# The Stickleback: The White Rat of the Aquarium.

by Mark Gottlob

The keeping and breeding of the native fishes has provided us all with endless hours of enjoyment and a greater knowledge of nature. Psychilogists, however, are using the behavior of fish as keys to discovering more about human nature. Dr. Richard D. Olson in his monthly series, "Fish Behavior" in the Tropical Fish Hobbyist has kept us informed of some of these studies, but has mostly related the behavior of fish that is pertinent for aquarists.

Niko Tinbergin, one of the founders of ethology (science of animal behavior), carried out a classic series of observations and experiments analysing the breeding behavior of the three-spined stickleback (Gasterosteus aculentus). Many aquarists are familiar with the stickleback breeding behavior, so it serves as a good example of how the psychologist uses controlled experimentation to develop theories of behavior.

Man's behavior is complicated by his ability to learn. The learning process has allowed man to adjust to all the different ecological and social conditions that he is known to inhabit. Man, however, does have basic innate drives and Tinbergen feels that studying the elements of behavior in simple animals, such as the stickleback, will give scientists a better understanding of these innate drives (1952:8)

Observation and experimentation with the stickleback led Tinbergen to discover what he calls sign stimuli as basic elements of the fish's behavior. The term sign stimuli refers to the fact that the stickleback responds to one characteristic rather than to the whole object. For example, the male, after he sets up his territory and builds a nest, undergoes a color change. Part of this color change occurs below his mouth, which turns a bright red. It is this red area that attracts the female and serves as a stimulus for her to enter the nest. This red color is considered to be a sign stimulus, because a female will respond with similar behavior to almost any object as long as it is red. Males will also react to the red sign stimulus. A male who has set up a territory will defend it with an aggressive charge against any red object; whether it is another male displaying breeding colors or a red mail van passing within sight of the aquarium (Tinbergen, 1952:9). Fish of both sexes will, however, respond to this red sign only when they are in the breeding condition.

Other breeding behavior exhibited by sticklebacks is not as simple as these sign stimulus responses. When two males displaying breeding colors come face to face, something must give. In this situation the high level of innate aggressive behavior often leads to both males digging into the sand, as they do when constructing a nest. This second behavior element, although only one reaction more complex than the simple sign stimulus reaction, at first mystified the ethologists, To explain this seemingly irrelevant reaction the psychologists labelled this new type of behavior a "displacement reaction." By definition, then, a displacement reaction is one that occurs when tension builds, during a seemingly unsolvable confrontation, to the point that an outlet can be found only through an irrelevant action (Tinberen, 1952:11).

Solving the problem by defining a new term may seem to be taking the easy way out, but by observing and experimenting with similar circumstances in other animals it was discovered that the displacement reaction is a common behavior pattern.

It is easy to see how rapidly the study of animal behavior can become complicated. This is why an understanding of innate behavior, behavior

that is consistant and thus simple[illegible] so essential to a basic understanding of man's more plastic learning based behavior.

Because of its high degree of rigid innate behavior and because it is tame, hardy, and small enough to be observed and experimented with in a minimum of space, the stickleback has become a popular subject in many zoological and psychological laboratories throughout the world.

Literature sited

Tinbergen, N.

1952 The Curious Behavior of the Stickleback, Scientific American, December.