Tubercled Blossom
Epioblasma torulosa torulosa

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
Asheville Ecological Services Field Office
Asheville, North Carolina

August 2011

5-YEAR REVIEW
Tubercled blossom (*Epioblasma torulosa torulosa*)

I. GENERAL INFORMATION

A. Methodology used to complete the review

The lead recovery biologist for this species in the Asheville Field Office completed this review for the freshwater mussel, the tubercled blossom. In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life histories, and habitats of this species. Our sources for this 5-year review include the final rule listing these species under the Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts on this species. All literature and documents used for this review are on file at the Asheville Field Office and are cited in the References section. Public notice was given in the Federal Register September 20, 2005 and a 60-day comment period was opened. No public comments were received. The 5-year review was peer reviewed by three experts (see Appendix A) familiar with the species. Peer reviewers provided additional information and references which were incorporated as appropriate.

B. Reviewers

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

Lead Field Office – Asheville, North Carolina, Ecological Services: Bob Butler, 828/258-3939 Ext. 235

Cooperating Regional Offices – Northeast Region: Mary Parkin, 617/417-3331
Midwest Region: Carlita Payne, 612/713-5339

Cooperating Field Offices (FO) – Contact name(s) and phone numbers: Rock Island, Illinois, FO: Kristen Lundh, 309/757-5800; Bloomington, Indiana, FO: Lori Pruitt, 812/334-4261; Columbus, Ohio, FO: Angela Boyer, 614/416-8993; Elkins, West Virginia, FO: Barbara Douglas, 304/636-6586; Frankfort, Kentucky, FO: Leroy Koch/Mike Floyd, 502/695-0468; Cookeville, Tennessee, FO: Geoff Call, 931/528-6481; Daphne, Alabama, FO: Jeff Powell, 251/441-5858

C. Background

1. FR Notice citation announcing initiation of this review:

September 20, 2005: 70 FR 55157

2. Species status:

Presumed extinct (2007, 2008, 2009, 2010 Recovery Data Call). No change in status from 2007. The tubercled blossom has been considered "possibly extinct" by Williams et al. (1993) or "extinct" by Neves (1993), Neves et al. (1997), and Turgeon et al. (1998).

3. Recovery achieved: 1 (0-25% recovery objectives achieved)

4. Listing history
Original Listing
FR notice: 41 (FR) 24062
Date listed: June 14, 1976
Entity listed: Species
Classification: Endangered

5. Associated rulemakings:

66 FR 32250; June 14, 2001; Establishment of Nonessential Experimental Population Status for 16 Freshwater Mussels and 1 Freshwater Snail (Anthony's Riversnail) in the Free Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, Alabama.

66 FR 43808; August 21, 2001; minor correction to June 2001 rule.

6. Review History:
Status Review, 1991: In this review (56 FR 56882), 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 this mussel in the review.

1985 Recovery Plan

Recovery Data Call: 2010, 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000

7. Species' Recovery Priority Number at start of review (48 FR 43098): 6 (high degree of threat, low recovery potential)

8. Recovery Plan
Name of plan: Recovery Plan for the Tubercled-blossom Pearly Mussel (*Epioblasma* (=*Dysnomia*) *torulosa torulosa*), Turgid-blossom Pearly Mussel (*Epioblasma* (=*Dysnomia*) *turgidula*), and Yellow-blossom Pearly Mussel (*Epioblasma* (=*Dysnomia*) *florentina florentina*)
Date issued: January 25, 1985

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy: Not applicable. The Act defines species to include any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments (DPS) only to vertebrate species of fish and wildlife. The tubercled blossom is an invertebrate and therefore not covered by the DPS policy.

B. Recovery Criteria

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

Since reproducing populations of the tubercled blossom pearly mussel were not known to exist at the time of approval of the recovery plan, the plan indicates that recovery efforts would be reevaluated if and when reproducing populations of one or both species was found and when each species and its habitat were protected from present and foreseeable events that might interfere with survival of the species. No populations – reproducing or non-reproducing – have been found since approval of the recovery plan.

2. Adequacy of recovery criteria.

a. **Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and their habitats?** Yes

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria? Yes

3. List the recovery criteria as they appear in the Recovery Plan, and discuss how each criterion has or has not been met, citing information.

There are two recovery criteria listed in the Recovery Plan (U.S. Fish and Wildlife Service 1985). They are addressed below:
Note: The Recovery Plan was written to cover three mussel species.

1. A reproducing population of either *E. t. torulosa*, *E. turgidula*, or *E. f. florentina* is found in any stream or river system.

