Assessment of Bioaccumulation Risks in San Diego Bay: Study Overview

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Workshop Agenda

- Study overview – Steve Bay
- Results summary – Steve Bay
- Wildlife risk – Katie Zeeman
- Human health risk – Steve Bay
- Next steps and perspectives
Many Partners

- SCCWRP
- USFWS
- San Diego Water Board / State Water Board
- San Diego State University
- San Diego Regional Harbor Monitoring Program (RHMP)
  - Amec Foster Wheeler
  - Port of San Diego
  - City of San Diego
- Bight ‘13 Regional Monitoring Program
Bioaccumulation Importance

- Many contaminants accumulate in organisms and biomagnify through the food chain (PCBs, DDT, mercury, selenium)

- Impacts to wildlife (birds and mammals) and human health are of high concern

- Regional contamination and wildlife impacts have improved over time in So. Calif., but many data gaps remain
  - Local conditions (e.g., San Diego Bay)
  - Contaminants of emerging concern (e.g., PBDE flame retardants)
  - Trends over time
Bioaccumulation Importance (Cont.)

- Elevated concentrations still exist in fish within harbors and bays
- San Diego Bay has a diverse environment supporting a wide variety of beneficial uses
San Diego Bay Bioaccumulation Study

Three major study elements

1. Food web contamination patterns
   - What are current levels of food web contamination?
   - Do conditions vary among Bay regions?

2. Potential risk to wildlife

3. Potential risk to human health

Integrated data from new and ongoing programs

- Regional monitoring
- Special studies

Supplemented by Water Board funding

Sampling in 2013 - 15
1. Food Web Contamination Study

- Combined efforts of three programs to conduct a comprehensive study of food web contamination
  - Bight ‘13 regional monitoring program
  - Regional harbor monitoring program
  - Shallow water habitat survey

- Sampling in 2013 and 2014

- 2 Primary objectives
  - Document contaminant transfer through San Diego Bay food web elements
  - Describe variations among Bay regions
2013 So. Calif. Bight Regional Survey

- Cooperative regional monitoring survey every 5 years to assess coastal contaminant trends and impacts
  - Sediment contamination impacts primary focus

- 2013 Survey included regional assessment of bird egg contamination
  - Additional studies of food web contamination in San Diego and Newport Bays

- Partnership with 2013 regional surveys provided a unique opportunity to investigate bioaccumulation processes in San Diego Bay
Bight ‘13 Regional Monitoring Program

Sediment chemistry
Sediment toxicity
Benthic macrofauna community condition
Fish community condition
Regional Harbor Monitoring Program

- Collaborative assessment of environmental conditions in harbors regulated by San Diego Water Board
  - San Diego Bay, Mission Bay, Oceanside Harbor, and Dana Pt. Harbor

- Coordinated with Bight ‘13 to enhance San Diego Bay sampling
  - Food web sampling and chemical analysis
  - Additional sediment sampling and chemical analysis
Shallow Water Habitat and Plankton Surveys

- Funding from City of San Diego to fill sampling gaps
  - Shallow areas important for bird foraging and fish habitat
  - Plankton collection

- 2014 Sampling
Sediment

- Three bay subregions
  - North, Central, South
  - Surface sediment
- Different habitats and uses
  - Marina, Port
  - Open bay, shallow
Sediment Sampling

Photos courtesy of Amec Foster Wheeler
Tissue

- Multiple food web elements
- Matched sediment and biota samples from each region
- Includes shallow and deep areas
Fish Sampling

Photos courtesy of Amec Foster Wheeler
Catch Examples

California halibut

Spotted sand bass

Anchovy

Topsmelt

Molluscs

Crustaceans

Polychaetes

Photos courtesy of Amec Foster Wheeler
Species Summary

Pelagic Fish and Invertebrates
- Anchovy
- Topsmelt
- Mackerel
- Zooplankton

Sediment-Dwelling Invertebrates
- Polychaetes
- Mollusks
- Crustaceans

Bottom Fish
- Barred Sand Bass
- Spotted Sand Bass
- California Halibut
- Perch
- Stingray
- Gobies
- Killifish
Bioaccumulation Pathways

