NEW JERSEY DEPARTMENT OF AGRICULTURE

NEW JERSEY DEPARTMENT OF HEALTH
A BETTER STATE OF HEALTH

NEW JERSEY VECTOR SURVEILLANCE

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ABSTRACT: New Jersey experienced an extremely wet Spring in 1989 that was followed by repeated rains during the Summer months. *Culiseta melanura* populations began the season at relatively low levels and were slow to respond to the increased habitat that the flooding conditions provided. During the months of July and August, however, the species expanded its range considerably and reached record levels at all of the sites where the mosquito has been monitored in the past. EEE virus first appeared in mid-July, peaked during late August and extended well into the month of October. Minimum Field Infection Rates (MFIR) ranged from 3.89-16.26 isolations/1000 specimens tested based on the highest risk rate for each geographic area in the surveillance effort. Surprisingly, only 13 equine cases were documented during the season. A single human case was reported in a young child but could not be confirmed because of autopsy refusal by the parents. Low levels of *Coquillettidia perturbans* may have been a contributing factor to the pattern of disease transmission in New Jersey this year. Data suggest that the severe epornitic

INTRODUCTION

Eastern equine encephalitis virus (EEE) was widespread along the Gulf coast and southern Atlantic seaboard in 1989. Twelve states reported equine involvement and human cases were confirmed from Mississippi and North Carolina. New Jersey appeared to be at the northern fringe of the epizootic this year.

The New Jersey Vector Surveillance Program monitored EEE virus and its mosquito vectors throughout the 1989 season at locations where EEE activity has been reported in the past. *Culiseta melanura* reached record levels at all of the study sites and EEE virus isolation rates were extremely high. Human and equine involvement, however, was limited in view of the amount of virus present in nature. This report chronicles the events that took place in New Jersey as the epornitic progressed and addresses possible reasons for the abortion of a potential major epizootic period.

METHODOLOGY OF THE SURVEILLANCE EFFORT

The epornitic vector, *Cs. melanura* was monitored with resting boxes at 7 collection stations in southern New Jersey from late May through the month of October (Fig. 1).

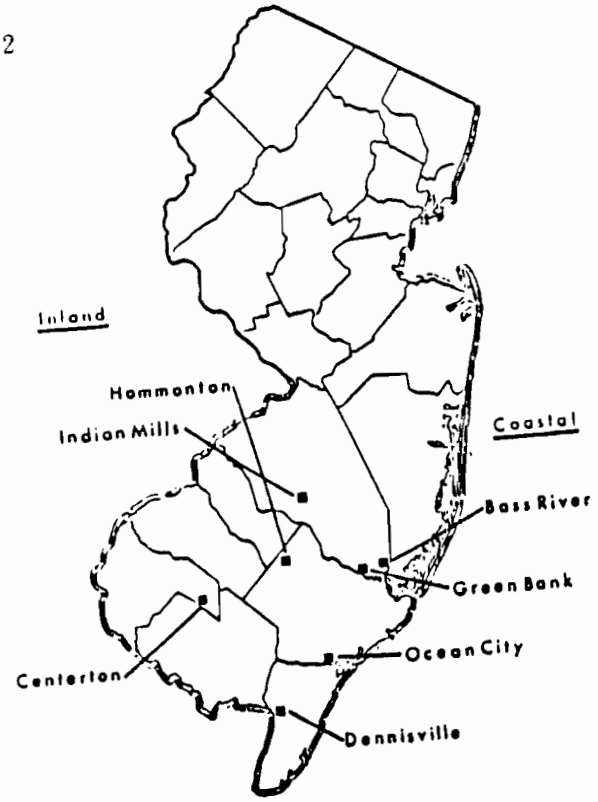

Fig. 1. Resting box sites for arbovirus surveillance in 1989.

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 at one coastal site (Dennisville) and one inland site (Hammonton). Mosquito specimens were frozen on dry ice at each collection site and transported to Rutgers University for speciation, pooling and trituration.

