Selenium Concentrations in Surf Scoter

Jennifer Hunt1, John Ross1, Jay Davis1, Sarah Lowe1, Jim Lovvom2, Dave Crane3, Brad Burkholder3

1San Francisco Estuary Institute, 7770 Pardee Lane, Oakland, CA 94621. 2University of Wyoming, Department of Zoology, Laramie, WY 82071. 3California Department of Fish and Game. Regional Monitoring Project and the California Department of Fish and Game.

Abstract

High selenium (Se) concentrations in the water and sediment of San Francisco Estuary are of potential health concern for both humans and wildlife. Results from 2002 bird tissue analysis showed that Se concentrations from Suisun Bay for surf scoter and greater scaup were significantly higher than tissue concentrations in San Pablo or South Bays. Most of the 2002 Se concentrations, except 2002 Suisun Bay scaup, were significantly lower than the peak year Se tissue concentrations that occurred during the late 1980s. There is, however, high inter-annual variation in the data. Additional sampling and data are necessary to see any long-term trends in tissue accumulation. Surf scoter gut content in Suisun Bay was 100% Potamocorbula amurenisis. Gut content for Scoter at other sites included mussels, clams and barnacles.

Methods

In late winter of 2002, 93 surf scoters (Melanitta perspicillata) and greater scaup (Aythya marila) were collected in Suisun Bay (n=31), San Pablo Bay (n=10) and n=17, respectively, and South Bay (n=10 each) (Figure 1). Male and female adult and juvenile birds were collected by shotgun with stephens shot. Breast muscle tissue without skin was prepared and each sample analyzed individually. Tissue samples were ashed and then analyzed by HGAAS. Food items from the esophagus-proventriculus of scoters were rinsed over a 0.5-mm screen, sorted by taxon, oven-dried to constant weight, and then weighed. Data were analyzed utilizing the nonparametric Kruskal-Wallis test. Chemical analysis of 2002 and historical data was performed by the California Department of Fish and Game.

Results

- Surf Scoter (see Figure 2)
  - 2002 Se tissue concentration for Suisun Bay was significantly higher than both San Pablo and South Bay concentrations (p<0.0004).
  - Suisun Bay 2002 Se tissue concentrations were significantly less than 1990 concentrations (p<0.0005).
  - San Pablo 2002 Se tissue concentrations were significantly less than 1990 concentrations (p<0.0005).
  - South Bay 2002 Se tissue concentrations were significantly less than 1990 (p<0.00001).

Discussion

The 2002 data show that Se concentrations in Suisun Bay surf scoter and greater scaup are significantly higher than tissue concentrations in San Pablo Bay and South Bay (Figures 2 and 3).

Se concentrations in Suisun Bay scoter may be higher due to a diet high in Potamocorbula amurenisis (Figure 4). P. amurenisis encompassed 100% of Suisun Bay scoter diet, 25% of San Pablo Bay scoter diet and not trace in South Bay scoter diet. There is evidence that P. amurenisis accumulates higher concentrations of Se than other benthic bivalves (Jenville et al. 2002). Higher levels of bird tissue Se concentrations might be expected at locations where birds prey predominantly on P. amurenisis.

Se concentrations in 2002 are lower in most regions of the Estuary, for both species, than the peak concentration years predominantly on P. amurenisis. Increased selenium threat as a result of invasion of the exotic bivalve Potamocorbula amurenisis

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