NOAA Technical Memorandum NMFS-SEFSC-647

NEKTON FROM FISHERY-INDEPENDENT TRAWL SAMPLES IN ESTUARIES OF THE U.S. GULF OF MEXICO: A COMPARATIVE ASSESSMENT OF GULF ESTUARINE SYSTEMS (CAGES)

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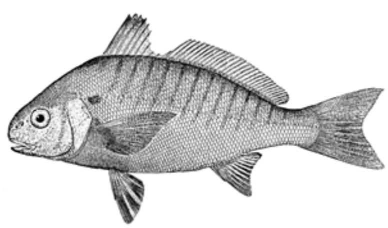

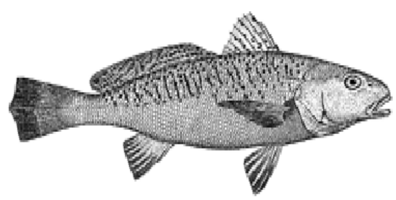

[1]U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
Galveston Laboratory
4700 Avenue U
Galveston, TX 77551

[2]Texas Parks and Wildlife Department
TPWD Field Office
702 Navigation Circle
Rockport, TX 78382

[3]University of Southern Mississippi
Gulf Coast Research Laboratory
703 East Beach Drive
Ocean Springs, MS 39564

[4]Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
100 8th Avenue SE
St. Petersburg, FL 33701

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[4]Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
100 8th Avenue SE
St. Petersburg, FL 33701

U.S. DEPARTMENT OF COMMERCE
Dr. Rebecca Blank, Acting Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Dr. Kathryn Sullivan, Acting Administrator

NATIONAL MARINE FISHERIES SERVICE
Samuel D. Rauch, III, Acting Assistant Administrator for NOAA Fisheries

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Executive Summary

Estuaries are important in supporting much of the fishery production in the Gulf of Mexico, but this support appears to vary widely among different estuarine systems. The main objective of this project was to assess variability among estuaries in supporting fishery species and other abundant nekton. The project is part of a larger effort of the National Marine Fisheries Service Galveston Laboratory to develop a Comparative Assessment of Gulf Estuarine Systems (CAGES). The nekton abundance data summarized in this report are available at http://data.gcoos.org.

This cooperative study with state natural resources agencies was designed to use fishery-independent monitoring data and compare historical catches from 4.9-m and 6.1-m trawl surveys. This report provides an assessment of the abundance, length frequencies, and biomass of 14 species of fish and four species of decapod crustaceans that were either abundant in the samples or economically important. The most abundant species in the analysis include bay anchovy, Atlantic croaker, spot, and brown shrimp. Other fishery species of particular interest include Gulf menhaden, white shrimp, pink shrimp, blue crab, spotted seatrout, southern flounder, and red drum. While the years analyzed varied among states, samples from most estuaries were available and analyzed for the years 1986 to 2005. The 24 estuaries analyzed were identified using the Estuarine and Coastal Drainage Areas delineated by the U. S. Geological Survey and listed in NOAA's Coastal Assessment Framework (http://coastalgeospatial.noaa.gov/data_gis.html).

While our goal was to provide nekton data for comparisons among all 24 estuaries, we have presented the data by state, because differences in sampling gear and protocols make comparisons among states challenging. Overall trawl size varied from 6.1 m in Texas and Florida to 4.9 m in Louisiana, Mississippi, and Alabama, and towing speeds varied from 2.2 kph in Florida to 4.8 kph in Texas and Louisiana. We converted catch to numbers per hectare swept to standardize the data and adjust for some of the gear differences among states, but effects of varying net mesh size make comparisons across state lines difficult. Size frequency distributions were different for most species among the states, suggesting that net mesh size affected abundance estimates. We converted abundance data to biomass using the size frequency data and length-weight relationships from the literature in an effort to reduce the impact of size selection. A more detailed analysis on brown shrimp, however, indicates that size selectivity still affects comparisons for many species. A comprehensive gear comparison study is needed to adequately address many of these problems.

Temporal trends in abundance and biomass within estuaries or within states are less likely to be affected by gear differences. Monthly mean values presented for each state and each estuary indicate that abundance and biomass peaks for most species are not consistent among the different estuaries. Annual variability within states was often high, and few similarities were apparent in annual trends among states.

Comparisons of abundance or biomass between estuaries should be made with care. Even within states, the selection of sampling sites may affect such comparisons. In Texas and in Florida, the randomization of sampling sites within estuaries can make these comparisons meaningful, if an adequate number of samples was collected. Within Louisiana, Mississippi, and Alabama, the location and distribution of fixed sampling stations should be considered when making comparisons among estuaries. Comparisons of nekton abundance or biomass in estuaries of different states also need to account for differences in sampling gear and size frequency distributions.

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The authors would like to thank the field crews who collected the data and the biologists who analyzed the samples at Texas Parks and Wildlife Department, Louisiana Department of Wildlife and Fisheries, University of Southern Mississippi, Gulf Coast Research Laboratory and Florida Fish and Wildlife Conservation Commission. We would like to thank Phil Caldwell of the NOAA Galveston Lab for his assistance with GIS and construction of figures. We also would like to thank Michael Harden, Harry Blanchet, and Marty Bourgeois at the LDWF for their assistance with the Louisiana data. Chris Stafford and Kerry Flaherty at FFWCC provided assistance in compiling the Florida Data and Harriet Perry at FFWCC provided valuable guidance.

Disclaimer:

The abundance estimates included in this report are applicable only to this Technical Memorandum. The data are limited to the years between 1981 – 2007 and no inferences should be made of the data beyond the years and the geographic regions discussed herein.
The scientific views, opinions and conclusions expressed herein are solely those of the authors and do not represent the views, opinions or conclusions of NOAA and/or the Department of Commerce.

Introduction

The northern Gulf of Mexico (Gulf) supports several economically important fisheries in the United States, including penaeid shrimp (*Farfantepenaeus aztecus, Farfantepenaeus duorarum*, and *Litopenaeus setiferus*), Gulf menhaden (*Brevoortia patronus*), red drum (*Sciaenops ocellatus*), and blue crabs (*Callinectes sapidus*). The productivity of these species is estuarine-dependent (Boesch and Turner 1984, Minello 1999, Zimmerman et al. 2000). Although spawning generally occurs in coastal waters, larvae recruit into estuaries and settle in nursery habitats such as salt marshes, seagrass beds, tidal flats, and mangroves (Beck et al. 2001) where they obtain protection from predators and an abundance of food for rapid growth. After three to six months of growth in these estuarine habitats, sub-adults generally migrate back to the Gulf to mature.

While estuaries appear important in supporting fishery production in the Gulf, there is evidence that this support varies widely among different estuarine systems. Deegan et al. (1986) and Turner (2001) discussed this variability and the potential causes. Correlative studies have identified vegetative cover (Turner 1977, 2001) and nutrient inflow (Day et al. 1982, Deegan et al. 1986) as two estuarine characteristics related to fishery production. However, the availability of data on both fishery production and associated estuarine characteristics limit the value of such comparisons, and the functional mechanisms behind these correlations have not been fully elucidated.

Pritchard (1967) defined an estuary as “a semi-enclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted by fresh water derived from land drainage.” Such a restrictive definition has generally not been recognized in the Gulf of Mexico where some systems considered estuaries, such as the Laguna Madre in Texas, have limited freshwater input, and areas with a great deal of fresh water, such as Mississippi Sound, are only marginally enclosed. NOAA’s Coastal Assessment Framework has identified 88 Coastal and Estuarine drainage and subdrainage areas in the Gulf of Mexico. We used this framework to identify estuarine systems in the Gulf. Of these systems, 24 have been sampled for nekton and included in this report (Figure 1).

The main objective of this project was to assess variability among estuaries in supporting fishery species and other abundant nekton. The project is part of a larger effort of the NMFS Galveston Laboratory to develop a Comparative Assessment of Gulf Estuarine Systems (CAGES). Fishery-independent monitoring of natural resources by state agencies has improved substantially for estuarine waters during the last 20 years. In this analysis, we compare historical catches from trawl surveys conducted in the five states bordering the Gulf. The work was done in cooperation with the state resource agencies that provided raw catch and hydrographic data from trawl samples. This report provides an assessment of the abundance, length frequencies, and biomass of 18 commercially important species of fish and invertebrates (Table 1) commonly caught by shrimp trawls throughout estuaries of the northern Gulf. While the years included varied among states, samples from most estuaries were available and analyzed for the years 1986 to 2005. Estimates were based on 4.9-m and 6.1-m (16-ft and 20-ft) trawls, and abundance and biomass are reported as values per hectare of area swept.

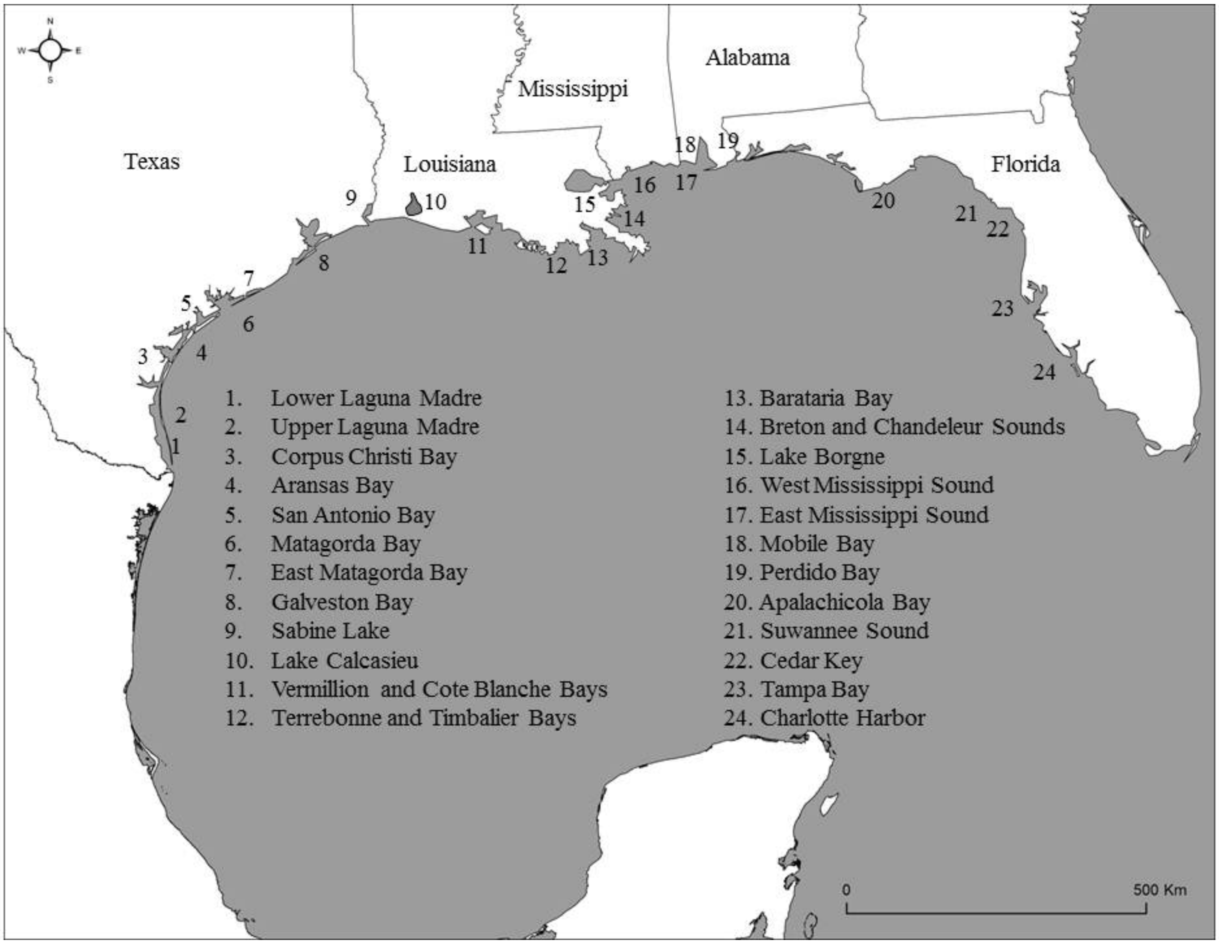

Figure 1. Estuaries along the U. S. coast of the Gulf of Mexico that were analyzed for nekton abundance.

Methods

Upon commencement of the project we explained our objectives to representatives of each of the five Gulf States along with the requests for data. Raw catch data from trawl surveys, information on sampling methods, and photographs of sampling gear were provided by the Coastal Fisheries Division of the Texas Parks and Wildlife Department (TPWD), the Marine Fisheries Division of the Louisiana Department of Wildlife and Fisheries (LDWF), the Mississippi Department of Marine Resources and the University of Southern Mississippi's Gulf Coast Research Laboratory (MDMR/GCRL), the Alabama Department of Conservation and Natural Resources (ADCNR), and the Fish & Wildlife Research Institute of the Florida Fish and Wildlife Conservation Commission (FFWCC).

Of the hundreds of species of fish and macroinvertebrates that inhabit Gulf estuaries and bays, 18 were selected for analysis in this study (Table 1). These species were of economic importance or were frequently caught in shrimp trawls.

Table. 1. Selected common and economically important species of interest that are widely distributed among Gulf of Mexico estuaries and analyzed in this study. The total number of each species caught is from fishery-independent sampling trawls in all five Gulf States. The total mean abundance in #/ha (±SE) is shown from all samples in Texas (n=38,559), Louisiana (n=23,633), Mississippi (n=1,288), Alabama (n=4,647), and Florida (n=6,944). No *Cynoscion nebulosus* were noted in Florida trawls. No *Sciaenops ocellatus* were noted in Alabama trawls.

Scientific Name	Common Name	Number Caught	Texas	Louisiana	Mississippi	Alabama	Florida
Anchoa mitchilli	bay anchovy	5,917,263	7.5 (0.2)	531.0 (7.6)	3,205.9 (224.6)	718.2 (32.8)	191.1 (18.5)
Micropogonias undulatus	Atlantic croaker	2,376,905	28.6 (0.4)	219.5 (4.5)	415.5 (117.2)	165.3 (14.3)	24.5 (4.5)
Leiostomus xanthurus	spot	1,424,103	28.0 (0.5)	31.1 (1.2)	653.2 (222.7)	527.1 (34.0)	40.5 (6.2)
Farfantepenaeus aztecus	brown shrimp	1,200,909	17.1 (0.4)	116.7 (2.5)	109.6 (16.2)	41.8 (3.0)	1.6 (0.2)
Litopenaeus setiferus	white shrimp	829,003	12.8 (0.4)	76.0 (1.7)	151.5 (20.1)	17.2 (1.3)	9.9 (2.9)
Brevoortia patronus	Gulf menhaden	691,302	5.0 (0.2)	66.9 (4.7)	86.5 (17.1)	87.6 (15.5)	4.1 (2.0)
Lagodon rhomboides	pinfish	550,651	29.1 (0.6)	0.7 (0.0)	0.6 (0.1)	52.7 (6.8)	52.5 (3.5)
Cynoscion arenarius	sand seatrout	362,355	1.6 (0.0)	30.0 (0.7)	91.3 (11.1)	33.8 (3.7)	43.5 (3.8)
Callinectes sapidus	blue crab	292,374	7.0 (0.1)	20.1 (0.6)	10.6 (1.1)	8.2 (0.5)	10.3 (0.3)
Ariopsis felis	hardhead catfish	196,284	4.3 (0.1)	11.3 (0.7)	39.6 (13.9)	16.5 (1.7)	16.3 (1.5)
Bairdiella chrysoura	silver perch	102,328	4.5 (0.1)	2.0 (0.2)	6.1 (1.4)	2.6 (0.3)	13.9 (2.0)
Farfantepenaeus duorarum	pink shrimp	78,046	1.6 (0.1)	0.7 (0.1)	0.6 (0.1)	6.1 (0.8)	34.7 (2.4)
Symphurus plagiusa	blackcheek tonguefish	43,108	0.1 (0.0)	1.3 (0.0)	3.5 (0.5)	16.3 (1.6)	11.8 (0.5)
Mugil cephalus	striped mullet	16,715	0.9 (0.1)	0.4 (0.0)	1.6 (0.6)	0.8 (0.4)	0.0 (0.0)
Pogonias cromis	black drum	10,179	0.5 (0.0)	0.3 (0.0)	0.9 (0.3)	0.0 (0.0)	0.0 (0.0)
Paralichthys lethostigma	southern flounder	7,852	0.2 (0.0)	0.5 (0.0)	0.8 (0.1)	0.5 (0.0)	0.1 (0.0)
Cynoscion nebulosus	spotted seatrout	5,793	0.2 (0.0)	0.7 (0.1)	0.6 (0.1)	0.4 (0.1)	
Sciaenops ocellatus	red drum	1,567	0.0 (0.0)	0.1 (0.1)	0.0 (0.0)		0.2 (0.0)

There are many small bays and estuaries along the Gulf coast in the U. S. that may be important for fishery species. We used the Estuarine and Coastal Drainage Areas identified by the U. S. Geological Survey and listed in NOAA's Coastal Assessment Framework (http://coastalgeospatial.noaa.gov/data_gis.html) to identify 24 estuaries that were sampled regularly for fisheries-independent resource assessment using trawls.

Sampling Protocols

All of the samples used in our analyses were collected using small otter trawls. Trawl specifications for each state are summarized in Table 2, and a general diagram of trawl components is shown in Figure 2. The headrope length is the distance between the points where the net is attached to the top line at either end of the net opening. The leg length is the distance between the net opening and the door. The bridle length is defined here as the length of line from the door to the single towing line.

Table 2. Specifications for otter trawls used for fishery-independent monitoring of estuarine natural resources by state agencies.

	Parameter	Texas	Louisiana	Mississippi	Alabama	Florida
Gear Name		6.1-m Trawl	4.9-m Trawl	4.9-m Trawl	4.9-m 2-seam Trawl	6.1-m Trawl
Bridles	Length to Center (m)	30.5	6.1	None	10.8	15.2
Doors	Length (m)	1.2	0.6	0.9	0.6	0.9
	Height (cm)	50	36	46	32	46
Leg	Length (m)	0.5	0.3	0.6	1.8	0.6
Net	Footrope (m)	7.0	6.1	6.1	5.4	6.6
	Headrope (m)	5.7	4.9	4.9	4.3	6.1
	Length (m)	5.7	5.7	5.7	3.4	4.7
Bag	Length (m)	2.2	1.5	1.8	0.6	3.2
Mesh	Body/Front (cm)	3.8 (stretch)	3.8 (stretch)	3.8 (stretch)	3.5 (stretch)	3.8 (stretch)
	Cod/Bag (cm)	3.8 (stretch)	0.6 (knotless bar)	0.6 (knotless bar)	4.4 (cover) and 0.5 (knotless bar liner)	3.8 (cover) and 0.3 (knotless bar-liner)
Weight	No. of weights	36 at 57-g each along the footrope webbing	6.3-mm chain along the footrope webbing	6.3-mm chain along the footrope webbing	4.8-mm chain, 7 chains along footrope	6.4-mm chain along the footrope webbing
Floats	No. of floats	3	4	4	2	4
	Dimensions (cm)	9.5 x 7.6	6.4 x 2.5	6.4 x 2.5	7.6 x 7.6	6.4 x 3.8 (SB3)
Tickler	Length (m)	None	None	None	None	7.3
	Material					6.4-mm dia. chain

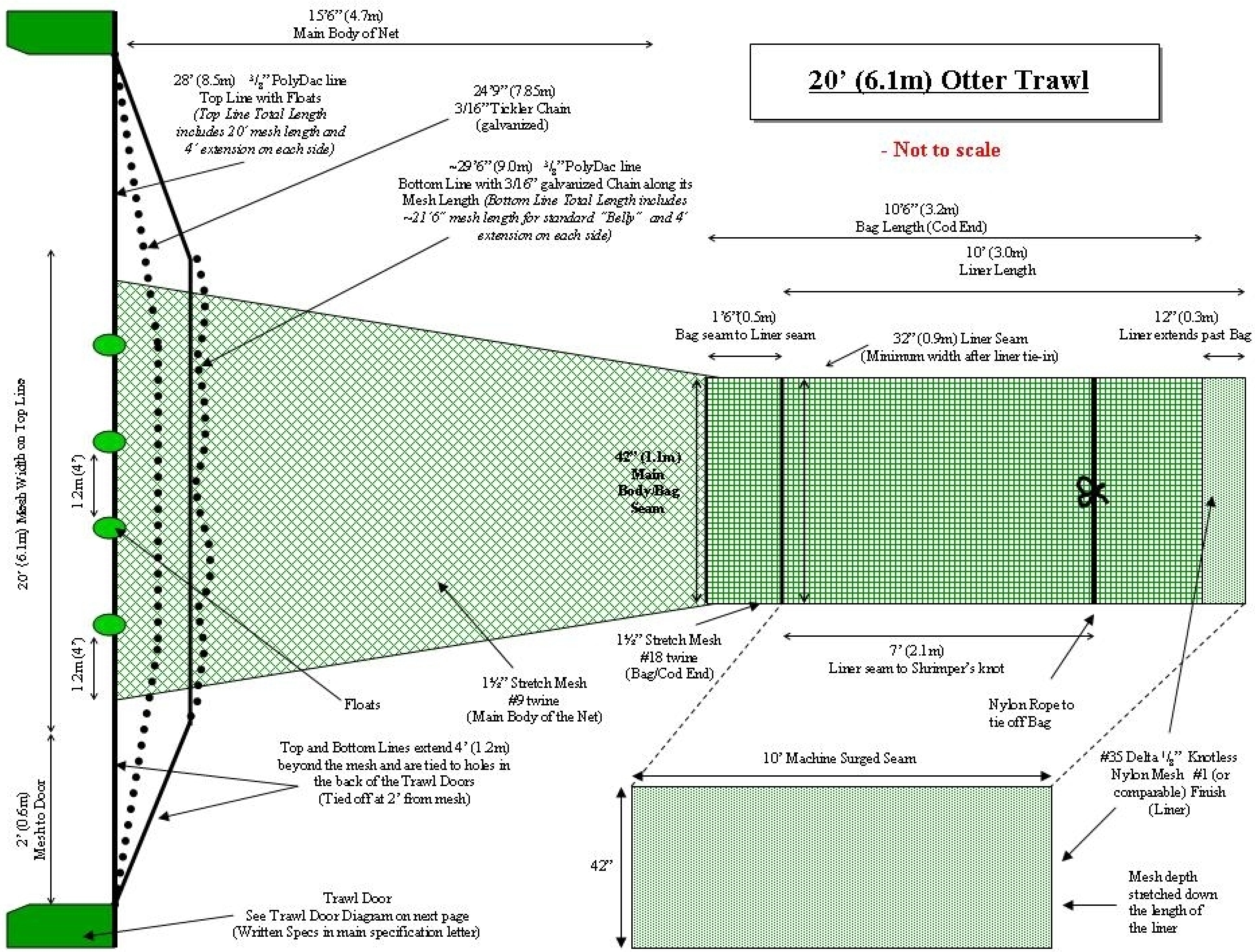

Figure 2. Diagram of a shrimp trawl; bridles (not shown) would extend to the left from the green doors (courtesy of FFWCC).

Texas

The Texas Parks and Wildlife Department (TPWD) Coastal Fisheries Division has used 6.1-m trawls to assess estuarine fishery-related resources via systematic fishery-independent sampling of its estuaries beginning in the 1960's. Since 1982, monthly sampling by trawling following a stratified cluster design with random site selections has been conducted in Texas estuaries. Galveston Bay, Matagorda Bay, San Antonio Bay, Aransas Bay, and Corpus Christi Bay were stratified into two equal-area zones for sampling to ensure good spatial distribution of samples in these larger estuarine systems; Sabine Lake, East Matagorda Bay, Upper Laguna Madre, and Lower Laguna Madre only had one zone. Each zone was divided into grids of one minute latitude by one minute longitude. Ten grids in each zone were randomly selected for sampling by trawl each month. If a chosen grid was not free of obstructions or did not contain water >1m deep in at least one third of its area, an adjoining grid was chosen by random selection until these conditions were met. Half of the monthly trawl samples in each zone were collected during the first and second half of each month. No grid was duplicated in a month. TPWD provided data for the years 1982-2005. Stations used for this study can be seen in Figures 3 – 5.

Once on site, hydrological and weather data were collected and recorded. A Kimmerer water sampler (or equivalent) was used to collect water from about 0.3 m (1 ft) off the bottom of each trawl site prior to trawling. Salinity (‰) and water temperature (°C) were measured from bottom water using an appropriate instrument or meter (YSI, HACH, or equivalent). The same parameters were measured from surface water.

Trawls were towed in a circular pattern to keep prop-wash out of the net and to stay near the center of each designated grid. All estuarine trawl tows were targeted to last 10 minutes, but actual duration was recorded. Towing vessels ranged from 6-7 m (22-24 ft) aluminum skiffs powered by outboard engines used in shallow areas, to 10-16 m trawler research vessels powered by inboard diesel marine engines used in deeper open-bay and Gulf waters. Trawls were towed at 4.8 kph (3 mph), and the start, midway, and end locations of each trawl were recorded. Water depths (m) were recorded at the start and end of each tow.

All organisms caught were identified to the lowest specific taxonomic level possible, usually to genus and species. Up to 50 shrimp of each species, 35 blue crabs, and 19 individuals of all other species were measured in each sample. Fish and shrimp were measured for total length (TL) and crabs for total width (from tip to tip of lateral spines) (Martinez-Andrade and Fisher 2010).

Louisiana

The Louisiana Department of Wildlife and Fisheries (LDWF) Marine Fisheries Division conducts fishery-independent sampling to assess the state's natural resources, to aid in setting opening and closing dates for fisheries, and to aid in setting catch limits for regulated species. Fishery-independent trawl sampling using the 4.9-m (16-ft) flat otter trawls was scheduled for each year as follows: Nov – Feb (bi-weekly) and Mar – Oct (weekly). Stations used for this study can be seen in Figures 6 – 7.

Hydrographic data were collected before each trawl tow. Temperature and salinity were measured from surface and bottom waters, and turbidity measured from surface water. Water depth was recorded at the start of the tow. The trawl was towed for 10 minutes: timed from when the trawl first began to move forward to when it stopped forward movement. Towing speed was 4.8 kph (3 mph), and the tow path was either weaving, circular, or straight depending on depth and design of the water body (bayou or open bay), allowing the prop-wash to pass to the side or over the top of the trawl. LDWF provided data for the years 1986-2007.

All organisms caught in the trawl were identified to the lowest taxon possible (usually genus and species), counted, and up to 50 of each species were measured in 5-mm intervals. Size measurements were taken as follows: shrimp – total length (TL) measured from the anterior tip of the rostrum to posterior tip of the telson; crabs – carapace width (CW) measured from tip to tip of posterior-lateral spines of the carapace; and fish – measured as total length (LDWF 2002).

Mississippi

The Mississippi Department of Marine Resources and the University of Southern Mississippi's Gulf Coast Research Laboratory (MDMR/GCRL) conducted monthly resource assessments at designated stations in the Mississippi Sound. MDMR/GCRL selected these few sites as being representative of their areas' nekton based on past surveys. The standard trawl used for fisheries-independent sampling was a 4.9-m (16-ft) flat otter trawl with 3.8-cm (1.5-in) stretched mesh webbing of nylon multifilament twine and was very similar to trawls used by LDWF (Table 3). Environmental data were collected at each site prior to the trawl tow. Surface and bottom water temperature and salinity were recorded along with water depth before each tow. The MDMR/GCRL trawl also was fitted with a 6-mm (1/4-in) bar mesh liner. The trawl was spread by 0.9 m long by 0.5 m tall (36 x 18 in) plank board trawl doors protected along their rims by iron plate. Tow line length was determined by a 6:1 scope with water depth. Trawls were towed for 10 minutes at about 3.7 kph (2.4 mph) from a 6.4-m (21-ft) research boat. Data presented here are for the years 1981-2005. Abundance data were not collected for the following species until 1985: *Anchoa mitchilli*, *Bairdiella chrysoura*, *Lagodon rhomboides*, *Paralichthys lethostigma*, *Pogonias cromis*, *Sciaenops ocellatus*, and *Symphurus plagiusa*. Stations used for this study can be seen in Figure 8.

All specimens caught in a trawl were identified, counted, and recorded. Standard length (mm) and weights (g) of up to 50 specimens of each species, including the minimum and maximum sizes, were measured and recorded for commercial species only. For non-commercial species only minimum and maximum standard lengths were recorded (Anderson 2009).

Alabama

The Alabama Department of Conservation and Natural Resources (ADCNR) Marine Resources Division has conducted regular assessments of their estuarine natural resources including shrimp, crabs, and finfish since 1977. Monthly sampling for all penaeid shrimp, *Callinectes* crabs, and finfish species started in October 1980. A 4.9-m (16-ft) flat otter trawl with 3.8-cm (1.5-in) stretched mesh webbing, similar to trawls used by Mississippi and Louisiana, was used to sample demersal nekton. Trawl tows were 10 min in duration at about 3.7 kph (2.4 mph). Salinity and temperature values were collected and recorded from surface and bottom waters at each site. Depth was recorded in meters. Site location data were recorded using a differential GPS (ADCNR 2010).

Standard lengths (mm) were recorded for up to 50 specimens of each fish species. Total length (mm) for shrimp and carapace width (mm) for crabs were recorded. Beginning in 1990, all organisms were enumerated and weighed according to SEAMAP procedures (Stuntz et al. 1983). From 1998 through October 2000, the number of sites sampled expanded. Trawl sampling was not conducted in December, 1998; January, June, July, and October, 1999; and December, 2000. Sampling was attempted as early in a month as possible. Sample sites were fixed locations in and near Biloxi Bay and Perdido Bay. Data presented here are for the years 1981-2007. Stations used for this study can be seen in Figure 9.

Florida

The Florida Fish and Wildlife Conservation Commission (FFWCC) manages fish and wildlife resources to maintain populations for their long-term well-being and for the benefit of the people. The Fisheries-Independent Monitoring (FIM) program, part of the Fish and Wildlife Research Institute of the FFWCC has been monitoring resource species in four regions of the Florida Gulf coast: Apalachicola Bay, the shallow Gulf area off the Suwannee River delta north of Cedar Key, Tampa Bay, and Charlotte Harbor. The data were subdivided in this report into estuaries based on the USGS Estuarine Drainage Areas. FFWCC collected trawl data from Suwannee Sound and Cedar Key as one sampling region, but data are presented separately in this report. Trawl samples and hydrologic data were collected at randomly selected sites monthly in the tidally influenced riverine areas of our sampling universe (1989-2005) or on a seasonal (spring-fall 1989-1995 and 1998-2005) basis to target the main juvenile recruitment periods depending on the year in each of these four estuarine areas. During 1996 and 1997 trawl samples and hydrologic data were collected monthly in both riverine systems and in the bays. Each of the four areas was subdivided into grids of 1 x 1 minute latitude and longitude. Each minute grid was further subdivided into microgrids using a 10 x 10 cell grid overlay. Each microgrid was also classified by habitat, and the percentage of all microgrids in each habitat defined the number of samples to be taken from that pool of microgrids. Data presented here are for the years 1989-2005. Samples collected from 1989-1994 included both day and night hauls with those after 1994 being daytime collections only. Sampling in Suwannee Sound and Cedar Key began in 1996 but no trawl sampling occurred in 1998-2000. Sampling in Apalachicola Bay did not begin until 1998. Stations used for this study can be seen in Figures 10 – 13.

Hydrographic data collected at each site included temperature and salinity. Observations were taken at 1-m depth intervals from the surface to the bottom. Water depth and habitat type also were recorded. Trawls were towed from 6.7 – 7.3-m (22 – 24-ft) wooden mullet skiffs, each powered by an outboard engine housed in a central well, thus leaving the rear deck and transom open for sampling operation. FFWCC used a 6.1-m (20-ft) two-panel otter trawl with 3.8-cm (1.5-in) stretch mesh webbing very similar to that used by TPWD (Table 3). The boat speed was set at about 2.2 kph (1.4 mph) to tow approximately 0.2 nm in 10 minutes (acceptable range was 0.16 to 0.24 nm).

All fishery samples collected by FFWCC were processed following a standard set of protocols. These protocols ensured that an accurate size representation and number collected were recorded for each species in each sample, and that the data taken reflected the entire catch. All fish and selected macroinvertebrate species captured were identified to the lowest practical taxonomic level and counted. A random sample of at least 10 individuals (40 for selected species) was measured (standard length [SL] for teleosts, carapace width for crabs, and post-orbital head length [carapace length] for shrimp) and recorded for each trawl. When the catch was estimated to include more than 1000 individuals, the catch could be subsampled. Subsamples were processed under the normal protocols and results extrapolated back to a whole catch (FFWCC 2010).

Sampling Intensity

Summary information on the number of trawl samples collected in each estuary is shown in Tables 3 and 4. Uneven sampling intensity can affect summary calculations of mean abundance and biomass. For example, Florida data were mainly available from Tampa Bay and Charlotte Harbor from 1989 to 1997, and sampling frequency among months also was uneven. Summary means will reflect abundance in estuaries and months with the most samples. When sampling intensity is very uneven, mean values presented in tables for each estuary will likely provide a better depiction of temporal patterns in abundance and biomass.

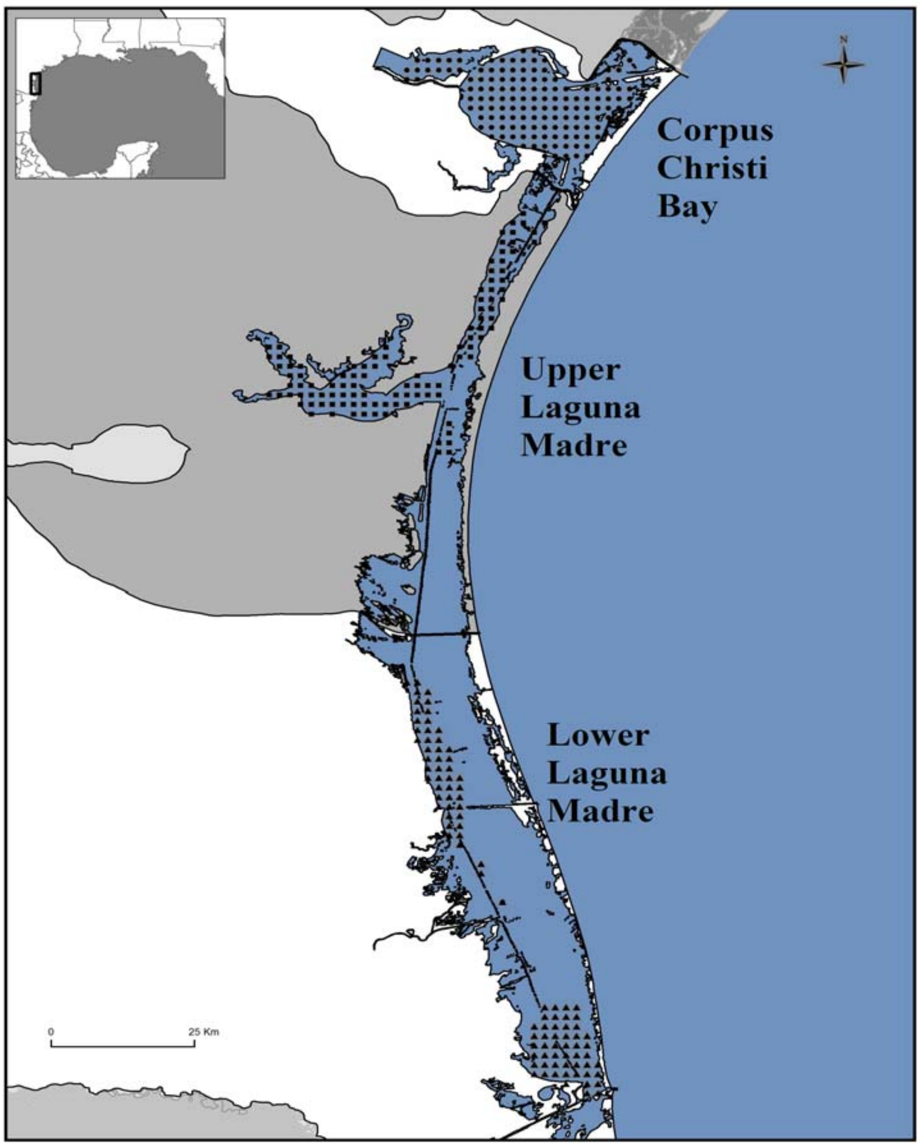

Figure 3. Trawl sites used by Texas Parks and Wildlife Department in Lower Laguna Madre (triangles), Upper Laguna Madre (squares), and in Corpus Christi Bay (dots) in their fisheries independent surveys, 1982-2005. Estuarine Drainage Areas are indicated by variations in shading.

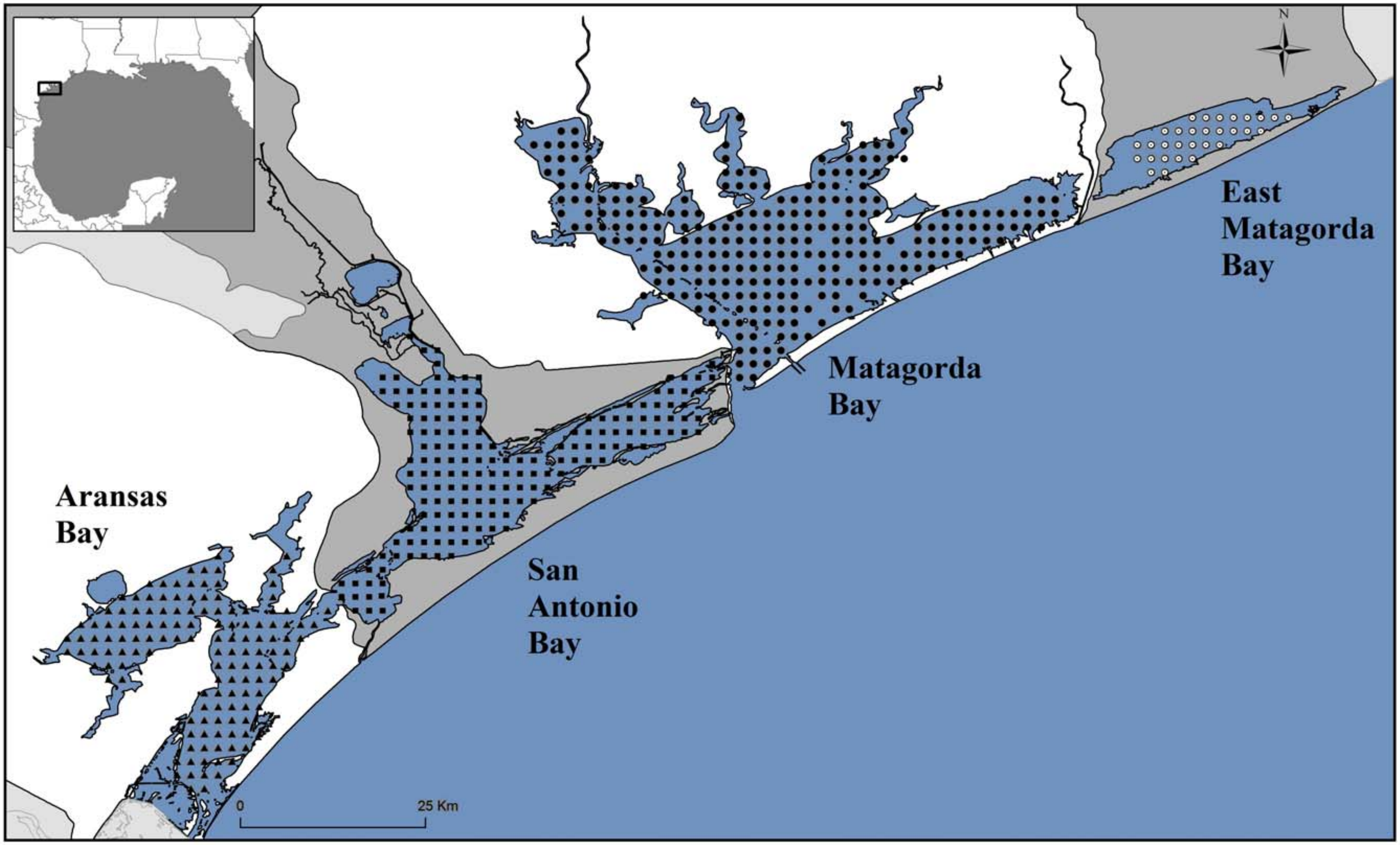

Figure 4. Trawl sites used by Texas Parks and Wildlife Department in Aransas Bay (triangles), San Antonio Bay (squares), Matagorda Bay (black dots), and in East Matagorda Bay (white dots) in their fisheries independent surveys, 1982-2005. Estuarine Drainage Areas are indicated by variations in shading.

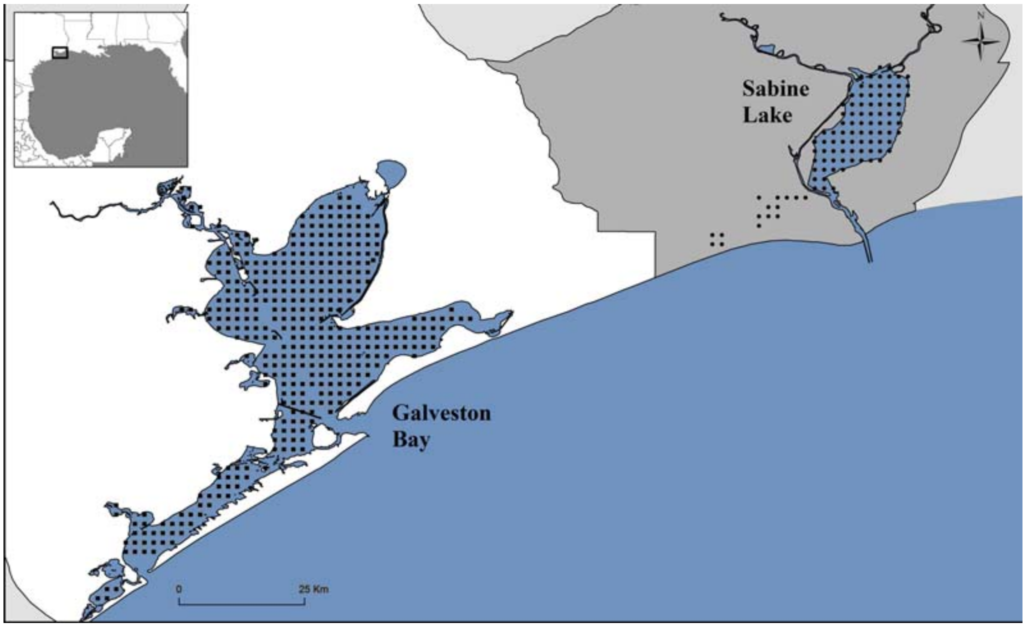

Figure 5. Trawl sites used by Texas Parks and Wildlife Department in Galveston Bay (squares) and Sabine Lake (dots) in their fisheries independent surveys, 1982-2005. Estuarine Drainage Areas are indicated by variations in shading.

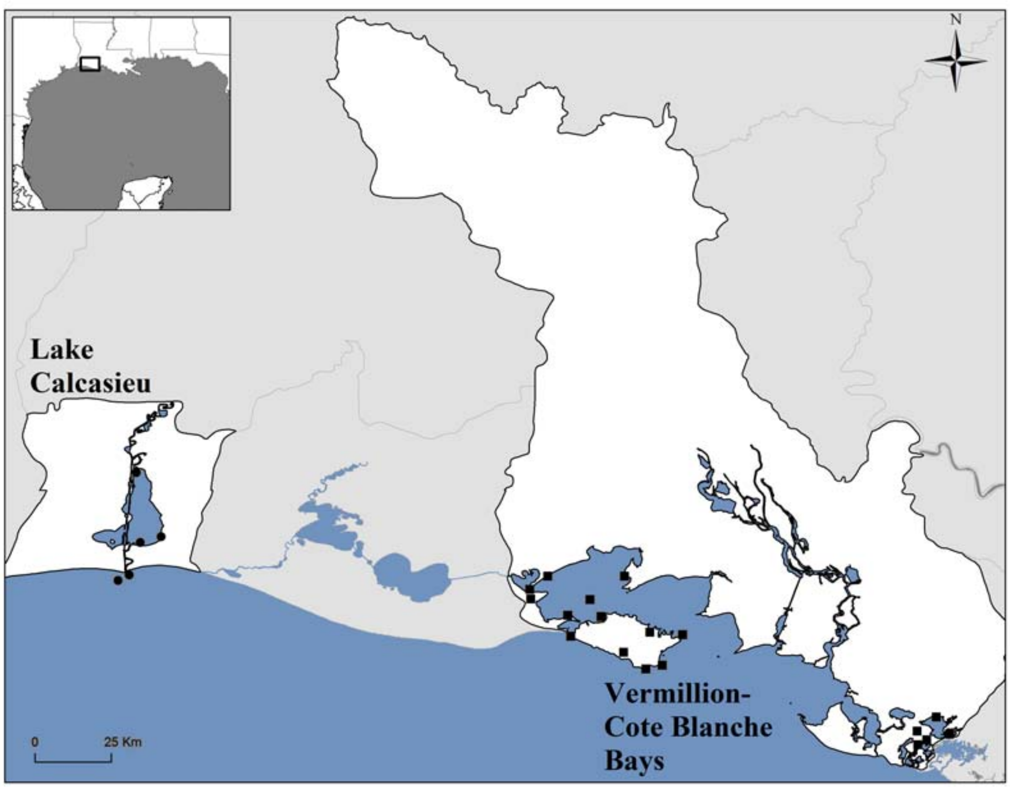

Figure 6. Trawl sites used by Louisiana Department of Wildlife and Fisheries in Lake Calcasieu (dots) and Vermilion-Cote Blanche Bays (squares) in their fisheries independent surveys, 1986-2007. Estuarine Drainage Areas are indicated by variations in shading.

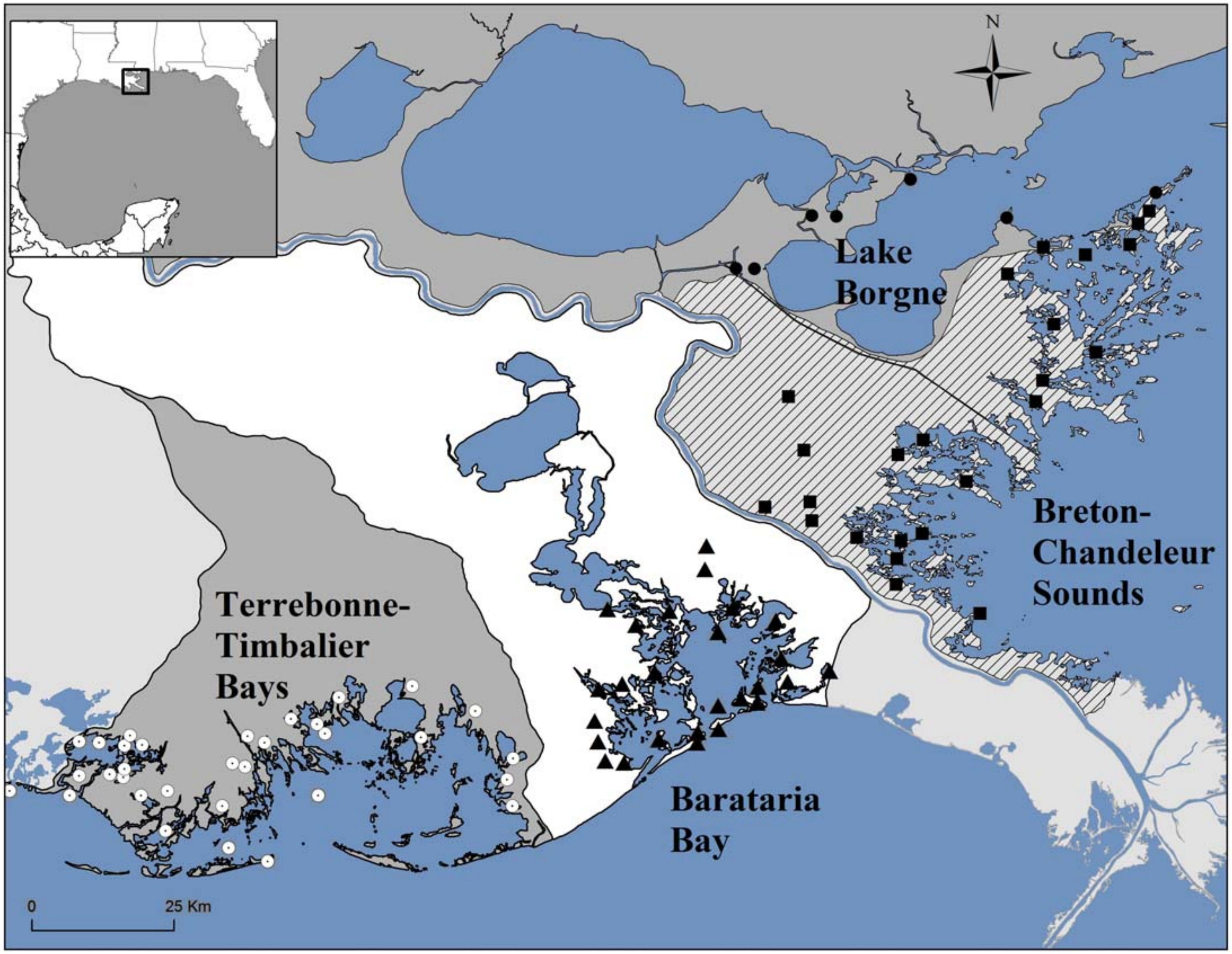

Figure 7. Trawl sites used by Louisiana Department of Wildlife and Fisheries in Terrebonne-Timbalier Bays (white dots), Barataria Bay (triangles), Breton-Chandeleur Sounds (squares), and Lake Borgne (black dots) in their fisheries independent surveys, 1986-2007. Estuarine Drainage Areas are indicated by variations in shading.

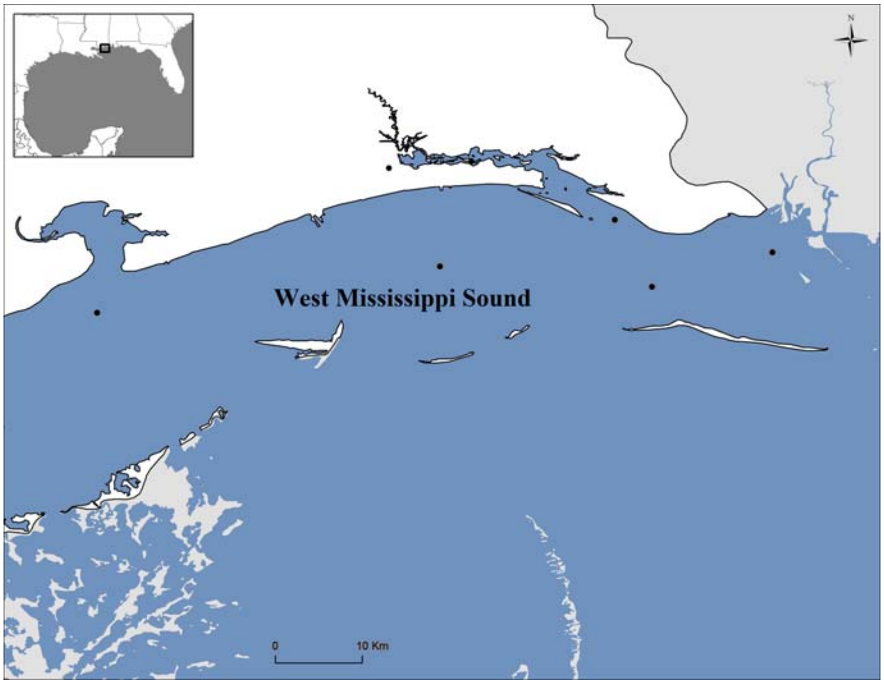

Figure 8. Trawl sites used by the Mississippi Department of Marine Resources and Gulf Coast Research Laboratory (1973-2005) in their fisheries independent surveys of West Mississippi Sound, including Biloxi Bay and Bay St. Louis. Sampling stations are indicated by black dots. Estuarine Drainage Areas are indicated by variations in shading.

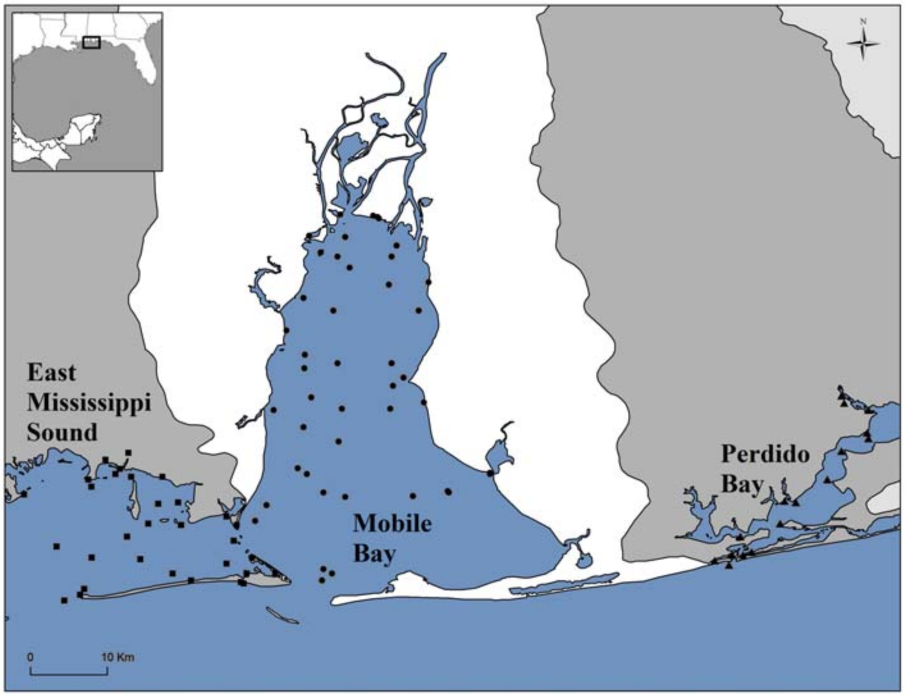

Figure 9. Trawl sites used by Alabama Department of Conservation and Natural Resources – Marine Resources Division (1981-2007) in their fisheries independent surveys. Sampling stations are indicated by squares in East Mississippi Sound, black dots in Mobile Bay, and triangles in Perdido Bay. Estuarine Drainage Areas are indicated by variations in shading.

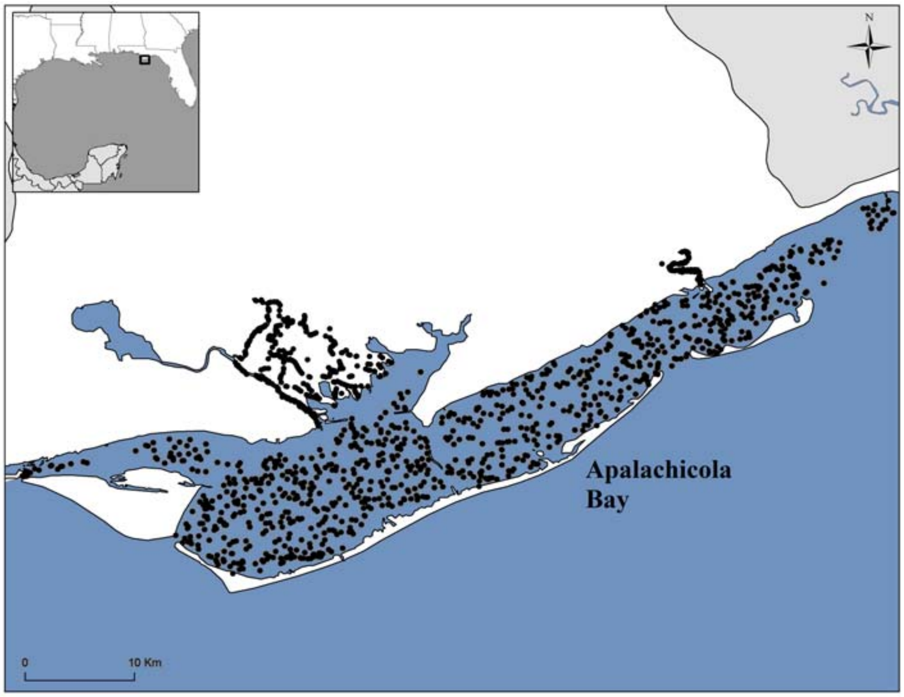

Figure 10. Trawl sites used by Florida Fish and Wildlife Conservation Commission in their fisheries independent surveys in Apalachicola Bay, 1998-2005. Sampling stations are indicated by black dots. Estuarine Drainage Areas are indicated by variations in shading.

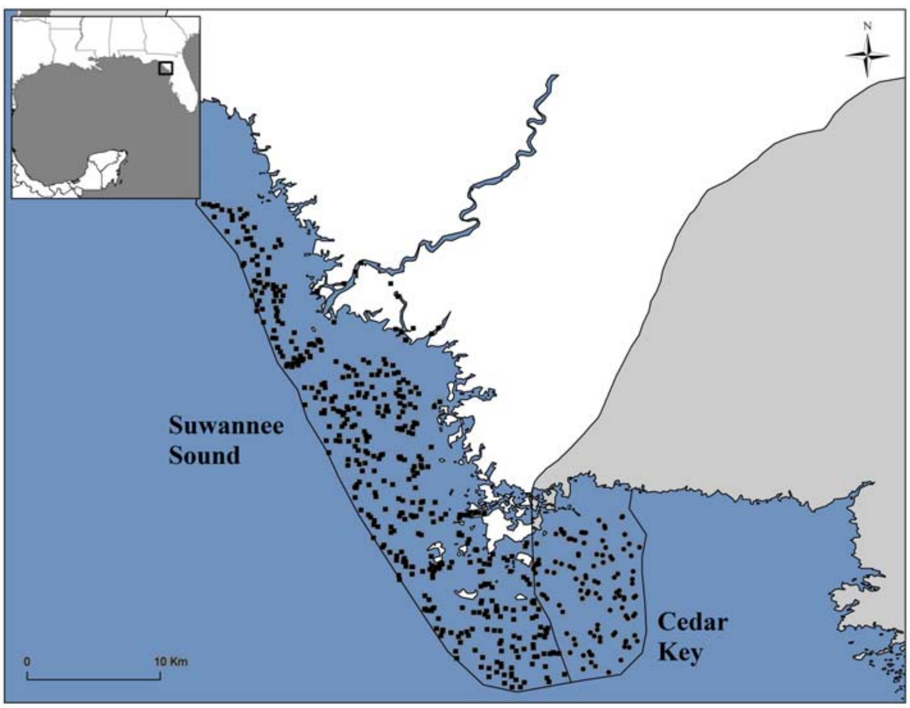

Figure 11. Trawl sites used by Florida Fish and Wildlife Conservation Commission in their fisheries independent surveys in Suwannee Sound and Cedar Key, 1996-1997 and 2001-2005. Sampling stations are indicated by black dots. Estuarine Drainage Areas are indicated by variations in shading.

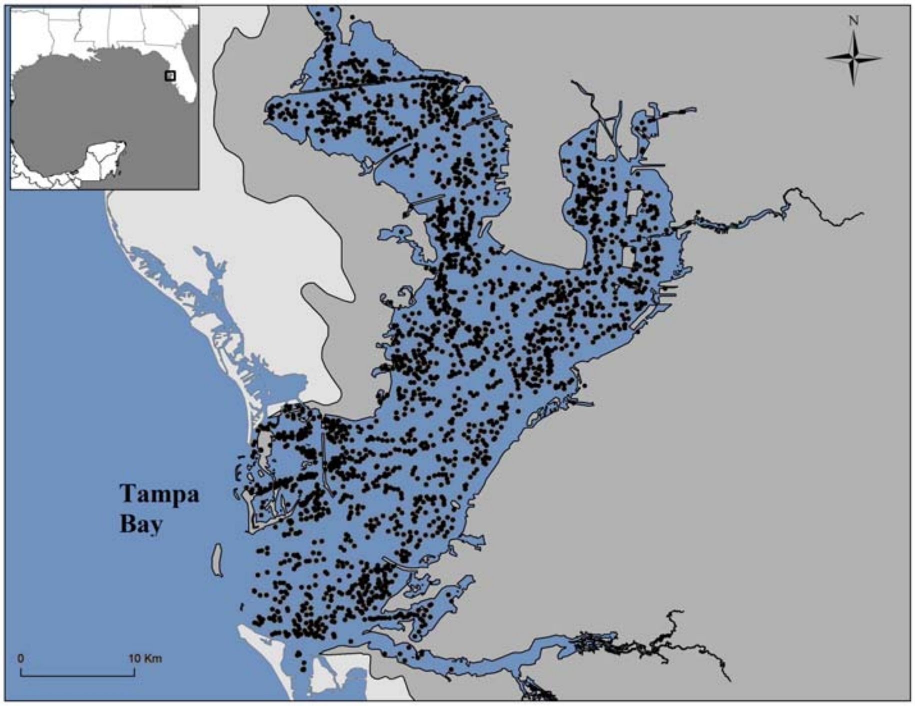

Figure 12. Trawl sites used by Florida Fish and Wildlife Conservation Commission in their fisheries independent surveys in Tampa Bay, 1989-2005. Sampling stations are indicated by black dots. Estuarine Drainage Areas are indicated by variations in shading.

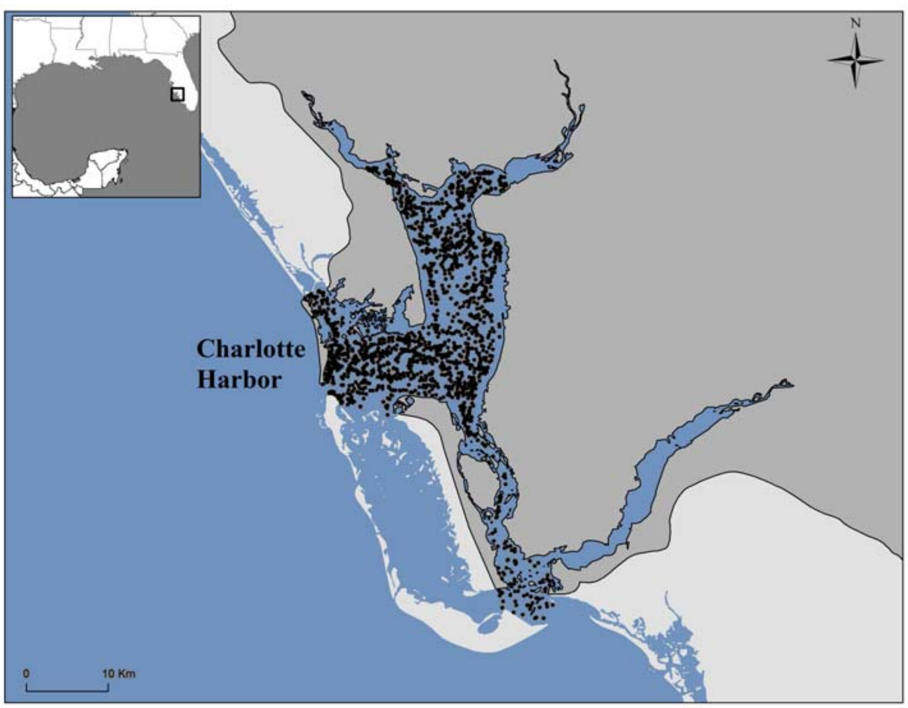

Figure 13. Trawl sites used by Florida Fish and Wildlife Conservation Commission in their fisheries independent surveys in Charlotte Harbor, 1989-2005. Sampling stations are indicated by black dots. Estuarine Drainage Areas are indicated by variations in shading.

Table 3. The total number of samples taken per year by the fisheries independent surveys in the 24 Gulf estuaries included in this study for the years 1981-2007.

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Texas														
Lower Laguna Madre		80	120	120	120	120	120	120	120	120	120	120	120	120
Upper Laguna Madre		80	120	120	120	120	120	120	120	120	120	120	120	120
Corpus Christi Bay		160	240	240	240	240	240	240	240	240	240	240	240	240
Aransas Bay		240	240	240	240	240	240	240	240	240	240	240	240	240
San Antonio Bay		240	240	240	240	240	240	240	240	240	240	240	240	240
Matagorda Bay		160	240	240	240	240	240	240	240	240	240	240	240	240
East Matagorda Bay							90	120	120	120	120	120	120	120
Galveston Bay		240	240	240	240	240	240	240	240	240	240	240	240	240
Sabine Lake						240	240	240	240	120	120	120	120	120
Louisiana														
Lake Calcasieu						108	123	125	110	114	126	126	129	126
Vermilion-Cote Blanche Bays						148	137	151	152	201	175	182	185	215
Terrebonne-Timbalier Bays						169	204	209	176	257	304	293	281	299
Barataria Bay						188	166	148	134	166	161	162	144	136
Breton-Chandeleur Sounds						57	97	221	241	251	206	204	230	215
Lake Borgne						18	78	68	73	80	62	57	83	73
Mississippi														
Mississippi Sound	108	48	48	48	54	51	48	51	49	49	48	49	53	49
Alabama														
East Mississippi Sound	88	93	75	55	36	35	37	37	35	35	37	36	36	35
Mobile Bay	61	138	119	106	73	86	96	79	67	67	72	108	114	111
Perdido Bay	11	12	10	11	11	12	32	34	30	36	36	36	29	36
Florida														
Apalachicola Bay														
Suwannee Sound														
Cedar Key														
Tampa Bay									297	300	300	300	300	300
Charlotte Harbor									174	180	180	180	180	240

Table 3 (continued).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Texas													
Lower Laguna Madre	120	120	120	120	120	120	120	120	120	120	120		
Upper Laguna Madre	120	120	120	120	120	120	120	120	120	120	120		
Corpus Christi Bay	240	240	240	240	240	240	240	240	240	240	240		
Aransas Bay	240	240	240	240	240	240	240	240	240	240	240		
San Antonio Bay	240	240	240	240	240	240	240	240	240	240	240		
Matagorda Bay	240	240	240	240	240	240	240	240	240	240	240		
East Matagorda Bay	120	120	120	120	120	120	120	120	120	120	120		
Galveston Bay	240	240	240	240	240	240	240	240	240	240	240		
Sabine Lake	120	120	120	120	120	120	120	120	120	120	120		
Louisiana													
Lake Calcasieu	129	123	129	123	129	123	120	108	132	123	114	126	109
Vermilion-Cote Blanche Bays	208	219	235	261	252	248	247	243	243	252	256	257	259
Terrebonne-Timbalier Bays	279	271	274	269	307	302	321	310	319	316	318	315	315
Barataria Bay	134	148	176	176	176	176	164	174	168	169	151	169	169
Breton-Chandeleur Sounds	247	244	249	243	250	261	265	268	264	263	217	268	268
Lake Borgne	82	85	81	84	93	84	91	93	91	91	81	92	93
Mississippi													
Mississippi Sound	48	50	48	48	48	48	51	48	49	48	49		
Alabama													
East Mississippi Sound	33	32	35	32	36	37	43	42	42	42	31	27	38
Mobile Bay	93	103	109	91	89	98	136	141	144	163	163	167	176
Perdido Bay	36	36	33	31	15	25	39	39	34	37	34	36	36
Florida													
Apalachicola Bay				64	96	138	228	228	228	228	228		
Suwannee Sound		68	98	0	0	0	46	64	53	58	39		
Cedar Key		24	33	0	0	0	19	12	20	19	20		
Tampa Bay	197	182	180	30	30	30	30	30	30	30	180		
Charlotte Harbor	160	130	120	18	18	18	18	18	40	150	360		

Table 4. The total number of monthly samples taken by the fisheries independent surveys in the 24 Gulf estuaries included in this study for the years 1982-2005 for Texas, 1986-2007 for Louisiana, 1981-2007 for Alabama, 1981-2005 for Mississippi, and 1989-2005 for Florida.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Texas												
Lower Laguna Madre	230	230	230	230	240	240	240	240	240	240	240	240
Upper Laguna Madre	230	230	230	230	240	240	240	240	240	240	240	240
Corpus Christi Bay	460	460	460	460	480	480	480	480	480	480	480	480
Aransas Bay	475	485	480	480	480	480	480	480	480	480	480	480
San Antonio Bay	480	480	480	480	480	480	480	480	480	480	480	480
Matagorda Bay	460	460	460	460	480	480	480	480	480	480	480	480
East Matagorda Bay	180	180	180	190	190	190	190	190	190	190	190	190
Galveston Bay	480	480	480	480	480	480	480	480	480	480	480	480
Sabine Lake	240	240	240	240	240	240	240	240	240	240	240	240
Louisiana												
Lake Calcasieu	124	122	296	278	261	282	282	273	250	267	129	111
Vermilion-Cote Blanche Bays	179	207	428	550	500	498	533	494	455	471	224	322
Terrebonne-Timbalier Bays	356	322	611	635	582	606	605	598	555	579	340	322
Barataria Bay	183	189	343	391	377	386	350	343	304	317	213	159
Breton-Chandeleur Sounds	227	213	477	603	530	522	553	526	437	460	245	236
Lake Borgne	81	75	149	251	184	173	172	181	150	166	72	79
Mississippi												
Mississippi Sound	168	172	171	170	169	171	169	169	173	169	172	171
Alabama												
East Mississippi Sound	80	100	91	98	100	93	123	91	105	85	89	85
Mobile Bay	211	254	246	240	249	253	266	290	242	232	249	238
Perdido Bay	59	61	64	66	63	68	63	69	66	67	68	53
Florida												
Apalachicola Bay	111	111	115	114	112	119	126	126	126	126	126	126
Suwannee Sound	26	30	29	31	34	37	35	42	38	39	39	46
Cedar Key	10	14	14	9	8	11	15	16	15	12	14	9
Tampa Bay	45	45	270	402	400	102	45	46	212	554	520	105
Charlotte Harbor	63	65	123	385	326	61	61	61	116	491	360	72

Relational Database

A relational database was constructed for this project that includes the raw data from the trawl catches and our abundance calculations. Data parameters included estuary (two separate variables—estuary defined by EDAs and estuary as defined by the state), site, latitude, longitude, date, time, tow duration, depth, surface and bottom temperature, and salinity. Also included for each trawl sample were numbers of each species caught and the available length data for each species. Latitude and longitude were converted to decimal degrees if necessary and recorded to five decimal places. Temperatures are reported in ºC, salinities in parts per thousand, and depths in meters. These data are publicly available at http://data.gcoos.org.

Abundance Calculations

Catch data in trawls were converted to numbers caught per hectare (#/ha) using the tow times and conversion factors calculated for each state (Table 5). "Zero catch" trawl samples were reported in Texas and Florida catch data sets, and we accounted for zero catch in the Louisiana, Mississippi, and Alabama data sets by matching all the physical data file samples with the biological data files for the same date. When no biological record was found to match a hydrological record (i.e., our selected species were not caught), a zero-sample record was added to the state's abundance table in the relational database.

A conversion factor for each state was calculated based on an assumed 80% spread of the width of the trawl webbing along the headrope (defined here as the headrope length) and the estimated distance towed in one minute calculated from reported tow times. The conversion factor is equal to the time needed (in minutes) for the trawl to cover one hectare. To calculate abundance the following formula was used:

Conversion factor / Tow duration (min) X Number caught = #/ha

If CPUE or catch is expressed as the number caught in a 1-min tow, multiplying CPUE by the conversion factor gives you the estimate of #/ha.

We were unable to analyze or compensate for all of the variables that affect catch rates of nekton in the trawls. We used an 80% spread of the headrope length to estimate the area swept, but this spread varies in relation to the net type, mesh size, headrope length, leg length, bridle length, and towing speed (Loesch et al. 1976, Carrothers 1980, Watson et al. 1984, Weinberg 2003). Towing speed through the water may be difficult to estimate, and this speed not only affects the spread of the net (width of the area swept) in a nonlinear manner but also affects contact of the leadline with the bottom (Weinberg 2003). In addition, each nekton species has a different ability to escape capture by trawls, and adjusting for the area swept does not correct for catch efficiency of the gear. Thus comparisons of number per area swept cannot easily be made among species. With the additional complication that environmental conditions and even fish density can affect this catch efficiency (Rozas and Minello 1997, Godo et al. 1999), conclusions from these trawl data should be made with care and are best made from summary data such as those presented in this report

Sampling was consistent from year to year due to established schedules, but samples were missed occasionally due to weather or other unforeseen circumstances. Additionally, sampling occurred in a wide range of salinities including nearly freshwater. While all of these data remain in the database, we established guidelines to assign samples to estuaries, to keep samples estuarine in nature, and to remove potential bias when we calculated mean values in this analysis. We only used data from sites that had average annual salinity greater than 1.0 ‰ or were not obviously up a river in the freshwater zone, nor were they out in the Gulf (exception here was the Suwannee Sound – Cedar Key area in Florida). Sampling sites were assigned to estuaries using a GIS spatial intersect method of overlaying sites (points) on estuarine water bodies (polygons) derived from USGS Estuarine Drainage Areas. Monthly means were calculated for each estuary in its entirety, and the annual means were calculated as a mean of the monthly means.

Table 5. The data used to calculate each state's conversion factor and abundance from trawl catches. Area swept is the estimated area covered by the trawl in 1 min of towing.

State	Netting Width		Speed		Area Swept	Conversion Factor
	trawl (m)	80%	Kph	m/min	m^2	
TX	5.67	4.54	4.8	80.0	362.9	27.56
LA	4.87	3.90	4.8	80.0	312.1	32.04
MS	4.87	3.90	3.7	61.7	240.6	41.56
AL	4.33	3.46	3.7	61.7	213.5	46.84
FL	6.10	4.88	2.2	36.7	178.8	55.92

Length Frequencies

Differences among states in trawl mesh size affected the size of animals caught and are reflected in the length frequency data of the catches. Size data were not available for *Cynoscion nebulosus* in Florida, as they did not report catches for this species. Mississippi did not measure *Anchoa mitchilli*, *Bairdiella chrysoura*, *Lagodon rhomboides*, *Paralichthys lethostigma*, *Pogonias cromis*, *Sciaenops ocellatus*, or *Symphurus plagiusa*. Alabama did not provide data for *Sciaenops ocellatus*. Florida measured the carapace (i.e., post-orbital head) length of shrimp species, therefore a conversion to total length was necessary (Table 6).

The length frequency data provided by the individual states were used to compare the overall size of nekton collected in each estuary and to convert abundance data into biomass. Lengths of all fishes and shrimps are presented as total lengths in these comparisons. In a few instances, unreasonably large nekton sizes were present in these data, due to apparent transcription or recording errors, and these values had the potential to dramatically affect biomass calculations. We conducted a literature search to identify the maximum reported length of each target species, and any lengths larger than this maximum reported value were excluded from our size-frequency and biomass analyses. Less than 0.1 percent of all lengths were removed from the analysis as a result. Kolmogorov-Smirnov tests were used to compare the length frequency distributions between the states, and a P value < 0.05 was considered statistically significant (Tate and Clelland 1957).

While general comparisons of the size of animals caught can be made with the length frequency data, differences in the number of specimens measured and the number of samples collected could affect the utility of these data. In Louisiana, for example, the number of samples collected and measured each month varied throughout the year (see Sampling Protocols –

Louisiana above). Because more samples were collected in the spring, the length frequency data are skewed to reflect the size of organisms during that season. A comparison of the overall mean length, monthly mean lengths, and mean of the monthly mean lengths of *Farfantepenaeus aztecus* to the number of samples collected and number of individuals measured on a monthly basis suggests that this uneven sampling effort did have an effect on the length data (Figure 14). The overall mean length of *F. aztecus* in Louisiana (66.7 mm) was approximately five percent higher than the mean of the monthly means (63.2 mm).

Table 6. The carapace length-total length conversion equations used for three shrimp species measured by FFWCC. TL=total length; CL=carapace length

Species	Length-Length Conversion Equation	Reference
Farfantepenaeus aztecus	TL=0.28+4.5*CL	Ditty (personal communication)
Farfantepenaeus duorarum	TL=1.616+4.503*CL	Diaz et al. 2001
Litopenaeus setiferus	TL=-0.53+5.06*CL	Ditty (personal communication)

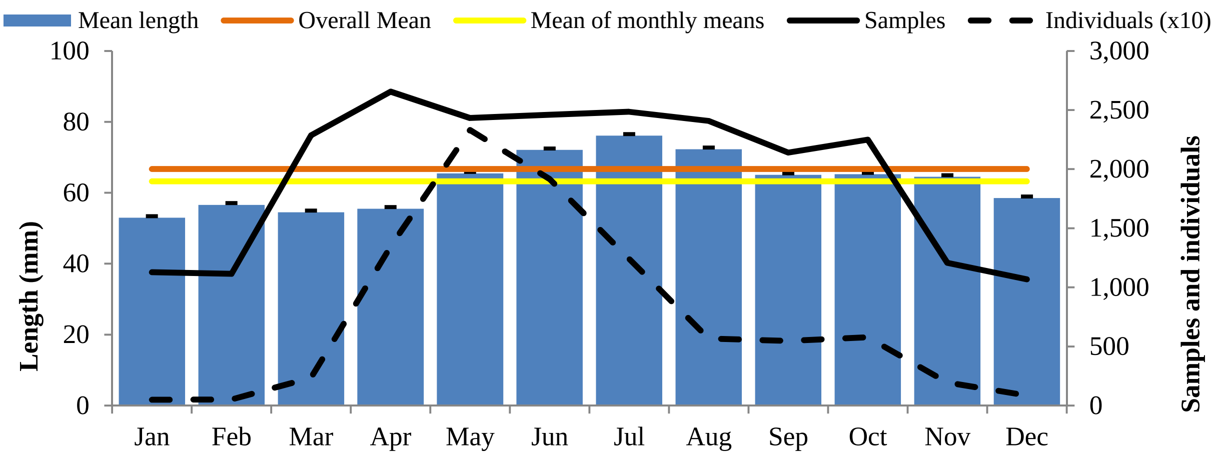

Figure 14. The monthly mean total length (bars) and SE, the overall mean length, and the mean of the monthly mean lengths of *Farfantepenaeus aztecus* in relation to the total number of trawl samples taken and number of individuals measured in that month by LDWF between 1986 and 2007.

Biomass Calculations

The biomass per sample of each target species was calculated using the length frequency data provided for each sample and published length-weight relationships (Table 7). Mississippi was the only state that provided weight data for the individuals collected in their trawls, and no length-weight conversions were used for these samples. Fish species lengths were provided in total length (TL), except for Alabama and Florida, which used standard length (SL). The fish lengths from Alabama and Florida were converted from SL to TL where necessary using published SL-TL conversions (Table 8). The majority of available length-weight conversion equations used TL to calculate weight (W). However, the published conversions for *Bairdiella chrysoura*, *Cynoscion arenarius*, and *Sciaenops ocellatus* used SL to calculate W, and *Brevoortia patronus* conversions used fork length (FL). A SL–TL or FL–TL conversion was necessary before calculating W for these species (Table 7). For each sample, the mean wet weight was calculated for the individuals measured and multiplied by the total number of individuals caught in that sample. This extrapolation provided an estimated biomass for the entire sample. The biomass data were converted to grams/hectare using the same conversion factor utilized in the abundance calculations. Monthly and annual biomass means were calculated for each target species, where length data were provided. Length and biomass data are not presented for *Cynoscion nebulosus* in Florida; *Anchoa mitchilli*, *Bairdiella chrysoura*, *Lagodon rhomboides*, *Paralichthys lethostigma*, *Pogonias cromis*, *Sciaenops ocellatus*, or *Symphurus plagiusa* in Mississippi; and *Sciaenops ocellatus* in Alabama.

Table 7. Published length-weight conversion equations used to calculate the biomass for each of the eighteen target species. TL=total length; SL=standard length; FL=fork length; W=weight.

Species	Length-Weight Conversion Equation	Reference
Anchoa mitchilli	logW=-4.76779+2.81451*logTL	Dawson 1965
Ariopsis felis	logW=-5.56+3.22*logTL	Classen et al. 1988
Bairdiella chrysoura	logW=(logSL/0.282)-5.819	Grammer et al. 2009
Brevoortia patronus	lnW=-11.8+3.2*lnFL	Vaughan et al. 2000
Callinectes sapidus	logW=-3.64+2.7*logCW	Pullen and Trent 1970
Cynoscion arenarius	logW=-4.5115+2.89217*logSL	Dawson 1965
Cynoscion nebulosus	logW=-5.192+3.062*logTL	Lassuy 1983
Farfantepenaeus aztecus	logW=-4.978+2.938*logTL	Fontaine and Neal 1971
Farfantepenaeus duorarum	logW=-5.113+3.029*logTL	Fontaine and Neal 1971
Lagodon rhomboides	logW=-4.66+2.93*logTL	Classen et al. 1988
Leiostomus xanthurus	logW=-4.98+3.06*logTL	Classen et al. 1988
Litopenaeus setiferus	logW=-5.665+3.247*logTL	Fontaine and Neal 1971
Micropogonias undulatus	logW=-5.28476+3.1475*logTL	Dawson 1965
Mugil cephalus	logW=-4.83+2.93*logTL	Classen et al. 1988
Paralichthys lethostigma	logW=-5.6067+3.2734*logTL	Stunz et al. 2000
Pogonias cromis	logW=-4.9431+3.05*logTL	Beckman et al. 1990
Sciaenops ocellatus	logW=-4.7358+3.005*logSL	Overstreet 1983
Symphurus plagiusa	logW=-4.8283+2.9873*logTL	Dawson 1965

Table 8. The length-length conversion equations used to calculate biomass for four of the target species. TL=total length; SL=standard length; FL=fork length

Species	Length-Length Conversion Equation	Reference
Anchoa mitchilli	TL=0.22391+1.20634SL	Matlock et al. 1975
Ariopsis felis	logTL=0.18+0.96*logSL	Classen et al. 1988
Bairdiella chrysoura	logSL=0.960*logTL	Grammer et al. 2009
Brevoortia patronus	FL=1.191+0.85*TL; FL=0.110+1.094*SL	Schueller et al. in prep
Brevoortia patronus	logTL=0.10+logSL	Classen et al. 1988
Cynoscion arenarius	TL=0.7+1.1SL	Moffet et al. 1979
Cynoscion nebulosus	TL=1.129SL+15.773	Nieland et al. 2002
Lagodon rhomboides	TL=SL/0.78	Muncy 1984
Leiostomus xanthurus	logTL=0.08+1.01*logSL	Classen et al. 1988
Micropogonias undulatus	logTL=0.18+0.96*logSL	Classen et al. 1988
Mugil cephalus	logTL=0.08+1.01*logSL	Classen et al. 1988
Paralichthys lethostigma	TL=8.959+1.175SL	Harrington et al. 1979
Pogonias cromis	TL=18.22+1.181*SL	Harrington et al. 1979
Sciaenops ocellatus	SL=-3.4416+0.8495TL	Overstreet 1983
Symphurus plagiusa	TL=-0.55+1.096*SL	Jorgenson and Miller 1968

Results

Temperature

Water temperatures measured during fishery-independent sampling generally followed a typical cycle with winter lows around 12-18 ºC during December through February. Mean temperatures rose from March through August to a peak near 30 ºC, and declined from September through January. This pattern differed in Mississippi with peak temperatures later in the year due to the influence of the Mississippi River. In most states, summer temperatures were similar in all estuaries, but differences among estuaries in Texas and Florida were often large in winter.

Annual mean water temperatures for these estuaries were highly uniform, varying only occasionally beyond a minimum of 20 ºC and a maximum of about 26 ºC. The annual differences between the cooler Apalachicola Bay and the warmer Charlotte Harbor in Florida were mirrored across the Gulf by the cooler Sabine Lake and the warmer Lower Laguna Madre in Texas. The estuaries along Louisiana, Mississippi, and Alabama showed only fractionally cooler annual means. Because these data were obtained during fishery-independent trawl sampling, variations in collection protocols (frequency and sampling locations) may be responsible for the more varied annual means from Mississippi and Alabama. Figures depicting the annual and monthly bottom water temperatures found in the estuaries of each state can be found in Appendix A.

Salinity

Mean monthly salinities varied by estuary, but seasonal variation generally ranged between 5-8‰ through the year. Salinities peaked in Texas estuaries during August and September. Salinities varied more throughout the year in Louisiana than in the other states, showing two cycles during the year in several estuaries.

Annual mean salinities for Gulf estuaries varied considerably during our study period. Estuarine salinities in the Gulf are greatly influenced by tropical storms, periods of climactic drought or excess rainfall, temperature shifts that increased or decreased evaporation, and inland rainfall that increased or decreased river flows to the estuaries. Figures depicting the annual and monthly salinities found in the estuaries of each state can be found in Appendix A.

Nekton

Nekton abundance in estuaries ranged widely among species. Mean abundances were calculated for each species in estuaries for each month (pooling years) and for each year (pooling months). The most abundant fish species across the Gulf Coast were *Anchoa mitchilli*, *Micropogonias undulatus*, and *Leiostomus xanthurus*, while the most abundant invertebrate species was *Farfantepenaeus aztecus*, except in Florida, where the dominant invertebrate species was *Farfantepenaeus duorarum*.

The monthly mean abundance varied widely among the 18 target species. Of the species that were consistently captured in the trawls, the abundance numbers between the largest catches and smallest catches could be considerable, while others showed little variation at all. Texas and

Florida consistently exhibited the lowest abundance numbers of the Gulf Coast states, while Louisiana and Mississippi had the highest abundance numbers.

Anchoa mitchilli

The most abundant fish species across the Gulf States was the bay anchovy (*Anchoa mitchilli*). No consistent peak month for bay anchovy abundances existed among the states (Figure 15). The abundance numbers in Mississippi were highest among the states with an overall mean (mean of 12 monthly means in Figure 15) of 3,207.9/ha, followed by Alabama (707.2/ha), Louisiana (506.2/ha), Florida (185.2/ha) and Texas (7.4/ha).

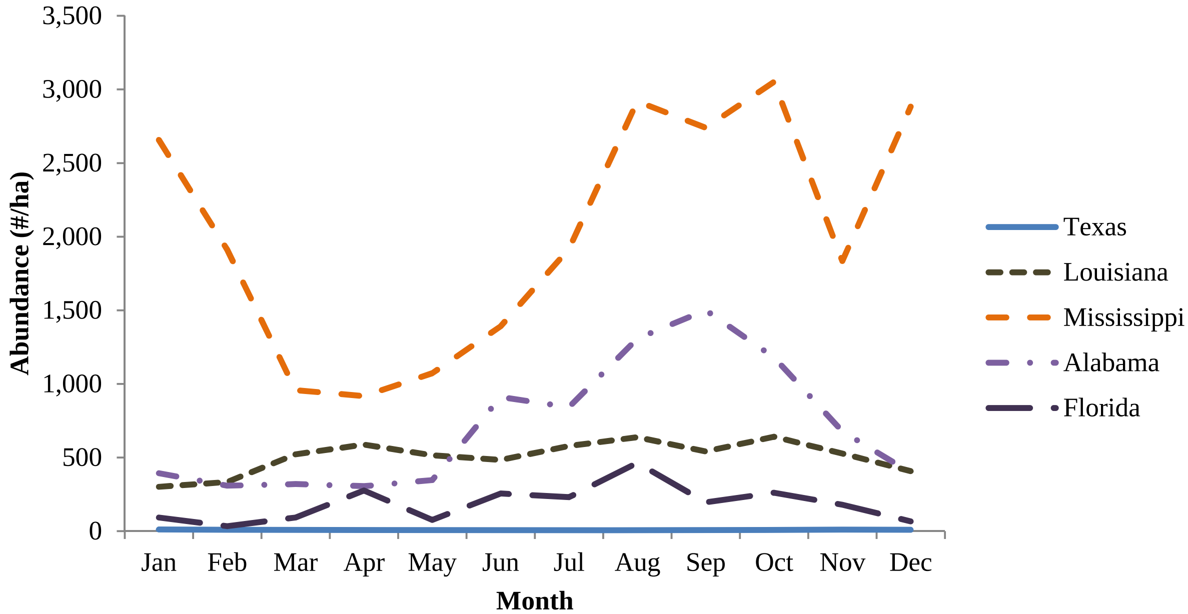

Figure 15. Monthly mean abundance of *Anchoa mitchilli* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

The maximum length of a bay anchovy recorded by Houde and Zastrow (1991) was 110 mm; therefore all measurements in the database greater than 110 mm were excluded from this analysis. The length frequency distributions for bay anchovy in each state (Figure 16) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Bay anchovy ranged in size from 5 – 106 mm (mean=50.8, SD=13.7) in Texas, 2 – 107 mm (mean=46.6, SD=13.8) in Louisiana, 2 – 110 mm (mean=48.1, SD=13.8) in Alabama, and 13 – 108 mm (mean=54.3, SD=15.6) in Florida. Length measurements were not recorded by Mississippi.

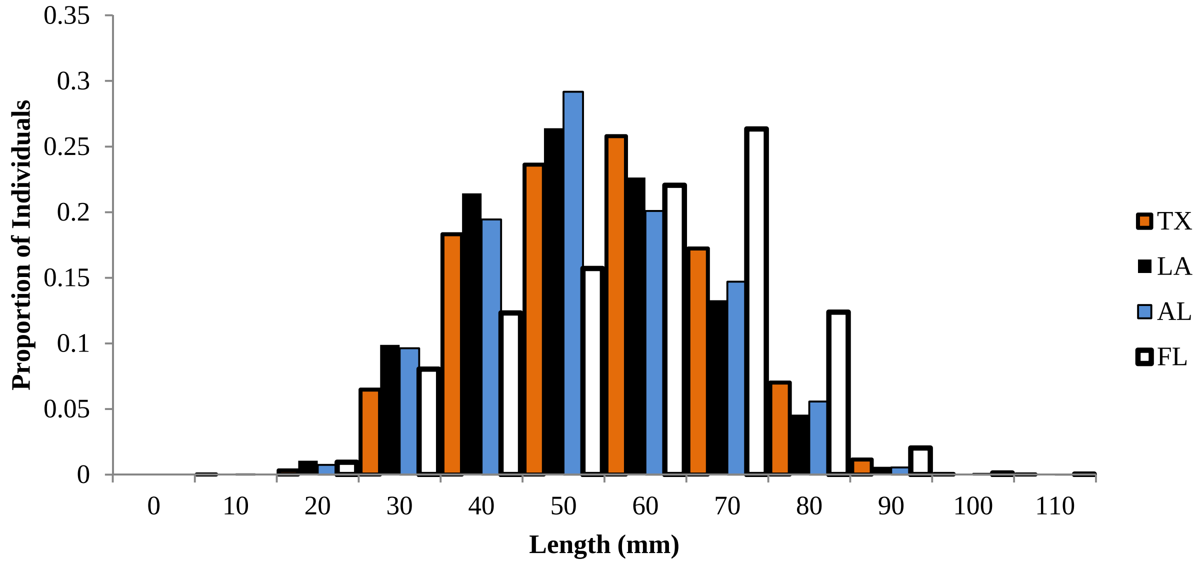

Figure 16. Length frequency of all bay anchovy (*Anchoa mitchilli*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states (Mississippi did not provide length measurements for *A. mitchilli*). The data encompass sampling from the following years: Texas (n=72,753): 1982 – 2005; Louisiana (n=126,981): 1986 – 2007; Alabama (n=86,027): 1981 – 2007; and Florida (n=16,233): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

The monthly variability of bay anchovy in Texas was relatively low with an even distribution in abundance and biomass except for the low mean values in the months of August and September (Figure 17). Mean annual abundance and biomass values exhibited similar patterns, the highest abundance occurred in 2004 (14.4/ha) and the highest biomass in 1995 (17.9 g/ha) (Figure 18). Mean abundance and biomass were highest in Matagorda Bay (Tables 9 and 10).

The bay anchovy was the most abundant fish species caught in the LDWF fishery-independent trawls. This species exhibited relatively little seasonal variability, but the lowest mean abundance and biomass values were in winter months (Figure 19). Bay anchovy mean annual abundance and biomass peaked in 1991 (844.6/ha and 805.9 g/ha, respectively) (Figure 20). Among estuaries, the highest numbers were found in Terrebonne and Timbalier Bays in the central part of the Louisiana coast, followed by Lake Borgne on the eastern edge of the coast and then by Lake Calcasieu in the western part of the state (Tables 11 and 12).

Bay anchovy was also the most abundant fish collected in Mississippi's fishery-independent monitoring trawls. This species was present in high numbers throughout the year, although the spring months had the lowest mean monthly abundances (Figure 21). The annual variability was high with a peak mean abundance in 1991 (10,164.1/ha) (Figure 22). Length measurements (therefore biomass data) were not available.

The dominant fish species in Alabama's fishery-independent trawls was bay anchovy. Seasonal variability in monthly mean abundance and biomass was high with peaks in late summer/early fall (Figure 23). Bay anchovy mean annual abundance and biomass peaked in 1981 (2,127.5/ha and 1,229.3 g/ha, respectively) (Figure 24). A gap in the length data exists for the years 1987 – 1988, and biomass data are unavailable for these years. Among the three estuaries in Alabama, the highest values were found in East Mississippi Sound and Mobile Bay (Tables 13 and 14).

The seasonal pattern of bay anchovy abundance in Florida showed a peak in late summer, while mean biomass peaked in the spring (Figure 25). Bay anchovy mean annual abundance peaked in 2000 (347.5/ha), but biomass peaked in 1999 (915.1 g/ha) (Figure 26). Overall mean abundance was highest in Tampa Bay and Suwanee Sound, while biomass was highest in Apalachicola Bay (Tables 13 and 14).

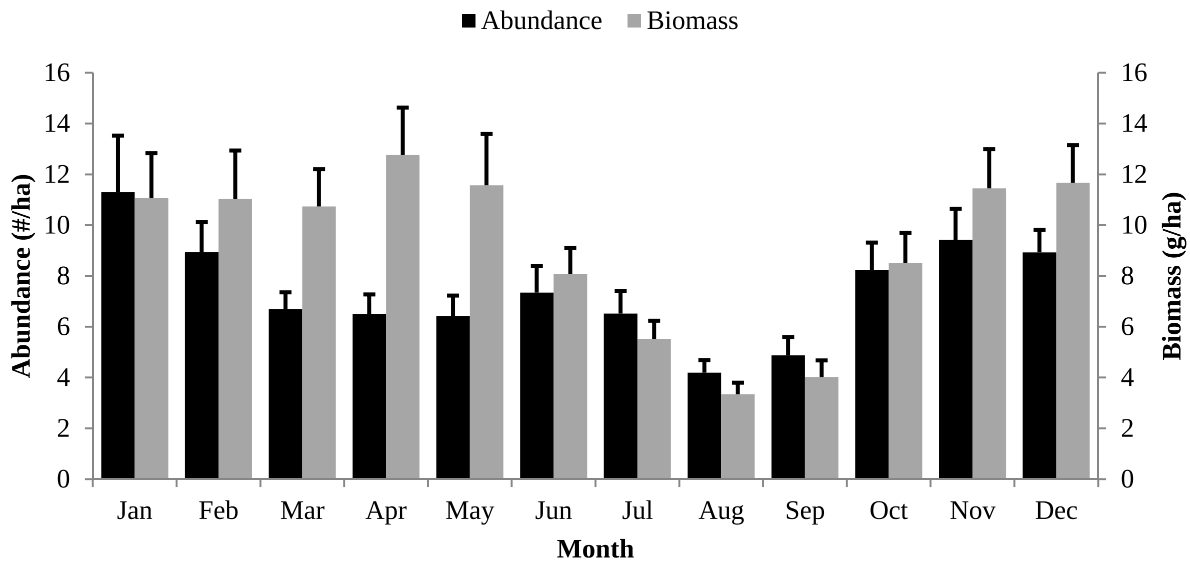

Figure 17. The monthly mean (+SE) abundance and biomass of *Anchoa mitchilli* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

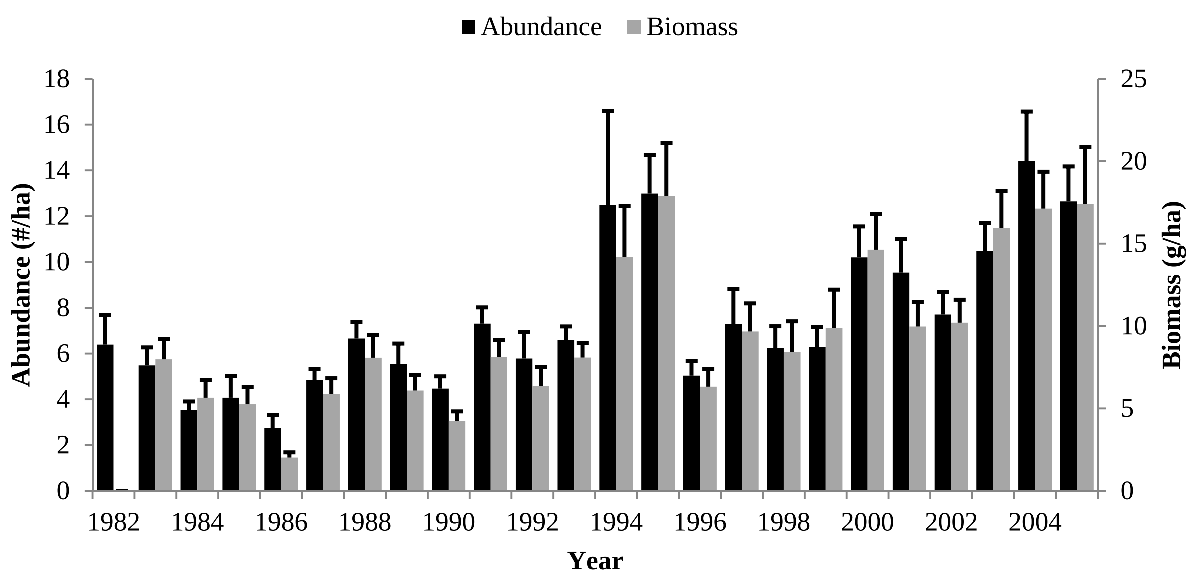

Figure 18. The mean (+SE) annual abundance and biomass of *Anchoa mitchilli* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 9. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May	Jun
Lower Laguna Madre	2.8 (1.9)	1.2 (1.0)	1.7 (2.8)	0.8 (1.4)	0.9 (1.1)	1.0 (0.9)
Upper Laguna Madre	3.6 (1.8)	4.9 (4.5)	1.3 (1.0)	1.5 (1.4)	2.0 (1.5)	8.9 (1.6)
Corpus Christi Bay	10.3 (11.3)	8.2 (11.3)	6.9 (10.5)	7.2 (13.6)	7.6 (12.9)	11.6 (8.4)
Aransas Bay	25.0 (18.4)	9.6 (9.8)	11.9 (15.9)	11.8 (19.1)	9.8 (14.5)	12.7 (17.3)
San Antonio Bay	10.1 (10.5)	11.5 (14.0)	7.4 (13.5)	6.4 (13.3)	5.6 (10.2)	6.4 (9.1)
Matagorda Bay	19.7 (29.1)	21.5 (34.6)	12.6 (25.9)	13.3 (35.6)	14.8 (34.7)	8.9 (13.7)
East Matagorda Bay	2.2 (2.9)	2.3 (1.4)	1.4 (2.0)	1.1 (1.2)	1.0 (1.1)	1.0 (0.9)
Galveston Bay	6.0 (4.9)	4.4 (3.7)	4.2 (6.6)	3.6 (6.0)	3.5 (5.2)	4.2 (5.0)
Sabine Lake	6.0 (4.0)	6.2 (3.8)	3.9 (2.3)	4.4 (3.1)	3.7 (3.9)	4.2 (2.8)

	Jul	Aug	Sep	Oct	Nov	Dec
Lower Laguna Madre	1.5 (0.3)	0.3 (0.2)	0.8 (0.4)	9.1 (4.6)	2.1 (1.6)	4.8 (4.8)
Upper Laguna Madre	5.9 (2.4)	3.7 (1.4)	6.3 (2.5)	8.7 (4.4)	13.5 (8.5)	6.1 (3.3)
Corpus Christi Bay	7.9 (6.2)	3.8 (2.5)	3.7 (2.3)	8.2 (5.8)	7.1 (7.5)	6.2 (6.6)
Aransas Bay	7.8 (8.8)	5.6 (5.4)	7.2 (5.7)	7.4 (7.7)	18.6 (19.5)	12.2 (14.8)
San Antonio Bay	6.6 (6.4)	2.7 (2.5)	2.4 (2.3)	6.2 (7.1)	6.9 (9.9)	10.5 (15.0)
Matagorda Bay	8.5 (7.1)	7.5 (5.6)	10.4 (8.9)	12.8 (16.6)	7.4 (11.7)	12.8 (24.5)
East Matagorda Bay	1.7 (1.5)	0.6 (0.4)	0.5 (0.4)	1.4 (1.8)	3.6 (4.9)	3.3 (3.0)
Galveston Bay	5.6 (4.8)	5.4 (4.5)	5.1 (5.9)	8.2 (11.6)	9.8 (16.1)	7.8 (9.8)
Sabine Lake	10.8 (7.2)	4.2 (3.9)	3.0 (2.7)	10.1 (10.5)	14.8 (18.0)	13.0 (11.8)

	Mean	SE
Lower Laguna Madre	2.2 (1.8)	0.7 (0.5)
Upper Laguna Madre	5.5 (2.9)	1.0 (0.6)
Corpus Christi Bay	7.4 (8.2)	0.7 (1.1)
Aransas Bay	11.6 (13.1)	1.6 (1.5)
San Antonio Bay	6.9 (9.5)	0.8 (1.2)
Matagorda Bay	12.5 (20.7)	1.3 (3.3)
East Matagorda Bay	1.7 (1.8)	0.3 (0.4)
Galveston Bay	5.7 (7.0)	0.6 (1.1)
Sabine Lake	7.0 (6.2)	1.2 (1.4)

Table 10. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Lower Laguna Madre	0.4	1.4 (2.7)	0.5 (0.9)	0.9 (1.1)	0.9 (1.3)	0.3 (0.1)	1.2 (1.6)	2.1 (2.1)	0.7 (0.6)	0.8 (0.6)
Upper Laguna Madre	28.5	9.3 (6.0)	0.6 (0.4)	3.3 (2.3)	2.4 (1.8)	1.9 (1.4)	1.9 (0.7)	3.0 (1.1)	10.3 (3.5)	1.4 (1.0)
Corpus Christi Bay	6.8	9.6 (11.2)	8.2 (12.0)	5.9 (8.4)	4.1 (2.5)	3.0 (3.4)	7.4 (7.2)	2.2 (1.6)	3.0 (2.6)	6.2 (5.5)
Aransas Bay	12.2	7.7 (13.8)	5.3 (5.7)	9.6 (10.7)	8.0 (5.3)	18.4 (18.4)	18.0 (19.1)	15.2 (14.1)	5.4 (5.2)	10.6 (12.3)
San Antonio Bay	1.2	6.2 (10.8)	2.1 (4.7)	2.6 (3.9)	2.3 (2.4)	5.5 (9.0)	6.8 (10.7)	7.1 (10.7)	7.0 (7.4)	9.3 (10.2)
Matagorda Bay	3.6	3.8 (7.3)	4.5 (10.5)	3.0 (4.9)	1.7 (1.6)	4.3 (7.0)	6.6 (12.2)	4.3 (7.2)	6.2 (8.8)	11.4 (17.4)
East Matagorda Bay						1.0 (0.8)	2.0 (2.3)	3.1 (3.1)	0.6 (0.6)	0.4 (0.4)
Galveston Bay	0.6	0.2 (0.5)	0.4 (0.4)	1.2 (1.9)	1.5 (0.8)	1.1 (1.3)	5.9 (7.0)	4.2 (4.8)	2.8 (2.3)	11.1 (9.1)
Sabine Lake					0.1 (0.0)	2.1 (3.5)	2.7 (2.0)	4.5 (4.3)	2.2 (1.9)	2.5 (2.8)
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Lower Laguna Madre	0.7 (0.8)	1.0 (0.6)	0.7 (0.8)	4.5 (1.8)	3.0 (1.9)	0.7 (0.7)	1.3 (1.2)	0.4 (0.7)	1.2 (1.0)	0.3 (0.2)
Upper Laguna Madre	4.2 (3.1)	7.2 (4.6)	8.9 (4.3)	4.0 (2.3)	1.5 (0.9)	0.4 (0.4)	1.1 (1.0)	0.7 (0.8)	16.2 (9.6)	12.9 (4.8)
Corpus Christi Bay	5.3 (5.6)	10.6 (12.9)	20.4 (22.2)	12.1 (12.1)	3.1 (4.3)	4.8 (5.6)	9.3 (12.9)	2.9 (3.3)	5.8 (7.4)	7.5 (7.3)
Aransas Bay	10.1 (10.6)	7.5 (8.9)	29.7 (19.9)	14.5 (18.1)	10.7 (14.6)	17.4 (19.5)	9.5 (11.9)	3.9 (5.9)	18.3 (30.1)	8.5 (12.8)
San Antonio Bay	10.6 (13.6)	6.3 (10.4)	10.7 (17.6)	21.1 (31.8)	4.9 (8.9)	3.5 (4.5)	2.6 (2.7)	3.9 (5.1)	6.6 (10.6)	3.8 (4.9)
Matagorda Bay	6.2 (7.1)	9.6 (12.8)	16.0 (30.3)	20.1 (35.6)	3.7 (4.8)	6.6 (10.8)	16.7 (25.9)	25.5 (45.6)	18.6 (29.8)	25.9 (29.7)
East Matagorda Bay	1.5 (1.0)	1.3 (1.2)	0.8 (0.7)	1.8 (2.5)	2.2 (1.4)	0.3 (0.3)	0.4 (0.2)	5.6 (6.5)	2.8 (3.1)	1.3 (1.4)
Galveston Bay	4.2 (3.9)	7.0 (7.8)	5.2 (6.1)	16.7 (23.1)	5.9 (7.2)	15.3 (24.2)	2.6 (3.5)	2.9 (4.1)	8.9 (14.6)	5.1 (5.1)
Sabine Lake	1.9 (2.4)	0.7 (1.2)	0.5 (0.5)	2.8 (2.5)	6.9 (4.7)	5.9 (4.6)	3.3 (1.7)	3.3 (2.4)	7.1 (7.3)	17.5 (13.5)
	2002	**2003**	**2004**	**2005**	**Mean**	**SE**				
Lower Laguna Madre	3.7 (2.5)	0.3 (0.4)	14.7 (8.3)	11.6 (9.6)	2.2 (1.7)	0.7 (0.5)				
Upper Laguna Madre	1.4 (1.1)	3.4 (3.0)	7.0 (8.6)	9.6 (5.1)	5.9 (2.8)	1.3 (0.5)				
Corpus Christi Bay	7.2 (11.9)	7.2 (10.8)	18.5 (13.9)	6.0 (9.2)	7.4 (8.1)	0.9 (1.0)				
Aransas Bay	10.1 (14.8)	10.5 (13.5)	8.4 (13.4)	9.4 (15.0)	11.6 (13.1)	1.2 (1.3)				
San Antonio Bay	12.5 (12.2)	11.1 (14.6)	12.4 (14.6)	5.5 (6.8)	6.9 (9.5)	0.9 (1.3)				
Matagorda Bay	13.8 (23.0)	28.3 (57.0)	25.1 (41.4)	30.4 (54.9)	12.3 (20.2)	1.9 (3.4)				
East Matagorda Bay	0.5 (0.6)	0.8 (0.8)	0.9 (0.9)	4.0 (5.8)	1.7 (1.8)	0.3 (0.4)				
Galveston Bay	3.7 (5.2)	6.6 (6.9)	13.2 (17.2)	9.3 (11.2)	5.7 (7.0)	1.0 (1.4)				
Sabine Lake	7.6 (4.5)	14.6 (13.6)	23.6 (21.0)	30.7 (29.0)	7.0 (6.2)	1.9 (1.7)				

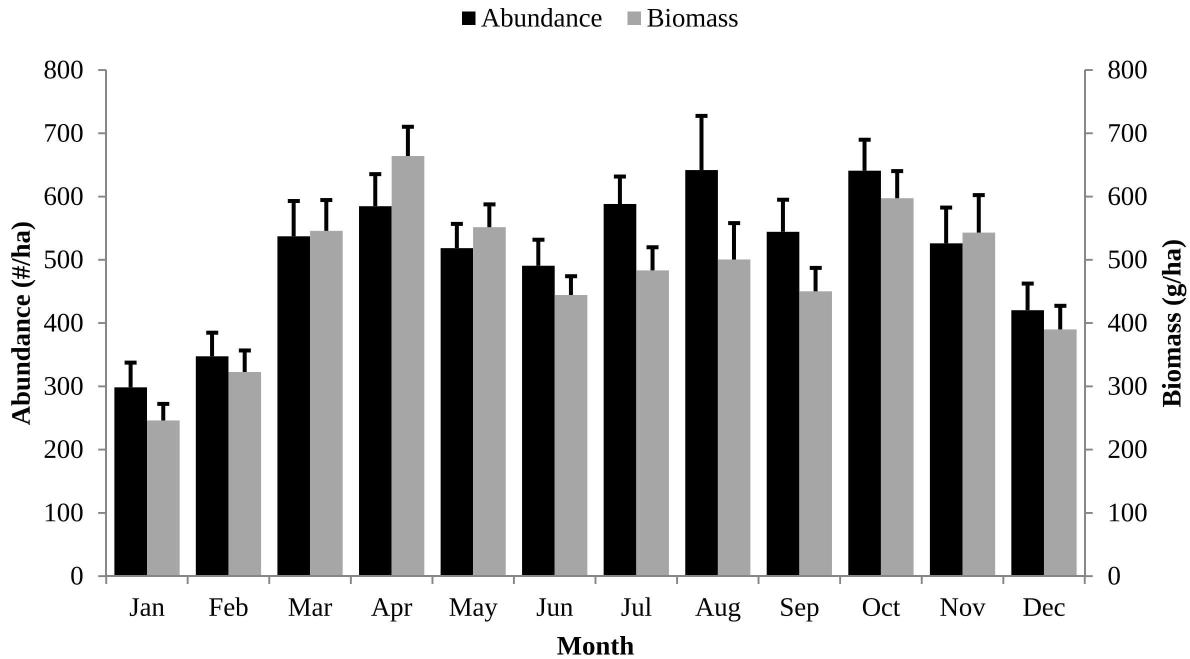

Figure 19. The monthly mean (+SE) abundance and biomass of *Anchoa mitchilli* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

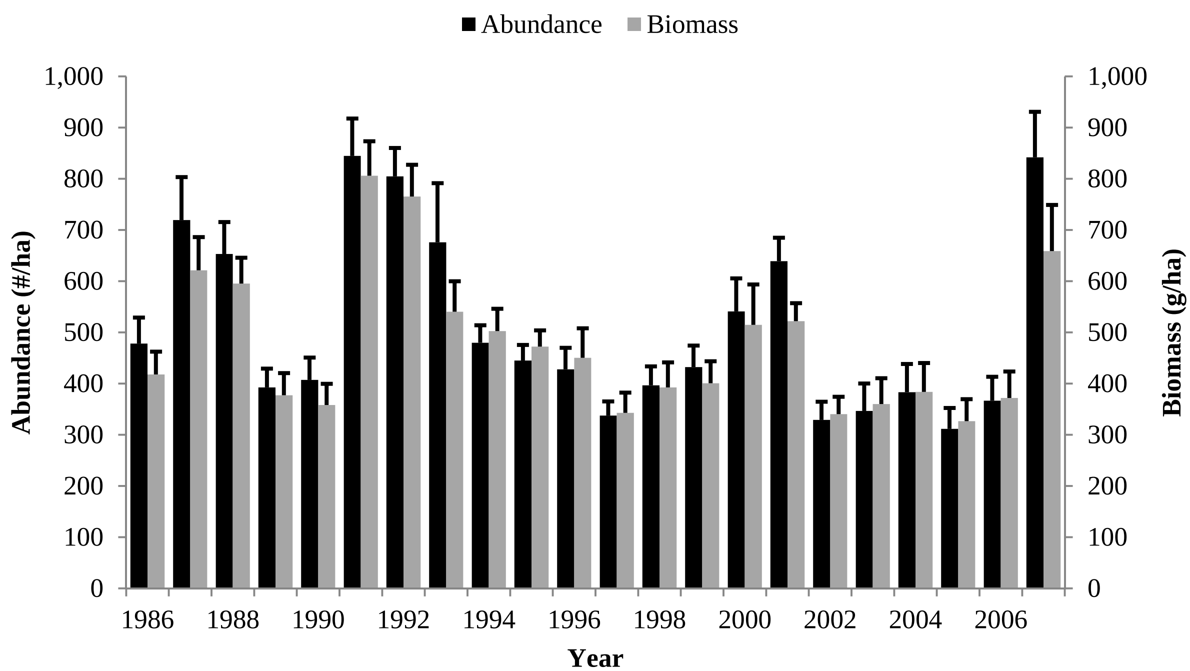

Figure 20. The mean (+SE) annual abundance and biomass of *Anchoa mitchilli* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 11. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	203.6 (131.0)	218.0 (125.6)	440.2 (258.6)	709.1 (458.1)
Vermilion-Cote Blanche Bays	252.0 (148.0)	159.1 (105.1)	360.8 (258.0)	296.1 (202.5)
Terrebonne-Timbalier Bays	353.0 (271.4)	669.6 (578.7)	989.0 (1074.3)	1275.1 (1560.9)
Barataria Bay	184.0 (191.6)	203.7 (241.8)	362.2 (445.6)	484.3 (731.9)
Breton-Chandeleur Sounds	296.3 (267.0)	248.4 (268.6)	199.7 (259.6)	205.6 (297.9)
Lake Borgne	540.5 (675.5)	597.0 (712.5)	920.2 (936.3)	409.8 (425.3)
	May	Jun	Jul	Aug
Lake Calcasieu	1127.4 (903.5)	857.0 (664.8)	788.2 (569.0)	846.0 (595.5)
Vermilion-Cote Blanche Bays	334.0 (249.1)	336.1 (237.8)	481.8 (312.5)	725.0 (493.4)
Terrebonne-Timbalier Bays	864.8 (1034.2)	940.9 (862.0)	1073.1 (893.4)	970.6 (697.0)
Barataria Bay	279.3 (357.4)	174.4 (204.8)	146.3 (152.6)	98.3 (90.5)
Breton-Chandeleur Sounds	207.3 (303.9)	216.4 (256.5)	284.2 (332.5)	356.0 (372.1)
Lake Borgne	385.6 (418.0)	319.7 (313.4)	822.5 (705.1)	980.6 (938.0)
	Sep	Oct	Nov	Dec
Lake Calcasieu	759.0 (538.3)	1055.2 (894.3)	635.7 (579.8)	568.1 (479.1)
Vermilion-Cote Blanche Bays	465.5 (350.9)	798.2 (660.8)	870.4 (841.5)	324.3 (277.5)
Terrebonne-Timbalier Bays	813.7 (651.0)	699.2 (963.2)	584.7 (634.8)	443.5 (396.1)
Barataria Bay	198.7 (158.6)	197.7 (193.4)	237.4 (306.3)	142.9 (160.1)
Breton-Chandeleur Sounds	343.0 (383.7)	303.1 (359.3)	236.7 (278.2)	302.6 (331.1)
Lake Borgne	724.8 (662.1)	1085.4 (981.2)	791.2 (734.1)	1097.9 (1137.9)
	Mean	SE		
Lake Calcasieu	683.9 (518.0)	84.0 (73.0)		
Vermilion-Cote Blanche Bays	450.3 (344.7)	65.9 (62.7)		
Terrebonne-Timbalier Bays	806.4 (778.9)	77.3 (98.4)		
Barataria Bay	225.8 (269.5)	30.7 (50.8)		
Breton-Chandeleur Sounds	266.6 (309.2)	15.8 (13.1)		
Lake Borgne	722.9 (719.9)	78.6 (72.1)		

Table 12. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990	1991
Lake Calcasieu	437.9 (406.9)	611.6 (473.7)	971.7 (711.6)	848.0 (440.7)	1213.4 (671.3)	1325.6 (892.6)
Vermilion-Cote Blanche Bays	854.3 (691.3)	930.6 (578.2)	616.8 (505.4)	266.6 (211.4)	323.6 (269.5)	690.7 (530.0)
Terrebonne-Timbalier Bays	777.8 (646.2)	1112.8 (960.8)	1037.3 (898.5)	649.4 (760.7)	481.5 (499.2)	1142.7 (1082.1)
Barataria Bay	118.6 (147.0)	297.6 (396.7)	157.0 (195.2)	81.7 (100.9)	168.0 (200.6)	339.0 (388.6)
Breton-Chandeleur Sounds	314.4 (408.2)	185.0 (222.2)	442.9 (536.9)	242.4 (292.2)	222.0 (254.8)	447.0 (614.6)
Lake Borgne	223.2 (361.0)	882.0 (931.5)	1056.2 (1099.2)	400.5 (469.2)	396.8 (465.3)	1483.6 (1788.8)
	1992	1993	1994	1995	1996	1997
Lake Calcasieu	672.1 (677.7)	261.9 (208.3)	313.2 (339.9)	649.7 (717.5)	946.2 (917.9)	486.0 (424.2)
Vermilion-Cote Blanche Bays	660.2 (536.9)	707.5 (427.3)	212.5 (199.7)	189.6 (187.5)	138.5 (115.0)	314.2 (187.1)
Terrebonne-Timbalier Bays	1168.2 (1126.7)	1214.3 (872.4)	921.0 (935.4)	885.7 (924.5)	780.4 (883.0)	620.6 (718.9)
Barataria Bay	692.2 (710.8)	389.9 (432.8)	70.8 (59.3)	183.2 (247.0)	210.1 (199.2)	145.2 (177.1)
Breton-Chandeleur Sounds	450.4 (461.5)	219.8 (232.4)	267.2 (247.0)	209.9 (213.2)	165.2 (221.2)	128.5 (154.1)
Lake Borgne	1228.2 (1186.9)	1034.5 (1070.3)	1131.8 (1122.4)	499.9 (528.6)	439.5 (446.6)	407.1 (377.1)
	1998	1999	2000	2001	2002	2003
Lake Calcasieu	351.2 (318.4)	352.4 (295.8)	677.9 (541.4)	425.3 (285.8)	453.6 (339.1)	321.8 (261.6)
Vermilion-Cote Blanche Bays	285.2 (224.1)	374.1 (303.7)	501.9 (348.5)	560.9 (373.7)	128.0 (104.1)	380.7 (325.3)
Terrebonne-Timbalier Bays	816.7 (860.2)	885.7 (827.0)	957.5 (901.5)	1326.2 (1064.2)	393.0 (434.9)	365.7 (408.6)
Barataria Bay	197.0 (258.1)	145.0 (165.4)	291.0 (487.6)	186.6 (228.6)	215.9 (188.0)	314.0 (334.4)
Breton-Chandeleur Sounds	223.2 (223.3)	199.2 (226.8)	249.0 (298.0)	257.1 (312.4)	365.1 (4668.4)	242.9 (302.8)
Lake Borgne	426.0 (403.9)	451.5 (406.3)	342.5 (362.9)	261.5 (246.3)	668.0 (642.8)	565.2 (616.2)
	2004	2005	2006	2007	Mean	SE
Lake Calcasieu	940.1 (598.2)	457.6 (403.1)	344.6 (373.7)	2001.4 (1181.5)	684.7 (517.3)	89.9 (52.7)
Vermilion-Cote Blanche Bays	240.2 (235.7)	153.6 (142.0)	421.0 (352.0)	955.3 (736.0)	450.3 (344.7)	55.5 (39.1)
Terrebonne-Timbalier Bays	260.6 (347.1)	462.1 (535.3)	507.2 (574.4)	975.6 (874.2)	806.4 (778.9)	64.8 (48.4)
Barataria Bay	268.6 (366.1)	208.1 (269.1)	164.4 (217.2)	123.9 (169.7)	225.8 (270.0)	28.4 (31.4)
Breton-Chandeleur Sounds	212.1 (253.0)	128.1 (145.8)	340.5 (322.8)	329.4 (286.9)	265.5 (309.0)	20.4 (25.8)
Lake Borgne	1256.2 (1143.9)	554.2 (492.6)	266.8 (219.5)	1554.8 (1172.1)	705.9 (707.0)	89.2 (87.9)

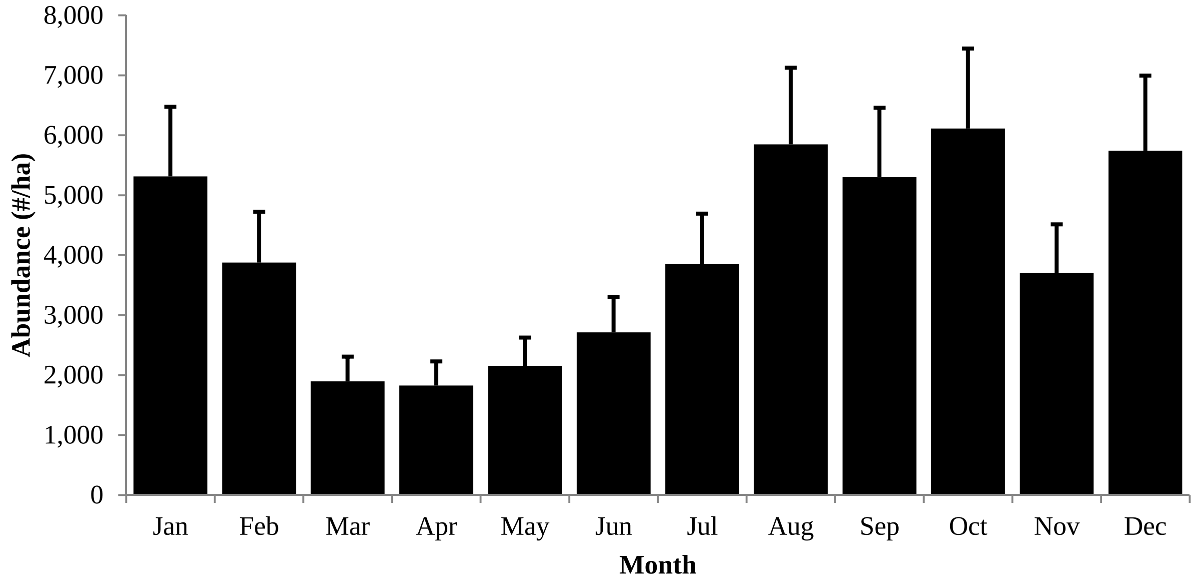

Figure 21. The monthly mean (+SE) abundance of *Anchoa mitchilli* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Length measurements for *A. mitchilli* were not available from MDMR/GCRL, therefore biomass data are not available.

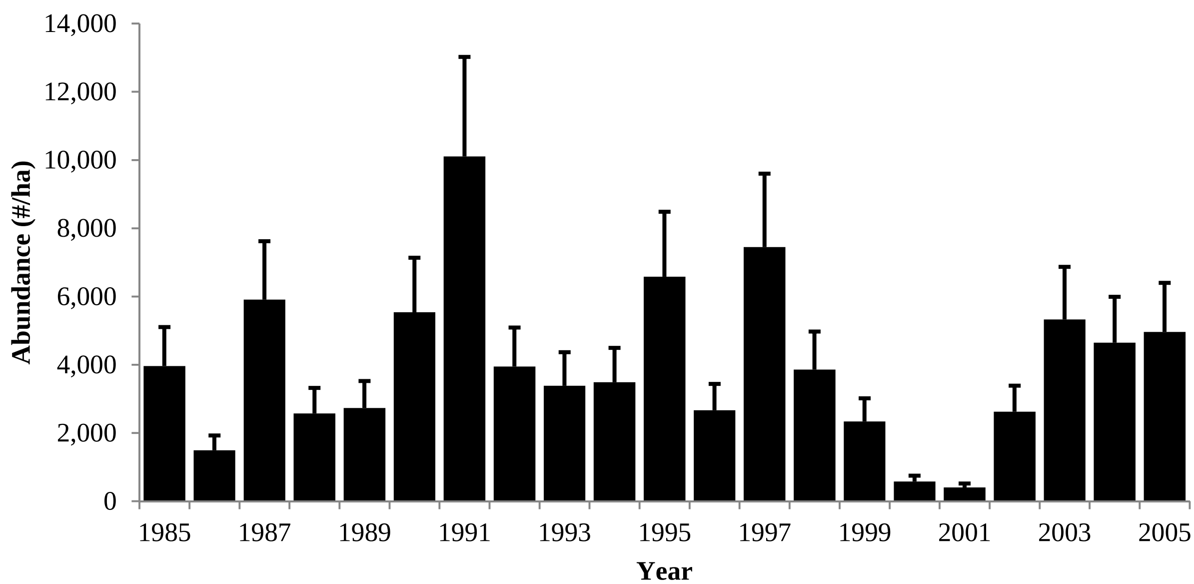

Figure 22. The mean (+SE) annual abundance of *Anchoa mitchilli* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Length measurements for *A. mitchilli* were not available from MDMR/GCRL, therefore biomass data are not available.

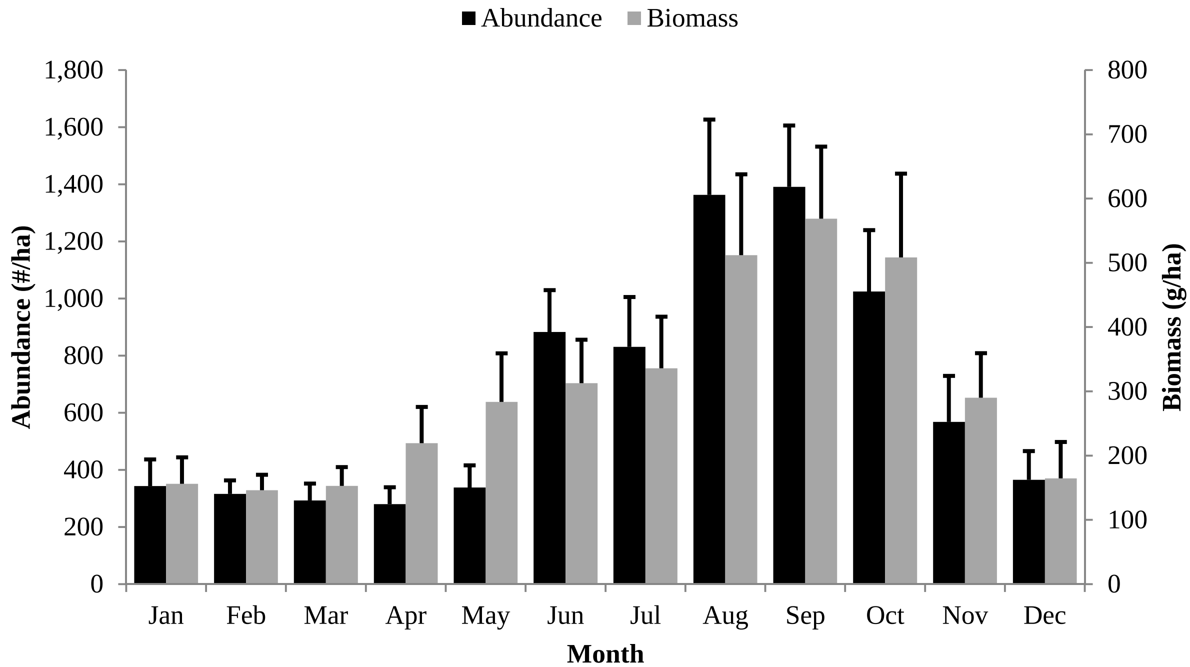

Figure 23. The monthly mean (+SE) abundance and biomass of *Anchoa mitchilli* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

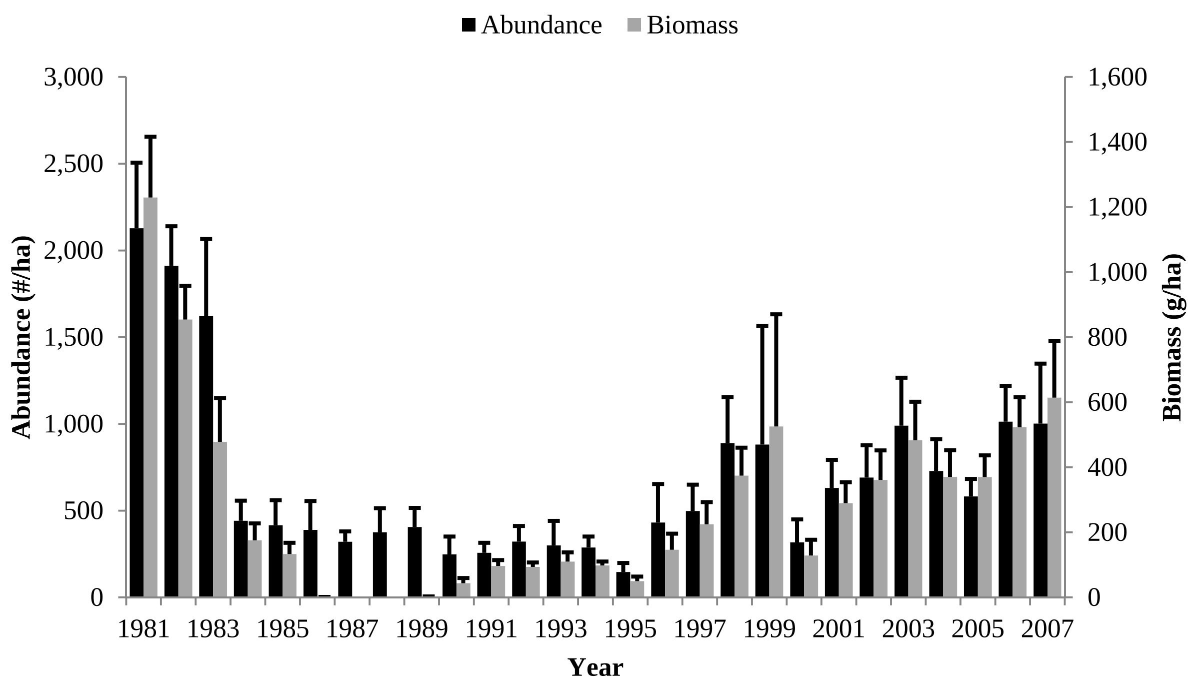

Figure 24. The mean (+SE) annual abundance and biomass of *Anchoa mitchilli* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements were not available for the years 1987 – 1988.

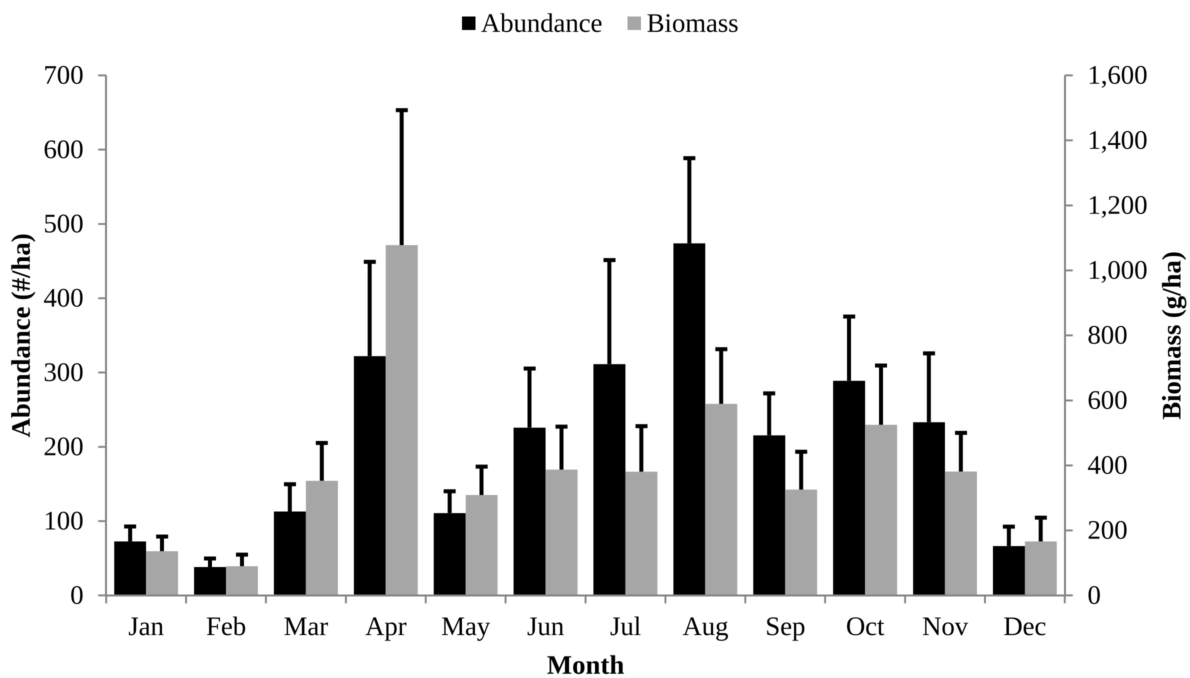

Figure 25. The monthly mean (+SE) abundance and biomass of *Anchoa mitchilli* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

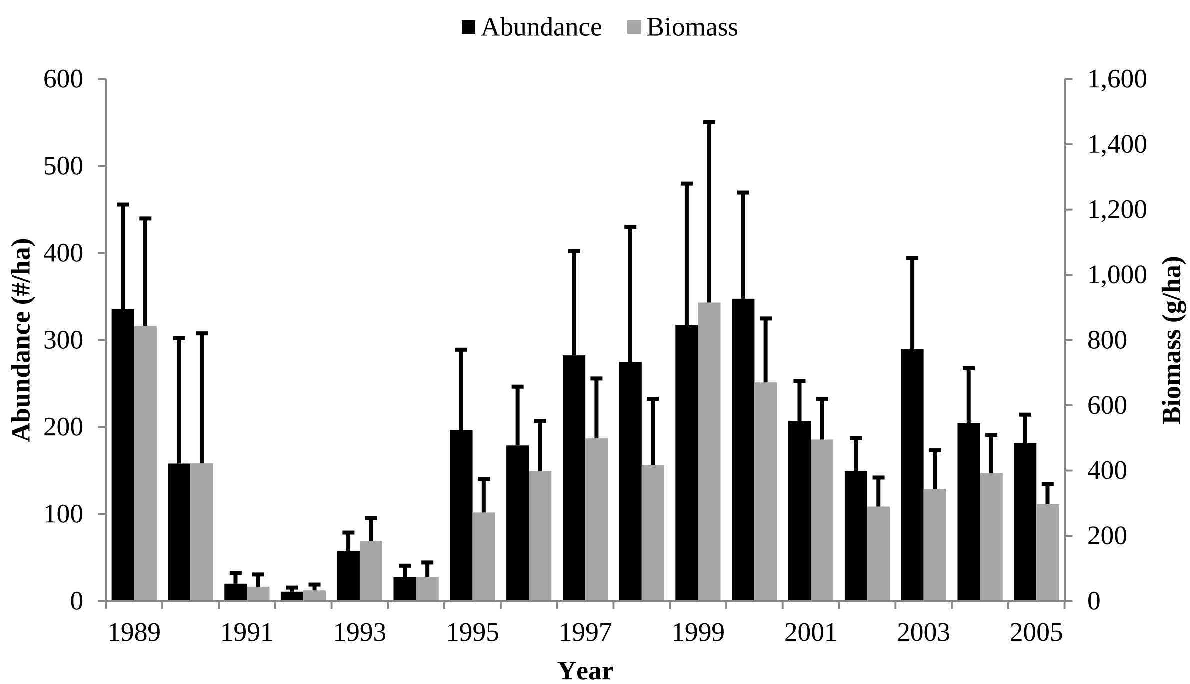

Figure 26. The mean (+SE) annual abundance and biomass of *Anchoa mitchilli* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 13. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	419.5 (165.7)	352.3 (140.4)	333.5 (152.9)	263.3 (163.3)	327.4 (272.5)
E MS Sound (AL)	256.0 (150.3)	384.9 (252.6)	315.4 (212.4)	272.4 (296.6)	325.6 (322.2)
Perdido Bay (AL)	230.0 (168.4)	49.3 (34.5)	80.1 (67.9)	271.1 (208.4)	273.8 (230.6)
Apalachicola Bay (FL)	77.7 (74.0)	51.7 (108.4)	125.6 (239.4)	452.9 (1589.2)	235.8 (600.6)
Suwannee Sound (FL)	27.0 (101.6)	15.2 (80.2)	38.9 (156.3)	36.9 (167.6)	77.1 (155.6)
Cedar Key (FL)	3.7 (8.5)	0.3 (1.0)	1.9 (4.1)	14.9 (60.9)	9.5 (32.1)
Tampa Bay (FL)	136.2 (363.9)	72.8 (176.1)	165.3 (632.0)	423.3 (1236.2)	96.8 (308.1)
Charlotte Harbor (FL)	59.5 (170.3)	1.5 (2.5)	38.5 (235.5)	82.8 (326.1)	17.4 (73.0)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Mobile Bay (AL)	1003.4 (325.9)	941.2 (333.1)	1570.5 (558.4)	1504.6 (560.7)	1250.8 (525.5)
E MS Sound (AL)	757.1 (340.1)	790.3 (345.5)	1007.7 (351.8)	1457.3 (617.5)	588.6 (395.6)
Perdido Bay (AL)	573.1 (304.3)	487.7 (328.8)	114.8 (74.5)	434.2 (343.1)	543.9 (483.0)
Apalachicola Bay (FL)	567.0 (935.0)	474.0 (550.7)	441.0 (584.6)	283.7 (542.0)	199.5 (376.9)
Suwannee Sound (FL)	97.6 (264.0)	104.5 (156.0)	792.0 (910.4)	61.1 (149.9)	94.4 (60.8)
Cedar Key (FL)	0.5 (0.6)	29.3 (31.5)	136.1 (431.1)	0 (0)	53.4 (234.7)
Tampa Bay (FL)	18.4 (23.0)	25.5 (63.2)	656.9 (312.7)	323.3 (324.8)	492.1 (902.0)
Charlotte Harbor (FL)	0 (0)	0.2 (0.1)	56.6 (53.9)	37.5 (71.3)	108.2 (133.2)
	Nov	**Dec**	**Mean**	**SE**	
Mobile Bay (AL)	738.1 (303.8)	446.4 (164.7)	762.6 (305.6)	113.9(46.9)	
E MS Sound (AL)	110.4 (99.1)	253.2 (173.9)	543.2 (296.5)	138.7 (39.4)	
Perdido Bay (AL)	609.1 (558.6)	187.1 (133.0)	321.2 (244.6)	57.9 (47.7)	
Apalachicola Bay (FL)	364.9 (423.8)	86.8 (217.6)	280.1 (520.2)	51.2 (119.8)	
Suwannee Sound (FL)	423.4 (819.6)	73.6 (198.0)	153.5 (268.3)	65.8 (82.1)	
Cedar Key (FL)	15.8 (88.0)	40.1 (130.2)	25.5 (85.2)	11.2 (37.4)	
Tampa Bay (FL)	165.7 (263.6)	96.6 (210.9)	222.7 (401.4)	59.1 (102.5)	
Charlotte Harbor (FL)	229.3 (421.9)	6.3 (13.5)	53.1 (125.4)	18.9 (40.1)	

Table 14. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Anchoa mitchilli* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	2265.6 (1115.6)	2177.7 (806.6)	1913.9 (555.4)	446.0 (136.6)	339.1 (110.4)
E MS Sound (AL)	1845.1 (1335.4)	1642.5 (949.3)	1374.9 (411.0)	464.1 (259.6)	684.8 (209.4)
Perdido Bay (AL)			76.8 (64.7)	359.4 (177.9)	22.1 (14.5)

	1986	1987	1988	1989	1990
Mobile Bay (AL)	435.5	428.9	634.4	357.4 (0.8)	400.1 (51.9)
E MS Sound (AL)	410.9	201.2	145.0	829.4 (2.8)	83.9 (32.2)
Perdido Bay (AL)	0.8	136.8	34.7	81.0	98.5 (38.2)
Tampa Bay (FL)				449.2 (1101.1)	303.9 (823.2)
Charlotte Harbor (FL)				204.1 (801.6)	3.1 (8.5)

	1991	1992	1993	1994	1995
Mobile Bay (AL)	392.5 (144.7)	431.4 (105.0)	412.1 (121.8)	286.4 (101.9)	190.3 (49.8)
E MS Sound (AL)	189.0 (76.2)	280.9 (132.3)	230.3 (138.7)	383.1 (139.1)	133.8 (77.9)
Perdido Bay (AL)	56.7 (22.4)	29.0 (19.6)	51.7 (46.3)	224.8 (50.0)	43.6 (23.7)
Tampa Bay (FL)	36.7 (80.0)	13.2 (37.3)	86.8 (224.7)	43.2 (121.8)	308.0 (406.3)
Charlotte Harbor (FL)	2.6 (8.3)	1.9 (5.5)	23.8 (157.3)	10.9 (20.0)	48.4 (164.5)

	1996	1997	1998	1999	2000
Mobile Bay (AL)	518.5 (186.4)	520.8 (203.2)	1181.7 (460.5)	815.1 (443.2)	449.4 (163.8)
E MS Sound (AL)	635.7 (195.3)	768.0 (461.9)	990.2 (329.0)	111.1 (98.9)	126.9 (86.3)
Perdido Bay (AL)	9.9 (4.0)	85.9 (25.4)	369.8 (317.5)	513.0 (636.6)	80.5 (54.2)
Apalachicola Bay (FL)			71.5 (192.9)	338.9 (974.4)	383.2 (730.1)
Suwannee Sound (FL)	379.0 (434.3)	271.8 (369.8)			
Cedar Key (FL)	0 (0)	81.0 (242.3)			
Tampa Bay (FL)	250.2 (600.9)	490.7 (908.5)	1031.4 (1128.1)	50.1 (69.2)	98.2 (190.3)
Charlotte Harbor (FL)	37.2 (96.7)	4.1 (6.7)	1917.7 (2173.4)	62.8 (89.3)	173.0 (322.3)

	2001	2002	2003	2004	2005
Mobile Bay (AL)	555.5 (233.6)	657.7 (307.5)	1057.1 (507.5)	856.7 (397.6)	615.7 (372.8)
E MS Sound (AL)	485.5 (240.1)	198.5 (166.4)	326.1 (127.4)	246.7 (187.2)	362.8 (187.2)
Perdido Bay (AL)	1141.1 (570.3)	1318.3 (741.5)	1181.4 (732.6)	471.7 (475.4)	623.0 (515.7)
Apalachicola Bay (FL)	304.8 (668.6)	133.9 (262.3)	389.6 (438.6)	329.4 (574.9)	290.2 (336.4)
Suwannee Sound (FL)	61.8 (114.6)	249.4 (540.6)	31.4 (80.8)	137.3 (220.2)	88.2 (245.1)
Cedar Key (FL)	33.2 (143.2)	1.9 (4.6)	15.6 (43.9)	19.2 (95.3)	14.4 (17.1)
Tampa Bay (FL)	71.4 (185.1)	50.1 (53.1)	116.7 (203.0)	16.4 (26.7)	301.1 (507.0)
Charlotte Harbor (FL)	132.0 (340.2)	96.3 (190.3)	4.0 (16.8)	45.2 (198.4)	65.8 (179.2)

	2006	2007	Mean	SE
Mobile Bay (AL)	1218.9 (563.1)	1104.7 (596.8)	765.3 (309.5)	117.2 (10.9)
E MS Sound (AL)	612.8 (526.3)	940.5 (755.1)	544.6 (296.9)	98.2 (13.2)
Perdido Bay (AL)	335.0 (311.8)	591.2 (601.0)	315.6 (247.4)	82.2 (12.4)
Apalachicola Bay (FL)			280.2 (522.3)	41.0 (93.5)
Suwannee Sound (FL)			174.1 (286.5)	48.5 (63.9)
Cedar Key (FL)			23.6 (78.1)	10.4 (33.8)
Tampa Bay (FL)			218.7 (392.1)	63.0 (93.0)
Charlotte Harbor (FL)			166.6 (276.4)	110.5 (127.8)

Micropogonias undulatus

The second most abundant species across the Gulf States was the Atlantic croaker (*Micropogonias undulatus*) (Figure 27). The abundance pattern was consistent across the states with peaks in the winter and spring and lows in the summer and fall. The overall mean (mean of 12 monthly means in Figure 27) abundance in Mississippi was highest among the states at 415.6/ha, followed by Louisiana (217.0/ha), Alabama (166.3/ha), Florida (37.7/ha) and Texas (28.4/ha).

The length frequency distributions for Atlantic croaker in each state (Figure 28) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Atlantic croaker ranged in size from 8 – 466 mm (mean=116.0, SD=36.2) in Texas, 2 – 572 mm (mean=77.8, SD=36.6) in Louisiana, 8 – 297 mm (mean=74.6, SD=41.7) in Mississippi, 5 – 331 mm (mean=68.5, SD=43.9) in Alabama, and 10 – 331 mm (mean=56.6, SD=41.0) in Florida.

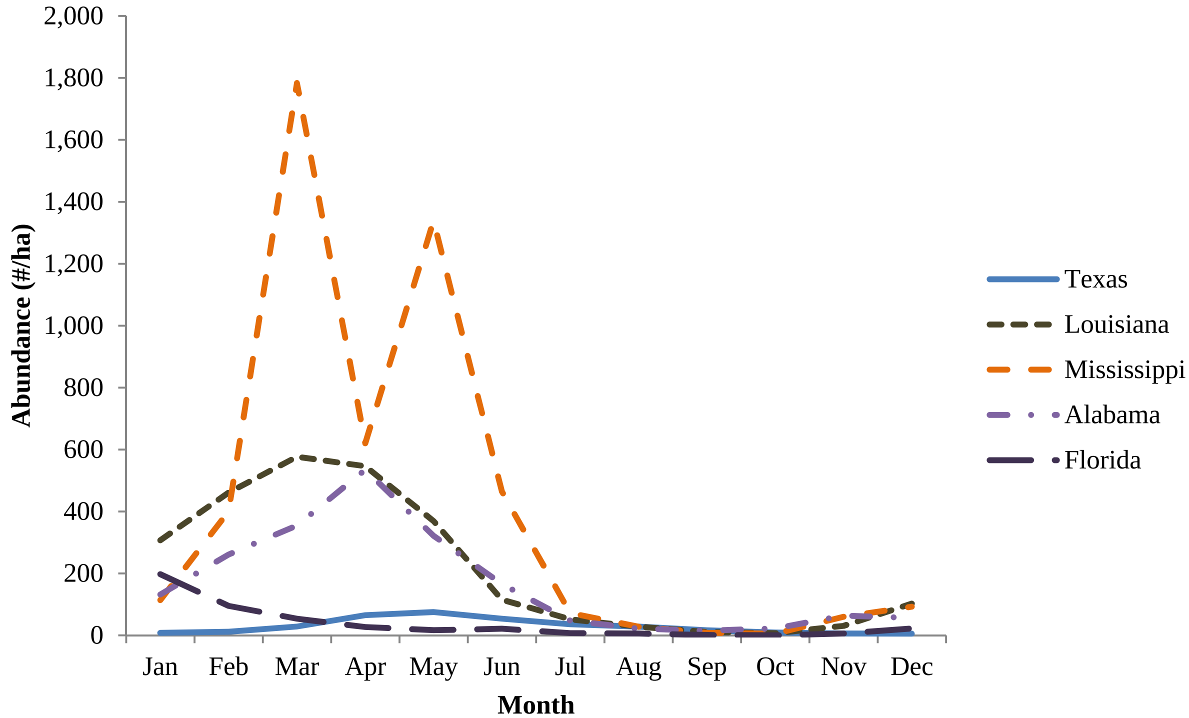

Figure 27. Monthly mean abundance of *Micropogonias undulatus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

Atlantic croaker showed a strong seasonal pattern in Texas with the highest abundances and biomasses occurring in the late spring and early summer (Figure 29). The mean annual abundance peaked in 1992 (50.8/ha) and biomass peaked in 2003 (689.4 g/ha) (Figure 30). There was geographical variability in Atlantic croaker distribution with the highest mean abundance in Aransas Bay and Matagorda Bay, but mean biomass was highest in Sabine Lake and Corpus Christi Bay (Tables 15 and 16).

