Arizona Game and Fish Department Native Fish Monitoring Trips 97-1 and 97-2 Report

14 - 20 February and 25 March - 4 April 1997

Timothy L. Hoffnagle, Mark J. Brouder, David W. Speas and William R. Persons

Grand Canyon Monitoring and Research Project
Research Branch
Arizona Game and Fish Department
2239 E. Cedar Ave.
Flagstaff, AZ 86004

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Unanticipated High Flow Trip (AGFD Trip 97-1): 14 - 20 February 1997

General Comments

The objective of Arizona Game and Fish Department (AGFD) Trip was to collect benthic invertebrates and sediment core samples from the six backwater, at river miles (RM) 44.27 L, 58.68 L, 60.85 L, 65.25 L, 117.00 R and 165.00 L, that were studied as part of the Experimental Beach/Habitat Building Flood and any additional backwaters encountered. Also, data were to be collected during the steady low 8,000 cfs flow before the unanticipated high (27,000 cfs) flow to give us baseline information to determine the effects of the unanticipated high flows of 1997. However, the steady low 8,000 cfs was not implemented and no baseline data were collected.

Data from sonic tag remote receiving stations (University of Arizona) were also downloaded from the Little Colorado River and Bright Angel Creek. These data are part of a research project examining the movements of flannelmouth suckers in the Glen and Grand Canyon reaches of the Colorado River.

Methods

The only samples collected during this trip were benthic invertebrate samples in backwaters. These samples were collected using a petite Ponar dredge and were collected from two locations within each backwater. Samples were then preserved in isopropanol for later examination in the laboratory.

Samples

Only three of the six backwaters, present throughout 1996 were still present during Trip 97-1, allowing benthic invertebrate and sediment core samples to be collected only from backwaters at RM 44.27 L, 60.85 L and 65.25 L. In addition to these backwaters, we collected benthic invertebrates and sediment core samples from 55.25 R (Kwagunt). Due to the unanticipated high flows of early 1997, the remaining three backwaters that we had planned to sample were either inundated (58.68 L; 165.00 L) or the reattachment bar had eroded (117.00 R).

Samples collected during this trip are being analyzed. Benthic invertebrate samples will be sorted into distinct taxonomic categories (usually to Family), dried, ashed and densities and biomass of each taxon will be calculated for each site. Sediment core samples will be analyzed and percentages of coarse and fine particulate organic matter (CPOM and FPOM), sand and silt will be calculated. These data will help determine long-term effects of the 1996 Experimental Flood on benthic invertebrates and sediment composition in backwaters.

Data from the sonic tag remote receiving stations were downloaded successfully. Minor routine maintenance was performed on each station by Michele Thieme.

Backwater Count

The four backwaters sampled were the only backwaters observed on this trip

Fish Collections

No fish or environmental data were collected on this trip.

Logistics

Personnel:

Biologists
Mark Brouder - AGFD
Dave Speas - AGFD
Michele Thieme - University of Arizona - hiked out South Kaibab (17 February)

Boatmen
Greg Williams (Humphrey's Summit Associates)

Support:

Support, in the form of a 22' snout and food was provided by PRO.

Campsites:

Date	Site	Location
14 February	Nautiloid Canyon	35 L
15 February	Tanner	68 R
16 February	Cremation	87 L
17 February	below Deer Creek	137 L
18 February	Whitmore Wash	188 R
19 February	Diamond Creek	225 L
20 February	take out	

AGFD Fish Monitoring Trip 97-2: 25 March - 4 April 1997

General Comments

A total of 162 samples was taken, from RM 30.30 - 156.93 (Table 1; Table 2 provides a list of all codes used in Table 1 and subsequent tables). These included three winged hoop net sets in tributary mouths, 59 minnow trap sets, 49 trammel net sets and 42 electrofishing runs (Table 3). The number of sites sampled in each reach ranged from 0 - 79 (Reach 1, 0 sites; Reach 2, 16 sites; Reach 3, 79 sites; Reach 4, 22 sites; Reach 5, 12 sites; Reach 6, 0 sites; Reach 7, 21 sites; Reach 8, 0 sites) and 12 tributary sites. Figure 1 shows the major tributaries and boundaries of AGFD sampling reaches in the Colorado River, Grand Canyon. In tributaries (Shinumo, Kanab and Havasu Creeks), a winged hoop net was set to capture all fish entering the mouth of the tributary at night. Groups of five minnow traps were also set further upstream in the tributaries to capture small fishes inhabiting these streams: two in Shinumo Creek, four in Kanab Creek and three in Havasu Creek. Electroshocking, minnow trapping and trammel netting duties were turned over to the Hualapai Department of Natural Resources at National Canyon (RM 166.5; Reach 7). No backwaters were sampled during this trip.

Methods

Each sample was given a distinctive study number and location (river mile and side) and time of the sample were recorded for each sample. Data collected at each sampling site included habitat information and fish collection data.

Habitat information collected at each site first included an estimation of river discharge and flow stage (steady high, steady low, ascending, or descending) and classifications of general habitat, the specific site and ambient light (see Table 2). Temperature (°C), dissolved oxygen (% saturation and mg/L), specific conductance (µS/cm), pH and redox (mV) were measured using a HydroLab H20 and recorded. Turbidity (NTU) was measured using a Hach Nephelometer and recorded. Minnow trap and electrofishing samples were done along specific shoreline types, talus, vegetation, or debris fans, which was recorded.

Fish collection data included a determination of effort: time (electrofishing, minnow traps, hoop nets and trammel nets) or area (seining). Each fish caught was identified to species, measured for total length (and standard length for humpback chub) and weighed (tenths of grams for small fish (>10 g) and whole grams for larger fish). Sex and maturity was determined, if possible. All native fish >150 mm were checked for the presence of a PIT tag and those without PIT tags were implanted with one. All PIT tag numbers were recorded and notation made as to whether this was a mark or recapture. Notations were made concerning any samples collected from the fish (i.e., fin clips for genetic research). All fish were examined for the presence of the external parasite, *Lernea* sp. Numbers of these parasites, if found, were recorded. Lastly, we recorded the disposition of the fish, usually released alive.

Environmental Conditions

Mainstem

Glen Canyon Dam discharge during this trip was relatively steady at approximately 23,000 cfs. Temperature in the mainchannel ranged from 8.8°C in Reach 2 to 10.4°C in Reach 7. Turbidity was low in the mainchannel above the LCR, ranging from 3.4 - 16.0 NTU. However, the LCR was flowing above base discharge and was very turbid, increasing mainchannel Colorado River turbidity as high as 234 NTU in Reach 3, decreasing downstream to as low as 39.6 NTU in Reach 7. No backwaters were sampled during this trip.

Tributaries

Three tributaries were sampled during this trip: Shinumo Creek (RM 108.6 R), Kanab Creek (RM 143.5 R) and Havasu Creek (RM 156.93 L). Stream discharge in Shinumo Creek was above base flow at 73 cfs on 31 March 1997. Stream discharges in Kanab and Havasu Creeks was near base flow: 2 cfs on 2 April 1997 in Kanab Creek and 52 cfs on 3 April 1997 in Havasu Creek. Temperatures in these streams were cool, with mean temperatures ranging from 11.8°C in Kanab Creek to 14.4°C in Havasu Creek. Turbidities in these streams were moderate, ranging from a mean of 39.85 NTU in Shinumo Creek to 26.60 NTU in Havasu Creek. A summary of water quality data by reach/tributary and habitat is presented in Table 4.

Backwater Count

A total of only 19 backwaters was found on this trip, largely due to the steady high discharges since last fall (Table 5). More than half (10) of the available backwaters during this trip were found above the Little Colorado River, the area of the river with the lowest density of both native and exotic fishes.

Fish Collections

A total of 465 fish was captured using minnow traps, hoop nets, trammel nets and electroshocking (Table 6 provides common and scientific names of native and common exotic fishes in the Colorado River and tributaries in Grand Canyon). Rainbow trout was the most common fish caught, comprising 46.0% of the catch. The most numerous native fish in our samples was flannelmouth sucker, comprising 13.8% of the catch. Humpback chub comprised only 2.8% of the captures with 13 individuals caught. All of the humpback chub were caught in Reaches 2, 3 and 4. Bluehead suckers and speckled dace comprised 2.8% and 3.4% of the catch, respectively. Fathead minnow comprised 26.5% of the catch. Other species caught include brown trout, channel catfish, common carp and red shiner. Table 7 summarizes the number and composition of the catch. Total catch and catch-per-unit-effort (CPUE) for minnow traps, trammel nets, electroshocking and hoop nets are summarized by reach in Tables 8 - 11. No

backwaters were sampled on this trip, so all captures came from either the mainchannel Colorado River or one of its tributaries.

Juvenile fish were uncommon in our catches, although some age 1 fish were captured. Most of the fish in our catch were adults. Figures 2 and 3 illustrate the length frequency distributions for native and commonly caught exotic fishes, respectively, captured during this trip. Table 12 gives the mean, minimum and maximum lengths and weights for each species captured in each reach. Table 13 gives the PIT tag number and the capture location and size of all fish implanted with a PIT during this trip. Table 14 gives the PIT tag number, present and previous capture locations and dates and length and weight of fish at present and previous captures for fish recaptured on this trip. All lengths reported are total length, unless otherwise specified.

Native Fish

Bluehead sucker (*Catostomus discobolus*)

Thirteen bluehead suckers were caught from RM 62.19 - 126.1 (Reaches 3, 4 and 7). Only one of 22 (4.5%) bluehead suckers >150 mm captured on this trip already had a PIT tag implanted.

Two bluehead suckers (236 - 239 mm, 128 - 149 g) were caught in Reach 3. In each of Reaches 4 and 7, only one bluehead sucker (324 mm; 331 g and 245 mm; 158 g, respectively) was captured.

