ABSTRACT

ACCUMULATION OF POLYCHLORINATED BIPHENYLS IN ECOSYSTEMS

Insufficient data on production and use figures of the polychlorinated biphenyls in industrialized and developing countries have hindered efforts to construct mass balance equations for major sinks such as the oceans. Determination of the long-term accumulation trends in these sinks, essential for the prediction of future effects upon fisheries and wildlife, would require accurate estimates of potential input. Considerable evidence suggests that aerial dispersal contributes PCB to marine ecosystems, but large amounts also enter the sea as components of industrial wastes. The relative importance of each pathway on a global scale has not yet been determined. Arctic ecosystems remote from input sources are contaminated with PCB and in the southern hemisphere marine birds carry substantial body burdens. South of the Antarctic Convergence, however, PCB residues in resident wildlife are considerably lower and in some samples are not detectable.

Comparatively high residues in Atlantic zooplankton suggest the need for studies of the interrelationships between trophic accumulation in aquatic food webs and partition coefficient phenomena based upon physicochemical equilibria between very low concentrations in ambient water and higher concentrations in lipids of organisms.

Populations of birds with exceptionally high PCB residues include the remaining Peregrine Falcons in North America and the Ospreys of the north-eastern United States.

Robert W. Risebrough
and
Brock de Lappe MONS 071372

Bodega Marine Laboratory
University of California
P.O.Box 247
Bodega Bay, California 94923

Contamination of the Bay of Fundy - Gulf of Maine area with polychlorinated biphenyls, polychlorinated terphenyls, chlorinated dibenzodioxins, and dibenzofurans.

V. Zitko

Environment Canada, Fisheries Research Board, Biological Station, St. Andrews, New Brunswick,

O. Hutzinger

Atlantic Regional Laboratory, National Research Council of Canada, Halifax, Nova Scotia

and P.M.K. Choi

McMaster University, Hamilton, Ontario, Canada

Modified cleanup-chromatography of Holden and Marsden was used to determine PCB and polychlorinated terphenyls (PCT) in aquatic animals. GLC on 3% OV-210 on Chromosorb WAW 60/80 in a 6 ft x 4 mm glass column at 200°C was used to detect PCT. Chlorinated dibenzodioxins and dibenzofurans were determined after additional chromatography on alumina essentially according to Porter and Burke. All samples contained PCB in most cases closely resembling Aroclor 1254. Higher chlorinated biphenyls of the Aroclor 1260 variety were also present in some samples, particularly in eggs and tissues of aquatic birds. PCT were detected only in eggs and tissues of herring gulls in levels of 0.1 and 1.4 μg/g wet weight as Aroclor 5460, respectively. Chlorinated dioxins and

MONS 071373

dibenzofurans were not detectable (detection limit 0.01-0.04 μg/g wet weight, depending on the degree of chlorination) in any of the examined samples: muscle and liver of white shark, eggs of double-crested cormorants and herring gulls, commercial herring oil, and groundfish-herring fishmeal. The levels of PCB and chlorinated hydrocarbon pesticides are summarized below:

Species	Tissue	PCB (as Aroclor 1254)	μg/g wet weight p,p'-DDE	Other
Herring *Clupea harengus*	whole fish	0.34	0.06	
Mackerel *Scomber scombrus*	muscle	0.35	0.07	
Plaice *Hippoglossoides platessoides*	muscle	0.38	0.01	
White hake *Urophycis tenuis*	muscle	0.44	0.03	
Ocean perch *Sebastes marinus*	muscle	0.32	0.03	
Cod *Gadus morhua*	muscle	0.55	0.04	
Sea raven *Hemitripterus americanus*	muscle viscera	0.21 0.73	0.08 0.30	DDT 0.24
Basking shark *Cetorhinus maximus*	muscle liver	0.07 1.07	-	
White shark *Carcharodon carcharias*	muscle liver	0.77 218	0.48 335	DDT 63 DDD 43
Bluefin tuna *Thunnus thynnus*	muscle	1.54	0.15	
Herring oil		3.55	2.27	DDT 0.37
Fishmeal		0.54	0.19	

Species	Tissue	PCB (as Aroclor 1254)	µg/g wet weight p,p'-DDE
Double-crested cormorant *Phalacrocorax auritus*	eggs	43.5*	29.4*
		17.2*	8.6*
	muscle	3.38	8.40
	liver	2.13	4.16
	Subcut. fat	38	164
	Abdom. fat	52	162
Herring gull *Larus argentatus*	eggs	12.6*	5.67*
		5.54*	2.83*
	muscle	5.06	2.07
	liver	6.50	2.08
	Subcut. fat	75	26

*Different nesting colonies