

Integrating Marine Ecosystem Research into the Management of Pacific Salmon

Marc Trudel¹, Rusty Sweeting¹, Ron Tanasichuk¹, Dave Mackas², & Brian Riddell¹
¹Pacific Biological Station & ²Institute of Ocean Sciences

Abstract

The implementation of the Wild Pacific Salmon Policy requires an assessment of the effects of climate and ocean conditions on the marine survival of Pacific salmon to establish management plans for these fish. Here, we show that marine ecosystem research conducted in coastal waters of British Columbia provides not only an understanding of the processes limiting the production of important marine fishery resources, but can also be used to develop forecasting models for Pacific salmon abundance. Such models are currently used to recommend harvest strategies for specific stocks of Pacific salmon as part of the annual Pacific Scientific Advice Review Committee process.

Strait of Georgia Coho Salmon

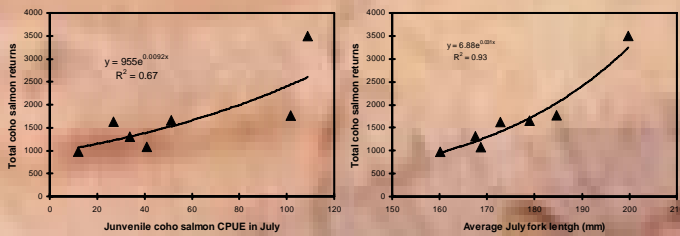


Figure 1. Return of adult coho salmon (*Oncorhynchus kisutch*) to the Strait of Georgia in relation to the catch per unit effort and size of juvenile coho salmon in July. Note that the predictions for 2005 ocean entry year differ by a factor of two between the models, but are similar for 2006 ocean entry year.

Barkley Sound Sockeye Salmon

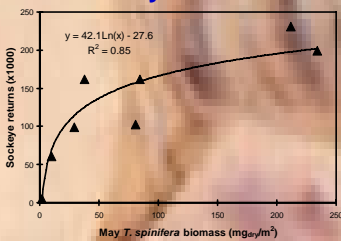


Figure 2. Relationship between the return of adult sockeye salmon (*O. nerka*) in Barkley Sound and the biomass of 3-5 mm euphausiids in May of the smolt year.

West Coast of Vancouver Island Coho Salmon

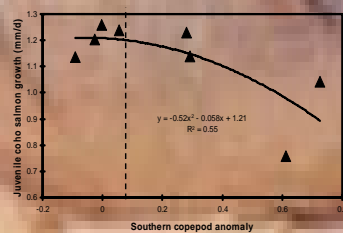


Figure 3. Growth of juvenile coho salmon caught off the west coast of Vancouver Island during their first summer at sea in relation to the abundance of southern copepods.

Management Implications

These results indicate that research conducted in the ocean environment has the potential for establishing harvest strategies and conservation measures for British Columbia Pacific salmon by forecasting the returns of adult salmon 1-2 years prior to their spawning migration. These models can be incorporated into the annual assessment process for Pacific salmon, a key element of the Wild Pacific Salmon Policy. However, given the low sample size (6-8 years of data), further effort will be required to assess the strength of these relationships across multiple climate regimes.

West Coast of Vancouver Island Coho Salmon

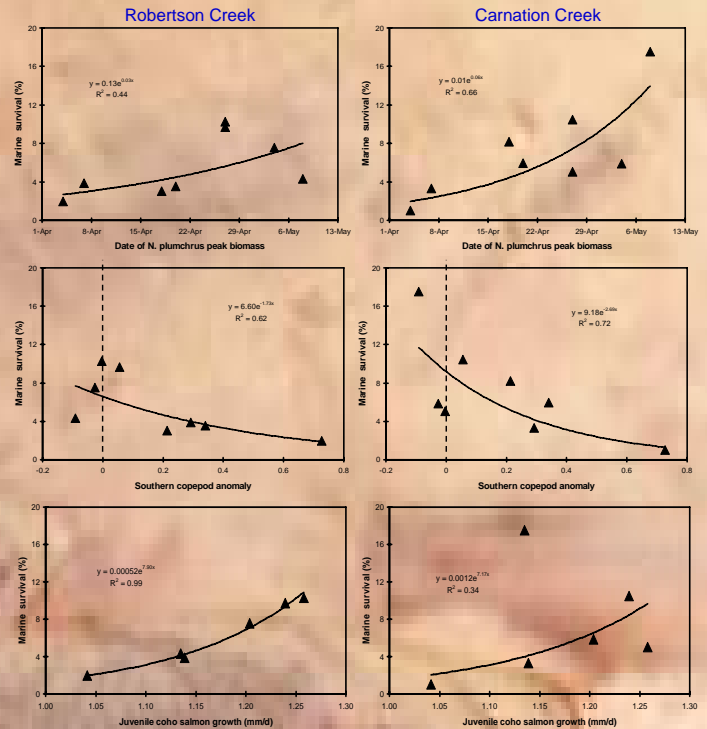
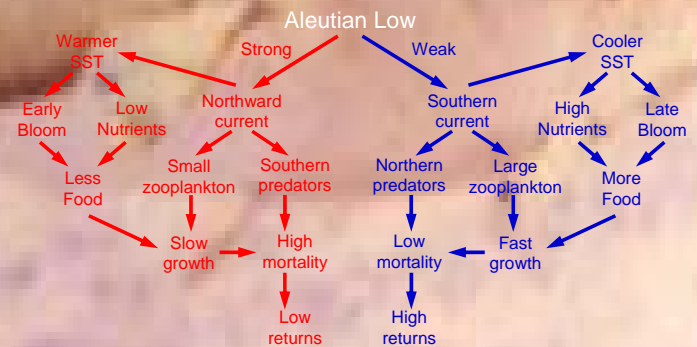


Figure 4. Marine survival of west coast of Vancouver Island coho salmon in relation to the timing plankton production, the abundance of small lipid-poor southern copepods, and juvenile salmon growth.

Ocean Conditions and Salmon Production



Conceptual Model

The strong positive correlation between adult return and juvenile salmon catch suggests that marine survival is determined early during the marine life of salmon. Our analyses also indicate that bottom-up forcing (i.e. prey quality and biomass) exerts a strong influence on salmon production via changes in ocean circulation. Although predators were not studied here, they may also play an important role in structuring salmon populations.