Coastal populations of *Aedes sollicitans* were monitored twice weekly at 6 collection stations to identify the periods of peak emergence during the season. On each collection date, specimens were also taken for physiological aging by ovarian

Table 1. Mosquito species tested for EEE and HJ virus in New Jersey during 1989.

MOSQUITO SPECIES	TOTAL TESTED	NO. POOLS	POSITIVE POOLS HJ	EEE
Genus *Culiseta*				
Cs. melanura	29130	1102	35	102
Genus *Aedes*				
Ae. canadensis	270	51	0	0
Ae. cantator	5	5	0	0
Ae. grossbecki	1	1	0	0
Ae. hendersoni	1	1	0	0
Ae. sollicitans	8	8	0	0
Ae. taeniorhynchus	1	1	0	0
Ae. thibaulti	1	1	0	0
Ae. triseriatus	58	12	0	0
Ae. vexans	141	30	0	0
Genus *Anopheles*				
An. bradleyi	231	77	0	0
An.punctipennis	397	125	0	0
An. quadrimaculatus	9878	261	0	0
Genus *Coquillettidia*				
Cq. perturbans	72	31	0	0
Genus *Culex*				
Cx. pipiens	474	46	0	0
Cx. restuans	1032	84	0	0
Cx. salinarius	912	84	0	0
Cx. territans	1259	150	0	0
Genus *Psorophora*				
Ps. columbiae	2	1	0	0
Ps. ferox	5	5	0	0
Genus *Uranotaenia*				
Ur. sapphirina	1	1	0	0

tracheolation. Virus isolation attempts were conducted by the New Jersey State Department of Health Laboratories in Trenton. Collection data were collated with a database system for rapid analysis and the information was distributed to county mosquito control agencies in the State throughout the encephalitis season.

MOSQUITO SPECIES TESTED FOR VIRUS DURING 1989

A total of 43,984 mosquito specimens were tested for Highlands J (HJ) and EEE virus during 1988. Table 1 lists the totals by species for all sites combined. *Cs. melanura* was the only species found positive with 35 HJ and 102 EEE isolations over the course of the season. The number of EEE isolations represented one of the highest ever recorded since this program's inception in 1976.

THE POPULATION DYNAMICS OF *CS. MELANURA* IN 1989

New Jersey began the 1989 season under drought conditions but experienced an extremely wet Spring. By mid-June, the State was experiencing flood conditions and the rains continued throughout most of the Summer. *Cs. melanura* populations began the season below the average experienced in a normal year. During the month of July, the species showed a marked population increase and during August and September the mosquito was being collected in record numbers throughout the southern portion of the State. Fig. 2 compares the 1989 populations of *Cs. melanura* at Dennisville with the 12 year mean for that study site.

