



MARINE MAMMAL COMMISSION

30 August 2018

Ms. Rebecca Hoff
National Ocean Service
National Oceanic and Atmospheric Administration
Western Regional Center
7600 Sand Point Way, Building 1
Seattle, Washington 98118

Dear Ms. Hoff:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Oceanic Service's (NOS) 31 July 2018 notice (83 Fed. Reg. 36883) notifying the public of its intent to assess natural resource damages at the Lower Duwamish River. The Commission also reviewed the draft injury assessment plan (draft plan) prepared by the Elliott Bay Trustee Council¹ (Trustees).

The Lower Duwamish River is a heavily-industrialized urban waterway that flows through Seattle, Washington, into southern Puget Sound. As noted in the draft plan, oil and hazardous substances have been released into the river since the early 1900s. Contaminant types and concentrations vary throughout the river, and include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, trace metals, phthalates, and dioxins/furans (Ebbert et al. 2000, NOAA 2013, Conn et al. 2018). There are three active Superfund sites along the river and cleanup of the river is being led by the Environmental Protection Agency and the Washington Department of Ecology. The injury assessment plan is being developed separately from cleanup efforts to determine the extent to which natural resources have been injured, as part of the Natural Resource Damage Assessment being conducted in accordance with regulations under the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. § 9651(c), as amended) and other applicable authorities. The draft plan states that the Trustees initially are focusing their assessment of contaminant-related injury on "organisms most likely to use the aquatic habitat complex." Those were identified as benthic invertebrates, forage fish, bottom-dwelling fish, and Chinook salmon. The Commission agrees that those species are important to include in the injury assessment because of their occurrence in the Lower Duwamish River and the ecological role they play in estuarine and marine habitats, particularly as prey for higher trophic-level predators such as marine mammals. The Commission believes certain marine mammals also should be included in the injury assessment plan because they are likely being exposed to contaminants through ingestion of contaminated prey.

¹ The Elliott Bay Trustees include the National Oceanic and Atmospheric Administration (NOAA), the Department of the Interior, the State of Washington, the Suquamish Tribe, and the Muckleshoot Indian Tribe.

Chinook salmon

The inclusion of Chinook salmon is of particular importance to the Commission because lipid-rich adult Chinook salmon are seasonally important prey species for critically endangered southern resident killer whales (SRKW; Ford et al. 2010, Ford et al. 2016). SRKWs can be found year-round throughout the Salish Sea, including southern Puget Sound (Carretta et al. 2018). Critical habitat for SRKWs includes waters at the mouth of the Duwamish River (71 Fed. Reg. 69054). Research indicates that the primary exposure pathway of SRKWs to PCBs is through the ingestion of Chinook salmon (Mongillo et al. 2016)². Although the summer diet of SRKWs primarily is comprised of adult Chinook salmon originating from the Fraser and Thompson Rivers, 6–14 percent of their salmon prey originates from further south in Puget Sound (Hanson et al. 2010), presumably including the Duwamish River. The daily intake of PCBs by SRKWs is estimated to be 4–6.6 times greater than that of the northern resident killer whale population in British Columbia; salmon originating from the Puget Sound area are believed to be partly responsible for that difference (Cullon et al. 2009).

Analyses of juvenile Chinook salmon collected from a number of Pacific Northwest estuaries and hatcheries showed that salmon from the Duwamish River had significantly greater concentrations of PCBs and PAHs than juvenile salmon from other areas (Johnson et al. 2006); another study indicated high concentrations of polybrominated diphenyl ethers (PBDEs) in juvenile salmon from Puget Sound (Sloan et al. 2010). PCBs and PAHs occurred at concentrations great enough to affect salmon health and survival, as well as the health and survival of salmon-eating predators (Johnson et al. 2006). Adult Chinook salmon in Puget Sound also have exhibited significantly greater PCB concentrations than salmon from other areas along the West Coast (Missildine et al. 2005, O'Neill and West 2009). The majority of PCB bioaccumulation in adult Chinook salmon from Puget Sound was found to occur in marine habitats (O'Neill and West 2009), but additional studies may help to determine more precisely the ecological factors (i.e., habitats and prey) contributing to PCB accumulation. For these reasons, the Commission supports the inclusion of Chinook salmon in the draft injury assessment plan and recommends that the Trustees expedite the exposure, toxicology, and life history studies identified in the draft plan for Chinook salmon to better understand contaminant types, sources, and concentrations at each stage of their life cycle.

Marine mammals

The Trustees' draft plan includes marine mammals, but proposed assessments are limited to a review of existing data on mammalian exposure and toxicity, life history information, and habitat-use data to determine if an additional assessment is warranted. The Commission believes that a literature review alone would be inadequate for both SRKWs and pinnipeds affected by contaminants from the Lower Duwamish River.

