

Black Clubshell (Curtus' Pearly Mussel) (*Pleurobema curtum*)
Heavy Pigtoe (Judge Tait's Mussel) (*Pleurobema taitianum*)
Southern Combshell (Penitent Mussel) (*Epioblasma penita*)

**5-Year Review:
Summary and Evaluation - 2021**



Black Clubshell (*Pleurobema curtum*), Heavy Pigtoe (*Pleurobema taitianum*), and
Southern Combshell (*Epioblasma penita*)

Photo credit: M. Wagner

**U.S. Fish and Wildlife Service
South Atlantic-Gulf Region and Mississippi Basin Regions
Jackson Ecological Services Field Office
Jackson, Mississippi**

5-YEAR REVIEW

Black Clubshell (Curtus' Pearly Mussel) (*Pleurobema curtum*)

Heavy Pigtoe (Judge Tait's Mussel) (*Pleurobema taitianum*)

Southern Combshell (Penitent Mussel) (*Epioblasma penita*)

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historical and contemporary distributions, life histories, genetics, habitats, disturbances, and potential threats to these species. We announced initiation of this review for black clubshell and southern combshell and requested information in a published *Federal Register* notice on March 25, 2020 (85 FR 16951). We did not receive any public comments during this comment period. We announced initiation of this review for heavy pigtoe and requested information in a published *Federal Register* notice on June 23, 2021 (86 FR 32965). We received one public comment during the comment period; however, that comment did not contain any information related to the biology, life history, demographics or threats of the species. In an effort to acquire the most current information available, various sources were solicited, including State conservation agencies and heritage programs, and knowledgeable individuals associated with Federal and State agencies, academia, and non-governmental conservation organizations. Specific sources included previous 5-year reviews (U.S. Fish and Wildlife Service (Service) 2009, 2015), the final rule listing these species under the Act; peer reviewed scientific publications; the Mississippi Museum of Natural Science Mollusk Collection; the Alabama Aquatic Biodiversity Center (AABC); unpublished field observations by State biologists; unpublished studies and survey reports; and notes and communications from other qualified individuals.

The following information updates the referenced sections of the 2009 5-year review (https://ecos.fws.gov/docs/five_year_review/doc2409.pdf), and the 2015 review (https://ecos.fws.gov/docs/five_year_review/doc4645.pdf). Sections of the 2009 and 2015 5-year reviews not referenced herein, do not contain new information related to this 2020 5-year review.

Two species previously addressed in the referenced 5-year reviews, the flat pigtoe (Marshall's pearly mussel, *Pleurobema marshalli*) and the stirrupshell (*Quadrula stapes*) were presumed extinct following both the 2009 and 2015 reviews. A proposed rule to delist the flat pigtoe and stirrupshell due to extinction is currently under development.

B. Reviewers

Lead Region: Atlanta Regional Office, South Atlantic-Gulf Region and Mississippi Basin Regions: Carrie Straight, 404-679-7226

Lead Field Offices

Black clubshell and southern combshell – Jackson, Mississippi, Ecological Services: Matthew Wagner, 601-965-4900

Heavy pigtoe – Daphne, Alabama, Ecological Services: Brittany Barker-Jones, 251-441-5838

C. Background

1. FR Notice citation announcing initiation of this review:

Black clubshell and southern combshell: March 25, 2020 (85 FR 16951)
Heavy pigtoe: June 23, 2021 (86 FR 32965)

2. Listing history

Original Listing

FR notice: 52 FR 11162

Date listed: April 7, 1987

Entity listed: Species

Classification:

Black clubshell (endangered)

Heavy pigtoe (endangered)

Southern combshell (endangered)

3. Associated rulemakings: None

4. Review History:

Recovery Plans:

1989. Recovery Plan for Five Tombigbee River Mussels.

2000. Mobile River Basin Aquatic Ecosystem Recovery Plan.

Recovery Data Call: Annually from 1999-2020

Five Year Reviews:

November 6, 1991 (56 FR 56882): In this review, multiple species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors and threats as they pertained to the different species' recovery. No changes were proposed to the status of the 5 mussels in the present review.

2009 5-year Review: No change in status for black clubshell, heavy pigtoe, southern combshell.

Delist recommendation for flat pigtoe and stirrupshell due to extinction.

2015 5-year Review: No change in status for black clubshell, heavy pigtoe, southern combshell.

Delist recommendation for flat pigtoe and stirrupshell due to extinction; a delisting proposal for these two mussels is currently in development.

5. Species' Recovery Priority Number at start of review (48 FR 43098):

Black clubshell: 5c

Heavy pigtoe: 5c

Southern combshell: 2

5 – Species with high degree of threat, low recovery potential.

2 – Species with high degree of threat, high recovery potential.

