In season Update for Juvenile Snake River Fall Chinook Salmon Early Life History and Passage at Lower Granite Dam 2001

William P. Connor
USFWS Idaho Fishery Resource Office
P.O. Box 18 Ahsahka, Idaho 83520

Summary.CFry emergence in 2001 occurred over a Atypical@ time period. Parr growth was rapid as normal. Shoreline rearing was complete in the Snake River upstream of the Salmon River confluence the week of 17-June. A small number of fish were collected in the Snake River the week of 17-June downstream of the Salmon River, and most of these fish were previously tagged recaptures. Water temperatures in both of the above river reaches will probably exceed 17ºC the week of 24-June. I believe the majority of wild fall chinook salmon of Snake River origin are presently in Lower Granite Reservoir. The 2000 passage forecast at Lower Granite Dam (for wild subyearling chinook salmon PIT-tagged in the Snake River) predicted passage Arelatively@ well except for the first week of July. A preliminary (probably near final) forecast for 2001 predicts 50% of passage will occur by 16-July, 70% by 25-July, 80% by 7-August, and 90% by 14-August.

Introduction

This is an in season update for 2001. The information presented includes: 1) a summary of 2001 catch and tagging data; 2) a comparison of observed time of fry and parr presence among the years 1992 to 2001; 3) a comparison of parr growth among the years 1992 to 2001; 4) passage dates of PIT-tagged wild subyearling chinook salmon at Lower Granite Dam in 2001; and 5) a comparison of the observed and forecasted passage of wild PIT-tagged subyearling chinook salmon at Lower Granite Dam in 2000, and a preliminary 2001 passage forecast. Questions regarding this update and other matters may be directed to me by e-mail (william_connor@fws.gov) or by telephone (208 476-2242).

Methods

Data collection.CWild subyearling chinook salmon were beach seined (NAJFM 18:530-536) along the free-flowing Snake River upstream of Lower Granite Reservoir at stations located between rkm 227 and rkm 366 (Figure 1) beginning in April. Sites were characterized by relatively low velocity pockets of water

adjacent to cobble or sandy shorelines that sloped gradually into the river channel.

Hatchery subyearling fall chinook salmon released from Hells Canyon Dam were identified based on adipose fin clips (100% mark rate). Non-clipped hatchery subyearling chinook salmon released at Pittsburg Landing and Billy Creek were subjectively identified based on body morphology. Accuracy of origin classification (i.e., hatchery versus wild) in 2001 has been 97.1% based on validation using recaptured PIT-tagged wild and hatchery fish as a baseline. Similar accuracy was achieved in 2000 (94%) using coded-wire tagged fish as a baseline.

Wild subyearling chinook salmon ≥ 60-mm fork length were PIT tagged, and then released at the collections sites after a 15-min recovery period to resume rearing and downstream movement. Water temperature was measured with a hand-held digital thermometer at each seining station.

Early life history and growth.C**I used the capture dates of fish ≤ 45-mm fork length to describe time of presence for newly emergent fall chinook salmon fry. I used the capture dates for fish > 45-mm fork length to describe time of presence for fall chinook salmon parr. All capture dates were adjusted to Sunday=s date the week of sampling to account for differences in day of sampling among the three segments beach seined. I used the PIT-tag detection data at Lower Granite Dam to represent the onset of seaward migration by wild subyearling chinook salmon smolts. Absolute growth rate (mm/d) during shoreline rearing was calcuated using length data from PIT-tagged parr recaptured by beach seine after initial capture and tagging. Absolute growth rate was calculated as: fork length at recapture minus fork length at initial capture divided by the number of days between initial capture and recapture.**

Passage forecasting.C**In 2000, I applied the passage forecast method described in detail in North American Journal of Fisheries Management (NAJFM 20:651-660). This method uses a model to predict which PIT-tagged wild subyearling chinook salmon will survive to pass Lower Granite Dam, and a second model to predict when these survivors will pass the dam. The forecast is in the form of a cumulative passage distribution plus and minus a 90% forecast interval.**

I assessed the 2000 passage forecast two ways. First, I determined the difference in days between forecasted and observed

dates when 50, 70, 80, and 90% passage was complete. Second, I determined if how many days the forecast and its 90% intervals did not contain observed passage.

Finally, a preliminary passage forecast for 2001 is presented. I classify this forecast as being preliminary because we have not reached the point of zero catch in seining areas downstream of the Salmon River confluence (although catch has dropped off markedly in recent weeks).

Results

Catch and Tagging Summary

As of the week of 17-June, a total of 6,980 wild subyearling chinook salmon has been captured along the shorelines of the Snake River. Of these: 2,624 were fry; 4,356 were parr; and 1,373 of the parr were PIT-tagged. A total of 131 of the PIT-tagged parr has been recaptured during rearing. As of 24-June, a total of 21 (1.5%) of the PIT-tagged parr has been detected at Lower Granite Dam.

