

NATIONAL MARINE FISHERIES SERVICE PERMIT NO. 1120 ANNUAL REPORT

For the Period
January 1, 2001 To December 31, 2001

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INTRODUCTION

This report satisfies the requirement for an annual reporting of "take" as specified in Permit No. 1120 (formerly Permit No. 795) issued to the Idaho Department of Fish and Game (IDFG) by the National Marine Fisheries Service (NMFS) under the Endangered Species Act of 1973, as amended. Permit No. 1120 covers research and enhancement activities associated with Idaho Department of Fish and Game's sockeye salmon *Oncorhynchus nerka* captive broodstock program including: 1) adult sockeye salmon trapping on Redfish Lake Creek and the upper Salmon River at the Sawtooth Fish Hatchery, 2) smolt trapping on Redfish Lake Creek and the upper Salmon River at the Sawtooth Fish Hatchery, 3) residual sockeye salmon trapping and spawner enumeration in Redfish Lake, 4) adult sockeye salmon telemetry and spawner enumeration in Redfish Lake, 5) broodstock and production rearing at Eagle and Sawtooth fish hatcheries, 6) egg and fish transfers between NMFS/IDFG facilities and Sawtooth Basin waters, and 7) eyed-egg, juvenile, and adult releases to Sawtooth Basin waters. Reporting for activities conducted at NMFS Burley Creek Fish Hatchery and/or the NMFS Manchester Marine Experimental Station is the responsibility of NMFS (Permit 1005) and will appear under separate cover.

SMOLT TRAPPING AND OUTMIGRATION IN 2001

Redfish Lake

The outmigrant trap on Redfish Lake Creek is used to estimate the number of wild and hatchery-produced sockeye salmon smolts emigrating from Redfish Lake. The trap is located 1.4 km downstream from the lake outlet and was operated from 22 April to 6 June in 2001. Personnel from IDFG checked the trap twice daily.

All *O. nerka* captured at the trap were anesthetized and scanned for PIT tags. Up to 50 hatchery-produced sockeye salmon smolts (1,390 total) and all wild/natural smolts were PIT-tagged each day and measured for fork-length (1 mm) and weight (0.1 g). Hatchery-produced *O. nerka* captured at the trap originated from 48,051 pre-smolts released in October 2000. To estimate trapping efficiency, PIT-tagged smolts were released approximately 250 m upstream of the weir one half-hour after sunset. Smolts that did not receive PIT tags and recaptured PIT-tagged smolts were released downstream of the weir one-half hour after sunset. Flow-through live boxes with locking lids were used to hold fish until the evening release.

Smolt outmigration peaked on 13 May 2001 (Figure 1). A total of 40 wild/natural and 4,119 hatchery-produced *O. nerka* were captured between 22 April and 6 June. Trapping efficiency varied with stream flow. Outmigrant run size was estimated at 110 wild/natural fish and 9,616 hatchery produced fish. Fork-lengths and weights averaged 114 mm and 14.1 g for wild/natural outmigrants and 116 mm and 13.5 g for hatchery-produced outmigrants. Aging of scales from wild/natural outmigrants indicated that approximately 20% of the year 2001 wild/natural outmigrants were age-2. In 2001, no outmigrants were taken into the captive broodstock program and no mortalities were associated with PIT-tagging or handling. However, there were 21 trap-related mortalities of hatchery-produced sockeye salmon and 2 mortalities of chinook salmon smolts associated with high discharge periods (0.5% of total number of fish handled).

One steelhead and nine chinook salmon outmigrants were captured at the Redfish Lake Creek trap in 2001.

Alturas Lake

Outmigrant trapping activities on Alturas Lake Creek were conducted by the Shoshone-Bannock tribes and are covered by a separate NMFS Permit. Results of their activities appear under separate cover. Hatchery-produced smolts that emigrated from Alturas Lake in 2001 originated from a pre-smolt release of 5,986 fish planted in July 2000 and a pre-smolt release of 6,003 fish planted in October 2000. All pre-smolts were released at a mid-lake location. Fifty-four hatchery-produced and 148 wild/natural *O. nerka* were intercepted at the IDFG juvenile fish trapping facility at the Sawtooth Fish Hatchery (downstream of Pettit and Alturas lakes on the Salmon River). No attempt was made to develop an estimate of total outmigration at this location.

