

**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT 1 - 1992
January 7, 1992 - January 26, 1992**

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INTRODUCTION

This report presents pertinent details associated with Trip 1, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results. We would again like to emphasize that these data are hand tabulated immediately upon their transfer to the data department and are subject to change upon further accuracy review. It is our goal to provide information from BIO/WEST trips as quickly as possible to aid other researchers.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 1, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 1, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 1, 1992. Table 4 is a summary of all humpback chubs handled during Trip 1, 1992. Table 5 presents information on all humpback chubs implanted with radiotransmitters during Trip 1, 1992. Table 6 summarizes the radio contacts during Trip 1, 1992 and presents original fish release locations and radiotag data.

Humpback Chubs Captured

A total of 61 humpback chub were handled during Trip 1, 1992. Of these fish, 22 were YOY (TL \leq 125 mm), 12 were juveniles (TL $>$ 125 and $<$ 200 mm), and 27 were adults (TL \geq 200 mm). The break point of 125 mm TL for YOY fish has been determined from analysis of length frequency data collected during 1990 and 1991 research trips. A fish with a total length of 125 mm or less will be considered a young-of-the-year from November of the spawned year through April of the next year. All humpback chubs were captured in Reach 1. No humpback chubs were captured in Reach 2 or 3. Of the 34 YOY and juvenile humpback chubs captured in Reach 1, 32 were captured by electrofishing, 2 were captured in minnow traps, and none were caught in gill or trammel nets.

All fish appeared robust and in good condition. All fish were released alive and in good condition.

Radiotelemetry

Five humpback chubs were implanted with radio transmitters during Trip 1, 1992. Three of these fish were implanted using midline incisions and 2 using lateral incisions.

One fish implanted during the September trip and two fish implanted during the November, 1991 trip were recontacted briefly during surveillance runs very late in the night. Extended observation of the behavior of these fish was not possible due to the scarcity of contacts.

One radio-tagged fish implanted during a previous trip was recaptured during Trip 1, 1992. Overall, the fish was in good condition. The mid-line incision was well-healed; three sutures had completely

dissolved, and one suture (posterior on incision) was still in place. There was some swelling and pustulation around the suture. The antenna exit was in poor condition. There was both mechanical damage of tissue and tissue necrosis around the opening. However, there was no sign of infection and the general health of the fish appeared to be good. Two maxon sutures were removed from the fish. Since the radio tag was not operating the antenna was clipped and the fish released.

The omnidirectional remote telemetry station located at RM 60.5 was checked and downloaded twice during during Trip 1, 1992. The first download was conducted on 1/14/92. It was discovered at that time that the data file and initialization of the data logging computer had been scrambled. Electrical surges caused by static discharge through the antenna is suspected as the cause for the problem. All data collected since the station was last downloaded on November 13 were lost. The batteries at the station were also found in a state of discharge. It is suspected that inadequate solar radiation reaches the solar panel to maintain a charge in the two 12 volt batteries that power the station. New batteries were installed in the station and it was re-activated on 1/14.

Habitat Mapping

Two reaches of river within Reach 1 were mapped in relation to macrohabitat for adult humpback chub. These two sites were located @ RM 60.8 and RM 64.5. A total station was established for each site. Depth and velocity were mapped in each area. Surface habitat features were also recorded and substrate and cover delineated where possible. Data will be used to generate bathometric contours and velocity isopleths for each area. Mapping results will be assimilate with telemetry data and capture information in the area.

Bench Marks

One new benchmark was established during Trip 1, 1992. The bench mark was located on river left at RM 61.1. The benchmark was used to tie in the camp staff gage.

OBSERVATIONS

1. Numbers of adult humpback chubs captured during Trip 1, 1992 were low as compared to Trip 1, 1991 (81 vs 27) with a comparable effort.
2. Recontact success of radio-tagged humpback chub was low during Trip 1, 1992. This is consistent with low netting catch rates and suggests low levels of near-surface activity of humpback chub during the field trip. This low contact success was consistent over a range of turbidity levels (high to low). This observation is inconsistent with results of telemetry work in 1991 indicated that success of recontact was significantly higher during periods of high turbidity. It is hypothesized that behavior of radio-tagged fish may be different this January as compared to last because of the more stable environment created by the interim flows.
3. No humpback chub were captured above Kwagunt Rapid. This is consistent with observations in November 1992, and suggests the upstream limit for dispersal of adult humpback chub may be around Kwagunt Rapid. However, it is likely that upper limits of dispersal may vary from year to year.
4. One adult humpback chub was captured in eddies above Tanner rapid during Trip 1, 1992. This suggests that the lower limit of dispersal of adult humpback chubs in Reach one may extend down stream to at least Tanner rapid, but densities are very low as compared to areas above Lava Chaur rapid.
5. Four juvenile and YOY humpback chubs were also captured in eddies above Tanner rapid. The capture of these fish in addition to the 17 juvenile and YOY chubs captured in the area in November, suggests that habitat in the area may be suitable for holding these fish under flows that have occurred during the last 3 months.
6. Ripe, spawning rainbow and brown trout were collected from Shinumo Creek. Only occasionally were trout seen spawning in the mainstem river.
7. No spawning fish were observed at Nankowep Creek on January 9, 1992. Three spawning rainbow trout were seen at Crystal Creek and two at Deer Creek.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Habitat mapping of adult chub macrohabitat took more time than anticipated (approximately one extra day). Analysis of bathometric and velocity data suggest that a 50% reduction in the number of data points collected would result in only a small reduction in resolution associated with final mapping efforts. A 50% reduction in the number of points will substantially reduce field efforts associated with generating maps.
2. Approximately two months of data from the omni-directional remote telemetry station at RM 60.5 were lost. The data files were discovered to be scrambled during downloading attempts in January. Power surges caused by static discharges transmitted through the antenna is suspected. The possibility of developing an in-line surge protector for the antenna feed is still being investigated.
3. The Hydrolab sonde unit malfunctioned on the first night of data collection. We were unable to repair the unit despite several hours of repair work. Later in the trip the unit began working and data for several sites was recorded.
4. One Yamaha generator failed during electrofishing. A problem with the 220 volt output was discovered and the back-up generator had to be used. The malfunctioning unit was labeled to be repaired by the distributor.

RECOMMENDATIONS

1. Sampling above Kwagunt Rapid and below Lava Chaur rapid will not be conducted during the March Trip.
2. Only male humpback chubs will be implanted during Trip 3, 1992 (March).
3. At least one additional reach will be mapped for macro-habitat during March.
4. The omni-directional remote telemetry station will be disassembled in February and the two directional stations will be re-established.

Table 1. Logistics and Research Schedule for Trip #92-01, Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
010892	31.0	Above South Canyon	X			
010992	55.0	Above Kwagunt	X		X	X
011092	55.0	Above Kwagunt		X	X	X
011192	59.7	Above 60 mile	X	X	X	X
011292	59.7	Above 60 mile		X	X	X
011392	61.2	LCR	X	X	X	X
011492	61.2	LCR		X	X	X
011592	61.2	LCR		X	X	X
011692	61.2	LCR		X	X	X
011792	61.2	LCR		X	X	X
011892	64.5	Lava Chuar	X	X	X	X
011992	64.5	Lava Chuar		X	X	X
012092	64.5	Lava Chuar		X	X	X
012192	64.5	Lava Chuar		X	X	X
012292	93.5	Granite	X			
012392	132.0	Stone Creek	X			
012492	168.0	Fern Glen	X			
012592	219.9	220 Canyon	X			
012692	225.5	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1. Logistics and Research Schedule for Trip 92-01, Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
010892			X			
010992	68.3	Tanner	X	X		X
011092	68.3	Tanner		X		
011192	98.7	Crystal Creek	X	X		
011292	98.7	Crystal Creek		X		
011392	108.4	Lower Bass	X	X		
011492	108.4	Lower Bass		X		
011592	108.4	Lower Bass		X		
011692	120.0	Blacktail	X	X		
011792	120.0	Blacktail		X		
011892	166.6	National Canyon	X	X		
011992	166.6	National Canyon		X		
012092	177.7	Vulcan's Anvil	X	X		
012192	177.7	Vulcan's Anvil		X		
012292	214.0	214 Canyon	X	X		
012392	214.0	214 Canyon		X		X
012492	219.9	220 Canyon	X	X		
012592	219.9	220 Canyon		X		
012692	225.5	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 92-01.

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #1			
B. Masslich	BIO/WEST	1/13 - 1/22	Project Leader
T. Wasowicz	BIO/WEST	1/8 - 1/22	Senior Biologist
H. Yard	BIO/WEST	1/8 - 1/22	Out Bright Angel
P. Weiss	BIO/WEST	1/8 - 1/26	
B. Cowdell	BIO/WEST	1/13 - 1/22	Out Bright Angel
C. Carrier	BIO/WEST	1/8 - 1/15	Out Tanner
K. Karas	BOR	1/8 - 1/15	Out Tanner
A. Hayden	GCES	1/8 - 1/26	
M. Yard	GCES	1/13 - 1/22	Out Bright Angel
M. Gonzalez	GCES	1/15 - 1/22	Heli. In, Out BA
F. Protiva	GCES	1/15 - 1/22	Heli. In, Out BA
L. Blufuss	OARS	1/8 - 1/26	
A. Cassidy	OARS	1/8 - 1/26	
K. Smith	OARS	1/8 - 1/26	
TEAM #2			
B. Leibfried	BIO/WEST	1/8 - 1/26	Project Leader
G. Hardwick	BIO/WEST	1/8 - 1/26	
R. VanHaverbeke	BIO/WEST	1/8 - 1/26	Senior Biologist
B. Ellwanger	BIO/WEST	1/8 - 1/26	Boatman/Biologist
J. Korn	BIO/WEST	1/8 - 1/18	Out Havasu
P. Zurk	BIO/WEST	1/18 - 1/26	In Havasu
P. Lauck	BIO/WEST	1/18 - 1/26	
K. Grady	BIO/WEST	1/8 - 1/26	B/W Volunteer
J. Mansour	BIO/WEST	1/8 - 1/26	B/W Volunteer
S. Reeter	OARS	1/8 - 1/26	

S. Bledsoe	OARS	1/8 - 1/26	
C. Krznarich	OARS	1/8 - 1/26	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	4	0	0	0	210	3	0	7	7	0	6	0
EL	J	12	2	2	20	0	0	0	1	2	0	1	0
N=59	Y	20	0	0	0	0	0	0	0	0	0	0	0
19.72 hr													
Reach 2	A	0	4	0	0	191	67	0	67	0	0	0	0
EL	J	0	0	0	4	4	4	0	0	0	0	0	0
N=36	Y	0	0	0	0	0	0	0	0	0	0	0	0
15.6 hr													
Reach 3	A	0	2	0	2	2	2	0	54	3	0	1	1
EL	J	0	4	0	0	0	0	0	0	0	0	0	0
N=26	Y	0	0	0	0	0	0	0	0	0	0	0	0
14.5 hr													
Reach 1	A	5	2	0	0	24	0	1	1	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=32	Y	0	0	0	0	0	0	0	0	0	0	0	0
64 hr													
Reach 2	A	0	2	0	0	0	0	0	2	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=52	Y	0	0	0	0	0	0	0	0	0	0	0	0
104 hr													
Reach 3	A	0	4	1	0	0	0	3	6	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=73	Y	0	0	0	0	0	0	0	0	0	0	0	0
146 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

1	2	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	6	0	0	14	0	0	0	0	0	0	0
TK	J	0	1	0	0	0	0	0	0	0	0	0
N=25	Y	0	0	0	0	0	0	0	0	0	0	0
50 hr												
Reach 2	A	0	0	0	6	2	0	1	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0
N=45	Y	0	0	0	0	0	0	0	0	0	0	0
90 hr												
Reach 3	A	0	1	1	0	0	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0
N=30	Y	0	0	0	0	0	0	0	0	0	0	0
60 hr												
Reach 1	A	8	12	0	7	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0
N=47	Y	0	0	0	0	0	0	0	0	0	0	0
94 hr												
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0
N=10	Y	0	0	0	0	0	0	0	0	0	0	0
20 hr												
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0
N=7	Y	0	0	0	0	0	0	0	0	0	0	0
14 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	2	1	2	21	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=31	Y	0	0	0	0	0	0	0	0	0	0	0	0
62 hr													
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=19	Y	0	0	0	0	0	0	0	0	0	0	0	0
38 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=13	Y	0	0	0	0	0	0	0	0	0	0	0	0
26 hr													
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0	0
18 hr													
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=18	Y	0	0	0	0	0	0	0	0	0	0	0	0
36 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0	0
12 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	0	0	0	3	0	0	0	0	0	0	0
GZ	J	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0
10 hr												
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0
MT	J	0	0	0	0	0	0	0	0	0	0	0
N=70	Y	2	0	0	0	0	0	0	0	0	0	0
1715 hr												
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0
MT	J	0	0	0	0	0	0	0	0	0	0	0
N=12	Y	0	0	0	0	0	0	0	0	0	0	0
488.1												
Reach 2	A	0	0	0	3	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0
N=8	Y	0	0	0	0	0	0	0	0	0	0	0
16 hr												
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0
4 hr												
Reach 1	A	1	1	0	3	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=4	Y	0	0	0	0	0	0	0	0	0	0	0
8 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

	¹	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 2	A	1	0	0	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0
18 hr												
Reach 3	A	0	0	0	0	0	0	2	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=21	Y	0	0	0	0	0	0	0	0	0	0	0
42 hr												
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0
HL	J	0	0	0	0	0	0	0	0	0	0	0
N=1	Y	0	0	0	0	0	0	0	0	0	0	0
22.5 hr												
Reach 1	A	27	16	2	282	3	1	8	7	0	6	0
	J	12	3	2	20	0	0	1	2	0	1	0
	Y	22	0	0	0	0	0	0	0	0	0	0
TOTAL												
Reach 2	A	0	6	0	200	69	0	70	0	0	0	0
	J	0	0	0	4	4	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL												
Reach 3	A	0	7	2	2	2	3	62	3	0	1	1
	J	0	4	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 92-01. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
	A	27	29	4	484	74	4	140	10	0	7	1
	J	12	7	2	24	4	0	1	2	0	1	0
TOTALS	Y	22	0	0	0	0	0	0	0	0	0	0

¹. Gear Types

- EL = Electrofishing
- TL = 75'x6'x1 1/2"x12" trammel net
- TK = 75'x5'x1"x12" trammel net
- GM = 10'x6'x2" gill net
- GP = 100'x6'x1 1/2" gill net
- GX = 100', 2" to 1/2" @ 1/2" increment, experimental gill net
- HL = Large hoop net (4' diameter)
- HS = Small hoop net (2' diameter)
- GZ = 60', 2" to 1/2" @ 1/2" increment, experimental gill net
- TN = 50'x6'x1 1/2"x12" trammel net
- TM = 50'x6'x1"x12" trammel net

² - A = Adult

- J = Juvenile
- Y = Young of year

³ - HB = humpback chub

- FM = flannelmouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace
- BK = brook trout
- FH = fathead
- FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip 1, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
1	920109	E	02		N		78	2	RA	68.5
2	920109	E	02		N		85	2	RA	68.5
3	920110	E	06		N		61	1	RA	68.5
4	920110	E	06		N		52	1	RA	68.5
5	920111	N	30	7F7F3E663A	N		237	146	RA	68.3
6	920111	N	27	7F7F272652	N		261	139	RA	58.90
7	920111	N	29	7F7E431037	N		372	556	RI	58.30
8	920112	N	36	7F7D164549	Y	PITTAG	396	605	RA	59.50
9	920112	N	36	7F7F3E637C	N		362	496	RA	59.50
10	920112	N	36	7F7D026D0F	Y	PITTAG	390	546	RA	59.50
11	920113	N	45	7F7F450D11	Y	PITTAG	360	338	RA	60.20
12	920113	N	52	7F7D2F3B1E	Y	PITTAG	287	224	RA	60.50
13	920113	N	54	7F7D140108	Y	PITTAG	415	728	RI	60.70
14	920113	N	54	7F7D086032	Y		431	696	RN	60.70
15	920113	N	21	7F7F3E501C	N		381	494	RA	60.20
16	920113	E	22	7F7E432514	N		451	959	RI	60.45
17	920114	E	30	--	N		88	6	RA	61.10
18	920114	N	60	7F7E430D1E	Y	034CY ^b	417	699	RI	60.80
19	920114	N	64	7F7E430D1E	Y	PITTAG	417	699	RR	60.80

Table 4. Summary of Humpback Chub handled during Trip 1, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
20	920115	E	33	--	N		151	22	RA	61.10
21	920115	E	33	7F7D2B1D78	Y	PITTAG	162	33	RA	61.10
22	920115	E	34	7F7F26116A	Y	PITTAG	275	159	RA	61.10
23	920115	E	34	7F7D086C43	Y	PITTAG	397	524	RA	61.10
24	920115	E	34	7F7F19033D	N		171	45	RA	61.10
25	920115	N	69	7F7F395538	N		324	373	RA	61.80
26	920115	N	70	7F7F450C5C	Y	PITTAG	393	701	RA	62.20
27	920115	N	70	7F7F217D50	N		364	422	RA	62.20
28	920115	N	74	7F7F217C57	N		420	665	RA	62.20
29	920116	N	81	7F7D1B7209	Y	PITTAG	415	600	RA	61.10
30	920116	N	79	-- ^c	N		0	0	RA	60.90
31	920116	T	16	--	N		65	4	RA	61.90
32	920117	E	35	7F7F3E5A17	N		199	64	RA	61.50
33	920117	E	35	--	N		96	7	RA	61.60
34	920118	N	94	7F7F22063F	N		377	561	RA	61.10
35	920118	N	98	7F7F3E232E	Y	PITTAG	367	448	RA	61.10
36	920119	E	41	7F7E432A5B	N	PITTAG	152	31	RA	61.70
37	920119	E	41	7F7E431A1C	N	PITTAG	153	29	RA	61.70
38	920119	E	41	--	N		148	26	RA	61.70

Table 4. Summary of Humpback Chub handled during Trip 1, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
39	920119	E	41	--	N		101	10	RA	61.70
40	920119	E	41	--	N		96	10	RA	61.70
41	920119	E	41	--	N		70	4	RA	61.70
42	920119	E	41	--	N		80	5	RA	61.70
43	920119	E	42	--	N		84	8	RA	64.90
44	920119	E	42	--	N		92	5	RA	64.90
45	920119	N	107	7F7D225677	Y	PITTAG	372	495	RA	64.20
46	920120	E	45	--	N		95	6	RA	63.50
47	920120	E	45	--	N		95	6	RA	63.50
48	920120	E	45	--	N		72	4	RA	63.50
49	920120	E	45	--	N		90	5	RA	63.50
50	920120	E	45	--	N		64	3	RA	63.50
51	920120	E	45	--	N		80	4	RA	63.50
52	920120	E	43	--	N		84	5	RA	64.40
53	920120	E	43	--	N		139	25	RA	64.40
54	920120	E	45	--	N		97	6	RA	63.50
55	920120	E	45	--	N		123	16	RA	63.50
56	920120	E	45	--	N		106	11	RA	63.50
57	920120	E	45	--	N		83	4	RA	63.50

Table 4. Summary of Humpback Chub handled during Trip 1, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
58	920120	E	45	--	N		83	4	RA	63.50
59	920120	T	33	--	N		70	10	RA	64.75
60	920120	N	125	7F7F1E514C	N		396	613	RI	65.30
61	920120	N	129	7F7F29075A	N		336	376	RA	65.30

^aGear Types

EL = Electrofishing

N = Netting

T = Traps

^bSmall Yellow Carlin

^cFish not processed due to stress

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 91-11.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	911107	7F7F456D61	393	710	40.740	80	11	75	920120	58.8	58.0
2	911108	7F7F095814	401	651	40.640	82	11	75	920121	58.8	58.8
3	911109	7F7F21747D	450	999	40.630	62	11	100	920216	60.1	60.1
4	911109	7F7F1F6A79	423	605	40.621	44	11	120	920307	60.1	60.1
5	911112	7F7F21741B	383	557	40.610	83	11	75	920125	64.8	64.8

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7F1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 6. A list of radio frequencies contacted on Trip 1, 1992, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/83 /70 /70 /70 /70 /70	11	911112 920111(1522) 920112(1520) 920113(1315) 920115(1451) 920116(1541)	64.80	64.80	64.78 64.80 64.80 64.80 64.80
¹ 40.650/82 /82	11	920111 920111(2213)	58.30	58.30	58.30
¹ 40.601/61 /80 /80 /62	11	920113 920116(0100) 920117(0055) 920118(0554)	60.45	60.45	60.70 60.70 60.70
40.621/44 40.620/35 /36 /36 /36	11	911109 920115(0104) 920116(0044) 920117(0050) 920118(0546)	60.1	60.1	60.1 60.1 60.1 60.5
¹ 40.710/60 /60 /62 /60 /60	11	920114 920115(0129) 920116(0105) 920116(1534) 920117(1502)	60.80	60.80	60.80 60.80 60.90 60.90
40.710/80 /72 /70	11	910915 920115(0153) 920116(0128)	64.4	64.4	61.8 61.8

¹ Fish newly implanted Trip 1, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT 2 - 1992
February 11 - 22, 1992**

Prepared For:

Bureau of Reclamation

Prepared By:

**Richard A. Valdez, Principal Investigator
William J. Masslich, Project Leader
William Leibfried, Project Leader**

**BIO/WEST INC.
1063 West 1400 North
Logan, UT. 84321**

March 2, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 2, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of trip details and results. We emphasize that these data are hand tabulated upon receipt at the data department and are subject to change upon further accuracy review. It is our goal to provide information from BIO/WEST trips as quickly as possible to aid administrators and other researchers.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 2, 1992. Table 2 identifies personnel who were present or participated in research activities for Trip 2, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 2, 1992. Table 4 is a summary of all humpback chubs handled during Trip 2, 1992. Table 5 presents information on all humpback chubs implanted with radiotransmitters during Trips 91-11 and 92-02.

Humpback Chubs Captured

A total of 6 humpback chub were handled during Trip 2, 1992. Data were collected on all of these fish.

Radiotelemetry

Nine of ten humpback chubs with known active transmitters were contacted during this trip. All nine fish were contacted during routine surveillance from Kwagunt Rapid to Lava/Chuar Rapid (Table 6). One chub moved four miles downstream toward the Little Colorado River. Four fish were observed for 24-hour periods to gather information on behavior related to Glen Canyon Dam releases. Three radiotagged chubs were located in the Little Colorado River during this trip in an apparent early upstream spawning movement.

Two remote telemetry stations were reestablished. The station at the mouth of the Little Colorado River was collecting data and operating normally. The second station, near river mile 62.6, developed receiver problems and will be repaired on the March trip.

Bench Marks

One new bench mark was established. It is located at river mile 61.3, left.

OBSERVATIONS

1. Recontact success of radio-tagged chubs was high during Trip 2, 1992. This high recontact rate was related to increased turbidity observed for the majority of the trip. The Paria River was causing turbidities in the moderate to high range.
2. The movement of three radio-tagged chubs into the Little Colorado River suggests that spawning behavior and movements are beginning for the 1992 season. Increased catch rates of chubs by Arizona State University personnel near the LCR mouth support this observation (Brain Bagley, Pers. Comm.).
3. Of the six chubs handled by BIO/WEST during Trip 2, 1992, two showed signs of tuberculation and one had spawning colors present.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The inoperable receiver for the lower remote telemetry station was removed for repairs. It should be in place in March 1992.

RECOMMENDATIONS

1. Maintain remote telemetry stations at the Little Colorado River and at 61.6 mile through the summer months to gather movement data on fish moving into and out of the LCR.
2. Continue collecting turbidity data concurrent with behavioral observations on humpback chubs to relate behavior to light availability.

Table 1. Logistics and Research Schedule for Trip #92-02.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
920211	34	34 Mile	X			
920212	61.2	Above LCR	X		X	
920213	61.2	Above LCR			X	
920214	61.2	Above LCR			X	
920215	61.2	Above LCR		X	X	
920216	61.2	Above LCR		X	X	
920217	61.2	Above LCR			X	
920218	87.5	Creamation	X			
920219	136.0	Across from Deer Creek	X			
920220	180.0	Below Lava Falls	X			
920221	225.4	Diamond Creek				
920222	225.4	Diamond Creek				

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 92-02.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Leibfried	BIO/WEST	2/11- -2/19	Project Leader
R. VanHaverbeke	BIO/WEST.	2/11 - 2/22	
T. Yeates	BIO/WEST	2/11 - 2/19	Out Kaibab Trail
B. Dierker	BIO/WEST	2/11 - 2/22	
L. Brown	BIO/WEST	2/11 - 2/19	Out Kaibab Trail
B. Cowdell	BIO/WEST	2/11 - 2/19	Out Kaibab Trail
A. Bleifuss	OARS	2/11 - 2/22	
S. Bledsoe	OARS	2/11 - 2/22	
T. Anderson	OARS	2/11 - 2/22	

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	2	4	0	0	0	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0
4 hr	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1	A	4	3	1	1	0	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0
4 hr	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0
MT	J	0	0	0	0	0	0	0	0	0	0	0
530 hr	Y	0	0	0	0	0	0	0	0	0	0	0

1. Gear Types

TL = 75'x6'x1½"x12" trammel net
 TK = 75'x5'x1"x12" trammel net
 MT = Minnow trap

2. A = Adult

J = Juvenile
 Y = Young of year

3.

HB = humpback chub
 FM = flannelmouth sucker
 BH = bluehead sucker
 RB = rainbow trout
 BR = brown trout
 CC = channel catfish
 CP = carp
 SD = speckled dace
 BK = brook trout
 RK = Rio Grande killifish
 FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #92-02.

	DATE	TYPE*	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
1	920215	TK	003	7F7E273320	N	-	383	504	RA	61.3
2	920215	TK	002	7F7F3E485A	N	-	350	308	RA	61.3
3	920215	TK	002	7F7D176F35	Y	-	340	280	RA	61.3
4	920216	TK	004	7F7D2B4A37	N	-	360	392	RA	61.3
5	920216	TL	003	7F7F3E5B37	N	-	385	532	RA	61.4
6	920216	TL	003	7F7D176C2F	Y	-	360	504	RA	61.4

*Gear Types
T = Traps

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 91-11.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	911107	7F7F456D61	393	710	40.740	80	11	75	920120	58.8	58.0
2	911108	7F7F095814	401	651	40.640	82	11	75	920121	58.8	58.8
3	911109	7F7F21747D	450	999	40.630	62	11	100	920216	60.1	60.1
4	911109	7F7F1F6A79	423	605	40.621	44	11	120	920307	60.1	60.1
5	911112	7F7F21741B	383	557	40.610	83	11	75	920125	64.8	64.8

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 92-01.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7F1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 6. A list of radio frequencies contacted on Trip #92-02, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.620/44 /37 /37 /37 /36 /36 /36 /37 /38	11	911109 920212(2135) 920213(2026) 920214(2050) 920215(2042) 920216(1213) 920216(2102) 920217(2150) 920218(1241)	60.1	60.1	61.15 60.2 60.2 60.2 60.15 60.15 60.0 60.2
40.630/62 /50 /50 /50 /50 /50 /50 /50 /50 /50 /50 /50 /50	11	911109 920212(2105) 920213(1328) 920213(2034) 920214(1330) 920214(2054) 920215(1231) 920215(2059) 920216(1221) 920216(2108) 920217(1304) 920217(2207) 920218(1252)	60.1	60.1	60.3 60.4 60.4 60.4 60.4 60.4 60.4 60.4 60.4 60.4 60.4 60.5 60.2 60.4
40.640/82 /69 /68 /68 /70 /72	11	911108 920213(1810) 920214(1626) 920215(1455) 920216(1440) 920218(1156)	58.8	58.8	250 m LCR 230 m LCR 635 m 750 m 800 m
40.600/61 /62 /62 /62 /64	11	920113 920214(1655) 920215(1506) 920216(1425) 920218(1138)	60.45	60.45	675 m LCR 660 m 700 m 800 m

Table 6. A list of radio frequencies contacted on Trip #92-02, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.710/60 /64 /64 /64 /64 /64 /64 /64 /64 /66 /62 /64 /64	11	920114 920212(2125) 920213(1430) 920213(1802) 920214(1432) 920214(2107) 920215(1243) 920215(2124) 920216(1356) 920216(2121) 920217(1457) 920217(2233) 920218(1013)	60.8	60.8	61.3 61.4 61.4 61.4 61.4 61.4 61.3 61.4 61.4 61.3 61.3 61.3
40.650/82 /70 /70 /70 /70 /70 /72	11	920111 920213(1248) 920214(1255) 920215(1201) 920216(1238) 920217(1304) 920217(2224) 920218(1244)	58.3	58.3	58.4 58.4 58.9 60.9 60.5 60.5 60.4
40.660/62 /66 /66 /66 /66 /66	11	920120 920214(1520) 920214(2133) 920215(1515) 920216(1437) 920217(1532) 920218(0938)	65.3	65.3	64.6 64.6 64.7 64.7 64.7 64.7
40.610/83 /71 /72 /71	11	91112 920213(1520) 920214(1500) 920214(2128)	64.8	64.8	63.9 63.9 63.9
40.730/62 /65 /64 /66 /64 /66	11	920114 920213(1825) 920214(1644) 920215(1446) 920216(1405) 920218(1135)	60.7	60.7	475 m LCR 450 m 530 m 600 m 660 m



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT 3 - 1992
March 3 - 22, 1992**

Prepared For:

Bureau of Reclamation

Prepared By:

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William J. Masslich, Project Leader
William Leibfried, Project Leader**

**BIO/WEST INC.
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April 7, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 3, 1992. Included in the report are a summary of the trip logistics, personnel and research schedules, data collected, problems encountered, pertinent observations, and recommendations. Most information is presented in tabular format to provide a quick synopsis of trip details and results. We emphasize that the data presented in this report were hand-tabulated and are subject to change upon following accuracy checks. It is our goal to provide information from BIO/WEST trips as quickly as possible to convey our preliminary findings to administrators and other researchers.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 3, 1992. Table 2 identifies personnel who were present or participated in research activities for Trip 3, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 3, 1992. Table 4 is a summary of humpback chub handled during Trip 3, 1992. Table 5 presents information on humpback chub implanted with radiotransmitters during Trip 11, 1991 through Trip 3, 1992.

Humpback Chub Captured

A total of 76 humpback chub were handled during Trip 3, 1992. Twenty-four were YOY (TL \leq 125 mm), 8 were juveniles (TL $>$ 125 and TL $<$ 200 mm), and 44 were adults (TL \geq 200 mm). The break point of 125 mm TL for YOY fish has been derived from analysis of length frequency data collected during 1990 and 1991 research trips. A fish with a total length of 125 mm or less will be considered a YOY from November of the spawned year through April of the next year. Of the 33 YOY and juvenile humpback chub captured in Reach 1, 20 were captured electrofishing, 12 in minnow traps, and 1 in a gill net.

