### Chucky Madtom (Noturus crypticus)

5-Year Review: Summary and Evaluation



Photo courtesy of Conservation Fisheries, Inc.

U.S. Fish and Wildlife Service Southeast Region Tennessee Ecological Services Field Office Cookeville, Tennessee

### 5-YEAR REVIEW Chucky Madtom/*Noturus crypticus*

### 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 historic and current distribution, life history, and habitat of this species. Our sources include the final rule listing this species under the Endangered Species Act (ESA); the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Federal, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. A *Federal Register* notice announcing the review and requesting information was published on May 7, 2018 (83 FR 20092). No part of this review was contracted to an outside party. This review was completed by U.S. Fish and Wildlife Service (Service) biologists in the Tennessee Ecological Services Field Office.

### **B.** Reviewers

**Lead Field Office** – Tennessee Ecological Services Field Office: David Pelren, 931-528-6481

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

### C. Background

**1.** Federal Register Notice citation announcing initiation of this review: May 7, 2018, 83 FR 20092.

2. Species status: Unknown. The Chucky Madtom is historically known from 15 individuals in two stream systems. The species has not been documented in Dunn Creek since the collection of one individual in 1940. Currently, the species is thought to persist only in Little Chucky Creek, where a total of 14 individuals have been collected since 1991. However, no Chucky Madtoms have been captured since 2004, despite considerable survey effort.

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

4. Listing history: <u>Original Listing</u> FR notice: 76 FR 48722 Date listed: August 9, 2011 Entity listed: Species Classification: Endangered

### 5. Associated rulemakings:

Final Critical Habitat RuleFR notice:77 FR 63603Date listed:October 16, 2012

### 6. Review History:

Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we submitted information for the annual recovery data call that included a "Unknown" status recommendation for the Chucky Madtom. The most recent evaluation for this fish was completed in 2018.

Final Recovery Plan: August 16, 2018 (USFWS 2018) This is the first five year review for this fish.

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

5 (degree of threat is high, potential for recovery is low, and the taxonomy is at the species level)

8. Recovery Plan

Name of plan: Final Recovery Plan for the Chucky Madtom (*Noturus crypticus*) (USFWS 2018) Date issued: August 16, 2018

### 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 consider listing this species as a DPS in accordance with the 1996 policy? No.

### B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? Yes. The recovery plan contains objective, measurable de-listing criteria.

2. Adequacy of recovery criteria.

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

The ultimate recovery objective is to remove (delist) the Chucky Madtom from the Federal List of Endangered and Threatened Wildlife by ensuring the longterm viability of the species in the wild. We are defining reasonable recovery criteria for what constitutes a recovered species based on the best available information on this species. Criteria will be re-evaluated as new information becomes available.

The species will be considered for removal from ESA protection when the following criteria have been met:

<u>Criterion 1</u>: Threats and causes of decline have been reduced or eliminated to a degree that the Chucky Madtom does not need protection under the ESA (addresses Factors A and E).

<u>Status</u>: Criterion 1 has not been met because habitat stressors and effects upon the species' range continue to be significant threats to the species' viability. Efforts should continue to document the Chucky Madtom's presence, understand the population's health, and address sources of impact to the species' habitats.

Conservation and recovery of this fish will require additional human intervention and participation. To that end, partnerships should be strengthened with the community of Greeneville, Tennessee; Middle Nolichucky Watershed Alliance; Natural Resources Conservation Service; Greene County Soil Conservation District; Tennessee Valley Authority; non-governmental organizations; universities; and the Tennessee Wildlife Resources Agency.

<u>Criterion 2</u>: Population studies show that a viable Chucky Madtom population in Little Chucky Creek and at least one other stream (Dunn Creek, Jackson Branch; e.g., the only known stream representing the historical range of the species) are naturally recruiting and sustainable (addresses Factors A, C, and E). We define "viable" to be a population that is stable or increasing, of no less than 500 individuals that is showing natural reproduction, no longer requires augmentation, and is able to maintain itself and offset mortality.

<u>Status</u>: Criterion 2 has not been met. Until the species' status is documented as extant, Factors A, C, and E (i.e., habitat/range, predation, and other factors) will continue to be of concern relative to the species' distribution and health. Given the species' narrow range, habitat conservation and protection in Little Chucky Creek is a top priority. We will monitor environmental factors and attempt to document the species' presence and population trend. Upon documentation of the

species' presence, population improvements would be pursued through hatchery propagation and augmentation/reintroduction. Habitat of Little Chucky Creek and other streams targeted for reintroduction will be protected and restored, and other perceived threats (e.g., predation and competition by fish and crayfish) will be addressed as appropriate.

