META-ANALYSIS OF STEELHEAD AND SALMON CATCH-AND-RELEASE SURVIVAL

IAN COURTER[1], MARK ROES[1], TARA BLACKMAN[1], KATIE KENNEDY[1], BEN BRISCOE[1], TIMOTHY COPELAND[2], THOMAS BUEHRENS[3], ANTHONY FRITTS[4], AND STEPHEN PHILLIPS[5]

[1]Mount Hood Environmental, 39085 Pioneer Blvd, suite 100 Sandy, OR 97055
[2]Idaho Department of Fish and Game, 1414 E Locust Ln, Nampa, ID 83686
[3]Washington Department of Fish and Wildlife, 2108 Grand Boulevard, Vancouver, WA 98661
[4]Washington Department of Fish and Wildlife, 201 N. Pearl St., Ellensburg, WA 98926
[5]Pacific States Marine Fisheries Commission, 205 SE Spokane Street Suite 100, Portland, OR 97202

Abstract

Efforts to recover depressed stocks of steelhead and salmon in North America include implementation of mark-selective recreational fisheries, whereby anglers are allowed to harvest hatchery-origin fish but must release natural-origin fish. Catch-and-release (C&R) is generally thought to be an effective tool for conservation due to high survival of released adult salmon and steelhead in freshwater. However, estimates of C&R survival are necessary to approximate the number fish that perish after being released.

Studies designed to estimate C&R mortality have produced highly variable results among species and fish size classes, gear types, and environmental conditions. Additionally, beliefs about C&R best practices have been promoted by recreational angling enthusiasts, though many of these techniques have little or no direct empirical support. Taken together, disparate studies with complex, nuanced findings and advocacy for principled restrictions on angling practices has led to diverse regulations, some of which do not provide a clear conservation benefit.

Mount Hood Environmental has collaborated with the Pacific States Marine Fisheries Commission, Idaho Department of Fish and Game, and Washington Department of Fish and Wildlife to develop a metadatabase[1] representing data collected in rivers throughout Washington, Oregon, and Idaho. This database is a near-comprehensive collection of currently available data for salmon and steelhead C&R in freshwater made public through a user-friendly web application. The metadatabase was analyzed to estimate effects of C&R and use of different terminal tackle types on survival for steelhead trout, Chinook Salmon, and Coho Salmon within 48-hours of C&R.

We found that survival of angled steelhead and Coho was very similar to survival of control fish, indicating no detectable effect of angling (Figure 1). However, survival of angled Chinook Salmon was approximately 9.4% lower than non-angled Chinook. Terminal tackle type, including barbed hooks, did not influence survival, but hooking location did (Figures 2 and 3).

[1] https://mounthoodenvironmental.shinyapps.io/CatchReleaseDatabase

These findings are useful for assessing trade-offs between conservation measures and harvest opportunity when defining fishing regulations in mark-selective salmon and steelhead fisheries. Specifically for steelhead, our finding that angled fish survived at very similar rates to control fish suggests that impacts of recreational angling in freshwater are negligible. The difference between C&R survival of Chinook Salmon and the other two species warrants further investigation but may be attributed to greater effects of hooking location on Chinook survival.

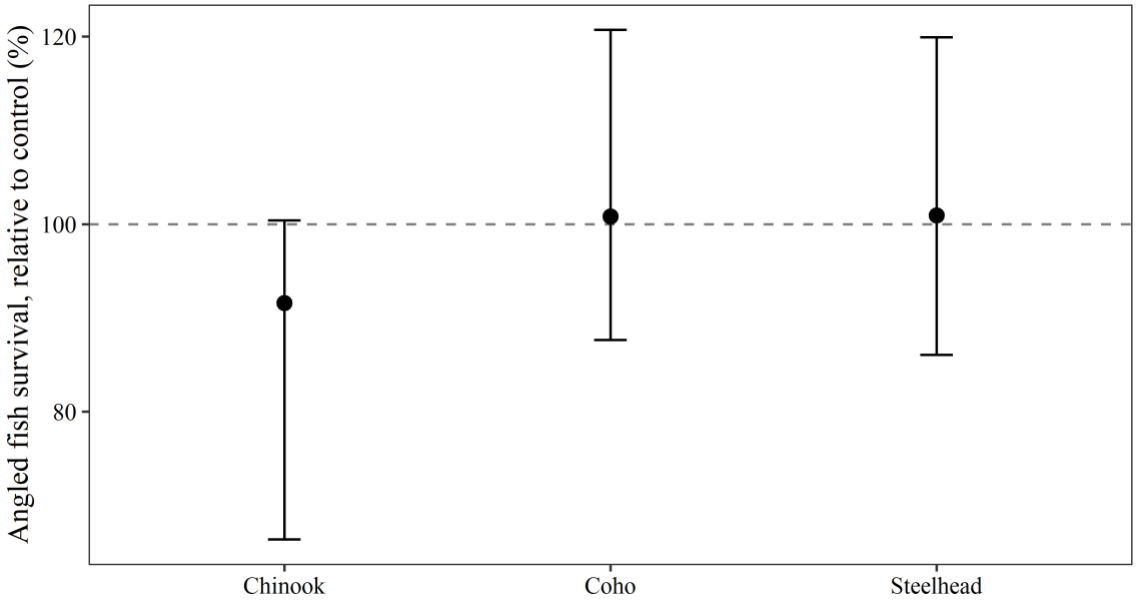

Figure 1. Predicted survival of catch-and-release angled fish from the base model, relative to control fish. Points are estimates, and error bars denote 95% credible intervals.

