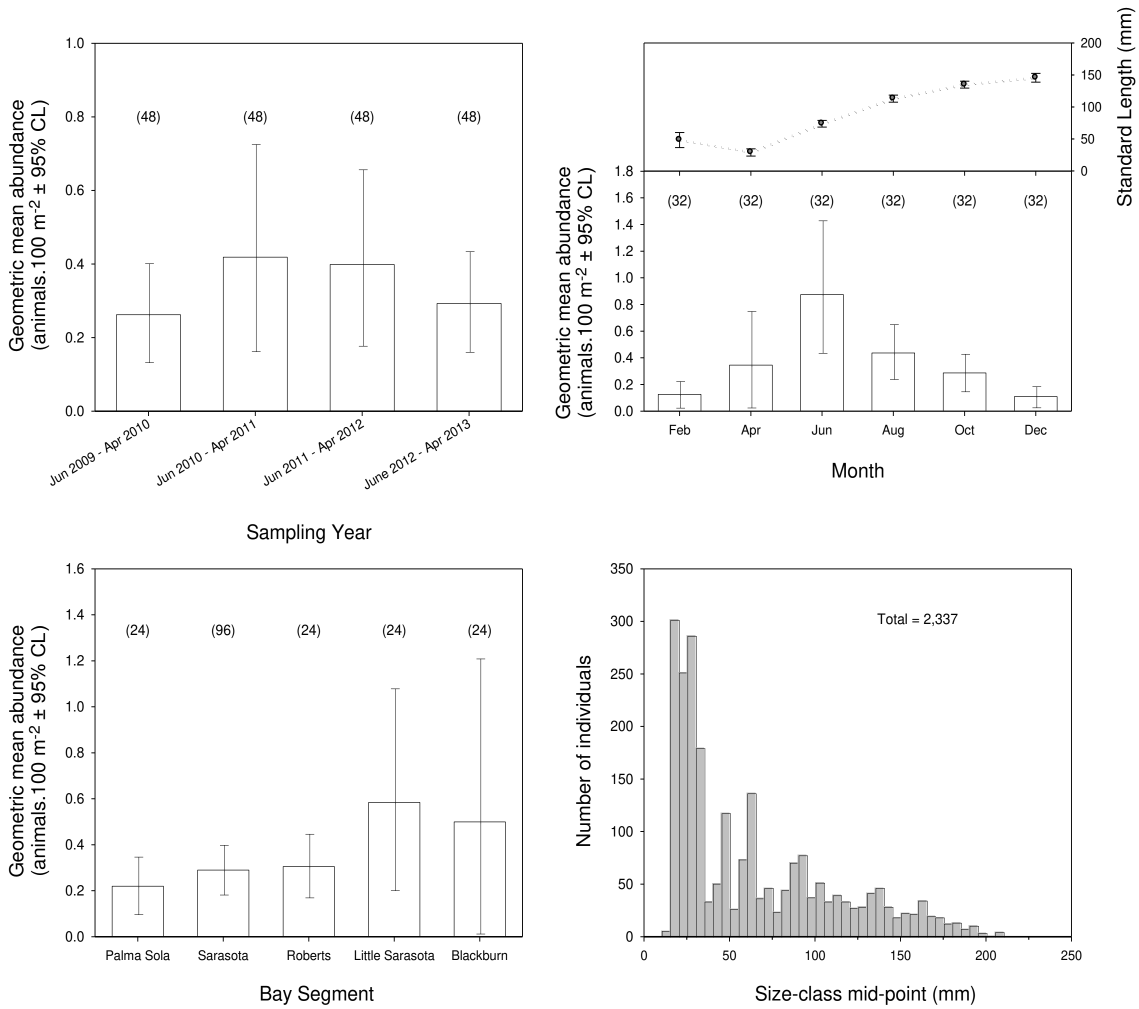

Fig. K6. Relative abundance and length-frequency distribution of Pigfish collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Lagodon rhomboides (Pinfish)

