

2014 Cheoah Fund Report

Captive Culture and Reintroduction of Priority Fishes and Mussels to Restore Cheoah River Populations

Interim Report 1

Grant Period January 2014-December 2016

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Introduction

In 2005, an improved flow regime was established in the Cheoah River and other habitat improvements are currently underway as part of the Federal Energy Regulatory Commission (FERC) Relicense Agreement. Restoration of multiple species, including Appalachian elktoe, *Alasmidonta raveneliana* (Fed. & NC Endangered); Spotfin chub, *Erimonax monachus* (Fed. & NC Threatened); Wavy-rayed lampmussel, *Lampsilis fasciola* (NC Species of Concern); and Rainbow mussel, *Villosa iris* (NC Species of Concern), are part of the cooperative restoration plan for the Cheoah River. We received support from the Cheoah Fund and other sources in 2008 to improve the NCWRC's infrastructure to enable propagation and culture of these species for reintroduction to the Cheoah River. As a result, the Conservation Aquaculture Center (CAC), was constructed at the Marion State Fish Hatchery, Marion, NC. Support from the Cheoah Fund has been provided ever since, most recently for 2014-2016, and is essential in enabling us to continue this work. This is an interim report for activities in 2014.

Background

A relict population of Appalachian Elktoe is presently extant in the Cheoah River and augmentation to improve demographics and genetic diversity and assist expansion into revitalized habitats is part of the restoration plan. The first evidence of natural reproduction and recruitment since the new flow regime began was documented in July 2009 with discovery of a young Appalachian elktoe estimated to be in its fourth growing season (3+ years old). This is a positive indication that habitats may have favorably improved for this species. Due to a drastic decline in the Appalachian elktoe population in the Little Tennessee River, translocation of adults from there is not an option for augmentation of the Cheoah population for the foreseeable future; however, translocation from the relatively healthy and numerous Tuckasegee River population was approved by the USFWS and carried out in 2012 to supplement previous failed captive culture attempts and move the project forward.

Propagation and culture of Appalachian elktoe has been challenging. Limited experiments to determine host fishes were the only attempts to culture the species prior to our efforts in 2009 with NCSU cooperator Chris Eads. For the next three years, work at both the CAC and at NCSU was plagued with a number of problems in getting juveniles to survive to 5mm length and beyond. Much was learned about feeding and environmental conditions required by early juveniles, but significant production numbers were still lacking. With lessons learned applied, our luck changed greatly in 2013, when temperature and substrate adjustments were made in the early juvenile culture units and a dedicated full-time biologist was assigned to the CAC, affording much more careful monitoring and adjustment of conditions. Over 5,000 juveniles from the 2013 cohort survived past the critical early stages and continued to survive and grow well.

Wavy-rayed lampmussel and Rainbow were believed to be extirpated from the Cheoah River and their restoration there will require reintroduction. Both species have been successfully cultured at the CAC and brood stock is readily available from the Little Tennessee River (LTN) in NC. In 2010-2013, 11,068 Wavy-rayed lampmussels and 4,506 Rainbows were released in the Cheoah. Monitoring shows good growth rates and multiple gravid females have been observed in monitoring surveys over the past two years. Prior to 2014, no recruitment of "wild" juveniles had been observed; however, few early juveniles are ever seen during such surveys anywhere, even in abundant and healthy populations. We are hopeful that detection will increase as they grow larger and more numerous with each year and adult densities increase with further stockings.

To date four cohorts of captively propagated Spotfin chub yearlings have been reared and released in the Cheoah River, totaling approximately 2,000 released. These were propagated at the Conservation Fisheries, Inc. (CFI) facility in Knoxville, TN and reared at the CAC in Marion, NC. Surveys in October 2011 observed both adult and apparently wild-spawned young of the year surviving throughout the release reach, and expanding approximately one river mile upstream. In 2011, CFI had problems with survival of brood stock being held at their facility and the result was no fry were produced for our efforts. Through coordination with USFWS Recovery Lead Biologist, Robert Butler (Asheville FO), NCWRC received approval to translocate adult Spotfin chubs from the thriving LTN population to the Cheoah in 2012. One hundred sixty adults were translocated and released in 2012. Similar problems were encountered in 2012 propagation efforts, when numbers received from CFI were lower than targets and only 260 juveniles survived to release in June 2013. We again received permission and translocated and released 45 adults. Problems at CFI with brood stock performance have continued into 2014, with no fry produced for the Cheoah project.

Further modifications, improvements, and expansions have been made at the CAC. These include the addition of new arrays for early juvenile grow-out and improved water temperature controls. These and previous improvements continue to increase our capacity to produce more juveniles with greater efficiency. These proved to be very effective, with greatly increased growth rates and no significant mortalities in 2013-2014.

