

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

**TRIP REPORT #5 - 1991
(May 8 - May 26, 1991)**

Prepared For:

Bureau of Reclamation

Prepared By:

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

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

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INTRODUCTION

This report presents pertinent details associated with Trip 5, 1991. 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, 1991. Table 2 presents personnel who were present or participated in research activities for Trip 5, 1991. This trip schedule deviated from the standard 20-day routine. On Trip 5, the upper crew spent the entire sample effort in the LCR Reach to more closely monitor movement of spawning fish into the LCR. This was done at some loss of sample effort in Reaches 2 and 3.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip 5, 1991. Table 4 is a summary of all humpback chubs handled during Trip 5, 1991. Table 5 presents information on all humpback chubs radio-tagged during Trip 5, 1991.

Humpback Chubs Captured

A total of 68 humpback chub were handled during this trip. Of these fish, there were 33 adults and 35 juveniles. Six of the chubs collected were recaptures, bearing either a Carlin tag, Floy tag or PIT tag. Data were collected on all humpback chubs with the exception of two juveniles that escaped during processing. All juvenile humpback chubs were captured either at or below the confluence of the LCR. The majority of these fish were captured by electrofishing along main channel shorelines with boulder and sand substrates.

Distribution of the humpback chub based on collections conducted as part of this project was expanded to include the mainstem Colorado River near its confluence with Bright Angel and Havasu Creeks.

One mortality of an adult female humpback chub occurred during Trip 5. The fish was seen floating in the water as the 'parallel' trammel net was being pulled. The carcass was recovered, processed and PIT tagged in the musculature of the nuchal region on the right side of the fish. The fish was preserved in 87% ETOH and transported from the canyon. The fish has been transferred to AGF at the request of the USFWS for further processing. A letter of transfer has been submitted. This is only the second known incidental mortality of a humpback chub incurred during this investigation.

Radiotelemetry

Three humpback chubs were implanted with radio transmitters during Trip 5, 1991. A summary of radiotelemetry location and movement data collected on radio-tagged humpback chubs during Trip 5, 1991 is presented in Table 6.

A total of 5 chubs radio-tagged during previous trips were contacted during Trip 5, 1991. Three of these fish resided in the LCR during the entire trip. Two radio-tagged chubs were initially contacted in the main channel on May 9 - 10, although one of these fish moved into the LCR by May 17. The four fish in the LCR were all located within 1000 meters of the LCR/Main Channel confluence. Two chubs with transmitters assumed to be active were not contacted.

Twenty-four hour monitoring was conducted on the one radio-tagged chub that remained in the main channel. Two other prolonged telemetry observations were conducted on the same fish to ascertain diel vertical movement patterns. A prolonged telemetry observation was also made on the other radio-tagged chub in the main channel as it moved from the main channel into the LCR.

One radio-tag was recovered on the bank, approximately 30 m up the LCR. The tag was found among boulders on river right of the LCR, approximately 15-20 vertical feet above the water surface elevation of the LCR. No signs of the carcass were found in proximity of the tag, although one white feather was found stuck to the transmitter when it was located. The tag was first contacted on May 12 at 1349. This contact was made following 6 previous telemetry surveillance efforts in the same area during which no contact was made. The tag was recovered at approximately 1030 on May 14. Bird predation on the radio-tagged fish is suspected. An osprey was sighted on May 12 and 13 in the LCR confluence area.

One radio-tagged fish was recaptured in the main channel on May 15. The fish was originally implanted on March 11, 1991, and appeared active and healthy. The primary incision was healed and no signs of infection or histological problems were evident. Slight swelling and redness at the antenna exit point was evident. The fish was measured, weighed, photographed and released at the capture location.

Bench Marks

No new bench marks were established during Trip 5, 1991.

OBSERVATIONS

1. Four radio-tagged chubs were observed in the LCR between the confluence and 1000 meter upstream. These fish were consistently located in eddies created by instream boulder cover. It is suspected that these fish may still be exhibiting staging behavior or are engaged in spawning activities.
2. Netting catch rates of adult humpback chubs (particularly large adults) in the main channel appears to be down from previous trips. This was particularly evident in the LCR confluence area and suggests that a large proportion of the adults have moved into the LCR. Only four humpback chubs large enough to implant were captured during Trip 5. Movement of adults into the LCR is also supported by radio telemetry observations.
3. Thirty-five juvenile humpback chubs (TL ranging from 43-176 mm) were captured in the mainstem from the confluence of the LCR (RM 61.4) to Lava Canyon (65.5). The majority of these fish were captured in main channel shoreline habitats in slow to moderately fast runs and eddies with boulder and sand substrates. The appearance of these size classes of chubs in the main channel may be a result of movement or transport of younger chubs out of the LCR during spring runoff. Previous electrofishing efforts in the same reach did not produced similar catch rates for juvenile humpback chubs. However, electrofishing effort has been inconsistent in the reach below the LCR.
4. Turbidity in the LCR consistently dropped throughout Trip 5, 1991. By May 16, the LCR was regaining its characteristic blue color, indicating that water levels were at base flows out of Blue Springs. As the water cleared, conductivities increased and telemetry in the LCR became more ineffective. By May 20, conductivities had reached 4,500 umhos and contact with most fish in the LCR was lost except for brief intermittent contacts. Temperatures in the LCR were ranging from 18 to 21°C by the end of Trip 5.
5. One gravid female humpback chub was captured in the "parallel" trammel net set at the mouth of the LCR. The fish expressed eggs while it was being processed, suggesting the possibility of humpback chub spawning in the fluctuation zone at the confluence of the LCR. During low water, attempts were made to collect eggs from substrates in the LCR plume and mixing zone in the main channel. One egg was collect from substrates very near to the location of the parallel net set. The egg will be sent to the Larval Fish Laboratory at Colorado State University for positive identification as to species.
6. Several adult humpback chubs captured in the plume of the LCR, exhibited a range of reproductive condition. Three females captured were flaccid in the abdominal region and had conspicuous abrasions on the margins of the fins and the vent, suggesting that the fish had recently spawned. Five adult females captured in the plume exhibited coloration, slight tuberculation and were firm in the abdominal region, but showed no physical evidence of spawning (i.e. abrasions). Of four adult males that were captured in the LCR confluence area, none had expressible gametes. However, one male captured at RM 61.7 was heavily tubercled.
7. Numerous flannelmouth suckers were captured in the plume of the LCR during Trip 5. Many of the fish were vividly colored and several fish (including males and one female) were expressing

gametes. This suggests that aggregations of flannelmouth suckers may be spawning in the plume of the LCR as it mixes with the main channel. Aggregations seemed particularly large during dusk.

8. The lower remote telemetry station was fitted with a receiver and data logger and was operational on May 13. Antenna range tests were conducted. The station appears to be functioning well, however due to site characteristics (i.e. excessive depths) we feel that it may be possible for a radio-tagged fish to pass the station undetected, especially during high flows. The station did successfully log free ranging radio-tagged fish released during Trip 5.

9. Larval fish became conspicuous in the LCR on May 20. Prior to this date no larval fish had been observed during daily telemetry monitoring sallies up the LCR. Upon closer inspection, it appeared that most of the larvae were Catostomids although Cyprinids were also present.

10. Adult humpback chub appeared to have been more concentrated around the mouths of some tributary streams during May than in previous months. Chubs were collected from the mainstem river at either the mouth or in the next eddy upstream at Bright Angel, Shinumo, and Havasu Creeks.

11. Concentrations of adult fish in the mainstem river at Bright Angel, Shinumo, and Havasu Creeks suggest the possibility of attempted spawning by humpback chubs in those areas. Seven adults were captured near the inflow areas of the tributaries during this trip. One chub was captured immediately adjacent to Bright Angel Creek. This fish was a moderately large male which exhibited tuberculation and a very abraded lower caudal fin suggesting spawning activity. Three small adult chubs were collected within .3 miles of Shinumo Creek including one from the confluence of Shinumo Creek and the mainstem, two of the three exhibited obvious tuberculations. In addition, three adult chubs were collected from the mainstem river in quiet water upstream of Havasu Creek. The largest fish collected from the mainstem near Havasu Creek was an 857 gram female which was very robust and appeared to be approaching spawning condition. This fish was collected approximately .1 miles upstream of Havasu Creek. The two other chubs collected in the area were moderate sized males which exhibited tuberculations across the dorsal surface of the head.

12. Relatively large concentrations of flannelmouth and bluehead suckers were found in and near the mouths of Bright Angel, Kanab, Deer, and Havasu Creeks. Particularly large aggregations of flannelmouth suckers were observed in Kanab Creek. Flannelmouth and bluehead suckers in spawning and post spawning condition were collected from each of the above tributaries.

13. Movement of flannelmouth suckers into Kanab Creek was heavily influenced by flow during the May sample. Fish heavily utilized flooded portions of Kanab Creek during high flows, but were absent from the creek and the mainstem confluence area during low stable flows. In excess of 60 flannelmouth suckers were collected in hoop net sets in the flooded portion of Kanab Creek during the high portion of fluctuating flows which ranged up to approximately 26,000 cfs. Only one fish was collected during low stable flows (5,000 cfs) from hoop nets set in the lower stream and in the confluence area with the mainstem river.

14. During May bluehead suckers were abundant in Kanab Creek immediately above the 26,000 cfs inundation zone. Flannelmouth suckers were rare above the 26,000 cfs inundation zone, but common within that zone during the high water stage.

15. Kanab Creek exhibited the greatest abundance of larval suckers of any of the major tributaries in Reach 2 and Reach 3.

16. Striped bass were collected for the first time in Reach 3 during May. One 10 pound female was collected at 215 mile canyon and four smaller fish were collected near Trail Canyon (~RM219). Timing of striped bass collections suggest a seasonal movement of fish into the Colorado River from Lake Mead.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Increasing conductivities in the LCR are reducing the effectiveness of telemetry and BIO/WEST's ability to track and locate fish in the LCR. Consequently, cooperative efforts between LCR fish sampling efforts (AGF and ASU) are increasingly important in order to continue to track the movements and timing of movements of radio-tagged fish in the LCR. If locations of radio-tagged fish with active transmitters can be communicated to BIO/WEST in a timely manner, it may be possible to relocate and track the fish's movements for a period of time.
2. During Trip 5 most radio-tagged fish were located in the LCR. Only one fish radio-tagged during a previous trip remained in the main channel Colorado River for the duration of the trip. Consequently, our ability to collect telemetry information in the main channel was limited. As fish move back into the main channel from the LCR, time spent collecting telemetry observations should increase.
3. Due to the apparent movement of adult humpback chubs into the LCR, the ability to collect implantable size fish in the main channel has decreased. Very few implantable size fish were handled during Trip 5, and of those, some females still appeared to be gravid and close to spawning so were not implanted. Consequently, only 3 humpback chubs were implanted during Trip 5. It is anticipated that catch rates of larger individuals will increase as more adults move back into the main channel. In order to maintain adequate numbers of radio-tagged fish available for telemetry purposes additional netting will be conducted on the June trip, in attempts to capture implantable size chubs.
4. Upon activation and testing of the lower remote telemetry station (RM 62.1) it became apparent that the station may not be 100% effective in logging the presence of a radio-tagged fish within the antenna's range. This is primarily due to a deep channel along river left (across the river from the antenna) that may allow the fish access up or down the channel without detection due to depth extinction of the signal. The problem is particularly acute at high flows. The antenna, however, effectively monitors the majority of the channel at the site and it is likely that a radio-tagged fish would be logged. Since other sites with more favorable characteristics have not been identified below the confluence of the LCR, no solution to this problem is available yet. Additional tests on antenna configuration and aiming will be conducted on future trips in attempts to maximize the signal reception capabilities of the station.

RECOMMENDATIONS

1. Maintain the remote telemetry stations at their current locations until radio-tagged fish move out of the LCR. This means extending the previously determined dates for removing the stations of June 15, and will require approval by the NPS.
2. Increase netting efforts on the 10 day trips in attempts to capture implantable sized humpback chubs in the main channel.
3. Maintain close coordination and information exchange between main channel and LCR humpback chub researchers. This is particularly important for the next few months as the potential for fish interchange between the two systems is high.
4. Maintain electrofishing effort in the LCR region to track relative densities of YOY and juvenile humpback chubs that were detected in the main channel during Trip 5.
5. Conduct electrofishing below Lava Chuar rapid (RM 65.5) to determine the extent of movement or transport of juvenile humpback chubs into the main channel.

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

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
5/8	33.6	Below Redwall Canyon	X			
5/9	57.3	Above Malgosa Canyon	X	X	X	X
5/10	57.3	Above Malgosa Canyon		X	X	X
5/11	58.2	Awatubi Canyon	X	X	X	X
5/12	58.2	Awatubi Canyon		X	X	X
5/13	61.2	LCR	X	X	X	X
5/14	61.2	LCR		X	X	X
5/15	61.2	LCR		X	X	X
5/16	61.2	LCR		X	X	X
5/17	61.2	LCR		X	X	X
5/18	61.2	LCR		X	X	X
5/19	61.2	LCR		X	X	X
5/20	61.2	LCR		X	X	X
5/21	64.5	Carbon Creek	X	X	X	X
5/22	64.5	Carbon Creek		X	X	X
5/23	139.0	Fishtail Canyon	X		X	
5/24	166.4	National Canyon	X			
5/25	225.0	Diamond Creek	X			
5/26	225.0	Takout				

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

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

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
5/8	34.0		X			
5/9	87.2	Roy's Beach	X			
5/10	87.2	Roy's Beach		X		X
5/11	108.3	Bass Camp	X	X		X
5/12	108.3	Bass Camp		X		X
5/13	133.5	Above Tapeats	X	X		X
5/14	133.5	Above Tapeats		X		X
5/15	137.4	Below Deer Creek	X	X		X
5/16	137.4	Below Deer Creek		X		X
5/17	143.2	Kanab Creek	X	X		X
5/18	143.2	Kanab Creek		X		X
5/19	155.5	Above Havasu	X	X		X
5/20	155.5	Above Havasu		X		X
5/21	204.0	Spring Canyon	X	X		X
5/22	214.1	214 Mile Canyon	X	X		X
5/23	219.3	Trail Canyon	X	X		X
5/24	219.3	Trail Canyon		X		X
5/25	224.9	Diamond Creek				

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

Table 2a. Personnel Participating in Trip #5, Team 1

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #1			
R. Valdez	BIO/WEST	5/17 - 5/25	In Tanner Trail
B. Masslich	BIO/WEST	5/8 - 5/25	Project Leader/BW
R. VanHaverbeke	BIO/WEST	5/8 - 5/26	
H. Yard	BIO/WEST	5/8 - 5/20	Chopper out - LCR
T. Wasowicz	BIO/WEST	5/8 - 5/23	Out B.A.
P. Weiss	BIO/WEST	5/8 - 5/26	
A. Bleifuss	OARS	5/8 - 5/26	Trip Leader/OARS
A. Cassidy	OARS	5/8 - 5/26	
J. Weir	OARS	5/8 - 5/26	
E. Kay	OARS/VOLUNTEER	5/8 - 5/26	
A. Haden	GCES	5/8 - 5/20	Out B.A.
J. Brown	GCES	5/17 - 5/26	In Tanner Trail
R. Lechlieghtner	BOR	5/17 - 5/20	In/Out Tanner
R. Williams	GCES/VOLUNTEER	5/8 - 5/25	
P. Trater	GCES/VOLUNTEER	5/8 - 5/25	

Table 2b. Personnel Participating in Trip #5, Team 2

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #2			
L. Crist	BIO/WEST	5/8 - 5/25	Project Leader/ BW
B. Leibfried	BIO/WEST	5/8 - 5/25	
G. Doster	BIO/WEST	5/8 - 5/25	
E. Prats	BIO/WEST	5/8 - 5/25	
G. Williams	BIO/WEST	5/8 - 5/25	
K. Mitchell	BIO/WEST/VOLUNTEER	5/8 - 5/25	
P. Gaudet	BIO/WEST/VOLUNTEER	5/8 - 5/25	
B. Dierker	OARS	5/8 - 5/25	
M. Jensen	OARS	5/8 - 5/25	
J. Kempster	OARS	5/8 - 5/25	
Suzanne	OARS	5/8 - 5/25	

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

1	2	IIB ³	FM	BII	RB	BR	CC	CP	SD	BK	RK	FV	SB
Reach 1 EL N=31 9.05 hr	A	1	4	1	205	1	0	4	3	0	0	0	0
	J	31	0	0	29	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 EL N=62 14.87 hr	A	1	9	1	240	161	0	113	1	0	0	0	0
	J	0	3	0	41	8	0	0	0	0	0	0	0
	Y	0	0	0	2	0	0	0	0	0	0	0	0
Reach 3 EL N=7 2.93 hr	A	0	0	0	1	0	0	5	3	0	0	0	1
	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 1 TL N=69 139 hr	A	8	22	1	62	0	1	1	0	0	0	2	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 TL N=109 218 hr	A	3	60	5	9	3	0	11	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 TL N=40 80 hr	A	0	0	0	0	0	1	5	0	0	0	0	1
	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

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV	SB
Reach 1 TK N=52 104 hr	A	8	8	0	31	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 TK N=90 180 hr	A	2	18	9	11	0	0	2	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 TK N=95 190 hr	A	0	5	3	0	0	3	4	0	0	0	0	3
	J	0	0	0	0	0	1	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GM N=29 58 hr	A	2	35	0	2	0	0	1	0	0	0	1	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 GM N=46 92 hr	A	0	7	0	2	2	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 3 GM N=11 22 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	0	0	0	0	0	0	0	0	0	0	0	0

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	RK	FV	SB
Reach 1 GP N=46 92 hr	A	2	1	1	46	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 GP N=35 70 hr	A	0	9	0	1	7	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 3 GP N=22 44 hr	A	0	1	0	0	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 1 GX N=24 48 hr	A	5	25	6	24	0	0	0	0	0	0	0	0
	J	3	1	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 GX N=15 30 hr	A	0	0	0	3	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 1 HL N=2 16.34 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	0	0	0	0	0	0	0	0	0	0	0	0

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

1	2	HIB ³	FM	BHI	RB	BR	CC	CP	SD	BK	RK	FV	SB
Reach 2 HL N=13 156 hr	A	0	103	30	24	0	0	2	0	0	0	0	0
	J	0	1	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 HL N=1 12 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	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HM N=4 48 hr	A	0	0	0	1	0	0	0	0	0	0	0	0
	J	0	0	0	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 HS N=1 1.5 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	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=14 168 hr	A	1	3	16	10	0	0	1	2	0	0	0	0
	J	0	4	2	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 MT N=18 216 hr	A	0	0	0	0	0	0	0	42	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

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	RK	FV	SB
Reach 2 SE N=1 26.4m ²	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	0	0	0	32	0	0	0	0	0	0	0	0
TOTAL	A	25	310	73	672	174	5	149	51	0	0	3	5
	J	34	9	2	72	8	1	0	0	0	0	0	0
	Y	0	0	0	34	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
 GP = 100'x6'x1½" gill net
 GX = 100', 2" to ½" @ ½ increment, experiment gill net
 HL = Large hoop net (4'diameter)
 HM = Medium hoop net (3'diameter)
 HS = Small hoop net (2' diameter)
 MT = Minnow Trap
 SE = Seining

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
 SB = striped bass

Table 4. Summary of Humpback Chub handled during Trip #5.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910516	EL	--	N	--	108	--	61.5	61.5
2	910517	EL	--	N	--	98	8	60.3	60.3
3	910520	EL	--	N	--	114	--	63.8	63.8
4	910520	EL	--	N	--	99	--	63.8	63.8
5	910520	EL	--	N	--	70	--	63.8	63.8
6	910520	EL	--	N	--	43	--	63.8	63.8
7	910520	EL	7F7D075B45	Y	678 ²	176	46	63.8	63.8
8	910520	EL	--	N	--	91	--	63.8	63.8
9	910520	EL	--	N	--	65	--	63.8	63.8
10	910520	EL	--	N	--	55	--	63.8	63.8
11	910521	EL	--	N	--	122	17	64.3	64.4
12	910521	EL	--	N	--	71	--	64.7	65.5
13	910521	EL	--	N	--	98	--	64.7	65.5
14	910521	EL	--	N	--	63	--	64.7	65.5
15	910521	EL	--	N	--	76	--	64.7	65.5
16	910521	EL	--	N	--	112	100	64.3	64.3
17	910521	EL	--	N	--	76	68	64.3	64.3
18	910521	EL	--	N	--	89	80	64.3	64.3
19	910521	EL	--	N	--	74	68	64.3	64.3

