

A STUDY OF THE MEDICALLY IMPORTANT MOSQUITOES AT HOLLOWAN AIR FORCE BASE, NEW MEXICO¹

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INTRODUCTION. Holloman Air Force Base is located in an arid valley in the southeastern section of New Mexico at an elevation of approximately 4,090 feet. The base is situated 10 miles from the town of Alamogordo in Otero county.

During the summer of 1958, the entire base area was under constant annoyance from vicious biting mosquitoes. Most seriously affected were the housing areas, golf course, and the aircraft flight line, where persons worked outside after dark.

Not only were the mosquitoes causing a great deal of personal annoyance and secondary infection in some of the bites, but there was a definite possibility of the occurrence of the virus encephalitides. Dr. W. G. Wisecup, Base Veterinarian, stated that there had been recent occurrences of encephalitis reported in New Mexico in both human and horse populations. Identification of larvae and adult mosquitoes collected from various areas on and adjacent to the base demonstrated the presence of *Culex tarsalis*. This species is the classic transmitter of encephalitis in the western United States.

COLLECTION AND IDENTIFICATION. Adult mosquitoes were hand collected in chloroform killing tubes from various areas on base, e.g., airmen housing, Wherry housing units, golf course, and the areas of heavy vegetation near the sewage oxidation ponds.

Approximately fifty adult female mosquitoes were mounted on entomological paper tabs and attached to mounting pins. After classifying each of five groups of adults, it was observed that only *Culex*

tarsalis was present in the housing areas while those from the outlying vegetated regions were predominantly *Aedes nigromaculis* with a few *Aedes dorsalis*. In order to supplement the hand collections, two New Jersey type light traps were placed in operation for one night and the collections counted and classified. The trap located near the golf course club house accounted for 44 percent male and 46 percent female *Culex tarsalis*, 2 percent male *Aedes nigromaculis*, and 7 percent male along with 1 percent female, of unidentified species. The collections from the trailer court trap showed 35 percent male and 65 percent female *Culex tarsalis*. It was quite evident, from the adult collections, that *Culex tarsalis* was the only species of any consequence causing annoyance in the housing areas at the time of the survey. Barnes, 1955, stated in his paper, "It (*Culex tarsalis*) is active at dusk and makes persistent efforts to enter buildings in search of blood."

A ground and aerial (helicopter) survey of all possible larval development sites on base and surrounding private property was accomplished.

Sod samples were taken from four general areas that would normally become flooded during the rainy season. The sod samples were placed in artificial containers and flooded with tap water. After a period of less than 6 hours, the first instar larvae of *Aedes nigromaculis* were noted in the samples taken from a dry shore line region surrounding the swamp where *Culex tarsalis* larval were in continuous development. No larvae emerged from the other three area samples, including those from the turf strips of the horticultural nursery which receive periodic flood irrigation.

ECOLOGY OF THE SWAMP. A large swamp and slow moving stream with an esti-

¹ This article represents the views of the author and does not necessarily constitute the opinions, ideas, or policies of the United States Air Force (AFR 160-94).

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mated 40 acres of water surface proved to be an ideal habitat for mosquito development. The marsh was created by the overflow from five sewage oxidation lagoons covering 12.7 acres. Approximately 600,000 to 800,000 gallons of sewage effluent flows into the swamp daily. During the wet winter and spring seasons, natural rainfall causes a rise in the water level and subsequent flooding of the dry shore line, which results in emergence of large populations of the floodwater mosquito, *Aedes nigromaculis*.

The predominant species in the entire marsh region was *Culex tarsalis*. The majority of the larvae and pupae were observed among the dense stands of grass in water from about four to eighteen inches deep and in the small open patches of water (one or two square feet) surrounded by green floating algal growth commonly called "green floating swamp moss."

The water from the swamp lake flowed southwest forming a slow moving stream with small side ponds and water-grass patches where there was a great abundance of breeding—up to 40 larvae or more per dip, with an average of 10 to 20 per dip. All of the larvae that were observed and mounted on slides from this area were *Culex tarsalis* with the exception of two specimens of *Culiseta* sp.

In the stream, the water was approximately 6 to 10 inches deep where the larvae were developing. The water was quite clear and cool. Green floating algae covered a large portion of the stream surface and side ponds. The breeding was again taking place in the open patches of water amongst the algae. Some of the larvae were apparently seeking shade during the heat of the day (100 degrees plus or minus 5 degrees F.) by occupying the sheltered areas just under the edge of the patches of floating algae. In places where the water was well shaded by scrub brush, salt cedar (*Tamarix* sp.), sedges (*Carex* spp.), and tall narrow leaf grasses, larvae could be found breeding in water less than 6 inches deep, but in shallow water

that lacked sufficient shade no larvae could be found, probably due to the high water temperatures during the day.

In the shallower regions of the swamp lake where the water temperature was a few degrees higher and the water more stagnant, a few unidentified species of *Aedes* and *Culex* were collected that were not observed in the main breeding areas.

In all parts of the swamp and stream, extremely large populations of rat-tailed maggots (*Tubifera* sp.) and other sewage breeding Diptera were found developing. The presence of these larvae was indicative of the large amount of contamination and organic material suspended in the water and settling-out on the bottom.

No fish were seen in the swamp or stream. The bird population of the vegetative belt in and around the marsh was very small.

DISCUSSION AND SUMMARY. According to the Otero County Agricultural Agent, the towns near Holloman Air Force Base generally do not have a mosquito problem which suggested that the mosquito problem was indigenous to the base area. This theory was confirmed by the fact that the flight range of *Culex tarsalis* is usually less than 2.5 miles (Barnes, 1955) and the nearest town, Alamogordo, is 10 miles away. This was further supported by the fact that the entire region around the base and town of Alamogordo is very dry and covered with sagebrush, with the exception of the sewage swamp, cattle-watering reservoirs and limited irrigation sites. Mosquito breeding could not be demonstrated at the latter two sites.

The floodwater mosquito, *Aedes nigromaculis*, hatches and develops in the water along the flooded shore lines and temporary rainwater pools which occur during the wet winter and spring. Having a much longer flight range (in excess of 10 miles), the floodwater mosquitoes not only cause a lot of annoyance to personnel on the military base, but also migrate on a southwest wind into Alamogordo.

Because of the hardpan layer just below the surface of the soil, which does not allow

the water to percolate through the upper ground layers, drainage of the swamp was considered impractical.

Biological control by introducing minnows into the swamp and stream was not feasible because of the low oxygen content resulting from the huge amount of decaying organic matter in the water.

Successful mosquito control was obtained

through the application of insecticides. Malathion was applied both as an adulticide and larvicide by ground fogging and aerial spraying.

Literature Cited

BARNES, R. C., PRATT, H. D. and LITTIG, K. S., 1955. Mosquitoes and their control. Communicable Disease Center, USPHS, Atlanta, Georgia. pp. 1-105, tpw.