

New Jersey Vector Surveillance

New Jersey Agricultural Experiment Station
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Introduction

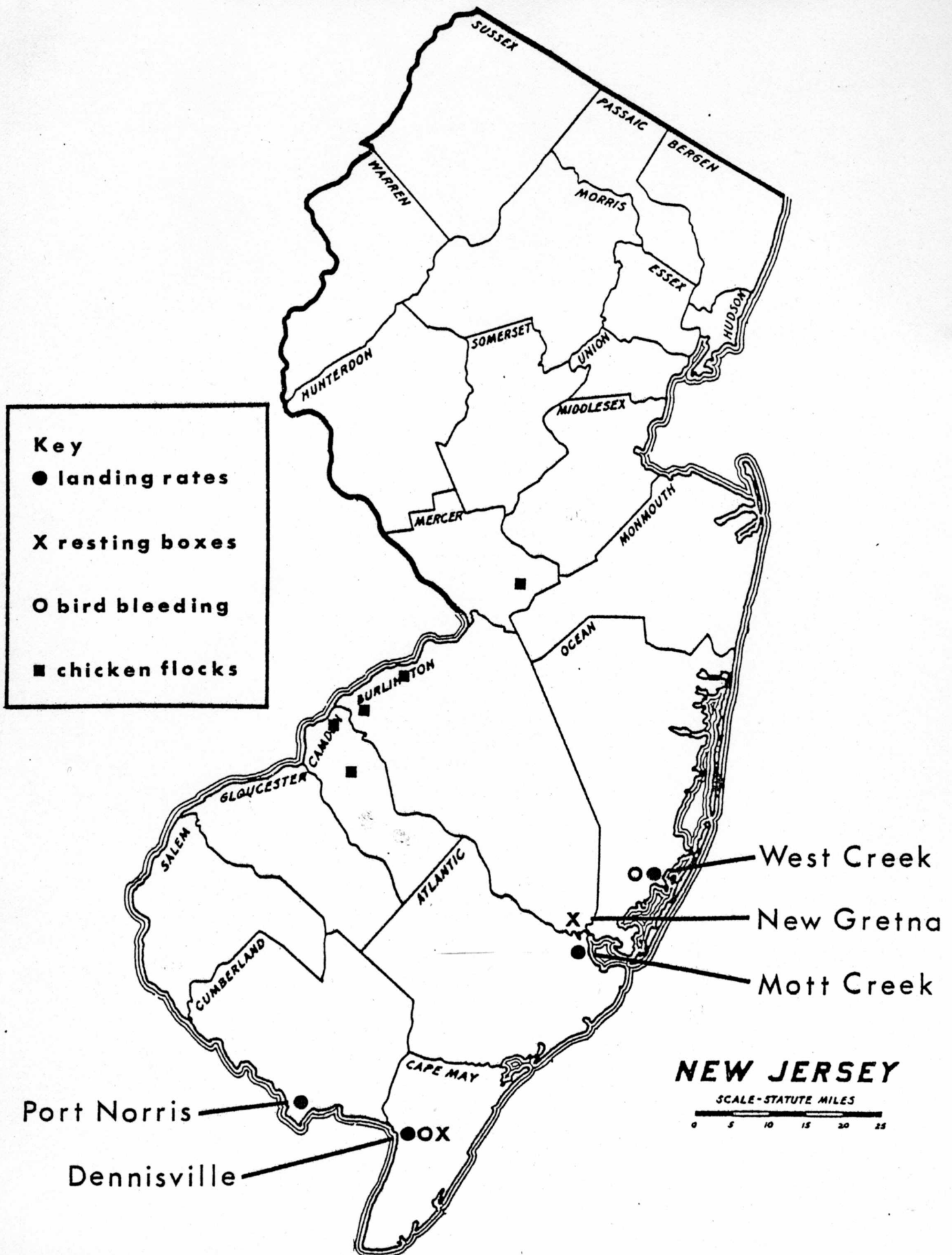
The vector surveillance program to monitor the encephalitis viruses in New Jersey is an ongoing effort to gather data on the mosquito vectors of eastern encephalitis virus (EE), Highlands J virus (HJ), and St. Louis encephalitis virus (SLE). The program, which was instituted in 1976, monitors vector populations in key areas of the state throughout the mosquito season. The information is analyzed on a weekly basis and the data are used to identify periods of virus amplification. The program functions primarily as a warning system to alert health related agencies to the status of the encephalitis viruses in the environment and provide control before human involvement is likely.

