

# TRIP 20 REPORT

AGFD Native Fish Studies

September 4 - 17, 1993



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Glenn Doster, Tim Hoffnagle, and Bill Persons  
Research Branch  
Arizona Game and Fish Department  
December 1993

565.00  
ENV-4,00  
C 719  
19922  
pt. 2

AGFD 315- t-rpt20

84

**Participants:**

Bill Persons - AGFD (hiked out at Phantom)

Tim Hoffnagle - AGFD

Glenn Doster - AGFD

Steve Pope - AGFD

Alyssa Reischauer - AGFD

Marty Tuegel - AGFD

Don Henry - USFWS

Marshall Henderson - volunteer

Bruce Helin - O.A.R.S.

Marcus "Sparky" Plassman - O.A.R.S.

Elizabeth Fuller - O.A.R.S.

Brian Coombs - O.A.R.S.

**General Comments:**

Two support rafts (one 37-foot and one snout) and one sport boat were provided by O.A.R.S.

Flows in the Colorado River ranged between 8,000 and 14,000 cfs. Turbidities in the mainstem were 13 to 40 NTUs upstream from the LCR, then exceeded 6000 NTUs at the LCR, and decreased during the remainder of the trip to less than 50 NTUs as the flow from the LCR diminished. Shinumo, Kanab, and Havasu Creeks were running near base flows and were clear. Temperatures in the mainstem were 10.5°C at the start of the trip and increased to 14.5°C at the end. Backwater temperatures ranged from 12°C to 20°C. Temperatures in the tributaries were: Little Colorado River 18.7°C, Shinumo Creek 18.4°C, Kanab Creek 14.8°C and Havasu Creek 16.5°C.

Young-of-year humpback chubs (27, 36, and 41mm) were again caught at the backwater at mile 44.27L: further evidence of spawning activity in Marble Canyon.

Over 2000 chubs were caught and measured during this trip, most of them young-of-year, and most were caught between the LCR and Bright Angel Creek. The LCR had recently flooded with monsoon runoff, and this pulse of water evidently pushed a large number of fish into the mainstem. A few of the fish had attached lerneae that were encrusted with travertine. Several chubs had apparent upper caudal fin clips with no associated pelvic fin clips, so we aren't certain if these fish were recaptures. Two recaptured chubs had dorsal fin punches. Few chubs were caught below Bright Angel Creek. Sampling during our next trip (Oct. 23-Nov. 12) may indicate farther downstream dispersal of these YOY chubs.

Nine chubs were preserved for otolith and stomach analyses:

<u>Length</u>	<u>River Mile</u>	<u>Date Collected</u>	<u>Study Number</u>
39mm	63.00L	090893	32009
24mm	65.25L	090893	32024
32mm	65.25L	090893	32024
35mm	65.25L	090893	32024
46mm	65.25L	090893	32024
30mm	68.39R	090993	32027
36mm	74.46R	091093	32029
98mm	108.60R	091293	32035
29mm	193.85R	091693	32053

A few young-of-year flannelmouth and bluehead suckers that were incidental mortalities were also preserved.

**Daily Notes:**

4 September: Launched from Lee's Ferry. Opportunistic sample at backwater at mile 2.41R: YOY rainbow trout and speckled dace. Camped at South Canyon, mile 31.5R.

5 September: Two Opportunistic samples near Redwall Cavern: YOY rainbow trout. Type

A sample at mile 44.27L backwater (below President Harding Rapid): 3 YOY humpback chub, YOY flannelmouth sucker, speckled dace, rainbow trout, one adult channel catfish (gravid female that had numerous tapeworms, roundworms, and encysted parasites, but no fish in its stomach). Opportunistic at mile 45.43L: no fish. Camped at mile 55.4L.

6 September: Opportunistic sample at backwater at Awatubi (mile 58.23R): YOY rainbow trout, speckled dace, a few YOY flannelmouth and one YOY bluehead sucker. Type A at backwater at mile 60.10R: YOY speckled dace, YOY rainbow trout, and one adult flannelmouth sucker. Overnight hoop net set in this backwater caught one green sunfish. Opportunistic seining in the LCR side channel and on the Colorado River side of the Sand Island produced YOY humpback chub in large numbers, as well as YOY carp, channel catfish, dace, flannelmouth and bluehead suckers, and fathead minnow plus a few juvenile chub and one adult rainbow trout. Set a datasonde in the LCR side channel for a three-day logging run. Salvage seining at the isolated backwater at mile 63.08L: 174 fish caught and returned to the adjacent mainchannel eddy (mostly YOY humpback chub, some flannelmouth and bluehead suckers, and speckled dace). Camped at the point camp across from the LCR.

7 September: Four Opportunistic and two Type A samples between the LCR and Crash Canyon: more of the same species composition and size distribution, but with more adult flannelmouth sucker and rainbow trout. Same camp across from the LCR.

8 September: Type A samples at mile 63.18L and at Lava Chuar (mile 65.25L): more of the same, with a higher number of juvenile chub at the Chuar site. Same camp across from the LCR.

