

- I. Project Title: Humpback chub population estimates for Desolation/Gray Canyons, Green River Utah.
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III. Project Summary:

Humpback chub population trends were monitored annually through the Interagency Standardized Program from 1991-1999. In 2002, an amended recovery plan for humpback chub identified measurable recovery objectives and criteria for the downlisting and delisting of humpback chub. To meet this recovery criteria, annual point population estimates for the humpback chub in Desolation and Gray canyons (Deso/Gray) were calculated using 3 pass mark-recapture methods beginning in 2001. Each year, twelve sites were sampled by mark-recapture methods, and data from these sites were combined to develop one annual population estimate. During the first two years of point estimates, sampling occurred during June and July when humpbacks were more active, thus increasing the probability of mixing between sites. However, due to fish mortality and stress concerns, sampling was moved to September and October. The mark-recapture sampling was also conducted in 2006 and 2007. As a result of these surveys, it was observed that fidelity for humpback chub ranges from 90–100% within Deso/Gray.

Site fidelity can influence the accuracy of a population estimate. High site fidelity means minimal mixing between sites within a sampling period, and therefore individual sites are not representative of the entire reach. This results in significant underestimation of the total population size in Deso/Gray. Instead, it is possible to calculate a population estimate at the individual site level and then extrapolate a population estimate for the reach.

Each site should be defined by the characteristics of a fall/winter habitat and not a linear distance. In general, fall/winter habitats are comprised of an upstream rapid entering into a deep pool, a series of eddies, and a downstream pool tail or run. The downstream end of a habitat is typically defined by another rapid or an extended low velocity run of 5–7 miles. Fall sampling has revealed that most fish are located in the initial pool and catch rates dwindle quickly downstream thereafter. Currently, the number of possible fall/winter habitats within the 75 miles of Deso/Gray supporting humpback chubs is estimated to be 63. An accurate accounting of the number of habitats still needs to be

developed.

IV. Study Schedule: Initial year 2010 – Final year 2011

V. Relationship to RIPRAP:

*Green River Action Plan: Mainstem*

*V.B.1. Conduct population estimates for humpback chub in Desolation/Gray Canyons.*

VI. Accomplishment of FY 2010 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1 – Complete three sampling trips in Deso/Gray from August-September: Three sampling passes were completed through Deso/Gray on September 3–9, September 22–28, and October 7–13. A total of 5 sites were sampled throughout Deso/Gray including the four long-term trend sites and one site previously sampled for 2001-7 population estimates, these were located at river mile (RM) 185, 174.4, 160.4, 145.7 and 167 respectively. It is estimated that there are a total of 63 sites in Deso/Gray having comparable qualities and a high probability of maintaining humpbacks through the fall and winter. The total number of RM sampled was 1.25 which represents 1.7% of the 75 river miles in which humpbacks have typically been found (RM 207-122). Mean daily flows during sampling ranged from 2,270–3,040 cfs (USGS gage #09315000, Green River at Green River gage). Average temperatures during each pass were 17.8°C, 16.4°C and 14.3°C, respectively (temperatures taken in the field).

Sampling occurred for a total of 1,163.5 trammel net hours and 7 hours of electrofishing over three passes (Table 1). Overall sampling efforts resulted in 69 adult and 4 juvenile humpback captures. The trammel net catch per unit effort (CPUE) for each site and pass averaged 0.057 humpbacks/hr and ranged from 0.015 to 0.102 humpbacks/hr. The mean trammel netting CPUE for 2010 was significantly lower than the 1985-2010 mean of 0.110 fish/hr ( $p < 0.05$ ; Figure 1). It should be noted that during 2009, one site was sampled in September for relocation of humpbacks, the resulting CPUE at that site was 0.170 fish/hr, which is the third highest catch rate observed in Deso/Gray.

Because of the distance between sample sites and the observed high site fidelity in fall months, population estimates were calculated for each individual site. If recaptures were insufficient for an estimate, the number of individual humpbacks is presented. For all sample sites three passes were completed. Due to low recapture rates, estimating the variation in probability of capture between passes was not possible and resulted in the use of the null estimator ( $M_0$ ) for all sites.

The adult humpback chub population estimate for the site at Cedar Ridge (RM 185) is 28 ( $\hat{p}=0.167$ , C.V.=52.4%, 95% C.I. 16-86). The estimate for Log Cabin (RM 174.5) is 37 ( $\hat{p}=0.144$ , C.V.=55.2%, 95% C.I. 18-189). The estimate for Chandler Falls (RM 167) is 41 ( $\hat{p}=0.098$ , C.V.=82.0%, 95% C.I. 17-186). At Cow Swim rapid (RM 167) 8

individuals were captured with no recaptures. The estimate for Coal Creek (RM 146) is 15 ( $\hat{p}=0.282$ , C.V.=36.0%, 95% C.I. 12-37).

