

Pygmy Sculpin (*Cottus paulus*)

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

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

5-YEAR REVIEW
Pygmy Sculpin (*Cottus paulus*)

I. GENERAL INFORMATION

A. Methodology used to complete the review

In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life histories, and habitats of the pygmy sculpin. We specifically solicited information from knowledgeable individuals, agencies, academia, and conservation organizations. Our sources include the final rule listing this species under the Endangered Species Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from qualified biologists or experts. Public notice of this review was given in the Federal Register on June 14, 2005, with a 60-day public comment period. We sent the 5-year review via email to five different agencies, individuals in academia, and non-government conservation organizations. Peer-reviewers are listed at the end of this document. Comments have been incorporated where appropriate directly into this document.

B. Reviewers

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

Lead Field Office – Jackson, MS, Ecological Services: Daniel J. Drennen, 601-321-1127

Cooperating Field Office – Daphne, AL, Ecological Services: Jeff Powell, 251-441-5858.

C. Background

1. FR Notice citation announcing initiation of this review: June 14, 2005: 70 FR 34492

2. Species status: 2005, 2006, and 2007 Recovery Data Call
Stable; Outside threats to the recharge area and the groundwater remained constant during FY 2007 along with threats from the spring run to the confluence of Coldwater Creek. Nevertheless, we consider the pygmy sculpin to be stable during this reporting period.

3. Recovery achieved: 1 (0-25% recovery objectives achieved) 2007 Recovery Data Call

4. Listing history

Original Listing

FR notice: 54 FR 39846

Date listed: September 28, 1989

Entity listed: Species

Classification: Threatened

5. Associated rulemakings: none

6. Review History:

Recovery Data Call: 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, and 1997.

Previous 5-year review for this species was noticed on November 6, 1991 (56 FR 56384). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors, threats, etc. as they pertained to the individual species. The notices summarily listed these species and stated that no changes in the designation of these species were appropriate at that time. In particular, no changes were proposed for the status of this species in this review.

7. Species' Recovery Priority Number at start of review (48 FR 43098): 8; the degree of threat is moderate and there is a high potential for the recovery of the species.

8. Recovery Plan or Outline

Name of plan: Pygmy Sculpin Recovery Plan. U.S. Fish and Wildlife Service. Atlanta, GA. 13 pp.

Date issued: August 6, 1991

Dates of previous revisions: NA

II. REVIEW ANALYSIS

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

- 1. Is the species under review listed as a DPS?** No
- 2. Is there relevant new information that would lead you to reconsider the classification of this species with regard to designation of DPSs?**
No

B. Recovery Criteria

1. Does the species have a final, approved recovery plan? Yes
2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria? Yes
3. 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 its habitat? No, the criteria need to be updated, modified and enhanced due to more up to date biological and threat information.
 - b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)? No. The 1991 Recovery Plan is not formatted with a specific section on recovery criteria as related to the 5 factors. Analysis shows that the factors are only moderately addressed in the recovery criteria, but criteria need to be updated.
4. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing supporting information. For threats-related recovery criteria, please note which of the 5-listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

There are only generalized recovery criteria listed in the recovery plan. The recovery objectives and criteria as listed in the plan are:

1. Prevent the pygmy sculpin from becoming endangered by implementing all the recovery tasks for the species.

All of the recovery tasks of the Recovery Plan have been sporadically implemented, to various degrees of intensity and success, over the last 15 years. Immediate threats to the species are limited and guarded since the species is only found in Coldwater Spring and the spring run, which is owned and protected by the Anniston Water Works and Sewer Board. The spring is the major water source for much of Anniston and surrounding portions of Calhoun County. An agreement between the U.S. Fish and Wildlife Service and the Anniston Water Works and Sewer Board protects the spring flow by establishing a minimum daily flow.

2. Delisting should be considered when all recovery tasks have been fully implemented and five years of consecutive data indicate the existence of five or more protected, viable populations in separate drainages fed by three or more separate aquifers.

All recovery tasks have not been fully implemented. No consistent population estimates over five years have been compiled. Existing survey estimates are based on various sampling techniques and are difficult to compare. The immediate recharge area has some minimal protections, however the 90 mile aquifer recharge area has very limited protection (Task 2).

The pygmy sculpin is only found in Coldwater Spring and the spring run, Calhoun County, Alabama. The spring flows from the Jacksonville Fault, in the Weisner formation of the Valley and Ridge Aquifers. The discovery of an additional separate viable population(s) within the same watershed or in another watershed fed by the same or different aquifers is extremely unlikely. This criterion for recovery is not likely obtainable and should be reevaluated.

