

ASMFC American Shad Sustainable Fishing Plan for Georgia

**Submitted by
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Introduction:

The purpose of this sustainable fisheries management plan for American shad is to allow the continuation of existing American shad fisheries in Georgia rivers where it has been determined continuation of fishing will not adversely impact the Atlantic Coast American shad stock. This plan is submitted to fulfill requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

Management of American shad in Georgia is shared between the Coastal Resources Division and the Wildlife Resources Division's Fisheries Management Section of the Georgia Department of Natural Resources (GADNR). The river complex utilized by fish stocks defines Georgia's management units. Historically, all of Georgia's Atlantic-slope rivers supported a commercial fishery for American shad (Figure 1). However, in recent years, commercial landings of American shad have been reported from only three (Altamaha, Savannah, and Ogeechee) of these five rivers. There have been no reports of commercial landings from the Satilla or St. Marys rivers since 1989. Small-scale recreational fisheries for American shad exist in the Savannah and Ogeechee rivers.

During 2010, the Georgia Board of Natural Resources adopted new commercial shad fishing rules based on a recommendation from GADNR. These changes modified the temporal and spatial components of commercial shad fishing effort in Georgia's Atlantic-slope rivers, both to provide the basis for American shad sustainability plans and to address shortnose sturgeon bycatch issues.

The commercial shad (American and hickory) season is open each year from January 1 to March 31. Drift gill nets with mesh sizes of at least 4-½ inches (stretch mesh) are legal gear in all waters open to commercial shad fishing. Set gill nets with mesh sizes of at 4-½ inches (stretch mesh) are legal gear in waters open to commercial shad fishing in the Altamaha and Savannah Rivers. The St. Marys and Satilla rivers are now closed to commercial shad fishing.

The Altamaha River is open to commercial shad fishing from the U.S. Hwy 1 Bridge (rkm 183) downstream to the Atlantic Ocean. Including the waters of its major tributaries, this is an area approximately 347 rkm or 65% smaller than previously open to commercial shad fishing. The Altamaha River is open Monday through Friday below the saltwater demarcation line and Tuesday through Saturday above the saltwater demarcation line.

The Savannah River is open to commercial shad fishing from the U.S. Hwy 301 Bridge (rkm 192) downstream to the Atlantic Ocean, an area approximately 103 rkm or 35% smaller than previously open to commercial shad fishing. The Savannah River is open from Tuesday through Friday east of the I-95 Bridge and Wednesday through Saturday west of the I-95 Bridge.

The Ogeechee River is open to commercial shad fishing from the Georgia Hwy 204 Bridge (rkm 71) downstream to the Atlantic Ocean, an area approximately 137 rkm or 66% smaller than previously open to commercial shad fishing. The Ogeechee River is open on Friday instead of Friday and Saturday as was permitted prior to 2011. The use of set gill nets is prohibited in the Ogeechee River.

Georgia has a statewide 8 shad (American and/or hickory) recreational daily creel limit.

Georgia's American Shad Fishery

Brief Description

The Altamaha River supports the state's largest commercial shad fishery and is Georgia's largest watershed, draining 37,192 km². The Altamaha is formed by the confluence of the Oconee and Ocmulgee rivers and flows for approximately 220 kilometers to the Atlantic Ocean. The Altamaha is free of dams for the entire length of the river; however dams are located on both the Oconee and Ocmulgee rivers. Drift and set gill nets are the gear types used to commercially fish for shad throughout the river. Most full-time commercial fishermen prosecute their effort in the lower 60 kilometers of the river. Drift nets are the most prevalent gear type in the lower river, whereas set nets are more prevalent in the upper river (upstream of the City of Jesup). No directed hook and line fishing for shad takes place in the Altamaha River.

The Savannah River drains a watershed of approximately 17,022 km² and forms the boundary between Georgia and South Carolina. The first barrier to upstream migration on the Savannah River is the New Savannah Bluff Lock and Dam (NSBLD) located at river km 301. American shad are passed through this dam via lockage. The upper commercial fishing boundary is approximately 109 rkm below NSBLD, thus fish reaching this point have escaped the commercial fishery. Above NSBLD are three dams located from river km 333 to river km 355. Both drift and set gill nets are used to commercially fish for shad throughout the river. Most of the commercial activity takes place in the lower reach of the river and drift gill nets are the primary commercial gear used east of the I-95 Bridge. A recreational fishery also exists in the tail waters of the NSBLD.

The Ogeechee River, which drains a watershed of approximately 14,300 km², rises out of the east central piedmont and flows southeasterly approximately 564 km to the Atlantic Ocean. There are no barriers to upstream migration the entire length of the Ogeechee River. In recent years, a very small commercial fishery has persisted in the Ogeechee River with all reported landings coming from the lower section of the river. Drift and set gill nets have traditionally been used in this river. Additionally, a small sport fishery also exists on the Ogeechee River.

The Satilla River rises out of the coastal plain south of Fitzgerald, GA and flows southeasterly 328 km to the Atlantic Ocean. The river drains approximately 9,143 km² of land. There are no barriers to upstream migration the entire length of the Satilla River. There has been no known commercial fishing activity on the Satilla River since 1982. No directed hook and line fishing for shad takes place on the Satilla River.

The St. Marys River originates in the southeastern portion of the Okefenokee Swamp and flows 239 km to the Atlantic Ocean, draining a watershed of approximately 3,900 km². There are no barriers to upstream migration the entire length of the St. Marys River. There has been no known commercial fishing activity on the St. Marys since 1989. There is no directed recreational fishery for shad on the St. Marys River.

Landings

Reported commercial landings of American shad are available from the National Marine Fisheries Service and the State of Georgia through GADNR, which has recorded river-specific landings since 1962. In 2001, Georgia instituted a mandatory reporting system that requires an individual record (trip-ticket) to be completed at the time of sale for each catch sold to a seafood dealer. Data collected includes the river of capture, type of gear, total net soak time, etc. Numbers of wholesale dealers processing shad have declined over time and during 2010 and 2011 there were less than 3 dealers that purchased shad from commercial fishermen. Due to the low number of dealers and corresponding confidentiality agreements, commercial landings data obtained from trip-tickets during 2010-2011 must be excluded from reports.