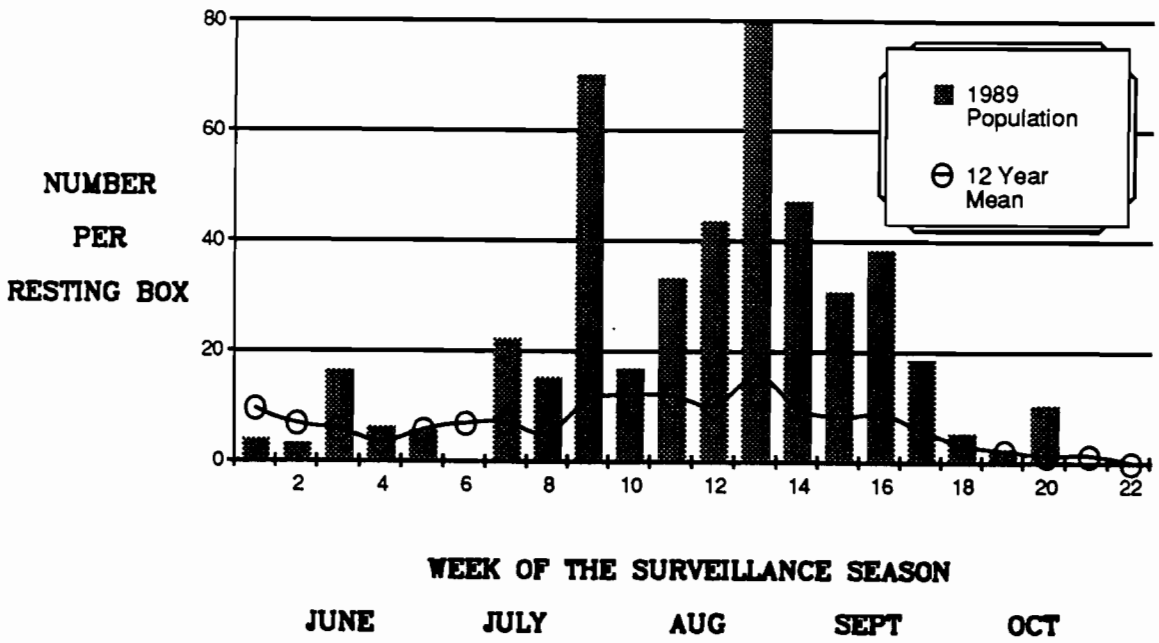

Fig. 2. Resting box populations of *Cs. melanura* at Dennisville in Cape May County during 1989.

The data clearly show the dynamics of the population increase in 1989. Virtually all of the study sites monitored in 1989 showed a similar trend and light trap data indicated significant numbers of the species from collection sites where the mosquito had never been reported. During the 1989 season, *Cs. melanura* populations were extremely high throughout the coastal plain region of New Jersey where EEE virus transmission to horses and humans poses a constant risk.

New Jersey experienced extreme mosquito annoyance because of the floodwater habitat that was expanded by the Spring and Summer rains. Multiple broods of floodwater mosquitoes emerged during the months of June, July and August and intermittent tidal flooding produced heavy populations of *Aedes sollicitans* along the coast. The only significant species that remained below average in New Jersey was *Coquillettidia perturbans*, a univoltine permanent water breeder, that was not affected by the increase in breeding habitat created by the floodwater conditions.

THE SEASONAL PROGRESSION OF EEE VIRUS IN 1989

Table 2 compares the earliest and latest isolation dates for EEE virus from *Cs. melanura* by collection site during the 1989 season. Data show that virus first appeared at the Green Bank site on July 18. At all of the coastal locations, EEE virus was initially amplified during the month of July. At Inland sites, virus amplification did not occur until mid-August. The data also show that the epornitic period was prolonged in 1989 with virus activity continuing through the month of September at most sites. In two geographic

Table 2. EEE virus isolations from *Culiseta melanura* in New Jersey during 1989.

LOCATION	POSITIVE POOLS	EARLIEST ISOLATION	LATEST ISOLATION
Coastal Sites			
Green Bank	12	Jul. 18	Sept. 12
Bass River	14	Jul. 25	Sept. 19
Ocean City	9	Jul. 24	Sept. 11
Dennisville	29	Jul. 24	Oct. 06
Inland Sites			
Hammonton	4	Aug. 10	Sept. 07
Indian Mills	2	Aug. 25	Aug. 26
Centerton	27	Aug. 25	Oct. 12

areas (Dennisville and Centerton) EEE virus was isolated from *Cs. melanura* during the month of October

Table 3 lists the MFIR values (virus isolations per 1000 specimens tested) by month for each site to illustrate the intensity of the epomitic during the 1989 season. MFIR values greater than 3.00 generally indicate potential equine involvement and values greater than 5.00 signal the possibility for human cases. In 1989, most of the study sites were at extreme risk and some had MFIR values that were higher than any ever recorded in past years.

The MFIR data show that EEE amplification began rather abruptly during the month of July at coastal sites and then extended to inland areas during August and September. Virus activity peaked at all of the sites during August with the exception of the Centerton site, an area in Salem County with a history of repeated equine involvement early in the season. In 1989 at Centerton, the MFIR values did not peak until September. During that period, EEE isolations from *Cs. melanura* were common during every week of the month.