Objectives

Our goal for 2014-2016 is to **restore and conserve priority aquatic species in the Cheoah River using captive propagation and culture.** Annual objectives are:

1. **Collect adult Spotfin chubs from the Little Tennessee River for brood stock.**
2. **Rear and release Spotfin chubs as they are available for grow-out from CFI (annual release target: 500 fish)**
3. **Collect brood stock and propagate and culture Wavy-rayed lampmussel and Rainbow cohorts at the CAC for release in the Cheoah River 2016-2018 (annual release target: 1,000 mussels of each species).**
4. **Collect brood stock, host fishes, and propagate Appalachian elktoe at NCSU and the CAC and grow-out at the CAC for release in the Cheoah River 2016-2018 (annual target release: 1,000 mussels).**
5. **Continue culture of Wavy-rayed lampmussel, Rainbow, and Appalachian elktoe presently held at the CAC for release in 2014 and 2015.**
6. **Release animals.**

Results

Mussel propagation and culture

Gravid female Wavy-rayed lampmussels and Rainbow mussels were collected from the Little Tennessee River in May 2014 and previously quarantined host fishes (Largemouth bass, *Micropterus salmoides*) were subsequently infested. Early juveniles recovered from host fishes were abundant and healthy and transferred to early culture units. Each cohort is held in early juvenile culture units for approximately 9 months to 1 year, and transferred to grow-out holding in either suspended upwelling units in the hatchery pond or tubs inside the CAC until release. The 2013 cohort from both species is strong with approximately 7300 Wavy-rayed lampmussels and 8400 Rainbows presently surviving and growing rapidly in the suspended upwelling units, awaiting release in 2015. The 2012 Rainbow cohort was not so numerous and only 40 mussels were available for stocking in 2014; however, Wavy-rayed lampmussels did better and we exceeded our target with 1600 stocked in 2014 (see Table 1).

Propagation of Appalachian elktoe began at the CAC in 2012 and a large cohort of early juveniles was produced; however, none survived beyond a few months after metamorphosis. Our luck changed significantly in 2013, when over 10,000 juvenile Appalachian elktoe from that cohort survived the 5mm "bottleneck" and beyond. In fact, survival surpassed our capacity to hold them all for the planned two years of early grow-out. Over half of the surviving 2013 cohort (~2200) were stocked in October 2014. There are presently approximately 2000 (remaining at the CAC held for further grow-out and stocking in 2015. Host fishes (Mottled sculpin, *Cottus bairdi*) were collected from Scott Creek in February, and gravid females were collected from the Tuckasegee River in March, 2014. Infestation, metamorphosis, and early growth of the 2014 cohort appeared good, with approximately 1500 juveniles surviving going forward for stocking in 2016.

Spotfin chub culture and translocation

We've continued to cooperate with CFI to collect Spotfin chub brood stock from the Little Tennessee River source population for propagation and release in the Tellico (Tennessee) and

Cheoah rivers. Spawning success has been low at CFI and we received no fish for rearing and subsequent release in 2014. Approval was again given from the USFWS to translocate another 45 Spotfin chubs from the Little Tennessee River in 2014 to continue to meet the Cheoah restoration objectives. Given the relatively low population level currently observed in the Little Tennessee River and the apparent early success in survival and expansion in the Cheoah, the need for further translocations is not anticipated.

Table 1. Captively-propagated species released in 2014.

Species	Year propagated	Date stocked	total #
WR lampmussel	2012	10/2014	1600
Rainbow	2012	10/2014	40
Appalachian elktoe	2013	10/2014	2200

Assessments

Spotfin chubs are doing very well in the Cheoah River. Early qualitative assessments in 2010-2011 indicated that Spotfin chubs were surviving and reproducing in the immediate reach near release sites, as well as expanding substantially upstream. Assessment surveys in 2012 and 2013 documented the extent of occupied reach as nearly four river miles and observed abundance in timed random snorkel surveys were equal to some of the best survey results from the Little Tennessee River (28 observations per person hour). Monitoring surveys in June 2014 continued to provide positive results. High densities (up to >30 fish/ person hour of survey time) of multiple age classes were found throughout the upper reach from the raft launch to Yellow Creek. Limited dispersal and lower densities were observed downstream to near RM 4. Numerous breeding males were observed defending spawning sites, and spawning acts with females were observed at some sites. Young of the year were consistently seen in appropriate habitats in the upper reach, but were never observed in abundance.

Mussels also appear to be doing very well. Monitoring surveys in August 2014 indicate good survival and growth of reintroduced Wavy-rayed lampmussels and Rainbows, as well as relict Appalachian elktoe. Some mortality among the mussels translocated in 2013 from the Tuckasegee R. was observed (see PAI report for details). Most encouraging was the finding of a juvenile Rainbow (see Figure 1). This is the first evidence of reproduction and juvenile survival in the Cheoah River seen since the restoration project began.



Figure 1. Juvenile Rainbow mussel, *Villosa iris*, length approx. 12mm, collected from Cheoah River, August 2014.

Conclusions

Our efforts in 2014 to reintroduce and augment the target species in the Cheoah River were successful in meeting our overall objectives, but there continued to be problems with consistently meeting them annually for all species. We are pleased with the recent successes in captive propagation of Appalachian elktoe and the continued, albeit mixed, with Wavy-rayed lampmussel and Rainbow mussels. We are hopeful that we can continue the positive results and our objective is to consistently produce target numbers of every species annually.

Our ability to rear and release Spotfin chubs for release in the Cheoah River is limited by higher priorities for limited propagation output for restoration in Tellico River in Tennessee. If fry are available in 2015 and 2016, we propose additional stocking of approximately 1000 individuals in the lower reach of the river. The success seen in the upper reaches, especially the tendency to disperse upstream, suggests that additional stocking beyond 2016 (or 1000 total released) may not be necessary to realize full occupancy of available habitats in the Cheoah soon thereafter.