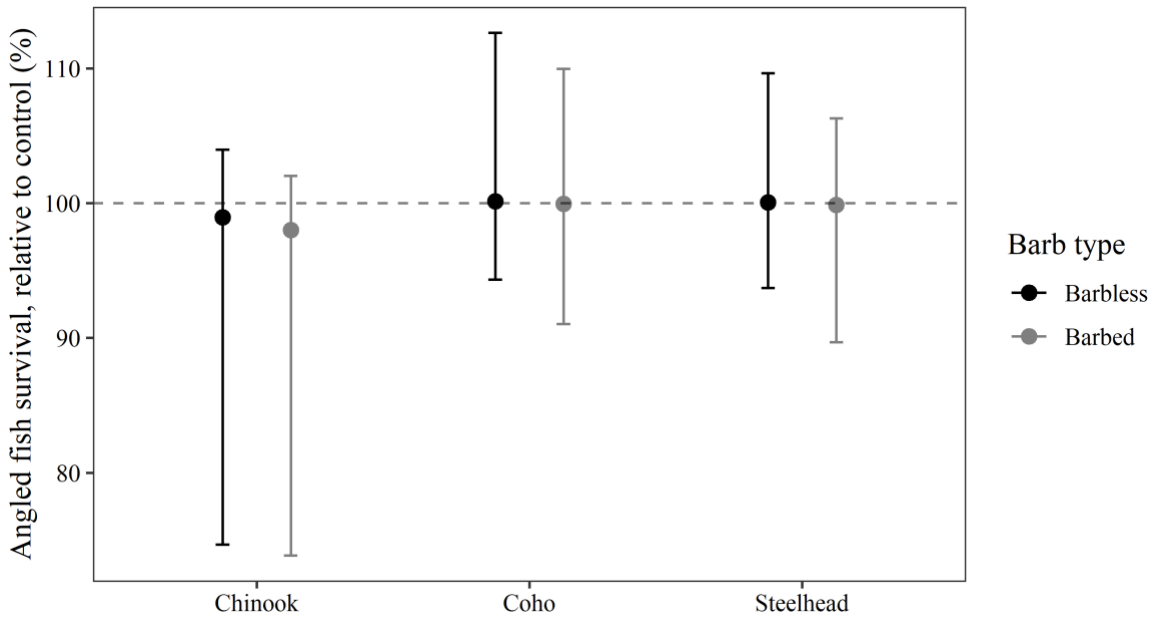

Figure 2. Predicted survival of angled fish relative to controls from the model expanded to include barb type.

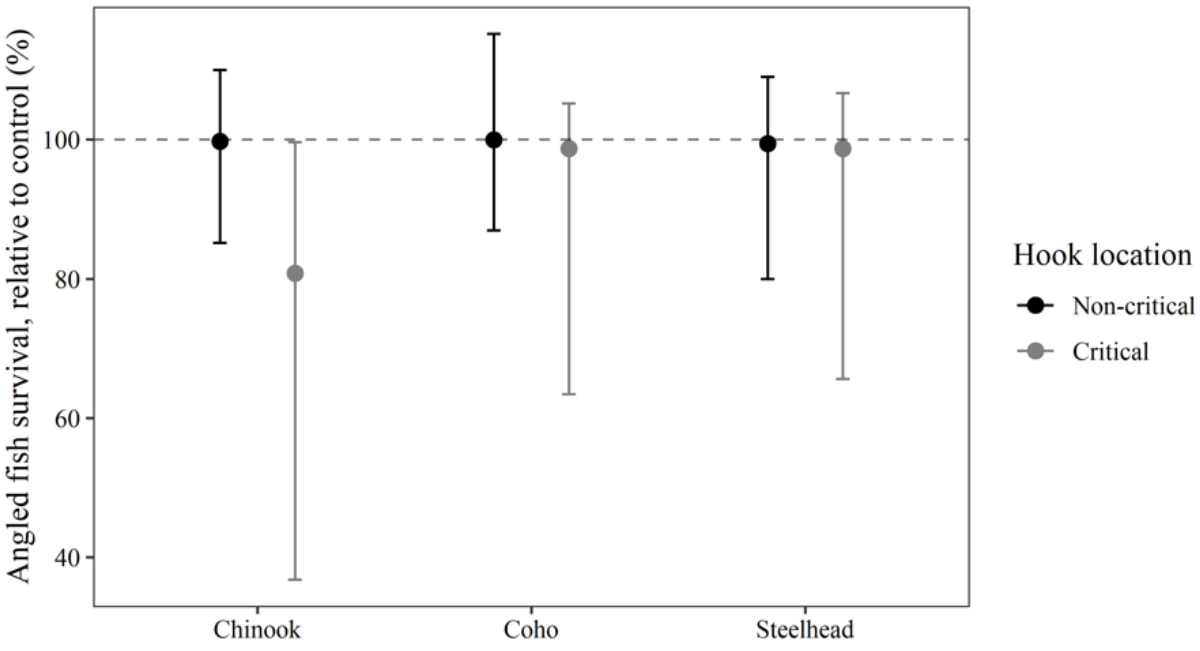

Figure 3. Predicted survival of catch-and-release angled fish, relative to controls, from the model expanded to include critical or non-critical hook location.