New Jersey Vector Surveillance

New Jersey Agricultural Experiment Station

Mosquito Research and Control

Vol. 5 No. 5

Period: Sept. 13-Oct. 31, 1980
and
Season Summation

INTRODUCTION

Eastern encephalitis (EE) remained active in New Jersey well into October of 1980. Cs. melanura populations were abnormally high in some parts of the State during the Fall and virus was isolated from the mosquito with considerable frequency in September and October. Virus was also isolated from a number of migrant birds (birds that nested much further to the North and passed through the study site on their way South) confirming that EE was still being transmitted late in the season. No additional horse cases were reported over this interval and no human cases were detected during the season. Although EE was especially active in 1980, the virus did not appear to pass beyond the basic epizootic cycle.

CHRONOLOGY OF EVENTS DURING 1980

Encephalitis investigations were initiated in May with resting box collections to sample the first generation of Cs. melanura that emerged from diapausing larvae as well as a bird bleeding program to sample summer residents before the nesting season began. All Cs. melanura were tested for virus by the New Jersey Department of Health. Bird bloods were not only screened for virus but tested for antibody throughout the season. Ae. sollicitans populations were monitored from late May to mid October at 4 sites along the coast. The location of each of the study areas included in this investigation can be found on the accompanying map.

Culiseta melanura Population Trends

Cs. melanura, the mosquito that is thought to initiate the virus cycle, were about average at both of the study sites when the season began but showed opposite trends as the summer progressed.

Figure 1 shows that the Cs. melanura at New Gretna (east coast) rose sharply during the month of June but declined markedly in July, probably as a result of the hot-dry weather conditions at that time. August resulted in rising populations at New Gretna which peaked in the second half of the month. There was a slight rise in numbers during September and a steady decline in October with very few mosquitoes present late in the Fall.

Figure 2 shows that the Dennisville (Delaware Bay) populations of Cs. melanura were also about average in the early part of the season but their numbers increased steadily during July and were about average throughout most of August. During the month of September, however, Cs. melanura at Dennisville were twice as high as in previous years and even showed an October peak before cold weather curtailed their activity.

