

Re-introduction of the Yellowfin madtom, upper Tennessee River drainage, Tennessee and Virginia

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Introduction

The Yellowfin madtom (*Noturus flavipinnis*, Taylor 1969) is endemic to the upper Tennessee River system known from only four widely distributed locations. The species is listed as Vulnerable (IUCN Red List) and federally threatened throughout its range in Tennessee and Virginia and presumed extirpated in Georgia. It was thought extirpated from the drainage in the early 1900's and considered extinct until specimens were collected in 1968-69 from the Powell River, Tennessee, and Copper Creek (tributary to Clinch River) Virginia (Etnier and Starnes 1993). In 1981, Yellowfin madtoms were collected from Citico Creek which is ~11 river km downstream from the mouth of Abrams Creek, Tennessee (Dinkins and Shute 1996). The species was collected during a reclamation (poisoning) project of lower Abrams Creek in 1957 (Lennon and Parker 1959). Based on this, Dinkins and Shute (1996) and others concluded that the species once occurred in the middle and lower reaches of Abrams Creek (Taylor 1971, Bauer et al. 1983). A reproducing population, propagated from Citico Creek stock, has now been re-established through reintroduction efforts to Abrams Creek (Shute et al. 2005). The following are listed as Nonessential Experimental Populations (NEPs): Tellico River upstream from Tellico Reservoir and Holston River and all tributaries thereof.

Goals

- Goal 1: Identification of re-introduction sites within the species' historic range.
- Goal 2: Captive propagation and restoration management at reintroduction sites.
- Goal 3: Sustainable populations of Yellowfin madtoms established in all areas where there is suitable habitat and hydrology.
- Goal 4: Annual monitoring of all Yellowfin madtom populations (both natural and re-introduced).

Success Indicators

- Indicator 1: Self-sustaining populations established at reintroduction sites.
- Indicator 2: Overall geographical distribution of the species extended.

Project Summary

Captive propagation of the federally threatened Yellowfin madtom has been part of a joint effort that was initiated in 1986 to reintroduce the species (along with three other listed fish species) into Abrams Creek, Tennessee (Shute et al. 2005) as recommended in the Recovery Plan. The species was listed in 1977 with the Powell River and Copper Creek designated as Critical Habitat. The Citico Creek population had not been discovered at the time of listing and is not included as Critical Habitat. Conservation Fisheries, Inc. (CFI) of Knoxville, Tennessee, has managed the captive propagation and is the lead in monitoring both source and target populations. These efforts have been

funded by the Tennessee Wildlife Resources Agency, U.S. Fish and Wildlife Service, and Cherokee National Forest. Additional cooperators in this reintroduction project include the North Carolina Wildlife Resources Commission, National Park Service, Great Smoky Mountains National Park, and the U.S. Forest Service. CFI's responsibilities in this effort include project coordination, captive rearing of wild-collected nests, captive breeding and rearing efforts, stockings, and annual population monitoring of all four species in Abrams Creek and the source populations in Citico Creek. Eggs and young to rear for the effort have been collected annually from nearby Citico Creek, now isolated from Abrams Creek by Chilhowee and Tellico reservoirs. Over the 20-year span, more than 1800 Yellowfin madtoms have been released. The species is reproducing, recruiting, and dispersing into suitable habitats in Abrams Creek, where numbers of fishes now often rival those seen in the source population in nearby Citico Creek (Shute et al. 2005, Rakes 2011). In the absence of reintroductions since 2002 the Yellowfin madtom population is maintaining itself in Abrams Creek.

Beginning in 2003, the pilot project was extended to a new restoration stream, the Tellico River, Tennessee, following publication of the final rule designating NEP status under the ESA for all four species. Reintroductions into the Tellico River upstream from Tellico Reservoir began in 2003 and are currently ongoing. Over 1900 fish have been stocked, wild reproduction has been observed nearly continuously since 2004, and multiple age classes of wild-spawned individuals are routinely observed (Petty et al. 2011). It will take several more years of reintroductions to ensure future success similar to the Abrams Creek reintroductions.

Methods for propagation, restoration, and monitoring are described in Shute et al. (2005) and rely upon collection and rearing of wild nests of madtom eggs and/or larvae in the CFI hatchery facility. Attempts to induce captive breeding have been largely unsuccessful and determined nonessential to the success of this effort. The successful restoration of this rare species to Abrams Creek and, increasingly likely, Tellico River (Petty et al. 2011), could potentially result in downlisting per Recovery Plan criteria. The species also is proposed to be released (as a NEP) into probable historical habitat in the free-flowing reach of the French Broad and Holston rivers, Tennessee. The USFWS and others believe that the species once likely inhabited these river reaches.

