FORTY-NINTH ANNUAL REPORT

OF THE

STATE MOSQUITO CONTROL COMMISSION

OF THE

STATE OF NEW JERSEY

Including the Key to Common Mosquitoes Found in
Light Trap Collections in New Jersey

For the Fiscal Year commencing July 1, 2004 and ending June 30, 2005

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE MOSQUITO CONTROL COMMISSION
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JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

To: The Honorable Jon S. Corzine, Governor
and the members of the Senate
and the General Assembly of the
State of New Jersey

In accordance with the provisions of Title 26, Chapter 9:12.6, we are pleased to submit the Forty-Ninth Annual Report of the State Mosquito Control Commission for the Fiscal Year covering the period from July 1, 2004 through June 30, 2005.

Respectfully,

Len Spiegel

Dr. Leonard E. Spiegel, Chairman
Thomas E. Sellers, Vice Chairman
Aaron H. Rappaport
Jacob C. Matthenius
John Sarnas
John Surmay
Dr. Colin Campbell
Dr. Robert Eisner
Dr. Zane Helsel
Anthony Petrongolo

FORTY –NINTH
ANNUAL REPORT

NEW JERSEY STATE MOSQUITO CONTROL COMMISSION

2005

STATE OF NEW JERSEY
RICHARD J. CODEY, ACTING GOVERNOR

NJ DEPARTMENT OF ENVIRONMENTAL PROTECTION
BRADLEY M. CAMPBELL, COMMISSIONER

Report prepared by the Office
of Mosquito Control Coordination,
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Mark Vlazny, Assistant Biologist
Eileen Shields, Secretary

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COMMISSION ACTIVITIES AND HIGHLIGHTS DURING FISCAL YEAR 2005

During the fiscal year 2004-2005, the State Mosquito Control Commission continued to monitor and address those issues, activities and legislation of importance to the mosquito control interests in New Jersey. Official meetings of the Commission were held monthly during the year on the following dates and at the following locations:

DATE	LOCATION
July 20, 2004	Office of Mosquito Control Coordination, DEP, Trenton, NJ
August 17, 2004	Office of Mosquito Control Coordination, DEP, Trenton, NJ
September 21, 2004	Office of Mosquito Control Coordination, DEP, Trenton, NJ
October 19, 2004	Headlee Laboratories, Rutgers University, New Brunswick, NJ
November 16, 2004	Office of Mosquito Control Coordination, DEP, Trenton, NJ
January 18, 2005	Office of Mosquito Control Coordination, DEP, Trenton, NJ
March 15, 2005	Office of Mosquito Control Coordination, DEP, Trenton, NJ
April 19, 2005	Assunpink W.M.A. Upper Freehold, NJ
June 21, 2005	Office of Mosquito Control Coordination, DEP, Trenton, NJ

In addition to the regularly scheduled meetings, the commissioners participated in numerous committee meetings and conferences with local, state and federal officials regarding mosquito control related matters. All business meetings were announced and held in compliance with the Open Public Meeting Law. P.L. 1975. C231.

The Fiscal year of 2004-2005 began as in past years with the mosquito control season well underway. In order to continue the operations of the State Mosquito Airspray Program, all uncommitted funds were placed into the line item for aircraft and insecticides. The administrative action would ensure uninterrupted service to those county mosquito control agencies in need of aerially applied mosquito control formulations.

Of great significance was action taken by the legislature which replaced "carry- forward" language for the budget into the appropriation law. This would allow for a more efficient transition of operations from fiscal year to fiscal year. As that date occurs in the middle of the busiest operational time of the mosquito control season, the Commission welcomed this correction in language. Department of Environmental Protection Commissioner Bradley Campbell and Ass't. Commissioner John S. Watson, Jr. were both instrumental, as were several Commission members, in effecting this important administrative adjustment.

As aircraft operations were underway, "Temporary Flight Restrictions" that were placed on the Airspray Program by the Federal Aviation Administration (in response to Homeland Security Rules during the Republican National Convention held in New York City in July) caused considerable complications while attempting to address the needs of the counties relying on the state supplied aerial applications of larval and adult control formulations. After considerable communication with federal authorities, representatives of the commission were successful in obtaining a waiver from the ADIZ (Air Defense Information Zone) and restrictions were lifted to a point, which allowed select aerial operations during critical mosquito development.

During the month of July, twenty-four human serum specimens, submitted to the State Department of Health and Senior Services had already qualified for West Nile virus testing. At this point in time, New York City had reported their first, confirmed human case. Almost simultaneously, the Commission-supported "Vector Surveillance Program" reported that the potential was extremely high for an outbreak of Eastern Equine Encephalitis.

Two EEE horses suffered from mosquito-borne Eastern Equine Encephalitis with the onset of symptoms of those cases occurring on August 3rd and 4th. As state surveillance had detected the virus in the wild bird population circa mid-July, counties were advised to target bridge (adult mosquito) vectors in order to interrupt the further transmission to mammals.

This evidence kept both the Airspray and the Bio-Control Programs very busy during the month of August; three counties treated over 44,000 acres by state supplied aircraft and over 10,000 larvae-eating minnows were stocked at this time. By seasons end, the Bio-Control Program had stocked fish into15 counties and offered distribution to Rockland County, New York for control and to a Princeton University research project. In total, for the season, over 196,300 fish were used.

By the end of the mosquito season of 2004 and as a result of improved communication, advanced surveillance, control and favorable weather conditions, Eastern Equine Encephalitis was limited to 6 equine cases to date; 1 additional case remained suspect. Although the epizootic presented by above average populations of the mosquito *Culiseta melanura* suggested high potential for transmission, there was no human involvement with the virus during the season of 2004. Similarly, though now considered endemic in New Jersey, there was only one human case of WNV reported in 2004 compared to 32 in '03.

In the Autumn of 2004, the Equipment Committee recommended (and the Commission approved) a proposal to raise the equipment repair deductible, as described in the "Guidelines for the Use and Repair of State-Owned Mosquito Control Equipment" from $500 to $1,000 and the minimum purchase price of equipment that they will recommend for acquisition from $2,500 to $5,000. All equipment will continue to be distributed and used according to the terms of the standard State-Equipment Use Agreement.

As a result of a proposal presented by the federal government, the Commission committed $50,000 for a partnership investment with the U.S. Fish and Wildlife service and other agencies in the N.J.D.E.P. for the purchase of an amphibious tracked personnel carrier and a brush-cutting mower. This machine will be used for the destruction of stands of the alien vegetation *Phragmites australis*, the common foxtail, in areas not conducive to typical control practices.

In other Equipment Program matters, the Commission continued to place it's Capital Budget priority on the acquisition of a temperature controlled and secured insecticide storage facility. The annual capital fund request included the continuation of the Forsythe Wildlife Refuge Open Marsh Water Management project. In other Equipment Program business, a proposal submitted by 3 counties and the N.J. Department of Health and Senior Services, to compare the device: "Rapid Analysis Measurement Platform (RAMP) to RT-PCR, was approved by the Commission. This device, which provides swift results of detected virus in prepared mosquito specimens, may result in area wide use in New Jersey should it prove to be a dependable field evaluation tool. The members dedicated $12,000 to support the proposal. The equipment was to be purchased by the state and used according to the terms of the standard, annual use agreement.

In January, the State Mosquito Control Commission was made aware of a proposal by the Cape May County Board of Chosen Freeholders to abolish the Cape May County Mosquito Commission. The Secretary was asked to participate in the discussions regarding the ramifications of changing the structure of the program. Correspondence and meetings regarding the abolishment of the autonomous county commission continued through the month of March.

Also in the month of March, the staff of the Office of Mosquito Control Coordination presented a proposal via the auspices of the Bio-Control Program. An expanded study, to explore the development and planting of copepods as predators to mosquito larvae was submitted. Based on the experiences of similar programs in southern states, the Program in cooperation by way of a Memorandum-of-Agreement with the N.J. State Department of Agriculture, colonization of the crustaceans would be initiated in the Beneficial Insect's Laboratory. Eventual laboratory and subsequent field efficacy trials would follow. Distribution, which would mimic the fish stocking protocol, would be developed. The Commission approved $10,000 for the project.

In April, aviation fuel surcharges and aircraft insurance increases were announced impacting Airspray Program operations. Flights had started up for springtime broods and over 2,000 acres had been treated by the end of the month. A new three-year state contract for aircraft services was executed also with significant increases in operating costs.

By way of the annual memorandum-of-agreement with the N.J. Department of Health and Senior Services Public Health and Environmental Laboratory, the testing of birds for West Nile Virus started on the15th of April. Staff from all county mosquito control agencies were trained with regard to data-input into the statewide computer database system. Some annual data, which suggests that a

MEMBERS OF THE STATE MOSQUITO CONTROL COMMISSION

Dr. Leonard E. Spiegel, Chairman	Monmouth County
Thomas E. Sellers, Vice Chariman	Camden County
Aaron H. Rappaport,	Essex County
Jacob C. Matthenius	Warren County
John P. Sarnas	Hudson County
John Surmay	Union County
Dr. Keith Cooper, Acting Executive Director *Ex Officio*	N.J. Agricultural Experiment Station, Rutgers University
Dr. Clifton Lacy, Commissioner *Ex Officio*	N.J. Department of Health & Senior Services
Charles Kuperus, Secretary *Ex Officio*	N.J. Department of Agriculture
Bradley M. Campbell, Commissioner *Ex Officio*	N.J. Department of Environmental Protection
Robert Kent, Secretary	N.J.Department of Environmental Protection

The following individuals served as representatives for the various *ex officio* members during the year:

Shereen Brynildsen	N.J. Department of Health & Senior Services
Anthony Petrongolo	N.J. Department of Environmental Protection
Dr. Robert Eisner	N.J. Department of Agriculture
Dr. Zane Helsel	N.J. Agricultural Experiment Station, Rutgers University

building of crow antibody to WNV may eventually compromise the birds as sentinels, was acknowledged. The database of statewide surveillance information has been built on a two-year compilation of county information. These databases will be use to adjust surveillance and control strategy as mosquito and West Nile Virus ecology evolves.

During the month of June, all remaining, unspent funds were committed to Aircraft operations in order to finish fiscal year without interruption. By the end of the month, almost 100,000 fish were stocked at this time. The Airspray Program had serviced three counties for larval mosquito control and an agreement with the U.S. Environmental Protection Agency had been secured in order to monitor state supported aerial applications of adulticides. All surveillance was fully underway for both West Nile Virus and Eastern Equine Encephalitis in mosquitoes, wildlife, horses and humans. Field investigations regarding the toxicology and resistance status of the mosquito populations to the select insecticides used by the Airspray Programs aircraft were also well underway.

At the close of the fiscal year, the resignations of Commission members Thomas Sellers and Jacob Mathenius was noted with regret. The two resignations, coupled with retirements and attrition at the NJ Agricultural Experiment Station may have an impact the field investigations related to statewide mosquito surveillance and control. Nominations to fill the vacancies on Commission would be forthcoming. On a positive note, the Executive Director of the N.J. Agricultural Experiment Station was welcomed as member, ex oficio.

STATE EQUIPMENT USE PROGRAM

The State Mosquito Control Commission has in its inventory 129 pieces of equipment available to the mosquito control community as part of its Equipment Use Program (Table 1.). This program assigns research, surveillance, or operational control equipment to the requesting mosquito control agencies on an as-needed basis. The equipment is used and maintained under the Department of Environmental Protection's Equipment Use Agreement and the State's "Guidelines for the Use and Repair of State-Owned Equipment". During fiscal year 2005, all twenty-one county mosquito control agencies, as well as Rutgers University's Mosquito Research and Control Unit and the New Jersey Department of Environmental Protection's Division of Fish and Wildlife utilized this equipment.

Upon the recommendation of the Equipment Committee, the Commission made changes to its equipment purchase and repair policies. These include increasing the minimum amount for equipment purchases from $2,500.00 to $5,000.00, and increasing the deductible for equipment repairs from $500.00 to $1,000.00. Additionally, the Commission now requires that any request for the purchase of new equipment be accompanied by documentation that the requesting agency has first approached its own administration with the request, and that it has been denied. This is in keeping with the underlying philosophy that the State Commission's programs exist to supplement the county programs, not to replace them. The Commission also recognizes that an increase in the equipment repair deductible may be problematic in some instances, and will continue to consider requests to waive the deductible on a case-by-case basis. These changes went into effect upon the commencement of fiscal year 2006.

The Commission added one new piece of equipment to its inventory list in fiscal year 2005. A tabletop autoclave was purchased at a cost of $3,454.00 and assigned to Hunterdon County Mosquito and Vector Control. The autoclave will be used in a multi-agency project to compare and evaluate two new arbovirus detection tools, a project that is partially funded by the State Mosquito Control Commission. The Rapid Analyte Measurement Platform (RAMP) and VecTest Antigen Panel Assay are two recent innovations that may be used to detect the presence of infectious disease pathogens, such as West Nile Virus, from mosquito and avian samples. These tests have the potential to offer mosquito control agencies affordable, quick, reliable, and relatively easy-to-use techniques to supplement virus monitoring already in place.

During the fiscal year the Commission expended a total of $7,045.00 on repairs to state-owned equipment. This included $4,380.00 for repairs to the 2002 hydraulic excavator assigned to Atlantic County, $583.00 for service to the 2003 long-reach hydraulic excavator assigned to Essex County, and $2,082.00 for repairs to the 2001 ultra low temperature freezer assigned to Warren County.

In addition to these repairs, the ultra low temperature freezer purchased in fiscal year 2004 and assigned to Union County was found to be defective. This freezer was subsequently replaced under warranty. The 2001 power sprayer assigned to Essex County was damaged in a motor vehicle accident. Essex County replaced the damaged sprayer, the new sprayer was added to the state's inventory, and Essex County retained the damaged sprayer in order to fulfill their insurance obligations.

There was one transfer of equipment from county to county. At the request of Bergen County, two 1966 6-inch water pumps were transferred to that agency from Cape May County. The 1985 hydraulic excavator assigned to Burlington County was loaned to the Division of Fish and Wildlife for most of the fiscal year, and was used on a number of projects on state-owned land.

A 1989 pickup truck was surrendered by Atlantic County, and is currently housed at the Division of Fish and Wildlife's Central Regional Office. Division personnel use it when needed.

Due to limited resources, the Commission was unable to respond favorably to a request for the purchase of new equipment and a request for equipment repairs. The former was submitted by Hudson County, for the purchase of an insecticide sprayer equipped with a granular bin and trailer. The latter was submitted by Ocean County, for repairs to the 1987 amphibious hydraulic rotary excavator. Hudson County has since withdrawn their request; Ocean County's request for repairs will be reconsidered in fiscal year 2006.

Table 1. State Mosquito Control Commission Equipment

No.	Type of Equipment	Location
1	1992 Amphibious Hydraulic Rotary Excavator	Cape May
2	1987 Amphibious Hydraulic Rotary Excavator	Ocean
3	1995 Amphibious Hydraulic Rotary Excavator	Atlantic
4	1971 Amphibious Dragline Crane	Salem
5	2003 Long-Reach Hydraulic Excavator	Essex/Morris
6	2003 Low Ground Pressure Hydraulic Excavator	Warren
7	2003 Low Ground Pressure Hydraulic Excavator	Salem
8	1992 Long-Reach Hydraulic Excavator	Salem
9	1961 Crawler Crane	Salem
10	1995 Amphibious Hydraulic Excavator	Salem
11	1986 Hydraulic Excavator	Div. Fish & Wildlife
12	2003 Low Ground Pressure Hydraulic Excavator	Cumberland
13	2002 Hydraulic Excavator	Atlantic
14	2002 All-Terrain Vehicle	Warren
15	2002 All-Terrain Vehicle Trailer	Warren
16	1983 Tracked Vehicle	Warren
17	1985 Widetrack Bulldozer/Backhoe	Salem
18	1972 17 Foot Boat	Atlantic
19	2002 Outboard Motor	Atlantic
20	2002 Boat Trailer	Atlantic
21	1987 13 Foot Boat	Burlington
22	1987 Boat Trailer	Burlington
23	2002 Outboard Motor	Burlington
24	1988 Stereo Microscope w/optics	Warren
25	1966 6" Water pump	Bergen
26	1966 6" Water pump	Bergen
27	1994 Ultra Low Temperature Freezer	Rutgers
28	1995 U.L.V. Machine	Somerset
29	1995 U.L.V. Machine	Salem
30	1995 U.L.V. Machine	Sussex
31	2003 Stereo Microscope w/optics	Mercer
32	1995 Turbine Sprayer	Cumberland
33	1995 U.L.V. Machine	Gloucester
34	1981 Phase-Contrast Microscope	Rutgers
34	1981 Power Pak	Rutgers
34	1981 Camera	Rutgers
35	1989 4WD Pickup Truck	State
36	2004 Incubator	Rutgers
37	1987 Stereo Microscope w/optics	Salem
38	1987 Stereo Microscope w/optics	Hudson
39	1992 U.L.V. Machine	Cumberland
40	1988 Microplate Reader	Rutgers
41	1988 Biosafety Cabinet	Rutgers
42	1977 Flatbed Truck	Sussex

No.	Type of Equipment	Location
43	2002 Pickup Truck w/Cap	Rutgers
44	1986 Excavator Trailer	Salem
45	1976 Compound Microscope	State
46	1977 Compound Microscope	Rutgers
47	1977 Stereo Microscope	Rutgers
48	1977 Stereo Microscope	Rutgers
49	1980 Bulldozer/Backhoe	Warren
50	1980 Rotary Ditcher Attachment	Salem
51	2004 Tabletop Autoclave	Hunterdon
52	1984 Stereo Microscope	Monmouth
53	1985 Hydraulic Excavator	Atlantic
54	2002 4WD Pickup Truck	State
55	1985 Hydraulic Excavator	Burlington
56	6" Water Pump	Cape May
57	1989 Stereo Microscope	Atlantic
58	1989 Tracked Vehicle	Salem
59	1989 All-Terrain Vehicle Trailer	Salem
60	1990 Stereo Microscope w/optics	Sussex
61	1990 20-Ton Trailer	Warren
62	1996 All-Terrain Vehicle	Monmouth
63	1996 All-Terrain Vehicle Trailer	Monmouth
64	1997 Turbine Sprayer	Gloucester
65	1997 17 Foot Boat	Ocean
66	1997 Outboard Motor	Ocean
67	1998 Boat Trailer	Ocean
68	2000 Stereo Microscope	Hunterdon
69	2000 U.L.V. Machine	Hunterdon
70	2000 U.L.V Machine	Burlington
71	2000 U.L.V. Machine	Essex
72	2000 U.L.V. Machine	Warren
73	2000 U.L.V. Machine	Atlantic
74	2000 U.L.V. Machine	Hunterdon
75	2000 U.L.V Machine	Gloucester
76	2001 Power Sprayer	Hunterdon
77	2000 U.L.V. Machine	Salem
78	2001 Ultra Low Temperature Freezer	Bergen
79	2001 Ultra Low Temperature Freezer	Middlesex
80	2001 Ultra Low Temperature Freezer	Monmouth
81	2001 Ultra Low Temperature Freezer	Morris
82	2001 Ultra Low Temperature Freezer	Salem
83	2001 Ultra Low Temperature Freezer	Warren
84	2001 Ultra Low Temperature Freezer	Camden
85	2001 Ultra Low Temperature Freezer	Sussex
86	2001 U.L.V. Machine	Sussex
87	2001 Insecticide Applicator	Sussex
88	2004 Power Sprayer	Essex
89	2001 4WD Pickup Truck w/Cap	State
90	2002 17 Foot Boat	Essex

No.	Type of Equipment	Location
91	2002 Outboard Motor	Essex
92	2002 Boat Trailer	Essex
93	2002 All-Terrain Vehicle	Camden
94	2002 All-Terrain Vehicle Trailer	Camden
95	2002 All-Terrain Vehicle	Essex
96	2002 All-Terrain Vehicle	Hunterdon
97	2002 All-Terrain Vehicle Trailer	Hunterdon
98	2002 4WD Pickup truck	State
99	2002 All-Terrain Vehicle	Sussex
100	2002 All-Terrain Vehicle Trailer	Sussex
101	2002 Acoustic Storm Drain System	Hunterdon
102	2002 Ultra Low Temperature Freezer	Rutgers
103	2002 All-Terrain Vehicle	Bergen
104	2002 All-Terrain Vehicle Trailer	Bergen
105	2002 U.L.V. Machine	Salem
106	2002 Ultra Low Temperature Freezer	Burlington
107	2002 Ultra Low Temperature Freezer	Mercer
108	2002 U.L.V. Machine	Cumberland
109	2002 U.L.V. Machine	Essex
110	2002 All-Terrain Vehicle	Union
111	2002 All-Terrain Vehicle Trailer	Union
112	2003 Microplate Reader	Rutgers
113	2003 Microplate Washer	Rutgers
114	2003 All-Terrain Vehicle	Mercer
115	2003 All-Terrain Vehicle Trailer	Mercer
116	2003 All-Terrain Vehicle	Ocean
117	2003 All-Terrain Vehicle Trailer	Ocean
118	2003 All-Terrain Vehicle	Cumberland
119	2003 All-Terrain Vehicle Trailer	Cumberland
120	2003 All-Terrain Vehicle	Hudson
121	2003 All-Terrain Vehicle Trailer	Hudson
122	2004 Ultra Low Temperature Freezer	Gloucester
123	2004 Ultra Low Temperature Freezer	Essex
124	2004 Ultra Low Temperature Freezer	Passaic
125	2004 Ultra Low Temperature Freezer	Somerset
126	2004 Ultra Low Temperature Freezer	Union
127	2004 Ultra Low Temperature Freezer	Hudson

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination
Department of Environmental Protection

STATE MOSQUITO AIRSPRAY PROGRAM

Fiscal year 2005 began with the 2004 mosquito season well underway. This was a season with very high levels of precipitation; consequently, the State Airspray Program was quite active in the control of both larval and adult mosquitoes during this period. By contrast, the latter part of the fiscal year, which corresponded to the first half of the 2005 mosquito season, exhibited lower than normal rainfall levels, and a slight reduction in the program's activity level. During the fiscal year a total of 48 insecticide applications were conducted in 7 counties, encompassing 73,812 acres (Table).

Once again, the Airspray Program's focus was directed primarily to the control of larval mosquitoes, in order to reduce the need to perform applications for adult mosquito control. To that end, the acreage treated for larval control comprised 79% of the program's total. The insecticides utilized in these larvicide applications were temephos (in emulsion as well as a 2% granular form and a 5% granular form), methoprene (20% liquid) or various formulations of *Bacillus thuringiensis* var. *israelensis* (Bti). Because of problems encountered in recent years with the efficacy of methoprene, an aqueous suspension formulation of Bti was utilized as the main larvicide in Atlantic County salt marsh applications. While control results were promising, the higher flow rate used with this formulation resulted in a marked increase in the amount of aircraft time expended during these applications.

Ten adulticide applications (21%) were conducted in fiscal year 2005, all using the insecticide Malathion. These included 5 in Atlantic County, 4 in Burlington County, and 1 in Ocean County. All took place in the first half of the fiscal year, during the very busy 2004 mosquito season.

In addition to aerial larviciding and adulticiding applications, program aircraft were also utilized for surveying mosquito habitats within Cumberland, Mercer, Ocean, and Salem Counties.

Aircraft available to the program included a twin-engine Beechcraft "King Air" for high speed ultra-low volume insecticide applications; single-engine Grumman "Ag Cats" and a Mielec "Dromader" for high payload applications; Cessna "Skylanes" for observation and survey work; and Bell "Jet Ranger" rotary-wing aircraft for both survey work and insecticide application.

Finally, a policy initiated in fiscal year 1996 was continued, whereby state aid was provided to those counties that applied insecticides to state-owned lands within their corporate borders. The aid was made in the form of in-kind replacement of the insecticides applied.

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination
Department of Environmental Protection

Table 2. State Airspray Program acreage treated in FY2005 by mode and county.

County	Larviciding Acreage	Adulticiding Acreage	Total Acreage
Atlantic County	30,768	11,092	41,860
Burlington County	- 0 -	8,953	8,953
Camden County	100	- 0 -	100
Cape May County	3,083	- 0 -	3,083*
Cumberland County	12,027 (+ survey)	- 0 -	12,027
Essex County	3,500	- 0 -	3,500
Mercer County	Survey only	- 0 -	- 0 -
Morris County	3,640	- 0 -	3,640
Ocean County	7,758 (+ survey)	3,200	10,958*
Salem County	Survey only	- 0 -	- 0 -
State Total	**50,567**	**23,245**	**73,812**

*County reimbursed for insecticides applied to state-owned land. Not part of State Airspray Program total acreage.