Emergence Timing

Fry emergence during 2001 occurred earlier upstream than downstream of the Salmon River based on time of fry presence (Table 1). The observed median for time of fry presence upstream of the Salmon River for 2001 (Table 1) was the same as the grand median for the time period 1995 to 2000 (22-April). The median for time of fry presence downstream of the Salmon River in 2001 was 6-May (Table 1), which is four days later than the observed grand median for the 1992 to 2000 time period.

Rearing Timing

Shoreline rearing by parr during 2001 occurred earlier upstream than downstream of the Salmon River based on time of parr presence (Table 2). The observed median for time of fry presence upstream of the Salmon River for 2001 (Table 2) was 29-d earlier than the grand median for the time period 1995 to 2000 (20 May). Earlier timing of parr presence may have resulted from unstable flows during the spring. No fish were captured upstream of the Salmon River confluence the week of 17-June. The median for time of parr presence downstream of the Salmon River in 2001 is presently was 20-May (Table 2), which is 11-d earlier than the

observed grand median for the 1992 to 2000 time period. During week of 17-June, water temperatures along the shorelines of the Snake River were approaching 17°C. This temperature typically occurs near the end of shoreline rearing.

Parr Growth

Absolute growth rate for parr during 2001 was faster for fish upstream than downstream of the Salmon River (Table 3). The observed mean for growth rate for parr upstream of the Salmon River in 2001 (Table 3) was slower than during the time period 1995 to 2000 (grand mean = 1.2±0.090). Mean growth in 2001 observed for parr downstream of the Salmon River confluence (Table 3) was similar to the 1992–2000 grand mean (0.0±0.113).

Passage at Lower Granite Dam

The first detection at Lower Granite Dam for wild subyearling chinook salmon PIT-tagged in the Snake River occurred on 18-May. The most recent detections (n = 2) occurred on 24-June.

Passage Forecasts

The 2000 forecast predicted 50% passage at Lower Granite Dam for wild subyearling chinook salmon PIT-tagged in the Snake River seven days later than was observed, 70% passage two days later than was observed, 80% passage three days earlier than was observed, and 90% passage 17 days earlier than was observed (Table 4). The 2000 forecast predicted passage "poorly" from 1-July to 7-July based on the fact that the 90% forecast intervals (forecast±18.9%) did not contain observed passage (Table 4). However, when viewed across the entire period of passage as designed, the 90% forecast intervals contained observed passage 96% of the time.

Passage at Lower Granite Dam in 2001 is forecasted to be 50% complete by 16-July, 70% complete by 25-July, 80% complete by 7-August, and 90% complete by 14-August (Table 5). The forecast intervals for these dates are also given in Table 5.

Table 1.CDates of presence (given as Sunday=s date for each week) of wild subyearling chinook salmon fry in the Snake River upstream and downstream of the Salmon River confluence, 1992 to 2001.

Year	Median date of presence (range)
Upstream of the Salmon River Confluence	
1995	23-Apr (02-Apr to 21-May)
1996	28-Apr (14-Apr to 05-May)
1997	20-Apr (N/A)
1998	19-Apr (12-Apr to 10-May)
1999	02-May (04-Apr to 23-May)
2000	09-Apr (02-Apr to 14-May)
2001	22-Apr (01-Apr to 20-May)
Downstream of the Salmon River Confluence	
1992	26-Apr (29-Mar to 24-May)
1993	16-May (04-Apr to 20-Jun)
1994	15-May (03-Apr to 05-Jun)
1995	30-Apr (02-Apr to 04-Jun)
1996	05-May (14-Apr to 23-Jun)
1997	04-May (20-Apr to 29-Jun)
1998	26-Apr (12-Apr to 14-Jun)
1999	02-May (04-Apr to 27-Jun)
2000	09-Apr (02-Apr to 04-Jun)
2001	06-May (01-Apr to 03-Jun)

Table 2.CDates of presence (given as Sunday=s date for each week) of wild subyearling chinook salmon parr in the Snake River upstream and downstream of the Salmon River confluence, 1992 to 2001.

