NEW JERSEY AGRICULTURAL EXPERIMENT STATION
MOSQUITO RESEARCH AND CONTROL

Vector Surveillance Report*

Vol. 3 **No.** 1 **Period.** June-July, 1978

Introduction

The Vector Surveillance Program to monitor eastern encephalitis in New Jersey mosquitoes will be entering its third full year of study in 1978. The program was originally instituted on a pilot basis during the emergency period of 1975 and was continued as a research-service effort in 1976 and 1977. Over the past two years, the objectives have been 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 of New Jersey where the virus has been active in the past.
2) Monitor the vector populations for EE virus and define 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 the status of EE in New Jersey during the encephalitis season.

In 1976, the study focused primarily on Ae. sollicitans and its population dynamics in terms of ability to transmit disease. A method to assess transmission potential was refined and a vector potential index was developed to quantify vector ability.

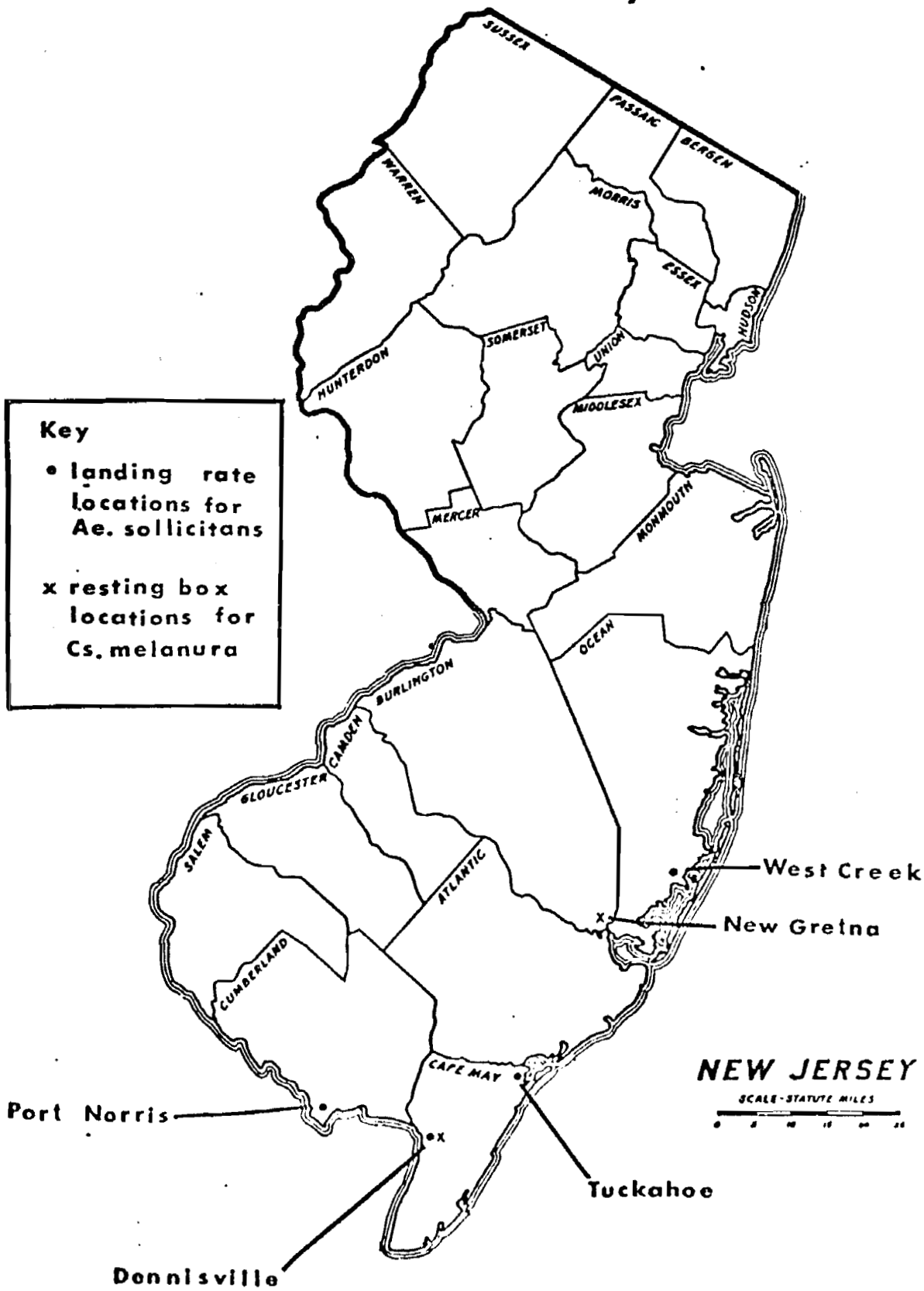
In 1977, the study examined Cs. melanura in greater detail to determine if fluctuations in populations might be important in the enzootic cycling of virus. Results showed that the two species interact closely at the freshwater swamp-salt marsh boundary, but the key to transfer of virus from one species to the next has not yet been determined.

