

TRIP 19 REPORT

AGFD Native Fish Studies

July 22 - August 6, 1993



Glen Doster, Tim Hoffnagle, and Bill Persons
Research Branch
Arizona Game and Fish Department
October 1993

565.00
ENV-4.00
C719

19922
pl.1

AQU315-trip19 85

Participants:

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Aylin Ozmelek - Cornell University (volunteer)

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Field Notes and General Comments (Glenn Doster)

River flows during this trip fluctuated between 11,000 and 19,000-cfs. Turbidities in the Colorado River and all tributaries were low and ranged from 2-15 NTUs (nephelometer turbidity units), except during the last day when thunderstorm activity and tributary outflow created turbidities of between 100 and 500 NTUs in the mainstem. Fish captures changed accordingly, that is the last day of sampling we caught juvenile and adult flannelmouth suckers in shallow backwaters during daytime sampling. Before the turbidity increased we were only catching them at night.

Temperatures in the mainstem ranged from 10°C in upper Marble Canyon to 16°C near Diamond Creek. Backwater temperatures ranged from 12°C to over 20°C. Tributary temperatures were: Little Colorado River - 19°C; Shinumo Creek - 19°C; Kanab Creek - 30°C; Havasu Creek - 21°C.

Some of the backwater habitats that appeared between the LCR and Lava Chuar during the winter have diminished in size or disappeared entirely. A few other backwaters seem to be persisting, even during the current higher river flows.

This trip has been the most productive yet in terms of numbers of fish captured, with a total of nearly 5000 fish, over 900 of which were humpback chub. Most of the remaining

fish were bluehead sucker, flannelmouth sucker, and speckled dace. The 1993 year class appears to be very strong for all the native fish species. Rainbow trout and fathead minnow were relatively scarce in our samples. Three striped bass were taken: two from Kanab Creek and one at mile 220.26R. All three had speckled dace in their stomachs. One young-of-the-year (YOY) channel catfish was caught at mile 220.26R. Several large adult catfish were observed during snorkeling observations at the mouth of the Little Colorado River and one was taken on hook-and-line for stomach analysis. It contained only *Cladophora* or filamentous green algae despite an abundance of YOY chub, suckers, and dace in the vicinity. A few carp were caught at various locations.

Of the chub caught, the noteworthy discovery was the capture of three YOY chub (22mm, 26mm, and 30mm) in the foot of the backwater at mile 44.27L (Study 31903 - below President Harding Rapid). One of these chub (22mm) was an incidental mortality and was preserved in 95% ethanol for otolith analysis. It is being forwarded to Bill Persons with the trip data and this report. These fish were likely spawned in the vicinity of South Canyon where Bio/West has caught adult chub near warm springs that issue into the river. Most of the remaining chub captured were caught between mile 60.10R and mile 72.30L (immediately above Unkar Rapid). No YOY chub were caught above the LCR other than the three already mentioned, although juveniles and adults were caught in the backwater at mile 60.10R during night sampling. One 21mm chub captured at mile 65.25L (Study 31922) was an incidental mortality and was preserved in 95% ethanol for otolith analysis and is being sent to Bill Persons with this report.

Two YOY chub were found dead in the lower 100 meters of the LCR - one 35mm fish appeared to have been stepped on (lots of tourist and biologist traffic in the area), and one 40mm chub had a *lernea* attached. Two juvenile chub were also found dead in the lower few hundred meters of the LCR. Both had very recent PIT tag wounds and most likely died as a result of handling. A 181mm chub had PIT tag number 1FOC794C10, and the other 143mm chub had tag number 1F2030731E. The first of these originally marked on 7/19/93 at river kilometer 1.54 in the LCR, the second was tagged on the same date at river kilometer 2.18 in the LCR (Paul Marsh, ASU, personal communication). All four of these fish were preserved in 10% formalin and are at the Flagstaff office.

Only one YOY chub was caught between Unkar and the Upper Granite Gorge. A juvenile chub was caught in an overnight hoop net set at the mouth of Shinumo Creek. It

had no PIT tag, and unfortunately escaped before we were able to tag it.

No chub were caught in the Blacktail area this trip. In fact, seining in this area yielded very few fish. One chub (23mm) was caught at mile 168.75R (below Fern Glen), and two chub (27mm and 28mm) were caught at 193.85R (Study 31948). The 27mm fish was preserved in 95% ethanol for otolith analysis and is being forwarded with this report.

Two additional chub for otolith study are being sent with this report - these fish were collected in June: a 14mm chub taken at mile 193.85R (Study 31832), and a 22mm chub from mile 192.40R (Study 31831).

