EXAMINING BIOLOIGCAL TRANSPORT OF MERCURY FROM THE OCEAN TO THE WATERSHED: A CASE OF PACIFIC SALMON LIFE HISTORY

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ABSTRACT

Currently available data on mercury in the United States Arctic show very low concentrations in seawater (order of 50 pg/L), atmosphere (order of 5 ng/m^3), and sediment (order of 20 ng/g). Low background levels are also reflected in mercury residues in tissues of several marine mammals that are hunted for subsistence. Except for beluga whale whose diet includes a variety of fish, reported average mercury levels in the muscle tissues of these species were less than 100 ng/g (wet weight); in the case of beluga whale, the average value exceeded 1,000 ng/g. Neither do the data suggest the presence of point sources of mercury, except for major rivers that could be transporting substantial amounts of atmospherically-deposited mercury from their vast watersheds. Locally in the vicinity of mercury mines in western Alaska – Kuskokwim River drainage – stream sediments have been reported to contain mercury in excess of 5,000 ppm. Presently, there is little understanding of the biological transport of mercury that in some cases may be quite significant. One such mechanism is the spawning migration of anadromous fish. Sockeye salmon *Oncorhyncus nerka* may be more appropriate in this regard due to its abundance, wide distribution, and spawning return to lakes. The mean concentration of total mercury in the muscle tissue of the sockeye salmon was found to be between 51 and 61 ng/g (wet weight) in three sampling areas; for methylmercury, it varied between 33 and 46 ng/g, amounting to about 75 percent of total mercury. Given these data and a general escapement value of 12 million sockeye salmon in the Bristol Bay region, an annual import of about 2 kg of mercury would be a significant source for the lakes and lake-related aquatic habitats in the region. Variations in N-15 and presence of diatoms in sediment cores have been used to reconstruct patterns of salmon abundance in relation to overall biological productivity over decadal to millennial scales and to estimate salmon runs prior to the start of commercial fishing. There may also be mercury-related signatures of regime shifts in biological productivity through mercury evasion and redeposition.

KEYWORDS
Mercury, United States Arctic, salmon, methylmercury, biological transport, regime shift