

**EFFECTS OF INTERIM FLOWS FROM GLEN CANYON DAM ON
THE AQUATIC RESOURCES OF THE LOWER COLORADO
RIVER FROM DIAMOND CREEK TO LAKE MEAD**

**Quarterly Report No. 7
(Trip No. 7: December 1-13, 1993)**

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INTRODUCTION

This report presents pertinent details associated with Trip 7, 1993 of the Hualapai Aquatic Resources Study. Included in the report are a summary of trip logistics, personnel, data collected, observations, and recommendations. Most information is presented in a tabular format to provide a quick synopsis of trip details and results. We emphasize that these data are hand tabulated and should be considered preliminary. The data will subsequently be computerized and checked for accuracy. The purpose of these trip reports is to provide information from BIO/WEST, Inc. trips as quickly as possible to aid other researchers.

LOGISTICS, RESEARCH SCHEDULE, AND PERSONNEL

Sampling during Trip 7 was conducted between Diamond Creek (river mile [RM] 225.7) and Scorpion Island (RM 279) on Lake Mead. Data were collected from December 1 through 12, 1993. Five campsites were established and sampling was conducted in the areas indicated in the schedule shown in Table 1. Sampling was also conducted in Diamond Creek near the launch site. The Colorado River near Travertine Falls was moderately swift and deep with fast runs and eddies. The river near Spencer Canyon had a slightly lower gradient, and was lined with vertical cliffs, talus slopes, and emergent shoreline vegetation. The river near the Bat Cave was slow with a greater degree of meandering, and banks were lined with dense stands of willows and other riparian vegetation. The campsite on Lake Mead was located on Scorpion Island adjacent to the river inflow. Data collection was conducted in the lower river from Emery Falls Canyon to (RM 274.7) to the vicinity of the Grand Wash Cliffs (RM 276.5). The river in this portion of the canyon was characterized by low water velocity, and banks were comprised of inundated riparian vegetation interspersed with travertine cliffs. Sampling was also collected in the large bay adjacent to Scorpion Island and east of Pearce Ferry.

Table 2 is a list of personnel who participated in research activities for Trip 7, 1993.

DATA COLLECTED

Fish

A summary of fish-sampling effort by gear type is presented in Table 3. Trammel nets and electrofishing (EL 220v DC) were employed in the main channel of the Colorado River and in Lake Mead. Overall, nets appeared to be a slightly more effective means of sampling adult fish than electrofishing. Backpack electrofishing, minnow trapping, and seining were only employed in tributaries. All three of the techniques were highly effective for collecting small fish species and juvenile individuals of larger species. However, in some cases large adult fish (primarily carp in deep pools) were observed in tributaries but eluded capture.

Multiple-pass sampling was again applied at two sites in Spencer Creek. Site 1, located near the confluence with the Colorado River, was about 30 m long with an average width of about 5 m. Site 2, located approximately 0.75 miles upstream of Site 1, was about 46 m long and 11 m wide. These two sampling sites correspond to those sampled during Trip 6. To preclude the escape of fish from the area being sampled, block nets were set at both the upstream and downstream ends of each site. Electrofishing (using a backpack electrofishing unit) was initiated at the downstream

end of the site and proceeded to the upstream block-net. This process was repeated three times, and fish captured on different passes were stored in separate containers.

Seining was conducted in Spencer Creek upstream of Site 2 (multiple-pass site) to evaluate whether or not exotic fish species abundance declined with increasing distance from the Colorado River. Sampling was conducted from about 100 m to 2.0 miles upstream of Site 2. All sampling locations were noted on a 7.5 minute USGS quadrangle map.

Fish species composition and abundance were similar to that reported for the previous sampling trip in September-October (Trip Report No. 6). Furthermore, catch rates were again very low in the main channel and relatively high in Spencer and Surprise Creeks. However, the following species captured during Trip 6 were not encountered during Trip 7: humpback chub, bluehead sucker, bluegill, and mosquitofish (Table 4). In contrast, largemouth bass and threadfin shad were captured during Trip 7 but not during the previous trip. Both of these species, however, have been captured by BIO/WEST during previous sampling trips. The two other major differences between Trips 7 and 6 were an observed decline in the abundance of flannemouth suckers and an apparent increase in the abundance of fathead minnows. The decline in flannemouth catch was due mainly to a decrease in the number of juveniles captured in Spencer Creek. Overall, there was a slight decline in the relative abundance of native species from 16 percent during Trip 6 to 10 percent during Trip 7. Razorback sucker (*Xyrauchen texanus*) were not captured or observed during Trip 7 or any previous trips.