Meetings of all project partners have occurred annually to evaluate progress and decide upon future goals. At the onset of the reintroduction project an extensive health screening program of captive fish was established. Approximately one month prior to releases, fish undergo parasitological and bacterial screening. Prior to any transfer of fish from CFI to any other facility, or any reintroductions, a sample of the appropriate captive population, representing each system occupied, if applicable, was sent to the Warm Springs National Fish Hatchery to screen for any detectable disease pathogens. Disease detection would initiate actions necessary to prevent the transfer of any pathogens between facilities or to wild populations of fish. All young-of-year captive madtoms were tagged prior to release using the Visible Implant Fluorescent Elastomer (VIE) tags produced by Northwest Marine Technologies.

Through the Tallassee Fund, Alcoa Power Generating Inc. (Tapoco Division) has funded a genetics study and fish population/ habitat studies. The goal of these studies includes monitoring levels of gene-flow/migration between the Citico, Abrams, and Tellico Creek populations of four federally threatened fish species--Spotfin chub, Smoky madtom, Yellowfin madtom, and Citico darter--as outlined. Preliminary analyses have been completed, and additional tissue samples were collected in 2010-2011. The genetics report will provide an objective/quantitative evaluation for a fish passage strategy. More important, these projects provide needed baseline genetics, demographic, population, and habitat data for these target imperiled species, which may prove vital to their long-term survival and management. Although additional monitoring will be required to document that these reintroduced populations are viable, captive propagation and reintroductions have proven to be a successful means for reestablishment of extirpated populations of these fish.

Major difficulties faced

- Until recently, the National Park Service sought to maintain the historical integrity of the park by allowing cattle farming in Abrams Creek headwaters resulting in sediment loading and elevated nutrient concentrations. Since 1993, a cooperative project between NPS, USFS, University of TN, TVA, Trout Unlimited, and a local wildlife artist improved water and habitat quality by restoring riparian vegetation and fencing and removing cattle.
- Part of the stocking area in Abrams Creek is adjacent to a well-used NPS campground and includes many frequent park users and visitors, locally and from across the country. Educational information was necessary to lessen the impacts of unintentional habitat destruction or fish harassment by these visitors. Campers building small rock dams in the creek reduce the spawning cover available for nesting madtoms and could also be reducing reproductive success by dislodging eggs.
- Recently the USFS proposed a 4-acre parking area adjacent to Citico Creek and the construction of 17.2 miles of new equestrian trails in the Cherokee National Forest. This is perhaps one of the most sensitive areas within the Citico watershed being the center of the population of the Yellowfin madtom within the stream.

Major lessons learned

- A partnership of co-operative stakeholders that meet regularly enabled decisions to be made quickly and appropriate actions implemented.
- Management decisions must be informed by scientific research.
- Must continue to work with public and private stakeholders on sustaining and improving the watershed management plan designed to encourage BMPs in construction, forestry, water development, and agriculture. This includes signs and education efforts to reduce dam-building which destroys cover and nesting habitat.
- The program has been running for nearly 25 years, and during this time has tried to embrace new ideas and protocols in reintroduction practice as they have been developed. Consequently the whole program has 'evolved' rather than been

'planned'. Our experiences prompt us to caution others looking for success in similar projects not to abandon efforts prematurely. It takes time to document success when stocking limited numbers of benthic non-game fishes because they are small, short-lived, and cryptic. Thus, they probably do not quickly move far from stocking sites.

Success of project

Highly Successful	Successful	Partially successful	Failure
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Reasons for success:

- Yellowfin madtom populations still appear to be well established in lower reaches of Abrams Creek in the absence of any reintroductions in more than eight years.
- Both of the re-introductions appear to have been successful. This has resulted in a significant extension of the original geographical range of the species.
- Abundance indices for the species reintroduced to Tellico River were higher in 2010 than the previous year and we again documented that the species successfully reproduced for the fourth consecutive year. The index for Yellowfin madtoms was still much lower than that for Citico Creek (.56 vs. 1.77; or Abrams Creek, 1.29), but a record number of 14 Yellowfin madtoms were observed, including YOY, 1+ and 2+ age classes, all wild-spawned. This endangered species is becoming so well established that reintroductions in core restoration areas in Tellico are probably no longer necessary and stocking of peripheral localities to accelerate dispersal and expand distribution in the Tellico River should now be a goal.

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