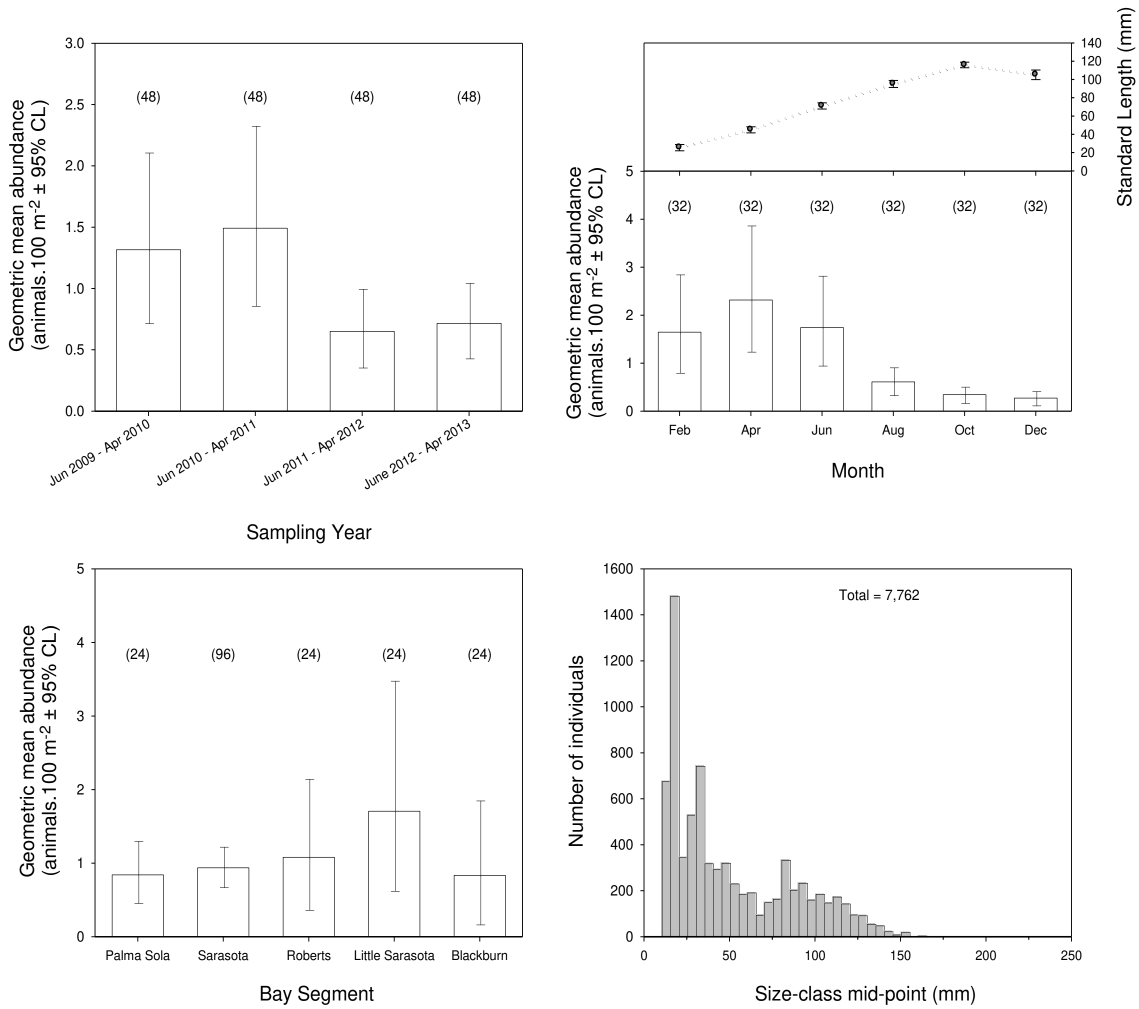

Fig. K7. Relative abundance and length-frequency distribution of Pinfish collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Archosargus probatocephalus (Sheepshead)

