

Boat Harbour Remediation: Assessing Legacy Impacts of Pulp Mill Effluent on Coastal Food Web Structure using Stable Isotope Analysis

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Industrial pulp and paper mills discharge nutrient-rich effluent wastewater into receiving aquatic environments which can negatively impact aquatic biota. Boat Harbour, Nova Scotia was formerly a wastewater treatment facility for pulp mill effluent with subsequent discharge from the facility into the coastal marine environment of the Northumberland Strait. Effluent release into Boat Harbour ceased in 2020 and remediation of the ecosystem will soon begin, restoring tidal influence back to Boat Harbour. To assess ecosystem impacts and establish baselines to evaluate the effectiveness of remediation activities on the aquatic system, an ecosystem-wide approach to determining the spatial impacts of effluent on the food web of the coastal marine environment was required. An effective tool that can be used to establish exposure of aquatic biota to effluent is stable isotope analysis. Naturally occurring stable isotopes can be used to measure the incorporation of nutrients from pulp mill effluent into organism's tissues, in addition to quantitatively defining each organism's trophic position within a food web. Aquatic biota including macroalgae, snails, mussels, crab, lobster and native fish were sampled from locations along the Northumberland Strait, originating at the former effluent outflow point. An analysis of nitrogen and carbon stable isotopes was completed to investigate the sources of bioavailable nitrogen along a pollution gradient and to determine if exposure to pulp mill effluent alters the length of coastal food webs. This study assisted in quantitatively characterizing the biogeochemistry and trophic ecology of an ecosystem impacted by pulp mill effluent prior to remediation and assessed the impacts of effluent on coastal food web structure.