



Monitoring Persistent Contaminants at Isle Royale

Importance

Atmospheric deposition has contaminated national parks in the Great Lakes region with several potentially harmful metals and organic chemicals. Aquatic food webs are principal pathways for exposure of humans and wildlife to many toxic substances, and some contaminants can concentrate in food webs to levels that adversely affect health and reproduction. In particular, the deposition of mercury has exposed fish and wildlife in the parks to methylmercury, a highly toxic compound that can biomagnify in food webs to harmful levels.

This monitoring program is assessing contamination of aquatic food webs to identify water bodies where concentrations of measured contaminants may be harmful to fish, wildlife, or fish-eating humans, and to identify patterns and trends of contamination.



Dip-netting for dragonfly larvae in Lake Harvey. Photo by Sean Bailey.

Status and Trends

Predatory fish (northern pike and large yellow perch), prey fish (1-year-old yellow perch), and larval dragonflies were collected in May 2009 from four inland lakes: Angleworm, Harvey, Richie, and Sargent. Muscle tissue (fillets) from the predatory fish is analyzed for mercury, lead, polychlorinated biphenyls (PCBs), the insecticide DDT (and its metabolites DDE and DDD), perfluorinated compounds (PFCs), and polybrominated diphenyl ethers (PBDEs). This group of contaminants accounts for most of the impairments of surface waters in the nine Great Lakes Network parks. Prey fish, which are important in the food web transfer of methylmercury to predatory fish and wildlife (including northern pike, bald eagles, and common loons), are being analyzed whole for mercury. Larval dragonflies, which are widespread predatory invertebrates, are being analyzed to assess their utility as biosentinels for assessing methylmercury contamination in fishless aquatic and wetland environments or in situations where sampling of fish is not logistically feasible.

Mercury concentrations in fillets from 13 of the 37 northern pike collected from Angleworm, Richie, and Sargent lakes exceeded 0.3 parts per million (ppm) wet weight, which is the U.S. Environmental Protection Agency criterion for methylmercury established to protect the health of humans who eat noncommercial fish. Concentrations of mercury in 3 of the 37 northern pike exceeded 0.5 ppm, an estimated threshold level associated with adverse effects on the health and reproduction of fish, based on information from published toxicological studies. Mercury concentrations in the fillets of all 9 yellow perch from Harvey Lake exceeded 0.5 ppm wet weight. Initial analyses of lead in the fillets of northern pike indicated that concentrations were low, averaging 8 parts per billion (ppb) and ranging from 2 to 25 ppb wet weight. Moreover, concentrations of PCBs, DDT (and its metabolites DDD and DDT), and PBDEs were below levels of detection.

Management Implications

A prior study found northern pike from some lakes on Isle Royale having elevated concentrations of methylmercury, and some fish exhibiting symptoms of sublethal poisoning. The reproduction of common loons that nest in the park and feed on fish could also be adversely affected by methylmercury.

The analyses of contaminants in edible fillets of sport fish will provide information useful for health-risk assessment and for providing fish consumption advice to persons who eat fish from the park. The potential risk of the measured contaminants to fish and fish-eating wildlife will also be evaluated by comparing thresholds for adverse effects with concentrations of contaminants measured in fish. Financial support from the Great Lakes Restoration Initiative is allowing for annual sampling of the same four lakes in 2010, 2011, and 2012. After that time, sampling will occur every three years.



Pike are weighed and liver samples are collected soon after they are caught. Photo by Roger Haro.