

Western Ecological Research Center

Publication Brief for Resource Managers

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Mercury in Forster's Terns in Relation to Space Use of San Francisco Bay Habitats

Fish-eating birds are good indicators of mercury contamination and risk to wildlife in aquatic food webs because they forage at a high trophic level and methylmercury biomagnifies through aquatic food chains. Despite a large body of literature assessing waterbird exposure to mercury, few studies have simultaneously examined mercury concentrations and space use in birds. To understand mercury exposure of waterbirds in San Francisco Bay, USGS scientists Dr. Josh Ackerman, Dr. Collin Eagles-Smith, Dr. John Takekawa, Jill Bluso, and USFWS scientist Terry Adelsbach investigated the mercury concentrations and habitat use of pre-breeding Forster's terns using radio telemetry. They reported their results in a recent issue of *Environmental Toxicology and Chemistry*.

In 2005 and 2006, the authors collected blood and feathers from 122 Forster's terns and radio-marked and tracked 72 terns to determine locations of dietary mercury uptake. Capture site and capture date were the most important factors explaining variation in blood mercury concentrations, followed by sex and year. Accordingly, radio telemetry data revealed that Forster's terns generally remained near their site of capture and foraged in nearby salt ponds, managed and tidal marshes, and tidal flats. In contrast, capture site and capture date were not important factors explaining variation in feather mercury concentrations, probably because feathers were grown on their wintering grounds several months prior to our sampling. Instead, sex and year were the most important factors explaining mercury concentrations in breast feathers and sex was the most important factor for head feathers. Overall, 13% and 22% of pre-breeding Forster's terns were estimated to be at high-risk for deleterious effects due to mercury concentrations in blood and feathers, respectively.

Management Implications:

- These results show that fish-eating waterbirds are at risk to mercury contamination in San Francisco Bay and should be incorporated into risk-assessment strategies.
- Currently, management agencies are implementing large-scale plans to restore or enhance wetland habitats along San Francisco Bay's margins. Restoration activities could increase the contamination of the aquatic biota within the estuary by accelerating microbial conversion of legacy inorganic mercury to methylmercury, the form which is highly toxic and most bioavailable to wildlife and humans.
- Post-restoration monitoring of mercury concentrations in terns and effects of mercury on tern reproductive success is warranted to evaluate potential impacts of mercury on breeding terns and to determine alternative management strategies.

Breeding terns are likely to be even more at risk because blood mercury concentrations more than tripled during the 45-day pre-breeding time period. These data illustrate the importance of space use and tissue type in interpreting mercury concentrations in birds.

Ackerman, J.T., C.A. Eagles-Smith, J.Y. Takekawa, J.D. Bluso, and T.L. Adelsbach. 2008. Mercury concentrations in blood and feathers of pre-breeding Forster's terns in relation to space use of San Francisco Bay habitats. Environmental Toxicology and Chemistry 27:897-908.