GADNR has conducted periodic recreational creel surveys on the Ogeechee River since 1986 to estimate harvest and catch-per-unit-effort (CPUE). The number of American shad caught per hour of fishing time has varied from a low of 0.2 shad/hour in 1986 and 2010 to a high of 0.5 fish/hour in 1995. It is important to note that flow conditions can have a significant impact on angler catch rates in this fishery. Total effort and fish harvested has ranged from a high of 2,210-angler hrs and 1,053 shad harvested in 1996 to a low of 1,010-angler hrs and 155 shad harvested in 2010. Effort data from the last four creel surveys has averaged 1,542-angler hrs and total shad harvested has averaged 486 fish.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by GADNR (1997) and South Carolina Department of Natural Resources (1998 and 1999). Estimates of catch from these surveys varied from year to year largely due to dramatically different flow conditions. Catch estimates from each of these creel surveys were provided by Boltin (1999).

Fishery Dependent Indices

Reported American shad landings from the Altamaha River reached a high of 471,700 lbs in 1968 and then declined for several years. Landings averaged approximately 299,000 lbs during 1962-1969 and approximately 130,000 lbs during 1970-1979. Reported Altamaha River shad landings peaked in 1983 at 143,963 lbs and again in 1995 at 121,811 lbs (Figure 2). Total reported landings have fluctuated at less than 62,000 lbs

since 2000. Ogeechee River shad reported landings exhibited a similar pattern and peaked in 1972 at 133,400 lbs before declining. Ogeechee River landings data is not available for 1983-1988, so it cannot be determined if landings increased anytime in this period. However, there was an increase in reported total pounds of American shad landed from the Ogeechee River in the mid-1990s that coincided with the increase in Altamaha River landings. Therefore, it is possible that the same trend occurred in the Ogeechee River in the mid-1980s. Savannah River landings data was supplied to SCDNR and will be combined with their landings data and reported in the South Carolina sustainability plan. In addition to collecting landings data, a commercial fishery creel survey was completed from 1982-1991 on the Altamaha River.

The ASMFC Shad Technical Committee (TC) asked GADNR to compare mean annual flows with commercial landings to provide precursory insight into whether or not there is a potential relationship between flow and landings. Figures 3 and 4 compare mean annual flows and January-March mean flows for the Altamaha River at the Doctortown gauge with reported landings. Correlation analysis between river flow and commercial landings resulted in R^2 values of 0.03 and 0.18 for annual and January-March mean flows, respectively.

Since 2001, commercial shad fishing effort has been quantified based on total number of reported commercial trips. The highest recorded statewide effort was 860 commercial fishing trips for the Altamaha River and 17 trips for the Ogeechee River in 2001 (Figure 5). During 2002-2011, commercial fishermen have averaged approximately 277 trips/yr for the Altamaha River and 6 trips/yr for the Ogeechee River. Effort data for the Savannah River was supplied to SCDNR and will be combined with their effort data and reported in the South Carolina sustainability plan.

Fishery Independent Indices

GADNR has utilized gill net surveys to generate population size and exploitation rate estimates for American shad through mark and recapture efforts in the Altamaha River since 1982 and CPUE since 1986. The American shad population was also estimated in 1967.

Adult shad electrofishing surveys were initiated in 2010 on the Ogeechee and Savannah rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management). GADNR staff will conduct these surveys twice monthly for three months during the spawning migration.

GADNR estimated juvenile American shad abundance from trawl surveys on the Altamaha River during 1982-1991 and the Ogeechee River during 1982-1985. Juvenile catch rates could not be correlated to estimated spawning populations nor future adult spawning return rates, so juvenile sampling ceased after 1991. However, GADNR reinstated a juvenile sampling program utilizing a 50-ft seine in 2010 on the Altamaha, Ogeechee, and Savannah rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad

Management). Seine mesh size and site locations were both experimental in 2010 and will become standardized. Current plans are to annually sample 3-6 sites/river twice a month from July-September.

Sustainable Fisheries

Altamaha River

GADNR has produced annual Lincoln-Peterson population estimates and exploitation rates from a tagging study that was initiated in 1982. Adult American shad are captured via gill nets in the lower 25 miles of the Altamaha River and tagged with a T-bar anchor tag produced by Floy Tag & Mfg, Inc. Tagging efforts are conducted on Saturday and Sunday each week of the commercial shad season that runs January 1 through March 31. These days were chosen due to the fact that the commercial fishery is closed in this portion of the river on weekends, thus allowing the fish to naturally disperse before potential recapture by commercial fishermen. Before the start of the season, 500 tags are randomly assigned values of \$4, \$10, \$50, or \$100. Two percent of the tags receive a \$100 value, 3% are \$50, 20% are worth \$10, and 75% worth \$4. Tag values are not printed on the tag. Upon capturing a tagged fish, commercial fishermen are required to remove tags and mail them into GADNR to receive the monetary award. GADNR keeps record of the number of fish tagged (M) and recaptured (R) and then utilizes reported commercial landings data to produce the total number of fish captured (C). In an effort to account for non-reported commercial landings and produce a more accurate estimate of "C", GADNR conducted a roaming creel survey from 1982-1992. After the 10 year creel survey was completed, GADNR staff developed a statistically based formula to account for non-reporting. From 1993 to present, "C" is calculated by entering the total reported commercial drift net landings into the formula $"C" = (2.322 \times 10^{-6} + 0.214 / \text{Reported Landings})^{-1}$.

From 1982 to present, the estimated size of the adult American shad population has ranged from a low of 70,396 shad in 1990 to a high of 284,442 fish in 1996. After 1996, estimated shad abundance declined for six consecutive years before showing a moderate rebound (Figure 6). However, the 2011 mark and recapture efforts revealed a sharp increase in American shad abundance with a population estimate of 277,824 fish. Trends in GADNR tagging CPUE data appear to be similar to those observed in GADNR's mark and recapture population estimates (Figure 7) and have ranged from a low of 0.7 shad/ft-hr in 1987 to a high of 3.05 shad/ft-hr in 1996. Exploitation rates estimated from recaptures of tagged fish were consistently greater than 30% from 1982 through the early-1990s before declining to present levels (Figure 6). From 2006-2010, exploitation of American shad averaged 21%, ranging from 17.8% to 24%. On January 1, 2011, new commercial regulations that closed approximately 65% of the Altamaha River system went into effect and during this first year total exploitation was 8.6%. Fisher attrition continues to reduce effort, as well.

