



**Exposure and Effects Pilot Study
Science Advisory Panel Meeting
San Francisco Estuary Institute
Meeting Minutes
November 22, 2005**

In attendance at the meeting:

Susan Anderson, UC-Davis Bodega Marine Laboratory
Sarah Cohen, RTC/San Francisco State University (SFSU)
Jay Davis, SFEI
Naomi Feger, SFRWQCB
Ben Greenfield, SFEI
Letitia Grenier, SFEI
Harry Ohlendorf, CH2M-Hill
Jeff Schinske, SFSU
Daniel Schlenk, UC-Riverside
Meg Sedlak, SFEI
Robert Spies, AMS
Karen Taberski, SFRWQCB
Bruce Thompson, SFEI
Steve Weisberg, SCCWRP
Don Weston, UC-Berkeley

By telephone:

Michael Fry, American Bird Conservancy

1.0 Introduction

Meg Sedlak gave an overview of goals for the meeting and described the purpose of EEPS. The goals of the meeting were to provide an update on 2005 activities that were approved in August and to discuss and approve the 2006 program elements. Ms. Sedlak distributed the most recent budget for EEPS. She also mentioned that two indicators, cormorant eggs and benthos, were being proposed for inclusion in the Status and Trends program for 2006 and 2007, respectively.

2.0 2005: Update on Fish Effects Work

Dr. Bob Spies of AMS received funding in March 2005 for a two-year research project (\$50,000 per year) to examine contaminant effects on shiner surfperch. Dr. Spies gave a status update on the project.

Summary of Research Project

The objective of the two-year study is to determine if shiner surfperch (*Cymatogaster aggregata*; Embiotocidae) show effects of contamination on some aspect of their fitness, growth or reproduction. In the second year, available information and data will be synthesized to develop the framework for understanding the relative contribution of contamination in the well-documented decline of the population in the San Francisco Estuary. In 2006, Spies and his colleagues will follow up with the field studies, initiate a laboratory study and begin to evaluate population effects.

Project status to date:

Dr. Spies highlighted the progress that has been made to date:

- Collected 36 adults in 10 seine hauls from Oakland Middle Harbor (5/9/05),
- Collected 10 fish from IEP station 106 in northern portion of South Bay (5/10/05),
- Collected 26 fish in 15 seine hauls from State Park Beach at Candlestick Park, So. San Francisco (5/11/05), and
- Collected 72 fish in 2 seine hauls at Big River estuary, Mendocino County (5/14/05).

All fish were measured, weighed, dissected, sexed, young counted, and tissues stored.

The first three sites were considered to be contaminated sites; the Mendocino site was originally the reference site, however, further research indicated that there was a creosote lumber treatment facility in the area and the site was probably not suitable as a reference site.

Preliminary observations:

- All of the fish caught in SF Bay were sexually mature. Smaller fish less than 8 grams from Big River were generally not sexually mature.
- All female fish from SF Bay were pregnant except 2 large females from Candlestick point area.
- Sex ratio more skewed in SF Bay towards females.
- The incubating juveniles from SF Bay were further developed than those of pregnant females from Big River.
- Big River was colder than SF Bay.
- All fish livers were positive for the vitellogenin antibody.
- All fish exhibited p450-1A induction.
- Fish exhibited varying EROD activity. Males in Oakland Harbor had the highest concentration, followed by the Big River site, which was somewhat of a surprise. Concentrations were the lowest at Candlestick. It could be there is some suppression of EROD activity in the Candlestick male fish.

- Zona Radiata Protein (ZRP) analyses indicated that the fish tested strongly positive for anti-herring in a 48-hour E2 injection study (estradiol) at 5 mg/kg. Dr. Spies indicated that no reliable antibody had been identified to date.

Several committee member suggested setting up a laboratory culture that would be allowed to depurate over the course of several weeks and using this as the reference site. Several individuals stated that it was difficult to identify clean reference sites (e.g., in Southern California, no water bodies have been identified that are not impacted). It was suggested that Drakes Bay could be used as a reference site; however, it was noted by others that dairy farms could be a source of estrogen compounds.

Dan Schlenk noted that there is a relationship between sexual precociousness and contaminated sediments and that the offspring from the young/immature fish tend to be less viable and therefore, there is an effect at the population level. Dr. Schlenk noted that Lyndel Johnson (NOAA Fisheries- WA) had given a particularly good summary of a paper on the effects of contaminants on English sole in the Puget Sound.