One humpback chub was captured in Reach 3 during Trip 3, 1992. This individual was captured by electrofishing near RM 195.6. The collection site was a side channel with cobble and sand substrate, adjacent to a small shallow riffle. This large female weighted 572 gms and showed no signs of spawning condition (TL = 370 mm, SL = 322 mm, WT = 572 gms, PIT tag #7F7D090047).

The stomachs of ten humpback chub were (TL $>$ 350 mm) were pumped for food habit analysis. All fish responded well to pumping and were in good condition when returned to the water. The dominant food items were invertebrates and pupa cases. Simuliids (black flies), chironomids, (midges) and the amphipod, Gammarus lacustris were numerically dominant. Some allochthonous material, possibly human food remains (i.e. cooked rice grains) was observed in two chub. Small amounts of algae were observed. Ten rainbow trout were also pumped as controls for comparison of pump efficiency, and to examine diets of sympatric species. All fish were released alive and in good condition.

Radiotelemetry

Three humpback chub were implanted with radio-transmitters during Trip 3, 1992. One of these fish was implanted using a midline incision and two using a lateral incision.

Nine radiotagged humpback chub, implanted during previous trips, were contacted during Trip 3, 1992. With the exception of three fish (one at RM 60.4, one at RM 64.6 and one at RM 63.9), all radiotagged fish were located either in close proximity to the LCR confluence or in the LCR. Two radiotagged chub were consistently located 1000 to 1400 m up the LCR. A third radiotagged fish was initially located 500 m up the LCR but moved into the main channel after one day. This fish resided in the plume of the LCR near the "plume net set" for the remainder of the trip.

A 72-hour observation was conducted on three fish in the confluence area. Locations were recorded every half hour for each fish along with corresponding river stage. A 24-hour observation was also conducted on a radiotagged humpback chub at RM 64.6.

The LCR remote telemetry station was downloaded. The station was operating normally and collecting data on radiotagged humpback chub in the confluence area. The lower remote station was not established because of continuing hardware problems, but we anticipate it to be operational in April.

Habitat Mapping

Intensive habitat mapping was conducted on two sites during Trip 3, 1992. These sites were designated as high use areas for humpback chub in the main channel and are located at RM 58.8 and RM 60.2. Bathymetric contours were surveyed using a total station approach with the aid of GCES surveyors. Surface habitats were mapped on 1:2400 and 1:1200 scale photography and velocities were characterized for each habitat type.

Bench Marks

No new temporary bench marks were established during Trip 3, 1992.

OBSERVATIONS

1. Recontact success of radiotagged chub was high during Trip 3, 1992. High recontact success was probably related to increased turbidity early in the field trip and staging behavior latter in the trip, when water clarity increased.
2. The presence of radiotagged humpback chub in the LCR and in concentrations close to the confluence continues to indicate that fish were engaged in staging and spawning activities in March.
3. High netting catch rates of humpback chub near the confluence of the LCR relative to catch rates in areas sampled up and downstream of the confluence also suggests that humpback chub were staging near the mouth of the LCR in March.

4. A total of 153 native suckers were PIT tagged in Reach 2 and 3 during Trip 3, 1992. The majority of these fish were spawning fish that were captured at the mouths of major tributaries. A small percentage were captured in the mainstem Colorado River and these fish did not show as high a spawning condition as those from the tributary mouths. The water temperatures of the tributaries ranged from 13-17°C.
5. Spawning aggregations of native suckers was observed at Bright Angel Creek, Deer Creek, Kanab Creek and Havasu Creek.
6. Flannelmouth suckers at Kanab Creek were all ripe. Milt and eggs were easily expressed from all fish handled.
7. Spawning aggregations of both bluehead and flannelmouth suckers were seen at Havasu Creek.
8. Flannelmouth suckers exhibiting a small but distinct razorback keel were captured regularly at the mouth of Havasu Creek. These fish were classified as "flannelmouth variants" to distinguish them from typical flannelmouth suckers. On several occasions both a male and female variant were caught next to each other in the same net.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The lower remote station was not established because of continuing hardware problems. The receiver was sent to ATS for repair and should be installed on the April trip.

RECOMMENDATIONS

1. Netting and implanting of humpback chub should be conducted in April to insure that adequate numbers of radiotagged fish are available through the spawning period. Only males should be implanted.

Table 1a. Logistics and Research Schedule for Trip 3, 1992, Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
3/3	30.0	Fence Fault	X			
3/4	58.3	Awatubi	X	X	X	X
3/5	58.3	Awatubi		X	X	X
3/6	58.3	Awatubi		X	X	X
3/7	61.2	LCR	X	X	X	X
3/8	61.2	LCR		X	X	X
3/9	61.2	LCR		X	X	X
3/10	61.2	LCR		X	X	X
3/11	61.2	LCR		X	X	X
3/12	65.3	Lava Chuar	X	X	X	X
3/13	65.3	Lava Chuar		X	X	X
3/14	65.3	Lava Chuar		X	X	X
3/15	114	114 Mile Camp	X			
3/16	137	Pancho's Kitchen	X			
3/17	182	Below Lava Falls	X			
3/18	209	Granite Park	X	X		
3/19	209	Granite Park		X		
3/20	222	222 Mile Canyon	X	X		
3/21	222	222 Mile Canyon		X		
3/22	226	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1b. Logistics and Research Schedule for Trip 3, 1992, Team 2

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
3/3	30.2	Fence Fault	X	X		X
3/4	30.2	Fence Fault		X		X
3/5	87.2	Cremation	X	X		X
3/6	87.2	Cremation		X		
3/7	87.2	Cremation		X		
3/8	108.4	Lower Bass	X	X		X
3/9	108.4	Lower Bass		X		
3/10	133.6	Tapeats Creek	X	X		X
3/11	133.6	Tapeats Creek		X		
3/12	136.3	Deer Creek	X	X		X
3/13	136.3	Deer Creek		X		
3/14	155.7	Last Chance	X	X		X
3/15	155.7	Last Chance		X		
3/16	155.7	Last Chance		X		
3/17	183.0	Hells Hollow	X	X		
3/18	196.5	RM 196.5	X	X		
3/19	196.5	RM 196.5		X		
3/20	225.3	Above Diamond Creek	X	X		
3/21	225.3	Above Diamond Creek		X		
3/22	225.6	Take Out		X		

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2a. Personnel Participating in Trip 3, 1992, Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	3/3 - 3/15	Project Leader - Chopper Out
T. Wasowicz	BIO/WEST	3/3 - 3/22	Senior Biologist
P. Weiss	BIO/WEST	3/3 - 3/22	
L. Brown	BIO/WEST	3/3 - 3/22	
H. Yard	BIO/WEST	3/3 - 3/22	
T. Martin	BIO/WEST VOLUNTEER	3/3 - 3/22	
I. Bromberg	BIO/WEST VOLUNTEER	3/3 - 3/22	
M. Yard	GCES	3/3-3/9, 3/15-3/22	Out Tanner - In LCR
A. Haden	GCES	3/3-3/9, 3/15-3/22	Out Tanner - In LCR
F. Protiva	GCES	3/3 - 3/15	Chopper Out
S. Houston	GCES VOLUNTEER	3/3 - 3/15	Chopper Out
M. Gonzales	GCES	3/5 - 3/15	Chopper Out
K. Malloy	GCES	3/9 - 3/13	In Tanner - Chopper Out
J. Brown	GCES	3/9 - 3/13	In Tanner - Chopper Out
L. Rasmussen	OARS	3/3 - 3/22	
K. Smith	OARS	3/3 - 3/22	Trip Leader
N. Bellows	OARS	3/3 - 3/22	

Table 2b. Personnel Participating in Trip 3, 1992, Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
W. Leibfried	BIO/WEST	3/3 - 3/22	
T. Yates	BIO/WEST	3/3 - 3/22	
R. VanHaverbeke	BIO/WEST	3/3 - 3/22	
K. McCabe	BIO/WEST	3/3 - 3/22	
E. Prats	BIO/WEST	3/3 - 3/22	
P. Abbott	BIO/WEST VOLUNTEER	3/3 - 3/22	
S. Shuhardt	BIO/WEST VOLUNTEER	3/3 - 3/22	
D. Comby	BIO/WEST VOLUNTEER	3/8 - 3/16	
A. Bleifuss	OARS	3/3 - 3/22	
S. Bledsoe	OARS	3/3 - 3/22	
A. Cassidy	OARS	3/3 - 3/22	

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip 3, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	PK	FH	FV
Reach 1	A	3	2	0	198	0	0	4	7	1	0	3	0	
EL	J	8	3	0	10	0	0	2	0	0	0	0	0	
N=73	Y	12	0	0	0	0	0	0	0	0	0	0	0	
11.94 hr														
Reach 2	A	0	5	1	75	54	0	101	8	0	0	0	0	
EL	J	0	1	0	20	5	0	0	0	0	0	0	0	
N=59	Y	0	0	0	0	0	0	0	0	0	0	0	0	
19.8 hr														
Reach 3	A	1	2	4	2	0	1	49	21	0	0	2	0	
EL	J	0	0	3	2	0	0	2	1	0	0	0	0	
N=59	Y	0	0	0	0	0	0	0	0	0	0	0	0	
11.2 hr														
Reach 1	A	21	13	1	31	1	0	0	0	0	0	0	0	
TL	J	0	0	0	0	0	0	0	0	0	0	0	0	
N=35	Y	0	0	0	0	0	0	0	0	0	0	0	0	
70 hr														
Reach 2	A	0	4	2	6	1	0	6	0	0	0	0	0	
TL	J	0	0	0	0	0	0	0	0	0	0	0	0	
N=72	Y	0	0	0	0	0	0	0	0	0	0	0	0	
144 hr														
Reach 3	A	0	1	4	0	0	3	1	0	0	0	0	0	
TL	J	0	0	0	0	0	0	0	0	0	0	0	0	
N=66	Y	0	0	0	0	0	0	0	0	0	0	0	0	
132 hr														
Reach 1	A	8	10	4	6	0	0	3	0	0	0	0	0	
TK	J	0	0	0	0	0	0	0	0	0	0	0	0	
N=29	Y	0	0	0	0	0	0	0	0	0	0	0	0	
58 hr														

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip 3, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	PK	FH	FV
Reach 2	A	0	1	1	6	0	0	3	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0
N=29	Y	0	0	0	0	0	0	0	0	0	0	0	0
58 hr													
Reach 3	A	0	0	2	1	0	1	4	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0
N=40	Y	0	0	0	0	0	0	0	0	0	0	0	0
80 hr													
Reach 1	A	9	11	0	2	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0
N=37	Y	0	0	0	0	0	0	0	0	0	0	0	0
74 hr													
Reach 2	A	0	0	0	0	2	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0
N=24	Y	0	0	0	0	0	0	0	0	0	0	0	0
48 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0
N=20	Y	0	0	0	0	0	0	0	0	0	0	0	0
40 hr													
Reach 1	A	2	6	0	43	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=35	Y	0	0	0	0	0	0	0	0	0	0	0	0
70 hr													
Reach 2	A	0	0	1	1	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=28	Y	0	0	0	0	0	0	0	0	0	0	0	0
56 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip 3, 1992. THESE DATA ARE PRELIMINARY

1	2	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	PK	FH	FV
Reach 3	A	0	0	1	0	0	1	2	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=41	Y	0	0	0	0	0	0	0	0	0	0	0	0
82 hr													
Reach 1	A	0	0	0	26	0	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0
10 hr													
Reach 2	A	0	0	0	1	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0	0
18 hr													
Reach 2	A	0	0	0	4	0	0	0	0	0	0	0	0
HL	J	0	0	0	2	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0
36 hr													
Reach 3	A	0	1	26	0	0	0	0	0	0	0	0	0
HL	J	0	0	7	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0
36 hr													
Reach 2	A	0	1	1	6	0	0	0	0	0	0	0	0
HS	J	0	0	0	1	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0	0
128 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
HS	J	0	0	0	0	0	0	0	0	0	0	0	0
N=3													
36 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip 3, 1992. THESE DATA ARE PRELIMINARY

1	2	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	PK	FH	FV
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TN N=5 10 hr	A	0	0	0	8	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TN N=26 52 hr	A	0	8	3	15	9	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TN N=38 56 hr	A	0	46	13	0	0	0	0	0	0	0	0	5
	J	0	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 SA N=5	A	0	9	0	0	0	0	3	3	0	42	0	0
	J	0	0	1	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 3 SA N=6	A	0	0	0	0	0	0	0	4	0	2	5	0
	J	0	9	4	0	0	0	0	101	0	0	0	0
	Y	0	8	1	0	0	0	0	0	0	1	0	0
Reach 1 MT N=4 5 hr	A	0	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0	0
	Y	12	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip 3, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	PK	FH	FV
Reach 2	A	0	0	0	0	0	0	1	0	0	0	0	0
MT	J	0	0	0	0	0	0	0	0	0	0	0	0
N=17	Y	0	0	0	3	0	0	0	0	0	0	0	0
461 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
MT	J	0	1	0	0	0	0	0	0	0	0	0	0
N=16	Y	0	0	0	0	0	0	0	0	0	0	0	0
385 hr													
TOTALS	A	44	120	64	431	67	6	178	43	1	44	10	5
	J	8	14	15	35	5	0	4	102	0	0	0	0
	Y	24	8	1	3	0	0	0	0	0	1	0	0

¹. Gear Types

- EL = Electrofishing
- TL = 75'x6'x1 1/2"x12" trammel net
- TK = 75'x5'x1"x12" trammel net
- GM = 10'x6'x2" gill net
- GP = 100'x6'x1 1/2" gill net
- GX = 100'x6', 2" to 1/2" @ 1/2" increments, experimental gill net
- HL = Large hoop net (4'diameter)
- HS = Small hoop net (2' diameter)
- GZ = 60'x6', 2" to 1/2" @ 1/2" increments, experimental gill net
- TN = 50'x6'x1 1/2"x12" trammel net
- TM = 50'x6'x1"x12" trammel net
- SA = 10'x3'x1/8" seine
- MT = minnow trap

² - A = Adult

- J = Juvenile
- Y = Young of year

³ -

- HB = humpback chub
- FM = flannelmouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace

BK = brook trout

- PK = plains killifish
- FV = flannelmouth variant
- FH = fathead minnow

Table 4. Summary of Humpback Chub handled during Trip 3, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP	OLD TAG NUMBER	TL	WT	DISP.	RADIO	RM RELEASE
1	920306	N	024	7F7F476F15	N		386	535	RA	N	58.80
2	920307	N	037	7F7F3E3370	Y	PITTAG	400	545	RA	N	60.20
3	920307	E	024	#####	N		89	5	RA	N	62.20
4	920307	N	040	7F7F1F6B4F	Y	PITTAG	360	479	RS	N	60.15
5	920307	E	021	7F7D176D66	Y	PITTAG	230	117	RA	N	62.00
6	920307	N	043	7F7E432C00	N		412	624	RS	N	60.20
7	920308	N	055	7F7F290467	N		376	634	RS	N	61.25
8	920308	E	026	#####	N		108	13	RA	N	61.70
9	920308	N	055	7F7E430660	N		406	714	RS	N	61.25
10	920308	N	051	7F7F475E72	N		405	633	RI	Y	61.50
11	920308	N	052	7F7F050945	Y	PITTAG	410	667	RS	N	60.40
12	920308	N	053	7F7F3E5B32	N		284	224	RA	N	60.50
13	920309	E	028	#####	N		71	2	RA	N	62.46
14	920309	E	034	7F7F220652	N		346	353	RA	N	62.20
15	920309	T	037	#####	N		74	2	RA	N	60.90
16	920309	E	034	#####	N		85	5	RA	N	0.00
17	920309	E	029	#####	N		87	3	RA	N	62.47
18	920309	N	074	7F7F3E607A	N		383	556	RS	N	61.10
19	920309	E	028	#####	N		139	22	RA	N	62.46
20	920309	E	036	7F7D2C3202	Y	PITTAG	272	170	RA	N	59.80
21	920309	N	069	7F7D1A3559	Y	PITTAG	306	231	RA	N	61.10

Table 4. Summary of Humpback Chub handled during Trip 3, 1992.

	DATE	TYPE*	SAMPLE NUMBER	PIT TAG	RECAP	OLD TAG NUMBER	TL	WT	DISP.	RADIO	RM RELEASE
22	920309	N	069	7F7F3E563A	N		301	231	RA	N	61.10
23	920309	N	069	7F7E432646	Y		336	346	RA	N	61.10
24	920310	N	075	7F7E432721	N		347	407	RA	N	61.85
25	920310	N	077	7F7F3E5321	N		363	465	RA	N	61.85
26	920310	N	080	7F7E431C1F	N		244	145	RA	N	62.20
27	920310	N	081	7F7E431369	N		312	320	RA	N	61.85
28	920310	N	080	7F7F3E5616	N		200	77	RA	N	62.20
29	920311	N	097	7F7D1B6F29	Y	PITTAG	374	489	RA	N	61.30
30	920311	N	088	7F7E432641	N		395	606	RI	N	61.10
31	920311	N	097	7F7D085671	N		440	739	RS	N	61.30
32	920311	N	089	7F7E432637	N		289	288	RA	N	61.30
33	920311	N	088	7F7E431A14	N		410	681	RS	N	61.10
34	920311	N	096	7F7D180568	Y	PITTAG	348	489	RS	N	61.10
35	920311	E	048	7F7F3E5B2C	N		176	58	RA	N	60.90
36	920311	N	091	7F7D22580E	Y	PITTAG	321	308	RA	N	61.35
37	920311	N	091	7F7D237C46	Y	PITTAG	315	263	RA	N	61.35
38	920311	N	089	7F7E432A1F	N		372	540	RA	N	61.30
39	920311	N	089	7F7F271C57	N		391	574	RI	N	61.30
40	920311	N	091	7F7F273233	N		304	212	RA	N	61.35
41	920311	N	092	7F7F475D1D	Y	109YC ^b	447	841	RS	N	61.10
42	920312	E	052	#####	N		126	17	RA	N	64.80

Table 4. Summary of Humpback Chub handled during Trip 3, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP	OLD TAG NUMBER	TL	WT	DISP.	RADIO	RM RELEASE
43	920312	N	104	7F7E432A15	N		285	271	RA	N	63.70
44	920312	E	053	#####	N		80	5	RA	N	64.80
45	920312	N	101	7F7D300635	Y	PITTAG	299	317	RA	N	63.80
46	920312	E	054	#####	N		74	4	RA	N	64.60
47	920312	E	055	#####	N		146	33	RA	N	64.70
48	920312	E	055	#####	N		131	23	RA	N	64.70
49	920312	E	054	#####	N		81	6	RA	N	64.60
50	920312	N	101	7F7D086604	N		316	428	RA	N	63.80
51	920312	E	053	#####	N		162	40	RA	N	64.90
52	920312	N	104	7F7F3E594F	N		323	309	RA	N	63.70
53	920312	N	100	7F7F3F3425	Y	PITTAG	327	365	RA	N	63.70
54	920312	T	054	#####	N		75	3	RA	N	62.10
55	920312	T	054	#####	N		69	3	RA	N	62.10
56	920312	N	101	7F7D075E55	Y	637YC ^b	337	438	RA	N	63.80
57	920312	N	101	7F7D08214A	N		318	289	RA	N	63.80
58	920312	N	101	7F7D08236A	N		353	392	RA	N	63.80
59	920312	N	101	7F7D07603D	N		376	257	RA	N	63.80
60	920312	N	101	7F7D222A33	Y	PITTAG	268	196	RA	N	63.80
61	920313	E	063	#####	N		60	2	RA	N	64.40
62	920313	E	063	#####	N		146	29	RA	N	64.40
63	920313	T	069	#####	N		85	0	RA	N	64.20

Table 4. Summary of Humpback Chub handled during Trip 3, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP	OLD TAG NUMBER	TL	WT	DISP.	RADIO	RM RELEASE
64	920313	T	077	#####	N		86	0	RA	N	64.20
65	920313	T	063	#####	N		71	0	RA	N	64.50
66	920313	T	070	#####	N		75	0	RA	N	64.20
67	920314	E	068	#####	N		50	1	RA	N	65.30
68	920314	E	068	#####	N		60	2	RA	N	65.30
69	920314	E	067	#####	N		37	1	RA	N	65.05
70	920314	E	067	#####	N		162	37	RA	N	65.05
71	920314	T	089	#####	N		60	0	RA	N	64.2
72	920314	T	090	#####	N		91	0	RA	N	64.2
73	920314	T	090	#####	N		57	0	RA	N	64.2
74	920314	T	095	#####	N		116	0	RA	N	64.5
75	920314	T	095	#####	N		89	0	RA	N	64.5
76	920319	E	078	7F7D090047	N		370	572	RA	N	195.6

^a Gear types

EL = Electrofishing

N = Netting

T = Traps

^b Small Yellow Carlin

Table 5a. Summary of radiotransmitter implants in humpback chub during Trip 11, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	911107	7F7F456D61	393	710	40.740	80	11	75	920120	58.8	58.0
2	911108	7F7F095814	401	651	40.640	82	11	75	920121	58.8	58.8
3	911109	7F7F21747D	450	999	40.630	62	11	100	920216	60.1	60.1
4	911109	7F7F1F6A79	423	605	40.621	44	11	120	920307	60.1	60.1
5	911112	7F7F21741B	383	557	40.610	83	11	75	920125	64.8	64.8

Table 5b. Summary of radiotransmitter implants in humpback chub during Trip 1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7F1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 5c. Summary of radiotransmitter implants in humpback chub during Trip 3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECT- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920308	7F7F475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7F271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 6. A list of radio frequencies contacted on Trip 3, 1992 and locations relative to capture and release sites.

-----River Mile-----

FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.650/82	11	920111	58.30	58.30	
		920305(1250)			61.30
		920306(1410)			61.35
		920307(1200)			61.35
		920307(2130)			61.35
		920308(1537)			61.35
		920308(2240)			61.35
		920309(1221)			61.35
		920309(2118)			61.35
		920310(1340)			61.30
		920310(2250)			61.35
		920311(2230)			61.35
		920314(1600)			61.25
		40.710/60			11
920305(1250)	61.35				
920307(1150)	61.30				
920307(2130)	61.35				
920308(1537)	61.35				
920308(2240)	61.35				
920309(1219)	61.35				
920309(2116)	61.35				
920310(1340)	61.30				
920310(2250)	61.35				
920311(2213)	61.35				
920312(1250)	61.35				
920313(0845)	61.35				
920314(1600)	61.30				
40.730/62	11	920114	60.70	60.70	
		920305(1535)			500 m LCR
		920306(1814)			61.35
		920307(1245)			61.55
		920307(2145)			61.50
		920308(1555)			61.50
		920308(2315)			61.50
		920309(1238)			61.50
		920309(2133)			61.50
		920311(2245)			61.50
		920312(1442)			61.50
		920313(1027)			61.50
		920314(1609)			61.50

Table 6. A list of radio frequencies contacted on Trip 3, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.630/62	11	911109	60.10	60.10	
		920305(1145)			60.40
		920306(1340)			60.40
		920307(1126)			60.40
		920307(2055)			60.40
		920308(1500)			60.35
		920308(2205)			60.40
		920309(1158)			60.40
		920309(2058)			60.40
		920310(1310)			60.40
		920310(2243)			60.40
		920311(2150)			60.40
		920312(1230)			60.40
		920312(0805)			60.40
920314(1524)	60.40				
40.620/44	11	911109	60.10	60.10	
		920305(1200)			60.75
		920306(1410)			61.35
		920307(2105)			60.75
		920308(1537)			61.35
		920308(2300)			61.15
		920309(1220)			61.35
		920309(2118)			61.35
		920311(2208)			61.15
		920312(1250)			61.35
		920313(0847)			61.35
920314(1608)	61.40				
40.640/82	11	911108	58.8	58.8	
		920305(1601)			1400 m LCR
		920306(1743)			1400 m LCR
		920307(1509)			1400 m LCR
		920308(1755)			1400 m LCR
		920309(1510)			1400 m LCR
		920310(1634)			1400 m LCR
		920312(1338)			1400 m LCR
		920313(0940)			1400 m LCR
		920314(1158)			1400 m LCR
40.610/83 /74	11	91112 920305(1750)	64.8	64.8	63.90

Table 6. A list of radio frequencies contacted on Trip 3, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.660/65	11	920120 920305(1725) 920306(1445) 920307(1345) 920308(1630) 920309(1215) 920310(1430) 920312(1522) 920313(1115) 920314(1700)	65.3	65.3	64.70 64.70 64.60 64.60 64.60 64.60 64.65 64.60 64.50
40.600/49	11	920113 920306(1735) 920307(1500) 920308(1745) 920309(1452) 920310(1625) 920312(1339) 920313(0940) 920314(1140)	60.45	60.45	1160 m LCR 1150 m LCR 1000 m LCR 1000 m LCR 1000 m LCR 1160 m LCR 1100 m LCR 1160 m LCR
¹ 40.680/45	11	920308 920308(2335) 920309(1248)	61.50	61.50	62.05 62.10
¹ 40.720/62	11	920311 920311(2215) 920312(1418) 920313(0828) 920314(1537)	61.10	61.10	61.30 60.95 60.95 60.95
¹ 40.700/86	11	920311 920311(2215) 920312(1250) 920313(1045) 920314(1620)	61.30	61.30	61.35 61.35 61.90 61.90

¹ Fish newly implanted Trip 3, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT 4 - 1992
April 7 - 18, 1992**

Prepared For:

Bureau of Reclamation

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April 23, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 4, 1992. Included in the report are a summary of the trip logistics, personnel and research schedules, data collected, problems encountered, pertinent observations, and recommendations. Most information is presented in tabular format to provide a quick synopsis of trip details and results. We emphasize that the data presented in this report were hand-tabulated and are subject to change following accuracy checks. It is our goal to provide information from BIO/WEST trips as quickly as possible to convey our preliminary findings to administrators and other researchers.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 4, 1992. Table 2 identifies personnel who were present or participated in research activities for Trip 4, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 4, 1992. Table 4 is a summary of humpback chub handled during Trip 4, 1992. Table 5 presents information on humpback chub implanted with radiotransmitters during Trip 11, 1991 through Trip 4, 1992.

Humpback Chub Captured

A total of 44 humpback chub were handled during Trip 4, 1992. Seven were juveniles (TL < 200 mm), and 37 were adults (TL > = 200 mm). Three of the seven juveniles were captured in unbaited minnow traps immediately (within 300 m) upstream of the LCR confluence along boulder talus shore lines. The remaining 41 humpback chubs were captured in gill and trammel nets in the main channel within one mile upstream or downstream of the LCR confluence.

All fish appeared in good condition with the exception of minor abrasions of the caudal and anal fins on a few individuals. Seven individuals were tubercled and milt was expressed from three.

Radiotelemetry

One male humpback chub was implanted with a radiotransmitter during Trip 4, 1992. The fish was implanted using a lateral incision.

Nine radiotagged humpback chub, implanted during previous trips, were contacted during Trip 4, 1992. Four radiotagged fish were observed using the lower 1.2 km of the LCR continuously during Trip 4, 1992. One radiotagged humpback chub was observed in the LCR until the final day of the trip (April 13, 1992) when it moved into the mainchannel but remained in the plume below the confluence at RM 61.5. The remaining four radiotagged humpback chub were located in the main channel for the duration of Trip 4, 1992. Of these four fish, one was located in a small side channel immediately below the confluence of the LCR for the duration of Trip 4, 1992. Temperatures at the fishes location were dominated by the LCR and were running 15-18°C. Daytime LCR temperatures recorded with hand-held thermometers ranged from 15 to 19°C. Two other radio-tagged fish were

located below the confluence in well mixed water. One of these fish moved upstream 2.15 miles during the course of the trip (from RM 64.15 to RM 62.0) while the other remained in a large eddy in the area of RM 61.9. The only radiotagged fish located above the confluence of the LCR was located intermittently immediately above the confluence, near the mixing zone. This fish was contacted only at night.

Five observations of radiotagged fish were conducted during Trip 4, 1992, with observation times ranging from 8 to 48 hours. All fish in the main channel were observed once for 24 hours and one fish in the LCR was observed for 8 hours.

The LCR remote telemetry station was downloaded. The station was operating normally and collecting data on radiotagged humpback chub in the confluence area. The lower remote station was deployed April 8, 1992 and was operating normally.

Habitat Mapping

Aerial habitat mapping was conducted for two bathymetry sites during Trip 4, 1992 including the sites at RM 60.1 and RM 60.9. Detailed bathymetry developed for these sites in February was very useful for accurately defining surface habitat features.

One shoreline juvenile habitat site was established at RM 61.2, immediately upstream of the boat beach at the LCR confluence. Three juvenile humpback chub were captured in shoreline boulder talus in the area during Trip 4, 1992. Depth, velocity, shoreline type and substrate were quantified in the area based on BIO/WEST juvenile habitat mapping protocol.

The USFWS also conducted habitat measurements on locations of radiotagged humpback chub in the LCR during Trip 4, 1992.

Bench Marks

Two new temporary bench marks (TBM) were established during Trip 4, 1992. These bench marks were located at RM 62.0 and RM 62.1, both on river right. Descriptions of location and photos were taken for each TBM and will be added to the BIO/WEST and GCES TBM record books.

OBSERVATIONS

1. Recontact success of radiotagged humpback chub was 100% during Trip 4, 1992. High recontact success was probably associated with turbid water conditions in and below the LCR as well as staging and spawning activity in and around the LCR.
2. As many as five radiotagged humpback chubs were observed in the LCR during Trip 4, 1992, indicating spawning ascent.
3. The LCR was in flood stage during all of Trip 4, 1992, and was steadily dropping during the trip. Water temperatures in the LCR ranged from 15 to 19°C during the trip.

4. The location of the LCR plume was relatively stable during Trip 4, 1992. Stability of the plume was probably associated with the relatively steady interim flows in the main channel and the high volume flowing from the LCR. Temperature effects of the LCR plume were significant, extending for approximately 300 meters below the confluence of the lowest LCR channel before mixing with main channel water was complete. Colorado River main channel temperatures were elevated 1°C (from 10 to 11°C) below the confluence of the LCR in the afternoon.
5. Up to three radiotagged humpback chub were observed in the LCR plume for significant periods (up to consecutive days) during Trip 4, 1992.
6. One radiotagged humpback chub was observed moving 2.15 miles upstream from RM 64.15 to RM 62.0. This fish is the first humpback chub observed making what could be considered a significant migrational movement to the LCR from a location below the confluence of the LCR.
7. Three juvenile humpback chub and one fathead minnow were captured in unbaited minnow traps 200-300 meters above the confluence of the LCR in boulder talus shoreline on river left. The chubs ranged for 75-86 mm total length and are assumed to be 1991 year class fish. Habitat measurements were taken in the area where the chubs were captured.
8. Twenty-seven flannelmouth suckers and nine bluehead suckers were captured and PIT tagged during Trip 4, 1992. Tuberculation, expressible gametes (males only), coloration and body/fin abrasion suggest possible spawning activities of these species in the LCR plume.
9. Coordination between the USFWS (John Seals), BIO/WEST (Bill Masslich and Randy VanHaverbeke) and GCES (Mike Yard and Allen Haden) on mapping the LCR confluence area was discussed during the Trip 4, 1992. Primary topics for coordination were: 1) consistency between research effort (i.e. substrate definitions and codes); 2) scheduling and prioritizing GCES survey efforts in the upcoming months; and 3) methods for determining plume temperature dynamics (See Recommendations).