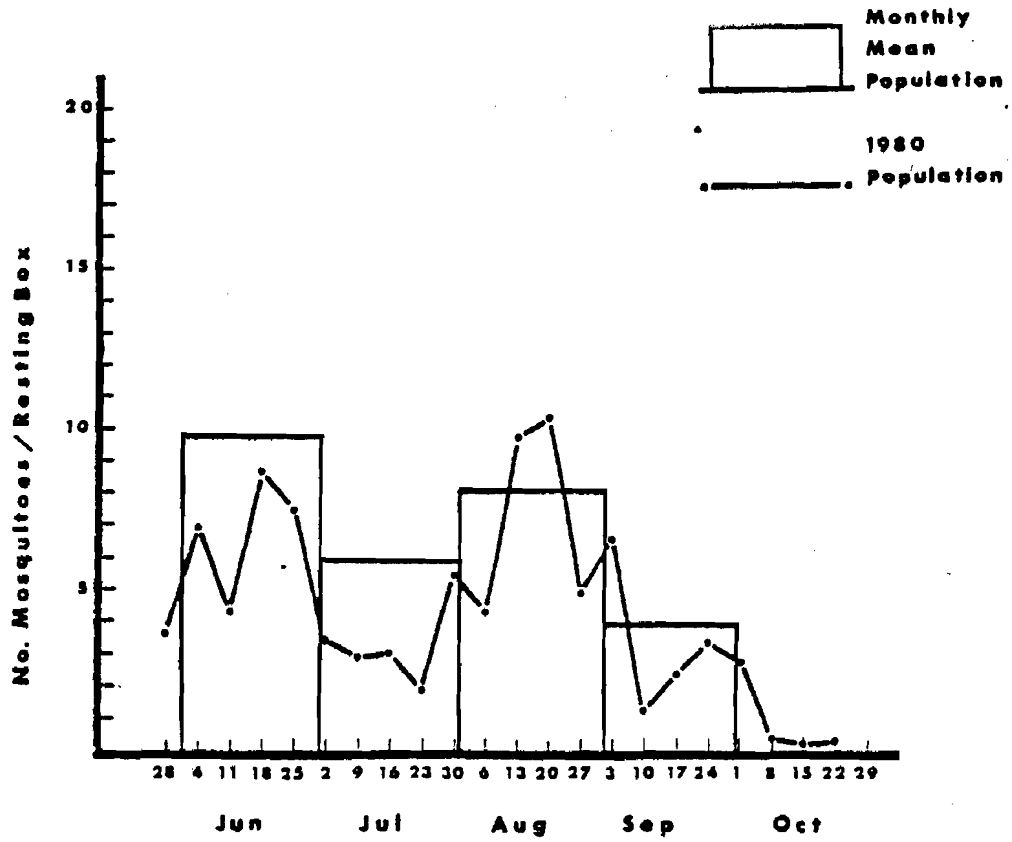


Fig. 1. Culiseta melanura populations at the New Gretna (East Coast) study site as measured by resting box collections.

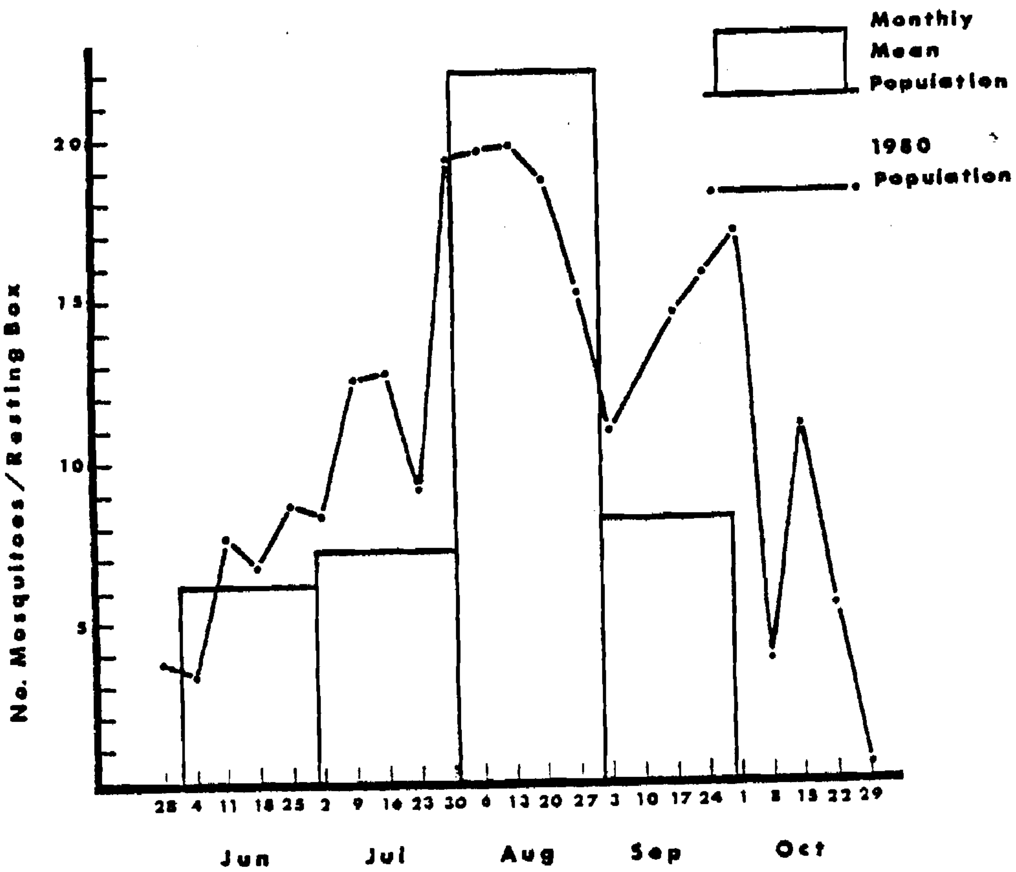


Fig. 2. Culiseta melanura populations at the Dennisville (Delaware Bay Coast) study site as measured by resting box collections.