Atlantic croaker was the second most abundant fish species caught by LDWF's trawls. This species showed a defined seasonal variability in abundance and biomass, with the highest numbers found in late winter/early spring and a relative absence in the summer months (Figure 31). Atlantic croaker mean annual abundance and biomass peaked in 2007 (471.1/ha and 2,241.7 g/ha, respectively) (Figure 32). The geographical distribution was primarily in the central and western portions of Louisiana with the highest numbers caught in Terrebonne-Timbalier Bays, Vermilion-Cote Blanche Bays, and Lake Calcasieu (Tables 17 and 18).

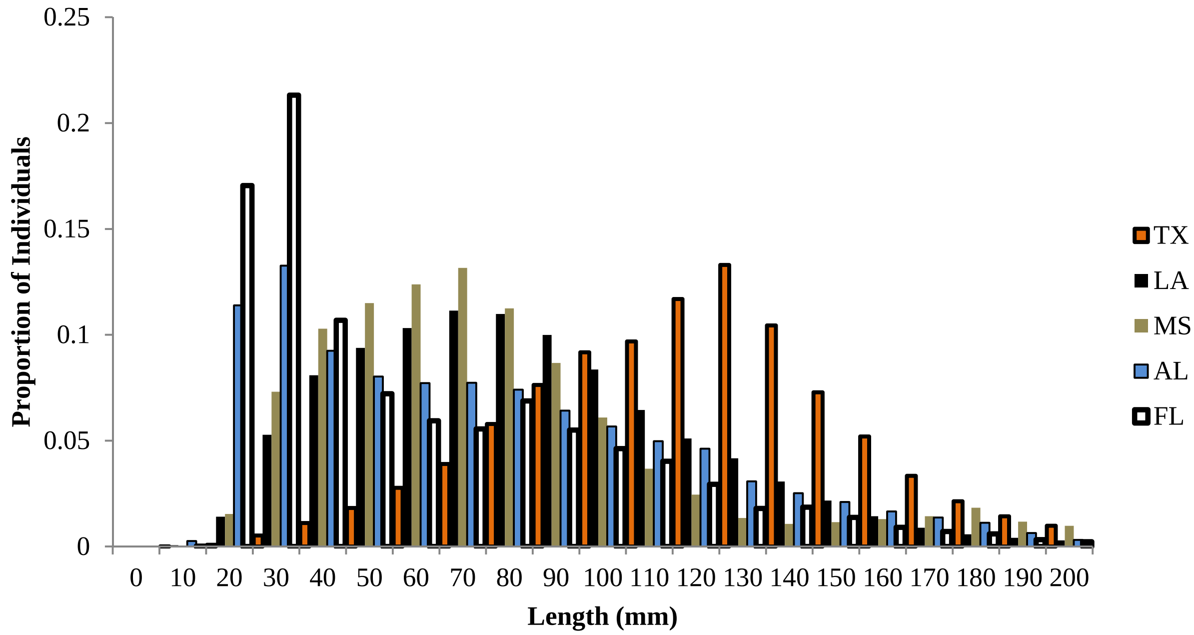

Figure 28. Length frequency of all Atlantic croaker (*Micropogonias undulatus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=202,808): 1982 – 2005; Louisiana (n=123,898): 1986 – 2007; Mississippi (n=14,537): 1985 – 2005; Alabama (n=47,389): 1981 – 2007; and Florida (n=8,067): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

A seasonal pattern could be seen in the abundance of Atlantic croaker in Mississippi with a peak in the spring and a relative absence in late summer and fall (Figure 33). Atlantic croaker mean annual abundance and biomass peaked in 1990 (2,998.9/ha and 1,638.5 g/ha, respectively) (Figure 34).

The monthly mean abundances and biomasses of Atlantic croaker peaked in the spring and early summer in Alabama (Figure 35). Atlantic croaker mean annual abundance and biomass peaked in 1998 (722.5/ha and 2,366.0 g/ha, respectively) (Figure 36). Length data were not available for the years 1987 – 1988. Atlantic croaker were found in their highest numbers in Mobile Bay, with numbers considerably higher, on average, than those in East Mississippi Sound, which were, in turn, slightly higher than those in Perdido Bay (Table 19 and 20).

The seasonal pattern for Atlantic croaker in Florida indicated peak abundance and biomass in the winter and spring (Figure 37). Mean annual abundance and biomass peaked in 1998 (290.4/ha and 1,078.2 g/ha, respectively) (Figure 38). The low abundance values for

Atlantic croaker in Florida observed from 1989 to 1997 were partly caused by the lack of samples during these years in Apalachicola Bay. Atlantic croaker were most abundant in this bay and not seen in appreciable numbers in the other Florida estuaries, except for Suwannee Sound (Tables 19 and 20).

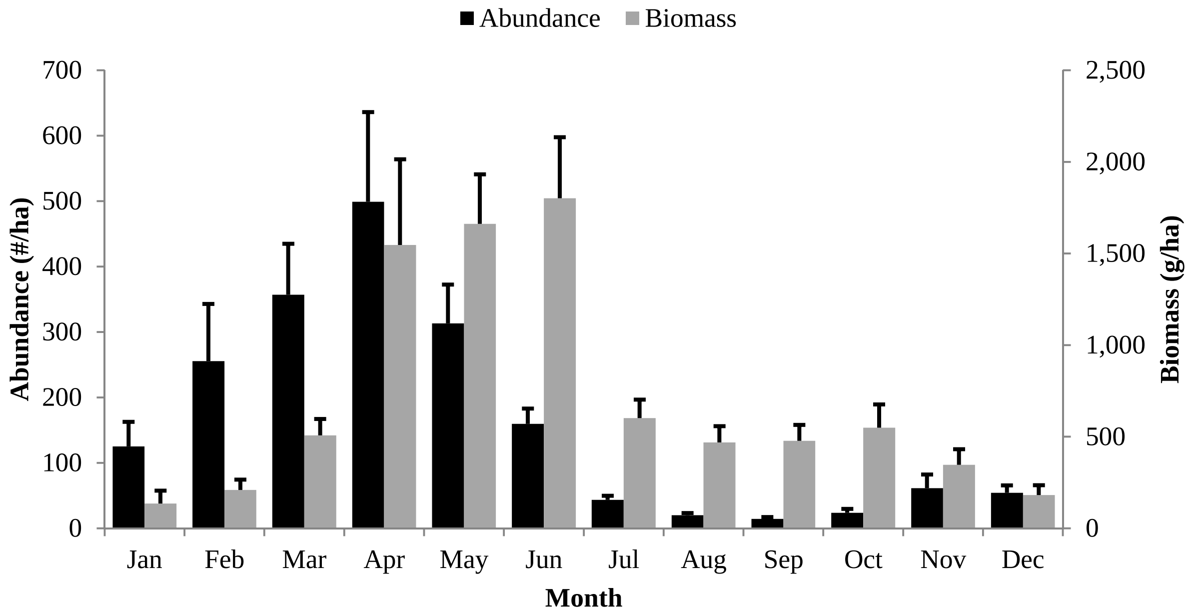

Figure 29. The monthly mean (+SE) abundance and biomass of *Micropogonias undulatus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

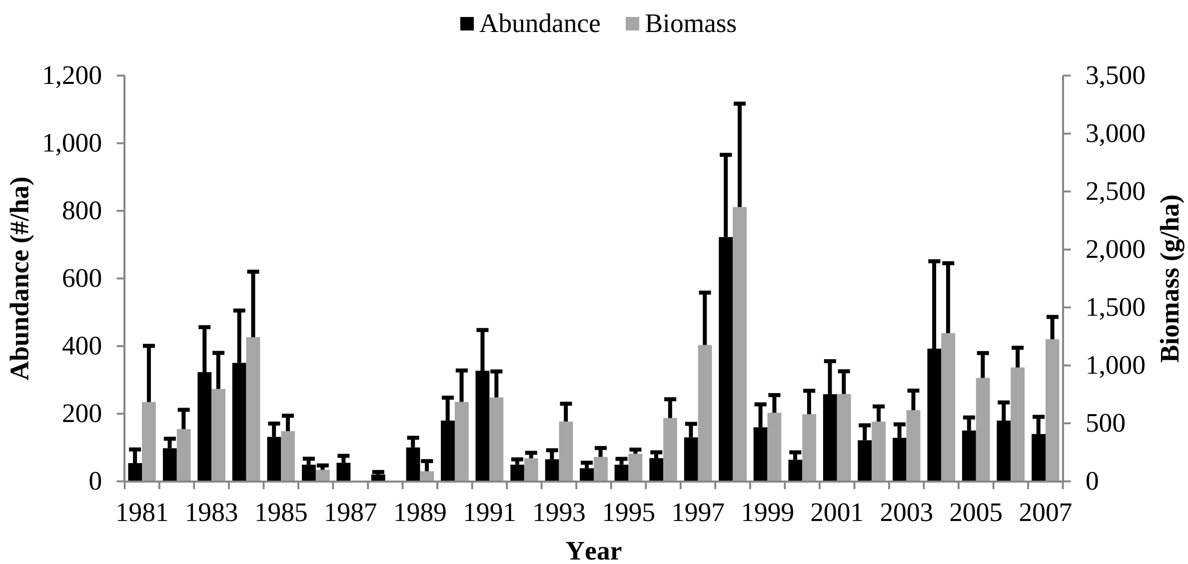

Figure 30. The mean (+SE) annual abundance and biomass of *Micropogonias undulatus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 15. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	2.0 (67.2)	2.8 (45.8)	7.5 (156.0)	20.7 (434.2)	17.5 (440.1)
Upper Laguna Madre	1.0 (48.1)	1.3 (51.0)	2.9 (60.9)	4.5 (111.4)	12.4 (283.0)
Corpus Christi Bay	2.1 (72.4)	3.4 (96.1)	11.1 (219.5)	25.6 (479.7)	57.9 (1157.8)
Aransas Bay	16.8 (72.9)	20.2 (108.0)	47.6 (366.7)	102.4 (1082.8)	112.9 (1484.8)
San Antonio Bay	18.2 (43.0)	19.5 (74.3)	51.2 (324.5)	111.7 (1157.4)	86.9 (1165.7)
Matagorda Bay	3.0 (16.8)	9.2 (35.5)	26.8 (174.1)	107.7 (1150.8)	158.9 (2270.0)
East Matagorda Bay	1.8 (42.2)	2.5 (76.5)	8.2 (189.8)	15.6 (356.7)	14.4 (418.6)
Galveston Bay	5.6 (91.8)	13.8 (212.4)	38.6 (469.1)	73.2 (1008.3)	74.6 (1164.8)
Sabine Lake	10.0 (346.0)	17.3 (588.1)	29.1 (848.2)	31.0 (968.4)	23.4 (845.4)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Lower Laguna Madre	24.9 (905.2)	29.7 (1072.8)	23.1 (1150.3)	17.3 (882.9)	10.9 (557.0)
Upper Laguna Madre	9.2 (306.1)	6.3 (190.8)	5.2 (242.5)	5.5 (265.6)	2.8 (143.3)
Corpus Christi Bay	63.2 (1518.7)	58.7 (1569.6)	46.4 (1527.4)	27.2 (1031.6)	13.8 (607.4)
Aransas Bay	81.2 (1083.8)	51.0 (870.5)	44.0 (985.5)	21.4 (621.5)	8.9 (310.0)
San Antonio Bay	39.2 (580.3)	32.0 (587.6)	15.4 (388.0)	3.0 (89.3)	0.8 (26.7)
Matagorda Bay	108.5 (1670.8)	46.5 (810.9)	33.4 (723.5)	14.6 (361.5)	5.2 (141.8)
East Matagorda Bay	7.9 (301.8)	9.0 (293.8)	11.7 (374.5)	14.9 (576.7)	7.1 (348.2)
Galveston Bay	46.5 (895.0)	26.3 (501.3)	22.3 (570.1)	13.5 (407.3)	7.3 (238.6)
Sabine Lake	25.2 (871.4)	29.0 (736.7)	27.7 (724.4)	32.3 (884.0)	30.6 (841.0)
	Nov	**Dec**	**Mean**	**SE**	
Lower Laguna Madre	5.1 (229.8)	2.1 (103.0)	13.6 (503.7)	2.8 (117.3)	
Upper Laguna Madre	1.8 (65.9)	0.9 (34.4)	4.5 (150.2)	1.0 (29.6)	
Corpus Christi Bay	5.2 (235.3)	2.4 (90.8)	26.4 (717.2)	6.9 (175.4)	
Aransas Bay	4.8 (128.5)	7.3 (68.7)	43.2 (598.7)	10.8 (141.3)	
San Antonio Bay	0.7 (9.9)	4.3 (12.9)	31.9 (371.6)	10.3 (123.0)	
Matagorda Bay	2.2 (47.5)	2.9 (19.5)	43.2 (618.6)	15.2 (214.0)	
East Matagorda Bay	5.2 (227.4)	2.9 (94.4)	8.4 (275.0)	1.4 (45.3)	
Galveston Bay	5.9 (187.2)	6.6 (139.8)	27.8 (490.5)	7.3 (103.5)	
Sabine Lake	26.2 (843.0)	16.7 (552.8)	24.9 (754.1)	2.0 (51.1)	

Table 16. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986
Lower Laguna Madre	13.0	14.7 (17073.3)	20.0 (930.5)	11.2 (724.3)	12.8 (568.8)
Upper Laguna Madre	16.3	6.9 (321.7)	6.7 (169.8)	5.8 (193.6)	6.6 (242.1)
Corpus Christi Bay	50.6	19.9 (1156.0)	54.9 (1641.9)	19.1 (875.8)	38.9 (918.1)
Aransas Bay	40.1	20.0 (443.2)	24.0 (283.7)	15.0 (300.5)	26.5 (316.2)
San Antonio Bay	4.5	8.2 (185.2)	10.1 (118.0)	7.9 (161.9)	20.6 (287.0)
Matagorda Bay	47.1	14.3 (390.7)	13.5 (272.4)	18.9 (436.8)	24.4 (415.9)
East Matagorda Bay					
Galveston Bay	20.0	13.6 (592.4)	6.8 (268.2)	9.0 (344.1)	14.4 (350.0)
Sabine Lake					4.7 (224.1)
	1987	1988	1989	1990	1991
Lower Laguna Madre	20.4 (486.4)	9.7 (320.3)	8.8 (247.5)	32.0 (681.0)	16.0 (460.5)
Upper Laguna Madre	3.4 (183.6)	2.3 (89.7)	0.8 (39.1)	5.6 (133.4)	6.6 (183.9)
Corpus Christi Bay	23.2 (608.7)	17.9 (421.4)	18.7 (455.6)	25.4 (583.9)	34.6 (793.4)
Aransas Bay	40.6 (498.8)	46.8 (598.3)	33.3 (411.9)	21.2 (222.7)	104.3 (1068.5)
San Antonio Bay	68.4 (701.1)	42.1 (629.0)	41.2 (492.6)	23.6 (262.3)	81.7 (782.3)
Matagorda Bay	58.9 (768.4)	20.1 (399.0)	34.9 (686.4)	37.0 (695.6)	63.2 (887.0)
East Matagorda Bay	7.8 (227.3)	6.2 (170.8)	2.0 (28.6)	5.5 (90.4)	3.6 (75.9)
Galveston Bay	12.2 (275.7)	26.5 (329.7)	16.7 (340.7)	16.8 (292.0)	19.4 (343.6)
Sabine Lake	11.5 (404.8)	21.0 (731.7)	20.9 (870.2)	18.8 (425.1)	14.5 (410.1)
	1992	1993	1994	1995	1996
Lower Laguna Madre	17.4 (669.9)	12.4 (504.9)	10.0 (436.4)	24.0 (1009.8)	27.6 (1207.1)
Upper Laguna Madre	7.8 (297.9)	1.0 (42.1)	1.0 (39.2)	1.0 (76.3)	3.5 (145.1)
Corpus Christi Bay	25.2 (485.7)	17.0 (486.9)	8.2 (267.5)	19.6 (485.2)	20.9 (722.2)
Aransas Bay	111.4 (694.1)	57.7 (702.1)	26.2 (392.6)	40.6 (843.6)	27.9 (479.4)
San Antonio Bay	72.5 (561.7)	22.5 (314.0)	68.2 (484.1)	41.0 (537.3)	12.2 (230.6)
Matagorda Bay	98.6 (1202.0)	55.9 (719.7)	46.3 (796.3)	50.4 (618.3)	25.4 (476.8)
East Matagorda Bay	2.1 (51.4)	6.9 (241.5)	7.7 (363.0)	11.1 (334.7)	7.3 (168.8)
Galveston Bay	25.2 (447.5)	41.6 (710.5)	34.2 (617.7)	21.9 (373.5)	32.0 (547.0)
Sabine Lake	18.7 (685.0)	2.8 (1147.3)	15.8 (673.0)	10.3 (296.8)	23.7 (616.7)
	1997	1998	1999	2000	2001
Lower Laguna Madre	13.8 (450.4)	9.6 (373.4)	9.8 (354.3)	4.6 (215.4)	10.5 (328.8)
Upper Laguna Madre	6.3 (261.7)	4.4 (161.7)	3.7 (113.9)	1.8 (102.8)	2.8 (117.9)
Corpus Christi Bay	27.8 (708.7)	38.5 (1007.5)	25.4 (818.8)	24.9 (932.9)	29.9 (866.1)
Aransas Bay	42.3 (736.6)	34.6 (546.9)	43.3 (651.3)	37.0 (783.0)	41.8 (775.3)
San Antonio Bay	15.0 (263.7)	23.6 (360.3)	13.9 (216.8)	15.4 (296.5)	15.5 (217.8)
Matagorda Bay	63.4 (925.2)	40.7 (536.5)	25.8 (440.8)	17.5 (336.3)	79.3 (916.9)
East Matagorda Bay	11.1 (313.4)	8.8 (318.4)	10.3 (286.3)	14.0 (304.4)	9.9 (61.3)
Galveston Bay	45.4 (676.0)	42.8 (694.6)	17.8 (365.5)	22.5 (559.3)	61.3 (934.4)
Sabine Lake	40.7 (1384.4)	37.5 (1095.2)	24.5 (705.3)	27.8 (924.8)	32.9 (1012.8)

Table 16 (continued).

	2002	2003	2004	2005	Mean
Lower Laguna Madre	6.3 (240.0)	7.5 (281.1)	4.5 (177.6)	11.8 (270.1)	13.7 (501.2)
Upper Laguna Madre	2.1 (69.0)	6.1 (234.2)	4.8 (155.2)	4.9 (208.9)	4.7 (149.3)
Corpus Christi Bay	21.3 (667.6)	40.1 (977.6)	20.6 (561.2)	24.9 (697.5)	27.0 (714.2)
Aransas Bay	53.0 (1031.2)	60.1 (980.6)	34.3 (573.5)	54.9 (709.1)	43.2 (598.7)
San Antonio Bay	21.5 (330.5)	54.4 (576.5)	38.4 (492.9)	43.3 (416.9)	31.9 (371.6)
Matagorda Bay	27.5 (459.0)	38.2 (552.6)	56.5 (787.6)	83.5 (1010.8)	43.4 (613.8)
East Matagorda Bay	13.3 (515.4)	10.8 (644.8)	7.8 (482.7)	14.9 (390.1)	8.5 (276.7)
Galveston Bay	31.1 (762.4)	33.8 (599.5)	30.2 (625.0)	73.2 (811.9)	27.8 (490.5)
Sabine Lake	27.4 (767.6)	56.7 (1117.6)	20.0 (658.5)	37.5 (910.9)	24.9 (754.1)

	SE
Lower Laguna Madre	1.4 (62.7)
Upper Laguna Madre	0.7 (62.7)
Corpus Christi Bay	2.2 (66.5)
Aransas Bay	4.7 (55.4)
San Antonio Bay	4.7 (40.0)
Matagorda Bay	4.7 (55.4)
East Matagorda Bay	0.8 (37.4)
Galveston Bay	3.3 (44.2)
Sabine Lake	2.7 (68.7)

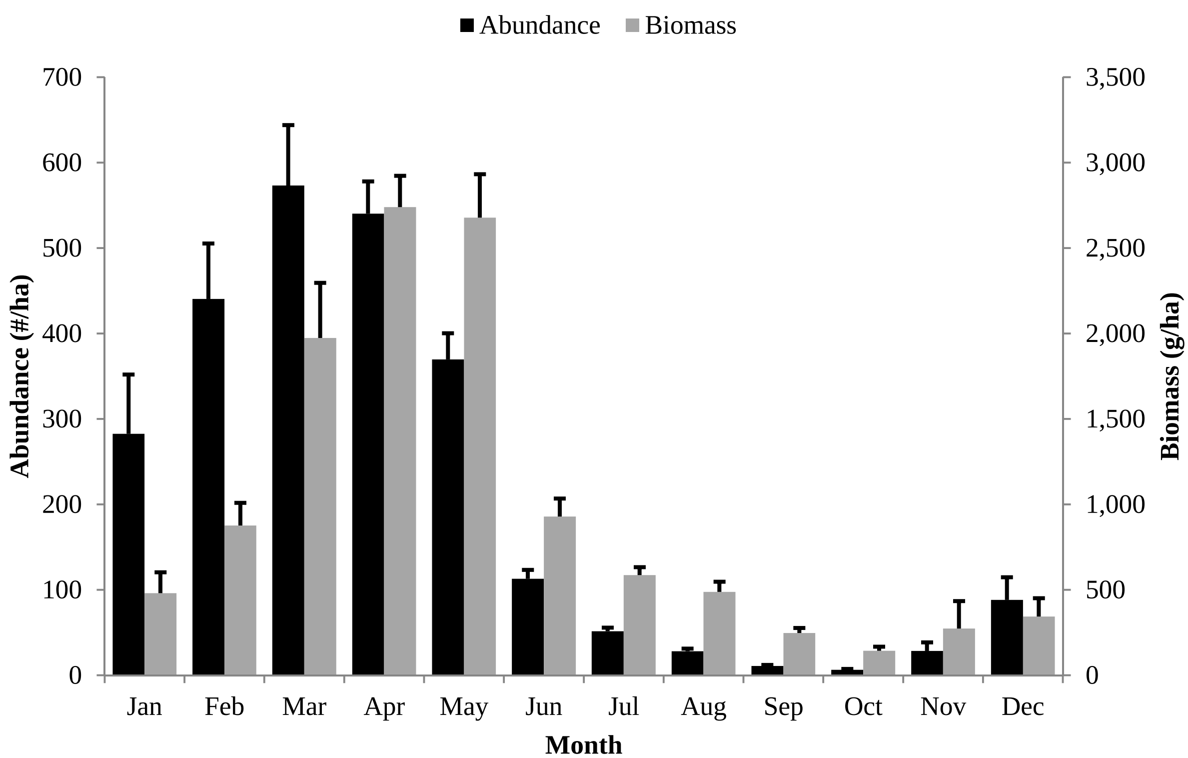

Figure 31. The monthly mean (+SE) abundance and biomass of *Micropogonias undulatus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

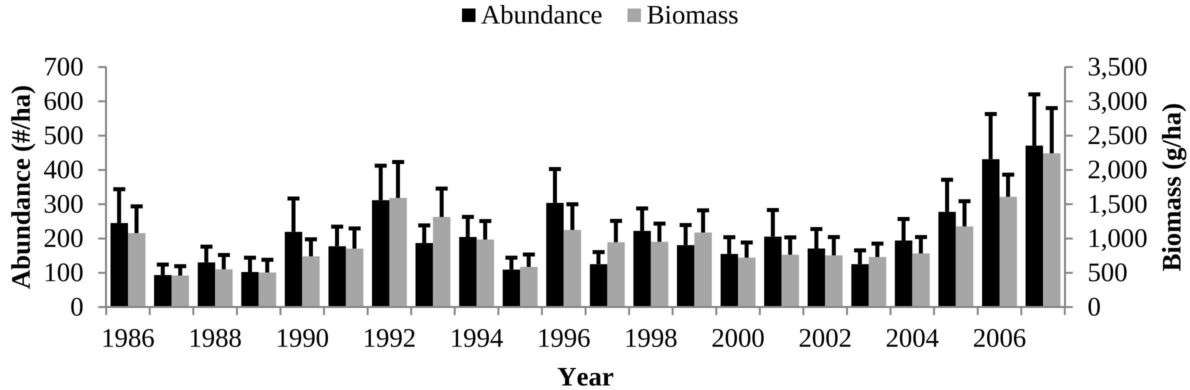

Figure 32. The mean (+SE) annual abundance and biomass of *Micropogonias undulatus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 17. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	252.2 (1008.6)	332.8 (1035.0)	631.4 (3150.7)	943.2 (6151.2)
Vermilion-Cote Blanche Bays	380.7 (968.1)	655.5 (1935.9)	762.2 (3263.1)	783.4 (3184.9)
Terrebonne-Timbalier Bays	469.2 (469.9)	831.3 (1066.8)	998.9 (2499.2)	829.6 (3758.7)
Barataria Bay	60.3 (95.1)	141.0 (248.1)	223.8 (687.1)	300.1(1342.4)
Breton-Chandeleur Sounds	104.0 (126.1)	81.3 (138.7)	187.6 (503.1)	117.4 (577.2)
Lake Borgne	45.3 (160.1)	53.0 (251.9)	162.1 (957.2)	203.9 (2233.7)
	May	Jun	Jul	Aug
Lake Calcasieu	804.3 (8562.9)	274.9 (2860.7)	111.3 (1293.6)	53.9 (975.2)
Vermilion-Cote Blanche Bays	466.7 (2051.6)	189.8 (1032.5)	99.9 (867.0)	42.0 (509.6)
Terrebonne-Timbalier Bays	481.9 (3085.5)	115.2 (925.8)	50.5 (694.1)	29.7 (626.0)
Barataria Bay	168.9 (1177.7)	27.4 (305.3)	10.7 (168.0)	24.7 (436.9)
Breton-Chandeleur Sounds	95.8 (814.3)	28.6 (330.7)	9.1 (150.6)	6.6 (127.2)
Lake Borgne	233.9 (2537.4)	53.1 (624.8)	20.4 (386.9)	13.1 (318.2)
	Sep	Oct	Nov	Dec
Lake Calcasieu	28.7 (698.1)	16.1 (366.2)	90.3 (428.2)	208.1 (471.8)
Vermilion-Cote Blanche Bays	17.3 (332.6)	13.4 (287.5)	55.0 (461.9)	245.0 (1304.9)
Terrebonne-Timbalier Bays	8.5 (232.6)	2.9 (84.2)	18.4 (383.8)	46.5 (101.3)
Barataria Bay	2.1 (62.3)	0.5 (16.2)	0.9 (4.1)	13.3 (17.0)
Breton-Chandeleur Sounds	2.8 (45.3)	2.2 (27.2)	8.2 (42.8)	27.1 (65.7)
Lake Borgne	4.4 (142.3)	1.8 (48.8)	13.3 (25.9)	18.8 (29.0)
	Mean	SE		
Lake Calcasieu	312.3 (2250.2)	90.6 (750.0)		
Vermilion-Cote Blanche Bays	305.5 (1350.0)	83.0 (301.5)		
Terrebonne-Timbalier Bays	323.6 (1160.7)	109.8 (359.3)		
Barataria Bay	81.1 (380.0)	29.5 (132.4)		
Breton-Chandeleur Sounds	55.9 (245.7)	17.4 (73.7)		
Lake Borgne	68.8 (643.0)	23.8 (248.3)		

Table 18. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990	1991
Lake Calcasieu	384.9 (2709.7)	244.4 (1200.0)	286.3 (1613.2)	102.4 (500.7)	194.7 (1144.2)	377.2 (2393.5)
Vermilion-Cote Blanche Bays	260.5 (875.3)	140.8 (702.2)	201.8 (897.3)	169.7 (1047.4)	404.9 (1181.6)	188.4 (734.4)
Terrebonne-Timbalier Bays	409.2 (1249.3)	118.5 (450.5)	195.9 (598.6)	253.0 (1018.5)	428.9 (1291.6)	266.2 (1079.3)
Barataria Bay	155.3 (575.0)	24.0 (170.3)	31.2 (149.7)	7.9 (73.7)	14.9 (68.1)	76.7 (273.9)
Breton-Chandeleur Sounds	21.2 (70.5)	17.3 (46.0)	16.1 (89.2)	18.9 (74.4)	27.4 (119.2)	56.8 (367.1)
Lake Borgne	63.9 (933.7)	40.8 (435.7)	17.9 (186.4)	28.4 (286.0)	45.1 (266.0)	43.8 (381.2)
	1992	1993	1994	1995	1996	1997
Lake Calcasieu	471.8 (4813.7)	234.8 (4465.7)	193.5 (2117.1)	132.6 (1299.8)	489.3 (3582.9)	412.9 (4033.7)
Vermilion-Cote Blanche Bays	199.4 (944.3)	246.1 (1319.0)	212.8 (1262.8)	115.9 (426.5)	432.7 (1073.0)	97.2 (432.6)
Terrebonne-Timbalier Bays	588.2 (1950.2)	182.0 (896.2)	395.6 (1313.9)	214.4 (904.9)	379.2 (1370.9)	127.9 (813.1)
Barataria Bay	99.9 (481.6)	139.3 (616.6)	36.6 (140.4)	42.5 (227.9)	71.1 (406.6)	61.4 (267.4)
Breton-Chandeleur Sounds	61.3 (450.6)	181.9 (577.1)	63.5 (260.6)	26.8 (230.8)	144.4 (298.9)	53.4 (209.3)
Lake Borgne	278.1 (1993.3)	121.1 (1552.0)	83.9 (787.8)	30.8 (527.4)	35.4 (243.2)	74.1 (1570.4)
	1998	1999	2000	2001	2002	2003
Lake Calcasieu	297.8 (2998.2)	286.5 (3170.8)	127.7 (949.2)	441.1 (1705.7)	172.5 (1485.0)	206.7 (1494.8)
Vermilion-Cote Blanche Bays	258.0 (665.4)	226.0 (655.0)	389.4 (1229.9)	252.4 (811.2)	216.2 (954.0)	157.3 (1238.9)
Terrebonne-Timbalier Bays	383.4 (1336.8)	289.9 (1466.2)	170.4 (952.8)	317.9 (1144.1)	285.3 (962.5)	196.9 (809.8)
Barataria Bay	185.6 (730.8)	120.5 (1033.8)	20.3 (213.3)	47.8 (333.6)	67.3 (240.1)	40.7 (287.7)
Breton-Chandeleur Sounds	38.1 (194.5)	37.7 (276.7)	24.8 (168.8)	42.5 (243.8)	93.3(420.5)	59.5 (256.0)
Lake Borgne	45.3 (577.0)	53.9 (637.1)	87.7 (742.8)	67.6 (354.9)	63.2 (552.6)	61.6 (562.5)
	2004	2005	2006	2007	Mean	SE
Lake Calcasieu	336.7 (1719.9)	492.2 (3273.7)	455.3 (1295.8)	537.4 (1786.1)	312.7 (2261.5)	28.6 (256.5)
Vermilion-Cote Blanche Bays	283.9 (1358.3)	473.9 (1511.5)	861.0 (3631.2)	932.5 (6748.2)	305.5 (1350.0)	46.0 (290.9)
Terrebonne-Timbalier Bays	298.1 (984.0)	316.8 (1165.9)	668.3 (2189.1)	632.1 (1676.1)	323.6 (1160.7)	32.7 (87.6)
Barataria Bay	96.2 (446.5)	155.4 (530.1)	73.1 (302.6)	230.0 (829.0)	81.7 (381.8)	12.8 (53.9)
Breton-Chandeleur Sounds	48.3 (193.3)	93.1 (411.1)	47.1 (217.7)	47.7 (222.9)	55.5 (246.6)	8.8 (28.8)
Lake Borgne	46.2 (279.5)	119.6 (814.0)	35.3 (302.0)	104.6 (670.5)	70.4 (666.2)	11.6 (101.5)

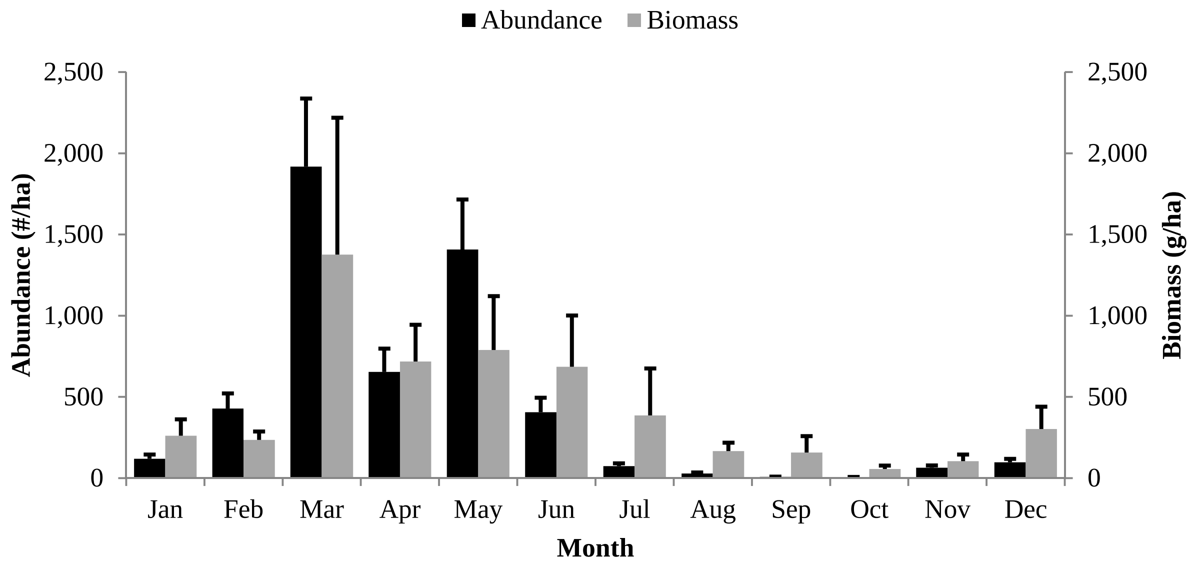

Figure 33. The monthly mean (+SE) abundance and biomass of *Micropogonias undulatus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data are only available for the years after 1984 as *M. undulatus* length measurements were not recorded until 1985.

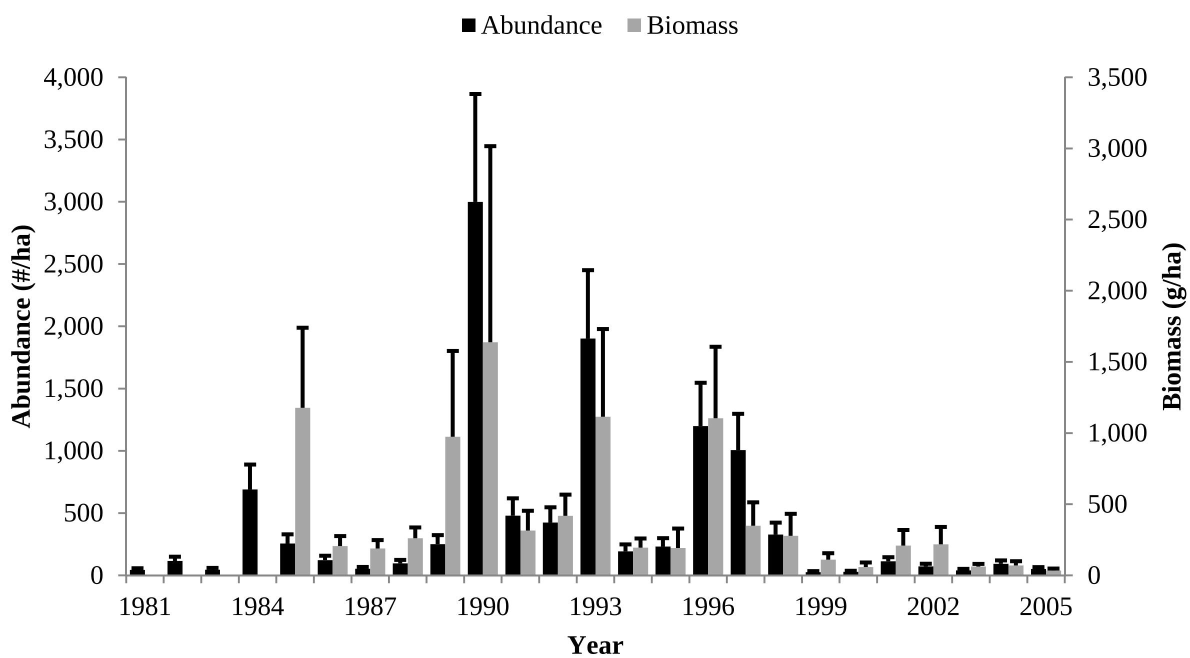

Figure 34. The mean (+SE) annual abundance and biomass of *Micropogonias undulatus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data are only available for the years after 1984 as *M. undulatus* length measurements were not recorded until 1985.

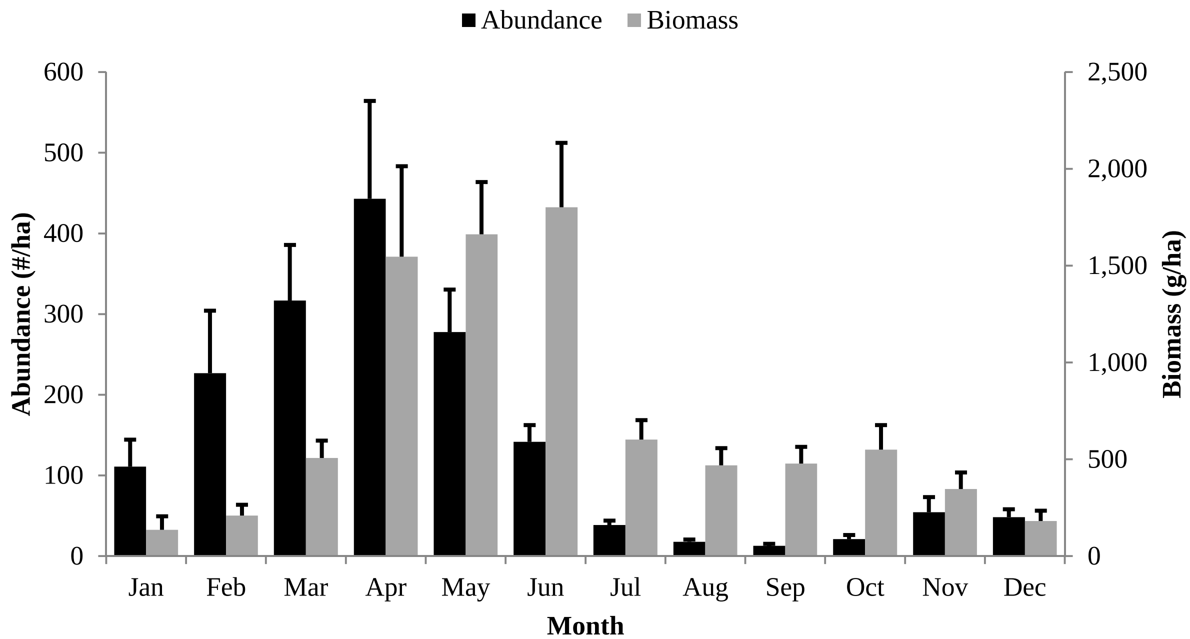

Figure 35. The monthly mean (+SE) abundance and biomass of *Micropogonias undulatus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length measurements of *M. undulatus* were not available in the years 1987 – 1988.

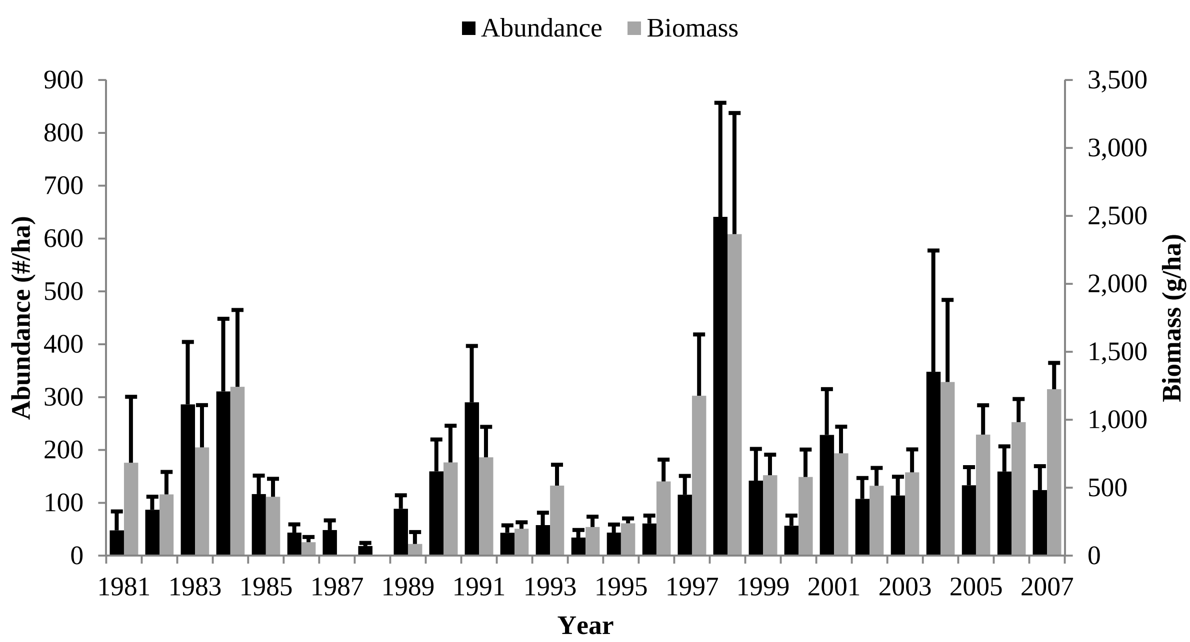

Figure 36. The mean (+SE) annual abundance and biomass of *Micropogonias undulatus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements of *M. undulatus* were not available in the years 1987 – 1988.

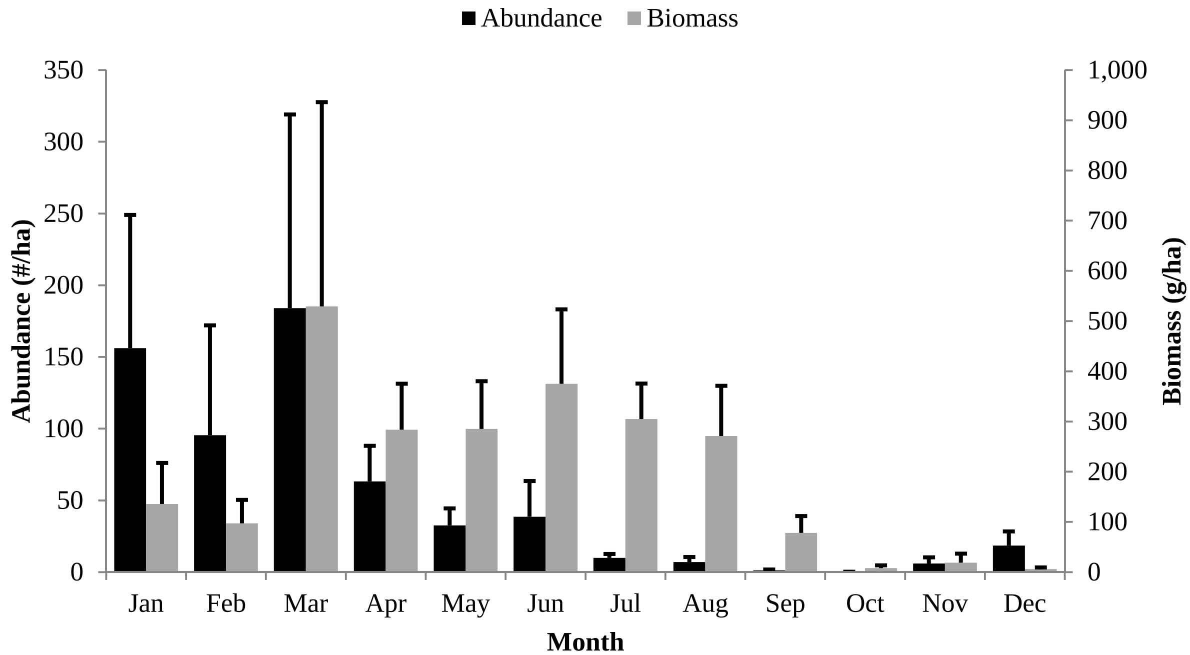

Figure 37. The monthly mean (+SE) abundance and biomass of *Micropogonias undulatus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

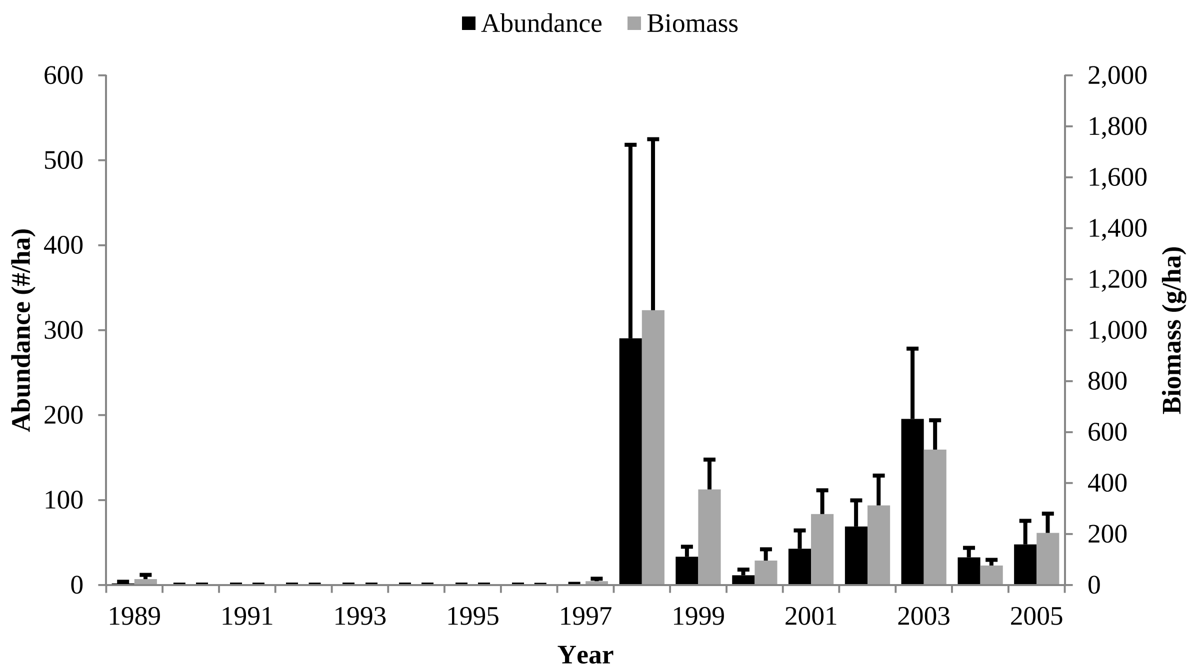

Figure 38. The mean (+SE) annual abundance and biomass of *Micropogonias undulatus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 19. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	159.1 (189.1)	309.8 (274.6)	437.4 (603.0)	655.6 (1961.0)	400.2 (2338.1)
E MS Sound (AL)	86.6 (31.6)	239.7 (131.0)	340.3 (450.9)	239.6 (615.4)	194.3 (1017.0)
Perdido Bay (AL)	53.4 (25.4)	120.9 (62.8)	155.0 (247.4)	235.5 (1296.4)	238.5 (1622.5)
Apalachicola Bay (FL)	350.5 (353.0)	193.1 (209.2)	425.3 (1184.4)	196.3 (950.4)	101.0 (841.8)
Suwannee Sound (FL)	0 (0)	0 (0)	0 (0)	4.8 (31.0)	16.1 (343.5)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	1.0 (0.4)	1.4 (2.2)	1.5 (12.6)	0.4 (2.3)	0.3 (12.6)
Charlotte Harbor (FL)	0 (0)	0 (0)	0.2 (2.4)	0.1 (0.8)	0.1 (3.8)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Mobile Bay (AL)	183.4 (2073.8)	53.7 (603.0)	21.4 (509.7)	21.1 (652.9)	26.7 (663.8)
E MS Sound (AL)	135.9 (1816.8)	22.0 (543.6)	10.6 (327.5)	7.2(352.0)	24.8 (483.9)
Perdido Bay (AL)	119.2 (1145.6)	45.1 (823.2)	20.8 (408.1)	5.1 (144.6)	4.7 (115.0)
Apalachicola Bay (FL)	74.0 (759.5)	16.1 (501.0)	11.8 (424.2)	3.1 (189.9)	1.0 (60.1)
Suwannee Sound (FL)	8.5 (240.9)	0.3 (13.9)	2.5 (228.5)	0.5 (41.1)	0 (0)
Cedar Key (FL)	0 (0)	0.3 (9.4)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0.1 (2.9)	0.0 (2.6)	0 (0)	0 (0)	0 (0)
	Nov	**Dec**	**Mean**	**SE**	
Mobile Bay (AL)	79.6 (497.5)	70.0 (239.5)	202.3 (883.8)	59.9 (222.1)	
E MS Sound (AL)	29.7 (123.8)	42.9 (87.2)	114.5 (498.4)	32.7 (144.0)	
Perdido Bay (AL)	8.1 (130.7)	12.3 (32.5)	84.9 (506.8)	25.3 (163.3)	
Apalachicola Bay (FL)	40.6 (126.5)	52.7 (17.9)	124.6 (468.2)	42.3 (110.7)	
Suwannee Sound (FL)	0 (0)	0 (0)	2.7 (74.9)	1.4 (35.2)	
Cedar Key (FL)	0 (0)	0 (0)	0.0 (0.8)	0.0 (0.8)	
Tampa Bay (FL)	0 (0)	0 (0)	0.4 (2.5)	0.2 (1.4)	
Charlotte Harbor (FL)	0 (0)	0 (0)	0.0 (1.0)	0.0 (0.4)	

Table 20. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Micropogonias undulatus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary. Length data were not available from Alabama for the years 1987 – 1989.

	1981	1982	1983	1984	1985	1986	1987	1988
Mobile Bay (AL)	163.7 (2012.6)	141.9 (576.1)	406.8 (1084.5)	519.8 (1788.7)	161.0 (468.8)	52.3 (81.4)	65.1	29.4
E MS Sound (AL)	12.7 (188.2)	42.8 (297.0)	227.3 (366.8)	105.9 (428.2)	113.7 (502.7)	50.0 (180.9)	24.2	12.0
Perdido Bay (AL)			70.7 (932.1)	18.3 (489.4)	0.4 (6.7)	19.5 (0.7)	41.8	7.5

	1989	1990	1991	1992	1993	1994	1995	1996
Mobile Bay (AL)	121.4 (127.2)	175.5 (508.8)	521.6 (1003.2)	59.9 (207.3)	81.0 (522.8)	59.3 (254.9)	50.5 (262.5)	79.8 (693.0)
E MS Sound (AL)	122.1 (5.6)	312.6 (1430.8)	218.4 (762.2)	16.9 (264.4)	55.7 (692.4)	14.3 (273.5)	39.7 (219.2)	78.0 (545.4)
Perdido Bay (AL)	13.1	51.5 (295.6)	48.7 (148.2)	47.9 (106.3)	29.0 (110.9)	2.1 (17.9)	49.8 (178.8)	25.1 (119.9)
Suwannee Sound (FL)								0 (0)
Cedar Key (FL)								0 (0)
Tampa Bay (FL)	2.1 (29.6)	0.4 (0.2)	0.0 (1.5)	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (0.3)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0.1 (2.2)	0 (0)	0 (0)	0.1 (1.8)	0 (0)

	1997	1998	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	90.9 (1150.7)	792.1 (2360.6)	279.5 (934.3)	91.3 (777.0)	232.6 (948.3)	176.4 (706.1)	160.1 (819.4)	583.6 (1803.4)
E MS Sound (AL)	253.7 (2106.5)	655.7 (1846.4)	25.4 (154.7)	9.5 (59.6)	532.3 (704.2)	26.0 (254.8)	20.9 (99.0)	27.7 (57.3)
Perdido Bay (AL)	116.8 (403.5)	981.1 (4425.1)	105.3 (465.8)	13.3 (250.3)	54.1 (284.0)	44.6 (195.5)	143.9 (410.4)	141.9 (927.4)
Apalachicola Bay (FL)		290.7 (1103.4)	33.4 (375.2)	11.4 (96.1)	56.9 (370.3)	93.1 (365.0)	272.8 (711.3)	65.1 (139.9)
Suwannee Sound (FL)	4.2 (90.6)				0 (0)	5.6 (165.7)	5.5 (172.6)	1.6 (22.5)
Cedar Key (FL)	0 (0)				0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	153.7 (1021.6)	223.7 (1083.7)	172.5 (1446.6)	209.1 (905.7)	39.9 (24.1)
E MS Sound (AL)	136.8 (423.3)	52.3 (388.7)	19.1 (344.8)	118.7 (503.9)	33.6 (21.4)
Perdido Bay (AL)	138.4 (664.7)	81.2 (909.5)	78.1 (840.8)	89.4 (529.7)	39.0 (39.3)
Apalachicola Bay (FL)	174.1 (721.1)			124.7 (485.3)	38.3 (119.5)
Suwannee Sound (FL)	0.6 (41.7)			2.5 (70.5)	1.0 (28.0)
Cedar Key (FL)	0.2 (6.0)			0.0 (0.9)	0.0 (0.9)
Tampa Bay (FL)	0.7 (2.5)			0.2 (2.0)	0.1 (1.7)
Charlotte Harbor (FL)	0.2 (5.6)			0.0 (0.6)	0.0 (0.4)

Leiostomus xanthurus

Spot (*Leiostomus xanthurus*) was the third most abundant fish species caught across the Gulf States. Spot showed a consistent pattern of abundance across the states with peaks in the spring and summer and lows in the fall and winter (Figure 39). The mean abundance (mean of 12 monthly means in Figure 39) in Mississippi was highest among the states at 653.0/ha, followed by Alabama (531.0/ha), Florida (58.6/ha), Texas (27.9/ha), and Louisiana (26.8/ha).

The maximum length of a spot recorded by Classen et al. (1988) was 479 mm; therefore we excluded all measurements in the database greater than 479 mm from our analysis. The length frequency distributions for spot in each state (Figure 40) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Spot ranged in size from 11 – 467 mm (mean=122.7, SD=27.4) in Texas, 7 – 247 mm (mean=98.8, SD=32.7) in Louisiana, 10 – 209 mm (mean=69.4, SD=24.6) in Mississippi, 5 – 395 mm (mean=69.9, SD=41.2) in Alabama, and 8 – 269 mm (mean=85.2, SD=59.9) in Florida.

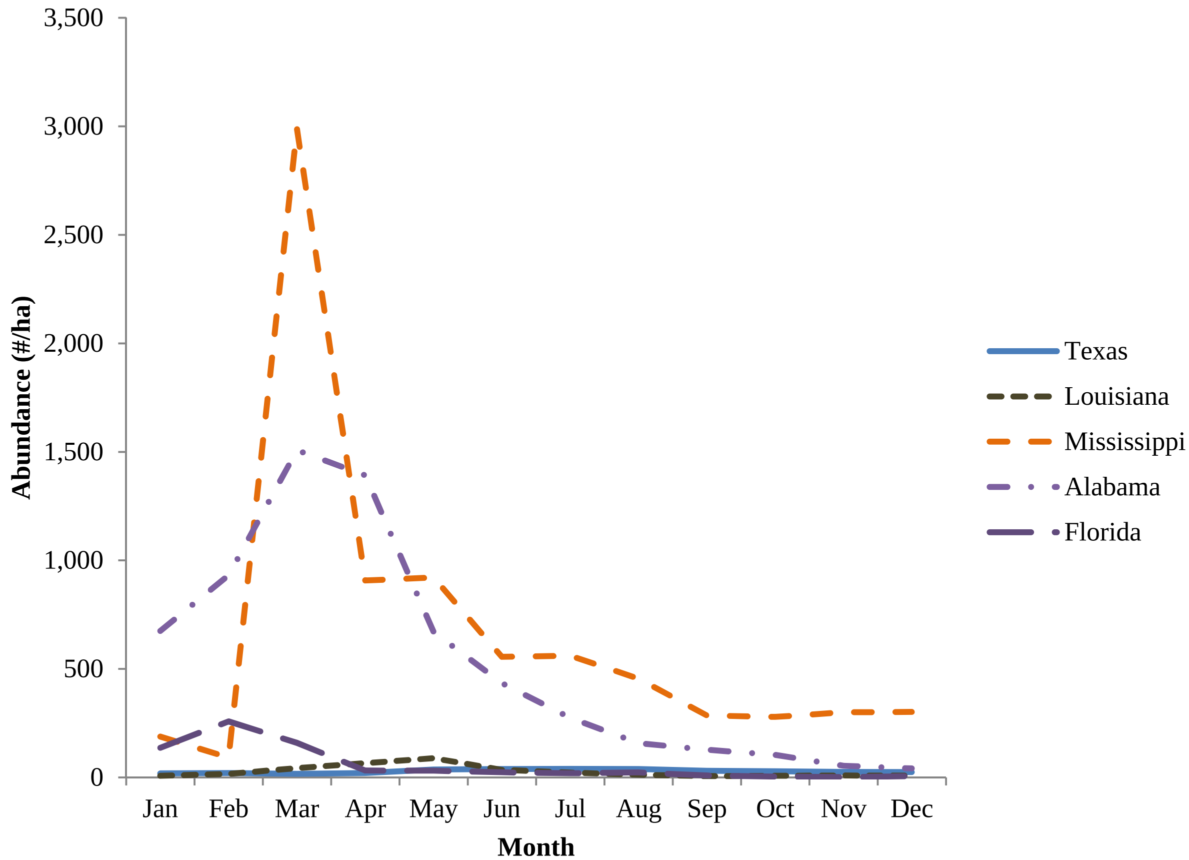

Figure 39. Monthly mean abundance of *Leiostomus xanthurus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

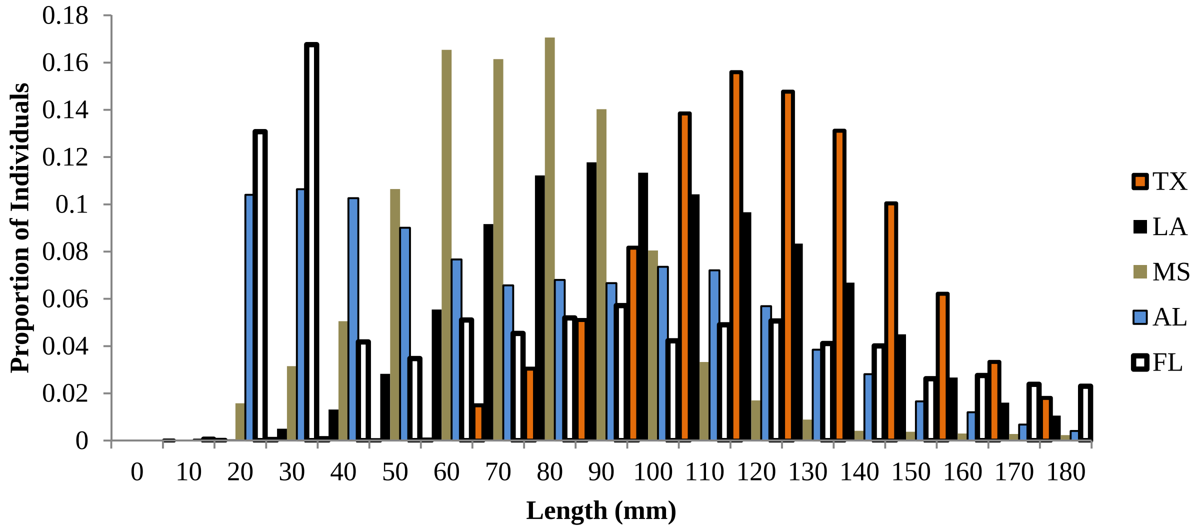

Figure 40. Length frequency of all spot (*Leiostomus xanthurus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=163,239): 1982 – 2005; Louisiana (n=38,488): 1986 – 2007; Mississippi (n=17,005): 1985 – 2005; Alabama (n=52,281): 1981 – 2007; and Florida (n=11,653): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

The monthly mean abundance and biomass of spot in Texas showed a seasonal variability with lows in late winter and early spring (Figure 41). The highest values of mean annual abundance and biomass occurred in 2003 (61.1/ha and 1,645.5 g/ha, respectively) (Figure 42). Some geographical variability existed in Texas, with the highest values being caught in Corpus Christi Bay and Aransas Bay (Tables 21 and 22).

Spot showed a strong seasonality to their abundance and biomass in Louisiana. The highest numbers were caught in the spring, with the peak in May (Figure 43). Mean annual abundance peaked in 1986 (134.1/ha), but biomass peaked in 1995 (707.4 g/ha) (Figure 44). The highest mean abundances and biomasses were found in Terrebonne-Timbalier Bays (Tables 23 and 24).

In Mississippi, the seasonal abundance of spot showed a strong peak in March, but the biomass numbers did not peak until late summer and fall (Figure 45). 1990 was an anomalous year in Mississippi with a mean annual abundance over 7,200/ha, while no other year averaged more than 1,900/ha (Figure 46). The highest mean biomass numbers were found in 1995 (3,058.0 g/ha) (Figure 46).

The seasonal variability of spot in Alabama showed a strong peak in mean abundance and biomass in early spring, with biomass remaining elevated through the fall (Figure 47). Mean annual abundance and biomass were at their highest in 2001 (1,822.8/ha and 4,241.7 g/ha, respectively) (Figure 48). Length data were not available for 1988. There was no evident geographical difference in abundance or biomass between Mobile Bay and East Mississippi Sound, but values in Perdido Bay were generally an order of magnitude higher (Tables 25 and 26).

In Florida the mean abundance of spot peaked in late winter and early spring, but the biomass did not peak until late summer and early fall (Figure 49). Spot mean annual abundance peaked in 2003 (343.6/ha), but biomass peaked in 1990 (599.8 g/ha) (Figure 50). The highest mean abundance and biomass values were typically in Apalachicola Bay (Tables 25 and 26).

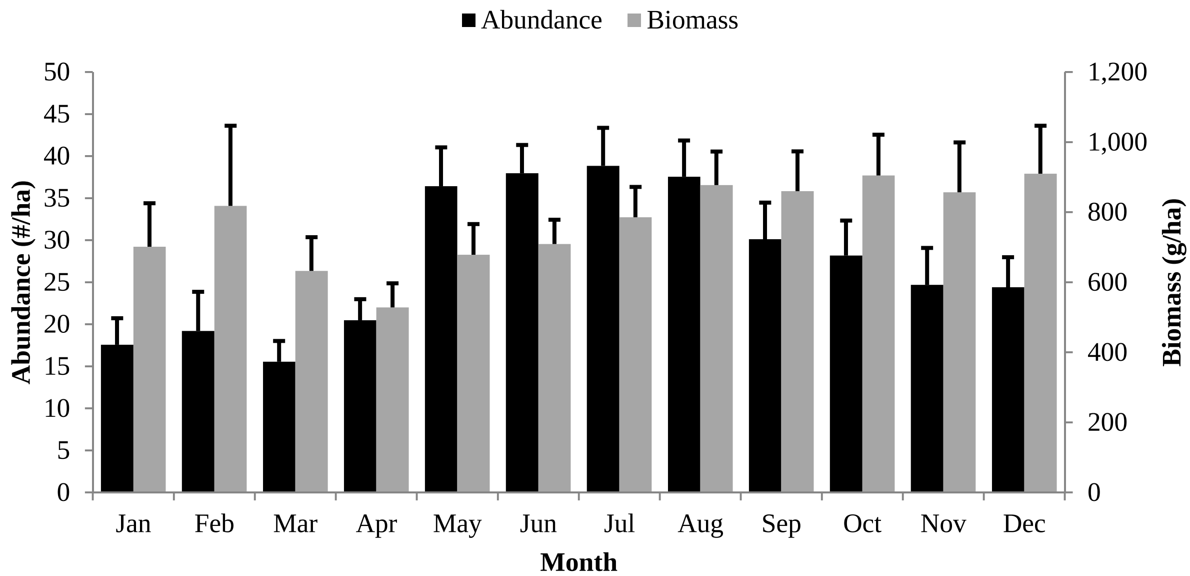

Figure 41. The monthly mean (+SE) abundance and biomass of *Leiostomus xanthurus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

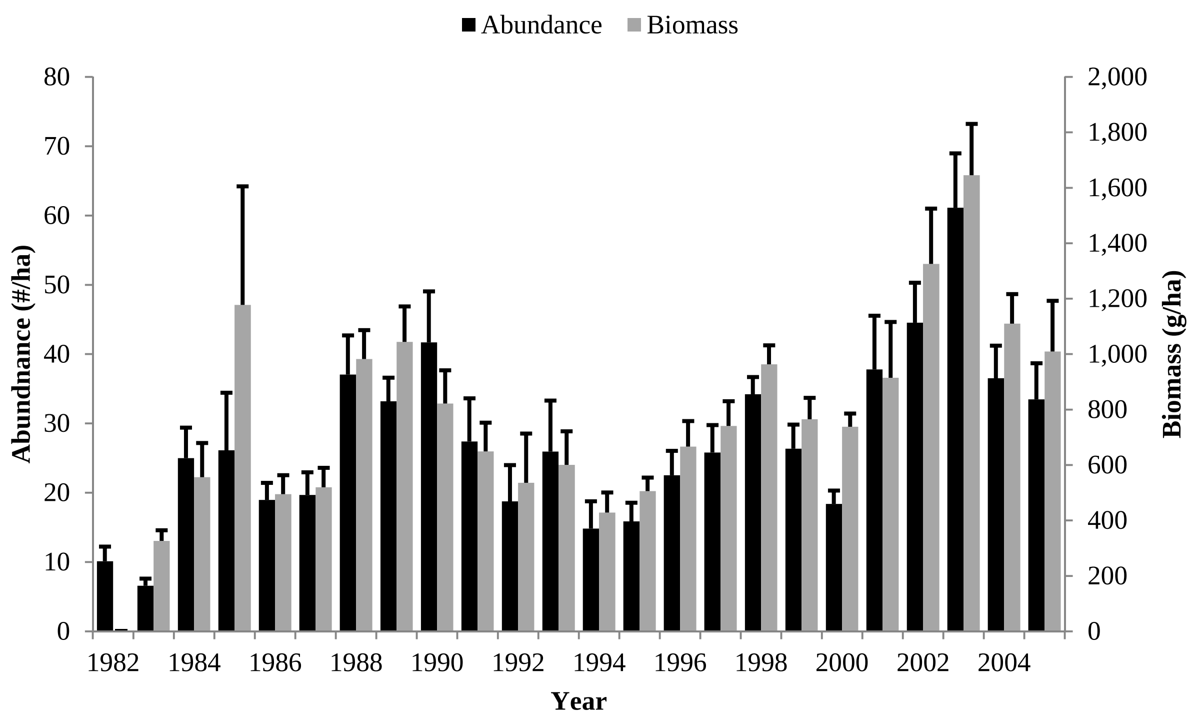

Figure 42. The mean (+SE) annual abundance and biomass of *Leiostomus xanthurus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 21. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	6.6 (288.2)	7.8 (341.2)	6.1 (225.6)	11.9 (290.9)	8.8 (184.1)
Upper Laguna Madre	5.6 (172.3)	1.4 (63.9)	1.4 (101.5)	2.1 (84.4)	5.7 (243.6)
Corpus Christi Bay	47.1 (2217.2)	69.1 (3313.1)	39.7 (1879.6)	34.4 (1494.4)	60.8 (1608.3)
Aransas Bay	23.7 (841.2)	21.7 (768.3)	30.4 (1029.3)	46.2 (814.9)	79.5 (1075.8)
San Antonio Bay	2.6 (92.7)	4.7 (157.0)	4.8 (152.4)	28.3 (335.0)	48.0 (628.4)
Matagorda Bay	33.3 (1181.0)	25.2 (906.6)	21.9 (829.6)	20.0 (705.7)	44.6 (970.8)
East Matagorda Bay	4.3 (166.4)	1.6 (73.4)	2.1 (133.2)	2.1 (75.5)	4.7 (91.3)
Galveston Bay	7.0 (256.0)	6.2 (237.8)	7.7 (338.1)	5.6 (169.5)	8.7 (124.3)
Sabine Lake	7.8 (310.0)	4.0 (171.4)	2.4 (114.5)	3.0 (101.5)	9.0 (210.8)

	Jun	Jul	Aug	Sep	Oct
Lower Laguna Madre	10.1 (224.8)	10.7 (242.8)	9.6 (240.8)	10.8 (322.5)	6.6 (257.9)
Upper Laguna Madre	6.4 (159.5)	6.1 (186.9)	7.4 (285.2)	9.8 (312.7)	13.7 (422.2)
Corpus Christi Bay	71.0 (1700.8)	99.9 (2207.9)	101.3 (2504.8)	78.4 (2420.0)	70.9 (2484.6)
Aransas Bay	78.4 (1213.2)	77.7 (1470.4)	66.6 (1461.1)	62.2 (1759.0)	67.5 (2061.4)
San Antonio Bay	35.9 (477.1)	37.0 (591.7)	35.2 (736.5)	18.8 (438.4)	10.5 (268.4)
Matagorda Bay	53.8 (1054.2)	35.1 (768.1)	34.7 (817.7)	19.2 (519.4)	16.4 (511.0)
East Matagorda Bay	3.2 (66.2)	4.2 (69.9)	3.2 (63.3)	5.1 (140.1)	5.9 (175.5)
Galveston Bay	10.9 (190.0)	8.0 (147.2)	8.3 (189.6)	5.0 (148.1)	7.0 (215.5)
Sabine Lake	12.1 (186.7)	9.6 (186.3)	15.5 (311.1)	33.5 (822.2)	25.4 (785.6)

	Nov	Dec	Mean	SE
Lower Laguna Madre	9.2 (327.3)	5.9 (227.0)	8.7 (264.4)	0.6 (14.2)
Upper Laguna Madre	10.6 (339.2)	8.5 (255.5)	6.6 (218.9)	1.1 (31.8)
Corpus Christi Bay	45.3 (1782.3)	46.9 (1878.3)	63.7 (2124.2)	6.4 (147.5)
Aransas Bay	57.4 (1910.7)	68.6 (2526.9)	56.7 (1410.8)	6.1 (161.3)
San Antonio Bay	21.9 (702.3)	8.3 (256.7)	21.3 (403.1)	4.4 (65.0)
Matagorda Bay	17.7 (577.6)	20.6 (787.7)	28.6 (802.5)	3.4 (59.9)
East Matagorda Bay	6.1 (188.0)	6.5 (194.3)	4.1 (120.0)	0.5 (15.0)
Galveston Bay	8.2 (269.5)	8.6 (315.6)	7.6 (216.8)	0.5 (19.7)
Sabine Lake	19.5 (681.5)	12.3 (422.9)	12.9 (358.7)	2.7 (75.5)

Table 22. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986
Lower Laguna Madre	1.9	2.6 (150.5)	4.4 (146.4)	8.7 (419.2)	2.8 (112.9)
Upper Laguna Madre	4.5	0.9 (46.3)	36.1 (655.4)	10.6 (319.9)	3.0 (89.2)
Corpus Christi Bay	15.3	16.5 (1049.9)	34.2 (1085.2)	98.7 (4980.0)	53.8 (1789.8)
Aransas Bay	31.3	8.2 (303.1)	60.2 (1083.8)	27.6 (973.6)	43.2 (804.6)
San Antonio Bay	2.1	2.5 (77.4)	16.0 (214.8)	5.8 (178.5)	9.7 (149.2)
Matagorda Bay	11.9	8.0 (323.8)	15.7 (427.4)	9.2 (332.4)	13.6 (367.4)
Galveston Bay	3.9	2.6 (106.2)	3.7 (124.8)	5.8 (230.3)	6.6 (179.8)
Sabine Lake					2.8 (72.7)
	1987	**1988**	**1989**	**1990**	**1991**
Lower Laguna Madre	5.9 (136.5)	8.2 (227.3)	8.6 (243.4)	47.4 (813.3)	38.1 (970.4)
Upper Laguna Madre	1.7 (117.0)	1.9 (95.0)	3.0 (107.9)	33.0 (638.0)	11.4 (389.3)
Corpus Christi Bay	57.1 (1698.9)	109.8 (3412.0)	108.3 (4042.1)	67.9 (1697.0)	96.4 (2265.2)
Aransas Bay	40.1 (995.6)	70.4 (1717.3)	45.3 (1443.0)	76.9 (1272.8)	24.4 (481.9)
San Antonio Bay	15.9 (231.4)	54.3 (1028.2)	34.1 (621.2)	54.5 (756.1)	18.1 (325.2)
Matagorda Bay	18.0 (423.7)	19.5 (611.5)	39.8 (1010.3)	44.1 (1118.0)	20.8 (599.8)
East Matagorda Bay	5.6 (139.9)	2.3 (42.2)	2.9 (90.9)	5.8 (71.8)	3.0 (55.7)
Galveston Bay	5.3 (169.2)	6.5 (166.5)	5.3 (156.6)	3.9 (99.9)	4.3 (116.6)
Sabine Lake	4.3 (156.4)	11.1 (248.9)	9.0 (311.7)	2.8 (97.5)	2.9 (93.4)
	1992	**1993**	**1994**	**1995**	**1996**
Lower Laguna Madre	11.8 (473.7)	5.1 (231.1)	4.1 (181.5)	7.2 (314.9)	5.5 (207.0)
Upper Laguna Madre	4.2 (222.0)	1.7 (72.2)	0.3 (22.6)	0.5 (22.6)	2.0 (78.1)
Corpus Christi Bay	30.7 (1118.0)	78.3 (1982.0)	26.2 (1070.3)	19.4 (957.7)	68.7 (2598.4)
Aransas Bay	36.6 (596.0)	29.5 (485.2)	28.5 (743.7)	34.9 (1093.5)	42.1 (869.7)
San Antonio Bay	11.5(310.6)	14.3 (228.5)	18.2 (304.3)	24.7 (522.1)	10.7 (277.5)
Matagorda Bay	33.1 (1018.1)	40.3 (837.3)	10.9 (297.7)	17.8 (463.8)	18.0 (371.9)
East Matagorda Bay	0.7 (23.8)	2.1 (76.8)	1.7 (62.0)	1.9 (50.4)	3.0 (101.8)
Galveston Bay	8.7 (257.9)	7.4 (273.5)	11.0 (262.0)	8.2 (269.8)	3.8 (120.3)
Sabine Lake	4.5 (179.6)	14.9 (411.3)	11.8 (375.2)	2.6 (84.8)	18.1 (470.8)
	1997	**1998**	**1999**	**2000**	**2001**
Lower Laguna Madre	4.5 (199.3)	4.9 (199.1)	3.6 (190.8)	4.3 (200.8)	6.4 (207.9)
Upper Laguna Madre	3.2 (139.9)	3.1 (189.2)	3.3 (159.2)	1.2 (131.1)	4.9 (157.1)
Corpus Christi Bay	93.8 (2634.7)	67.6 (1898.9)	52.4 (1873.5)	22.1 (1079.7)	41.9 (1523.2)
Aransas Bay	40.1 (1048.2)	77.4 (2084.9)	66.9 (1792.6)	58.7 (2307.8)	129.3 (2941.9)
San Antonio Bay	5.4 (145.3)	15.2 (279.9)	32.8 (659.1)	9.1 (173.1)	20.4 (334.2)
Matagorda Bay	24.0 (716.6)	53.9 (1650.0)	19.6 (566.6)	24.3 (916.3)	43.7 (955.8)
East Matagorda Bay	11.7 (346.1)	3.2 (124.8)	2.8 (90.0)	1.2 (76.5)	6.4 (143.6)
Galveston Bay	6.2 (230.7)	7.8 (272.9)	5.3 (155.7)	4.7 (211.5)	16.0 (291.7)
Sabine Lake	2.5 (135.2)	24.2 (598.5)	5.4 (176.2)	12.7 (517.7)	9.0 (209.0)

Table 22 (continued).

	2002	2003	2004	2005	Mean
Lower Laguna Madre	3.3 (149.5)	7.6 (253.9)	2.3 (65.3)	6.5 (156.4)	8.6 (260.5)
Upper Laguna Madre	3.6 (214.3)	14.5 (734.3)	5.9 (440.0)	3.3 (177.9)	6.6 (217.4)
Corpus Christi Bay	65.6 (2008.0)	169.0 (4573.2)	72.3 (2966.8)	52.9 (1936.3)	63.3 (2093.4)
Aransas Bay	120.1 (3695.0)	113.0 (3013.3)	57.5 (1299.6)	97.6 (2811.2)	56.7 (1410.8)
San Antonio Bay	40.4 (1028.6)	31.7 (711.7)	48.1 (786.1)	16.4 (330.5)	21.3 (403.1)
Matagorda Bay	53.2 (1620.0)	54.7 (1527.2)	53.8 (1802.1)	32.8 (999.4)	28.4 (789.9)
East Matagorda Bay	3.6 (146.4)	5.2 (187.6)	7.0 (280.6)	8.5 (198.2)	4.1 (120.0)
Galveston Bay	13.3 (334.6)	14.1 (375.0)	11.4 (379.5)	16.7 (417.3)	7.6 (216.8)
Sabine Lake	27.9 (675.1)	63.8 (1460.7)	9.9 (286.5)	17.8 (613.2)	12.9 (358.7)
	SE				
Lower Laguna Madre	2.2 (44.7)				
Upper Laguna Madre	1.9 (42.5)				
Corpus Christi Bay	7.5 (244.6)				
Aransas Bay	6.5 (195.2)				
San Antonio Bay	3.2 (59.3)				
Matagorda Bay	3.2 (99.2)				
East Matagorda Bay	0.6 (19.3)				
Galveston Bay	0.8 (20.8)				
Sabine Lake	3.1 (72.0)				

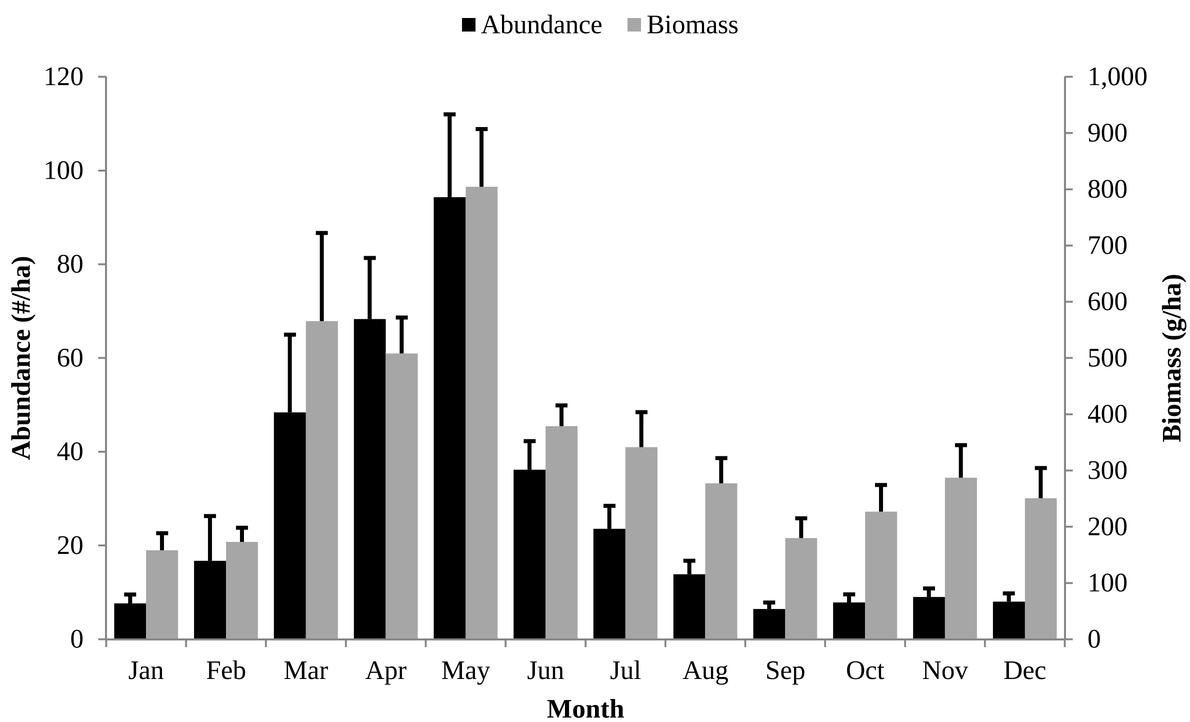

Figure 43. The monthly mean (+SE) abundance and biomass of *Leiostomus xanthurus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

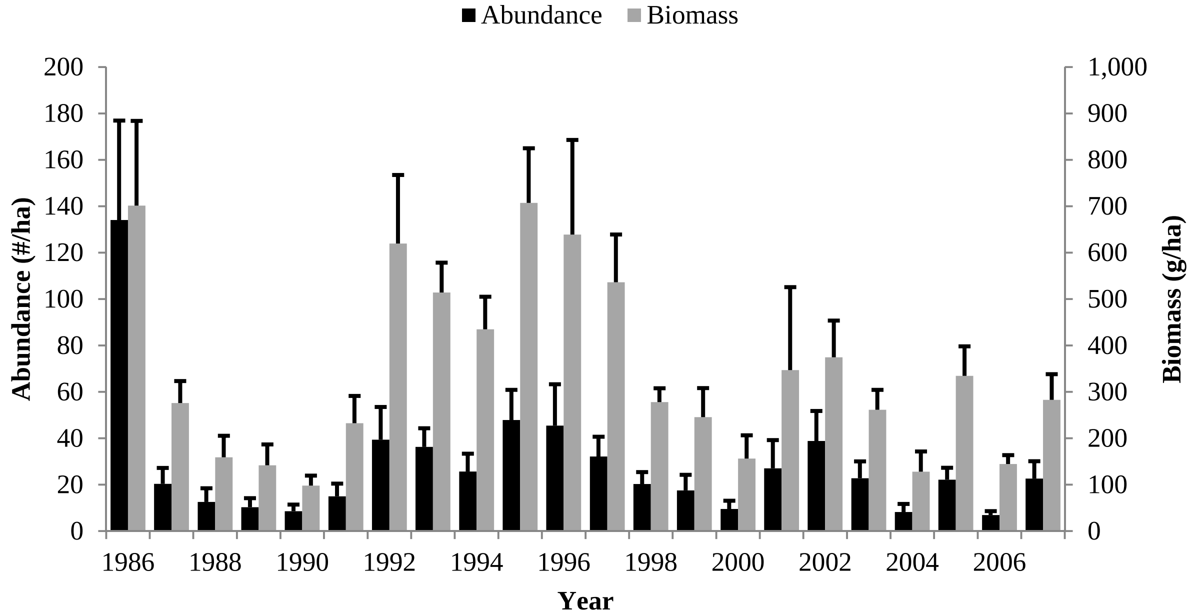

Figure 44. The mean (+SE) annual abundance and biomass of *Leiostomus xanthurus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 23. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	13.5 (382.9)	9.3 (240.4)	15.2 (267.2)	51.7 (322.3)	153.1 (987.4)
Vermilion-Cote Blanche Bays	1.1 (28.3)	2.2 (80.3)	26.7 (241.1)	12.2 (107.1)	18.1 (133.1)
Terrebonne-Timbalier Bays	11.8 (292.4)	71.0 (356.1)	95.2 (788.4)	157.9 (1115.6)	215.3 (1792.4)
Barataria Bay	9.8 (63.6)	1.2 (9.1)	6.6 (60.3)	45.1 (309.3)	50.3 (480.9)
Breton-Chandeleur Sounds	2.0 (20.6)	4.1 (62.3)	45.8 (386.6)	64.1 (533.7)	45.9 (602.1)
Lake Borgne	2.0 (52.0)	12.9 (298.4)	108.3 (3611.6)	9.7 (212.7)	23.2 (280.6)

	Jun	Jul	Aug	Sep	Oct
Lake Calcasieu	59.8 (487.5)	31.9 (388.7)	13.9 (223.4)	9.5 (243.4)	5.0 (149.9)
Vermilion-Cote Blanche Bays	23.7 (236.9)	19.3 (258.1)	15.0 (217.4)	9.2 (255.2)	9.3 (262.8)
Terrebonne-Timbalier Bays	75.5 (812.9)	52.7 (793.0)	29.0 (645.6)	8.6 (249.5)	14.8 (462.0)
Barataria Bay	9.6 (127.3)	5.7 (106.6)	7.1 (149.1)	1.5 (48.4)	1.1 (37.3)
Breton-Chandeleur Sounds	14.6 (207.8)	6.5 (127.6)	2.6 (72.2)	1.2 (34.2)	2.3 (76.5)
Lake Borgne	10.8 (130.8)	5.8 (115.0)	2.0 (59.9)	1.3 (21.1)	10.2 (127.4)

	Nov	Dec	Mean	SE
Lake Calcasieu	8.4 (199.7)	17.4 (488.0)	32.4 (365.1)	12.1 (64.8)
Vermilion-Cote Blanche Bays	10.7 (354.2)	8.2 (210.2)	13.0 (198.7)	2.3 (26.8)
Terrebonne-Timbalier Bays	15.3 (497.4)	9.9 (324.2)	63.1 (677.5)	19.0 (126.7)
Barataria Bay	1.1 (51.5)	1.6 (50.6)	11.7 (122.0)	5.0 (40.1)
Breton-Chandeleur Sounds	4.5 (133.8)	6.8 (218.8)	16.7 (206.4)	6.4 (56.9)
Lake Borgne	14.7 (538.6)	3.1 (141.9)	17.0 (476.7)	8.5 (288.2)

Table 24. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990	1991
Lake Calcasieu	164.6 (858.9)	48.2 (616.6)	26.3 (303.5)	11.0 (141.7)	11.3 (184.5)	12.9 (194.8)
Vermilion-Cote Blanche Bays	107.8 (819.0)	11.4 (284.4)	4.1 (66.8)	2.8 (88.0)	1.7 (38.4)	10.8 (255.9)
Terrebonne-Timbalier Bays	381.6 (1535.3)	43.9 (469.9)	26.2 (338.3)	3.7 (490.4)	10.3 (150.7)	24.4 (343.0)
Barataria Bay	13.2 (145.0)	9.1 (124.1)	13.3 (125.8)	7.5 (114.2)	3.2 (40.1)	10.5 (100.7)
Breton-Chandeleur Sounds	0.9 (25.3)	1.3 (14.6)	2.7 (41.1)	1.8 (19.8)	9.5 (82.0)	14.2 (222.6)
Lake Borgne	0.2 (5.7)	1.1 (42.8)	4.3 (52.0)	0.3 (11.3)	27.3 (141.0)	3.8 (62.1)
	1992	1993	1994	1995	1996	1997
Lake Calcasieu	34.2 (495.6)	33.6 (562.3)	24.7 (303.8)	11.9 (302.0)	42.8 (653.9)	16.9 (393.9)
Vermilion-Cote Blanche Bays	14.5 (270.1)	8.9 (203.5)	1.3 (34.2)	13.6 (170.5)	2.3 (52.2)	10.6 (137.0)
Terrebonne-Timbalier Bays	94.6 (1035.0)	75.9 (980.8)	42.9 (816.4)	148.2 (2189.8)	53.1 (1166.2)	83.2 (1253.8)
Barataria Bay	2.7 (23.2)	46.5 (476.2)	14.1 (153.1)	32.5 (204.5)	8.7 (98.3)	8.3 (81.7)
Breton-Chandeleur Sounds	24.2 (642.9)	13.8 (286.4)	25.4 (253.9)	6.1 (76.3)	106.0 (717.7)	25.5 (497.4)
Lake Borgne	32.5 (2190.1)	4.8 (200.3)	43.7 (1150.8)	14.5 (421.2)	41.5 (1272.2)	38.0 (1247.7)
	1998	1999	2000	2001	2002	2003
Lake Calcasieu	32.4 (312.1)	31.3 (398.1)	8.3 (182.5)	16.1 (144.0)	41.9 (426.3)	86.1 (669.3)
Vermilion-Cote Blanche Bays	5.2 (150.1)	3.7 (111.3)	2.3 (78.3)	3.3 (47.2)	25.4 (351.7)	16.3 (254.6)
Terrebonne-Timbalier Bays	36.9 (540.6)	34.2 (485.8)	20.2 (310.4)	29.3 (302.2)	87.2 (637.8)	33.6 (409.7)
Barataria Bay	14.0 (131.5)	16.1 (161.6)	3.8 (53.4)	11.7 (119.7)	6.9 (90.7)	4.4 (81.3)
Breton-Chandeleur Sounds	16.8 (162.7)	11.8 (147.0)	9.7 (140.8)	31.8 (486.5)	33.1 (408.3)	4.2 (59.5)
Lake Borgne	14.9 (577.3)	1.9 (37.1)	6.2 (61.6)	122.1 (2412.9)	0.9 (38.1)	0.2 (12.5)
	2004	2005	2006	2007	Mean	SE
Lake Calcasieu	14.1 (135.6)	23.5 (264.7)	4.9 (116.6)	30.2 (383.9)	33.1 (365.7)	7.3 (43.6)
Vermilion-Cote Blanche Bays	2.8 (52.0)	17.1 (374.2)	6.3 (224.9)	13.4 (307.6)	13.0 (198.7)	4.7 (37.4)
Terrebonne-Timbalier Bays	10.0 (167.3)	45.3 (524.7)	12.7 (207.3)	56.2 (548.7)	63.1 (677.5)	16.7 (107.5)
Barataria Bay	10.5 (134.6)	6.5 (82.7)	6.0 (83.5)	8.6 (61.2)	11.7 (122.1)	2.1 (19.1)
Breton-Chandeleur Sounds	8.8 (153.6)	8.2 (149.1)	4.3 (56.3)	6.5 (73.8)	16.7 (205.3)	4.7 (42.5)
Lake Borgne	1.1 (27.4)	8.4 (199.3)	1.5 (68.7)	4.6 (231.7)	17.0 (475.8)	5.9 (153.1)

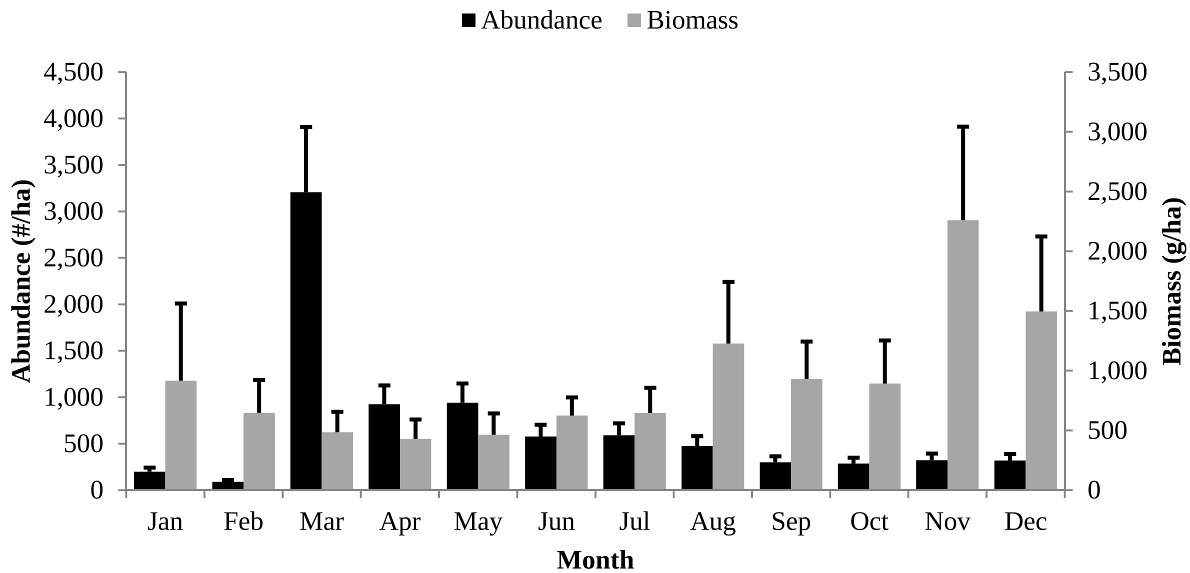

Figure 45. The monthly mean (+SE) abundance and biomass of *Leiostomus xanthurus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *L. xanthurus* length measurements were not recorded until 1985.

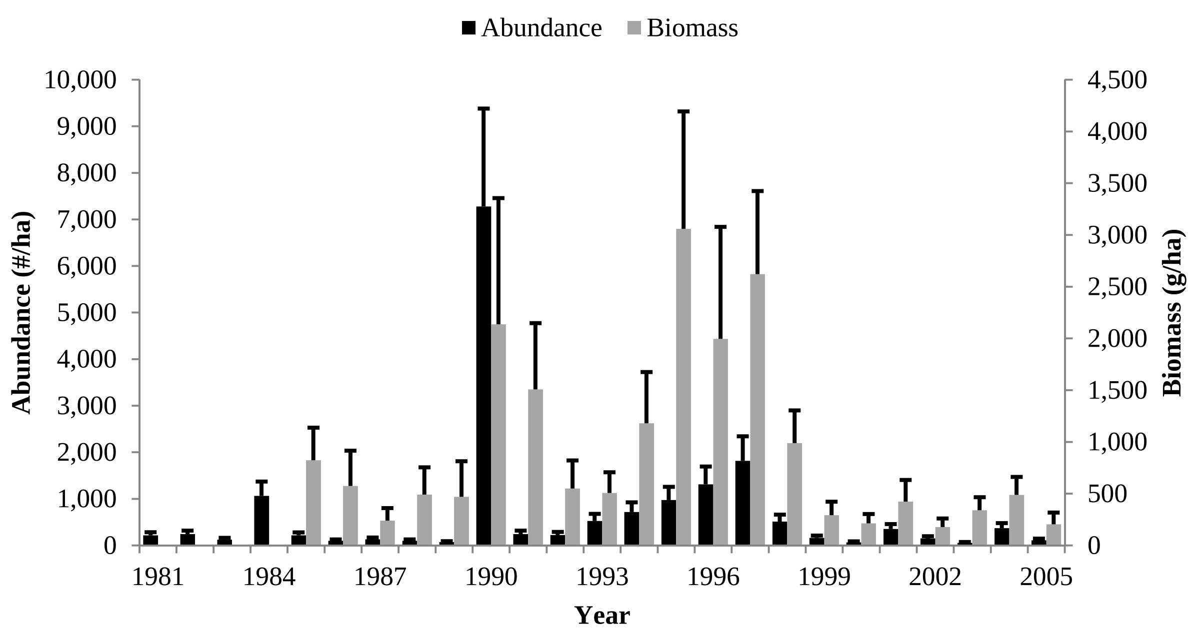

Figure 46. The mean (+SE) annual abundance and biomass of *Leiostomus xanthurus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *L. xanthurus* length measurements were not recorded until 1985.

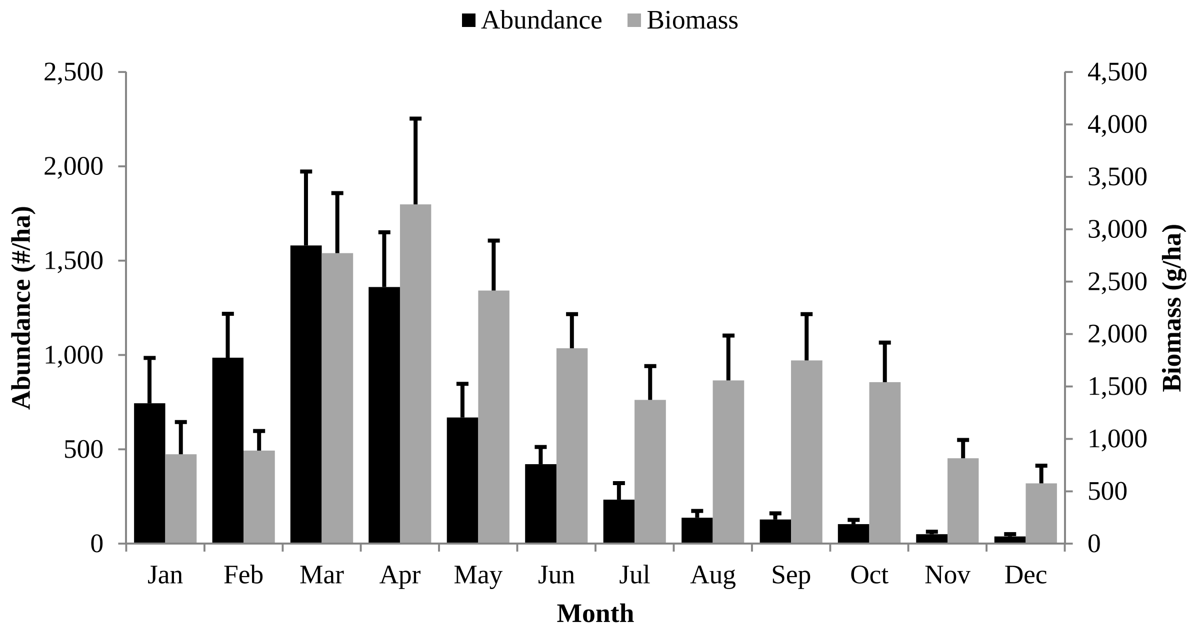

Figure 47. The monthly mean (+SE) abundance and biomass of *Leiostomus xanthurus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length measurements of *L. xanthurus* were not available for 1988.

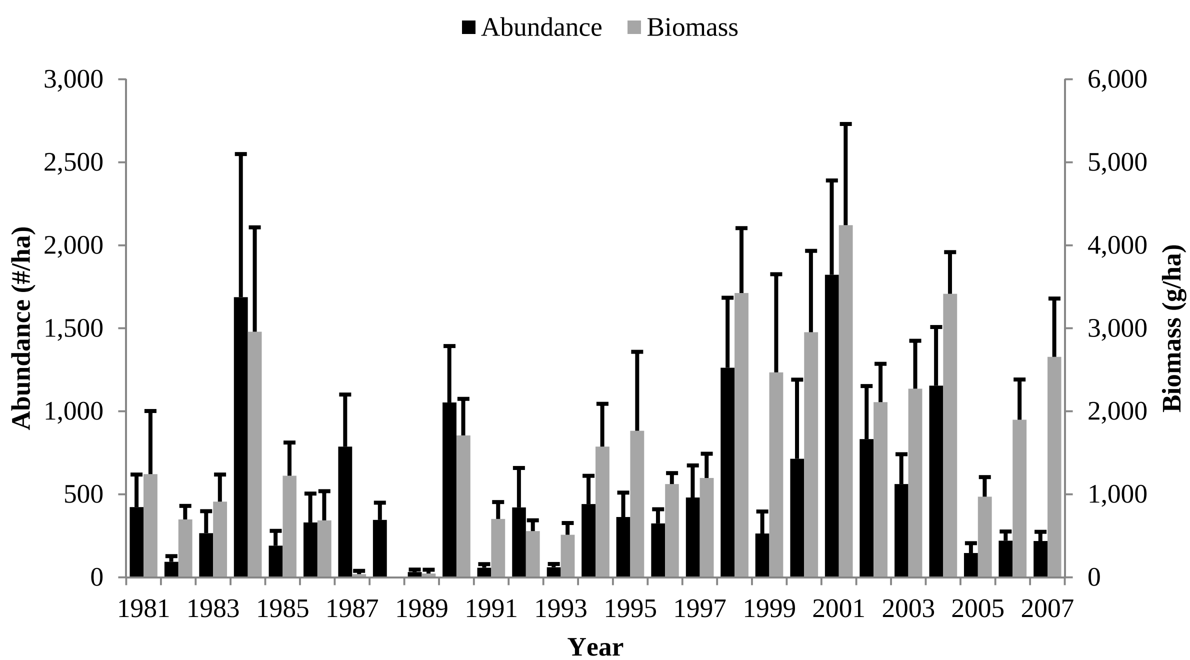

Figure 48. The mean (+SE) annual abundance and biomass of *Leiostomus xanthurus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements of *L. xanthurus* were not available for 1988.

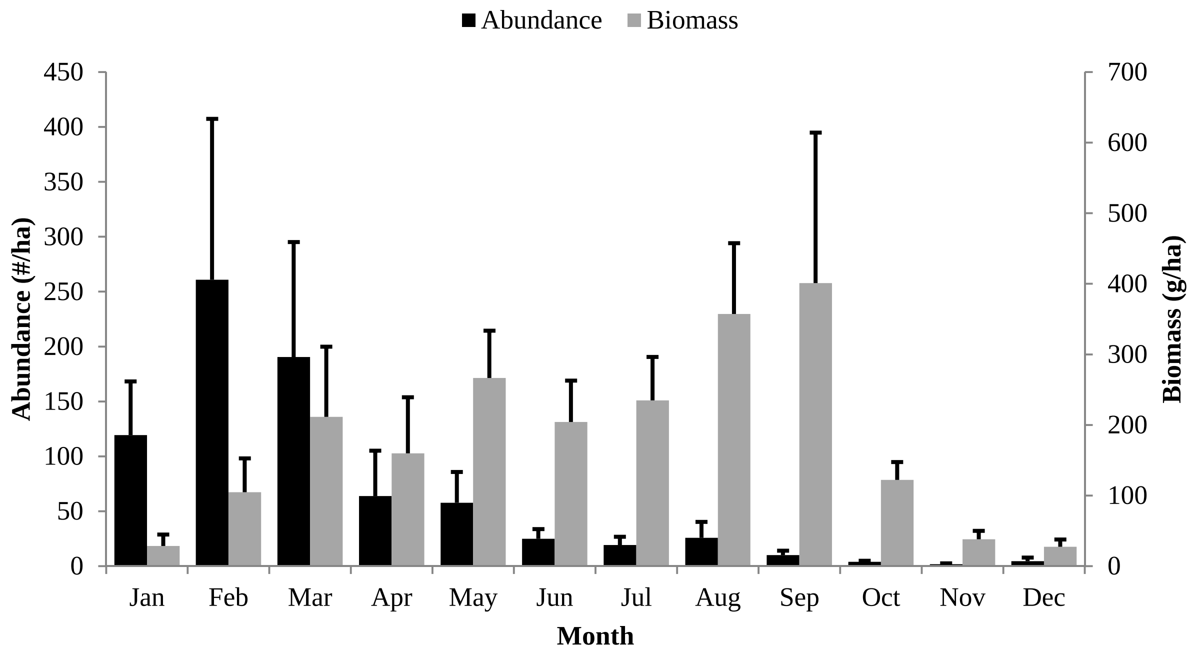

Figure 49. The monthly mean (+SE) abundance and biomass of *Leiostomus xanthurus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

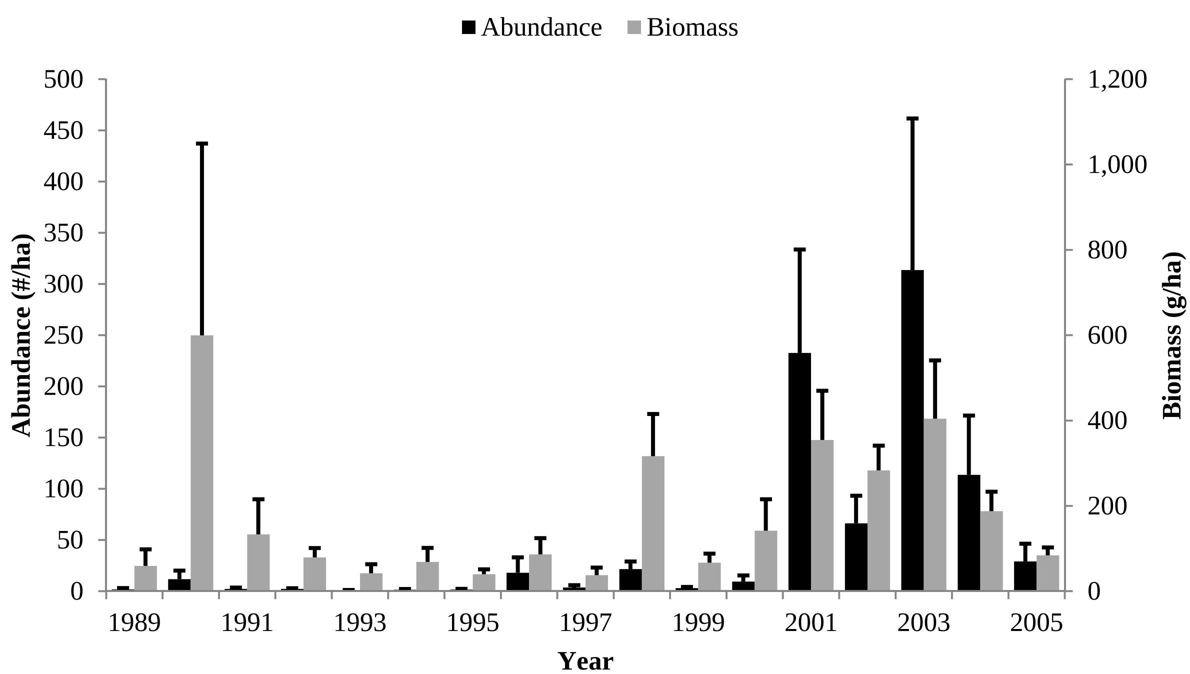

Figure 50. The mean (+SE) annual abundance and biomass of *Leiostomus xanthurus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 25. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	575.5 (1206.3)	439.7 (832.8)	1176.9 (1744.0)	1037.8 (2611.2)
E MS Sound (AL)	81.1 (108.7)	194.4 (401.1)	1187.0 (1841.4)	422.3 (1258.8)
Perdido Bay (AL)	2180.2 (1303.3)	5679.5 (1936.9)	3707.7 (7252.3)	4182.7 (11780.1)
Apalachicola Bay (FL)	254.3 (235.1)	466.9 (851.4)	573.2 (2032.9)	195.7 (1531.3)
Suwannee Sound (FL)	23.3 (25.3)	34.1 (22.1)	5.1 (202.3)	1.7 (50.6)
Cedar Key (FL)	1.9 (13.7)	3.4 (0.7)	0 (0)	1.1 (70.2)
Tampa Bay (FL)	0.5 (7.1)	1.2 (116.3)	1.9 (183.2)	1.7 (128.3)
Charlotte Harbor (FL)	0 (0)	95.6 (220.1)	1.2 (11.7)	0.3 (9.1)
	May	Jun	Jul	Aug
Mobile Bay (AL)	585.0 (2976.7)	282.2 (1741.7)	80.3 (970.1)	54.6 (1048.5)
E MS Sound (AL)	315.8 (1372.3)	85.2 (774.6)	31.0 (750.9)	8.9 (364.4)
Perdido Bay (AL)	1492.3 (4823.4)	1523.1 (4808.6)	1495.3 (6013.9)	652.3 (5463.3)
Apalachicola Bay (FL)	162.6 (1771.0)	46.9 (1034.3)	33.3 (1172.1)	44.6 (1729.1)
Suwannee Sound (FL)	21.3 (777.0)	44.2 (1728.2)	3.0 (263.1)	2.6 (174.0)
Cedar Key (FL)	14.0 (623.0)	0 (0)	3.8 (368.6)	1.6 (88.3)
Tampa Bay (FL)	4.8 (355.2)	5.1 (398.9)	1.4 (215.6)	3.0 (202.7)
Charlotte Harbor (FL)	2.8 (241.7)	0.9 (74.1)	1.9 (175.5)	1.3 (130.7)
	Sep	Oct	Nov	Dec
Mobile Bay (AL)	67.6 (1127.9)	47.7 (1205.2)	20.5 (551.2)	37.8 (676.4)
E MS Sound (AL)	4.2 (258.7)	3.1 (172.3)	1.8 (68.3)	3.6 (159.2)
Perdido Bay (AL)	418.9 (5135.7)	405.9 (4809.9)	204.1 (2774.4)	83.9 (878.5)
Apalachicola Bay (FL)	10.7 (483.0)	12.1 (675.0)	8.0 (559.1)	13.8 (147.9)
Suwannee Sound (FL)	14.6 (2006.9)	6.0 (642.5)	0.8 (45.3)	0.2 (8.7)
Cedar Key (FL)	0.3 (21.0)	3.6 (179.4)	5.6 (362.0)	2.8 (136.1)
Tampa Bay (FL)	8.6 (1386.7)	2.9 (267.0)	0.6 (37.3)	0.7 (61.8)
Charlotte Harbor (FL)	1.4 (153.9)	2.0 (238.2)	0.1 (4.5)	0 (0)
	Mean	SE		
Mobile Bay (AL)	367.1 (1391.0)	117.1 (216.9)		
E MS Sound (AL)	194.1 (627.6)	97.9 (168.1)		
Perdido Bay (AL)	1835.5 (4748.4)	518.0 (855.6)		
Apalachicola Bay (FL)	151.8 (1018.5)	55.4 (199.1)		
Suwannee Sound (FL)	13.1 (495.5)	4.2 (50.8)		
Cedar Key (FL)	3.2 (155.3)	1.1 (57.1)		
Tampa Bay (FL)	2.7 (280.0)	0.7 (106.4)		
Charlotte Harbor (FL)	9.0 (105.0)	7.9 (28.7)		

Table 26. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Leiostomus xanthurus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984
Mobile Bay (AL)	352.3 (2911.4)	105.8 (560.3)	107.2 (939.5)	1148.0 (2038.1)
E MS Sound (AL)	467.5 (637.4)	78.1 (866.8)	110.3 (480.6)	2462.3 (3061.3)
Perdido Bay (AL)		1.6 (293.1)	3487.2 (3981.6)	3547.9 (13180.9)
	1985	1986	1987	1988
Mobile Bay (AL)	78.8 (831.9)	173.9 (388.4)	212.9	52.4
E MS Sound (AL)	270.0 (1420.6)	249.8 (819.7)	23.6	23.4
Perdido Bay (AL)	666.0 (3100.7)	1662.0 (2584.3)	6279.4 (179.9)	1388.4
	1989	1990	1991	1992
Mobile Bay (AL)	10.6 (69.1)	187.9 (942.0)	10.9 (332.3)	437.3 (515.3)
E MS Sound (AL)	10.9	483.7 (702.4)	51.8 (644.4)	7.0 (212.4)
Perdido Bay (AL)	108.4	3104.6 (4248.2)	158.2 (1499.7)	784.0 (1009.8)
Tampa Bay (FL)	3.3 (273.8)	12.2 (1766.3)	2.7 (383.3)	3.1 (260.4)
Charlotte Harbor (FL)	0.0 (5.4)	2.2 (256.7)	0.2 (20.7)	0.7 (34.8)
	1993	1994	1995	1996
Mobile Bay (AL)	45.1 (486.3)	350.2 (2288.9)	153.4 (693.2)	350.2 (823.5)
E MS Sound (AL)	9.2 (348.5)	100.7 (578.7)	92.4 (1055.8)	41.6 (816.0)
Perdido Bay (AL)	184.4 (836.9)	1115.1 (1387.0)	1110.8 (5015.6)	564.3 (2115.8)
Suwannee Sound (FL)				10.5 (1551.9)
Cedar Key (FL)				2.1(265.5)
Tampa Bay (FL)	0.8 (81.3)	2.0 (2118.2)	1.9 (99.4)	2.0 (145.9)
Charlotte Harbor (FL)	0.8 (134.5)	1.2 (90.5)	2.7 (126.1)	32.2 (94.3)
	1997	1998	1999	2000
Mobile Bay (AL)	387.0 (1084.6)	1174.2 (2870.9)	197.1 (1230.8)	774.4 (1791.2)
E MS Sound (AL)	23.4 (1009.5)	202.7(470.9)	14.7 (117.5)	1.9 (102.2)
Perdido Bay (AL)	1177.1 (1660.8)	3550.8 (10437.1)	784.3 (9113.5)	1255.5 (9638.4)
Apalachicola Bay (FL)		23.2 (900.5)	3.0 (139.4)	9.5 (385.3)
Suwannee Sound (FL)	10.1 (59.7)			
Cedar Key (FL)	1.4 (41.4)			
Tampa Bay (FL)	3.0 (218.8)	6.0 (532.0)	0.2 (26.0)	0 (0)
Charlotte Harbor (FL)	0.1 (11.2)	2.5 (247.2)	0 (0)	0.3 (32.1)
	2001	2002	2003	2004
Mobile Bay (AL)	1665.2 (4867.4)	756.5 (1860.2)	420.4 (2148.9)	687.1 (2187.6)
E MS Sound (AL)	223.6 (442.6)	13.5 (113.7)	4.3 (95.6)	308.9 (406.7)
Perdido Bay (AL)	3832.6 (6941.9)	1901.7 (5153.9)	2172.6 (6322.9)	3935.3 (11937.5)
Apalachicola Bay (FL)	296.4 (457.6)	84.6 (337.9)	424.2 (458.8)	213.1 (307.7)
Suwannee Sound (FL)	8.6 (283.9)	21.0 (779.7)	22.2 (761.4)	9.7 (120.9)
Cedar Key (FL)	0.7 (39.9)	2.2 (106.1)	4.2 (283.0)	8.5 (328.7)
Tampa Bay (FL)	5.6 (348.2)	0 (0)	2.1 (167.4)	0 (0)
Charlotte Harbor (FL)	0 (0)	0.3 (17.7)	6.4 (865.7)	2.2 (184.6)

Table 26 (continued).

	2005	2006	2007	Mean
Mobile Bay (AL)	100.3 (836.5)	77.4 (1121.3)	121.3 (1511.8)	375.5 (1413.3)
E MS Sound (AL)	9.9 (162.6)	30.4 (263.1)	8.6 (122.8)	195.5 (623.0)
Perdido Bay (AL)	459.7 (2186.6)	903.1 (5981.6)	816.6 (9660.1)	1728.9 (4936.1)
Apalachicola Bay (FL)	104.3 (693.0)			144.8 (1026.0)
Suwannee Sound (FL)	5.4 (489.6)			12.5 (578.1)
Cedar Key (FL)	1.5 (83.9)			3.0 (164.1)
Tampa Bay (FL)	0.4 (31.1)			2.7 (267.8)
Charlotte Harbor (FL)	0.6 (41.1)			3.1 (127.2)
	SE			
Mobile Bay (AL)	86.1 (42.9)			
E MS Sound (AL)	98.6 (26.2)			
Perdido Bay (AL)	326.0 (163.4)			
Apalachicola Bay (FL)	54.1 (194.9)			
Suwannee Sound (FL)	2.4 (41.2)			
Cedar Key (FL)	1.0 (46.7)			
Tampa Bay (FL)	0.7 (100.7)			
Charlotte Harbor (FL)	1.9 (50.4)			

Farfantepenaeus aztecus

The most abundant invertebrate species across the Gulf States was the brown shrimp (*Farfantapenaeus aztecus*). The abundance pattern for this species was consistent across the states with peaks in the spring and summer and lows in the fall and winter (Figure 51). The abundance values in Mississippi were highest among the states with an overall mean (mean of 12 monthly means in Figure 51) of 110.0/ha, followed by Louisiana (94.0/ha), Alabama (40.6/ha), Texas (16.6/ha), and Florida (2.2/ha).

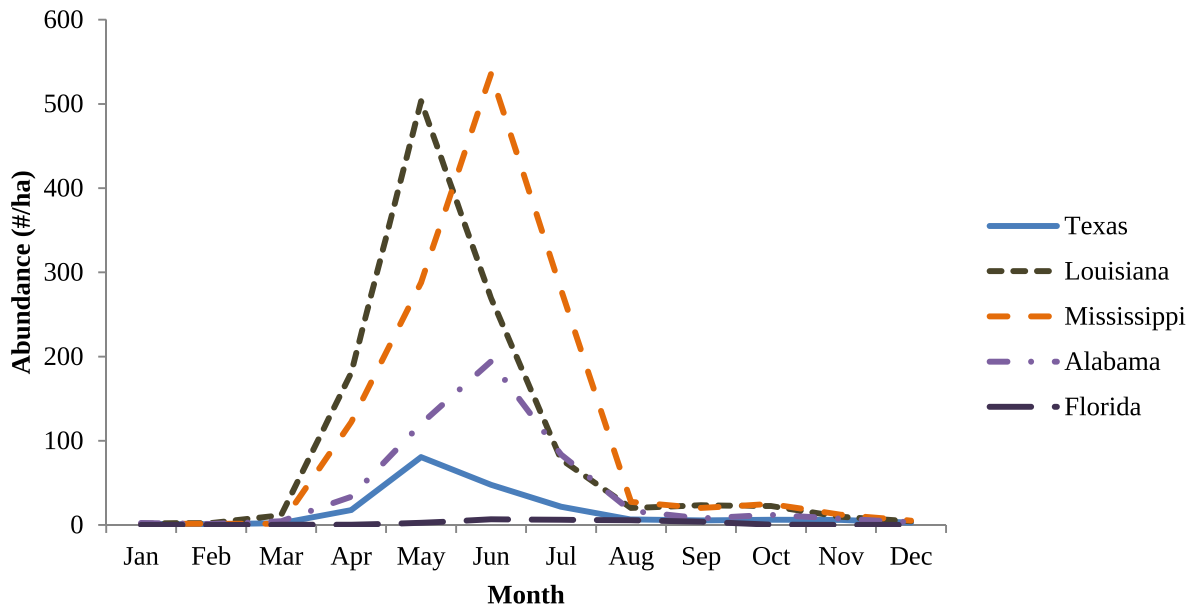

Figure 51. Monthly mean abundance of *Farfantepenaeus aztecus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

The length frequency distributions for brown shrimp in each state (Figure 52) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Brown shrimp ranged in size from 15 – 169 mm (mean=87.4, SD=18.4) in Texas, 2 – 177 mm (mean=66.7, SD=24.1) in Louisiana, 10 – 155 mm (mean=77.7, SD=22.7) in Mississippi, 8 – 196 mm (mean=74.6, SD=25.9) in Alabama, and 31 – 216 mm (mean=106.0, SD=33.9) in Florida.

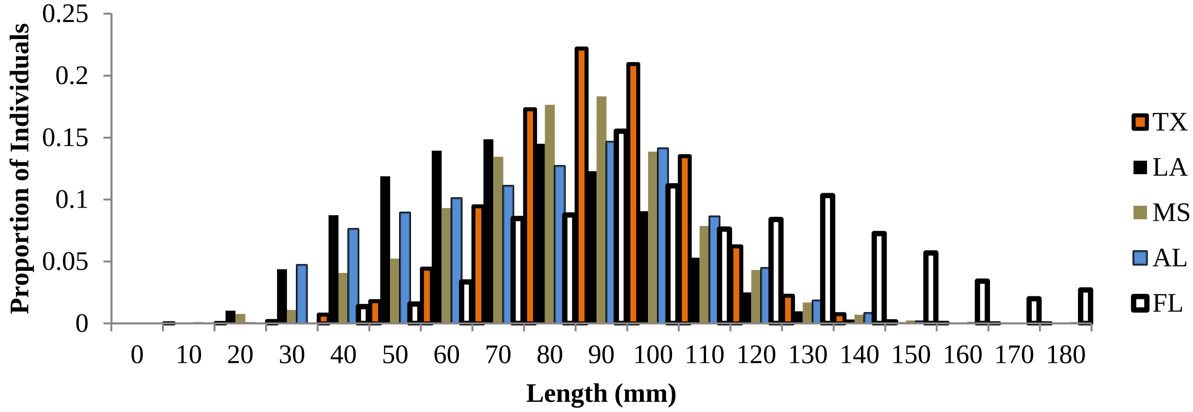

Figure 52. Length frequency of all brown shrimp (*Farfantepenaus aztecus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=19,159): 1982 – 2005; Louisiana (n=91,435): 1986 – 2007; Mississippi (n=7,639): 1985 – 2005; Alabama (n=11,464): 1981 – 2007; and Florida (n=1,405): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

Brown shrimp showed a seasonal pattern in abundance and biomass in Texas, with values peaking in May and declining to a low point in January (Figure 53). The mean annual abundance peaked in 1989 (24.1/ha) and biomass peaked in 1984 (192.2 g/ha), but annual variability was relatively low (Figure 54). Among the Texas estuaries, mean abundance and biomass were highest in Aransas Bay and San Antonio Bay (Tables 27 and 28).

Seasonal variability of brown shrimp in Louisiana showed mean abundance and biomass peaks in the spring (Figure 55). Mean annual abundance and biomass peaked in 1986 (159.2/ha and 539.0 g/ha, respectively) (Figure 56). All the major estuaries of Louisiana yielded high numbers of brown shrimp, but mean abundances and biomass from samples in Lake Calcasieu were higher than the other estuaries in Louisiana (Tables 29 and 30).

In Mississippi samples, the mean monthly abundance of brown shrimp peaked in the late spring/early summer, but biomass peaked in February (Figure 57). Both seasonal and annual variability was high. Mean annual abundance peaked in 1985 (325.4/ha) and mean annual biomass peaked in 2002 (1,148.6 g/ha) (Figure 58).

In Alabama samples, the monthly mean abundance and biomass of brown shrimp peaked in late spring/early summer, with relatively low values in the fall and winter months (Figure 59). Mean annual abundance peaked in 1997 (83.5/ha) and mean annual biomass peaked in 2007 (338.6 g/ha) (Figure 60). Length data were not available for the years 1986 – 1988 and 1990 –

1999. Mean abundance and biomass were highest in Mobile Bay and East Mississippi Sound (Table 31 and 32).

In Florida, brown shrimp were only reported from Apalachicola Bay, and sampling did not begin there until 1998. Seasonally, the mean abundance and biomass of brown shrimp had an extended peak from May to September (Figure 61). Mean annual abundance and biomass peaked in 1998 (25.8/ha and 292.4 g/ha, respectively) (Figure 62).

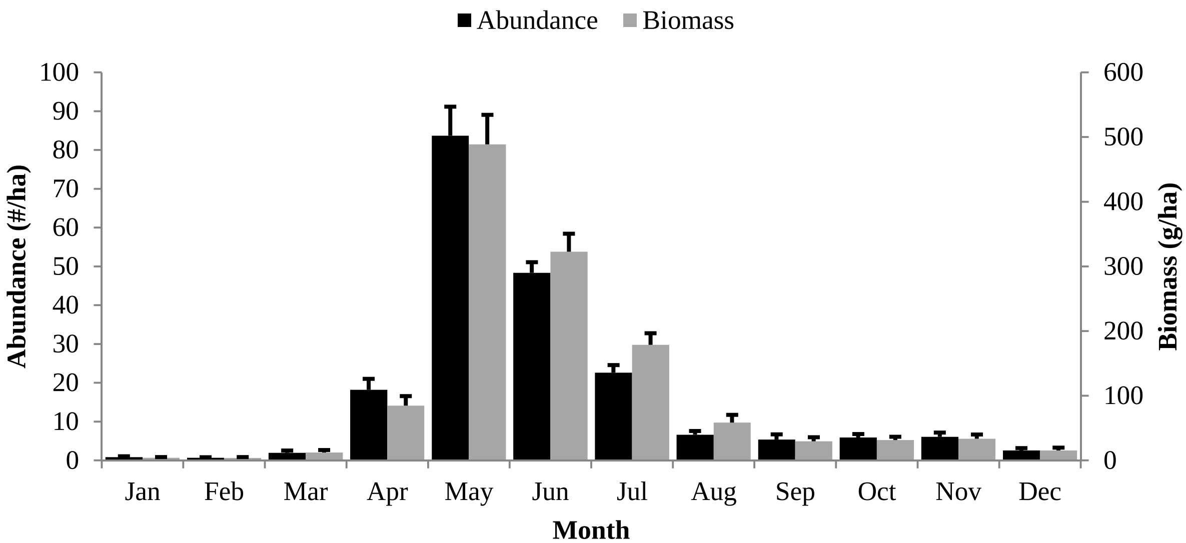

Figure 53. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus aztecus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

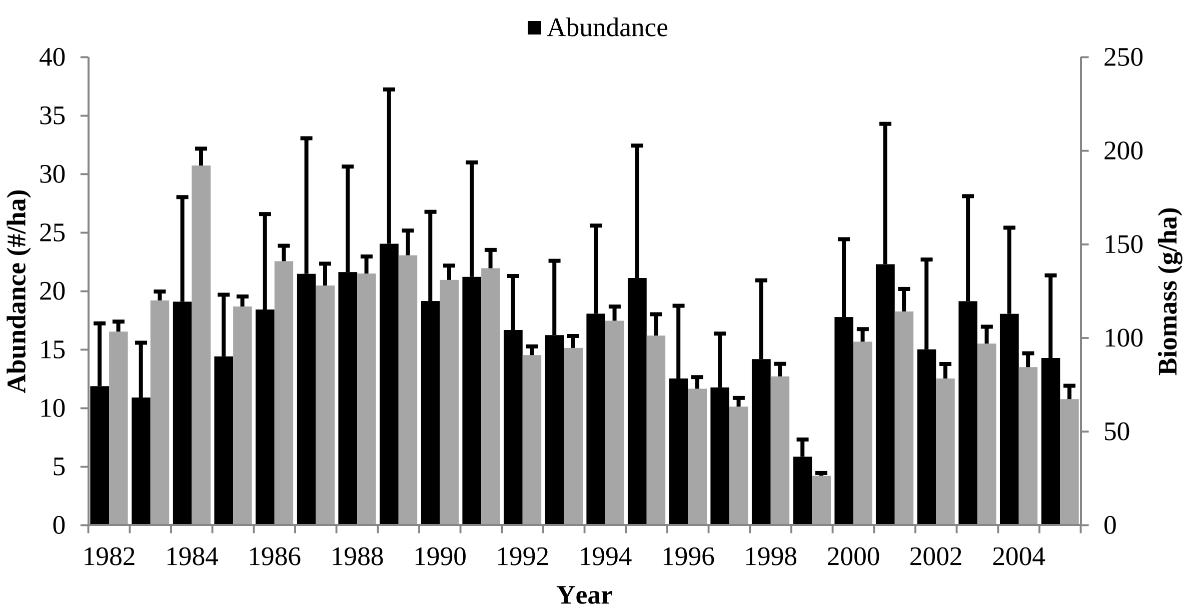

Figure 54. The mean (+SE) annual abundance and biomass of *Farfantepenaeus aztecus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 27. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	0.6 (2.1)	0.7 (3.6)	1.7 (10.7)	22.2 (60.0)	24.3 (46.2)
Upper Laguna Madre	1.2 (9.7)	1.2 (10.8)	4.0 (37.3)	7.6 (66.4)	27.8 (212.0)
Corpus Christi Bay	0.9 (6.6)	1.1 (8.3)	1.6 (11.6)	12.1 (80.9)	61.6 (417.6)
Aransas Bay	1.6 (7.0)	0.8 (3.4)	3.2 (15.8)	36.2 (155.7)	170.7 (956.2)
San Antonio Bay	1.6 (5.3)	1.2 (4.5)	3.5 (20.8)	42.9 (179.0)	191.7 (1083.9)
Matagorda Bay	0.6 (2.7)	0.4 (3.6)	0.9 (6.4)	9.4 (58.3)	62.8 (419.4)
East Matagorda Bay	0.1 (0.2)	0.1 (0.2)	2.6 (8.0)	8.2 (29.9)	58.8 (309.9)
Galveston Bay	0.2 (0.7)	0.3 (1.4)	0.7 (5.5)	6.4 (34.2)	41.1 (226.3)
Sabine Lake	0.2 (0.4)	0.0 (0.2)	0.1 (0.4)	4.0 (19.3)	14.7 (68.7)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Lower Laguna Madre	5.3 (22.5)	3.5 (10.1)	1.7 (3.3)	3.7 (7.3)	1.9 (5.8)
Upper Laguna Madre	20.3 (223.6)	8.0 (85.1)	4.3 (41.1)	4.5 (36.3)	4.1 (28.7)
Corpus Christi Bay	34.6 (249.5)	17.6 (129.8)	6.2 (64.6)	1.8 (14.0)	2.7 (16.8)
Aransas Bay	90.0 (559.4)	41.9 (317.5)	12.0 (100.9)	9.6 (55.9)	17.2 (91.4)
San Antonio Bay	74.6 (470.3)	37.8 (300.7)	11.1 (94.2)	10.6 (52.7)	8.3 (43.6)
Matagorda Bay	59.5 (415.6)	20.9 (176.3)	4.1 (38.1)	4.2 (25.3)	4.6 (26.9)
East Matagorda Bay	20.4 (98.5)	12.4 (90.4)	3.1 (24.2)	3.3 (9.4)	2.1 (5.1)
Galveston Bay	42.8 (277.6)	24.4 (199.3)	6.2 (54.9)	5.3 (27.2)	2.8 (13.5)
Sabine Lake	25.8 (131.3)	6.9 (31.5)	3.8 (22.8)	1.3 (5.7)	3.1 (10.2)
	Nov	**Dec**	**Mean**	**SE**	
Lower Laguna Madre	2.9 (12.1)	1.5 (7.6)	5.9 (15.9)	2.4 (5.3)	
Upper Laguna Madre	3.8 (24.5)	4.1 (28.3)	7.6 (67.0)	2.3 (21.2)	
Corpus Christi Bay	4.6 (32.3)	2.8 (22.2)	12.3 (87.8)	5.3 (36.3)	
Aransas Bay	15.1 (81.9)	6.2 (36.2)	33.7 (198.4)	14.4 (83.0)	
San Antonio Bay	13.8 (75.7)	4.1 (20.6)	33.4 (195.9)	15.7 (90.4)	
Matagorda Bay	1.8 (9.2)	0.7 (3.3)	14.2 (98.8)	6.6 (45.1)	
East Matagorda Bay	1.2 (3.5)	0.5 (1.4)	9.4 (48.4)	4.8 (25.7)	
Galveston Bay	2.2 (10.2)	0.7 (3.1)	11.1 (71.2)	4.6 (29.2)	
Sabine Lake	2.0 (4.8)	0.4 (1.0)	5.2 (24.7)	2.2 (11.2)	

Table 28. The annual mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	2.8 (9.2)	4.3 (17.1)	2.9 (18.9)	4.9 (18.6)	6.9 (16.9)	2.2 (7.4)	1.4 (5.4)	4.3 (10.1)	12.4 (55.1)
Upper Laguna Madre	17.5 (114.8)	3.4 (23.1)	11.0 (85.7)	7.1 (55.7)	3.4 (37.6)	3.5 (30.2)	2.6 (18.0)	2.5 (17.7)	5.8 (40.0)
Corpus Christi Bay	18.5 (173.7)	3.8 (45.6)	23.0 (311.0)	10.8 (122.3)	19.5 (144.4)	30.7 (217.9)	7.8 (47.7)	7.8 (45.4)	12.9 (83.0)
Aransas Bay	25.0 (170.2)	26.3 (260.5)	49.0 (367.5)	31.2 (228.3)	51.9 (401.4)	47.3 (276.2)	64.8 (363.7)	49.1 (264.4)	36.5 (249.2)
San Antonio Bay	7.7 (102.1)	14.1 (171.6)	26.5 (298.9)	12.4 (117.4)	32.1 (255.1)	43.5 (232.6)	57.9 (376.4)	72.9 (463.6)	48.8 (322.4)
Matagorda Bay	11.4 (120.1)	11.8 (152.2)	3.0 (41.0)	11.1 (99.2)	13.3 (109.5)	22.1 (131.2)	14.8 (127.8)	19.2 (120.4)	12.1 (92.5)
East Matagorda Bay						3.4 (14.2)	4.6 (29.5)	22.1 (172.9)	18.8 (153.7)
Galveston Bay	10.6 (104.3)	5.7 (70.6)	6.1 (82.4)	15.1 (97.1)	6.8 (48.4)	11.4 (64.7)	11.2 (59.6)	13.4 (67.5)	5.1 (42.2)
Sabine Lake					0.2 (1.5)	2.0 (13.6)	1.3 (7.1)	3.6 (20.0)	0.6 (6.8)
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	3.7 (18.0)	3.4 (12.7)	2.2 (6.3)	25.1 (43.8)	6.5 (20.3)	3.4 (18.9)	5.8 (18.1)	4.1 (16.1)	0.7 (2.7)
Upper Laguna Madre	9.1 (70.0)	18.5 (210.7)	5.8 (55.1)	8.6 (80.5)	7.0 (48.6)	6.0 (30.5)	11.2 (112.8)	11.2 (113.3)	7.3 (54.8)
Corpus Christi Bay	13.4 (90.1)	14.1 (94.3)	10.4 (58.1)	4.9 (29.7)	10.5 (66.5)	9.1 (64.1)	7.4 (48.2)	24.5 (136.7)	2.7 (14.0)
Aransas Bay	74.1 (478.3)	30.0 (134.0)	44.6 (261.9)	17.2 (91.7)	50.3 (259.0)	32.4 (149.6)	33.3 (144.2)	15.4 (70.9)	10.0 (37.4)
San Antonio Bay	24.1 (147.4)	30.4 (144.1)	20.9 (104.9)	47.4 (279.6)	47.0 (183.0)	16.9 (108.0)	10.8 (51.4)	15.4 (85.5)	6.5 (25.9)
Matagorda Bay	10.0 (55.7)	10.8 (51.1)	20.0 (139.4)	23.9 (174.0)	25.3 (130.5)	10.7 (92.4)	13.8 (92.7)	8.0 (55.3)	7.3 (37.7)
East Matagorda Bay	29.2 (219.7)	4.2 (27.8)	6.4 (21.1)	1.6 (4.9)	4.2 (10.4)	11.5 (26.4)	2.1 (4.6)	7.4 (18.5)	5.3 (15.1)
Galveston Bay	5.9 (33.6)	17.7 (83.6)	8.5 (48.2)	13.4 (114.7)	5.6 (29.0)	6.4 (46.1)	6.2 (41.1)	12.9 (76.1)	5.9 (28.3)
Sabine Lake	0.5 (3.4)	1.5 (7.3)	4.1 (18.1)	4.1 (20.7)	0.6 (3.6)	3.9 (24.6)	3.4 (16.3)	23.6 (116.1)	3.6 (11.1)
	2000	2001	2002	2003	2004	2005	Mean	SE	
Lower Laguna Madre	0.4 (1.7)	34.5 (33.1)	0.5 (1.5)	1.6 (5.7)	0.6 (2.1)	4.8 (19.9)	5.8 (15.8)	1.6 (2.7)	
Upper Laguna Madre	7.8 (54.7)	3.9 (17.0)	5.0 (42.1)	13.6 (181.9)	8.6 (89.3)	6.3 (51.5)	7.8 (68.2)	0.9 (10.1)	
Corpus Christi Bay	4.1 (20.4)	10.4 (55.8)	29.1 (161.3)	2.9 (16.1)	8.6 (49.5)	13.0 (61.5)	12.5 (89.9)	1.6 (14.5)	
Aransas Bay	22.1 (97.0)	42.7 (225.5)	17.6 (80.2)	10.3 (46.9)	11.9 (42.3)	15.8 (62.0)	33.7 (198.4)	3.6 (25.4)	
San Antonio Bay	22.4 (136.5)	27.8 (154.1)	26.9 (132.1)	83.5 (358.6)	66.0 (270.2)	40.8 (181.7)	33.4 (195.9)	4.3 (22.6)	
Matagorda Bay	21.9 (150.7)	14.1 (113.2)	10.5 (61.8)	11.3 (69.2)	20.8 (120.3)	15.5 (76.2)	14.3 (100.2)	1.2 (7.8)	
East Matagorda Bay	17.4 (50.8)	29.4 (110.8)	6.0 (23.0)	1.8 (6.1)	1.0 (3.5)	3.1 (9.4)	9.4 (48.5)	2.1 (14.9)	
Galveston Bay	27.3 (164.9)	23.6 (147.5)	13.9 (73.3)	14.8 (83.2)	12.0 (56.5)	6.6 (44.7)	11.1 (71.2)	1.2 (7.2)	
Sabine Lake	27.9 (127.2)	7.2 (45.4)	3.2 (14.1)	5.5 (16.4)	4.2 (9.9)	2.7 (10.5)	5.2 (24.7)	1.6 (7.7)	

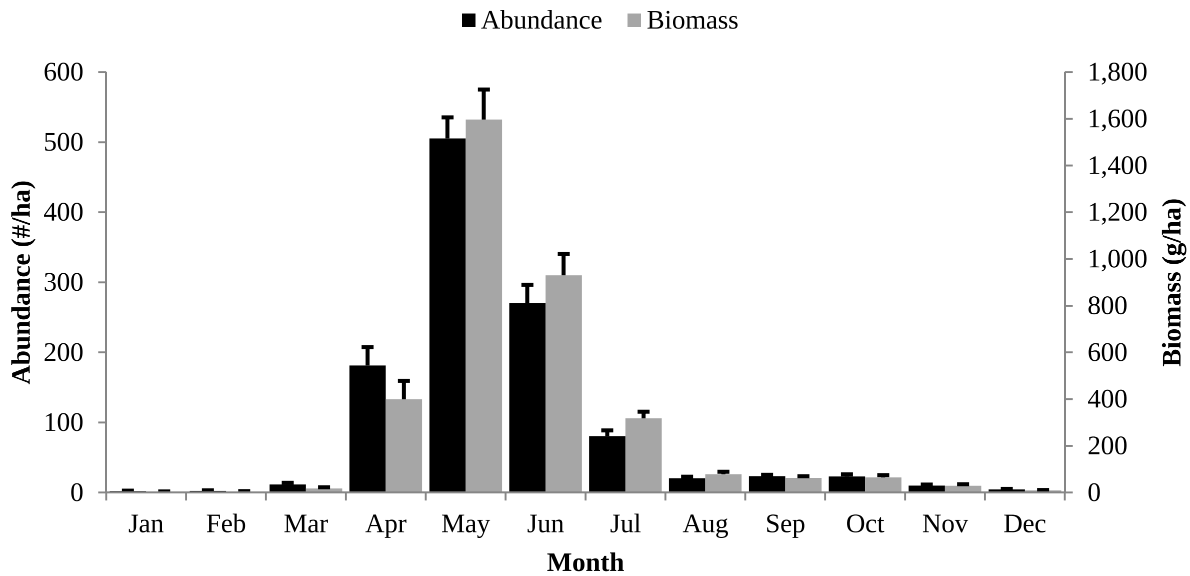

Figure 55. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus aztecus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

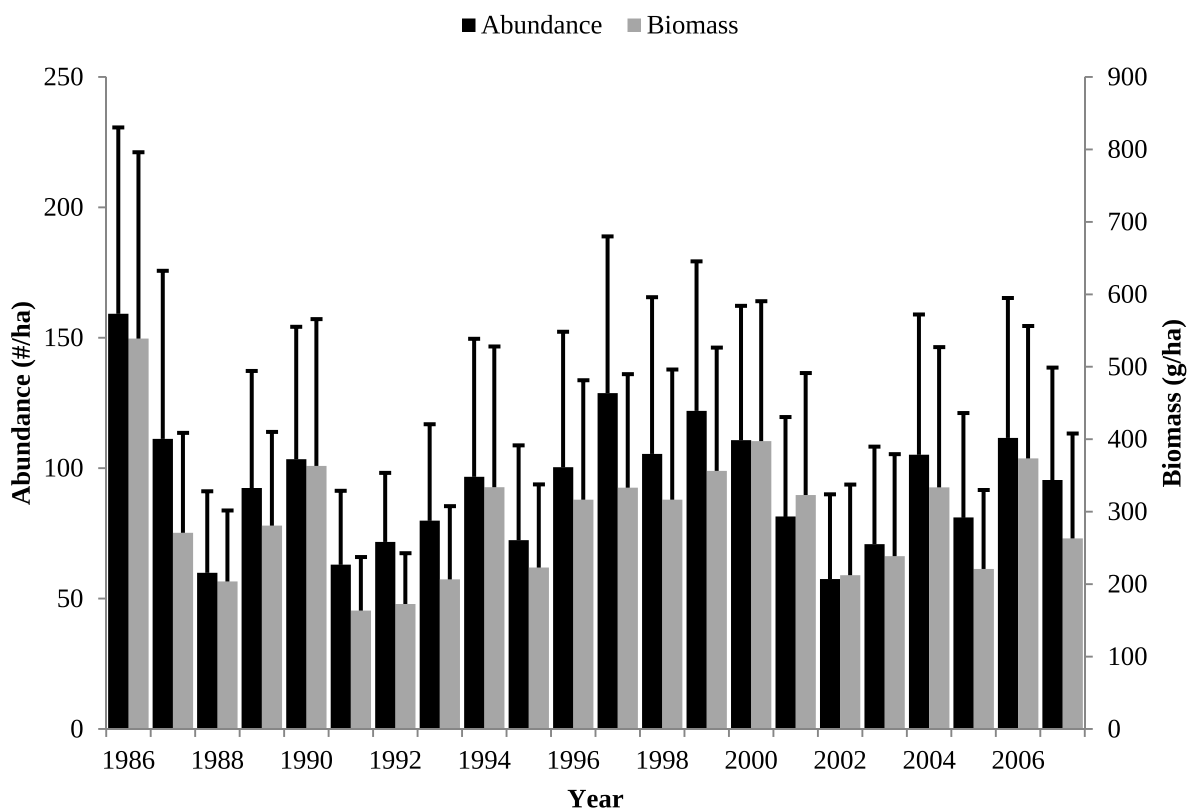

Figure 56. The mean (+SE) annual abundance and biomass of *Farfantepenaeus aztecus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 29. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	2.0 (2.1)	0.8 (1.0)	20.1 (6.0)	421.4 (347.0)
Vermilion-Cote Blanche Bays	1.9 (1.7)	0.5 (0.9)	2.9 (4.7)	54.3 (59.7)
Terrebonne-Timbalier Bays	3.8 (6.4)	5.5 (11.9)	25.1 (49.0)	296.8 (857.8)
Barataria Bay	1.8 (4.0)	2.6 (5.7)	6.1 (14.1)	188.6 (607.6)
Breton-Chandeleur Sounds	0.1 (0.4)	0.2 (0.4)	5.4 (7.4)	80.6 (179.4)
Lake Borgne	0.5 (1.5)	0.2 (0.1)	1.1 (1.8)	64.1 (101.6)
	May	Jun	Jul	Aug
Lake Calcasieu	1073.9 (2142.0)	657.9 (2087.8)	110.0 (343.1)	12.1 (32.4)
Vermilion-Cote Blanche Bays	279.2 (496.7)	354.7 (923.7)	168.0 (500.7)	51.3 (141.8)
Terrebonne-Timbalier Bays	530.7 (1953.8)	233.1 (874.5)	61.2 (282.2)	13.9 (54.4)
Barataria Bay	490.9 (1956.1)	95.9 (404.8)	32.8 (213.5)	4.5 (24.7)
Breton-Chandeleur Sounds	387.2 (1646.5)	163.5 (783.0)	37.0 (224.9)	12.2 (82.5)
Lake Borgne	461.1 (1333.8)	173.4 (700.9)	41.8 (258.8)	16.6 (126.2)
	Sep	Oct	Nov	Dec
Lake Calcasieu	26.4 (52.9)	26.4 (40.2)	11.4 (14.9)	7.6 (11.8)
Vermilion-Cote Blanche Bays	50.9 (101.1)	44.7 (87.0)	16.2 (27.2)	3.8 (5.9)
Terrebonne-Timbalier Bays	16.3 (49.0)	12.2 (36.3)	8.7 (23.1)	6.1 (10.9)
Barataria Bay	8.8 (34.1)	15.3 (70.8)	11.2 (49.6)	6.1 (19.1)
Breton-Chandeleur Sounds	12.1 (53.7)	19.9 (81.5)	5.2 (16.5)	1.5 (4.0)
Lake Borgne	14.9 (75.0)	15.9 (68.4)	6.7 (21.9)	1.9 (4.9)
	Mean	SE		
Lake Calcasieu	197.5 (423.4)	99.6 (230.9)		
Vermilion-Cote Blanche Bays	85.7 (195.9)	34.2 (84.0)		
Terrebonne-Timbalier Bays	101.2 (350.8)	48.2 (172.6)		
Barataria Bay	74.5 (283.7)	42.2 (161.6)		
Breton-Chandeleur Sounds	60.4 (256.7)	32.7 (141.2)		
Lake Borgne	66.5 (224.6)	38.6 (115.8)		

Table 30. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990	1991	1992
Lake Calcasieu	428.7 (1042.1)	459.6 (903.0)	159.8 (399.6)	259.1 (473.9)	225.4 (110.4)	107.7 (297.2)	228.3 (273.6)
Vermilion-Cote Blanche Bays	144.2 (428.8)	104.0 (180.7)	67.2 (254.5)	68.2 (160.1)	67.8 (182.4)	22.3 (41.3)	111.1 (284.8)
Terrebonne-Timbalier Bays	108.5 (453.8)	67.0 (221.6)	77.3 (253.0)	148.8 (577.8)	135.7 (475.4)	77.0 (234.8)	49.4 (186.7)
Barataria Bay	131.0 (649.2)	48.4 (208.5)	23.0 (95.3)	51.6 (180.4)	104.2 (473.3)	74.6 (207.8)	19.8 (73.4)
Breton-Chandeleur Sounds	42.8 (212.7)	38.0 (136.5)	32.7 (130.7)	36.8 (161.6)	56.6 (325.2)	43.9 (179.4)	19.9 (43.9)
Lake Borgne	33.1 (122.3)	49.7 (140.2)	38.4 (175.4)	64.8 (219.7)	58.5 (228.8)	89.1 (185.0)	38.5 (121.4)
	1993	1994	1995	1996	1997	1998	1999
Lake Calcasieu	136.1 (433.2)	180.5 (229.5)	91.4 (1117.2)	322.1 (898.4)	457.9 (690.5)	287.5 (130.1)	67.1 (124.7)
Vermilion-Cote Blanche Bays	81.1 (191.0)	43.4 (102.4)	44.9 (92.9)	140.5 (307.3)	38.1 (90.5)	75.7 (162.3)	113.5 (230.2)
Terrebonne-Timbalier Bays	108.3 (260.7)	147.1 (606.1)	105.7 (241.5)	87.6 (317.7)	161.0 (433.7)	78.3 (277.4)	199.5 (633.7)
Barataria Bay	30.4 (105.2)	99.6 (356.9)	87.7 (302.7)	51.4 (156.3)	55.4 (113.3)	63.0 (220.5)	80.2 (269.4)
Breton-Chandeleur Sounds	41.0 (153.0)	13.8 (52.5)	32.2 (116.5)	17.7 (87.4)	73.0 (292.1)	106.3 (412.3)	105.6 (371.2)
Lake Borgne	87.7 (259.7)	49.5 (130.3)	77.8 (269.7)	46.6 (144.3)	122.1 (446.3)	96.3 (302.9)	101.6 (282.8)
	2000	2001	2002	2003	2004	2005	2006
Lake Calcasieu	44.7 (124.7)	34.9 (112.2)	35.2 (107.9)	75.0 (110.9)	208.6 (193.0)	91.4 (175.2)	223.5 (625.7)
Vermilion-Cote Blanche Bays	125.4 (268.8)	67.2 (157.1)	36.3 (58.0)	64.9 (115.7)	75.2 (109.3)	155.0 (329.1)	118.7 (361.8)
Terrebonne-Timbalier Bays	179.9 (677.0)	90.6 (363.4)	49.4 (204.4)	54.2 (143.2)	65.9 (219.0)	64.7 (204.6)	98.3 (367.3)
Barataria Bay	40.3 (212.6)	91.9 (483.2)	60.4 (227.5)	103.5 (452.2)	137.0 (514.1)	57.3 (229.6)	106.9 (368.6)
Breton-Chandeleur Sounds	127.0 (567.6)	84.2 (359.8)	83.8 (373.0)	68.6 (351.0)	127.8 (638.8)	61.6 (219.7)	88.8 (349.7)
Lake Borgne	52.3 (204.4)	1008.2 (468.9)	94.7 (337.2)	74.5 (277.6)	72.2 (223.0)	36.7 (122.7)	41.7 (125.5)
	2007	Mean	SE				
Lake Calcasieu	314.4 (527.0)	201.8 (432.7)	28.6 (69.3)				
Vermilion-Cote Blanche Bays	121.1 (201.5)	85.7 (195.9)	8.2 (21.9)				
Terrebonne-Timbalier Bays	71.1 (264.5)	101.2 (350.8)	9.2 (32.8)				
Barataria Bay	70.7 (357.3)	72.2 (284.4)	7.0 (33.0)				
Breton-Chandeleur Sounds	43.3 (176.9)	61.2 (259.7)	7.3 (33.8)				
Lake Borgne	49.0 (200.4)	67.4 (226.7)	5.6 (21.1)				

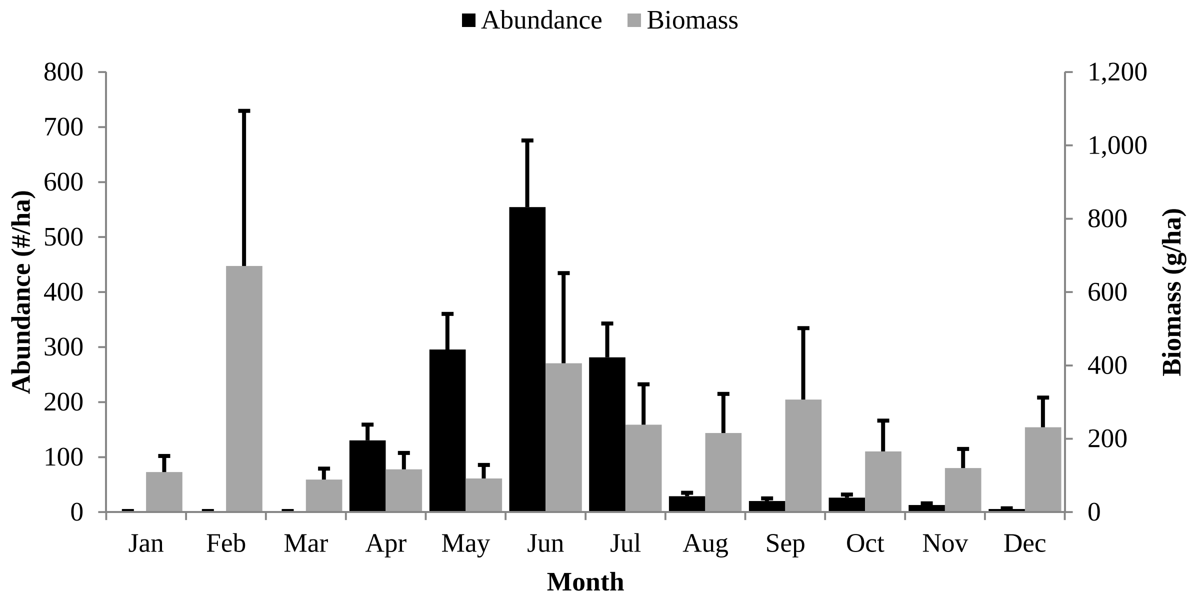

Figure 57. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus aztecus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data are only available for the years after 1984 as *F. aztecus* length measurements were not recorded until 1985.

