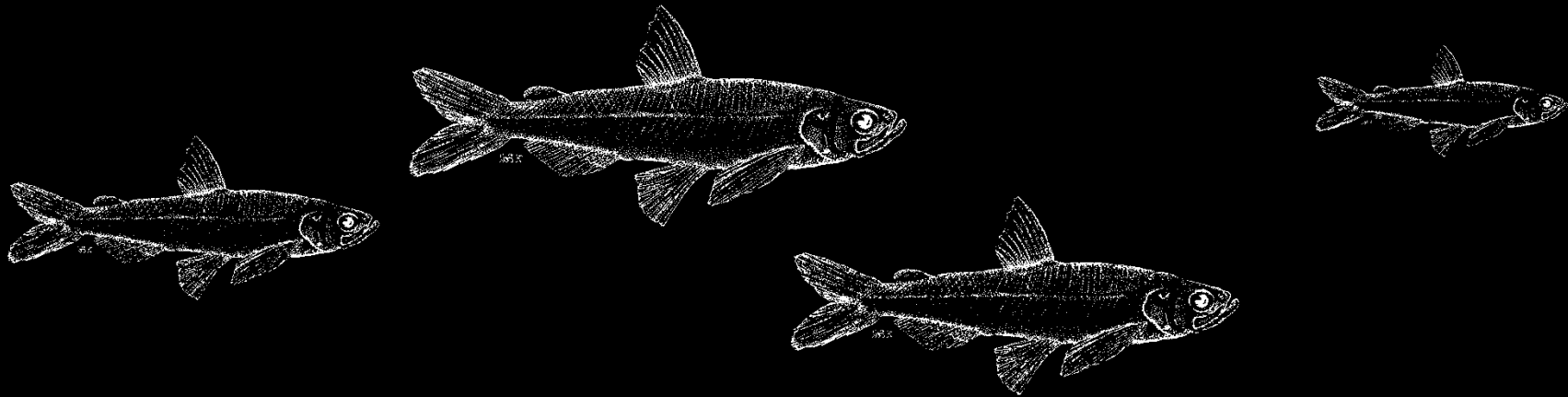


What do contaminants have to do with it? Lessons learned from the Pelagic Organism Decline investigations into contaminant effects on fishes and their food web



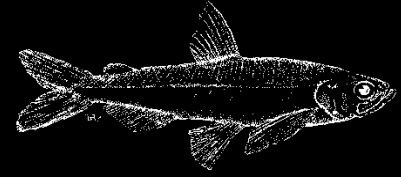
Randall D. Baxter

California Department of Fish and Wildlife
Bay-Delta Region

Bay-Delta Science Conference, October 28-30, 2014



Take Home Message:



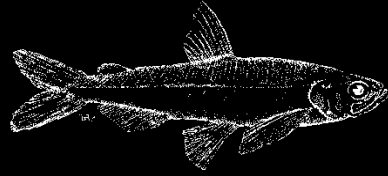
Contaminant effects -- ongoing complex concern best addressed by a multidisciplinary and multi-pronged approach.

Get involved!