9 September: Three Opportunistic and one Type A between Lava Chuar and Unkar Rapid: more YOY and juvenile chub, bluehead and flannelmouth suckers, dace, fathead minnow, and rainbow trout. Camp at mile 74R (Georgie's camp above Rattlesnake).

- 10 September: Type A sample at Rattlesnake backwater (mile 74.46R) and four Opportunistic samples between there and Bright Angel Creek (mile 87.62R): still catching numerous YOY chub, a few juvenile and adult chub, many bluehead and flannelmouth suckers, dace and fathead minnow. Camp at Cremation (mile 87L).
- 11 September: Picked up three hoop nets set overnight in and just downstream of the mouth of Bright Angel Creek: one brown trout. Bill Persons hiked out to the South Rim. Travelled to camp at mile 108R.
- 12 September: Overnight hoop net set in mouth of Shinumo Creek (mile 108.60R): one adult bluehead sucker and one adult rainbow trout. Seining effort in the mouth of Shinumo: YOY bluehead, flannelmouth, dace, and fatheads. One nearly dead 96mm humpback chub was picked up in the mouth of the creek and preserved. Three Opportunistic samples between Elves' Chasm (mile 117L) and Blacktail (mile 120R): similar results with the addition of six adult humpback chub (two recaptures) at mile 119.13R. Camp at mile 119.5L.
- 13 September: One Type A and four Opportunistic samples between Blacktail and Poncho's Kitchen (mile 137L): same species and size distributions, but fewer fish being caught. Camp at mile 137.3L.
- 14 September: Opportunistic sampling at Kanab Creek (mile 143.5R): a few bluehead, dace, and fathead minnow caught in the mainstem just outside the mouth of the creek, and only one fish observed in the lower 500m of the creek itself - a dying YOY flannelmouth sucker with three lemeae attached. Camp just above Havasu Creek (mile 156.9L).
- 15 September: Overnight hoop net set in the mouth of Havasu Creek yielded 7 bluehead suckers (including one ripe female and three ripe or tuberculate males) and one adult flannelmouth sucker. One Type A and five Opportunistic samples between Havasu Creek and mile 192.42R: one YOY humpback chub, numerous bluehead and

flannelmouth sucker, and many speckled dace and fathead minnow.

16 September: One Type A and two Opportunistic samples between mile 193.85R and 203.80R: 3 YOY humpback chub (the smallest was 25mm), some bluehead and flannelmouth sucker, and numerous speckled dace and fathead minnow.

17 September: Take out and return to Flagstaff.

Table 1. List of studies and sites from Trip 20, 4 - 17 September 1993.

