

# OBSERVATIONS OF *Aedes taeniorhynchus* DISPERSAL IN EXTREME SOUTH FLORIDA AND THE EVERGLADES NATIONAL PARK

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## I. INTRODUCTION

### *A. History*

In the early summers of 1951 and of 1953, Southeast Florida was invaded by a large flight of salt-marsh mosquitoes, primarily *Aedes taeniorhynchus*. These flights were of an apparent unprecedented nature in that the counties involved had organized mosquito control districts which

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claimed that their respective breeding marshes were dry and that the invasion was from an outside source. As a result, the Bureau of Entomology, Florida State Board of Health, began, in 1954, a study of the situation to determine the source of the two invasions.

### *B. Geographical Description*

The area under study was all of the Florida Peninsula, from the Tamiami Trail, southward to Rock Harbor on Key Largo. (Figure 1.) This area is 65 miles wide and 60 miles long, or approximately

2½ million acres, of which the authors estimate 100 to 200 thousand acres are capable of producing salt-marsh mosquitoes.

### C. Ecological Description of the Area to be Surveyed

(1) *Metro Miami and Pine Lands.* In the northeast corner of this area is metropolitan Miami with a population of 800,000 which is rapidly expanding in a south-westerly direction. The outward expansion of the metro area can extend only into the rocky pine lands, due to their higher elevation. These rocky pine lands join Biscayne Bay in the southern part of Miami proper and run approximately 40 miles southwesterly to Florida City and Homestead. They have an average width of 5 to 10 miles.

(2) *East Farming Area and Marsh.* Lying between the pine lands and Biscayne Bay is a farming area and the outer one third is semi-salt marsh.

(3) *Transition Area.* South of the farming area lying along the bay, is a transitional area which is a semi-marsh, fresh to brackish.

(4) *Florida Keys (Sands, Elliott, Old Rhodes, Key Largo, etc.)* These Keys or islands begin 15 miles south of metro Miami and extend 30 miles in a slightly southwesterly direction. Sands Key at the northern end is 9 miles offshore, while the distance from Key Largo to the mainland varies from 2 to 5 miles due to the irregularity of the shoreline. These Keys are of rock formation (Key Largo Limestone) fringed with marsh, the center of which is of higher elevation supporting a tropical hammock or woodland.

(5) *Florida Bay.* A very shallow bay lying between the Florida Keys and the mainland; scattered throughout the bay are hundreds of islands, varying from a fraction of an acre to several hundred acres in size. All of these islands have salt marsh characteristics with practically all of them capable of producing mosquitoes. A typical island is flat with a small wave action dike around the perimeter. Tide in

Florida Bay is almost exclusively from wind action, with a total range from a few inches to about 3 feet.

(6) *Cape Sable and the Mainland Shore of Florida Bay.* From Jewfish Creek west across to the western end of Cape Sable there is a band of salt marsh dominated by black mangrove and pickleweed, varying in width from ¼ mile to 3 miles. Lying behind the salt marsh band is a transitional zone of buttonwood and red and white mangrove, changing gradually to a fresh water environment which eventually becomes pure sawgrass. Scattered throughout this transitional zone are numerous brackish and fresh water lakes and ponds, and patches of tropical hammock. The ponds dry up seasonally.

(7) *The Gulf Coast Zone.* This zone extends from Cape Sable northwesterly to the Ten Thousand Islands. It consists of ecological types which represent all of the types of salt marshes found on the east coast of Florida except salt flats. Lying behind this area is a non-typical transitional zone of usually *juncus* and sawgrass.

(8) *Sawgrass Glades.* The central portion of the entire area is a pure stand of sawgrass over rock; it is extremely flat and pocked with small cocoplum-myrtle hammocks commonly known as Everglades Keys. The sawgrass area usually goes under water in June and dries up in early winter.

## II. PROCEDURE

After several trial runs with a thirty-foot boat it was decided to use a seaplane to survey the vast breeding areas. Thirty stations scattered through the breeding area on both coasts were checked twice weekly. At each station an adult landing rate was taken, rain and wind data recorded and larval observations made. Seventy other stations were collected by truck one or more times a week.

