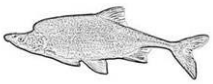
LITTLE COLORADO RIVER FISH MONITORING
2005 ANNUAL REPORT



David Ward
William Persons
Arizona Game and Fish Department, Research Branch
2221 West Greenway Road
Phoenix, AZ 85023

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Grand Canyon Monitoring and Research Center
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INTRODUCTION

In 1987, the Arizona Game and Fish Department (AGFD) began to monitor fish in the Little Colorado River (LCR) to assess the population trends and status of endangered humpback chub (*Gila cypha*) (HBC)(Robinson and Clarkson 1992). Annual standardized hoop net sampling is conducted for 30 – 40 days each spring to capture humpback chub during the spawning period (Table 1). This program was discontinued in 2000 but then reinstated in 2002 at the advice of the Grand Canyon Monitoring and Research Center Protocol Evaluation Panel (Anders *et al*. 2001). Catch-per-unit-effort (CPUE) indices derived from this monitoring program are useful as independent validation for mark-recapture population models of humpback chub developed by Coggins *et al*. (2006). With the exception of the period 2000-2001, the lower 1200 meter sampling represents one of the most consistent, long-term sampling methods in use for Grand Canyon fishes.

STUDY SITE

The study site is the lower LCR, 1200 m upstream from its confluence with the Colorado River. The LCR in the study area is a deeply entrenched channel located in a vertical-walled canyon that in places narrows to less than 50 m. The LCR channel contains runs, riffles, deep pools and small rapids. Substrates are primarily silt and sand with scattered large boulders. The LCR is the primary spawning site for endangered HBC in Grand Canyon and is the only known HBC aggregate in the Colorado River Ecosystem (CRE) from which fish are recruited into the adult population (Valdez and Ryel 1995; Coggins and Walters 2001). Other native fishes, bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and speckled dace (*Rhinichthys osculus*) spawn in the LCR (Robinson *et al*. 1998) as do exotic species including channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), and common carp (*Cyprinus carpio*).

METHODS

Thirteen standardized AGFD hoop nets were fished continuously from April 8 through May 6, 2005, and checked once daily. Hoop nets measured 5 m long and 1 m diameter with 6.3 mm mesh, 7 hoops and two throats. Nets were set at 100, 119, 137, 165, 420, 480, 500, 577, 675, 1045, 1110, 1160, and 1195 m upstream from the confluence. Net locations were set as close as possible to those used in previous sampling efforts (Brouder and Hoffnagle 1998). In

2005, high flows prevented the net at 137 and 675 meters from the confluence from being fished. Catch per unit effort was calculated as number of fish caught per hour.

All fish caught were handled following protocols in Ward (2002). All fish collected were identified to species and measured for total length (TL; nearest mm). Fork length was also measured for humpback chub, flannelmouth sucker, and bluehead sucker. Weights were not measured to reduce handling time and because scales did not yield accurate weights in the high winds common during the study period. Analysis of previous weight data also indicates this data is not useful as an index of fish condition because it is confounded by sexual condition and tapeworm loads. Native fish were sexed when possible based on external sexual characteristics or manual expulsion of gametes and sexual condition (not ripe, ripe, spent) was recorded. Examination of sexual characteristics (none, color, tuberculate) was also noted. Number and type of external parasites were recorded. Native fish ≥ 100 mm TL were scanned for the presence of a PIT tag with both new 134.2 kHz tag reader and an old 400 kHz tag reader to verify that no tags were missed. If a tag was not found and the fish was ≥ 150 mm TL, a 134.2 kHz PIT tag was inserted into the abdominal cavity. Tag presence or absence and PIT tag number were recorded. Fish were also checked for fin clips or elastomer dye (marks used in previous years to identify tag loss or fish translocated above Chute Falls) (Stone and Sponholtz 2003). PIT tag information was downloaded electronically and checked for errors.

RESULTS

A total of 1,337 fish representing 8 species were captured in the LCR during standardized monitoring in 2005. Native species dominated the catch and comprised 99.3 % of total fish caught (Table 3). Speckled dace, bluehead sucker, humpback chub and flannelmouth sucker, were the predominant species caught (Table 3 & 4). Catch rates of native fishes were generally lower than in 2004 but still represented an overall increase since 2000. Catch rates of bluehead suckers in 2005 were the highest that have ever been recorded since monitoring began in 1987 (Table 5, & Figure 9).

The LCR was above base flow during the entire 2005 sampling period (Figure 4) and turbidity was very high (Figure 5). In general turbidity during the entire sampling period was above 1000 NTU and peaked at over 19,000 NTU (Figure 5). Water temperature ranged from 3 to 31 ºC during the sampling period (Figure 7).

Native species

Humpback chub

A total of 344 humpback chub were collected in standardized hoop net sets during the 2005 spring monitoring period. The number of humpback chub caught in 2005 was half that of 2004 (743) which was the highest number of humpback chub recorded since 1992. Over half of the fish caught in 2005 were greater than 150 mm TL (Table 6) so the percentage of the total catch that were recaptures was much higher in 2005 (26%) than in 2004 (5%) .

We examined 208 humpback chub ≥ 150 mm TL for presence of a PIT tag and 91 (44 %) were PIT tag recaptures (Table 4). Ninety seven humpback chub (< 100 mm TL) were caught; the smallest was 61 mm TL, although most (80) were between 60 and 89 mm TL (Table 6). Only two ripe male HBC were found in 2005 and no ripe female chub were collected. Twenty six humpback chub were reported with at least one *Lernaea* during 2005 sampling as opposed to only one fish in 2004. Of the 128 new tags that were inserted only 26 of them were put into fish over 250 mm TL indicating that most of the new fish being tagged are new fish recruiting to the population and not previously untagged older fish.

Flannelmouth sucker

Flannelmouth sucker were the least abundant native species captured (356, 11.2%) in 2005 (Table 3) with multiple sizes and cohorts captured (Figure 2). A total of 95 flannelmouth suckers over 150 mm TL were caught and 38 (40 %) were recaptures (Table 4). CPUE of flannelmouth suckers has been highly variable during the last 4 years but still indicates an increasing trend since 1999.

Bluehead sucker

Bluehead suckers caught in 2005 had a mean TL of 226 mm and ranged in size from 60 to 328 mm TL. A large cohort of age-0 bluehead suckers was not detected in 2005. Spawning of bluehead suckers may have occurred later in 2005 and age-0 blueheads may have been too small to be captured during the sampling period. (Figure 3). A total of 335 bluehead suckers were scanned for presence of a PIT tag, with 17 recaps (5 %). CPUE of bluehead suckers in 2005 was the highest that has ever been recorded since monitoring began in 1987.

Speckled dace

Speckled dace were the most abundant species caught in 2005 with 445 individuals caught (Table 3). CPUE of speckled dace suckers is highly variable among years but recent data suggests an increasing trend since about 2002 (Figure 9).

Nonnative species

Nonnative species made up only 0.66 % of the total catch in 2005 with no fathead minnow or red shiner caught (Table 3). Black bullhead were the most abundant non-native fish caught.

DISCUSSION

Native species

Catch rates of native fishes in 2005 were generally lower than in 2004 which can be partially attributed to high turbidity and flows during the sampling period (Figure 4 & 5). Recent investigations of the effects of turbidity on hoop net catch rates have revealed that at turbidities < 180 NTU catch rates increase significantly (Stone 2004). We hypothesize that fish use the nets as cover in clear water. Although catch rates of native fish were lower than in 2005 they still show an overall increasing trend since 2002.

The mean CPUE of humpback chub ≥ 150 mm TL shows severe declines from 1987 to 1994 and has remained relatively stable since about 1994 (Figure 8). It may be that the pre-1987 population of humpback chub represented individuals that were born prior to or during the time in which Lake Powell was filling when mainstem Colorado River water temperatures were warmer and the mainstem Colorado River was humpback chub habitat. Since about 1994 the number of humpback chub has been relatively stable at a lower level. This may indicate that the present chub population represents the carrying capacity of the Little Colorado River alone and the higher pre-1987 chub population represented the carrying capacity of the mainstem Colorado River and the Little Colorado River. The ongoing trout removal efforts near the confluence of the Little Colorado River should help to address the question of whether or not the mainstem Colorado River is actually humpback chub habitat. If chub numbers do not increase as a result of these efforts it may be that the mainstem Colorado River is still not humpback chub habitat possibly because of the cold water temperatures, even after predators are removed. Warmer mainstem water temperatures because of drought conditions and low water levels in Lake Powell will make interpretation of recent increases in CPUE of native fish even harder to interpret.

In 2005, mean CPUE of flannelmouth sucker was lower than in 2004 and less than one third that of 2003 but still represents an increasing trend since 2000 (Figure 9). Catch rates of flannelmouth suckers collected in the Little Colorado River and in the mainstem Colorado River within Grand Canyon between 1991 and 2000 suggest that the population of flannelmouth suckers was stable with few strong year classes. The population of flannelmouth suckers sampled during this time was dominated by age 0 fish (< 150 mm TL) and adults (> 400 mm TL) (Figure 2). Recent monitoring in the Little Colorado River (2002-2005) as well as electrofishing in the mainstem shows evidence of increased abundance of sub-adult flannelmouth suckers. This trend was most evident in mainstem electrofishing data between 233 km and 346 km downstream of Glen Canyon Dam (Scott Rogers AGFD, personal communication). The observed trend corresponds temporally and spatially to an increased number of days with water temperature greater than 15°C (Figure 11). It is likely that increased river temperatures resulting from lower Lake Powell water levels and stable summer discharges from Glen Canyon Dam are partially responsible for the increased recruitment of flannelmouth suckers within the Little Colorado River. Many flannelmouth suckers tagged or recaptured in the Colorado River mainstem as part of the predator removal project do not have river miles associated with capture. This information needs to be included in the GCMRC fish database so that movement can be assessed for these fish.

Catch of bluehead suckers ≥ 150 mm TL continued to increase in 2005 with higher catch rates than have ever been recorded since monitoring began in 1987 (Figure 9). Large numbers of adult bluehead suckers continue to be caught compared with previous years (Figure 3). Warmer mainstem water temperatures caused by drought conditions and lowered water levels in Lake Powell (Susan Hueftle, USGS unpublished data) may have led to increased survival of suckers.