Contaminants PWT - Stephanie Fong
or thru IEP Website

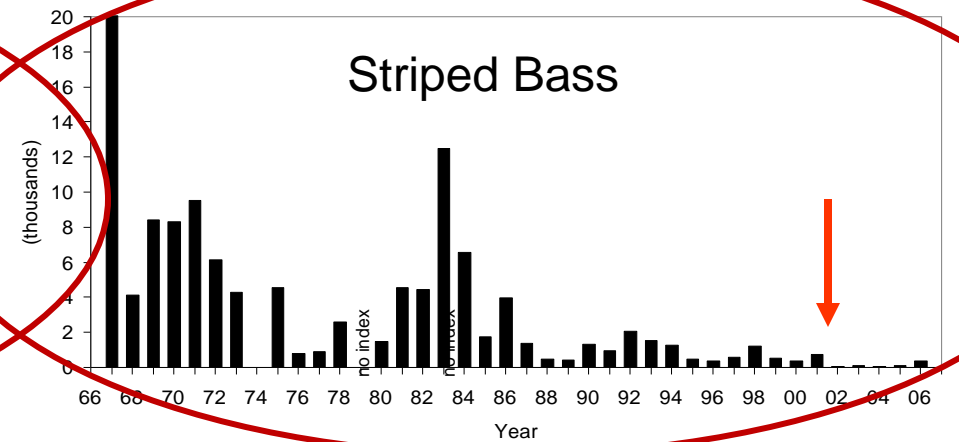
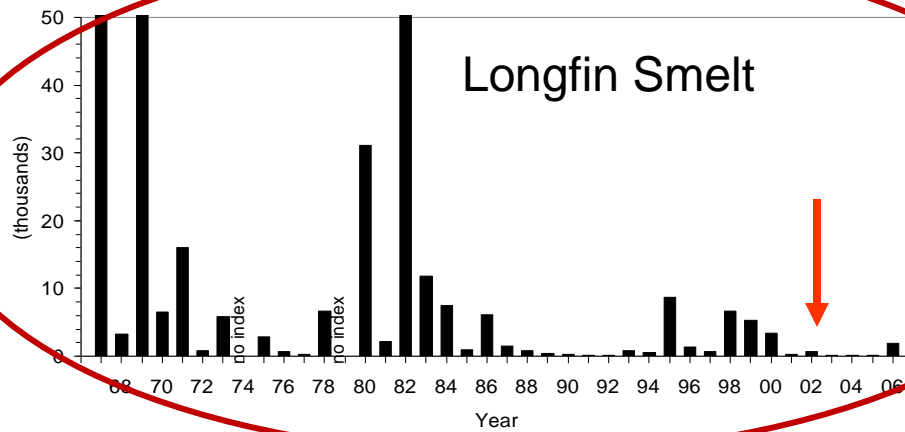
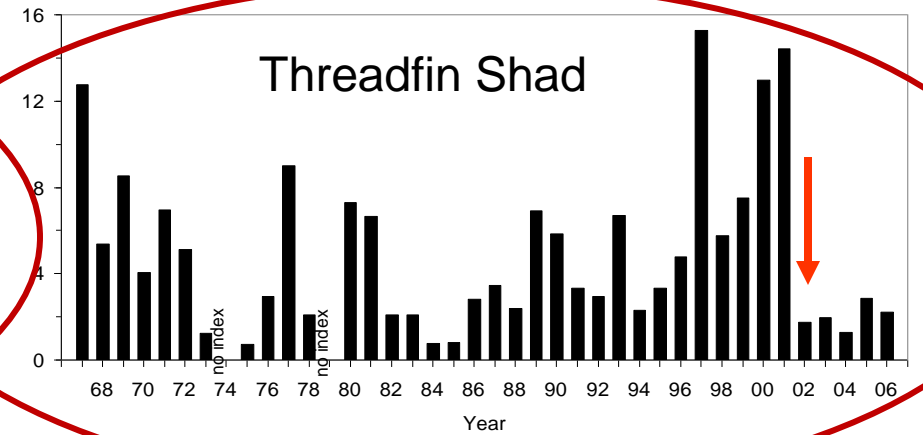
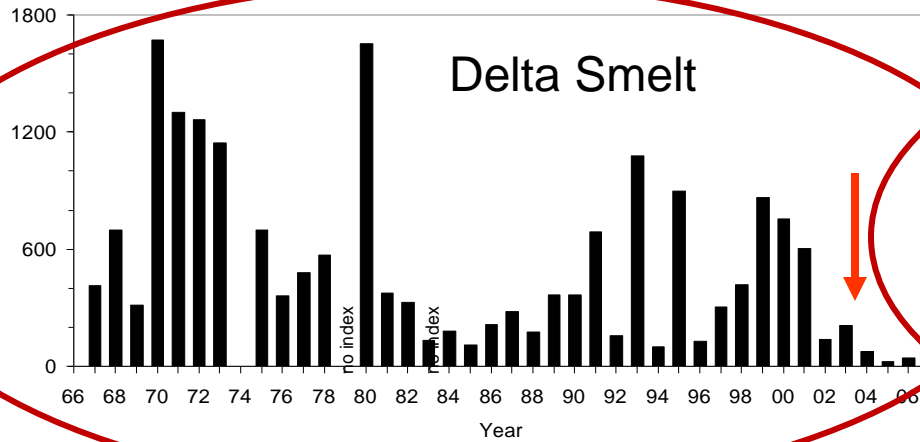
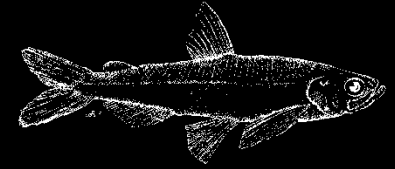
<http://www.water.ca.gov/iep/activities/teams-iep.cfm>