C. Updated Information and Current Species Status

1. Biology and Habitat

The only known population of this species is in Coldwater Spring and the spring run in Calhoun County, Alabama. Coldwater Spring is impounded by a low weir dam to form a pool of over 0.4 hectares (1 ac), 0.6 to 1.2 m deep (2 to 4 ft). The spring run is up to 18 m (60 ft) wide and 152 m (500 ft) long to its confluence with Dry Creek. The average flow is 121 million liters (32 million gallons) per day with a fairly constant temperature of 16^o to 18^o C (61^o to 64^oF). The variability of flow is low compared to other springs in northern Alabama.

In 1973, the population of pygmy sculpins in the Coldwater Spring run was estimated at 2,250 to 2,700 individuals (U.S. Fish and Wildlife Service 1991); however the number of sculpins in Coldwater Spring pool was not estimated. Estimates by Catchings (1992) ranged from 1,710 to 2,722 in the spring pool and as many as 5,392 in the spring run. Stiles (1999) estimated the population numbers of pygmy sculpins within the spring pool from 1997 to 1998 to be as high as 25,000 individuals, and within the spring run, during the same time, as high as 2500. There has been no thorough population survey of the species since 1999 (Tasks 1.1, 1.2). However, population numbers appear to be stable in the spring pool. Sculpins are difficult to survey in their habitat due to large boulder and cobble piles throughout the spring pool (Drennen 2006, USFWS, pers. observ.). In the spring run, they are less frequent, and water temperatures increase with the flow toward the confluence with Dry Creek, which may limit population numbers.

Stiles (1999, 2002) found the majority of pygmy sculpins in the sand, boulder and pebble zones or about 34% of the total habitat in the spring pool. Pygmy sculpins were also found in the vegetation zones (57% of total habitat) but not to the level of the sand, boulder and pebble zones. Much of the vegetation habitat has changed (Drennen 2006, pers. observ.) since Stiles' studies (1999, 2002).

Pygmy sculpins spawn throughout the year with a peak from April to August. Males and females reach sexual maturity at 25 to 29mm (1 to 1.1 in), and the total number of ovarian eggs varies from 18 to 59, with the number of eggs directly related to the individual's size. Eggs are laid in masses on the underside of rocks and bricks in clumps of one to nine, and are pale yellow to orange. Johnston (2000) found that eggs changed color as they developed; new eggs were light orange to pink, developing eggs were dark orange, and eyed embryos had black eyes. Eggs may number over 200 on a nest, and more than one female may deposit eggs in a nest although the incubation period is unknown. Fry measure 5.3 mm (0.2 in) total length and are well-developed and pigmented.

Mature individuals rarely exceed 45 mm (1.8 in) in total length. The head is large, body moderately robust, and the lateral line is incomplete. Coloration varies by sex, maturity, and breeding condition, and pigmentation generally consists of up to three dorsal saddles and mottled or spotted fins. Upon maturity, the body color becomes lighter, and the grayish black color that remains forms two dark saddles. In juveniles, the head is black, changing to white with small scattered melanophores (black color pigments) in adults. In breeding males, the dark spots in the spinous dorsal fin enlarge and become more intense and the fin margins become reddish orange. The entire body becomes suffused with black pigment which almost completely conceals the underlying pattern. The breeding color of females tends to be slightly darker than in off-breeding females (U.S. Fish and Wildlife Service 2000).

Isopods are the most important food item throughout the year, with gastropods and amphipods of seasonal importance (Williams 1968, McCaleb 1973, U.S. Fish and Wildlife Service 1991).

2. Five Factor Analysis

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

The U.S. Geological Survey determined the recharge area for Coldwater Spring to be approximately 90 square miles, which includes a portion of the Anniston Army Depot (Depot), Cities of Anniston, Jacksonville and Oxford, Fort McClellan, and other suburban areas. The importance of protection of the recharge area (Valley and Ridge Aquifers) is essential to the survival of the species (Tasks 2.1, 2.2, 2.3). Water percolating from the spring has been determined to be around 15 years old and of excellent quality. The large volume of discharge, low variability of flow, and low lag time between drought and fluctuations in discharge are all consistent with a spring that flows from a deep, regional source of water (Robison 2004). However, within the Coldwater Spring recharge area, the aquifer is vulnerable to point source and non-point source pollution, urbanization, and changes in watershed geomorphology. The Anniston Water Works and Sewer Board recently has purchased properties on all sides of the

spring recharge area protecting about 250 acres. Coldwater Mountain, the western border of Coldwater Spring, is now being managed and protected by the State of Alabama Forever Wild program (Miller pers.com. 2006) (Task 2.3).

