Impact of Climate Variation and Change Events on Several Threatened or Vulnerable Salmon (*Oncorhynchus spp.*) Populations in Southern British Columbia: Implications for Conservation and Restoration Planning

Kim Hyatt, Margot M. Stockwell and D. Paul Rankin

Fisheries and Oceans Canada, C-CIARN Fisheries, Pacific Biological Station, 3190 Hammond Bay Rd., Nanaimo, BC V9T 6N7, Phone: 250-756-7217, < hyattk@pac.dfo-mpo.gc.ca >.

We reviewed knowledge of behavioural and physiological responses of salmon (Oncorhynchus spp.) to annual and seasonal variations in thermal regimes experienced at selected life history stages. This enabled us to identify underlying sets of "decision rules" as biophysical models of how aquatic thermal regimes may influence life history events and production variations exhibited by several threatened or vulnerable populations of salmon in southern British Columbia. These biophysical models were then applied in a retrospective analysis of the potential contributions of climate variation and change (CVC) events to historic population trends exhibited by salmon stocks at risk. Results indicate a pervasive influence of CVC events on several life history stages of the subject populations. Climate warming impacts included: (i.) delays to adult migration, adult spawning and timing of egg hatch, (ii.) increases to spatial and temporal restrictions on juvenile rearing habitat or access to food supplies, and (iii.) alteration of the timing of seaward migration by salmon smolts. Our analyses suggest that CVC effects are not only temporally variable but also appear to be mediated by processes associated with "warm-phase" and then "cold-phase" periods of the Pacific Interdecadal Oscillation. Future "climate warming" episodes will complicate the manageability and threaten the sustainability of many salmon populations in the southern end of their range (i.e. Georgia Basin and the Pacific Northwest). This recommends the development of strategies that minimize the impact of uncertain CVC scenarios on the resilience of the salmon resource and that maximize our adaptive capacity for both short and long-term fisheries planning and management decisions. We suggest that recovery strategies for salmon as well as other species-at-risk should routinely consider the implications of "non stationary" CVC events in restoration planning.