Bluehead suckers were caught in hoop nets in Kanab and Havasu Creeks. In Kanab Creek, eight bluehead suckers were caught, ranging in size from 169 - 284 mm and 43 - 296 g. Many bluehead suckers were also seen as far as 1.5 km upstream in Kanab Creek. One observation was made of spawning activity, but in general, the movement of the fish seemed unorganized, as if the spawning season had not yet begun in earnest. Only one bluehead sucker (109 mm; 10.6 g) was caught in a minnow trap in Havasu Creek.

Flannelmouth sucker (*Catostomus latipinnis*)

Sixty-four flannelmouth suckers were caught from RM 52.68 - 107.96 (Reaches 2 - 5) and in the mouths of Kanab and Havasu Creeks. Of the 62 captured flannelmouth suckers >150 mm, 16 (25.8%) already had a PIT tag implanted.

Three flannelmouth suckers were captured in the lower sections of Reach 2, ranging in size from 402 - 525 mm and 682 - 1220 g. In Reach 3, six flannelmouth suckers were captured (435 - 545 mm; 570 - 1838 g). One flannelmouth sucker was captured in each of Reaches 4 (177 mm; 45 g) and 5 (448 mm; 920 g).

Flannelmouth suckers were also captured in Havasu and Kanab Creeks. Thirty-one flannelmouth suckers (213 - 540 mm, 98 - 1360 g) were captured in the hoop net set in the mouth of Kanab Creek. We also saw a school of approximately 14 flannelmouth suckers in a pool approximately 250 m upstream from the mouth of Kanab Creek and several dead flannelmouth suckers further upstream. From this evidence, it appears that we may have arrived at Kanab Creek near the end of the spawning season for flannelmouth suckers. We captured 22 flannelmouth suckers (229 - 435 mm; 504 - 995 g) in the hoop net in the mouth of Havasu Creek, eight of which were tuberculate, ripe, or spent. We also observed large schools of flannelmouth suckers in the spawning area above the narrows (approximately 50 m from mouth). It appears

that spawning may also have been in progress in Havasu Creek. No flannelmouth suckers were captured in Shinumo Creek.

Humpback chub (*Gila cypha*)

Thirteen humpback chubs were caught on Trip 97-2, from RM 62.45 - 68.29 (Reaches 3 and 4). All seven humpback chubs >150 mm captured on this trip already had been previously PIT tagged.

Only one humpback chub (365 mm; 485 g) was caught in the lower part of Reach 2. In Reach 3, eight humpback chubs were captured, ranging in size from 76 - 368 mm and 3.7 - 430 g. In Reach 4, four humpback chubs (61 - 79 mm, 1.6 - 4.2 g) were caught.

Speckled dace (*Rhinichthys osculus*)

Sixteen speckled dace were caught from RM 62.63 - 143.20, Reaches 3 and 7. They were also caught in Kanab and Havasu Creeks.

Two speckled dace were caught in Reach 3 (74 - 78 mm; 4.8 - 5.4 g). In Reach 7, two speckled dace were also captured (56 - 72 mm; 3.8 g)

Four speckled dace (58 - 94 mm; 1.5 - 7.0 g) were captured in Kanab Creek. In Havasu Creek, eight speckled dace were captured, ranging in size from 69 - 88 mm and 2.8 - 8.2 g.

Nonnative Fish

Fathead minnow (*Pimephales promelas*)

A total of 123 fathead minnows was caught from RM 61.53 - 107.96 (Reaches 3, 4 and 5), but were most commonly captured in Reach 3. They were also caught in Kanab Creek.

In Reach 3, 110 fathead minnows (26 - 86 mm; 0.4 - 6.1 g) were captured. In Reach 4, five fathead minnows (49 - 72 mm; 1.4 - 3.2 g) were captured and two (50 - 62 mm; 1.4 - 2.4 g) were captured in Reach 5.

In Kanab Creek, five fathead minnows were caught in the minnow traps. These fish ranged in size from 51 - 71 mm and 1.2 - 4.0 g.

Rainbow trout (*Oncorhynchus mykiss*)

Rainbow trout were the most commonly captured species, with 214 caught in Reaches 2, 3, 4, 5 and 7 (RM 30.25 - 127.10). They were also caught in the mouths of Shinumo, Kanab and Havasu Creeks.

Thirty-three rainbow trout were caught in Reach 2. These fish ranged in size from 262 - 406 mm and 201 - 673 g. In Reach 3, 104 rainbow trout were captured, ranging from 132 - 484 mm and 22.5 - 757 g. Thirty-five rainbow trout (49 - 425 mm; 1.3 - 570 g) were caught in Reach 4. A total of nine rainbow trout (212 - 406 mm; 72 - 483 g) was caught in Reach 5. In Reach 7, 19 rainbow trout (195 - 475 mm; 70 - 868 g) were captured.

Six rainbow trout (45 - 419 mm; 0.7 - 510 g) were caught in the hoop net and minnow traps in Shinumo Creek. One rainbow trout (241 mm, 142 g) was caught in the hoop net set in the mouth of Kanab Creek and four (44 - 175 mm; 0.9 - 1.4 g) in the mouth of Havasu Creek. Rainbow trout were also observed guarding redds in a pool just above the mainstem in Royal Arch Creek (Elves Chasm; RM 116.5).

Plains Killifish (*Fundulus zebrinus*)

No plains killifish were captured in the mainstem Colorado River or tributaries on this trip.

Common Carp (*Cyprinus carpio*)

Common carp were captured in low numbers in Reaches 3, 4 and 7 (from RM 62.45 - 126.6). No carp were captured in any of the sampled tributaries.

In Reach 3, six carp (105 - 379 mm, 16.6 - 66.0 g) were captured. One carp (189 mm; 63 g) was caught in Reach 4 and two carp (540 mm ; one not measured) were caught in Reach 7.

Other Species

Three other species were captured during this trip. Two brown trout were caught in Reach 4. These fish ranged from 371 - 424 mm and 538 - 810 g. Five brown trout (145 - 318 mm; 29 - 245 g) were captured in Reach 5. In Reach 7, three brown trout were captured, ranging from 183 - 312 mm and 54 - 249 g. One channel catfish was captured at RM 30.85 (Reach 2). This fish was 445 mm in total length and weighed 820 g. Lastly, two red shiners (46 - 49 mm; 0.9 - 1.2 g) were captured in Reach 3 (RM 63.15 - 65.12).

Interestingly, green sunfish were neither captured nor observed (in the lower 1.5 km) in Kanab Creek. These fish had invaded Kanab Creek in 1995 and were very common in 1996. It is possible that a flood flushed them from the lower reaches of Kanab Creek during the winter (1996/1997).

Parasitological Sampling

All fish captured were examined externally for infection by *Lernea* sp. (Copepoda). Six fish (1.3%) were found to be infected: one (1.6%) flannelmouth sucker, three (23.1%) humpback chub and two (1.6%) fathead minnows (Table 15). As many as four *Lernea* sp. were found on a single fish (humpback chub).

Fish were also collected by Drs. Mike and Marlis Douglas (ASU) from the mainstem Colorado River and several tributaries. These fish will be sampled for *Bothriocephalus acheilognathi* (Cestoda) in addition to their use in genetic studies.

Logistics

Personnel:

Biologists

Tim Hoffnagle - AGFD - hiked out Havasu Creek (3 April)
Mark Brouder - AGFD - hiked out Havasu Creek (3 April)
Dave Speas - AGFD
Bill Persons - AGFD - hiked in Bright Angel (30 March)
Mike Douglas - ASU
Marlis Douglas - ASU
Ross Timmons - AGFD Volunteer

Boatmen

Greg Williams - netting sportboat
Lars Niemi - shocking sportboat
Dan Dierker - HDNR 33' boat
Steve Bledsoe - GCMRC 32' snout

Support:

Support provided by GCMRC for this trip included a 32' snout for personal gear and the kitchen and one Achilles research craft, rigged for electroshocking. The Hualapai Department of Natural Resources supplied a 33' boat for sampling gear and one Achilles research craft for netting/backwater work. The two Achilles and the HDNR boat were turned over to the HDNR crew at Havasu Creek. Food was provided by PRO.

Campsites:

Date	Site	Location
25 March	South Canyon	30.29 R
26 March	LCR Point	61.3 R
27 March	LCR Point	61.3 R
28 March	Carbon Creek	64.7 R
29 March	Tanner	68.4 R
30 March	Bass	108.20 R
31 March	Randy's Rock	126.37 R
1 April	Kanab Creek	143.31 L
2 April	Last Chance (above Havasu)	155.6 R
3 April	RM 211	211.5 R
4 April	take out - Diamond Creek	225.6

Table 1. List of sample sites and their time conducted and location on the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997. River mile is distance downstream from Lee's Ferry or distance (meters) upstream from mouth for tributaries. Units of effort vary with gear type: seine effort is in m^2; minnow traps, hoop nets and trammel nets are in hours; electroshocking is in minutes. Note: codes used in Table 1 are referenced in Table 2.

