Potential influence of pink salmon on steelhead smolts in Puget Sound

Matthew Klungle, Clayton Kinsel, Joseph H. Anderson and Peter Topping

Washington Department of Fish and Wildlife

Abstract

The semelparous nature of anadromous Pacific salmon *Oncorhynchus* spp. provides annual nutrient subsidies that often regulate freshwater productivity ecosystems throughout the north Pacific region.

In recent years Puget Sound rivers have seen a dramatic increases in pink salmon *Oncorhynchus gorbuscha* escapements with the changes occurring in southern Puget Sound. The ecological implications of increased pink salmon runs are varying ranging from decreased survival of other ocean-type salmon species *Oncorhynchus spp.* due to competition in the marine environment to potential increased survival of stream-type salmon and steelhead *Oncorhynchus mykiss* due to benefits from the pulsed nutrient subsidy. The unique life history of pink salmon provides a natural experimental control to assess interspecific interactions. This natural experimental design was used to test the effects of pink salmon on outmigrating steelhead smolts in the Nisqually River. We hypothesized that the pink salmon resource subsidy would increase steelhead smolt abundance; advance median run timing; increase mean smolt length; shift the age structure to younger; and increase mean smolt length at age. We found that pink salmon did have effects on outmigrating steelhead smolts. Steelhead smolts mean length was 7.0% (13.7 mm) larger, the proportion of age-1 smolts increased 73.7% and mean fork length of age-3 smolts was 16.0% (34.3 mm) larger in the spring of years following pink salmon spawning. Pink salmon did not affect abundance, run timing of steelhead smolts or mean length of age-1 or age-2 smolts. We will look for similar patterns within the Washington Department of Fish and Wildlife network of smolt trapping sites throughout Puget Sound including the Skagit, Green and Dungeness Rivers as well as available adult steelhead age data from sport and commercial fisheries. Steelhead marine survival has been positively correlated with smolt size, suggesting that this new nutrient subsidy associated with the increased pink salmon run may help ESA listed Puget Sound steelhead stocks that have experience chronically low marine survival rates over the last 30 years.