

THE MUDMINNOW *Umbra limi* (Kirt.): A
POSSIBLE MOSQUITO CONTROL AGENT IN
SEMI-PERMANENT POOLS

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The minnow *Gambusia affinis* (Baird and Girard) and the guppy *Lebistes reticulatus* (Peters) are the fishes most often mentioned in the literature as mosquito-control species (Gerberich and Laird, 1966) but their value declines in higher latitudes and in non-permanent pools. The mudminnow *Umbra limi* (Kirtland), previously overlooked as a potential control agent, offers promise from two points of view: it is better adapted to survive low temperatures and seasonal drought, and it readily eats larvae and pupae of mosquitoes.

In Canada the mudminnow occurs from Quebec, throughout the upper St. Lawrence and the Great Lakes Region, northward to Lake Nipissing and westward to Manitoba. It is small, seldom exceeding 3.5 inches in length, and inhabits marshes, pools and sluggish streams; it can live under severe conditions such as are found in shallow ditches and ponds (Scott, 1954). It can exist in very small bog holes, and survive, buried in mud, for a considerable time if the water evaporates (Hicks, 1943).

In nature it feeds on aquatic insects, vegetable matter, and occasionally small fishes (Scott, 1954). In the laboratory at Belleville one mature, newly caught fish ate 25 larvae or pupae of *Aedes trichurus* (Dyar) in as many seconds. The rate of consumption declined after the first burst of activity but captures totalled 200 larvae or pupae during the next 30 hours. The fish continued to consume between 60 and 100 larvae or pupae every 24 hours from mid-May (time of capture) until mid-June. From this date through July, the numbers of larvae eaten each 24-hour period steadily decreased until by the end of the month no more food was taken. The fish became less active and hid under a layer of sphagnum moss in the aquarium. The state of inactivity continued until mid-August when the fish again appeared from hiding for increasingly longer periods each day and in 5 days ate two half-inch-long guppies and readily took mosquito larvae. Perhaps the fish's inactivity reflects a parallel period of aestivation that might occur during adverse conditions in summer in its normal habitat.

This fish merits consideration as a possible agent for use in integrated control programs, at least in Canada and the northern U. S. A.

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AN AUTOGENOUS GYNANDROMORPH OF *Culex tarsalis* Coq.

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Autogeny in colonized *Culex tarsalis* Coq. has been described by Bellamy and Kardos (1958) and Chao (1958). Bipolar differentiation of gynandromorphs of this species has been reported with female heads and male genitalia (Keh 1955, Rigby and Blakeslee 1964), and one with a male head and female genitalia (Rigby 1966). A possible mosaic was described by Harmston (1965).

A male-appearing mosquito with an unusually enlarged abdomen was noticed among a group of colonized *C. tarsalis* (Bakersfield strain, California State Department of Public Health, Bureau of Vector Control—University of California Cooperative Mosquito Study Project, Fresno, California). The individual was found to be a gynandromorph containing mature oöcytes.

The right side of the head possessed a female antenna with small torus, large eye, and a normal female palpus. On the left side of the head was a male antenna with enlarged torus, smaller eye, and a normal male palpus. The right wing was larger than the left, a further indication of bilateral differentiation. The tarsal claws on both sides of the body were male. The external genitalia were male and unrotated even though the mosquito was post-teneral.

Internally, only the paired seminal vesicles with their usual granular seminal fluid represented the male reproductive elements. There were no seminal receptacles, no testes, and, of course, no sperm. The two ovaries each had about 40 mature oöcytes. The female accessory appendages, bursa copulatrix, spermathecae, and accessory gland, were lacking. There were only four rectal glands in the hind gut which implied a male digestive tract.

Apart from the genetic aspects of the individual, the humoral implications are especially interesting. Sufficient female gonadotropic hormone was present to permit development of an autogenous batch of eggs without apparent interference from the male components.

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