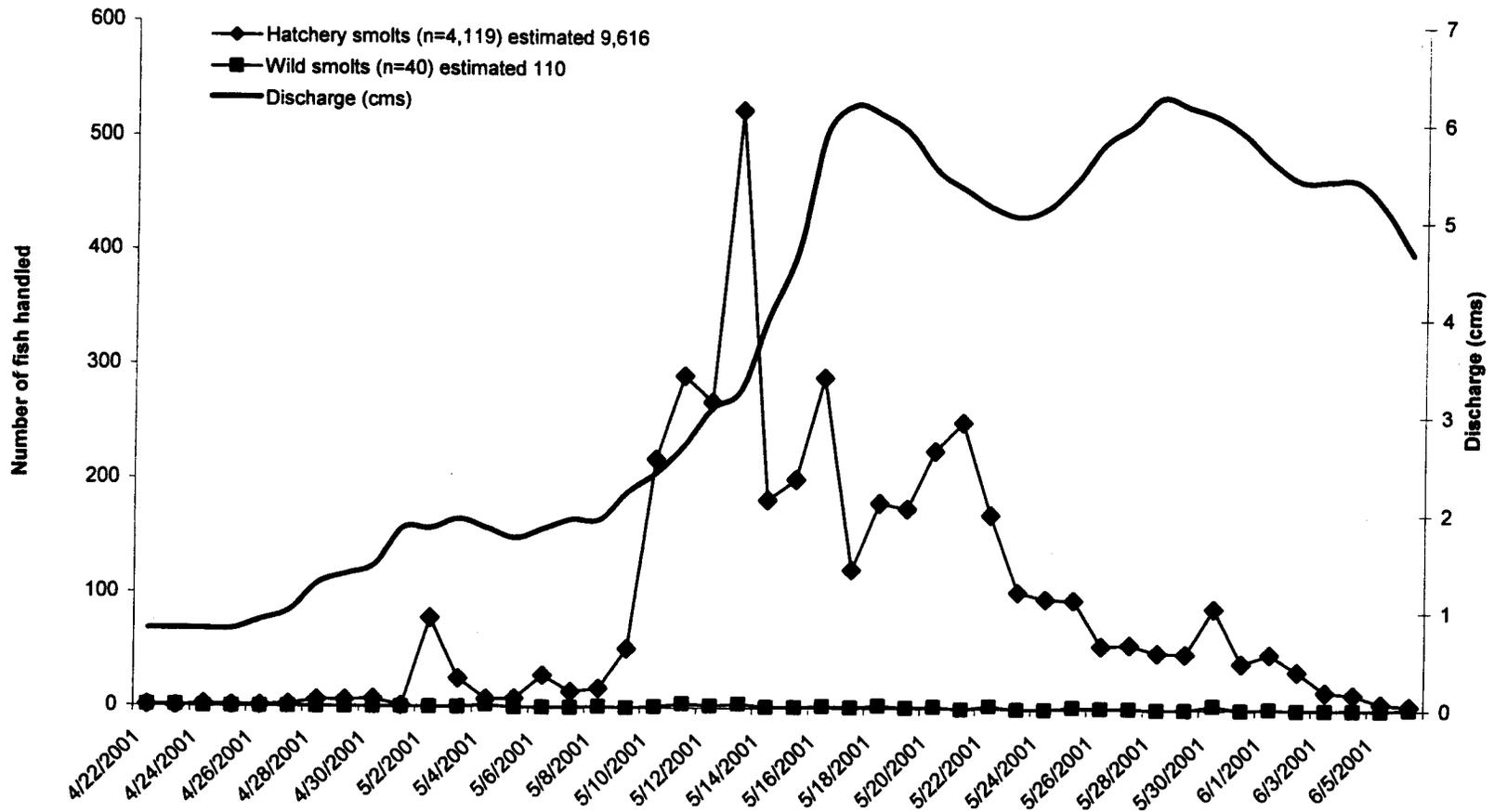


Figure 1. Daily trap capture and estimated outmigration of wild/natural and hatchery-produced sockeye salmon smolts at Redfish Lake Creek Trap for the 2001 outmigration year.

Pettit Lake

Outmigrant trapping activities on Pettit Lake Creek were conducted by the Shoshone-Bannock tribes and are covered by a separate NMFS Permit. Results of their activities appear under separate cover. Hatchery-produced smolts that emigrated from Pettit Lake in 2001 originated from a pre-smolt release of 6,007 pre-smolts planted in July 2000 and a pre-smolt release of 6,067 fish in October 2000. All pre-smolts were released at a mid-lake location. Fifty-four hatchery-produced and 148 wild/natural *O. nerka* were intercepted at the IDFG juvenile fish trapping facility at the Sawtooth Fish Hatchery (downstream of Pettit and Alturas lakes on the Salmon River). No attempt was made to develop an estimate of total outmigration at this location.

ADULT TRAPPING ACTIVITIES IN 2001

Two adult traps are used to capture returning anadromous sockeye salmon in the Sawtooth Basin. The first trap is located on Redfish Lake Creek approximately 1.4 km downstream from the lake outlet and was operated from 25 June to 12 October in 2001. The second trap is located on the upper Salmon River at the Sawtooth Fish Hatchery weir and was operated from 24 May to 12 October in 2001.

In 2001, 26 anadromous sockeye salmon returned to the Sawtooth Basin. Traps on Redfish Lake Creek and the upper Salmon River at the Sawtooth Fish Hatchery intercepted 15 and 8 adults, respectively. Additionally, three adult sockeye salmon were observed immediately downstream of the Sawtooth Fish Hatchery trap but were not handled. Fish were captured between 23 July and 3 October 2001. Returning adult sockeye salmon originated from a variety of release options including: 1) 1998 smolt release in Redfish Lake Creek, 2) 1998 pre-smolt releases in Redfish, Alturas, and Pettit lakes, 3) 1999 smolt releases in Redfish Lake Creek and the upper Salmon River, and 4) 1997 eyed-egg releases and pre-spawn adult releases in Redfish Lake. With the exception of outmigrants originating from pre-spawn adult and eyed-egg releases, all juveniles released in 1998 and 1999 were adipose fin-clipped. A portion of fish released as pre-smolts and smolts were also PIT-tagged. Additionally, fish released as smolts and reared at the Bonneville Fish Hatchery were left ventral fin-clipped and coded wire-tagged. A summary of adult returns is presented in Table 1.

One adult chinook salmon *O. tshawytscha* female was captured at the Redfish Lake Creek trap and passed upstream.

RESIDUAL SOCKEYE SALMON TRAPPING/ENUMERATION ACTIVITIES IN 2001

No residual sockeye salmon trapping activities were conducted in 2001. The Shoshone-Bannock Tribe and IDFG conducted night snorkeling to enumerate residual sockeye salmon spawner abundance weekly from 25 September to 6 November. Transects at the south end of the lake and along Sockeye Beach were snorkeled after sunset. Seven residual sockeye salmon were observed on Sockeye Beach and two residual sockeye salmon were observed at the south end of the lake.

Table 1. Year 2001 anadromous sockeye salmon adult return summary.

Summary Category	Total Number Trapped	Number Trapped at Redfish Lake Cr.	Number Trapped at Sawtooth Hatchery
All Anadromous Adults	23	16	8
Anadromous Males	17	12	5
Anadromous Females	6	3	3
Un-Marked Adults ¹	4	4	0
Adipose-Clipped Adults ²	17	10	7
Adipose-Clipped and Left Ventral-Clipped Adults ³	2	1	1

¹ Un-marked adults are presumably the result of eyed-egg and pre-spawn adult release strategies conducted in Redfish Lake in 1997. Un-marked adults could also be progeny of Redfish Lake residual sockeye salmon.

² Adipose-clipped adults are the result of pre-smolt and smolt release strategies conducted in 1998 and 1999, respectively. All juveniles released with an adipose clip (only) were reared at IDFG facilities.

³ Adipose and left ventral-clipped adults are the result of smolt releases conducted in 1998. All juveniles released with adipose and left ventral clips were reared at the Oregon Department of Fish and Wildlife's Bonneville Fish Hatchery.

