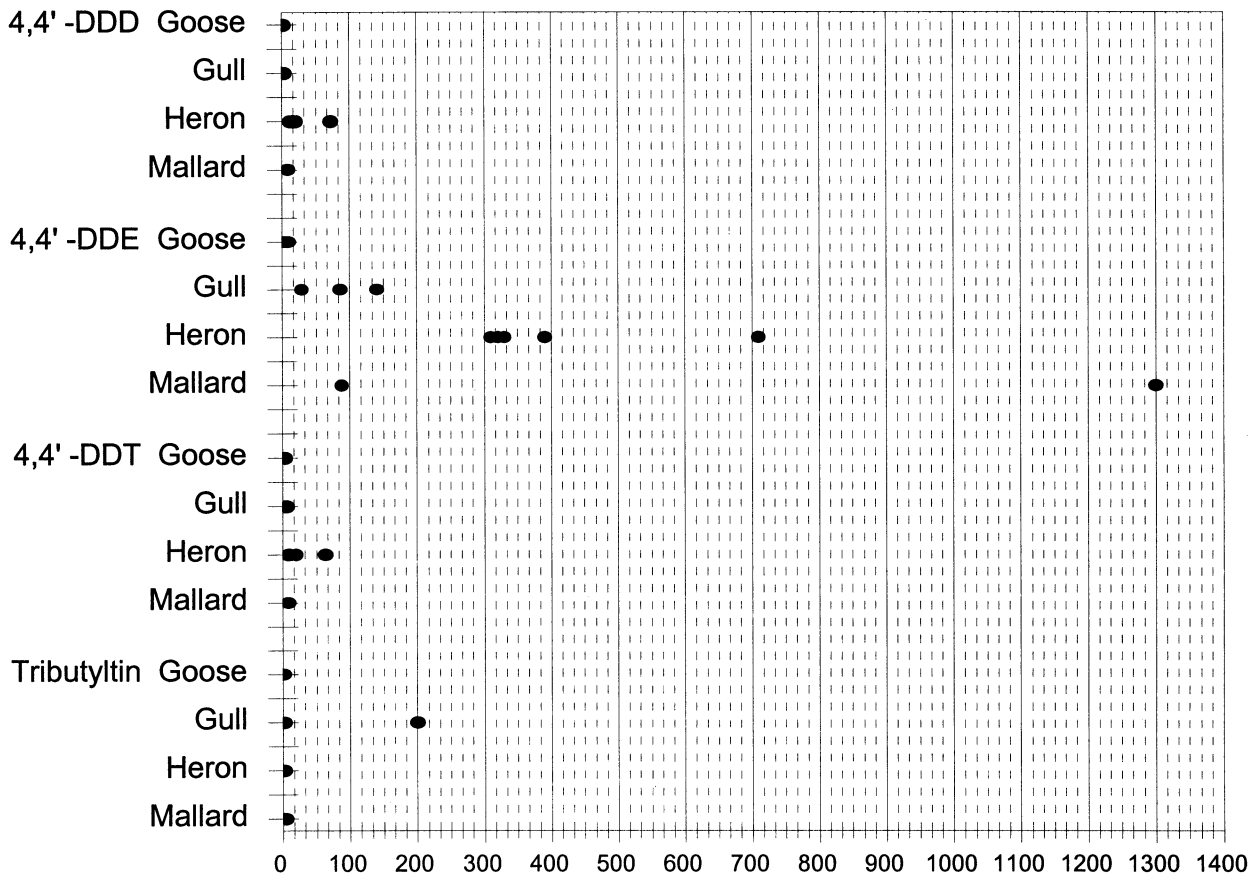


Contaminant	Canada Goose n=4	Glaucous-winged Gull n=4	Great Blue Heron n=5	Mallard Duck n=2
	Geo. Mean (Range) µg/kg wet weight	Geo. Mean (Range) µg/kg wet weight	Geo. Mean (Range) µg/kg wet weight	Geo. Mean (Range) µg/kg wet weight
<b>Pesticides</b>				
Aldrin	<1.50 (<1.50 - <1.50) <sup>†</sup>	4.04 (<3.00 - 6.70) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
alpha-BHC	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
beta-BHC	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	8.37 (<8.00 - 10.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
delta-BHC	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
gamma-BHC	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
alpha-Chlordane	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
gamma-Chlordane	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
4,4'-DDD	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
4,4'-DDE	3.63 (<1.50 - 8.70) <sup>†</sup>	74.02 (29.00 - 140.00)	21.53 (12.00 - 72.00)	<8.00 (<8.00 - <8.00) <sup>†</sup>
4,4'-DDT	<3.00 (<3.00 - <3.00) <sup>†</sup>	<6.00 (<6.00 - <6.00) <sup>†</sup>	390.36 (320.00 - 710.00)	338.23 (88.00 - 1300.00)
Dieldrin	2.20 (<1.50 - 3.60) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	15.12 (<8.00 - 63.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
Endosulfan I	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Endosulfan II	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Endosulfan Sulfate	<4.50 (<4.50 - <4.50) <sup>†</sup>	<9.00 (<9.00 - <9.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Endrin	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Endrin Aldehyde	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Endrin Ketone	<3.00 (<3.00 - <3.00) <sup>†</sup>	<6.00 (<6.00 - <6.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>	<16.00 (<16.00 - <16.00) <sup>†</sup>
Heptachlor	<4.50 (<4.50 - <4.50) <sup>†</sup>	<9.00 (<9.00 - <9.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
Heptachlor Epoxide	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	12.50 (<8.00 - 20.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
Methoxychlor	<7.50 (<7.50 - <7.50) <sup>†</sup>	<15.00 (<15.00 - <15.00) <sup>†</sup>	<80.00 (<80.00 - <80.00) <sup>†</sup>	<80.00 (<80.00 - <80.00) <sup>†</sup>
Toxaphene	<40.00 (<40.00 - <40.00) <sup>†</sup>	<80.00 (<80.00 - <80.00) <sup>†</sup>	<160.00 (<160.00 - <160.00) <sup>†</sup>	<160.00 (<160.00 - <160.00) <sup>†</sup>
2,4'-DDD	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
2,4'-DDE	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	32.06 (16.00 - 56.00)	8.49 (<8.00 - 9.00) <sup>†</sup>
2,4'-DDT	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
trans-Nonachlor	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	57.34 (29.00 - 110.00)	<8.00 (<8.00 - <8.00) <sup>†</sup>
cis-Nonachlor	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
Mirex	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>
Oxychlordane	<1.50 (<1.50 - <1.50) <sup>†</sup>	<3.00 (<3.00 - <3.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>	<8.00 (<8.00 - <8.00) <sup>†</sup>

