Common Name: ALABAMA SHAD

Scientific Name: *Alosa alabamae*

Other Commonly Used Names: gulf shad, Ohio shad

Previously Used Scientific Names: none

Family: Clupeidae

Rarity Ranks: G3/S1

State Legal Status: Threatened

Federal Status: Not Listed

Description: Like other clupeids in the genus *Alosa*, the Alabama shad has an elongated, laterally compressed body with a forked tail. Adult females are larger than males and may grow to 500 mm total length (ca. 20 in). This species has a large terminal mouth with a lower jaw projecting only slightly beyond the upper jaw. The tongue has a median row of small teeth; teeth are also present on the jaw in juveniles. There is a sharply angled notch in the center of the upper jaw. The number of gill rakers on the lower limb of the first gill arch usually exceeds 30 for all ages and typically numbers 42-48 for adults. The overall body coloration is silvery with a blue-green back; a darker shoulder spot may be evident in some individuals.

Similar Species: The Alabama shad is distinguished from American shad by having 42–48 (vs. 59–73) gill rakers on the lower limb of the first gill arch, non-glossy cheek and opercular bones covered with conspicuous mucous pores and canals (vs. glossy cheek and opercular bones with inconspicuous mucous pores and canals), and a pelvic fin axillary scale which is approximately 75% of the fin length [vs. ~50% of the fin length. These species are also allopatric, with Alabama shad inhabiting the Gulf coast of Florida west to the Mississippi River, whereas American shad range from the Atlantic coast of northeastern Florida north to Maine and southeastern Canada. The Alabama shad is distinguished from the skipjack herring (*A. chrysochloris)* by having a sharply angled notch in the upper jaw (vs. a weakly angled or obtuse notch), a slightly protruding lower jaw (vs. a strongly protruding lower jaw), and more than 30 gill rakers on the lower limb of the first gill arch (vs. less than 30, usually 18-24). It differs from the gizzard shad and threadfin shad in lacking an elongated last dorsal fin ray and having scales along the midline in front of the dorsal fin.

Habitat: Alabama shad are a schooling, pelagic species that requires access to both saline and freshwater environments throughout its life span. Estuarine and marine habitat use by Alabama shad is generally unknown. During the spawning run, adult Alabama shad inhabit large rivers or streams and are generally found in areas with moderate currents and sand and gravel substrates. When inhabiting rivers and streams, adults and juvenile shad are rarely found in backwaters or areas with sluggish current. Alabama shad movement patterns may be similar to those of American shad, which move to deeper, quieter areas of the river channel at night.

Diet: Adult Alabama shad apparently feed little or not at all while in fresh water, as evidenced by the lack of food in their stomachs when captured. However, adult shad in fresh water will strike at fishing lures, and fishery biologists have angled for shad using tiny jigs as their primary collecting method. Although its significance is unknown, researchers have observed an unidentifiable slimy, green substance in the stomachs of several adult Alabama shad collected from the Apalachicola and Choctawhatchee rivers. Juvenile Alabama shad in the Apalachicola and other river drainages feed largely on aquatic dipterans and small fishes. In a diet study, fish collected from the Jim Woodruff Lock and Dam (JWLD) area contained a greater volume and variety of food per stomach, including fishes, than those collected further downstream, which likely contributed to the faster growth of juveniles from the JWLD region. The feeding habits of Alabama shad at sea are unknown.

Life History: The Alabama shad is an anadromous species, entering freshwater rivers to spawn and then returning to the sea to mature. Adults ascend open waters of medium to large Gulf Coast rivers from January to July; spawning usually occurs in April in Georgia. Alabama shad spawn over sand and gravel substrates in reaches with moderate current velocities. Eggs and larvae have been collected within a 6.5 km reach downstream of JWLD, from coarse sand and gravel habitats having moderate to swift current velocities (0.5 to 1.0 m/s). Spawning habitats occurred in areas with limestone outcroppings in the Choctawhatchee River, which may be an indicator of other potential spawning sites for the species. Juveniles are found in stream margin habitats over sand and gravel and then apparently move into salt water habitats at the end of their first summer. Adults may live to 6 years of age, and are usually 2 years old at time of spawning. Adults may spawn more than one time, although the proportion that repeat spawn is probably low.

