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Western Ecological Research Center
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The Ups and Downs of Mercury in Small Prey Fish

Small fish are commonly used to assess mercury risk to wildlife and monitor mercury in wetlands. However, limited research has evaluated short-term mercury variability in small fish, which can have important implications for monitoring programs and risk assessment. A recent USGS study authored by Drs. Collin Eagles-Smith and Josh Ackerman evaluated how widely mercury concentrations varied over a short time period in small estuarine prey fish, and how this variation overlapped with the timing of breeding activities of fish-eating birds that preyed upon them. They reported their results in a recent issue of *Environmental Science and Technology*.

Eagles-Smith and Ackerman evaluated prey deliveries to nests of Forster's terns in San Francisco Bay, which have been previously shown to be at high risk from mercury exposure in the estuary. The authors also continuously measured mercury levels in the two most abundant fish prey species (three-spine stickleback and longjaw mudsucker) in three wetland types over a four month time-frame that included the Forster's tern breeding season. They found that fish mercury concentrations changed dramatically during that short time period, increasing by 40% during the first two months, and decreasing by 40% during the last two months. Importantly, the period of peak fish mercury concentrations overlapped with the period of peak Forster's tern egg formation, which is when maternal dietary mercury is incorporated into eggs. In fact, the authors estimated that 78% of all Foster's tern eggs were produced and 31% of chicks hatched during the time period of peak prey mercury levels, when risk to reproduction was highest.

Forster's tern with a longjaw mudsucker. Photo © Michael Kern, used with permission.

Management Implications:

- Mercury monitoring programs should be designed to control for short-term variability in fish mercury concentrations.
- Mercury exposure in fish-eating birds was highest during the breeding season, when reproductive effects are most likely to occur.
- Management actions to reduce fish mercury during wildlife reproduction periods may reduce wildlife risk to mercury impairment.

The results of this study have important implications for land managers and water quality regulators dealing with mercury issues. First, it highlights the importance of standardizing the timing of fish sampling for monitoring programs since fish sampled at different time periods may not be comparable. Secondly, if assessing wildlife risk is a goal of monitoring programs, then fish sampling should occur during or just before critical life-history phases for wildlife, such as egg laying and chick rearing in waterbirds.

Eagles-Smith, C.A., and J.T. Ackerman. 2009. Rapid changes in small fish mercury concentrations: implications for wildlife risk and monitoring programs. Environmental Science and Technology 43:8658–8664.