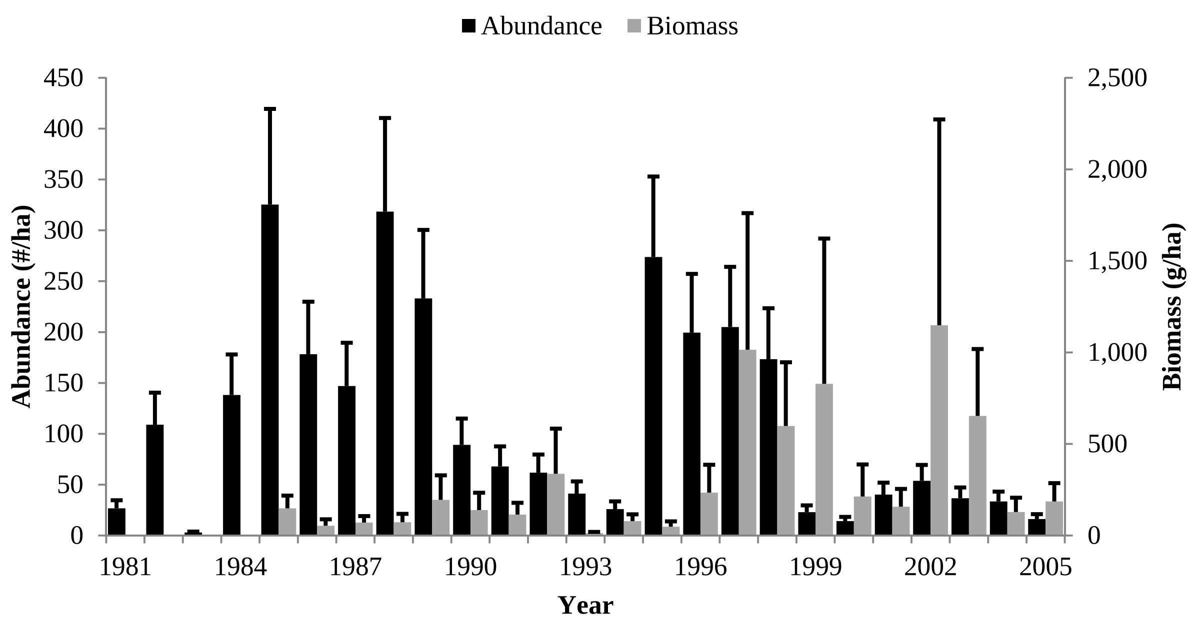

Figure 58. The mean (+SE) annual abundance and biomass of *Farfantepenaeus aztecus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data are only available for the years after 1984 as *F. aztecus* length measurements were not recorded until 1985.

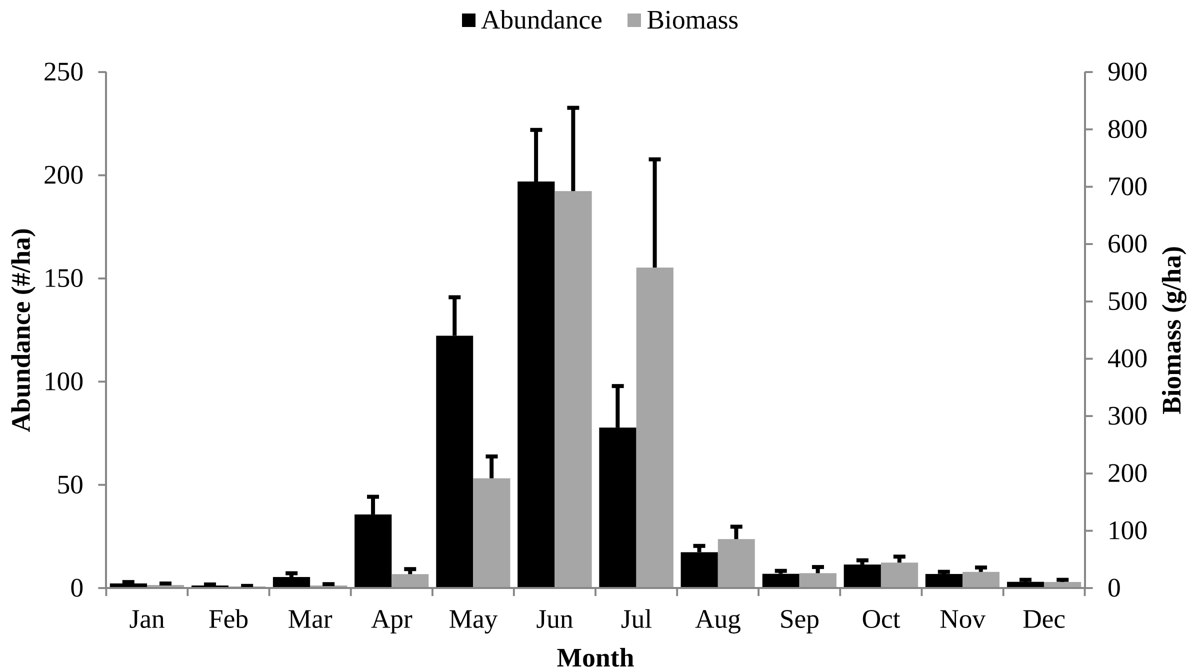

Figure 59. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus aztecus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length data were not available for the years 1986 – 1988 and 1990 – 1999.

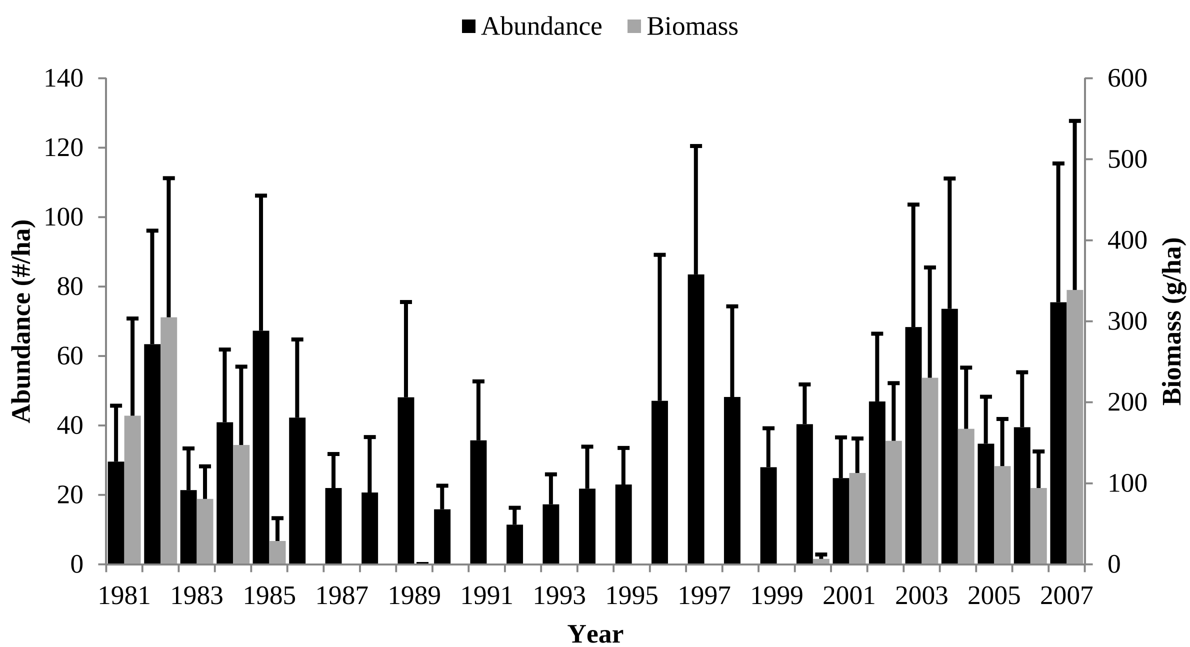

Figure 60. The mean (+SE) annual abundance and biomass of *Farfantepenaeus aztecus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length data were not available for the years 1986 – 1988 and 1990 – 1999.

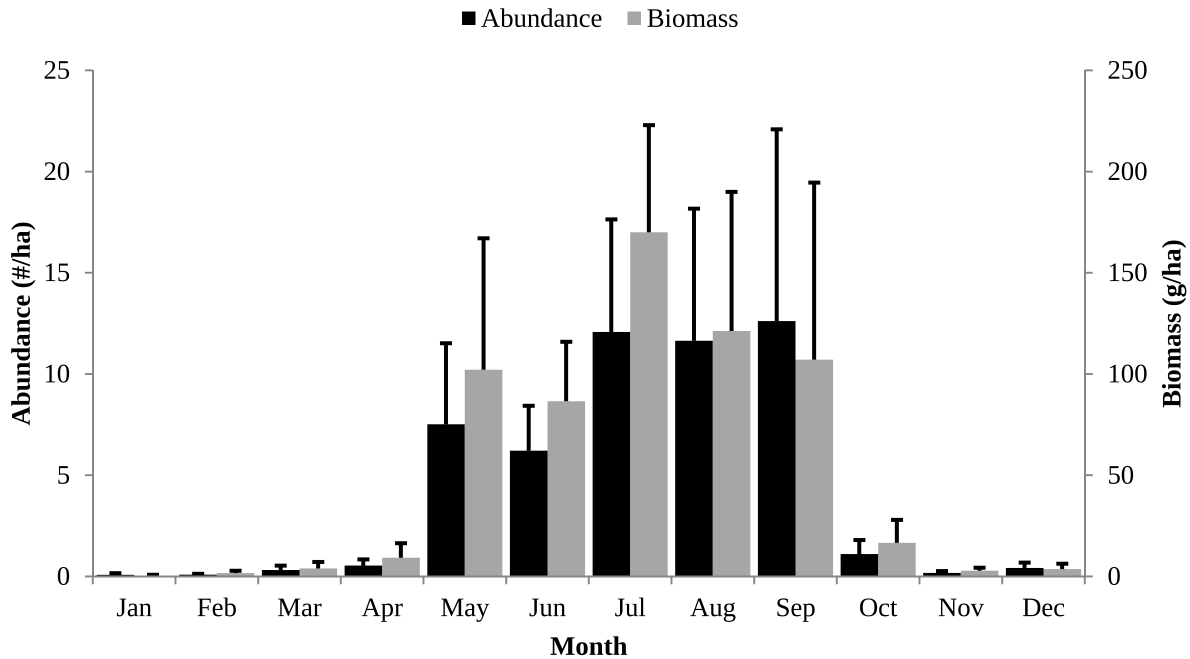

Figure 61. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus aztecus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability. No *F. aztecus* were collected in trawls outside Apalachicola Bay.

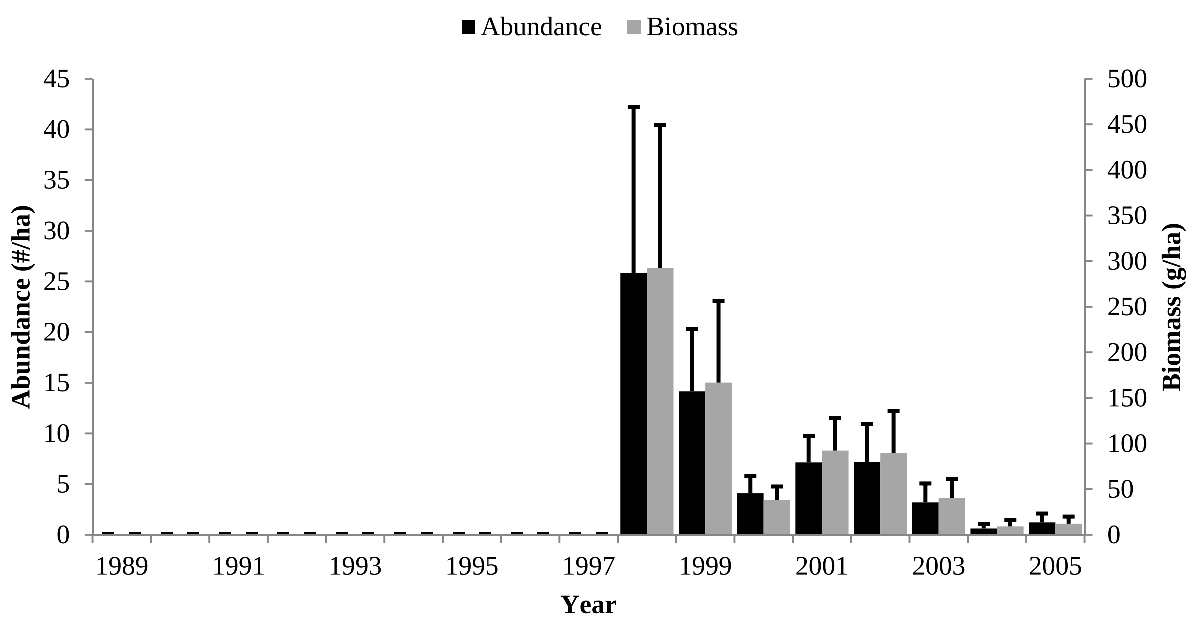

Figure 62. The mean (+SE) annual abundance and biomass of *Farfantepenaeus aztecus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability. No *F. aztecus* were collected in trawls outside Apalachicola Bay.

Table 31. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Alabama and Florida. The mean and standard error of the monthly means are also reported for the estuaries. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May	Jun	Jul
Mobile Bay (AL)	2.2 (5.5)	1.0 (2.6)	6.0 (4.9)	21.9 (23.2)	116.2 (168.0)	192.8 (642.8)	96.0 (666.9)
E MS Sound (AL)	1.5 (3.6)	0.6 (2.3)	2.3 (2.0)	30.5 (10.3)	110.2 (270.7)	288.7 (804.5)	51.9 (334.8)
Perdido Bay (AL)	3.7 (10.2)	3.4 (7.8)	6.3 (13.3)	71.8 (59.9)	127.2 (244.5)	34.2 (98.4)	12.9 (56.0)
Apalachicola Bay (FL)	0.1 (0.5)	0.2 (3.0)	0.8 (10.5)	1.5 (27.2)	18.9 (247.9)	16.0 (207.0)	17.1 (246.3)

	Aug	Sep	Oct	Nov	Dec	Mean	SE
Mobile Bay (AL)	21.4 (93.4)	8.6 (41.3)	11.3 (52.0)	8.6 (30.4)	3.2 (11.1)	40.8 (145.2)	17.7 (70.1)
E MS Sound (AL)	8.3 (70.0)	6.1 (8.3)	14.3 (28.2)	2.1 (5.6)	1.7 (6.2)	43.2 (128.9)	24.2 (69.6)
Perdido Bay (AL)	3.6 (10.5)	3.3 (10.8)	9.9 (51.0)	9.0 (56.4)	4.3 (14.6)	24.1 (52.8)	11.0 (19.3)
Apalachicola Bay (FL)	16.5 (170.7)	27.2 (232.8)	8.5 (129.6)	1.2 (19.9)	0.8 (6.5)	9.1 (108.5)	2.7 (30.8)

Table 32. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus aztecus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985	1986	1987	1988
Mobile Bay (AL)	13.2 (66.9)	36.6 (175.4)	17.2 (64.6)	54.7 (201.1)	77.5 (24.5)	41.0	31.6	14.1
E MS Sound (AL)	34.7 (222.0)	96.9(467.0)	29.9 (113.3)	21.6 (69.5)	66.7 (16.9)	59.4	16.3	45.0
Perdido Bay (AL)		0 (0)	0.5 (1.7)	0.9 (1.6)	8.1 (1.0)	1.2	5.5	9.2

	1989	1990	1991	1992	1993	1994	1995	1996
Mobile Bay (AL)	28.2	11.8	39.7	10.6	14.7	27.1	23.4	55.5
E MS Sound (AL)	96.7	3.6	31.5	13.4	33.3	12.2	40.4	65.8
Perdido Bay (AL)	46.7	35.5	32.0	11.7	10.3	15.4	8.7	3.8

	1997	1998	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	65.7	45.7	21.5	41.1 (10.3)	21.2 (127.8)	59.5 (179.3)	86.3 (313.3)	82.8 (185.6)
E MS Sound (AL)	128.0	70.6	10.3	22.6 (0.5)	28.1 (61.6)	33.3 (199.6)	59.1 (207.2)	40.7 (126.5)
Perdido Bay (AL)	83.0	57.6	115.1	10.9 (5.6)	33.2 (148.2)	27.3 (42.2)	26.7 (17.9)	66.3 (104.3)
Apalachicola Bay (FL)		29.7 (357.5)	14.7 (172.0)	4.4 (41.6)	9.2 (120.0)	9.9 (123.5)	4.0 (52.4)	1.2 (17.2)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	43.4 (154.8)	42.9 (114.5)	89.2 (417.1)	40.6 (145.4)	5.0 (8.3)
E MS Sound (AL)	15.7 (53.1)	43.3 (49.7)	33.8 (54.1)	42.7 (128.5)	6.2 (9.5)
Perdido Bay (AL)	15.0 (38.9)	19.6 (31.2)	38.5 (160.5)	26.3 (46.4)	5.9 (4.9)
Apalachicola Bay (FL)	4.4 (43.2)			9.7 (115.9)	3.2 (39.2)

Litopenaeus setiferus

The seasonal abundance pattern for white shrimp (*Litopenaeus setiferus*) was generally consistent across the Gulf States, with the highest values in the late summer and fall, and lows in the winter and spring (Figure 63). The overall mean abundance (mean of 12 monthly means in Figure 63) in Mississippi was highest among the states at 150.9/ha, followed by Louisiana (79.3/ha), Alabama (17.3/ha), Texas (12.5/ha) and Florida (9.9/ha).

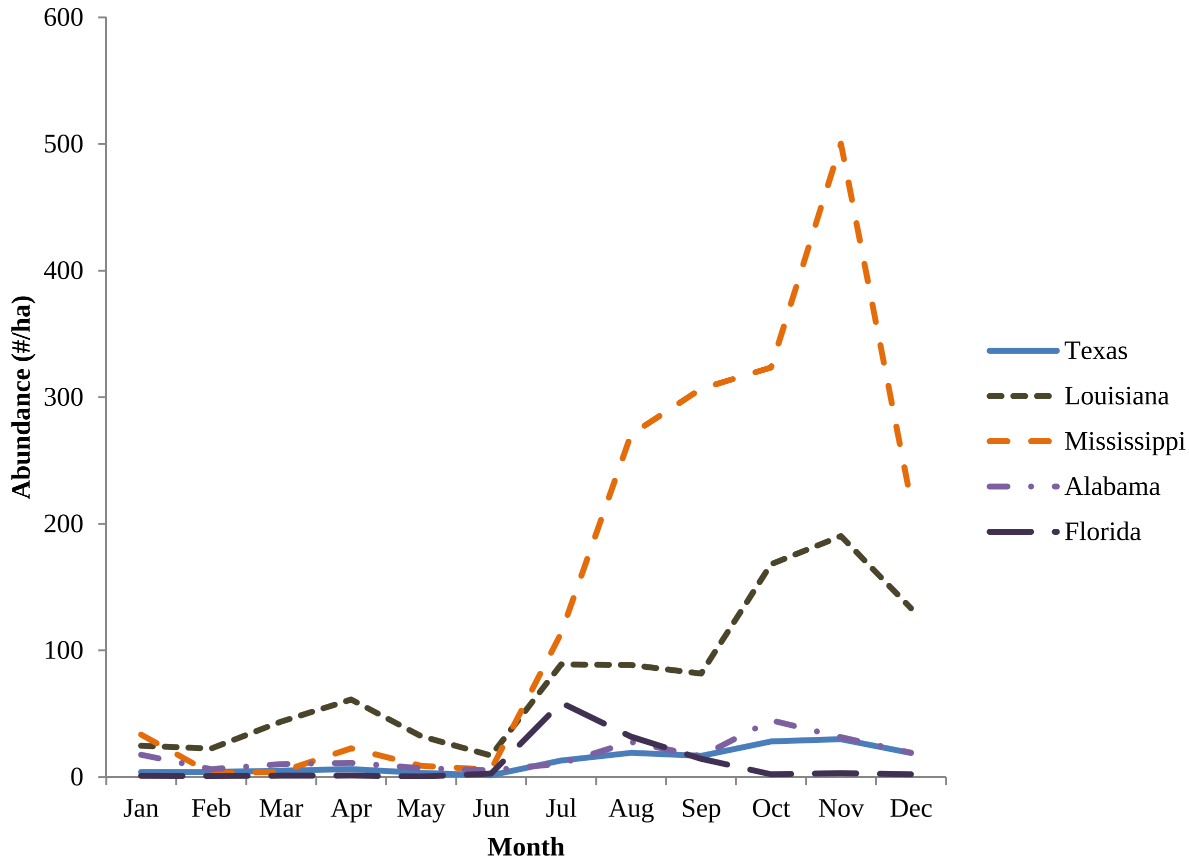

Figure 63. Monthly mean abundance of *Litopenaeus setiferus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

The maximum length of a white shrimp recorded by Linder and Cook (1970) was 203 mm; therefore we excluded all measurements in the database greater than 203 mm from our size and biomass analyses. The length frequency distributions for white shrimp in each state (Figure 64) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. White shrimp ranged in size from 6 – 203 mm (mean=95.0, SD=20.8) in Texas, 5 – 192 mm (mean=83.0, SD=28.5) in Louisiana, 12 – 186 mm (mean=83.9, SD=23.8) in Mississippi, 4 – 200 mm (mean=88.1, SD=30.5) in Alabama, and 15 – 202 mm (mean=104.7, SD=43.6) in Florida.

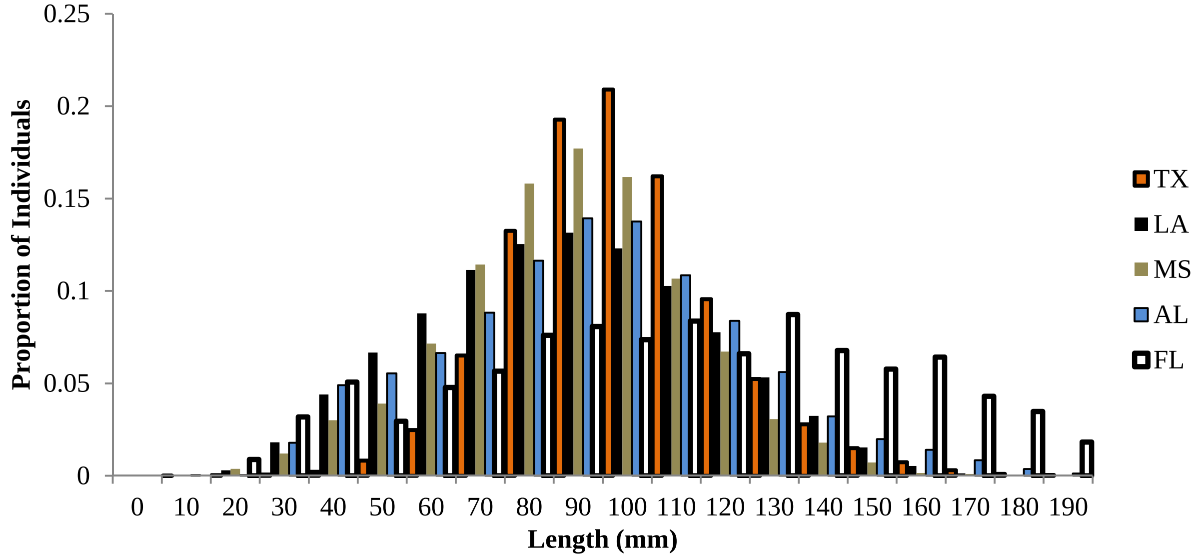

Figure 64. Length frequency of all white shrimp (*Litopenaeus setiferus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=136,134): 1982 – 2005; Louisiana (n=96,976): 1986 – 2007; Mississippi (n=7,394): 1985 – 2005; Alabama (n=8,113): 1981 – 2007; and Florida (n=1,697): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

A strong seasonal signature was apparent in the distribution of white shrimp in Texas. The mean abundance and biomass were relatively low in the winter through early summer and increased from late summer through the fall (Figure 65). The mean annual abundance and biomass both peaked in 2004 (27.7/ha and 191.5 g/ha, respectively) (Figure 66). The highest concentrations of white shrimp were found in Galveston Bay, East Matagorda Bay, and Sabine Lake (Tables 33 and 34).

Monthly variability of white shrimp abundance and biomass was relatively high in Louisiana, with values peaking in October and November (Figure 67). The mean annual abundance and biomass both peaked in 2006 (169.9/ha and 713.6 g/ha, respectively) (Figure 68). The largest catches occurred in Lake Calcasieu, Vermilion-Cote Blanche Bays, Terrebonne-Timbalier Bays, and Breton-Chandeleur Sound (Tables 35 and 36).

The seasonal pattern of abundance and biomass for white shrimp in Mississippi showed mean values peaked in the late summer and fall (Figure 69). The mean annual abundance and biomass both peaked in 1987 (712.3/ha and 1,232.5 g/ha, respectively) (Figure 70).

The seasonal variability of white shrimp in Alabama also showed a peak in the fall, but values were relatively high in other months (Figure 71). Annual variability was high, and both abundance and biomass peaked in 2005 (46.5/ha and 264.3 g/ha, respectively) (Figure 72). Length data were not available for the years 1986 – 1988, 1991 – 1993, 1995 – 1996, and 1998 – 1999. Mobile Bay and East Mississippi Sound had the highest mean abundance of white shrimp in Alabama (Tables 37 and 38).

The mean abundance and biomass numbers for white shrimp in Florida peaked in the summer (Figure 73). Mean annual abundance and biomass peaked in 2004 (47.8/ha and 230.6 g/ha, respectively) (Figure 74). White shrimp were not reported outside of Apalachicola Bay at any point during the study period (Tables 37 and 38).

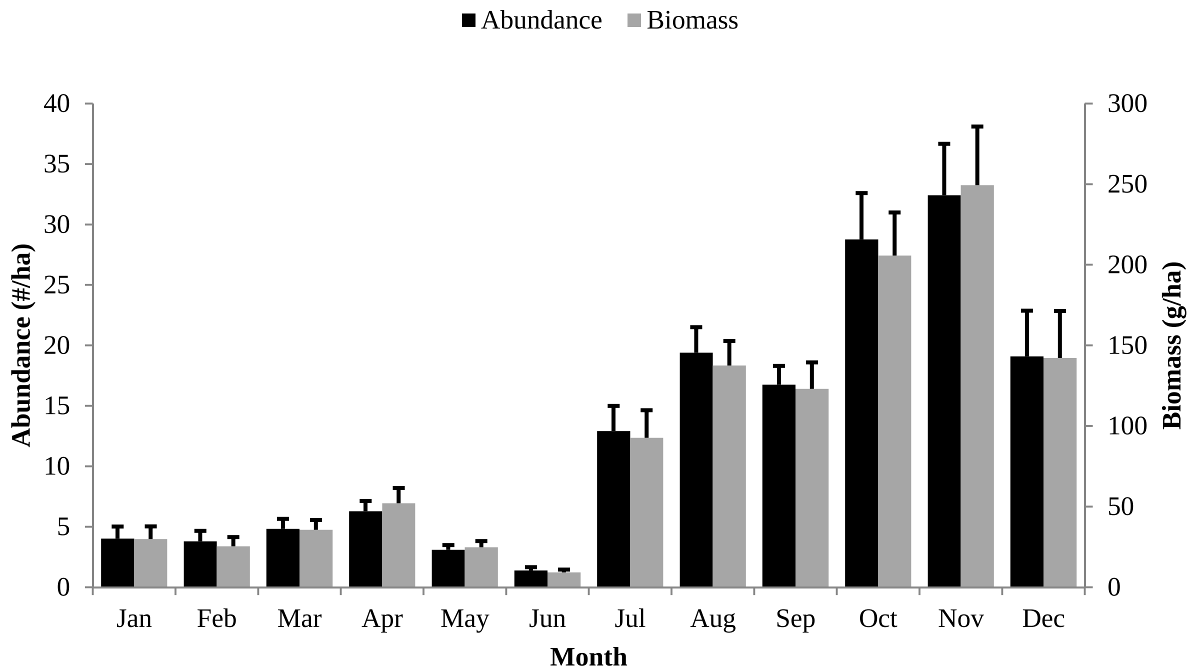

Figure 65. The monthly mean (+SE) abundance and biomass of *Litopenaeus setiferus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

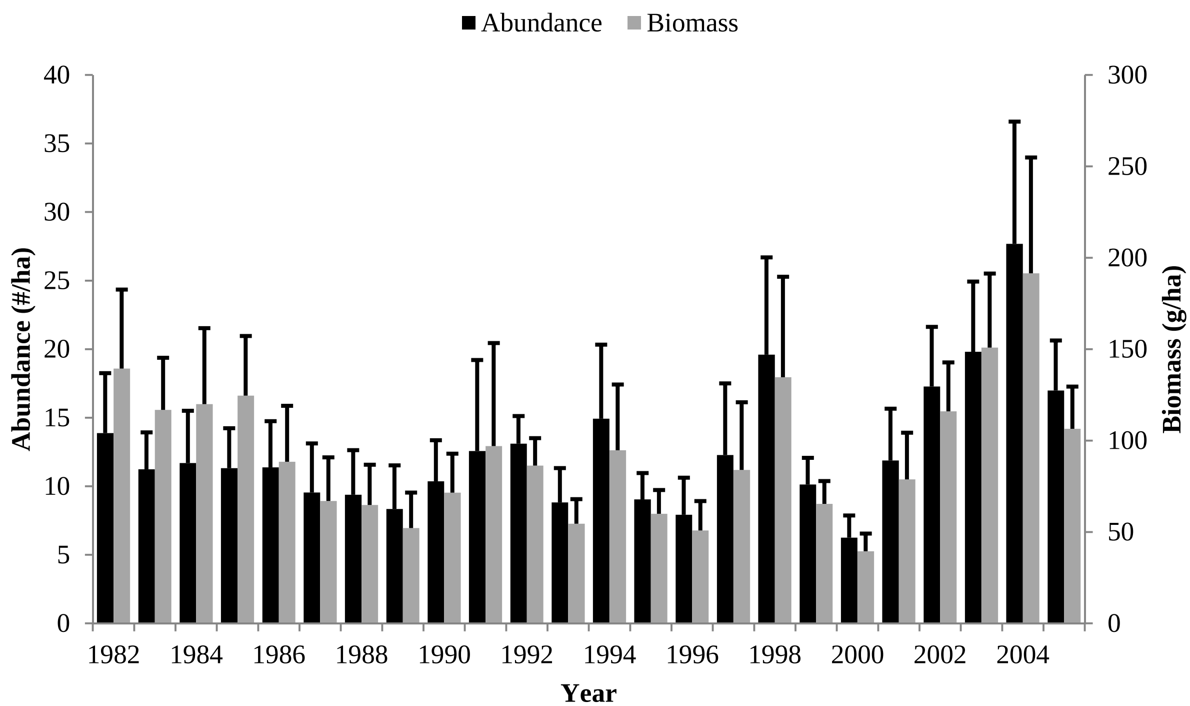

Figure 66. The mean (+SE) annual abundance and biomass of *Litopenaeus setiferus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 33. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	0.3 (1.6)	0.8 (3.2)	0.4 (1.5)	0.8 (4.3)	0.0 (0.2)
Upper Laguna Madre	1.6 (10.5)	0.6 (3.5)	1.5 (7.5)	0.6 (3.7)	0.4 (2.5)
Corpus Christi Bay	4.6 (30.3)	1.3 (7.3)	1.9 (11.3)	1.0 (6.5)	1.2 (6.9)
Aransas Bay	5.5 (35.4)	5.9 (35.4)	7.0 (49.4)	5.7 (33.3)	3.1 (20.4)
San Antonio Bay	2.9 (17.0)	1.4 (8.8)	1.7 (11.8)	4.2 (28.1)	1.5 (9.5)
Matagorda Bay	3.9 (27.5)	4.4 (26.2)	4.2 (27.8)	5.7 (44.0)	3.2 (22.1)
East Matagorda Bay	0.8 (5.0)	1.1 (8.2)	2.9 (19.3)	4.0 (22.6)	1.1 (6.7)
Galveston Bay	8.1 (67.8)	11.8 (89.6)	15.7 (127.0)	20.4 (188.1)	7.4 (71.9)
Sabine Lake	0.7 (5.6)	0.5 (3.2)	1.3 (10.6)	3.6 (37.9)	7.9 (55.8)

	Jun	Jul	Aug	Sep	Oct
Lower Laguna Madre	0.1 (0.6)	0.1 (0.4)	0.6 (2.5)	1.5 (6.1)	1.3 (7.9)
Upper Laguna Madre	0.2 (0.8)	1.0 (4.1)	4.4 (23.0)	8.5 (52.4)	7.7 (45.6)
Corpus Christi Bay	1.8 (10.2)	12.2 (78.3)	10.4 (77.9)	7.2 (64.4)	9.4 (811.5)
Aransas Bay	1.2 (8.1)	10.6 (88.8)	12.8 (97.1)	10.2 (82.1)	20.3 (148.2)
San Antonio Bay	1.9 (11.2)	17.0 (117.6)	33.6 (197.4)	21.2 (148.3)	32.8 (178.4)
Matagorda Bay	1.6 (10.7)	14.7 (131.0)	19.8 (140.1)	13.6 (101.5)	22.3 (155.1)
East Matagorda Bay	1.3 (8.8)	35.2 (198.9)	48.3 (316.6)	49.1 (268.0)	69.6 (438.8)
Galveston Bay	1.7 (13.9)	13.1 (94.4)	26.1 (213.0)	24.3 (199.5)	40.3 (335.9)
Sabine Lake	1.2 (11.5)	15.5 (119.1)	20.6 (150.2)	28.2 (196.9)	83.8 (669.4)

	Nov	Dec	Mean	SE
Lower Laguna Madre	2.7 (16.6)	1.9 (8.8)	0.9 (4.5)	0.2 (1.4)
Upper Laguna Madre	10.0 (65.5)	4.2 (27.5)	3.4 (20.5)	1.0 (6.5)
Corpus Christi Bay	14.5 (112.5)	7.4 (55.9)	6.1 (45.2)	1.4 (10.8)
Aransas Bay	29.0 (187.0)	19.1 (136.4)	10.9 (76.8)	2.4 (16.4)
San Antonio Bay	31.4 (202.8)	17.5 (109.6)	13.9 (86.7)	3.8 (23.2)
Matagorda Bay	26.3 (188.1)	16.6 (109.9)	11.4 (82.0)	2.5 (18.0)
East Matagorda Bay	27.0 (165.7)	43.8 (379.3)	23.7 (153.1)	7.2 (42.3)
Galveston Bay	74.9 (661.2)	43.1 (336.9)	23.9 (199.9)	5.9 (51.3)
Sabine Lake	58.0 (543.4)	13.4 (100.9)	19.6 (158.7)	7.5 (63.5)

Table 34. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986
Lower Laguna Madre	1.7 (13.8)	0.7 (3.7)	4.7 (31.5)	0.4 (2.5)	2.6 (10.9)
Upper Laguna Madre	7.4 (26.6)	2.8 (13.3)	4.7 (20.3)	2.8 (13.0)	1.6 (9.8)
Corpus Christi Bay	11.8 (114.3)	6.5 (57.3)	10.9 (142.5)	9.9 (105.9)	8.9 (52.7)
Aransas Bay	7.4 (63.0)	8.2 (80.5)	17.5 (166.6)	8.0 (84.7)	5.9 (37.7)
San Antonio Bay	6.6 (55.0)	5.9 (55.8)	3.8 (34.2)	10.4 (104.3)	7.2 (42.8)
Matagorda Bay	18.0 (171.2)	9.3 (81.8)	6.9 (57.6)	9.7 (116.8)	28.0 (280.2)
Galveston Bay	39.5 (439.3)	35.8 (416.9)	26.4 (292.8)	28.3 (327.8)	20.8 (148.4)
Sabine Lake					6.7 (46.5)

	1987	1988	1989	1990	1991
Lower Laguna Madre	1.1 (5.1)	0.1 (0.4)	0.05 (0.2)	0.3 (0.9)	0.6 (1.8)
Upper Laguna Madre	0.9 (6.9)	1.5 (8.4)	1.2 (10.1)	9.9 (62.3)	6.4 (34.2)
Corpus Christi Bay	7.0 (41.3)	5.8 (38.9)	4.3 (25.7)	10.1 (51.5)	11.4 (90.4)
Aransas Bay	4.5 (26.4)	7.4 (52.2)	3.4 (20.0)	6.3 (45.2)	14.2 (87.3)
San Antonio Bay	19.4 (123.6)	19.0 (106.2)	20.2 (102.0)	22.0 (140.0)	12.8 (81.8)
Matagorda Bay	7.6 (48.4)	7.4 (58.7)	4.4 (23.0)	7.6 (59.7)	5.1 (32.7)
East Matagorda Bay	10.5 (58.3)	3.7 (19.5)	5.2 (30.4)	6.8 (30.7)	2.9 (12.2)
Galveston Bay	17.2 (125.5)	10.0 (75.7)	13.7 (101.9)	6.3 (56.0)	35.6 (335.6)
Sabine Lake	10.6 (106.5)	18.2 (140.2)	13.4 (98.5)	23.3 (201.8)	7.9 (53.5)

	1992	1993	1994	1995	1996
Lower Laguna Madre	0.5 (3.0)	0.8 (2.4)	1.1 (5.2)	4.0 (14.5)	0.4 (1.7)
Upper Laguna Madre	2.6 (16.4)	6.7 (60.9)	4.8 (27.9)	3.4 (24.2)	1.6 (8.5)
Corpus Christi Bay	2.5 (15.4)	4.7 (29.8)	15.8 (100.3)	2.7 (23.2)	1.5 (8.0)
Aransas Bay	24.6 (150.7)	9.1 (62.2)	2.9 (15.8)	4.2 (27.7)	2.2 (13.9)
San Antonio Bay	11.2 (74.7)	8.6 (43.5)	20.5 (107.8)	13.1 (69.4)	8.3 (49.0)
Matagorda Bay	14.7 (107.4)	7.9 (48.5)	4.1 (25.7)	5.2 (30.8)	6.4 (42.0)
East Matagorda Bay	2.3 (14.7)	14.4 (77.8)	7.0 (34.4)	16.0 (104.0)	40.6 (224.6)
Galveston Bay	27.4 (164.5)	17.9 (107.9)	44.2 (309.8)	25.5 (190.9)	8.5 (63.2)
Sabine Lake	17.2 (148.4)	5.2 (39.0)	20.9 (140.3)	1.7 (12.8)	14.7 (124.4)

	1997	1998	1999	2000	2001
Lower Laguna Madre	1.1 (4.4)	0.4 (1.6)	0.1 (0.4)	0.0 (0.3)	0.4 (1.2)
Upper Laguna Madre	0.9 (5.0)	2.4 (14.7)	3.1 (17.3)	1.0 (5.7)	4.4 (28.2)
Corpus Christi Bay	1.7 (8.5)	4.0 (22.1)	8.6 (58.9)	1.3 (8.0)	1.3 (6.3)
Aransas Bay	12.9 (83.1)	15.9 (94.7)	9.6 (56.1)	5.0 (34.2)	8.2 (50.8)
San Antonio Bay	17.4 (109.6)	18.4 (99.2)	8.5 (52.9)	2.8 (20.1)	15.2 (87.7)
Matagorda Bay	12.4 (74.3)	19.5 (112.8)	9.9 (59.6)	3.6 (22.2)	12.4 (91.2)
East Matagorda Bay	11.6 (70.9)	77.2 (641.7)	24.9 (151.6)	26.1 (125.4)	23.4 (123.6)
Galveston Bay	23.6 (177.8)	28.3 (212.6)	16.4 (113.8)	12.6 (90.2)	21.3 (166.7)
Sabine Lake	22.2 (189.0)	22.6 (144.8)	8.2 (63.8)	9.9 (70.9)	21.3 (144.6)

Table 34 (continued).

	2002	2003	2004	2005	Mean
Lower Laguna Madre	0.2 (3.0)	0.3 (1.3)	0.2 (0.4)	0.3 (1.1)	0.9 (4.6)
Upper Laguna Madre	2.2 (14.0)	2.6 (16.7)	5.1 (35.3)	3.7 (20.1)	3.5 (20.9)
Corpus Christi Bay	4.2 (25.4)	7.3 (46.7)	1.1 (6.8)	6.2 (39.7)	6.2 (46.6)
Aransas Bay	26.0 (166.6)	31.9 (254.5)	13.4 (95.1)	12.6 (74.4)	10.9 (76.8)
San Antonio Bay	16.2 (101.2)	17.4 (111.1)	36.5 (234.6)	12.4 (74.3)	13.9 (86.7)
Matagorda Bay	21.0 (129.2)	12.3 (84.3)	21.0 (124.3)	22.9 (132.2)	11.6 (83.9)
East Matagorda Bay	33.1 (215.0)	31.9 (234.8)	60.0 (418.1)	54.7 (333.8)	23.8 (153.8)
Galveston Bay	31.1 (232.8)	21.5 (222.0)	43.7 (294.1)	18.3 (132.8)	23.9 (199.9)
Sabine Lake	9.3 (81.4)	62.0 (421.4)	90.9 (717.7)	34.2 (228.7)	21.0 (158.7)
	SE				
Lower Laguna Madre	0.2 (1.4)				
Upper Laguna Madre	0.5 (3.1)				
Corpus Christi Bay	0.8 (7.8)				
Aransas Bay	1.6 (11.8)				
San Antonio Bay	1.5 (9.0)				
Matagorda Bay	1.4 (11.9)				
East Matagorda Bay	4.9 (37.6)				
Galveston Bay	2.2 (22.5)				
Sabine Lake	4.7 (35.5)				

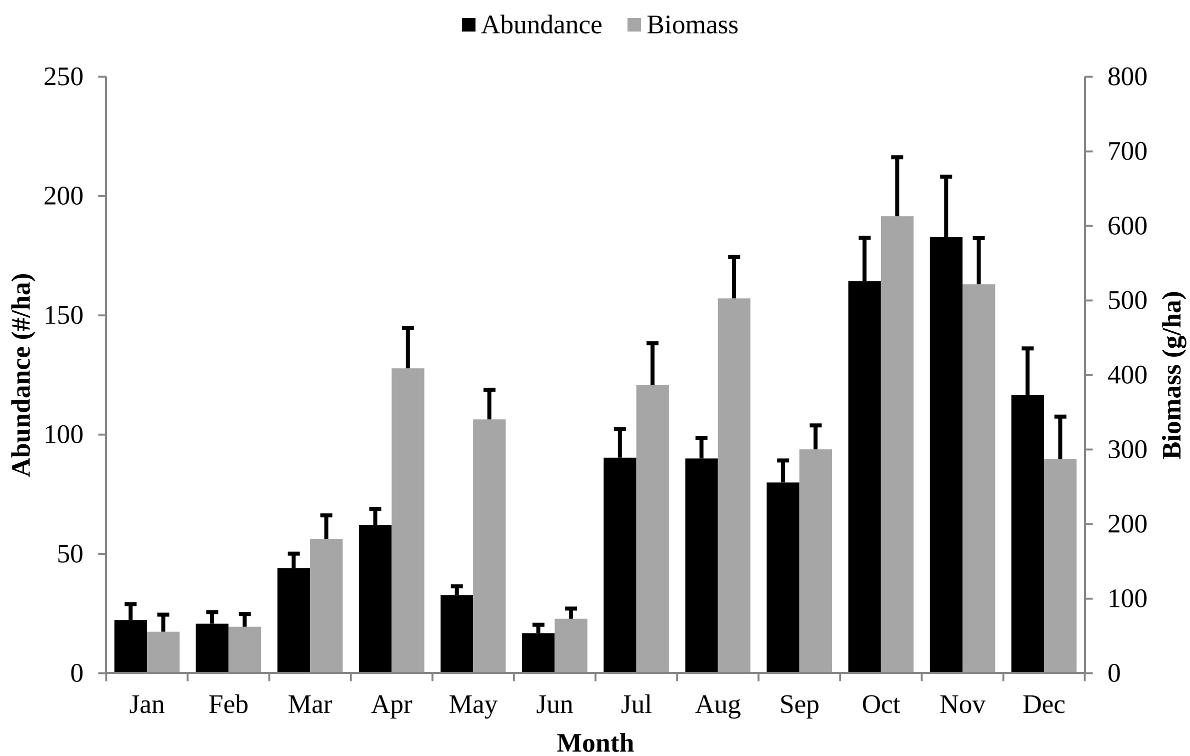

Figure 67. The monthly mean (+SE) abundance and biomass of *Litopenaeus setiferus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

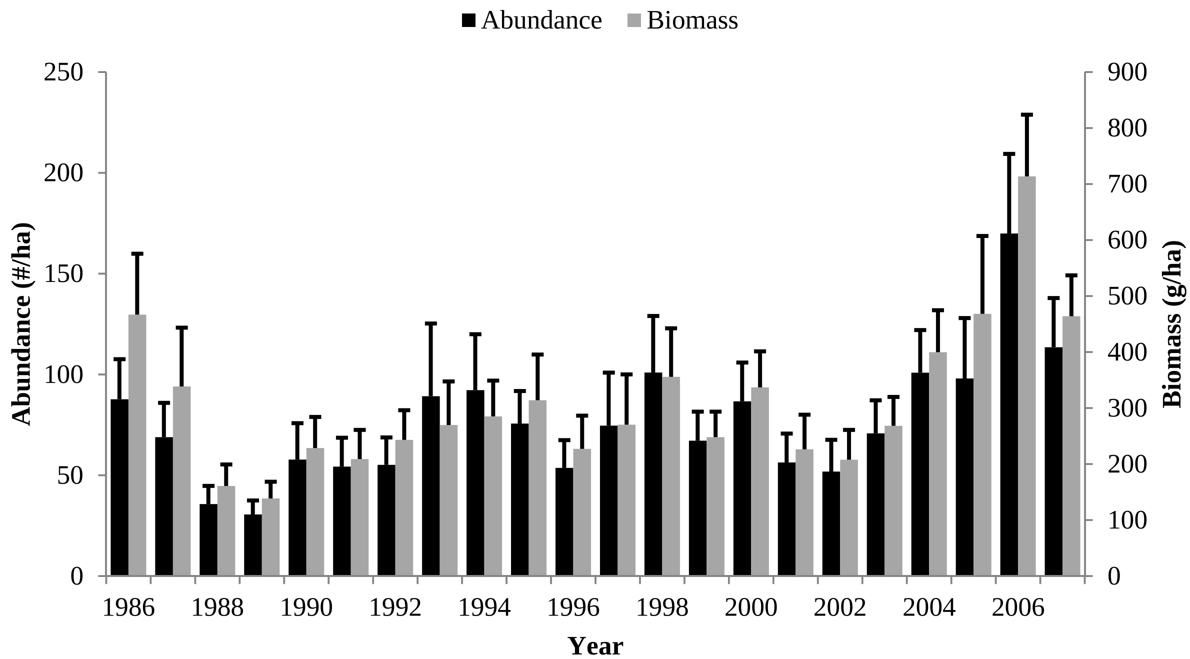

Figure 68. The mean (+SE) annual abundance and biomass of *Litopenaeus setiferus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 35. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	13.9 (26.6)	19.4 (44.6)	42.9 (140.8)	67.3 (385.3)	32.8 (353.8)
Vermilion-Cote Blanche Bays	18.2 (38.8)	36.7 (122.5)	89.1 (383.7)	155.1 (957.5)	96.5 (872.0)
Terrebonne-Timbalier Bays	26.7 (57.1)	30.6 (90.0)	59.2 (203.6)	64.0 (453.1)	22.2 (280.9)
Barataria Bay	84.1 (168.2)	15.9 (45.0)	9.5 (55.4)	6.5 (73.9)	2.0 (32.7)
Breton-Chandeleur Sounds	12.6 (73.3)	1.1 (5.1)	15.6 (110.5)	15.6 (119.0)	8.9 (120.0)
Lake Borgne	1.5 (1.9)	0.7 (1.0)	3.2 (13.6)	27.7 (194.6)	31.3 (396.1)

	Jun	Jul	Aug	Sep	Oct
Lake Calcasieu	46.0 (130.5)	171.7 (591.3)	123.5 (531.3)	106.5 (407.9)	253.5 (933.8)
Vermilion-Cote Blanche Bays	28.0 (166.3)	141.1 (631.4)	149.3 (925.5)	171.5 (587.0)	328.4 (1158.0)
Terrebonne-Timbalier Bays	13.9 (54.3)	86.4 (461.7)	67.3 (465.6)	56.0 (227.0)	138.0 (461.5)
Barataria Bay	0.9 (7.4)	5.9 (48.1)	4.6 (49.8)	5.8 (33.4)	23.3 (124.3)
Breton-Chandeleur Sounds	5.7 (22.7)	50.5 (179.8)	97.3 (480.7)	47.0 (194.7)	119.6 (572.4)
Lake Borgne	10.0 (62.7)	67.5 (228.0)	65.2 (235.8)	49.1 (205.8)	87.6 (343.5)

	Nov	Dec	Mean	SE
Lake Calcasieu	269.5 (787.5)	138.3 (300.1)	107.1 (386.1)	25.3 (82.8)
Vermilion-Cote Blanche Bays	373.0 (1089.3)	252.0 (600.2)	153.2 (627.7)	33.0 (111.1)
Terrebonne-Timbalier Bays	214.2 (502.3)	144.3 (346.9)	76.9 (300.3)	17.4 (49.6)
Barataria Bay	35.1 (133.2)	70.9 (235.7)	22.0 (83.9)	8.0 (19.5)
Breton-Chandeleur Sounds	64.0 (263.7)	26.8 (90.7)	38.7 (186.1)	11.0 (50.6)
Lake Borgne	57.3 (191.9)	7.8 (10.2)	34.1 (157.1)	8.8 (39.7)

Table 36. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	155.3 (673.9)	145.7 (508.3)	93.7 (328.5)	26.9 (98.5)
Vermilion-Cote Blanche Bays	203.4 (1122.4)	111.0 (626.2)	72.6 (397.1)	85.3 (388.1)
Terrebonne-Timbalier Bays	91.9 (443.6)	78.9 (441.6)	41.8 (195.0)	32.5 (160.1)
Barataria Bay	14.1 (85.5)	9.1 (58.0)	5.6 (32.2)	5.2 (27.2)
Breton-Chandeleur Sounds	9.5 (46.1)	18.6 (103.8)	4.3 (25.2)	7.5 (30.6)
Lake Borgne	10.8 (56.8)	37.6 (175.5)	7.2 (21.2)	6.1 (30.2)
	1990	1991	1992	1993
Lake Calcasieu	37.4 (136.1)	99.0 (337.5)	120.6 (515.5)	74.0 (206.9)
Vermilion-Cote Blanche Bays	129.8 (540.2)	57.8 (245.2)	138.8 (608.9)	170.8 (570.0)
Terrebonne-Timbalier Bays	105.4 (366.1)	88.2 (342.8)	46.3 (192.5)	105.0 (271.9)
Barataria Bay	11.1 (51.5)	7.8 (43.5)	2.7 (14.9)	6.9 (34.5)
Breton-Chandeleur Sounds	7.8 (40.7)	7.0 (42.4)	10.0 (66.7)	50.8 (179.1)
Lake Borgne	10.3 (45.0)	17.8 (81.8)	13.5 (68.8)	17.8 (105.7)
	1994	1995	1996	1997
Lake Calcasieu	122.5 (333.8)	92.5 (334.8)	198.6 (772.8)	193.6 (704.6)
Vermilion-Cote Blanche Bays	239.4 (690.0)	156.9 (606.9)	91.7 (390.5)	126.0 (383.4)
Terrebonne-Timbalier Bays	62.6 (244.7)	59.9 (278.3)	42.0 (152.6)	65.4 (227.7)
Barataria Bay	2.8 (16.1)	3.2 (18.3)	3.5 (12.4)	9.4 (42.0)
Breton-Chandeleur Sounds	12.2 (53.6)	61.3 (290.1)	13.0 (85.6)	41.3 (209.2)
Lake Borgne	13.1 (73.7)	33.3 (129.6)	4.2 (18.9)	26.4 (149.7)
	1998	1999	2000	2001
Lake Calcasieu	140.2 (475.0)	74.7 (287.5)	78.1 (343.3)	125.8 (427.1)
Vermilion-Cote Blanche Bays	161.0 (583.2)	189.4 (666.5)	189.3 (817.6)	91.5 (381.5)
Terrebonne-Timbalier Bays	154.7 (548.0)	47.5 (179.1)	116.3 (359.0)	59.9 (256.5)
Barataria Bay	56.6 (181.7)	8.1 (36.0)	16.5 (64.2)	7.0 (33.6)
Breton-Chandeleur Sounds	12.1 (65.2)	21.0 (88.3)	12.8 (71.2)	30.4 (123.4)
Lake Borgne	52.2 (167.2)	35.4 (139.7)	22.3 (76.3)	13.7 (49.5)
	2002	2003	2004	2005
Lake Calcasieu	64.9 (213.6)	43.3 (206.6)	146.9 (449.2)	90.6 (370.7)
Vermilion-Cote Blanche Bays	63.6 (253.6)	96.2 (408.3)	224.3 (852.3)	179.9 (855.6)
Terrebonne-Timbalier Bays	34.2 (155.1)	68.3 (271.9)	70.6 (283.5)	67.3 (335.2)
Barataria Bay	11.7 (44.7)	138.3 (288.4)	30.3 (171.0)	33.6 (230.0)
Breton-Chandeleur Sounds	88.9 (356.2)	64.8 (245.8)	72.2 (343.4)	153.5 (718.6)
Lake Borgne	40.2 (127.6)	47.2 (169.6)	24.8 (121.0)	92.7 (422.7)
	2006	2007	Mean	SE
Lake Calcasieu	97.6 (385.3)	127.2 (416.9)	106.8 (387.6)	9.8 (37.3)
Vermilion-Cote Blanche Bays	331.7 (1441.8)	261.1 (979.3)	153.2 (627.7)	15.0 (62.6)
Terrebonne-Timbalier Bays	165.6 (510.3)	87.6 (401.8)	76.9 (300.3)	7.6 (24.5)
Barataria Bay	63.6 (223.4)	40.0 (153.7)	22.1 (84.7)	6.7 (17.6)
Breton-Chandeleur Sounds	97.7 (640.9)	62.1 (306.6)	39.0 (187.9)	8.3.0 (41.0)
Lake Borgne	161.5 (884.9)	43.9 (293.9)	33.3 (155.0)	7.5 (40.0)

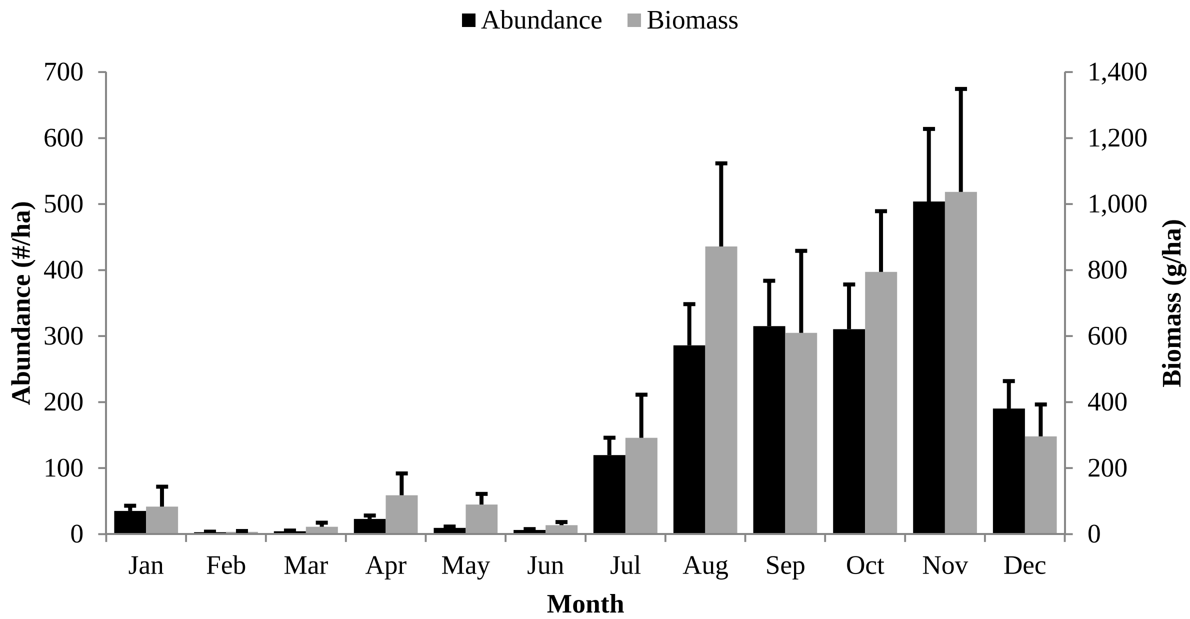

Figure 69. The monthly mean (+SE) abundance and biomass of *Litopenaeus setiferus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *L. setiferus* length measurements were not recorded until 1985.

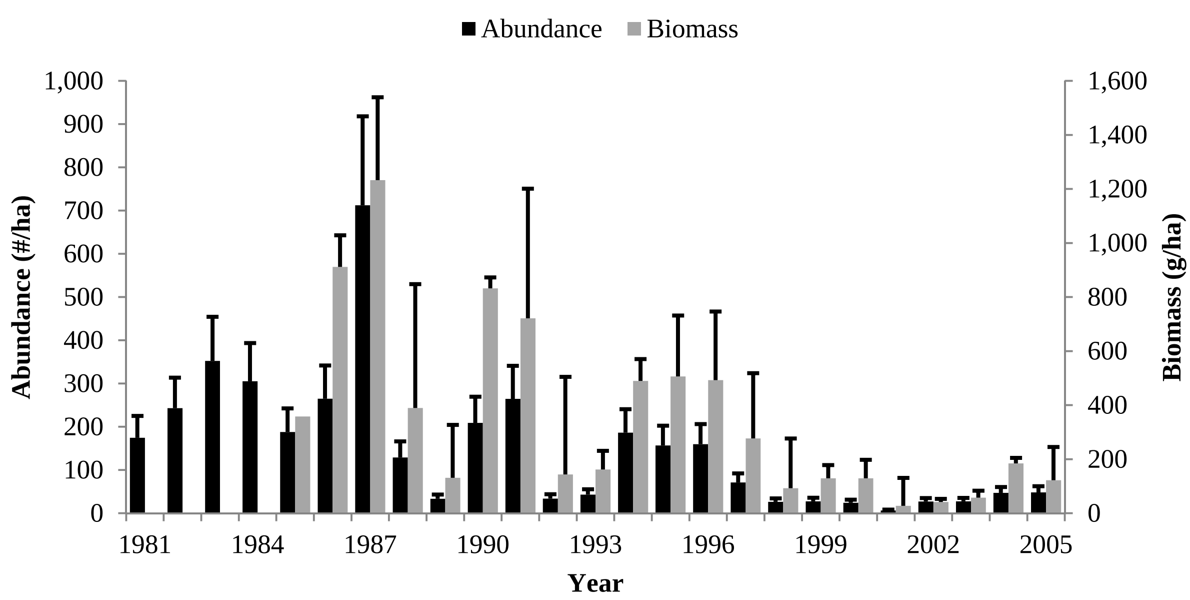

Figure 70. The mean (+SE) annual abundance and biomass of *Litopenaeus setiferus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *L. setiferus* length measurements were not recorded until 1985.

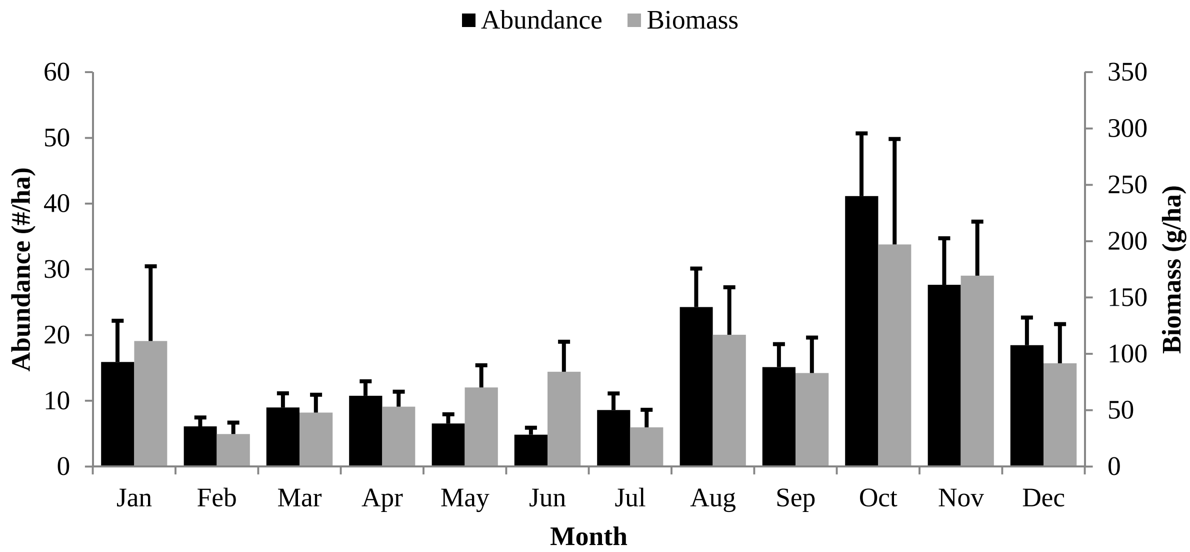

Figure 71. The monthly mean (+SE) abundance and biomass of *Litopenaeus setiferus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length measurements of *L. setiferus* were not available for the years 1986 – 1988, 1991 – 1993, 1995 – 1996, and 1998 – 1999.

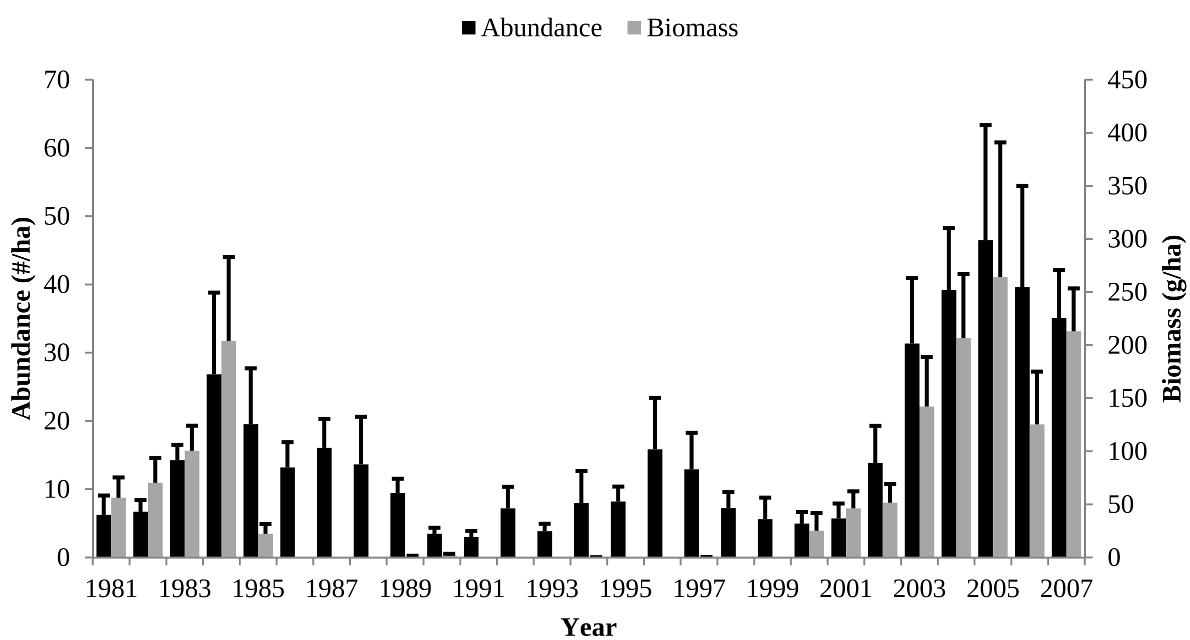

Figure 72. The mean (+SE) annual abundance and biomass of *Litopenaeus setiferus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements of *L. setiferus* were not available for the years 1986 – 1988, 1991 – 1993, 1995 – 1996, and 1998 – 1999.

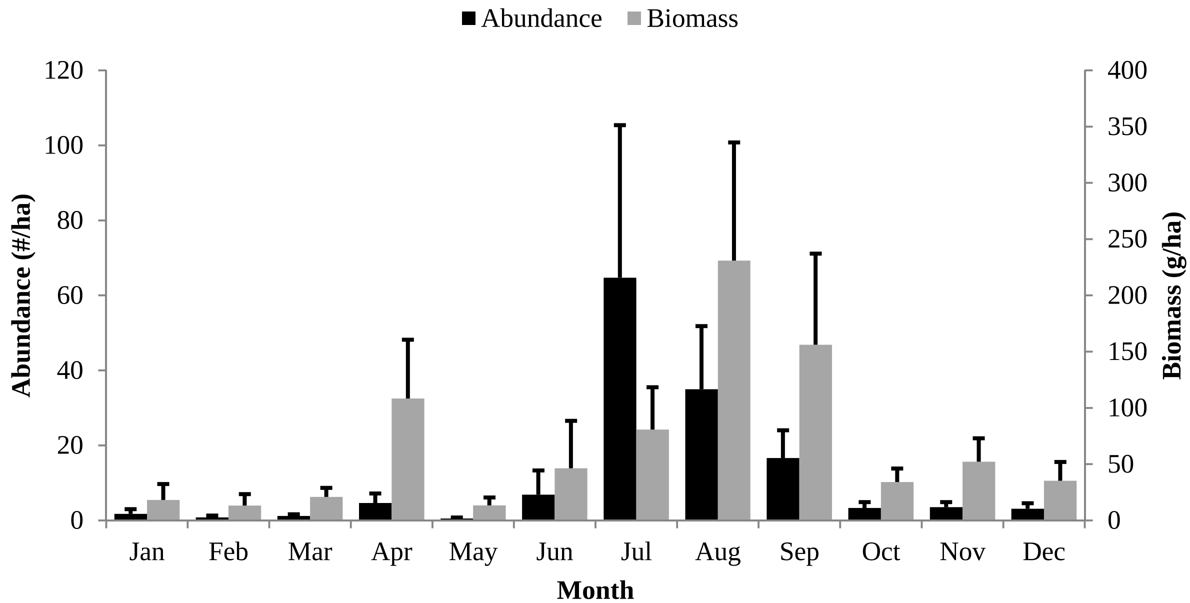

Figure 73. The monthly mean (+SE) abundance and biomass of *Litopenaeus setiferus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability. *L. setiferus* were not collected in trawls outside Apalachicola Bay.

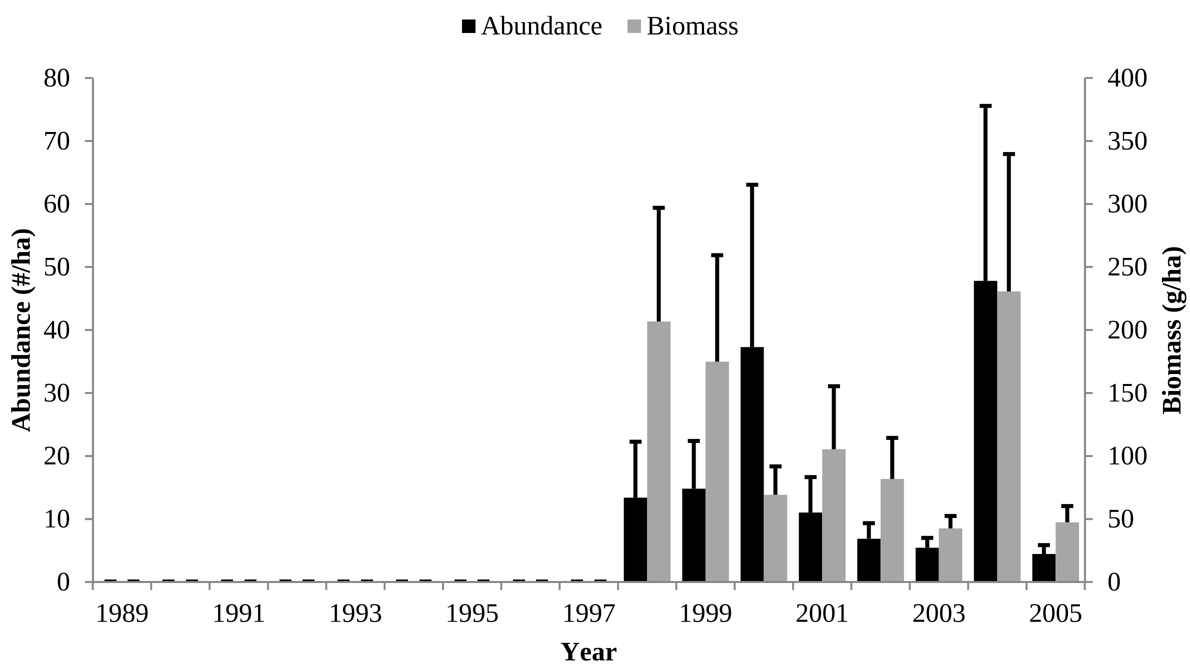

Figure 74. The mean (+SE) annual abundance and biomass of *Litopenaeus setiferus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability. *L. setiferus* were not collected in trawls outside Apalachicola Bay.

Table 37. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary. *L. setiferus* were not collected in trawls outside Apalachicola Bay in Florida.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	23.3 (174.3)	7.6 (37.6)	9.5 (50.1)	9.1 (53.1)	7.5 (58.6)
E MS Sound (AL)	7.8 (28.1)	4.7 (13.6)	10.6 (54.0)	22.1 (91.1)	8.1 (118.7)
Perdido Bay (AL)	0.2 (1.2)	0.3 (2.6)	0.2 (3.8)	0 (0)	0 (0)
Apalachicola Bay (FL)	2.7 (26.9)	1.8 (24.2)	4.0 (69.6)	12.1 (288.3)	2.4 (62.1)

	Jun	Jul	Aug	Sep	Oct
Mobile Bay (AL)	6.0 (83.6)	10.9 (40.6)	30.9 (144.2)	18.2 (118.9)	39.4 (232.6)
E MS Sound (AL)	3.5 (99.1)	6.6 (26.1)	10.7 (27.0)	15.6 (33.9)	84.0 (247.9)
Perdido Bay (AL)	0.1 (0.8)	0.2 (3.8)	0.2 (0.0)	1.1 (10.6)	2.2 (37.3)
Apalachicola Bay (FL)	12.3 (86.6)	117.1 (152.9)	68.2 (86.9)	51.2 (557.2)	20.2 (235.4)

	Nov	Dec	Mean	SE
Mobile Bay (AL)	33.0 (216.1)	22.5 (120.9)	18.2 (110.9)	3.3 (19.8)
E MS Sound (AL)	32.8 (117.2)	14.5 (43.3)	18.4 (75.0)	6.4 (19.1)
Perdido Bay (AL)	2.5 (41.0)	3.1 (38.7)	0.8 (11.6)	0.3 (4.8)
Apalachicola Bay (FL)	25.6 (388.8)	6.6 (77.8)	27.0 (196.4)	10.2 (50.3)

Table 38. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Litopenaeus setiferus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary. *L. setiferus* were not collected in trawls outside Apalachicola Bay in Florida. Length data were not available from ADCNR from 1986 – 1988 and 1991 – 1999.

	1981	1982	1983	1984	1985	1986
Mobile Bay (AL)	4.3 (30.0)	6.6 (56.9)	11.9 (76.2)	38.2 (283.9)	16.5 (20.1)	9.4
E MS Sound (AL)	7.5 (68.3)	6.9 (87.9)	18.5 (144.8)	10.1 (91.5)	31.9 (31.1)	28.1
Perdido Bay (AL)		0 (0)	0 (0)	0 (0)	0 (0)	0

	1987	1988	1989	1990	1991	1992
Mobile Bay (AL)	20.1	7.1	8.4 (0.8)	3.4 (0.7)	4.2	3.3
E MS Sound (AL)	20.3	40.2	19.6 (0.8)	6.4 (5.2)	3.6	25.2
Perdido Bay (AL)	0.5	0.4	0 (0)	0.7	0	0.7

	1993	1994	1995	1996	1997	1998
Mobile Bay (AL)	4.9	7.2	6.6	23.9	17.7	10.3
E MS Sound (AL)	3.8	18.2	20.3	8.8	9.9	5.5
Perdido Bay (AL)	0.2	0.7	1.8	0.3	0.5	1.7
Apalachicola Bay (FL)						15.0 (285.4)

	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	5.7	6.9 (40.9)	9.2 (70.2)	12.7 (46.7)	42.5 (193.5)	52.8 (274.6)
E MS Sound (AL)	2.4	2.7 (9.3)	1.9 (24.6)	29.5 (106.4)	9.6 (49.5)	18.4 (124.0)
Perdido Bay (AL)	0.3	1.3 (8.6)	0.1 (1.9)	1.6 (13.1)	1.4 (4.1)	5.4 (27.0)
Apalachicola Bay (FL)	18.4 (243.1)	40.5 (85.3)	14.8 (143.7)	9.8 (120.5)	10.3 (72.4)	93.6 (493.7)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	55.2 (346.3)	45.9 (141.2)	44.9(273.2)	17.8 (109.2)	3.5 (7.0)
E MS Sound (AL)	58.7 (120.9)	53.1(178.4)	17.8 (76.3)	17.7 (74.5)	3.1 (3.6)
Perdido Bay (AL)	0.5 (3.7)	1.3 (10.5)	1.7 (27.5)	0.8 (12.0)	0.2 (1.3)
Apalachicola Bay (FL)	15.9 (170.5)			27.3 (201.8)	10.1 (49.1)

Brevoortia patronus

The abundance pattern for Gulf menhaden (*Brevoortia patronus*) was generally consistent across the states with low values in summer and fall and a peak in late winter or in spring (Figure 75). The abundance values in Alabama were highest among the states with an overall mean (mean of 12 monthly means in Figure 75) of 88.4/ha, followed by Mississippi (86.7/ha), Louisiana (74.8/ha), Florida (5.5/ha) and Texas (4.8/ha).

The maximum length of Gulf menhaden recorded by Classen et al. (1988) was 390 mm; therefore all measurements in the database greater than 390 mm were excluded from this analysis. The length frequency distributions for Gulf menhaden in each state (Figure 76) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Gulf menhaden ranged in size from 10 – 341 mm (mean=92.8, SD=35.4) in Texas, 2 – 287 mm (mean=66.4, SD=36.3) in Louisiana, 22 – 275 mm (mean=66.5, SD=32.8) in Mississippi, 7 – 270 mm (mean=37.2, SD=22.9) in Alabama, and 16 – 327 mm (mean=55.9, SD=65.5) in Florida.

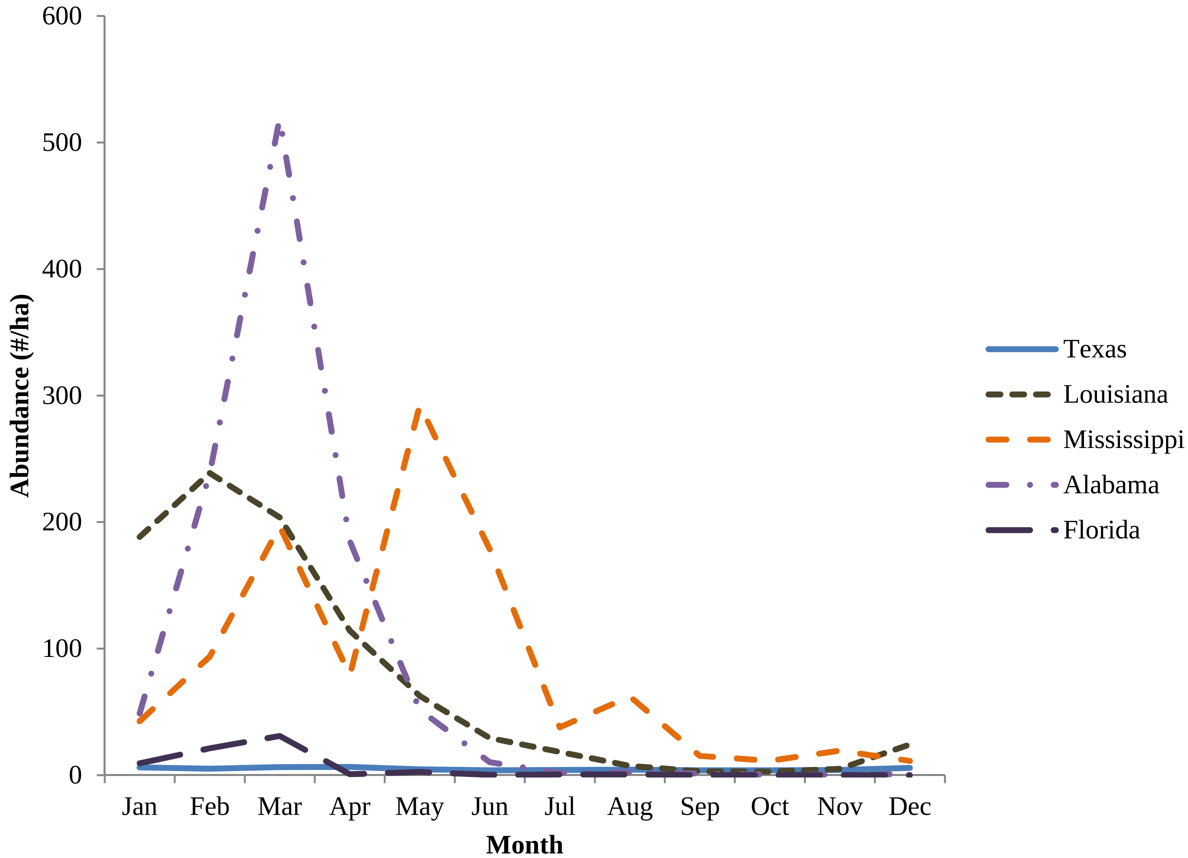

Figure 75. Monthly mean abundance of *Brevoortia patronus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

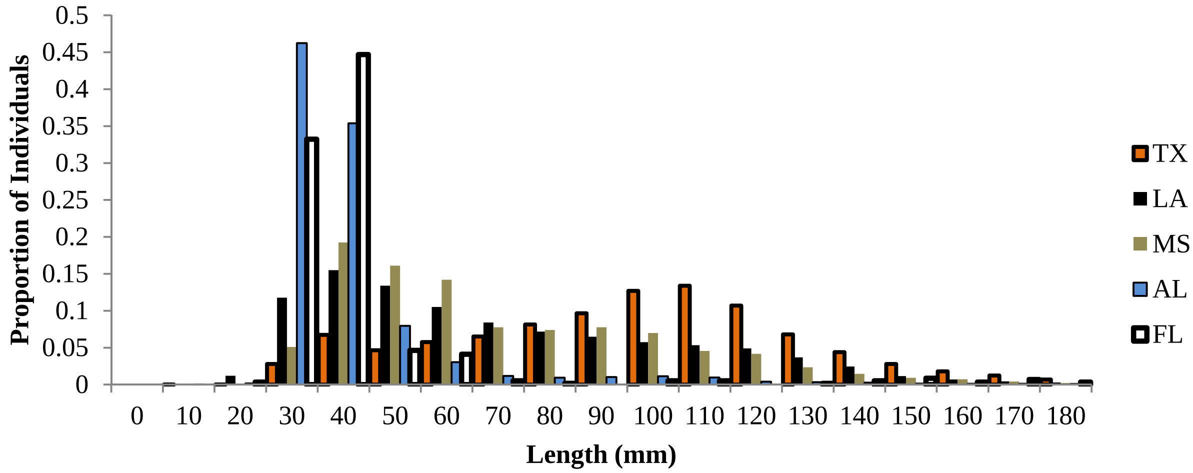

Figure 76. Length frequency of all Gulf menhaden (*Brevoortia patronus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=46,087): 1982 – 2005; Louisiana (n=24,266): 1986 – 2007; Mississippi (n=4,366): 1985 – 2005; Alabama (n=12,352): 1981 – 2007; and Florida (n=584): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

The seasonal pattern of abundance for Gulf menhaden in Texas showed a slightly higher mean abundance during winter and early spring; mean biomass values were relatively even throughout the year (Figure 77). The mean annual abundance and biomass peaked in 2002 (8.1/ha and 116.7 g/ha, respectively) (Figure 78). Within Texas, Gulf menhaden were primarily found in Galveston Bay, Matagorda Bay, Aransas Bay, and San Antonio Bay (Tables 39 and 40).

The seasonal variability of Gulf menhaden in Louisiana showed a peak of both mean abundance and biomass in late winter and early spring (Figure 79). Mean annual abundance was at its highest in 2007 (155.4/ha) and mean biomass was at its highest in 1988 (511.9 g/ha) (Figure 80). Gulf menhaden were primarily found in the western portion of the state, particularly Lake Calcasieu, Vermilion-Cote Blanche Bays, and Terrebonne-Timbalier Bays (Tables 41 and 42).

In Mississippi, the mean monthly abundance of Gulf menhaden peaked in May and June, but biomass peaked in January and August (Figure 81). The mean annual abundance was highly variable and peaked in 1994 (313.7/ha); biomass data were only available after 1984 and values peaked in 1988 (232.4 g/ha) (Figure 82).

Gulf menhaden mean abundance and biomass peaked in March in Alabama (Figure 83). A spike in mean biomass occurred in September, apparently due to catches of large Gulf menhaden during this month in 1998. Mean annual abundance was at its highest in 1984 (526.1/ha) and mean biomass was at its highest in 1998 (759.6 g/ha) (Figure 84). Length measurements were not available for the years 1987 – 1988. Gulf menhaden was primarily found in Mobile Bay and Perdido Bay (Tables 43 and 44).

The abundance of Gulf menhaden in Florida increased in winter to a peak in late winter/early spring. Biomass remained high until late spring and then peaked again in the fall (Figure 85). Annual variability was high, and mean biomass was highest in 1991 (68.7 g/ha), while mean abundance peaked in 2001 (53.4/ha) (Figure 86). Gulf menhaden were mainly found in Apalachicola Bay (Tables 43 and 44).

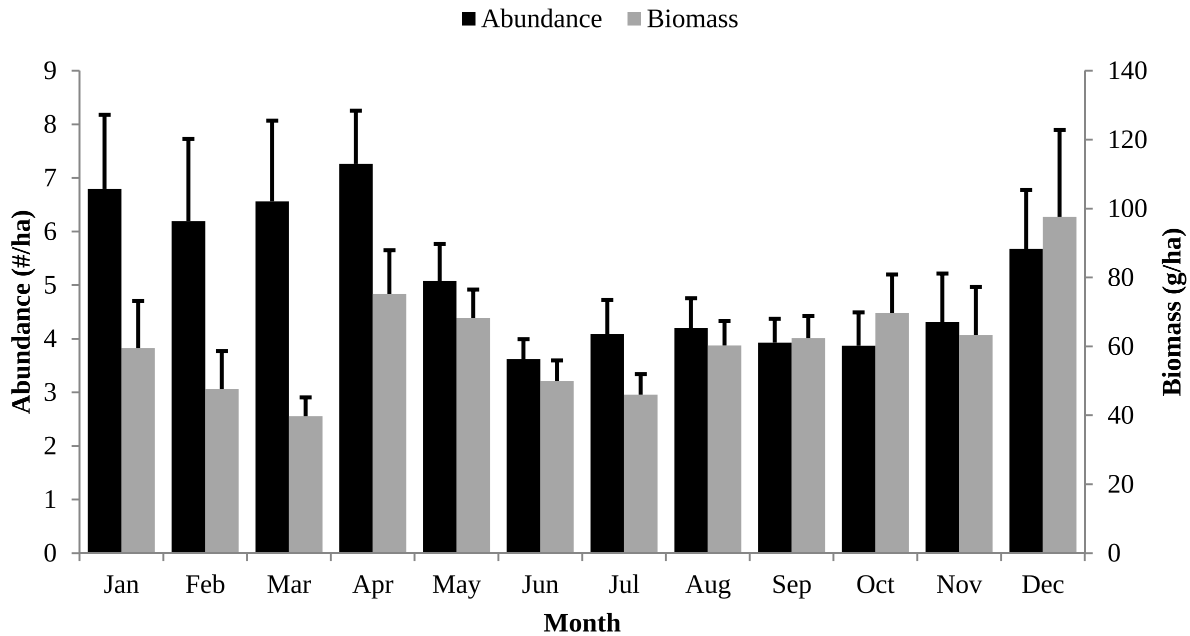

Figure 77. The monthly mean (+SE) abundance and biomass of *Brevoortia patronus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

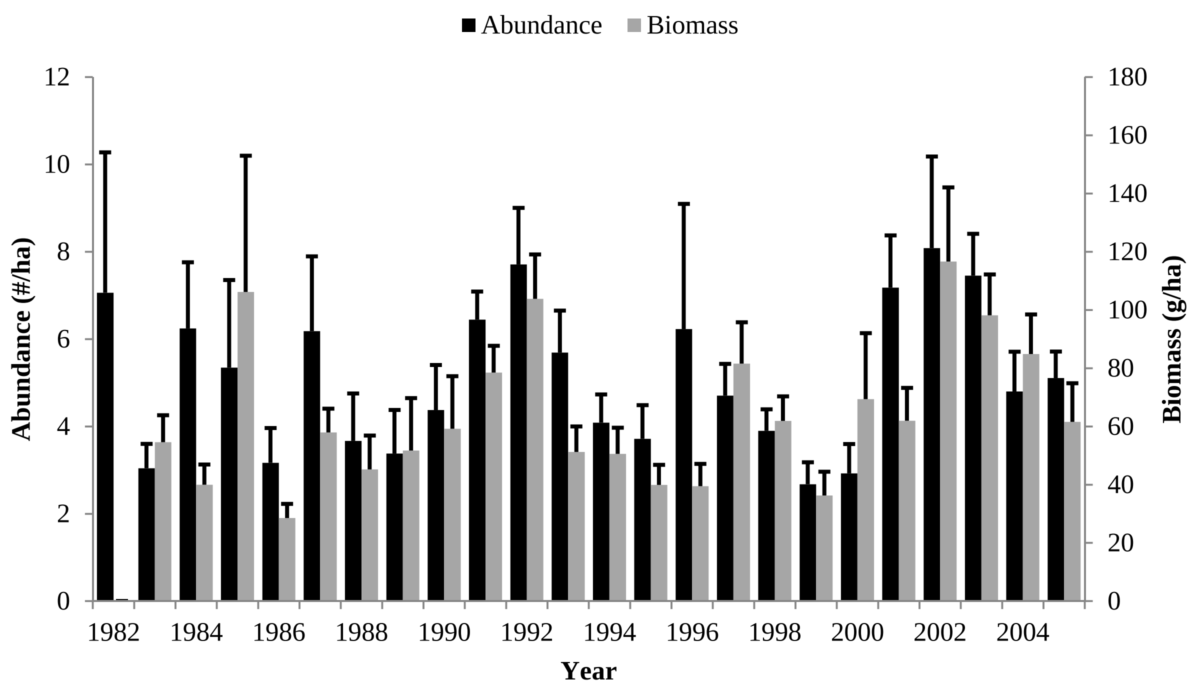

Figure 78. The mean (+SE) annual abundance and biomass of *Brevoortia patronus* across in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 39. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	0.0 (1.4)	0.1 (0.9)	0.0 (0.03)	0.3 (4.2)	0.1 (3.9)
Upper Laguna Madre	0.8 (9.4)	0.3 (2.1)	0.4 (0.5)	0.5 (2.3)	0.3 (2.1)
Corpus Christi Bay	0.5 (16.9)	0.7 (9.6)	0.9 (13.5)	3.2 (81.7)	1.5 (40.3)
Aransas Bay	7.1 (40.2)	9.4 (32.4)	14.0 (36.8)	14.7 (91.3)	8.1 (67.9)
San Antonio Bay	12.3 (84.8)	9.7 (83.4)	7.5 (35.5)	11.3 (44.9)	5.6 (60.1)
Matagorda Bay	12.3 (144.6)	4.5 (62.5)	3.2 (41.3)	6.2 (144.9)	5.4 (140.6)
East Matagorda Bay	2.7 (6.9)	1.9 (4.3)	10.3 (7.2)	2.8 (10.4)	2.6 (21.6)
Galveston Bay	9.7 (118.6)	10.3 (140.7)	13.5 (139.4)	10.2 (153.0)	10.1 (116.6)
Sabine Lake	0.8 (11.3)	2.1 (12.4)	4.0 (14.9)	5.9 (19.8)	5.5 (25.6)
	Jun	Jul	Aug	Sep	Oct
Lower Laguna Madre	0.2 (3.3)	0.1 (4.2)	0.0 (0.2)	0 (0)	0.0 (0.4)
Upper Laguna Madre	0.3 (3.3)	0.2 (0.7)	0.3 (6.7)	0.5 (7.0)	0.4 (7.0)
Corpus Christi Bay	1.3 (46.1)	1.6 (45.3)	2.1 (47.2)	2.2 (56.1)	2.5 (73.7)
Aransas Bay	4.3 (62.3)	4.3 (55.0)	3.4 (62.4)	6.4 (106.1)	5.8 (117.8)
San Antonio Bay	6.1 (59.4)	7.7 (57.5)	8.0 (78.4)	5.5 (57.2)	7.3 (71.3)
Matagorda Bay	3.6 (75.2)	3.4 (63.6)	2.4 (46.1)	6.2 (105.2)	4.3 (81.5)
East Matagorda Bay	3.3 (22.3)	2.5 (17.5)	1.7 (19.0)	1.2 (18.6)	1.2 (23.7)
Galveston Bay	5.9 (76.1)	9.2 (83.4)	11.5 (140.2)	5.6 (83.6)	5.1 (95.6)
Sabine Lake	4.5 (29.5)	2.1 (11.4)	2.2 (26.3)	1.5 (31.9)	2.3 (74.3)
	Nov	Dec	Mean	SE	
Lower Laguna Madre	0.0 (0.4)	0.0 (0.8)	0.1 (1.6)	0.0 (0.5)	
Upper Laguna Madre	0.2 (2.1)	0.2 (2.8)	0.4 (3.8)	0.1 (0.8)	
Corpus Christi Bay	1.0 (29.6)	2.4 (65.5)	1.7 (43.8)	0.2 (6.7)	
Aransas Bay	4.9 (101.7)	4.8 (115.8)	7.3 (74.1)	1.1 (9.0)	
San Antonio Bay	8.7 (92.8)	9.8 (103.5)	8.3 (69.1)	0.6 (5.8)	
Matagorda Bay	2.2 (38.9)	6.2 (105.2)	5.0 (87.5)	0.8 (11.5)	
East Matagorda Bay	2.6 (28.5)	3.8 (37.7)	3.1 (18.1)	0.7 (2.8)	
Galveston Bay	11.2 (150.3)	12.2 (219.1)	9.5 (126.4)	0.8 (11.6)	
Sabine Lake	1.7 (35.3)	3.3 (73.9)	3.0 (30.5)	0.5 (6.3)	

Table 40. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986
Lower Laguna Madre	0.1	0 (0)	0.1 (1.2)	0 (0)	0 (0)
Upper Laguna Madre	0.1	0.3 (2.5)	2.6 (16.2)	1.7 (20.0)	0.1 (0.2)
Corpus Christi Bay	0.8	1.4 (32.7)	1.9 (34.7)	0.7 (31.8)	0.3 (20.4)
Aransas Bay	11.1	1.4 (25.6)	20.8 (54.8)	5.2 (120.6)	3.8 (15.9)
San Antonio Bay	5.2	7.7 (77.6)	10.6 (42.5)	12.5 (113.5)	8.3 (40.4)
Matagorda Bay	4.7	4.4 (113.8)	1.4 (26.2)	4.8 (123.7)	1.6 (17.2)
Galveston Bay	5.4	3.3 (76.6)	1.5 (32.0)	8.1 (237.7)	7.9 (104.0)
Sabine Lake					0.1 (1.9)

Table 40 (continued).

	1987	1988	1989	1990	1991
Lower Laguna Madre	0 (0)	0.0 (0.8)	0.0 (0.4)	0.2 (3.1)	0.0 (0.5)
Upper Laguna Madre	0.0 (0.8)	0.4 (2.0)	0.1 (0.3)	1.1 (9.3)	0.7 (5.6)
Corpus Christi Bay	0.7 (22.9)	0.6 (17.8)	3.2 (65.8)	1.1 (23.7)	0.7 (22.1)
Aransas Bay	10.5 (60.9)	2.0 (43.8)	1.5 (13.1)	9.0 (147.9)	7.5 (90.4)
San Antonio Bay	15.9 (109.0)	5.2 (67.1)	9.8 (144.6)	11.1 (97.7)	16.0 (172.1)
Matagorda Bay	5.6 (86.8)	7.6 (101.0)	1.3 (24.4)	1.8 (44.2)	8.1 (120.3)
East Matagorda Bay	6.9 (61.1)	0.5 (5.2)	3.2 (39.2)	1.0 (10.0)	1.8 (15.7)
Galveston Bay	9.3 (108.2)	10.4 (87.3)	6.4 (108.4)	5.4 (84.1)	10.0 (119.0)
Sabine Lake	1.2 (19.5)	1.3 (18.3)	1.4 (11.6)	2.2 (11.1)	2.9 (29.4)

	1992	1993	1994	1995	1996
Lower Laguna Madre	0.3 (5.3)	0.1 (4.2)	0.2 (7.9)	0.2 (4.6)	0.0 (0.8)
Upper Laguna Madre	0.3 (5.9)	0.1 (2.0)	0.0 (2.0)	0.1 (2.1)	0.1 (0.6)
Corpus Christi Bay	1.2 (25.2)	1.6 (29.8)	2.3 (31.9)	0.9 (34.2)	0.8 (26.1)
Aransas Bay	17.6 (178.0)	7.7 (47.3)	1.4 (34.6)	3.0 (27.5)	19.2 (40.0)
San Antonio Bay	7.8 (91.5)	5.5 (27.7)	5.9 (43.8)	8.7 (19.0)	3.7 (42.3)
Matagorda Bay	14.6 (225.7)	4.7 (72.0)	3.2 (70.0)	1.4 (23.4)	2.7 (35.2)
East Matagorda Bay	3.1 (20.8)	2.6 (4.6)	2.0 (5.1)	0.7 (2.2)	13.4 (11.6)
Galveston Bay	10.5 (185.8)	18.3 (171.9)	13.9 (156.8)	11.0 (168.1)	6.7 (109.2)
Sabine Lake	0.8 (9.0)	1.1 (9.4)	1.8 (19.1)	0.9 (5.5)	7.5 (34.2)

	1997	1998	1999	2000	2001
Lower Laguna Madre	0.2 (6.0)	0.0 (0.01)	0 (0)	0.1 (2.3)	0 (0)
Upper Laguna Madre	0.1 (2.2)	0.2 (2.9)	0.1 (2.2)	0.1 (4.6)	0.0 (0.1)
Corpus Christi Bay	1.5 (46.0)	2.3 (64.5)	1.4 (31.2)	4.7 (145.4)	0.5 (14.1)
Aransas Bay	9.6 (159.1)	7.0 (104.6)	3.9 (39.4)	5.1 (143.2)	6.9 (41.4)
San Antonio Bay	4.3 (43.6)	4.9 (50.0)	2.0 (22.5)	1.2 (16.5)	8.7 (44.9)
Matagorda Bay	2.2 (55.5)	2.4 (54.0)	3.7 (79.3)	1.2 (42.2)	11.5 (174.0)
East Matagorda Bay	3.2 (24.0)	1.4 (9.2)	0.9 (9.2)	0.6 (4.5)	4.3 (22.1)
Galveston Bay	13.0 (244.9)	7.8 (145.8)	6.0 (64.8)	3.9 (75.5)	18.3 (137.3)
Sabine Lake	1.3 (11.7)	4.1 (16.5)	2.5 (21.5)	7.9 (114.0)	4.3 (21.9)

	2002	2003	2004	2005	Mean
Lower Laguna Madre	0.0 (0.01)	0 (0)	0.1 (1.4)	0.0 (0.4)	0.1 (1.6)
Upper Laguna Madre	0.0 (1.3)	0.1 (4.1)	0.0 (1.3)	0.1 (2.9)	0.4 (3.8)
Corpus Christi Bay	2.9 (105.6)	2.1 (99.0)	2.5 (79.4)	3.3 (36.3)	1.7 (43.4)
Aransas Bay	4.2 (109.5)	6.0 (74.7)	4.5 (125.2)	6.0 (81.9)	7.3 (74.1)
San Antonio Bay	18.6 (176.8)	17.2 (129.5)	3.5 (43.4)	5.0 (42.2)	8.3 (69.1)
Matagorda Bay	13.9 (237.8)	7.3 (122.7)	6.3 (155.7)	2.7 (61.6)	5.0 (86.1)
East Matagorda Bay	1.7 (37.2)	1.0 (13.5)	1.0 (14.5)	9.4 (48.6)	3.1 (18.9)
Galveston Bay	13.1 (154.8)	15.1 (151.2)	12.9 (162.1)	10.6 (147.8)	9.5 (126.4)
Sabine Lake	5.9 (25.6)	7.8 (120.0)	6.5 (39.3)	6.6 (71.0)	3.4 (30.5)

	SE
Lower Laguna Madre	0.0 (0.5)
Upper Laguna Madre	0.1 (1.0)
Corpus Christi Bay	0.2 (6.9)
Aransas Bay	1.1 (10.4)
San Antonio Bay	1.0 (10.1)
Matagorda Bay	0.8 (13.0)
East Matagorda Bay	0.8 (3.4)
Galveston Bay	0.9 (11.8)
Sabine Lake	0.6 (6.8)

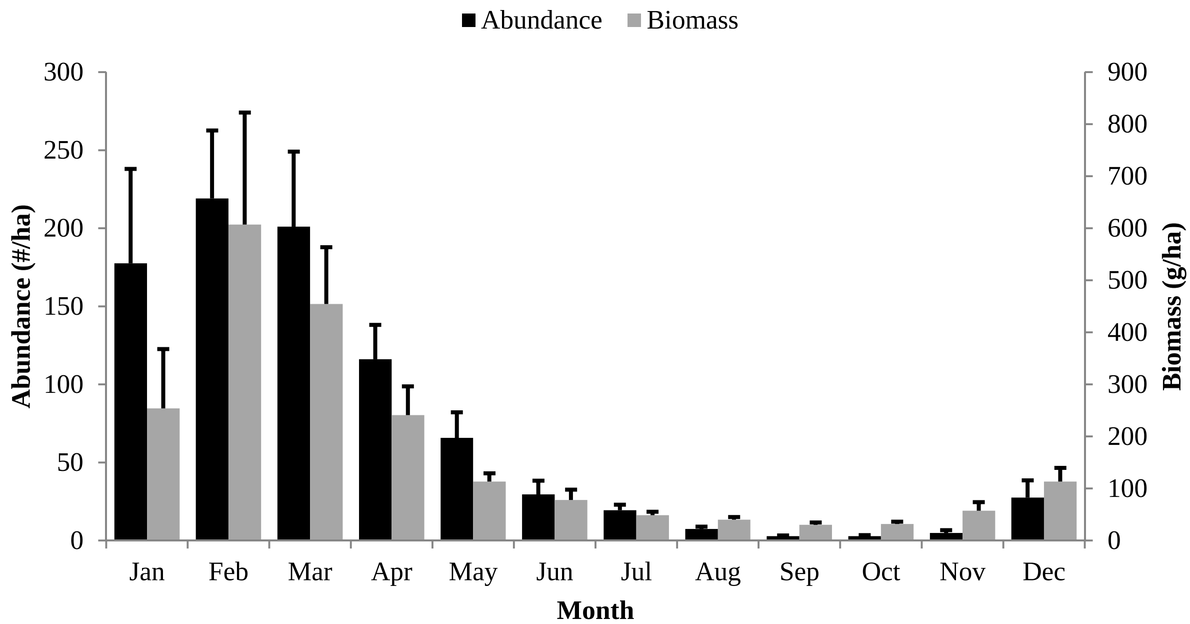

Figure 79. The monthly mean (+SE) abundance and biomass of *Brevoortia patronus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

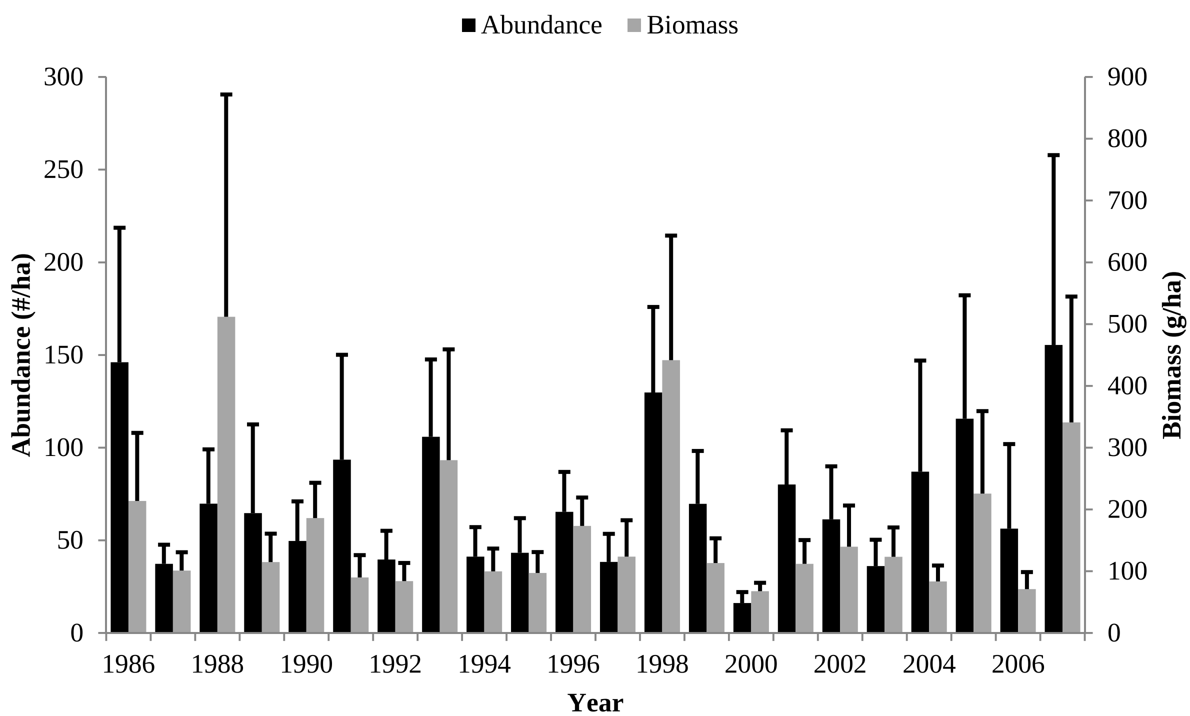

Figure 80. The mean (+SE) annual abundance and biomass of *Brevoortia patronus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 41. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	910.4 (359.6)	521.0 (332.0)	773.0 (751.0)	558.4 (769.5)
Vermilion-Cote Blanche Bays	166.5 (801.8)	76.1 (312.2)	212.7 (705.9)	86.5 (299.2)
Terrebonne-Timbalier Bays	157.5 (157.6)	508.0 (1628.0)	232.4 (783.2)	120.9 (364.7)
Barataria Bay	17.8 (111.1)	2.9 (37.0)	1.6 (15.5)	1.4 (8.9)
Breton-Chandeleur Sounds	3.3 (13.3)	4.3 (13.9)	14.2 (75.8)	11.5 (50.0)
Lake Borgne	4.9 (8.3)	6.1 (21.4)	59.6 (76.0)	34.6 (56.0)
	May	Jun	Jul	Aug
Lake Calcasieu	333.3 (418.5)	132.4 (331.6)	86.6 (166.5)	13.4 (55.6)
Vermilion-Cote Blanche Bays	58.3 (103.0)	28.5 (70.4)	16.4 (32.0)	5.7 (38.6)
Terrebonne-Timbalier Bays	49.2 (136.9)	28.3 (80.2)	15.9 (60.5)	10.4 (71.7)
Barataria Bay	1.0 (21.1)	0.9 (6.7)	1.0 (7.8)	0.9 (7.1)
Breton-Chandeleur Sounds	9.4 (29.9)	4.0 (23.9)	10.9 (27.3)	1.2 (14.6)
Lake Borgne	21.6 (43.1)	21.1 (22.1)	13.1 (36.3)	22.7 (48.4)
	Sep	Oct	Nov	Dec
Lake Calcasieu	6.2 (37.0)	2.2 (21.6)	3.0 (25.2)	132.7 (291.9)
Vermilion-Cote Blanche Bays	3.3 (32.5)	4.1 (53.8)	16.2 (187.5)	69.3 (283.5)
Terrebonne-Timbalier Bays	4.5 (56.7)	5.0 (47.6)	3.5 (43.6)	6.4 (42.1)
Barataria Bay	0.4 (6.1)	1.3 (19.2)	1.0 (13.6)	4.2 (31.6)
Breton-Chandeleur Sounds	1.0 (14.2)	1.1 (13.9)	0.8 (10.0)	1.7 (25.7)
Lake Borgne	1.6 (127.8)	0.5 (6.4)	0.2 (1.2)	0.7 (6.0)
	Mean	SE		
Lake Calcasieu	289.4 (296.7)	93.7 (75.0)		
Vermilion-Cote Blanche Bays	62.0 (243.4)	19.4 (75.6)		
Terrebonne-Timbalier Bays	95.1 (289.4)	43.2 (136.5)		
Barataria Bay	2.8 (23.8)	1.4 (8.4)		
Breton-Chandeleur Sounds	5.3 (26.0)	1.4 (5.5)		
Lake Borgne	15.6 (28.2)	5.2 (6.8)		

Table 42. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990
Lake Calcasieu	533.5 (324.3)	131.7 (107.8)	252.2 (159.4)	161.1 (27.1)	139.9 (147.0)
Vermilion-Cote Blanche Bays	269.4 (845.4)	126.7(221.6)	64.4 (482.8)	170.5 (469.1)	76.7 (406.0)
Terrebonne-Timbalier Bays	84.9 (105.8)	19.5 (122.2)	102.9 (1241.3)	27.3 (110.0)	61.0 (290.9)
Barataria Bay	0.9 (7.2)	6.4 (47.4)	4.3 (37.3)	1.2 (30.8)	1.0 (16.1)
Breton-Chandeleur Sounds	0.6 (22.2)	1.0 (11.0)	0.8 (9.8)	1.7 (8.1)	3.0 (25.9)
Lake Borgne	6.3 (10.2)	6.4 (15.5)	7.2 (10.8)	16.3 (26.2)	5.0 (9.2)
	1991	1992	1993	1994	1995
Lake Calcasieu	200.6 (69.4)	143.8 (91.6)	239.2 (118.9)	115.2 (149.2)	167.0 (334.5)
Vermilion-Cote Blanche Bays	18.3 (48.4)	21.2 (123.3)	66.9 (127.1)	17.5 (47.7)	34.0 (44.0)
Terrebonne-Timbalier Bays	230.3 (218.3)	40.2 (141.5)	227.8 (783.3)	68.3 (206.7)	39.1 (104.4)
Barataria Bay	0.4 (6.4)	2.1 (3.5)	7.0 (50.1)	0.5 (7.0)	4.1 (56.5)
Breton-Chandeleur Sounds	1.3 (11.5)	12.4 (28.3)	14.4 (11.6)	2.4 (25.5)	2.0 (8.1)
Lake Borgne	4.2 (12.2)	87.5 (96.7)	33.5 (51.2)	46.6 (75.1)	14.2 (47.0)
	1996	1997	1998	1999	2000
Lake Calcasieu	229.1 (458.2)	164.4 (206.0)	542.6 (1299.2)	217.5 (201.0)	43.1 (152.1)
Vermilion-Cote Blanche Bays	49.1 (87.1)	19.8 (185.4)	66.1 (119.7)	43.1 (87.6)	32.3 (127.8)
Terrebonne-Timbalier Bays	111.8 (411.6)	47.3 (197.9)	198.7 (931.9)	118.3 (214.7)	7.4 (46.5)
Barataria Bay	10.8 (57.8)	1.0 (8.1)	1.2 (17.0)	10.7 (57.7)	2.9 (31.2)
Breton-Chandeleur Sounds	2.1 (19.6)	2.5 (26.2)	5.6(15.1)	20.6 (43.7)	4.0 (21.3)
Lake Borgne	10.3 (25.0)	14.1 (25.1)	2.6 (47.5)	7.4 (10.3)	13.1 (35.0)
	2001	2002	2003	2004	2005
Lake Calcasieu	320.4 (446.8)	348.8 (265.0)	162.3 (426.1)	454.5 (321.1)	778.7 (834.7)
Vermilion-Cote Blanche Bays	22.8 (106.1)	17.4 (112.0)	21.3 (195.9)	17.1 (63.9)	13.0 (31.4)
Terrebonne-Timbalier Bays	123.1 (106.7)	65.6 (246.8)	45.9 (93.2)	103.3 (116.1)	88.0 (339.4)
Barataria Bay	0.3 (4.5)	2.5 (47.5)	1.6 (17.9)	1.0 (13.7)	0.8 (14.4)
Breton-Chandeleur Sounds	12.9 (24.4)	7.1 (62.6)	4.7 (85.1)	5.2 (28.4)	3.9 (30.4)
Lake Borgne	5.5 (12.5)	17.2 (37.3)	14.4 (22.8)	8.7 (10.5)	12.1 (29.4)
	2006	2007	Mean	SE	
Lake Calcasieu	38.3 (38.4)	1018.2 (293.8)	291.0 (295.1)	51.6 (61.7)	
Vermilion-Cote Blanche Bays	28.1 (113.7)	167.3 (1308.3)	62.0 (243.4)	14.0 (65.6)	
Terrebonne-Timbalier Bays	165.9 (146.6)	116.7 (191.3)	95.1 (289.4)	13.6 (64.9)	
Barataria Bay	0.9 (10.5)	1.0 (12.2)	2.8 (23.8)	0.7 (4.0)	
Breton-Chandeleur Sounds	2.6 (10.5)	5.2 (13.0)	5.3 (26.0)	1.1 (4.2)	
Lake Borgne	5.6 (6.3)	9.7 (7.2)	15.8 (28.3)	4.0 (5.0)	

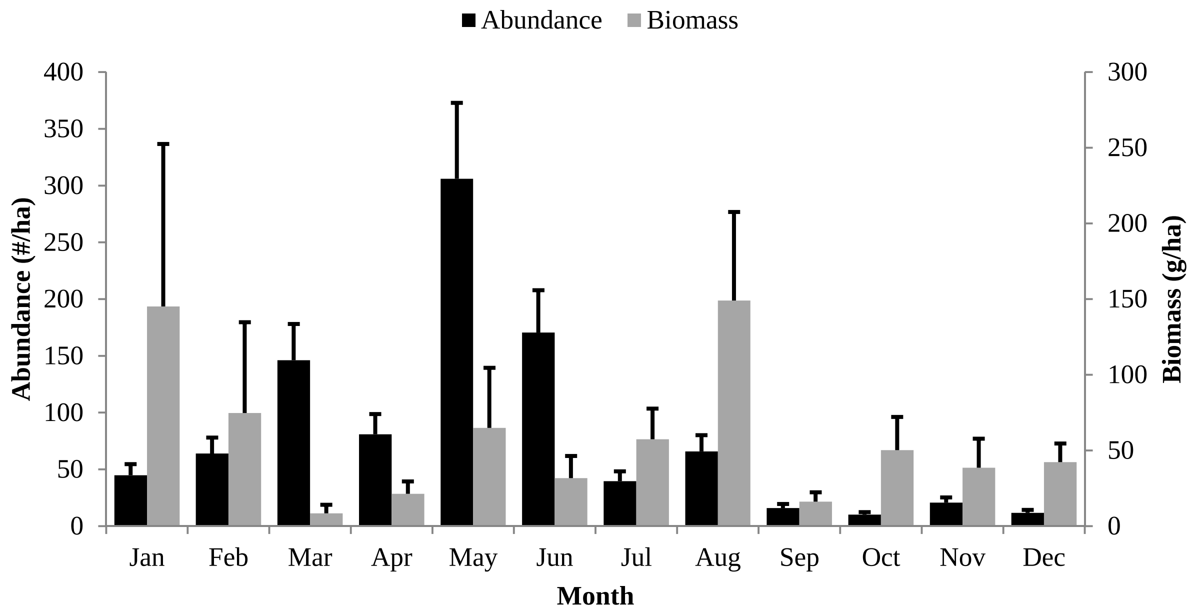

Figure 81. The monthly mean (+SE) abundance and biomass of *Brevoortia patronus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *B. patronus* length measurements were not recorded until 1985.

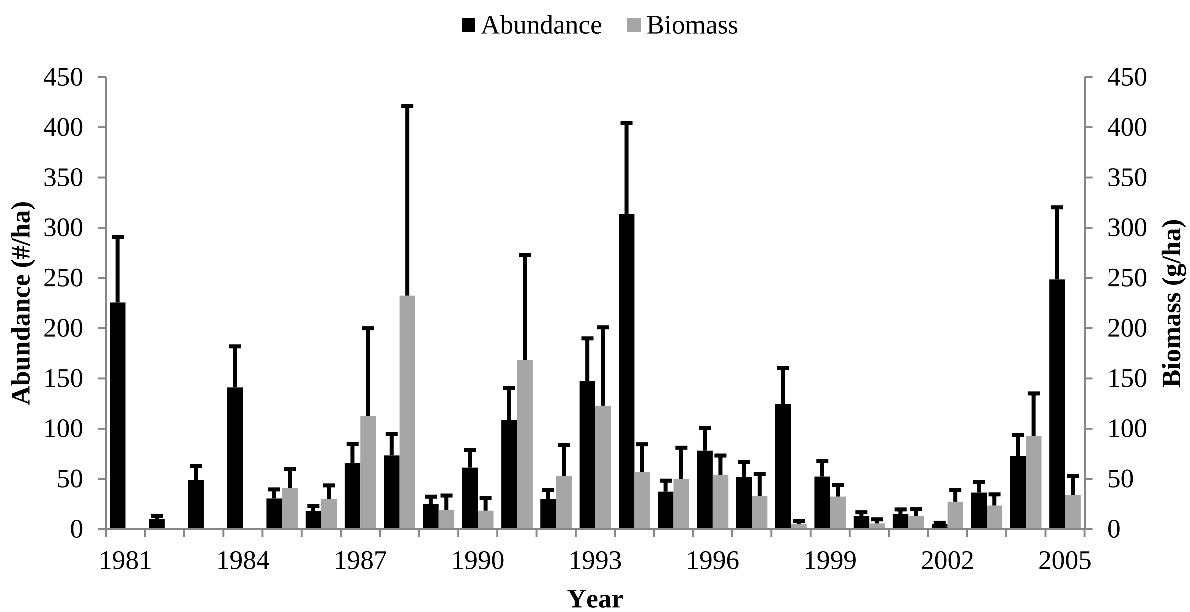

Figure 82. The mean (+SE) annual abundance and biomass of *Brevoortia patronus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *B. patronus* length measurements were not recorded until 1985.

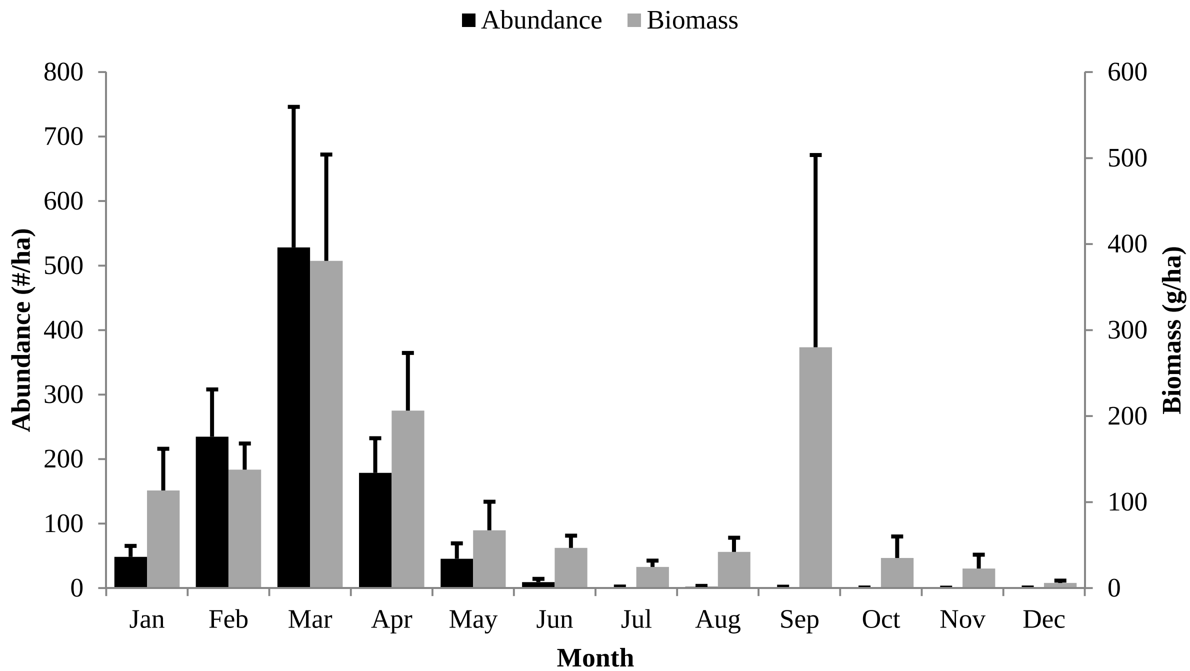

Figure 83. The monthly mean (+SE) abundance and biomass of *Brevoortia patronus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length measurements of *B. patronus* were not available for the years 1987 – 1988.

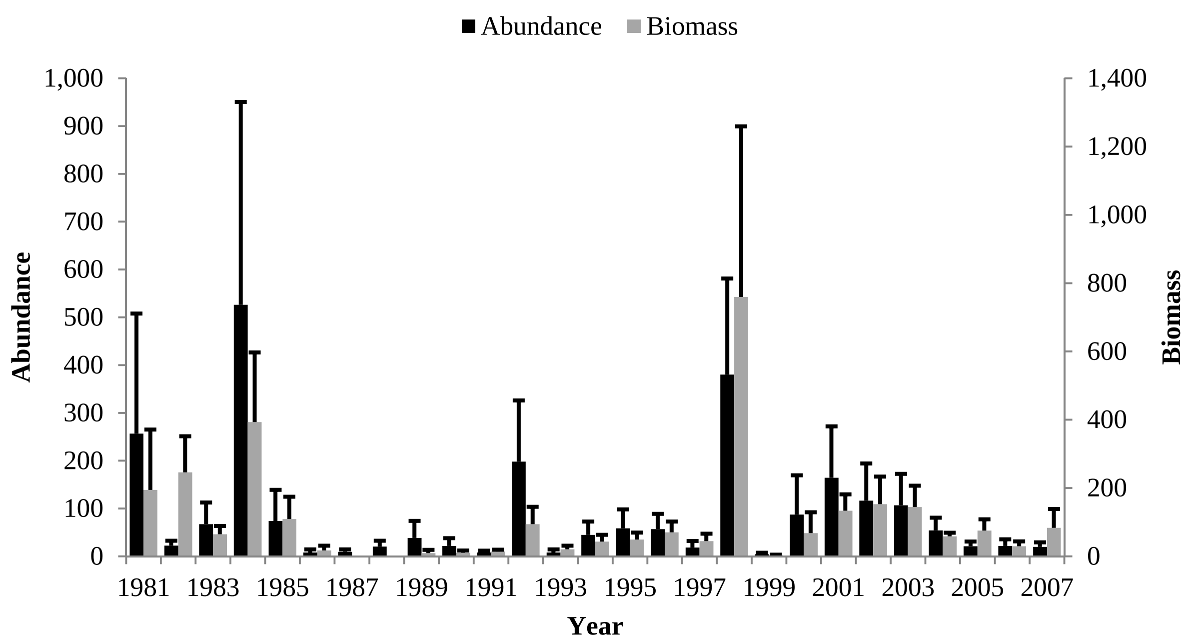

Figure 84. The mean (+SE) annual abundance and biomass of *Brevoortia patronus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements of *B. patronus* were not available for the years 1987 – 1988.

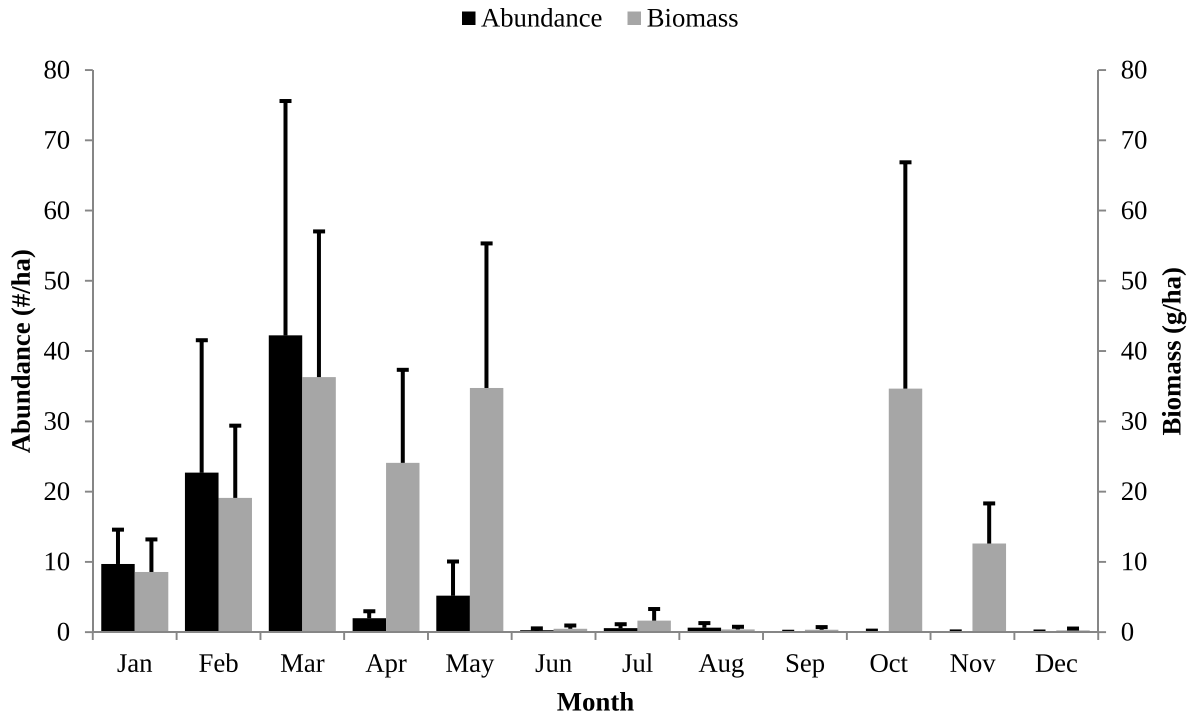

Figure 85. The monthly mean (+SE) abundance and biomass of *Brevoortia patronus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

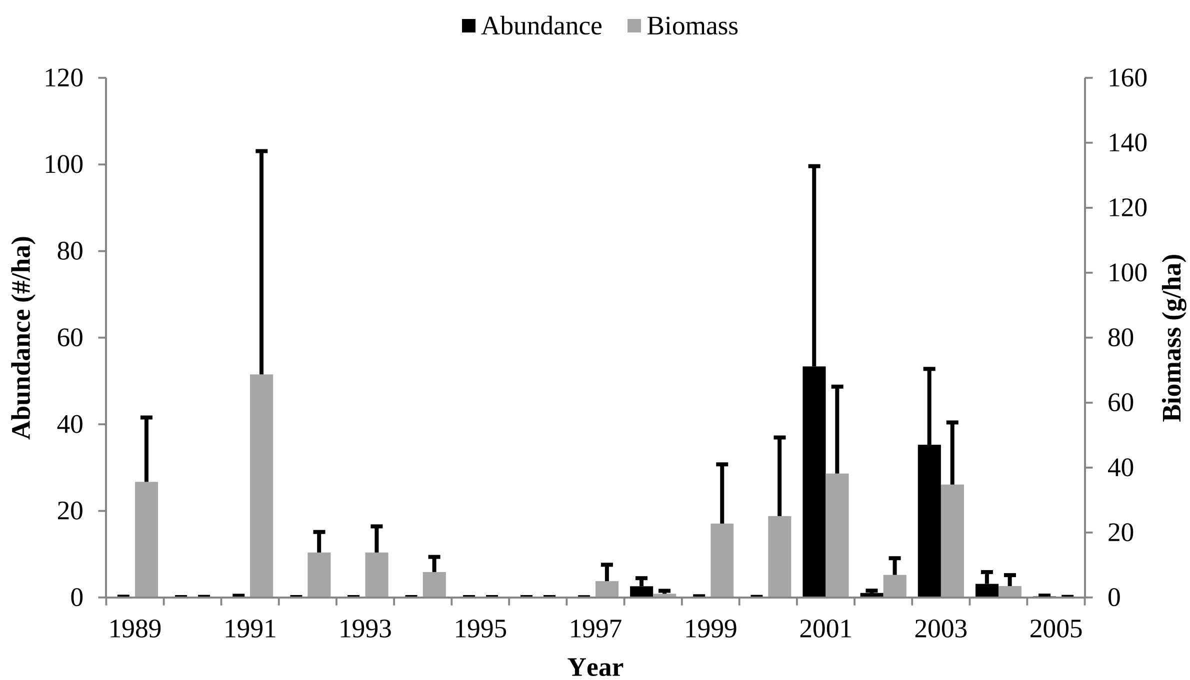

Figure 86. The mean (+SE) annual abundance and biomass of *Brevoortia patronus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 43. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	61.9 (137.8)	275.2 (164.9)	582.1 (326.7)	248.0 (288.0)	48.5 (74.5)
E MS Sound (AL)	20.9 (66.2)	21.7 (25.3)	213.0 (252.8)	15.2 (22.5)	39.8 (55.8)
Perdido Bay (AL)	30.6 (71.4)	407.4 (247.0)	283.0 (297.7)	177.7 (185.1)	14.6 (25.8)
Apalachicola Bay (FL)	17.8 (17.1)	42.4 (22.7)	113.9 (67.3)	5.5 (39.9)	14.4 (73.2)
Suwannee Sound (FL)	0.1 (0.0)	0 (0)	0 (0)	0 (0)	0 (0)
Cedar Key (FL)	0 (0)	0.4 (144.9)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0.1 (20.0)	0.1 (22.6)	0.1 (12.9)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (0.0)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Mobile Bay (AL)	7.3 (51.1)	1.6 (33.1)	3.0 (62.6)	1.1 (75.7)	0.2 (8.2)
E MS Sound (AL)	14.7 (51.4)	0.1 (8.3)	0.0 (1.0)	0.9 (258.5)	0.4 (145.8)
Perdido Bay (AL)	0.6 (8.2)	4.1 (14.2)	0.4 (9.1)	1.5 (36.8)	0.3 (5.5)
Apalachicola Bay (FL)	0.6 (1.1)	0.9 (2.7)	1.2 (0.7)	0.0 (0.9)	0 (0)
Suwannee Sound (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0.1 (8.9)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0.0 (0.0)	0.1 (61.8)
	Nov	**Dec**	**Mean**	**SE**	
Mobile Bay (AL)	0.4 (32.5)	0.7 (9.7)	102.5 (105.4)	52.0 (30.5)	
E MS Sound (AL)	0 (0)	1.6 (0.6)	27.4 (74.0)	17.3 (27.2)	
Perdido Bay (AL)	0.8 (13.0)	0.2 (3.3)	76.8 (76.4)	39.7 (30.3)	
Apalachicola Bay (FL)	0.0 (19.5)	0.0 (0.6)	16.4 (20.5)	9.6 (7.6)	
Suwannee Sound (FL)	0 (0)	0 (0)	0.0 (0.0)	0.0 (0.0)	
Cedar Key (FL)	0 (0)	0 (0)	0.0 (8.6)	0.0 (8.6)	
Tampa Bay (FL)	0.1 (12.7)	0 (0)	0.0 (6.4)	0.0 (2.5)	
Charlotte Harbor (FL)	0.0 (5.6)	0 (0)	0.0 (5.6)	0.0 (5.1)	

Table 44. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Brevoortia patronus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985	1986	1987	1988
Mobile Bay (AL)	17.6 (48.5)	15.7 (166.3)	59.4 (84.4)	776.7 (555.3)	119.4 (163.8)	11.4 (28.8)	8.7	4.9
E MS Sound (AL)	376.0 (270.1)	30.3 (348.6)	85.1 (39.2)	129.2 (147.8)	5.1 (30.3)	2.0 (0.7)	2.3	0.1
Perdido Bay (AL)		0 (0)	25.3 (12.6)	51.5 (97.9)	7.2 (16.1)	7.8 (3.4)	14.4	83.8

	1989	1990	1991	1992	1993	1994	1995	1996
Mobile Bay (AL)	35.6 (14.1)	19.1 (0.6)	7.2 (13.3)	315.9 (145.6)	2.0 (19.2)	75.1 (62.8)	59.9 (36.7)	76.0 (98.6)
E MS Sound (AL)	16.0	4.7 (1.3)	5.7 (17.5)	11.7 (14.4)	1.2 (11.5)	2.3 (33.2)	15.8 (7.6)	1.4 (3.1)
Perdido Bay (AL)	79.8	38.6 (38.7)	12.0 (11.6)	30.3 (17.8)	39.8 (40.4)	1.6 (0.8)	97.5 (115.4)	68.4 (52.3)
Suwannee Sound (FL)								0 (0)
Cedar Key (FL)								0 (0)
Tampa Bay (FL)	0.2 (48.9)	0.01 (0.2)	0.1 (9.0)	0.0 (10.9)	0.1 (23.1)	0.1 (14.8)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0.6 (262.7)	0.1 (15.9)	0.1 (0.0)	0.0 (0.0)	0 (0)	0 (0)

	1997	1998	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	5.6 (50.6)	575.2 (350.2)	6.1 (3.8)	124.4 (97.2)	170.8 (136.6)	140.8 (215.5)	112.3 (81.4)	66.7 (71.9)
E MS Sound (AL)	0.4 (0.1)	32.2 (639.5)	0.2 (0.1)	0.5 (0.2)	4.3 (46.4)	2.5 (13.4)	18.2 (254.9)	3.4 (1.8)
Perdido Bay (AL)	71.2 (70.4)	426.8 (379.0)	0 (0)	32.3 (21.0)	303.3 (226.4)	141.8 (74.8)	193.5 (251.4)	61.9 (63.6)
Apalachicola Bay (FL)		2.6 (1.2)	0.1 (18.0)	0.1 (24.2)	67.0 (48.9)	1.5 (15.3)	48.2 (45.8)	6.1 (6.9)
Suwannee Sound (FL)	0.1 (0.02)				0 (0)	0 (0)	0 (0)	0 (0)
Cedar Key (FL)	0.2 (60.4)				0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0.4 (60.7)	0.4 (13.9)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	25.9 (82.9)	12.6 (20.9)	26.4 (110.5)	106.3 (98.5)	37.6 (4.5)
E MS Sound (AL)	1.0 (0.6)	16.4 (8.6)	0.6 (17.4)	28.5 (70.7)	15.7 (5.4)
Perdido Bay (AL)	20.3 (114.3)	68.0 (83.3)	0.9 (1.7)	72.2 (65.1)	20.7 (3.5)
Apalachicola Bay (FL)	1.0 (0.4)			15.8 (20.1)	9.3 (6.6)
Suwannee Sound (FL)	0 (0)			0.0 (0.0)	0.0 (0.0)
Cedar Key (FL)	0 (0)			0.0 (8.6)	0.0 (8.6)
Tampa Bay (FL)	0 (0)			0.1 (10.7)	0.0 (4.4)
Charlotte Harbor (FL)	0 (0)			0.0 (16.4)	0.0 (15.4)

Lagodon rhomboides

The seasonal abundance patterns for pinfish (*Lagodon rhomboides*) were not consistent across the Gulf (Figure 87). Mean overall abundance (mean of 12 monthly means in Figure 87) was highest in Florida at 54.8/ha, followed by Alabama (52.9/ha), Texas (29.2/ha), Louisiana (0.6/ha), and Mississippi (0.6/ha).

The maximum length of a pinfish recorded by Muncy (1984) was 400 mm; therefore all measurements in the database greater than 400 mm were excluded from this analysis. The length frequency distributions for pinfish in each state (Figure 88) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Pinfish ranged in size from 9 – 339 mm (mean=112.7, SD=21.8) in Texas, 17 – 342 mm (mean=100.8, SD=26.5) in Louisiana, 7 – 256 mm (mean=69.8, SD=37.7) in Alabama, and 13 – 272 mm (mean=111.7, SD=34.3) in Florida. Pinfish length measurements were not recorded in Mississippi.

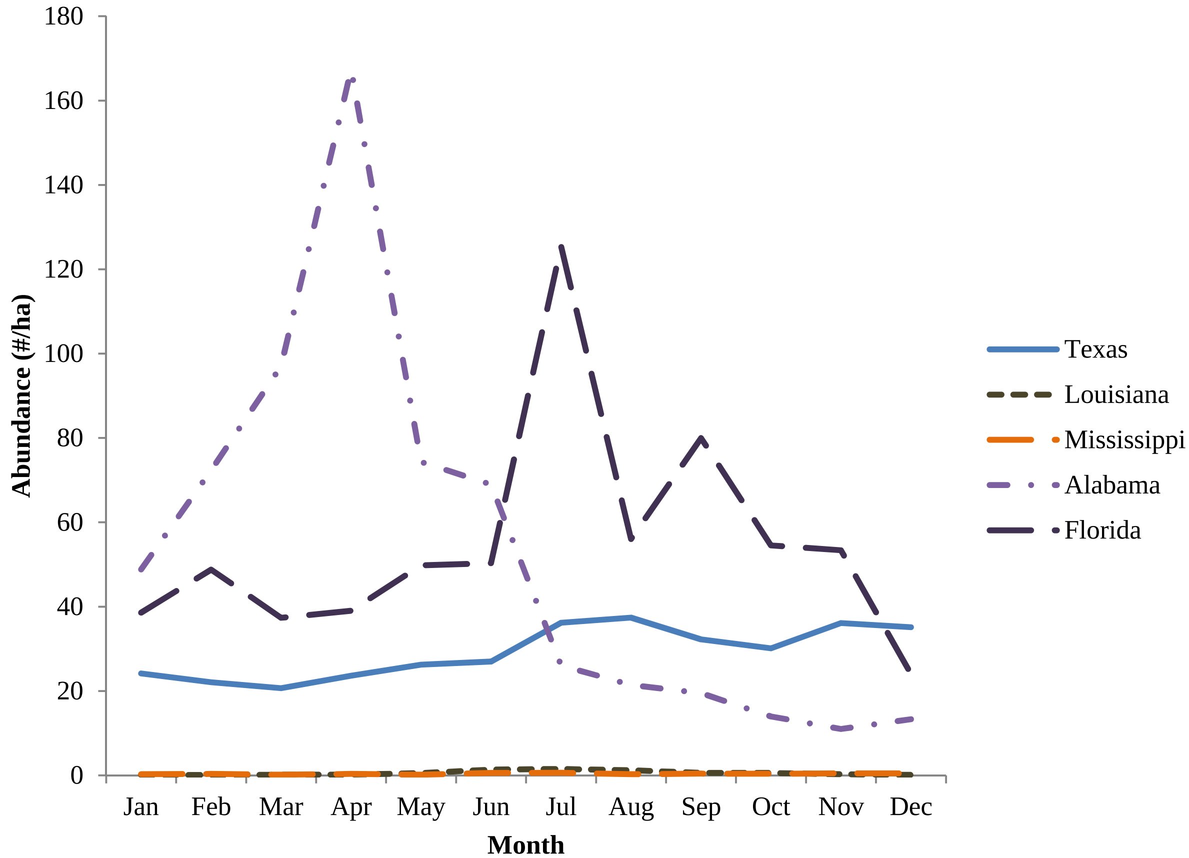

Figure 87. Monthly mean abundance of *Lagodon rhomboides* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

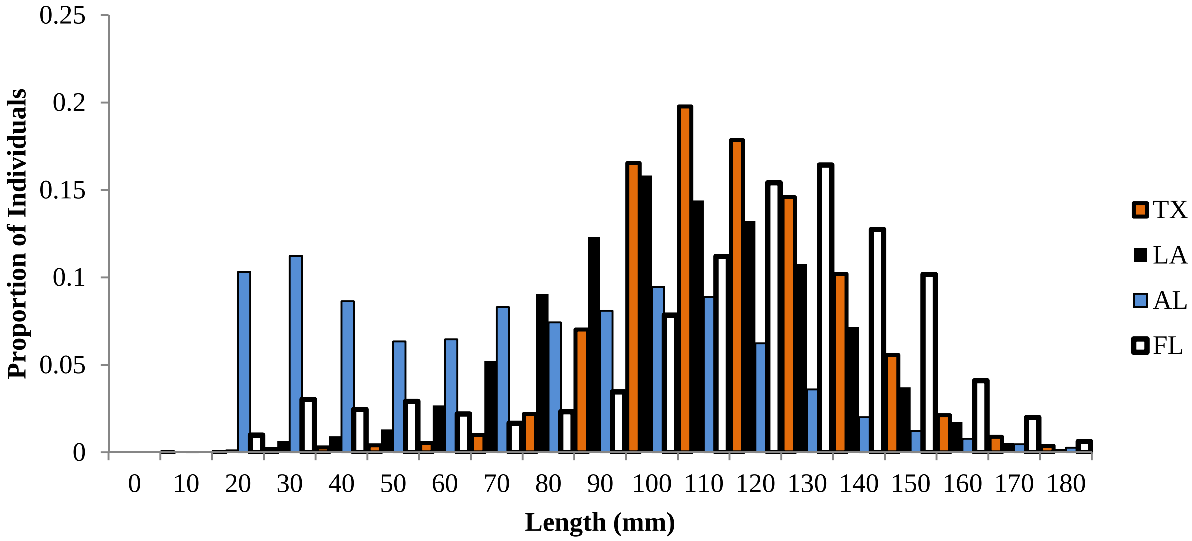

Figure 88. Length frequency of all pinfish (*Lagodon rhomboides*) measured as part of the fishery-independent monitoring programs in four of the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=149,702): 1982 – 2005; Louisiana (n=3,576): 1986 – 2007; Alabama (n=15,505): 1981 – 2007; and Florida (n=18,675): 1989 – 2005 (n-values represent the number of individuals measured). *L. rhomboides* length measurements were not recorded in Mississippi. Lengths are combined into 10-mm bins.

In Texas, pinfish mean abundance and biomass were relatively even throughout the year with slightly higher mean values in the summer and fall (Figure 89). The mean annual abundance was at its highest point in 2002 (48.4/ha), but mean biomass was highest in 1999 (1,135.4 g/ha) (Figure 90). In Texas, pinfish mean abundance and biomass were highest in Corpus Christi Bay and Lower Laguna Madre (Tables 45 and 46).

In Louisiana, a definite seasonality could be seen in the abundance and biomass of pinfish. Values were low in the winter and spring and mean abundance peaked in July followed by a biomass peak in August (Figure 91). The mean annual abundance and biomass peaked in 2006 (2.5/ha and 31.1 g/ha, respectively) (Figure 92). The highest mean abundance and biomass were found in Lake Calcasieu (Tables 47 and 48).

Length measurements of pinfish were not recorded in Mississippi, so no biomass data are available for the state. The abundance values were low year round in Mississippi, with the highest monthly mean abundance seen in June and July (Figure 93). The highest mean annual abundance occurred in 1985 (2.7/ha) (Figure 94).

Seasonality could be seen in both abundance and biomass of pinfish in Alabama. Mean abundance peaked in April, and biomass remained relatively high from April through December (Figure 95). Mean annual abundance and biomass both peaked in 2001 (364.4/ha and 1,178.2 g/ha, respectively) (Figure 96). Length data were not available for the years 1986 – 1988. Pinfish abundance was highest in Mobile Bay and Perdido Bay (Tables 49 and 50).

There also was some seasonal variability of pinfish biomass and abundance in Florida, with the highest mean values occurring in summer and fall (Figure 97). The mean annual abundance and biomass peaked in 2004 (161.9/ha and 6,210.5 g/ha, respectively) (Figure 98). Charlotte Harbor and Cedar Key had the highest mean abundance and biomass of pinfish in Florida (Tables 49 and 50).

