NEW JERSEY STATE MOSQUITO CONTROL COMMISSION

Vector Surveillance Report

MOSQUITO RESEARCH AND CONTROL
NEW JERSEY AGRICULTURAL EXPERIMENT STATION

Vol. 2 **No.** 1 **Period** Spring Survey June-July
Intensive Survey Aug. 1-2, 1977

Introduction

The New Jersey State Mosquito Control Commission recently voted to continue the surveillance of eastern encephalitis in coastal areas of southern New Jersey during the summer of 1977. The program which was instituted on a pilot basis in 1975 and continued as a research-service effort in 1976 is designed to accumulate data which will better define the epidemiology of eastern encephalitis cycling within the State.

The objectives of the Program are three-fold:

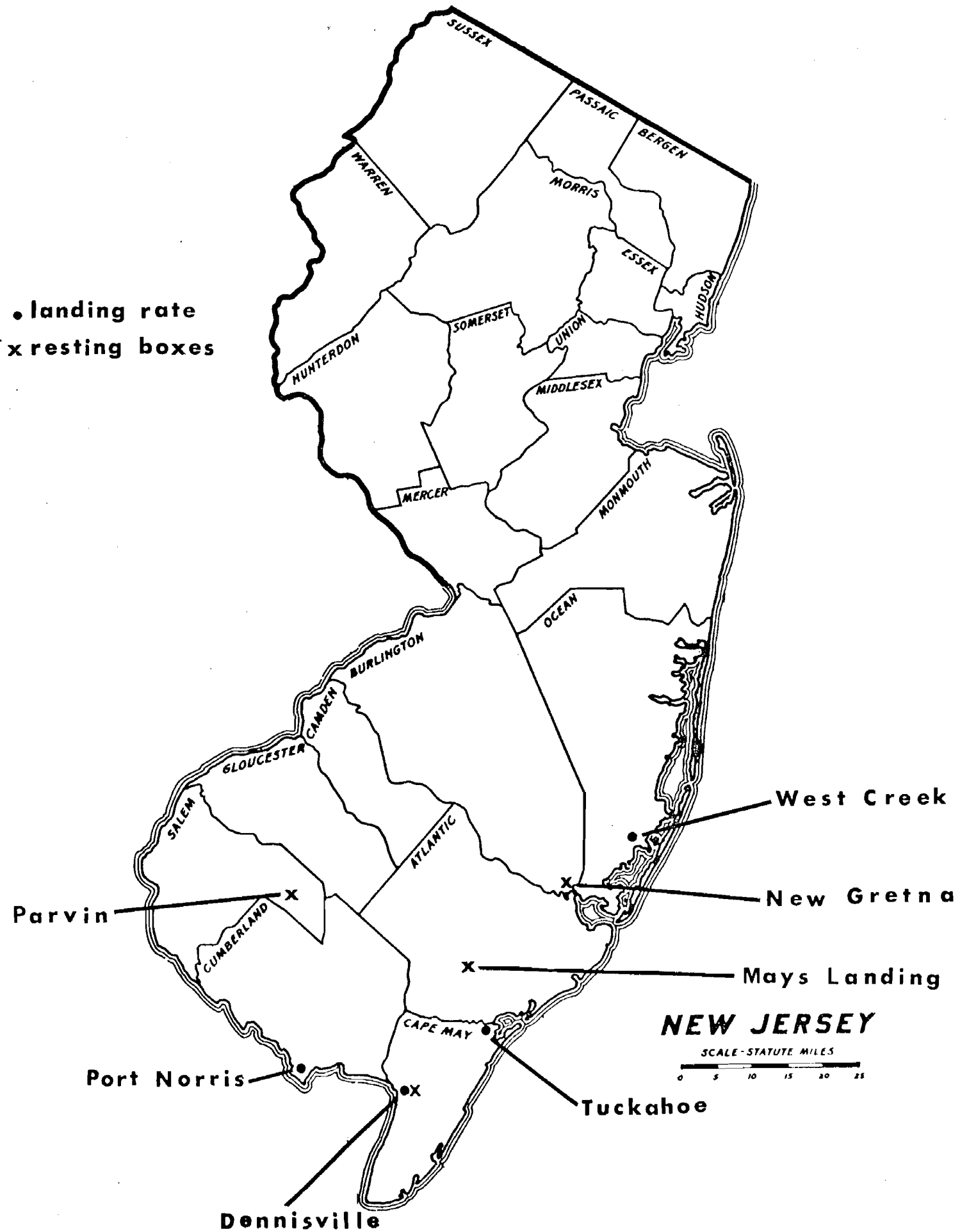
1) Gather continuous data on the status of the 2 major vector species of EE, Aedes sollicitans, the epidemic vector, and Culiseta melanura, the epizootic vector in areas where EE virus has been active in the past.