6. Recovery Plan

Name of original plan: Five Tombigbee River Mussels Recovery Plan

Date issued: November 14, 1989

Name of revised plan: Mobile River Basin Aquatic Ecosystem Recovery Plan

Date issued: November 17, 2000. Note: the 2000 ecosystem recovery plan did not replace the existing recovery plan. It was intended to provide additional habitat protection and species husbandry recovery tasks.

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy:

The Endangered Species Act (ESA) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. For plants add the language. This definition limits listing DPSs to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

B. Recovery Criteria

1. Do the species have a final, approved recovery plan containing objective, measurable criteria?

Yes.

2. Adequacy of recovery criteria.

- a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?**

Yes. Refer to # 3 below.

- b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?**

Yes, recovery criteria addresses all listing factors. Refer to # 3 below.

3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been achieved.

At the time of the 1989 recovery plan, the black clubshell, heavy pigtoe, and southern combshell were only known or suspected to survive from localized areas of the upper Tombigbee River system. Recovery was unforeseeable due to modification of most historical habitats, and the objective was to prevent extinction of these species through protection of remaining habitat. At the time of the 2000 ecosystem recovery plan, recovery potential was unchanged, and no new recovery criteria were identified.

The development of mollusk propagation technology and facilities by the State of Alabama over the 2 decades following the ecosystem recovery plan provided the potential to restore the species into improved habitats within their historical ranges. Additionally, a surviving population of the heavy pigtoe was discovered in the Alabama River. Based upon these advances, and in order to comply with the Department of Interior Strategic Plan for Fiscal Years 2018-2022, new delisting objectives and criteria were identified for the black clubshell, heavy pigtoe, and southern combshell (Service 2019; 84 **FR** 38291).

AMENDED RECOVERY OBJECTIVE

The recovery objective is to secure the conservation of black clubshell, heavy pigtoe, and southern combshell mussels to the extent that the protections of the Act are no longer required. This will require reestablishing multiple, independent viable populations across the range of each species, and securing management of those populations and their habitats for the foreseeable future.

AMENDED RECOVERY CRITERIA

BLACK CLUBSHELL: Delisting Recovery Criteria

Black clubshell mussel will be considered for delisting when:

- 1) At least three (3) populations within the historical range of the species are established or discovered that exhibit a stable or increasing trend, evidenced by natural recruitment and multiple age classes.
- 2) Spatial distribution of all three populations is protective against extinction from any single catastrophic event and provides for maintaining the adaptive potential of the species.
- 3) Active management programs and partnerships are in place in the historically occupied drainage with assurance of continuing for the foreseeable future. Programs must demonstrate their potential to maintain or improve habitats, provide for stability or expansion of existing or re-established populations.

HEAVY PIGTOE: Delisting Recovery Criteria

Heavy pigtoe mussel will be considered for delisting when:

- 1) At least four (4) populations exhibit a stable or increasing trend, natural recruitment, and multiple age classes.
- 2) Spatial distribution of populations includes one (1) population in each of the Alabama and Tombigbee rivers, and two (2) additional populations within the lower reaches of their tributaries.
- 3) Threats have been addressed and/or managed to the extent that the species will remain viable into the foreseeable future.

SOUTHERN COMBSHELL: Delisting Recovery Criteria

Southern combshell mussel will be considered for delisting when:

- 1) The southern combshell population in the Buttahatchee River exhibits a stable or increasing trend, evidenced by natural recruitment and multiple age classes.
- 2) At least two (2) additional populations within the historical range of the species are established or discovered that exhibit a stable or increasing trend, evidenced by natural recruitment and multiple age classes.
- 3) Spatial distribution of all three populations is protective against extinction from any single catastrophic event and provides for maintaining the adaptive potential of the species.
- 4) Active management programs and partnerships are in place in occupied drainages and have assurance of continuing for the foreseeable future. Programs must demonstrate their potential to maintain or improve habitats, provide for stability or expansion of existing or re-established populations.

The information section in the 2009 and 2015 five-year reviews, and the updates presented below consist of the best available information on the current distribution and status of these mussels and their habitats.

C. Updated Information and Current Species Status

1. Biology and Habitat

Data on abundance, population trends, demographics, distribution, and habitat were summarized in the 2009 5-year review. Mussel surveys, propagation advances, and reintroduction attempts between 2009-2015 were summarized in the 2015 5-year review.

New information for each species is summarized below:

Black Clubshell

Live black clubshells have not been observed since the construction of the Tennessee-Tombigbee Waterway, and fresh dead shells of the species were last collected in 1997 from a single shoal on the East Fork Tombigbee River, Itawamba County, MS. The East Fork Tombigbee River was last searched for the species in 2011 (Hamstead *et al.*, 2020). No new surveys have been completed since the 2015 5-year review, and there is no new information regarding survival of the black clubshell at this location; however, mussel habitats within the East Fork Tombigbee River continue to support a diverse although altered mussel community (Service 2015; Hamstead *et al.*, 2020).

