

## 2) Correlating Selenium in Sturgeon Muscle Plugs and Eggs

Oversight Group: Selenium Strategy Team  
Proposed by: Jay Davis, SFEI

**Funding requested for 2015: \$20,000**

### Introduction and Background

In April 2014 the RMP formed a Selenium Strategy Team to evaluate information needs that can be addressed by the Program in the next several years. The charge given to the Team by the RMP Steering Committee was to focus on low-cost, near-term monitoring elements that could provide information that provides high value in support of policy development and decision-making. A TMDL for the North Bay is in development by the Regional Water Board, with a staff report in preparation.

The TMDL will establish a target concentration in white sturgeon muscle tissue as the basis for evaluating impairment. White sturgeon is a bottom-feeding species that is considered to be at substantial risk for selenium exposure in the Bay (Beckon and Mauer 2008). White sturgeon are particularly at risk because their diet consists primarily of the overbite clam (*Potamocorbula amurensis*), which are selenium-rich relative to other prey (Stewart et al. 2004). Other increased risk factors for sturgeon include their longevity (they can live over 100 years), their year-round resident status, and long egg maturation times (several years) (Beckon and Mauer 2008). Green sturgeon are also considered to be vulnerable to selenium but their exposure could be limited. Adults and sub-adults spend a large portion of their lives in coastal marine waters outside of the estuary, and are only briefly exposed to high selenium diet during their infrequent spawning migrations through the Bay. In addition, green sturgeon are threatened species and fishing for them is prohibited.

White sturgeon have been routinely sampled (in 1997, 2000, 2003, 2006, 2009, and 2014) by the RMP sport fish monitoring element since 1997. The tissue analyzed has been muscle fillets. Future monitoring of white sturgeon is anticipated to focus on muscle plugs, as described in the 2014 proposal “Selenium in Sturgeon Muscle Plugs”. Sampling of sturgeon eggs, although logistically more challenging, would provide a more direct metric of the risk to sturgeon reproduction. USEPA recently published draft selenium criteria for freshwater that highlight egg or ovary data as a preferred endpoint most directly tied to adverse effects. Data that would allow evaluation of the correlation between muscle concentrations and egg concentrations would enhance the application of muscle plugs as an impairment indicator.

An annual sturgeon fishing tournament in the Delta provides an opportunity to obtain a small number of female sturgeon in 2015. In this Sturgeon Derby, held on Super Bowl weekend, anglers attempt to catch sturgeon that come closest to a selected size. Fish that are close to the target size are brought in to a central location and sacrificed. For the past several years, the USFWS has collected tissues from these sturgeon and analyzed them for a suite of metals and organics, including selenium, in gonads (including ovaries), liver, and plasma. These data have not yet been published. But the USFWS study does not analyze muscle, because the USFWS has

not requested muscle tissue from the anglers. The average number of fish that are sampled in this effort is around 40, with about half being females. Eggs will be targeted in this proposed study if possible, with ovaries as an alternative if eggs can not be sampled. If eggs are collected, stage of egg development will be noted if possible.

This proposal is requesting funds to measure selenium in muscle plugs and eggs or ovaries from the sturgeon Derby in 2015.

### **Study Objective and Applicable RMP Management Questions:**

This objective of this study is to obtain data to evaluate the correlation between muscle and egg or ovary selenium concentrations through a collaboration with USFWS, local fishermen, and USGS.

Selenium Strategy questions addressed:

2. Are the beneficial uses of San Francisco Bay impaired by selenium?

RMP Management Questions addressed:

1. Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?
  - B. What potential for impacts on humans and aquatic life exists due to contaminants in the Estuary ecosystem?

### **Study Approach**

The study would be performed in collaboration with USFWS and USGS. SFEI staff would plan the study, perform sampling, manage the data, and write a brief technical report. USGS (Robin Stewart and her team) would perform analysis of selenium and stable isotopes of C, N, and S in the plugs, and of selenium on the eggs or ovaries. The stable isotopes provide information on diet and habitat use by the sturgeon. The sampling would occur on Super Bowl weekend in 2015.

Fifteen white sturgeon muscle plugs will be collected and analyzed. Fifteen splits of their egg or ovary samples will also be obtained from USFWS for analysis by USGS.

### **Tasks and Budget**

- Planning: decide on methods, coordination
  - SFEI: \$1260 (2 days)
- Field work
  - SFEI: \$2520 (1 person, 4 “days” - the Derby is two days but goes around the clock)
- Sample processing (including archiving)
  - USGS: \$200
- Analysis
  - Selenium
    - USGS: \$4,950 (30 samples @ \$165)
  - Isotopes

- UCD: \$750 (15 samples @ \$50)
- Data management and QA
  - SFEI: \$7,350
- Reporting - short technical report to document methods and results, plot data with past data, examine correlation among tissues
  - SFEI: \$2,625 (4 days)

Total Cost: \$20,000 (rounded up from \$19,655)

## **Deliverables and Timeline**

Draft technical report	Jul 2015
Final technical report	Aug 2015

## **References**

Beckon, W. and T. Mauer. 2008. Species at Risk from Selenium Exposure in San Francisco Estuary. Final report to the USEPA. US Department of the Interior, Fish and Wildlife Service.  
[http://www.waterboards.ca.gov/sanfranciscobay/water\\_issues/programs/TMDLs/northsfbayselenium/Species\\_at\\_risk\\_FINAL.pdf](http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/northsfbayselenium/Species_at_risk_FINAL.pdf)

Stewart, R.A., S. Luoma, C. Schlekot, M. Doblin, and K. Hieb. 2004. Food web pathway determines how selenium affects aquatic ecosystems: a San Francisco Bay case study. Environ. Sci. Technol. 38. 4519-4526.