NEW JERSEY VECTOR SURVEILLANCE

Vol. 12 No. 5 Season Summation

ABSTRACT: New Jersey experienced an exceptionally wet spring in 1987 and Culiseta melanura populations reached record levels in many portions of the state during the early portion of the season. Eastern equine encephalitis virus (EEE) was first detected in Cs. melanura in late July and reached epornitic levels during the month of August. Fifteen equine cases of EEE were confirmed and 2 were listed as presumptive during the period of August 8 to September 20. Transfer to equines was limited to inland areas of Middlesex, Monmouth, Ocean, Burlington, Gloucester and Salem counties. Virus isolation data showed brief periods of intense transmission to birds just prior to the equine cases in most areas. No human involvement was associated with the epizootic.

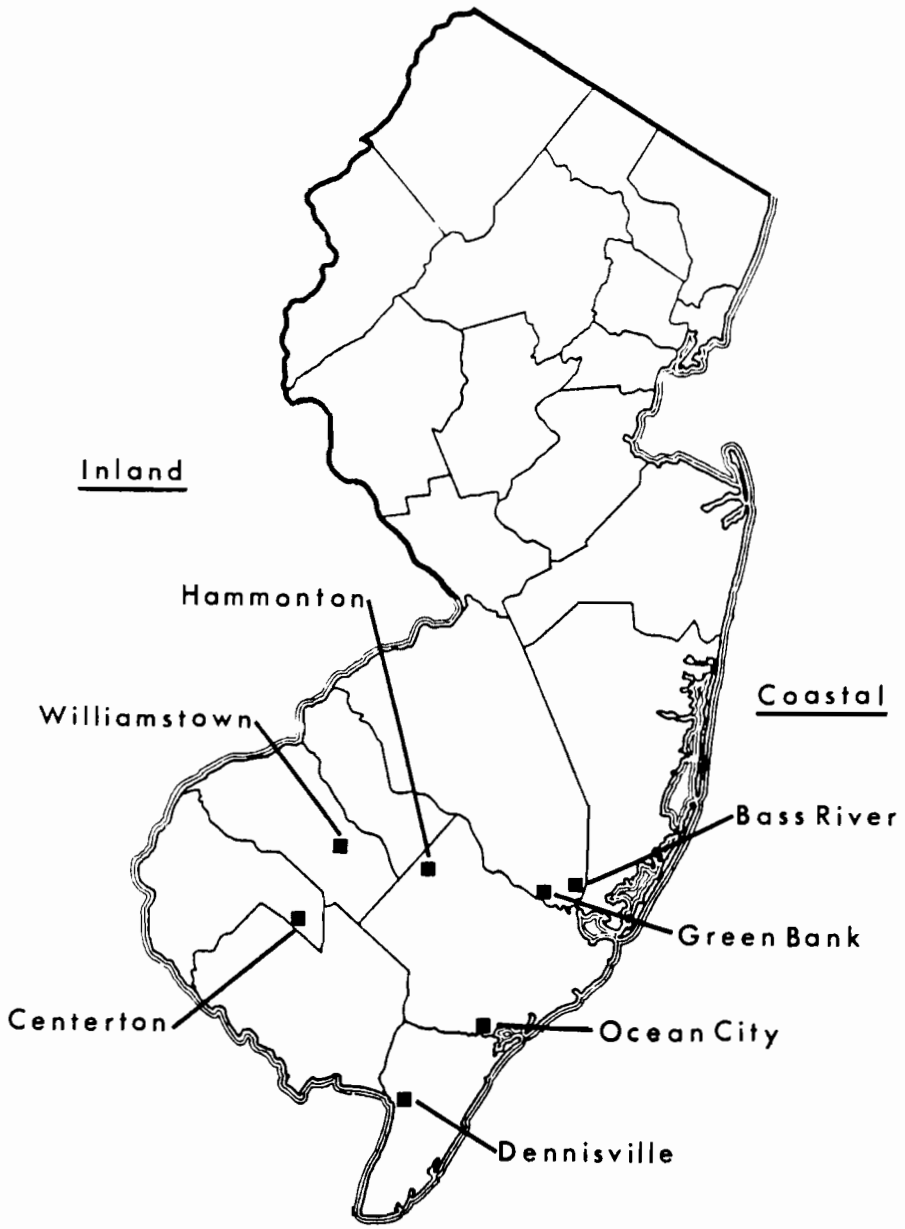
INTRODUCTION

Eastern equine encephalitis virus (EEE) was active primarily in the deep south during 1987 with documented foci in Florida, Louisiana, Mississippi and Georgia. Despite the rather marked southern distribution in virus activity, New Jersey experienced a severe epizootic that began in late July and extended well into September. During the epizootic period, 15 equine cases were confirmed and 2 were listed as presumptive. No evidence of human involvement was detected during the season.

The New Jersey Vector Surveillance Program monitored EEE virus and its mosquito vectors throughout the 1987 season. The results of the survey and the information collected during the epizootic period are the subjects of this report.

RESTING BOX SITES

1987



ACKNOWLEDGEMENTS: This document is the result of a cooperative effort among the following State and County Agencies: New Jersey State Mosquito Control Commission, New Jersey State Department of Health, the Mosquito Research and Control Unit of NJAES, the New Jersey Department of Environmental Protection, the New Jersey Department of Agriculture, the County Mosquito Control Agencies in Atlantic, Burlington, Cape May, Camden, Cumberland, Gloucester, Ocean, Middlesex and Salem Counties.