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The lower remote station was deployed April 8, 1992 and was collecting data successfully during Trip 4, 1992. Attempts to download the station at the completion of the trip were unsuccessful, although the data in the data logger appeared intact. During the down time for the station in the last two months (associated with a repair of malfunctioning components in the receiver) the data logger was sent to the manufacturer for a software upgrade. It is assumed that new programming associated with the changes in communications software caused problems that can be worked out through communication with ATS Inc. All data will be downloaded at a future date.

RECOMMENDATIONS

1. Mapping efforts of the LCR confluence area should commence as soon as possible so that adequate time is available for adjustments and data collection to insure that mapping products can be produced prior to the completion of current humpback chubs studies. Based on

conversations with GCES personnel it is anticipated that surveyors may be available in June to develop bathymetric profiles and establish control points for USFWS and BIO/WEST.

2. Bathymetric surveys of the LCR confluence area should also incorporate substrate identification at all survey points. It will be possible to generate a substrate map of the confluence area using computer software and a plotter. BIO/WEST requests that at each bathymetric survey point, corresponding dominant and subdominant substrate be identified and coded. Substrate categories should be coded with a number representing a substrate category consistent with the modified Wentworth classification, i.e. 1=sand, 2=gravel, etc. The dominant substrate should be defined as the substrate category the has or would have the most profound effect on the hydraulics of the area. The subdominant substrate would be the most abundant substrate other than or inclusive of the dominant substrate.
3. Mapping of temperature dynamics in the plume should be initially conducted at base flows in the LCR, to eliminate the variable of flow from the LCR. Initial temperature mapping should be conducted during the day on the descending limb of the hydrograph using hand held temperature probes positioned along 5 to 7 transects which would be strategically located to model the plume. Transects used to map temperature dynamics should be at least semi-permanent so they can be reoccupied at different flows without need for the surveyors to be present. End points of transects should be marked with discrete but solid marks. Future use of remote temperature recording devices can be evaluated based on results of hand-held temperature mapping .

Table 1. Logistics and Research Schedule for Trip 4, 1992.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
4/7	31.0	South Canyon	X			
4/8	61.2	LCR	X	X	X	X
4/9	61.2	LCR		X	X	X
4/10	61.2	LCR		X	X	X
4/11	61.2	LCR		X	X	X
4/12	61.2	LCR		X	X	X
4/13	61.2	LCR		X	X	X
4/14	61.2	LCR		X	X	X
4/15	132	Stone Creek	X			
4/16	182	Hells Hollow	X			
4/17	225	Diamond Creek	X			
4/18		Take Out	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 4, 1992.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	4/7-4/15	Project Leader - Out Bright Angel
T. Wasowicz	BIO/WEST	4/7-4/15	Senior Biologist - Out Bright Angel
R. VanHaverbeke	BIO/WEST	4/7-4/18	Senior Biologist
E. Prats	BIO/WEST	4/7-4/18	
G. Hardwick	BIO/WEST	4/7-4/15	Out Bright Angel
P. Weiss	BIO/WEST	4/7-4/15	Out Bright Angel
R. Buckley	GCES Volunteer	4/7-4/18	
M. Yard	GCES	4/7-4/14	Chopper Out - LCR
A. Haden	GCES	4/7-4/14	Chopper Out - LCR
J. Seals	USFWS	4/7-4/14	Chopper Out - LCR
S. Bledso	OARS	4/7-4/18	
S. Rieder	OARS	4/7-4/18	
J. Kempster	OARS	4/7-4/18	
S. Trimmer	OARS Volunteer	4/7-4/18	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 4, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	7	9	1	1	0	0	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=14	Y	0	0	0	0	0	0	0	0	0	0	0	0
28 hr													
Reach 1	A	27	13	7	1	0	0	0	0	0	0	0	0
TK	J	4	0	0	0	0	0	0	0	0	0	0	0
N=15	Y	0	0	0	0	0	0	0	0	0	0	0	0
30 hr													
Reach 1	A	2	2	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0	0
12 hr													
Reach 1	A	1	3	1	0	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0
4 hr													
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0	0
MT	J	3	0	0	0	0	0	0	0	0	0	0	0
N=45	Y	0	0	0	0	0	0	0	0	0	0	0	0
1,260 hr													
TOTALS	A	37	27	9	2	0	0	0	0	0	0	0	0
	J	7	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0

1. Gear Types

EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1" x12" trammel net
GM = 10'x6'x2" gill net
TN = 50'x6'x1½"x12" trammel net
MT = Minnow traps

2 - A = Adult
J = Juvenile
Y = Young of year

3 - HB = humpback chub
FM = flannelmouth sucker
BH = bluehead sucker
RB = rainbow trout
BR = brown trout
CC = channel catfish

BK = brook trout
FH = fathead minnow
FV = flannelmouth variant
CP = carp
SD = speckled dace

Table 4. Summary of Humpback Chub handled during Trip 4, 1992.

	DATE	TYPE	SAMPLE NO.	PITTAG	RECAPTURE	OLD TAG	TL	WT	DISP	RADIO	RM_RELEASE
1	920408	N	001	7F7F287D08	N		206	95	RA	N	61.40
2	920408	N	001	7F7F3E5546	Y	978CRS	235	131	RA	N	61.40
3	920408	N	001	7F7F03194E	Y	PITTAG	314	310	RA	N	61.40
4	920408	N	001	7F7F3E6140	N		244	148	RA	N	61.40
5	920408	N	001	7F7F272917	N		220	104	RA	N	61.40
6	920408	N	001	7F7D170A43	Y	PITTAG	235	130	RA	N	61.40
7	920408	N	002	7F7D302E6B	Y	PITTAG	226	119	RA	N	61.30
8	920408	N	001	7F7D177318	Y	PITTAG	294	305	RA	N	61.40
9	920408	N	002	7F7F272A0E	N		242	127	RA	N	61.30
10	920408	N	002	7F7D22321A	Y	PITTAG	292	224	RA	N	61.30
11	920408	N	002	7F7F26590F	N		375	422	RA	N	61.30
12	920408	N	002	#####	N		174	55	RA	N	61.30
13	920409	N	009	7F7F27307B	N		208	76	RA	N	61.85
14	920409	N	009	7F7F27310D	N		265	190	RA	N	61.85
15	920409	N	009	7F7D196C3C	Y	PITTAG	197	87	RA	N	61.85
16	920409	N	010	7F7F1F6D3C	N		308	280	RA	N	61.50
17	920409	N	012	7F7D081F07	N		273	200	RA	N	61.85

Table 4. Summary of Humpback Chub handled during Trip 4, 1992.

	DATE	TYPE	SAMPLE NO.	PITTAG	RECAPTURE	OLD TAG	TL	WT	DISP	RADIO	RM_RELEASE
18	920409	N	012	7F7D2A683C	Y	PITTAG	259	191	RA	N	61.85
19	920409	N	007	7F7D24105C	Y	PITTAG	321	333	RA	N	61.50
20	920409	N	011	7F7F1E7A65	N		414	843	RI	Y	61.75
21	920409	N	007	7F7F3E4B56	N		315	295	RA	N	61.50
22	920409	N	010	7F7D177356	Y	PITTAG	306	308	RA	N	61.10
23	920410	N	013	7F7D2C0F3A	Y	PITTAG	325	389	RA	N	61.90
24	920410	N	013	7F7F475E72	Y	PITTAG	398	602	RR	Y	61.90
25	920411	N	024	7F7F48392F	N		247	130	RA	N	61.30
26	920411	N	026	7F7D222F22	Y	PITTAG	248	141	RA	N	61.50
27	920411	N	021	7F7D085C68	N		245	140	RA	N	61.30
28	920411	N	026	7F7D225876	Y	PITTAG	220	98	RA	N	61.50
29	920411	N	026	7F7F290562	N		237	122	RA	N	61.50
30	920411	N	021	7F7D1B7667	Y	PITTAG	277	222	RA	N	61.30
31	920411	N	023	7F7F3E5944	N		367	547	RA	N	61.20
32	920412	N	028	7F7D075F5C	N		282	232	RA	N	61.30
33	920412	N	029	7F7D027439	N		310	316	RA	N	61.50
34	920412	N	029	7F7D085A08	N		200	85	RA	N	61.50

Table 4. Summary of Humpback Chub handled during Trip 4, 1992.

	DATE	TYPE	SAMPLE NO.	PITTAG	RECAPTURE	OLD TAG	TL	WT	DISP	RADIO	RM_RELEASE
35	920412	N	029	7F7D2A6D27	Y	PITTAG	213	98	RA	N	61.50
36	920412	N	029	7F7D223305	Y	PITTAG	259	172	RA	N	61.50
37	920412	N	029	7F7D026958	N		239	134	RA	N	61.50
38	920412	T	023	#####	N		82	3	RA	N	61.25
39	920412	N	029	7F7D241E7E	Y	PITTAG	255	168	RA	N	61.50
40	920412	N	029	7F7D077C78	N		280	241	RA	N	61.50
41	920412	T	023	#####	N		86	3	RA	N	61.25
42	920413	N	033	7F7D2B1472	Y	PITTAG	334	363	RA	N	61.30
43	920413	N	034	7F7D08575E	N		194	79	RA	N	61.30
44	920413	T	033	#####	N		75	5	RA	N	61.30

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 11, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	911107	7F7E456D61	393	710	40.740	80	11	75	920120	58.8	58.0
2	911108	7F7E095814	401	651	40.640	82	11	75	920121	58.8	58.8
3	911109	7F7E21747D	450	999	40.630	62	11	100	920216	60.1	60.1
4	911109	7F7E1F6A79	423	605	40.621	44	11	120	920307	60.1	60.1
5	911112	7F7E21741B	383	557	40.610	83	11	75	920125	64.8	64.8

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7E1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920308	7F7E475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7E271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 4, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920418	7F7E1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 6. A list of radio frequencies contacted on Trip 4, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.601/61	11	920113 920409(0949) 920409(2235) 920410(1605) 920411(1545) 920412(1607) 920413(1712) 920414(1514)	60.45	60.45	900 m LCR 900 m LCR 800 m LCR 900 m LCR 930 m LCR 950 m LCR 900 m LCR
40.621/44	11	911109 920409(1034) 920410(1536) 920411(1613) 920412(1546) 920413(1744) 920414(1455)	60.1	60.1	1,000 m LCR 950 m LCR 1,200 m LCR 1,010 m LCR 1,150 m LCR 1,100 m LCR
¹ 40.630/84	11	920418 920410(1310) 920410(2235) 920411(1513) 920411(2144) 920412(1419) 920412(2215) 920413(1105) 920413(2116) 920414(1202)	61.75	61.75	61.65 61.60 61.40 61.65 61.65 61.70 61.70 61.65 61.60
40.640/82	11	911108 920409(1052) 920409(2306) 920410(1610) 920411(1621) 920412(1432) 920413(2116)	58.8	58.8	1,200 m LCR 1,200 m LCR 1,200 m LCR 1,200 m LCR 490 m LCR 61.50

Table 6. A list of radio frequencies contacted on Trip 4, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.650/82	11	920111 920409(2111) 920409(2209) 920410(2205) 920411(2049) 920413(2103)	58.3	58.3	61.35 100 m LCR 61.35 61.35 61.35
40.661/62	11	920120 920408(1758) 920409(1550) 920410(1350) 920411(1557) 920412(1506) 920413(1210) 920413(2150) 920414(1239)	65.30	65.30	64.00 64.15 64.15 63.90 63.30 62.40 62.20 62.00
40.680/44	11	920308 920408(1058) 920408(1727) 920409(1522) 920409(2130) 920410(1320) 920410(2245) 920411(1530) 920411(2113) 920412(1443) 920412(2230) 920413(1116) 920413(2130) 920414(1235)	61.50	61.50	61.85 61.90 61.90 61.90 61.85 61.90 61.90 61.90 61.95 61.90 61.90 61.95 61.90 61.90

Table 6. A list of radio frequencies contacted on Trip 4, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.700/83	11	920311	61.30	61.30	61.55
		920408(1053)			61.50
		920409(1507)			61.70
		920409(2127)			61.65
		920410(1245)			61.60
		920410(2235)			61.60
		920411(1510)			61.65
		920411(2143)			61.60
		920412(1423)			61.60
		920412(2265)			61.70
		920413(1105)			61.65
		920413(2116)			61.60
40.710/60	11	920114	60.80	60.80	61.35
		920408(1025)			0 m LCR
		920409(0935)			61.40
		920409(1457)			61.35
		920409(2112)			100 m LCR
		920410(1220)			180 m LCR
		920410(1444)			200 m LCR
		920411(1525)			200 m LCR
		920412(1410)			950 m LCR
		920413(1704)			850 m LCR
		920414(1423)			
		40.720/62			11
920409(1016)	750 m LCR				
920410(1525)	900 m LCR				
920411(1548)	910 m LCR				
920412(1607)	950 m LCR				
920413(1703)	800 m LCR				
920414(1452)					

¹ Fish newly implanted Trip #4, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #5 - 1992
May 5 - 23, 1992**

Prepared For:

Bureau of Reclamation

Prepared By:

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June 8, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 5, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 5, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 5, 1992. AGFD personnel were generally involved with separate, concurrent research activities during the trip.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 5, 1992. Table 4 is a summary of all humpback chubs handled during Trip 5, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip 5, 1992.

Humpback Chubs Captured

A total of 202 humpback chub were handled during Trip 5, 1992. Of these 202 fish, 50 were classified as YOY (year class 1991, TL \leq 80 mm), 98 were juveniles (TL $>$ 80 and TL $<$ 200 mm) and 54 were adults (TL \geq 200). The smallest humpback chub captured was 43 mm and was assumed to be from the 1991 year class. It is possible that this fish and two others ($<$ 45 mm TL) are from the 1992 year class. However, based on conversations with AGF personnel working in the LCR, larval fish observed in the LCR (including possible *Gila* sp.) were 10 to 15 mm TL, indicating that the 1992 year class was just beginning to appear and were significantly smaller than any fish observed in the main channel during Trip 5, 1991. Most YOY and small juvenile humpback chubs were captured by electrofishing along low velocity boulder talus shorelines, although a substantial number were captured either by unbaited minnow traps (8 individuals), seining (14 individuals) or in the 1/2" mesh of experimental gill nets (12 individuals).

Thirteen humpback chub were captured in Reaches 2 and 3 during Trip 5, 1992. Five were in spawning condition, four with tubercles and one male expressing milt. Nine of these chubs were captured near major tributaries. One chub at Bright Angel Creek and two chub at Havasu Creek were captured at the creek mouth. The remaining four chubs were captured at RM 126.6, in the Middle Granite Gorge.

One previously PIT-tagged chub was recaptured at RM 108.1. This fish was originally PIT-tagged by BIO/WEST in September 1991 at RM 108.1.

Three incidental mortalities of humpback chubs occurred in Reach 1 during Trip 5, 1992. Mortalities included one small adult that was fatally injured during removal from a trammel net, and two juveniles, one of which was found on the floor of the electrofishing boat following a sampling run and the second was found lodged between live well dividers several days after sampling activities had ended in Reach 1. The fish were preserved and are being transferred to AGF.

One probable humpback chub (approx. 150 mm TL) was found in the stomach of a 500 mm brown trout. The trout was captured electrofishing along with 10 humpback chubs ranging in size from 80 to 134 mm TL. Stomach contents of the brown trout were preserved and transported to Flagstaff for further analysis.

Personnel from the Gila Taxonomy Program accompanied BIO/WEST during Trip 5, 1992 for the purpose of collecting tissue samples and taking video of humpback chubs in the main channel, Colorado River. Tissue samples and videography were taken of 28 adult humpback chubs captured in Reach 1 during Trip 5, 1992.

Radiotelemetry

Two humpback chubs were implanted with radio transmitters during Trip 5, 1992. One fish was implanted with a lateral incision and one with a mid-line incision.

Five radiotagged humpback chub, implanted during previous trips, were contacted during Trip 5, 1992 resulting in a 83% contact success of expected active transmitters. Three radiotagged humpback chubs were observed using the lower 5.5 km of the LCR, with two of the fish exhibiting slow but steady upstream movement over the course of the trip. The other two fish were contacted in the main channel consistently during the trip. One of the main channel fish was observed moving widely between RM 60.0 and 60.8. The second main channel fish was observed utilizing the LCR plume until attempts were made to recapture the fish. At that time the contact was lost with the fish then regained two days later approximately a mile downstream.

One observation of a radiotagged fish was conducted during Trip 5, 1992. The observation was conducted on the humpback chub utilizing the LCR plume area and lasted approximately 72 hours.

One radiotagged humpback chub was recaptured during Trip 5, 1992. The fish was originally implanted on January 14, 1992 at RM 60.7 and weighed 728 gms. It was recaptured at RM 61.3 on May 8, 116 days later. The fish weighed 666 gms when recaptured resulting in a weight loss of 62 gms or 9%. The fish was active and appeared to be in good condition. Healing of the primary incision was nearly complete and the antenna exit was in relatively good condition. The transmitter was no longer functional so the antenna was clipped, photographs were taken and the fish was released.

Both the LCR and the lower remote telemetry stations were operating normally and downloaded twice during the trip.

Bench Marks

No new bench marks were established during Trip 5, 1992.

OBSERVATIONS

1. Three radiotagged humpback chubs were found utilizing the lower 5.5 km of the LCR during Trip 5, 1992. Two of these fish, contacted consistently (three times during the trip) between 4.9 and 5.3 km up the LCR represent the furthest upstream in the LCR that radiotagged fish have been contacted by BIO/WEST. Successive locations of two of the three fish in the LCR indicated that the fish were still migrating slowly up the LCR.
2. Catch rates of implantable adult humpback chubs were low during the trip, indicating that a significant number of the larger adults may still be occupying the LCR.
3. Catch rates of adult humpback chubs in the main channel were low during Trip 5, 1992. Of the adult humpback chubs that were captured in the main channel a substantial number were small adults or larger individuals that appeared flaccid or spent suggesting recent spawning activities. Because of the difficulty capturing implantable size adults, only two fish were radiotagged during the trip.
4. Conditions in the LCR were variable during Trip 5, 1992. Initially the LCR was near base flow and clearing (a blue color was perceptible on May 6). On May 7 the LCR was running very turbid and significantly higher. This flood event lasted for several days after which the flows slowly began to recede. Turbidity remained high in the LCR for the remainder of the Trip and significantly influenced turbidity in the mainchannel below the confluence.
5. Significant numbers of YOY (1991 year class) and small juvenile humpback chubs were observed in the main channel below the confluence of the LCR during Trip 5, 1992. These chubs were readily captured using a variety of techniques. High numbers of these size classes of chubs in the main channel may represent a recent influx of chubs from the LCR, possible associated with the flood event that occurred during the Trip.
6. Stomach contents of a 500 mm brown trout contained the remains of a fish tentatively identified as a humpback chub (TL = approximately 150 mm). The trout was collected in the same electrofishing run as 10 juvenile and YOY humpback chubs suggesting that it may have been actively been feeding on humpback chub in the main channel.
7. Dynamics of the LCR plume in the main channel were again minimal during Trip 5, 1992. Stage changes associated interim flows during Trip 5, 1992 did not substantially alter the location of the plume. One radiotagged humpback chub was located consistently in the plume during the majority of the trip. This observation in addition to observations of radiotagged humpback chubs using the plume on previous trips in 1992 suggest that a humpback chubs may utilize the LCR plume under more stable conditions. No radiotagged humpback chubs were observed consistently utilizing the plume in 1991.
8. Approximately 90 native suckers were PIT-tagged in and around tributaries.
9. Spawning aggregations of native suckers were observed at Bright Angel Creek, Kanab Creek and Havasu Creek.

10. Spawning flannelmouth suckers were outnumbered by bluehead suckers during Trip 5, 1992. The large spawning flannelmouths observed during March from Kanab Creek appeared spent in May and were physically weak.
11. Havasu Creek exhibited spawning aggregations of both bluehead and flannelmouth suckers.
12. One flannelmouth x razorback sucker exhibiting a distinct razorback keel was captured at RM 83.9, near Clear Creek. This possible razorback had a dorsal ray count of 16, and all the physical characteristics of a razorback sucker. Photographs were taken for documentation.
13. The observation of 15-20 dead bluehead suckers in Kanab Creek during May 1992 is of concern. These fish were all between 150 and 200 mm and found dead on the creek bottom throughout the lower 3 km of Kanab Creek. No external cause of death was observed. The same phenomenon was observed in April 1992 (Tom Martin; Canyon Explorations boatman, pers. comm.).
14. Two striped bass weighing about 1 pound were collected near RM 217.6 during Trip 5, 1992.
15. One black bullhead was captured in a hoop-net at Kanab Creek during Trip 5, 1992. This juvenile is the first record of this species below the Little Colorado River in recent time.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Low catch rates of adult humpback chubs in the main channel resulted in only two chubs being implanted with transmitters during Trip 5, 1992. This combined with low numbers of implants during the previous two trips will soon begin to affect the number of radiotagged fish available to work during future trips, especially 10-day telemetry trips. In order to maintain adequate numbers of radiotagged fish available for research it will be necessary to attempt to capture more implantable fish during Trip 6, 1992.
2. Both Yamaha generators failed during Trip 5, 1992. One full day was spent attempting repairs in the field. These efforts were unsuccessful. The Yamaha generators are being inspected for causes of failure. Repairs will be made, but smaller more reliable Honda generators of the same kilowatt output may be purchased for future field trips.
3. Electrofishing effort in Reach 2 was lost due to generator failure. Netting effort was increased to compensate.

RECOMMENDATIONS

1. In order to augment numbers of radiotagged fish available for research, netting should be conducted during Trip 6, 1992 for the purpose of capturing implantable size humpback chubs. Electrofishing will not be employed during Trip 6, 1992 and netting activities should be discontinued upon capture of sufficient numbers of implantable chubs (four).

Table 1. Logistics and Research Schedule for Trip 5, 1992 Team 1

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
5/05/92	29.0	Shinomu Wash	X			
5/06/92	58.2	Awatubi	X	X	X	X
5/07/92	58.2	Awatubi		X	X	X
5/08/92	61.2	LCR	X	X	X	X
5/09/92	61.2	LCR		X	X	X
5/10/92	61.2	LCR		X	X	X
5/11/92	61.2	LCR		X	X	X
5/12/92	61.2	LCR		X	X	X
5/13/92	61.2	LCR		X	X	X
5/14/92	65.5	Lava Chuar	X	X	X	X
5/15/92	65.5	Lava Chuar		X	X	X
5/16/92	65.5	Lava Chuar		X	X	X
5/17/92	127.0	127 Mile Creek	X	X		
5/18/92	156.0	Above Havasu Creek	X	X		
5/19/92	180.0	Below Lava Falls	X	X		
5/20/92	180.0	Below Lava Falls	X	X		
5/21/92	214	214 Mile Creek	X	X		
5/22/92	214	214 Mile Creek	X	X		
5/23/92	225	Diamond Creek	X	X		

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1. Logistics and Research Schedule for Trip 5, 1992, Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
5/05/92	29	Shinumo Wash	X			
5/06/92	84	Clear Creek	X	X		
5/07/92	84	Clear Creek		X		X
5/08/92	87.1	Cremation	X	X		
5/09/92	87.1	Cremation		X		X
5/10/92	108.3	Bass Rapid	X			
5/11/92	108.3	Bass Rapid		X		X
5/12/92	127.4	127.4	X	X		
5/13/92	133.1	133.1	X	X		
5/14/92	137.7	137.7	X	X		
5/15/92	143.3	Above Kanab Creek	X	X		
5/16/92	143.3	Above Kanab Creek		X		X
5/17/92	143.3	Above Kanab Creek		X		X
5/18/92	156.5	Last, Last Chance	X	X		
5/19/92	156.5	Last, Last Chance		X		X
5/20/92	190.3	190.3	X	X		
5/21/92	190.3	190.3		X		
5/22/92	219.7	Middle 220	X	X		
5/23/92	219.7	Middle 220		X		
5/24/92	225.7	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 5, 1992, Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	5/5 - 5/18	Project Leader
R. VanHaverbeke	BIO/WEST	5/5 - 5/23	Senior Biologist
H. Yard	BIO/WEST	5/5 - 5/23	
G. Hardwick	BIO/WEST	5/5 - 5/23	
B. Dierker	BIO/WEST	5/5 - 5/23	
R. Valdez	BIO/WEST	5/8 - 5/13	Principal Investigator
M. Douglas	ASU	5/5 - 5/18	Gila Taxonomy
M. Kalizewski	BYU	5/5 - 5/12	Gila Taxonomy
W. Starnes	SMITHSONIAN	5/5 - 5/18	Gila Taxonomy
L. Crist	BOR	5/8 - 5/13	
D. Wydowski	GCES-VOLUNTEER	5/5 - 5/23	
D. Reynolds	GCES-VOLUNTEER	5/5 - 5/23	
L. Bleifuss	OARS	5/5 - 5/23	Trip Leader
L. Rasmussen	OARS	5/5 - 5/23	
A. Cassidy	OARS	5/5 - 5/23	

Table 2. Personnel Participating in Trip 5, 1992, Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Leibfried	BIO/WEST	5/5 - 5/24	Project Leader
E. Prats	BIO/WEST	5/5 - 5/24	
K. McCabe	BIO/WEST	5/5 - 5/24	
T. Yates	BIO/WEST	5/5 - 5/24	
B. Cowdell	BIO/WEST	5/5 - 5/24	
D. Kuznitz	BIO/WEST VOLUNTEER	5/5 - 5/24	
M. Littlefield	BIO/WEST VOLUNTEER	5/5 - 5/24	
M. Gregg	BIO/WEST VOLUNTEER	5/9 - 5/24	
S. Bledsoe	OARS	5/5 - 5/24	
S. Reeder	OARS	5/5 - 5/24	
C. Krznarich	OARS	5/5 - 5/24	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

	1	2	HB'	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	F	S
															V	B
Reach 1	A	2	11	0	128	1	0	5	5	0	0	0	0	14	0	0
EL	J	65	1	0	2	0	0	2	0	0	0	0	0	0	0	0
N=31	Y	46	0	0	1	0	0	1	0	0	0	0	0	0	0	0
10.7 hr																
Reach 2	A	1	3	0	72	148	0	33	0	0	0	0	0	0	0	0
EL	J	0	1	1	15	19	0	0	0	0	0	0	0	0	0	0
N=37	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 hr																
Reach 3	A	0	1	0	0	0	0	13	1	0	0	0	0	2	0	1
EL	J	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
N=28	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 hr																
Reach 1	A	6	9	0	12	1	1	0	0	0	0	0	0	0	0	0
TL	J	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=34	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 hr																
Reach 2	A	1	20	3	0	3	0	8	0	0	0	0	0	0	0	0
TL	J	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
N=127	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
254 hr																
Reach 3	A	0	0	0	0	0	1	4	0	0	1	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=30	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 hr																

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

1	2	HB'	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	F	S
														V	B
Reach 1	A	22	27	4	6	0	0	2	0	0	0	0	0	0	0
TK	J	2	0	0	0	0	0	0	0	0	0	0	0	0	0
N=43	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86 hr															
Reach 2	A	2	14	4	9	12	0	4	0	0	0	0	0	0	0
TK	J	0	0	0	1	0	0	0	0	0	0	0	0	0	0
N=74	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
148 hr															
Reach 3	A	0	0	0	0	0	3	8	0	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=29	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 hr															
Reach 1	A	1	0	0	1	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=16	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 hr															
Reach 3	A	0	0	0	0	0	0	1	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 hr															
Reach 1	A	1	3	0	18	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=23	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 hr															

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

	1	2	IB'	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	F	S
															V	B
Reach 2	A	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=34	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 hr																
Reach 3	A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=19	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 hr																
Reach 1	A	6	1	0	0	1	0	0	0	0	0	0	0	0	0	0
GX	J	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=13	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 hr																
Reach 2	A	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 hr																
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 hr																
Reach 1	A	0	0	0	0	0	0	0	0	1	1	0	0	0	16	0
MT	J	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=99	Y	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240 hr																

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

	1	2	HB'	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	F	S
															V	B
Reach 2	A	0	0	0	0	0	0	0	0	0	9	0	0	4	0	0
MT	J	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0
N=17	Y	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
280 hr																
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MT	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=4	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96 hr																
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 hr																
Reach 2	A	3	22	4	16	7	0	0	0	0	0	0	0	0	1	0
TN	J	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
N=67	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
134 hr																
Reach 3	A	2	31	0	0	0	2	5	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=44	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88 hr																
Reach 1	A	2	3	0	1	0	1	0	0	0	0	0	0	0	0	0
GF	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

1	2	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	F	S
														V	B
Reach 1	A	1	3	12	0	0	0	0	0	0	0	0	0	0	0
TI	J	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N=16	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 hr															
Reach 2	A	0	1	1	0	0	0	0	8	0	0	0	1	0	0
HL	J	0	3	1	0	0	0	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115 hr															
Reach 3	A	0	3	10	0	1	0	0	0	0	0	0	0	0	0
HL	J	0	2	12	0	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 hr															
Reach 2	A	0	1	3	0	0	0	1	4	0	0	0	0	0	0
HS	J	0	3	13	1	0	0	0	0	0	1	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82 hr															
Reach 1	A	0	0	0	1	0	0	0	1	1	0	0	7	0	0
SA	J	12	1	4	0	0	0	1	8	0	0	0	21	0	0
N=14	Y	2	5	1	0	0	0	0	0	0	0	0	0	0	0
Reach 2	A	0	1	0	0	0	0	0	27	1	0	0	0	0	0
SA	J	0	3	0	0	0	0	0	1	0	0	0	0	0	0
N=5	Y	0	26	0	0	0	0	0	0	0	0	16	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 5, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	BB	SU	FH	FV	S
Reach 3	A	0	0	0	0	0	0	0	13	2	0	0	101	0	0
SA	J	0	2	0	0	0	0	0	7	0	0	0	0	0	0
N=5	Y	0	0	2	0	0	0	0	0	0	0	3	0	0	0
TOTALS	A	54	102	37	249	166	6	81	60	15	0	0	145	1	1
	J	98	23	34	20	19	0	2	16	0	1	0	21	0	0
	Y	50	31	3	6	0	0	1	0	0	0	19	0	0	0

¹- Gear Types

- EL = Electrofishing
- TL = 75'x6'x1 1/2"x12" trammel net
- TK = 75'x5'x1"x12" trammel net
- GM = 10'x6'x2" gill net
- GP = 100'x6'x1 1/2" gill net
- GX = 100'x6', 2" to 1/2" @ 1/2" increments, experimental gill net
- MT = minnow trap
- TN = 50'x6'x1 1/2"x12" trammel net
- GF = Floated gill net
- TI = 50'x5'x1 1/2"
- HL = Large hoop net (4' diameter)
- HS = Small hoop net (2' diameter)
- SA = 10'x3'x1/8" seine

² - A = Adult

- J = Juvenile
- Y = Young of year

³ - HB = humpback chub

- FM = flannelmouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace
- PK = plains killifish
- BB = black bullhead
- SU = unidentified sucker
- FH = fathead
- FV = flannelmouth variant
- SB = striped bass

Table 4. Summary of Humpback Chub handled during Trip 5, 1992.