To extrapolate these estimates across all probable sites within Deso/Gray, the mean estimate per site (25.8) is multiplied over the 63 available sites, resulting in a total estimate of 1,625.4 (variance for this has not yet been calculated). Extrapolation relative to river miles is possible as well, by summing the estimates (129) dividing by the total miles sampled (1.25) and then multiplying by the total miles of observed humpback habitat (75); the result is an estimate of 7,740 humpbacks within Deso/Gray/Desolation/Gray Canyons. The later estimate assumes an even distribution throughout the canyons and ignores the typical pattern of chub congregations just below rapids within large eddies and pools; thus, it likely produces a significant overestimate of the population.

Observed site fidelity by humpback chub during the fall months was 100%. All within year and between year recaptures occurred in their site of original capture; this includes one individual initially marked in 2003 at Cedar Ridge who measured 285 mm originally and was recaptured at the same location this year measuring 279 mm. Although this individual gained no overall length, it did increase in mass by 64%. In addition to the recapture from 2003, fourteen humpbacks marked in 2006-7 were recaptured in their site of initial marking.

The length-frequencies of *Gila* spp. captured in 2010 revealed a similar pattern to that observed in past years (Fig. 2). Juveniles ranging between 110-117 mm were captured via electrofishing and older adults over 350 mm continue to be present. The absence of juveniles in the trammel nets precludes estimating their relative abundance; however, first year adults (200-220 mm) represented 7.3% of the adult captures.

Task 2 – Data will be entered into a database on the computer and transferred to the UCRRP database manager by January 15 each year. Data entry is complete and will be transferred to the UCRRP database manager by the end of December 2010.

Task 3 –An annual progress report submitted Nov 15, 2010. Completed.

Task 4 – Complete a collection trip for young-of-year *Gila* and transport fish to Ouray National Fish Hatchery. This task will be complete with assistance from hatchery personnel. Twenty-five humpback chub were captured during a separate trip in October of 2009. Fish health was maintained during transport by boats equipped with live-wells utilizing an oxygen supply and a re-circulating pump system. Fish were then be transported to a hatchery truck and acclimated to water temperature and conditions and tempered with salt. A hatchery truck then transported fish to the Ouray National Fish Hatchery.

In 2010, sampling was conducted at the same site where salvage collections occurred in 2009 but no *Gila* were encountered during this

sampling. the next closest site because the transportation time would require holding the fish for more than two days, therefore, no *Gila* were removed for salvage in 2010.

VII. Recommendations:

- Trammel net sampling should continue as the primary sampling tool for adult humpbacks. Electrofishing should continue to provide relative catch rates for juvenile *Gila*.
- Mark-recapture, three pass estimates should be continued through 2011 to provide a measure of population trends relative to humpback chub recovery goals.
- Estimates should be made relative to specific sample sites and extrapolated through the estimated number of fall/winter habitats to develop total Deso/Gray population estimates. Linear distances should not be used to extrapolate densities into total population estimates.
- Sample five different sites in 2011. With only five of sixty-three possible sampling sites covered in one year, sampling other sites may shed light on the overall average for site estimates, providing a more robust estimate for the two canyons.
- Current estimates of the number of fall/winter habitats within Deso/Gray need to be refined through examination of detailed maps, past geomorphology or habitat reports, and discussion with other investigators familiar with the reach.
- Past population estimates (2001-3 and 2006-7) should be revisited to determine what site fidelity was during those sampling periods to and if total population estimates should be recalculated as site specific estimates, which would be extrapolated to more accurate total population estimates.

VIII. Project Status: Project is on track and ongoing.

IX. FY 2010 Budget Status

- A. Funds Provided: \$70,297
- B. Funds Expended: \$70,297
- C. Difference: \$0
- D. Percent of the FY 2010 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges:

X. Status of Data Submission: *Expected to be submitted by the end of December 2010.*

XI. Signed: Paul Badame 11/10/2010  
Principal Investigator Date



Table 1. Summary of effort for each gear type and total number of humpback chub (HBC) collected during population sampling in Deso/Gray Canyon 2001-2003, 2006-2007 and 2010. This data includes all captures at all sites.

