

ASMFC American Shad Sustainable Fishing Plan for Georgia

Submitted by

Georgia Department of Natural Resources

Wildlife Resources Division

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Introduction:

The purpose of Georgia's 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 Georgia Department of Natural Resources' (GADNR) Wildlife Resources Division's Fisheries Management Section (FMS) and GADNR's Coastal Resources Division (CRD). 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 (Fig. 1). However, in recent years, commercial landings of American shad have been reported from only two (Altamaha and Savannah) of these five rivers. Recreational shad fisheries exist only at the New Savannah Bluff lock and dam (NSBL&D) on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure greatly reduced the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. There have been no reports of commercial landings from the Satilla or St. Marys rivers since 1989.

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 the commercial shad fishing efforts along Georgia's Atlantic-slope rivers, both to provide the basis for American shad sustainability plans and to address shortnose sturgeon bycatch issues. Following these changes, the St. Marys and Satilla rivers were officially closed to commercial shad fishing. The Ogeechee River commercial shad fishery was also closed prior to the 2014 commercial shad season due to lack of participation during the 2012 and 2013 seasons and to reduce concerns of potential sturgeon bycatch issues. These three rivers will remain closed to commercial American shad fishing.

Georgia's Commercial American Shad Fisheries

The commercial shad (American and hickory) season is open each year from January 1 to March 31. Drift and set gill nets with mesh sizes of at least 4-½ inches (stretch mesh) are legal gear in the Altamaha and Savannah Rivers. Shad fishermen are required to possess a letter of authorization (LOA) in conjunction with a commercial fishing license to fish in Georgia's commercial shad fishery. These LOA's were adopted in 2015 because Georgia has a general commercial fishing license that doesn't specify the targeted fishery. Since inception, the LOA's have increased information about participation in Georgia's commercial shad fishery.

The Altamaha River is open to commercial shad fishing from the U.S. Hwy 1 Bridge (rkm 183) downstream to the Atlantic Ocean (Fig. 1). 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 and Tuesday through Saturday above the Seaboard Railroad bridge crossing (Fig. 1). 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 main stem Altamaha is free of dams for the entire length of the river; however, dams are located upriver on both tributaries. Drift and set gill nets are the gear types used to commercially fish for shad throughout the river. Most full-time commercial fishermen focus their efforts in the lower 60 kilometers of the river. Drift nets are the most prevalent gear type in the lower river, whereas set nets are the more prevalent gear type in the upper river (upstream of the City of Jesup).

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 (Fig. 1). 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 (Fig. 1). 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 NSBL&D located at river km 301, just south of Augusta, Georgia. American shad once passed through this dam via lockage, but in recent years the U.S. Army Corps of Engineers (USACE) has declared the facility unsafe to operate, so fish are not being passed through the lock at this time. The NSBL&D is now a true migration barrier and is the uppermost reach of the American shad migration in the Savannah River. The USACE is currently overseeing the Savannah Harbor Expansion Project which has mitigation plans to install a migratory fish passage at the NSBL&D. After installing this migratory fish passage, the NSBL&D will not be a migratory barrier to the American shad run and American shad will be able to access further upriver habitats above the NSBL&D. The upper commercial fishing boundary is approximately 109 rkm below the NSBL&D, thus fish reaching this point have escaped the commercial fishery. Above the NSBL&D 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 does exist in the tail waters of the NSBL&D. However, the USACE's closing public access to the locks outer wall, significantly decreased the recreational fishery at this site.

Georgia's Recreational American Shad Fisheries

Small-scale recreational fisheries for American shad still exist in the Savannah and Ogeechee rivers. Georgia has a statewide 8 shad (American and/or hickory) recreational daily creel limit. Recreational shad fisheries exist only at the NSBL&D on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. Georgia has periodically conducted recreational creel surveys on the Ogeechee River specifically targeting the recreational shad fishery. The most recent of those was completed in 2015. The creel survey estimated that 463 American shad were harvested with a total harvest weight of 473 Kg. Anglers also released 27 American shad and zero hickory shad were harvested by anglers.

Numerous recreational creel surveys have been conducted on the Altamaha and Satilla rivers in recent years and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad.

Landings

Reported commercial landings of American shad are available from the National Marine Fisheries Service and the State of Georgia through CRD, 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 from 2010 to 2013 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 on the Altamaha and Savannah rivers during 2010-2013, along with the 2014 Savannah River commercial landings data, must be excluded from reports (Fig. 2).

The 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 0.75 fish/hour in 2015. 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 620-angler hrs in 2015 and a low of 10 shad harvested in 2000. Effort data from the last five creel surveys has averaged 1,148-angler hrs and total shad harvested has averaged 424 fish.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by the 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 1987 at 193,469 lbs and again in 1995 at 121,811 lbs (Fig. 2). During 1980-2000, total reported shad landings averaged 89,739 lbs. Since 2000, total reported shad landings have averaged around 34,776 lbs. Landings for the last ten years have averaged approximately 37,437 lbs. Savannah River landings data was supplied to the SCDNR and will be combined with their landings data and reported in the South Carolina sustainability plan.