	DATE	GEAR TYPE	SAMPLE NO	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
1	920507	N	021	7F7D025F6F	Y	PITTAG	297	240	RA	N	58.80
2	920507	N	010	7F7F284717	N		227	108	RA	N	83.9
3	920507	N	015	7F7F07564F	N		323	321	RA	N	83.9
4	920508	N	029	7F7D224A17	Y	PITTAG	377	411	RA	N	61.30
5	920508	N	029	7F7F21264E	N		376	478	RA	N	61.30
6	920508	N	029	7F7F217911	N		339	301	RA	N	61.30
7	920508	N	033	7F7F217E36	N		420	595	RI	N	61.30
8	920508	N	033	7F7F3E2772	Y	PITTAG	376	450	RA	N	61.30
9	920508	N	033	7F7F3E594F	Y	PITTAG	319	297	RA	N	61.30
10	920508	N	034	7F7D224870	Y	PITTAG	224	112	RA	N	61.30
11	920508	E	008	#####	N		84	5	RA	N	61.10
12	920508	E	008	#####	Y	FIN CLIP	110	12	RA	N	61.10
13	920508	S	001	7F7D074026	N		158	28	RA	N	0.00
14	920508	N	025	7F7D086B1C	N		282	246	RA	N	61.20
15	920508	N	034	7F7D2A693B	Y	PITTAG	287	238	RA	N	61.30
16	920508	N	040	7F7F333843	N		195	91	RA	N	87.7
17	920508	S	001	ESCAPED							0.0
18	920508	S	001	ESCAPED							0.0
19	920509	N	039	7F7F104136	N		312	242	RA	N	61.30
20	920509	N	052	7F7D2B5975	Y	PITTAG	383	414	RA	N	61.30

21	920509	N	052	7F7D080024	N		423	600	RI	Y	61.50
22	920509	N	052	7F7D140108	Y	PITTAG	409	666	RN	Y	61.50
23	920509	N	052	7F7F33211A	Y	PITTAG	205	84	DP	N	61.50
24	920509	E	010	7F7F217E36	Y	PITTAG	420	595	RR	Y	61.90
25	920509	E	009	#####	N		44	0	RA	N	61.10
26	920509	E	010	#####	N		76	8	RA	N	61.90
27	920509	E	010	#####	N		90	6	RA	N	61.90
28	920510	N	52A	7F7D075E17	N		312	234	RA	N	61.30
29	920510	S	004	7F7D177841	Y	PITTAG	173	44	RA	N	61.60
30	920510	E	013	7F7D086936	Y	PITTAG	170	45	RA	N	59.80
31	920510	E	022	7F7D084D01	Y	PITTAG	266	240	RA	N	108.1
32	920510	N	094	7F7F1F147D	N		289	232	RA	N	108.1
33	920510	N	097	7F7F1F103B	N		212	96	RA	N	108.2
34	920511	E	017	#####	Y	FIN CLIP	64	2	RA	N	63.10
35	920511	E	017	#####	N		88	6	RA	N	63.10
36	920511	E	017	#####	N		79	4	RA	N	63.10
37	920511	E	017	#####	N		80	4	RA	N	63.10
38	920511	E	017	#####	N		89	8	RA	N	63.10
39	920511	E	017	#####	N		91	7	RA	N	63.10
40	920511	E	017	#####	N		54	0	RA	N	63.10
41	920511	E	017	#####	N		99	6	RA	N	63.10
42	920511	E	017	#####	N		87	5	RA	N	63.10
43	920511	E	017	#####	N		115	9	RA	N	63.10

44	920511	E	017	#####	Y	FIN CLIP	102	6	RA	N	63.10
45	920511	E	017	#####	N		109	8	RA	N	63.10
46	920511	E	017	#####	Y	FIN CLIP	69	2	RA	N	63.10
47	920511	E	017	#####	N		129	18	RA	N	63.10
48	920511	E	016	#####	N		85	0	RA	N	62.80
49	920511	E	016	#####	N		84	5	RA	N	62.80
50	920511	E	016	#####	N		73	2	RA	N	62.80
51	920511	E	016	#####	N		95	12	RA	N	62.80
52	920511	E	016	#####	Y	FIN CLIP	59	9	RA	N	62.80
53	920511	E	016	#####	Y	FIN CLIP	70	2	RA	N	62.80
54	920511	E	017	#####	N		61	3	RA	N	63.10
55	920511	N	061	7F7F10410D	N		377	252	RA	N	61.30
56	920511	N	061	7F7D077312	N		247	85	RA	N	61.30
57	920511	N	061	7F7D027D75	N		390	311	RA	N	61.30
58	920511	N	065	7F7F1F6C19	N		338	379	RA	N	61.30
59	920511	N	065	7F7D255C1B	Y	PITTAG	348	369	RA	N	61.30
60	920511	N	065	7F7D026B43	N		342	375	RA	N	61.30
61	920511	N	068	7F7D2C417F	Y	PITTAG	215	127	RA	N	61.50
62	920511	E	015	#####	N		42	0	RA	N	62.50
63	920511	E	015	#####	N		48	0	RA	N	62.50
64	920511	T	068	#####	N		77	0	RA	N	61.70
65	920511	T	081	#####	N		78	0	RA	N	61.70
66	920511	T	081	#####	N		89	0	RA	N	61.70

67	920512	E	019	#####	N		125	18	RA	N	61.20
68	920512	E	019	#####	N		79	5	RA	N	61.20
69	920512	E	019	#####	N		53	0	RA	N	61.20
70	920512	E	019	#####	N		137	28	RA	N	61.20
71	920512	E	019	#####	N		131	22	RA	N	61.20
72	920512	E	019	#####	N		108	11	RA	N	61.20
73	920512	E	019	#####	N		148	32	RA	N	61.20
74	920512	E	018	#####	N		54	1	RA	N	63.20
75	920512	E	018	#####	N		75	4	RA	N	63.20
76	920512	E	018	7F7D075B0A	N		155	31	RA	N	63.20
77	920512	E	018	#####	N		129	16	RA	N	63.20
78	920512	E	018	#####	N		81	3	RA	N	63.20
79	920512	E	018	#####	N		86	4	RA	N	63.20
80	920512	E	018	#####	N		88	7	RA	N	63.20
81	920512	E	018	#####	N		94	7	RA	N	63.20
82	920512	E	018	#####	N		82	6	RA	N	63.20
83	920512	E	018	#####	N		89	6	RA	N	63.20
84	920512	E	018	#####	N		48	0	RA	N	63.20
85	920512	E	018	#####	N		83	6	RA	N	63.20
86	920512	E	018	#####	N		65	3	RA	N	63.20
87	920512	E	018	#####	N		90	5	RA	N	63.20
88	920512	E	018	#####	N		76	3	RA	N	63.20
89	920512	E	018	#####	N		100	7	RA	N	63.20

90	920512	E	018	#####	N		83	3	RA	N	63.20
91	920512	E	018	#####	N		124	18	RA	N	63.20
92	920512	E	018	#####	N		117	12	RA	N	63.20
93	920512	E	018	#####	N		134	22	RA	N	63.20
94	920512	N	074	7F7D084C3B	N		357	397	RA	N	61.30
95	920512	N	072	7F7D02673F	N		355	407	RA	N	61.30
96	920512	N	072	7F7D085E20	N		226	102	RA	N	61.50
97	920512	N	077	7F7D086135	N		197	75	RA	N	61.50
98	920512	N	077	7F7F104103	N		392	446	RA	N	61.30
99	920512	N	077	7F7F104346	N		345	328	RA	N	61.30
100	920512	N	077	7F7D255C1B	Y	PITTAG	346	360	RA	N	61.30
101	920512	S	010	#####	N		93	6	RA	N	61.50
102	920512	S	010	#####	N		93	4	RA	N	61.50
103	920512	S	010	#####	N		104	8	RA	N	61.50
104	920512	S	010	#####	N		76	3	RA	N	61.50
105	920512	S	010	#####	N		81	6	RA	N	61.50
106	920512	S	010	#####	N		117	11	RA	N	61.50
107	920512	S	010	#####	N		90	6	RA	N	63.10
108	920512	S	006	7F7D090048	Y	0843CR	365	364	RA	N	61.25
109	920512	S	005	7F7D076705	N		390	449	RA	N	61.25
110	920512	S	012	#####	N		71	0	RA	N	61.50
111	920512	S	014	#####	N		89	0	RA	N	61.60
112	920512	S	014	#####	N		92	0	RA	N	61.60

113	920512	E	019	#####	N		91	6	RA	N	61.20
114	920512	E	019	#####	N		65	0	RA	N	61.20
115	920512	E	019	7F7D082147	N		185	79	RA	N	61.20
116	920512	E	019	7F7D087A3F	N		267	200	RA	N	61.20
117	920512	E	019	#####	N		114	15	DP	N	0.00
118	920512	E	022	#####	N		77	2	RA	N	63.70
119	920512	E	022	#####	N		55	0	RA	N	63.70
120	920513	E	023	#####	N		124	15	RA	N	0.00
121	920513	E	023	#####	N		120	14	RA	N	0.00
122	920513	E	023	#####	N		80	4	RA	N	0.00
123	920513	E	023	#####	N		85	4	RA	N	0.00
124	920513	E	023	#####	N		87	4	RA	N	0.00
125	920513	N	082	7F7F1E6A4B	N		324	347	RA	N	61.30
126	920513	N	082	7F7D180C78	Y	PITTAG	344	325	RA	N	61.30
127	920513	N	087	7F7D180A30	Y	PITTAG	343	306	RA	N	61.30
128	920513	N	088	7F7D240158	Y	PITTAG	387	496	RA	N	61.30
129	920513	N	092	7F7D17135D	Y	PITTAG	397	0	RA	N	61.30
130	920513	E	023	#####	N		93	5	RA	N	0.00
131	920513	E	023	#####	N		140	22	RA	N	0.00
132	920513	E	025	#####	N		70	5	RA	N	64.30
133	920513	E	024	7F7D081952	N		153	37	RA	N	62.50
134	920514	N	099	7F7D086732	N		224	95	RA	N	64.70
135	920514	N	099	7F7D073D77	N		234	137	RA	N	64.70

136	920514	N	100	7F7D08182D	N		244	116	RA	N	64.80
137	920514	N	103	7F7D077751	N		184	100	RA	N	64.70
138	920514	E	025	#####	N		80	4	RA	N	64.30
139	920514	E	025	#####	N		65	2	RA	N	64.30
140	920514	E	025	#####	N		52	1	RA	N	64.30
141	920514	E	025	#####	N		73	3	RA	N	64.30
142	920514	E	025	#####	N		62	2	RA	N	64.30
143	920514	E	025	#####	N		65	2	RA	N	64.30
144	920514	E	025	#####	N		71	3	RA	N	64.30
145	920514	E	025	#####	N		52	1	RA	N	64.30
146	920514	E	025	#####	N		73	3	RA	N	64.30
147	920514	E	025	#####	N		109	11	RA	N	64.30
148	920515	N	133	#####	N		109	12	RA	N	64.70
149	920515	N	133	#####	N		131	21	RA	N	64.70
150	920515	N	133	7F7D08572A	N		216	89	RA	N	64.70
151	920515	N	127	#####	Y	FIN CLIP	131	21	RA	N	64.70
152	920515	N	127	#####	Y	FIN CLIP	113	12	RA	N	64.70
153	920515	N	127	#####	Y	FIN CLIP	108	12	RA	N	64.70
154	920515	N	127	#####	Y	FIN CLIP	132	16	RA	N	64.70
155	920515	N	127	#####	Y	FIN CLIP	154	30	RA	N	64.70
156	920515	N	127	#####	N		136	21	RA	N	64.70
157	920515	N	127	#####	N		111	13	RA	N	64.70
158	920515	N	127	#####	N		118	13	RA	N	64.70

159	920515	N	127	#####	N	127	#####	N	132	23	RA	N	64.70
160	920515	N	127	#####	N	127	#####	N	111	11	RA	N	64.70
161	920515	E	027	#####	E	027	#####	N	89	6	RA	N	64.20
162	920515	E	027	#####	E	027	#####	N	80	4	RA	N	64.20
163	920515	E	027	#####	E	027	#####	N	99	8	RA	N	64.20
164	920515	E	027	#####	E	027	#####	N	77	5	RA	N	64.20
165	920515	E	027	#####	E	027	#####	N	134	15	RA	N	64.20
166	920515	E	027	#####	E	027	#####	N	87	4	RA	N	64.20
167	920515	E	027	#####	E	027	#####	N	97	8	RA	N	64.20
168	920515	E	027	#####	E	027	#####	N	68	2	RA	N	64.20
169	920515	E	027	#####	E	027	#####	N	96	8	RA	N	64.20
170	920515	E	027	#####	E	027	#####	N	106	11	RA	N	64.20
171	920515	E	028	#####	E	028	#####	N	75	2	RA	N	64.90
172	920515	E	028	#####	E	028	#####	N	43	1	RA	N	64.90
173	920515	T	084	7F7D084B34	T	084	7F7D084B34	N	184	0	RA	N	61.70
174	920516	E	030	#####	E	030	#####	N	137	26	RA	N	65.20
175	920516	E	030	#####	E	030	#####	N	119	15	RA	N	65.20
176	920516	E	030	#####	E	030	#####	N	92	7	RA	N	65.20
177	920516	N	140	7F7D084B34	N	140	7F7D084B34	N	191	8	RA	N	65.20
178	920516	E	029	#####	E	029	#####	N	100	9	RA	N	67.50
179	920516	E	029	#####	E	029	#####	N	69	4	RA	N	67.50
180	920516	E	029	#####	E	029	#####	N	50	1	RA	N	67.50
181	920516	E	029	#####	E	029	#####	N	64	3	RA	N	67.50

182	920516	E	030	#####	N		67	2	RA	N	65.20
183	920516	E	030	#####	N		64	2	RA	N	65.20
184	920516	E	030	#####	N		55	1	RA	N	65.20
185	920516	E	030	#####	N		65	2	RA	N	65.20
186	920516	E	030	#####	N		55	1	RA	N	65.20
187	920516	E	030	#####	N		78	3	RA	N	65.20
188	920516	E	030	#####	N		80	4	RA	N	65.20
189	920516	E	030	#####	N		47	0	RA	N	65.20
190	920516	E	030	#####	N		52	1	RA	N	65.20
191	920516	E	030	#####	N		93	6	RA	N	65.20
192	920516	N	209	7F7F332A3F	M		242	152	RA	N	143.2
193	920517	T	099	#####	N		94	0	RA	N	64.50
194	920517	T	097	#####	N		82	0	RA	N	64.70
195	920517	T	092	#####	N		95	0	RA	N	65.40
196	920517	T	092	#####	N		80	0	RA	N	65.40
197	920518	N	292	#####	N		245	156	RA	N	156.7
198	920518	N	292	7F7F29650E	N		384	520	RA	N	156.7
199	920518	N	134	7F7D08585E	N		229	115	RA	N	126.6
200	920518	N	134	7F7D08601D	N		219	106	RA	N	126.6
201	920518	N	134	7F7D077D5A	N		235	-	RA	N	126.6
202	920518	N	134	7F7D08523D	N		197	88	RA	N	126.6

N = Netting
T = Trapping

E = Electrofishing
S = Seining

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 11, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	911107	7F7E456D61	393	710	40.740	80	11	75	920120	58.8	58.0
2	911108	7F7E095814	401	651	40.640	82	11	75	920121	58.8	58.8
3	911109	7F7E21747D	450	999	40.630	62	11	100	920216	60.1	60.1
4	911109	7F7E1F6A79	423	605	40.621	44	11	120	920307	60.1	60.1
5	911112	7F7E21741B	383	557	40.610	83	11	75	920125	64.8	64.8

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7E1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920308	7F7F475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7F271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 4, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920418	7F7F1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 5 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTAN- CY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920508	7F7F217E36	420	595	40.610	42	11	120	920905	61.9	61.9
2	920509	7F7D080024	423	600	40.730	83	11	75	920723	61.5	61.5

Table 6. A list of radio frequencies contacted on Trip 5, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.650/82 /74	11	920111 920508(0957) 920508(2150) 920510(2155)	58.3	58.3	60.05 60.05 60.75
/75		920511(1430) 920516(1355)			60.80 60.75
40.630/86 /87 /86 /87 /86 /87 /86	11	920418 920507(1605) 920508(1545) 920509(1248) 920516(1159) 920510(1724) 920511(1227) 920512(1724) 920513(1750) 920514(1702) 920515(0947)	61.75	61.75	1,275 M LCR 1,275 M LCR 1,290 M LCR 1,975 M LCR 1,500 M LCR 1,880 M LCR 2,000 M LCR 1,975 M LCR 1,975 M LCR 2,005 M LCR
40.720/62 /60	11	920311 920508(1710) 920511(1309) 920515(1103)	61.10	61.10	4,500 M LCR 3,880 M LCR 3,900 M LCR
40.700/83 /62 /64	11	920311 920509(1530) 920510(0055) 920510(1700) 920510(2212) 920511(1500) 920512(0030) 920514(1327) 920515(1656) 920516(1425)	61.30	61.30	61.4 61.4 61.4 61.4 61.4 61.4 62.1 62.3 62.3
40.661/62 /52 /53 /43	11	920120 920508(1740) 920511(1415) 920515(1135)	65.30	65.30	5,350 M LCR 5,200 M LCR 4,760 M LCR
¹ 40.610/42 /43	11	920508 920509(1535) 920513(1615) 920514(1340) 920515(1800)	61.9	61.9	61.85 62.6 63.2 64.4

Table 6. A list of radio frequencies contacted on Trip 5, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.730/83	11	920509	61.5	61.5	
/84		920511(1510)			61.7
/83		920512(0035)			61.7
		920512(1800)			61.7
		920512(2152)			61.7
		920513(1555)			61.8
/85		920513(2219)			61.7
/83		920514(1314)			61.7
		920515(1626)			61.7
		920516(1413)			61.7

¹ Fish newly implanted Trip 5, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #6 - 1992
June 13 - 24, 1992**

Prepared For:

Bureau of Reclamation

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June 26, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip #6, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #6, 1992. Table 2 presents personnel who were present or participated in research activities for Trip #6, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #6, 1992. Table 4 is a summary of all humpback chubs handled during Trip #6, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip #6, 1992.

Humpback Chubs Captured

A total of 39 humpback chub were handled during Trip #6, 1992. Two were classified as YOY (year class 1991, TL \leq 90mm), and 37 were adults (TL \geq 200mm). Two YOY humpback chub were captured directly below the LCR confluence in unbaited minnow traps. The remaining 36 humpback chubs were captured in gill and trammel nets in the main channel within one mile downstream of the LCR confluence.

All fish were released at capture locations in good condition.

Radiotelemetry

Three humpback chubs were implanted with radio transmitters during Trip #6, 1992. One fish was implanted with a lateral incision and two implanted with midline incisions.

Two radiotagged humpback chub, implanted during previous trips, were contacted during Trip #6, 1992. Both fish were located in the LCR using a GCES helicopter surveillance. One fish was located at the base of Atomizer Falls, approximately 8 miles from confluence with the Colorado. The other radiotagged humpback chub was located above AGF's lower camp, 1.5 miles from the confluence. No radiotagged humpback chub were located in the Colorado River.

The Crash Canyon remote station was operating normally and downloaded twice during the trip. The initialization program on the LCR station was scrambled. The last signal recorded was on May 27, 1992, scanning did not resume until the initialization program was reinstalled on June 14, 1992. One battery at the LCR station was replaced. The LCR station was operating normally when downloaded on June 20, 1992.

Habitat Mapping

Four juvenile habitat sites were mapped during Trip #6, 1992. Each of the four sites were mapped during a 'high' and 'low' flow cycle. Flows at three of the sites were tied into the bench mark at 2.0645.

Bench Marks

No new bench marks were established during Trip #6, 1992.

OBSERVATIONS

1. Two radiotagged humpback chub were located in the LCR using a GCES helicopter for surveillance. One fish was located at the base of Atomizer Falls, approximately 8 miles from confluence with the Colorado. This is the furthest upstream movement of a humpback chub recorded in the LCR by BIO/WEST.
2. Conditions in the LCR were near base flow and clear (light blue) during Trip #6, 1992.
3. Six rainbow trout were caught angling from the left LCR camp. Stomachs were removed and preserved for content analysis.
4. One humpback chub was caught by Don Metz angling from 'surgery point' at the left LCR camp. The fish was a gravid female measuring 362 mm TL and weighing 451 gm. A spin casting rod with a 1/4 oz. silver crocodile spoon were used.
5. Two YOY humpback chub, one speckled dace and one fathead minnow were captured in unbaited minnow traps 100-200 m below the confluence of the LCR. The chubs were 84 and 89 mm TL. Both were assumed to be 1991 year class fish.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. No fish were located in the main channel during Trip #6, 1992. Locations of radiotagged fish during Trip #5, 1992 indicated that fish were probably still in the LCR. To extend surveillance range in the LCR Helen Yard and Rich Valdez got a ride on a GCES helicopter flight from AGF boulder camp. The flight was successful in locating two of the five active radio tagged fish.
2. Four props were 'spun' during Trip #5, 1992. All props were recently rebuilt, it was suspected that the rubber hubs may have been overheated during the rebuild.

RECOMMENDATIONS

1. The location of a radiotagged fish at the base of Atomizer Falls indicates that fish are moving long distances up the LCR. The long distance (> 8 miles) and general lack of a trail makes foot surveillances to Atomizer inefficient. Therefore helicopter reconnaissances of the LCR would be benefit during trips in the spawning season (April - July).

Table 1. Logistics and Research Schedule for Trip #6, 1992.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
6/13	34.9	Nautaloid Canyon	X			
6/14	61.2	LCR	X	X	X	
6/15	61.2	LCR		X	X	
6/16	61.2	LCR		X	X	
6/17	61.2	LCR		X	X	
6/18	61.2	LCR		X	X	X
6/19	61.2	LCR			X	X
6/20	87.5	Cremation	X		X	
6/21	132.0	Below Dubendorff	X			
6/22	182.4	Hells Hollow	X			
6/23	224.5	Above Diamond	X			
6/24	225.5	Diamond Creek				

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #6, 1992.

PERSONNEL	AFFILIATION	DATES	COMMENTS
R. Valdez	BIO/WEST	6/13 - 6/19	Out Tanner
H. Yard	BIO/WEST	6/13 - 6/19	Out Tanner
L. Brown	BIO/WEST	6/13 - 6/19	Out Tanner
E. Prats	BIO/WEST	6/13 - 6/21	Out Bright Angel
B. Cowdell	BIO/WEST	6/13 - 6/21	Out Bright Angel
B. Dierker	BIO/WEST	6/14 - 6/21	Out Bright Angel
D. Metz	USFWS	6/14 - 6/21	Out Bright Angel
M. Moretti	BIO/WEST Vol.	6/13 - 6/24	
J. Williams	BIO/WEST Vol.	6/13 - 6/24	
J. Miller	BOR	6/13 - 6/15	Chopper Out - LCR
S. Reeder	OARS	6/13 - 6/24	
L. Rasmussen	OARS	6/13 - 6/24	
D. Stonebraker	OARS	6/13 - 6/24	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip #6, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	4	1	0	0	0	0	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0	0
6 hr													
Reach 1	A	19	7	1	2	0	1	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0
N=19	Y	0	0	0	0	0	0	0	0	0	0	0	0
38 hr													
Reach 1	A	2	0	0	1	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0
N=1	Y	0	0	0	0	0	0	0	0	0	0	0	0
2 hr													
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0	0
12 hr													
Reach 1	A	11	11	1	5	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=8	Y	0	0	0	0	0	0	0	0	0	0	0	0
16 hr													
Reach 1	A	0	0	0	0	0	0	0	0	2	0	1	0
MT	J	0	0	0	0	0	0	0	0	0	0	0	0
N=16	Y	2	0	0	0	0	0	0	0	0	0	0	0
384 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip #6, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	1	0	0	11	0	0	0	0	0	0	0
AN	J	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0
5 hr												
TOTALS	A	37	19	2	9	0	1	0	2	0	1	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	2	0	0	0	0	0	0	0	0	0	0

¹. Gear Types

TL = 75'x6'x1½"x12" trammel net
 TK = 75'x5'x1"½"x12" trammel net
 GP = 100'x6'x1½" gill net
 GX = 100', 2" to ½" @ ½" increment, experimental gill net
 TN = 50'x6'x1½"x12" trammel net
 MT = Minnow Trap
 AN = Angling

² - A = Adult
 J = Juvenile
 Y = Young of year

³ - HB = humpback chub
 FM = flannelmouth sucker
 BH = bluehead sucker
 RB = rainbow trout
 BR = brown trout
 CC = channel catfish
 CP = carp
 SD = speckled dace

BK = brook trout
 FH = fathead
 FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip # 6, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
1	920614	N	02	7F7F3E6117	N		408	566	RI	62.70
2	920614	N	06	7F7F394B15	Y	PITTAG	311	223	RA	62.70
3	920614	N	05	7F7E432B23	N		272	140	RA	61.30
4	920614	N	05	7F7D2A5105	Y	PITTAG	311	224	RA	61.30
5	920614	N	07	7F7D222540	Y	PITTAG	242	110	RA	61.30
6	920614	N	07	7F7F28335E	Y	PITTAG	361	371	RA	61.30
7	920614	N	07	7F7E431706	N		377	460	RA	61.30
8	920615	N	17	7F7F3E5B39	N		427	641	RI	62.70
9	920615	N	12	7F7F3E2E05	Y	PITTAG	338	296	RA	61.30
10	920615	N	12	7F7D085056	N		352	316	RA	61.30
11	920615	N	12	7F7D08181F	N		305	217	RA	61.30
12	920615	N	20	7F7F206C19	Y	PITTAG	369	257	RA	61.30
13	920615	N	20	7F7D084E46	N		398	438	RA	61.30
14	920615	N	20	7F7D076457	N		290	215	RA	61.30
15	920615	N	20	7F7F3F3C2B	N		342	322	RA	61.30
16	920615	N	16	7F7F050668	Y	PITTAG	332	239	RA	61.30
17	920615	N	11	7F7F3E6075	N		380	401	RA	61.40

Table 4. Summary of Humpback Chub handled during Trip # 6, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
18	920615	N	19	7F7F3E494E	N		343	306	RA	61.40
19	920615	N	19	7F7F3E4953	N		336	293	RA	61.40
20	920615	N	19	7F7D29500A	Y	PITTAG	402	447	RA	61.40
21	920615	N	22	7F7F182F7A	Y	PITTAG	234	80	RA	61.40
22	920616	N	34	7F7E431B2C	N		415	668	RI	61.40
23	920616	N	34	7F7E431C19	N		400	501	RA	61.40
24	920616	N	34	7F7F3E6378	N		385	455	RA	61.40
25	920616	N	34	7F7D17616A	Y	PITTAG	381	357	RA	61.40
26	920616	N	34	7F7E432940	N		357	328	RA	61.40
27	920616	N	34	7F7E427628	N		250	100	RA	61.40
28	920616	N	32	7F7E432716	Y	PITTAG	394	528	RA	62.70
29	920616	N	36	7F7F205916	Y	PITTAG	370	375	RA	62.70
30	920616	N	36	7F7D1A311F	Y	PITTAG	378	505	RA	62.70
31	920616	N	35	7F7F3E6117	Y	PITTAG	408	566	RA	62.70
32	920616	N	35	7F7E432623	N		377	445	RA	62.70
33	920616	N	33	7F7F19043E	Y	PITTAG	374	365	RA	62.70
34	920616	N	33	7F7D080274	N		365	392	RA	62.70

Table 4. Summary of Humpback Chub handled during Trip # 6, 1992.

	DATE	TYPE ^a	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
35	920616	N	33	7F7D177E1C	Y	PITTAG	321	248	RA	62.70
36	920616	N	33	7F7D076839	N		370	420	RA	62.70
37	920616	T	03	#####	N		89	-	RA	61.70
38	920616	T	10	#####	N		84	-	RA	61.70
39	920617	A	01	7F7D025F00	N		362	451	RA	61.30

^aGear Types
 N = Netting
 T = Traps
 A = Angling

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7F1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920308	7F7F475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7F271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #4, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920418	7F7F1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #5, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920508	7F7F217E36	420	595	40.610	42	11	120	920905	61.9	61.9
2	920509	7F7D080024	423	600	40.730	83	11	75	920723	61.5	61.5

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920614	7F7F3E6117	408	566	670	80	11	75	920828	62.7	62.7
2	920615	7F7F3E5B39	427	641	640	40	11	120	921013	62.7	62.7
3	920616	7F7E431B2C	415	668	740	42	11	120	921014	61.4	61.4

Table 6. A list of radio frequencies contacted on Trip #6, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.670/80 /80 /84 /82	11	920614 920615 (2319) 920617 (1600) 920618 (1014)	62.7	62.7	62.4 62.3 62.6
¹ 40.640/42 /42 /44 /42 /42	11	920615 920616 (1520) 920616 (2340) 920617 (1605) 920618 (1020)	62.7	62.7	62.5 62.7 62.6 62.6
¹ 40.740/42 /44 /42	11	920616 920616 (2338) 920617 (1544)	61.4	61.4	61.4 62.2
40.660/62 40.600/??	11	920414 920616 (1105)	65.3	65.3	LCR (8.0)
40.630/84 /70 40.630/??	11	920418 920615 (1244) 920616 (1115)	61.75	61.75	LCR (1.5) LCR (1.5)

¹ Fish newly implanted Trip #6, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #7 - 1992
(July 8-27)**

Prepared For:

Bureau of Reclamation

Prepared By:

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INTRODUCTION

This report presents pertinent details associated with Trip 7, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results. We would again like to emphasize that these data are hand tabulated immediately upon their transfer to the data department and are subject to change upon further accuracy review. It is our goal to provide information from BIO/WEST trips as quickly as possible to aid other researchers.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 7, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 7, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 7, 1992. Table 4 is a summary of all humpback chubs handled during Trip 7, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip 7, 1992. Table 6 summarizes the radio contacts during Trip 7, 1992, and presents original fish release locations and radiotag data.

