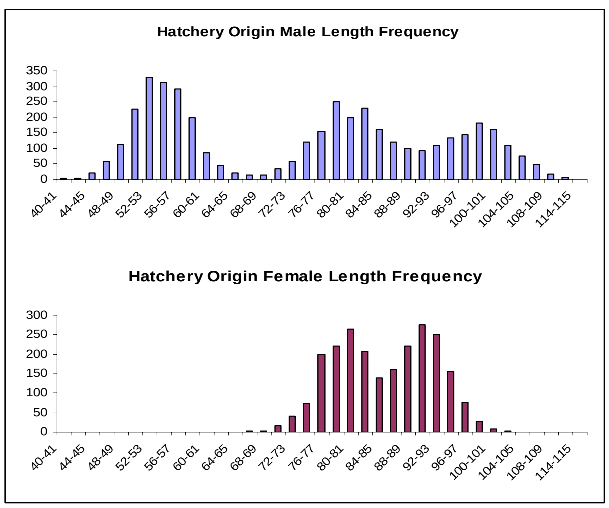
FISHERY RESEARCH

LOWER SNAKE RIVER COMPENSATION PLAN CHINOOK SALMON FISH HATCHERY EVALUATIONS—IDAHO

Project Progress Report

Report Period October 1, 2002 to September 30, 2003



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Lower Snake River Compensation Plan
Chinook Salmon Fish Hatchery Evaluations—Idaho
Part 1: Chinook Salmon

2003 Annual Report
October 1, 2002 to September 30, 2003

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ABSTRACT

This annual report summarizes brood year 2001 juvenile survival and 2003 adult return data for Chinook salmon at Lower Snake River Compensation Plan (LSRCP) hatcheries operated by Idaho Department of Fish and Game (IDFG).

Idaho-LSRCP hatcheries (McCall, Clearwater, and Sawtooth) released a combined 5,491,179 brood year 2001 Chinook salmon in 2002 and 2003 including 4,196,335 yearling smolts and 1,294,844 subyearling parr and presmolts.

Representative groups of brood year 2001 Chinook salmon juveniles were tagged with passive integrated transponders (PIT) to estimate survival to Lower Granite Dam (LGD). Estimated survival rates ranged from 1.6% for parr released into Colt Killed Creek to 86.2% for smolts released from the Powell rearing pond on Walton Creek.

In 2003, 99,463 adult and jack spring and summer Chinook salmon were counted at LGD, which was slightly less than the 2002 return of 101,226, but 2.2 times higher than the most recent 10 year average. Of the total 2003 return, 54,951 were estimate to be of hatchery origin.

Contribution of adult Chinook salmon from individual LSRCP fish hatcheries operated by IDFG include 14,180 for McCall stock released at Knox Bridge, 747 for Sawtooth stock released at Sawtooth Fish Hatchery, and 4,308 for the Clearwater Fish Hatchery satellite facilities (1,965 at Powell, 2,343 at Red and Crooked rivers). These numbers include the estimated number of fish harvested in the Pacific Ocean, the Columbia and Snake River basins, and those trapped at the hatchery weirs.

Smolt-to-adult return (SAR) rates for brood year 1998 LSRCP spring and summer Chinook salmon (including the estimated harvest) ranged from 0.8% for Sawtooth Fish Hatchery to 1.5% for fish released from McCall Fish Hatchery.

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INTRODUCTION

The U.S. Army Corps of Engineers (USACE) constructed four hydroelectric dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) on the lower Snake River between 1961 and 1975. Fishery managers and biologists expected the survival of downstream migrating smolts and upstream migrating adults to be reduced by dam construction and operation and the alteration of the river ecosystem. A joint Coordination Act Report (CAR) written by the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) in 1972 was submitted to the USACE describing the impacts of the four Lower Snake River dams on both fish and wildlife. Based on that report, the USACE submitted a Special Report to Congress which was used to authorize the Lower Snake River Compensation Plan (LSRCP) through the Water Resources Development Act of 1976 (90 Stat. 2917). Intent of the LSRCP was to mitigate for the reduced survival of anadromous fish resulting from dam construction and operation. The primary compensation tool specified in the LSRCP was a hatchery mitigation program. In 1977, the USFWS was given budgeting and administrative responsibility for operation and maintenance funding of LSRCP fish hatchery programs through an interagency agreement among the USACE, NMFS, and the USFWS.

The LSRCP hatchery program specified the use of fish hatcheries to produce and release enough juvenile anadromous salmonids to meet adult return goals that were established to offset the estimated mortality caused by the four lower Snake River dams. Original mortality estimates for spring and summer run Chinook salmon *Oncorhynchus tshawytscha* attributable to the four lower Snake River dams were derived by applying a 15% smolt mortality rate at each of the four projects (a total estimated loss of 48%). That expected loss was multiplied by the estimated return of spring/summer Chinook salmon adults (122,200) to the Snake River in 1957 (pre dam construction) resulting in a mitigation goal of 58,677 (50,677 spring run and 8,000 summer run) spring and summer run Chinook salmon above LGD (LSRCP 1991, Table 1). Additionally, a return goal of 18,300 fall run Chinook salmon above LGD was also established using similar criteria.

To achieve the established mitigation goals, LSRCP funded hatcheries were constructed in Idaho, Oregon, and Washington. Hatcheries located in Idaho include three operated by Idaho Department of Fish and Game (IDFG) and one operated by the USFWS. Facilities operated by IDFG include Clearwater, McCall, and Sawtooth fish hatcheries (with four associated satellite facilities) (Figure 1; Table 2). Facilities operated by USFWS include Dworshak National Fish Hatchery (DNFH) and the associated Kooskia satellite facility (Figure 1). Adult return goals for LSRCP hatcheries operated by IDFG account for 39,360 of the 58,677 return goal above LGD (Table 2). Hatchery capacity specifications for LSRCP facilities operated by IDFG were based on adult escapement goals (Table 2) and an average smolt-to-adult return (SAR) rate of 0.87%.

In addition to the LSRCP funded hatcheries located in Idaho, Idaho Power Company (IPC) owns and maintains three additional Chinook salmon hatcheries that are operated by IDFG (Rapid River, Oxbow, and Pahsimeroi fish hatcheries) (Figure 1). Specific information pertaining to the DNFH and IPC hatcheries are summarized in separate reports.

Table 1. Adult spring and summer run Chinook salmon return goals for the LSRCP program.

Agency / River System	Run Type	Adult Return Goal
IDFG		
S.F. Salmon River	Summer	8,000
Upper Salmon River	Spring	19,445
Clearwater River	Spring	11,915
USWFS		
Clearwater River	Spring	9,135
ODFW		
Grande Ronde River	Spring	5,820
Imnaha River	Spring	3,210
WDFW		
Tucannon River	Spring	1,152
	GRAND TOTAL	**58,677**

Table 2. Adult spring and summer run Chinook salmon return goals for LSRCP funded hatcheries located in Idaho and operated by IDFG. Return goals listed for satellite facilities are a subset of the overall hatchery return goal (in bold font).

Hatchery and Satellite	First Year of Operation	Run Type	Adult Return Goal
McCall Hatchery	**1979**	**Summer**	**8,000**
Sawtooth Hatchery	**1985**	**Spring**	**19,445**
E.F. Salmon R. Satellite	1984	Spring	6,090
Clearwater Hatchery	**1990**	**Spring**	**11,915**
Powell Satellite	1989	Spring	2,553
Red River Satellite	1986	Spring	2,553
Crooked River Satellite	1990	Spring	6,809
		TOTAL	**39,360**

LSRCP Hatcheries operated by IDFG

McCall Fish Hatchery

McCall Fish Hatchery was built in 1979 and is located on the North Fork of the Payette River in the city of McCall, Idaho (Figure 1). It is the incubation and rearing facility for the South Fork Salmon River (SFSR) Chinook salmon program. An adult trapping and spawning facility is located on the upper SFSR near Warm Lake (Figure 1). The adult escapement goal for the SFSR is 8,000 adults above LGD. Original broodstock for the SFSR program was composed of summer run adults collected at Little Goose Dam from 1974 to 1978, from Lower Granite Dam (LGD) in 1979, and from LGD and the SFSR trap in 1980 (Kiefer et al. 1992). Adults collected during these years (1974-1980) were spawned at Rapid River or Dworshak National fish hatcheries. Juveniles produced from these adults were released into the upper SFSR near the current location of the adult trap. Beginning in 1981, brood stock collection has come exclusively from adults captured at the adult trap site on the SFSR. From the inception of the SFSR program through brood year 1990, not all of the juvenile Chinook salmon released have been marked with a fin clip. Because of this, an unknown proportion of the unmarked retuning adults through 1995 were hatchery-origin. Beginning with brood year 1991, all juvenile Chinook salmon released into the upper SFSR were marked or tagged, and the origin of adults returning from these releases could be distinguished from naturally produced adults either from a fin clip or from the presence of a coded wire tag (CWT) or visual implant.

Sawtooth Fish Hatchery

Sawtooth Fish Hatchery was constructed in 1985 and is located on the mainstem Salmon River approximately ten kilometers upstream from the town of Stanley, Idaho (Figure 1). The hatchery consists of an adult weir, adult trap, spawning and incubation facilities, and rearing space for 2.3 million Chinook salmon smolts at 15 fish per pound. The original escapement goal for Sawtooth Fish Hatchery was 19,445 adult Chinook salmon above LGD from juvenile releases at Sawtooth Fish Hatchery, the East Fork Salmon River, and Valley Creek.

A rearing pond was constructed in 1966 at the current Sawtooth Fish Hatchery site and received fry releases from Hayden Creek, Rapid River, and Marion Forks Fish Hatchery in Oregon in the late 1960s (Bowles and Leitzinger 1991). During the 1970s, several releases into the rearing pond from Rapid River stock were made. Bowles and Leitzinger (1991) note that adult returns from these releases were negligible. The original brood source for the Sawtooth Fish Hatchery program came from adults captured at a temporary weir operated from 1981-1984 at the site of the current hatchery location. It was estimated that at least 50% of the adults trapped in 1981 resulted from a hatchery smolt release (914,000) in 1979 that was Rapid River stock raised at the Mullen Fish Hatchery (Moore 1981). Also, an unknown proportion of adults trapped in 1982 consisted of age-five adults from the same Rapid River smolt release. Beginning in 1983, all returning hatchery adults at the trap were Sawtooth Fish Hatchery stock. Eggs collected from adults trapped at the temporary weir were incubated and reared at the McCall Fish Hatchery from 1981-1983 and at Pahsimeroi Fish Hatchery in 1984. Smolts reared at McCall and Pahsimeroi fish hatcheries for brood years 1981-1984 were released in the Upper Salmon in 1983-1986 at the current hatchery location. Brood year 1985 was the first year that all adult trapping, incubation, and rearing occurred at the Sawtooth Fish Hatchery. Through brood year 1990, not all of the juvenile Chinook salmon released were marked with a fin clip. Because of this, an unknown proportion of the unmarked retuning adults through 1995 were hatchery-origin. Beginning with brood year 1991, all juvenile Chinook salmon released at or above the Sawtooth Fish Hatchery weir were marked or tagged and the origin of adults retuning from those releases could be distinguished from naturally produced adults either from a fin clip or from the presence of a CWT.

The East Fork Salmon River adult trap is a satellite facility of Sawtooth Fish Hatchery that began operation in 1984. It is located approximately 29 kilometers upstream of the mouth of the East Fork Salmon River (Figure 1). The escapement goal for the East Fork weir is 6,090 above LGD (Table 2). Eggs from adults that are trapped and spawned at the East Fork satellite are transferred to the Sawtooth Fish Hatchery for incubation and rearing. Adult collection and spawning occurred at the East Fork satellite from 1985-1993 (Brent Snider, Idaho Dept. of Fish and Game, personal communication). From 1994-1997, the trap was operated but, due to low numbers of returning adults, all adults captured were released above the weir to spawn naturally. Trapping operations for Chinook salmon were discontinued from 1998-2003 due to low numbers of returning adults.

While Valley Creek was initially slated to receive releases of up to 300,000 smolts annually, due to lack of adult returns to Sawtooth Fish Hatchery, no juvenile releases have been made to Valley Creek.

Clearwater Fish Hatchery

Clearwater Fish Hatchery was constructed in 1992 and is located on the North Fork Clearwater River approximately one kilometer above the mouth near the town of Orofino, Idaho. The original adult escapement goal for Clearwater Fish Hatchery was set at 11,915 Chinook salmon above LGD. Clearwater Fish Hatchery contains adult holding, spawning, incubating facilities, and rearing space for 1,500,000 Chinook smolts and 1,700,000 steelhead smolts. Three satellite facilities (Red River, Crooked River, and Powell) associated with Clearwater Fish Hatchery were constructed prior to Clearwater Fish Hatchery (Table 2; Figure 1). Incubation and initial rearing of all Chinook salmon juveniles released at the three satellite facilities occurs at Clearwater Fish Hatchery.

Red River Satellite—In 1976, a rearing pond and temporary weir were constructed at the site of the current satellite facility as part of the Columbia River Fisheries Development Program (Kiefer et al. 1992). In 1986, the satellite facility was updated and a permanent weir was installed near the rearing pond as part of the LSRCP program. Both fall presmolt and spring smolt releases have occurred at Red River. The Red River satellite facility is located approximately 21 km upstream from the mouth of Red River and approximately 183 km upstream from Clearwater Fish Hatchery.

Crooked River Satellite—An adult trap and juvenile rearing ponds were constructed on Crooked River in 1989. The adult trap is located on Crooked River approximately one kilometer upstream from the mouth. The juvenile rearing ponds are located approximately 16 km upstream of the adult trap. The Crooked River satellite facility is located approximately 150 km upstream from the Clearwater Fish Hatchery. Both fall presmolt and spring smolt releases have occurred at Crooked River. There are no adult holding facilities at Crooked River so all adults retained for broodstock are transported to the Red River satellite facility. Initially, Red River and Crooked River adults were kept separate and treated as two different stocks. However, in 1997 it was decided to treat the Red River and Crooked River adults as a single stock and adults trapped from each of the facilities are combined in the same holding ponds and are referred to as the "South Fork" stock (McGhee and Patterson 1999). For this report, harvest and escapement estimates for the South Fork stock will represent the combined juvenile release and adult recovery data from Red and Crooked River satellite facilities.

Powell Satellite—Construction of an adult trap, weir, holding ponds, and a juvenile rearing pond was completed in 1989 but adult trapping began in 1988. The Powell facility is located on the upper Lochsa River approximately 200 km upstream from the Clearwater Fish Hatchery (Figure 1). Originally, a floating weir that spanned the Lochsa River was used to guide fish into Walton Creek where another weir guided them into the trap box. The floating weir was operated from 1988 to 1992. High water events in 1992 caused extensive damage to weir panels and the floating weir has not been operated since. Since 1992, fish have no longer been guided to Walton Creek by a mechanical structure, but rather from the attraction flow of Walton Creek, the water source for the Powell satellite facility. It should be noted that Walton Creek is a small tributary with no natural run of Chinook salmon. Adults that are retained for broodstock are spawned at the Powell facility and eggs are transferred to the Clearwater Fish Hatchery for incubation and rearing. Both fall presmolt and spring smolt releases occur at the Powell facility.