Since 2000, 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 in 2000 (Fig. 3). During 2000-2005, commercial fishermen averaged approximately 420 trips/yr in the Altamaha River, while during the 2006-2015 period commercial fishermen averaged approximately 264 trips/yr. 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 (Fig. 4) and Savannah (Fig. 5) 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 (Shad and River Herring ISFMP). GADNR staff conducts these surveys twice a month for three months during the spawning immigration. Since 2010, the Ogeechee River adult shad electrofishing surveys have averaged around 15 shad per hour, and the Savannah River adult shad electrofishing surveys have averaged around 300 shad per hour. The reason that the Savannah River electrofishing catch rates are much higher than the

Ogeechee River catch rates is because the electrofishing samples on the Savannah River are concentrated immediately below the NSBL&D. The Ogeechee River is undammed and electrofishing samples are not concentrated below a migration barrier so efforts are much less effective.

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 Shad and River Herring ISFMP. Seine mesh size and site locations are standardized. GADNR staff annually sample 3-6 sites/river twice a month from July-September. Since 2011, the Altamaha, Ogeechee, and Savannah River juvenile shad geometric means have averaged around 24.2, 7.9, and 7.6 shad per seine haul, respectively (Fig. 6). No juvenile sampling was completed in 2013 due to high water. The decrease in juvenile shad sampled on the Ogeechee and Savannah Rivers from 2014 to 2015 should be attributed to water level issues and changes in manpower of the monitoring staff, and not a true depiction of a decrease in juvenile shad abundances.

Sustainable Fisheries

Table 1. Management Benchmarks and Triggers

River System	Index	Years Included in Index	Benchmark Value	Benchmark Level	Management Trigger
Altamaha (commercial & recreational)	Gillnet CPUE Index	1983-2015	1.11 shad/ft-hr	25 th percentile	3 consecutive years below the benchmark
Savannah (commercial & recreational)	Commercial Gillnet CPUE Index	2001-2015	9.03 kg shad/trip	25 th percentile	3 consecutive years below the benchmark
Ogeechee (recreational)	Electrofishing CPUE Index	2010-2015	3.7 shad/hr	25 th percentile	3 consecutive years below the benchmark

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 section of the Altamaha River and tagged with a T-bar anchor tag produced by Floy Tag & Mfg, Inc. Tagging efforts are conducted on Saturday, Sunday, or Monday each week of the commercial shad season that runs from January 1 through March 31. These days were chosen because the commercial fishery is closed in different portions of the river on these days, 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 in the Altamaha River has ranged from a low of 70,396 shad in 1990 to a high of 560,023 fish in 2014

(Fig. 7). After 1996, estimated shad abundance declined for six consecutive years, through 2002, before showing a moderate rebound through 2006. The population estimates decreased again through 2010. However, the 2011 mark and recapture efforts revealed a sharp increase in American shad abundance with a population estimate of 277,824 fish. This upward trend peaked in 2014 at 560,023 which is the highest population estimate in the time series. Population estimates have averaged around 236,000 American shad in the Altamaha River American shad run for the last ten years.

Trends in GADNR tagging CPUE data appear to be like those observed in GADNR's mark and recapture population estimates (Fig. 8) and have ranged from a low of 0.59 shad/ft-hr in 2005 to a high of 3.66 shad/ft-hr in 1998 (Fig. 9). CPUE, for the last ten years, has averaged 2.4 shad/ft-hr in the Altamaha River American shad run.

From 1982 through 1992, exploitation rates estimated from recaptures of tagged fish averaged 43.63%, which was often above the previous 40% maximum sustainable yield recommended by ASMFC in the Addendum to Amendment 1, before declining to present levels (Fig. 7). Since 1990, the exploitation rates have been below ASMFC's recommended 40% maximum sustainable yield. From 1993-2003, exploitation of American shad averaged 26.1%, ranging from 17.7% to 33%. From 2004-2010, exploitation of American shad averaged 19.7%, ranging from 13.7% to 23.6%. On January 1, 2011, new commercial regulations went into effect that closed approximately 65% of the Altamaha River system. This change resulted in a decrease in exploitation rates. Following these new regulations, from 2011-2015, exploitation of American shad averaged 11.5%, ranging from 8.6% to 12.7%. Total exploitation has averaged around 16%, for the last ten years, for the Altamaha River American shad run. As an additional measure to ensure the conservation of this stock, an American shad stocking program was initiated in 2014. American shad are annually stocked above migration barriers in an attempt to re-establish shad in section of the Oconee and Ocmulgee rivers.

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 ½-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. Since 2011, GADNR has utilized 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 26.8 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. Since 2011, the Altamaha River juvenile American shad geometric means have averaged around 24.2 shad per seine haul (Fig. 6).

The ASMFC American Shad Stock Assessment Sub-committee (SASC) utilized CPUE data 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 2006-2015, CPUE data from GADNR's tagging efforts averaged 2.4 shad/ft-hr, which is 112.4% higher than the average of 1.13 shad/ft-hr observed from 2000-2005 (Fig. 9). 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 changes in the 2011 regulations have allowed sufficient escapement of adults and helped ensure that fishery harvest will not adversely impact the Atlantic Coast American Shad population. Over the years, the attrition of commercial fishermen has also lessened effort and exploitation on American shad in the Altamaha River and even more so on the Savannah River. For example, there were only two commercial shad fishermen on the Savannah River in 2015, and one of these fishermen retired from shad fishing after the 2015 season.