2) Monitor the vector populations for EE virus and look for interactions between the 2 species which may be important in the transfer of virus from the epizootic cycle to the epidemic cycle.

3) Provide health-related agencies with current information on all aspects of the study.

It is hoped that this program, together with the ongoing studies which are being conducted by the New Jersey State Department of Health, will add to our knowledge of eastern encephalitis epidemiology and provide information which will lead to effective vector control for the prevention of disease. The study is a cooperative effort which involves the participation of a number of mosquito related agencies including the State Mosquito Control Commission, the County Mosquito Control Commissions, the New Jersey Agricultural Experiment Station, the State Department of Environmental Protection, the State Department of Health and the State Airspray Program. The role played by each of these components will be discussed in future issues of this report. The collective goal of these agencies is to provide New Jersey with efficient, coordinated mosquito control.

Study Sites


• landing rate
x resting boxes
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
SOMERSET
UNION
HUNTERDON
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
West Creek
New Gretna
Parvin
Mays Landing
Port Norris
Tuckahoe
Dennisville
NEW JERSEY
SCALE - STATUTE MILES
0 5 10 15 20 25

BACKGROUND INFORMATION ON THE VECTOR SURVEILLANCE PROGRAM

Eastern encephalitis has been of special concern to mosquito control personnel in New Jersey for many years. Repeated horse cases and widespread outbreaks in commercially raised pheasant flocks stimulated veterinary interest in the disease during the 1940's and 1950's. The human outbreak in 1959 underscored the public health significance of the virus to the State and stimulated a detailed virus surveillance program under the direction of the New Jersey State Department of Health. During the decade of their intensive study, a great deal of information was obtained on the yearly and seasonal fluctuation of EE virus within vectors and vertebrates. The studies conducted by the State Department of Health showed that virus could be extremely active in some years and virtually non detectable in others.

Interest in virus surveillance was renewed during 1975 when exceptionally heavy rains produced abnormally high mosquito populations in New Jersey at a time when St. Louis encephalitis was evident in many parts of the country. Horse cases of EE signaled that both mosquito-borne viruses were active in New Jersey and emergency funds from the Federal Government were provided to collect and test vertebrates and mosquitoes for both SLE and EE. During this period, the New Jersey Agricultural Experiment Station refined a method to monitor the major mosquito populations for vector potential on the basis of physiological age. The studies showed that the overall age of the vector populations might be more important in assessing vector potential than the criterion of density alone.

In 1976, an Interdepartmental Committee was assigned to oversee mosquito control activities in New Jersey. The Committee provided funds to continue eastern encephalitis surveillance along the New Jersey shore during the Bicentennial year, a time when coastal resorts were receiving an overflow of tourists from the Philadelphia area. The program was designed to keep health-related agencies informed of the status of vector populations throughout the season and the information from vector surveillance trips was included in the Vector Surveillance Report, a weekly newsletter prepared by the New Jersey Agricultural Experiment Station. The Report was widely distributed in New Jersey as well as to key personnel in other parts of the country. During this period a considerable amount of information was obtained on the interaction of the major mosquito vectors of EE over the course of one full season.

In late 1976, the Governor of the State of New Jersey reactivated the State Mosquito Control Commission whose major responsibility is to oversee the spending of State allocations which are provided for mosquito control. The State Commission canvassed the health related agencies in the State and elected to fund the surveillance of eastern encephalitis through the 1977 season and continue the documentation of vector populations. Key populations of Aedes sollicitans and Culiseta melanura will be monitored on a weekly basis throughout the encephalitis season. Specimens will be screened for EE virus by the Department of Animal Sciences at the Vineland Diagnostic Laboratories. The New Jersey State Department of Health will confirm all positive pools to document the presence of virus in the mosquito populations.

The information will be distributed in the Vector Surveillance Report which will be issued weekly throughout August and September and the county mosquito control commissions will have data to back their control activities as the encephalitis season approaches.

RESULTS OBTAINED DURING THE 1976 SEASON

Six separate populations of Ae. sollicitans and a population of Cs. melanura were examined weekly from July to October during 1976. The data obtained showed a number of interesting relationships between the two species as the season progressed from Spring through Fall.

Light trap data from May and June indicated that Cs. melanura populations were higher than usual during the Spring months (based upon mean values from the prior 3 years) but the mosquitoes entered a period of low population in all areas of the State during the mid summer months. Data indicated that Cs. melanura were most likely stressed by the low water table during July which limited the amount of breeding habitat available to this fresh water swamp breeder.

Hurricane Belle restored the breeding habitat of the permanent water mosquitoes during August of 1976 but populations of Cs. melanura responded differently on opposite coasts of the State. On the Atlantic coast, the Cs. melanura increased slightly but did not exhibit a marked fall population peak. On the Delaware Bay, the populations of Cs. melanura recovered dramatically after the hurricane and collections showed a 28-fold increase during late August and early September. As a result, the epizootic potential of the Cs. melanura populations in the Fall was considerably different on opposite coasts of the State in southern New Jersey.