Virus in Culiseta melanura

The differing population trends exhibited by Cs. melanura did not necessarily reflect the frequency of virus isolations that were obtained from the species. Although more isolations were obtained at Dennisville, Fig. 3 (based on the number of HJ and EE isolations per 100 mosquitoes tested at each site) shows that virus activity was intense in Cs. melanura at New Gretna during the summer months. EE virus appeared late in July and remained at rather high levels until late in August. HJ virus did not appear until the very end of August at New Gretna and was only detectable for a very brief period of time. When the Cs. melanura populations collapsed at that site in the Fall, virus could no longer be detected in any of the samples.

Overall virus activity at Dennisville (Fig. 2) was not as high as New Gretna, but the epizootic extended over a much longer period of time. HJ virus was detected in mid July and isolations were obtained well into September. EE virus activity was first detected in Cs. melanura at this site late in July and the virus built to a peak late in the month of August. The virus appeared to be diminishing during September but late season activity was then documented that was sustained well into October.

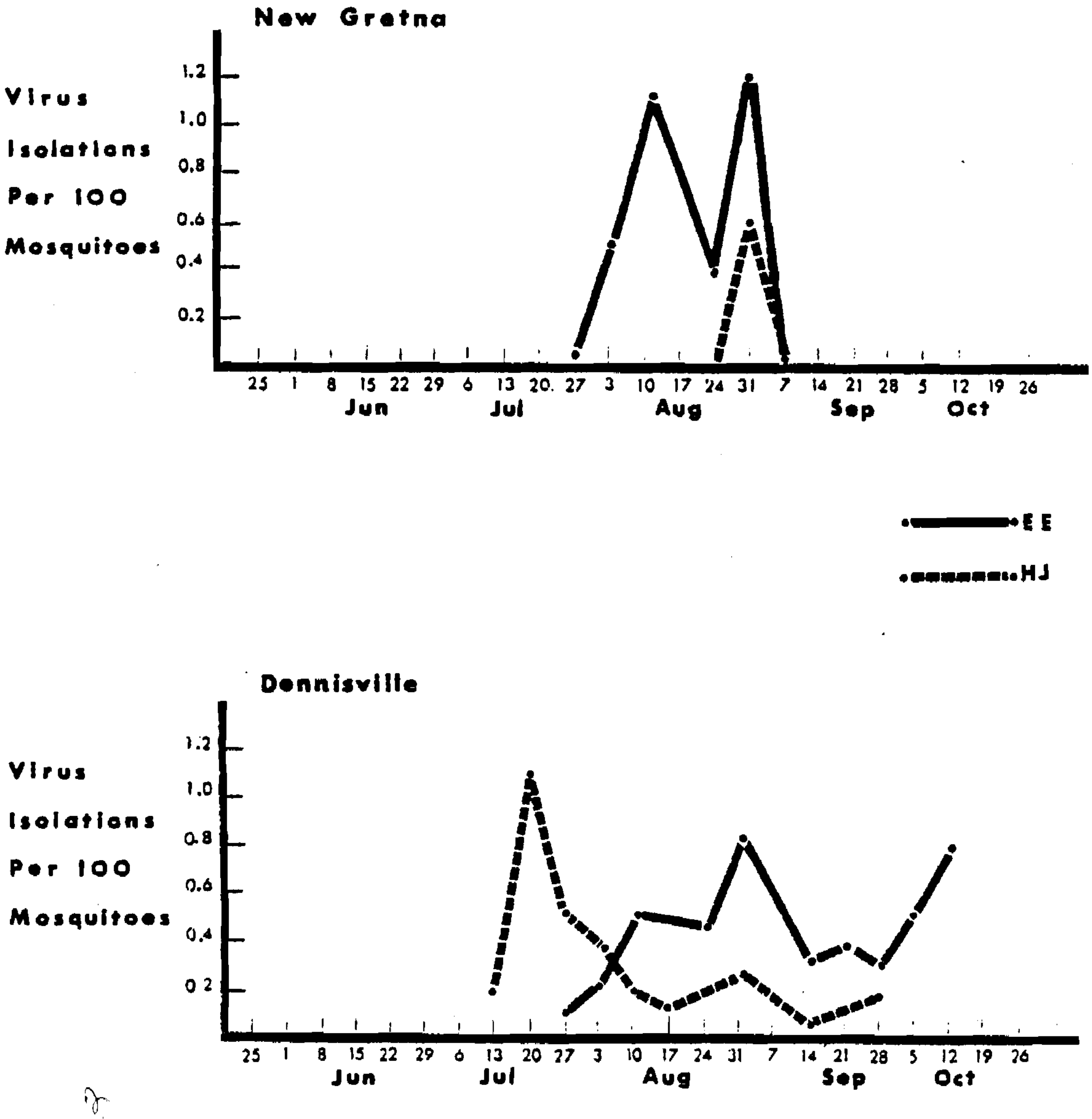


Fig. X. Number of virus isolations obtained per 100 Culiseta melanura tested at the New Gretna and Dennisville study sites during 1980.

Antibody in Wild Birds

Data from the bird bleeding program yielded interesting and unexpected results as the season progressed. In the early Spring, a number of the Summer resident birds showed a relatively high incidence of antibody to both EE and HJ which was not surprising since both of these viruses reached epizootic proportions in 1979. Table 1 lists some representative birds that are known to nest in the area and the antibody rates that were detected prior to the epizootic in Cs. melanura.

Table 1. Antibody rates prior to documented epizootic activity in adult birds that are known to nest within the study sites.

Common Name	No. Tested	No. with EE Antibody	Rate %	No. with HJ Antibody	Rate %
Brown Thrasher	6	5	83	2	33
Wood Thrush	17	11	70	11	70
Robin	16	10	63	5	32
Towhee	8	3	38	2	25
Catbird	19	6	32	9	48
Blue Jay	10	3	30	4	40
Cardinal	13	3	23	2	15
Ovenbird	29	6	21	4	14
Titmouse	7	1	14	3	43
