

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*)

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



Black Clubshell (*Pleurobema curtum*)
credit: Dr. Bob Jones, Mississippi Museum of Natural Science

**U.S. Fish and Wildlife Service
Southeast Region
Jackson Ecological Services Field Office
Jackson, Mississippi**

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*)
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Stirrupshell (*Quadrula stapes*)

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 current distributions, life histories, and habitats of these species. Our sources include the final rule listing these species under the Act; the Recovery Plan; the 2009 5-year review, peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. The public notice for this review was published on March 25, 2014, with a 60-day public comment period (79 FR 16366). We also sought peer review on this document from several experts. Comments received were evaluated and incorporated, as appropriate (see Appendix A).

B. Reviewers

Lead Region – Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office – Jackson, Mississippi, Ecological Services: Paul Hartfield, 601-321-1125

Cooperating Field Offices –

Daphne, Alabama, Ecological Services: Jeff Powell, 251-441-5858

C. Background

1. FR Notice citation announcing initiation of this review:

79 FR 16366; March 25, 2014

2. Species status:

Black clubshell – Has not been observed since 1997.

Flat pigtoe – Presumed extinct; not observed since 1987

Heavy pigtoe – Declining; single population and no evidence of recruitment.

Southern combshell – Stable; increase in existing population, some habitat protection achieved.

Stirrupshell – Presumed extinct; not observed since 1987.

3. Recovery achieved (1 = 0-25% recovery objectives achieved; 2 = 25-50% recovery objectives achieved):

Black clubshell – 1; Recent surveys have not relocated the species, but habitat is stabilizing.

Flat pigtoe – 1

Heavy pigtoe – 1; Recent surveys indicate continuing recruitment failure in the single localized surviving population.

Southern combshell – 1; Recent surveys indicate expanding range and abundance of the single surviving population.

Stirrupshell – 1

4. Listing history

Original Listing

FR notice: 52 FR 11162

Date listed: April 7, 1987

Entity listed: Species

Classification:

Black clubshell (endangered)

Flat pigtoe (endangered)

Heavy pigtoe (endangered)

Southern combshell (endangered)

Stirrupshell (endangered)

5. Associated rulemakings: None

6. 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 1999-2014

Five Year Reviews:

November 6, 1991 (56 FR 56882): In this review, different 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. In particular, no changes were proposed for the status of these 5 mussels in the 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.

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

Black clubshell: 5C.

Flat pigoe: 5

Heavy pigtoe: 5CSouthern combshell: 2C.

Stirrupshell: 5

(5 – High degree of threat, low recovery potential; 2 – High degree of threat, high recovery potential; and C – potential for conflict with development type activities)

8. 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

- 1. Is the species under review listed as a DPS?** No. These mussels are invertebrates, therefore the DPS policy is not applicable to these species.

B. Recovery Criteria

- 1. Do the species have a final, approved recovery plan containing objective, measurable criteria?** No. At the time of the 1989 recovery plan, these five mussels were only known from a very small segment of the Tombigbee River. 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 information section in the 2009 five-year review and below consists of the best available information on the current distribution and status of these mussels and their habitats.

C. Updated Information and Current Species Status

Data on abundance, population trends, demographics, distribution, and habitat were summarized in the 2009 5-year review. There is little new information on species biology or distribution since the last 5-year review. Surveys conducted since 2009 include a survey of the East Fork Tombigbee River (Gangloff and Hamstead 2012), various spot surveys of the Buttahatchee River (Paul Johnson, Alabama Aquatic Biodiversity Center (AABC) *in litt.* 2014, Bob Jones, Mississippi Museum of Natural Science, pers. comm., 2014), a more comprehensive survey of the lower Buttahatchee River in Mississippi (Gangloff *et al.* 2015), and a survey of a mussel bed on the Alabama River (Garner and Buntin 2011).

New information for each species is summarized below:

Black Clubshell

An intensive systematic survey of the East Fork Tombigbee and the site last known to support black clubshell (1997) was conducted in 2010-11 (Gangloff and Hamstead 2012). No live or fresh dead black clubshells were located. Conditions at the historical collection site had degraded to such an extent that few mussels of any species were found there. However, other portions of the river appear to be stabilizing (Gangloff and Hamstead 2012), and the potential of survival persists.

Flat Pigtoe

No live or fresh dead shells of flat pigtoe have been observed since the species was listed (U.S. Fish and Wildlife Service 1987). All historical habitat is impounded or modified by impoundment.