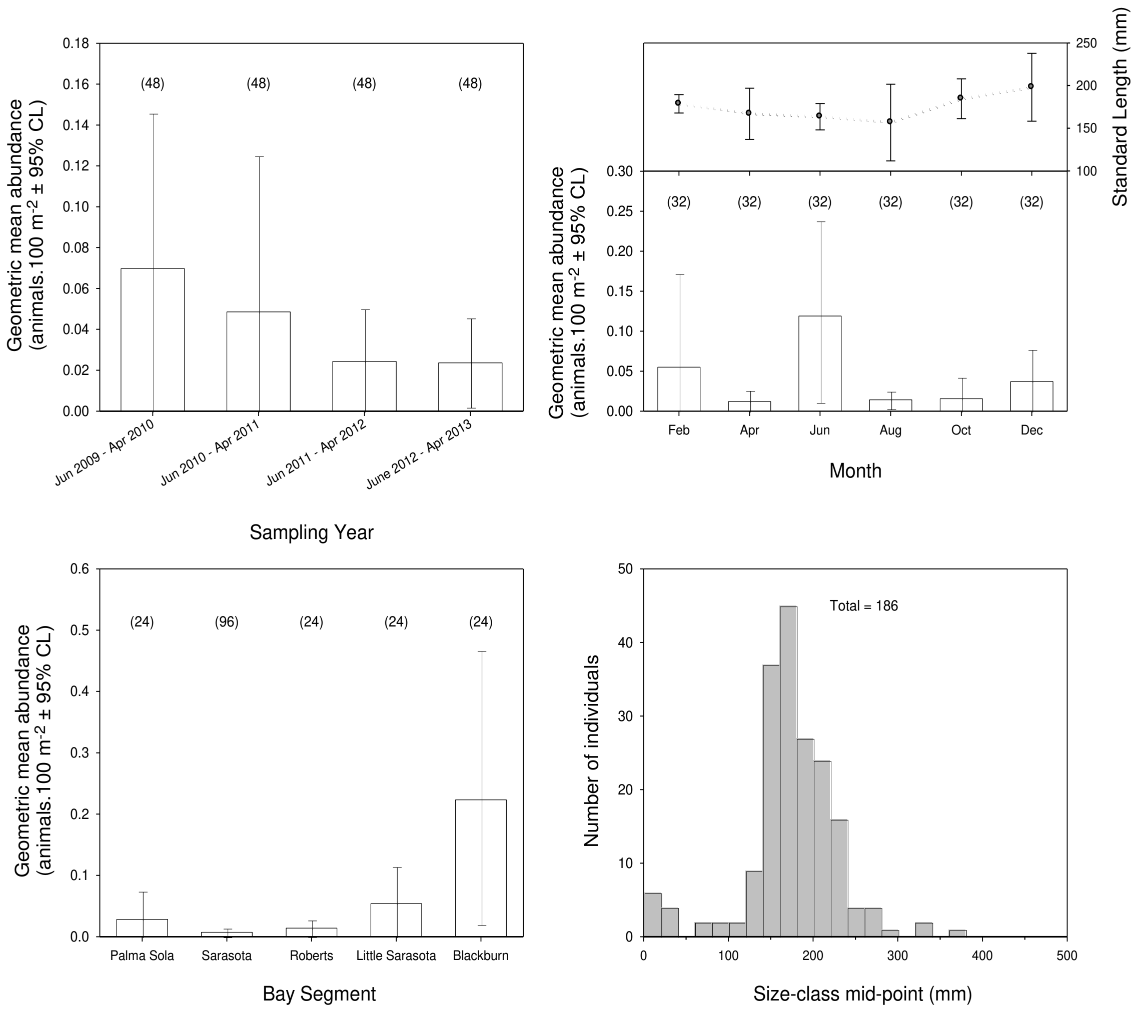

Fig. K8. Relative abundance and length-frequency distribution of Sheepshead collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Bairdiella chrysoura (Silver Perch)

