IDENTIFYING FALL CHINOOK FISHWAY USE ON THE LOWER COLUMBIA RIVER

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EXTENDED ABSTRACT ONLY- DO NOT CITE

Fall chinook (*Oncorhynchus tshawytscha*) represent an important life history strategy in the lower Columbia River. The relatively late upstream migration of pre-spawning adults exposes them to high water temperatures concurrent with gonadal development. Therefore, the consequences of delay at dams may be more significant for these fish than for spring and summer chinook.

We used radiotelemetry to examine migration behavior and passage success of adult fall chinook at the four lower Columbia River dams: Bonneville (rkm 235.1), The Dalles (rkm 208.1), John Day (rkm 346.9), and McNary (rkm 469.8). In 1997, 1998 and 2000, fish (male and female) were captured at the adult trapping facility at Bonneville, outfitted with radio transmitters, and released 10 km downstream from the dam. We radio-tagged 51 fish in 1997, 1032 fish in 1998, and 745 fish in 2000.

Fish movement was monitored using fixed radio receivers at the dams and by tracking fish with mobile receivers. To pinpoint the areas of each dam that may be problematic for chinook, we divided the area in and around the dam into

specific segments. We considered an ‘Arrival’ to be the time from the first detection of a fish approximately 2.8 km downstream from the dam to the first detection just outside of one of the entrances (as shown for Powerhouse 2 of Bonneville Dam in Figure 1). An ‘Entrance’ was from the first detection just outside of one of the entrances to detection inside the collection channel. Time spent in the ‘Collection Channel’ was calculated as the difference between the first record in the collection channel and the first record in the transition pools. Time spent in the ‘Transition Pools’ was calculated as the difference between the first record in the transition pools and the last record in the transition pools. And finally, duration in the ‘Ladder and Exit’ was calculated as the difference between the last record in the transition pool and the last record at the top of the ladder.

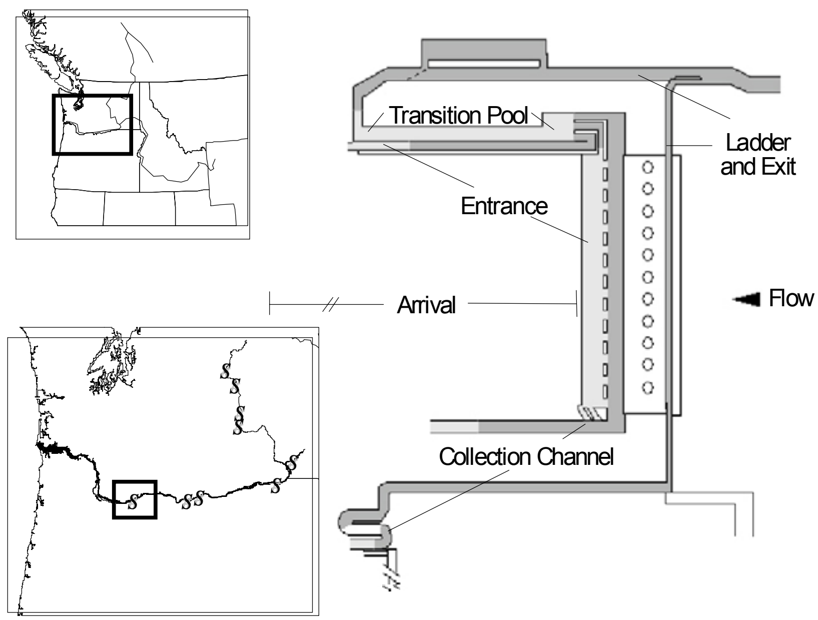

Figure 1. Powerhouse 2 at Bonneville Dam. All fishways were similarly divided.

Due to the non-normal distribution of travel durations through each of the segments, median durations are presented and non-parametric statistics were used for all comparisons. Median duration through each of the segments at all four dams was generally under 3 hours (Figure 2). However, the transition pool showed significantly higher passage times than did any other segment. This trend was consistent throughout the 3 years studied. Because of the higher passage times in the transition pool, we examined actual fish locations throughout this period to determine possible causes of delay.

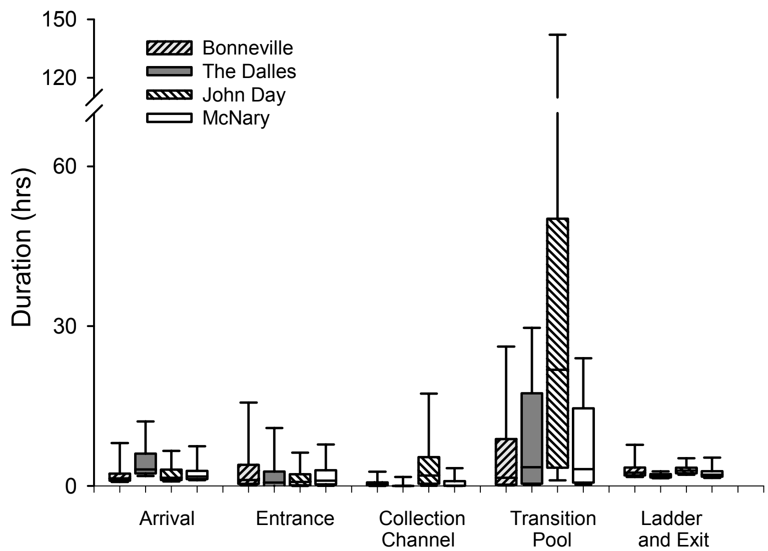

Figure 2. Passage duration through various fishway segments of the four lower Columbia River dams in 2000. Box plots show the median (bar), 25th and 75th quartile (box), and the 5th and 95th percentile (line).

We defined passage efficiency as the ratio of the number of fish that passed the top of a dam to the number of fish that approached that dam. Passage efficiencies differed among dams, but only at The Dalles in 1997 and at John Day in 1998 and 2000 were passage efficiencies below 90%. For fish that passed a dam, total duration of passage was calculated as the time from the first record outside a fishway entrance to the last record at the top of the ladder.

Although fish had the highest median passage time at John Day dam, total passage time was generally under 24 hours at all dams.

Migrating salmon have a choice of entering a fishway via one of the main entrances at the ends of powerhouses and spillways or using one of the many orifice entrances along the base of powerhouses. We tested whether fall chinook use various entrances preferentially so that recommendations can be made regarding the state (open versus closed) of the orifice gates (if orifice gates are not used, closing them would better direct fish through the collection channel and allow greater flows from the main entrances). There was a clear difference between entrance use; main entrances were used by fall chinook more often than orifice entrances.

In 2000, gender was determined for radio-tagged fish that returned to hatcheries (N = 63). Since fall chinook develop gonadal tissue as they migrate upstream, we tested whether gender affects passage efficiency and duration. Although there seemed to be a trend for faster female passage at the first two dams (Bonneville and The Dalles) and faster male passage at the third and fourth dams (John Day and McNary), we detected no significant gender-specific patterns in passage efficiency or duration.

Acknowledgments

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