Hatchery Evaluation Component of LSRCP

The LSRCP includes a Hatchery Evaluation Study (HES) component to monitor and evaluate the hatchery mitigation program. The primary goal of the HES is to work with individual hatcheries to help determine the best hatchery management practices that allow the hatcheries to meet LSRCP and IDFG anadromous fisheries goals. Objectives to address the goal are: 1) to monitor and document the extent to which hatcheries meet their mitigation goals and 2) to conduct small-scale manipulative studies involving modified or alternative hatchery practices that show potential for increasing adult returns and achieving LSRCP and IDFG goals. These small-scale studies may be printed and bound as independent reports.

In addition to monitoring production and productivity of the LSRCP hatcheries, some production and productivity data collected from natural populations that are adjacent to the LSRCP hatchery programs are also reported. These data are typically collected by ongoing IDFG research programs (e.g., Idaho Supplementation Studies and Idaho Natural Production Monitoring programs).

The primary purpose of this report is to summarize activities at each of the LSRCP funded hatcheries operated by IDFG and to estimate at what level each facility contributed to fisheries in the Pacific Ocean and Columbia River as well as to the adult return above LGD and back to the respective hatchery trapping facilities. This includes reporting adult returns to hatchery facilities and juvenile rearing and release information on a yearly basis. Additionally, life stage specific survival during periods when fish are not directly associated with the hatcheries is reported to address overall survival from release to return. In each annual report, a brood year is summarized or "closed out" by consolidating the juvenile rearing and release information and the adult returns from a given brood year. Because of the five year generation length of Chinook salmon, there is an associated five year lag associated with summarizing the productivity of a brood year. Hence, brood year 1998 is summarized in the current 2003 report. To avoid unnecessary duplication of data reporting, only the major components of data collected by hatchery staff are reported. Specific hatchery broodstock collection, spawning, incubation, and rearing summaries can be found in hatchery specific Brood Year reports available from IDFG.

This report is organized into three major sections: 1) juvenile release and survival information for brood year 2001 juveniles including parr or presmolts released in 2002 and yearling smolts released in 2003; 2) adult return information, by age class, collected in 2003 including the estimated number of spring and summer Chinook salmon harvested in the Pacific Ocean, Columbia and Snake River fisheries, the number that passed over LGD, and the number of adults that returned to each hatchery; and 3) productivity estimates of the adults that returned to each hatchery facility from brood year 1998 (e.g., brood year reconstruction and parent:progeny relationships).

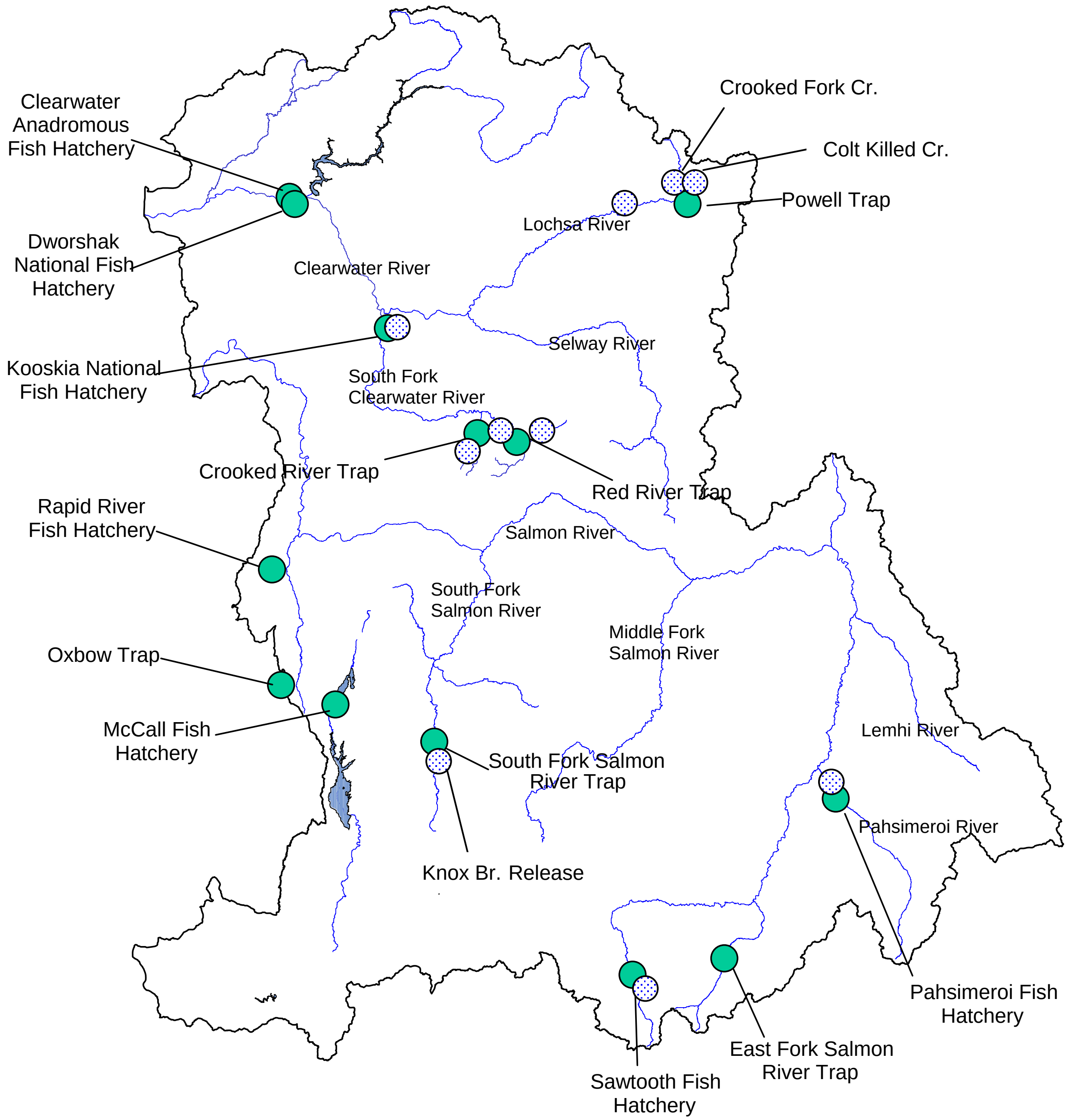


Figure 1. Locations of Chinook salmon hatcheries and trapping facilities in Idaho. Solid circles represent adult trapping or hatchery locations. Circles with dot matrix represent locations where natural-origin Chinook salmon are PIT tagged in order to estimate survival to Lower Granite Dam.

METHODS

Smolt Survival From Release To LGD

Survival estimates of hatchery-origin juvenile Chinook salmon from release to arrival at LGD are generated using PIT tag release groups from the various hatchery facilities. Specifically, the Survival Under Proportional Hazards (SURPH) computer program (Lady et al. 2001) is used to generate a point estimate of survival and 95% confidence intervals. The program uses the Cormack-Jolly-Seber model (Cormack 1964, Jolly 1965, Seber 1965) for single release and multiple recapture events. This method accounts for differences in collection efficiency at the dams so comparisons between release groups from different facilities and releases from different time periods are appropriate. PIT tag groups are generally made up of 300-700 fish from LSRCP facilities released every year to evaluate migration timing and survival of hatchery-reared juveniles to LGD. In addition to reporting survival rates of hatchery-origin fish, survival rates for several groups of natural-origin Chinook that are tagged from other ongoing research projects in Idaho located adjacent to hatchery release sites are also reported for comparison. All PIT tagged natural-origin fish were captured using rotary screw traps as they volitionally emigrated from the rearing areas. In order to make comparisons with the hatchery-origin releases, natural-origin fish were classified as parr, presmolts, or smolts based on the date they were captured and tagged. Subyearlings trapped prior to September 1 are considered parr, and those captured on or after September 1 are considered presmolts. Yearling smolts are captured between February and June of the following year.

To compare arrival timing at LGD from different release groups, the “arrival window” in which the middle 80% of PIT tag detections occurred is also reported. This interval provides a measure of when fish arrive at LGD and how “spread out” the major component of each release group of juveniles were as they passed LGD.

Estimating Downstream Harvest (Ocean and Columbia River)

In order to estimate the total production of the LSRCP hatchery facilities in Idaho, estimates of harvest from fisheries in the Pacific Ocean and Columbia River are also reported. Estimates are generated by utilizing CWT harvest data retrieved from the Regional Mark Information System (RMIS) database that is maintained by the Pacific States Marine Fisheries Commission (PSMFC). Coded-wire tag recoveries are expanded based on two criteria: 1) the estimated sample rate of the fishery. and 2) the proportion of the release group that was tagged with CWTs. These expanded values represent the total estimated harvest of each release group.

Adult Returns to LGD

Adult returns to LGD are comprised of both spring and summer run components. Adult counting facilities operated by the Fish Passage Center (FPC) at Lower Snake and Columbia River hydroelectric projects categorize spring and summer runs based on the arrival timing at individual projects. For example, Chinook salmon arriving at LGD between March 1 and June 17 are classified as spring run while Chinook salmon arriving between June 18 and August 17 are classified as summer run. The FPC does not discriminate Chinook salmon return numbers by their respective origins (wild or hatchery). Some hatchery-origin Chinook salmon have no external mark, and a visual determination of origin is not possible.

The U.S. v. Oregon Technical Advisory Committee (TAC) further breaks down the adult escapement crossing LGD into hatchery- or wild-origin by using data collected at hatcheries and from fisheries. It should be noted that the TAC estimate does do not include jacks. Adult Chinook salmon return data presented in this report is from both methods (FPC and TAC).

Estimating Harvest from Fisheries in Idaho

The occurrence of Chinook salmon sport fisheries in Idaho is variable and from 1979 through 1996 only occurred on the Little Salmon River (a terminal fishery for the Rapid River Fish Hatchery). From 1979 to 2003, some limited sport fisheries occurred in the Salmon and Clearwater rivers. Estimates of harvest from these fisheries are determined from IDFG regional staff and from IDFG staff funded through the LSRCP Harvest Monitoring Program (HMP). Methods include a combination of angler check stations, roving creel, and voluntary drop-off check station boxes.

Adult Age Classification

Depending on the availability of known age information (e.g., CWTs, PIT tags, or other age-specific marks) recovered from returning adults, age composition of adults returning to individual LSRCP hatchery facilities is determined from either visual examination of length frequency histograms, or in cases where some known age information is available, the computer program Rmix is used. Rmix was developed by Du (2002) as an add-on program to the R (R-Development Core Team 2004) computing environment that utilized the original MIX program developed by Macdonald and Pitcher (1979). Rmix was designed to estimate the parameters of a mixture distribution with overlapping components, such as the overlapping length distributions associated with adult salmon returns composed of multiple age classes. Rmix utilizes the maximum likelihood estimation method.

The age notations used throughout this report for retuning adults refer to the total age of the fish (fresh- and saltwater) and assume all juveniles migrate to the ocean as age 1+ smolts. Therefore, fish that spend one, two, or three years in the ocean are classified as three, four, and five-year-olds, respectively.

Determination of Origin

Chinook salmon bearing an external mark, typically an adipose or ventral fin clip, are classified as hatchery-origin. However, some hatchery-origin fish have no external mark but do have a coded-wire tag (CWT) inserted in their snout. All externally unmarked fish with a CWT were also classified as hatchery-origin. Some hatchery-origin fish are referred to as reserve or production fish; the terms reserve and production are used in reference to a hatchery-origin Chinook salmon with an adipose fin clip (AD) that can be legally harvested in a selective sport fishery. Other hatchery-origin fish are referred to as supplementation fish. Supplementation fish refer to Chinook salmon that are part of the Idaho Supplementation Study (ISS) or the Nez Perce Tribal (NPT) hatchery program and are not intended to contribute to selective sport fisheries. Supplementation fish are typically marked with a right ventral (RV) or left ventral (LV) fin clip or with a CWT and no external mark. For a more detailed explanation of the ISS program, refer Bowles and Leitzinger (1991).

Brood Year Reconstruction, SARs, and Progeny-to-Parent Ratios

In order to reconstruct a brood year for hatchery-origin Chinook salmon, adults that return from a given brood year over three return years are summarized. For example, the 1998 brood year includes age-3 fish that return in 2001, age-4 fish that return in 2002, and age-5 fish that return in 2003. These returns include fish recovered at hatchery weirs, those recovered in fisheries, and those that were recovered as strays, at trap sites, or during spawning ground surveys. For those recovered in mixed-stock fisheries (ocean, Columbia and Snake rivers), the total number of fish harvested from each age class is estimated based on the number of CWTs recovered from each age class expanded by the sample rate of the fishery, and the tagging rate. For those recovered in terminal fisheries, the number of fish harvested in each age class is estimated based on the number of CWTs recovered from each age class expanded by tagging rate. Then the proportion of the expanded recoveries from each age class is applied to the total estimated harvest in the terminal fishery.

Smolt-to-adult survival rates (SARs) are estimated by summing up the total returns from a given brood year (brood year reconstruction as described above) divided by the number of smolts released from the brood in question.

Female-progeny to female-parent ratios are estimated by dividing the number of female returns from a brood year by the number of females that were spawned to create the brood in question. For example, brood year 1998 female-progeny to female-parent ratio is calculated by dividing the age-4 and age-5 females that returned in 2002 and 2003, respectively, by the number of females that were spawned in 1998. A ratio of one signifies the brood was at replacement or, simply stated, that each female spawned in 1998 produced one returning female adult. Two different female-progeny to female-parent ratios are provided in this report: one includes only the number of female-progeny that returned to the hatchery weir, and the second includes the estimated number of females harvested in addition to those returning to the weir. Harvest information includes ocean, Columbia and Snake River, and terminal fisheries. The number of females harvested is estimated by applying the sex ratio of adults recovered at the hatchery weir to the estimated number of fish harvested in each fishery with the assumption that there is no gender bias in the fisheries. The sex ratio does not include age-3 males captured at the weir because there appears to some selectivity against age-3 males in the harvest.

RESULTS

Brood Year 2001 Juvenile Releases

From July 17, 2002 through April 28, 2003, a total of 5,491,179 brood year 2001 juvenile Chinook salmon were released from three LSRCP hatcheries (McCall, Sawtooth, and Clearwater) operated by IDFG (Table 3). An additional 5,667,274 brood year 2000 juvenile Chinook salmon were released from two IPC and two USFWS fish hatcheries in Idaho (Table 3).

Smolt releases occurred from March 14 through April 28, 2003, and subyearling parr and presmolts were released from July 17 through September 27, 2002.

Table 3. Brood Year 2001 juvenile Chinook salmon released in 2002 (subyearling parr and presmolts) and 2003 (yearling smolts) from hatcheries located in Idaho.