This criterion has not been met. When the 1985 Recovery Plan was written, it was declared that *E. t. torulosa* "may already be extinct."

2. Each species and its habitat are protected from present and foreseeable anthropogenic and natural events that may interfere with the survival of the population.

This recovery criterion was written on the chance that a population of *E. t. torulosa* might be discovered. However, no population of this species has been discovered since 1969. This criterion has not been met. Listing Factors B, C, D, and E are not relevant to these species because live individuals have not been found.

C. Updated Information and Current Species Status

1. Biology and Habitat:

a. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

This is a large-river species that was endemic to the Ohio River system. According to the Recovery Plan, records for this species included the Ohio, Kanawha, Scioto, Kentucky, Cumberland, Tennessee, Nolichucky, Elk, and Duck Rivers. Historical museum records (primarily Ohio State University Museum of Biological Diversity) gathered subsequently add the Muskingum, Olentangy, Salt, Green, Barren, Wabash, White, East Fork White, and Hiwassee Rivers to its range. Its total range includes the states of Alabama, Illinois, Indiana, Kentucky, Ohio, Tennessee, and West Virginia. This species was abundant in archaeological sites along the Tennessee River in extreme northwestern Alabama, making it likely that the species also occurred in adjacent northeastern Mississippi where the Tennessee River borders that state.

The last individuals were collected live or freshly dead in 1969 in the Kanawha River, West Virginia, below Kanawha Falls; in 1968 in the Nolichucky River, Tennessee; and in 1963 in the Green River, Kentucky. All three streams have been extensively sampled in the intervening years without further evidence of this species' occurrence. Subsequent sampling efforts include Kanawha River (Morris and Taylor 1978, Clarke 1982, Taylor 1983), Nolichucky River (Ahlstedt 1991), and Green River (Williams 1969; Isom 1974; Miller et al. 1994; Gordon and Sherman 1995; Cicerello and Hannan 1990; Cicerello 1999, 2005).

Sampling efforts subsequent to ca. 1950 in other streams of historical occurrence have likewise not produced the species. These include Ohio River (Williams 1969, Zeto et al. 1987, Ecological Specialists, Inc. 2000, Williams and Schuster 1989, Kentucky State Nature Preserves Commission (KSNPC) records), Muskingum River (Watters and Dunn 1993-94, Ohio State University Museum (OSUM) records), Scioto River (OSUM records), Olentangy River (Stein 1973, Hoggarth 1990), Kentucky and Salt Rivers (KSNPC records), Wabash River (Krumholz et al. 1970, Meyer 1974, Clark 1976, Cummings et al. 1992, EnviroScience, Inc. 2005), White River (Krumholz et al. 1970, Meyer 1974), East Fork White River (Krumholz et al. 1970, Meyer 1974, Harmon 1998, EnviroScience, Inc. 2005, Indiana Department of Natural Resources records),

Barren River (Gordon and Sherman 1995, KSNPC records), Cumberland River (Neel and Allen 1964, Tennessee Valley Authority 1976, Parmalee et al. 1980, Miller et al. 1984, Blalock and Sickel 1996, Sickel and Chandler 1996, Hubbs 2008, Tennessee Wildlife Resources Agency (TWRA) records), Tennessee River (Scruggs 1960; Bates 1962; Isom 1969, Williams 1969, Isom 1972, Gooch et al. 1979, Parmalee et al. 1982, Sickel 1985, Garner and McGregor 2001, Alabama Department of Conservation and Natural Resources (ADCNR) records, TWRA records), Hiwassee River (Parmalee and Hughes 1994), Elk River (Isom et al. 1973, Ahlstect 1983, U.S. Fish and Wildlife Service 1999, ADCNR records), and Duck River (Isom and Yokley 1968; Ahlstedt 1981, 1991; Schilling and Williams 2002; Ahlstedt et al. 2004; TWRA records).

Based on this body of survey information in large rivers in the Ohio River system, investigators have been considering this species as possibly extinct since the mid-1970s. Possibly the best reach of potential habitat remaining may be in the lowermost 50 miles of the free-flowing portion of the Ohio River, Illinois and Kentucky. This reach is one of the last remnants of large-river habitat remaining in the entire historical range of the tubercled blossom and is home to other large-river endangered species (e.g., *Lampsilis abrupta*, *Plethobasus cooperianus*). Based on the size of the lower Ohio River, the sheer extent of potential habitat, and the difficulty in adequately sampling large river habitats (e.g., due to depth, sampling conditions, equipment logistics), even if the species were extant, the chances of finding an individual is extremely low. However, if live individuals are found, there are several mussel culture facilities within its range that could attempt to hold and/or propagate this species.

b. Genetics, genetic variation, or trends in genetic variation:

No information is currently known concerning population genetics.

c. Taxonomic classification or changes in nomenclature:

There has been no change in the classification or nomenclature of this species. It is considered the large-river nominal subspecies of *Epioblasma torulosa*.

d. Spatial distribution, trends in spatial distribution, or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

No live specimens or fresh dead shells have been found since 1969.

e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

This is a large river species. Very little large river habitat remains anywhere within its historical range.

