Analyses of Polychlorinated Biphenyls in Bird Tissues and Aroclor Standards with Gas Chromatography and Mass Spectrometry

by

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Polychlorinated biphenyls (PCB's) consist of complex mixtures of isomeric biphenyls with various numbers of chlorine atoms substituted on the biphenyl rings. There are some 210 theoretically possible isomers of PCB's with 102 probable combinations (WIDMARK, 1968). Aroclor 1254 produced by Monsanto Chemical Company has been shown to have more than 50 components when analyzed by capillary gas chromatography columns (SESSONS and WELTI, 1971). In order to observe changes due to metabolism, it is desirable to relate peaks seen on gas-liquid chromatography (GLC) chromatograms to the PCB isomers composing the peaks. Also, HUTZINGER et al. (1972) has shown that in environmental samples, the pattern of PCB peaks change with trophic levels. WEBB and McCALL (1972) have related the relative retention times of the peaks seen on GLC chromatograms to the number of chlorines in the isomers which compose each peak for six different Aroclors. BAGLEY et al. (1970) demonstrated that most of the PCB peaks occuring in bald eagle carcasses were identical to components of Aroclor 1254 using combined GLC-mass spectrometry.

Many environmental samples are routinely monitored for insecticides and PCB's in this laboratory. Therefore a study was done to relate the peaks identified by GLC to the PCB isomers present in each peak as determined by mass spectrometry (MS).

Methods and Materials

Double-crested Cormorants (Phalacrocorax a. auritus) and eggs and White Pelicans (Pelecanus erythrorhynchos) were collected from rookeries at Dry Lake and South Waubay Lake, South Dakota. Eggs and carcasses did not necessarily come from the same birds. Four samples each of cormorant carcass and egg and three samples

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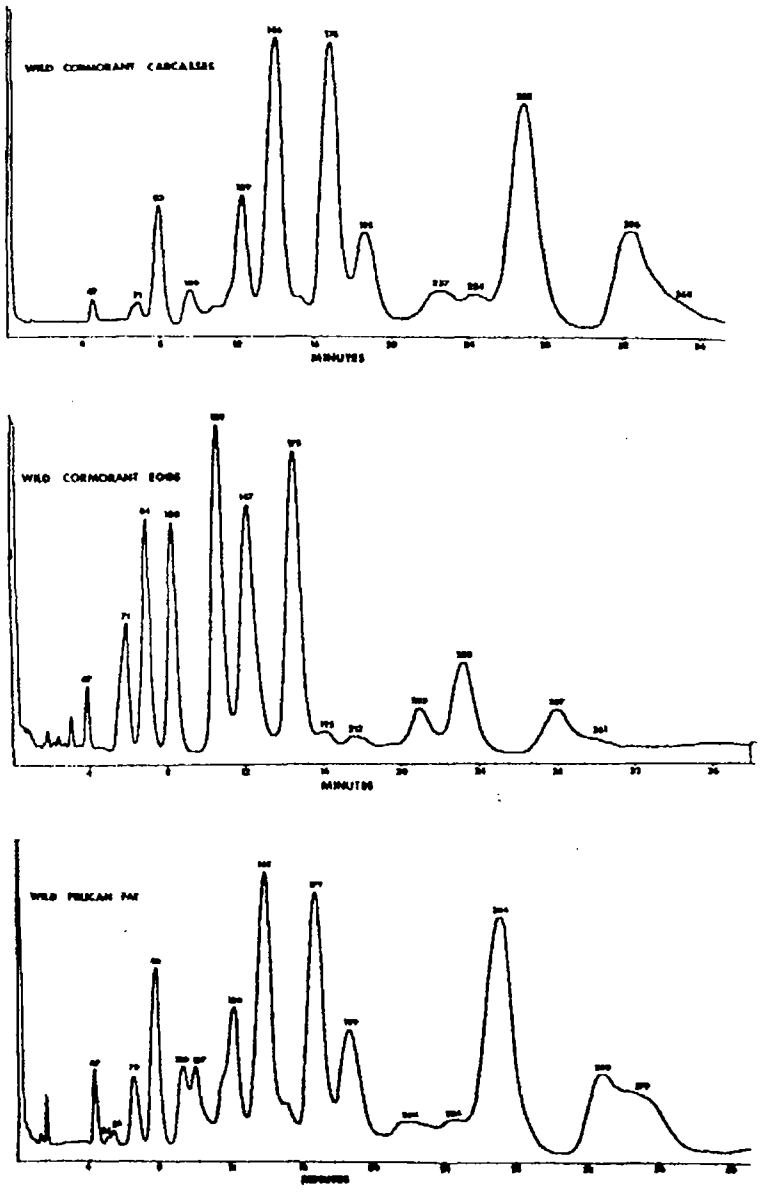