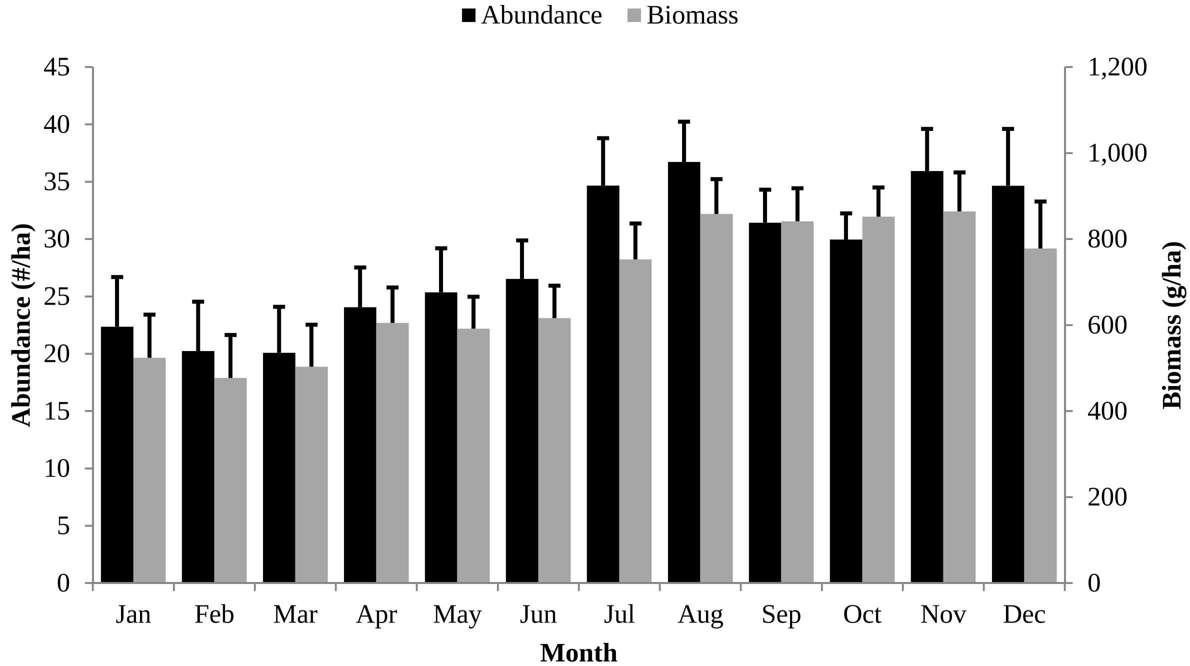

Figure 89. The monthly mean (+SE) abundance and biomass of *Lagodon rhomboides* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

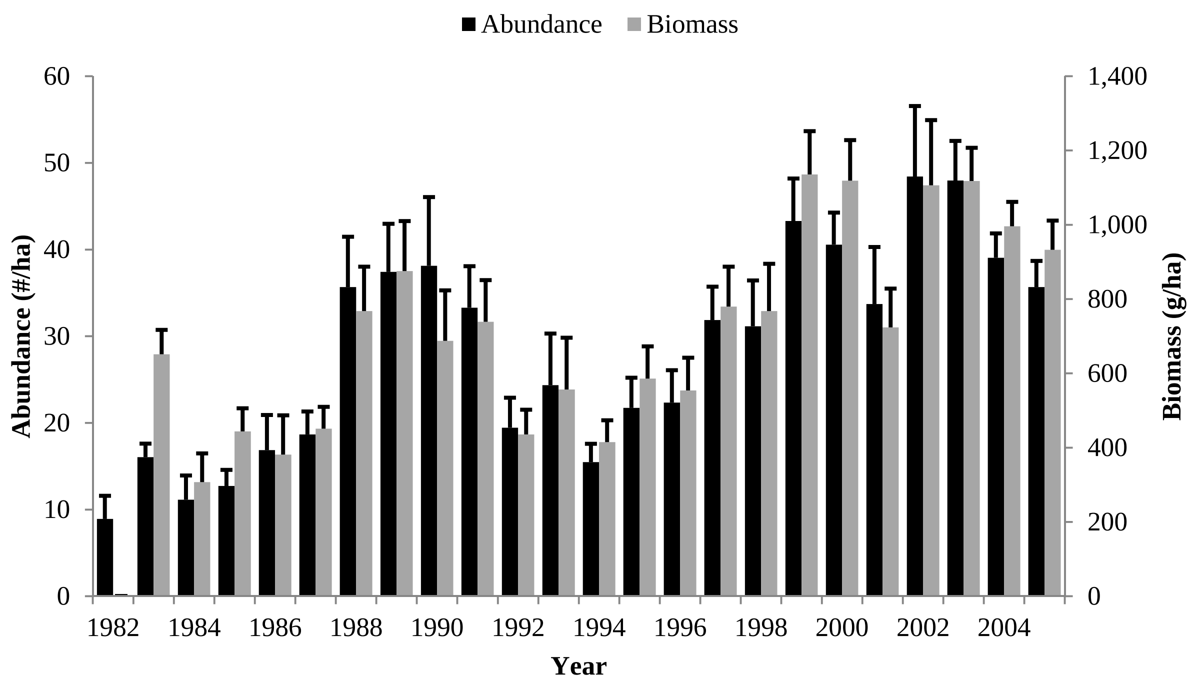

Figure 90. The mean (+SE) annual abundance and biomass of *Lagodon rhomboides* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 45. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	37.5 (804.6)	40.6 (899.5)	41.0 (880.9)	46.3 (1009.1)
Upper Laguna Madre	9.0 (185.4)	6.3 (138.0)	6.2 (157.0)	11.7 (296.2)
Corpus Christi Bay	116.7 (2869.2)	108.4 (2690.8)	104.2 (2743.1)	123.0 (3278.2)
Aransas Bay	18.6 (336.0)	12.6 (211.0)	12.6 (247.7)	16.9 (334.6)
San Antonio Bay	2.2 (37.4)	2.0 (33.4)	2.5 (44.8)	3.0 (48.4)
Matagorda Bay	2.6 (39.7)	1.3 (21.9)	2.1 (44.8)	2.8 (65.8)
East Matagorda Bay	0.4 (13.3)	0.1 (6.1)	0.2 (7.4)	0.1 (4.2)
Galveston Bay	0.3 (15.5)	0.3 (12.0)	0.4 (14.7)	0.4 (8.4)
Sabine Lake	0.1 (3.7)	0.1 (2.4)	0.02 (0.3)	0.01 (1.1)
	May	**Jun**	**Jul**	**Aug**
Lower Laguna Madre	83.4 (1115.3)	54.1 (1181.6)	50.2 (993.6)	64.8 (1539.6)
Upper Laguna Madre	11.9 (361.8)	26.0 (512.2)	26.8 (636.4)	37.2 (855.8)
Corpus Christi Bay	97.3 (2736.9)	92.0 (2644.4)	97.9 (2538.7)	85.7 (2402.0)
Aransas Bay	20.3 (441.3)	24.5 (417.7)	56.9 (1072.8)	66.8 (1331.6)
San Antonio Bay	8.2 (105.9)	21.1 (271.0)	30.2 (489.0)	31.3 (553.1)
Matagorda Bay	3.4 (87.6)	4.2 (73.6)	13.4 (233.3)	14.6 (295.9)
East Matagorda Bay	0.4 (5.3)	0.7 (10.6)	2.3 (30.5)	2.6 (43.4)
Galveston Bay	0.7 (15.4)	2.9 (44.0)	3.3 (69.2)	2.4 (66.6)
Sabine Lake	0.1 (1.4)	1.4 (20.0)	4.1 (94.2)	6.3 (174.1)
	Sep	**Oct**	**Nov**	**Dec**
Lower Laguna Madre	48.7 (1256.0)	62.2 (1695.6)	77.7 (1793.7)	44.4 (951.6)
Upper Laguna Madre	22.9 (554.2)	33.4 (823.4)	22.5 (563.7)	10.0 (209.1)
Corpus Christi Bay	85.3 (2624.5)	75.8 (2474.2)	98.1 (2576.6)	130.0 (3090.9)
Aransas Bay	57.4 (1364.5)	53.0 (1359.9)	53.5 (1202.6)	71.4 (1486.4)
San Antonio Bay	24.5 (516.5)	17.4 (380.4)	39.5 (797.7)	9.8 (176.4)
Matagorda Bay	9.3 (218.6)	8.0 (205.7)	4.2 (100.6)	1.8 (37.1)
East Matagorda Bay	3.9 (94.9)	5.4 (143.6)	4.8 (129.9)	1.7 (49.1)
Galveston Bay	2.2 (72.8)	2.1 (88.5)	2.7 (95.0)	0.9 (33.6)
Sabine Lake	6.4 (263.2)	4.1 (210.6)	1.6 (66.9)	0.3 (12.1)
	Mean	**SE**		
Lower Laguna Madre	54.3 (1181.2)	4.3 (97.3)		
Upper Laguna Madre	18.7 (441.1)	3.1 (73.3)		
Corpus Christi Bay	101.2 (2724.7)	4.7 (73.4)		
Aransas Bay	38.6 (817.2)	6.6 (150.2)		
San Antonio Bay	16.0 (287.8)	3.8 (73.9)		
Matagorda Bay	5.6 (118.7)	1.3 (27.0)		
East Matagorda Bay	1.9 (44.9)	0.6 (14.6)		
Galveston Bay	1.5 (44.6)	0.3 (9.3)		
Sabine Lake	2.0 (70.8)	0.7 (27.2)		

Table 46. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986
Lower Laguna Madre	17.6	20.7 (752.4)	33.6 (1190.7)	22.3 (792.6)	44.6 (1037.2)
Upper Laguna Madre	19.3	8.8 (270.4)	29.4 (454.2)	8.2 (239.0)	15.2 (351.4)
Corpus Christi Bay	38.9	54.6 (2592.0)	11.4 (418.7)	21.8 (894.4)	46.9 (1205.0)
Aransas Bay	9.9	17.4 (510.7)	17.9 (433.2)	24.2 (799.3)	25.7 (482.4)
San Antonio Bay	2.3	6.3 (186.5)	3.1 (68.8)	10.5 (298.2)	8.3 (131.8)
Matagorda Bay	3.3	2.8 (92.4)	2.7 (82.0)	4.2 (140.2)	4.5 (79.3)
Galveston Bay	0.3	0.3 (15.2)	0.4 (17.6)	0.4 (15.8)	1.0 (29.5)
Sabine Lake					1.7 (46.0)
	1987	1988	1989	1990	1991
Lower Laguna Madre	26.2 (677.7)	30.6 (580.0)	37.8 (791.7)	132.0 (2381.6)	130.1 (2877.5)
Upper Laguna Madre	5.6 (238.1)	9.5 (229.6)	7.7 (179.9)	48.8 (506.0)	37.9 (791.3)
Corpus Christi Bay	60.7 (1771.5)	127.1 (3164.9)	183.9 (4653.6)	75.7 (1562.1)	115.5 (2643.7)
Aransas Bay	39.0 (767.5)	65.1 (1086.1)	38.2 (714.2)	50.8 (875.0)	14.8 (321.1)
San Antonio Bay	15.1 (198.4)	43.1 (802.8)	24.9 (452.4)	29.7 (503.6)	12.2 (211.6)
Matagorda Bay	6.3 (111.5)	8.3 (188.0)	7.3 (179.4)	15.9 (334.9)	2.6 (67.8)
East Matagorda Bay	2.5 (57.6)	2.3 (48.1)	4.4 (70.6)	2.4 (42.7)	3.9 (65.7)
Galveston Bay	0.3 (7.8)	1.1 (29.3)	0.8 (25.0)	2.5 (54.8)	1.9 (56.8)
Sabine Lake	0.2 (5.8)	1.7 (58.9)	0.7 (18.6)	1.5 (36.1)	0.3 (6.7)
	1992	1993	1994	1995	1996
Lower Laguna Madre	61.7 (1485.6)	65.0 (1405.4)	45.5 (1002.0)	54.3 (1195.7)	50.6 (1101.3)
Upper Laguna Madre	22.4 (607.3)	21.6 (500.4)	19.6 (524.2)	11.8 (347.1)	25.7 (387.5)
Corpus Christi Bay	74.6 (1633.8)	63.4 (1695.0)	35.8 (1202.3)	64.7 (2140.5)	76.8 (2228.8)
Aransas Bay	10.7 (182.7)	42.6 (843.7)	18.4 (502.3)	32.3 (793.7)	24.5 (489.7)
San Antonio Bay	4.8 (87.2)	15.8 (280.5)	12.7 (239.4)	17.7 (282.6)	8.7 (173.0)
Matagorda Bay	2.4 (54.9)	2.2 (41.5)	4.2 (74.6)	2.9 (58.5)	2.1 (43.7)
East Matagorda Bay	0.7 (16.7)	1.3 (28.7)	0.8 (27.4)	0.8 (25.3)	1.7 (43.3)
Galveston Bay	1.0 (33.4)	1.7 (44.1)	4.1 (101.4)	0.9 (39.5)	1.4 (30.1)
Sabine Lake	0.5 (7.7)	1.6 (49.3)	0.5 (17.7)	0.3 (7.4)	7.8 (292.0)
	1997	1998	1999	2000	2001
Lower Laguna Madre	49.0 (1198.2)	51.3 (1182.4)	48.8 (1252.6)	65.9 (1579.1)	113.1 (1165.0)
Upper Laguna Madre	13.1 (254.5)	12.9 (352.7)	11.3 (334.3)	16.6 (828.3)	27.6 (570.9)
Corpus Christi Bay	155.6 (3923.4)	109.6 (2997.3)	193.9 (5370.2)	123.2 (3833.2)	72.5 (2265.0)
Aransas Bay	27.6 (606.4)	48.8 (1009.0)	43.7 (976.6)	92.6 (2244.6)	58.4 (1291.9)
San Antonio Bay	4.9 (91.6)	13.7 (281.8)	26.1 (572.3)	15.6 (285.1)	22.2 (357.9)
Matagorda Bay	1.0 (23.4)	9.0 (189.1)	6.7 (146.9)	5.7 (117.0)	8.1 (171.0)
East Matagorda Bay	4.1 (123.9)	1.2 (29.2)	0.6 (17.5)	3.2 (72.7)	1.7 (31.2)
Galveston Bay	0.3 (10.9)	1.4 (31.9)	2.0 (66.5)	1.6 (53.7)	2.5 (63.4)
Sabine Lake	1.0 (28.2)	5.8 (168.4)	0.6 (26.5)	4.0 (157.6)	2.2 (65.8)

Table 46 (continued).

	2002	2003	2004	2005	Mean
Lower Laguna Madre	48.7 (1231.9)	38.1 (920.7)	45.6 (985.0)	61.1 (1264.3)	53.9 (1168.8)
Upper Laguna Madre	20.0 (586.3)	21.0 (739.6)	21.2 (740.3)	16.2 (488.2)	18.8 (438.4)
Corpus Christi Bay	168.7 (4107.2)	200.3 (4987.3)	194.3 (5152.6)	134.3 (3983.1)	100.2 (2684.4)
Aransas Bay	84.8 (1719.1)	71.9 (1421.1)	21.3 (484.2)	46.6 (1057.4)	38.6 (817.2)
San Antonio Bay	34.8 (600.2)	21.7 (296.0)	14.4 (245.0)	14.5 (261.5)	16.0 (287.8)
Matagorda Bay	6.2 (128.1)	8.1 (151.5)	7.2 (140.4)	11.5 (218.8)	5.6 (118.1)
East Matagorda Bay	1.6 (50.9)	0.5 (21.1)	0.5 (16.0)	2.3 (75.7)	1.9 (45.5)
Galveston Bay	5.8 (173.8)	2.9 (91.6)	0.9 (30.5)	1.4 (48.5)	1.5 (44.6)
Sabine Lake	6.7 (165.1)	2.0 (71.6)	3.0 (97.3)	3.1 (89.5)	2.3 (70.8)
	SE				
Lower Laguna Madre	6.3 (114.9)				
Upper Laguna Madre	2.1 (43.1)				
Corpus Christi Bay	11.9 (313.3)				
Aransas Bay	4.7 (101.5)				
San Antonio Bay	2.1 (38.0)				
Matagorda Bay	0.7 (15.1)				
East Matagorda Bay	0.3 (6.3)				
Galveston Bay	0.3 (7.6)				
Sabine Lake	0.5 (16.5)				

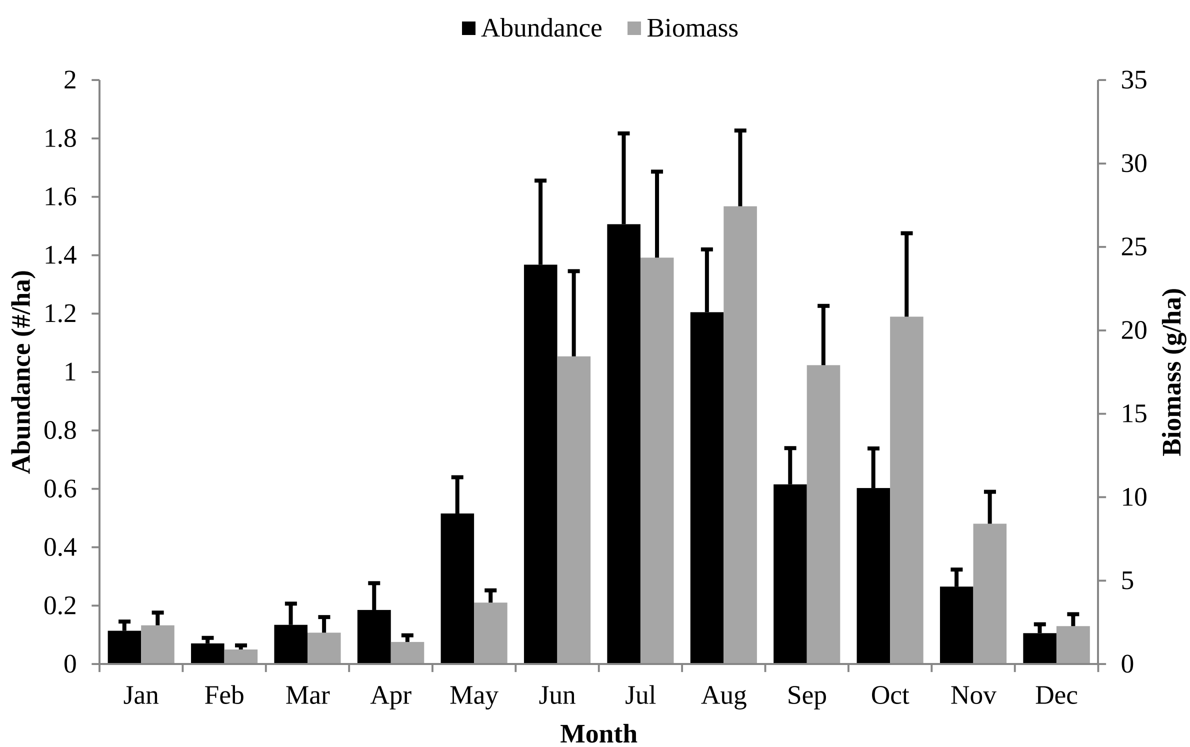

Figure 91. The monthly mean (+SE) abundance and biomass of *Lagodon rhomboides* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

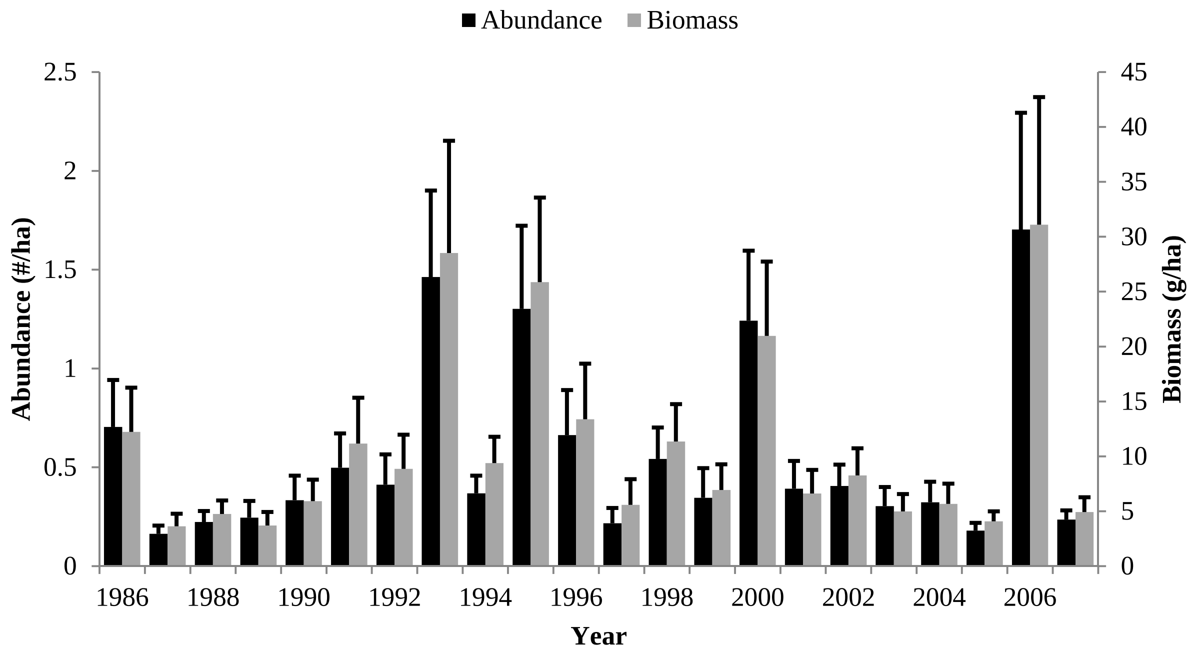

Figure 92. The mean (+SE) annual abundance and biomass of *Lagodon rhomboides* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 47. The monthly mean abundance in#/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	0.3 (8.6)	0.1 (4.1)	0.1 (2.4)	0.8 (4.1)	1.7 (8.8)
Vermilion-Cote Blanche Bays	0.0 (0.0)	0.0 (0.0)	0.0 (0.3)	0.0 (0.0)	0.2 (1.3)
Terrebonne-Timbalier Bays	0.0 (0.6)	0.0 (0.2)	0.0 (0.4)	0.2 (1.0)	0.7 (5.3)
Barataria Bay	0 (0)	0.0 (0.4)	0.0 (0.0)	0.1 (0.3)	0.8 (5.5)
Breton-Chandeleur Sounds	0.4 (5.9)	0.2 (1.0)	0.4 (6.0)	0.2 (2.2)	0.2 (2.6)
Lake Borgne	0.3 (3.1)	0.2 (1.2)	0.1 (1.9)	0.0 (1.2)	0.1 (0.5)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Lake Calcasieu	1.9 (18.0)	2.7 (40.4)	2.3 (44.4)	1.6 (42.0)	0.9 (28.1)
Vermilion-Cote Blanche Bays	0.6 (9.6)	0.8 (11.8)	0.7 (18.1)	0.4 (13.0)	0.4 (15.2)
Terrebonne-Timbalier Bays	2.2 (33.9)	2.7 (42.7)	1.5 (34.3)	0.6 (16.5)	0.4 (12.3)
Barataria Bay	2.0 (23.7)	2.0 (36.9)	1.3 (29.9)	0.6 (19.4)	0.2 (9.9)
Breton-Chandeleur Sounds	0.6 (8.1)	0.4 (7.7)	0.7 (16.7)	0.5 (12.3)	0.7 (21.4)
Lake Borgne	1.3 (16.4)	0.8 (11.9)	0.6 (15.5)	0.3 (9.4)	1.9 (69.9)
	Nov	**Dec**	**Mean**	**SE**	
Lake Calcasieu	0.4 (9.9)	0.1 (5.0)	1.1 (18.0)	0.3 (4.7)	
Vermilion-Cote Blanche Bays	0.1 (4.0)	0.1 (1.7)	0.3 (6.2)	0.1 (2.0)	
Terrebonne-Timbalier Bays	0.4 (11.8)	0.1 (2.9)	0.7 (13.5)	0.3 (4.4)	
Barataria Bay	0.3 (9.7)	0.1 (2.2)	0.6 (11.5)	0.2 (3.7)	
Breton-Chandeleur Sounds	0.3 (9.6)	0.1 (0.6)	0.4 (7.8)	0.1 (1.8)	
Lake Borgne	0.3 (4.9)	0.3 (3.5)	0.5 (11.6)	0.2 (5.5)	

Table 48. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	2.8 (47.0)	0.6 (10.1)	0.1 (4.0)	0.5 (9.7)
Vermilion-Cote Blanche Bays	0.5 (5.4)	0.0 (0.5)	0.0 (1.2)	0.0 (0.5)
Terrebonne-Timbalier Bays	0.2 (3.3)	0.1 (2.2)	0.4 (9.9)	0.7 (8.4)
Barataria Bay	0.2 (4.5)	0.1 (3.7)	0.4 (5.1)	0.2 (1.5)
Breton-Chandeleur Sounds	0.4 (12.9)	0.2 (5.6)	0.1 (1.9)	0.1 (2.2)
Lake Borgne	0 (0)	0.0 (2.1)	0.3 (4.2)	0 (0)
	1990	1991	1992	1993
Lake Calcasieu	0.8 (12.5)	0.2 (6.3)	0.2 (1.7)	0.9 (17.9)
Vermilion-Cote Blanche Bays	0.0 (0.2)	0.2 (1.0)	0.3 (6.8)	0.1 (2.2)
Terrebonne-Timbalier Bays	0.2 (3.0)	0.2 (5.5)	0.2 (9.3)	1.6 (24.2)
Barataria Bay	0.8 (15.5)	1.4 (30.2)	0.3 (6.8)	2.3 (47.3)
Breton-Chandeleur Sounds	0.2 (3.5)	0.3 (8.9)	0.6 (13.5)	2.6 (53.2)
Lake Borgne	0.6 (8.0)	0.8 (26.1)	0.8 (11.9)	1.0 (35.4)
	1994	1995	1996	1997
Lake Calcasieu	0.3 (7.4)	0.1 (2.3)	1.4 (27.2)	0.3 (9.1)
Vermilion-Cote Blanche Bays	0.1 (5.3)	1.5 (34.0)	0.9 (18.0)	0.2 (8.1)
Terrebonne-Timbalier Bays	0.2 (3.6)	2.4 (42.7)	0.9 (18.0)	0.3 (5.5)
Barataria Bay	0.2 (1.7)	0.8 (15.8)	0.5 (9.0)	0.1 (2.7)
Breton-Chandeleur Sounds	0.8 (21.0)	0.5 (8.6)	0.0 (0.1)	0.1 (1.9)
Lake Borgne	0.8 (22.6)	2.3 (51.0)	0.4 (13.4)	0.4 (7.8)
	1998	1999	2000	2001
Lake Calcasieu	1.6 (31.2)	0.7 (19.2)	2.6 (35.3)	1.3 (17.0)
Vermilion-Cote Blanche Bays	0.2 (7.2)	0.4 (7.7)	0.7 (20.4)	0.0 (3.1)
Terrebonne-Timbalier Bays	0.6 (12.1)	0.3 (5.5)	2.0 (28.3)	0.1 (1.4)
Barataria Bay	0.9 (18.2)	0.6 (8.8)	1.2 (21.1)	0.8 (12.6)
Breton-Chandeleur Sounds	0.1 (2.5)	0.0 (0.3)	0.6 (9.2)	0.4 (6.4)
Lake Borgne	0.3 (3.6)	0.4 (6.7)	0.4 (9.1)	0.4 (10.3)
	2002	2003	2004	2005
Lake Calcasieu	1.1 (21.9)	1.0 (24.4)	0.7 (15.4)	0.4 (10.6)
Vermilion-Cote Blanche Bays	0.1 (2.6)	0.1 (1.3)	0.0 (1.2)	0.2 (5.0)
Terrebonne-Timbalier Bays	0.3 (8.0)	0.4 (4.9)	0.2 (4.7)	0.2 (3.9)
Barataria Bay	0.4 (6.7)	0.4 (5.3)	0.3 (4.8)	0.1 (1.4)
Breton-Chandeleur Sounds	0.4 (6.4)	0.1 (0.8)	0.3 (3.5)	0.2 (3.7)
Lake Borgne	0.7 (12.2)	0.0 (0.2)	1.1 (14.8)	0.1 (0.9)
	2006	2007	Mean	SE
Lake Calcasieu	5.1 (49.6)	1.1 (20.7)	1.1 (18.2)	0.2 (2.8)
Vermilion-Cote Blanche Bays	0.2 (5.1)	0.0 (0.5)	0.3 (6.2)	0.1 (1.7)
Terrebonne-Timbalier Bays	3.8 (86.9)	0.2 (5.5)	0.7 (13.5)	0.2 (4.1)
Barataria Bay	1.3 (19.9)	0.2 (4.6)	0.6 (11.4)	0.1 (2.4)
Breton-Chandeleur Sounds	0.2 (3.3)	0.2 (3.3)	0.4 (7.8)	0.1 (2.4)
Lake Borgne	0.1 (1.7)	0.1 (4.7)	0.5 (11.2)	0.1 (2.7)

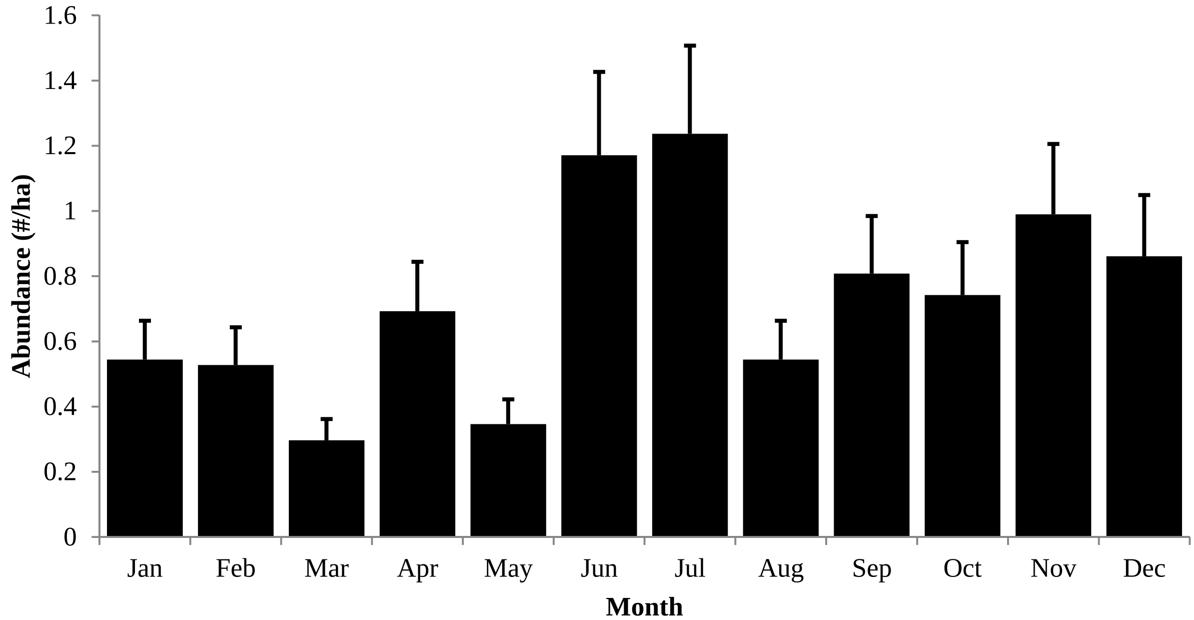

Figure 93. The monthly mean (+SE) abundance of *Lagodon rhomboides* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Biomass data were not available as *L. rhomboides* length measurements were not recorded.

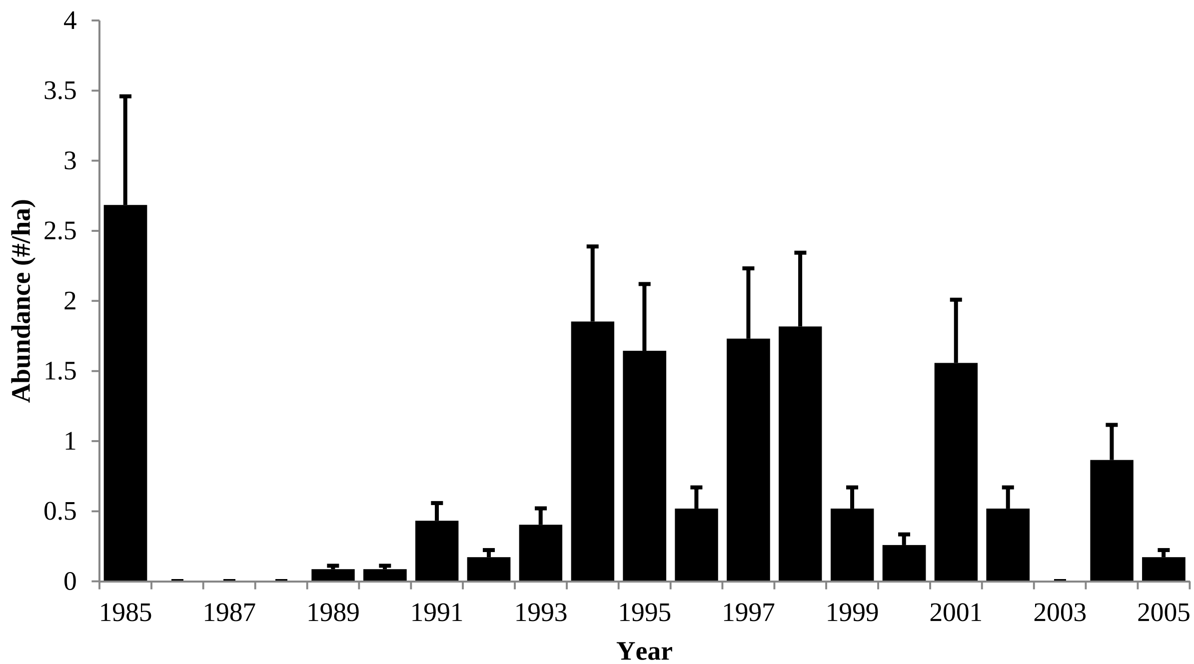

Figure 94. The mean (+SE) annual abundance of *Lagodon rhomboides* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data were not available as *L. rhomboides* length measurements were not recorded.

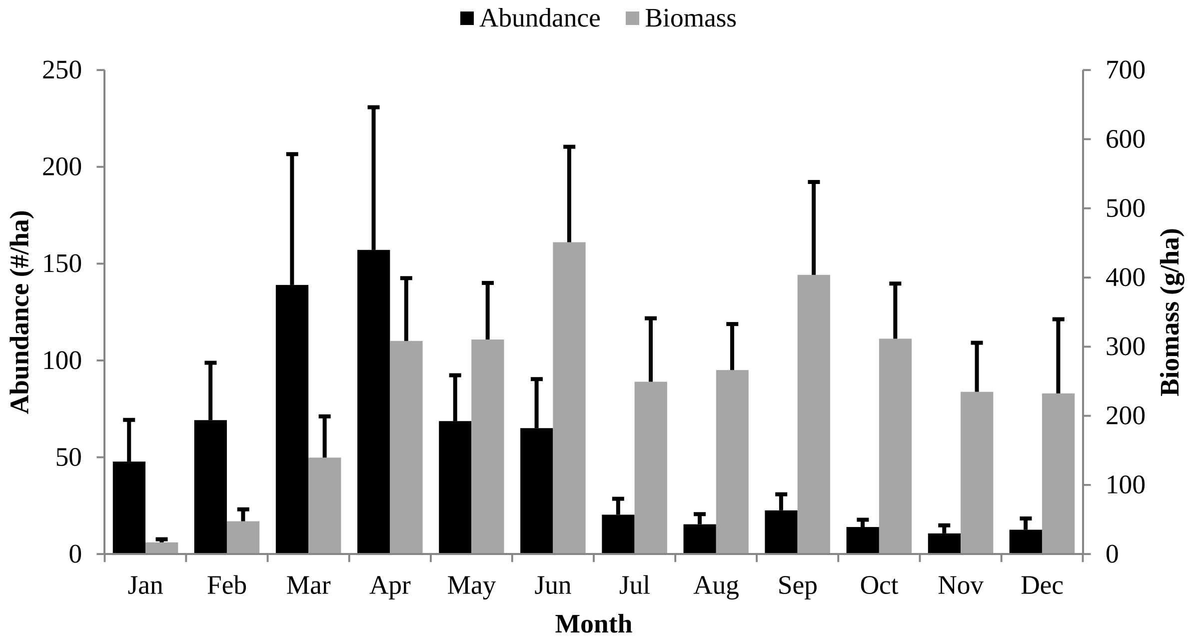

Figure 95. The monthly mean (+SE) abundance and biomass of *Lagodon rhomboides* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

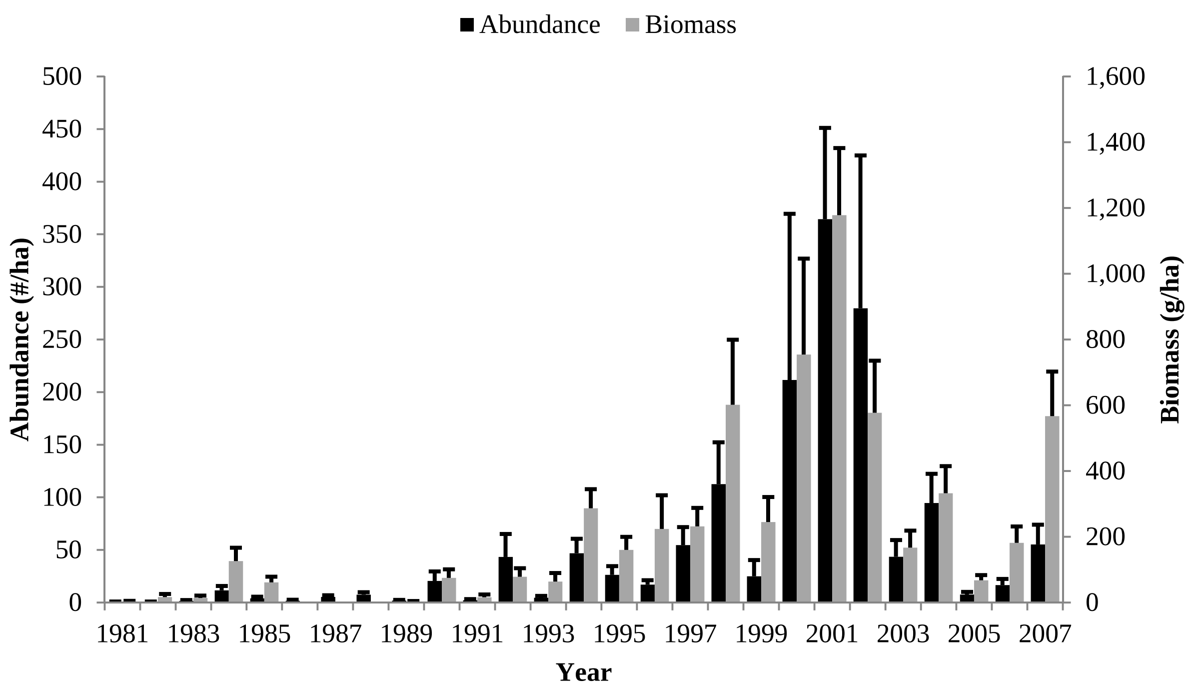

Figure 96. The mean (+SE) annual abundance and biomass of *Lagodon rhomboides* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length data were not available for the years 1986 – 1988.

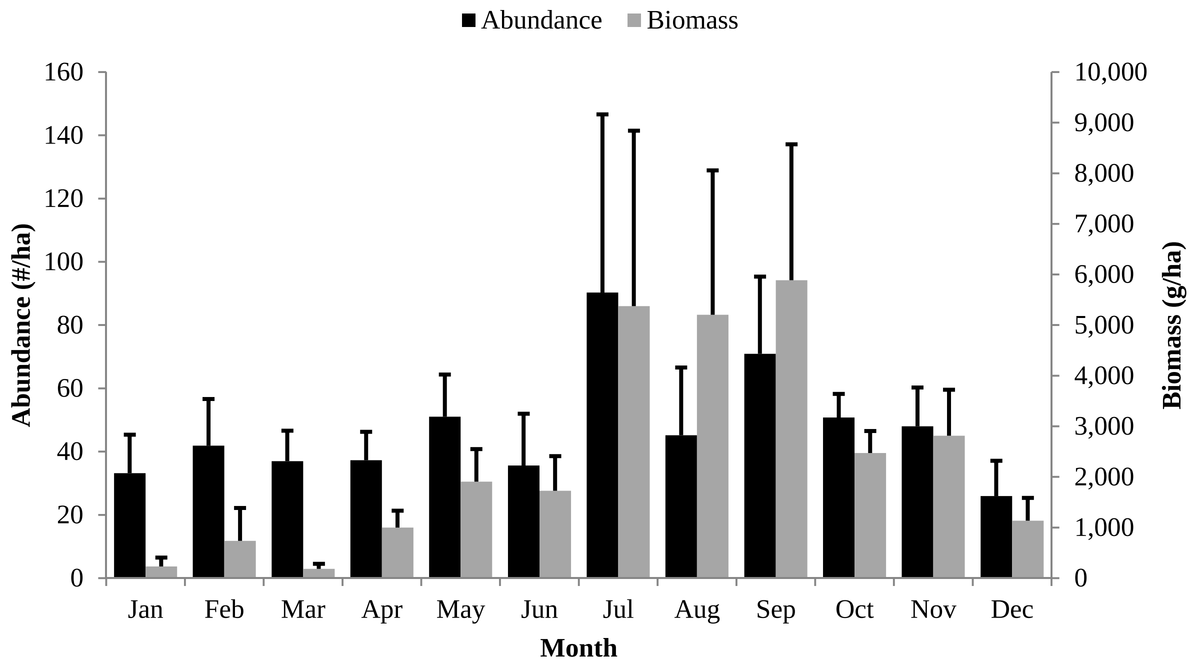

Figure 97. The monthly mean (+SE) abundance and biomass of *Lagodon rhomboides* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

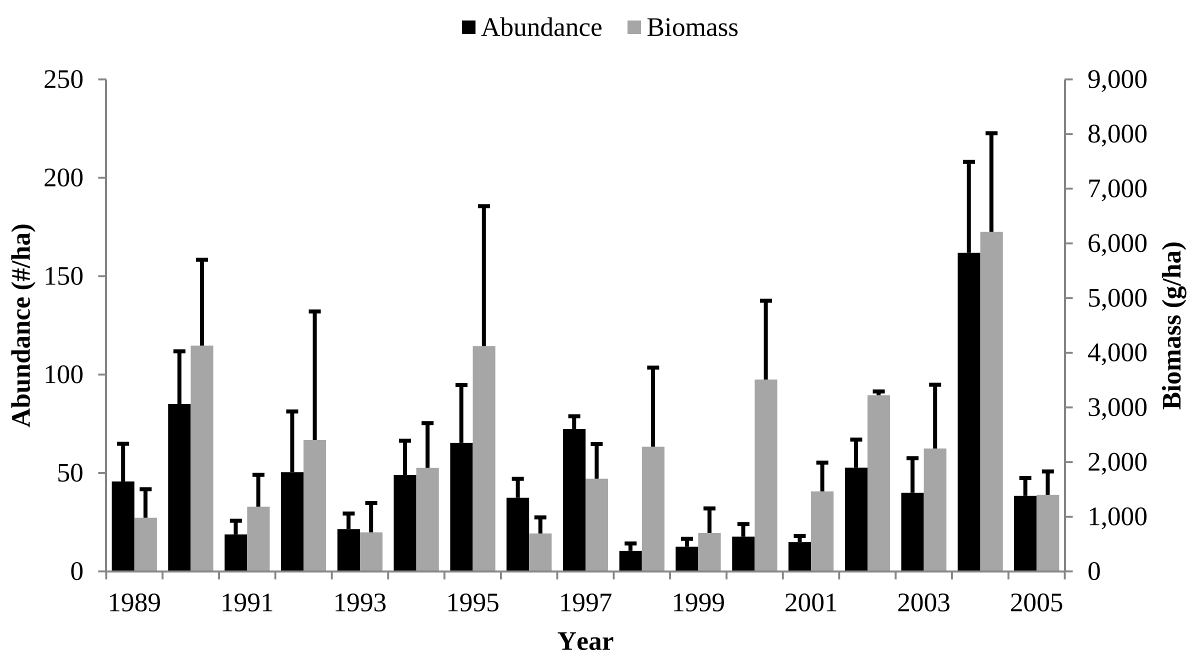

Figure 98. The mean (+SE) annual abundance and biomass of *Lagodon rhomboides* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 49. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	62.4 (19.2)	102.9 (70.1)	196.6 (173.5)	230.2 (390.1)
E MS Sound (AL)	0.5 (2.7)	0.8 (4.0)	0.7 (6.3)	0.4 (9.9)
Perdido Bay (AL)	53.2 (30.2)	38.4 (30.4)	46.3 (178.9)	99.5 (520.7)
Apalachicola Bay (FL)	4.1 (53.3)	31.6 (48.1)	19.9 (306.1)	16.0 (251.8)
Suwannee Sound (FL)	23.7 (310.2)	23.6 (490.5)	38.7 (709.8)	9.8 (220.7)
Cedar Key (FL)	634.9 (7412.0)	2.2 (19.2)	55.9 (1201.6)	67.1 (1657.4)
Tampa Bay (FL)	50.0 (989.0)	48.1 (1034.9)	42.4 (853.6)	44.4 (662.7)
Charlotte Harbor (FL)	35.6 (229.9)	124.6 (736.5)	52.0 (183.8)	57.4 (997.8)
	May	Jun	Jul	Aug
Mobile Bay (AL)	77.0 (306.6)	72.7 (518.6)	25.6 (311.1)	17.3 (346.2)
E MS Sound (AL)	0.3 (11.4)	0.6 (14.0)	0.5 (16.4)	0.9 (33.1)
Perdido Bay (AL)	154.8 (983.2)	123.1 (936.2)	61.6 (715.7)	25.1 (278.7)
Apalachicola Bay (FL)	42.9 (719.6)	13.6 (399.2)	13.5 (397.6)	6.8 (216.3)
Suwannee Sound (FL)	26.7 (664.0)	27.5 (949.1)	58.1 (1800.7)	16.0 (498.6)
Cedar Key (FL)	72.7 (1258.6)	28.7 (1126.6)	61.7 (2398.5)	65.1 (1923.4)
Tampa Bay (FL)	40.9 (823.4)	30.7 (838.7)	39.3 (1505.1)	67.4 (1532.3)
Charlotte Harbor (FL)	82.4 (1907.5)	208.6 (1726.3)	524.2 (5373.8)	249.5 (5204.8)
	Sep	Oct	Nov	Dec
Mobile Bay (AL)	19.8 (379.2)	13.8 (358.1)	12.7 (311.2)	16.6 (322.4)
E MS Sound (AL)	1.0 (32.9)	1.0 (33.5)	0.3 (5.4)	0.2 (3.9)
Perdido Bay (AL)	39.9 (703.7)	29.7 (578.3)	20.3 (403.3)	21.0 (371.3)
Apalachicola Bay (FL)	20.7 (836.0)	11.3 (335.6)	10.4 (244.7)	9.7 (239.0)
Suwannee Sound (FL)	92.9 (1882.5)	30.8 (177.3)	15.8 (294.9)	14.4 (158.2)
Cedar Key (FL)	54.7 (1352.7)	163.1 (6695.7)	84.5 (1794.1)	23.6 (454.2)
Tampa Bay (FL)	35.9 (1347.0)	26.8 (921.8)	24.6 (779.7)	33.2 (953.4)
Charlotte Harbor (FL)	267.7 (5887.2)	90.4 (2471.8)	98.4 (2812.8)	49.9 (1133.8)
	Mean	SE		
Mobile Bay (AL)	70.6 (292.2)	21.2 (40.4)		
E MS Sound (AL)	0.6 (14.5)	0.1 (3.5)		
Perdido Bay (AL)	59.4 (477.5)	12.6 (92.6)		
Apalachicola Bay (FL)	16.7 (337.3)	3.2 (67.9)		
Suwannee Sound (FL)	31.5 (754.7)	6.7 (167.5)		
Cedar Key (FL)	109.5 (2274.5)	49.1 (671.1)		
Tampa Bay (FL)	40.3 (1020.1)	3.4 (82.8)		
Charlotte Harbor (FL)	153.4 (2388.8)	40.8 (588.4)		

Table 50. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Lagodon rhomboides* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	1.1 (3.3)	0.2 (8.0)	0.1 (1.3)	1.2 (24.7)	0.7 (9.0)
E MS Sound (AL)	0.4 (2.8)	0.9 (22.1)	1.5 (6.6)	0.6 (14.4)	0.9 (23.4)
Perdido Bay (AL)		4.7 (144.8)	20.1 (233.7)	171.6 (1640.4)	34.9 (528.1)

	1986	1987	1988	1989	1990
Mobile Bay (AL)	0.2	0.0	0.3	1.6	0
E MS Sound (AL)	0.6	0.2	0.7	0.4	0.3 (6.2)
Perdido Bay (AL)	10.9	25.4	31.5	4.5 (10.3)	75.5 (293.7)
Tampa Bay (FL)				46.6 (1357.1)	65.6 (2106.3)
Charlotte Harbor (FL)				34.0 (981.4)	132.0 (4130.6)

	1991	1992	1993	1994	1995
Mobile Bay (AL)	0.1 (3.4)	69.4 (100.7)	3.5 (55.9)	74.6 (452.9)	28.3 (200.7)
E MS Sound (AL)	0.1 (3.6)	0.7 (19.0)	0.7 (16.7)	0 (0)	0.4 (26.4)
Perdido Bay (AL)	8.3 (54.6)	7.7 (71.8)	13.3 (156.4)	14.3 (150.4)	41.9 (168.5)
Tampa Bay (FL)	15.3 (505.1)	35.0 (1054.4)	20.4 (467.5)	18.9 (598.2)	24.9 (576.8)
Charlotte Harbor (FL)	29.1 (1184.6)	80.0 (2402.6)	27.7 (716.7)	91.3 (1893.7)	156.3 (4122.5)

	1996	1997	1998	1999	2000
Mobile Bay (AL)	28.4 (368.6)	77.2 (329.6)	205.9 (1020.5)	31.0 (306.5)	275.6 (557.7)
E MS Sound (AL)	0.1 (1.4)	0.7 (17.9)	0.4 (22.3)	0.7 (13.6)	1.6 (31.8)
Perdido Bay (AL)	4.4 (53.1)	43.7 (157.4)	29.8 (424.0)	39.6 (441.5)	126.8 (1800.8)
Apalachicola Bay (FL)			5.6 (181.6)	13.9 (337.0)	12.2 (308.0)
Suwannee Sound (FL)	12.2 (324.1)	44.7 (914.1)			
Cedar Key (FL)	50.2 (1460.6)	146.2 (2887.5)			
Tampa Bay (FL)	41.2 (742.6)	58.1 (1494.7)	9.5 (294.7)	44.6 (1220.2)	10.3 (389.2)
Charlotte Harbor (FL)	34.2 (694.1)	92.0 (1695.5)	78.6 (2281.0)	24.9 (704.3)	133.3 (3509.9)

	2001	2002	2003	2004	2005
Mobile Bay (AL)	516.8 (1472.6)	401.1 (687.2)	64.7 (241.0)	116.4 (305.6)	6.6 (47.4)
E MS Sound (AL)	0.3 (2.6)	0.8 (27.0)	0.1 (4.8)	1.0 (21.1)	1.3 (23.0)
Perdido Bay (AL)	300.5 (1587.7)	155.2 (732.1)	20.7 (97.5)	142.1 (852.5)	20.9 (227.7)
Apalachicola Bay (FL)	13.0 (281.3)	33.9 (664.5)	38.1 (575.6)	5.3 (101.5)	9.6 (270.7)
Suwannee Sound (FL)	12.5 (249.8)	75.5 (1909.4)	13.8 (333.9)	43.8 (1131.4)	11.9 (350.7)
Cedar Key (FL)	39.7 (1298.1)	384.0 (6768.2)	7.1 (238.6)	73.3 (2157.6)	25.0 (840.5)
Tampa Bay (FL)	14.2 (404.2)	13.4 (541.6)	12.5 (493.4)	47.7 (1034.5)	34.8 (734.3)
Charlotte Harbor (FL)	68.7 (1463.1)	104.1 (3222.9)	100.7 (2249.2)	485.8 (6210.5)	62.1 (1400.5)

	2006	2007	Mean	SE
Mobile Bay (AL)	9.1 (136.1)	54.3 (559.4)	72.9 (299.6)	27.2 (16.1)
E MS Sound (AL)	0.6 (12.8)	0.4 (16.3)	0.6 (14.6)	0.1 (0.4)
Perdido Bay (AL)	54.4 (467.5)	96.3 (975.2)	57.7 (490.0)	14.6 (23.4)
Apalachicola Bay (FL)			16.4 (340.0)	4.4 (67.1)
Suwannee Sound (FL)			30.6 (744.8)	9.4 (233.0)
Cedar Key (FL)			103.6 (2235.9)	49.7 (822.1)
Tampa Bay (FL)			30.2 (824.4)	4.3 (118.6)
Charlotte Harbor (FL)			102.0 (2286.1)	25.9 (368.6)

Cynoscion arenarius

In all of the estuaries examined, the abundance of sand seatrout (*Cynoscion arenarius*) was relatively low in winter months, but periods of peak abundance varied among the states (Figure 99). Mean overall abundance (mean of 12 monthly means in Figure 99) was highest in Mississippi at 91.5/ha, followed by Florida (49.8/ha), Alabama (33.3/ha), Louisiana (25.1/ha) and Texas (1.6/ha).

The maximum length of a sand seatrout recorded by Pattillo et al. (1997) was 590 mm; therefore all measurements in the database greater than 590 mm were excluded from this analysis. The length frequency distributions for sand seatrout in each state (Figure 100) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Sand seatrout ranged in size from 12 – 409 mm (mean=117.3, SD=45.3) in Texas, 5 – 412 mm (mean=66.8, SD=34.7) in Louisiana, 7 – 245 mm (mean=58.4, SD=22.4) in Mississippi, 6 – 353 mm (mean=51.0, SD=36.7) in Alabama, and 5 – 335 mm (mean=45.7, SD=34.8) in Florida.

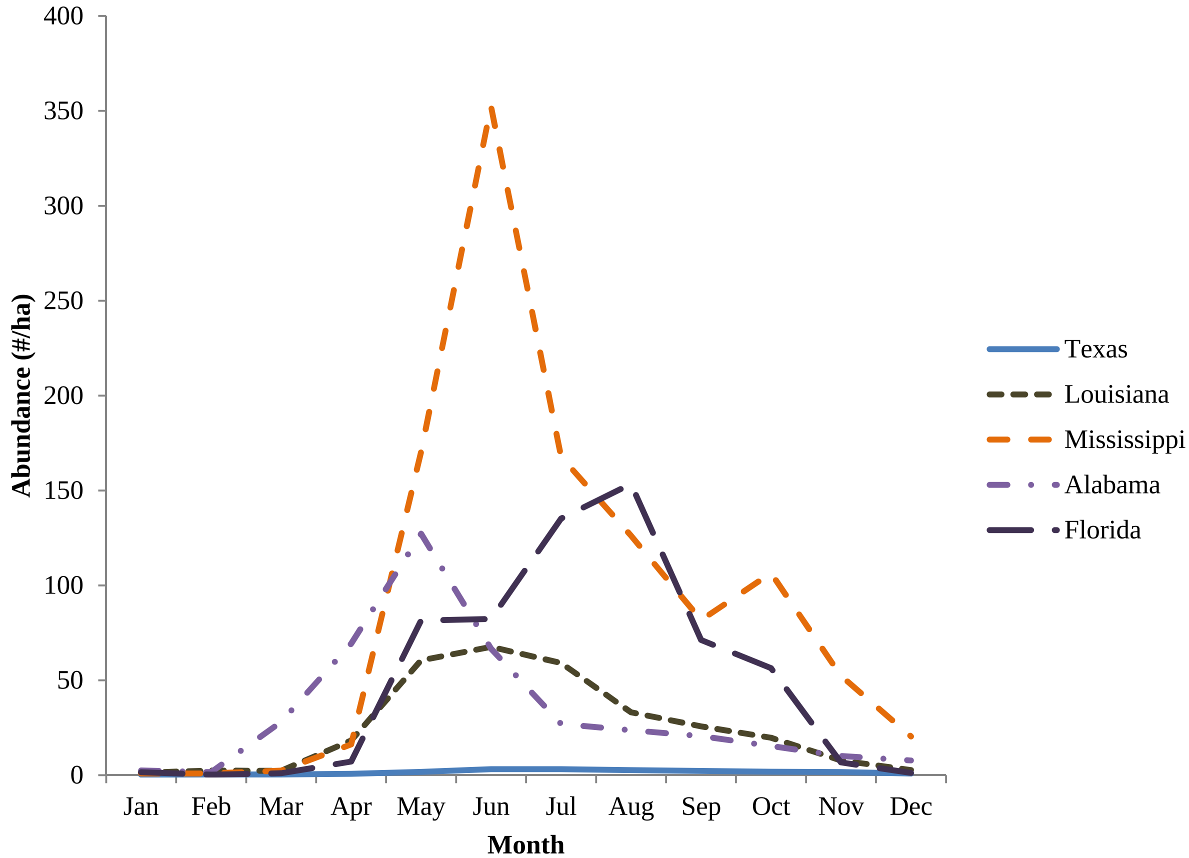

Figure 99. Monthly mean abundance of *Cynoscion arenarius* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

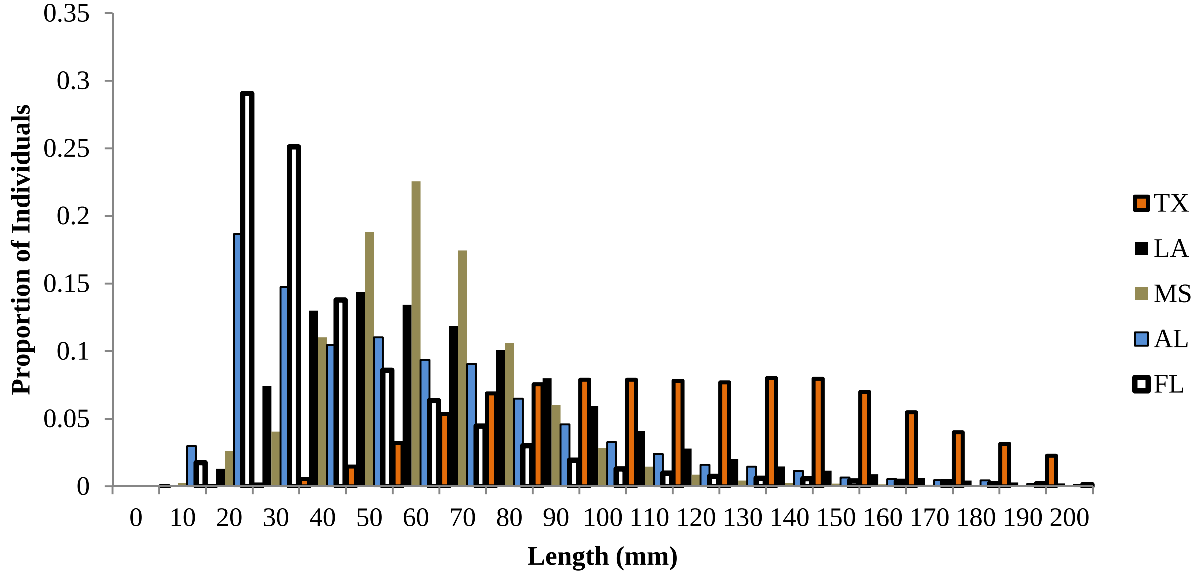

Figure 100. Length frequency of all sand seatrout (*Cynoscion arenarius*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=22,116): 1982 – 2005; Louisiana (n=169,991): 1986 – 2007; Mississippi (n=10,373): 1985 – 2005; Alabama (n=17,534): 1981 – 2007; and Florida (n=24,336): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

The mean abundance and biomass of sand seatrout in Texas were low in winter and high in summer and early fall (Figure 101). The mean annual abundance and biomass peaked in 2004 (3.8/ha and 117.6 g/ha, respectively) (Figure 102). No geographic trend could be seen in abundance and biomass throughout Texas, though Galveston Bay and Sabine Lake had the highest mean values throughout the study period (Tables 51 and 52).

In Louisiana, mean abundance and biomass were lowest in the winter and highest in the late spring and summer (Figure 103). The mean annual abundance and biomass peaked in 2007 (59.5/ha and 264.7 g/ha, respectively) (Figure 104). The highest values occurred in Lake Calcasieu, Vermilion-Cote Blanche Bays and Lake Borgne (Tables 53 and 54).

In Mississippi, sand seatrout mean abundance and biomass were low in the winter months, but rapidly increased to a peak in June (Figure 105). Mean annual abundance was at its highest in 1989 (303.7/ha) while biomass peaked in 1993 (511.5 g/ha) (Figure 106).

Sand seatrout exhibited seasonality in both abundance and biomass in Alabama. Mean monthly abundance peaked in May. Biomass increased from winter to late spring/early summer and then remained relatively flat through the fall (Figure 107). The highest peak of mean annual abundance occurred in 1983 (135.4/ha) while biomass peaked in 1999 (458.6 g/ha) (Figure 108). Sand seatrout were generally absent from Perdido Bay but could be found in comparable numbers in both Mobile Bay and East Mississippi Sound (Tables 55 and 56).

In Florida, the mean monthly abundance and biomass of sand seatrout both peaked in summer months (Figure 109). Mean annual abundance peaked in 1989 (125.6/ha), while biomass peaked in 1998 (375.0 g/ha) (Figure 110). The highest abundance values in Florida occurred in Apalachicola Bay, while biomass was highest in Suwannee Sound (Tables 55 and 56).

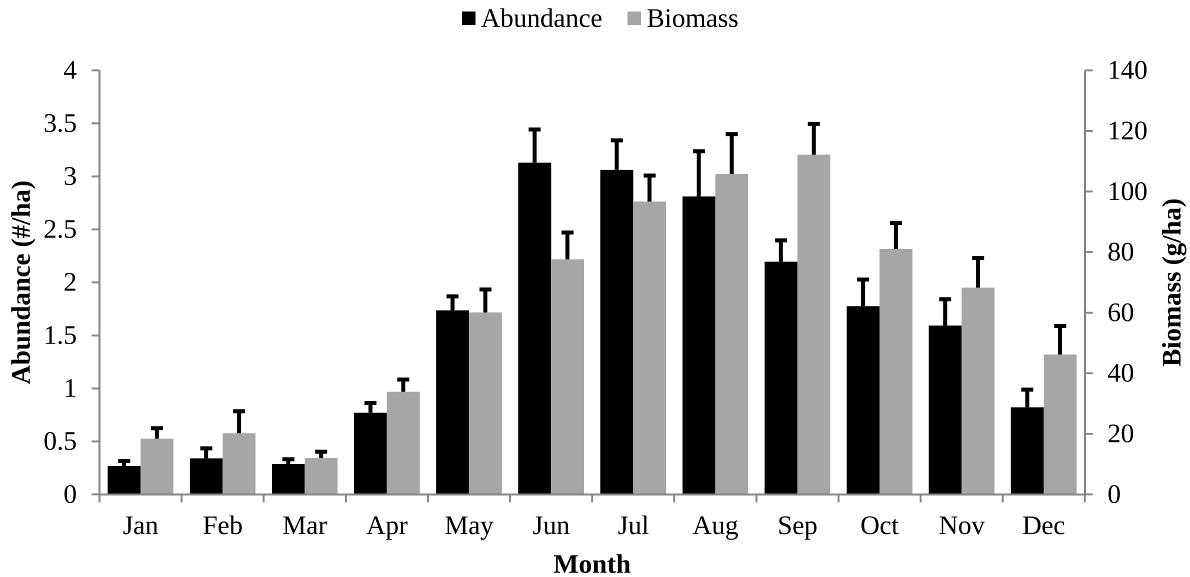

Figure 101. The monthly mean (+SE) abundance and biomass of *Cynoscion arenarius* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

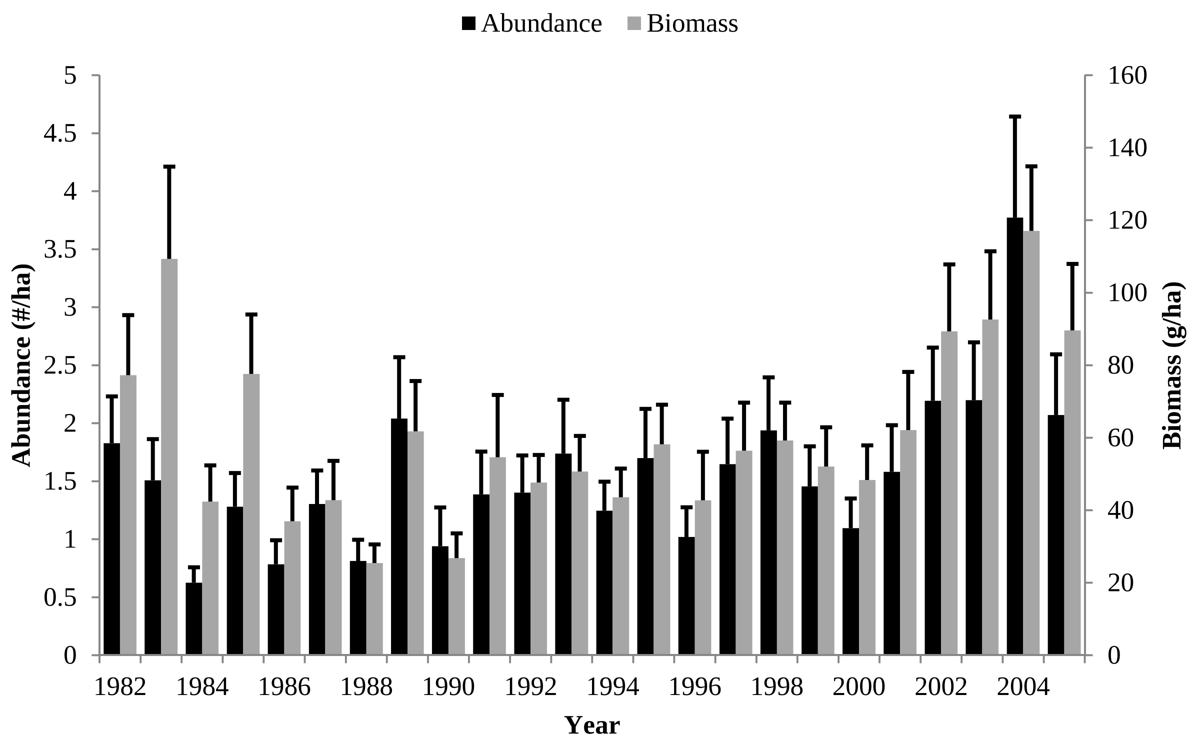

Figure 102. The mean (+SE) annual abundance and biomass of *Cynoscion arenarius* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 51. The monthly mean abundance in #/ and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.1 (3.5)	0.2 (6.6)	0.0 (0.9)	0.3 (7.6)
Upper Laguna Madre	0 (0)	0 (0)	0 (0)	0.0 (2.5)
Corpus Christi Bay	0.6 (72.6)	1.1 (99.4)	0.6 (37.3)	1.3 (63.9)
Aransas Bay	0.4 (10.8)	0.3 (13.7)	0.5 (17.9)	0.9 (47.5)
San Antonio Bay	0.1 (1.5)	0.0 (0.3)	0.1 (1.5)	0.1 (4.1)
Matagorda Bay	0.5 (22.8)	0.7 (25.7)	0.4 (10.5)	1.1 (50.2)
East Matagorda Bay	0 (0)	0.0 (0.5)	0 (0)	0.0 (0.6)
Galveston Bay	0.2 (6.8)	0.1 (5.1)	0.4 (15.3)	1.4 (53.8)
Sabine Lake	0.2 (36.0)	0.1 (3.2)	0.0 (0.5)	0.2 (3.4)
	May	Jun	Jul	Aug
Lower Laguna Madre	0.3 (22.0)	0.6 (16.1)	0.5 (30.2)	1.1 (40.4)
Upper Laguna Madre	0.0 (0.4)	0.1 (1.8)	0.2 (13.0)	0.1 (5.5)
Corpus Christi Bay	2.2 (117.3)	4.0 (155.3)	5.9 (274.0)	5.4 (291.2)
Aransas Bay	2.0 (62.6)	4.1 (82.9)	3.2 (109.0)	3.4 (122.6)
San Antonio Bay	0.3 (6.2)	0.6 (9.7)	0.5 (12.8)	0.3 (7.8)
Matagorda Bay	2.5 (93.8)	4.4 (92.0)	2.0 (53.2)	2.2 (62.5)
East Matagorda Bay	1.0 (7.5)	1.1 (17.2)	3.1 (34.5)	1.7 (33.0)
Galveston Bay	3.6 (104.2)	5.3 (120.4)	5.7 (126.8)	4.7 (125.9)
Sabine Lake	1.3 (16.2)	5.2 (113.2)	4.5 (114.7)	4.0 (156.5)
	Sep	Oct	Nov	Dec
Lower Laguna Madre	1.1 (75.5)	0.5 (24.6)	0.4 (21.7)	0.1 (10.1)
Upper Laguna Madre	0.1 (11.4)	0.1 (11.9)	0.0 (2.5)	0.0 (0.2)
Corpus Christi Bay	3.4 (208.8)	2.1 (168.9)	1.5 (142.9)	1.2 (128.3)
Aransas Bay	2.2 (109.1)	1.8 (74.8)	1.9 (70.5)	1.1 (43.8)
San Antonio Bay	0.3 (8.7)	0.1 (9.5)	0.3 (11.4)	0.1 (5.2)
Matagorda Bay	2.3 (102.1)	1.6 (58.7)	2.0 (74.6)	1.2 (56.3)
East Matagorda Bay	3.4 (86.4)	3.8 (91.8)	1.2 (54.8)	0.4 (22.1)
Galveston Bay	3.2 (170.7)	3.4 (134.4)	3.0 (100.8)	1.5 (57.3)
Sabine Lake	3.6 (215.5)	3.0 (123.9)	3.2 (78.2)	0.6 (27.3)
	Mean	SE		
Lower Laguna Madre	0.4 (21.6)	0.1 (6.0)		
Upper Laguna Madre	0.1 (4.1)	0.0 (1.5)		
Corpus Christi Bay	2.5 (146.7)	0.5 (23.0)		
Aransas Bay	1.8 (63.8)	0.4 (11.1)		
San Antonio Bay	0.2 (6.6)	0.1 (1.2)		
Matagorda Bay	1.7 (58.5)	0.3 (8.4)		
East Matagorda Bay	1.3 (29.0)	0.4 (9.5)		
Galveston Bay	2.7 (85.1)	0.6 (16.1)		
Sabine Lake	2.1 (74.1)	0.6 (20.4)		

Table 52. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	2.9 (19.3)	0.6 (59.3)	0.4 (36.8)	0.4 (22.3)	0.1 (3.6)	0.2 (10.8)	0.2 (8.6)	1.0 (56.8)	0.8 (19.0)
Upper Laguna Madre	0.5 (41.9)	0.1 (5.7)	0 (0)	0.3 (11.5)	0 (0)	0.1 (5.9)	0.0 (0.4)	0 (0)	0 (0)
Corpus Christi Bay	6.3 (526.5)	4.3 (392.7)	1.9 (137.2)	3.4 (247.1)	2.3 (125.4)	4.1 (173.2)	1.6 (58.0)	5.1 (242.5)	1.5 (52.6)
Aransas Bay	1.4 (69.4)	1.3 (52.4)	0.3 (8.8)	0.5 (26.4)	0.3 (10.4)	0.5 (7.0)	0.9 (19.6)	1.9 (25.8)	0.3 (7.7)
San Antonio Bay	0.1 (1.7)	0.1 (3.6)	0.0 (1.6)	0.1 (6.0)	0.1 (2.6)	0.5 (8.2)	0.2 (8.6)	0.6 (12.1)	0.2 (6.9)
Matagorda Bay	2.3 (1.4)	1.8 (100.6)	0.6 (27.2)	1.6 (79.4)	1.0 (26.6)	2.4 (64.4)	1.1 (35.9)	1.6 (40.3)	1.4 (39.8)
East Matagorda Bay						0.9 (22.0)	0.7 (22.9)	0.3 (2.7)	0.3 (5.3)
Galveston Bay	2.0 (0.0)	1.2 (74.2)	0.8 (61.1)	1.7 (89.9)	1.5 (76.3)	1.1 (27.7)	1.5 (33.5)	4.6 (91.1)	2.3 (60.4)
Sabine Lake					0.3 (15.6)	0.7 (23.2)	0.4 (19.4)	0.9 (21.7)	0.7 (16.3)
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.7 (32.9)	0.8 (51.1)	0.6 (30.0)	1.1 (69.4)	0.8 (48.5)	0.2 (14.4)	0.2 (8.3)	0.4 (17.7)	0.1 (2.9)
Upper Laguna Madre	0 (0)	0.0 (6.0)	0.3 (12.5)	0.0 (4.7)	0 (0)	0 (0)	0.0 (2.8)	0 (0)	0.0 (0.4)
Corpus Christi Bay	2.3 (112.7)	1.2 (57.6)	2.1 (85.2)	1.4 (77.2)	1.5 (93.7)	0.9 (72.5)	0.7 (37.8)	2.5 (89.9)	1.3 (86.8)
Aransas Bay	1.9 (51.6)	1.8 (66.4)	2.5 (51.1)	0.8 (35.8)	1.7 (58.6)	1.3 (37.1)	1.8 (68.9)	2.2 (49.0)	2.7 (115.7)
San Antonio Bay	0.5 (16.9)	0.9 (20.8)	0.3 (7.3)	0.1 (6.0)	0.5 (10.4)	0.1 (8.7)	0.2 (3.8)	0.0 (1.4)	0.1 (3.4)
Matagorda Bay	0.9 (28.3)	2.6 (75.9)	1.9 (51.3)	1.3 (37.5)	3.5 (82.0)	1.6 (46.6)	2.4 (82.3)	1.5 (45.1)	0.6 (21.5)
East Matagorda Bay	0.3 (12.7)	0.0 (1.0)	1.4 (36.1)	1.2 (46.6)	1.1 (21.8)	1.2 (21.3)	0.7 (11.1)	0.9 (21.3)	5.8 (84.3)
Galveston Bay	3.4 (142.7)	2.6 (73.7)	2.8 (74.0)	3.6 (84.5)	3.6 (122.0)	0.9 (32.0)	3.6 (117.0)	2.2 (80.7)	1.4 (53.0)
Sabine Lake	0.4 (14.7)	0.8 (20.0)	2.8 (93.4)	0.6 (7.3)	0.5 (11.0)	3.1 (168.7)	4.7 (148.0)	9.3 (258.4)	2.2 (80.8)
	2000	2001	20 02	2003	2004	2005	Mean	SE	
Lower Laguna Madre	0.0 (5.0)	0.0 (1.2)	0.0 (1.1)	0.1 (3.7)	0 (0)	0 (0)	0.5 (21.8)	0.1 (4.4)	
Upper Laguna Madre	0 (0)	0 (0)	0 (0)	0 (0)	0.1 (2.4)	0.0 (17.9)	0.1 (4.7)	0.0 (1.9)	
Corpus Christi Bay	1.2 (95.9)	1.1 (105.0)	3.5 (165.5)	2.6 (176.1)	3.9 (272.4)	3.9 (191.0)	2.5 (153.1)	0.3 (23.7)	
Aransas Bay	1.4 (83.5)	1.1 (55.7)	4.9 (183.3)	5.2 (194.3)	3.2 (102.0)	3.5 (150.3)	1.8 (63.8)	0.3 (10.7)	
San Antonio Bay	0.0 (0.3)	0.1 (2.2)	0.2 (6.1)	0.3 (4.7)	0.6 (8.5)	0.1 (5.7)	0.2 (6.6)	0.0 (1.0)	
Matagorda Bay	1.0 (36.9)	2.3 (92.2)	1.7 (78.3)	1.3 (44.1)	3.0 (124.7)	3.2 (134.1)	1.8 (58.2)	0.2 (6.8)	
East Matagorda Bay	1.3 (22.6)	1.0 (13.1)	0.9 (36.8)	1.2 (59.0)	3.9 (76.0)	2.3 (40.7)	1.3 (29.3)	0.3 (5.4)	
Galveston Bay	2.2 (67.5)	4.4 (148.4)	3.7 (148.1)	2.0 (96.3)	10.5 (205.3)	1.5 (83.8)	2.7 (85.1)	0.4 (9.3)	
Sabine Lake	2.3 (80.8)	3.1 (48.6)	1.5 (50.3)	6.5 (202.6)	6.3 (134.6)	2.2 (66.2)	2.5 (74.1)	0.6 (16.2)	

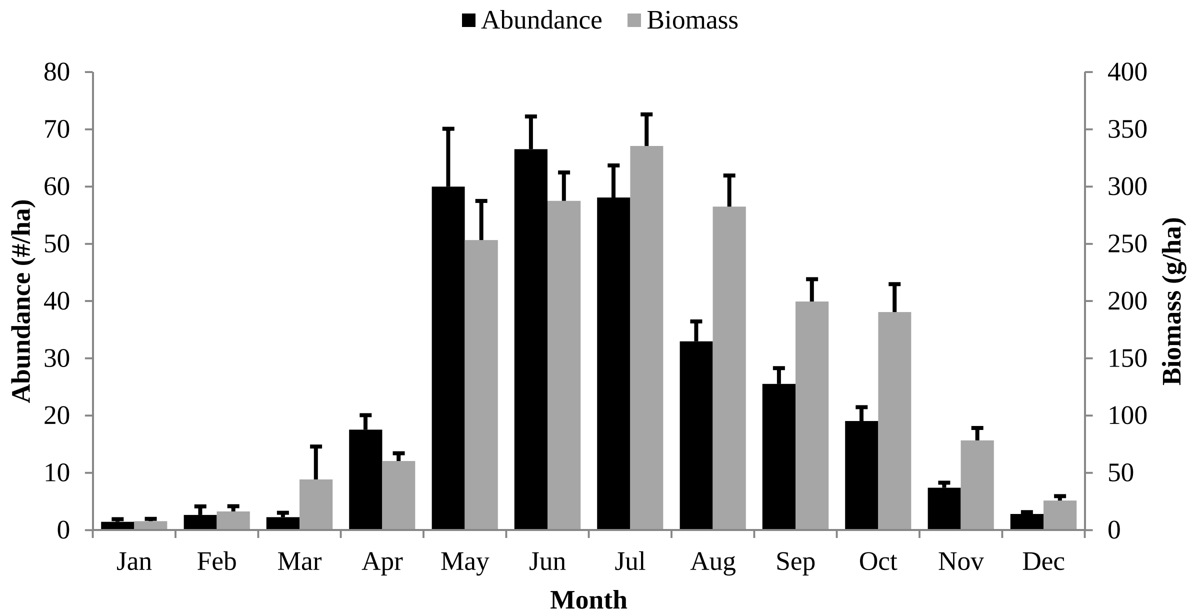

Figure 103. The monthly mean (+SE) abundance and biomass of *Cynoscion arenarius* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

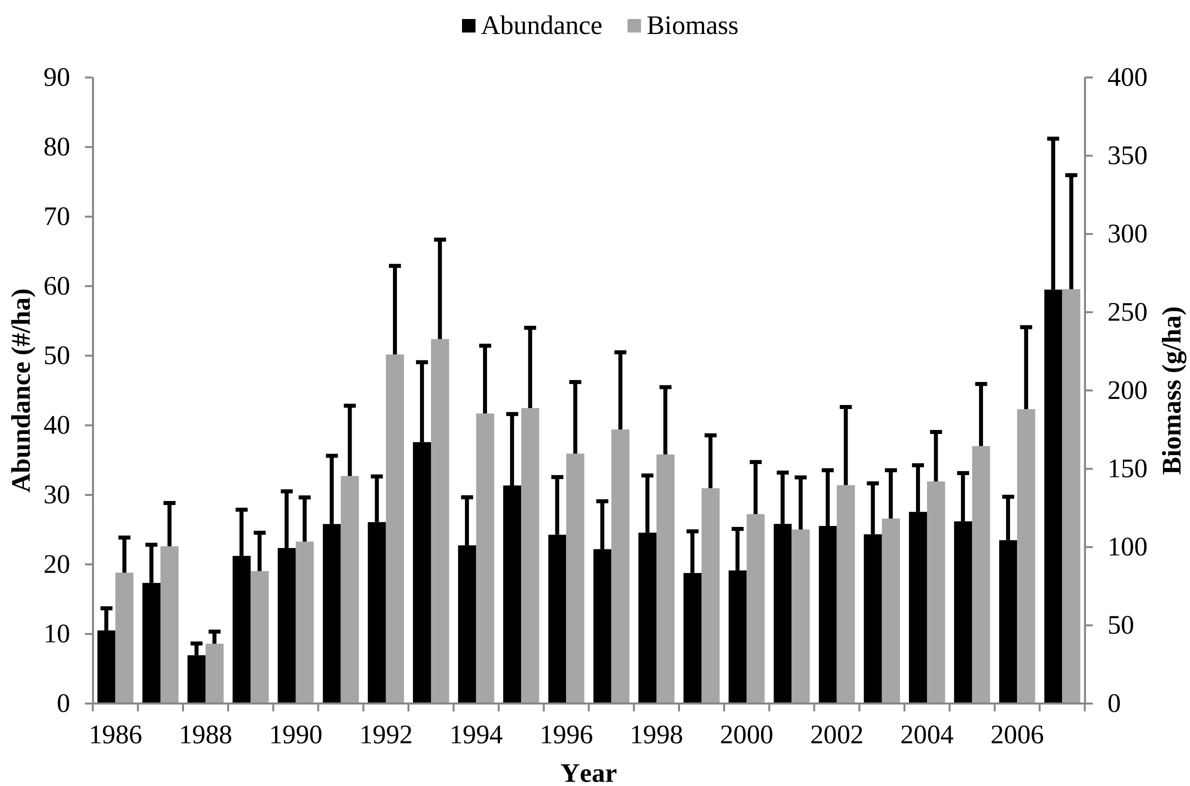

Figure 104. The mean (+SE) annual abundance and biomass of *Cynoscion arenarius* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 53. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.4 (7.6)	0.1 (2.1)	2.0 (2.2)	75.7 (117.3)
Vermilion-Cote Blanche Bays	0.3 (1.2)	0.5 (2.6)	1.3 (12.0)	19.9 (54.8)
Terrebonne-Timbalier Bays	3.5 (12.9)	4.4 (27.8)	3.0 (34.9)	16.8 (107.6)
Barataria Bay	0.6 (4.8)	6.0 (10.4)	0.4 (4.6)	3.0 (9.8)
Breton-Chandeleur Sounds	1.2 (5.0)	0.9 (8.3)	4.6 (156.6)	2.8 (26.4)
Lake Borgne	0.3 (6.9)	7.3 (76.2)	0.4 (10.2)	6.7 (36.8)
	May	Jun	Jul	Aug
Lake Calcasieu	131.5 (515.9)	134.8 (671.3)	90.9 (543.0)	44.8 (374.1)
Vermilion-Cote Blanche Bays	93.2 (252.7)	140.4 (426.6)	134.3 (564.2)	62.0 (416.6)
Terrebonne-Timbalier Bays	43.9 (247.4)	38.4 (222.8)	42.6 (371.0)	22.0 (289.8)
Barataria Bay	6.0 (22.1)	6.3 (23.1)	3.6 (23.6)	1.6 (18.2)
Breton-Chandeleur Sounds	29.0 (133.4)	26.8 (177.8)	16.7 (151.7)	18.9 (156.9)
Lake Borgne	101.4 (714.7)	85.1 (365.6)	60.2 (368.0)	65.5 (549.9)
	Sep	Oct	Nov	Dec
Lake Calcasieu	32.1 (280.1)	28.0 (181.4)	10.3 (62.4)	3.7 (55.5)
Vermilion-Cote Blanche Bays	41.7 (250.8)	34.3 (384.0)	10.9 (146.8)	3.4 (26.3)
Terrebonne-Timbalier Bays	18.1 (220.8)	10.6 (150.0)	5.5 (76.2)	2.6 (21.5)
Barataria Bay	2.7 (12.8)	7.6 (37.8)	3.7 (21.5)	1.9 (16.1)
Breton-Chandeleur Sounds	15.3 (108.6)	14.1 (121.4)	5.9 (37.4)	2.5 (19.0)
Lake Borgne	58.8 (421.5)	28.5 (273.2)	14.9 (147.5)	3.8 (42.2)
	Mean	SE		
Lake Calcasieu	46.2 (234.4)	14.5 (68.8)		
Vermilion-Cote Blanche Bays	45.2 (211.5)	14.9 (57.5)		
Terrebonne-Timbalier Bays	17.6 (148.5)	4.6 (34.7)		
Barataria Bay	3.6 (17.1)	0.7 (2.7)		
Breton-Chandeleur Sounds	11.6 (91.9)	2.9 (19.3)		
Lake Borgne	36.1 (251.1)	10.5 (67.9)		

Table 54. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990	1991
Lake Calcasieu	26.5 (265.8)	46.7 (245.8)	16.2 (55.8)	81.9 (184.5)	51.6 (155.5)	79.9 (255.0)
Vermilion-Cote Blanche Bays	12.6 (66.1)	29.7 (126.7)	16.8 (84.0)	27.2 (131.4)	55.4 (257.0)	33.9 (160.0)
Terrebonne-Timbalier Bays	7.5 (65.0)	11.5 (106.4)	5.7 (42.7)	16.2 (112.4)	6.8 (74.7)	16.5 (167.6)
Barataria Bay	1.9 (8.9)	3.2 (21.4)	0.3 (2.6)	1.8 (5.3)	2.1 (18.9)	4.5 (25.8)
Breton-Chandeleur Sounds	7.7 (34.2)	5.4 (30.0)	2.1 (11.9)	5.8 (23.5)	6.9 (30.1)	20.7 (142.6)
Lake Borgne	5.3 (194.1)	20.1 (114.1)	11.6 (77.2)	32.6 (142.4)	25.7 (99.1)	14.5 (80.9)
	1992	1993	1994	1995	1996	1997
Lake Calcasieu	67.9 (426.2)	56.9 (286.7)	31.3 (233.1)	63.4 (288.8)	66.7 (416.9)	69.7 (473.5)
Vermilion-Cote Blanche Bays	37.6 (143.9)	45.7 (203.1)	30.7 (181.4)	41.6 (218.4)	41.7 (198.8)	19.0 (113.6)
Terrebonne-Timbalier Bays	16.9 (158.3)	29.7 (266.4)	26.3 (312.2)	27.2 (243.5)	23.0 (200.6)	22.1 (213.3)
Barataria Bay	0.4 (3.5)	12.4 (31.9)	0.7 (1.9)	3.8 (14.4)	2.9 (9.5)	1.7 (7.5)
Breton-Chandeleur Sounds	13.4 (323.0)	24.0 (130.2)	9.5 (47.8)	21.1 (90.4)	6.4 (38.3)	14.1 (102.5)
Lake Borgne	55.6 (510.3)	111.4 (824.4)	59.8 (300.1)	52.0 (317.5)	15.5 (110.3)	40.6 (370.2)
	1998	1999	2000	2001	2002	2003
Lake Calcasieu	50.0 (274.5)	31.0 (162.6)	41.6 (250.4)	38.8 (160.1)	21.6 (152.9)	21.1 (137.0)
Vermilion-Cote Blanche Bays	42.8 (273.8)	36.9 (235.5)	36.0 (121.3)	68.2 (214.3)	39.5 (132.7)	55.1 (190.9)
Terrebonne-Timbalier Bays	32.4 (194.1)	23.2 (198.4)	16.1 (143.6)	18.1 (113.4)	22.2 (101.1)	21.1 (108.3)
Barataria Bay	3.8 (8.4)	0.8 (4.5)	0.3 (1.7)	1.5 (9.9)	4.2 (10.6)	5.4 (20.5)
Breton-Chandeleur Sounds	5.9 (56.4)	6.1 (52.3)	8.5 (79.9)	8.0 (52.3)	20.6 (152.4)	11.3 (77.6)
Lake Borgne	21.4 (153.3)	13.7 (132.0)	24.5 (222.4)	19.6 (107.5)	62.5 (477.2)	38.0 (205.0)
	2004	2005	2006	2007	Mean	SE
Lake Calcasieu	45.6 (135.6)	20.4 (134.0)	27.0 (182.3)	72.2 (323.7)	46.7 (236.4)	4.4 (22.5)
Vermilion-Cote Blanche Bays	59.0 (288.8)	50.4 (280.9)	53.3 (295.1)	160.6 (735.7)	45.2 (211.5)	6.3 (28.8)
Terrebonne-Timbalier Bays	14.7 (81.6)	23.6 (149.9)	14.4 (97.8)	36.9 (116.7)	19.6 (148.5)	1.7 (14.8)
Barataria Bay	11.9 (58.5)	5.3 (41.7)	4.0 (13.8)	7.2 (46.4)	3.6 (17.2)	0.7 (3.3)
Breton-Chandeleur Sounds	14.1 (100.6)	18.3 (138.5)	15.2 (257.7)	10.7 (56.6)	11.6 (92.2)	1.3 (16.4)
Lake Borgne	33.4 (224.3)	31.9 (232.5)	24.1 (269.8)	67.4 (316.6)	35.5 (249.1)	5.2 (37.7)

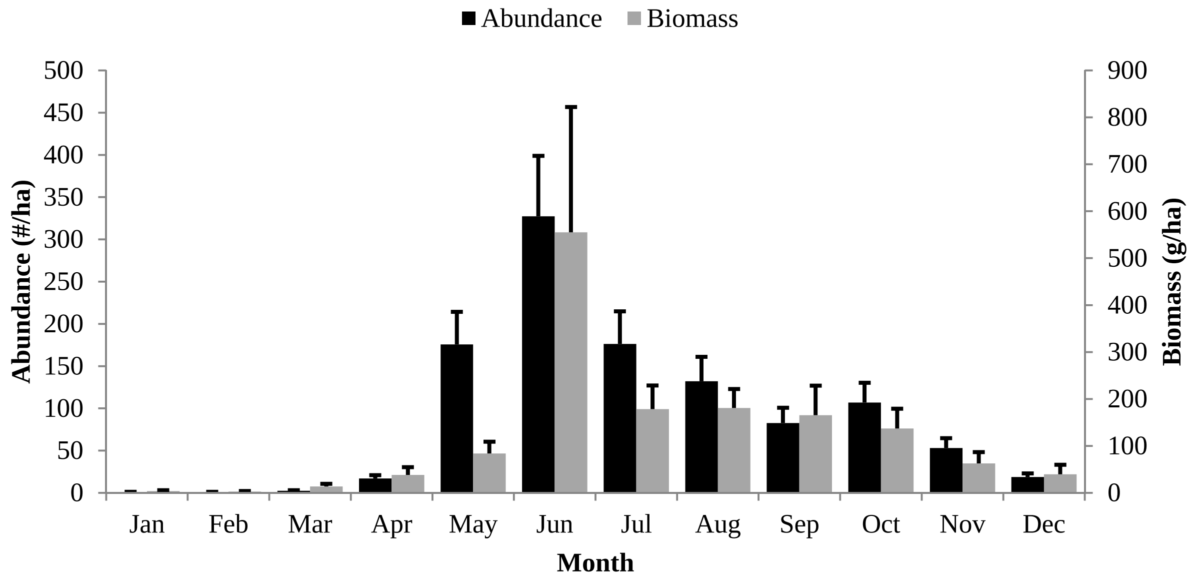

Figure 105. The monthly mean (+SE) abundance and biomass of *Cynoscion arenarius* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *C. arenarius* length measurements were not recorded until 1985.

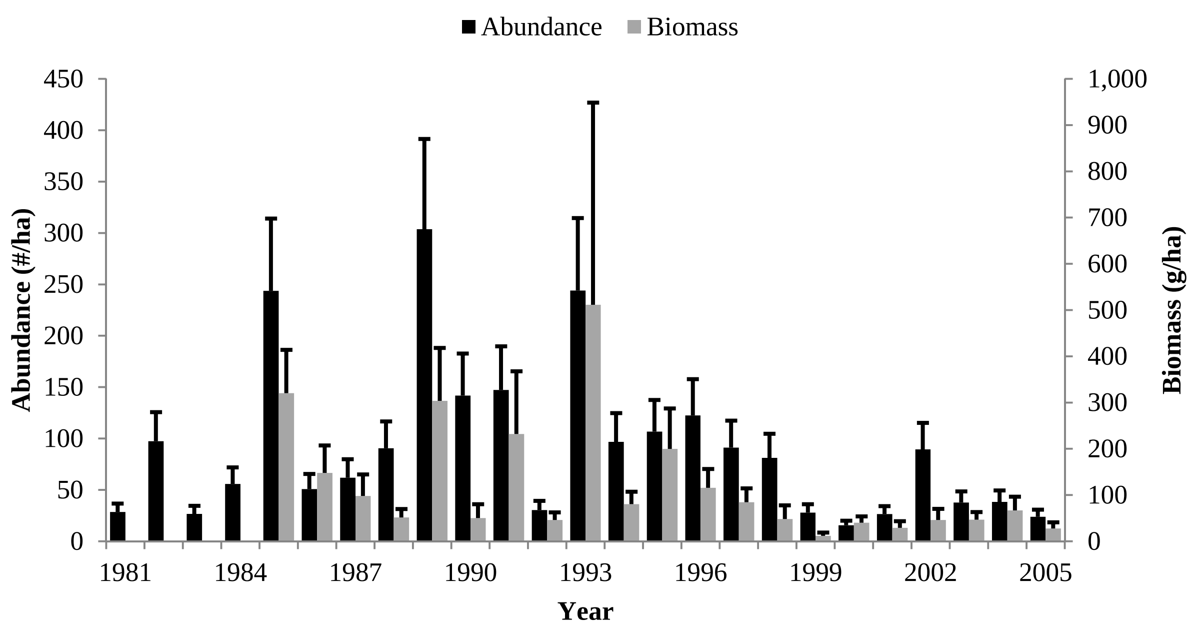

Figure 106. The mean (+SE) annual abundance and biomass of *Cynoscion arenarius* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *C. arenarius* length measurements were not recorded until 1985.

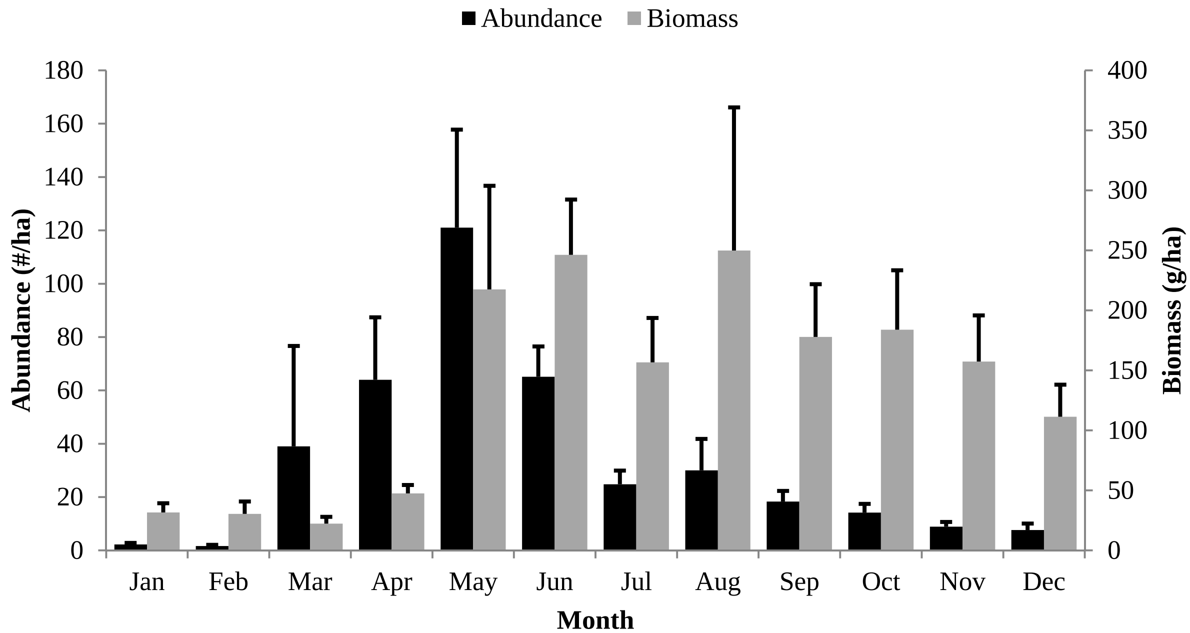

Figure 107. The monthly mean (+SE) abundance and biomass of *Cynoscion arenarius* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

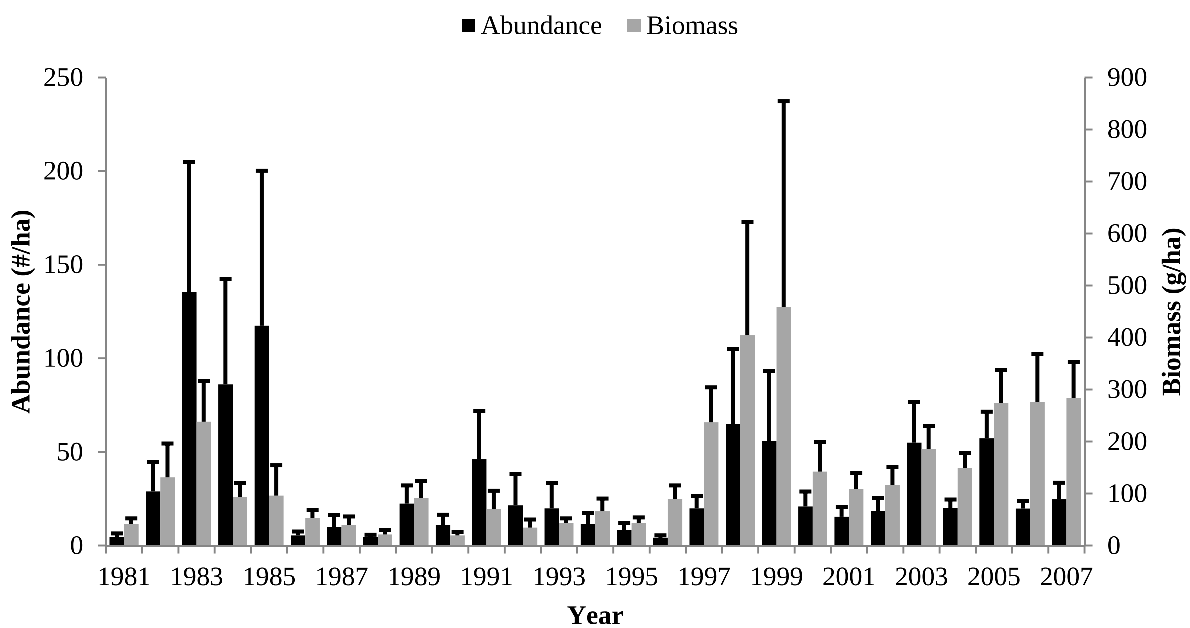

Figure 108. The mean (+SE) annual abundance and biomass of *Cynoscion arenarius* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

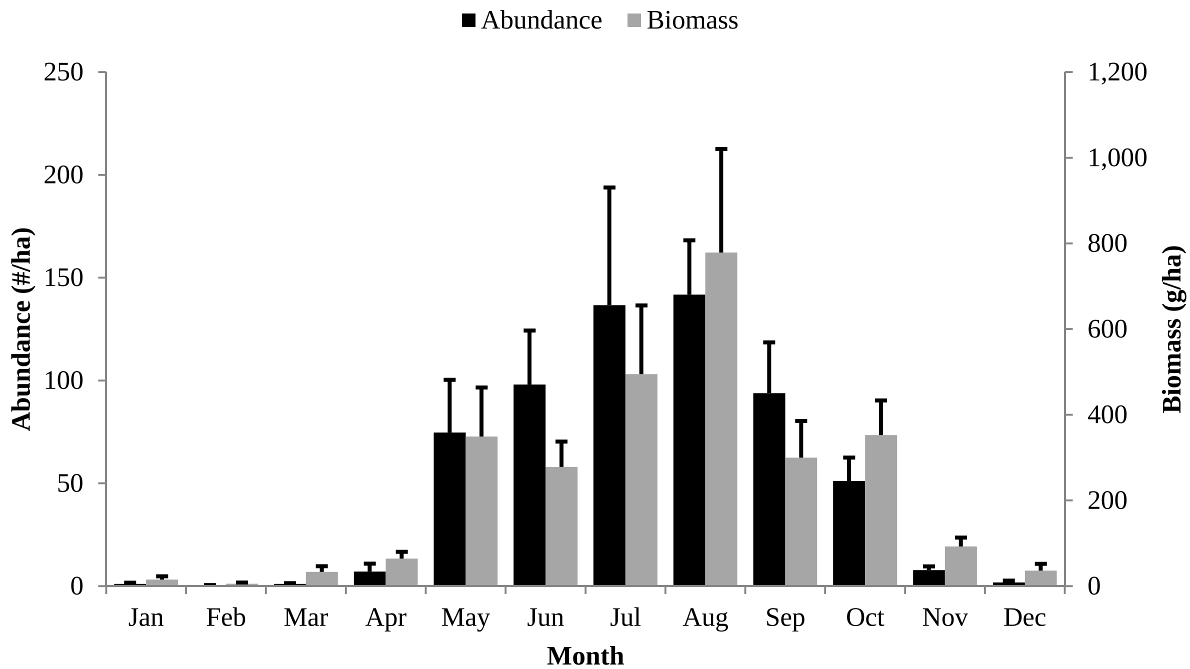

Figure 109. The monthly mean (+SE) abundance and biomass of *Cynoscion arenarius* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

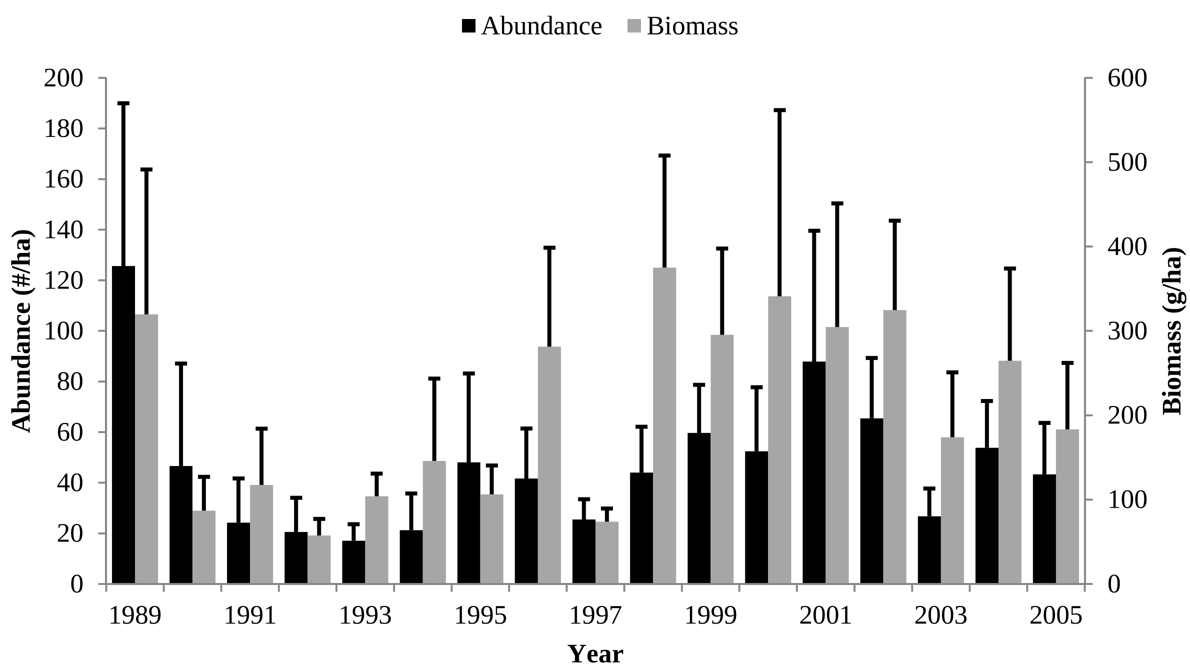

Figure 110. The mean (+SE) annual abundance and biomass of *Cynoscion arenarius* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 55. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	3.1 (36.2)	2..0 (42.2)	64.1 (23.1)	71.7 (53.8)
E MS Sound (AL)	1.8 (43.1)	1.7 (23.0)	2.2 (30.6)	81.3 (72.7)
Perdido Bay (AL)	0.1 (0.6)	0 (0)	0.2 (4.8)	0.8 (11.4)
Apalachicola Bay (FL)	0.4 (6.3)	0.5 (5.7)	0.6 (13.7)	1.5 (61.3)
Suwannee Sound (FL)	0.6 (14.2)	0 (0)	0 (0)	8.6 (155.0)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	3.6 (38.5)	0.2 (13.5)	1.6 (51.5)	18.3 (99.5)
Charlotte Harbor (FL)	1.4 (22.8)	0 (0)	1.0 (42.9)	3.4 (17.0)
	May	**Jun**	**Jul**	**Aug**
Mobile Bay (AL)	140.8 (210.1)	89.6 (300.0)	34.6 (186.1)	34.6 (280.6)
E MS Sound (AL)	138.9 (392.6)	47.4 (264.0)	15.9 (193.5)	10.7 (117.5)
Perdido Bay (AL)	3.7 (20.1)	0.5 (20.0)	0.3 (1.3)	0.3 (9.0)
Apalachicola Bay (FL)	61.3 (302.6)	87.3 (305.1)	205.6 (757.0)	182.0 (945.3)
Suwannee Sound (FL)	182.7 (1209.4)	156.7 (1000.0)	26.8 (70.6)	93.6 (456.4)
Cedar Key (FL)	66.0 (2290.8)	2.8 (0.6)	4.1 (152.4)	5.0 (91.7)
Tampa Bay (FL)	127.2 (314.0)	96.4 (150.5)	37.3 (201.9)	188.7 (559.6)
Charlotte Harbor (FL)	1.2 (13.8)	50.0 (186.8)	58.7 (236.0)	141.7 (611.1)
	Sep	**Oct**	**Nov**	**Dec**
Mobile Bay (AL)	24.7 (200.7)	19.3 (235.3)	12.4 (99.0)	10.5 (151.7)
E MS Sound (AL)	14.6 (171.2)	11.3 (257.5)	4.0 (99.0)	3.1 (53.8)
Perdido Bay (AL)	1.8 (14.5)	1.8 (12.7)	2.3 (9.2)	0.3 (1.4)
Apalachicola Bay (FL)	120.6 (478.9)	44.7 (302.8)	17.4 (119.6)	2.7 (48.7)
Suwannee Sound (FL)	89.4 (458.0)	48.3 (878.1)	6.4 (204.8)	0.5 (7.0)
Cedar Key (FL)	0.9 (0.6)	13.4 (244.1)	4.3 (108.4)	0 (0)
Tampa Bay (FL)	87.6 (117.1)	68.3 (438.4)	7.8 (89.4)	1.3 (32.7)
Charlotte Harbor (FL)	11.1 (176.9)	42.7 (358.7)	4.7 (46.2)	0.2 (1.3)
	Mean	**SE**		
Mobile Bay (AL)	42.3 (160.4)	12.1 (28.3)		
E MS Sound (AL)	27.7 (143.2)	12.2 (33.2)		
Perdido Bay (AL)	1.0 (8.8)	0.3 (2.1)		
Apalachicola Bay (FL)	60.4 (278.9)	21.3 (89.6)		
Suwannee Sound (FL)	51.1 (371.1)	18.8 (125.2)		
Cedar Key (FL)	8.0 (240.7)	5.4 (187.8)		
Tampa Bay (FL)	53.2 (175.6)	17.7 (50.3)		
Charlotte Harbor (FL)	26.3 (142.8)	12.2 (54.0)		

Table 56. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion arenarius* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985	1986	1987	1988
Mobile Bay (AL)	5.2 (38.2)	37.0 (126.7)	107.9 (188.5)	125.4 (99.2)	185.1 (119.5)	6.5 (60.4)	16.0 (55.0)	5.5 (29.5)
E MS Sound (AL)	4.3 (54.3)	18.8 (136.7)	193.2 (342.0)	26.5 (101.8)	21.3 (79.8)	4.0 (42.4)	5.4 (37.0)	6.4 (18.0)
Perdido Bay (AL)		0 (0)	2.8 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0.4 (2.0)

	1989	1990	1991	1992	1993	1994	1995	1996
Mobile Bay (AL)	31.6 (61.6)	10.5 (28.2)	65.6 (109.6)	29.6 (40.7)	31.4 (44.8)	17.1 (82.3)	8.8 (39.7)	5.0 (94.7)
E MS Sound (AL)	24.7 (225.5)	23.3 (21.4)	55.3 (59.3)	18.6 (52.0)	4.7 (62.5)	5.6 (84.7)	15.4 (103.2)	5.9 (161.5)
Perdido Bay (AL)	1.7 (5.6)	0 (0)	0.3 (5.5)	0 (0)	0.5 (3.8)	0 (0)	0 (0)	0.4 (5.5)
Suwannee Sound (FL)								61.3 (494.7)
Cedar Key (FL)								2.2 (1.7)
Tampa Bay (FL)	195.2 (574.2)	49.4 (111.3)	46.3 (208.9)	35.7 (97.6)	21.5 (153.4)	53.6 (239.9)	47.9 (140.3)	36.4 (274.5)
Charlotte Harbor (FL)	3.7 (15.7)	0.2 (6.4)	3.1 (6.1)	3.5 (7.4)	7.7 (14.1)	16.6 (48.5)	6.3 (74.3)	45.7(322.3)

	1997	1998	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	28.5 (331.8)	36.1 (389.0)	59.1 (483.1)	57.1 (254.6)	23.8 (146.6)	26.9 (166.5)	77.8 (283.3)	28.1 (208.8)
E MS Sound (AL)	15.0 (227.8)	234.4 (1081.4)	16.4 (58.1)	1.4 (8.6)	8.3 (100.6)	12.6 (59.4)	29.7 (47.5)	4.6 (51.6)
Perdido Bay (AL)	0 (0)	2.2 (28.3)	5.0 (4.2)	0.2 (0.1)	0.7 (6.1)	0.7 (28.8)	1.0 (1.4)	2.7 (16.9)
Apalachicola Bay (FL)		53.3 (434.3)	59.3 (331.2)	51.2 (326.7)	104.3 (374.4)	65.8 (225.2)	17.0 (79.9)	75.9 (218.1)
Suwannee Sound (FL)	30.8 (79.4)				27.1 (53.4)	71.4 (670.0)	74.3 (351.4)	64.5 (651.3)
Cedar Key (FL)	3.9 (46.1)				8.0 (146.5)	0 (0)	0.9 (58.3)	29.7 (972.8)
Tampa Bay (FL)	34.4 (102.7)	40.6 (196.9)	23.3 (133.9)	23.3 (287.8)	54.6 (122.0)	7.5 (18.8)	29.5 (190.7)	38.2 (176.4)
Charlotte Harbor (FL)	8.2 (26.0)	44.4 (244.1)	26.1 (23.5)	19.9 (21.4)	33.6 (102.7)	32.0 (417.6)	70.5 (1413.8)	5.4 (25.5)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	76.2 (355.5)	26.23 (290.1)	31.8 (361.1)	43.0 (166.2)	8.7 (4.9)
E MS Sound (AL)	18.9 (71.1)	8.6 (559.9)	11.3 (171.6)	29.4 (148.9)	11.4 (8.1)
Perdido Bay (AL)	8.5 (69.7)	0.8 (27.2)	1.0 (12.1)	1.1 (8.4)	0.4 (0.6)
Apalachicola Bay (FL)	65.0 (311.1)			61.5 (287.9)	8.7 (39.0)
Suwannee Sound (FL)	40.3 (392.2)			52.8 (384.6)	9.9 (93.7)
Cedar Key (FL)	1.0 (93.0)			6.5 (188.3)	4.0 (132.2)
Tampa Bay (FL)	25.5 (34.7)			45.1 (180.2)	9.9 (30.5)
Charlotte Harbor (FL)	41.2 (157.6)			21.6 (172.2)	4.9 (83.1)

Callinectes sapidus

The seasonal abundance pattern for blue crab (*Callinectes sapidus*) was different among the states with major peaks varying between winter and spring and secondary peaks occuring in summer and fall (Figure 111). Abundance was highest in Louisiana among the states with an overall mean (mean of 12 monthly means in Figure 111) of 21.1/ha, followed by Mississippi (10.6/ha), Florida (10.2/ha), Alabama (8.1/ha) and Texas (6.8/ha).

The maximum carapace width of a blue crab recorded by Pattillo et al. (1997) was 246 mm; therefore we excluded all measurements in the database greater than 246 mm from this analysis. The size frequency distributions for blue crab in each state (Figure 112) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Blue crab ranged in size from 6 – 245 mm (mean=80.6, SD=41.5) in Texas, 2 – 232 mm (mean=68.8, SD=47.4) in Louisiana, 4 – 202 mm (mean=59.3, SD=41.2) in Mississippi, 3 – 225 mm (mean=68.8, SD=45.6) in Alabama, and 2 – 246 mm (mean=87.7, SD=40.3) in Florida.

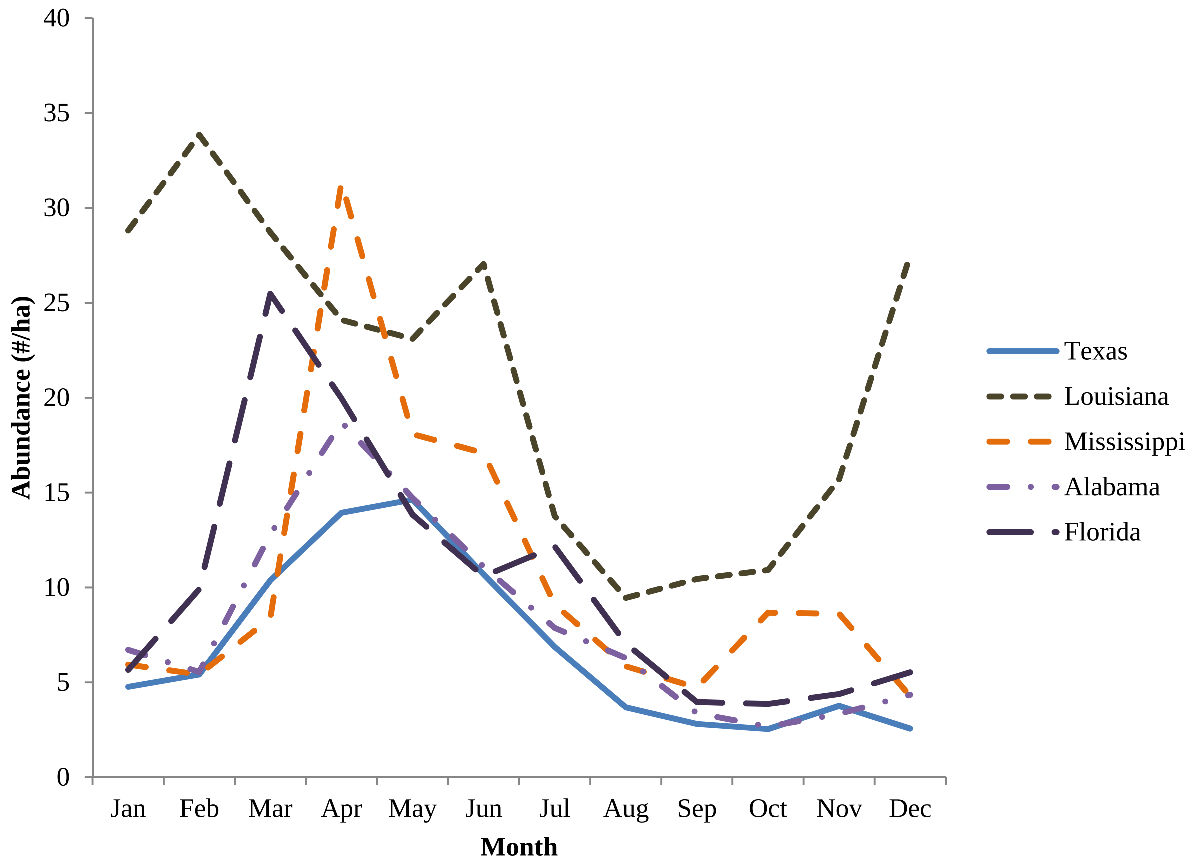

Figure 111. Monthly mean abundance of *Callinectes sapidus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

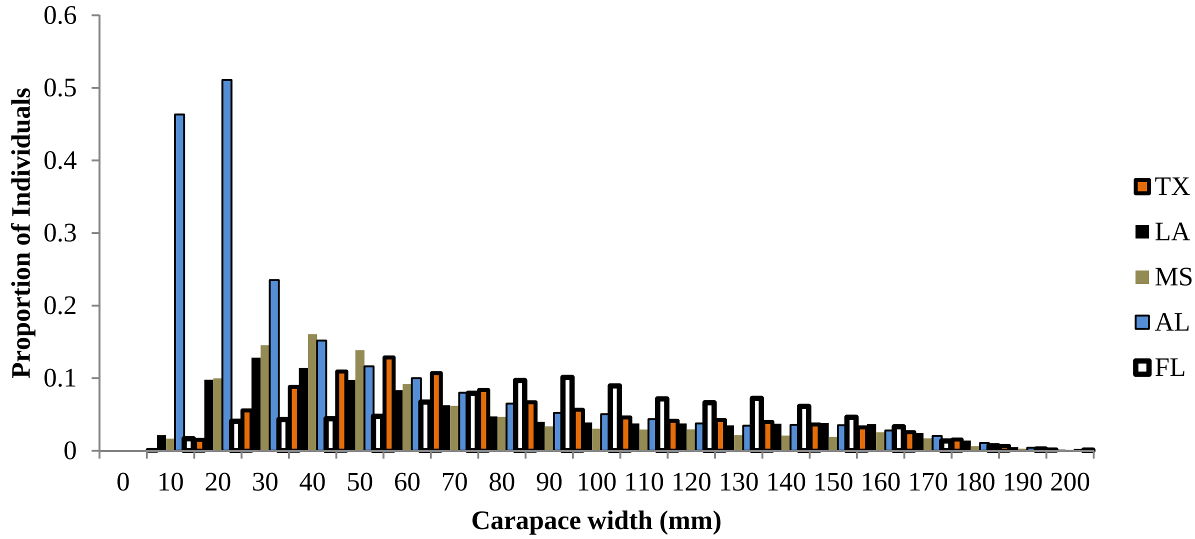

Figure 112. Size frequency of all blue crab (*Callinectes sapidus*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=92,393): 1982 – 2005; Louisiana (n=64,027): 1986 – 2007; Mississippi (n=2,502): 1985 – 2005; Alabama (n=11,053): 1981 – 2007; and Florida (n=12,072): 1989 – 2005 (n-values represent the number of individuals measured). Sizes in carapace width are combined into 10-mm bins.

In Texas, blue crab exhibited a seasonal variability, with low mean abundance and biomass in fall and peaks in April, May, and June (Figure 113). While mean annual abundance peaked in 1992 (13.3/ha), and biomass peaked in 1983 (691.9 g/ha), all abundance and biomass values before 1995 were higher than values after this year (Figure 114). The highest abundance and biomass values in Texas were found in San Antonio Bay and Lower Laguna Madre (Tables 57 and 58).

In Louisiana, the mean abundance of blue crab peaked in winter, while biomass peaked in late spring and summer (Figure 115). Mean annual abundance and biomass peaked in 1990 (61.0/ha and 1,719.4 g/ha, respectively) (Figure 116). The abundance and biomass were well spread throughout Louisiana, but highest values could be found in Vermilion-Cote Blanche Bays and Terrebonne-Timbalier Bays (Tables 59 and 60).

In Mississippi, the abundance and biomass of blue crab varied seasonally, with the highest mean values found in late spring/early summer (Figure 117). Mean annual abundance peaked in 1991 (34.5/ha), but biomass peaked in 1989 (421.2 g/ha) (Figure 118).

In Alabama, blue crab mean abundance was highest in spring, but biomass peaked in summer (Figure 119). Mean annual abundance peaked in 1989 (25.7/ha), but biomass peaked in 1984 (761.6 g/ha) (Figure 120). The highest mean abundance and biomass occurred in East Mississippi Sound (Tables 61 and 62).

In Florida, the abundance and biomass of blue crab peaked in the spring months, with lower and relatively even numbers throughout the rest of the year (Figure 121). Mean annual abundance peaked in 1998 (33.6/ha), and biomass peaked in 1989 (1,692.8 g/ha) (Figure 122). The distribution in Florida indicates a wide geographic spread, but the highest mean values appeared in Charlotte Harbor (Tables 61 and 62).

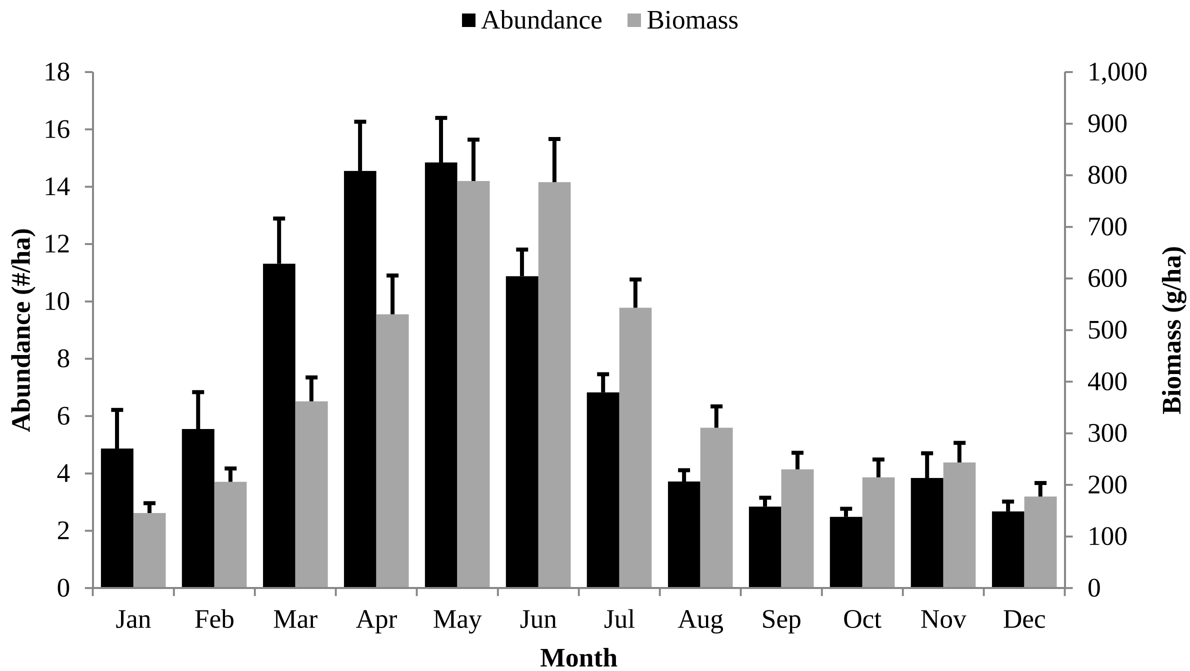

Figure 113. The monthly mean (+SE) abundance and biomass of *Callinectes sapidus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

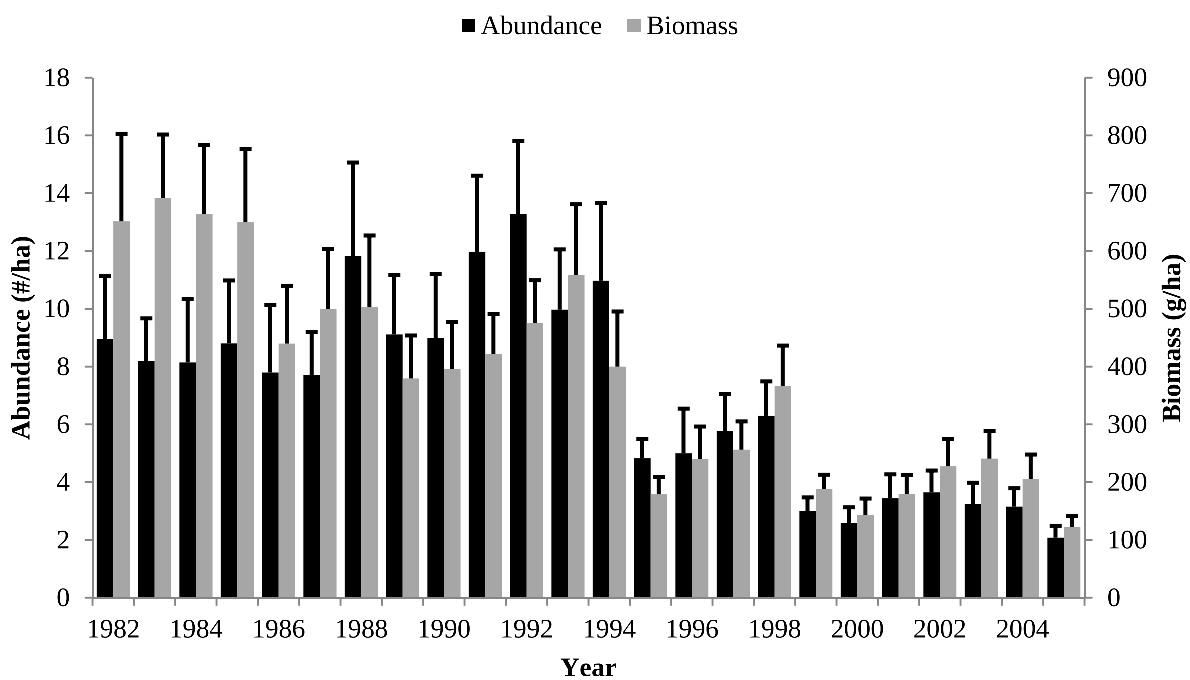

Figure 114. The mean (+SE) annual abundance and biomass of *Callinectes sapidus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 57. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	2.5 (192.4)	4.3 (319.8)	12.5 (714.5)	23.5 (1072.4)
Upper Laguna Madre	0.7 (67.7)	1.8 (183.1)	2.8 (204.9)	7.3 (414.6)
Corpus Christi Bay	0.9 (48.9)	1.1 (65.6)	3.4 (165.5)	5.8 (244.2)
Aransas Bay	7.0 (184.0)	7.5 (254.2)	21.7 (506.8)	23.0 (708.0)
San Antonio Bay	18.2 (201.4)	19.2 (337.4)	29.8 (678.0)	24.4 (780.7)
Matagorda Bay	0.9 (58.8)	1.9 (66.2)	4.7 (136.8)	6.8 (213.5)
East Matagorda Bay	1.0 (148.1)	2.6 (177.7)	6.7 (297.4)	12.6 (513.9)
Galveston Bay	2.3 (128.1)	3.2 (143.3)	5.4 (231.2)	16.8 (498.0)
Sabine Lake	2.4 (342.4)	3.6 (361.4)	3.0 (287.3)	1.1 (142.7)
	May	**Jun**	**Jul**	**Aug**
Lower Laguna Madre	15.5 (878.1)	12.7 (838.7)	9.6 (762.3)	6.8 (585.2)
Upper Laguna Madre	9.7 (625.3)	8.4 (529.1)	7.3 (596.7)	3.5 (339.7)
Corpus Christi Bay	7.0 (434.8)	3.7 (314.9)	3.8 (371.4)	1.9 (193.1)
Aransas Bay	17.6 (774.9)	14.6 (100.7)	8.8 (581.2)	5.3 (401.5)
San Antonio Bay	27.4 (1359.7)	17.2 (1023.2)	9.9 (692.9)	5.9 (427.0)
Matagorda Bay	12.2 (636.8)	8.1 (587.8)	4.3 (330.7)	2.1 (159.4)
East Matagorda Bay	13.0 (775.2)	8.5 (675.5)	5.0 (482.3)	1.5 (142.8)
Galveston Bay	18.9 (889.1)	14.8 (1140.8)	7.9 (563.6)	3.6 (272.9)
Sabine Lake	3.3 (457.1)	4.5 (597.7)	4.0 (583.3)	1.7 (271.4)
	Sep	**Oct**	**Nov**	**Dec**
Lower Laguna Madre	4.0 (312.0)	2.8 (254.5)	2.1 (179.8)	2.3 (242.9)
Upper Laguna Madre	2.8 (284.3)	1.9 (204.8)	1.6 (182.3)	1.1 (116.9)
Corpus Christi Bay	0.9 (90.7)	0.9 (100.6)	0.9 (79.3)	0.9 (62.3)
Aransas Bay	4.3 (303.1)	4.3 (349.9)	6.0 (413.7)	5.0 (346.0)
San Antonio Bay	4.6 (341.6)	3.2 (218.6)	9.8 (373.5)	4.9 (185.1)
Matagorda Bay	1.8 (107.5)	1.5 (80.4)	1.9 (103.0)	1.1 (60.2)
East Matagorda Bay	0.7 (43.8)	1.8 (163.0)	1.5 (91.4)	1.3 (90.3)
Galveston Bay	3.2 (211.1)	2.6 (150.8)	4.0 (207.0)	3.4 (173.8)
Sabine Lake	2.3 (349.4)	2.8 (490.9)	2.5 (490.1)	1.9 (292.3)
	Mean	**SE**		
Lower Laguna Madre	8.2 (529.4)	1.9 (90.8)		
Upper Laguna Madre	4.1 (312.5)	0.9 (54.5)		
Corpus Christi Bay	2.6 (180.1)	0.6 (28.0)		
Aransas Bay	10.4 (485.6)	2.0 (69.6)		
San Antonio Bay	14.5 (551.6)	2.7 (105.5)		
Matagorda Bay	3.9 (211.8)	1.0 (58.5)		
East Matagorda Bay	4.7 (300.1)	1.3 (71.8)		
Galveston Bay	7.2 (384.1)	1.7 (95.0)		
Sabine Lake	2.7 (388.8)	0.3 (39.4)		

Table 58. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985
Lower Laguna Madre	4.6 (521.0)	5.6 (599.0)	22.9 (1758.1)	16.5 (1318.8)
Upper Laguna Madre	4.0 (565.2)	3.1 (250.7)	10.6 (667.4)	9.2 (562.5)
Corpus Christi Bay	3.4 (372.3)	1.1 (127.1)	3.6 (295.4)	2.4 (368.0)
Aransas Bay	13.2 (706.2)	18.5 (1513.5)	14.4 (1185.5)	10.4 (619.2)
San Antonio Bay	7.6 (573.1)	9.7 (703.3)	3.5 (272.3)	8.9 (558.5)
Matagorda Bay	2.4 (257.0)	4.6 (368.6)	1.7 (154.4)	4.5 (373.5)
Galveston Bay	12.9 (1295.5)	10.9 (1013.7)	8.8 (893.8)	13.8 (1037.7)
	1986	1987	1988	1989
Lower Laguna Madre	7.1 (362.7)	9.1 (550.1)	8.2 (432.3)	4.1 (183.3)
Upper Laguna Madre	3.8 (290.5)	3.7 (343.1)	3.3 (260.9)	1.2 (102.3)
Corpus Christi Bay	6.6 (383.3)	3.0 (226.7)	3.3 (205.5)	1.1 (85.3)
Aransas Bay	11.7 (530.2)	8.3 (525.9)	26.9 (844.2)	11.1 (353.6)
San Antonio Bay	8.9 (485.1)	18.8 (1256.9)	41.5 (1549.4)	23.1 (850.7)
Matagorda Bay	6.0 (323.7)	4.8 (226.8)	1.6 (71.2)	2.7 (123.1)
East Matagorda Bay		13.0 (712.6)	6.0 (374.2)	23.9 (523.1)
Galveston Bay	13.1 (632.7)	8.9 (436.9)	4.4 (178.5)	11.6 (380.6)
Sabine Lake	2.8 (396.8)	2.2 (340.6)	2.4 (390.3)	4.1 (684.2)
	1990	1991	1992	1993
Lower Laguna Madre	15.6 (906.5)	16.2 (946.5)	12.7 (971.9)	10.4 (592.0)
Upper Laguna Madre	2.2 (134.3)	2.2 (190.9)	12.1 (1196.8)	7.7 (830.7)
Corpus Christi Bay	6.4 (431.2)	3.3 (278.5)	4.6 (244.3)	4.6 (367.4)
Aransas Bay	8.0 (299.1)	23.9 (587.0)	17.8 (375.7)	16.2 (783.1)
San Antonio Bay	18.2 (602.5)	31.8 (799.1)	49.2 (1010.1)	23.5 (1040.8)
Matagorda Bay	1.9 (122.1)	2.9 (124.3)	3.0 (106.6)	6.3 (344.6)
East Matagorda Bay	7.1 (305.6)	12.3 (465.3)	1.0 (93.4)	2.8 (277.8)
Galveston Bay	14.6 (514.2)	4.9 (155.6)	3.8 (197.1)	7.5 (338.0)
Sabine Lake	2.8 (261.5)	3.4 (419.2)	3.3 (519.1)	2.5 (369.9)
	1994	1995	1996	1997
Lower Laguna Madre	11.6 (705.6)	8.1 (418.0)	5.8 (315.2)	7.2 (386.3)
Upper Laguna Madre	9.6 (497.9)	5.1 (220.1)	1.7 (110.4)	3.2 (239.7)
Corpus Christi Bay	1.5 (62.2)	1.7 (65.3)	2.3 (98.2)	1.7 (91.8)
Aransas Bay	12.2 (482.1)	5.3 (191.0)	4.7 (188.8)	5.6 (203.5)
San Antonio Bay	33.0 (525.9)	11.8 (282.5)	6.5 (268.5)	9.7 (358.7)
Matagorda Bay	10.7 (566.8)	3.6 (139.9)	7.5 (346.6)	8.6 (340.3)
East Matagorda Bay	1.3 (104.5)	1.4 (169.8)	3.0 (323.1)	2.1 (346.5)
Galveston Bay	7.3 (321.8)	3.6 (100.0)	6.7 (169.3)	7.6 (149.6)
Sabine Lake	1.9 (373.8)	0.9 (141.5)	4.2 (475.4)	2.1 (325.7)

Table 58 (continued).

	1998	1999	2000	2001
Lower Laguna Madre	6.1 (353.8)	6.2 (295.1)	2.9 (145.9)	3.0 (123.3)
Upper Laguna Madre	4.0 (315.5)	3.9 (268.4)	0.8 (60.0)	0.4 (26.9)
Corpus Christi Bay	3.0 (160.8)	1.3 (97.1)	0.8 (70.2)	2.0 (82.8)
Aransas Bay	9.0 (458.0)	4.1 (184.6)	3.7 (183.0)	5.6 (348.2)
San Antonio Bay	6.9 (392.8)	1.5 (111.1)	2.9 (148.4)	6.1 (341.3)
Matagorda Bay	6.1 (288.5)	3.2 (131.6)	2.9 (110.7)	2.3 (89.8)
East Matagorda Bay	3.5 (453.3)	4.1 (386.4)	1.7 (87.0)	1.1 (104.5)
Galveston Bay	9.8 (332.4)	2.4 (146.8)	4.4 (188.2)	5.3 (183.8)
Sabine Lake	5.1 (747.0)	3.0 (343.7)	1.6 (319.1)	1.0 (168.3)
	2002	2003	2004	2005
Lower Laguna Madre	1.9 (103.4)	6.8 (508.7)	1.6 (126.3)	1.0 (63.6)
Upper Laguna Madre	0.7 (29.3)	3.3 (293.0)	1.1 (80.9)	1.4 (77.1)
Corpus Christi Bay	1.3 (116.7)	1.0 (99.6)	1.6 (61.2)	1.0 (32.0)
Aransas Bay	9.4 (478.1)	4.3 (331.1)	3.6 (208.3)	2.3 (101.3)
San Antonio Bay	4.6 (233.1)	7.0 (309.2)	8.2 (342.5)	6.1 (222.3)
Matagorda Bay	2.0 (163.0)	1.7 (119.8)	2.4 (167.9)	0.8 (67.3)
East Matagorda Bay	2.8 (408.9)	2.2 (348.2)	1.5 (267.0)	0.7 (86.2)
Galveston Bay	4.4 (194.6)	1.6 (101.0)	2.5 (136.7)	1.4 (120.7)
Sabine Lake	2.2 (273.4)	1.9 (297.5)	3.6 (564.6)	2.8 (401.2)
	Mean	SE		
Lower Laguna Madre	8.1 (528.6)	1.1 (83.8)		
Upper Laguna Madre	4.1 (317.3)	0.7 (57.5)		
Corpus Christi Bay	2.6 (184.3)	0.3 (25.9)		
Aransas Bay	10.4 (485.6)	1.3 (68.3)		
San Antonio Bay	14.5 (551.6)	2.6 (75.3)		
Matagorda Bay	3.9 (213.7)	0.5 (26.2)		
East Matagorda Bay	4.8 (306.8)	1.3 (39.2)		
Galveston Bay	7.2 (384.1)	0.8 (69.9)		
Sabine Lake	2.7 (388.8)	0.2 (33.0)		

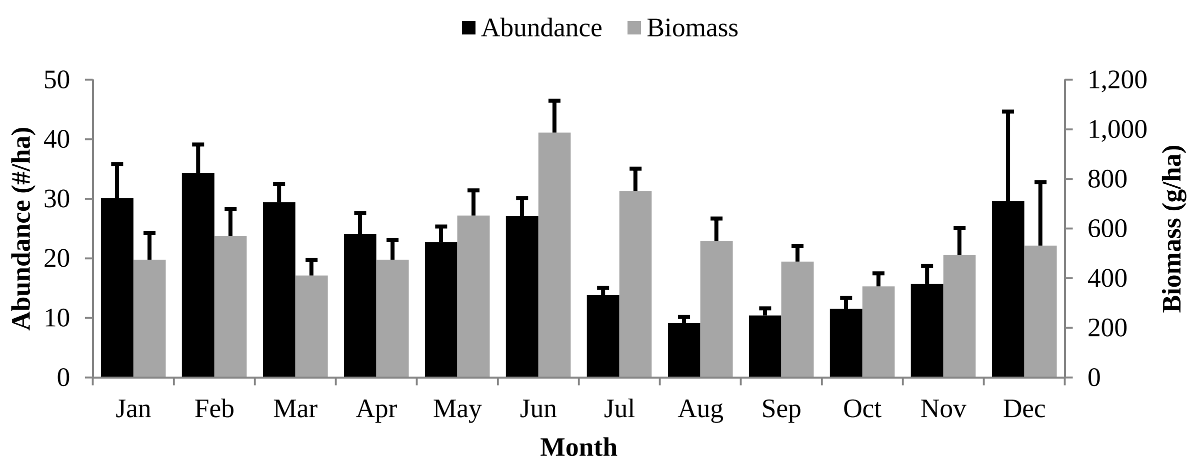

Figure 115. The monthly mean (+SE) abundance and biomass of *Callinectes sapidus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

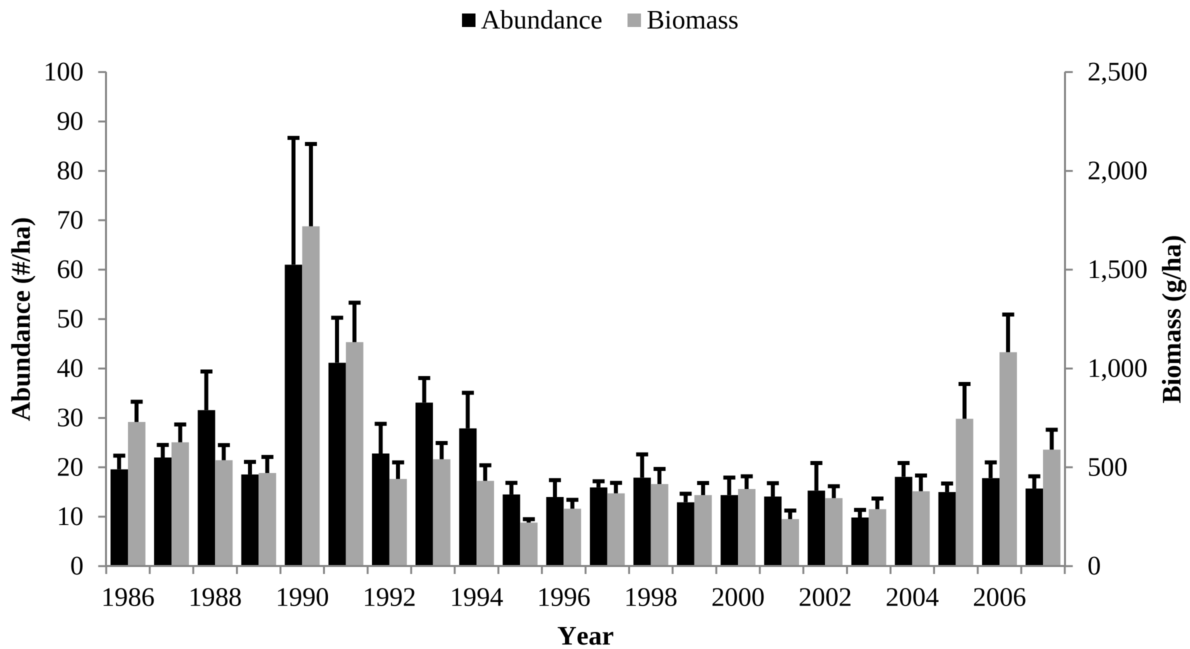

Figure 116. The mean (+SE) annual abundance and biomass of *Callinectes sapidus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 59. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	14.6 (514.3)	39.3 (1351.7)	29.9 (681.4)	25.9 (806.0)	19.2 (1019.8)
Vermilion-Cote Blanche Bays	44.0 (595.2)	69.1 (695.6)	42.3 (581.3)	26.4 (711.4)	23.2 (755.0)
Terrebonne-Timbalier Bays	54.9 (710.2)	46.4 (686.9)	42.3 (349.0)	39.1 (437.8)	33.4 (671.2)
Barataria Bay	8.9 (233.4)	10.2 (344.3)	12.9 (76.3)	10.8 (92.8)	17.4 (284.4)
Breton-Chandeleur Sounds	9.8 (200.4)	6.0 (208.6)	11.9 (306.9)	12.6 (403.3)	13.7 (585.1)
Lake Borgne	8.1 (112.7)	14.8 (239.8)	49.6 (1387.9)	11.8 (375.8)	17.9 (851.7)

	Jun	Jul	Aug	Sep	Oct
Lake Calcasieu	12.7 (1090.9)	5.8 (560.0)	2.6 (262.2)	2.6 (203.2)	2.7 (196.8)
Vermilion-Cote Blanche Bays	50.5 (1455.7)	19.7 (857.4)	9.8 (428.0)	16.0 (623.6)	20.1 (616.0)
Terrebonne-Timbalier Bays	25.1 (866.9)	16.9 (861.9)	12.5 (604.3)	13.6 (455.5)	15.5 (309.2)
Barataria Bay	24.4 (768.2)	11.8 (816.7)	8.6 (899.7)	3.6 (212.8)	3.7 (89.5)
Breton-Chandeleur Sounds	15.4 (753.6)	8.8 (589.9)	7.1 (455.3)	8.1 (501.6)	8.1 (428.7)
Lake Borgne	27.4 (1081.7)	14.3 (694.2)	9.2 (501.3)	8.4 (567.7)	6.1 (363.0)

	Nov	Dec	Mean	SE
Lake Calcasieu	4.3 (308.4)	4.6 (239.0)	13.7 (602.8)	3.6 (113.1)
Vermilion-Cote Blanche Bays	20.7 (596.9)	27.3 (318.7)	30.7 (686.2)	4.9 (80.9)
Terrebonne-Timbalier Bays	25.1 (423.7)	83.3 (1318.5)	34.0 (641.3)	6.0 (81.9)
Barataria Bay	10.0 (87.2)	6.3 (183.2)	10.7 (340.7)	1.7 (88.6)
Breton-Chandeleur Sounds	12.1 (906.4)	7.1 (343.3)	10.1 (473.6)	0.9 (60.9)
Lake Borgne	8.8 (855.2)	11.2 (314.0)	15.6 (619.6)	3.5 (106.4)

Table 60. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	24.7 (1197.1)	12.6 (498.9)	8.2 (334.7)	32.9 (877.4)
Vermilion-Cote Blanche Bays	24.2 (1044.6)	38.4 (1059.6)	50.7 (1029.5)	27.0 (537.1)
Terrebonne-Timbalier Bays	27.5 (603.8)	25.6 (527.3)	45.1 (635.5)	33.0 (670.0)
Barataria Bay	8.3 (421.5)	17.3 (441.1)	20.6 (285.0)	3.3 (118.8)
Breton-Chandeleur Sounds	11.5 (648.5)	17.3 (552.0)	9.5 (246.9)	8.8 (430.4)
Lake Borgne	6.4 (382.2)	23.3 (980.9)	14.6 (418.6)	8.7 (320.2)
	1990	1991	1992	1993
Lake Calcasieu	41.0 (2190.1)	14.7 (647.1)	7.3 (407.6)	10.6 (470.9)
Vermilion-Cote Blanche Bays	43.8 (988.6)	32.5 (561.3)	42.8 (495.5)	77.3 (641.8)
Terrebonne-Timbalier Bays	156.4 (3180.8)	71.8 (1482.1)	27.1 (410.2)	56.8 (881.3)
Barataria Bay	12.3 (601.8)	27.6 (684.8)	4.6 (214.9)	8.5 (276.4)
Breton-Chandeleur Sounds	32.5 (1782.4)	23.3 (1572.8)	7.1 (218.9)	9.4 (329.5)
Lake Borgne	18.1 (657.7)	28.4 (1577.3)	85.6 (2684.6)	12.9 (273.5)
	1994	1995	1996	1997
Lake Calcasieu	4.9 (359.6)	5.7 (135.5)	29.8 (730.7)	17.4 (681.2)
Vermilion-Cote Blanche Bays	31.2 (484.4)	23.6 (390.1)	19.3 (571.2)	31.7 (546.7)
Terrebonne-Timbalier Bays	54.4 (653.6)	23.4 (243.5)	17.2 (179.4)	18.3 (286.1)
Barataria Bay	5.5 (113.8)	5.6 (71.1)	1.4 (28.3)	2.8 (70.7)
Breton-Chandeleur Sounds	10.8 (309.9)	4.4 (209.6)	4.6 (137.1)	8.8 (389.4)
Lake Borgne	3.2 (68.1)	4.7 (144.3)	2.8 (92.5)	13.3 (340.5)
	1998	1999	2000	2001
Lake Calcasieu	17.2 (728.3)	3.4 (217.0)	3.2 (237.4)	5.8 (168.3)
Vermilion-Cote Blanche Bays	18.2 (293.3)	16.4 (305.1)	28.6 (845.5)	28.0 (440.6)
Terrebonne-Timbalier Bays	26.0 (321.3)	27.1 (487.1)	21.1 (341.7)	19.6 (212.7)
Barataria Bay	16.1 (273.9)	5.9 (354.3)	2.8 (169.1)	5.8 (85.1)
Breton-Chandeleur Sounds	12.9 (758.6)	4.2 (346.5)	7.3 (276.5)	3.5 (145.2)
Lake Borgne	11.6 (447.9)	5.1 (407.2)	5.9 (233.8)	8.0 (463.5)
	2002	2003	2004	2005
Lake Calcasieu	2.5 (200.6)	1.1 (67.3)	6.4 (155.4)	11.5 (448.7)
Vermilion-Cote Blanche Bays	17.8 (420.9)	16.3 (511.9)	28.1 (680.1)	30.6 (1131.1)
Terrebonne-Timbalier Bays	28.7 (323.1)	9.5 (175.0)	10.3 (150.6)	9.9 (427.8)
Barataria Bay	9.9 (384.3)	6.1 (102.7)	31.3 (407.8)	19.1 (1442.3)
Breton-Chandeleur Sounds	6.6 (272.6)	6.9 (235.7)	12.7 (273.9)	6.6 (415.0)
Lake Borgne	11.6 (530.2)	18.2 (801.7)	27.8 (992.9)	6.1 (121.4)
	2006	2007	Mean	SE
Lake Calcasieu	26.8 (1176.7)	18.2 (1486.1)	13.9 (609.8)	2.4 (110.6)
Vermilion-Cote Blanche Bays	27.0 (1489.6)	23.0 (628.5)	30.7 (686.2)	2.9 (66.6)
Terrebonne-Timbalier Bays	18.4 (1243.6)	21.1 (670.9)	34.0 (641.3)	6.7 (140.7)
Barataria Bay	10.5 (624.0)	11.8 (426.4)	10.8 (345.4)	1.7 (66.3)
Breton-Chandeleur Sounds	10.2 (727.7)	4.5 (208.2)	10.2 (476.7)	1.4 (91.1)
Lake Borgne	14.5 (1114.3)	10.1 (435.6)	15.5 (613.1)	3.7 (127.1)

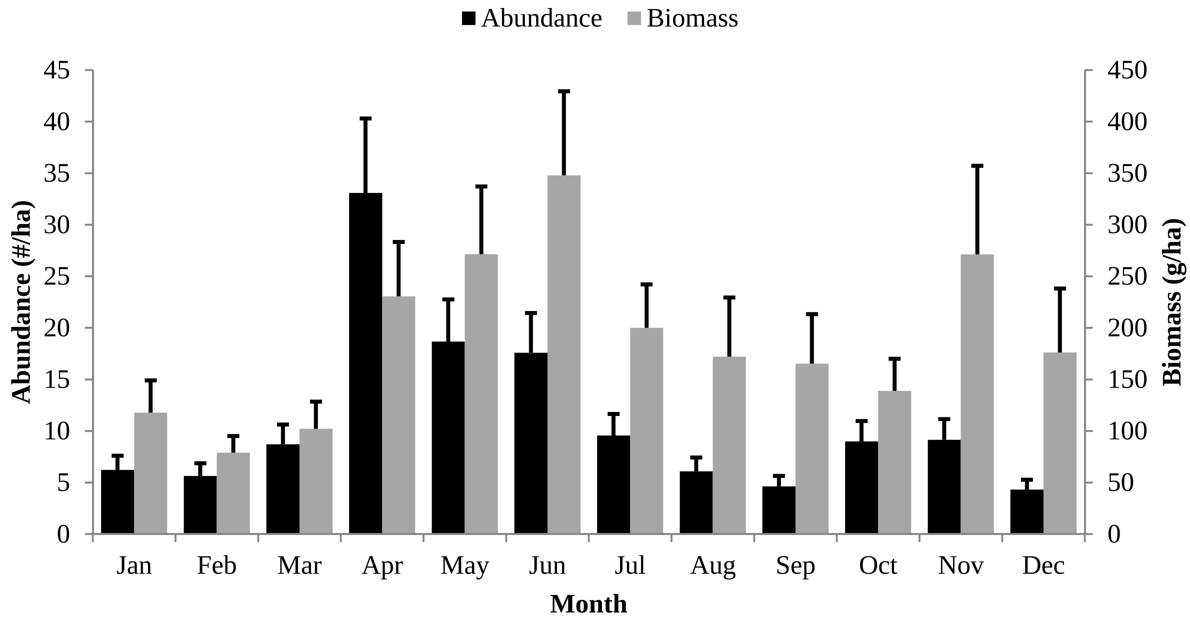

Figure 117. The monthly mean (+SE) abundance and biomass of *Callinectes sapidus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *C. sapidus* length measurements were not recorded until 1985.

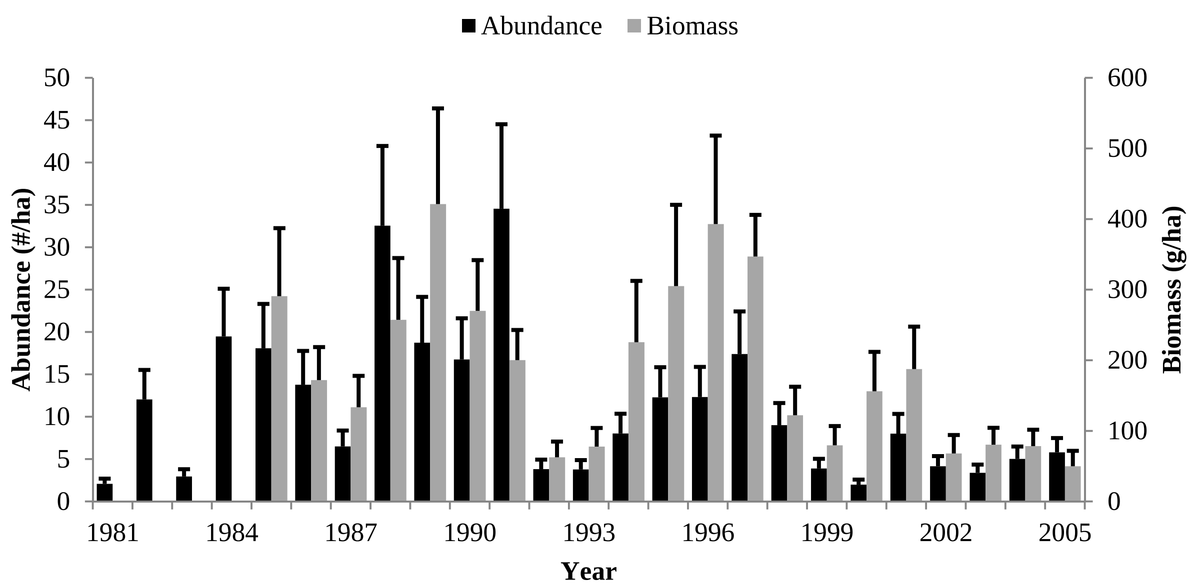

Figure 118. The mean (+SE) annual abundance and biomass of *Callinectes sapidus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *C. sapidus* length measurements were not recorded until 1985.

