

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 2008, 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 concluded in 2008 and will resume 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 2008 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

In 2008, three sampling trips were conducted through Westwater Canyon: September 5 - 12, September 23 - 30, and October 7 - 15. 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). A fifth site, Big Hole (RM 116), was also sampled during the third trip. The Big Hole site was sampled to determine if any humpback chub had begun inhabiting the area. *Gila* species captures at the Big Hole site consisted of only two roundtail chubs and two bonytail. No humpback chubs were captured at the Big Hole sampling site. As the Big Hole site was only sampled on one occasion, data from the Big Hole site was not included in the analysis. The two bonytail captured at the Big Hole sampling site were likely recently stocked.

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 4,758 cfs (4,610 - 5,050 cfs), and temperature ranged from 15.6 - 19.4 °C. Mean flow for the second pass was 4,723 cfs (4,580 - 4,910 cfs), and temperature ranged from 15.2 - 18.1 °C. Mean flow for the third pass was 4,617 cfs (4,540 - 4,790 cfs), and temperature ranged from 8.9 - 14.5 °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. Big Hole was sampled for one night during the third pass. 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 2008 results include 358 adult humpback chub captures, 1050 adult roundtail chub captures, and two adult bonytail. Seven subadult humpback chubs, 28 subadult roundtail chubs and 110 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 280.5 mm with a range of 198-385 mm. Average total length of humpback chub caught via electrofishing was 267.8 with a range of 149-383. Average total length of roundtail chub caught via trammel nets was 263.8 mm with a range of 197-380 mm. Average total length of roundtail chub caught via electrofishing was 246.8 with a range of 148-347. All chub less than 197 mm TL were collected by electrofishing.

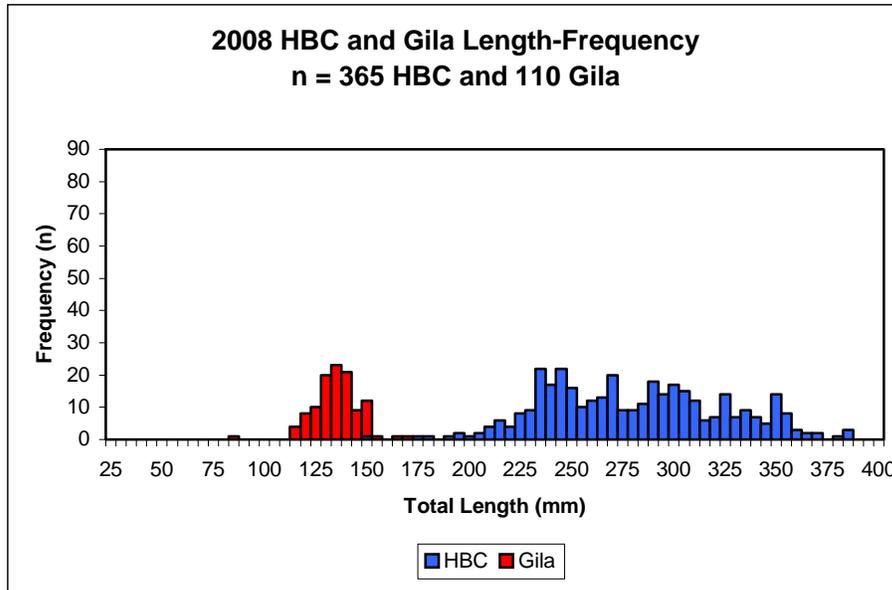


Figure 1. Length-frequency histogram for 2008 humpback chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

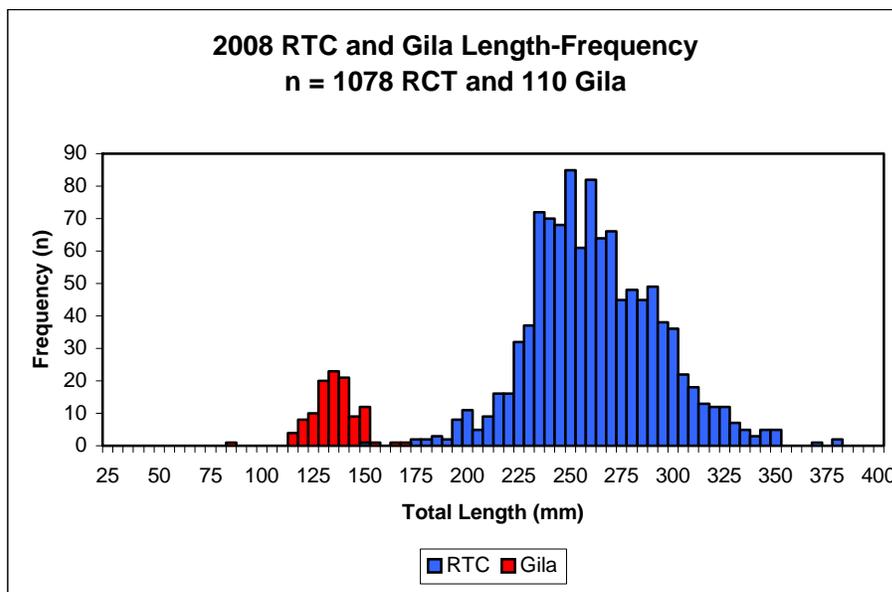


Figure 2. Length-frequency histogram for 2008 roundtail chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