The Viruses and Their Cycles in Nature

EE virus has the potential for causing the greatest damage in New Jersey because of its high mortality rate and geographic proximity to the resort community. Though the virus is widespread in the state, New Jersey's seacoast provides the classical focus for greatest activity. EE originates in wild birds and severe epizootics occur in birds that nest in upland areas along the coast. Research has shown that the mosquito, Culiseta melanura, is responsible for the majority of avian involvement, and that large numbers of birds can be infected during the summer months. In some years, human cases occur and all evidence points to the salt marsh mosquito, Aedes sollicitans, as the primary vector. In theory, Ae. sollicitans picks up the virus late in the season by feeding on infected birds in the uplands. Under certain environmental conditions (still largely unknown) transfer to humans in the coastal strip is possible.

HJ virus apparently follows a similar epidemiological pattern but does not seem to produce an overt disease in humans. The virus is frequently found in birds and is regularly isolated from the same mosquito vectors, but human cases have never been confirmed. The value of monitoring a benign virus such as HJ is based primarily on its seasonal distribution. HJ appears in birds and mosquitoes 2-4 weeks earlier than EE and thereby serves as a valuable indicator for the more serious mosquito-borne disease.

SLE virus has the potential for affecting the greatest number of people in New Jersey, but does not occur on a regular basis. Unlike EE and HJ, which can be isolated from birds and mosquitoes in New Jersey nearly every year, SLE virus has a more western distribution and infrequently enters the state. When it does, the virus is usually associated with Culex mosquitoes in urban areas with peridomestic birds serving as the reservoirs.



Methodology of the Survey

Three populations of Ae. sollicitans and two populations of Cs. melanura form the baseline for assessing EE and HJ activity in the state. The study sites represent areas of high mosquito density as well as a history of high virus activity. Each of the study sites is visited twice weekly from May through October. Cs. melanura are monitored with a line of 50 resting boxes to assess peaks and declines in the population from spring until fall. All Cs. melanura are screened for virus by the N. J. State Department of Health; virus in Cs. melanura is interpreted as an indirect indication of viremia in the local bird populations. Wild birds are also bled on a regular basis but the information is not being used for surveillance purposes. The bird bloods are currently being tested under separate contract at Yale University and the information will be analyzed at the end of the season.

Ae. sollicitans are monitored by a technique that combines population density with physiological age. Landing rates are taken at each study site to assess the nuisance levels during the daylight hours and a subsample is dissected to determine the age of the biting population. When virus is known to be present in birds, large numbers of Ae. sollicitans are collected for virus screening. The combination of virus in birds and physiologically "old" Ae. sollicitans results in a recommendation for vector control targeted against specific populations along the coast.

SLE virus is monitored by a network of sentinel chicken flocks that are placed in urban areas of the state where the disease has presented a problem in the past. The flocks, consisting of 10 birds each, are bled from the wing vein every other week and the blood is tested for SLE antibody by the N. J. State Department of Health. Sero-conversion (conversion from antibody negative to antibody positive) in any of the birds is a direct indicator of local virus activity. During these periods, accelerated Culex control is recommended to minimize the risk of human involvement.

The Current Status of EE and its Mosquito Vectors

The 1982 season began with a number of indications that suggest potential virus activity again this year. Cs. melanura populations were above average in late May and early June, thus large numbers of larvae apparently survived the winter to initiate the first generation. The extremely wet spring provided perfect conditions for expanded breeding habitat and a sizeable emergence can be expected late in August. Virus was present at extremely high levels last year and EE has been documented in some of the southern states. To date, no virus has been detected in any of the New Jersey samples but the conditions all appear favorable for amplification as the season advances.

