

OBSERVATIONS ON *CULISETA MORSITANS* IN THE LANDSTUHL/PFALZ AREA OF GERMANY 1956-59¹

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Several mosquito species of the genus *Culiseta* have been shown to be potential vectors of the viruses of human encephalitis. Some of these, including *Culiseta morsitans* (Theobald) are thought to feed primarily on birds or other small animals and may possibly fill a connecting link in the little-understood epidemiology of various human virus infections.

Wesenberg-Lund (1) in Denmark and Marshall (2) in England report that they never have been able to induce laboratory reared females of *C. morsitans* to feed on man. Natvig (3) cites a reference where Eckstein claims to have induced a female of this species to feed on blood of a greenfinch, indicating that the species probably feeds on birds.

Carpenter and La Casse (4) report the distribution of *C. morsitans* as Northern United States, Alaska, Canada and Europe, the larvae occurring in rather large, temporary, cold rain-water pools in both shaded and open marshes. Various European workers have recorded the species as having a wide distribution in Europe, including France, England, Denmark and other areas; however, very meager information is found in the literature on its biology, seasonal occurrence, specific larval habitats and ecologic association with other mosquito species.

In the course of conducting routine surveys for mosquito species occurring in the southwest area of Germany during 1956, 1957, 1958 and early 1959, some habitats were observed in the Landstuhl/Pfalz area in which larvae of *C. morsitans* were collected during most months of the year. The two habitats from which larvae were most consistently collected and in greatest numbers were quite similar to each other. Both were ditches about two

to three feet deep with sloping sides, being partially shaded by trees and/or low-growing vegetation, and separated by a dirt road from a field. Both held rain-water and seepage water almost the year around. One (Figure 1) was located along the edge of Landstuhl Air Base on level ground at an altitude of about 760 feet above sea level. The other was about 1/2 mile south of the above on low-lying, level ground at about the same elevation. One other place where larvae were occasionally found was a temporary woods pool, about 3 miles west of the above places, containing rain-water.

Current records indicate that hatching of *C. morsitans* takes place in August, after which either second, third or fourth instar larvae may be found in each ensuing month until about May. Pupae were field collected in March and May. No stage of the species was collected during the warmer season of June and July. It is therefore assumed that the adults emerge during March to May and deposit eggs which do not hatch until August, or else the adults survive the summer and deposit their eggs in late summer, as observed by Marshall (2) in England. The species overwinters in the larval stage and there apparently is only one generation per year. The larvae survive low temperatures under the ice and snow.

Table 1 contains summarized records of ten other species of mosquitoes including seven of the genus *Aedes*, one *Anopheles*, one *Culex* and one other *Culiseta* collected from the same larval habitats with *C. morsitans*.

Adults of *C. morsitans* were never collected in the field in biting collections or otherwise.

During the winter, in early 1958, an attempt was made to establish a laboratory colony of *C. morsitans*. On 8 January, about 180 third and fourth instar larvae

¹ A contribution of the Entomology Department, U. S. Army, Europe, Medical Laboratory, APO 180, New York, New York.

TABLE 1.—Summary by months of larvae of *C. morsitans* and/or associated species taken from breeding sites in Landstuhl, Germany Area 1956–1959

Month of collection	Total No. of collections	Number & instar of <i>C. morsitans</i> taken		Other species taken with <i>C. morsitans</i>	Water temperature ranges at times of collections and other remarks
		1st instar	2, 3 & 4th instar		
August	3	21	0	<i>Culex pipiens</i> , <i>Aedes vexans</i> <i>Aedes cantans</i> , <i>Aedes cinereus</i> <i>Aedes punctor</i>	66° to 70° F.
September	3	0	32	<i>Culex pipiens</i> , <i>Aedes punctor</i> <i>Aedes cantans</i> , <i>Aedes cinereus</i> <i>Aedes vexans</i>	58° to 60° F.
October	9	0	221	<i>Culex pipiens</i> <i>Caliseta annulata</i>	50° to 56° F.
November	4	0	71	None	40° to 46° F.
December	3	0	43	None	1 to 2 inches of ice on water
January	5	0	428	<i>Aedes rusticus</i>	3 to 4 inches of ice on water
February	4	0	337	<i>Aedes rusticus</i>	34° to 46° F.
March	5	0	82	<i>Aedes rusticus</i> <i>Aedes communis</i> <i>Aedes punctor</i> <i>Aedes cantans-annulipes</i>	38° to 54° F. 14 field collected pupae reared in lab. to adult <i>C. morsitans</i>
April	10	0	47	<i>Aedes rusticus</i> , <i>Aedes punctor</i> <i>Aedes communis</i> , <i>Aedes cantans-annulipes</i> <i>Anopheles claviger</i>	44° to 58° F.
May	3	0	3	<i>Aedes punctor</i> , <i>Culex pipiens</i> <i>Aedes cantans-annulipes</i> <i>Aedes cinereus</i>	38° to 65° F. 1 field coll. pupa reared in lab. to adult <i>C. morsitans</i>
June	1	0	0	<i>Aedes cantans-annulipes</i>	65° F.
July	2	0	0	<i>Culex pipiens</i> <i>Aedes vexans</i> <i>Aedes cinereus</i>	58° to 70° F.

were collected from under about four inches of ice, put in a two-gallon glass animal jar and kept in the laboratory at room temperature. The larvae were kept in some of the ditch water and fed on powdered dog food and yeast mixture. As the larvae began pupating about 1 February, they were transferred into a large, white, enamel pan inside a 15" x 15" x 15" screen cage. Adults began emerging on 6 February. During February, additional larvae were field collected and added to the glass jar and used as a continuous supply of pupae for adult

emergence in the cage. Repeated attempts made to induce the females to feed on human blood by inserting the hand and forearm into the cage failed. Also in February, newly hatched chickens and very young white mice were placed in the cage, but none of the adult mosquitoes were observed to take blood. The males, and possibly the females also, fed on pieces of apple and also on sugar solution, suspended from the top of the cage. Daily observations were made to determine whether oviposition was occurring. Later a block of damp earth, from the edge of



FIG. 1.—Shaded ditch separating old road and a field, adjacent to Landstuhl Air Base, Germany where *C. morsitans* larvae were collected each month in the year except June and July.

the ditch from which the larvae were taken, was placed in one end of the pan of water as additional inducement for egg laying. No oviposition was ever recorded.

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March 27-30**