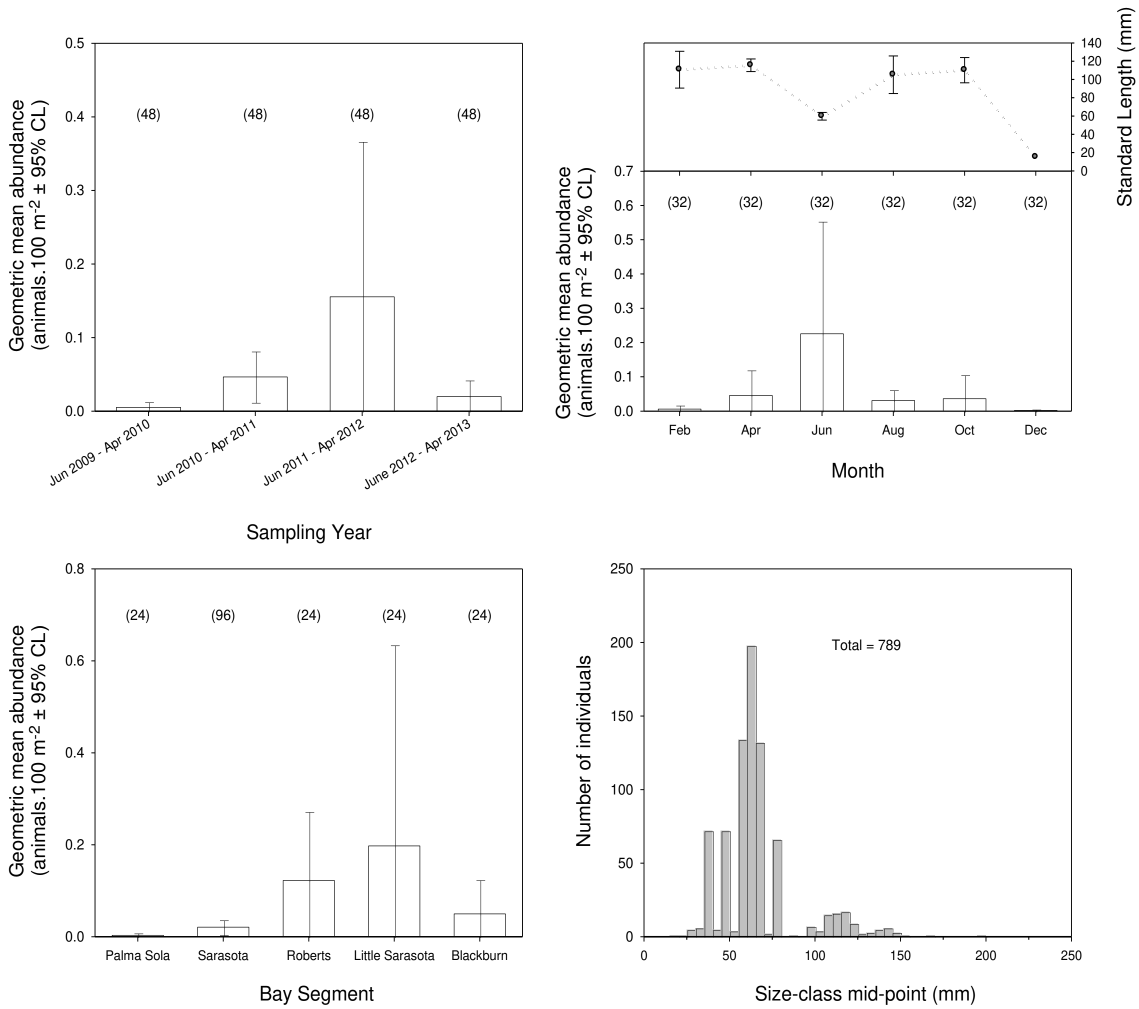

Fig. K9. Relative abundance and length-frequency distribution of Silver Perch collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Leiostomus xanthurus (Spot)