Juvenile sampling on the Altamaha River was initiated in 2010, and 291 juvenile shad were collected in 12 seine hauls utilizing a combination of two 50-ft bag seines (one with 1/2-inch mesh and one with 3/8-inch mesh). The resulting geometric mean was 14.6 shad/haul. However, staff observed juvenile shad escaping through both of these nets. Therefore, catch rates would have been higher if a smaller mesh seine had been utilized.

For 2011 and future years, GADNR staff are utilizing a 50ft bag seine with ¼-inch mesh to sample juvenile shad. During July 2011, 1,282 juvenile shad were captured in 20 seine hauls with a resulting geometric mean of 38.4 shad/haul. During July 1968, Godwin and Adams (1969) utilized a similar seine to collect juvenile shad and reported an arithmetic mean of approximately 15 shad/haul. Therefore, the CPUE of juvenile shad observed in July 2011 seems to indicate that American shad reproduction is currently at a sufficient level to sustain the population.

The ASMFC American Shad Stock Assessment Sub-committee (SASC) utilized catch-per-unit-effort data (CPUE) through 2005 from GADNR tagging efforts on the Altamaha River as an indicator that the Altamaha stock was in decline when the 2007 stock assessment was completed. During 2006-2011, CPUE data from GADNR tagging efforts averaged 1.97 shad/ft-hr, which is 74% higher than the average of 1.13 shad/ft-hr observed from 2000-2005 (Figure 8). This fact along with the apparent increase in population abundance, decreased exploitation rates, and recent juvenile abundance data supports the fact that the current fishery appears to be sustainable. In addition, GADNR believes that the 2011 regulations will allow sufficient escapement of adults and help ensure that fishery removals will not adversely impact the Atlantic Coast American Shad population.

The SASC and TC expressed concerns with utilizing population estimates and exploitation rates generated from annual tagging efforts as stock indicators since GADNR has not studied non-reporting rates, tag loss, tagging mortality, post tagging movements, or repeated the 1980's creel survey to validate the formula that accounts for non-reporting of commercial landings. Instead, the TC recommends using annual CPUE data as a benchmark. Therefore, GADNR will continue to monitor the Altamaha stock through a fishery independent gill netting survey in order to develop annual CPUE data for use as a stock abundance indicator. GADNR will utilize a CPUE benchmark of 75% of the mean for 3 consecutive years. The TC asked GADNR to consider two potential CPUE benchmark means. The first would utilize the entire time series of data (1986-2011) to calculate the mean, resulting in a benchmark CPUE of 1.11 shad/ft-hr (Figure 8). The second option was to exclude the first seven years and utilize data from 1993 through 2011 to present and would establish a CPUE benchmark of 1.29 shad/ft-hr. GADNR believes it is more appropriate to utilize the entire time series of data to establish the benchmark CPUE since it encompasses a greater degree of environmental and population variability, the Altamaha shad population has historically shown the capacity to rebound after 7 consecutive years below this benchmark, and historically a benchmark of 1.29 shad/ft-hr would not have triggered action any more frequently than a benchmark of 1.11 shad/ft-hr. If gill netting CPUEs drop below 1.11 shad/ft-hr for 3 consecutive years, GADNR will evaluate commercial fishing regulations and harvest data and consider modifications to the Altamaha fishery to ensure the fishery remains sustainable. In the future, utilization of a juvenile index of abundance may be added once GADNR has collected several years of data in order to establish a CPUE benchmark appropriate to the Altamaha River.

Since the TC was interested in examining the effects of river flow and commercial landings, GADNR also compared CPUE data collected during tagging efforts and flow on the Altamaha River (Figures 9 and 10). As with reported commercial landings, there

did not appear to be a strong relationship between river flow and CPUE. Correlation analysis revealed that approximately 12% of the variability in catch rate could be explained by flow for both annual and January-March mean flows.

Savannah River

Historically, GADNR was not required to collect fishery independent data from the Savannah River. In 2010, GADNR initiated fishery independent sampling for both adults and juveniles. Savannah River data collected by GADNR was provided to SCDNR to be combined with their data and reported in the South Carolina sustainability plan.

Ogeechee River

Historically, GADNR was not required to collect fishery independent data on the American shad fishery in the Ogeechee River. In 2010, GADNR initiated fishery independent sampling for both adults and juveniles. Adult electrofishing CPUEs were 15.19 shad/hr in 2010 and 11.84 shad/hr in 2011. Utilizing data from six sites where juvenile shad were consistently captured in 2010, the geometric mean for juveniles collected using 50-ft seine with $\frac{1}{8}$ -inch mesh was 17.2 shad/haul. The Ogeechee River commercial fishery is extremely small and over the last ten years has averaged six commercial fishing trips/yr with a total reported harvest averaging less than 400 lbs. Even though the fishery is very small, due to the lack of data, GADNR has closed approximately 66% of the waters that were previously open to commercial fishing and reduced the number of days that commercial fishing activity can take place to 1-day/week (a 50% reduction). GADNR believes that this will allow adequate escapement to ensure the sustainability of the population. At this time, GADNR is hesitant to establish sustainability benchmarks from adult electrofishing CPUE data or juvenile abundance indices since there is only one complete year of data available. Once data has been collected for several years, appropriate benchmarks will be established.

Satilla River and St. Marys River

The Satilla and St. Marys rivers are currently closed to commercial fishing for American shad and there are no plans to open these rivers in the foreseeable future. If it were deemed prudent to open these rivers to commercial shad fishing, GADNR will submit, prior to opening the rivers, a sustainability plan for each river.

