

Lower Colorado River Multi-Species Conservation Program



Balancing Resource Use and Conservation

Establishing a Refuge Population of
Endangered Humpback Chub
(*Gila cypha*) at the Dexter National Fish
Hatchery and Technology Center

2011 Completion Report



January 2012

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState Local Governments Authority
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Wildlife
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
The Metropolitan Water District of Southern California

Nevada Participant Group

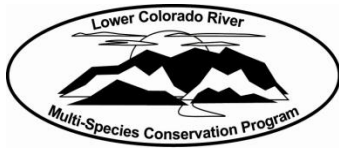
Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy



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Establishing a Refuge Population of Endangered Humpback Chub (*Gila cypha*) at the Dexter National Fish Hatchery and Technology Center

2011 Completion Report

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Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
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INTRODUCTION

The purpose of this project is to develop a captive population (refugia) for protecting and/or enhancing the wild population of humpback chub in the Grand Canyon as outlined in the Humpback Chub Recovery Plan (U.S. Fish and Wildlife Service.1990). This project employs a conservation and management action to protect the species against potential future catastrophic loss in its primary habitat in the Little Colorado River (LCR). A refuge population of humpback chub is essential to help meet future species needs due to the recent decline of the Grand Canyon population to its lowest level in over a decade. In the fall/winter of 2008, the U.S. Fish and Wildlife Service began establishing a refuge population of Grand Canyon humpback chub at the Dexter National Fish Hatchery and Technology Center (Dexter NFH& TC), Dexter, New Mexico in collaboration with the Bureau of Reclamation, USFWS Arizona Fish and Wildlife Conservation Office, and the National Park Service in fulfillment of Work Task C14, under the Fish Augmentation portion of the Lower Colorado River Multi-Species Conservation Program.

Dexter NFH&TC contains the expertise, infrastructure, security and biohazard backup systems to provide appropriate care for the fish and reduce risk of loss. The genetic refuge and captive propagation program being developed and implemented at the facility, follows guidelines outlined in the September 5, 2008 USFWS “Genetic Management Plan for Captive and Translocated Endangered Humpback Chub in the Lower Colorado River Basin”. The plan includes a broodstock management strategy for the Grand Canyon population.

This project is conducted under the authority of the Endangered Species Act. The US Fish & Wildlife Service’s “Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act” (65 FR 56916) addresses the housing of refuge populations, as well as captive propagation activities. All of the safeguards recommended in said policy are followed, with the ultimate goal being to protect the genetic integrity of wild humpback chub.

REPORTING PERIOD: January 01, 2011 through December 31, 2011

PROJECT DURATION March 30, 2012

PROJECT OBJECTIVES

Establish and maintain a humpback chub refuge stock from fish collected from the LCR. Maintain the stock in a secure environment and protect against catastrophic loss in the wild or captivity and ensure the stock is available for propagation to augment the wild population if the need arises.

- (1) Develop, maintain and staff facilities at Dexter NFH&TC necessary to implement refuge stock requirements identified in the “Genetic Management Plan for Captive and Translocated Endangered Humpback Chub in the Lower Colorado River Basin” (USFWS September 5, 2008).
- (2) Establish a 500 to 1000 adult fish refuge stock from fish collected from the LCR (2008-2012).
- (3) Transfer (38-99YC) adult humpback chub from Willow Beach NFH to Dexter NFH&TC.
- (4) Evaluate and refine fish culture, marking and transport methodologies for wild caught humpback chub.
- (5) Complete acute toxicity tests on humpback chub larvae and juveniles (90-160 mm) to determine median lethal concentration (LC50) of potassium chloride.

STUDY AREA

All fish culture and maintenance activities were completed at the USFWS, Dexter NFH & TC located in the Pecos River Valley of southeastern New Mexico which is approximately 200 miles southeast of Albuquerque, 20 miles south of Roswell, and one mile east of Dexter on State Road 190. This project utilizes as many as eleven 3’ diameter fiberglass tanks and associated systems in the newly built Isolation/Quarantine building and two 10’ rectangular fiberglass tanks in the Fish Culture building. Once the fish reach the target size of 125-150mm in total length they are tagged with a passive integrated transponder (PIT) tag and maintained in one 40’ outdoor raceway and two .10-.25 surface acre outdoor lined ponds.