Year	Months	Passes completed	# Sites sampled	Trammel Net Hours	Total HBC	Shock Hours	Total HBC	Hoop Net and Minnow Trap Hours	Total HBC
2001	Jun-Jul	3	12	2,803	214	8	3	0	-
2002	Jun-Jul	2	12	2,008	239	22.5	38	1,440	7
2003	Sep-Oct	3	12	3,042	236	11	1	1,946	5
2006	Sep-Oct	3-4	12	3,289	119	16.4	12	729	9
2007	Sep-Oct	3	12	2,727	130	0	-	988	6
2010	Sep-Oct	3	5	1,163	68	7	5	0	-

Table 2. Summary of population estimates (N) for specific sites in Desolation/Gray Canyons 2010. Summary data include the 95% confidence interval (C.I.), probability of capture (p-hat), and coefficient of variation (C.V.). An estimate could not be calculated for Cow Swim so the number of individuals captured is presented.

Sampling Site (RM)	N	95% C.I	p-hat	C.V.
Cedar Ridge (185)	28	16 - 86	0.1674	52.4%
Log Cabin (174.4)	37	20 - 116	0.1435	55.2%
Chandler Falls (167)	41	17 - 186	0.0976	82%
Cow Swim (160.4)	8	na	na	na
Coal Creek (145.7)	15	12 - 37	0.2820	36%

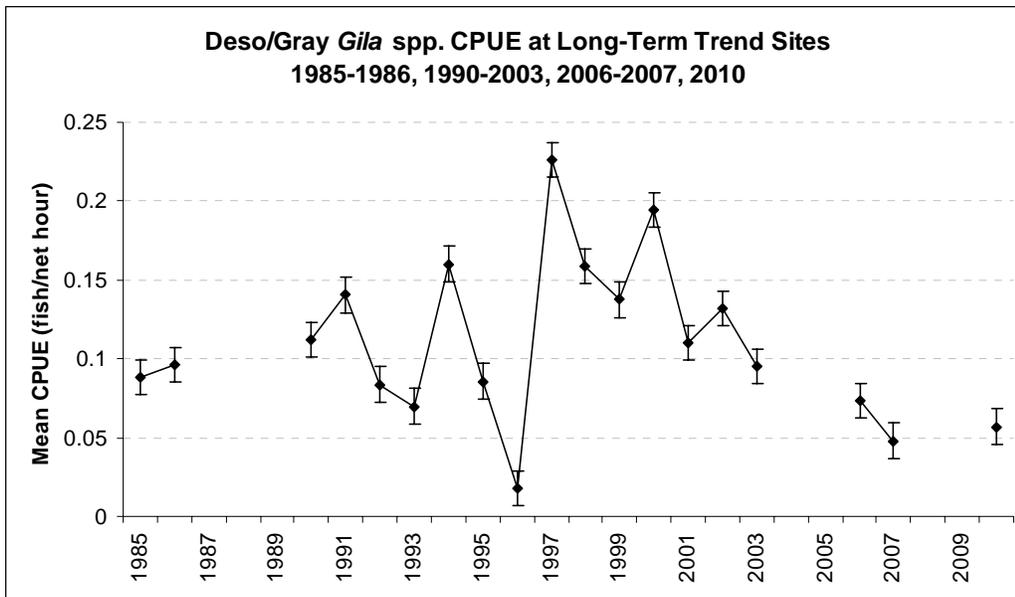


Figure 1. Desolation/Gray long term trend site mean CPUE for all *Gila* by year for 1985-1986, 1990-2003, 2006-2007, and 2010. The 1989 data point has been excluded as an outlier (0.59) to maintain scale. Error bars represent one standard error.

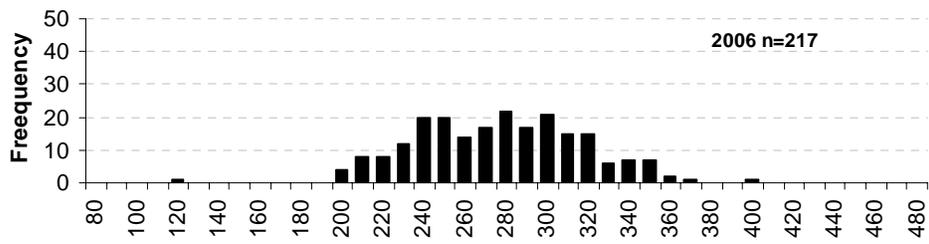
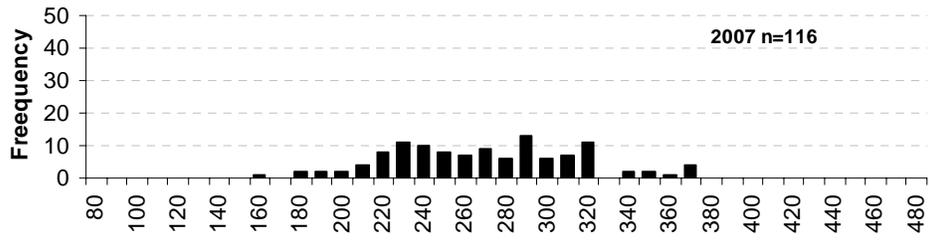
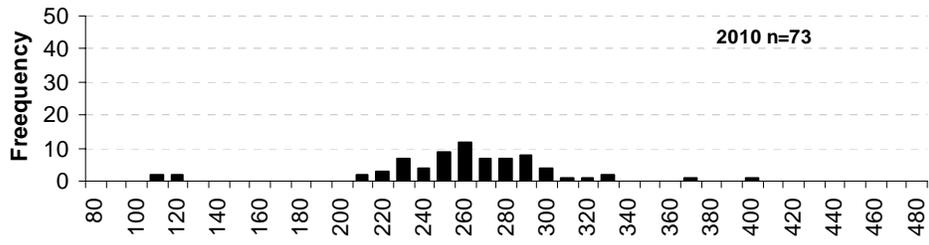