Thirty-five New Jersey type light traps using 40-watt bulbs were run *nightly* throughout the summer.

Truck trapping as a means of sampling

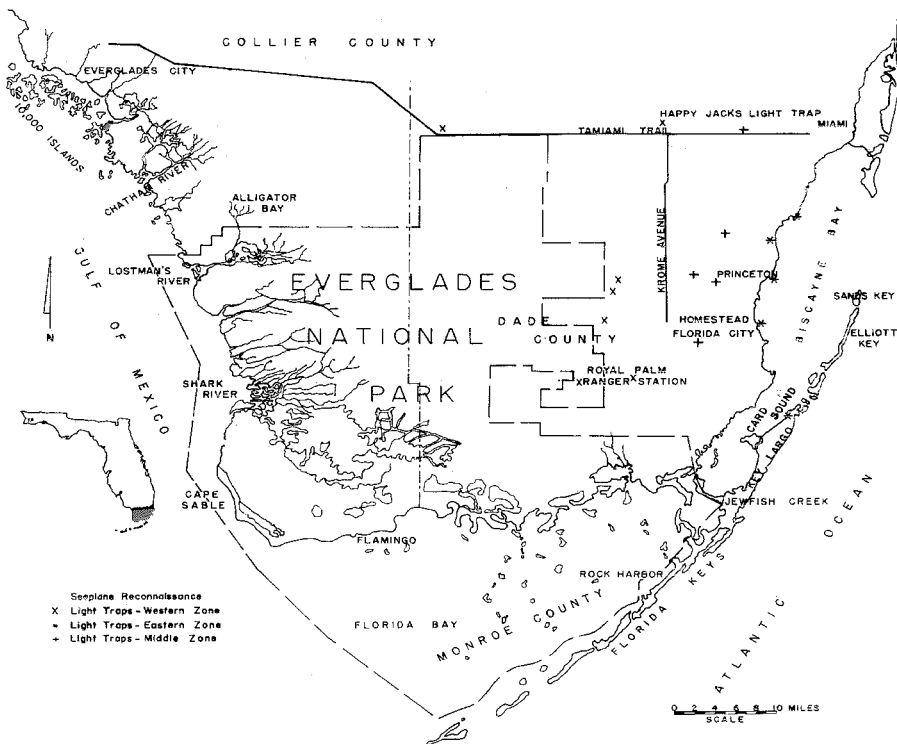


FIG. 1.—Southern tip of Florida

adult density was used on this survey in the summers of 1955 and 1956, but was abandoned as it required far too many men and too much time.

On charts 1, 2, and 3 are shown in hour miles (hours times miles) easterly and westerly winds and winds from due south along with the average of the nightly collection of the light traps of the eastern zone (N. Key Largo and coast line of Biscayne Bay); middle zone (Pinelands); and western zone (Krome Avenue westward and eastern edge of sawgrass) for 1956. The wind data in the charts were taken from the U. S. Weather Bureau at Miami International Airport, wind 6 p.m. to 6 a.m. only.

During the summer of 1956 there were four major peaks of the western traps (June 4, July 15, August 8 and August 27). Of the four major peaks, three are associated with periods of west wind, while the fourth (July 15) was associated with a period of west wind, followed by south wind, followed by west wind, in one day succession.