Daily notes:

22 July: Launched at 11am. One opportunistic sample in upper Marble Canyon: no fish. Camp at South Canyon (mile 31.5L).

23 July: Two opportunistic and one Type A sample between South Canyon and Nankoweap: numerous YOY flannelmouth sucker, YOY and adult dace, the three humpback chub discussed above, several YOY and adult rainbow trout, and a carp. Camp above Nankoweap on the right (mile 50.0).

24 July: Two opportunistic and one Type A sample above the LCR. Quarterly benthos/sediment/plankton sampling at the Kwagunt backwater (mile 55.5R), from which we seined only four fish - all adult rainbow trout. Daytime Type A sample at 60.10R backwater yielded only speckled dace and rainbow trout. Opportunistic sample after dark at the same site produced three adult and one juvenile humpback chub, in addition to adult and YOY rainbow trout and YOY speckled dace. Camp below the LCR on the right at mile 63.0.

25 July: Benthos/sediment/plankton sampling at mile 63.18L backwater. Low water seining effort at the top of the Sand Island at the mouth of the LCR (several YOY speckled dace and one YOY chub), and a concurrent low water effort along the Phragmites/Equisetum bank lining the north side of the LCR side channel (numerous YOY chub, flannelmouth and bluehead suckers, and speckled dace). At this water stage (est. 11,000-cfs) the entire side channel is warm LCR water, and the plume of LCR water passes around the upper end of the sand island. At high water (19,000-cfs), colder river water pushes into the side channel, and the warmer LCR water is restricted to a narrow plume along the Tapeats ledges that line the south side of the side channel, and the depth and velocity of water in the side channel increases markedly. At the suggestion of Alan Haden, who along with Frank Protiva and other GCES personnel are conducting temperature profile studies along the LCR plume, we will repeat these sampling efforts at high water later.

Opportunistic night seining at backwater at mile 62.25R: numerous YOY chub and relatively few YOY dace and bluehead sucker.

Overnight hoop net set in the LCR side channel: YOY, juvenile, and adult humpback chub, and one large female flannelmouth with color. Camp again at 63.0L.

26 July: Type A sample at the backwater at mile 62.25R in daylight: YOY chub, bluehead

sucker, speckled dace, and one adult rainbow trout.

Opportunistic seining at mile 63.08L: YOY bluehead sucker and chub from the backwater, and five YOY chub, three YOY bluehead sucker, and one adult speckled dace from the isolated pool. This is the same isolated pool from which we collected over 120 juvenile chub in April (Study 31625). With the present high river flows the pool becomes connected with the mainstem at night, then becomes isolated as the river level drops during the day.

Type A sample during the day at the backwater at mile 63.18L: 557 fish caught, most of which were YOY chub, but with some YOY bluehead sucker, speckled dace, and fathead minnow. Opportunistic sample along the beach face at the same location that night yielded six juvenile chub, where none were captured during the day.

Overnight hoop net set in the LCR side channel: 16 YOY chub and one YOY bluehead sucker. Camp again at 63.0L.

27 July: Resampled the two LCR side channel seining locations, but this time at high river level (17,000-cfs): no fish were caught at the top of the Sand Island, and only eight fish (YOY dace and bluehead - no chub) were caught along the *Phragmites/Equisetum* bank, where 445 fish were caught at low water a few days earlier. We also seined along the Tapeats ledges on the south side of the side channel in the plume of LCR water, and caught 5 YOY chub, 11 dace, and 1 YOY bluehead sucker. Several other fish were observed that were not caught due to the difficulty of seining effectively along ledge cover. Sampling seems to indicate that there are fewer fish in the side channel when river water is pushing through there, and it's uncertain whether the young chub, dace, and blueheads found there during low river stage (when the water is warmer, lower velocity LCR water) find their way back upstream to enter the LCR, or if they are swept downstream and out into the mainstem during the higher flows. If they are being swept out into the mainstem, then there may be a daily pulse of young native fish from the LCR into the mainstem at this flow regime. Fish may be moving down out of the LCR into the side channel during the day as the main river level drops, then get washed out into the main river at night when the river rises.

Type A sample at the Lava Chuar backwater (mile 65.25L) at low water (12,000-cfs): 112 fish, mostly YOY blueheads with some chub and dace and a few YOY flannelmouth sucker and fathead minnow.

Opportunistic seining near the rocks by Carbon Creek (mile 64.60R) in the early evening at low water produced no fish, but the seining effort was poor due to the depth of the water.

Camp again at mile 63.0L.

28 July: Another Type A at Lava Chuar backwater this time at high water: 399 fish were caught where we only caught 112 the afternoon before at lower water. Fewer YOY chub, and more YOY flannelmouth and bluehead sucker, a few dace, rainbow trout, and fathead minnow.