Rearing Hatchery	**Life Stage**	**Release Date**	**Release Location**	**Marks**	**Purpose[a]**	**Number Released**
Clearwater	Parr	8/4	Pete King Cr*	CWT	ISS	13,948
	Parr	8/4	Fishing Cr*	CWT	ISS	14,067
	Parr	7/27-7/29	Colt Killed Cr*	RV	ISS	299,787
	Presmolt	9/23-9/27	Crooked R.	RV	ISS	169,768
	Presmolt	9/27	Red R.	LV	ISS	85,064
	Presmolt	9/25-9/27	Walton Cr	AD	LSRCP	526,733
	Presmolt	9/30	S.Fk. Clearwater R.	AD	LSRCP	123,677
	Smolt	4/2	Crooked River	AD	LSRCP	629,687
	Smolt	4/2	Red River	AD	LSRCP	351,066
	Smolt	4/1	Walton Cr.	AD	LSRCP	350,665
	Smolt	4/10	Legendary Bear *	CWT	ISS	52,225
	Smolt	3/17-3/18	Lolo Cr.	CWT	NPT	147,488
	Smolt	3/14	Mill Cr*	CWT	NPT	43,621
	Smolt	3/20	Boulder Cr.*	CWT	NPT	101,513
	Smolt	3/21	Newsome Cr.	CWT	NPT	74,066
	Smolt	3/17-3/18	Meadow Cr.*	AD	NPT	287,175
			Total			3,270,550
McCall	Parr	7/17	Stolle Pond	CWT	ISS	61,800
	Smolt	3/31-4/3	Knox Bridge	AD/CWT	LSRCP	1,053,660
			Total			1,115,460
Sawtooth	Smolt	4/7-4/18	Sawtooth Weir	AD/CWT	LSRCP	960,193
	Smolt	4/7-4/18	Sawtooth Weir	CWT	ISS	144,976
			Total			1,105,169
Pahsimeroi	Smolt	3/29-4/6	Pahsimeroi R.	AD	IPC	909,926
	Smolt	4/15	Pahsimeroi R.	CWT	ISS	295,992
			Total			1,205,918
Rapid River	Smolt	3/17-4/28	Rapid River	AD/CWT	IPC	2,330,557
	Smolt	3/18	Little Salmon R.*	AD	IPC	199,900
	Smolt	3/19	Hells Canyon Dam	AD	IPC	299,854
			Total			2,830,311
Dworshak[b]	Smolt	3/19-3/20	N.F Clearwater R.	AD	LSRCP	1,033,982
Kooskia[b]	Smolt	3/26	Clearwater R.	AD	USFWS	597,063
			Grand Total			11,158,453

* This is an offsite release and no adult trapping facilities exists to evaluate adult returns

[a] ISS = Idaho Supplementation Study, LSRCP = Lower Snake River Compensation Program, NPT= Nez Perce Tribal release, IPC=Idaho Power mitigation program, USWFS= US Fish and Wildlife Service program

[b] Data is from Burge et al. 2005

<u>Migration Timing and Survival of Brood Year 2001 Juvenile Chinook Salmon</u>

Representative groups from all hatchery facilities were PIT tagged to evaluate migration timing and survival to LGD. These evaluation groups include fish released as subyearling parr and presmolts and yearling smolts.

Hatchery-Origin Yearling Smolts

The majority of PIT tagged juvenile Chinook salmon released as yearling smolts from Idaho fish hatcheries arrived at LGD from mid-April to mid-May (Table 4). The “80% arrival window” for yearling smolt releases averaged 24 days and ranged from 14 to 34 days (Table 4).

Survival estimates for yearling smolts from release to LGD averaged 62.3% and ranged from 27.0% for the Crooked River Pond release to 86.2% for the Powell Pond release group (Table 4; Figure 2). In 2003 there does not appear to an inverse relationship between estimated smolt survival and migration distance to LGD (r2 =.16; Figure 3) as has been observed in previous years (Leth et. al. 2004; Leth 2007). This may be due to the relatively imprecise survival estimates for the two groups with the longest migration distances (Figure 4).

Hatchery-Origin Subyearling Parr and Presmolts

Generally, arrival timing to LGD of hatchery-origin juvenile Chinook salmon released as subyearling parr and presmolts was more protracted than for those released as yearling smolts (Table 4). The majority of individuals released as parr and presmolts arrived at LGD from early-April to late-May. The “80% arrival window” for parr and presmolt releases averaged 32.2 days (range: 14-44 days) compared to 24 days for the yearling smolt releases (Table 4).

Averaged over all release sites, estimated survival to LGD of hatchery-origin juveniles released as subyearling parr and presmolts was 3.2% (range: 1.6-5.8%), a substantial decrease from the hatchery-origin smolt survival (Figure 2 and 4), and is likely due to the overwinter mortality associated with fish released as subyearlings.

Table 4. Estimated survival, migration, and arrival timing of brood year 2001 juvenile Chinook salmon released from fish hatcheries located in Idaho and from natural-origin juveniles PIT tagged in populations adjacent to the hatchery release sites. Probability of detection is based on output from the SURPH computer program and represents collection efficiency of the juvenile detection system at Lower Granite Dam. Survival data for natural-origin fish is from Dave Venditti (IDFG, personal communication). Interrogation data is from the PTAGIS database (www.ptagis.org).

Rearing Hatchery	Life Stage	Release Site	Program*	Distance to LGD (Km)	Number PIT Tagged	Number of Unique Detections at LGD	Estimated Survival (%) to LGD (95% CI)	Probability of Detection	Median Arrival Date	80% Arrival Window (# of Days)
Clearwater	Parr	Colt Killed Cr.	Supp.	341	701	5	1.6 (0.5-2.7)	0.44	5/18	05/12-05/25 (14)
	Parr	Crooked Fork Cr.	Natural	323	197	11	12.0 (6.0-18.0)	0.45	4/25	04/22-06/09 (49)
	Parr	Fishing Cr.	Natural	304	279	18	14.4 (9.2-19.6)	0.45	5/16	04/23-06/01 (40)
	Parr	Fishing Cr.	Supp.	304	701	9	1.6 (0.6-2.5)	0.82	4/26	04/14-05/27 (44)
	Presmolt	Colt Killed Cr.	Natural	341	687	29	10.0 (6.0-14.0)	0.41	5/28	05/04-06/15 (43)
	Presmolt	Crooked Fork Cr.	Natural	323	2375	95	10.0 (8.0-12.0)	0.38	5/17	04/22-06/07 (46)
	Presmolt	Crooked R. Pond	Supp.	280	489	2	2.7 (1.2-4.1)	0.44	—	—
	Presmolt	Powell Pond	LSRCP	321	700	19	5.85 (3.0-8.5)	0.47	4/3	03/28-04/19 (23)
	Presmolt	Red R. Pond	Natural	299	723	17	4.0 (2.0-6.0)	0.65	5/18	04/24-06/22 (60)
	Presmolt	Red R. Pond	Supp.	299	491	7	4.3 (1.8-6.8)	0.33	5/12	04/12-05/25 (44)
	Smolt	American River	Natural	272	1,559	444	50.0 (46.0-54.0)	0.57	6/22	06/03-07/08 (36)
	Smolt	Colt Killed Cr.	Natural	341	189	27	35.0 (25.0-45.0)	0.41	6/9	05/14-06/27 (45)
	Smolt	Crooked Fork Cr.	Natural	323	237	42	41.0 (31.0-51.0)	0.44	6/7	05/09-06/24 (47)
	Smolt	Crooked R.	Natural	266	472	70	32.0 (24.0-40.0)	0.46	6/23	05/28-07/11 (44)
	Smolt	Crooked R. Pond	LSRCP	280	299	30	27.0 (19.0-35.1)	0.37	5/6	04/22-05/18 (27)
	Smolt	Powell Pond	LSRCP	321	295	60	86.2 (57.7-114.8)	0.24	4/29	04/19-05/08 (20)
	Smolt	Red R.	Natural	299	769	148	34.0 (30.0-38.0)	0.57	6/18	05/28-07/08 (41)
	Smolt	Red R. Pond	LSRCP	299	297	49	59.6 (46.4-72.7)	0.28	5/5	04/24-05/19 (26)
McCall	Parr	S.Fk. Salmon R.	Natural	457	648	11	3.9 (2.4-5.4)	0.44	5/13	04/03-06/13 (72)
	Parr	Stolle Pond	Supp.	470	600	11	—	—	5/18	04/15-05/30 (36)
	Smolt	S.Fk. Salmon R.	LSRCP	457	51521	9475	57.4 (56.1-58.6)	0.32	5/12	04/02 -05/20 (24)
	Smolt	S.Fk. Salmon R.	Natural	457	587	117	46.0 (40.0-52.0)	0.43	5/31	05/18-06/25 (39)
Sawtooth	Smolt	Sawtooth Weir	LSRCP	747	498	105	60.8 (27.8-93.8)	0.35	5/12	05/05-05/18 (14)
	Smolt	Sawtooth Weir	Supp.	747	491	83	61.3 (0.0-124.5)	0.28	5/9	05/05-05/17 (13)
	Smolt	Sawtooth Weir	Natural	747	2649	540	52.0 (48.0-56.0)	0.40	5/25	05/06-06/04 (30)
Pahsimeroi	Smolt	Pahsimeroi R.	IPC	630	498	105	71.4 (15.6-127.2)	0.30	4/26	04/19-05/07 (19)
	Smolt	Pahsimeroi R.	Supp.	630	484	87	—	—	5/4	04/24-05/16 (23)
Rapid River	Smolt	Rapid River Hat.	IPC	283	51762	12209	69.2 (67.8-70.6)	0.34	5/3	04/22- 5/16 (25)
Dworshak	Smolt	N.F. Clearwater R.	LSRCP	116	51787	10243	70.5 (69.0-72.0)	0.28	5/8	04/22-05/25 (34)
Kooskia	Parr	Clear Cr.	Natural	176	275	9	7.0 (2.0-4.0)	0.50	4/30	04/24-05/16 (23)
	Presmolt	Clear Cr.	Natural	176	190	10	11.5 (6.9-16.1)	0.45	4/25	04/12-05/14 (33)
	Smolt	Clear Cr.	Natural	176	218	40	45.0 (36.6-53.4)	0.40	5/25	04/30-05/30 (31)
	Smolt	Clear Cr.	Supp.	176	1,504	279	65.4 (58.9-71.9)	0.28	4/29	04/17-05/13 (27)

*Natural = refers to natural-origin fish and is used as a comparison to hatchery-origin fish in areas adjacent hatchery programs; Supp. = fish released as part of the Idaho Supplementation Study; LSRCP = fish released as part of the LSRCP mitigation program; IPC = fish released as part of the Idaho Power Co. mitigation program.

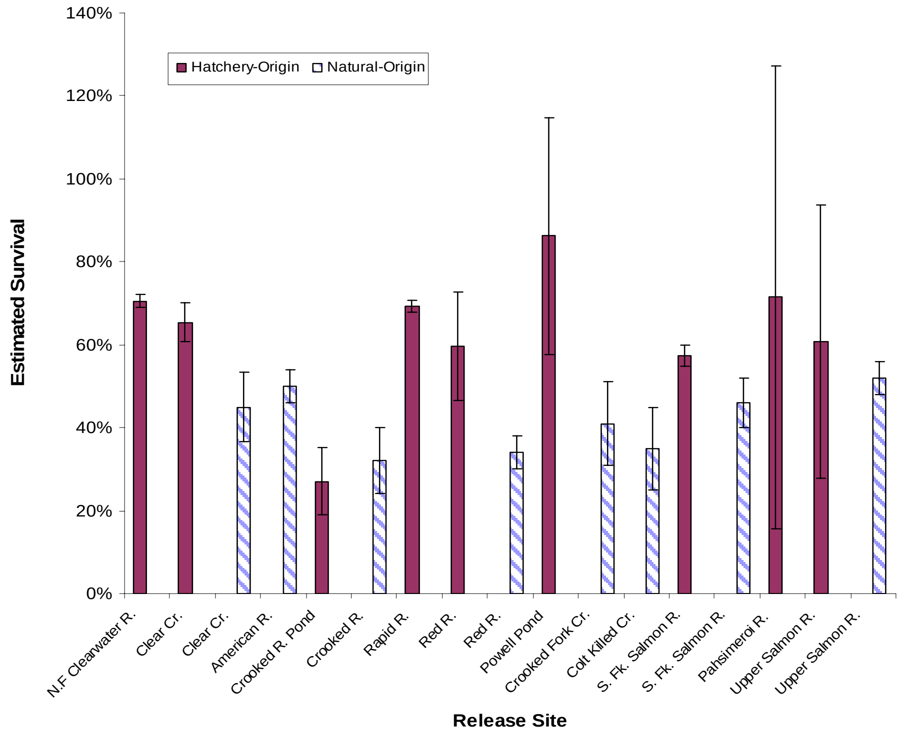


Figure 2. Estimated survival to Lower Granite Dam (LGD) of hatchery- and natural-origin Chinook salmon tagged and released as yearling smolts, spring 2003. Release sites are ordered in increasing distance from LGD (see Table 4). Error bars represent two standard errors.

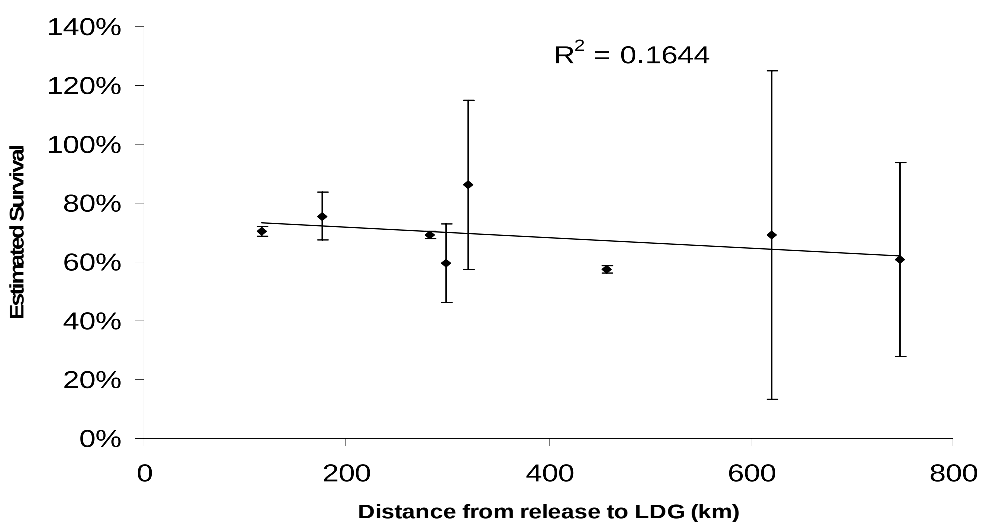


Figure 3. Relationship between estimated survival and distance from release site to Lower Granite Dam for hatchery-origin Chinook salmon PIT tagged and released as yearling smolts, 2003. Error bars represent two standard errors.

