SACRAMENTO–YOLO MOSQUITO AND VECTOR CONTROL DISTRICT

Biological control elements are natural predators, parasites or pathogens that reduce pest population levels.

Mosquitofish, Gambusia affinis, are indispensable to mosquito control programs throughout the world. This relative of the common guppy feeds primarily on aquatic insects, and are effective predators of mosquito larvae in many diverse aquatic habitats throughout the world. A comparatively small species, the full-grown females are typically under 1½ inches. The muted silver and light olive green color is common in both sexes.

Gambusia exhibits a tremendous tolerance for a wide range of water temperatures, although the preferred temperatures appear to lie between 77° and 86°F. When surface water temperatures approach higher lethal limits, mosquitofish usually swim down to cooler water strata. Conversely, in the cooler seasons, mosquitofish will move into shoal areas to reach the sun-warmed shallow waters.

If you would like to request mosquitofish for your pool or pond please contact the District at 1-800-429-1022 or visit us online at FIGHTtheBITE.net

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT

FIGHT THE BITE

OFFICE LOCATIONS AND HOURS OF OPERATION

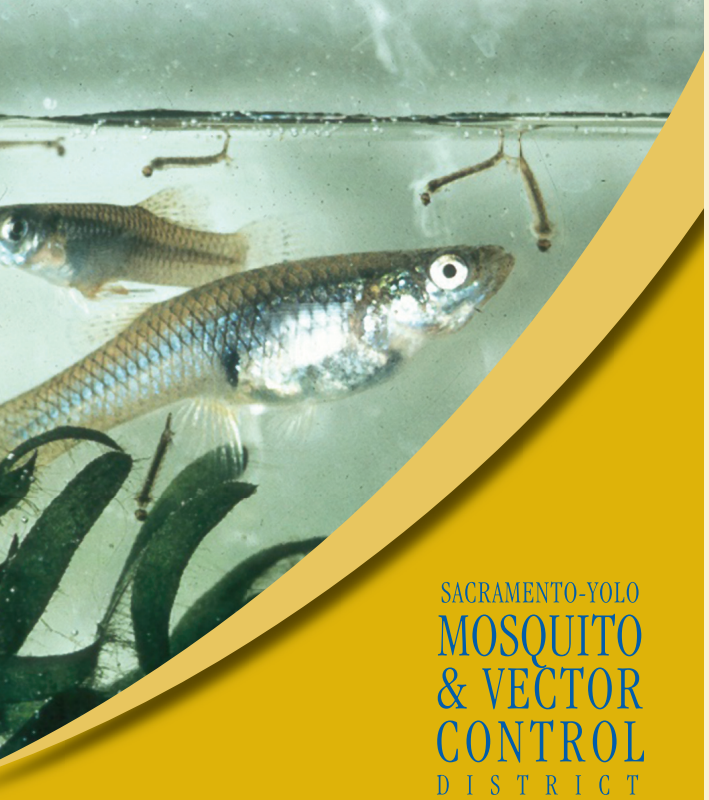
Sacramento County
8631 Bond Road
Elk Grove, CA 95624
Phone: 1-800-429-1022
Fax: 916-685-5464
Web site: FIGHTtheBITE.net
Hours: 7:00 am to 3:30 pm

Yolo County
1234 Fortna Avenue
Woodland, CA 95695
Phone: 1-800-429-1022
Fax: 530-668-3403
Web site: FIGHTtheBITE.net
Hours: 7:00 am to 3:30 pm

BIOLOGICAL CONTROL

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT

FIGHT THE BITE



SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

Life Cycle
Mosquitofish are ovoviviparous: that is, a female is fertilized internally, the eggs hatch within her body and are delivered as free-swimming independent juveniles. Their gestation period is quite variable (18—35+ days) as are their broods (10—300+ young). Several broods if young may be produced from a single fertilization and are delivered during the warmer seasons in temperate climates. In tropical climates, almost continual reproduction may occur. One can easily see that water temperature is very important to the growth and reproduction of this fish.

Applications
Mosquitofish are stocked by state-certified technicians. In general, mosquitofish are stocked in very small numbers because they quickly reproduce to the maximum population levels that a particular habitat may sustain. If supplemental feed is needed, especially in temporary situations where very few natural food organisms exist, almost any live or dry feed (even crushed dog biscuits or chicken feed) may be sparingly applied.