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New Jersey Agricultural Experiment Station Publication No. R-40500-01-88 supported by State funds and funding from the New Jersey State Mosquito Control Commission.

METHODS OF THE SURVEY

The epornitic vector, Culiseta melanura was monitored with resting boxes at 7 collection stations in southern New Jersey from early June to late October. The boxes were placed in the field during the month of May and collections were made once weekly during the surveillance period. CDC light traps baited with dry ice were used to collect a broad spectrum of mosquito species only at the Dennisville site. Regardless of collection method, specimens were frozen on dry ice at the collection site and transported to Rutgers University for speciation and pooling.

Coastal populations of Aedes sollicitans were monitored twice weekly at 6 collection stations to identify the major periods of emergence during the season. On each collection date, specimens were also taken for physiological aging by ovarian tracheolation. Virus tests were conducted on all specimens collected during the survey at the New Jersey State Department of Health Laboratories in Trenton. Collection records were collated with a database system for rapid analysis and the results (presence or absence of virus, size of Cs. melanura populations and parity in the biting population of Ae. sollicitans) were made available to county mosquito control agencies in New Jersey throughout the encephalitis season.

MOSQUITO SPECIES TESTED FOR VIRUS DURING 1987

A total of 92,771 mosquito specimens were tested for Highlands J (HJ) and EEE virus during 1987. Twenty-one mosquito species were included in the 1987 data base. Table 1 lists the totals by species for all sites combined. As usual, Cs. melanura proved to be the primary indicator of virus activity with 10 HJ and 23 EEE isolations. Culex salinarius was the only other species to yield virus with a single EEE isolation during the course of the season.

Table 1. Mosquito species tested for HJ and EEE virus in New Jersey during 1987.