Chickadee	11	0	0	0	0
Black & White Warbler	13	0	0	0	0
Yellow Throat	9	0	0	0	0

Most of the birds that showed a high rate of antibody were relatively large in size. The smaller birds that were collected early in the year showed little in the way of antibody to either virus. Antibody data from after the epizootic (which is not yet completely available) showed that many of these small birds had contracted the disease in 1980. The small birds, therefore, either succumb to the virus or lose their antibody titer over time.

In late June, antibody to both EE and HJ was detected in the first of several fledgling birds (Table 2). Since fledgling birds are strictly local, this was the first indication that these viruses were active in the State during the 1980 season.

Table 2. Antibody in Juvenile Birds Prior to Documented Epizootic Activity.

Common Name	Date Detected		Area
	EE	HJ	
Titmouse	-	6/18	Dennisville
Wood Thrush	6/24	-	Dennisville
Wood Thrush	6/30	-	New Gretna
Black & White Warbler	-	7/09	Dennisville
Robin	8/07	-	New Gretna
Robin	-	8/07	New Gretna
Wood Pewee	-	8/12	Dennisville

It is interesting to note that antibody to HJ virus was detected in a juvenile tufted titmouse on June 18 but HJ virus was not recovered from Cs. melanura until July 13. Likewise, two juvenile wood thrushes showed antibody to EE virus in late June, while isolations were not made from mosquitoes until the end of July. Detecting antibody in juvenile birds one month prior to discovering the virus in the epizootic vector, suggests that the birds may have acquired the virus from a source other than Cs. melanura. Many species of early season mosquitoes (e.g. Ae. canadensis, Ae. cantator) were present at the study sites and could have served as a vehicle for transfer from an unknown overwintering host. No specimens were tested, however, and no data are available to substiate the hypothesis.

Virus in Wild Birds

By the end of the first week of August, live virus was being recovered from birds as well as mosquitoes. Fig. 3 shows the sequence of virus isolations from Cs. melanura at each of the sites, while Table 3 lists the birds that were captured with an active viremia. Early in August, the summer resident and year-round resident birds functioned as the amplifying hosts for both EE and HJ virus.

Table 3. Birds Captured with an Active Viremia During 1980.