Humpback Chubs Captured

A total of 242 humpback chub were handled during Trip 7, 1992. Of these, 177 chubs were captured in Reach I : three were classified as YOY (TL \leq 50 mm), 89 were juveniles (TL 51-199 mm), and 85 were adults (TL $>$ 199 mm).

Sixty-five humpback chubs were captured in the lower end of Reach 1 and Reach 2 during Trip #7, 1992. Twenty-two chubs were collected near RM 74 (Reach 1). All but one of these were juvenile fish. Two chubs were caught at RM 92.2, two at RM 115, fifteen near RM 120, and twenty-four in the Middle Granite Gorge RM 127-128. The majority of chubs from Reaches 2 and 3 were adults.

Two previously PIT Tagged chubs were recaptured in Reach 2 during July 1992. Both fish were captured in the Middle Granite Gorge. One fish was originally tagged in September 1991 and had moved only 0.2 mile. This fish gained 45 grams in one year. The second fish was tagged in May 1992 and was recaptured at the same location.

One chub was taken incidentally in a minnow trap at RM 73.8. This juvenile was 89 mm TL and weighed 4 grams. This chub was accidentally released dead.

Forty-seven of the chubs collected were recaptures, bearing either a Carlin, Floy, or PIT tag.

Radiotelemetry

Four humpback chubs were implanted with radio transmitters during Trip 7, 1992. Two of these fish were implanted using midline incisions and two using lateral incisions.

Each of the three chubs implanted during the June trip were recontacted on Trip 7, 1992. One of the June-implanted fish was observed for approximately 12 hr and another was observed for 48 hr. We were unable to locate either of the two chubs implanted during the May trip.

No contacts were made in the LCR, between the confluence and the AGF camp.

The LCR remote station was checked and downloaded twice during Trip 7, 1992. On July 11, two batteries were changed at the station, and 42 blocks of data were downloaded. The last recorded contact from the LCR station was on July 6. The station was operating normally when downloaded on July 19.

The Crash Canyon remote station was operating normally when checked on July 10, however we were unable to successfully download the 1,051 blocks of data recorded at the station. The problem could be a faulty serial cable, or possibly software error. The DCC was disconnected and transported to Logan for repair. No data was lost; the last recorded contact at the Crash Canyon station was on June 30. This station is currently not in operation.

Bench Marks

One new benchmark was established during Trip 7, 1992. The bench mark was located on river left at RM 62.95. The bench mark was used to tie in staff gages monitored during a telemetry observation at that site.

OBSERVATIONS

1. The LCR flooded on July 10, turning the water bright red and washing much debris into the main channel. The water in the LCR was still very turbid when we left the upper reach on July 20.
2. No chubs were contacted during telemetry surveillance between the main channel and the AGF camp in the LCR. All three fish implanted in June were located in the mainstem, however we were unable to locate two chubs which were implanted in May. High catch rates of adult chub (especially around Awatubi Canyon and Lava Chuar Canyon) corroborate the telemetry evidence that the majority of spawning chubs have moved out of the LCR and dispersed in the mainstem.
3. Two adult chub were captured by BIO/WEST anglers using bait ("power" salmon eggs).
4. BIO/WEST talked with an angler on a private trip who captured a chub angling with salmon eggs at Lava Chuar camp (RM 65.3). The fish was correctly described as a humpback chub to biologists, and the angler reported matching the fish with a picture of a chub in a river guide. The angler reported that the fish had swallowed the bait, and he cut the line and released it immediately.
5. The numbers of chubs captured during July 1992 from Reach 2 was the highest to date for BIO/WEST efforts. High numbers of chubs from the 120 mile and Middle Granite Gorge sites may warrant increased efforts at these locations.
6. Turbidities in the lower reaches were very high during the entire trip. This may have had an effect on the high chub catch rate.
7. Fifteen adult humpback chubs were sampled for genetic studies under the Gila Taxonomy Project headed by W. Starnes, Smithsonian Institution. Tissues were taken from each of these fish with no observed detrimental effects.
8. One striped bass was captured near RM 185 during Trip 7, 1992. Two stripers were observed but not netted while electrofishing near RM 179.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The pH probe on the upper crew Hydrolab malfunctioned and no pH readings were recorded from that instrument for the entire trip. This information should be available from the data-sonde unit deployed concurrently with the Hydrolab at each camp.
2. One juvenile humpback chub was discovered dead under the cooler of the electrofishing boat. This problem has occurred previously; we suspect the juvenile chubs are jumping out of the cooler. A new protocol will be tested in August to alleviate this problem. The netter will be required to hand-deliver each humpback chub into one side of the cooler and close the lid behind it.

RECOMMENDATIONS

1. Electrofishing and minnow trapping should be implemented during August 1992 to provide continuity in monitoring the timing and abundance of YOY humpback chub emigrating from the LCR.

Table 1A. Logistics and Research Schedule for Trip #7, 1992, Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
7/08/92	43.1	Anasazi Foot Bridge	X			
7/09/92	58.2	Awatubi Canyon	X	X	X	X
7/10/92	58.2	Awatubi Canyon		X	X	X
7/11/92	58.2	Awatubi Canyon		X	X	X
7/12/92	61.2	LCR	X	X	X	X
7/13/92	61.2	LCR		X	X	X
7/14/92	61.2	LCR		X	X	X
7/15/92	61.2	LCR		X	X	X
7/16/92	62.6	Crash Canyon	X	X	X	X
7/17/92	62.6	Crash Canyon		X	X	X
7/18/92	64.6	Carbon Creek	X	X	X	X
7/19/92	64.6	Carbon Creek				
7/20/92	114	114 Mile	X			
7/21/92	138	Below Deer Creek	X			
7/22/92	158	Below Havasu Creek	X			
7/23/92	174.2	Cove Canyon	X	X		
7/24/92	174.2	Cove Canyon		X		
7/25/92	202.2	202 Mile Canyon	X	X		
7/26/92	202.2	202 Mile Canyon		X		
7/27/92	225.7	Diamond Ck. Take Out	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1B. Logistics and Research Schedule for Trip #7, 1992, Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
7/08/92	43.2	Anasazi Bridge	X			
7/09/92	75.0	75 mile Canyon	X	X		
7/10/92	75.0	75 mile Canyon		X		
7/11/92	92.0	92.0	X			
7/12/92	92.0	92.0		X		X
7/13/92	118.6	118.0	X			
7/14/92	118.6	118.0		X		X
7/15/92	127.6	Middle Granite Gorge	X	X		
7/16/92	127.6	Middle Granite Gorge		X		
7/17/92	127.6	Middle Granite Gorge		X		X
7/18/92	145.2	Above Olo Canyon	X	X		
7/19/92	157.6	Below Havasu	X			
7/20/92	157.6	Below Havasu		X		
7/21/92	157.6	Below Havasu	X			
7/22/92	157.6	Below Havasu		X		
7/23/92	184.6	184.0	X	X		
7/24/92	184.6	184.0		X		
7/25/92	214.2	214.0	X	X		
7/26/92	214.2	214.0		X		
7/27/92	225.7	Diamond Ck. Take Out	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2A. Personnel Participating in Trip #7, 1992, Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
T. Wasowicz	BIO/WEST	7/8 - 7/27	Senior Biologist
H. Yard	BIO/WEST	7/8 - 7/27	Biologist
L. Brown	BIO/WEST	7/8 - 7/27	Biologist
E. Prats	BIO/WEST	7/8 - 7/27	In Bright Angel
P. Weiss	BIO/WEST	7/8 - 7/20	Out Bright Angel
T. Yates	BIO/WEST	7/8 - 7/27	
M. Yard	GCES	7/15 - 7/19	In Tanner
A. Haden	GCES	7/8 - 7/19	Out Tanner
J. Brown	GCES	7/16 - 7/20	In Tanner, Out Bright Angel
K. Malloy	GCES	7/8 - 7/22	Out Havasu
R. Bushman	AGF	7/8 - 7/20	Out Bright Angel
D. Erikson	BIO/WEST VOLUNTEER	7/8 - 7/22	
S. Kaplan	BIO/WEST VOLUNTEER	7/8 - 7/27	In Bright Angel
J. Wasowicz	BIO/WEST VOLUNTEER	7/20 - 7/27	In Bright Angel
J. Susita	BIO/WEST VOLUNTEER	7/20 - 7/27	
L. Bleifuss	OARS	7/8 - 7/27	
L. Niemi	OARS	7/8 - 7/27	
S. Rhodes	OARS	7/8 - 7/27	

Table 2B. Personnel Participating in Trip #7, 1992, Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Leibfried	BIO/WEST	7/8 - 7/27	Project Leader
R. VanHaverbeke	BIO/WEST	7/8 - 7/27	
G. Hardwick	BIO/WEST	7/8 - 7/27	
B. Dierker	BIO/WEST	7/8 - 7/27	
K. Linder	USFWS	7/8 - 7/27	Agency
D. Phillips	BIO/WEST	7/8 - 7/27	Volunteer
D. Comly	BIO/WEST	7/8 - 7/27	Volunteer
S. Bledsoe	OARS	7/8 - 7/27	Trip Leader
S. Reeder	OARS	7/8 - 7/27	
C. Krznarich	OARS	7/8 - 7/27	
L. Roeder	OARS	7/8 - 7/27	

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

	1	2	HB'	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
Reach 1	A	35	8	157	2	4	1	16					
EL	J	78	2	8									
N=68	Y	3											
13.80 hr													
Reach 2	A	4	4	7	96	54	76	7	6				
EL	J	4	12	4	39	11							
N=43	Y				18								
18.7 hr													
Reach 3	A	2	2	4	2	90	9	1					
EL	J	13	2	8									
N=47	Y	3	1										
14.5 hr													
Reach 1	A	20	5	11									
TL	J												
N=27	Y												
54 hr													
Reach 2	A	4		1	1								
TL	J												
N=21	Y												
42 hr													
Reach 3	A												
TL	J												
N=8	Y												
16 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

	1	2	HB'	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
Reach 1	A	5	5	5	1	6							
TK	J												
N=25	Y												
50 hr													
Reach 2	A	6	2	2	1	6	7		1				
TK	J												
N=116	Y												
232 hr													
Reach 3	A	4	4	4	1	1	1		22				1
TK	J												
N=94	Y												
188 hr													
Reach 1	A	2	3	3									
GM	J												
N=19	Y												
38 hr													
Reach 2	A												
GM	J												
N=29	Y												
58 hr													
Reach 3	A												
GM	J												
N=9	Y												
18 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB'	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
Reach 1	A	9				4	1						
GP	J												
N=29													
58 hr	Y												
Reach 2	A	1		1		1			3				
GP	J												
N=73													
146 hr	Y												
Reach 3	A			1					2				
GP	J												
N=24													
48 hr	Y												
Reach 1	A												
GX	J												
N=10													
20 hr	Y												
Reach 2	A												
GX	J												
N=23													
46 hr	Y												
Reach 3	A			1					3				
GX	J												
N=19													
38 hr	Y												

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
Reach 1	A	8	7		1							
TN	J											
N=6												
12 hr	Y											
Reach 3	A											
TN	J											
N=1												
2 hr	Y											
Reach 1	A	6	5		2							
TM	J											
N=7												
14 hr	Y											
Reach 2	A	19	4		13	8		4				
TM	J											
N=42												
84 hr	Y											
Reach 1	A	2		1	1					8		
SB	J	7	1									
1,022 M ²	Y											
Reach 2	A		5	1					9	2	2	
SB	J	5	24	4	2				9	9		
N=8	Y		14									

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

1	2	HB'	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
Reach 1	A								1	1		
MT	J	22										
N=82												
1,952 hr	Y				1							
Reach 2	A											
MT	J									1		
N=25												
375 hr	Y											
Reach 1	A	2										
AN	J											
N=2												
5 hr	Y											
Reach 1	A	89	33	2	182	3		4	2	25		
J	J	107	1	2	8							
Y	Y	3			1							
TOTAL												
Reach 2	A	34	16	9	116	70		85	16	8	2	
J	J	9	36	8	41	11			9	10		
Y	Y		14		18							
TOTAL												
Reach 3	A		8	1	5	2	1	117	9	1		1
J	J		13	2	8							
Y	Y		3		1							
TOTAL												

Table 3. Summary of Fish Collected and Effort by Gear Type during Trip #7, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	FH	PK	SB
A	123	57	12	303	75	1	206	27	34	2	1	
J	116	50	12	57	11			9	10			
Y	3	17		20								
TOTALS												

¹. Gear Types

- EL = Electrofishing
- TL = 75'x6'x1 1/2"x12" trammel net
- TK = 75'x5'x1"x12" trammel net
- GM = 10'x6'x2" gill net
- GP = 100'x6'x1 1/2" gill net
- GX = 100', 2" to 1/2" @ 1/2" increment, experimental gill net
- HL = Large hoop net (4' diameter)
- HS = Small hoop net (2' diameter)
- GZ = 60', 2" to 1/2" @ 1/2" increment, experimental gill net
- TN = 50'x6'x1 1/2"x12" trammel net
- TM = 50'x6'x1"x12" trammel net
- SB = 30'x4'x1/4"x12" seine
- AN = angling

² - A = Adult

- J = Juvenile
- Y = Young of year

³ -

- HB = humpback chub
- FM = flannelmouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace
- FH = fathead
- PK = plains killifish
- SB = striped bass

Table 4. Summary of Humpback Chub handled during Trip #7, 1992.

	DATE	GEAR TYPE ¹	SAMPLE NO	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEA SE
1	920709	N	004	7F7F3E5133	N		411	649	RI	Y	58.30
2	920709	N	004	7F7F273517	N		354	448	RA	N	58.30
3	920709	N	004	7F7D080D77	Y	PITTAG	364	485	RA	N	58.30
4	920709	N	004	7F7F3E506C	N		418	634	RI	Y	58.30
5	920709	N	009	7F7F456E36	Y	PITTAG	417	848	RA	N	58.30
6	920709	N	009	7F7D085406	N		387	499	RA	N	58.30
7	920709	N	009	7F7F05095F	Y	PITTAG	360	377	RA	N	58.30
8	920709	E	002	7F7F272652	Y	PITTAG	258	143	RA	N	58.90
9	920709	E	001	7F7F287559	Y	PITTAG	370	471	RA	N	58.80
10	920709	E	001	7F7F332F28	Y	0315230FO	425	706	RA	N	58.80
11	920709	E	001	7F7D173431	Y	PITTAG	400	511	RA	N	58.80
12	920709	E	001	7F7F333420	N		409	565	RA	N	58.80
13	920709	E	001	7F7F050906	N		402	574	RA	N	58.80
14	920709	E	001	7F7D180413	N		385	556	RA	N	58.80
15	920709	E	001	7F7F334532	N		384	438	RA	N	58.80
16	920709	E	001	7F7F3C4341	Y	PITTAG	360	423	RA	N	58.80
17	920709	E	001	7F7D081F7B	Y	PITTAG	351	392	RA	N	58.80
18	920709	E	001	7F7F332850	Y	0315877CY	332	397	RA	N	58.80

19	920710	N	018	7F7D331E08	Y	PITTAG	370	425	RA	N	58.30
20	920710	N	018	7F7F3E2640	Y	PITTAG	373	461	RA	N	58.30
21	920710	N	019	7F7F332F28	Y	PITTAG	425	656	RA	N	58.60
22	920710	N	010	7F7F1F1B16	N		202	94	RA	N	75.00
23	920710	E	001	#####	N		140	24	RA	N	74.30
24	920710	E	001	#####	N		115	16	RA	N	74.30
25	920710	E	001	#####	N		97	9	RA	N	74.30
26	920710	E	002	#####	N		120	19	RA	N	73.50
27	920710	E	002	#####	N		129	20	RA	N	73.50
28	920710	E	002	#####	N		79	2	RA	N	73.50
29	920710	E	002	#####	N		107	10	RA	N	73.50
30	920711	E	003	7F7F1F0F01	N		156	36	RA	N	74.00
31	920711	E	003	#####	N		113	13	RA	N	74.00
32	920711	E	003	#####	N		137	0	RA	N	74.00
33	920711	E	003	#####	N		119	14	RA	N	74.00
34	920711	E	003	#####	N		128	20	RA	N	74.00
35	920711	E	003	#####	N		140	20	RA	N	74.00
36	920711	E	003	#####	N		122	14	RA	N	74.00
37	920711	E	003	#####	N		68	1	RA	N	74.00
38	920711	T	001	#####	N		89	4	DR ²	N	73.80
39	920711	T	002	#####	N		83	6	RA	N	73.80
40	920711	T	004	#####	N		82	4	RA	N	73.90

41	920711	T	004	#####	N		73	7	RA	N	73.90
42	920711	T	004	#####	N		91	6	RA	N	73.90
43	920711	E	004	#####	N		109	12	RA	N	75.30
44	920712	E	019	7F7D225134	Y	PITTAG	224	122	RA	N	60.70
45	920713	N	042	7F7D085A33	N		394	570	RI	Y	60.90
46	920713	N	042	7F7D085A33	N		325	340	RA	N	60.90
47	920713	N	042	7F7D076002	N		391	431	RA	N	60.90
48	920713	N	044	7F7D2A4C67	Y	PITTAG	360	396	RA	N	61.15
49	920713	N	044	7F7F3E384D	Y	PITTAG	376	424	RA	N	61.15
50	920713	N	045	7F7D081228	N		355	349	RA	N	61.30
51	920713	N	045	7F7F321C62	Y	PITTAG	424	628	RI	Y	61.30
52	920713	N	047	7F7D225C70	Y	PITTAG	310	340	RA	N	60.90
53	920713	N	047	7F7D077871	N		374	454	RA	N	60.90
54	920713	N	047	7F7F456130	Y	PITTAG	391	527	RA	N	60.90
55	920713	N	048	7F7D1B7209	Y	PITTAG	415	578	RA	N	60.90
56	920713	N	049	7F7D181478	Y	PITTAG	380	478	RA	N	61.15
57	920713	E	024	#####	N		116	17	RA	N	62.55
58	920713	E	024	#####	N		112	14	RA	N	62.55
59	920713	E	024	#####	N		96	6	RA	N	62.55
60	920713	E	024	#####	N		96	8	RA	N	62.55
61	920713	E	024	#####	N		106	10	RA	N	62.55
62	920713	E	024	#####	N		83	5	RA	N	62.55

63	920713	E	024	#####	N		97	8	RA	N	62.55
64	920713	E	024	#####	N		76	4	RA	N	62.55
65	920713	E	024	#####	N		88	5	RA	N	62.55
66	920713	E	024	#####	N		65	2	RA	N	62.55
67	920713	E	024	#####	N		64	1	RA	N	62.55
68	920713	E	024	#####	N		61	1	RA	N	62.55
69	920713	E	024	#####	N		0	0	RA	N	62.55
70	920713	E	022	7F7F33365A	N		387	767	RA	N	60.00
71	920713	E	023	#####	N		77	0	RA	N	62.70
72	920713	E	024	#####	N		115	13	RA	N	62.55
73	920713	E	024	#####	N		131	19	RA	N	62.55
74	920713	E	024	#####	N		94	7	RA	N	62.55
75	920713	E	024	#####	N		82	6	RA	N	62.55
76	920713	N	070	7F7F1F1346	N		272	229	RA	N	92.20
77	920713	N	069	7F7F1F0D3F	N		296	278	RA	N	92.20
78	920713	N	093	7F7F1F111E	N		223	118	RA	N	114.90
79	920714	T	031	#####	N		77	4	RA	N	61.90
80	920714	T	032	#####	N		64	2	RA	N	62.10
81	920714	N	054	7F7D170A34	Y	PITTAG	421	586	RA	N	61.30
82	920714	N	054	7F7F1F670E	N		205	86	RA	N	61.30
83	920714	N	050	7F7D074430	N		435	724	RA	N	61.30
84	920714	T	022	#####	N		92	9	RA	N	62.10

85	920714	T	022	#####	N		92	9	RA	N	62.10
86	920714	T	022	#####	N		78	2	RA	N	62.10
87	920714	E	027	#####	N		96	8	RA	N	61.60
88	920714	E	027	#####	N		66	3	RA	N	61.60
89	920714	E	029	#####	N		58	1	RA	N	62.10
90	920714	E	032	7F7D487912	Y	PITTAG	172	48	RA	N	61.60
91	920714	E	033	#####	N		64	2	RA	N	62.15
92	920714	E	033	#####	N		72	4	RA	N	62.15
93	920715	S	001	#####	Y	FINCLIP	92	6	RA	N	61.40
94	920715	N	059	7F7F3F4E04	Y	PITTAG	310	253	RA	N	61.80
95	920715	N	059	7F7F3E620B	N		329	266	RA	N	61.80
96	920715	N	059	7F7D08040A	N		332	328	RA	N	61.80
97	920715	N	059	7F7D2B1C10	Y	PITTAG	359	378	RA	N	61.80
98	920715	N	058	7F7D225500	Y	PITTAG	332	335	RA	N	61.80
99	920715	N	061	7F7D2A5A2D	Y	PITTAG	343	320	RA	N	61.80
100	920715	N	062	7F7F3F4B78	N		400	555	RA	N	61.80
101	920715	E	036	#####	N		114	12	RA	N	63.10
102	920715	E	036	#####	N		78	3	RA	N	63.10
103	920715	E	036	#####	N		78	3	RA	N	63.10
104	920715	E	036	#####	N		96	6	RA	N	63.10
105	920715	E	036	#####	N		60	1	RA	N	63.10
106	920715	E	036	#####	N		56	1	RA	N	63.10

107	920715	E	036	#####	N		98	6	RA	N	63.10
108	920715	T	042	#####	N		95	7	RA	N	62.10
109	920715	E	036	#####	N		102	9	RA	N	63.10
110	920715	E	036	#####	N		68	2	RA	N	63.10
111	920715	E	036	7F7F287B65	Y	PITTAG	362	368	RA	N	63.10
112	920715	E	037	#####	N		74	3	RA	N	68.20
113	920715	E	037	#####	N		61	2	RA	N	68.20
114	920715	N	135	7F7F201665	N		208	100	RA	N	119.00
115	920715	N	135	7F7F265A5F	N		265	176	RA	N	119.00
116	920715	N	135	7F7F264861	N		225	113	RA	N	119.00
117	920715	E	024	#####	N		82	6	RA	N	119.00
118	920716	N	066	7F7E432721	Y	PITTAG	336	327	RA	N	62.50
119	920716	N	066	7F7F284359	N		380	522	RA	N	62.50
120	920716	N	070	7F7E43082F	Y	PITTAG	325	299	RA	N	62.50
121	920716	S	005	#####	N		90	7	RA	N	62.40
122	920716	S	005	#####	N		83	7	RA	N	62.40
123	920716	S	005	7F7F3F4907	N		400	489	RA	N	62.40
124	920716	S	005	#####	N		106	13	RA	N	62.40
125	920716	S	005	7F7F3C2957	N		164	49	RA	N	62.40
126	920716	S	005	#####	N		95	8	RA	N	62.40
127	920716	S	005	#####	N		70	4	RA	N	62.40
128	920716	E	047	#####	N		100	10	RA	N	63.10

129	920716	E	047	#####	N		97	11	RA	N	63.10
130	920716	E	047	#####	N		173	52	RA	N	63.10
131	920716	E	047	7F7F333470	N		185	66	RA	N	63.10
132	920716	E	047	#####	N		165	48	RA	N	63.10
133	920716	E	048	#####	N		146	38	RA	N	63.00
134	920716	E	048	#####	N		104	8	RA	N	63.00
135	920716	T	043	#####	N		88	7	RA	N	63.10
136	920716	T	043	#####	N		84	5	RA	N	63.10
137	920716	T	044	#####	N		118	13	RA	N	63.10
138	920716	T	045	#####	N		92	6	RA	N	63.10
139	920716	E	041	#####	N		96	6	RA	N	62.50
140	920716	E	043	#####	N		46	3	RA	N	62.70
141	920716	E	043	#####	N		70	3	RA	N	62.70
142	920716	E	046	#####	N		95	8	RA	N	62.85
143	920716	E	046	#####	N		77	4	RA	N	62.85
144	920716	E	046	#####	N		97	8	RA	N	62.85
145	920716	E	047	#####	N		91	7	RA	N	63.10
146	920716	S	007	#####	N		65	3	RA	N	62.40
147	920716	N	153	7F7F264937	N		234	125	RA	N	119.00
148	920716	N	158	7F7F010631	N		215	107	RA	N	119.00
149	920716	N	171	7F7F284812	N		235	155	RA	N	119.50
150	920716	N	170	7F7F480150	N		204	88	RA	N	119.80

151	920716	E	029	#####	N		99	7	RA	N	119.10
152	920717	N	071	7F7F3F4F13	Y	PITTAG	296	227	RA	N	62.65
153	920717	N	071	7F7F1F0A40	N		357	372	RA	N	62.65
154	920717	N	075	7F7D2A7A12	Y	PITTAG	371	385	RA	N	62.65
155	920717	N	077	7F7F28477D	N		400	490	RA	N	63.05
156	920717	A	001	7F7F321C3D	Y	PITTAG	375	434	RA	N	64.50
157	920717	A	002	7F7F3D0460	Y	PITTAG	370	405	RA	N	64.50
158	920717	T	055	#####	N		57	2	RA	N	63.10
159	920717	T	058	#####	N		75	2	RA	N	63.10
160	920717	T	059	#####	N		82	8	RA	N	63.40
161	920717	T	060	#####	N		87	7	RA	N	63.40
162	920717	T	062	#####	N		100	19	RA	N	63.40
163	920717	E	050	#####	N		139	24	RA	N	63.00
164	920717	E	050	7F7F332A29	N		165	48	RA	N	63.00
165	920717	E	052	#####	N		120	16	RA	N	63.30
166	920717	E	053	#####	N		90	5	RA	N	63.50
167	920717	E	053	7F7F477E5D	N		185	54	RA	N	63.50
168	920717	E	053	#####	N		103	7	RA	N	63.50
169	920717	E	053	7F7F471B02	N		330	360	RA	N	63.50
170	920717	E	032	7F7D081E3C	N		208	104	RA	N	120.10
171	920717	S	002	#####	N		58	0	RA	N	119.00
172	920717	S	002	#####	N		73	3	RA	N	119.00

173	920717	S	002	#####	N		56	0	RA	N	119.00
174	920717	S	002	#####	N		107	10	RA	N	119.00
175	920717	S	002	#####	N		110	0	RA	N	119.00
176	920718	T	071	#####	N		89	6	RA	N	63.40
177	920718	T	073	#####	N		92	7	RA	N	63.40
178	920718	T	067	#####	Y	FIN CLIP	74	5	RA	N	63.10
179	920718	N	079	7F7F45556D	Y	PITTAG	335	344	RA	N	65.20
180	920718	N	079	7F7F477B1C	N		341	401	RA	N	65.20
181	920718	N	202	ESCAPED	--	--	--	--	RA	N	127.6
182	920718	N	198	7F7F1F1508	Y	PITTAG	--	--	RA	N	127.6
183	920718	N	079	7F7F450369	Y	PITTAG	382	500	RA	N	65.20
184	920718	N	078	7F7F475E7D	Y	PITTAG	341	380	RA	N	65.30
185	920718	N	078	7F7F27314B	Y	PITTAG	380	486	RA	N	65.30
186	920718	N	080	7F7F477E4F	N		323	287	RA	N	65.20
187	920718	E	058	7F7F471328	N		176	63	RA	N	64.60
188	920718	E	058	7F7F477B1D	N		189	59	RA	N	64.60
189	920718	E	058	#####	N		95	7	RA	N	64.60
190	920718	E	058	#####	N		134	23	RA	N	64.60
191	920718	E	058	#####	N		93	8	RA	N	64.60
192	920718	E	058	#####	N		138	25	RA	N	64.60
193	920718	E	058	#####	N		81	7	RA	N	64.60
194	920718	E	058	#####	N		103	12	RA	N	64.60

195	920718	E	059	#####	N		75	4	RA	N	64.60
196	920718	E	060	#####	N		96	20	RA	N	64.40
197	920718	E	061	#####	N		99	14	RA	N	64.30
198	920718	E	062	#####	N		70	3	RA	N	63.75
199	920718	E	062	#####	N		80	3	RA	N	63.75
200	920718	E	062	#####	N		90	8	RA	N	63.75
201	920718	E	054	#####	N		95	7	RA	N	63.50
202	920718	E	054	#####	N		96	7	RA	N	63.50
203	920718	E	054	#####	N		60	1	RA	N	63.50
204	920718	E	054	#####	N		113	15	RA	N	63.50
205	920718	E	054	#####	N		133	22	RA	N	63.50
206	920718	E	055	7F7F480326	N		172	42	RA	N	63.55
207	920718	E	056	#####	N		70	2	RA	N	63.55
208	920718	N	188	7F7F1F1567	N		254	186	RA	N	127.60
209	920718	N	196	7F7F48015B	N		271	232	RA	N	127.50
210	920718	N	189	7F7F1F1B4E	N		207	102	RA	N	127.60
211	920718	N	189	7F7F480969	N		289	288	RA	N	127.60
212	920718	N	189	7F7F1F1E5C	N		280	251	RA	N	127.60
213	920718	N	189	7F7F1F0B30	N		267	166	RA	N	127.60
214	920718	N	189	7F7F1F1508	N		222	112	RA	N	127.60
215	920718	N	189	7F7F284926	N		203	92	RA	N	127.60
216	920718	N	189	7F7F28422B	N		234	112	RA	N	127.60

217	920718	N	194	7F7D0077D5A	Y	PITTAG	252	173	RA	N	127.20
218	920718	N	194	7F7F471500	N		222	125	RA	N	127.20
219	920718	N	197	7F7F477E69	N		307	282	RA	N	127.60
220	920719	N	085	7F7F480218	N		187	76	RA	N	65.30
221	920719	N	085	7F7F3F5016	Y	PITTAG	345	339	RA	N	65.30
222	920719	N	089	7F7F480043	N	PITTAG	377	445	RA	N	65.30
223	920719	N	089	7F7F3F3425	Y	PITTAG	329	300	RA	N	65.30
224	920719	E	063	#####	N		93	7	RA	N	63.55
225	920719	E	063	#####	N		42	1	RA	N	63.55
226	920719	N	209	7F7F1F1872	N		248	136	RA	N	127.6
227	920719	N	213	7F7F48015B	Y	PITTAG	--	--	RA	N	127.6
228	920719	E	063	#####	N		75	3	RA	N	63.55
229	920719	E	063	#####	N		89	5	RA	N	63.55
230	920719	E	064	#####	N		145	26	RA	N	64.80
231	920719	E	064	#####	N		79	5	RA	N	64.80
232	920719	E	064	#####	N		75	4	RA	N	64.80
233	920719	E	064	#####	N		46	1	RA	N	64.80
234	920719	E	064	#####	N		50	1	RA	N	64.80
235	920719	N	208	7F7D084D41	N		341	475	RA	N	127.60
236	920719	N	208	7F7F1F1872	N		248	136	RA	N	127.60
237	920719	N	220	7F7D085367	N		226	141	RA	N	128.30
238	920719	E	041	7F7D075A72	N		261	207	RA	N	127.00

239	920719	E	040	7F7F290C67	N		219	100	RA	N	128.80
240	920719	E	040	#####	N		119	14	RA	N	128.80
241	920719	N	214	7F7F264E78	N		257	167	RA	N	127.20
242	920720	E	043	7F7F48091D	N		251	158	RA	N	127.40

¹ N = Netting, T = Trapping, E = Electrofishing ² Dead fish accidentally released.