For 2005, Dr Spies proposed using SPMD passive sampler to collect contaminants; however, the panel recommended against conducting this activity, in part because it was thought that the passive samplers would not mimic actual exposure to contaminants (e.g., diet) as well as some compounds may not stick to the samplers (e.g., EDCs).

For 2006, Dr. Spies proposed:

- Carrying out field sampling and developing a reference site. The panel recommended that this be a laboratory culture.
- Testing plasma for ZRP.
- Emphasizing analyses for EDC.
- Continuing to examine fish for effects, sex ratios, egg proteins in males, and possible sex reversals.

3.0 2006: Update on Possible Tern Injection Studies

Funding for an egg injection study was allocated at \$50,000 for 2006. Letitia Grenier outlined recent discussions she had had with avian research groups and presented several research proposals for discussion.

It appears unlikely that EEPS will be able to piggy-back off of studies conducted by the USFWS as part of a larger CalFed grant (Adelsbach and Schwarzbach) as this group was unable to collect tern eggs from a colony in Washington this year due to a lawsuit. Terry Adelsbach is looking into the possibility that tern eggs could be collected from San Diego bay, a site with little mercury contamination. However, it is possible that the San Diego site may be contaminated by other pollutants.

Letitia queried the group as to whether common terns could be used as a surrogate for those species that are native to the Bay (the common tern is not). Dr. Grenier indicated that Gary Heinz at the USGS Patuxent Wildlife Research Center and Maryann Ottinger

of University of Maryland are interested in collaborating on this project. Another advantage of this project is the eggs would not need to be shipped from the west coast to the east coast research laboratories. The CalFed researchers have had some difficulty with eggs breaking and failing to hatch when they are shipped across the country. David Hoffman is currently investigating whether clean common tern eggs can be found. Both Michael Fry and Harry Ohlendorf felt that the common tern was closely enough related to the Forster's tern that an egg injection study would be useful. The Regional Board is particularly interested in PBDEs and effects. Letitia will pursue this study idea and keep the advisory panel informed through e-mail.

Letitia presented several other ideas including: supplementing the existing USFWS and USGS tern monitoring, likely by providing funding for organics; monitoring organics in small forage fish for piscivorous birds; and monitoring Hg in song sparrows in tidal marshes. Karen Taberski was very interested in the small fish study; this item was discussed later in the day as part of the small fish discussion. The committee was less enthusiastic about pursuing research on song sparrows as it is not clear that the RMP is currently tasked with monitoring in Bay marshes. It is possible that with the advent of the South Bay Salt Pond restoration project that this may change.

4.0 2005: Update on the Small Fish Project

Ben Greenfield summarized the research that has been conducted to date on small fish. This project was approved in August of 2005 at a funding level of \$50,000 for 2005, \$40,000 for 2006 and \$40,000 for 2008. The goal of the research is three-fold:

- to characterize mercury concentrations in small fish as a means for identifying spatial and temporal patterns in the Bay;
- to characterize exposure of small fish for later use in bioaccumulation modeling; and
- to understand the impact of marsh restoration on bioaccumulation of Hg in small fish .

The project is targeting eight sites for both benthic and pelagic species. Four sites are located at areas slated for wetland restoration; four are located at extant tidal marshes or beaches. Samples from 2 - 4 additional sites in the deeper waters of the Bay will be collected by IEP and used for this study. Four composites for each species from each site are collected; each composite with 5 -10 individuals. Six of the eight sites have been sampled.

Karen Taberski indicated that the State Board is interested in funding a small fish study focusing on mercury. It is possible that this work could be conducted by EEPS and the existing funding that is being used to analyze for mercury could be used to analyze for organics.

There was some discussion about the size range of fish that piscivorous birds such as herons eat. Terry Adelsbach has data on this.

Susan Anderson commented that she was not previously aware of EEPS work on the Bay margins and is very interested in collaborating with EEPS. Dr. Anderson is particularly active in the PEEIR (Pacific Estuarine Ecosystem Indicator Research Consortium). She would like to give a presentation at the EEPS meeting and potentially show the models that she has developed to the SFEI staff.

