

Contaminants

THE TRANSPORT, BIOACCUMULATION, AND BIOMAGNIFICATION OF CONTAMINANTS IN THE MARINE ECOSYSTEMS OF ALASKA ARE OF UTMOST CONCERN.

The National Research Council noted in its guidance to the Board that there are three primary risks from contaminants moving through the food web. These include toxicity to individual organisms; toxicity to humans, especially Alaska Natives who may depend predominantly on aquatic foods, and contamination of commercially-fished species, which may affect marketability and cause health problems.

The Board responded to these concerns by including a contaminants priority in each of the eight RFPs from 2002 to 2008, mainly directed at the sources, transport, and accumulation of contaminants and their effects on ecosystem structure and function. The Board received many contaminants-related proposals in its 2003 RFP, but a financial crisis in March of that year led the Board to place a higher priority on other marine research.

OTHER PROMINENT ISSUES :: Contaminants

Flame Retardant Chemicals in Invertebrates in Southeast Alaska

Project 421

IN 2004, THE BOARD'S FIRST CONTAMINANTS STUDY, Project 421, examined the levels of polybrominated diphenyl ether (PBDE) in sediments and invertebrates collected from two study sites in Southeast Alaska: one at Lemon Creek near an industrial landfill in Juneau, and a second, more pristine site, at Peterson Creek north of Juneau.

PBDEs are man-made chemicals widely used as flame retardants from 1970 to 1980. U.S. production has been curtailed, but PBDEs continue to be produced elsewhere. Bioaccumulation of PBDEs and transmission up the food web may be of particular concern in North Pacific ecosystems if they become concentrated in commercially important fish and shellfish species. PBDEs are neurotoxins that can act as endocrine disruptors and impact thyroid hormone regulation.

The research concluded that even the highest PBDE levels, found at Lemon Creek, were four to twenty-seven times lower than those found in surface sediments from bodies of water bordering heavily industrialized areas, such as the Great Lakes or in the North Sea. Unlined municipal solid waste landfills bordering the Lemon Creek estuary appeared to be a significant source for PBDEs. In Peterson Creek, concentrations were much less, though measurable. Those contaminants may be spread to glaciers through atmospheric transport and then carried into estuaries through ice melt. Researchers studied a number of invertebrate species including amphipods, mussels, clams and isopods, finding the highest concentrations in filter-feeding clams.

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Looking for Hydrocarbons in Nelson Lagoon

Project 422

PROJECT 422 EXAMINED POLYCYCLIC AROMATIC HYDROCARBON (PAHs) contamination in blue mussels in Nelson Lagoon, on the north coast of the Alaska Peninsula. These mussels are important prey for threatened Steller's eiders that gather by the thousands in the lagoon to molt beginning in July. Boating activities, salmon fishing, and accidental oil discharges ran the risk of polluting the water with hydrocarbons. PAHs are associated with chronic risks of cancer, reproductive anomalies, and endocrine dysfunction. Researchers found very low concentrations of PAHs in the marine sediments, tissues of invertebrates, and in the water. In general, the lagoon remains relatively pristine.



Nelson Lagoon from the air.

Ellen Lance

FEATURE PROJECT

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Monitoring Seabird Eggs

Project 534

A LONG-TERM PROGRAM TO MONITOR CONTAMINANTS MEASURED IN seabird eggs, an important subsistence food for local residents, began in 2005. Project 534 helped support a collaborative project with the U.S. Fish and Wildlife Service and residents of 15 communities to monitor trends in Alaska marine environmental quality by collecting seabird eggs, and processing and banking the samples to ensure chemical stability during decadal storage.

The overall program, called the Seabird Tissue Archival and Monitoring Project (STAMP), seeks to provide a record of long-term anthropogenic contaminants, such as chlorinated pesticides, polychlorinated biphenyls (PCBs), PBDEs, and mercury in murre and gull eggs from the Gulf of Alaska and Bering Sea.

Examining north-south and east-west patterns helps provide clues to contaminant sources and transport patterns, and their impact on the food web. NPRB's support was used to analyze contaminants in eggs collected in 2002-2005. Researchers found that PCBs and dichlorodiphenyldichloroethylene (DDE) were higher in the Gulf of Alaska than the Bering Sea, while levels of hexachlorobenzene (HCB) had just the opposite pattern.

Levels of persistent organic pollutants appear to have declined in Alaska murre colonies since the mid-1970s. Mercury levels in murre eggs were comparable to levels reported elsewhere in the world. Mercury levels around Norton Sound were higher than elsewhere and may reflect historical mining activities on the Seward Peninsula and natural inputs from the Yukon River and smaller drainages.



The 1999-2007 Seabird Tissue Archival and Monitoring Project (STAMP) seabird egg collecting sites



Murre eggs, St. George Island.



Francis Wise

Carrie Eischens

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Assessing Mercury Levels in Murre and Gulls in Norton Sound

Project 822

RELATED TO STAMP (PROJECT 534), PROJECT 822 supports an assessment of mercury contamination in murre and gull eggs in the Norton Sound region to determine if contaminant levels correlate with large estuarine wetlands, river outflows, or historical gold mining sites. When completed in 2010, the study will provide local residents with important information about the contaminant levels in bird eggs used for subsistence purposes. It will also help identify potential sources of contaminants and the presence of those contaminants at traditional egg harvesting locations.

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Characterizing Kachemak Bay Sediments

Project 726

RESEARCHERS ARE ASSESSING HABITAT CONDITIONS that influence biodiversity and distribution of soft bottom benthic infaunal communities in Kachemak Bay in Project 726. By characterizing sediment properties, benthic infaunal community distribution and condition, sediment contaminant concentrations, and toxicity, the study will provide important benthic community and sediment toxicity data that can be integrated with other national status and trends databases.

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Analyzing Mussels and Dogwinkles for TBT Contamination

Project 727

TRIBUTYLTIN (TBT) IS ONE OF THE MOST TOXIC COMPOUNDS EVER TO COME ON THE MARKET, AND POSES A POTENTIAL threat to subsistence harvest, mariculture, and natural populations of marine resources in Alaska. Project 727 will assess TBT impacts throughout Southeast Alaska and the Gulf of Alaska to determine whether levels are elevated in ports used by large ships. The study will also obtain baseline data for long-term monitoring of nearshore ecosystems. By analyzing mussels and file dogwinkles, researchers will quantify TBT contamination in and near harbors and compare changes at Auke Bay and Kodiak over twenty years.



Mussels on beach.

Ryan Soderlund