

Work Task C40: Genetic and Demographic Studies to Guide Conservation Management of RASU and BONY in Off-Channel Habitats

FY13 Estimate	FY13 Actual Obligations	Cumulative Expenditures Through FY13	FY14 Approved Estimate	FY15 Proposed Estimate	FY16 Proposed Estimate	FY17 Proposed Estimate
\$180,000	\$221,864.02	\$360,294.88	\$180,000	\$190,000	\$200,000	\$200,000

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Start Date: FY10

Expected Duration: FY18

Long-term Goal: Effective fishery management of backwater habitats developed by the LCR MSCP.

Conservation Measures: RASU2, RASU6, BONY2, BONY5.

Location: Reaches 2, 3, 4, and 5 backwater habitats.

Purpose: Quantify genetic and demographic parameters that are necessary for informed, long-term management of RASU and BONY in off-channel habitats.

Connections with Other Work Tasks (past and future): This work is related to Imperial Ponds Native Fish Research (C25), RASU Genetic Diversity Assessment (C31), Characterization of Lake Mohave Backwaters to Evaluate Factors Influencing Spawning Success (C56), Lake-Side Rearing Ponds (B7), and (G3) Adaptive Management Research.

Project Description: When observed on Lake Mohave and elsewhere, RASU and BONY demonstrate a group spawning behavior whereby a female will spawn with multiple partners many times over a period of a few weeks. These observations led biologists to believe that all possible genetic crosses were being made during the spawn. However, analyses of adult RASU placed into the Yuma Cove backwater in 1991 and 1992, along with analyses of the larval RASU produced each year, showed that not all of the adults contributed genetic material to the next generation. It is possible that individual adults do not spawn every year or that even if they do, they do not always contribute genetic material to the next generation. This information needs to be verified in order to model population structure within these isolated habitats over subsequent generations, and to predict at what frequency genetic material needs to be exchanged between habitats to maintain robustness of the overall RASU and BONY populations within the LCR MSCP program area.

This study will collect demographic and genetic information that will lead to recommendations to optimize long-term management of off-channel habitats for these two critically endangered fishes. Genetic data will be captured from larval, juvenile, and adult RASU and BONY from at least two replicate groups from off-channel habitats. Characterization of microsatellite and mitochondrial DNA variation will be used to assign the parentage of individual larvae to specific adults. These data can then be compared and contrasted to determine the actual number of individuals that participate in annual spawning activities, census the populations, and quantify patterns of survivorship.

There are three phases to the study: field observations, laboratory analyses of genetic materials, and modeling of population dynamics. The study will require multiple years of data collection and analyses; final recommendations are anticipated by 2018. Numbers of samples will be fewest during the first two years of the study, but estimated costs are initially high to cover purchase of specialized, analytical equipment.

This project requires stable populations for both RASU and BONY to allow for multiple years of censusing. These stable populations are currently available for RASU, and BONY will be incorporated into the study as habitats and populations of BONY become available.

Previous Activities: Tissues from reared RASU and BONY were collected under C31. RASU larvae and juveniles from lake-side ponds (B7) were also collected. Adults, larvae and juveniles have been genotyped and multiple iterations have been completed in AJ and Dandy backwaters along Lake Mohave. Collections from FY10 to FY12 were analyzed, identifying considerable variability in individual reproductive success within and especially among different lake-side ponds.

FY13 Accomplishments: AJ backwater has typically produced offspring that remained viable into the autumn, with little change in the proportion of individuals contributing to larval production across years. This year was different, the proportion of the original individuals contributing to larvae was reduced and fewer juveniles were captured this fall. Dandy backwater has often had poor larval production and growth to the juvenile stage; however, this year larvae and especially juveniles were more abundant. The proportion of the original individuals contributing to larvae was similar to previous years, lower than for AJ. This was our first year of sampling from Yuma backwater; larvae and juveniles were readily captured, with parental contributions to larvae similar to AJ.

Despite the high level of contribution of different stocked individuals to the larval pool, a small proportion of individuals seem to be contributing a relatively large number of larvae in any given year. This variation in reproductive success is not unexpected and needs to be quantified in order to effectively generate a management strategy for backwater ponds.

FY14 Activities: Sample collections and analysis similar to previous years will continue. Yuma cove backwater will require special attention during FY14 as we adjust the population in order to maintain a standing population. Continuation of AJ and Dandy

backwaters will provide replication that will allow us to assess stability of life history parameters across time, patterns that seem to be fluctuating regularly over time.

The budget increase in FY14 and beyond are to support additional ponds that will be dedicated to bonytail reproduction. This portion of the project will be new in FY14, this will allow for analysis of the variation in reproductive success for this species.

Proposed FY15 Activities: Sample collections and analysis similar to previous years will continue. This will allow for analysis of the variation in reproductive success for these species.

Pertinent Reports: Two interim reports (2011 and 2012) titled, *Genetic and demographic studies to guide conservation management of bonytail chub and razorback sucker in off-channel habitats* are posted to the LCR MSCP website and a final report is completed and will also be posted to the website. An additional report titled, *Development and characterization of microsatellite PCR primers for bonytail chub for use in assessing relatedness of fishes produced in off-channel habitats* was completed under work task G3 and will be posted to the LCR MSCP website.