Reducing Methylmercury Accumulation in the Food Webs of San Francisco Bay and Its Local Watershed

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Interesting Case Study: Features Typical of Estuaries

- Sediment retention
- Dense population
- Urban and industrial
- High productivity
- Food web contamination
Interesting Case Study: Atypical Features

- Mining legacy
- Lack of local atmospheric sources
- Unusual speciation
- Erosional sediment regime
- Extensive wetland restoration
- Not eutrophic
- Thorough monitoring

Mining legacy Hg matters

- Isotopes
- Spatial patterns
- Even Hg in cinnabar and related forms makes it into the food web
- Sediment from historic mining regions is clearly a concern
- Elemental Hg from gold mining, urban/industrial, and atmosphere is also important

Fluvial inputs of THg should be controlled

Atmospheric deposition is a secondary concern

THg in Sediment

- 2002-2009
- 378 data points
- Average 0.25 ppm
- Regional variation

There is a lot of THg in circulation and it is thoroughly mixed
MeHg in Sediment

- 2002-2009
- Average 0.5 ppb
- Contrasting regional pattern to THg

Internal net MeHg production dominates the mass budget and is another possible intervention point
Habitats

- Open Bay
- Tidal Marsh
- Managed Pond
- Reservoir
MeHg production varies by habitat

And so does degradation
Open Bay: Risk Indicator

Mercury in Striped Bass

San Francisco Bay
New Jersey
South Carolina
Chesapeake Bay
Narragansett Bay
Louisiana
Open Bay: Risk Indicator

Mercury in Striped Bass
1971-2009
Open Bay: Possible Knobs

- **Elective strategies**
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Nutrient control?

- **Non-elective changes**
  - Suspended sediment regime
  - Temperature change
  - Sea level rise
  - Food web shifts
Open Bay: Non-elective Change

Suspended Sediment (mg/L)

MeHg in Water (ng/L)
**Tidal Marsh**

**Risk Indicators**

**Knobs**

- **Elective strategies**
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Design of restored marshes

- **Non-elective changes**
  - Temperature change
  - Food web shifts
Managed Pond

Knobs

- Elective strategies
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Pond management
    - Pond placement

- Non-elective changes
  - Temperature change
  - Food web shifts

Reservoir

**Knobs**

- **Elective strategies**
  - Slow knobs
    - THg inputs: mining region runoff, urban runoff
  - Faster knobs
    - Water management
    - Water chemistry
    - Fishery management

- **Non-elective changes**
  - Temperature change
  - Food web shifts
To be submitted to
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