

OUTLINE OF FEDERAL REGISTER NARRATIVE FOR DELISTING DUE TO EXTINCTION

SOUTHERN ACORNSHELL (*EPIOBLASMA OTHCALOOGENSIS*)

I. Background Information:

The Southern acornshell, *Epioblasma othcaloogensis*, was listed as endangered on March 17, 1993 (58 FR 14330), primarily due to habitat modification, sedimentation, and water quality degradation. The recovery plan (“Mobile River Basin Aquatic Ecosystem Recovery Plan”) was completed on November 17, 2000. The species’ recovery priority number (RPN) is 5, indicating a high degree of threat and low recovery potential. Critical habitat was initially determined to be not prudent and later not determinable, but in 2001, in response to a legal challenge to the “not determinable” findings, the U.S. District Court for the Eastern District of Tennessee issued an order requiring the Service to propose and finalize critical habitat for 11 Mobile River Basin-listed mussels, including the Southern acornshell. The Service subsequently published a final critical habitat rule on July 1, 2004 (see actions outlined in proposed listing rule (56 FR 58339), final listing rule (58 FR 14330), proposed critical habitat rule (68 FR 14752) and final critical habitat rule (69 FR 40084)). Two 5-year reviews were published on April 7, 2008 and October 15, 2018, both recommending delisting the Southern acornshell due to extinction. The Service solicited peer review from eight experts for both 5-year reviews from State, Federal, University, NGO, and Museum biologists with known expertise and interest in Mobile River Basin mussels (Service 2008, pp.36-37; Service 2018, p.15); we received responses from five peer reviewers and they concurred with the content and conclusion that the species is extinct.

The Southern acornshell was described in 1857 from Othcalooga Creek in Gordon County, Georgia (58 FR 14331). Adult Southern acornshells were round to oval in shape and approximately 1.2 inches in length (Service 2000, p.57). Johnson (1978) included *Epioblasma othcaloogensis* in his synonymy of *E. penita* and considered the Southern acornshell to be an ectomorph of the latter (58 FR 14331). Stansbery (1983) described *E. othcaloogensis* as distinct, belonging in a different subgenus; the Southern acornshell was distinguished from the Upland combshell and the Southern combshell by its smaller size, round outline, a poorly developed sulcus, and its smooth, shiny, yellow periostracum (58 FR 14331). The Service recognizes *Unio othcaloogensis* (Lea) and *Unio modicellus* (Lea) as synonyms of *Epioblasma othcaloogensis*.

The Southern acornshell was historically found in shoals in small rivers to small streams in the Coosa and Cahaba river systems (Service 2000, p.57). As with many of the freshwater mussels in the Mobile River Basin, it was found in stable sand/gravel/cobble substrate in moderate to swift currents. The species had a sexual reproduction strategy and require a host fish to complete the life cycle. Historically the species occurred in upper Coosa River tributaries and the Cahaba River in Alabama, Georgia, and Tennessee (Service 2000, p.57). In the upper Coosa River

system, the Southern acornshell occurred in the Conasauga River, Cowan’s Creek, and Othcalooga Creek (58 FR 14331). At the time of listing in 1993, the species was believed to persist in low numbers in streams in the upper Coosa River drainage in Alabama and Georgia, and possibly in the Cahaba River (58 FR 14331; Service 2018, p.6). The Southern acornshell was last collected in 1973 from the Conasauga River in Georgia and from Little Canoe Creek, near the Etowah and St. Clair County line, Alabama. It has not been collected from the Cahaba River since the 1930s (Service 2018, p.5).

