

## 2010-2013 Cheoah Fund Report

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

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(Funded 2010-2011)

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#### Statement of Problem

In 2005, minimum flows were 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); Spottfin 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. Those funds were used to successfully leverage further funding and an appropriate facility, the Conservation Aquaculture Center, was constructed at the Marion State Fish Hatchery, Marion, NC. Support from the Cheoah fund was provided again in 2009 and 2010 and was essential in enabling us to continue captive propagation of target species for reintroduction and to improve and maintain the Conservation Aquaculture Center (CAC) to meet those objectives.

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 underway. The first evidence of natural reproduction and recruitment since minimum flows began was documented in July 2009 with discovery of a young Appalachian elktoe estimated to be in its fourth growing season (3+ years old). Further observations through 2013 confirm continued survival and growth of the relict population, as well as translocated animals. While translocation of relatively few individuals from the Tuckasegee River is possible, and was done in 2012, populations there and in the Little Tennessee River can't sustain as long-term sources for translocation. Captive propagation using gravid females from the Tuckasegee River offers a viable alternative to augment and expand the Cheoah River population. Early efforts to propagate Appalachian elktoe in captivity were largely unsuccessful, but obstacles were identified and addressed in subsequent efforts. Significant advances in knowledge and techniques, as well as improvements in infrastructure and personnel at the CAC, have resulted in successful production of juveniles in numbers sufficient to support restoration in the Cheoah.

Specific objectives for the 2010-2011 grant cycle were:

1. Complete grow-out of 2009 Spotfin chub cohort to releasable size and release in the Cheoah River, collect brood stock for continued propagation, and obtain 2010 cohort fry from Conservation Fisheries, Inc. (CFI).
2. Continue to grow-out Wavy-rayed lampmussel and Rainbow 2009 cohorts propagated on site at the Marion Hatchery for release in the Cheoah River (late 2011).
3. Collect brood stock and propagate and culture second batch of Wavy-rayed lampmussel and Rainbow 2010 cohort and first batch of 2011 cohort at the CAC for release in the Cheoah River (late 2012 and 2013, resp.).
4. Begin production-oriented propagation of second Appalachian elktoe cohort at both NCSU and at the CAC, and continue development of propagation and culture techniques for production of releasable size animals for release in the Cheoah River.

Objectives for 2011-13 remained similarly focused on propagation and release of the same priority species. Primary deviations were translocation of Spotfin chubs in 2012 and 2013 to augment poor production and/or survival in 2011 and 2012 captively cultured cohorts.

## Results

***Mussel propagation and culture*** Gravid female Wavy-rayed lampmussels and Rainbow mussels were collected from the Little Tennessee River in June 2010-2013 and previously quarantined host fishes (Largemouth bass, *Micropterus salmoides*, and Rock bass, *Ambloplites rupestris* 2010, Largemouth bass only 2011-2013) were subsequently infested. Each cohort was held in early juvenile culture units for approximately 9 months – 1 year, and transferred to grow-out holding in either suspended upwelling units in the hatchery pond or tubs inside the CAC until release. Growth rates in the suspended upwelling units were much improved over previous techniques and consequently, we are now able to release those species after only two growing seasons at the CAC. There have been intermittent problems with survival, but we believe that that will improve in total numbers and consistency as technical improvements and experience progress. See Table 1 for details.

Appalachian elktoe propagation efforts using brood stock collected from the Tuckasegee River spring continued with mixed, but improving, success in 2010-2013. Attempts made at the NCSU College of Veterinary Science in 2010 and 2011 were largely unsuccessful, with extremely low rates of survival; however, we learned a lot from those failures and our 2012 and 2013 attempts look much more promising. In 2010, three fish species were used for Appalachian elktoe hosts: Mottled sculpin, *Cottus bairdi*, were collected from Tuckasegee River tributaries; Channel catfish, *Ictalurus punctatus*, were obtained from NCWRC Table Rock Hatchery; and, juvenile Sicklefin redbhorse, *Moxostoma* sp., were obtained from cohort propagated from Little Tennessee River stock, presently held at USFWS National Fish Hatchery, Warm Springs, GA. Mottled sculpins proved to be the most efficient and easily obtainable host and they were used exclusively in subsequent efforts. *In vitro* metamorphosis on artificial substrate, by-passing the fish host, was used experimentally at NCSU for the first time with Appalachian elktoe in 2011, with no success. However, it was successful in 2012 with five juveniles surviving to date. Juveniles produced from host-fish infestations also fared better at NCSU in 2012, with 110 presently surviving and growing at the CAC over one year after metamorphosis. 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 in 2013, when temperature and substrate adjustments were made in the early juvenile culture units and a dedicated full-time technician was assigned to the CAC, affording much more careful monitoring and adjustment of conditions. Presently, there are over 10,000 juvenile Appalachian elktoe from that cohort surviving and