BIOLOGICAL CONTROL PROGRAM

In keeping with its integrated pest management approach to mosquito control, the State Mosquito Control Commission continued to support the Biological Control Program during fiscal year 2005. Five species of mosquito-eating fish were available to New Jersey's county mosquito control commissions and agencies for use in their control programs. Additionally, the Commission has expanded this program to include investigations into the use of other organisms as mosquito control agents. The first of these involves the use of copepods, crustaceans that occur naturally in New Jersey. These have been used as biological control agents of mosquitoes in other states, most notably Florida and Louisiana. The Commission has entered into a Memorandum of Agreement with the New Jersey Department of Agriculture, whereby various native species of copepods will be propagated at the Phillip Alampi Beneficial Insect Rearing Laboratory. Once native species of copepods have been identified and cultured in the lab, trials to determine their efficacy as mosquito control agents will be conducted. At present, the focus of this project is directed toward identifying native species of copepods, and establishing a protocol for their successful laboratory propagation.

The Commission renewed its longstanding Memorandum of Agreement with the New Jersey Division of Fish and Wildlife for developing, maintaining, and providing fishery stocks at the Charles O. Hayford Fish Hatchery at Hackettstown. Bureau of Freshwater Fisheries personnel raised several healthy stocks of fish for release into known mosquito-breeding sites throughout New Jersey. The Bureau continues to supply invaluable assistance to the Office of Mosquito Control Coordination and the using county mosquito control agencies. This assistance is vital to the continued success of this program. All stocking is performed strictly in accordance with the guidelines and policy outlined in the DEP document "How to Use the State Bio-Control (Mosquitofish) Program for Mosquito Control in New Jersey".

A total of 154,495 fish were stocked through the Biological Control Program in fiscal year 2005. These fish were released in 13 counties in New Jersey and 1 county in New York (Table). Species stocked included the Mosquitofish, *Gambusia affinis*; the Fathead Minnow, *Pimephales promelas*; the Freshwater Killifish, *Fundulus diaphanous*; the Bluegill Sunfish, *Lepomis macrochirus*; and the Pumpkinseed Sunfish, *Lepomis gibbosus*. Since its inception in 1992, a total of 2,278,988 fish have been stocked for mosquito control purposes through the Commission's Biological Control Program.

Table #3. Mosquitofish stocking by county and species during FY 2005

County	Species	Number of Fish
Bergen	*Gambusia*	19,000
	Fathead minnows	6,000
	Mixed Sunfish species	200
Burlington	*Gambusia*	5,000
Camden	*Gambusia*	13,740
	Fathead minnows	580
Cumberland	*Gambusia*	6,000
	Fathead minnows	1,000
Essex	*Gambusia*	15,000
Gloucester	*Gambusia*	4,600
	Fathead minnows	2,200
Hunterdon	*Gambusia*	3,105
	Fathead minnows	4,595
Mercer	*Gambusia*	12,150
	Fathead minnows	10,000
	Fathead/Killifish mix	1,455
	Mixed Sunfish species	190

County	Species	Number of Fish
Morris	Fathead/Killifish mix	3,000
	Mixed Sunfish species	50
Ocean	*Gambusia*	10,000
	Fathead minnows	20,000
Passaic	*Gambusia*	1,900
	Fathead minnows	1,950
Salem	*Gambusia*	5,000
	Fathead minnows	3,080
Somerset	*Gambusia*	2,200
	Fathead minnows	2,300
Rockland County, NY	*Gambusia*	200
TOTAL		**154,495**

Program Director: Claudia O'Malley, Office of Mosquito Control Coordination
Department of Environmental Protection

MONITORING THE EFFICACY OF INSECTICIDES FOR MOSQUITO CONTROL IN NEW JERSEY

Ochlerotatus sollicitans host seeking females were field collected during June through early October in 2004 in four southern New Jersey field sites. The F1 generation of larvae was used for testing the toxicities for temephos (Abate®), and methoprene (Altosid®).

As in prior fiscal years, host seeking *Oc. sollicitans* females were collected from four locations in southern New Jersey, West Creek in Ocean County, Leed's Point in Atlantic County, the Dennis Creek area, Cape May County, and the Heislerville area, Cumberland County. Collections were made between June and October 2003, Table 1. The females were brought back to the Rutgers lab in New Brunswick and fed bovine blood (purchased from the Carteret Abattoir) with a Hemotek apparatus 3 or 4 times. They were transferred to shell vials (2 females per vial) provided with a moistened cotton ball and sealed with a piece of nylon screen through which they could feed. After they had laid eggs and died, each female was identified by microscopic inspection. Vials with dead females that were not *Oc. sollicitans* were discarded. The egg-containing shell vials were stored in an environment-controlled incubator set at a16/8 hours of light/dark photophase, 25°C, and 80% RH. The moisture was monitored weekly. Each shell vial contained from 2 to 50 eggs.

Table 4. shows a summary of shell vials with eggs obtained from capture of blood-seeking females. In 2001, a total of 1,027 vials were obtained from 7 field collecting trips and in 2002, a total of 322

shell vials were obtained from 10 trips. In 2003 the number of trips was increased to 19. The increased number of trips combined with the wet and rather cool season resulted in a total of 1,385 vials, implying that about 2,800 female mosquitoes were blood-fed several times and transferred individually to the vials. In 2004, 25 trips resulted in the collection of a total of 2,661 vials with eggs, 1,075 from Ocean County, 789 from Atlantic County, 555 from Cape May county, and 242 from Cumberland county. A summary of our colleting activities in 2004 was provided as Appendix 1 in the progress report dated January 5, 2005.

Table 4. Egg collections (number of vials) in 2001, 2002, 2003, and 2004.

Site\ Date	2001	2002	2003	2004
West Creek	326	131	626	1075
Leeds Point	340	40	223	789
Dennis Creek	215	118	306	555
Heislerville	146	33	230	242

OBTAINING AND REARING THE MOSQUITO LARVAE.

The eggs laid by the blood-fed females were allowed to dry for at least three weeks and hatched as needed by adding oxygen-depleted (by vacuum), pure fresh water to the vials. The larvae were transferred from the vials to enamel or plastic pans filled with pure fresh water. The larvae were fed ground rat chow (Purina) fortified with lyophilized, pulverized raw liver and powderized baker's yeast. The water was kept at room temperature, 21°C, and kept clean by toweling the surface each day before feeding. Uniformly sized, fourth (last) instar larvae were selected and used for the experiments.

IN VIVO TOXICITY ASSAYS WITH TEMEPHOS AND METHOPRENE.

The assays were conducted as described in previous progress reports. Analytical grade, >99% pure, temephos and analytical grade, >99% pure, methoprene were purchased from Chem Service, West Chester, PA. The methoprene was the racemic mixture. Test solutions were prepared by dissolving temephos or methoprene in analytical grade acetone and serially diluting the stock solutions with acetone.

Sets of 250-mL Pyrex glass beakers were used for the *in vivo* toxicity tests. Each beaker had 100 mL of pure, fresh water, 10 mosquito larvae, and μL quantities of temephos or methoprene solution. The assays were incubated at room temperature and natural lighting. A range of 4 to 5 concentrations of insecticide were used for both compounds. Acetone blanks were included for each assay. Temephos toxicity (larval mortality) was assessed 24 hours after application.

To assess methoprene toxicity, the glass beakers were inserted inside plastic mosquito breeding cages as illustrated in the 2000 report. The beakers were provided with very small quantities of larval food every other day for as long as larvae were present. One beaker in each set was used as control and served to time the experiment. When all larvae in the control beaker had emerged as adults, the experiment was terminated and emerged adults were counted in all the other beakers. In several cases, the emerged adults were unable to escape from the beaker and enter the breeding cage. In these cages the emerged adults were counted as emerged adults although they died from causes presumably unrelated to the presence of methoprene in the larval stage.

TEMEPHOS TOXICITY IN 2004.

Incubations with up to 20 µL of pure acetone in 100 mL of water did not affect the *Oc. sollicitans* larvae over 24 hours. The range of concentrations was 5, 10, 15, 20, 30, 50, and 100 ppb for the West Creek larvae and 0.5, 1, 2.5, 5, 10, and 20 ppb for larvae from the other three sites.

Table 5. shows the toxicity data of temephos obtained with 2004 *Oc. sollicitans* larvae. In 2004, the LC_{50} of temephos to 4th instar *Oc. sollicitans* larvae was 28 ppb for West Creek, 16 ppb for Leed's Point, 8 ppb for Dennis Creek , and 7 ppb for Heislerville larvae, respectively. This year again, larvae from West Creek showed a significantly ($P<0.05$) higher tolerance to temephos than larvae from the other three sites.

In comparison with previous years (Table 6.), the "Bay-side" larvae appear remarkably stable and still highly susceptible to temephos. The "Ocean-side" larvae are again much more variable and the Ocean County/ West Creek larvae appear more tolerant than larvae from the other three counties. The LC_{50} data from Leed's Point and West Creek differ significantly from each other ($P<0.05$) and from those for Dennis' Creek and Heislerville. The latter two were not significantly different from each other.

Table 5. Toxicity of temephos to *Oc. sollicitans* in 2004.

Location	# of tests (N)	Mean LC_{50} (ppb)	Slope	95% Confidence Interval for Mean	
				Lower	Upper
West Creek	6	27.76	3.95	24.28	31.86
Leeds Point	6	15.52	4.14	13.56	17.75
Dennis Creek	6	7.87	1.76	6.46	9.52
Heislerville	4	6.98	3.58	6.14	8.02

Table 6. Summary of LC_{50} (ppb) of temephos to *Oc. sollicitans* over six years.

Location	1999	2000	2001	2002	2003	2004
West Creek	32	24	10	16	27	28
Leeds Point	22	16	10	11	4	16
Dennis Creek	7	8	7	7	4	8
Heislerville	-	10	11	8	5	7

METHOPRENE TOXICITY IN 2004.

Incubations with up to 20 µL of pure acetone in 100 mL of water did not affect the *Oc. sollicitans* larvae over the 10 to 12 days duration of the experiment; most, if not all had probably evaporated within the first few days. A range of ppb concentrations of methoprene dissolved in acetone was used for the experiments.

Table 7. below shows the methoprene toxicity data for the larvae collected in 2004. The error in the data from the methoprene assays is still on the high side. Many larvae were used for assays that did not yield usable data. Unaccounted for changes in the methoprene compound used or in the mosquito populations could be involved, especially the age of the larvae could cause the high variability in the data. Just like with the data for temephos toxicity, the LC_{50} data from Leed's Point and West Creek differ significantly from each other ($P<0.05$) and from those for Dennis' Creek and Heislerville. The latter two were not significantly different from each other.

The data in Table 8., showing a comparison of LC_{50} data over the years, indicate a very high toxicity of methoprene to *Oc. sollicitans* larvae collected in Heislerville and Dennis Creek. The larvae from West Creek show consistent mortality from methoprene over the five years. The LC_{50} to larvae from Leed's Point was still high but not nearly as high as in 2003.

Table 7. Toxicity of methoprene to *Oc. sollicitans* in 2004.

Location	# of tests (N)	Mean LC_{50} (ppb)	Slope	95% Confidence Interval for Mean	
				Lower	Upper
West Creek	4	11.96	0.927	8.66	16.65
Leeds Point	3	53.50	1.41	31.85	91.80
Dennis Creek	4	1.44	1.16	1.01	1.93
Heislerville	3	1.73	1.63	1.36	2.16

Table 8. Toxicity (LC_{50}) of methoprene (ppb) to *Oc. sollicitans* larvae.

Field site\Year	1999	2000	2001	2002	2003	2004
West Creek	-	10	14	13	19	12
Leed's Point	5	7	8	7	258	54
Dennis Creek	-	-	12	10	5	1
Heislerville	-	-	10	-	1	2

The data for both the temephos and methoprene assays were analysed with the PoloPlus software package for Windows. Simple descriptive statistic (Student's T-test) was done with Excel. The data in this final report may differ slightly from those in the interim report dated 1/5/05. The data in this report are based on a more complete set of experiments than the previously reported ones.

CONCLUSIONS.

Both temephos and methoprene are still highly toxic to *Oc. sollicitans* larvae in southern New Jersey. It appears that the population in Atlantic County should be studied in further detail to better characterize its response to methoprene and that in Ocean County to clarify its response to temephos.

TOXICITY OF METHOPRENE TO *AEDES AEGYPTI*

As reported previously, the toxicity of formulated samples of methoprene used by the Ocean County Mosquito Control Commission and the State Air Spray Program were tested to a lab culture of *Aedes aegypti*, known to be susceptible to insecticides. The data are reproduced in Table 9. and show no significant differences between the two formulated samples but a doubling in the LC_{50} dose for the analytical grade methoprene, which was the racemic mixture. The formulated samples contained a fraction, not well defined, of slow-release-formulated methoprene and otherwise consisted of the pure S-enantiomer, which is the only active form of methoprene and seems to be available commercially only from one supplier of formulated methoprene for mosquito control. The colony of *Ae. aegypti* was provided by the mosquito research group at Rutgers University and proved extremely homogeneous genetically as reflected in extremely steep regression lines. This colony has been kept for some 20 years and seems very highly inbred.

Table 9. Toxicity (LC_{50}) of methoprene (ppb) to *Ae. aegypti* larvae.

Methoprene sample	LC_{50} (ppb)	LC_{90} (ppb)	Slope
Analytical grade, racemic mixture	0.58	5.77	1.28
Formulated sample from Ocean County	0.27	1.34	1.84
Formulated sample from the State Air Spray Program	0.26	1.07	2.07

EFFECT OF SILANIZING THE GLASS BEAKERS.

According to the Extoxnet website, methoprene has the following Physical Properties:

- **Appearance:** Technical methoprene is a amber or pale yellow liquid with a faint fruity odor **Chemical Name:** ispropyl(E,E)-(R,S)-11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate CAS **Number:** 40596-69-8
- **Molecular Weight:** 310.48
- **Water Solubility:** 1.4 mg/L @ 25°C
- **Solubility in Other Solvents:** Miscible in organic solvents
- **Melting Point:** Not Available
- **Vapor Pressure:** 3.15 mPa @ 25 C
- **Partition Coefficient:** Not Available
- **Adsorption Coefficient:** Not Available

Unfortunately, the partition coefficient, indicating the polarity of the compound is not available. Methoprene is only marginally water soluble and may therefore adhere to the silica in the walls of the glass beakers used for the assays. Treating the glass with another layer of silica (silanizing the beakers) may decrease the adsorption. To test this possibility, beakers were silanized by treating them with Sigmacote® according to the manufacturer's protocol. The experiment was run with *Ae. aegypti* larvae in parallel sets of untreated and silanized beakers with the racemic mixture of methoprene. The data in Table 10. indicate that there is no effect of silanizing the glass beakers.

Table 10. Toxicity (LC_{50}) of methoprene (ppb) to *Ae. aegypti* larvae in untreated and silanized glass beakers.

	LC_{50}	Slope	95% Confidence Interval for LC_{50}	
			Lower	Upper
Untreated beakers	0.400	1.237	0.276	0.567
Silanized beakers	0.440	1.260	0.307	0.622

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SURVEILLANCE FOR THE MOSQUITO VECTORS OF EASTERN EQUINE ENCEPHALITIS AND WEST NILE VIRUS IN NEW JERSEY

The NJ State Commission's Vector Surveillance program monitored mosquito populations in New Jersey for both eastern equine encephalitis (EEE) and West Nile virus (WNV) during the 2004 mosquito season. Severe flooding in southern NJ in mid-July produced high bridge vector populations over most of the area. Virus isolations and equine deaths point toward two periods of EEE activity during the year. The first occurred in early August producing 2 equine deaths. The second occurred during the month of September resulting in 4 additional equine deaths. Data suggest that timing of the flooding event in southern New Jersey was, in part, responsible for the bi-modal EEE events that took place in 2004. All of New Jersey's 21 county mosquito control agencies participated in the WNV surveillance program. Evidence for WNV, however, was limited to bird feeding mosquitoes this year. No virus was detected in any of the mammal biting species that serve as bridge vectors in the cycle. The low number of human and equine cases that New Jersey experienced suggest that WNV was largely contained within the amplification phase of the disease cycle in 2004.

INTRODUCTION

The NJ State Mosquito Control Commission (SMCC) initiated a Vector Surveillance Program in 1975 to monitor eastern equine encephalitis (EEE) virus and its mosquito vectors in southern New Jersey. The Mosquito Research and Control Program at Rutgers University has been funded annually since that time to collect and process mosquito samples for virus isolation attempts at the NJ State Department of Health laboratories in Trenton.. The program is designed as a cooperative effort between the NJ Department of Environmental Protection, the NJ Department of Health and the NJ Agricultural Experiment Station at Rutgers to provide mosquito control agencies with ongoing information that can be used to target vectors populations for the prevention of human disease. When West Nile virus (WNV) appeared in 1999, the SMCC expanded their surveillance efforts to include the new exotic pathogen. Monitoring two mosquito-borne disease systems required a new approach to get the job completed and biologists from county mosquito control agencies were recruited and trained to collect and process specimens to assure state wide coverage during the active season. SMCC made specialized equipment available to allow mosquito control agencies to identify, pool and store specimens at their facilities under the cold chain restraints required by the National Centers for Disease Control (CDC) guidelines. A courier service was also provided to allow timely testing of the specimens at the re-furbished NJDOH Public Health Environmental Laboratories (PHEL) using rapid detection technology that provides results within 1 week of collection. This report documents the results of SMCC's virus surveillance efforts during the 2004 encephalitis season, a year when both EEE and WNV were active.

METHODOLOGY FOR EEE SURVEILLANCE

The mosquito, *Culiseta melanura*, is monitored from late May to mid-October as the primary indicator of EEE virus in southern New Jersey. This bird feeding mosquito does not bite humans but can be used to monitor virus levels in local bird populations as the season progresses. Weekly collections of *Cs. melanura* are made from resting boxes at permanent study sites by a team of field staff from Rutgers for virus isolation attempts conducted at the PHEL in Trenton. The mosquitoes are frozen on dry ice in the field and transported to Headlee Research Labs at Rutgers for further processing. The frozen specimens are sorted on a chill table to maintain the cold chain and are identified to species, pooled by stage of blood meal digestion and submitted weekly to PHEL via the courier service for virus isolation attempts. Information from the investigation is summarized and distributed weekly to mosquito control agencies in New Jersey. The resting box collection sites for 2004 included: Turkey Swamp in Monmouth Co., Green Bank in Burlington Co., Corbin City in Atlantic Co., Dennisville in Cape May Co., Waterford in Camden Co., and, Centerton in Salem Co.

RESULTS FOR EEE SURVEILLANCE IN 2004

Culiseta melanura passes the winter as a larva, an overwintering mechanism that regulates this mosquito's abundance from year to year. Resting box populations of *Culiseta melanura* were well above average during early spring collections suggesting that larval mortality was low during the January–March winter period of the 2004 mosquito season. Population levels remained higher than average throughout the month of June providing ample numbers of adult mosquitoes to initiate amplification of EEE virus in local bird populations. A pool of *Cs. melanura* collected July 12 from the Green Bank site in Burlington Co. represented the first EEE positive for the 2004 season. Severe flooding throughout most of southern New Jersey occurred that same week, producing large numbers of floodwater mosquitoes capable of functioning in a bridge vector capacity. Positive pools of *Cs. melanura* from Centerton, in Salem Co. during that time period suggested that virus was being amplified in at least 2 areas of the state.

Table 11. lists the mosquitoes tested by site together with positives and earliest isolation dates. EEE was confirmed from *Cs. melanura* at 5 of the 6 sites monitored in 2004 including: Green Bank (4 positives), Centerton (9 positives), Waterford (1 positive) and Corbin City (2 positives). The data clearly show a bi-modal pattern for virus activity for Green Bank and Centerton vs. the other 4 study sites. It would appear that EEE was very focal during the months of July and August and was not dispersed widely until early in September.

The combination of large floodwater mosquito populations in late July in the presence of EEE in local birds produced 2 confirmed equine cases during the first week of August. The initial case was reported from Cumberland Co. with an onset date of August 3. The second was from Camden Co. with onset the following day. No further evidence for EEE in either mosquitoes or equines occurred until early in September when EEE was detected in *Cs. melanura* at: Corbin City (Aug. 31), Dennisville (Sept. 7) and Waterford (Sept. 12). Multiple virus positives followed at each of the sites confirming local amplification rather than virus in transient birds. This second round of virus activity produced 4 additional equine cases located in Gloucester Co. (Sept.1 & 14), Camden Co. (Sept. 8) and Burlington Co. (Sept. 20).

Data suggest that the timing of the flooding event in southern New Jersey may have produced the bimodal pattern of EEE activity in 2004. Floodwater bridge vectors (together with the July cohort of *Cq. perturbans* at some sites) contributed to equine involvement in the early part of August. EEE, however, was focal and not fully amplified when high bridge vector populations produced by the floods were present. Data from the surveillance effort indicate that dispersal of EEE by hatch-year birds did not occur for several weeks and was not evident in *Cs. melanura* in most areas of southern New Jersey until early in September. Floodwater mosquito populations were exceptionally high during the later part of July and the first week of August. After that, the mosquitoes produced by the flooding event had virtually disappeared. If the floods that New Jersey experienced in 2004 had been a week or two later, events may have been very different. It would appear that the timing of amplification of EEE in wild birds did not synchronize with the availability of suitable bridge vectors in 2004. As a result, transmission to mammalian hosts was minimal during a fairly active virus season.

Table 11. Resting box populations of *Culiseta melanura* tested for EEE in New Jersey during 2004.

SITE	TOTAL TESTED	NO. POOLS	NO. EEE POSITVES	EARLIEST POSITIVE
Coastal Sites				
Green Bank	1,818	85	4	July 12
Corbin City	1,144	77	2	Aug. 31
Dennisville	2,588	101	3	Sept. 7
Inland Sites				
Waterford	1,807	78	1	Sept. 12
Centerton	3,547	115	9	July 19
Turkey Swamp	637	67	0	None
TOTALS	**11,541**	**523**	**19**	

METHODOLOGY FOR WNV SURVEILLANCE

New Jersey's WNV surveillance program in 2004 included a county initiative as well as a Rutgers initiative to conduct meaningful surveillance throughout the state. The Rutgers initiative used gravid traps and CO_2 baited traps to collect mosquitoes from areas where either crow deaths, equine cases or county needs required special surveillance. The county initiative trapped specimens by a variety of techniques from areas where prior surveillance data suggested high WNV activity. In all cases, each of the agencies identified and pooled their own specimens for virus isolation attempts. The NJ State Mosquito Control Commission purchased additional ultra low temperature freezers to expand the availability of cold chain storage sites within the state. Rutgers University was funded to provide weekly courier service for agencies to assure that specimens were delivered to the PHEL labs in Trenton for rapid turnover of results.

RESULTS FOR WNV SURVEILLANCE IN 2004

During the 2004 mosquito season, a total of 132,559 specimens were tested in 6,800 pools. Results from the surveillance effort yielded 270 WNV positive pools. Every one of New Jersey's 21 county mosquito control agencies participated in the state program in 2004. Table 12 combines collections made by Rutgers personnel with those collected and processed at agency facilities and lists totals by county.

Table 12. Mosquitoes tested for West Nile in New Jersey during 2004.

County	No. Pools Submitted	Total Mosquitoes for the Year	No. Positive Pools
Atlantic	489	9,491	10
Bergen	322	18,405	66
Burlington	369	5,703	14
Camden	287	2,868	2
Cape May	538	10,468	67
Cumberland	359	2,850	2
Essex	205	2,807	1
Gloucester	327	6,442	38
Hudson	213	5,432	32
Hunterdon	248	10,397	17
Mercer	407	8,573	35
Middlesex	57	803	0
Monmouth	628	7,719	11
Morris	190	6,260	3
Ocean	507	5,897	8
Passaic	191	3,472	9
Salem	421	6,874	4
Somerset	234	4,484	6
Sussex	441	5,825	1
Union	74	2,261	5
Warren	293	5,528	0
TOTAL	**6,800**	**132,559**	**270**

Data from this year's SMCC surveillance effort differs drastically from that obtained in previous years. Table 13 shows that WNV was limited to bird feeding mosquitoes in 2004 with no evidence of transfer to any of the bridge vector species that tested positive in prior years. *Culex pipiens* had the highest infection rate (4.5 positives per 1000 tested) suggesting that it functions as the primary amplification vector. *Culex restuans* and *Culiseta melanura* had infection rates of 1.8 and 1.0 per thousand, respectively, indicating that those 2 species function primarily as secondary vectors in the WNV transmission cycle. *Culex salinarius* was the only other mosquito species that tested positive for WNV in 2004. Although this mosquito has indiscriminant feeding habits and can function as an important bridge vector, the species also participates in the amplification cycle by feeding avidly on birds.

Table 13. WNV Minimum Infection Rates (MIR) in New Jersey Mosquitoes during 2004.