METHODS

Project partners collect 300+ (50 – 120 mm total length (TL)) humpback chub from the LCR, Grand Canyon in late-July/August or October. The age-0 fish are collected in the lower 3 km of the river, upstream from the confluence with the mainstem Colorado River on Navajo Nation lands. Following collection, the fish are transported to the Dexter NFH&TC by truck for quarantine and eventual incorporation into the refuge stock. All fish are handled with the best animal husbandry practices available. Transport follows guidelines described in the USFWS Protocols for Biological Investigations developed by Dr. Gary Carmichael, retired U.S. Fish & Wildlife Service employee. Upon arrival Dexter staff provides on-site monitoring for the species. The fish are counted and placed in 3’ diameter fiberglass tanks for disease treatment and quarantine for up to 6 months. Nylon tank covers are placed on all tanks to stop fish from jumping out. Aeration and oxygen are supplied to the tank to ensure that oxygen levels are

maintained at ≥ 6 ppm. The fish are treated twice with Praziquantel at 2 ppm for 24 hours static bath to control and remove cestodes. Dexter staff also administered 1 hour salt baths (uniodized), followed by static bath treatments of formalin at 125-150 ppm to control external bacteria, parasites and aquatic invasive species. These procedures continue for several weeks depending on the life cycle of the parasite being treated. A daily log recording water quality, temperature, treatments and comments on fish health is maintained.

Following completion of the quarantine period and two weeks prior to being moved to outdoor raceways, each fish is marked with a (PIT) tag and a tissue sample collected for future genetic identification and differentiation from natural recruitment that may occur in the rearing units. Staff monitor water quality (DO, pH, conductivity, and temperature) daily using a Yellow Springs Instruments (YSI) meter and record all water quality parameters, observations and mortalities daily. Fish are fed a combination of live, frozen and formulated feeds.

PROJECT RESULTS

On October 12-13, 2008 Dexter NFH&TC began the development of a humpback chub refuge population in collaboration with Bureau of Reclamation, National Park Service, and U.S. Fish and Wildlife Service partners. In 2009 Dexter staff developed PIT tagging protocols for the species and completed the draft USFWS “Genetic Management Plan for Captive and Translocated Endangered Humpback Chub in the Lower Colorado River Basin”. In 2011, Dexter successfully completed year 4 of a 5 year captive propagation program to develop the refuge population. The Dexter refuge stock currently contains 857 fish (Table 1). In addition to the refuge population, the facility is maintaining humpback chub adults and F1’s received from Willow Beach NFH, Willow Beach, AZ on January 15, 2009, (Table 2). These fish were part of a collection of wild age-0 humpback chub taken from the LCR in July 1999 to conduct temperature /growth studies. They were captured near Salt Camp which is approximately 10 km upstream of the confluence with the Colorado River and transported to the Willow Beach NFH. This group of fish is being held separate from the refuge stock until genetic screening and genotyping of all individuals is conducted in 2012 and Dexter staff determines if they should be added to the refuge stock. Survival for this group of fish over a two year period at Dexter is 81%.

Table 1. Composition of humpback chub refuge stock at Dexter NFH&TC, Dexter, NM.

Collection Date	Number	Age class
July- October 2008	277	3
July- October 2009	205	2
July 2010	175	1
November 2011	200	<1
Total	857	

Table 2. Survival of humpback chub adults received from Willow Beach NFH.

Fish Lot	Number received 01-15-2009	Number on hand 12-31-2011	% survival over 2 year period
99 Year Class Adults	38	27	71
F1's	37	34	92
Total	75	61	81

No additional HBC were brought on or taken off station during the months of July - October 2011. This action was primarily due to Dexter's *suspect* LMBV disease classification which limited stockings and fish receipts for the year. On October 31, Dexter's annual fish health inspection was completed using enhanced testing protocols agreed to by the USFWS and state of California. No pathogens of concern were detected. In addition to the October annual inspection, fish lots were tested in Nov 2010 (all fish), and April 2011 (all fish, brood fish via ovarian and seminal fluids and larval fish), using the enhanced protocols. The enhanced testing protocols increased the number of viral detection tests and number of fish tested. A total of 1,660 fish from 15 species were sacrificed for testing. The official report was provided to all partnering state and federal fish pathologists. Dexter is currently on track to regain its Class A (Pathogen Free) disease classification in October of 2012.

2011 ACCOMPLISHMENTS

Fish Culture

On November 8, 2011, Dexter received a total of 523 wild caught humpback chub; ~200 to augment the Dexter refuge stock and 300 for translocation into Havasu Creek in spring 2012. In addition to the chub, 32 fish representing 5 different species were provided for use as surrogates for fish health testing. All the fish were captured in the Little Colorado River, Navajo County, near the "New Coyote" Reach of the LCR (435002mE, 4005232mN), however due to highly turbid conditions, crews worked approximately 1 mile downstream of this location as well as extended upstream to just past "Salt" camp (436172mE, 4004702mN) so that capture targets could be met. Most fish were captured via seining as the turbid conditions made hoopnets ineffective as the primary capture gear.

Upon arrival at Dexter the fish were placed in quarantine following a slow water exchange to acclimate them to Dexter's water quality and water temperature. The fish averaged .65 grams each and 39.1mm in length. The fish were counted into four, 3' circular round tanks containing a 0.5% salt and 10ppm oxytetracycline solution. The fish are currently receiving scheduled treatments for internal and external parasites and bacteria. Three mortalities were collected upon arrival at Dexter and five additional mortalities have been collected during the quarantine period.