Common Name	Date of Capture	Area	Status
EE Virus:			
Blue Jay	8/05	New Gretna	Resident
Wood Thrush	8/06	Dennisville	Summer Resident
Ovenbird	8/07	Dennisville	Summer Resident
Swainson's Thrush	8/28	West Creek	Migrant
Robin	9/03	Dennisville	Summer Resident
Redstart	9/03	Dennisville	Migrant
Black & White Warbler	9/10	Dennisville	Migrant*
Myrtle Warbler	10/10	New Gretna	Migrant
HJ Virus:			
Ovenbird	8/06	Dennisville	Summer Resident
Chickadee	8/07	Dennisville	Resident
Grackle	8/13	Dennisville	Resident

*Although this species is known to nest in the area, the late capture date suggests that the specimen was a migrant that nested well to the North.

As the season progressed, however, and the summer residents moved South, a number of migrating species apparently acquired EE virus as they passed through the study areas. Migrating birds probably functioned as the main amplifying hosts during the September-October peak in virus activity that was detected at Dennisville. Swainson's Thrush, Redstart and Myrtle Warbler all represent species that nested much further to the North and only appeared at the study sites for a brief period of time late in the season. The birds may have acquired the virus in more northern latitudes and demonstrated their viremia in New Jersey, but data strongly suggest that each species remained long enough to actually participate in the epizootic cycle that was active at the time of their capture. Much has been written about the role of birds in the dissemination of virus along the eastern seaboard. In 1980, there seems to be little question that birds were carrying virus South. A similar mechanism, therefore, could function in the early Spring as birds move North from areas where EE activity is already peaking in the southern states.

Non-avian Vertebrate Involvement

Although virus was very active in the Cs. melanura-avian cycle, very little in the way of "spillover" to non-avian vertebrates took place during the 1980 season. A single horse case due to EE was documented in August in the south-central portion of the State and HJ virus was confirmed from a pony at an inland site. Even though virus was widespread in the State, New Jersey did not experience the intense equine involvement that took place in Michigan this year. There was no evidence of human disease and, remarkably, no record of pen deaths in caged pheasants.

The Status of Aedes sollicitans

For many years, mosquito investigators have pointed to Ae. sollicitans as the most plausable epidemic vector of EE in New Jersey. The geographic distribution of human cases over the years is the biggest single reason. An overwhelming majority of human cases have been contracted within several miles of the coast, even in years when EE has been documented over a much wider geographic range. Ae. sollicitans populations were not exceptionally high this year, but the species did demonstrate a vector potential peak at the time that virus activity was most intense. (See accompanying figures at the end of this report.) No virus was recovered from the thousands of mosquitoes that were collected during this period and no evidence of human involvement was documented.

The events that lead to human involvement, therefore, remain unclear. In 1979, New Jersey experienced one human case and the physiological status of the Ae. sollicitans populations in the area supported vector involvement by that species. In 1980, the stage again appeared to be set along the New Jersey coast, but the virus was contained within the basic Cs. melanura wild bird cycle. In the State of Michigan, (where the vector is thought to be Coquillettidia perturbans) the virus exploded from the epizootic cycle this year and struck humans as well as horses. Vector control may have made the difference in New Jersey*, but this would be difficult to substantiate. Eastern encephalitis virus remains unpredictable and, luckily, N.J. has not experienced a widespread outbreak in humans for many years. Data from these investigations, however, show that the pathogen is present in the environment in large quantity and continues to pose a potential health threat to the residents in the southern portion of the State.

---

*The N. J. State Airspray Program treated approximately 20,000 acres of Ae. sollicitans habitat during the period of greatest epizootic activity and individual county mosquito commissions intensified larval control to keep salt marsh mosquito populations as low as possible in August and September. Data from the Vector Surveillance Program was used to locate potentially dangerous populations and "spot control" based on vector potential was utilized on a number of occasions.