In small, confined mosquito sources, such as bird baths and cattle water troughs, 10-15 adult fish will provide rapid mosquito control and soon reproduce to increase their numbers. Larger sources, like small ponds and ditches, are usually stocked at a minimum rate of 0.1 pounds of fish per surface acre in the spring.

GUPPY, *Poecilia reticulata*

The guppy, *Poecilia reticulata*, has been used for biological mosquito control since World War I. It has been introduced almost all over the world from the areas of tropical South America to which it is indigenous. In many areas the guppy has provided good control of mosquitoes in highly polluted sources. These sources include sewage pools, dairy lagoons, chicken ranch ditches and slightly acidic sources. Guppies can also tolerate a wide range of salinity, from fresh to brackish waters. Low levels of dissolved oxygen do not reduce the Guppies ability to reproduce or control mosquitoes. Water quality rarely limits the survival of the guppy. Water temperature is the most limiting factor for guppies in Northern California.

Biology and Culture
Guppies are cultured in an indoor raceway system, one breeder tank and two 540 gallon grow out tanks. Guppies like the common mosquitofish are ovoviviparous: that is, a female is fertilized internally, the eggs hatch within her body and are delivered as free-swimming independent juveniles. Their gestation period (20—40 days) is dependent on water temperature with broods of 10 to 200 free swimming fry. Several broods of young may be produced from a single fertilization and are delivered during the warmer seasons in temperate climates. At our District we can control the photo period and the water temperature, so guppies breed year around in our indoor system. Juvenile fish mature in four to six weeks and can produce fry in eight weeks.

Applications
Guppies are stocked by state-certified technicians in Sacramento and Yolo counties with a special permit issued by the Department of Fish and Game. Guppies that are cultured indoors are primarily used for stocking koi and gold fish ponds. Since they have been raised indoors they are exposed to very few parasites that are commonly found in outdoor or pond cultured fish. Guppies will not survive the cold water temperatures during the winter months so there is little danger that homeowners will move them into habitats where they could impact any threatened or endangered species.

Pond cultured guppies are stocked into dairy lagoons and slightly acidic sources that will not support mosquitofish. During the last few years the District has stocked over 300 mosquito sources with guppies.

To request fish for your pool/pond, please call 1-800-429-1022 or visit us online at fightthebite.net

THREESPINE STICKLEBACK, *Gasterosteus aculeatus*

The Threespine stickleback, *Gasterosteus aculeatus*, an egg-laying California native fish, is being evaluated as a predator of mosquito larvae in some limited habitats. Sticklebacks prefer to feed on invertebrates that are usually found on the pond bottom, but when there are no benthic invertebrates to feed on, they will feed at the surface, and on mosquito larvae. This is a small fish, never more than three inches in total length.

Sticklebacks have a high salinity tolerance. They move freely from fresh to brackish water and some thrive in seawater habitats. Anadromous populations live most of their lives in salt water and return to costal freshwater streams and marshes for spawning only.

Sticklebacks exhibit a more limited tolerance of warm temperatures than the common mosquitofish. Intolerance to warm water is one of the factors that have limited the Sticklebacks use in mosquito control. Previously acclimated fish may tolerate minimum and maximum temperatures of 30° and 86°F, although sudden changes of temperature are often lethal. In mosquito sources where there are deeper areas the sticklebacks will swim down to cooler water strata to avoid the heat.

Life Cycle
The breeding cycle in the Sacramento Valley has two distinct peaks, one in the late spring starting in March and one in the fall beginning in late September. A small portion of the population continues to breed throughout the summer.

Sticklebacks are egg layers, each female laying between 50—100 eggs each time she spawns and may spawn often throughout the breeding season. The male builds an elaborate nest usually in the pond bottom, constructed of vegetable matter, straw, sticks, and other debris. The nest is held together with a mucus secretion from the kidney of the male. The eggs hatch between 10 and 18 days after they are laid and the male guards the young, and will chase off other species of fish that get too close.

Applications
Sticklebacks are stocked by state-certifed technicians. The District has raised and stocked the Threespine stickleback, *Gasterosteus aculeatus*, since 1998. The District has had fair to good success in controlling mosquitoes in these types of sources. The District has also stocked large landscape lakes with these fish for the control of midges.

FISHERIES

The Fisheries Department is responsible for breeding mosquitofish and other fish species that prey on mosquito larvae. Mosquitofish are readily available to the public through the District's service request program. The District is one of, if not the largest, mosquitofish producing facilities in the nation.