Estimates of age-class structure of Alabama shad differ according to study and drainage. Laurence and Yerger (1966) and Mills (1972) counted scale annuli and estimated a maximum age of three to four years, respectively, for both sexes in the Apalachicola River, FL. Mettee and O'Neil (2003) counted otolith annuli and identified a maximum age of five years for male and six years for female shad in the Choctawhatchee River, AL-FL. Interestingly, none of these studies identified any age-1 females from their collections. Alabama shad collected from the Apalachicola River in 2005 and 2006 were aged using scales and sagittal otoliths, and the ages identified using these two techniques were in agreement (Ingram 2007). This study found that the spawning population was comprised predominately of age-1 and -2 males and age-2 and -3 females. Males ranged from 1 to 3 years old, and females from 1 to 4 years old. Age-1 males comprised 49% of males collected, but only one age-1 female was collected. Ingram (2007) examined the growth of male and female Alabama shad in the Apalachicola River separately. He found that growth was best described by the von Bertalanffy models:

$$\text{male; } L_t = 359.6\,[1 - e^{-2.1712(t-0.3757)}],$$

$$\text{female; } L_t = 389.5\,[1 - e^{-2.3193(t-0.6424)}].$$

Where L_t = length at time t.

In this same study, females were longer and heavier on average at age-2 and age-3 than their male counterparts. Length-weight relationships for spawning Alabama shad were best described by the equations:

$$\text{male; } Wt = -4.9926 + 2.9992TL,$$

$$\text{female; } Wt = -5.8708 + 3.3699TL.$$

Where TL = total length.

The maximum lengths reported for Alabama shad are a 510 mm TL female and a 435 mm TL male, both from the Ohio River (Hildebrand 1963). In Gulf drainages, adults average 300–400 mm TL. During a 2005 study on the Apalachicola River, the largest fish collected was a 462 mm TL male (SCCFWRU unpublished data) and 25% of the 1,497 fish collected were longer than 400 mm TL.

Fecundity estimates for Alabama shad are similar across studies. Laurence and Yerger (1966) reported that female shad from the Apalachicola River contained 46,500–149,450 ova, although the authors stated that this number may have been underestimated by 6–8% using their methodology. During 1969 and 1970, Mills (1972) observed that female shad from the same river contained 61,238–257,655 ova. Ingram (2007) described the widest range in observed ova (26,095-208,494) and attributed his findings to fractional spawning. Female Alabama shad from the Choctawhatchee River population contained between 36,225–357,189 ova (Mettee and O'Neil 2003). In addition, Mettee and O'Neil (2003) suggested that Choctawhatchee River shad may have multiple spawning periods during a given reproductive season based on fluctuating numbers of mature versus immature ova in females during the spawning period; a pattern also observed by Mills (1972).

Survey Recommendations: Standardized sampling protocols to collect fishery dependent and independent data are important to measure the success of a recovery program. Spawning stock surveys and representative sampling for biological data should be conducted for Alabama shad in the Apalachicola River each year. The population of migrating adult Alabama shad in the Apalachicola River can be estimated using mark-recapture techniques (Ely 2007). Standardized annual electrofishing and gill netting can be used to monitor long-term population trends. Length-at-age data can be used to determine year class strength and population structure. Juvenile abundance indices should be developed for the lower Apalachicola River mainstem and estuary utilizing standardized haul seine, trawl, or beach seine protocols. Catch-per-unit-effort indices can be used to assess year class strength from natural reproduction and annual fry stockings. Estimates of the size of annual spawning migrations in the Apalachicola, Flint, and Chattahoochee Rivers should be made using mark-recapture methods. For evaluating long-term trends, correlations should be developed between population estimates from mark-recapture studies and CPUE values from electrofishing in rivers and gillnetting in reservoirs. Capture data of adult and juvenile fish can be used to identify and locate Alabama shad preferred habitats, and these locations can be catalogued by plotting GPS coordinates of collected fish into a GIS database. These habitat types should then be described. Additionally, fish tagged with radio or sonic transmitters can be telemetered to assess habitat usage by migrating adults. River discharge, temperature, depth, and substrate data should be collected at each sample location to determine habitat suitability criteria for this species. Passage efficiency and behavior of Alabama shad in relation to navigation lock operation at the JWLD can be evaluated with fixed-station sonic telemetry. The effects of locking event duration, discharge, and time of day of lock operation on passage through the navigation lock should be determined. The percentage of fish successfully passed above JWLD in conjunction with a population estimate, sex ratio, and fecundity can be used to assess spawning recruitment potential and overall population status in the entire Apalahicola River drainage. The route of outmigration for those fish that pass successfully should also be determined.

