

## Work Task C11: Bonytail Rearing Studies

FY09 Estimates	FY09 Actual	Cumulative Accomplishment Through FY09	FY10 Approved Estimate	FY11 Proposed Estimate	FY12 Proposed Estimate	FY13 Proposed Estimate
\$165,000	\$135,376.13	\$502,139.95	\$165,000	\$150,000	\$150,000	\$150,000

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**Start Date:** FY06

**Expected Duration:** FY26

**Long-term Goal:** Continuously seek measures to improve quantity, quality, and cost-effectiveness of fish reared for the Fish Augmentation Program.

**Conservation Measures:** BONY3, BONY4, and BONY5

**Location:** Various locations including hatcheries, rearing ponds, universities, and private research facilities.

**Purpose:** Evaluate factors affecting growth of subadult BONY to maximize total length at release and reduce rearing time in hatcheries.

**Connections with Other Work Tasks (past and future):** This work task is a companion study to C10 and may share some of the same locations, source data, and testing staff during implementation. Also, investigations carried out may be conducted at hatcheries identified in Section B.

**Project Description:** Provides funding for investigations into rearing and culture of BONY. The species is a rare fish for which only limited life history data exist, and data that exist are mostly for adults, not young life stages such as those being reared in hatcheries. The goal is to investigate ways to accelerate growth of BONY through manipulation of physical, chemical, and biological attributes of the rearing environment (e.g., manipulate feed, fish density, water temperature, water hardness, turbidity, lighting, presence/absence of cover). Current hatchery practices rear 250-300 mm TL fish in roughly three to four years. However, BONY over 150 mm TL are generally sexually mature and oftentimes spawn in rearing ponds, increasing the number of mouths to feed and general biomass in the ponds. Overcrowding reduces growth and increases the risk of disease. Funds are expended over numerous small studies to fill life history gaps.

**Previous Activities:** Investigations and evaluations of current culture practices for BONY were performed through literature reviews, survey questionnaires, site visits to culture facilities, and interviews with fish culturists. A workshop was held in August

2007 for fish culturists to review survey findings and prioritize research actions. Research hypotheses were formulated for study designs and investigations are being carried out. Findings and results will be documented and reported. Dexter NFH developed and initiated an alternative rearing strategy to assist with BONY restoration in Lake Mohave. Hatchery staff investigated the potential for increased growth and resource conservation by rearing larval BONY within the same pond as adult brood stock, and determined the effect individual size variation has on growth within an intensive culture environment. In addition, in 2008 researchers began investigating how to improve growth performance of BONY through diet optimization, temperature, and rearing density. Arizona State University conducted a comprehensive review of available published and gray literature, compiled an annotated bibliography, and submitted a report titled, *BONY Rearing Studies: Literature Review*.

**FY09 Accomplishments:** Dexter NFH with assistance from the USGS New Mexico Cooperative Fish and Wildlife Research, the USDA ARS Hagerman Fish Culture Experiment Station, and the USFWS Bozeman FTC completed the second year of research associated with the development of a formulated species-specific diet for BONY.

A study was initiated to look at rearing BONY and RASU together; however, water quality problems caused the study to be terminated. An investigation into handling stressors in BONY at Achii Hanyo was completed and a report is available on the LCR MSCP Web site. The primary recommendation was that fish tagging should be done at temperatures below 16°C.

**FY10 Activities:** Investigations into the formulation of a species-specific diet for BONY will continue. Survival and growth of juvenile and subadult BONY will be evaluated based on the findings from the studies completed in 2009. Dexter NFH will conduct a 12-week diet/growth study in sixteen 0.10- acre outdoor ponds using the top three performing experimental diets and current densities used for grow out of BONY at Dexter NFH. The 2007 workshop for fish culturists to review survey findings and prioritize research actions will be revisited. Planning will begin for convening a second workshop on rearing and culturing BONY and RASU in 2011. Research hypotheses will be formulated for study designs. A planning process will be completed to evaluate stress measures in BONY related to transport.

**Proposed FY11 Activities:** Field testing will be implemented, and procedures evaluated to examine relationships between BONY growth and physical, chemical, and biological characteristics of their hatchery rearing environment. A workshop will be held to discuss the status of rearing endangered Colorado River fishes, including BONY and RASU.

**Pertinent Reports:** The scopes of work and completed work project reports are available upon request. *Passive Integrated Transponders in Gila elegans: Location, Retention, Stress, and Mortality*, and *BONY Rearing Studies: Literature Review* are available on the LCR MSCP Web site. A report providing a summary of research projects conducted under C10 and C11 will be completed during FY10.