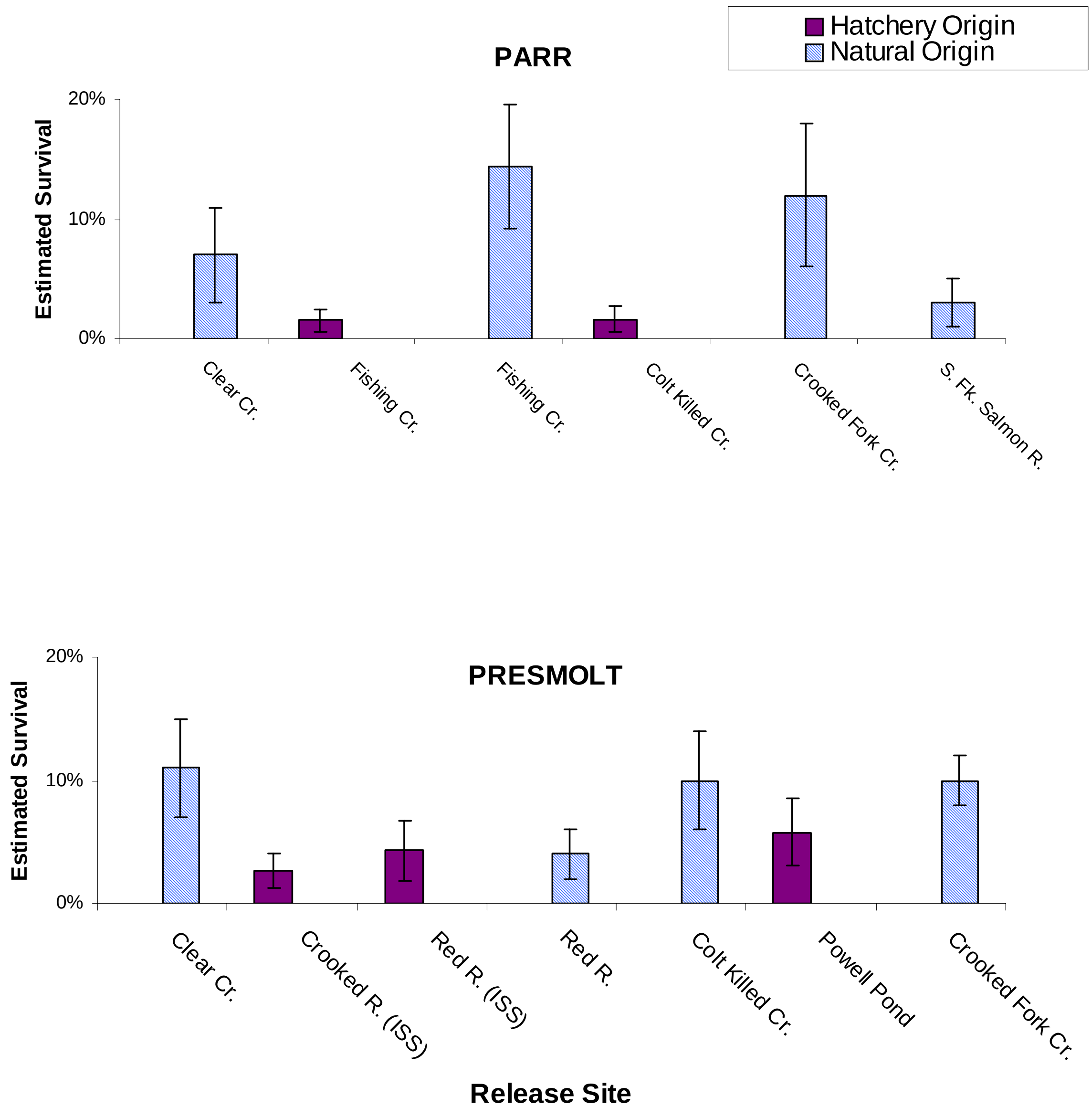


Figure 4. Estimated survival to Lower Granite Dam (LGD) of hatchery- and natural-origin Chinook salmon tagged and released as subyearling parr (top panel) and presmolts (bottom panel) during the summer/fall 2001. Release sites are ordered in increasing distance from LGD (see Table 4). Error bars represent two standard errors.

Naturally Produced Chinook Salmon

Naturally produced Chinook salmon were PIT tagged throughout the Salmon and Clearwater River subbasins as both subyearling parr and presmolts and yearling smolts (Table 4; Figure 2 and 4).

Arrival timing to LGD of natural-origin juveniles that were tagged as yearling smolts was later and more protracted than the hatchery-origin smolts. The date at which 50% of the natural-origin juveniles arrived at LGD was four weeks later, on average, than the hatchery-origin smolts. The 80% arrival window for natural-origin smolts ranged from 31 to 47 days and averaged 39 days compared to a range of 14 to 34 days and an average of 24 days for hatchery-origin smolts. Averaged over all release sites, the estimated survival rate for natural-origin yearling smolts was 41.9% (range: 32.0-52.0%) compared to 62.3% (range: 27.0-86.2%) for the hatchery-origin smolts.

Arrival timing of natural-origin fish tagged as subyearling parr and presmolts was later and more protracted than hatchery-origin fish tagged and released as subyearlings (Table 4). The average date at which 50% of the natural-origin juveniles that were tagged as subyearling parr and presmolts arrived at LGD was May 10 (range: 4/25-5/28) compared to May 3 (range: 4/3-5/18) for hatchery-origin subyearling parr and presmolts. The 80% arrival window for natural-origin juveniles tagged as subyearling parr and presmolts averaged 45.8 days (range: 23-72 days) compared to an average of 32.2 days for the hatchery-origin parr and presmolts (range: 14-44 days). Averaged over all release sites, the estimated survival rate for natural-origin juveniles tagged as subyearling parr or presmolts was 9.1% (range: 3.9-14.4%) compared to 3.2% for the hatchery-origin parr and presmolts (range: 1.6-5.8%).

2003 Adult Returns to LGD

During the 2003 spawning migration, 99,463 combined hatchery- and natural-origin Chinook salmon crossed LGD between March 23 and August 17, of which 87,031 were adults and 12,432 were jacks. The 2003 return was 98% of the return in 2002 but 2.2 times greater than the most recent 10 year average of 46,075 (Table 5).

Table 5. Hatchery- and natural-origin spring and summer Chinook salmon counted at Lower Granite Dam (LGD) in 2003. Spring Chinook salmon are defined as crossing LGD March 1 to June 17 and summer Chinook salmon as crossing June 18 to August 17. Data obtained from Fish Passage Center (www.fpc.org).

	LGD Count						
Return Year	**Spring Adult**	**Spring Jack**	**Spring Total**	**Summer Adult**	**Summer Jack**	**Summer Total**	**Spring and Summer Combined**
2003	70,609	8,295	78,904	16,422	4,137	20,559	99,463
2002	75,025	2,089	77,114	22,159	1,953	24,112	101,226
2001	171,958	3,135	175,093	13,735	3,804	17,539	192,632
2000	33,822	10,318	44,140	3,939	3,756	7,695	51,835
1999	3,296	2,507	5,803	3,260	1,584	4,844	10,647
1998	9,854	109	9,963	4,355	328	4,683	14,646
1997	33,855	81	33,936	10,709	127	10,836	44,772
1996	4,207	1,639	5,846	2,607	944	3,551	9,397
1995	1,105	373	1,478	692	157	849	2,327
1994	3,120	43	3,163	795	73	868	4,031
1993	21,035	183	21,218	7,889	130	8,019	29,237
1992	21,391	533	21,924	3,014	298	3,312	25,236
1991	6,623	980	7,603	3,809	1,179	4,988	12,591
1990	17,315	244	17,559	5,093	128	5,221	22,780
1989	12,955	1,549	14,504	3,169	902	4,071	18,575
1988	29,495	924	30,419	6,145	362	6,507	36,926
1987	28,835	946	29,781	5,891	660	6,551	36,332
1986	31,576	1,307	32,883	6,154	1,255	7,409	40,292
1985	25,207	2,530	27,737	4,938	1,568	6,506	34,243
1984	6,511	1,410	7,921	5,429	1,815	7,244	15,165
1983	9,517	509	10,026	3,895	767	4,662	14,688
1982	12,367	379	12,746	4,210	318	4,528	17,274
1981	13,115	527	13,642	3,326	479	3,805	17,447
1980	5,461	1,298	6,759	2,688	759	3,447	10,206
1979	6,753	786	7,539	2,714	858	3,572	11,111
1993-2002	Ten Year	Average					46,075

The estimated number of natural-origin adult Chinook salmon crossing LGD in 2003 from TAC was 32,080. Based on this TAC estimate, total adult hatchery escapement above LGD was 54,951, which is slightly below the LSRCP escapement goal of 58,677 spring/summer Chinook. However, it should be noted that not all hatchery fish crossing LGD are from LSRCP funded hatcheries but also include fish destined to return to IPC funded hatcheries.

2003 Adult Returns And Harvest Information By Hatchery Facility

McCall Fish Hatchery

Adult returns—Trapping of adult Chinook salmon at the South Fork Salmon River Trap began on June 25 and continued until September 12 when the weir was removed. The first Chinook salmon was captured on June 27 and the last was captured on September 9. During the 2003 trapping period, 8,098 Chinook salmon were captured including 6,603 (4,251 males and 2,352 females) hatchery- and 1,495 (844 males and 651 females) natural-origin fish

(McPherson et al. 2005). The 2003 adult return was slightly below the 2002 total return of 8,603, but 2.1 times higher than the previous ten year average (IDFG unpublished data).

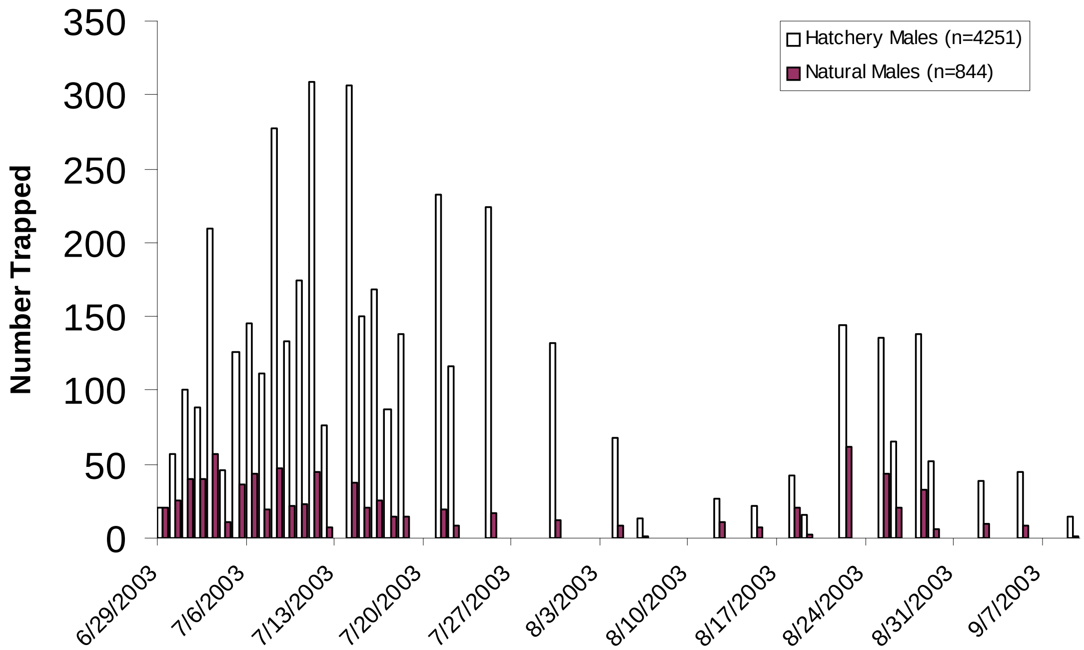
During the 2003 adult migration, 65 CWTs were recovered from McCall Fish Hatchery Chinook salmon from fisheries in the ocean, Columbia River, Snake River below LGD, and from strays in Columbia and Snake River tributaries. Expansions based on sample and tagging rates resulted in an estimate of 653 McCall Fish Hatchery fish recovered from fisheries and traps (Table 6). Estimated harvest from the terminal fishery that occurred on the South Fork Salmon River from June 18 to July 16 included 5,456 from the sport fishery and 1,391 from the tribal fisheries. During spawning ground surveys above the SFSR weir, IDFG research staff collected 77 adipose clipped Chinook salmon that had escaped above the weir. It is suspected that some hatchery-origin spawned below the SFSR weir but data is not available to make that estimate. Total estimated harvest and escapement of McCall hatchery-origin Chinook salmon for 2003 was 14,180 (Table 6).

Table 6. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2003. Recoveries are from fish released from McCall Fish Hatchery into the South Fork Salmon River (SFSR) at Knox Bridge and include fish from brood year 1998, 1999, and 2000.

Release Group/Site	Location and Recovery Type	Number CWTs Recovered	Expanded Estimate
	Ocean	2	22
SFSR-Knox Bridge	Columbia River		
	Non-Treaty Sport	9	219
	Non-Treaty Commercial	4	28
	Treaty Net	39	322
	Treaty C&S	0	0
	Strays	2	6
	Snake River		
	Non-Treaty Sport	5	44
	Strays	4	12
	Idaho		
	Sport Harvest		5,456
	Tribal Harvest		1,391
	Strays*		77
	SFSR weir		6,603
Total		**65**	**14,180**

*Idaho strays include hatchery-origin fish that were recovered above the SFSR weir during spawning ground surveys. Data from Venditti et al. 2005.

Run Timing—Arrival timing of adults to the South Fork Salmon River Trap in 2003 resembles a bimodal distribution. The majority of adults returned in the first mode from late June to early August (Figure 5). The second mode occurred during August and early September. The median arrival date for males occurred on 7/14 and 7/11 for hatchery- and natural-origin fish, respectively. Median arrival date for females occurred on 7/10 and 7/9 for hatchery- and natural-origin females, respectively.