SPECIES	TOTAL TESTED	NO. POOLS	POSITIVE POOLS HJ	POSITIVE POOLS EEE
Genus Aedes				
Ae. canadencis	7629	207	0	0
Ae. cantator	1858	76	0	0
Ae. cinereus	1	1	0	0
Ae. sollicitans	6233	199	0	0
Ae. taeniorhynchus	31	10	0	0
Ae. thibaulti	3	3	0	0
Ae. triseriatus	19	12	0	0
Ae. vexans	124	23	0	0
Genus Anopheles				
An. bradleyi	12650	224	0	0
An. punctipennis	294	92	0	0
An. quadrimaculatus	3968	235	0	0
Genus Coquillettidia				
Cq. perturbans	4169	910	0	0
Genus Culiseta				
Cs. inornata	1	1	0	0
Cs. melanura	21265	910	10	23
Genus Culex				
Cx. pipiens	22	16	0	0
Cx. restuans	993	197	0	0
Cx. salinarius	33153	437	0	1
Cx. territans	339	121	0	0
Genus Psorophora				
Ps. columbiae	8	3	0	0
Ps. ferox	1	1	0	0
Genus Uranotaenia				
Ur. sapphirina	8	4	0	0
TOTALS	92771	2988	10	24

CULISETA MELANURA AND THE SEASONAL PROGRESSION OF EEE VIRUS

New Jersey experienced an exceptionally wet spring in 1987 and mosquito collections, in general, were well above average. Culiseta melanura responded to the favorable breeding conditions with record population levels at most of the sites that were being monitored.

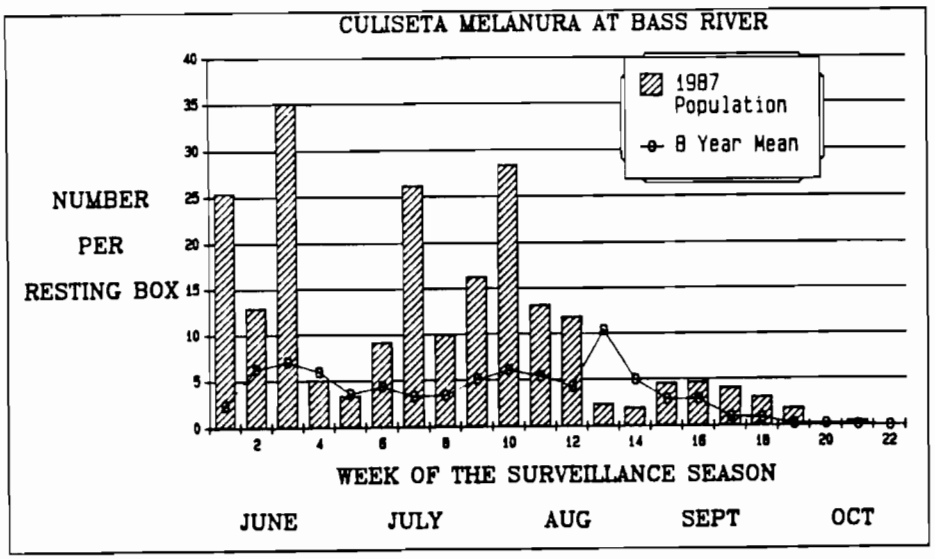

Fig. 1. Resting box populations of Cs. melanura at Bass River, Burlington Co. compared with the 8-year mean for that site.

Figure 1 compares the 1987 population levels with the 8-year mean at Bass River, a site on the east coast of the state in Burlington County. Record peaks were documented for each of the June, July and August generations. Figure 2 compares 1987 population levels with the 2-year mean at Centerton, an inland study site in Salem County. The data clearly show that Cs. melanura were well above average during the early part of the season. Similar phenomena were recorded at other study stations indicating above average populations of the main vector to birds during the spring and summer seasons in the areas of New Jersey where EEE was most likely to reach epizootic proportions.