Opportunistic samples at Tanner (mile 68.39R) and above Unkar (mile 72.30L). Numerous fish, and similar species to what we caught at Lava Chuar. The backwater above Unkar on the left was literally teeming with fish. It was sampled at low water in the late afternoon, and was long and narrow with a lot of woody debris along the shoreline (tamarisk hanging down into the water). We did only a short seine haul near the foot of the backwater, then had to subsample for species identification and length as there were over 1000 fish in the net. Noteworthy was the presence of larger YOY chub in this backwater. Even though I fully expected to find more YOY chub in backwaters below Unkar, this did not prove to be the case.

Camp at 72.0R (Furnace Flats).

29 July: Type A at backwater at mile 74.46R (Rattlesnake Camp): YOY bluehead, dace and fathead minnows.

Opportunistic at the mouth of Vishnu Creek (mile 81.07R): one juvenile flannelmouth sucker with ASU fin clips indicating previous capture in the LCR, and one YOY bluehead sucker.

Camp at Clear Creek (mile 84.2L).

30 July: No sampling. Travelled to Shinumo Creek. Camped at mile 106.5R.

31 July: Overnight hoop net set in Shinumo Creek: one chub, one flannelmouth, and two bluehead sucker - all juveniles.

Three opportunistic samples and one Type A between Shinumo and Blacktail (mile 120): bluehead, dace, and rainbow trout.

Camp above Blacktail on the left.

1 August: One Type A and five opportunistic samples between Blacktail and Kanab Creek (mile 143.5): few fish captured, YOY rainbow trout, bluehead, and flannelmouth.

Benthos/sediment/plankton sample at the backwater at mile 119.13R.

Seined mouth of Kanab Creek at high water: dace, fathead, and two striped bass that had been eating dace - the 385mm striper had nine dace 20-52mm long in its stomach as well as one partly digested unidentifiable fish, and the 390mm striper had five dace 27-85mm long in its stomach.

Camped across from Kanab Creek.

2 August: Overnight hoop net set at Kanab Creek above the high water side channel caught four YOY flannelmouth sucker.

Kanab Creek was running clear and very warm (30°C). Only a few small groups of large YOY or juvenile bluehead sucker were seen in the lower three miles of the creek. About 15 or 20 dead or dying fish (YOY flannelmouth sucker and dace) were picked up, all of which had from 1 - 5 lerneae. Observed about 20 adult carp and two adult flannelmouth sucker in the plume of Kanab Creek water while the main river was low.

Camped just above Havasu Creek (mile 156.9L).

3 August: Overnight hoop net set in Havasu Creek collected ten adult flannelmouth sucker, including two barely ripe females and three tuberculate males. Three of these fish were recaptures. One adult carp was also caught.

Six additional opportunistic samples between Havasu Creek and Lava Falls (mile 179): YOY bluehead and dace, and a few YOY flannelmouth.

Sport boat turned over in Lava Falls, but no injuries, losses, or damage incurred.

Camp at 182.83L.

4 August: Two Type A's and three opportunistics between mile 182.83 and mile 201.06: YOY flannelmouth, bluehead, and lots of speckled dace.

Camp at 201.06R.

5 August: One Type A and three opportunistics between 201.06 and Diamond Creek under moderately turbid conditions. Thunderstorm activity upstream has resulted in one or more tributaries contributing muddy water to the river. Same species in the catch, but we also caught some larger juvenile and small adult flannelmouth sucker.

Camp just above Diamond Creek on the right (mile 225).

6 August: Take-out and return to Flagstaff.

Table 1. List of studies and sites from Trip 19, 22 July - 6 August 1993.