In both years, mosquito specimens were collected and screened for EE virus to identify enzootic cycling in its earliest stages and follow the interaction of the vectors during the critical period. EE virus, however, was not active in 1976 and 1977, thus, data are not available on this most important aspect of EE epidemiology.

Arthropod-borne diseases such as EE are the culmination of a complex series of events involving the causal agent, the reservoir hosts and the arthropod vectors. The Vector Surveillance Program is an attempt to monitor those events and eventually quantify the potential for transmission in any given year.

*Supported by the New Jersey State Mosquito Control Commission.

Vector Surveillance Study Sites



Methodology of the Survey

Four separate populations of Ae. sollicitans and two populations of Cs. melanura have been monitored since 1976 and form the baseline data points for assessing EE activity in the State. The locations of the individual study sites can be found on the accompnaying map; in most cases, the study sites represent areas of known high mosquito density as well as past EE activity.

Cs. melanura are monitored weekly by a line of 50 resting boxes at each site to assess peaks and declines in the population from spring through fall. All of the Cs. melanura have been saved for virus screening in past years; in 1978 the New Jersey State Department of Health has agreed to perform the tests.

Ae. sollicitans are monitored by a technique which combines population density with physiological age. Weekly landing rates are taken at each of the study sites to assess nuisance and a subsample from the biting population is dissected to determine the percentage which has laid eggs and is returning for subsequent bloodmeals. Multiplication of the landing rate by the parous rate of the population indicates the number of parous mosquitoes which are coming to bite per unit time. The parous landing rate is plotted and used as a vector potential index, a number which is extremely useful in comparing risk as the season progresses.

Past research has shown that the vector potential of Ae. sollicitans shows definite peaks during the season with a predictable buildup in late August and September. Data from past years suggest that the timing of peak activity for the two vector species may be the major factor in the transfer of virus from the epizootic cycle to the epidemic vector population.

Presentation of Data

Population data from the weekly surveillance trips will be presented as a series of cumulative graphs at the end of each Vector Surveillance Report. The information on Cs. melanura will be based totally on population density as indicated by resting box collections. The mean monthly number of Cs. melanura per resting box from 1976 and 1977 collections have been superimposed on the graphs to show how current populations compare with those of previous years.

The vector potential (parous landing rate) of Ae. sollicitans will also be plotted on a continuing basis and the information can be used to follow the seasonal trends from spring to fall. Comments on the landing rates and parous rates of each population will be added under the remarks section to clarify the trends and interpret the effects of mosquito control on the local populations.

The New Jersey State Department of Health will furnish the results of virus tests and the information will be included in tabular form. The narrative portion of the report will briefly review the status of current mosquito populations, the presence or absence of detectable virus from the screenings and any other pertinent information on the status of EE and its vectors in New Jersey.

The Present Status of EE in the Eastern United States

Eastern encephalitis virus appears to present a greater than normal threat to the eastern seaboard in 1978 and public health officials are calling for increased surveillance in areas where the infection is known to be endemic. The concern stems from an outbreak in the Dominican Republic which was first recognized in mid

February and continued into early April. Details on the outbreak and attempts to control it can be found in the Morbidity and Mortality Report of June 23, 1978/ Vol27/ No. 25.