Heavy Pigtoe

A single surviving population of heavy pigtoe is known from the Alabama River, Dallas County, Alabama (Hartfield and Garner 1998). An intensive systematic survey of the site known to support heavy pigtoe was conducted in 2010 (Garner and Buntin 2011). The area of habitat supporting mussels was quantified as 6,250 square meters (m²). Only two heavy pigtoe were collected from 150 m² sample quadrats within this area. Qualitative searches resulted in collection of four additional heavy pigtoe. All heavy pigtoe collected were mature adults, providing no evidence of recruitment. Total number of heavy pigtoe mussels occupying the bed was estimated at 81 animals (Garner and Buntin 2011).

The six heavy pigtoe mussels collected in 2010 were returned to AABC for propagation studies, and to determine the feasibility of establishing a hatchery population to prevent extinction (Ark population). Propagation trials were unsuccessful. The attempt to establish an Ark population was

also unsuccessful, due to mortality of the six specimens (P. Johnson, AABC, *in litt.* 2014).

Southern Combshell

The southern combshell is known to have persisted since listing in an approximately 12 kilometer (km) reach of the Buttahatchee River in Lowndes/Monroe Counties, Mississippi, as evidenced by spot collections of small adult and subadult southern combshells (P. Johnson *in litt.* 2014). Gangloff *et al.* (2015) recently conducted the first intensive mussel survey of the Buttahatchee River in Mississippi, since 1989-1990 (Hartfield and Jones 1990, Jones 1991), documenting an increase in mussel density, and locating 53 live southern combshell from 18 sites, over more than a 50 km river reach.

The *Buttahatchee River Restoration Project* (BRRP) was initiated by Mississippi Fish and Wildlife Foundation (MFWF) in 2003, as part of a larger effort with the Mississippi Department of Environmental Quality (MDEQ) and other partners to secure conservation easements along key water resources in the state. In 2005, MFWF partnered with the Mississippi Department of Transportation, U.S. Army Corps of Engineers, the USFWS and others to protect over 5,000 acres of bottomland hardwoods located along the Buttahatchee River in Mississippi. Since then, the MFWF has purchased an additional 3,000 acres in Mississippi and Alabama, and now manages and protects 8,000 acres of land bordering approximately 43 km of frontage along the Buttahatchee River in Mississippi and Alabama. This protected reach includes approximately 50 percent of the habitat currently known to be occupied by the southern combshell.

Recent recovery efforts for the southern combshell have focused on host fish determination, artificial propagation, a reintroduction effort, and development of a captive brood stock lineage. These efforts, nearly a decade in development, culminated in the first successful culture efforts in the spring of 2010 and the first stocking effort that took place in the fall of 2012. Recovery partners for southern combshell have been led by the Service, Alabama Department of Conservation and Natural Resources (AABC), and the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP).

Southern combshell host fish trials have identified appropriate fish hosts, and larvae were successfully propagated and transformed at AABC in 2010 and 2011 (P. Johnson, AABC, *in litt.* 2014). During spring of 2010, 5 gravid female southern combshell were collected for culture trials, resulting in successful transformation of approximately 30 larvae. An additional 5 gravid broodstock were collected in 2011, and approximately 3,000 larvae were successfully transformed into juveniles. All broodstock

were returned to the Buttahatchee following glochidial release. Ten propagated southern combshell have been successfully retained at AABC for 3 years as future potential broodstock (P. Johnson, AABC, *in litt.* 2014).

Following habitat condition trials, 148 propagated southern combshell juvenile mussels were tagged and released in the Cahaba River, Bibb County, Alabama, in an attempt to reestablish a historical population (P. Johnson, AABC, *in litt.* 2012). A limited examination of the Cahaba River release site one year following release found two healthy females exhibiting significant growth (P. Johnson, AABC, *in litt.* 2013).

During April 2014, 5 gravid females were collected from the Buttahatchee River near Caledonia Lowndes/Monroe County, Mississippi. Juvenile mussels were transformed on *Percina kathae* (Mobile Basin Logperch) and *Percina nigrofasciata* (Blackbanded Darter) infected via aerial suspension from May to July 2014. Most of these propagules (~400) are being used to augment the 2012 Cahaba River release site during September 2015; planning is in progress to utilize the remainder (~115) to conduct habitat suitability trials in Bull Mountain Creek/East Fork Tombigbee River, Mississippi.

Propagation of new broodstock collected spring 2015 resulted in the successful transformation of 6,222 juvenile combshells. These will be monitored for condition and survival at AABC, and will be assessed for release during summer 2016 (P. Johnson, *in litt.* 2015).