Study	Sites	Date--Time	Mile	Rch	Flo Cod	Flow CFS	Typ A	Typ B	Ang Lng	Opp	Son de	Ben ths	Sed	Chl	Pkn	Tot Map	Pla Map	Vis cer	Dri ft	-A- 2nd	Fsh Coll
31901	2	07/22/93 11:27	2.41	L	20 AC	16000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31902	1	07/23/93 08:13	32.90	L	20 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31903	3	07/23/93 12:50	44.27	L	20 DC	11000	1	.	.	.	.	.	.	.	.	.	1	.	.	.	16
31904	1	07/23/93 15:57	44.77	L	20 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31905	4	07/24/93 09:17	55.50	R	20 DC	18000	.	.	.	1	12	12	.	4	.	.	.	.	.	.	0
31906	2	07/24/93 15:00	60.10	R	20 DC	15000	1	.	.	.	.	.	.	.	.	.	1	.	.	.	0
31907	1	07/24/93 20:30	60.10	R	20 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31908	1	07/25/93 06:00	60.50	L	22 AC	17000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31909	1	07/25/93 13:49	60.45	L	22 DC	13000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	2
31910	1	07/25/93 14:00	60.50	L	22 DC	13000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	44
31911	4	07/25/93 16:30	63.18	L	30 DC	12000	.	.	.	.	12	12	.	4	.	.	.	.	.	.	0
31912	1	07/25/93 20:00	62.25	R	30 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	10
31913	1	07/26/93 06:30	60.50	L	22 AC	14000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31914	3	07/26/93 09:00	63.18	L	30 AC	15000	1	.	.	.	.	.	.	.	.	.	1	.	.	.	55
31915	3	07/26/93 09:00	63.08	L	30 AC	15000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	1
31916	2	07/26/93 14:10	62.25	R	30 DC	13000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	1
31917	2	07/26/93 20:40	63.18	L	30 DC	11000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31918	1	07/27/93 10:00	60.45	L	22 DC	17000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31919	2	07/27/93 10:30	60.50	L	22 DC	17000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	2
31920	2	07/27/93 16:30	65.25	L	30 DC	12000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	11
31921	1	07/27/93 18:25	64.60	R	30 DC	11500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31922	3	07/28/93 08:30	65.25	L	30 DC	18000	1	.	.	.	.	.	.	.	.	.	1	.	.	.	39
31923	1	07/28/93 14:00	68.39	R	30 DC	16000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	13
31924	1	07/28/93 16:30	72.30	L	30 DC	14000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1024
31925	2	07/29/93 09:00	74.46	R	30 DC	16000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	3
31926	1	07/29/93 11:20	81.07	R	30 DC	16000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31927	1	07/31/93 08:20	108.60	R	40 AC	17000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31923	1	07/31/93 11:00	114.25	L	40 AC	18500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31929	2	07/31/93 14:20	118.10	R	40 AC	19000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31930	2	07/31/93 15:10	120.30	L	40 DC	18000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	1
31931	1	07/31/93 16:20	120.05	R	40 DC	17000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31932	2	08/01/93 07:30	119.13	R	40 DC	12000	1	.	.	.	6	6	.	2	.	1	.	.	.	.	0
31933	1	08/01/93 08:45	120.47	L	40 AC	13000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31934	2	08/01/93 09:50	122.30	L	40 AC	14000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31935	2	08/01/93 12:00	122.55	L	40 AC	16000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31936	1	08/01/93 14:50	137.12	L	40 DC	17000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31937	1	08/01/93 16:00	143.50	R	45 DC	16000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	3
31938	1	08/02/93 07:30	143.50	R	45 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
31939	1	08/03/93 08:00	156.93	L	46 DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31940	2	08/03/93 10:30	164.44	R	40 DC	12000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31941	1	08/03/93 11:00	164.80	L	40 DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31942	1	08/03/93 11:30	165.75	R	40 DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31943	2	08/03/93 12:00	166.85	L	50 DC	11000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	7
31944	2	08/03/93 13:30	168.75	R	50 DC	11000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
31945	1	08/03/93 14:05	169.53	R	50 DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	2
31946	2	08/04/93 08:00	182.83	L	50 DC	16000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	1
31947	2	08/04/93 11:00	192.40	R	50 DC	14500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
31948	4	08/04/93 13:15	193.85	R	50 DC	13000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	55
31949	3	08/04/93 16:30	201.06	R	50 DC	11000	.	.	.	2	9	9	.	3	.	.	.	.	.	.	8
31950	2	08/04/93 15:43	192.40	R	50 DC	12000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	15
31951	3	08/05/93 08:30	201.06	R	50 DC	16000	1	.	.	.	.	.	.	.	.	1	.	.	.	.	7
31952	3	08/05/93 10:30	204.07	R	50 DC	15000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	0
31953	2	08/05/93 11:00	204.37	L	50 DC	15000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	32
31954	1	08/05/93 14:30	220.26	R	50 DC	15000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	7
Sum	96							12		58		39	39		13		12				1365

Table 2. Length frequencies for each species, Trip 19.

Length Interval	SPECIES								
	BHS	CCF	CRP	FHM	FMS	HBC	RBT	SPD	STB
10 - 19	11			26	2			12	
20 - 29	160			59	43	19		81	
30 - 39	159			48	100	100	2	168	
40 - 49	139			3	80	261	2	84	
50 - 59	39			4	81	127	2	25	
60 - 69	11			3	65	8	6	30	
70 - 79	6				25	6	1	15	
80 - 89					11	6	2		
90 - 99		1			1	1	2	2	
100 - 109			1			2	1		
110 - 119						2	3	1	
120 - 129						3	1		
130 - 139						1			
140 - 149	2					2			
150 - 159	1					2			
160 - 169	1				2	2			
170 - 179	2					1	1		
180 - 189	1				1				
190 - 199					1	2			
200 - 209					1	1	1		
210 - 219					1	1			
220 - 229					2				
260 - 269					1				
270 - 279					2				
300 - 309							1		
310 - 319					1		2		
320 - 329							3		1
330 - 339					1		4		
340 - 349					1	1	1		
350 - 359					1	1	3		
360 - 369						1	1		
370 - 379						1	2		
380 - 389							3		1
390 - 399							1		1
400 - 409							4		
430 - 439			1						
460 - 469					1				
470 - 479					3				
490 - 499					1				
500 - 509					1				
520 - 529					1				
540 - 549					1				
610 - 619			1						
630 - 639					1				

Table 3. Length frequencies, by reach, for each species, Trip 19.