Year	Median date of presence (range)
Upstream of the Salmon River Confluence	
1995	28-May (09-Apr to 21-Jun)
1996	12-May (14-Apr to 16-Jun)
1997	25-May (20-Apr to 15-Jun)
1998	17-May (12-Apr to 05-Jul)
1999	23-May (11-Apr to 27-Jun)
2000	23-Apr (02-Apr to 11-Jun)
2001	29-Apr (01-Apr to 10-Jun)
Downstream of the Salmon River Confluence	
1992	17-May (29-Mar to 07-Jun)
1993	06-Jun (11-Apr to 18-Jul)
1994	29-May (03-Apr to 10-Jul)
1995	04-Jun (02-Apr to 02-Jul)
1996	26-May (14-Apr to 14-Jul)
1997	08-Jun (20-Apr to 13-Jul)
1998	31-May (12-Apr to 05-Jul)
1999	06-Jun (04-Apr to 11-Jul)
2000	14-May (02-Apr to 25-Jun)
2001	20-May (01-Apr to 17-Jun)

Table 3.CMean absolute growth rates (mm/d±SD) for wild subyearling chinook salmon parr collected upstream and downstream of the Salmon River confluence from 1992 to 2001.

Year	Growth rate by location	
	Upstream of Salmon	Downstream of Salmon
1992	-	0.9±0.130
1993	-	0.7±0.361
1994	-	1.1±0.345
1995	1.2±0.253	1.0±0.353
1996	1.1±0.245	0.9±0.384
1997	1.3±0.322	0.8±0.310
1998	1.1±0.295	0.9±0.309
1999	1.3±0.315	1.0±0.309
2000	1.3±0.202	1.0±0.275
2001	1.1±0.139	0.9±210

Table 4.CForecasted versus observed cumulative (%) passage at Lower Granite Dam for wild subyearling chinook salmon that were PIT-tagged along the shoreline of the Snake River in 2000. The difference between the two is also given.

Date	Forecasted	Observed	Difference
21-Jun	7.5%	11.6%	-4.0%
22-Jun	9.0%	12.8%	-3.8%
23-Jun	10.9%	13.4%	-2.4%
24-Jun	13.2%	16.4%	-3.2%
25-Jun	14.8%	21.0%	-6.2%
26-Jun	17.1%	24.6%	-7.5%
27-Jun	17.9%	26.7%	-8.8%
28-Jun	20.2%	31.0%	-10.8%
29-Jun	20.8%	34.3%	-13.5%
30-Jun	22.0%	37.1%	-15.1%
01-Jul	25.0%	45.6%	-20.6%
02-Jul	27.0%	58.1%	-31.1%
03-Jul	29.1%	61.7%	-32.6%
04-Jul	32.2%	64.1%	-32.0%
05-Jul	35.4%	66.3%	-30.9%
06-Jul	40.5%	66.6%	-26.1%
07-Jul	45.3%	66.9%	-21.5%
08-Jul	51.3%	68.7%	-17.4%
09-Jul	55.4%	69.3%	-13.9%
10-Jul	64.9%	70.2%	-5.3%
11-Jul	68.2%	72.3%	-4.2%
12-Jul	73.6%	73.3%	0.3%
13-Jul	77.7%	73.9%	3.8%
14-Jul	80.1%	76.6%	3.5%
15-Jul	83.3%	78.4%	4.9%
16-Jul	85.4%	79.9%	5.5%
17-Jul	87.3%	80.9%	6.4%
18-Jul	89.2%	81.5%	7.7%
19-Jul	90.5%	82.1%	8.5%
20-Jul	90.7%	82.7%	8.0%
21-Jul	91.3%	83.3%	8.0%
22-Jul	92.0%	84.2%	7.8%
23-Jul	92.2%	84.8%	7.4%
24-Jul	92.0%	84.8%	7.2%

Table 4.C(Continued)

Date	Forecasted	Observed	Difference
25-Jul	92.6%	85.1%	7.5%
26-Jul	92.6%	85.1%	7.5%
27-Jul	92.6%	85.7%	6.9%
28-Jul	92.7%	86.0%	6.6%
29-Jul	92.7%	86.3%	6.4%
30-Jul	92.7%	87.2%	5.5%
31-Jul	92.7%	87.2%	5.5%
01-Aug	92.7%	87.5%	5.2%
02-Aug	92.8%	87.8%	4.9%
03-Aug	92.8%	88.1%	4.6%
04-Aug	92.8%	88.8%	4.0%
05-Aug	92.8%	89.1%	3.8%
06-Aug	92.8%	90.0%	2.9%
07-Aug	92.9%	90.0%	2.9%
08-Aug	92.9%	90.3%	2.6%
09-Aug	92.9%	90.3%	2.6%
10-Aug	92.9%	90.3%	2.6%
11-Aug	92.9%	90.6%	2.4%
12-Aug	93.0%	90.6%	2.4%
13-Aug	93.0%	91.2%	1.8%
14-Aug	93.0%	91.2%	1.8%
15-Aug	93.0%	91.2%	1.8%
16-Aug	93.0%	91.2%	1.9%
17-Aug	93.1%	91.2%	1.9%
18-Aug	93.6%	91.5%	2.1%
19-Aug	94.1%	91.5%	2.6%
20-Aug	94.6%	91.5%	3.1%
21-Aug	95.0%	91.5%	3.5%
22-Aug	95.1%	91.5%	3.6%
23-Aug	95.7%	91.5%	4.2%
24-Aug	96.0%	91.5%	4.5%
25-Aug	95.9%	91.5%	4.4%
26-Aug	95.8%	91.8%	4.0%
27-Aug	96.1%	91.8%	4.3%
28-Aug	96.2%	91.8%	4.4%
29-Aug	96.2%	91.8%	4.4%
30-Aug	96.4%	92.1%	4.3%

