

Fish Avoidance Reactions

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This is a description of research currently being carried out at Marist College. It is only part of a continuing and extensive effort to attempt to evaluate the effects of water quality upon fish population.

Fish Avoidance Studies

Many investigators (1,2,3) have shown that salmonoid and centrarchid fish exhibit a statistical avoidance to polluted areas when given an alternate path. These observations become important from a number of aspects: The mechanism by which the fish detect the pollution, and the effect of concentration, fish type and nature of the pollutant upon the avoidance and reaction are important to the environmentalist and the disappearance of fish species from sections of the river are important to the economy of the river. We feel strongly that at this time the Hudson is still a healthy river and that we are dealing with local pollution inputs which are not killing the fish life as much as altering their habits. Avoidance reaction information would yield data that would yield information that would be pertinent to pollution legislation.

The fish to be studied are to be chosen in accordance with general fish population shifts in the Hudson. The common sunfish, shiner, killifish and carp have increased their relative abundance a hundred fold or more (4,5), while the shad, alewife, bass and white perch have shown a marked decrease in relative population. If one ignores the short range changes in population caused by natural phenomena, such as draught or flood conditions moving the salt front or data discrepancies caused by diverse sampling techniques, the general trend over the last thirty years is to see an increase in the relative abundance of carp and goldfish, and non migratory fish at the expense of the migratory fish species. In 1937 a biological survey of the Hudson listed 67 species of fish. A 1968 survey lists 14 species common and 20 species occasional. (6)

In order to carry out the avoidance experiments, a plexi-glass tank was constructed and designed. This tank is similar to that described by Jones (1), with the difference that there are fine plastic rods hanging in each channel. The rods are connected to a triggering device which sends a pulse to an

electric counter. Each time a fish enters a channel he is counted. This apparatus does not require an observer and therefore can run for greater lengths of time which is statistically more significant than having an observer running the experiment for a short time.

Results of Whitmore, et al, (3) Mount (7) and Jones, et al (1) as well as our own investigation with dye studies have shown by appropriate adjustment of flow rates it is possible to keep additives or pollution inputs localized in channels. Flow rates are most easily controlled by first pumping the river water into a plastic holding tank and regulating the output from the tank.

The pollutants to be studied at first will be heavy metal ions, (Cr^{+3} , Zn^{+2} , Cd^{+2}). There are a number of heavy metal profiles of the Hudson available (4,5). These profiles indicate seasonal and geographic variances which actually simulates local inputs, therefore would be important in evaluating fish habits.

Analytical Methods - Heavy metal ion analysis will be carried out after complexation with APDC and extraction with methylisobutyl ketone (8). Results - Preliminary results with striped bass (*Morone saxatilis*) indicates an avoidance to lethal concentrations (50 ug/l).

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