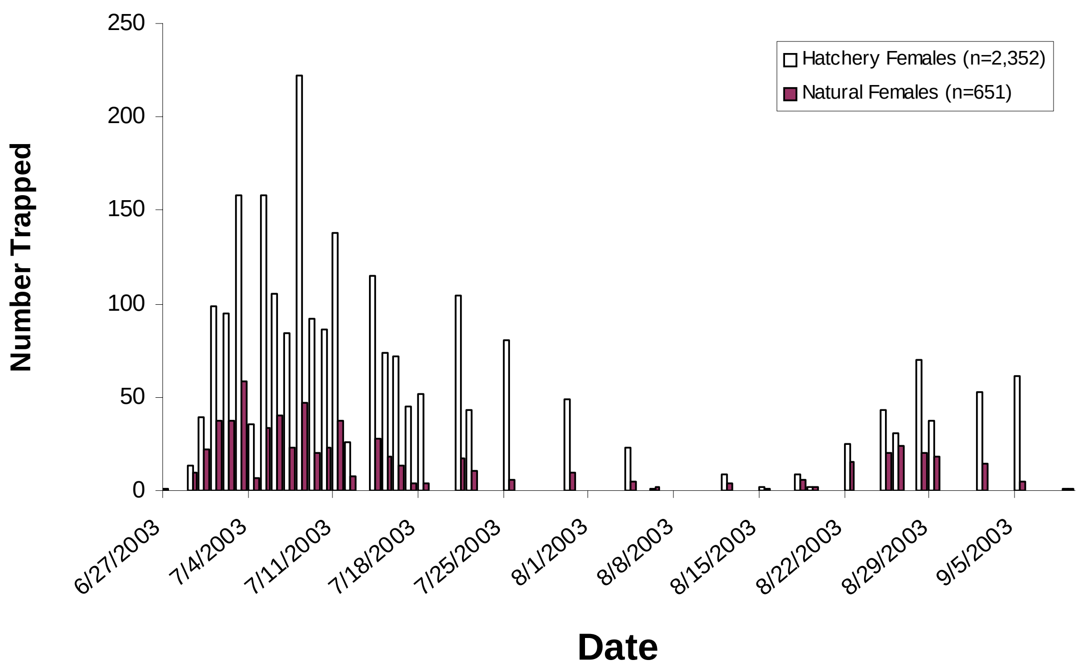


Figure 5. Run timing of hatchery- and natural-origin Chinook salmon at the South Fork Salmon River Trap in 2003.

Age Structure—Age classification of returning hatchery-origin adults was estimated using the computer program Rmix. Coded-wire tags were recovered from 711 (359 age 3, 196 age 4, and 156 age 5) of the 6,603 hatchery-origin fish that returned to the South Fork Salmon River trap in 2003. Results from the Rmix analysis indicated that the male return was composed of 40.4% age 3, 32.5% age 4, and 27.1% age 5 returns. The female return was composed of 46.5% age 4 and 53.5% age 5 fish (Table 7). One age 3 female with a CWT was recovered in 2003 but was not included in the Rmix analysis. Average length-at-age for males and females is displayed in Table 7.

Table 7. Estimated age structure of hatchery-origin Chinook salmon that returned to South Fork Salmon River Trap in 2003. Average length-at-age is based on fish recovered with CWTs. Fish lengths are in centimeters. SD = standard deviation. The "Number Represented" and 95% confidence interval is based on the Rmix analysis.

Gender	Age	CWTs Recovered	Average Length (SD)	Number Represented (95% CI)	Percent of Return
Male	3	359	55.4 (5.6)	1,718 (+/-64)	40.4%
	4	88	80.1 (8.3)	1,383(+/-72)	32.5%
	5	44	94.7 (6.3)	1,150(+/-69)	27.1%
Male total	*Total*	*491*		*4,251*	*100.0%*
Female	4	108	79.2 (4.0)	1,094(+/-57)	46.5%
	5	112	89.6 (4.5)	1,258(+/-56)	53.5%
Female Total	*Total*	*220*		*2,352*	*100.0%*
Total		**711**		**6,603**	

Age classification of natural-origin adults for the 2003 adult return is based on a visual examination of the length frequency data. Length criteria used to distinguish age classes for males and females is shown in Figure 6 and Table 8 below. Based on these length criteria, the male return was composed of 8.1% one-ocean, 37.4% two-ocean, and 54.5% three-ocean fish. The female return was composed of 22.9% two-ocean and 77.1% three-ocean.

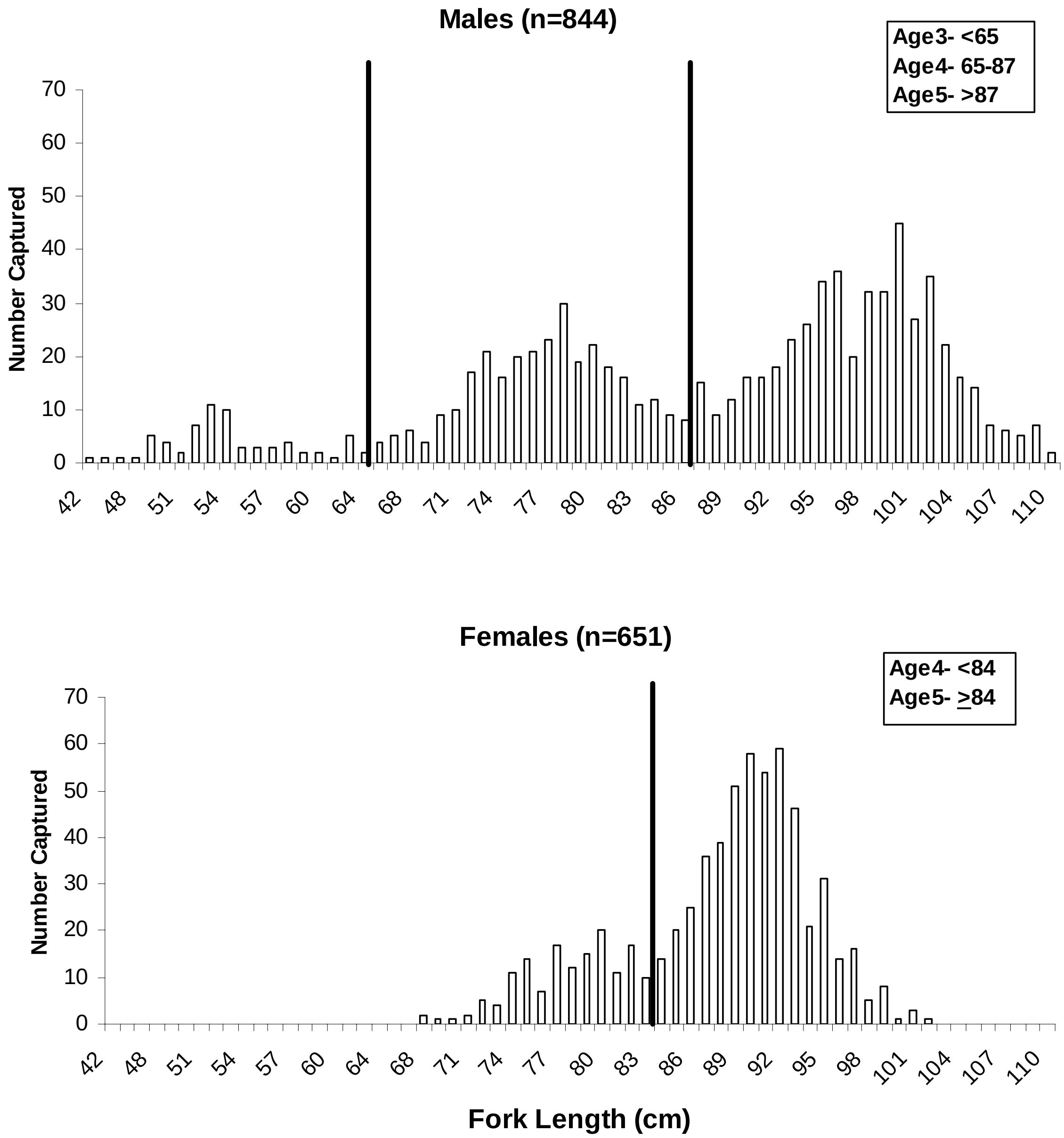


Figure 6. Length frequency and estimated age composition of natural-origin Chinook salmon trapped at the South Fork Salmon River Trap in 2003. Dark vertical bars represent length cutoffs used for age determination.

Table 8. Estimated age composition of natural-origin Chinook salmon that returned to the South Fork Salmon River Trap in 2003.

Gender	**Age**	**Length Criteria**	**Number Trapped**	**Percent of Return**
Male	3	<65	68	8.1%
	4	65-87	316	37.4%
	5	>87	460	54.5%
Male Total			*844*	
Female	4	<84	149	22.9%
	5	≥84	502	77.1%
Female Total			*651*	
Total			**1495**	

1998 Brood Year Reconstruction and SAR—In 2003, the last of the progeny from the 1998 brood stock returned to the SFSR. In 1998, 277 females were spawned to create the release of 1,039,930 smolts in April of 2000 above the SRSR weir (Table 9). From the 1,039,930 smolts released above the SFSR weir, 8,399 adults returned to the weir in 2001, 2002, and 2003 (Table 10). Additionally, an estimated 7,789 fish were harvested or recovered as strays resulting in 16,188 fish and an overall SAR of 1.5%.

Female-Progeny:Female-Parent Ratio—From the 277 females that were spawned in 1998, 3,556 females returned to the SFSR weir in 2002 and 2003 resulting in a female-progeny:female-parent ratio of 12.8 (Table 10). In addition to the 3,556 females recovered at the weir, an estimated 3,673 brood year 1998 females were harvested or recovered as strays in 2002 and 2003 resulting in 7,229 females and a female-progeny:female-parent ratio of 26.1 indicating, that for brood year 1998, the McCall Fish Hatchery program was well above replacement (Table 10).

Table 9. Number of females spawned and survival of resultant progeny from egg to release at the McCall Fish Hatchery for brood year 1998 fish released above the SFSR weir. The "# of Females Spawned" does not include females whose eggs were culled.

# of Females Spawned	**Average Fecundity**	**# of Green Eggs**	**# of eyed Eggs**	**# of Smolts released**	**Green Egg to Release Survival**
277	4,793	1,328,259	1,053,017	1,039,930	78.3%

Table 10. Estimated escapement and harvest of brood year 1998 hatchery-origin Chinook salmon adults from McCall Fish Hatchery in 2001, 2002, and 2003. Numbers in parentheses represent the percentage of the total for each recovery type. Estimated harvest and strays are reported for the area downstream of LGD (Blw. LGD) and upstream of LGD (Abv. LGD) separately.

Recovery Type	Age 3 Recoveries in 2001	Age 4 Recoveries in 2002	Age 5 Recoveries in 2003	Total Brood Year Recoveries
Hatchery Weir	991(11.8%)	5,000(59.5%)	2,408(28.7%)	8,399
Harvest (Blw. LGD)	14(2.7%)	299(58.4%)	199(38.9%)	512
Strays (Blw. LGD)	8(30.8%)	13(50.0%)	5(19.2%)	26
Harvest (Abv.LGD)[a]	47(0.6%)	5,381(75.3%)	1,719(24.1%)	7,147
Strays (Abv.LGD)[b]	5(4.8%)	23(22.1%)	76(73.1%)	104
Total Recoveries	**1,065(6.6%)**	**10,716(66.2%)**	**4407(27.2%)**	**16,188**
Estimated # of Females[c]	0	4,929 (68.1%)	2,300 (31.9%)	7,229
# of Females at Weir	0	2,298(64.6%)	1,258(35.4%)	3,556

[a] Harvest above LGD does not include NPT terminal harvest because data was not available to estimate harvest by age class for 2001, 2002, and 2003 fisheries.

[b] Only includes fish recovered with CWTs; individual fish recovered are then expanded based on the tagging rate. Strays include fish recovered above and below the SFSR weir.

[c] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2002 and 2003, respectively. In 2002, 46.0% of the age-4 hatchery-origin fish were female. In 2003, 52.2% of the age-5 hatchery-origin fish were female.

Sawtooth Fish Hatchery

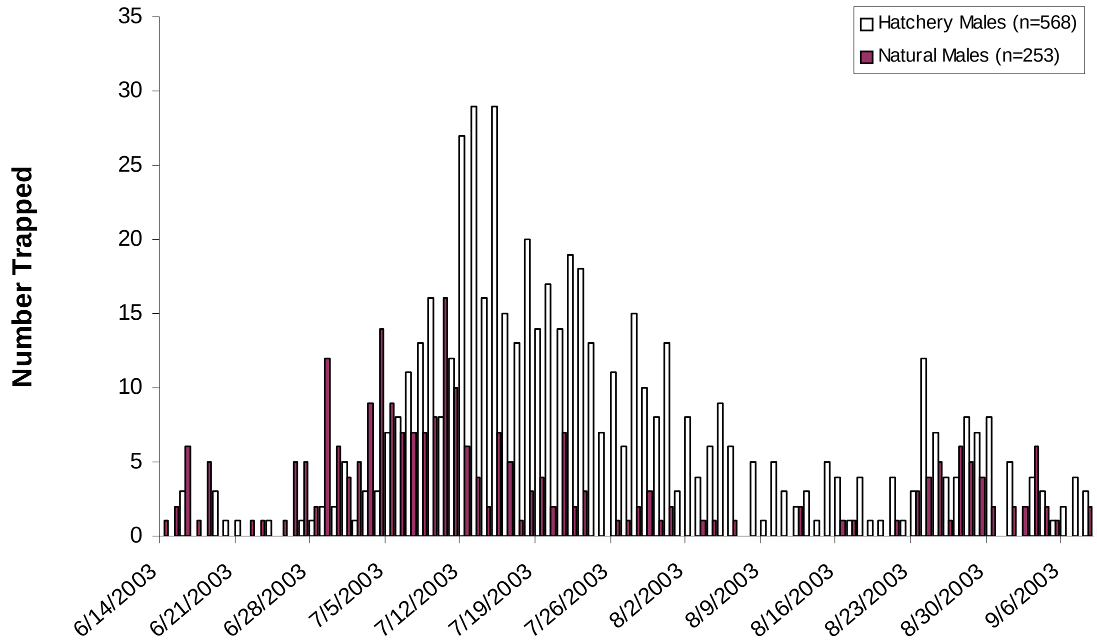
Adult Returns—Trapping of adult Chinook salmon at the Sawtooth Fish Hatchery began on June 12 and continued until September 9 when the weir panels were removed. The first Chinook salmon was captured on June 14 and the last was captured on September 8. During the 2003 trapping period, 1,236 Chinook salmon were captured including 698 (568 males, 130 females) hatchery- and 538 (253 males, 285 females) natural-origin fish (Snider et al. 2005). The 2003 adult return was below the 2002 total return of 1,786 Chinook salmon, but 1.9 times higher than the previous ten year average (IDFG unpublished data).

Harvest of Sawtooth Fish Hatchery fish in 2003 from ocean and Columbia River fisheries was estimated at 43 and six stray fish were recovered in the Tucannon River (Table 11). No fisheries targeting Sawtooth Fish Hatchery stock occurred in Idaho in 2003 and no incidental take of Sawtooth Fish Hatchery fish in the Lower Salmon River fishery was observed. In total, an estimated 747 hatchery-origin fish contributed to the weir return, fisheries and strays in 2003 (Table 11).

Table 11. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2003. Recoveries are from fish released from Sawtooth Fish Hatchery.

Release Group/Site	Location and Recovery Type	Number CWTs Recovered	Expanded Estimate
	Ocean	1	6
Sawtooth Weir	Columbia River		
	Non-Treaty Sport	2	22
	Non-Treaty Commercial	0	0
	Treaty Net	5	15
	Treaty C&S	0	0
	Strays	1	6
	Idaho		
	Harvest	0	0
	Strays	0	0
	Sawtooth Hatchery Weir	—	698
Total		**12**	**747**

Run Timing—Arrival timing of adults to the Sawtooth Fish Hatchery facility in 2003 resembles a bimodal distribution and is typical of previous years. The majority of adults returned in the first mode from mid-June to early August (Figure 7). The second mode occurred between mid-August and early September (Figure 7). Median arrival date for males occurred on 7/21 and 7/10 for hatchery- and natural-origin adults respectively. The hatchery-origin males consisted of 85.1% jacks while the natural-origin males consisted of 19.0% jacks and likely played a role in the differential arrival timing of the hatchery- and natural-origin males since jacks typically arrive later than the age-4 and age-5 males. Median arrival date for females occurred on 7/6 for both hatchery- and natural-origin adults.