The removal of rainbow trout in the area around the confluence of the Little Colorado River may also be partly responsible for the increased catch of suckers within the Little Colorado River. Although separating the effects of warmer water and fewer predators may not be possible, the overall effect appears to have been beneficial to sucker populations. Seventeen bluehead suckers were recaptured in 2005 with one individual having first been tagged in 2001 (Appendix).

Catch of speckled dace is highly variable among years with no apparent directional trends in speckled dace CPUE from 1987 to 2005 (Figure 9). The effects of high flow and turbidity may obscure any trends in speckled dace catch rates, although warmer mainstem water temperatures and fewer introduced predators are expected to benefit speckled dace populations, as well as humpback chub and sucker populations.

Nonnative species

The percentage of nonnative fishes in the Little Colorado River continues to remain at low levels (Figure 6). There is some indication that the number of fathead minnows has increased since 1994 although high variation in catch rate between years makes trends difficult to assess (Figure 10). Catch rate of red shiner also appears to have increased since 2002 (Figure 10). Black bullhead has shown higher variability in catch since 1995 (Figure 10) and was the most abundant nonnative species captured in 2005. Catch of channel catfish is also highly variable creating very large confidence intervals surrounding the mean. This makes it difficult to assess trends for channel catfish although no increases in CPUE are apparent since monitoring began in 1987 (Figure 10). No trends are evident in catch rate of common carp (Figure 10). Adult carp are not very susceptible to capture in hoop nets within the Little Colorado River so hoop net catch trends are not likely to be a good index of the carp population.

The pattern of nonnative fish abundance in the Little Colorado River is not typical of most southwestern streams. Typically, once small bodied introduced species such as fathead minnow or red shiner appear they gradually increase in abundance over time until they numerically dominate (Reviewed in Marsh and Pacey 2005). The extreme flood regime and high turbidity of the Little Colorado River during the spring and late summer may prevent these nonnative species that are adapted for more stable systems from becoming established (Minckley and Meffe 1987, Ward et al. 2003). Assuming that this model is valid for the LCR, the large amount of winter flooding in 2005 may be the mechanism that removed fathead minnows and red shiners from the system causing lower catch rates. If the mainstem Colorado River continues to be warm because of drought conditions fathead minnow and red shiner may be able to become established in the mainstem and invade the Little Colorado River between flood events much more quickly.

Strengths of lower 1200 meter monitoring

The lower 1200 meter hoopnet monitoring represents one of the longest ongoing trend indexes for Grand Canyon fishes. The real strength of this data set is the length of time over which the data has been collected in a consistent manner. Catch-per-unit-effort (CPUE) indices derived from the lower 1200 meter monitoring show dramatic declines in CPUE of adult humpback chub and validate mark-recapture population estimates. This index of catch rate is also valuable as an independent method to confirm output of age structured mark recapture (ASMR) open population models. The lower 1200 meter standardized hoop net monitoring should be continued as a means of comparing catch rate data with population estimates from the Fish and Wildlife Service and validating age structured mark-recapture stock assessment models produced by the Grand Canyon Monitoring and Research Center.

Additional projects done in conjunction with lower 1200 meter monitoring

Several small studies were undertaken in 2005 in conjunction with Lower 1200 meter fish monitoring to answer specific questions related to native fish and sampling protocols. A short summary of each of these projects follows along with recommendations based on the results of those studies.

Remote detection of PIT tags

During 2004 and 2005 we experimented with a solar powered PIT tag antenna to remotely detect tags in moving fish without handling them. Recent technological advances and 134.2 kHz PIT tags have allowed new possibilities for remote detection of fish which may help address questions of fish movement and population closure within the Little Colorado River. In 2004 one antenna was used experimentally. Some difficulties were encountered with keeping enough power to run the antenna continually. In 2005 two, 28 cm diameter remote antennas (Biomark) were fastened to the cod end of a baited Fyke net and fished in 2 locations concurrently in the Little Colorado River for 25 nights. Larger batteries and solar panels were used but power issues continued to be problematic. A total of 62 unique fish passed through the antenna in 2004 and over 100 unique fish were detected in 2005. This type of non-intrusive sampling with a remote antenna could be used in conjunction with a temporary weir to answer questions about population closure, spawning and movement patterns of humpback chub in the Little Colorado River. We believe it is time to move past the experimental phase of this project and implement remote detection of PIT tags in the Little Colorado River on a larger scale.

Removal and quantification of Asian tapeworm

Thirty humpback chub were captured in May, 2005 in conjunction with lower 1200 meter monitoring efforts and treated with praziquantel to remove Asian tapeworm (*Bothriocephalus*

acheilognathi) according to protocols established in the laboratory (Ward 2005). No mortality or abnormal behavior was noted in any of the humpback chub that were treated. Tapeworm infestation in humpback chub from the Little Colorado River was highly variable. Small humpback chub (≤ 150 mm TL) had few tapeworms but juvenile and adult humpback chub infestation was highly variable from 0 to 183 worms per fish (Figure 12). Tapeworm infestation appeared to increase dramatically in fish > 200 mm TL. Choudhury *et al.* (2004) examined humpback chub < 150 mm TL in the Little Colorado River in 2001 for parasites and found an average of 18 tapeworms per fish. Our results showed little if any tapeworm infestation in fish < 150 mm TL. The discrepancy in these results may be related to Little Colorado River hydrology. The winter and spring flooding in the Little Colorado River, in 2005, were probably not conducive to copepod survival, whereas in 2001, low flow and blue water conditions would have been very conducive to high numbers of copepods. Our field results demonstrate that tapeworm loads in endangered fish can be removed and accurately quantified in the field for monitoring purposes without killing and dissecting the fish. We propose to continue monitoring tapeworm loads in humpback chub in the Little Colorado River using this methodology to establish baseline information that will be needed to assess the impacts of Asian tapeworm on humpback chub in Grand Canyon.

Evaluationof tag loss and tagging induced mortality in bluehead sucker

Prior to 2005 we rarely encountered recaptures for bluehead suckers. The low recapture rate of bluehead suckers evoked concern that current handling and PIT tagging methods may lead to high tag loss or handling/tagging induced mortality in bluehead suckers. In 2005 we evaluated short-term tag retention and PIT tag induced mortality in bluehead suckers by holding them in a net pen for several days post. Eighteen bluehead suckers (164 – 278 mm TL) were

captured in hoop nets near Boulder Camp (RKM 1.9) on the Little Colorado River. All fish were handled according to standardized monitoring and PIT tagging protocols and then held for 2-6 days in a 1 m^2 net pen in the Little Colorado River. Duration of the holding period depended on when fish were caught in relation to the end of the sampling trip. Approximately half of the fish were pit tagged below the pelvic girdle and half were PIT tagged above the pelvic girdle. No tag loss was observed in any of the fish that were held. One bluehead sucker died in the holding pen. This fish was dissected and no sign of internal damage or puncture of internal organs was evident. Most of the pit tagging wounds had already begun to mend within a few days of tagging, with the wound sealed by a thin layer of tissue. Tagging either above or below the pelvic girdle did not appear to make a difference in short-term survival although tagging above the pelvic girdle appeared to have less incidence of bleeding especially in smaller fish. Laboratory experiments with bonytail chub (*Gila elegans*) indicate that most PIT tag induced mortality occurs during the first 2 days after tagging (Childs 2002), suggesting that any bluehead sucker that suffered a fatal tagging wound likely have died during the holding period. This field study was not extensive and sample sizes were low, but our results do suggest that tag loss or high short-term mortality as a result of PIT tagging is not the cause of observed low recapture rates for bluehead suckers in Grand Canyon.

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TABLES

Table 1. Little Colorado River hoop netting effort by year, 1987 – 2005.
This is only HN gear types fished during April and May in the Lower 1200 meters of the Little Colorado River.

Year	Effort (Hours)	Days
1987	1428	21
1988	3668	26
1989	4920	25
1990	4479	27
1991	7773	58
1992	6038	55
1993	9116	31

Year	Effort (Hours)	Days
1994	9987	32
1995	9449	30
1996	9175	30
1997	9076	31
1998	7060	21
1999	9373	25
2000	0.00	0

Year	Effort (Hours)	Days
2001	0.00	0
2002	3138	30
2003	3415	25
2004	7190	23
2005	6333	26

Table 2. Trip dates and number of net sets 1987 - 2004.

Lower 1200 meter LCR trips					Average duration of set	
Year	Start	End	Trip ID	Days	in hours	# of net sets per year [a]
1987	9-May	30-May	LC19870509	21	11.52	124
1988	3-May	29-May	LC19880503	26	11.15	329
1989	3-May	28-May	LC19890503	25	24.00	205
1990	17-Apr	14-May	LC19900417	27	23.70	189
1991	3-May	30-Jun	LC19910503	58	14.56	534
1992	5-May	28-May	LC19920505	23	18.93	319
1993	30-Apr	31-May	LC19930430	31	12.25	744
1994	19-Apr	21-May	LC19940419	32	12.27	814
1995	20-Apr	20-May	LC19950420	30	12.01	787
1996	18-Apr	18-May	LC19960418	30	12.25	750
1997	13-Apr	14-May	LC19970413	31	12.05	753
1998	5-Apr	26-Apr	LC19980405	21	16.38	431
1999	7-Apr	1-May	*GC19990406	24	18.86	497
2002	19-Apr	19-May	LC20020419	30	24.14	130
2003	11-Apr	9-May	LC20030411	28	24.75	138
2004	9-Apr	3-May	LC20040409	24	24.05	299
2005	8-Apr	6-May	LC20050408	26	23.99	264

[a] This number represents all hoop nets set within the lower 1200 meters of the LCR during the months of April and May but does not include Fyke nets or D hoop nets.
* 1999 has a GC extension because it was submitted with USFWS downstream data.
From 1993 to 1997 nets were often checked twice daily which led to a higher number of net sets.

Table 3. Catch by species, lower 1200 m hoop net monitoring, Little Colorado River, April 8 - May 6, 2005. Total effort = 6332.58 net hours.

Species	Number	%
Bluehead sucker (BHS)	347	26.1
Flannelmouth sucker (FMS)	192	14.5
Humpback chub (HBC)	344	25.9
Speckled dace (SPD)	445	33.5
Total Native	**1,328**	**99.3**
Black bullhead (BBH)	4	0.3
Channel catfish (CCF)	3	0.22
Common carp (CRP)	1	0.07
Fathead minnow (FHM)	0	0
Plains killifish (PKF)	0	0
Rainbow trout (RBT)	1	0.07
Red shiner (RSH)	0	0
Total Non-native	**9**	**0.66**
Total	**1,337**	**100**

Table 4. Numbers of fish scanned, tagged, and recaptured by species during LCR lower 1200 meter hoopnet monitoring, 2005.

