OCT 1 1976

AFFIDAVIT OF ROBERT W. RISEBROUGH

Robert W. Risebrough, having been duly sworn, deposes and says:

My name is Robert W. Risebrough and I live at 142 Vicente Road, Berkeley, California. I am currently employed by the University of California as a Research Ecologist at the Bodega Marine Laboratory, Bodega Bay, California 94923. I received an A.B. degree in zoology from Cornell University in 1956, and a Ph.D. in molecular biology from Harvard University in 1962. I have been employed by the University of California continuously since 1965.

During my employment at the University of California, I have undertaken research on the global distribution of pollutants, the transfer of pollutants to the marine environment and their effects on organisms. Attached hereto as Exhibit A is my curriculum vitae, which includes a list of my publications and a list of national and international committees to which I have belonged and which have examined various pollution questions.

We began to study polychlorinated biphenyls in 1967. In that year, we obtained an unhatched egg of a Peregrine Falcon from Baja California: because many populations of this species had already become extinct, and since pollution seemed a likely cause, we made a considerable effort to identify the unknown compounds which we had noted on electron capture gas chromatograms since 1965. These were identified as PCBs; subsequently many other samples were examined for their presence. A resulting publication entitled "Polychlorinated biphenyls in the global ecosystem" was published in 1968. A copy is attached as Exhibit B.

We have wished to determine whether PCBs, their metabolic derivatives, or the chemically related chlorinated dibenzofurans might be responsible for embryonic mortality occasionally observed in populations of wild birds. Several publications have examined the possible role of the chlorinated dibenzofurans. Exhibit C is a paper entitled "Identification of chlorinated dibenzofurans in American polychlorinated biphenyls" which presents the concentrations of chlorinated dibenzofurans in American commercial PCB mixtures.

A paper entitled "Transfer of higher molecular weight organochlorine compounds to the marine environment" by R. W. Risebrough, B. W. de Lappe and W. Walker II summarizes much of our recent work and reviews the literature relating to the transfer of PCB to the marine environment. A copy is attached as Exhibit D.[1] This paper presents our initial determinations of PCB in seawater and describes the development of in situ sampling systems. For the reasons outlined in detail in this paper, we believe that the reported values of PCB concentrations in the Atlantic and portions of the Pacific must be too high: there has not been enough PCB of this chlorine composition manufactured in the world to allow such amounts to be present in the marine environment.

A primary focus of current research is to determine the partitioning of PCB compounds, of other pollutants, and of naturally occurring substances, among the larger particulates, the smaller

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[1] This paper is in press in Marine Pollutant Transfer. H. L. Windom and R. A. Duce, eds., D. C. Heath Company. The original title of this paper, "Pollutant Transfer to the Marine Environment: Synthetic Organics" was changed to conform to the format of the book. The paper is otherwise equivalent to citation #56 of the Criteria Document (EPA Exhibit 2).

particulates and the dissolved phase, invertebrates such as mussels, Mytilus, birds and fish.

Since writing the manuscript which is Exhibit D, we have continued our measurements of PCB in seawater, relating these when possible to concentrations in organisms. In addition, we have measured PCB levels in the water of Lake Ontario: Lake Ontario is highly contaminated with PCB, with exceptionally high levels recorded in both fish and birds. Water samples were obtained on August 13, 1976, with the assistance of personnel of the Canada Centre for Inland Waters. The in situ sampling system described by Risebrough, de Lappe and Walker was used, except that a glass fiber filter was placed before the column on which particulate material was retained. Thus, separate measurements could be obtained for material remaining on the filter and for material retained by the polyurethane column. Samples were obtained at a depth of 2 meters: water was pumped through the system using a vacuum pump onboard a small vessel. Two samples of 93 liters each were obtained approximately two miles east of the Burlington Causeway; an additional sample was obtained in Burlington Harbour. For controls, an additional sample of 2.5 liters was taken in Lake Ontario. Also, a column and filter taken to the site were returned to the laboratory unused and extracted in the same manner as the other samples. Analytical procedures employed were identical to those described in Exhibit D. The results are summarized in Table 1.

Sample blanks were found to have maximum PCB values one to two orders of magnitude lower than those recorded. Most of the PCB was found to be in the "dissolved" phase; association with very small particulate matter cannot be excluded. PCB in "solution" consisted

primarily of tri-, tetra-, and penta-chlorobiphenyls, most closely resembling the PCB mixtures Aroclor 1242 or 1248. PCB in the particulate fraction consisted of higher chlorinated isomers, principally penta-, hexa-, and hepta-chlorbiphenyls.

Total PCB concentrations in these two samples from Lake Ontario, in the order of 3 ng/liter, represent values in a highly contaminated freshwater lake.

As noted in Exhibit D, recent developments in the methodologies of PCB determinations in water now make it feasible to measure PCB in the tens or hundreds of parts per quadrillion range. These techniques could readily be made routine for PCB determinations in effluent and receiving waters.

Robert W. Risebrough

Subscribed as sworn to for me this 29 th day of September 1976

Nancy C. Conway

Notary Public My Commission Expires Feb. 14 1977

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