

CARP FOR CHIRONOMID MIDGE CONTROL

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The common carp has been added to the list of operational methods employed by the Orange County Mosquito Abatement District for the control of several local species of chironomid midges.

The use of a biological control method for chironomids in small impoundments has been developed recently to avoid the unnecessary use of chemical insecticides as well as to eliminate the high cost of repetitive spray operations. Some 143 small impoundments in Orange County are potential breeding sources for both chironomids and mosquitos. During the past twenty years, however, the District's source reduction program, in cooperation with the property owner and other public agencies, has established conditions which eliminate any significant mosquito production from the small impoundments. The adoption of standards for design, construction and maintenance, and the use of the well known fish, *Gambusia affinis*, has eliminated the use of chemical larvicides for many years.

The encroachment of urbanization around these impoundments dictated the need for chironomid control and chemical larvicides had to be employed in spite of the fact that mosquito production had long been prevented by the source reduction program. The present program of using carp and mosquito fish as biological control agents in conjunction with the source reduction program provides an effective and economical control program for both mosquitoes and midges, the only two pest insects which breed in the small impoundments.

Public annoyance from hordes of these otherwise harmless mosquito-like insects has rapidly increased over the past fifteen years. Chironomids thrive in the silty bottoms of flood water drainage facilities and water impoundments of all types. Southern California's mild climate per-

mits continuous breeding throughout the year. Breeding activity is diminished only during the three winter months of December, January and February when the average daily temperature drops to a minimum of 52° F. Breeding in the drainage facilities is interrupted only by the scouring action of run-off from our infrequent winter storms. The chironomid's breeding cycle may be as long as 40 days during the winter months and as short as 15 days during the long summer season. Breeding intensity quickly builds up to over 500 larvae per sq. foot of bottom surface. The daily emergence of adult midges is so great that walls, windows, doors and shrubbery are covered by the resting insects. At night, they are attracted to light and readily enter the home. Since chironomids are weak travelers, public annoyance has resulted from the location of residential and commercial developments contiguous to the breeding sources. Orange County's phenomenal record of urbanization over the past 15 years has developed the need for the precise control of chironomid midges as well as of mosquitoes. Over one million people are now living in an area laced with some 250 miles of major drainage facilities and dotted with 143 water impoundments.

The use of chemical larvicides is, by necessity, the method used to control chironomid breeding in the drainage facilities. Baytex granules, applied at the rate of 0.2 lb/acre have been effective over the past 5 years. During the 1967 season, Abate granules, applied at half the rate for Baytex, gave equally good control. These larviciding operations are designed and timed to control mosquitoes as well as the chironomids. Dosage rates for chironomids, however, are double the rate required for mosquitoes.

A method of drying up special impoundments used as water spreading fa-

cilities at frequencies determined by the entomological evaluation of the development of the chironomid larvae has been successful over the past 5 years by a cooperative project between the Mosquito Abatement District and the Orange County Flood Control District. Four impoundments are used to sink imported Colorado River water into the underground basin at the rate of 100 second feet. Mosquito production was prevented by regulation of water depth, marginal weed control and the use of mosquito fish. The intensity of the public nuisance from the chironomid midges and the desirability of excluding any possibility of contaminating the underground water supply by a chemical larvicide dictated the necessity to shut down this entire operation every 30 days for a 7-day drying period. At the present time, water management facilities are being constructed by the Flood Control District to permit one-half or all of each impoundment to be removed from service and dried up while the other three remain in operation.

A method of water quality control has been successful in the complete elimination of chironomid breeding in a 200-acre tidal marsh lagoon filled with storm water run-off and located adjacent to a beach community. The operation of existing tide gates was programmed to permit free access of ocean water during periods of high tides. Gradual dilution of the fresh water quickly eliminated the ideal environment for chironomid production. In addition to the control methods mentioned above, the District has started a program of biological control of chironomid midge production in several types of water impoundments that are closely associated with the urban development in Orange County. These types are mainly sewage effluent oxidation basins, irrigation water storage reservoirs, wash water clarification lagoons used for rock and sand production, and ornamental ponds and lakes in golf courses and other recreational areas.

The biological control of chironomid midges by the use of the common carp is well-known. Although carp, *Cyprinus carpio*, is widely distributed throughout California and elsewhere, the California State Department of Fish and Game has the responsibility of protecting sport fishing waters from contamination by this so-called "pest." It destroys aquatic plants utilized by waterfowl, roils the water, causing silt-sensitive fish to disappear, and competes directly with game fish for food and space. Because it is an extremely hardy fish, it often overpopulates waters and depresses game species.

The State Department of Fish and Game has recently recognized the public nuisance problem created by chironomid midges and is aware that the carp is the only fish currently available that will control midge production in small impoundments. Consequently, the Department has approved the District's program to use carp for this purpose. Applications for a permit to transport and plant carp must be submitted by the District for each impoundment. Permits are issued by the Department if the impoundment meets the following criteria: (1) There not be a sport fishery which the introduction of carp would disrupt, or a migration route into a sport fishery; and, (2) that the area either be fenced or clearly posted against public use so that anyone entering the area would realize he was trespassing. Before applying for a permit, the District reviews the program with the owner of the impoundment and secures his written permission to plant the carp.

The District accepts the responsibility for protecting existing or potential sport fishing waters in Orange County from contamination by carp. It depends on the Department of Fish and Game for training in the identification, salvage and transportation of fish. The District is guided by the recommendations of the Department of Fish and Game so that the use of carp for the control of chironomid midges will not be detrimental to the public interest.