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972101	N	MAIN	CR2	30.84	R	SH	23000	25 MAR 97	25 MAR 97	TM	2.92
3972102	N	MAIN	CR2	30.87	R	SH	23000	25 MAR 97	25 MAR 97	TN	1.79
3972103	N	MAIN	CR2	30.46	R	SH	23000	25 MAR 97	25 MAR 97	TK	1.9
3972104	N	MAIN	CR2	30.47	R	SH	23000	25 MAR 97	25 MAR 97	TK	1.64
3972301	E	MAIN	CR2	30.25	R	SH	24000	25 MAR 97	.	EL	409
3972302	E	MAIN	CR2	31.30	R	SH	24000	25 MAR 97	.	EL	280
3972501	T	MAIN	CR2	30.31	L	SH	23000	25 MAR 97	26 MAR 97	MT	14.67
3972502	T	MAIN	CR2	30.47	R	SH	23000	25 MAR 97	26 MAR 97	MT	13.85
3972503	T	MAIN	CR2	30.82	R	SH	23000	25 MAR 97	26 MAR 97	MT	14.5
3972105	N	MAIN	CR2	30.87	R	SH	23000	26 MAR 97	26 MAR 97	TN	2.17
3972106	N	MAIN	CR2	30.62	R	SH	23000	26 MAR 97	26 MAR 97	TK	2.2
3972107	N	MAIN	CR2	30.47	R	SH	23000	26 MAR 97	26 MAR 97	TK	2.1
3972108	N	MAIN	CR2	58.68	R	SH	23000	26 MAR 97	26 MAR 97	TM	2.05
3972109	N	MAIN	CR2	52.68	R	SH	23000	26 MAR 97	26 MAR 97	TL	1.93
3972110	N	MAIN	CR3	61.53	L	SH	23000	26 MAR 97	26 MAR 97	TL	2.08
3972111	N	MAIN	CR3	61.83	L	SH	23000	26 MAR 97	26 MAR 97	TL	2.02
3972303	E	MAIN	CR3	62.05	R	SH	23000	26 MAR 97	.	EL	501
3972304	E	MAIN	CR3	62.15	R	SH	23000	26 MAR 97	.	EL	200
3972305	E	MAIN	CR3	62.25	R	SH	23000	26 MAR 97	.	EL	305

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972306	E	MAIN	CR3	62.45	R	SH	23000	26 MAR 97	.	EL	392
3972307	E	MAIN	CR3	62.6	R	SH	23000	26 MAR 97	.	EL	322
3972504	T	MAIN	CR3	61.7	L	SH	23000	26 MAR 97	27 MAR 97	MT	15.17
3972505	T	MAIN	CR3	62.2	R	SH	23000	26 MAR 97	27 MAR 97	MT	16.08
3972506	T	MAIN	CR3	62.45	R	SH	23000	26 MAR 97	27 MAR 97	MT	16
3972507	T	MAIN	CR3	62.63	R	SH	23000	26 MAR 97	27 MAR 97	MT	16.42
3972508	T	MAIN	CR3	62.74	R	SH	23000	26 MAR 97	27 MAR 97	MT	16.33
3972509	T	MAIN	CR3	63.13	R	SH	23000	26 MAR 97	27 MAR 97	MT	16.59
3972510	T	MAIN	CR3	63.35	R	SH	23000	26 MAR 97	27 MAR 97	MT	16.57
3972511	T	MAIN	CR3	63.42	L	SH	23000	26 MAR 97	27 MAR 97	MT	16.8
3972512	T	MAIN	CR3	63.484	L	SH	23000	26 MAR 97	27 MAR 97	MT	17.4
3972513	T	MAIN	CR3	64.12	R	SH	23000	26 MAR 97	27 MAR 97	MT	17.71
3972514	T	MAIN	CR3	65.12	L	SH	23000	26 MAR 97	27 MAR 97	MT	18.25
3972515	T	MAIN	CR3	63.48	R	SH	23000	26 MAR 97	27 MAR 97	MT	17.08
3972112	N	MAIN	CR2	58.68	R	SH	23000	27 MAR 97	27 MAR 97	TM	2.04
3972113	N	MAIN	CR2	58.2	R	SH	23000	27 MAR 97	27 MAR 97	TL	2
3972114	N	MAIN	CR3	61.53	L	SH	23000	27 MAR 97	27 MAR 97	TL	2
3972115	N	MAIN	CR3	61.83	L	SH	23000	27 MAR 97	27 MAR 97	TL	2
3972116	N	MAIN	CR3	62.03	R	SH	23000	27 MAR 97	27 MAR 97	TL	1.87
3972117	N	MAIN	CR3	62.08	R	SH	23000	27 MAR 97	27 MAR 97	TK	1.89
3972118	N	MAIN	CR3	62.19	R	SH	23000	27 MAR 97	27 MAR 97	TK	1.88
3972119	N	MAIN	CR3	62.21	R	SH	23000	27 MAR 97	27 MAR 97	TN	1.94

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972123	N	MAIN	CR3	62.21	R	SH	23000	27 MAR 97	27 MAR 97	TN	2.05
3972308	E	MAIN	CR3	65.2	L	SH	23000	27 MAR 97	.	EL	1638
3972309	E	MAIN	CR3	65.15	R	SH	23000	27 MAR 97	.	EL	341
3972310	E	MAIN	CR3	62.65	L	SH	23000	27 MAR 97	.	EL	166
3972311	E	MAIN	CR3	63.15	R	SH	23000	27 MAR 97	.	EL	769
3972312	E	MAIN	CR3	63.4	L	SH	23000	27 MAR 97	.	EL	621
3972313	E	MAIN	CR3	63.55	L	SH	23000	27 MAR 97	.	EL	425
3972314	E	MAIN	CR3	62.2	R	SH	23000	27 MAR 97	.	EL	305
3972315	E	MAIN	CR3	62.3	R	SH	23000	27 MAR 97	.	EL	256
3972516	T	MAIN	CR3	61.7	L	SH	23000	27 MAR 97	28 MAR 97	MT	24.82
3972517	T	MAIN	CR3	62.2	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.07
3972518	T	MAIN	CR3	62.45	R	SH	23000	27 MAR 97	28 MAR 97	MT	24.58
3972519	T	MAIN	CR3	62.63	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.41
3972520	T	MAIN	CR3	62.74	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.19
3972521	T	MAIN	CR3	63.13	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.01
3972522	T	MAIN	CR3	63.35	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.12
3972523	T	MAIN	CR3	63.42	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.1
3972524	T	MAIN	CR3	63.48	R	SH	23000	27 MAR 97	28 MAR 97	MT	25.1
3972525	T	MAIN	CR3	63.55	L	SH	23000	27 MAR 97	28 MAR 97	MT	25.08
3972526	T	MAIN	CR3	62.92	R	SH	23000	27 MAR 97	28 MAR 97	MT	25
3972527	T	MAIN	CR3	65.12	L	SH	23000	27 MAR 97	28 MAR 97	MT	25.29
3972120	N	MAIN	CR3	62.03	R	SH	23000	28 MAR 97	28 MAR 97	TL	1.96

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972121	N	MAIN	CR3	62.08	R	SH	23000	28 MAR 97	28 MAR 97	TK	1.99
3972122	N	MAIN	CR3	62.19	R	SH	23000	28 MAR 97	28 MAR 97	TK	2.02
3972124	N	MAIN	CR3	65.24	L	SH	23000	28 MAR 97	28 MAR 97	TM	1.94
3972125	N	MAIN	CR3	64.81	L	SH	23000	28 MAR 97	28 MAR 97	TL	2.03
3972126	N	MAIN	CR3	64.45	L	SH	23000	28 MAR 97	28 MAR 97	TL	2.02
3972127	N	MAIN	CR3	64.5	R	SH	23000	28 MAR 97	28 MAR 97	TN	1.87
3972316	E	MAIN	CR3	61.85	L	SH	23000	28 MAR 97	.	EL	278
3972317	E	MAIN	CR3	64.15	R	SH	23000	28 MAR 97	.	EL	493
3972318	E	MAIN	CR3	64.55	L	SH	23000	28 MAR 97	.	EL	279
3972319	E	MAIN	CR3	65	L	SH	23000	28 MAR 97	.	EL	665
3972320	E	MAIN	CR3	65.1	L	SH	23000	28 MAR 97	.	EL	746
3972321	E	MAIN	CR3	65.2	L	SH	23000	28 MAR 97	.	EL	149
3972322	E	MAIN	CR3	65.15	R	SH	23000	28 MAR 97	.	EL	526
3972528	T	MAIN	CR3	61.7	R	SH	23000	28 MAR 97	29 MAR 97	MT	24.08
3972530	T	MAIN	CR3	62.45	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.6
3972531	T	MAIN	CR3	62.63	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.62
3972532	T	MAIN	CR3	62.74	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.4
3972533	T	MAIN	CR3	63.13	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.32
3972534	T	MAIN	CR3	63.35	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.39
3972535	T	MAIN	CR3	63.42	L	SH	23000	28 MAR 97	29 MAR 97	MT	23.53
3972536	T	MAIN	CR3	63.48	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.48
3972537	T	MAIN	CR3	63.55	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.59

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972538	T	MAIN	CR3	64.12	R	SH	23000	28 MAR 97	29 MAR 97	MT	23.67
3972539	T	MAIN	CR3	65.12	L	SH	23000	28 MAR 97	29 MAR 97	MT	23.41
3972529	T	MAIN	CR3	62.2	R	SH	23000	28.2 MAR 97	29 MAR 97	MT	23.76
3972128	N	MAIN	CR3	65.24	L	SH	23000	29 MAR 97	29 MAR 97	TM	2
3972129	N	MAIN	CR3	64.45	L	SH	23000	29 MAR 97	29 MAR 97	TL	2.02
3972130	N	MAIN	CR3	64.5	R	SH	23000	29 MAR 97	29 MAR 97	TN	1.99
3972131	N	MAIN	CR4	68.41	L	SH	23000	29 MAR 97	29 MAR 97	TL	1.85
3972132	N	MAIN	CR4	68.39	R	SH	23000	29 MAR 97	29 MAR 97	TL	1.83
3972133	N	MAIN	CR4	68.05	L	SH	23000	29 MAR 97	29 MAR 97	TN	1.92
3972134	N	MAIN	CR4	68.09	R	SH	23000	29 MAR 97	29 MAR 97	TM	1.86
3972323	E	MAIN	CR3	63.35	R	SH	23000	29 MAR 97	.	EL	387
3972324	E	MAIN	CR3	63.28	L	SH	23000	29 MAR 97	.	EL	148
3972325	E	MAIN	CR3	63.3	L	SH	23000	29 MAR 97	.	EL	98
3972326	E	MAIN	CR3	63.25	R	SH	23000	29 MAR 97	.	EL	476
3972327	E	MAIN	CR4	67.3	R	SH	23000	29 MAR 97	.	EL	502
3972328	E	MAIN	CR4	67.7	R	SH	23000	29 MAR 97	.	EL	521
3972329	E	MAIN	CR4	67.8	L	SH	23000	29 MAR 97	.	EL	523
3972330	E	MAIN	CR4	68.1	R	SH	23000	29 MAR 97	.	EL	762
3972331	E	MAIN	CR4	68.25	R	SH	23000	29 MAR 97	.	EL	449
3972540	T	MAIN	CR4	66.81	L	SH	23000	29 MAR 97	30 MAR 97	TM	19.02
3972541	T	MAIN	CR4	67	L	SH	23000	29 MAR 97	30 MAR 97	MT	18.88
3972542	T	MAIN	CR4	67.75	R	SH	23000	29 MAR 97	30 MAR 97	MT	18.84