Figure 1 shows that Cs. melanura at New Gretna (east coast) progressively increased during the month of June and reached high enough numbers to produce a sizeable emergence later in the season. The New Gretna populations often reach near zero levels during the later part of July, a phenomenon that normally curtails virus amplification until very late in the year. In 1979, Cs. melanura on the east coast showed a population gradient quite similar to this year's pattern and EE amplification was intense during the month of August. A human case was contracted on the east coast that year, thus this season's populations should be closely monitored.

Figure 1 shows also that Cs. melanura at Dennisville were extremely high in the early part of the season and a population explosion can be anticipated in August. Collections have been very sporadic in recent weeks, due in part to the erratic weather conditions in the area. Most of the nesting birds in the area have fledged their young, thus numerous susceptible hosts are now available for amplification.

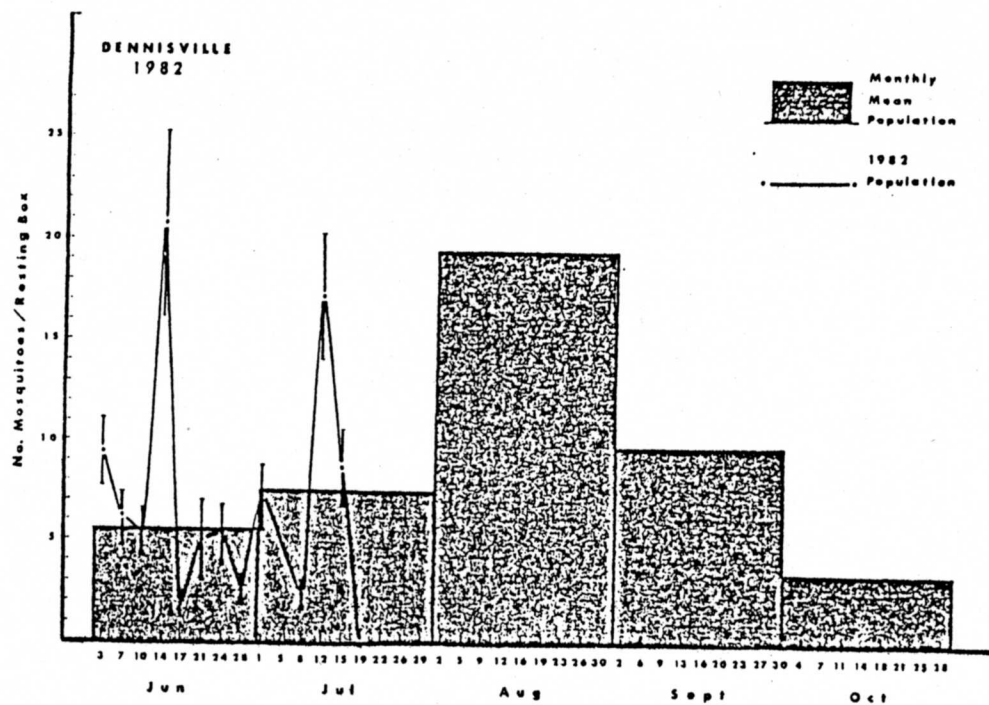
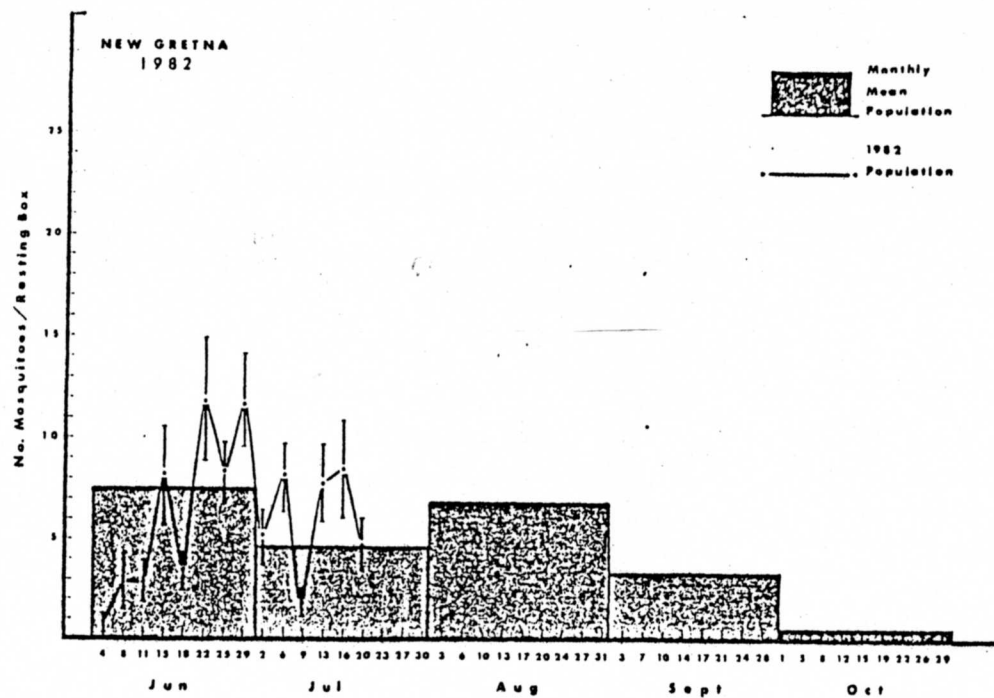