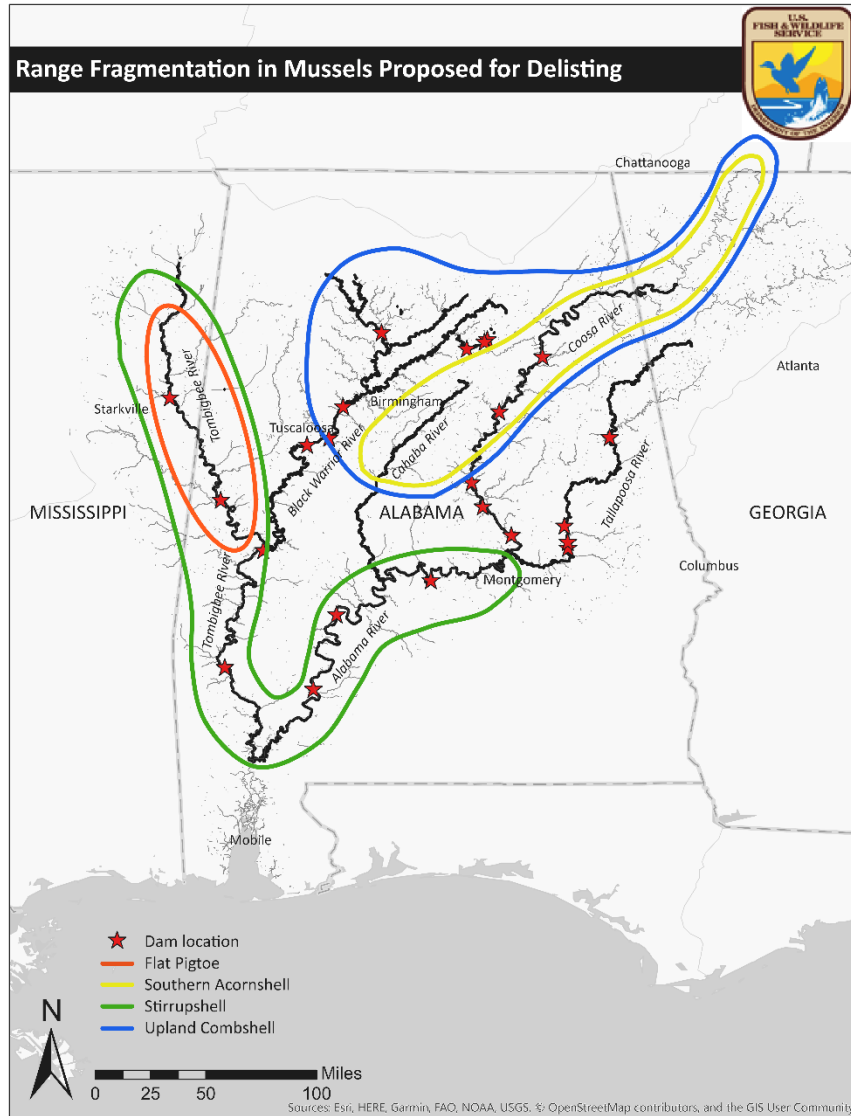


Figure 1 Historical range of the Southern acornshell (in yellow)

Habitat modification, sedimentation, eutrophication, and other forms of water quality degradation are the primary causes of decline (Service 2000, p.57). The Southern acornshell did

not tolerate impoundment, and was highly sensitive to water quality degradation (Service 2000, p.57). More than 1,000 miles of large and small river habitat in the Mobile River drainage have been impounded for navigation, flood control, water supply, and/or hydroelectric production purposes (58 FR 14335). Habitat within the species' range has also been impacted by several types of pollution events, including carpet mill and other industrial discharge, sewage treatment plant discharge, urban and agricultural runoff, and surface mine drainage (Service 2000, p.57). Because of extensive habitat degradation and inability to locate the species, experts presumed the species to be extinct as of the 2008 5-year review (Service 2008, p.19; Service 2018, p.7).

II. Information about the Three Criteria and Related Information:

Species detectability – Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors, including:

- size of the mussel (smaller mussels, including juvenile mussels, can be more difficult to find in complex substrates than larger mussels, and survey efforts must be thorough enough to try to detect smaller mussels);
- behavior of the mussel (some are found sub-surface, some at the surface, some above the surface, and position can vary seasonally (some are more visible during the reproductive phase when they need to come into contact with host fish, therefore surveys likely need to be conducted during different times of the year to improve detection));
- substrate composition (it can be easier to see/feel mussels in sand and clay than in gravel or cobble, therefore surveys need to include all substrate types because mussels can fall off host fish into a variety of substrates);
- size of river (larger rivers usually have more expansive habitat areas to search and are sometimes deep, requiring specialized survey techniques (SCUBA));
- flow conditions (visibility can be affected in very fast flowing, very shallow, or turbid conditions, therefore surveys need to use tactile or excavation methods, or delay until turbidity conditions improve);
- surveyor experience (finding mussels requires a well-developed search image, knowledge of instream habitat dynamics, and ability to identify and distinguish species); and
- survey methodology and effort (excavation and sifting of stream bottom can detect more mussels than visual or tactile surveys).

All of these challenges are taken into account when developing survey protocols for any species of freshwater mussel, including the Southern acornshell. The Southern acornshell was small-sized (but juveniles are very small) and most often found buried in sand, gravel, or cobble in fast flowing runs. However, mussels can be found in sub-optimal conditions, depending on where they drop off their host fish as juveniles. Therefore, all of the above-mentioned considerations need to be considered when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have not

been able to locate extant populations of Southern acornshell (Service 2000, p.57; Service 2018, p.7).