Seining conducted in Diamond Creek near the confluence with the main channel produced only speckled dace. Although the lower portion of this stream appeared accessible to fish present in the main channel no exotic species were encountered. In contrast, seining conducted in Surprise Creek showed that very high densities of exotic fish were present. Red shiner and fathead minnow accounted for the majority of the individuals captured.

Sampling in Spencer Creek indicates that exotic fish species were only present in about the first mile (beginning at the confluence with the Colorado River) of stream. No exotic fish were captured beginning about 500 m above the upstream electrofishing station (Site 2). At this point, Spencer Creek is constricted for a distance of several meters and water velocities are high. Below this constriction exotic fish species, primarily red shiner were abundant (up to 250 per seine haul). Above this constriction, only speckled dace were captured. In fact, a seine haul conducted in one pool produced 174 adult speckled dace ranging in length from 70 to 95 mm. Actual densities of fish (m^2) and locations of capture will be provided in BIO/WEST's Final Report.

Of the two flannemouth suckers captured during Trip 7 only two were adults. A female captured at RM 230.7 was initially PIT-tagged during October, 1993. The location of recapture for this individual was 0.3 miles downstream from where it was originally captured. Measurements indicate that this fish increased in length (387 to 390 mm) and weight (491-515 g) between Trips 6 and 7. The other adult flannemouth sucker was captured along a travertine cliff immediately downstream of Emery Falls Canyon. The fish was PIT-tagged and released near the capture location. Adult flannemouth suckers have been captured in this location (RM 274-275) during several previous sampling trips. All other flannemouth suckers captured during Trip 7 were juveniles and were too small to be tagged. The following is a list of individual fish PIT-tagged during Trip 7.

PIT-tag	RM	TL (mm)	Weight (g)	Sex	Recapture
1F1F5B7077	230.7	390	515	F	Y
1F200C5065	274.4	412	679	F	N

Water Quality

Water quality parameters were measured with a Hydrolab Surveyor 3 at each campsite. This instrument recorded water temperature, pH, conductivity, and dissolved oxygen at 60-minute intervals. In addition, a Hydrolab DataSonde 2 was deployed in Spencer Creek. Parameters measured by this instrument were the same as those in the main channel, but only 5 hours of data were recorded.

Temperature data recorded by the three thermographs (Ryan Instruments Tempmentor: 2 in the main channel and 1 in Spencer Creek) were successfully downloaded during Trip 7. All thermographs were reset in their original locations (main channel at RM 229.7 and 246.0, and in Spencer Creek) and programmed to record at 30-minute intervals.

Temperatures recorded by the Surveyor 3 ranged from 8.7 to 9.6 °C in the Colorado River above Spencer Canyon. In Spencer Creek, temperatures were higher ranging from 14.4 to 16.0 °C during the five-hour period recorded by the DataSonde. Downstream of Spencer Creek main channel temperatures were slightly higher than those measured further upstream ranging from 10.0 to 10.6 °C. Finally, temperatures recorded in Lake Mead near Scorpion Island ranged from 9.8 to 10.6 °C.

Turbidity in the main channel was high for the duration of the trip; Secchi disk readings ranged from 0.05 to 0.40 m.

Primary/Secondary Productivity

One set of drift samples was collected in the Colorado River immediately upstream of the confluence with Spencer Creek. Stream benthos were collected with a Surber sampler in Diamond Creek, Travertine Falls Creek, and at the multiple-pass sites in Spencer Creek. In addition, six Hess samples were taken near the mouth (about the first 150 m) of Spencer Creek. Plankton tows and incidental algae and invertebrate sampling were conducted in the main channel, Spencer Creek, and Travertine Falls Creek.

River Stage Monitoring

Changes in stage were measured at three locations, and one new temporary benchmark (TBM) was established. River level was monitored at RM 230.5 (left), but strong current associated with an increase in flow moved the gauge during the night. A TBM was established and stage was monitored near the Spencer Creek camp (RM 245.9: left). Changes in stage were also monitored at the mouth of Spencer Creek (RM 246: left).

During Trip 7, measurements were taken along the two transects previously established (October 1993) at the confluence of Spencer Creek and the main channel. Depths and velocities were

measured at 1-foot intervals along these transects at two different main-channel flows. These measurements will be used to assess the impact of river fluctuations on habitat at the confluence.

Mapping

All sites seined in Spencer Creek were located on a 7.5 minute USGS quadrangle map.