Research

On September 26, tissue samples were collected for genetic analysis from the 2008, 2009 and 2010 year class refuge fish and the adults and F1's received from Willow Beach NFH in 2009. Genotyping has been completed on 657 humpback chub that make up the captive stock. Dexter staff also completed the QA/QC genotyping on 10% of these samples to ensure genotyping accuracy. The additional 61 samples representing the fish from Willow Beach NFH have not been genotyped. A total of 19 microsatellite markers were used for the initial analysis and data interpretation and statistical analysis will be completed in 2012.

The acute toxicity of potassium chloride (KCl) to two life stages of humpback chub (7-day post-hatch larvae and 50 and 100 mm juvenile) were conducted in 2011. The level of KCl toxicity was determined by 24-, 48-, 72-, and 96-hour LC₅₀ static tests, which measure the concentration of a chemical that produces 50% mortality in the test population within the specified time frame. Groups of 10 humpback chub were exposed to five and seven concentrations of KCl and a control treatment. Larval fish were tested at KCl concentrations of 140, 235, 390, 650, 1080, 1800, and 3000 mg/L. Juvenile fish (50 mm) were tested at concentrations of 960, 1370, 1960, 2800, and 4000 mg/L; and 100 mm size fish were tested at concentrations of 700, 950, 1260, 1690, 2250, 3000, and 4000 mg/L. The results for the humpback chub acute toxicity tests are as follows:

Size of Fish	LC ₅₀ in mg/L Potassium Chloride			
	24 hour	48 hour	72 hour	96 hour
Larval	1993	1166	1001	904
50 mm	2260	1698	1638	1525
100 mm	3464	2873	2635	2598

In addition to the LC₅₀ studies, four pairs of humpback chub adults were spawned in late April and 2,400 newly hatched larvae provided to the USGS, Grand Canyon Monitoring and Research Center in Flagstaff, AZ for research studies to evaluate effects of turbidity and temperature on predation vulnerability by rainbow and brown trout.

DISCUSSION

Year 2011 marked the third year of a three year agreement and fourth year of a 5 year program to develop and establish a humpback chub refuge population at Dexter NFH &TC. The refuge stock was inventoried in December, 2011 and is comprised of 857 individuals from four year classes. Since 2008, Dexter has successfully transported, cultured and PIT tagged HBC collected from the LCR using modified warm water fish culture and handling techniques. The gauge used to determine the success of the program is the % survival at each critical control point. HBC have been transported from the LCR to Dexter and vice versa for translocation activities a total of 6 times. Each trip logged over 600 miles (> 10 hours transport time) by truck and a 45 minute helicopter flight in or out of the LCR in ice chests. Survival rates during transport to and from Dexter have ranged from 98 -100%. Survival rates following receipt of the fish at Dexter vary

with cohort and range from 98 to 99 % during the quarantine period and 97.7% to 99.6% over a three year period.

Indoor and outdoor facilities are used to maintain and culture the fish. When held indoor the fish are cultured in 18.0° to 22.5°C water and grow an average of .21mm in length per day. The minimum PIT tagging target size of 100mm in total length is achieved in six months. At the time of tagging the fish have averaged 125-128mm in total length and 15.3-18.61 grams each. PIT tags are injected intraperitoneal and tag retention has ranged from 98 to 100% with 100% survival.

PROPOSED SCHEDULE

Funds for this project will be expended by March of 2012. Prior to that timeframe management will have to decide on whether to continue developing and holding the refuge stock. Currently, Dexter does not have sufficient base funding to hold the stock indefinitely. To-date the refuge stock consists of 857 fish from the 2008, 2009, 2010 and 2011 year classes. The program is well on track to completing the 1,000 fish refuge stock by the fall of 2012. A tentative date of October, 2012 has been scheduled to receive the final shipment of LCR wild caught young of year humpback chub.

DEXTER NATIONAL FISH HATCHERY & TECHNOLOGY CENTER BUDGET:

Project Charges

17% Admin Overhead	\$11,324.72
O&M Labor Costs	\$20,091.54
Materials and Supplies	\$ 3,645.61
Fish Health	\$ 5,800.00
Feed	\$ 5,697.71
Utilities & Equipment Maintenance	\$ 2,170.42
Travel	\$ 386.00
Total Expended as of 12-2011	\$49,116.00

Projected Charges

O&M Labor Costs	\$10,000.00
Materials and Supplies	\$ 2,000.00
Utilities & Equipment Maintenance	\$ 4,500.00
Travel	\$ 1,000.00
Total Projected Costs	\$17,500.00
Total Project Funds for 2011	\$66,616.00

LITERATURE CITED

U.S. Fish and Wildlife Service. 1990. Humpback chub (*Gila cypha*) Recovery Plan:
U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.