Differences in Ae. sollicitans populations were less obvious but became apparent upon careful examination of the data. Two major emergences were evident at each of the 6 study areas but the timing of each emergence was slightly different and the aging of each population also showed variation. As a result, the periods of highest vector potential for Ae. sollicitans varied considerably from one sight to the next. At most of the sights, however, the vector potential of the Ae. sollicitans populations was highest in the early Fall, the period of greatest concern in the transmission of EE to humans.

The most interesting correlation occurred at the Dennisville site in Cape May County where the pronounced peak in Cs. melanura was followed by an abrupt increase in vector potential on the part of Ae. sollicitans. Had virus been present in the bird population at that time, conditions would have been ideal for bird to bird transmission of EE virus by Cs. melanura in late August. This would have been followed by a population of Ae. sollicitans capable of transferring the virus from birds to mammals approximately 2 weeks later.

Eastern encephalitis virus, however, was not detectable in any of the samples collected in July and August and data from other states suggested that virus was apparently not active on the eastern seaboard during the 1976 season. Late in September, however, after the last issue of the Vector Surveillance Report had been written, EE virus was detected in 2 pools of Cs. melanura. The mosquito populations had declined by this time and vector potential remained minimal for the remainder of the season. Although samples were screened until November, no further virus was detected.

STRATEGY OF THE INVESTIGATION IN 1977

The interactions between Cs. melanura and Ae. sollicitans appear to be critical to the successful epizootic cycling and eventual epidemic transmission of EE in the coastal portions of the State. While other mosquito species are undoubtedly involved, particularly in inland areas where horse cases frequently appear, the status of Cs. melanura and Ae. sollicitans appears to be the key to eventual human involvement. As a result, these 2 species will be closely monitored throughout the season.

During 1976, only 2 populations of Cs. melanura were followed and the differences in epizootic potential showed that considerable variation occurred from one part of the State to the next. Surveillance of Cs. melanura, therefore, will be increased to 4 sites in 1977 to define the extent of variation and their ultimate role in the amount of EE activity during the season. During 1976, 6 populations of Ae. sollicitans were monitored. Although a great deal of information on the vector potential of the individual populations was acquired, Ae. sollicitans surveillance will be reduced to 4 sites in 1977 to allow for the increased monitoring of Cs. melanura. Collection sites have been selected so that each of the 6 coastal counties in the southern portion of the State will receive surveillance monitoring.

Data from 1976 indicated that the Cs. melanura populations late in the year may have been a function of the size of the early Spring emergence. As a result, Cs. melanura has been monitored with resting boxes at each of the 4 sites since early June. Ae. sollicitans is a brooded species which does not appear to become important in the cycling of EE virus until late in the summer. As a result, data on Ae. sollicitans was not collected until mid July in 1977 but will be intensively followed into the Fall. As in prior years, County Mosquito Control Commissions State Airspray personnel and the State Department of Health will be informed of the status of the vector populations by telephone as soon as the data is available.

METHODOLOGY OF THE SURVEY AND PRESENTATION OF DATA

Little change is anticipated in the methodology of assessing vector potential to the Ae. sollicitans populations. Each of the areas will be visited once weekly by a team of mosquito biologists from the New Jersey Agricultural Experiment Station. The first day will be spent at the 2 sites on the Atlantic Coast, West

Creek in Ocean County and Tuckahoe in Cape May County. The second day will be spent on the Delaware Bay coast at Dennisville in Cape May County and Port Norris in Cumberland County. The size of the biting population will be determined by a series of 1 minute landing rates. A minimum of 20 specimens which come to bite will be collected to determine the physiological age of the biting population. Dissections will be performed in a mobile laboratory and the parous rate will be determined by the Detinova technique of ovarian tracheolation. The vector potential of the biting population will be calculated by multiplying the landing rate by the parous rate of the population. This will reveal the number of potential bites per minute from parous mosquitoes and separate the nuisance portion of the population from the potential vectors of disease.