5.0 2006: Benthos

Bruce Thompson presented a detailed plan for assessing archived material in 2005 and a more general plan for studies related to benthos for 2006. The \$6,000 allocated for analyses of archived benthic material collected in 1999 and 2003 will be used to characterize four of the 18 samples that need to be characterized. This work will be conducted by City and County of San Francisco by Mike Kellog. SFEI is in the process of developing a contract for this work.

Approximately \$40,000 per year for the next three years has been allocated to benthos studies. As background, Bruce Thompson mentioned that the Sediment Quality Objectives are scheduled to be promulgated in 2007 and that the EEPS benthos project would be used to validate the threshold effects and to better understand contaminant gradients in the Bay. Dr. Thompson stated that the causes of sediment toxicity and benthic impacts have not yet been identified in most Bay locations. Therefore, a second objective of this study is to identify contaminants or mixtures that are causing toxicity.

This work would be coordinated with other on-going projects in the RMP including the episodic toxicity monitoring and the core status and trends sampling program (e.g., sediment toxicity).

Dr. Thompson anticipates developing a workplan by April of 2006 with sampling to commence in Fall 2006.

7.0 2007/2008: Hg in Clapper Rails

Letitia Grenier presented two possibilities for research on clapper rail Hg exposure. One option would be a field study of trophic ecology and mercury exposure. This would be a collaboration with the Invasive Spartina Project and USGS. The goal of the study would be to characterize the clapper rail food web and mercury exposure in rail tissues (feathers, possibly blood) in order to identify a key prey species as a monitoring tool for clapper rail Hg exposure. This study would use stable isotopes (C, N, possibly S) to characterize food web structure. The USGS study would use radiotelemetry to monitor rail behavior (use of space and habitats) with respect to Spartina treatment. It was agreed that terns could not be used as a surrogate for rails as they forage in different areas.

A second option would be to study mercury exposure in rail fail-to-hatch eggs. If the permits could be obtained, nests could be monitored as a piggy-back study to rail surveys

early in the breeding season. Avocet Research Associates and the Point Reyes Bird Observatory are currently conducting a comprehensive survey of California clapper rails.

Dr. Ohlendorf stated that it could be informative to conduct a trophic study. He did not feel it would be worthwhile for EEPS to look at fail-to-hatch eggs.

9.0 Summary of Panel Members Closed-Door Meeting: Studies for 2005 and Discussion of Studies for 2006 and Beyond

The panel members met amongst themselves to discuss the projects. After this meeting, Steve Weisberg summarized the findings of the internal meeting. Overall, the panel indicated that none of the project explicitly tied back to the conceptual framework that was developed in 2004 and that more of an effort needed to be made to demonstrate how the projects related to the framework.

Fish Effects

The panel approved of the project and felt that the top-down approach was correct (population level to molecular effects). They had concern though about whether an appropriate reference site had been identified and recommended that Spies develop a laboratory culture or at a minimum hold fish for at least 30 days to allow them to remove some of the chemical burden. The panel also recommended against spending a lot of funding on chemistry (e.g. SPMDs and analyses). They felt it was more important to understand the biological effects and to determine that there were impacts before spending significant funds on chemistry. Dr. Weisberg stated that it is possible that the fish work will need more funding in the future and that the EEPS workgroup would need to think carefully about which studies will work.

Small Fish

In general, the panel was very supportive of this project and recommended that SFEI staff begin to develop a coherent argument for inclusion of this work into the status and trends program. The panel felt that it needed to be articulated as to how this was more than a monitoring study, connecting it to higher trophic level studies and abiotic monitoring.

Birds

The panel supported the decision to pursue research on egg injections in the common tern and recommended that PBDEs be the chemical of choice based on regulatory priorities.

Clapper Rails

The panel felt that the Regional Board needs to decide whether the RMP should conduct work in marshlands. If so, then the EEPS panel felt it would be worthwhile to pursue the trophic ecology and Hg exposure study that Letitia Grenier presented.

Benthos

The panel felt one of the most likely indicators to move into the RMP would be benthos. However, they felt that there needed to be a wider acceptance of the sediment quality objectives and indices before this could occur. They felt that a process needed to be developed to achieve consensus on the idea of indices. The panel recommended that Bruce use existing databases to develop indices.

10.0 Wrap-up and Adjournment

A meeting will be scheduled for Spring of 2006. The meeting was adjourned at 3:10 pm.