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 continues to monitor the Altamaha stock through a fishery independent gill netting survey to develop annual CPUE data for use as a stock abundance indicator. GADNR utilizes a CPUE benchmark of 75% of the mean for 3 consecutive years. In the last fishery management plan, the TC asked GADNR to consider two potential CPUE benchmark means. The first would utilize the entire time series of data (1983-2011) to calculate the mean, resulting in a benchmark CPUE of 1.11 shad/ft-hr (Fig. 9). 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 to establish a CPUE benchmark appropriate to the Altamaha River. When the 2007 stock assessment was completed, the SASC utilized available data as an indicator that the Altamaha stock was in decline. Since that time, GADNR's relative abundance data from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with

increases in population estimates, decreased exploitation rates, and JIA data all point to healthy and sustainable stock.

The Altamaha River is legally open to recreational harvest of American shad with the statewide limit of 8 fish. However, annual recreational creel surveys that have been conducted for over 20 consecutive years indicate that a recreational fishery does not exist on this river. No American shad harvest has ever been recorded in this angler harvest survey. Since the river is open to commercial fishing, GA DNR proposes utilizing the same sustainability benchmark that is used for the commercial fishery, which is a gill netting CPUE below 1.11 shad/ft-hr for 3 consecutive years.

Savannah River

Historically, the GADNR was not required to collect fishery independent data from the Savannah River. In 2010, the GADNR initiated fishery independent sampling for both adults and juveniles. Adults are sampled via electrofishing below the NSBL&D each spring. Juveniles are sampled in the lower river via seining July-September each year. The SCDNR supplements GADNR's juvenile sampling by utilizing electrofishing gear. The GADNR's fishery dependent and independent data will be combined with data collected by the SCDNR for measuring sustainability.

The Savannah River has a recreational shad fishery and harvest is controlled by a statewide regulation of 8 fish/day. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery.

The GADNR and SCDNR worked cooperatively to establish a joint benchmark for the Savannah River. The proposed sustainability benchmark is a commercial gillnet CPUE of 9.03 kg shad/trip for 3 consecutive years. This benchmark will be used as a sustainability measure for both the commercial and recreational fisheries.

Ogeechee

The Ogeechee River was officially closed to commercial fishing due to lack of participation and potential sturgeon interactions. There are no plans to re-open the commercial fishery on the Ogeechee River. An American shad stocking program was initiated in 2014 as an additional measure to ensure the conservation of this stock. Adult American shad are monitored via electrofishing and juveniles are sampled with a 50' bag seine.

The Ogeechee River is the second of two rivers in Georgia that has a recreational shad fishery. Recreational harvest on this river is also controlled by the statewide regulation of 8 fish/day. The GADNR initiated an electrofishing survey in 2010 for adult American shad and the CPUE has averaged 14.8 fish/hr over a 7-year period. The GADNR suggest using the 25th percentile for 3 consecutive years as a sustainability benchmark for the recreational fishery. If the adult

shad CPUE falls below 3.7 fish/hr for 3 consecutive years, the GADNR would need to establish conservation measures to ensure the sustainability of the fishery.

Satilla and St. Marys Rivers

The Satilla and St. Marys rivers are currently closed to commercial shad fishing and there are no plans to open these rivers.

Technically, the Satilla and St Marys river are open to recreational harvest of shad. However, several recreational creel surveys have been conducted on the Satilla River in recent years (2006-2014) and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad. Additionally, annual spring electrofishing surveys targeting sportfish populations indicate that American shad abundance is extremely low in both rivers. In the last 10 years, 1 American shad has been captured in the Satilla River and 3 American shad were captured in the St. Marys River. There is very little chance of incidental angler interactions due to the low abundance of shad in these rivers.

The TC has recommended that the GADNR either develop a sustainable fishing plan for the Satilla and St. Marys rivers or take the necessary action to prohibit the recreational harvest of American shad from those rivers. GADNR disagrees with the TC recommendation. It will be impossible to develop a sustainable fishing plan with any credible metrics for two river systems where American shad are currently at such low abundance as to be functionally absent. A modification of Georgia state law to prohibit the harvest of American shad in the Satilla and St. Marys rivers will result in no demonstrable conservation benefit. Furthermore, the TC did not recommend that the State of Florida take action to prohibit the recreational harvest of American shad from those portions of the St. Marys River subject to the jurisdiction of the State of Florida. Rather than the options recommended by the TC, the GADNR proposes to continue monitoring the fish populations of the Satilla and St. Marys rivers through periodic fishery-independent and fishery-dependent surveys. If these surveys reveal that American shad numbers are increasing and exploitation by recreational fisheries is occurring, GADNR will take the necessary steps to ensure that the harvest in those rivers is not detrimental to American shad conservation efforts along the Atlantic Coast.

A. Adaptive Management

The GADNR will continue to monitor the commercial shad fishery through fishery dependent and independent sampling on the Altamaha and Savannah 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.