Because of the sculpin's limited range, the threat from ground water degradation is potentially the greatest impact facing the species. Surface water contamination may be preventing the species from occupying potential habitat in nearby Dry Creek, which receives some runoff water from the Depot. Recent observations in August, 2006, (Drennen pers.observ.) highlighted increased bank disturbances and poor erosion control practices of power line easements at the confluence and mixing zone of the Coldwater Spring run and Dry Creek, all within the range of the pygmy sculpin.

Water sampling on and adjacent to the Depot indicated hexavalent chromium discharged to Dry Creek and chlorinated hydrocarbons in the groundwater at the Depot. Trichloroethylene occurs in strong concentrations (up to 120,000 parts per billion (ppb)) in test wells on the Depot and up to 3.4 ppb in Coldwater Spring (U.S. Fish and Wildlife Service 2000). Groundwater is being monitored, and the Depot is working on methods to remove contaminants from the aquifer.

In addition to the Recovery Tasks in the Pygmy Sculpin Recovery Plan, the final listing rule (54 FR 39846) included a special regulation that protects the spring by establishing a 2 million gallon a day flow minimum (3 cubic feet/second of flow) yet also allowed for continued use by the Anniston Water Works and Sewer Board. The Anniston Water Works and Sewer Board withdraw about 12.45 million gallons a day, 37.5% of the total daily volume of an estimated 32 million gallons a day, with a potential to withdraw almost 30 million gallons a day. Reductions of flow below 2 million gallons per day for prolonged periods could adversely affect the spring pool and spring run population. Very little protection of the 90 square mile recharge area has occurred (Task 2.1, 2.2, 2.3).

Water that is pumped from the spring for human consumption is chlorinated on the spring site. Any overflow pipes from the pumping buildings to the spring run are closely monitored for accidental chlorine releases.

Non-point source pollution from land surface runoff can originate from virtually any land use activity and include sediments, fertilizers, herbicides, pesticides, animal wastes, septic tank and gray water leakage, and petroleum products. These pollutants tend to increase concentrations of nutrients and toxins in groundwater and alter water quality chemistry. Construction and road maintenance activities associated with urban development typically involve earth moving activities that increase sediment loads into nearby streams, and other siltation sources, including timber harvesting, clearing of riparian vegetation, and mining and agricultural practices, allow exposed earth to enter streams during or after precipitation events and may enter into the groundwater. The diminutive range of the pygmy sculpin is in close proximity to Anniston and other cities where the mentioned activities are occurring, thus impacts from these activities to the pygmy sculpin and its habitat are feasible. Industrialization is extensive throughout the watershed, particularly near Coldwater Spring. Optimistically, runoff from the clay

mining operation adjacent to the immediate recharge area is no longer a threat (Miller pers. com. 2006).

A strategy for rescue of pygmy sculpins in the event Coldwater Spring becomes unsuitable habitat is being developed. If the habitat becomes unsuitable, an emergency location, adjacent to the spring (Anniston Water Works and Sewer Board), will be the depository for the species until the Coldwater Spring habitat is recovered or/and suitable transplant sites are discovered (Task 3.2, 3.3, 4.0). Caldwell (1965) and Williams (1968) failed to find this species in other springs within the area, emphasizing the rarity of the species and the uniqueness of Coldwater Spring. For emergency refugia, Catchings (1992) surveyed springs in the area and found Germania Spring was somewhat similar to Coldwater Spring, while a recent survey by the Alabama Natural Heritage Program (Stiles 2002), did not find a surrogate spring that was sufficiently analogous to support an introduction of pygmy sculpins in the event of a catastrophe at Coldwater Spring.

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

Over utilization has not been implicated in the decline of these species. No new information in our files suggests a change to this determination.

c. Disease or predation: Disease is not known to be a factor in the status of these species. No new information in our files suggests a change to this determination.

Adult pygmy sculpins occasionally feed upon sculpin eggs. Johnston (2000) observed that four of ten allopaternal males (males care for an unrelated brood) consumed entire clutches of eggs from nests when taking over existing nests. Crayfish (*Cambarus latimanus*) also eat pygmy sculpin eggs (Johnston and Knight 2004).

The grass pickerel is the other known fish predator. Large water snakes often bask in the sun below the spring weir in the spring run and could prey on sculpins (U.S. Fish and Wildlife Service 1991). Stiles (2004, pers. observ) noticed a Queen snake (*Regina septemvittata*) within the spring pool. The Anniston Water Works and Sewer Board has initiated a river otter (*Lutra canadensis*) exclusion system at the spring pool because of increase otter depredation on the aquatic life (Miller pers. com 2006).

