

Operation of the Adult Trap at Lower Granite Dam, 2011

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Report of research by

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EXECUTIVE SUMMARY

During 2011, we operated the adult salmonid trap at Lower Granite Dam from 1 March through 18 November. Trap operation was continuous except for a 2-h period on 10 August from 1000 to 1200 PDT, when a small log came up through the bottom of the trap, breaking one of the dewatering bars and allowing smaller adult salmonids to move under the trap. We collected and handled a total of 20,169 steelhead *Oncorhynchus mykiss*, and of these fish, we PIT tagged 4,758 wild steelhead. We collected and handled a total of 14,135 spring/summer Chinook salmon *O. tshawytscha*, and of these fish, we PIT tagged 2,571 wild spring/summer Chinook for age and genetic analysis. We collected 17 PIT-tagged Lemhi River spring Chinook using the separation-by-code system within the trap. We radio-tagged all 17 of these fish for the Idaho Department of Fish and Game.

We collected and handled a total of 8,057 fall Chinook. Of these fish, 1,352 adults and 950 jacks were transported to Lyons Ferry Hatchery on the Snake River in Washington. In addition, 584 adults and no jacks were transported to the Nez Perce Tribal Hatchery on the Clearwater River in Idaho. The remaining 5,171 fall Chinook salmon were passed upstream to continue their adult migration. Scale samples were taken from 2,721 PIT-tagged fall Chinook that were collected by the separation-by-code system. Seventeen spring/summer Chinook were collected by the separation-by-code system and examined for the presence of marine mammal marks. Twenty-five American shad *Alosa sapidissima* were collected during random sampling.

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INTRODUCTION

Lower Granite Dam, located 695 river kilometers from the mouth of the Columbia River, is the farthest upstream dam with adult fish passage facilities on the Snake River. Since the completion of Lower Granite Dam in 1975, adult salmonids have been collected and sampled using an off-ladder trap built into the fish ladder, and these collections have been an integral part of many studies (Harmon 2003). Trap operations have been conducted primarily by National Marine Fisheries Service (NMFS) personnel in cooperation with other agencies. Demands on use of the Lower Granite Dam adult trap have increased in recent years and are expected to continue to increase. To meet this increased demand, the adult trapping facility was revised during winter 1995-1996, and completely remodeled during winter 2006-2007. The most recent modification of the facility was used for the first time during the 2007 adult migration.

Current collections using the Lower Granite Dam adult trap include fall Chinook salmon *Oncorhynchus tshawytscha* for a captive broodstock program, multiple species samples for run-reconstruction monitoring, fish tagged with passive integrate transponder (PIT) tags for transportation and life history studies, steelhead *O. mykiss* for adult PIT-tag studies, and adults for radio telemetry studies (with both tagging and tag removal conducted at the adult trap).

Operation of the Lower Granite Dam adult trap provides the following benefits to listed stocks:

- 1) Reduces risk to the fall Chinook salmon ESU by improving hatchery practices (i.e., provides hatcheries with the ability to collect and use natural-origin fish for broodstock).
- 2) Jump-starts fall Chinook salmon production in underutilized areas of the Clearwater Basin by providing natural-origin fish.
- 3) Reduces risks to ESUs from atypical straying of hatchery-origin fish from areas outside the Snake River Basin by facilitating the removal of unusually high numbers of stray fish.
- 4) Provides information on age-class distribution and hatchery/wild composition of spring/summer Chinook salmon and steelhead returns to improve understanding of ESU status, and provides critical information needed for run-reconstructions of these stocks.
- 5) Provides critical life history information for fall Chinook salmon (from scale samples) to better manage this stock.

The adult trap at Lower Granite Dam has been operated by the NMFS and maintained by the U.S. Army Corps of Engineers since its origin in 1975; however, the Bonneville Power Administration (BPA) began funding trap operations in mid-2005 (Harmon 2006, 2007, 2008, 2009; Ogden 2010, 2011). Here we report on adult trap operations during 2011.

