REPRODUCTIVE IMPAIRMENT IN WHITE CROAKER FROM CONTAMINATED AREAS OFF LOS ANGELES

In the last 30 years, populations of several sport and commercial fishes have declined in the coastal waters off southern California. The declines have been attributed to overfishing and habitat degradation, including pollution (e.g., Vojkovich and Reed, 1983). Unfortunately, the data required to distinguish among these possibilities are not available, but all have probably played a role.

In this study, J. N. Cross of SCCWRP and J.E. Hose of Occidental College examine the possibility that reproduction in white croaker (Sciaenidae: *Genyonemus lineatus*) living in the coastal waters near Los Angeles is impaired by exposure to high levels of contamination. They found that white croaker from the contaminated area have higher body burdens of chlorinated hydrocarbons, spawn fewer eggs, and have reduced fertility compared to fish from the reference area.

White croaker were collected from outer Los Angeles Harbor, a highly contaminated site, and from Dana Point, a relatively uncontaminated site. Total DDT averaged 1.64 ppm (wet weight) and total PCB averaged 1.31 ppm in the livers of females from the harbor ($n = 21$); the corresponding liver concentrations in females from the reference site were 0.17 ppm DDT and 0.03 ppm PCB ($n = 8$). Fish were returned to the laboratory and induced to spawn by hormone injection. Fewer fish from Los Angeles Harbor (21/51 = 41 percent) spawned successfully compared to fish from Dana Point (15/28 = 53 percent). Fish from Los Angeles Harbor produced significantly fewer eggs (mean = 67,400 versus 104,500) and had significantly lower fertilization success (80 percent versus 93 percent) than fish from Dana Point. Females from Los Angeles Harbor also had a significantly higher incidence of early oocyte destruction (18 percent versus 2 percent).

Of the non-spawning females, all of the fish from Dana Point ($n = 13$) had hydrated oocytes indicating that spawning was imminent. Only 27 percent (8/30) of the non-spawning fish from Los Angeles Harbor had hydrated oocytes; the remaining fish were unresponsive to hormone injection.

Female white croakers from Los Angeles Harbor that were spawned in the laboratory in January and February averaged 1.4 ppm total DDT ($n = 11$). This was significantly less than the 5.1 ppm average of females ($n = 10$) collected in the same months from the general population in the harbor. Half of the females in the general population had total DDT concentrations higher than 2.9 ppm, the upper 95 percent confidence limit for livers of spawning females. This was surprisingly close to the proportion of females that could not be induced to spawn. Total liver PCB concentrations were the same in both populations, about 1.0 ppm.

The apparent DDT threshold for successful reproduction of about 3 ppm has also been reported for salmonids in hatcheries (Burdick et al. 1964, 1972). Higher PCB body burdens than were measured during this study are probably required to elicit reproductive impairment (Hogan and Brauhn, 1975; Sivarajah et al, 1978).

This is one of the first reports on contaminant-induced reproductive impairment in wild fish populations (Spies et al, 1987). It is likely that DDT is not solely responsible for the observed reproductive effects. Many other contaminants, including polycyclic aromatic hydrocarbons, are found at high concentrations in sediments and fishes in and around Los Angeles Harbor (this volume, p. 13; Malins et al, 1986).

The mechanisms of reproductive toxicity are not completely understood but are thought to include modulation of hormone levels essential for oocyte maturation and ovulation, toxicity to developing gametes and

nutritive cells, and general stress responses (Saxena and Garg, 1978; Truscott et al., 1983; Spies et al., 1984).

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