Figure 2. (Continued on next page)

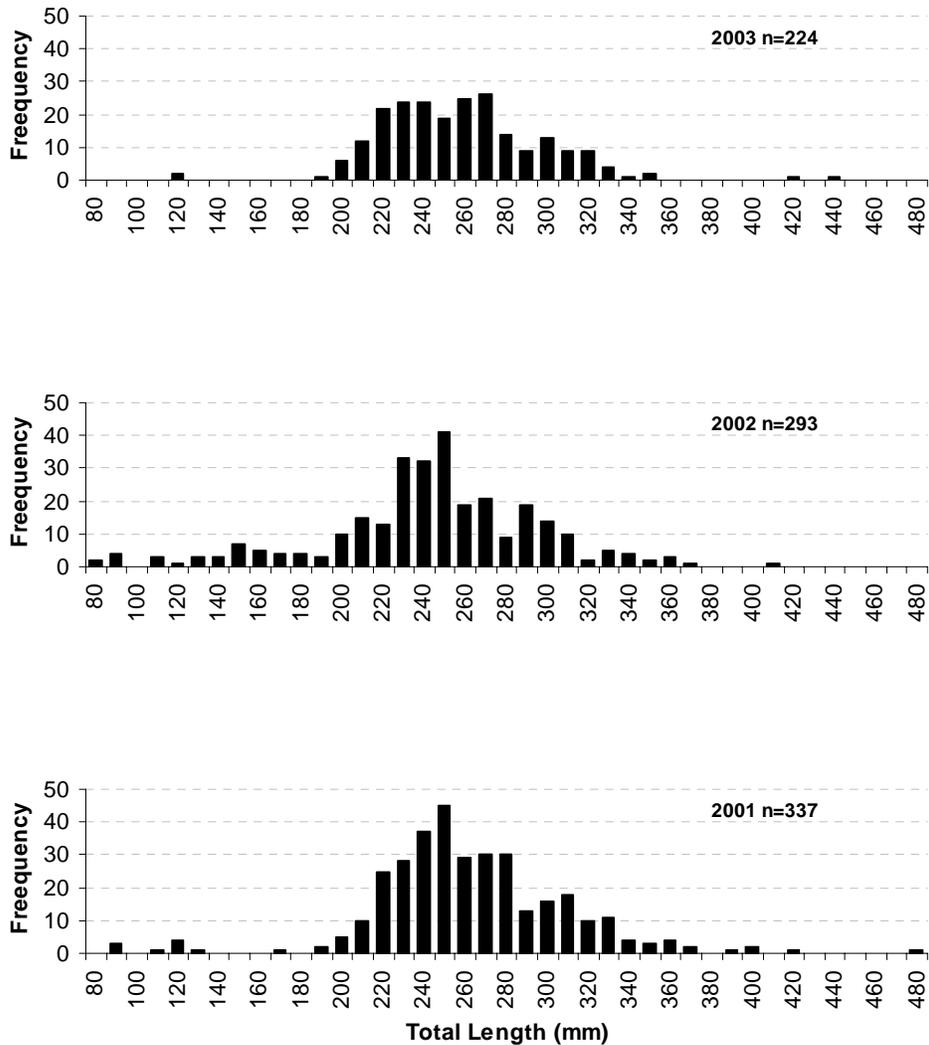


Figure 2. (Continued) Desolation/Gray Canyon humpback chub length frequency histograms for 2001-3, 2006-7, and 2010. Represents all humpback and *Gila* spp. captures via electrofishing and trammel netting. [Chub](#) greater than 199 mm are considered adults and those between 200 and 220 mm are considered first year adults.

Deleted: Chubs