Considerable change is anticipated in the methodology of assessing epizootic potential to the Cs. melanura populations. The first day will be spent at Bass River in Burlington County and Mays Landing in Atlantic County. The second day will be spent on the coast of the Delaware Bay at Dennisville in Cape May County and Parvin in Salem County. Twenty-five to fifty resting boxes will be examined at each site depending upon the size of the population. Data from 1976 suggested that Cs. melanura was not nearly as long lived as Ae. sollicitans and the number of parous Cs. melanura per resting box did not appear to be an entirely valid indicator of epizootic potential. The parous rate of the Cs. melanura populations showed a great deal of fluctuation but remained below 50% for most of the season. When populations were high, the greatest percentage of mosquitoes in the collection were either fully engorged or gravid. Since ovarian tracheolation cannot be assessed in either of these categories, physiological aging was restricted to that percentage of the population which had no visable trace of blood or egg development. As a result, a small percentage of the overall collection was being used to determine the physiological age of the entire population. Whether or not this technique was valid is not known, but the epizootic potential rating appeared to be an exact duplication of the density of the population on a reduced scale in all cases from Spring through Fall. In 1977, the epizootic potential of the Cs. melanura populations will be reported as the total number of specimens per resting box rather than the number of parous specimens per box. Dissections will be continued at one of the sites (Dennisville) to confirm that the 2 values remain similar. The information from physiological aging, status of gonotrophic development and population size will be used to determine if an alternate method of evaluating epizootic potential is possible.

RESULTS FOR THE PERIOD FROM JUNE 14 TO JULY 25

Culiseta melanura

Populations of Cs. melanura have shown a trend which is similar to the 1976 season. In general, resting box collections were high when the study was initiated in mid June, but the populations have subsided considerably in most areas with the advent of warm weather. The Delaware Bay with its extensive belt of cedar swamp habitat in the Dennisville area appears to be sustaining a continuous series

of generations. The Cs. melanura are far less evident further North in Salem County. The populations on the Atlantic coast where the habitat is more spotty appears to be less capable of continuous breeding. The dry situation in New Jersey was emphasized by the recent outbreak of forest fires in the pine barrens area. One of the major fire belts occurred in the Bass River area within 1/2 mile of the resting box site. It is possible that the fires may reduce the Cs. melanura even further by exposing their breeding habitat to severe drying conditions.

Aedes sollicitans

The early part of July marked the emergence of a brood of Ae. sollicitans in most areas of the State which reached maximum vector potential during the 2nd and 3rd week of the month. The emergence along the Atlantic coast occurred slightly earlier than that on the Delaware Bay and vector potential peaked during the 2nd week of July. The figures obtained from West Creek in Ocean County were somewhat surprising since the vector potential in July was as high as any calculated from that area at any time last year. The populations along the Delaware Bay were not exceedingly high and vector potential peaked during the 3rd week of the month. By the end of July, all populations had reached maximum parity and landing rates at all sites were below nuisance levels.

RESULTS FOR THE PERIOD AUGUST 1-2, 1977

Culiseta melanura

The Cs. melanura populations in the southern portion of the State appear to be showing the first evidence of a population increase since the extremely dry weather New Jersey experienced in mid July. With the exception of the Dennisville site where populations remained high throughout the Spring, Cs. melanura have been barely detectable. The New Gretna site in the Bass River State Forest offers a good example. A total of 48 resting boxes have been examined at this site since early Spring. Throughout June and early July, the total collections ranged from 30 to 60+ mosquitoes or more than 1 mosquito for each resting box in the line. With the advent of hot weather, the total collections dropped to less than 10 mosquitoes. Light trap records and truck trap collections which are routinely run by many of the county mosquito commissions showed similar declines. This week, the resting boxes at New Gretna yielded a total of 48 Cs. melanura or exactly 1 mosquito per box.

The increase is difficult to account for in view of the dry conditions but an increase was evident at each of the sites that were monitored. At Dennisville, collections rose from 4.4 to 6.1 mosquitoes per box and at Parvin, where Cs. melanura have been extremely low, the resting boxes yielded 7 freshly engorged specimens, the highest collections of the year. Rain has fallen in most parts of the State during the past week, thus some of the breeding habitat for this mosquito may be restored.

The sudden, high increase in the blooded portion of the Cs. melanura collections suggest that the mosquitoes may have been in aestivation during the dry weather. Nearly 70% of the collections were freshly engorged at New Gretna and all of the specimens from Parvin contained blood. At Dennisville, where the collections have been consistently high, only 24% of the specimens contained blood. Aestivation as a means of survival during hot dry weather is a common phenomenon for some permanent water breeding species in the drier parts of the world. The mosquitoes disappear once their breeding habitat dries down but reappear to feed and lay eggs soon after the rains. Data suggest that Cs. melanura may be capable of exhibiting similar behavior. Research in this area is needed to answer the question definitively.

Aedes sollicitans

The Ae. sollicitans in all parts of the State remain low at this point in time with a few residual remnants of the last brood still surviving. Data from West Creek in Ocean County suggest that some newly emerged Ae. sollicitans were introduced during the past week and landing rates to the North confirm that a local brood did emerge. For the most part, however, populations are well below nuisance levels and vector potential is minimal.