Stirrupshell

No live or fresh dead shells of stirrupshell have been encountered since the species was listed. Unimpounded historical habitats have been repeatedly surveyed since the species was listed (e.g., Hartfield and Garner 1998, McCullagh et al. 2002, Haag *in litt.* 2006, Hartfield and Jones 1989b, McGregor and Garner 2001, 2002, 2003; Garner and Buntin 2011).

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

Available information on threats and regulatory mechanisms are summarized in the 2009 five-year review. Conservation measures implemented since the last review include development of a draft Strategic Habitat Conservation Plan for the Buttahatchee River, and formation of a partnership to implement this plan (U.S. Fish and Wildlife Service 2014). Over 8,000 acres of land have been purchased, protected, and are being appropriately managed along the Buttahatchee River, including approximately 43 km of river frontage along the in Mississippi and Alabama. No new information regarding threats is available.

D. Synthesis

Black clubshell: A small population was known to have persisted on a single shoal in the East Fork Tombigbee River through 1997. Repeated surveys of the area during the past two decades have reported significant channel erosion, decline of the mussel fauna, and the absence of black clubshell. Although the evidence suggests the species may be extinct, mussels are cryptic species, sometimes burying deeply in the river bottom. This reach of the river should continue to be monitored for another 5 years prior to concluding extinction of black clubshell. No change in status is currently warranted.

Flat pigtoe: There has been no evidence of the continued existence of flat pigtoe for more than two decades. Mussel surveys within the Tombigbee River drainage during the past six years have failed to document the presence of the species. All known historical habitat has been altered or degraded by impoundment, and the species is presumed extinct by most authorities. Recommend delisting due to extinction.

Heavy pigtoe: Since listing, all third order stream populations have become extirpated. A single surviving population in the Alabama River appears to have experienced recruitment failure. The single population is vulnerable to any natural or human-induced random catastrophic event. Currently, the only known conservation option is artificial propagation and re-establishment of one or more populations into historical habitat; however attempts to propagate the species to date have been unsuccessful. No change in status for heavy pigtoe is currently warranted.

Southern combshell: The southern combshell persists only in the Buttahatchee River of Mississippi. Channel erosion due to headcutting negatively affected the species in the lower Buttahatchee during the late 1980's through the 1990's; however, the system now appears to be stabilizing and the species is reoccupying some areas in the degraded lower reaches. A recent survey (Gangloff et al. 2015) indicates expanding range and abundance in the system. Conservation measures are being implemented throughout the drainage to reduce the effects of nonpoint source pollution. Although range in the Buttahatchee is expanding, the single population remains vulnerable to natural or human-induced random catastrophic

events. Conservation strategies include artificial propagation to re-establish the species into historically occupied drainages where conditions have improved. A trial to reintroduce hatchery propagated southern combshell into a reach of the Cahaba River, Alabama, is in progress. A proposal to reintroduce propagated combshells into the East Fork Tombigbee drainage is under development. No change in status for the southern combshell is currently warranted.

Stirrupshell: There has been no evidence of the continued existence of stirrupshell for over two decades. All known historical habitat has been altered or degraded by impoundment, and the species is presumed extinct by most authorities. Recommend delisting due to extinction.

III. RESULTS

A. Recommended Classification:

**Black clubshell
Heavy pigtoe
Southern combshell**

No change is needed

B. New Recovery Priority Number:

Black clubshell: 5; conflict no longer exists.

Heavy pigtoe: 5; conflict no longer exists.

Southern combshell: 2; conflict no longer exists.

A. Recommended Classification:

**Flat pigtoe
Stirrupshell**

Downlist to Threatened

Uplist to Endangered

Delist

No change is needed

B. Delisting (Removal from list regardless of current classification)

Priority Number: 6

IV. RECOMMENDATIONS FOR FUTURE ACTIONS:

- (1) Continue to search for black clubshell, heavy pigtoe, and southern combshell; quantify, and monitor surviving populations and habitats.
- (2) Complete the draft Strategic Habitat Conservation Plan for the Buttahatchee River.
- (3) Maintain and enhance conservation partnerships within the Tombigbee drainage and Mobile River Basin.
- (4) Develop and implement a strategic habitat conservation plan for the East Fork Tombigbee River.
- (4) Continue to describe and monitor habitat conditions at potential reintroduction sites.
- (5) Continue to work with States to refine and implement the Mobile River Basin Mollusk Propagation Plan.
- (6) Continue to work with AABC to propagate and reintroduce hatchery reared mussels into restored habitats, as appropriate.