Table 4. Summary of Humpback Chub handled during Trip #5.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
20	910521	EL	--	N	--	68	60	64.3	64.3
21	910521	EL	--	N	--	55	49	64.3	64.3
22	910521	EL	--	N	--	51	46	64.3	64.3
23	910521	EL	--	N	--	149	139	64.0	64.0
24	910521	EL	--	N	--	75	68	64.0	64.0
25	910521	EL	--	N	--	63	58	64.0	64.0
26	910521	EL	--	N	--	68	62	64.0	64.0
27	910521	EL	--	N	--	75	65	64.4	64.4
28	910521	EL	--	N	--	80	72	64.4	64.4
29	910521	EL	--	N	--	71	63	64.4	64.4
30	910522	EL	7F7D02662D	N	--	301	254	65.0	65.0
31	910522	EL	--	N	--	180	62	64.7	64.7
32	910522	EL	--	N	--	72	53	64.9	64.9
33	910518	MT	--	N	--	75	--	61.4	61.4
34	910512	TL	7F7D025F6F	N	--	300	256	58.8	58.8
35	910516	TL	7F7D087707	N	--	377	458	61.4	61.4
36	910517	TL	7F7D080003	N	--	380	547	61.7	61.7
37	910517	TL	7F7D07661F	N	--	377	494	61.8	61.8
38	910517	TL	7F7D08684B	N	--	342	322	61.3	61.3

Table 4. Summary of Humpback Chub handled during Trip #5.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
39	910517	TL	7F7D073C7C	N	--	410	472	61.3	61.3
40	910517	TL	7F7D085E2B	N	--	359	340	61.3	61.3
41	910517	TL	7F7D081D0C	N	--	351	337	61.3	61.3
42	910515	GP	7F7F3F520D	Y	PITTAG	385	576	60.9	60.9
43	910518	GP	7F7D086C43	N	--	396	328	60.7	60.7
44	910510	TK	7F7D075C61	N	--	232	123	57.1	57.1
45	910513	TK	7F7D087C24	N	--	257	163	60.5	60.5
46	910513	TK	7F7D086551	N	--	277	268	60.6	60.6
47	910514	TK	7F7D08230F	N	--	301	268	60.4	60.4
48	910516	TK	7F7D176D19	Y	PITTAG	249	149	61.3	61.3
49	910516	TK	7F7D081F06	N	--	400	644	61.3	61.3
50	910516	TK	7F7D08181D	N	--	362	355	61.3	61.3
51	910516	TK	7F7D08186A	N	--	340	329	61.3	61.3
52	910515	GX	7F7D076862	N	--	389	469	61.5	61.9
53	910517	GX	--	N	--	147	26	61.4	61.4
54	910518	GX	7F7F3C6F15 ^A	Y	PITTAG	395	554	61.4	61.4
55	910518	GX	7F7D081266	Y	LOST PIT	211	93	61.4	61.4
56	910518	GX	--	-	--	JUV	--	61.4	61.4
57	910518	GX	7F7D085A4A	N	--	305	219	61.4	61.4

Table 4. Summary of Humpback Chub handled during Trip #5.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
58	910519	GX	--	-	--	JUV	--	61.4	61.4
59	910521	GX	7F7D17604D	Y	PITTAG	229	109	65.0	65.0
60	910513	GM	7F7D076050 ^A	N	--	364	517	60.5	60.5
61	910519	GM	7F7D026506 ^A	N	--	405	551	61.4	61.4
62	910512	HS	7F7F3E2E2A	N	--	247	142	108.6	108.6
63	910510	TL	7F7D080849	N	--	357	442	87.5	87.5
64	910520	TL	7F7F3C2B1E	N	--	407	857	156.7	156.7
65	910519	TL	7F7F3E2617	N	--	325	372	156.2	156.2
66	910519	TK	7F7F456EA0	N	--	296	284	155.8	155.8
67	910512	TK	7F7F3F5041	N	--	223	113	108.3	108.3
68	910511	EL	7F7F3F4F3B	N	--	229	125	108.4	108.4

^c- Gear Types

- 1- Yellow Floy tag - AGFD
- 2- Small Yellow Carlin
- 3- Orange Floy - AGFD
- 4- Yellow Floy - AGFD
- 5- Small Orange Carlin Tag
- A- Fish implanted with radio transmitter
- B- Probable misreading

- 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, experiment gill net
- MT = Minnow Trap
- HL = Large hoop net (4' diam.)
- HM = Medium hoop net (3' diam.)
- HS = Small hoop net (2' diam.)

Table 5a. Summary of radio-transmitter implants in humpback chub during Trip #1, 1990.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	10/17/90	7F7F3F5050	428	840	40.670	60	11	100	910125	60.2	60.4
2	10/17/90	7F7F3E2D2D	439	865	40.640	59	11	100	910125	60.4	60.4
3	10/17/90	7F7F3F3626	432	780	40.620	78	11	75	901231	60.4	60.4
4	10/17/90	7F7F3E2253	382	535	40.650	81	11	75	901231	60.2	60.4
5	10/18/90	7F7F3F4054	415	720	40.630	39	9	50	901207	60.4	60.5
6	10/18/90	7F7F3F5044	388	580	40.680	77	11	75	910101	60.6	60.5
7	10/19/90	7F7F3F4E11	376	465	40.690	40	9	50	901208	64.6	64.9
8	10/20/90	7F7F3E2F3A	367	500	40.660	39	9	50	901209	64.6	64.7
9	10/20/90	7F7F456B2C	390	605	40.610	58	11	100	910128	64.6	64.7
10	10/20/90	7F7F3C311C	395	525	40.600	40	9	50	901210	64.6	64.7

Table 5b. Summary of radio-transmitter implants in humpback chub during Trip #2, 1990.

#	DATE	PITTAG	TL (mm)	WT (gm)	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gm)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (RM)	RELEASE (RM)
1	11/16/90	7F7F3C4452	404	670	40.600	62	11	100	02/23/91	60.4	60.4
2	11/16/90	7F7F3C303B	396	665	40.700	62	11	100	02/23/91	60.1	60.1
3	11/17/90	7F7F3F4E77	407	675	40.710	79	11	75	01/30/91	61.0	61.0
4	11/18/90	7F7F3E3C5C	422	798	40.730	61	11	75	01/31/91	61.1	61.1
5	11/19/90	NO PITTAG	407	825	40.740	79	11	75	02/01/91	62.0	62.0
6	11/21/90	7F7F3C2919	394	635	40.640	78	11	75	02/03/91	64.1	64.1
7	11/23/90	7F7F3C4162	402	732	40.630	62	11	100	02/29/91	64.4	64.4

Table 5c. Summary of radio-transmitter implants in humpback chub during Trip #1, 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	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5d. Summary of radio-transmitter implants in humpback chub during Trip #3, 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	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECT- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.630/86 /56 /88 /88 /87	11	5/10 (1135) 5/13 (2218) 5/15 (2220) 5/16 (0950) 5/16 (2232) 5/17 (1335) 5/18 (2210) 5/20 (1359)	61.2	61.2	60.8 61.0 61.0 61.2 61.3 170 m LCR 145 m LCR 215 m LCR
40.650/44 ¹ /46 /46 /45 /45 /44	11	910518 5/14 (1353) 5/15 (1405) 5/15 (2240) 5/16 (2156) 5/17 (1617) 5/17 (2111) 5/19 (2240)	61.4	61.4	60.5 60.3 60.3 60.4 60.3 60.3 60.4
40.600/85 /88	11	910525 5/09 (1901) 5/10 (1308) 5/10 (1805) 5/11 (1443) 5/13 (1546) 5/14 (1510) 5/15 (1529) 5/16 (1420) 5/16 (1840) 5/17 (1410)	61.4	61.4	~800 m LCR 880 m LCR 1000 m LCR ~1000 m LCR 1000 m LCR 1000 m LCR 900 m LCR 960 m LCR 960 m LCR 1000 m LCR
40.680/44 /41 /42 /42 /44 /44 /44 /40	11	910109 5/09 (1842) 5/10 (1257) 5/10 (1819) 5/11 (1418) 5/12 (1555) 5/14 (1434) 5/15 (1515) 5/16 (1845)	58.8	58.8	550 m LCR 550 m LCR 580 m LCR ~575 m LCR 950 m LCR 550 m LCR 500 m LCR 525 m LCR

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.680/66	11	910311	61.2	61.2	
/68		5/09 (1828)			100 m LCR
/154-156		5/10 (1235)			110 m LCR
/>180		5/10 (1830)			145 m LCR
/180		5/11 (1406)			100 m LCR
/88		5/12 (1520)			137 m LCR
/90		5/13 (1532)			200 m LCR
/67 & variable		5/14 (1434)			200 m LCR
/138		5/16 (1340)			195 m LCR
/>300		5/16 (1855)			195 m LCR
/erratic,rapid		5/17 (1345)			200 m LCR
/erratic,rapid		5/18 (1340)			190 m LCR
/erratic,rapid		5/18 (2213)			180 m LCR
/~130		5/19 (1610)			450 m LCR
/erratic,rapid		5/19 (2130)			450 m LCR
/erratic		5/20 (1347)			190 m LCR
/erratic,rapid		5/21 (1030)			137 m LCR
40.620/64	11	910311	61.2	61.2	
/58		5/09 (1747)			60.8
/58		5/10 (1150)			60.8
/54		5/11 (1330)			60.7
/53		5/12 (1320)			60.9
/58		5/14 (2154)			60.9
/52		5/15 (2210)			60.9
/52		5/16 (2217)			60.9
/48		5/17 (2122)			60.9
/50		5/18 (2352)			60.9
/62		5/19 (2105)			60.9
/54		5/19 (2234)			60.9

¹Implanted during current trip



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

**TRIP REPORT #6 - 1991
(June 6-22, 1991)**

Prepared For:

Bureau of Reclamation

Prepared By:

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

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

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INTRODUCTION

This report presents pertinent details associated with Trip #6, 1991. 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. All data are preliminary.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #6, 1991. Table 2 presents personnel who were present or participated in research activities for Trip #6, 1991. 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 #6, 1991. Table 4 is a summary of all humpback chubs handled during Trip #6, 1991. Table 5 presents information on all humpback chubs radio-tagged during Trip #6, 1991.

Humpback Chubs Captured

A total of 51 humpback chub were handled during Trip #6, 1991. Of these fish, 16 were juveniles (TL=62-191 mm) and 35 were adults (TL=205-432 mm). Eleven of the chubs collected were recaptures, bearing either a Carlin tag, Floy tag or PIT tag. Data were collected on all humpback chubs. All juvenile humpback chub were captured at or below the confluence of the Little Colorado river. The majority of these fish were captured either by electrofishing or in minnow traps along main channel shorelines with boulder and sand substrates.

Radiotelemetry

Four humpback chubs were implanted with radio transmitters during Trip #6, 1991. A summary of radio telemetry location and movement data collected on radio-tagged humpback chubs during Trip #6, 1991 is presented in Table 6.

Four chubs radio-tagged during previous trips were recontacted during Trip #6, 1991. One of these fish was found in the LCR approximately 1100 meter up from the confluence. All three of the other fish were located in the main channel. One of the four chubs implanted during the trip moved into the LCR on June 17, five days after being implanted.

One radio-tagged fish was recaptured in the main channel on June 12. The fish appeared to be generally in good condition and was quite active during holding. The primary surgical incision had dehiscenced, due to tissue failure around three of the sutures. Two new sutures were used to close the opening. The fish was measured, weighed, photographed and released at the recapture location.

Bench Marks

No new bench marks were established during Trip #6, 1991.

OBSERVATIONS

1. All chubs handled appeared robust, vigorous and in good condition.
2. Two radio-tagged chubs were located in the LCR during Trip #6, 1991, suggesting that spawning activities may still be occurring in the LCR.
3. Netting catch rates in the main channel between RM 60.0 and 61.7 appeared to be up from the very low catch rates observed in May. This suggests that chubs may be dispersing into the main channel from the LCR and LCR/MC confluence area.
4. Sixteen juvenile humpback chubs were captured in the main channel from the confluence of the LCR (RM 61.4) to Lava Canyon (RM 65.5). The presence of juvenile HB chubs in this reach is consistent with May observations and may be due to movement or transport of these fish out of the LCR during spring runoff.
5. Adult HB chubs handled during Trip #6, 1991 exhibited a range of reproductive conditions. One male was tubercled and 2 males and 1 female were exhibiting reproductive coloration. Two females were flacid in the abdominal region and two females possessed abrasions on the ventral surface, which suggests recent spawning attempts. One female captured was very tight in the abdominal region and may still have been gravid. No humpback chubs were captured with expressible gametes.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Extreme flow fluctuations in the main channel during Trip #6, 1991 created difficult sample conditions in the main channel, particularly with nets. Rapid increases in stage while nets were fishing made it difficult to check and secure nets before drastic changes in the currents either fouled nets or inundated markers. One 1" trammel net was lost in the main channel at RM 61.8 on June 14 during an large fluctuation. Numerous attempts were made to retrieve the net with drag lines and hooks, but proved unsuccessful. Shoreline attachments to the net were cut and all indications are that the net was rolled and snagged in boulders on the bottom of the channel. We believe that the net is in such a condition that it will not effectively fish or present any hazards to boating traffic in the area. During future trips additional efforts will be made to monitor nets more closely during rapid rises in stage so that adjustments can be made in location or rigging that will accommodate increased flows.

RECOMMENDATIONS

1. Remote telemetry stations above and below the confluence of the LCR will be dismantled during Trip #7, 1991 and all evidence of the stations will be removed from the site. This recommendation is based on the low numbers of radio-tagged fish moving into the LCR during Trip #6, 1991, and on agreements with the NPS to remove the stations to minimize visual impacts during the summer high use rafting period.
2. One remote telemetry site should be relocated to RM 60.5 and fitted with an omni-directional whip antenna. A site has been identified that will conceal the station from view yet allow diel behavior information to be collected on radio-tagged fish residing in the reach between RM 60.0 and RM 61.3. Since the station will utilize a whip antenna instead of the larger Yagi antennas (which are currently being used) and the site is located 300-400 feet above the river in an area not used by hikers, visual impacts would be minimal if any.

Table 1. Logistics and Research Schedule for Trip #6, 1991.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
6/11	33.7	Little Redwall	X			
6/12	61.3	LCR		X	X	X
6/13	61.3	LCR		X	X	X
6/14	61.3	LCR		X	X	X
6/15	61.3	LCR		X	X	X
6/16	65.3	Lava Canyon	X	X	X	X
6/17	65.3	Lava Canyon		X	X	X
6/18	87.5	Roy's Camp	X	X	X	X
6/19	136.0	Above Deer Creek	X			
6/20	187.0	Above Whitmore	X			
6/21	224.0	Above Diamond Creek	X			

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

Table 2. Personnel Participating in Trip #6, 1991.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	6/11 - 6/18	Project Leader - B/W
B. Cowdell	BIO/WEST	6/11 - 6/18	
H. Yard	BIO/WEST	6/11 - 6/18	
R. VanHaverbeke	BIO/WEST	6/11 - 6/21	
E. Prats	BIO/WEST	6/11 - 6/21	
P. Weiss	BIO/WEST	6/11 - 6/21	
M. Yard	GCES	6/11 - 6/18	
J. Sartoris	BOR	6/11 - 6/18	
S. Dalton	OARS	6/11 - 6/21	
Whale	OARS	6/11 - 6/21	Trip Leader - OARS
M. Buhler	OARS/VOLUNTEER	6/11 - 6/21	
K. Tinning	GCES/VOLUNTEER	6/11 - 6/21	
S. Nelson	GCES/VOLUNTEER	6/11 - 6/18	
L. Thirkhill	PHOENIX ZOO	6/11 - 6/18	
B. Starrett	PHOENIX ZOO	6/11 - 6/18	

Table 3. Summary of Fish Collected and Effort by Gear Type for Trip #6, 1991.

¹	²	HB ³	FM	BH	SD	RB	BR	CC	CP	SB
EL N=32 8.84 hr	A	4	2	0	11	148	1	0	4	0
	J	9	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
TL N=12 24 hr	A	22	28	1	0	17	0	0	1	0
	J	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
TK N=15 30 hr	A	2	0	0	0	2	0	0	1	0
	J	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
GM N=13 26 hr	A	1	5	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
GP N=7 14 hr	A	2	0	0	0	7	0	0	0	0
	J	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type for Trip #6, 1991.

¹	²	HB ³	FM	BH	SD	RB	BR	CC	CP	SB
GX N=17 34 hr	A	4	2	1	0	0	0	0	0	0
	J	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
MT N=32 235.5 hr	A	0	0	0	4	0	0	0	0	0
	J	5	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0
TOTAL	A	35	37	2	15	175	1	0	6	0
	J	16	0	0	0	0	0	0	0	0
	Y	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

GP = 100'x6'x1½" gill net

GX = 100', 2" to ½" @ ½ increment, experiment gill net

MT = Minnow trap

² - A = Adult

J = Juvenile

Y = Young of year

³ - HB = humpback

FM = flannelmouth

BH = bluehead sucker

SD = speckled dace

RB = rainbow trout

BR = brown trout

CC = channel catfish

CP = carp

SB = striped bass

Table 4. Summary of Humpback Chub handled during Trip #6, 1991.

#	PIT TAG	DATE	GEAR ^c TYPE	TL (mm)	WT (gm)	RECAP	OLD TAG	RM (capture)	RM (release)
1	7F7D086828	910612	N 004	391	576	Y	315224FY ¹	60.6	60.6
2	7F7D086731	910612	N 003	336	311	N	--	60.2	60.2
3	7F7D076138	910612	N 003	376	453	Y	LOST CARLIN	60.2	60.2
4	7F7D075B05 ^A	910612	N 003	399	644	N	--	60.2	60.2
5	7F7F7E674B	910612	E 003	371	410	N	--	60.7	60.7
6	7F7F04461F ^A	910612	N 006	394	653	Y	PITTAG	60.2	60.2
7	7F7D082235	910612	N 007	349	395	Y	314394FY ¹	60.2	60.2
8	7F7D075C56	910612	N 007	392	568	N	--	60.2	60.2
9	7F7D086D63	910612	N 006	354	410	Y	073CY ²	60.2	60.2
10	7F7F3C243E	910612	E 004	376	525	Y	PITTAG	60.9	60.9
11	7F7D090653	910613	N 013	418	667	N	--	60.9	60.9
12	7F7D086032 ^A	910613	N 014	426	669	N	--	61.1	61.1
13	7F7D08204A	910613	E 008	396	455	N	--	59.9	59.9
14	7F7F3E3310	910613	N 017	367	367	Y	PITTAG	60.9	60.9
15	7F7D08030B	910613	N 017	341	304	N	--	60.9	60.9
16	7F7D08750D	910614	N 023	337	303	N	--	61.4	61.4
17	7F7D074270	910614	N 023	378	378	N	--	61.4	61.4
18	7F7D075E31	910614	N 024	381	382	Y	314868FY ¹	62.6	62.6
19	7F7D08217D	910614	N 024	---	474	N	--	62.6	62.6
20	7F7D09026C	910614	N 024	375	382	N	--	62.6	62.6

Table 4. Summary of Humpback Chub handled during Trip #6, 1991.

#	PIT TAG	DATE	GEAR ^c TYPE	TL (mm)	WT (gm)	RECAP	OLD TAG	RM (capture)	RM (release)
21	7F7D086B69	910614	E 014	241	111	N	--	61.8	61.8
22	7F7F456D7D	910614	N 025	340	348	Y	PITTAG	61.4	61.4
23	7F7F3F452E	910614	N 025	375	479	Y	PITTAG	61.4	61.4
24	7F7D17580C	910614	N 025	388	454	Y	PITTAG	61.4	61.4
25	7F7D090756	910614	N 025	378	503	N	--	61.4	61.4
26	7F7D09035D	910614	N 026	205	96	N	--	62.6	62.6
27	7F7D027246	910614	N 027	376	467	N	--	61.4	61.4
28	7F7D087860	910614	N 027	373	419	N	--	61.4	61.4
29	7F7D08555C	910614	N 027	328	296	N	--	61.4	61.4
30	7F7D08715E	910614	N 027	380	530	N	--	61.4	61.4
31	7F7D073A08	910614	N 027	348	360	N	--	61.4	61.4
32	7F7D087057	910614	N 027	365	370	N	--	61.4	61.4
33	7F7D07776A ^A	910614	N 027	432	784	Y	LOST CARLIN	61.4	61.4
34	7F7D081769	910615	N 037	266	156	Y	132CO ^s	62.1	62.1
35	--	910615	N 038	139	20	N	--	62.0	62.0
36	7F7D077724	910615	E 020	181	46	N	--	61.7	61.7
37	7F7D027C4B	910616	N 053	363	453	N	--	64.5	64.5
38	7F7D085A24	910617	N 069	191	74	N	--	64.9	64.9
39	--	910614	E 013	131	20	N	-	61.5	61.5
40	--	910614	E 013	82	2	N	-	61.5	61.5

Table 4. Summary of Humpback Chub handled during Trip #6, 1991.