OBSERVATIONS

1. Fish densities were again much greater in Spencer and Surprise Creeks than in the main channel of the Colorado River. Fish may be entering these streams in response to differences in water quality or food availability associated with the tributary inflows.
2. Few large fish and no piscivores were captured in Spencer Creek during Trip 7. However, a largemouth bass was observed in a large bedrock-formed pool about 0.75 miles upstream from the confluence. The majority of fish captured during multiple-pass sampling were red shiners and speckled dace.
3. Channel stability in Spencer Creek has increased dramatically since Trip 5 (this tributary was disturbed by a large flood event that occurred in early Spring, 1993). Bedload has declined substantially, and algal and associated invertebrate production have increased greatly as a result. During Trip 7 much of the braided area of Spencer Creek near the mouth was carpeted with the filamentous green alga *Cladophora*.

RECOMMENDATIONS

- Continue intensive sampling of Spencer Creek including multiple-pass and incidental fish sampling.
- Continue monitoring main-channel sites, particularly areas where native fish have been PIT-tagged.
- Continue to sample in Diamond Creek concentrating on the confluence with the main channel.
- Continue to sample the area where the humpback chub was collected and sample similar habitats in other locations.

Table 1. Dates, campsites, and sample locations for Trip No. 7, December 1 - 13, 1993.

Date	Camp Site	Sample Locations
Dec 1 - 4	Travertine Falls (RM 230.5)	RM 228.5 - 230.7
Dec 4 - 9	Spencer Creek (RM 246.0)	RM 242.5 - 249.1 including Spencer Creek (RM 246), Surprise Creek (RM 248.4), the mouth of Lost Creek (RM 248.9) and above Salt Creek (RM 253.2)
Dec 9 - 11	Near Bat Caves (RM 266)	RM 259.9 including mouth of Quartermaster Creek and main channel from RM 264.5 - 267
Dec 11 - 13	Scorpion Island (RM 279)	RM 274.7 - 279 including Lake Mead

RM = River Mile

Table 2. Personnel participating in Trip No. 7, December 1 - 13, 1993.

Personnel	Affiliation	DATES
Gloria Hardwick	BIO/WEST, Inc.	12/01 - 12/13
Randall Filbert	BIO/WEST, Inc.	12/01 - 12/13
Teresa Yates	BIO/WEST, Inc.	12/01 - 12/13
Rich Valdez	BIO/WEST, Inc.	12/11 - 12/13
Morris Sampson	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	12/01 - 12/13
Stan Dashee	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	12/01 - 12/13
Wallace Wilson	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	12/01 - 12/13
Ben Zimmerman	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	12/11 - 12/13
Bill Leibfried	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT and BIO/WEST	12/11 - 12/13
Steve Bledsoe	OARS	12/01 - 12/13
Stuart Reeder	OARS	12/01 - 12/13
Elizabeth Fuller	OARS	12/01 - 12/13

Table 3. Fish sample gears, codes, descriptions, and number of samples from the Lower Grand Canyon and Lake Mead.

SAMPLE GEAR CODE - DESCRIPTION	TOTAL NUMBER SAMPLES
Electrofishing	
EL - 220-v DC (Coffelt CPS)	25
EL - Backpack Coffelt	2 (multiple pass)
Trammel Nets	
Detail on types of trammels set will be included in final report	111
Minnow Traps	
MT - commercial minnow traps	25
Seines	
SA - 10'x3'x1/8" seine	10
Total	173

Table 4. Numbers of fish by species captured during Trip No. 7 in the Lower Grand Canyon and Lake Mead Inflow.

FAMILY COMMON NAME (Code)	SCIENTIFIC NAME	TOTAL CAPTURED
CYPRINIDAE (minnows)		
red shiner (RS)	<u>Cyprinella lutrensis</u>	3,064
fathead minnow (FH)	<u>Pimephales promelas</u>	857
common carp (CP)	<u>Cyprinus carpio</u>	17
speckled dace (SD)	<u>Rhinichthys osculus</u>	417
CATOSTOMIDAE (suckers)		
flannelmouth sucker (FM)	<u>Catostomus latipinnis</u>	6
PERCICHTHYIDAE (temperate basses)		
striped bass (SB)	<u>Morone saxatilis</u>	3
ICTALURIDAE (catfishes)		
channel catfish (CC)	<u>Ictalurus punctatus</u>	8
CYPRINODONTIDAE (killifish)		
plains killifish	<u>Fundulus zebrinus</u>	5
CENTRARCHIDAE (sunfishes)		
black crappie (BC)	<u>Pomoxis nigromaculatus</u>	2
largemouth bass (LB)	<u>Micropterus salmoides</u>	9
CLUPEIDAE		
threadfin shad	<u>Dorosoma petenense</u>	6
TOTAL		4,394