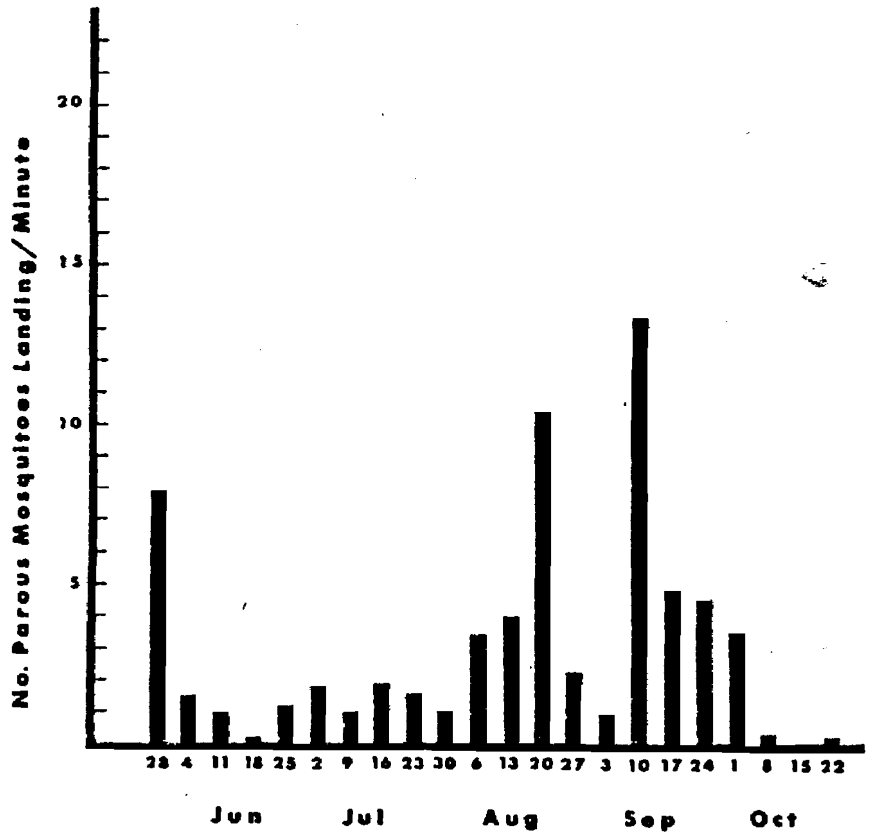


Fig. 4. Weekly vector potential ratings in Aedes sollicitans at West Creek (Ocean County) during 1980.

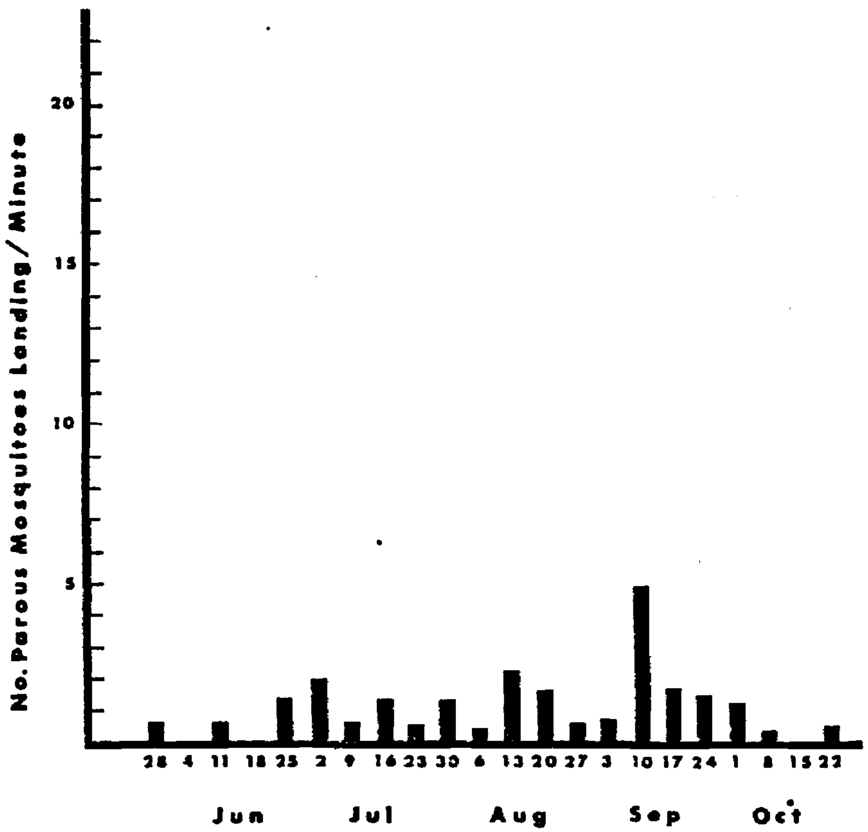


Fig. 5. Weekly vector potential ratings in Aedes sollicitans at Dennisville (Cape May County) during 1980.