METHODS

The adult salmonid trap is located adjacent to the south shore adult fish ladder at Lower Granite Dam on the Snake River. A complete description of the adult trap and its operation was reported by Harmon (2003). When the adult trap is in operation, a diversion gate is rotated across the fish ladder to redirect upstream-migrating fish. Diverted fish then enter an attraction pool and pass through pipes fitted with coded-wire-tag (CWT) and PIT-tag detectors. Tagged fish are then diverted from the pool to a holding area (for PIT tagged fish, only those selected by tag code are diverted to holding). Non-tagged adults continue through the pipes to the exit ladder, where they re-enter the main fish ladder to continue their upstream migration. Diversion gates are also set to sample the run-at-large at a predetermined rate.

The trap has a gravity-flow dewatering system that reduces stress on fish by allowing them to pass directly from the holding area to an anesthetic tank without being handled. Fish are sedated with eugenol (99.9% pure) and inspected, and sample data are collected and recorded. Fish are then placed either in a freshwater recovery tank for release back to the fish ladder, or into holding tanks for eventual transfer to trucks to be hauled from the facility to various hatcheries.

The adult trap is generally operated 7 d/week, 24 h/d during the adult migration period from early March through November each year. During short periods in summer, when water temperatures reach 21°C (70°F), trap operation is temporarily suspended while temperatures are too high to handle fish safely.

RESULTS AND DISCUSSION

The Lower Granite Dam adult trap was remodeled during winter 2006-2007. Work was contracted through the U.S. Army Corps of Engineers (USACE), with funding provided by BPA. Modifications to the trap addressed the need to increase holding capacity for fall Chinook salmon broodstock collection. Capacity was increased by adding four additional holding tanks, which are approximately one and one-half times larger than the original two tanks. The original holding tanks were also modified, but their capacity was not increased. Anesthetic capacity was also increased, with an increase in size of the main anesthetic and recovery tanks, and installation of two additional anesthetic tanks. These modifications also provided substantial expansion of the work area, and it is now feasible to handle a larger proportion of the adult steelhead and Chinook salmon migrations.

During 2011, we operated the adult trap from 7 March to 20 November. Samples of the run at large were taken automatically four times an hour, 24 h/d, using a 10% sample rate for the entire trapping period for all species. The trap ran continuously except for a 2-h period on 10 August from 1000 to 1200 PDT when the trap was shut down for repair. A small log came up through the bottom of the trap and broke one of the dewatering bars, allowing smaller adult salmonids to move under the trap.

In addition to periodic samples of the run at large, we also used the PIT-tag separation-by-code system (SbyC) at the trap to collect spring, summer, and fall Chinook salmon that had been PIT-tagged as juveniles. Sampled fish were inspected for species, length, injuries, brands, visible implant tags, PIT tags, and fin clips. Scale and tissue samples were also taken from some spring, summer, and fall Chinook, as well as some steelhead. Fall Chinook salmon collected at the trap and transported to hatcheries were inoculated with erythromycin and oxytetracycline, and their operculi were hole-punched for identification.

The following data is preliminary and will be further analyzed by researchers from the respective agencies for which the data were collected. A total of 20,169 steelhead were collected and handled during the sampling period (Table 1). Of these fish, 1,443 were sampled during spring and 18,726 during fall. Of the 1,443 steelhead sampled during spring, 364 were of wild origin and received a PIT tag, and 71 were recaptured fish that had been previously PIT tagged. Of the 18,726 steelhead sampled during fall, 4,394 were of wild origin and received a PIT tag, and 699 were recaptured fish that had been previously PIT tagged.

Table 1. Number of adult salmonids collected and handled at the Lower Granite Adult trap during 2011.