A. Adaptive Management

GADNR will continue to monitor the commercial shad fishery through fishery dependent and independent sampling on the Altamaha, Savannah, and Ogeechee rivers. Data from the Savannah River will be shared with SCDNR, and the agencies will work cooperatively towards the management of this population.

If three consecutive years of data show that CPUE of adults is decreasing, and/or juvenile abundance is decreasing beyond established benchmark levels, GADNR would evaluate and identify the causes thereof and initiate appropriate actions. Potential actions may include reducing the number of fishing days, modifying season dates, or altering legal fishing gears. In the event such actions are not successful in reversing negative trends, GADNR would then consider closing the fishery in that river system.



Figure 1. Georgia Atlantic-Slope Rivers.

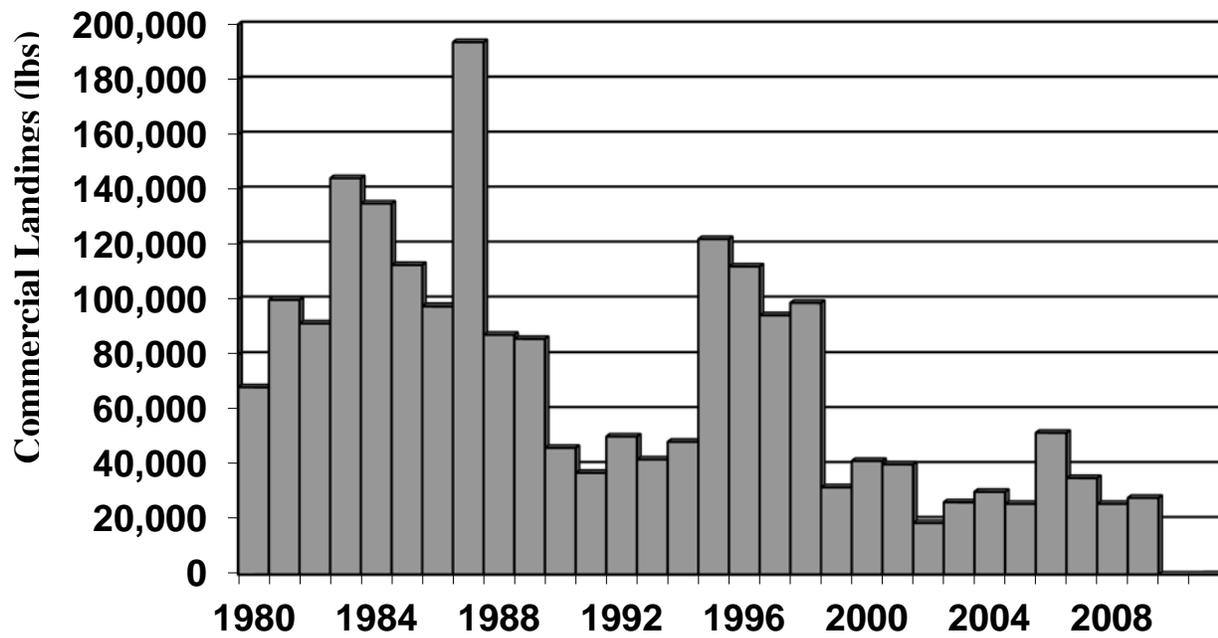


Figure 2. Reported commercial landings of American shad from the Altamaha River, Georgia. Due to confidentiality agreements, data from 2010-2011 have been excluded.

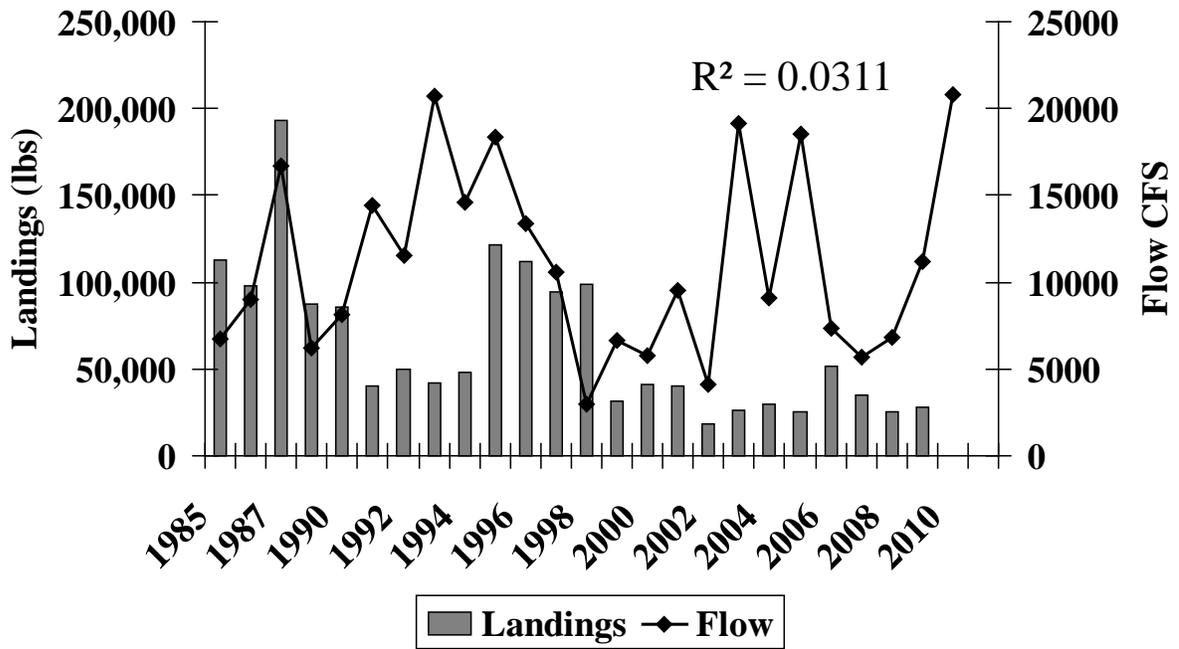


Figure 3. Reported commercial landings of American shad and mean annual flow from the Altamaha River, Georgia. Due to confidentiality agreements, landings data from 2010-2011 have been excluded.

