Managing Salt Ponds to Increase Waterbird Nesting Habitat While Minimizing Methyl Mercury Biomagnification

Josh Ackerman[1], Collin Eagles-Smith[1], Mark Marvin-DiPasquale[2], Cheryl Strong[3], Eric Mruz[3], & Mark Herzog[1]

[1]U.S. Geological Survey, Davis Field Station, University of California, Davis, CA (jackerman@usgs.gov); [2]U.S. Geological Survey, Menlo Park, CA; [3]U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex, Newark, CA

Background: The South Bay Salt Pond Restoration Project plans to convert 50-90% of 25,000 acres of salt ponds into tidal marsh. However, salt ponds are currently preferred habitat for many migrating and breeding waterbirds. Managers plan to enhance the remaining salt ponds to maintain current waterbird populations, *yet it is unclear how to manage salt ponds to increase waterbird foraging and nesting opportunities while minimizing the deleterious effects of methyl mercury production*. We conducted a pilot study at the Don Edwards San Francisco Bay National Wildlife Refuge and created nesting islands and monitored the response of waterbirds and mercury bioaccumulation.

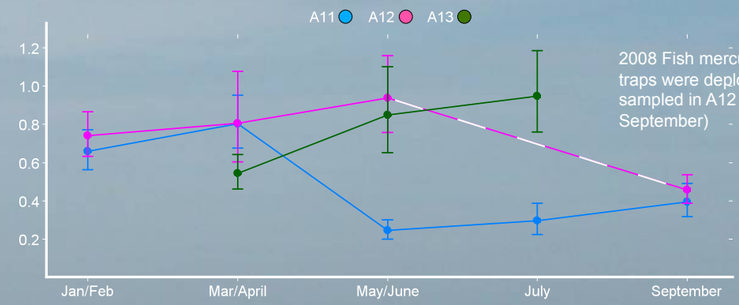
Methods: We created islands by lowering water levels in Pond A12 to expose submerged substrate suitable for use as nesting islands (background photo). We then monitored the response of waterbirds by conducting weekly nest monitoring surveys. We also examined mercury bioaccumulation using biosentinel fish and waterbird eggs. We sampled longjaw mudsuckers every 2 months in manipulated Ponds A12 and A13, and an adjacent control pond with unaltered water management (Pond A11). We sampled Avocet, Stilt, and Forster's Tern eggs from nests within Pond A12 as well as several nearby salt ponds where water management was not manipulated. All fish and eggs were analyzed for total mercury at the USGS Davis Field Station Mercury Lab.

Results:

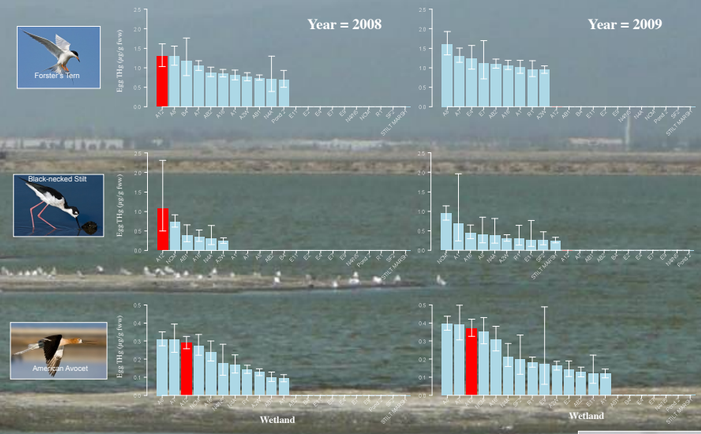
1. By lowering water levels, we successfully created numerous islands that were used by waterbirds as nesting habitat. In 2008, nearly 400 waterbird nests were found in Pond A12, despite this pond having no prior history of nesting attempts. Nest success was 56% for Avocets and 66% for Forster's Terns. In 2009, only avocets nested in A12, and nest success was comparable: 63%

Results continued:

2. Fish mercury concentrations in Ponds A12 and A13 spiked in the summer after water levels were lowered in early spring to expose nesting islands. In contrast, fish mercury concentrations in the control Pond A11 actually decreased during the same time period.



3. Forster's Tern and Stilt eggs had higher mercury concentrations in Pond A12 than in any other wetland monitored, and Avocets were third highest among ponds.



Conclusion: We successfully created waterbird nesting habitat, however methyl mercury production was enhanced due to water management actions (see poster by Marvin-DiPasquale et al.) and methyl mercury subsequently biomagnified up the food web. Further study is warranted to determine if similar water management actions will increase methyl mercury bioaccumulation within other salt pond habitats as restoration proceeds in San Francisco Bay.

Acknowledgments: This research was funded by the U. S. Fish and Wildlife Service, U. S. Fish and Wildlife Service Coastal Program, U. S. Geological Survey, and the efforts of John Klochak. We thank the staff at the Don Edwards San Francisco Bay National Wildlife Refuge for logistical support. Bird photographs by Ken Phenicie.