Outline



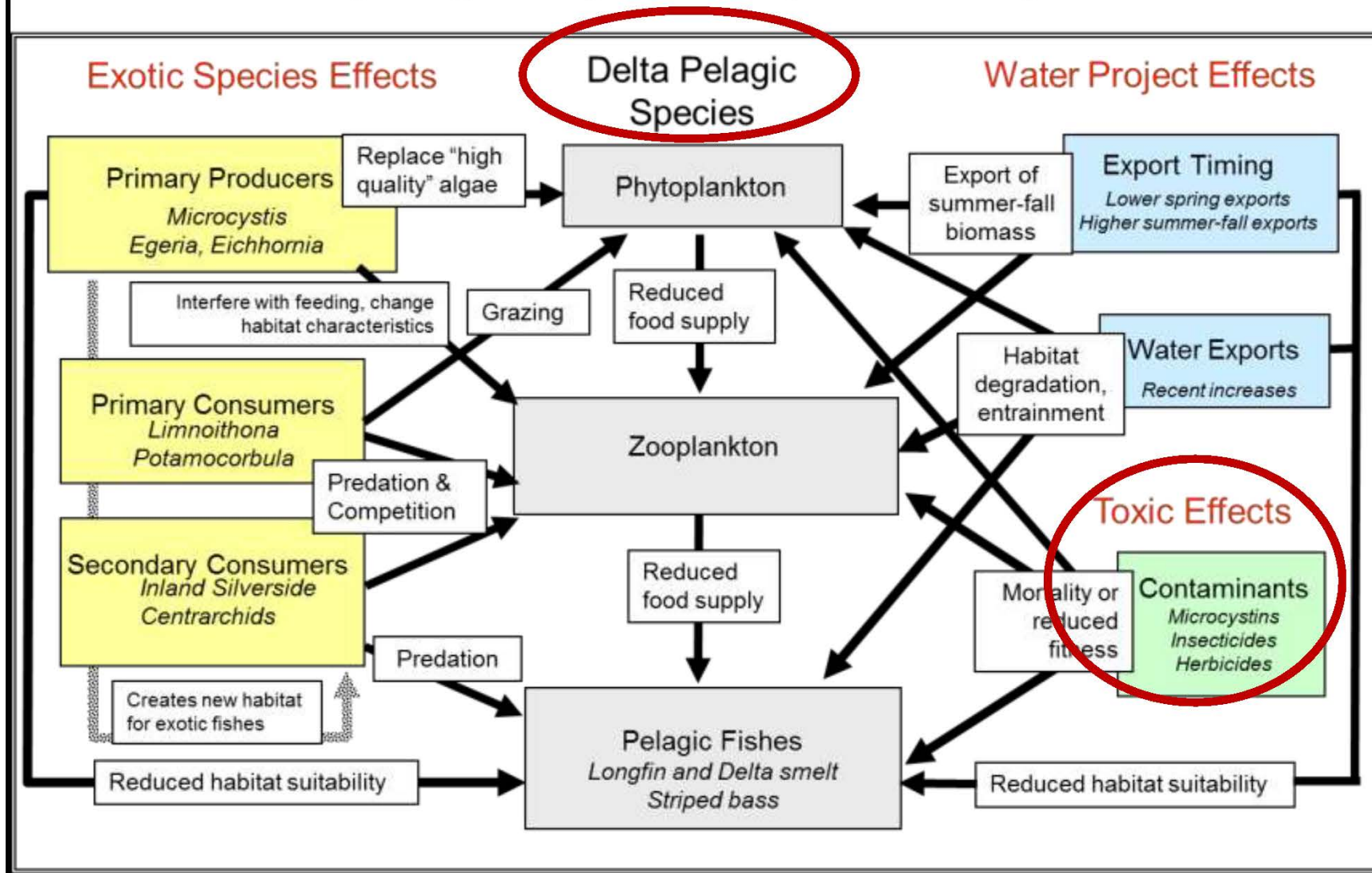
- Pelagic Organism Decline
- Conceptual models & contaminant studies
- Project work-teams - the village
- Some Lessons - sampling & logistics, in the lab
- Read more about it...