Heavy Pigtoe

A single surviving population of heavy pigtoe is known from the Alabama River, Dallas County, Alabama (Hartfield and Garner 1998, Garner and Buntin 2011). The area of habitat supporting mussels at this site has been quantified (6,250 square meters (m²)); based upon quantitative sampling the surviving heavy pigtoe population within this bed was estimated at 81 animals (Garner and Buntin 2011; Service 2015). No evidence of recruitment of heavy pigtoe within this bed has been found since its discovery. Propagation attempts with captive adults have been unsuccessful (Service 2015). There have been no surveys or monitoring of this population since 2011 as cited in the 2015 review.

Southern Combshell

The southern combshell continues to persist at multiple sites through an approximately 50-kilometer (km) reach of the Buttahatchee River in Lowndes/Monroe Counties, Mississippi (Gangloff *et al.* 2015; Service 2015). No comprehensive survey has been conducted since the 2015 review; however, multiple live combshells were collected from 2 sites within this area in 2019 (C. Atkinson, University of Alabama, *in litt.* 2020).

As noted in the 2015 5-year review, gravid female southern combshell mussels have been collected from the Buttahatchee River over 2 decades for host fish determination and hatchery and propagation trials. These successful efforts resulted in the 2012 release of tagged propagated southern combshell juvenile mussels in the Cahaba River, Bibb County, Alabama. To date, there have been 7 releases at this location totaling 680 cultured mussels; annual follow-up monitoring (2016-2019) has confirmed persistence of some of the cultured mussels at this location, including gravid females; however, no evidence of recruitment has been documented (P. Johnson, AABC, *in litt.* 2020).

Efforts were initiated in late 2015 to reintroduce southern combshell propagules into the Bull Mountain/East Fork Tombigbee drainage. To date, a total of 548 tagged cultured combshell mussels have been released at 3 locations within the lower Bull Mountain Creek; limited monitoring has revealed some survival at two of the release sites (P. Johnson, AABC, *in litt.* 2020).

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

Available information on threats and regulatory mechanisms are summarized in the 2009 5-year review (USFWS 2009). Conservation measures, including development of a draft Strategic Habitat Conservation Plan for the Buttahatchee River, formation of a partnership to implement this plan, and the purchase and protection of approximately 43 km of river frontage along the river in Mississippi and Alabama are summarized in the 2015 5-year review. No new information regarding threats has developed since those reviews.

There have been two mortality events at the AABC hatchery, one involving mortality of several gravid southern combshell broodstock due to a fungal infection (T. Fobian, AABC, *in litt.* 2017), and the other involving late winter mortality of several thousand southern combshell propagules, apparently due to competition from a population of invasive Asian clams (*Corbicula fluminea*) (P. Johnson, AABC, *in litt.* 2019). These issues have since been resolved (P. Johnson, AABC, *in litt.* 2020).

Disease or predation. There is not much known about disease related to any of these three species. There is a concern related to disease causing significant die-off events of mussels in Tennessee River basins and may be a cause of similar significant declines of mussel species in other basins. Recent research in the Clinch River suggests that mussels involved with an ongoing mussel die-off are strongly associated with infection and high viral load of densovirus, which is known to be the cause of lethal epidemics in other invertebrate groups, indicating that some freshwater mussel declines could be

the result of viral epidemics (Richard et al. 2020). Novel viruses and diseases could be a significant threat to species with limited population sizes in these heavily impacted systems.

Inadequacy of existing regulatory mechanisms. In addition to the discussion in the 2009 review that ammonia is extremely toxic to freshwater mussels at levels well below the current federal standard for this pollutant (Augspurger et al. 2003). Significant sources of ammonia include municipal and package wastewater treatment plants, agricultural runoff (animal wastes and chemical fertilizers), and lawn and turf runoff. In 2013, the U.S. Environmental Protection Agency (EPA) revised the water quality criteria for ammonia (EPA 2013). Acute and chronic criteria were developed to protect organisms from both immediate effects, such as mortality, and longer-term effects on reproduction, growth and survival, respectively. EPA provides several supporting documents to aid states considering adoption of the updated criteria. Also, recent studies indicate that pharmaceuticals and personal care products are commonly being discharged into surface waters and may be having acute and chronic impacts on aquatic species. For example, Fluoxetine, an often prescribed antidepressant drug, is increasingly being detected in surface waters at high enough levels that can cause female mussels to discharge/abort undeveloped glochidia and has the potential to disrupt numerous other aspects of native mussel reproduction (Bringolf et al. 2007). However, very few if any treatment plants monitor for these pollutants and there are no federal or state standards regulating the discharge of pharmaceuticals or numerous other pollutants commonly found in wastewater discharges.