Future Considerations

Georgia will continue to actively pursue effective management strategies that will allow the continued sustainability of our shad fishery. In recent years, fishery managers in Georgia have seen positive trends in our shad populations, particularly in the Altamaha River, which supports our largest shad population and fishery. As previously mentioned, GADNR's relative abundance data in the Altamaha River from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with increases in population estimates, decreased exploitation rates, and juvenile indices data all point to a healthy and sustainable stock. In an effort to pursue effective shad management beyond traditional data collection efforts, fishery managers will continue conducting various monitoring programs conducted annually since 2010, including juvenile sampling in the Ogeechee, Altamaha, and Savannah Rivers along with conducting electrofishing surveys targeting adults in the Savannah and Ogeechee Rivers. Data from these efforts, which may include length, age, or other biological metrics, may eventually be considered with traditional management benchmarks to inform fishery managers in decision making efforts. Additionally, future considerations may include additional assessments of the impacts of a new fish passage structure at the NSBL&D, should such a structure be developed. Managers will also continue to evaluate the effectiveness of stocking efforts in the Altamaha and Ogeechee, which have been performed annually since 2014, and data from these efforts may also be considered for use in future management decisions. Finally, considerations may be given in the future for collecting genetic samples for analysis of shad stocks in Georgia to better identify and understand stock compilation.

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.

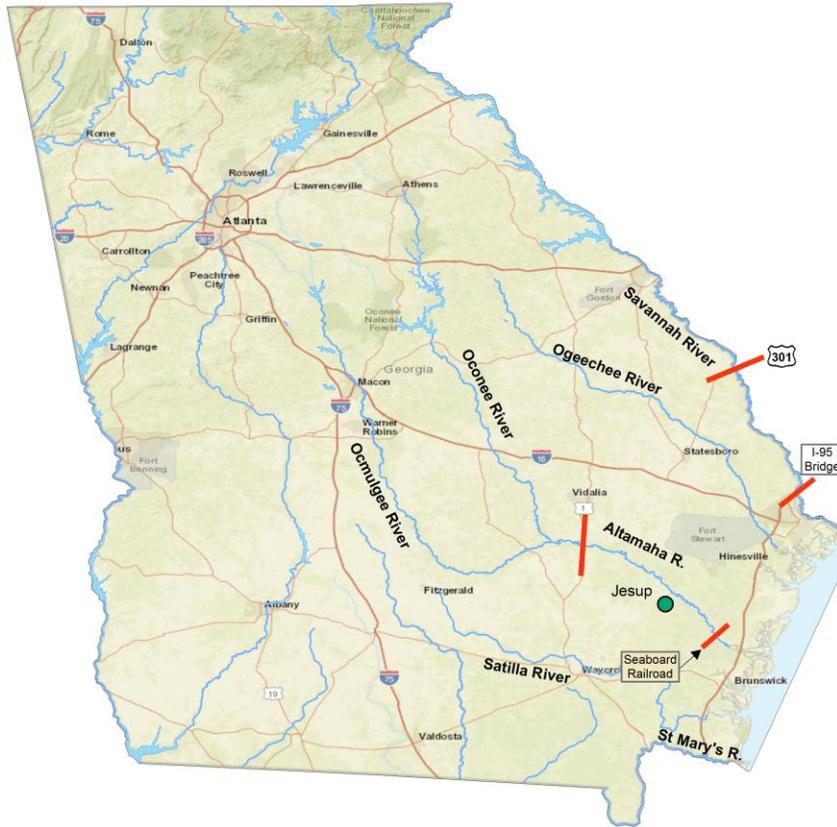


Figure 1. Georgia Atlantic-Slope Rivers. The larger lines are the upper boundaries to the commercial American shad fishery and the smaller lines are the boundary lines for different open days of the fishery.

Altamaha River

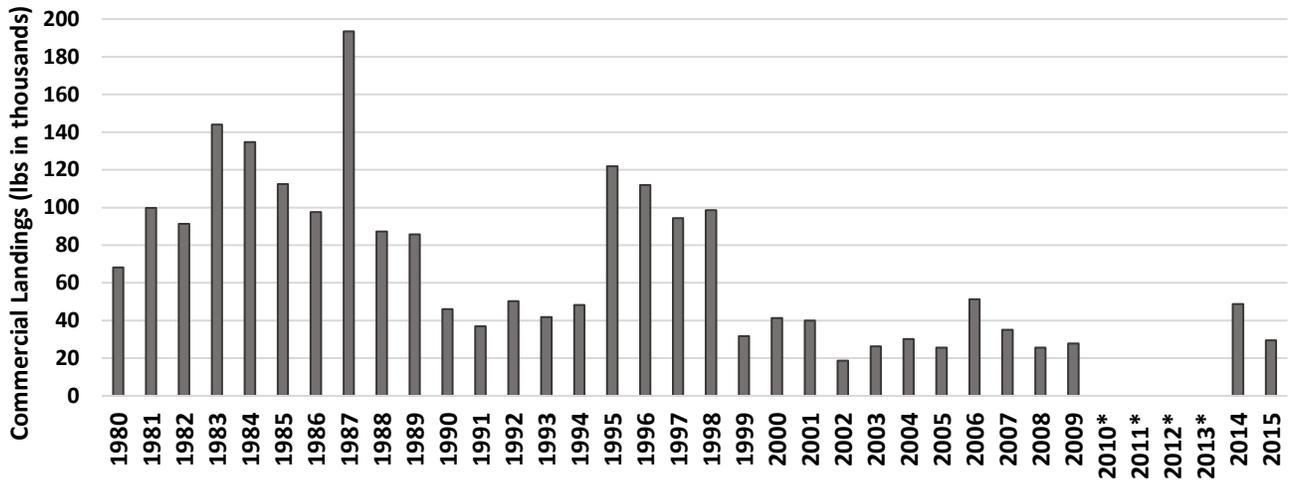


Figure 2. Reported commercial landings, reported by pounds in thousands, of American shad from the Altamaha River, Georgia. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