TELEMETRY INVESTIGATIONS IN 2001

On 9,10,11 September 2001, anadromous and hatchery-reared maturing adult sockeye salmon were released to Redfish Lake. Prior to release, six male and three female sockeye salmon were implanted with radio transmitters (two anadromous males and seven NMFS seawater-reared (three female and four male)). Telemetry investigations of adult locations began on 30 September and continued weekly through 7 November. Fish locations were recorded at least weekly by boat tracking. The first area of excavation was located at the south end of the lake on 23 October. Five of the nine radio tags were recovered after release. None of the recovered tags were associated with carcasses. The first tag recovery was on 11 October on a hillside south of the Point Campground (NMFS reared). The second and third tags recovered were found on 21 October on the west shore of the lake south of the Point Campground (NMFS reared) and near the U. S. Forest Service Transfer Camp dock (anadromous). The fourth and fifth tags were recovered on 6 November in Glacier View Campground (anadromous) and on the shore of the lake north of the U. S. Forest Service Transfer Camp dock (NMFS reared). A total of 11 areas of excavation (possible redds) were located at the south end of the lake on the opposite shore from the U. S. Forest Service Transfer Camp dock. This location was also used for spawning by adult sockeye salmon released in 2000. Aerial surveys conducted in November indicated another three areas of excavation near the inlet of Redfish Lake Creek at the south end of the lake.

PERFORMANCE OF CULTURED GROUPS IN 2001

During this reporting period, five broodstock and two production groups were in culture at IDFG facilities representing brood years 1997, 1998, 1999, 2000, and 2001. Summaries of losses, while in culture during this reporting period, are presented in Tables 2 and 3. Culture groups developed to meet future spawning needs are designated as "broodstock" groups. Culture groups developed primarily for supplementation to Sawtooth Basin waters are designated as "production" groups. The year of development for specific culture groups may appear abbreviated (e.g., BY96 refers to brood year 1996).

BY97 Broodstock

This group consists of progeny from ANBY94 females and cryopreserved milt from 1991 Redfish Lake outmigrant males (OM91), 1992 Redfish Lake outmigrant males (OM92), and the single male sockeye salmon that returned to Redfish Lake in 1992 (AN92). Initial inventory for BY97 broodstock was 12 fish. Eleven fish matured in 2001; none of the BY97 fish were utilized in spawn crosses. At the end of the reporting period, zero fish from this broodstock remained in culture at the Eagle Fish Hatchery (Table 2).

Table 2. Summary of losses and magnitude of mortality for five captive sockeye salmon broodstocks reared at IDFG facilities in 2001.

	Broodstocks				
	BY97	BY98	BY99	BY00	BY01
Starting Inventory (January 1, 2001)	12	278 ^a	377	515 ^b	870 ^c
<u>Eyed-Egg to Fry</u> Undetermined	na	na	na	36 ^d	na
<u>Mechanical Loss</u>					
Handling	0	0	3	1	na
Jump-out	0	0	0	0	na
Human Error	0	0	0	1	na
<u>Non-infectious</u>					
Lymphosarcoma	0	1	0	0	na
Nephroblastoma	0	0	0	0	na
Other	1 ^e	12 ^e	28 ^e	7 ^e	na
<u>Infectious</u>					
Bacterial	0	0	0	0	na
Viral	0	0	0	0	na
Other	0	0	0	4	na
<u>Maturation</u>					
Mature Males	9	90	75	0	na
Mature Females	2	152	8	0	na
Other	0	0	0	0	na
<u>Relocation</u>					
Transferred In	0	0	0	0	na
Transferred Out	0	0	0	0	435 ^f
Planted/Released	0	0	0	0	0
Ending Inventory (December 31, 2001)	0	23	271	271	435

^a Starting inventory reflects an inventory adjustment made post-completion of the 2000 NMFS Annual Report.

^b December 2000 developing fry and egg numbers. Starting inventory reflects an inventory adjustment made post completion of the 2000 NMFS Annual Report.

^c December 2001 developing fry and eyed-egg numbers.

^d Typical egg to fry mortality includes non-hatching eggs, abnormal fry, and swim-up loss.

^e Includes culling associated with cultural abnormalities, and all undetermined, non-infectious

^f Transferred from IDFG Eagle Fish Hatchery to NMFS for broodstock rearing

BY98 Broodstock

Three primary culture groups were developed in 1998 to meet future broodstock needs. The first group (produced at the Big Beef Creek Hatchery and transferred to the Eagle Fish Hatchery in November, 1998) was developed from second generation females (ANBY91) produced from the four anadromous adults that returned to Redfish Lake Creek in 1991 (AN91) and the single anadromous male that returned to Redfish Lake Creek in 1998 (AN98). The second culture group was developed from first generation females (ANBY96) produced from the single female that returned to Redfish Lake Creek in 1996 (AN96). Males used for spawn crosses included first generation males (ANBY94) produced from the single female that returned to Redfish Lake Creek in 1994 (AN94), the single anadromous male that returned to Redfish Lake Creek in 1998 (AN98), and cryopreserved milt from first generation progeny (OMBY93) of female 1991 Redfish Lake outmigrants (OM91) and the six male sockeye salmon that returned to Redfish Lake Creek in 1993 (AN93). The third culture group was developed from first generation females and males (ANBY96) produced from the single female that returned to Redfish Lake Creek in 1996 (AN96). All fish were combined post-PIT tagging and reared collectively as BY98 broodstock. Initial inventory for this reporting period was 278 fish. One hundred fifty-two females and 90 males matured at age-3 in 2001. One hundred twenty-nine females and nine males were utilized in hatchery spawn crosses. At the end of this reporting period, 23 BY98 broodstock remained in culture at the Eagle Fish Hatchery (Table 2).