Species	<150 mm TL	> 150 mm TL	New tags inserted	Recaps	*Total Catch
BBH		4			4
BHS	11	335	303	17	347
CCF		3			3
CRP		1	1		1
FHM					0
FMS	94	95	58	38	192
HBC	134	208	128	91	344
PKF					
RBT	1				1
RSH					
SPD	445				445

* Several fish escaped prior to being measured but are included in total numbers
* Total Effort = 6,332.58 hours of net sets

Table 5. Total Catch of species by year, LCR standardized hoop net monitoring 1987 – 2005.

Species	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2002	2003	2004	2005
BBH									1		1	1			3	5	4
BHS	39	65	72	25	106	19	44	64	32	413	45	27	61	122	93	154	347
CCF	5	8	41	2	4	8		5	1	1	12	5	10	1	3	7	3
CRP	2	1							1	8	60		5		7	7	1
FHM	1	12	17	10	3	1	1	265	19	237	726	52	14	46	42	91	
FMS	81	91	28	30	106	25	50	88	65	237	97	6	21	79	256	357	192
GSH	1																
HBC	396	596	548	418	316	199	431	657	243	359	123	132	156	130	157	743	344
PKF											97	1		1		52	
RBT			1		1		2		1	8	1	4	6	3		5	1
RSH			2							14	74	8	70	3	13	65	
SPD	132	192	204	90	1003	110	455	1022	488	741	417	106	187	115	116	1918	445
SUC				3			1			2							

Table 6. Length frequency distribution of fish collected during LCR sampling, April 8 – May 6, 2005.

	Species										
Length	**BBH**	**BHS**	**CCF**	**CRP**	**FHM**	**FMS**	**HBC**	**PKF**	**RBT**	**RSH**	**SPD**
30 - 39											
40 - 49											1
50 - 59											7
60 - 69		3				1	21				60
70 - 79		1				8	38		1		176
80 - 89		1				10	21				132
90 - 99		2				13	5				36
100 - 109		1				12	6				23
110 - 119		1				13	6				5
120 - 129		1				12	5				3
130 - 139		1				12	21				1
140 - 149						13	11				
150 - 159	1	1				10	20				
160 - 169		6				4	22				
170 - 179		8					17				
180 - 189	1	20				1	19				
190 - 199		20	1			2	16				
200 - 209		29				4	23				
210 - 219		39				3	18				
220 - 229	2	50				2	17				
230 - 239		38				3	7				
240 - 249		27				1	5				
250 - 259		39				1	8				
260 - 269		17				3	12				
270 - 279		17				2	4				
280 - 289		7					2				
290 - 299		6				1	4				
300 - 309		6				3	1				
310 - 319		3				1	1				
320 - 329		2				4					
330 - 339						8	3		1		
340 - 349						5					
350 - 359			1			3	1		1		
360 - 369						6			2		
370 - 379						2	2				
380 - 389						4	3		1		
390 - 399				1		1	2				
400 - 409						1					
410 - 419						1					
420 - 429						4	1				
430 - 439						5					
440 - 449						3					
450 - 459			1			2					
460 - 469											
470 - 479						1					
480 - 489						2					
490 - 499						1					
500 - 509											
510 - 519						1					
520 - 529											
530 - 539											
540 - 549											

FIGURES

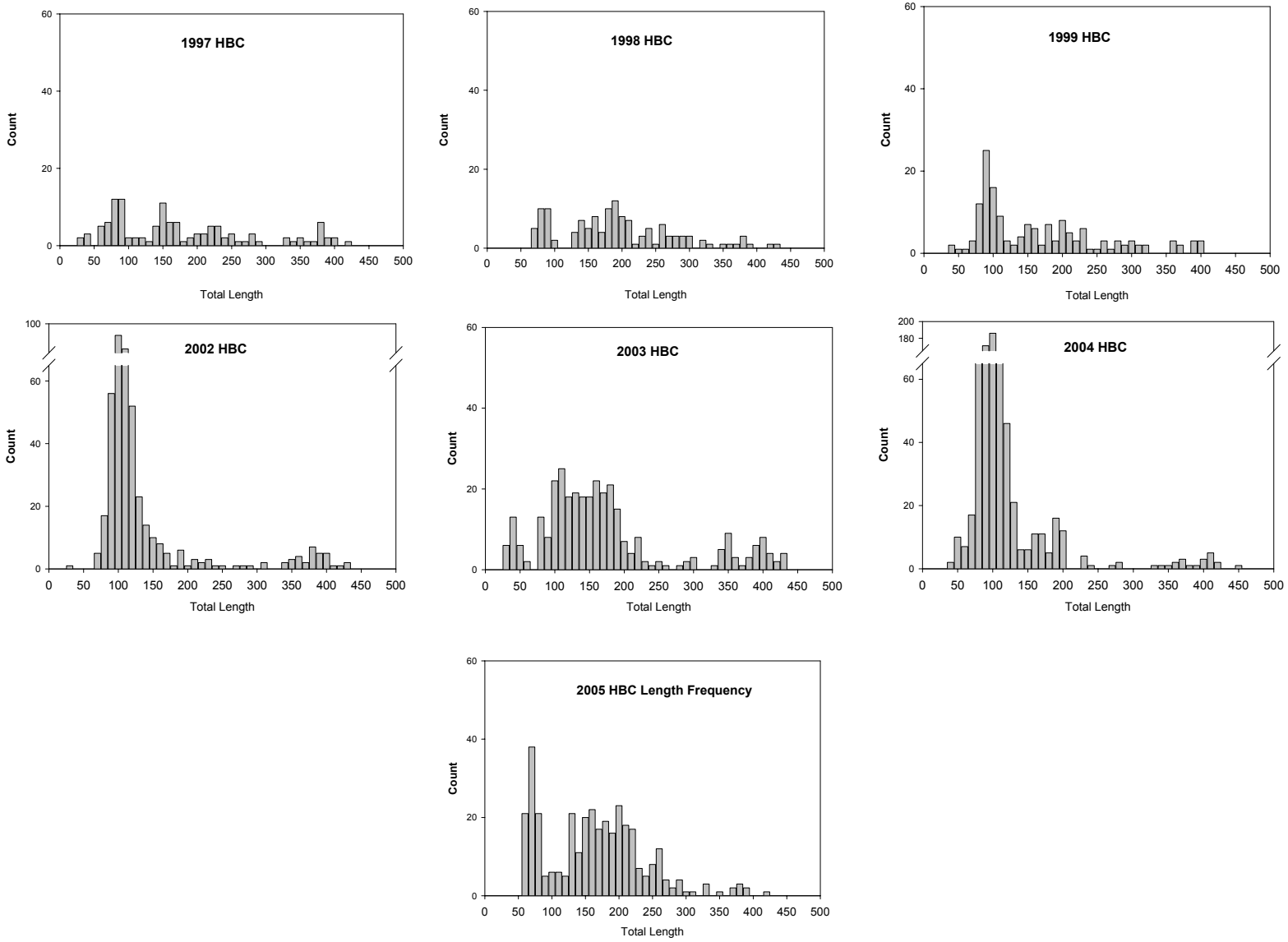


Figure 1. Length frequency distributions for humpback chub (HBC), caught in the Little Colorado River during the most recent 7 years of monitoring.

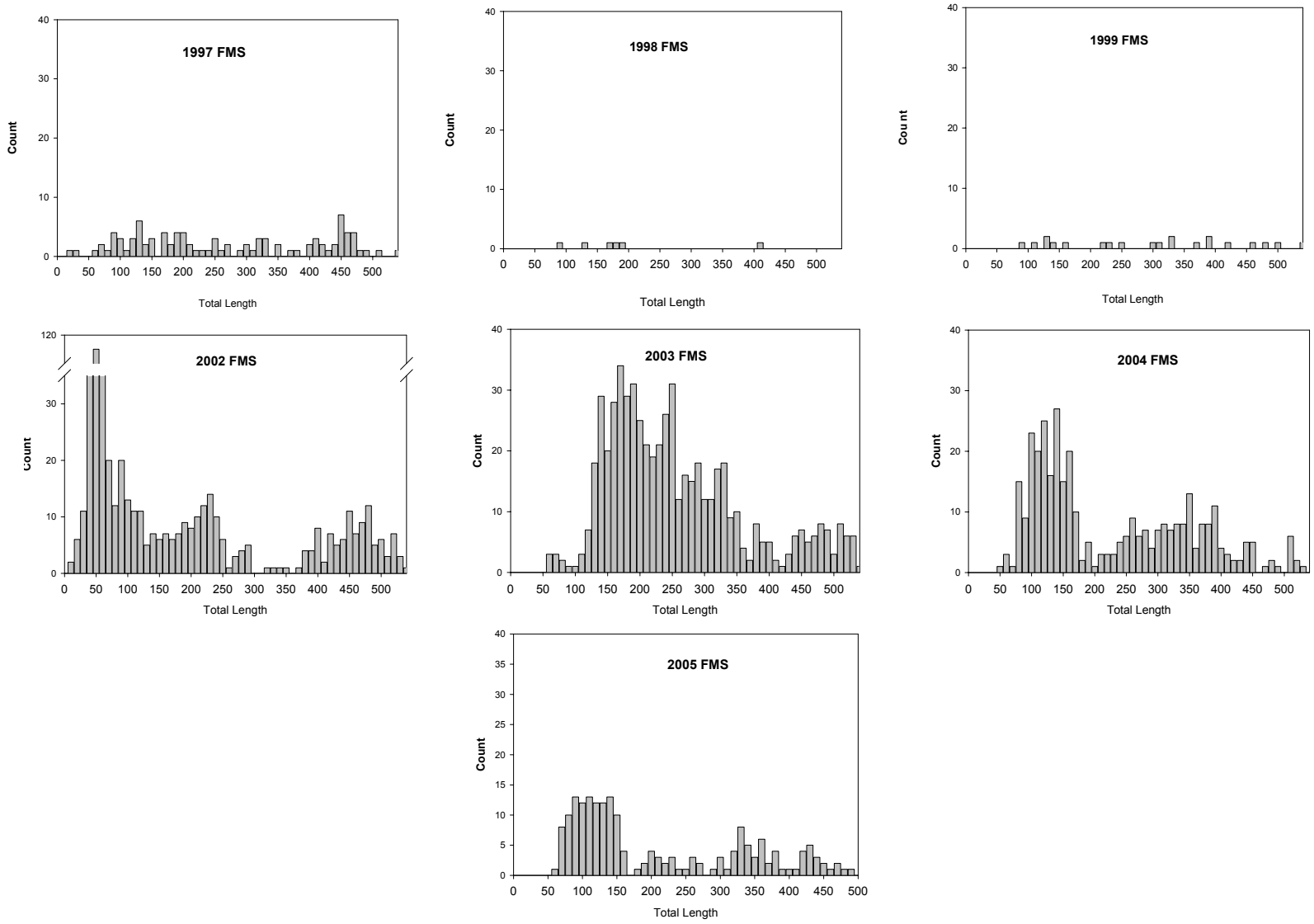


Figure 2. Length frequency distributions of flannelmouth sucker (FMS), caught in the Little Colorado River during the most recent 7 years of monitoring.

