DISPERSAL OF *AEDES MELANIMON* IN THE SAN JOAQUIN VALLEY OF CALIFORNIA [1]

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The long axis of Merced County lies perpendicular to that of the San Joaquin Valley of California, the lowest part of the county being at the southwestern end. Drainage from the valley occurs through these lowlands, flowing northwest toward the delta area of San Francisco Bay. Soil fertility of this basin region is relatively poor. Except for some grazing, a large part of it is not used for agricultural purposes. In late summer and early autumn, when nearby rice fields are drained for harvest, this marginal area is flooded to create a migratory water fowl habitat. Many private and corporately owned duck clubs are established in the area and hunters are drawn to the clubs each fall. Prevailing winds are from the San Francisco Bay area, blowing toward the southeast.

The "duck club area" of the Grasslands Water District comprises approximately 80,000 acres lying cigar-shaped along the valley floor, its southeast end touching the Fresno County line. When flooded, the area produces enormous broods of *Aedes melanimon* Dyar, a species which appears to be suited to the somewhat brackish water (Kliewer *et al.*, 1964). As the season progresses, other species, notably *Culex tarsalis* Coquillett and *Culiseta inornata* (Williston), appear in collections and *A. melanimon* diminishes in number until it is relatively insignificant, corroborating the observations of Mortenson (1963). The initial populations of *A. melanimon,* however, are large and constitute a major nuisance both to local residents and, according to Mosquito Abatement District personnel who have observed this problem for years, to those some distance downwind from emergence sites.

This study was conducted at the southeast end of the duck club area and extended into Fresno County. It summarizes observations made during the 1962 season, supplemented by observations from the 1961 and 1963 seasons. The purpose of the study was to determine the extent and timing of downwind dispersion of *A. melanimon* mosquitoes from their source. Such dispersion patterns have been reported for *Aedes* mosquitoes in California (Smith, 1952; Smith *et al.*, 1956).

METHODS. The "American Model" New Jersey light trap (Mulhern, 1953) was used as the population monitoring device in this study. Eight light traps were located in three roughly semicircular bands leeward of the mosquito source. The first band of three traps was approximately 3 miles from the source. One trap was located south (Panoche Water District Office), another southeast (Eag'e Field), and the third east (Koda Rice Mill) of the southern tip of the mosquito producing area. The second band of three traps averaged about 8.5 miles from the source. One trap was located south (Drew Ranch), another southeast by south (Producers Cotton Gin), and the third southeast by east (Tai Hing Ranch) of the source. The third band consisted of two traps approximately 13 miles from the source, one south southeast (Hammond Ranch), the other southeast by east (Broadview Farms). Light trap placement was limited by the availability of electricity. Hence, locations were not uni-

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formly precise with respect to direction and distance. Additionally, a light trap was placed at the south edge of the duck club area to monitor populations at the suspected source.

Light traps were set to operate through the night, including both the evening and morning civil twilight periods since these are the peak activity periods for this species (Kliewer *et al.*, 1967; Miura & Reed, 1969). Traps were serviced each Monday, Wednesday, and Friday starting the first week in September and continuing through November. This provided information on mosquito populations prior to flooding of the duck club and into the period following population decline.

Light trap collections were transported to the laboratory where the mosquitoes were identified and counted by sex. Numbers were recorded on the basis of average number of mosquitoes caught per trap night.

RESULTS AND DISCUSSION. Results of this study indicate that there is a downwind dispersal of *A. melanimon*. As can be seen in Fig. 1, the numbers of mosquitoes taken in each band of light traps diminished with distance from the duck club and the lag in timing of peak catches in relation to distance indicated that the mosquitoes were produced in the duck club area. Furthermore, minor peaks and fluctuations on the curves appear to be associated. In several instances this association is striking

Information preceding the flooding of the duck club and following the decline of duck club mosquito populations indicated the virtual absence of this species in the vicinity of the traps. Populations of *A. melanimon* persisted in the duck club area for 2½ to 3 months suggesting an adult longevity approaching that length of time. After this period they were replaced by mosquitoes of other genera. It was only during this 3-month period that appreciable numbers of mosquitoes of this

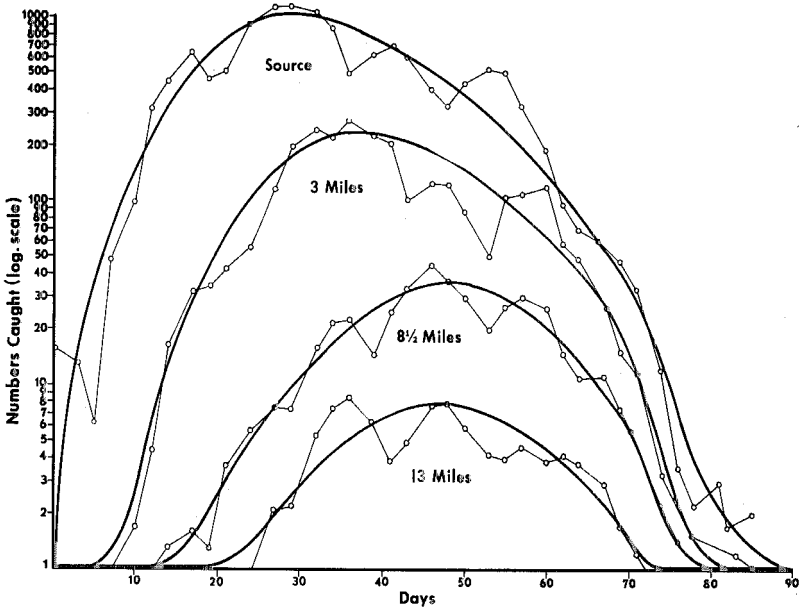

FIG. 1.—One-week moving averages of *A. melanimon* occurrence in light traps at distances from the major breeding site. A log scale is used to accentuate the lower numbers caught at greater distance from the source.

TABLE 1.—Response of two light traps in relation to distance from the major source of *A. melanimon* and direction of prevailing wind.

	Panoche	Eagle Field
Distance	3.4 miles	4.1 miles
Direction	South	Southeast (downwind)
Mosquitoes caught		
Total	3986	5311
Largest number per trap night	278	542
Percent of time with larger collection	28	72

species were taken in bands of light traps 3 and 8½ miles from the duck club area. While there was an increase in *A. melanimon* taken in traps at about 13 miles, this increase in numbers was small but still suggestive as to their having originated in the duck club area.

The fact that traps placed downwind of the emergence site collected more *A. melanimon* than did those placed out of the direction of prevailing winds is significant. Table 1 illustrates this relationship and indicates the influence of prevailing winds on dispersal of this mosquito in the area where our studies were made.

Inasmuch as secondary population density fluctuations at the various localities appear to be related in our study, it would seem advisable to conduct further studies of a more refined nature. Mass tagging (perhaps with dyes or radioactive isotopes) at the source, daily population sampling, and monitoring of local weather conditions would enable one to relate wind direction and speed as well as other climatic factors to mosquito dispersal.

SUMMARY. Light trap studies of *A. melanimon* in western Merced and Fresno Counties disclosed a downwind dispersal of several miles from the source. Time lag in peak collections and diminishing numbers of mosquitoes with increased distance indicated origination in the "duck club area." The marked association of secondary population fluctuations substantiates this conclusion. Traps placed directly downwind from the emergence site collected more *A. melanimon* than did those placed out of the prevailing winds.

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