Altamaha River

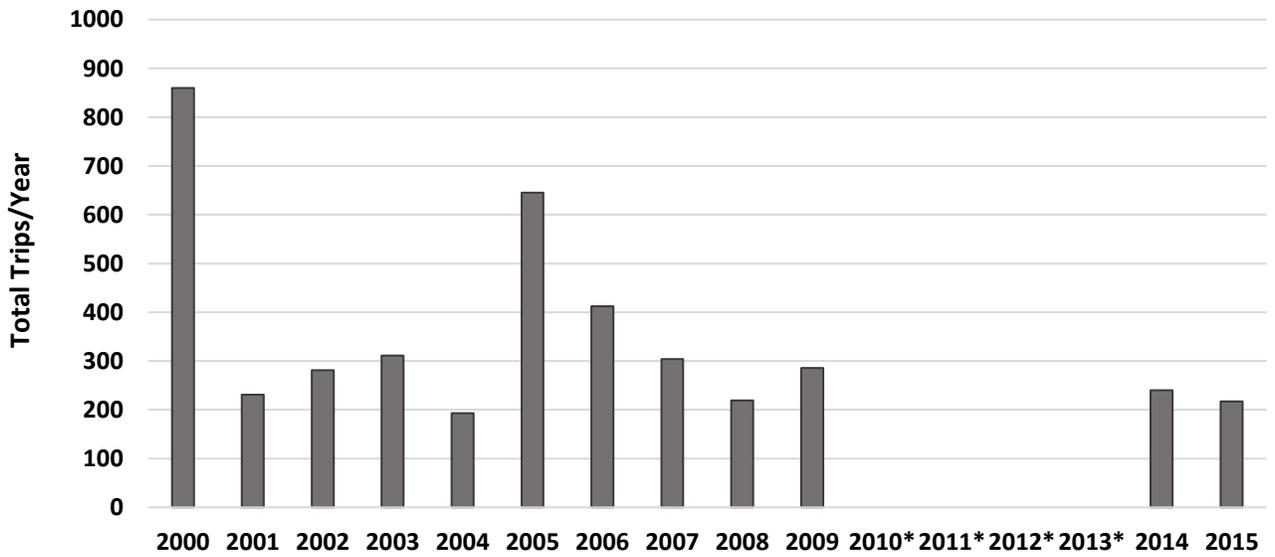


Figure 3. Total commercial fishing effort for American shad in the Altamaha River. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

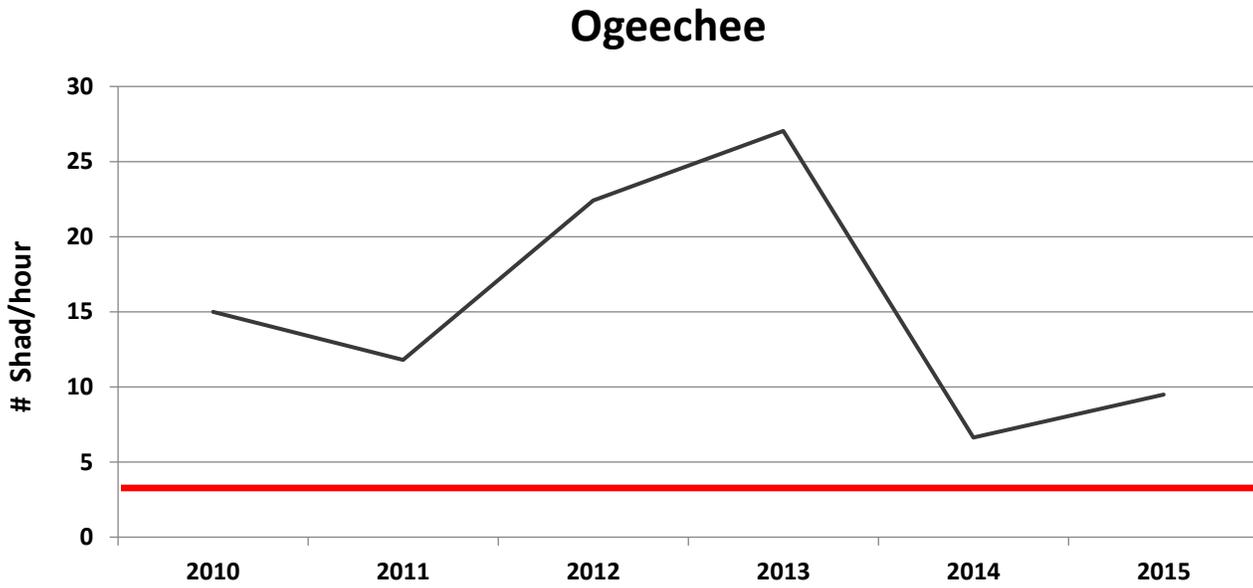


Figure 4. Ogeechee River adult American shad electrofishing CPUE's and the 3.7 shad/hr sustainability benchmark developed by GADNR.

