



# FISH PASSAGE CENTER

1827 NE 44<sup>th</sup> Ave., Suite 240, Portland, OR 97213

Phone: (503) 230-4099 Fax: (503) 230-7559

<http://www.fpc.org/>

e-mail us at [fpcstaff@fpc.org](mailto:fpcstaff@fpc.org)

## Memorandum

TO: FPAC

*Michele DeHart*

FROM: Michele DeHart

DATE: January 4, 2007

RE: Summary of PIT-tag detections of fall Chinook salmon at Lower Granite Dam in 2006

The Fish Passage Advisory Committee (FPAC) discussed their concern regarding male to female ratio of returning fall Chinook to the Snake River in 2006. FPAC requested that the FPC staff review and summarize the available data on adult returns of fall Chinook to the Snake River Basin. In response to that request, FPC staff prepared a summary of PIT-tags detected at the Adult Ladder at Lower Granite Dam during the fall chinook migration in 2006. The review focused on tag groups that would provide inference to the unmarked population. This includes tag groups that were part of production releases or wild marking efforts. In order to address the female to male ratio of the adult return, since female proportion increases with increasing age of return, the tag data was analyzed the 2006 data by migration year to determine the age of adults (2 to 5-ocean) as well as jacks (1-ocean) and minijacks (0-ocean).

Tag detection data was summarized from August 1 and November 7, 2006. Late arriving spring, summer migrants were excluded from the analysis, where possible, in order to focus primarily on fall Chinook PIT-tags. A few fish initially marked as part of spring marking operations may be included in the analysis, when those fish were designated '15W', '15H or '15U'.

Our findings for 2006 PIT-tag detections at Lower Granite Dam adult ladder are summarized below:

- The FPC analysis suggests that existing PIT-tag marks do not represent the overall population since coordinated marking basin wide has not been attempted until the 2006 fall Chinook transportation study.
- In 2006 the largest return group was comprised of fall Chinook which were released from Snake River acclimation ponds as yearlings in 2006. These fish were mostly in-river migrants (only 2 were transported) that appeared to pass Bonneville Dam by mid-May. Return detections at Bonneville Dam ladders began in early September, indicating that these fish could have spent at most 3 to 4 months in salt-water.
- The second largest return group was comprised of fall Chinook jacks released as sub-yearlings and yearlings from production facilities in 2005. There were some wild fall Chinook that returned as jacks from the 2005 outmigration.

- The smallest fall Chinook return group in 2006 was comprised of true adult returns. The largest component of the adult PIT tag return of fall Chinook to Lower Granite Dam was comprised of jacks and mini-jacks, mostly 1-ocean or younger fish.
- Because of limited PIT tagging this analysis may not represent the run-at-large. However a large component of jacks and mini-jacks in the adult return would result in more males than females in the return. This may provide some understanding of the large proportion of males in the population, since many of those males are likely jacks and minijacks returning from 2005 and 2006 out-migration.

For the analysis the Fish Passage Center summarized all PIT-tag marks detected at Lower Granite Dam in the adult facility since August 1, 2006. Only those fish likely to be fall Chinook salmon were included in the summary. For example PIT-tags with srtr "12H", "11H" or other designation for spring/summer migrant Chinook, were excluded, as were other species. We removed those detections that were likely out-migrant fall chinook that appeared to pass through the adult ladder. Only one juvenile out-migrant was excluded as a spurious adult detection. All other 2006 juvenile releases that were subsequently detected at the Lower Granite adult ladders, were previously detected at Bonneville and/or McNary dam adult ladders prior to Lower Granite detections. We designated PIT-tagged fish that returned to LGR in 2006, as jacks or mini-jacks if the fish were released as migrants in 2005 or 2006, respectively. A returning fish was considered an adult if it was released in 2004 or earlier year.