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920111	7F7E431037	372	556	650	82/min	11	75	920326	58.30	58.30
2	920113	7F7E432514	451	959	601	61/min	11	100	920412	60.45	60.45
3	920114	7F7D140108	415	728	730	62/min	11	100	920413	60.70	60.70
4	920114	7F7E430D1E	417	699	710	60/min	11	100	920413	60.80	60.80
5	920120	7F7F1E514C	396	613	661	62/min	11	100	920419	65.30	65.30

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920308	7F7E475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7E271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #4, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920418	7F7F1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #5, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920508	7F7E217E36	420	595	40.610	42	11	120	920905	61.9	61.9
2	920509	7F7D080024	423	600	40.730	83	11	75	920723	61.5	61.5

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920614	7F7F3E6117	408	566	670	80	11	75	920828	62.7	62.7
2	920615	7F7F3E5B39	427	641	640	40	11	120	921013	62.7	62.7
3	920616	7F7E431B2C	415	668	740	42	11	120	921014	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920709	7F7F3E506C	418	634	620	62	11	100	921017	58.3	58.3
2	920709	7F7F3E5133	411	649	710	41	11	120	921106	58.3	58.3
3	920713	7F7D085A33	394	570	600	84	11	75	920926	61.2	61.2
4	920713	7F7F321C62	424	628	650	60	11	100	921021	61.2	61.2

Table 6. A list of radio frequencies contacted on Trip #7, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.620/62 /60 /62 /62 /62 /62 /62	11	920709 920709/2136 920710/1540 920711/1412 920712/926 920713/1111 920714/1435	58.3	58.3	58.4 58.85 58.85 58.5 58.9 59.2
¹ 40.710/41 /39 /41 /41 /42 /42 /40 /42 /41 /41	11	920709 920709/2153 920710/1540 920710/1418 920712/930 920713/1112 920714/1435 920715/1359 920716/1453 920717/1020	58.3	58.3	58.4 58.85 58.85 58.85 58.9 58.95 58.95 58.9 58.8
40.640/42 /42 /42 /42 /42 /42 /42 /42 /42 /40	11	920615 920710/1630 920711/1544 920712/1340 920713/1325 920714/1530 920715/1446 920716/1652 920717/1100 920718/1208	62.7	62.7	62.7 62.7 62.7 61.9 62.75 62.75 62.8 63.0 62.95
40.740/42 /42 /42 /42 /42 /?? /43 /42 /44	11	920616 920711/1452 920712/1324 920713/1325 920713/2145 920714/1520 920714/2126 920714/1528 920718/1146	61.4	61.4	62.0 62.1 61.9 61.8 62.2 61.9 61.7 61.8
40.670/84 /80	11	920614 920712/1310	62.7	62.7	61.4

Table 6. A list of radio frequencies contacted on Trip #7, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.600/84	11	920713	61.2	61.2	
/84		920713/2130			61.0
/84		920714/2107			60.95
/86		920716/2111			60.3
¹ 40.650/60	11	920713	61.2	61.2	
/62		920714/1505			61.3
/64		920716/1509			60.3
/64		920717/2044			60.6
/62		920718/2050			60.4

¹ Fish newly implanted Trip #7, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #8 - 1992
August 11-22, 1992**

Prepared For:

Bureau of Reclamation

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August 31, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 8, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 8, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 8, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 8, 1992. Table 4 is a summary of all humpback chubs handled during Trip 8, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip 3, 1992 through Trip 8, 1992.

Humpback Chubs Captured

A total of 68 humpback chub were handled during Trip 8, 1992. Of these, six were classified as adults (TL > 199 mm), 60 were juveniles (TL 61-199 mm), and two were YOY (TL ≤ 60 mm).

Most humpback chub (36) were captured by electrofishing, however seining and unbaited minnow traps were also successful techniques for catching both juvenile and adult humpback chubs. A total of 27 humpback chubs, including one adult were captured using a large seine in low velocity main channel habitats. Four juvenile and one YOY humpback chub were captured in unbaited minnow traps placed along shorelines with boulder cover.

Five humpback chubs were recaptured during Trip 8, 1992. Of these five fish, three were recaptures of PIT tagged fish, one was previously Carlin tagged but had lost its tag and one was fin clipped.

One incidental mortality of a humpback chub occurred during Trip 8, 1992. The fish was an adult captured electrofishing at RM 63.70 and failed to recover normally after being held for 12 hours. Obvious signs of spinal disfunction were also evident. The fish was choppered out via regularly scheduled flights from the LCR and is currently being held in a freezer at GCES. BIO/WEST plans to X-ray and necropsy the carcass to document any evidence of injury associated with electrofishing. Additionally, the fish was a PIT tag recapture, PIT tag = 7F7F0E2F10, so necropsy results will also include an evaluation of peritoneal tissue response to the PIT tag. The fish will then be transferred to D. Kubley, Arizona Game and Fish.

Radiotelemetry

No humpback chubs were implanted with radio transmitters during Trip 8, 1992.

A total of seven radio-tagged humpback chubs were contacted during Trip 8, 1992 resulting in a 64% contact success based on records indicating that 11 radiotags implanted during previous trips were still active. Observations ranging in length from 24 to 48 hours were conducted on six of the seven radiotagged fish contacted.

No fish were contacted in the lower two kilometers of the LCR, however failure to contact four radiotagged fish suggest that some individuals may still be utilizing the LCR further upstream.

The LCR remote station (KLCR) was downloaded and disassembled on August 13. The Crash Canyon remote station (KRSH) was also disassembled the following day. The omni-directional remote station at RM 60.5 (KILR) was reestablished on August 14 and was operating normally. KILR was downloaded on August 19.

Mike Yard, GCES, was contacted by a private boater following Trip 8, 1992 regarding an angler capture of a radiotagged humpback chub at the mouth of Awatubi Canyon on August 5. The angler was recontacted by B. Masslich on August 25 in an attempt to obtain more information. The fish was captured using salmon eggs at RM 58.3. The chub was hooked in the lower lip and fought well, suggesting it was in good condition. The fisherman indicated that the fish was handled with care and inspected briefly before being released. Based on his inspection the fish appeared to be in good condition with no obvious signs of tissue damage or infection. The sutures were still in place along the primary incision suggesting that the fish was probably one of the two individuals that were implanted in the Awatubi area during July. No photographs were taken. A 48 hour telemetry observation was conducted on a radiotagged fish using the eddy return channel immediately below the Awatubi camp on August 12-14. It is probable that it was the same fish handled by the fisherman.

Habitat Measurements

Four sites were measured to document habitat characteristics for juvenile humpback chub. These sites were located in areas where juvenile humpback chubs were captured consistently during Trip 8, 1992.

Bench Marks

No new bench marks were established during Trip 8, 1992.

OBSERVATIONS

1. High turbidity was present in the LCR for the duration of Trip 8, 1992. Turbidity from the LCR significantly affected main channel turbidity below the confluence. Flows in the LCR were fluctuating widely during the trip, with at least two noticeable peak flows.
2. Main channel turbidities above the LCR were variable from low to high. It is assumed that several flow spikes from the Paria drainage occurred during the trip which significantly affected turbidities in the main channel.
3. Juvenile humpback chubs were readily captured below the confluence of the LCR using three techniques suggesting that densities of this age class in the main channel remain relatively high. Most individuals were captured in low velocities habitats with boulder cover. However, seining over sand substrates at the break point of large eddies also produced numerous juvenile humpback chubs. It is speculated that under the cover of high turbidity, fish are utilizing these depositional areas as feeding sites.
4. Of the 129 rainbow trout captured during Trip 8, 1992, only 12 (9%) were captured below the confluence of the LCR. Similar sampling efforts were expended above and below the confluence. This discrepancy in catch rates may be a reflection of two factors: 1) high turbidity below the LCR affected the netter's ability to see and net trout during electrofishing and; 2) consistently high turbidity below the LCR during 1992 have forced rainbow trout to migrate out of the area (presumably upstream).

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. One incidental mortality of an adult humpback chub occurred during Trip 8, 1992, presumably as the result of injuries sustained by electrofishing. The fish failed to recover normally even after being held for 12 hours and showed obvious signs of spinal disfunction. The fish is currently being held for necropsy by BIO/WEST to determine if physical evidence of electrofishing injury can be documented. The fish was captured using an output of 8-10 amperes. This output level is reduced from output levels used prior to June 1992 (10-15 amperes) in response to observations of deleterious effects on two adult humpback chubs. It is felt the further reduction of output amperage would reduce electrofishing efficiency to unacceptable levels. Electrofishing injury to the adult humpback chub in August may have been associated with an inordinately long exposure to the electrical field. Turbid conditions present during Trip 8, 1992 may have prevented netters from observing the fish for a significant period of time after it entered the field. Based on the value of electrofishing as the primary sampling technique for sampling juvenile humpback chubs, a solution to the problem of occasional injury to large adults is not readily apparent.

RECOMMENDATIONS

1. The BIO/WEST October field trip should be rescheduled to October 8-19 from October 13-24. This would allow BIO/WEST to utilize steady low flows scheduled for October 10-11 for purposes of observing radiotagged humpback chubs and mapping the LCR confluence area. Additionally downstream travel from Lee's Ferry to the LCR could be made during higher flows.

Table 1. Logistics and Research Schedule for Trip #8, 1992.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
8/11	34.9	Nautaloid Canyon	X			
8/12	58.2	Awatubi Canyon	X	X	X	
8/13	58.2	Awatubi Canyon		X	X	X
8/14	61.2	LCR		X	X	X
8/15	61.2	LCR		X	X	X
8/16	61.2	LCR		X	X	X
8/17	61.2	LCR		X	X	X
8/18	61.2	LCR	X	X	X	X
8/19	132	Stone Creek	X			
8/20	182	Hells Hollow	X			
8/21	225	Diamond Creek	X			
8/22	225	Take Out	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #8, 1992.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	8/11 - 8/19	Out Bright Angel
T. Wasowicz	BIO/WEST	8/11 - 8/19	Out Bright Angel
B. Cowdell	BIO/WEST	8/11 - 8/19	Out Bright Angel
B. Dierker	BIO/WEST	8/11 - 8/22	
E. Prats	BIO/WEST	8/11 - 8/19	Out Bright Angel
K. Tinning	BIO/WEST	8/11 - 8/19	Out Bright Angel
M. Yard	GCES	8/11 - 8/22	
A. Fegly	BIO/WEST Vol.	8/11 - 8/19	Out Bright Angel
F. Baucom	USFWS	8/11 - 8/19	Out Kaibab
S. Rieder	OARS	8/11 - 8/22	
S. Rhodes	OARS	8/11 - 8/22	
L. Niemi	OARS	8/11 - 8/22	
C. Hunsaker	OARS	8/11 - 8/22	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip #8, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1	A	5	4		123	2		3	6			6
EL	J	30			4							
N=40												
9.8 hr	Y	1			1							
Reach 1	A	1			1				3			4
SG	J	26	3									
N=13												
650 m ²	Y		1									
Reach 1	A											
MT	J	4										1
N=53												
1,272 hr	Y	1										
TOTALS	A	6	4		124	2		3	9			10
Reach 1	J	60	3		4							1
	Y	2	1		1							

¹ - Gear Types

EL = Electrofishing
 SG = 30'x5'x1/4" seine
 MT = Minnow trap

² - A = Adult

J = Juvenile
 Y = Young of year

³ - HB = humpback chub
 FM = flannelmouth sucker
 BH = bluehead sucker
 RB = rainbow trout
 BR = brown trout
 CP = carp
 SD = speckled dace

BK = brook trout
 FH = fathead minnow
 FV = flannelmouth variant
 CC = channel catfish

Table 4. Summary of Humpback Chub handled during Trip #8, 1992.

	DATE	GEAR TYPE	SAMPLE NO	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
1	920814	E	018	7F7D175722	Y	PITTAG	176	46	RA	N	61.30
2	920815	E	020	#####	N		127	19	RA	N	61.80
3	920815	E	021	7F7D180A5A	Y		195	50	RA	N	62.60
4	920815	E	023	7F7F334663	N		207	91	RA	N	62.40
5	920815	E	023	#####	N		95	6	RA	N	62.40
6	920815	E	025	7F7F326920	N		336	387	RA	N	63.20
7	920815	E	025	7F7F183A47	N		164	43	RA	N	63.20
8	920815	E	025	#####	N		76	0	RA	N	63.20
9	920815	T	028	#####	N		103	7	RA	N	62.15
10	920815	T	029	#####	N		95	0	RA	N	62.40
11	920816	E	026	#####	N		83	6	RA	N	63.40
12	920816	E	026	#####	N		102	13	RA	N	63.40
13	920816	E	027	7F7F333774	N		159	45	RA	N	63.00
14	920816	E	027	7F7F334836	Y	CARLIN SCAR	396	562	RA	N	63.00
15	920816	E	027	7F7F33452F	N		167	62	RA	N	63.00
16	920816	E	027	#####	N		82	7	RA	N	63.00
17	920816	E	028	#####	N		73	5	RA	N	63.00
18	920816	E	029	#####	N		138	29	RA	N	63.20

19	920816	E	029	#####	N		110	15	RA	N	63.20
20	920816	S	004	#####	N		79	3	RA	N	62.10
21	920816	S	004	#####	N		95	10	RA	N	62.10
22	920816	S	004	#####	N		67	0	RA	N	62.10
23	920816	S	004	#####	N		80	7	RA	N	62.10
24	920816	S	005	#####	N		117	14	RA	N	62.10
25	920816	S	001	#####	N		107	10	RA	N	61.30
26	920816	S	001	#####	N		87	4	RA	N	61.30
27	920817	E	030	#####	N		122	16	RA	N	62.60
28	920817	E	030	#####	N		65	2	RA	N	62.60
29	920817	E	030	#####	N		160	28	RA	N	62.60
30	920817	T	037	#####	Y	FIN CLIP	137	14	RA	N	62.60
31	920817	T	037	#####	N		98	11	RA	N	62.60
32	920817	T	037	#####	N		59	3	RA	N	62.60
33	920817	E	030	#####	N		85	7	RA	N	62.60
34	920817	E	032	#####	N		50	0	RA	N	64.40
35	920817	E	033	#####	N		137	21	RA	N	63.10
36	920817	E	033	#####	N		125	18	RA	N	63.10
37	920817	E	033	#####	N		107	10	RA	N	63.10
38	920817	E	033	#####	N		98	9	RA	N	63.10
39	920817	E	033	#####	N		107	12	RA	N	63.10
40	920817	E	034	7F7F345405	N		183	53	RA	N	63.10

41	920817	E	034	#####	N		128	24	RA	N	63.10
42	920817	E	034	7F7F390A07	N		150	37	RA	N	63.10
43	920817	E	034	#####	N		137	23	RA	N	63.10
44	920817	E	034	#####	N		103	10	RA	N	63.10
45	920817	E	034	#####	N		76	5	RA	N	63.10
46	920817	E	034	#####	N		77	3	RA	N	63.10
47	920818	S	011	#####	N		104	9	RA	N	62.70
48	920818	S	011	#####	N		103	9	RA	N	62.70
49	920818	S	011	#####	N		80	6	RA	N	62.70
50	920818	S	011	#####	N		94	11	RA	N	62.70
51	920818	S	011	#####	N		83	6	RA	N	62.70
52	920818	S	011	#####	N		107	10	RA	N	62.70
53	920818	S	011	#####	N		94	9	RA	N	62.70
54	920818	S	007	#####	N		107	0	RA	N	61.90
55	920818	S	007	#####	N		102	0	RA	N	61.90
56	920818	S	007	#####	N		100	0	RA	N	61.90
57	920818	S	007	#####	N		82	0	RA	N	61.90
58	920818	S	007	#####	N		77	0	RA	N	61.90
59	920818	S	007	#####	N		93	0	RA	N	61.90
60	920818	S	007	#####	N		92	0	RA	N	61.90
61	920818	S	010	#####	N		126	16	RA	N	62.10
62	920818	S	010	#####	N		88	4	RA	N	62.10

63	920818	S	010	#####	N		315	303	RA	N	62.10
64	920818	S	011	#####	N		91	8	RA	N	62.70
65	920818	S	011	#####	N		104	10	RA	N	62.70
66	920818	S	011	#####	N		75	4	RA	N	62.70
67	920818	E	039	7F7F344F27	N		359	395	RA	N	62.70
68	920818	E	040	7F7F0E2F10	Y	PITTAG	399	702	DP	N	63.70

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #4 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920418	7F7F1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #5 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920508	7F7F217E36	420	595	40.610	42	11	120	920905	61.9	61.9
2	920509	7F7D080024	423	600	40.730	83	11	75	920723	61.5	61.5

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920614	7F7F3E6117	408	566	40.670	80	11	75	920828	62.7	62.7
2	920615	7F7F3E5B39	427	641	40.640	40	11	120	921013	62.7	62.7
3	920616	7F7E431B2C	415	668	40.740	42	11	120	921014	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920709	7F7F3E506C	418	634	40.620	62	11	100	921017	58.3	58.3
2	920709	7F7F3E5133	411	649	40.710	41	11	120	921106	58.3	58.3
3	920713	7F7D085A33	394	570	40.600	84	11	75	920926	61.2	61.2
4	920713	7F7F321C62	424	628	40.650	60	11	100	921021	61.2	61.2

Table 6. A list of radio frequencies contacted on Trip #8, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/84 /84 /84 /83 /83 /84 /84 /80 /80	11	920713 920812 (1754) 920814 (2120) 920815 (1448) 920815 (2103) 920816 (1439) 920816 (2059) 920817 (1423) 920817 (2130)	61.2	61.2	60.15 60.15 60.00 60.00 60.15 60.15 60.20 60.20
40.620/62 /62 /64 /62 /62 /62 /62 /62 /62 /64	11	920709 920812 (1710) 920813 (2129) 920813 (1025) 920813 (2140) 920814 (1132) 920815 (1418) 920816 (1414) 920817 (1355) 920818 (1054)	58.3	58.3	58.30 58.30 58.30 58.30 58.30 58.80 58.85 59.25 59.25
40.650/60 /64 /64 /64 /64 /64 /56	11	920713 920812 (1750) 920815 (2105) 920816 (1439) 920816 (2101) 920817 (1423) 920817 (2127)	61.2	61.2	60.15 60.20 60.15 60.15 60.20 60.20
40.710/41 /43 /43 /41 /43 /43 /43 /43	11	920709 920812 (1725) 920812 (2135) 920813 (1112) 920814 (1143) 920815 (1413) 920816 (1417) 920817 (1355)	58.3	58.3	58.80 58.80 59.20 58.90 58.80 58.85 59.25

Table 6. A list of radio frequencies contacted on Trip #8, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.680/44 /36 /36 /36 /38 /38 /38 /38 /36 /36 /38	11	920308 920813 (1136) 920814 (1204) 920814 (2128) 920815 (1503) 920815 (2119) 920816 (1442) 920816 (2115) 920817 (1435) 920817 (2141) 920818 (1113)	61.5	61.5	60.40 60.30 60.40 60.40 60.40 60.40 60.40 60.65 60.40 60.40 60.40
40.740/42 /42 /42 /41 /41 /41 /41 /39 /40 /42	11	920616 920814 (1353) 920814 (2149) 920815 (1523) 920815 (2142) 920816 (1513) 920816 (2139) 920817 (1505) 920817 (2210) 920818 (1220)	61.4	61.4	61.90 61.90 62.15 62.15 62.20 62.20 62.20 62.20 62.20 62.20
40.630/84 /80 /80	11	920418 920718 (1220) 920718 (1622)	61.75	61.75	62.20 62.20



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #9 - 1992
September 8-27, 1992**

Prepared For:

Bureau of Reclamation

Prepared By:

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INTRODUCTION

This report presents pertinent details associated with Trip 9, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 9, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 9, 1992.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 9, 1992. Table 4 is a summary of all humpback chubs handled during Trip 9, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip 9, 1992.

Humpback Chubs Captured

A total of 120 humpback chub were handled during Trip 9, 1992. Of these, 89 chubs were captured in the upper part of Reach 1: three were classified as YOY (TL \leq 70 mm), 50 were juveniles (TL = 71-199 mm) and 36 were adults (TL $>$ 199 mm). Twenty were captured in the lower part of Reach 1, 11 were captured in Reach 2 and no chubs were captured in Reach 3.

In Reach 1 all but one adult humpback chub were captured in nets. Most juvenile humpback chubs (37) were captured by electrofishing in shoreline habitat with boulder cover. A total of 8 juvenile humpback chubs were captured using a large seine in low velocity main channel habitats. Seven juvenile humpbacks were captured in unbaited minnow traps fished along shoreline habitats with large boulder cover.

In Reach 1 twenty-six fish were recaptured during Trip 9, 1992. Of these fish, 24 were recaptures of PIT tagged fish and 2 were previously Carlin tagged. No evidence of fin clips was observed on any YOY or juvenile humpback chub captured during Trip 9, 1992.

In the lower section of Reach 1 two chubs were recaptured. One was a recent capture during trip 9, 1992 and the other was a fish tagged from past efforts, possibly in the LCR.

Three chubs were recaptured from Reach 2 during Trip 9, 1992. All three of these fish were captured near RM 127, in the Middle Granite Gorge. No gross movements were observed. One fish moved upstream about 1 mile while the other 2 were within 0.5 miles of original capture location. All fish had gained weight and appeared in good health. One fish had been used for genetics tissue sampling in July 1992 and showed no ill effects of the tissue plugs.

A total of 11 humpback chubs were stomach pumped for purposes of analyzing gut contents. The technique was successful with the exception of one adult humpback chub mortality (see next paragraph). The death of the fifth fish processed is considered to be an anomaly because of an

unusual blockage of the lower intestine by a large seed ingested by the fish. Prior to this, all fish were processed without the use of an anesthetic. Following the mortality, a mild anesthetic (MS-222) was administered prior to performing lavage and pressure used to evacuate gut contents was more carefully monitored. If gut contents could not easily be flushed, the process was stopped and the fish released. The mild anesthetic relaxed the fish so that excessive water pressure in the stomach resulted in water backflushing out of the fishes mouth. Without the anesthetic, it is speculated that a 'gag' reflex may prevent this backflushing. Generally gut contents could be evacuated through the vent with mild pressure applied to the pump.

Two incidental mortalities occurred during Trip 9, 1992. Both fish were adults, one from Reach 1 and one from Reach 2. The humpback chub from Reach 1 appeared to have died as a result of trauma from stomach pumping procedures. One attempt was made to evacuate gut contents of the fish without success. During the procedure it was noted that the abdominal region of the fish was expanding slightly, so the lavage was stopped. The fish was then placed in a recovery tank and died within 90 minutes. Examination of the intestinal tract revealed no signs of a rupture or acute trauma. Further examination of the intestinal tract led to the discovery of a large seed located in the lower intestinal tract. It is suspected that this seed created an anomalous blockage. The digestive tract was removed from the fish and preserved in 10% ETOH and the carcass was skeletonized. The eye of the fish (only one eye was present) was removed from the carcass and preserved in a 5% formalin solution for later examination of retinal cell makeup, i.e. rods and cones. A letter of transfer has been issued and the skeletonized carcasses of both mortalities have been transferred to Mike Douglas at ASU. The digestive tract is currently being held by BIO/WEST for further coordination with Dr. Kubley at AGF regarding analysis of the gut contents.

The second fish was a small adult chub that was missed when pulling a net after dark during an extremely heavy rain and flash flood in the vicinity of RM 126.7. The net was tied in a channel on a gravel fan. This channel was discharging water and basketball-sized rocks while this net was being pulled and the chub was caught in the near-shore portion of the net. In trying to watch for large rocks and untie the net the chub was not noticed until the next morning when the net was stretched for cleaning.

Radiotelemetry

Four humpback chubs were implanted with radio transmitters during Trip 9, 1992. Three fish were implanted with a midline incision and one with a lateral incision. All surgeries were performed without complications.

A total of six fish implanted on previous trips were recontacted during Trip 9, 1992. Based on estimated extinction dates, eight transmitters should have still been active from previous trips. This results in a recontact success of 75% for Trip 9, 1992. No observations were performed during Trip 9, 1992.

The KILR remote telemetry site at RM 60.5 was operating normally and downloaded twice during Trip 9, 1992.

One radiotagged fish was recaptured at RM 60.2 on 920912. The fish was originally tagged 61 days earlier (920713) and released at RM 61.3. The fish appeared active and in good condition. Four

sutures were still in place and the incision was healed except for a small pustulated area around the fourth suture. Two sutures were removed. The antenna exit was in excellent condition with only slight redness around the exit. The fish weighed 628 gm when originally captured on July 13 and weighed 671 gm when recaptured, resulting in a net weight gain (compensating for transmitter weight) of 32 gm. The radiotag was still active, so the fish was photographed and released.

Bench Marks

No new bench marks were established during Trip 9, 1992.

OBSERVATIONS

1. Main channel turbidities above the LCR were variable during Trip 9, 1992. Turbidities were low at the beginning of the trip and then increased dramatically after a series of storms beginning on Sept 14.
2. LCR turbidities were variable during Trip 9, 1992. Turbidities gradually decreased during the first part of the trip to the point where the LCR was running blue and had a minimal effect on main channel turbidities below the confluence. Turbidities went from low to high on the morning of September 15 and remained high for the remainder of the trip.
3. Radiotagged fish were generally difficult to locate during Trip 9, 1992 until several days after increases in turbidities. This is consistent with results from 1991 during the late summer/early fall period. It is speculated that behavior of humpback chubs during this time of year may involve consistent use of deeper habitats. Radiotagged fish did seem to respond to increases in turbidity based on higher and more consistent relocation success when turbidities increased. However, based on telemetry surveillance runs just prior and just following significant increases in turbidity, behavioral responses to increases in turbidity do not seem to be immediate. Inconsistency in locating radiotagged fish resulted in no observational data being collected during Trip 9, 1992.
4. Juvenile humpback chubs in the 90-120 mm range were readily captured below the confluence of the LCR using three techniques suggesting that the densities of this age group in the main channel remain relatively high. Most individuals were captured in shoreline habitats with boulder cover. However, juvenile humpback chubs were again captured over sand substrates at the break point of large eddies when turbidities were high.
5. A YOY bluegill (Lepomis macrochirus) was captured approximately two miles below the confluence of the LCR. This is the first bluegill captured by BIO/WEST during the Grand Canyon studies.
6. A total of 67 fathead minnows were captured during Trip 9, 1992. An apparent increase in numbers of this species throughout 1992 may be a reflection of more suitable habitat created by the relatively stable interim flow regime.
7. Several juvenile chubs were again taken in the lower end of Reach 1.
8. Reach 2 chubs were mostly adults with only a few juveniles captured.
9. The recapture of 3 chubs from the Middle Granite Gorge indicates an aggregation of humpback chub in this area. Further sampling in this area will help determine the origin, movement, and age composition of the fish.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. High intensity storm events affected sampling efforts on two occasions in Reach 1 during Trip 9, 1992. A flash flood from the small drainage at 'surgery point' (RM 61.2) on September 15 swept sampling equipment into the main channel. Thanks to a private float trip passing our camp at the time of the flood, we were alerted to the problem and were able to salvage all of our equipment. A second flood event emanating primarily from the LCR (other tributaries also flashed) netting was suspended during one night due to high amounts of floating debris in the main channel. Heavy rains also precluded electrofishing during the same night.
2. A mortality of one adult humpback chub was incurred as a result of stomach pumping procedures during Trip 9, 1992. It is speculated that an anomalous blockage of the lower intestinal tract by a seed created conditions that led to the mortality. As the result of this mortality, the technique was modified to include: 1) mildly anesthetizing fish with MS-222 prior to pumping and; 2) monitoring pressure used during lavage very carefully and aborting technique at the first sign of excessive pressure. Gut contents of 10 other humpback chubs were flushed during Trip 9, 1992 without incident.
3. The problem of inadvertently leaving fish in nets clogged with debris is to thoroughly check each net when it is being pulled from the water and to not tie nets in obvious drainage channels when the weather is unsettled.

RECOMMENDATIONS

1. Consider increasing our effort in 1993 in those areas that have consistently produced chubs. Lengthening the number of days at these locations would provide the opportunity to recapture additional chubs.

Table 1a. Logistics and Research Schedule for Trip 9, 1992, Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
9/8	30	30 Mile	X			
9/9	58.2	Awatubi		X	X	X
9/10	58.2	Awatubi		X	X	X
9/11	58.2	Awatubi		X	X	X
9/12	61.2	LCR	X	X	X	X
9/13	61.2	LCR				
9/14	61.2	LCR				
9/15	61.2	LCR				
9/16	61.2	LCR				
9/17	64.7	Carbon Creek	X			
9/18	64.7	Carbon Creek				
9/19	64.7	Carbon Creek				
9/20	114	Lower 114-Mile	X		X	
9/21	138.8	Above Fishtail	X			
9/22	168	Fern Glen	X			
9/23	208.9	Granite Park	X	X		
9/24	208.9	Granite Park		X		
9/25	215.8	Below Three Springs	X	X		
9/26	215.8	Below Three Springs		X		
9/27	225.7	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1b. Logistics and Research Schedule for Trip 9, 1992, Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
9/8	30.4	Fence Fault	X			
9/9	75.8	Papago Creek	X	X		
9/10	75.8	Papago Creek		X		X
9/11	87.5	Cremation	X	X		
9/12	87.5	Cremation		X		
9/13	108.2	Shinumo Area	X	X		
9/14	108.2	Shinumo Area		X		
9/15	119.1	RM 119	X	X		
9/16	119.1	RM 119		X		
9/17	126.2	Randy's Rock	X	X		
9/18	126.2	Randy's Rock		X		X
9/19	143.5	Kanab Creek	X	X		
9/20	143.5	Kanab Creek		X		
9/21	168.0	Fern Glen	X	X		
9/22	168.0	Fern Glen		X		
9/23	198.5	Parashant	X	X		
9/24	198.5	Parashant		X		
9/25	222	RM 222	X	X		
9/26	222	RM 222		X		
9/27	225.7	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 9, 1992.