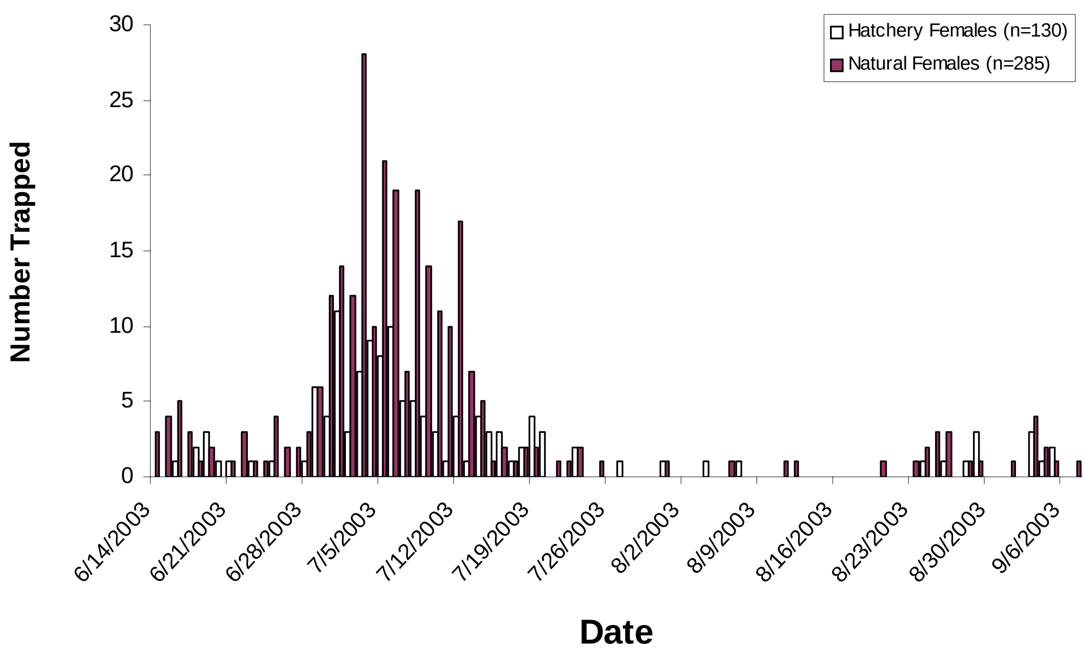


Figure 7. Run timing of hatchery- and natural-origin Chinook salmon at Sawtooth Fish Hatchery in 2003.

Age Structure—Age classification of returning hatchery-origin adults is estimated using the computer program Rmix. Coded-wire tags were recovered from 492 (413 age 3, 34 age 4, and 45 age 5) of the 698 hatchery-origin fish that returned to the Sawtooth Fish Hatchery in 2003. Results from the Rmix analysis indicate that the male return is composed of 85.1% age 3, 6.8% age 4, and 8.1% age 5 fish. The female return was composed of 46.5% age 4 and 53.5% age 5 fish (Table 12). No age 3 females with CWTs were recovered in 2003. Average length at age for males and females is displayed in Table 12.

Table 12. Estimated age structure of hatchery-origin Chinook salmon that returned to Sawtooth Fish Hatchery in 2003. Average length-at-age is based on fish recovered with CWTs. Fish lengths are in centimeters. SD= standard deviation. The “Number Represented” and associated confidence intervals are based on the Rmix analysis.

Gender	**Age**	**CWTs Recovered**	**Average Length (SD)**	**Number Represented (95% CI)**	**Percent of Return**
Male	3	413	55.0 (4.6)	483 (+/-17)	85.1%
	4	12	77.1 (6.9)	38(+/-13)	6.8%
	5	20	96.2 (5.5)	46(+/-14)	8.1%
Male total	*Total*	*445*		*568*	
Female	4	22	79.0 (4.2)	60(+/-12)	46.5%
	5	25	91.0 (4.4)	70(+/-13)	53.5%
Female Total	*Total*	*47*		*130*	
Total		**492**		**698**	

Age classification of natural-origin adults for the 2003 adult return is based on a visual examination of the length frequency data. Length criteria used to distinguish age classes for males and females is shown in Figure 8 and Table 13 below. Based on these length criteria, the male return was composed of 19.0% one-ocean, 23.7% two-ocean, and 57.3% three-ocean fish. The female return was composed of 22.1% two-ocean and 77.9% three-ocean.

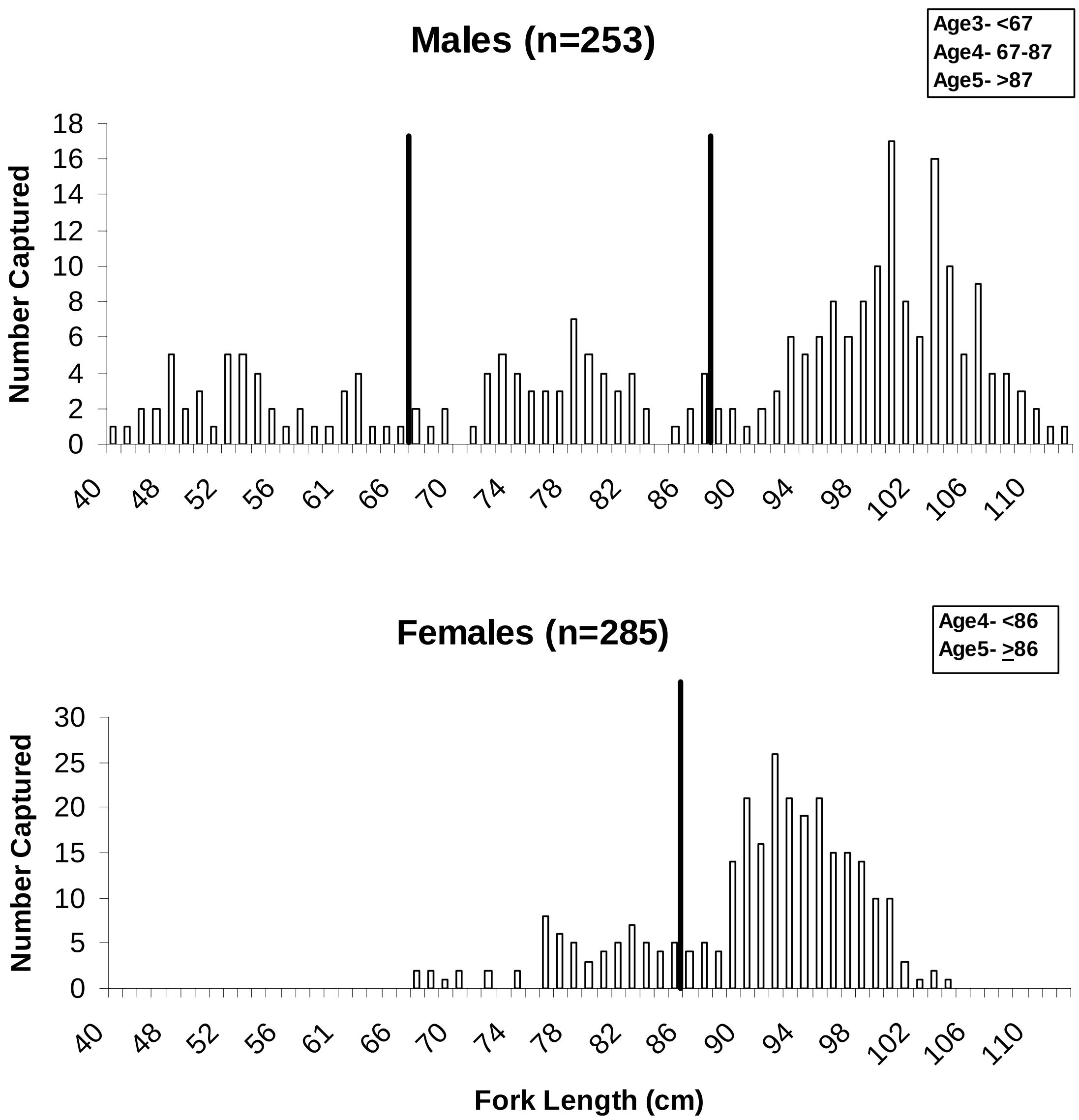


Figure 8. Length frequency and estimated age class composition of natural-origin Chinook salmon trapped at the Sawtooth Fish Hatchery weir in 2003. Dark vertical bars represent length cutoffs used for age determination.

Table 13. Estimated age composition of natural-origin Chinook salmon trapped at the Sawtooth Fish Hatchery weir in 2003. Lengths are in centimeters and measured as fork length.

Gender	Age	Length Criteria	Number Trapped	Percent of Return
Male	3	<67	48	19.0%
	4	67-87	60	23.7%
	5	>87	145	57.3%
Male Total			*253*	
Female	4	<86	63	22.1%
	5	≥86	222	77.9%
Female Total			*285*	
Total			**538**	

1998 Brood Year Reconstruction and SAR—In 2003, the last of the progeny from the 1998 brood stock returned to the Sawtooth Fish Hatchery. In 1998, 27 females were spawned resulting in the release of 123,425 smolts in April of 2000 (Table 14). Approximately 97% of the smolts released were tagged with CWT only and no adipose fin clip and as such would not be susceptible to mark-selective fisheries.

From this smolt release, 959 adults were produced that either returned to the hatchery weir or contributed to harvest resulting in an overall SAR of 0.78% (Table 14 and Table 15).

Female-Progeny:Female-Parent Ratio—From the 27 females that were spawned in 1998, 416 females returned to the Sawtooth Fish Hatchery weir in 2002 and 2003 resulting in a female-progeny:female-parent ratio of 15.4 (Table 15). In addition to the 416 females recovered at the weir, an estimated 27 brood year 1998 females were harvested in 2002 and 2003 resulting in a total female-progeny:female-parent ratio of 16.4 indicating that for brood year 1998 the Sawtooth Fish Hatchery program was well above replacement.

Table 14. Number of females spawned and survival of resultant progeny from egg to release at the Sawtooth Fish Hatchery for brood year 1998.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of eyed Eggs	# of Smolts released	Green Egg to Release Survival
27	5,165	139,469	129,593	123,425	88.5%

Table 15. Estimated escapement and harvest of brood year 1998 hatchery-origin Chinook salmon adults from Sawtooth Fish Hatchery in 2001, 2002, and 2003. Numbers in parentheses represent the percentage of the total for the recovery type. Estimated harvest and strays are reported for the area downstream of LGD (Blw. LGD) and upstream of LGD (Abv. LGD) separately.

Recovery Type	Age 3 Recoveries in 2001	Age 4 Recoveries in 2002	Age 5 Recoveries in 2003	Total Brood Year Recoveries
Hatchery Weir	177(19.9%)	614(69.1%)	116(11.0%)	907
Harvest (Blw. LGD)	1(2.1%)	33(68.8%)	14(29.1%)	48
Strays (Blw. LGD)	3	1	0	4
Harvest (Abv.LGD)	0	0	0	0
Strays (Abv.LGD)	0	0	0	0
Total Recoveries	**181(18.8%)**	**648(67.6%)**	**130(13.6%)**	**959**
Estimated # of Females[a]	0(0%)	365(82.4%)	78(17.6%)	443
# of Females at Weir	0(0%)	346(83.2%)	70(16.8%)	416

[a] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2002 and 2003 respectively. In 2002, 56.4% of the age-4 hatchery-origin fish were female. In 2003, 60.3% of the age-5 hatchery-origin fish were female.

Clearwater Fish Hatchery Adult Returns and Harvest

All three of the Clearwater Fish Hatchery satellite trapping facilities were operated in 2003, and adult returns to each facility are described below. Beginning in 1997, broodstocks for Red River and Crooked River satellites have been combined into one stock and referred to as the “South Fork” stock. For this report, adult returns and harvest estimates from both Red River and Crooked River satellites are combined.

Columbia River 2003 harvest estimates for fish released from the three satellite facilities only include age 5 fish from brood year 1998 as these were the only adipose-clipped fish released with coded-wire. As such, harvest estimates from Columbia River fisheries are likely underestimated. Adipose-clipped fish released from brood year 1999 and 2000 did not have any coded-wire.

Chinook salmon sport fisheries were held on sections of the mainstem Clearwater River and its tributaries in 2003. These fisheries were targeting fish destined for Dworshak Fish Hatchery, Kooskia Fish Hatchery, and the three satellite facilities of Clearwater Fish Hatchery. Specific areas and time frames of the fisheries are listed in Table 16 below.

Table 16. Chinook salmon sport fisheries in the Clearwater River drainage in 2003.

River	Section	Start Date	End Date
Lower Clearwater R.	Lewiston -Orofino	4/12	5/26
		6/14	5/26
N.Fk. Clearwater R.	Mouth-Dworshak Dam	4/12	5/26
		6/14	8/01
Upper Clearwater R.	Kamiah – Clear Creek	4/26	5/26
		6/14	8/01
Lochsa R.	Mouth- Colt Killed Creek	6/14	8/01
S. Fk. Clearwater R.	Mouth- American River	6/14	8/01

Powell Satellite Facility

Adult Returns—Trapping of adult Chinook salmon at the Powell Satellite facility began on June 5 and continued until September 15 when the trap was taken out of operation. The first Chinook salmon was captured on June 8 and the last was captured on September 10. During the 2003 trapping period, 1,440 (1,397 hatchery-origin, and 43 natural-origin) Chinook salmon were captured at the Powell satellite facility. Additionally, 83 hatchery-origin (63 AD-clipped and 20 CWT-only) Chinook salmon were captured at a temporary weir on Crooked Fork Creek. This trap is operated by IDFG staff associated with the ISS study to monitor the escapement of natural-origin Chinook salmon in Crooked Fork Creek and to intercept hatchery-origin strays. Hatchery-origin fish captured at this trap are considered strays from the Powell release site and, in 2003, were either transferred to the Powell holding ponds or released approximately 20 miles downstream of the Powell trap in an effort to recycle excess hatchery fish back through the sport fishery. Of the 83 hatchery-origin fish captured at the Crooked Fork trap, 20 were transferred to the Powell holding ponds. The combined total of hatchery-origin fish captured at both traps was 1,480 fish (823 males and 657 females). Due to excess broodstock arriving at the Powell trap, trapping was discontinued from June 28 through July 9 and the number of adults reported at the trap is likely an underestimate of the number of fish returning to the area (Figure 9).

