

Long-term Investigation of Benthic Communities in Port Valdez, Alaska 1971-2007

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Long-term studies (1971 to 2007) of the marine environment in Port Valdez, Alaska, have demonstrated large change over time with human activities contributing substantially to small and ecosystem-level changes in the fjord. Sampling of benthic invertebrates at sites in Port Valdez was initiated in 1971 and modified in 1989 to address effects of treated ballast-water discharges on benthic communities at the marine oil terminal. A retrospective analysis was performed to determine the important scales of factors contributing to spatial and temporal variability in the benthos. Overall, the 1964 earthquake in Prince William Sound, deposition of glacial sediments, and returns of adult hatchery salmon appear to have the largest influences on faunal communities in the fjord. At small scales (< 2 km), measurable effects from anthropogenic stressors include discharges of ground fish wastes from a fish processing plant and treated ballast waters at the marine oil terminal. Infaunal communities affected by fish wastes were dominated by the opportunistic polychaete *Capitella capitata*. Interactions between vessel traffic and fish waste deposition resulted in delayed recovery of fauna from the deposition of dredged sediments. Assessments of sediments adjacent to the oil terminal indicate subtle, long-term alterations of fauna at low hydrocarbon concentrations. Fauna sensitive to hydrocarbons include the polychaetes *Galathowenia oculata* and *Melinna cristata* and a cumacean *Eudorella emarginata*. These fauna declined in abundance at 100 to 300 ng g⁻¹ PAH in sediments. Overall, biological communities Port Valdez have experienced substantial temporal variability with natural and anthropogenic stressors contributing to measurable local and ecosystem-level adjustments of fauna. The results of the long-term investigations in Port Valdez have implications for understanding effects from anthropogenic stressors and long-term variability in benthic systems throughout Alaskan waters.