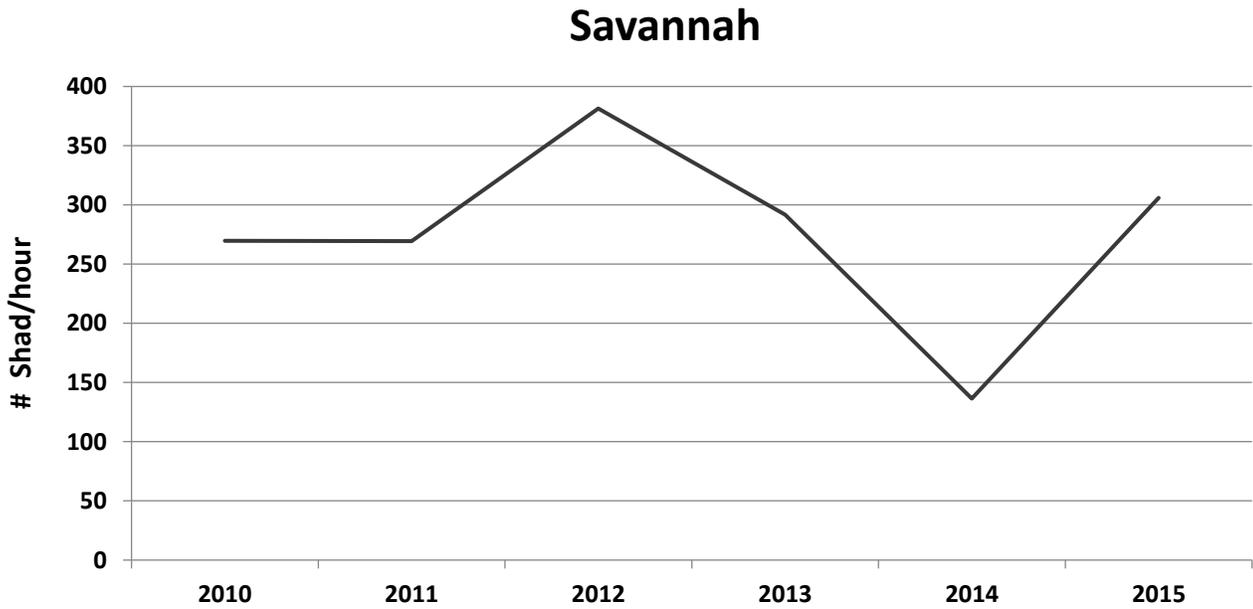


Figure 5. Savannah River adult American shad electrofishing CPUE's collected below the New Savannah Bluff Lock and Dam.

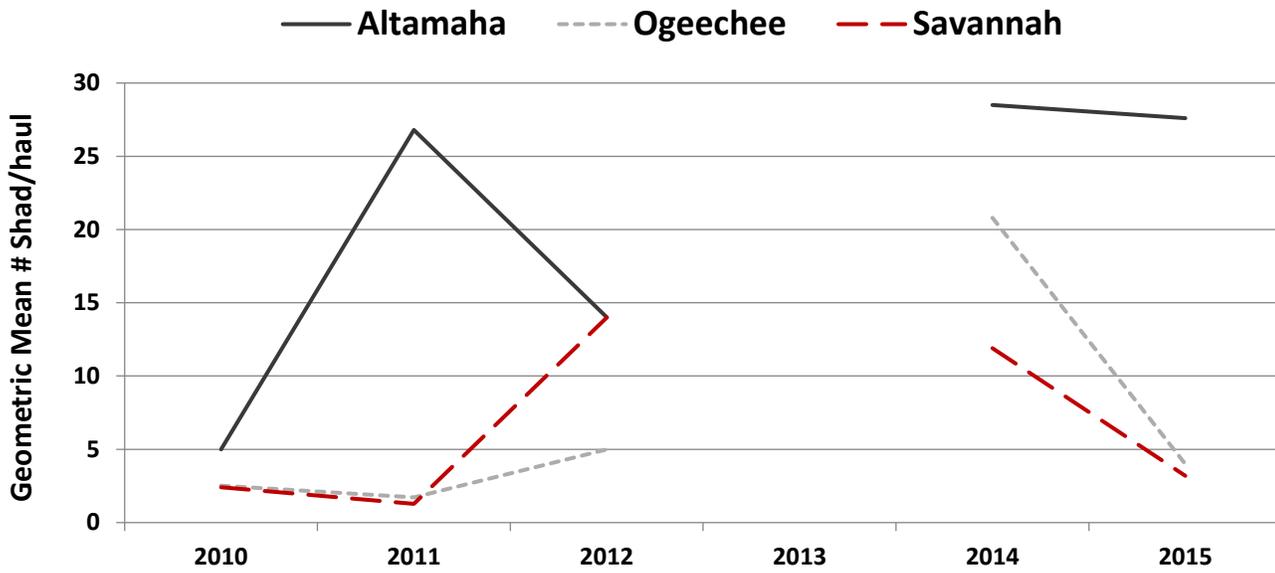


Figure 6. Juvenile American shad sampling program, initiated in 2010, utilizing a 50-ft bag seine on the Altamaha, Ogeechee, and Savannah rivers for monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