Length Interval (mm)	REACH																								Hav asu ch 50	Rea ch 50		
	Reach 20				LCR				Reach 30				Reach 40				Kanab											
	SPECIES				SPECIES				SPECIES				SPECIES				SPECIES											
	BHS	CRP	FMS	HBC	RBT	SPD	BHS	FMS	HBC	SPD	BHS	FHM	FMS	HBC	RBT	SPD	BHS	FHM	FMS	HBC	RBT	SPD	FHM	FMS			SPD	STB	FMS	BHS
10 - 19									1	7	21	2																4
20 - 29	1		9	2	3	1		1	2	127	32	26	13															26
30 - 39			10	1	2	3	20	3	25	24	84	34	63	74														50
40 - 49			9		2	9	29	5	67	23	46	3	31	194														52
50 - 59			30		2	12	5	7	19	6	13	1	21	108														12
60 - 69			17		6	20	1	1	3	2	3		21	5														1
70 - 79			3			9	3	3	1				6	6														2
80 - 89					1			1					6	6														
90 - 99										1				1														
100 - 109														2														
110 - 119									1					1														
120 - 129									2					1														
130 - 139														1														
140 - 149				1					1																			
150 - 159														2														
160 - 169									2					1														
170 - 179														1														
180 - 189														1														
190 - 199																												
200 - 209									1																			
210 - 219				1								1																
220 - 229																												
260 - 269																												
270 - 279																												
300 - 309						1																						
310 - 319						2																						
320 - 329						1									2													
330 - 339						3								1														
340 - 349						1			1																			
350 - 359						2																						
360 - 369						1									1													
370 - 379						1			1						1													
380 - 389						2									1													
390 - 399						1									1													
400 - 409						3																						
430 - 439																												
460 - 469																												1
470 - 479																												3
490 - 499																												1
500 - 509																												1
520 - 529																												1
540 - 549																												1
610 - 619	1																											1
630 - 639										1																		

(continued)

Table 3. Length frequencies, by reach, for each species, Trip 19 (cont'd).

Length Int	REACH						
	Reach 50						
	SPECIES						
	CCF	CRP	FHM	FMS	HBC	SPD	STB
10 - 19			2				8
20 - 29			17	6		3	60
30 - 39			12	23			100
40 - 49				33			23
50 - 59			3	20			3
60 - 69			3	24			7
70 - 79				11			6
80 - 89				9			
90 - 99	1			1			
100 - 109		1					
110 - 119							
120 - 129							
130 - 139							
140 - 149							
150 - 159							
160 - 169				2			
170 - 179							
180 - 189							
190 - 199				1			
200 - 209				1			
210 - 219							
220 - 229				2			
260 - 269				1			
270 - 279				2			
300 - 309							
310 - 319				1			
320 - 329							1
330 - 339				1			
340 - 349				1			
350 - 359				1			
360 - 369							
370 - 379							
380 - 389							
390 - 399							
400 - 409							
430 - 439		1					
460 - 469							
470 - 479							
490 - 499							
500 - 509							
520 - 529							
540 - 549							
610 - 619							
630 - 639							

Table 4. Length frequencies, by gear type, for each species, Trip 19.

Gear Code	SPECIES								
	BHS	CCF	CRP	FHM	FMS	HBC	RBT	SPD	STB
Large bag seine (30 x 6 x 1/8)									
Length Interval									
10 - 19	11			26	2				11
20 - 29	155			59	42	19			80
30 - 39	158			48	100	100	2	160	
40 - 49	138			3	80	255	2	79	
50 - 59	35			4	81	119	2	24	
60 - 69	9			3	63	7	6	30	
70 - 79	6				24	6	1	15	
80 - 89					10	6	2		
90 - 99		1			1		2	2	
100 - 109			1			2			
110 - 119						1	2	1	
120 - 129						1	1		
140 - 149	2					1			
160 - 169	1				2				
170 - 179	1						1		
180 - 189	1								
190 - 199					1	1			
200 - 209					1		1		
210 - 219					1	1			
220 - 229					2				
260 - 269					1				
270 - 279					2				
300 - 309							1		
310 - 319					1		2		
320 - 329							2		1
330 - 339					1		3		
340 - 349					1				
350 - 359					1	1	3		
360 - 369						1	1		
370 - 379							1		
380 - 389							3		1
390 - 399							1		1
400 - 409							4		
430 - 439			1						
610 - 619			1						
Small bag seine (15 x 6 x 1/8)									
Length Interval									
10 - 19									1
20 - 29									1
30 - 39									8
40 - 49						1			5
50 - 59									1

Table 4. Length frequencies, by gear type, for each species, Trip 19 (cont'd).