Study	Sites	Date--Time	Mile	Rch	Flo Cod	Flow CFS	Typ A	Typ B	Ang Ingr	Opp	Son de	Ben ths	Sed	Chl	Ptkn	Tot Map	Pln Map	Vis cer	Dri ft	-A- 2nd	Fsh Coll
32001	3	09/04/93 12:00	2.41	L 20	AC	12000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	11
32002	3	09/05/93 07:00	30.48	R 20	DC	13000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	0
32003	1	09/05/93 09:20	32.90	L 20	DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	4
32004	1	09/05/93 09:40	32.05	R 20	DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	3
32005	3	09/05/93 12:00	44.27	L 20	DC	12000	1	.	.	.	.	.	.	.	.	.	1	.	.	.	97
32006	2	09/05/93 15:30	45.43	L 20	DC	11000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	0
32007	4	09/06/93 08:45	58.23	R 20	DC	11000	.	.	.	4	.	.	.	.	.	.	.	.	.	.	84
32008	2	09/06/93 10:00	60.10	R 20	DC	11000	1	.	.	.	.	.	.	.	.	.	.	.	.	.	10
32009	1	09/06/93 12:30	63.08	L 30	DC	10900	.	.	.	1	.	.	.	.	.	.	.	1	.	.	174
32010	2	09/06/93 14:25	61.50	L 22	DC	10800	.	.	.	2	1	.	.	.	.	.	.	.	.	.	317
32011	1	09/06/93 16:00	61.50	L 30	DC	10500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	12
32012	1	09/06/93 16:15	61.50	L 20	DC	10000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	11
32013	1	09/06/93 18:40	60.10	R 20	DC	9000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
32014	1	09/07/93 08:30	60.10	R 20	AC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
32015	1	09/07/93 09:42	61.54	R 30	DC	14000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	33
32016	1	09/07/93 10:15	61.80	R 30	DC	13500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	8
32017	2	09/07/93 10:50	61.95	L 30	DC	13000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	90
32018	2	09/07/93 12:30	62.10	R 30	DC	12500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	181
32019	2	09/07/93 13:11	62.25	R 30	DC	12000	1	.	.	.	.	.	.	.	.	.	.	1	.	.	287
32020	2	09/07/93 15:31	62.75	R 30	DC	11500	1	.	.	.	.	.	.	.	.	.	.	1	.	.	221
32021	1	09/08/93 08:30	61.50	L 22	AC	14000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	11
32022	2	09/08/93 10:00	63.18	L 30	DC	14000	1	.	.	.	.	.	.	.	.	.	.	.	.	.	169
32024	3	09/08/93 13:00	65.25	L 30	DC	12000	1	.	.	.	.	.	.	.	.	.	.	1	.	.	572
32025	1	09/09/93 09:00	65.70	L 30	AC	14500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	5
32026	2	09/09/93 09:40	68.10	L 30	AC	14500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	61
32027	1	09/09/93 10:20	68.39	R 30	DC	14500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	472
32028	3	09/09/93 14:30	72.30	L 30	DC	12000	1	.	.	.	.	.	.	.	.	.	.	.	.	.	188
32029	2	09/10/93 08:15	74.46	R 30	AC	14500	1	.	.	.	.	.	.	.	.	.	.	1	.	.	269
32030	1	09/10/93 10:00	74.47	R 30	AC	14500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	62
32031	1	09/10/93 11:00	75.90	R 30	DC	14500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	3
32032	1	09/10/93 13:15	81.17	L 30	DC	13000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	32
32033	2	09/10/93 18:00	87.45	R 30	DC	10000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	18
32034	3	09/11/93 06:00	87.62	R 32	DC	10000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	1
32035	2	09/12/93 07:30	108.60	R 42	DC	8500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	134
32036	3	09/12/93 11:00	117.40	R 40	AC	9000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	79
32037	3	09/12/93 13:00	119.13	R 40	AC	9500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	13
32038	2	09/12/93 15:00	119.55	L 40	AC	10500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	4
32039	2	09/13/93 08:19	120.47	L 40	DC	8000	1	.	.	.	.	.	.	.	.	.	.	1	.	.	29
32040	2	09/13/93 10:35	122.01	R 40	DC	8000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	2
32041	2	09/13/93 11:30	122.55	L 40	DC	8000	.	.	.	2	.	.	.	.	.	.	.	.	.	.	17
32042	1	09/13/93 13:40	126.85	R 40	DC	7500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
32043	2	09/13/93 16:30	137.12	L 40	DC	7500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	11
32044	2	09/14/93 09:00	143.50	R 40	DC	7500	.	.	.	2	.	.	.	.	.	.	.	.	.	.	5
32045	1	09/14/93 09:15	143.50	R 45	DC	7500	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0
32046	1	09/15/93 07:45	156.93	L 46	DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	8
32047	1	09/15/93 08:45	160.83	L 40	DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	5
32048	1	09/15/93 09:45	164.80	L 40	DC	11000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	13
32049	2	09/15/93 10:10	168.75	R 50	DC	10000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	37
32050	3	09/15/93 13:40	182.37	R 50	DC	9000	.	.	.	3	.	.	.	.	.	.	.	.	.	.	9
32051	2	09/15/93 15:10	192.42	R 50	DC	9000	1	.	.	.	.	.	.	.	.	.	.	1	.	.	516
32052	2	09/16/93 08:00	193.85	R 50	DC	13000	1	.	.	.	.	.	.	.	.	.	.	1	.	.	164
32053	1	09/16/93 11:00	201.06	R 50	DC	13000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	49
32054	1	09/16/93 11:40	203.80	R 50	DC	12000	.	.	.	1	.	.	.	.	.	.	.	.	.	.	75
Sum	95						11	.	.	68	1	.	.	.	.	.	10	.	.	.	4577

Table 2. Length frequencies for each species, Trip 20, 4 - 17 September 1993.

Length Interval	SPECIES										
	BHS	BNT	CCF	CRP	FHM	FMS	GSF	HBC	PKF	RBT	SPD
10 - 19					5						
20 - 29	12				81	2		6		5	60
30 - 39	52			1	121	21		119		5	197
40 - 49	133		2		73	79		441	1	7	186
50 - 59	109	2	2		56	106		521		7	46
60 - 69	35		1		24	59		242		8	9
70 - 79	9		1	1	1	34		77		2	10
80 - 89				2		21		42		2	1
90 - 99				2		7		40		5	1
100 - 109	1					5	1	30		1	
110 - 119	1			1		2		34		3	
120 - 129	1			2				24		3	
130 - 139	1			1		2		29			
140 - 149	6					2		23		1	
150 - 159	1					2		19			
160 - 169	2					2		10			
170 - 179						2		4			
180 - 189						3		9			
190 - 199	1			1		3		2		1	
200 - 209						1		2		1	
210 - 219						1		1		1	
220 - 229						2		1			
230 - 239	1					1		1			
240 - 249	1	1				3		1			
250 - 259						3		1			
260 - 269	1					3					
270 - 279	1					1		2		2	
280 - 289						1				2	
290 - 299						3					
300 - 309						1				1	
310 - 319								1		1	
320 - 329										4	
330 - 339						1				2	
340 - 349										3	
350 - 359						1				1	
360 - 369			1					1			
380 - 389								1		1	
400 - 409										3	
410 - 419								1			
420 - 429						1					
450 - 459						1					
540 - 549						1					
550 - 559						1					



Table 3. Length frequencies for each species, by reach, Trip 20, 4 - 17 September 1993.