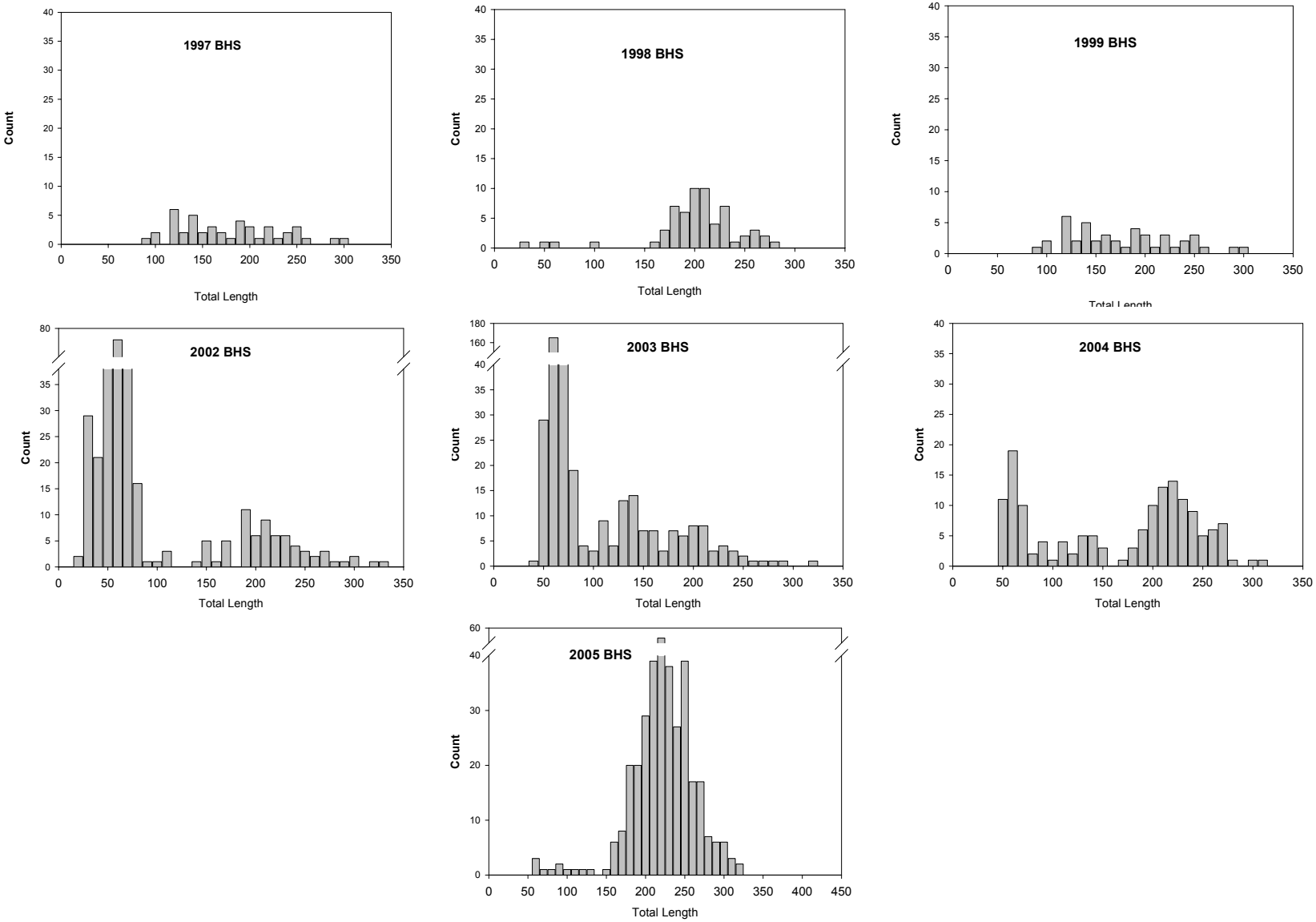


Figure 3. Length frequency distributions of bluehead sucker (BHS), caught in the Little Colorado River during the most recent 7 years of monitoring.

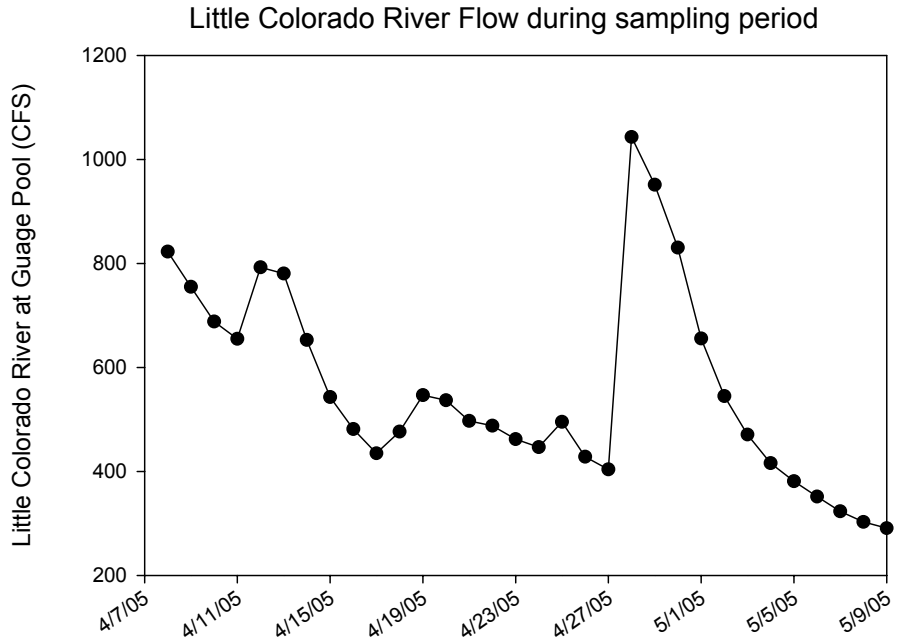


Figure 4. Mean daily flow of the Little Colorado River during the sampling period in 2005. USGS gauge above confluence with the Colorado River.

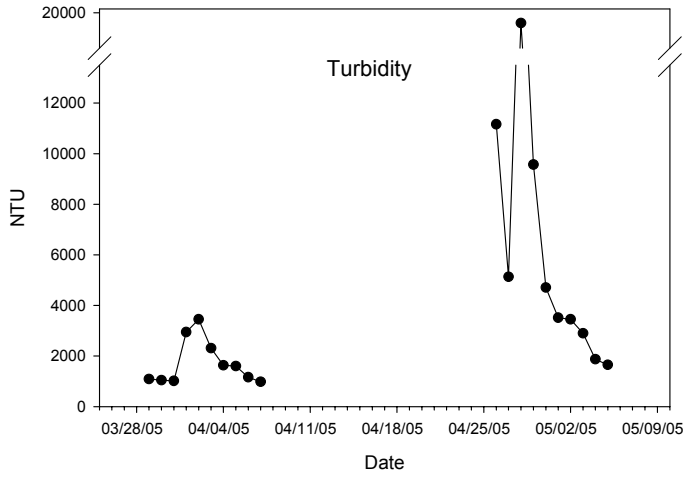


Figure 5**.** Mean daily turbidity (NTU's) in the Little Colorado River during 2004 sampling measured at Salt Camp (RKM by the Dennis Stone (US fish and Wildlife service). Exact turbidity data is not available from April 8 – 24, but was high, exceeding 300 NTU.

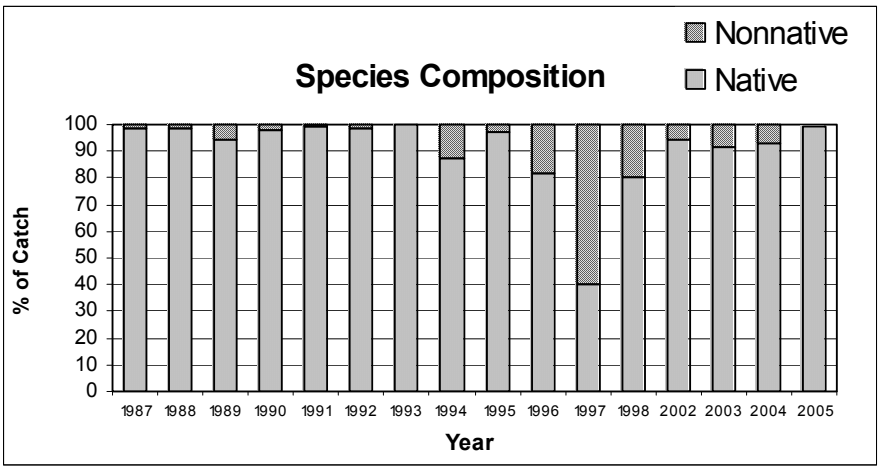


Figure 6. Species composition in standardized hoop net monitoring, 1987 - 2005.