EQUINE CASES OF EEE IN 1989

The first equine case of EEE was confirmed by the New Jersey Department of Agriculture in early August from a yearling quarterhorse stabled near the town of Waterford Works in the western portion of Camden County. Emergency surveillance performed by the Camden County Mosquito Control Commission showed that *Cq. perturbans* was present at that site, but ground ULV operations prevented a thorough surveillance effort to assess the magnitude of the populations. Table 4 lists

Table 3. Minimum Field Infection Rates (MFIR) for *Culiseta melanura* by month during 1989.

LOCATION	TOTAL TESTED	MFIR VALUE June	July	Aug	Sept	Oct
Coastal Sites						
Green Bank	3321	3.84	3.81	0		
Bass River	3245	0	2.39	7.99	2.11	0
Ocean City	1307	0	6.58	8.88	6.54	0
Dennisville	12,031	0.75	3.89	1.19	2.04	
Inland Sites						
Hammonton	518	0	0	3.37	2.64	0
Indian Mills	3087	0	16.26	0	0	
Centerton	4645	0	0	1.97	11.60	7.61

Table 4. Equine cases of EEE investigated in New Jersey during 1989.[1]

ONSET	TOWN	COUNTY	DESCRIPTION	STATUS
Aug 10	Waterford Works	Camden	Quarterhorse Yearling	CONFIRMED
Aug 23	South Egg Harbor	Atlantic	1 year-old Pony	CONFIRMED
Aug 23	Vineland	Cumberland	4 year-old Pony	CONFIRMED
Aug 23	Vineland	Cumberland	5 month-old Thoroughbred	CONFIRMED
Aug 28	Buena	Atlantic	3 year-old Quarterhorse	PRESUMPTIVE
Sep 12	Bridgeport	Gloucester	Adult Quarterhorse	CONFIRMED
Sep 21	Sicklerville	Camden	1 year-old Quarterhorse	PRESUMPTIVE
Sep 23	Salem	Salem	6 month old Standardbred	CONFIRMED
Sep 23	Mays Landing	Atlantic	25 year-old Grade mare	PENDING
Sep 24	Franklinville	Gloucester	No info avail	PRESUMPTIVE
Sep 24	Sicklerville	Camden	6 month old Grade horse	PRESUMPTIVE
Sep 25	Cedar Brook	Camden	12 year-old Grade horse	PRESUMPTIVE
Sep 29	Sicklerville	Camden	4 year-old Pony	PENDING
Sep 30	Pedricktown	Salem	6 year-old Grade Horse	PRESUMPTIVE

[1] Information supplied by the State Departments of Agriculture and Health

the equine cases that followed in New Jersey during the remainder of August and the month of September. From August 10 to September 30, 9 cases were confirmed to EEE by isolation of virus from brain tissue. An additional 4 cases were listed as presumptive based on serological evidence. Camden County had the highest number of cases (5) with an epizootic period that extended throughout the active season. Despite the extremely high MFIR recorded for Salem County during September and October, only 2 equine cases were confirmed.

DATA ON A POSSIBLE HUMAN CASE

In early August, the New Jersey State Department of Health investigated a possible human case in a 5 yr-old girl who lived in Cherry Hill, Camden County and vacationed at the shore at Ocean City in Cape May County from July 29 to August 5. The child developed CNS symptoms on August 4 and died 3 days later. The parents refused autopsy but serum and spinal fluid was sent to CDC. The samples tested negative and the diagnosis was listed as possible EEE based on symtomology.

