

I. Project Title: **Population estimate of humpback chub in Westwater Canyon, Colorado River, Utah.**

II. Principal Investigator:

Darek Elverud
Utah Division of Wildlife Resources
Moab Field Station
1165 South HWY 191 - Suite 4
Moab, UT 84532
435-259-3782/(fax) 435-259-3785
darekelverud@utah.gov

III. Project Summary:

Westwater Canyon on the Colorado River contains one of the five remaining populations of the endangered humpback chub in the Upper Colorado River Basin. Recovery goals identified by the RIP require maintaining several populations of humpback chub within the Upper Colorado River Basin. Monitoring efforts are essential to evaluate the population of humpback chubs in Westwater Canyon and meet the recovery goals. In 2007, trammel netting and electrofishing were used to capture and PIT tag humpback chubs and roundtail chubs in Westwater Canyon. Population estimates were subsequently calculated for both species using Program Mark. Humpback chub monitoring in Westwater canyon concludes in 2008 and will begin again in 2011.

IV. Study Schedule:

- a. Initial year: 2007
- b. Final year: 2008

V. Relationship to RIPRAP:

Colorado River Action Plan: Mainstem
V.C. Estimate humpback chub populations
V.C.2. Westwater

VI. Accomplishments of FY 2007 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Three sampling trips were conducted through Westwater Canyon on September 9-16, October 1 - 8, and October 25 – November 1. Four sites were sampled during each pass: Miners Cabin (RM 123.5), Upper Cougar (RM 122.5), Little Hole (121.5), and Hades Bar (RM 120).

Mean daily flows and temperature for each pass were recorded by USGS gage #09163500 (Colorado River near Colorado-Utah State Line). Mean flow for the first pass was 3,826 cfs (3,710-3,980 cfs), and temperature ranged from 17.7-20.6 °C. Mean flow for the second pass was 4,678 cfs (4,070-4,960 cfs), and temperature ranged from 10.6-16.2 °C. Mean flow for the third pass was 4,653 cfs (4,420-4,770 cfs), and temperature ranged from 8.6-11.5 °C.

Sampling was conducted for two nights at the Miners Cabin, Upper Cougar and Little Hole sites and for one night at the Hades site during each of the three passes. Humpback chub and roundtail chub were sampled using trammel nets and electrofishing. Trammel nets were set in the afternoon each day, checked approximately every two hours, and pulled around midnight. The nets were reset the next morning prior to dawn, checked approximately every two hours and pulled mid-morning. Seven to eight trammel nets were set per site depending upon habitat availability and speed at which fish could be removed from the nets. Electrofishing was conducted prior to nets being set in the afternoon and subsequent to trammel nets being pulled in mid-morning. Chubs were identified to species when possible, scanned for a PIT tag, PIT tagged (if necessary), measured (total length and standard length; mm), weighed (g), principle dorsal and anal fin rays counted and released.

Sampling efforts in 2007 results include 285 adult humpback chub captures, 884 adult roundtail chub captures, and five adult bonytail. Five subadult humpback chubs, 78 subadult roundtail chubs and 49 subadult *Gila spp.* with intermediate characteristics were also collected. Fish identified simply as *Gila* were either too small to reliably identify in the field or displayed characteristics of both species. Average total length of humpback chub caught via trammel nets was 278.8 mm with a range of 212-375 mm. Average total length of humpback chub caught via electrofishing was 258.5 with a range of 126-360. Average total length of roundtail chub caught via trammel nets was 268.2 mm with a range of 171-370 mm. Average total length of roundtail chub caught via electrofishing was 238.6 with a range of 125-370. All chub less than 171 mm TL were collected by electrofishing.