List of Personnel:

Project Leader:	Wayne J. Crans
Surveillance Specialist:	Jere D. Downing
Mosquito Program Coordinator:	Anthony A. Di Edwardo
Mosquito Program Acting Director:	Harry D. Brown
State Airspray Program Director:	Donald J. Sutherland
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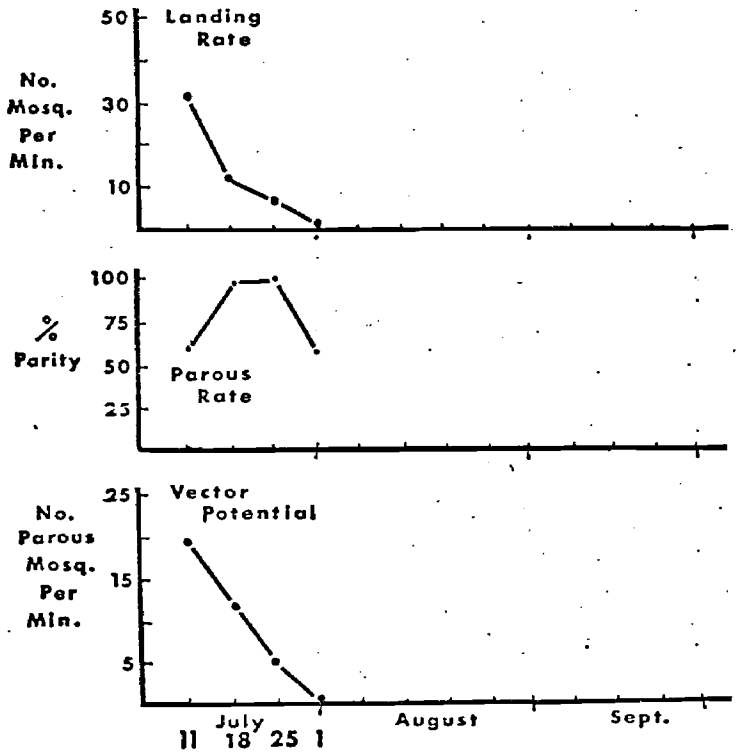
Cooperating Experiment Station Personnel:	David Tudor Otto Schwabe
Cooperating State Health Personnel:	Ronald Altman, Walter Gusciora Oscar Sussman, David Adams
State Health Associate Staff:	
Cooperating County Mosquito Control Superintendents:	Frederick Lesser, Ocean County Brian Gooley, Burlington County Judy Hansen, Cape May County Joseph Mason, Atlantic County Patrick Slavin, Cumberland County William Fisher, Salem County
State Mosquito Control Coordinator:	Kenneth W. Bruder
State Mosquito Control Commission:	Eleanore Renk Grant Walton Aaron Rappaport Theodore Czech Leonard Spiegel Benjamin Hiatt James Gaspari

Aedes sollicitans

SITE WEST CREEK
COUNTY Ocean County
COLLECTION DATA
Date Aug. 1, 1977
Landing Rate 1/min
Parous Rate 60%
Vector Potential 1
(Parous Landing Rate)

REMARKS: Data indicate a slight influx of newly emerged mosquitoes which have mixed with the remnants of the last brood.

CUMULATIVE RECORD



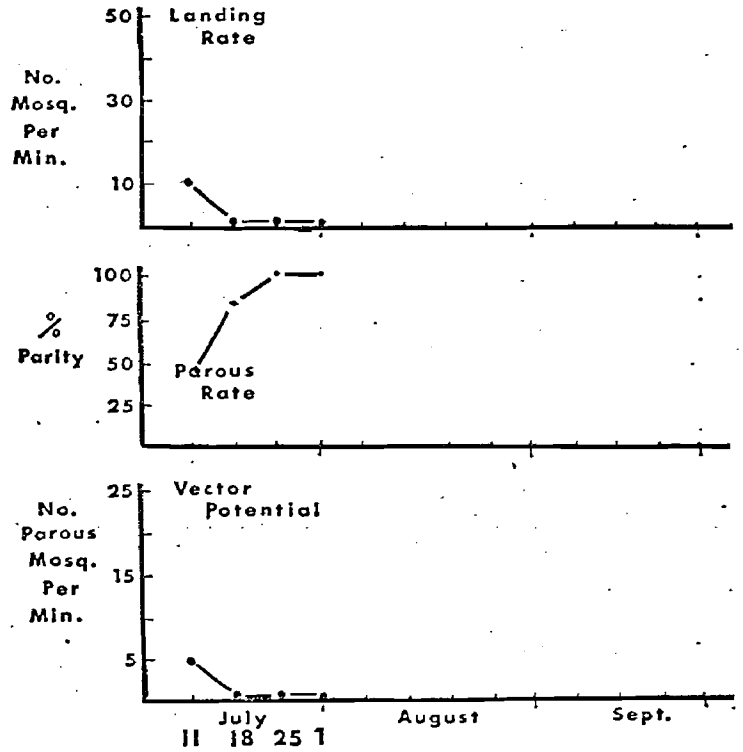
NOTES: Ocean County Mosquito Commission reports relatively high landing rates in some adjacent areas. These probably represent a scattered emergence from the surrounding marshland.