#	PIT TAG	DATE	GEAR ^c TYPE	TL (mm)	WT (gm)	RECAP	OLD TAG	RM (capture)	RM (release)
41	--	910614	E 014	69	-	N	-	61.8	61.8
42	--	910616	T 024	97	10	N	-	64.3	64.3
43	--	910616	E 023	132	22	N	-	64.2	64.2
44	--	910616	E 023	100	10	N	-	64.2	64.2
45	--	910616	E 023	98	8	N	-	64.2	64.2
46	--	910616	E 023	74	4	N	-	64.2	64.2
47	--	910616	E 023	87	5	N	-	64.2	64.2
48	--	910614	T 010	62	-	N	-	61.7	61.7
49	--	910614	T 023	70	-	N	-	65.4	65.4
50	--	910616	T 030	63	-	N	-	64.3	64.3
51	--	910616	T 032	133	-	N	-	64.3	64.3

^c - Gear Types

1. Yellow Floy tag - AGFD

2. Small Yellow Carlin

3. Orange Floy - AGFD

4. Yellow Floy - AGFD

5. Small Orange Carlin Tag

A. Fish implanted with radio transmitter

B. Probable misreading

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, experiment gill net
 MT = Minnow Trap
 HL = Large hoop net (4' diam.)
 HM = Medium hoop net (3' diam.)
 HS = Small hoop net (2' diam.)

Table 5a. Summary of radio-transmitter implants in humpback chub during Trip #1, 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	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5b. Summary of radio-transmitter implants in humpback chub during Trip #3, 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	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	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	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5d. Summary of radio-transmitter implants in humpback chub during Trip #6, 1991.

#	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	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 6. A list of radio frequencies contacted on Trip #6, 1991, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.620/64 /53 /53 /54 /56	11	910311 6/12 (2250) 6/12 (2321) 6/13 (2324) 6/14 (1053)	61.2	61.2	60.9 60.9 60.8 60.9
¹ 40.610/82 /82 /84 /82 /82 /84 /82	11	910612 6/13 (1453) 6/13 (2312) 6/14 (1053) 6/14 (2343) 6/16 (0019) 6/17 (1430)	60.2	60.2	60.8 60.8 60.8 60.8 60.8 200 m LCR
40.700/42 /44 /44 /43 /44	11	910518 6/13 (1531) 6/14 (1442) 6/16 (1933) 6/17 (1842)	61.4	61.4	64.7 64.7 64.7 64.7
40.630/86 /75	11	910311 6/13 (0109)	61.2	61.2	1100 m LCR
¹ 40.640/60 /60 /60 /60	11	910612 6/13 (1408) 6/14 (1229) 6/16 (1619)	60.2	60.2	60.4 60.4 61.2
40.730/41 /42	11	910519 6/14 (2257)	61.4	61.4	61.9
¹ 40.650/60 /60 /60 /60 /60	11	910613 6/14 (1318) 6/14 (2346) 6/16 (1538) 6/17 (1756)	61.1	61.1	60.8 60.8 60.5 60.5
¹ 40.740/59 /60	11	910614 6/16 (1904)	61.4	61.4	61.5
40.650/40 /45 /45	11	910513 6/14 (1248) 6/14 (2328)	60.5	60.5	60.5 60.4

¹Implanted during current trip



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

**TRIP REPORT - 1991 TRIP #7
July 9, 1991 - July 28, 1991**

Prepared For:

Bureau of Reclamation

Prepared By:

**Richard A. Valdez, Principal Investigator
William J. Masslich, Project Leader
William Leibfried, Project Leader
and
David R. VanHaverbeke, Senior Biologist**

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

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INTRODUCTION

This reports presents pertinent details associated with Trip #7, 1991. 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. All data are preliminary.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #7, 1991. Table 2 presents personnel who were present or participated in research activities for Trip #7, 1991. 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 #7, 1991. Table 4 is a summary of all humpback chubs handled during Trip #7, 1991. Table 5 presents information on all humpback chubs radio-tagged during Trip #7, 1991.

Humpback Chubs Captured

A total of 133 humpback chub were handled during Trip #7, 1991. Of these fish, 122 were captured in Reach 1 from RM 57.0 to RM 64.8. The 122 humpback chubs captured in Reach 1 consisted of 67 adults, 49 juveniles and 6 YOY. Twenty-seven of the chubs collected were recaptures bearing either a Carlin, Floy or PIT tag. All large juvenile chub except one were captured in the main channel at or below the confluence of the LCR using electrofishing or minnow traps. Data were collected on all humpback chubs.

Eleven humpback chubs were collected from Reach II. Ten of these chubs were new fish and one was a recapture from previous B/W efforts. Two new chub collection sites for B/W efforts were found during this trip. One of the new fish was a running ripe male with extreme tuberculation. This fish was collected at RM 118.5 by electrofishing. Four chubs were collected in the Middle Granite Gorge, at RM 127.0. Six new chubs were collected near Shinumo Creek, RM 108.4.

The recaptured chub was initially radiotagged (40.660/39 pulses) in October 1990 and released at RM 64.7. The last telemetry contact for this fish was in December 1990 at RM 64.7. During November 1991, this fish was observed to have moved several tenths of a mile up and downstream from its release location. Between this time and recapture date this fish moved approximately 50 miles downstream. The transmitter was assumed expired, therefore the external antenna was removed to allow for the exit wound to heal. This fish was in good condition and had lost about 46 grams.

Exotic Species Encountered

Twelve striped bass, 19 channel catfish and one walleye (Stizostedion vitreum) were collected from Reach II and III. Six were collected by electrofishing, six by netting and one by angling. Stomachs were taken from all bass, the walleye and most of the catfish. All samples were preserved and returned to the laboratory for food habit analysis.

The most upstream collection of striped bass during Trip #7 was at RM 156.4, with the species consistently collected at all sites to the end of the reach at Diamond Creek. Striped bass were caught 58 miles further upstream in July than in May 1991.

Radiotelemetry

Four humpback chubs were implanted with radio transmitters during Trip #7, 1991. A summary of radio telemetry location and movement data collected on radio-tagged humpback chubs during Trip #7, 1991 is presented in Table 6.

Six chubs radio-tagged during previous trips were recontacted during Trip #7, 1991. Three of these fish were located in the lower 200 meters of the LCR during one or more contacts. Two of the fish implanted during the trip also moved into the lower 200 meters of the LCR and remained for the duration of the trip.

OBSERVATIONS

1. All chubs handled appeared robust, vigorous and in good condition, with the exception of one recaptured PIT tagged fish that exhibited signs of poor condition (i.e. low weight, slightly emaciated).
2. Five radio-tagged chubs were located in the LCR during Trip #7, 1991, suggesting that spawning activities may still be occurring in the LCR. Two of the five radio-tagged fish were recently implanted chubs that moved into the LCR shortly after the implant procedure.
3. One gravid female (that expressed eggs during PIT tagging procedure) was captured in the plume trammel net set. This net set is located in the main channel along the mixing zone between the LCR and main channel water. Water temperature in this zone of mixing was approximately 20 C. The capture of a gravid female in the main channel, suggests that some spawning may be occurring, particularly in the mixing zone between the two rivers.
4. Netting catch rates in the main channel between RM 57.3 and 65.5 appear to be higher than catch rates observed in May, indicating return of fish from the LCR to the main channel after spawning. However, catch rates above RM 60.0 and below RM 61.8, appear to still be lower than those observed during the winter months.
5. Adult chubs were still in various stages of reproductive condition, although the intensity of sexual characters (tubercles, coloration) was reduced.
6. Forty-nine juvenile and 6 young-of-year (YOY) humpback chubs were captured in the main channel during Trip #7, 1991. Juveniles were observed in the main channel below the confluence of the LCR as in Trips #5 and #6, however, the capture of 6 YOY chubs (<50mm) indicates that smaller size classes may be dispersing into the main channel as well.
7. Numerous carp were observed in the confluence area of the LCR and the lower intermittent channel during Trip #7, 1991. The possibility exists that these fish are preying on larval or egg stages of native fish in the LCR and confluence area. Low catch rates of carp using conventional sampling gear in these areas may not be reflective of actual densities.
8. Aggregations of flannelmouth suckers, including ripe males were captured in the mixing zone of the LCR and the main channel near the confluence, suggesting spawning activity in this area. Flannelmouths were also found in aggregations at several locations above the LCR confluence (between RM 60.0 and RM 61.2)
9. Unbaited minnow traps have proven to be an effective means for catching YOY or juvenile chubs in low velocity habitats in the main channel.
10. Humpback chub were captured at two new locations during this trip. One chub was collected at RM 118.5 and four chubs were collected at RM 127.0.
11. One very robust male chub expressing gametes was collected at RM 118.5. This fish was also intensely colored and tubercled.

12. One chub, recaptured at RM 127.0, had moved downstream about 50 miles since its last telemetry observation at RM 64.7 in December 1990.
13. This recaptured chub was in good condition and had complete healing of midline sutures. The external antenna was removed to promote healing at the exit point. Still photographs and video were taken of this fish.
14. Striped bass were encountered 58 miles further upstream from May collections.
15. One walleye was collected at RM 179.8.

PROBLEMS ENCOUNTERED

1. Approximately one month of data were lost from the LCR remote telemetry station. During a routine maintenance check of the station at the beginning of the trip, the data logger and receiver were found non operational. A down load of scrambled data from the station and software problems in the data logger suggest the possibility of a static discharge (lighting) near the station. Attempts will be made to fit remote stations with lightning arrestors or other suitable protection.
2. One hoop net was lost on July 18 in the lower intermittent channel of the LCR. Extensive attempts were made to find and retrieve the net with no success. The net was probably lost during high flows in the channel. Future net sets at this location will be secured using heavier line. this net collapses easily when detached and probably did not continue to catch fish, although fish in the net at the time, if any, probably died.
3. One outboard motor lower unit was damaged in Granite Falls, while running at 5000 cfs test flows. Unit was replaced with no sampling effort lost.

RECOMMENDATIONS

1. The LCR remote telemetry station should be maintained until trip # 8, 1991 due to the high numbers of chubs still utilizing the LCR. BIO/WEST feels that information on timing of movements is essential in order to meet objectives of the study. Maintenance of the remote station will be coordinated with NPS and GCES.
2. Future remote telemetry stations will be fitted with lightning arresters or suitable protection.
3. Based on high catch rates of juvenile humpback chubs in the main channel below the confluence to RM 65.5, it is recommended to expand sampling below Lava/Chuar during September.
4. Sampling during trip #8, 1991 should focus primarily on radiotelemetry and habitat evaluation.
5. In order to increase precision of radiotelemetry observations in the LCR, BIO/WEST would request 1:2400 black and white aerial photo coverage of the LCR to approximately 2 km above the confluence. These photos will be used to construct photographic river guides with mylar overlays so specific fish locations can be delineated for telemetry movement data and MIPS applications.

Table 1a. Logistics and Research Schedule for Trip #7, 1991. Team 1.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
7/10	37.8	Tatahatso Canyon	X			
7/11	57.5	Malgosa Canyon	X	X	X	X
7/12	57.5	Malgosa Canyon		X	X	X
7/13	57.5	Malgosa Canyon		X	X	X
7/14	57.5	Malgosa Canyon		X	X	X
7/15	61.3	LCR	X	X	X	X
7/16	61.3	LCR		X	X	X
7/17	61.3	LCR		X	X	X
7/18	61.3	LCR		X	X	X
7/19	65.1	Carbon Creek	X	X	X	X
7/20	65.1	Carbon Creek		X	X	X
7/21	91.0	Below Horn Creek	X	X		
7/22	133.4	Above Tapeats Creek	X			
7/23	143.0	Below Kanab Creek	X			
7/24	158.0	Below Havasu	X			
7/25	190.3	Below Whitmore		X		
7/26	190.3	Below Whitmore		X		
7/27	214	214 Mile Creek	X	X		
7/28	214	214 Mile Creek		X		
7/29	225	Take out/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 #7, 1991. Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
7/10			X			
7/11	84.0	Clear Creek		X		
7/12	84.0	Clear Creek		X		
7/13	108.0	Bass Area		X		X
7/14	108.0	Bass Area		X		X
7/15	112.0	Waltenburg		X		
7/16	118.4	RM 118.4		X		X
7/17	118.4	RM 118.4		X		X
7/18	126.1	RM 126.1	X	X		X
7/19	126.1	RM 126.1	X	X		X
7/20	145.2	Near Olo Canyon	X	X		
7/21	145.2	Near Olo Canyon	X	X		
7/22	156.2	Above Havasu Creek		X		
7/23	160.1	Below Havasu Creek		X		
7/24	160.1	Below Havasu Creek		X		
7/25	179.5	Below Lava Falls		X		
7/26	185	RM 185	X	X		
7/27	225	RM 225	X	X		
7/28	225	RM 225	X	X		
7/29	225.4	Diamond Creek				

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

Table 2a. Personnel Participating in Trip #7, 1991. Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #1			
B. Masslich	BIO/WEST	7/10 - 7/21	Project Leader/Out Tanner Trail
R. VanHaverbeke	BIO/WEST	7/10 - 7/29	
T. Wasowicz	BIO/WEST	7/10 - 7/29	
H. Yard	BIO/WEST	7/10 - 7/29	
B. Dierker	BIO/WEST	7/10 - 7/29	
M. Yard	GCES	7/10 - 7/21	Out Tanner Trail
R. Freeman	GCES/VOLUNTEER	7/10 - 7/29	
B. Smith	GCES/VOLUNTEER	7/10 - 7/21	Out Tanner Trail
M. Phillips	BOR	7/10 - 7/14	Chopper out LCR
R. Lechleitner	BOR	7/10 - 7/29	
S. Bledso	OARS	7/10 - 7/29	Trip Leader - OARS
C. Krznarich	OARS	7/10 - 7/29	
R. Valdez	OARS	7/10 - 7/29	
M. Buhler	OARS/VOLUNTEER	7/10 - 7/29	

Table 2b. Personnel Participating in Trip #7, 1991. Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #2			
B. Leibfried	BIO/WEST	7/10 - 7/29	Project Leader
E. Prats	BIO/WEST	7/10 - 7/29	
G. Doster	BIO/WEST	7/10 - 7/29	
B. Cowdell	BIO/WEST	7/10 - 7/29	
P. Weiss	BIO/WEST	7/10 - 7/29	
L. Brown	BIO/WEST VOLUNTEER	7/10 - 7/29	Volunteer
P. Gaudet	BIO/WEST VOLUNTEER	7/10 - 7/29	Volunteer
C. Lange	BIO/WEST VOLUNTEER	7/10 - 7/29	Volunteer
A. Haden	GCES	7/16 - 7/29	Joined trip late
J. Korn	GCES	7/16 - 7/25	Joined trip late
A. Blyfuss	OARS	7/10 - 7/29	Boatman
C. Hanson	OARS	7/10 - 7/29	Boatman
S. Rhodes	OARS	7/10 - 7/29	Cook

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

¹	²	HB'	FM	BH	RB	BR	CC	CP	SD	FH	KF	WE	SB
Reach 1 EL N=41 12.5 hr	A	4	5	1	373	3	0	7	8	0	0	0	0
	J	24	0	1	19	0	0	0	0	0	0	0	0
	Y	2	0	0	1	0	0	0	0	0	0	0	0
Reach 2 EL N=56 20.07 hr	A	1	1	0	145	60	0	89	2	0	0	0	0
	J	0	0	0	14	4	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 3 EL N=44 16.93 hr	A	0	3	0	11	2	1	157	2	2	1	0	6
	J	0	3	0	16	2	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TL N=43 86 hr	A	29	62	0	71	0	0	2	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 TL N=88 176 hr	A	3	1	0	3	1	0	2	0	0	0	0	1
	J	1	2	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 TL N=62 124 hr	A	0	1	0	1	0	11	4	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

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	FH	KF	WE	SB
Reach 1 TK N=14 28 hr	A	5	2	0	2	0	0	0	0	0	0	0	0
	J	2	0	0	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TK N=109 218 hr	A	5	3	6	18	1	0	4	0	0	0	0	0
	J	1	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 TK N=96 192 hr	A	0	2	0	1	0	5	9	0	1	0	1	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 1 GM N=20 40 hr	A	1	4	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 GM N=19 38 hr	A	0	1	0	0	1	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 3 GM N=11 22 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	0	0	0	0	0	0	0	0	0	0	0	0

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	FH	KF	WE	SB
Reach 1 GP N=29 58 hr	A	21	6	0	45	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 3 GP N=17 34 hr	A	0	0	0	0	0	2	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 1 GX N=15 30 hr	A	7	14	0	8	0	1	1	0	0	0	0	0
	J	3	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 GX N=34 68 hr	A	0	0	0	1	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 3 GX N=9 18 hr	A	0	0	0	0	0	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 2 HL N=1 4.41 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	0	0	0	0	0	0	0	0	0	0	0	0

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	FH	KF	WE	SB
Reach 2 HS N=3 22.18 hr	A	0	1	0	0	0	0	0	0	0	0	0	0
	J	0	1	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0	0
Reach 1 MT N=38 413.5 m	A	0	0	0	0	0	0	0	0	0	0	0	0
	J	20	0	0	0	0	0	0	0	0	0	0	0
	Y	4	0	0	0	0	0	0	0	0	0	0	0
Reach 2 MT N=22 85.53 hr	A	0	0	0	0	0	0	0	0	1	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 SB N=1 Qualitative	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	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	76	106	7	687	68	20	277	12	4	1	1	12
	J	51	6	1	50	6	0	0	0	0	0	0	0
	Y	6	0	0	1	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
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net (4'diameter)
HS = Small hoop net (2' diameter)
MT = Minnow trap
SB = 30'x4'x1/4" seine

2. Age

A = Adult
J = Juvenile
Y = Young of year

3. Species

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

FIH = fathead minnow
KF = plain killifish
WE = walleye
SB = striped bass

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910712	TL	7F7F3F4E5B	N	-	345	568	57.0	57.0
2	910713	TK	7F7D081528	N	-	195	75	108.1	108.1
3	910713	TK	7F7D076400	N	-	219	91	108.3	108.3
4	910713	TL	7F7D090E52	N	-	284	265	108.2	108.2
5	910713	TK	7F7D076554	N	-	283	220	108.3	108.3
6	910713	TL	7F7F3E276F	Y	PITTAG	419	749	58.4	58.4
7	910713	TL	7F7F3E276F	N	-	419	749	58.4	58.4
8	910713	TK	7F7D085477	N	-	212	95	108.1	108.1
9	910713	TL	7F7F3E2640	Y	PITTAG	378	446	58.4	58.4
10	910713	TL	7F7F3E2856	N	-	322	440	58.4	58.4
11	910714	GM	7F7D026D0F	N	-	392	493	58.4	58.4
12	910714	MT	-	N	-	60	-	61.9	61.9
13	910714	GP	7F7F3F4D4A	Y	PITTAG	300	254	58.8	58.8
14	910714	TL	7F7F3F4A5B	N	-	355	439	58.8	58.8
15	910714	TL	7F7D02652D	N	-	368	448	58.4	58.4
16	910714	TK	7F7D085F38	N	-	204	94	108.3	108.3
17	910714	MT	-	N	-	52	-	LCR	LCR
18	910714	GP	7F7D08667F	N	-	356	343	58.8	58.8
19	910714	GP	7F7D080D77	N	-	362	427	58.8	58.8
20	910714	GP	7F7D077D7D	N	-	398	518	58.8	58.8

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
21	910714	TL	7F7F3E3121	N	-	430	804	58.8	58.8
22	910714	MT	-	N	-	75	-	61.9	61.9
23	910715	GP	7F7D184176	Y	PITTAG	368	378	60.1	60.1
24	910715	TL	7F7D084A7D	N	-	400	531	60.3	60.3
25	910715	TL	7F7D08640D	Y	023 ^s	392	488	60.3	60.3
26	910715	TL	7F7D08545E	Y	LOST TAG ⁷	439	618	60.3	60.3
27	910715	GP	7F7F3E3112	N	-	400	516	60.1	60.1
28	910715	TL	7F7F3C422F	N	-	332	270	60.1	60.1
29	910715	TL	7F7F040122	Y	PITTAG	349	348	60.1	60.1
30	910715	GP	7F7F3E250C	N	-	370	424	60.1	60.1
31	910715	GP	7F7D181C6E	Y	PITTAG	415	652	60.1	60.1
32	910715	TL	7F7F3C3A19	N	-	363	381	60.3	60.3
33	910715	EL	7F7F3F441C	Y	PITTAG	352	321	60.5	60.5
34	910715	TL	7F7F3F4C51	N	-	302	276	60.3	60.3
35	910715	GP	7F7F050842	Y	PITTAG	367	441	60.1	60.1
36	910715	GP	7F7F3F487F	N	-	371	422	60.1	60.1
37	910715	GP	7F7F3C6E3B	Y	171 ³	373	451	60.1	60.1
38	910715	TL	7F7F3E2F26	Y	PITTAG	369	445	60.3	60.3
39	910715	TL	7F7F3C2610	N	-	342	281	60.1	60.1
40	910715	EL	7F7D084C05	N	-	401	566	59.9	59.9