- A total of 546 PIT-tag detections were identified as likely fall chinook.
- 315 detections were determined to be adult fish (2-ocean or older); 220 of those detections were from adults tagged at Bonneville (5) and Ice Harbor (215) dams in 2006.
- 232 fish were PIT-tagged above Lower Granite Dam, 193 of these fish were either jacks (89-2005 releases) or minijacks (104-2006 releases). One of the 2006 releases was determined to be downstream migrant detected in the adult ladder.
- 140 of the returns that were PIT-tagged above Lower Granite Dam were part of production or wild marking programs. There were 17 2-ocean or older adult returns, from tags representing larger populations; either as part of production releases (direct hatchery or acclimation) or wild populations. By ocean age there were; 6 2-ocean, 7 3-ocean, 2 4-ocean, 2 5-ocean fish. Nine of these 16 adults were wild origin.
- There were a total of fifteen holdover PIT-tag fish detected at LGR in 2006. Overall twelve of the fifteen holdover returns were either transportation research releases at LGR or surrogates. Six of the holdover fish were jacks (BCCAP surrogate releases in 2005). Two of the holdover fish were adult fish, although one return was a 2004 subyearling migrant that exited the hydrosystem in 2005, so might be described as a 1+ adult.

Table 1 summarizes all of the marks detected at Lower Granite in 2006 that FPC identified as fall Chinook returns. A large portion (220) of the marks detected at Lower Granite in 2006 were adults released at either Bonneville Dam (5) or Ice Harbor Dam (215) as part of adult salmon studies (SNAKE1, BONAFF release sites). Jack detections (104) of fish released in 2005, and mini-jack detections (127) of fish marked and released as out-migrants in 2006 are the next largest groups of detections at Lower Granite.

Those PIT-tags that might best represent the unmarked population would be those released above Lower Granite Dam and released as part of hatchery production releases or wild marking programs in the Clearwater and Snake rivers. Of the 546 PIT-tags detected in the adult

ladders, 232 were marked above Lower Granite, but only 140 were from fish released as part of production releases or wild marking programs. Those data are summarized in Table 2. There were 17 2-ocean or older adult returns, from tags representing larger populations; either as part of production releases (direct hatchery or acclimation) or wild populations. By ocean age there were; 6 2-ocean, 7 3-ocean, 2 4-ocean, 2 5-ocean fish. Nine of these 17 adults were wild origin. We identified two of the 17 adult returns as fish that heldover in the hydrosystem after being released above Lower Granite Dam. Each were production fish, one released from BCCAP in 2004 and one from CJRAP in 2001. In essence the BCCAP released fish would be 1+ ocean (similar to a jack) since it spent 1 year in freshwater. But it likely would be larger than a jack when returning. In addition two of the 17 adults were fish transported as subyearlings.

**Table 1. Summary of PIT-tag detections of fall Chinook salmon at Lower Granite Dam adult detection array, from August 1 to November 7, 2006. Detections were grouped by release site and organized by year of marking for juveniles. Adults marked in 2006 were also shown separately.**

Release Site – Type	sr rt	Year of Juvenile Mark/Release						Adult Marks 2006	Total
		2001	2002	2003	2004	2005	2006		
BONAFF-ADULT	15U							5	5
SNAKE1-ADULT	15U							215	215
BCCAP-PROD	13H				2	8	19		29
CJRAP-PROD	13H	1			2		66		69
HCD-PROD	13H			1	1				2
LYFE-PROD	13H					1			1
PLAP-PROD	13H					4	19		23
SNAKE4-PROD	13H			1		1			2
BCCAP-RES	13H	1							1
IHRCOL-RES	13H					2			2
IHRSPF-RES	13H		2						2
IHRTAL-RES	13H			2					2
IHRTAL-RES	15H						4		4
LGRRBR-RES	13W						1		1
LGRRBR-RES	15H				1				1
LGRRBR-RES	15W					1			1
LGRRRR-RES	13U				11				11
LGRRRR-RES	15H						15		15
LGRRRR-RES	15W				1				1
LGRRTTR-RES	13U		9	20	12	11			52
SNAKER-RES	13H		2			2			4
SNKTRP-RES	15H			1			1		2
UNKNOWN-SUR	13H						1		1
BCCAP-SUR	13H					30	1		31
SNAKE3-SUR	13H		13	2		38			53
CLWR-WILD	13W					1			1
CLWR-WILD	15U			1					1
SNAKE3-WILD	15W			2		3			5
SNAKE4-WILD	15W				1	2			3
SNAKER-WILD	15W	1	2	2					5
TUCR-WILD	13W		1						1
Total	Total	3	29	32	31	104	127	220	546