Species	Total Tested	Positive Pools	MIR
Primary Amplification Vectors			
Cx. pipiens	10,318	46	4.5
Cx. spp.	63,667	208	3.3
Cx. restuans	5,016	9	1.8
Cs. melanura	15,277	15	1.0
Potentiel Bridge Vectors			
Ae. albopictus	1,061	0	0
Ae. vexans	6,850	0	0
An. punctipennis	1,409	0	0
An. quadrimaculatus	4,506	0	0
Cx. salinarius	5,968	1	0.2
Oc. cantator	986	0	0
Oc. japonicus	3,840	0	0
Oc. sollicitans	2,531	0	0
Oc. triseriatus	1,120	0	0
Oc. trivittatus	1,823	0	0
Ps. columbiae	840	0	0
Ps. ferox	1,922	0	0

The absence of WNV in bridge vectors suggests that the virus did not transcend the amplification phase of the cycle in New Jersey in 2004. Evidence for that hypothesis is borne out by the paucity of human and equine cases. Only one (1) human case of WNV was reported by the NJ State Department of Health in 2004 versus 30 the previous year. The New Jersey State Department of Agriculture reported only 6 equine cases during the 2004 season compared to 152 in 2003.

PRELIMINARY RESULTS FOR THE SEASON OF 2005

New Jersey experienced an abnormally cold spring in 2005 which suppressed mosquito populations in general and resulted in reduced emergence of *Cs. melanura* during the later part of May. Resting box collections for *Cs. melanura* were lower than normal during the early part of June suggesting that the potential for amplification of EEE might be relatively low for the 2005 season. Events during the later part of June, however, changed that prognosis somewhat. Florida reported an accelerated number of equine cases in May which usually translates to virus activity in New Jersey later in the year. *Culiseta melanura* populations increased unexpectedly in June at a time when populations are usually in decline. Population surges in June usually indicate that local emergences have taken place from larvae that overwintered in early instars. The population surge New Jersey experienced in 2005 was probably a delayed emergence due to the abnormally cold spring. Any influx of nullipars in early summer favors amplification of virus by putting large numbers of nullipars in contact with juvenile birds that fledge at that time of year. Weather will dictate whether or not EEE will become a health issue in during the summer of 2005.

Preliminary results from WNV surveillance activities point toward diminished virus activity for the third year in a row. A single crow death due to WNV was the only indication of virus activity during the spring. The overall trend for WNV in the northeast has been a decline in virus activity. WNV, however, is a very new entity and it will take years before we understand its ecology to the point where we can accurately predict risk.

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THE NEW JERSEY STATE SURVEILLANCE PROGRAM

.The annual statewide surveillance program of New Jersey monitors mosquito populations from a variety of landscape regions throughout the state. Mosquito population trends were reported back to state and county officials on a weekly basis from May through October. Comparisons with historical data from the preceding 5 years were made with a number of species, indicating whether current population levels are above, at, or below expected levels. Species are presented here in a manner employing Cran's (2004) classification system of mosquito life cycle types.

The statewide surveillance program is a cooperative effort by the State Mosquito Control Commission, local agencies and Rutgers University to combine standard New Jersey light trap (Mulhern 1942) data collected by the counties in order to monitor pest trends on a regional basis. This data is collected by local county agencies as a part of a cadre of methods they use to follow pest populations for the purposes of control. County data, however, is rarely exchanged, apart from general reports given throughout the season. This report combines county data into regional New Jersey mosquito populations. Regional changes in mosquito populations allows the entirety of mosquito control effort in New Jersey to 1) monitor regional control efforts including water management practices, 2) monitor species of health concerns where suppression is practiced at a local level, and 3) monitor invading species.

MATERIALS AND METHODS

Data collection and dataset management have been previously described in length (Reed *et al.* 2002). Historical data ran from 1998 through 2003. The current dataset ran from 15 May through 30 October, 2004. Data is from 82 traps within ten regions. The ten regions were defined based on topology, land use, and subsequently, mosquito breeding habitat (See Fig. 1)

1. Agricultural (Monmouth, Ocean, Burlington, Camden, Gloucester, Salem, and Cumberland counties).
2. Coastal (Monmouth, Ocean, Atlantic, and Cape May counties).
3. Delaware Bayshore (Cumberland and Cape May counties).
4. Delaware River Basin (Gloucester and Cumberland counties).
5. New York Metro (Bergen, Passaic, Hudson, Essex, Union, Middlesex, and Monmouth counties).
6. North Central Rural (Passaic, Morris, Hunterdon, Somerset, and Mercer counties).
7. North West Rural (Sussex and Warren counties).
8. Philadelphia Metro (Burlington, Camden, and Salem counties).
9. Pinelands (Monmouth, Ocean, Burlington, Atlantic, Camden, Gloucester, Salem, Cumberland, and Cape May counties).
10. Suburban (Bergen, Passaic, Essex, Morris, Somerset, Middlesex, Mercer, and Burlington counties).

RESULTS AND DISCUSSION

Over 258,000 individual mosquitoes representing 34 of the 63 species of mosquitoes found in New Jersey were trapped by NJ light traps in 2004. Table 14 shows the regional abundance of mosquito species in which more than 1000 specimens were caught. The most cosmopolitan species include the three *Culex* species (*Cx. pipiens, Cx. restuans,* and *Cx. salinarius,* grouped due to identification issues), *Aedes vexans*, and *Ochlerotatus sollicitans*. These mosquitoes account for over 68.9% of the total caught in those light traps submitted for this project.

The mosquitoes collected in county operated light traps belong to a series of very different life cycle types: Early Season Species, Fresh Floodwater Species, Salt Marsh Floodwater Species, Multivoltine Culex Species, Multivoltine Anopheles Species, Container Breeding Aedines and a Miscellaneous Group. Each of these mosquito life cycle types has a seasonal distribution that reflects a biological strategy. Each figure referenced below includes a species summary for the season on the figure page.

EARLY SEASON SPECIES

Mosquito species that are active early in the season generally come from two life cycle types: the Univoltine Aedine (*stimulans*) or Univoltine Aedine (*canadensis*). Members that belong to this group overwinter as eggs and have a single generation in early spring. The eggs hatch when water temperatures are still quite cold and the adults are usually on the wing during the month of May. In most species, eggs laid in May and June enter diapause and do not hatch until they are flooded the following year. Some of the members in this group have a generation that reappears in the fall. Most biologists feel that these are eggs that did not hatch during the spring flooding and were left behind as survival insurance. Species represented in these two groups include *Oc.* stimulans (Fig. 2), *Oc. grossbecki* (Fig. 3), *Oc. canadensis* (Fig. 4), *Oc. sticticus* (Fig. 5) and *Oc. cinereus* (Fig. 6).

Oc. stimulans (Fig. 2) is a snow-pool species that is expected to reach their highest number in northern regions, and this year was no exception. Trends indicate the early emergence of this species and this year's data may be more typical than the limited historical dataset suggests. Populations disappeared earlier than expected, given the long life span of this mosquito.

FRESH FLOODWATER SPECIES

Species whose multiple emergences are controlled by the temporary presence of fresh water are in the Multivoltine Aedine (*vexans*) group. Members of this group also overwinter as eggs but do not hatch until later in the season when water temperatures rise to ideal levels. These mosquitoes have multiple generations during the summer months that are regulated by flooding patterns. Each period of excessive rainfall produces a major brood. Minor floodings can generate overlapping broods that are usually localized. Mosquito species collected in light traps that belong to this group include: *Ae. vexans* (Fig. 7), *Oc. trivitattus* (Fig. 8), *Psorophora ciliata* (Fig. 9), *Ps. columbiae* (Fig. 10), *Ps. ferox* (Fig. 11).

Data from the Agricultural and Philadelphia Metro Regions suggest that *Ae. vexans* (Fig. 7) had three major broods in 2004. The effects from the abundant rainfall as several hurricanes passed through the Northeast resulted in overlapping emergences with less-definitive peaks characteristic of dry periods. This year's rainfall also shifted the timing of peak population as historic data would seem to be more typical in terms of nuisance presence. Some shifts from historical data might be anticipated (as in the Philadelphia Metro and Northwestern Rural Regions) as indicated by large error bars (suggests locally flooded areas within a region).

SALT MARSH FLOODWATER SPECIES

Species whose multiple brood emergences are controlled by flooding salt water are in the Multivoltine Aedine (sollicitans) life cycle. Members that belong to this group overwinter as eggs but lay them on tidal marshes where lunar tides provide a method to inundate the eggs. There are multiple generations during the summer months with as many as 2 broods each month from May to October. Rainfall can produce egg hatch which complicates the picture. As a result, the distinct broods seen in fresh floodwater areas become muddled and biting populations can include mosquitoes of mixed age. Mosquito species collected in light traps that belong to this group include: *Oc. sollicitans* (Fig. 12), *Oc. cantator* (Fig. 13), and *Oc. taeniorhynchus* (Fig. 14).

Oc. sollicitans (Fig. 12) produced 3 – 4 broods during the 2004 season in the breeding areas of the Coastal and Delaware Bayshore Regions. A strong flyer, *Oc. sollicitans* migrated to Agricultural habitat as well as through the Pinelands. A large migration event occurred at the end of July (Week 31). This species was significantly reduced in the Delaware River Basin as compared to previous years. This same region produced an abundance of Ae. vexans, which frequently emanates from dredge spoil activity.

CONTAINER BREEDING AEDINES

These Multivoltine Aedine (*triseriatus*) mosquitoes glue their eggs to the sides of containers above the water line and rely on rains to raise the water level and hatch the eggs. Like other Aedines, they overwinter as eggs and reappear each spring when water temperatures begin to rise. Most members of the group are active during the day and enter light traps in very low numbers. Mosquito species collected in light traps that belong to this group include: *Oc. triseriatus* (Fig. 15), *Oc. japonicus* (Fig. 16), and *Oc. albopictus* (Fig. 17).

Oc. japonicus (Fig. 16) continue to appear in state surveillance light traps despite published reports that this species generally avoids our standard monitoring method. This years' dataset show that Oc.

japonicus has been present very early in the season throughout the state and continues to enter light traps well into the summer. This dataset demonstrates the value of numerous trap sites to monitor species that occur in low levels.

MULTIVOLTINE ANOPHELES (*QUADRIMACULATUS*) SPECIES

Members that belong to this group have a life cycle strategy that is very similar to the Multivoltine *Culex*. Mated females overwinter. Upon leaving the hibernaculae the following Spring, these species build their populations over the course of the summer. They are included as a separate group because they represent an entire genus. Mosquito species collected in light traps that belong to this group include: *An. quadrimaculatus* (Fig. 18), *Cx. territans* (Fig. 19), *Cx. erraticus* (Fig. 20), and *Uranotaenia sapphirina* (Fig. 21).

Population trends for *An. quadrimaculatus* (Fig. 18) were generally what we might expect of a mosquito whose mated females overwintered. Most regions saw a gradual building of populations, although not to the extent of historical values (Agricultural). The pattern of this species mirrored those of *An. punctipennis*, including that of the Delaware River Basin pattern.

MULTIVOLTINE CULEX (SALINARIUS) SPECIES

Members that belong to this group overwinter as mated females so the season distribution is very different from any of those listed above. Populations in early spring are represented by mosquitoes that survived the winter and the numbers are at relatively low levels. These mosquitoes cannot become active until night time temperatures enter the 60's, thus host seeking and oviposition is delayed until late May or June. The first generation of larvae takes time to develop and populations do not build until mid-summer at the earliest. As soon as night time temperatures begin to cool down, the mosquitoes mate, seek winter hibernaculae, enter diapause and hibernate. Only the females survive in this group. Males will not appear until the eggs hatch very late the following spring. Mosquito species collected in light traps that belong to this group include: *Cx. salinarius* (but see the *Culex* Complex, below) and *An. bradleyi* (Fig. 22).

Anopheles bradleyi (Fig. 22) is a salt marsh anopheline that reaches greatest numbers in brackish habitat along the coast. Like most anophelines that overwinter as mated females, the population builds gradually as the season progresses. This years' dataset clearly shows this trend, particularly in the Coastal and Delaware Bayshore Regions, habitats that are expected to contain the largest populations.

MULTIVOLTINE CULEX SPECIES

Members that belong to this group also overwinter as mated females, but the preferred larval habitat is fresh water. Water quality tolerances, however, are variable and can include polluted and/or highly organic water. Mosquito species collected in light traps that belong to this group include: The *Culex* Complex (Fig. 23) and *An. punctipennis* (Fig. 24).

The *Culex* Complex (Fig. 23) is a mixture of three different species (*Cx. pipiens, Cx. restuans, Cx. salinarius*) that are difficult to identify, and are thus placed into an encompassing group. The Agricultural Region displays the typical trend of *Culex* Complex, with building populations through the summer and a decline as diapause sets in. Apart from the Delaware River Basin, *Culex* populations appear to be lower than typical trends. Populations also appear to have shifted peaks from historic data.

MISCELLANEOUS GROUPS

The members in this group have little in common because each utilizes either a unique life cycle strategy (*melanura*) or are monotypic (*perturbans* and *walkeri*). The mosquito species collected in light traps that we have included in the group include: *Cs. melanura* (Fig. 25), *Cq. perturbans* (Fig. 26), and *An. walkeri* (Fig. 27)

Culiseta melanura (Fig. 25) populations were higher in the spring than historical trends. There was a noticeable drop in numbers in July (see Agricultural, Coastal, Delaware Bayshore and the Pinelands Regions). This was followed by an increased population late in the season. This pattern is fairly typical of *Cs. melanura*, which generally show increased numbers during the spring and fall.

Coquillettidia perturbans (Fig. 26) is a univoltine species that exhibits a simple extended generation each season. The mosquito overwinters in the larval stage. Each instar emerges as a separate cohort giving the appearance of multiple generations. This year's dataset shows that there is considerable regional variation in the structure of overwintering populations. Evidence for emergence of larvae that overwinter in the 2nd, 3rd, and 4th instars can be seen in most regions. With the exception of the Delaware Bayshore, Delaware River Basin and the Philadelphia Metro Regions, the 4th instar larvae made up the bulk of the overwintering larval form.

CONCLUDING REMARKS

Data from standard New Jersey light traps are used on a routine basis to follow mosquito population trends by county agencies within their own borders. Sharing of this raw data can develop regional trends of pest mosquitoes at the state landscape level. This program allows the re-examination of local data to illustrate regional trends of mosquito species regularly attracted to light traps. The use of historical data allows simple comparisons with past population levels.

ACKNOWLEDGEMENTS and Publication - "New Jersey State Surveillance 2004."

We thank all the 21 counties of the State of New Jersey for their generous cooperation in sharing their data and extending help with regards to their traps. This report was submitted to the NJMCA Proceedings as New Jersey Agricultural Experiment Station publication No. E-08-08400-01-05 that was conducted with funds and support from the State Mosquito Control Commission of the New Jersey Department of Environmental Protection.

IDENTIFICATION KEY

"Key to Common Mosquitoes Found in Light Trap Collections in New Jersey."

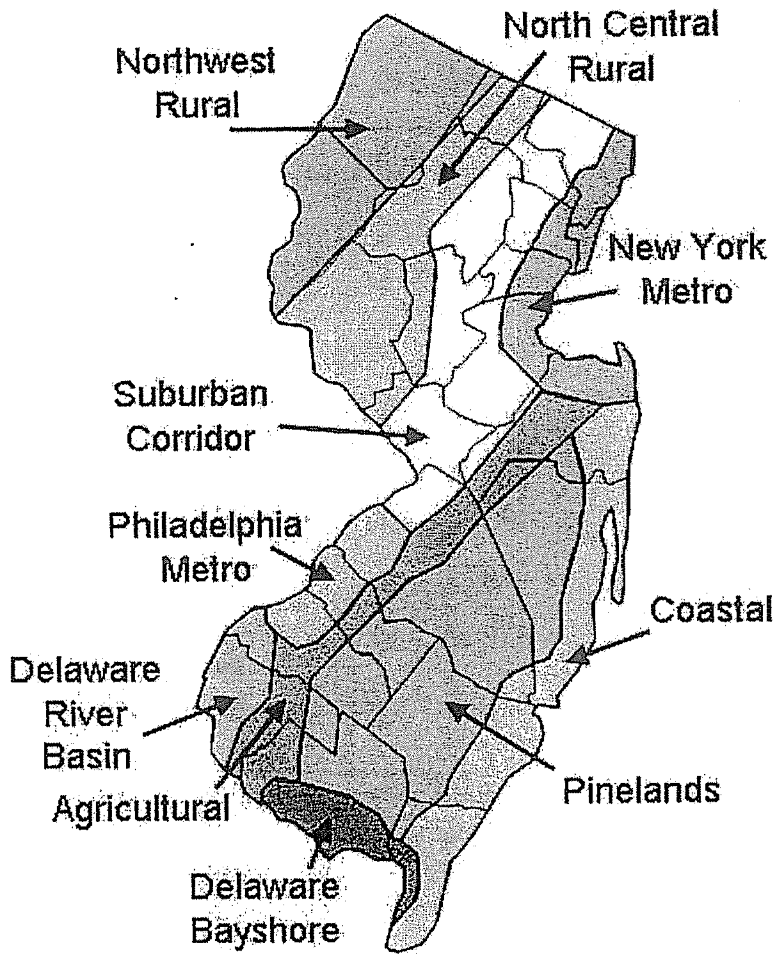
The identification key for those mosquito species most commonly found in light traps in New Jersey has been developed and sent to mosquito control agencies for comment. The figures used in the key were scanned from original works found in Carpenter and LaCasse (1955) and Tanaka *et al.* (1979). Copyright privileges were granted for all applicable images. Appendix 1.

Table 14. Abundance of mosquito species per region during the 2004 season. These species represent the top 16 (i.e., those who had more than 1000 specimens trapped in total throughout the season) in the NJ light traps used in the Statewide Surveillance program.

Mosquito Species	Agric.	Coastal	Delaware Bayshore	Delaware River Basin	New York Metro	North Central Rural	NW Rural	Philadel Metro	Pinelands	Suburban Corridor	Grand Total
Culex Mix	5979	3350	25720	13408	6762	548	1892	4307	3457	5217	70640
Aedes vexans	4531	5441	3927	16299	5177	848	5317	12078	4051	9120	66789
Ochlerotatus sollicitans	573	23348	15297	6	870			1	342	37	40474
Oc. cantator	1744	5105	21696	447	195		175		496		29858
Coquillettidia perturbans	235	849	4767	372	153	58	164	711	1420	2639	11368
Culiseta. melanura	458	1279	317	90		19	10	130	4260	272	6835
Anopheles quadrimaculatus	640	289	2618	533	38	282	52	353	292	387	5484
Uranotaenia sapphirina	244	56	13	359	56	44	190	638	620	2589	4809
An. punctipennis	871	26	961	542	136	101	406	497	271	939	4750
Oc. canadensis	149	168		1496	24	48		824	431	165	3305
An. bradleyi	40	1545	1471	18				23	120		3217
Psorophora columbiae	781	8	15	522	41	58	1	250	347	175	2198
Ps. ciliata	721		105	421	2	2	73	229	107	177	1837
Oc. japonicus	85	79	4	147	74	37	14	252	129	335	1156

Other species (in order of total abundance) caught in the New Jersey light trap included: *Anopheles walkeri, Ochlerotatus taeniorhynchus, Oc. triseriatus, Culex territans, Psorophora ferox, Oc. sticticus, Oc. stimulans, Aedes albopictus, Oc. grossbecki, Ae. cinereus, Oc. erraticus, Oc. abserratus, An. crucians, Ps. howardii, Orthopodomyia signifera, An. barberi, Cx. tarsalis, Cs. inornata, Cs. morsitans,* and *Oc. atropalpus.*

Figure 1a: Map of ten regions selected for the New Jersey Surveillance Program overlaid with county borders.



SUMMARY FOR MOSQUITO POPULATIONS THROUGH JUNE 2005

Cooler than normal spring temperatures appeared to have delayed or suppressed certain mosquito populations sensitive to the cold. The summaries below represent the population trends for the mosquito species described in the Week 27 (last week of June, 2005) State Surveillance Report issued to the State and County Agencies. The overall effects of a cooler spring resulted in mosquito populations that were significantly attenuated, and further acerbated by the drier than normal summer. Not all species were equally affected by the cooler temperatures – most notably, the cold-tolerant species were represented by normal population levels in New Jersey.

Aedes vexans - Aedes vexans *populations appear to be sporadic, locally abundant in some areas within some regions. This response to the sometimes scattered nature of rainfall throughout the state means that* Ae. vexans *trends may be above average in certain areas (the Coastal and Delaware Bayshore regions) while below average in others (Northwest Rural or the Suburban Corridor). The passage of a tropical storm (Cindy) may set the stage for increasing larval habitat in the near future.*

Culex *Complex - Culex populations, while slowly on the rise, continue to show the impact of a cool spring. All regions show population levels that are lower than historical trends. Given the role of primary WN vector, the impact of this lowered abundance in Culex may translate to decreased levels of amplified West Nile virus. Whether this is the case, however, remains to be seen*

Ochlerotatus sollicitans - Ochlerotatus sollicitans *appear to be between the time of the first and second brood. Migrants have begun to show up at inland sites, such as in the Agricultural and Pineland regions.* Oc. sollicitans *numbers appear to be lower in the Delaware River Basin region than in previous years. Populations can be expected to increase given the flooding effects with the passage of Tropical Storm Cindy and the recent lunar high tide.*

Culiseta melanura - Culiseta melanura *populations may have been delayed early in the spring but now appear to be at near normal levels for at least the Pinelands, Agricultural, and Coastal regions. Despite the delay, there is no lack of juvenile (and thus immunologically naïve) birds for these mosquitoes to feed on since these avian hosts are available through the spring and summer.*

Ochlerotatus japonicus - Cooler spring temperatures have had little, if any, impact on *Ochlerotatus japonicus* populations (as would be expected for a cold-tolerant species). Population trends appear on par with the previous season for most regions. This container-breeder is a most competent West Nile vector. In addition, vector competency for EEE has been found, under lab situations*. This opportunistic feeder (i.e., potential bridge vector) deserves a closer scrutiny.

*** Sardelis et. al 2002 Experimental transmission of eastern equine encephalitis virus by Ochlerotatus j. japonicus (Diptera: Culicidae). J Med Entomol. May;39(3):480-4.**

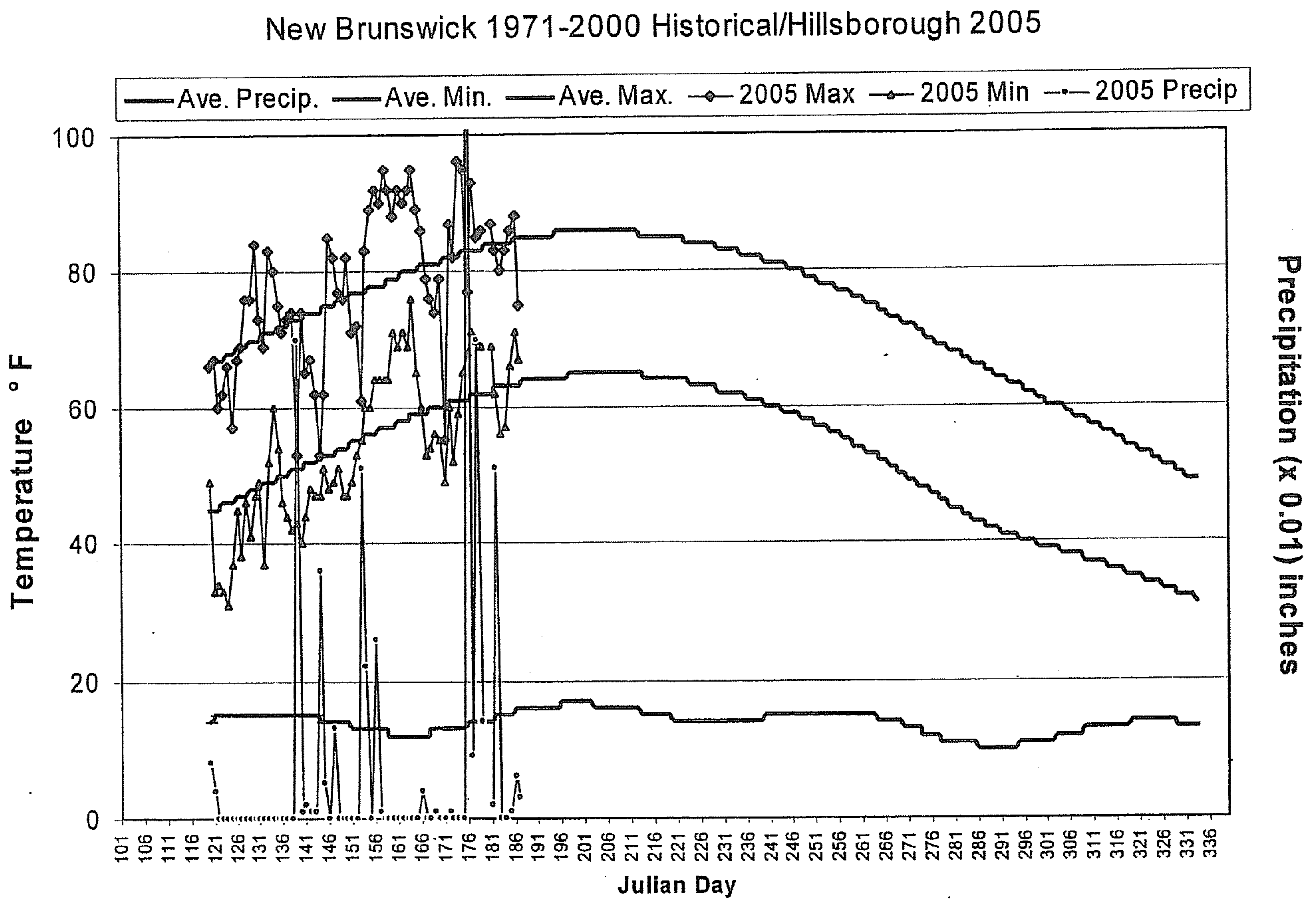
Summary table – Week 27

	Aedes vexans		*Culex complex*		*Coquillettidia perturbans*		*Ochlerotatus sollicitans*	
Region	This Week	Average*	This Week	Average*	This Week	Average*	This Week	Average*
Agricultural	0.46	9.50	0.71	9.40	1.48	1.03	0.00	4.26
Coastal	2.30	8.60	1.71	15.35	2.76	1.48	21.57	15.79
Delaware Bayshore	1.43	9.27	19.86	92.64	1.21	7.36	1.81	18.36
Delaware River Basin	1.14	26.28	0.32	9.19	0.25	0.19	0.00	0.73
New York Metro	0.76	4.91	3.44	11.83	0.23	0.28	0.01	0.74
North Central Rural	0.20	1.74	0.35	6.45	0.22	0.14	0.00	0.00
Northwest Rural	4.43	10.08	0.81	8.13	0.29	0.16	0.00	0.00
Philadelphia Metro	2.66	19.94	1.67	14.17	1.67	1.05	0.00	0.00
Pinelands	0.43	6.15	0.61	9.68	3.10	1.10	0.05	0.38
Suburban Corridor	1.32	20.14	1.59	7.35	1.78	28.16	0.00	0.00

Graphs include *Ae. vexans*, *Culex* complex (*Cx. pipiens*, *Cx. restuans, and Cx. salinarius*), *Oc. sollicitans*, *Cs. melanura and* *Oc. japonicus*

16 of 21 counties in current week; 20 of 21 counties reporting.