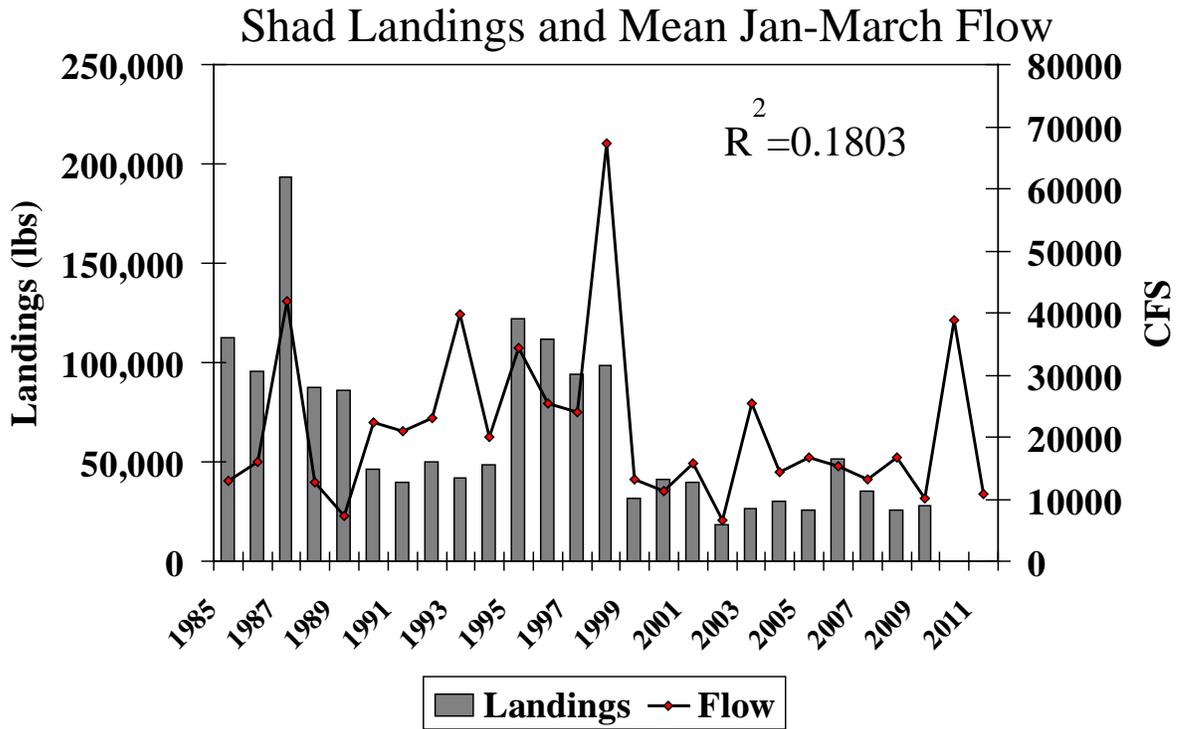
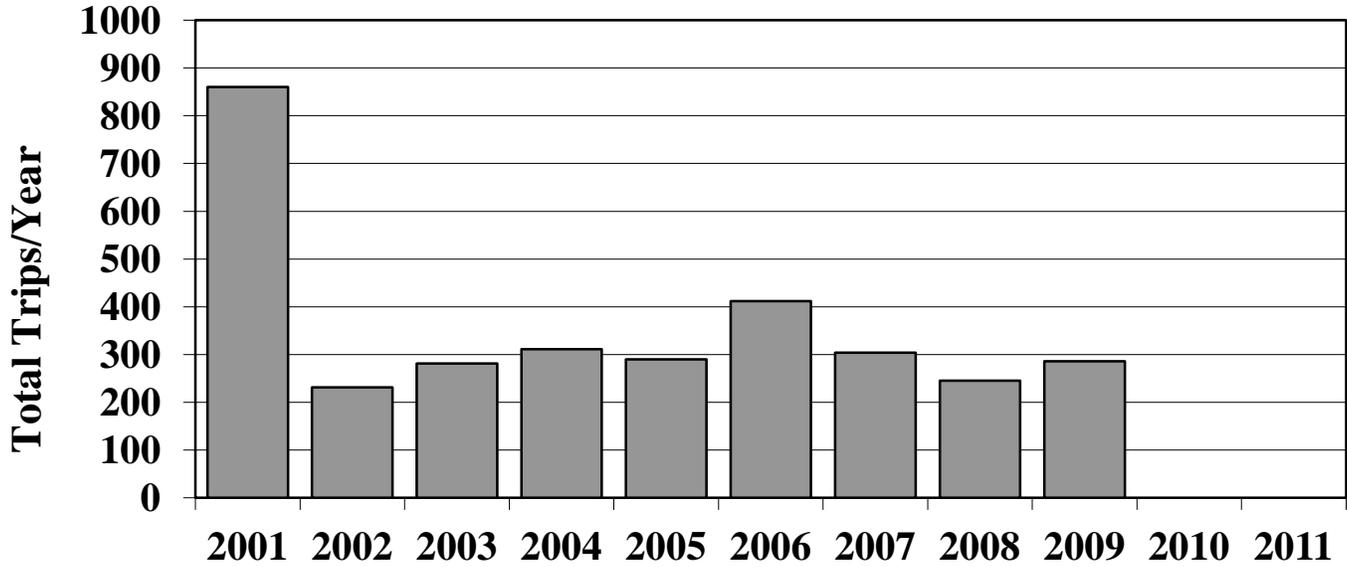


Figure 4. Reported commercial landings of American shad and January-March mean flow from the Altamaha River, Georgia. Due to confidentiality agreements, landings data from 2010-2011 have been excluded.