Public Health officials are concerned because epizootic activity in the Dominican Republic often coincides with EE outbreaks in the U. S. The virus becomes active in the Carribean very early in the season and, as such, functions as an indicator of potential cycling on the eastern seaboard in the late summer and fall. The most notable instance occurred in 1959, the year when New Jersey recorded 66 equine and 32 human cases. Similar U. S. epizootic activity coincided with Carribean involvement in 1949, 1950, 1955 and 1960.

At the present time, however, no one can accurately predict EE activity because the factors involved in virus amplification and movement from one geographic area are unknown. The Center for Disease Control is encouraging virus monitoring along the eastern seaboard to detect EE activity in its earliest stages if the pattern holds true in 1978.

The Status of EE and its Vectors in New Jersey

Data from the early portion of the 1978 season show interesting trends in terms of vector species in New Jersey, but at the present time there is no indication of EE virus activity in the areas under study. The graphs at the end of this report show that Cs. melanura populations are well above normal for this time of year at both of the study sites where the species is being monitored. The trend has been most striking at the New Gretna site where average monthly collections in 1976 and 1977 remained between 1 and 2 Cs. melanura per box throughout the season. In June, when monitoring was initiated, the populations were 3-4 times above normal and increased even further before the warm weather and dry conditions resulted in a minor population decline. At the present time, Cs. melanura at New Gretna (and presumably along the entire eastern coast) remain exceptionally high for this time of year. If New Jersey experiences a wet August, the fall population of Cs. melanura would rise to tremendous numbers before frosts finally terminate adult activity.

The Cs. melanura on the Delaware Bay coast are harder to analyze because the populations at the Dennisville site have been controlled to minimize risk in this area where EE has been a recurrent problem. The control effort is most obvious on the graph for this area during the week of July 24. Exceptionally high collections (32. 9 Cs. melanura/box) prompted a larvicide treatment of the adjacent cedar swamps with Abate granules. The numbers of adults in the resting boxes dropped dramatically after the treatment but data indicate a rising trend in the past week and the promise of above normal populations during August. If the Dennisville site is any indication, Cs. melanura populations are well above normal along most of the Delaware Bay Coast of the State, particularly in areas where control has not been attempted.

Vector potential in Ae. sollicitans has also been exceptionally high this spring with mosquitoes exhibiting behavior that is commonly associated with late season populations. Light traps do not appear to be accurately reflecting the numbers of mosquitoes that are present and the individual populations appear to

be surviving for longer periods of time than usual. Parity dissections reveal that two major emergences have occurred to date, one in early June and the second in early July. Parous rates increased geometrically after each emergence indicating that little or no minor influxes of mosquitoes occurred between broods.

Vector potential in terms of potential EE transmission does not assume major importance with this species until later in the season. The high values recorded this spring, however, suggest that diseases such as dog heartworm are probably in an active state of transmission at the present time.

The New Jersey State Department of Health has been screening mosquitoes for arbovirus since June but no pools have been positive for EE to date. More than 4000 Cs. melanura from the Vector Surveillance Program have been included in the samples. Details can be found in tabular form at the end of this report.

The State Department of Health, however, did detect Western encephalitis in 2 pools of Cs. melanura that were collected from the same resting boxes used by the Vector Surveillance Program at Bass River. WE was isolated on two occasions in 1977; most authorities feel that this virus is generally more common on the eastern seaboard than EE. WE does not appear to pose a health problem at the present time because none of the common New Jersey mosquitoes are able to function as efficient vectors to humans. The detection of Culex tarsalis in recent years, however, suggests that WE could become more important in the future.

Summary

Early season data show that Cs. melanura populations are well above normal this year. Vector potential in Ae. sollicitans is also extremely high compared to 1976 and 1977. Virus screening, however, has not detected EE virus in any of the samples. In view of recognized EE activity in the Carribean this year, each of the vector species should be monitored closely as the encephalitis season approaches. Data indicate that the vector populations are fully capable of creating an emergency situation if virus were added to the epidemiological setting at this time.