BY99 Broodstock

Eleven families, represented by 30 unique sub-families, were developed from brood year 1999 broodstock spawn crosses at the Eagle Fish Hatchery. To simplify tracking, families were grouped under two broodstock group titles: BY99 and ANHBY99. The BY99 broodstock group was developed using male and female sockeye salmon from the ANBY96, BY96 and BY97 broodstocks (described above). Specific crosses performed to develop this broodstock group included: 1) ANBY96 females x BY97 males, 2) ANBY96 females x ANBY96 males, 3) ANBY96 females x BY96 males, 4) BY96 females x ANBY96 males, and 5) BY96 females x BY97 males. The ANHBY99 broodstock group was developed using male and female sockeye salmon from ANBY96, BY96, BY97 broodstocks and four of the seven anadromous adults that returned to the Sawtooth Fish Hatchery in 1999 (ANH99). Specific crosses performed to develop this broodstock group included: 1) ANBY96 females x ANH99 males, 2) BY96 females x ANH99 males, 3) ANH99 female x ANBY96 males, 4) ANH99 female x BY96 males, 5) ANH99 female x BY97 males and 6) ANH99 female x cryopreserved milt from the single male sockeye salmon that returned to Redfish Lake Creek in 1998 (AN98). Initial inventory for this reporting period was 377 fish. Seventy-five males matured at age-2 in 2001; 56 were utilized in hatchery spawn crosses. At the end of this reporting period, 271 BY99 fish remained in culture at the Eagle Fish Hatchery (Table 2).

BY00 Production

Sixteen families, represented by 49 unique sub-families, were developed from brood year 2000 production spawn crosses at the Eagle Fish Hatchery. To simplify tracking, families were grouped under two production group titles: BY00 and ANHBY00. The BY00 production group was developed using male and female sockeye salmon from the BY97 and BY98 broodstocks (described above). Specific crosses performed to develop this production group included: 1) BY97 females x

BY97 males, 2) BY97 females x BY98 males and 3) BY98 females x BY97 males. Approximately 170,419 eyed-eggs were produced from BY00 spawn crosses. The ANHBY00 production group was developed using male and female sockeye salmon from BY97 and BY98 broodstocks and 38 (18 females and 20 males) of the 41 anadromous adults that returned to the Stanley Basin in 2000 and were retained for spawning. Specific crosses performed to develop this production group included: 1) ANH00 females x BY97 males, 2) ANH00 females x BY98 males, 3) ANH00 females x ANH00 males and 4) BY97 females x ANH00 males. Initial inventory of developing fry and eggs for this reporting period included approximately 110,641 at Sawtooth Fish Hatchery and 62,554 at Eagle Fish Hatchery. On 27 July 2001, 6,123 age-0 pre-smolts from this production group were released to Alturas (3,064) and Pettit (3,059) lakes. On 31 July 2001, an additional 3,357 age-0 pre-smolts from this production group were released to Alturas (3,059) and Pettit (2,998) lakes. As part of the fall direct release strategy, 52,512 age-0 pre-smolts were released to Alturas (5,990), Pettit (4,993), and Redfish (41,529) lakes on 8 and 9 October 2001. On 18, 19 and 21 of June 2001, 49,090 BY00 pre-smolts were transferred from Eagle Fish Hatchery to net pens in Redfish Lake; 41,474 pre-smolts were released from the net pens on 10 October 2001. At the end of this reporting period, 38,851 fish from this production group remained in culture at the Sawtooth Fish Hatchery (Table 3). These fish are scheduled for direct release as smolts in May of 2002.

BY00 Broodstock

Approximately 900 eyed-eggs were segregated from production groups described above to create the BY00 broodstock representing ten families (54 unique sub-families). Approximately 346 eyed-eggs and 42 fry were transferred to NMFS facilities where they will remain through maturation. The majority of BY00 broodstock adults produced at NMFS facilities will contribute to future spawning designs. Inventory reporting for these fish will appear under separate cover by NMFS. Initial inventory for the BY00 broodstock at Eagle Fish Hatchery was 515 developing fry. At the end of this reporting period, 473 BY00 broodstock fish were in culture (Table 2).

Table 3. Summary of losses and magnitude of mortality for two captive sockeye salmon production groups reared at IDFG facilities in 2001.

	Production Groups	
	BY00	BY01
Starting Inventory (January 1, 2001)	173,195 ^a	116,600 ^b
<u>Eyed-Egg to Fry</u> Undetermined	13,475 ^c	na
<u>Mechanical Loss</u>		
Handling	14	na
Jump-out	0	na
Human Error	0	na
<u>Non-infectious</u>		
Lymphosarcoma	0	na
Other	12,088 ^d	na
<u>Infectious</u>		
Bacterial	2,601	na
Viral	0	na
Other	0	na
<u>Maturation</u>		
Mature Males	0	na
Mature Females	0	na
Other	0	na
<u>Relocation</u>		
Transferred In	0	0
Transferred Out	0	0
Planted/Released	106,166	0
Ending Inventory (December 31, 2001)	38,851	116,600

^a December 2000 developing fry and eyed-egg numbers.

^b December 2001 eyed-egg numbers.

^c Typical egg to fry mortality includes non-hatching eggs, abnormal fry, and swim-up loss.

^d Includes culling associated with cultural abnormalities, and all undetermined, non-infectious mortality.

BY01 Production

Sixteen families, represented by 86 unique sub-families, were developed from brood year 2001 production spawn crosses at the Eagle Fish Hatchery. To simplify tracking, families were grouped under two production group titles: BY01 and ANHBY01. The BY01 production group was developed using male and female sockeye salmon from the BY98 and BY99 broodstocks (described above). Specific crosses performed to develop this production group included: 1) BY98 females x BY99 males and 2) BY98 females x BY98 males. Approximately 95,209 eyed-eggs were produced from BY01 spawn crosses. The ANHBY01 production group was developed using male and female sockeye salmon from the BY98 broodstock male sockeye salmon from the BY99 broodstock and 9 (2 females and 7 males) of the 26 anadromous adults that returned to the Stanley Basin in 2001 and were retained for spawning. Specific crosses performed to develop this production group included: 1) ANH01 females x BY98 males, 2) ANH01 females x BY99 males, and 3) BY98 females x ANH01 males. Approximately 23,092 eyed-eggs were produced from ANHBY01 spawn crosses. Eagle Fish Hatchery transferred 116,600 BY01/ANHBY01 production eggs to the Sawtooth Fish Hatchery in November 2001. At the end of this reporting period, approximately 116,600 eyed eggs were in culture at Sawtooth Fish Hatchery (Table 3).