Length Interval	Reach 20						LCR						Reach 30						Reach 40					
	BHS	CCF	FMS	GSF	HBC	HBC	RBT	SPD	BHS	CCF	CRP	FHM	FMS	HBC	HBC	PKF	RBT	SPD	BHS	BNT	FHM	FMS	HBC	
10 - 19	1																							
20 - 29							5	7			1							18	1			2		
30 - 39							5	24			1							80	5			4		
40 - 49							7	15			1							128	16			10		
50 - 59			11				6	7			1							26	12			3		
60 - 69			12				4	6			4							3	5			3		
70 - 79			13				8	4			1							1	4			2		
80 - 89			9				2	7			1							1	1			2		
90 - 99			3				1	1			2							7	38			2		
100 - 109							5	1			2							4	30					
110 - 119					1		3				1							1						
120 - 129							2				2							1						
130 - 139											1							1						
140 - 149											1							1						
150 - 159											1							2	22					
160 - 169											1							1	19					
170 - 179											2							8	4					
180 - 189											1							4	4					
190 - 199											1							9	1					
200 - 209																		1						
210 - 219																		1						
220 - 229																		1						
230 - 239																		1						
240 - 249																		1						
250 - 259																		2						
260 - 269																		1						
270 - 279																		1						
280 - 289																		1						
290 - 299																		1						
300 - 309																		1						
310 - 319																		1						
320 - 329																		1						
330 - 339																		4						
340 - 349																		1						
350 - 359																		2						
360 - 369																		1						
380 - 389																		1						
400 - 409																		1						
410 - 419																		3						
420 - 429																		1						
450 - 459																		1						
540 - 549																		1						
550 - 559																		1						

Table 3 (cont'd). Length frequencies for each species, by reach, Trip 20, 4 - 17 September 1993.

Length Interval	Reach 40			Shiruno						Havesu			Reach 50					
	RBT	SPD	BHS	FMI	FMS	HBC	RBT	SPD	BHS	FMS	BHS	FMS	BHS	FMI	FMS	HBC	SPD	
10 - 19																		
20 - 29		18	4	1										4	42	2	1	17
30 - 39		13	6	2			4							18	31	4	4	75
40 - 49		6	4				5							33	14	13	1	30
50 - 59		1	1				2							15	11	17		11
60 - 69		1			1									3	1	8	1	1
70 - 79															9	4		2
80 - 89																		
90 - 99						1												
100 - 109																1		
110 - 119								1										
120 - 129																		
130 - 139																		
140 - 149										1								
150 - 159										1								
160 - 169																		
170 - 179																		
180 - 189																		
190 - 199									1									
200 - 209		1																
210 - 219		1																
220 - 229																		
230 - 239										1								
240 - 249										1								
250 - 259																		
260 - 269																		
270 - 279										1								
280 - 289																		
290 - 299																		
300 - 309																		
310 - 319																		
320 - 329																		
330 - 339																		
340 - 349																		
350 - 359																		
360 - 369																		
380 - 389																		
400 - 409																		
410 - 419																		

Table 4. Length frequency for each species, by gear type, Trip 20, 4 - 17 September 1993.

Gear Type	SPECIES										
	BHS	BNT	CCF	CRP	FHM	FMS	GSF	HBC	PKF	RBT	SPD
Large bag seine (30 x 6 x 1/8)											
Length Interval											
10 - 19					5						
20 - 29	8				74	2		5		4	59
30 - 39	46				111	20		105		5	189
40 - 49	127		2	1	72	79		422		5	180
50 - 59	107	2	2		53	105		503		6	43
60 - 69	35		1		23	58		237		8	9
70 - 79	9		1	1	1	33		73		2	10
80 - 89				2		21		39		2	1
90 - 99				2		7		35		5	1
100 - 109	1					5		28		1	
110 - 119				1		2		27		3	
120 - 129	1			2				22		3	
130 - 139	1			1		2		27			
140 - 149	5					1		20		1	
150 - 159						2		17			
160 - 169	2					2		10			
170 - 179						2		4			
180 - 189						3		9			
190 - 199				1		3		1		1	
200 - 209						1		1		1	
210 - 219						1				1	
220 - 229						2		1			
230 - 239						1					
240 - 249						3		1			
250 - 259						3		1			
260 - 269						3		1			
270 - 279						1				1	
280 - 289						1		1		2	
290 - 299						3					
300 - 309										1	
310 - 319										1	
320 - 329								1		1	
330 - 339										4	
340 - 349						1				2	
350 - 359										3	
360 - 369						1				1	
380 - 389			1					1			
400 - 409								1		1	
420 - 429										3	
450 - 459						1					
540 - 549						1					
550 - 559						1					

Table 4 (cont'd).

Length frequency for each species, by gear type, Trip 20, 4 - 17 September 1993.

