

IMPACTS OF CATCH AND RELEASE ANGLING ON ANADROMOUS SALMONIDS

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Abstract

Efforts to recover depressed stocks of anadromous salmonids in North America include implementation of catch-and-release (C&R) recreational fisheries. C&R is generally thought to be an effective tool for conservation due to high survival of released fish. However, estimates of C&R mortality are necessary for conservation and management to determine how many fish are killed post-release. Previous studies designed to estimate C&R mortality have produced highly variable results among species and size classes of fish, gear types, and environmental conditions. Moreover, these studies had considerable variability in study design, sample sizes, and associated scientific rigor, making it challenging for managers to identify mortality rates for use in specific fisheries. Therefore, managers have often adopted C&R mortality rates based on qualitatively averaging the results of previous studies. In addition, recreational fisheries throughout the Pacific States region often restrict use of certain angling methods and terminal tackle that are assumed to result in higher mortality, leading to diverse regulations developed with limited empirical basis.

Improved estimates of C&R mortality rates for adult salmonids would enable development of management plans with stronger empirical support. To address this need, WDFW partnered with Mount Hood Environmental (MHE) to conduct a novel three-year mark-recapture study in the Cowlitz River, Washington to estimate effects of a variety of factors hypothesized to influence salmon and steelhead C&R survival using a treatment-control design. Three species of anadromous salmonids (including spring Chinook Salmon, Coho Salmon, and steelhead) were captured and released as treatments using various angling techniques and terminal tackle. Non-angled fish were captured in a trap and released back into the fishery to serve as controls. Statistical models were used to estimate the probability of recovery for both treatments and controls, where survival was estimated as the probability of recovery of treatments divided by controls.

Hooking mortality rates were generally very low and the effects of covariates on survival supported the results of previous research. Recovery rates of Coho Salmon differed less than a percent between angled and non-angled fish across multiple gear types, indicating negligible effects of C&R (Figure 1). Angled Spring Chinook Salmon were predicted to experience 3.6% to 10.2% C&R mortality relative to non-angled control fish, depending on terminal tackle. Barbless hooks were associated with higher survival than barbed hooks for both Chinook and Coho Salmon, although differences were small for Chinook and negligible for Coho. In contrast, steelhead angled on barbed hooks were recovered at

slightly higher rates than those caught on barbless hooks (Figure 2). We also found strong evidence for a reduction in landing rates while using barbless hooks, particularly when angling for steelhead. Finally, use of bait increased the probability that fish would be hooked in a critical location such as the esophagus or stomach (Figure 3). These findings are useful for assessing trade-offs between conservation measures and harvest opportunity when defining fishing regulations in C&R fisheries.

We are now expanding the utility of our analysis by incorporating data from other related studies, including research conducted in the Wind River and Yakima River, Washington, Willamette River, Oregon, Snake River, Idaho, and Nushagak River, Alaska, and Fraser River, British Columbia. A queryable regional database and analytical tool is being developed with a web-based graphic user interface. Managing biologists will be able to access the database to predict impacts of different terminal tackle and angling tactics within their respective fisheries, promoting use of available data and consistency in scientific rationale for recreational angling regulations.