#### C. Updated Information and Current Species Status

#### 1. Biology and Habitat –

a. Abundance, population trends (i.e., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, and mortality rate), or demographic trends: No new information exists concerning this fish's abundance or population trends.

The Chucky Madtom is historically known from two stream systems and 15 individuals. One individual was collected in Dunn Creek, a tributary to the East Fork Pigeon River, in 1940. Currently, the species is thought to persist only in Little Chucky Creek, where a total of 14 individuals have been collected since 1991. None have been captured since 2004 despite considerable survey effort.

Four surveys for Chucky Madtoms were completed during the 1993-2003 timeframe (Burr and Eisenhour 1994, Shute et al. 1997, Lang et al. 2001, Rakes and Shute 2004, Weber and Layzer 2007). Burr and Eisenhour (1994) found nine Chucky Madtoms, four of which were captured in Little Chucky Creek and sacrificed for potential genetic analysis. Five additional specimens were captured at a new location at Jackson Branch, a tributary to Little Chucky Creek, upstream of the site at which the four specimens were collected. These five individuals were preserved in the Southern Illinois University at Carbondale's museum collection. One individual was documented in Little Chucky Creek during a night-time snorkeling survey in 2000 (Lang et al. 2001). Two individuals were collected from Little Chucky Creek in 2004 and transported to a captive rearing facility of Conservation Fisheries, Inc. (CFI) for the purpose of initiating a captive propagation program (Rakes 2008). One of these specimens died in 2004, leaving a single live specimen in captivity that died in 2008. A survey was conducted in 2005 and 2006, and artificial nesting structures (i.e., PVC tubes and terra cotta pots) were monitored during the period of 2007-2010. Almost all of the structures were inhabited by crayfish, but the Chucky Madtom was not encountered using the structures during the 2007-2010 monitoring period.

## b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

There have been no genetic analyses conducted on the Chucky Madtom. However, such species that are restricted in range and population size are more likely to suffer loss of genetic diversity due to genetic drift, potentially increasing their susceptibility to inbreeding depression and limiting their ability to adapt to environmental changes.

#### c. Taxonomic classification or changes in nomenclature:

There are no changes in the taxonomy of the Chucky Madtom since it was originally described.

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

There are no changes in the spatial distribution or historic range of the Chucky Madtom since the Recovery Plan was issued in 2018, because the fish has not been documented despite extensive survey efforts.

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

Chucky Madtoms have been found at sites with cobble and "slabrock" boulder materials within riffle and run habitats (1994 Burr and Eisenhour) on clean, fine gravel substrates that are adjacent to patches of water willow (2004 Rakes and Shute). There is no new information concerning this species' habitat.

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

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

The current range of the Chucky Madtom is believed to be restricted to an approximately 1.8-mi (3-km) reach of Little Chucky Creek in Greene County, Tennessee. The range of the Chucky Madtom has been reduced to only one stream due to fragmentation and destruction of habitat. Habitat fragmentation has subjected the small population to genetic isolation, reduced space for rearing and reproduction, reduced adaptive capabilities, and increased the likelihood of extinction (Hallerman 2003, Burkhead et al. 1997).

Land use data from the Southeast GAP Analysis Program (SE-GAP) show that land use within the Little Chucky Creek watershed is predominantly agricultural, with the vast majority of agricultural land being devoted to production of livestock and their forage base (Jones et al. 2000). Traditional farming practices, feedlot operations, and associated land use practices contribute many pollutants to streams. These practices result in erosion of stream banks and alterations to stream hydrology and geomorphology, degrading habitat. Nutrients, bacteria, pesticides, and other organic compounds generally are found in higher concentrations in agricultural areas than forested areas. Nutrient concentrations in streams may result in increased algal growth, with related alteration in fish community composition (Petersen et al. 1999).

The TVA Index of Biological Integrity results indicate that Little Chucky Creek is biologically impaired (Middle Nolichucky Watershed Alliance 2006). Given the predominantly agricultural land uses within the Little Chucky Creek watershed, non-point source sediment and agrochemical discharges may pose a threat to the Chucky Madtom by altering the physical characteristics of its habitat, thus potentially impeding its ability to feed, seek shelter from predators, and successfully reproduce. The Chucky Madtom is a bottom-dwelling species. Bottom-dwelling fish are especially susceptible to effects related to sedimentation and other pollutants that degrade or eliminate habitat and food sources (Berkman and Rabeni 1987, Richter et al. 1997, Waters 1995). Etnier and Jenkins (1980) suggested that madtoms, which are heavily dependent on chemoreception (detection of chemicals) for survival, are susceptible to human-induced disturbances, such as chemical and sediment inputs, because the olfactory (sense of smell) interference that chemicals produce could negatively affect a madtom's ability to obtain food and otherwise monitor its environment.

