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THE MUD PUPPY, AN ENEMY OF FISH?

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Mud puppies, scientifically named Necturus maculosus (Rafinesque), are common inhabitants of lakes and larger streams throughout Michigan. They are sometimes called water lizards or water dogs, and many people consider them poisonous. Anglers often cut their lines rather than remove these animals from the hooks. In one extreme instance, a woman flung rod and all out into the lake after one horrified look at the strange creature which had taken her bait!

Fear of and aversion for mud puppies are without basis in fact, since they are really harmless, sluggish salamanders and have actually been found to be an unusual table delicacy. The flesh along the sides of the body is as white and tender as that of frog's legs. Michigan's ice fishermen, who frequently catch these animals on their lines, would do well to string them up, along with the bluegills and perch, and try eating them. Fried in butter or bacon grease, with bread crumbs or cornmeal, they will provide tasty eating and are fit to be served at any table.

These salamanders are very common in certain localities. Several years ago a fisherman at Ecorse, Michigan, is reported to have caught 2,000 in one seine haul--an average of four per square rod of the area through which

the haul was made<sup>1</sup> In New York State several hundreds are taken annually with set lines from an extremely small area in the southern part of Cayuga Lake. The sets are made for only a few nights each fall to secure mud puppies for dissection by zoology students at Cornell University. In streams, mud puppies prefer water of moderate depth and a bottom with numerous flat rocks or other objects under which they can hide in the daytime. They do not become active, generally, until after dark.

Mud puppies are strictly aquatic animals and apparently "breathe" chiefly by means of their characteristic, red, fish-like gills although they do have lungs. The gills may be seen in the illustration, three on each side, just behind the head. They often help the collector spot "pups" where they lie under the rocks, with only head and gills exposed, the latter waving gently back and forth to secure oxygen from the water. When disturbed, they swim away with rapid strokes of their paddle-like tails.

Eggs are laid late in spring and may easily be found, sixty-five to one hundred in a "nest," attached to undersides of flat rocks, logs, and boards. At time of hatching, larval mud puppies are less than an inch in length. Growth seems to be relatively slow and it is doubtful whether the animals reach sexual maturity before the fourth or fifth year. In over 100 Michigan specimens which we measured, the average length was  $10\frac{1}{2}$  inches, and the maximum  $12\frac{1}{2}$  inches.

The nature of the relations of mud puppies to fish have been argued for many years. Various authors have written that fish make up an important part of their food. These authors, however, have not been specific as to the kinds, amounts, or numbers of fish eaten. A. S. Pearse states "though the mud-puppy is not directly injurious to man, it does great damage by

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<sup>1</sup> A. S. Pearse. Habits of the Mud Puppy. U. S. Bur. Fish. Econ. Circ. No. 49, (1921) p. 2.

eating the eggs of fish." His study of the stomach contents of thirty-one specimens collected in November and December showed crawfish to constitute the bulk of the food, while fish were relatively insignificant.

On the night of April 27, 1937, Lester T. Harkness, then Conservation Officer at Adrian, collected 105 specimens from Evans Lake, Lenawee County, and sent them to us for food study. We opened all the stomachs and examined their contents under a microscope. We found that at this time of the year, in what may be considered an average southern Michigan lake, the larvae and nymphs ("wigglers") of aquatic insects, mostly mayflies, dragonflies, and damselflies, were the most important food from the standpoint of frequency of occurrence and per cent of total volume of food in the stomachs. Crawfish were the next most important, earthworms next, and fish were fourth in importance. Other items, in order of decreasing frequency and per cent of volume, were snails, frogs, and turtles.

Of the fish found in the stomachs, fragments of a small bluegill or pumpkinseed occurred in about one out of every ten stomachs. Remains of other small fish, usually either Iowa darters or black-chinned shiners, were found in about one of every nine stomachs. This evidence is hardly enough to give Michigan fishermen much concern about the mud puppy as an enemy of fish. It is possible that some of the fish taken by the salamanders were picked up dead.

It is interesting to note that we found a young musk turtle ("stink-pot") about an inch long in the stomachs of two different specimens. This is apparently a new record of a natural enemy of turtles. Since musk turtles are generally thought to be predatory upon small fish and fish eggs, the occurrence of these little fellows in the diet of the mud puppy, also

accused as a fish predator, suggests that we should not be hasty in condemning any animal on the basis of too few facts.

According to the brief and localized study we made, indications are that, under certain conditions at least, the mud puppy cannot be considered an important limiting factor in production and maintenance of food fish crops. Rather, it seems to us, this salamander is more important indirectly as a competitor for food than as a predator of small fish. How significant this competition may be depends in part upon the abundance of food present and also upon the extent to which the young of this salamander are in turn eaten by fish.

At any rate, until more complete information on the year-round habits of this animal is obtained, wholesale destruction in the name of fish predator control is not recommended.

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Captions for illustrations for mud puppy  
article in Michigan Conservation.

1. The lowly mud puppy, believed poisonous by many, but actually harmless and recommended for eating. Note the feathery external gills, which are bright red in life; the rest of the body blends with the surroundings. About one-half natural size. Photo by courtesy of Dr. S. C. Bishop.

2. A nest of more than 135 mud puppy eggs found by turning up a large flat rock in a creek. Each egg is about the size of a pea and is suspended beneath the rock by a soft gelatinous sheath. Photo by courtesy of Dr. S. C. Bishop.