growing at the CAC, almost six months after metamorphosis. They have already surpassed the 5mm “bottleneck” that’s appeared to be a threshold for significant survival going forward.

**Mussel translocation** Early fears that propagation might not provide enough Wavy-rayed lampmussels to support restoration in the Cheoah River proved to be unwarranted, and translocation was not needed to support our efforts in 2010-2013. However, as indicated above, Appalachian elktoe propagation efforts were slower to prove successful. In October 2012, 97 Appalachian elktoe adults collected from the Tuckasegee River were released in the Cheoah River. They were released within the reach known to contain the bulk of the known population. This was the culmination of cooperative efforts with the US Fish and Wildlife Service to determine the best approach to accomplish the objectives of augmentation of the Cheoah population while conserving the Tuckasegee population. A Section 10 ESA permit (TE31057A-0) was issued to the NCWRC for these and other activities with Appalachian elktoe and other listed species.

**Spotfin chub culture and translocation** We’ve continued to cooperate with CFI to collect brood stock from the Little Tennessee River source population, propagate, and rear Spotfin chub for release in the Cheoah River. Success has been mixed. A strong cohort was produced in 2010 and released in 2011 (Table 1); however, spawning success was low at CFI in 2011 and we received no fish for rearing and subsequent release in 2012. Approval was given from the USFWS to translocate up to 200 Spotfin chubs from the Little Tennessee River to continue to meet the Cheoah restoration objectives. In May 2012 and June 2013, 160 and 45 Spotfin chubs, respectively, were collected from the Little Tennessee River and released in the Cheoah River. The 2012 captively produced cohort suffered losses from disease while at the CAC, and only 260 survived to release. CAC personnel continue to work with the USFWS Fish Health Laboratory at Warm Springs, GA for assistance with diagnoses and prevention and we are optimistic that more consistent results will be achieved, negating the need for further translocations.

**Table 1. Captive propagation results 2010-2013.**

<b>Species</b>	<b>Year propagated</b>	<b>Date stocked</b>	<b>total #</b>
Spotfin chub	2010	2011	588
WR lampmussel	2009	11/1/2011	8422
Rainbow	2009	11/1/2011	3,218
WR lampmussel	2010	10/11/2012	2,592
Rainbow	2010	10/11/2012	1,138
Spotfin chub	2012	6/4/2013	260
WR lampmussel	2011	6/6/2013	54
Rainbow	2011	6/6/2013	150

**Assessments** Spotfin chubs have done 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).

Mussels also appear to be doing very well. Monitoring surveys conducted by NCWRC in 2009 and 2013 indicate good survival and growth of both relict Appalachian elktoe and reintroduced species. An exception was at the lowermost release site for Wavy rayed lampmussels and Rainbows at Bear Creek Road bridge where none of the mussels release there in 2012 were recovered. Observations indicated that substrates were deeply scoured during high flows in early 2013 and mussels were probably displaced and washed downstream. No further releases will be made at that locality.

**Conclusions** Our efforts in 2010-2013 to reintroduce Spotfin chub, Wavy-rayed lampmussel, and Rainbow mussel, and augment Appalachian elktoe 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 progress toward successful captive propagation of Appalachian elktoe and the continued success, albeit mixed, with Spotfin chub, Wavy-rayed lampmussel, and Rainbow mussel. We are hopeful that we have can continue the positive results and consistently produce the animals necessary for successful restoration to the Cheoah River. Having met our challenges with personnel and infrastructure improvements at the CAC satisfactorily over the past two years, we will seek to resume support from the Cheoah Restoration Fund in 2014.