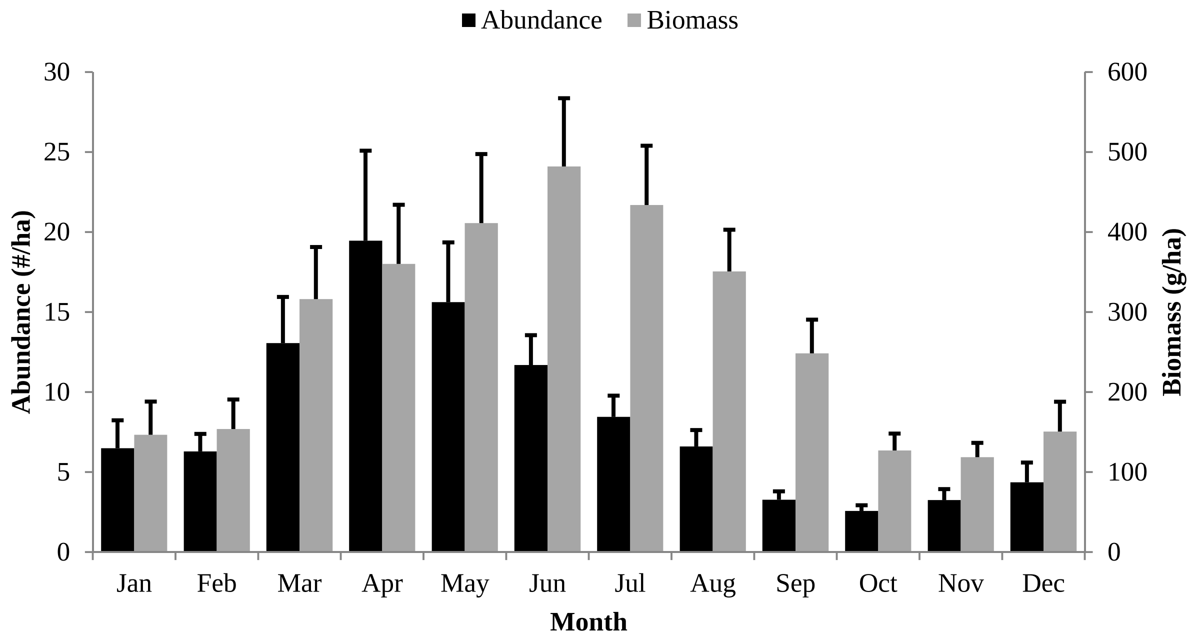

Figure 119. The monthly mean (+SE) abundance and biomass of *Callinectes sapidus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

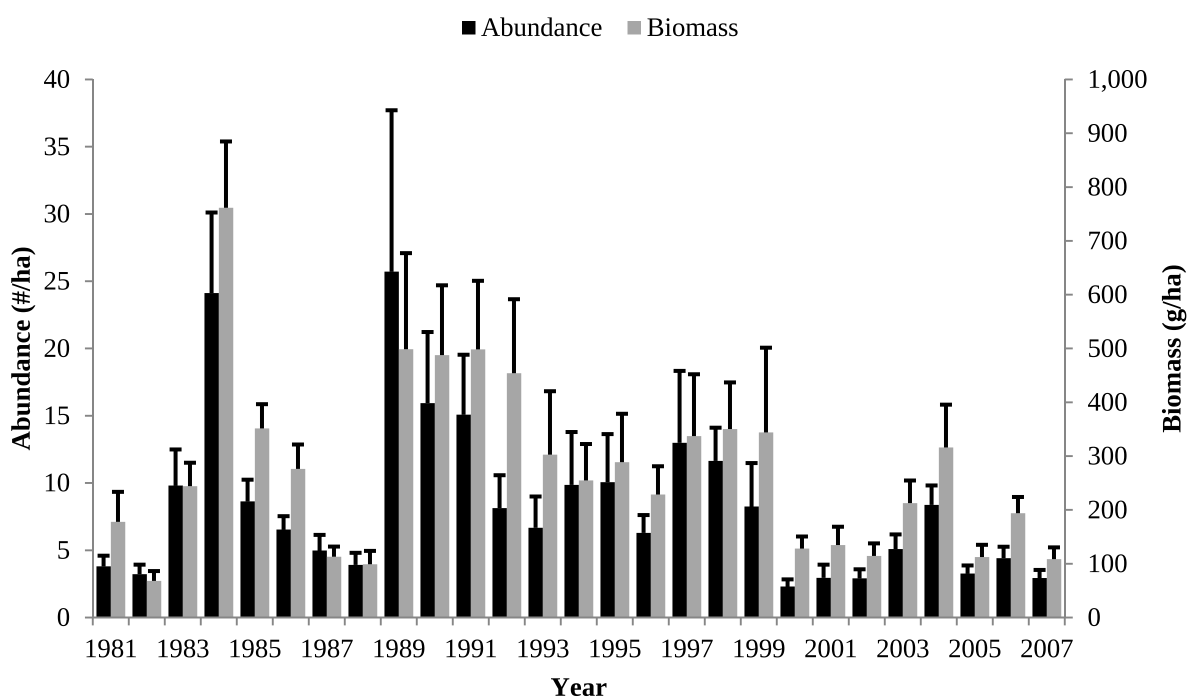

Figure 120. The mean (+SE) annual abundance and biomass of *Callinectes sapidus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

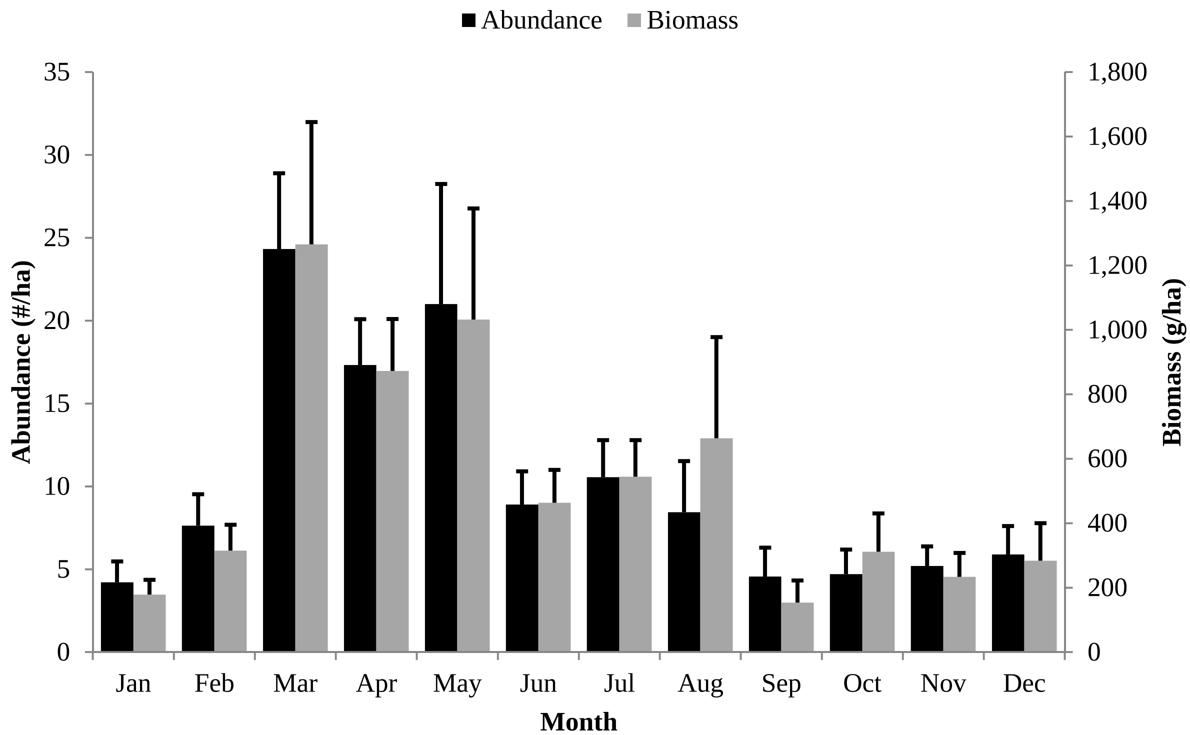

Figure 121. The monthly mean (+SE) abundance and biomass of *Callinectes sapidus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

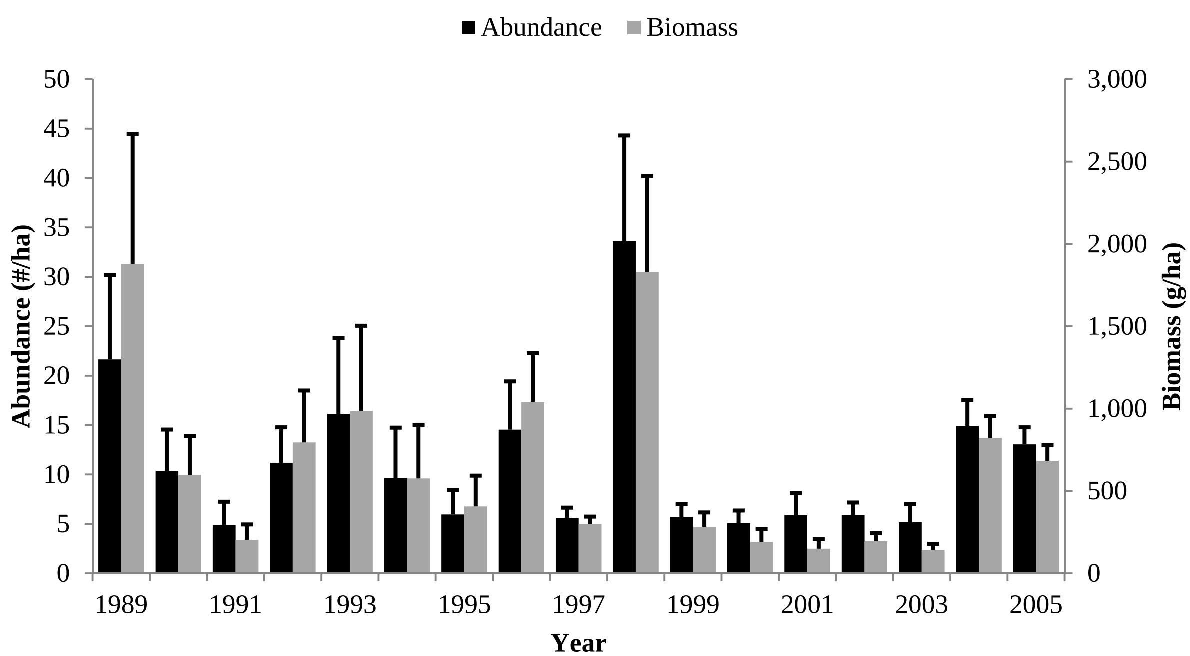

Figure 122. The mean (+SE) annual abundance and biomass of *Callinectes sapidus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 61. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	8.6 (220.5)	5.6 (188.6)	11.6 (385.7)	15.2 (385.6)
E MS Sound (AL)	4.1 (59.3)	8.1 (115.9)	28.9 (530.0)	38.0 (583.0)
Perdido Bay (AL)	2.8 (87.6)	4.0 (112.7)	4.3 (137.8)	6.8 (80.4)
Apalachicola Bay (FL)	4.2 (127.2)	7.4 (142.3)	12.2 (286.6)	11.0 (400.6)
Suwannee Sound (FL)	3.5 (215.9)	5.1 (385.7)	9.9 (346.8)	17.8 (645.0)
Cedar Key (FL)	4.3 (522.6)	2.2 (287.7)	2.0 (290.2)	2.9 (423.3)
Tampa Bay (FL)	5.7 (366.8)	12.9 (769.2)	27.5 (1850.4)	21.7 (1361.7)
Charlotte Harbor (FL)	8.0 (278.7)	18.5 (941.6)	47.2 (2753.6)	24.4 (1418.3)
	May	Jun	Jul	Aug
Mobile Bay (AL)	20.4 (485.8)	12.5 (434.7)	7.6 (334.2)	7.2 (318.5)
E MS Sound (AL)	15.0 (474.0)	18.0 (916.6)	12.4 (779.3)	5.4 (438.2)
Perdido Bay (AL)	5.1 (189.3)	2.1 (103.9)	4.4 (273.6)	2.6 (227.7)
Apalachicola Bay (FL)	28.6 (1186.7)	8.2 (345.3)	9.9 (516.2)	8.5 (644.6)
Suwannee Sound (FL)	5.3 (137.1)	1.3 (96.2)	36.5 (430.2)	2.8 (76.4)
Cedar Key (FL)	0 (0)	0.5 (3.7)	1.1 (34.4)	0 (0)
Tampa Bay (FL)	16.4 (1266.4)	11.8 (759.3)	5.0 (356.4)	4.2 (428.2)
Charlotte Harbor (FL)	15.2 (914.0)	14.5 (989.2)	21.5 (1849.8)	16.7 (1775.2)
	Sep	Oct	Nov	Dec
Mobile Bay (AL)	3.6 (270.2)	2.8 (127.2)	3.5 (143.4)	4.7 (173.5)
E MS Sound (AL)	4.0 (288.4)	2.9 (207.5)	2.4 (71.5)	4.2 (119.6)
Perdido Bay (AL)	2.2 (221.0)	1.4 (53.8)	1.7 (95.9)	1.5 (118.2)
Apalachicola Bay (FL)	9.3 (160.7)	3.3 (83.0)	7.7 (303.4)	6.3 (169.1)
Suwannee Sound (FL)	3.2 (169.8)	2.9 (184.1)	7.8 (287.7)	7.5 (533.6)
Cedar Key (FL)	0 (0)	0 (0)	1.6 (5.3)	2.8 (254.2)
Tampa Bay (FL)	1.6 (131.8)	3.5 (313.9)	3.5 (135.4)	4.5 (389.6)
Charlotte Harbor (FL)	4.4 (483.1)	8.6 (632.4)	6.9 (432.7)	4.6 (348.0)
	Mean	SE		
Mobile Bay (AL)	8.6 (289.0)	1.6 (34.5)		
E MS Sound (AL)	12.0 (381.9)	3.3 (82.4)		
Perdido Bay (AL)	3.2 (141.6)	0.5 (20.0)		
Apalachicola Bay (FL)	9.7 (363.8)	1.9 (89.3)		
Suwannee Sound (FL)	8.6 (292.4)	2.8 (51.9)		
Cedar Key (FL)	1.5 (151.8)	0.4 (55.6)		
Tampa Bay (FL)	9.9 (677.4)	2.4 (157.5)		
Charlotte Harbor (FL)	15.9 (1068.0)	3.4 (216.7)		

Table 62. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Callinectes sapidus* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	5.2 (226.3)	2.5 (64.6)	9.4 (229.3)	30.0 (831.3)	7.4 (351.1)
E MS Sound (AL)	2.8 (139.6)	4.3 (67.2)	10.6 (257.6)	16.6 (707.2)	11.6 (220.4)
Perdido Bay (AL)			3.3 (94.2)	3.8 (202.1)	6.0 (912.0)

	1986	1987	1988	1989	1990
Mobile Bay (AL)	7.4 (313.7)	6.4 (132.3)	4.2 (113.1)	15.0 (394.9)	18.9 (643.5)
E MS Sound (AL)	5.8 (202.2)	2.6 (51.6)	4.0 (114.2)	63.0 (1081.5)	22.1 (566.5)
Perdido Bay (AL)	2.7 (207.2)	3.2 (149.9)	3.5 (56.3)	8.9 (131.7)	3.9 (172.2)
Tampa Bay (FL)				23.7 (2142.0)	11.1 (701.4)
Charlotte Harbor (FL)				11.2 (695.8)	8.5 (332.0)

	1991	1992	1993	1994	1995
Mobile Bay (AL)	18.4 (530.1)	6.3 (268.1)	4.7 (264.5)	12.2 (273.3)	8.6 (223.7)
E MS Sound (AL)	20.9 (791.8)	16.7 (1201.3)	16.3 (632.3)	11.6 (445.4)	28.3 (843.7)
Perdido Bay (AL)	2.3 (114.0)	5.1 (261.4)	2.7 (81.2)	1.0 (27.7)	0.9 (42.1)
Tampa Bay (FL)	4.8 (204.0)	10.2 (736.7)	13.8 (836.4)	4.8 (323.3)	3.2 (239.6)
Charlotte Harbor (FL)	4.6 (249.4)	11.0 (771.0)	22.2 (1365.8)	17.7 (1013.7)	14.0 (950.1)

	1996	1997	1998	1999	2000
Mobile Bay (AL)	5.9 (211.0)	6.5 (242.5)	13.0 (407.3)	11.7 (625.4)	2.8 (108.9)
E MS Sound (AL)	11.8 (502.0)	38.6 (902.9)	15.5 (605.5)	1.9 (228.2)	0.6 (42.7)
Perdido Bay (AL)	1.3 (5.2)	5.2 (43.7)	9.2 (163.1)	7.8 (31.1)	3.7 (396.9)
Apalachicola Bay (FL)			29.9 (1582.4)	7.2 (255.1)	5.0 (189.3)
Suwannee Sound (FL)	2.6 (185.2)	7.9 (275.7)			
Cedar Key (FL)	1.6 (145.0)	3.4 (395.4)			
Tampa Bay (FL)	14.3 (994.1)	4.2 (279.1)	7.8 (1219.7)	0 (0)	3.4 (19.0)
Charlotte Harbor (FL)	16.7 (1358.8)	6.4 (306.9)	63.4 (3646.9)	5.9 (710.8)	0.3 (55.4)

	2001	2002	2003	2004	2005
Mobile Bay (AL)	3.9 (164.9)	4.1 (153.4)	6.5 (294.0)	10.7 (397.6)	4.1 (102.8)
E MS Sound (AL)	1.4 (37.4)	1.2 (22.2)	2.3 (85.6)	4.9 (240.3)	2.0 (206.9)
Perdido Bay (AL)	1.8 (153.4)	0.9 (55.2)	2.3 (17.2)	3.0 (74.8)	0.9 (72.9)
Apalachicola Bay (FL)	6.5 (151.6)	7.7 (232.3)	6.3 (133.9)	6.7 (161.4)	12.5 (445.8)
Suwannee Sound (FL)	5.5 (91.2)	0.8 (64.2)	1.4 (77.3)	9.4 (529.6)	30.3 (746.0)
Cedar Key (FL)	0.1 (24.0)	0 (0)	0.6 (125.5)	1.9 (86.7)	1.4 (153.2)
Tampa Bay (FL)	0.2 (14.2)	1.1 (69.3)	3.0 (47.7)	6.0 (377.1)	17.2 (917.9)
Charlotte Harbor (FL)	5.2 (297.9)	0.9 (86.6)	5.5 (340.5)	32.5 (2132.5)	10.8 (735.5)

	2006	2007	Mean	SE
Mobile Bay (AL)	5.4 (221.8)	3.1 (137.5)	8.7 (293.6)	1.3 (6.8)
E MS Sound (AL)	2.3 (84.7)	2.1 (11.2)	11.9 (381.3)	2.9 (13.1)
Perdido Bay (AL)	1.7 (124.5)	2.7 (40.7)	3.4 (139.6)	0.5 (7.0)
Apalachicola Bay (FL)			10.2 (394.0)	2.9 (173.4)
Suwannee Sound (FL)			8.3 (281.3)	3.9 (99.0)
Cedar Key (FL)			1.3 (132.8)	0.4 (49.1)
Tampa Bay (FL)			7.6 (536.6)	1.6 (138.0)
Charlotte Harbor (FL)			13.9 (885.3)	3.7 (216.7)

Ariopsis felis

The abundance pattern for hardhead catfish (*Ariopsis felis*) was consistent between the states with peaks in the summer (Figure 123). Abundance in Mississippi was highest among the states with an overall mean (mean of 12 monthly means in Figure 123) of 39.8/ha, followed by Alabama (16.9/ha), Florida (16.9/ha), Louisiana (9.5/ha) and Texas (4.3/ha).

The length frequency distributions for hardhead catfish in each state (Figure 124) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Hardhead catfish ranged in size from 36 – 419 mm (mean=167.3, SD=67.6) in Texas, 7 – 537 mm (mean=126.0, SD=69.1) in Louisiana, 27 – 437 mm (mean=141.0, SD=76.5) in Mississippi, 2 – 494 mm (mean=120.1, SD=57.9) in Alabama, and 29 – 538 mm (mean=179.0, SD=98.0) in Florida.

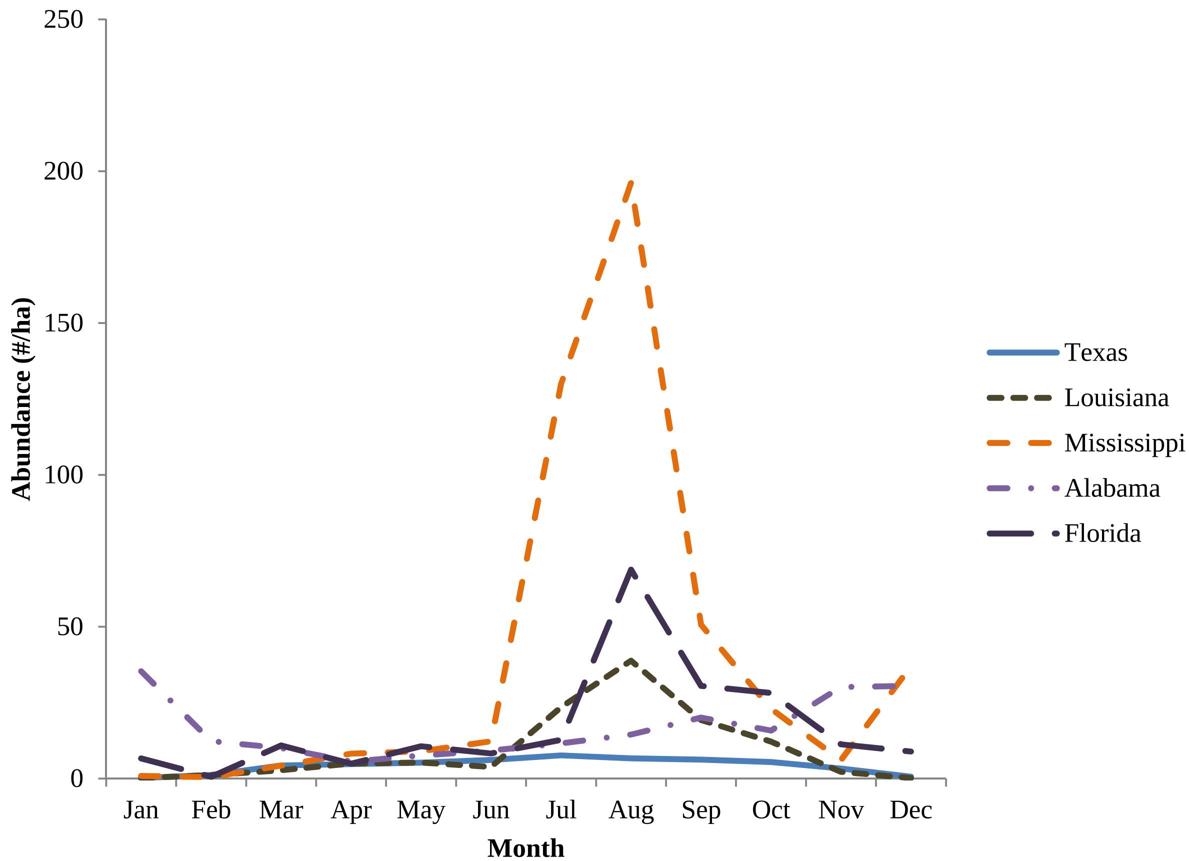

Figure 123. Monthly mean abundance of *Ariopsis felis* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

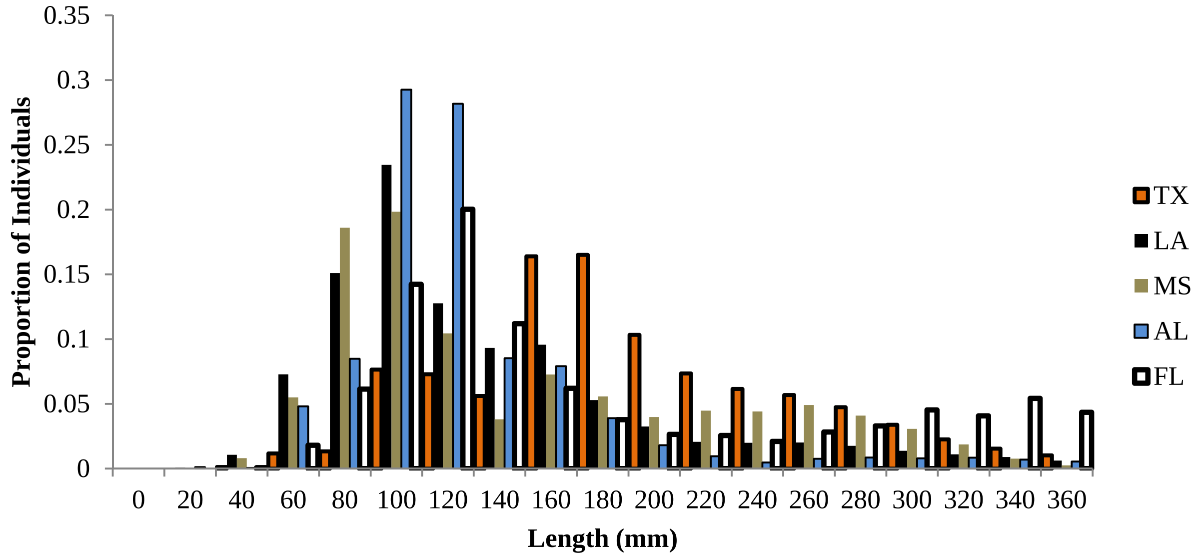

Figure 124. Length frequency of all hardhead catfish (*Ariopsis felis*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=53,671): 1982 – 2005; Louisiana (n=25,625): 1986 – 2007; Mississippi (n=2,834): 1985 – 2005; Alabama (n=9,039): 1981 – 2007; and Florida (n=8,157): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 20-mm bins.

In Texas, hardhead catfish showed a strong seasonal variability with regard to both abundance and biomass, and mean values peaked in July (Figure 125). Mean annual abundance and biomass peaked in 1995 (7.9/ha and 511.9 g/ha, respectively) (Figure 126). Corpus Christi Bay had the highest abundance of hardhead catfish in Texas (Tables 63 and 63).

The peak period for both mean abundance and biomass for hardhead catfish in Louisiana was summer (Figure 127). Mean annual abundance peaked in 1987 (20.4/ha), but biomass peaked in 1992 (748.7 g/ha) (Figure 128). The highest mean abundance in Louisiana was found in the Breton-Chandeleur Sounds, with high numbers also seen in Terrebonne-Timbalier Bays and Lake Borgne (Tables 65 and 66).

The seasonal variability of hardhead catfish in Mississippi showed lows in mean abundance and biomass in the winter and peaks in summer (Figure 129). Mean annual abundance peaked in 1988 (268.2/ha), but biomass peaked in 1987 (1,591.8 g/ha) (Figure 130).

The highest mean abundance of hardhead catfish in Alabama occurred in late fall and in winter (Figure 131). Mean biomass peaked in the spring, though numbers were relatively even throughout the summer and fall. Mean annual abundance and biomass peaked in 1991 (42.4/ha and 870.9 g/ha, respectively) (Figure 132). Length measurements were not available for the years 1987 – 1988. Mobile Bay had the highest abundance numbers in Alabama, though Perdido Bay had the highest biomass values (Tables 67 and 68).

In Florida, the mean abundance of hardhead catfish peaked in August with low values during the rest of the year (Figure 133). Mean biomass, however, was relatively high from March through December. Mean annual abundance peaked in 1999 (75.4/ha), but biomass peaked in 1989 (4,095.5 g/ha) (Figure 134). Geographically, the highest mean abundance was found in Apalachicola Bay and biomass was highest in Tampa Bay (Tables 67 and 68).

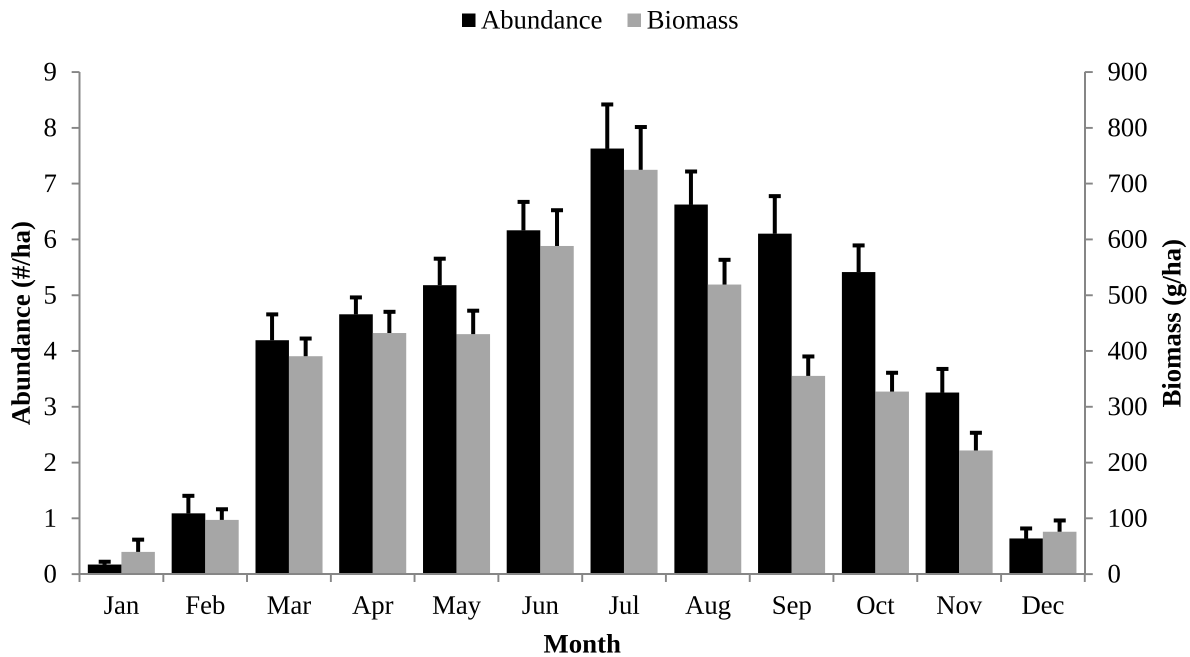

Figure 125. The monthly mean (+SE) abundance and biomass of *Ariopsis felis* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

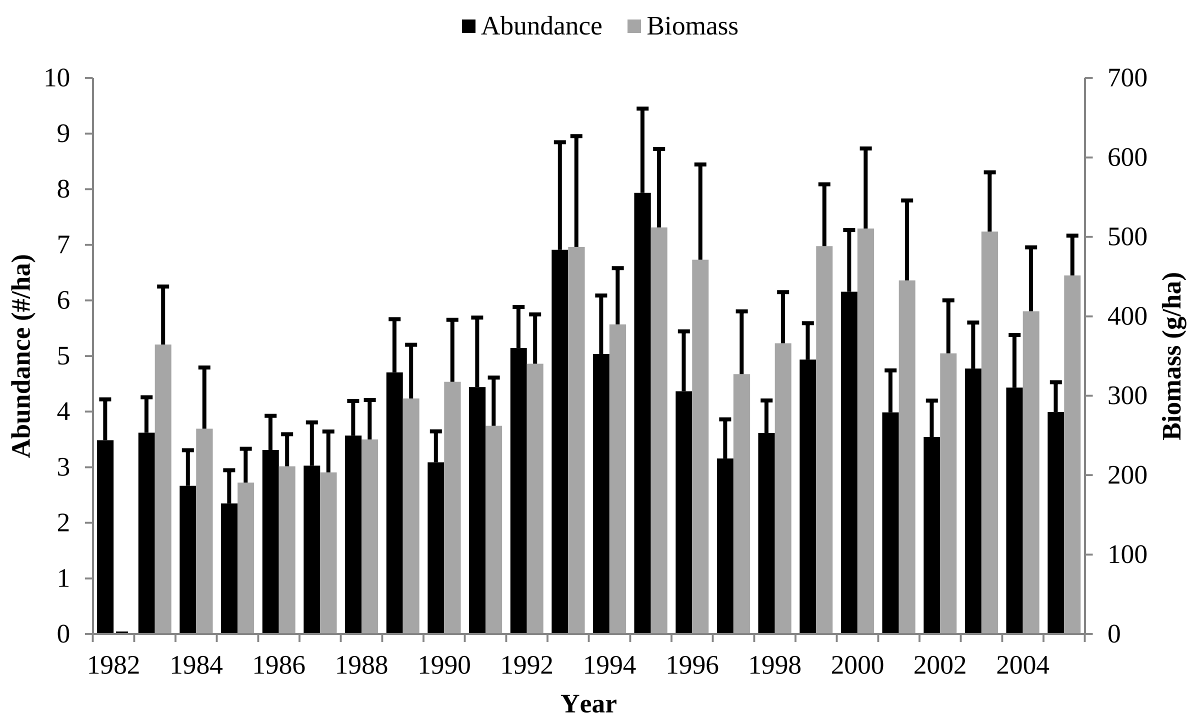

Figure 126. The mean (+SE) annual abundance and biomass of *Ariopsis felis* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 63. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.2 (61.5)	0.7 (84.6)	1.5 (183.3)	3.2 (226.9)
Upper Laguna Madre	0.0 (5.4)	0.3 (50.3)	2.4 (295.8)	2.9 (350.2)
Corpus Christi Bay	0.3 (33.3)	1.9 (212.2)	10.4 (846.5)	13.2 (1287.1)
Aransas Bay	0.2 (50.8)	2.0 (166.0)	5.3 (555.2)	6.1 (494.5)
San Antonio Bay	0.0 (1.4)	0.5 (88.2)	2.6 (317.9)	3.3 (361.9)
Matagorda Bay	0.6 (171.1)	2.7 (117.6)	4.8 (375.9)	3.4 (331.8)
East Matagorda Bay	0 (0)	0.2 (46.1)	2.1 (276.3)	2.9 (234.3)
Galveston Bay	0 (0)	0.1 (27.4)	3.2 (293.3)	1.4 (95.0)
Sabine Lake	0 (0)	0 (0)	0.7 (85.9)	1.9 (226.6)

	May	Jun	Jul	Aug
Lower Laguna Madre	4.0 (362.4)	5.5 (478.8)	4.7 (363.4)	4.2 (406.8)
Upper Laguna Madre	2.6 (267.8)	3.4 (243.9)	3.3 (257.1)	3.9 (262.1)
Corpus Christi Bay	15.2 (1287.0)	17.1 (1690.3)	18.4 (1899.9)	15.1 (1414.6)
Aransas Bay	6.2 (499.5)	6.2 (741.2)	11.0 (1064.9)	7.8 (546.1)
San Antonio Bay	3.7 (278.6)	3.4 (294.2)	3.8 (351.6)	5.3 (279.7)
Matagorda Bay	3.1 (208.1)	4.1 (242.4)	6.3 (529.0)	5.8 (449.8)
East Matagorda Bay	3.0 (237.7)	4.3 (367.2)	8.1 (533.4)	5.4 (319.2)
Galveston Bay	0.7 (44.7)	2.2 (146.0)	3.8 (317.8)	3.3 (249.0)
Sabine Lake	4.8 (530.3)	7.1 (1050.0)	5.5 (782.4)	5.0 (433.9)

	Sep	Oct	Nov	Dec
Lower Laguna Madre	1.7 (171.4)	2.0 (243.3)	1.7 (243.0)	0.5 (62.6)
Upper Laguna Madre	2.3 (211.3)	1.8 (168.2)	1.7 (69.3)	0.2 (20.2)
Corpus Christi Bay	12.4 (1046.1)	11.3 (959.0)	5.7 (498.0)	1.0 (131.9)
Aransas Bay	9.0 (309.1)	7.9 (314.6)	6.1 (361.9)	0.7 (116.8)
San Antonio Bay	5.6 (223.7)	5.8 (221.8)	3.3 (194.0)	0.6 (158.8)
Matagorda Bay	5.0 (209.6)	3.8 (188.6)	5.1 (251.9)	1.7 (76.2)
East Matagorda Bay	9.0 (476.7)	5.4 (360.1)	0.8 (110.0)	0.0 (2.4)
Galveston Bay	2.8 (120.4)	2.8 (111.1)	0.3 (14.6)	0.0 (1.2)
Sabine Lake	4.0 (382.2)	3.6 (279.6)	0.5 (55.8)	0.0 (0.1)

	Mean	SE
Lower Laguna Madre	2.5 (240.7)	0.5 (39.9)
Upper Laguna Madre	2.1 (183.5)	0.4 (34.0)
Corpus Christi Bay	10.2 (942.2)	1.8 (177.8)
Aransas Bay	5.7 (435.1)	0.9 (81.7)
San Antonio Bay	3.2 (231.0)	0.6 (31.1)
Matagorda Bay	3.9 (262.7)	0.5 (38.9)
East Matagorda Bay	3.4 (246.6)	0.9 (51.2)
Galveston Bay	1.7 (118.4)	0.4 (32.7)
Sabine Lake	2.8 (318.9)	0.7 (97.3)

Table 64. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985
Lower Laguna Madre	2.5	2.3 (262.5)	2.1 (247.5)	2.4 (195.6)
Upper Laguna Madre	11.0	5.2 (337.8)	3.1 (230.0)	2.4 (178.0)
Corpus Christi Bay	13.4	11.7 (1377.8)	9.6 (1027.4)	6.4 (566.9)
Aransas Bay	3.9	3.7 (171.8)	2.5 (131.4)	1.7 (122.2)
San Antonio Bay	0.9	1.0 (161.6)	0.4 (55.8)	0.7 (84.1)
Matagorda Bay	1.5	0.9 (111.1)	0.7 (66.0)	1.9 (111.9)
Galveston Bay	0.5	0.7 (64.2)	0.3 (31.7)	1.0 (72.2)
	1986	1987	1988	1989
Lower Laguna Madre	4.5 (460.0)	0.7 (72.3)	1.1 (81.1)	1.2 (122.3)
Upper Laguna Madre	1.1 (160.2)	1.2 (120.6)	1.6 (187.5)	0.8 (97.9)
Corpus Christi Bay	8.4 (488.9)	8.8 (536.0)	7.5 (400.2)	12.3 (636.1)
Aransas Bay	4.1 (229.7)	2.4 (231.6)	4.7 (334.6)	5.4 (304.1)
San Antonio Bay	0.6 (63.6)	2.5 (181.8)	3.3 (244.9)	4.2 (261.3)
Matagorda Bay	1.6 (67.7)	3.2 (174.3)	5.0 (319.4)	6.5 (455.5)
East Matagorda Bay		1.8 (85.6)	1.6 (124.2)	1.1 (47.1)
Galveston Bay	3.7 (190.7)	1.8 (110.2)	1.4 (71.1)	3.5 (239.4)
Sabine Lake	2.0 (127.5)	2.4 (154.50	2.8 (271.5)	1.9 (194.8)
	1990	1991	1992	1993
Lower Laguna Madre	1.9 (197.9)	1.8 (192.2)	3.3 (198.6)	6.7 (384.8)
Upper Laguna Madre	0.6 (80.1)	0.6 (50.8)	1.6 (112.6)	2.1 (149.9)
Corpus Christi Bay	8.5 (863.6)	7.3 (576.1)	5.1 (323.6)	12.1 (1008.1)
Aransas Bay	2.2 (222.8)	13.6 (520.1)	5.6 (401.5)	11.9 (912.2)
San Antonio Bay	3.4 (383.4)	2.2 (182.4)	4.8 (342.4)	3.5 (282.1)
Matagorda Bay	3.7 (327.8)	3.7 (228.6)	10.1 (537.7)	7.4 (359.0)
East Matagorda Bay	0.9 (58.6)	1.3 (64.2)	1.2 (57.9)	5.6 (349.7)
Galveston Bay	1.4 (122.8)	1.6 (106.6)	4.9 (437.5)	1.9 (137.3)
Sabine Lake	1.5 (268.6)	1.6 (134.6)	5.1 (309.2)	8.6 (540.1)
	1994	1995	1996	1997
Lower Laguna Madre	3.2 (363.6)	4.5 (459.1)	5.5 (668.7)	2.2 (207.4)
Upper Laguna Madre	2.6 (315.3)	1.9 (227.9)	1.7 (260.0)	1.1 (106.4)
Corpus Christi Bay	6.5 (613.0)	11.6 (1189.3)	10.7 (1056.0)	7.2 (745.6)
Aransas Bay	5.4 (525.4)	8.4 (687.9)	7.2 (956.6)	4.9 (419.1)
San Antonio Bay	7.2 (335.3)	14.3 (547.0)	2.9 (325.2)	1.8 (242.2)
Matagorda Bay	4.5 (286.1)	8.9 (329.5)	2.2 (125.3)	2.1 (139.7)
East Matagorda Bay	4.9 (385.5)	8.9 (380.3)	4.8 (356.3)	3.1 (266.8)
Galveston Bay	5.3 (348.1)	3.5 (163.5)	0.4 (34.5)	1.0 (109.0)
Sabine Lake	1.8 (176.7)	2.6 (264.8)	2.3 (316.6)	3.8 (687.8)

Table 64 (continued).

	1998	1999	2000	2001
Lower Laguna Madre	2.5 (237.9)	3.3 (340.1)	2.9 (222.3)	1.6 (237.1)
Upper Laguna Madre	2.6 (228.3)	2.2 (226.7)	2.1 (235.8)	1.9 (245.4)
Corpus Christi Bay	10.8 (1229.8)	14.2 (1423.6)	20.7 (1882.0)	12.9 (1648.0)
Aransas Bay	5.8 (422.9)	6.9 (546.5)	9.9 (595.4)	5.9 (621.7)
San Antonio Bay	1.8 (197.2)	3.0 (463.6)	3.0 (227.3)	2.1 (151.8)
Matagorda Bay	1.4 (143.7)	3.6 (271.4)	2.6 (185.9)	2.6 (204.6)
East Matagorda Bay	2.8 (297.8)	3.1 (136.8)	4.4 (262.7)	2.9 (219.0)
Galveston Bay	0.2 (5.4)	0.6 (43.3)	0.9 (47.0)	0.7 (64.4)
Sabine Lake	2.5 (362.5)	4.0 (636.8)	2.7 (559.5)	0.9 (150.9)
	2002	2003	2004	2005
Lower Laguna Madre	1.2 (199.7)	1.4 (199.4)	0.7 (107.1)	0.7 (72.3)
Upper Laguna Madre	1.0 (154.0)	1.1 (237.2)	2.1 (232.3)	1.1 (170.4)
Corpus Christi Bay	9.7 (1027.9)	9.8 (1461.3)	12.4 (1286.1)	8.5 (1047.1)
Aransas Bay	6.6 (608.9)	8.1 (771.7)	3.2 (304.7)	3.3 (398.5)
San Antonio Bay	2.4 (179.2)	4.6 (256.6)	2.9 (141.3)	2.5 (233.4)
Matagorda Bay	3.0 (289.0)	4.6 (387.9)	4.3 (340.2)	6.7 (758.7)
East Matagorda Bay	2.0 (149.2)	4.9 (386.7)	6.2 (664.9)	3.8 (386.9)
Galveston Bay	0.5 (52.4)	1.2 (97.6)	2.3 (145.5)	2.1 (146.7)
Sabine Lake	1.1 (130.2)	2.9 (318.3)	2.7 (249.6)	4.1 (523.2)
	Mean	SE		
Lower Laguna Madre	2.5 (238.7)	0.3 (6.2)		
Upper Laguna Madre	2.2 (181.0)	0.4 (3.4)		
Corpus Christi Bay	10.3 (933.9)	0.7 (19.1)		
Aransas Bay	5.7 (435.1)	0.6 (10.4)		
San Antonio Bay	3.2 (231.0)	0.6 (5.3)		
Matagorda Bay	3.9 (259.2)	0.5 (7.1)		
East Matagorda Bay	3.4 (246.3)	0.5 (7.7)		
Galveston Bay	1.7 (118.4)	0.3 (4.3)		
Sabine Lake	2.9 (318.9)	0.4 (8.1)		

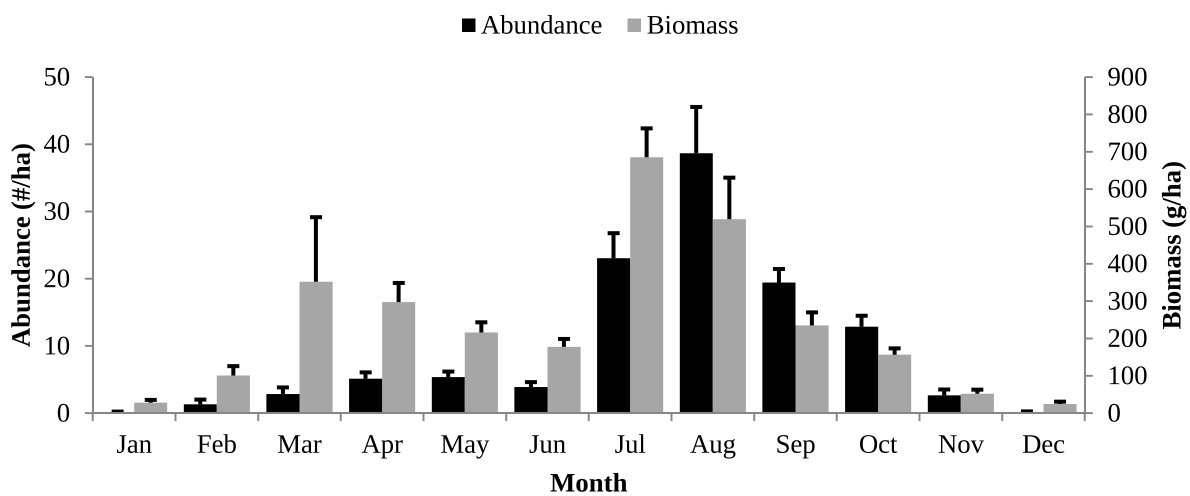

Figure 127. The monthly mean (+SE) abundance and biomass of *Ariopsis felis* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

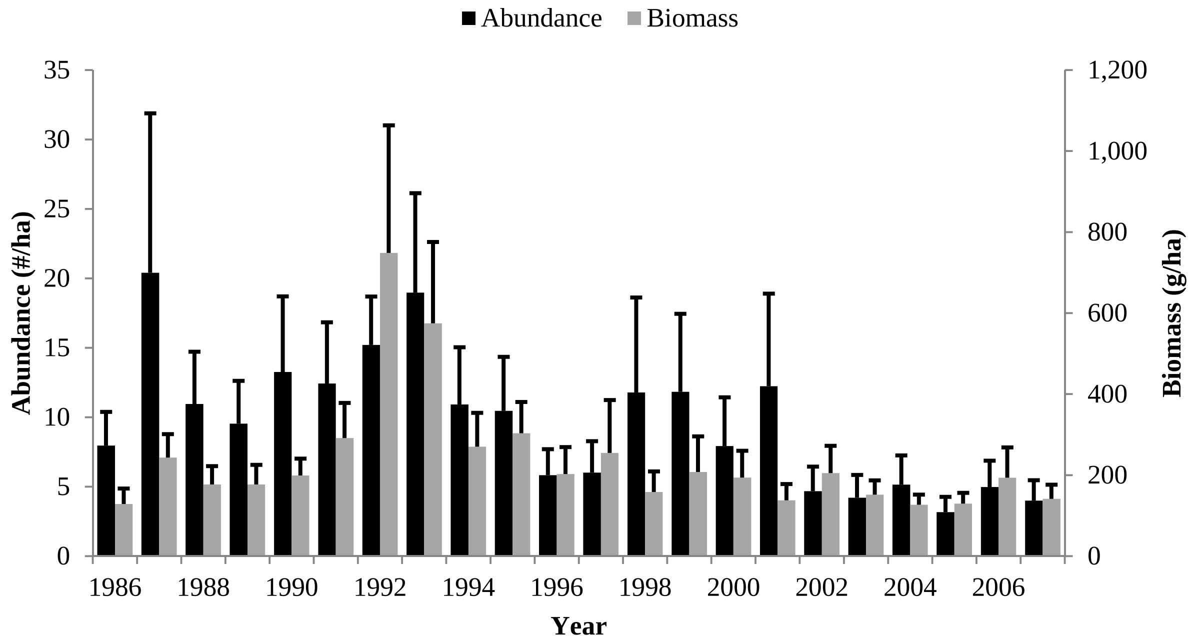

Figure 128. The mean (+SE) annual abundance and biomass of *Ariopsis felis* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 65. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	0.0 (0.1)	0 (0)	0.9 (72.1)	5.0 (251.3)	9.9 (403.1)
Vermilion-Cote Blanche Bays	0 (0)	0.7 (44.3)	0.3 (33.3)	1.7 (58.9)	2.5 (53.2)
Terrebonne-Timbalier Bays	0.2 (49.1)	0.6 (97.6)	1.2 (137.6)	2.1 (92.0)	2.1 (56.0)
Barataria Bay	0.3 (55.8)	0.9 (192.9)	1.9 (180.3)	1.4 (131.3)	1.6 (73.4)
Breton-Chandeleur Sounds	0.1 (22.2)	3.8 (132.5)	6.2 (387.3)	13.8 (782.6)	12.3 (571.1)
Lake Borgne	0 (0)	0.1 (0.9)	11.0 (4858.3)	5.0 (633.0)	3.8 (239.0)
	Jun	Jul	Aug	Sep	Oct
Lake Calcasieu	9.6 (370.5)	13.1 (452.1)	15.2 (416.7)	8.4 (187.8)	3.7 (82.8)
Vermilion-Cote Blanche Bays	1.8 (54.6)	10.1 (254.0)	14.2 (140.5)	9.6 (81.0)	5.7 (68.6)
Terrebonne-Timbalier Bays	1.7 (68.1)	25.9 (1043.6)	39.7 (485.6)	23.0 (188.5)	15.1 (147.8)
Barataria Bay	0.7 (35.9)	10.8 (271.8)	23.5 (276.7)	17.2 (212.6)	6.3 (105.8)
Breton-Chandeleur Sounds	7.2 (381.5)	44.7 (1095.0)	82.1(1039.7)	29.3 (344.1)	25.7 (280.3)
Lake Borgne	5.1 (319.5)	32.2 (609.9)	42.0 (668.7)	28.6 (773.6)	8.5 (272.1)
	Nov	Dec	Mean	SE	
Lake Calcasieu	0.1 (26.1)	0 (0)	5.5 (188.6)	1.6 (52.4)	
Vermilion-Cote Blanche Bays	0.3 (13.1)	0 (0)	3.9 (66.8)	1.4 (20.3)	
Terrebonne-Timbalier Bays	3.8 (35.3)	0.3 (20.9)	9.6 (201.9)	3.8 (84.5)	
Barataria Bay	2.7 (123.7)	0.2 (137.0)	5.6 (149.8)	2.2 (22.8)	
Breton-Chandeleur Sounds	3.0 (64.0)	0.2 (10.8)	19.0 (426.8)	6.9 (108.6)	
Lake Borgne	0.9 (17.5)	0.0 (0.2)	11.4 (699.4)	4.2 (387.2)	

Table 66. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	8.8 (185.5)	6.9 (152.7)	1.9 (55.0)	3.7 (100.9)
Vermilion-Cote Blanche Bays	8.2 (75.0)	7.5 (162.8)	4.8 (122.7)	5.9 (170.0)
Terrebonne-Timbalier Bays	7.7 (91.5)	15.4 (173.3)	14.9 (199.8)	11.5 (202.8)
Barataria Bay	8.8 (191.2)	18.4 (318.9)	14.1 (174.0)	2.2 (101.5)
Breton-Chandeleur Sounds	7.6 (108.4)	86.9 (391.8)	18.2 (288.7)	17.4 (235.0)
Lake Borgne	1.9 (66.2)	12.4 (356.0)	3.4 (98.5)	8.4 (190.3)
	1990	1991	1992	1993
Lake Calcasieu	2.4 (44.4)	10.6 (310.1)	13.9 (418.0)	19.1 (699.8)
Vermilion-Cote Blanche Bays	2.1 (57.0)	2.1 (43.8)	8.3 (118.9)	4.5 (53.0)
Terrebonne-Timbalier Bays	11.8 (207.3)	8.2 (187.3)	11.1 (419.9)	9.0 (175.9)
Barataria Bay	4.9 (85.1)	6.4 (162.2)	6.7 (127.8)	10.5 (167.2)
Breton-Chandeleur Sounds	23.2 (386.6)	35.3 (763.8)	22.2 (611.7)	50.8 (1547.4)
Lake Borgne	49.6 (407.9)	4.8 (223.6)	63.1 (10096.9)	11.0 (757.1)
	1994	1995	1996	1997
Lake Calcasieu	4.8 (199.8)	8.4 (195.6)	5.2 (272.5)	3.5 (256.3)
Vermilion-Cote Blanche Bays	2.5 (85.0)	4.2 (44.4)	2.1 (49.7)	2.0 (86.2)
Terrebonne-Timbalier Bays	8.2 (263.3)	10.3 (351.5)	5.8 (114.5)	11.1 (519.8)
Barataria Bay	3.5 (68.5)	8.5 (319.1)	1.8 (131.5)	3.1 (29.1)
Breton-Chandeleur Sounds	30.4 (619.9)	14.8 (471.0)	12.3 (390.1)	8.3 (319.4)
Lake Borgne	10.5 (435.7)	22.2 (394.8)	3.4 (308.8)	6.8 (364.3)
	1998	1999	2000	2001
Lake Calcasieu	2.6 (74.4)	4.7 (225.0)	1.9 (95.4)	0.5 (34.3)
Vermilion-Cote Blanche Bays	5.0 (25.6)	2.7 (32.3)	5.1 (31.4)	8.0 (72.7)
Terrebonne-Timbalier Bays	15.4 (122.6)	23.4 (449.8)	11.1 (207.3)	7.9 (132.0)
Barataria Bay	3.9 (116.1)	8.3 (91.0)	2.1 (45.2)	2.6 (87.7)
Breton-Chandeleur Sounds	24.4 (405.1)	17.1 (227.8)	8.7 (407.4)	34.7 (287.9)
Lake Borgne	8.4 (64.6)	0.9 (60.9)	22.2 (373.4)	7.5 (124.0)
	2002	2003	2004	2005
Lake Calcasieu	2.9 (186.2)	3.3 (102.8)	6.8 (214.4)	1.7 (49.5)
Vermilion-Cote Blanche Bays	1.5 (42.4)	3.7 (22.1)	1.1 (17.9)	1.8 (25.4)
Terrebonne-Timbalier Bays	7.1 (73.8)	4.3 (149.2)	2.9 (66.7)	4.1 (33.4)
Barataria Bay	1.4 (142.3)	2.0 (152.1)	3.2 (85.5)	1.0 (248.8)
Breton-Chandeleur Sounds	7.5 (586.0)	6.9 (297.3)	14.3 (302.3)	4.4 (335.0)
Lake Borgne	5.3 (141.3)	2.6 (162.8)	2.8 (107.0)	1.4 (144.4)
	2006	2007	Mean	SE
Lake Calcasieu	3.3 (169.1)	2.8 (143.3)	5.4 (190.2)	1.0 (31.7)
Vermilion-Cote Blanche Bays	4.7 (37.7)	1.7 (63.7)	4.1 (66.8)	0.5 (9.2)
Terrebonne-Timbalier Bays	7.2 (140.4)	5.9 (158.8)	9.7 (201.9)	1.0 (27.1)
Barataria Bay	1.9 (127.0)	6.0 (326.2)	5.5 (149.9)	1.0 (18.2)
Breton-Chandeleur Sounds	5.2 (404.7)	4.0 (93.2)	20.7 (430.9)	4.1 (63.3)
Lake Borgne	4.9 (224.8)	2.2 (120.6)	11.6 (692.0)	3.4 (449.3)

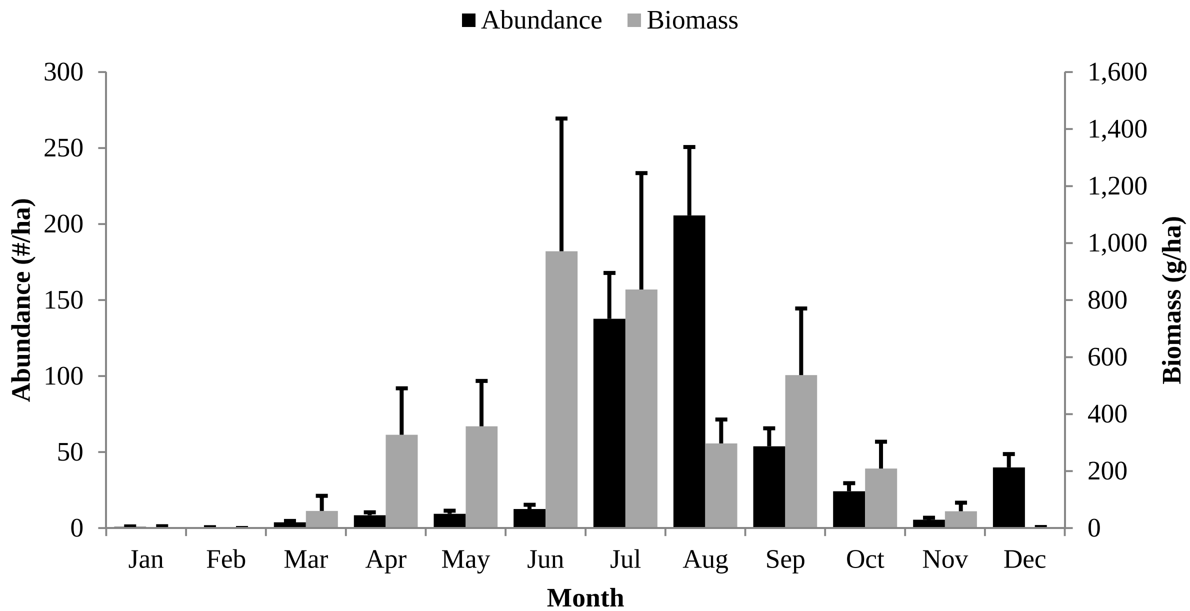

Figure 129. The monthly mean (+SE) abundance and biomass of *Ariopsis felis* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *A. felis* length measurements were not recorded until 1985.

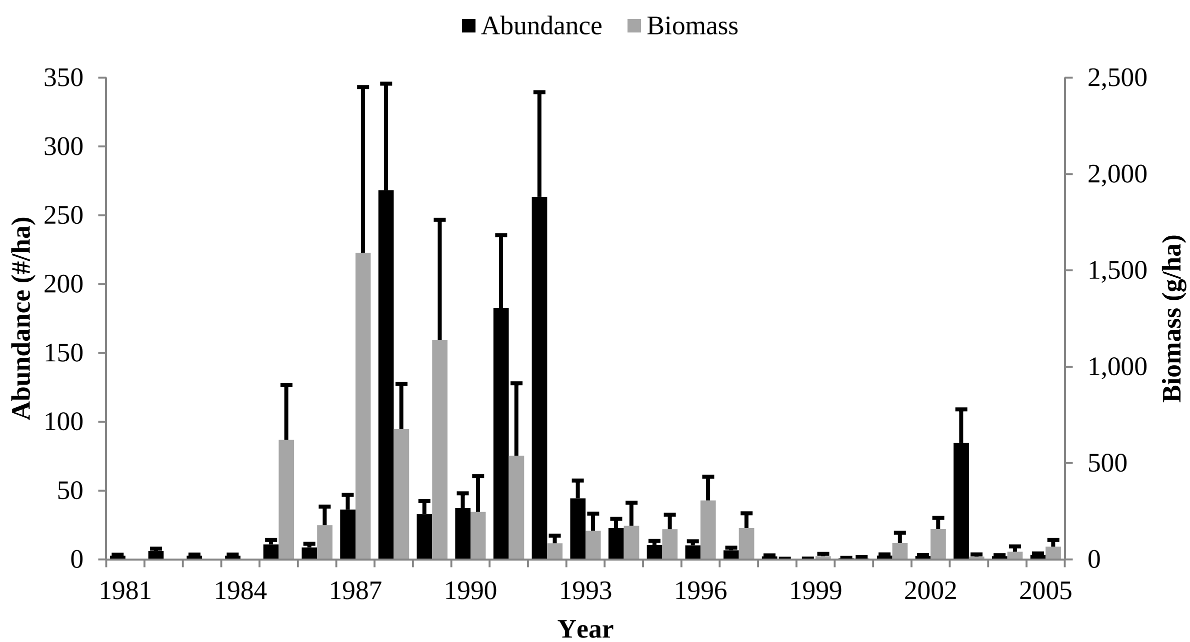

Figure 130. The mean (+SE) annual abundance and biomass of *Ariopsis felis* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were not available for the years after 1984 as *A. felis* length measurements were not recorded until 1985.

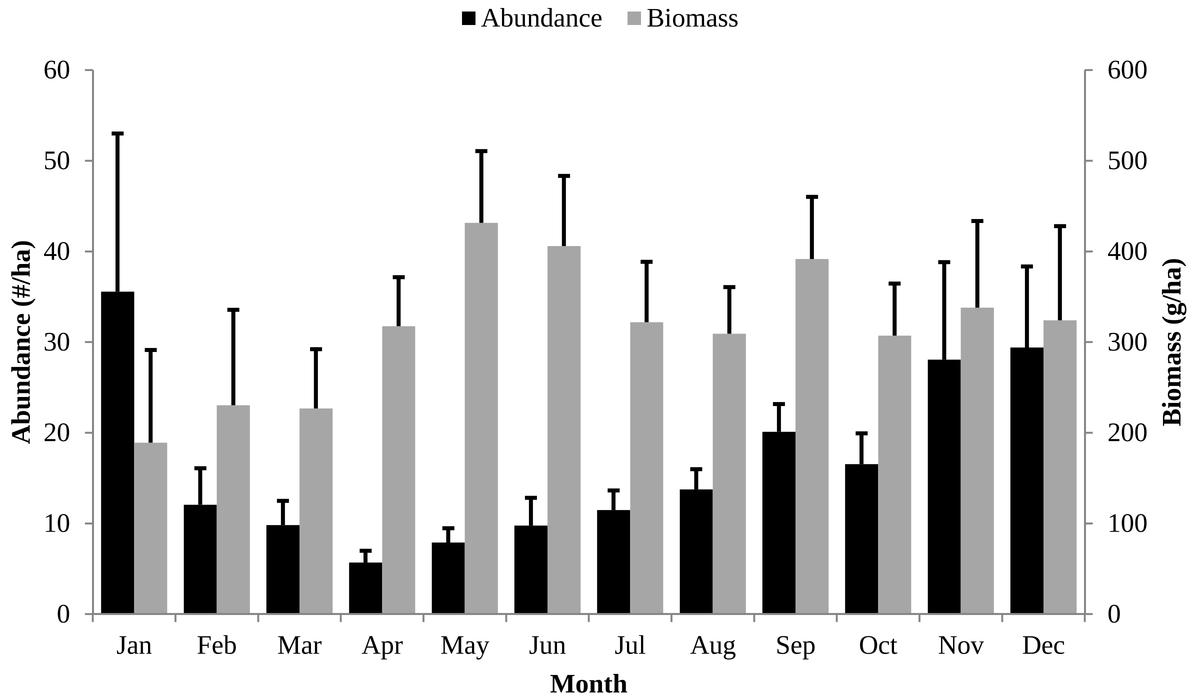

Figure 131. The monthly mean (+SE) abundance and biomass of *Ariopsis felis* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length measurements of *A. felis* were not available for the years 1987 – 1988.

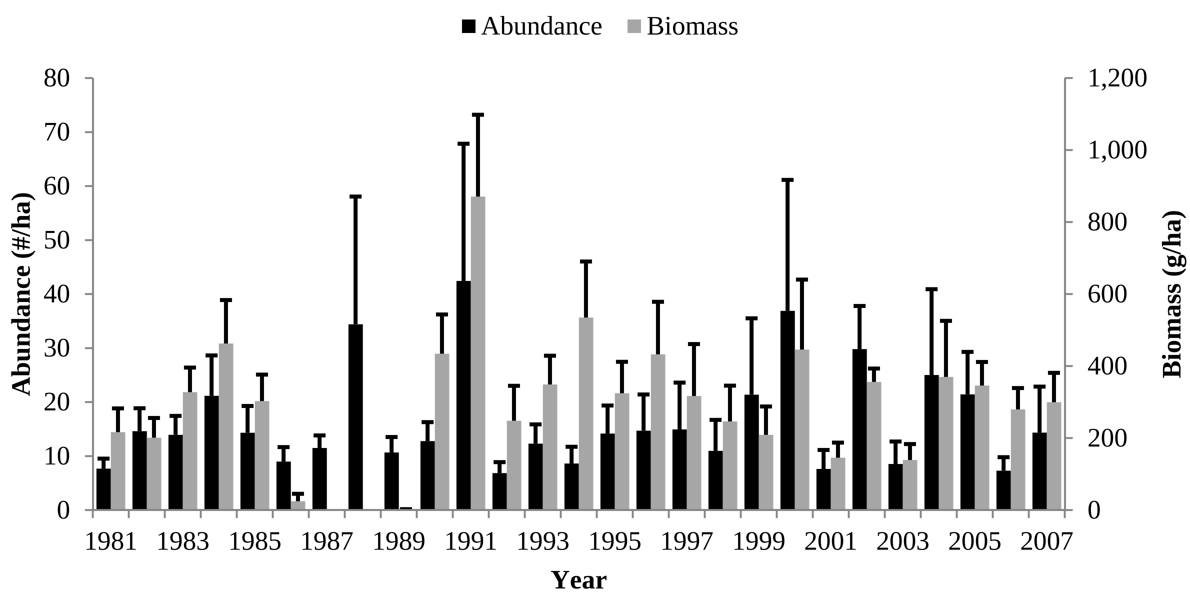

Figure 132. The mean (+SE) annual abundance and biomass of *Ariopsis felis* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length measurements of *A. felis* were not available for the years 1987 – 1989.

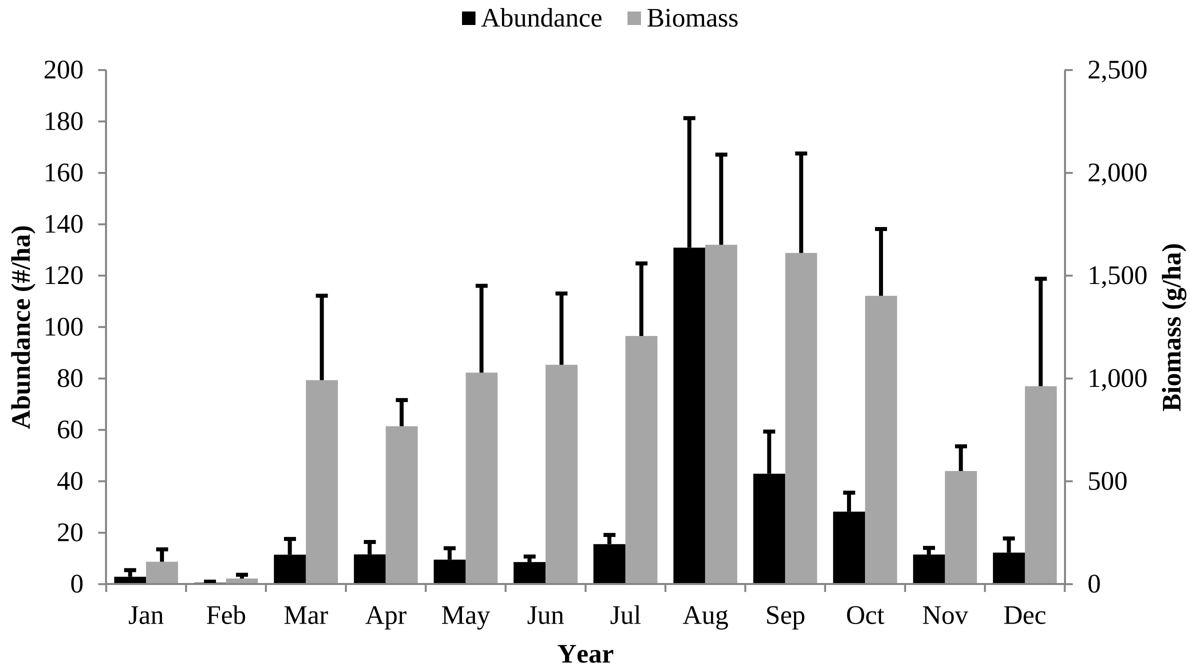

Figure 133. The monthly mean (+SE) abundance and biomass of *Ariopsis felis* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

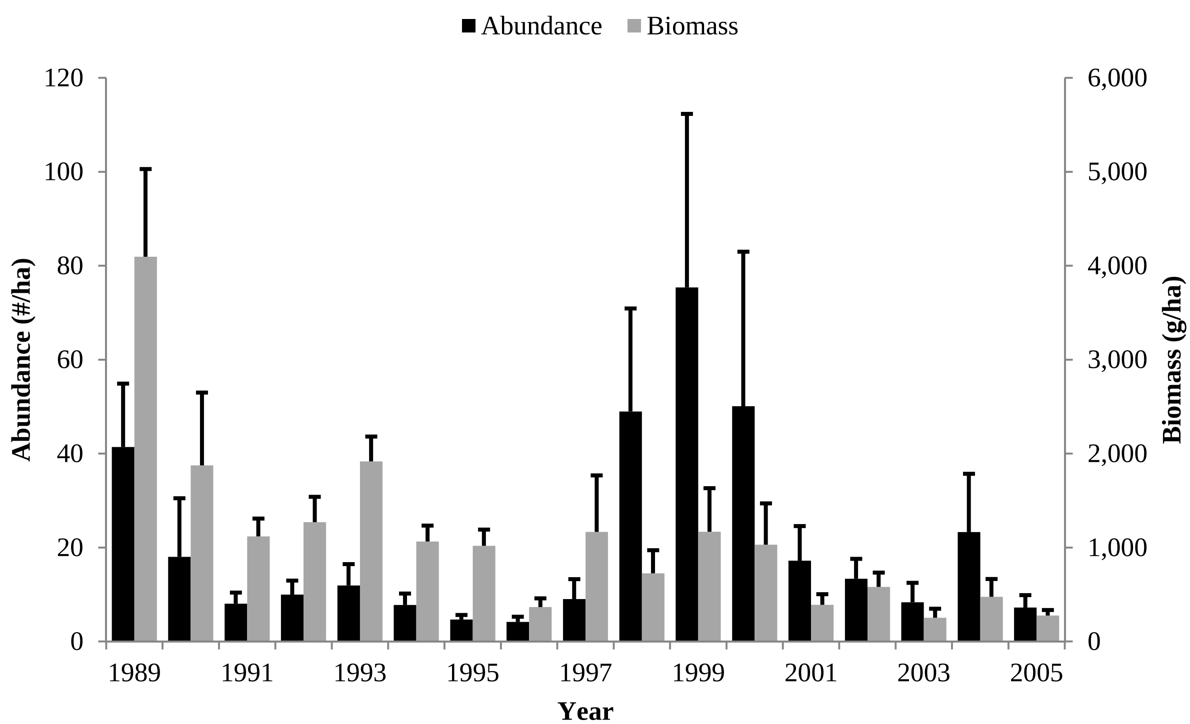

Figure 134. The mean (+SE) annual abundance and biomass of *Ariopsis felis* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 67. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	40.6 (326.1)	18.6 (150.9)	10.5 (242.5)	2.3 (154.5)
E MS Sound (AL)	61.9 (25.0)	6.0 (5.7)	12.5 (120.8)	12.7 (236.7)
Perdido Bay (AL)	0.1 (64.3)	1.6 (912.0)	2.0 (412.9)	5.1 (1089.3)
Apalachicola Bay (FL)	12.1 (281.7)	0.8 (10.5)	6.8 (117.5)	21.0 (430.7)
Suwannee Sound (FL)	0 (0)	0.1 (1.3)	1.8 (371.4)	12.3 (1176.3)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0.1 (236.3)
Tampa Bay (FL)	0.9 (100.8)	0.7 (159.5)	15.8 (1862.0)	6.2 (1825.3)
Charlotte Harbor (FL)	0.3 (3.7)	0 (0)	0.4 (24.3)	0.1 (18.3)
	May	**Jun**	**Jul**	**Aug**
Mobile Bay (AL)	5.6 (354.2)	9.2 (348.9)	9.1 (289.1)	10.5 (249.0)
E MS Sound (AL)	13.9 (290.2)	13.0 (433.0)	15.3 (453.2)	20.8 (448.9)
Perdido Bay (AL)	5.4 (1398.3)	5.4 (661.7)	10.8 (565.4)	7.5 (316.4)
Apalachicola Bay (FL)	9.2 (425.0)	8.7 (509.8)	21.5 (1526.4)	171.8 (1837.2)
Suwannee Sound (FL)	0.7 (136.0)	0.3 (22.6)	5.6 (155.4)	15.1 (826.5)
Cedar Key (FL)	0 (0)	0 (0)	0.4 (93.9)	59.3 (1044.1)
Tampa Bay (FL)	17.3 (2627.2)	13.3 (2452.1)	11.6 (1376.6)	13.7 (1108.5)
Charlotte Harbor (FL)	0.5 (51.9)	3.6 (199.0)	2.9 (275.5)	2.6 (259.2)
	Sep	**Oct**	**Nov**	**Dec**
Mobile Bay (AL)	15.0 (302.4)	12.8 (225.4)	51.1 (443.8)	43.6 (432.5)
E MS Sound (AL)	27.1 (485.0)	25.5 (271.9)	10.9 (95.6)	7.3 (28.5)
Perdido Bay (AL)	9.7 (394.4)	8.7 (620.7)	5.4 (609.9)	0.4 (351.9)
Apalachicola Bay (FL)	77.3 (1112.3)	92.2 (1705.6)	37.5 (436.4)	5.9 (68.6)
Suwannee Sound (FL)	12.3 (715.7)	27.9 (1472.9)	13.5 (282.7)	12.3 (202.3)
Cedar Key (FL)	1.9 (22.5)	79.8 (1826.4)	14.0 (194.3)	2.8 (41.0)
Tampa Bay (FL)	12.0 (2040.0)	20.2 (2010.0)	7.3 (755.3)	20.0 (3187.3)
Charlotte Harbor (FL)	38.8 (723.0)	6.2 (230.4)	4.4 (158.5)	0.1 (2.6)
	Mean	**SE**		
Mobile Bay (AL)	19.1 (293.3)	4.7 (27.3)		
E MS Sound (AL)	18.9 (241.2)	4.3 (53.0)		
Perdido Bay (AL)	5.2 (616.4)	1.0 (106.0)		
Apalachicola Bay (FL)	38.7 (705.1)	14.7 (190.7)		
Suwannee Sound (FL)	8.5 (446.9)	2.5 (141.8)		
Cedar Key (FL)	13.3 (288.4)	7.8 (163.6)		
Tampa Bay (FL)	11.6 (1625.4)	1.9 (276.6)		
Charlotte Harbor (FL)	5.0 (162.2)	3.1 (59.8)		

Table 68. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Ariopsis felis* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	6.2 (381.7)	7.0 (162.3)	9.5 (416.4)	23.6 (439.4)	7.2 (280.7)
E MS Sound (AL)	11.9 (179.1)	24.1 (249.6)	21.7 (181.5)	21.1 (362.2)	32.1 (368.7)
Perdido Bay (AL)			4.7 (477.9)	3.4 (1375.9)	3.8 (262.3)
	1986	**1987**	**1988**	**1989**	**1990**
Mobile Bay (AL)	5.8 (4.7)	5.9	4.9	2.8	9.6 (154.5)
E MS Sound (AL)	19.1 (84.8)	29.1	136.2	34.0	21.3 (409.8)
Perdido Bay (AL)	1.6	5.1	9.0	3.0	10.4 (1018.4)
Tampa Bay (FL)				60.8 (5756.0)	18.8 (2097.7)
Charlotte Harbor (FL)				11.6 (374.8)	2.0 (165.9)
	1991	**1992**	**1993**	**1994**	**1995**
Mobile Bay (AL)	70.9 (792.1)	5.5 (130.9)	12.5 (162.6)	8.4 (178.0)	15.7 (189.3)
E MS Sound (AL)	20.8 (363.2)	13.3 (375.2)	16.3 (639.6)	13.3 (856.8)	12.2 (467.9)
Perdido Bay (AL)	7.4 (1542.5)	4.4 (449.4)	7.8 (619.9)	4.9 (1246.2)	10.0 (546.34)
Tampa Bay (FL)	8.8 (1560.2)	13.6 (1889.8)	16.9 (3024.5)	9.6 (1823.5)	6.3 (1492.2)
Charlotte Harbor (FL)	10.4 (271.5)	2.3 (163.1)	1.1 (19.2)	3.2 (131.8)	2.9 (439.7)
	1996	**1997**	**1998**	**1999**	**2000**
Mobile Bay (AL)	20.2 (359.2)	22.4 (239.0)	9.3 (130.1)	65.1 (473.4)	56.5 (466.3)
E MS Sound (AL)	7.2 (185.3)	9.6 (239.2)	9.3 (204.9)	14.6 (132.8)	1.9 (54.8)
Perdido Bay (AL)	5.7 (766.9)	1.3 (618.5)	1.4 (417.1)	2.0 (466.2)	24.4 (617.5)
Apalachicola Bay (FL)			74.0 (1365.3)	88.8 (1274.8)	49.8 (1009.6)
Suwannee Sound (FL)	8.3 (134.9)	8.2 (222.9)			
Cedar Key (FL)	0.4 (96.9)	30.6 (533.3)			
Tampa Bay (FL)	6.4 (724.6)	11.0 (2562.1)	0.7 (322.2)	6.9 (598.0)	11.0 (438.3)
Charlotte Harbor (FL)	0.5 (16.5)	0.6 (30.2)	0.3 (37.9)	0 (0)	2.2 (51.2)
	2001	**2002**	**2003**	**2004**	**2005**
Mobile Bay (AL)	11.1 (136.8)	45.0 (472.3)	12.2 (162.7)	36.7 (418.0)	26.9 (287.2)
E MS Sound (AL)	2.0 (100.5)	7.5 (136.3)	2.8 (90.7)	5.9 (126.7)	5.5 (95.2)
Perdido Bay (AL)	1.9 (198.4)	5.4 (183.2)	0.7 (70.0)	3.4 (511.2)	7.7 (815.8)
Apalachicola Bay (FL)	26.0 (470.4)	17.6 (527.1)	13.9 (310.8)	33.4 (549.7)	17.5 (336.6)
Suwannee Sound (FL)	8.4 (346.2)	7.7 (1023.3)	1.7 (265.3)	13.0 (598.1)	15.2 (482.5)
Cedar Key (FL)	31.1 (365.7)	18.6 (811.2)	0 (0)	7.0 (97.1)	2.0 (129.7)
Tampa Bay (FL)	7.3 (378.3)	2.1 (707.2)	2.2 (334.5)	0.6 (280.3)	1.9 (391.8)
Charlotte Harbor (FL)	0.6 (8.8)	0 (0)	8.2 (141.8)	25.8 (455.8)	2.7 (158.4)
	2006	**2007**	**Mean**	**SE**	
Mobile Bay (AL)	9.4 (265.3)	18.7 (354.9)	19.6 (262.5)	4.0 (6.9)	
E MS Sound (AL)	0.8 (53.5)	0.2 (1.3)	18.3 (220.9)	5.3 (7.6)	
Perdido Bay (AL)	2.6 (472.3)	3.6 (253.4)	5.2 (587.6)	1.0 (16.6)	
Apalachicola Bay (FL)			40.2 (730.5)	10.0 (149.4)	
Suwannee Sound (FL)			8.9 (439.0)	1.6 (114.1)	
Cedar Key (FL)			12.8 (290.6)	5.2 (111.4)	
Tampa Bay (FL)			10.9 (1434.2)	3.4 (343.0)	
Charlotte Harbor (FL)			4.4 (145.1)	1.6 (37.4)	

Bairdiella chrysoura

The abundance pattern for silver perch (*Bairdiella chrysoura*) was not consistent among the states with peaks in all seasons (Figure 135). Abundance in Florida was highest among the states with an overall mean (mean of 12 monthly means in Figure 135) of 13.6/ha, followed by Texas (4.3/ha), Mississippi (6.2/ha), Alabama (2.5/ha), and Louisiana (1.7/ha).

In our literature review, the maximum length we found for silver perch was 300 mm recorded by Lee et al. (1980); therefore all measurements in the database greater than 300 mm were excluded from this analysis. The length frequency distributions for silver perch in each state (Figure 136) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Silver perch ranged in size from 15 – 277 mm (mean=131.1, SD=27.9) in Texas, 11 – 247 mm (mean=85.7, SD=34.0) in Louisiana, 5 – 236 mm (mean=104.5, SD=44.4) in Alabama, and 7 – 245 mm (mean=95.0, SD=53.9) in Florida. Length data were not available from Mississippi for silver perch.

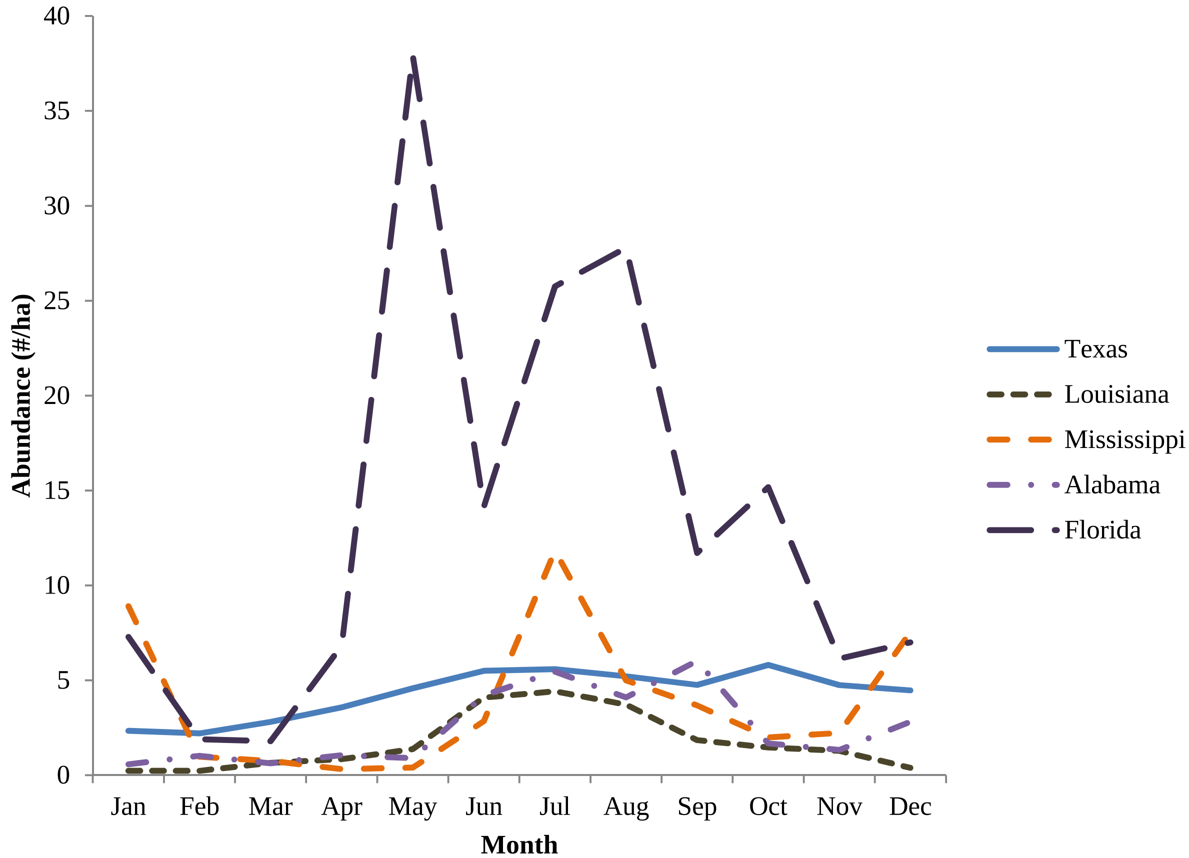

Figure 135. Monthly mean abundance of *Bairdiella chrysoura* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

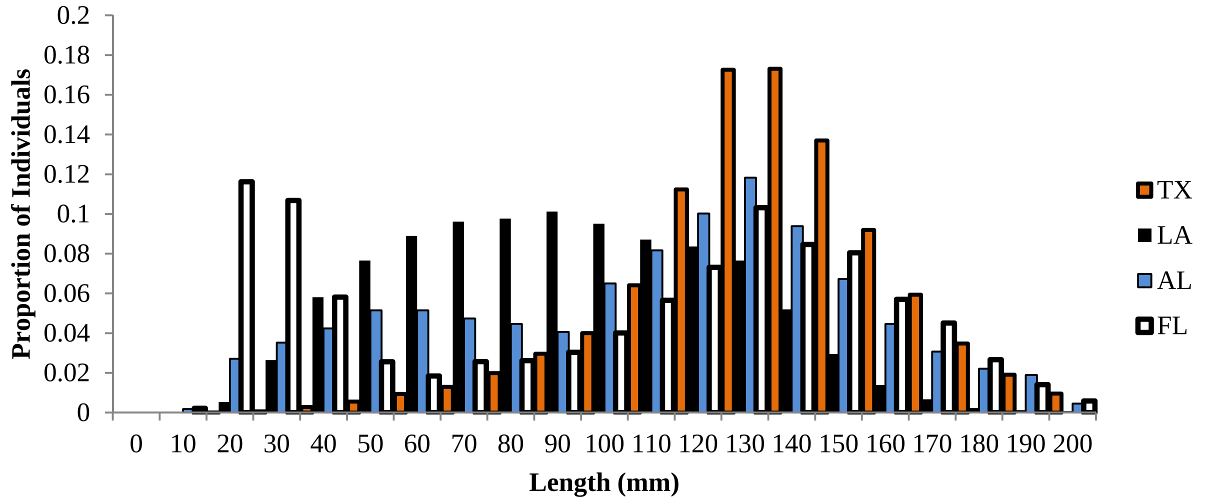

Figure 136. Length frequency of all silver perch (*Bairdiella chrysoura*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states. The data encompass sampling from the following years: Texas (n=47,867): 1982 – 2005; Louisiana (n=6,542): 1986 – 2007; Alabama (n=2,215): 1981 – 2007; and Florida (n=6,453): 1989 – 2005 (n-values represent the number of individuals measured). Length data were not available from MDMR/GCRL for *B. chrysoura*. Lengths are combined into 10-mm bins.

In Texas, the seasonal variability of silver perch showed an increase of both mean abundance and biomass from a low in the winter to a high in early summer and relatively even numbers through the fall (Figure 137). Mean annual abundance and biomass peaked in 2004 (13.5/ha and 335.4 g/ha, respectively) (Figure 138). Silver perch were found throughout Texas estuaries, but the highest mean values occurred in Aransas Bay and Lower Laguna Madre (Tables 69 and 70).

More seasonal variability was apparent for silver perch in Louisiana. The lowest mean numbers were found in the winter months before increasing rapidly in the summer. The mean biomass lagged behind abundance, with the highest values in the summer and fall (Figure 139). Mean annual abundance peaked in 2006 (4.5/ha), but biomass peaked in 2000 (138.2 g/ha) (Figure 140). Silver perch were most abundant in Terrebonne-Timbalier Bays (Tables 71 and 72).

Biomass data were not available in Mississippi as silver perch length measurements were not recorded. The abundance data did reveal a seasonal variability, with the lowest numbers in late winter and in spring before peaking in summer (Figure 141). Annual variability appeared high with mean annual abundance peaking in 1989 (27.7/ha) (Figure 142).

In Alabama, the seasonal variability of silver perch showed peaks in mean abundance and biomass in the summer and fall months (Figure 143). Mean annual abundance and biomass peaked in 2007 (15.8/ha and 421.2 g/ha, respectively) (Figure 144). The largest mean values in Alabama estuaries were found in East Mississippi Sound (Tables 73 and 74).

Silver perch in Florida exhibited peaks of mean abundance and biomass in late spring and summer (Figure 145). Mean annual abundance peaked in 1989 (40.7/ha), but biomass peaked in 2002 (805.7 g/ha) (Figure 146). Silver perch were found most often in Suwannee Sound and Cedar Key (Tables 73 and 74).

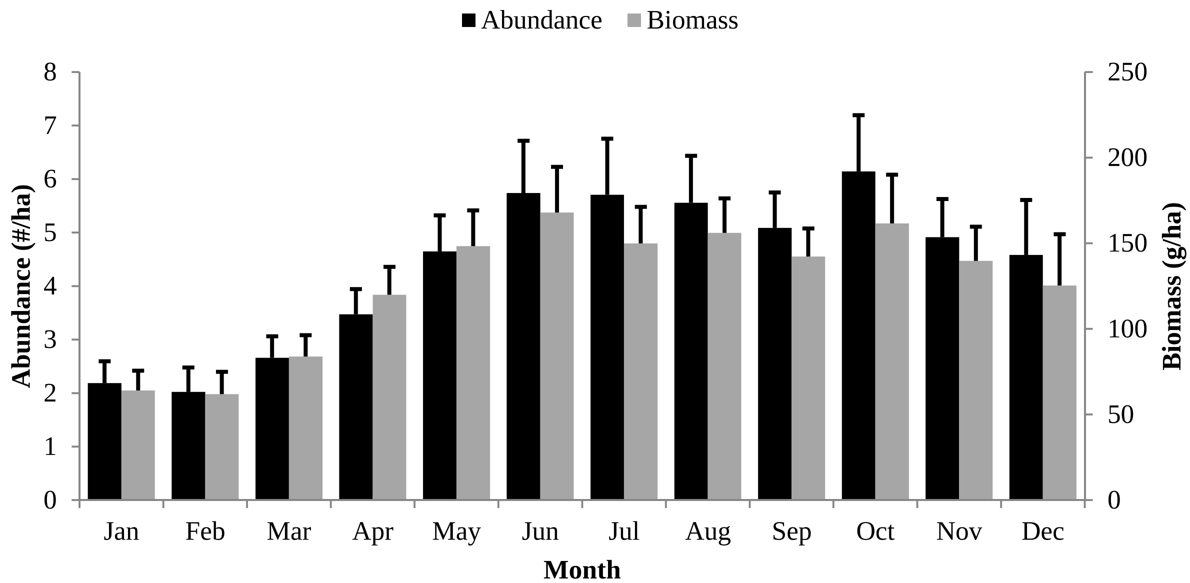

Figure 137. The monthly mean (+SE) abundance and biomass of *Bairdiella chrysoura* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

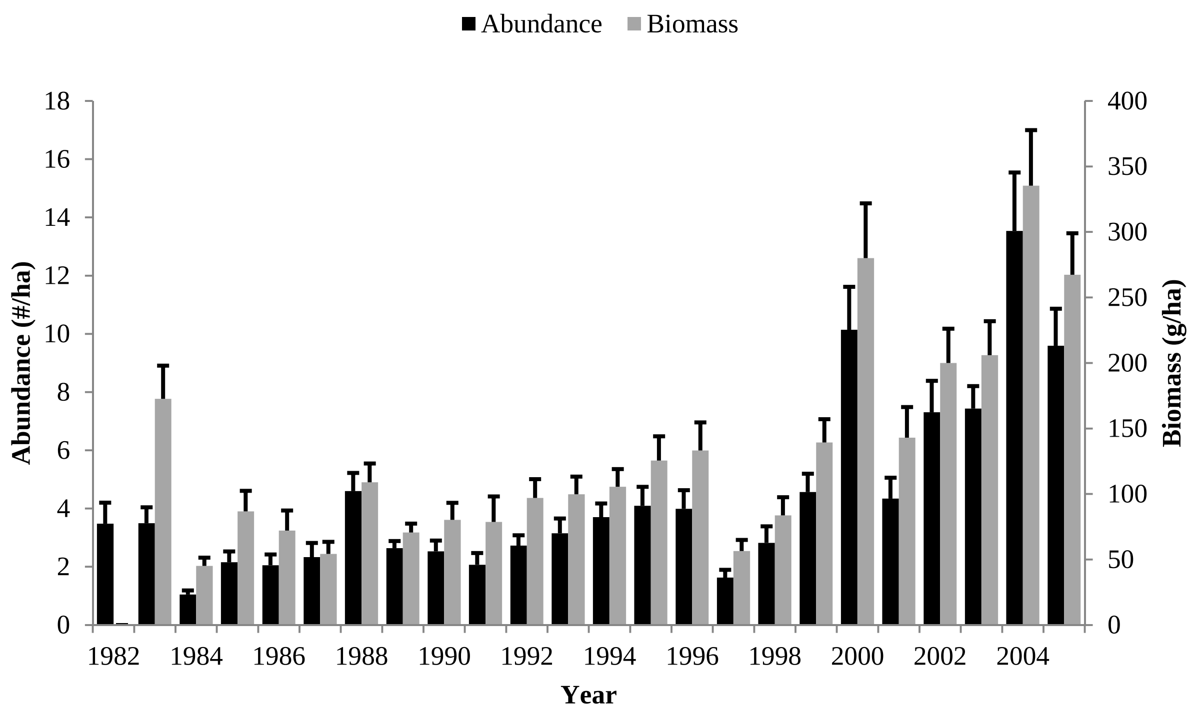

Figure 138. The mean (+SE) annual abundance and biomass of *Bairdiella chrysoura* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 69. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	4.8 (156.7)	4.8 (153.2)	6.4 (219.0)	11.2 (450.5)
Upper Laguna Madre	0.8 (27.2)	0.6 (21.3)	0.6 (29.3)	1.2 (51.9)
Corpus Christi Bay	5.3 (146.0)	3.9 (129.2)	5.6 (196.6)	6.5 (228.1)
Aransas Bay	3.7 (98.7)	3.8 (105.6)	5.7 (153.4)	6.4 (195.1)
San Antonio Bay	1.5 (45.2)	0.7 (18.4)	0.9 (29.2)	1.4 (44.7)
Matagorda Bay	1.1 (25.7)	2.7 (74.8)	1.1 (28.9)	2.0 (58.4)
East Matagorda Bay	2.7 (92.9)	0.9 (44.4)	3.4 (119.9)	1.9 (64.8)
Galveston Bay	0.1 (3.2)	0.3 (9.3)	0.6 (17.3)	1.3 (45.6)
Sabine Lake	0.4 (21.3)	0.2 (4.3)	0.1 (4.3)	0.1 (1.8)
	May	**Jun**	**Jul**	**Aug**
Lower Laguna Madre	11.3 (415.7)	11.9 (440.3)	13.8 (566.8)	15.2 (632.9)
Upper Laguna Madre	1.3 (44.4)	1.7 (57.9)	1.6 (66.6)	1.7 (50.3)
Corpus Christi Bay	9.3 (305.1)	11.6 (403.6)	7.8 (245.4)	5.6 (195.9)
Aransas Bay	10.8 (316.2)	11.9 (281.8)	13.1 (292.3)	12.9 (273.7)
San Antonio Bay	2.2 (57.8)	6.3 (110.0)	8.7 (107.8)	8.1 (173.7)
Matagorda Bay	2.4 (73.4)	1.3 (36.5)	1.3 (39.4)	1.4 (33.1)
East Matagorda Bay	1.5 (63.6)	2.1 (113.9)	1.3 (44.7)	3.8 (118.3)
Galveston Bay	0.6 (20.8)	0.7 (25.6)	0.6 (20.2)	0.4 (12.3)
Sabine Lake	0.1 (3.1)	0.1 (6.9)	0.1 (6.7)	0.2 (5.3)
	Sep	**Oct**	**Nov**	**Dec**
Lower Laguna Madre	9.8 (418.9)	13.3 (469.1)	11.0 (359.3)	6.3 (211.6)
Upper Laguna Madre	2.9 (101.6)	4.5 (124.9)	3.3 (99.8)	3.9 (120.3)
Corpus Christi Bay	5.8 (185.8)	6.2 (170.7)	4.9 (155.8)	5.5 (147.9)
Aransas Bay	14.3 (341.1)	17.3 (417.4)	13.4 (342.2)	15.1 (400.1)
San Antonio Bay	3.8 (70.3)	3.6 (70.2)	3.1 (69.3)	1.8 (38.6)
Matagorda Bay	1.9 (33.4)	1.3 (27.2)	1.5 (39.9)	1.9 (42.9)
East Matagorda Bay	4.2 (131.1)	8.1 (210.5)	6.6 (190.4)	3.2 (100.3)
Galveston Bay	1.4 (39.4)	1.5 (39.1)	1.3 (51.8)	0.6 (15.2)
Sabine Lake	0.8 (19.5)	1.4 (47.9)	0.8 (24.3)	0.4 (19.3)
	Mean	**SE**		
Lower Laguna Madre	10.0 (374.5)	1.0 (45.5)		
Upper Laguna Madre	2.0 (66.3)	0.4 (10.5)		
Corpus Christi Bay	6.5 (209.2)	0.6 (22.7)		
Aransas Bay	10.7 (268.1)	1.3 (31.0)		
San Antonio Bay	3.5 (69.6)	0.8 (12.5)		
Matagorda Bay	1.7 (42.8)	0.1 (4.9)		
East Matagorda Bay	3.3 (107.9)	0.6 (15.2)		
Galveston Bay	0.8 (25.0)	0.1 (4.5)		
Sabine Lake	0.4 (13.7)	0.1 (3.9)		

Table 70. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	14.3	9.2 (574.3)	4.2 (204.9)	10.1 (464.8)	9.9 (385.0)	6.2 (239.6)	11.6 (411.0)	10.9 (339.2)	21.3 (744.9)
Upper Laguna Madre	7.3	10.2 (337.5)	0.4 (7.2)	1.2 (30.4)	1.3 (60.7)	5.1 (174.9)	2.2 (115.3)	0.9 (25.3)	0.5 (11.4)
Corpus Christi Bay	13.7	7.8 (474.6)	2.0 (86.7)	3.5 (154.3)	5.0 (173.9)	3.0 (92.7)	7.0 (194.8)	4.4 (155.4)	2.0 (64.0)
Aransas Bay	2.1	2.1 (55.0)	0.7 (23.9)	2.2 (55.0)	1.8 (46.3)	5.6 (51.8)	11.7 (178.9)	4.6 (75.8)	1.4 (36.9)
San Antonio Bay	0.4	0.6 (21.1)	0.2 (8.2)	0.4 (13.9)	0.7 (18.1)	1.9 (19.1)	4.0 (55.7)	1.8 (27.1)	1.3 (28.7)
Matagorda Bay	1.0	0.7 (26.5)	0.9 (38.2)	1.1 (44.3)	0.6 (172.5)	0.6 (11.2)	2.0 (48.3)	1.6 (39.6)	1.4 (36.3)
East Matagorda Bay						0.4 (12.4)	2.9 (62.0)	0.6 (15.3)	0.1 (4.0)
Galveston Bay	0.5	0.1 (3.0)	0.2 (7.6)	0.1 (5.5)	0.3 (10.5)	0.5 (14.8)	0.7 (20.9)	0.7 (25.0)	0.3 (10.6)
Sabine Lake					0.3 (15.2)	0.0 (2.9)	0.9 (24.4)	0.5 (16.9)	0.8 (10.6)
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Lower Laguna Madre	17.9 (739.7)	28.2 (1050.6)	16.9 (681.4)	8.7 (365.3)	10.3 (404.3)	7.8 (398.0)	4.1 (197.7)	4.2 (158.7)	2.8 (101.1)
Upper Laguna Madre	0.2 (6.8)	0.5 (15.5)	1.6 (57.1)	0.7 (30.1)	0.9 (46.2)	0.5 (24.5)	0.1 (2.9)	0.3 (7.6)	2.0 (59.9)
Corpus Christi Bay	2.2 (90.5)	2.3 (78.9)	4.6 (138.0)	11.5 (270.3)	7.0 (234.3)	9.6 (320.6)	3.0 (111.4)	3.7 (128.4)	8.4 (280.8)
Aransas Bay	1.2 (29.8)	0.9 (23.4)	3.9 (75.5)	5.0 (139.5)	10.1 (259.8)	6.6 (179.7)	3.9 (107.4)	8.5 (227.4)	11.3 (341.6)
San Antonio Bay	1.2 (30.9)	0.5 (12.4)	1.4 (21.0)	2.3 (43.6)	4.1 (95.6)	4.9 (140.8)	0.8 (35.6)	1.0 (30.4)	5.5 (150.1)
Matagorda Bay	0.4 (13.4)	0.7 (19.7)	0.4 (7.8)	0.8 (20.6)	0.7 (18.1)	1.5 (45.7)	0.8 (22.4)	2.1 (49.3)	1.4 (39.1)
East Matagorda Bay	0.3 (6.5)	0.3 (10.0)	2.2 (79.4)	1.8 (82.4)	1.5 (63.5)	1.0 (23.2)	0.7 (25.4)	1.4 (51.7)	4.0 (105.4)
Galveston Bay	0.2 (8.1)	0.1 (6.0)	1.2 (34.1)	0.7 (19.5)	0.4 (12.1)	0.6 (21.4)	0.4 (10.4)	1.1 (32.0)	0.9 (28.8)
Sabine Lake	0.1 (3.3)	0.1 (1.6)	0.5 (27.2)	0.2 (13.0)	0.1 (3.6)	0.1 (3.4)	0.2 (10.2)	0.6 (17.9)	0.1 (3.6)
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**Mean**	**SE**	
Lower Laguna Madre	3.6 (133.9)	2.5 (112.8)	2.9 (114.5)	3.7 (138.0)	12.9 (399.3)	18.3 (547.5)	10.1 (371.1)	1.4 (52.0)	
Upper Laguna Madre	2.5 (108.8)	1.1 (33.0)	0.4 (19.3)	2.8 (108.4)	5.4 (177.1)	2.5 (120.4)	2.1 (65.8)	0.5 (16.0)	
Corpus Christi Bay	10.5 (380.2)	4.8 (192.0)	4.4 (155.4)	8.9 (278.5)	14.2 (438.4)	15.3 (468.2)	6.6 (206.8)	0.8 (27.0)	
Aransas Bay	41.2 (988.5)	17.7 (522.5)	36.3 (958.7)	21.5 (619.4)	31.1 (808.5)	25.2 (630.1)	10.7 (268.1)	2.4 (311.7)	
San Antonio Bay	5.0 (130.0)	2.1 (66.1)	4.6 (86.0)	9.0 (163.0)	22.5 (292.2)	8.3 (190.6)	3.5 (69.6)	1.0 (14.9)	
Matagorda Bay	6.5 (175.4)	1.3 (34.8)	1.6 (40.6)	4.0 (77.9)	5.2 (119.5)	2.5 (65.2)	1.6 (42.1)	0.3 (7.8)	
East Matagorda Bay	3.7 (133.8)	1.6 (45.0)	4.0 (139.1)	8.9 (295.8)	20.5 (675.4)	6.4 (201.5)	3.3 (106.9)	1.1 (36.0)	
Galveston Bay	2.0 (58.1)	1.8 (58.7)	0.6 (21.8)	0.8 (27.1)	2.3 (58.3)	2.3 (78.6)	0.8 (25.0)	0.1 (4.7)	
Sabine Lake	2.2 (82.4)	0.2 (9.2)	0.0 (3.5)	0.3 (9.4)	0.2 (9.3)	0.2 (7.8)	0.4 (13.7)	0.1 (4.0)	

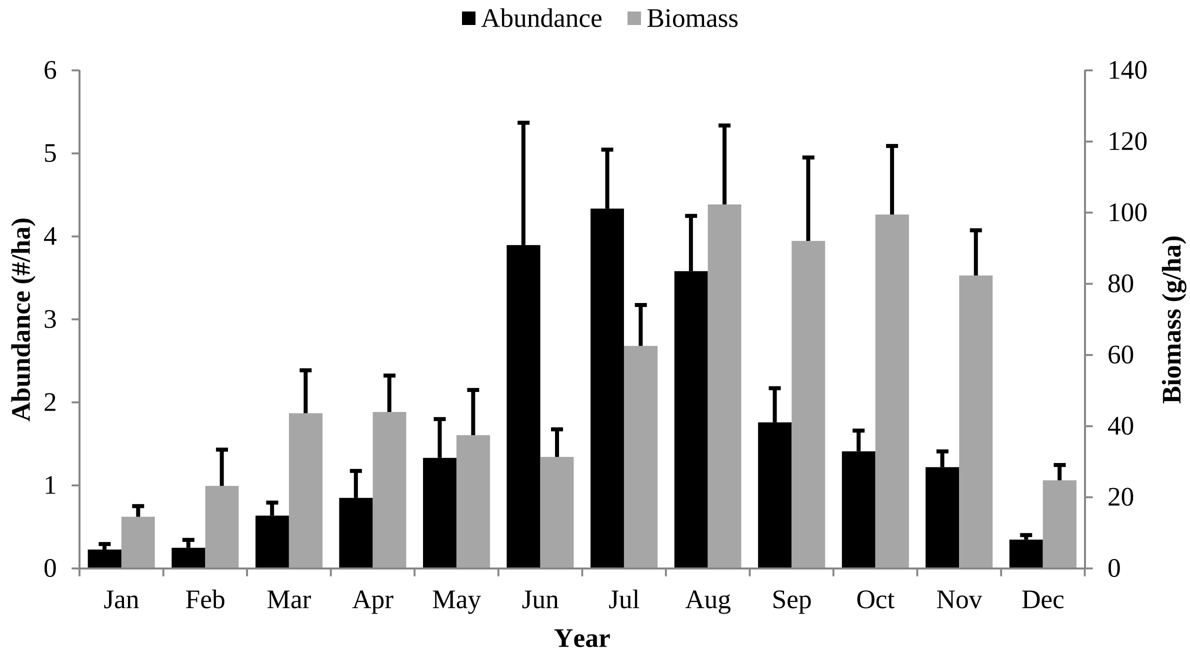

Figure 139. The monthly mean (+SE) abundance and biomass of *Bairdiella chrysoura* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

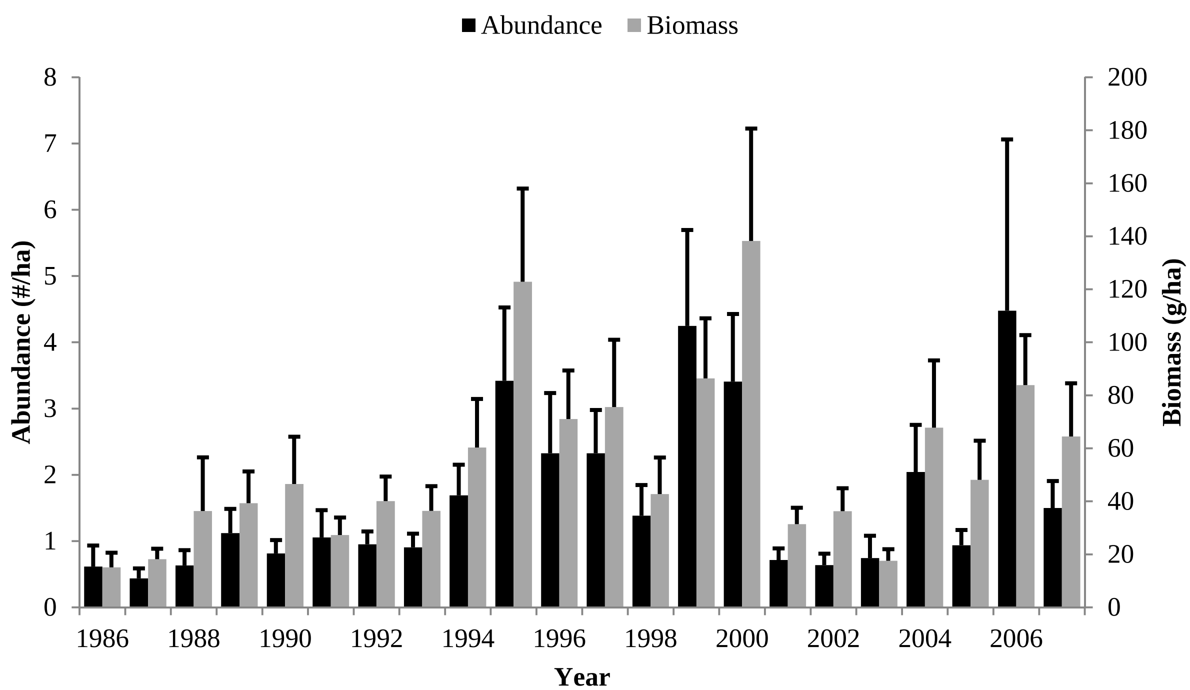

Figure 140. The mean (+SE) annual abundance and biomass of *Bairdiella chrysoura* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 71. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.1 (9.4)	0.1 (13.2)	0.1 (13.3)	0.2 (12.2)
Vermilion-Cote Blanche Bays	0.0 (0.4)	0.0 (1.0)	0.1 (3.7)	0.0 (2.6)
Terrebonne-Timbalier Bays	0.3 (22.7)	0.2 (10.1)	0.5 (38.9)	0.8 (73.0)
Barataria Bay	0.2 (11.7)	0.0 (0.7)	0.1 (9.2)	0.2 (18.1)
Breton-Chandeleur Sounds	0.4 (11.1)	0.8 (80.0)	2.2 (109.9)	2.8 (95.1)
Lake Borgne	0.1 (31.0)	0.2 (31.8)	0.7 (64.6)	0.0 (3.4)
	May	Jun	Jul	Aug
Lake Calcasieu	0.8 (6.0)	11.9 (43.8)	4.3 (59.5)	2.8 (84.4)
Vermilion-Cote Blanche Bays	0.0 (1.0)	1.0 (6.0)	1.1 (16.4)	3.0 (61.4)
Terrebonne-Timbalier Bays	3.0 (44.7)	7.5 (49.0)	8.4 (113.6)	7.2 (200.6)
Barataria Bay	0.1 (10.7)	1.3 (9.5)	5.7 (61.7)	0.9 (18.1)
Breton-Chandeleur Sounds	2.5 (105.3)	1.9 (53.1)	2.5 (58.7)	3.5 (101.5)
Lake Borgne	0.2 (2.5)	1.0 (4.5)	4.4 (75.6)	1.6 (40.9)
	Sep	Oct	Nov	Dec
Lake Calcasieu	1.6 (119.1)	0.6 (61.8)	0.3 (30.8)	0.1 (7.4)
Vermilion-Cote Blanche Bays	1.5 (57.6)	0.9 (58.1)	0.4 (32.1)	0.1 (15.7)
Terrebonne-Timbalier Bays	3.0 (141.1)	3.0 (207.2)	3.0 (192.9)	0.8 (43.8)
Barataria Bay	0.1 (3.9)	0.1 (2.3)	0.1 (6.6)	0.2 (8.6)
Breton-Chandeleur Sounds	2.3 (123.4)	1.2 (67.7)	1.2 (55.2)	0.4 (26.1)
Lake Borgne	1.5 (82.8)	2.5 (177.3)	1.4 (96.0)	0.2 (24.1)
	Mean	SE		
Lake Calcasieu	1.9 (38.4)	1.0 (10.5)		
Vermilion-Cote Blanche Bays	0.7 (21.3)	0.3 (7.1)		
Terrebonne-Timbalier Bays	3.1 (94.8)	0.9 (21.2)		
Barataria Bay	0.7 (13.4)	0.5 (4.7)		
Breton-Chandeleur Sounds	1.8 (73.9)	0.3 (14.6)		
Lake Borgne	1.2 (52.9)	0.4 (14.6)		

Table 72. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	0.1 (5.1)	0.8 (9.0)	1.2 (12.8)	0.3 (18.6)
Vermilion-Cote Blanche Bays	0.6 (7.3)	0.4 (22.7)	0.0 (1.8)	1.2 (12.1)
Terrebonne-Timbalier Bays	1.3 (32.6)	0.8 (29.7)	0.1 (6.1)	2.6 (72.6)
Barataria Bay	0.2 (9.0)	0.0 (4.8)	0 (0)	0.3 (3.8)
Breton-Chandeleur Sounds	0.0 (11.6)	0.5 (17.7)	1.5 (115.6)	1.1 (75.4)
Lake Borgne	2.9 (8.3)	0.2 (28.0)	1.0 (83.3)	0.4 (10.6)
	1990	1991	1992	1993
Lake Calcasieu	0.2 (15.1)	0.1 (5.5)	0.3 (5.5)	0.0 (4.3)
Vermilion-Cote Blanche Bays	1.2 (28.0)	0.3 (9.4)	1.3 (50.4)	0.3 (4.5)
Terrebonne-Timbalier Bays	0.4 (16.3)	3.0 (56.3)	1.2 (55.1)	1.7 (54.9)
Barataria Bay	0.0 (2.5)	0.0 (1.2)	0.2 (13.1)	0.2 (14.6)
Breton-Chandeleur Sounds	1.8 (154.7)	0.7 (38.6)	1.1 (39.5)	1.2 (53.9)
Lake Borgne	1.7 (52.6)	0 (0)	0.1 (46.8)	1.5 (92.8)
	1994	1995	1996	1997
Lake Calcasieu	0.9 (17.9)	0.2 (14.2)	0.3 (23.8)	0.5 (45.1)
Vermilion-Cote Blanche Bays	1.4 (44.5)	1.4 (58.3)	0.4 (28.1)	0.3 (26.5)
Terrebonne-Timbalier Bays	4.0 (142.4)	11.0 (365.4)	5.4 (192.8)	5.7 (218.9)
Barataria Bay	0 (0)	0.2 (4.4)	5.6 (77.1)	4.1 (29.1)
Breton-Chandeleur Sounds	0.5 (22.8)	1.4 (48.3)	0.5 (12.7)	1.2 (26.6)
Lake Borgne	0.5 (16.3)	0.5 (40.5)	0.9 (42.2)	0.4 (33.1)
	1998	1999	2000	2001
Lake Calcasieu	0.6 (39.3)	0.3 (19.4)	3.8 (43.4)	0.2 (26.0)
Vermilion-Cote Blanche Bays	0.4 (10.3)	2.8 (59.8)	1.1 (29.2)	0.2 (5.0)
Terrebonne-Timbalier Bays	4.5 (117.7)	11.6 (206.0)	5.3 (228.8)	0.5 (12.6)
Barataria Bay	0.4 (22.3)	1.4 (16.3)	0.6 (32.8)	0.1 (6.3)
Breton-Chandeleur Sounds	0.4 (10.7)	2.2 (65.9)	5.3 (276.4)	2.1 (97.6)
Lake Borgne	0.3 (18.6)	0.7 (20.7)	3.3 (90.4)	0.6 (31.3)
	2002	2003	2004	2005
Lake Calcasieu	0.0 (6.4)	0.1 (1.2)	0.3 (14.5)	0.6 (23.6)
Vermilion-Cote Blanche Bays	0.2 (14.7)	0.0 (0.0)	0.1 (6.3)	0.3 (18.8)
Terrebonne-Timbalier Bays	0.5 (27.7)	1.2 (28.6)	2.3 (52.5)	1.1 (47.7)
Barataria Bay	0.1 (4.5)	1.2 (19.0)	0.6 (14.1)	0.1 (8.9)
Breton-Chandeleur Sounds	1.8 (99.3)	1.0 (25.7)	5.2 (188.0)	1.6 (92.9)
Lake Borgne	0.6 (29.7)	0.4 (17.6)	1.0 (47.3)	2.2 (95.7)
	2006	2007	Mean	SE
Lake Calcasieu	30.8 (428.2)	1.2 (67.1)	2.0 (38.5)	1.4 (18.9)
Vermilion-Cote Blanche Bays	0.3 (20.4)	0.2 (11.0)	0.7 (21.3)	0.1 (3.8)
Terrebonne-Timbalier Bays	1.9 (69.8)	1.2 (51.0)	3.1 (94.8)	0.7 (19.8)
Barataria Bay	0.1 (4.7)	0.1 (7.2)	0.7 (13.4)	0.3 (3.6)
Breton-Chandeleur Sounds	2.7 (55.0)	3.2 (102.6)	1.7 (74.2)	0.3 (14.0)
Lake Borgne	1.9 (44.1)	4.1 (274.8)	1.1 (51.1)	0.2 (12.2)

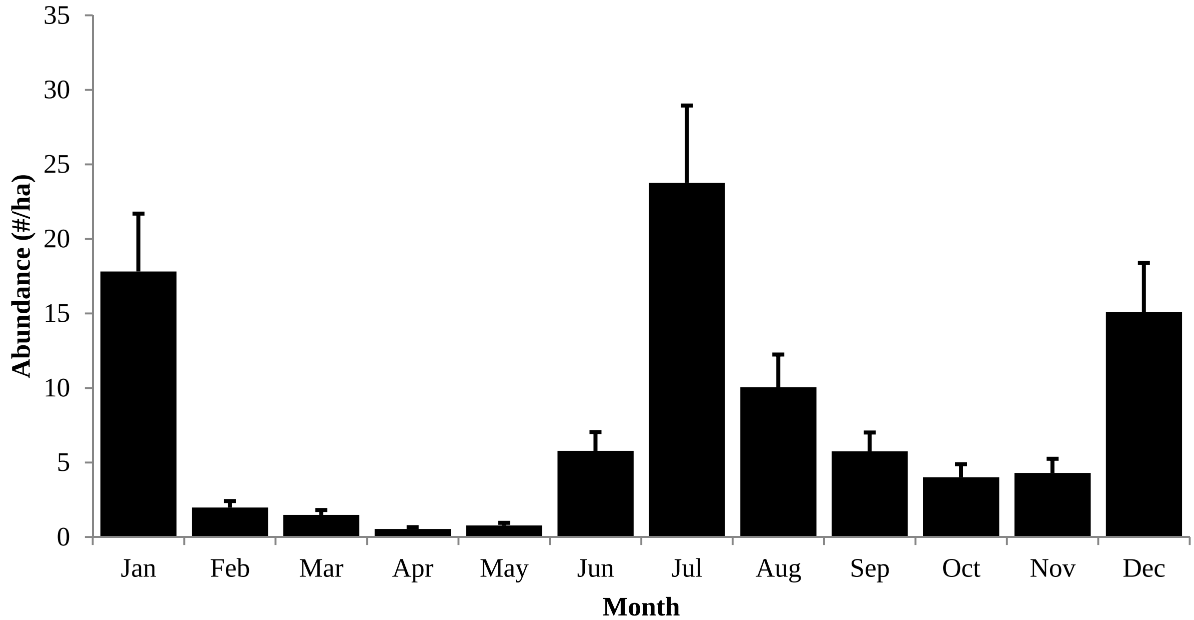

Figure 141. The monthly mean (+SE) abundance of *Bairdiella chrysoura* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Biomass data were not available as *B. chrysoura* length measurements were not recorded.

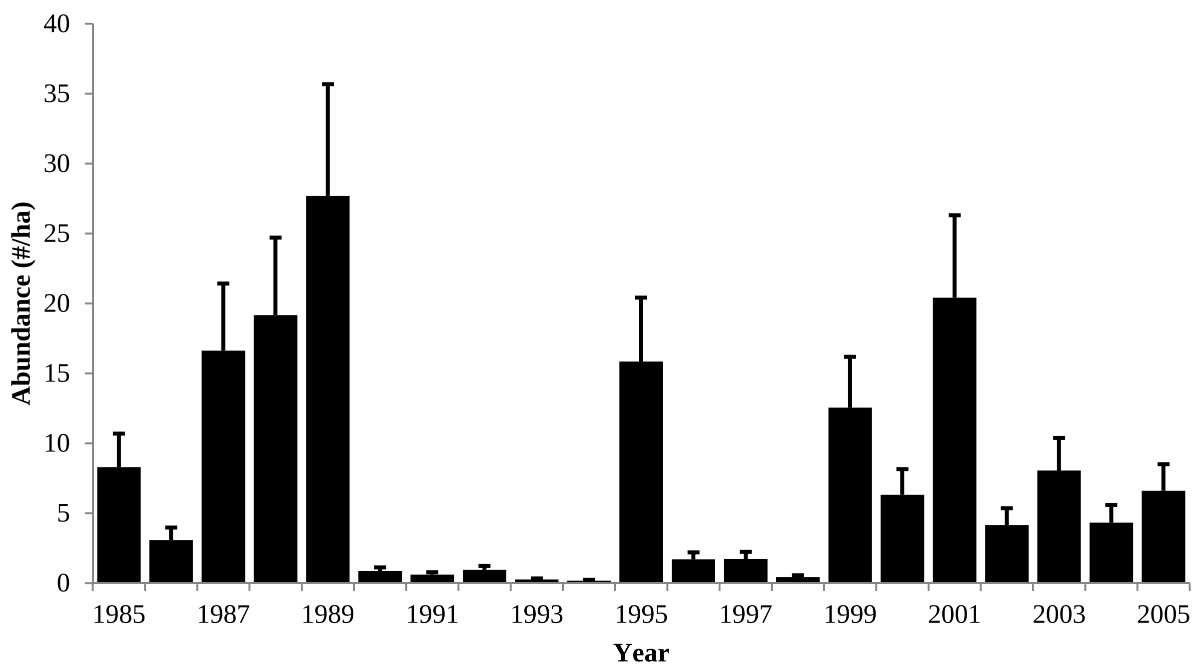

Figure 142. The mean (+SE) annual abundance of *Bairdiella chrysoura* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data were not available as *B. chrysoura* length measurements were not recorded.

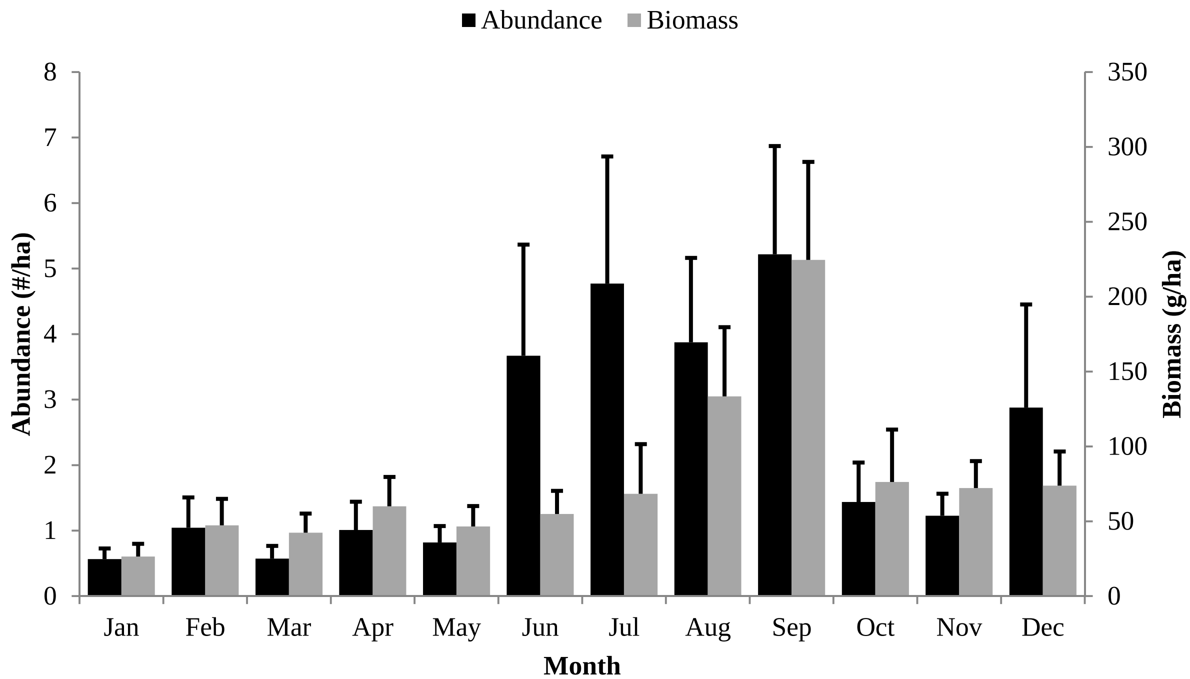

Figure 143. The monthly mean (+SE) abundance and biomass of *Bairdiella chrysoura* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

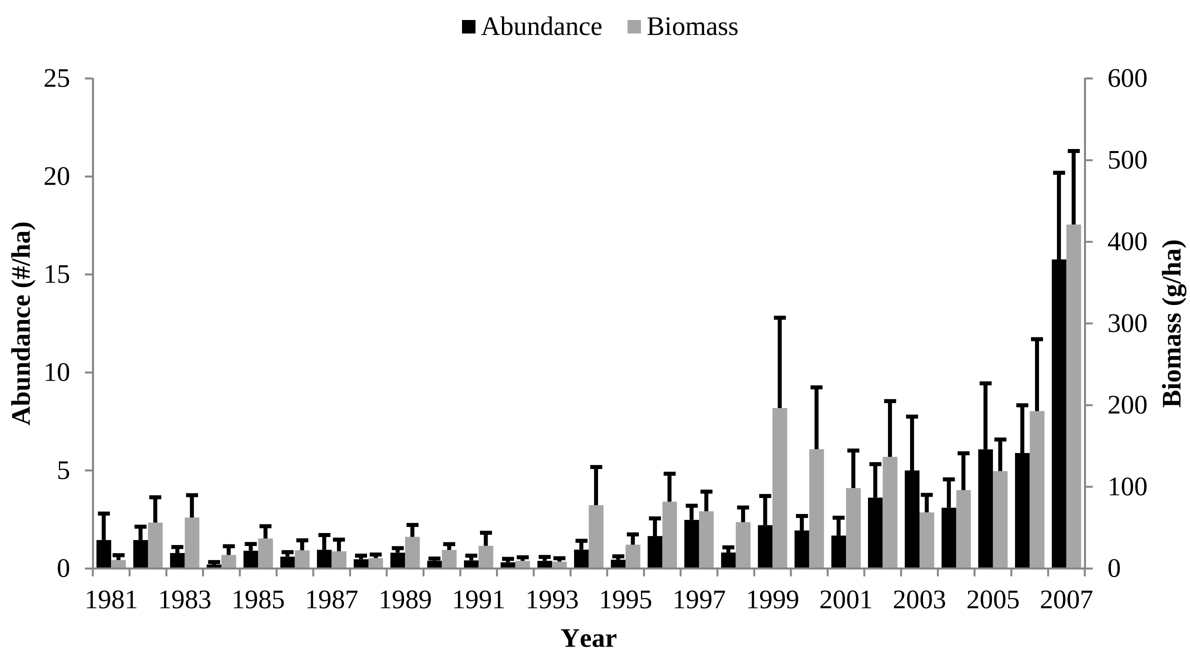

Figure 144. The mean (+SE) annual abundance and biomass of *Bairdiella chrysoura* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

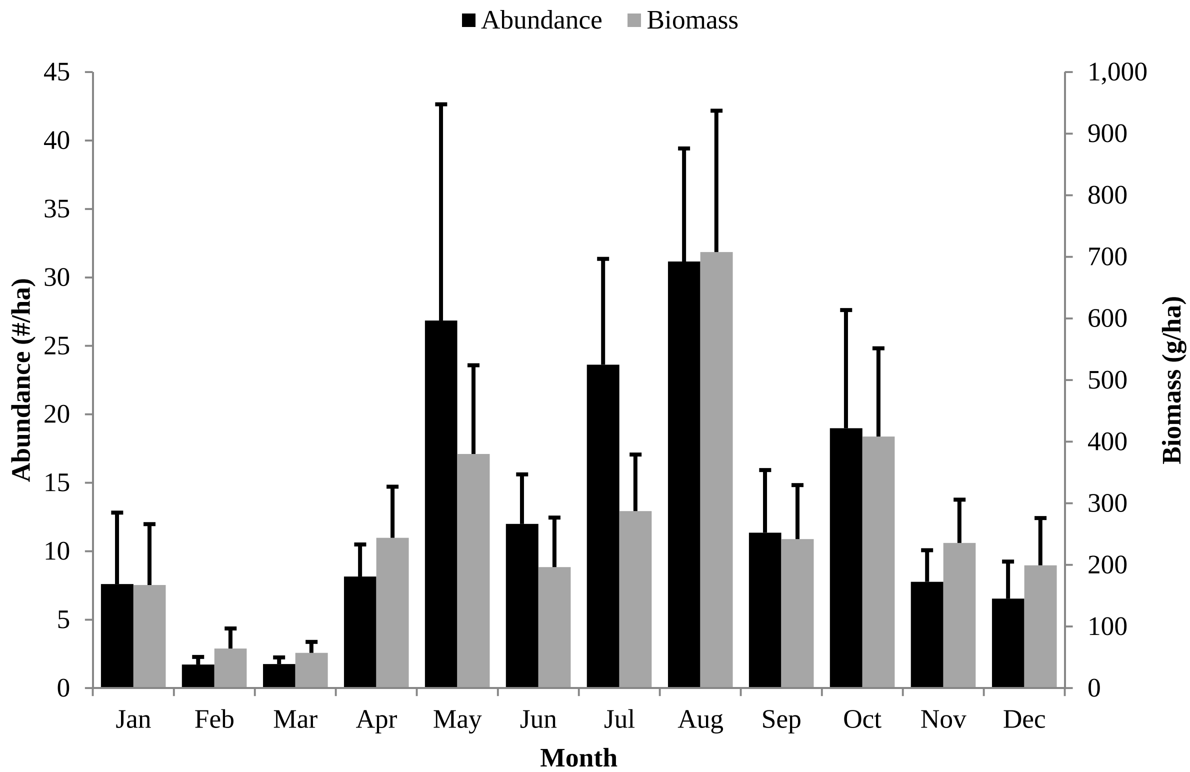

Figure 145. The monthly mean (+SE) abundance and biomass of *Bairdiella chrysoura* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

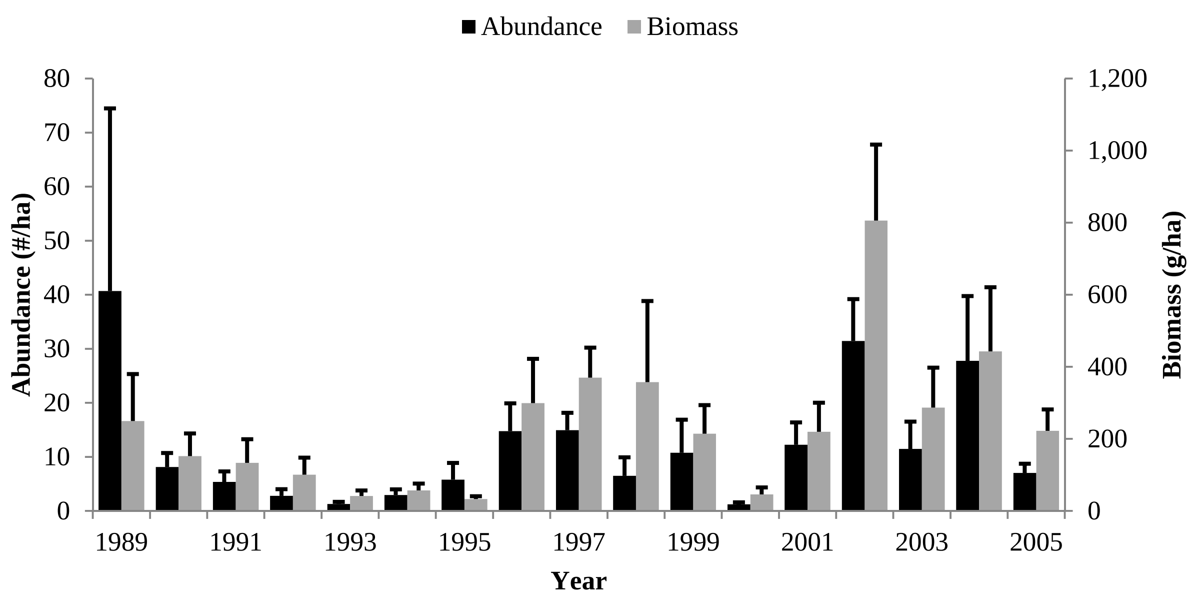

Figure 146. The mean (+SE) annual abundance and biomass of *Bairdiella chrysoura* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 73. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	0.4 (16.5)	0.6 (32.7)	0.2 (10.1)	0.6 (27.2)
E MS Sound (AL)	1.4 (59.0)	2.5 (102.8)	1.4 (110.3)	2.5 (175.8)
Perdido Bay (AL)	0.3 (30.9)	0.2 (12.8)	0.5 (55.2)	0.7 (49.9)
Apalachicola Bay (FL)	7.6 (167.5)	2.0 (42.5)	1.1 (21.6)	7.7 (217.3)
Suwannee Sound (FL)	18.8 (467.0)	6.6 (415.6)	11.3 (486.3)	57.5 (2225.8)
Cedar Key (FL)	18.3 (269.8)	0 (0)	9.3 (142.9)	3.4 (158.1)
Tampa Bay (FL)	4.6 (92.5)	0.1 (12.3)	1.2 (35.6)	4.9 (70.9)
Charlotte Harbor (FL)	0.3 (4.5)	0.2 (4.1)	0.5 (17.4)	4.8 (105.2)
	May	Jun	Jul	Aug
Mobile Bay (AL)	0.9 (34.4)	4.4 (23.1)	3.5 (36.0)	3.4 (122.4)
E MS Sound (AL)	1.7 (154.8)	4.9 (223.4)	12.4 (216.3)	7.5 (196.6)
Perdido Bay (AL)	0 (0)	0.2 (4.8)	1.0 (39.6)	0.0 (0.8)
Apalachicola Bay (FL)	5.3 (319.4)	5.1 (149.4)	25.7 (361.5)	23.8 (440.0)
Suwannee Sound (FL)	56.0 (1628.2)	49.1 (1350.0)	31.8 (878.3)	75.1 (2439.4)
Cedar Key (FL)	30.8 (810.9)	30.4 (263.8)	11.7 (419.4)	1.3 (16.5)
Tampa Bay (FL)	58.6 (252.8)	12.6 (96.7)	14.8 (66.5)	22.0 (375.4)
Charlotte Harbor (FL)	7.0 (48.5)	9.4 (90.6)	28.6 (148.3)	17.1 (286.5)
	Sep	Oct	Nov	Dec
Mobile Bay (AL)	7.1 (246.8)	1.1 (60.4)	1.3 (72.8)	3.4 (67.7)
E MS Sound (AL)	2.9 (266.4)	2.9 (186.0)	1.2 (60.2)	1.7 (102.7)
Perdido Bay (AL)	0.9 (20.7)	1.4 (52.0)	0.6 (42.8)	0 (0)
Apalachicola Bay (FL)	6.3 (149.2)	12.0 (379.6)	9.3 (318.5)	1.9 (40.7)
Suwannee Sound (FL)	90.8 (1851.5)	292.0 (5411.0)	114.2 (4165.8)	26.5 (746.1)
Cedar Key (FL)	15.2 (394.0)	128.8 (2721.3)	37.6 (610.1)	13.5 (259.0)
Tampa Bay (FL)	3.6 (84.5)	3.6 (74.6)	2.7 (82.3)	6.3 (169.3)
Charlotte Harbor (FL)	11.5 (158.3)	6.2 (155.2)	0.9 (20.7)	0.1 (4.1)
	Mean	SE		
Mobile Bay (AL)	2.2 (62.5)	0.6 (19.4)		
E MS Sound (AL)	3.6 (154.5)	1.0 (19.0)		
Perdido Bay (AL)	0.5 (25.8)	0.1 (6.3)		
Apalachicola Bay (FL)	9.0 (220.1)	2.3 (40.7)		
Suwannee Sound (FL)	69.1 (1831.2)	22.3 (452.3)		
Cedar Key (FL)	25.0 (505.5)	10.1 (212.4)		
Tampa Bay (FL)	11.3 (117.8)	4.7 (29.6)		
Charlotte Harbor (FL)	7.2 (87.0)	2.5 (25.4)		

Table 74. The mean annual abundance in #/ha and mean in g/ha (in parentheses) of *Bairdiella chrysoura* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	0.0 (4.0)	1.0 (42.6)	0.0 (1.4)	0.0 (0.5)	0.5 (10.4)
E MS Sound (AL)	2.0 (11.4)	2.1 (74.4)	2.2 (178.9)	0.3 (28.3)	2.0 (75.4)
Perdido Bay (AL)		0 (0)	0 (0)	0.9 (78.8)	0.4 (85.8)
	1986	1987	1988	1989	1990
Mobile Bay (AL)	0 (0)	0.1 (1.4)	0.6 (12.5)	0.1 (1.8)	0.1 (7.1)
E MS Sound (AL)	2.3 (84.4)	4.3 (90.0)	0.7 (24.0)	2.7 (141.9)	0.9 (58.5)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.3 (3.9)	0.3 (13.5)
Tampa Bay (FL)				71.8 (317.0)	8.6 (169.0)
Charlotte Harbor (FL)				5.0 (102.9)	8.3 (101.0)
	1991	1992	1993	1994	1995
Mobile Bay (AL)	0.1 (5.4)	0.2 (0.7)	0.2 (6.2)	0.4 (17.3)	0.2 (4.2)
E MS Sound (AL)	1.2 (86.7)	0.9 (44.3)	0.3 (15.5)	3.5 (334.4)	1.8 (146.0)
Perdido Bay (AL)	0.1 (4.1)	0 (0)	1.1 (6.3)	0.1 (4.5)	0 (0)
Tampa Bay (FL)	5.5 (159.0)	4.0 (146.8)	1.7 (59.5)	2.8 (63.2)	6.2 (6.9)
Charlotte Harbor (FL)	5.8 (17.7)	0.4 (10.9)	0.5 (10.7)	3.6 (53.9)	2.9 (79.7)
	1996	1997	1998	1999	2000
Mobile Bay (AL)	1.0 (68.9)	2.2 (53.6)	0.6 (33.2)	1.9 (169.6)	1.6 (66.3)
E MS Sound (AL)	4.7 (184.5)	5.3 (147.6)	1.7 (161.0)	0.7 (53.4)	3.7 (318.1)
Perdido Bay (AL)	0 (0)	0.1 (19.9)	1.2 (68.0)	2.1 (196.0)	0.2 (8.2)
Apalachicola Bay (FL)			6.9 (356.2)	14.3 (344.5)	1.1 (41.6)
Suwannee Sound (FL)	32.3 (1663.5)	8.3 (996.0)			
Cedar Key (FL)	63.3 (312.3)	39.0 (200.6)			
Tampa Bay (FL)	7.1 (26.9)	9.1 (195.5)	1.5 (32.3)	3.0 (84.1)	2.1 (78.8)
Charlotte Harbor (FL)	2.0 (66.4)	6.9 (165.6)	5.0 (36.7)	0.3 (6.9)	0.9 (37.7)
	2001	2002	2003	2004	2005
Mobile Bay (AL)	1.7 (84.4)	4.8 (154.5)	7.9 (84.6)	3.7 (93.5)	6.9 (110.8)
E MS Sound (AL)	1.6 (143.3)	3.7 (257.5)	0.4 (45.3)	1.8 (147.5)	5.9 (231.2)
Perdido Bay (AL)	1.1 (77.5)	0.5 (20.8)	0.3 (25.0)	2.0 (59.9)	0.9 (47.6)
Apalachicola Bay (FL)	7.8 (113.5)	16.6 (290.3)	13.6 (289.5)	5.6 (134.7)	6.4 (232.5)
Suwannee Sound (FL)	35.5 (1054.8)	85.9 (2565.5)	19.9 (974.5)	175.4 (2899.8)	80.3 (2970.9)
Cedar Key (FL)	54.7 (902.6)	37.0 (988.5)	2.3 (72.0)	39.0 (761.5)	6.3 (304.2)
Tampa Bay (FL)	0 (0)	3.7 (68.5)	5.6 (197.9)	2.2 (53.7)	2.8 (7.05)
Charlotte Harbor (FL)	5.3 (167.3)	2.2 (68.1)	11.9 (204.0)	21.0 (153.3)	2.3 (46.0)
	2006	2007	Mean	SE	
Mobile Bay (AL)	5.1 (226.9)	18.3 (438.8)	2.2 (63.0)	0.8 (3.6)	
E MS Sound (AL)	16.8 (180.2)	20.9 (897.6)	3.5 (154.2)	1.0 (6.4)	
Perdido Bay (AL)	1.0 (36.9)	0.9 (32.0)	0.5 (30.3)	0.1 (1.7)	
Apalachicola Bay (FL)			9.0 (225.3)	1.9 (41.0)	
Suwannee Sound (FL)			71.3 (1875.0)	19.6 (346.0)	
Cedar Key (FL)			25.7 (505.9)	7.6 (139.3)	
Tampa Bay (FL)			8.1 (97.5)	4.0 (20.9)	
Charlotte Harbor (FL)			5.0 (78.3)	1.3 (15.0)	

Farfantepenaeus duorarum

The abundance pattern for pink shrimp (*Farfantepenaeus duorarum*) was not consistent among the states with peaks in all seasons (Figure 147). Abundance was highest in Florida with an overall mean (mean of 12 monthly means in Figure 147) of 27.8/ha, followed by Alabama (6.0/ha), Texas (1.6/ha), Louisiana (0.7/ha), and Mississippi (0.6/ha).

Brunenmeister (1980) reported the maximum length of pink shrimp at 239 mm; therefore all measurements in the database greater than 239 mm were excluded from this analysis. The length frequency distributions for pink shrimp in each state (Figure 148) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests, except for Louisiana and Mississippi (P=0.167). Pink shrimp ranged in size from 27 – 130 mm (mean=93.2, SD=15.6) in Texas, 12 – 197 mm (mean=74.0, SD=24.0) in Louisiana, 24 – 150 mm (mean=76.7, SD=26.5) in Mississippi, 21 – 192 mm (mean=93.6, SD=23.4) in Alabama, and 11 – 236 mm (mean=97.9, SD=39.7) in Florida.

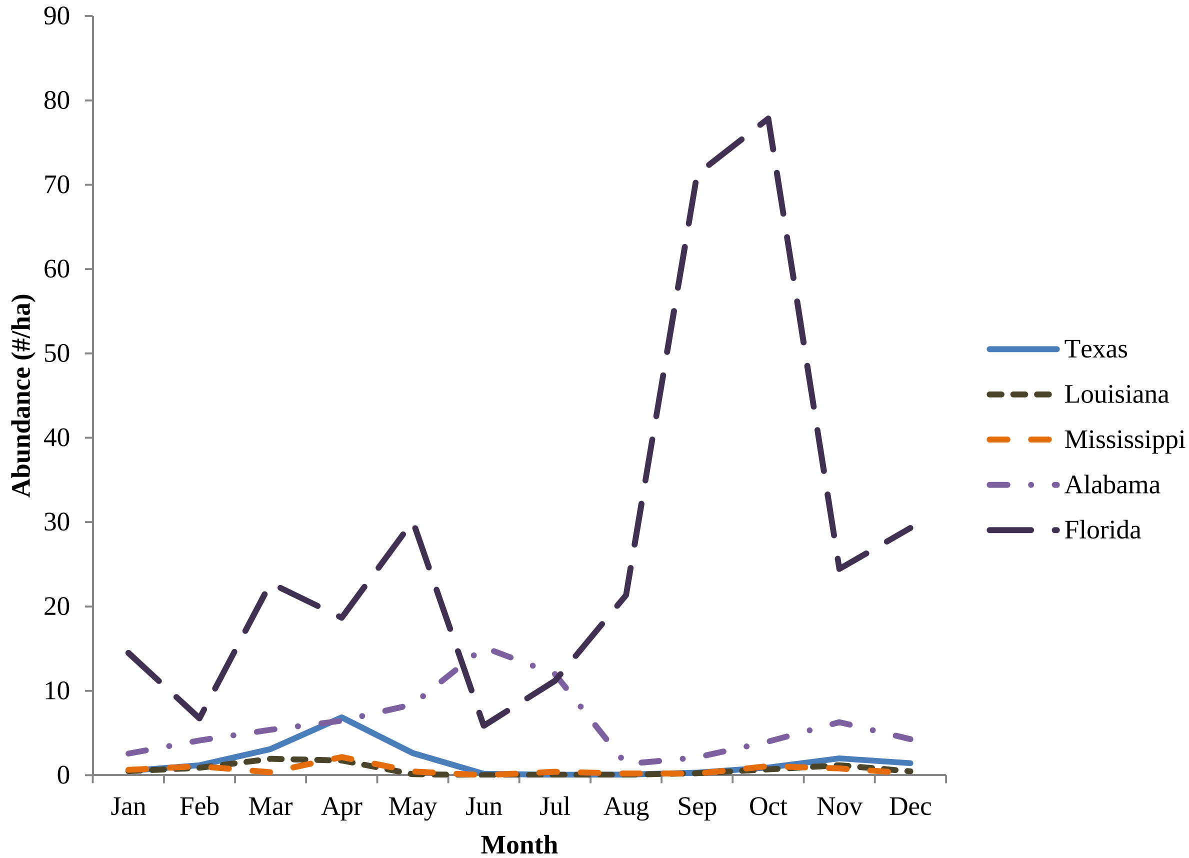

Figure 147. Monthly mean abundance of *Farfantepenaeus duorarum* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

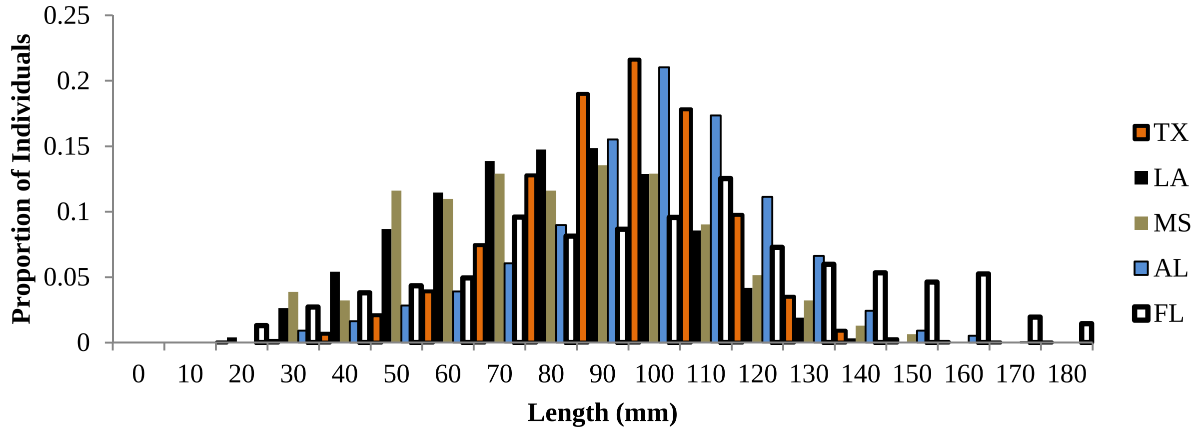

Figure 148. Length frequency of all pink shrimp (*Farfantepenaeus duorarum*) measured as part of the fishery-independent monitoring programs in the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=22,329): 1982 – 2005; Louisiana (n=2,732): 1986 – 2007; Mississippi (n=155): 1985 – 2005; Alabama (n=2,506): 1981 – 2007; and Florida (n=19,849): 1989 – 2005 (n-values represent the number of individuals measured). Lengths are combined into 10-mm bins.

In Texas, the mean abundance and biomass of pink shrimp peaked in the spring, with a relative absence in the summer months (Figure 149). Mean annual abundance and biomass peaked in 1991 (3.3/ha and 23.4 g/ha, respectively) (Figure 150). Pink shrimp were most abundant in Corpus Christi Bay and Aransas Bay (Tables 75 and 76).

In Louisiana, the seasonal variability of pink shrimp showed two peaks in mean abundance and biomass, one in the spring and again in the fall (Figure 151). Mean annual abundance peaked in 1992 (2.0/ha), but biomass peaked in 1986 (9.0 g/ha) (Figure 152). The geographical distribution was well spread out through Louisiana, but some of the larger catches occurred in Barataria Bay (Tables 77 and 78).

In Mississippi, seasonal variability was relatively high, but the mean abundance and biomass of pink shrimp peaked in April (Figure 153). The mean annual abundance varied from zero to a high of 2.3/ha in 1982; biomass reached a high of 7.7 g/ha in 1999 (Figure 154).

The seasonal distribution of pink shrimp in Alabama showed a peak of mean abundance and biomass in the summer (Figure 155). Mean annual abundance and biomass peaked in 2007 (23.9/ha and 180.5 g/ha, respectively) (Figure 156). Length data were not available for the years 1986 – 1988, 1991 – 1995, and 1997 – 1999. Perdido Bay was the predominant location for pink shrimp in Alabama (Tables 79 and 80).