	SPECIES										
	BHS	BNT	CCF	CRP	FHM	FMS	GSF	HBC	PKF	RBT	SPD
<b>Small bag seine (15 x 6 x 1/8)</b>											
Length Interval											
20 - 29	4				7			1		1	
30 - 39	6				10	1		13		1	1
40 - 49	6				1			17	1	2	8
50 - 59	2				3	1		12		1	6
60 - 69					1	1		5			3
70 - 79						1		4			
80 - 89								3			
90 - 99								5			
100 - 109								2			
110 - 119								7			
120 - 129								2			
130 - 139								2			
140 - 149						1		3			
150 - 159								2			
190 - 199								1			
200 - 209								1			
210 - 219								1			
230 - 239								1			
270 - 279								1			
410 - 419								1			
<b>Hoop net (5 x 3 x 3/8)</b>											
Length Interval											
30 - 39											
40 - 49								1			
50 - 59								2			
100 - 109								6			
110 - 119	1								1		
140 - 149	1										
150 - 159	1										
190 - 199	1										
230 - 239	1										
240 - 249	1										
260 - 269	1										
270 - 279	1										
300 - 309						1				1	

Table 5. List of tags and recaptures, Trip 20, 4 - 17  
 September 1993. Tag codes: LC = lower caudal LCLP2  
 = lower caudal + left pelvic.

Tag	Mark/ Recap	Species	Length (mm)	Weight (g)	Date	Time	Study Number	Mile	Side	Gear Code
7F7B131058	M	FMS	550	1584	09/06/93	10:00	32008	60.10	R	BL
7F7B113912	M	HBC	164	38	09/06/93	16:15	32012	61.50	L	BL
7F7B177304	M	HBC	158	29	09/07/93	09:42	32015	61.54	R	BL
7F7B195B2B	M	FMS	264	156	09/07/93	12:30	32018	62.10	R	BL
7F7B1B049	M	HBC	165	.	09/07/93	15:31	32020	62.75	R	BL
7F7D1A4737	M	HBC	171	53	09/07/93	15:31	32020	62.75	R	BL
7F7B122F52	M	HBC	188	62	09/07/93	15:31	32020	62.75	R	BL
7F7B135507	M	HBC	151	39	09/09/93	09:40	32026	68.10	L	BS
7F7B11444A	M	FMS	293	251	09/09/93	10:20	32027	68.39	R	BL
7F7B194532	M	HBC	159	42	09/09/93	10:20	32027	68.39	R	BL
7F7B19464C	M	HBC	180	63	09/10/93	08:15	32029	74.46	R	BL
7F7B1B6E08	M	HBC	150	30	09/10/93	08:15	32029	74.46	R	BL
7F7B143E51	M	HBC	152	31	09/10/93	08:15	32029	74.46	R	BL
7F7D222774	M	HBC	154	34	09/10/93	08:15	32029	74.46	R	BL
7F7B126A7D	M	HBC	189	67	09/10/93	13:15	32032	81.17	L	BL
7F7D1E2918	M	HBC	244	139	09/10/93	13:15	32032	81.17	L	BL
7F7B092927	M	HBC	194	68	09/10/93	13:15	32032	81.17	L	BL
7F7B122C12	M	HBC	182	65	09/10/93	13:15	32032	81.17	L	BL
7F7B1B664E	M	HBC	183	61	09/10/93	13:15	32032	81.17	L	BL
7F7D1D4C1C	M	HBC	225	104	09/10/93	13:15	32032	81.17	L	BL
7F7B130C62	M	HBC	188	63	09/10/93	13:15	32032	81.17	L	BL
7F7B1A4B44	M	HBC	276	241	09/12/93	13:00	32037	119.1	R	BS
7F7B11490F	M	HBC	205	98	09/12/93	13:00	32037	119.1	R	BS
7F7B114825	M	HBC	197	72	09/12/93	13:00	32037	119.1	R	BS
7F7B134F3B	M	HBC	237	122	09/12/93	13:00	32037	119.1	R	BS
7F7D1E7E3E	M	HBC	206	89	09/13/93	08:19	32039	120.5	L	BL
7F7B10607A	M	HBC	250	170	09/13/93	08:19	32039	120.5	L	BL
7F7B122D48	M	FMS	257	135	09/13/93	08:19	32039	120.5	L	BL
7F7B106F48	M	FMS	309	223	09/15/93	07:45	32046	156.9	L	HN
7F7DLDO320	M	BHS	277	211	09/15/93	07:45	32046	156.9	L	HN
7F7B112948	M	BHS	266	164	09/15/93	07:45	32046	156.9	L	HN
7F7B123257	M	BHS	238	144	09/15/93	07:45	32046	156.9	L	HN
7F7D1D2A70	M	BHS	246	150	09/15/93	07:45	32046	156.9	L	HN
7F7D1D543B	M	FMS	213	92	09/15/93	15:10	32051	192.4	R	BL
7F7D1B6865	M	FMS	228	113	09/15/93	15:10	32051	192.4	R	BL
7F7D1E1237	M	FMS	223	97	09/15/93	15:10	32051	192.4	R	BL
7F7B10772E	M	FMS	206	71	09/15/93	15:10	32051	192.4	R	BL
7F7B1B1E4E	M	FMS	359	454	09/15/93	15:10	32051	192.4	R	BL
7F7B195A21	M	FMS	273	172	09/15/93	15:10	32051	192.4	R	BL
7F7D4C245F	M	FMS	245	129	09/15/93	15:10	32051	192.4	R	BL
7F7D1D353C	M	FMS	283	194	09/16/93	08:00	32052	193.9	R	BL
7F7B123B34	M	FMS	231	114	09/16/93	11:00	32053	201.1	R	BL
7F7D1D7669	M	FMS	183	55	09/16/93	11:00	32053	201.1	R	BL
7F7B133865	M	FMS	295	263	09/16/93	11:40	32054	203.8	R	BL
7F7D1A3160	M	FMS	290	225	09/16/93	11:40	32054	203.8	R	BL
1F0F6E2341	M	FMS	261	145	09/16/93	11:40	32054	203.8	R	BL
7F7B103A52	M	FMS	244	124	09/16/93	11:40	32054	203.8	R	BL

Table 5 (cont'd).

