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Inoffensive in appearance, these Gambusia affinis (male above) are none the less dangerous to the continued existence of more valuable species into whose waters they have been haphazardly introduced. Photo by G. J. M. Timmerman.

Gambusia, The Fish Destroyer

BY **DR. GEORGE S. MYERS**

Few tropical fish hobbyists nowadays try to keep *Gambusia affinis* in their aquariums, except for occasional black-spotted individuals. In the early days of the hobby, when comparatively few kinds of fishes were available, this little livebearer from our southeastern states was often seen, but hobbyists soon discovered that *Gambusia* was much too hard on other kinds of fishes. And thereby hangs a tale.

About the turn of the century, not long after it was discovered that mosquitoes transmit both malaria and the deadly yellow fever, public health officers and doctors in many parts of the world began to take an interest in reducing or eradicating those diseases by introducing into local waters certain small fishes known to feed on the aquatic larvae of mosquitoes. Among the first of these fishes to be used for that purpose in tropical countries was the guppy, which was known as the "millions fish" in Trinidad and other Caribbean islands where it occurred. Guppies were introduced into even such remote places as Malaya.

However, American research on mosquito-destroying fishes was concentrated mostly on our own mosquitofish, *Gambusia affinis* (and its subspecies, *holbrooki*), and *Gambusia* gradually became known throughout the world as THE fish to introduce in the fight against mosquito-transmitted diseases. Unfortunately, this earlier American research was not as well conceived as it might have been, and it missed several important points. It was pointed out that because *Gambusia* does not normally penetrate thickly matted aquatic plants, such plants must be periodically removed if *Gambusia is* to control mosquito larvae effectively. This is quite true, but it entirely missed the point that other available small fishes penetrate such aquatic plant growths and assist *Gambusia* in controlling mosquito larvae which cannot be gotten at by *Gambusia.* Among such inhabitants of thick plant growths are *Gambusia's* close relative in our southeastern states, *Heterandria formosa,* and, in tropical America, *Rivulus* (see my article on *Rivulus* in the December **TROPICAL FISH HOBBYIST**). Moreover, it was also pointed out that *Gambusia* and similar fishes cannot exist long in temporary ponds which dry up in the dry season, and must be re-introduced when the ponds again fill up with rainwater. Again true, but it was not known at that time that *annual* mosquito-larvae-eating fishes exist (even in the temperate climate of Argentina), which survive drying up of their ponds in the form of eggs buried in the crusted mud and hatch out and grow rapidly when the rains come again. And the destructiveness of *Gambusia* to other fishes was simply not recognized.

However, relatively few physicians and health officers were aware of even such research as had been done, and *Gambusia,* because of its success in a few widely scattered countries, gained world renown and was uncritically accepted as a sort of panacea for mosquito troubles. Introductions were made in many new places throughout the world, and they are still being made, despite what we know now about *Gambusia.*

The fact is that *Gambusia* is a very dangerous fish to introduce into a place where it does not occur naturally, and is little or no better as a mosquito destroyer than many other species (including the guppy) which are somewhat less dangerous. *Gambusia* is a very destructive creature, not only to fishes of its own small size but also to much larger fishes.

This was first called to my attention 30 years or so ago, when the crew of the California State Fish and Game Department's black-bass hatchery at Friant had to discontinue using *Gambusia as* a "forage fish" with which to feed the bass. *Gambusia* was destroying a large proportion of the young bass ! Through the years, such information has slowly accumulated. Almost everywhere that *Gambusia* has been introduced, it has gradually wiped out most or all of the smaller native mosquito-destroying species. It has also almost certainly taken

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a heavy toll of the young of important larger food or game fishes. Unfortunately, because nobody has paid much attention to this probability, there is no first class research to back up what is so strongly suspected.

From my own almost daily observations of a garden pond in San Jose, California, during seven consecutive years, I can give the following data: The pond was approximately ten by fifteen feet, two and one-half feet deep in the center, shelving to three inches at the margins. It had a heavy growth of *Elodea* and pond lilies. It was stocked with eleven goldfish and approximately 250 *Gambusia,* and the fishes were fed with fair regularity. The goldfish spawned each Spring, and the *Gambusia* produced regular broods. At all times, the biomass of goldfish in the pond exceeded that of *Gambusia* in a ratio of approximately two to one. Goldfish were seen occasionally to eat smaller *Gambusia.* The *Gambusia* population remained comparatively stable in size. So did the goldfish population, with an average increment of one young goldfish every two years, which exactly equalled the death rate of the older fish. After five years the *Gambusia* were removed, resulting in an increase in the number of surviving goldfish to 30 at the end of the year and an approximate doubling of that number the following year! At the end of the seventh year of observation, the biomass of goldfish in the pond was approximately three times as great as when *Gambusia* was present, and was still increasing, which indicated what *Gambusia* can do to cut down the population of a much larger, stronger species.

The reports are ominous. In certain of our southwestern streams, the native *Poeciliopsis* is gone; *Gambusia* was introduced. In the canals of Bangkok, Thailand, the common native *Aplocheilus panchax* is now rare and the unique little *Phenacostethus* (known only from there) has disappeared; *Gambusia* is common. In the creeks around Laguna de Bay, in the Philippines, *Gulaphallus* is gone and *Gambusia* reigns. In the lower Nile, the native *Micropanchax schoelleri* cannot be found, but *Gambusia* is common. And so it goes. No one has yet assessed the damage.

Why should *Gambusia* do this? Why does it not wipe out other small species and affect bass and other larger fishes in its native haunts ? The answer lies in what ecologists call, somewhat roughly, "the balance of nature." In our southeastern states, a balance has been evolved through the ages. *Gambusia* is kept from too much destruction by its naturally evolved enemies, and smaller fishes have learned to hide from it. But when placed in a new situation, where natural checks do not occur and native species have evolved no defenses, many introduced species of animals will take over and become pests which crowd out the natural fauna. The introduced house sparrow (English spar-

row) in North America is one example. The pest of introduced rabbits in Australia is another.

Why should we worry ? It is simply that such tamperings with nature often have much more serious repercussions than we can foresee. Rabbits, introduced as an apparently harmless addition (who can imagine a "bunny" being a plague ?) to the Australian fauna, eventually overran vast areas of the continent and caused such damage as to cost the Australian people untold millions of dollars. We are not sure that *Gambusia* will not eventually turn out to be quite as expensive a plague in many places.

In addition, tropical fish hobbyists should, above all people, be concerned with the possible extinction faced by hundreds of species of small fishes in many parts of the world where man has introduced *Gambusia.* Many of these threatened species are potential avarium fishes, many are far more attractive than *Gambusia,* and many are unique and interesting species which many aquarists as well as ichthyologists might hope some day to see alive. Alas, it seems possible that many of them are already extinct. And for no good reason, because other less dangerous fishes can almost always destroy mosquito larvae quite as effectively as *Gambusia.* Thus does man's ignorance often destroy what nature has taken millions of years to produce.