

# BIOMAGNIFICATION FACTORS (FISH TO OSPREY EGGS FROM WILLAMETTE RIVER, OREGON, U.S.A.) FOR PCDDS, PCDFS, PCBS AND OC PESTICIDES

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(Received 26 October 2001; accepted 1 July 2002)

**Abstract.** A migratory population of 78 pairs of Osprey (*Pandion haliaetus*) nesting along the Willamette River in western Oregon was studied in 1993. The study was designed to determine contaminant concentrations in eggs, contaminant concentrations in fish species predominant in the Ospreys diet, and Biomagnification Factors (BMFs) of contaminants from fish species eaten to Osprey eggs. Ten Osprey eggs and 25 composite samples of fish (3 species) were used to evaluate organochlorine (OC) pesticides, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs). Mercury was also analyzed in fish. Geometric mean residues in Osprey eggs were judged low, e.g., DDE  $2.3 \mu\text{g g}^{-1}$  wet weight (ww),  $\Sigma$  PCBs  $0.69 \mu\text{g g}^{-1}$ , 2,3,7,8-TCDD  $2.3 \text{ ng kg}^{-1}$ , and generally well below known threshold values for adverse effects on productivity, and the population was increasing. Osprey egg residue data presented by River Mile (RM) are discussed, e.g., higher PCDDs were generally found immediately downstream of paper mills and eggs from the Willamette River had significantly elevated PCBs and PCDDs compared to reference eggs collected nearby in the Cascade Mountains. Prey remains at nest sites indicated that the Largescale Sucker (*Catostomus macrocheilus*) and Northern Pikeminnow (*Ptychocheilus oregonensis*) accounted for an estimated 90.1% of the biomass in the Osprey diet, and composite samples of these two species were collected from different sampling sites throughout the study area for contaminant analyses. With the large percentage of the fish biomass in the Osprey diet sampled for contaminants (and fish eaten by Ospreys similar in size to those chemically analyzed), and fish contaminant concentrations weighted by biomass intake, a mean BMF was estimated from fish to Osprey eggs for the large series of contaminants. BMFs ranged from no biomagnification (0.42) for 2,3,7,8-TCDF to 174 for OCDD. Our findings for the migratory Osprey were compared to BMFs for the resident Herring Gull (*Larus argentatus*), and differences are discussed. We believe a BMF approach provides some basic understanding of relationships between contaminant burdens in prey species of fish-eating birds and contaminants incorporated into their eggs, and may prove useful in understanding sources of contaminants in migratory species although additional studies are needed.

**Keywords:** biomagnification factors, DDE, fish, mercury, Oregon, Osprey, *Pandion haliaetus*, PCBs, PCDDs, PCDFs

## 1. Introduction

Major river systems, like the Columbia and its tributary the Willamette, drain



*Environmental Monitoring and Assessment* **84**: 275–315, 2003.  
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