Pelagic Organism Decline (POD) Fishes ... very different life histories

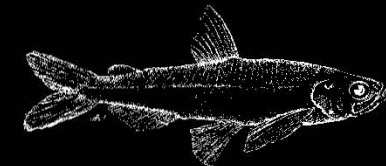
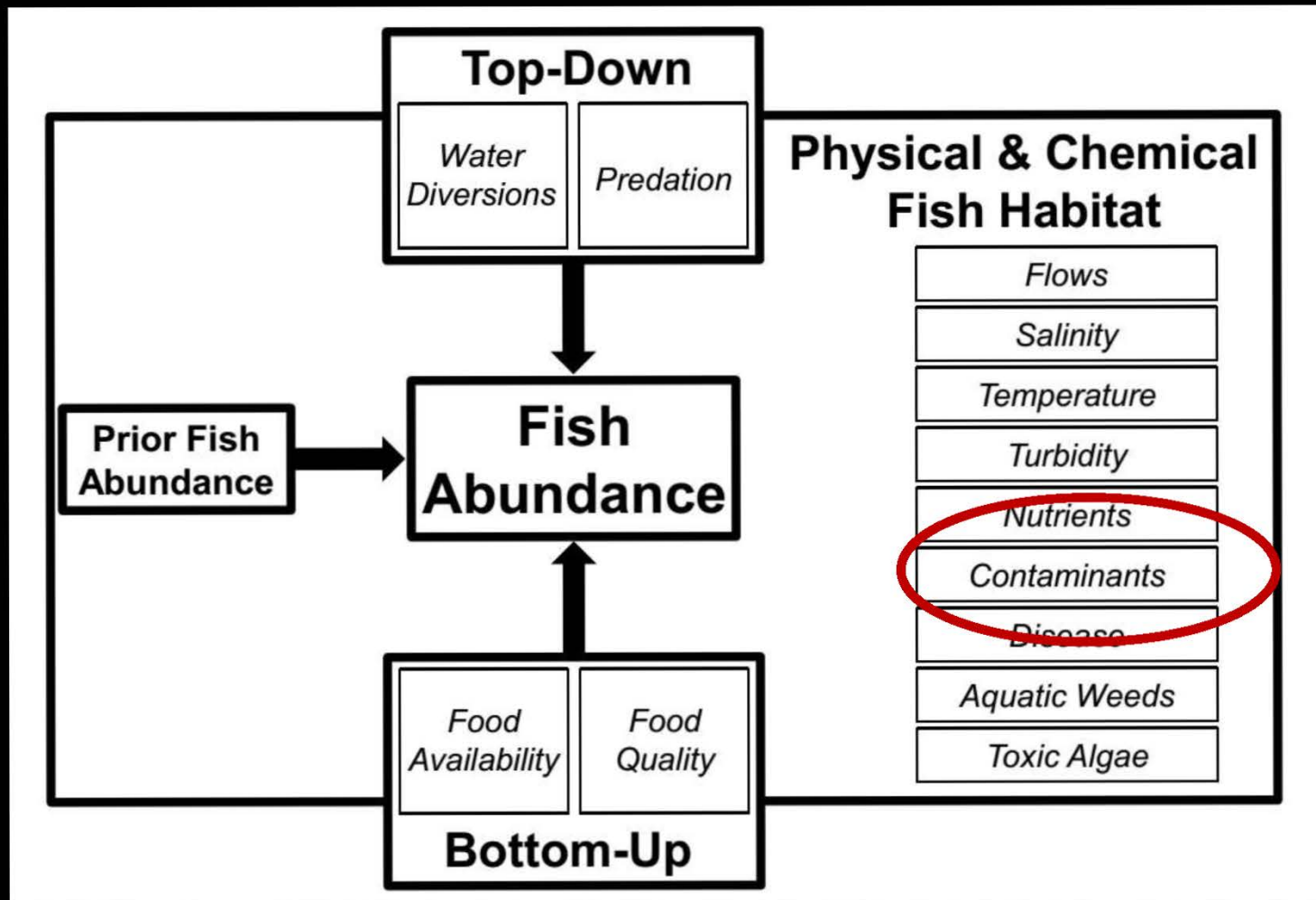


1st POD conceptual model included contaminants...