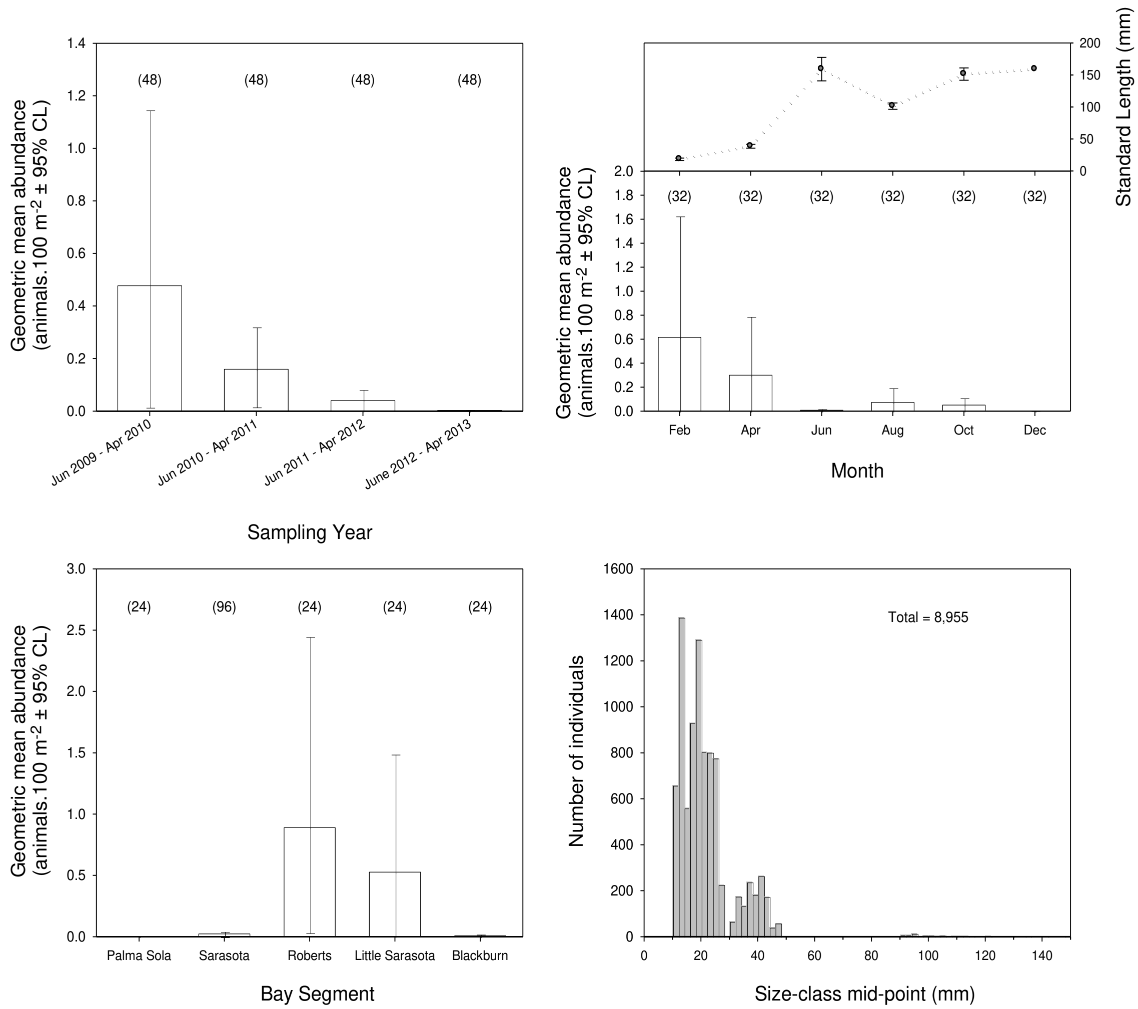

Fig. K10. Relative abundance and length-frequency distribution of Spot collected with 6.1-m otter trawls in the Sarasota Bay estuary, June 2009 to April 2013. Numbers in parenthesis along the top of each abundance graph represent the number of samples collected within each category. Error bars represent 95% confidence intervals.

Appendix L. Analysis of Variance post-hoc Tukey test results identifying bay segments with significant difference (*P*<0.05) in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

Appendix Table L1. Tukey post-hoc test results comparing estuary bay segments for 21.3-m shoreline seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	Upper CH	Middel CH	Gasparilla Sound	Pine Island Sound	Palma Sola Bay	Sarasota Bay	Robert Bay	Little Sarasota Bay	Blackburn Bay	Upper TB	Middle TB	Hillsborough Bay	Lower TB - North	Lower TB - South
Upper CH		***0.0009***	***0.0018***	***0.0002***	***<0.0001***	***<0.0001***	***0.0030***	***<0.0001***	***<0.0001***	0.1165	0.9999	1.0000	***0.0029***	***0.0034***
Middel CH	***0.0009***		1.0000	1.0000	0.5892	0.8840	1.0000	***0.0207***	0.5299	0.9995	0.3281	***0.0093***	1.0000	1.0000
Gasparilla Sound	***0.0018***	1.0000		1.0000	0.4803	0.8106	1.0000	***0.0121***	0.4236	0.9999	0.4212	***0.0169***	1.0000	1.0000
Pine Island Sound	***0.0002***	1.0000	1.0000		0.7643	0.9620	1.0000	***0.0470***	0.7106	0.9930	0.1876	***0.0026***	1.0000	1.0000
Palma Sola Bay	***<0.0001***	0.5892	0.4803	0.7643		1.0000	0.9758	0.9965	1.0000	0.1584	***0.0022***	***<0.0001***	0.9714	0.6838
Sarasota Bay	***<0.0001***	0.8840	0.8106	0.9620	1.0000		0.9990	0.9449	1.0000	0.4051	***0.0105***	***<0.0001***	0.9987	0.9247
Roberts Bay	***0.0030***	1.0000	1.0000	1.0000	0.9758	0.9990		0.3229	0.9632	0.9862	0.2446	***0.0156***	1.0000	1.0000
Little Sarasota Bay	***<0.0001***	***0.0207***	***0.0121***	***0.0470***	0.9965	0.9449	0.3229		0.9984	***0.0018***	***<0.0001***	***<0.0001***	0.3008	***0.0402***
Blackburn Bay	***<0.0001***	0.5299	0.4236	0.7106	1.0000	1.0000	0.9632	0.9984		0.1320	***0.0017***	***<0.0001***	0.9573	0.6281
Upper TB	0.1165	0.9995	0.9999	0.9930	0.1584	0.4051	0.9862	***0.0018***	0.1320		0.9230	0.3377	0.9874	0.9997
Middle TB	0.9999	0.3281	0.4212	0.1876	***0.0022***	0.0105	0.2446	***<0.0001***	***0.0017***	0.9230		1.0000	0.2474	0.4016
Hillsborough Bay	1.0000	***0.0093***	***0.0169***	***0.0026***	***<0.0001***	***<0.0001***	***0.0156***	***<0.0001***	***<0.0001***	0.3377	1.0000		***0.0154***	***0.0230***
Lower TB – North	***0.0029***	1.0000	1.0000	1.0000	0.9714	0.9987	1.0000	0.3008	0.9573	0.9874	0.2474	***0.0154***		1.0000
Lower TB - South	***0.0034***	1.0000	1.0000	1.0000	0.6838	0.9247	1.0000	***0.0402***	0.6281	0.9997	0.4016	***0.0230***	1.0000	