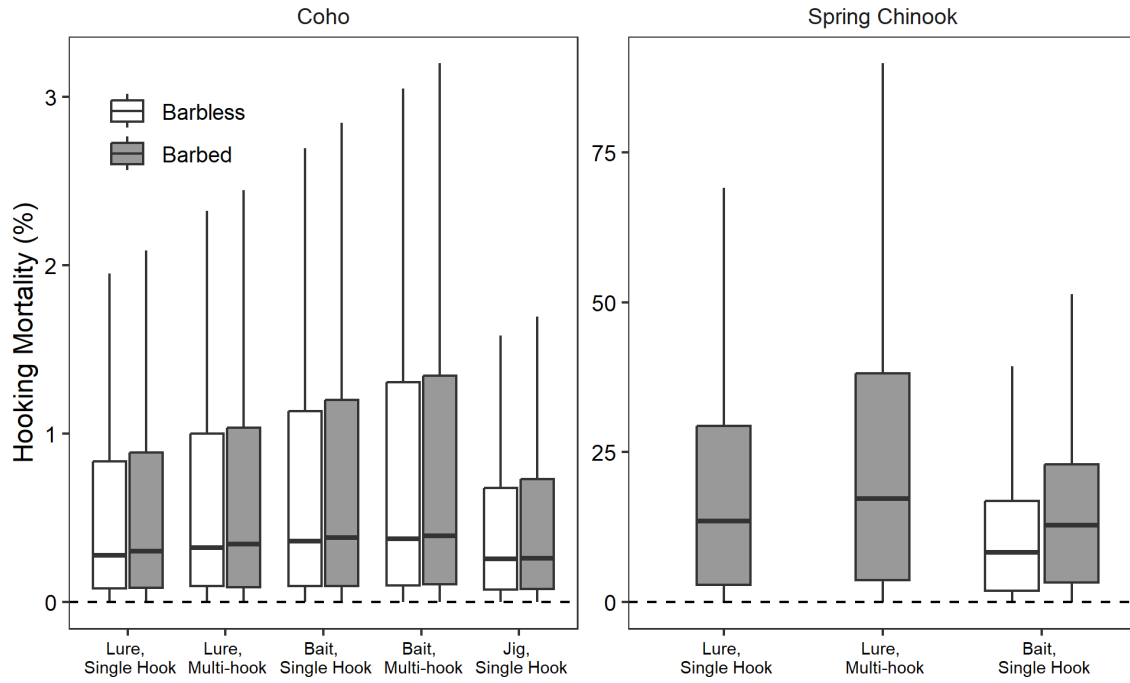


Figure 1. Predicted hooking mortality for Coho Salmon and spring Chinook Salmon, given the combinations of gear, single or multi-hook types, and barbed or barbless hooks that were observed during the study.

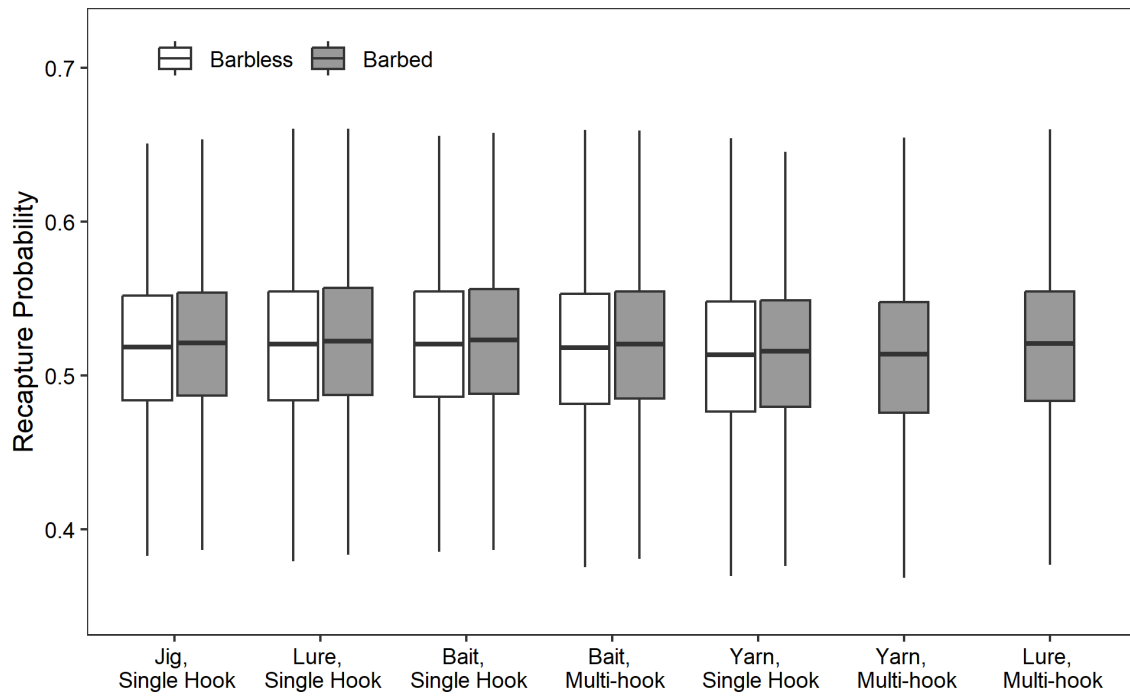


Figure 2. Predicted variation in recapture probability for angled steelhead trout, given the combinations of gear, single or multi-hook types, and barbed or barbless hooks that were observed during the study.