BY01 Broodstock

Approximately 870 eyed-eggs were segregated from production groups described above to create the BY01 broodstock representing eleven families (50 unique sub-families). Approximately 435 eyed-eggs were transferred to NMFS facilities where they will remain through maturation. The majority of BY01 broodstock adults produced at NMFS facilities will contribute to future spawning designs. Inventory reporting for these fish will appear under separate cover by NMFS. At the end of this reporting period, 435 developing fry were in culture at Eagle Fish Hatchery (Table 2).

2001 SPAWNING MATRIX

The Idaho Department of Fish and Game is required by Permit No. 1120 to discuss proposed broodstock spawning matrices with NMFS Northwest Fisheries Science Center (NWFSC) genetics staff. In 2001, this was accomplished by distributing and discussing a proposed spawning matrix at the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC) held on 2 October 2001 in Manchester, Washington (Appendix A). Representatives from NMFS Conservation Biology and Resource Enhancement and Utilization Technologies divisions (NWFSC) were present at this meeting. No objections to the proposed spawning design were aired.

YEAR 2001 SPAWNING ACTIVITIES

Results from 2001 Eagle Fish Hatchery spawning activities are reviewed below. Results from spawning activities conducted by NMFS personnel at Washington State facilities will appear under separate cover by that agency. The year of development for specific broodstocks may appear abbreviated (e.g., BY96 refers to brood year 1996).

During the fall of 2001, 242 age-3 fish (152 females and 90 males) from the BY98 broodstock and 75 age-2 fish (all males) from the BY99 broodstock matured at the Eagle Fish Hatchery. In addition to these maturing broodstocks, 9 (2 females and 7 males) of the 26 anadromous adults (ANH01) that returned to the Stanley Basin in 2001 were transferred to the Eagle Fish Hatchery and incorporated in the spawning design. Eggs from crosses performed with anadromous adults contributed to both production and broodstock program needs.

2001 Production Spawning

One hundred thirty-one females and 72 males were spawned at Eagle Fish Hatchery between 5 October and 7 November 2001 to generate 282,434 green eggs. To avoid inbreeding, an effort was made to outcross fish from different brood years (e.g., BY96 females spawned with BY97 males and BY96 anadromous males). When this was not possible, within brood year spawn crosses were made based on a desirability matrix designed to avoid or minimize inbreeding.

Sixteen families, represented by 86 unique sub-families, were developed from brood year 2001 production spawn crosses at the Eagle Fish Hatchery. To simplify tracking, families were grouped under two production group titles: BY01 and ANHBY01. The BY01 production group was developed using male and female sockeye salmon from the BY98 broodstock and male sockeye salmon from the BY99 broodstock. Specific crosses performed to develop this production group included: 1) BY98 females x BY99 males, and 2) BY98 females x BY98 males. Spawn crosses produced approximately 234,027 green and 95,029 eyed-eggs. Brood year 1998 female fecundity averaged 2,213 eggs. Egg survival to the eyed stage of development for the BY01 production group averaged 40.7% (median 31.7%) (Table 4).

The ANHBY01 production group was developed using male and female sockeye salmon from the BY98 broodstock, male sockeye salmon from the BY99 broodstock, and 9 (2 females and 7 males) of the 26 anadromous adults that returned to the Stanley Basin in 2001 and were retained for spawning. Specific crosses performed to develop this production group included: 1) ANH01 females x BY98 males, 2) ANH01 females x BY99 males, and 3) BY98 females x ANH01 males. Spawn crosses produced approximately 48,407 green and 23,092 eyed-eggs. Fecundity for ANH01 females averaged 2,743 eggs. Egg survival to the eyed stage of development for the ANHBY01 production group averaged 47.7% (median 55.8%) (Table 4).

Table 4. Summary information fore 2001 sockeye salmon spawning activities at Eagle Fish Hatchery.

Spawning Cross*		No. of Green Eggs Taken	No. Of Eyed-Eggs	Mean Egg Survival to Eyed-Stage	Median Egg Survival to Eyed-Stage
Female	Male				
ANH01	BY98	2,724	1,877	68.9%	86.7%
ANH01	BY99	2,650	1,322	49.8%	49.8%
BY98	ANH01	43,033	19,893	46.2%	54.5%
BY98	BY98	25,138	11,386	45.2%	41.3%
BY98	BY99	208,889	83,643	40.0%	29.5%
TOTALS		282,343	118,121	42.0%	35.4%

NOTE: * ANH01 refers to year 2001 anadromous sockeye salmon.
 BY98 refers to captive adults produced in spawn year 1998.
 BY99 refers to captive adults produced in spawn year 1999.

2001 Broodstock Spawning

Approximately 870 eyed-eggs representing eleven unique families (50 sub-families) were selected from specific spawn crosses described above and incubated separately for future broodstock needs. Spawn crosses represented in the Eagle broodstock are presented in Table 5.

CRYOPRESERVATION IN 2001

No milt from maturing sockeye salmon was cryopreserved in 2001.

FISH AND GAMETE TRANSFERS IN 2001

Eyed eggs, milt and adult fish were transferred in 2001. In all cases, the required State transfer permits were acquired prior to shipping.

On 14, 21, and 29 November 2001, approximately 435 eyed-eggs from broodstock crosses were transferred from the Eagle Fish Hatchery to the NMFS Burley Creek Fish Hatchery. Fish that mature as a result of this transfer will be incorporated in future NMFS spawning designs.

On 14, 19, 21 and 29 November 2001, approximately 116,600 eyed-eggs from production crosses were transferred from the Eagle Fish Hatchery to the Sawtooth Fish Hatchery. Fish that result from this transfer will be used to fill spring 2003 smolt release strategies.

On 25 October 2001, milt harvested from seven brood year 1999, and two brood year 1998 sockeye salmon was transferred from Eagle Fish Hatchery to the NMFS Burley Creek Fish Hatchery to accommodate spawning needs.

On 9 and 10 September 2001, NMFS transferred 66 BY97 adults to Redfish Lake to be released for volitional spawning. One mortality was associated with the transportation.

PRODUCTION RELEASES MADE IN 2001

Pursuant to Special Condition B. 9. of Permit No. 1120, IDFG received authorization from NMFS to carryout the following production releases of sockeye salmon in 2001 (Table 6). All sockeye salmon released were adipose fin-clipped.