Gear Code	SPECIES								
	BHS	CCF	CRP	FHM	FMS	HBC	RBT	SPD	STB
Hoop net (5 x 3 x 3/8)									
Length Interval									
40 - 49						4			
50 - 59	1					8			
60 - 69					2	1			
70 - 79					1				
80 - 89					1				
110 - 119						1			
120 - 129						2			
140 - 149						1			
150 - 159	1								
160 - 169						2			
170 - 179	1								
180 - 189					1				
190 - 199						1			
200 - 209						1			
340 - 349						1			
370 - 379						1			
460 - 469					1				
470 - 479					3				
490 - 499					1				
500 - 509					1				
520 - 529					1				
540 - 549					1				
630 - 639					1				
Straight Block seine (50 x 6 x 3/16)									
Length Interval									
320 - 329							1		
330 - 339							1		
340 - 349							1		
370 - 379							1		

Table 5. List of tags and recaptures, Trip 19. Original marking information on recaptures where available.

Tag	Mark Recap	Species	Length (mm)	Weight (g)	Date-Time	Study Number	Mile	Side	Gear Code
7F7B142868	M	FMS	638	1590	07/25/93 06:00	31908	60.50	L	HN
7F7D172E59	M	HBC	374	401	07/25/93 06:00	31908	60.50	L	HN
7F7D1D3331	M	HBC	202	65	07/25/93 06:00	31908	60.50	L	HN
7F7D170F13	M	HBC	167	39	07/25/93 06:00	31908	60.50	L	HN
7F7D1D3F55	M	HBC	167	41	07/25/93 06:00	31908	60.50	L	HN
7F7D225748	M	HBC	172	57	07/26/93 20:40	31917	63.18	L	BX
7F7B180A35	M	HBC	153	34	07/26/93 20:40	31917	63.18	L	BX
7F7B1B202F	M	FMS	183	.	07/31/93 08:20	31927	108.6	R	HN
7F7D1D4925	M	BHS	185	.	07/31/93 16:20	31931	120.1	R	BL
7F7D1D7C13	M	FMS	540	.	08/03/93 08:00	31939	156.9	L	HN
7F7D1E1A4D	M	FMS	470	.	08/03/93 08:00	31939	156.9	L	HN
7F7B073E35	M	FMS	462	.	08/03/93 08:00	31939	156.9	L	HN
7F7D1E1710	M	FMS	475	.	08/03/93 08:00	31939	156.9	L	HN
7F7B0D5570	M	FMS	473	.	08/03/93 08:00	31939	156.9	L	HN
7F7D1E1037	M	FMS	528	.	08/03/93 08:00	31939	156.9	L	HN
7F7D1E0E2D	M	FMS	338	.	08/05/93 08:30	31951	201.1	R	BL
7F7D1D4B25	M	FMS	351	.	08/05/93 08:30	31951	201.1	R	BL
7F7D1E332A	M	FMS	262	.	08/05/93 08:30	31951	201.1	R	BL
7F7D1D633A	M	FMS	270	.	08/05/93 08:30	31951	201.1	R	BL
7F7B151718	M	FMS	272	.	08/05/93 08:30	31951	201.1	R	BL
7F7D1D004F	M	FMS	200	.	08/05/93 08:30	31951	201.1	R	BL
7F7B143A39	M	FMS	319	.	08/05/93 08:30	31951	201.1	R	BL
7F7D1D486A	M	FMS	221	.	08/05/93 11:00	31953	204.4	L	BL
7F7D1D6C40	M	FMS	221	.	08/05/93 11:00	31953	204.4	L	BL
7F7B087A74	M	FMS	348	.	08/05/93 14:30	31954	220.3	R	BL
7F7F20077B	R	HBC	351	392	07/24/93 20:30	31907	60.10	R	BL
7F7F391902	R	HBC	362	381	07/24/93 20:30	31907	60.10	R	BL
7F7D30257C	R	HBC	211	81	07/24/93 20:30	31907	60.10	R	BL
1F20150329	R	HBC	146	26	07/24/93 20:30	31907	60.10	R	BL
7F7D170D50	R	HBC	347	285	07/25/93 06:00	31908	60.50	L	HN
7F7D3E3619	R	HBC	194	59	07/25/93 20:00	31912	62.25	R	BL
LCLP2	R	HBC	123	.	07/26/93 06:30	31913	60.50	L	HN
1F0936633F	R	HBC	154	23	07/26/93 20:40	31917	63.18	L	BX
7F7B1B6520	R	FMS	213	.	07/29/93 11:20	31926	81.07	R	BL
7F7D0B1A0C	R	FMS	.	.	08/03/93 08:00	31939	156.9	L	HN
7F7D172E7A	R	FMS	492	.	08/03/93 08:00	31939	156.9	L	HN
7F7F480B33	R	FMS	503	.	08/03/93 08:00	31939	156.9	L	HN