Adult SRKWs have some of the greatest PCB and PBDE concentrations among cetaceans in the world (Ross et al. 2000, Alonso et al. 2014), as revealed by analyses of fatty tissues (i.e., blubber) and, more recently, feces (Lundin et al. 2016). Although PCB concentrations in SRKWs appear to be declining over time, they are not expected to fall below mammalian toxic threshold levels for several

² PCBs and other persistent organic pollutants also are transferred from females to their offspring via gestation and lactation (Mongillo et al. 2016).

decades (Hickie et al. 2007). Organochlorine exposure in killer whales can cause endocrine disruption and suppress immune function, increasing the risk of infection and disease (Mongillo et al. 2016). Elevated concentrations of organochlorine and other contaminants in SRKWs have been identified as a primary threat to their survival (National Marine Fisheries Service; NMFS 2016). Ongoing monitoring of the types, sources, and concentrations of contaminants in SRKWs is needed to inform both restoration efforts and SRKW recovery. The Commission therefore recommends that the Trustees include in the injury assessment plan (1) an updated assessment of available data on contaminants in SRKWs and (2) analyses of archived biological samples (blubber biopsies, scat, etc.) from SRKWs to further determine types, sources and concentrations of contaminants; those studies should be coordinated with researchers at NMFS, the Canada Department of Fisheries and Oceans, the Washington State Departments of Ecology and Fish and Wildlife, and other relevant research institutions.

The presence of harbor seals in the Duwamish River also warrants more extensive consideration in injury assessment efforts. Harbor seals occur year-round in Washington inland waters and exhibit strong site fidelity to haul-out sites (Carretta et al. 2014). Although there are anecdotal reports of harbor seals hauled out along the Duwamish River³, no consistent monitoring effort is in place. Harbor seals from Puget Sound feed on a wide variety of prey, including Pacific tomcod, Pacific herring, and several species of salmonids (Purcell et al. 2004, Cullon et al. 2005). Concentrations of PCBs in harbor seal prey from Puget Sound were seven times greater than the same prey species in the adjacent Strait of Georgia area (Cullon et al. 2005). Concentrations of PCBs and other organochlorines have been elevated in tissues from harbor seals occurring in the Puget Sound area, attributed at least in part to their proximity to southern Puget Sound industrial activities and consumption of prey originating from those areas (Simms et al. 2000, Ross et al. 2004, Noël et al. 2011). Elevated concentrations of organochlorines in tissues from harbor seal pups captured in southern Puget Sound have been linked to decreased immune function and disruption of retinol and thyroid hormones (Simms et al. 2000, Mos et al. 2006 and 2010, Tabuchi et al. 2006), with adverse effects observed at relatively low levels of exposure (Tabuchi et al. 2006, Mos et al. 2010). Although more recent studies have shown decreasing concentrations of organochlorines in harbor seals (Ross et al. 2013), the persistence of those contaminants in the food web will continue to be a health risk.

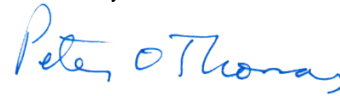
Given the complexity of the exposure pathways, the relative contributions of contaminant sources from the Duwamish River, and the deleterious long-term health effects of contaminant exposure, the Commission believes that a literature review alone would not be sufficient for an adequate assessment of injury to harbor seals. As a high trophic-level predator that occurs regularly in the Duwamish River, harbor seals are likely being exposed to contaminants through ingestion of contaminated prey and are particularly vulnerable due to their year-round presence in Puget Sound. Therefore, the Commission recommends that the Trustees include ecotoxicology, life history, and foraging/habitat-use studies of Pacific harbor seals as part of the injury assessment plan and coordinate those studies with researchers at NMFS, the Canada Department of Fisheries and Oceans, the Washington State Departments of Ecology and Fish and Wildlife, and other relevant research institutions. The Commission further recommends that the Trustees initiate periodic year-round monitoring of the waters of the Duwamish River and Elliott Bay to determine the extent and frequency with which harbor seals and potentially other marine mammals (such as California sea

³ sealsitters.org/dangerous_waters/duwamish.html

lions, Steller sea lions, and harbor porpoises) occur in the area and are foraging on Chinook salmon or other prey that have elevated concentrations of contaminants.

The Commission appreciates the opportunity to review the draft plan proposed for the Lower Duwamish River, and the efforts of NOS and other federal and state agencies to restore the Duwamish River to reduce the potential exposure of SRKWs, harbor seals, and other marine mammals to harmful contaminants. Please contact me if you have questions regarding these recommendations.

Sincerely,



Peter O. Thomas, Ph.D.,
Executive Director

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