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
41	910715	TL	7F7D077C15	Y	172 ⁴	419	568	60.3	60.3
42	910715	GP	7F7F3E3453	N	-	407	521	60.1	60.1
43	910715	TL	7F7F3C391D	N	-	375	471	60.1	60.1
44	910715	TL	7F7D081A18	Y	LOST TAG ⁷	350	355	60.3	60.3
45	910715	EL	7F7D082175	N	-	210	78	59.9	59.9
46	910715	TL	7F7D076556	N	-	396	478	60.3	60.3
47	910716	TK	7F7D181C5C	Y	PITTAG	352	380	60.9	60.9
48	910716	GP	7F7F3F4B7D	N	-	383	569	60.7	60.7
49	910716	TK	7F7D085054	Y	PITTAG	342	380	60.9	60.9
50	910716	MT	-	N	-	71	-	61.4	61.4
51	910716	MT	-	N	-	48	-	61.4	61.4
52	910716	TL	7F7F433951	Y	0314235 ¹	400	520	61.1	61.1
53	910716	GP	7F7F3C4225	Y	690 ³	364	411	60.7	60.7
54	910716	MT	-	N	-	81	-	61.4	61.4
55	910716	TL	7F7F3C3A07	N	-	368	378	61.1	61.1
56	910716	TL	7F7F051132	Y	PITTAG	415	650	61.1	61.1
57	910716	GP	7F7F3F4A54	N	-	330	302	60.7	60.7
58	910716	TK	7F7F3F395D	N	-	408	530	60.9	60.9
59	910716	TK	7F7F3E277A	N	-	211	96	60.9	60.9
60	910716	TK	7F7F3F4E45	N	-	384	585	60.9	60.9

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
61	910716	TK	7F7F3F4E6F	N	-	251	136	60.9	60.9
62	910716	TL	7F7D177B51	Y	PITTAG	356	320	61.1	61.1
63	910717	EL	7F7D085054	N	-	343	389	60.8	60.8
64	910717	MT	-	N	-	51	-	-	-
65	910717	MT	-	N	-	57	-	61.4	61.4
66	910717	GX	7F7F3C6FIA	Y	0314302 ¹	370	494	61.4	61.4
67	910717	GX	7F7F3E2772	N	-	382	520	61.4	61.4
68	910717	GX	7F7F3E2955	N	-	405	565	61.4	61.4
69	910717	MT	-	N	-	61	-	61.4	61.4
70	910717	MT	-	N	-	47	-	61.4	61.4
71	910717	EL	7F7F45197D	Y	528 ^s	194	52	60.8	60.8
72	910717	TL	7F7F3E3045	Y	305655 ^s	406	602	61.3	61.3
73	910717	TL	7F7F45090C	N	-	403	566	61.3	61.3
74	910717	TL	7F7F3C2F7A	Y	0314856 ¹	402	410	61.3	61.3
75	910717	GX	7F7F45037D	N	-	352	432	-	-
76	910717	MT	-	N	-	61	-	61.4	61.4
77	910717	TL	7F7F3F4B5B	N	-	355	354	61.3	61.3
78	910717	GX	-	N	-	138	24	61.3	61.3
79	910717	GX	7F7D180455	Y	PITTAG	248	125	61.3	61.3
80	910717	EL	7F7D075B77	N	-	408	870	118.6	118.6

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
81	910718		-	N	-	82	-	61.4	61.4
82	910718	TL	7F7D090828	N	-	339	529	127.0	127.0
83	910718	GP	7F7F43345A	N	-	345	340	62.2	62.2
84	910718		-	N	-	95	-	61.4	61.4
85	910718	TL	7F7F3E2F3A	Y	PITTAG	373	463	127.0	127.0
86	910718	GP	7F7D222A07	Y	PITTAG	384	480	62.2	62.2
87	910718	GP	7F7D181F69	Y	PITTAG	326	272	62.2	62.2
88	910718	EL	-	N	-	123	-	62.4	62.4
89	910718		-	N	-	89	-	61.4	61.4
90	910718	GP	7F7F3F4E0B	N	-	318	248	62.2	62.2
91	910718	GP	7F7F3E272F	N	-	358	435	62.2	62.2
92	910718	GP	7F7F3F4C5F	N	-	378	516	62.2	62.2
93	910719	EL	-	N	-	43	-	64.3	64.3
94	910719	EL	-	N	-	47	-	64.3	64.3
95	910719	TK	7F7D026008	N	-	333	464	127.0	127.0
96	910719	EL	7F7D08195F	N	-	192	113	64.3	64.3
97	910719	TL	7F7D076009	N	-	291	297	127.0	127.0
98	910719	EL	-	N	-	161	85	64.3	64.3
99	910719	EL	-	N	-	146	31	64.7	64.7
100	910719	EL	-	N	-	167	113	63.4	63.4

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
101	910719	EL	-	N	-	91	-	64.3	64.3
102	910719	EL	-	N	-	158	42	64.7	64.7
103	910719	EL	-	N	-	78	-	64.3	64.3
104	910719	EL	7F7D086323	N	-	221	108	64.7	64.7
105	910719	EL	-	N	-	81	-	64.3	64.3
106	910719	EL	-	N	-	150	85	64.3	64.3
107	910719	EL	7F7D076C2E	N	-	193	66	64.7	64.7
108	910719	EL	7F7D08141A	N	-	194	69	64.7	64.7
109	910719	EL	-	N	-	181	58	64.7	64.7
110	910719	EL	-	N	-	178	46	64.7	64.7
111	910720	MT	-	N	-	68	-	64.7	64.7
112	910720	MT	-	N	-	45	-	64.2	64.2
113	910720	MT	-	N	-	70	-	64.2	64.2
114	910720	MT	-	N	-	55	-	64.2	64.2
115	910720	EL	-	N	-	59	-	64.7	64.7
116	910720	GX	7F7D075E54	N	-	370	418	64.7	64.7
117	910720	GX	7F7D084B7A	N	-	390	543	64.7	64.7
118	910720	GX	-	N	-	122	14	64.7	64.7
119	910720	TK	7F7F3E2E20	N	-	327	248	64.8	64.8
120	910720	GX	7F7F3E2340	N	-	308	321	64.7	64.7

Table 4. Summary of Humpback Chub handled during Trip #7, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
121	910720	EL	-	N	-	80	-	64.7	64.7
122	910720	EL	-	N	-	129	-	64.7	64.7
123	910720	MT	-	N	-	58	-	64.3	64.3
124	910720	EL	-	N	-	129	-	64.7	64.7
125	910720	EL	-	N	-	131	21	-	-
126	910720	MT	-	N	-	49	-	64.3	64.3
127	910720	EL	-	N	-	95	-	65.1	65.1
128	910720	EL	-	N	-	54	-	64.7	64.7
129	910720	MT	-	N	-	65	-	64.3	64.3
130	910720	EL	-	N	-	121	-	64.7	64.7
131	910720	MT	-	N	-	54	-	64.3	64.3
132	910721	MT	-	N	-	120	11	64.7	64.7
133	910721	MT	-	N	-	72	-	64.2	64.2

^c Gear Types

1. Yellow Floy - AGFD
 2. Orange Floy - AGFD
 3. Yellow Carlin
 4. Orange Carlin
 5. Red Carlin
 6. Blue Carlin
 7. Carlin Tag Scar
 8. Floy Tag Scar
-
- 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, experiment gill net
 - MT = Minnow Trap
 - HL = Large hoop net (4' diam.)
 - HM = Medium hoop net (3' diam.)
 - HS = Small hoop net (2' diam.)

Table 5a. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5b. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	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	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5d. Summary of radio-transmitter implants in humpback chub during Trip #6, 1991.

#	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	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 5e. Summary of radio-transmitter implants in humpback chub during Trip #7, 1991.

#	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	910713	7F7F3E276F	419	749	40.620	80	11	75	910926	58.4	58.4
2	910715	7F7F3C2610	401	566	40.630	38	11	120	911111	59.9	59.9
3	910715	7F7D08545E	439	618	40.610	59	11	100	911023	60.3	60.3
4	910716	7F7F3F4E45	384	585	40.720	80	11	75	910928	60.9	60.9

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.650/45 /38	11	910513 910711(1725) 910712(1224) 910718(2123)	60.5	60.5	60.4 60.4 60.5
40.700/42 /43 NC /43	11	910518 910711(1813) 910717(1700) 910718(0943) 910719(2030)	61.4	61.4	64.7 64.6 64.6 64.7
40.650/60 /62 /62 /61	11	910613 910712(1237) 910715(2119) 910716(2144)	61.1	61.1	60.8 61.2 60.4
40.640/60 /62 /60 /61 /62 /61 /62 /62 /62 /62	11	910612 910712(1336) 910715(1819) 910715(2215) 910716(1735) 910716(2253) 910717(1800) 910717(2300) 910719(0120) 910719(0625)	60.2	60.2	225 M LCR 225 M LCR 145 M LCR 150 M LCR 61.3 200 M LCR 180 M LCR 180 M LCR 200 M LCR
40.730/41 /40 /40 /41 /41 /42 /41 /41	11	910519 910712(1652) 910714(1635) 910715(2232) 910716(2255) 910717(2300) 910719(1523) 910720(1320)	61.4	61.4	200 M LCR 200 M LCR 200 M LCR 125 M LCR 180 M LCR 190 M LCR 190 M LCR
¹ 40.620/80 /81 /82 /83 /83	11	910713 910715(2020) 910716(2251) 910717(2300) 910719(0135)	58.4	58.4	61.3 61.3 180 M LCR 150 M LCR

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.610/59 /62	11	910715 910716(1340)	60.3	60.3	60.4
¹ 40.630/38 /38 /39	11	910715 910716(1435) 910716(2155) 910717(2154)	59.9	59.9	60.5 60.7 60.5
40.740/59 /60 /62 /62	11	910614 910716(2258) 910719(0130) 910719(1540)	61.4	61.4	125 M LCR 150 M LCR 150 M LCR
¹ 40.720/80 /82 /82 /82	11	910716 910717(1838) 910717(2300) 910719(0125)	60.9	60.9	170 M LCR 180 M LCR 180 M LCR

Implanted during current trip.



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

**TRIP REPORT #8 - 1991
(August 13-24, 1991)**

Prepared For:

Bureau of Reclamation

Prepared By:

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

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

September 3, 1991

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INTRODUCTION

This report presents pertinent details associated with Trip 8, 1991. Included in the report are a summary of the trip logistics, personnel and research schedules, 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 #8, 1991. Table 2 presents personnel who were present or participated in research activities for Trip #8, 1991. Tables 3 and 4 (summary of fish sample effort and fish handled) are not presented in this report. Table 5 provides information on humpback chub with active radio transmitters.

DATA COLLECTED

Only radiotelemetry observations and surveillance data were collected on humpback chubs during this trip. Table 6 represents a summary of implanted chubs contacted during boat surveillance performed twice daily. Eight implanted chubs were monitored by telemetry on the rising and falling limb of dam releases. Macroinvertebrate and algal drift were collected during all stages of river discharge. Habitat mapping at various discharges for various reaches continued during Trip #8, 1991.

Radiotelemetry

Twelve humpback chubs radio-tagged during previous trips were recontacted during this field effort, Trip #8, 1991. One fish was contacted at the mouth of the Little Colorado River (LCR), and not recontacted. All other fish were contacted in the main river. Of the five radio-tagged chubs located in the LCR in July 1991, all five had moved to locations in the mainstem Colorado River by August 15, 1991. Three of these fish had moved back to within .10 mile of their original capture location. Eight were monitored for approximately 12 hours each under both rising and falling stage levels.

The remote telemetry station at the LCR was deactivated and disassembled and a new remote station installed at RM 60.4, river-left. This new station operates with an omnidirectional Kulrod-Larson antenna used to collect data on diel vertical movement of implanted chubs in the reach from RM 59.8 to 61.2.

Bench Marks

One new bench mark was established at RM 60.1, river-left.

Radiotransmitter Tests

Two internal antennae transmitters (IAT) were tested during this trip to determine if new radiotags manufactured by Advanced Telemetry Systems (ATS) had comparable transmission strength to the external antennae transmitters (EAT). The two IATs were manufactured at the request of BIO/WEST as an alternative to the EATs; the purpose was to provide an IAT of the same power level and weight as a comparable EAT. ATS used the same power source as a 13-gm EAT but internalized the antennae and reduced the weight of the transmitter to about 11 gm by using a lighter

material to isolate the internal antennae. Each IAT weighed 11.2 gm and measured 7.6 x 1.2 cm. By comparison, the EATs weighed 11.0 gm and measured 6.0 x 1.2 cm with a 15 cm long antennae.

One rainbow trout was implanted with an EAT and one with an IAT to simulate radiosignal behavior of an internally-implanted transmitter.

The first test was to determine depth extinction, or the maximum depth reception of each transmitter. This test was conducted at 50 m distance which is the usual distance at which most monitoring of radiotagged fish is conducted. The distance was maintained by extending a previously-measured rope from shore to a raft with two biologist, one to hold the boat in position and one to lower the fish at the signal of the onshore observer. Each transmitter was tested three times to determine average extinction depth. All tests were conducted with an ATS receiver and an omni-directional Kulrod-Larson whip antennae. The same observer determined extinction through headphones by adjusting the AF gain to full and the RF gain to reduce external noise. Extinction depth was defined as the point at which no audible signal was perceptible to the observer.

The average extinction depth for the IAT was 3.2 m (3.2, 3.2, 3.2) and that of the EAT was 4.5 m (4.5, 4.5, 4.6) for a difference of 1.3 m or 29%.

The second test was to determine the distance of reception. The same two rainbow trout with the respective IAT and EAT were placed at a constant 2 m depth and moved from the observer until the signal was extinct. The IAT was received 600 m away while the EAT was received 1200 m away for a difference of 600 m or 50%.

These tests revealed that the new IATs manufactured by ATS did not transmit with the same signal strength as the EATs and may be unsuitable for use with humpback chub in the Grand Canyon. Average extinction depth for the IAT was 29% less than the EAT and distance reception was 50% less.

Efforts will continue to produce an IAT with similar transmission power and weight to the EAT.

OBSERVATIONS

1. Five implanted chubs, last located in the LCR in July 1991, had moved back to their original capture locations in the mainstem Colorado River. These movements may mark the end of emigration of spawning fish from the LCR for the 1991 season.
2. Eleven radiotagged humpback chubs were contacted during this trip. Those were all the fish expected to be contacted based on life expectancy of the radiotransmitter. One additional chub, implanted in March 1991 was contacted briefly. This transmitter should have gone extinct in June 1991.
3. The LCR remote telemetry station was downloaded successfully and decommissioned. A new remote station to monitor diel vertical movements was installed at RM 60.4, river-left. This station began logging data on August 17, 1991.
4. Two specially-designed internal-antennae radiotransmitters were tested in rainbow trout. Average depth extinction was 29% less than the external-antennae transmitters (4.5 vs 3.2 m). Distance reception was 50% less (1200m vs 600 m).

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Aerial photographs for the reach from Kwagunt Rapid to Awatubi Canyon are needed to accurately map habitats and humpback chub locations. GCES will assist B/W in obtaining these photographs.
2. One Datasonde was not operable during August 1991. Corrosion was evident in the battery connection and cleaned prior to use, but it still was nonfunctional after deployment. Data for LCR water chemistry was lost during this trip. This faulty Datasonde unit has been repaired and will be operational for use on the September research trip.

RECOMMENDATIONS

1. B/W will continue to pursue an improved radio-transmitter antenna system that will allow accurate radio-tracking and reduce impacts to implanted chubs.
2. Obtain aerial photographs of the Kwagunt to Awatubi reach.

Table 1. Logistics and Research Schedule for Trip #8, 1991.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
8/13	34	RM 34	X			
8/14	61.2	LCR			X	X
8/15	61.2	LCR			X	X
8/16	61.2	LCR			X	X
8/17	61.2	LCR			X	X
8/18	61.2	LCR			X	X
8/19	61.2	LCR			X	X
8/20	87.5	Cremation	X			X
8/21	118.4	Stephen Aisle	X			
8/22	150.5	Below Upset	X			
8/23	209	Granite Park	X			
8/24	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 #8, 1991.

PERSONNEL	AFFILIATION	DATES	COMMENTS
R. Valdez	BIO/WEST	8/13 - 8/24	Principal Investigator
W. Leibfried	BIO/WEST	8/13 - 8/21	Out at BA Project Leader
H. Yard	BIO/WEST	8/13 - 8/21	Out at BA
B. Cowdell	BIO/WEST	8/13 - 8/21	Out at BA
P. Weiss	BIO/WEST	8/13 - 8/24	Take out
R. VanHaverbeke	BIO/WEST	8/13 - 8/21	Out at BA
E. Prats	BIO/WEST	8/13 - 8/21	Out at BA
A. Zwinger	BIO/WEST VOLUNTEER	8/13 - 8/24	Take out
R. Blaylock	BIO/WEST VOLUNTEER	8/13 - 8/21	Out at BA
J. Weir	OARS	8/13 - 8/24	Oar Trip Leader
C. Hanson	OARS	8/13 - 8/24	Take Out
A. Cassidy	OARS	8/13 - 8/24	Take Out
D. Edwards	OARS	8/13 - 8/24	Take Out
R. Hugie	BIO/WEST CONSULTANT	8/13 - 8/24	in at BA
D. Pruhs	BIO/WEST CONSULTANT	8/13 - 8/24	in at BA
K. Pruhs	BIO/WEST CONSULTANT	8/13 - 8/24	in at BA
M. Leyda	BIO/WEST CONSULTANT	8/13 - 8/24	in at BA

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 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	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 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	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	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	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1991.

#	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	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1991.

#	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	910713	7F7F3E276F	419	749	40.620	80	11	75	910926	58.4	58.4
2	910715	7F7F3C2610	401	566	40.630	38	11	120	911111	59.9	59.9
3	910715	7F7D08545E	439	618	40.610	59	11	100	911023	60.3	60.3
4	910716	7F7F3F4E45	384	585	40.720	80	11	75	910928	60.9	60.9

Table 6. A list of radio frequencies contacted on Trip #8, 1991, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/59 /62 /62 /62 /62 /60	11	910715 8/14(1800) 8/14(2216) 8/15(1453) 8/15(2140) 8/16(2139)	60.3	60.3	60.2 60.2 60.2 60.2 60.2
40.610/82 /84 /84 /82 /84 /82	11	910612 8/14(1800) 8/15(2138) 8/16(2135) 8/18(2150) 8/19(2125)	60.2	60.2	60.2 60.2 60.1 60.2 60.2
40.620/80 /82 /82 /82 /84 /84	11	910713 8/15(1408) 8/16(1405) 8/17(1346) 8/18(1411) 8/19(1454)	58.4	58.4	58.8 58.4 58.4 58.4 58.8
40.621/64 /56	11	910311 8/14(1705)	61.2	61.2	58.4
40.630/38 /40 /40 /40 /40 /42 /42 /40 /40	11	910715 8/14(2154) 8/16(2044) 8/17(1406) 8/17(2033) 8/18(1438) 8/18(2212) 8/19(1521) 8/19(2111)	59.9	59.9	59.9 59.8 59.8 59.8 59.8 59.9 59.8 59.8
40.640/60 /50 /50 /49 /50 /50 /50 /50 /50 /51 /51 /52 /52	11	910612 8/14(1740) 8/14(2214) 8/15(1437) 8/15(2128) 8/16(2058) 8/17(1406) 8/17(2039) 8/18(1438) 8/18(2208) 8/19(1531) 8/19(2121)	60.2	60.2	60.1 60.1 60.0 60.0 60.1 60.1 60.1 60.1 60.1 60.1 60.1 60.1

Table 6. A list of radio frequencies contacted on Trip #8, 1991, and locations relative to capture and release sites.

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.650/40 /40 /40 /42 /40 /40 /40 /40 /41 /41 /40	11	910513 8/15(1446) 8/15(1529) 8/15(2151) 8/16(1501) 8/16(2112) 8/17<1435> 8/17<2044> 8/18<1503> 8/18<2143> 8/19<1554>	60.5	60.5	60.2 60.3 60.3 60.4 60.4 60.4 60.4 60.4 60.4 60.4
40.650/60 /60 /60	11	910613 8/14<2138> 8/16<2106>	60.1	60.1	60.2 60.2
40.700/42 /42 /42 /44 /44 /45	11	910518 8/14<1919> 8/15<1824> 8/16<1545> 8/17<1024> 8/18<1616>	61.4	61.4	64.7 64.7 64.7 64.7 64.7
40.720/80 /82 /84 /82 /82 /82 /84 /84 /84 /82 /84	11	910716 8/14<1840> 8/14<2238> 8/15<1538> 8/15<2217> 8/16<2211> 8/17<1445> 8/17<2106> 8/18<1525> 8/19<1635>	60.9	60.9	60.8 60.8 60.8 60.8 60.8 60.8 60.8 60.8 61.2 61.9
40.730/41 /40 /40	11	910519 8/14<2058> 8/15<2228>	61.4	61.4	60.7 LCR MOUTH
40.740/59 /62 64 62 64	11	910614 8/14(2121) 8/15(2203) 8/16<2139> 8/18<2224>	61.4	61.4	60.4 60.4 60.1 60.4



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

**TRIP REPORT 9 - 1991
September 5, 1991 - September 25, 1991**

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**

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INTRODUCTION

This report presents pertinent details associated with Trip 9, 1991. 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, 1991. Table 2 presents personnel who were present or participated in research activities for Trip 9, 1991. 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 9, 1991. Table 4 is a summary of all humpback chubs handled during Trip 9, 1991. Table 5 presents information on all humpback chubs radio-tagged during 1991.