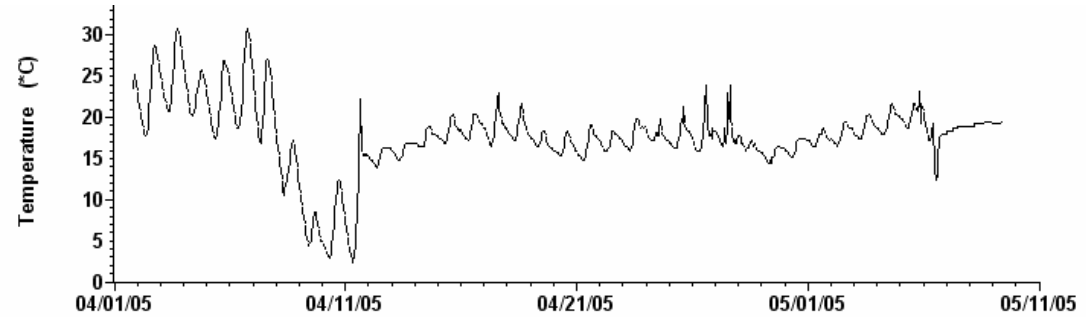


Figure 7. Daily water temperature fluctuations in the Little Colorado River during 2005 sampling as measured with an hourly Hobotemp® data logger.

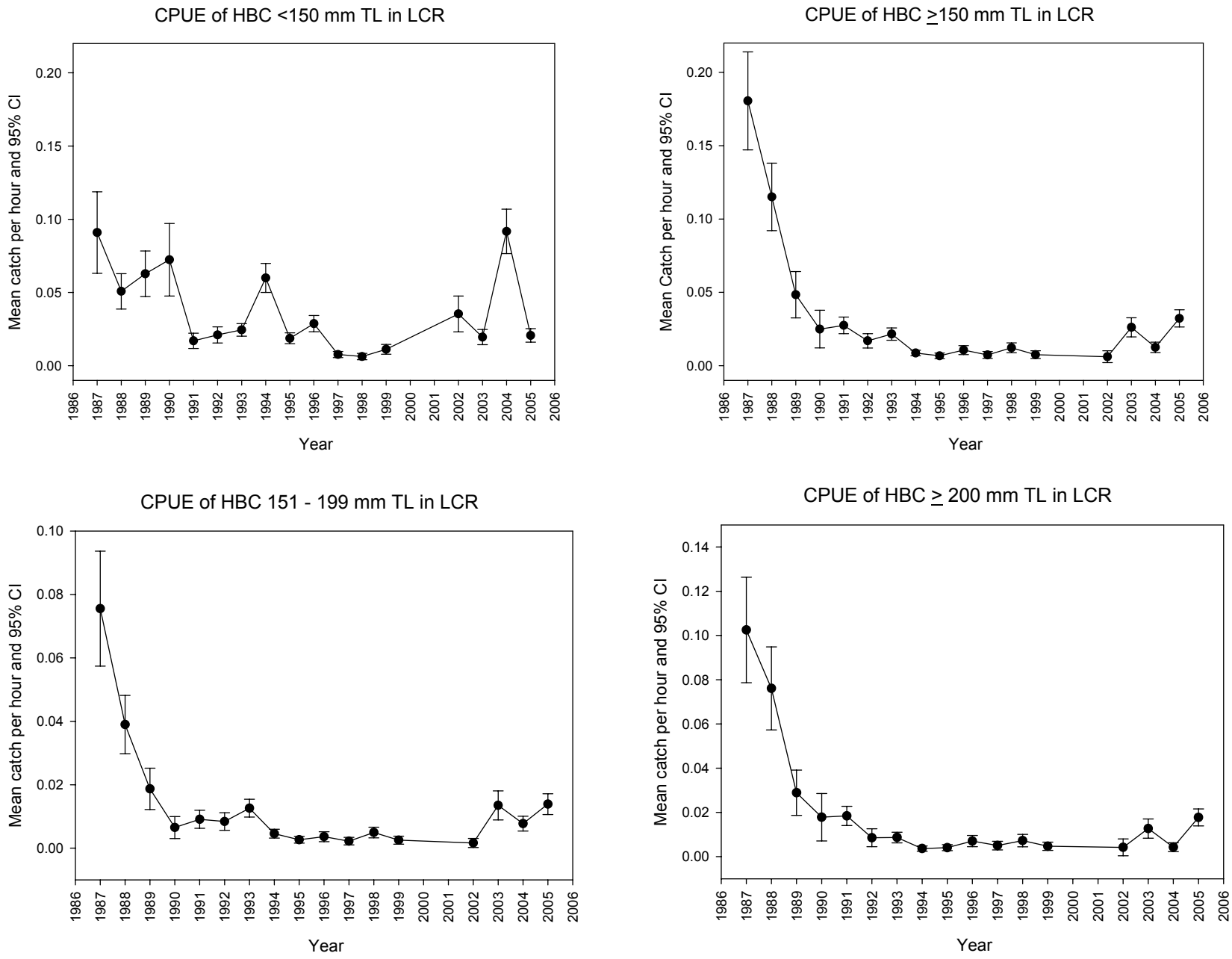
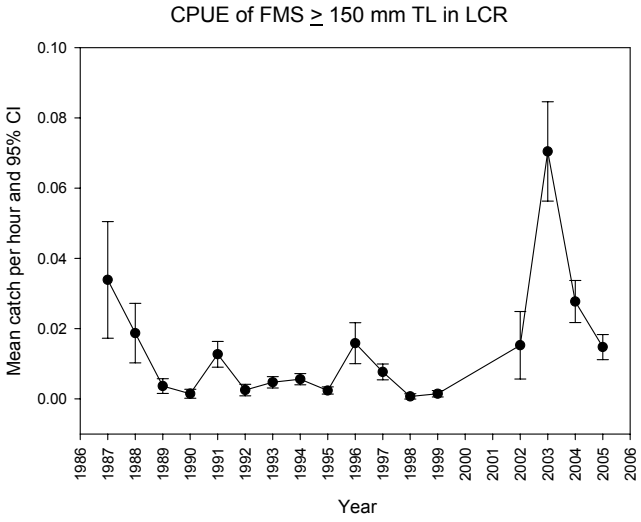
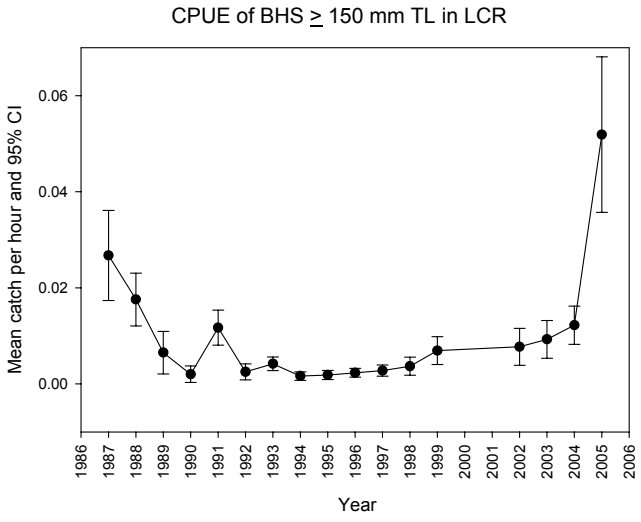


Figure 8. Mean catch/hr for 4 size groupings of humpback chub in the LCR, 1987 – 2005.





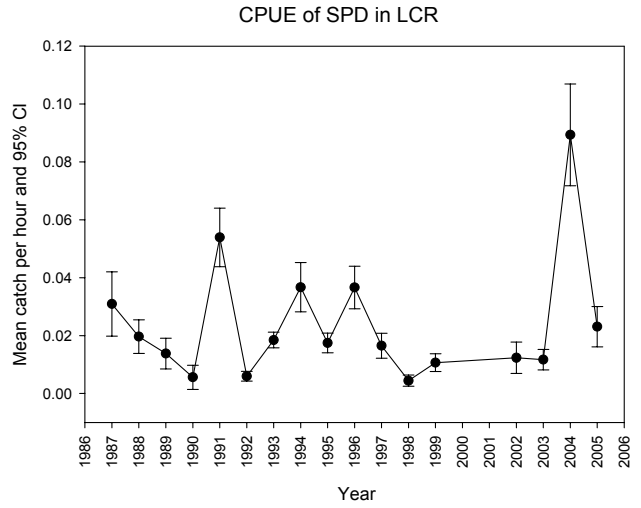


Figure 9. Mean catch/hr of flannelmouth sucker ≥ 150 mm TL, Bluehead sucker ≥ 150 mm TL and all sizes of speckled dace in the LCR, 1987 – 2005.

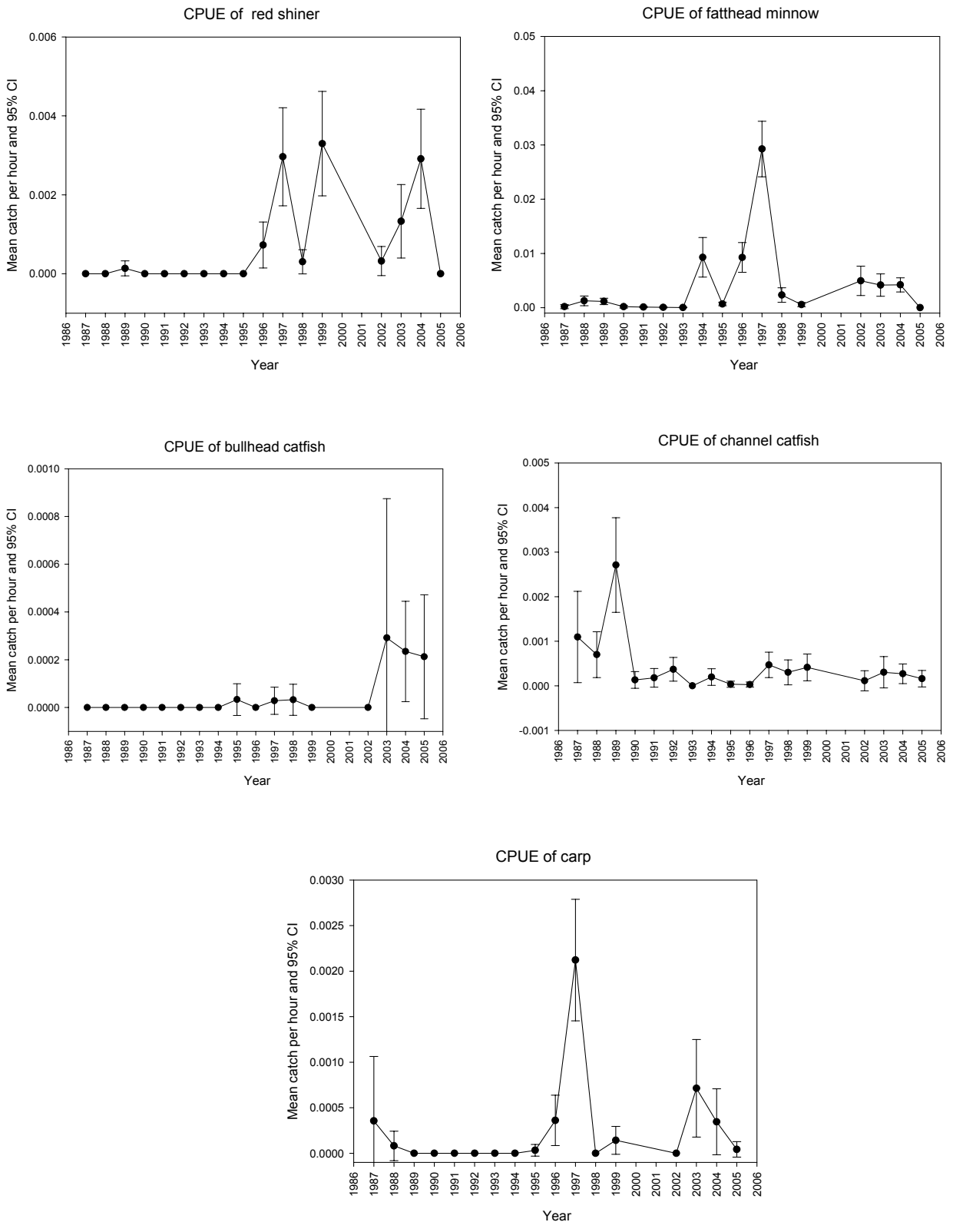


Figure 10. Mean catch/hr of nonnative fishes in the LCR, 1987-2005.