2. Five-Factor Analysis

a. Present or threatened destruction, modification or curtailment of its habitat or range:

Impoundments were probably the primary reason for this species' decline. No new information is available due to failure to find populations or live individuals.

b. Overutilization for commercial, recreational, scientific, or educational purposes:

Overutilization for commercial, recreational, scientific or educational purposes was not considered to be a limiting factor in the Recovery Plan. We have no new information to indicate that this has changed.

c. Disease or predation:

We have no new information on disease or predation that would indicate either is a limiting factor.

d. Inadequacy of existing regulatory mechanisms:

We have no new information regarding inadequacy of existing regulatory mechanisms for protecting this species.

e. Other natural or manmade factors affecting its continued existence:

We have no new information on any pertinent issues.

D. Synthesis

The tubercled blossom is a large-river species that was reported historically from 18 rivers in the Ohio River system. It is known from the states of Alabama, Illinois, Indiana, Kentucky, Ohio, Tennessee, and West Virginia. Impoundments likely played the primary role in destroying much of its habitat rangewide. The last individuals were collected in the Kanawha River, West Virginia (1969), Nolichucky River, Tennessee (1968), and Green River, Kentucky (1963).

It is true that the tubercled blossom has not been seen since 1969 despite extensive survey work in nearly all of the rivers of historical occurrence, prompting many investigators to consider this species as possibly extinct. Although most large river habitat for this species has been drastically altered, it is possible the species survives in a remnant habitat patch. The most extensive reach of remaining habitat for the species is in the lowermost 50 miles of the Ohio River. Potentially several square miles of large river mussel habitat occurs in this reach. However, the broad expanse of potential habitat, coupled with the extreme difficulty of thoroughly and systematically sampling for extremely rare mussels in large rivers, makes finding the species a low probability event. Based on this information, if the species continues to exist, it may do so at virtually undetectable levels. Therefore, based on available information presented herein we believe that the tubercled blossom should remain an endangered species.

III. RESULTS

A. Recommended Classification:

__x_ **No change is needed**

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Our only recommendation is that malacologists and other biologists remain prepared to take appropriate actions (e.g., attempt to hold and propagate the species) should individuals or a populations be discovered.

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Peer Reviewers: Steve Ahlstedt, U.S. Geological Survey, retired (865/545-4140); Jess Jones, FWS (540/231-2266); Paul Johnson, Alabama Aquatic Biodiversity Center, Alabama Department of Conservation and Natural Resources (334/683-5069).

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

Current Classification: Endangered
Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__x__ **No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable _____

Review Conducted By: Bob Butler

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 3/7/11

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

for
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 3-17-11

The Lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required.

Cooperating Assistant Regional Director, Ecological Services, Fish and Wildlife, Midwest Region

__X__ Concur _____ Do Not Concur

Signature _____ Date 5/5/11

Cooperating Regional Director, Fish and Wildlife Service

__X__ Concur _____ Do Not Concur

Signature _____ Date 8/12/11
Acting Regional Director

APPENDIX A: Summary of peer review for the 5-year review of Tubercled blossom (*Epioblasma torulosa torulosa*)

A. Peer Review Method: Three individuals that have decades of experience with mussel surveys and research and were well acquainted with the genus *Epioblasma* and the habitat of its species were selected as peer reviewers. A memorandum was sent via email to the peer reviewers soliciting their comments on a draft of this 5 rear review. Comments from all three individuals were received.

B. Peer Review Charge: Peer reviewers were specifically asked if they agreed with the summary of the current status of the tubercled blossom.

C. Summary of Peer Review Comments/Report: The three peer reviewers generally agreed with the statements and content of the status review. A few comments and suggestions were provided that served to strengthen our assessment.

D. Response to Peer Review*:* All comments and suggested edits were carefully considered and incorporated where deemed appropriate in the final draft of the 5 year review. Comments were generally in agreement with our assessment on population status and other information contained in the document. No major concerns were raised.