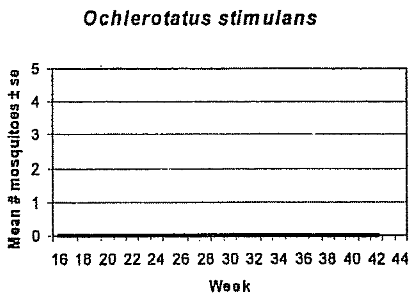
Climate Data



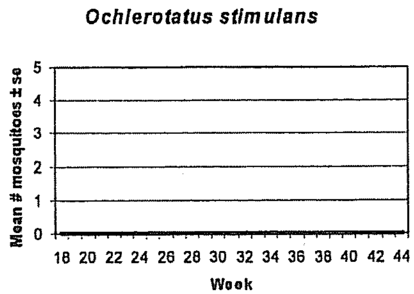
This figure shows historical average maximum and minimum temperatures and average precipitation recorded in the New Brunswick, NJ weather station over a recent 30 year period. Also graphed are the current year's minimum and maximum temperatures as recorded at the Hillsborough NJ weather station (a station close to central NJ which recorded all three parameters and was available online at the NJ state climatologist).

Figure 2. Ochlerotatus stimulans – *Univoltine Aedine* (stimulans) *Species*

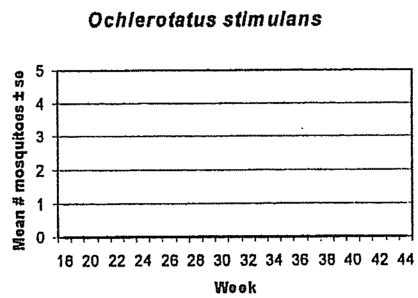
Agricultural



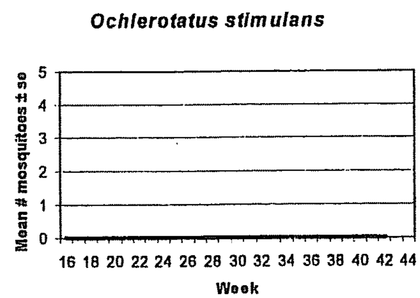
Coastal



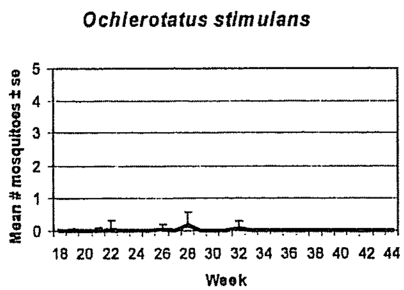
Delaware Bayshore



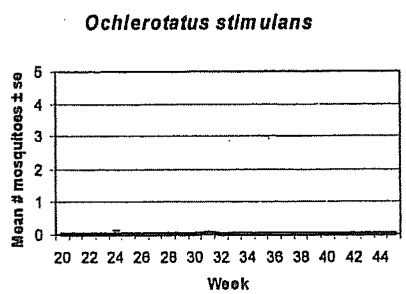
Delaware River Basin



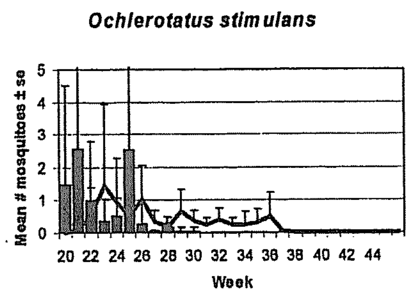
New York Metro



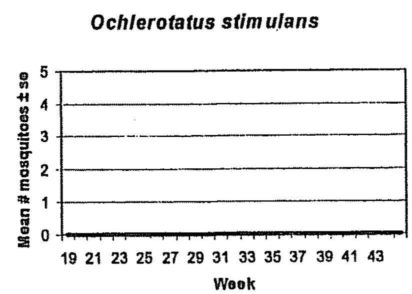
North Central Rural



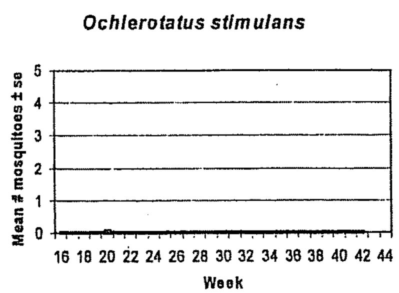
Northwestern Rural



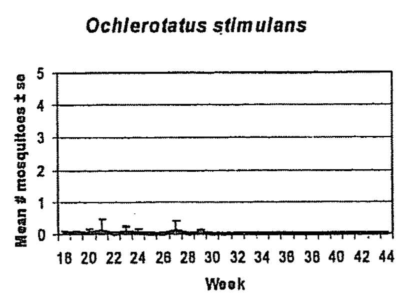
Philadelphia Metro



Pinelands



Suburban Corridor

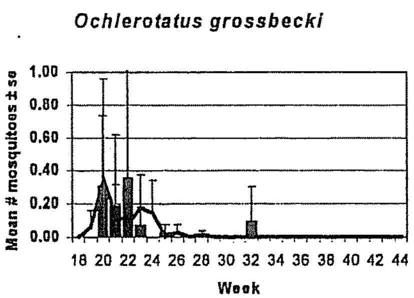


Comments

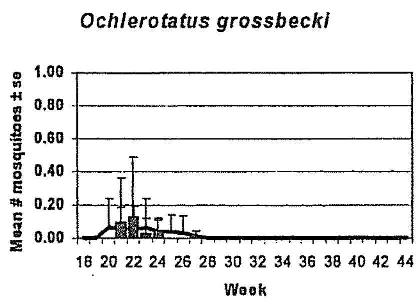
Ochlerotatus stimulans is a snow-pool species that is expected to reach their highest number in northern regions, and this year was no exception. Trends indicate the early emergence of this species and this year's data may be more typical than the limited historical dataset suggests. Populations disappeared earlier than expected, given the long life span of this mosquito.

Figure 3. Ochlerotatus grossbecki – *Univoltine Aedine* (stimulans) *Species*

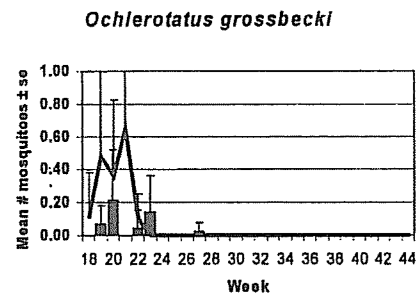
Agricultural



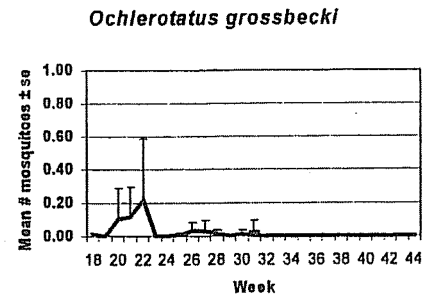
Coastal



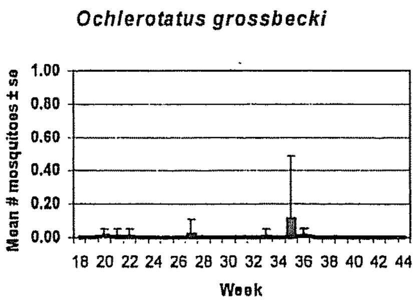
Delaware Bayshore



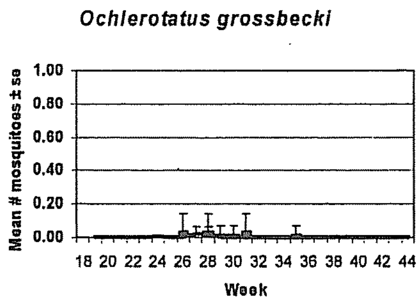
Delaware River Basin



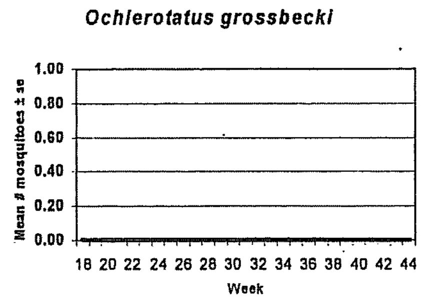
New York Metro



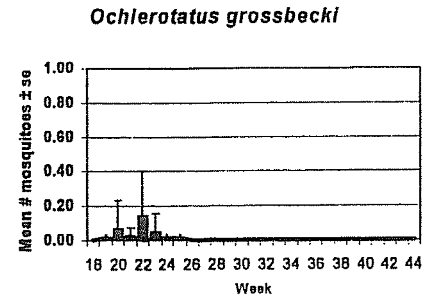
North Central Rural



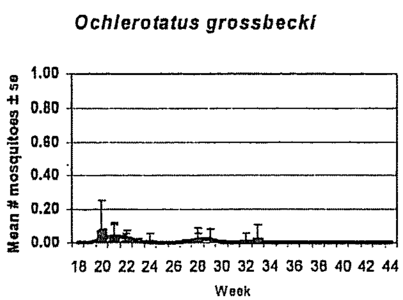
Northwestern Rural



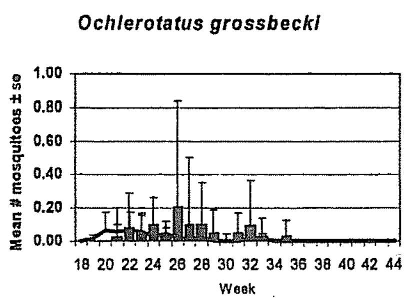
Philadelphia Metro



Pinelands



Suburban Corridor

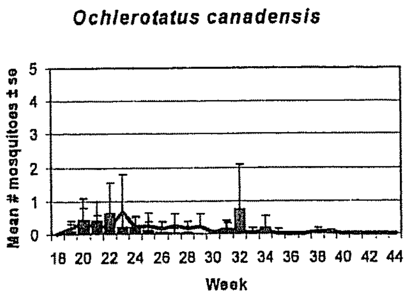


Comments

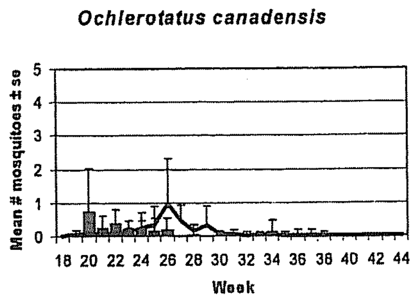
Ochlerotatus grossbecki is primarily a southern New Jersey species, but can typically be found in low levels throughout most of the rest of the state. It is cold-tolerant, hatching from overwintering eggs early in the season. Historic data from the Delaware Bayshore indicate that *Oc. grossbecki* may well be on the wing prior to the start of trapping. As with *Oc. stimulans*, this mosquito is long-lived. Unlike *Oc. stimulans*, *Oc. grossbecki* appears to have persisted longer into the season.

Figure 4. Ochlerotatus canadensis – *Univoltine Aedine* (canadensis) *Species*

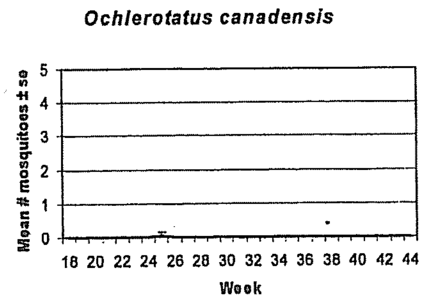
Agricultural



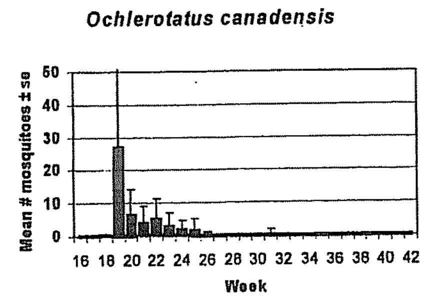
Coastal



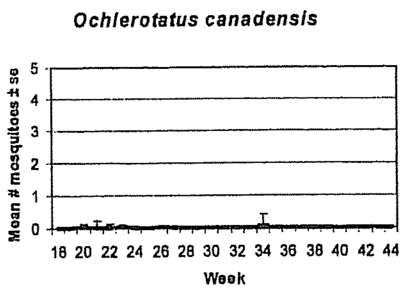
Delaware Bayshore



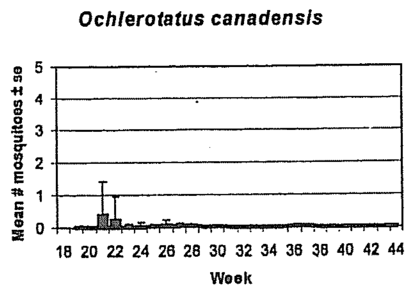
Delaware River Basin



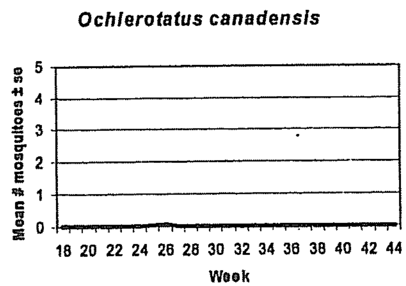
New York Metro



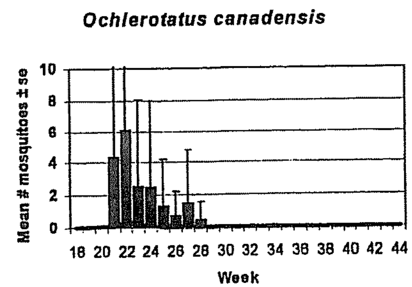
North Central Rural



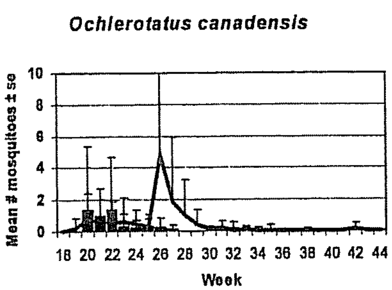
Northwestern Rural



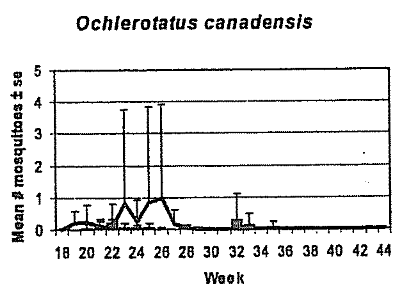
Philadelphia Metro



Pinelands



Suburban Corridor

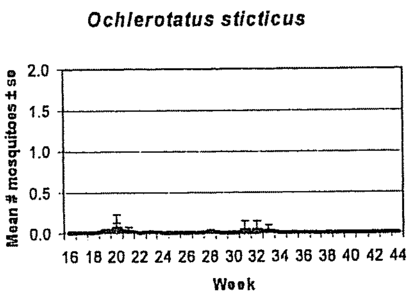


Comments

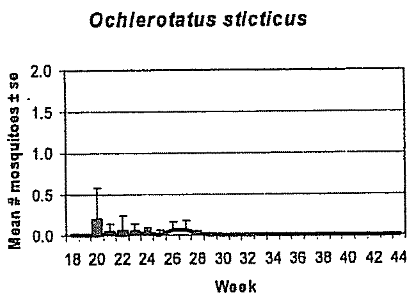
The typical seasonal distribution of *Oc. canadensis* is the emergence of an early-season generation with the possibility of a re-appearance during the fall from eggs that had failed to hatch earlier in the year. Hints of this pattern are seen in the Agricultural, Coastal, Pinelands, and Suburban Regions. However, the greatest numbers appeared in the Delaware River Basin, followed by the Philadelphia Metro Region. These adjacent regions are where major flooding occurred early season and the patterns seen there correlate with this wet spring.

Figure 5. Ochlerotatus sticticus – *Univoltine Aedine* (canadensis) *Species*

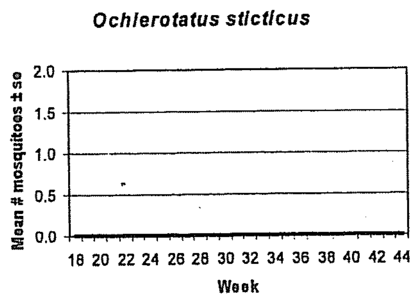
Agricultural



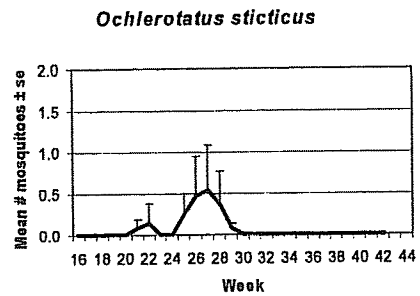
Coastal



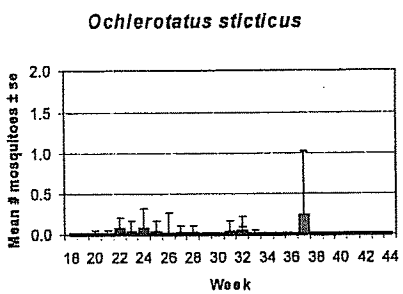
Delaware Bayshore



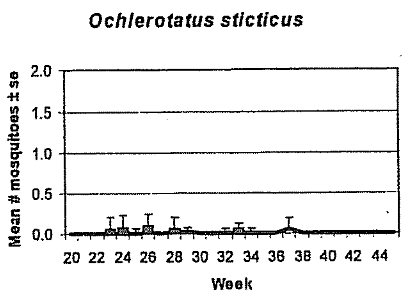
Delaware River Basin



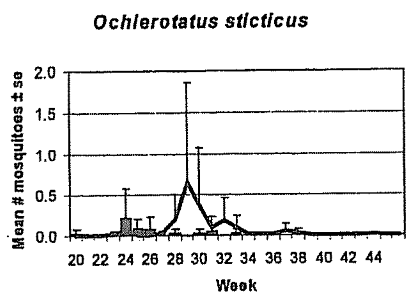
New York Metro



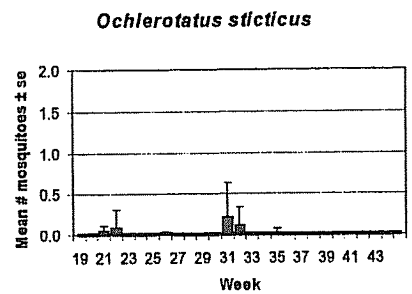
North Central Rural



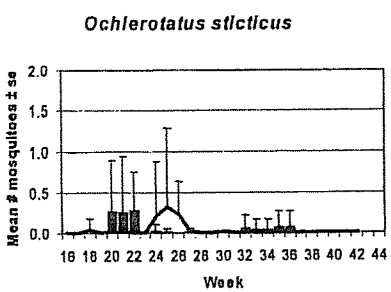
Northwestern Rural



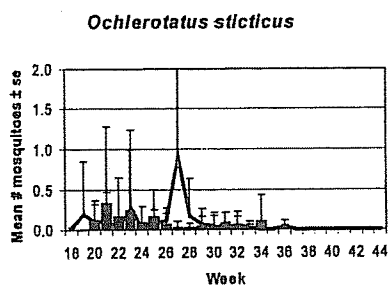
Philadelphia Metro



Pinelands



Suburban Corridor

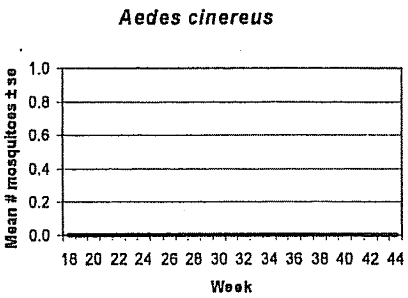


Comments

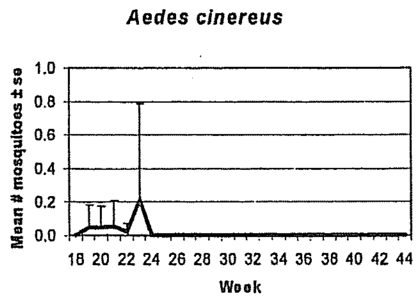
Ochlerotatus sticticus is another early-season floodwater species that may re-appear later under the appropriate conditions. This species often is found in floodplains where habitat shifts from wooded areas adjacent to rivers early in the season to more central locations along the floodplain. The New York Metro, Pinelands and Philadelphia Metro Regions indicate the pattern typical of *Oc. sticticus*. *Oc. sticticus* was absent from both the Delaware-influenced regions. Future trends will become more apparent as the dataset grows.

Figure 6. **Aedes cinereus** – ***Univoltine Aedine*** **(canadensis)** ***Species***

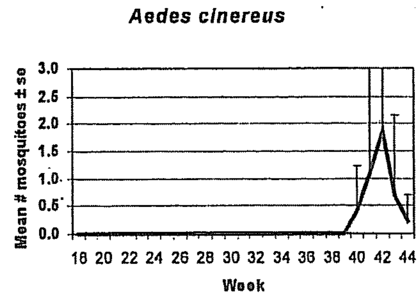
Agricultural



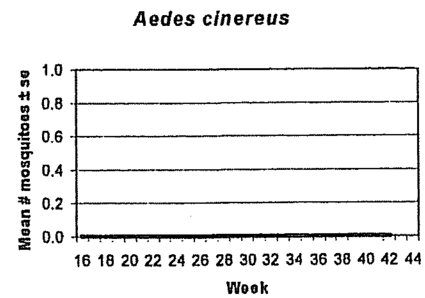
Coastal



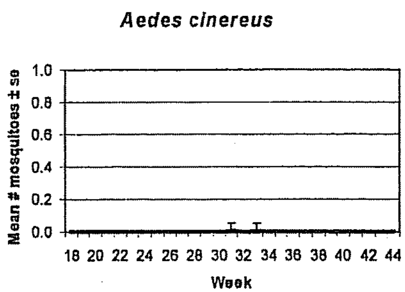
Delaware Bayshore



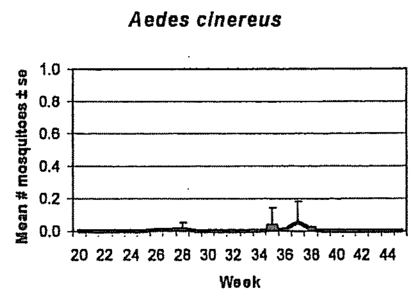
Delaware River Basin



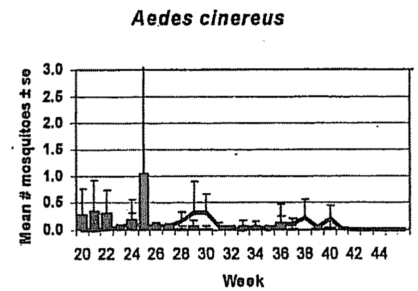
New York Metro



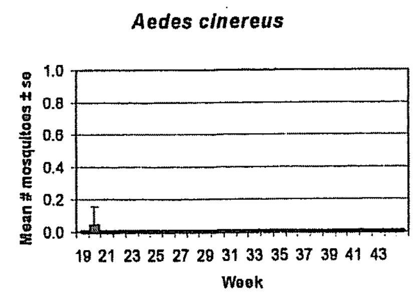
North Central Rural



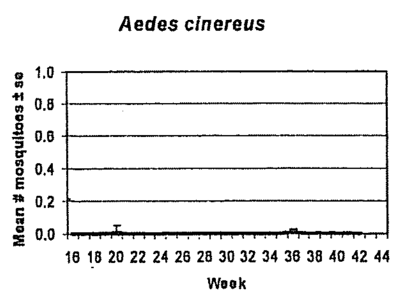
Northwestern Rural



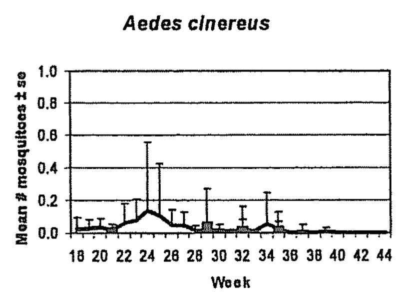
Philadelphia Metro



Pinelands



Suburban Corridor

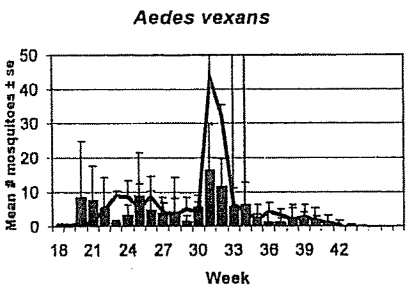


Comments

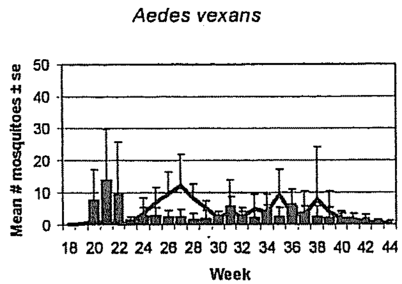
Ae. cinereus is the third of the early-season species that follow the *canadensis* life cycle. As such, we could expect a late-season re-appearance. This species can be found as deceptively small stage 4 larvae in bogs with emergent vegetation. The Northwest Rural region most typifies the pattern of early emergence, with adults being on the wing prior to the beginning of the trapping season. Their numbers persisted through to the end of September (week 40).