**Table 12. Mean and range values for pesticides in µg/kg (ppb) dry weight in avian egg tissues collected in Commencement Bay in 1995 and 1996.**

<sup>†</sup>Detection Limit for some or all of the values.

## Pesticides and Butyltin



**Figure 10. Comparison of 4,4' -DDT, -DDD, -DDE residue values in  $\mu\text{g}/\text{kg}$  (ppb) wet weight and tributyltin residue values in  $\mu\text{g}/\text{kg}$  (ppb) dry weight between avian species egg tissues collected in Commencement Bay in 1995 and 1996.**

## **B2.0 Methods**

The Fish and Wildlife Service is an implementing agency under the Puget Sound Ambient Monitoring Program (PSAMP) and is responsible for monitoring marine birds to characterize spatial and seasonal patterns of distribution. PSAMP is a multi-agency, long-term monitoring program designed to measure environmental conditions in Puget Sound (PSWQA 1988). As part of this effort, the FWS provided additional funding through the Natural Resource Damage Assessment and Restoration Fund to specifically expand upon the monitoring of surf scoters in the Commencement Bay area. Completed in November 1997 (Mahaffy *et al.*), this report and its findings relevant to this assessment are discussed in this section.

### **B2.1 Objectives**

The surf scoter (*Melanitta perspicillata*) was the species selected to monitor because: (1) they are abundant in Puget Sound; (2) they forage in the marine system; and (3) they spend a substantial portion of their lives in Puget Sound either as year-round or winter residents. The primary objective in monitoring the surf scoter was to measure the occurrence and concentration of selected trace elements and organics in their tissues and document any changes in contaminant concentrations between the October (fall) and February (late winter) sampling periods.

Under this additional funding effort, the FWS: (1) helped expand the list of contaminants to be analyzed to include low and high molecular weight polynuclear aromatic hydrocarbons (LPAHs and HPAHs); (2) analyzed liver samples for cytochrome P450-associated microsomal monooxygenase activity; and (3) conducted a hematology screen for various parameters in blood samples in order to accomplish a more complete health assessment of the surf scoters wintering in Commencement Bay. Telemetry conducted over a two-year period prior to collection indicated that the surf scoters in Commencement Bay were very predictable in their movements. Twenty out of twenty-three radio-tagged birds exhibited strong site fidelity (87%) and were found within 11 km from their capture sites.

### **B2.2 Collection and Processing**

Twenty adult male surf scoters were collected in the study area during the two sampling periods of fall and late winter (October 30 - November 1, 1995 and February 26 - 27, 1996). **Figure 11** identifies the locations of the collection efforts during 1995-1996. **Figure 11** also identifies the radiotelemetry site and the previous collection site used by Henny *et al.* (1991) in 1984-1985.