Humpback Chubs Captured

A total of 279 humpback chub were handled during Trip 9, 1991. Of these 279, 265 were handled in Reach 1, 14 were handled in Reaches 2 and 3. Humpback chubs handled in Reach 1 included 93 adults, 163 juveniles and 9 young-of-year (< 50 mm). We recognize that many of the young chubs over 50 mm TL were YOY, and will determine length ranges for age groups from future length-frequency and age-analyses. Humpback chubs collected in Reach 2 included 7 adults and 7 juveniles captured by minnow traps in the mouth of Shinumo Creek. Five of the adults were captured in the middle of Granite Gorge. No humpback chubs were collected from Reach 3 during Trip 9. The majority of juveniles were captured between the confluence of LCR and Lava Canyon by electrofishing. Several larger juveniles were captured in the small mesh end of experimental gill nets and 10 juvenile and 1 adult were captured in the vicinity of Papago Creek (RM 75.9-76.5). Additionally, two juveniles (74 and 107 mm TL) were captured above the confluence of the LCR by electrofishing. These fish were captured at RM 61.2 and 61.0 respectively and represent the first small juveniles captured above the confluence of the LCR by BIO/WEST.

All fish appeared robust and in good condition. All fish were released alive and in good condition with the exception of one juvenile humpback chub that was captured and eventually released at RM 62.7. The fish (TL=243 mm, WT=147 gm, PITTAG=7F7D08521D) was captured by electrofishing and failed to recover normally. Observations of the fishes behavior suggested possible spinal injury just posterior to the dorsal fin. The fish was held for approximately 8 hours, after which it regained equilibrium and appeared to be swimming almost normally (a slight disfunction of the caudal region was still apparent). No deformities or other external evidence of injury were apparent, so the fish was returned to the capture site and released. A vertebral compression injury was suspected in this case.

Radiotelemetry

Six humpback chubs were implanted with radio transmitters during Trip 9, 1991. All fish were implanted using lateral incisions and a sheathed needle antenna guide. A summary of radiotelemetry data collect on radio-tagged humpback chubs during Trip 9, 1991 is presented in Table 6.

Eleven humpback chubs implanted on previous trips were contacted and located during Trip 9, 1991. All of these fish were located above the LCR with the exception of one fish that consistently resided near the mouth of Carbon Creek (RM 64.7).

One radio-tagged fish was recaptured in a gill net at RM 64.7, 114 days following the surgical implant. The fish appeared in good condition and was vigorous. A weight difference of 1 gram was noted since the time of surgery (WT @ original capture = 554 gm, WT @ recapture = 566 - 11 gms for transmitter = 555 gm). The primary medial (or lateral) incision was well healed and remaining sutures were removed. The antenna exit was in relatively good condition, although slight redness and swelling were apparent immediately around the opening. The fish was photographed, returned to the point of capture and released.

The omnidirectional remote telemetry station located at RM 60.5 was downloaded after a month of operation. A significant amount of data was collected on two to five fish (presence or absence of the fish above the radio signal extinction zone, i.e. vertical movement patterns) during the period between Trip 8 and Trip 9.

Bench Marks

One new bench mark was establish on river right at RM 58.7

Habitat Mapping

Two areas in Reach 2 were mapped for habitat availability. River miles 108.0 to 108.6; from Bass Rapids to Shinumo Creek, and river miles 118.0 to 118.7. Both areas have produced humpback chubs in BIO/WEST collections.

OBSERVATIONS

1. Rain storms early in Trip 9, 1991 resulted in turbid conditions during the majority of the field trip. Main channel turbidities above the LCR were high to moderate until the 15th of September when suspended solids began to settle and turbidities were classified as low. Turbidities below the LCR were high to moderate until the final days of the field trip at which time they marginally fell into the low category.
2. Higher numbers of juvenile and young-of-year (YOY) humpback chub were captured in the main channel during Trip 9, 1991 than during previous trips. This suggests the possibility of emigration or transport of these fish out of the LCR since Trip 7, 1991.
3. Electrofishing was the most effective means of capturing juvenile and YOY chubs in the main channel during Trip 9, 1991. A slight modification of standard electrofishing techniques were made to improve effectiveness of the technique in high turbidities. The modification included a "blind sweep" of the dip net around the anode as the boat moved in and out from the shoreline. The majority of juvenile and YOY humpback chubs, as well as other adult and YOY of other species were captured using the "blind sweep" technique.
4. Unbaited minnow traps proved ineffective for capturing juvenile and YOY humpback chubs during Trip 9, 1991. High turbidities present during Trip 9, 1991, undoubtedly affected minnow trapping success. Minnow traps have proven very effective during previous trips under clear water conditions.
5. Several YOY flannelmouth suckers and one YOY bluehead sucker were captured in the main channel below the confluence of the LCR during Trip 9, 1991. This represents the first collection of YOY flannelmouth and blueheads in the main channel by BIO/WEST. It is suspected that these fish may have recently emigrated or been transported from the LCR.
6. Significantly higher numbers of brown trout were observed in the LCR reach than on previous trips. Since these higher catch rates for brown trout coincide with increased catch rates for small juvenile and YOY native fishes, it is possible that higher numbers of brown trout in the reach may suggest a migratory response of brown trout to increased availability of young native fish (prey) in the LCR confluence region.
7. Radio-tagged humpback chubs were readily contacted in the main channel during daylight hours of Trip 9, 1991 while turbidities remained high. Fewer day time contacts were made after turbidities dropped to levels classified as low.
8. Short duration net sets, using trammel and gill nets, proved an effective technique for capturing adult humpback chubs during Trip 9, 1991.
9. On September 6 an osprey was sighted flying upstream over the main channel at RM 57.1. The bird was observed carrying a large fish in its talons that was positively identified as a humpback chub by two BIO/WEST biologists (Tony Wasowicz and Helen Yard). The osprey flew directly over the observers at a low elevation. This represents positive documentation of osprey

predation on humpback chubs in the Grand Canyon and lends support to a case of suspected osprey predation on a radio-tagged fish in May, 1991 (See trip report for Trip 5, 1991).

10. The abundance of juvenile humpback chubs in the lower part of Reach 1 and in Reach 2 in September collections were the highest of any efforts to date. This collection coincided with the first major flood event of the year from the Little Colorado River.
11. Five adult humpback chubs were collected from the Middle Granite Gorge (RM 126-127). One chub weighed 917 grams.
12. No striped bass were collected during this trip.
13. High turbidity in the Colorado River was present for the majority of the trip.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Sampling time was lost during Trip 9, 1991, due to time spent using BIO/WEST research boats for purposes other than sampling or picking up pre-arranged personnel at hike-in points. BIO/WEST recognizes the utility of the research boats for other uses, particularly shuttling personnel up-river and is willing to cooperate in performing these activities as deemed necessary by the NPS and GCES for the completion of important research activities or in the case of an emergency. However, BIO/WEST would request and expects to be notified of the need to use research boats by others prior to the launch of the trip. Plans can then be made accordingly.
2. High turbidity created visibility problems for electrofishing efforts. Two netters were utilized to increase netting efficiency and blind sweeps were responsible for many fish collected.

RECOMMENDATIONS

1. The omnidirectional remote telemetry station located at RM 60.5 should be maintained until Trip 1, 1992, at which time we recommend re-establishing the directional stations both above and below the LCR (RM 61.4 and 62.0) in anticipation of pre-spawning staging activities of humpback chubs prior to the 1992 spawning runs in the LCR.
2. Continue sampling those areas in Reach 2 and 3 that are consistently producing chubs to determine the extent of these populations.

Table 1. Logistics and Research Schedule for Trip 9, 1991. Team A

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
9/5	29.0	Above South Canyon	X			
9/6	57.5	Malgosa Canyon	X	X	X	X
9/7	57.5	Malgosa Canyon		X	X	X
9/8	57.5	Malgosa Canyon		X	X	X
9/9	57.5	Malgosa Canyon		X	X	X
9/10	61.3	LCR	X	X	X	X
9/11	61.3	LCR		X	X	X
9/12	61.3	LCR		X	X	X
9/13	61.3	LCR		X	X	X
9/14	65.2	Lava Chuar	X	X	X	X
9/15	65.2	Lava Chuar		X	X	X
9/16	65.2	Lava Chuar		X	X	X
9/17	104.0	Above 104 mile Rapid	X			
9/18	134.5	Owl Eyes	X			
9/19	168.0	Fern Glen	X			
9/20	208.8	Granite Park	X	X		
9/21	208.8	Granite Park		X		
9/22	220.0	220 Mile Canyon	X	X		
9/23	220.2	220 Mile Canyon		X		
9/24	225.0	Take Out/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 9, 1991. Team B.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
9/5						
9/6	75.8	Papago Creek	X	X		X
9/7	75.8	Papago Creek		X		X
9/8	87.5	Cremation Camp	X	X		
9/9	87.5	Cremation Camp		X		
9/10	108.4	Above Shinumo Creek	X	X		X
9/11	108.4	Above Shinumo Creek		X		X
9/12	119.0	RM 119, Left	X	X		X
9/13	119.0	RM 119, Left		X		X
9/14	126.1	RM 126.1, Left	X	X		X
9/15	126.1	RM 126.1, Left		X		X
9/16	143.5	Kanab Creek	X	X		
9/17	143.5	Kanab Creek		X		
9/18	168.0	Fern Glen	X	X		
9/19	168.0	Fern Glen		X		
9/20	198.5	Parashont Wash	X	X		
9/21	198.5	Parashont Wash		X		
9/22	222.0	222 Mile Canyon	X	X		
9/23	222.0	222 Mile Canyon		X		
9/24	225.6	Diamond Creek/Take Out	X			

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

Table 2. Personnel Participating in Trip 9, 1991. Team A

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	9/5 - 9/22	Project Leader
H. Yard	BIO/WEST	9/5 - 9/24	
T. Wasowicz	BIO/WEST	9/5 - 9/24	Senior Biologist
P. Weiss	BIO/WEST	9/5 - 9/24	
T. McKay	BIO/WEST	9/5 - 9/24	
R. Valdez	BIO/WEST	9/13 - 9/22	Principal Investigator
P. Holden	BIO/WEST	9/17 - 9/22	Principal-in-Charge
R. Ryel	BIO/WEST	9/13 - 9/22	Statistical Consultant
B. Williams	BOR	9/17 - 9/22	COTR
M. Yard	GCES	9/17 - 9/24	
A. Haden	GCES	9/17 - 9/17	
L. Brown	GCES/VOLUNTEER	9/5 - 9/17	
L. Vogel	GCES/VOLUNTEER	9/5 - 9/17	
K. Linder	USFWS	9/5 - 9/24	
L. Bleifuss	OARS	9/5 - 9/24	Trip Leader
Whale	OARS	9/5 - 9/24	
D. Stonebraker	OARS	9/5 - 9/24	

Table 2. Personnel Participating in Trip 9, 1991. Team B

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Leibfried	BIO/WEST	9/5 - 9/24	Project Leader
R. Vanhaverbeke	BIO/WEST	9/5 - 9/24	
E. Prats	BIO/WEST	9/5 - 9/24	
B. Dierker	BIO/WEST	9/5 - 9/24	
G. Hardwick	BIO/WEST	9/5 - 9/24	
L. Jonas	BIO/WEST VOLUNTEER	9/5 - 9/24	
D. Phillips	GCES VOLUNTEER	9/5 - 9/24	
S. Bledsoe	OARS	9/5 - 9/24	Trip Leader
B. Helin	OARS	9/5 - 9/24	
C. Krzuarich	OARS	9/5 - 9/24	

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1 EL N=67 20.34 hr	A	13	5	0	431	3	0	7	8	0	1	0
	J	158	4	0	25	0	0	2	0	0	0	0
	Y	9	7	1	0	0	1	1	0	0	0	0
Reach 2 EL N=51 14.8 hr	A	0	6	1	188	70	0	72	8	0	0	1
	J	0	6	0	26	4	0	2	0	0	0	0
	Y	0	0	0	1	0	0	0	0	0	0	0
Reach 3 EL N=43 14.8 hr	A	0	5	3	6	2	0	51	26	0	1	1
	J	0	7	2	7	1	0	2	1	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TL N=71 142 hr	A	33	20	0	40	1	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TL N=60 120.0 hr	A	4	10	0	1	25	0	13	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TL N=45 90.0 hr	A	0	6	0	1	0	9	6	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1 TK N=76 152 hr	A	21	1	2	25	3	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TK N=16 32.0 hr	A	3	3	2	7	0	0	4	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TK N=54 108.0 hr	A	0	5	0	0	0	1	10	0	0	0	1
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GM N=31 62 hr	A	7	2	0	2	2	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GM N=31 62.0 hr	A	0	2	0	0	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GM N=31 62.0 hr	A	0	0	0	0	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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

¹	²	IB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1 GP N=21 242 hr	A	8	0	0	10	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GP N=60 120.0 hr	A	0	2	2	0	1	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GP N=19 38.0 hr	A	0	1	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GX N=15 58 hr	A	11	1	0	4	1	0	0	0	0	0	0
	J	2	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GX N=25 50.0 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GX N=17 34.0 hr	A	0	1	1	2	0	0	3	0	0	0	0
	J	0	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	BK	FH	FV
Reach 1 MT N=44 915.32 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	3	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 MT N=31 436.3 hr	A	0	0	0	7	0	0	0	0	0	1	0
	J	7	3	1	0	0	0	0	0	0	0	0
	Y	0	1	0	0	0	0	0	0	0	0	0
Reach 3 MT N=22 340.91 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HL N=2 24.25 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	2	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=1 4.721	A	0	0	0	4	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	100	70	11	728	108	1	171	42	0	3	3
	J	170	22	3	59	5	0	6	1	0	0	0
	Y	9	8	0	1	0	1	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
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net (4'diameter)
HS = Small hoop net (2' diameter)

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 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910906	TK	7F7D075C60	N	-	370	488	57.3	57.3
2	910907	TK	7F7D074319	N	-	220	114	76.1	76.1
3	910907	MT	-	N	-	103	-	75.9	75.9
4	910907	MT	-	N	-	97	-	75.9	75.9
5	910907	EL	-	N	-	82	-	76.5	76.5
6	910907	MT	-	N	-	74	-	75.9	75.9
7	910907	EL	-	N	-	71	-	76.5	76.5
8	910907	EL	-	N	-	67	-	76.5	76.5
9	910908	TK	7F7D087D35	N	-	374	489	58.8	58.8
10	910908	EL	-	N	-	76	-	76.4	76.4
11	910908	EL	-	N	-	101	9	76.3	76.3
12	910908	EL	-	N	-	66	-	76.3	76.3
13	910908	GP	7F7F3C3457	Y	PITTAG	362	409	58.8	58.8
14	910908	TK	7F7D025F6F	Y	PITTAG	300	251	58.8	58.8
15	910908	EL	-	N	-	135	23	76.3	76.3
16	910908	TL	7F7D08552A ^A	Y	176 ^A	455	942	58.3	58.3
17	910908	GP	7F7F3F3D79	Y	PITTAG	332	298	58.8	58.8
18	910908	GP	7F7F3F427E	Y	PITTAG	390	468	58.8	58.8
19	910908	GP	7F7D081F7B	N	-	351	396	58.8	58.8

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
20	910908	TL	7F7D081904 ^A	N	-	339	461	58.3	58.3
21	910908	TK	7F7D087F24	N	-	248	173	58.8	58.8
22	910908	GM	7F7D081904	Y	PITTAG	339	461	58.3	58.3
23	910908	TL	7F7D085017	N	-	425	817	58.3	58.3
24	910908	TL	7F7D081B65	N	-	420	668	58.3	58.3
25	910909	GM	7F7D081721	N	-	415	852	58.9	58.9
26	910910	TL	7F7D080474	N	-	363	425	60.2	60.2
27	910910	TL	7F7D075F38	N	-	355	431	59.9	59.9
28	910910	TL	7F7D026E26	N	-	284	219	60.75	60.75
29	910910	GP	7F7D026520	Y	PITTAG	338	328	60.2	60.2
30	910910	TL	7F7D09067B ^A	N	-	371	580	60.1	60.1
31	910910	TL	7F7D177D4E	Y	PITTAG	360	458	60.2	60.2
32	910911	TK	7F7D084D01	N	-	268	248	108.1	108.1
33	910911	MT	CLIP	N	-	70	2	108.6	108.6
34	910911	MT	CLIP	N	-	93	4	108.6	108.6
35	910911	MT	CLIP	N	-	110	8	108.6	108.6
36	910911	MT	CLIP	N	-	73	2	108.6	108.6
37	910911	MT	CLIP	N	-	89	3	108.6	108.6
38	910911	MT	CLIP	N	-	89	2	108.6	108.6

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
39	910911	TK	7F7D027E29	N	-	355	367	60.75	60.75
40	910911	TK	7F7D085D37	Y	684 ³	237	101	60.8	60.8
41	910911	TL	7F7F3F4F0A	Y	PITTAG	321	279	60.3	60.3
42	910911	TK	7F7F3C277A	Y	PITTAG	330	270	60.9	60.9
43	910911	EL	-	N	-	133	-	60.7	60.7
44	910911	TK	7F7D085E2B	Y	PITTAG	374	415	60.7	60.7
45	910911	TK	7F7F3E3A5B	N	-	382	440	60.8	60.8
46	910911	MT	CLIP	N	-	63	1	108.6	108.6
47	910912	EL	7F7D08545A	N	-	182	45	61.5	61.5
48	910912	TK	7F7D0B2140	N	-	220	110	119.0	119.0
49	910912	EL	-	N	-	74	4	61.2	61.2
50	910912	TL	7F7F3C7115	Y	PITTAG	414	732	61.3	61.3
51	910912	TK	7F7F3C3B2D	Y	PITTAG	274	148	61.1	61.1
52	910912	GM	7F7F3F451B	N	-	420	703	61.2	61.2
53	910912	EL	-	N	-	107	12	61.0	61.0
54	910912	GM	7F7D1B7209	N	-	411	617	61.2	61.2
55	910912	GM	7F7F3E3D45	N	-	407	651	61.2	61.2
56	910912	TK	7F7F3F3C74	N	-	361	396	61.1	61.1
57	910912	TK	7F7F451029	N	-	329	322	61.1	61.1

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
58	910913	TL	7F7F3C423A	Y	754 ^b	384	488	62.0	62.0
59	910913	TL	7F7F3F4F11	N	-	402	545	62.0	62.0
60	910913	TL	7F7F3F3B67	N	-	375	483	62.0	62.0
61	910913	GP	7F7F3C3440	N	-	292	223	62.1	62.1
62	910913	TL	7F7F3E2426	N	-	399	553	62.0	62.0
63	910913	EL	-	N	-	47	-	62.1	62.1
64	910913	EL	-	N	-	62	2	62.1	62.1
65	910913	TL	7F7F3F4067	N	-	335	322	62.0	62.0
66	910913	EL	-	N	-	71	3	62.1	62.1
67	910913	GP	7F7D2B4A22	Y	PITTAG	311	241	62.1	62.1
68	910913	GP	7F7F3F4A24	N	-	323	352	62.1	62.1
69	910913	TL	7F7F3F5151	N	-	390	508	62.0	62.0
70	910913	EL	7F7D090733	N	-	317	210	62.1	62.1
71	910913	TL	7F7D17336C	Y	PITTAG	295	206	62.0	62.0
72	910913	TL	7F7F3F4E04	N	-	321	296	62.0	62.0
73	910913	TL	7F7F3E2821	N	-	340	369	62.0	62.0
74	910913	EL	7F7D177318	Y	PITTAG	288	254	62.1	62.1
75	910913	TL	7F7F450C5C	N	-	390	669	62.0	62.0
76	910913	TL	7F7F3E3F1D	N	-	379	494	62.0	62.0