It may also be noted that the two prominent peaks of easterly winds co-ordinate with the two prominent valleys of light trap collections in all three zones. It should be emphasized that all of the traps referred to as "western traps" are eight miles to fifteen miles from a breeding area, whereas all of the eastern zone

CHART 1  
June 1956

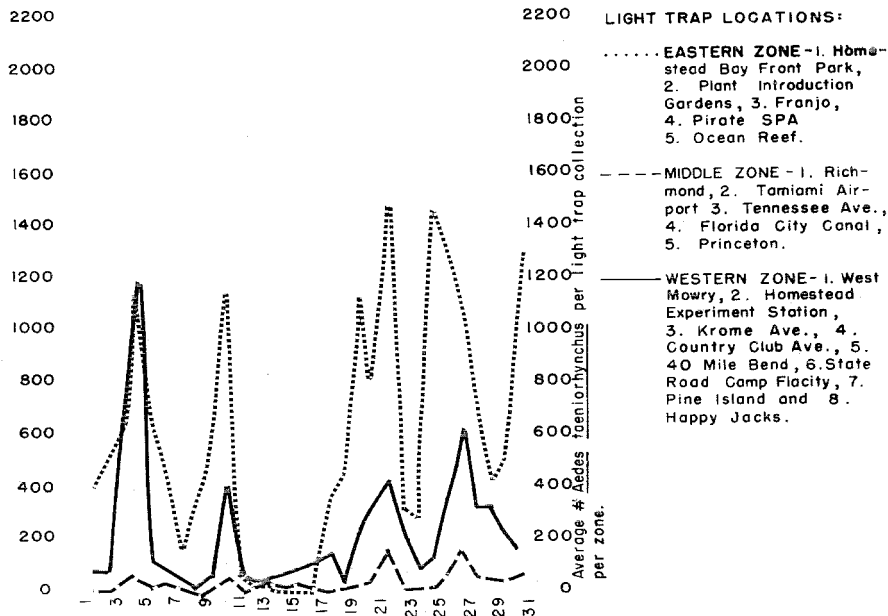
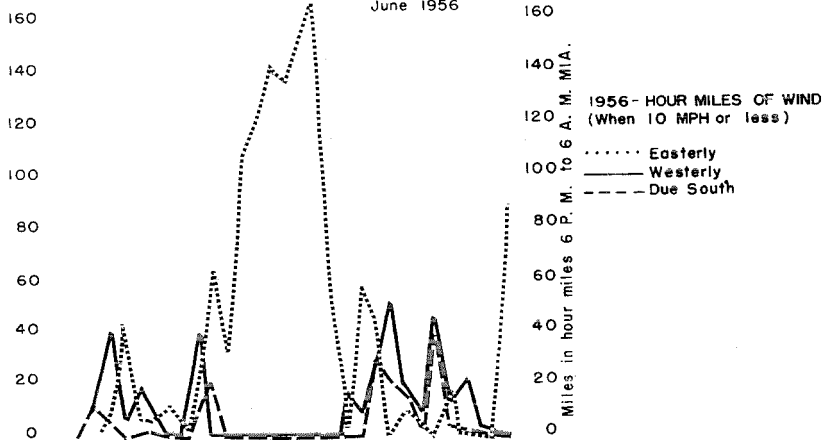