V. REFERENCES

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- U.S. Fish and Wildlife Service. 1987. Endangered and threatened wildlife and plants; endangered status Marshall's mussel (*Pleurobema marshalli*), Curtus' mussel (*Pleurobema curtum*), Judge Tait's mussel (*Pleurobema taitianum*), the stirrup shell, (*Quadrula stapes*), and the penitent mussel (*Epioblasma penita*). Federal Register 52(66):11162-11169.
- U.S. Fish and Wildlife Service. 1989. Recovery Plan for Five Tombigbee River Mussels. Southeast Region, Atlanta. 18 pp.
- U.S. Fish and Wildlife Service. 2000. Mobile River Basin Aquatic Ecosystem Recovery Plan. Mobile River Basin Coalition Planning Committee. Jackson, MS. 128 pp.
- U.S. Fish and Wildlife Service. 2014. Strategic Habitat Conservation Plan for the Buttahatchee River. Draft. Jackson, MS. 12 p.

Peer-Reviewers:

Mr. Jeff Garner
Alabama Department of Conservation and Natural Resources

Dr. Paul Johnson
Alabama Department of Conservation and Natural Resources

Dr. Jim Williams
U.S. Geological Survey (retired)

Dr. Robert Jones
Mississippi Museum of Natural Science

Stewart McGregor
Alabama Geological Survey

Dr. Mike Gangloff
Appalachian State University

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

of

**Black Clubshell
Heavy Pigtoe
Southern Combshell**

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

X No change is needed

Review Conducted by: Paul Hartfield, Mississippi Ecological Services Field Office

FIELD OFFICE APPROVAL:

for **Lead Field Supervisor, Fish and Wildlife Service**

Approve *Paul Hartfield* Date 8-21-15

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

of

**Flat pigtoe
Stirrupshell**

Current Classification Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
 Up list to Endangered
 Delist
 No change is needed

Appropriate Listing/Reclassification Priority Number, if applicable 6

Review Conducted by: Paul Hartfield, Mississippi Ecological Services Field Office

FIELD OFFICE APPROVAL:

for **Lead Field Supervisor, Fish and Wildlife Service**

Approve

Paul Hartfield

Date

8-21-15

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve

Franklin J. ...

Date

9/8/15

Acting for

APPENDIX A: Summary of peer review for the 5-year review of:

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*)

A. Peer Review Method: The 5-year review was emailed to six potential reviewers with known expertise and interest in the 5 mussels and the Mobile River Basin, along with a request for peer review. Solicited reviewers included State, Federal, University, and Museum biologists.

B. Peer Review Charge:

Request sent to potential peer reviewers by email:

On March 25, 2014, the U.S. Fish and Wildlife Service published a notice in the Federal Register announcing a 5-year review of 33 federally listed southeastern species, including 5 Mobile River Basin mussels. The purpose of the 5-year review is to summarize new information for the species, ensure that the classification of species as threatened or endangered is accurate and reflects the best available information, and to identify actions required to conserve the species.

You have recently provided data regarding the status on one or more of these 5 mussel species, and you have been identified as knowledgeable about the species and the Mobile River Basin. In order to ensure that the best available information has been used to conduct this 5-year review, we now request your peer review of the attached document. The format is standardized, and we are seeking comments on the accuracy of the data used, and identification of any additional new information on any of these species that has not been considered in this review. Also note that this review will not be published, but will become a part of the species' administrative record.

We appreciate your interest in furthering the conservation of rare plants and animals by becoming directly involved in the review process of our Nation's threatened and endangered species. Your review and comments will also become a part of the administrative record for these 5 mussel species, and you can be certain that your information, comments, and recommendations will receive serious consideration.

We hope that you view this peer review process as a worthwhile undertaking. Please give me a call if you have any questions (601-321-1125). Also feel free to respond by email (paul_hartfield@fws.gov) or letter, whichever is most convenient. Thank you for your assistance.

Sincerely,

Paul Hartfield

Endangered Species Biologist
U.S. Fish and Wildlife Service
6578 Dogwood View Parkway
Jackson, MS 39213

C. Summary of Peer Review Comments/Report:

Jeff Garner, Mussel Management Supervisor
Alabama Division of Wildlife and Freshwater Fisheries

Jeff Garner concurred with the content and conclusion of the review, and provided one editorial suggestion, and pointed out one grammatical error.

Stewart McGregor
Alabama Geological Survey

Mr. McGregor responded that he had no additional information to contribute.

Dr. Paul Johnson, Director
Alabama Aquatic Biodiversity Center
Alabama Division of Wildlife and Freshwater Fisheries

Dr. Johnson provided information on fish host trials, propagation success, and mussel surveys since the last 5-year review.

No other comments were received.

D. Response to Peer Review:

Editorial revisions were made according to Mr. Garner's suggestions.

Information and data provided by Dr. Johnson were incorporated into the current review.