Species	Number collected	Number PIT tagged	Number previously PIT tagged
Spring Chinook	8,368	991	306
Summer Chinook	5,767	1,580	264
Fall Chinook	8,057	0	2,865
Steelhead	20,169	4,758	770
Sockeye	142	0	39
Coho	583	0	11

Data taken from these fish will be analyzed to evaluate the A- and B-run segments, as well as the hatchery/wild composition of the steelhead run. These data will be analyzed and reported by the Idaho Department of Fish and Game (Bill Schrader, IDFG, personal communication) and Quantitative Consultants Inc. (Jody White, QCI, personal communication). No freeze-brands were observed during 2011 adult collections.

We also collected and handled a total of 8,368 spring Chinook salmon and 5,767 summer Chinook salmon (Table 1). Of the 8,368 spring Chinook salmon sampled, 991 were of wild origin and received a PIT tag and 306 were recaptures of fish that had been previously PIT tagged. Of the 5,767 summer Chinook salmon sampled, 1,580 were of wild origin and received a PIT tag, and 264 were recaptures of fish that had been previously PIT tagged. Adult spring Chinook salmon from the Lower Granite Trap were used for the following investigations during 2011:

1. Scale and genetic samples were taken from all fish that were PIT tagged and will be analyzed by IDFG and QCI. Age structure and genetic analysis will be determined from these samples, and results from these analyses will be available from IDFG (Bill Schrader, IDFG, personal communication) and QCI (Jody White, QCI, personal communication).
2. We collected 15 PIT-tagged adult spring Chinook salmon that were of Lemhi River origin using the SBC system in the adult trap. We radio-tagged these fish for IDFG as part of the BPA-funded Integrated Status Effectiveness Monitoring Project. This project has the following objectives:
 - a) Determine the timing of adult Chinook salmon from Lower Granite Dam to spawning grounds in the Lemhi River watershed
 - b) Identify stream flow and instream migration barriers in the Lemhi River watershed to prioritize future habitat actions

- c) Determine the effectiveness of habitat restoration actions taken to reduce fish migration barriers in the Lemhi River watershed
- d) Identify staging area habitat in the Lemhi River watershed to prioritize future habitat restoration actions
- e) Determine adult Chinook salmon distribution in the Lemhi River watershed

Further information about this study is available from IDFG (Mike Biggs, IDFG, personal communication) and on the ISEMP web pages (www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/index.cfm).

3. We collected 17 spring Chinook using the SBC system for a study of adult survival of Chinook salmon from the mouth of the Columbia River to Bonneville Dam. A picture of each fish was taken to document any marine mammal marks that may have been present. Detailed information on this study is available from the Northwest Fisheries Science Center (Michelle Wargo-Rub, NMFS, personal communication).

We collected and handled a total of 8,057 fall Chinook salmon (Table 1). Of these fish, 1,352 adults and 950 jacks were transported to Lyons Ferry Hatchery on the Snake River in Washington. In addition, 584 adults were transported to the Nez Perce Tribal Hatchery on the Clearwater River in Idaho. The remaining 5,171 fall Chinook salmon were passed upstream to continue their migration. Adult fall Chinook salmon from the Lower Granite Trap were used for the following investigations during 2011:

1. From the Fall Chinook salmon transported to the Lyons Ferry and Nez Perce Tribal Hatcheries, run reconstruction and hatchery data are being analyzed and will be available from the Washington Department of Wildlife when these analyses are complete (Debbie Milks, WDFW, personal communication).
2. Scale samples were taken from 2,721 PIT-tagged fall Chinook that were collected using the SBC system. Data from these scales will be used for a study of fall Chinook salmon early life history. Information on this study is available from the Northwest Fisheries Science Center, Seattle (Doug Marsh, NMFS, personal communication).

During the spring and summer months, 25 American shad *Alosa sapidissima* were collected during random sampling. Information on this study is available from the University of Washington School of Aquatic and Fishery Sciences (Daniel J. Hasselman, University of Washington, personal communication).

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