Harvest of Powell origin Chinook salmon in the Pacific Ocean and Columbia River fisheries is estimated based on the recoveries of CWT. In 2003, CWTs were recovered from 86 Powell origin Chinook salmon in the Columbia River and one in the Lower Snake River. Based on these recoveries, an estimated 280 were harvested in the Columbia River, five in the Lower Snake River, and two were recovered as strays (Table 17).

IDFG staff estimated that 73 Chinook salmon were harvested in the Lochsa River fishery and were all assumed to be Powell origin. Additionally, 102 of the 1,687 fish harvested in the lower Clearwater River were estimated to be Powell origin based on recovery of CWTs (IDFG, unpublished data). Twenty-three Powell origin fish with CWTs were recovered at Dworshak National Fish Hatchery in 2003 and recorded as strays. In all, 1,965 Powell origin Chinook salmon were accounted for in 2003 (Table 17).

Table 17. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2003. Recoveries are from fish released from the Powell satellite facility.

Release Group/Site	**Location and Recovery Type**	**Number CWTs Recovered**	**Expanded Estimate**
	Ocean	0	0
Powell Satellite	Columbia River		
	Non-Treaty Sport	32	148
	Non-Treaty Commercial	25	51
	Treaty Net	25	79
	Treaty C&S	2	2
	Strays	2	2
	Snake River Sport	1	5
	Idaho		
	Harvest		175
	Strays	23	23
	Powell Satellite Trap*		1,480
Total		110	1,965

* Includes 83 hatchery-origin fish captured at the Crooked Fork Creek weir.

Run Timing—Arrival timing of adults to the Powell trap in 2003 resembles a bimodal distribution. The majority of adults returned in the first mode in June and July and the second mode occurred during late August and early September (Figure 9). Median arrival date for hatchery-origin males and females occurred on June 24 and June 23 respectively.

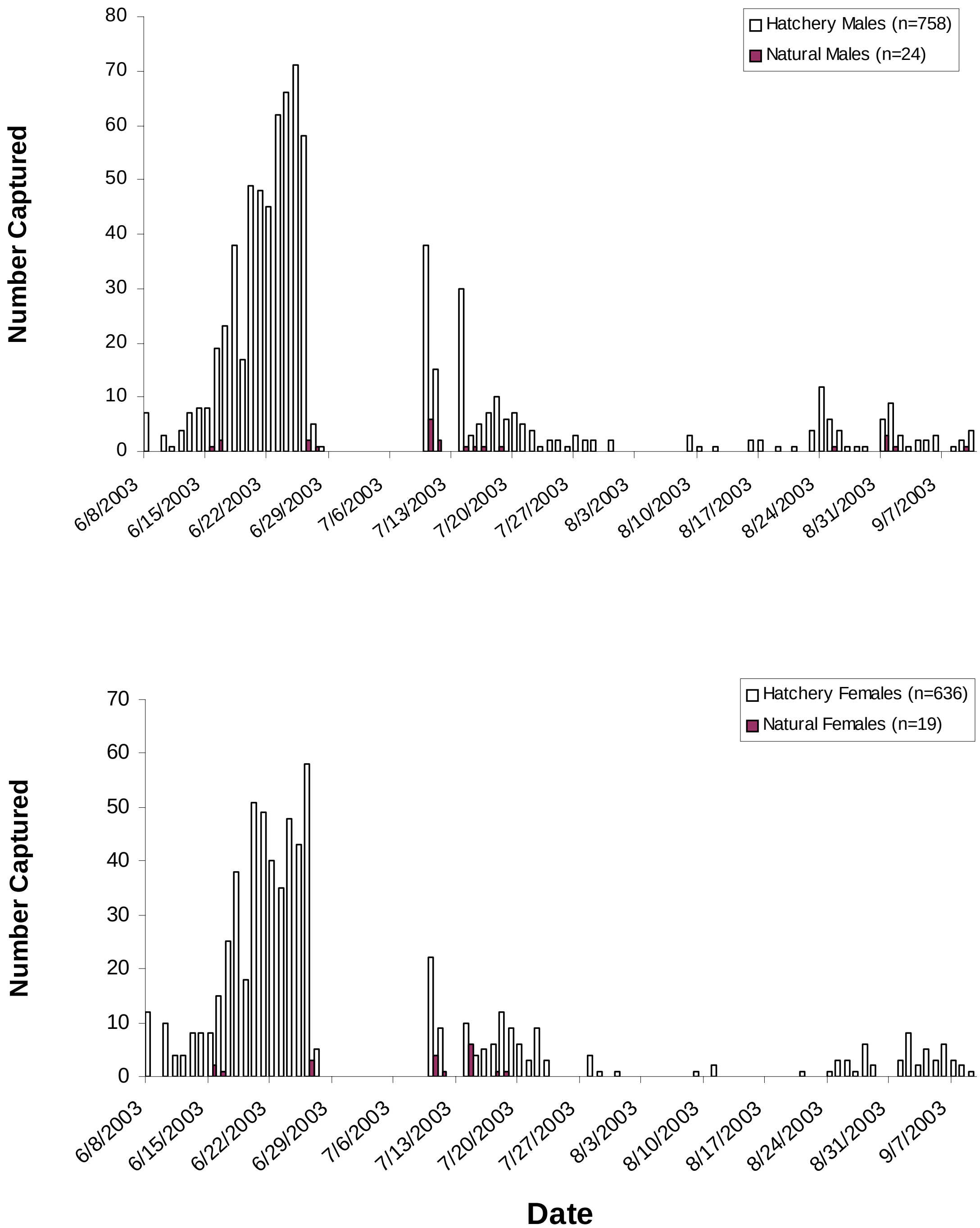


Figure 9. Run timing of hatchery- and natural-origin Chinook salmon at the Powell satellite facility in 2003. Does not include hatchery-origin adults captured at the Crooked Fork Creek weir. Three hatchery-origin fish were of unknown gender.

Age Structure—Age classification of returning hatchery-origin adults was estimated using the computer program Rmix. Coded-wire tags were recovered from 313 (0 age 3, 150 age 4, and 163 age 5) of the 1,480 hatchery-origin fish that returned to the Powell and Crooked Fork Creek traps in 2003. The age 4 CWTs all came from fish that were released without an adipose-clip and all age 5 CWTs came from fish released with an adipose clip. Since no age 3 CWTs were recovered, age 3 males are excluded from the Rmix analysis and it is assumed (based on length frequency data) that all males less than 62 cm fork length are age 3. Results from the Rmix analysis for age 4 and age 5 fish indicated that the male return was composed of 14.1% age 3, 41.0% age 4, and 44.9% age 5 returns. The female return was composed of 64.8% age 4 and 35.2% age 5 fish (Table 18).

Table 18. Estimated age composition of hatchery-origin Chinook salmon that returned to Powell and Crooked Fork traps in 2003. Average length-at-age is based on fish recovered with CWTs. Fish lengths are in centimeters. SD = standard deviation. The "Number Represented" and associated confidence interval is based on the Rmix analysis.

Gender	Age	CWTs Recovered	Average Length (SD)	Number Represented (95% CI)	Percent of Return
Male	3	0	*NA*	116(*NA*)	14.1%
	4	56	74.9(5.0)	337(+/-27)	41.0%
	5	57	94.3(5.2)	370(+/-27)	44.9%
Male total	*Total*	*113*		*823*	*100.0%*
Female	4	94	73.2(3.6)	426(+/-30)	64.8%
	5	106	87.5(3.9)	231(+/-30)	35.2%
Female Total	*Total*	*200*		*657*	*100.0%*
Total		**313**		**1,480**	

1998 Brood Year Reconstruction and SAR—In 2003, the last of the progeny from the 1998 brood stock returned to the Powell satellite facility. In 2000, 293,522 brood year 1998 smolts were released from the Powell facility. From this release, 3,694 adults were produced that either returned to the hatchery weir or contributed to harvest resulting in an overall SAR of 1.3%.

Female-Progeny:Female-Parent Ratio—From the 87 females that were spawned in 1998 (Table 19), 957 females returned to the Powell satellite facility in 2001, 2002, and 2003 resulting in a female-progeny to female-parent ratio of 11.0 (Table 20). In addition to the 957 females recovered at the weir, an estimated 954 brood year 1998 females were harvested in 2002 and 2003 resulting in 1,911 females, and a female-progeny to female-parent ratio of 22.0 indicating, that for brood year 1997, the Powell stock was above replacement.

Table 19. Number of females spawned and survival of resultant progeny from egg to release at the Powell satellite facility for brood year 1998.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of eyed Eggs	# of Smolts released	Green Egg to Release Survival
87	4,726	411,162	331,397	293,522	71.4%

Table 20. Estimated escapement and harvest of brood year 1998 Chinook salmon from the Powell satellite facility in 2001, 2002, and 2003. Numbers in parentheses represent the percentage of the total for the recovery type. Estimated harvest and strays are reported for the area downstream of LGD (Blw. LGD) and upstream of LGD (Abv. LGD) separately.

Recovery Type	Age 3[a] Recoveries in 2001	Age 4 Recoveries in 2002	Age 5 Recoveries in 2003	Total Brood Year Recoveries
Hatchery Weir	78(4.2%)	1,200(63.9%)	601(31.9%)	1,879
Harvest (Blw. LGD)	6(0.5%)	884(76.4%)	267(23.1%)	1,157
Strays (Blw. LGD)	0	11(84.6%)	2(15.4%)	13
Harvest (Abv.LGD)[b]	15(2.6%)	410(71.1%)	152(26.3%)	577
Strays (Abv.LGD)	0	45(66.2%)	23(33.8%)	68
Total Recoveries	99(2.7%)	2,550 (69.0%)	1,045(28.3%)	3,694
Estimated # of Females[c]	0 (0%)	1,509(79.0%)	402(21.0%)	1,911
# of Females at Weir	16(1.7%)	710(74.2%)	231(24.1%)	957

[a] Age composition for age 3 fish weir returns was taken from McGhee and Huntzenbiler 2003.
[b] Idaho harvest data is from IDFG unpublished data.
[c] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the Powell weir in 2002 and 2003 respectively. In 2002, 59.2% of the age-4 hatchery-origin fish were female. In 2003, 38.4% of the age-5 hatchery-origin fish were female.

South Fork Clearwater River Satellites (Red River and Crooked River)

Adult Returns—Trapping of adult Chinook salmon at the Crooked River Satellite began on April 4 and continued until September 11. During the 2003 trapping period, 1,358 Chinook were trapped at Crooked River including 1,137 (599 males and 538 females) hatchery-origin and 221 (92 males and 129 females) natural-origin fish. Trapping at Red River began on March 17 and continued until September 9. During the 2003 trapping period, 298 Chinook were trapped including 261 (163 males and 98 females) hatchery-origin and 37 (15 males and 22 females) natural origin fish. All ponded fish from the Red and Crooked river traps were combined at the Red River adult holding facility. Due to excess broodstock arriving at the Red and Crooked river traps, trapping was discontinued from July 2 through July 9 at both traps and the number of adults reported at the traps are likely underestimates of the number of fish returning to the area (Figure 10 and 11).

Harvest of Red and Crooked river Chinook salmon from ocean and Columbia River fisheries is estimated based on the recoveries of CWTs. In 2003, CWTs were recovered from 16 age 5 Chinook salmon in the Columbia River. Based on these recoveries, an estimated 764 were harvested in the Columbia River (Table 21).

IDFG staff estimated that 181 hatchery-origin Chinook salmon were harvested in the South Fork Clearwater River and were all assumed to be South Fork stock (IDFG, unpublished data). No South Fork origin strays with CWTs were recovered anywhere in Idaho in 2003.

Table 21. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2003. Recoveries are from fish released from Red River and Crooked River satellite facilities.

Release Group/Site	**Location and Recovery Type**	**Number CWTs Recovered**	**Expanded Estimate**
	Ocean	0	0
Red River Pond	Columbia River		
	Non-Treaty Sport	4	184
	Non-Treaty Commercial	8	214
	Treaty Net	4	366
	Treaty C&S	0	0
	Strays	0	0
	Idaho		
	Harvest		181
	Strays		0
	Red and Crooked R. traps		1,398
Total			**2,343**

Run Timing—Adults returning to the Crooked River trap arrived primarily in a singe mode during June and July with a much smaller second mode towards the end of August (Figure 10). The median arrival date for hatchery- and natural-origin males occurred on 6/23 and 6/26 respectively. The median arrival date for hatchery- and natural-origin females occurred on 6/20 and 6/22, respectively.

Adults returning to the Red River trap arrived primarily in a singe mode during June and July with a much smaller second mode towards the end of August (Figure 11). The median arrival date for both hatchery- and natural-origin males occurred on 6/26. The median arrival date for hatchery- and natural-origin females occurred on 6/24 and 6/20, respectively.

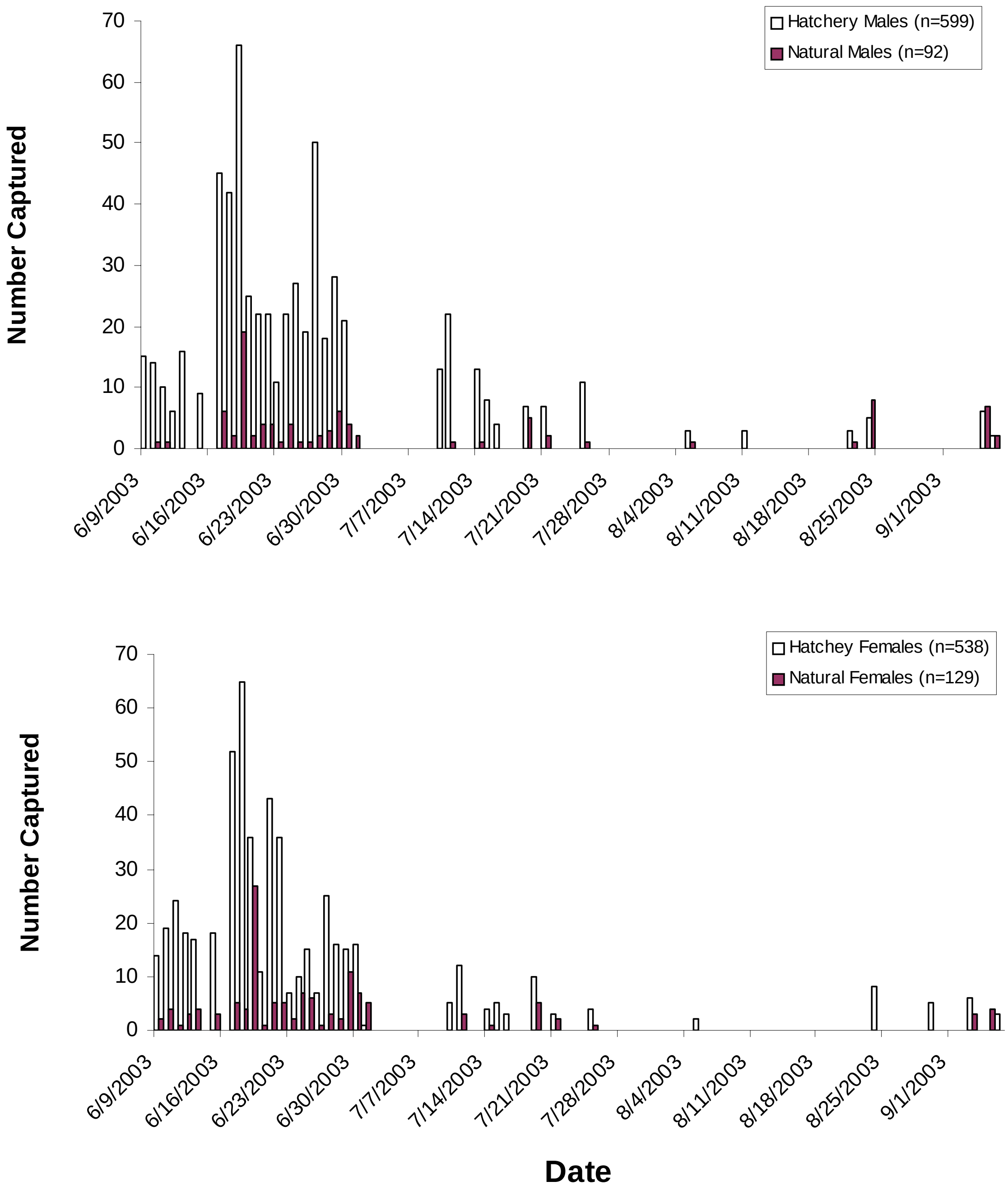


Figure 10. Run timing of hatchery- and natural- origin Chinook salmon at the Crooked River satellite facility in 2003.