<sup>a</sup> PIT-tags were grouped into “release types” as follows: “ADULT” – fish marked downriver migrating toward LGR in 2006; PROD – juveniles PIT-tagged and release in association with production releases from direct hatchery releases or acclimation releases; RES – released for research studies, such as transportation, hatchery release evaluations, smolt monitoring; SUR – research releases reared to small size to mimic wild fish; WILD – Fish marked as part of wild marking programs typically Clearwater River “CLWR” and Snake River Wild “SNAKE3”, “SNAKE4”, “SNAKER” marking of wild subyearling fall Chinook.

We compared the PIT-tag returns with the run-at-large adult return data in 2006. The proportion of PIT-tagged adults was  $17/140 = 0.12$  compared to the run-at-large where there were 8,044 adults and 6,666 jacks or  $8,044/14688 = 0.55$ . This large difference in adult ratios between the PIT-tag population and the run-at-large is likely due largely to the disproportionate marking of the juvenile population. We compared the timing of PIT-tag adult returns to the run-at-large but due to low numbers found it difficult to draw any conclusions about adult timing. PIT-tag jack timing did seem to match up fairly well with run-at-large jack timing in 2006. It suggests that the PIT-tag marks do not represent the overall population well. This is not surprising since coordinated marking basin wide has not been attempted until the 2006 transportation study. And marking of wild fish proportionate to hatchery fish is not possible, since the wild population is unknown in any given year as well as difficult to mark. Finally, there may be differences in how fish are designated jacks. PIT-tagged fish are known release age, while the counting of adults at the windows relies on length criteria to separate mini-jacks, jacks and adults.

Based on the PIT-tag data, the largest source of returns were yearling fall chinook released from acclimation facilities in 2006. These fish were mostly in-river migrants (only 2 were transported) that appeared to pass Bonneville Dam by mid-May. Return detections at Bonneville Dam ladders began in early September, so that these fish could have spent at most 3 to 4 months in salt-water. The next largest proportion of returns were the jacks from 2005 which were a combination of subyearling and yearling production releases, as well as wild marks that returned as 1 ocean fish. Finally, the small proportion of true adult PIT-tagged fish would suggest that the population at Lower Granite Dam was made up of mostly 1 ocean or younger fish. While the analysis of the PIT-tag returns likely do not represent the run-at-large well, it is also likely that the PIT-tags do help explain to some extent the large proportion of males in the population, since many of those males are likely returning from 2005 and 2006 out-migration.

**Table 2. Summary of PIT-tag detections in 2006 of fish released above Lower Granite Dam either from wild marking programs or as part of larger production releases.**

SITE-Release Type <sup>a</sup>	srirt	Year of Juvenile Mark/Release						Total
		2001	2002	2003	2004	2005	2006	
BCCAP-PROD	13H				2	8	19	29
CJRAP-PROD	13H	1			2		66	69
HCD-PROD	13H			1	1			2
PLAP-PROD	13H					4	19	23
SNAKE4-PROD	13H			1		1		2
CLWR-WILD	13W					1		1
CLWR-WILD	15U			1				1
SNAKE3-WILD	15W			2		3		5
SNAKE4-WILD	15W				1	2		3
SNAKER-WILD	15W	1	2	2				5
Total		2	2	7	6	19	104	140

<sup>a</sup> PIT-tags were grouped into "release types" as follows: PROD – juveniles PIT-tagged and release in association with production releases from direct hatchery releases or acclimation releases; WILD – Fish marked as part of wild marking programs typically Clearwater River "CLWR" and Snake River Wild "SNAKE3", "SNAKE4", "SNAKER" marking of wild subyearling fall Chinook.