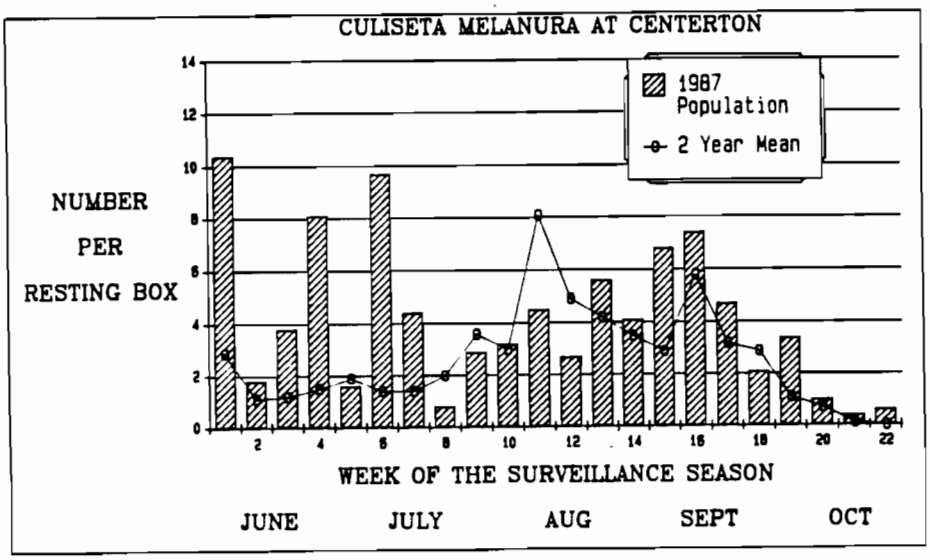

Fig. 2. Resting box populations of Cs. melanura at Centerton, Salem Co. compared to the 2-year mean for that site.

Table 2 lists EEE isolations from Cs. melanura by collection site during the 1987 season. Data show that EEE virus first appeared at the Hammonton site in northern Atlantic County in late July. With the exception of Dennisville, on the Delaware Bay, and Centerton, in Salem County, the periods of potential epizootic activity were relatively brief. Data indicate a peak in activity during the month of August at most of the sites. EEE, however, was detected as late as October at Green Bank, on the east coast, and at Centerton, a study site located well inland.

Table 2. EEE virus isolations from Culiseta melanura in New Jersey during 1987.

Location	Positive Pools	Earliest Isolation	Latest Isolation
Coastal Sites*			
Green Bank	1	Oct. 11	-
Bass River	3	Aug. 04	Aug. 11
Ocean City	2	Aug. 11	Aug. 25
Dennisville	6	Jul. 28	Sep. 08
Inland Sites			
Hammonton	3	Jul. 27	Aug. 17
Williamstown	0	-	-
Centerton	8	Aug. 12	Oct. 04

* A single EEE isolation was also obtained from a pool of 100 unengorged Culex salinarius collected by CDC light trap at Dennisville on August 11.

Table 3 lists the MFIR values (virus isolations per 1000 specimens tested) by month for each collection site. The data show that EEE virus in Cs. melanura (and presumably the bird population as well) appeared at low levels in July and reached epornitic levels during the month of August. The extremely high MFIR recorded at the Ocean City site during August reflects a pattern first seen in 1984 when a human case was reported from the area. Cs. melanura occurs in the area at relatively low levels but virus frequently reaches extremely high levels for very brief periods of time.

Transmission to birds subsided at most of the sites during the month of September. The Centerton site was unique in that EEE persisted at relatively high levels well into October. In fact, the virus activity documented at the Centerton site reflected the overall pattern of 1987 equine cases in the southern portion of the state.

Table 3. Minimum field infection rates (MFIR) for Culiseta melanura by month during 1987.

Location	Total Tested	MFIR Value June	July	Aug.	Sept.	Oct.
Coastal Sites						
Green Bank	2335	0.00	0.00	0.00	0.00	23.81
Bass River	5554	0.00	0.00	2.23	0.00	0.00
Ocean City	489	0.00	0.00	25.64	0.00	0.00
Dennisville	7884	0.00	0.26	2.17	1.40	0.00
Inland Sites						
Hammonton	2220	0.00	1.61	2.84	0.00	0.00
Williamstown	659	0.00	0.00	0.00	0.00	0.00
Centerton	2009	0.00	0.00	8.20	6.21	20.00

EQUINE CASES OF EEE DURING 1987

Equine cases of EEE were limited to the coastal plain in the southern half of the state where sandy soils and acid water conditions are conducive to Cs. melanura breeding. The most northern case occurred at Englishtown in Middlesex County, near the upper limit of the New Jersey Pine Barrens. The most southern was in Penns Grove, Salem County. All of the cases were distributed inland, well beyond the normal flight range of Ae. sollicitans. Limited trapping studies revealed a variety of floodwater Aedes and high populations of Coquillettidia perturbans. No virus was obtained from any of the specimens collected at the horse farms.