Figure 7. Aedes vexans – *Multivoltine Aedine* (vexans) *Species*

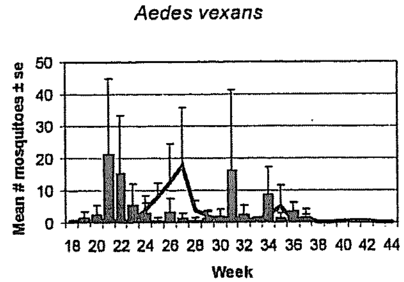
Agricultural



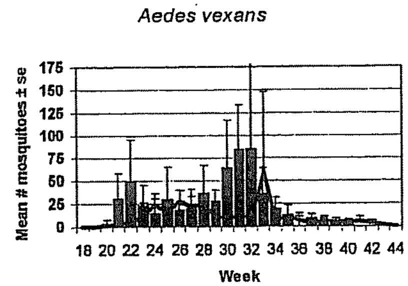
Coastal



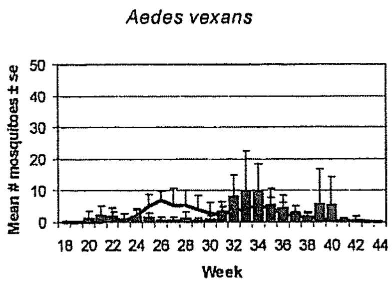
Delaware Bayshore



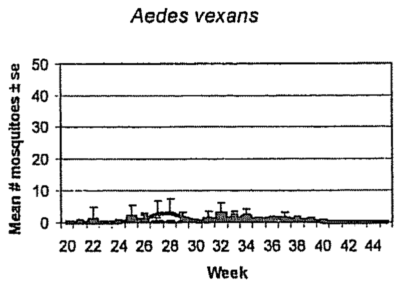
Delaware River Basin



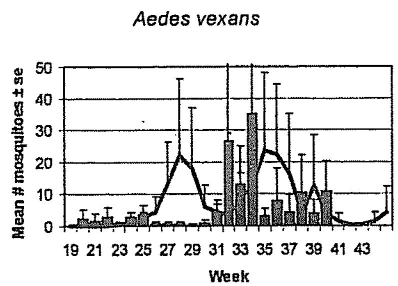
New York Metro



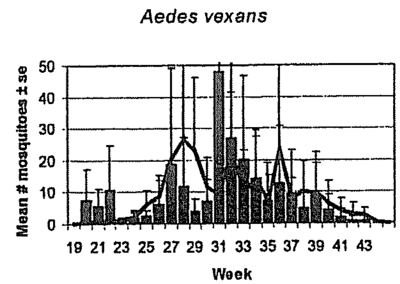
North Central Rural



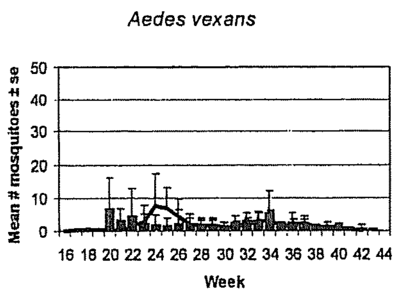
Northwestern Rural



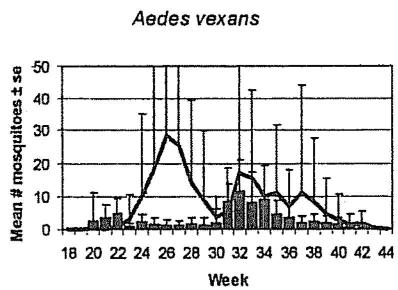
Philadelphia Metro



Pinelands



Suburban Corridor

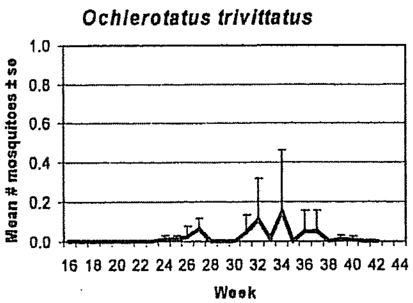


Comments

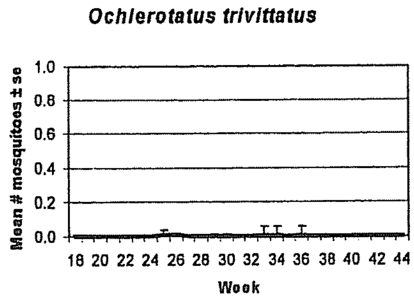
Data from the Agricultural and Philadelphia Metro Regions suggest that *Aedes vexans* had three major broods in 2004. The effects from the abundant rainfall as several hurricanes passed through the Northeast resulted in overlapping emergences with less-definitive peaks characteristic of dry periods. This year's rainfall also shifted the timing of peak population as historic data would seem to be more typical in terms of nuisance presence. Some shifts from historical data might be anticipated (as in the Philadelphia Metro and Northwestern Rural Regions) as indicated by large error bars (suggests locally flooded areas within a region).

Figure 8. Ochlerotatus trivittatus – *Multivoltine Aedine* (vexans) *Species*

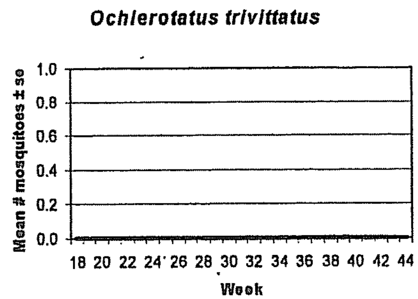
Agricultural



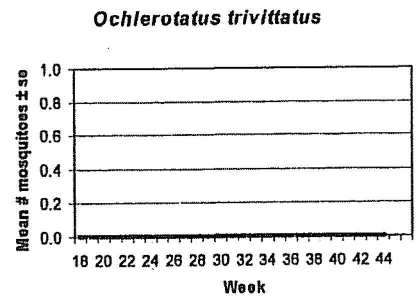
Coastal



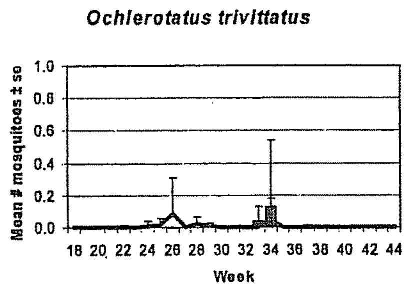
Delaware Bayshore



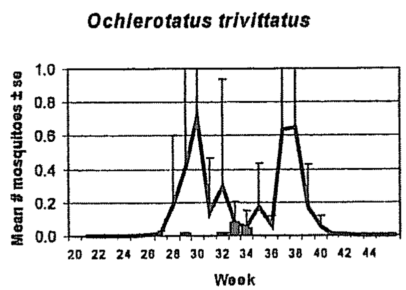
Delaware River Basin



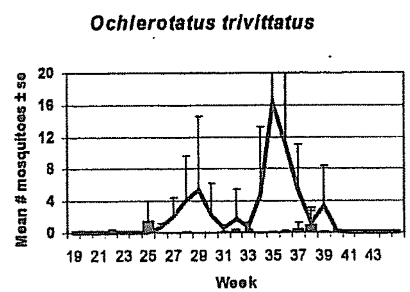
New York Metro



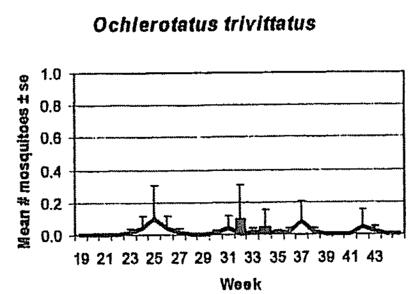
North Central Rural



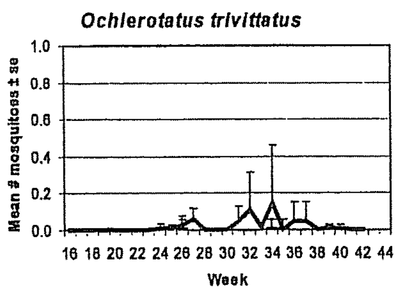
Northwestern Rural



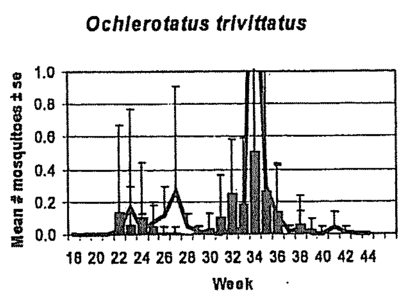
Philadelphia Metro



Pinelands



Suburban Corridor

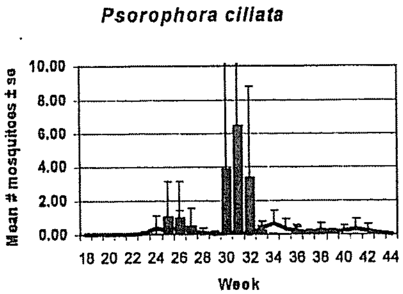


Comments

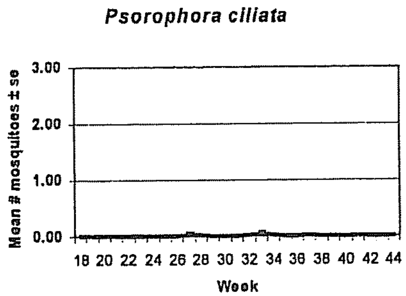
Ochlerotatus trivittatus populations were lower than average this year. Two distinct broods are evident for most of the regions where the species appeared (Suburban Region). Particularly noteworthy is the severely reduced populations in the Northwest Region. Historically populations have been variable, but generally notable.

Figure 9. Psorophora ciliata – *Multivoltine Aedine* (vexans) *Species*

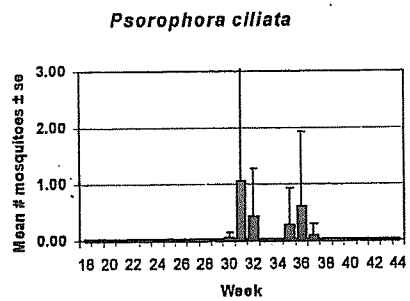
Agricultural



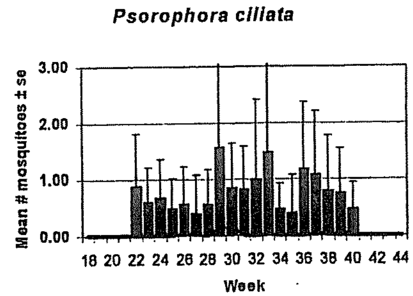
Coastal



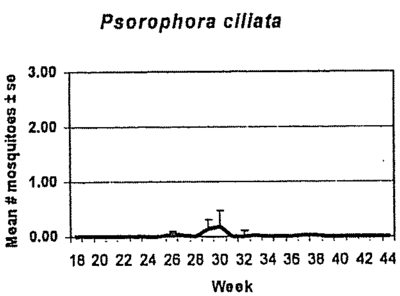
Delaware Bayshore



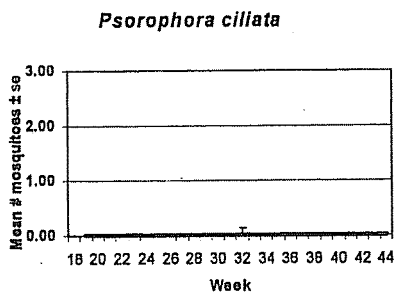
Delaware River Basin



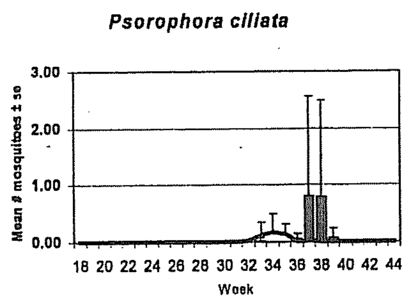
New York Metro



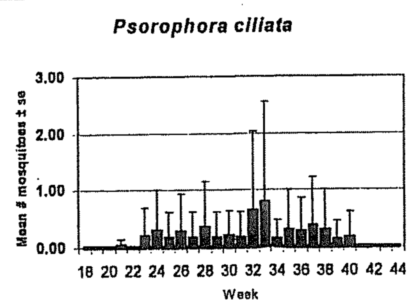
North Central Rural



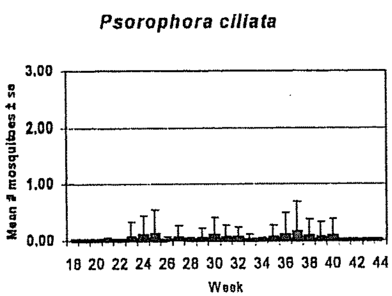
Northwestern Rural



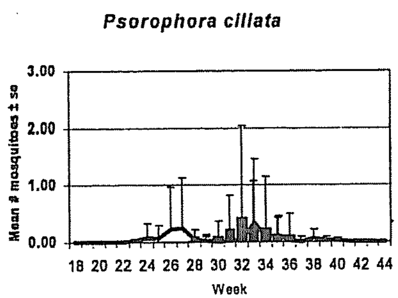
Philadelphia Metro



Pinelands



Suburban Corridor

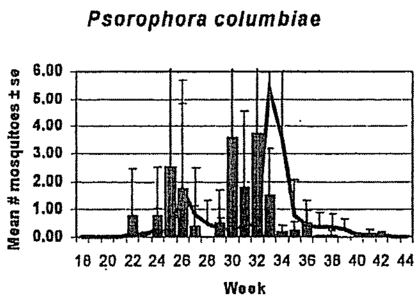


Comments

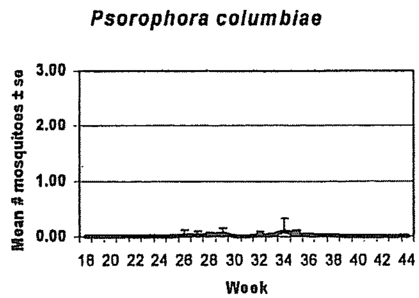
Psorophora ciliata is predacious in the larval stage. It feeds mainly on other fresh floodwater mosquitoes that are found in its habitat. This years population curves mimic those of other *Psorophora* species because the mosquitoes are generated by similar climatic events.

Figure 10. **Psorophora columbiae** – ***Multivoltine Aedine*** **(vexans)** ***Species***

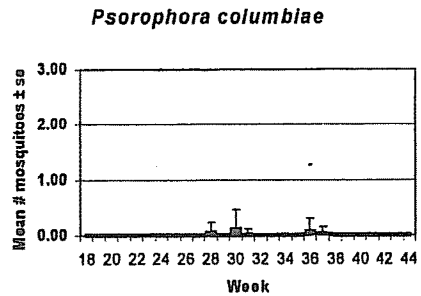
Agricultural



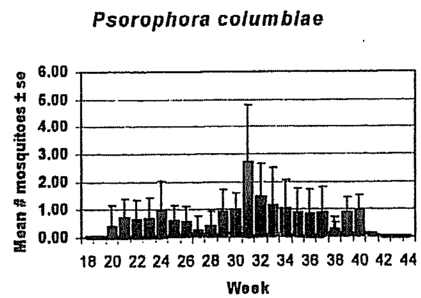
Coastal



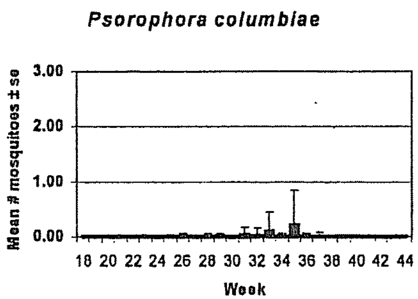
Delaware Bayshore



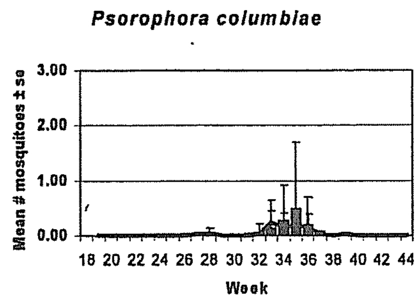
Delaware River Basin



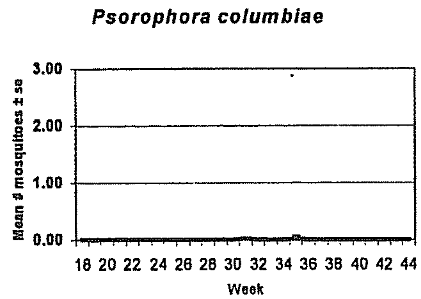
New York Metro



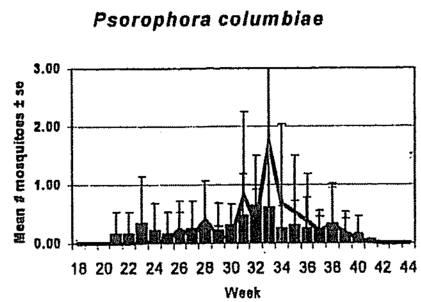
North Central Rural



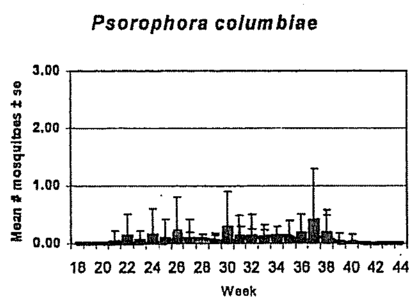
Northwestern Rural



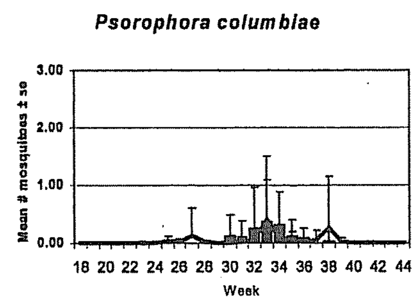
Philadelphia Metro



Pinelands



Suburban Corridor

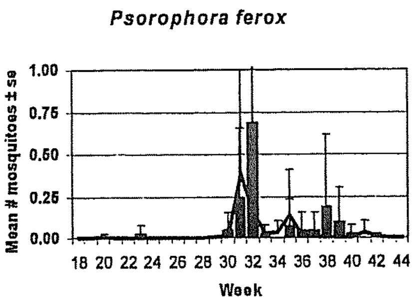


Comments

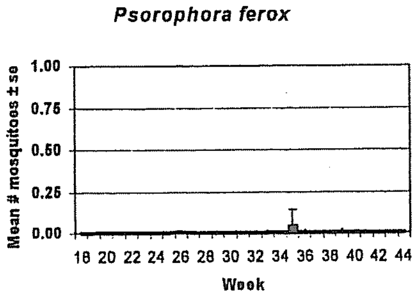
As with *Psorophora ferox* and other vexans types, populations of *Ps. columbiae* appear in response to floodwater events. Unlike *Ps. ferox*, *Ps. columbiae* experienced a substantial brood early in the season and the last emergence in this region was insignificant.

Figure 11. Psorophora ferox – *Multivoltine Aedine* (vexans) *Species*

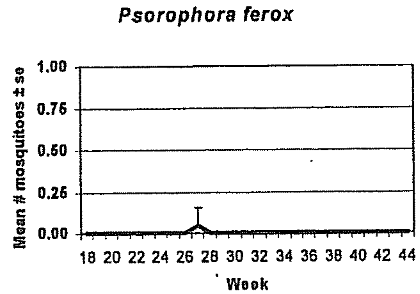
Agricultural



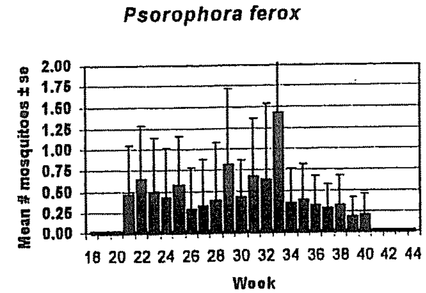
Coastal



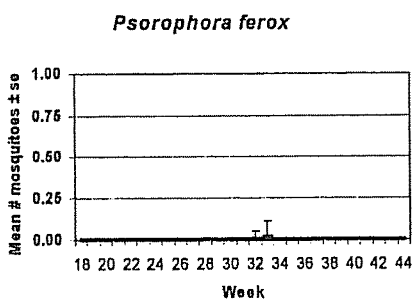
Delaware Bayshore



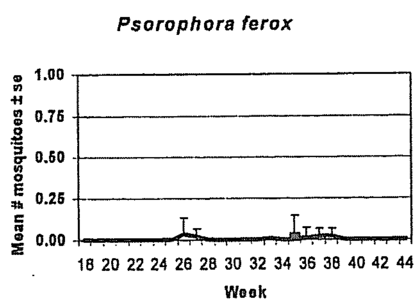
Delaware River Basin



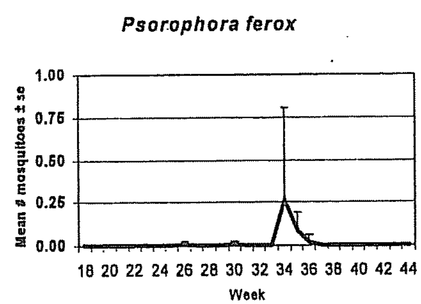
New York Metro



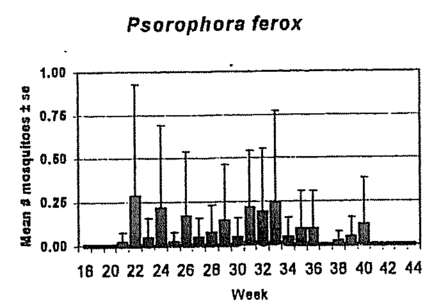
North Central Rural



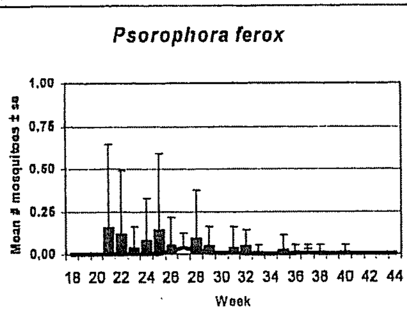
Northwestern Rural



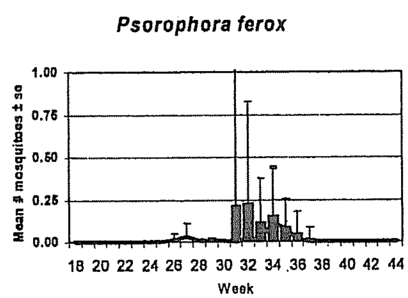
Philadelphia Metro



Pinelands



Suburban Corridor

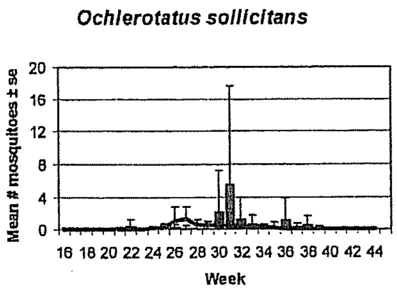


Comments

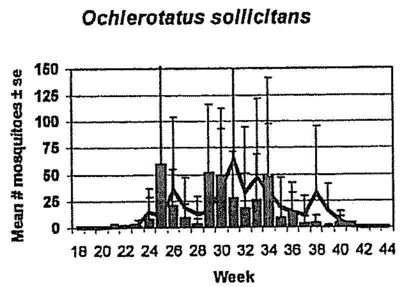
Psorophora populations usually appear as distinct broods in response to floodwater events. The Agricultural Region clearly depicts 3 flooding events, with the 2nd flooding producing the largest biting populations. The overlapping broods seen in the Delaware River Basin and Philadelphia Metro Regions are atypical for this group of mosquitoes as some specimens were present in the light trap collections virtually every week of the season.

