

## Work Task C11: Bonytail Rearing Studies

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|----------------|-------------|--|------------------------|------------------------|------------------------|------------------------|
| \$165,000      | \$95,301    | \$95,301                               | \$165,000              | \$165,000              | \$165,000              | \$165,000              |

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**Start Date:** FY06

**Expected Duration:** FY11

**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 in order to maximize total length at release and reduce rearing time in hatchery.

**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. A workshop planned for FY07 will focus on culture needs for both RASU (C10) and BONY (C11). Also, some of the investigations to be carried out under this work task may be conducted at hatcheries identified in Section B.

**Project Description:** This is a 5-year investigation into rearing and culture of BONY to determine cost-effective techniques to rear BONY to 300 mm TL for stocking into the lower Colorado River. Bonytail exhibit many of the same culture problems shown by RASU (see C10), especially the extremely varied growth in captivity, even for fish from the same family lot. However, BONY are even rarer than RASU, and have less culture history. Diet formulation, feeding rates, best time of day to feed, effects of temperature on food conversion, effects of day length on food conversion, effects of prophylactic treatments on food conversion, and effects of handling on food conversion are just some of the fish culture variables that need investigation. Like RASU, BONY exhibit some nocturnal tendencies both as juveniles and as adults. However, unlike RASU, subadult BONY will eat large insects like crickets, bees, and grasshoppers, and adult BONY will eat other fish and possibly are cannibalistic on their own young. If this is indeed a fact, it must be taken into consideration during the culturing process. It may be necessary to rear bait fish to feed the larger BONY or develop a different diet formulation for larger fish.

The extreme variation in growth presents another problem to the fish culturist. Because this is a protected species, fish culturists do not routinely kill off the small fish following sorting and tagging operations, but instead these small fish are returned to the pond to continue growing.

After a few such operations, the small BONY in the grow-out pond may be some of the oldest fish in the pond. Since it appears that age, not size, determines sexual maturity for this species and since 2-year-old males and 3-year-old females have been shown to sexually mature, the fish begin reproducing in the pond before they reach target size for stocking. Each spawning event results in thousands more fish in the pond, and upsets the food conversion balance (more mouths to feed). The end result is that very few of the initial stock reach target size in a reasonable period of time.

This work task evaluates the current culture practices for BONY through literature reviews, survey questionnaires, site visits to culture facilities, and interviews with fish culturists. A workshop will be held among fish culturists to review survey findings and prioritize research actions. Research hypotheses will be formulated for study designs and investigations will be carried out. Findings and results will be documented and reported.

**Previous Activities:** This is a new start in FY06.

**FY06 Accomplishments:** Dexter NFH developed an alternative rearing strategy to assist with BONY restoration in Lake Mohave. They investigated the potential for increased growth and resource conservation by rearing larval BONY within the same pond as adult broodstock, and determined the effect individual size variation has on growth within an intensive culture environment. Dexter staff spawned adult BONY and prepared ponds for fry production, and released 90 female BONY from broodstock in three ponds and stocked six ponds with 4,000 BONY fry. The ponds were sampled monthly and weight and length data were collected. The ponds were then harvested and total weight, survival, and length/weight data were collected. The female BONY were separated from the larvae and returned to the broodstock. Data were analyzed for growth indices, survival, size, and variation.

Arizona State University conducted a comprehensive review of available published and gray literature and compiled an annotated bibliography. Site visits were made to the following facilities, which are rearing BONY for release into the Colorado River Basin:

- Achii Hanyo – Located on CRIT Tribal land near Parker, AZ; operated by USFWS.
- Dexter NFH – Located near Roswell, NM; operated by USFWS.
- Willow Beach NFH – Located on Colorado River in Arizona, below Hoover Dam; operated by USFWS.
- John W. Mumma Native Aquatic Restoration Facility – Located in Colorado and operated by Colorado Division of Wildlife.
- Wahweap SFH – Located in Utah and operated by Utah Division of Wildlife.

Hatchery personnel were interviewed on their knowledge of facility characteristics and standard practices. Data from the literature review and site visits were collated and interpreted to determine if specific factors could be identified that contribute to rapid BONY growth and high survival. Investigations into handling stressors in BONY were initiated at Achii Hanyo.

**FY07 Activities:** Dexter NFH will continue the investigation into multi-year-class production. Staff will prepare four ponds for production fish. The BONY brood stock will be split between two ponds with a 1:1 ratio of male to female, and five pairs of fish will be held back from each pond to induce spawning. The larval BONY will be combined and each of the four ponds will be stocked with 5,000 larval BONY. The ponds will be monitored daily for water quality and sampled monthly for length and weight gain. The ponds will then be harvested and the brood stock combined into one pond. The larval BONY will be placed into a raceway for a final growth assessment. Data will be compiled and an annual report will be written.

Also, a workshop will be convened during summer 2007 at which knowledgeable hatchery personnel and other qualified and interested professionals can exchange information on hatchery rearing of BONY and RASU (C10). The purpose of the workshop is to review final reports and survey findings, prioritize research needs, obtain expert advice on how to optimize hatchery production of BONY and RASU, and produce preliminary designs and a planning process for field and laboratory experiments to test hypotheses.

**Proposed FY08 Activities:** The planning process will be completed, field testing implemented, and procedures evaluated to examine relationships between BONY growth and physical, chemical, and biological characteristics of their hatchery rearing environment.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.