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #1			
B. Masslich	BIO/WEST	9/8 - 9/18	Project Leader
T. Wasowicz	BIO/WEST	9/8 - 9/27	Senior Biologist
P. Weiss	BIO/WEST	9/8 - 9/27	
H. Yard	BIO/WEST	9/8 - 9/27	
C. Carrier	BIO/WEST	9/8 - 9/20	Out Tanner
W. Burkhardt	BIO/WEST VOLUNTEER	9/8 - 9/27	
M. Cooper	BIO/WEST VOLUNTEER	9/8 - 9/27	
B. Roberts	BIO/WEST VOLUNTEER	9/8 - 9/27	
L. Wasowicz	BIO/WEST VOLUNTEER	9/20 - 9/27	In Tanner
S. Bledso	OARS	9/8 - 9/27	Trip Leader
R. Heliene	OARS	9/8 - 9/27	
L. Bluth	OARS	9/8 - 9/27	
TEAM #2			
W. Leibfried	BIO/WEST	9/8 - 9/21	Out Havasu
G. Hardwick	BIO/WEST	9/8 - 9/27	
E. Prats	BIO/WEST	9/8 - 9/27	
A. Fegley	BIO/WEST	9/8 - 9/27	
D. McCabe	BIO/WEST	9/8 - 9/27	
K. Linder	FWS	9/8 - 9/27	
P. Wood	BIO/WEST VOLUNTEER	9/8 - 9/27	
M. Hensley	BIO/WEST VOLUNTEER	9/8 - 9/27	
S. Reeder	OARS	9/8 - 9/27	
A. Bleifuss	OARS	9/8 - 9/27	
R. Running	OARS	9/8 - 9/27	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

	¹	HB ²	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 1	A	1	0	1	64	1	0	8	4	0	5	0	0
EL	J	46	1	0	4	0	1	0	0	0	0	1	0
N=74	Y	3	0	0	0	0	0	0	0	0	0	0	1
14.27 hr													
Reach 2	A	0	7	1	66	95	0	32	7	0	21	0	0
EL	J	1	8	1	29	14	0	0	0	0	0	0	0
N=46	Y	0	0	0	2	0	0	0	0	0	0	0	0
18.7 hr													
Reach 3	A	0	3	1	1	0	0	12	8	1	7	0	0
EL	J	0	2	2	5	0	0	1	1	0	0	0	0
N=33	Y	0	0	0	1	0	0	0	0	0	0	0	0
11.2 hr													
Reach 1	A	24	29	0	24	1	0	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=39	Y	0	0	0	0	0	0	0	0	0	0	0	0
78 hr													
Reach 2	A	0	3	0	0	0	0	1	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=27	Y	0	0	0	0	0	0	0	0	0	0	0	0
63.8 hr													
Reach 3	A	0	0	0	0	0	1	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0	0
N=8	Y	0	0	0	0	0	0	0	0	0	0	0	0
17 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 1	A	7	2	0	7	1	0	0	0	0	0	0	0	0
TK	J	1	0	0	0	0	1	0	0	0	0	0	0	0
N=39	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
79 hr														
Reach 2	A	4	4	1	9	1	0	2	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=66	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
134 hr														
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=19	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
38.5 hr														
Reach 1	A	2	4	0	3	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=10	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
20 hr														
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=10	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
15.5 hr														
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=4	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
7.75 hr														

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 1	A	2	4	0	10	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=20	Y	0	0	0	0	0	0	0	0	0	0	0	0
40 hr													
Reach 2	A	0	1	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=11	Y	0	0	0	0	0	0	0	0	0	0	0	0
17.5 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0	0
N=24	Y	0	0	0	0	0	0	0	0	0	0	0	0
37.5 hr													
Reach 1	A	0	0	0	0	0	0	2	0	0	0	0	0
GX	J	1	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0
9.75 hr													
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0	0
5 hr													
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0
GX	J	0	0	0	0	0	0	0	0	0	0	0	0
N=25	Y	0	0	0	0	0	0	0	0	0	0	0	0
47.5 hr													

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 1	A	3	0	0	1	0	0	0	0	0	0	0	0	0
TM	J	1	0	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
18 hr														
Reach 2	A	1	2	2	3	1	0	0	3	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=23	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
47.5 hr														
Reach 3	A	0	0	1	0	0	0	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=24	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
42.5 hr														
Reach 1	A	0	6	0	3	0	0	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
18.3 hr														
Reach 2	A	5	13	0	0	11	0	0	3	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=85	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
165.8 hr														
Reach 3	A	0	1	0	0	0	0	0	5	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=48	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
86.5 hr														

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 1	A	0	0	0	0	0	0	0	0	1	0	1	0	0
SE	J	0	0	0	0	0	0	0	0	0	0	0	0	0
N=8	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2	A	0	1	0	0	2	0	0	1	0	0	4	0	0
SE	J	0	1	1	2	2	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	J	0	1	0	1	0	0	0	0	0	0	3	0	0
N=1	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1	A	0	0	0	0	0	0	0	0	1	0	1	0	0
MT	J	10	0	0	0	0	0	0	0	0	0	0	0	0
N=108	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
2027 hr														
Reach 2	A	0	1	0	0	0	0	0	0	1	0	19	0	0
MT	J	0	6	2	2	1	0	1	0	0	0	0	0	0
N=15	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
302 hr														
Reach 2	A	0	0	0	0	1	1	0	0	6	0	1	0	0
HL	J	0	0	1	0	0	0	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0	0	0
41 hr														

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 9, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	BB	BG
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0	0
HS	J	0	0	0	1	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0	0
54 hr													
Reach 1	A	0	0	0	2	0	0	0	0	0	0	0	0
AN	J	0	0	0	0	0	0	0	0	0	0	0	0
N=1	Y	0	0	0	0	0	0	0	0	0	0	0	0
0.5 hr													
Reach 1	A	0	1	0	0	0	0	0	0	0	4	0	0
SG	J	8	1	1	0	0	0	0	1	0	1	0	0
N=16	Y	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	A	49	82	7	196	112	1	69	31	1	63	0	0
	J	68	20	8	43	17	3	1	2	0	4	1	0
	Y	3	0	0	3	0	0	0	0	0	0	0	1

¹. Gear Types

EL = Electrofishing
 TL = 75'x6'x1½"x12" trammel net
 TK = 75'x5'x1"x12" trammel net
 GM = 10'x6'x2" gill net
 GP = 100'x6'x1½" gill net
 GX = 100', 2" to ½" @ ½" increment, experimental gill net
 HL = Large hoop net (4' diameter)
 HS = Small hoop net (2' diameter)
 MT = Minnow trap
 TN = 50'x6'x1½"x12" trammel net

² - A = Adult

J = Juvenile
 Y = Young of year

³ - HB = humpback chub
 FM = flannelmouth sucker
 BH = bluehead sucker
 RB = rainbow trout
 BR = brown trout
 CC = channel catfish
 CP = carp

PK = Plains killifish
 FH = fathead minnow
 BB = black bullhead
 BG = blue gill
 SD = speckled dace

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
1	920909	N	002	7F7F206B7B	N		409	760	RI	Y	58.25
2	920909	N	004	7F7F477F56	N		415	653	RI	Y	58.35
3	920910	N	012	7F7D2C4239	Y	PITTAG	423	650	RA	N	58.30
4	920910	N	013	7F7F041527	Y	PITTAG	410	662	RS	N	58.80
5	920910	N	016	7F7D181173	Y	PITTAG	385	539	RS	N	58.30
6	920910	N	016	7F7F3F427E	Y	PITTAG	386	449	RS	N	58.30
7	920910	N	016	7F7F1F1153	N		406	501	DP	N	58.30
8	920910	N	016	7F7F1F1C1E	N		393	515	RS	N	58.30
9	920910	N	018	7F7F041527	Y	PITTAG	410	661	RA	N	58.85
10	920910	E	002	#####	N		111	7	RA	N	75.70
11	920910	E	004	#####	Y	ANAL CLIP	115	14	RA	N	76.60
12	920910	E	004	#####	N		102	10	RA	N	76.60
13	920910	E	004	#####	N		98	7	RA	N	76.60
14	920910	E	004	#####	N		94	6	RA	N	76.60
15	920910	N	002	7F7F330F61	Y	PITTAG	199	92	RA	N	76.40
16	920910	N	003	7F7F2D512F	N		202	86	RA	N	76.30
17	920910	E	006	#####	N		90	5	RA	N	76.50
18	920910	E	006	#####	N		131	21	RA	N	76.50
19	920910	E	006	#####	N		130	17	RA	N	76.50

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
20	920910	E	006	#####	N		122	12	RA	N	76.50
21	920910	E	006	7F7F273054	N		180	56	RA	N	76.50
22	920910	E	008	#####	N		66	2	RA	N	76.50
23	920910	N	007	7F7F2D512F	Y	PITTAG	0	0	RA	N	76.30
24	920910	N	015	#####	N		125	15	RA	N	76.60
25	920910	N	016	7F7F272E3D	N		215	92	RA	N	76.30
26	920910	T	008	#####	N		73	3	RA	N	75.7
27	920910	T	006	#####	N		80	3	RA	N	75.7
28	920910	T	007	#####	N		84	5	RA	N	75.7
29	920911	N	027	7F7F050906	Y	PITTAG	402	595	RS	N	58.85
30	920911	N	032	7F7D331957	Y	PITTAG	377	486	RS	N	58.85
31	920911	N	032	7F7F480420	N		363	403	RS	N	58.85
32	920911	S	005	#####	N		120	15	RA	N	61.50
33	920911	S	005	#####	N		112	10	RA	N	61.50
34	920911	S	005	#####	N		105	12	RA	N	61.50
35	920911	S	005	#####	N		112	11	RA	N	61.50
36	920911	S	005	#####	N		123	15	RA	N	61.50
37	920911	N	036	7F7F287A74	N		195	78	RA	N	76.30
38	920912	T	028	#####	N		90	0	RA	N	62.45

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
39	920912	T	028	#####	N		104	0	RA	N	62.45
40	920912	N	048	7F7F322E21	Y	PITTAG	354	358	RA	N	60.75
41	920912	N	049	7F7D085056	Y	PITTAG	355	367	RA	N	60.90
42	920912	N	051	7F7D2F1F49	Y	PITTAG	336	315	RA	N	60.75
43	920912	E	027	#####	N		110	14	RA	N	63.10
44	920912	E	027	#####	N		96	9	RA	N	63.10
45	920912	E	027	#####	N		74	5	RA	N	63.10
46	920912	E	028	#####	N		112	14	RA	N	63.10
47	920912	E	029	#####	N		90	7	RA	N	62.50
48	920912	E	030	#####	N		101	9	RA	N	61.80
49	920912	E	031	#####	N		100	11	RA	N	62.00
50	920912	N	043	7F7F3E2720	Y	PITTAG	363	435	RS	N	60.40
51	920912	N	043	7F7F1F6B4F	Y	PITTAG	358	455	RA	N	60.40
52	920912	N	043	7F7D2A731B	Y	PITTAG	341	403	RA	N	60.40
53	920912	N	040	7F7F446643	Y	PITTAG	283	242	RA	N	60.60
54	920912	N	041	7F7F28487E	N		376	621	RA	N	60.20
55	920912	N	041	7F7F321C62	Y	PITTAG	425	671	RR	Y	60.20
56	920912	N	042	7F7F3E2A49	Y	PITTAG	346	351	RA	N	60.20
57	920912	N	043	7F7F284840	N		365	493	RS	N	60.40

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
58	920912	N	043	7F7F284B23	N		321	287	RA	N	60.40
59	920912	N	043	7F7D293E21	Y	PITTAG	366	458	RS	N	60.40
60	920912	N	043	7F7E430660	Y	PITTAG	406	695	RI	Y	60.40
61	920912	N	039	7F7D2C5023	Y	PITTAG	377	433	RA	N	60.60
62	920912	N	041	7F7D331F60	Y	PITTAG	407	592	RA	N	60.20
63	920912	N	041	7F7D171962	Y	PITTAG	376	534	RA	N	60.20
64	920912	N	041	7F7F295C1C	N		383	587	RA	N	60.20
65	920912	N	041	7F7F284B73	Y	117CY	339	424	RA	N	60.20
66	920913	T	038	#####	N		81	3	RA	N	62.15
67	920913	T	038	#####	N		71	2	RA	N	62.15
68	920913	T	040	#####	N		92	8	RA	N	62.45
69	920913	E	033	#####	N		114	15	RA	N	61.60
70	920913	E	037	#####	N		122	16	RA	N	63.10
71	920913	E	037	#####	N		82	5	RA	N	63.10
72	920913	E	037	#####	N		87	6	RA	N	63.10
73	920913	E	037	#####	N		66	1	RA	N	63.10
74	920913	E	038	#####	N		95	9	RA	N	63.10
75	920913	E	038	#####	N		103	10	RA	N	63.10
76	920914	E	042	7F7F477A11	Y	PITTAG	230	120	RA	N	60.90

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
77	920914	N	059	7F7F284C1A	N		374	471	RA	N	61.30
78	920914	N	116	7F7F477F66	N		185	70	RA	N	108.50
79	920915	T	054	#####	N		102	0	RA	N	63.10
80	920915	N	064	7F7F333715	N		396	624	RI	Y	61.30
81	920915	E	043	#####	N		95	8	RA	N	61.70
82	920915	N	128	7F7F477F5E	N		222	119	RA	N	119.10
83	920916	N	073	7F7D173A22	Y	PITTAG	244	127	RA	N	61.70
84	920916	S	014	#####	N		103	7	RA	N	62.70
85	920916	S	014	#####	N		98	13	RA	N	62.70
86	920916	S	014	#####	N		75	5	RA	N	62.70
87	920916	E	052	#####	N		105	11	RA	N	63.10
88	920916	E	052	#####	N		93	7	RA	N	63.10
89	920916	N	142	7F7F477B79	N		221	113	RA	N	119.30
90	920917	T	070	#####	N		80	0	RA	N	62.15
91	920917	N	086	7F7F3E2B52	Y	PITTAG	343	427	RA	N	64.35
92	920917	E	056	#####	N		64	2	RA	N	63.50
93	920917	E	057	#####	N		102	10	RA	N	63.55
94	920917	E	057	#####	N		131	21	RA	N	63.55
95	920917	E	057	#####	N		99	8	RA	N	63.55

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
96	920917	E	057	#####	N		83	6	RA	N	63.55
97	920917	E	058	#####	N		90	6	RA	N	63.57
98	920917	E	058	#####	N		87	7	RA	N	63.57
99	920917	E	060	#####	N		85	4	RA	N	63.50
100	920918	E	061	#####	N		48	1	RA	N	63.52
101	920918	E	063	#####	N		90	8	RA	N	63.60
102	920918	E	063	#####	N		105	9	RA	N	63.60
103	920918	E	063	#####	N		132	25	RA	N	63.60
104	920918	E	063	#####	N		97	8	RA	N	63.60
105	920918	E	063	#####	N		73	4	RA	N	63.60
106	920918	E	063	#####	N		92	7	RA	N	63.60
107	920918	E	065	#####	N		74	3	RA	N	68.20
108	920918	E	065	#####	N		98	8	RA	N	68.20
109	920918	N	187	7F7F480352	N		312	366	RA	N	127.70
110	920918	N	192	7F7D073D4A	Y	PITTAG	398	919	RA	N	127.70
111	920918	N	196	7F7F26507E	N		245	157	RA	N	126.10
112	920918	N	208	7F7D085367	Y	PITTAG	235	153	RA	N	127.00
113	920918	N	202	7F7F272D23	N		301	294	RA	N	127.70
114	920918	N	201	#####	N		234	159	DP	N	126.10

Table 4. Summary of Humpback Chub handled during Trip #9, 1992.

	DATE	GEAR TYPE	SAMPLE NO.	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (gm)	DISP	RADIO	RM RELEASE
115	920919	E	066	#####	N		134	20	RA	N	64.65
116	920919	E	066	#####	N		143	28	RA	N	64.65
117	920919	E	066	#####	N		162	46	RA	N	64.65
118	920919	E	066	#####	Y	134CR	158	33	RA	N	64.65
119	920919	E	046	#####	N		115	10	RA	N	126.60
120	920919	N	213	7F7D075A72	Y	PITTAG	266	226	RA	N	127.00

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920308	7F7F475E72	405	633	40.680	44	11	120	920705	61.5	61.5
2	920311	7F7E432641	395	606	40.720	62	11	100	920619	61.1	61.1
3	920311	7F7F271C57	391	574	40.700	83	11	75	920525	61.3	61.3

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #4 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920418	7F7F1E7A65	414	843	40.630	84	11	75	920701	61.75	61.75

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #5 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920508	7F7F217E36	420	595	40.610	42	11	120	920905	61.9	61.9
2	920509	7F7D080024	423	600	40.730	83	11	75	920723	61.5	61.5

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920614	7F7F3E6117	408	566	40.670	80	11	75	920828	62.7	62.7
2	920615	7F7F3E5B39	427	641	40.640	40	11	120	921013	62.7	62.7
3	920616	7F7E431B2C	415	668	40.740	42	11	120	921014	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920709	7F7F3E506C	418	634	40.620	62	11	100	921017	58.3	58.3
2	920709	7F7F3E5133	411	649	40.710	41	11	120	921106	58.3	58.3
3	920713	7F7D085A33	394	570	40.600	84	11	75	920926	61.2	61.2
4	920713	7F7F321C62	424	628	40.650	60	11	100	921021	61.2	61.2

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 9, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920909	7F7F206B7B	409	760	40.680	60	11	100	921218	58.2	58.2
2	920909	7F7F477F56	415	653	40.740	60	11	100	921218	58.3	58.3
3	920912	7F7E430660	406	695	40.610	59	11	100	921221	60.4	60.4
4	920915	7F7F33715	396	624	40.720	83	11	75	921127	61.3	61.3

Table 6. A list of radio frequencies contacted on Trip 9, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.680/60 ¹ /60 /60 /61 /61 /61 /61 /61 /62 /62 /62	11	920909 920909(2213) 920910(1128) 920910(2240) 920911(1210) 920911(2219) 920912(1045) 920916(1446) 920917(1140) 920918(1020) 920919(1140)	58.2	58.2	58.35 58.8 58.8 58.85 58.85 58.85 58.8 58.8 58.8 58.8
40.620/61 /51 /51	11	920709 920909 920917	58.3	58.3	58.85 58.4
40.610/59 ¹ /58 /60 /59 /60 /60	11	920912 920912(2300) 920913(2118) 920915(0449) 920916(2055) 920919(1201)	60.4	60.4	60.15 60.2 60.15 60.2 61.1
40.650/60 /62	11	920713 920912(2310)	61.2	61.2	60.4
40.600/84 /76 /70 /70	11	920709 920915(0449) 920917(1233) 920918(1039)	61.2	61.2	61.15 60.15 60.2
40.740/60 ¹ /59 /59 /60 /60 /60 /60 /60 /60 /60 /60 /60 /60 /60	11	920909(2118) 920909(2213) 920910(1115) 920910(2233) 920911(1155) 920911(2205) 920912(1030) 920914(1745) 920916(1434) 920917(1121) 920918(1013) 920919(1128)	58.3	58.3	58.3 58.35 58.35 58.35 58.35 58.35 58.35 58.35 58.4 58.35 58.4 58.4

Table 6. A list of radio frequencies contacted on Trip 9, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.740/42 /34 /34 /34 /34	11	910616 920909(1820) 920910(1205) 920911(1258) 920913(2330)	61.4	61.4	62.2 62.2 61.85 61.8
40.710/41 /34 /34	11	920709 920917(1208) 920918(1025)	58.3	58.3	59.05 59.1
40.670/80 /68 /67	11	920614 920909(1820) 920910(1200)	62.7	62.7	62.2 62.2
40.720/84 ¹ /84 /84 /84 /84 /85 /86 /86	11	920915 920915(1344) 920915(1745) 920916(1515) 920916(2107) 910917(1248) 920918(1052) 920919(1201)	61.3	61.1	61.25 61.2 60.9 60.9 60.9 60.9 60.9 60.9

¹ Fish newly implanted Trip 9, 1992.



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #10 - 1992
October 8-19, 1992**

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Bureau of Reclamation

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INTRODUCTION

This report presents pertinent details associated with Trip #10, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #10, 1992. Table 2 presents personnel who were present or participated in research activities for Trip #10, 1992.

DATA COLLECTED

The primary purpose of Trip #10 was to recontact and monitor previously radio-tagged adult humpback chub. Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #10, 1992. Table 4 is a summary of all humpback chubs handled during Trip #10, 1992. Table 5 presents information on all humpback chubs radio-tagged during 1992.

Humpback Chubs Captured

A total of 3 humpback chub were handled during Trip #10, 1992. All chub were classified as YOY (TL = 59-72). All humpback chub were captured at or below the confluence of the Little Colorado River. All fish were captured in minnow traps along shorelines with boulder and sand substrates.

Radiotelemetry

Two humpback chub radio-tagged during previous trips were recontacted during Trip #10, 1992. Both fish were contacted in the mainstem Colorado River. A summary of telemetry and movement data collected on radio-tagged humpback chub during Trip #10, 1992 is presented in Table 6.

The omnidirectional remote telemetry station located at RM 60.5 was downloaded and checked. Data on presence of absence of radio-tagged fish between RM 59.8 and RM 61.2 was successfully logged during the period between Trip 9 and Trip 10.

Bench Marks

No new bench marks were established during Trip #10, 1992.

OBSERVATIONS

1. Water clarity was high during Trip #10, 1992. Secchi disc readings ranged from a low of 2.7 m to a high of 6.3 m, turbidity readings ranged from 2.2 to 8.1 NTU's. Secchi readings for the previous trip (Trip #9, 1992) ranged from 0.01 to 2.0 m and turbidity readings ranged from 4.4 to >1000 NTU's.
2. The 8000 cfs research flows reached the LCR camp (RM 61.3) approximately 2100 hrs on 10/10/92, flow levels remained constant until 0800 hrs on 10/13/92 when water levels started rising and fluctuations returned to interim rates.
3. Two radiotagged chub were observed continuously before, during and after the steady 8000 research flows. Both fish remained in the same general location with very little movement observed.
4. Unbaited minnow traps were successful in capturing YOY humpback chubs near the Little Colorado River confluence.
5. Several seine hauls were attempted below the Little Colorado confluence area, no fish were captured. The poor success was likely due to extreme clarity of the water.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The water clarity during Trip #10, 1992 created difficulty in locating radiotagged fish. It was felt that the fish were taking cover in deeper water and therefore below the depth extinction limits of the radio transmitters. In an attempt to locate fish, efforts were concentrated on nighttime surveillance. Extended night surveillance runs (RM 56.5 to 65.4) were tried during early morning (0200-0500) and after dusk (1830-2100). This type of surveillance proved successful last October when turbidity conditions were similar, however this technique revealed no additional fish during Trip #10, 1992. The two fish used for observations (610/60 and 720/80) were the only fish located during Trip #10.
2. The download of the KILR remote station indicated that the station was logging noise on all channels. The sensitivity of the receiver was turned down 1/2 turn.

Table 1. Logistics and Research Schedule for Trip #10, 1992.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
10/08	30.0	Below Shinumo Wash	X			
10/09	58.2	Awatubi	X		X	X
10/10	61.3	LCR	X	X	X	X
10/11	61.3	LCR		X	X	X
10/12	61.3	LCR		X	X	X
10/13	61.3	LCR		X	X	X
10/14	61.3	LCR		X	X	X
10/15	61.3	LCR		X	X	X
10/16	118.0	Below Elves Chasm	X			
10/17	180.0	Below Lava Falls	X			
10/18	224.0	224 Mile	X			
10/19	225.6	Take Out @ Diamond	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #10, 1992.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Cowdell	BIO/WEST	10/08 - 10/16	Out Bright Angel
L. Brown	BIO/WEST	10/08 - 10/16	Out Bright Angel
H. Yard	BIO/WEST	10/08 - 10/19	
B. Dierker	BIO/WEST	10/08 - 10/19	
P. Wood	BIO/WEST	10/08 - 10/16	Out Bright Angel
J. Kleinfelter	BIO/WEST	10/08 - 10/16	Out Bright Angel
P. Cone	BIO/WEST Vol.	10/08 - 10/19	
A. Haden	GCES	10/08 - 10/19	
F. Proteva	GCES	10/08 - 10/16	Out Bright Angel
M. Gonzales	GCES	10/08 - 10/19	
S. Bledsoe	OARS	10/08 - 10/19	
L. Niemi	OARS	10/08 - 10/19	
R. Running	OARS	10/08 - 10/19	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip #10, 1992. THESE DATA ARE PRELIMINARY

	¹	²	HB ³	SD	FH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1		A											
MT		J											
N=65		Y	3	1	1								
780 hr													
TOTALS			3	1	1								

¹- Gear Types

MT = Minnow Trap

² - A = Adult

J = Juvenile

Y = Young of year

³ - HB = humpback chub

SD = speckled dace

FH = fathead minnow

Table 4. Summary of Humpback Chub handled during Trip # 01, 1992.

	DATE	TYPE*	SAMPLE NUMBER	PIT TAG	RECAP.	OLD TAG NUMBER	TL	WT	DISP.	RM RELEASE
1	921011	T	007	--	N		59	-	RA	61.70
2	921013	T	029	--	N		72	-	RA	61.70
3	921015	T	062	--	N		72	-	RA	61.70

*Gear Types

T = Traps

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920614	7F7F3E6117	408	566	40.670	80	11	75	920828	62.7	62.7
2	920615	7F7F3E5B39	427	641	40.640	40	11	120	921013	62.7	62.7
3	920616	7F7E431B2C	415	668	40.740	42	11	120	921014	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920709	7F7F3E506C	418	634	40.620	62	11	100	921017	58.3	58.3
2	920709	7F7F3E5133	411	649	40.710	41	11	120	921106	58.3	58.3
3	920713	7F7D085A33	394	570	40.600	84	11	75	920926	61.2	61.2
4	920713	7F7F321C62	424	628	40.650	60	11	100	921021	61.2	61.2

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 9, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	920909	7F7F206B7B	409	760	40.680	60	11	100	921218	58.2	58.2
2	920909	7F7F477F56	415	653	40.740	60	11	100	921218	58.3	58.3
3	920912	7F7E430660	406	695	40.610	59	11	100	921221	60.4	60.4
4	920915	7F7F33715	396	624	40.720	83	11	75	921127	61.3	61.3

Table 6. A list of radio frequencies contacted on Trip #10, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/59 /60 /60 /60 /60 /60 /60 /60	11	920912 921009(1701) 921010(1010) 921011(1053) 921012(0555) 921013(1638) 921014(1133) 921015(1256)	60.4	60.4	60.75 60.75 60.75 60.75 60.75 60.75 60.75
40.720/83 /92 /?? /87 /86 /87 /82 /87	11	920915 921009(1723) 921010(1010) 921011(1053) 921012(1536) 921013(1638) 921014(1917) 921015(1256)	61.3	61.3	60.75 60.75 60.75 60.75 60.75 60.75 60.75



**CHARACTERIZATION OF THE LIFE
HISTORY AND ECOLOGY
OF THE HUMPBACK CHUB IN THE
GRAND CANYON**

**TRIP REPORT #11 - 1992
October 29 - November 15, 1992**

Prepared For:

Bureau of Reclamation

Prepared By:

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William J. Masslich, Project Leader
William Leibfried, Project Leader**

**BIO/WEST INC.
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November 30, 1992

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INTRODUCTION

This report presents pertinent details associated with Trip 11, 1992. Included in the report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip 11, 1992. Table 2 presents personnel who were present or participated in research activities for Trip 11, 1992. AGFD personnel were generally involved with separate, concurrent research activities during the trip.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 11, 1992. Table 4 is a summary of all humpback chubs handled during Trip 11, 1992. Table 5 presents information on all humpback chubs radio-tagged during Trip 11, 1992.

Humpback Chubs Captured

A total of 203 humpback chub were handled during Trip 11, 1992. Of these, 197 chubs were captured in Reach 1: 23 were classified as YOY (TL \leq 90 mm), 120 were juveniles (TL = 91 - 199 mm), and 54 were adults (TL > 199 mm). Four adult chubs and two juveniles were collected in Reach 2. No chub were collected in Reach 3.

In Reach 1, all but four adult chubs were captured in nets. Out of 143 sub-adult chubs collected, 67 were captured electrofishing, 66 with seines, and 10 with minnow traps. Twenty-six sub-adult chubs were captured in the lower end of Reach 1, near Cardenas Creek (RM 71.5).

In Reach 1, 41 humpback chubs were recaptured during Trip 11, 1992. Of these fish, 38 were recaptures of PIT-tagged fish and two were previously Carlin tagged. One juvenile chub appeared to have been processed by BIO/WEST previously, as evidenced by some missing scales along its back. No evidence of fin clips was observed on any YOY or juvenile humpback chub captured.

One chub was recaptured from Reach 2 during Trip 11, 1992. This fish was captured near RM 127, in the Middle Granite Gorge. No gross movements occurred since its previous recapture in September of 1992. This is the third time this fish has been recaptured during the past year. Each time the fish was caught in the same location as the original capture.

Two juvenile chub (82 mm and 89 mm TL) were found dead in a minnow trap on November 11, 1992, at RM 63.1. The trap appeared to be in relatively deep, quiet water so the cause of death is not known. It is possible that shifting flow patterns/velocities through the trap caused by fluctuations in the mainstem water level led to lethal stress levels within the trap.

Radiotelemetry

No humpback chubs were implanted with radio transmitters during Trip 11, 1992.

A total of eight fish implanted on previous trips were recontacted during Trip 11, 1992. Based on estimated extinction dates, seven transmitters should have still been active from previous trips. This results in a recontact success of 100% for Trip 11, 1992. A total of three telemetry observations were conducted during Trip 11, 1992.

The KILR remote telemetry site at RM 60.5 was operating normally and downloaded twice during Trip 11, 1992.

Bench Marks

No new bench marks were established during Trip 9, 1992.