Table 5. Parent family and number of eyed-eggs retained for brood year 2001 captive broodstock development at Eagle Fish Hatchery.

Family Cross*		No. of Eyed-eggs
Female	Male	Retained for Eagle Broodstock
ANH01 H9	BY99	48
ANH01 H25	BY99	48
ANH01 H25	BY98	48
BY98	ANH01 H9	115
BY98	ANH01 H25	22
BY98	BY99	154
TOTAL		435

Note: * ANH01 refers to year 2001 anadromous sockeye salmon.
 ANH01 H9 refers to female mitochondrial haplotype "H9".
 ANH01 H25 refers to female mitochondrial haplotype "H25".
 BY98 refers to captive adults produced in spawn year 1998.
 BY99 refers to captive adults produced in spawn year 1999.

Table 6. Sockeye salmon releases made to Sawtooth Basin waters in 2001.

Release Location	Strategy (Brood Year)	Release Date	Number Released	Number PIT-Tagged	Marks	Release Weight (g)	Rearing Location
Redfish Lake Creek (downstream of weir)	smolt (1999)	05/02/01	13,915	1000	Ad/CWT	49.4	Bonneville Fish Hatchery
Alturas Lake (direct lake)	pre-smolt (2000)	07/27/01	3,064	-	Ad/Lv	14.5	IDFG Eagle Fish Hatchery
	(2000)	07/31/01	3,059	-	Ad/Rv	4.0	Sawtooth Fish Hatchery
	(2000)	10/09/01	5,990	-	Ad only	14.0	IDFG
Pettit Lake (direct lake)	pre-smolt (2000)	07/01/01	3,059	-	Ad/Lv	14.4	IDFG Eagle Fish Hatchery
	(2000)	10/08/01	4,993	-	Ad only	15.4	IDFG Sawtooth Fish Hatchery
Redfish Lake (direct lake)	pre-smolt (2000)	10/08/01	41,529	-	Ad only	10.8	IDFG Sawtooth Fish Hatchery
Redfish Lake (net pen)	pre-smolt (2000)	10/10/01	41,474	-	Ad/Lv	994.0	IDFG Hatchery/IDFG net pen.
Redfish Lake	adult (1997)	09/09/01	33	-	None	2522.2	NMFS Manchester Marine Laboratory
	(1999)	07/31/00	32	-	None	2522.2	NMFS Manchester Marina
Laboratory	(1999)	10/11/00	14	-	None and Ad ^b	1500.0	
Anadromous return							
<p>NOTE: Ad refers to adipose fin-clip. Lv refers to left ventral fin-clip. Rv refers to right ventral fin-clip. ^a Only the smolts for the 2001 release year were PIT-tagged. Additional lake outmigrants will be PIT-tagged during trapping activities in 2002. ^b Four anadromous fish did not have any marks; ten anadromous fish were adipose fin-clipped.</p>							

Smolt Releases

Age-1 sockeye salmon smolts (BY99) were released into Redfish Lake Creek (13,374) below the Redfish Lake Creek trap and (541) above the trap on 2 May 2001. The mean weight at release was 49.3 grams. All smolts were reared at Oregon Department of Fish and Wildlife's Bonneville Fish Hatchery. All smolts released were adipose-clipped and coded wire-tagged. One thousand of the smolts were PIT-tagged.

Adult Releases

Maturing adult sockeye salmon were released to Redfish Lake in September 2001 for volitional spawning. On 9 and 10 September, 33 and 32 (65 total) NMFS Manchester Marine Laboratory hatchery-reared BY97 adults (mean weight 2,522.0 grams) were released. Efforts were made to release fish of equal sex ratios. Due to a lack of sexual dimorphism, sex ratios could not be positively determined. Fourteen anadromous adults (7 females and 7 males), mean weight of 1,500.0 grams, were released on 10 September.

Pre-smolt Releases

Pre-smolt releases to Stanley Basin lakes were conducted in July and October during 2001 at mid-lake (pelagic) locations with the aid of a release barge on loan to IDFG from NMFS. All pre-smolts were from brood year 2000 and were reared at either Eagle Fish Hatchery or Sawtooth Fish Hatchery. On 27 July, Alturas Lake received 3,064 pre-smolts and Pettit Lake received 3,059 pre-smolts reared at the Eagle Fish Hatchery. This group was adipose/left ventral fin-clipped and had a mean weight of 14.4 grams. On 31 July, Alturas Lake received an additional 3,059 pre-smolts and Pettit Lake received an additional 2,998 pre-smolts reared at the Sawtooth Fish Hatchery. Fish from this group were adipose/right ventral fin-clipped and had a mean weight of 4.0 grams. On 8 October Redfish Lake received 41,529 pre-smolts (mean weight 10.8 grams) released directly to the lake, and on 10 October an additional 41,474 pre-smolts (mean weight 30.0 grams) were released from net pens. Alturas Lake received 5,990 pre-smolts (mean weight 14.0 grams) and Pettit Lake received 4,993 pre-smolts (mean weight 15.4 grams) on 9 October. All October direct release pre-smolts were reared at Sawtooth Fish Hatchery and were adipose fin-clipped. Redfish Lake net pen pre-smolts were hatched and reared at the Eagle Fish Hatchery. On 18 through 22 June they were placed into net pens in Redfish Lake (mean weight 6.8 grams). Net pen released pre-smolts were adipose/left ventral fin-clipped to differentiate this release group from the direct lake release group at outmigration.

PATHOLOGY FINDINGS IN 2001

The IDFG Eagle Fish Health Laboratory processed samples for diagnostic and inspection purposes from broodstock and production groups of sockeye salmon; anadromous adult sockeye salmon that were retained for hatchery spawning; sockeye salmon smolts obtained from outmigrant

traps; and kokanee obtained from trawl efforts. Eighty-one laboratory cases involving 386 individual fish were processed in 2001. The laboratory also summarized pathology findings to satisfy the needs of adjacent state agencies for issuance of sockeye salmon import and transport permits.