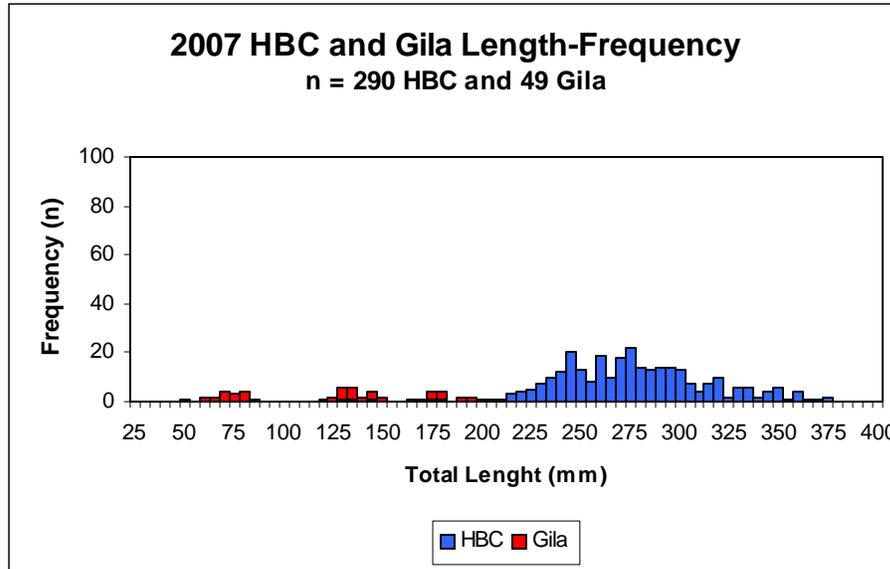


Figure 1. Length-frequency histogram for 2007 humpback chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

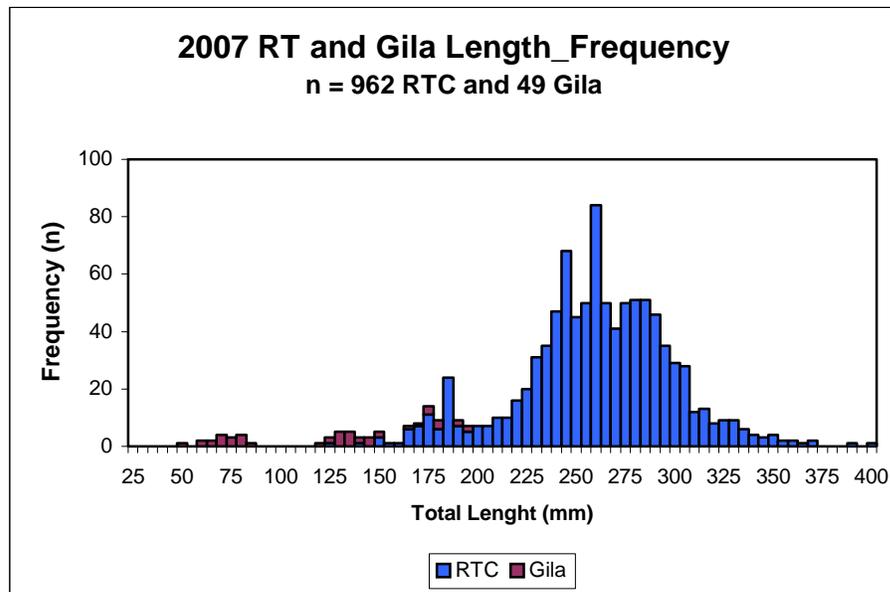


Figure 2. Length-frequency histogram for 2007 roundtail chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

Trammel netting resulted in 1,749.4 hours of effort and electrofishing was conducted for 18.4 hours total. Four hundred two chubs were collected electrofishing, and eight hundred ninety nine chubs were captured via trammel netting. Electrofishing proved particularly effective at collecting subadult fish as all but one chub < 212 mm total length was collect by electrofishing.

Catch per unit effort (CPUE) is presented for each species by sampling approach (Table 1). Trammel net CPUE values for 2007 are similar to those recorded in 2003, 2004 and 2005. Electrofishing CPUE from 2007 is similar to rates from 2005 and about half of what was observed in 2003 and 2004. The electrofishing catch rates for 2003 and 2004 were some of the highest ever recorded by the Utah Division of Wildlife Resources since monitoring began in Westwater Canyon for humpback and roundtail chub.

Table 1. Catch per unit effort (CPUE) for humpback chub, roundtail chub and *Gila* by sampling approach for Westwater Canyon in 2003-2005 and 2007.

