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Endangered Whale Species in a Pristine Environment: Pollutant Concentrations Indicative of a Problem?

Temporal trends and concentrations of persistent organic pollutants were found in bowhead whales in US Arctic waters.

SOURCE: Marine Pollution Bulletin

By Briana Coulter 9 October 2020

Western Arctic bowhead whales follow the ice pack and migrate annually from their wintering grounds in the Bering Sea, through the Chukchi Sea, and to their summering grounds in the Beaufort Sea. The Bering-Chukchi-Beaufort (BCB) stock is the only stock of bowhead whales that resides in US Arctic waters and is classified as an endangered species. The endangered status of the BCB bowhead whale stock not only has implications for the marine ecosystems they inhabit, but also substantial implications for the indigenous people who rely on these organisms.

Inuit communities in the northern Arctic rely heavily on the muscle and blubber of bowhead whales to provide essential nutritional, cultural, and spiritual resources. Persistent organic pollutants (POPs) as their name indicates, are persistent. They remain in ecosystems well after being discharged through accumulation and biomagnification. Contaminants accumulate in the tissues of organisms and are incorporated into the tissues of their predators. Though the production of POPs has been terminated or severely restricted, they are still found in the environment today. Bowhead whales are filter feeders, feeding at the base of the food chain and typically have lower POP concentrations than odontocetes-toothed whales.

The Bering, Chukchi, and Beaufort Seas have traditionally had low POP concentrations despite the Arctic being a sink for contaminants. Bowhead whales are believed to have a lifespan up to 200 years. A long lifespan has the potential for large POP bioaccumulation rates due to longer exposure in their environment and food.

Bolton et al. collected blubber and muscle tissues from BCB bowhead whales from 2006-2015 to analyze POP concentrations and compare them to a previous study conducted from 1992-1993. Samples were cleaned, digested, and placed in a gas chromatography–mass spectrometer (GC/MS) to be analyzed for 67 different contaminants including the major groups: DDX's, HCH's, CHL's, PCB's, and PBDE's.

Overall, POP concentrations in bowhead whales have decreased between 1992-1993 and 2005-2016. Specifically, DDX's decreased by 6.1%, CHL's decreased by 4.6%, HCH's decreased by 4.3%, PCBs and HCBs showed no significant decrease over the 10 year study, but they have decreased since 1992.

The findings of this study indicate that POP concentrations have continued to decline in the Arctic since these organic pollutants were severely restricted. Because bowhead whales feed at the base of the food chain they are frequently used as an indicator species to determine and monitor ecosystem health. Ecosystem health can be threatened by anthropogenic activity, as well as the changing of air and water movements which is occurring in the Arctic today. The decline of POP concentrations in BCB bowhead whales is a significant finding. However, the once pristine Arctic ecosystem is changing continuously and continued study of this species is necessary to monitor the Arctic ecosystem health as well as ensuring that bowhead whale contaminant concentrations remain low to protect the species and the communities that depend on them.

Citation: Bolton, J.L., G.M. Ylitalo, P. Chittaro, J.C. George, R. Suydam, B.T. Person, J.B. Gates, K.A. Baugh, T. Sformo, and R. Stimmelmayer. (2020). Multi-year assessment (2006–2015) of persistent organic pollutant concentrations in blubber and muscle from Western Arctic bowhead whales (*Balaena mysticetus*), North Slope, Alaska. *Mar. Pollut. Bull.*, **151**: 110857, <https://doi.org/10.1016/j.marpolbul.2019.110857>.