Range: Alabama shad are found along the Gulf Coast from the Suwannee River in Florida to the Mississippi River in Louisiana. In Georgia, this species has been collected in the Suwannee (Little and Withlacoochee rivers), Chattahoochee and Flint River systems and was recently recorded from Ichawaynochaway Creek near the confluence with the Flint River. Check the Fishes of Georgia Webpage for a watershed-level distribution map.

Threats: The construction of dams has long been considered the primary reason for the dramatic decline of Alabama shad and similar anadromous fishes across their ranges. Noting that large numbers of Alabama shad congregated below Keokuk Dam, IA, but none were ever captured above it, Coker (1930) reasoned that the dam likely limited the upstream passage of the species in the Mississippi River. Despite a lack of species-specific data, the proliferation of impassible structures constructed on rivers within its range is widely believed to have restricted returning adults from reaching their historic spawning grounds, and thus severely reducing or eliminating their ability to reproduce. Most studies of Alabama shad used specimens which congregated below dams (Laurence and Yerger 1966; Mills 1972), and collection records from state and federal agencies, as well as ichthyological collections, indicate a rarity of specimens collected upstream of dams (Coker 1930; Etnier and Starnes 1993). In addition, similar declines in closely-related American shad populations have resulted from dam construction, as evidenced by population resurgence once those structures were either removed or modified to allow fish passage (Odeh 1999; St. Pierre 2003). Any additional impoundments, particularly on the lower Flint River, threaten the survival of Alabama shad in Georgia. Dredging, sedimentation, water quantity, and habitat and water quality degradation are considered contributing factors to the decline of Alabama shad populations throughout its range. Hydropeaking operations may also result in intermittent reduction in discharge levels required for egg survival (PGEC 2005). Alteration of flows that decrease the stream margin habitat utilized by juveniles or shoal spawning habitat also pose problems. Poor water quality in the Flint or Suwannee river systems, especially downstream from major urban centers, is an additional threat.

Georgia Conservation Status: The Alabama shad is currently recognized as a species of concern by the National Marine Fisheries Service. This status does not confer any protections under the U.S. Endangered Species Act, but does highlight the species as a priority for research and conservation efforts. As a result of fish passage efforts at JWLD, adult Alabama shad have recently been recorded moving into the Flint River, as far upstream as Albany. The last confirmed record from the Suwannee drainage was in late 1990's, but that population has not been extensively studied.

Conservation and Management Recommendations: A restoration plan entitled "Alabama Shad Restoration and Management Plan for the Apalachicola-Chattahoochee-Flint River Basin" is near completion. This plan was produced by an ad hoc group of fisheries biologists who share common interests and concerns regarding the fate of anadromous fish species in the Apalachicola-Chattahoochee-Flint river system, particularly that of Alabama shad. Contributors to this document include Prescott Brownell (NMFS), Jimmy Evans (GADNR), Joel Fleming (GADNR), Travis Ingram (GADNR), Karen Herrington (USFWS), Steve Herrington (TNC), Jeff Isely (SCCFWRU), Alice Lawrence (USFWS), Rick Long (FFWCC), Ramon Martín (GADNR), and Steve Rider (ADCNR). Directed research and management is necessary to conserve and restore declining Alabama shad populations throughout their range. This focus is especially crucial considering the dearth of information available on what was once a wide-ranging species in North America. For example, the down-listing of Alabama shad from a candidate species to a species of special concern was based on the scarcity of studies available for NOAA Fisheries to make a well-supported decision regarding its conservation status (Federal Register 19975, Vol. 69, No. 73, 15 April 2004). Because it contains what is likely the largest remaining of the few known populations of Alabama shad, the Apalachicola River population has been a focus for research and conservation efforts. Information attained from future studies on this population is necessary, at the minimum, to provide information to state and federal conservation agencies on the ecology and status of this species. Conserving populations of Alabama shad depends upon maintaining and improving habitat quality in large rivers in the Apalachicola and Suwannee river drainages. The elimination of sediment runoff from land-disturbing activities and contaminants from urban and agricultural uses is critical to ensuring adequate resources and habitat for young shad. The impact from impoundments might be reduced somewhat in the Flint and Chattahoochee rivers by providing appropriate passage through Jim Woodruff Dam during spring spawning runs.

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B. Freeman, 1999: Original account
K. Owers, Jan 2009: Added picture, updated status and ranks, added fish atlas link, converted to new format, minor edits to text
R. Weller, May 2009: Extensive update based on the Alabama Shad Restoration and Management Plan for the Apalachicola-Chattahoochee-Flint River Basin, and other studies.
B. Albanese, June 2009: Final editing and website posting.


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