Aedes sollicitans

SITE TUCKAHOE
COUNTY Cape May
COLLECTION DATA
Date Aug. 1, 1977
Landing Rate 1/min
Parous Rate 100%
Vector Potential 1
(Parous Landing Rate)

REMARKS: Very few mosquitoes remain from the last brood.

CUMULATIVE RECORD



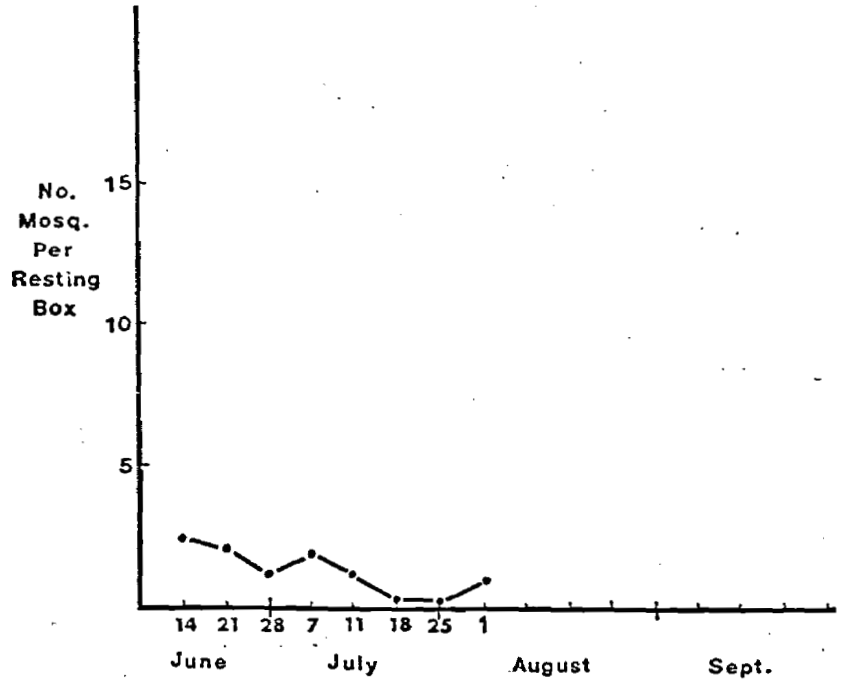
NOTES: Those few mosquitoes which are still biting are seeking refuge along the woodland areas which border open field.

Culiseta melanura

SITE NEW GRETNA
COUNTY Burlington
COLLECTION DATA
Date Aug. 1, 1977
No. Boxes Examined: 48
Total C.mel. 48
C.mel./Box 1.0

REMARKS: First indication of a population increase in this area for several weeks; majority of collection freshly engorged.

CUMULATIVE RECORD



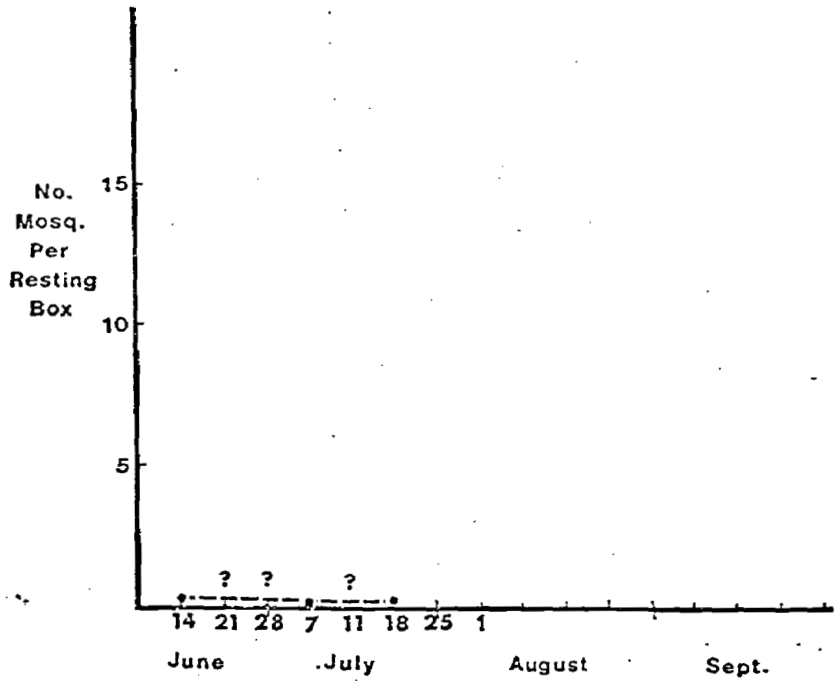
NOTES: Submitted 32 blooded and 16 non blooded Cs. melanura for virus assay.