CHART 2  
July 1956

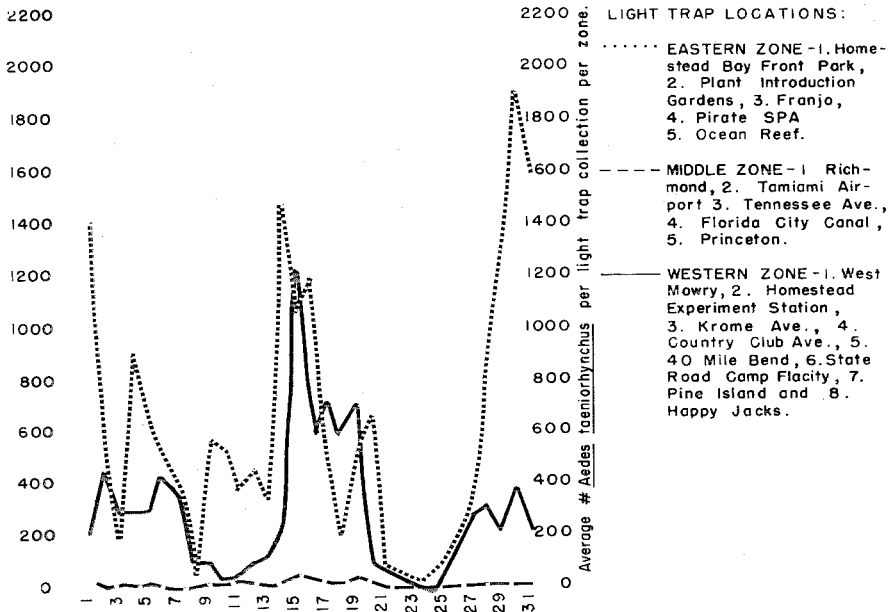
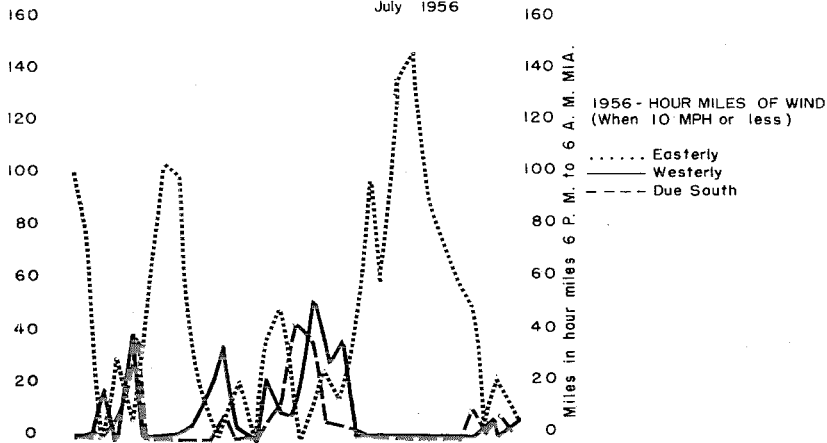
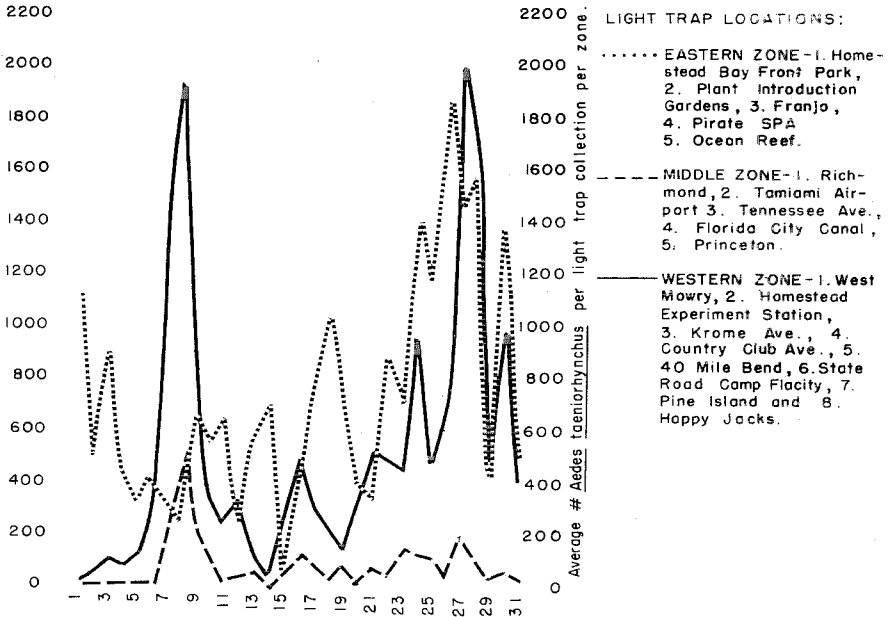
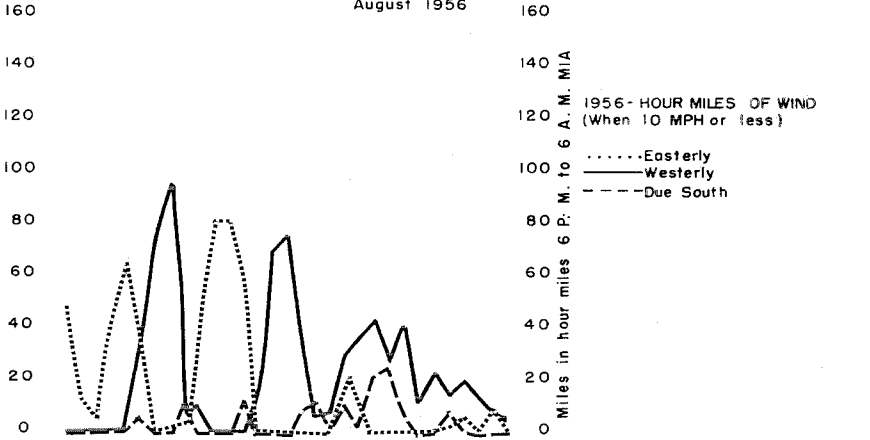


