Contaminant Exposure & Potential Impacts in Steller Sea Lions in Alaska

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Issue

The dramatic decline in Steller sea lion (SSL) populations in the northern Gulf of Alaska led NMFS to declare them endangered in 1997. Currently, nutritional stress is cited as the initial cause of the decline.

Recent data suggest other factors, including exposure to environmental contaminants, may be impeding recovery. In 2001 a panel convened by NMFS concluded there were *insufficient data to reject* contaminants as an impediment to recovery and urged a more systematic evaluation of their role in the decline.

Effects correlated with contaminants in pinnipeds

- Premature parturition
- Low reproductive rate
- Reduced plasma retinol
- Immunosuppression
- Uterine lesions
- Death from epizootics
- Impaired thyroid function

Each of these effects could potentially impede recovery of depleted SSL populations, but insufficient data exist on action thresholds & SSL body burdens.

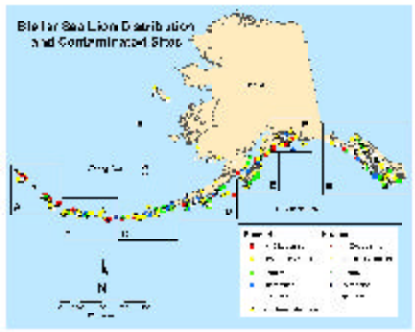
SSL Risk Assessment

There are few data on contaminant loads in SSL, their prey or competitors. However, detectable loads of chlordanes, HCHs, PCBs, DDTs, butyl tin, & Hg have been reported.

The highest organochlorine loads in females occur prior to first lactation. After parturition, up to 80% of this load can be transferred via milk to pups, with unknown effect.

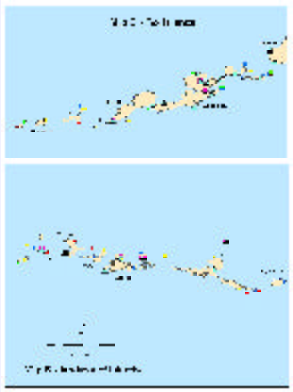
Adult SSL in the eastern Aleutians have a greater frequency of dermal fungal patches & higher concentrations of DDTs and PCBs in their feces than those in southeastern AK.

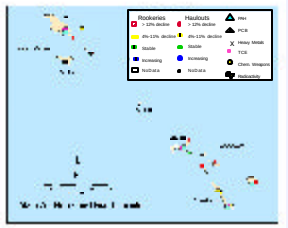
Proximity of Rookeries to Toxic Sites



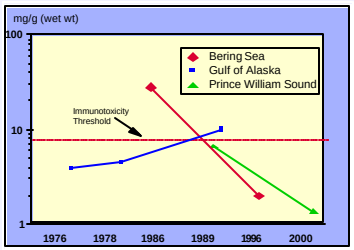
This map shows the range of the two major population groups of Steller sea lions: western (sites A - F) and eastern (G). The western stocks have experienced an 80% decline while the eastern stock has increased.

To assess the potential role of point sources of contamination, we constructed a GIS relating trend counts at haul-outs & rookeries with known toxic sites.





The documented hazards include pesticides, TCE, HCHs, dioxin compounds, cadmium, lead, radioactivity, ordnance, PCBs and chemical weapons.



Prolonged consumption of contaminated herring by harbor seals results in impaired cellular immunity. Published and unpublished data for PCBs in the blubber of juvenile SSL (< 5 years) from the western stock suggest PCBs may have exceeded the harbor seal immunotoxicity threshold between 1980 & 1990. However, only 71 juveniles have been sampled over the entire range in the last 25 years.

NMFS Research Plan

1. Review what is known about contaminant exposure in SSL & associated species.

2. Coordinate research activities which:
   - characterize point & non-point sources of exposure
   - contrast contaminant loads in SSL with health parameters
   - establish a sample archive and database.

Cooperating agencies:
NOAA Fisheries, AK Dept. Fish & Game, AK Vet Pathology Services, Mystic Aquarium & AK Sea Life Center