List of tags and recaptures, Trip 20, 4 - 17  
September 1993. Tag codes: LC = lower caudal  
LCLP2 = lower caudal + left pelvic.

Tag	Mark/ Recap	Species	Length (mm)	Weight (g)	Date	Time	Study Number	Mile	Side	Gear Code
7F7D17271E	M	FMS	254	143	09/16/93	11:40	32054	203.8	R	BL
7F7B1A576C	M	FMS	191	71	09/16/93	11:40	32054	203.8	R	BL
1FOC733B27	M	FMS	187	55	09/16/93	11:40	32054	203.8	R	BL
7F7B14472E	M	FMS	175	51	09/16/93	11:40	32054	203.8	R	BL
7F7B112805	M	FMS	175	51	09/16/93	11:40	32054	203.8	R	BL
7F7B134623	M	FMS	169	37	09/16/93	11:40	32054	203.8	R	BL
LCLP2	R	HBC	144	.	09/06/93	14:25	32010	61.50	L	BL
LCRP2	R	HBC	164	38	09/06/93	16:15	32012	61.50	L	BL
7F7D2B4836	R	FMS	452	837	09/07/93	13:11	32019	62.25	R	BL
7F7F3E6200	R	FMS	540	1448	09/07/93	13:11	32019	62.25	R	BL
7F7F287509	R	HBC	310	218	09/07/93	13:11	32019	62.25	R	BL
LCLP2	R	HBC	104	.	09/07/93	13:11	32019	62.25	R	BL
1FOF636609	R	FMS	251	120	09/07/93	13:11	32019	62.25	R	BL
7F7D3F7E09	R	HBC	368	.	09/08/93	13:00	32024	65.25	L	BL
7F7B08103A	R	FMS	261	182	09/08/93	13:00	32024	65.25	L	BL
D	R	HBC	109	.	09/08/93	13:00	32024	65.25	L	BL
D	R	HBC	123	.	09/08/93	13:00	32024	65.25	L	BL
7F7D08763C	R	HBC	180	.	09/08/93	13:00	32024	65.25	L	BL
7F7B082F16	R	HBC	383	531	09/09/93	10:20	32027	68.39	R	BL
UC	R	HBC	47	.	09/10/93	08:15	32029	74.46	R	BL
7F7D075B77	R	HBC	412	878	09/12/93	13:00	32037	119.1	R	BS
7F7D076C2E	R	HBC	210	88	09/12/93	13:00	32037	119.1	R	BS
7F7F48091D	R	HBC	275	261	09/13/93	08:19	32039	120.5	L	BL
1FOC775806	R	FMS	423	1393	09/13/93	11:30	32041	122.6	L	BL
7F7D1E361E	R	FMS	331	338	09/15/93	15:10	32051	192.4	R	BL
7F7D1E573E	R	FMS	240	131	09/15/93	15:10	32051	192.4	R	BL

Table 6. Original tag and recapture data for fish recaptured during Trip 20, 4 - 17 September 1993.

TAG NUMBER	TAG/ RECAP	DATE	MILE	LOC	SPECIES	LENGTH	WEIGHT	AGENCY	
7F7F287509	M	16 OCT 91	10900	LCR	HBC	270	130	ASU	
	R	7 SEP 93	62.26	Col. R.		310	218	AGFD	
7F7D3F7E09	M	20 APR 93	62.25	Salt Camp	HBC	370	378	ASU	
	R	8 SEP 93		Col. R.		368		AGFD	
7F7D08763C	M	22 MAY 91	64.70	Col. R.	HBC	180	62	BWST	
	R	8 SEP 93	62.25	Col. R.		180		AGFD	
7F7D075B77	M	17 JUL 91	118.50	Col. R.	HBC	408	870	BWST	
	R	12 SEP 93	119.10	Col. R.		412		878	AGFD
7F7D076C2E	M	19 JUL 91	64.70	Col. R.	HBC	193	66	BWST	
	R	9 NOV 92	64.65	Col. R.		200		77	BWST
	R	12 SEP 93	119.10	Col. R.		210		88	AGFD
7F7F48091D	M	20 JUL 92	127.40	Col. R.	HBC	251	158	BWST	
	R	22 FEB 93	127.30	Col. R.		266		192	BWST
	R	20 APR 93	127.15	Col. R.		268		184	BWST
	R	13 SEP 93	120.50	Col. R.		275		261	AGFD
7F7D1E361E	M	28 MAY 93	192.40	Col. R.	FMS	273	185	AGFD	
	R	15 SEP 93	192.40	Col. R.		331		338	AGFD
7F7D1E573E	M	28 MAY 93	192.40	Col. R.	FMS	188	68	AGFD	
	R	15 SEP 93	192.40	Col. R.		240		131	AGFD

Table 7. Number measured, mean length, minimum length, maximum length for each species collected by reach, Trip 20, 4 - 17 September 1993.