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972543	T	MAIN	CR4	67.9	L	SH	23000	29 MAR 97	30 MAR 97	MT	18.61
3972544	T	MAIN	CR4	68.09	L	SH	23000	29 MAR 97	30 MAR 97	MT	18.68
3972545	T	MAIN	CR4	68.29	L	SH	23000	29 MAR 97	30 MAR 97	MT	18.7
3972135	N	MAIN	CR4	68.41	L	SH	23000	30 MAR 97	30 MAR 97	TL	2.02
3972136	N	MAIN	CR4	68.39	R	SH	23000	30 MAR 97	30 MAR 97	TL	2.05
3972137	N	MAIN	CR4	68.05	L	SH	23000	30 MAR 97	30 MAR 97	TN	2.02
3972138	N	MAIN	CR4	68.09	R	SH	23000	30 MAR 97	30 MAR 97	TM	2.12
3972139	N	MAIN	CR5	108.49	R	SH	23000	30 MAR 97	30 MAR 97	TN	2.02
3972140	N	MAIN	CR5	107.96	L	SH	23000	30 MAR 97	30 MAR 97	TL	2.1
3972141	N	MAIN	CR5	107.97	L	SH	23000	30 MAR 97	30 MAR 97	TL	2.12
3972142	N	MAIN	CR5	107.95	R	SH	23000	30 MAR 97	30 MAR 97	TL	1.81
3972332	E	MAIN	CR4	68.1	L	SH	23000	30 MAR 97	.	EL	317
3972333	E	MAIN	CR4	68.3	L	SH	23000	30 MAR 97	.	EL	501
3972334	E	MAIN	CR4	68.45	L	SH	23000	30 MAR 97	.	EL	272
3972335	E	MAIN	CR5	107.96	R	SH	23000	30 MAR 97	.	EL	590
3972336	E	MAIN	CR5	108.13	R	SH	23000	30 MAR 97	.	EL	614
3972546	T	MAIN	CR5	108.29	L	SH	23000	30 MAR 97	31 MAR 97	MT	15.8
3972547	T	MAIN	CR5	108.12	L	SH	23000	30 MAR 97	31 MAR 97	MT	15.48
3972548	T	MAIN	CR5	107.9	L	SH	23000	30 MAR 97	31 MAR 97	MT	15.18
3972549	T	MAIN	CR5	108.51	R	SH	23000	30 MAR 97	31 MAR 97	MT	15.36
3972550	T	MAIN	CR5	108.52	R	SH	23000	30 MAR 97	31 MAR 97	MT	16.22
3972551	H	TRIB	SHM	10		SH	73	30 MAR 97	31 MAR 97	HW	15.12

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972552	T	TRIB	SHM	50		SH	73	30 MAR 97	31 MAR 97	MT	15.55
3972553	T.	TRIB	SHM	60		SH	73	30 MAR 97	31 MAR 97	MT	15.06
3972143	N	MAIN	CR7	126.1	L	SH	23000	31 MAR 97	31 MAR 97	TL	2.03
3972144	N	MAIN	CR7	126.15	R	SH	23000	31 MAR 97	31 MAR 97	TL	2.25
3972145	N	MAIN	CR7	126.5	R	SH	23000	31 MAR 97	31 MAR 97	TN	2.4
3972146	N	MAIN	CR7	127.05	L	SH	23000	31 MAR 97	31 MAR 97	TN	1.48
3972337	E	MAIN	CR7	125.9	R	SH	23000	31 MAR 97	.	EL	414
3972338	E	MAIN	CR7	126.6	R	SH	23000	31 MAR 97	.	EL	327
3972339	E	MAIN	CR7	127.1	R	SH	23000	31 MAR 97	.	EL	366
3972554	T	MAIN	CR7	126.15	L	SH	23000	31 MAR 97	1 APR 97	MT	15.61
3972555	T	MAIN	CR7	126.09	L	SH	23000	31 MAR 97	1 APR 97	MT	16.2
3972556	T	MAIN	CR7	125.9	R	SH	23000	31 MAR 97	1 APR 97	MT	15.65
3972557	T	MAIN	CR7	126.58	R	SH	23000	31 MAR 97	1 APR 97	MT	15.76
3972558	T	MAIN	CR7	126.9	L	SH	23000	31 MAR 97	1 APR 97	MT	15.67
3972559	T	MAIN	CR7	126.93	R	SH	23000	31 MAR 97	1 APR 97	MT	15.67
3972560	T	MAIN	CR7	126.28	R	SH	23000	31 MAR 97	1 APR 97	MT	14.6
3972147	N	MAIN	CR7	126.1	L	SH	20000	1 APR 97	1 APR 97	TL	2.07
3972148	N	MAIN	CR7	126.15	L	SH	20000	1 APR 97	1 APR 97	TL	2
3972340	E	MAIN	CR7	125.9	R	SH	20000	1 APR 97	.	EL	255
3972341	E	MAIN	CR7	126.6	R	SH	20000	1 APR 97	.	EL	534
3972342	E	MAIN	CR7	127.05	R	SH	20000	1 APR 97	.	EL	512
3972561	T	MAIN	CR7	143.2	R	SH	21000	1 APR 97	2 APR 97	MT	20.45

Table 1 (cont'd).

Study	Sample Type	Habitat	Reach	River Mile	Side	Flow Stage	Estimated Discharge (cfs)	Set Date	Run Date	Gear Type	Effort
3972562	T	MAIN	CR7	143.3	R	SH	21000	1 APR 97	2 APR 97	MT	20.73
3972563	T	TRIB	KAN	200		SL	2	1 APR 97	2 APR 97	MT	17.24
3972564	T	TRIB	KAN	216		SL	2	1 APR 97	2 APR 97	MT	17.16
3972565	T	TRIB	KAN	175		SL	2	1 APR 97	2 APR 97	MT	15.97
3972566	T	TRIB	KAN	75	R	SL	2	1 APR 97	2 APR 97	MT	17.14
3972567	H	TRIB	KAN	0		SL	2	1 APR 97	2 APR 97	HW	16.06
3972568	H	TRIB	HAV	10		SL	52	2 APR 97	3 APR 97	HW	16.57
3972569	T	TRIB	HAV	100	L	SL	52	2 APR 97	3 APR 97	MT	17.15
3972570	T	TRIB	HAV	120	L	SL	52	2 APR 97	3 APR 97	MT	17.48
3972571	T	TRIB	HAV	120	R	SL	52	2 APR 97	3 APR 97	MT	16.92

Table 2. List of data codes used by AGFD during AGFD Monitoring Trip 97-2 (25 March - 4 April), 1997.

FISH COLLECTION FORM

SPECIES CODES

Common

BHS Bluehead Sucker
BNT Brown Trout
CCF Channel Catfish
CRP Common Carp
FHM Fathead Minnow
FMS Flannelmouth Sucker
HBC Humpback Chub
PKF Plains Killifish
RBT Rainbow Trout
RSH Red Shiner
SPD Speckled Dace
STB Striped Bass
NFC No fish captured

Uncommon

BBH Black Bullhead
BGS Bluegill
BKT Brook Trout
CUT Cutthroat Trout
FRX Flannelmouth Sucker x Razorback Sucker Hybrid
GSH Golden Shiner
GSF Green Sunfish
RBS Razorback Sucker
RSS Redside Shiner
SMB Smallmouth Bass
TFS Threadfin Shad
UTC Utah Chub
YBH Yellow Bullhead
SUC Sucker (unidentified)
WEP Walleye
UID Unidentified

MATURITY

0 Larval, Juvenile
1 Adult, Non-breeding
2 Gravid
3 Ripe (sperm or eggs flowing)
4 Spent
5 Tuberculate

TAG: MARKS/FIN CLIPS/PUNCHES

D Dorsal
UC Upper Caudal
LC Lower Caudal
CD Caudal
RP2 Right Pelvic
LP2 Left Pelvic
CWTA Coded Wire Tag in Adipose Fin
CWTN Coded Wire Tag in Nose

COLLECTIONS

GI Gastrointestinal Tract
HE Head
OP Opercle
OT Otolith
SC Scales
SP Spine
TS Tissue Sample

SEX

F Female
M Male
U Undetermined

DISPOSITION

RA Released Alive
MN Mortality, Not Preserved
MP Mortality, Preserved
SP Sacrificed, Preserved
DP Found Dead, Preserved

HABITAT DATA FORM

SAMPLE TYPE

A Type A
E Electrofishing
F Steady Flow Study Sample
H Hoop Net
L Larval Sample
N Trammel and Gill Nets
O Opportunistic
P Parasite
R Predator Removal
S Sonde Set
T Minnow Trap
Z Setlines

REACH CODES

Mainstem

CR1 Lee's Ferry (RM 0) to Shinumo Wash (RM 29.3)
CR2 Shinumo Wash to Little Colorado R. (RM 61.5)
CR3 LCR to Lava Chuar (RM 65.5)
CR4 Lava Chuar to Hance Rapid (RM 76.7)
CR5 Hance Rapid to Elves Chasm (RM 116.5)
CR6 Elves Chasm to 140 Mile Canyon (RM 140.0)
CR7 Forster Rapid to Hell's Hollow (RM 182.5)
CR8 Hell's Hollow to Diamond Creek (RM 225.6)
CR9 Diamond Creek to Lake Mead (~RM 277)

