Killer whales at risk: characterizing habitat quality for the most contaminated marine mammals in the world

Peter S. Ross[1] and Steven J. Jeffries[2]

[1]Institute of Ocean Sciences, Fisheries and Oceans Canada, PO Box 6000, Sidney, BC V8L 4B2, Canada, < rosspe@pac.dfo-mpo.gc.ca >, Phone: 250-363-6806. [2]Washington Department of Fish and Wildlife, 7801 Phillips Rd SW, Tacoma, WA 98498, USA.

The southern resident killer whale (*Orcinus orca*) population that frequents the transboundary waters of British Columbia (BC), Canada, and Washington State, USA, is considered 'at risk' as a result of noise and disturbance associated with vessels, diminished prey (salmon) abundance, and high levels of environmental contaminants. Our discovery that these whales are heavily contaminated with polychlorinated biphenyls (PCBs) highlights concerns that human activities may be threatening the viability of this small (n=83) population. Identifying the sources of these and other contaminants to killer whales represents a critical, albeit challenging, aspect of designing effective mitigative strategies. On the one hand, salmon 'import' contaminants of largely Asian origin into the coastal waters of BC and Washington, providing killer whales with a 'global' source of contaminants. On the other hand, resident killer whales also consume non-salmonid, non-migratory prey items while in Puget Sound and the Strait of Georgia. The importance of such 'local' sources of contaminants to the chemical burden in killer whales is unknown. Because of their high trophic position and non-migratory nature, harbour seals can serve as useful sentinels of local killer whale habitat quality. We analyzed both 'legacy' (largely regulated) and 'new' (largely unregulated) pollutants of concern in approximately 100 live-captured harbour seals from different sites in BC and Washington during the period 1984 - 2003, providing a temporal and spatial overview of contaminant trends. Our findings suggest that: i) PCBs and DDT decreased during the period 1972 - 1984; ii) Puget Sound remains a regional PCB 'hotspot'; and iii) the Strait of Georgia remains contaminated with dioxins and furans associated with pulp and paper processes. And while regulations have reduced inputs of these contaminants into regional waters, other chemicals represent emerging risks. New generation flame retardants, designed to replace the banned PCBs, increased in harbour seals from 1984 to present. Our results suggest that local sources of contaminants are delivering both old and new chemicals to high trophic level species. Management actions to regulate their sources (both locally and globally) are needed to reduce the risk of adverse health effects in killer whales as they feed in the industrialized waters of BC and Washington State.