MICHIGAN DEPARTMENT OF CONSERVATION
Research and Development Report No. 92*

January 17, 1967

# MORTALITY OF RECENTLY HATCHED BLUEGILL FRY DUE TO HYDRA[1]

By Michael D. Clady and Gerald U. Ulrikson

* Institute for Fisheries Research Report No. 1732.

[1] Contribution from Dingell-Johnson Project F-29-R; Michigan.

## Introduction

There are numerous accounts of predation on young fish by hydra. The majority of these incidents were observed in rearing ponds or raceways. Because of the small size of these predators, only the very young stages in the life history of the fish are affected. Eisler and Simon (1961) have summarized much of the literature on hydra as enemies of fish. Our paper describes mortalities of several broods of newly hatched bluegills, Lepomis macrochirus, caused by hydra[2] in an artificial situation. The apparent movement of the hydra to active bluegill nests has not been described before.

## Description of rearing facility

A metal tank, 14.4 feet long, 1.9 feet wide and 2.3 feet deep, and containing 6 inches of sand and gravel, was set up outdoors as a rearing facility at the Saline Fisheries Research Station, Saline, Michigan. An adjoining pond provided a gravity flow of water through the tank. Depth of water in the tank was maintained at 15 inches. Outflow was screened to prevent escape of most aquatic organisms.

## Observations

During May and June a dense bloom of zooplankton, mostly Daphnia pulex, occurred in the tank. Between June 27 and July 2

[2] Judging by their standing-water habitat, these hydra were probably Hydra carnea. However, positive separation of the species from H. littoralis could not be made because of a lack of sexually mature individuals. Park (1961) has shown that hydra undergo alternating sexual and asexual periods.

large numbers of hydra were seen floating on the surface and attached to the sides of the tank and the sand substrate. During this build-up of the hydra population, the Daphnia gradually disappeared and were virtually eliminated by July 4. The hydra fed heavily on the Daphnia, and some hydrozoans contained as many as four of the crustaceans at one time.

Six bluegills, 6.5 to 7.5 inches long, were placed in the tank in late May. Within a week five nests were constructed by the males. Eggs were first seen in two of the nests on July 4 when the hydra population was very dense. These eggs appeared to be developing normally on July 5, but, when attempts were made to collect fry off the nest the following day, only numerous hydra and dead, newly emerged fry were taken. No live fish or eggs (dead or alive) were found. The two active nests had been invaded by large numbers (literally thousands) of hydra. There were no similar concentrations of hydra on the three inactive nests or in other areas of the tank. Eggs taken from the nest previous to hatching were placed in a Petri dish and developed into normal free-swimming fry which survived.

Live hydra were taken into the laboratory and placed in small dishes containing 1/2 inch of water, Daphnia, and free-swimming, 2-week-old bluegill fry. The hydra quickly stung, killed, and ate both Daphnia and bluegill fry. Fry which broke away from their grasp subsequently died anyway. The attached hydra leaned toward movement in the water and "grasped" at any moving organism that came in contact

with their tentacles. Less than 10 minutes were needed to ingest the prey. Digestion also seemed very rapid. In some cases the fish were nearly assimilated within an hour.

On July 8 two male and two female bluegills again were placed in the tank. These fish produced a clean nest on July 12 and this contained eggs by the 15th. Live, newly hatched fry and hydra were taken from the nest on July 16. On July 17 only hydra and dead fry were collected. In this second test there were live bluegill fry in the nest for one day, which did not occur in the test on July 4-6. The reason was that the hydra population was significantly less than on July 4-6, and unusually large concentrations of hydra were not observed on the nest during the latter period. The hydra population disappeared by July 19 and none were observed between July 19 and 22. Up to July 19 the Daphnia population had been low for 3 weeks, but large numbers of Daphnia pulex were again noticed on July 20.

## Discussion

The apparent movement of large numbers of hydra onto active bluegill nests has not been previously described. In our study this invasion probably was in response to a stimulus which occurred during the hatching and/or post-hatching stages of the bluegills. Perhaps micro-currents set up by the movement of newly hatched bluegills attracted the hydrozoans, since the hydra reacted to the movement of free-swimming fry in the laboratory. Another possibility is a chemical stimulus exuded from the egg during hatching which was detected by the

hydra. It has been shown that the feeding reflex in hydra is activated by the protein glutathione (Lenhoff, 1961). This response occurs while the animal is attached and does not elicit locomotion, but it does show that hydra react to a single environmental compound. Griffing (1965) found that hydra are capable of considerable movement and migrate in response to environmental stimuli in a lake.

We did not see symptoms of any disease on the dead bluegill larvae because of their tiny size and rapid deterioration, but undoubtedly death of bluegill fry was caused by the hydra since eggs removed to the laboratory showed no excess post-hatching mortality. Bluegills do not become free swimming until about 4 days after hatching, so there was a considerable period when they were in close contact with any hydra attached to the nest. Apparently the hydra do not damage the eggs, as was found also by Eisler and Simon (1961) with salmon eggs.

Literature cited

Eisler, R., and R. C. Simon. 1961. Destruction of salmon larvae by Hydra oligactis. Trans. Amer. Fish. Soc., 90(3): 329-332.

Griffing, T. C. 1965. Dynamics and energetics of populations of brown hydra. Univ. Michigan, PhD thesis.

Lenhoff, H. M. 1961. Activation of the feeding reflex in Hydra littoralis, pp. 203-232. In: H. M. Lenhoff and W. F. Loomis (eds), The biology of hydra and of some other coelenterates: 1961, 467 pp., University of Miami Press, Coral Gables, Florida.

Park, H. D. 1961. Apparent rhythmicity in sexual differentiation of Hydra littoralis, pp. 363-372. In: H. M. Lenhoff and W. F. Loomis (eds.), The biology of hydra and of some other coelenterates: 1961, 467 pp., University of Miami Press, Coral Gables, Florida.

INSTITUTE FOR FISHERIES RESEARCH

Michael D. Clady and Gerald U. Ulrikson

Report approved by G. P. Cooper

Typed by M. S. McClure