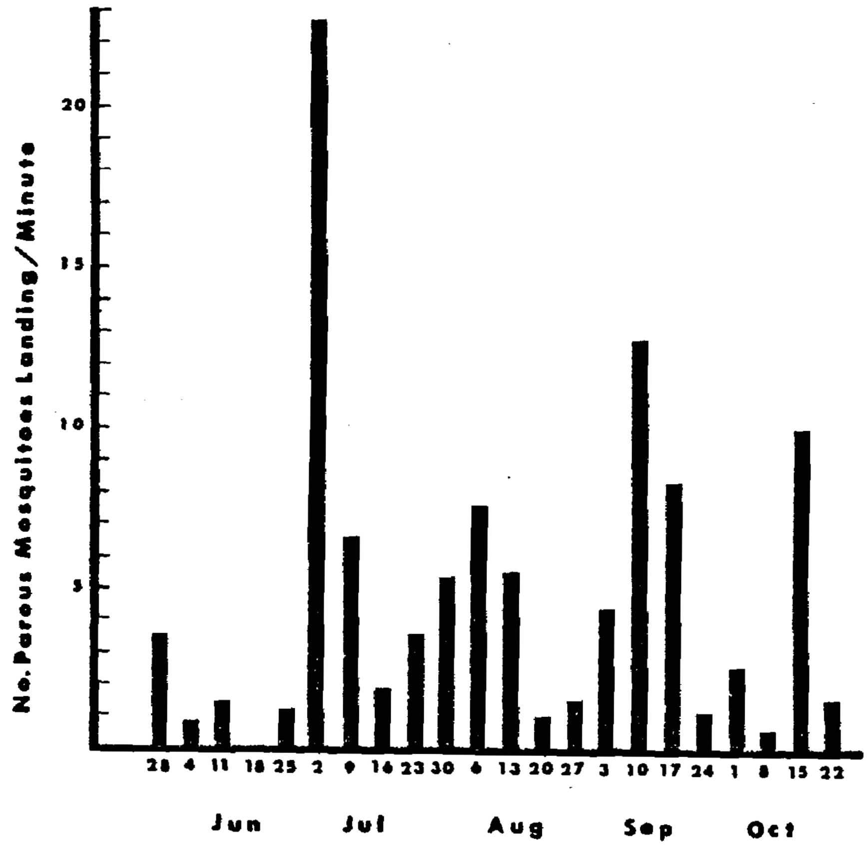
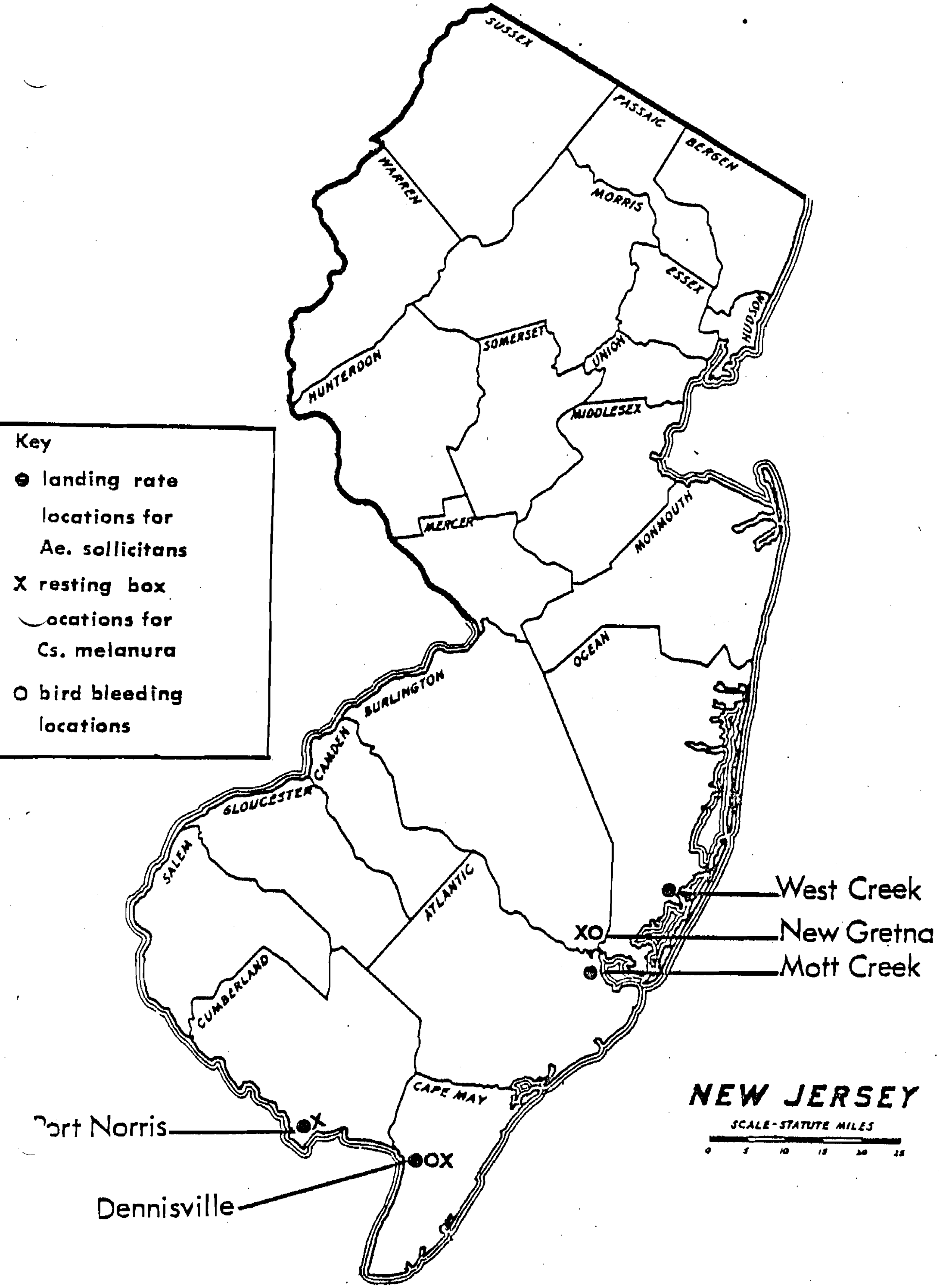