Appendix Table K2. Tukey post-hoc test results comparing estuary bay segments for 21.3-m offshore seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	Upper CH	Middel CH	Gasparilla Sound	Pine Island Sound	Palma Sola Bay	Sarasota Bay	Robert Bay	Little Sarasota Bay	Blackburn Bay	Upper TB	Middle TB	Hillsborough Bay	Lower TB - North	Lower TB - South
Upper CH		***0.0031***	0.1670	***0.0271***	0.6485	***<0.0001***	***0.0469***	***<0.0001***	***0.0023***	0.9999	1.0000	0.9865	***0.0258***	1.0000
Middel CH	***0.0031***		0.9977	1.0000	0.9605	0.9981	1.0000	0.1136	1.0000	0.0927	***0.0026***	***<0.0001***	1.0000	***0.0126***
Gasparilla Sound	0.1670	0.9977		1.0000	1.0000	0.5412	1.0000	***0.0034***	0.9586	0.7557	0.1272	***0.0023***	0.9999	0.3203
Pine Island Sound	***0.0271***	1.0000	1.0000		0.9990	0.9225	1.0000	***0.0258***	0.9992	0.3362	***0.0209***	***0.0001***	1.0000	0.0759
Palma Sola Bay	0.6485	0.9605	1.0000	0.9990		0.3109	0.9980	***0.0015***	0.8265	0.9845	0.5423	0.0520	0.9939	0.8014
Sarasota Bay	***<0.0001***	0.9981	0.5412	0.9225	0.3109		0.9873	0.5672	1.0000	***0.0006***	***<0.0001***	***<0.0001***	0.9946	***<0.0001***
Roberts Bay	***0.0469***	1.0000	1.0000	1.0000	0.9980	0.9873		0.0927	0.9999	0.3794	***0.0351***	***0.0005***	1.0000	0.1060
Little Sarasota Bay	***<0.0001***	0.1136	***0.0034***	***0.0258***	***0.0015***	0.5672	0.0927		0.5712	***<0.0001***	***<0.0001***	***<0.0001***	0.1169	***<0.0001***
Blackburn Bay	***0.0023***	1.0000	0.9586	0.9992	0.8265	1.0000	0.9999	0.5712		0.0519	***0.0018***	***<0.0001***	1.0000	***0.0078***
Upper TB	0.9999	0.0927	0.7557	0.3362	0.9845	***0.0006***	0.3794	***<0.0001***	0.0519		0.9992	0.7170	0.2772	1.0000
Middle TB	1.0000	***0.0026***	0.1272	***0.0209***	0.5423	***<0.0001***	***0.0351***	***<0.0001***	***0.0018***	0.9992		0.9993	***0.0194***	1.0000
Hillsborough Bay	0.9865	***<0.0001***	***0.0023***	***0.0001***	0.0520	***<0.0001***	***0.0005***	***<0.0001***	***<0.0001***	0.7170	0.9993		***0.0002***	0.9783
Lower TB – North	***0.0258***	1.0000	0.9999	1.0000	0.9939	0.9946	1.0000	0.1169	1.0000	0.2772	0.0194	***0.0002***		0.0652
Lower TB - South	1.0000	***0.0126***	0.3203	0.0759	0.8014	***<0.0001***	0.1060	***<0.0001***	***0.0078***	1.0000	1.0000	0.9783	0.0652	