SPECIES	REACH						
	Reach 20	LCR	Reach 30	Reach 40	Shinu mo	Havas u	Reach 50
<b>BHS</b>							
Valid N	1	11	211	49	16	7	73
Mean	24	51	52	63	47	207	44
Minimum	24	37	24	27	21	116	25
Maximum	24	67	148	165	195	277	62
<b>BNT</b>							
Valid N				2			
Mean	.	.	.	56	.	.	.
Minimum	.	.	.	55	.	.	.
Maximum	.	.	.	57	.	.	.
<b>CCF</b>							
Valid N	1	5	1				
Mean	366	57	47	.	.	.	.
Minimum	366	43	47	.	.	.	.
Maximum	366	71	47	.	.	.	.
<b>CRP</b>							
Valid N		11					
Mean	.	104	.	.	.	.	.
Minimum	.	38	.	.	.	.	.
Maximum	.	193	.	.	.	.	.
<b>FHM</b>							
Valid N		7	227	24	3		100
Mean	.	46	42	37	29	.	34
Minimum	.	20	18	17	26	.	19
Maximum	.	57	70	62	32	.	60
<b>FMS</b>							
Valid N	49	3	212	28	1	1	84
Mean	70	54	68	80	63	309	111
Minimum	40	43	31	31	63	309	23
Maximum	550	70	540	423	63	309	359
<b>GSF</b>							
Valid N	1						
Mean	106	.	.	.	.	.	.
Minimum	106	.	.	.	.	.	.
Maximum	106	.	.	.	.	.	.
<b>HBC</b>							
Valid N	11	192	1449	26	1		6
Mean	68	52	65	126	98	.	35
Minimum	27	30	25	31	98	.	25
Maximum	164	144	383	412	98	.	40



Table 7 (cont'd).

Number measured, mean length, minimum length, maximum length for each species collected by reach, Trip 20, 4 - 17 September 1993.

SPECIES	REACH						
	Reach 20	LCR	Reach 30	Reach 40	Shinu mo	Havas u	Reach 50
PKF							
Valid N			1				
Mean	.	.	45	.	.	.	.
Minimum	.	.	45	.	.	.	.
Maximum	.	.	45	.	.	.	.
RBT							
Valid N	49		20	2	1		
Mean	87	.	280	209	278	.	.
Minimum	21	.	52	200	278	.	.
Maximum	358	.	407	217	278	.	.
SPD							
Valid N	64	3	257	39	11		136
Mean	45	43	42	33	42	.	38
Minimum	23	39	24	21	31	.	21
Maximum	93	45	84	67	54	.	78

Table 8. Number of each species collected and species composition by reach, Trip 20, 4 - 17 September 1993.

SPECIES	REACH							Total
	Reach 20	LCR	Reach 30	Reach 40	Shinu mo	Havas u	Reach 50	
BHS								
Number caught	1	11	236	50	18	7	75	398
%	.6%	4.7%	8.9%	28.8%	47.1%	87.5%	17.9%	10.8%
BNT								
Number caught	.	.	.	2	.	.	.	2
%				1.2%				.1%
CCF								
Number caught	1	5	1	.	.	.	.	7
%	.6%	2.2%	.0%					.2%
CRP								
Number caught	.	11	.	.	.	.	.	11
%		4.7%						.3%
FHM								
Number caught	.	7	249	27	3	.	108	394
%		3.0%	9.5%	14.1%	8.8%		24.8%	10.6%
FMS								
Number caught	54	3	232	28	1	1	87	406
%	27.8%	1.3%	8.9%	16.5%	2.9%	12.5%	20.9%	11.1%
GSF								
Number caught	1	.	.	.	.	.	.	1
%	.6%							.0%
HBC								
Number caught	11	288	1764	28	1	.	6	2098
%	6.3%	82.8%	60.9%	15.3%	2.9%		1.5%	49.5%
PKF								
Number caught	.	.	1	.	.	.	.	1
%			.0%					.0%
RBT								
Number caught	52	.	21	2	1	.	.	76
%	27.8%		.9%	1.2%	2.9%			2.1%
SPD								
Number caught	102	3	292	42	110	.	574	1123
%	36.4%	1.3%	10.8%	22.9%	35.3%		34.9%	15.2%
Total								
Number caught	222	328	2797	179	134	8	850	4518

Table 9. Catch-per-unit-effort and total catch for seines and traps, by species, Trip 20, 4 - 17 September 1993.