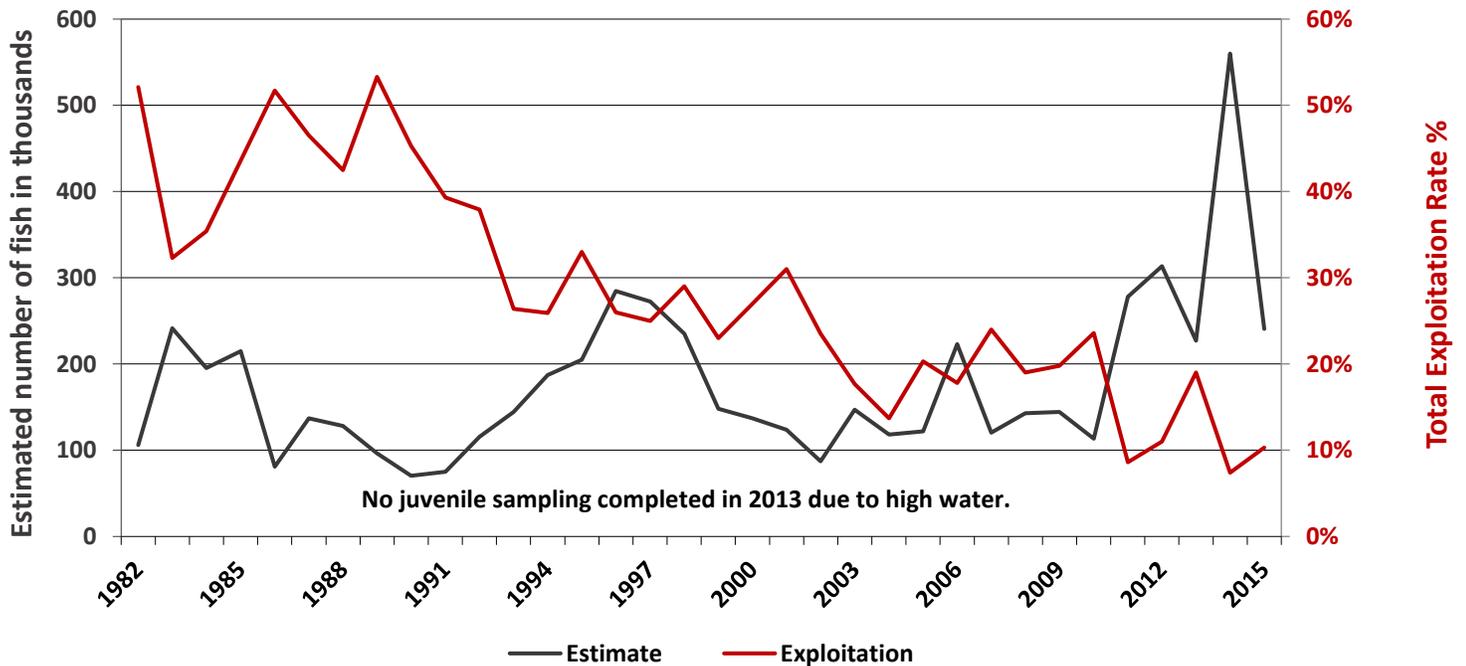


Figure 7. Population estimates and exploitation rates from the Altamaha River American shad run.