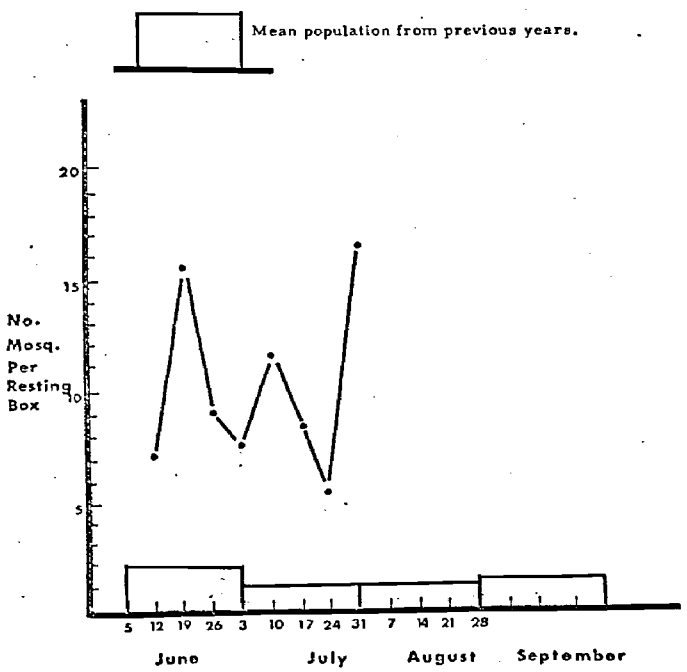
List of Personnel:

Project Leader:	Wayne J. Crans
Mosquito Program Technical Advisor:	Anthony A. Di Edwardo
Mosquito Program Acting Director:	Harry D. Brown
State Airspray Program Director:	Donald J. Sutherland
Associate Mosquito Program Staff:	Bunnie Hajek, Jeanette Angalet, Bob Kent, Rebecca Laughlin, Marc Slaff, Phil Levy, Leon Blaustein, Gwendolyn Oliver
Cooperating State Health Personnel:	Ronald Altman, Walter Gusciora, Bernard Taylor, David Adams
State Health Associate Staff:	Joseph Frascella, Glen Sherman, Clay Kirby
Coperating County Mosquito Control Superintendents:	Frederick Lesser, Ocean County Brian Gooley, Burlington County Judy Hansen, Cape May County David Risley, Atlantic County Patrick Slavin, Cumberland County William Fisher, Salem County
State Mosquito Control Coordinator:	Kenneth W. Bruder

Culiseta melanura

SITE New Gretna
COUNTY Burlington

CUMULATIVE POPULATION RECORD



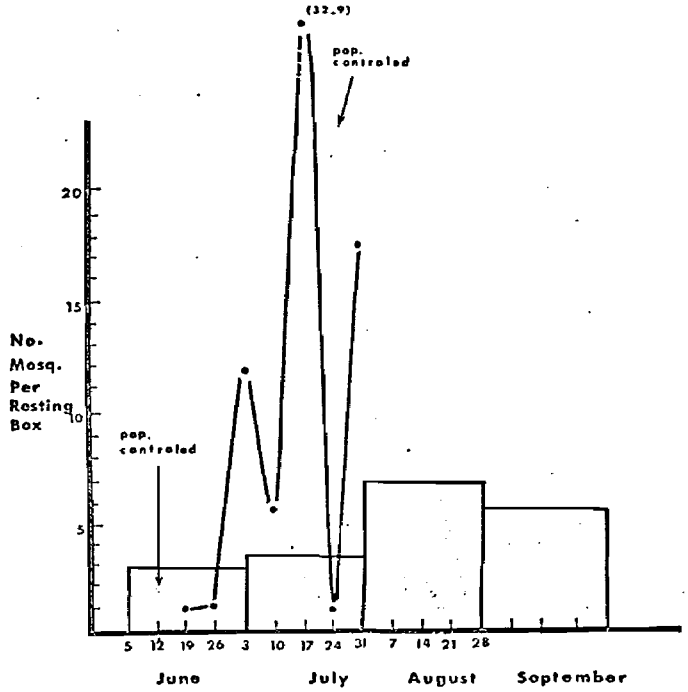
REMARKS:

Cs. melanura are 16 times higher than the mean from previous years. WE virus was isolated from this population in early July.