Pink shrimp was the dominant penaeid in Florida. The mean abundance peaked in the fall while biomass peaked in the fall/early winter and in the spring (Figure 157). Mean annual abundance and biomass was highest between 1989 and 1994 (values peaked in 1989 at 145.5/ha and 1,977.0 g/ha) (Figure 158). These years were the period when night samples were collected. In part, daytime burrowing behavior of pink shrimp was likely responsible for this apparent temporal pattern. More samples also were collected in southern estuaries (Tampa Bay and Charlotte Harbor) during these early years of the program, where the highest abundance and biomass values were recorded (Tables 79 and 80).

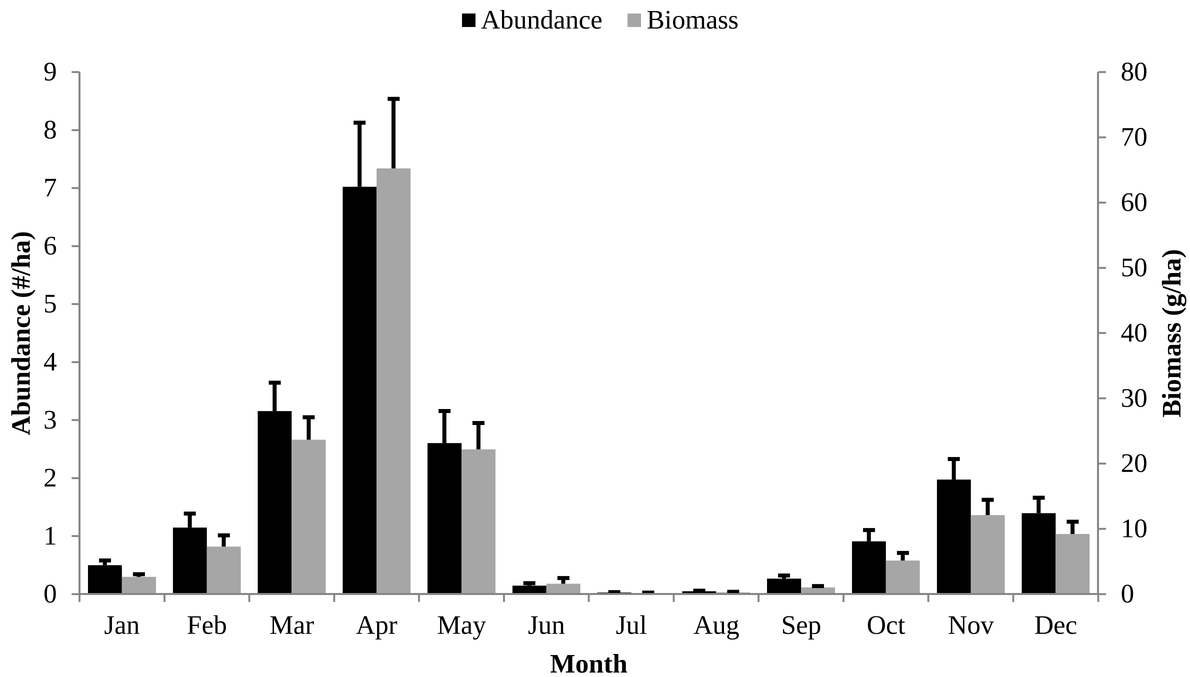

Figure 149. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus duorarum* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

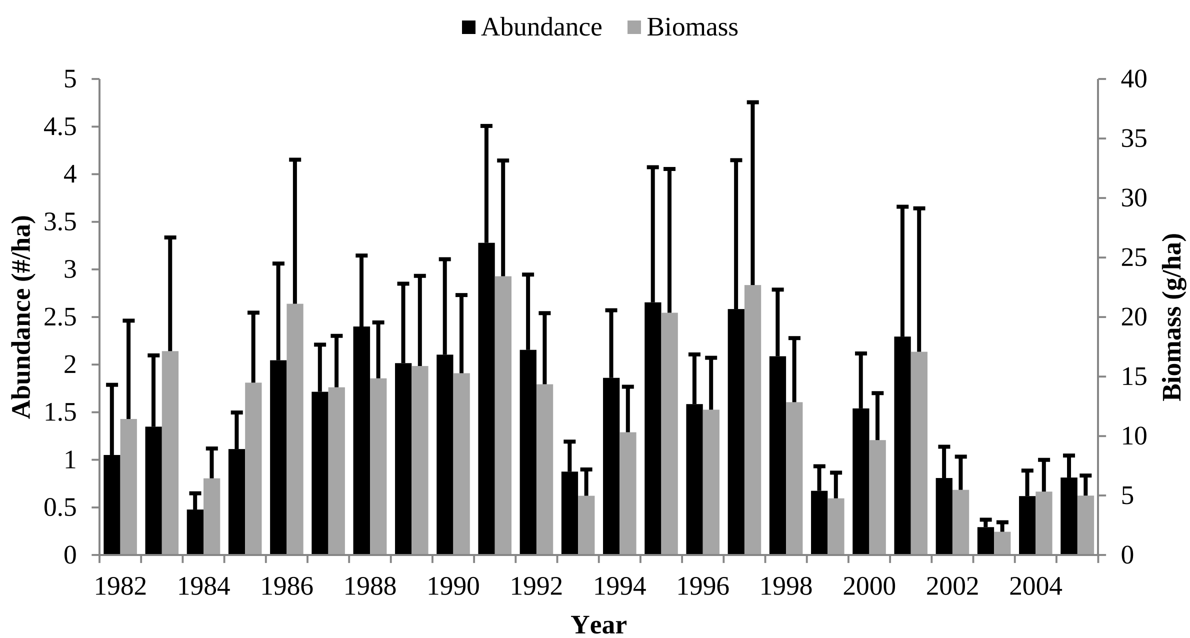

Figure 150. The mean (+SE) annual abundance and biomass of *Farfantepenaeus duorarum* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 75. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	1.5 (6.1)	2.9 (11.5)	4.8 (30.0)	5.6 (23.5)
Upper Laguna Madre	0.5 (4.2)	0.7 (7.2)	2.7 (26.9)	4.4 (46.4)
Corpus Christi Bay	0.8 (5.4)	1.8 (14.3)	6.3 (61.0)	14.1 (142.2)
Aransas Bay	1.0 (3.8)	2.3 (13.9)	6.3 (39.5)	15.9 (142.7)
San Antonio Bay	0.4 (1.4)	1.5 (7.3)	4.5 (26.5)	7.3 (65.8)
Matagorda Bay	0.3 (3.1)	0.8 (7.0)	0.9 (8.6)	4.9 (48.5)
East Matagorda Bay	0.1 (0.2)	0.1 (0.4)	1.2 (6.5)	2.0 (18.6)
Galveston Bay	0.0 (0.0)	0.0 (0.2)	0.2 (1.4)	0.4 (4.1)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)
	May	Jun	Jul	Aug
Lower Laguna Madre	3.1 (7.5)	0.7 (2.5)	0.1 (0.6)	0.3 (0.9)
Upper Laguna Madre	1.7 (16.3)	0.3 (2.7)	0.0 (0.6)	0.1 (0.6)
Corpus Christi Bay	4.5 (43.5)	0.4 (6.3)	0.1 (0.3)	0.1 (0.5)
Aransas Bay	7.3 (52.0)	0.0 (0.2)	0.0 (0.1)	0.0 (0.1)
San Antonio Bay	1.9 (18.8)	0.0 (0.3)	0.0 (0.1)	0.0 (0.6)
Matagorda Bay	1.8 (24.8)	0.0 (0.8)	0 (0)	0 (0)
East Matagorda Bay	0.2 (1.3)	0 (0)	0.0 (0.1)	0 (0)
Galveston Bay	0.2 (0.7)	0.0 (0.0)	0 (0)	0 (0)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)
	Sep	Oct	Nov	Dec
Lower Laguna Madre	1.0 (2.0)	0.7 (2.1)	1.5 (5.0)	1.7 (6.7)
Upper Laguna Madre	0.1 (0.5)	0.9 (4.1)	3.1 (13.3)	0.9 (5.8)
Corpus Christi Bay	0.3 (1.3)	1.3 (8.5)	4.5 (35.2)	3.1 (23.9)
Aransas Bay	0.9 (3.8)	3.6 (19.9)	5.0 (25.7)	3.5 (20.8)
San Antonio Bay	0.1 (0.4)	0.2 (1.3)	1.0 (6.6)	1.3 (8.6)
Matagorda Bay	0.1 (0.4)	0.4 (2.5)	0.5 (4.3)	0.4 (3.8)
East Matagorda Bay	0.0 (0.2)	0.1 (0.3)	0.5 (1.5)	0.1 (0.3)
Galveston Bay	0.0 (0.0)	0.0 (0.2)	0.4 (2.7)	0.0 (0.3)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)
	Mean	SE		
Lower Laguna Madre	2.0 (8.2)	0.5 (2.7)		
Upper Laguna Madre	1.3 (10.7)	0.4 (4.0)		
Corpus Christi Bay	3.1 (28.5)	1.2 (11.8)		
Aransas Bay	3.8 (26.9)	1.3 (11.6)		
San Antonio Bay	1.5 (11.5)	0.6 (5.5)		
Matagorda Bay	0.9 (8.6)	0.4 (4.1)		
East Matagorda Bay	0.4 (2.4)	0.2 (1.6)		
Galveston Bay	0.1 (0.9)	0.0 (0.4)		
Sabine Lake	0 (0)	0 (0)		

Table 76. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0 (0)	0.3 (2.8)	0.1 (0.4)	0.4 (5.0)	0.0 (0.1)	0.7 (2.8)	1.0 (4.6)	0.6 (3.1)	1.2 (7.9)
Upper Laguna Madre	0.3 (1.7)	0.4 (3.7)	0.1 (0.8)	2.0 (17.4)	0.5 (6.2)	0.4 (4.4)	0.2 (1.0)	0.2 (1.2)	1.3 (5.5)
Corpus Christi Bay	0.8 (12.3)	0.8 (12.7)	1.4 (25.3)	2.2 (28.7)	5.6 (57.3)	5.4 (52.7)	4.0 (30.4)	4.0 (32.6)	2.0 (18.2)
Aransas Bay	3.1 (31.2)	4.1 (47.8)	1.2 (11.7)	1.7 (24.4)	5.2 (50.6)	2.8 (15.4)	9.6 (52.8)	6.6 (50.1)	10.9 (76.3)
San Antonio Bay	0.1 (1.1)	2.1 (24.9)	0.0 (0.1)	1.4 (18.6)	2.1 (20.2)	1.1 (8.3)	2.8 (17.6)	3.6 (28.6)	0.4 (3.3)
Matagorda Bay	0.1 (2.5)	0.6 (12.6)	0.1 (0.9)	0.2 (3.5)	1.2 (16.2)	2.2 (17.7)	0.8 (6.1)	0.5 (5.1)	0.2 (2.4)
East Matagorda Bay						1.2 (11.8)	0.1 (0.9)	0.1 (0.7)	0 (0)
Galveston Bay	0.0 (0.4)	0.1 (1.6)	0 (0)	0.0 (0.5)	0.0 (0.3)	0.1 (1.1)	0.3 (1.2)	0.0 (0.3)	0.0 (0.1)
Sabine Lake					0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Lower Laguna Madre	1.9 (10.0)	9.4 (51.1)	1.8 (8.0)	7.0 (17.2)	3.1 (11.3)	2.5 (6.8)	2.5 (12.3)	2.7 (6.1)	1.2 (5.1)
Upper Laguna Madre	1.9 (19.6)	4.2 (42.4)	0.5 (4.4)	1.7 (13.2)	1.9 (16.1)	1.5 (10.5)	1.0 (9.1)	1.7 (9.5)	2.8 (25.4)
Corpus Christi Bay	3.6 (31.2)	4.6 (37.3)	1.8 (13.1)	2.1 (14.5)	5.9 (54.9)	2.3 (21.1)	6.5 (68.3)	6.5 (45.9)	0.9 (7.1)
Aransas Bay	12.5 (83.3)	3.4 (14.5)	2.5 (10.7)	2.9 (16.9)	1.8 (12.7)	2.0 (14.7)	6.3 (49.5)	2.9 (15.0)	1.0 (5.9)
San Antonio Bay	3.9 (22.9)	0.1 (0.3)	0.5 (3.0)	2.2 (10.3)	3.0 (15.8)	3.4 (25.6)	2.0 (16.6)	1.6 (9.9)	0.0 (0.2)
Matagorda Bay	0.8 (8.4)	0.2 (1.3)	0.2 (1.7)	1.4 (14.6)	4.8 (42.7)	0.6 (8.8)	1.4 (12.5)	0.9 (8.2)	0.4 (2.5)
East Matagorda Bay	0.4 (5.9)	0.1 (0.6)	0 (0)	0.2 (1.2)	1.1 (5.2)	0.9 (6.7)	0.3 (1.2)	0.7 (4.3)	0.9 (4.6)
Galveston Bay	0.0 (0.3)	0.0 (0.1)	0.0 (0.3)	0.0 (0.1)	0.0 (0.1)	0.3 (3.2)	0.1 (0.6)	0.1 (1.0)	0.0 (0.1)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**Mean**	**SE**	
Lower Laguna Madre	1.7 (4.8)	1.6 (8.1)	1.5 (3.5)	0.9 (3.5)	0.6 (1.7)	4.1 (15.5)	1.9 (8.0)	0.5 (2.1)	
Upper Laguna Madre	1.4 (7.3)	2.6 (8.1)	0.4 (5.1)	0.6 (6.2)	0.8 (12.2)	2.0 (19.9)	1.3 (10.5)	0.2 (1.9)	
Corpus Christi Bay	1.2 (7.5)	4.4 (37.3)	2.7 (22.6)	0.9 (7.3)	1.9 (19.4)	1.8 (12.0)	3.0 (27.9)	0.4 (3.6)	
Aransas Bay	4.1 (20.7)	4.3 (26.7)	1.6 (8.5)	0.3 (1.1)	0.4 (2.0)	0.5 (2.5)	3.8 (26.9)	0.7 (4.7)	
San Antonio Bay	1.8 (13.7)	2.8 (24.9)	0.1 (0.8)	0 (0)	1.2 (7.8)	0.2 (1.1)	1.5 (11.5)	0.3 (2.0)	
Matagorda Bay	1.1 (11.5)	2.0 (19.3)	0.1 (1.1)	0.1 (0.5)	0.1 (1.2)	0.2 (1.5)	0.8 (8.4)	0.2 (1.9)	
East Matagorda Bay	0.5 (2.6)	0.4 (2.1)	0.2 (1.0)	0 (0)	0 (0)	0.0 (0.2)	0.4 (2.6)	0.1 (0.7)	
Galveston Bay	0.8 (6.9)	0.3 (2.2)	0.1 (0.5)	0 (0)	0 (0)	0 (0)	0.1 (0.9)	0.0 (0.3)	
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	

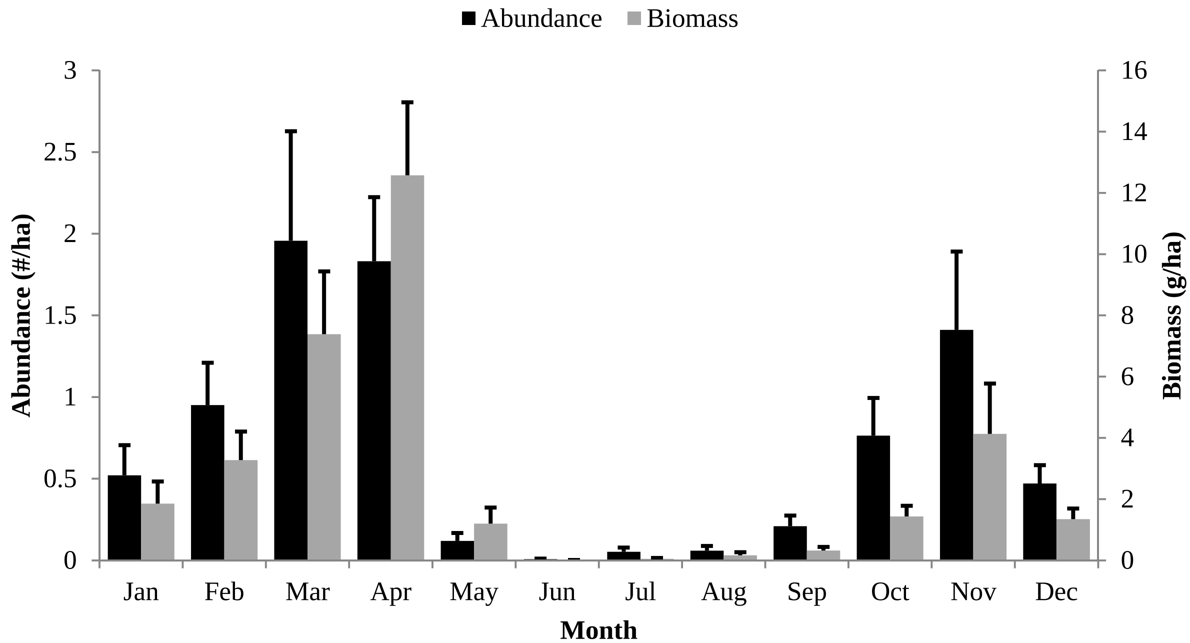

Figure 151. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus duorarum* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

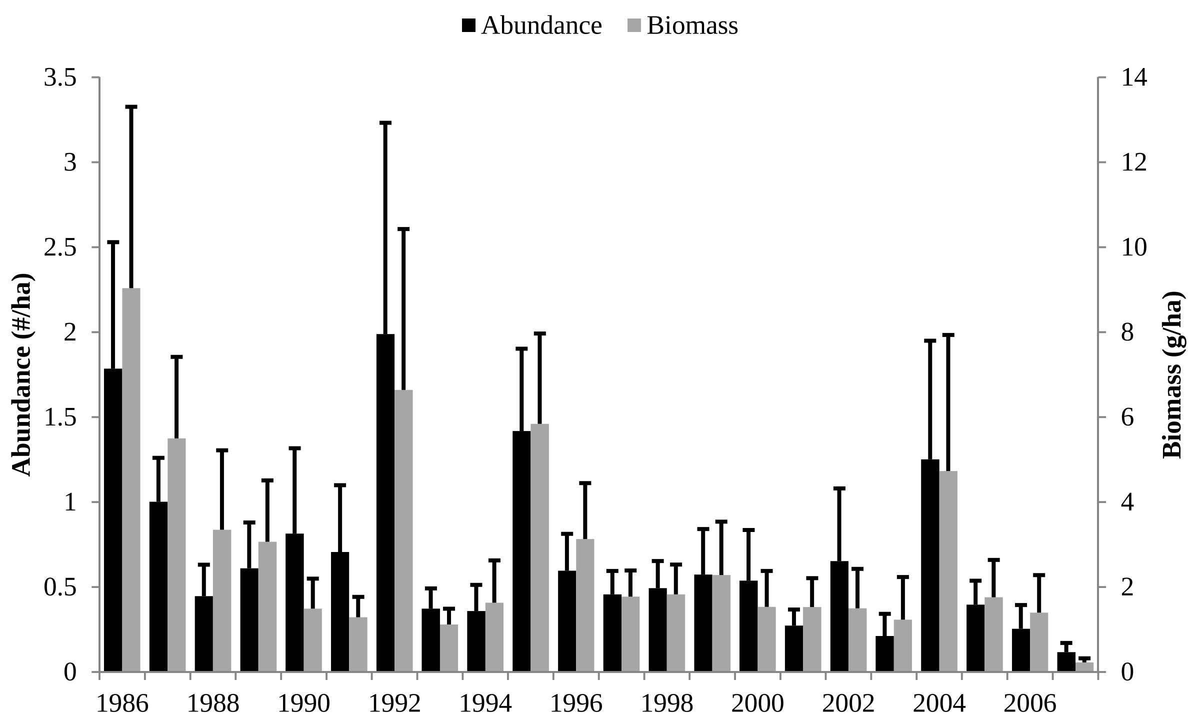

Figure 152. The mean (+SE) annual abundance and biomass of *Farfantepenaeus duorarum* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 77. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0 (0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Vermilion-Cote Blanche Bays	0.0 (0.0)	0.1 (0.0)	0.0 (0.2)	0 (0)
Terrebonne-Timbalier Bays	0.4 (1.2)	0.9 (3.1)	2.0 (9.2)	1.8 (12.8)
Barataria Bay	1.9 (6.5)	3.3 (12.1)	4.1 (16.7)	4.4 (37.2)
Breton-Chandeleur Sounds	0.1 (0.2)	0.2 (0.6)	3.7 (10.8)	2.9 (16.4)
Lake Borgne	0.5 (1.2)	0.6 (1.1)	0.3 (0.7)	0.4 (1.5)
	May	Jun	Jul	Aug
Lake Calcasieu	0 (0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0 (0)	0 (0)	0 (0)	0 (0)
Terrebonne-Timbalier Bays	0.0 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Barataria Bay	0.5 (5.4)	0.0 (0.0)	0.1 (0.1)	0.1 (0.2)
Breton-Chandeleur Sounds	0.1 (1.0)	0.0 (0.0)	0.1 (0.2)	0.2 (0.5)
Lake Borgne	0.1 (0.4)	0 (0)	0 (0)	0 (0)
	Sep	Oct	Nov	Dec
Lake Calcasieu	0 (0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0.1 (0.2)	0.0 (0.0)	0.1 (0.8)	0.0 (0.1)
Terrebonne-Timbalier Bays	0.2 (0.1)	0.1 (0.4)	0.3 (1.7)	0.3 (1.1)
Barataria Bay	0.2 (0.8)	1.1 (2.8)	3.5 (8.5)	1.6 (5.5)
Breton-Chandeleur Sounds	0.5 (0.6)	2.0 (3.7)	1.9 (3.3)	0.2 (0.6)
Lake Borgne	0.1 (0.6)	1.2 (2.2)	2.2 (6.6)	1.2 (2.7)
	Mean	SE		
Lake Calcasieu	0.0 (0.0)	0.0 (0.0)		
Vermilion-Cote Blanche Bays	0.0 (0.1)	0.0 (0.1)		
Terrebonne-Timbalier Bays	0.5 (2.5)	0.2 (1.2)		
Barataria Bay	1.7 (8.0)	0.5 (3.0)		
Breton-Chandeleur Sounds	1.0 (3.2)	0.4 (1.5)		
Lake Borgne	0.5 (1.4)	0.2 (0.5)		

Table 78. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990
Lake Calcasieu	0.0 (0.2)	0.0 (0.0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0.0 (0.1)	0 (0)	0 (0)	0.3 (1.3)	0 (0)
Terrebonne-Timbalier Bays	1.0 (4.5)	0.2 (0.6)	0.1 (0.5)	2.4 (10.9)	0.5 (2.2)
Barataria Bay	4.3 (23.9)	3.7 (22.9)	1.9 (16.1)	0.3 (3.0)	0.6 (1.6)
Breton-Chandeleur Sounds	0.5 (3.8)	0.5 (1.2)	0.4 (2.2)	0.3 (1.4)	2.4 (2.1)
Lake Borgne	0.4 (1.0)	0.2 (0.7)	0.0 (0.0)	0.1 (0.3)	0.4 (1.7)
	1991	1992	1993	1994	1995
Lake Calcasieu	0.0 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0.0 (0.1)	0 (0)	0 (0)	0.1 (0.1)	0.1 (0.1)
Terrebonne-Timbalier Bays	0.1 (0.5)	1.1 (4.6)	0.2 (0.8)	0.5 (1.8)	2.2 (9.8)
Barataria Bay	0.6 (2.2)	4.0 (16.7)	0.6 (2.8)	0.8 (3.3)	3.7 (17.1)
Breton-Chandeleur Sounds	2.6 (3.5)	5.6 (15.3)	0.8 (2.0)	0.5 (2.9)	0.7 (1.7)
Lake Borgne	1.5 (1.5)	0.6 (1.5)	0.6 (0.6)	0.1 (0.2)	1.5 (7.2)
	1996	1997	1998	1999	2000
Lake Calcasieu	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0.1 (0.1)	0 (0)	0.0 (0.0)	0.0 (0.0)	0.3 (0.1)
Terrebonne-Timbalier Bays	0.9 (5.5)	0.3 (0.8)	0.3 (1.0)	0.8 (3.5)	0.5 (1.1)
Barataria Bay	0.6 (2.8)	0.6 (2.7)	1.4 (6.0)	1.4 (6.6)	1.7 (5.4)
Breton-Chandeleur Sounds	0.9 (5.6)	0.9 (3.8)	0.7 (2.3)	0.5 (1.4)	0.2 (1.0)
Lake Borgne	0.8 (2.4)	1.1 (3.2)	0.6 (2.5)	0.6 (1.3)	0.3 (0.7)
	2001	2002	2003	2004	2005
Lake Calcasieu	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vermilion-Cote Blanche Bays	0 (0)	0.0 (0.0)	0 (0)	0 (0)	0 (0)
Terrebonne-Timbalier Bays	0.3 (1.9)	0.2 (0.8)	0.1 (0.2)	0.5 (2.3)	0.1 (0.1)
Barataria Bay	1.1 (6.2)	3.1 (6.1)	0.6 (3.7)	2.9 (11.5)	1.7 (10.4)
Breton-Chandeleur Sounds	0.2 (0.9)	0.4 (1.5)	0.4 (2.7)	2.9 (10.5)	1.1 (2.0)
Lake Borgne	0.1 (0.1)	0.2 (0.4)	0.2 (0.7)	0.9 (1.9)	0.5 (1.5)
	2006	2007	Mean	SE	
Lake Calcasieu	0 (0)	0 (0)	0.0 (0.0)	0.0 (0.0)	
Vermilion-Cote Blanche Bays	0 (0)	0 (0)	0.0 (0.1)	0.0 (0.1)	
Terrebonne-Timbalier Bays	0.2 (1.0)	0.0 (0.0)	0.6 (2.5)	0.1 (0.6)	
Barataria Bay	0.7 (4.6)	0.5 (1.2)	1.7 (8.0)	0.3 (1.5)	
Breton-Chandeleur Sounds	0.7 (2.4)	0.0 (0.0)	1.1 (3.2)	0.3 (0.7)	
Lake Borgne	0.2 (0.3)	0.7 (0.9)	0.5 (1.4)	0.1 (0.3)	

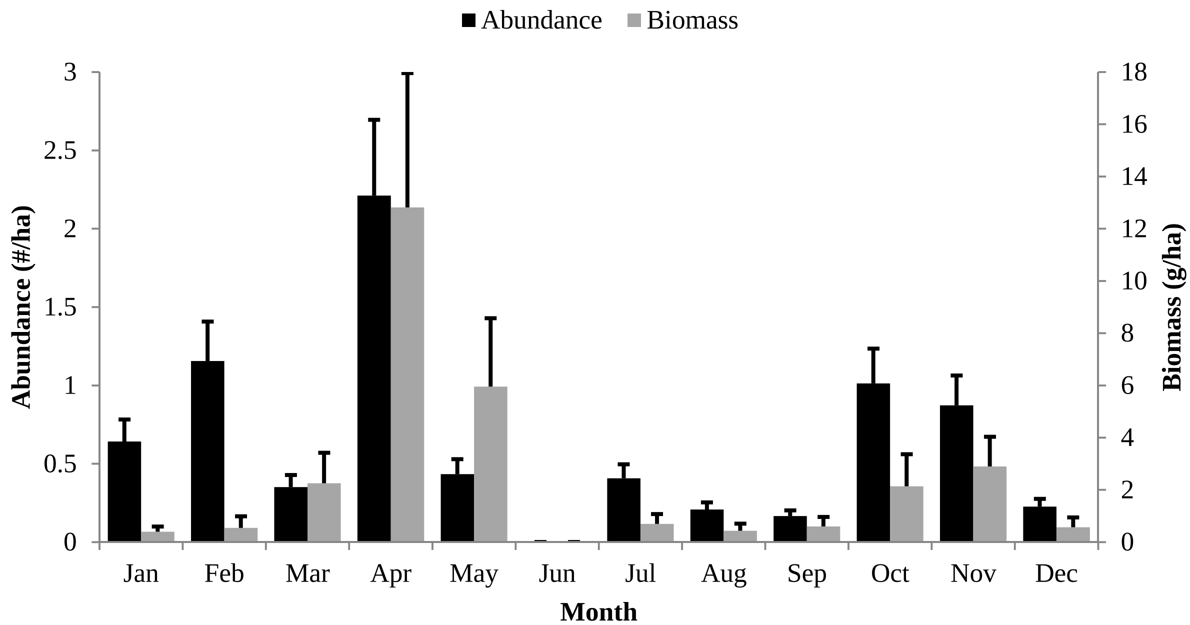

Figure 153. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus duorarum* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *F. duorarum* length measurements were not recorded until 1985.

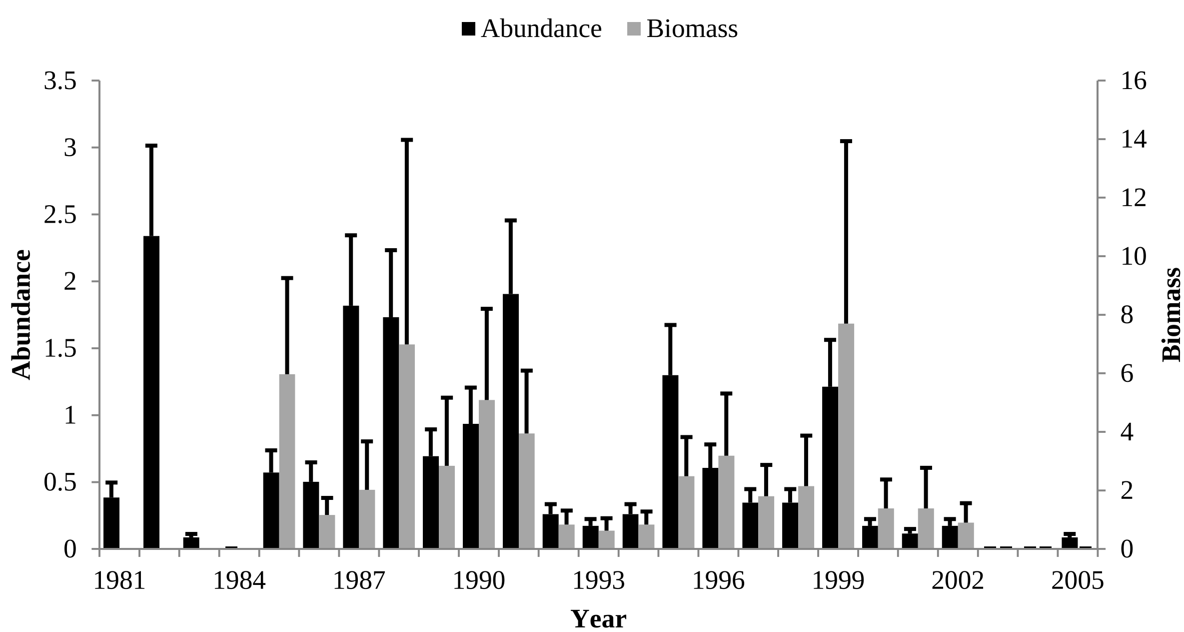

Figure 154. The mean (+SE) annual abundance and biomass of *Farfantepenaeus duorarum* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *F. duorarum* length measurements were not recorded until 1985.

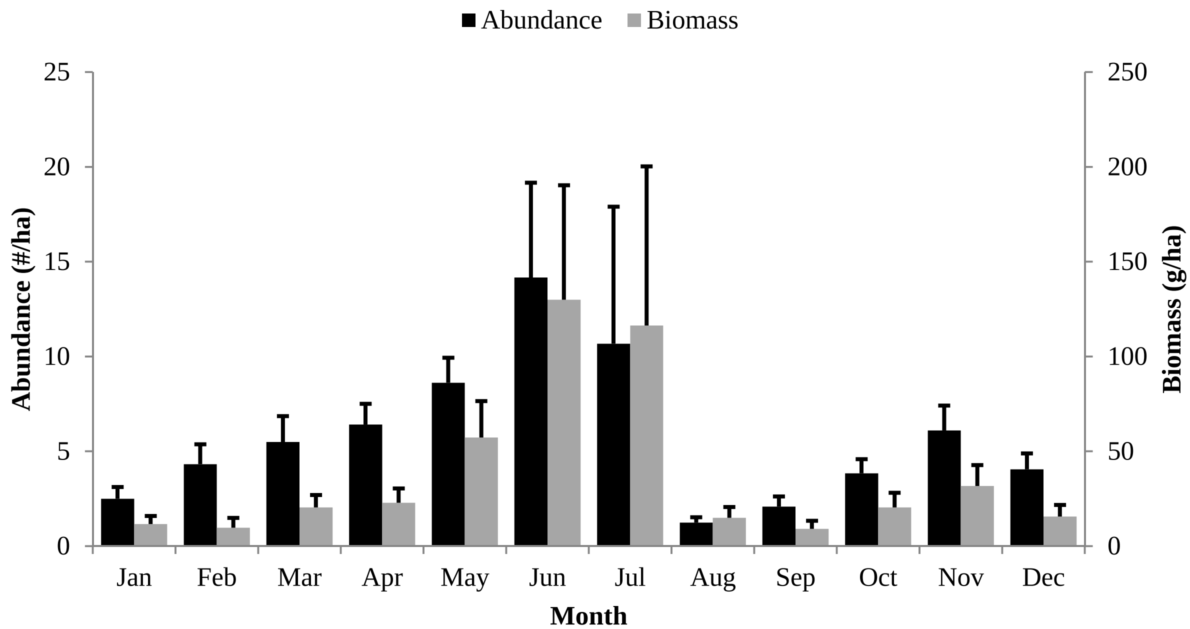

Figure 155. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus duorarum* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability. Length data were not available for the years 1986 – 1988, 1991 – 1995, and 1997 – 1999.

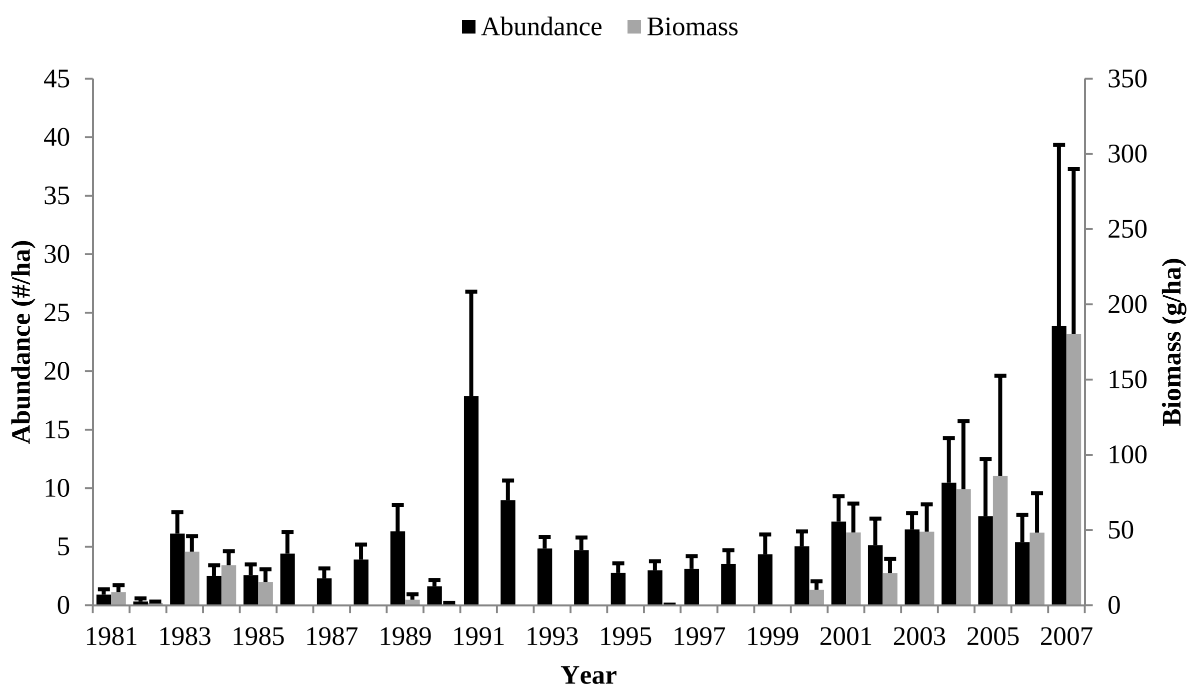

Figure 156. The mean (+SE) annual abundance and biomass of *Farfantepenaeus duorarum* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability. Length data were not available for the years 1986 – 1988, 1991 – 1995, and 1997 – 1999.

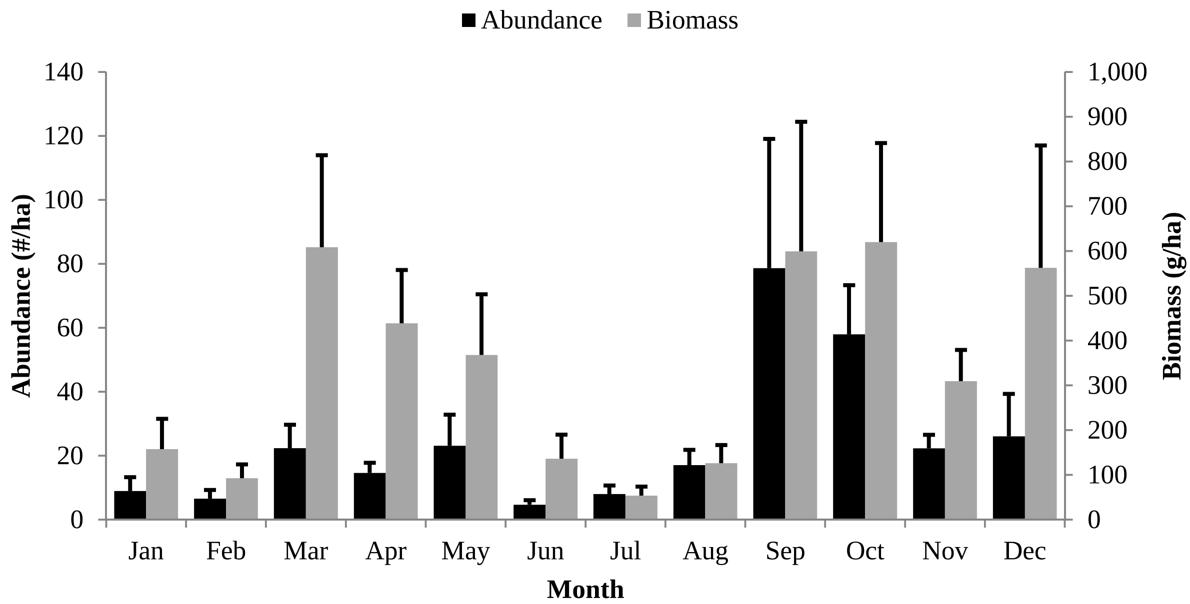

Figure 157. The monthly mean (+SE) abundance and biomass of *Farfantepenaeus duorarum* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

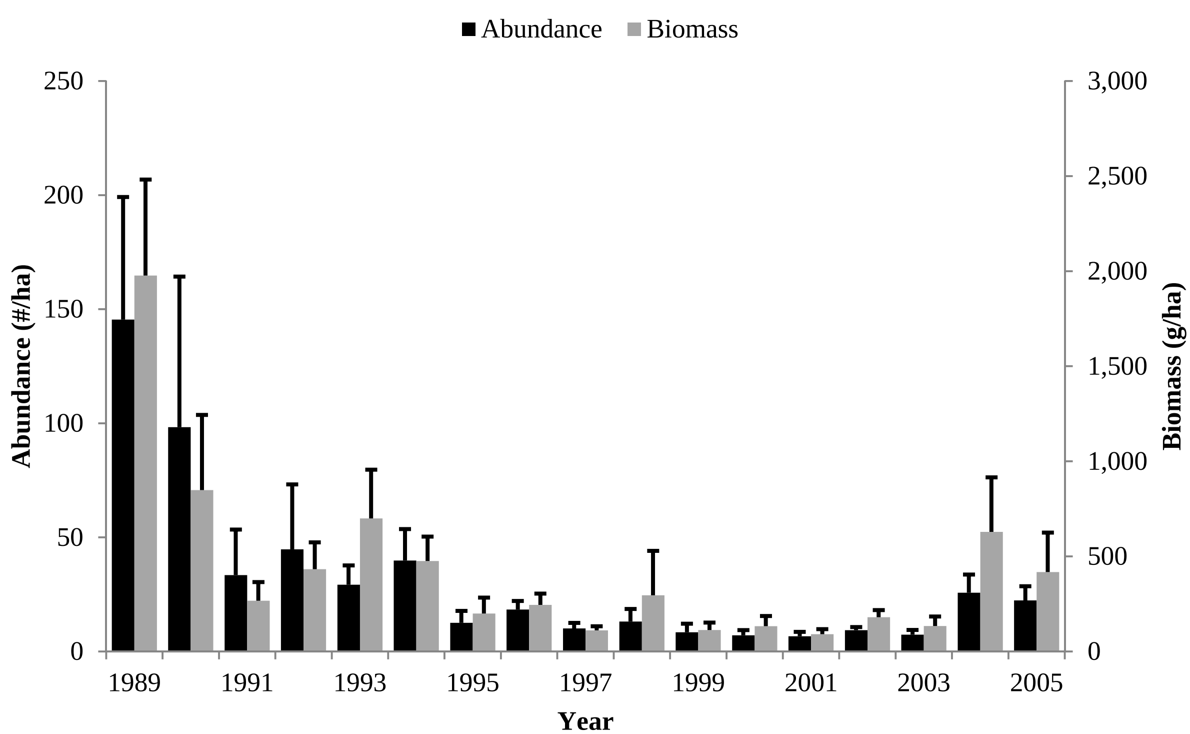

Figure 158. The mean (+SE) annual abundance and biomass of *Farfantepenaeus duorarum* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 79. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	2.7 (13.9)	2.9 (10.0)	6.6 (19.9)	5.1 (23.4)
E MS Sound (AL)	0.9 (3.2)	0.7 (0.5)	0.8 (3.1)	2.8 (11.8)
Perdido Bay (AL)	3.9 (24.7)	14.2 (31.4)	9.7 (72.4)	16.8 (100.6)
Apalachicola Bay (FL)	2.4 (45.4)	2.9 (60.2)	6.0 (125.7)	11.2 (273.6)
Suwannee Sound (FL)	4.3 (41.0)	3.0 (52.2)	15.9 (305.0)	32.5 (1128.1)
Cedar Key (FL)	0 (0)	7.3 (116.2)	1.7 (39.1)	2.2 (54.7)
Tampa Bay (FL)	8.7 (194.4)	9.2 (154.5)	33.3 (1036.4)	22.4 (722.1)
Charlotte Harbor (FL)	32.7 (562.9)	14.1 (125.5)	21.3 (388.9)	9.4 (224.0)
	May	Jun	Jul	Aug
Mobile Bay (AL)	7.7 (49.4)	21.3 (172.3)	13.9 (152.3)	1.4 (15.3)
E MS Sound (AL)	5.5 (56.9)	4.7 (25.5)	1.2 (16.4)	0.7 (10.1)
Perdido Bay (AL)	22.5 (293.2)	3.8 (47.8)	5.0 (61.5)	0.8 (12.1)
Apalachicola Bay (FL)	16.6 (512.6)	5.6 (172.6)	5.5 (61.8)	6.5 (94.4)
Suwannee Sound (FL)	5.8 (90.4)	10.8 (586.4)	11.2 (63.8)	17.8 (263.4)
Cedar Key (FL)	4.5 (67.5)	0 (0)	0.3 (2.8)	1.9 (4.1)
Tampa Bay (FL)	8.4 (225.9)	4.8 (67.1)	12.3 (76.6)	22.0 (110.8)
Charlotte Harbor (FL)	45.8 (321.2)	4.9 (15.1)	21.4 (54.0)	66.5 (116.1)
	Sep	Oct	Nov	Dec
Mobile Bay (AL)	2.4 (9.9)	3.5 (15.2)	4.6 (27.2)	4.6 (19.6)
E MS Sound (AL)	0.4 (1.8)	1.1 (15.7)	0.7 (6.6)	1.2 (5.1)
Perdido Bay (AL)	3.1 (19.9)	8.1 (58.4)	16.6 (108.0)	6.0 (18.6)
Apalachicola Bay (FL)	1.7 (18.8)	3.1 (35.1)	10.2 (231.1)	4.6 (81.7)
Suwannee Sound (FL)	39.8 (764.0)	31.3 (862.2)	11.1 (101.4)	9.0 (109.8)
Cedar Key (FL)	2.2 (19.8)	12.4 (228.2)	35.4 (1391.9)	20.5 (1421.3)
Tampa Bay (FL)	133.1 (977.7)	55.7 (581.1)	18.9 (320.1)	36.4 (709.3)
Charlotte Harbor (FL)	34.7 (171.4)	69.6 (977.1)	33.3 (269.3)	47.7 (1402.4)
	Mean	SE		
Mobile Bay (AL)	6.4 (44.0)	1.7 (16.3)		
E MS Sound (AL)	1.7 (13.1)	0.5 (4.5)		
Perdido Bay (AL)	9.2 (70.7)	2.0 (22.2)		
Apalachicola Bay (FL)	6.3 (142.8)	1.3 (40.7)		
Suwannee Sound (FL)	16.0 (364.0)	3.5 (108.5)		
Cedar Key (FL)	7.4 (278.8)	3.1 (153.2)		
Tampa Bay (FL)	30.4 (435.5)	10.3 (104.0)		
Charlotte Harbor (FL)	33.4 (385.7)	6.0 (119.7)		

Table 80. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Farfantepenaeus duorarum* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	1.5 (9.9)	0.5 (2.6)	9.0 (50.2)	1.6 (20.6)	1.8 (9.0)
E MS Sound (AL)	0.7 (9.0)	0 (0)	1.4 (9.9)	1.3 (14.5)	0.3 (0.9)
Perdido Bay (AL)		0 (0)	5.6 (35.7)	18.3 (158.2)	15.3 (105.6)

	1986	1987	1988	1989	1990
Mobile Bay (AL)	5.2	2.3	2.4	6.6 (5.4)	0.9 (1.5)
E MS Sound (AL)	2.8	1.0	1.4	2.5	0.6
Perdido Bay (AL)	2.7	3.7	9.9	10.1	4.2
Tampa Bay (FL)				139.3 (2189.3)	90.5 (866.6)
Charlotte Harbor (FL)				116.8 (946.2)	56.8 (362.4)

	1991	1992	1993	1994	1995
Mobile Bay (AL)	27.1	9.4	5.1	5.1	2.7
E MS Sound (AL)	10.5	1.4	1.0	1.4	0.4
Perdido Bay (AL)	8.7	14.7	8.5	6.0	4.6
Tampa Bay (FL)	10.0 (266.7)	60.4 (556.3)	32.3 (943.6)	48.2 (626.9)	11.3 (227.4)
Charlotte Harbor (FL)	103.5 (275.3)	17.4 (182.7)	24.7 (310.7)	36.1 (318.8)	17.0 (192.0)

	1996	1997	1998	1999	2000
Mobile Bay (AL)	3.4 (0.3)	3.2	4.7	1.3	4.9 (8.2)
E MS Sound (AL)	0.5	0.3	1.7	2.7	1.1 (0.9)
Perdido Bay (AL)	4.2	5.5	4.5	28.4	9.7 (44.2)
Apalachicola Bay (FL)			7.5 (293.4)	6.8 (169.1)	4.5 (114.7)
Suwannee Sound (FL)	0 (0)	0 (0)			
Cedar Key (FL)	0 (0)	0 (0)			
Tampa Bay (FL)	22.4 (382.3)	13.6 (221.0)	17.0 (163.7)	22.2 (181.3)	16.6 (220.2)
Charlotte Harbor (FL)	24.9 (165.6)	15.4 (64.2)	84.8 (94.1)	56.5 (151.8)	39.5 (154.2)

	2001	2002	2003	2004	2005
Mobile Bay (AL)	6.1 (44.8)	5.1 (23.3)	7.1 (61.2)	9.0 (83.3)	8.9 (109.9)
E MS Sound (AL)	1.2 (6.7)	0.3 (1.4)	2.6 (22.4)	3.9 (42.8)	0.6 (7.1)
Perdido Bay (AL)	17.2 (106.2)	10.0 (36.1)	8.8 (37.7)	19.4 (57.5)	7.9 (448.4)
Apalachicola Bay (FL)	3.0 (62.7)	8.4 (206.1)	6.5 (82.7)	8.5 (156.1)	6.3 (97.4)
Suwannee Sound (FL)	11.8 (97.2)	3.1 (94.1)	2.1 (448.2)	28.4 (1128.5)	1.1 (649.9)
Cedar Key (FL)	13.5 (191.1)	8.1 (19.1)	12.7 (58.1)	51.2 (1417.1)	22.3 (25.8)
Tampa Bay (FL)	22.2 (244.9)	3.1 (73.7)	2.1 (145.1)	28.4 (177.4)	1.1 (110.6)
Charlotte Harbor (FL)	29.5 (229.4)	17.3 (36.0)	8.4 (46.4)	39.0 (1262.3)	41.2 (869.9)

	2006	2007	Mean	SE
Mobile Bay (AL)	6.3 (61.1)	28.8 (212.3)	6.3 (44.0)	1.4 (3.5)
E MS Sound (AL)	3.7 (30.6)	1.6 (19.1)	1.7 (12.7)	0.4 (1.0)
Perdido Bay (AL)	3.4 (11.8)	15.4 (138.6)	9.5 (65.0)	1.4 (4.2)
Apalachicola Bay (FL)			6.5 (147.8)	0.7 (26.8)
Suwannee Sound (FL)			15.4 (345.4)	3.9 (160.3)
Cedar Key (FL)			6.7 (244.5)	6.7 (197.0)
Tampa Bay (FL)			33.9 (445.3)	8.4 (125.9)
Charlotte Harbor (FL)			42.8 (333.1)	7.7 (85.3)

Symphurus plagiusa

The abundance pattern for blackcheek tonguefish (*Symphurus plagiusa*) was not consistent among the states with peaks in all seasons (Figure 159). Abundance in Alabama was highest among the states with an overall mean (mean of 12 monthly means in Figure 159) of 16.9/ha, followed by Florida (10.3/ha), Mississippi (3.5/ha), Louisiana (1.3/ha), and Texas (0.1/ha).

The maximum length reported in the literature for blackcheek tonguefish was recorded by Wenner and Sedberry (1989) was 210 mm; therefore all measurements in the database greater than 210 mm were excluded from this analysis. The length frequency distributions for blackcheek tonguefish in each state (Figure 160) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Blackcheek tonguefish ranged in size from 18 – 178 mm (mean=123.8, SD=15.9) in Texas, 2 – 187 mm (mean=74.5, SD=24.9) in Louisiana, 7 – 198 mm (mean=97.2, SD=29.2) in Alabama, and 14 – 210 mm (mean=97.6, SD=31.5) in Florida. Lengths of blackcheek tonguefish were not measured in Mississippi.

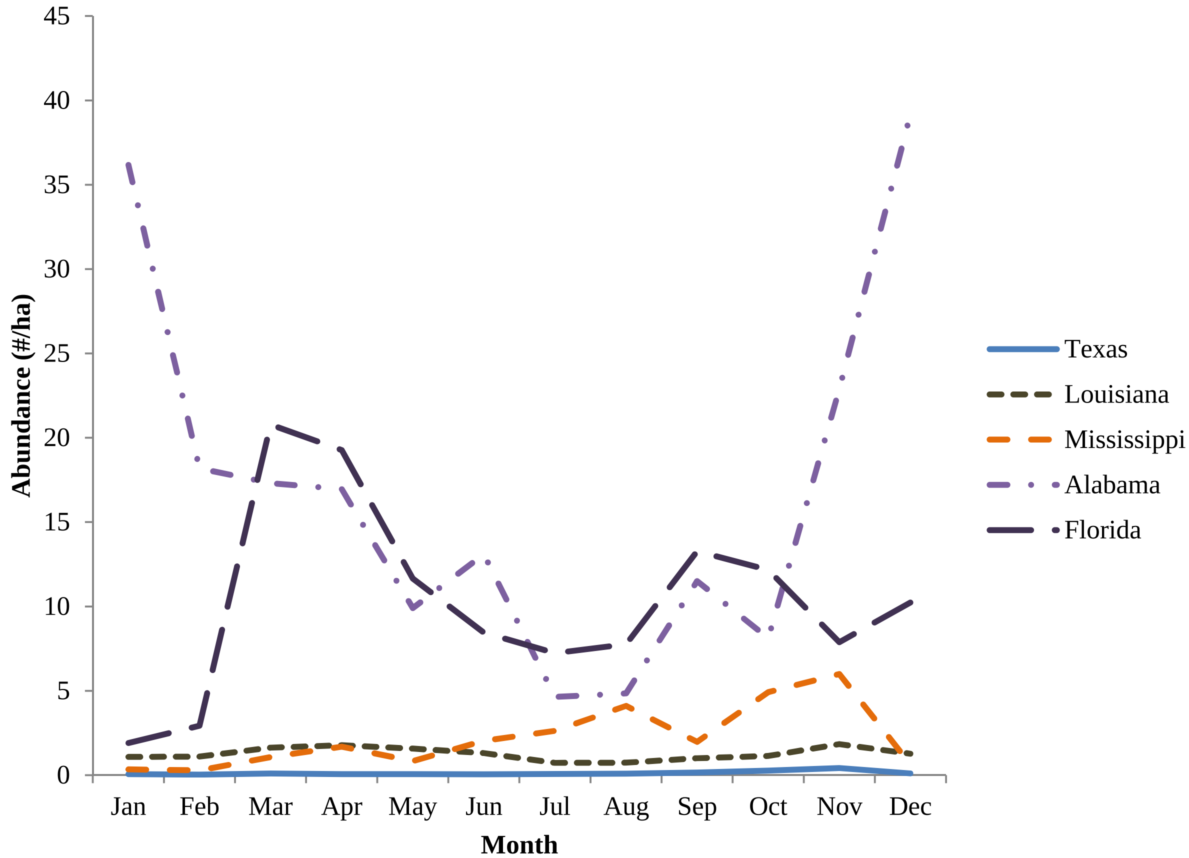

Figure 159. Monthly mean abundance of *Symphurus plagiusa* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

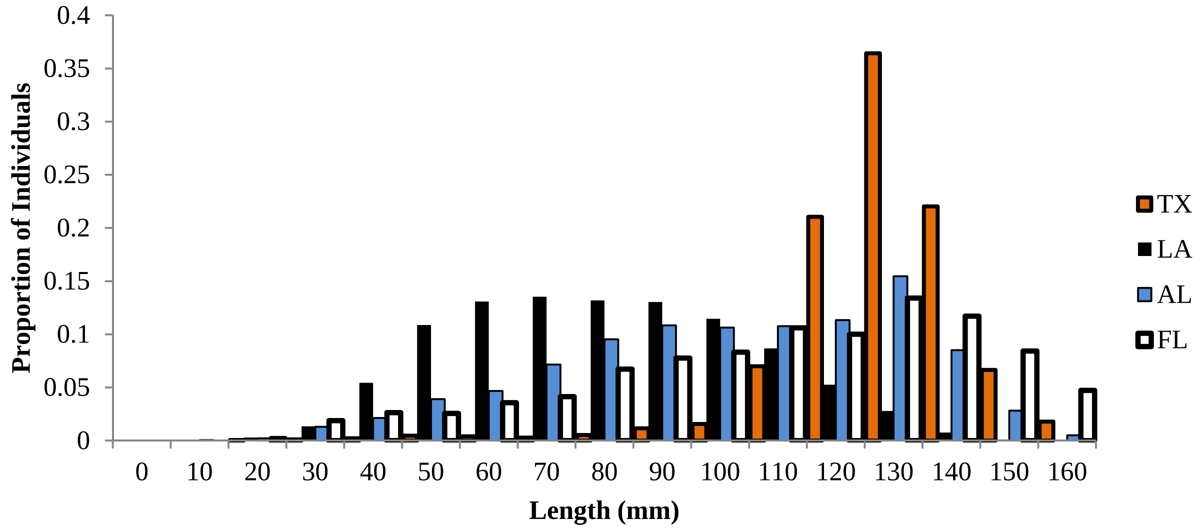

Figure 160. Length frequency of all blackcheek tonguefish (*Symphurus plagiusa*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states, except Mississippi. The data encompass sampling from the following years: Texas (n=1,729): 1982 – 2005; Louisiana (n=7,038): 1986 – 2007; Alabama (n=9,946): 1981 – 2007; and Florida (n=11,914): 1989 – 2005 (n-values represent the number of individuals measured). Length measurements were not recorded for *S. plagiusa* in Mississippi. Lengths are combined into 10-mm bins.

In Texas, blackcheek tonguefish mean abundance and biomass peaked in late fall and were relatively low throughout the rest of the year (Figure 161). Mean annual abundance and biomass peaked in 1989 (0.3/ha and 7.7 g/ha, respectively) (Figure 162). The highest mean abundance and biomass values were in Corpus Christi Bay (Tables 81 and 82).

The seasonal distribution of blackcheek tonguefish was relatively flat in Louisiana throughout the year with a peak of monthly mean abundance in June and another in November and December. The mean biomass was also relatively flat with a peak in the fall months (Figure 163). Mean annual abundance peaked in 2004 (2.1/ha) and mean annual biomass peaked in 1986 (17.6 g/ha) (Figure 164). The highest catch values were seen in Terrebonne-Timbalier Bays and Barataria Bay (Tables 83 and 84).

Biomass data were not available for blackcheek tonguefish in Mississippi as length measurements were not recorded. Mean abundance data did show a seasonal increase with lows in the winter months and a peak in the fall (Figure 165). Mean annual abundance peaked in 1989 (20.4/ha) (Figure 166).

The seasonal variability of mean abundance and biomass of blackcheek tonguefish in Alabama showed peak periods in late fall/early winter and the lowest numbers in summer (Figure 167). Mean annual abundance and biomass peaked in 1983 (54.5/ha and 528.5 g/ha, respectively) (Figure 168). Mean abundance of blackcheek tonguefish in Mobile Bay was an order of magnitude higher than in East Mississippi Sound and Perdido Bay (Tables 85 and 86).

Florida populations of blackcheek tonguefish exhibited little seasonality with regard to abundance and biomass, other than a low period in January and February (Figure 169). Mean annual abundance and biomass peaked in 1989 (37.9/ha and 1,057.3 g/ha, respectively) (Figure 170). Blackcheek tonguefish were found in the highest concentrations in Suwanee Sound and Tampa Bay (Tables 85 and 86).

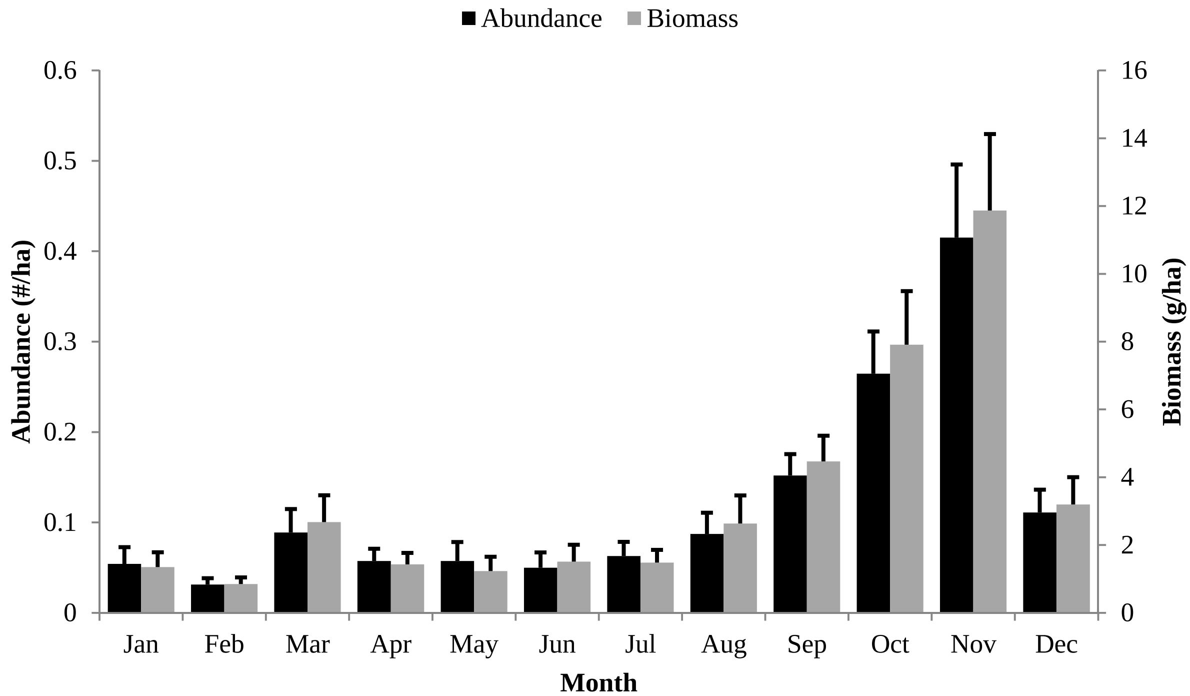

Figure 161. The monthly mean (+SE) abundance and biomass of *Symphurus plagiusa* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

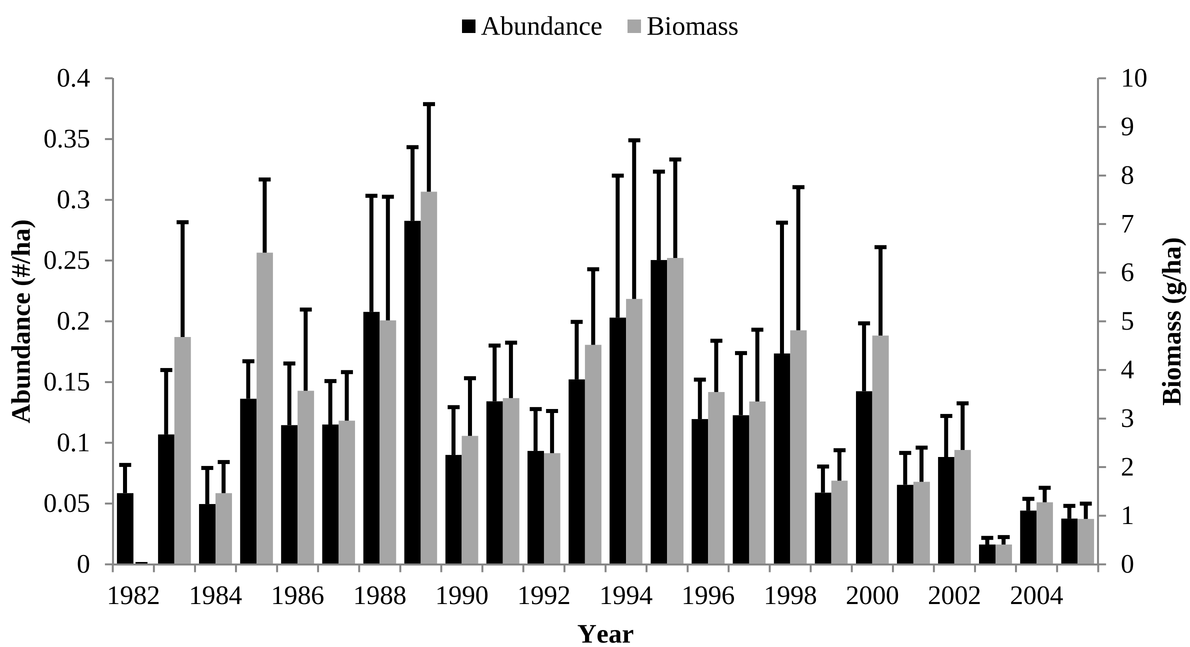

Figure 162. The mean (+SE) annual abundance and biomass of *Symphurus plagiusa* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 81. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.0 (1.5)	0.0 (0.5)	0.4 (10.7)	0.1 (1.7)
Upper Laguna Madre	0.0 (1.4)	0 (0)	0.0 (1.0)	0 (0)
Corpus Christi Bay	0.2 (4.8)	0.1 (2.5)	0.3 (9.9)	0.2 (5.6)
Aransas Bay	0.1 (0.9)	0.0 (0.6)	0.1 (1.1)	0.0 (0.9)
San Antonio Bay	0.0 (0.5)	0.0 (0.9)	0.0 (0.2)	0.0 (0.7)
Matagorda Bay	0.1 (1.5)	0.1 (1.9)	0.1 (2.1)	0.1 (2.1)
East Matagorda Bay	0 (0)	0 (0)	0.0 (0.5)	0 (0)
Galveston Bay	0.0 (0.4)	0.0 (0.1)	0.0 (0.0)	0.0 (0.2)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)

	May	Jun	Jul	Aug
Lower Laguna Madre	0.1 (1.8)	0.0 (0.8)	0.1 (3.2)	0.3 (8.0)
Upper Laguna Madre	0 (0)	0.0 (1.2)	0.0 (0.8)	0 (0)
Corpus Christi Bay	0.2 (4.7)	0.1 (4.8)	0.2 (4.6)	0.2 (5.3)
Aransas Bay	0.0 (0.3)	0 (0)	0.0 (0.2)	0.0 (1.1)
San Antonio Bay	0.1 (1.7)	0.1 (3.4)	0.1 (1.9)	0.1 (3.7)
Matagorda Bay	0.1 (1.0)	0.0 (0.8)	0.1 (1.3)	0.1 (1.5)
East Matagorda Bay	0.0 (0.4)	0 (0)	0 (0)	0 (0)
Galveston Bay	0.0 (0.0)	0.0 (0.3)	0.0 (0.1)	0.0 (0.7)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)

	Sep	Oct	Nov	Dec
Lower Laguna Madre	0.3 (9.6)	0.2 (5.3)	0.4 (12.9)	0.1 (2.1)
Upper Laguna Madre	0.0 (0.4)	0 (0)	0 (0)	0.0 (0.6)
Corpus Christi Bay	0.3 (8.6)	0.3 (9.2)	0.7 (22.1)	0.2 (5.6)
Aransas Bay	0.2 (4.8)	0.5 (16.9)	0.5 (12.4)	0.2 (6.9)
San Antonio Bay	0.2 (5.8)	0.5 (13.9)	0.5 (14.2)	0.1 (4.6)
Matagorda Bay	0.1 (3.2)	0.2 (6.6)	0.8 (19.9)	0.1 (2.0)
East Matagorda Bay	0.1 (3.6)	0.1 (3.3)	0.1 (0.9)	0 (0)
Galveston Bay	0.1 (2.2)	0.2 (3.4)	0.3 (7.7)	0.0 (1.5)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)

	Mean	SE
Lower Laguna Madre	0.2 (4.8)	0.0 (1.3)
Upper Laguna Madre	0.0 (0.5)	0.0 (0.2)
Corpus Christi Bay	0.2 (7.3)	0.0 (1.5)
Aransas Bay	0.1 (3.8)	0.1 (1.6)
San Antonio Bay	0.2 (4.3)	0.0 (1.4)
Matagorda Bay	0.1 (3.7)	0.1 (1.5)
East Matagorda Bay	0.0 (0.7)	0.0 (0.4)
Galveston Bay	0.1 (1.4)	0.0 (0.7)
Sabine Lake	0 (0)	0 (0)

Table 82. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary. Biomass data were not available for 1982.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0.1	0.1 (5.5)	0.0 (1.5)	0.1 (4.8)	0.4 (15.7)	0.7 (18.0)	0.2 (6.3)	0.6 (18.1)	0 (0)
Upper Laguna Madre	0.0	0.0 (1.0)	0 (0)	0.1 (1.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corpus Christi Bay	0.2	0.2 (8.9)	0.1 (5.0)	0.6 (27.6)	0.4 (11.0)	0.3 (8.4)	0.6 (16.0)	0.7 (18.8)	0.2 (4.7)
Aransas Bay	0.1	0.3 (13.9)	0.1 (1.7)	0.0 (1.3)	0.0 (1.4)	0.0 (0.3)	0.4 (6.9)	0.1 (4.3)	0.3 (8.4)
San Antonio Bay	0.0	0.0 (0.3)	0 (0)	0.0 (1.5)	0.1 (2.0)	0 (0)	0.1 (2.3)	0.5 (12.5)	0.1 (3.7)
Matagorda Bay	0.0	0.0 (1.7)	0.0 (0.1)	0.0 (1.1)	0.1 (1.6)	0.1 (2.5)	0.3 (5.9)	0.4 (10.1)	0.0 (1.4)
East Matagorda Bay						0 (0)	0.2 (4.0)	0.2 (4.5)	0 (0)
Galveston Bay	0.0	0.0 (0.1)	0.1 (1.2)	0.1 (3.6)	0.1 (1.2)	0.1 (1.6)	0.1 (1.3)	0.0 (0.6)	0.0 (0.3)
Sabine Lake					0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.0 (0.7)	0.3 (9.0)	0.1 (3.8)	0.0 (1.1)	0.3 (6.8)	0.1 (2.4)	0.2 (6.0)	0.1 (2.8)	0.0 (0.8)
Upper Laguna Madre	0 (0)	0 (0)	0 (0)	0.0 (1.2)	0.0 (1.0)	0.0 (1.2)	0 (0)	0.0 (0.8)	0 (0)
Corpus Christi Bay	0.4 (8.7)	0.1 (2.9)	0.8 (20.9)	0.3 (7.4)	0.2 (6.1)	0.2 (4.9)	0.1 (2.2)	0.0 (1.4)	0.1 (4.1)
Aransas Bay	0.2 (6.7)	0.1 (2.5)	0.0 (0.9)	0.1 (4.3)	0.1 (3.3)	0.0 (0.1)	0.1 (2.2)	0.3 (9.6)	0.1 (1.5)
San Antonio Bay	0.1 (3.8)	0 (0)	0.1 (1.2)	0.7 (20.0)	1.2 (28.6)	0.4 (13.5)	0.1 (4.6)	0.2 (6.7)	0.0 (0.3)
Matagorda Bay	0.1 (4.1)	0.2 (5.6)	0.1 (1.6)	0.2 (3.8)	0.1 (2.3)	0.1 (3.1)	0.4 (9.8)	0.5 (13.0)	0.1 (1.8)
East Matagorda Bay	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (1.0)	0.0 (0.6)	0 (0)	0.1 (2.4)
Galveston Bay	0.0 (0.4)	0.0 (0.5)	0 (0)	0.1 (1.6)	0 (0)	0.0 (1.0)	0.1 (1.3)	0.1 (1.1)	0.1 (2.7)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	2000	2001	2002	2003	2004	2005	Mean	SE
Lower Laguna Madre	0.1 (4.1)	0.1 (1.8)	0.1 (4.1)	0 (0)	0 (0)	0.1 (1.5)	0.2 (4.8)	0.0 (1.1)
Upper Laguna Madre	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (0.8)	0.1 (2.7)	0.0 (0.4)	0.0 (0.2)
Corpus Christi Bay	0.2 (8.3)	0.0 (1.2)	0.0 (0.9)	0 (0)	0.1 (3.4)	0.0 (0.6)	0.2 (7.2)	0.0 (1.5)
Aransas Bay	0.2 (7.0)	0.2 (5.6)	0.3 (8.9)	0.0 (0.5)	0.0 (0.8)	0.0 (0.1)	0.1 (3.8)	0.0 (0.8)
San Antonio Bay	0.0 (0.9)	0 (0)	0.0 (0.5)	0 (0)	0.0 (0.6)	0.0 (0.0)	0.2 (4.3)	0.1 (1.5)
Matagorda Bay	0.2 (4.9)	0.2 (3.2)	0.1 (2.4)	0.1 (1.8)	0.1 (3.0)	0.1 (2.2)	0.1 (3.6)	0.0 (0.7)
East Matagorda Bay	0.0 (0.7)	0 (0)	0.0 (0.6)	0 (0)	0 (0)	0 (0)	0.0 (0.7)	0.0 (0.3)
Galveston Bay	0.3 (9.4)	0.0 (1.0)	0.1 (1.6)	0.0 (0.6)	0.0 (0.7)	0.1 (1.5)	0.1 (1.4)	0.0 (0.4)
Sabine Lake	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

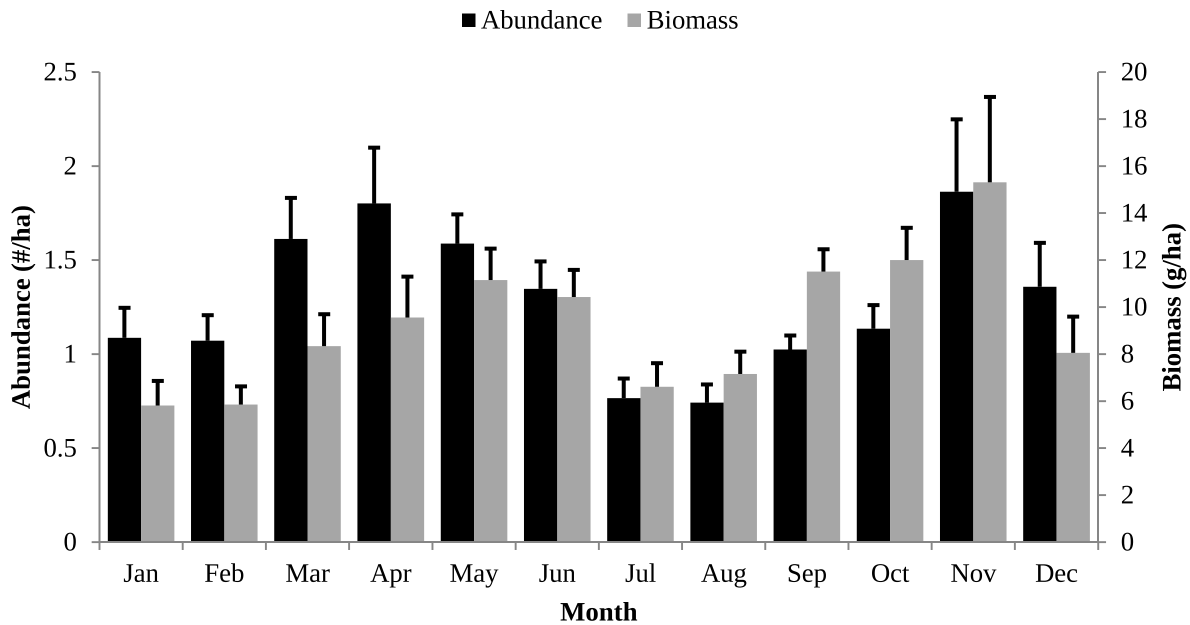

Figure 163. The monthly mean (+SE) abundance and biomass of *Symphurus plagiusa* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

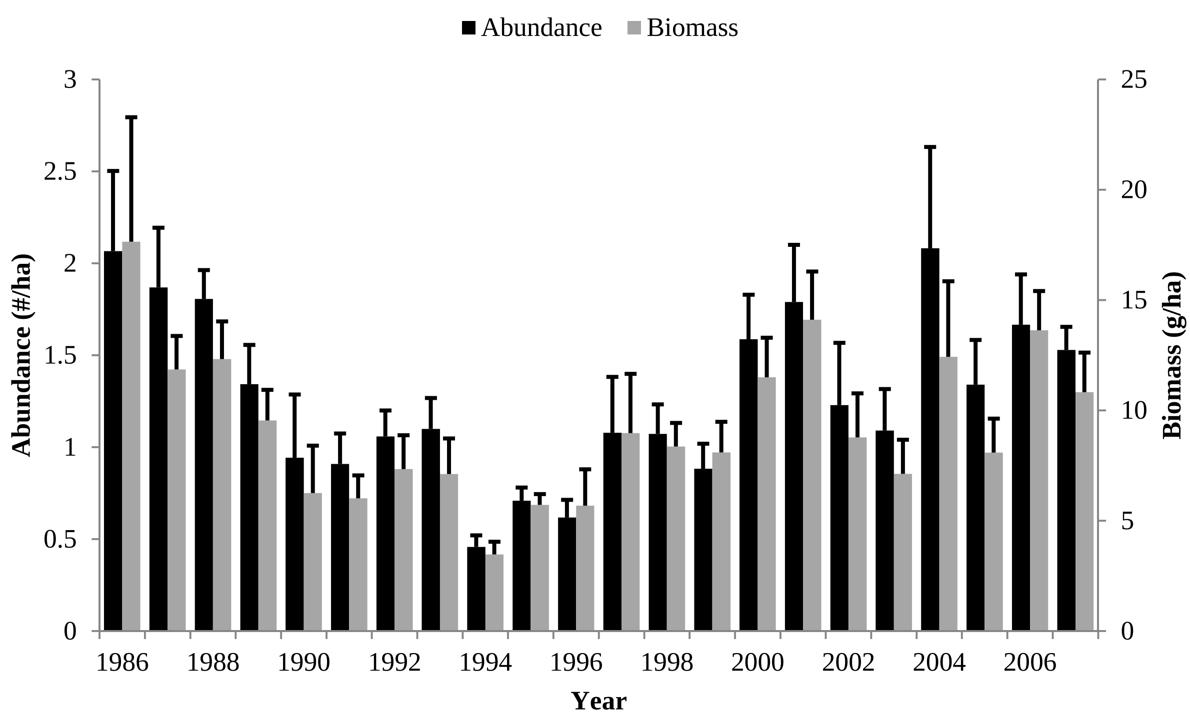

Figure 164. The mean (+SE) annual abundance and biomass of *Symphurus plagiusa* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 83. The monthly mean abundance in #/ha and biomass g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.3 (1.7)	0.7 (2.2)	0.6 (2.0)	0.3 (1.6)
Vermilion-Cote Blanche Bays	1.1 (5.5)	1.0 (3.3)	0.9 (2.5)	0.6 (2.2)
Terrebonne-Timbalier Bays	1.5 (8.7)	2.0 (12.4)	2.8 (16.3)	2.2 (11.7)
Barataria Bay	1.6 (8.0)	1.2 (8.0)	2.8 (16.0)	3.8 (20.8)
Breton-Chandeleur Sounds	0.2 (1.0)	0.2 (1.1)	1.1 (4.0)	2.3 (12.3)
Lake Borgne	0.1 (0.3)	0.1 (1.5)	0.2 (0.5)	0.5 (2.2)
	May	Jun	Jul	Aug
Lake Calcasieu	0.5 (1.1)	0.4 (1.7)	0.1 (0.8)	0.2 (1.4)
Vermilion-Cote Blanche Bays	0.6 (2.7)	0.5 (2.4)	0.3 (2.8)	0.8 (5.4)
Terrebonne-Timbalier Bays	2.2 (14.7)	2.3 (16.0)	1.5 (10.5)	1.3 (11.9)
Barataria Bay	2.2 (16.2)	1.4 (12.0)	1.0 (10.7)	0.6 (7.8)
Breton-Chandeleur Sounds	2.4 (20.3)	1.4 (14.6)	0.5 (5.9)	0.6 (7.1)
Lake Borgne	0.4 (1.6)	1.6 (10.0)	0.5 (4.3)	0.5 (3.7)
	Sep	Oct	Nov	Dec
Lake Calcasieu	0.1 (0.5)	0.4 (2.1)	0.2 (0.8)	0.2 (0.9)
Vermilion-Cote Blanche Bays	0.7 (4.5)	1.2 (7.1)	1.6 (9.3)	1.3 (3.7)
Terrebonne-Timbalier Bays	1.9 (22.2)	1.4 (17.6)	2.1 (19.8)	2.0 (9.9)
Barataria Bay	0.8 (12.1)	1.1 (14.3)	2.9 (23.2)	2.1 (13.2)
Breton-Chandeleur Sounds	1.0 (13.8)	1.2 (15.3)	1.7 (10.9)	0.8 (10.5)
Lake Borgne	1.0 (5.2)	0.6 (4.8)	0.2 (0.7)	0.4 (1.8)
	Mean	SE		
Lake Calcasieu	0.3 (1.4)	0.1 (0.2)		
Vermilion-Cote Blanche Bays	0.9 (4.3)	0.1 (0.6)		
Terrebonne-Timbalier Bays	1.9 (14.3)	0.1 (1.2)		
Barataria Bay	1.8 (13.5)	0.3 (1.4)		
Breton-Chandeleur Sounds	1.1 (9.7)	0.2 (1.7)		
Lake Borgne	0.5 (3.0)	0.1 (0.8)		

Table 84. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989	1990
Lake Calcasieu	0.5 (3.6)	0.8 (4.8)	0.3 (1.4)	0.9 (1.6)	0.5 (1.8)
Vermilion-Cote Blanche Bays	0.4 (2.6)	0.6 (2.8)	1.7 (10.8)	0.7 (5.2)	0.1 (0.2)
Terrebonne-Timbalier Bays	1.7 (14.1)	2.0 (9.7)	2.1 (13.1)	4.2 (27.4)	1.3 (7.6)
Barataria Bay	4.5 (36.5)	2.8 (23.6)	3.2 (20.6)	0.9 (8.1)	0.5 (7.0)
Breton-Chandeleur Sounds	0.3 (3.0)	2.2 (14.9)	1.3 (12.7)	0.9 (7.5)	1.8 (12.8)
Lake Borgne	0.8 (6.9)	2.6 (166.2)	0.6 (3.0)	0.1 (1.3)	0.6 (2.1)
	1991	1992	1993	1994	1995
Lake Calcasieu	0.2 (0.5)	0.2 (0.4)	0.5 (2.5)	0.2 (1.1)	0.3 (1.1)
Vermilion-Cote Blanche Bays	0.2 (0.6)	0.8 (3.8)	0.1 (0.2)	0.2 (1.0)	0.7 (2.9)
Terrebonne-Timbalier Bays	0.9 (7.9)	1.8 (13.3)	1.9 (11.9)	0.8 (5.8)	0.9 (6.6)
Barataria Bay	1.9 (10.1)	0.7 (4.6)	0.7 (4.3)	0.7 (6.5)	1.5 (14.8)
Breton-Chandeleur Sounds	1.4 (9.6)	0.7 (7.3)	1.1 (9.6)	0.5 (4.7)	0.4 (5.2)
Lake Borgne	0.2 (0.7)	1.0 (4.0)	1.8 (10.6)	0.1 (1.2)	0.3 (2.7)
	1996	1997	1998	1999	2000
Lake Calcasieu	0.7 (2.3)	0.5 (1.9)	0.1 (0.3)	0.1 (0.6)	0.1 (0.4)
Vermilion-Cote Blanche Bays	0.6 (3.1)	0.8 (3.4)	0.4 (1.6)	0.4 (2.5)	1.9 (13.3)
Terrebonne-Timbalier Bays	0.6 (4.7)	2.0 (16.7)	2.1 (16.5)	2.3 (20.4)	4.0 (26.1)
Barataria Bay	0.3 (4.4)	0.2 (1.8)	1.5 (14.2)	0.4 (6.1)	0.1 (1.5)
Breton-Chandeleur Sounds	0.9 (12.9)	1.6 (17.9)	1.1 (9.2)	0.7 (7.0)	0.7 (9.2)
Lake Borgne	0.1 (0.9)	0.1 (0.3)	0.1 (0.2)	0 (0)	0.1 (0.2)
	2001	2002	2003	2004	2005
Lake Calcasieu	0.2 (1.2)	0.1 (0.1)	0.1 (0.2)	0.3 (0.5)	0.5 (0.8)
Vermilion-Cote Blanche Bays	1.1 (2.9)	1.1 (2.6)	1.1 (4.3)	1.7 (4.9)	1.3 (7.6)
Terrebonne-Timbalier Bays	4.6 (35.6)	1.3 (13.1)	1.1 (8.1)	1.5 (12.9)	0.9 (6.0)
Barataria Bay	0.9 (12.3)	1.7 (14.1)	1.8 (12.2)	7.0 (40.9)	3.7 (23.8)
Breton-Chandeleur Sounds	0.8 (10.6)	1.8 (11.6)	1.4 (10.6)	1.7 (10.5)	1.0 (5.9)
Lake Borgne	0.1 (0.6)	0.2 (1.8)	0.2 (0.4)	0.2 (1.2)	0.4 (0.8)
	2006	2007	Mean	SE	
Lake Calcasieu	0.5 (3.5)	0.1 (0.8)	0.3 (1.4)	0.1 (0.3)	
Vermilion-Cote Blanche Bays	2.3 (13.1)	1.0 (4.8)	0.9 (4.3)	0.1 (0.8)	
Terrebonne-Timbalier Bays	1.9 (118.3)	2.6 (19.0)	1.9 (14.3)	0.2 (1.7)	
Barataria Bay	1.4 (11.3)	2.8 (19.8)	1.8 (13.6)	0.4 (2.2)	
Breton-Chandeleur Sounds	1.7 (15.4)	0.7 (7.4)	1.1 (9.8)	0.1 (0.8)	
Lake Borgne	0.7 (6.5)	0.8 (6.4)	0.5 (3.1)	0.1 (0.9)	

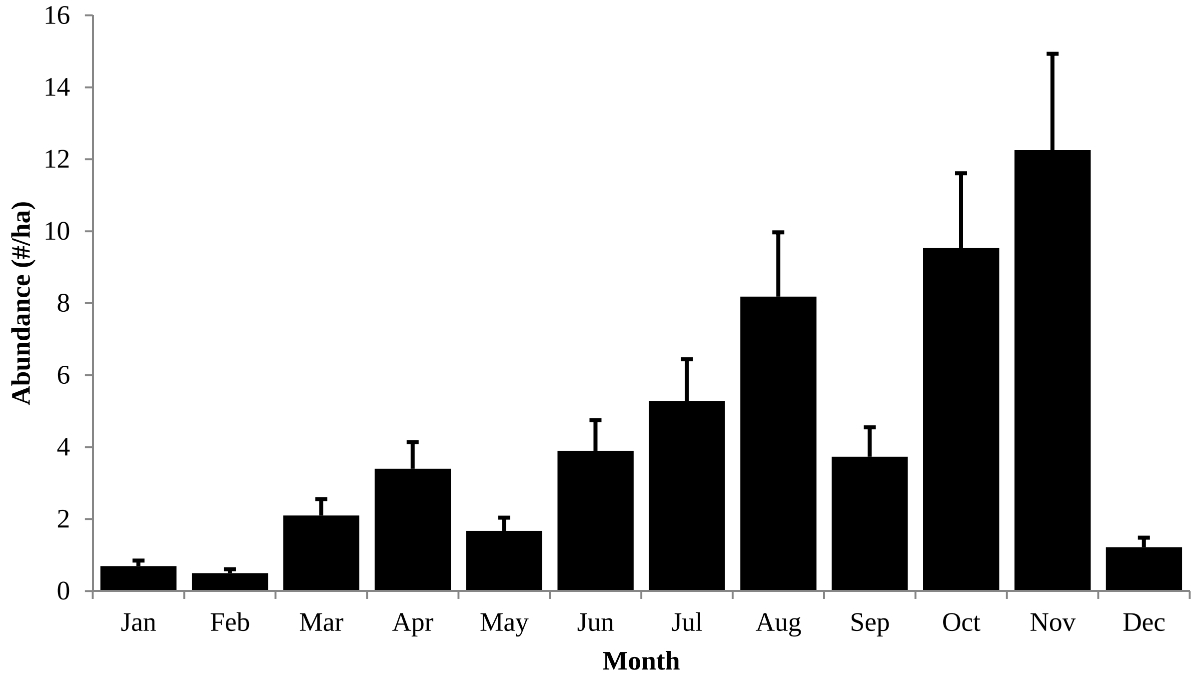

Figure 165. The monthly mean (+SE) abundance of *Symphurus plagiusa* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Biomass data were not available for *S. plagiusa* as length measurements were not recorded.

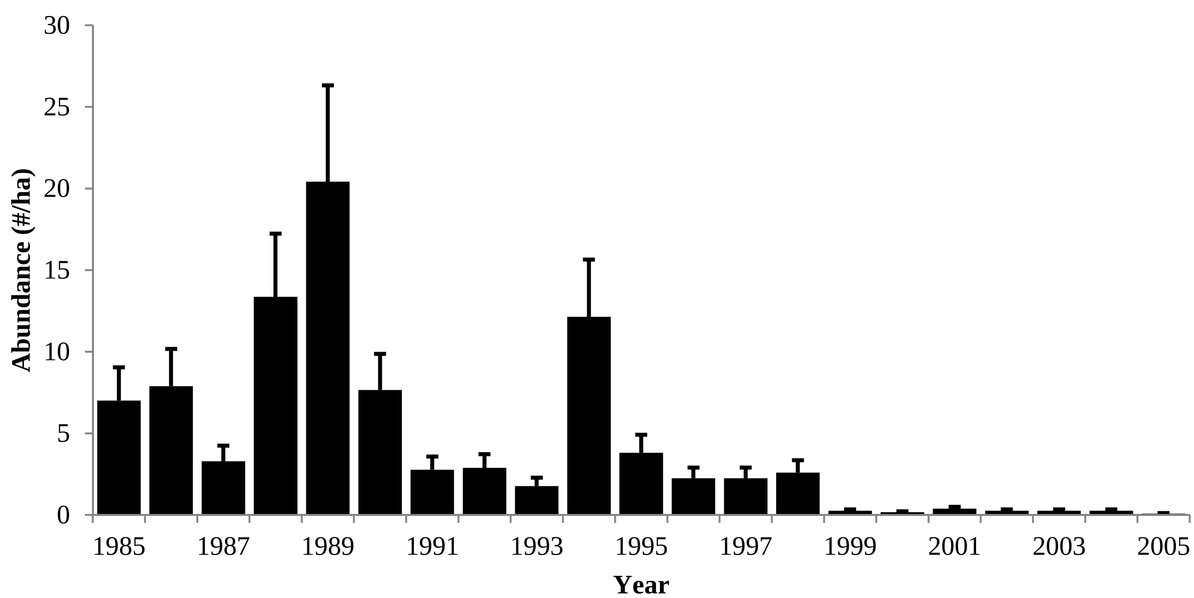

Figure 166. The mean (+SE) annual abundance of *Symphurus plagiusa* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data are not available for *S. plagiusa* as length measurements were not recorded.

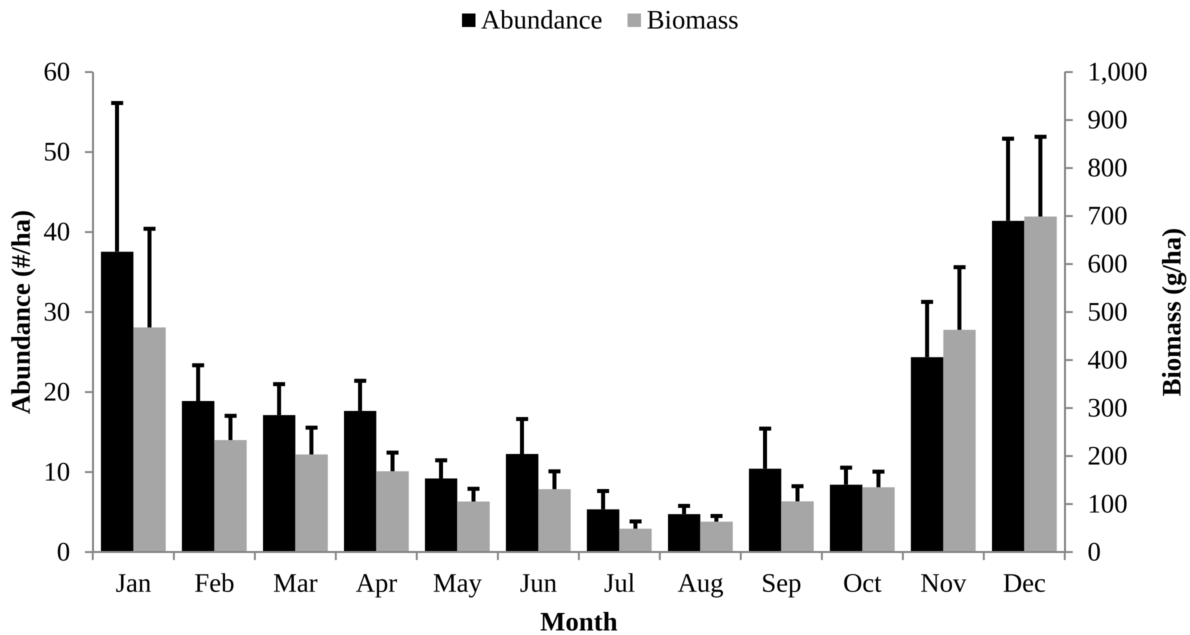

Figure 167. The monthly mean (+SE) abundance and biomass of *Symphurus plagiusa* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

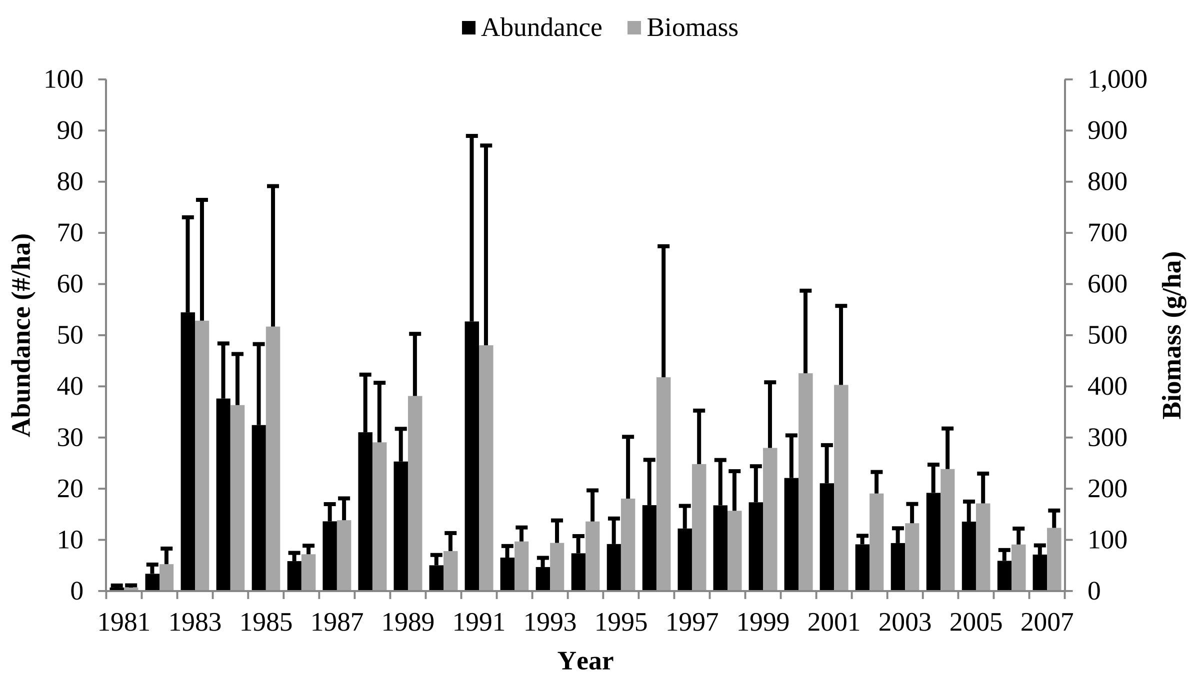

Figure 168. The mean (+SE) annual abundance and of *Symphurus plagiusa* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

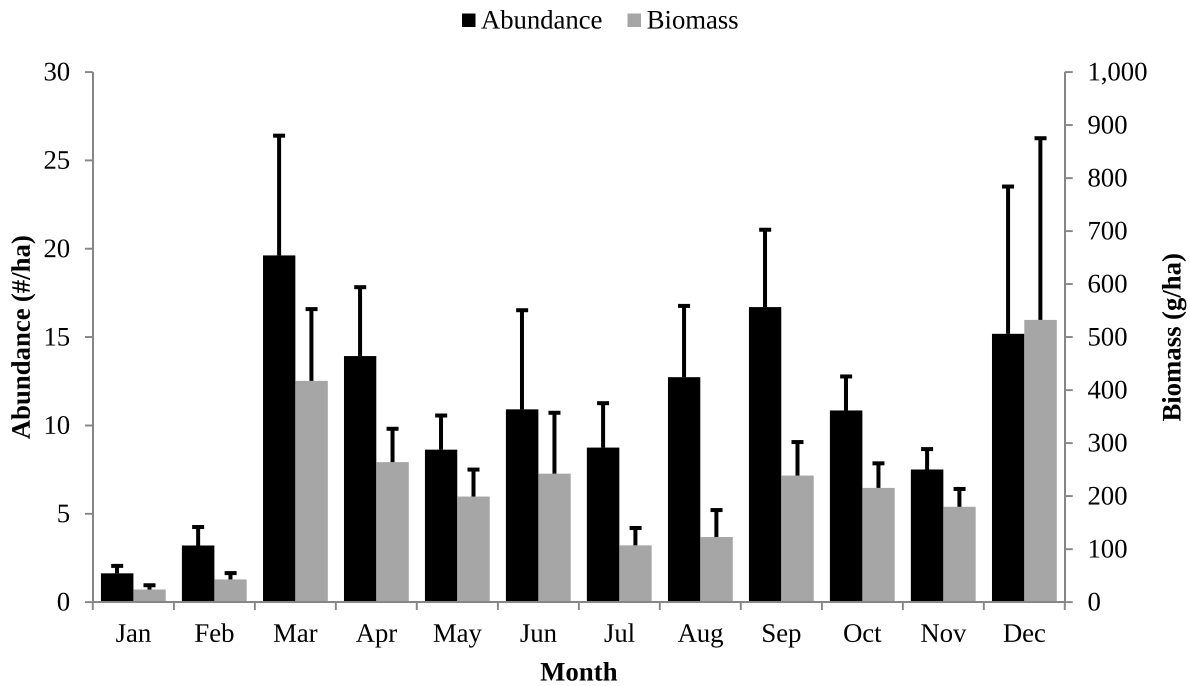

Figure 169. The monthly mean (+SE) abundance and biomass of *Symphurus plagiusa* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

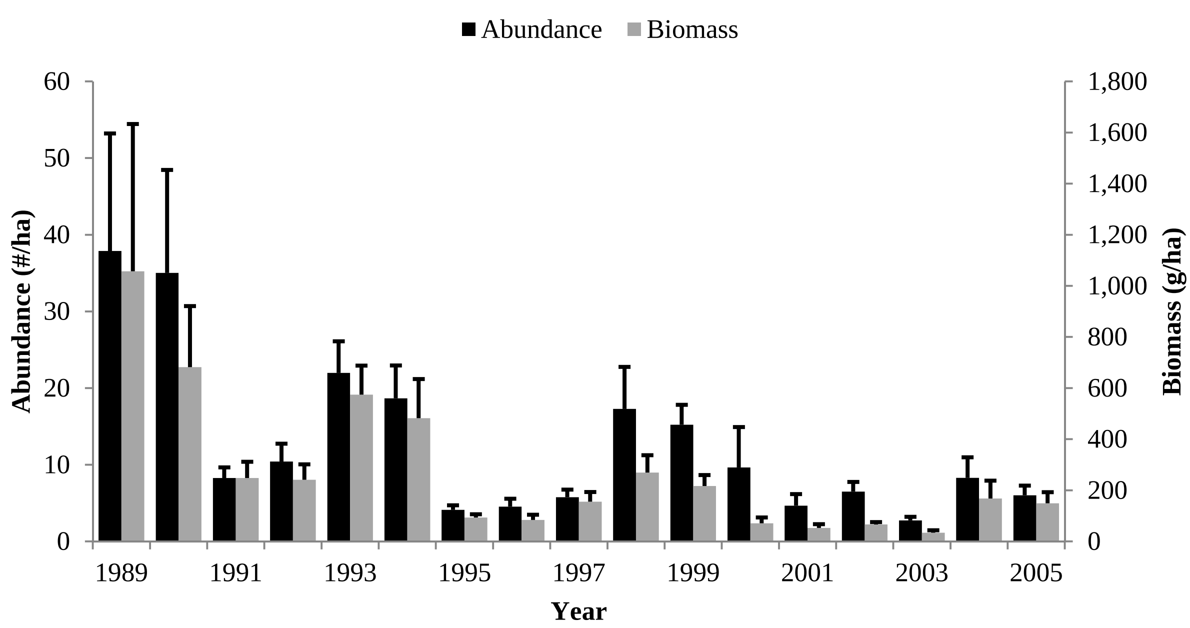

Figure 170. The mean (+SE) annual abundance and biomass of *Symphurus plagiusa* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 85. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Mobile Bay (AL)	68.3 (848.5)	31.5 (386.2)	27.0 (307.3)	37.0 (370.0)
E MS Sound (AL)	3.6 (54.6)	2.2 (16.7)	4.7 (62.3)	3.1 (40.2)
Perdido Bay (AL)	0.3 (1.2)	0.1 (0.4)	0.5 (1.5)	1.1 (5.4)
Apalachicola Bay (FL)	1.4 (16.3)	4.4 (42.9)	6.2 (126.4)	9.8 (125.1)
Suwannee Sound (FL)	2.1 (60.1)	8.3 (226.5)	14.4 (522.2)	56.6 (1812.8)
Cedar Key (FL)	0.4 (3.5)	0.8 (10.3)	2.8 (99.2)	0.7 (18.8)
Tampa Bay (FL)	1.4 (24.2)	1.2 (30.1)	31.3 (699.3)	24.1 (501.9)
Charlotte Harbor (FL)	1.9 (30.2)	0.8 (8.8)	6.7 (98.2)	6.7 (109.4)
	May	**Jun**	**Jul**	**Aug**
Mobile Bay (AL)	15.3 (171.3)	20.2 (216.8)	8.7 (72.9)	7.0 (86.1)
E MS Sound (AL)	1.4 (20.8)	1.7 (16.7)	1.8 (28.6)	1.2 (23.9)
Perdido Bay (AL)	1.4 (16.9)	1.0 (6.5)	0.8 (9.1)	0.7 (9.2)
Apalachicola Bay (FL)	3.9 (49.6)	3.7 (48.0)	11.0 (98.4)	15.8 (149.7)
Suwannee Sound (FL)	11.1 (463.4)	4.3 (55.9)	1.3 (15.7)	5.9 (59.9)
Cedar Key (FL)	2.8 (62.1)	0 (0)	0.4 (1.4)	0.2 (1.6)
Tampa Bay (FL)	14.1 (394.5)	19.7 (518.6)	10.2 (303.0)	5.0 (32.1)
Charlotte Harbor (FL)	9.1 (198.2)	2.2 (49.1)	3.1 (47.5)	2.6 (36.5)
	Sep	**Oct**	**Nov**	**Dec**
Mobile Bay (AL)	18.7 (179.8)	12.8 (198.9)	37.9 (707.7)	60.6 (992.3)
E MS Sound (AL)	1.5 (30.0)	2.5 (55.4)	7.0 (145.7)	13.5 (302.0)
Perdido Bay (AL)	0.7 (6.8)	1.0 (7.7)	1.6 (24.4)	0.6 (1.5)
Apalachicola Bay (FL)	25.3 (229.5)	9.4 (172.6)	6.6 (121.2)	4.6 (80.5)
Suwannee Sound (FL)	14.5 (218.2)	41.9 (1178.4)	17.4 (620.5)	6.8 (191.0)
Cedar Key (FL)	1.6 (39.4)	2.5 (79.2)	32.6 (1039.3)	11.5 (334.3)
Tampa Bay (FL)	9.8 (244.2)	11.2 (200.6)	6.5 (173.9)	25.8 (973.3)
Charlotte Harbor (FL)	4.4 (81.5)	7.0 (134.4)	6.7 (113.1)	0.7 (19.2)
	Mean	**SE**		
Mobile Bay (AL)	28.8 (378.2)	5.7 (88.4)		
E MS Sound (AL)	3.7 (66.4)	1.0 (23.7)		
Perdido Bay (AL)	0.8 (7.6)	0.1 (2.0)		
Apalachicola Bay (FL)	8.5 (105.0)	1.9 (17.8)		
Suwannee Sound (FL)	15.4 (452.0)	4.9 (156.7)		
Cedar Key (FL)	4.7 (140.8)	2.7 (86.0)		
Tampa Bay (FL)	13.4 (341.3)	2.8 (84.4)		
Charlotte Harbor (FL)	4.3 (77.2)	0.8 (16.1)		

Table 86. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Symphurus plagiusa* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	2.5 (18.4)	5.26 (79.4)	86.2 (772.8)	55.5 (475.8)	49.2 (767.4)
E MS Sound (AL)	0.2 (3.0)	1.0 (18.1)	9.3 (169.4)	11.4 (223.1)	5.9 (135.9)
Perdido Bay (AL)			2.3 (11.8)	0.9 (18.9)	3.0 (57.3)
	1986	1987	1988	1989	1990
Mobile Bay (AL)	8.2 (93.2)	20.6 (209.2)	54.4 (491.6)	32.0 (378.4)	7.9 (130.9)
E MS Sound (AL)	1.8 (44.7)	5.48 (55.3)	5.37 (81.1)	2102 (675.1)	4.0 (49.1)
Perdido Bay (AL)	0.4 (0.8)	0.4 (0.4)	0.8 (3.3)	0.8 (2.8)	0.3 (2.6)
Tampa Bay (FL)				40.4 (1100.1)	41.3 (783.0)
Charlotte Harbor (FL)				13.8 (336.9)	10.3 (184.4)
	1991	1992	1993	1994	1995
Mobile Bay (AL)	103.1 (929.6)	10.2 (146.2)	7.0(141.4)	13.0 (239.5)	15.1 (297.5)
E MS Sound (AL)	4.5 (63.1)	1.2 (33.9)	2.0 (44.9)	0.5 (13.6)	0.3 (7.0)
Perdido Bay (AL)	0 (0)	1.2 (16.0)	0.6 (4.4)	0.1 (0.1)	0.3 (2.7)
Tampa Bay (FL)	9.5 (296.7)	12.3 (274.4)	28.4 (765.9)	20.7 (630.7)	4.7 (117.8)
Charlotte Harbor (FL)	4.7 (60.9)	7.5 (184.7)	10.0 (186.2)	15.0 (215.8)	3.5 (59.6)
	1996	1997	1998	1999	2000
Mobile Bay (AL)	27.8 (698.1)	20.0 (416.9)	29.9 (288.6)	29.7 (432.4)	61.7 (1048.0)
E MS Sound (AL)	1.4 (40.7)	1.2 (12.6)	6.0 (31.6)	0.6 (9.4)	0 (0)
Perdido Bay (AL)	1.4 (5.4)	1.3 (7.2)	0.2 (0.2)	0.6 (9.6)	1.8 (26.8)
Apalachicola Bay (FL)			19.0 (298.4)	16.7 (254.2)	9.7 (67.7)
Suwannee Sound (FL)	7.4 (154.2)	5.8 (159.7)			
Cedar Key (FL)	1.6 (31.8)	0.8 (23.2)			
Tampa Bay (FL)	6.3 (111.7)	9.1 (258.5)	5.2 (199.0)	5.0 (42.1)	5.2 (100.9)
Charlotte Harbor (FL)	1.8 (29.4)	2.2 (35.5)	18.3 (284.0)	2.8 (1.4)	3.7 (100.7)
	2001	2002	2003	2004	2005
Mobile Bay (AL)	37.1 (719.9)	14.6 (309.1)	15.1 (214.6)	29.9 (374.1)	19.3 (244.8)
E MS Sound (AL)	0.7 (7.5)	0.7 (7.7)	0.1 (0.4)	0.7 (7.2)	1.0 (3.0)
Perdido Bay (AL)	1.3 (4.0)	0.8 (7.8)	0.3 (0.5)	1.0 (4.8)	0 (0)
Apalachicola Bay (FL)	5.6 (54.3)	8.5 (87.6)	2.4 (19.3)	4.9 (51.6)	4.0 (51.9)
Suwannee Sound (FL)	2.5 (42.7)	3.2 (63.9)	4.2 (61.0)	37.6 (1008.4)	42.3 (1480.1)
Cedar Key (FL)	0.9 (26.5)	0 (0)	2.3 (88.0)	21.3 (643.1)	2.7 (77.6)
Tampa Bay (FL)	3.2 (73.4)	1.1 (9.7)	2.8 (83.3)	4.8 (90.6)	6.2 (151.5)
Charlotte Harbor (FL)	4.3 (105.1)	3.7 (48.5)	5.3 (100.5)	3.3 (58.2)	3.3 (62.3)
	2006	2007	Mean	SE	
Mobile Bay (AL)	8.3 (128.6)	9.5 (166.9)	28.6 (378.3)	5.3 (10.3)	
E MS Sound (AL)	0 (0)	0 (0)	3.6 (64.3)	1.3 (5.0)	
Perdido Bay (AL)	0.7 (7.0)	1.0 (11.2)	0.8 (7.9)	0.2 (0.5)	
Apalachicola Bay (FL)			8.8 (110.6)	2.1 (37.0)	
Suwannee Sound (FL)			14.7 (424.3)	6.6 (218.6)	
Cedar Key (FL)			4.2 (127.2)	2.9 (86.8)	
Tampa Bay (FL)			12.1 (299.4)	3.1 (77.5)	
Charlotte Harbor (FL)			6.7 (120.8)	1.2 (23.1)	

Mugil cephalus

The abundance of striped mullet (*Mugil cephalus*) in most states peaked in winter, except in Alabama where mean densities were highest in spring (Figure 171). Overall abundance was highest in Mississippi with a mean (mean of 12 monthly means in Figure 171) of 1.6/ha, followed by Texas (0.8/ha), Alabama (0.8/ha), Louisiana (0.5/ha), and Florida (0.0/ha).

The length frequency distributions for striped mullet in each state (Figure 172) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Striped mullet ranged in size from 13 – 465 mm (mean=245.3, SD=76.5) in Texas, 17 – 512 mm (mean=167.5, SD=66.7) in Louisiana, 28 – 402 mm (mean=194.7, SD=62.5) in Mississippi, and 25 – 458 mm (mean=57.0, SD=55.1) in Alabama. Length data were not recorded in Florida.

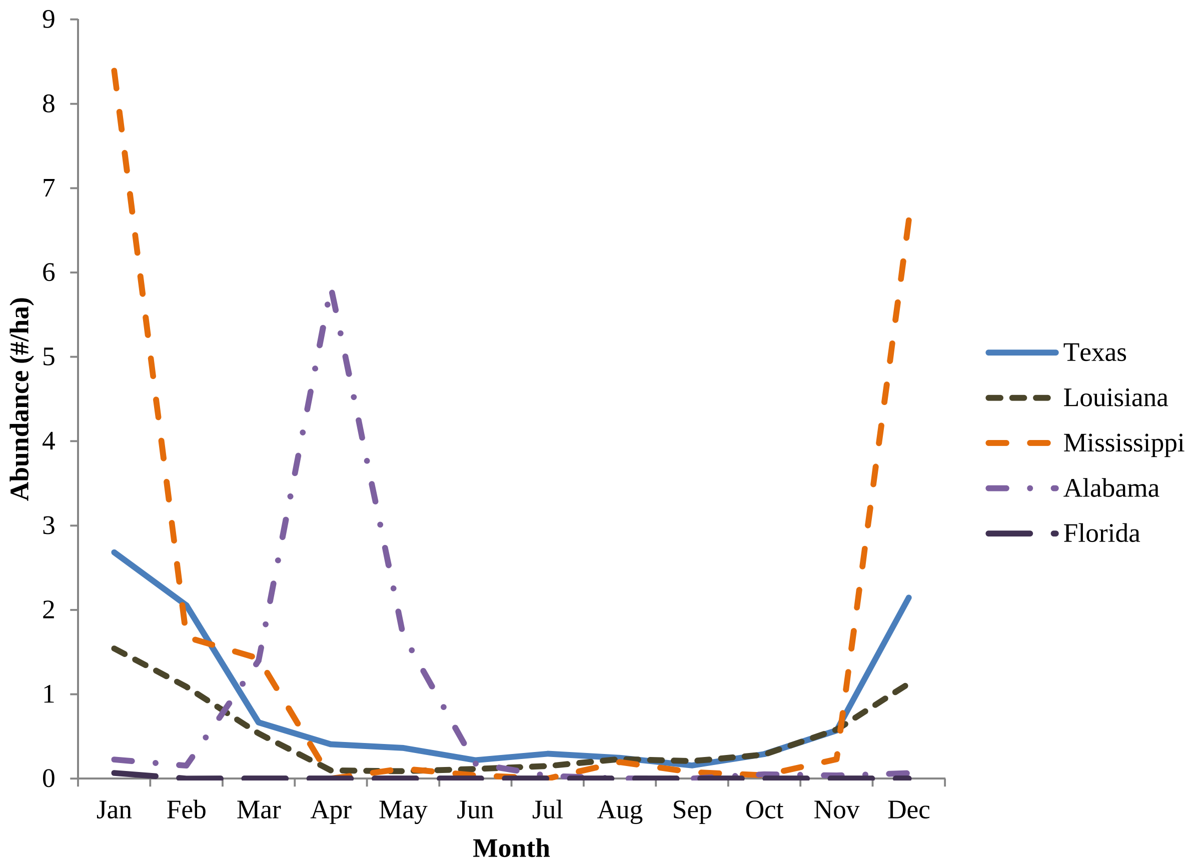

Figure 171. Monthly mean abundance (#/hectare) of *Mugil cephalus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

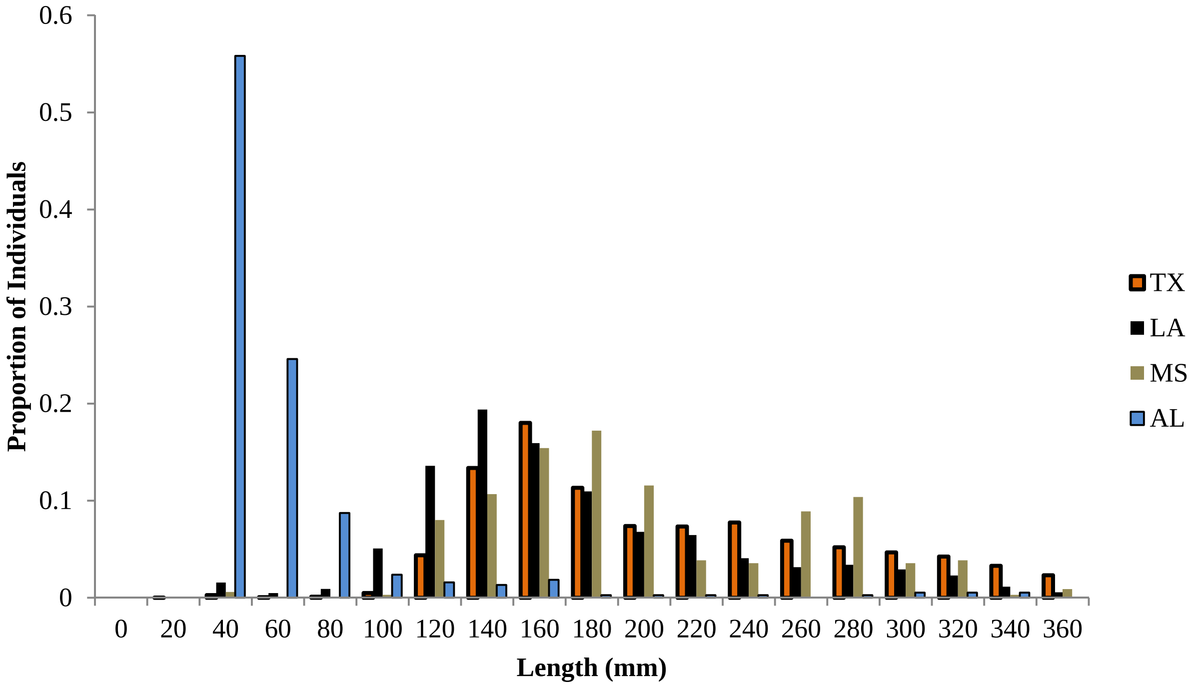

Figure 172. Length frequency of all striped mullet (*Mugil cephalus*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states. The data encompass sampling from the following years: Texas (n=9,078): 1982 – 2005; Louisiana (n=2,089): 1986 – 2007; Mississippi (n=337): 1985 – 2005; Alabama (n=378): 1981 – 2007; and Florida (n=3): 1989 – 2005 (not shown) (n-values represent the number of individuals measured). Lengths are combined into 20-mm bins.

The seasonal variability of striped mullet in Texas showed peaks of both mean abundance and biomass in winter (Figure 173). Mean annual abundance peaked in 2002 (2.3/ha) and biomass peaked in 1996 (260.4 g/ha) (Figure 174). The highest mean abundance values were seen in Aransas Bay, Galveston Bay, and Sabine Lake, while the highest mean biomass values were seen in Galveston Bay and Aransas Bay (Tables 87 and 88).

The seasonal variability of striped mullet abundance and biomass in Louisiana showed peaks in late fall and winter with low values in spring and summer (Figure 175). Mean annual abundance peaked in 1987 (1.2/ha) and biomass peaked in 1998 (107.6 g/ha) (Figure 176). The largest catches in Louisiana were typically in Lake Calcasieu (Tables 89 and 90).

In Mississippi, mean abundance and biomass of striped mullet peaked in winter (Figure 177). Mean annual abundance and biomass peaked in 1989 (13.9/ha and 600.3 g/ha, respectively) (Figure 178).

Seasonal variability of striped mullet in Alabama showed peaks of mean abundance in March and April with a mean biomass peak in February (Figure 179). Mean annual abundance peaked in 2001 (14.2/ha) and biomass peaked in 1996 (54.0 g/ha) (Figure 180). Most of the striped mullet were collected in Mobile Bay with relatively low numbers in East Mississippi Sound and Perdido Bay (Tables 91 and 92).

Only three striped mullet were reported in Florida trawls. They were captured in January 2002 in Apalachicola Bay (Tables 91 and 92).

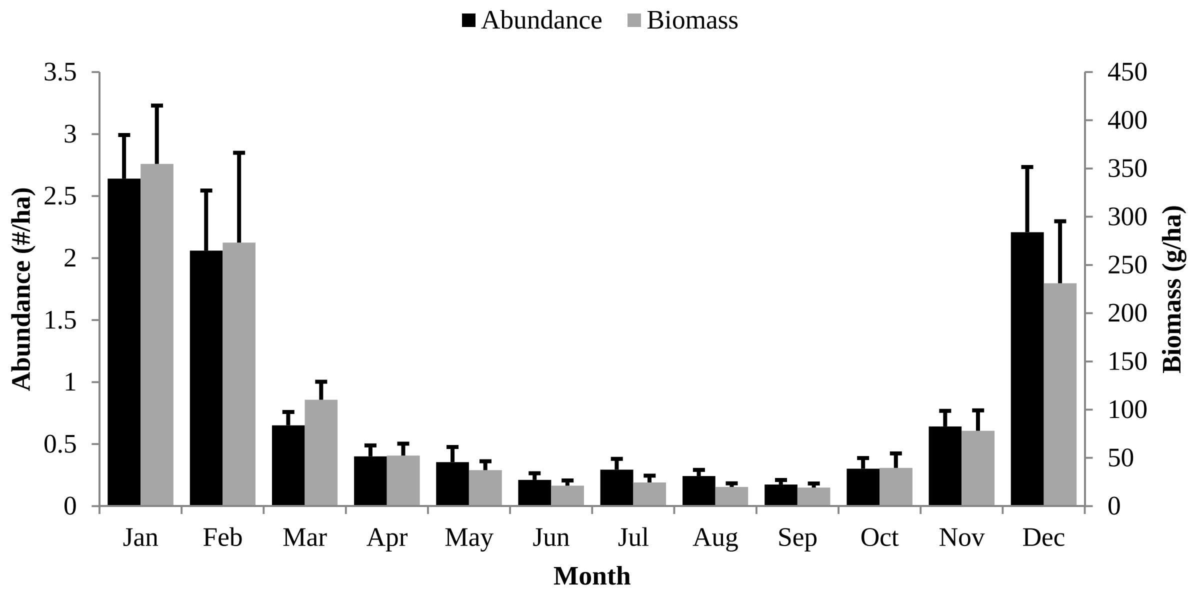

Figure 173. The monthly mean (+SE) abundance and biomass of *Mugil cephalus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

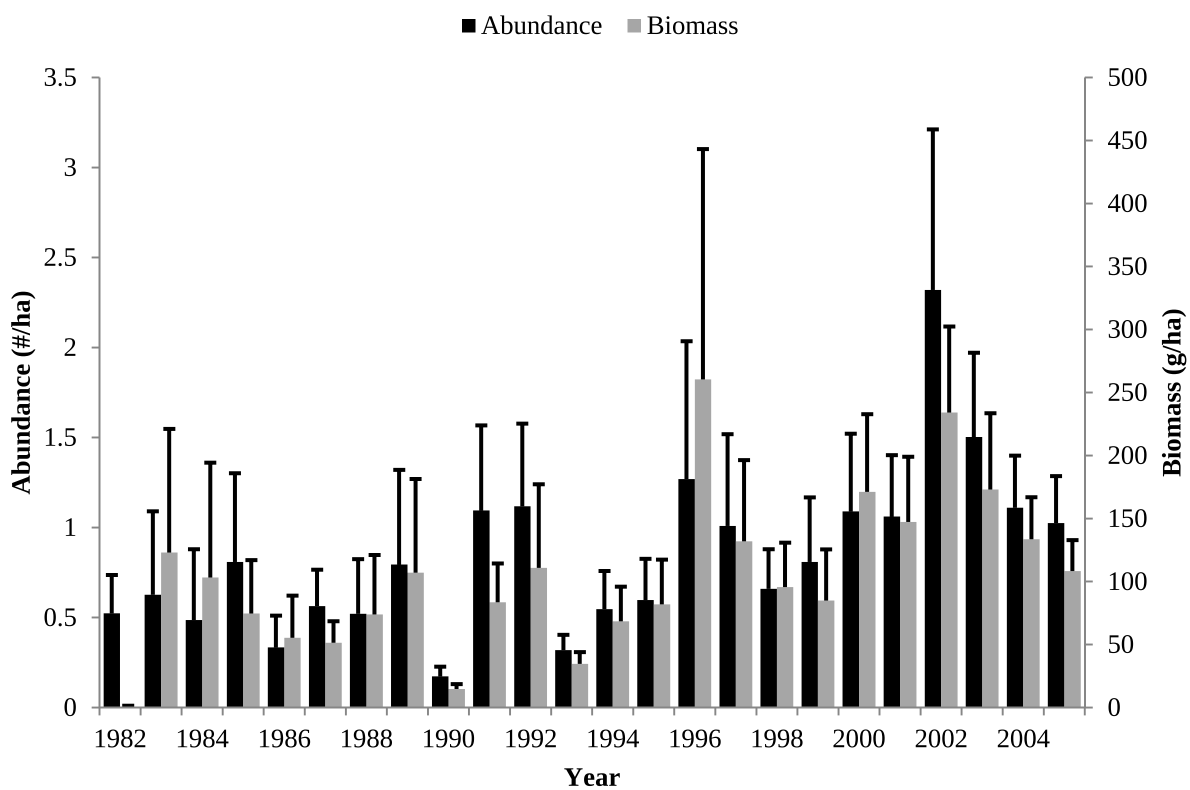

Figure 174. The mean (+SE) annual abundance and biomass of *Mugil cephalus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 87. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Mugil cephalus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.5 (152.7)	0.1 (7.0)	0.0 (4.2)	0 (0)
Upper Laguna Madre	2.5 (348.7)	0.7 (113.1)	0.1 (44.4)	0.2 (68.9)
Corpus Christi Bay	1.6 (178.3)	0.9 (82.9)	0.4 (74.1)	0.9 (93.9)
Aransas Bay	4.8 (557.1)	3.8 (321.1)	1.4 (197.5)	1.4 (180.6)
San Antonio Bay	2.5 (178.5)	2.2 (78.6)	0.6 (40.8)	0.1 (8.0)
Matagorda Bay	0.1 (11.3)	0.0 (0.4)	0.0 (1.6)	0.1 (1.4)
East Matagorda Bay	0.9 (87.8)	0.6 (66.1)	0.3 (59.8)	0.2 (36.3)
Galveston Bay	5.0 (866.6)	5.0 (1135.0)	1.5 (353.2)	0.1 (29.9)
Sabine Lake	5.0 (790.7)	2.6 (450.2)	0.7 (141.4)	0.1 (23.5)

	May	Jun	Jul	Aug
Lower Laguna Madre	0.0 (2.1)	0.0 (5.0)	0.0 (2.0)	0.0 (6.5)
Upper Laguna Madre	0.1 (41.8)	0.1 (28.0)	0.1 (42.8)	0.1 (44.9)
Corpus Christi Bay	0.4 (33.9)	0.2 (32.3)	0.2 (23.0)	0.4 (21.1)
Aransas Bay	1.3 (110.4)	0.7 (50.6)	0.6 (44.4)	0.6 (48.2)
San Antonio Bay	0.2 (13.1)	0.3 (11.5)	0.4 (16.4)	0.3 (15.4)
Matagorda Bay	0.2 (9.8)	0.1 (2.2)	0.5 (19.9)	0.1 (4.1)
East Matagorda Bay	0.2 (66.9)	0.1 (28.6)	0.0 (2.4)	0.1 (17.4)
Galveston Bay	0.2 (44.9)	0.1 (15.9)	0.2 (39.1)	0.1 (12.1)
Sabine Lake	0.0 (3.4)	0.1 (17.1)	0.1 (14.3)	0.2 (14.9)

	Sep	Oct	Nov	Dec
Lower Laguna Madre	0.0 (3.2)	0.0 (5.7)	0.0 (3.9)	0.4 (178.6)
Upper Laguna Madre	0.1 (44.9)	0.1 (29.1)	0.5 (146.2)	0.7 (203.9)
Corpus Christi Bay	0.1 (12.1)	0.9 (133.3)	0.9 (107.1)	0.8 (91.7)
Aransas Bay	0.7 (58.1)	0.6 (69.5)	2.1 (221.4)	3.3 (319.2)
San Antonio Bay	0.1 (8.4)	0.1 (3.4)	0.4 (17.7)	4.3 (162.8)
Matagorda Bay	0.1 (2.9)	0.1 (5.0)	0.2 (6.3)	0.4 (25.8)
East Matagorda Bay	0.1 (20.2)	0.1 (27.6)	0.2 (31.6)	2.5 (151.4)
Galveston Bay	0.1 (18.6)	0.1 (13.0)	0.4 (79.1)	2.9 (526.3)
Sabine Lake	0.0 (5.7)	0.3 (57.1)	0.4 (67.2)	4.0 (381.9)

	Mean	SE
Lower Laguna Madre	0.1 (30.9)	0.0 (18.2)
Upper Laguna Madre	0.4 (99.4)	0.2 (30.3)
Corpus Christi Bay	0.6 (73.6)	0.1 (14.8)
Aransas Bay	1.8 (181.5)	0.4 (45.1)
San Antonio Bay	1.0 (46.2)	0.4 (17.8)
Matagorda Bay	0.2 (7.5)	0.0 (2.3)
East Matagorda Bay	0.4 (49.7)	0.2 (11.7)
Galveston Bay	1.3 (261.2)	0.6 (111.3)
Sabine Lake	1.8 (163.9)	0.5 (71.8)

Table 88. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Mugil cephalus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0.1 (0.0)	0.6 (324.3)	0.6 (248.9)	0.0 (17.8)	0.1 (17.3)	0 (0)	0 (0)	0.0 (10.9)	0 (0)
Upper Laguna Madre	0.4 (10.3)	1.0 (270.4)	2.5 (467.5)	0.4 (47.3)	0.0 (9.9)	0 (0)	0.0 (8.4)	0 (0)	0.1 (22.0)
Corpus Christi Bay	0.7 (1.7)	0.3 (59.4)	0.3 (62.8)	0.2 (19.8)	0.4 (53.8)	0.4 (37.9)	1.5 (120.9)	0.6 (71.0)	0.1 (21.0)
Aransas Bay	0.8 (0.0)	1.2 (233.5)	0.5 (80.6)	3.2 (223.9)	0.2 (6.9)	0.5 (33.3)	0.2 (10.7)	0.1 (7.6)	0.4 (16.8)
San Antonio Bay	0.7 (0.0)	0.8 (34.5)	0.1 (18.8)	0.1 (3.6)	0.0 (2.1)	2.0 (66.0)	0.3 (7.2)	0.4 (37.5)	0.2 (6.6)
Matagorda Bay	0.0 (0.0)	0.02 (0.6)	0.1 (17.4)	0.0 (1.1)	0.0 (0.2)	0.0 (1.9)	0.0 (0.7)	0.1 (27.0)	0.1 (1.7)
East Matagorda Bay						0.2 (7.7)	0.2 (8.6)	0.7 (35.9)	0.1 (2.3)
Galveston Bay	0.1 (0.0)	0.6 (113.2)	0.3 (81.0)	1.1 (166.6)	1.6 (308.9)	0.7 (207.0)	1.0 (291.8)	2.2 (436.8)	0.3 (33.0)
Sabine Lake					0.0 (1.7)	0.4 (20.0)	0.7 (114.0)	2.2 (198.9)	0.1 (23.4)
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.1 (22.7)	0.0 (1.3)	0.0 (3.4)	0.0 (3.2)	0.0 (2.5)	0 (0)	0.1 (7.4)	0.0 (6.7)	0.0 (10.9)
Upper Laguna Madre	0.8 (246.9)	0.1 (25.3)	0.0 (8.4)	0.1 (37.9)	0 (0)	0.2 (90.8)	1.8 (197.4)	0.1 (26.2)	0.1 (16.9)
Corpus Christi Bay	0.4 (59.2)	0.3 (33.2)	0.3 (44.3)	0.4 (85.4)	1.6 (175.1)	0.2 (15.5)	0.1 (7.8)	0.3 (20.8)	0.7 (73.8)
Aransas Bay	1.2 (37.7)	2.0 (74.2)	0.6 (40.1)	1.6 (122.0)	0.7 (64.7)	1.4 (219.9)	1.6 (145.5)	1.9 (145.0)	3.4 (353.8)
San Antonio Bay	3.2 (104.1)	1.5 (53.1)	0.5 (19.0)	0.4 (12.7)	0.1 (4.1)	0.5 (62.4)	1.4 (135.5)	0.3 (36.3)	0.8 (41.2)
Matagorda Bay	0.0 (0.7)	0.1 (3.4)	0.0 (1.1)	0.1 (2.0)	0 (0)	0.1 (2.5)	0.2 (6.5)	0.0 (1.6)	0.1 (3.7)
East Matagorda Bay	0.1 (1.2)	0 (0)	0.1 (4.5)	0.1 (12.8)	0.1 (25.4)	0.4 (35.7)	0.4 (63.8)	0.1 (19.0)	0.0 (3.1)
Galveston Bay	1.4 (170.3)	2.4 (368.6)	0.4 (97.2)	0.3 (28.4)	1.4 (294.2)	6.0 (1407.0)	2.3 (455.5)	1.0 (312.9)	0.3 (58.6)
Sabine Lake	2.1 (153.9)	3.0 (459.5)	0.6 (64.8)	2.0 (403.3)	0.5 (42.3)	0.9 (104.2)	0.5 (76.8)	1.8 (254.3)	0.5 (95.0)
	2000	2001	2002	2003	2004	2005	Mean	SE	
Lower Laguna Madre	0.0 (4.1)	0.1 (15.7)	0.0 (3.9)	0.0 (5.8)	0.0 (7.6)	0.1 (13.7)	0.1 (30.3)	0.0 (16.3)	
Upper Laguna Madre	0.5 (159.5)	0.3 (115.9)	0.1 (44.6)	1.4 (290.5)	0.4 (178.8)	0.2 (62.8)	0.4 (97.4)	0.1 (24.8)	
Corpus Christi Bay	1.0 (166.8)	0.4 (32.8)	0.9 (129.1)	2.0 (135.3)	0.6 (112.3)	1.4 (192.4)	0.6 (72.2)	0.1 (11.4)	
Aransas Bay	3.2 (480.3)	3.2 (462.8)	6.2 (878.2)	4.0 (406.3)	2.4 (165.2)	2.3 (146.9)	1.8 (181.5)	0.3 (42.5)	
San Antonio Bay	0.5 (53.7)	1.3 (109.7)	5.7 (203.9)	0.8 (36.0)	0.8 (39.4)	0.4 (21.4)	1.0 (46.2)	0.3 (10.0)	
Matagorda Bay	0.1 (5.5)	0.6 (14.1)	0.8 (33.5)	0.2 (7.3)	1.1 (42.0)	0.1 (5.4)	0.2 (7.5)	0.1 (2.3)	
East Matagorda Bay	1.3 (97.7)	0.3 (47.7)	0.1 (16.3)	0.9 (134.3)	1.5 (209.8)	1.5 (202.0)	0.4 (48.8)	0.1 (15.1)	
Galveston Bay	1.4 (258.6)	1.1 (222.1)	1.1 (208.3)	1.7 (342.6)	1.5 (317.6)	1.0 (87.4)	1.3 (261.2)	0.2 (56.5)	
Sabine Lake	1.0 (173.8)	0.9 (199.2)	2.7 (306.4)	1.2 (137.2)	0.9 (120.1)	1.9 (329.8)	1.2 (163.9)	0.2 (28.8)	

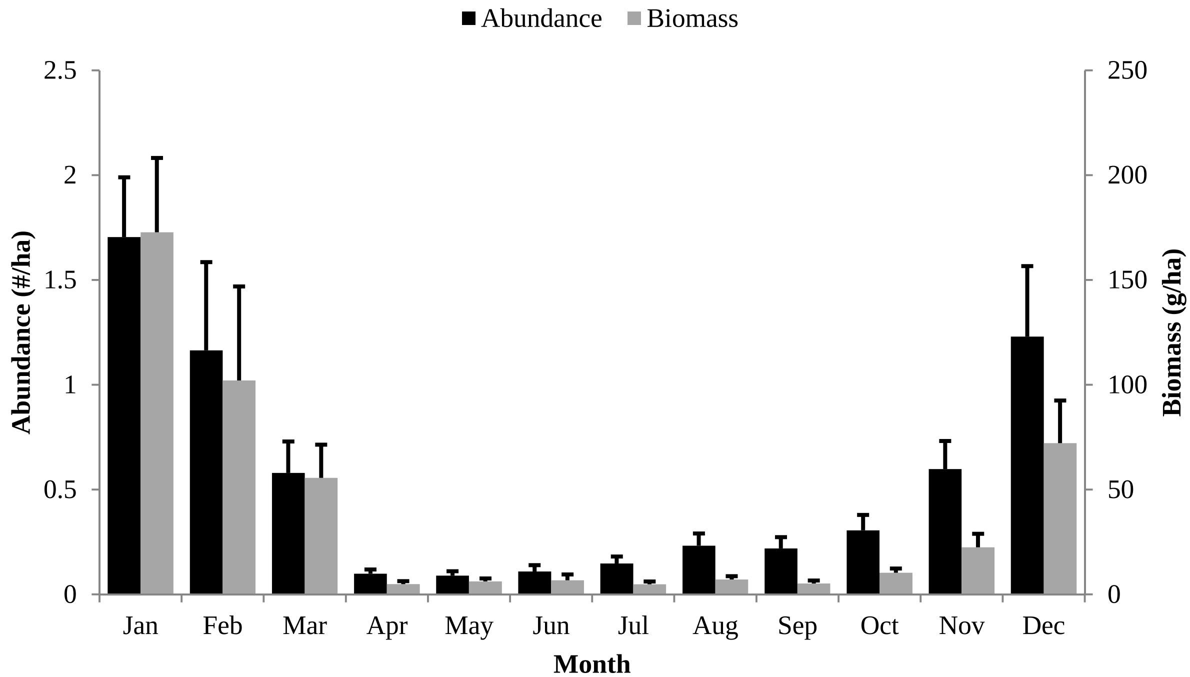

Figure 175. The monthly mean (+SE) abundance and biomass of *Mugil cephalus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

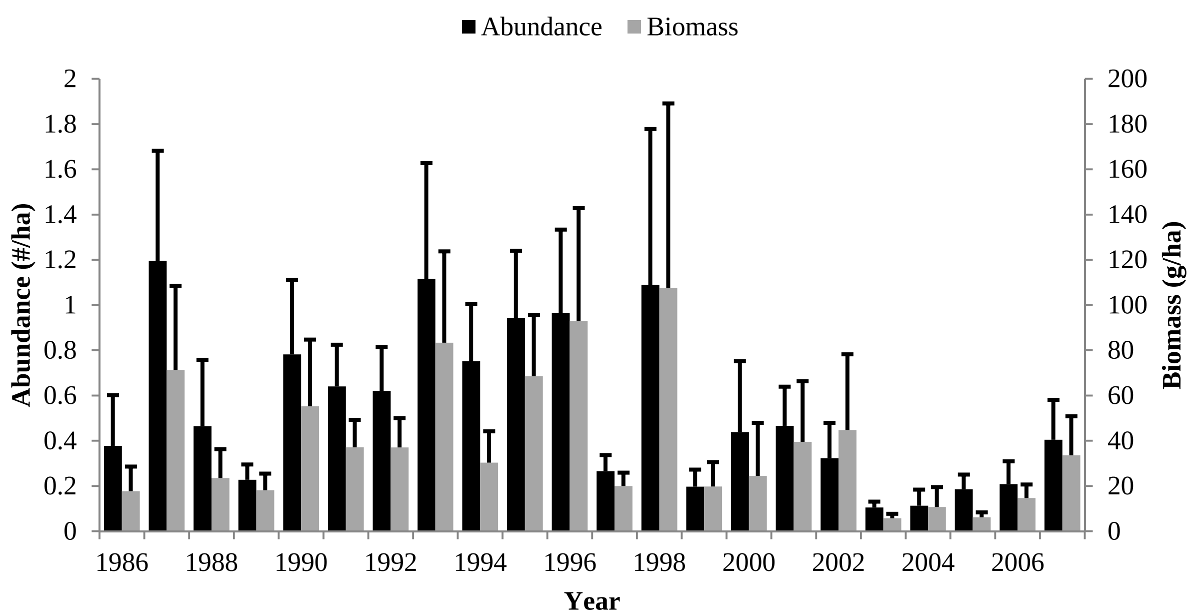

Figure 176. The mean (+SE) annual abundance and biomass of *Mugil cephalus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 89. The monthly mean abundance #/ha and biomass in g/ha (in parentheses) of *Mugil cephalus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar
Lake Calcasieu	10.8 (1131.4)	3.9 (279.3)	1.9 (268.4)
Vermilion-Cote Blanche Bays	1.6 (139.4)	1.1 (80.1)	0.8 (74.1)
Terrebonne-Timbalier Bays	0.6 (32.4)	0.2 (6.7)	0.4 (13.6)
Barataria Bay	0.0 (0.1)	0.0 (0.5)	0.5 (0.1)
Breton-Chandeleur Sounds	0.2 (79.7)	0.1 (31.9)	0.0 (0.2)
Lake Borgne	0.1 (3.1)	8.5 (1108.3)	0.1 (5.0)
	Apr	**May**	**Jun**
Lake Calcasieu	0.1 (12.3)	0.2 (24.4)	0.2 (20.2)
Vermilion-Cote Blanche Bays	0.0 (3.1)	0.0 (2.6)	0.0 (5.0)
Terrebonne-Timbalier Bays	0.3 (12.3)	0.2 (8.2)	0.3 (13.2)
Barataria Bay	0 (0)	0.0 (0.5)	0 (0)
Breton-Chandeleur Sounds	0.0 (0.5)	0.0 (4.6)	0.0 (0.6)
Lake Borgne	0 (0)	0 (0)	0.0 (0.6)
	Jul	**Aug**	**Sep**
Lake Calcasieu	0.4 (28.4)	0.4 (25.8)	0.6 (13.5)
Vermilion-Cote Blanche Bays	0.1 (2.7)	0.1 (4.2)	0.1 (1.7)
Terrebonne-Timbalier Bays	0.4 (6.5)	0.5 (12.4)	0.5 (11.8)
Barataria Bay	0.1 (0.1)	0.0 (0.9)	0.0 (0.7)
Breton-Chandeleur Sounds	0 (0)	0.0 (0.0)	0.1 (0.2)
Lake Borgne	0 (0)	0.5 (0.1)	0 (0)
	Oct	**Nov**	**Dec**
Lake Calcasieu	0.2 (16.0)	0.7 (34.5)	2.9 (188.6)
Vermilion-Cote Blanche Bays	0.2 (7.8)	0.8 (37.4)	3.0 (151.6)
Terrebonne-Timbalier Bays	0.9 (22.0)	1.3 (34.9)	1.1 (40.4)
Barataria Bay	0 (0)	0 (0)	0.1 (17.1)
Breton-Chandeleur Sounds	0.0 (4.6)	0 (0)	0.0 (10.5)
Lake Borgne	0.0 (0.2)	0 (0)	0.1 (2.2)
	Mean	**SE**	
Lake Calcasieu	1.9 (170.2)	0.9 (92.2)	
Vermilion-Cote Blanche Bays	0.6 (42.5)	0.3 (16.1)	
Terrebonne-Timbalier Bays	0.6 (17.9)	0.1 (3.4)	
Barataria Bay	0.0 (1.8)	0.0 (1.4)	
Breton-Chandeleur Sounds	0.0 (11.1)	0.0 (6.8)	
Lake Borgne	0.8 (93.2)	0.7 (92.3)	

Table 90. The mean annual abundance in #/ha and biomass of *Mugil cephalus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	1.9 (120.2)	4.9 (344.7)	3.4 (132.3)	0.9 (77.5)
Vermilion-Cote Blanche Bays	0.0 (0.7)	2.2 (41.9)	0.1 (5.1)	0.0 (4.6)
Terrebonne-Timbalier Bays	0.3 (7.0)	0.3 (6.6)	0.2 (7.4)	0.5 (9.2)
Barataria Bay	0.0 (0.9)	0.0 (0.9)	0.0 (0.5)	0.1 (30.6)
Breton-Chandeleur Sounds	0.1 (0.0)	0 (0)	0.0 (9.0)	0 (0)
Lake Borgne	0 (0)	0.3 (15.2)	0.1 (4.4)	0 (0)
	1990	1991	1992	1993
Lake Calcasieu	2.0 (213.7)	1.7 (180.7)	3.4 (198.2)	3.3 (422.6)
Vermilion-Cote Blanche Bays	1.5 (125.7)	0.8 (52.6)	0.3 (34.7)	0.5 (43.8)
Terrebonne-Timbalier Bays	0.6 (20.5)	0.8 (19.6)	0.4 (21.9)	1.9 (62.5)
Barataria Bay	0.0 (0.7)	0.0 (1.4)	0 (0)	0.2 (2.5)
Breton-Chandeleur Sounds	0.0 (0.3)	0.0 (3.6)	0 (0)	0.1 (17.4)
Lake Borgne	1.0 (11.0)	0.1 (0.1)	0.1 (2.0)	0 (0)
	1994	1995	1996	1997
Lake Calcasieu	1.6 (160.2)	2.9 (361.1)	6.7 (751.0)	0.5 (82.7)
Vermilion-Cote Blanche Bays	0.9 (42.5)	0.9 (35.8)	1.0 (104.1)	0.3 (13.7)
Terrebonne-Timbalier Bays	1.1 (32.2)	1.4 (44.6)	0.8 (39.4)	0.6 (27.4)
Barataria Bay	0.9 (0.2)	0 (0)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0.1 (0.7)	0 (0)	0.0 (0.1)	0.0 (0.8)
Lake Borgne	0 (0)	0 (0)	0 (0)	0.0 (1.3)
	1998	1999	2000	2001
Lake Calcasieu	1.1 (194.0)	0.7 (152.8)	0 (0)	1.0 (50.1)
Vermilion-Cote Blanche Bays	0.8 (49.8)	0.1 (8.1)	1.3 (85.5)	0.7 (67.4)
Terrebonne-Timbalier Bays	0.9 (16.6)	0.3 (7.2)	0.4 (2.7)	0.7 (37.2)
Barataria Bay	0 (0)	0.0 (0.2)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0.0 (1.0)	0.0 (0.6)	0.0 (17.5)	0.1 (47.0)
Lake Borgne	14.5 (1922.3)	0 (0)	0 (0)	0.1 (0.0)
	2002	2003	2004	2005
Lake Calcasieu	1.1 (137.4)	0.4 (23.0)	0.4 (45.7)	1.3 (40.6)
Vermilion-Cote Blanche Bays	0.3 (9.9)	0.1 (10.0)	0.1 (14.4)	0.1 (6.3)
Terrebonne-Timbalier Bays	0.4 (14.7)	0.2 (4.9)	0.1 (3.2)	0.1 (1.7)
Barataria Bay	0 (0)	0 (0)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0.3 (120.7)	0 (0)	0.0 (5.8)	0 (0)
Lake Borgne	0.0 (0.4)	0 (0)	0.1 (0.0)	0.1 (2.2)
	2006	2007	Mean	SE
Lake Calcasieu	0.5 (57.3)	0.9 (51.4)	1.8 (170.1)	0.4 (36.7)
Vermilion-Cote Blanche Bays	0.7 (44.8)	1.3 (132.9)	0.6 (42.5)	0.1 (8.4)
Terrebonne-Timbalier Bays	0.0 (0.6)	0.2 (5.9)	0.6 (17.9)	0.1 (3.5)
Barataria Bay	0.0 (0.7)	0 (0)	0.1 (1.8)	0.0 (1.4)
Breton-Chandeleur Sounds	0 (0)	0.1 (4.7)	0.0 (10.4)	0.0 (5.7)
Lake Borgne	0 (0)	0 (0)	0.7 (89.0)	0.7 (87.3)

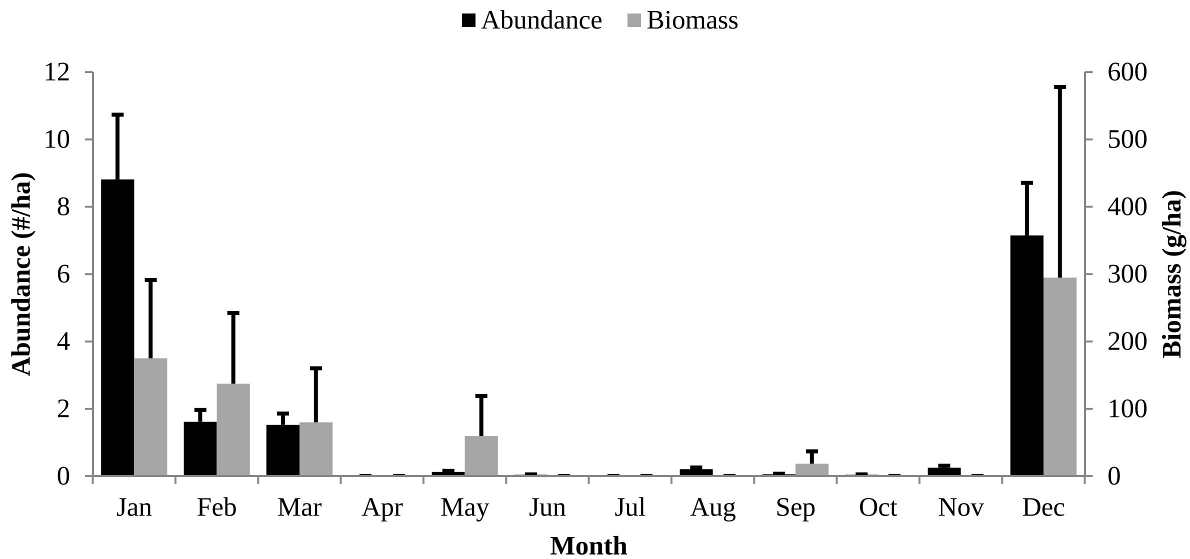

Figure 177. The monthly mean (+SE) abundance and biomass of *Mugil cephalus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *M. cephalus* length measurements were not recorded until 1985.