Altamaha River



Ogeechee River

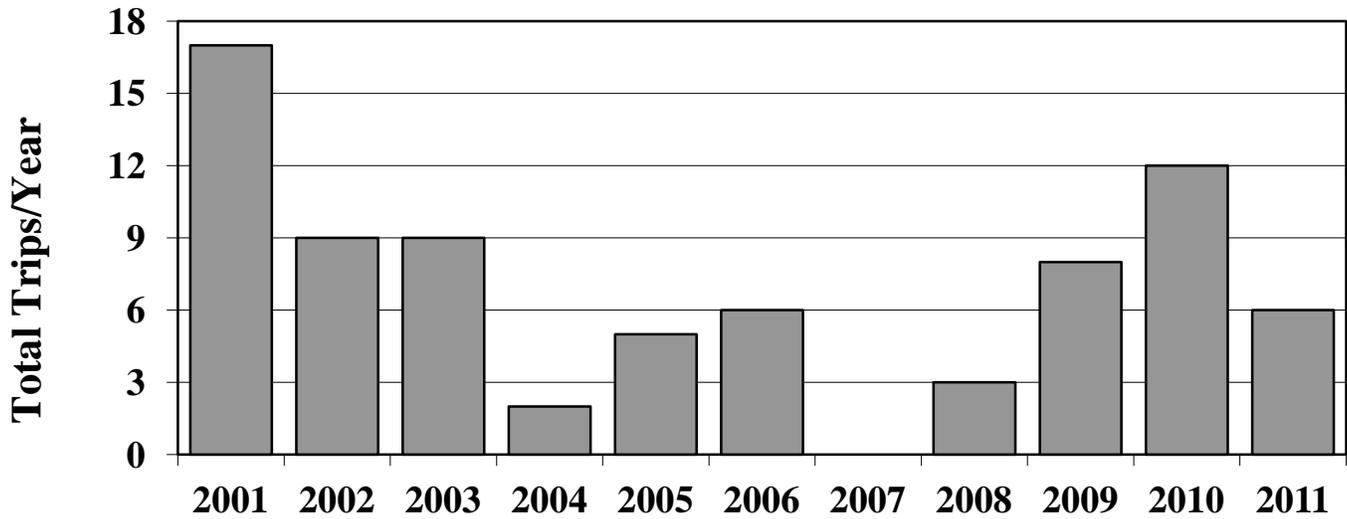


Figure 5. Total commercial fishing effort for American shad in the Altamaha and Ogeechee rivers. Due to confidentiality agreements, data from 2010-2011 have been excluded.

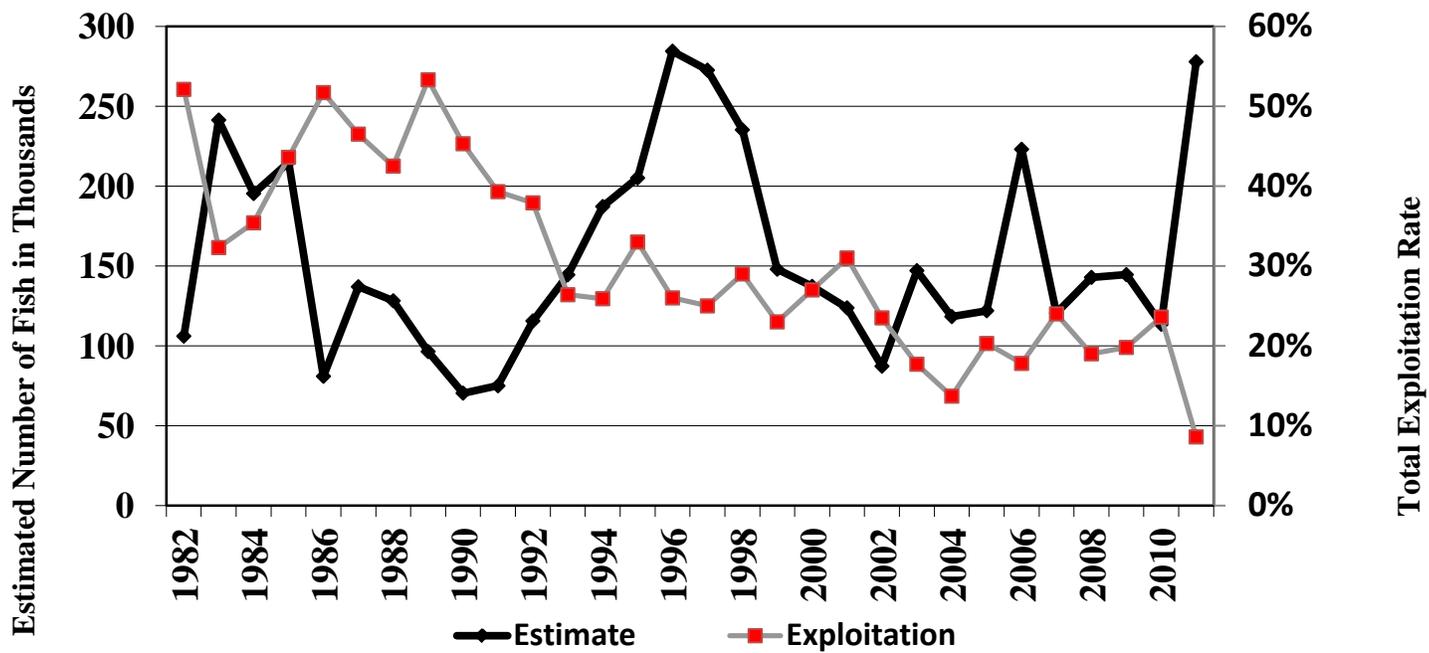


Figure 6. Population estimates and exploitation rates of American shad from the Altamaha River, GA.