There was no evidence of viral pathogens in any of the production and broodstock groups in 2001. This result is consistent with results from previous years. In addition, no viral pathogens were detected in the nine anadromous adults examined in 2001. The Redfish Lake population remains the only sockeye salmon population in the Pacific Northwest that does not have infectious hematopoietic necrosis virus.

Clinical bacterial kidney disease (BKD), caused by *Renibacterium salmoninarum*, did not occur in any production groups of sockeye salmon juveniles reared at Eagle Fish Hatchery or at Sawtooth Fish Hatchery. There were two cases from Sawtooth Fish Hatchery in which elevated ELISA OD values were demonstrated, however, the levels did not indicate a clinical disease. Captive adult sockeye salmon spawned in 2001 were also free of clinical levels of BKD. Bacterial kidney disease antigen was detected in two (both males) of the nine anadromous adults examined in 2001. Bacterial kidney disease antigen was also detected in one of the ten smolt samples collected during emigration from Alturas Lake. Bacterial kidney disease was not detected at Pettit or Redfish Lake trapping locations.

No furunculosis, caused by *Aeromonas salmonicida*, was detected in any of the anadromous adults retained for spawning. However, as a precaution, we administered intraperitoneal injections of both Oxytetracycline and Erythromycin shortly after the adults were trapped.

Clinical disease caused by motile *Aeromonas spp.* was present in both anadromous adults, captive reared adults, and in BY99 and BY00 production sockeye salmon. Antibiotic therapy was administered three times in 2001 to control losses in captive reared adults and production groups. Myxobacterial infections (cold water disease and columnaris) were detected in the net pen reared fish and were also treated with antibiotics.

The myxosporean parasite, *Myxobolous cerebralis*, which can cause salmonid whirling disease, is present in the upper Salmon River. The Eagle Fish Health Laboratory demonstrated the seasonal infectivity in the river water supply of the Sawtooth Fish Hatchery using sentinel rainbow trout fry. Infection of this parasite was detected all months except January and February. In addition, two groups of sockeye salmon fingerlings were exposed as part of this study to examine relative susceptibility to the disease. These exposures resulted in a low prevalence of infection and were used to evaluate the risk of rearing sockeye salmon on river water during the winter months. In 2001, eight anadromous adults were examined for presence of the parasite. Sixty-two percent (five fish) of these adults were positive for *M. cerebralis*. Sockeye salmon have been reared almost exclusively on pathogen free well water at the Sawtooth Fish Hatchery; this suggests that smolts are being infected during seaward migration. In addition, since the inception of this project in 1991, *M. cerebralis* has not been identified in juveniles emigrating from Redfish, Pettit, or Alturas lakes. Kokanee present in these lakes have also tested negative.

In 2001, the nine anadromous adults were examined for the presence of *Piscirickettsia salmonis*. The results were all negative indicating that this emerging pathogen has not become established in Idaho.

One neoplasm, thymic lymphosarcoma, was observed in one BY98 sockeye salmon. Thymic lymphosarcomas have been observed in past years at the Eagle Fish Hatchery. Slides and tissues of this tumor were deposited and cataloged in the National Registry of Tumors of Lower Vertebrates at George Washington University Medical Center, an arm of the Smithsonian Institute.

Kokanee obtained by trawling in Redfish, Pettit, and Alturas lakes were shown to be negative for viral pathogens, BKD and *M. cerebralis*.

JUVENILE FISH QUALITY ASSESSMENT IN 2001

In 1999, the SBSTOC recommended applying assessments of fish quality to juvenile sockeye salmon produced in this program to provide additional perspective on factors that may affect fish survival from outplanting through outmigration. General parameters considered for investigation included: 1) proximate body composition analysis, 2) organosomatic index, 3) fish health and 4) smoltification assay.

Year 2001 fish samples for proximate analysis are summarized in Table 7. Mean percent fat dry weight calculations are pending.

Table 7. Year 2001 juvenile sockeye salmon and kokanee proximate body analysis summary. Redfish Lake Creek weir=RFL, Alturas Lake Creek screw trap=ALT, and Pettit Lake Creek weir=PET.

Sample Date	Sample Location	Description of Fish Sampled	Number Sampled	Mean Wt. (g)	Mean F. L. (mm)	Mean % Fat Dry Wt.
5/16/2001	RFL Weir	Hatchery-produced outmigrants (Ad only)	20	13.8	116.4	Pending
5/16/2001	RFL Weir	Bonneville outmigrant	1	57.8	188	Pending
5/17/2001	ALT Screw Trap	Hatchery-produced outmigrants (Ad only)	10	11.4	115	Pending
5/17/2001	ALT Screw Trap	Hatchery-produced outmigrants (Ad/Lv)	2	5.6	92	Pending
5/17/2001	ALT Screw Trap	Wild/Natural outmigrants	8	5.8	92.3	Pending
5/17/2001	PET Trap	Hatchery-produced outmigrants (Ad only)	13	19.8	131.8	Pending
5/17/2001	PET Trap	Hatchery-produced outmigrants (Ad/Lv)	15	18.9	127.2	Pending
5/17/2001	PET Trap	Hatchery-produced outmigrants (Ad/Lv)	11	15.2	119.3	Pending
6/28/2001	Eagle Fish Hatchery	Net Pen fish at introduction to pens (Ad/Lv)	20	9.9	98.3	Pending
7/26/2001	Eagle Fish Hatchery	Hatchery pre-smolts Ad/Lv	20	14.2	110	Pending
7/30/2001	Sawtooth Fish Hatchery	Hatchery re-smolts Ad/Rv	20	3.6	73	Pending
8/1/2001	Eagle Fish Hatchery	Net Pen fish mid season (Ad/Lv)	20	14.5	120.6	Pending
10/8/2001	Eagle Fish Hatchery	Net Pen fish at release (Ad/Lv)	20	24.7	128.9	Pending
10/8/2001	Sawtooth Fish Hatchery	Hatchery pre-smolts (Ad only)	20	13.8	110.7	Pending
9/17/2001	Redfish Lake	Trawl kokanee-age 0	10	75.9	4.4	Pending
9/17/2001	Redfish Lake	Trawl kokanee-age 1	1	107	12.2	Pending
9/18/2001	Pettit Lake	Trawl kokanee-age	12	178.5	60.2	Pending
9/19/2001	Alturas Lake	Trawl kokanee-age 0	4	51.8	1.0	Pending
9/19/2001	Alturas Lake	Trawl kokanee-age 1	7	76.1	3.7	Pending
9/19/2001	Alturas Lake	Trawl kokanee-age 2	5	119.2	15.2	Pending
9/19/2001	Alturas Lake	Trawl kokanee-age 3	1	159	28.4	Pending
Jun-01	Redfish Lake	Hook and line caught kokanee	20	na	na	Pending
Jun-01	Alturas Lake	Hook and line caught kokanee	20	na	na	Pending

Note: Ad refers to adipose fin-clip; Lv refers to left ventral fin-clip; and Rv refers to right ventral fin-clip.