d. Inadequacy of existing regulatory mechanisms: Current laws and regulations require future federally funded projects that may cause impacts to the pygmy sculpins' habitat to be assessed in regard to need, environmental impact, and possible alternatives. However, laws and regulations cannot guarantee that the least damaging project to the watershed will be chosen. Enforcement of current laws and regulations (Task 2.2) are essential to the species survival since the recharge area for Coldwater Spring is approximately 90 square miles, which includes a portion of the Anniston Army Depot, Cities of Anniston, Jacksonville, Oxford, Fort McClellan, and other suburban areas. Because of the sculpin's limited range, the threat from ground water degradation of the Valley and Ridge Aquifers (limestone and dolomite of the Knox Group of Cambrian and

Ordovician age of the Jacksonville Thrust Fault) is potentially the greatest impact facing the species.

e. Other natural or manmade factors affecting its continued existence: The low weir dam prevents sculpins of the spring run from entering the spring pool, sufficiently isolating the spring pool population from any genetic contributions to the pygmy sculpins in the spring run population. Isolation of the spring pool population may, over time, lead to inbreeding depression and the expression of undesirable alleles, similar to some of the grass pickerel (*Esox americanus*) (Drennen, pers. observ. 2006). However, it is possible for pygmy sculpins of the spring pool population to enter the spring run population.

D. Synthesis: There has been no significant change in the status of the pygmy sculpin since it was listed under the Act on September 28, 1989. The most current population estimate was completed in 1999 (Stiles). Even though survey methods have been inconsistent thus far, it is believed the species has not experienced significant curtailment of population size, range and habitat. Paradoxically, deterioration of water quality within Coldwater Spring's 90 square mile recharge area has increased, although water quality in the spring is still excellent. The pygmy sculpins' very limited distribution makes it vulnerable to random natural or human induced events such as spills and groundwater contamination. Long-term monitoring is needed to accurately assessing population trends within the spring and spring run along with monitoring groundwater quality and quantity throughout the Coldwater Spring recharge area. Therefore, the pygmy sculpin continues to meet the definition of threatened species under the Act.

III. RESULTS

- A. **Recommended Classification:**
No change is needed.
- B. **New Recovery Priority Number - no change**

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- a. A consistent monitoring plan should be developed and implemented for the pygmy sculpin and Coldwater Spring recharge area.
- b. Habitats within Coldwater Spring, both microhabitats and macrohabitats, should be assessed, prioritized, and monitored.
- c. Continue working closely with the Anniston Water Works and Sewer Board in regard to water extraction, quality and quantity.
- d. Continue working closely with the Anniston Water Works and Sewer Board in regard to management practices for the pygmy sculpin.
- e. Existing regulations and land management laws within the recharge area should be enforced.

- f. Develop a comprehensive land use and impact data base and conservation strategy on the 90 square mile recharge area of Coldwater Spring. Work through various agreements, memorandums of understanding, partnerships and funding mechanisms, with private land owners, municipalities, Calhoun County, State of Alabama and Federal Agencies such as the Natural Resources Conservation Service, Environmental Protection Agency, and Department of the Army, to protect the recharge area.
- g. Propagation studies and efforts should begin and implementation of a disaster recovery plan for the species along with aquaria and possible surrogate spring refugia. An ark aquarium will provide environmental education and public outreach about the ecology and habitat of the pygmy sculpin and the importance to conserve Coldwater Spring and the spring run. Over 1000 schoolchildren from local schools throughout the area routinely visit the facility. Along with school groups, teachers, and citizens will be able to observe the sculpin closely. This will link the species with the citizenry of the area. The pygmy sculpin is very small and unnoticeable in its native habitat: the individuals in captivity and on display will allow the public to identify with the species and its ecological struggle in an urbanized area.
- g. All other recovery tasks should be implemented.
- h. Revise and incorporate the listed recommendations for future actions within the Pygmy Sculpin Recovery Plan to reflect new information and threat concerns.

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Peer-Reviewers

Dr. Carol E. Johnston, Auburn University, Auburn, Alabama

Mr. Jim Miller, Anniston Water Works and Sewer Board, Anniston, Alabama

Mr. Steve Rider, Alabama Department of Conservation and Natural Resources

Dr. Robert Stiles, Samford University, Birmingham, Alabama

Dr. James Williams, U.S. Geological Survey

Only a few comments were received on this 5-year review. Minor editorial comments were incorporated into this document as appropriate. The general assessment from comments received was that this review looked good and presented information accurately. One reviewer shared that we should mention a road built near one of this fish's locations. We have determined this road is stable. However, we do mention road maintenance and construction in this review and explain how it is a factor to this fish.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
of
PYGMY SCULPIN

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

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By: Daniel Drennen

FIELD OFFICE APPROVAL:

for Lead Field Supervisor, Fish and Wildlife Service

Approve *Carly Wright* Date 7-1-08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve *Franklin Wood III* Date 7/28/08
ACTING Assistant Regional Director
Ecological Services