Figure 12. Ochlerotatus sollicitans – *Multivoltine Aedine* (sollicitans) *Species*

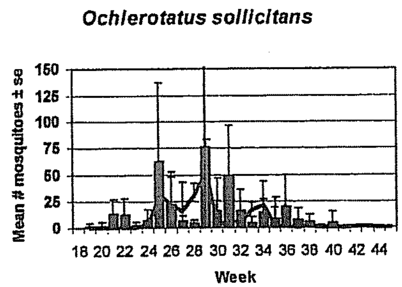
Agricultural



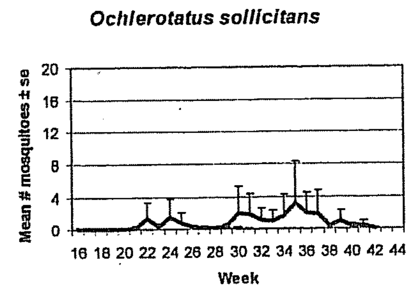
Coastal



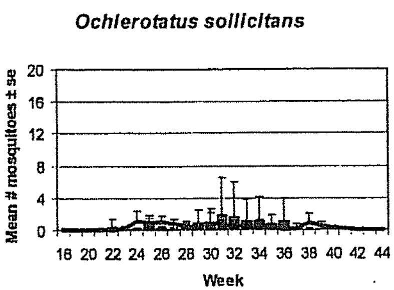
Delaware Bayshore



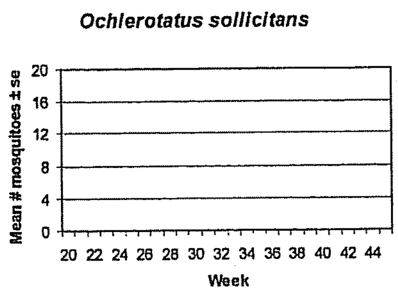
Delaware River Basin



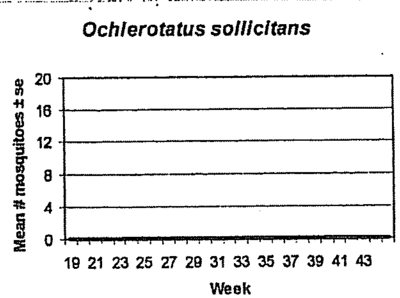
New York Metro



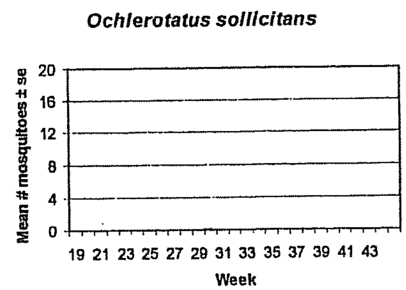
North Central Rural



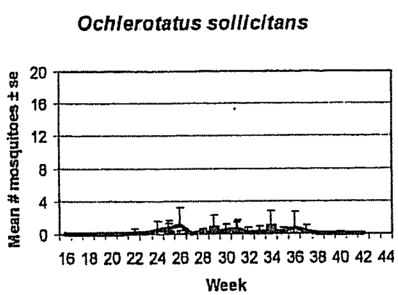
Northwestern Rural



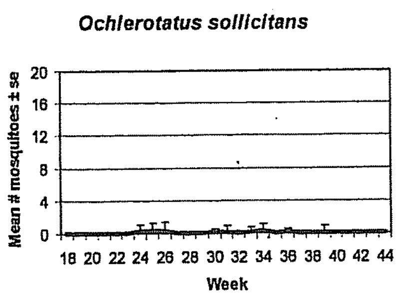
Philadelphia Metro



Pinelands



Suburban Corridor

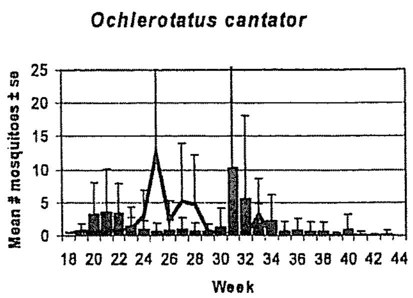


Comments

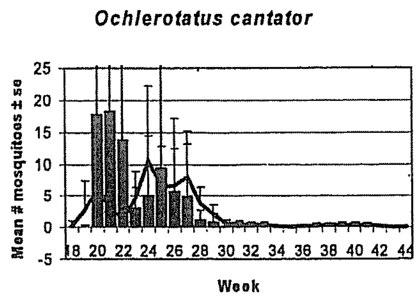
Ochlerotatus sollicitans produced 3 – 4 broods during the 2004 season in the breeding areas of the Coastal and Delaware Bayshore Regions. A strong flyer, *Oc. sollicitans* migrated to Agricultural habitat as well as through the Pinelands. A large migration event occurred at the end of July (Week 31). This species was significantly reduced in the Delaware River Basin as compared to previous years. This same region produced an abundance of *Ae. vexans*, which frequently emanates from dredge, spoil activity.

Figure 13. Ochlerotatus cantator – *Multivoltine Aedine* (sollicitans) *Species*

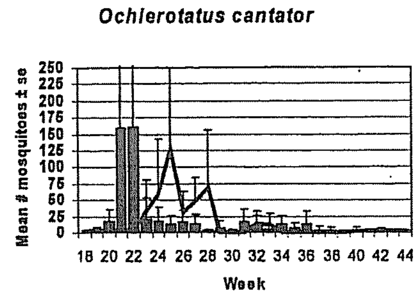
Agricultural



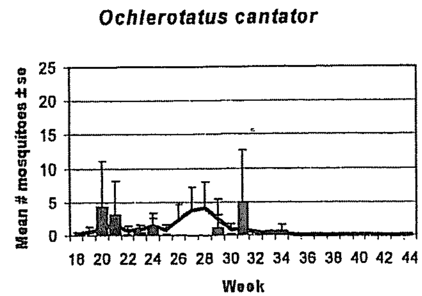
Coastal



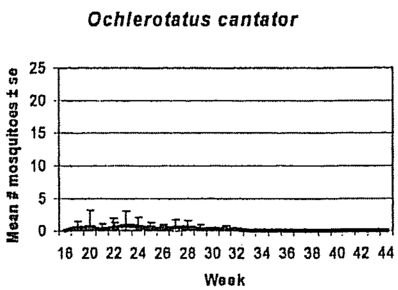
Delaware Bayshore



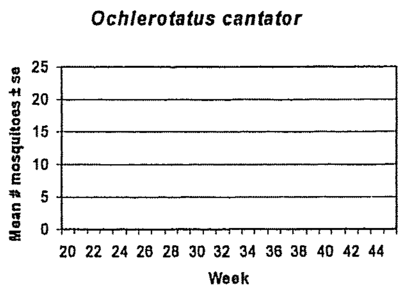
Delaware River Basin



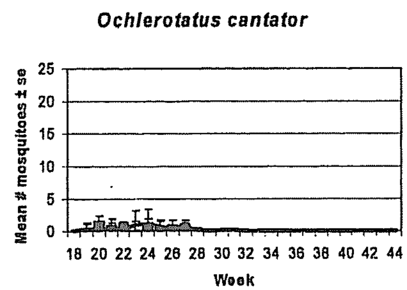
New York Metro



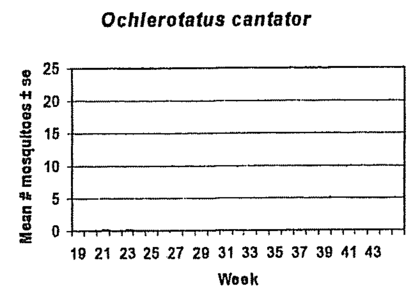
North Central Rural



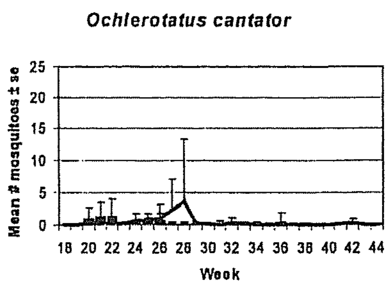
Northwestern Rural



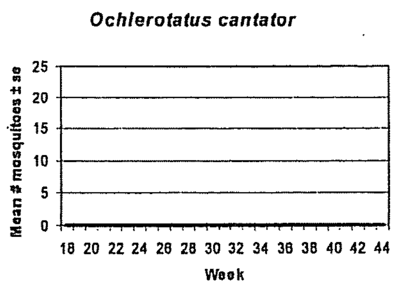
Philadelphia Metro



Pinelands



Suburban Corridor



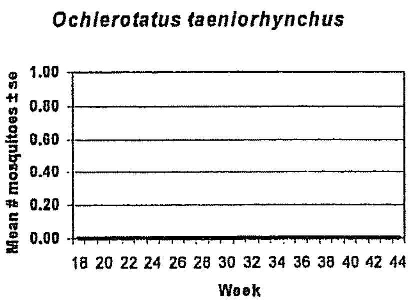
Comments

Ochlerotatus cantator is salt marsh floodwater species that emerges early in the season. Typical population trends can be seen in the Coastal Region, where large broods come off the marsh and then slowly decline through the first half of the season. Unlike historic trends, however, *Oc. sollicitans* appears to have produced broods earlier and in greater numbers than is generally seen for those regions.

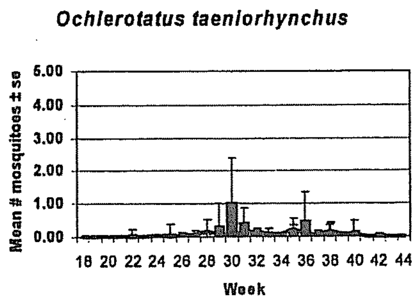
Oc. cantator is not an obligate salt marsh inhabitant, and can be produced from fresh floodwaters, as evidenced by Agricultural, Northwestern, and Pineland populations.

Figure 14. Ochlerotatus taeniorhynchus – *Multivoltine Aedine* (sollicitans) *Species*

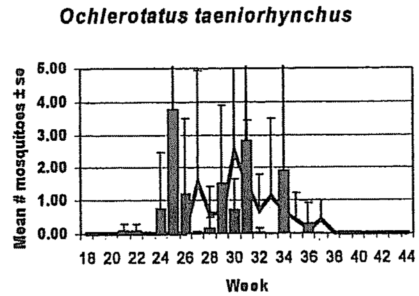
Agricultural



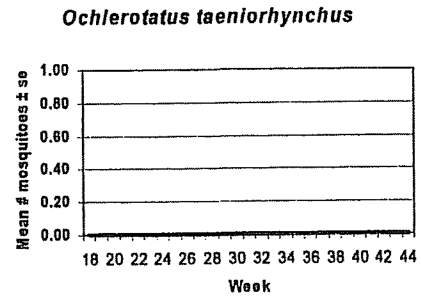
Coastal



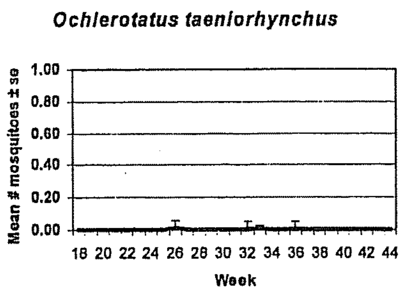
Delaware Bayshore



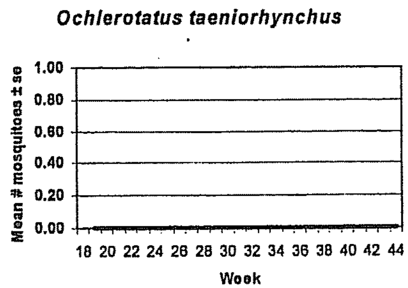
Delaware River Basin



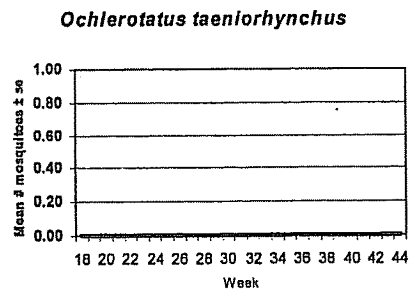
New York Metro



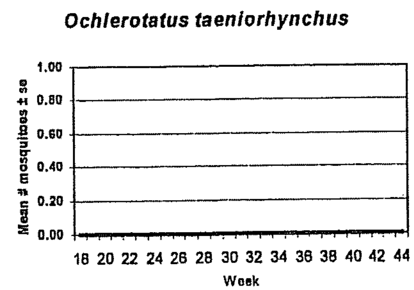
North Central Rural



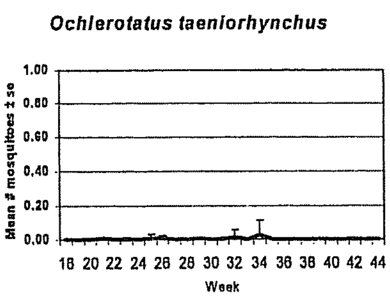
Northwestern Rural



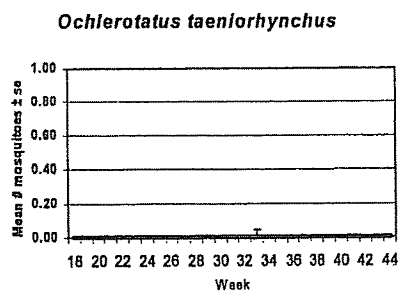
Philadelphia Metro



Pinelands



Suburban Corridor



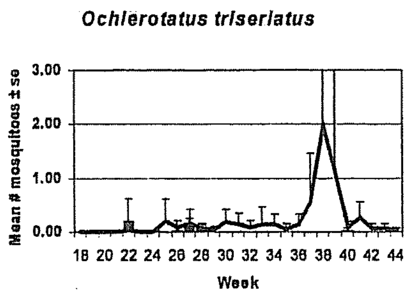
Comments

This aggressive biter is found almost exclusively in the Coastal and Delaware Bayshore Regions despite an ability to breed in habitats ranging from fresh to marine ("euryhaline" or all salt ranges). Although females will fly inland to find suitable bloodmeal hosts, clearly this species lacks the penetration that *Oc. sollicitans* has. Tidal influences are clearly seen in the Delaware Bayshore Region. As with a number of other species, this year's population peaks appear earlier than historical trends indicate.

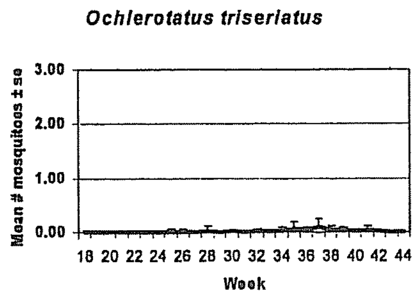
Oc. taeniorhynchus shares habitat with *Oc. sollicitans* and will usually appear in numbers somewhat later in the season. New Jersey is near the northern limit for this species and it attains pest status in more southerly states, where it replaces *Oc. sollicitans* as the dominant salt marsh mosquito.

Figure 15. Ochlerotatus triseriatus – *Multivoltine Aedine* (triseriatus) *Species*

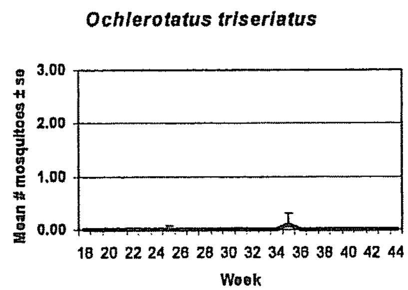
Agricultural



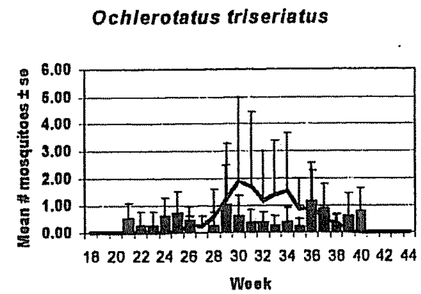
Coastal



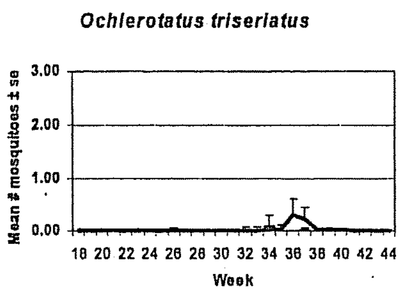
Delaware Bayshore



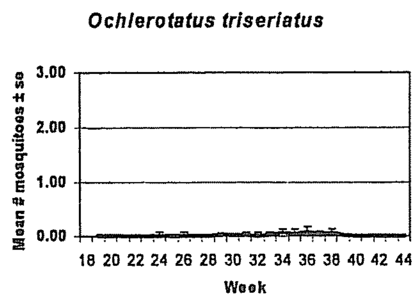
Delaware River Basin



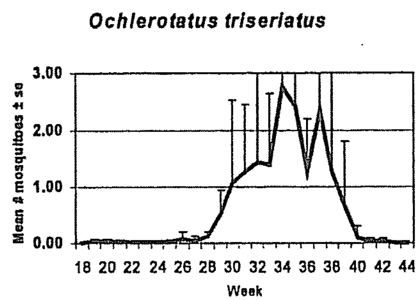
New York Metro



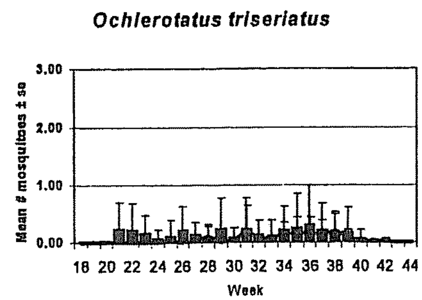
North Central Rural



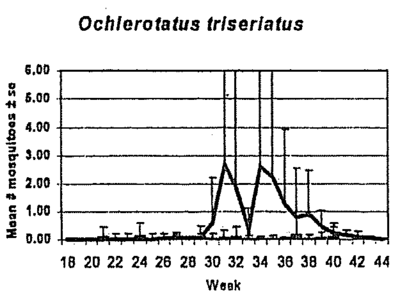
Northwestern Rural



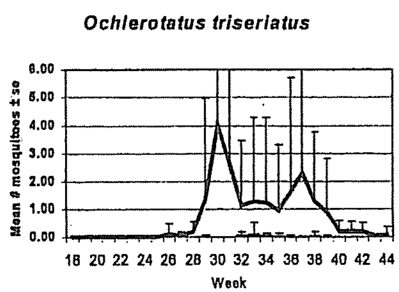
Philadelphia Metro



Pinelands



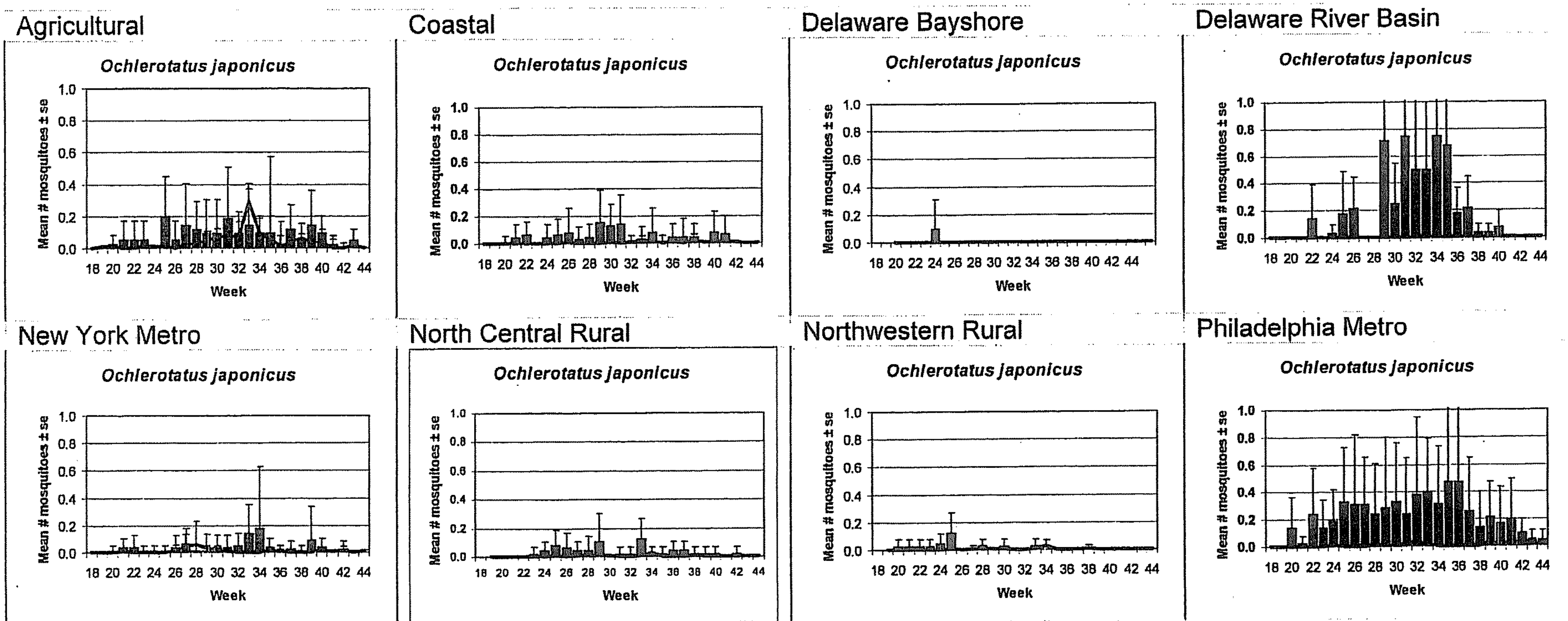
Suburban Corridor

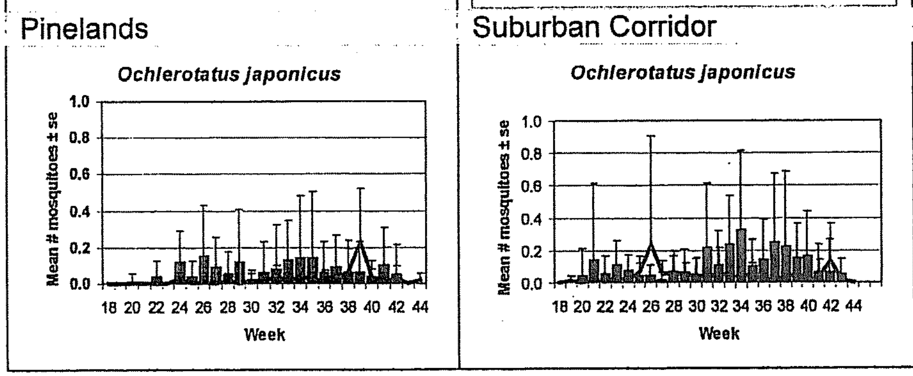


Comments

Ochlerotatus triseriatus populations were well below normal trends this year. However, *Oc. triseriatus* is also not normally attracted to light traps and thus population trends may be questionable. It has been a participant in the West Nile cycle every year since 2000. Interestingly, no virus-positive pools were found this year. This may be due to true population depression, and thus this year's light traps may very well reflect reality.

Figure 16. Ochlerotatus japonicus – *Multivoltine Aedine* (triseriatus) *Species*



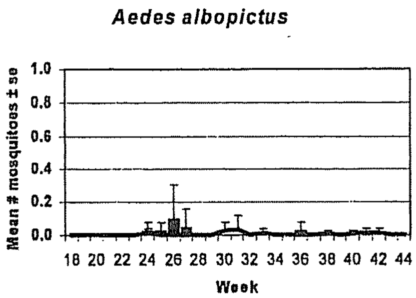


Comments

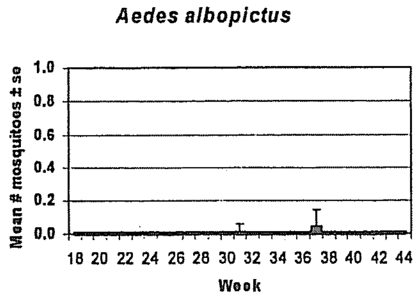
Ochlerotatus japonicus continue to appear in state surveillance light traps despite published reports that this species generally avoids our standard monitoring method. This years' dataset show that *Oc. japonicus* has been present very early in the season throughout the state and continues to enter light traps well into the summer. This dataset demonstrates the value of numerous trap sites to monitor species that occur in low levels.

