Delta Mercury Exposure Reduction Program (Delta MERP)

Kathryn Kynett, Delta Conservancy, Kathryn.Kynett@deltaconservancy.ca.gov
Gabriela Pasat, California Department of Public Health-Environmental Health Investigations Branch, Gabriela.Pasat@cdph.ca.gov
Alyce Ujihara, California Department of Public Health - Environmental Health Investigations Branch, Alyce.Ujihara@cdph.ca.gov
Lauren Joe, California Department of Public Health - Environmental Health Investigations Branch, Lauren.Joe@cdph.ca.gov
Alcira Dominguez, California Department of Public Health - Environmental Health Investigations Branch, Alcira.Dominguez@cdph.ca.gov
Margy Gassel, Office of Environmental Health Hazard Assessment, Margy.Gassel@oehha.ca.gov
Laura McLellan, Central Valley Regional Water Quality Control Board, Laura.McLellan@Waterboards.ca.gov
Janis Cooke, Central Valley Regional Water Quality Control Board, janis.cooke@waterboards.ca.gov

Elevated levels of mercury in fish are present in parts of the Sacramento-San Joaquin River Delta (Delta). Those who eat Delta fish may be exposed to harmful mercury levels. Mercury is a toxic metal that is most harmful to infants, children, and the developing fetus. As it will take many years to reduce the levels of mercury in fish, the Central Valley Regional Water Quality Control Board, California Department of Public Health, Office of Environmental Health Hazard Assessment, and Sacramento-San Joaquin Delta Conservancy are taking action now to protect public health by implementing the Delta Mercury Exposure Reduction Program (Delta MERP). This program aims to reduce human exposure to mercury through collaborative work with community-based organizations, community members, local agencies, and other entities. Delta MERP activities educate at-risk populations about mercury exposure from eating contaminated fish caught in the Delta and elsewhere. Following interviews with local social service, Tribal, and community-based organizations, the project team developed a multi-pronged approach for education and outreach based on the needs and interests of the organizations. The Delta MERP approach to reduce risk includes developing and distributing multilingual educational materials based on existing fish consumption advisories, building capacity of community-based organizations through small grants to promote culturally relevant outreach in their respective communities, developing and posting signs at fishing locations, sharing information through community stakeholder meetings, providing trainings, and supporting programs already operating in the Delta to educate about fish contamination.

Keywords: outreach, education, mercury, fish advisory, public health, fish contamination

Poster Topic: Fish Contamination

Impact of Hypersalinity on Embryonic Development of the Japanese Medaka (*Oryzias latipes*)

Allison Kupsco*, University of California- Riverside, akups001@ucr.edu
Rafid Sikder, University of California-Riverside, rsikd@ucr.edu
Daniel Schlenk, University of California-Riverside, Daniel.schlenk@ucr.edu

Increasing salinity of freshwater is one understudied component of climate change. Rising sea levels, decreased precipitation, decreased snow melt input and drought have led to an increase in salinity of certain water restrained estuaries, such as the San Francisco Bay Delta. Furthermore, two desalination plants have been proposed to combat water shortages in the area. These plants will dispose of concentrated brine back into the estuary, which could further increase salinity. The SF Bay Delta is a unique habitat and several key species of fish spawn in these waters, including salmonids and Delta smelt. Saltwater of differing ionic contents may have varying impacts on fish development and chronic effects of hypersalinity coupled with other stressors on fish development remain unknown. The goal of this research was to determine toxicity thresholds for fish embryos exposed to different types of saltwater. Embryos of the euryhaline model fish, Japanese medaka (*Oryzias latipes*), were treated with different dilutions of artificial seawater (35, 42, 49, 56 and 70 parts per thousand), saline San Joaquin River water (13, 19, 24 and 30ppth) and desalination brine from Monterey Bay Aquarium (37, 43, 51, and 67ppth) beginning at fertilization. Embryos were monitored for survival, hatch, deformities and survival for 3 days post hatch. Thresholds for each type of saltwater were calculated. Seawater and desalination brine caused significant mortality beginning at 56ppth and greater numbers of deformities were observed in San Joaquin River Valley saltwater. These results will aid regulators investigating the effects of hypersalinity on fish population decline.

Keywords: climate change, salinity, desalination, fish development

Poster Topic: Fish Contamination

Immunogenetic Variation in X-cell Tumor Diseased Fish across an Estuarine Gradient of Contaminants

Calvin Lee*, San Francisco State University, cal10lee@gmail.com
C. Sarah Cohen, San Francisco State University, sarahcoh@sfsu.edu

Juvenile English sole (*Parophrys vetulus*) use the San Francisco Bay Estuary (SFBE) as a nursery but are subject to environments with different sediment contaminant loads. Juveniles are susceptible to parasitic protozoans that cause skin tumors. We used molecular methods to confirm the presence of the causative pathogen, known in fish pathology literature as X-cell disease. In other regions higher incidences of skin tumors have been seen in urbanized estuaries. Contaminants in urbanized estuaries can alter adaptive immune response in flatfish. Habitat in San Pablo Bay (SPB) is less impacted by contaminants than regions in the South Bay (SB). We examine variation in Major Histocompatibility Complex (MHC) genes, which recognize parasites and diseases. We isolated the exon 2 region of the MHC class IIB genes from infected and uninfected English sole caught in the two differentially impacted regions. In other studies, contaminants and disease have been shown to be important influences on variation in the MHC. By examining fish from these two contrasting environments in SFBE, we assess how contaminants may be influencing relationships between population genetics and disease. We compare differences in the antigen binding region of the MHC protein from infected and uninfected fish in contaminated and less contaminated areas. Preliminary data from 50 individuals (27 from SPB and 23 from SB) shows high levels of allelic diversity and substitutions concentrated on inferred antigen binding sites of the protein. Selection tests using confirmed alleles show a signal of positive selection in samples from both regions of the bay combined ($dN/dS = 2.35$ $p = 0.010$, n= 14 confirmed alleles) and each separately (SPB: $dN/dS = 2.28$ $p = 0.012$, n=13, SB: $dN/dS = 2.32$ $p = 0.011$, n=10). This study will provide information on immunogenetic diversity in juvenile fish in SFBE in relation to contaminant distribution patterns.

Keywords: Immunogenetics, juvenile fish, flatfish, *Parophrys vetulus*, MHC, selection

Poster Topic: Fish Contamination