Conceptual Model for step change in pelagic organisms (2002-2004)



POD conceptual model evolved into...

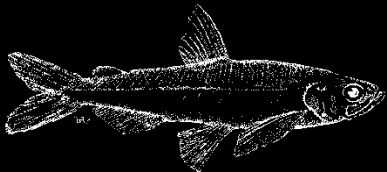


Project development - project work-team (PWT)

POD PWT -> conceptual model

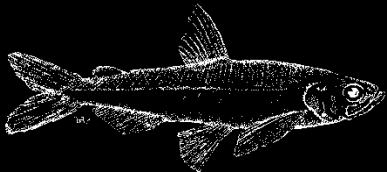
Contaminants PWT

- discussed and developed approaches,
- proposed and conducted work,
- discussed prelim results...



POD PWT -> 3 prong approach

1. Field Sampling : a) locate sensitive life stage(s); b) collect water samples for toxicity testing; c) measure other stressors
2. Lab Work: a) bioassays w/ambient water; b) toxicity testing w/contaminants obs.
3. Modeling: a) to link varied measures; b) to understand processes; c) ??

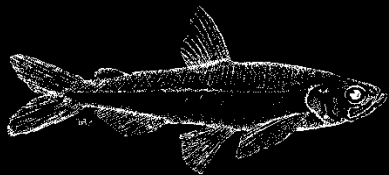
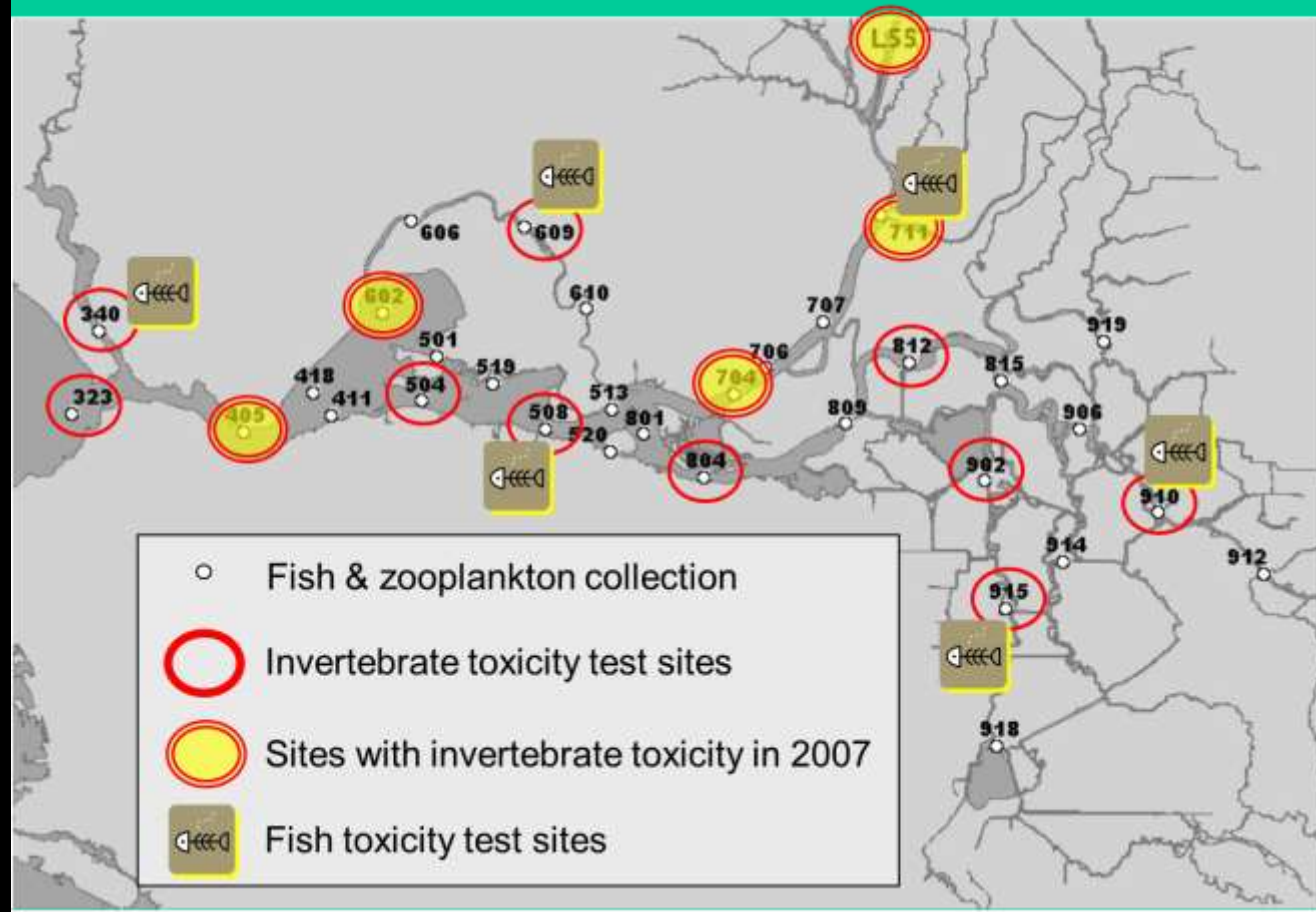