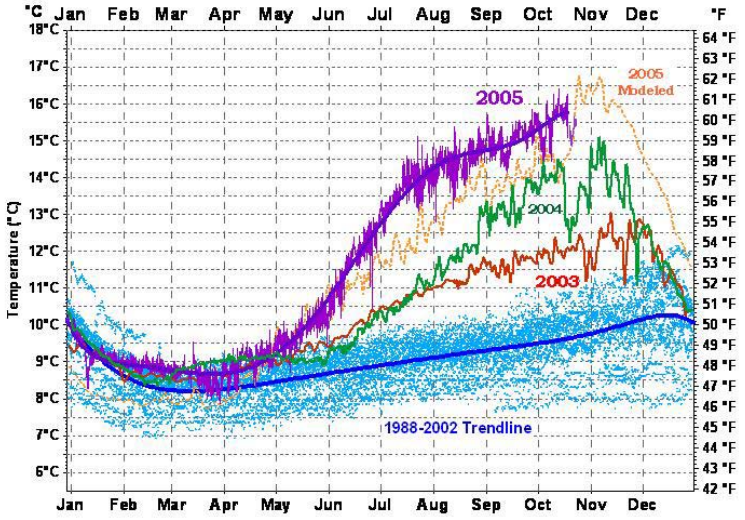


Figure created by Susan Hueftle (USGS)

Figure 11. Mainstem Colorado River water temperature below Glen Canyon Dam. Cloud of points represents 1988 – 2002 water temperatures.

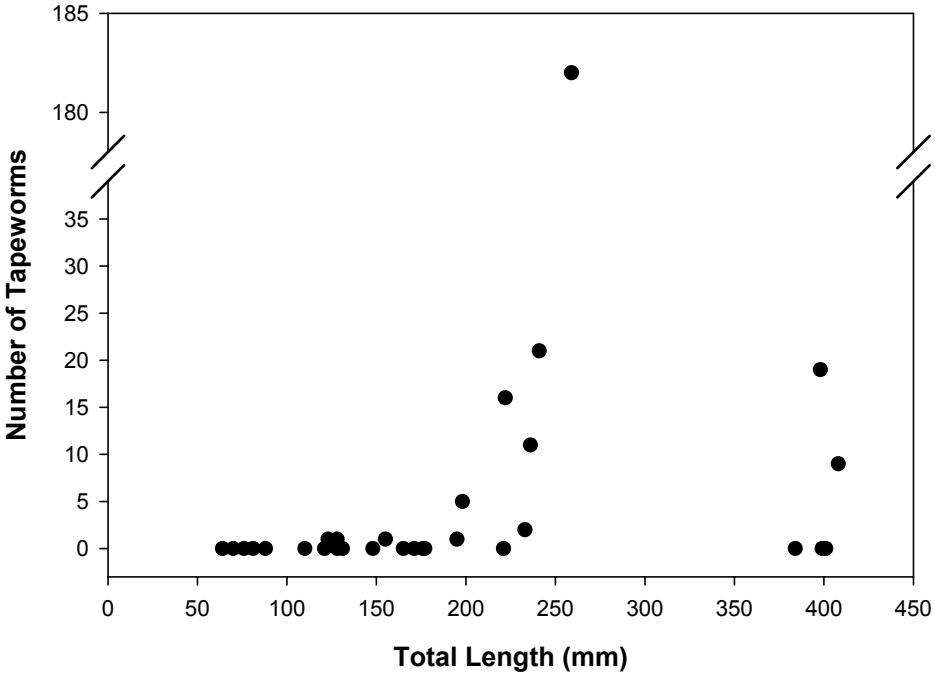


Figure 12. Asian tapeworm removed from Humpback chub in the Little Colorado River in May of 2005 using praziquantel bath treatments.

APPENDIX

2005 Humpback chub recapture summary

Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF195DE7C		HBC	287	5/2/2005	4/28/2005	291	LCR	0.265	-4	3	0
3D9.1BF195E216		HBC	180	4/30/2003	4/29/2003	182	LCR	0.119	-2	1	0
3D9.1BF195E216		HBC	228	4/30/2005	4/30/2003	180	LCR	0.577	48	730	2
3D9.1BF198B465		HBC	199	5/1/2005	4/30/2005	197	LCR	0.119	2	1	0
3D9.1BF198B465		HBC	197	5/2/2005	5/1/2005	199	LCR	0.265	-2	0	0
3D9.1BF198B484		HBC	202	4/15/2005	7/22/2004	168	LCR	1.045	34	266	1
3D9.1BF198B50C	1F7829625E	HBC	233	4/9/1998	4/9/1998	233	LCR	0.1	0	0	0
3D9.1BF198B50C	1F7829625E	HBC	322	1/18/2004	4/9/1998	233	COR		89	2110	6
3D9.1BF198B50C	1F7829625E	HBC	322	1/18/2004	1/18/2004	322	COR		0	0	0
3D9.1BF198B50C	1F7829625E	HBC	337	4/23/2005	1/18/2004	322	LCR	0.48	15	460	1
3D9.1BF198B5A3	43623D2665	HBC	209	8/15/2004	8/19/2003	187	COR		22	362	1
3D9.1BF198B5A3	43623D2665	HBC	208	8/17/2004	8/15/2004	209	COR		-1	1	0
3D9.1BF198B5A3		HBC	225	11/18/2004	8/17/2004	208	COR		17	92	0
3D9.1BF198B5A3		HBC	225	4/19/2005	11/18/2004	225	LCR	0.48	0	152	0
3D9.1BF198B8DB		HBC	254	4/11/2005	5/3/2003	194	LCR	1.11	60	708	2
3D9.1BF198C500		HBC	151	5/1/2005	11/29/2004	152	LCR	0.48	-1	153	0
3D9.1BF198C500		HBC	150	5/2/2005	5/1/2005	151	LCR	0.42	-1	0	0
3D9.1BF198C5CC		HBC	244	4/15/2005	10/26/2003	223	LCR	0.1	21	536	1
3D9.1BF198C72A		HBC	215	9/26/2004	7/17/2004	200	LCR	1.31	15	70	0
3D9.1BF198C72A		HBC	227	5/2/2005	9/26/2004	215	LCR	0.119	12	217	1
3D9.1BF198D64E		HBC	234	4/18/2005	4/5/2003	165	LCR	1.16	69	744	2
3D9.1BF198DE9B	7F7D177013	HBC	397	4/30/2005	8/21/1991	168	LCR	1.195	229	5001	14
3D9.1BF198E68E		HBC	206	4/10/2005	7/19/2003	157	LCR	0.1	49	630	2
3D9.1BF198EA5E		HBC	237	4/19/2005	7/19/2003	154	LCR	0.265	83	639	2
3D9.1BF19937C2		HBC	153	4/30/2005	4/28/2005	153	LCR	0.119	0	1	0
3D9.1BF19937C2		HBC	153	5/1/2005	4/30/2005	153	LCR	0.48	0	1	0
3D9.1BF1A068F2		HBC	227	4/29/2004	4/28/2004	230	LCR	2.1	-3	1	0
3D9.1BF1A068F2		HBC	256	4/26/2005	4/29/2004	227	LCR	1.16	29	361	1
3D9.1BF1A09B06		HBC	210	9/28/2004	9/26/2004	212	LCR	1.25	-2	1	0
3D9.1BF1A09B06		HBC	217	4/19/2005	9/28/2004	210	LCR	0.48	7	202	1
3D9.1BF1A0C148		HBC	193	4/28/2005	9/17/2004	172	LCR	0.48	21	222	1
3D9.1BF1A0C148		HBC	190	4/29/2005	4/28/2005	193	LCR	0.5	-3	0	0
3D9.1BF1A0D17D		HBC	194	10/28/2003	10/28/2003	194	LCR	0.15	0	0	0
3D9.1BF1A0D256		HBC	177	5/1/2005	4/30/2005	176	LCR	0.119	1	0	0
3D9.1BF1A0D52C		HBC	205	4/15/2005	4/4/2004	175	LCR	0.119	30	375	1
3D9.1BF1A0DA19		HBC	203	9/22/2003	9/22/2003	203	LCR	1.3	0	0	0
3D9.1BF1A0DA19		HBC	267	4/11/2005	9/22/2003	203	LCR	0.48	64	566	2
3D9.1BF1A0DA19		HBC	268	4/28/2005	4/11/2005	267	LCR	1.16	1	17	0
3D9.1BF1A0DA19		HBC	267	5/2/2005	4/28/2005	268	LCR	0.577	-1	3	0
3D9.1BF1A0DB69		HBC	188	10/28/2003	10/26/2003	195	LCR	1.33	-7	1	0
3D9.1BF1A0E9CE		HBC	184	4/6/2004	4/24/2003	170	LCR	1.5	14	347	1
3D9.1BF1A0E9CE		HBC	216	4/14/2005	4/6/2004	184	LCR	0.1	32	372	1
3D9.1BF1A0EAB1	7F7D15296A	HBC	314	6/16/1992	4/26/1992	310	LCR		4	50	0
3D9.1BF1A0EAB1	7F7D15296A	HBC	345	5/14/1997	6/16/1992	314	LCR	0.05	31	1793	5
3D9.1BF1A0EAB1	7F7D15296A	HBC	377	9/22/2003	5/14/1997	345	LCR	1.1	32	2321	6
3D9.1BF1A0EAB1	7F7D15296A	HBC	377	9/22/2003	9/22/2003	377	LCR	1.1	0	0	0

Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF1A0EAB1	7F7D15296A	HBC	382	4/15/2005	9/22/2003	377	LCR	0.48	5	570	2
3D9.1BF1A0EAE8		HBC	228	5/1/2005	4/30/2005	228	LCR	0.5	0	1	0
3D9.1BF1A0EEBD		HBC	254	4/27/2005	7/26/2004	225	LCR	0.48	29	274	1
3D9.1BF1A0EEBD		HBC	254	4/28/2005	4/27/2005	254	LCR	0.42	0	1	0
3D9.1BF1A516E5		HBC	207	5/1/2005	9/28/2004	202	LCR	1.16	5	215	1
3D9.1BF1AC4CD0		HBC	211	4/28/2005	4/27/2005	209	LCR	1.045	2	0	0
3D9.1BF1AC594C		HBC	160	4/16/2004	4/15/2004	240	LCR	1.045	-80	0	0
3D9.1BF1AC5BB0		HBC	160	4/12/2004	4/12/2004	160	LCR	1.11	0	0	0
3D9.1BF1AC5BB0		HBC	217	10/20/2004	4/12/2004	160	LCR	4.12	57	191	1
3D9.1BF1AC5BB0		HBC	217	10/20/2004	10/20/2004	217	LCR	4.12	0	0	0
3D9.1BF1AC5BB0		HBC	214	4/13/2005	10/20/2004	217	LCR	1.11	-3	174	0
3D9.1BF1AC5BB0		HBC	214	4/14/2005	4/13/2005	214	LCR	1.11	0	1	0
3D9.1BF1AC5BB0		HBC	215	4/21/2005	4/14/2005	214	LCR	1.11	1	6	0
3D9.1BF1AC5BB0		HBC	215	4/27/2005	4/21/2005	215	LCR	1.045	0	6	0
3D9.1BF1AC5BB0		HBC	215	5/1/2005	4/27/2005	215	LCR	1.045	0	3	0
3D9.1BF1CD2950		HBC	183	5/2/2005	4/20/2005	180	LCR	1.045	3	12	0
3D9.1BF1CD2EE0	7F7F0D1870	HBC	325	6/11/1993	3/9/1993	323	LCR		2	93	0
3D9.1BF1CD2EE0	7F7F0D1870	HBC	384	4/10/2002	6/11/1993	325	LCR	7.9	59	3225	9
3D9.1BF1CD2EE0	7F7F0D1870	HBC	385	5/19/2004	4/10/2002	384	COR	96.78135	1	770	2
3D9.1BF1CD2EE0	7F7F0D1870	HBC	385	5/19/2004	5/19/2004	385	COR	96.78135	0	0	0
3D9.1BF1CD2EE0	7F7F0D1870	HBC	389	4/13/2005	5/19/2004	385	LCR	0.48	4	328	1
3D9.1BF1CD3D14		HBC	188	4/28/2005	4/27/2005	187	LCR	1.045	1	0	0
3D9.1BF1CD421B		HBC	202	4/29/2004	4/28/2004	204	LCR	2.8	-2	1	0
3D9.1BF1CD4663		HBC	272	4/14/2005	10/23/2004	269	LCR	0.265	3	172	0
3D9.1BF1D894A1		HBC	221	4/29/2005	10/22/2004	216	LCR	0.577	5	189	1
3D9.1BF1D894A1		HBC	222	5/1/2005	4/29/2005	221	LCR	0.5	1	2	0
3D9.1BF1D894A1		HBC	222	5/2/2005	5/1/2005	222	LCR	0.265	0	0	0
3D9.1BF1E9BA5B		HBC	150	10/23/2004	10/19/2004	150	LCR	2.4	0	3	0
3D9.1BF1E9BA5B		HBC	150	10/24/2004	10/23/2004	150	LCR	2.5	0	0	0
3D9.1BF1E9BA5B		HBC	145	4/17/2005	10/24/2004	150	LCR	1.11	-5	175	0
3D9.1BF229EBB3	53207D4B02	HBC	208	4/22/2005	9/18/1999	130	LCR	0.265	78	2042	6
3D9.1BF22A7943		HBC	180	4/18/2005	4/17/2005	178	LCR	0.1	2	0	0
3D9.1BF22A7943		HBC	180	4/19/2005	4/18/2005	180	LCR	0.42	0	1	0
3D9.1BF22A7AF2	7F7D153331	HBC	280	2/15/1992	5/24/1991	278	LCR		2	266	1
3D9.1BF22A7AF2	7F7D153331	HBC	294	3/5/1993	2/15/1992	280	LCR	0.44	14	384	1
3D9.1BF22A7AF2	7F7D153331	HBC	290	3/8/1993	3/5/1993	294	LCR	0.2	-4	2	0
3D9.1BF22A7AF2	7F7D153331	HBC	308	3/19/1994	3/8/1993	290	LCR	1.26	18	376	1
3D9.1BF22A7AF2	7F7D153331	HBC	357	4/12/2005	3/19/1994	308	LCR	1.11	49	4042	11
3D9.1BF22A7B67		HBC	208	4/20/2005	4/19/2005	208	LCR	0.48	0	0	0
3D9.1BF22A7B67		HBC	208	4/21/2005	4/20/2005	208	LCR	0.5	0	1	0
3D9.1BF22A7EBF		HBC	205	4/21/2005	4/19/2005	203	LCR	1.11	2	2	0
3D9.1BF22A83DD		HBC	238	4/18/2005	4/17/2005	238	LCR	0.48	0	1	0
3D9.1BF22A9071		HBC	195	4/19/2005	4/18/2005	195	LCR	0.42	0	0	0
3D9.1BF22A9071		HBC		4/21/2005	4/19/2005	195	LCR	0.48	-195	2	0
3D9.1BF22A9789		HBC	242	5/1/2005	4/19/2005	242	LCR	0.48	0	12	0
3D9.1BF22BEDEB		HBC	226	4/19/2005	4/19/2005	229	LCR	0.5	-3	0	0
3D9.1BF22D434E	42421C526B	HBC	212	4/24/2005	4/16/2005	212	LCR	1.16	0	8	0
3D9.1BF22D537F		HBC	176	4/24/2005	4/23/2005	175	LCR	0.5	1	1	0
3D9.1BF22D57A8	7F7D505A35	HBC	378	4/14/2005	5/4/1994	345	LCR	1.195	33	3997	11

Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF22D592C		HBC	185	5/1/2005	4/24/2005	185	LCR	1.045	0	7	0
3D9.1BF22E3DE4		HBC	225	4/17/2005	4/16/2005	227	LCR	0.48	-2	1	0
3D9.1BF22E3E2C		HBC	219	4/15/2005	4/14/2005	219	LCR	0.48	0	0	0
3D9.1BF22E3E2C		HBC	219	4/17/2005	4/15/2005	219	LCR	0.265	0	2	0
3D9.1BF22E7A6F		HBC	186	4/19/2005	4/16/2005	187	LCR	0.48	-1	2	0
3D9.1BF22E7AB3	7F7D7C3613	HBC	326	3/2/1995	3/24/1993	305	LCR	0.4	21	707	2
3D9.1BF22E7AB3	7F7D7C3613	HBC	349	5/2/1998	3/2/1995	326	LCR	3.1	23	1156	3
3D9.1BF22E7AB3	7F7D7C3613	HBC	368	5/3/2002	5/2/1998	349	LCR	0.119	19	1461	4
3D9.1BF22E7AB3	7F7D7C3613	HBC	370	5/2/2003	5/3/2002	368	LCR	2.65	2	363	1
3D9.1BF22E7AB3	7F7D7C3613	HBC	370	4/15/2005	5/2/2003	370	LCR	0.48	0	713	2
3D9.1BF22E7CC8	7F7D2B322D	HBC	392	4/16/1995	3/27/1993	394	LCR	10.12	-2	749	2
3D9.1BF22E7CC8	7F7D2B322D	HBC	387	5/6/2001	4/16/1995	392	LCR	1.75	-5	2211	6
3D9.1BF22E7CC8	7F7D2B322D	HBC	389	4/27/2002	5/6/2001	387	LCR	0.1	2	356	1
3D9.1BF22E7CC8	7F7D2B322D	HBC	390	4/23/2005	4/27/2002	389	LCR	1.16	1	1092	3
3D9.1BF22E7F48		HBC	162	4/24/2005	4/23/2005	162	LCR	0.265	0	1	0
3D9.1BF22E7F48		HBC	163	4/26/2005	4/24/2005	162	LCR	0.577	1	2	0
3D9.1BF22E7FB6		HBC	261	4/17/2005	4/16/2005	262	LCR	0.42	-1	1	0
3D9.1BF22F3B7E	42421B043D	HBC	260	4/21/2005	4/16/2002	131	LCR	0.1	129	1100	3
3D9.1BF22F3E58		HBC	162	4/18/2005	4/16/2005	165	LCR	1.11	-3	2	0
3D9.1BF22F3E58		HBC	165	4/21/2005	4/18/2005	162	LCR	1.11	3	2	0
3D9.1BF22F41D3	7F7F332746	HBC	388	4/6/2004	11/3/1992	360	LCR	1.5	28	4171	11
3D9.1BF22F41D3	7F7F332746	HBC	387	4/14/2005	4/6/2004	388	LCR	1.11	-1	372	1
3D9.1BF22F421D		HBC	163	4/27/2005	4/25/2005	165	LCR	1.195	-2	2	0
3D9.1BF22F4845	424222201C	HBC	266	4/15/2005	6/10/2001	194	LCR	0.1	72	1404	4
3D9.1BF22F4845		HBC	268	4/17/2005	4/15/2005	266	LCR	0.42	2	2	0
3D9.1BF22F4845		HBC	266	4/19/2005	4/17/2005	268	LCR	1.16	-2	2	0
3D9.1BF22F4C9A		HBC	235	4/14/2005	4/13/2005	235	LCR	0.265	0	1	0
3D9.1BF22F5025	7F7D180530	HBC	372	4/19/1995	6/5/1991	350	LCR	6.5	22	1414	4
3D9.1BF22F5025	7F7D180530	HBC	384	4/24/1996	4/19/1995	372	LCR	1.07	12	371	1
3D9.1BF22F5025	7F7D180530	HBC	412	5/6/2003	4/24/1996	384	COR	98.4708	28	2567	7
3D9.1BF22F5025	7F7D180530	HBC	425	4/12/2005	5/6/2003	412	LCR	1.195	13	706	2
3D9.1BF22F5389	43471A7762	HBC	171	10/6/2001	10/4/2001	173	LCR	12.1	-2	2	0
3D9.1BF22F5389	43471A7762	HBC	292	4/14/2005	10/6/2001	171	LCR	1.195	121	1286	4