Figure 17. Aedes albopictus – *Multivoltine Aedine* (triseriatus) *Species*

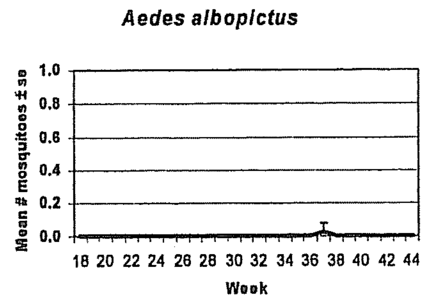
Agricultural



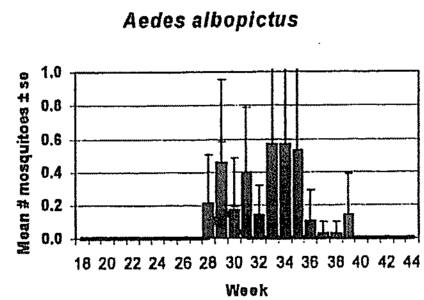
Coastal



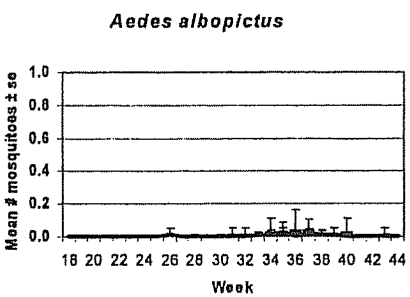
Delaware Bayshore



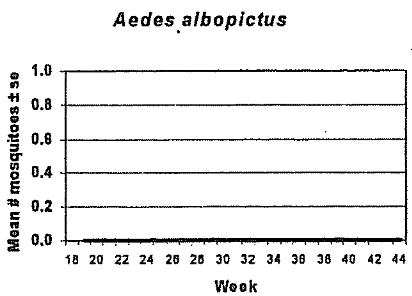
Delaware River Basin



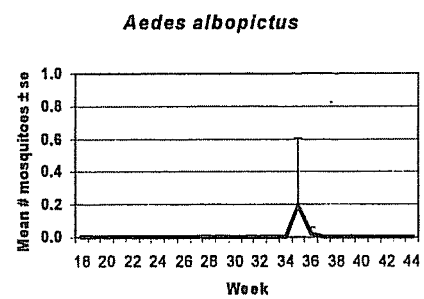
New York Metro



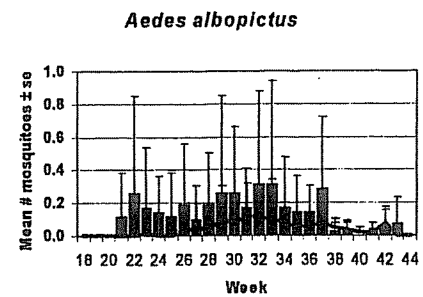
North Central Rural



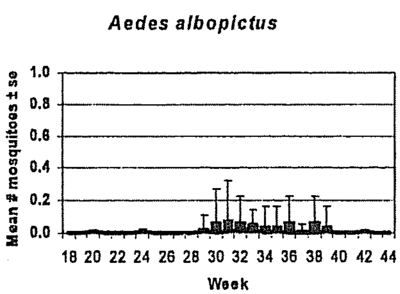
Northwestern Rural



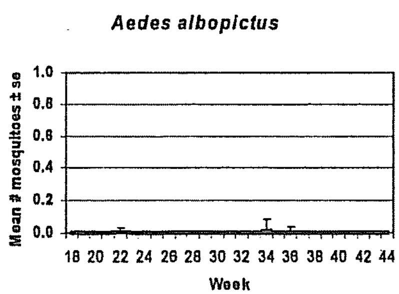
Philadelphia Metro



Pinelands



Suburban Corridor

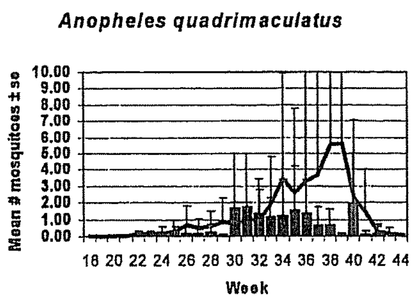


Comments

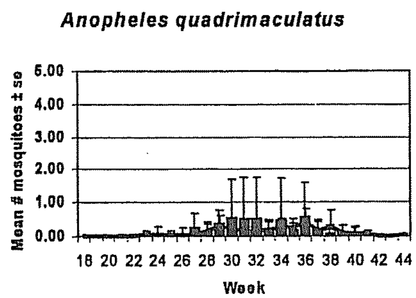
Aedes albopictus is a day-active species that seldom enters light traps. This year's dataset indicates that the species is especially numerous in the Delaware River Basin and Philadelphia Metro Regions. Monitoring of this non-native invader should be continued and compared with other trapping techniques.

Figure 18. Anopheles quadrimaculatus – *Multivoltine Culex/Anopheles* (quadrimaculatus) *Species*

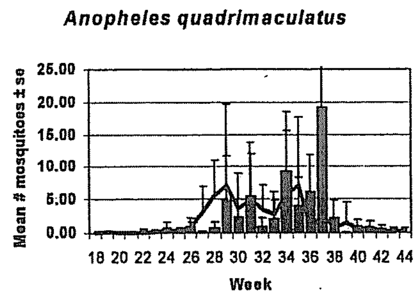
Agricultural



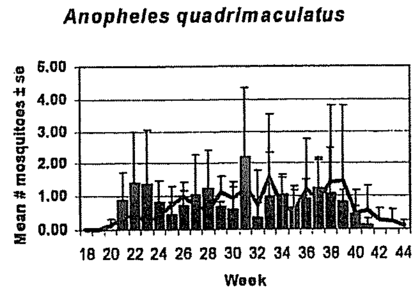
Coastal



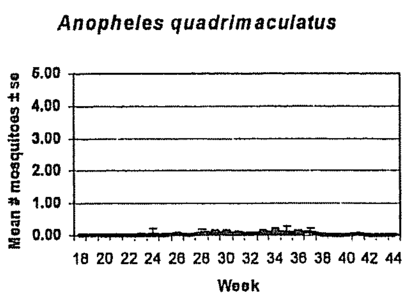
Delaware Bayshore



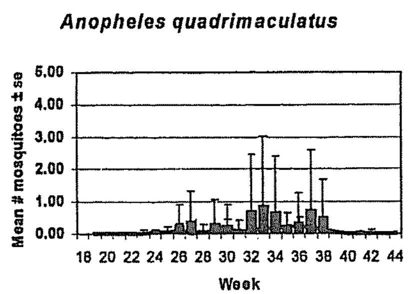
Delaware River Basin



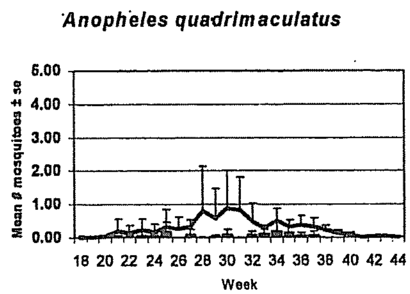
New York Metro



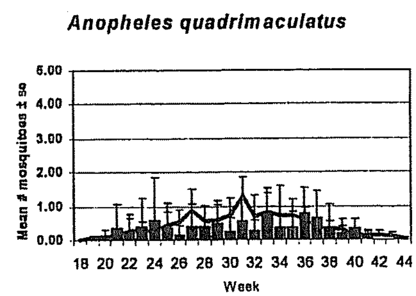
North Central Rural



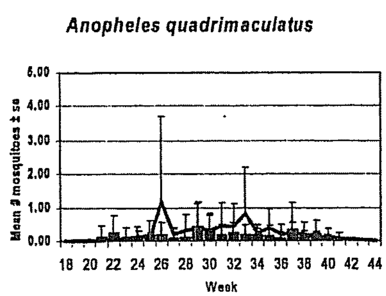
Northwestern Rural



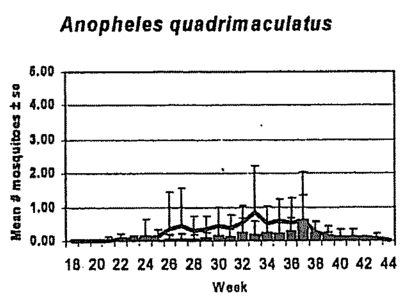
Philadelphia Metro



Pinelands



Suburban Corridor

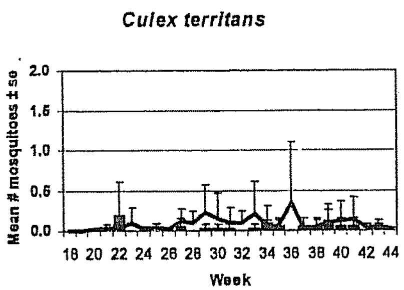


Comments

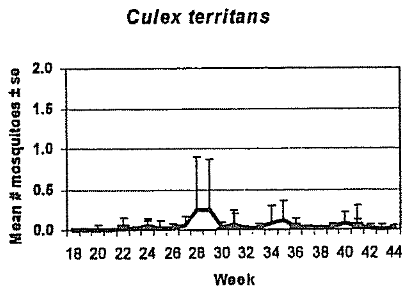
Population trends for this species were generally what we might expect of a mosquito whose mated females overwintered. Most regions saw a gradual building of populations, although not to the extent of historical values (Agricultural). The pattern of this species mirrored those of *An. punctipennis*, including that of the Delaware River Basin pattern.

Figure 19. Culex territans – *Multivoltine Culex/Anopheles* (quadrimaculatus) *Species*

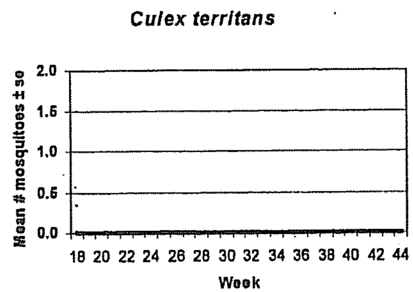
Agricultural



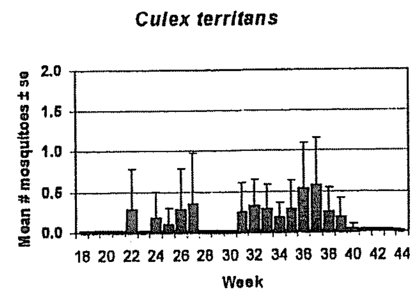
Coastal



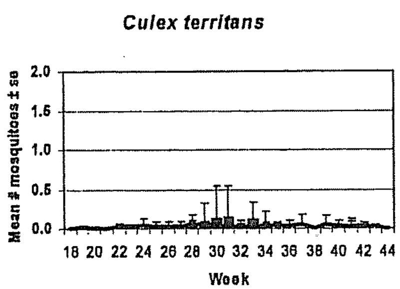
Delaware Bayshore



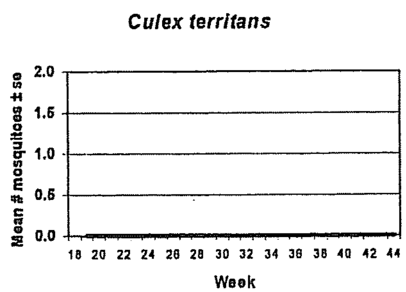
Delaware River Basin



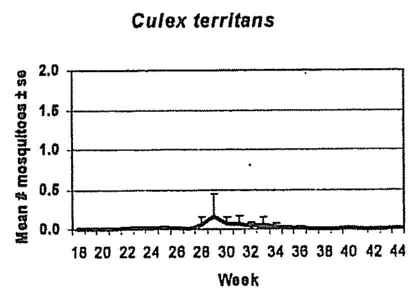
New York Metro



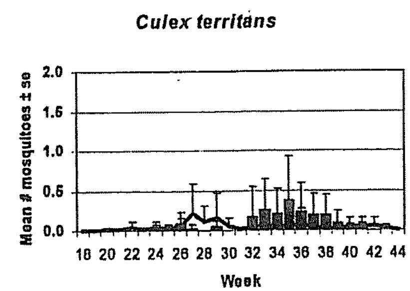
North Central Rural



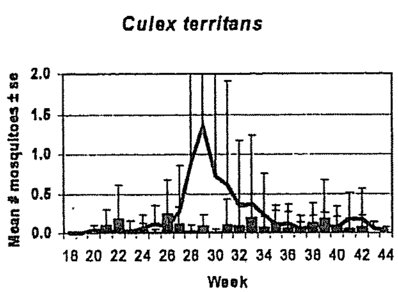
Northwestern Rural



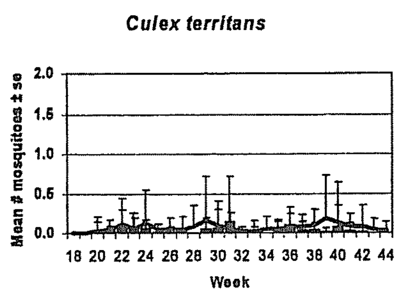
Philadelphia Metro



Pinelands



Suburban Corridor



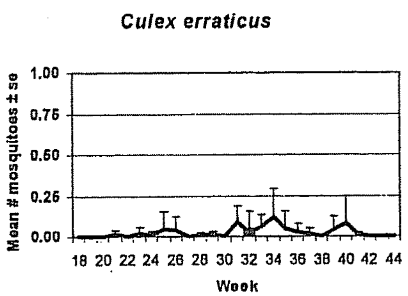
Comments

Culex territans is a specialized frog-feeder and has evolved cold-tolerance that should allow it to be active when early-season frogs come out of hibernation to breed. However, the light trap data might be misleading as it would indicate a late emergence. Earliest trap record this year occurred during week 20, at least 2 weeks after the beginning of the season. However, the first generation likely emerged well prior to when the traps were activated, and the trap activity actually reflects adults from the first generation of larvae.

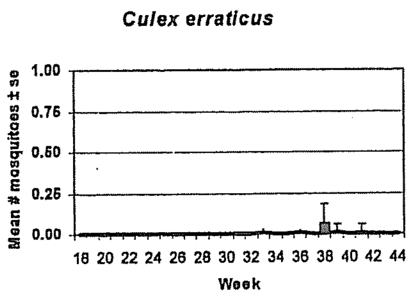
Southern regions, such as the Philadelphia Metro and the Pinelands, show populations to either build throughout the summer or maintain low, consistent levels. High light trap collections indicate an abundance of local mosquitoes as this species does not travel far.

Figure 20. Culex erraticus – *Multivoltine Culex/Anopheles* (quadrimaculatus) *Species*

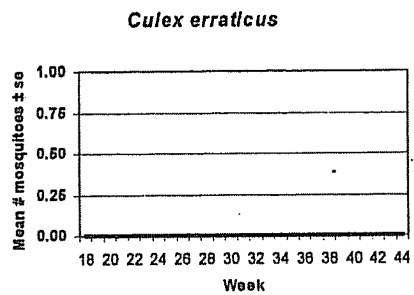
Agricultural



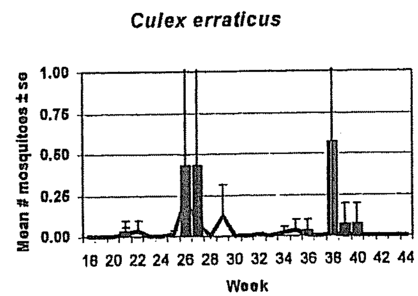
Coastal



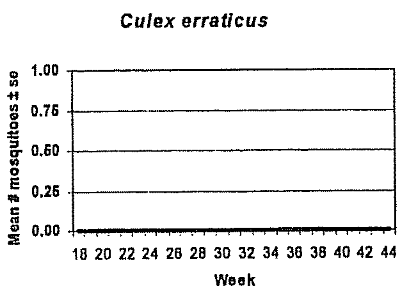
Delaware Bayshore



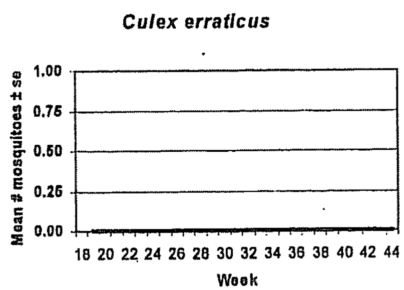
Delaware River Basin



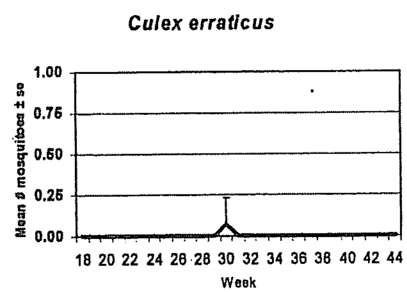
New York Metro



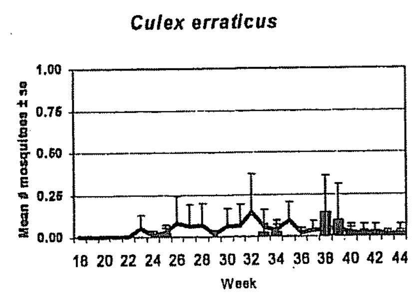
North Central Rural



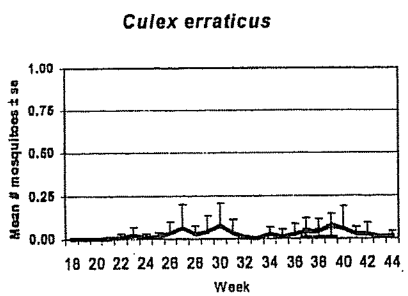
Northwestern Rural



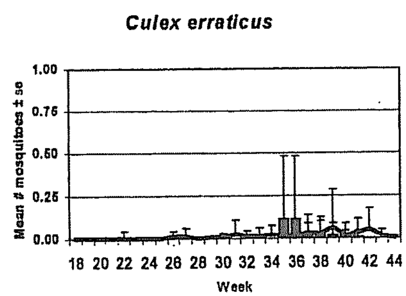
Philadelphia Metro



Pinelands



Suburban Corridor

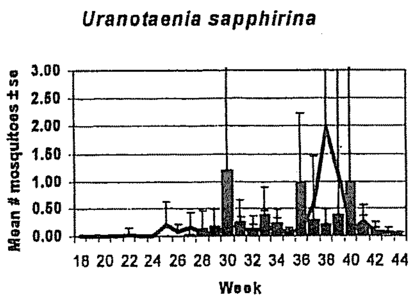


Comments

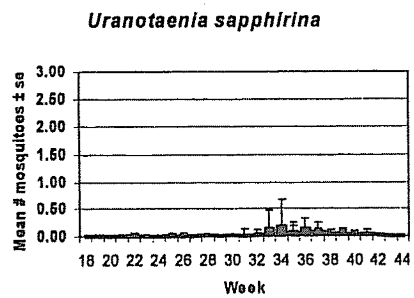
Little is known regarding the biology of this species. New Jersey populations may represent the northern range. While *Cx. erraticus* is not normally found in resting boxes prior to July (Week 27/28), historic light trap data indicate adults during the time more typical of other *Culex* species. This year, *Cx. erraticus* appeared to be less consistent through the season as compared to the previous year. Low numbers that were seen later in the season is typically described in the literature for New Jersey *Cx. erraticus* trends.

Figure 21. Uranotaenia sapphirina – *Multivoltine Culex/Anopheles* (quadrimaculatus) *Species*

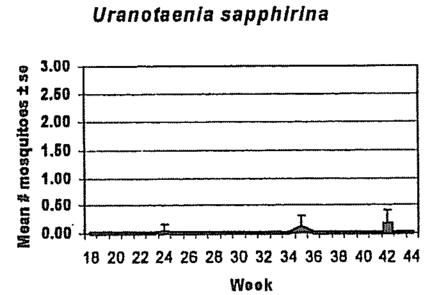
Agricultural



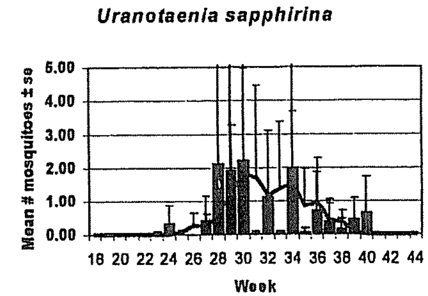
Coastal



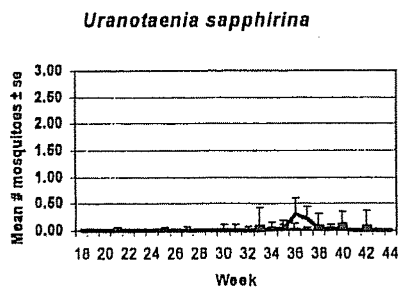
Delaware Bayshore



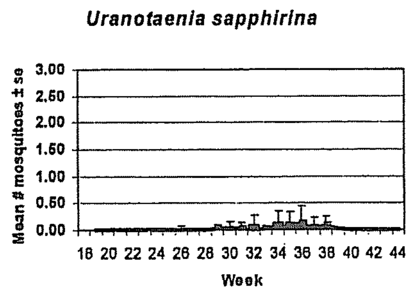
Delaware River Basin



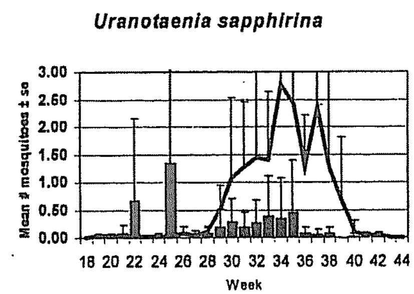
New York Metro



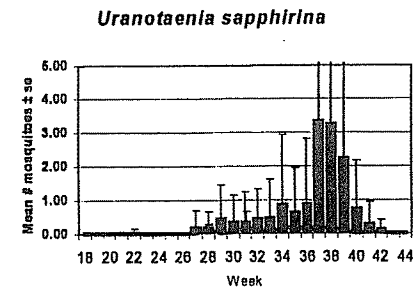
North Central Rural



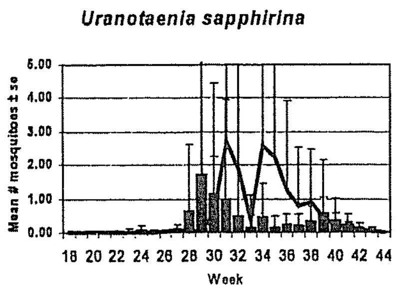
Northwestern Rural



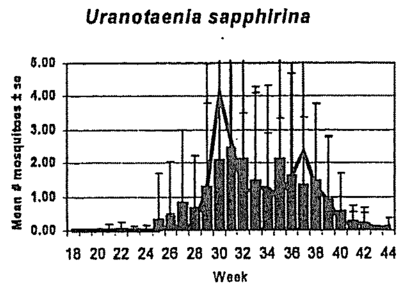
Philadelphia Metro



Pinelands



Suburban Corridor



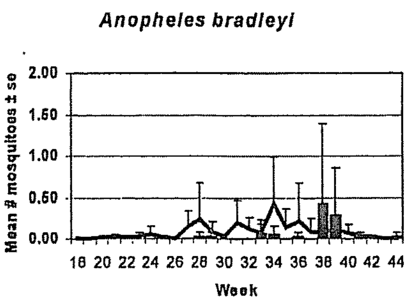
Comments

The Philadelphia Metro Region shows the trend typical of this multivoltine species – low numbers in the spring, building up to the highest populations in the fall, often rising sharply. Light trap records show this species can occur in high numbers during July.

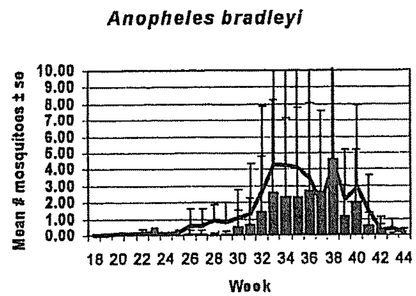
Our knowledge about the biology of this species is limited. Questions remain such as why doesn't this species appear earlier and what mechanism allows them to lag so far behind typical Culex/Anopheline species with which *Ur. sapphirina* share hibernaculae? Further work is needed for this presumably benign species (of which we know so little).