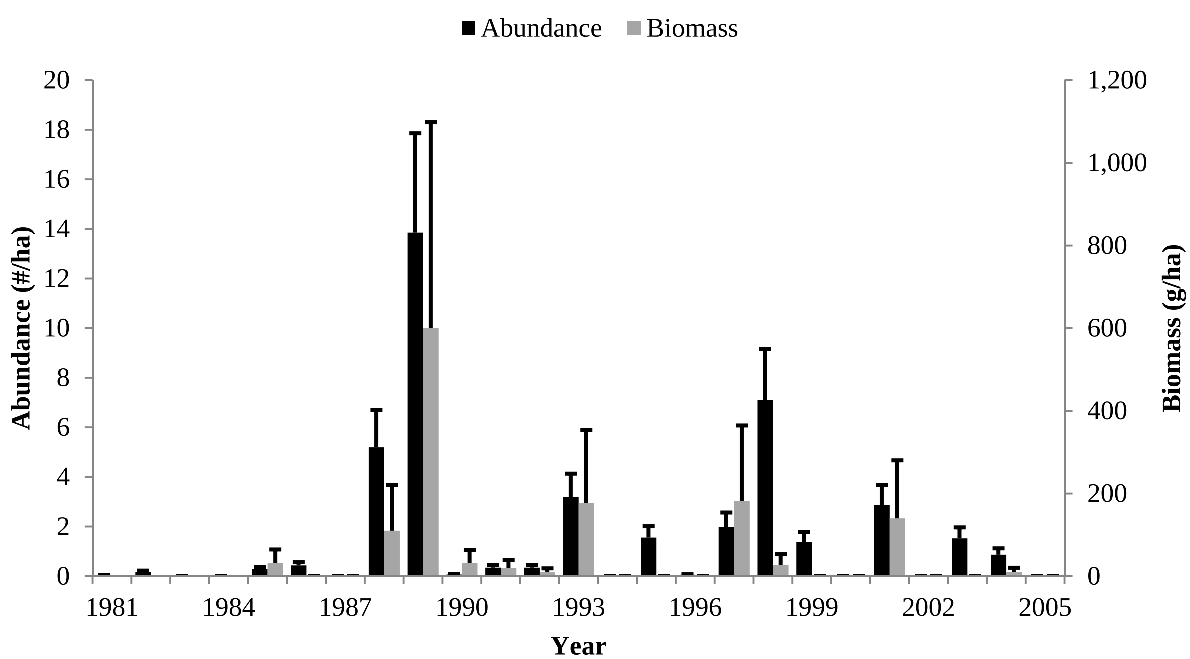

Figure 178. The mean (+SE) annual abundance and biomass of *Mugil cephalus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *M. cephalus* length measurements were not recorded until 1985.

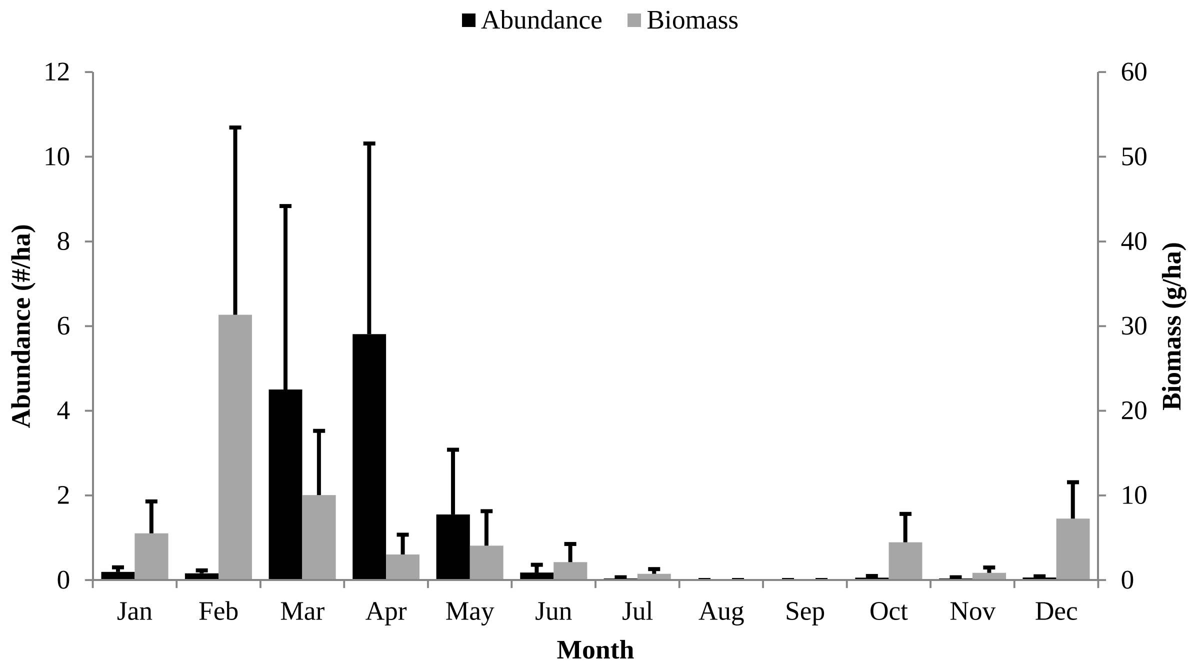

Figure 179. The monthly mean (+SE) abundance and biomass of *Mugil cephalus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

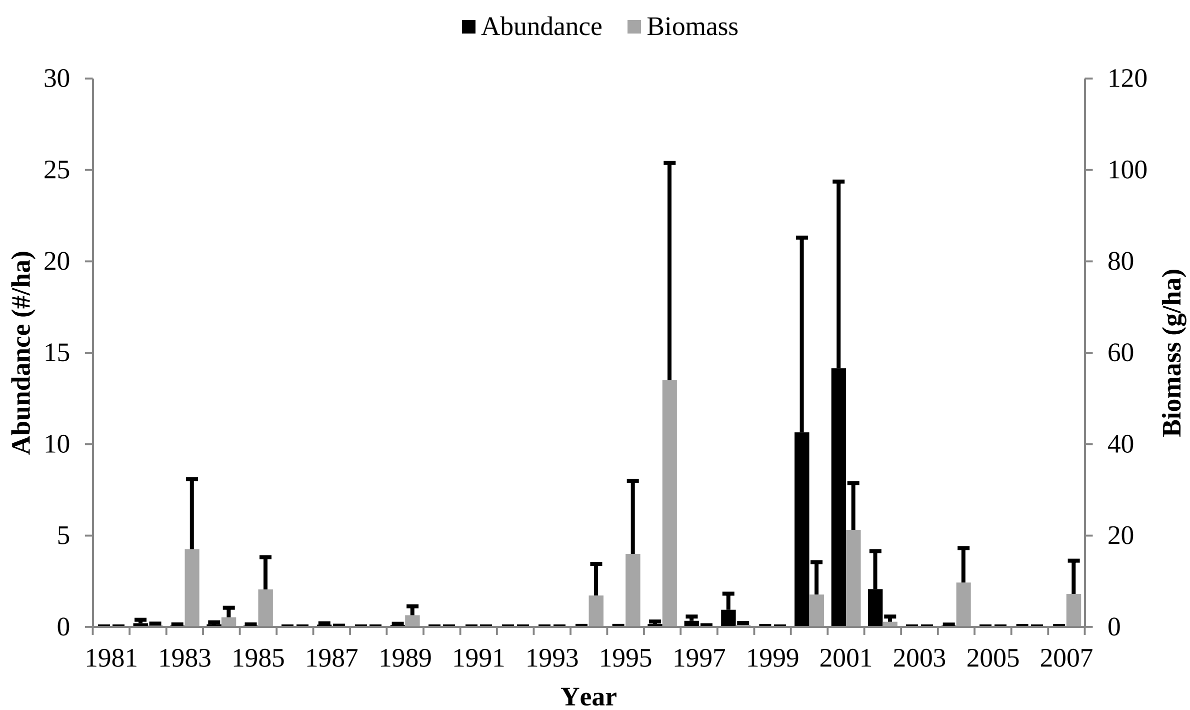

Figure 180. The mean (+SE) annual abundance and biomass of *Mugil cephalus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

Table 91. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses of *Mugil cephalus* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary. No *M. cephalus* were collected in trawls outside Apalachicola Bay in Florida.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	0.2 (8.2)	0.3 (57.5)	6.1 (15.5)	9.1 (4.6)	2.7 (7.2)
E MS Sound (AL)	0.2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	2.7 (2.0)	0.4 (0.5)
Apalachicola Bay (FL)	0.1 (0.0)	0 (0)	0 (0)	0 (0)	0 (0)
	Jun	Jul	Aug	Sep	Oct
Mobile Bay (AL)	0.3 (3.5)	0.0 (0.1)	0 (0)	0 (0)	0.0 (0.6)
E MS Sound (AL)	0 (0)	0.1 (2.1)	0 (0)	0 (0)	0.1 (11.3)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0.1 (3.7)
Apalachicola Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Nov	Dec	Mean	SE	
Mobile Bay (AL)	0.0 (0.9)	0.1 (12.4)	1.6 (9.2)	0.9 (4.6)	
E MS Sound (AL)	0.1 (1.2)	0 (0)	0.0 (1.2)	0.0 (0.9)	
Perdido Bay (AL)	0 (0)	0.1 (0.6)	0.3 (0.6)	0.2 (0.3)	
Apalachicola Bay (FL)	0 (0)	0 (0)	0.0 (0.0)	0.0 (0.0)	

Table 92. The mean annual abundance in#/ha and biomass in g/ha (in parentheses) of *Mugil cephalus* for each estuary in Alabama and Florida. The mean and standard error of the annual means also are reported for the estuaries. The data encompass all samples taken as part of the fishery-independent monitoring programs of ADCNR (1981 – 2007) and FFWCC (1989 – 2005). No *M. cephalus* were collected in trawls outside Apalachicola Bay in Florida.

	1981	1982	1983	1984	1985	1986
Mobile Bay (AL)	0 (0)	0.0 (0.0)	0.1 (24.5)	0.2 (3.3)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0.4 (0.8)	0 (0)	0 (0)	0.3 (27.4)	0 (0)
Perdido Bay (AL)		0 (0)	0 (0)	0.9 (1.0)	0 (0)	0 (0)
	1987	1988	1989	1990	1991	1992
Mobile Bay (AL)	0.2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0 (0)	0.1 (2.5)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0.3 (8.9)	0 (0)	0 (0)	0 (0)
	1993	1994	1995	1996	1997	1998
Mobile Bay (AL)	0 (0)	0.0 (12.1)	0.0 (26.0)	0.3 (106.4)	0.6 (0.3)	1.8 (0.9)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	0.0 (0.0)	15.6 (10.4)	22.8 (35.0)	3.3 (1.8)	0 (0)	0.1 (16.0)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	5.5 (5.2)	0 (0)	0 (0)	0 (0)
Apalachicola Bay (FL)	0 (0)	0 (0)	0 (0)	0.1 (0.0)	0 (0)	0 (0)
	2005	2006	2007	Mean	SE	
Mobile Bay (AL)	0 (0)	0.0 (0.0)	0.0 (10.0)	1.7 (9.1)	1.1 (0.8)	
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.0 (1.1)	0.0 (0.2)	
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.3 (0.6)	0.2 (0.1)	
Apalachicola Bay (FL)	0 (0)			0.0 (0.0)	0.0 (0.0)	

Pogonias cromis

The abundance pattern for black drum (*Pogonias cromis*) was consistent between the states with peaks in winter and fall months (Figure 181). The abundance numbers in Mississippi were highest among the states with an overall mean (mean of 12 monthly means in Figure 181) of 0.9/ha, followed by Texas (0.5/ha), Louisiana (0.3/ha), Alabama (0.0/ha) and Florida (0.0/ha).

The length frequency distributions for black drum in most states (Figure 182) were significantly different from those in other states, based on Kolmogorov-Smirnov two sample tests. The exception was the distribution in Florida that was not significantly different from Texas (P=0.252), Louisiana (P=0.133), or Alabama (P=0.082). This lack of significance is likely due to the low number of individuals measured in Florida (n=11). Lengths of black drum were not measured in Mississippi. Black drum ranged in size from 14 – 1152 mm (mean=236.8, SD=109.4) in Texas, 17 – 1017 mm (mean=221.2, SD=97.5) in Louisiana, 25 – 436 mm (mean=161.3, SD=129.9) in Alabama, and 186 – 942 mm (mean=329.1, SD=242.2) in Florida.

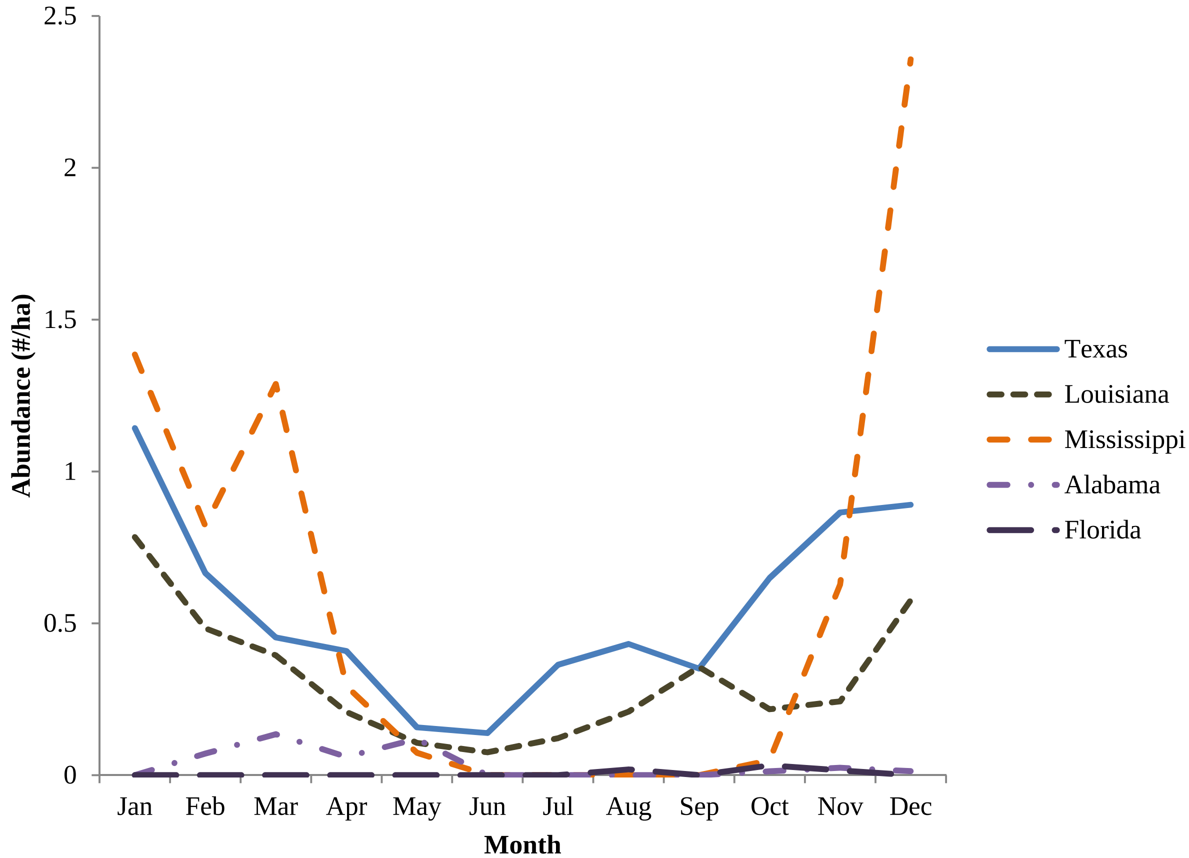

Figure 181. Monthly mean abundance of *Pogonias cromis* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

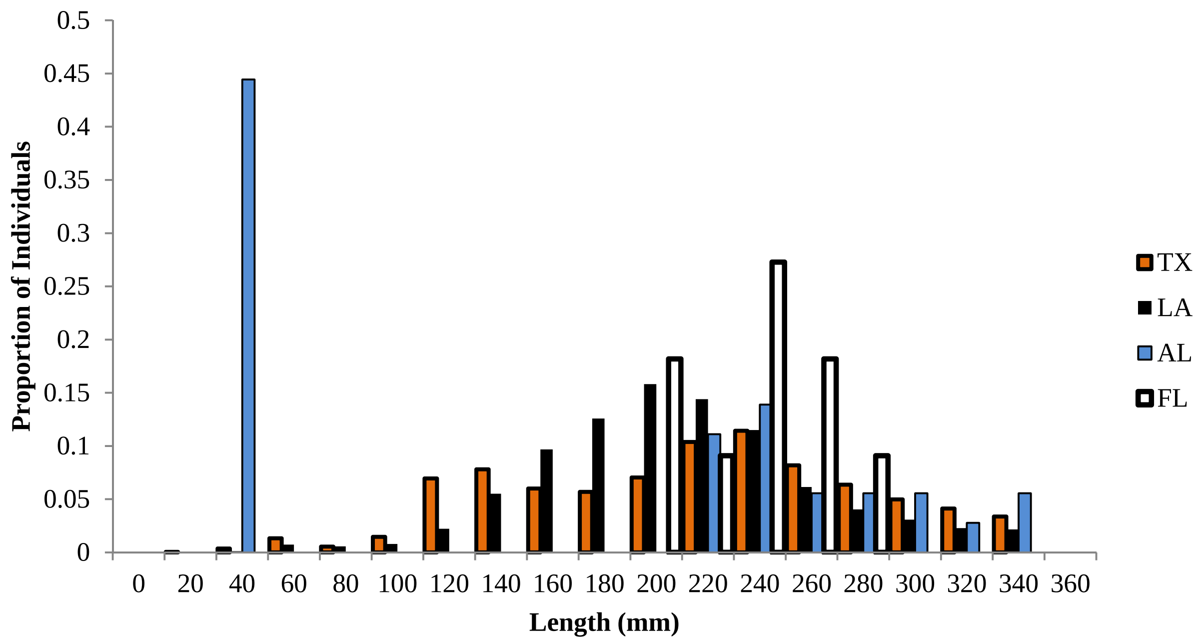

Figure 182. Length frequency of all black drum (*Pogonias cromis*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states, except Mississippi. The data encompass sampling from the following years: Texas (n=5,783): 1982 – 2005; Louisiana (n=1,757): 1986 – 2007; Alabama (n=36): 1981 – 2007; and Florida (n=11): 1989 – 2005 (n-values represent the number of individuals measured). Length measurements were not recorded for *P. cromis* in Mississippi. Lengths are combined into 20-mm bins.

The seasonal variability of black drum mean abundance and biomass in Texas showed peak numbers in the fall and early winter with the lowest numbers in late spring/early summer (Figure 183). Mean annual abundance peaked in 1990 (3.3/ha) and biomass peaked in 2002 (362.8 g/ha) (Figure 184). The largest concentrations were consistently in Upper Laguna Madre and Sabine Lake (Tables 93 and 94).

The seasonal variability in mean abundance and biomass of black drum in Louisiana showed peaks in fall and winter and the lowest abundances and biomass in the summer months (Figure 185). Mean annual abundance peaked in 1998 (0.6/ha) and biomass peaked in 1997 (200.7 g/ha) (Figure 186). The highest mean abundances and biomass were consistently in Lake Calcasieu (Tables 95 and 96).

The seasonal variability of black drum mean abundance in Mississippi showed highs in winter and early spring and a near absence in the summer months (Figure 187). Biomass data were not available in Mississippi as length measurements were not recorded by MDMR/GCRL. Mean annual abundance peaked in 1996 (8.7/ha) (Figure 188).

The seasonal pattern of black drum abundance and biomass in Alabama peaked in the winter and early spring (Figure 189). Mean annual abundance peaked in 1989 (0.3/ha) and biomass peaked in 2006 (41.6 g/ha) (Figure 190). Few black drum were caught in Perdido Bay, while Mobile Bay had larger catches than East Mississippi Sound (Tables 97 and 98).

Black drum were only caught in Florida in late summer and fall (Fig 191). Mean annual abundance peaked in 2005 (0.02/ha) and biomass peaked in 2004 (107.8 g/ha) (Figure 192). Black drum were not caught in Cedar Key or Charlotte Harbor (Tables 97 and 98).

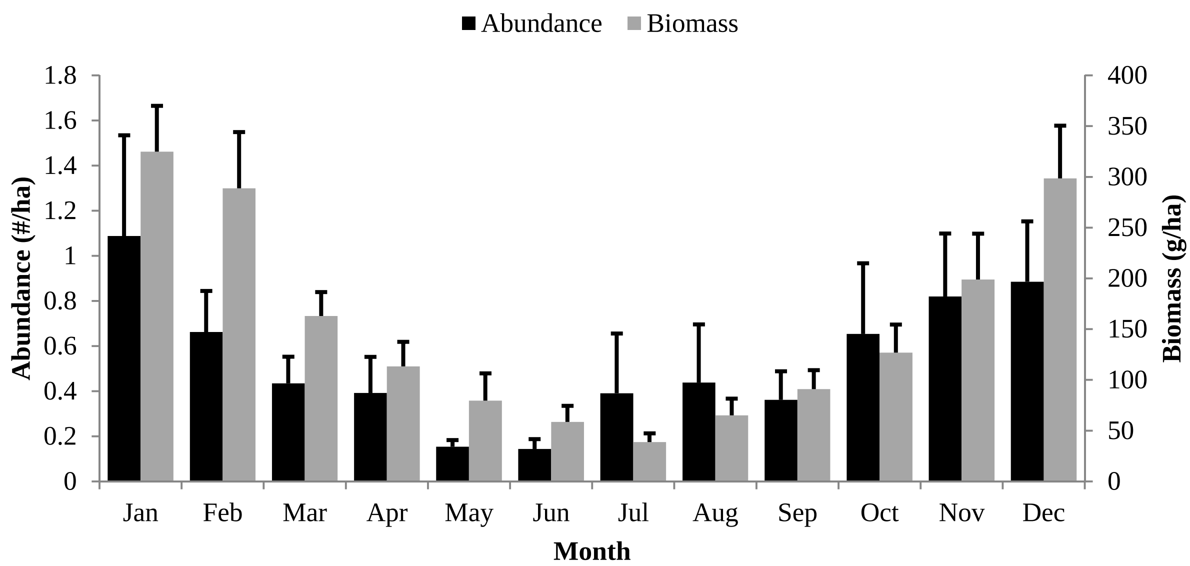

Figure 183. The monthly mean (+SE) abundance and biomass of *Pogonias cromis* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

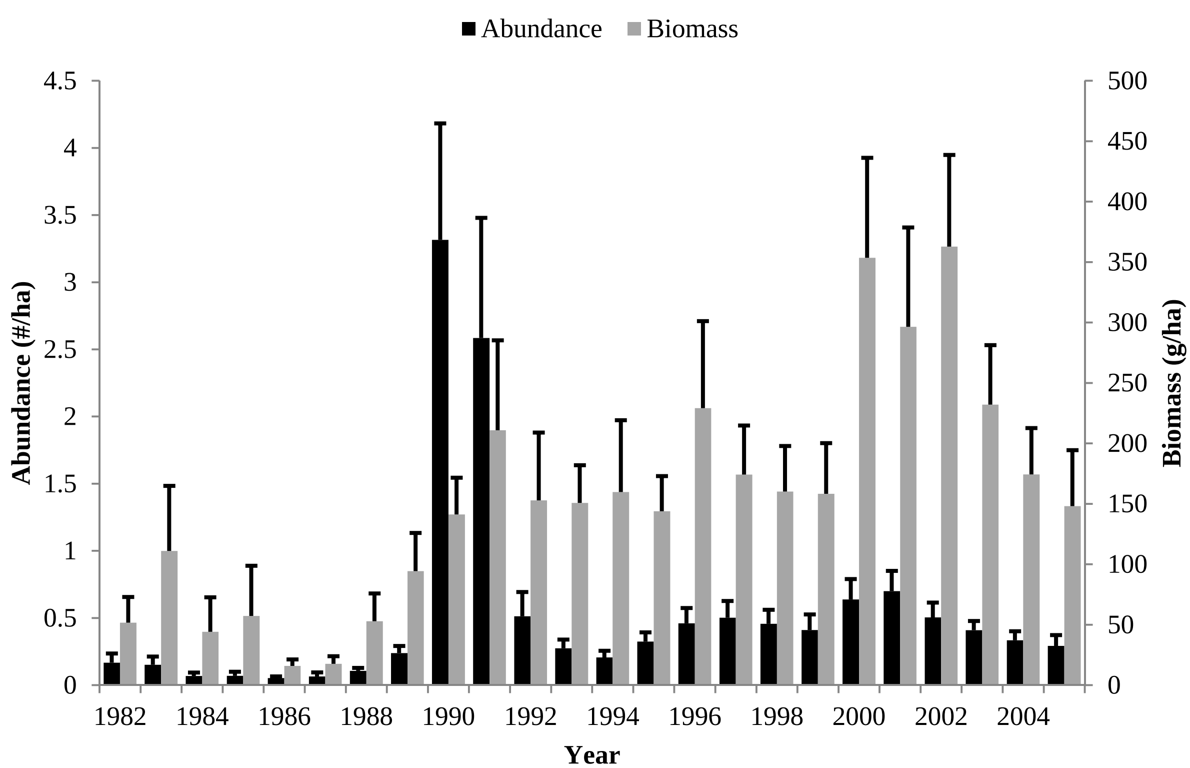

Figure 184. The mean (+SE) annual abundance and biomass of *Pogonias cromis* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 93. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.1 (236.8)	0.0 (10.9)	0.0 (8.4)	0.0 (17.5)
Upper Laguna Madre	9.6 (1035.3)	4.2 (531.4)	2.9 (421.4)	3.6 (238.5)
Corpus Christi Bay	0.2 (317.7)	0.3 (518.2)	0.1 (284.1)	0.1 (106.9)
Aransas Bay	0.4 (283.5)	0.1 (369.2)	0.1 (53.3)	0.0 (72.1)
San Antonio Bay	0.8 (219.5)	0.4 (95.9)	0.2 (91.0)	0.2 (40.7)
Matagorda Bay	0.0 (77.3)	0 (0)	0.0 (60.7)	0.0 (40.0)
East Matagorda Bay	0.6 (253.4)	1.2 (392.8)	0.7 (187.0)	0.4 (164.9)
Galveston Bay	0.4 (202.1)	0.3 (149.7)	0.2 (79.6)	0.1 (63.5)
Sabine Lake	2.0 (1039.3)	2.3 (1082.3)	1.6 (694.1)	1.0 (617.6)
	May	Jun	Jul	Aug
Lower Laguna Madre	0.1 (35.9)	0.0 (8.2)	0.1 (18.8)	0.2 (86.5)
Upper Laguna Madre	0.6 (91.1)	1.1 (75.9)	4.3 (122.0)	4.6 (247.9)
Corpus Christi Bay	0.1 (66.1)	0.0 (6.1)	0.1 (6.5)	0.1 (22.8)
Aransas Bay	0.0 (184.6)	0.0 (14.2)	0.1 (2.8)	0.1 (85.2)
San Antonio Bay	0.1 (27.6)	0.0 (29.4)	0.1 (23.2)	0.1 (17.9)
Matagorda Bay	0 (0)	0.0 (79.5)	0.0 (0.5)	0 (0)
East Matagorda Bay	0.3 (90.4)	0.3 (111.6)	0.1 (60.1)	0.2 (64.9)
Galveston Bay	0.1 (21.6)	0.0 (6.1)	0.0 (13.7)	0.0 (22.3)
Sabine Lake	0.8 (368.7)	0.5 (444.3)	0.6 (310.7)	0.6 (273.5)
	Sep	Oct	Nov	Dec
Lower Laguna Madre	0.1 (75.8)	0.1 (11.3)	0.1 (36.4)	0.1 (34.3)
Upper Laguna Madre	2.9 (295.8)	5.7 (360.7)	6.6 (826.1)	6.5 (870.1)
Corpus Christi Bay	0.1 (74.0)	0.2 (71.2)	0.3 (117.2)	0.6 (422.9)
Aransas Bay	0.1 (69.1)	0.1 (137.0)	0.5 (176.3)	0.4 (161.7)
San Antonio Bay	0.2 (49.2)	0.3 (68.0)	0.4 (73.5)	0.4 (182.3)
Matagorda Bay	0.0 (1.4)	0.0 (1.8)	0.0 (78.1)	0.1 (82.9)
East Matagorda Bay	0.4 (114.4)	0.6 (202.3)	0.6 (241.5)	0.7 (276.2)
Galveston Bay	0.1 (51.0)	0.1 (28.3)	0.2 (78.0)	0.3 (135.4)
Sabine Lake	0.7 (377.0)	1.5 (724.8)	1.7 (734.3)	2.2 (1197.0)
	Mean	SE		
Lower Laguna Madre	0.1 (48.4)	0.0 (18.7)		
Upper Laguna Madre	4.4 (426.3)	0.7 (93.5)		
Corpus Christi Bay	0.2 (167.8)	0.0 (50.1)		
Aransas Bay	0.2 (134.1)	0.1 (31.5)		
San Antonio Bay	0.3 (76.5)	0.1 (18.5)		
Matagorda Bay	0.0 (35.2)	0.0 (10.9)		
East Matagorda Bay	0.5 (180.0)	0.1 (28.8)		
Galveston Bay	0.1 (70.9)	0.0 (17.9)		
Sabine Lake	1.3 (655.3)	0.2 (91.5)		

Table 94. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986
Lower Laguna Madre	0 (0)	0.0 (30.2)	0.0 (120.2)	0 (0)	0.1 (45.5)
Upper Laguna Madre	0.1 (30.8)	0.3 (93.6)	0.4 (35.5)	0.4 (123.6)	0.1 (13.4)
Corpus Christi Bay	0.8 (260.5)	0.3 (432.2)	0.2 (171.2)	0.1 (89.7)	0.0 (24.6)
Aransas Bay	0.1 (7.3)	0.2 (45.2)	0.0 (13.5)	0.0 (155.6)	0 (0)
San Antonio Bay	0.1 (23.1)	0.0 (4.9)	0 (0)	0 (0)	0 (0)
Matagorda Bay	0 (0)	0.0 (1.3)	0 (0)	0 (0)	0 (0)
East Matagorda Bay					
Galveston Bay	0.1 (38.0)	0.2 (120.8)	0.0 (2.7)	0.1 (36.9)	0.1 (11.6)
Sabine Lake					0.2 (46.2)
	1987	1988	1989	1990	1991
Lower Laguna Madre	0.0 (1.4)	0 (0)	0.0 (52.0)	0.1 (6.8)	0.7 (193.6)
Upper Laguna Madre	0.4 (125.1)	0.3 (39.5)	0.9 (193.2)	45.2 (970.9)	33.4 (2126.1)
Corpus Christi Bay	0.1 (10.3)	0.1 (192.6)	0.1 (130.1)	0.0 (159.0)	0.0 (1.7)
Aransas Bay	0 (0)	0.0 (1.4)	0.0 (1.7)	0.0 (4.6)	0.1 (23.3)
San Antonio Bay	0.0 (2.8)	0.0 (0.6)	0.1 (41.5)	0.0 (0.2)	0.1 (12.1)
Matagorda Bay	0 (0)	0.0 (0.8)	0 (0)	0.0 (148.2)	0 (0)
East Matagorda Bay	0 (0)	0.1 (10.8)	0.0 (5.1)	0.0 (1.0)	0.4 (82.1)
Galveston Bay	0.0 (5.2)	0.1 (43.2)	0.1 (64.0)	0.1 (52.3)	0.1 (63.6)
Sabine Lake	0.1 (49.2)	0.3 (133.0)	0.9 (344.8)	0.7 (270.8)	1.1 (349.8)
	1992	1993	1994	1995	1996
Lower Laguna Madre	0.6 (129.7)	0.2 (282.8)	0.0 (24.0)	0 (0)	0.0 (22.1)
Upper Laguna Madre	4.8 (906.2)	1.6 (618.4)	0.4 (352.6)	1.2 (348.9)	2.5 (677.5)
Corpus Christi Bay	0.1 (166.2)	0.2 (237.6)	0.2 (344.8)	0.3 (277.3)	0.2 (249.6)
Aransas Bay	0.0 (2.1)	0.0 (3.8)	0.0 (14.1)	0.1 (200.9)	0.1 (263.1)
San Antonio Bay	0.0 (3.2)	0.0 (3.9)	0.2 (23.5)	0.5 (86.5)	1.0 (349.2)
Matagorda Bay	0 (0)	0 (0)	0.1 (161.4)	0 (0)	0 (0)
East Matagorda Bay	0.1 (14.5)	0.1 (59.7)	0.5 (168.7)	0.5 (139.5)	0.3 (151.8)
Galveston Bay	0.2 (35.4)	0.1 (35.4)	0.0 (38.4)	0.2 (34.9)	0.1 (82.7)
Sabine Lake	0.9 (675.8)	1.4 (588.4)	0.9 (256.4)	0.6 (326.7)	0.9 (467.2)
	1997	1998	1999	2000	2001
Lower Laguna Madre	0.1 (100.2)	0.0 (3.2)	0 (0)	0.0 (7.1)	0.0 (114.1)
Upper Laguna Madre	2.3 (555.6)	1.1 (231.5)	0.7 (221.3)	1.0 (647.8)	1.9 (359.4)
Corpus Christi Bay	0.0 (52.4)	0.0 (5.0)	0.3 (42.2)	0.4 (415.2)	0.1 (48.9)
Aransas Bay	0.4 (139.7)	0.4 (277.2)	0.4 (127.9)	1.0 (282.5)	0.6 (458.0)
San Antonio Bay	0.7 (229.1)	0.6 (118.0)	0.5 (170.0)	0.5 (164.6)	0.7 (187.8)
Matagorda Bay	0.1 (16.5)	0.0 (2.3)	0.0 (117.0)	0.0 (148.9)	0 (0)
East Matagorda Bay	0.5 (170.7)	0.5 (129.6)	0.6 (248.8)	0.7 (129.4)	1.1 (337.2)
Galveston Bay	0.2 (80.7)	0.2 (69.4)	0.2 (47.1)	0.1 (27.2)	0.3 (326.5)
Sabine Lake	1.5 (574.9)	2.2 (935.0)	1.7 (738.0)	3.3 (2093.1)	3.5 (1297.4)

Table 94 (continued).

	2002	2003	2004	2005	Mean
Lower Laguna Madre	0 (0)	0 (0)	0 (0)	0.0 (5.9)	0.1 (47.4)
Upper Laguna Madre	1.0 (332.5)	0.5 (334.6)	1.6 (340.1)	1.1 (378.6)	4.3 (419.0)
Corpus Christi Bay	0.3 (272.9)	0.2 (151.5)	0.1 (79.4)	0.4 (197.2)	0.2 (167.2)
Aransas Bay	0.4 (726.8)	0.3 (241.6)	0.0 (227.4)	0 (0)	0.2 (134.1)
San Antonio Bay	0.4 (245.9)	0.3 (42.3)	0.2 (91.4)	0.1 (35.5)	0.3 (76.5)
Matagorda Bay	0.0 (154.6)	0.0 (2.4)	0.0 (1.3)	0.0 (74.7)	0.0 (34.6)
East Matagorda Bay	1.0 (335.3)	1.3 (55.4)	0.9 (406.7)	0.8 (403.7)	0.5 (176.3)
Galveston Bay	0.2 (134.8)	0.3 (234.0)	0.2 (52.4)	0.1 (65.2)	0.1 (70.9)
Sabine Lake	2.2 (1341.3)	1.7 (1016.1)	1.0 (791.0)	1.0 (540.8)	1.3 (655.3)

	SE
Lower Laguna Madre	0.0 (15.0)
Upper Laguna Madre	2.2 (92.1)
Corpus Christi Bay	0.0 (25.7)
Aransas Bay	0.0 (36.8)
San Antonio Bay	0.1 (20.0)
Matagorda Bay	0.0 (12.4)
East Matagorda Bay	0.1 (37.4)
Galveston Bay	0.0 (14.9)
Sabine Lake	0.2 (111.4)

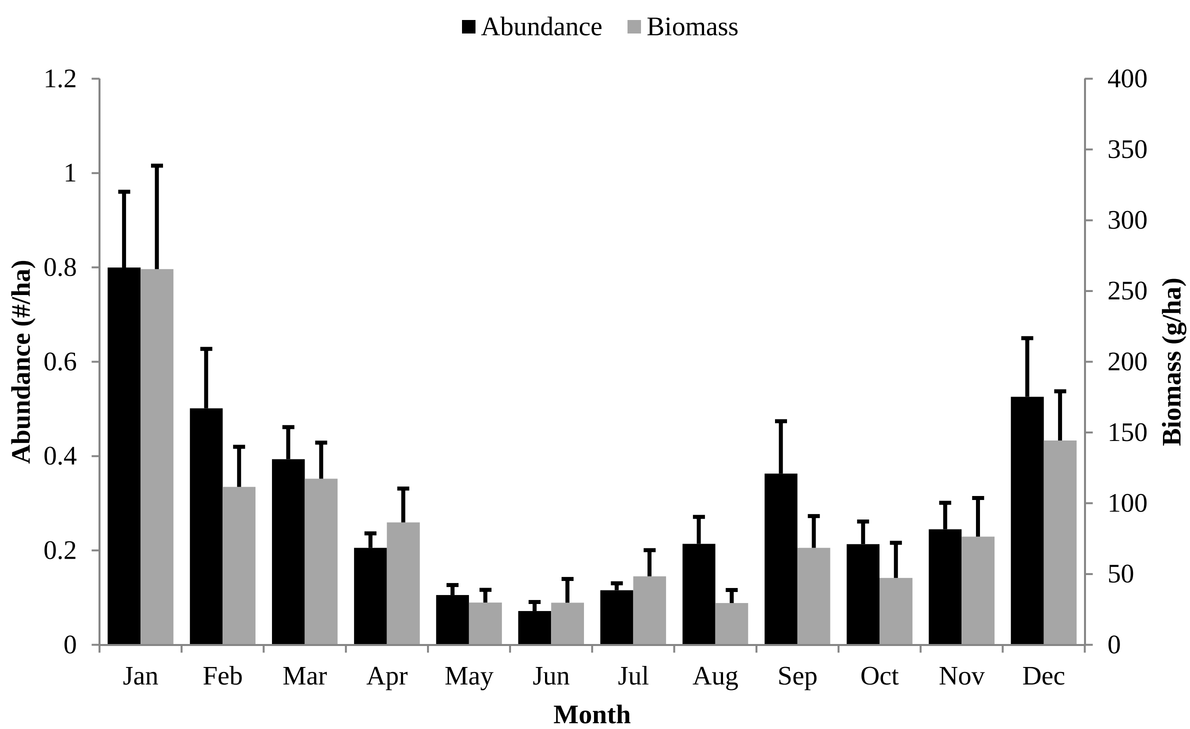

Figure 185. The monthly mean (+SE) abundance and biomass of *Pogonias cromis* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

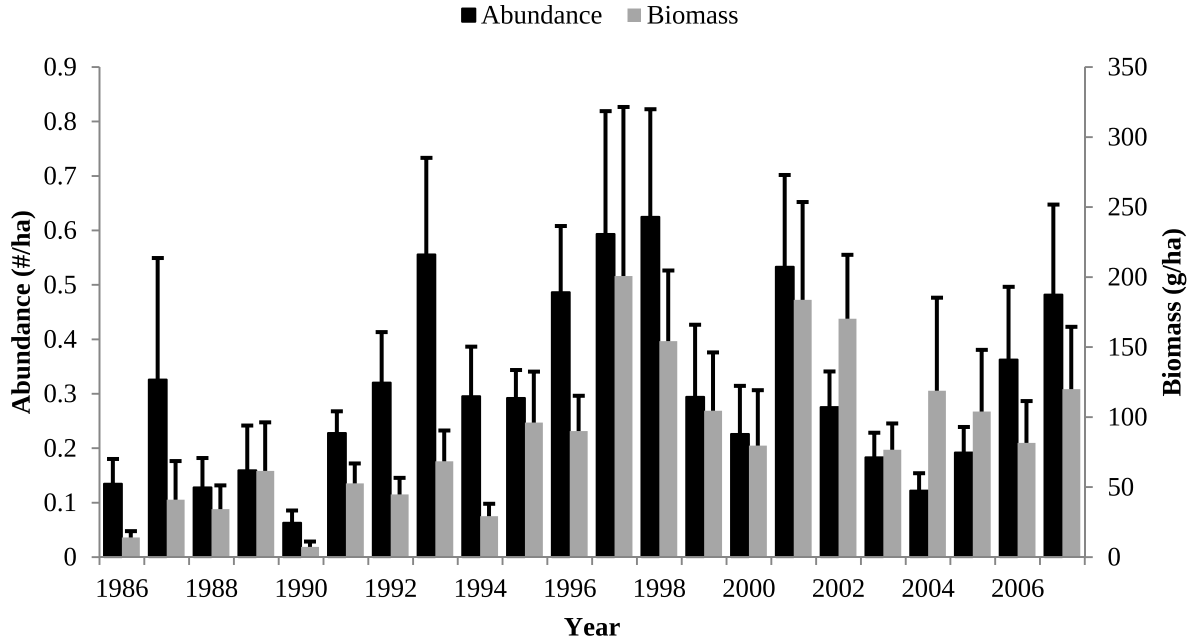

Figure 186. The mean (+SE) annual abundance and biomass of *Pogonias cromis* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 95. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lake Calcasieu	4.1 (149.2)	2.8 (549.3)	2.1 (577.7)	1.1 (313.3)	0.6 (149.8)
Vermilion-Cote Blanche Bays	1.4 (302.1)	0.7 (188.5)	0.6 (187.5)	0.4 (82.5)	0.2 (59.6)
Terrebonne-Timbalier Bays	0.2 (42.5)	0.0 (0.6)	0.0 (1.7)	0.0 (144.3)	0.0 (1.1)
Barataria Bay	0.0 (179.9)	0 (0)	0.0 (69.2)	0.0 (16.3)	0 (0)
Breton-Chandeleur Sounds	0.1 (3.6)	0.0 (33.2)	0 (0)	0.0 (6.8)	0 (0)
Lake Borgne	0.1 (8.6)	0 (0)	0.1 (9.6)	0.0 (11.6)	0 (0)
	Jun	Jul	Aug	Sep	Oct
Lake Calcasieu	0.3 (75.2)	0.5 (118.6)	0.6 (179.3)	1.1 (325.0)	0.7 (119.7)
Vermilion-Cote Blanche Bays	0.1 (99.7)	0.2 (142.7)	0.3 (41.0)	0.5 (50.0)	0.5 (122.4)
Terrebonne-Timbalier Bays	0.0 (0.2)	0.1 (13.3)	0.2 (6.8)	0.6 (84.9)	0.1 (4.8)
Barataria Bay	0.1 (0.5)	0 (0)	0.0 (0.0)	0.0 (2.0)	0.0 (0.1)
Breton-Chandeleur Sounds	0.0 (0.2)	0 (0)	0 (0)	0.0 (0.5)	0 (0)
Lake Borgne	0.0 (1.4)	0 (0)	0 (0)	0.0 (1.8)	0 (0)
	Nov	Dec	Mean	SE	
Lake Calcasieu	1.6 (556.0)	3.4 (794.2)	1.6 (437.5)	0.4 (116.7)	
Vermilion-Cote Blanche Bays	0.4 (88.9)	1.8 (318.6)	0.6 (140.3)	0.1 (26.8)	
Terrebonne-Timbalier Bays	0.0 (88.9)	0.0 (91.6)	0.1 (32.8)	0.1 (13.9)	
Barataria Bay	0 (0)	0.1 (7.1)	0.0 (22.9)	0.0 (15.4)	
Breton-Chandeleur Sounds	0.0 (31.9)	0.0 (5.1)	0.0 (6.8)	0.0 (3.5)	
Lake Borgne	0.1 (5.4)	0 (0)	0.0 (3.2)	0.0 (1.3)	

Table 96. The mean annual abundance in# /ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	0.9 (93.4)	1.5 (191.5)	0.8 (222.9)	0.8 (144.9)
Vermilion-Cote Blanche Bays	0.0 (5.3)	0.2 (23.1)	0.0 (7.5)	0.1 (20.1)
Terrebonne-Timbalier Bays	0 (0)	0 (0)	0 (0)	0.0 (158.3)
Barataria Bay	0 (0)	0 (0)	0 (0)	0.1 (12.9)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0 (0)	0 (0)
Lake Borgne	0 (0)	0.1 (10.4)	0 (0)	0 (0)
	1990	1991	1992	1993
Lake Calcasieu	0.3 (40.5)	1.4 (339.4)	2.1 (295.5)	1.8 (327.0)
Vermilion-Cote Blanche Bays	0.1 (5.0)	0.2 (41.0)	0.5 (56.1)	2.6 (191.3)
Terrebonne-Timbalier Bays	0.0 (0.0)	0.0 (3.1)	0 (0)	0.2 (9.1)
Barataria Bay	0 (0)	0 (0)	0 (0)	0.0 (1.0)
Breton-Chandeleur Sounds	0.0 (0.9)	0 (0)	0 (0)	0.0 (0.1)
Lake Borgne	0.1 (12.8)	0 (0)	0 (0)	0 (0)
	1994	1995	1996	1997
Lake Calcasieu	1.1 (116.1)	1.1 (242.2)	1.9 (295.1)	3.7 (1437.2)
Vermilion-Cote Blanche Bays	0.6 (61.0)	0.9 (344.5)	1.1 (261.2)	0.2 (127.1)
Terrebonne-Timbalier Bays	0.2 (5.4)	0.0 (105.7)	0.3 (13.0)	0.2 (21.4)
Barataria Bay	0 (0)	0 (0)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0.0 (10.1)	0.0 (0)
Lake Borgne	0.2 (25.4)	0.1 (16.4)	0 (0)	0 (0)
	1998	1999	2000	2001
Lake Calcasieu	2.9 (993.2)	1.7 (306.2)	0.6 (575.8)	3.8 (1283.1)
Vermilion-Cote Blanche Bays	0.6 (148.3)	0.5 (233.2)	0.6 (68.9)	0.4 (130.1)
Terrebonne-Timbalier Bays	0.9 (58.4)	0.0 (87.0)	0.1 (4.3)	0.1 (46.0)
Barataria Bay	0.0 (0.2)	0 (0)	0.0 (0.6)	0.0 (29.9)
Breton-Chandeleur Sounds	0.0 (2.7)	0 (0)	0.0 (8.9)	0.0 (9.7)
Lake Borgne	0 (0)	0 (0)	0 (0)	0.0 (3.7)
	2002	2003	2004	2005
Lake Calcasieu	3.3 (1137.6)	1.1 (413.2)	0.6 (245.0)	0.4 (289.1)
Vermilion-Cote Blanche Bays	0.2 (231.0)	0.2 (48.3)	0.3 (46.4)	0.6 (303.3)
Terrebonne-Timbalier Bays	0.0 (49.6)	0.1 (32.2)	0.0 (120.1)	0.0 (1.8)
Barataria Bay	0.0 (128.5)	0 (0)	0.0 (329.7)	0.1 (0.1)
Breton-Chandeleur Sounds	0.0 (50.8)	0.0 (58.5)	0 (0)	0 (0)
Lake Borgne	0 (0)	0 (0)	0 (0)	0 (0)
	2006	2007	Mean	SE
Lake Calcasieu	1.3 (287.5)	1.3 (186.9)	1.6 (430.1)	0.2 (85.3)
Vermilion-Cote Blanche Bays	0.9 (240.2)	1.6 (493.0)	0.6 (140.3)	0.1 (28.1)
Terrebonne-Timbalier Bays	0.1 (2.9)	0.0 (1.9)	0.1 (32.8)	0.0 (9.8)
Barataria Bay	0.0 (0.8)	0.2 (0.4)	0.0 (22.9)	0.0 (15.8)
Breton-Chandeleur Sounds	0.1 (6.0)	0 (0)	0.0 (6.7)	0.0 (3.4)
Lake Borgne	0.0 (3.0)	0 (0)	0.0 (3.3)	0.0 (1.5)

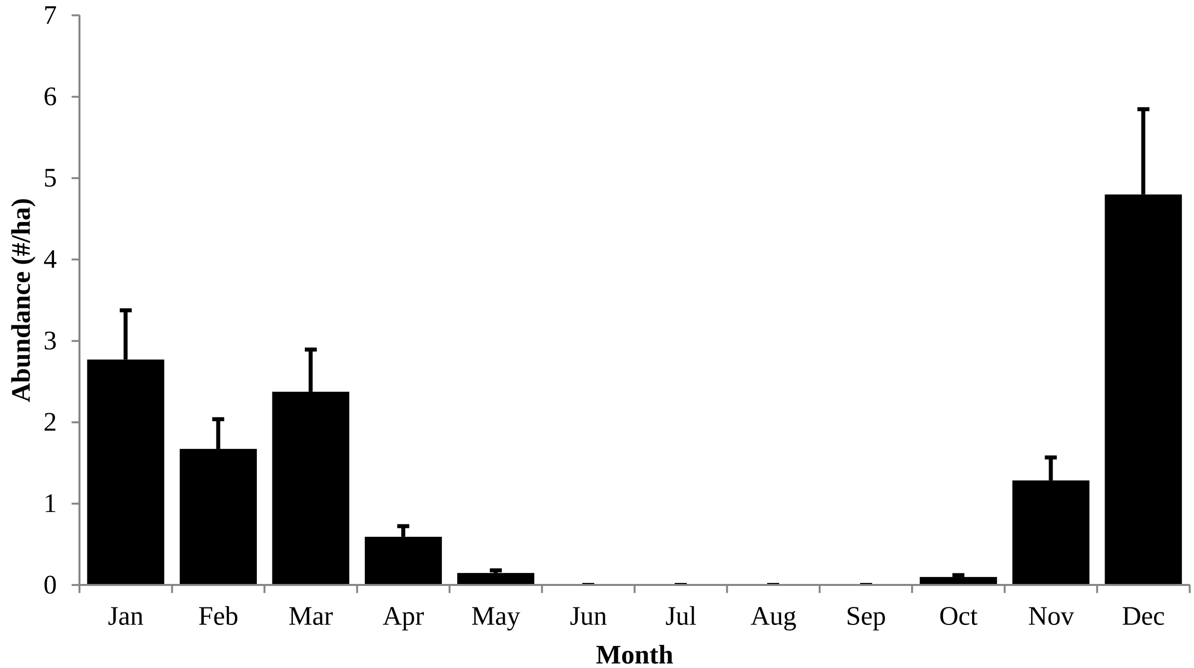

Figure 187. The monthly mean (+SE) abundance of *Pogonias cromis* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were not available as *P. cromis* length measurements were not recorded.

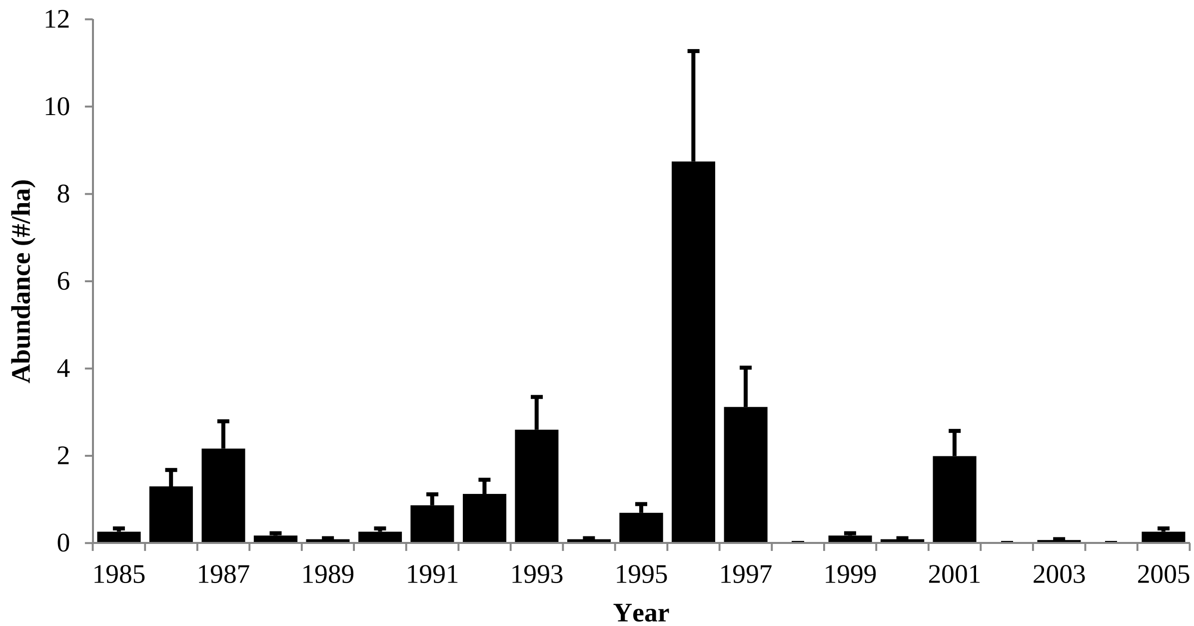

Figure 188. The mean (+SE) annual abundance of *Pogonias cromis* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data were not available as *P. cromis* length measurements were not recorded.

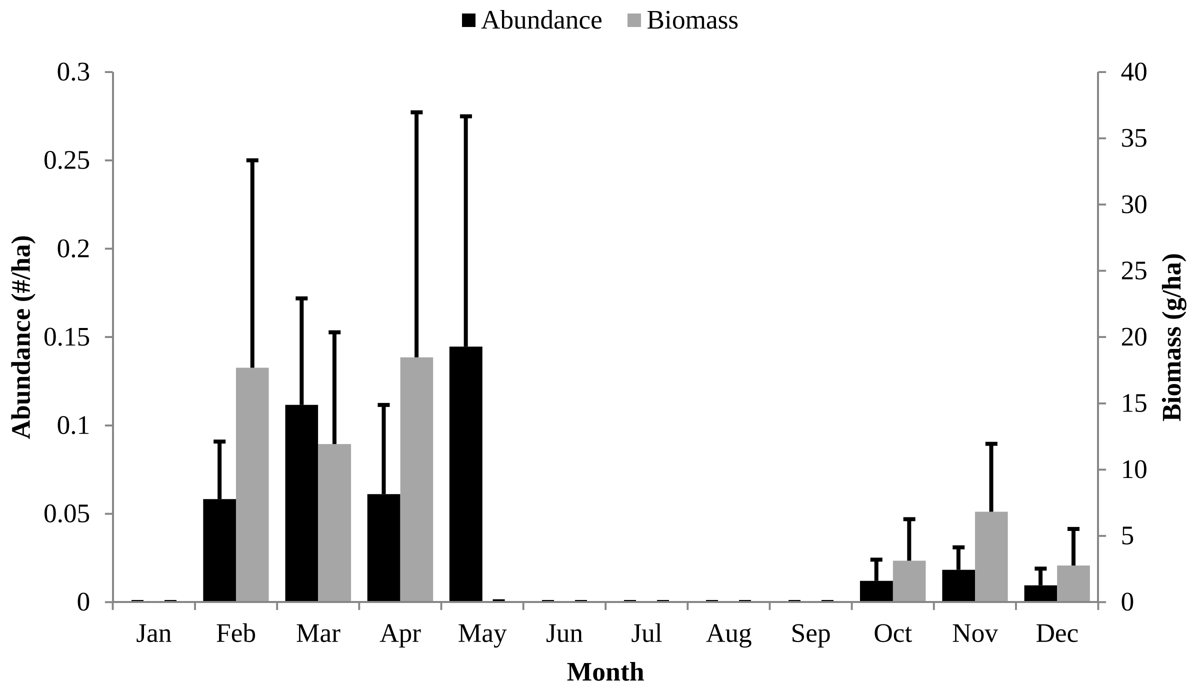

Figure 189. The monthly mean (+SE) abundance and biomass of *Pogonias cromis* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

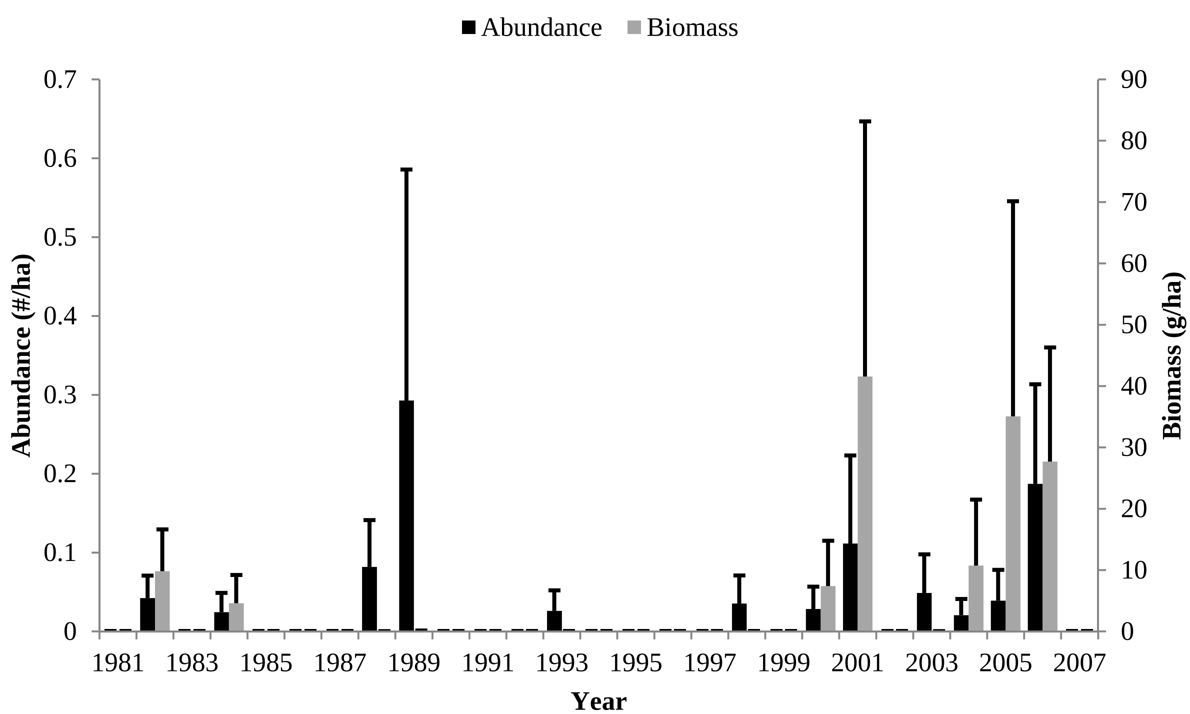

Figure 190. The mean (+SE) annual abundance and biomass of *Pogonias cromis* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

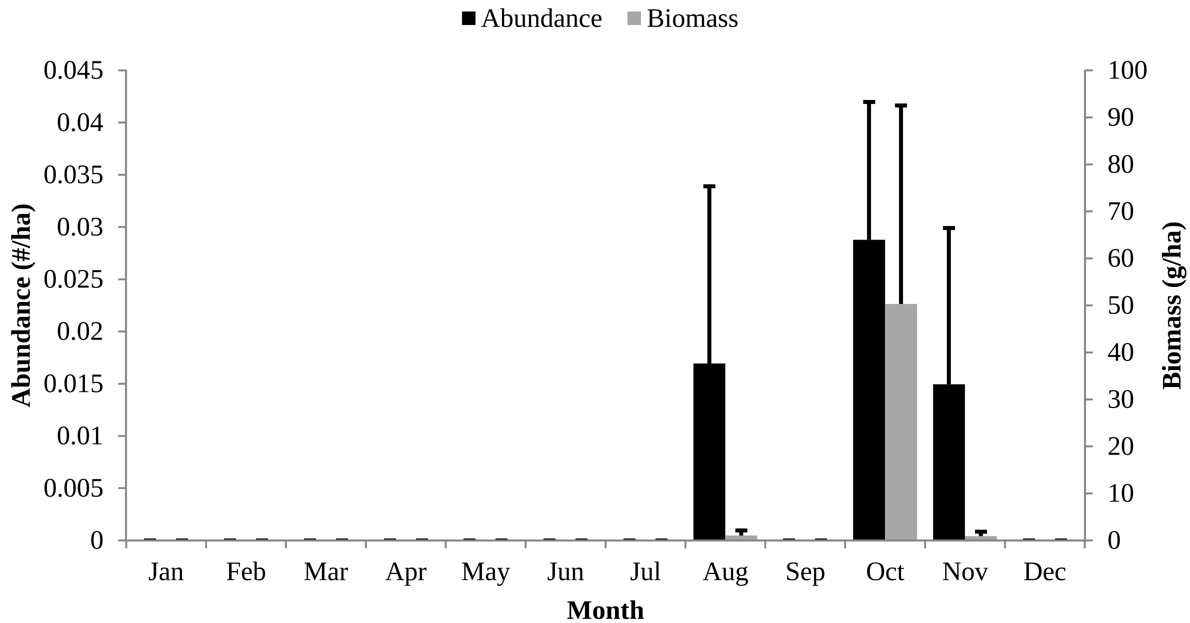

Figure 191. The monthly mean (+SE) abundance and biomass of *Pogonias cromis* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

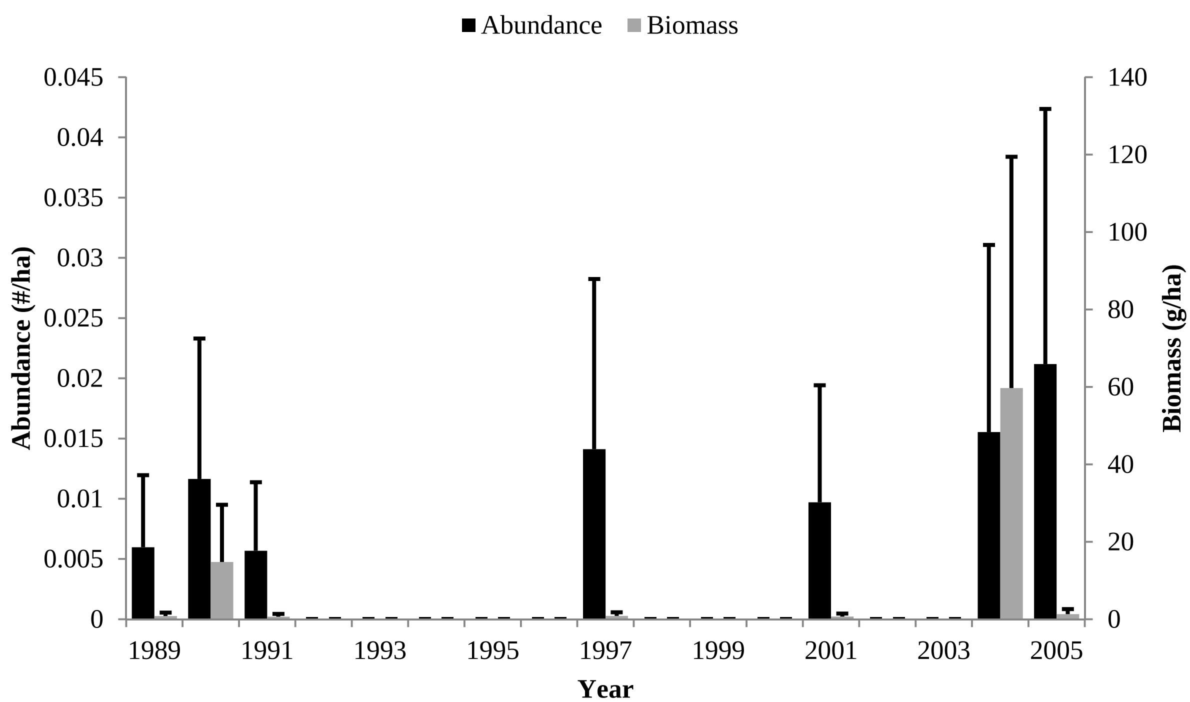

Figure 192. The mean (+SE) annual abundance and biomass of *Pogonias cromis* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 97. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May	Jun
Mobile Bay (AL)	0 (0)	0.1 (25.2)	0.1 (17.4)	0.1 (32.3)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0.1 (0.0)	0 (0)	0.0 (0.0)	0.6 (0.1)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0.2 (0.1)	0 (0)	0 (0)	0 (0)
Apalachicola Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Suwannee Sound (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mobile Bay (AL)	0 (0)	0 (0)	0 (0)	0.0 (0)	0.0 (0)	0.0 (4.8)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Apalachicola Bay (FL)	0 (0)	0 (0)	0 (0)	0.0 (6.7)	0.1 (15.3)	0 (0)
Suwannee Sound (FL)	0 (0)	0.2 (22.5)	0 (0)	0.6 (2254.8)	0 (0)	0 (0)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0.0 (28.8)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Mean	**SE**				
Mobile Bay (AL)	0.0 (7.9)	0.0 (3.3)				
E MS Sound (AL)	0.1 (0.0)	0.0 (0.0)				
Perdido Bay (AL)	0.0 (0.0)	0.0 (0.0)				
Apalachicola Bay (FL)	0.0 (1.8)	0.0 (1.3)				
Suwannee Sound (FL)	0.1 (189.8)	0.0 (187.7)				
Cedar Key (FL)	0 (0)	0 (0)				
Tampa Bay (FL)	0.0 (2.4)	0.0 (2.4)				
Charlotte Harbor (FL)	0 (0)	0 (0)				

Table 98. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Pogonias cromis* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985	1986
Mobile Bay (AL)	0 (0)	0.1 (17.2)	0 (0)	0.0 (7.4)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	1987	1988	1989	1990	1991	1992
Mobile Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0.1 (0.0)	1.2 (0.3)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0.3 (0.0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)			0.0 (3.5)	0.0 (54.9)	0.0 (2.8)	0 (0)
Charlotte Harbor (FL)			0 (0)	0 (0)	0 (0)	0 (0)

	1993	1994	1995	1996	1997	1998
Mobile Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (0.0)
Perdido Bay (AL)	0.2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Apalachicola Bay (FL)						0 (0)
Suwannee Sound (FL)				0 (0)	0.1 (13.1)	
Cedar Key (FL)				0 (0)	0 (0)	
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	0 (0)	0.1 (0)	0.2 (0)	0 (0)	0 (0)	0.0 (0)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0.3 (0.1)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Apalachicola Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (4.4)
Suwannee Sound (FL)			0.3 (41.8)	0 (0)	0 (0)	0.1 (1276.9)
Cedar Key (FL)			0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

	2005	2006	2007	Mean	SE
Mobile Bay (AL)	0.1 (0)	0.3 (37.7)	0 (0)	0.1 (8.6)	0.0 (0.3)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.1 (0.0)	0.0 (0.0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.0 (0.0)	0.0 (0.0)
Apalachicola Bay (FL)	0.1 (10.2)			0.0 (1.8)	0.0 (1.3)
Suwannee Sound (FL)	0 (0)			0.1 (190.3)	0.0 (181.2)
Cedar Key (FL)	0 (0)			0 (0)	0 (0)
Tampa Bay (FL)	0 (0)			0.0 (3.6)	0.0 (3.2)
Charlotte Harbor (FL)	0 (0)			0 (0)	0 (0)

Paralichthys lethostigma

The abundance pattern for southern flounder (*Paralichthys lethostigma*) was not consistent among the states with peaks in all seasons (Figure 193). Abundance in Mississippi was highest among the states with an overall mean (mean of 12 monthly means in Figure 193) of 0.8/ha, followed by Alabama (0.5/ha), Louisiana (0.4/ha), Texas (0.2/ha) and Florida (0.2/ha).

The length frequency distributions for southern flounder in each state (Figure 194) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Lengths of southern flounder were not measured in Mississippi. Southern flounder ranged in size from 22 – 542 mm (mean=175.6, SD=73.6) in Texas, 7 – 487 mm (mean=118.8, SD=70.3) in Louisiana, 20 – 566 mm (mean=141.7, SD=91.0) in Alabama, and 20 – 609 mm (mean=203.8, SD=103.0) in Florida.

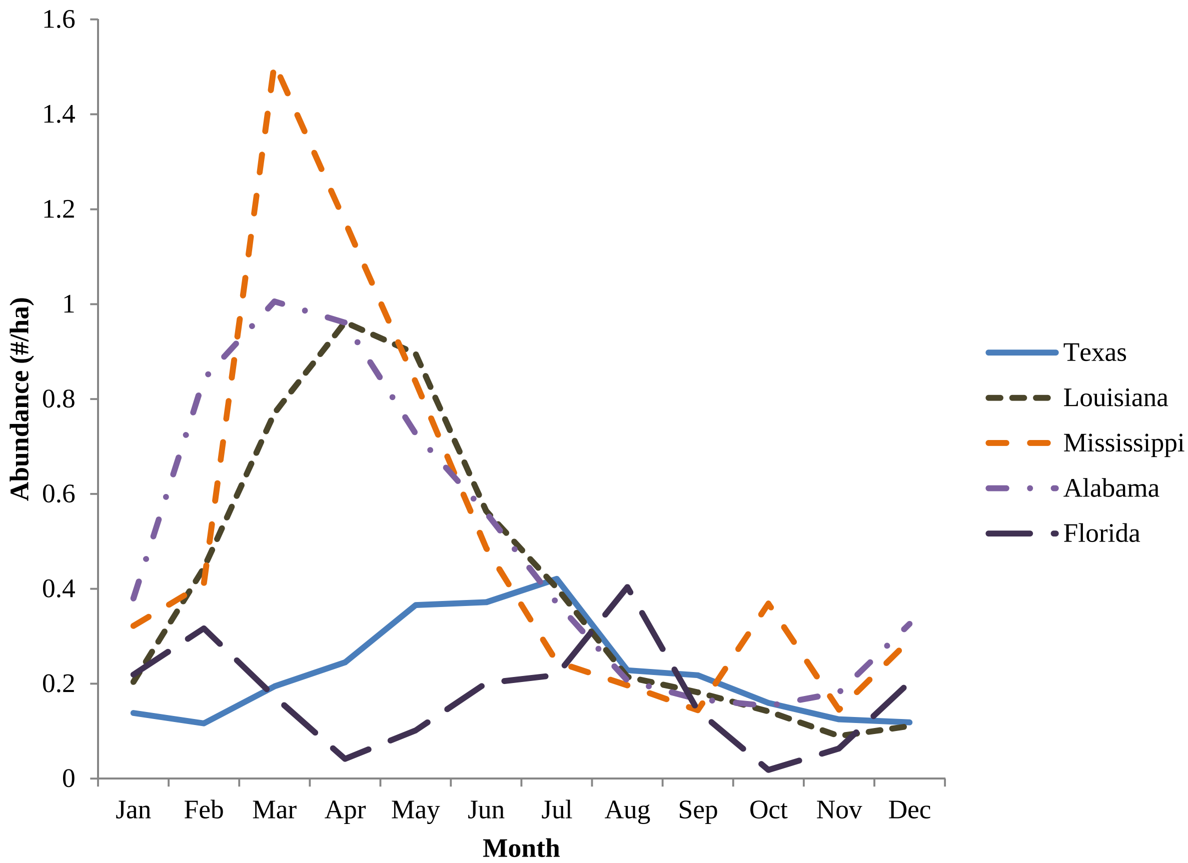

Figure 193. Monthly mean abundance (#/hectare) of *Paralichthys lethostigma* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, 1981 – 2007 for Alabama, and 1989 – 2005 for Florida.

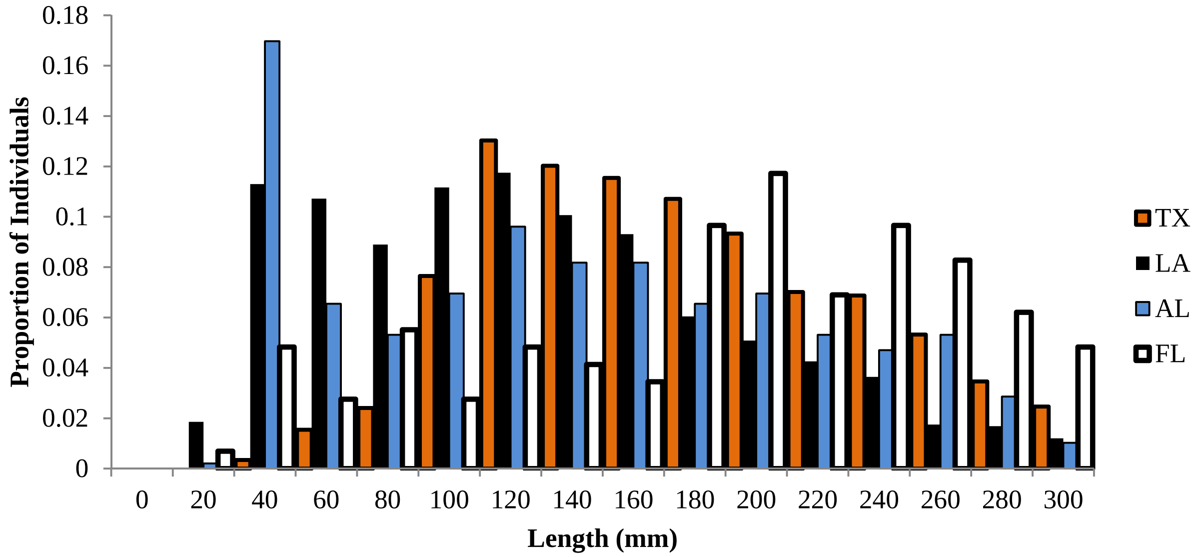

Figure 194. Length frequency of all southern flounder (*Paralichthys lethostigma*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states, except Mississippi. The data encompass sampling from the following years: Texas (n=3,492): 1982 – 2005; Louisiana (n=2,911): 1986 – 2007; Alabama (n=489): 1981 – 2007; and Florida (n=145): 1989 – 2005 (n-values represent the number of individuals measured). Length measurements were not recorded for *P. lethostigma* in Mississippi. Lengths are combined into 20-mm bins.

Southern flounder showed a strong seasonal abundance and biomass variability in Texas with mean numbers increasing in the winter and spring to their peak in summer (Figure 195). Mean annual abundance peaked in 1990 (0.5/ha) and biomass peaked in 1985 (37.9 g/ha) (Figure 196). The highest mean abundance and biomass values were seen in Sabine Lake and Aransas Bay (Tables 99 and 100).

The peak mean abundance and biomass of southern flounder in Louisiana occurred in the spring (Figure 197). Mean annual abundance peaked in 1995 (0.7/ha) and biomass peaked in 2007 (35.3 g/ha) (Figure 198). The highest abundances occurred in Lake Calcasieu (Tables 101 and 102).

Biomass data were not available for southern flounder in Mississippi as length measurements were not recorded. The peak mean abundance occurred in the early spring (Figure 199). Mean annual abundance peaked in 1996 (5.0/ha) (Figure 200).

The monthly mean abundance of southern flounder in Alabama showed a peak in late winter/early spring, but biomass peaked in December (Figure 201). Mean annual abundance and biomass peaked in 2004 (2.9/ha and 108.8 g/ha, respectively) (Figure 202). Perdido Bay and Mobile Bay had the highest mean abundance of southern flounder in Alabama (Tables 103 and 104).

Southern flounder mean abundance and biomass in Florida both peaked in summer, with a smaller peak in winter (Figure 203). Mean annual abundance peaked in 2001 (0.6/ha) and biomass peaked in 1998 (100.2 g/ha) (Figure 204). Apalachicola Bay was the predominant estuary in Florida, though some larger catches occurred in Suwannee Sound and Cedar Key (Tables 103 and 104).

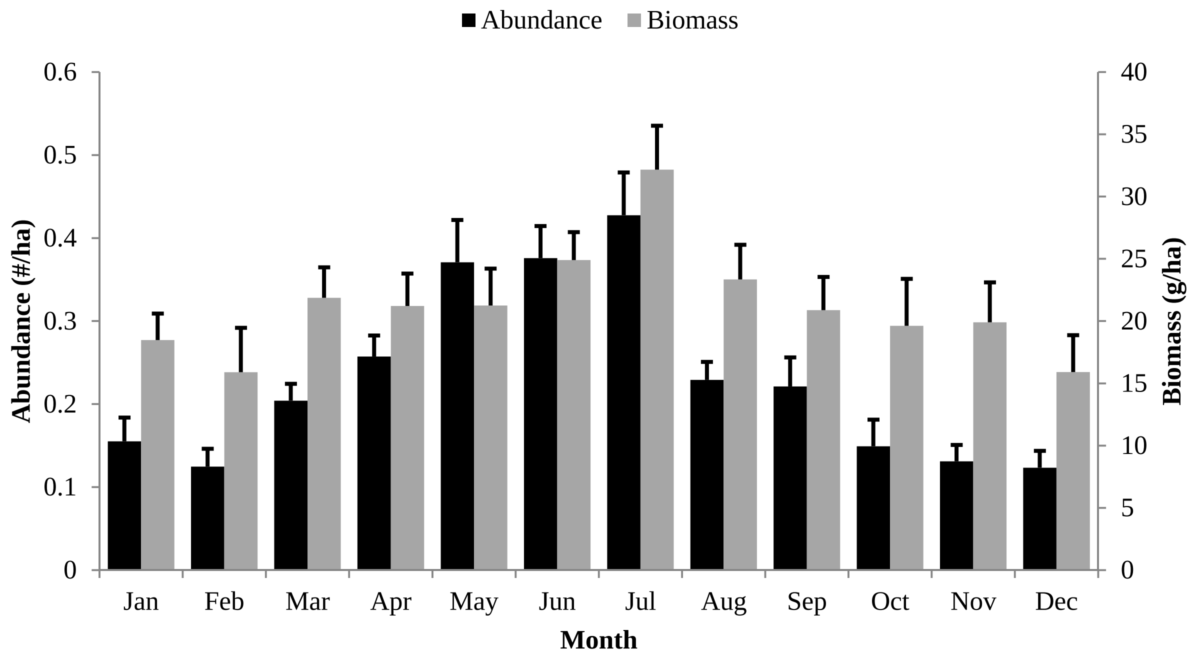

Figure 195. The monthly mean (+SE) abundance and biomass of *Paralichthys lethostigma* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

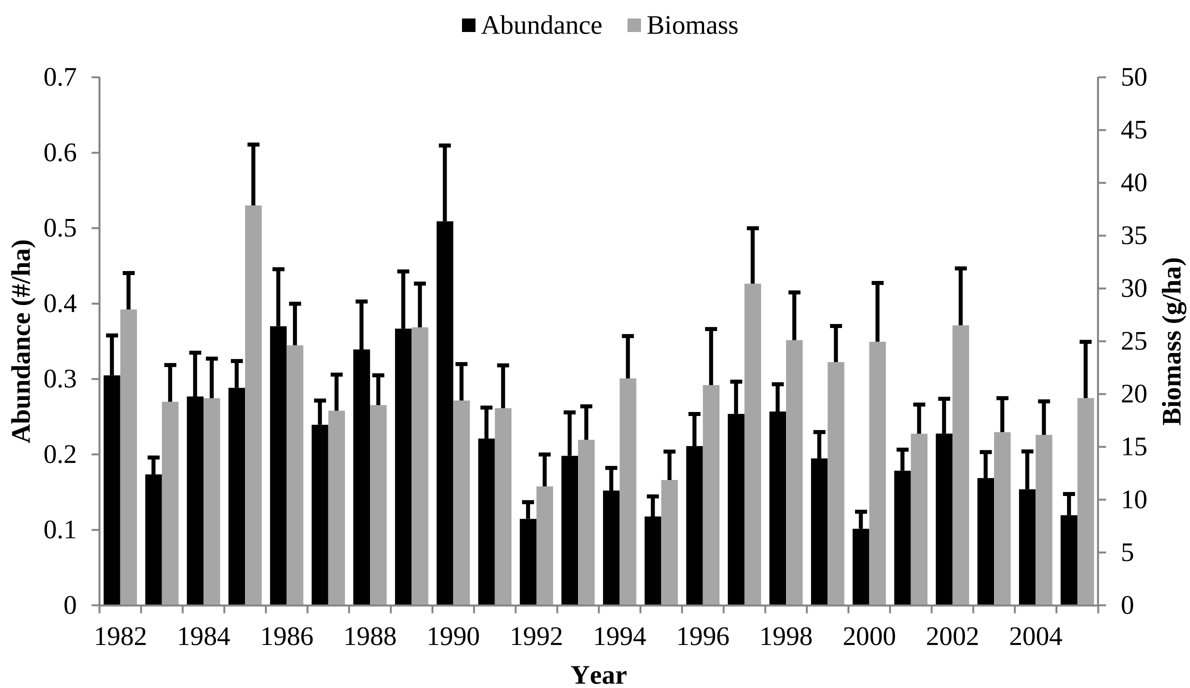

Figure 196. The mean (+SE) annual abundance and biomass of *Paralichthys lethostigma* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 99. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.1 (43.2)	0.1 (16.0)	0.1 (6.4)	0.1 (17.1)
Upper Laguna Madre	0.1 (8.2)	0.1 (11.9)	0.0 (12.6)	0.1 (6.7)
Corpus Christi Bay	0.0 (3.8)	0.0 (7.4)	0.0 (8.5)	0.1 (6.9)
Aransas Bay	0.2 (19.3)	0.2 (18.2)	0.4 (28.6)	0.5 (40.2)
San Antonio Bay	0.3 (19.3)	0.1 (11.3)	0.3 (20.5)	0.4 (27.2)
Matagorda Bay	0.1 (9.7)	0.0 (5.4)	0.1 (13.9)	0.2 (14.9)
East Matagorda Bay	0 (0)	0.1 (15.7)	0.1 (16.5)	0.3 (22.4)
Galveston Bay	0.1 (16.6)	0.1 (20.5)	0.1 (26.6)	0.1 (14.9)
Sabine Lake	0.4 (69.4)	0.5 (53.2)	0.5 (74.1)	0.4 (35.0)
	May	Jun	Jul	Aug
Lower Laguna Madre	0.2 (18.3)	0.2 (18.8)	0.2 (33.7)	0.2 (34.0)
Upper Laguna Madre	0.1 (8.6)	0.2 (13.2)	0.2 (24.2)	0.2 (26.7)
Corpus Christi Bay	0.2 (16.3)	0.2 (20.2)	0.4 (54.8)	0.1 (17.2)
Aransas Bay	0.5 (42.2)	0.7 (50.3)	0.7 (43.5)	0.4 (36.7)
San Antonio Bay	0.6 (18.5)	0.5 (13.8)	0.7 (31.2)	0.3 (13.2)
Matagorda Bay	0.3 (14.2)	0.3 (18.4)	0.3 (18.8)	0.1 (11.1)
East Matagorda Bay	0.3 (34.6)	0.2 (17.9)	0.2 (8.9)	0.1 (38.7)
Galveston Bay	0.4 (18.1)	0.3 (23.5)	0.3 (19.1)	0.1 (24.1)
Sabine Lake	0.4 (23.2)	0.7 (42.1)	0.8 (45.5)	0.6 (28.0)
	Sep	Oct	Nov	Dec
Lower Laguna Madre	0.3 (51.5)	0.2 (34.3)	0.1 (7.1)	0.0 (8.2)
Upper Laguna Madre	0.4 (45.1)	0.1 (20.9)	0.1 (10.7)	0.1 (27.6)
Corpus Christi Bay	0.2 (13.0)	0.1 (17.9)	0.1 (17.7)	0.0 (14.7)
Aransas Bay	0.2 (29.2)	0.2 (28.2)	0.3 (34.4)	0.2 (10.6)
San Antonio Bay	0.2 (16.8)	0.1 (10.5)	0.1 (16.3)	0.1 (14.0)
Matagorda Bay	0.1 (14.2)	0.1 (22.1)	0.1 (14.1)	0.1 (12.0)
East Matagorda Bay	0.1 (6.5)	0.1 (18.1)	0.1 (21.3)	0.1 (11.6)
Galveston Bay	0.1 (7.1)	0.1 (6.3)	0.1 (21.2)	0.1 (15.7)
Sabine Lake	0.6 (24.9)	0.4 (33.0)	0.3 (28.2)	0.5 (28.0)
	Mean	SE		
Lower Laguna Madre	0.1 (24.1)	0.0 (4.3)		
Upper Laguna Madre	0.1 (18.0)	0.0 (3.3)		
Corpus Christi Bay	0.1 (16.5)	0.0 (3.8)		
Aransas Bay	0.4 (31.8)	0.1 (3.4)		
San Antonio Bay	0.3 (17.7)	0.1 (1.8)		
Matagorda Bay	0.1 (14.1)	0.0 (1.3)		
East Matagorda Bay	0.1 (17.7)	0.0 (3.2)		
Galveston Bay	0.2 (17.8)	0.0 (1.8)		
Sabine Lake	0.5 (40.4)	0.0 (5.0)		

Table 100. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0.1 (28.8)	0.1 (11.1)	0.2 (19.2)	0.2 (74.0)	0.2 (21.1)	0.2 (43.7)	0.1 (17.1)	0.1 (14.5)	0.5 (33.7)
Upper Laguna Madre	0.7 (54.6)	0.1 (7.8)	0.5 (16.1)	0.4 (28.8)	0.3 (79.5)	0 (0)	0.2 (20.0)	0.1 (35.6)	0.4 (30.7)
Corpus Christi Bay	0.3 (42.0)	0.1 (16.3)	0.2 (20.4)	0.3 (66.1)	0.6 (49.5)	0.1 (4.6)	0.2 (23.4)	0.2 (24.1)	0.6 (28.9)
Aransas Bay	0.5 (53.8)	0.6 (55.6)	0.8 (58.9)	0.6 (48.2)	0.7 (20.7)	0.4 (18.8)	0.6 (42.8)	0.6 (30.3)	0.7 (18.6)
San Antonio Bay	0.3 (14.5)	0.1 (5.6)	0.1 (7.5)	0.2 (14.8)	0.3 (13.4)	0.6 (31.6)	0.7 (17.5)	0.5 (16.0)	1.0 (26.4)
Matagorda Bay	0.1 (8.7)	0.2 (22.7)	0.0 (4.4)	0.1 (15.0)	0.2 (10.5)	0.1 (9.4)	0.0 (1.0)	0.1 (14.5)	0.1 (5.7)
East Matagorda Bay						0.2 (18.2)	0.1 (2.1)	0.1 (6.1)	0.0 (0.8)
Galveston Bay	0.2 (14.0)	0.1 (6.0)	0.1 (8.8)	0.1 (31.7)	0.4 (23.1)	0.1 (21.5)	0.1 (8.9)	0.2 (16.8)	0.2 (12.2)
Sabine Lake					0.2 (5.0)	0.4 (20.3)	0.6 (29.1)	0.9 (67.7)	1.0 (22.9)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.5 (75.1)	0.0 (4.6)	0.0 (15.3)	0.2 (35.6)	0 (0)	0.3 (50.2)	0.1 (19.9)	0.0 (1.7)	0.0 (14.7)
Upper Laguna Madre	0.0 (16.6)	0 (0)	0.1 (48.6)	0.0 (2.9)	0.0 (9.0)	0.2 (9.3)	0.1 (12.5)	0.1 (15.5)	0.1 (7.2)
Corpus Christi Bay	0.1 (14.7)	0 (0)	0.0 (8.0)	0.0 (17.9)	0.0 (0.3)	0.2 (35.1)	0.0 (2.3)	0 (0)	0.0 (0.9)
Aransas Bay	0.4 (30.7)	0.1 (4.4)	0.3 (8.7)	0.2 (14.9)	0.2 (22.3)	0.2 (16.3)	0.3 (38.0)	0.3 (52.6)	0.5 (62.2)
San Antonio Bay	0.5 (15.3)	0.3 (26.4)	0.3 (12.3)	0.2 (33.0)	0.3 (17.1)	0.2 (11.4)	0.3 (29.0)	0.3 (10.8)	0.1 (2.1)
Matagorda Bay	0.0 (8.7)	0.1 (9.1)	0.3 (12.9)	0.1 (3.6)	0.1 (12.0)	0.4 (17.6)	0.4 (58.1)	0.2 (21.3)	0.2 (23.5)
East Matagorda Bay	0.1 (7.8)	0.0 (1.3)	0.1 (8.5)	0.1 (30.4)	0 (0)	0.2 (11.5)	0.4 (19.2)	0.3 (61.2)	0.2 (15.4)
Galveston Bay	0.1 (3.0)	0.1 (20.8)	0.1 (7.2)	0.2 (17.4)	0.1 (14.6)	0.1 (15.4)	0.3 (41.3)	0.4 (29.0)	0.1 (6.9)
Sabine Lake	0.3 (17.0)	0.4 (30.1)	0.4 (48.9)	0.4 (58.3)	0.4 (24.8)	0.3 (29.1)	0.4 (37.2)	0.7 (45.8)	0.7 (93.9)

	2000	2001	2002	2003	2004	2005	Mean	SE
Lower Laguna Madre	0.1 (37.2)	0.3 (12.7)	0.1 (22.5)	0.0 (24.3)	0.0 (0.2)	0.02 (2.7)	0.1 (24.2)	0.0 (4.2)
Upper Laguna Madre	0.0 (5.8)	0.0 (4.8)	0.1 (31.7)	0.1 (8.9)	0.0 (1.5)	0 (0)	0.2 (18.7)	0.0 (4.1)
Corpus Christi Bay	0.0 (3.4)	0.1 (7.8)	0.0 (27.9)	0.0 (2.7)	0.0 (9.5)	0.0 (3.0)	0.1 (17.0)	0.0 (3.6)
Aransas Bay	0.1 (45.9)	0.3 (15.1)	0.5 (48.0)	0.1 (18.2)	0.2 (19.4)	0.1 (18.2)	0.4 (31.8)	0.0 (3.6)
San Antonio Bay	0.1 (8.3)	0.2 (15.1)	0.1 (9.7)	0.3 (24.9)	0.5 (39.5)	0.2 (22.8)	0.3 (17.7)	0.0 (1.9)
Matagorda Bay	0.1 (3.7)	0.1 (12.1)	0.2 (33.5)	0.1 (10.2)	0.1 (11.0)	0.0 (7.6)	0.1 (14.0)	0.0 (2.4)
East Matagorda Bay	0.1 (71.1)	0.2 (2.7)	0.2 (29.9)	0.1 (8.0)	0 (0)	0.1 (43.6)	0.1 (17.8)	0.0 (4.8)
Galveston Bay	0.1 (31.9)	0.2 (24.1)	0.2 (10.6)	0.1 (9.0)	0.2 (19.4)	0.2 (33.8)	0.1 (17.8)	0.0 (2.1)
Sabine Lake	0.3 (47.6)	0.4 (58.8)	0.7 (27.7)	0.8 (58.6)	0.1 (27.0)	0.4 (57.9)	0.5 (40.4)	0.1 (4.7)

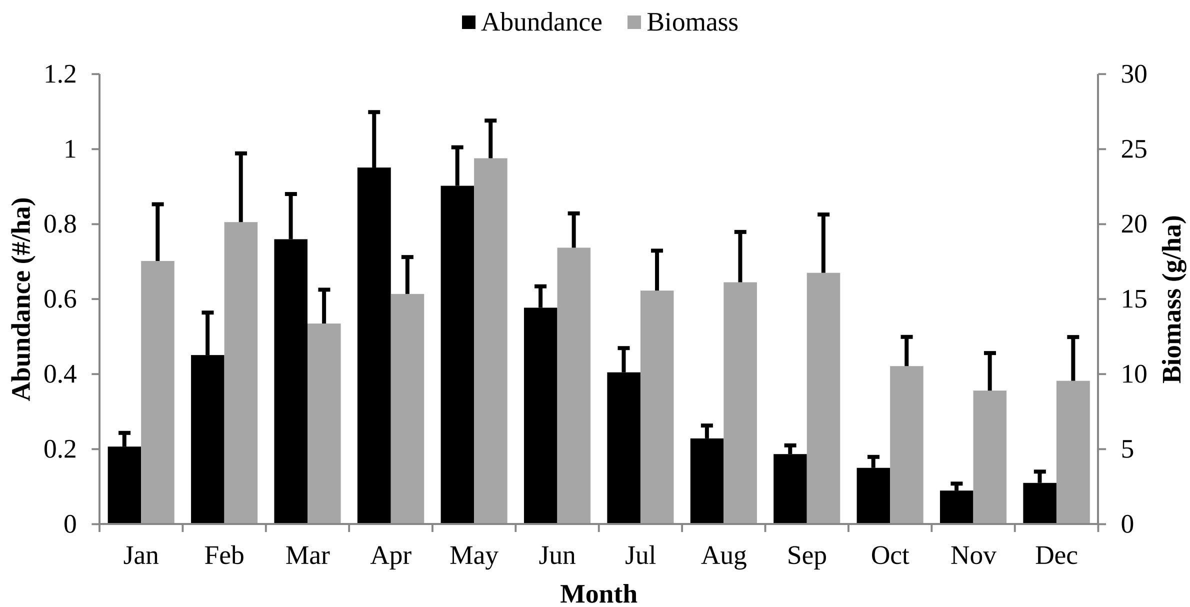

Figure 197. The monthly mean (+SE) abundance and biomass of *Paralichthys lethostigma* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

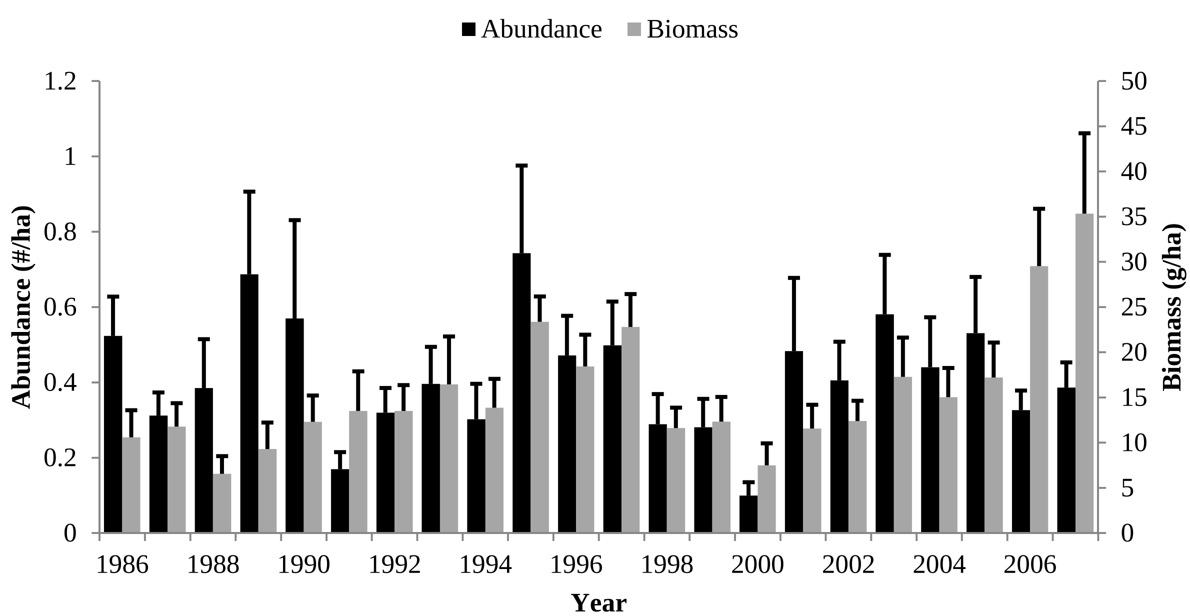

Figure 198. The mean (+SE) annual abundance and biomass of *Paralichthys lethostigma* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 101. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.4 (28.1)	0.8 (33.9)	2.9 (32.3)	4.0 (36.9)
Vermilion-Cote Blanche Bays	0.4 (24.2)	0.7 (30.8)	0.6 (16.4)	0.5 (8.7)
Terrebonne-Timbalier Bays	0.2 (17.6)	0.6 (17.9)	0.8 (14.4)	1.0 (27.4)
Barataria Bay	0.1 (3.4)	0.1 (5.0)	0.1 (0.4)	0.1 (0.5)
Breton-Chandeleur Sounds	0.1 (12.3)	0.1 (12.4)	0.2 (6.5)	0.3 (11.4)
Lake Borgne	0.1 (13.8)	0.2 (19.2)	0.7 (19.6)	1.6 (8.6)
	May	Jun	Jul	Aug
Lake Calcasieu	2.7 (67.5)	1.3 (57.7)	0.8 (52.1)	0.6 (45.9)
Vermilion-Cote Blanche Bays	0.7 (22.5)	0.6 (12.8)	0.5 (12.5)	0.1 (6.2)
Terrebonne-Timbalier Bays	1.2 (32.3)	0.4 (11.9)	0.5 (18.2)	0.3 (14.2)
Barataria Bay	0.1 (1.1)	0.1 (5.1)	0.1 (3.0)	0.0 (2.8)
Breton-Chandeleur Sounds	0.5 (10.6)	0.5 (16.3)	0.4 (8.9)	0.1 (14.0)
Lake Borgne	1.1 (34.3)	1.3 (27.8)	0.3 (15.6)	0.3 (37.0)
	Sep	Oct	Nov	Dec
Lake Calcasieu	0.5 (29.0)	0.1 (17.7)	0.1 (3.7)	0.1 (1.8)
Vermilion-Cote Blanche Bays	0.2 (15.5)	0.1 (9.2)	0.1 (13.3)	0.2 (13.7)
Terrebonne-Timbalier Bays	0.1 (8.1)	0.1 (11.8)	0.1 (6.7)	0.1 (12.5)
Barataria Bay	0.0 (3.6)	0.0 (1.5)	0.0 (8.0)	0.0 (3.6)
Breton-Chandeleur Sounds	0.2 (7.2)	0.4 (15.4)	0.1 (11.4)	0.1 (9.3)
Lake Borgne	0.2 (36.5)	0.2 (7.3)	0.1 (6.9)	0.1 (7.8)
	Mean	SE		
Lake Calcasieu	1.2 (36.3)	0.4 (6.1)		
Vermilion-Cote Blanche Bays	0.4 (15.5)	0.1 (2.1)		
Terrebonne-Timbalier Bays	0.4 (16.1)	0.1 (2.1)		
Barataria Bay	0.1 (3.2)	0.0 (0.6)		
Breton-Chandeleur Sounds	0.3 (11.3)	0.0 (0.9)		
Lake Borgne	0.5 (19.5)	0.1 (3.4)		

Table 102. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	1.9 (43.9)	0.8 (42.1)	1.1 (13.2)	2.4 (23.4)
Vermilion-Cote Blanche Bays	0.1 (5.0)	0.2 (10.1)	0.1 (8.6)	1.6 (24.4)
Terrebonne-Timbalier Bays	0.3 (6.9)	0.3 (12.0)	0.4 (3.2)	0.5 (7.1)
Barataria Bay	0.1 (2.0)	0.1 (3.0)	0.0 (0.8)	0 (0)
Breton-Chandeleur Sounds	1.1 (7.8)	0.2 (0.7)	0.3 (5.8)	0.1 (4.2)
Lake Borgne	0 (0)	0.3 (2.0)	0.4 (4.2)	0.2 (5.1)
	1990	1991	1992	1993
Lake Calcasieu	1.5 (12.4)	0.5 (20.6)	0.7 (11.9)	0.5 (42.2)
Vermilion-Cote Blanche Bays	0.2 (1.9)	0.1 (9.8)	0.3 (11.0)	0.7 (14.9)
Terrebonne-Timbalier Bays	0.2 (14.5)	0.1 (18.0)	0.3 (17.5)	0.6 (19.2)
Barataria Bay	0.1 (5.1)	0.1 (12.4)	0.0 (5.5)	0.1 (2.8)
Breton-Chandeleur Sounds	0.4 (15.5)	0.1 (3.5)	0.2 (9.3)	0.3 (14.3)
Lake Borgne	2.5 (43.1)	0.4 (14.4)	0.7 (39.4)	0.2 (10.5)
	1994	1995	1996	1997
Lake Calcasieu	0.5 (7.3)	0.6 (17.3)	1.5 (55.4)	0.7 (73.8)
Vermilion-Cote Blanche Bays	0.3 (13.5)	0.9 (5.9)	0.4 (10.7)	0.4 (10.0)
Terrebonne-Timbalier Bays	0.3 (12.6)	1.6 (45.1)	0.6 (20.7)	0.8 (23.4)
Barataria Bay	0.2 (0.2)	0.1 (2.0)	0.1 (2.8)	0.0 (1.7)
Breton-Chandeleur Sounds	0.4 (32.2)	0.2 (27.4)	0.2 (13.4)	0.3 (15.8)
Lake Borgne	0.5 (3.2)	0.4 (24.5)	0.2 (7.8)	1.3 (52.9)
	1998	1999	2000	2001
Lake Calcasieu	0.8 (28.3)	0.8 (47.6)	0.4 (40.0)	3.5 (47.4)
Vermilion-Cote Blanche Bays	0.1 (2.3)	0.3 (7.8)	0.0 (0.6)	0.3 (8.7)
Terrebonne-Timbalier Bays	0.3 (16.8)	0.5 (16.5)	0.1 (6.4)	0.5 (3.2)
Barataria Bay	0.0 (0.1)	0 (0)	0.0 (3.0)	0.0 (2.5)
Breton-Chandeleur Sounds	0.2 (11.4)	0.1 (4.6)	0.0 (2.7)	0.1 (14.6)
Lake Borgne	0.6 (26.3)	0.1 (5.7)	0.1 (3.9)	0.2 (16.0)
	2002	2003	2004	2005
Lake Calcasieu	0.7 (29.9)	1.3 (41.9)	3.0 (28.3)	1.5 (45.1)
Vermilion-Cote Blanche Bays	0.3 (11.5)	0.6 (20.7)	0.3 (22.0)	0.3 (12.4)
Terrebonne-Timbalier Bays	0.5 (6.9)	0.7 (22.1)	0.2 (15.4)	0.8 (21.5)
Barataria Bay	0.1 (1.1)	0.1 (1.0)	0.2 (12.2)	0.0 (0.0)
Breton-Chandeleur Sounds	0.5 (12.7)	0.3 (6.2)	0.1 (7.0)	0.2 (14.5)
Lake Borgne	0.4 (35.7)	0.6 (18.5)	0.0 (0.1)	0.8 (7.4)
	2006	2007	Mean	SE
Lake Calcasieu	0.4 (43.0)	1.6 (92.9)	1.2 (36.7)	0.2 (4.4)
Vermilion-Cote Blanche Bays	0.4 (53.9)	0.6 (75.3)	0.5 (15.5)	0.1 (3.7)
Terrebonne-Timbalier Bays	0.3 (22.7)	0.3 (22.0)	0.5 (16.1)	0.1 (2.0)
Barataria Bay	0.0 (9.2)	0.0 (2.3)	0.1 (3.2)	0.0 (0.8)
Breton-Chandeleur Sounds	0.2 (18.5)	0.1 (4.8)	0.3 (11.2)	0.0 (1.7)
Lake Borgne	0.8 (35.5)	0.4 (59.8)	0.5 (18.9)	0.1 (3.9)

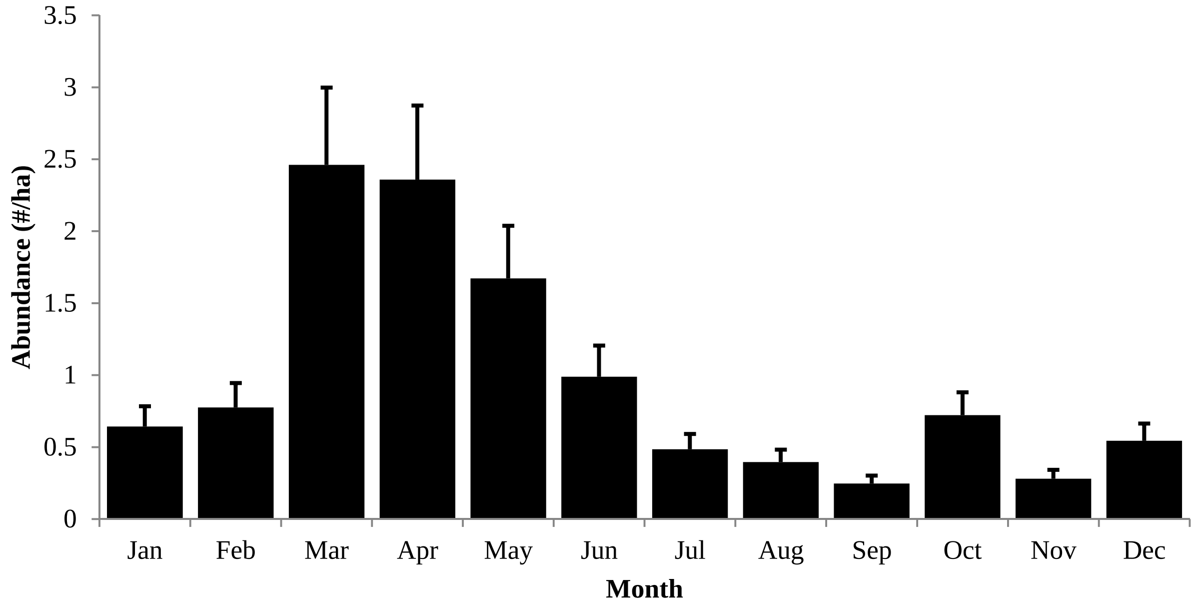

Figure 199. The monthly mean (+SE) abundance of *Paralichthys lethostigma* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Biomass data were not available for *P. lethostigma* as length measurements were not recorded.

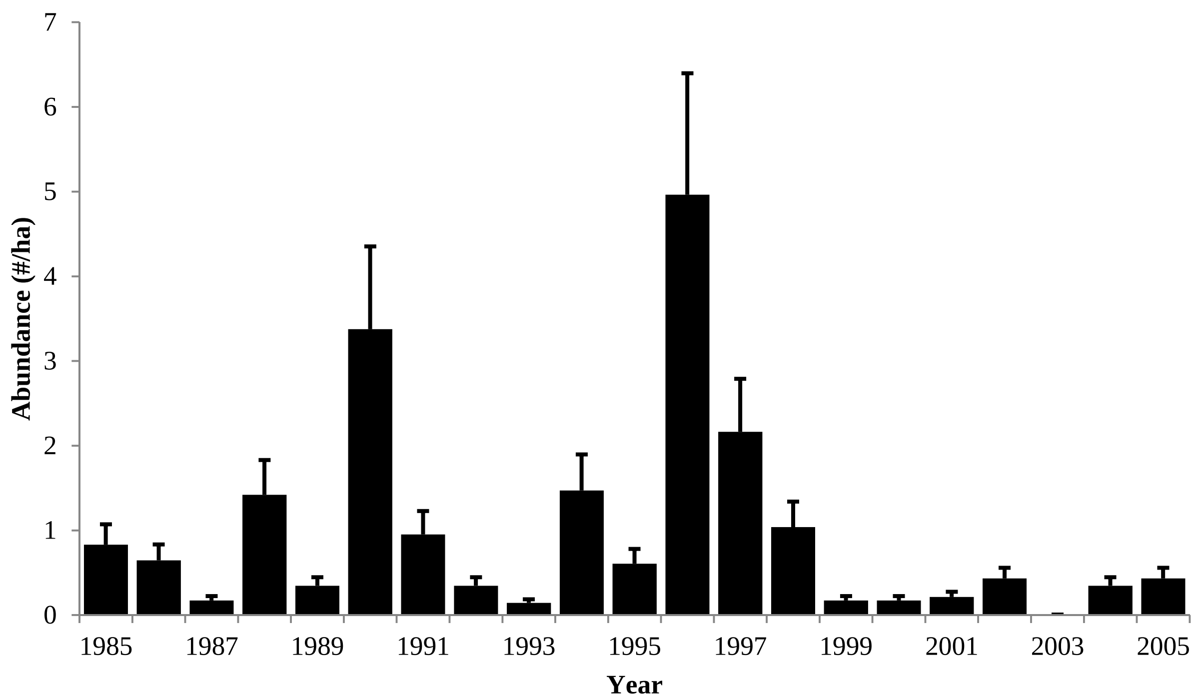

Figure 200. The mean (+SE) annual abundance of *Paralichthys lethostigma* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data were not available for *P. lethostigma* as length measurements were not recorded.

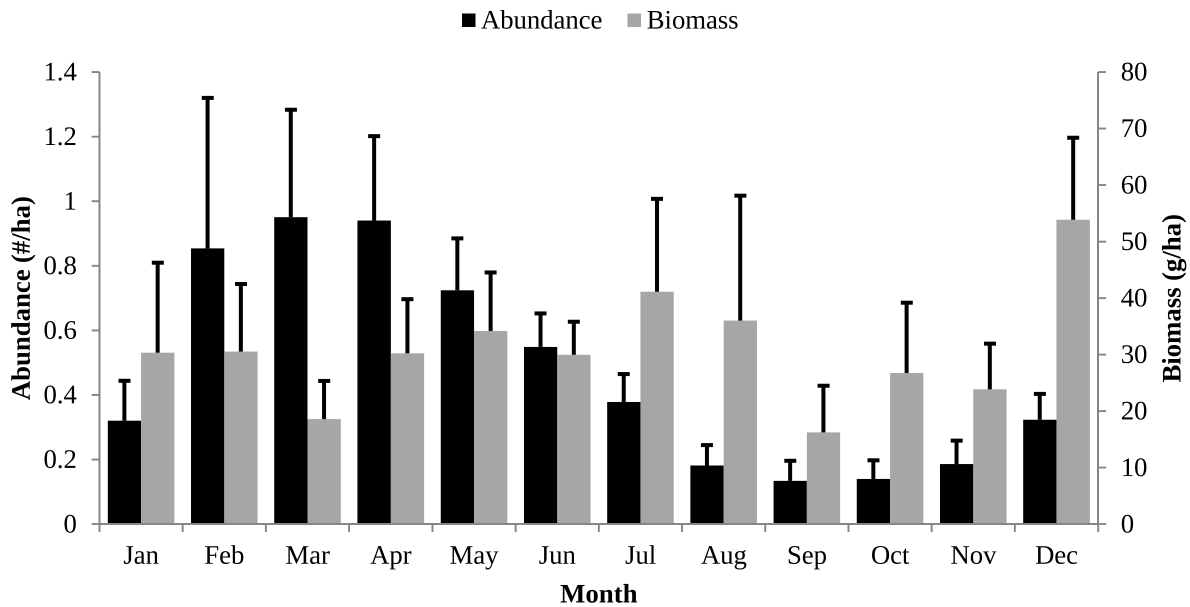

Figure 201. The monthly mean (+SE) abundance and biomass of *Paralichthys lethostigma* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

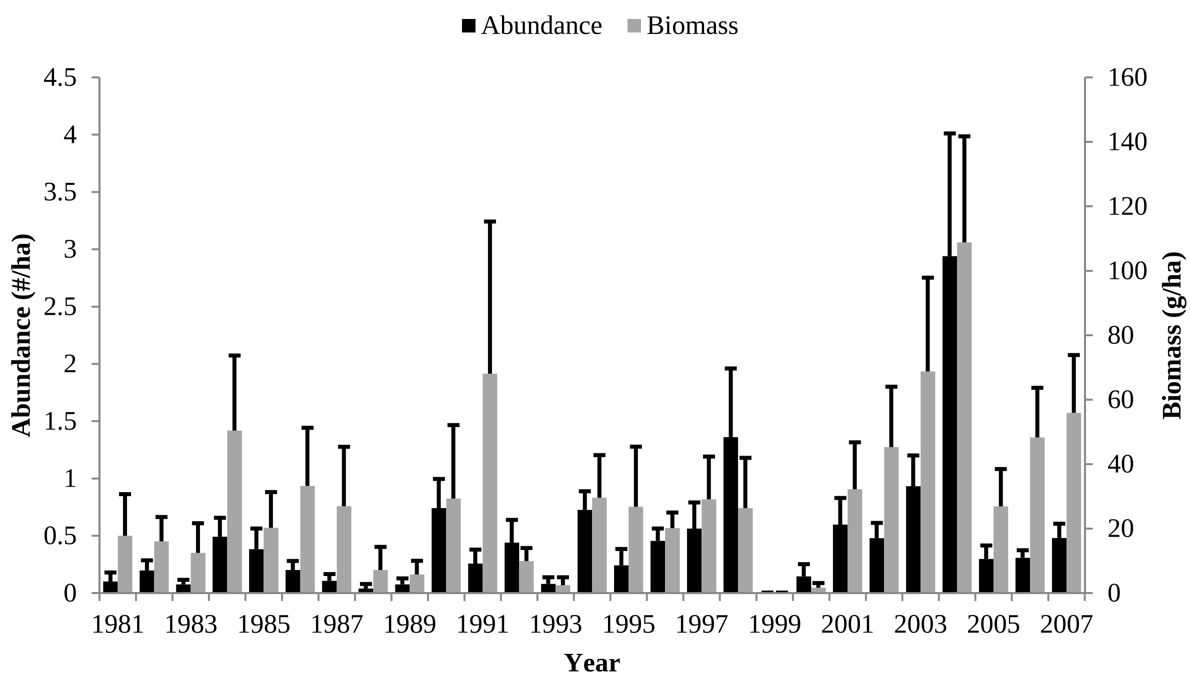

Figure 202. The mean (+SE) annual abundance and biomass of *Paralichthys lethostigma* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

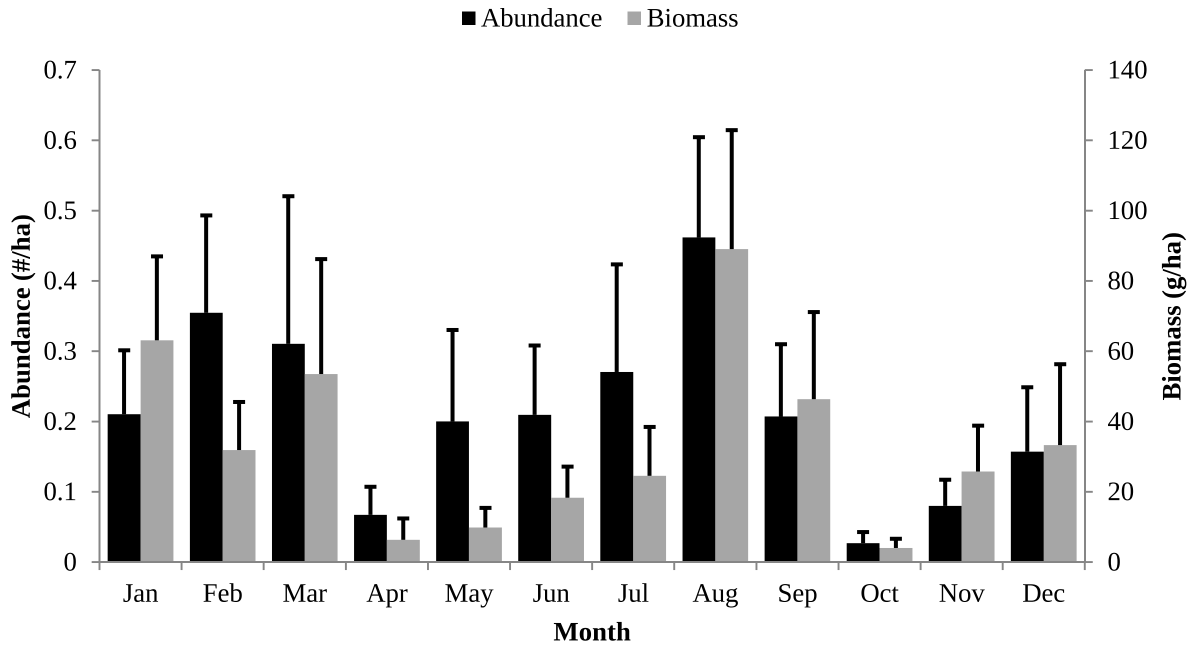

Figure 203. The monthly mean (+SE) abundance and biomass of *Paralichthys lethostigma* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

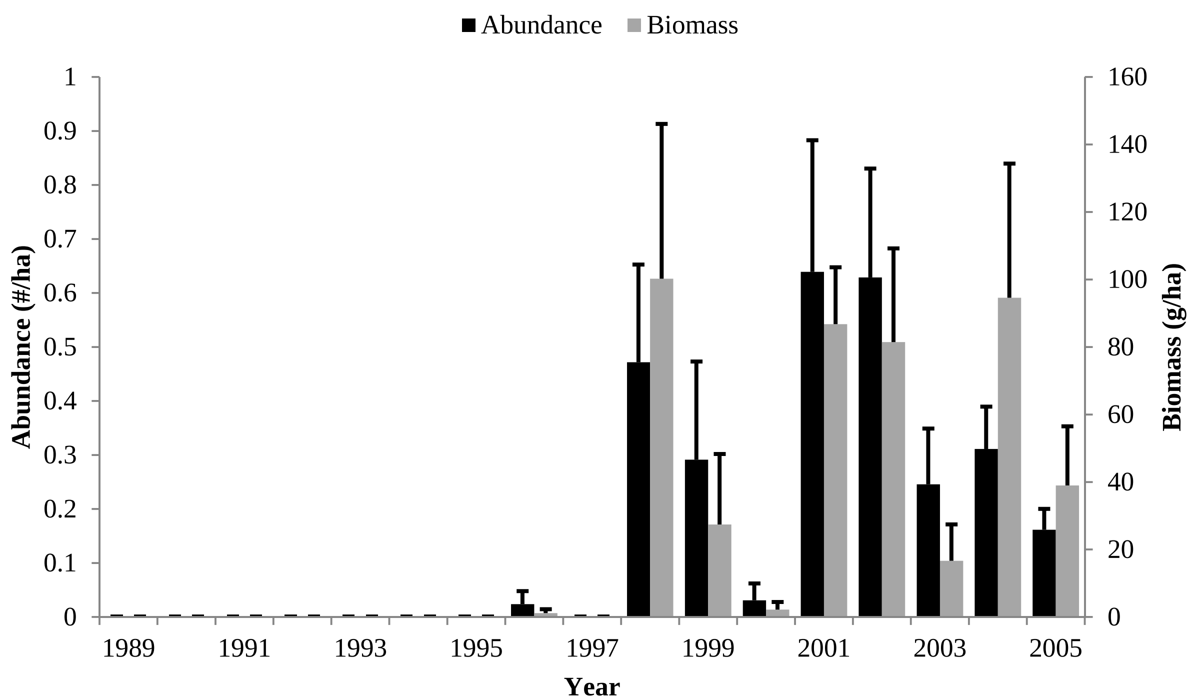

Figure 204. The mean (+SE) annual abundance and biomass of *Paralichthys lethostigma* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 103. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Alabama and Florida. Values are means of monthly means over the years from 1986-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Mobile Bay (AL)	0.4 (45.9)	1.1 (24.2)	1.1 (19.3)	0.7 (32.1)	0.8 (31.9)
E MS Sound (AL)	0.1 (0.0)	0.4 (37.6)	0.2 (12.2)	0.6 (15.0)	0.1 (7.0)
Perdido Bay (AL)	0.3 (7.8)	1.0 (104.2)	1.3 (15.2)	2.0 (46.2)	1.3 (74.8)
Apalachicola Bay (FL)	0.3 (144.0)	0.7 (56.0)	0.8 (174.9)	0.2 (25.0)	0.6 (20.2)
Suwannee Sound (FL)	0.4 (119.4)	0 (0)	0 (0)	0 (0)	0.2 (115.8)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0.4 (0.2)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Jun	**Jul**	**Aug**	**Sep**	**Oct**
Mobile Bay (AL)	0.6 (35.1)	0.5 (54.6)	0.2 (19.1)	0.2 (22.6)	0.1 (34.4)
E MS Sound (AL)	0.3 (19.8)	0.3 (14.8)	0.1 (3.3)	0 (0)	0 (0)
Perdido Bay (AL)	0.6 (25.1)	0 (0)	0.2 (108.9)	0.2 (11.9)	0.3 (25.5)
Apalachicola Bay (FL)	0.5 (45.1)	0.5 (37.5)	0.8 (183.6)	0.5 (126.5)	0.1 (17.8)
Suwannee Sound (FL)	0 (0)	0 (0)	0.2 (9.5)	0.3 (46.6)	0.4 (42.6)
Cedar Key (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Nov	**Dec**	**Mean**	**SE**	
Mobile Bay (AL)	0.2 (31.1)	0.3 (37.5)	0.5 (32.3)	0.1 (3.0)	
E MS Sound (AL)	0 (0)	0.3 (44.8)	0.2 (12.9)	0.1 (4.3)	
Perdido Bay (AL)	0.3 (23.0)	0.6 (137.7)	0.7 (48.4)	0.2 (13.4)	
Apalachicola Bay (FL)	0.6 (167.0)	0.4 (66.6)	0.5 (88.7)	0.1 (18.9)	
Suwannee Sound (FL)	0 (0)	0.3 (76.3)	0.1 (34.2)	0.0 (13.4)	
Cedar Key (FL)	0.3 (123.1)	0 (0)	0.1 (10.3)	0.0 (10.3)	
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	

Table 104. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Paralichthys lethostigma* for each estuary in Alabama and Florida. Values are means of monthly means over the years 1981-2007 for Alabama and 1989-2005 for Florida. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985	1986
Mobile Bay (AL)	0.0 (21.8)	0.2 (10.4)	0.1 (21.3)	0.7 (68.8)	0.6 (31.9)	0.1 (10.6)
E MS Sound (AL)	0.1 (7.8)	0.2 (23.4)	0 (0)	0.1 (27.9)	0.1 (2.0)	0.3 (34.5)
Perdido Bay (AL)		0 (0)	0 (0)	0 (0)	0 (0)	0.4 (175.5)
	1987	1988	1989	1990	1991	1992
Mobile Bay (AL)	0.1 (45.8)	0 (0)	0.1 (6.0)	0.6 (9.0)	0.2 (17.3)	0.3 (4.8)
E MS Sound (AL)	0.1 (5.2)	0.1 (23.8)	0.1 (7.1)	1.6 (27.8)	0.1 (26.9)	0.7 (27.5)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.3 (71.7)	0.5 (211.5)	0.8 (8.9)
Tampa Bay (FL)			0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)			0 (0)	0 (0)	0 (0)	0 (0)
	1993	1994	1995	1996	1997	1998
Mobile Bay (AL)	0.0 (2.3)	0.2 (4.3)	0.2 (13.8)	0.7 (33.7)	0.7 (38.2)	1.7 (33.5)
E MS Sound (AL)	0.3 (5.3)	0.1 (4.0)	0.3 (84.6)	0.3 (1.7)	0 (0)	0.3 (10.1)
Perdido Bay (AL)	0 (0)	2.5 (111.4)	0.4 (7.8)	0 (0)	0.8 (30.1)	2.3 (37.2)
Apalachicola Bay (FL)						0.6 (147.5)
Suwannee Sound (FL)				0.2 (9.6)	0 (0)	
Cedar Key (FL)				0 (0)	0 (0)	
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	1999	2000	2001	2002	2003	2004
Mobile Bay (AL)	0 (0)	0.2 (2.8)	0.5 (34.1)	0.4 (61.0)	1.4 (105.8)	3.5 (130.5)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.1 (1.6)	0.3 (22.1)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	1.4 (61.6)	0.9 (31.1)	0.1 (1.3)	3.8 (120.2)
Apalachicola Bay (FL)	0.3 (27.4)	0.0 (2.2)	0.8 (109.1)	0.9 (113.7)	0.3 (24.5)	0.5 (161.9)
Suwannee Sound (FL)			0.6 (105.3)	0 (0)	0 (0)	0.2 (49.8)
Cedar Key (FL)			0 (0)	0 (0)	0.2 (0.1)	0.2 (61.6)
Tampa Bay (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor (FL)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	2005	2006	2007	Mean	SE	
Mobile Bay (AL)	0.4 (20.4)	0.3 (56.0)	0.5 (68.0)	0.5 (31.6)	0.2 (1.2)	
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.2 (12.7)	0.1 (0.7)	
Perdido Bay (AL)	0.5 (140.6)	0.4 (52.8)	0.9 (41.0)	0.6 (42.4)	0.2 (2.3)	
Apalachicola Bay (FL)	0.6 (131.1)			0.5 (89.7)	0.1 (22.0)	
Suwannee Sound (FL)	0.1 (57.9)			0.2 (31.8)	0.1 (15.4)	
Cedar Key (FL)	0 (0)			0.1 (8.8)	0.0 (8.8)	
Tampa Bay (FL)	0 (0)			0 (0)	0 (0)	
Charlotte Harbor (FL)	0 (0)			0 (0)	0 (0)	

Cynoscion nebulosus

The abundance pattern for spotted seatrout was consistent between Texas, Louisiana and Mississippi with peaks in fall and winter, but in Alabama, abundance peaked in spring and summer (Figure 205). Florida did not report spotted seatrout (*Cynoscion nebulosus*) from trawl catches, and no abundance or biomass data were available in that state. Abundance in Louisiana was highest among the states with an overall mean (mean of 12 monthly means in Figure 205) of 1.0/ha, followed by Mississippi (0.6/ha), Alabama (0.4/ha), and Texas (0.2/ha).

The length frequency distributions for spotted seatrout in each state (Figure 206) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests, except for Texas and Mississippi (P=0.720). Spotted seatrout ranged in size from 20 – 702 mm (mean=176.6, SD=71.7) in Texas, 7 – 557 mm (mean=139.4, SD=48.2) in Louisiana, 29 – 371 mm (mean=171.1, SD=60.5) in Mississippi, and 26 – 471 mm (mean=87.4, SD=64.1) in Alabama.

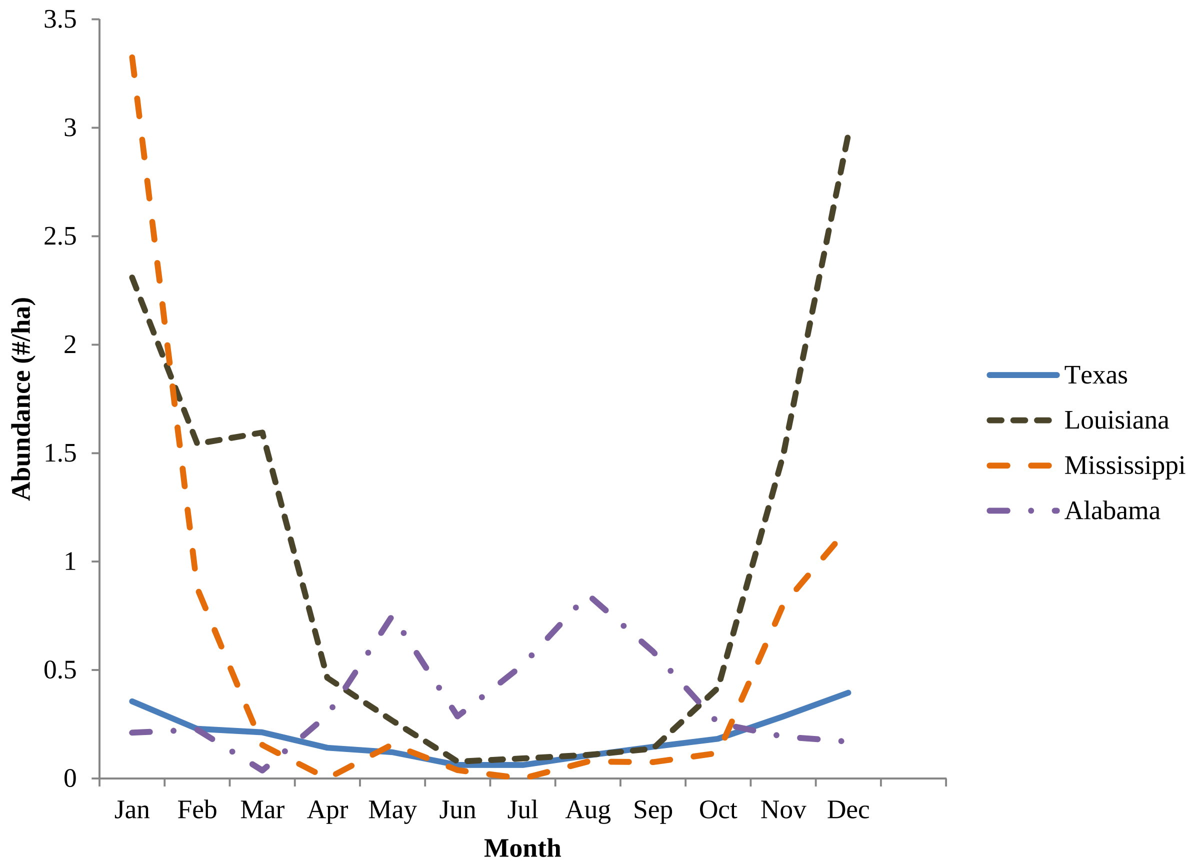

Figure 205. Monthly mean abundance of *Cynoscion nebulosus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1986 – 2007 for Louisiana, 1981 – 2005 for Mississippi, and 1981 – 2007 for Alabama.

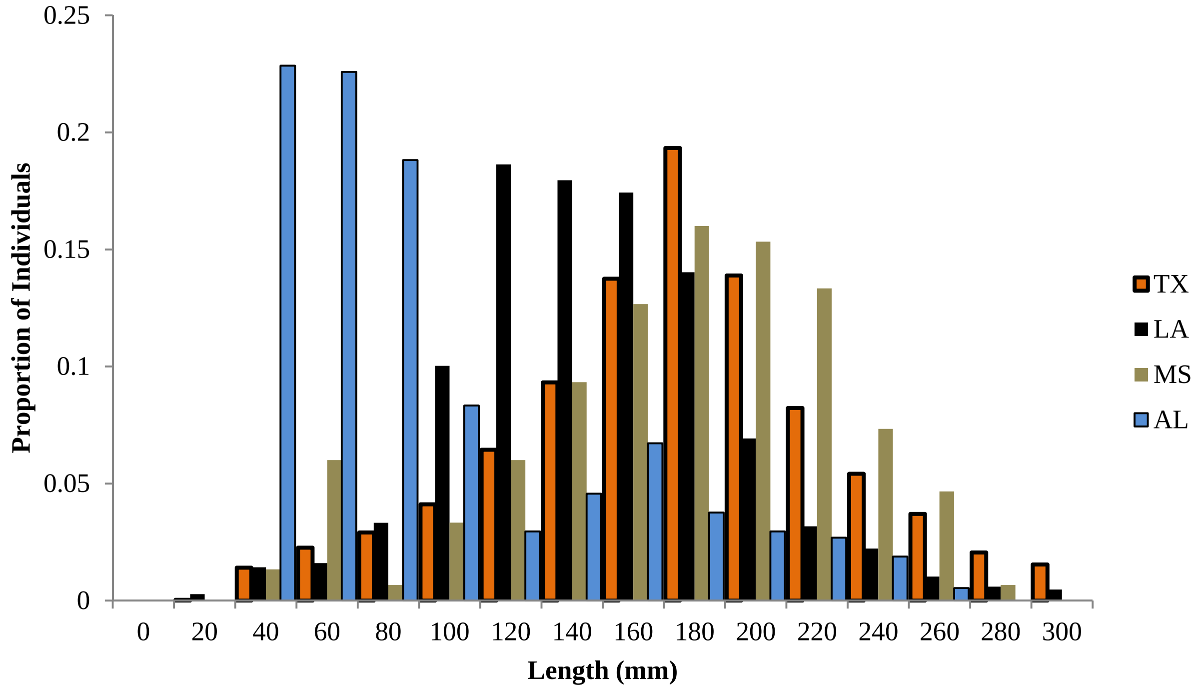

Figure 206. Length frequency of all spotted seatrout (*Cynoscion nebulosus*) measured as part of the fishery-independent monitoring programs in the four of the five Gulf Coast states. The data encompass sampling from the following years: Texas (n=2,179): 1982 – 2005; Louisiana (n=3,999): 1986 – 2007; Mississippi (n=150): 1985 – 2005; and Alabama (n=372): 1981 – 2007 (n-values represent the number of individuals measured). Florida did not report *C. nebulosus* in trawls. Lengths are combined into 20-mm bins.

In Texas, the mean monthly abundance and biomass showed a seasonal pattern with peaks in the late fall/early winter and low numbers in the summer months (Figure 207). Mean annual abundance peaked in 1992 (0.3/ha) and biomass peaked in 1984 (59.0 g/ha) (Figure 208). A strong spatial variability was seen in Texas with the highest mean numbers in Upper Laguna Madre and Aransas Bay (Tables 105 and 106).

In Louisiana, the mean monthly abundance and biomass showed a seasonal pattern with peaks in the late fall/early winter and low numbers in the summer months (Figure 209). Mean annual abundance and biomass peaked in 1993 (2.5/ha and 93.3 g/ha, respectively) (Figure 210). A strong spatial variability was seen in Louisiana with the highest mean numbers in Lake Borgne and Terrebonne-Timbalier Bays (Tables 107 and 108).

A strong seasonal mean abundance and biomass variability was present for spotted seatrout in Mississippi with higher mean abundance and biomass in the winter (Figure 211). A lone peak of monthly mean biomass occurred in May. Mean annual abundance and biomass peaked in 1987 (3.2/ha and 30.7 g/ha, respectively) (Figure 212).

In Alabama, spotted seatrout showed a peak in mean abundance in spring and summer, while biomass showed peaks in winter, summer, and fall (Figure 213). Mean annual abundance peaked in 2007 (2.3/ha) and biomass peaked in 2006 (112.6 g/ha) (Figure 214). Spotted seatrout were found in higher abundance and biomass in Mobile Bay (Tables 109 and 110).

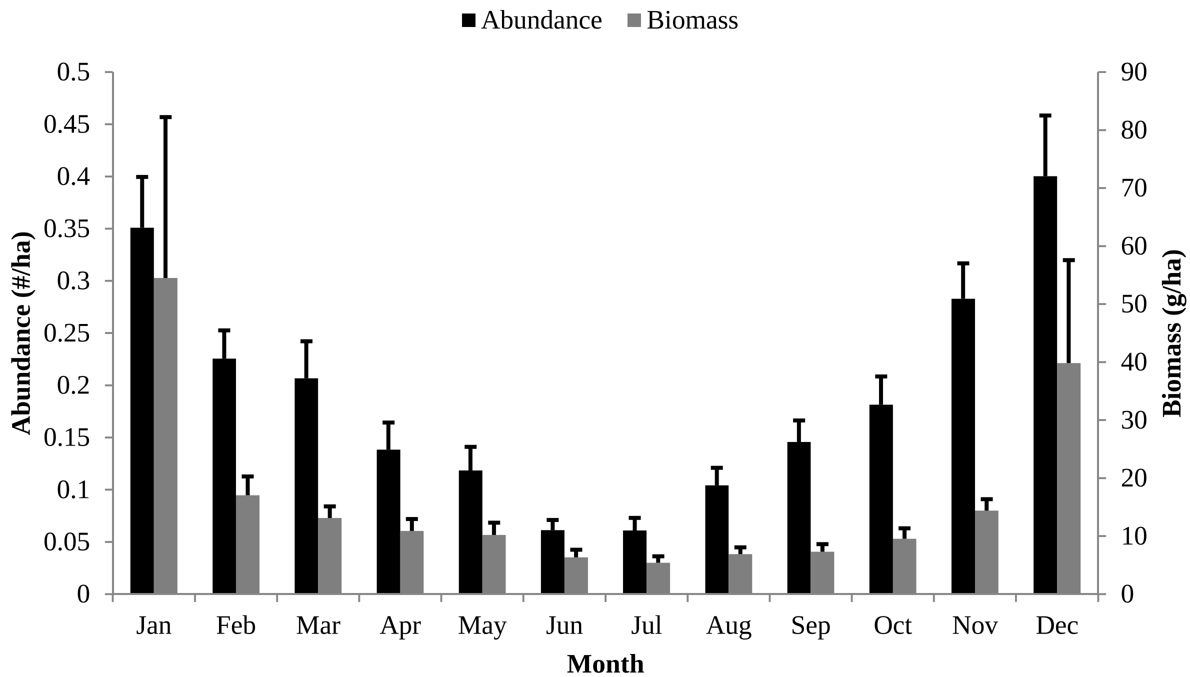

Figure 207. The monthly mean (+SE) abundance and biomass of *Cynoscion nebulosus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

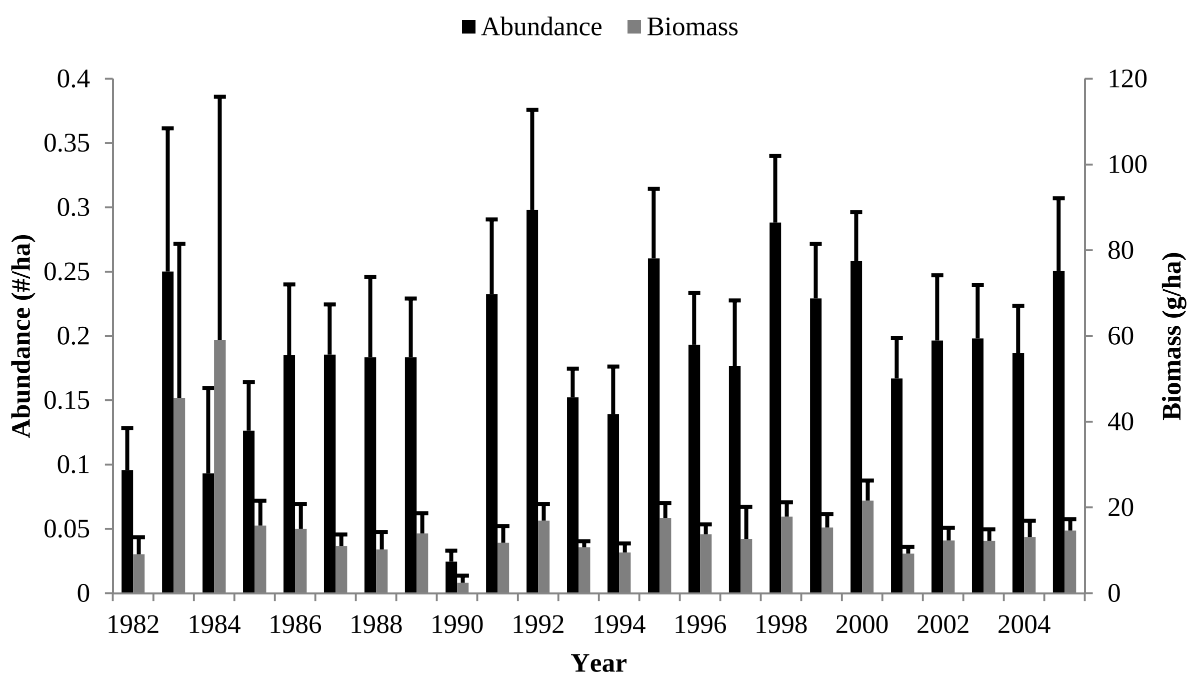

Figure 208. The mean (+SE) annual abundance and biomass of *Cynoscion nebulosus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 105. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May
Lower Laguna Madre	0.3 (50.4)	0.2 (12.0)	0.1 (8.1)	0.1 (3.2)	0.1 (4.9)
Upper Laguna Madre	0.4 (84.3)	0.3 (21.5)	0.4 (37.3)	0.2 (18.6)	0.3 (19.7)
Corpus Christi Bay	0.3 (89.3)	0.2 (9.6)	0.1 (8.7)	0.1 (3.9)	0.1 (5.4)
Aransas Bay	0.9 (72.2)	0.5 (32.4)	0.6 (37.5)	0.5 (38.0)	0.4 (37.8)
San Antonio Bay	0.4 (30.5)	0.3 (13.4)	0.1 (4.2)	0.1 (11.8)	0.1 (6.2)
Matagorda Bay	0.2 (12.7)	0.0 (0.8)	0.1 (3.2)	0.0 (2.5)	0.0 (3.9)
East Matagorda Bay	0.1 (8.5)	0.1 (12.3)	0.2 (7.5)	0.0 (1.8)	0.1 (2.7)
Galveston Bay	0.2 (66.4)	0.2 (28.7)	0.1 (5.4)	0.0 (3.6)	0.0 (2.6)
Sabine Lake	0.2 (21.4)	0.2 (18.5)	0.1 (17.9)	0.1 (10.1)	0.0 (5.6)

	Jun	Jul	Aug	Sep	Oct
Lower Laguna Madre	0.1 (11.1)	0.1 (10.9)	0.4 (22.0)	0.2 (14.5)	0.2 (9.2)
Upper Laguna Madre	0.3 (12.0)	0.4 (22.7)	0.6 (30.3)	1.0 (44.8)	0.7 (27.7)
Corpus Christi Bay	0.1 (14.0)	0.0 (5.7)	0.0 (4.1)	0.0 (4.2)	0.1 (11.9)
Aransas Bay	0.1 (10.4)	0.1 (12.1)	0.1 (10.8)	0.2 (10.3)	0.3 (17.5)
San Antonio Bay	0.0 (2.4)	0.0 (0.8)	0.1 (2.7)	0.1 (3.1)	0.3 (9.1)
Matagorda Bay	0.0 (0.1)	0.0 (1.2)	0.0 (1.2)	0.0 (0.3)	0.0 (0.8)
East Matagorda Bay	0.0 (5.7)	0.0 (1.4)	0 (0)	0.1 (3.1)	0.2 (17.6)
Galveston Bay	0.0 (0.0)	0 (0)	0.0 (0.3)	0.0 (1.7)	0.0 (0.4)
Sabine Lake	0.0 (9.1)	0 (0)	0.0 (3.8)	0 (0)	0.1 (3.0

	Nov	Dec	Mean	SE
Lower Laguna Madre	0.5 (35.1)	0.3 (28.8)	0.2 (17.5)	0.0 (4.1)
Upper Laguna Madre	0.7 (31.7)	0.7 (40.8)	0.5 (32.6)	0.1 (5.5)
Corpus Christi Bay	0.1 (10.5)	0.3 (67.5)	0.1 (19.6)	0.0 (8.1)
Aransas Bay	0.6 (32.1)	1.0 (99.2)	0.4 (34.1)	0.1 (7.9)
San Antonio Bay	0.3 (10.5)	0.3 (10.0)	0.2 (8.7)	0.0 (2.3)
Matagorda Bay	0.1 (2.7)	0.1 (4.5)	0.0 (2.8)	0.0 (1.0)
East Matagorda Bay	0.2 (9.5)	0.2 (20.6)	0.1 (7.6)	0.0 (1.9)
Galveston Bay	0.2 (5.3)	0.3 (27.8)	0.1 (11.9)	0.0 (20.0)
Sabine Lake	0.1 (4.4)	0.3 (15.3)	0.1 (9.1)	0.0 (2.2)

Table 106. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0.1 (6.5)	0.1 (17.7)	0.2 (13.0)	0.1 (15.5)	0.6 (55.5)	0.1 (6.7)	0.0 (0.7)	0.3 (12.2)	0 (0)
Upper Laguna Madre	0.5 (36.6)	0.8 (45.7)	0.1 (79.6)	0.3 (8.7)	0.1 (4.4)	0.5 (51.9)	0.3 (15.4)	0.3 (22.1)	0.0 (1.6)
Corpus Christi Bay	0.0 (3.2)	0.1 (83.7)	0.2 (150.2)	0.1 (10.3)	0.3 (20.1)	0.1 (6.1)	0.1 (7.1)	0.2 (33.4)	0.0 (0.9)
Aransas Bay	0.1 (9.8)	0.8 (132.4)	0.2 (47.1)	0.3 (22.6)	0.3 (14.5)	0.4 (21.4)	0.8 (37.9)	0.6 (32.9)	0.0 (2.5)
San Antonio Bay	0.0 (9.1)	0.1 (5.5)	0.0 (3.3)	0.1 (4.2)	0.1 (4.8)	0.3 (15.2)	0.1 (4.9)	0.1 (9.4)	0.0 (0.6)
Matagorda Bay	0 (0)	0.0 (2.5)	0.0 (1.1)	0.0 (1.5)	0.1 (5.9)	0.0 (1.5)	0.0 (5.5)	0.0 (1.3)	0 (0)
East Matagorda Bay						0.2 (11.4)	0.1 (9.6)	0.1 (1.3)	0 (0)
Galveston Bay	0.1 (4.1)	0.0 (17.6)	0.1 (91.0)	0.1(43.8)	0.1 (31.2)	0.1 (2.0)	0.0 (1.0)	0.1 (2.9)	0.0 (0.2)
Sabine Lake					0.0 (2.6)	0.0 (1.3)	0.1 (7.2)	0.0 (7.0)	0.0 (24.1)
	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.5 (33.8)	0.4 (35.2)	0.2 (26.8)	0.2 (33.4)	0.5 (38.6)	0.2 (13.4)	0.1 (6.4)	0.2 (28.9)	0.1 (3.8)
Upper Laguna Madre	0.3 (8.8)	0.7 (42.3)	0.7 (48.6)	0.5 (29.7)	0.5 (24.1)	0.7 (39.5)	0.4 (38.5)	0.7 (44.0)	0.8 (36.9)
Corpus Christi Bay	0.2 (10.8)	0.0 (1.1)	0.0 (3.1)	0.0 (4.4)	0.1 (20.6)	0.1 (10.3)	0.0 (1.5)	0.2 (10.8)	0.2 (13.5)
Aransas Bay	0.6 (28.4)	0.8 (49.9)	0.3 (17.4)	0.1 (11.4)	0.5 (42.0)	0.3 (27.6)	0.3 (16.6)	0.8 (43.3)	0.5 (37.0)
San Antonio Bay	0.2 (5.7)	0.3 (11.3)	0.1 (2.6)	0.3 (6.5)	0.4 (14.2)	0.3 (20.5)	0.3 (19.6)	0.2 (12.5)	0.2 (8.6)
Matagorda Bay	0.0 (1.3)	0.1 (5.1)	0.1 (3.0)	0 (0)	0.0 (2.6)	0.0 (0.6)	0.1 (13.7)	0.1 (3.0)	0.0 (3.1)
East Matagorda Bay	0.0 (1.3)	0.0 (0.7)	0.1 (3.6)	0.1 (18.5)	0.1 (9.6)	0.2 (7.6)	0.1 (3.9)	0.2 (15.9)	0.3 (25.9)
Galveston Bay	0.1 (2.5)	0.2 (6.6)	0.1 (2.2)	0.1 (2.2)	0.1 (3.8)	0.0 (1.5)	0.2 (11.0)	0.2 (9.2)	0.1 (6.7)
Sabine Lake	0.1 (23.3)	0.2 (10.5)	0.1 (14.5)	0.1 (2.0)	0.1 (7.1)	0.2 (11.0)	0.1 (3.8)	0.1 (3.4)	0.1 (9.8)
	2000	2001	2002	2003	2004	2005	Mean	SE	
Lower Laguna Madre	0.1 (9.2)	0.1 (1.4)	0.2 (9.0)	0.2 (11.5)	0.1 (0.9)	0.4 (6.8)	0.2 (17.4)	0.0 (3.2)	
Upper Laguna Madre	0.9 (35.2)	0.5 (21.2)	0.3 (7.0)	0.4 (26.8)	1.0 (62.7)	0.8 (57.1)	0.5 (32.4)	0.1 (4.1)	
Corpus Christi Bay	0.2 (27.8)	0.1 (8.3)	0.1 (7.5)	0.0 (2.8)	0.1 (7.5)	0.1 (15.6)	0.1 (19.2)	0.0 (6.7)	
Aransas Bay	0.7 (77.8)	0.4 (25.4)	0.8 (49.1)	0.6 (42.3)	0.2 (15.9)	0.3 (19.2)	0.4 (34.2)	0.0 (5.5)	
San Antonio Bay	0.1 (11.7)	0.1 (6.2)	0.1 (8.9)	0.2 (9.2)	0.1 (10.0)	0.1 (6.9)	0.2 (8.7)	0.0 (1.0)	
Matagorda Bay	0.1 (1.8)	0.0 (0.6)	0.0 (2.9)	0.1 (3.0)	0.1 (1.8)	0.1 (4.6)	0.0 (2.8)	0.0 (0.6)	
East Matagorda Bay	0.2 (13.3)	0.0 (1.8)	0.0 (4.8)	0.1 (2.5)	0.0 (2.9)	0.2 (9.5)	0.1 (7.6)	0.0 (1.6)	
Galveston Bay	0.1 (0.8)	0.1 (3.2)	0.1 (6.8)	0.1 (2.5)	0.1 (19.3)	0.3 (12.7)	0.1 (11.9)	0.0 (4.1)	
Sabine Lake	0.0 (2.8)	0.1 (17.1)	0.0 (1.1)	0.3 (10.5)	0.2 (8.0)	0.2 (14.9)	0.1 (9.1)	0.0 (1.5)	

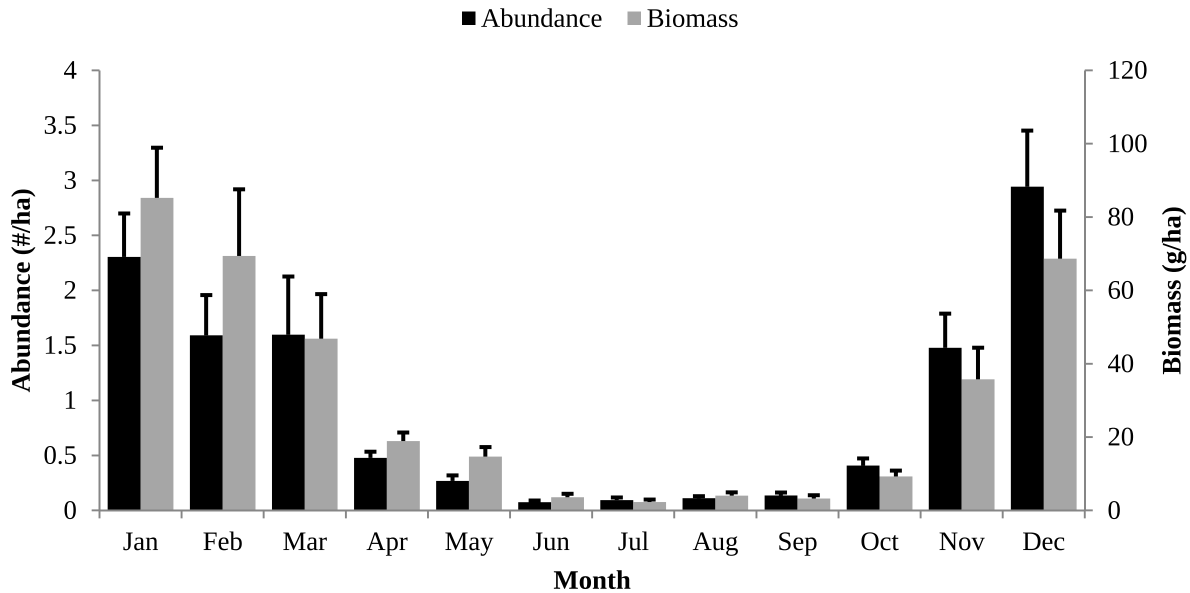

Figure 209. The monthly mean (+SE) abundance and biomass of *Cynoscion nebulosus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

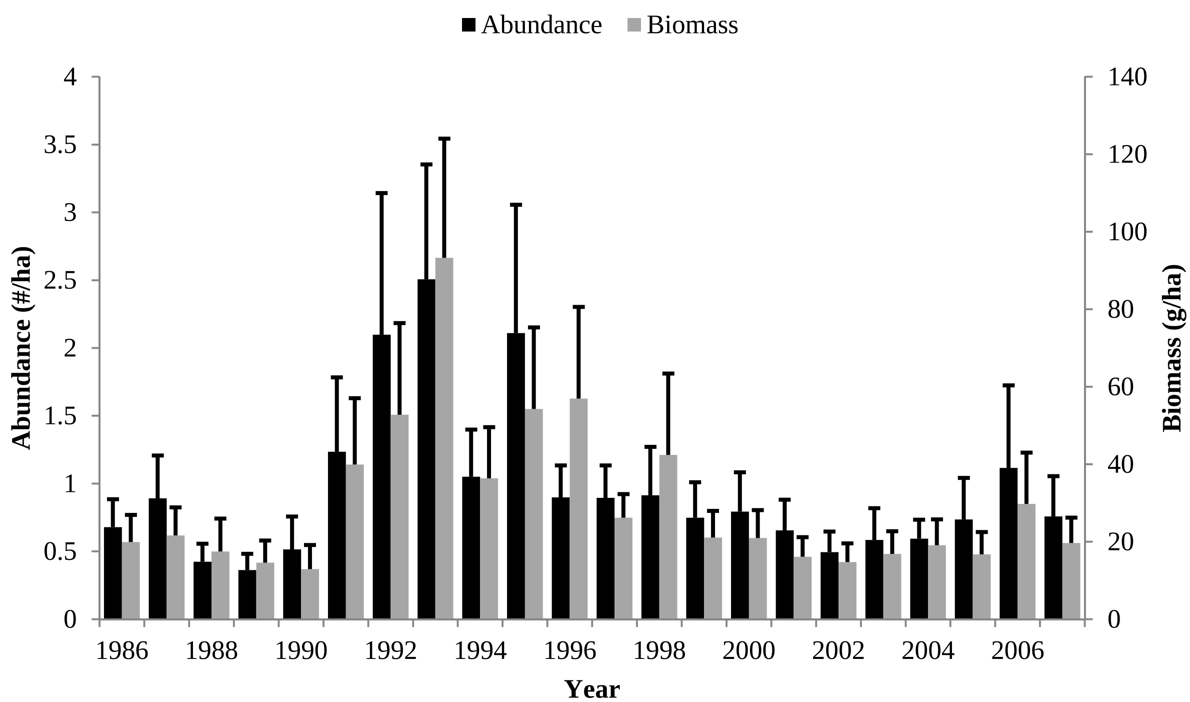

Figure 210. The mean (+SE) annual abundance and biomass of *Cynoscion nebulosus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 107. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.8 (160.9)	0.5 (46.9)	0.4 (27.0)	0.4 (15.5)
Vermilion-Cote Blanche Bays	0.7 (32.8)	0.8 (27.8)	0.4 (16.8)	0.4 (20.1)
Terrebonne-Timbalier Bays	4.2 (109.7)	2.0 (53.9)	1.4 (39.8)	0.7 (27.7)
Barataria Bay	1.1 (35.8)	0.2 (5.3)	0.2 (3.2)	0.0 (1.2)
Breton-Chandeleur Sounds	1.2 (42.9)	1.2 (53.2)	3.5 (84.9)	0.3 (10.3)
Lake Borgne	4.1 (202.9)	8.5 (576.3)	5.4 (193.3)	1.2 (47.1)
	May	Jun	Jul	Aug
Lake Calcasieu	0.1 (7.0)	0.0 (2.4)	0.1 (0.2)	0.0 (0.1)
Vermilion-Cote Blanche Bays	0.1 (10.1)	0.0 (0.8)	0.0 (0.2)	0.1 (2.4)
Terrebonne-Timbalier Bays	0.4 (21.3)	0.1 (4.4)	0.2 (5.4)	0.2 (8.6)
Barataria Bay	0.0 (1.5)	0.0 (0.5)	0 (0)	0.0 (1.5)
Breton-Chandeleur Sounds	0.4 (18.7)	0.1 (6.2)	0.1 (2.7)	0.1 (3.3)
Lake Borgne	0.5 (31.6)	0.2 (8.4)	0.1 (3.7)	0.3 (5.3)
	Sep	Oct	Nov	Dec
Lake Calcasieu	0.3 (2.3)	0.4 (3.3)	0.7 (9.2)	0.4 (8.2)
Vermilion-Cote Blanche Bays	0.0 (0.9)	0.1 (3.9)	0.4 (13.1)	1.6 (73.9)
Terrebonne-Timbalier Bays	0.2 (8.7)	0.4 (12.6)	2.1 (55.0)	4.5 (87.0)
Barataria Bay	0 (0)	0.0 (0.3)	0.3 (3.3)	1.0 (23.6)
Breton-Chandeleur Sounds	0.1 (0.5)	0.4 (4.8)	1.0 (20.6)	2.1 (48.0)
Lake Borgne	0.2 (3.6)	1.9 (52.4)	7.3 (188.3)	10.0 (276.2)
	Mean	SE		
Lake Calcasieu	0.3 (23.6)	0.1 (13.1)		
Vermilion-Cote Blanche Bays	0.4 (16.9)	0.1 (6.1)		
Terrebonne-Timbalier Bays	1.4 (36.2)	0.4 (9.9)		
Barataria Bay	0.3 (6.4)	0.1 (3.3)		
Breton-Chandeleur Sounds	0.9 (24.7)	0.3 (7.7)		
Lake Borgne	3.3 (132.4)	1.1 (49.1)		

Table 108. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	0.3 (14.0)	0.9 (19.5)	0.5 (33.7)	0.2 (21.2)
Vermilion-Cote Blanche Bays	0.8 (23.5)	0.5 (20.4)	0.3 (21.1)	0.2 (7.0)
Terrebonne-Timbalier Bays	1.0 (27.7)	0.7 (20.4)	0.4 (21.1)	0.5 (14.7)
Barataria Bay	0.3 (6.5)	0.2 (1.7)	0.2 (4.0)	0.2 (13.0)
Breton-Chandeleur Sounds	0.6 (18.8)	0.7 (25.4)	0.2 (4.1)	0.2 (4.9)
Lake Borgne	2.4 (77.3)	4.0 (92.3)	1.1 (32.0)	1.2 (38.2)
	1990	1991	1992	1993
Lake Calcasieu	0.2 (1.4)	0.4 (98.3)	0.3 (8.5)	0.8 (29.2)
Vermilion-Cote Blanche Bays	0.2 (6.7)	0.3 (11.0)	0.9 (29.2)	1.3 (100.3)
Terrebonne-Timbalier Bays	0.4 (9.1)	1.6 (39.1)	1.7 (32.1)	3.2 (86.9)
Barataria Bay	1.1 (23.4)	0.7 (13.5)	0.1 (10.1)	0.0 (2.8)
Breton-Chandeleur Sounds	0.5 (16.8)	0.3 (6.2)	5.7 (129.6)	1.3 (35.8)
Lake Borgne	0.6 (14.4)	6.4 (144.0)	5.3 (192.2)	14.4 (651.4)
	1994	1995	1996	1997
Lake Calcasieu	0.1 (0.8)	0.6 (24.9)	0.4 (183.6)	0.3 (27.1)
Vermilion-Cote Blanche Bays	0.2 (18.5)	0.3 (5.7)	0.2 (10.0)	0.3 (8.1)
Terrebonne-Timbalier Bays	2.3 (77.0)	4.8 (126.1)	1.1 (1.0)	1.6 (40.1)
Barataria Bay	0.0 (0.9)	0.1 (2.1)	0.1 (1.0)	0.2 (3.9)
Breton-Chandeleur Sounds	0.7 (31.4)	0.7 (11.1)	0.5 (65.0)	0.4 (10.6)
Lake Borgne	2.4 (54.3)	3.7 (128.1)	4.1 (160.5)	4.8 (135.4)
	1998	1999	2000	2001
Lake Calcasieu	0.2 (9.0)	0.1 (3.2)	0 (0)	0.3 (1.4)
Vermilion-Cote Blanche Bays	0.6 (16.5)	0.1 (2.7)	0.3 (7.0)	0.3 (10.5)
Terrebonne-Timbalier Bays	1.5 (36.5)	1.5 (42.1)	1.2 (30.9)	1.0 (18.6)
Barataria Bay	0.1 (3.2)	0.7 (21.8)	0.2 (2.6)	0 (0)
Breton-Chandeleur Sounds	0.3 (9.9)	0.5 (11.5)	0.9 (15.0)	0.5 (17.3)
Lake Borgne	6.1 (562.7)	1.3 (37.2)	2.4 (116.4)	1.7 (55.6)
	2002	2003	2004	2005
Lake Calcasieu	0.2 (2.9)	0.1 (1.7)	0.6 (14.6)	0.3 (6.0)
Vermilion-Cote Blanche Bays	0.1 (3.1)	0.2 (8.7)	0.2 (5.8)	0.6 (13.5)
Terrebonne-Timbalier Bays	0.4 (16.3)	0.6 (17.4)	0.3 (10.0)	0.6 (16.7)
Barataria Bay	0.1 (1.3)	0.1 (0.4)	0.0 (13.4)	0.2 (5.7)
Breton-Chandeleur Sounds	1.1 (25.7)	0.9 (20.2)	1.0 (30.5)	0.5 (20.8)
Lake Borgne	1.9 (46.2)	2.0 (69.3)	0.6 (82.8)	1.8 (50.8)
	2006	2007	Mean	SE
Lake Calcasieu	0.6 (8.3)	0.3 (11.9)	0.3 (23.7)	0.1 (8.8)
Vermilion-Cote Blanche Bays	0.5 (24.3)	0.5 (18.2)	0.4 (16.9)	0.1 (4.3)
Terrebonne-Timbalier Bays	2.4 (56.6)	1.3 (23.4)	1.4 (36.2)	0.2 (6.1)
Barataria Bay	0.5 (6.6)	0.2 (2.6)	0.3 (6.4)	0.1 (1.4)
Breton-Chandeleur Sounds	0.5 (16.1)	0.4 (8.9)	0.9 (24.4)	0.2 (5.8)
Lake Borgne	3.2 (30.5)	1.5 (76.7)	3.2 (129.5)	0.6 (34.6)

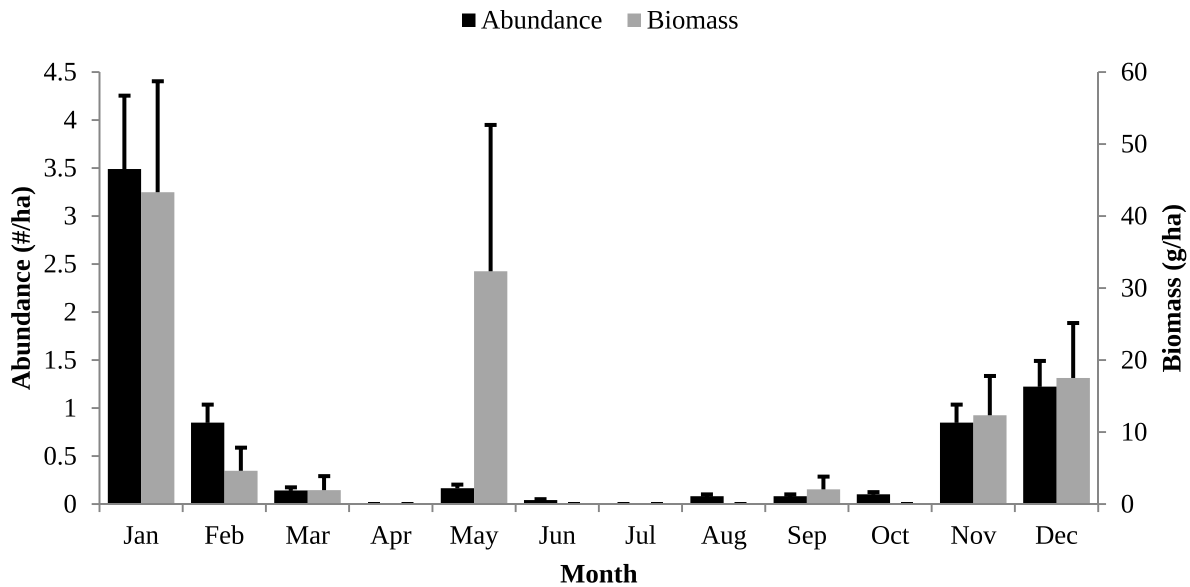

Figure 211. The monthly mean (+SE) abundance and biomass of *Cynoscion nebulosus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2005 and error bars represent annual variability. Biomass data were only available for the years after 1984 as *C. nebulosus* length measurements were not recorded until 1985. Error bars indicate annual variability.