Tributaries

PAR Paria River (RM 0.9L)
NKW Nankoweap Creek (RM 52.2R)
LCR Little Colorado River (RM 61.5L)
CHU Chuar Cr. (RM 65.3R)
CLR Clear Cr. (RM 84.03R)
BAC Bright Angel Creek (RM 87.62R)
PIP Pipe Cr. (RM 88.95L)

REACH CODES (cont'd)

Tributaries (cont'd)

HER Hermit Cr. (RM 95.0L)
CRY Crystal Cr. (RM 98.04R)
SHM Shinumo Cr. (RM 108.6R)
ELV Elves Chasm (RM 116.5L)
STC Stone Cr. (RM 131.8R)
TAP Tapeats Cr. (RM 133.83R)
DRC Deer Cr. (RM 136.25R)
KAN Kanab Cr. (RM 143.5R)
OLO Olo Canyon (RM 145.5L)
HAV Havasu Cr. (RM 156.93L)
DIA Diamond Cr. (RM 225.6L)
TVT Travertine Cr. (RM 229.0)
SPN Spencer Cr. (RM 246.0)

FLOW CODES

AC Ascending
DC Descending
SH Stable High
SL Stable Low

HABITAT and SITE CODES

Connected Backwaters: CB

CB Connected Backwater
CF Connected Foot
CC Connected Center
CM Connected Mouth

Isolated Backwater: IB

IB Isolated Backwater

Mainchannel: MC

MC Mainchannel
ME Mainchannel Eddy
BE Backwater Eddy
CO Cove
SC Side Channel
SP Spring

HABITAT and SITE CODES (cont'd)

Tributaries: TM

TM Tributary Mouth
RU Run
RI Riffle
PO Pool
ED Eddy
SP Spring

GEAR CODES

BS Small Bag Seine 15' x 6' x 1/8" (1/32" bag mesh)
BL Large Bag Seine 30' x 6' x 1/4" (1/8" bag mesh)
SS Small Straight Seine
SX Straight Seine 50' x 6' x 3/16"
KS Kick Seine 3' x 3' x 1/32"
DN Dip Net
MH Mini-Hoop Net 1.5' x 4' x 3/8"
HN Hoop Net w/o wings 3' x 5 ' x 1/2"
HW Hoop Net w/ 40' wings 4' x 5' x 3/8"
BH Baited Hoop Net
MT Minnow Trap
BT Baited Minnow Trap
LD Larval Drift
LL Larval Light Trap
LT Larval Trap (acrylic)
AN Angling
BI Bi-directional Trapnet (In)
BO Bi-directional Trapnet (Out)
SD Sonde
EL Electrofishing
TK Trammel Net: 75' x 6' x 1" x 12"
TL Trammel Net: 75' x 6' x 1.5" x 12"
TM Trammel Net: 50' x 6' x 1" x 12"
TN Trammel Net: 50' x 6' x 1.5" x 12"
GN Gill Net
ST Setline
SG Spear Gun
BF Bowfishing

SUBSTRATE CODES

CL Clay
SI Silt
SA Sand
GR Gravel
PE Pebble
CO Cobble
BO Boulder
BD Bedrock
TR Travertine

SHORELINE TYPE

DF Debris Fan
TS Talus Slope
VG Vegetation

AMBIENT LIGHT

SU Sunny
PC Partly Cloudy (<50%)
MC Mostly Cloudy (50-95%)
OC Overcast (>95%)
SH Shade (PC or SU, otherwise)
DK Dusk
NI Night
ML Moonlight
DN Dawn

Table 3. Amount of collection effort expended by AGFD and number of sites in each reach and tributary with each gear type in the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Electroshocking (sec)		Trammel Nets (hr)		Minnow Traps (hr)				Hoop Nets (hr)	
	Mainchannel		Mainchannel		Mainchannel		Tributary		Tributary	
Reach/Tributary	Effort	Sites	Effort	Sites	Effort	Sites	Effort	Sites	Effort	Sites
Reach 2	689	2	22.73	11	43.02	3				
Reach 3	10486	24	37.52	19	784.02	36				
Reach 4	3847	8	15.65	8	112.73	6				
Reach 5	1204	2	10.06	5	78.04	5				
Shinumo Creek							30.61	2	15.12	1
Reach 7	2408	6	12.22	6	150.34	9				
Kanab Creek							67.51	4	16.06	1
Havasu Creek							51.55	3	16.57	1
Total	18634	42	98.18	49	1168.15	59	149.67	9	47.75	3

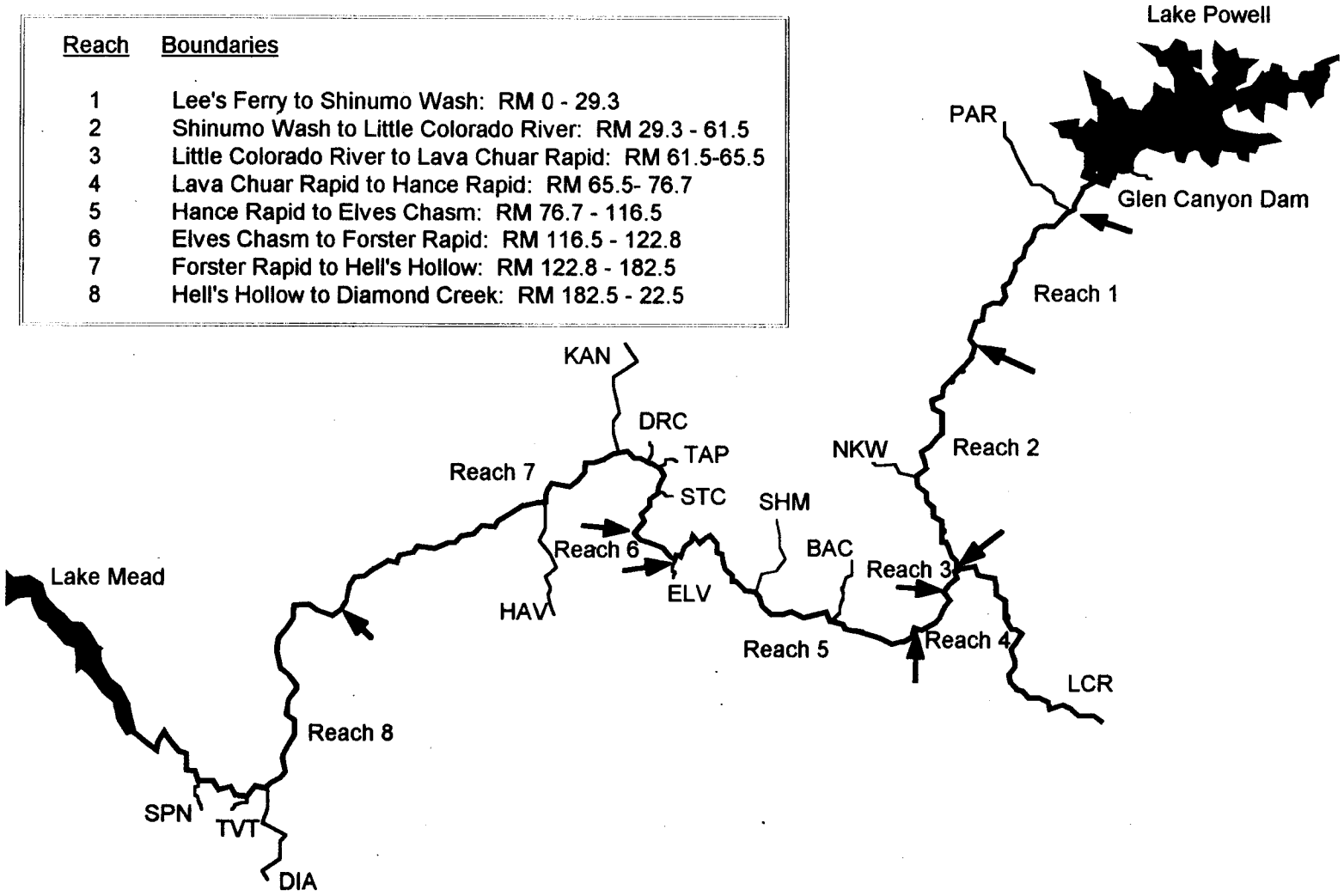

Figure 1. Tributaries and AGFD sampling reaches of the Colorado River, Grand Canyon, Arizona. Arrows denote reach boundaries. Tributary designation codes are provided in Table 2.

Table 4. Mean, minimum and maximum temperature, turbidity, specific conductance, dissolved oxygen, pH, redox potential, velocity and depth at sampling point of mainchannel and tributary habitats in each reach of the Colorado River and tributaries, Grand Canyon, Arizona, sampled during AGFD Monitoring Trip 97-2, 25 March - 4 April 1996.

		Temperature (°C)			Turbidity (NTU)			Specific Conductance (µS/cm)		
Reach/ Tributary	Habitat	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Reach 2	Mainchannel	9.14	8.8	9.9	5.74	3.4	16.0	624.5	597	635
Reach 3	Mainchannel	9.39	8.9	10.2	156.47	92.0	235.0	762.0	761	763
Reach 4	Mainchannel	9.49	9.0	10.3	73.08	48.5	76.0	687.0	687	687
Reach 5	Mainchannel	9.95	9.8	10.0	64.32	62.5	70.0	679.0	679	679
Shinumo Creek	Tributary	12.80	12.8	12.8	39.85	33.7	46.0	183.0	183	183
Reach 7	Mainchannel	10.29	10.2	10.4	47.29	39.5	52.0	685.6	678	691
Kanab Creek	Tributary	11.80	11.8	11.8	28.90	23.0	35.0	925.0	925	925
Havasu Creek	Tributary	14.40	14.4	14.4	26.60	25.0	28.1	581.5	582	582

Table 4 (cont'd).