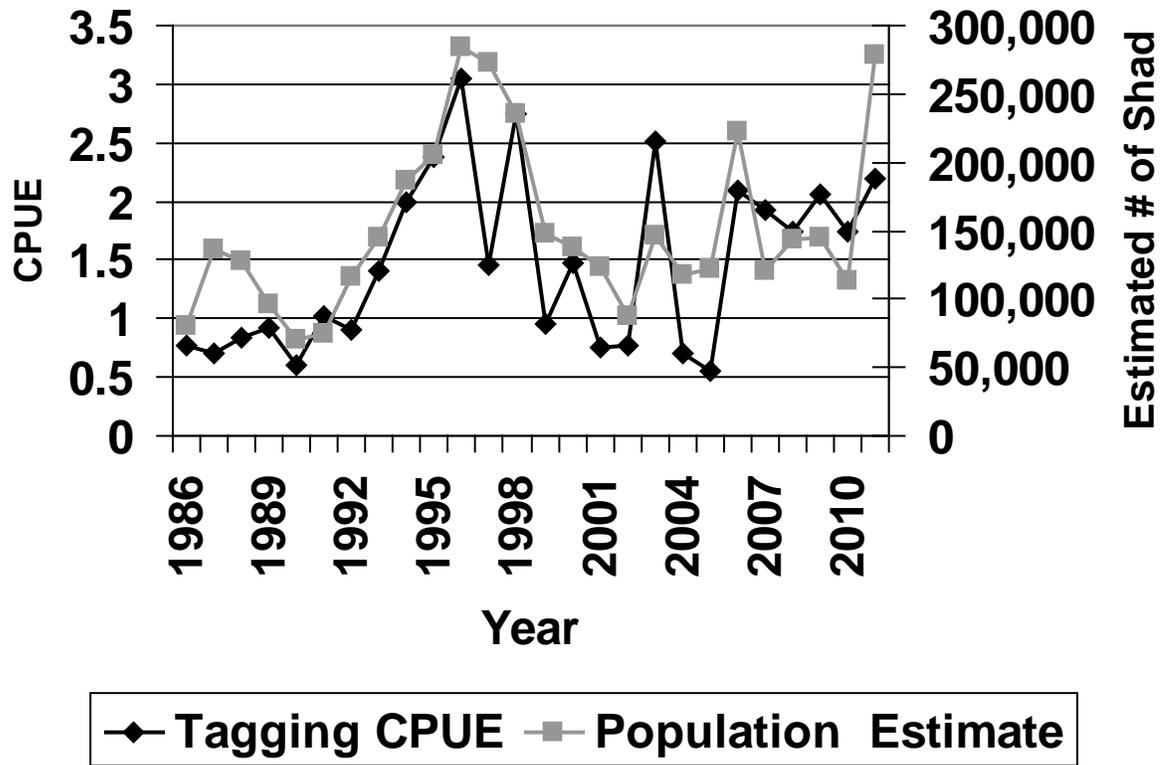


Figure 7. Fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and population estimates from GADNR mark and recapture efforts.

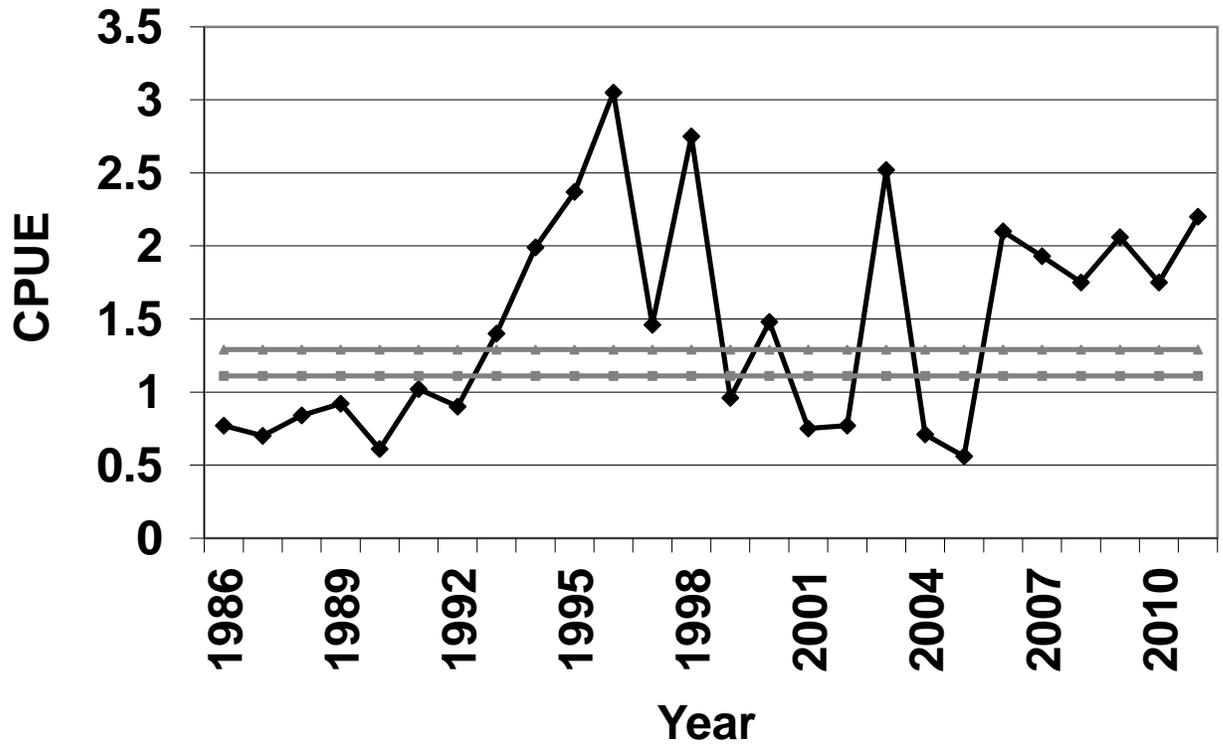


Figure 8. Fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and potential benchmarks developed from GADNR gill-net tagging data.