Trammel netting resulted in 1615.7 hours of effort and electrofishing was conducted for 16.0 hours total. Three hundred seventeen chubs were collected electrofishing, and one thousand thirty six chubs were captured via trammel netting. Electrofishing proved particularly effective at collecting subadult fish as all but two chub < 200 mm total length were collected by electrofishing.

Catch per unit effort (CPUE) is presented for each species by sampling approach (Table 1). Trammel net CPUE values for both humpback and roundtail chub in 2008 are higher than values observed in 2003, 2004, 2005 and 2007.

Electrofishing CPUE of humpback and roundtail chubs from 2008 is lower than values from previous years. The electrofishing CPUE of chubs classified as *Gila* was higher in 2008 than it was in 2007, but it is still lower than observed rates from years prior to 2007. 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 2007-2008.

Year	Humpback Chub		Roundtail Chub		<i>Gila</i> spp.	
	Trammel Net CPUE	Electro-fishing CPUE	Trammel Net CPUE	Electro-fishing CPUE	Trammel Net CPUE	Electro-fishing CPUE
2003	0.168	8.824	0.468	34.804	0.004	40.196
2004	0.164	7.901	0.496	27.901	0.013	9.382
2005	0.176	3.322	0.379	15.813	0.020	8.205
2007	0.134	3.046	0.380	16.156	0.000	2.666
2008	0.199	2.065	0.541	11.140	0.000	6.822

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 2008 for humpback chub were similar to 2005 and 2007 but are approximately double those from 1998 to 2004. Roundtail chub within year recaptures in 2008 were higher than values prior to 2005 and are about four times 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, 2003-2005 and 2007-2008.

Year	HBC	Long-term Recaps	Within-year Recaps	RTC	Long-term Recaps	Within-year Recaps
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	285	86	26	962	114	89
2008	358	113	26	1051	166	75

A mark/recapture population estimate was calculated for both humpback chub (Table 3) and roundtail chub (Table 4) in 2008. 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 lower than the population estimates in 2007, 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.

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	Estimate	SE	PLI	CV	p-hat
1998	Mo	5,005	1,500	3,586 -19,781	0.3	0.026
1999	Mo	4,234	973	3,349 -12,917	0.23	0.037
2000	Mo	4,971	1,249	3,824 -16,641	0.25	0.31
2003	Mt	3,288	507	2,458 - 4,469	0.15	
2004	Mt	3,867	444	3,124 - 4,912	0.11	0.09, 0.05, 0.08
2005	Mt	4,317	565	3,390 - 5,673	0.11	0.05, 0.06, 0.07
2007	Mt	5,696	863	4,310 - 7,828	0.15	0.05, 0.04, 0.06
2008	Mt	3,940	397	3,266 - 4,851	0.10	0.07, 0.08, 0.10

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.

Year	Model	Estimate	SE	PLI	CV	p-hat
1998	Mo	4,744	1,089	3,760 -14,665	0.23	0.035
1999	Mo	2,215	625	1,608 - 7,508	0.28	0.041
2000	Mo	2,201	626	1,335 - 4,124	0.28	0.041
2003	Mt	2,973	941	1,710 - 6,042	0.31	0.03, 0.05, 0.02
2004	Mt	1,729	424	1,121 - 2,967	0.24	0.10, 0.03, 0.04
2005	Mt	1,210	213	880 - 1,769	0.17	0.06, 0.10, 0.10
2007	Mt	1,757	470	1,097 - 3,173	0.27	0.08, 0.05, 0.02
2008	Mt	1,315	223	969 - 1896	0.17	0.11, 0.08, 0.06

VII. Recommendations

1. Electrofishing should be conducted during every pass to collect subadult chub.
2. Electrofishing should be conducted during times when the river is too debris laden for trammel netting.
3. Continue occasion sampling at Big Hole to determine if humpback chub begin using the area.

VIII. Project Status:

Second 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. FY08 Budget:

A. Funds budgeted:	\$ 77,514
B. Funds expended/obligated:	\$ 62,011
C. Difference:	\$ 15,503
D. Percent FY2008 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, 2008.

XI. Signed: *Derek Elverud* Date: 11/14/2008