31-Aug	96.4%	92.1%	4.3%

Table 5.CForecasted cumulative passage (%) at Lower Granite Dam for wild subyearling chinook salmon that were PIT-tagged along the shoreline of the Snake River in 2001. The lower (L.I.) and upper (U.I.) 90% forecast intervals are also given.

Date	Forecast	L.I.	U.I.
21-Jun	4.4%	0.0%	22.5%
22-Jun	4.6%	0.0%	22.7%
23-Jun	5.1%	0.0%	23.2%
24-Jun	5.3%	0.0%	23.4%
25-Jun	6.3%	0.0%	24.4%
26-Jun	6.4%	0.0%	24.5%
27-Jun	6.7%	0.0%	24.8%
28-Jun	6.7%	0.0%	24.8%
29-Jun	6.8%	0.0%	24.9%
30-Jun	7.1%	0.0%	25.2%
01-Jul	6.5%	0.0%	24.6%
02-Jul	6.8%	0.0%	24.9%
03-Jul	6.5%	0.0%	24.6%
04-Jul	7.8%	0.0%	25.9%
05-Jul	9.3%	0.0%	27.4%
06-Jul	10.8%	0.0%	28.9%
07-Jul	15.3%	0.0%	33.4%
08-Jul	18.6%	0.5%	36.7%
09-Jul	21.8%	3.7%	39.9%
10-Jul	23.6%	5.5%	41.7%
11-Jul	30.0%	11.9%	48.1%
12-Jul	35.4%	17.3%	53.5%
13-Jul	42.0%	23.9%	60.1%
14-Jul	45.9%	27.8%	64.0%
15-Jul	48.5%	30.4%	66.6%
16-Jul	52.3%	34.2%	70.4%
17-Jul	54.7%	36.6%	72.8%
18-Jul	57.5%	39.4%	75.6%
19-Jul	59.3%	41.2%	77.4%
20-Jul	60.6%	42.5%	78.7%
21-Jul	61.9%	43.8%	80.0%
22-Jul	63.4%	45.3%	81.5%

23-Jul	65.2%	47.1%	83.3%
24-Jul	67.7%	49.6%	85.8%

Table 5.C(Continued)

Date	Forecast	L.I.	U.I.
25-Jul	71.6%	53.5%	89.7%
26-Jul	73.7%	55.6%	91.8%
27-Jul	74.3%	56.2%	92.4%
28-Jul	73.8%	55.7%	91.9%
29-Jul	74.4%	56.3%	92.5%
30-Jul	75.7%	57.6%	93.8%
31-Jul	76.4%	58.3%	94.5%
01-Aug	77.1%	59.0%	95.2%
02-Aug	77.7%	59.6%	95.8%
03-Aug	78.7%	60.6%	96.8%
04-Aug	78.6%	60.5%	96.7%
05-Aug	79.0%	60.9%	97.1%
06-Aug	79.6%	61.5%	97.7%
07-Aug	80.9%	62.8%	99.0%
08-Aug	82.6%	64.5%	100.0%
09-Aug	85.1%	67.0%	100.0%
10-Aug	86.1%	68.0%	100.0%
11-Aug	86.8%	68.7%	100.0%
12-Aug	88.9%	70.8%	100.0%
13-Aug	89.6%	71.5%	100.0%
14-Aug	90.6%	72.5%	100.0%
15-Aug	90.6%	72.5%	100.0%
16-Aug	90.5%	72.4%	100.0%
17-Aug	91.2%	73.1%	100.0%
18-Aug	92.7%	74.6%	100.0%
19-Aug	93.3%	75.2%	100.0%
20-Aug	93.9%	75.8%	100.0%
21-Aug	94.6%	76.5%	100.0%
22-Aug	95.0%	76.9%	100.0%
23-Aug	95.1%	77.0%	100.0%
24-Aug	95.7%	77.6%	100.0%
25-Aug	96.0%	77.9%	100.0%
26-Aug	95.9%	77.8%	100.0%
27-Aug	95.8%	77.7%	100.0%

28-Aug	**96.1%**	**78.0%**	**100.0%**
29-Aug	**96.2%**	**78.1%**	**100.0%**
30-Aug	**96.2%**	**78.1%**	**100.0%**
31-Aug	**96.4%**	**78.3%**	**100.0%**