Appendix Table K3. Tukey post-hoc test results comparing estuary bay segments for 183-m haul seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	Upper CH	Middel CH	Gasparilla Sound	Pine Island Sound	Palma Sola Bay	Sarasota Bay	Robert Bay	Little Sarasota Bay	Blackburn Bay	Upper TB	Middle TB	Hillsborough Bay	Lower TB - North	Lower TB - South
Upper CH		***<0.0001***	***<0.0001***	***<0.0001***	***<0.0001***	***<0.0001***	***0.0100***	***<0.0001***	***0.0015***	***<0.0001***	***<0.0001***	***<0.0001***	***<0.0001***	***<0.0001***
Middel CH	***<0.0001***		0.1014	1.0000	0.9944	0.5092	0.9909	1.0000	0.9999	0.3439	1.0000	0.3764	0.9569	0.9998
Gasparilla Sound	***<0.0001***	0.1014		***0.0087***	0.0800	***<0.0001***	1.0000	0.4407	0.9973	1.0000	0.3996	1.0000	***0.0008***	***0.0026***
Pine Island Sound	***<0.0001***	1.0000	***0.0087***		1.0000	0.8967	0.8892	1.0000	0.9905	0.0529	0.9864	0.0614	0.9999	1.0000
Palma Sola Bay	***<0.0001***	0.9944	0.0800	1.0000		1.0000	0.7686	1.0000	0.9381	0.1911	0.9421	0.2054	1.0000	1.0000
Sarasota Bay	***<0.0001***	0.5092	***<0.0001***	0.8967	1.0000		0.1999	0.9944	0.4603	***0.0007***	0.1981	***0.0008***	0.9997	0.9028
Roberts Bay	***0.0100***	0.9909	1.0000	0.8892	0.7686	0.1999		0.9813	1.0000	1.0000	0.9997	1.0000	0.5675	0.8449
Little Sarasota Bay	***<0.0001***	1.0000	0.4407	1.0000	1.0000	0.9944	0.9813		0.9990	0.6849	0.9999	0.7066	1.0000	1.0000
Blackburn Bay	***0.0015***	0.9999	0.9973	0.9905	0.9381	0.4603	1.0000	0.9990		0.9999	1.0000	1.0000	0.8611	0.9831
Upper TB	***<0.0001***	0.3439	1.0000	0.0529	0.1911	0.0007	1.0000	0.6849	0.9999		0.7746	1.0000	***0.0062***	***0.0214***
Middle TB	***<0.0001***	1.0000	0.3996	0.9864	0.9421	0.1981	0.9997	0.9999	1.0000	0.7746		0.8040	0.6896	0.9631
Hillsborough Bay	***<0.0001***	0.3764	1.0000	0.0614	0.2054	***0.0008***	1.0000	0.7066	1.0000	1.0000	0.8040		***0.0074***	***0.0255***
Lower TB – North	***<0.0001***	0.9569	***0.0008***	0.9999	1.0000	0.9997	0.5675	1.0000	0.8611	***0.0062***	0.6896	***0.0074***		0.9999
Lower TB - South	***<0.0001***	0.9998	***0.0026***	1.0000	1.0000	0.9028	0.8449	1.0000	0.9831	***0.0214***	0.9631	***0.0255***	0.9999	