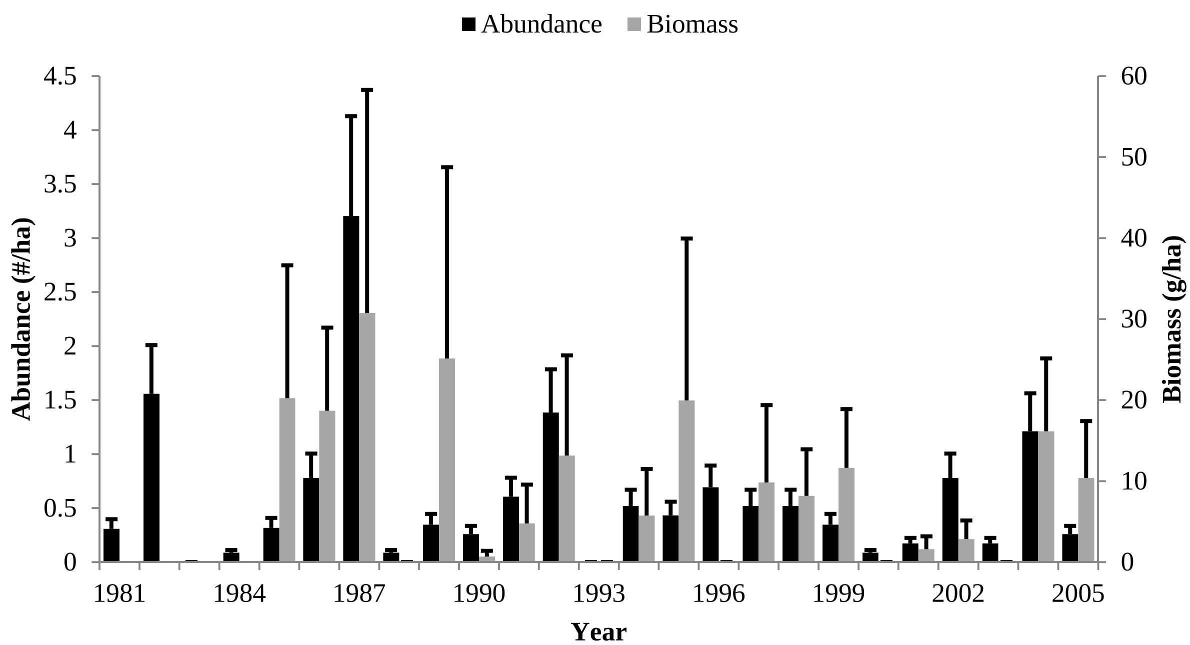

Figure 212. The mean (+SE) annual abundance and biomass of *Cynoscion nebulosus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2005 and error bars represent monthly variability. Biomass data were only available for the years after 1984 as *C. nebulosus* length measurements were not recorded until 1985.

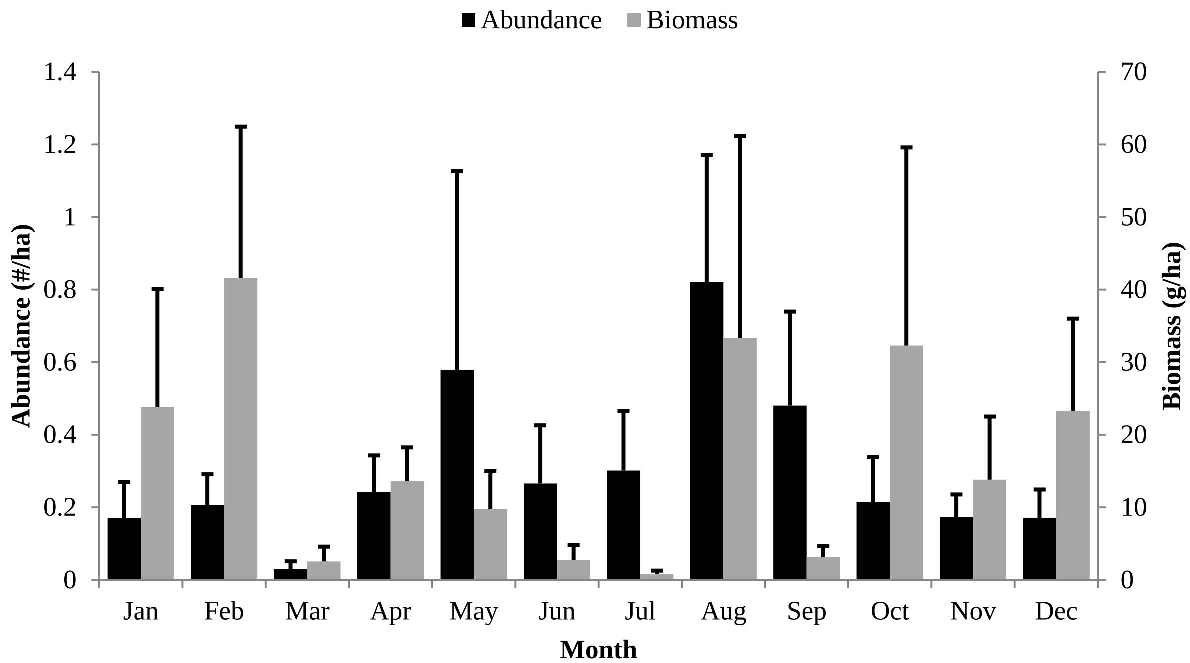

Figure 213. The monthly mean (+SE) abundance and biomass of *Cynoscion nebulosus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1981 – 2007 and error bars represent annual variability.

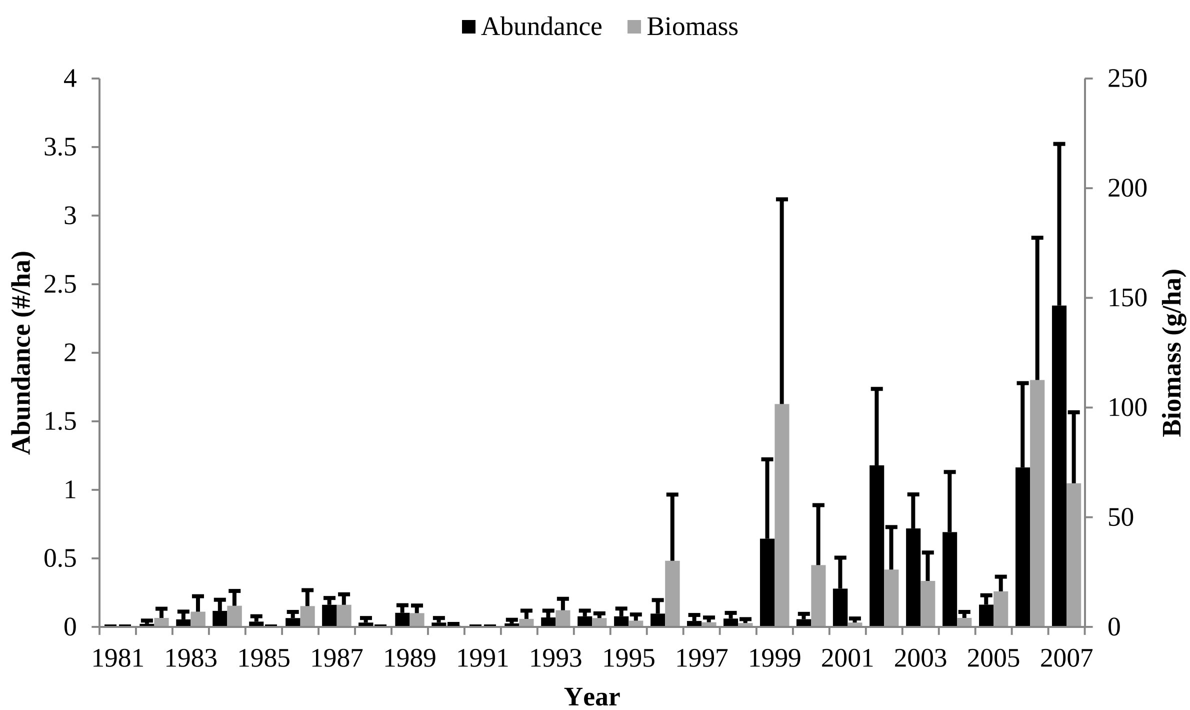

Figure 214. The mean (+SE) annual abundance and biomass of *Cynoscion nebulosus* in Alabama estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1981 – 2007 and error bars represent monthly variability.

Table 109. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Alabama. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May	Jun	Jul
Mobile Bay (AL)	0.2 (27.8)	0.3 (39.3)	0.0 (2.3)	0.1 (12.5)	0.8 (11.9)	0.4 (4.9)	0.4 (1.1)
E MS Sound (AL)	0.1 (5.8)	0.2 (66.5)	0 (0)	0.2 (13.0)	0.1 (9.8)	0 (0)	0.2 (0.1)
Perdido Bay (AL)	0.1 (14.3)	0 (0)	0.1 (7.9)	0.7 (11.7)	0 (0)	0 (0)	0 (0)
	Aug	Sep	Oct	Nov	Dec	Mean	SE
Mobile Bay (AL)	1.1 (35.9)	0.8 (5.1)	0.3 (34.2)	0.2 (18.2)	0.2 (33.0)	0.4 (18.9)	0.1 (4.2)
E MS Sound (AL)	0.1 (0.0)	0 (0)	0.2 (19.7)	0.1 (7.4)	0.3 (12.5)	0.1 (11.2)	0.0 (5.4)
Perdido Bay (AL)	0 (0)	0 (0)	0.1 (23.1)	0.1 (3.4)	0 (0)	0.1 (5.0)	0.1 (2.2)

Table 110. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Cynoscion nebulosus* for each estuary in Alabama. Values are means of monthly means over the years 1981-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1981	1982	1983	1984	1985
Mobile Bay (AL)	0 (0)	0.0 (7.8)	0.1 (9.8)	0.0 (5.2)	0 (0)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.3 (20.1)	0.1 (0.1)
Perdido Bay (AL)		0 (0)	0 (0)	0 (0)	0 (0)
	1986	1987	1988	1989	1990
Mobile Bay (AL)	0.0 (3.6)	0.2 (15.3)	0.1 (0.0)	0 (0)	0.1 (1.4)
E MS Sound (AL)	0.1 (28.3)	0.1 (6.2)	0 (0)	0.3 (17.5)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.2 (7.5)	0 (0)
	1991	1992	1993	1994	1995
Mobile Bay (AL)	0 (0)	0.0 (6.1)	0.1 (6.4)	0.0 (2.1)	0.1 (2.3)
E MS Sound (AL)	0 (0)	0 (0)	0 (0)	0.3 (13.8)	0.1 (7.3)
Perdido Bay (AL)	0 (0)	0 (0)	0.2 (20.0)	0 (0)	0 (0)
	1996	1997	1998	1999	2000
Mobile Bay (AL)	0.1 (6.7)	0 (0)	0.1 (3.4)	0.6 (102.7)	0.1 (51.7)
E MS Sound (AL)	0.1 (107.2)	0.1 (6.4)	0 (0)	0 (0)	0 (0)
Perdido Bay (AL)	0 (0)	0 (0)	0 (0)	0.3 (15.3)	0 (0)
	2001	2002	2003	2004	2005
Mobile Bay (AL)	0.5 (3.4)	1.9 (35.5)	1.1 (27.4)	0.9 (6.5)	0.1 (13.2)
E MS Sound (AL)	0 (0)	0 (0)	0.1 (14.8)	0.4 (0.2)	0.3 (34.0)
Perdido Bay (AL)	0 (0)	0.1 (19.7)	0.1 (8.5)	0 (0)	0.1 (15.1)
	2006	2007	Mean	SE	
Mobile Bay (AL)	1.5 (139.4)	2.9 (88.6)	0.4 (19.9)	0.1 (1.3)	
E MS Sound (AL)	0.2 (34.5)	0.2 (2.7)	0.1 (11.0)	0.0 (0.8)	
Perdido Bay (AL)	0.3 (46.1)	1.3 (3.5)	0.1 (5.2)	0.1 (0.4)	

Sciaenops ocellatus

The abundance pattern for red drum varied among the Gulf states with peaks in spring, fall, and winter (Figure 215). No abundance or biomass data were available for red drum (*Sciaenops ocellatus*) in Alabama, because ADCNR did not report catches for this species. Overall abundance in Florida was highest among the states with a mean (mean of 12 monthly means in Figure 215) of 0.1/ha, followed by Louisiana (0.1/ha), Mississippi (0.0/ha) and Texas (0.0/ha).

The length frequency distributions for red drum in each state (Figure 216) were significantly different from those in each other state, based on Kolmogorov-Smirnov two sample tests. Lengths of red drum were not measured in Mississippi. Red drum ranged in size from 20 – 843 mm (mean=260.3, SD=182.8) in Texas, 12 – 1107 mm (mean=176.4, SD=183.1) in Louisiana, and 24 – 612 mm (mean=52.9, SD=62.7) in Florida.

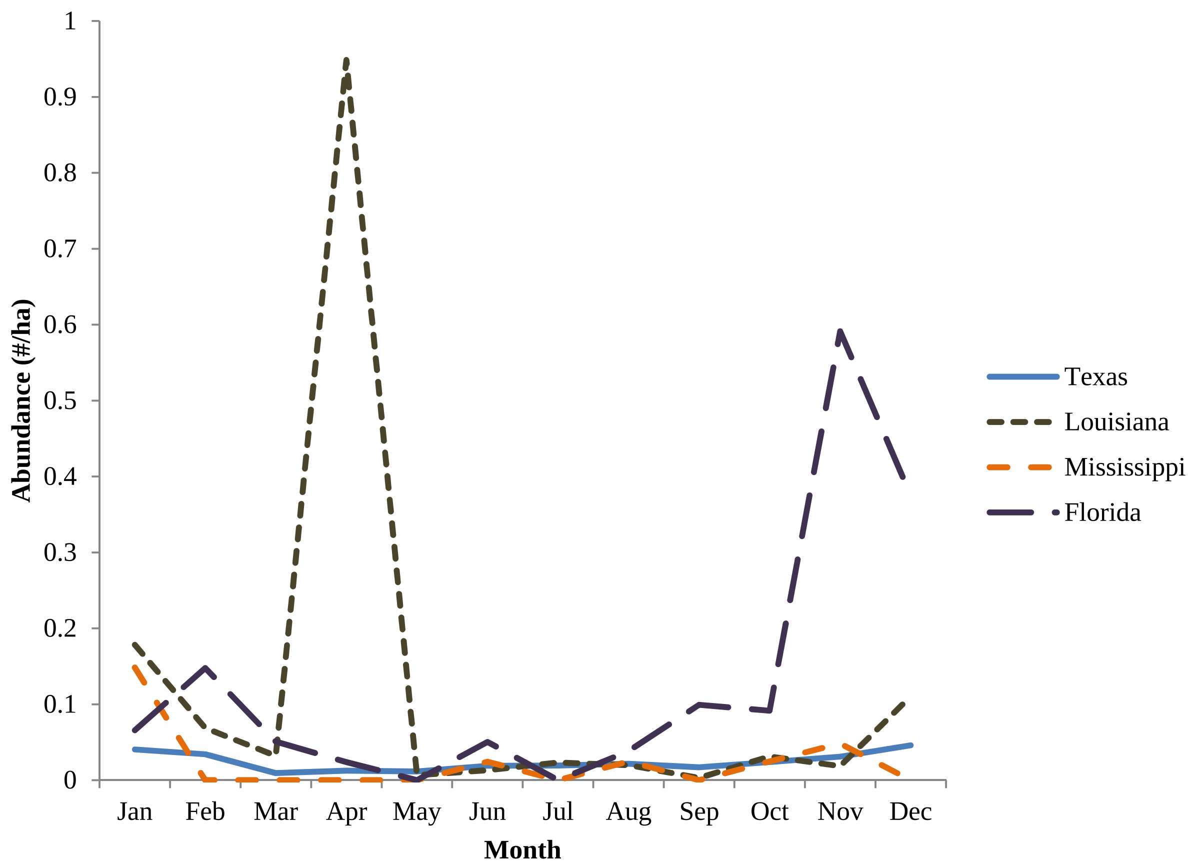

Figure 215. Monthly mean abundance (#/hectare) of *Sciaenops ocellatus* as determined from all samples collected in the fishery-independent monitoring programs of the Gulf Coast states. The data cover the years 1982 – 2005 for Texas, 1986 – 2007 for Louisiana, 1985 – 2005 for Mississippi, and 1989 – 2005 for Florida.

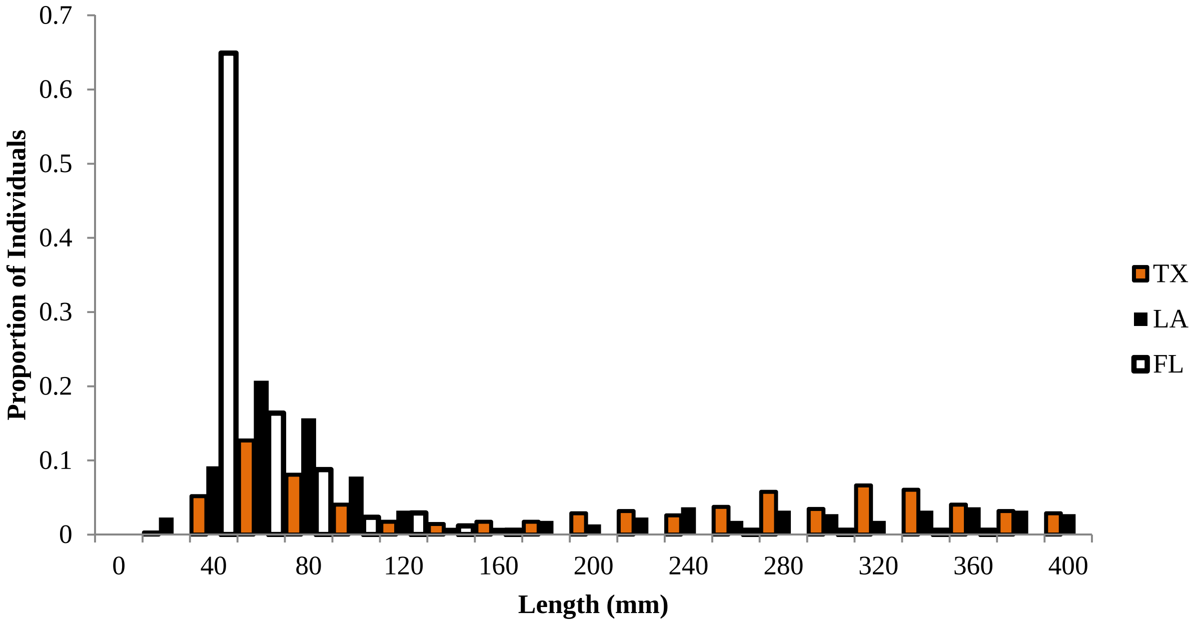

Figure 216. Length frequency of all red drum (*Sciaenops ocellatus*) measured as part of the fishery-independent monitoring programs in the Gulf Coast states, except Mississippi and Alabama. The data encompass sampling from the following years: Texas (n=347): 1982 – 2005; Louisiana (n=217): 1986 – 2007; and Florida (n=171): 1989 – 2005 (n-values represent the number of individuals measured). Length measurements were not recorded for *S. ocellatus* in Mississippi. Alabama did not monitor for *S. ocellatus*. Lengths are combined into 20-mm bins.

The mean monthly abundance of red drum in Texas was low ranging between 0.01/ha and 0.04/ha, but the highest values occurred in winter months (Figure 217). Mean annual abundance peaked in 1997 (0.05/ha) and biomass peaked in 2002 (32.5 g/ha) (Figure 218). The highest mean abundance and biomass values were in Sabine Lake and Lower Laguna Madre (Tables 111 and 112).

The monthly mean abundance of red drum in Louisiana was typically below 0.1/ha, but it did exceed 1.0/ha in April. Similarly, the monthly mean biomass was typically below 10 g/ha but did reach 19 g/ha in Dec and 107.6 g/ha in January (Figure 219). Mean annual abundance peaked in 1989 (2.0/ha) and biomass peaked in 1998 (96.9 g/ha) (Figure 220). The highest biomass values were seen in Lake Calcasieu, Barataria Bay, and Terrebonne-Timbalier Bays (Tables 113 and 114).

Biomass data were not available for red drum in Mississippi as length measurements were not recorded. Mean monthly abundance of red drum exceeded 0.25/ha in January, but was either not present in other months or below 0.1/ha (Figure 221). Red drum was only caught in seven of the 21 sampling years and the mean annual abundance only exceeded 0.4/ha in 1993 (Figure 222).

The monthly mean abundance and biomass for red drum in Florida peaked in the late fall/early winter months (Figure 223). Mean annual abundance peaked in 2003 (0.6/ha) and biomass peaked in 2005 (22.3 g/ha) (Figure 224). Red drum were found in the highest concentrations in Apalachicola Bay (Tables 115 and 116).

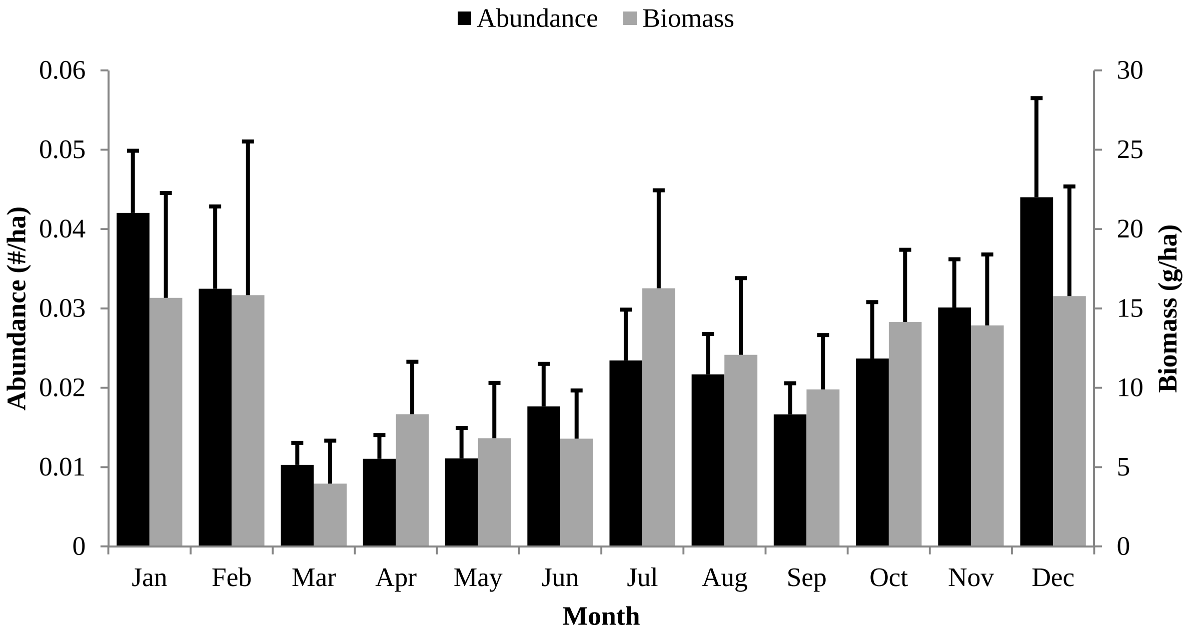

Figure 217. The monthly mean (+SE) abundance and biomass of *Sciaenops ocellatus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1982 – 2005 and error bars represent annual variability.

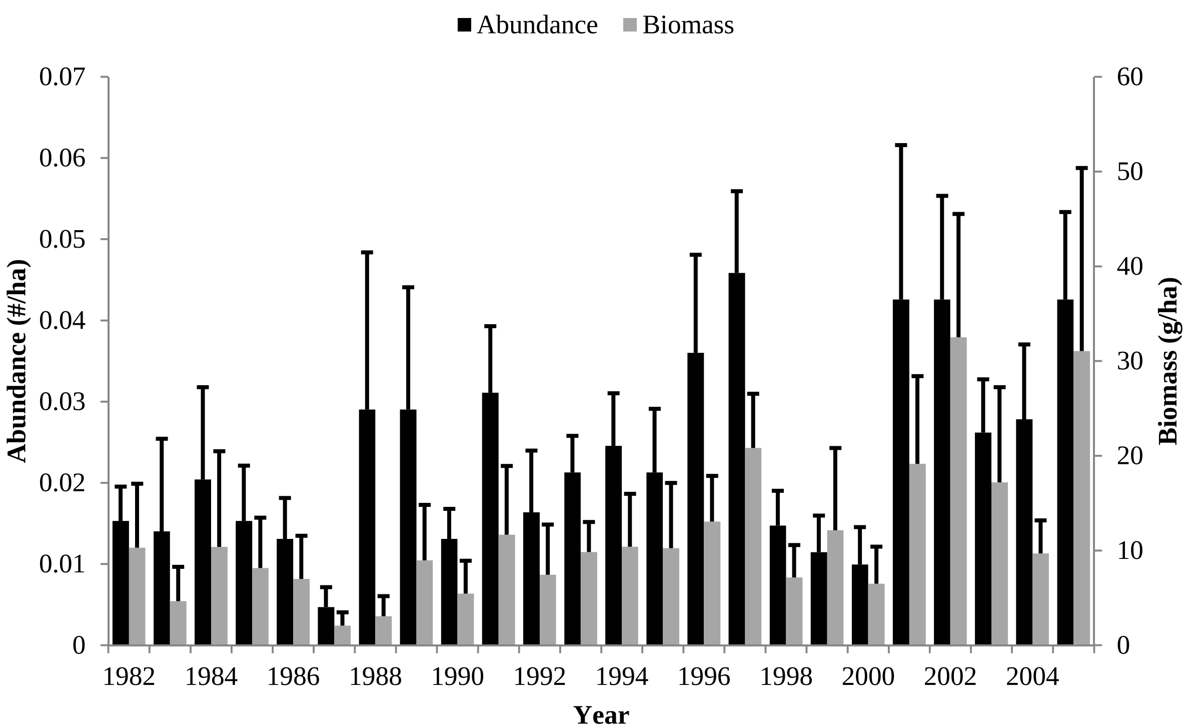

Figure 218. The mean (+SE) annual abundance and biomass of *Sciaenops ocellatus* in Texas estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1982 – 2005 and error bars represent monthly variability.

Table 111. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Texas. Values are means of monthly means over the years from 1982-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lower Laguna Madre	0.1 (49.8)	0.0 (16.6)	0 (0)	0.0 (31.9)
Upper Laguna Madre	0.1 (13.0)	0.1 (62.9)	0.0 (4.9)	0.1 (25.2)
Corpus Christi Bay	0.0 (0.1)	0.0 (0.0)	0 (0)	0 (0)
Aransas Bay	0.0 (24.8)	0.0 (0.1)	0.0 (0.0)	0 (0)
San Antonio Bay	0.0 (2.4)	0.0 (4.0)	0.0 (0.2)	0.0 (3.5)
Matagorda Bay	0.0 (15.2)	0 (0)	0 (0)	0 (0)
East Matagorda Bay	0.0 (22.2)	0 (0)	0.0 (0.0)	0.0 (7.8)
Galveston Bay	0.0 (15.4)	0.1 (7.0)	0.0 (0.0)	0 (0)
Sabine Lake	0.0 (21.4)	0.0 (141.5)	0.0 (55.5)	0.0 (34.3)
	May	Jun	Jul	Aug
Lower Laguna Madre	0.0 (7.1)	0.1 (40.0)	0.1 (11.4)	0.1 (24.8)
Upper Laguna Madre	0.0 (0.4)	0.0 (1.6)	0.0 (62.1)	0.0 (16.5)
Corpus Christi Bay	0.0 (16.0)	0.0 (0.1)	0.0 (8.7)	0.0 (8.4)
Aransas Bay	0.0 (5.4)	0.0 (0.3)	0.0 (39.2)	0 (0)
San Antonio Bay	0.0 (0.9)	0.0 (6.5)	0.0 (0.9)	0.0 (5.4)
Matagorda Bay	0 (0)	0 (0)	0 (0)	0.0 (1.4)
East Matagorda Bay	0.0 (48.1)	0.0 (6.8)	0.0 (4.3)	0 (0)
Galveston Bay	0 (0)	0.0 (0.4)	0.0 (13.5)	0.0 (27.7)
Sabine Lake	0 (0)	0.0 (40.1)	0.0 (29.9)	0.0 (50.9)
	Sep	Oct	Nov	Dec
Lower Laguna Madre	0.1 (25.0)	0.1 (82.2)	0.1 (41.3)	0.1 (92.2)
Upper Laguna Madre	0.0 (38.8)	0.0 (31.1)	0.1 (32.9)	0.0 (2.7)
Corpus Christi Bay	0.0 (2.50	0 (0)	0.0 (0.0)	0 (0)
Aransas Bay	0.0 (5.3)	0.0 (2.6)	0.0 (2.6)	0.1 (15.7)
San Antonio Bay	0.0 (4.8)	0.0 (4.3)	0.0 (7.2)	0.0 (3.0)
Matagorda Bay	0.0 (1.1)	0.0 (4.4)	0.0 (0.2)	0.1 (0.1)
East Matagorda Bay	0.0 (6.8)	0 (0)	0 (0)	0 (0)
Galveston Bay	0 (0)	0.0 (12.9)	0.0 (0.0)	0.1 (10.1)
Sabine Lake	0.0 (44.0)	0.0 (43.7)	0.0 (121.7)	0.0 (73.2)
	Mean	SE		
Lower Laguna Madre	0.1 (35.2)	0.0 (8.2)		
Upper Laguna Madre	0.0 (24.4)	0.0 (6.4)		
Corpus Christi Bay	0.0 (3.0)	0.0 (1.5)		
Aransas Bay	0.0 (8.0)	0.0 (3.6)		
San Antonio Bay	0.0 (3.6)	0.0 (0.6)		
Matagorda Bay	0.0 (1.9)	0.0 (1.3)		
East Matagorda Bay	0.0 (8.0)	0.0 (4.1)		
Galveston Bay	0.0 (7.3)	0.0 (2.6)		
Sabine Lake	0.0 (54.7)	0.0 (11.7)		

Table 112. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Texas. Values are means of monthly means over the years 1982-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Lower Laguna Madre	0 (0)	0.0 (5.0)	0.0 (30.0)	0.0 (0.3)	0.1 (37.6)	0 (0)	0.1 (41.1)	0.0 (0.1)	0.1 (27.5)
Upper Laguna Madre	0.0 (83.0)	0 (0)	0.1 (3.1)	0.1 (92.7)	0.0 (58.3)	0 (0)	0 (0)	0 (0)	0.0 (0.0)
Corpus Christi Bay	0.0 (47.9)	0 (0)	0.0 (0.1)	0.0 (2.4)	0 (0)	0.0 (7.3)	0 (0)	0.0 (16.8)	0 (0)
Aransas Bay	0.0 (0.7)	0.1 (21.8)	0.0 (14.6)	0.0 (0.0)	0.0 (0.0)	0 (0)	0.0 (0.0)	0 (0)	0 (0)
San Antonio Bay	0.0 (1.4)	0.0 (3.7)	0.0 (4.7)	0 (0)	0.0 (0.0)	0 (0)	0 (0)	0 (0)	0.0 (0.0)
Matagorda Bay	0.0 (0)	0 (0)	0.0 (3.2)	0.0 (0.0)	0 (0)	0 (0)	0 (0)	0.1 (0.1)	0 (0)
East Matagorda Bay						0 (0)	0 (0)	0 (0)	0 (0)
Galveston Bay	0 (0)	0 (0)	0.0 (23.2)	0 (0)	0 (0)	0.0 (0.0)	0.1 (0.2)	0.0 (0.1)	0.0 (24.4)
Sabine Lake					0.0 (1.1)	0.0 (7.6)	0.0 (2.3)	0.1 (50.3)	0 (0)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lower Laguna Madre	0.1 (24.1)	0.0 (12.7)	0.1 (26.6)	0.1 (75.2)	0.1 (111.6)	0.1 (20.8)	0.3 (47.2)	0.1 (56.5)	0.0 (25.5)
Upper Laguna Madre	0.1 (121.8)	0 (0)	0.0 (16.5)	0.0 (0.8)	0.0 (15.1)	0.1 (60.6)	0.1 (26.5)	0 (0)	0.1 (41.6)
Corpus Christi Bay	0.0 (4.2)	0.0 (0.2)	0 (0)	0 (0)	0.0 (1.5)	0.0 (2.5)	0 (0)	0.0 (0.1)	0 (0)
Aransas Bay	0 (0)	0.0 (34.9)	0.0 (8.1)	0.0 (0.0)	0 (0)	0.0 (19.1)	0.03 (5.8)	0 (0)	0.0 (0.0)
San Antonio Bay	0.0 (0.2)	0.0 (9.9)	0.0 (11.8)	0.1 (6.9)	0.0 (5.2)	0.1 (3.8)	0.1 (27.0)	0 (0)	0 (0)
Matagorda Bay	0 (0)	0.0 (0.0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0 (25.8)	0 (0)	0 (0)
East Matagorda Bay	0 (0)	0 (0)	0.0 (10.7)	0.0 (0.1)	0 (0)	0.1 (50.3)	0 (0)	0 (0)	0 (0)
Galveston Bay	0.0 (4.3)	0.0 (0.8)	0 (0)	0.0 (27.8)	0 (0)	0 (0)	0.0 (13.7)	0 (0)	0.0 (51.4)
Sabine Lake	0 (0)	0 (0)	0.0 (44.3)	0 (0)	0.0 (3.4)	0 (0)	0.0 (73.2)	0.1 (43.4)	0 (0)

	2000	2001	2002	2003	2004	2005	Mean	SE
Lower Laguna Madre	0.0 (45.9)	0.1 (81.7)	0.1 (76.2)	0.0 (16.6)	0.0 (12.8)	0.1 (61.6)	0.1 (34.9)	0.0 (6.1)
Upper Laguna Madre	0 (0)	0 (0)	0.1 (28.3)	0.1 (9.6)	0.0 (3.7)	0.1 (41.4)	0.0 (25.1)	0.0 (7.1)
Corpus Christi Bay	0 (0)	0.0 (0.0)	0.0 (0.1)	0 (0)	0.0 (3.2)	0.0 (1.1)	0.0 (3.6)	0.0 (2.1)
Aransas Bay	0 (0)	0.0 (0.5)	0.0 (3.1)	0.0 (70.3)	0.0 (11.9)	0.0 (1.1)	0.0 (8.0)	0.0 (3.3)
San Antonio Bay	0 (0)	0 (0)	0.0 (5.8)	0.0 (0.8)	0.0 (1.9)	0.1 (3.1)	0.0 (3.6)	0.0 (1.2)
Matagorda Bay	0 (0)	0 (0)	0.0 (2.2)	0 (0)	0.1 (11.6)	0.1 (0.3)	0.0 (1.8)	0.0 (1.2)
East Matagorda Bay	0.0 (0.2)	0 (0)	0 (0)	0.0 (10.8)	0 (0)	0.0 (78.0)	0.0 (7.9)	0.0 (4.7)
Galveston Bay	0 (0)	0.2 (7.9)	0.0 (7.6)	0.0 (0.1)	0.0 (12.5)	0 (0)	0.0 (7.3)	0.0 (2.6)
Sabine Lake	0.1 (44.7)	0.1 (169.5)	0.2 (312.9)	0.1 (61.4)	0.0 (36.8)	0.1 (242.6)	0.0 (54.7)	0.0 (19.5)

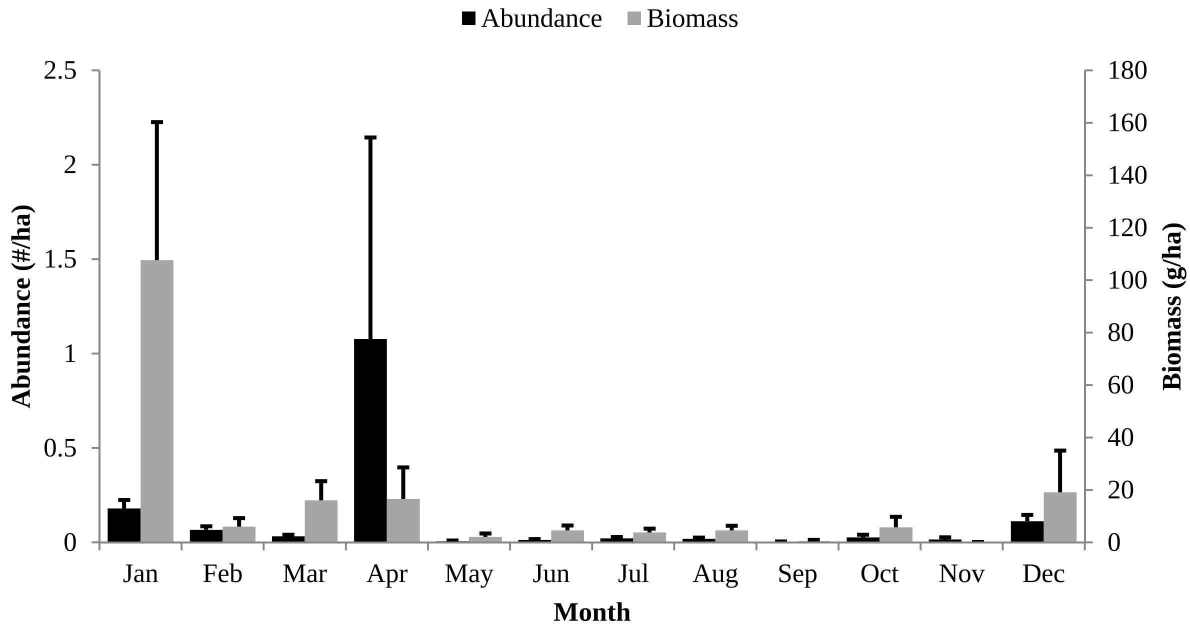

Figure 219. The monthly mean (+SE) abundance and biomass of *Sciaenops ocellatus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1986 – 2007 and error bars represent annual variability.

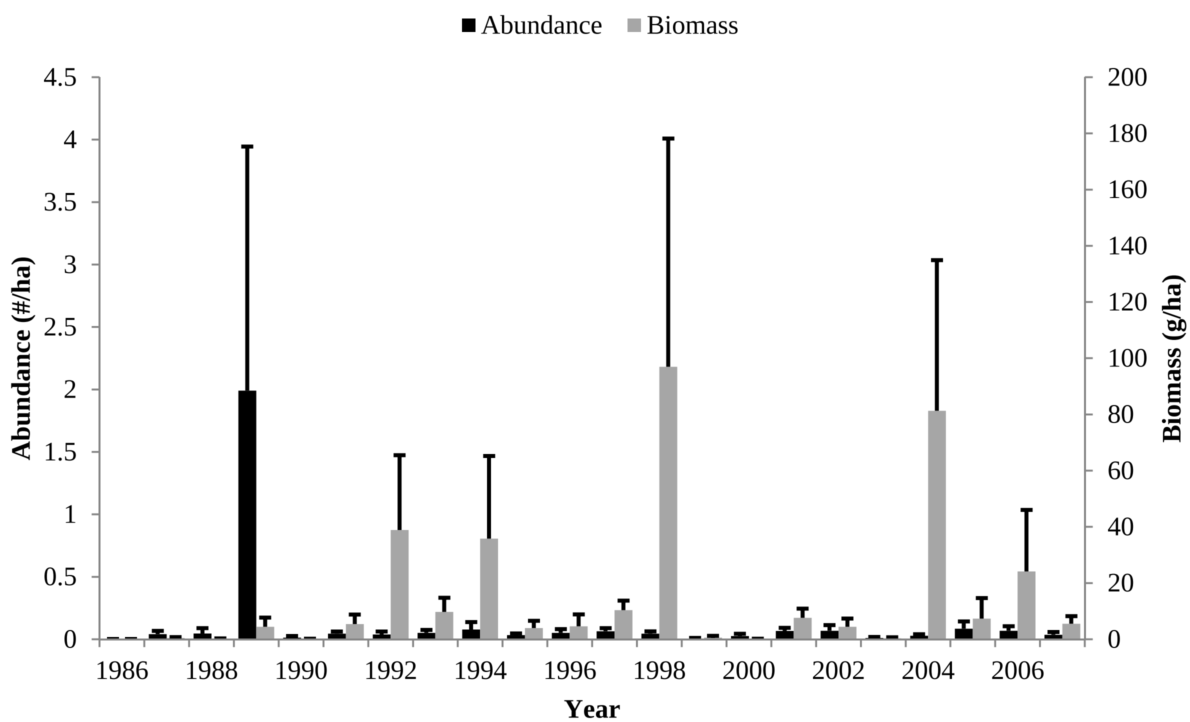

Figure 220. The mean (+SE) annual abundance and biomass of *Sciaenops ocellatus* in Louisiana estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1986 – 2007 and error bars represent monthly variability.

Table 113. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Louisiana. Values are means of monthly means over the years from 1986-2007. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr
Lake Calcasieu	0.7 (149.7)	0.2 (14.7)	0.2 (84.8)	0.0 (16.0)
Vermilion-Cote Blanche Bays	0.1 (6.4)	0.0 (18.4)	0.0 (20.6)	0.0 (4.5)
Terrebonne-Timbalier Bays	0.2 (230.8)	0.1 (0.4)	0.0 (0.1)	4.9 (8.1)
Barataria Bay	0.1 (177.9)	0 (0)	0 (0)	0.0 (93.2)
Breton-Chandeleur Sounds	0.1 (5.3)	0.0 (0.1)	0.0 (0.1)	0 (0)
Lake Borgne	0.0 (180.8)	0.1 (18.2)	0.0 (0.0)	0 (0)

	May	Jun	Jul	Aug
Lake Calcasieu	0.0 (0.7)	0.0 (8.1)	0.1 (16.9)	0.1 (23.7)
Vermilion-Cote Blanche Bays	0.0 (7.7)	0.0 (15.6)	0.0 (6.5)	0.0 (7.7)
Terrebonne-Timbalier Bays	0.0 (0.9)	0.0 (1.0)	0.0 (1.7)	0.0 (0.7)
Barataria Bay	0 (0)	0 (0)	0.0 (1.3)	0.0 (0.4)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0 (0)	0 (0)
Lake Borgne	0 (0)	0 (0)	0 (0)	0 (0)

	Sep	Oct	Nov	Dec
Lake Calcasieu	0 (0)	0.0 (9.9)	0.0 (0.0)	0.1 (14.0)
Vermilion-Cote Blanche Bays	0.0 (2.1)	0.0 (16.8)	0.0 (0.0)	0.0 (0.9)
Terrebonne-Timbalier Bays	0 (0)	0 (0)	0.0 (0.1)	0.1 (0.3)
Barataria Bay	0 (0)	0.0 (0.0)	0 (0)	0.3 (0.3)
Breton-Chandeleur Sounds	0.0 (0.0)	0.0 (0.0)	0 (0)	0.1 (98.5)
Lake Borgne	0 (0)	0.2 (0.0)	0 (0)	0.1 (0.1)

	Mean	SE
Lake Calcasieu	0.1 (28.2)	0.1 (12.8)
Vermilion-Cote Blanche Bays	0.0 (8.9)	0.0 (2.1)
Terrebonne-Timbalier Bays	0.4 (20.3)	0.4 (19.1)
Barataria Bay	0.0 (22.8)	0.0 (16.1)
Breton-Chandeleur Sounds	0.0 (8.7)	0.0 (8.2)
Lake Borgne	0.0 (16.6)	0.0 (15.0)

Table 114. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Louisiana. Values are means of monthly means over the years 1986-2007. The overall mean and standard error of the annual means also are reported for each estuary.

	1986	1987	1988	1989
Lake Calcasieu	0 (0)	0.0 (0.3)	0.4 (1.2)	0.2 (8.9)
Vermilion-Cote Blanche Bays	0 (0)	0.3 (1.5)	0.0 (0.2)	0 (0)
Terrebonne-Timbalier Bays	0 (0)	0.0 (1.2)	0 (0)	9.1 (14.9)
Barataria Bay	0 (0)	0 (0)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0 (0)	0 (0)
Lake Borgne	0 (0)	0.1 (0.6)	0 (0)	0 (0)
	1990	1991	1992	1993
Lake Calcasieu	0 (0)	0.1 (29.2)	0.2 (279.0)	0.1 (41.1)
Vermilion-Cote Blanche Bays	0.0 (0.2)	0.1 (3.6)	0 (0)	0.0 (33.5)
Terrebonne-Timbalier Bays	0 (0)	0.0 (2.1)	0 (0)	0.1 (0.2)
Barataria Bay	0.0 (0.2)	0.0 (0.1)	0 (0)	0 (0)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0 (0)	0.0 (0.0)
Lake Borgne	0 (0)	0 (0)	0.1 (31.2)	0 (0)
	1994	1995	1996	1997
Lake Calcasieu	0.1 (38.1)	0.0 (13.9)	0.1 (60.3)	0.2 (43.4)
Vermilion-Cote Blanche Bays	0.0 (1.4)	0.0 (10.8)	0.1 (0.9)	0.0 (10.9)
Terrebonne-Timbalier Bays	0.2 (0.3)	0.1 (0.1)	0.1 (0.8)	0.1 (0.1)
Barataria Bay	0 (0)	0 (0)	0 (0)	0.0 (0.7)
Breton-Chandeleur Sounds	0 (0)	0.0 (0.2)	0 (0)	0.1 (9.0)
Lake Borgne	0.1 (361.6)	0 (0)	0.1 (0.1)	0.1 (0.1)
	1998	1999	2000	2001
Lake Calcasieu	0.1 (62.7)	0 (0)	0.0 (0.0)	0.0 (0.4)
Vermilion-Cote Blanche Bays	0.0 (35.0)	0.0 (2.2)	0 (0)	0.1 (24.6)
Terrebonne-Timbalier Bays	0.1 (418.7)	0.0 (0.5)	0.1 (0.3)	0.0 (5.0)
Barataria Bay	0 (0)	0 (0)	0 (0)	0.1 (1.8)
Breton-Chandeleur Sounds	0.0 (0.0)	0 (0)	0 (0)	0.0 (0.0)
Lake Borgne	0 (0)	0 (0)	0 (0)	0.3 (0.0)
	2002	2003	2004	2005
Lake Calcasieu	0 (0)	0 (0)	0 (0)	0.1 (0.1)
Vermilion-Cote Blanche Bays	0.0 (9.7)	0 (0)	0.0 (17.9)	0.1 (27.0)
Terrebonne-Timbalier Bays	0.0 (0.3)	0.0 (1.4)	0.0 (0.0)	0.0 (0.1)
Barataria Bay	0.2 (0.2)	0 (0)	0.0 (325.9)	0.5 (0.4)
Breton-Chandeleur Sounds	0.1 (8.8)	0.0 (0.0)	0.1 (155.2)	0 (0)
Lake Borgne	0 (0)	0.0 (0.0)	0 (0)	0 (0)
	2006	2007	Mean	SE
Lake Calcasieu	0.6 (16.2)	0.3 (23.1)	0.1 (28.1)	0.0 (12.7)
Vermilion-Cote Blanche Bays	0.0 (14.5)	0.0 (16.0)	0.0 (8.9)	0.0 (2.5)
Terrebonne-Timbalier Bays	0.0 (1.2)	0.0 (0.2)	0.4 (20.3)	0.4 (19.0)
Barataria Bay	0.0 (170.9)	0.0 (0.7)	0.0 (22.8)	0.0 (16.4)
Breton-Chandeleur Sounds	0 (0)	0 (0)	0.0 (7.9)	0.0 (7.0)
Lake Borgne	0 (0)	0 (0)	0.0 (17.9)	0.0 (16.4)

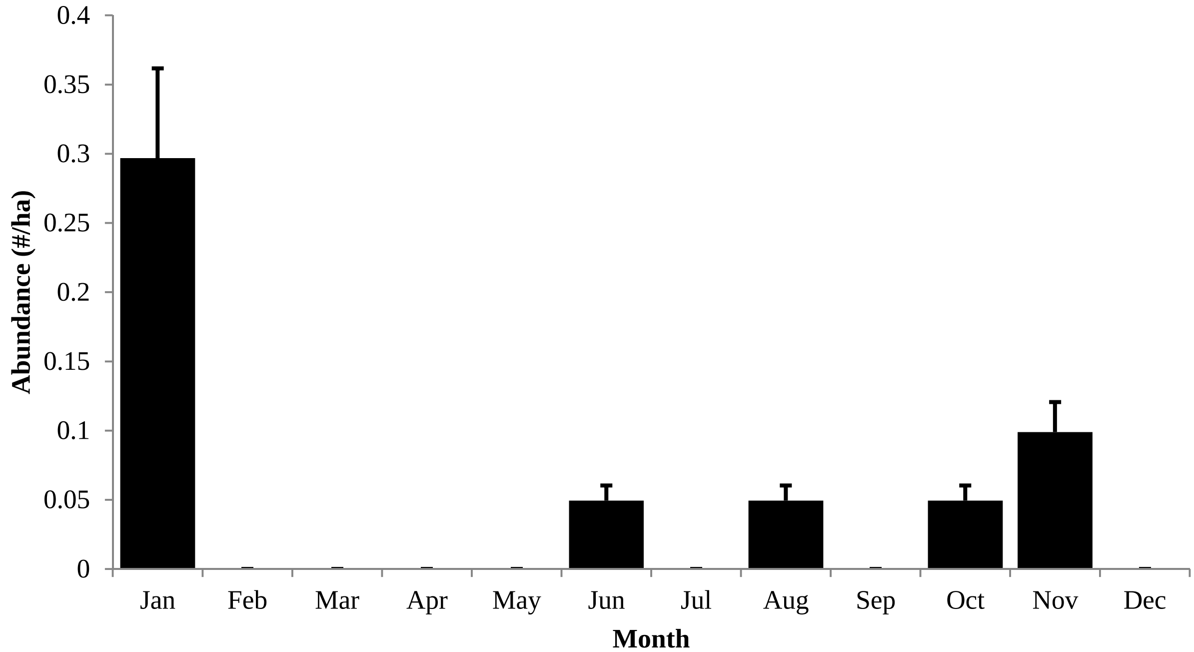

Figure 221. The monthly mean (+SE) abundance of *Sciaenops ocellatus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1985 – 2005 and error bars represent annual variability. Biomass data were not available for *S. ocellatus* as length measurements were not recorded.

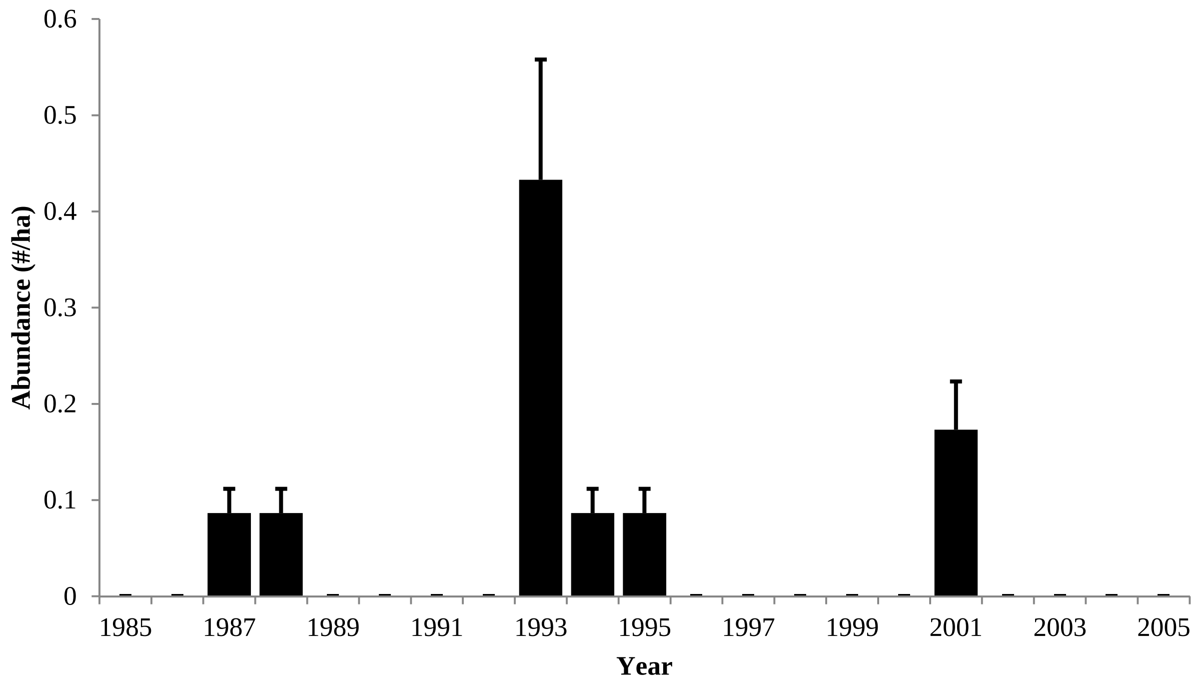

Figure 222. The mean (+SE) annual abundance of *Sciaenops ocellatus* in Mississippi estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1985 – 2005 and error bars represent monthly variability. Biomass data were not available for *S. ocellatus* as length measurements were not recorded.

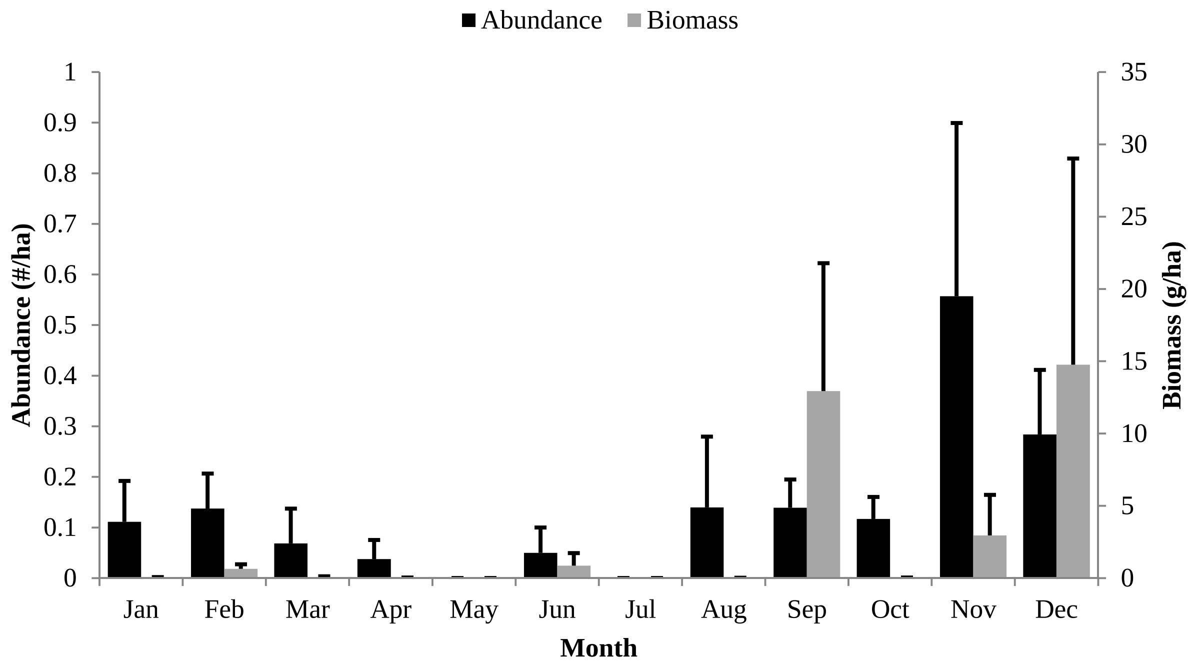

Figure 223. The monthly mean (+SE) abundance and biomass of *Sciaenops ocellatus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each year from 1989 – 2005 and error bars represent annual variability.

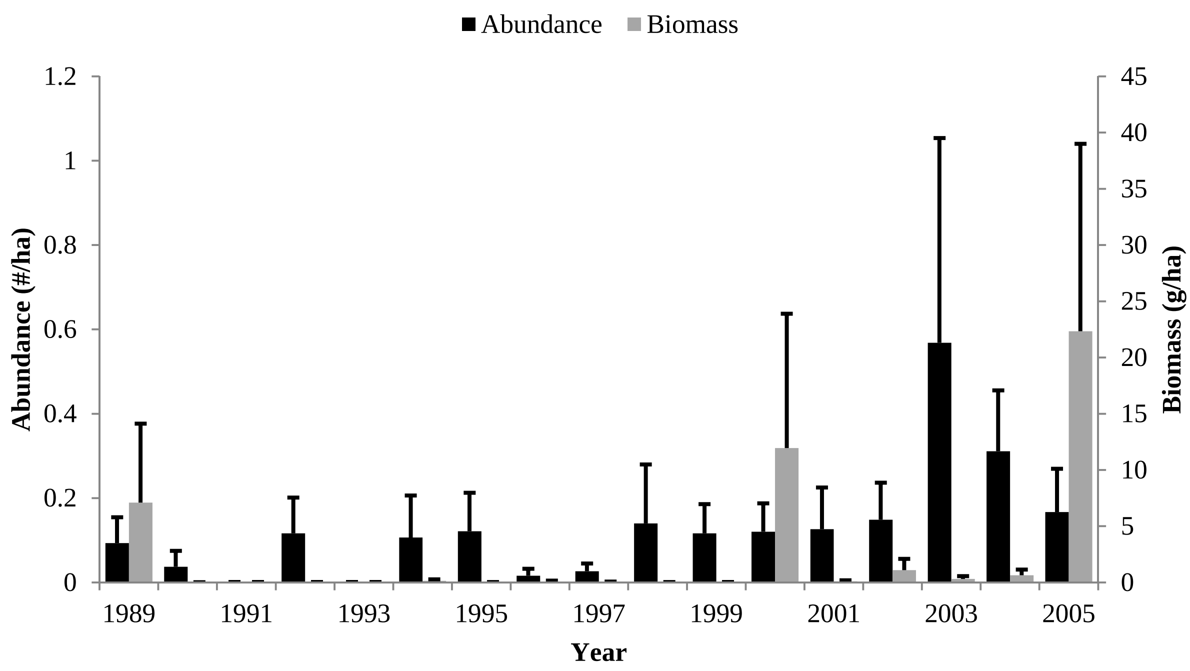

Figure 224. The mean (+SE) annual abundance and biomass of *Sciaenops ocellatus* in Florida estuaries. Mean values are calculated from means of all samples collected in all estuaries each month from 1989 – 2005 and error bars represent monthly variability.

Table 115. The monthly mean abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Florida. Values are means of monthly means over the years from 1989-2005. The overall mean and standard error of the monthly means also are reported for each estuary.

	Jan	Feb	Mar	Apr	May	Jun	Jul
Apalachicola Bay	0.2 (0.1)	0.3 (1.1)	0.2 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)
Suwannee Sound	0 (0)	0 (0)	0 (0)	0.9 (0.2)	0 (0)	0.8 (13.8)	0 (0)
Cedar Key	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Charlotte Harbor	0 (0)	0.1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Aug	**Sep**	**Oct**	**Nov**	**Dec**	**Mean**	**SE**
Apalachicola Bay	0.2 (0.0)	0.2 (26.8)	0.3 (0.0)	2.8 (21.0)	0.4 (92.1)	0.4 (11.8)	0.2 (7.8)
Suwannee Sound	0 (0)	0.1 (0.0)	0 (0)	0 (0)	2.0 (6.4)	0.3 (1.7)	0.2 (1.2)
Cedar Key	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tampa Bay	0 (0)	0.1 (5.6)	0.1 (0.0)	0.2 (0.2)	0 (0)	0.0 (0.5)	0.0 (0.5)
Charlotte Harbor	0 (0)	0.1 (0.0)	0.1 (0.0)	0.0 (0.0)	0 (0)	0.0 (0.0)	0.0 (0.0)

Table 116. The mean annual abundance in #/ha and biomass in g/ha (in parentheses) of *Sciaenops ocellatus* for each estuary in Florida. Values are means of monthly means over the years 1989-2005. The overall mean and standard error of the annual means also are reported for each estuary.

	1989	1990	1991	1992	1993
Tampa Bay	0.1 (7.1)	0.1 (0.0)	0 (0)	0.2 (0.01)	0 (0)
Charlotte Harbor	0 (0)	0 (0)	0 (0)	0.0 (0.0)	0 (0)
	1994	**1995**	**1996**	**1997**	**1998**
Apalachicola Bay					0.1 (0.01)
Suwannee Sound			0 (0)	0.1 (0.1)	
Cedar Key			0 (0)	0 (0)	
Tampa Bay	0.2 (0.2)	0.1 (0.0)	0 (0)	0.0 (0.0)	0 (0)
Charlotte Harbor	0 (0)	0.2 (0.0)	0.0 (0.2)	0 (0)	0 (0)
	1999	**2000**	**2001**	**2002**	**2003**
Apalachicola Bay	0.1 (0.0)	0.1 (11.9)	0.1 (0.1)	0.1 (0.1)	1.7 (0.6)
Suwannee Sound			0 (0)	0.5 (8.1)	0 (0)
Cedar Key			0 (0)	0 (0)	0 (0)
Tampa Bay	0.4 (0.2)	0 (0)	0.6 (0.1)	0 (0)	0 (0)
Charlotte Harbor	0.6 (0.1)	0 (0)	0 (0)	0 (0)	0.1 (0.0)
	2004	**2005**	**Mean**	**SE**	
Apalachicola Bay	0.1 (0.2)	0.6 (81.2)	0.4 (11.8)	0.2 (10.0)	
Suwannee Sound	1.6 (3.7)	0 (0)	0.3 (1.7)	0.2 (1.2)	
Cedar Key	0 (0)	0 (0)	0 (0)	0 (0)	
Tampa Bay	0.4 (0.1)	0 (0)	0.1 (0.5)	0.0 (0.4)	
Charlotte Harbor	0.0 (0.0)	0 (0)	0.1 (0.0)	0.0 (0.0)	

Interstate Comparisons

One of our objectives in this project was to develop a database that would be useful in making comparisons across all estuaries in the northern Gulf. For some of the nekton characteristics such as annual variability and seasonality, the data can provide such comparisons. Comparisons of total abundance, however, are still difficult to make across state lines. We attempted to standardize the CPUE data and account for differences among states in trawl duration, towing speed, and overall net size, by calculating abundance as numbers per ha swept. Differences in net mesh size, however, undoubtedly affect abundance estimates. Comparisons among Louisiana, Mississippi, and Alabama benefit from the similarity in mesh sizes used in their trawls (Table 2). However, the large and significant differences in the size-frequency distributions for most nekton species among the states, suggest that size selection may still have occurred in these catches. Texas trawls have a much larger mesh size in the cod end or bag of the trawl and this is reflected in the larger mean size and skewed size frequency distributions for many species in Texas estuaries. We suspect that this difference in gears also is responsible for the generally low abundance estimates in Texas bays, especially for smaller species. A gear comparison study is needed to address this issue.

We converted abundance estimates to biomass where size data were available in an effort to improve our ability to make comparisons among states. The use of a small mesh size in the cod end of nets generally increases the percentage of smaller individuals in the catch, and the conversion of abundance to biomass should reduce the impact of small nekton and subsequently their impact on the interstate comparisons.

A study on brown shrimp, *Farfantepenaeus aztecus*, in Galveston Bay, TX by Trent et al. (1974) provides some insight into the problem. They reported catch using a 3-m shrimp trawl with 24-mm stretched mesh in the body and 15-mm stretched mesh in the cod end. The portion of the catch that passed through the cod end of the main net was trapped in a 2-mm stretched mesh nylon cover. The mean size of the shrimp collected in the net and cover was recorded from 996 trawl samples collected from March through August in 1965 and all months in 1966. A comparison of the length-frequency distributions from these catches is shown in Figure 225. Mean length of brown shrimp was 62 mm (SD=16.1) from the main net and 22 mm (SD=11.1) from the cover. The overall abundance estimate from the net and the cover combined was 155.6 brown shrimp per tow (SE=11.84), and this value would have been about half if only the catch in the main net was counted (80.8/tow, SE=6.29). When we estimated mean biomass from the catches, however, the difference was much smaller (152 g/tow in the net and cover combined versus 146 g in the main net). These data suggest that biomass may be a better measure for comparisons across state lines.

Another approach to correcting differences due to variations in net mesh involves truncating the data based on the size frequency distributions. We explored this approach using data on brown shrimp from Texas and Louisiana for the years 1986 – 2005, when trawl samples were available from both states. Texas used nets with a larger mesh size in the cod end (38 mm) compared with that in Louisiana trawls (6 mm), and the difference was reflected in the overall size frequency distributions of shrimp collected (Figure 226). In Texas, the mean size of all brown shrimp measured was 87.4 mm (SD=18.4), with a range of 6 – 204 mm, and in Louisiana the mean size was 66.7 mm (SD=4.1), with a range of 2 – 177 mm. The overall abundance of brown shrimp in Texas estuaries was considerably lower than in Louisiana estuaries (Figure 227). The highest mean abundance in Texas occurred in San Antonio Bay at 37.0/ha, and the lowest mean abundance for brown shrimp in Louisiana was in Breton-Chandeleur Sounds at 60.7/ha. If we truncate the data based on size, however, the differences among the estuaries decrease. In Texas, the abundance of shrimp > 50 mm and > 70 mm was similar to the overall abundance (Figure 227). In Louisiana, however, this truncation of the data made a large difference in the estimates. For shrimp > 70 mm in size, i.e. shrimp perhaps equally available to the nets in both states, the abundance estimates are more similar among the estuaries.

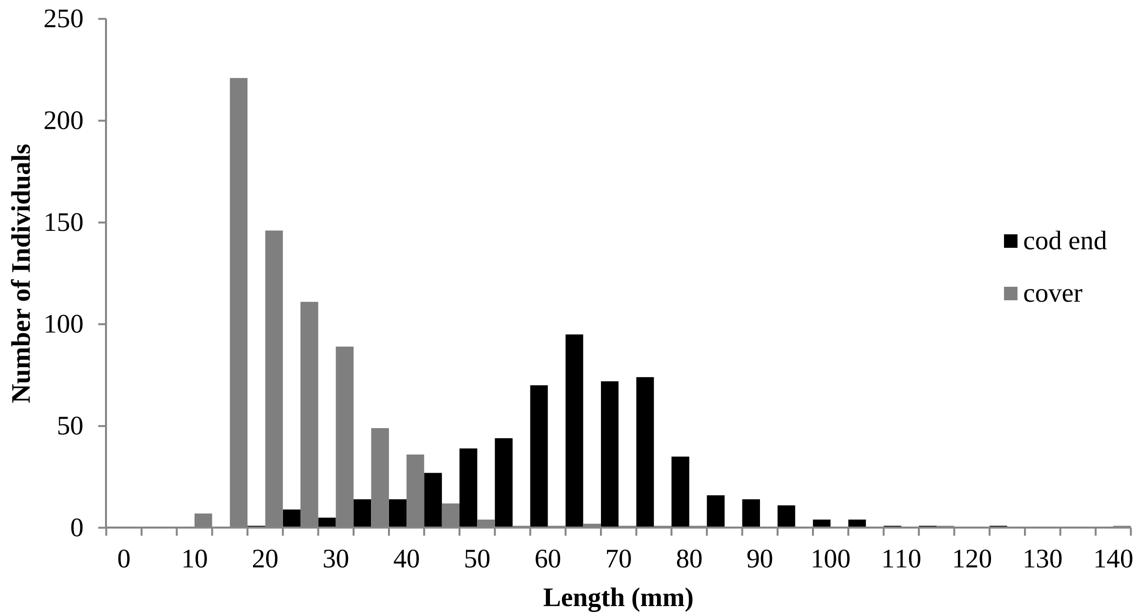

Figure 225. Comparison of the length frequency of brown shrimp (*Farfantepenaeus aztecus*) captured in the cod-end and cover of a 3-m shrimp trawl study. Data from Trent et al (1974). Lengths are combined into 5-mm bins.

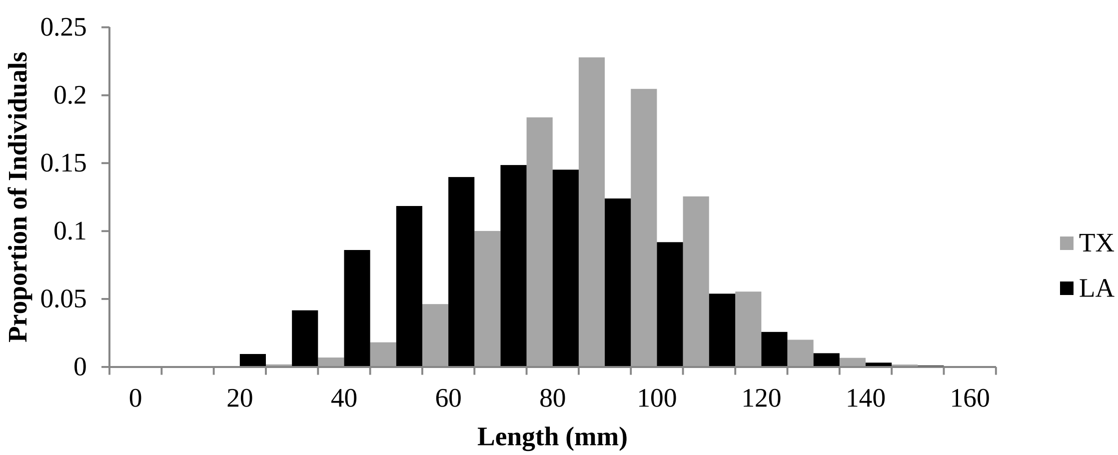

Figure 226. The length frequency distributions of *Farfantepenaeus aztecus* caught in the fishery-independent trawl sampling conducted by TPWD and LDWF in the years 1986-2005. Lengths are combined into 5-mm bins.

We also compared biomass estimates of brown shrimp among estuaries in Texas and Louisiana using this approach. These comparisons suggest that overall production of brown shrimp between the two states is closer than immediately apparent from the abundance data. When overall biomass was compared with just the biomass of shrimp > 50 mm and > 70 mm in total length, the estimates in Texas were similar (Figure 228). The same comparison using the Louisiana data, however, showed that a considerable amount of the biomass in estuaries such as Lake Calcasieu was derived from small shrimp. The number of individuals eliminated from Texas data in this analysis was far less than in Louisiana. In Texas, only 2.5% of all individuals measured were smaller than 50 mm, and 15.3% of those measured were less than 70 mm in length. In contrast, more than two-thirds of the individuals in Lake Calcasieu and Vermilion-Cote Blanche Bays were eliminated when restricting the data to the size classes larger than 70 mm. Of course, eliminating small shrimp from the comparisons reduces the value of abundance and biomass estimates, because only a small portion of the population is being assessed.

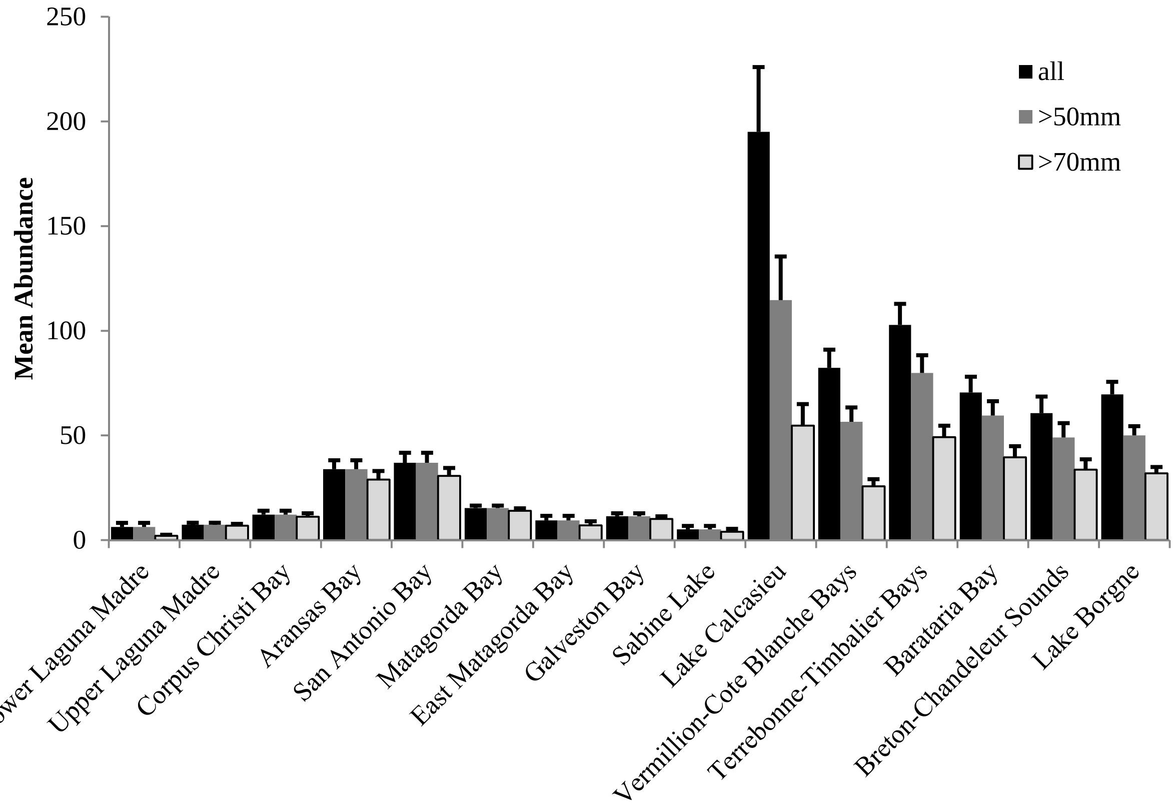

Figure 227. The mean abundance (#/ha) of total catch of *Farfantepenaeus aztecus*, those larger than 50 mm, and those larger than 70 mm in Texas and Louisiana estuaries as determined by the fishery-independent trawl samples from TPWD and LDWF in the years 1986–2005.

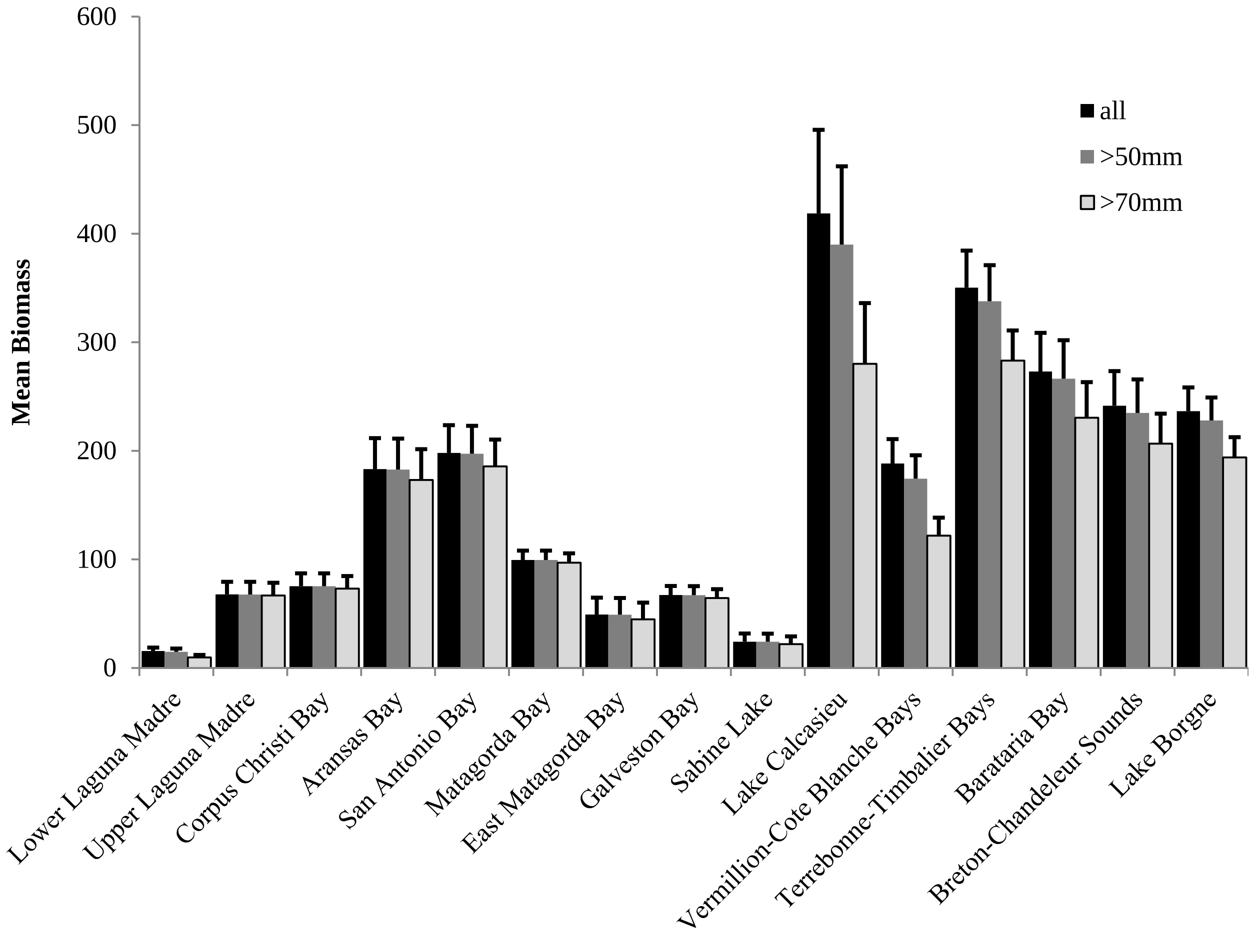

Figure 228. The mean biomass (g/ha) of all *Farfantepenaeus aztecus* caught, those larger than 50 mm, and those larger than 70 mm in Texas and Louisiana estuaries as determined by the fishery-independent trawl samples from TPWD and LDWF in the years 1986–2005.

Discussion

The data presented in this analysis provide a general picture of nekton collected in trawls from 24 estuaries in the five states along the U.S. coast in the northern Gulf of Mexico. The species examined included 14 species of fish and four species of decapod crustaceans that were either abundant in the samples or economically important. The most abundant species collected included bay anchovy, Atlantic croaker, spot, and brown shrimp. We recognize that trawls are selective in capturing nekton, however, and the relative abundance of species may reflect their susceptibility to the gear as opposed to overall abundance in estuaries (Loesch et al. 1976, Penn 1984, Somerton et al. 2007).

Our goal was to provide data on nekton for comparisons of estuaries throughout the northern Gulf of Mexico. We have presented the data by state, however, because differences in sampling gear and protocols continue to make comparisons among states challenging. Overall trawl size varied from 6.1 m in Texas and Florida to 4.9 m in Louisiana, Mississippi, and Alabama, and towing speeds varied from 2.2 kph in Florida to 4.8 kph in Texas and Louisiana. We converted the catch data to numbers per hectare swept to adjust for these differences among the states in trawl size, towing speed, and tow duration, but these differences in gear also may affect catch efficiency (Kjelson and Johnson 1978). The potential effects of differences in net mesh size were more difficult to assess. Size frequency distributions were generally different for all species among the states, suggesting that net mesh size affected abundance estimates. We converted abundance data to biomass in an effort to reduce the impact of size selection, but our analysis on brown shrimp indicates that this problem still affects comparisons. A comprehensive gear comparison study is needed to adequately address many of these problems.

Comparisons among estuaries also may be affected by environmental characteristics that affect behavior and capture efficiency (Penn 1984, Rozas and Minello 1997). For pelagic species such as Gulf menhaden, for example, water depth may affect abundance estimates. Trawls in shallow water sample much of the water column, while at deeper stations much of the pelagic habitat is not sampled. Variability among estuaries in water clarity also may affect trawl efficiency. Penaeid shrimps, blue crabs, and some fishes can burrow in the substrate, becoming less available to trawls. Environmental factors that affect burrowing (Wickham and Minkler 1975) can therefore affect abundance estimates.

Differences in the overall objectives of sampling programs and therefore the selection of sampling sites also can affect comparisons among estuaries. In Texas and Florida, a random or stratified random sampling approach has been used with an objective to estimate nekton abundance throughout the deep water areas of the bays. Randomly selected stations often include locations with low densities of species. In contrast, fixed station locations have been selected in sampling programs for Louisiana, Mississippi, and Alabama. Fixed stations can more effectively target species of interest and often provide better information on temporal trends in abundance. Samples from fixed stations, however, may not adequately census nekton populations throughout entire estuaries. The selection of sampling stations can affect abundance estimates in other ways as well. For example, avoidance of seagrass beds and oyster reefs is common in an effort to reduce damage to both habitats and trawls. The preponderance of these habitats and their relative use by nekton species will affect both intrastate and interstate comparisons among estuaries.

Despite all of the problems discussed above, the data presented here are valuable in making comparisons of nekton abundance among Gulf estuaries. Broad scale temporal trends in relative abundance and biomass within states should not be dramatically affected by gear issues. Some comparisons of abundance and biomass across all 24 estuaries may be useful in situations where length frequency distributions of species are similar. However caution is needed when sampling intensity varies among estuaries or months. Comparisons of abundance among estuaries within Texas and Florida should be possible because of the random site selection employed in these states. Comparisons among estuaries within Louisiana and Alabama will require some analysis of how the location of the fixed sampling locations is related to the distribution of a species.

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Appendix A. Hydrological characteristics of Gulf of Mexico estuaries along the US coast.

Temperature

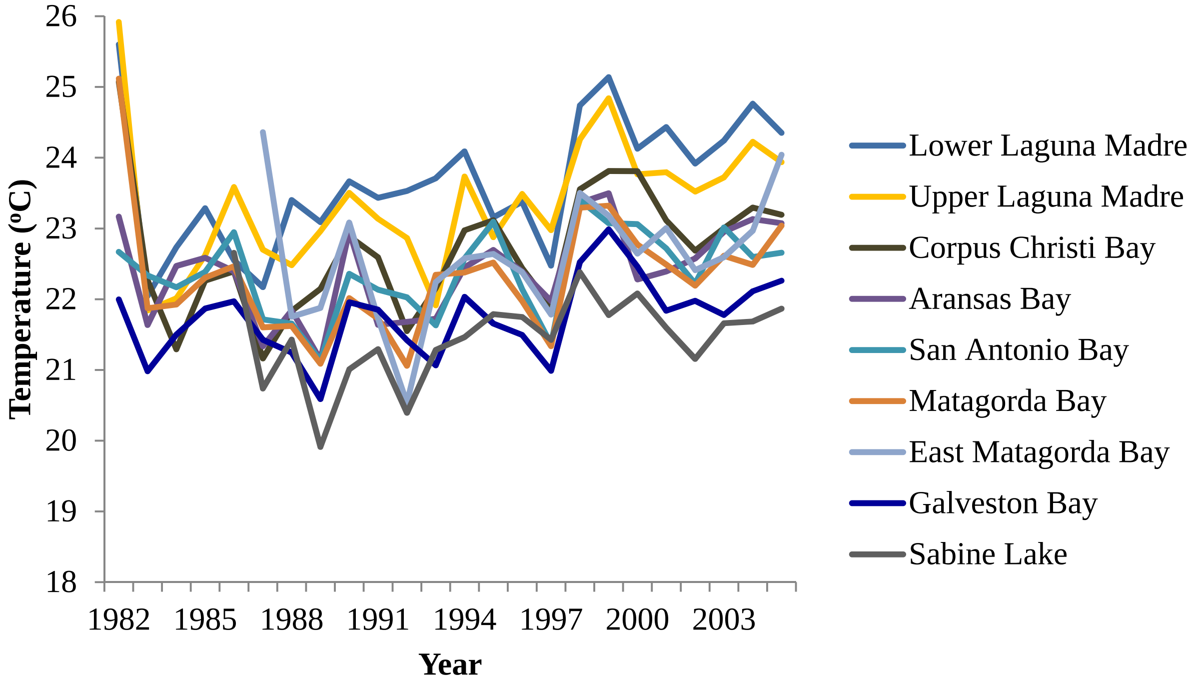

Figure A1. Average annual bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Texas for the years 1982-2005.

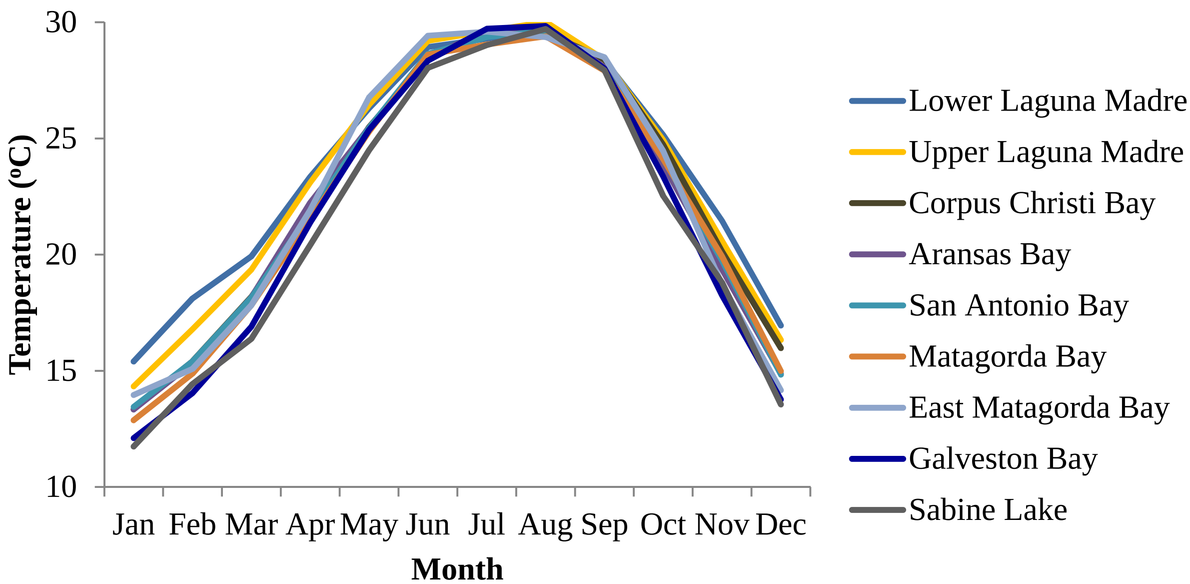

Figure A2. Monthly mean bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Texas for the years 1982-2005.

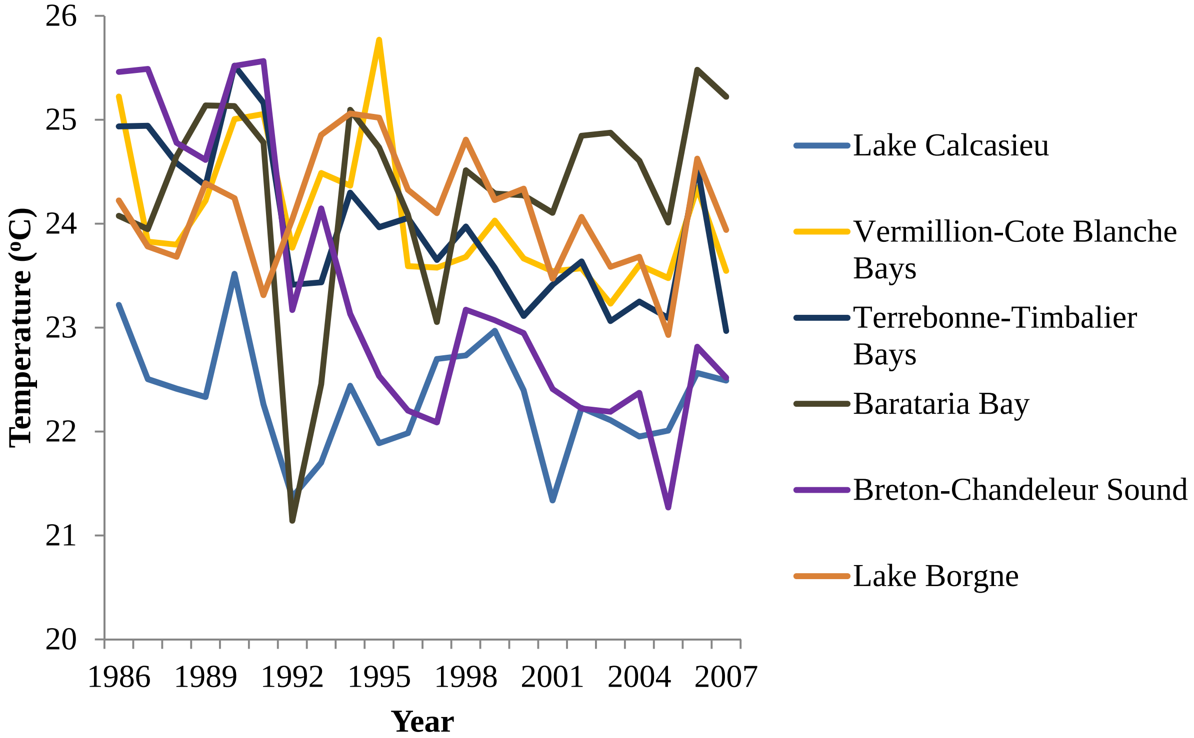

Figure A3. Average annual bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Louisiana for the years 1986-2007.

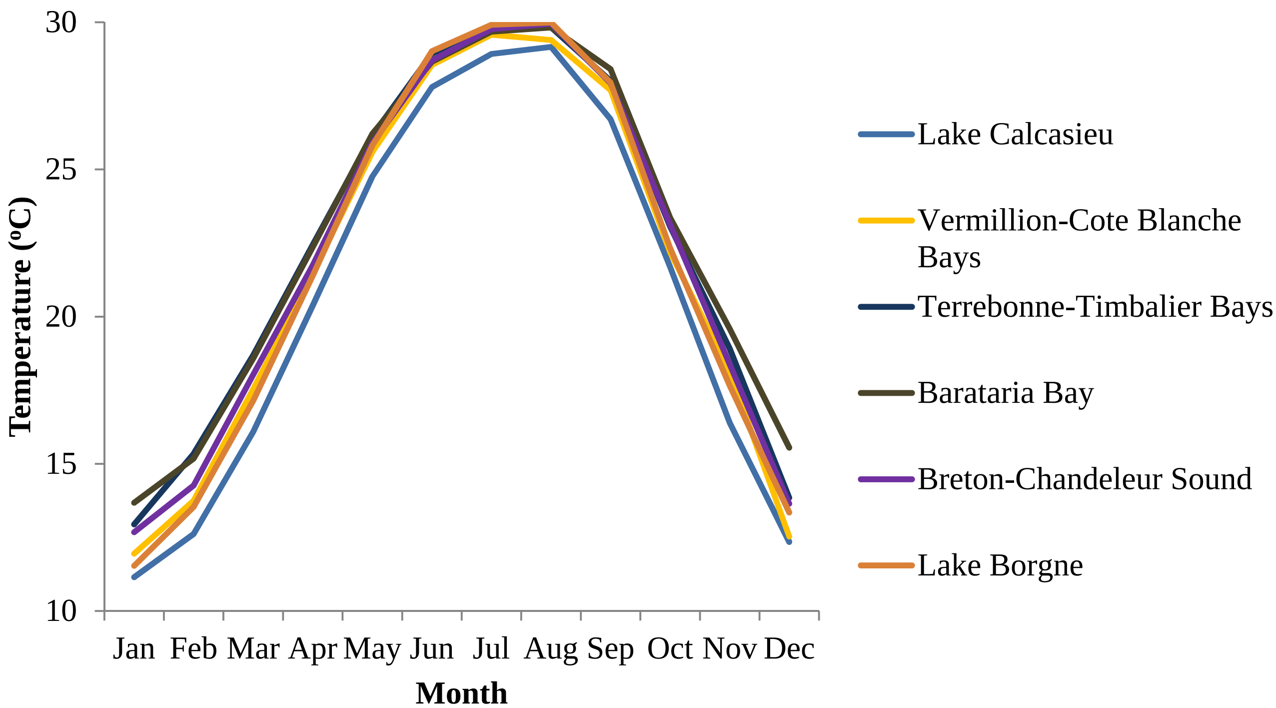

Figure A4. Monthly mean bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Louisiana for the years 1986-2007.

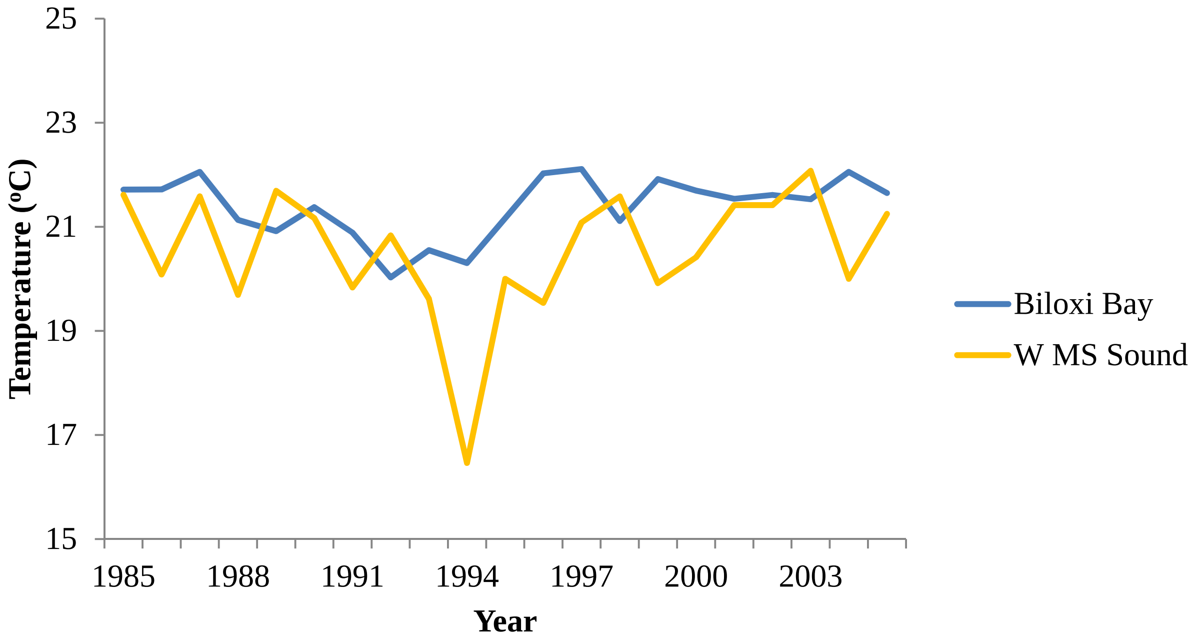

Figure A5. Average annual bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Mississippi for the years 1985-2005.

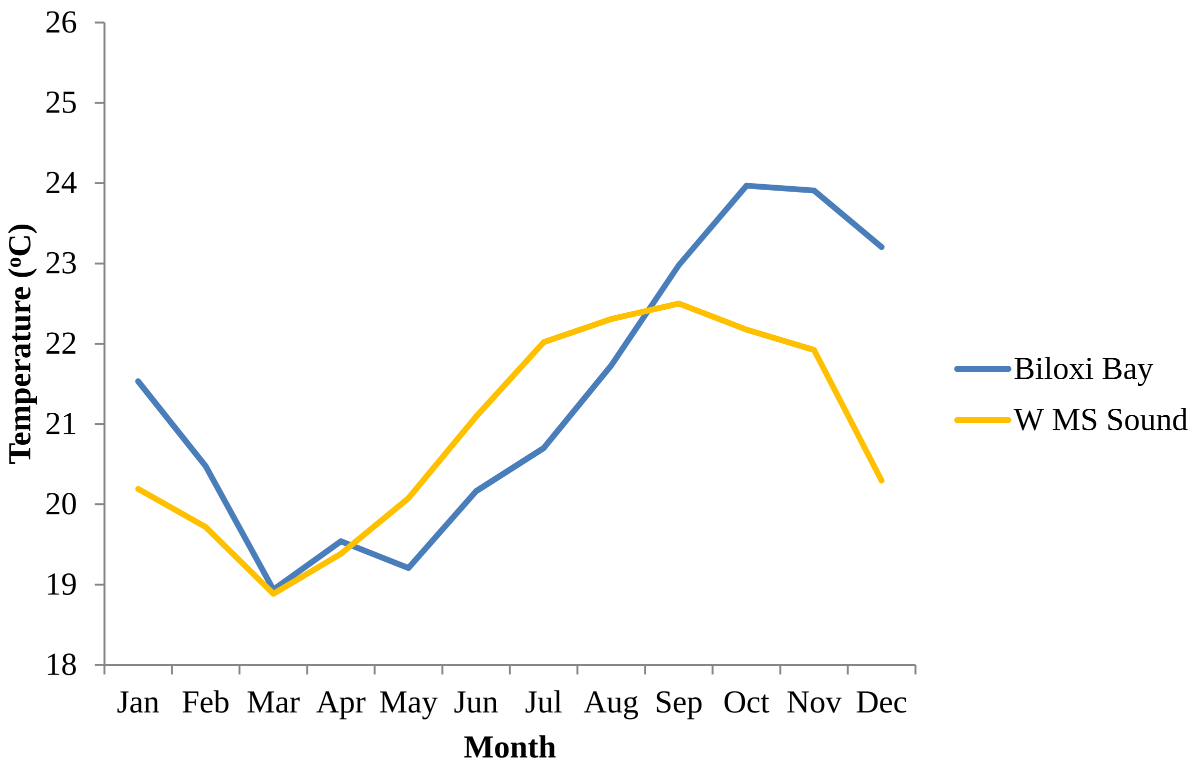

Figure A6. Monthly mean bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Mississippi for the years 1985-2005.

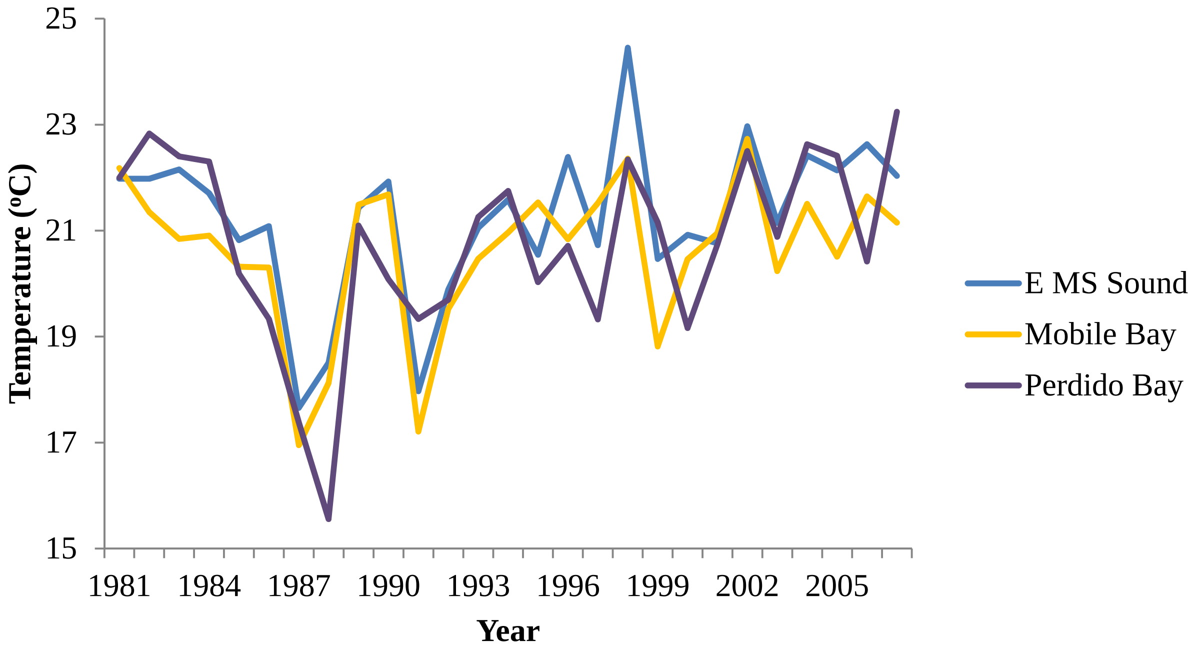

Figure A7. Average annual bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Alabama for the years 1981-2007.

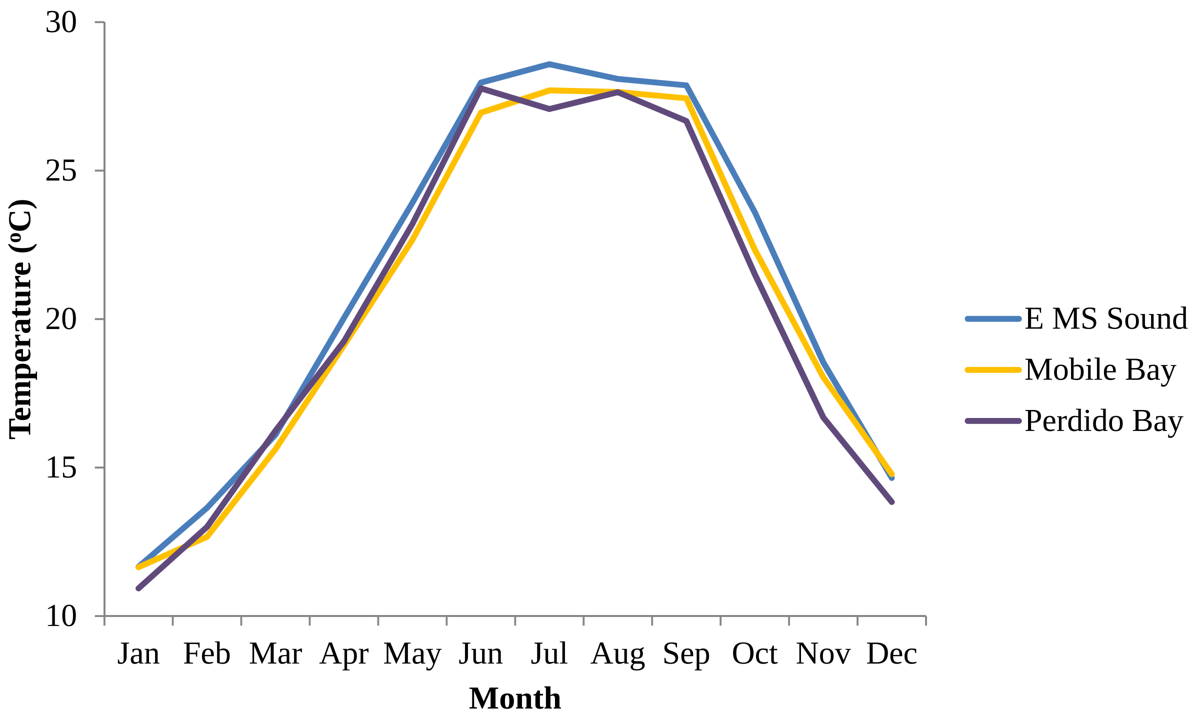

Figure A8. Monthly mean bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Alabama for the years 1981-2007.

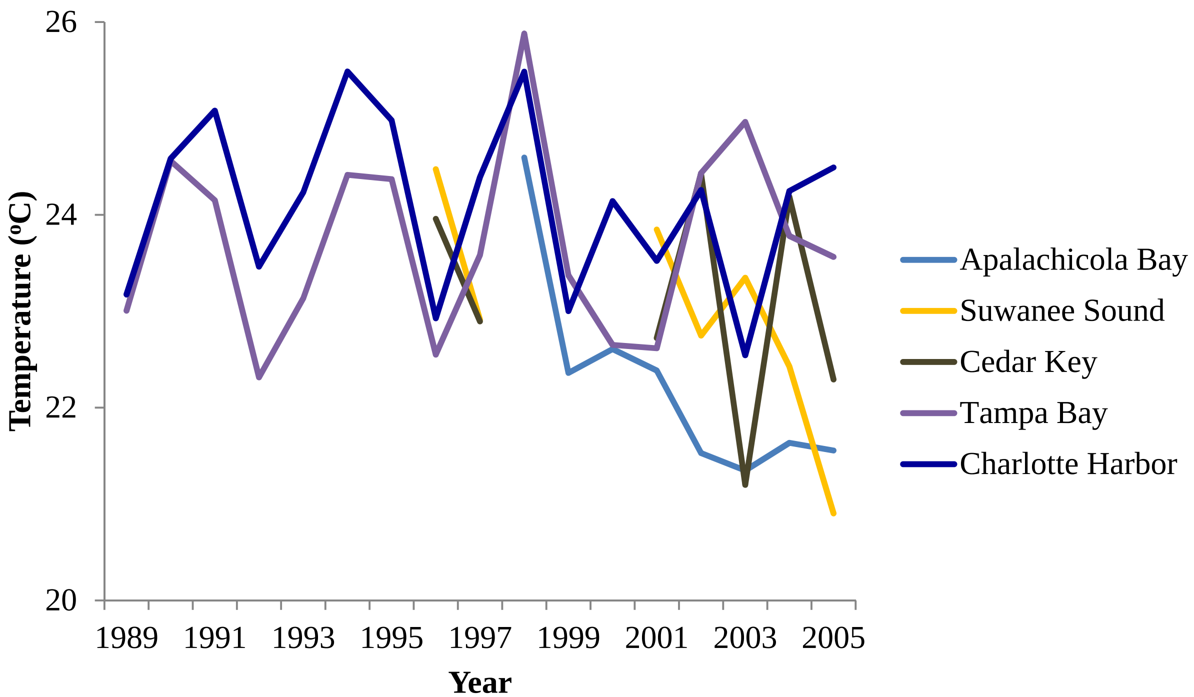

Figure A9. Average annual bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Florida for the years 1989-2005.

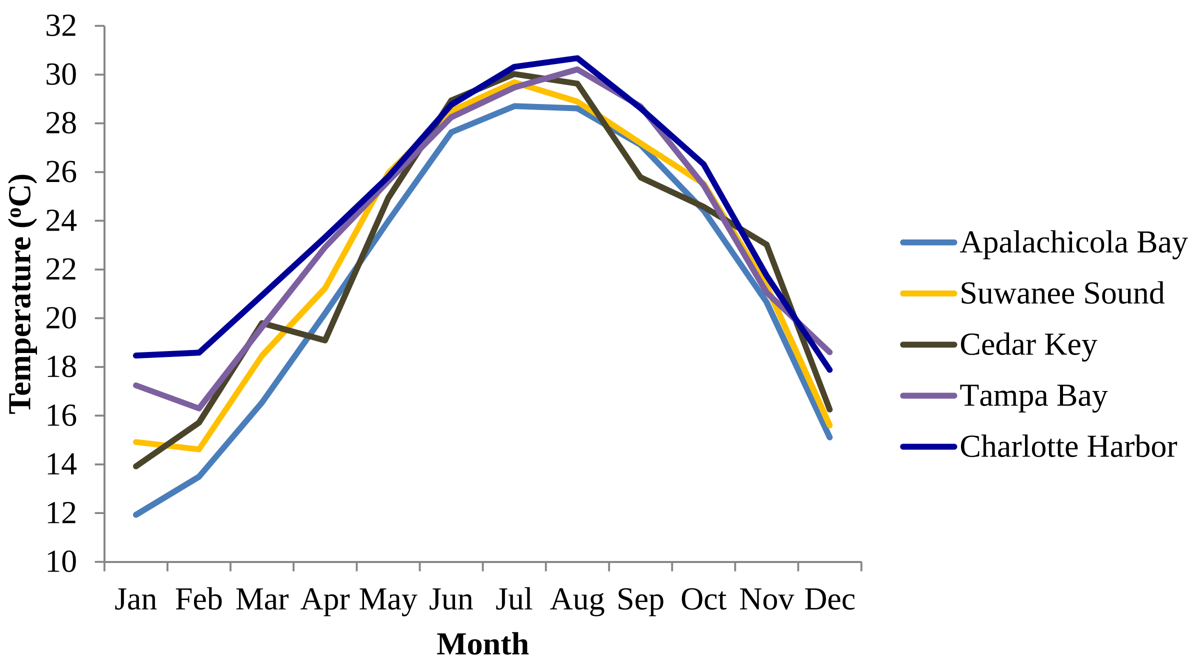

Figure A10. Monthly mean bottom water temperatures (°C) of selected water bodies obtained during fishery-independent sampling in Florida for the years 1989-2005.

Salinity

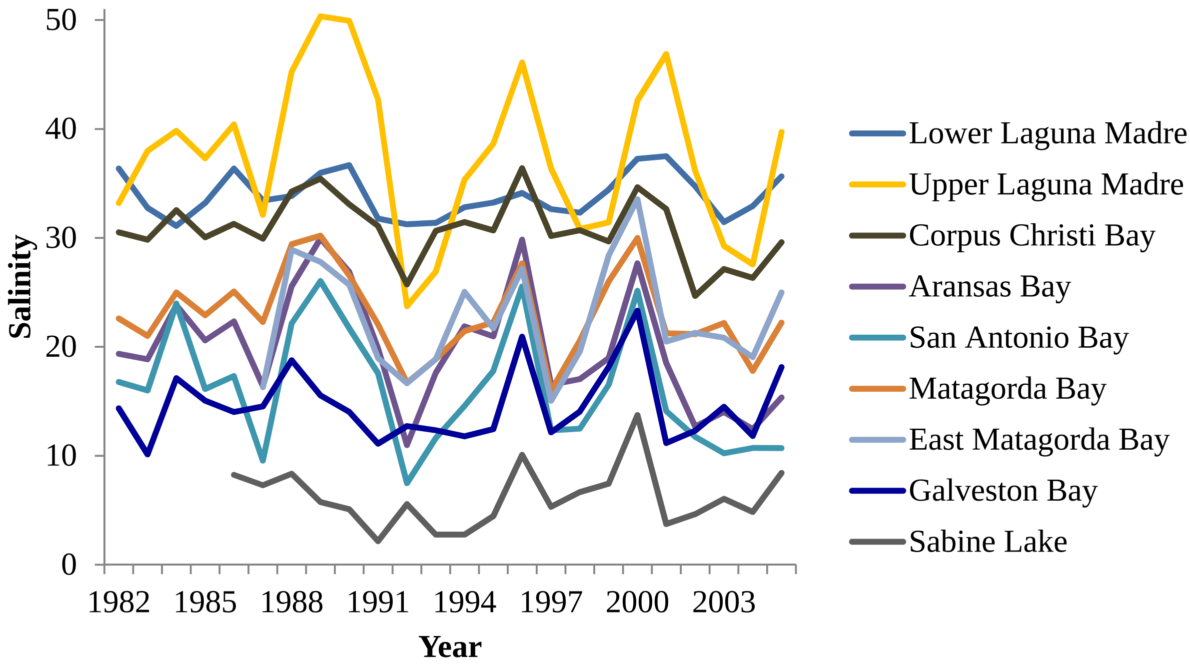

Figure A11. Average annual salinities of selected water bodies obtained during fishery-independent sampling in Texas for the years 1982-2005.

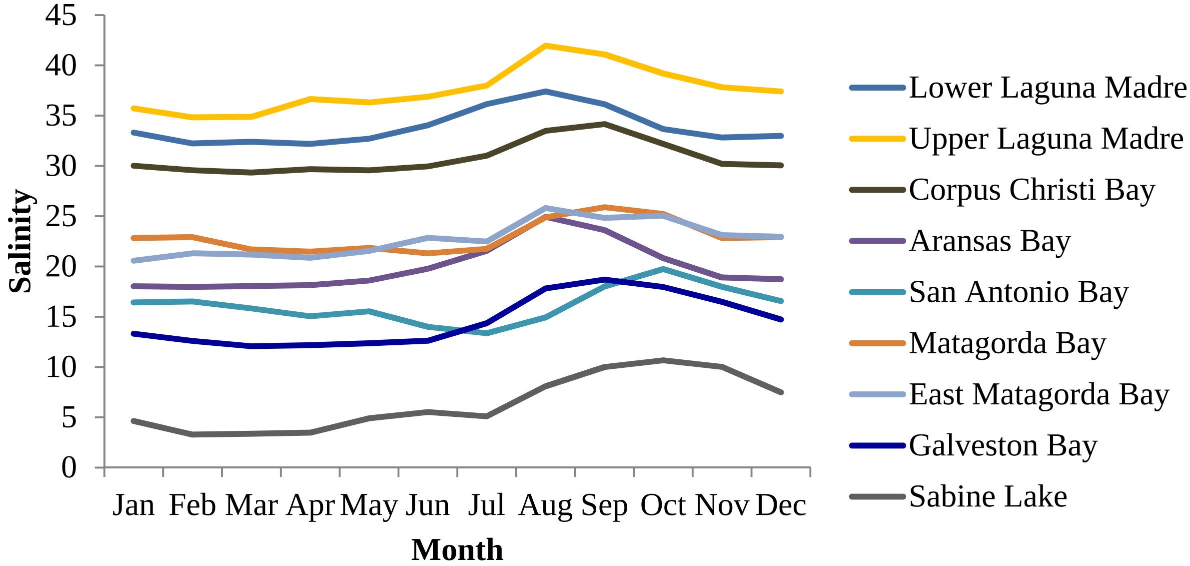

Figure A12. Monthly mean salinities of selected water bodies obtained during fishery-independent sampling in Texas for the years 1982-2005.

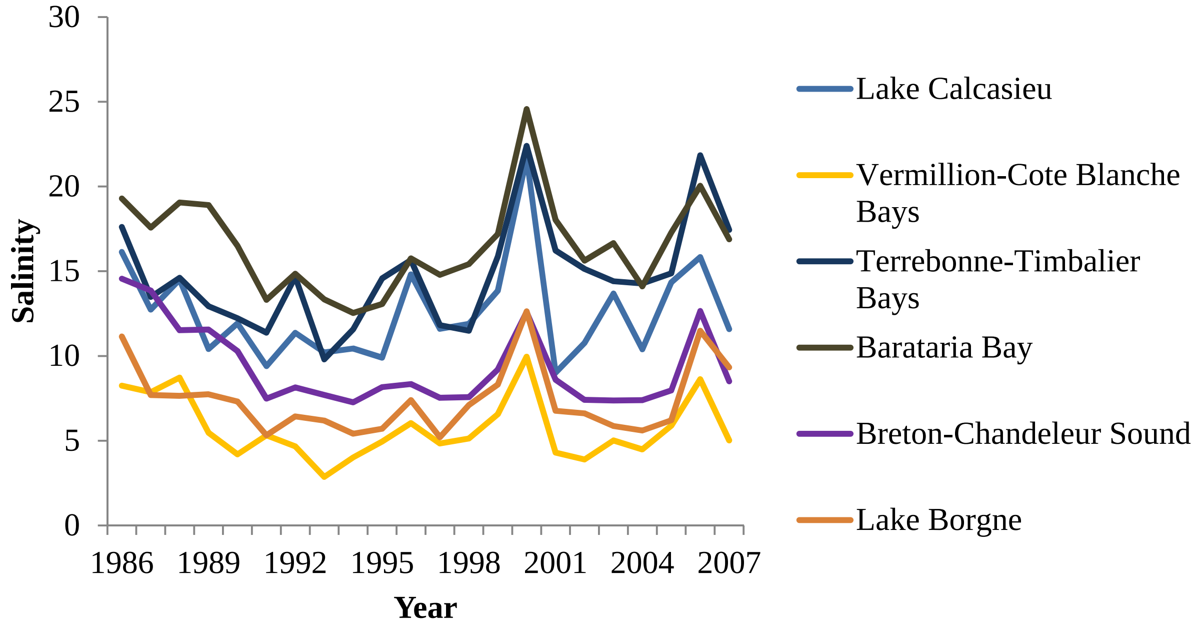

Figure A13. Average annual salinities of selected water bodies obtained during fishery-independent sampling in Louisiana for the years 1986-2007.

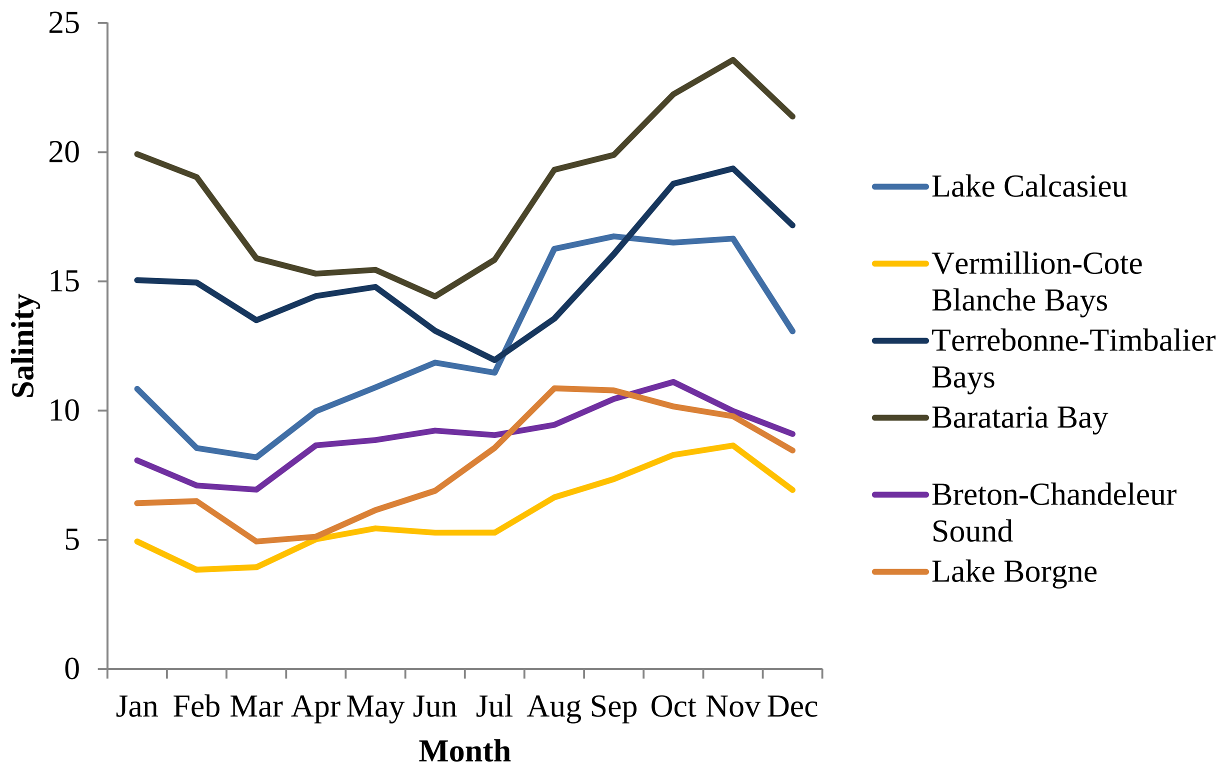

Figure A14. Monthly mean salinities of selected water bodies obtained during fishery-independent sampling in Louisiana for the years 1986-2007.

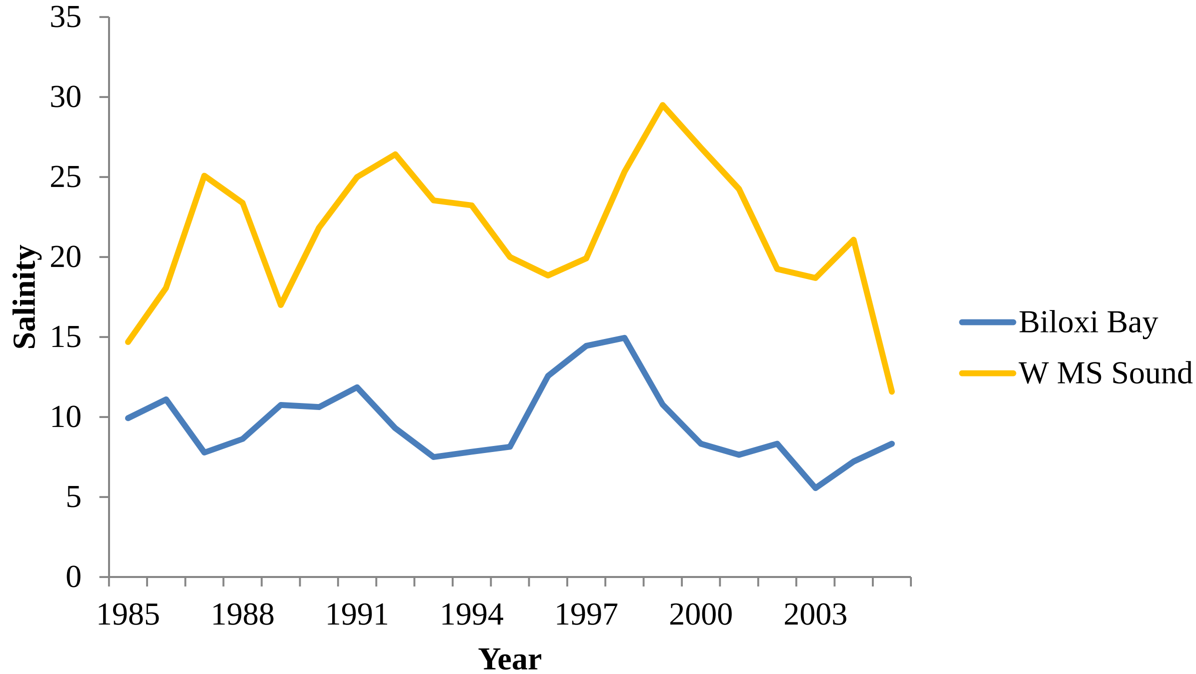

Figure A15. Average annual salinities of selected water bodies obtained during fishery-independent sampling in Mississippi for the years 1985-2005.

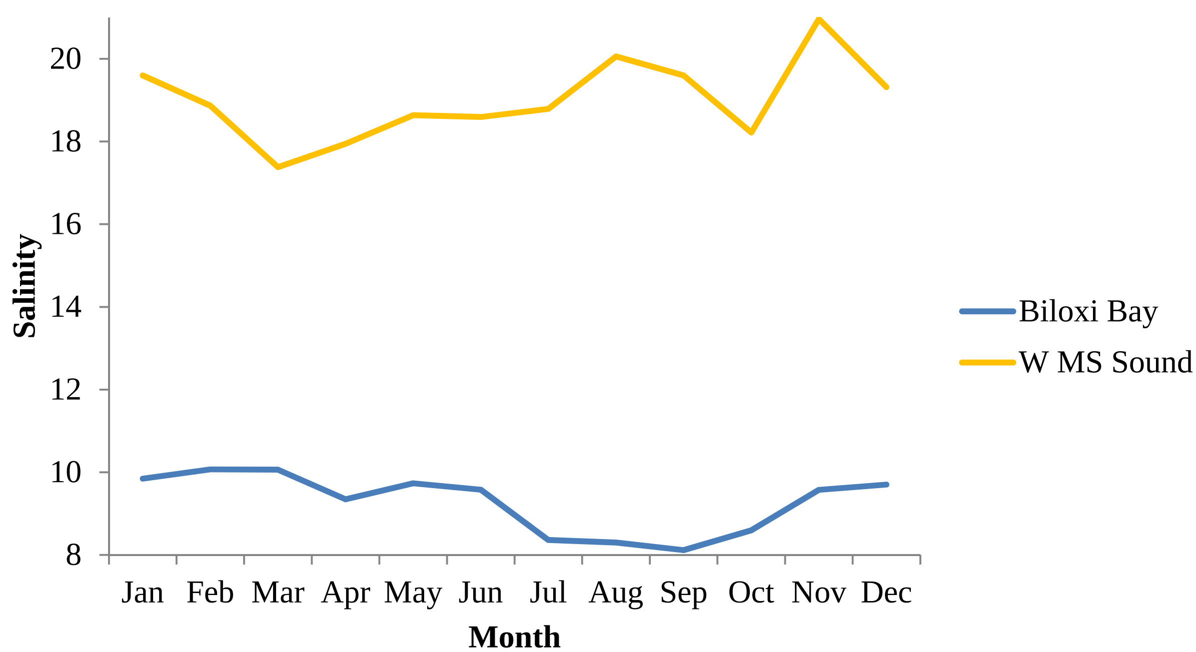

Figure A16. Monthly mean salinities of selected water bodies obtained during fishery-independent sampling in Mississippi for the years 1985-2005.

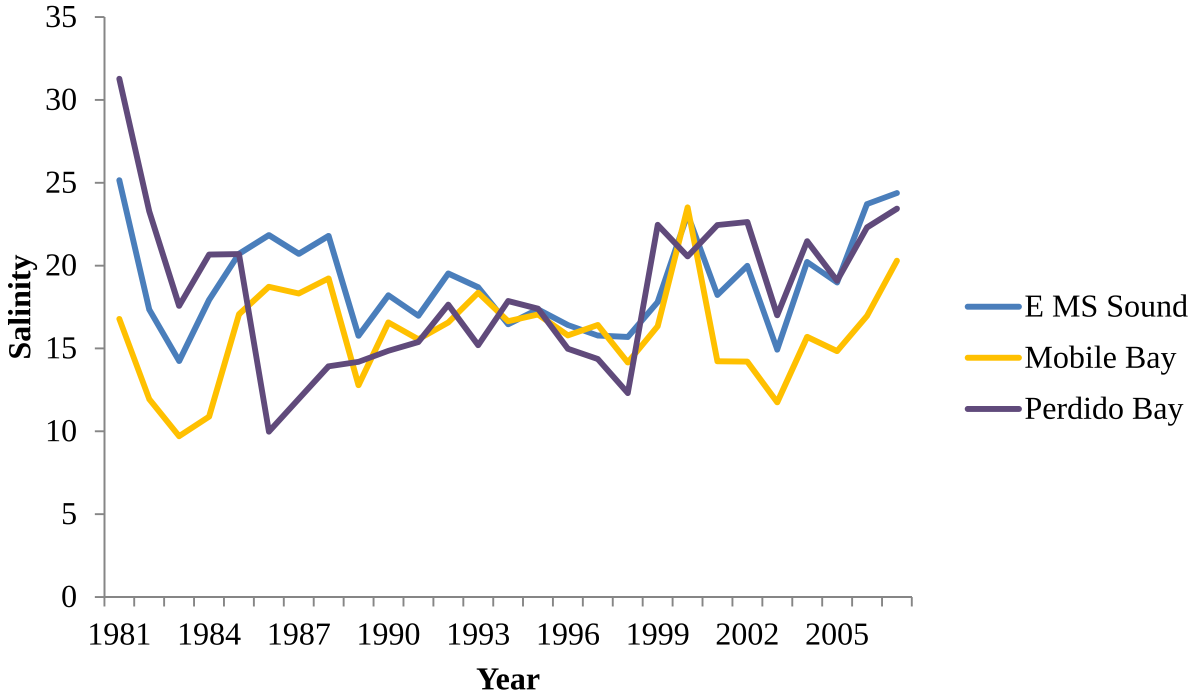

Figure A17. Average annual salinities of selected water bodies obtained during fishery-independent sampling in Alabama for the years 1981-2007.

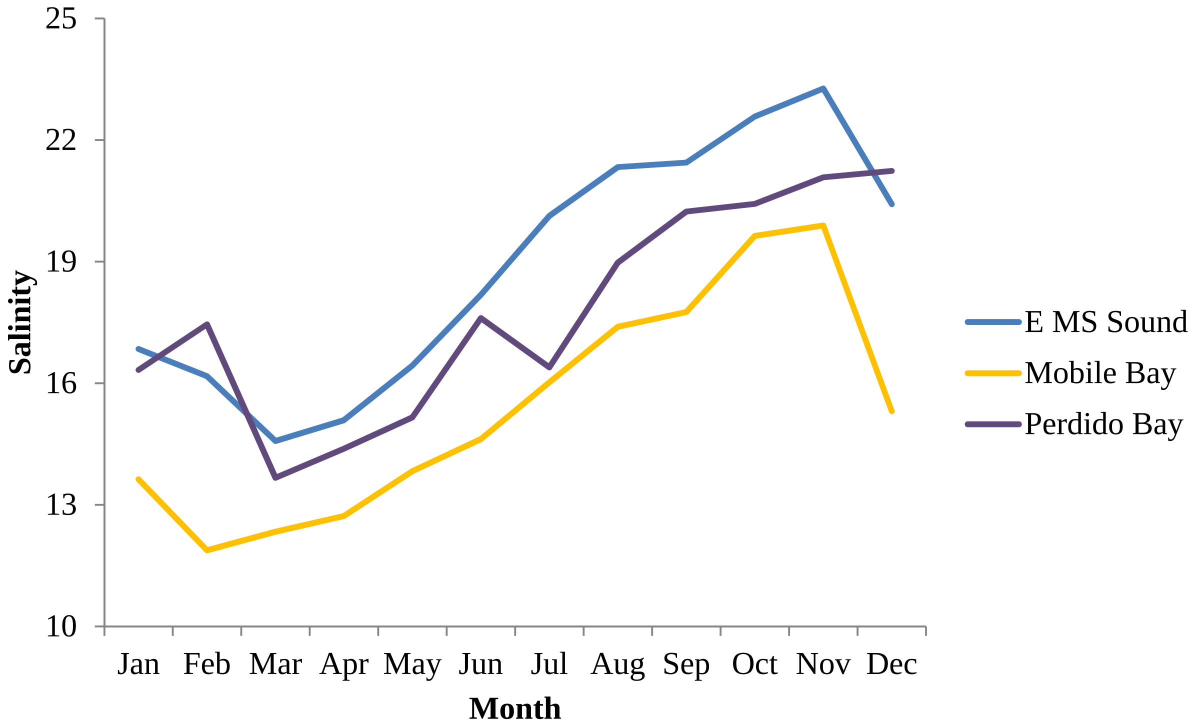

Figure A18. Monthly mean salinities of selected water bodies obtained during fishery-independent sampling in Alabama for the years 1981-2007.

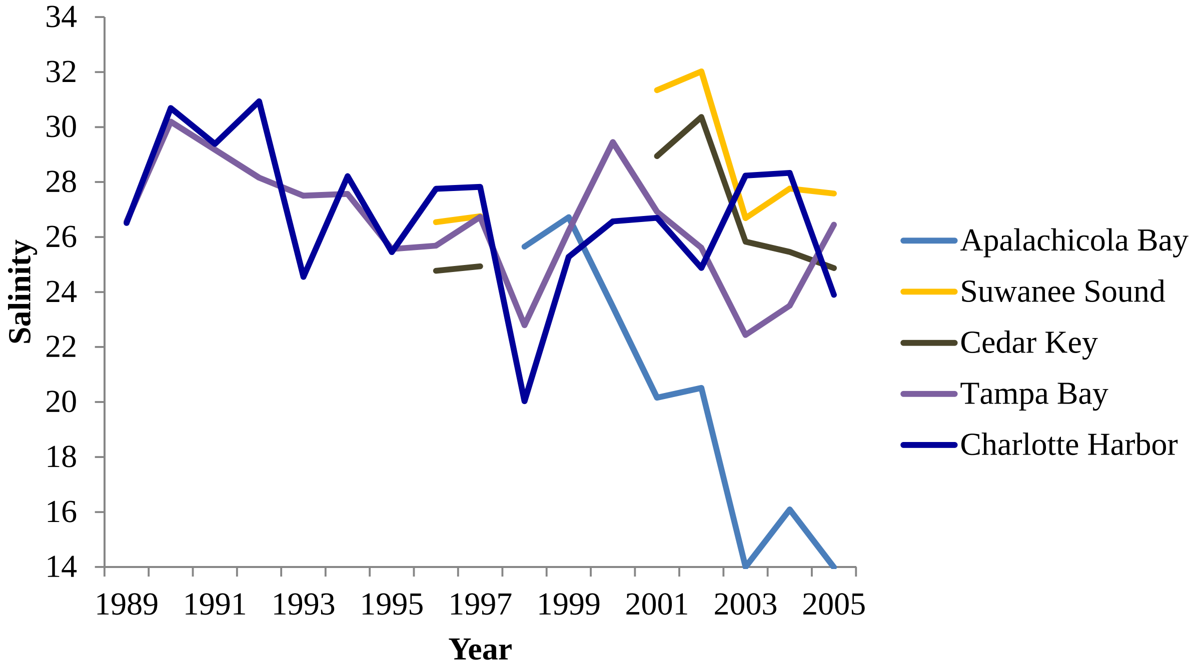

Figure A19. Average annual salinities of selected water bodies obtained during fishery-independent sampling in Florida for the years 1989-2005.

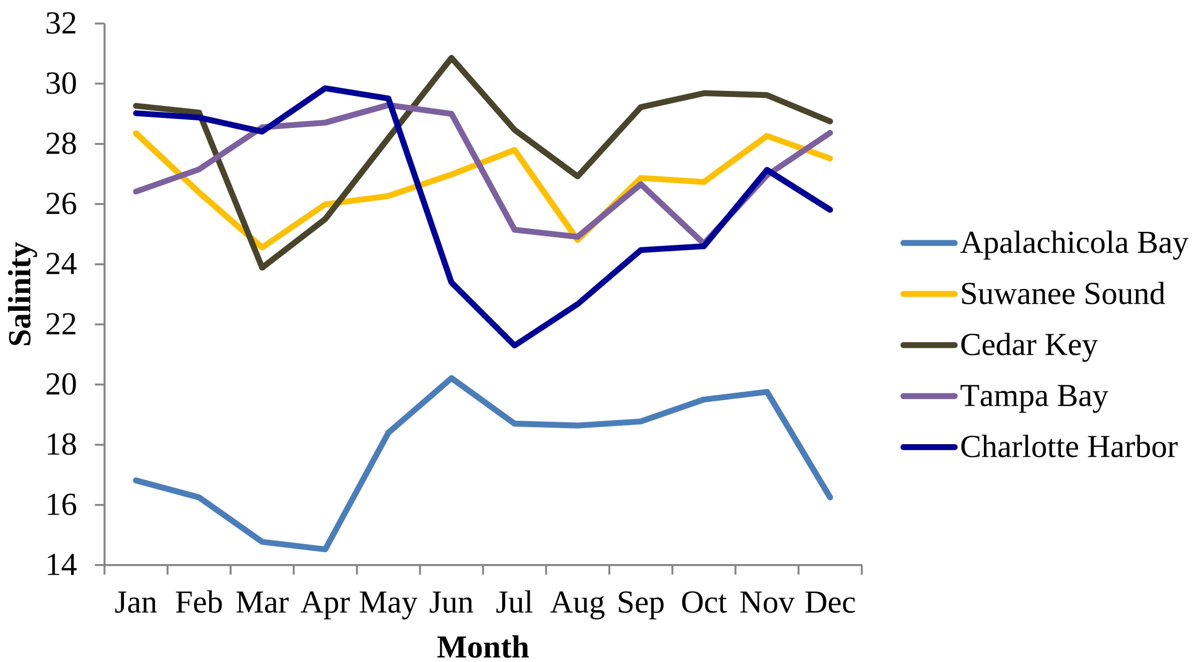

Figure A20. Monthly mean salinities of selected water bodies obtained during fishery-independent sampling in Florida for the years 1989-2005.