OBSERVATIONS

1. Main channel turbidities above the LCR ranged from low to high during Trip 11, 1992. Below the LCR, turbidity was consistently high.
2. Although recontact rate of radiotagged fish was 100% for Trip 11, 1992, the fish were relatively difficult to locate. Most contacted individuals appeared to be utilizing deep-water habitat, similar to what was observed in October. Similar behavior was observed by radiotagged fish in 1991, possibly indicating a preference for deeper water by the fish during late fall/winter.
3. Sub-adult humpback chub were captured below the confluence of the LCR using three different gear types. A total of 23 YOY chub were captured, representing the first significant collection of this age class in 1992. This may indicate a late spawn by adult chubs in the LCR in 1992, or YOY chub may have simply held in the LCR longer in 1992.
4. Both juvenile and YOY chub were collected from a variety of low-velocity habitats below the LCR. High turbidity input from the LCR may act as cover for sub-adult chub and allow them to utilize a wider range of habitat types.
5. Collections of sub-adult chub dropped dramatically below Lava Chuar Rapid. This may represent disjunct distribution of sub-adult chub within Reach 1 due to a lack of suitable holding habitat between Lava Chuar and Cardenas Creek.
6. A total of 342 fathead minnows were collected from the mainstem, 302 from Reach 1, 36 from Reach 2, and 4 from Reach 3. Fathead minnow abundance appears to be increasing significantly in 1992. This may be a reflection of the stabilization of low-velocity habitat since the initiation of interim flows.
7. A total of 20 humpback chub were processed with the stomach pump during Trip 11, 1992. No complications were encountered during the procedure. On several occasions, evacuation of gut contents could not be easily induced with one or two gentle injections of water; these fish were termed "unsuccessful" and released immediately in good condition. Field examination of gut contents revealed that nearly all chub had food remains in their gut, and the bulk of the diet was Gammarus. It was also noted that tapeworms were expelled from the gut of several chub, presumably the Asian tapeworm, Bothriocephalus acheilognathi. The stomach pump continues to prove itself as a safe, effective, and highly valuable tool in collecting pertinent information on humpback chub food habits.
8. Three juvenile humpback chub collected in the mainstem, below the confluence of the LCR, showed prominent signs of distended abdomens and emaciation. The afflicted chub were carefully photographed and released. It is speculated that these fish were infected with tapeworms, presumably the Asian tapeworm, Bothriocephalus acheilognathi.
9. The recapture of another chub from the Middle Granite Gorge may further indicate a distinct population in this area. Further efforts in this area may provide useful information about this population.

10. Habitat maps of the Middle Granite Gorge subreach were constructed using aerial photographs and mylar overlays.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Two juvenile humpback chub mortalities were discovered in a minnow trap. In 1993, the trapline will be checked at least twice a day to reduce the potential for chub mortality due to trap stress.
2. Arizona Game and Fish field crews were encountered during Trip 11, 1992. Potential overlap of effort at Kanab Creek was avoided by staggering our effort at Kanab one day. This allowed AGF to perform their work undisturbed.

RECOMMENDATIONS

1. Increasing effort in sampling YOY and juvenile chub both above and below Lava Chuar Rapid in order to further define their abundance and range of distribution.

Table 1. Logistics and Research Schedule for Trip 11, 1992, Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
10/29	24	24 Mile	X			
10/30	56	Kwagunt		X	X	X
10/31	56	Kwagunt		X	X	X
11/01	58.2	Awatubi	X	X	X	X
11/02	58.2	Awatubi		X	X	X
11/03	58.2	Awatubi		X	X	X
11/04	61.2	LCR	X	X	X	X
11/05	61.2	LCR		X	X	X
11/06	61.2	LCR		X	X	X
11/07	61.2	LCR		X	X	X
11/08	65.4	Lava Chuar	X	X	X	X
11/09	65.4	Lava Chuar		X	X	X
11/10	68	Tanner	X	X		X
11/11	68	Tanner		X		X
11/12	114	114 Mile	X			
11/13	174.2	Cove Canyon	X			
11/14	214	214 Mile	X			
11/15	225.7	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 1. Logistics and Research Schedule for Trip 11, 1992 Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
10/29			X			
10/30	71.1	Cardenas Creek	X	X		
10/31	87.1	Cremation	X	X		
11/01	87.1	Cremation		X		
11/02	108.4	Lower Bass	X	X		
11/03	108.4	Lower Bass		X		
11/04	126.2	Middle Granite Gorge	X	X		
11/05	126.2	Middle Granite Gorge		X		
11/06	126.2	Middle Granite Gorge		X		
11/07	133.7	Tapeats Creek	X	X		
11/08	143.3	Kanab Creek	X	X		
11/09	143.3	Kanab Creek		X		
11/10	155.6	Last Chance	X	X		
11/11	155.6	Last Chance		X		
11/12	187.8	Whitmore Wash	X			
11/13	214	214 Mile Creek	X	X		
11/14	214	214 Mile Creek		X		
11/15	225.7	Diamond Creek	X			

¹ T&R = Travel and Reconnaissance
 FS = Fish Sampling
 TE = Telemetry
 HQ = Habitat Quantification

Table 2. Personnel Participating in Trip 11, 1992. Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	10/29 - 11/12	Project Leader
T. Wasowicz	BIO/WEST	10/29 - 11/12	Senior Biologist
H. Yard	BIO/WEST	10/29 - 11/15	
E. Prats	BIO/WEST	10/29 - 11/12	
P. Weiss	BIO/WEST	10/29 - 11/12	
K. Tinning	BIO/WEST	10/29 - 11/12	
G. Jarmillio	B/W VOLUNTEER	10/29 - 11/12	
M. Preus	B/W VOLUNTEER	10/29 - 11/12	
P. Trater	B/W VOLUNTEER	10/29 - 11/12	
A. Hayden	GCES	10/29 - 11/15	
C. Brode	GCES	10/29 - 11/5	Surveyor Crew
S. Saunders	GCES VOL.	10/29 - 11/5	Surveyor Crew
J. Weiss	GCES	10/29 - 11/12	Surveyor Crew
F. Protiva	GCES	10/30 - 11/10	Surveyor Crew
L. Bleifuss	OARS	10/29 - 11/15	Trip Leader
S. Rieder	OARS	10/29 - 11/15	
A. Cassidy	OARS	10/29 - 11/15	

Table 2. Personnel Participating in Trip 11, 1992. Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
W. Leibfried	BIO/WEST	10/29 - 11/11	
T. Yates	BIO/WEST	10/29 - 11/15	
R. VanHaverbeke	BIO/WEST	10/29 - 11/15	
G. Hardwick	BIO/WEST	10/29 - 11/15	
J. Bravo	BIO/WEST VOLUNTEER	10/29 - 11/15	
C. Heck	BIO/WEST VOLUNTEER	10/29 - 11/15	
J. Roach	BIO/WEST VOLUNTEER	10/29 - 11/15	
S. Bledsoe	OARS	10/29 - 11/15	
K. Claypool	OARS	10/29 - 11/15	
R. Running	OARS	10/29 - 11/15	

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 11, 1992. THESE DATA ARE PRELIMINARY

	¹	HB ²	FM	BH	RB	BR	CC	CP	SD	PK	FH	FZ
Reach 1	A	4	1	0	268	1	0	10	1	0	26	0
EL	J	49	3	0	37	0	0	1	0	0	5	0
N=85	Y	18	4	0	2	0	0	0	0	0	0	0
17.4 hr												
Reach 2	A	0	8	1	39	68	0	40	2	0	16	0
EL	J	1	6	0	10	7	0	0	0	0	0	0
N=72	Y	0	0	0	0	0	1	0	0	0	0	0
19 hr												
Reach 3	A	0	0	0	0	0	0	1	2	0	4	0
EL	J	0	0	2	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	2	0	0	0	0
2.3 hr												
Reach 1	A	27	12	0	51	0	0	0	0	0	0	1
TL	J	0	0	0	0	0	0	0	0	0	0	0
N=67	Y	0	0	0	0	0	0	0	0	0	0	0
134 hr												
Reach 2	A	3	8	2	0	0	0	8	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0
N=67	Y	0	0	0	0	0	0	0	0	0	0	0
134 hr												
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0
TL	J	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0
6.8 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 11, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	FZ
Reach 1	A	18	10	0	22	1	1	0	0	0	0	0
TK	J	0	0	1	1	0	0	0	0	0	0	0
N=52	Y	0	0	0	0	0	0	0	0	0	0	0
104 hr												
Reach 2	A	1	1	0	1	0	0	0	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0
N=31	Y	0	0	0	0	0	0	0	0	0	0	0
63 hr												
Reach 3	A	0	0	0	0	0	0	3	0	0	0	0
TK	J	0	0	0	0	0	0	0	0	0	0	0
N=12	Y	0	0	0	0	0	0	0	0	0	0	0
25 hr												
Reach 1	A	0	0	0	3	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0
N=5	Y	0	0	0	0	0	0	0	0	0	0	0
10 hr												
Reach 2	A	0	7	1	1	0	0	3	0	0	0	0
TM	J	1	0	0	0	0	0	0	0	0	0	0
N=50	Y	0	0	0	0	0	0	0	0	0	0	0
99 hr												
Reach 3	A	0	0	0	0	0	0	0	0	0	0	0
TM	J	0	0	0	0	0	0	0	0	0	0	0
N=6	Y	0	0	0	0	0	0	0	0	0	0	0
12.5 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 11, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	FZ
Reach 1	A	2	1	0	6	0	0	0	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=8	Y	0	0	0	0	0	0	0	0	0	0	0
16 hr												
Reach 2	A	0	2	0	0	0	0	7	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=39	Y	0	0	0	0	0	0	0	0	0	0	0
74 hr												
Reach 3	A	0	0	0	0	0	0	4	0	0	0	0
TN	J	0	0	0	0	0	0	0	0	0	0	0
N=9	Y	0	0	0	0	0	0	0	0	0	0	0
20 hr												
Reach 1	A	3	2	0	10	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0
N=23	Y	0	0	0	0	0	0	0	0	0	0	0
46 hr												
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0
GP	J	0	0	0	0	0	0	0	0	0	0	0
N=17	Y	0	0	0	0	0	0	0	0	0	0	0
33 hr												
Reach 2	A	0	0	0	0	0	0	0	0	0	0	0
TW	J	0	0	0	0	0	0	0	0	0	0	0
N=10	Y	0	0	0	0	0	0	0	0	0	0	0
19 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 11, 1992. THESE DATA ARE PRELIMINARY

	¹	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	FZ
Reach 2	A	0	0	0	0	1	0	0	0	0	0	0
GM	J	0	0	0	0	0	0	0	0	0	0	0
N=7	Y	0	0	0	0	0	0	0	0	0	0	0
14.5 hr												
Reach 1	A	0	0	0	0	0	0	0	0	0	0	0
MT	J	10	0	0	0	0	0	0	0	0	1	0
N=56	Y	0	0	0	0	0	0	0	0	0	0	0
1262 hr												
Reach 1	A	0	0	0	2	0	0	0	13	3	196	0
SG	J	61	9	10	0	0	0	0	3	0	74	0
N=39	Y	5	0	0	0	0	0	0	0	0	0	0
Reach 2	A	0	0	0	0	0	0	0	2	0	20	0
SA	J	0	0	0	0	0	0	0	0	0	0	0
N=3	Y	0	0	0	0	0	0	0	0	0	0	0
4 hr												
Reach 2	A	0	0	4	1	0	0	0	0	0	0	0
HL	J	0	0	3	0	0	0	0	0	0	0	0
N=10	Y	0	0	0	0	0	0	0	0	0	0	0
19 hr												
Reach 2	A	0	0	0	1	1	0	0	0	0	0	0
HS	J	0	0	0	2	0	0	0	0	0	0	0
N=2	Y	0	0	0	0	0	0	0	0	0	0	0
39 hr												

Table 3. Summary of Fish Collected and Effort by Gear Type, Trip 11, 1992. THESE DATA ARE PRELIMINARY

¹	²	HB ³	FM	BH	RB	BR	CC	CP	SD	PK	FH	FZ
A	58	52	8	405	72	1	76	20	3	262	1	
J	122	18	15	50	7	0	1	3	0	79	0	
Y	23	4	0	2	0	1	2	0	0	0	0	
TOTALS												

¹- Gear Types

- EL = Electrofishing
- TL = 75'x6'x1 1/2"x12" trammel net
- TK = 75'x5'x1"x12" trammel net
- TM = 50"x6'x1"x12" trammel net
- TN = 50'x6'x1 1/2"x12" trammel net
- GP = 100'x6'x1 1/2" gill net
- TW = 75'x6'x1/2"x10"

² - A = Adult

- J = Juvenile
- Y = Young of year

³ - HB = humpback chub

- FM = flannemouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace
- PK = plains killifish
- FH = fathead minnow
- FZ = flannemouth X razorback

² - A = Adult

- J = Juvenile
- Y = Young of year

³ - HB = humpback chub

- FM = flannemouth sucker
- BH = bluehead sucker
- RB = rainbow trout
- BR = brown trout
- CC = channel catfish
- CP = carp
- SD = speckled dace
- PK = plains killifish
- FH = fathead minnow
- FZ = flannemouth X razorback

Table 4. Summary of Humpback Chub handled during Trip 11, 1992

	Date	Type	Sample No.	Pittag	Recapture	Old Tag	TL	WT	Disp	Radio	RM Release
1	921030	E	001	#####	N		82	6	RA	N	71.50
2	921030	E	001	#####	N		100	9	RA	N	71.50
3	921030	E	001	#####	N		92	6	RA	N	71.50
4	921030	E	001	#####	N		94	7	RA	N	71.50
5	921030	E	001	#####	N		87	6	RA	N	71.50
6	921030	E	001	#####	N		73	4	RA	N	71.50
7	921030	E	001	#####	N		92	4	RA	N	71.50
8	921030	E	001	#####	N		118	14	RA	N	71.50
9	921030	E	001	#####	N		117	11	RA	N	71.50
10	921030	E	001	#####	N		116	15	RA	N	71.50
11	921030	E	001	#####	N		104	12	RA	N	71.50
12	921030	E	001	#####	N		105	9	RA	N	71.50
13	921030	E	001	#####	N		77	8	RA	N	71.50
14	921031	E	004	#####	N		85	5	RA	N	71.50
15	921031	E	004	#####	N		82	4	RA	N	71.50
16	921031	E	004	#####	N		115	12	RA	N	71.50
17	921031	E	004	#####	N		86	5	RA	N	71.50

18	921031	E	004	#####	N		56	1	RA	N	71.50
19	921031	E	005	#####	N		81	5	RA	N	71.10
20	921031	E	004	#####	N		98	12	RA	N	70.30
21	921031	E	004	#####	N		83	5	RA	N	70.30
22	921031	E	004	#####	N		80	4	RA	N	70.30
23	921031	E	004	#####	N		85	6	RA	N	70.30
24	921031	E	004	#####	N		90	9	RA	N	70.30
25	921031	E	004	#####	N		81	7	RA	N	70.30
26	921031	E	004	#####	N		80	6	RA	N	70.30
27	921101	N	024	7F7F315F0A	Y	PITTAG	400	635	RA	N	58.30
28	921102	N	024	7F7D085017	Y	PITTAG	433	850	RA	N	58.30
29	921103	E	019	7F7E432847	Y	PITTAG	169	34	RA	N	61.20
30	921103	E	020	#####	N		118	18	RA	N	61.20
31	921103	E	020	#####	N		86	7	RA	N	61.20
32	921103	E	021	7F7F206E75	Y	PITTAG	276	173	RA	N	61.20
33	921103	E	021	FIN PUNCH	N		83	9	RA	N	61.20
34	921103	E	022	7F7F183B46	Y	PITTAG	203	64	RA	N	61.20
35	921103	E	022	7F7F264B29	N		185	44	RA	N	61.20
36	921103	N	040	7F7F3E5208	Y	PITTAG	374	427	RA	N	60.40
37	921103	N	042	7F7F334466	N		389	539	RA	N	60.40

38	921103	N	042	7F7F050F0A	Y	PITTAG	410	673	RA	N	60.40
39	921103	N	042	7F7F2C105D	Y	PITTAG	394	600	RA	N	60.40
40	921103	N	045	7F7D330E79	Y	PITTAG	357	413	RA	N	60.20
41	921103	N	046	7F7F332746	N		360	442	RA	N	60.40
42	921103	N	046	7F7D18100E	Y	PITTAG	337	346	RA	N	60.40
43	921103	N	047	7F7F334466	Y	PITTAG	0	0	RA	N	0.00
44	921103	N	048	7F7E432637	Y	PITTAG	310	256	RA	N	60.50
45	921103	N	049	7F7D181B25	Y	PITTAG	368	529	RA	N	60.50
46	921103	N	049	7F7F33292F	N		309	302	RA	N	60.50
47	921103	N	051	7F7D18100E	Y	PITTAG	330	350	RA	N	60.40
48	921103	N	054	7F7D224E7E	Y	PITTAG	364	485	RA	N	60.20
49	921103	N	055	7F7F45533C	Y	PITTAG	335	365	RA	N	60.40
50	921104	N	058	7F7F334240	N		375	452	RS	Y	60.90
51	921104	N	061	7F7F334240	Y	PITTAG	382	445	RS	N	60.90
52	921104	N	068	7F7D2C4B46	Y	PITTAG	306	229	RS	N	60.40
53	921104	N	069	7F7F3E5718	Y	PITTAG	243	119	RA	N	60.90
54	921104	N	069	7F7F343C1D	Y	146CY	384	525	RS	N	60.90
55	921104	E	029	7F7D226C23	Y	PITTAG	302	291	RA	N	60.20
56	921105	N	089	7F7D181478	Y	PITTAG	382	541	RS	N	60.50
57	921105	N	089	7F7F3C6F28	Y	PITTAG	381	433	RS	N	60.50

58	921105	N	089	7F7F3E485A	Y	PITTAG	355	361	RS	N	60.50
59	921105	N	081	7F7F471678	N		355	408	RS	N	60.80
60	921105	N	082	7F7F3F4C51	Y	PITTAG	322	326	RS	N	60.40
61	921105	N	086	7F7D1B7209	Y	PITTAG	418	660	RS	N	60.80
62	921105	N	087	7F7F477E17	N		215	116	RA	N	60.40
63	921105	N	087	7F7F3F451B	Y	PITTAG	425	691	RS	N	60.40
64	921105	T	007	FIN PUNCH	N		81	0	RA	N	62.15
65	921105	E	034	FIN PUNCH	N		100	8	RA	N	62.85
66	921105	E	035	FIN PUNCH	N		104	8	RA	N	63.00
67	921105	E	037	FIN PUNCH	N		85	7	RA	N	61.55
68	921105	E	037	FIN PUNCH	N		50	4	RA	N	61.55
69	921105	E	037	FIN PUNCH	N		107	12	RA	N	61.55
70	921105	E	038	FIN PUNCH	N		100	6	RA	N	61.60
71	921105	N	082	7F7D073D4A	Y	PITTAG	391	878	RA	N	127.10
72	921105	N	089	7F7F1F1F02	N		330	385	RA	N	127.60
73	921105	N	092	7F7F1F1140	N		266	201	RA	N	127.60
74	921105	N	093	7F7F1F2D0F	N		196	75	RA	N	127.60
75	921105	E	038	#####	N		158	31	RA	N	126.40
76	921106	T	018	FIN PUNCH	N		74	1	RA	N	62.20
77	921106	N	092	7F7F480A30	N		335	335	RS	N	60.90

78	921106	N	100	7F7D2D6205	Y	PITTAG	335	328	RS	N	60.75
79	921106	E	040	FIN PUNCH	Y	MARKS	100	8	RA	N	62.55
80	921106	E	040	FIN PUNCH	N		71	3	RA	N	62.55
81	921106	E	040	FIN PUNCH	N		82	6	RA	N	62.55
82	921106	E	041	#####	N		47	1	RA	N	62.64
83	921106	E	041	7F7F48066B	N		155	27	RA	N	62.64
84	921106	E	043	FIN PUNCH	N		76	3	RA	N	63.10
85	921106	E	043	FIN PUNCH	N		71	2	RA	N	63.10
86	921106	E	044	FIN PUNCH	N		112	8	RA	N	63.35
87	921106	E	045	7F7F472929	Y	401FY	184	50	RA	N	61.87
88	921106	E	046	7F7F30312F	N		190	53	RA	N	62.20
89	921106	E	046	7F7F48067A	N		162	46	RA	N	62.20
90	921106	E	047	7F7F264A1C	Y	PITTAG	231	95	RA	N	62.35
91	921106	S	001	#####	N		42	0	RA	N	62.10
92	921106	N	107	7F7F471736	N		271	197	RA	N	127.10
93	921107	T	028	FIN PUNCH	N		87	4	RA	N	62.20
94	921107	T	115	7F7F480A6E	N		455	908	RS	N	60.75
95	921107	N	113	7F7D080C65	N		377	421	RS	N	61.90
96	921107	N	113	7F7D08176D	N		380	499	RS	N	61.90
97	921107	N	113	7F7D2C374A	Y	PITTAG	380	457	RS	N	61.90

98	921107	N	113	7F7F3E5D53	Y	PITTAG	300	206	RA	N	61.90
99	921107	N	119	7F7F33151A	Y	PITTAG	410	682	RS	N	61.70
100	921107	N	119	7F7D086401	N		425	590	RS	N	61.70
101	921107	S	005	#####	N		98	8	RA	N	63.15
102	921107	S	005	#####	N		99	8	RA	N	63.15
103	921107	S	005	#####	N		123	19	RA	N	63.15
104	921107	S	006	#####	N		76	3	RA	N	63.15
105	921107	S	006	#####	N		127	18	RA	N	63.15
106	921107	S	006	#####	N		95	8	RA	N	63.15
107	921107	S	009	#####	N		120	14	RA	N	62.75
108	921107	S	009	#####	N		104	10	RA	N	62.75
109	921107	S	009	#####	N		106	10	RA	N	62.75
110	921107	S	009	#####	N		98	7	RA	N	62.75
111	921107	S	009	#####	N		101	8	RA	N	62.75
112	921107	S	010	#####	N		152	30	RA	N	62.75
113	921107	S	010	#####	N		127	19	RA	N	62.75
114	921107	S	010	#####	N		124	22	RA	N	62.75
115	921107	S	010	#####	N		120	15	RA	N	62.75
116	921107	S	010	#####	N		115	14	RA	N	62.75
117	921107	S	010	#####	N		102	7	RA	N	62.75

118	921107	S	010	#####	N		107	0	RA	N	62.75
119	921107	S	010	#####	N		100	9	RA	N	62.75
120	921107	S	010	#####	N		139	25	RA	N	62.75
121	921107	S	010	#####	N		95	7	RA	N	62.75
122	921107	S	010	#####	N		59	1	RA	N	62.75
123	921107	S	010	#####	N		56	0	RA	N	62.75
124	921107	S	010	#####	N		63	2	RA	N	62.75
125	921108	N	124	7F7D077A71	N		332	332	RA	N	64.20
126	921108	N	125	7F7F456122	Y	PITTAG	354	478	RA	N	64.30
127	921108	N	129	7F7F477E4F	Y	PITTAG	325	320	RA	N	64.20
128	921108	T	033	FIN PUNCH	N		70	3	RA	N	63.10
129	921108	N	121	7F7F484B33	Y	PITTAG	364	462	RS	N	63.70
130	921108	N	121	7F7D08621A	N		320	315	RS	N	63.70
131	921108	N	121	7F7D027F19	Y	640CY	400	549	RS	N	63.70
132	921108	N	121	7F7F2C162C	Y	PITTAG	371	458	RS	N	63.70
133	921108	N	121	7F7F2D4C15	Y	PITTAG	372	575	RS	N	63.70
134	921108	N	122	7F7D09081A	N		330	359	RA	N	63.80
135	921108	S	016	#####	N		105	13	RA	N	61.80
136	921108	S	016	#####	N		128	20	RA	N	61.80
137	921108	S	016	#####	N		135	19	RA	N	61.80

138	921108	S	016	#####	N		91	8	RA	N	61.80
139	921108	S	016	#####	N		91	6	RA	N	61.80
140	921108	S	016	#####	N		98	8	RA	N	61.80
141	921108	S	016	#####	N		92	6	RA	N	61.80
142	921108	S	016	#####	N		92	4	RA	N	61.80
143	921108	S	016	#####	N		95	5	RA	N	61.80
144	921108	S	017	#####	N		94	7	RA	N	61.80
145	921108	S	017	#####	N		103	10	RA	N	61.80
146	921108	E	056	#####	Y	PITTAG	255	123	RA	N	61.91
147	921108	E	058	FIN CLIP	N		103	10	RA	N	64.80
148	921108	E	058	FIN CLIP	N		146	31	RA	N	64.80
149	921108	E	058	#####	N		59	2	RA	N	64.80
150	921108	E	059	#####	N		60	2	RA	N	0.00
151	921108	E	059	FIN PUNCH	N		157	44	RA	N	0.00
152	921108	E	060	FIN PUNCH	N		115	14	RA	N	64.80
153	921109	N	132	7F7D073678	N		228	108	RA	N	64.70
154	921109	N	133	7F7D301B64	Y	PITTAG	308	255	RA	N	64.80
155	921109	T	039	#####	N		71	6	RA	N	63.05
156	921109	T	042	#####	N		82	6	DP	N	0.00
157	921109	T	042	#####	N		89	7	DP	N	0.00

158	921109	T	044	#####	N		67	0	RA	N	63.40
159	921109	T	045	#####	N		68	0	RA	N	63.40
160	921109	T	047	#####	N		92	9	RA	N	64.45
161	921109	T	131	7F7D076C2E	Y	PITTAG	200	77	RA	N	64.65
162	921109	E	061	FIN PUNCH	N		67	3	RA	N	64.60
163	921109	E	061	FIN PUNCH	N		113	12	RA	N	64.60
164	921109	E	065	FIN PUNCH	N		110	13	RA	N	63.50
165	921109	E	065	FIN PUNCH	N		76	5	RA	N	63.50
166	921109	E	066	FIN PUNCH	N		73	5	RA	N	63.55
167	921109	E	067	FIN PUNCH	N		90	8	RA	N	63.90
168	921109	E	068	FIN PUNCH	N		65	3	RA	N	64.10
169	921109	E	068	7F7F200229	N		182	63	RA	N	64.10
170	921109	S	021	#####	N		117	13	RA	N	64.60
171	921109	S	021	#####	N		146	29	RA	N	64.60
172	921109	S	021	#####	N		98	7	RA	N	64.60
173	921109	S	021	#####	N		77	0	RA	N	64.60
174	921109	S	021	#####	N		149	32	RA	N	64.60
175	921109	S	021	#####	N		155	35	RA	N	64.60
176	921109	S	022	#####	N		150	0	RA	N	64.70
177	921109	S	022	#####	N		158	0	RA	N	64.70

178	921109	S	022	#####	N		158	0	RA	N	64.70
179	921109	S	022	#####	N		167	0	RA	N	64.70
180	921109	S	022	#####	N		128	0	RA	N	64.70
181	921109	S	022	#####	N		149	0	RA	N	64.70
182	921109	S	022	#####	N		127	0	RA	N	64.70
183	921110	S	023	#####	N		55	0	RA	N	64.50
184	921110	S	023	#####	N		47	0	RA	N	64.50
185	921110	S	026	#####	N		94	9	RA	N	64.50
186	921110	S	026	#####	N		86	6	RA	N	65.40
187	921110	S	026	#####	N		84	5	RA	N	65.40
188	921110	S	026	#####	N		110	12	RA	N	65.40
189	921110	S	026	#####	N		115	13	RA	N	65.40
190	921110	S	026	#####	N		89	7	RA	N	65.40
191	921110	S	026	#####	N		86	5	RA	N	65.40
192	921110	S	026	#####	N		99	6	RA	N	65.40
193	921110	S	026	#####	N		80	4	RA	N	65.40
194	921110	S	026	FIN PUNCH	N		121	18	RA	N	65.40
195	921110	S	028	#####	N		41	0	RA	N	65.70
196	921110	S	033	#####	N		104	11	RA	N	67.70
197	921110	S	035	#####	N		76	3	RA	N	67.70

198	921110	S	025	#####	N		52	0	RA	N	65.4
199	921110	S	039	#####	N		152	34	RA	N	67.80
200	921110	E	072	#####	N		62	1	RA	N	67.10
201	921110	E	072	#####	N		60	1	RA	N	67.10
202	921110	E	072	#####	N		71	4	RA	N	67.10
203	921111	E	078	#####	N		103	6	RA	N	68.25

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECT- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920709	7F7F3E506C	418	634	40.620	62	11	100	921017	58.3	58.3
2	920709	7F7F3E5133	411	649	40.710	41	11	120	921106	58.3	58.3
3	920713	7F7D085A33	394	570	40.600	84	11	75	920926	61.2	61.2
4	920713	7F7F321C62	424	628	40.650	60	11	100	921021	61.2	61.2

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 9, 1992.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	920909	7F7F206B7B	409	760	40.680	60	11	100	921218	58.2	58.2
2	920909	7F7F477F56	415	653	40.740	60	11	100	921218	58.3	58.3
3	920912	7F7E430660	406	695	40.610	59	11	100	921221	60.4	60.4
4	920915	7F7F33715	396	624	40.720	83	11	75	921127	61.3	61.3

Table 6. A list of radio frequencies contacted on Trip 11, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/60	11	921030(1652)	60.4	60.4	~60.7
/60		921031(1215)			60.7
/60		921101(1354)			60.8
/60		921102(1418)			60.8
/60		921103(1037)			60.8
/60		921103(1943)			60.8
/60		921104(1453)			60.8
/60		921105(1506)			60.8
/60		921105(1506)			60.8
/60		921106(1455)			60.8
/60		921106(2236)			60.8
/60		921107(1507)			60.8
/60		921107(2145)			60.8
/60		921108(1334)			60.8
/60		921109(1455)			60.8
40.620/53	11	921030(1645)	60.4	60.4	~57.1
/52		921030(2020)			58.3
/54		921031(1120)			58.3
/52		921101(1314)			58.95
/50		921101(2121)			~58.9
/52		921102(1355)			58.8
/54		921103(0940)			58.3
/53		921104(1404)			58.35
/53		921105(1421)			58.35
40.650/53	11	921030(1659)	60.4	60.4	~61.2
40.680/61	11	921030(1645)	60.4	60.4	~57.1
/61		921031(1143)			58.85
/61		921101(1257)			58.8
/60		921103(0945)			58.8
/60		921104(1416)			58.85
40.710/33	11	921030(2044)	60.4	60.4	59.0
/32		921101(1332)			~59.35
/34		921103(1000)			59.0
		921107(2125)			59.3

Table 6. A list of radio frequencies contacted on Trip 11, 1992 and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/70 /69 /68	11	921103(1924) 921104(2117) 921105(1454)	60.4	60.4	60.2 60.15 60.15
40.720/84 /83	11	921030(1654) 921105(2103)	60.4	60.4	~60.7 60.35
40.740/60 /60 /62 /60 /60 /60 /60 /60 /60 /56	11	921030(1645) 921030(2020) 921031(1120) 921101(0937) 921101(1243) 921101(2117) 921102(1346) 921103(0940) 921106(1422) 921109(1420)	60.4	60.4	~57.1 58.35 58.35 58.35 58.3 58.25 58.25 58.25 58.25 58.25