Degradation from sedimentation, physical habitat disturbance, and contaminants threatens the habitat and water quality of the species. Sedimentation from agricultural lands could negatively affect the Chucky Madtom by reducing growth rates, disease tolerance, and gill function; reducing spawning habitat, reproductive success, and egg, larvae, and juvenile development; reducing food availability through impacts to prey densities; and reducing foraging efficiency. Sediment is prevalent throughout the Little Chucky Creek watershed, limiting the availability of habitat to the Chucky Madtom (Rakes and Shute 2004). Contaminants associated with agriculture (e.g., fertilizers, pesticides, herbicides, and animal waste) can cause degradation of water quality and habitats through instream oxygen deficiencies, excess nutrient transport, and excessive algal growth.

Portions of the Nolichucky River and its tributaries in Greene County are listed as impaired (303(d)) by the State of Tennessee due to pasture grazing, irrigated crop production, unrestricted cattle access, land development, municipal point source discharges, sand/gravel/rock mining, and channelization (TDEC 2017). However, Little Chucky Creek is not

listed as an "impaired water" by the State of Tennessee (TDEC 2017). For water bodies on the 303(d) (impaired) list, states are required under the Clean Water Act to establish an acceptable total maximum daily load (TMDL) for the pollutants of concern that will bring water quality into the applicable standard. The TDEC has developed TMDLs for the Nolichucky River watershed to address the problems of fecal coliform loads, siltation, and habitat alteration by agriculture.

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

Overutilization is not known to be a factor in the decline of this species.

#### c. Disease or predation:

Disease and predation have not been demonstrated as factors in the decline of this species.

#### d. Inadequacy of existing regulatory mechanisms:

The Chucky Madtom and its habitats are afforded limited protection from water quality degradation under the Clean Water Act of 1977 (33 U.S.C. 1251 et seq.) and the Tennessee Water Quality Control Act of 1977. These laws focus on point-source discharges, and many water quality problems are the result of nonpoint source discharges. Therefore, these laws and corresponding regulations have been inadequate to halt population declines and degradation of habitat for the Chucky Madtom.

In addition, the Chucky Madtom is listed as Endangered by the State of Tennessee. Under the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 (Tennessee Code Annotated §§ 70-8-101-112), "...it is unlawful for any person to take, attempt to take, possess, transport, export, process, sell or offer for sale or ship nongame wildlife, or for any common or contract carrier knowingly to transport or receive for shipment nongame wildlife." Further, regulations included in the Tennessee Wildlife Resources Commission Proclamation 00-15 Endangered Or Threatened Species state the following: "Except as provided for in Tennessee Code Annotated, Section 70-8-106 (d) and (e), it shall be unlawful for any person to take, harass, or destroy wildlife listed as threatened or endangered or otherwise to violate terms of Section 70-8-105 (c) or to destroy knowingly the habitat of such species without due consideration of alternatives for the welfare of the species listed in (1) of this proclamation, or (2) the United States list of Endangered fauna." Potential collectors of this species would be required to have a state collection permit.

The ESA provides two paths for incidental take coverage - sections 7 and 10. Section 7 is more routinely used, and it requires Federal agencies to consult with the Service when projects they fund, authorize, or carry out may affect the Chucky Madtom. However, since its listing, the lack of Federal authority over the many actions likely impacting the species' habitat has become apparent. Many of the threats (including those identified at the time of listing, during recovery planning, and since development of the Recovery Plan) involve activities that likely do not have a Federal nexus (such as water quality changes resulting from development, water withdrawals, or indiscriminate logging) and, thus, may not result in section 7 consultation. The take prohibitions of ESA section 9 apply to these types of activities and their effects on the Chucky Madtom, but enforcement of the section 9 prohibitions is difficult. The Service is not informed when many activities are being considered, planned, or implemented; therefore, we have no opportunity to provide input into the design of the project or to inform project proponents of the potential need for a section 10 permit and the coverage that it would provide for activities that may otherwise be prohibited by section 9.