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
77	910913	EL	-	N	-	70	-	62.1	62.1
78	910913	EL	-	N	-	72	3	62.1	62.1
79	910913	EL	7F7D08521D	N	-	243	147	62.7	62.7
80	910913	TL	7F7F3E297B	N	-	300	229	62.0	62.0
81	910913	TL	7F7F3F3C78	N	-	462	361	62.0	62.0
82	910913	EL	-	N	-	85	4	62.1	62.1
83	910913	EL	-	N	-	77	3	62.1	62.1
84	910913	RL	7F7D07124A	N	-	227	91	62.1	62.1
85	910913	EL	7F7F3E4176	N	-	235	127	62.1	62.1
86	910913	EL	7F7D075D7D	N	-	308	195	61.9	61.9
87	910913	EL	-	N	-	81	8	61.9	61.9
88	910913	EL	-	N	-	84	3	61.9	61.9
89	910913	GX	7F7D086111	N	-	354	355	61.8	61.8
90	910913	TL	7F7F3C2766	N	-	370	485	62.0	62.0
91	910913	TL	7F7D17336C	Y	-	295	206	62.0	62.0
92	910913	TL	7F7F3E2A19	N	-	329	284	62.0	62.0
93	910913	EL	-	N	-	67	2	62.1	62.1
94	910913	TL	7F7F3F452F	N	-	338	359	62.0	62.0
95	910913	EL	-	N	-	112	10	61.9	61.9

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
96	910913	EL	-	N	-	115	7	62.0	62.0
97	910913	EL	-	N	-	113	13	61.9	61.9
98	910913	EL	-	N	-	115	14	61.9	61.9
99	910913	EL	-	N	-	62	1	62.1	62.1
100	910914	EL	-	N	-	103	8	63.8	63.8
101	910914	EL	-	N	-	84	3	62.8	62.8
102	910914	EL	-	N	-	53	-	63.8	63.8
103	910914	EL	-	N	-	70	4	63.8	63.8
104	910914	EL	-	N	-	81	3	62.8	62.8
105	910914	EL	-	N	-	154	33	63.8	63.8
106	910914	EL	7F7D07124A	Y	PITTAG	226	89	65.7	65.7
107	910914	EL	-	N	-	60	02	65.7	65.7
108	910914	EL	-	N	-	101	8	62.8	62.8
109	910914	EL	-	N	-	92	6	62.8	62.8
110	910914	EL	-	N	-	88	6	62.8	62.8
111	910914	EL	-	N	-	80	3	63.8	63.8
112	910914	EL	-	N	-	76	4	63.8	63.8
113	910914	EL	-	N	-	57	-	63.8	63.8
114	910914	EL	-	N	-	63	2	63.8	63.8

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
115	910914	EL	-	N	-	146	34	63.8	63.8
116	910914	EL	-	N	-	100	10	63.8	63.8
117	910914	EL	-	N	-	152	32	63.8	63.8
118	910914	EL	-	N	-	172	50	63.8	63.8
119	910914	EL	-	N	-	127	16	63.8	63.8
120	910914	EL	-	N	-	119	17	63.8	63.8
121	910914	EL	-	N	-	106	10	63.8	63.8
122	910914	GX	7F7F3C446E	N	-	316	260	64.7	64.7
123	910914	GX	7F7F3F4D77	Y	0314536 ¹	354	389	64.7	64.7
124	910914	GX	7F7F3C7D0C	N	-	209	98	64.7	64.7
125	910914	GX	7F7F3F3764	Y	SCAR ⁷	396	639	64.7	64.7
126	910914	GX	7F7F3F4D73	N	-	383	446	64.7	64.7
127	910914	GX	7F7F3C6F15	Y	PITTAG	394	566	64.7	64.7
128	910914	GX	7F7F3E3C5F	Y	PITTAG	366	474	64.7	64.7
129	910914	EL	-	N	-	147	27	63.8	63.8
130	910914	GX	7F7F3F3C2F	Y	PITTAG	210	81	64.7	64.7
131	910914	GX	-	N	-	129	20	64.7	64.7
132	910914	GX	7F7F3C4518	N	-	325	372	64.7	64.7
133	910914	EL	7F7D2B141B	Y	PITTAG	297	196	63.8	63.8

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
134	910914	GX	-	N	-	144	29	64.7	64.7
135	910914	GX	7F7F450369	Y	SCAR ⁷	391	456	64.7	64.7
136	910914	EL	-	N	-	72	2	65.7	65.7
137	910914	EL	-	N	-	69	3	62.8	62.8
138	910914	EL	-	N	-	71	3	62.8	62.8
139	910914	EL	-	N	-	87	8	62.8	62.8
140	910914	EL	-	N	-	78	1	62.8	62.8
141	910914	EL	-	N	-	55	1	65.7	65.7
142	910914	EL	-	N	-	62	1	65.7	65.7
143	910914	EL	-	N	-	86	5	65.7	65.7
144	910914	EL	-	N	-	81	3	62.8	62.8
145	910914	EL	-	N	-	69	2	62.8	62.8
146	910914	EL	-	N	-	84	3	62.8	62.8
147	910914	EL	-	N	-	88	8	62.8	62.8
148	910914	EL	-	N	-	92	6	62.8	62.8
149	910914	EL	-	N	-	68	1	62.8	62.8
150	910914	EL	-	N	-	75	1	62.8	62.8
151	910914	EL	-	N	-	87	5	62.8	62.8
152	910914	EL	-	N	-	94	7	62.8	62.8

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
153	910915	EL	7F7D027870	Y	SCAR ⁷	371	468	63.8	63.8
154	910915	EL	-	N	-	103	10	63.8	63.8
155	910915	EL	-	N	-	75	3	65.1	65.1
156	910915	EL	-	N	-	63	2	63.8	63.8
157	910915	EL	-	N	-	74	4	63.8	63.8
158	910915	EL	-	N	-	128	15	65.1	65.1
159	910915	EL	-	N	-	56	1	63.8	63.8
160	910915	EL	-	N	-	104	11	63.8	63.8
161	910915	EL	-	N	-	78	4	63.8	63.8
162	910915	EL	-	N	-	144	32	63.8	63.8
163	910915	EL	-	N	-	65	2	65.1	65.1
164	910915	EL	-	N	-	67	3	65.1	65.1
165	910915	EL	7F7D080428	N	-	153	38	63.8	63.8
166	910915	EL	-	N	-	67	3	64.0	64.0
167	910915	TL	7F7D076335	N	-	293	250	126.7	126.7
168	910915	TL	7F7D084D41	N	-	339	455	126.7	126.7
169	910915	TL	7F7D073D4A	N	-	395	917	126.7	126.7
170	910915	EL	-	N	-	77	4	64.0	64.0
171	910915	EL	-	N	-	50	<1	64.0	64.0

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
172	910915	EL	-	N	-	79	4	65.1	65.1
173	910915	EL	-	N	-	62	3	63.8	63.8
174	910915	EL	-	N	-	61	2	63.8	63.8
175	910915	EL	-	N	-	54	<1	64.0	64.0
176	910915	EL	-	N	-	119	14	65.1	65.1
177	910915	EL	-	N	-	127	21	63.8	63.8
178	910915	EL	7F7D026776	N	-	291	261	63.8	63.8
179	910915	EL	-	N	-	69	3	63.8	63.8
180	910915	TL	7F7F3F3A24	N	-	384	514	63.2	63.2
181	910915	EL	-	N	-	45	<1	63.8	63.8
182	910915	EL	-	N	-	45	<1	63.8	63.8
183	910915	EL	-	N	-	117	14	63.8	63.8
184	910915	EL	-	N	-	53	2	63.8	63.8
185	910915	TL	7F7D17107B	Y	PITTAG	289	218	64.5	64.5
186	910915	GM	7F7F3E3149 ^A	N	-	394	653	64.4	64.4
187	910915	EL	-	N	-	71	3	65.1	65.1
188	910915	EL	-	N	-	72	2	63.8	63.8
189	910915	EL	-	N	-	61	2	63.8	63.8
190	910915	TL	7F7D177406	Y	PITTAG	363	397	63.2	63.2

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
191	910915	TL	7F7F3F3A24	Y	PITTAG	384	514	63.2	63.2
192	910915	TL	7F7F3E3B0C	N	-	354	348	63.2	63.2
193	910915	GM	7F7F3E3542 ^A	N	-	399	612	64.4	64.4
194	910915	EL	-	N	-	59	2	63.8	63.8
195	910915	EL	-	-	-	130	20	63.8	63.8
196	910915	EL	-	N	-	95	8	64.0	64.0
197	910915	EL	-	N	-	73	3	64.0	64.0
198	910915	EL	-	N	-	47	<1	63.8	63.8
199	910915	EL	-	N	-	77	4	63.8	63.8
200	910915	EL	-	N	-	115	12	65.1	65.1
201	910915	EL	-	N	-	105	10	63.8	63.8
202	910915	EL	-	N	-	67	2	63.8	63.8
203	910915	EL	-	N	-	72	3	63.8	63.8
204	910915	EL	-	N	-	60	2	64.0	64.0
205	910915	EL	-	N	-	90	5	63.8	63.8
206	910915	EL	-	N	-	75	3	65.1	65.1
207	910915	EL	-	N	-	53	1	65.1	65.1
208	910915	EL	-	N	-	68	2	65.1	65.1
209	910915	EL	7F7D085055	N	-	218	108	63.8	63.8

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
210	910915	EL	-	N	-	95	8	65.1	65.1
211	910916	TK	7F7E3F4146	Y	PITTAG	350	377	65.2	65.2
212	910916	EL	-	N	-	83	6	64.6	64.6
213	910916	TK	7F7F3C4479	N	-	252	163	65.2	65.2
214	910916	EL	-	N	-	91	5	64.6	64.6
215	910916	TK	7F7D08027F	N	-	235	139	65.2	65.2
216	910916	EL	-	N	-	90	6	65.4	65.4
217	910916	TK	7F7F3F3B5C	N	-	285	195	65.3	65.3
218	910916	TK	7F7F7E6A18	N	-	360	528	65.3	65.3
219	910916	EL	-	N	-	78	5	64.6	64.6
220	910916	EL	-	N	-	66	3	64.6	64.6
221	910916	EL	-	N	-	89	4	64.6	64.6
222	910916	EL	-	N	-	62	2	64.6	64.6
223	910916	EL	-	N	-	69	2	64.9	64.9
224	910916	EL	-	N	-	136	21	64.6	64.6
225	910916	EL	-	N	-	96	8	64.6	64.6
226	910916	EL	7F7D07604C	N	-	203	082	63.9	63.9
227	910916	EL	7F7D084F11	N	-	237	135	63.9	63.9
228	910916	EL	-	N	-	87	6	63.5	63.5

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
229	910916	TK	7F7D09004B	N	-	303	295	126.1	126.1
230	910916	TL	7F7D087B21	N	-	290	233	126.7	126.7
231	910916	EL	-	N	-	42	<1	63.9	63.9
232	910916	EL	-	N	-	42	<1	63.9	63.9
233	910916	TK	7F7F3E256C	N	-	371	520	65.3	65.3
234	910916	TK	7F7F3E3531	N	-	374	403	65.2	65.2
235	910916	EL	-	-	-	103	9	65.4	65.4
236	910916	EL	-	N	-	65	3	63.5	63.5
237	910916	EL	-	N	-	55	3	63.5	63.5
238	910916	EL	-	N	-	67	2	64.6	64.6
239	910916	EL	-	N	-	134	2 ^B	65.2	65.2
240	910916	EL	-	N	-	110	11	65.2	65.2
241	910916	EL	-	N	-	136	24	65.2	65.2
242	910916	EL	-	N	-	83	4	65.2	65.2
243	910916	EL	-	N	-	96	9	65.2	65.2
244	910916	EL	7F7D075F3E	N	-	194	85	65.4	65.4
245	910916	EL	-	N	-	51	1	65.2	65.2
246	910916	EL	-	N	-	48	1	63.9	63.9
247	910916	EL	-	N	-	54	1	63.9	63.9

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
248	910916	EL	-	N	-	76	4	65.2	65.2
249	910916	EL	-	N	-	72	4	65.2	65.2
250	910916	EL	-	N	-	100	7	65.2	65.2
251	910916	EL	-	N	-	60	1	65.2	65.2
252	910916	EL	-	N	-	87	4	65.2	65.2
253	910916	EL	-	N	-	111	11	65.2	65.2
254	910916	EL	-	N	-	76	4	65.2	65.2
255	910916	EL	-	N	-	92	6	65.2	65.2
256	910916	EL	-	N	-	80	4	65.2	65.2
257	910916	EL	-	N	-	111	12	65.2	65.2
258	910916	EL	-	N	-	117	13	65.2	65.2
259	910916	TK	7F7F45664B	Y	PITTAG	215	91	65.2	65.2
260	910916	EL	-	N	-	53	1	63.9	63.9
261	910916	EL	-	N	-	65	2	65.4	65.4
262	910916	EL	-	N	-	81	4	64.6	64.6
263	910916	EL	-	N	-	60	1	63.5	63.5
264	910916	EL	-	N	-	62	1	65.2	65.2
265	910916	EL	-	N	-	111	11	64.6	64.6
266	910916	EL	-	N	-	46	<1	64.9	64.9

Table 4. Summary of Humpback Chub handled during Trip 9, 1991

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
267	910916	EL	-	N	-	153	30	64.6	64.6
268	910916	EL	-	N	-	60	2	64.6	64.6
269	910916	EL	-	N	-	55	<1	64.5	64.5
270	910916	EL	-	N	-	60	<1	64.5	64.5
271	910916	EL	-	N	-	65	2	63.9	63.9
272	910916	EL	-	N	-	60	1	63.9	63.9
273	910916	EL	-	N	-	102	9	65.2	65.2
274	910916	EL	-	N	-	123	14	63.9	63.9
275	910916	EL	-	N	-	62	2	63.6	63.6
276	910916	EL	-	N	-	81	4	64.9	64.9
277	910916	EL	-	N	-	95	6	63.9	63.9
278	910916	EL	-	N	-	77	4	64.9	64.9
279	910916	EL	-	N	-	42	<1	63.6	63.6

^a. Fish implanted with radio transmitter

^b. Probable misreading

^c. 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, experiment gill net

MT = Minnow Trap

1. Yellow Floy - AGFD

2. Orange Floy - AGFD

3. Yellow Carlin

4. Orange Carlin

5. Red Carlin

6. Blue Carlin

7. Carlin Tag Scar

8. Floy Tag Scar

9. Fin Clip

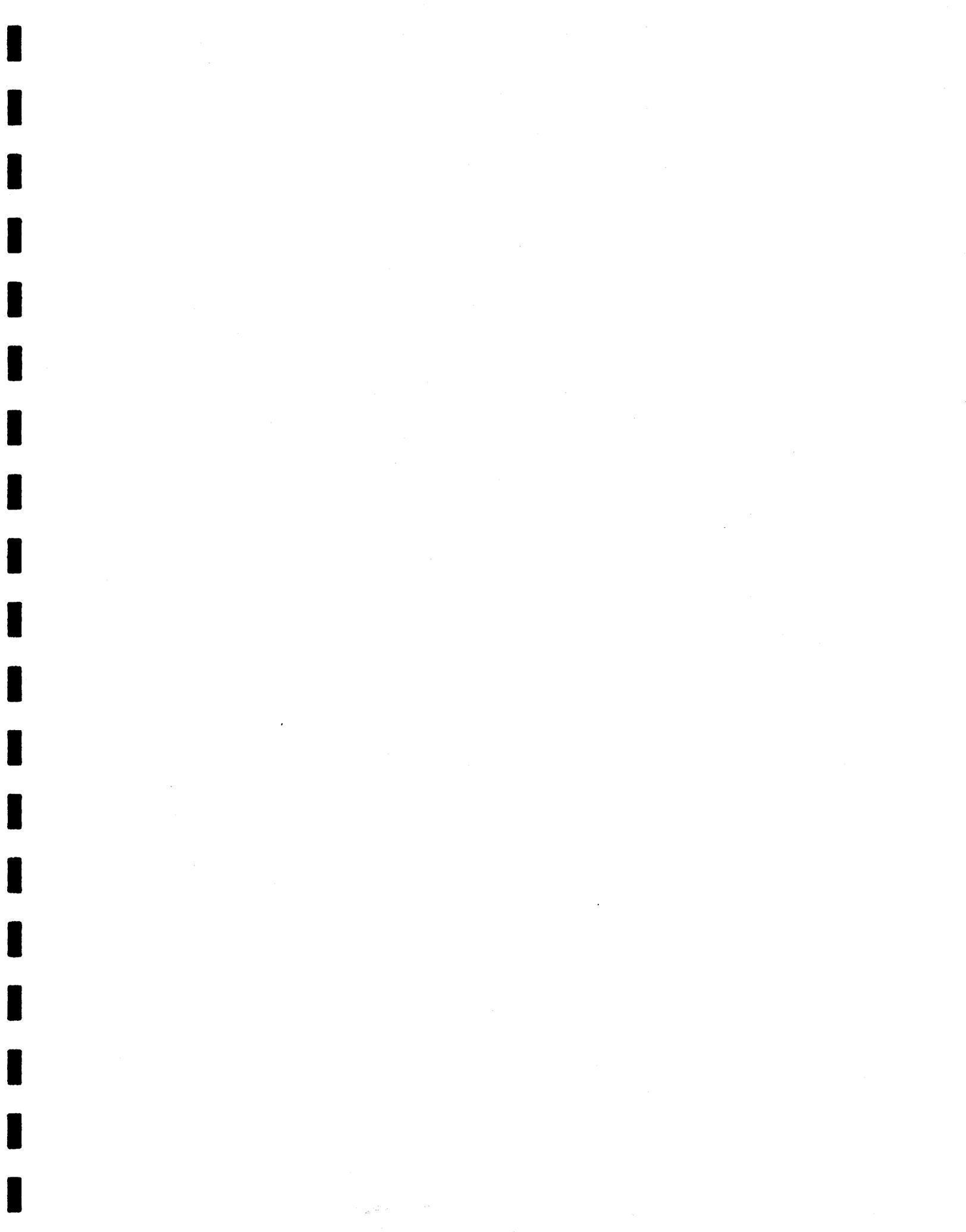


Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 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	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 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	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1991.