Reach/ Tributary	Habitat	Dissolved Oxygen (mg/L)			pH			Redox Potential (mV)		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Reach 2	Mainchannel	11.90	11.7	12.3	7.97	7.9	8.1	301.6	286	354
Reach 3	Mainchannel	10.44	9.6	11.2	8.13	7.9	8.3	303.2	258	337
Reach 4	Mainchannel	9.83	9.6	13.1	8.20	8.2	8.2	319.2	308	323
Reach 5	Mainchannel	13.18	13.1	13.2	8.10	8.1	8.1	330.7	329	336
Shinumo Creek	Tributary	12.15	12.2	12.2	8.35	8.4	8.4	303.0	303	303
Reach 7	Mainchannel	13.02	12.9	13.1	8.21	8.1	8.3	307.2	305	309
Kanab Creek	Tributary	12.50	12.5	12.5	8.30	8.3	8.3	301.9	301	302
Havasu Creek	Tributary	11.45	11.5	11.5	8.35	8.3	8.4	302.0	302	302

Reach/ Tributary	Habitat	Velocity (cm/s)			Depth (cm)		
		Mean	Min.	Max.	Mean	Min.	Max.
Reach 2	Mainchannel						
Reach 3	Mainchannel						
Reach 4	Mainchannel						
Reach 5	Mainchannel						
Shinumo Creek	Tributary	13.3	1	30	69.6	23	123
Reach 7	Mainchannel						
Kanab Creek	Tributary	8.0	1	23	37.2	23	88
Havasu Creek	Tributary	12.7	2	39	61.5	23	190

Table 5. Number of backwaters counted in each reach during AGFD monitoring Trip 97-2, 25 March - 4 April 1997.

Reach	Boundaries (River Miles)	Boundaries (Landmarks)	Number of Backwaters
1	0 - 29.3	Lee's Ferry to Shinumo Wash	4
2	29.3 - 61.5	Shinumo Wash to Little Colorado River	6
3	61.5 - 65.5	Little Colorado River to Lava Chuar Rapid	1
4	65.5 - 76.7	Lava Chuar Rapid to Hance Rapid	3
5	76.7 - 116.5	Hance Rapid to Elve's Chasm	0
6	116.5 - 122.8	Elve's Chasm to Forster Rapid	1
7	122.8 - 182.5	Forster Rapid to Hell's Hollow	2
8	182.5 - 225.6	Hell's Hollow to Diamond Creek	2
Total			19

Table 6. Common and scientific names and families of native and commonly captured exotic fishes found in the Colorado River and tributaries in Grand Canyon.

Common Name	Scientific Name	Family
Native Species		
Bluehead Sucker	*Catostomus discobolus*	Catostomidae
Flannelmouth Sucker	*Catostomus latipinnis*	Catostomidae
Humpback Chub	*Gila cypha*	Cyprinidae
Speckled Dace	*Rhinichthys osculus*	Cyprinidae
Exotic Species		
Common Carp	*Cyprinus carpio*	Cyprinidae
Fathead Minnow	*Pimephales promelas*	Cyprinidae
Red Shiner	*Cyprinella lutrensis*	Cyprinidae
Plains Killifish	*Fundulus zebrinus*	Cyprinodontidae
Green Sunfish	*Lepomis cyanellus*	Centrarchidae
Striped Bass	*Morone saxatilis*	Percichthyidae
Channel Catfish	*Ictalurus punctatus*	Ictaluridae
Brown Trout	*Salmo trutta*	Salmonidae
Rainbow Trout	*Oncorhynchus mykiss*	Salmonidae

Table 7. Number and composition of catch in AGFD samples from backwater and mainchannel habitats in each reach and from tributaries of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Backwaters		Mainchannel		Tributary	
Reach/Species	N	%	N	%	N	%
Reach 2						
Flannelmouth Sucker			3	8.8		
Humpback Chub			1	2.9		
Channel Catfish			1	2.9		
Rainbow Trout			33	97.1		
Total			34			
Reach 3						
Bluehead Sucker			2	0.8		
Flannelmouth Sucker			6	2.5		
Humpback Chub			8	3.3		
Speckled Dace			2	0.8		
Common Carp			6	2.5		
Fathead Minnow			110	46.0		
Rainbow Trout			103	43.1		
Red Shiner			2	0.8		
Total			239			
Reach 4						
Bluehead Sucker			1	2.0		
Flannelmouth Sucker			1	2.0		
Humpback Chub			4	8.2		
Brown Trout			2	4.1		
Common Carp			1	2.0		
Fathead Minnow			5	10.2		
Rainbow Trout			35	71.4		
Total			49			
Reach 5						
Flannelmouth Sucker			1	5.9		
Brown Trout			5	29.4		
Fathead Minnow			2	11.8		
Rainbow Trout			9	52.9		

Table 7 (cont'd).

Reach/Species	Backwaters N	Backwaters %	Mainchannel N	Mainchannel %	Tributary N	Tributary %
Reach 5 (cont'd)						
Total			17			
Shinumo Creek						
Rainbow Trout					6	100.0
Total					6	
Reach 7						
Bluehead Sucker			1	3.7		
Speckled Dace			2	7.4		
Brown Trout			3	11.1		
Common Carp			2	7.4		
Rainbow Trout			19	70.4		
Total			27			
Kanab Creek						
Bluehead Sucker					8	16.3
Flannelmouth Sucker					31	63.3
Speckled Dace					4	8.2
Fathead Minnow					5	10.2
Rainbow Trout					1	2.0
Total					49	
Havasu Creek						
Bluehead Sucker					1	2.9
Flannelmouth Sucker					22	62.9
Speckled Dace					8	22.9
Rainbow Trout					4	11.4
Total					35	

Table 8. Total catch and mean catch-per-unit-effort for commonly captured species in AGFD minnow traps (CPUE = number of fish captured / 100 hours / group of 5 traps) in each reach of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Reach 2		Reach 3		Reach 4		Reach 5		Reach 7	
Species	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
Bluehead Sucker	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Flannelmouth Sucker	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Humpback Chub	0	0.00	1	0.03	4	0.71	0	0.00	0	0.00
Speckled Dace	0	0.00	1	0.02	0	0.00	0	0.00	1	0.11
Common Carp	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Fathead Minnow	0	0.00	18	0.43	0	0.00	0	0.00	0	0.00
Plains Killifish	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Rainbow Trout	0	0.00	1	0.03	0	0.00	0	0.00	0	0.00

Table 9. Total catch and mean catch-per-unit-effort for commonly captured species in AGFD trammel nets (CPUE = number of fish captured / 100 hours) in each reach of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Reach 2		Reach 3		Reach 4		Reach 5		Reach 7	
Species	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
Bluehead Sucker	0	0.00	2	3.08	1	3.14	0	0.00	1	4.94
Flannelmouth Sucker	3	7.19	5	7.30	0	0.00	0	0.00	0	0.00
Humpback Chub	1	2.47	5	7.44	0	0.00	0	0.00	0	0.00
Speckled Dace	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Common Carp	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Fathead Minnow	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Plains Killifish	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Rainbow Trout	9	24.21	23	35.54	16	56.08	0	0.00	0	0.00

Table 10. Total catch and mean catch-per-unit-effort for commonly captured species by AGFD electrofishing (CPUE = number of fish captured / 10 minutes) in each reach of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Reach 2		Reach 3		Reach 4		Reach 5		Reach 7	
Species	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
Bluehead Sucker	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Flannelmouth Sucker	0	0.00	1	0.01	1	0.03	1	0.09	0	0.00
Humpback Chub	0	0.00	2	0.02	0	0.00	0	0.00	0	0.00
Speckled Dace	0	0.00	1	0.01	0	0.00	0	0.00	1	0.04
Common Carp	0	0.00	6	0.06	1	0.03	0	0.00	2	0.10
Fathead Minnow	0	0.00	92	2.44	5	0.15	2	0.17	0	0.00
Plains Killifish	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Rainbow Trout	24	3.95	74	4.23	18	0.62	9	0.75	19	0.77

Table 11. Total catch and mean catch-per-unit-effort for commonly captured species in AGFD hoop nets and minnow traps (CPUE = number of fish captured / 100 hours / net) in each tributary of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Shinumo Creek				Kanab Creek				Havasu Creek			
	Minnow Traps		Hoop Nets		Minnow Traps		Hoop Nets		Minnow Traps		Hoop Nets	
Species	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
Bluehead Sucker	0	0.00	0	0.00	0	0.00	8	49.81	1	0.38	0	0.00
Flannelmouth Sucker	0	0.00	0	0.00	0	0.00	31	193.03	0	0.00	22	132.77
Humpback Chub	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Speckled Dace	0	0.00	0	0.00	4	1.19	0	0.00	8	3.14	0	0.00
Common Carp	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Fathead Minnow	0	0.00	0	0.00	4	1.17	1	6.23	0	0.00	0	0.00
Plains Killifish	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Rainbow Trout	1	0.66	5	33.07	0	0.00	1	6.23	3	1.15	1	6.04