Appendix A. Year 2001 spawning matrix memo.

**IDAHO DEPARTMENT OF FISH AND GAME
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September 30, 2001

MEMORANDUM

**To: SBSTOC Cooperators
NMFS Northwest Fisheries Science Center**

From: Paul Kline

Subject: Proposed 2001 sockeye salmon spawning design

Eagle Fish Hatchery (IDFG) and Burley Creek Fish Hatchery (NMFS) circumstances for 2001 are similar and are to be discussed together.

The following full-term hatchery adults are maturing at IDFG and NMFS facilities:

1) BY98 - Three primary culture groups were developed in 1998 to meet future broodstock needs. The first group (produced at the NMFS Big Beef Creek Hatchery) was developed from second generation females (ANBY91) produced from the four anadromous adults that returned to Redfish Lake Creek in 1991 (AN91) and the single anadromous male that returned to Redfish Lake Creek in 1998 (AN98). The second culture group was developed from first generation females (ANBY96) produced from the single female that returned to Redfish Lake Creek in 1996 (AN96). Males used for spawn crosses included first generation males (ANBY94) produced from the single female that returned to Redfish Lake Creek in 1994 (AN94), the single anadromous male that returned to Redfish Lake Creek in 1998 (AN98), and cryopreserved milt from first generation progeny (OMBY93) of female 1991 Redfish Lake outmigrants (OM91) and the six male sockeye salmon that returned to Redfish Lake Creek in 1993 (AN93). The third culture group was developed from first generation females and males (ANBY96) produced from the single female that returned to Redfish Lake Creek in 1996 (AN96). **In general terms -this broodstock was developed from 1991, 1993, 1994, 1996, and 1998 anadromous sockeye salmon.**

2) BY99 - Progeny from spawn activities conducted in 1999 including the following lineage-specific crosses (female x male): 1) ANBY96 x BY97, 2) ANBY96 x BY96, 3) ANBY96 x ANBY96, 4) BY96 x BY97, 5) BY96 x ANBY96, 6) ANBY96 x ANH99, 7) BY96 x ANH99, 8) ANH99 x BY97, 9) ANH99 x ANH99, 10) ANH99 x ANBY96 and 11) ANH99 x AN98 cryo. **In general terms - this broodstock was developed from 1993, 1996, and 1999 anadromous sockeye salmon in addition to cryopreserved milt.**

In addition to BY98 and BY99 adults, the Eagle Fish Hatchery is currently holding nine anadromous adults that returned to the program in 2001. These fish are described below:

1) ANH01 anadromous adults - two females and six males were retained for spawning in 2001. Selection of these nine adults was based on genetic information developed by the University of Idaho. ANH01 adults retained include two age-five males, seven age-four males, and two age-four females. Age-five males originated from the Bonneville hatchery smolt group released in 1998. These two males are second generation progeny of AN93 female and male parents. Crosses were performed to avoid relatedness (2 anadromous females and 6 males returned to the program in 1993). Age-four adults (produced in spawn year 1997) are progeny of ANBY94 F, females x BY93 F, males.

In addition to BY98 and BY99 adults, the Burley Creek Hatchery is currently holding BY97 captive adult sockeye salmon (seawater rearing history). These adults are described below:

1) BY97 broodstock adults are progeny of ANBY94 F, females x cryopreserved milt from OM91, OM92, and AN92 males. **In general, this broodstock was developed using 1991, 1993, and 1994 anadromous sockeye salmon and cryopreserved milt from 1991 and 1982 outmigrants.**

Proposed Crosses

Brood year 1998 represents the primary spawning component in 2001. Because most BY98 adults at both facilities share a common male parent, preferred crosses will involve out-crossing BY98 females with BY97, BY99, and ANH01 males. In addition, cryopreserved milt from unique program males could be used in the spawning design to expand the diversity of the 2001 broodstock.

In some cases, out-crossing brood years will not completely eliminate all inbreeding risk. In such cases, PIT tag information will be used to select individuals from unrelated subfamilies (across brood years).

The following table identifies preferred crosses for spawn year 2001:

Year 2001 desirability matrix

FEMALES		MALES			Comment
		FIRST PREFERENCE	SECOND PREFERENCE	THIRD PREFERENCE	
ANH01 (age-4)	x	ANH01(age-5)			1
ANH01 (age-4)	x	CYRO			1
ANH01 (age-4)	x	BY99			1
ANH01 (age-4)	x		BY97		2
ANH01 (age-4)	x		BY98		2
ANH01 (age-4)	x			BY96	3
ANH01 (age-4)	x			ANH01(age-04)	3

BY97	x	CRYO			1
BY97	x	ANH01(age-5)			1
BY97	x		BY98		2
BY97	x		BY99		2
BY97	x		ANH01(age-04)		2
BY97	x			BY97	3

BY98	x	CRYO			1
BY98	x	ANH01(age-5)			1
BY98	x		ANH01(age-04)		2
BY98	x		BY97		2
BY98	x		BY99		2
BY98	x			BY98	3

BY99	x	ANH01(age-4)			1
BY99	x	ANH01(age-5)			1
BY99	x	CRYO			1
BY99	x		BY97		2
BY99	x		BY98		2
BY99	x			BY99	3

(table recommendations the same when organized by male x female order)

- 1) All crosses avoid inbreeding.
- 2) Possible inbreeding risk, use PIT-tag data to establish safe lineages to cross.
- 3) Greatest inbreeding risk, more difficult to identify - avoid crosses if possible.