Field Sampling - Toxicity (DFW & UCD)

Use long-term fish survey sampling locations & DFW boats & operators

Sub-sample locations for toxicity

POD water toxicity sampling (Inge Werner, UCD)

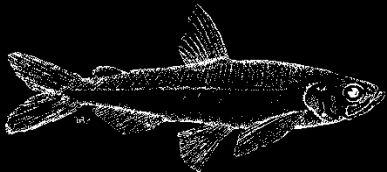


Field Sampling - lessons (re)learned

Water's heavy -- limited container size.

Glass breaks - necessary to use single use poly containers

Over-loaded boats sink - water weight controlled logistics

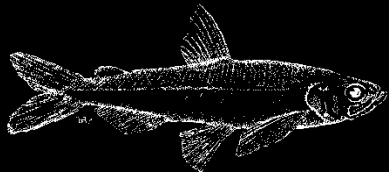


Lab Work (UCD)

Bioassay - ambient water 7 & 10-day static renewal w/ invertebrates, Delta Smelt

Positive bioassay -> Toxicity Identification Evaluation -> chemical analysis

Comparative sensitivity to chemical stressors

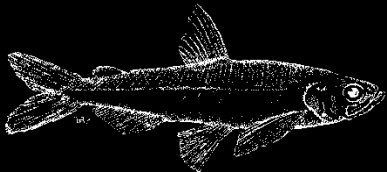


Lab Work -- Selected Results

Bioassay - Amphipod

Acute mortality -- 5.6% of 693 ambient water samples 2006-2007, 0.5% of 752 samples collected 2008-2009

Growth reduction w/PBO - 10.1% and 13.3% in 2006-2007 and 2008-2009

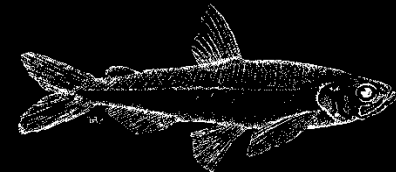


Lab Work -- Selected Results

Comparative sensitivity to chemical stressors - Delta Smelt vs Fathead Minnow

Exposed to: copper, total ammonia, OP insecticides chlorpyrifos and diazinon, and pyrethroid insecticides bifenthrin, cyfluthrin, esfenvalerate and permethrin

Delta Smelt were 1.8 to > 11 x more sensitive to copper, ammonia and all insecticides except permethrin



Lab Work -- Selected Results

Important result an artifact of the bioassay process—

Delta Smelt larvae sensitive and stressed by high and low EC and low turbidity



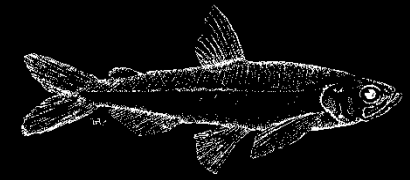
"While four years of biweekly water toxicity tests have provided evidence for sporadic direct, acute toxicity, the majority of contaminant effects are likely sublethal and/or mediated by the food web (Scholz et al. in review, Brooks et al. in review)

Source Baxter et al. 2010

Read more about POD and contaminants investigations at:

<http://www.water.ca.gov/iep/pod/>

Take Home Message:



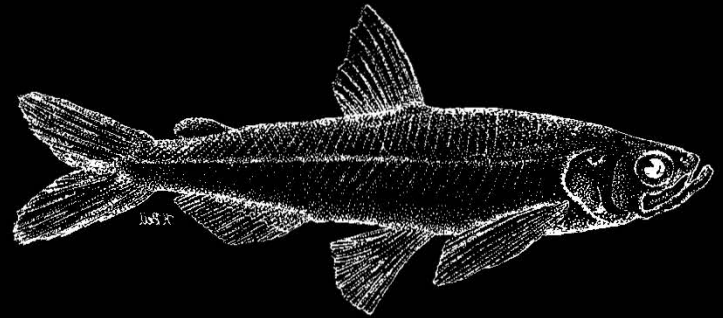
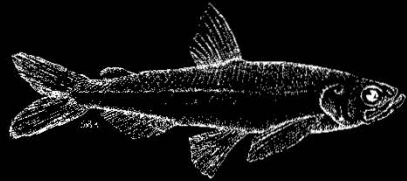
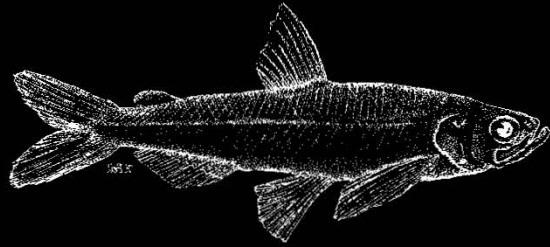
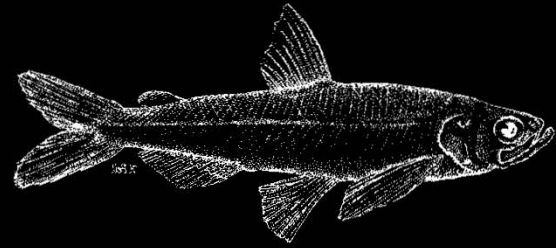
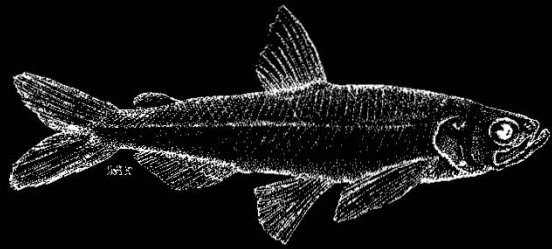
Contaminant effects -- ongoing complex concern best addressed by a multidisciplinary and multi-pronged approach.

Next focus area - restored tidal wetland habitats

Get involved!

Contaminants PWT - Stephanie Fong
or thru IEP Website

<http://www.water.ca.gov/iep/activities/teams-iep.cfm>



Reference: <http://www.water.ca.gov/iep/pod/>

Baxter, R., R. Breuer, L. Brown, L. Conrad, F. Feyrer, S. Fong, K. Gehrts, L. Grimaldo, B. Herbold, P. Hrodey, A. Mueller-Solger, T. Sommer, and K. Souza. 2010. Interagency Ecological Program 2010 Pelagic organism decline work plan and synthesis of results through August 2010. Interagency Ecological Program for the San Francisco Estuary.

Brooks, M. L., E. Fleishman, L. R. Brown, P. W. Lehman, I. Werner, N. Scholz, C. Mitchelmore, J. R. Lovvorn, M. L. Johnson, D. Schlenk, S. van Drunick, J. I. Drever, D. M. Stoms, A. E. Parker, and R. Dugdale. 2012. Life histories, salinity zones and sublethal contributions of contaminants to pelagic fish declines illustrated with a case study of San Francisco Estuary, California, USA. *Estuaries and Coasts* DOI 10.1007/s12237-011-9459-6:19 pages.

Werner, I., D. Markiewicz, L. Deanovic, R. Connon, S. Beggel, S. Teh, M. Stillway, and C. Reece. 2010. Pelagic Organism Decline (POD): Acute and chronic invertebrate and fish toxicity testing in the Sacramento-San Joaquin Delta 2008-2010, Final Report. Aquatic Toxicology Laboratory, School of Veterinary Medicine, University of California Davis, Davis, CA. 115 pages plus appendices