CHART 3  
August 1956



traps are within a mile of a breeding area. It might also be emphasized that the two high peaks of the western traps are higher than those of the eastern traps despite their much less advantageous locations.

With reference to the peak of August 8, it is of the utmost importance to know that the seaplane reconnaissance information verifies the following facts:

1. The breeding areas from Sands Key down to Jewfish Creek and across Florida Bay to Flamingo were dry.
2. The rain cans showed little or no rain and adult landing rates were low from July 20 to August 10.

Thus we feel that a sufficient number of mosquitoes to send up all the traps on August 8, could not have come from this area. On the contrary, from Cape Sable northward to Chatham River, rainfall from July 27 to July 30 ranged from one and one-half inches to the south to four inches at Alligator Bay and two and one-quarter inches at nearby Chatham River. Heavy breeding of second instar was observed at Alligator Bay on July 27 and July 30. Landing rates rose from 75 per minute on July 30 at Alligator Bay to 100 plus per minute on August 10 and 150 plus at the Chatham River. These facts, coupled with the period of west wind beginning August 6, lead us to the conclusion that the mosquitoes producing the peak in the traps on August 8, originated in the area between Cape Sable and the Ten Thousand Islands.

We feel that the light trap at Happy Jack's is of particular interest and importance in that it is approximately 18 miles west of Biscayne Blvd. in Miami, and 15 miles from the nearest salt marsh. During the August 6 to 8 invasion mentioned above, it had over 1100 adults on two separate nights, August 6 and 7, and nearly 1100 on August 8, including 40 males on the night of the 7th. It was not uncommon for this trap to have several hundred female *Aedes taeniorhynchus*

with an astonishing number of males. Considering that this trap is usually surrounded by many miles of submerged sawgrass after the middle of June and considering that the traps at, or near the east coast had only a fraction as many mosquitoes as Happy Jack's during the August 7 to 8 invasion, it again seems to lead to the conclusion that these mosquitoes came from the heavy breeding areas to the west.

### CONCLUSIONS

The authors feel that ample evidence has been presented to draw the conclusion that: When the density of adult mosquitoes in the vast breeding areas between Everglades City and Jewfish Creek is sufficiently high and if at the same time, the wind prevails from the west or southwest steadily and for a long enough period, these mosquitoes will be carried into the populated areas of Dade County, some 30 to 60 miles away.

Inasmuch as Homestead is almost halfway to these breeding areas from Miami, mosquitoes are blown, or move into the Homestead areas much more frequently; moreover, coupled with the fact that east or south wind can also bring mosquitoes into Homestead, this area can expect 50 to 100 nights of annoyance a year from these sources.

In six of the seven years 1951-1957, there was a so-called "Flight" or period of severe annoyance in the Miami area during the first ten days of June.

In nine of the twelve years 1945 to 1956 there were 100 or more hour miles of west wind (nighttime only) during the first ten days of June. During the second ten days of June this occurred in only six of the twelve years and during the third ten days of June it only occurred in four of the twelve years. Therefore, it appears more likely than not, that west wind and mosquito annoyance may be expected during the first ten days of June.