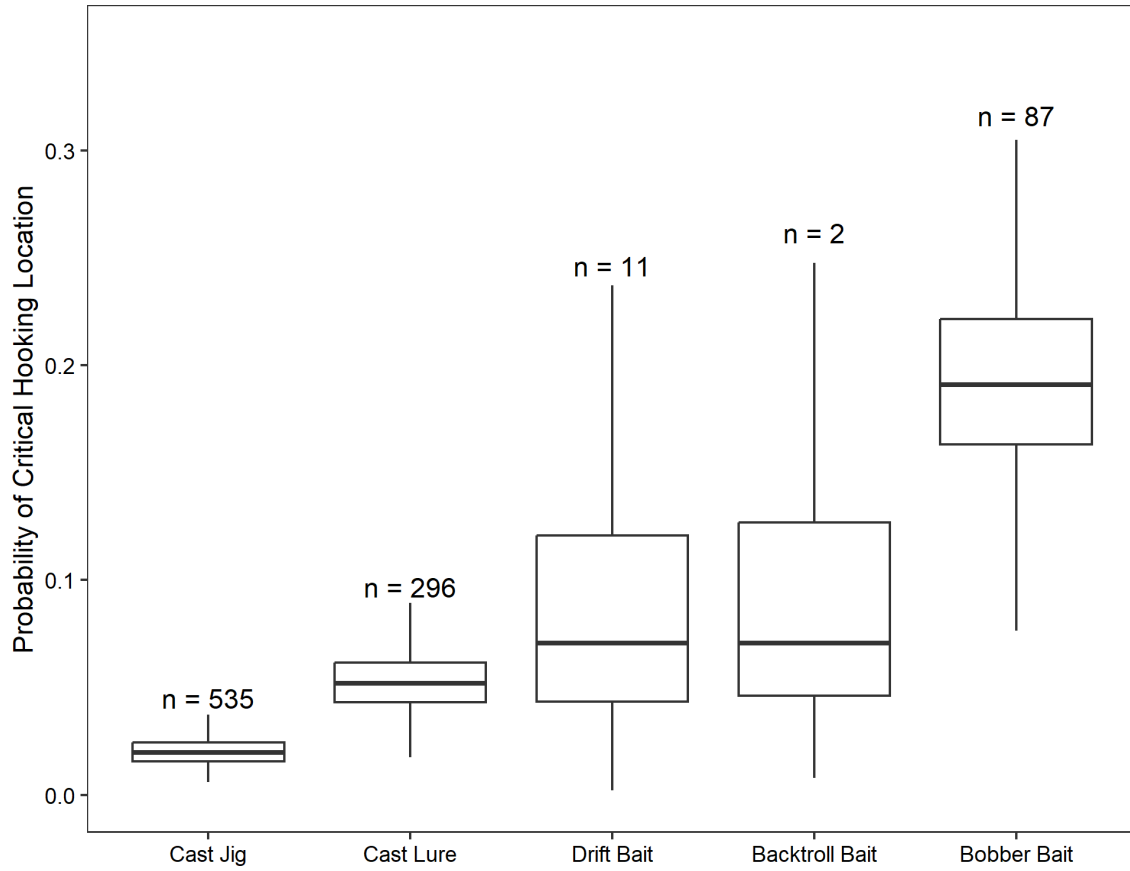


Figure 3. Critical hook probability for Coho Salmon by combinations of angling method and gear type. Values above boxplots are the sample sizes observed for each combination.