Figure 1. Culiseta melanura populations at the New Gretna (east coast, top graph) and at the Dennisville (west coast, bottom graph) study sties as measured by resting box collections.

The status of Ae. sollicitans does not become significant to transmission until virus appears, but monitoring has shown that three major emergences occurred at each of the study sites that are being monitored. A June brood appeared early in the month and peaked in vector potential on or about June 17. The brood was quite large and produced vector potential indices exceeding 35 in some areas. A second and smaller emergence took place in late June with a minor increase in vector potential over the July 4 holiday period. This was followed by an overlapping brood that appeared during the first week of July and reached peak vector potential near the middle of the month. The moon tide of July 20 will produce the biting populations experienced in early August throughout most of the coast with a peak period of vector potential probably extending into mid-month.

The Current Status of SLE

Sentinel chicken flocks have been in place in Camden, Burlington and Mercer counties since late May with no evidence of sero-conversion at the present time. The wet spring was conducive to Culex breeding and the hot, dry weather in mid July would appear to favor what we know of SLE amplification if it were present. SLE virus has appeared in Florida quite recently, thus the results of the next several weeks will be very important to the New Jersey situation.

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The first EE isolation was reported in Cs. melanura collected in Dennisville July 13, 1982.

List of Personnel

Project Leader:	Wayne J. Crans	
Mosquito Program Acting Director:	Harry D. Brown	
Associate Mosquito Program Staff:	Donald J. Sutherland Joseph K. Shisler Marc Slaff Bunnie Hajek	Dan Sprenger Linda McCuiston Steve Racioppe
Cooperating State Health Personnel:	Epid. & Dis. Control David Kirsh Ronald Altman William Parkin Terry Schulze	Division of Labs Wayne Pizutti Bernard Taylor Consumer Health Walter Gusciora Dave Adam
Cooperating State Mosquito Control Commission Personnel:	Kenneth W. Bruder Robert B. Kent	
Cooperating County Mosquito Control Superintendents:	Harry Tillet, Atlantic County Brian Gooley, Burlington County Judy Hansen, Cape May County Pat Slavin, Cumberland County Tom Candeletti, Ocean County Bill Fisher, Salem County	

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Prepared by: Dr. Wayne J. Crans
Mosquito Research and Control
New Jersey Agricultural Experiment Station
Cook College, P. O. Box 231
New Brunswick, New Jersey 08903

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