**Water Column**
- Plankton-feeding fish: anchovy, topsmelt, mackerel

**Sediment**
- Bottom-feeding fish: bass, halibut, perch, stingray
Chemical Analyses

Sediment
- Trace metals
  - 15 metals including mercury, selenium, copper, lead, and zinc
- Trace organics
  - PCB congeners
  - DDTs and other pesticides
  - Petroleum compounds (PAHs)
  - Flame retardants (PBDEs)
- Total organic carbon
- Particle size

Tissue
- Trace metals
  - Mercury
- Trace organics
  - PCB congeners
  - DDTs, Chlordanes, dieldrin
  - PAHs (some samples)
  - PBDEs and other CECs
- Lipid

Data will be publicly available
2. Wildlife Risk Study

- Sampled eggs at 5 locations in San Diego Bay
  - Subset of 12 sites studied for Bight ‘13
  - Collect abandoned eggs at end of nesting
  - Analyzed for Chlordanes, PCBs, DDTs, PBDEs, Hg

- Four species representing different life history/feeding strategies

- Sampling in 2013

- 2 types of risk analyses
  - Egg contamination and risk to offspring
  - Diet contamination and risk to adults
Target Species

Pelagic forager: Caspian Tern

Benthic forager: Cormorant

Mixed forager: Western Gull

Species of special concern: CA Least Tern
Exposure Pathways

Mid-size Fish

- consumers of medium-size fish - pelicans, Cormorants, sea lions, large terns, humans
- medium size demersal fish - sand bass, halibut, perch, stingray
- bottom feeding bird - scoter
- shorebirds - plover, peeps, curlew
- large infauna - clams, mussels
- large epifauna - lobsters, crabs

Small Fish

- consumers of small (forage) fish - skimmers, grebe, small terns, humans
- Small-medium pelagic fish - topsmelt, anchovy, mackerel
- herbivores - wigeon, sea turtle
- aquatic vegetation - seagrass, algae

Sediment/Detritus and Sediment/Porewater
2013 Bird Egg Sampling Locations
San Diego Bay Nest Sites

Lea Squires

Brian Collins/USFWS
So Calif Bight Bird Nesting Sites

- Pismo Beach
- Vandenberg

- Pt Mugu
- Anacapa Isl
- LA Harbor
- Bolsa Chica
- Santa Barbara Isl
- Lindbergh Field
- NAS North Isl
- Dstreet Fill
- Chula Vista
- Salt Works
- TJ Estuary

= Western gull
★ = CA least tern
= Multiple species
3. Human Health Risk Study

- Collected samples of common sport fish
  - Spotted sand bass, halibut, topsmelt, round stingray
  - PCBs, DDTs, chlordanes, dieldrin

- Sampling in 2014 and 2015
  - Boats, piers, and shore

- 2 types of analyses
  - Comparison to seafood advisory tissue levels
  - Evaluation of potential cancer risk and linkage to sediment contamination
Sampling Methods

- Collected fish using typical methods
  - Rod and reel
  - Boats and public access shore locations
- Included undersize fish
  - Halibut
  - Spotted sand bass
- Multiple sampling events
  - Guided boat fishing
  - Fishing derby

San Diego Bay Fishing for Science Derby
Saturday, June 6th

Free!

For More Info: 858-775-5547

Presented by:
San Diego Regional Water Board & Partners

San Diego Bay

Location: Four check-in tents around SD Bay
Orientation required to participate
- Shelter Island Pier
- Embarcadero S. Pier
- Pepper Park
- Silver Strand (Crown Cove)

Launch Time:
Check-in & Orientation 6:30AM
Fishing 7:00AM—2:30PM
Awards/Raffle 2:30PM

Registration:
100% FREE! Email corey.sheredy@amecfvu.com or check-in day of
Register early to secure your free swag bag & raffle tickets!
Spaces are limited

Prizes:
Biggest Target Fish & Raffle Draw

Donate your fish to support a human health risk assessment of San Diego Bay.
Sportfish Sampling
Sport Fish Sample Locations

- Chemical analysis for PCBs, DDTs, mercury, Chlordanes, and dieldrin

- Composites of 5 fish
  - Individual halibut
  - Fillet or whole body (depending on size)
Study Products

- Final report
  - Draft report available from Water Board
  - External peer review in progress

- Project data
  - CEDEN (in progress)
  - Project data set (in preparation)
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