Catch-per-unit-Effort	GEAR	
	Seine	Trap
<b>BHS</b>		
Mean	2.30	.86
Minimum		
Maximum	141.7	6.00
<b>BKT</b>		
Mean		
Minimum		
Maximum		
<b>CCF</b>		
Mean	.02	
Minimum		
Maximum	1.19	
<b>CRP</b>		
Mean	.03	
Minimum		
Maximum	2.98	
<b>FHM</b>		
Mean	1.61	
Minimum		
Maximum	28.57	
<b>FMS</b>		
Mean	1.34	.11
Minimum		
Maximum	27.78	.86
<b>HBC</b>		
Mean	7.41	.69
Minimum		
Maximum	150.0	5.50
<b>PKF</b>		
Mean	.01	
Minimum		
Maximum	1.19	
<b>RBT</b>		
Mean	.25	.11
Minimum		
Maximum	6.67	.86
<b>SPD</b>		
Mean	9.79	
Minimum		
Maximum	916.7	

Catch	GEAR	
	Seine	Trap
<b>BHS</b>		
Mean	3	1
Minimum		
Maximum	84	7
<b>BKT</b>		
Mean		
Minimum		
Maximum		
<b>CCF</b>		
Mean	0	
Minimum		
Maximum	4	
<b>CRP</b>		
Mean	0	
Minimum		
Maximum	10	
<b>FHM</b>		
Mean	3	
Minimum		
Maximum	55	
<b>FMS</b>		
Mean	3	0
Minimum		
Maximum	100	1
<b>HBC</b>		
Mean	15	1
Minimum		
Maximum	313	11
<b>PKF</b>		
Mean	0	
Minimum		
Maximum	1	
<b>RBT</b>		
Mean	1	0
Minimum		
Maximum	17	1
<b>SPD</b>		
Mean	8	
Minimum		
Maximum	396	

Table 10. Trap effort (hours) and catches, Trip 20, 4 - 17 September 1993.

REACH	EFFORT	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
20	61										
22	24							11			
42	14	1								1	
46	14	7					1				
Total	113	8					1	11		1	

Table 11. Total effort and number of hauls, by reach, Trip 20, 4 - 17 September 1993.

REACH	EFFORT	HAULS
	Sum	Sum
20	9,254	39
22	426	2
30	20,593	93
40	5,250	28
42	12	1
45	40	1
50	8,214	34
Total	43,789	198

Table 12. Seine effort (m<sup>2</sup>) and catches, by species and reach, Trip 20, 4 - 17 September 1993.

REACH	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
20	9,254	39	1		1			54	11		52	102
22	426	2	11		5	11	7	3	277			3
30	20,593	93	235		1		249	232	1759	1	21	292
40	5,250	28	49				27	24	28		2	41
42	12	1	17				3	1	1			110
45	40	1										
50	8,214	34	75				108	87	6			574
Total	43,789	198	388		7	11	394	401	2082	1	75	1122

Table 13. Seine effort (m<sup>2</sup>) and catches, by species and habitat type, Trip 20, 4 - 17 September 1993.

HAB_CD	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
BE	80	1	2				2	7				38
CB	14,845	89	189		1		273	225	862	1	23	666
CF	2,295	15	2		1		13	33	35		11	31
CM	3,540	15	2				4	6	80		19	17
CO	560	3	10				10	4	67		1	5
IB	300	2	9				1	26	133			5
MC	6,373	21	30				13	6	104		4	82
ME	14,317	44	50				47	50	220		14	138
RU	426	2	11		5	11	7	3	277			3
SC	1,001	4	66				21	40	303		3	27
TM	52	2	17				3	1	1			110
Total	43,789	198	388		7	11	394	401	2082	1	75	1122

Table 14. Seine effort (m<sup>2</sup>) and catches, by species and temperature, Trip 20, 4 - 17 September 1993.

TEMP	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FHMCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
11	7,907	30	79				75	55	522		18	30
12	13,316	52	126				59	148	538		17	131
13	9,021	48	22		2		51	50	380		22	160
14	2,548	12	28				29	22	25		17	91
15	5,012	18	53				53	44	7			156
16	2,373	15	10				43	5	132			26
17	1,280	7										
18	656	4	18				27	5	66	1	1	114
19	510	3	11		5	11	7	3	277			3
20	764	6	27				48	38				403
21	300	2	9				1	26	133			5
Total	43,687	197	383		7	11	393	396	2080	1	75	1119

Table 15. Seine effort (m<sup>2</sup>) and catches, by turbidity (NTUs),  
 Trip 20, 4 - 17 September 1993.

Turbidity	EFFORT	HAULS	BHSCATCH	BKTCATCH	CCFCATCH	CRPCATCH	FMNCATCH	FMSCATCH	HBCCATCH	PKFCATCH	RBTCATCH	SPDCATCH
< 570 NTU	21,011	102	179				104	131	719		30	446
570 - 1699	200	1						1	8			3
>1699 NTU	786	3	12				7	5	285		1	3
Total	21,997	106	191		5	11	111	137	1012		31	452

Table 16. Mean turbidity (NTUs), by reach, Trip 20, 4 - 17  
 September 1993.

REACH	Mean Turbidity
20	53
22	6600
30	484
40	68
42	32
45	3
46	14
50	48