**Alternative steelhead smolt rearing strategies for locally derived broodstocks.**

Chris Tatara1\*, Bill Gale2, Matt Cooper2, Penny Swanson3, Don Larsen3, Chris Pasley4, Mollie Middleton3, Jon Dickey3, Jeff Atkins1, Matt Hall2, and Barry Berejikian1

1NOAA, Northwest Fisheries Science Center, Manchester Research Station, 7305 Beach Drive East, Port Orchard, Washington, 98366.

2Mid-Columbia River Fishery Resource Office, USFWS, 7501 Icicle Road, Leavenworth, Washington 98826

3NOAA, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, Washington 98112

4Winthrop National Fish Hatchery, USFWS, 453A Twin Lakes Road, Winthrop, Washington 98862

The Winthrop National Fish Hatchery (WNFH) rears summer-run steelhead to assist in the recovery of ESA-listed Upper Columbia River steelhead in the Methow River basin (Okanogan County, WA). Previously, the hatchery produced yearling steelhead smolts (S1) from co-mingled (Okanogan and Methow Rivers) broodstock collected at Wells Dam. To minimize the genetic and demographic risks inherent in rearing a co-mingled stock, the WNFH began transitioning to locally-sourced broodstock (Methow River) in 2008. However, the later spawn timing of the local broodstock combined with cold water temperatures at the WNFH precludes successful production of yearling smolts, requiring an additional year of hatchery rearing (S2). During the transition, the WNFH is producing both S1 and S2 smolts, allowing evaluation of outmigration survival, travel time, and residualism (and its causes) for both rearing strategies simultaneously over six release years. Transitioning to the local broodstock requires hatchery reform actions that accommodate later adult return timing, that produce appropriate timing of smoltification with high post-release survival, and that maintain fitness in the hatchery stock.

Results from the first four release years indicate that on average the S2 steelhead program at WNFH produced fish with higher post-release survival and faster downstream travel times than the S1 steelhead program. It also indicates that larger body size at release for S1 and S2 steelhead played an important role in decreasing residualism and increasing survival during migration. In most years, despite their larger size at release, S2 smolts exhibit low levels of precocious male maturation, with rates only slightly elevated over those of S1 males. In all years, a large percentage of captured residual S1 and S2 steelhead were maturing males. Analysis of 15 years of historic S1 size data for WNFH shows that average body size at release is smaller (mean = 184 mm, range = 38 mm) and more variable in the S1 program than in the S2 program (mean = 195 mm, range = 29 mm). The historic size data suggests that in most years a S1 program at WNFH would produce smaller steelhead smolts with lower survival rates, slower travel times, and greater rates of residualism than a S2 program. Thus, the S1 program should be expected to more consistently result in size-selective mortality that favors rapid growth under conditions of increased rearing temperature and high feed rations.

\*Contact information

360-871-8304 (tel)

206-842-8364 (fax)

chris.p.tatara@noaa.gov