Culiseta melanura

SITE Dennisville
COUNTY Cape May

CUMULATIVE POPULATION RECORD



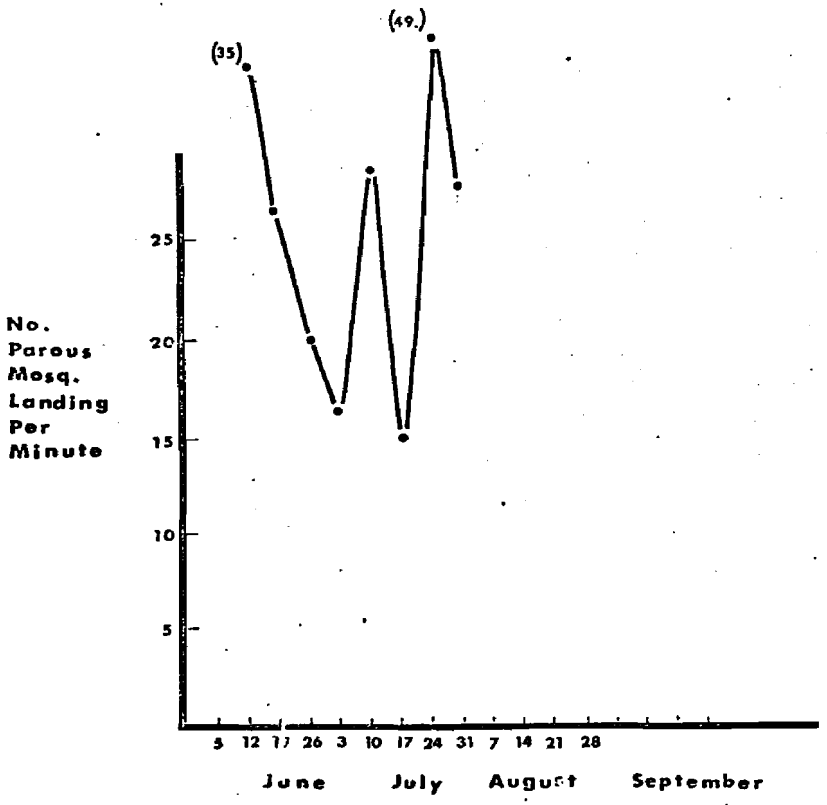
REMARKS:

This population was controlled early in the season before monitoring was instituted. The numbers increased rapidly and control was repeated 7/21. Resting box data indicate a resurgence and numbers are again well above average at the present time.