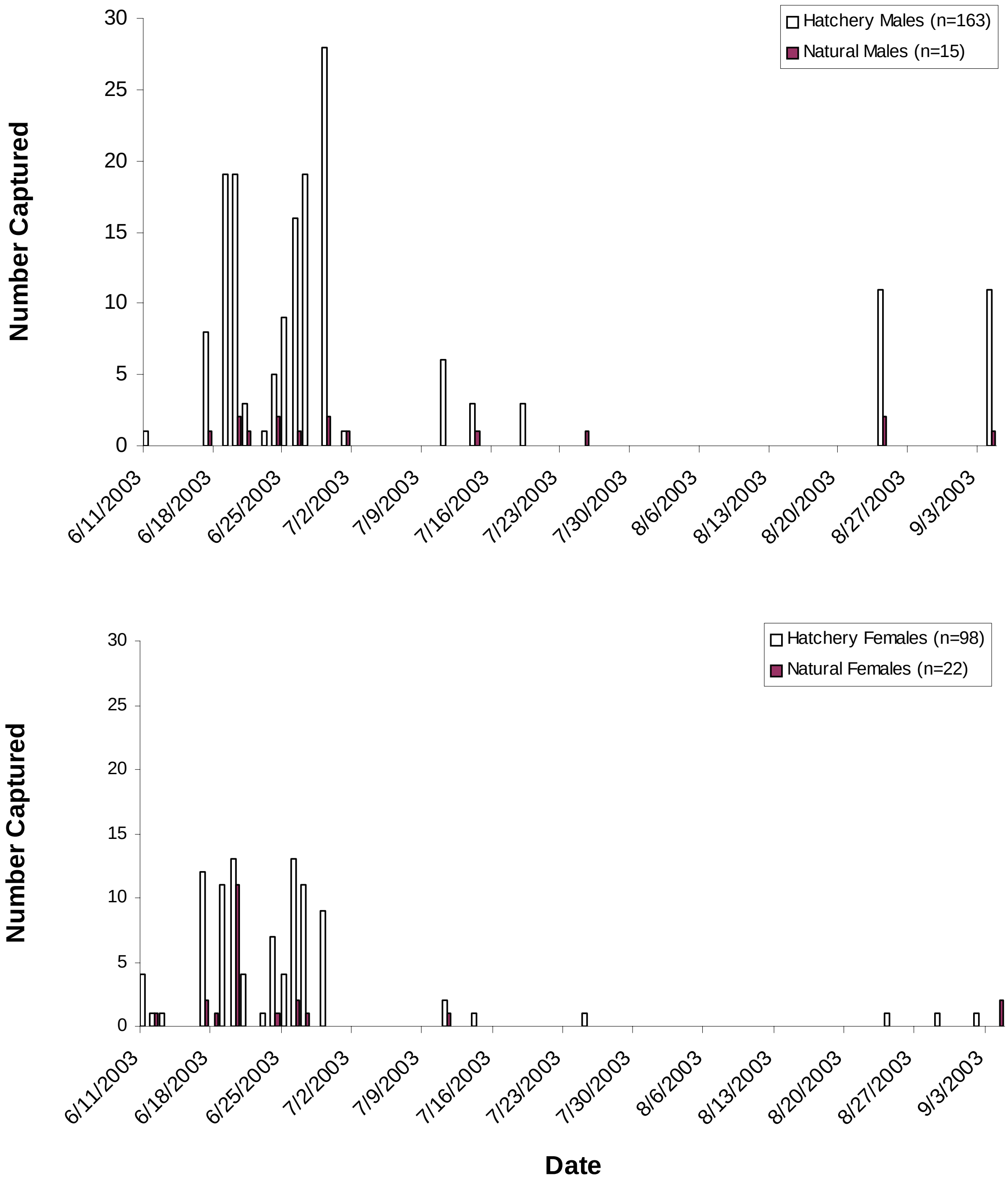


Figure 11. Run timing of hatchery- and natural- origin Chinook salmon at the Red River satellite facility in 2003.

Age Structure—Age classification of returning hatchery-origin adults was estimated using the computer program Rmix. Coded-wire tags were recovered from 95 (0 age 3, 83 age 4, and 12 age 5) of the 1,398 hatchery-origin fish that returned to the Red and Crooked River traps in 2003. Since no CWTs were recovered from age 3 males, they are excluded from the Rmix analysis and it is assumed (based on length frequency data) that all males less than 63 cm fork length are age 3. Results from the Rmix analysis for age 4 and age 5 fish indicated that the male return was composed of 24.7% age 3, 8.4% age 4, and 66.9% age 5 returns. The female age composition was estimated to be 27.4% age 4 and 72.6% age 5 fish (Table 22).

Table 22. Estimated age composition of hatchery-origin Chinook salmon that returned to the Crooked River and Red River trapping facilities in 2003. Average length-at-age is based on fish recovered with CWTs. Fish lengths are in centimeters. SD= standard deviation. The "Number Represented" and associated confidence interval is based on the Rmix analysis.

Gender	Age	CWTs Recovered	Average Length (SD)	Number Represented (95% CI)	Percent of Return
Male	3	0	*NA*	189(*NA*)	24.8%
	4	22	74.5(5.3)	64(+/-27)	8.4%
	5	4	93.0(4.7)	509(+/-27)	66.8%
Male total	*Total*	*26*		*762*	*100.0%*
Female	4	61	73.4(3.3)	174(+/-30)	27.4%
	5	8	89.3(4.9)	462(+/-30)	72.6%
Female Total	*Total*	*69*		*636*	*100.0%*
Total		**95**		**1398**	

Estimated age composition of natural-origin Chinook salmon captured at the Red River and Crooked River traps is based on visual examination of length frequency data. Age composition for males is estimated at 3.8% age 3, 38.3% age 4, and 57.9% age 5. Female age composition is estimated to be 51.7% age 4 and 48.3% age 5 (Figure 16; Table 23).

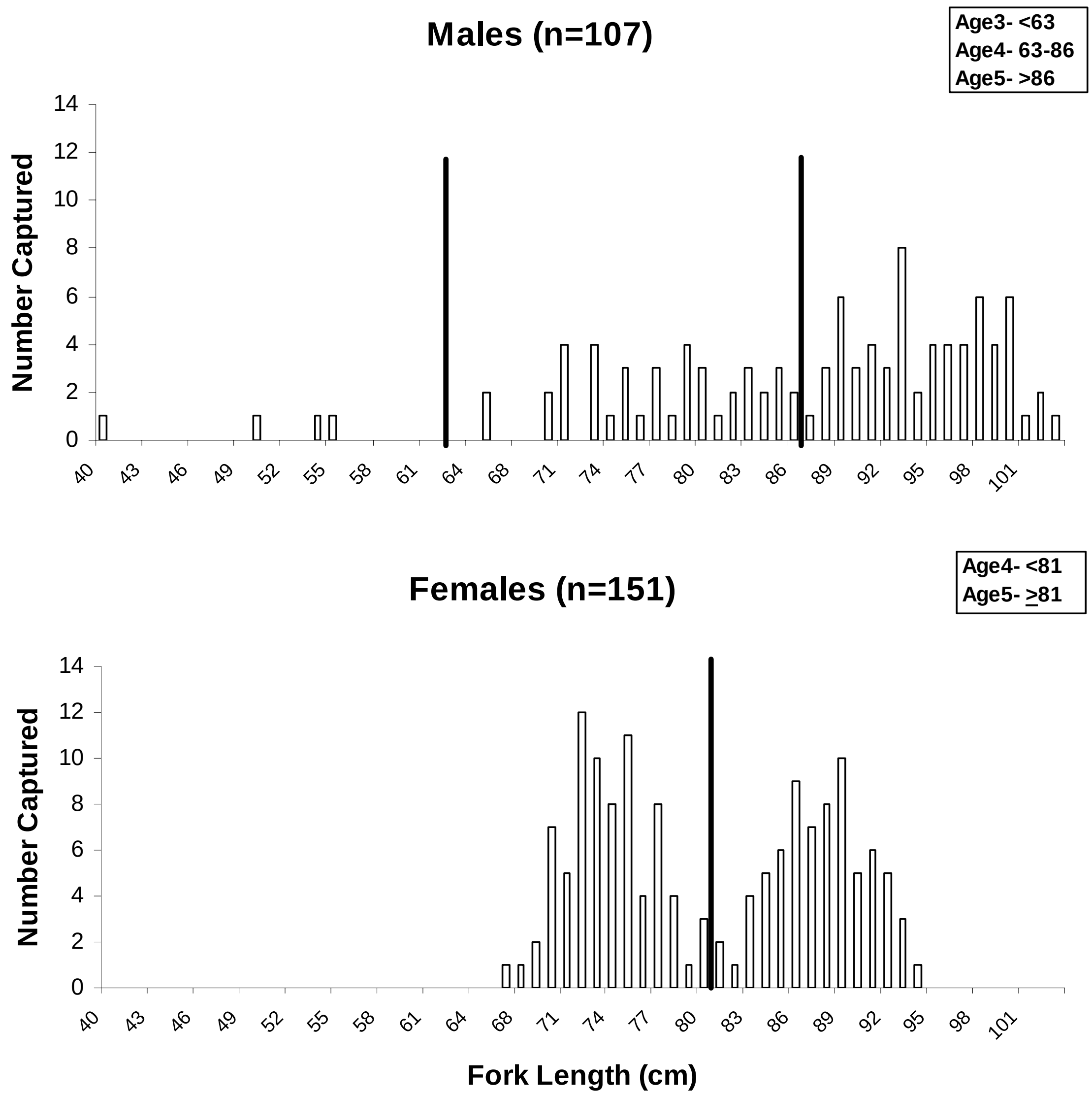


Figure 12. Length frequency and estimated age composition of natural-origin Chinook salmon trapped at the Red and Crooked River satellites in 2003. Dark vertical bars represent length cutoffs used for age determination.

Table 23. Estimated age composition of natural-origin Chinook salmon trapped at the Red River and Crooked River satellite facilities in 2003. Lengths are in centimeters and measured as fork length.

Gender	Age	Length Criteria	Number Trapped	Percent of Return
Male	3	<63	4	3.8%
	4	63-86	41	38.3%
	5	>86	62	57.9%
Male Total			*107*	*100.0%*
Female	4	<81	78	51.7%
	5	≥81	73	48.3%
Female Total			*151*	*100.0%*
Total			**258**	

1998 Brood Year Run Reconstruction and SAR—For brood year 1998, 555,061 adipose clipped yearling smolts were released in 2000. Additionally, 162,280 ventral clipped subyearling presmolts were released in 1999. From these releases, 5,333 adults were accounted for in 2001, 2002, and 2003 resulting in an overall SAR of 0.74%. Because there is a significant overwinter mortality associated with the presmolt release, this SAR is biased low for the smolt release. From the 162, 280 presmolts released, 113 adults were captured at the Red and Crooked River traps resulting in a 0.07% SAR. From the 555,061 yearling smolts released, 5,220 adults were accounted for resulting in a 0.94% SAR.

Female-Progeny:Female-Parent Ratio—From the estimated 190 females spawned in 1998 used to create the presmolt and smolt releases in 1999 and 2000, 1,325 females returned to the weir resulting in a female-progeny to female-parent ratio of 7.0. In addition to the 1,325 females recovered at the weir, an estimated 1,544 brood year 1998 females were harvested in 2002 and 2003 resulting in 2,869 females, and a female-progeny to female-parent ratio of 15.1 indicating that for brood year 1998 the South Fork stock was above replacement (Table 24 and 25).

Table 24. Number of females spawned and survival of resultant progeny from egg to release at the Red River and Crooked River satellite facilities for brood year 1998.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of eyed Eggs	# of Juveniles released	Green Egg to Release Survival
190	5,001	950,190	812,412	717,341	75.5%

* Includes 162,250 presmolts released in September of 1999

Table 25. Estimated escapement and harvest of brood year 1998 Chinook salmon adults from the Red River and Crooked River satellite facilities in 2001, 2002, and 2003. Numbers in parentheses represent the percentage of the total for that recovery type. Includes adults returning from both smolt and presmolt releases in 1999 and 2000.

Recovery Type	**Age 3[a] Recoveries in 2001**	**Age 4 Recoveries in 2002**	**Age 5 Recoveries in 2003**	**Total Brood Year Recoveries**
Hatchery Weir	57(2.3%)	1,461(58.7%)	971(39.0%)	2,489
Harvest (Blw. LGD)	0	695(47.6%)	764(52.4%)	1,459
Strays (Blw. LGD)	0	7(100%)	0	7
Harvest (Abv.LGD)[b]	35(%)	1,185(%)	158(%)	1,378
Strays (Abv.LGD)	0	0	0	0
Total Recoveries	**92(1.7%)**	**3,348(62.8%)**	**1,893(35.5%)**	**5,333**
Estimated # of Females[c]	18(0.6%)	1,952(68.0%)	899(31.4%)	2,869
# of Females at Weir	11(0.8%)	852(64.3%)	462(34.9%)	1,325

[a] Age composition for age-3 weir returns was taken from McGehee and Huntzenbiler 2003.
[b] Idaho harvest data is from IDFG unpublished data
[c] he fraction of total recoveries estimated to be female is based on the sex ratio of age3, age-4 and age-5 fish observed at the hatchery weir in 2001, 2002 and 2003 respectively. In 2001, 19.2% of the age3 fish were females. In 2002, 58.3% of the age-4 hatchery fish were females. In 2003, 47.5% of the age-5 hatchery-origin fish were females.

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