RECAPTURE						MARKED				
Tag Number	Sps	TL mm	Wt g	Date	River Mile	Date	River	Meters	TL mm	Agency
7F7F20077B	HBC	351	392	07/24/93	60.10 R	03/08/93	LCR	800	341	ASU
7F7F391902	HBC	362	381	07/24/93	60.10 R	05/22/92	LCR	354	320	ASU
7F7D30257C	HBC	211	81	07/24/93	60.10 R	07/26/91	LCR	11900	173	ASU
7F7D3E3619	HBC	194	59	07/25/93	62.25 R	05/18/93	LCR	137	191	AGFD
1F0936633F	HBC	154	23	07/26/93	63.18 L	07/17/93	LCR	1160	155	ASU

Table 6. Mean, minimum and maximum length, by reach, for each species collected, Trip 19.

Species	REACH						
	Reach 20	LCR	Reach 30	Reach 40	Kanab	Havas u	Reach 50
BHS							
Mean	26	44	32	65	.	.	38
Minimum	26	28	16	23	.	.	16
Maximum	26	78	76	185	.	.	75
CCF							
Mean	.	.	.	.	.	.	90
Minimum	.	.	.	.	.	.	90
Maximum	.	.	.	.	.	.	90
CRP							
Mean	615	.	.	.	.	.	269
Minimum	615	.	.	.	.	.	108
Maximum	615	.	.	.	.	.	430
FHM							
Mean	.	.	27	26	23	.	33
Minimum	.	.	12	21	18	.	17
Maximum	.	.	55	31	32	.	67
FMS							
Mean	50	80	43	59	73	493	72
Minimum	21	30	16	25	67	462	22
Maximum	79	638	213	183	84	540	351
HBC							
Mean	164	55	48	197	.	.	26
Minimum	22	25	20	197	.	.	23
Maximum	362	374	194	197	.	.	28
RBT							
Mean	222	.	358	121	.	.	.
Minimum	33	.	321	78	.	.	.
Maximum	405	.	407	202	.	.	.
SPD							
Mean	57	41	37	45	36	.	34
Minimum	21	19	18	22	31	.	14
Maximum	78	90	94	118	42	.	77
STB							
Mean	.	.	.	.	388	.	326
Minimum	.	.	.	.	385	.	326
Maximum	.	.	.	.	390	.	326

Table 7. Number of each species collected, by reach, Trip 19.

Species	REACH							Total
	Reach 20	LCR	Reach 30	Reach 40	Kanab	Havas u	Reach 50	
BHS								
Number caught	1	260	306	45	.	.	151	763
CCF								
Number caught	.	.	.	.	.	.	1	1
CRP								
Number caught	1	.	.	.	.	1	2	4
FHM								
Number caught	.	.	382	2	33	.	40	457
FMS								
Number caught	98	28	182	10	4	9	140	471
HBC								
Number caught	7	134	483	1	.	.	3	628
RBT								
Number caught	29	.	8	10	.	.	.	47
SPD								
Number caught	50	101	141	10	4	.	1052	1358
STB								
Number caught	.	.	.	.	2	.	1	3
SUC								
Number caught	.	.	91	.	.	.	.	91
UID								
Number caught	<u>.</u>	<u>.</u>	<u>816</u>	<u>.</u>	<u>.</u>	<u>.</u>	<u>.</u>	<u>816</u>
Total	186	523	2409	78	43	10	1390	4639

Table 8. Species composition, by reach, Trip 19.

Species	REACH							Total
	Reach 20	LCR	Reach 30	Reach 40	Kanab	Havas u	Reach 50	
BHS % Caught	.6%	22.3%	26.6%	57.1%			27.0%	24.7%
CCF % Caught							.2%	.0%
CRP % Caught	.6%					10.0%	.4%	.2%
FHM % Caught			8.9%	2.6%	56.5%		6.8%	6.8%
FMS % Caught	44.9%	8.2%	16.1%	13.0%	17.4%	90.0%	25.7%	20.1%
HBC % Caught	4.0%	46.8%	39.3%	1.3%			.6%	25.6%
RBT % Caught	18.2%		.8%	13.0%				2.3%
SPD % Caught	31.8%	22.7%	7.9%	13.0%	17.4%		39.2%	19.8%
STB % Caught					8.7%		.2%	.1%
SUC % Caught			.4%					.2%
UID % Caught			.1%					.0%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 9. Catch-per-unit-effort (A) and total catch (B) for seines and traps, by species, Trip 19.

