Effect of PCBs and Other Organochlorine Compounds on the Hatchability of Atlantic Salmon (Salmo salar) Eggs

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This paper reports the levels of PCB's, hexachloro-benzene, and several organochlorine pesticides in Atlantic salmon (Salmo salar) eggs used in the genetics program of the North American Salmon Research Center. An attempt is made to relate these levels to hatchability under normal hatchery conditions.

The effects of PCB's and organochlorine pesticides on reproduction in Atlantic salmon were reviewed by Elson et al. (1973). In 1971, levels of PCB's, DDT and metabolites, and dieldrin in the eggs were compared with concentrations associated with effects on hatchability and survival. It was indicated that only levels of PCB's were close to those reported to affect hatchability and survival. PCB levels of 7.7 and 34 μg/g lipid resulted in 34 and 100% mortality of Atlantic salmon fry, respectively (Jensen et al. 1970). PCB's (Aroclor 1242) at 2.7 μg/g, corresponding to about 41 μg/g lipid resulted in a 75% mortality of rainbow trout (Salmo gairdneri) fry by 30 days after hatching with 60-70% of the fry deformed (Hogan and Braun 1975). Mortality of 10-28% occurred in batches of eggs containing 0.39 μg/g (6 μg/g lipid) of Aroclor 1254.

EXPERIMENTAL

Egg Collection

In 1975, a pooled sample of eggs of Big Salmon, Saint John and Magaguadavic Rivers and of Rocky Brook origin was collected from hatchery stocks. In 1976, eggs from the same rivers were sampled separately. Figure 1 shows the locations of these New Brunswick rivers.
Analysis

Approximately 3-10 g of eggs were taken at random from each of the four stocks. The eggs taken were the dead ones normally removed during incubation. Dead eggs regularly appear during incubation and are recognized by their white opaque appearance in contrast with red-orange viable eggs. Dead eggs may result from non-fertilization or from death of the embryo. There is no reason to believe that hydrocarbon levels should differ among the eggs produced by a given female. Eggs were freeze-dried, homogenized with anhydrous sodium sulfate and extracted with hexane in Soxhlet extractors. Aliquots of extracts were cleaned by column chromatography on alumina and silica and analyzed by gas chromatography. Details of the analytical procedure are described in ZITKO et al. 1974. The accuracy of the analyses, established in intercalibration programs, is normally ±10-20%. 