Culiseta melanura

SITE MAYS LANDING
COUNTY Atlantic
COLLECTION DATA
Date Aug. 1, 1977
No. Boxes Examined: No collections
Total C.mel.
C.mel./Box

REMARKS: Resting boxes being moved to locate a suitable population for study.

CUMULATIVE RECORD



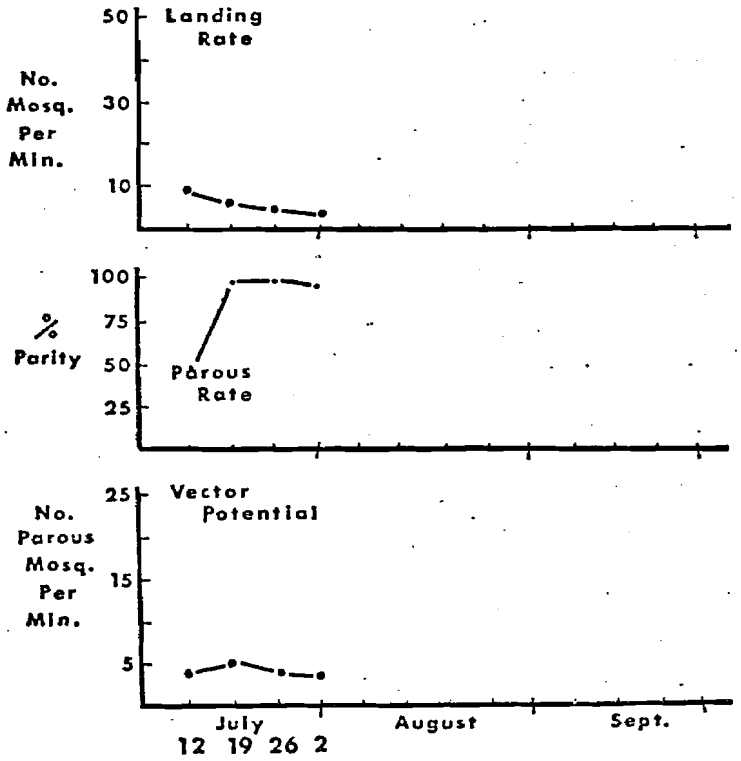
NOTES:

Aedes sollicitans

SITE DENNISVILLE
COUNTY Cape May
COLLECTION DATA
Date Aug. 2, 1977
Landing Rate 4/min
Parous Rate 95%
Vector Potential 3.8
(Parous Landing Rate)

REMARKS: Population remaining static.

CUMULATIVE RECORD



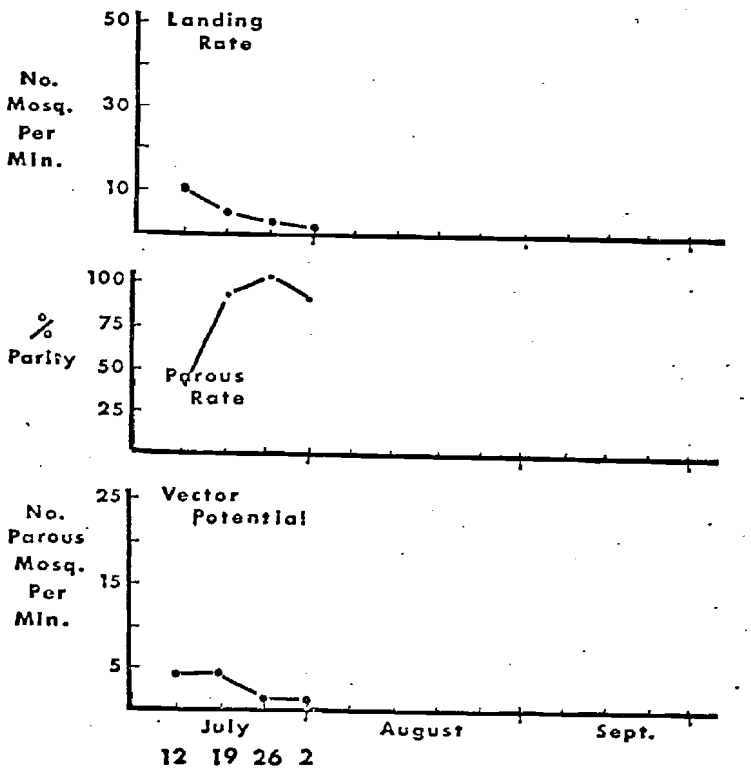
NOTES: Static population probably the result of influx from surrounding areas since the airspray earlier in the month.

Aedes sollicitans

SITE PORT NORRIS
COUNTY Cumberland
COLLECTION DATA
Date Aug. 2, 1977
Landing Rate 1/min
Parous Rate 90%
Vector Potential 1
(Parous Landing Rate)

REMARKS: Very few mosquitoes remain.