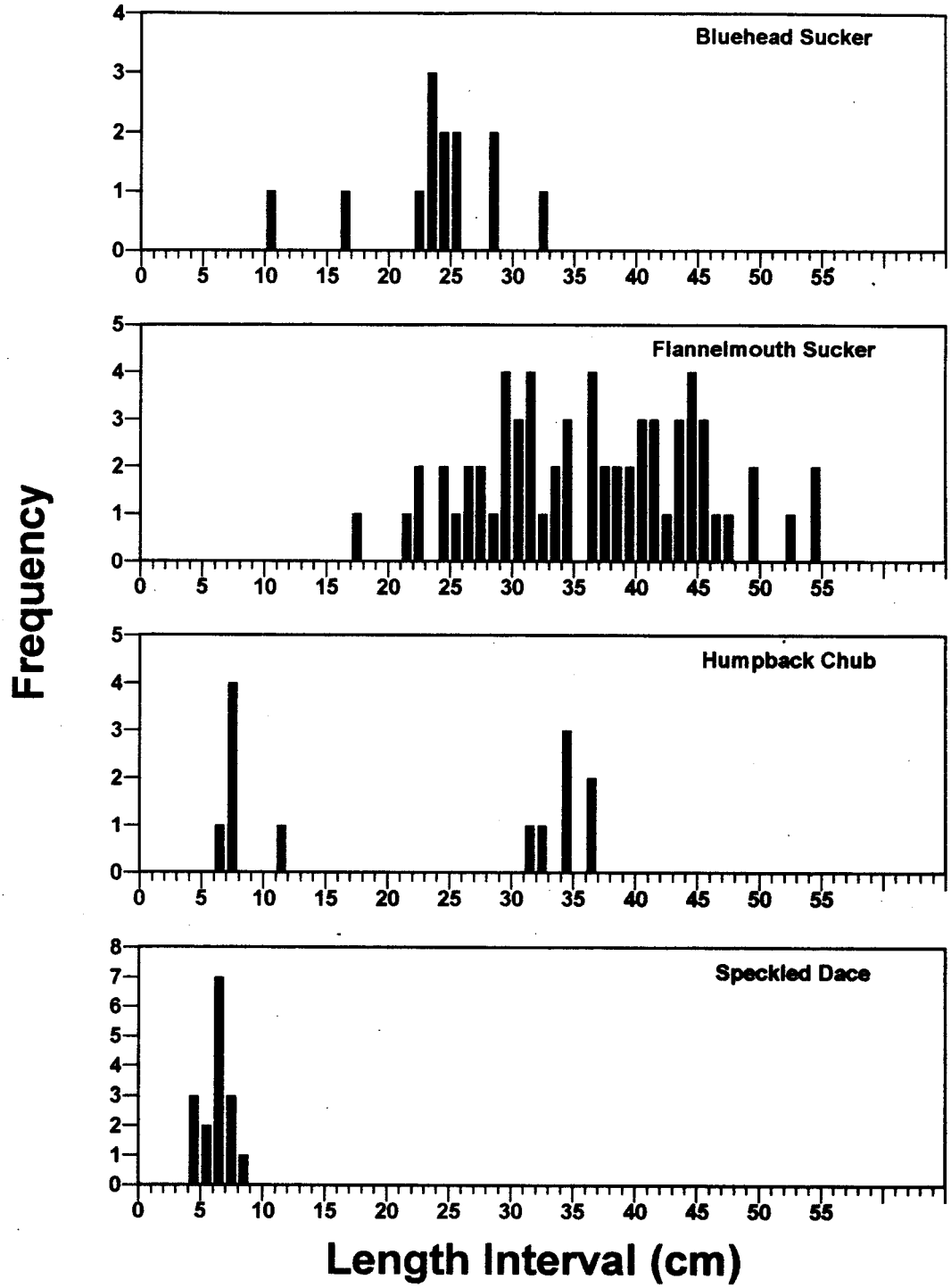

Figure 2. Length frequencies of Colorado River native species captured in the Colorado River and tributaries, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

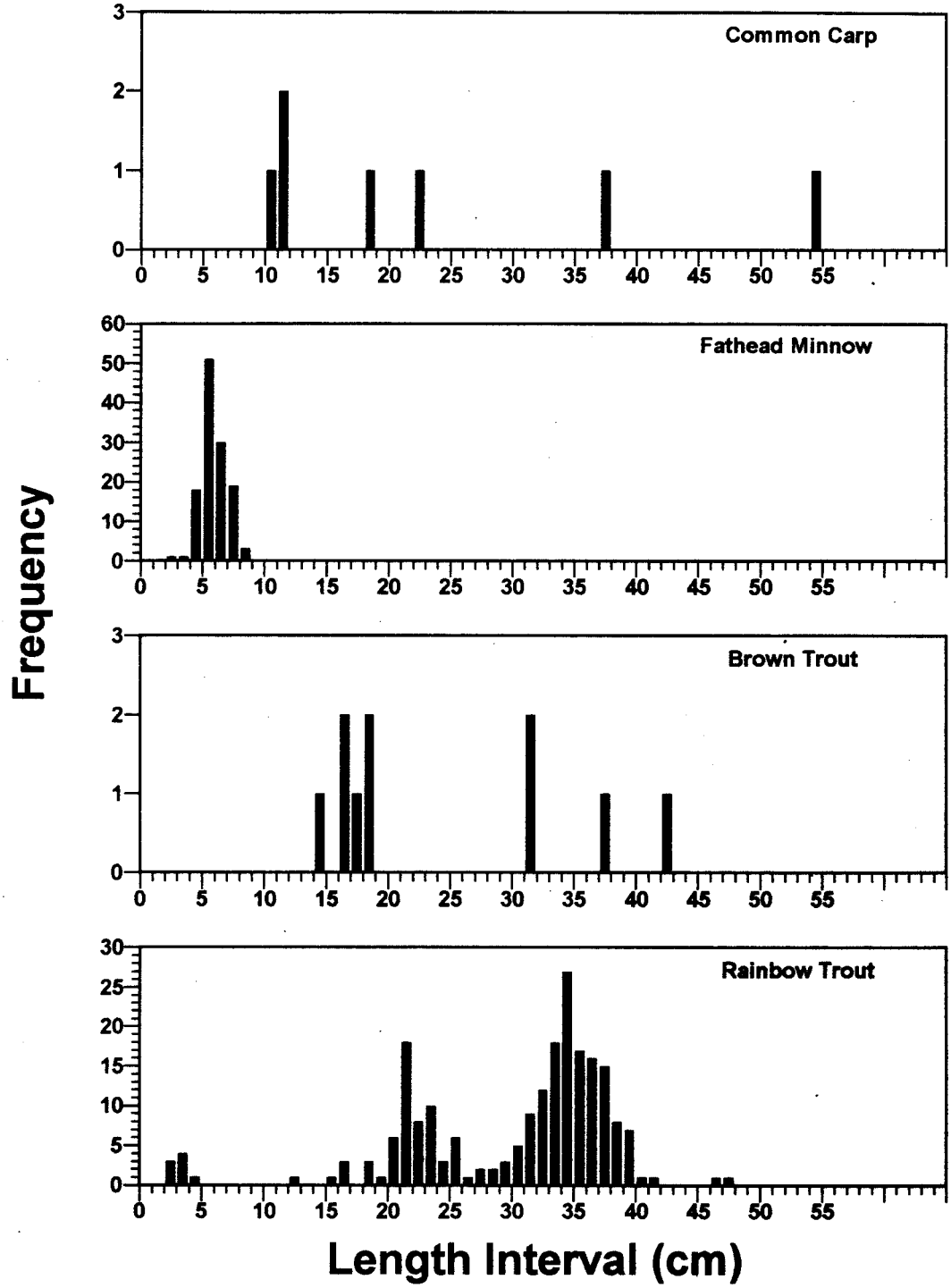

Figure 3. Length frequencies of common exotic species captured in the Colorado River and tributaries, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

Table 12. Mean, minimum and maximum total length, standard length and weight for each species caught in each reach and tributary of the Colorado River, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Total Length (mm)			Standard Length (mm)			Weight (g)		
Reach/Species	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Reach 2									
Flannelmouth Sucker	474.7	402	525				951.00	682.0	1220.0
Humpback Chub	365.0	365	365	315.0	315	315	485.00	485.0	485.0
Channel Catfish	445.0	445	445				820.00	820.0	820.0
Rainbow Trout	348.6	262	406				405.73	201.0	673.0
Reach 3									
Bluehead Sucker	237.5	236	239				138.50	128.0	149.0
Flannelmouth Sucker	471.0	435	545				1087.17	570.0	1838.0
Humpback Chub	280.0	76	368	235.5	62	301	282.58	3.7	430.0
Speckled Dace	76.0	74	78				5.10	4.8	5.4
Common Carp	187.8	105	379				31.45	16.6	66.0
Fathead Minnow	58.7	26	86				2.45	0.4	6.1
Rainbow Trout	321.5	132	484				323.68	22.5	757.0
Red Shiner	47.5	46	49				1.05	0.9	1.2
Reach 4									
Bluehead Sucker	324.0	324	324				331.00	331.0	331.0
Flannelmouth Sucker	177.0	177	177				45.00	45.0	45.0
Humpback Chub	71.0	61	79	56.5	47	61	3.03	1.6	4.2
Brown Trout	397.5	371	424				674.00	538.0	810.0
Common Carp	189.0	189	189				63.00	63.0	63.0
Fathead Minnow	57.4	49	72				2.04	1.4	3.2
Rainbow Trout	338.9	211	425				355.46	86.0	570.0
Reach 5									
Flannelmouth Sucker	448.0	448	448				920.00	920.0	920.0
Brown Trout	193.4	145	318				79.80	29.0	245.0
Fathead Minnow	56.0	50	62				1.90	1.4	2.4
Rainbow Trout	285.4	212	406				210.22	72.0	483.0
Shinumo Creek									
Rainbow Trout	229.5	45	419				169.62	0.7	510.0

Table 12 (cont'd).