At this time there have been no significant changes to the threats to these three species and the threats noted in the 2009 status review. Destruction, modification and curtailment of habitat, continued threat of accidental harvest for commercial purposes of heavy pigtoe, inadequacy of existing regulatory mechanisms, and habitat fragmentation / lack of recruitment remain significant threat for each of these species.

D. Synthesis

Black clubshell: A small black clubshell population was known to have persisted on a single shoal in the East Fork Tombigbee River through 1997. All other historical collection sites were inundated by construction of the Tennessee-Tombigbee Waterway. Although this record suggests the species may be extinct, mussels are cryptic species, sometimes burying deeply in the river bottom. Due to the absence of monitoring over the past 5 years, no change in status is warranted.

Heavy pigtoe: Since listing, all Tombigbee River drainage populations of heavy pigtoe have been extirpated. While our last information is that a single localized

population survives in an impounded reach of the Alabama River, it appears also to have experienced recruitment failure. The current status of that population is unknown since the last assessment of the population was in 2004. Currently, the only conservation option for heavy pigtoe is artificial propagation and augmentation and re-establishment of populations into historical habitat; however, attempts to propagate the species have been unsuccessful. No change in status for heavy pigtoe is warranted.

Southern combshell: A viable population of the southern combshell continues to persist only in the Buttahatchee River of Mississippi. Recent surveys (2019) indicate expanding range and abundance of the species within this river channel. Attempts to reintroduce hatchery propagated southern combshell juvenile mussels into the Cahaba River, Alabama, and Bull Mountain Creek, Mississippi, are in progress. Until the viability of these introduced populations can be determined, we have not included these populations as range expansions or to count toward species recovery. No change in status for the southern combshell is currently warranted.

III. RESULTS

A. Recommended Classification:

Black clubshell
Heavy pigtoe
Southern combshell

 X **No change is needed**

IV. RECOMMENDATIONS FOR FUTURE ACTIONS:

1. Conduct comprehensive survey for black clubshell in the East Fork Tombigbee River prior to determining extinction.
2. Continue to monitor the Buttahatchee River southern combshell population.
3. Continue to augment and monitor reintroduced southern combshell populations in the Cahaba River and Bull Mountain Creek.
4. Maintain and enhance conservation partnerships within the Tombigbee drainage and Mobile River Basin. Develop and implement a strategic habitat conservation plan for the East Fork Tombigbee River.
5. Continue to support AABC mission to propagate and reintroduce hatchery reared imperiled mollusks into restored habitats, as appropriate.

V. REFERENCES

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- U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; 21 Draft Recovery Plan Revisions for 43 Southeastern Species. *Federal Register* 84 (151): 3829- 38294.

U.S. Fish and Wildlife Service. 2015. 5-year Review: Black Clubshell (Curtus' Pearly Mussel) (*Pleurobema curtum*), Flat Pigtoe (Marshall's Pearly Mussel) (*Pleurobema marshalli*), Heavy Pigtoe (Judge Tait's Mussel) (*Pleurobema taitianum*), Southern Combshell (Penitent Mussel) (*Epioblasma penita*), Stirrupshell (*Quadrula stapes*). Mississippi Ecological Services Field Office, Jackson, MS.

U.S. Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; 21 Draft Recovery Plan Revisions for 43 Southeastern Species. Federal Register 84 (151): 38291.

**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW**

of

**Black Clubshell (*Pleurobema curtum*)
Heavy Pigtoe (*Pleurobema taitianum*)
Southern Combshell (*Epioblasma penita*)**

Current Classification: __Endangered__

Recommendation resulting from the 5-Year Review:

 X No change is needed (All three species)

New Recovery Priority Number: We are changing the recovery priority number from 2c to 2 for the southern combshell (*Epioblasma penita*) as the conflict of being able to reintroduce the species in Alabama and Mississippi has been resolved. It is still a species with high degree of threat (see above five-factor analyses) with a high recovery potential (reintroduced populations in the Cahaba River in Alabama and Bull Mountain Creek in Mississippi). No change in recovery priority number is needed for black clubshell (*Pleurobema curtum*) or heavy pigtoe (*Pleurobema taitianum*).

Review Conducted by: Paul Hartfield and Matthew Wagner, Mississippi Ecological Services Field Office and Brittany Barker-Jones, Alabama Ecological Services Field Office.

FIELD OFFICE APPROVAL:

Field Supervisor, Mississippi Ecological Services Fish and Wildlife Service

Approve _____ Date _____

* Since 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.