Aedes sollicitans

SITE West Creek
COUNTY Ocean

CUMULATIVE VECTOR POTENTIAL RECORD

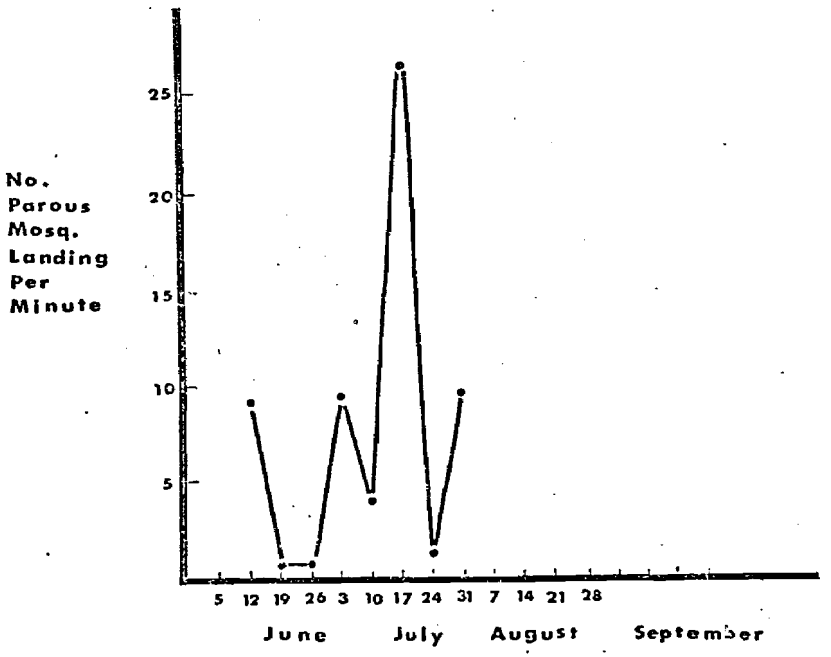


REMARKS:
Vector potential has remained extremely high at this site all season. The parous rate is currently 90% with landing rates of approximately 30/min.

Aedes sollicitans

SITE Tuckahoe
COUNTY Cape May

CUMULATIVE VECTOR POTENTIAL RECORD

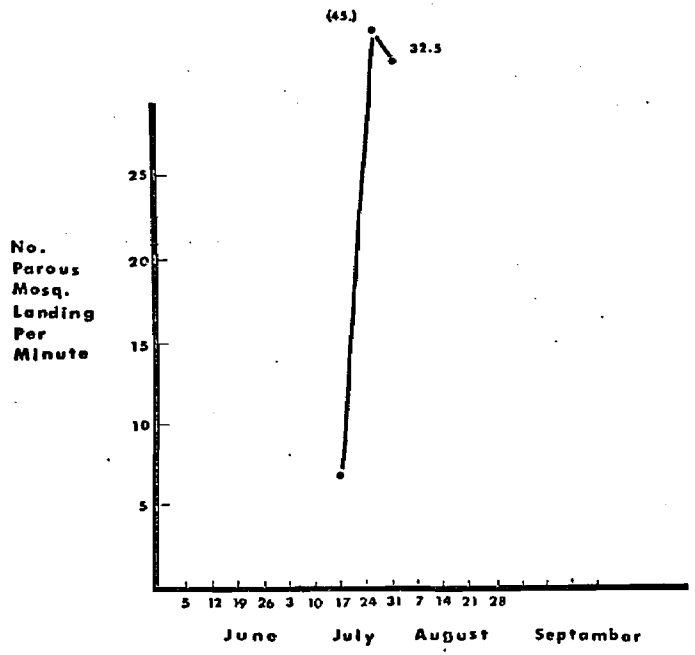


REMARKS:
Data from this site show that fresh mosquitoes have been added to the population over the past week. The parous rate is currently 35% with landing rates of approximately 26/min.

Aedes sollicitans

SITE Port Norris
COUNTY Cumberland

CUMULATIVE VECTOR POTENTIAL RECORD

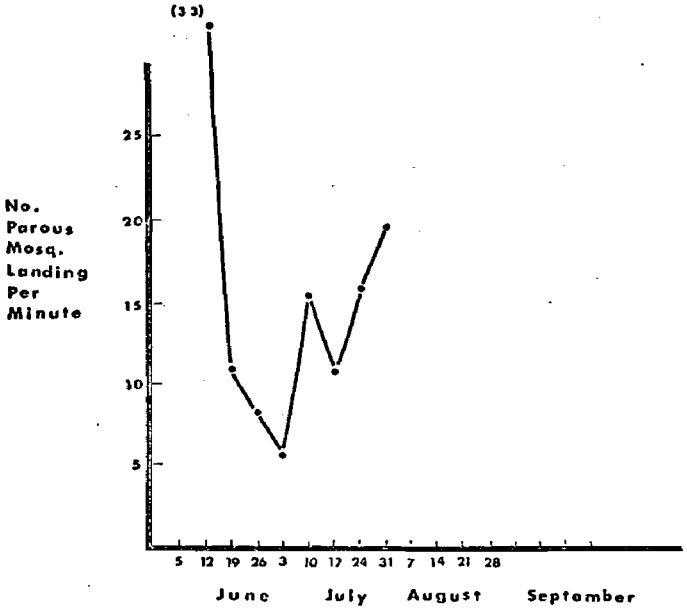


REMARKS:
Data indicate that a minor brood emerged from the hay meadows recently. Vector potential is very high with a parous rate of 65% and landing rates over 50/min.