Reach/Species	Total Length (mm) Mean	Min.	Max.	Standard Length (mm) Mean	Min.	Max.	Weight (g) Mean	Min.	Max.
Reach 7									
Bluehead Sucker	245.0	245	245				158.00	158.0	158.0
Speckled Dace	64.0	56	72				3.80	3.8	3.8
Brown Trout	226.7	183	312				120.33	54.0	249.0
Common Carp	540.0	540	540						
Rainbow Trout	261.1	195	475				175.00	70.0	868.0
Kanab Creek									
Bluehead Sucker	241.9	169	284				157.38	43.0	296.0
Flannelmouth Sucker	348.4	213	540				484.03	98.0	1360.0
Speckled Dace	67.8	58	94				3.08	1.5	7.0
Fathead Minnow	58.0	51	71				2.18	1.2	4.0
Rainbow Trout	241.0	241	241				142.00	142.0	142.0
Havasu Creek									
Bluehead Sucker	109.0	109	109				10.60	10.6	10.6
Flannelmouth Sucker	346.9	229	435				733.78	504.0	995.0
Speckled Dace	76.0	69	88				4.58	2.8	8.2
Rainbow Trout	79.5	44	175				1.10	0.9	1.4

Table 13. Capture location, total length, weight and sex of fish implanted with a PIT tag in the Colorado River and its tributaries, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997.

	Location*	Date	Total Length (mm)	Weight (g)	Sex	PIT Tag Number
Bluehead Sucker						
3972118	62.19	27 MAR 97	236	149	U	1F78250341
3972124	65.24	28 MAR 97	239	128	U	1F781D1E2E
3972138	68.09	30 MAR 97	324	331	M	1F7B5A3656
3972143	126.10	31 MAR 97	245	158	U	1F3E581833
3972567	143.50	1 APR 97	169	43	M	7F7D7F4E0A
3972567	143.50	1 APR 97	231	124	U	7F7B1A0A79
3972567	143.50	1 APR 97	242	163	U	7F7A12390E
3972567	143.50	1 APR 97	256	174	M	7F7B073713
3972567	143.50	1 APR 97	251	159	U	1F3C162F60
3972567	143.50	1 APR 97	280	194	M	7F7A136334
3972567	143.50	1 APR 97	284	296	U	7F7B196D09
Flannelmouth Sucker						
3972113	58.20	27 MAR 97	525		M	1F7A792E40
3972114	61.53	27 MAR 97	457	1071	F	1F7A3A416C
3972335	107.96	30 MAR 97	448	920	U	7F7D7F4B33
3972567	143.50	1 APR 97	213	98	U	7F7B073A28
3972567	143.50	1 APR 97	229	118	U	7F7B19780A
3972567	143.50	1 APR 97	249	152	U	7F3C26512E
3972567	143.50	1 APR 97	256	167	U	7F7D7F3975
3972567	143.50	1 APR 97	277	225	U	7F7B1A057B
3972567	143.50	1 APR 97	297	267	U	7F7B1A036A
3972567	143.50	1 APR 97	294	263	U	1F7B56355B
3972567	143.50	1 APR 97	290	231	U	7F7D7F3C5D
3972567	143.50	1 APR 97	292	259	U	1F3C1E0403
3972567	143.50	1 APR 97	306	275	U	7F7B19745C
3972567	143.50	1 APR 97	301	315	U	7F7A165F4D
3972567	143.50	1 APR 97	319	305	U	7F7B18500E
3972567	143.50	1 APR 97	311	310	U	7F7B097954
3972567	143.50	1 APR 97	334	366	U	7F7D7F4B7E
3972567	143.50	1 APR 97	344	400	U	7F7B197E46

Table 13 (cont'd).

Species/Study	Location*	Date	Total Length (mm)	Weight (g)	Sex	PIT Tag Number
Flannelmouth Sucker (cont'd)						
3972567	143.50	1 APR 97	342	441	U	1F3E5E3F06
3972567	143.50	1 APR 97	343	450	M	7F7B187D54
3972567	143.50	1 APR 97	366	543	U	7F7B197C41
3972567	143.50	1 APR 97	361	453	M	7F7B19755D
3972567	143.50	1 APR 97	366	493	U	7F7B181946
3972567	143.50	1 APR 97	379	705	U	7F7B1A0347
3972567	143.50	1 APR 97	410	708	U	7F7A13502C
3972567	143.50	1 APR 97	415	737	U	1F3C26512E
3972567	143.50	1 APR 97	444	616	M	7F7D7F401E
3972567	143.50	1 APR 97	459	1057	U	7F7D7F473C
3972567	143.50	1 APR 97	490	1145	M	1F3E677646
3972568	156.93	2 APR 97	261	.	U	7F7B185120
3972568	156.93	2 APR 97	267	.	U	7F7D7F4F49
3972568	156.93	2 APR 97	275	.	U	7F7B1A0044
3972568	156.93	2 APR 97	284	.	U	7F7A16633E
3972568	156.93	2 APR 97	308	.	U	7F7A124E1F
3972568	156.93	2 APR 97	319	.	U	1F3E6F3004
3972568	156.93	2 APR 97	327	.	U	7F7B073967
3972568	156.93	2 APR 97	330	.	U	7F7B073363
3972568	156.93	2 APR 97	374	.	U	7F7A165C6E
3972568	156.93	2 APR 97	386	579	U	1F3E693E7C
3972568	156.93	2 APR 97	391	576	U	7F7B197D29
3972568	156.93	2 APR 97	401	984	U	1F3C1A4249
3972568	156.93	2 APR 97	406	984	M	7F7D7F3D20
3972568	156.93	2 APR 97	413	620	M	7F7B197C78
3972568	156.93	2 APR 97	423	746	M	1F3E5E7352
3972568	156.93	2 APR 97	430	995	U	1F3E6A3900
3972568	156.93	2 APR 97	435	.	U	7F7B197E37

* Tributary mouths are denoted by the following river miles: 61.5 = Little Colorado River; 108.60 = Shinumo Creek; 143.50 = Kanab Creek; 156.93 = Havasu Creek.

Table 14. Capture location, length, weight and sex of fish recaptured with a PIT tag in the Colorado River and its tributaries, Grand Canyon, Arizona, during AGFD Monitoring Trip 97-2, 25 March - 4 April 1997 and the location, size and date of its original marking and previous recapture. Note: PIT tag number = 'CWT' denotes coded wire tag, used only for rainbow trout stocked at Lee's Ferry.

	Present Capture					Previous Captures				
PIT Tag Number	Date	Location*	Total Length (mm)	Weight (g)	Sex	Mark/ Recapture	Date	Location*	Total Length (mm)	Weight (g)
Bluehead Sucker										
1F1E2D0412	1 APR 97	143.50	222	106	M					
Flannelmouth Sucker										
1F1E483F3C	26 MAR 97	52.68	402	682	M					
7F7A121506	26 MAR 97	61.53	454	951	U	M	15 AUG 94	61.50	219	72
1F78423275	27 MAR 97	58.68	497	1220	M	M	16 OCT 94	61.50	442	892
1F2032523D	27 MAR 97	61.53	435	968	F	M	11 JUN 94	61.50	228	83
1F46605863	27 MAR 97	61.53	470	1125	F	M	13 JUL 94	61.50	430	764
7F7D075B75	27 MAR 97	61.53	545	1838	F					
7F7D3F0254	28 MAR 97	64.15	465	570	U					
1F7B691A63	1 APR 97	143.50	316	377	U	M	8 APR 95	156.93	160	48
1F7A304B6C	1 APR 97	143.50	366	465	M					
7F7F1F3234	1 APR 97	143.50	445	852	F					
1F1E44502F	1 APR 97	143.50	445	852	F	M	15 AUG 94	61.50	375	484
7F7F334B09	1 APR 97	143.50	540	1360	F					
1F3E6A3900	2 APR 97	156.93	430	995	U					
1F79010463	2 APR 97	156.93	246		U					
1F7A3F1018	2 APR 97	156.93	395	616	U					

Table 14 (cont'd).

	Present Capture					Previous Captures				
PIT Tag Number	Date	Location*	Total Length (mm)	Weight (g)	Sex	Mark/ Recapture	Date	Location*	Total Length (mm)	Weight (g)
Flannelmouth Sucker (cont'd)										
1F7B5E3E4A	2 APR 97	156.93	384	504	M					
Humpback Chub										
7F7F041F6A	26 MAR 97	52.68	365	485	M	M	20 MAY 89	61.50	353	360
						R	31 MAR 91	61.50	379	494
1F777A511F	26 MAR 97	61.53	348	388	M					
7F7D17705C	26 MAR 97	61.53	342	419	M	M	7 MAY 91	61.50	270	192
7F7F1F112E	26 MAR 97	61.83	329	353	F	M	21 MAR 93	64.60	320	318
7F7D401857	27 MAR 97	62.03	316	305	M	M	16 MAY 93	61.50	248	118
						R	12 MAY 94	61.50	266	
7F7B082654	28 MAR 97	64.50	342	344	F	M	8 MAR 93	61.50	337	356
7F7D170B38	26 MAR 97	62.45	368	430	M	M	24 JUL 91	61.50	332	300
Rainbow Trout										
CWT	25 MAR 97	31.30	375	515	U	R		Lee's Ferry		

* Tributary mouths are denoted by the following locations: 61.50 = Little Colorado River; 108.60 = Shinumo Creek; 143.50 = Kanab Creek; 156.93 = Havasu Creek.

Table 15. Number sampled, number infected, percent infected and mean, minimum and maximum number of *Lernea* sp. per infected fish during AGFD monitoring Trip 97-2, 25 March - 4 April 1997.

Species	Number Sampled	Number Infected	Percent Infected	Number of *Lernea* / Infected Fish		
				Mean	Minimum	Maximum
Native Species						
Bluehead Sucker	13	0	0	0	0	0
Flannelmouth Sucker	64	1	1.6	1	1	1
Humpback Chub	13	3	23.1	2	1	4
Speckled Dace	16	0	0	0	0	0
Exotic Species						
Brown Trout	10	0	0	0	0	0
Channel Catfish	1	0	0	0	0	0
Common Carp	9	0	0	0	0	0
Fathead Minnow	123	2	1.6	1	1	1
Rainbow Trout	214	0	0	0	0	0
Red Shiner	2	0	0	0	0	0
Total	465	6	1.3	1.5	1	4