

Mercury Concentrations in Harbor Seals

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The Question: How do mercury concentrations differ in harbor seals that inhabit various nearshore regions along the California coast?

Considerable amounts of mercury have been added to coastal environments through human activities such as combustion of fossil fuels, pulp and paper mills, and gold mining. For example, along the Coastal Range of California, mercury has been mined since the mid 1800s and has been used extensively in California's Central Valley to recover gold. Mercury has also been discarded in mine tailings and has been found in nearby rivers that flow from the Central Valley into the San Francisco Bay estuary. In Tomales Bay, California, mercury has been leaching directly from a mercury mine that was situated on Walker Creek, which runs south into the bay. Once mercury is transported into nearby bays, it is incorporated into aquatic flora and fauna as it is cycled throughout the ecosystem. Mercury exposure in mammals can cause harmful effects on the central nervous system, immune system, and overall reproductive success of the individual. Harbor seals are useful mammalian biomonitors for mercury because they are 1) endemic (belonging to a locality) to the nearshore coastal environment and 2) are situated near the top of the marine food web, consuming a considerable amount of fish, thereby accumulating significant amounts of mercury (high-level trophic consumers).

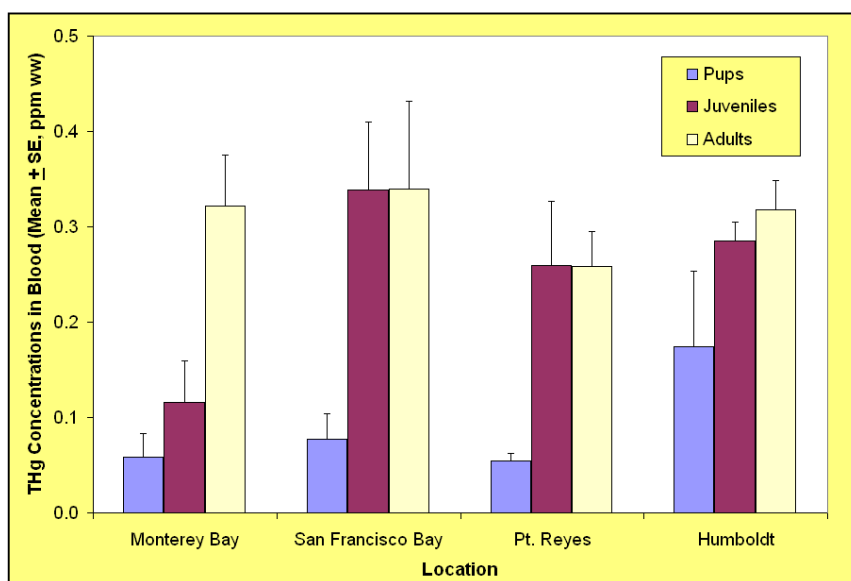


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Harbor seals can accumulate significant amounts of mercury through the considerable amount of fish they consume.

The Project: Determine location-based differences in mercury concentrations of harbor seals using blood samples.

Mercury concentrations in harbor seal blood are indicative of mercury concentrations in their recently ingested prey, which can be reflective of a specific location. By analyzing harbor seal blood samples from various locales, distinguishable trends of site-specific mercury concentrations in harbor seal prey should be determined. Because harbor seals rest onshore, they are easily captured for diagnostic sampling. Live harbor seals (n=189) were captured and sampled in Monterey Bay, San Francisco Bay, Point Reyes, and Humboldt, CA, from 2003- 2005; blood samples were then analyzed for mercury.



Total mercury concentrations in harbor seals from selected California regions, 2003-2005 (taken from Brookens 2006)

Preliminary Results: *Mercury concentrations in blood of harbor seals along the California coast are indicative of recently ingested prey species, but location differences have yet to be fully determined.*

It was determined that mercury concentrations in blood were dependent on the age of individuals. For example, adults and juveniles had greater mercury concentrations than pups. This is due in part to:

- 1) Weaned pups are not as efficient at foraging as adults, and pups tend to consume more crustaceans than older, mature harbor seals. The mercury concentrations in crustaceans should be less than in fish because fish are at a higher trophic level than crustaceans.
- 2) Juveniles (consisting of yearlings and subadults), most likely forage on similar prey species as adults and feed on a larger variation of prey types than newly weaned pups. This would explain similar concentrations of mercury in blood of juveniles and adults.

Differences among mercury concentrations based on location were not as apparent as mercury concentrations based on age of harbor seals. Because of this, equal sampling of all age classes at each site is needed to determine if significant differences exist among locations. Continued research is needed to distinguish site-specific mercury concentrations in harbor seals.

Additional Resources

T.J. Brookens and J.T. Harvey. 2006. Trace element concentrations in the Pacific harbor seal, *Phoca vitulina richardii*, in central and northern California. M.Sc. thesis, Department of Marine Science, Moss Landing Marine Laboratories and California State University Monterey Bay, Moss Landing, CA. 91pp.