

# The Behavior of Fishes

## by Antonios Pappantoniou

### I. A GENERAL OVERVIEW OF FISH BEHAVIOR

This article is the first in a series of articles on the behavior of North American freshwater fishes. Although this first article will not stress any species in particular, each future article will focus on the behavior of a single species or group of closely related fishes. It is the intent of the articles to supply the readers with a knowledge of fish behavior so that they may better understand and enjoy their aquarium fishes. The articles will draw on information from the scientific literature and the authors' own observations.

The behavior of fishes is very much dictated by their environment. Two factors, temperature and light, are probably the most critical environmental factors controlling fish behavior.

Fish are classed as ectothermic animals. Ectothermic means they must rely on outside sources of heat to maintain their body temperature. Temperature governs biochemical and physiological activities which in turn control fish behavior.

The preferred temperature of fish varies with the species. Fish species adapted to swift-flowing streams prefer cooler temperatures than those species adapted to life in a small pond.

Temperatures may fluctuate on a daily or seasonal basis. Daily fluctuations, especially in the summer months, can cause onshore - offshore movements in species of lake fish. Seasonal changes in temperature are partly responsible for initiating physiological changes which lead to reproductive activity in fish.

Light is the other critical environmental factor controlling fish behavior. A fish may be diurnal. Such a fish would be active during the day. Fish may be nocturnal, active during the night. Still other fish prefer the twilight hours. Light, like temperature, also varies on a seasonal basis. This variation is also partly responsible for initiating physiological changes which lead to reproduction and its associated behaviors. The combination of proper light and temperature is critical to the spawning of most freshwater fish. Aquarists may induce fish to spawn in aquaria by supplying the fish with the proper combination of light and temperature.

Much of fish behavior falls under the general category of taxis. A taxis is defined as an orientation towards or away from a stimulus. There are many different forms of taxis.

Rheotaxis is a fish's reaction to water current. It is a prevalent behavior in stream fish. Stream fish tend to orient themselves upstream. This is called a positive rheotaxis. The closely related optomotor response involves the fish taking a visual fix on a stationary object on the sides or bottom of the stream. The fish then swims to maintain its position relative to the fixed object. Both rheotaxis and the optomotor response allow fish to maintain their position in quickly moving stream waters.

Chemotaxis is the response to a chemical stimulus. This behavior is associated with the senses of smell and taste.

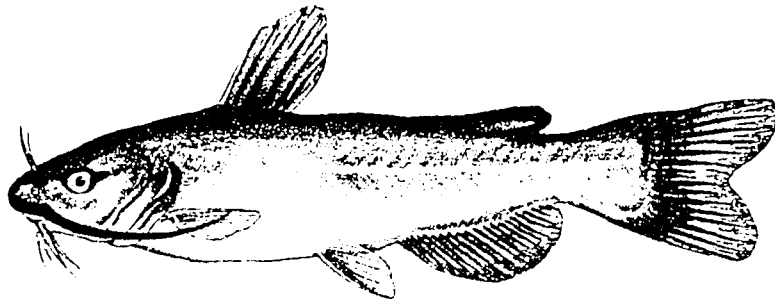
Pheromones are chemical substances released by an individual which in some way affects the behavior of an individual of the same species. Many interesting types of pheromones have been shown to exist in fish. In certain minnows, a pheromone is released when the skin of an individual is broken, i.e. the fish is eaten or attacked. Nearby minnows will sense this pheromone and immediately dive to the bottom. This may save them from the fate that befell the minnow releasing the pheromone.

Other pheromones are released under crowded conditions. These pheromones will act to stunt the growth of nearby fish. This is something that should be kept in mind when crowding fish in an aquarium.

Catfish of the genus *Ictalurus* produce pheromones which allow recognition of individuals and help to create a hierarchy among them.

## WHITE CATFISH

*Ictalurus catus*



Aside from taxis, fish display much more complex forms of behavior. The behaviors associated with reproduction, i.e. territoriality, courtship, spawning, can be very complex. To describe these in general terms would be difficult. The exceptions to the generalities would outnumber the fish that fit the mold.

It was the intent of this article to give the reader a look at some of the external and internal forces which dictate the behavior of fishes. This was not meant to be a complete treatment of fish behavior. Such an attempt could fill many books. The next article in this series will focus on catfish and their behavior.

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### Literature Cited

Bardach, J.E. et al. 1967. Orientation by taste in fish of the genus *Ictalurus*. Science 155: 1276-78.

Todd, J.H. et al. 1968. Chemical communication in social behavior of a fish the yellow bullhead (*Ictalurus natalis*). Science 158: 672-73.

Todd, J.H. 1971. The chemical languages of fishes. Scientific American 224 (5): 99-107.

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