Survey effort – Prior to listing, Southern acornshell was observed during surveys in the upper Coosa River drainage in Alabama and Georgia in 1966-1968 and in 1971-1973 by Hurd (58 FR 14331). Records of the species in the Cahaba River are from surveys at Lily Shoals in Bibb County, Alabama in 1938 and from Buck Creek (Cahaba River tributary), Shelby County, Alabama in the early 1900s (58 FR 14331). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists including 17 survey reports from 1993-2006 and 6 survey reports from 2008-2017 across which no living animals or fresh or weathered shells of the Southern acornshell were located (Service 2008, p.19; Service 2018, p.6).

Time since last detection – The most recent records for the Southern acornshell were from tributaries of the Coosa River in the early 1970s and the Cahaba River in the 1930s (58 FR 14331; Service 2008, p.19; Service 2018, p.5). No living populations of the Southern acornshell have been located since the time of listing (Service 2000, p.57; Service 2008, p.20; Service 2018, p.7).

Any other overarching considerations – Habitat modification is the major cause of decline of the Southern acornshell (Service 2000, p.57). More than 1,000 miles of large and small river habitat in the Mobile River drainage has been impounded for navigation, flood control, water supply, and/or hydroelectric production purposes; the Southern acornshell cannot tolerate impounded waters. Other threats include channel improvements such as clearing and snagging, sand and gravel mining, diversion of flood flows, and water removal for municipal use. These activities impact mussels by alteration of the river substrate, increasing sedimentation, alteration of water flows, and direct mortality from dredging and snagging (Service 2000, p.6-13). Runoff from fertilizers and pesticides causes algal blooms and excessive growth of other aquatic vegetation, resulting in eutrophication and death of mussels due to lack of oxygen (Service 2000, p.13). The cumulative impacts of habitat degradation likely led to the Southern acornshell populations becoming scattered and isolated over time. Small population sizes increased the difficulty of successful reproduction (Service 2000, p.14) because when individuals become scattered, the opportunity for successful egg fertilization diminishes. Low population density and resulting low reproductive rates coupled with habitat changes lead to extirpation and eventual extinction (Service 2000, p.14).

III. Analysis:

There has been no evidence of the continued existence of the Southern acornshell for over five decades; the last known specimens were collected in the early 1970s. When listed, it was thought that the Southern acornshell was likely to persist in low numbers in the upper Coosa

River drainage, and possibly, in the Cahaba River. Numerous mussel surveys have been completed within these areas, as well as other areas within the historical range of the species since the listing, with no success. Although other federally-listed mussels have been found by mussel experts during these surveys, no live or fresh-dead specimens of the Southern acornshell have been found (Service 2018, p.7). The species is presumed extinct.

IV. Summary/Conclusion/Determination

We conclude that the Southern acornshell is extinct, and therefore should be delisted. This conclusion is based on significant alteration of known historical habitat and lack of detections during numerous surveys conducted throughout the species range.

References

U.S. Fish and Wildlife Service. 2000. Mobile River Basin Aquatic Ecosystem Recovery Plan. U.S. Fish and Wildlife Service. Atlanta, GA. 128pp.

https://ecos.fws.gov/docs/recovery_plan/001117.pdf

----- 2008. Fine-lined Pocketbook (*Hamiota* (= *Lampsilis*) *altilis*), Orange-nacre Mucket (*Hamiota* (= *Lampsilis*) *perovalis*), Alabama Moccasinshell (*Medionidus acutissimus*), Coosa Moccasinshell (*Medionidus parvulus*), Southern Clubshell (*Pleurobema decisum*), Dark Pigtoe (*Pleurobema furvum*), Southern Pigtoe (*Pleurobema georgianum*), Ovate Clubshell (*Pleurobema perovatum*), Triangular Kidneyshell (*Ptychobranhus greenii*), Upland Combshell (*Epioblasma metastriata*), Southern Acornshell (*Epioblasma othcaloogensis*) 5-Year Review. U.S. Fish and Wildlife Service. Jackson, MS. 24pp. https://ecos.fws.gov/docs/five_year_review/doc2365.pdf

----- 2018. Upland Combshell (*Epioblasma metastriata*), Southern Acornshell (*Epioblasma othcaloogensis*) 5-Year Review. U.S. Fish and Wildlife Service. Jackson, MS. 16pp. https://ecos.fws.gov/docs/five_year_review/doc5963.pdf