Aedes sollicitans

SITE Dennisville
COUNTY Cape May

CUMULATIVE VECTOR POTENTIAL RECORD



REMARKS:
Fresh mosquitoes have also been added to this population during the past week. The parous rate is currently 40% with landing rates of 48/min. and a rising vector potential trend.

Virus Data From the New Jersey State Department of Health

Culiseta melanura tested for EE Virus during 1978

Key:

NG - New Gretna Study Site
DV - Dennisville Study Site

U- Unengorged specimens
E- Engorged (blooded) specimens

Pool No.	Date Collected	Study Area	No. Tested	Initial Screening	Confirmation
1	6/12/78	N.G.	100-U	Neg	
2	6/12/78	N.G.	120-U	Neg	
3	6/12/78	N.G.	100-E	Neg	
4	6/12/78	N.G.	44-E	Neg	
5	6/19/78	N.G.	100-U	Neg	
6	6/19/78	N.G.	100-U	Neg	
7	6/19/78	N.G.	100-U	Neg	
8	6/19/78	N.G.	112-U	Neg	
9	6/19/78	N.G.	100-E	Neg	
10	6/19/78	N.G.	100-E	Neg	
11	6/19/78	N.G.	123-E	Neg	
12	6/19/78	D.V.	15-U	Neg	
13	6/19/78	D.V.	3-E	Neg	
14	6/26/78	N.G.	100-U	Neg	
15	6/26/78	N.G.	100-U	Neg	
16	6/26/78	N.G.	72-U	Neg	
17	6/26/78	N.G.	100-E	Neg	
18	6/26/78	N.G.	35-E	Neg	
19	6/26/78	D.V.	12-U	Neg	
20	6/26/78	D.V.	11-E	Neg	
21	7/06/78	D.V.	100-E	Neg	
22	7/06/78	D.V.	95-E	Neg	
23	7/06/78	D.V.	97-U	Neg	
24	7/06/78	N.G.	100-E	Neg	
25	7/06/78	N.G.	52-E	Neg	
26	7/06/78	N.G.	100-U	Neg	
27	7/06/78	N.G.	119-U	Neg	
28	7/10/78	D.V.	100-E	Neg	
29	7/10/78	D.V.	72-E	Neg	
30.	7/10/78	D.V.	49-U	Neg	
31	7/10/78	N.G.	100-E	Neg	
32	7/10/78	N.G.	42-E	Neg	
33	7/10/78	N.G.	100-U	Neg	
34	7/10/78	N.G.	100-U	Neg	
35	7/10/78	N.G.	56-U	Neg	
36	7/17/78	D.V.	100-U		
37	7/17/78	D.V.	100-U		
38	7/17/78	D.V.	100-U		
39	7/17/78	D.V.	81-U		
40	7/17/78	D.V.	100-E		
41	7/17/78	D.V.	100-E		
42	7/17/78	D.V.	55-E		
43	7/17/78	N.G.	100-U		
44	7/17/78	N.G.	45-U		
45	7/17/78	N.G.	115-E		
46	7/24/78	N.G.	90-U		
47	7/24/78	N.G.	93-E		
48	7/24/78	D.V.	7-U		
49	7/24/78	D.V.	27-E		
50	7/31/78	D.V.	100-U		
51	7/31/78	D.V.	119-U		
52	7/31/78	D.V.	100-E		
53	7/31/78	D.V.	89-E		
54	7/31/78	N.G.	125-U		
55	7/31/78	N.G.	119-U		
56	7/31/78	N.G.	100-E		
57	7/31/78	N.G.	50-E		