2005 Flannelmouth sucker recapture summary

Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF198B48A		FMS	300	4/18/2005	3/13/2004	230	LCR	0.5	70	400	1
3D9.1BF198B619		FMS	326	4/22/2005	7/26/2003	166	LCR	1.195	160	635	2
3D9.1BF198B7A8		FMS	265	7/25/2003	5/16/2002	165	COR		100	434	1
3D9.1BF198B7A8	426D766F19	FMS	369	6/14/2004	7/25/2003	265	COR	102.8151	104	325	1
3D9.1BF198B7A8	426D766F19	FMS	369	6/14/2004	6/14/2004	369	COR	102.8151	0	0	0
3D9.1BF198B7A8	426D766F19	FMS	410	4/16/2005	6/14/2004	369	LCR	0.48	41	305	1
3D9.1BF198B827		FMS	380	4/18/2005	7/24/2003	236	LCR	0.48	144	633	2
3D9.1BF198C1DF		FMS	310	4/29/2004	2/15/2004	270	LCR	2.1	40	73	0
3D9.1BF198C1DF		FMS	297	5/3/2004	4/29/2004	310	COR	100.4016	-13	4	0
3D9.1BF198C1DF		FMS	379	4/23/2005	5/3/2004	297	LCR	0.577	82	354	1
3D9.1BF198CE55		FMS	429	4/25/2005	6/17/2003	293	LCR	0.42	136	677	2
3D9.1BF198EB04		FMS	438	4/17/2005	9/16/2004	428	LCR	0.265	10	212	1
3D9.1BF198ECD7		FMS	338	4/10/2005	8/16/2003	177	LCR	0.577	161	602	2
3D9.1BF198F207		FMS	305	8/18/2004	9/17/2003	231	COR		74	336	1
3D9.1BF198F207		FMS	348	4/26/2005	8/18/2004	305	LCR	0.265	43	250	1
3D9.1BF198F55E		FMS	344	7/25/2004	8/17/2003	278	COR		66	342	1
3D9.1BF198F55E		FMS	365	4/16/2005	7/25/2004	344	LCR	0.48	21	264	1
3D9.1BF198FBEA		FMS	152	5/1/2003	5/1/2003	152	LCR	1.16	0	0	0
3D9.1BF198FBEA		FMS	343	4/12/2005	5/1/2003	152	LCR	0.48	191	711	2
3D9.1BF198FBEA		FMS	340	4/19/2005	4/12/2005	343	LCR	0.577	-3	6	0
3D9.1BF19925AE		FMS	210	4/27/2005	4/26/2005	207	LCR	0.42	3	0	0
3D9.1BF1993CAF		FMS	430	4/16/2005	4/12/2004	362	LCR	1.195	68	369	1
3D9.1BF19FA77F		FMS	217	4/24/2005	4/28/2004	156	LCR	1.16	61	361	1
3D9.1BF1A035E1		FMS	205	4/17/2005	4/29/2004	153	LCR	0.265	52	352	1
3D9.1BF1A035E1		FMS	203	4/18/2005	4/17/2005	205	LCR	0.42	-2	1	0
3D9.1BF1A0D17D		FMS	207	11/1/2003	10/28/2003	194	COR		13	4	0
3D9.1BF1A0D17D		FMS	207	11/1/2003	11/1/2003	207	COR		0	0	0
3D9.1BF1A0D17D		FMS	289	11/20/2004	11/1/2003	207	COR		82	384	1
3D9.1BF1A0D17D		FMS	289	11/20/2004	11/20/2004	289	COR		0	0	0
3D9.1BF1A0D17D		FMS	300	4/16/2005	11/20/2004	289	LCR	0.48	11	147	0
3D9.1BF1A0D17D		FMS	297	4/17/2005	4/16/2005	300	LCR	0.5	-3	1	0
3D9.1BF1A0D4AF		FMS	200	9/14/2004	7/23/2004	172	COR		28	52	0
3D9.1BF1A0D4AF		FMS	199	9/19/2004	9/14/2004	200	COR		-1	4	0
3D9.1BF1A0D4AF		FMS	225	4/20/2005	9/19/2004	199	LCR	0.48	26	213	1
3D9.1BF1A0DB69		FMS	275	4/27/2005	10/28/2003	188	LCR	0.42	87	547	1
3D9.1BF1A0E71B		FMS	196	4/22/2003	4/21/2003	197	LCR	0.119	-1	0	0
3D9.1BF1A0E71B		FMS	196	4/25/2003	4/22/2003	196	LCR	0.119	0	3	0
3D9.1BF1A0E71B		FMS	196	4/27/2003	4/25/2003	196	LCR	0.119	0	2	0
3D9.1BF1A0E71B		FMS	229	7/20/2003	4/27/2003	196	COR		33	84	0
3D9.1BF1A0E71B		FMS	298	4/19/2004	7/20/2003	229	LCR	0.119	69	273	1
3D9.1BF1A0E71B		FMS	382	4/19/2005	4/19/2004	298	LCR	0.5	84	364	1
3D9.1BF1A0E9C1		FMS	428	4/24/2005	4/22/2003	250	LCR	1.045	178	733	2
3D9.1BF1A0F09E		FMS	213	4/18/2005	11/19/2004	205	LCR	0.13	8	149	0
3D9.1BF1A0F1CE		FMS	242	4/18/2005	7/28/2004	199	LCR	0.42	43	264	1
3D9.1BF1AC4E6F		FMS	330	4/23/2005	4/24/2003	175	LCR	0.42	155	729	2
3D9.1BF1AC594C		FMS	338	4/19/2005	4/12/2005	205	LCR	0.265	133	6	0
3D9.1BF1AC59BC		FMS	314	4/19/2004	4/18/2003	210	LCR	0.137	104	366	1
3D9.1BF1AC59BC		FMS	372	4/22/2005	4/19/2004	314	LCR	0.42	58	367	1

Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF1CD32B5		FMS	207	4/26/2005	9/17/2004	172	LCR	0.5	35	220	1
3D9.1BF1CD421B		FMS	228	4/19/2005	4/29/2004	202	LCR	0.265	26	354	1
3D9.1BF1CD54ED	42424C6A5D	FMS	417	9/13/2004	6/7/2001	132	COR		285	1194	3
3D9.1BF1CD54ED	42424C6A5D	FMS	417	9/13/2004	9/13/2004	417	COR		0	0	0
3D9.1BF1CD54ED	42424C6A5D	FMS	437	4/17/2005	9/13/2004	417	LCR	0.577	20	215	1
3D9.1BF22BEC01	423F0D1254	FMS	232	9/1/2001	8/31/2001	234	COR	99.2753	-2	0	0
3D9.1BF22BEC01	423F0D1254	FMS	334	4/12/2003	9/1/2001	232	LCR	0.42	102	588	2
3D9.1BF22BEC01	423F0D1254	FMS	446	4/15/2005	4/12/2003	334	LCR	0.577	112	733	2
3D9.1BF22D4B26	43624F2618	FMS	347	4/28/2003	2/16/2003	325	LCR	1.195	22	70	0
3D9.1BF22D4B26	43624F2618	FMS	500	4/14/2005	4/28/2003	347	LCR	0.577	153	716	2
3D9.1BF22D5AA7		FMS	458	4/18/2005	4/18/2005	458	LCR	0.13	0	0	0
3D9.1BF22F41D5		FMS	335	4/21/2005	4/12/2005	330	LCR	0.5	5	8	0

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Tag Number	Old Tag Number	Species	TL	Recapture Date	Initial Tag Date	TL	RIVER	RKM	Delta TL	Days out	Years out
3D9.1BF1993E5A		BHS	240	4/15/2005	4/4/2004	228	LCR	1.195	12	375	1
3D9.1BF19F9319		BHS	251	4/24/2005	5/2/2004	216	LCR	1.16	35	357	1
3D9.1BF1AC52EB		BHS	220	4/24/2005	8/16/2004	217	LCR	1.16	3	250	1
3D9.1BF1AC594C		BHS	205	4/12/2005	4/16/2004	160	LCR	0.48	45	361	1
3D9.1BF1CD3DF4		BHS	240	4/17/2005	4/10/2005	188	LCR	0.265	52	6	0
3D9.1BF1E91D02		BHS	313	4/13/2005	4/26/2004	295	LCR	1.16	18	351	1
3D9.1BF1E99759		BHS	258	4/16/2005	4/15/2005	257	LCR	1.195	1	1	0
3D9.1BF22A7CC2		BHS	220	4/18/2005	4/17/2005	220	LCR	1.16	0	1	0
3D9.1BF22A849F		BHS	222	4/17/2005	4/16/2005	224	LCR	1.16	-2	1	0
3D9.1BF22A8A67		BHS	228	4/19/2005	4/18/2005	227	LCR	1.195	1	1	0
3D9.1BF22A91CB		BHS	220	4/15/2005	4/13/2005	215	LCR	1.16	5	2	0
3D9.1BF22A9951		BHS	227	4/25/2005	4/18/2005	231	LCR	1.16	-4	7	0
3D9.1BF22BF368		BHS	197	4/22/2005	4/21/2005	195	LCR	1.16	2	0	0
3D9.1BF22D434E		BHS	212	4/16/2005	6/10/2001	104	LCR	1.11	108	1406	4
3D9.1BF22D4DFE		BHS	235	4/16/2005	4/15/2005	234	LCR	1.195	1	1	0
3D9.1BF22E82B9		BHS		4/17/2005	4/16/2005	210	LCR	1.11	-210	1	0
3D9.1BF22F5607		BHS	230	4/25/2005	4/24/2005	231	LCR	1.195	-1	0	0