A	GEAR		B	GEAR	
	Seine	Trap		Seine	Trap
BHSCPUE			BHSCATCH		
Mean	1.84	.49	Mean	5	1
Minimum			Minimum		
Maximum	51.00	1.60	Maximum	255	2
BKTCPUE			BKTCATCH		
Mean			Mean		
Minimum			Minimum		
Maximum			Maximum		
CCFCPUE			CCFCATCH		
Mean	.01		Mean	0	
Minimum			Minimum		
Maximum	1.00		Maximum	1	
CRPCPUE			CRPCATCH		
Mean	.01	.17	Mean	0	0
Minimum			Minimum		
Maximum	.57	.86	Maximum	2	1
FHMCPUUE			FHMCATCH		
Mean	.83		Mean	3	
Minimum			Minimum		
Maximum	82.00		Maximum	328	
FMSCPUE			FMSCATCH		
Mean	1.36	2.69	Mean	2	3
Minimum			Minimum		
Maximum	33.33	7.71	Maximum	98	9
HBCCPUE			HBCCATCH		
Mean	1.03	4.29	Mean	4	5
Minimum			Minimum		
Maximum	47.25	13.24	Maximum	189	16
PKFCPUE			PKFCATCH		
Mean			Mean		
Minimum			Minimum		
Maximum			Maximum		
RBTCPUE			RBTCATCH		
Mean	.10		Mean	0	
Minimum			Minimum		
Maximum	5.00		Maximum	10	
SPDCPUE			SPDCATCH		
Mean	8.32		Mean	10	
Minimum			Minimum		
Maximum	306.0		Maximum	397	

Table 10. Total effort and number of hauls, by reach, Trip 19.

Reach	EFFORT	HAULS
20	8,288	30
22	680	4
30	19,339	64
40	5,784	29
45	780	1
50	<u>8,594</u>	<u>56</u>
Total	43,465	184

Table 11. Seine effort (m²) and catches, by species and reach, Trip 19.

Reach	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
20	8,288	30	1			1		98	7		29	50
22	680	4	258					27	105			88
30	19,339	64	225				333	73	408		8	111
40	5,784	29	30				1	8			8	10
45	780	1					33					4
50	<u>8,594</u>	<u>56</u>	<u>147</u>		<u>1</u>	<u>2</u>	<u>39</u>	<u>133</u>	<u>3</u>			<u>1052</u>
Total	43,465	184	661		1	3	406	339	523		45	1315

Table 12. Seine effort (m²) and catches, by species and habitat type, Trip 19.

HAB	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
BE	1,380	7	2									1
CB	10,237	49	193				19	50	136		18	554
CF	6,091	34	154			1	344	226	273		7	576
CM	8,046	30	11			2	7	15	4		12	21
CO	300	1	7				1	2				2
IB	420	1	3						5			1
IP	75	1	3									
MC	6,276	22	7					2			2	7
ME	8,930	30	8				2	1			6	6
SC	1,060	7	267			1		42	105			143
TM	<u>930</u>	<u>3</u>	<u>6</u>				<u>33</u>	<u>1</u>				<u>5</u>
Total	43,745	185	661			1	3	406	339	523	45	1316

Table 13. Seine effort (m²) and catches, by species and temperature, Trip 19.

Temp °C	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
10	228	2										
11	400	3									6	
12	9,067	32	33				1		84		5	16
13	7,718	38	28				2	3	17		6	10
14	6,083	18	27				328	4	189		20	15
15	5,795	19	77			1	2	102	37		8	56
16	6,079	25	19				11	21	1			152
17	1,868	15	85				7	79	79			116
18	1,877	13	26		1	2	3	24	5			80
19	1,160	5	57				9	21				75
20	900	3	7				1	9				306
21	240	2	47				9	46	2			397
22	10	1						3				5
24	40	1							1			24
25	740	3	255					27	104			59
29	240	2										
34	780	1					33					4
Total	43,225	183	661		1	3	406	339	519		45	1315

Table 14. Seine effort (m²) and catches, by turbidity, Trip 19.

	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Turbidity level < 570 NTU	22,213	95	391			1	53	96	198		21	708
Total	22,213	95	391			1	53	96	198		21	708

Table 15. Mean turbidity (NTU's), by reach, Trip 19.

	TURB_N
	Mean
REACH	
20	5
22	5
30	8
40	10
45	4
46	3
50	93

Table 16. Trap effort (hours) and catches, by species and reach, Trip 19.

Reach	EFFORT	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
22	28	1					1	24			
40	15	2					1	1			
45	12						4				
46	14				1		9				
Total	69	3			1		15	25			