

ton, D.C. and Dr. Laurence W. Quate, Bernice P. Bishop Museum, Honolulu, for checking the identification of these specimens.

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## BIOLOGICAL NOTES ON *CULEX TARSALIS* IN THE LOWER RIO GRANDE VALLEY OF TEXAS

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As a primary vector of western and St. Louis encephalitis, *Culex tarsalis* has been intensively studied in a variety of ecological situations. It would be surprising if a species showing such efficient environmental adaptability did not exhibit diverse behavioral characteristics in widely separated parts of its extensive geographical range. Snow and Pickard (1956) observed that east of the Mississippi River *C. tarsalis* occurs from late August to late November, with a population peak in September. In the western United States, the species may become extremely abundant during the summer, with larval development in rain or waste irrigation water. Overwintering is by unfed, fertilized females.

It is the purpose of these notes to comment on two unusual characteristics of *C. tarsalis* in Cameron and Hidalgo Counties in the Lower Rio Grande Valley of Texas, viz., (1) the species is a winter mosquito, with both larvae and adults undetectable by standard population sampling procedures during certain summer months, and (2) it does not appear to utilize chicken houses or other man-made structures as diurnal resting sites to any appreciable extent, even during population peaks.

The seasonal population fluctuation ex-

plains the apparently contradictory statements found in the literature concerning the prevalence of *C. tarsalis* in the Lower Rio Grande Valley. Fisk and LeVan (1940) reported *C. tarsalis* to be abundant in light trap catches in Cameron County from December through April in 1939. Hammon *et al.* (1944) collected 22,768 mosquitoes by hand and light traps in Cameron County, April through June of 1942, only 60 of which were *C. tarsalis*. During a major epidemic of St. Louis encephalitis in Hidalgo County in 1954, Beadle *et al.* (1957) took some 2,000 mosquitoes for virus isolation studies in September, none of which were *C. tarsalis*. Approximately the same number of mosquitoes were obtained during a 1957 St. Louis encephalitis outbreak in Cameron County in August, only three of which were *C. tarsalis*, according to Wiseman *et al.* (1959).

Both Beadle *et al.* (1957) and Wiseman *et al.* (1959) state that *C. tarsalis* is uncommon in the Lower Rio Grande Valley, although conditions appear favorable for its development. Actually, this statement is true only for the summer months. Public Health Service Quarantine Station light trap records for Brownsville indicate that the species is prevalent from October through March, with a population peak in November. One to four light traps have been operated continuously since 1943, in connection with vector surveillance, and the 1962-63 records for two of the traps given in Table 1 are

<sup>1</sup>Public Health Service, Quarantine Station, U. S. Department of Health, Education and Welfare, Brownsville, Texas.

representative of the seasonal population fluctuation which *C. tarsalis* has shown each year.

Reasons for this pronounced seasonal variation in population density are not readily apparent. The Cameron County climate is semitropical and marked seasonal changes do not usually occur. The average January temperature is 60° F., with 84° F. in July, and the annual mean is 77° F. The average rainfall is 29.55 inches, with much of it falling during spring or fall. The moderate year-around temperature should have little effect on

TABLE 1.—Catches in two New Jersey light traps operated continuously in Brownsville, Texas, 1962-63.

Month	1962		1963	
	No. tarsalis	Total no. mosq-quitoes	No. tarsalis	Total no. mos-quitoes
Jan.	80	206	87	393
Feb.	138	430	103	288
Mar.	112	480	200	977
Apr.	12	329	6	9,266
May	2	572	5	4,868
June	0	701	0	1,001
July	0	1,111	0	227
Aug.	0	9,710	0	1,278
Sept.	0	2,746	0	1,751
Oct.	398	828	154	1,298
Nov.	809	1,579	234	1,261
Dec.	97	475	39	220

the presence or abundance of all stages of *C. tarsalis*, except that larval development would normally be lengthened in the winter, as the temperature occasionally drops to near freezing or below.

Standing water resulting from rainfall is usually more abundant during the winter months, as the small amount of precipitation that falls in the summer evaporates rapidly. However, most farming operations utilize irrigation water and the numerous irrigation canals in the area are usually provided with adjacent drainage ditches which frequently hold seepage or waste water. This habitat appears ideal for *C. tarsalis* development. As shown in Table 1, appreciable numbers of mosquitoes are taken by light trap during the summer months. Avail-

ability of suitable larval breeding sites would no doubt account for seasonal variation in population densities, but not for the apparent disappearance of larvae and adults during the summer.

The diurnal resting habits of the Lower Rio Grande Valley *C. tarsalis* also seem to be unusual. For several years personnel of the Brownsville Quarantine Station have been making regular collections of live, adult mosquitoes for virus isolation studies, in chicken houses and other diurnal resting stations. Irrespective of the time of year, the only mosquito taken in any numbers has been *C. quinquefasciatus*, with occasional *C. erraticus*, *Anopheles quadrimaculatus*, *A. crucians* and *A. pseudopunctipennis*. *C. tarsalis* has not

TABLE 2.—*Culex tarsalis* taken by two New Jersey light traps October, 1963-January, 1964, in Brownsville, Texas.

Month	Males	Females			Total
		Engorged	Gravid	Empty	
Oct.	1	38	44	71	154
Nov.	6	11	33	182	232
Dec.	4	1	11	23	39
Jan.	12	3	67	41	123

been located in these situations, even during the cooler months when adults were being taken in light traps and larvae were common.

To cite an example, one of our light traps located on a farm a few miles outside the Brownsville city limits hangs immediately adjacent to a chicken house. In November of 1962, 30 to 40 *C. tarsalis* were frequently taken each night in the trap. However, not a single *C. tarsalis* could be found resting in the chicken house or other sheds on the premises during the day.

With the appearance of the first *C. tarsalis* in the fall of 1963, males and females have been separated and the latter classified as to whether blood-engorged, gravid or empty. The results for several months are given in Table 2.

SUMMARY. Two unusual characteristics of *C. tarsalis* in the Lower Rio Grande

Valley of Texas are discussed. The species is a winter mosquito, not detectable by standard survey techniques during the summer months; and apparently it does not utilize man-made structures as diurnal resting sites, even during winter periods of peak abundance.

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