Appendix Table K4. Tukey post-hoc test results comparing estuary bay segments for 6.1-m otter trawl. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	Upper CH	Middel CH	Gasparilla Sound	Pine Island Sound	Palma Sola Bay	Sarasota Bay	Robert Bay	Little Sarasota Bay	Blackburn Bay	Upper TB	Middle TB	Hillsborough Bay	Lower TB - North	Lower TB - South
Upper CH		***0.0010***	0.9398	***0.0004***	1.0000	0.9999	0.1822	***<0.0001***	0.9808	0.7789	0.9975	1.0000	***0.0009***	0.8084
Middel CH	***0.0010***		***<0.0001***	1.0000	0.6576	0.1356	1.0000	0.0597	0.9999	0.9632	***0.0005***	***0.0453***	0.9873	***<0.0001***
Gasparilla Sound	0.9398	***<0.0001***		***<0.0001***	0.9997	0.6467	***0.0161***	***<0.0001***	0.6062	0.0783	1.0000	0.8782	***<0.0001***	1.0000
Pine Island Sound	***0.0004***	1.0000	***<0.0001***		0.5019	0.0622	1.0000	0.1336	0.9982	0.8594	***0.0002***	0.0188	0.9993	***<0.0001***
Palma Sola Bay	1.0000	0.6576	0.9997	0.5019		1.0000	0.6953	***0.0026***	0.9994	0.9984	1.0000	1.0000	0.2240	0.9935
Sarasota Bay	0.9999	0.1356	0.6467	0.0622	1.0000		0.5421	***<0.0001***	0.9998	0.9975	0.9223	1.0000	***0.0306***	0.4789
Roberts Bay	0.1822	1.0000	***0.0161***	1.0000	0.6953	0.5421		0.7250	0.9978	0.9687	0.0508	0.3828	1.0000	***0.0099***
Little Sarasota Bay	***<0.0001***	0.0597	***<0.0001***	0.1336	***0.0026***	***<0.0001***	0.7250		0.0842	***0.0048***	***<0.0001***	***<0.0001***	0.7575	***<0.0001***
Blackburn Bay	0.9808	0.9999	0.6062	0.9982	0.9994	0.9998	0.9978	0.0842		1.0000	0.7783	0.9978	0.9281	0.4372
Upper TB	0.7789	0.9632	0.0783	0.8594	0.9984	0.9975	0.9687	***0.0048***	1.0000		0.3201	0.9747	0.4923	0.0589
Middle TB	0.9975	***0.0005***	1.0000	***0.0002***	1.0000	0.9223	0.0508	***<0.0001***	0.7783	0.3201		0.9861	***0.0002***	1.0000
Hillsborough Bay	1.0000	***0.0453***	0.8782	***0.0188***	1.0000	1.0000	0.3828	***<0.0001***	0.9978	0.9747	0.9861		***0.0113***	0.7149
Lower TB – North	***0.0009***	0.9873	***<0.0001***	0.9993	0.2240	***0.0306***	1.0000	0.7575	0.9281	0.4923	***0.0002***	***0.0113***		***<0.0001***
Lower TB - South	0.8084	***<0.0001***	1.0000	***<0.0001***	0.9935	0.4789	***0.0099***	***<0.0001***	0.4372	0.0589	1.0000	0.7149	***<0.0001***	

Appendix M. Analysis of Variance post-hoc Tukey test results identifying sampling years with significant differences (*P*<0.05) in the Tampa Bay, Sarasota Bay and Charlotte Harbor estuaries.

Appendix Table M1. Tukey post-hoc test results comparing sampling years for 21.3-m shoreline seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	June 2009 to April 2010	June 2010 to April 2011	June 2011 to April 2012	June 2012 to April 2013
June 2009 to April 2010		0.0143	***<0.0001***	***0.0391***
June 2010 to April 2011	0.0143		0.3325	0.9859
June 2011 to April 2012	***<0.0001***	0.3325		0.178
June 2012 to April 2013	***0.0391***	0.9859	0.178	

Appendix Table M2. Tukey post-hoc test results comparing sampling years for 21.3-m offshore seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	June 2009 to April 2010	June 2010 to April 2011	June 2011 to April 2012	June 2012 to April 2013
June 2009 to April 2010		***0.0066***	***<0.0001***	***0.0016***
June 2010 to April 2011	***0.0066***		0.4299	0.9765
June 2011 to April 2012	***<0.0001***	0.4299		0.692
June 2012 to April 2013	***0.0016***	0.9765	0.692	

Appendix Table M3. Tukey post-hoc test results comparing sampling years for 183-m haul seine. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	June 2009 to April 2010	June 2010 to April 2011	June 2011 to April 2012	June 2012 to April 2013
June 2009 to April 2010		***0.0007***	***0.0235***	0.1711
June 2010 to April 2011	***0.0007***		0.733	0.2626
June 2011 to April 2012	***0.0235***	0.733		0.8563
June 2012 to April 2013	0.1711	0.2626	0.8563	

Appendix Table M4. Tukey post-hoc test results comparing sampling years for 6.1-m otter trawl. Comparisons that were significantly different ($P < 0.05$) are denoted with grey shaded cells and by bold and italic font.

	June 2009 to April 2010	June 2010 to April 2011	June 2011 to April 2012	June 2012 to April 2013
June 2009 to April 2010		0.9947	0.0591	***0.0039***
June 2010 to April 2011	0.9947		0.1077	***0.009***
June 2011 to April 2012	0.0591	0.1077		0.8092
June 2012 to April 2013	***0.0039***	***0.009***	0.8092	