Fig. 1 - Relative retention times of GLC tracings of cormorant carcasses, eggs and pelican fat. Conditions: 1/8" o.d. x 6' glass column with 1:1 mixture of 15% QF-1 and 10% DC-200 on 80/100 mesh Chromosorb W operated at 200C with a nitrogen gas flow rate of 40 ml/min. p,p'-DDE = 100.

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at rrt 107 in fat but not in carcass or egg. This peak is prominent in Aroclor 1254 (Fig. 2). The peak at rrt 70 was consistently smaller than the peak at 83 in the samples while they were about the same size in Aroclors 1254 and 1260 (Figs. 1 and 2). GRANT et al. (1971) observed that peaks with shorter rrt were metabolized to a greater degree than those with longer rrt

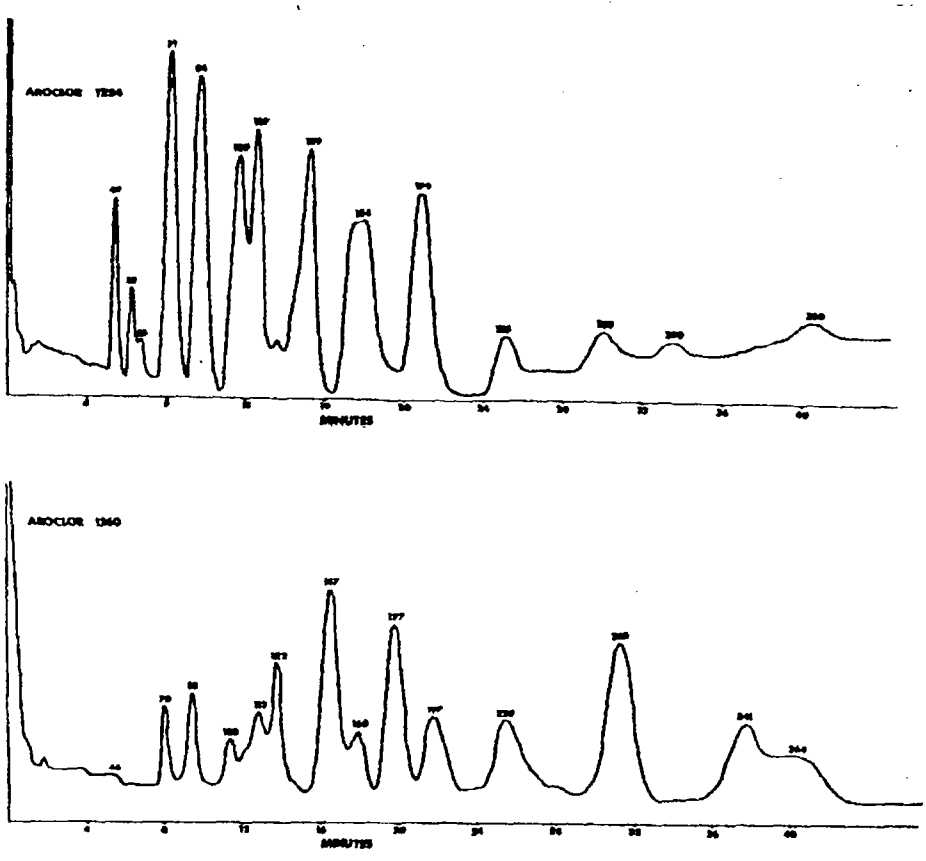

Fig. 2 - Relative retention times of GLC tracings of Aroclor 1254 and 1260. Conditions: 1/8" o.d. x 6' glass column with 1:1 mixture of 15% QF-1 and 10% DC-200 on 80/100 mesh Chromosorb W operated at 200 C with a nitrogen gas flow rate of 40 ml/min. p,p'-DDE = 100.

TABLE I

Relative retention times and mass spectra data for PCB residues in carcasses, eggs and fat of birds.

Pelican

Component

Component

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