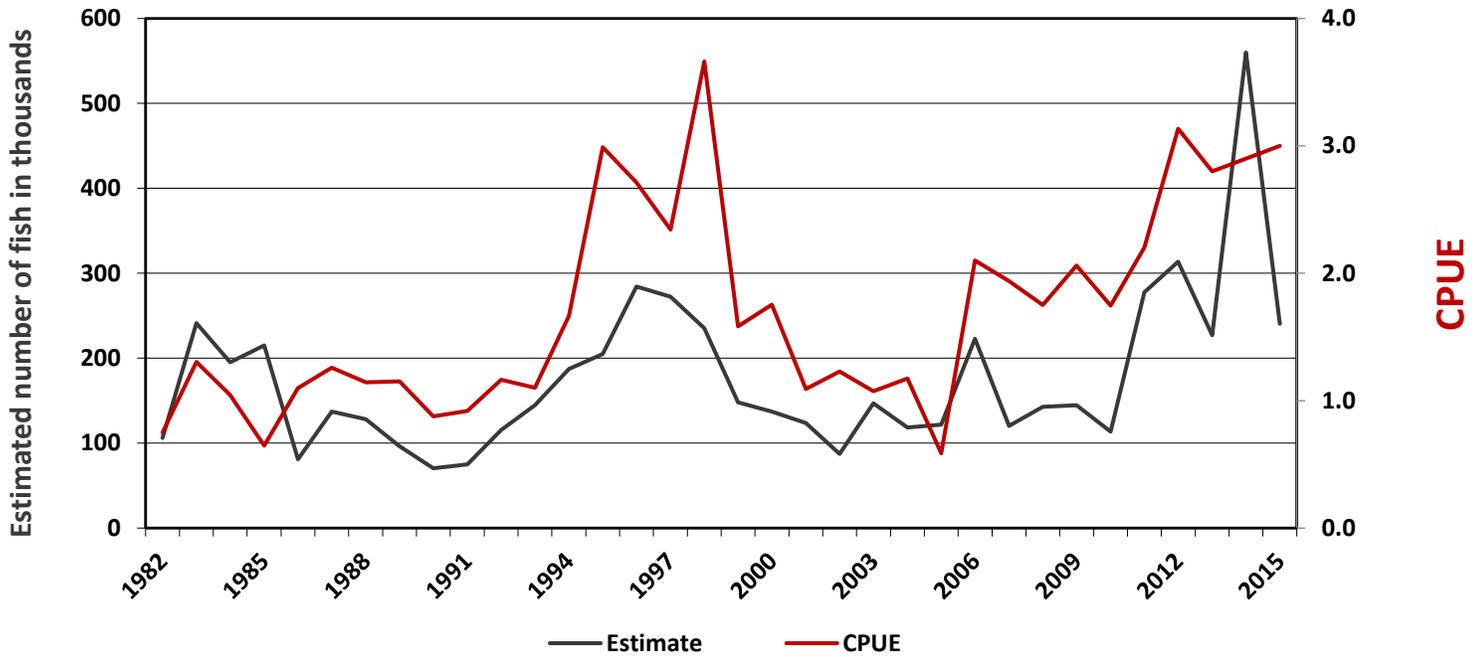


Figure 8. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and population estimates from GADNR mark and recapture efforts.

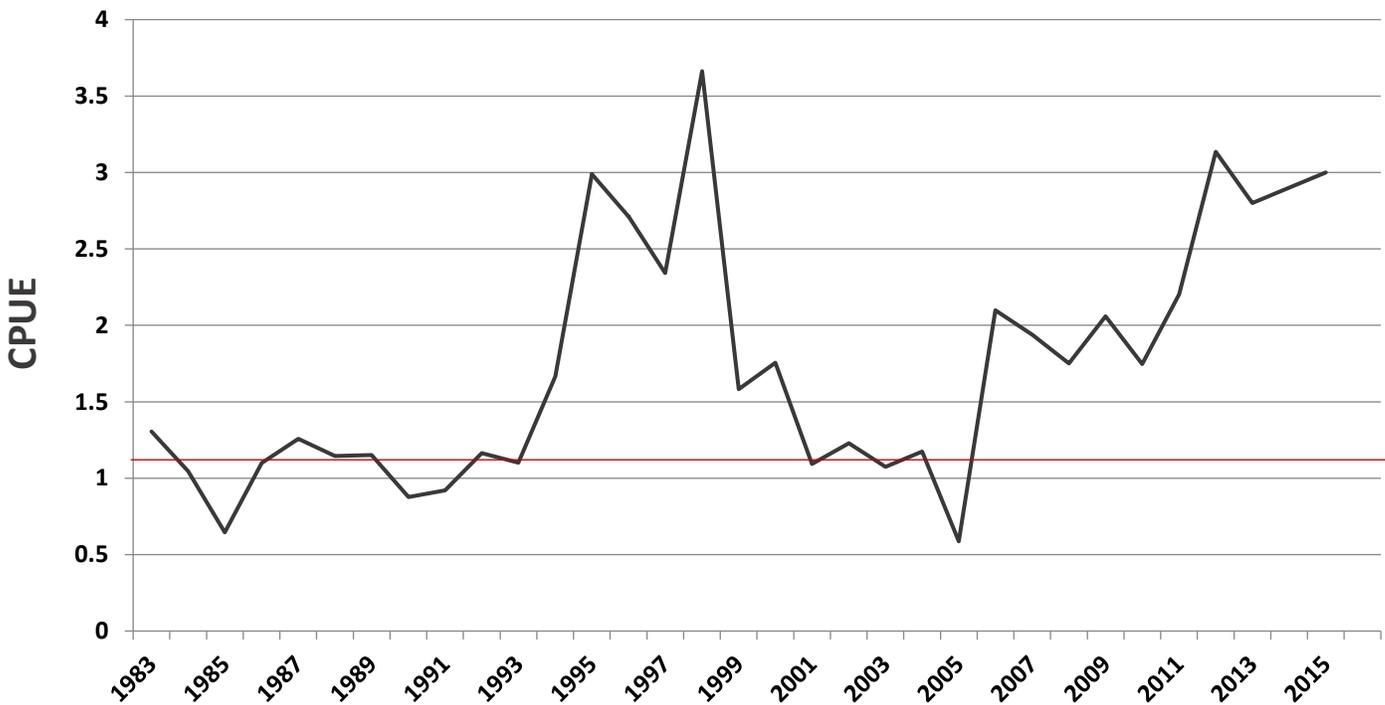


Figure 9. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and the 1.11 shad/ft-hr benchmark developed from GADNR gill-net tagging data.