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

The Chucky Madtom's limited geographic range and apparent small population size leaves the species extremely vulnerable to localized extinctions from accidental toxic chemical spills or other stochastic disturbances and to decreased fitness from reduced genetic diversity. Potential sources of such spills include potential accidents involving vehicles transporting chemicals over road crossings of streams inhabited by the Chucky Madtom and accidental or intentional releases of chemicals into streams by agricultural or residential applications.

The Chucky Madtom's small population size naturally results in vulnerability to losses in genetic diversity and fitness. Species that are restricted in range and population size are more likely to suffer loss of genetic diversity and associated limited adaptability to environmental stressors.

The low fecundity rates exhibited by many madtom catfishes (Breder and Rosen 1966 in Dinkins and Shute 1996) could limit the potential for populations to rebound from disturbance events. Members of the *N. hildebrandi* clade (a taxonomic group of organisms classified together on the basis of homologous features traced to a common ancestor) of madtoms exhibit relatively short lifespans. If also true of Chucky Madtoms, the species' viability could be further limited, rendering it vulnerable to severe demographic shifts from disturbances that prevent

reproduction in even a single year. If the disturbance persists for successive years, this could have significant impacts upon the population.

The Chucky Madtom may be displaced by two crayfish, the virile crayfish (*Orconectes virilis*) and Kentucky River crayfish (*Orconectes juvenilis*). Both are introduced species that are abundant in Little Chucky Creek and considered to compete with Chucky Madtoms for access to the limited habitat available for cover and spawning.

Climate change has the potential to increase the vulnerability of the Chucky Madtom to random catastrophic events (e.g., McLaughlin et al. 2002; Thomas et al. 2004). Climate change is expected to result in increased frequency and duration of droughts and the strength of storms (e.g., Cook et al. 2004). Climate change could intensify or increase the frequency of drought events, such as the one that occurred in 2007. Thomas et al. (2004) report that the frequency, duration, and intensity of droughts are likely to increase in the southeastern United States as a result of global climate change. Stream flow is strongly correlated with important physical and chemical parameters that limit the distribution and abundance of riverine species (Power et al. 1995, Resh et al. 1988), and it regulates the ecological integrity of flowing water systems (Poff et al. 1997).

### D. Synthesis

The Chucky Madtom is known from only one population in the Nolichucky River system. Since the species was listed as endangered in 2011, efforts to document its presence have not been successful. Habitat and water quality degradation remain the greatest threats to the species. Attempts at initiating captive propagation for the Chucky Madtom has been severely hampered by the difficulty in finding individuals for broodstock. The species remains highly vulnerable to extinction from stochastic events.

Due to the Chucky Madtom's limited distribution, small population size, and continued threats, the Chucky Madtom continues to be in danger of extinction throughout its range. Therefore, the endangered status of the Chucky Madtom remains appropriate. The recovery priority number of 5 for the Chucky Madtom should be retained, due to the high degree of threat and low potential for recovery of this fish.

### III. RESULTS

### A. Recommended Classification:

<u>X</u> No change is needed

### **IV. RECOMMENDATIONS FOR FUTURE ACTIONS –**

The following recovery actions are in priority order and should be undertaken for the Chucky Madtom over the next five years:

#### Priority 1 Actions

Conduct surveys to document persistence of the Chucky Madtom.

Capture and maintain Chucky Madtom broodstock to facilitate propagation of individuals for an ark population and conduct future population augmentation efforts.

Protect, restore, and enhance existing habitat in Little Chucky Creek.

Conduct life history studies on Chucky Madtoms and/or surrogate species.

#### Priority 2 Actions

Promote voluntary stewardship as a practical means of reducing nonpoint source pollution from private land use and improving habitat.

Develop models to identify potential Chucky Madtom habitat and determine species presence at those sites.

Develop and implement programs and materials to help inform the public about the Chucky Madtom.

Coordinate all recovery activities, evaluate success of recovery efforts, and revise the recovery plan, as appropriate.

### V. REFERENCES

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### U.S. FISH AND WILDLIFE SERVICE 5-YEAR REVIEW of Chucky Madtom (*Noturus crypticus*)

### Current Classification: Endangered

### **Recommendation resulting from the 5-Year Review:**

 Downlist to Threatened

 Uplist to Endangered

 Delist

 X\_\_\_\_\_ No change is needed

**Review Conducted By:** David Pelren, Tennessee Ecological Services Field Office, Cookeville, Tennessee

### FIELD OFFICE APPROVAL:

### Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve \_\_\_\_\_

Date August 15, 2019