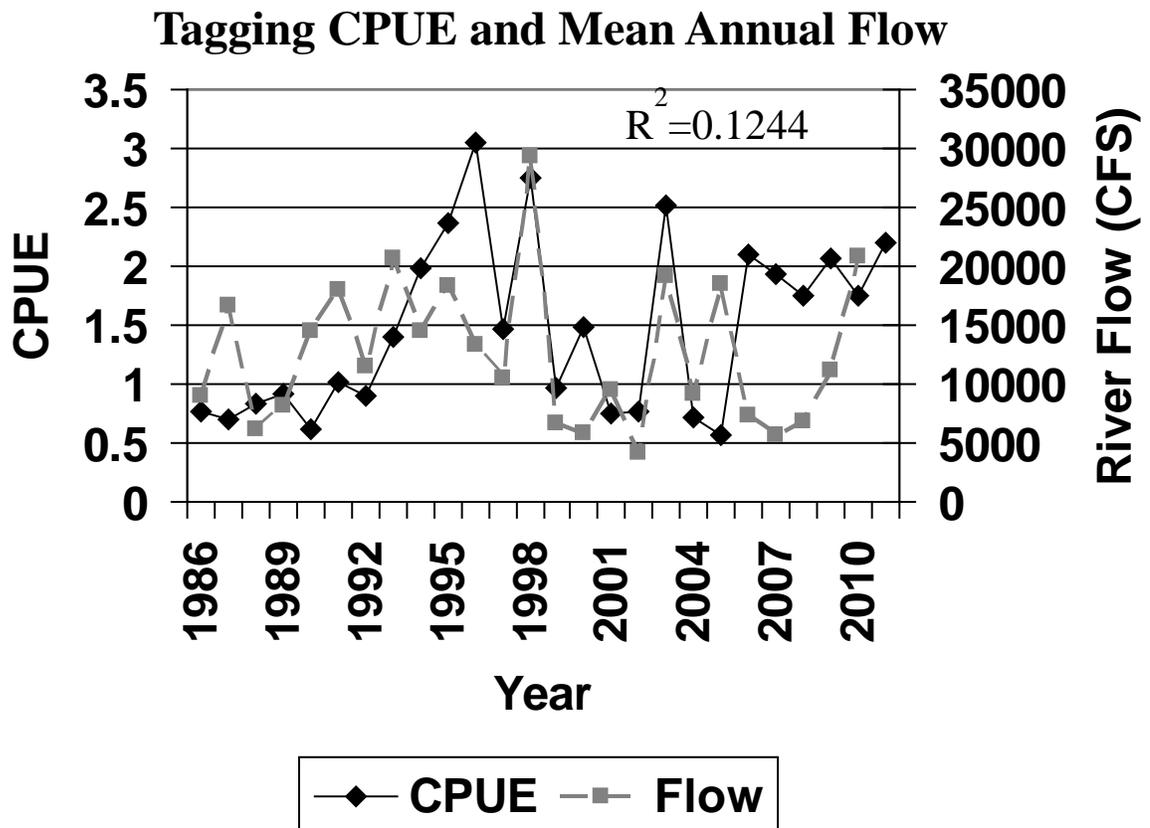


Figure 9. Fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad from GADNR gill-net tagging data and mean annual flow for the Altamaha River at the Doctortown gauge.

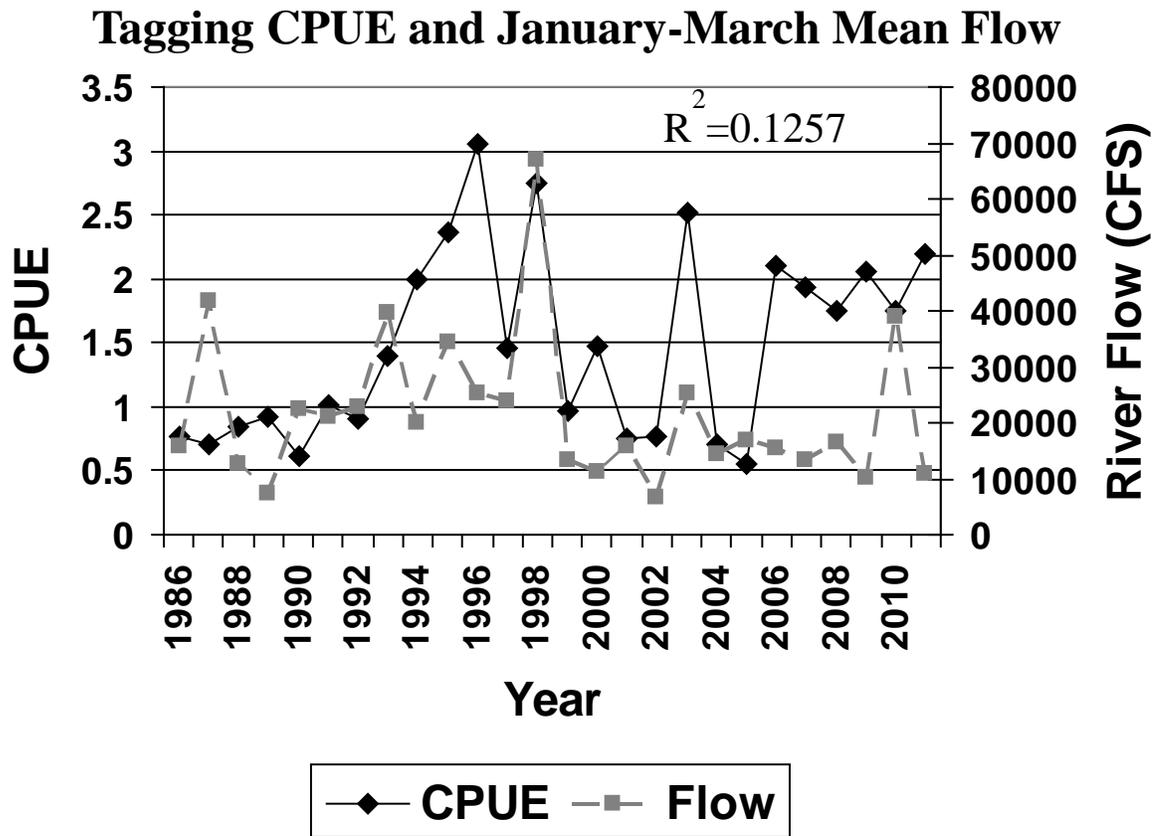


Figure 10. Fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad from GADNR gill-net tagging data and January-March mean flow for the Altamaha River at the Doctortown gauge.

Literature Cited

Godwin, W.F. and J.G. Adams. 1969. Young Clupeids of the Altamaha River, Georgia.
GA Game and Fish Comm., Mar. Fish. Div., Contribution. Ser. No. 15.