CONTAMINANTS IN SPORT FISH OF CALIFORNIA LAKES AND RESERVOIRS

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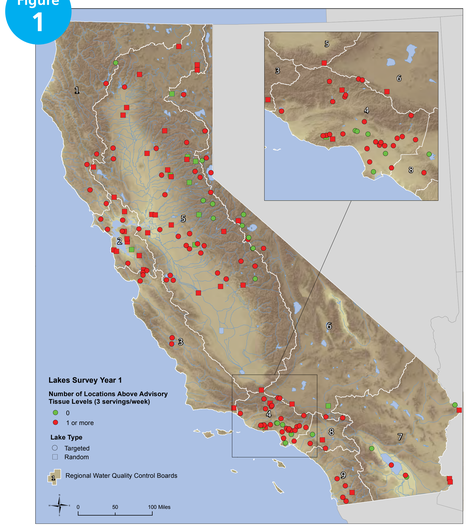
Abstract

The California State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP) has established a new statewide bioaccumulation monitoring program. The program has begun with a two-year screening survey of bioaccumulation in California's 9,000 lakes and reservoirs in 2007 and 2008. The program plans to perform a two-year survey of the coast in 2009 and 2010, and survey of rivers and streams in 2011. The cycle will then be repeated in 2012. The lakes survey includes two major components: 1) a probabilistic sampling of 50 lakes to provide a statewide assessment of condition and 2) sampling of the state's 200 most popular fishing lakes to determine the need for inclusion on the 303(d) list of impaired waters. Species targeted at each lake include a top predator as a mercury indicator and a high-lipid benthic species as an indicator for organic contaminants. Largemouth bass, carp, and catfish were the species most commonly sampled. Mercury analyses in predator species were performed on individual fish. A compositing strategy was used for other contaminants to maximize use of limited resources. Edible muscle was analyzed. Samples were collected from a single location in small lakes (< 500 ha) and multiple locations in larger lakes. Contaminants analyzed included mercury, selenium, PCBs, organochlorine pesticides, and PBDEs. Mercury was measured in individual fish from 98 lakes sampled in 2007. Preliminary data indicate that eleven lakes had fish with maximum mercury concentrations above 1.5 ppm, 23 with fish above 1 ppm, 66 with fish above 0.5 ppm, 84 with fish above 0.2 ppm, and 96 with fish above 0.1 ppm. None of the lakes had an average selenium concentration above 3.9 ppm. A summary of data from the first round of sampling in the summer of 2007 will be presented.

Methods

- In the first year of this screening study (2007), over 6000 fish from 18 species were collected from 152 lakes and reservoirs in California.
- Targeted sampling of "popular" lakes comprised the bulk of the year 1 effort (102 of 152), with the remainder comprising a random sampling.
- Results were compared to new sets of thresholds ("Fish Contaminant Goals" and "Advisory Tissue Levels") developed by the California Office of Environmental Health Hazard Assessment (Klasing and Brodberg 2008).
- Further details on methods are available in Davis et al. (2008).

Figure 1



Findings

- 29 of 152 lakes (19%) tested "clean" (all species averages below all thresholds) (Figure 1).
- 81% had a species average above a threshold. Mercury was the main problem at most of these lakes.
- For mercury (Figure 2), 26% of the lakes were in the no consumption range (>0.44 ppm), 50% above 0.22 ppm, 60% above 0.15 ppm, and 74% above 0.07 ppm.
- Mercury concentrations were low in some Sierra Nevada and southern CA lakes (Figure 3). Mercury is a problem across the entire state, not just in the well-known mining-impacted areas of northern California.
- Species distribution has a big influence on mercury concentrations. Concentrations in standard-size (350 mm) largemouth bass provide a clearer picture of spatial patterns. Only one lake in northern California and three lakes in southern California were below all thresholds.
- For PCBs (Figure 4), 1% of lakes were in the no consumption range (120 ppb), 7% above 42 ppb, 12% above 21 ppb, and 44% above 3.6 ppb.
- PCB concentrations were relatively high across the south, and elevated in some lakes in the north.
- PBDEs (Figure 5) were found in many lakes throughout the state, but were generally higher in southern California.