2003	<i>Trammel Nets</i>	<i>Electrofishing</i>	2005	<i>Trammel Nets</i>	<i>Electrofishing</i>
<i>Humpback Chub</i>	0.168	8.824	<i>Humpback Chub</i>	0.176	3.322
<i>Roundtail Chub</i>	0.468	34.804	<i>Roundtail Chub</i>	0.379	15.813
<i>Gila</i>	0.004	40.196	<i>Gila</i>	0.020	8.205
2004	<i>Trammel Nets</i>	<i>Electrofishing</i>	2007	<i>Trammel Nets</i>	<i>Electrofishing</i>
<i>Humpback Chub</i>	0.164	7.901	<i>Humpback Chub</i>	0.134	3.046
<i>Roundtail Chub</i>	0.496	27.901	<i>Roundtail Chub</i>	0.380	16.156
<i>Gila</i>	0.013	9.382	<i>Gila</i>	0.000	2.666

The number of long-term recaptures of humpback chub and roundtail chub in 2007 were higher than any figures observed since 1998 and were approximately two times greater than figures from 2005 (Table 2). Within-year recaptures during 2007 for humpback chub were similar to 2005 but are approximately double those from 1998 to 2004. Roundtail chub within-in year recaptures were approximately double the figures from 2004 and 2005 and are about four time the values from 1998-2003.

Table 2. Adult humpback chub and roundtail chub captures, long-term recaptures, and within-year recaptures for Westwater Canyon 1998-2000 and 2003-2005.

<i>Year</i>	<i>HBC</i>	<i>Long-term Recaps</i>	<i>Within-year Recaps</i>	<i>RTC</i>	<i>Long-term Recaps</i>	<i>Within-year Recaps</i>
1998	488	54	14	389	42	9
1999	281	65	10	486	70	13
2000	279	76	6	527	73	18
2003	298	50	12	636	43	9
2004	290	41	11	817	48	56
2005	292	38	24	763	40	44
2007	290	86	26	962	114	89

A mark/recapture population estimate was calculated for both humpback chub (Table 3) and roundtail chub (Table 4) in 2007. Chub captures from both electrofishing and trammel netting were used in the population estimate. Population estimates for both humpback chubs and roundtail chubs were slightly higher than the population estimates in 2005, but are still within the profile likelihood interval. The time dependant model was used as p-hat varied between sampling trips. The time dependant model was also used from 2003 to 2005.

Year	Model	N	SE	PLI	CV	p-hat
1998	M ₀	4,744	1,089	3,760-14,665	0.23	0.035
1999	M ₀	2,215	625	1,608-7,508	0.28	0.041
2000	M ₀	2,201	626	1,335-4,124	0.28	0.041
2003	M _t	2,973	941	1,710-6,042	0.31	0.03, 0.05, 0.02
2004	M _t	1,729	424	1,121-21,967	0.24	0.10, 0.03, 0.04
2005	M _t	1,210	213	880-1,769	0.17	0.06, 0.10, 0.10
2007	M _t	1,757	470	1,097-3,173	0.27	0.08, 0.05, 0.02

Table 3. Population estimate (N) for adult humpback chub (>200 mm) in Westwater Canyon. Standard error (SE), profile likelihood interval (PLI), coefficient of variation (CV), and probability of capture (p-hat) are included for each estimate.

Year	Model	N	SE	PLI	CV	p-hat
1998	M _o	5,005	1,500	3,586-19,781	0.3	0.026
1999	M _o	4,234	973	3,349-12,917	0.23	0.037
2000	M _o	4,971	1,249	3,824-16,641	0.25	0.31
2003	M _t	3,288	507	2,458-4,469	0.15	
2004	M _t	3,867	444	3,124-4,912	0.11	0.09, 0.05, 0.08
2005	M _t	4,317	565	3,390-5,673	0.11	0.05, 0.06, 0.07
2007	M _t	5,696	863	4,310-7,828	0.15	0.05, 0.04, 0.06

Table 4. Population estimate (N) for adult roundtail chub (>200 mm) in Westwater Canyon. Standard error (SE), profile likelihood interval (PLI), coefficient of variation (CV), and probability of capture (p-hat) are included for each estimate.

VII. Recommendations

1. Electrofishing should be conducted during every pass to collect subadult chub.
2. Electrofishing should be conducted in the afternoon before nets are set.
3. Electrofishing should be conducted during times when the river is too debris laden for trammel netting.

VIII. Project Status:

First year of two-year project completed. Project is on track and ongoing. No changes in objective, deadlines, predicted funding, project direction or probability of success are foreseen.

IX. FY07 Budget:

A. Funds budgeted:	\$ 78,286
B. Funds expended/obligated:	\$ 62,629
C. Difference:	\$ 15,657
D. Percent FY2005 work completed:	80%
E. Recovery Program funds spent for publication charges:	\$ 0

X. Status of data submission:

Data will be transferred to USFWS by December 15, 2007.

XI. Signed: Darek Elverud Date: 11/06/2007