The Ocean City study site represented one of the highest risk areas for EEE in New Jersey during the months of July and August based on the size of the *Cs. melanura* populations and the MFIR values detected this year. Figure 3 shows that *Cs. melanura* were well above the 4 year mean recorded for that site and Table 3 shows that EEE persisted in *Cs. melanura* throughout the period. Whether or not EEE was actually transmitted to the child in question, however, is not known. The data merely suggest that

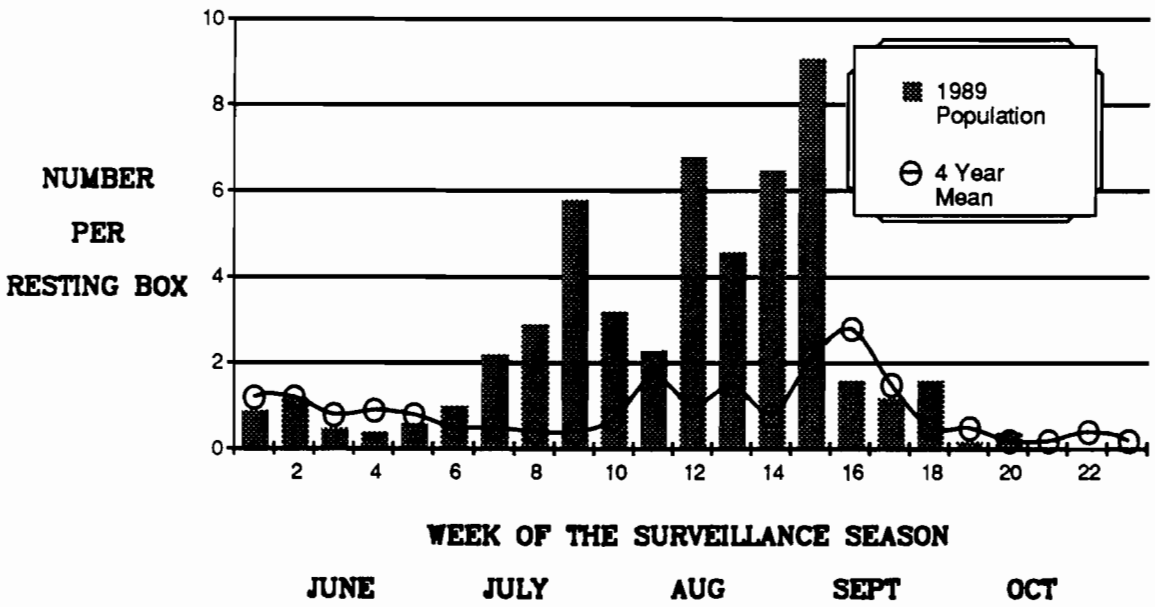

Fig. 3. Resting box populations of *Cs. melanura* at Ocean City (Corbin City site) in Atlantic County during 1989.

the conditions for transmission to humans were highest at that coastal site.

DISCUSSION

The 1989 season was a year where the threat for EEE transmission appeared great, based on the population levels of *Cs. melanura* and the amount of virus detected in the *Cs. melanura* populations over a broad geographic area. Although virus was transmitted beyond the epornitic (bird - Cs. melanura - bird) cycle, however, the numbers of human and equine cases were surprisingly low. In 1984, New Jersey experienced 22 equine and 2 human cases when MFIR values remained below 5.00. In 1987, the State experienced 17 equine cases in areas where the MFIR values did not exceed 3.00.

The low levels of *Cq. perturbans* that were documented in 1989 may have been a contributing factor to the pattern of disease transmission this year. Data suggest that the severe epornitic experienced at inland sites may have occurred in the absence of a suitable epizootic vector. In the past, equine cases have always been associated with high *Cq. perturbans* populations and trapping studies at horse farms where deaths due to EEE were documented have repeatedly implicated that species. In 1989, *Cq. perturbans* was poorly represented in light trap collections throughout the southern coastal plain. The hypothesis will be tested by comparing all of the variables encountered this year with the data base that has been compiled through this monitoring effort since its inception in 1976.

ACKNOWLEDGEMENTS

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Prepared by Dr. Wayne J. Crans
Mosquito Research & Control, Cook College
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