Figure 2

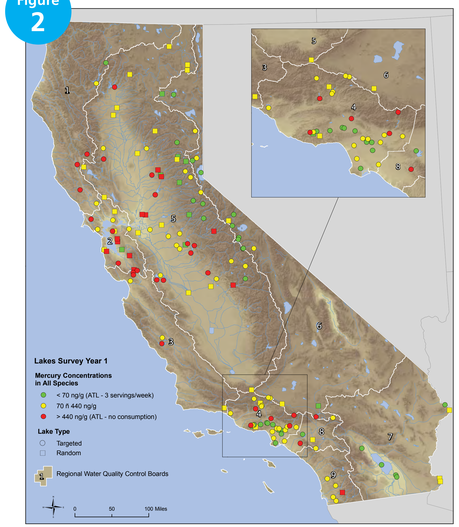


Figure 3

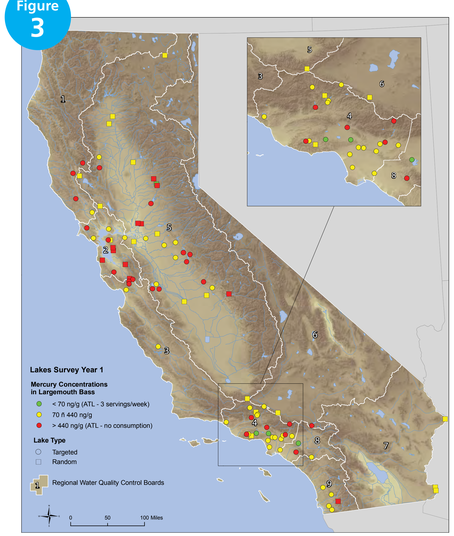


Figure 4

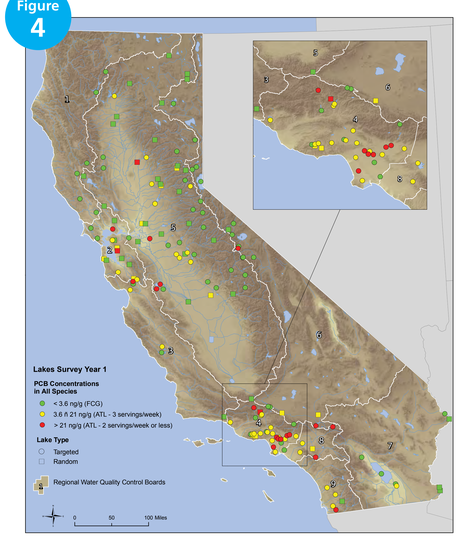
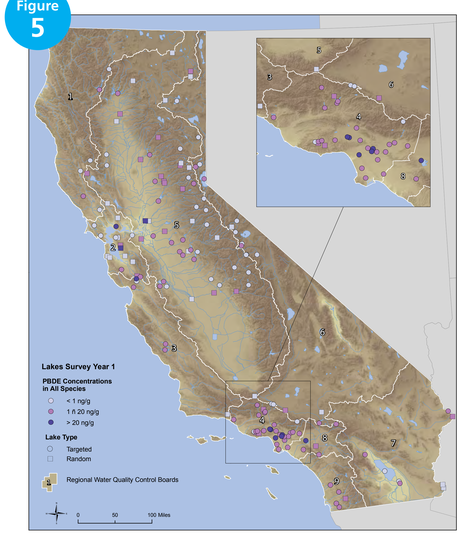


Figure 5



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SWAMP
Surface Water Ambient Monitoring Program

References

Davis, J.A., A.R. Melwani, S.N. Bezalel, G. Ichikawa, A. Bonnema, C. Lamerdin, W.A. Heim, D. Crane, M. Stephenson. 2008. Draft Technical Report on Year One of a Two-Year Screening Study of Bioaccumulation in California Lakes and Reservoirs. Contact Jay Davis (jay@sfei.org) for a copy.

Klasing, S. and R. Brodberg. 2008. Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. California Office of Environmental Health Hazard Assessment, Sacramento, CA.