#	DATE	PIITAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910713	7F7F3E276F	419	749	40.620	80	11	75	910926	58.4	58.4
2	910715	7F7F3C2610	401	566	40.630	38	11	120	911111	59.9	59.9
3	910715	7F7D08545E	439	618	40.610	59	11	100	911023	60.3	60.3
4	910716	7F7F3F4E45	384	585	40.720	80	11	75	910928	60.9	60.9

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #9, 1991

#	DATE	PIITAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910908	7F7D081904	420	668	40.700	87	11	75	911126	58.3	58.3
2	910908	7F7D08552A	455	942	40.660	87	11	75	911126	58.3	58.3
3	910910	7F7D09067B	371	580	40.670	61	11	100	911219	60.1	60.1
4	910914	7F7F3F3764	396	639	40.600	60	11	100	911223	64.7	64.7
5	910915	7F7F3E3149	394	653	40.710	80	11	75	911129	64.4	64.4
6	910915	7F7F3E3542	399	612	40.680	78	11	75	911129	64.4	64.4

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.620/82	11	910713	58.4	58.4	
/82		910906(1714)			58.4
/81		910906(2144)			58.4
		910907(1131)			58.4
/80		910908(1157)			58.4
/80		910909(1334)			58.7
/76		910911(1150)			59.9
/76		910911(2035)			59.9
/78		910912(1125)			58.4
/72		910913(1200)			58.3
40.630/39	11	910715	59.9	59.9	
		910906(1742)			59.9
/39		910907(1215)			59.8
/40		910912(2110)			59.9
/38		910913(1237)			59.9
/38		910913(2040)			59.9
40.650/40	11	910513	60.5	60.5	
/39		910907(1312)			60.4
/38		910908(1240)			60.4
/38		910910(1230)			60.3
/38		910910(2055)			60.3
/38		910911(1230)			60.2
/38		910911(2035)			60.1
/38		910912(1215)			60.4
/38		910912(2200)			60.4
/37		910913(1321)			60.4
/37		910913(2130)			60.4
/37		910914(1138)			60.4

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.640/60	11	910612	60.2	60.2	
/53		910907(1356)			60.0
/53		910908(1235)			60.0
/56		910909(1355)			60.0
/53		910910(1213)			60.0
/53		910910(2051)			60.0
/53		910911(1228)			60.0
/53		910911(2037)			60.0
/54		910912(1234)			60.0
/54		910912(2125)			60.1
/53		910913(1250)			60.0
/53		910913(2055)			60.0
/52		910914(1110)			60.0
40.650/60	11	910613	61.1	61.1	
/60		910906(1820)			
/60		910907(1300)			60.2
/60		910908(1241)			60.1
/58		910910(2055)			60.1
/58		910911(2055)			60.1
/60		910912(1228)			60.1
/60		910912(2133)			60.2
/60		910913(2105)			60.1
/57		910914(1125)			60.1
40.610/81	11	910612	60.2	60.2	
/81		910906(1826)			60.2
/82		910907(1415)			60.2
/82		910909(1401)			60.2
/80		910911(2030)			60.1
/80		910912(1208)			60.1
/80		910912(2130)			60.2
/81		910913(1303)			60.1
/81		910913(2110)			60.1
/80		910914(1125)			60.1

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/59 /62 /62 /64 /62 /~60 /61	11	910715 910906(1830) 910907(1415) 910912(1208) 910913(1303) 910913(2115) 910914(1125) 910915(1455)	60.3	60.3	 60.2 60.1 60.1 60.1 60.1 60.1
40.740/59 /62 /61 /62 /62 /62 /62 /62 /61	11	910614 910906(1841) 910907(1340) 910909(1411) 910910(2103) 910911(2108) 910912(2220) 910913(2145) 910915(1522)	61.4	61.4	 60.5 60.3 60.3 60.3 60.3 60.4 60.5 60.4
40.720/80 /83 /83 /82 /82 /82 /84 /84 /82	11	910716 910906(1849) 910907(1330) 910911(1239) 910911(2113) 910912(2226) 910913(1330) 910913(2220) 910914(1150)	60.9	60.9	 60.8 60.4 60.4 60.6 60.5 60.5 60.5
40.730/41 /35 /35 /35 /35 /36 /35 /35 /35 /35 /34	11	910519 910907(1450) 910910(1335) 910910(2025) 910911(1356) 910911(2149) 910912(1534) 910913(1509) 910913(2355) 910914(1242) 910915(1635)	61.4	61.4	 60.5 61.4 61.4 61.4 61.4 61.5 61.6 61.5 61.5 61.5 61.8

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.700/87 /86 /87 /87 /88 /88 /88	11	910908 910909 910910(1147) 910911(1135) 910912(1138) 910913(1214) 910915(1444)	58.3	58.3	58.4 58.4 58.4 58.9 58.8 >59.8
¹ 40.660/87 /86 /87 /87 /88 /88	11	910908 910909 910910(1135) 910911(1125) 910912(1133) 910913(1214)	58.3	58.3	58.3 58.4 58.4 58.6 58.8
¹ 40.670/61 /62 /60 /62 /64 /62 /64 /64	11	910910 910911(1259) 910911(2130) 910912(1400) 910912(2232) 910913(1500) 910914(1159) 910915(1536)	60.1	60.1	61.2 61.2 60.3 60.3 61.2 60.8 60.8
40.700/44 /42 /42 /42 /42 /42 /43 /42	11	9105.8 910908 910910(1414) 910911(1425) 910912(1450) 910913(1604) 910914(1323) 910915(1728)	61.4	61.4	64.7 64.7 64.7 64.7 64.6 64.8 64.7
¹ 40.680/78 /81	11	910915 910915(1705)	64.4	64.4	64.5
¹ 40.600/60 /63	11	910914 910916(1823)	64.7	64.7	65.2
¹ 40.710/8 /81	11	910915 910915(1705)	64.4	64.4	64.5

¹- New Implants



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

**TRIP REPORT #10 - 1991
October 18, 1991 - October 29, 1991**

Prepared For:

Bureau of Reclamation

Prepared By:

**Richard A. Valdez, Principal Investigator
Bryan R. Cowdell, Senior Biologist**

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

November 5, 1991

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INTRODUCTION

This report presents pertinent details associated with Trip #10, 1991. 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 #10, 1991. Table 2 presents personnel who were present or participated in research activities for Trip #10, 1991.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #10, 1991. Table 4 is a summary of all humpback chubs handled during Trip #10, 1991. Table 5 presents information on all humpback chubs radio-tagged during 1991.

Humpback Chubs Captured

A total of 5 humpback chub were handled during Trip #10, 1991. Of these fish, 4 were YOY (TL=41-48 mm) and one was a juvenile (TL=132 mm). The juvenile had a scar indicating a previous clipping of the lower caudal fin. 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

Seven humpback chub radio-tagged during previous trips were recontacted during Trip #10, 1991. All fish were contacted in the mainstem Colorado River. A summary of telemetry and movement data collected on radio-tagged humpback chub during Trip #10, 1991 is presented in Table 6.

The omnidirectional remote telemetry station located at RM 60.5 was downloaded and checked. Data on presence or 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, 1991.

OBSERVATIONS

1. Water clarity was very high during Trip #10, 1991. Secchi disc readings ranged from a low of 3.1 m to a high of 6.3 m (compared to 0.04 - 1.4 m recorded on Trip #9, 1991).
2. One radio-tagged fish was located near the surface on river left RM 60.4. Visual observation revealed a wound on the top of the caudal peduncle. The wound appeared to be a puncture approximately 2 cm² in size. A white fungus was observed to extend from the wound forward to the dorsal fin, back to the caudal fin and down the right side of the caudal peduncle to the mid-line. It was the opinion of the biologists observing the fish (Bryan Cowdell and Randy VanHaverbeke) that the wound was the result of a bird attack, possibly a heron or osprey.
3. Unbaited minnow traps were successful in capturing YOY and juvenile humpback chubs near the Little Colorado River confluence.
4. The juvenile humpback chub captured at RM 61.5 appeared to be a recapture. The lower caudal fin was scared indicating a previous fin clip. This method is used in the LCR by Paul Marsh of ASU.
5. Osprey were sighted several times in the RM 60.4 region. Investigation of the cliffs on river right at RM 60.4 revealed areas of white-wash and fish remains (remains found were identified as trout).

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The extreme water clarity during Trip #10, 1991 created difficulty in locating radio tagged fish during the day. It was felt the fish were taking cover in deeper water and therefore below the depth extinction limits of the radio transmitters. To locate fish, efforts were concentrated on nighttime surveillance and observations. Extended night surveillance runs (RM 56.5 to RM 65.4) were tried during early morning (0200-0500) and after dusk (1830-2100). The most successful runs were after dusk runs when the moon was still down. Night observations were successful when crews stayed in the area of a previous contact and waited for the fish to "come up".

RECOMMENDATIONS

1. Radiotelemetry efforts should concentrate on nighttime surveillance and observations when water turbidity is clear.
2. Safety considerations of lighting and flow level should be taken when extended nighttime surveillance runs (RM 56.5 to 65.4) are used.

Table 1. Logistics and Research Schedule for Trip #10, 1991.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
10/18	29.2	Shinumo Wash	X			
10/19	61.2	LCR	X		X	
10/20	61.2	LCR			X	X
10/21	61.2	LCR		X	X	X
10/22	61.2	LCR		X	X	X
10/23	61.2	LCR		X	X	X
10/24	61.2	LCR		X	X	X
10/25	87.5	Cremation	X		X	
10/26	131.9	Below Dubendorff	X			
10/27	182.4	Hells Hollow	X			
10/28	224.5	Above Diamond	X			
10/29	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 #10, 1991.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Cowdell	BIO/WEST	10/18 - 10/29	Project Leader - B/W
R. VanHaverbeke	BIO/WEST	10/18 - 10/29	
P. Weiss	BIO/WEST	10/18 - 10/26	Out Bright Angel
E. Prats	BIO/WEST	10/18 - 10/26	Out Bright Angel
R. Cowdell	BIO/WEST	10/18 - 10/29	
P. Wood	BIO/WEST	10/18 - 10/26	Out Bright Angel
K. Burke	BIO/WEST VOL.	10/18 - 10/29	
S. Bledsoe	OARS	10/18 - 10/29	Trip Leader - OARS
C. Krznarich	OARS	10/18 - 10/29	
C. Geanious	OARS	10/18 - 10/29	

Table 3. Summary of Fish Collected and Effort by Gear Type.

¹	²	HB	FM	BH	SD	RB	BR	CC	CP	SB
MT N=29 690 hr	A	0	0	0	1	0	0	0	0	0
	J	1	0	0	0	0	0	0	0	0
	Y	4	0	0	0	0	0	0	0	0
TOTAL	A	0	0	0	1	0	0	0	0	0
	J	1	0	0	0	0	0	0	0	0
	Y	4	0	0	0	0	0	0	0	0

¹- Gear Types

MT = Minnow Trap

² - A = Adult

J = Juvenile

Y = Young of Year

Table 4. Summary of Humpback Chub handled during Trip #10, 1991.

#	DATE	GEAR ^c TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	911020	MT	-	N	-	41	3	61.5	61.5
2	911021	MT	-	Y	CLIP ¹	132	16	61.5	61.5
3	911021	MT	-	N	-	54	2	61.3	61.3
4	911022	MT	-	N	-	69	3	61.3	61.3
5	911022	MT	-	N	-	48	1	61.3	61.3

C- Gear Type

MT = Minnow Trap

¹- Lower caudal fin clip scar - ASU

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 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	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 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	910713	7F7F3E276F	419	749	40.620	80	11	75	910926	58.4	58.4
2	910715	7F7F3C2610	401	566	40.630	38	11	120	911111	59.9	59.9
3	910715	7F7D08545E	439	618	40.610	59	11	100	911023	60.3	60.3
4	910716	7F7F3F4E45	384	585	40.720	80	11	75	910928	60.9	60.9

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #9, 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	910908	7F7D081904	420	668	40.700	87	11	75	911126	58.3	58.3
2	910908	7F7D08552A	455	942	40.660	87	11	75	911126	58.3	58.3
3	910910	7F7D09067B	371	580	40.670	61	11	100	911219	60.1	60.1
4	910914	7F7F3F3764	396	639	40.600	60	11	100	911223	64.7	64.7
5	910915	7F7F3E3149	394	653	40.710	80	11	75	911129	64.4	64.4
6	910915	7F7F3E3542	399	612	40.680	78	11	75	911129	64.4	64.4

Table 6. A list of radio frequencies contacted on Trip #10, 1991 and locations relative to capture and release sites.

			-----River Mile-----		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/60 /64 /64 /64	11	910908 911022(0458) 911023(0437) 911024(2120)	64.7	64.7	64.7 64.7 64.7
40.610/59 /54 /54 /56 /56 /54	11	910715 911019(2203) 911020(2255) 911023(1355) 911024(1540) 911025(0826)	60.3	60.3	60.2 60.1 60.2 60.1 60.1
40.630/38 /38 /40 /40	11	910715 911019(2140) 911020(2156) 911024(1941)	59.9	59.9	59.9 59.9 59.8
40.680/78 /66	11	910915 911024(2114)	64.4	64.4	64.5
40.700/87 /84 /84 /84 /82 /78 /84 /84 /74	11	910908 911019(2211) 911020(1200) 911020(2301) 911022(0325) 911023(0315) 911024(1545) 911024(1956) 911025(0828)	58.3	58.3	60.4 60.4 60.4 60.4 60.4 60.5 60.5 60.5
40.710/80 /70 /70	11	910915 911023(0416) 911024(2050)	64.4	64.4	63.8 63.8
40.730/39 /36	11	910519 911022(0400)	59.0	59.0	61.8



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

**TRIP REPORT #11 - 1991
November 4, 1991 - November 23, 1991**

Prepared For:

Bureau of Reclamation

Prepared By:

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

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

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INTRODUCTION

This report presents pertinent details associated with Trip #11, 1991. 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, 1991. Table 2 presents personnel who were present or participated in research activities for Trip #11, 1991.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #11, 1991. Table 4 is a summary of all humpback chubs handled during Trip #11, 1991. Table 5 presents information on all humpback chubs radio-tagged during 1991.

Humpback Chubs Captured

A total of 114 humpback chub were handled during Trip #11, 1991. Of these fish, 3 were YOY (TL=<50 mm), 66 were juveniles (TL=>50 and <200 mm) and 45 adults (>200 mm). We recognize that many of the young chubs of >50 mm TL were YOY, and will determine length ranges for age groups from future length-frequency and age analyses. All humpback chubs were collected in Reach 1. No humpback chubs were captured in Reach 2 or 3. Sixty-three of the juvenile humpback chubs in Reach 1 were captured electrofishing. The remaining three were captured in unbaited minnow traps. One YOY and 2 juvenile humpback chub were captured above the confluence of LCR (between RM 61.0 and 61.3). Additionally 17 juvenile humpback chub were captured in the eddies above Tanner Rapid (RM 68.2).

All fish appeared robust and in good condition. All fish were released alive and in good condition with the exception of two adult humpback chubs. These fish were both captured in the proximity of RM 63.8 during the same electrofishing run on November 12. Upon processing the fish, both fish were showing signs of stress which included, loss of equilibrium and lethargy. One fish, PIT tag # 7F7E43193F (TL = 260 mm and WT = 212 gms) appeared to recover after approximately 30 minutes and was taken back to the capture point and released. The other fish PIT tag # 7F7D07604C (TL = 206 mm and WT = 79 gms) was held and observed for approximately 10 hours, after which it regained equilibrium and appeared to be slightly sluggish but swimming normally. No deformities or other external evidence of injury were apparent, so the fish was released at RM 65.4. It was observed swimming upstream in an eddy for approximately 20 meters before it swam from sight.

Three day later on November 15, the first fish of the two described above (PIT tag # 7F7E43193F) was recaptured at RM 68.0 (4.2 miles downstream of the location it was released) again by electrofishing. Again the fish failed to recover normally and was held and observed for approximately 19 hours until its death. During the observation period the fish was never able to regain equilibrium and appeared sluggish. External examination of the fish revealed a bruise on the dorsal surface just

anterior to the dorsal fin and an abrasion on the ventral surface of the fish between the pelvic fins. It is inconclusive whether either of these injuries were related to the behavior and death of the fish. Although electrofishing injury is suspected, the netter that originally handled the fish when it was first captured on November 12, indicated that the fish was netted among rocks and may possibly have sustained an injury while being scooped into the dipnet. The fish was preserved in 10% buffered formalin and transported out of the Canyon to the GCES office in Flagstaff AZ. The fish was subsequently transferred into a 75% ethanol solution and transferred to Dr. Dennis Kubley of AGF. X-rays were taken of the fish (2 lateral, 1 dorsal view) to determine if spinal injuries were present.

Radiotelemetry

Five fish were implanted with radio transmitters during Trip 11, 1991. Three fish were implanted using midline incisions and 2 using lateral incisions. A sheathed needle antenna guide was used during all five implants. A summary of humpback chubs implanted during Trip 11, 1991 is presented in Table 5.

Eight humpback chub radio-tagged during previous trips were recontacted during Trip #11, 1991. All fish were contacted in the mainstem Colorado River. A summary of telemetry and movement data collected on radio-tagged humpback chub during Trip #11, 1991 is presented in Table 6.

The omnidirectional remote telemetry station located at RM 60.5 was downloaded and checked twice during the trip. Data on presence or absence of radio-tagged fish between RM 59.8 and RM 61.2 was successfully logged during the period between Trip 10 and Trip 11 and during Trip 11.

Four radio-tagged humpback chubs that had been implanted on previous trips were recaptured during trip 11, 1991. Details associated with each of these fish are as follows:

1. Implant date: 910612, Recapture date: 911110, Elapsed time: 112 days
PIT tag: 7F7DP75B05, Frequency: 40.610, Pulse: 82, midline incision
Capture location: RM 60.2, Recapture location: RM 60.8
Original wt: 644 gms, Recapture wt (w/ 11 gm transmitter): 594 gms, wt change: -61 gms
Condition and disposition: Fish swimming actively, incision healed but boils and ulcerations on and around primary incision - possible furunculosis with a secondary Saprolegnia infection, radio-tag active but weak, antenna cut off, sutures removed, infected areas swabbed with chlorohexidine, photographed and released at capture point.
2. Implant date: 901118, Recapture date: 911110, Elapsed time: 357 days
PIT tag: 7F7F3E3C5C, Frequency: 40.730, Pulse: 61, midline incision
Capture location: RM 61.1, Recapture location: RM 60.9
Original wt: 798 gms, Recapture wt (w/ 11 gm transmitter): 583 gms, wt change: -226 gms
Condition and disposition: Fish swimming actively and appeared healthy, although slightly emaciated. Incision well healed. Antenna exit in good condition. Transmitter dead, antenna cut off, photographed and released at capture point.
3. Implant date: 910914, Recapture date: 911112, Elapsed time: 59 days
PIT tag: 7F7F3F3764, Frequency: 40.600, Pulse: 63, lateral incision, antenna guide used
Capture location: 64.7, Recapture location: RM 64.75

Original wt: 639 gms, Recapture wt (w/ 11 gm transmitter): 615 gms, wt change: -35 gms
Condition and disposition: Fish swimming actively and appeared healthy, Incision well healed and sutures removed, antenna exit in excellent condition. Photographed and released at capture point.

4. Implant date: 910915, recapture date: 911113, Elapsed time: 59 days
PIT tag: 7F7F3E3542, Frequency: 40.680, Pulse: 78, lateral incision, antenna guide used
Capture location: RM 64.4, Recapture location: RM 64.4
Original wt: 612 gms, Recapture wt (w/ 11 gm transmitter): 591 gms, wt change: -33 gms
Condition and disposition: Fish swimming actively and appeared healthy, incision healed will and sutures removed, antenna exit in good condition. Photographed and released at capture point.

Bench Marks

One new bench mark was established during Trip #11, 1991. Details are as follows:

RM 59.0, river right, at first camp above 60 mile rapid on river right.

OBSERVATIONS

1. No humpback chubs were captured above Kwagunt rapid (RM 55.0 - RM 55.9) during Trip 11, 1991. This suggests that the LCR population may not disperse or extend above Kwagunt rapid in November (late fall).
2. One YOY flannelmouth sucker was captured above Kwagunt rapid at RM 55.4 during Trip 11, 1991. This suggests the possibility of successful tributary or main channel spawning of this species above the Little Colorado River.
3. High numbers of juvenile and YOY humpback chubs were collected in the main channel below the confluence of the LCR. However, fewer chubs were collected with similar efforts during Trip 11 than Trip 9 (September) suggesting a decrease in density in this reach between September and November.
4. Again, electrofishing was the most effective means of capturing juvenile and YOY humpback chubs in the main channel during Trip 11, 1991.
5. Unbaited minnow traps were effective for catching humpback chubs in the main channel during Trip 11, 1991. Water clarity was moderate to high during the trip which increases the effectiveness of minnow trapping. It is possible that during periods of high water clarity that the minnow traps are utilized as cover by humpback chubs and speckled dace.
6. Two adult humpback chubs appeared to be adversely affected by electrofishing in the main channel. This in addition to one chub that appeared to sustain an electrofishing related injury in September suggests that current electrofishing operations in the main channel in Reach 1 should possibly be modified to reduce the possibility of injuring adult humpback chubs.
7. No brown trout were captured in Reach 1 during Trip 11. This contrasts with September where catch rates for brown trout were higher than any previous trip. Higher numbers in September may have been associated with prey abundance or possibly an artifact of a seasonal spawning migration.
8. In contrast to November 1990 (Trip 2, 1990), the majority of rainbow trout captured in Reach 1 appeared robust and healthy. However, a few individuals captured still appeared emaciated and snake-like, similar to a large percentage of rainbows captured in Reach 1 during November 1990.
9. Seventeen juvenile and YOY humpback chubs were captured in the area above Tanner rapid (RM 68.0 to RM 68.4). It is assumed that these fish are part of the cohort that appeared in the main channel in September and are holding in suitable habitat in the Tanner region. Habitat where these fish were collected in the Tanner area was similar to habitat where juvenile humpback chubs are collected between the LCR and Lava Chuar. This habitat was composed primarily of shorelines with boulder talus cover.
10. One adult humpback chub was captured in the Tanner area during 2 days of sampling. This chub had been captured 3 days earlier above Lava Chuar and may reflect more of an incidental

capture. Excluding this fish, no adult humpback chubs were captured in the Tanner region during Trip 11, 1991. This suggests that the LCR humpback chub population does not extend or disperse as far downstream as Tanner Rapid (RM 68.4) in November (late fall).

11. Radio-tagged humpback chubs were primarily contacted during night surveillance run during Trip 11, 1991. Very few contacts were made during daylight hours. This pattern is consistent with past trips under clear water conditions.
12. No humpback chubs were captured in Reaches 2 or 3 during Trip 11, 1991. This suggests that fish may be more dispersed and less likely to be captured, or that seasonal behavioral differences reduce the availability of fish to sampling techniques.
13. Overall catch rates of all fish in Reaches 2 and 3 appeared low during Trip 11, 1991.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Due to restrictions associated with the non-motorized restrictions during Trip 11, 1991, all research boats were piggy-backed from Lee's Ferry to the research sites. This created a problem with the overloading the 37' support boat for the LCR crew, primarily associated with the additional weight incurred by loading all three research boats rather than motoring one and loading two. This overloading problem could be alleviated during the next non-motorized season by providing two 37' boats for the LCR crew. Overloading was not a problem for the downstream crew.