Fig. 6. Weekly vector potential ratings in <u>Aedes sollicitans</u> at Port Norris (Cumberland County) during 1980.



Key
landing rate
locations for
Ae. sollicitans
X resting box
ocations for
Cs. melanura
O bird bleeding
locations
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
SOMERSET
UNION
HUNTERDON
MIDDLESEX
MONMOUTH
MERCER
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
XO
West Creek
New Gretna
Mott Creek
ort Norris
OX
Dennisville
NEW JERSEY
SCALE-STATUTE MILES
0 5 10 15 20 25

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 Wayne Johnson John Gamble Doreen Klingert Linda McCuiston
Cooperating State Health Personnel:	Oscar Ross Ronald Altman William Parkin Terry Schulze Wayne Pizutti Bernard Taylor Joyce Veazey Walter Gusciora Dave Adam
Cooperating State Mosquito Control Commission Personnel:	Kenneth W. Bruder Robert B. Kent
Cooperating County Mosquito Control Superintendents:	Harry Tillett, Atlantic County Brian Gooley, Burlington County Judy Hansen, Cape May County Patrick Slavin, Cumberland County Tom Candeletti, Ocean County William Fisher, Salem County

* * * * * * * * * * *

Prepared by: Dr. Wayne J. Crans
Mosquito Research and Control
Cook College, Rutgers University
New Brunswick, New Jersey 08903

This work was performed as a part of NJAES Project 40500. Supported by the New Jersey Agricultural Experiment Station and the New Jersey State Mosquito Control Commission.