CUMULATIVE RECORD



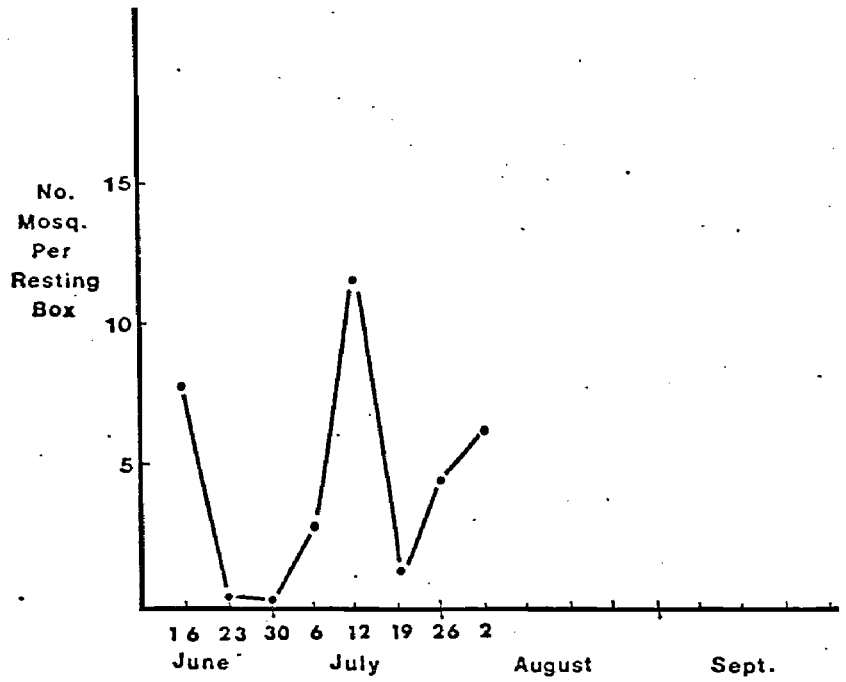
NOTES:

Culiseta melanura

SITE DENNISVILLE
COUNTY Cape May
COLLECTION DATA
Date Aug. 2, 1977
No. Boxes
Examined: 25
Total C.mel. 153
C.mel./Box 6.1

REMARKS: Population appears to be increasing. Parity recorded at 60%.

CUMULATIVE RECORD



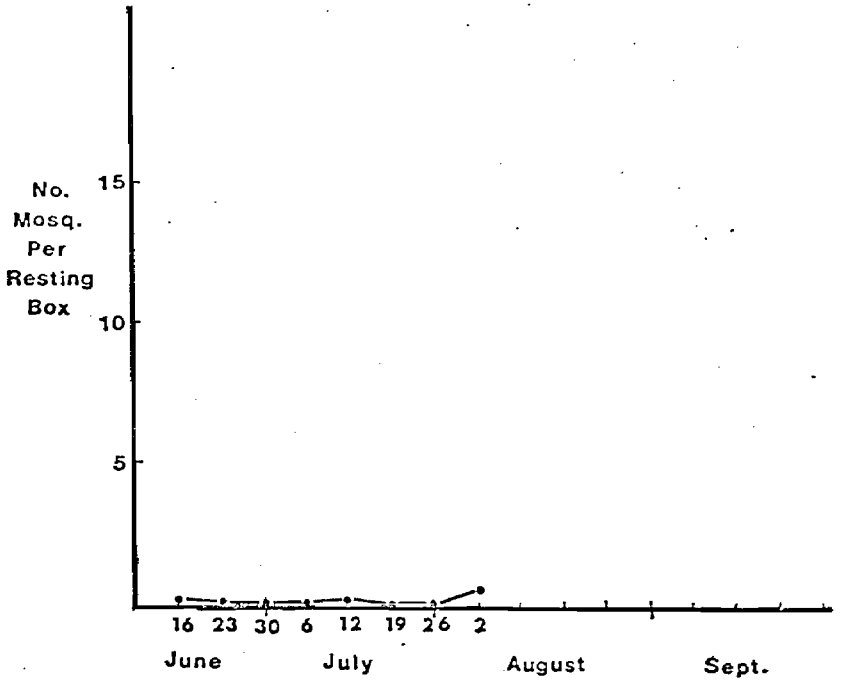
NOTES: Submitted 37 blooded and 116 non blooded specimens for virus assay.

Culiseta melanura

SITE PARVIN STATE PARK
COUNTY Salem
COLLECTION DATA
Date Aug. 2, 1977
No. Boxes
Examined: 40
Total C.mel. 7
C.mel./Box 0.2

REMARKS: Population still very low but collections indicate the first evidence of an increase since June.

CUMULATIVE RECORD



NOTES: Submitted 7 blooded specimens for virus assay.