Table 4 lists the seasonal progression of equine cases by county. Epizootic activity was first confirmed by an equine case in Monroe Township, Gloucester County on August 8. Date of onset occurred approximately 10 days after the first isolations from Cs. melanura. Interestingly, no virus was detected at Williamstown, the closest study area to the equine case. EEE activity was, however, documented at Hammonton prior to the case, a study site 12 mi. to the west.

Eight equine cases were reported from August 15-26 in an area that was centered in Burlington and Ocean Counties. During this period, virus was repeatedly isolated from Cs. melanura at most of the sites. In September, 7 equine cases were documented from 2 distinct geographic locations in the state. The first was an area that included Middlesex, Monmouth and northern Ocean Counties in the northern area of the Pine Barrens region. The second was centered near Medford, Burlington County along the western edge of the Pine Barrens region.

The Centerton site (well to the southwest) was the only study area that reflected a high degree of virus activity during this period but equine cases were not detected in the vicinity. The paucity of equine cases in Salem County may have been due to concerted control efforts. Ground ULV applications were instituted in high risk areas of Salem County in response to the abnormally high Cs. melanura populations recorded early in the season. The single horse case in Salem County occurred during the September epizootic in an area of the county well removed from the Centerton focus.

Table 4. Monthly progression of confirmed and presumptive equine cases of EEE in New Jersey.

County	No. Equine Cases				
	July	Aug	Sept	Oct	Total
Middlesex	0	0	1	0	1
Monmouth	0	0	1	0	1
Ocean	0	3	1	0	4
Burlington	0	4	4	0	8
Gloucester	0	2	0	0	2
Salem	0	0	1	0	1
TOTALS	0	9	8	0	17

DISCUSSION

The 1987 season represents a first in terms of documenting virus in Cs. melanura during an inland epizootic. The inland study areas were established primarily to compare the seasonal patterns of inland virus transmission with those seen along the coast. Preliminary data show that Cs. melanura numbers at inland areas are much lower than the sizeable populations that emanate from coastal cedar swamps. Virus transmission, however, can be intense for brief periods of time, particularly when Cs. melanura populations are higher than average. Data indicate that epornitics are probably very localized at inland foci and appear to cycle independently from the rather broad areas of virus activity that are frequently seen along the coast. The presence or absence of Cq. perturbans appears to be a determining factor in the eventual transmission of EEE beyond the avian cycle but considerably more data are needed to identify the true scope of inland vector species.

The pattern of equine transmission in 1987 documents the need for additional long-term study sites along the inland corridor. Virus activity appears to be unpredictable at inland foci but the traditional areas for equine outbreaks continue to re-occur. The Jackson Township study site was dropped after a 3-year trial period because Cs. melanura all but disappeared from the area after the equine epizootic in 1983. In 1987, 6 equine cases occurred in the general vicinity of Jackson Township but no data are available to assess the presence or absence of either Cs. melanura or EEE virus in the area. The Medford Lakes-Indian Mills area of Burlington County represents a second focus that should be investigated on a long-term basis. Data as far back as 1965 show that transmission to equines can be intense in this geographic region but repeated attempts to locate an area that sustains Cs. melanura in any numbers have failed. The 1987 equine epizootic in New Jersey underscores the need for continued surveillance in high risk inland regions. Data suggest that Cs. melanura may be a transitory species in these areas and its mere presence could represent a potential risk to equines.