RECOMMENDATIONS

1. Sampling in the areas above Kwagunt Rapid and in the area above Tanner Rapid should be continued during the January 1992 Trip. Results of previous sampling suggest that fish in the LCR population are most widely dispersed in January. This being the case, the greatest likelihood of capturing these fish on the periphery of their range will be in January. The decision to continue sampling the outlying areas beyond that point should be based on numbers of fish captured in January.
2. In light of 3 potential injuries to adult humpback chubs related to electrofishing in September and November, BIO/WEST recommends testing the effectiveness of lower output settings in Reach 1 during January. Normal output settings used to past trips are in the range of 12 to 13 amperes. Since main channel electrofishing in Reach 1 is targeting primarily YOY and juvenile humpback chubs in shallow shoreling habitats, BIO/WEST will compare of effectiveness electrofishing with lower outputs (8 to 10 amperes) vs. normal settings during the January Trip (Trip 1, 1992). If lower output setting are satisfactory for catching younger chubs, they will be instituted in Reach 1 to reduce the possibility of injuring adult humpback chubs.

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

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
911104	29.0	Shinumo Wash	X			
911105	55.6	Above Kwagant	X	X	X	X
911106	55.6	Above Kwagant		X	X	X
911107	59.0	Above 60 Mile Canyon	X	X	X	X
911108	59.0	Above 60 Mile Canyon		X	X	X
911109	61.3	LCR	X	X	X	X
911110	61.3	LCR		X	X	X
911111	61.3	LCR		X	X	X
911112	65.4	Lava Chuar	X	X	X	X
911113	65.4	Lava Chuar		X	X	X
911114	68.3	Above Tanner	X	X	X	X
911115	68.3	Above Tanner		X	X	X
911116	118.0	Below Elves Chasm	X			
911117	131.8	Stone Creek	X			
911118	156.4	Above Havasu	X			
911119	187.7	Whitmore Wash	X	X		
911120	187.7	Whitmore Wash		X		
911121	224.7	Above Diamond Creek	X	XX		
911122	224.7	Above Diamond Creek		X		
911123	225.5	Take Out				

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

Table 1. Logistics and Research Schedule for Trip 11, 1991, Team 2.

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R ¹	FS	TE	HQ
11/4	29.0	Shinumo	X			
11/5	68.3	Tanner	X	X		
11/6	81.4	Grapevine	X	X		
11/7	87.4	Cremation	X	X		X
11/8	87.4	Cremation		X		X
11/9	108.3	Shinumo	X	X		X
11/10	108.3	Shinumo		X		X
11/11	126.2	Middle Granite Gorge	X	X		X
11/12	126.2	Middle Granite Gorge		X		X
11/13	133.2	Tapeats Creek	X	X		
11/14	133.2	Tapeats Creek		X		
11/15	144.3	Kanab Creek	X	X		
11/16	144.3	Kanab Creek		X		
11/17	155.6	Havasu Creek	X	X		
11/18	155.6	Havasu Creek		X		
11/19	204	Spring Canyon	X	X		
11/20	204	Spring Canyon		X		
11/21	214	214 mile		X		X
11/22	214	214 mile		X		X
11/23	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 #11, Team 1.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	11/4 - 11/16	Project Leader
T. Wasowicz	BIO/WEST	11/4 - 11/23	Senior Biologist
H. Yard	BIO/WEST	11/4 - 11/16	Out Bright Angel
P. Weiss	BIO/WEST	11/4 - 11/23	
T. McKay	BIO/WEST	11/4 - 11/23	
L. Brown	BIO/WEST	11/4 - 11/23	
K. Kline	GCES (Volunteer)	11/4 - 11/23	
O. Gahni	GCES (Volunteer)	11/4 - 11/23	
M. Trammel	GCES (Volunteer)	11/4 - 11/16	Out Bright Angel
S. Bledso	OARS	11/4 - 11/23	
S. Rhodes	OARS	11/4 - 11/23	
A. Tines	OARS	11/4 - 11/23	
M. Yard	GCES	11/11 - 11/16	In Tanner - Out B.A.
J. Brown	GCES	11/6 - 11/12	In Tanner/Chopper out

Table 2. Personnel Participating in Trip 11, 1991, Team 2.

PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Leibfried	BIO/WEST	11/7 - 11/19	Project Leader
R. Vanhaverbeke	BIO/WEST	11/4 - 11/23	
B. Dierker	BIO/WEST	11/4 - 11/23	
G. Hardwick	BIO/WEST	11/4 - 11/23	
S. Reeder	BIO/WEST	11/4 - 11/23	
J. Larson	BIO/WEST VOLUNTEER	11/4 - 11/23	
L. Gelchis	BIO/WEST VOLUNTEER	11/4 - 11/23	
L. Bleifuss	OARS	11/4 - 11/23	Trip Leader
L. Neimi	OARS	11/4 - 11/23	
A. Cassidy	OARS	11/4 - 11/23	

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	FH	BB	FV
Reach 1 EL N=79 32.4 hr	A	10	0	0	259	0	0	6	5	3	1	0
	J	63	4	0	43	0	0	2	1	0	0	0
	Y	3	0	1	0	0	0	0	0	0	0	0
Reach 2 EL N=68 23.47 hr	A	0	3	4	79	130	0	116	11	0	0	0
	J	0	3	2	36	5	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 EL N=32 10.56 hr	A	0	2	0	3	0	1	18	4	0	0	0
	J	0	1	0	3	0	0	1	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TL N=37 74 hr	A	8	7	2	36	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TL N=71 142 hr	A	0	3	0	2	4	0	5	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TL N=14 28 hr	A	0	0	0	0	0	1	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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

¹	²	IIB ³	FM	BH	RB	BR	CC	CP	SD	FH	BB	FV
Reach 1 TK N=41 82 hr	A	11	15	0	22	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TK N=63 126 hr	A	0	4	1	12	1	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TK N=30 60 hr	A	0	0	0	0	0	0	2	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GM N=27 54 hr	A	3	17	2	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GM N=43 86 hr	A	0	0	1	0	1	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GM N=24 48 hr	A	0	0	0	0	0	0	2	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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	FH	BB	FV
Reach 1 GP N=28 56 hr	A	10	0	0	48	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GP N=35 70 hr	A	0	0	0	1	4	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GP N=26 52 hr	A	0	0	0	0	0	2	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GX N=17 34 hr	A	4	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GX N=21 42 hr	A	0	0	0	2	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GX N=21 42 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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	FH	BB	FV
Reach 2 GZ N=28 56 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GZ N=5 10 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HL N=4 69.6 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=3 41.12 hr	A	0	0	0	1	0	0	0	0	0	0	0
	J	0	0	0	5	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 MT N=70 700 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	3	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 MT N=16 337.3 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

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	FH	BB	FV
Reach 3 MT N=4 83.9 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	46	34	8	465	140	5	153	19	3	1	0
	J	66	8	2	87	0	0	3	0	0	0	0
	Y	3	1	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 = 100'x6'x2" gill net
 GP = 100'x6'x1½" gill net
 GX = 100', 2" to ½" @ ½ increment, experiment gill net
 HL = Large hoop net (4' diameter)
 HS = Small hoop net (2' diameter)
 GZ = 60'x6' experimental
 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

BB = black bullhead
 FH = fathead
 FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
1	911107	N	039	7F7F456D61 ^A	Y	PITTAG	393	710	58.80	58.80
2	911107	N	040	7F7E431442 ¹	Y	0314816FY	360	473	58.95	59.00
3	911108	N	049	7F7F095814 ^A	N		401	651	58.80	58.80
4	911108	N	050	7F7D1B6771	Y	PITTAG	355	355	58.80	58.80
5	911108	N	052	7F7D1B6A55	Y	PITTAG	338	305	59.10	59.10
6	911109	N	065	7F7F22021C	N		375	484	60.15	60.15
7	911109	N	065	7F7F22016E	N		401	664	60.15	60.15
8	911109	N	065	7F7F10452F	N		402	665	60.15	60.15
9	911109	N	064	7F7F1F6B4F	N		356	450	60.40	60.40
10	911109	N	064	7F7F19661F	N		387	443	60.40	60.40
11	911109	N	066	7F7F113535	N		255	176	60.40	60.40
12	911109	N	065	7F7D1B6671	Y	PITTAG	408	544	60.15	60.15
13	911109	N	063	7F7D17510C	Y	PITTAG	328	319	60.15	60.15
14	911109	N	065	7F7D08030B	Y	PITTAG	345	366	60.15	60.15
15	911109	N	063	7F7F053006	Y	PITTAG	355	436	60.15	60.15
16	911109	N	065	7F7F220012 ¹	Y	0314307FY	370	438	60.15	60.15
17	911109	N	065	7F7F1F6E5A	N		348	408	60.15	60.15
18	911109	N	065	7F7F1F6A79 ^A	N		423	605	60.15	60.15
19	911109	N	061	7F7F21747DA	N		450	999	60.15	60.15

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
20	911109	E	018	7F7E432646 ³	Y	385CY	330	340	60.60	60.60
21	911109	E	019	7F7E43220B	N		298	0	60.80	60.80
22	911110	N	071	7F7F196437	N		378	536	61.75	61.75
23	911110	N	071	7F7D15454C	Y	PITTAG	373	438	61.75	61.75
24	911110	N	071	7F7F220754	N		401	501	61.75	61.75
25	911110	N	071	7F7F1F6B53	N		340	300	61.75	61.75
26	911110	N	073	7F7F3C277A	Y	PITTAG	329	300	60.90	60.90
27	911110	N	074	7F7F456D7D	Y	PITTAG	338	369	61.75	61.75
28	911110	N	076	7F7D027E29	Y	PITTAG	351	354	60.90	60.90
29	911110	N	077	7F7F042E75	Y	PITTAG	289	178	60.90	60.90
30	911110	N	077	7F7F3E3C5C	Y	PITTAG	407	583	60.90	60.90
31	911110	N	077	##### _g	N		##	##	60.90	60.90
32	911110	E	020	7F7D075B05	Y	PITTAG	397	605	60.80	60.80
33	911110	E	022	#####	N		83	5	62.50	62.50
34	911110	E	023	#####	N		64	1	61.30	61.30
35	911110	E	023	#####	N		75	4	61.30	61.30
36	911110	E	023	#####	N		148	27	61.30	61.30
37	911110	T	027	#####	N		94	5	61.70	61.70

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
38	911111	E	027	#####	N		143	23	61.80	61.80
39	911111	E	027	#####	N		87	3	61.80	61.80
40	911111	E	029	#####	N		50	1	61.90	61.90
41	911111	E	029	#####	N		63	1	61.90	61.90
42	911111	E	029	7F7E43287B	N		355	391	61.90	61.90
43	911111	E	029	7F7D177356	Y	PITTAG	306	272	61.90	61.90
44	911111	E	029	7F7D2B6913	Y	PITTAG	258	106	61.90	61.90
45	911111	E	028	#####	N		108	7	61.90	61.90
46	911111	E	026	#####	N		153	23	61.50	61.50
47	911111	N	088	7F7F217274 ²	Y	890CO	395	515	61.20	61.20
48	911111	T	036	#####	N		71	1	61.70	61.70
49	911112	E	033	#####	N		78	5	63.80	63.80
50	911112	E	033	#####	N		163	36	63.80	63.80
51	911112	E	033	#####	N		56	1	63.80	63.80
52	911112	E	033	7F7D07604C	Y	PITTAG	206	79	65.40	65.40
53	911112	E	033	7F7E432B4B ^A	N		336	324	58.80	0.00
54	911112	E	033	7F7E43193F	N		260	203	63.80	63.80
55	911112	E	033	#####	N		47	1	63.80	63.80
56	911112	E	033	#####	N		62	2	63.80	63.80

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
57	911112	E	033	#####	N		58	1	63.80	63.80
58	911112	E	033	#####	N		89	5	63.80	63.80
59	911112	E	033	#####	N		83	5	63.80	63.80
60	911112	E	033	#####	N		62	4	63.80	63.80
61	911112	E	033	#####	N		82	5	63.80	63.80
62	911112	E	033	#####	N		58	1	63.80	63.80
63	911112	E	033	#####	N		63	3	63.80	63.80
64	911112	E	033	#####	N		70	5	63.80	63.80
65	911112	E	033	#####	N		56	1	63.80	63.80
66	911112	E	031	#####	N		80	5	63.80	63.80
67	911112	E	031	#####	N		68	5	63.80	63.80
68	911112	E	032	#####	N		90	5	63.80	63.80
69	911112	N	098	7F7F21741B	N		383	557	64.75	64.80
70	911112	N	098	7F7F3F3764	Y	PITTAG	403	615	64.75	64.80
71	911112	N	109	7F7F10405E	N	PITTAG	339	363	64.35	64.40
72	911113	E	036	#####	N		62	3	64.80	64.80
73	911113	E	036	#####	N		60	2	64.80	64.80
74	911113	E	036	#####	N		50	1	64.80	64.80
75	911113	E	037	#####	N		68	3	64.90	64.90

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
76	911113	E	037	#####	N		72	2	64.90	64.90
77	911113	E	037	#####	N		67	2	64.90	64.90
78	911113	E	035	#####	N		63	1	64.30	64.30
79	911113	E	036	#####	N		82	7	64.80	64.80
80	911113	E	036	#####	N		104	10	64.80	64.80
81	911113	E	036	#####	N		99	8	64.80	64.80
82	911113	E	036	#####	N		103	8	64.80	64.80
83	911113	E	036	#####	N		74	4	64.80	64.80
84	911113	E	036	#####	N		62	2	64.80	64.80
85	911113	E	038	#####	N		100	11	64.80	64.80
86	911113	E	038	#####	N		111	13	64.80	64.80
87	911113	E	038	#####	N		108	10	64.80	64.80
88	911113	E	038	#####	N		98	8	64.80	64.80
89	911113	E	038	#####	N		110	11	64.80	64.80
90	911113	E	038	#####	N		110	9	64.80	64.80
91	911113	E	038	#####	N		70	3	64.80	64.80
92	911113	E	038	#####	N		88	6	64.80	64.80
93	911113	E	039	#####	N		73	3	64.90	64.90
94	911113	T	046	#####	N		83	5	63.75	63.75

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
95	911113	N	116	7F7F394F26	N		371	528	64.45	65.40
96	911113	N	123	7F7F217C25	N		320	299	65.25	65.25
97	911113	N	126	7F7F3E3542	Y	PITTAG	390	591	64.40	65.25
98	911115	E	049	#####	N		85	5	68.20	68.20
99	911115	E	049	#####	N		118	12	68.20	68.20
100	911115	E	049	#####	N		104	10	68.20	68.20
101	911115	E	049	#####	N		73	4	68.20	68.20
102	911115	E	049	#####	N		88	7	68.20	68.20
103	911115	E	049	#####	N		81	5	68.20	68.20
104	911115	E	049	#####	N		115	15	68.20	68.20
105	911115	E	042	7F7E43193F	Y	PITTAG	256	199	68.00	68.00
106	911115	E	046	#####	N		72	3	0.00	0.00
107	911115	E	047	#####	N		80	5	68.30	68.30
108	911115	E	048	#####	N		121	16	68.30	68.30
109	911115	E	048	#####	N		77	4	68.30	68.30
110	911115	E	049	#####	N		83	6	68.20	68.20
111	911115	E	049	#####	N		109	12	68.20	68.20
112	911115	E	049	#####	N		93	7	68.20	68.20
113	911115	E	049	#####	N		77	3	68.20	68.20

Table 4. Summary of Humpback Chub handled during Trip #11.

	DATE	TYPE	SAMPLE_NO	PIT_TAG	RECAP	OLD TAG	TL	WT	RM (capture)	RM (release)
114	911115	E	049	#####	N		73	3	68.20	68.20
115	911115	E	049	#####	N		76	4	68.20	68.20

¹-Yellow Floy - AGFD

²-Orange Carlin

³-Yellow Carlin

^A-Fish implanted with radio transmitter

^B-Escaped

^C-Gear Types

E = electrofishing

N = netting

T = traps

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (mm)	RELEASE (mm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

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

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECT- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910518	7F7F3C6F15	395	554	700	42	11	120	9/9/91	61.4	61.4
2	910513	7F7D076050	364	517	650	40	11	120	9/14/91	60.5	60.5
3	910519	7F7D026506	405	551	730	41	11	120	9/15/91	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #6, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECT- TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910612	7F7D075B05	399	644	40.610	82	11	75	910816	60.2	60.2
2	910612	7F7F04461F	394	653	40.640	60	11	100	910925	60.2	60.2
3	910613	7F7D086032	426	669	40.650	60	11	100	910926	61.1	61.1
4	910614	7F7D07776A	432	784	40.740	59	11	100	910927	61.4	61.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #7, 1991.

#	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	910713	7F7F3E276F	419	749	40.620	80	11	75	910926	58.4	58.4
2	910715	7F7F3C2610	401	566	40.630	38	11	120	911111	59.9	59.9
3	910715	7F7D08545E	439	618	40.610	59	11	100	911023	60.3	60.3
4	910716	7F7F3F4E45	384	585	40.720	80	11	75	910928	60.9	60.9

Table 5. Summary of radio-transmitter implants in humpback chub during Trip 9, 1991

#	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	910908	7F7D081904	420	668	40.700	87	11	75	911126	58.3	58.3
2	910908	7F7D08552A	455	942	40.660	87	11	75	911126	58.3	58.3
3	910910	7F7D09067B	371	580	40.670	61	11	100	911219	60.1	60.1
4	910914	7F7F3F3764	396	639	40.600	60	11	100	911223	64.7	64.7
5	910915	7F7F3E3149	394	653	40.710	80	11	75	911129	64.4	64.4
6	910915	7F7F3E3542	399	612	40.680	78	11	75	911129	64.4	64.4

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.610/59 /53 /54 /52	11	910715 911107(1304) 911108(1242) 911109(1135)	60.3	60.3	60.15 60.1 60.15
40.730/41 /36 /36 /36	11	910519 911107(1250) 911112(0016) 911113(1600)	61.4	61.4	60.4 60.5 60.5
40.700/87 /74 /76 /76 /76 /76 /75 /75	11	910908 911009(1307) 911109(1221) 911109(2246) 911110(1411) 911110(2240) 911111(1652) 911112(0041)	58.3	58.3	61.6 61.75 61.75 61.75 61.75 61.75 61.75
40.680/78 /66 /66	11	910915 911112(2400) 911114(0010)	64.4	64.4	64.4 64.4
40.600/60 /64	11	910914 911114(0025)	64.7	64.7	64.6
¹ 40.740/80 /86	11	911107 911108(2343)	58.8	58.8	58.9
¹ 40.640/82 /84	11	911108 911109(0020)	58.8	58.8	58.9
40.660/87 /64	11	910908 911109(0036)	58.3	58.3	58.9
¹ 40.620/44 /46 /45 /46	11	911109 911110(2221) 911111(2359) 911112(1320)	60.1	60.1	60.35 60.4 60.4
40.630/38 /35	11	910715 911111(2317)	59.9	59.9	59.85

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

-----River Mile-----					
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
¹ 40.630/62 /65 /66	11	911109 911112(0028) 911113(1625)	60.1	60.1	60.8 60.8
40.710 /74 /72		911112(2315) 911113(2335)			63.8 63.85

¹- New Implants



BIO/WEST, Inc.

1063 West 1400 North
Logan, Utah 84321
(801) 752-4202

MEMORANDUM

TO: Grand Canyon Investigators
FROM: Rich Valdez
SUBJECT: Errata to Trip Report #11, 1991
DATE: December 11, 1991

Please note the following errors to entries in Trip Report #11, 1991.

Page 17 -- Entry #19 PIT_TAG should read "7F7F21747D^{Au}" not "7F7F21747DA"

Page 19 -- Entry #53 PIT_TAG should read "7F7E432B4B^{Du}" not "7F7E432B4B^{Au}"

Page 19 -- Entry #53 RM capture should read "63.8"

Page 20 -- Entry #69 PIT_TAG should read "7F7F21741B^{Au}" not "77F7F21741B"

Page 23 -- An additional foot note ^D should be included that reads Fish transfered to Arizona Game and Fish Department via helicopter for brood stock.



BIO/WEST Inc. 1992 RESEARCH TRIP SCHEDULE

TRIP NUMBER	MONTH	TRIP LENGTH	LAUNCH DATE	HIKE OUT DATE	TAKE OUT DATE
92-01	January	20-day	01/07	--	01/26
92-02	February	12-day	02/11	02/19	02-22
92-03	March	20-day	03/03	--	03/22
92-04	April	12-day	04/07	04/15	04/18
92-05	May	20-day	05/05	--	05/24
92-06	June	12-day	06/10	06/17	06/20
92-07	July	20-day	07/08	--	07/26
92-08	August	12-day	08/11	08/19	08/22
92-09	September	20-day	09/08	--	09/27
92-10	October	12-day	10/13	10/21	10/24
92-11	November	20-day	11/03	--	11/22
NO DECEMBER TRIP PLANNED					

• Biologists hike out at Bright Angel Trail