Figure 22. Anopheles bradleyi – *Multivoltine Culex/Anopheles* (salinarius) *Species*

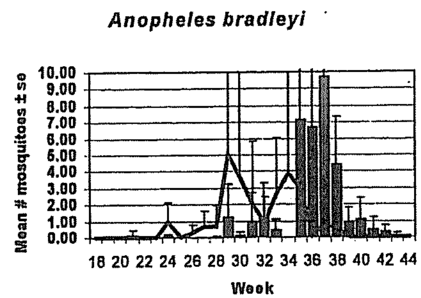
Agricultural



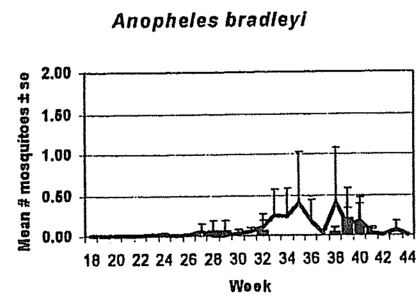
Coastal



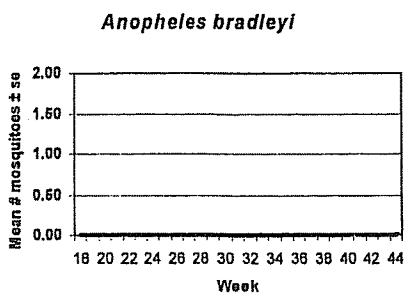
Delaware Bayshore



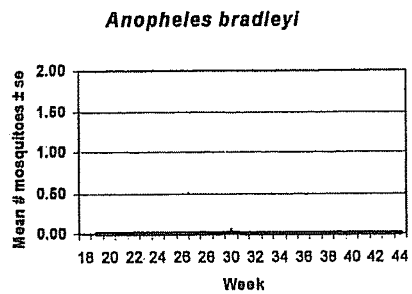
Delaware River Basin



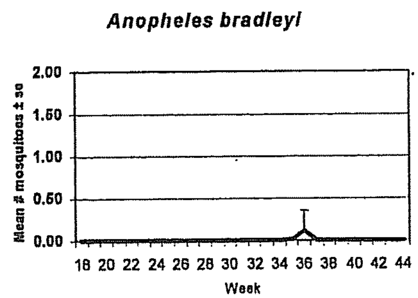
New York Metro



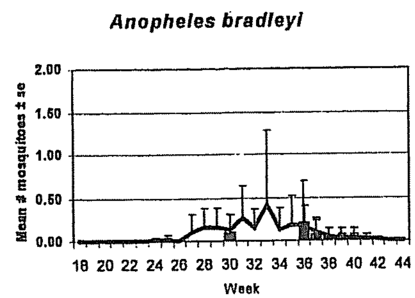
North Central Rural



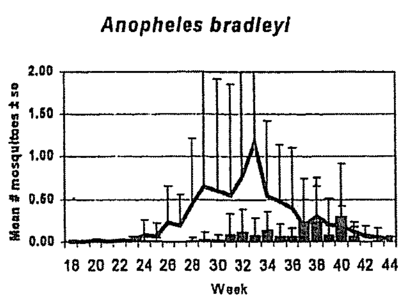
Northwestern Rural



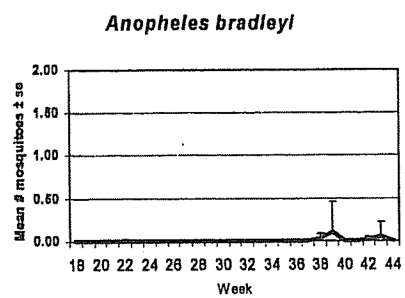
Philadelphia Metro



Pinelands



Suburban Corridor

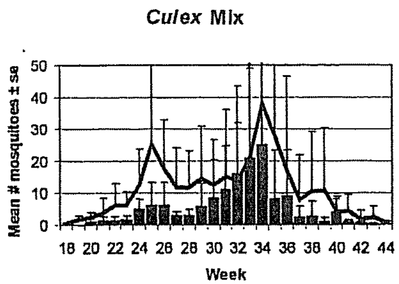


Comments

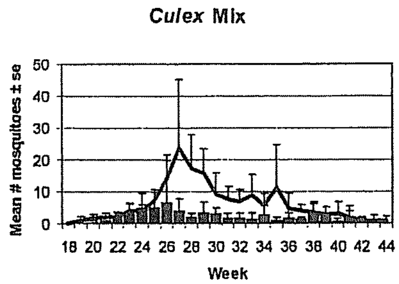
Anopheles bradleyi is a salt marsh anopheline that reaches greatest numbers in brackish habitat along the coast. Like most anophelines that overwinter as mated females, the population builds gradually as the season progresses. This years' dataset clearly shows this trend, particularly in the Coastal and Delaware Bayshore Regions, habitats that are expected to contain the largest populations.

Figure 23. Culex *Complex - Multivoltine Culex/Anopheles* (pipiens) *Species*

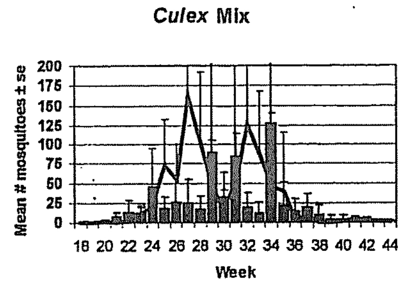
Agricultural



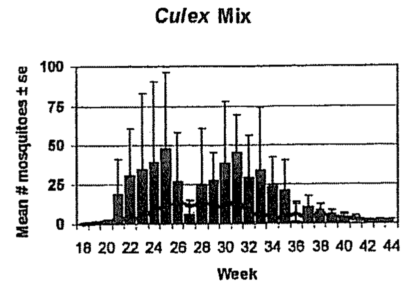
Coastal



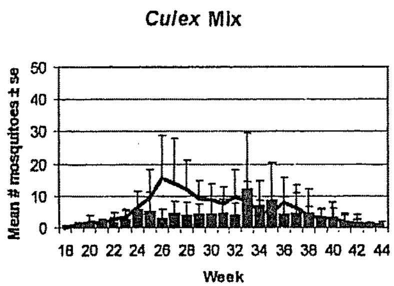
Delaware Bayshore



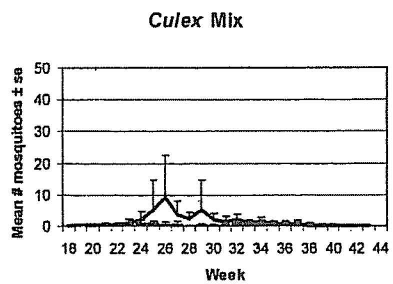
Delaware River Basin



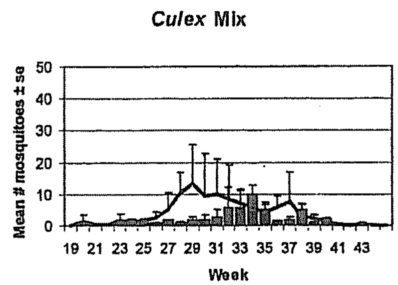
New York Metro



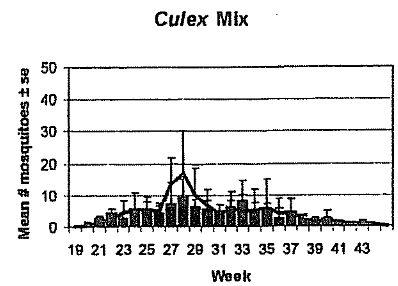
North Central Rural



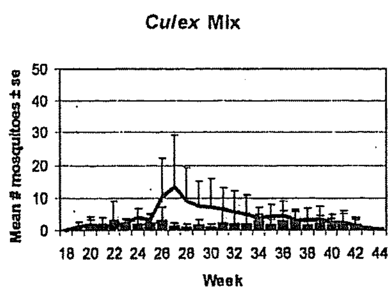
Northwestern Rural



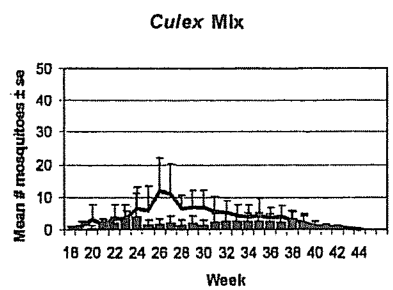
Philadelphia Metro



Pinelands



Suburban Corridor

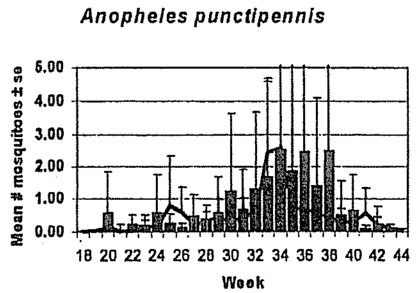


Comments

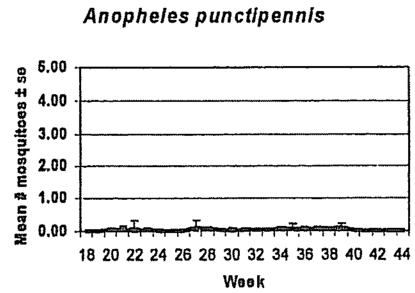
The *Culex* Complex is a mixture of three different species (*Cx. pipiens, Cx. restuans, Cx. salinarius*) that are difficult to identify, and are thus placed into an encompassing group. The Agricultural Region displays the typical trend of *Culex* Complex, with building populations through the summer and a decline as diapause sets in. Apart from the Delaware River Basin, *Culex* populations appear to be lower than typical trends. Populations also appear to have shifted peaks from historic data.

Figure 24. Anopheles punctipennis – *Multivoltine Culex/Anopheles* (pipiens) *Species*

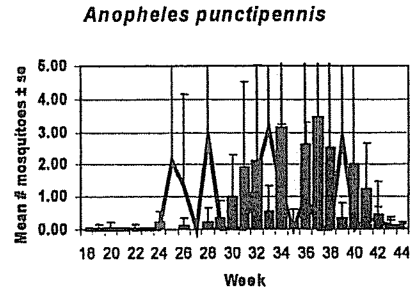
Agricultural



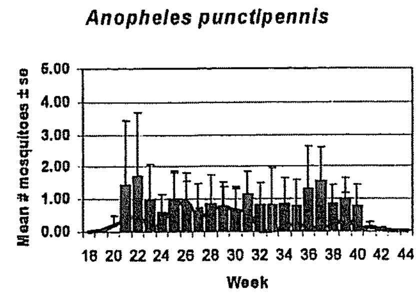
Coastal



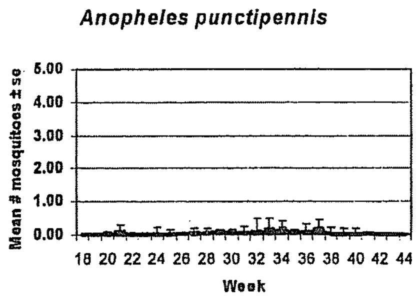
Delaware Bayshore



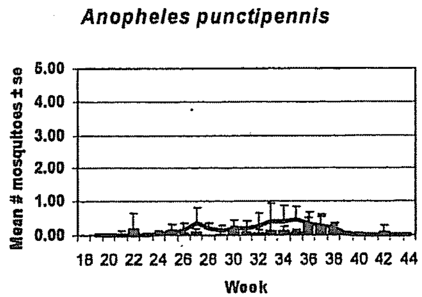
Delaware River Basin



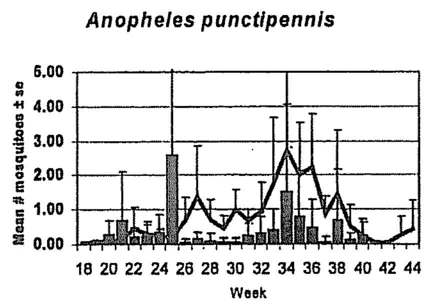
New York Metro



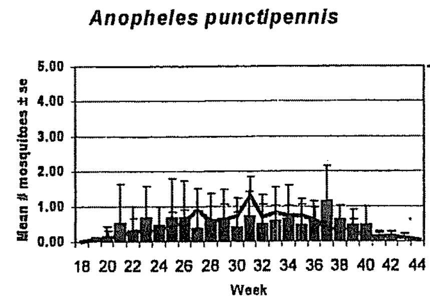
North Central Rural



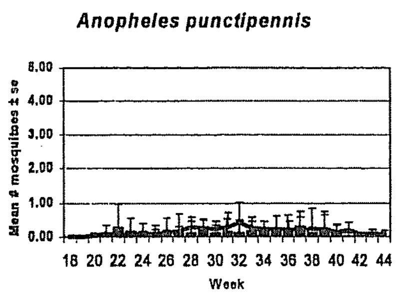
Northwestern Rural



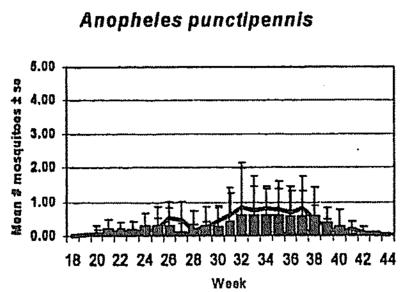
Philadelphia Metro



Pinelands



Suburban Corridor

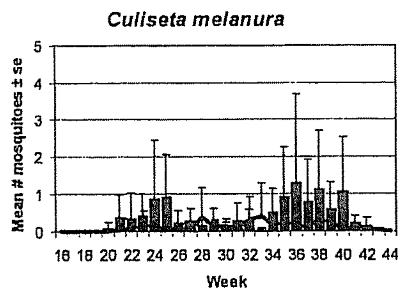


Comments

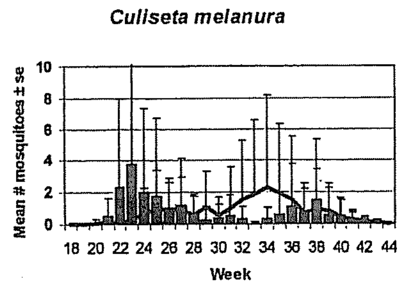
The Agricultural Region for this year's dataset show the trend expected of species that overwinter as mated adult females: a gradual buildup through the season, peak, and eventual die-off as females retreat to hibernaculae. This year, *An. punctipennis* appears to have entered hibernaculae later than *Culex* species. The Delaware River Basin presents a very atypical picture of mosquitoes available during most of the season at a constant rate. This may indicate that some of the traps may have been located near hibernaculae. Light trap data suggests this year's population levels were about normal.

Figure 25. Culiseta melanura – *Unique* (melanura) *Species*

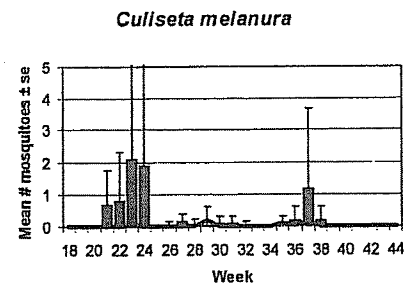
Agricultural



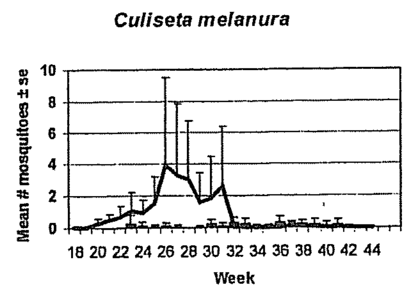
Coastal



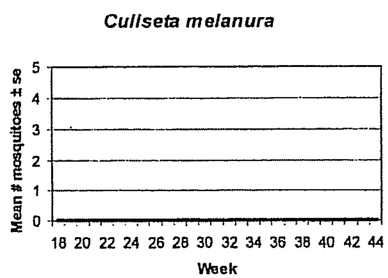
Delaware Bayshore



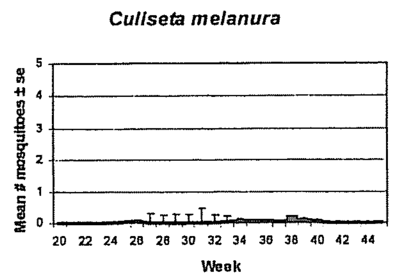
Delaware River Basin



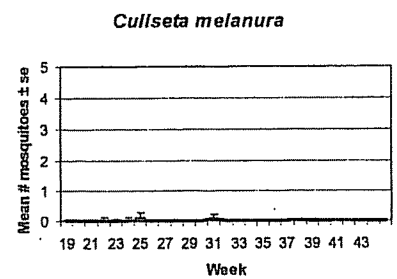
New York Metro



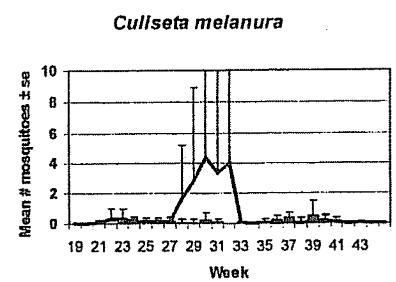
North Central Rural



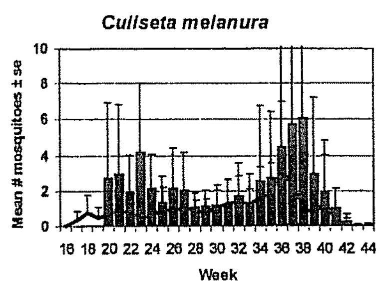
Northwestern Rural



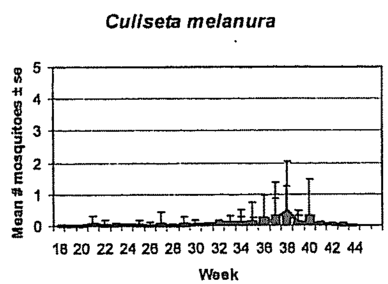
Philadelphia Metro



Pinelands



Suburban Corridor

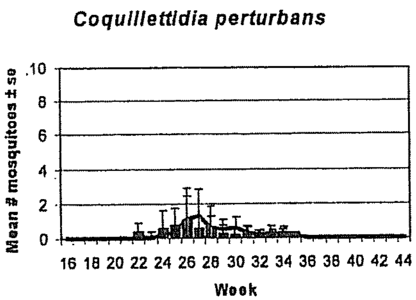


Comments

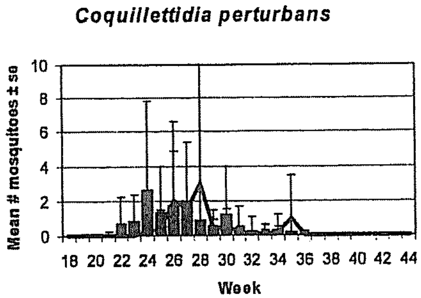
Culiseta melanura populations were higher in the spring than historical trends. There was a noticeable drop in numbers in July (see Agricultural, Coastal, Delaware Bayshore and the Pinelands Regions). This was followed by an increased population late in the season. This pattern is fairly typical of *Cs. melanura*, which generally show increased numbers during the spring and fall.

Figure 26. **Coquillettidia perturbans** – ***Monotypic* (perturbans) *Species***

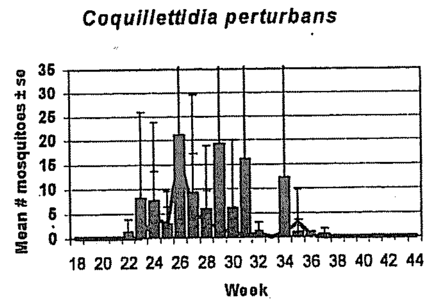
Agricultural



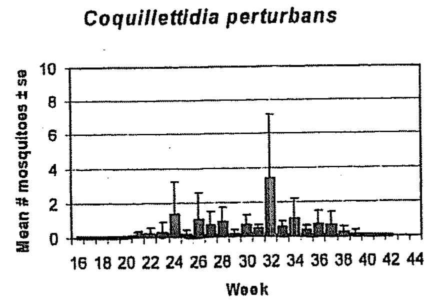
Coastal



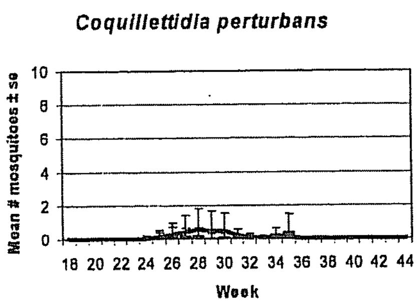
Delaware Bayshore



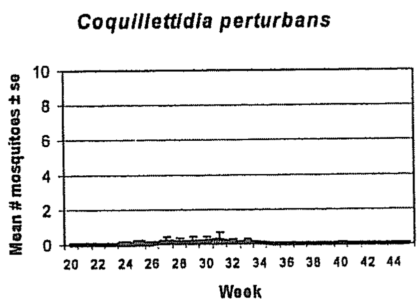
Delaware River Basin



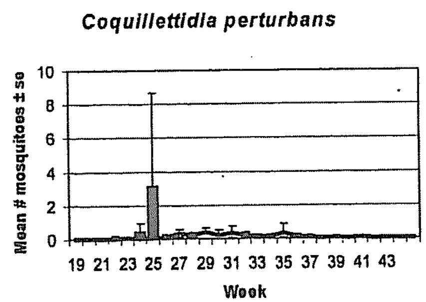
New York Metro



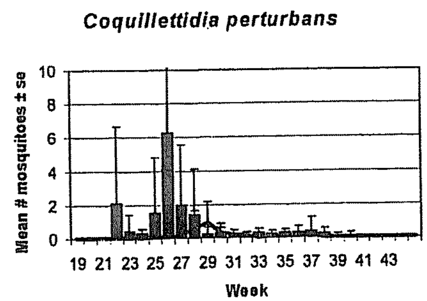
North Central Rural



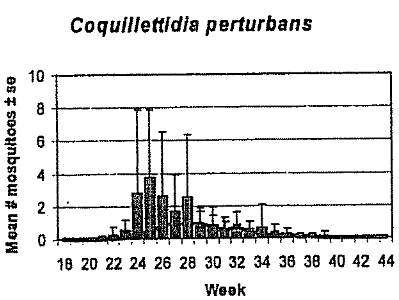
Northwestern Rural



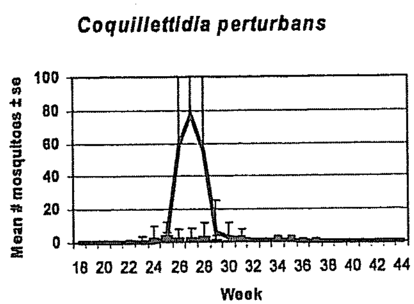
Philadelphia Metro



Pinelands



Suburban Corridor

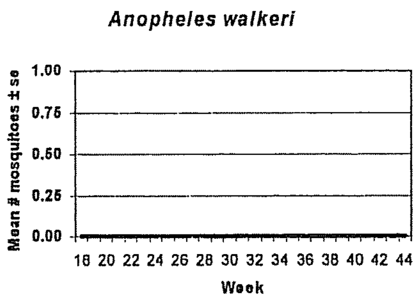


Comments

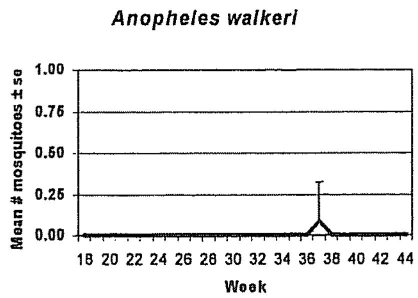
Coquillettidia perturbans is a univoltine species that exhibits a simple extended generation each season. The mosquito overwinters in the larval stage. Each instar emerges as a separate cohort giving the appearance of multiple generations. This year's dataset shows that there is considerable regional variation in the structure of overwintering populations. Evidence for emergence of larvae that overwinter in the 2nd, 3rd, and 4th instars can be seen in most regions. With the exception of the Delaware Bayshore, Delaware River Basin and the Philadelphia Metro Regions, the 4th instar larvae made up the bulk of the overwintering larval form.

Figure 27. Anopheles walkeri – *Monotypic* (walkeri) *Species*

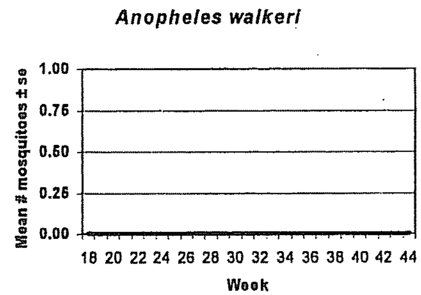
Agricultural



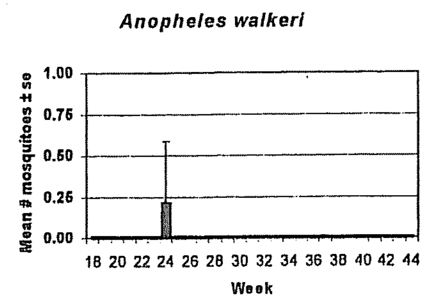
Coastal



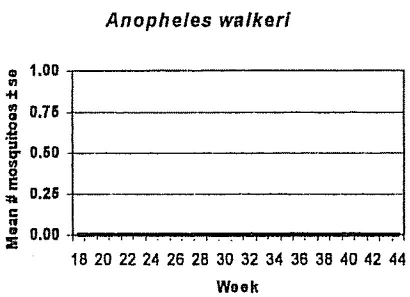
Delaware Bayshore



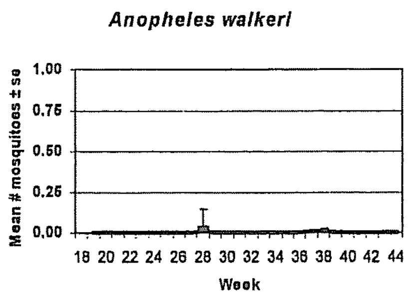
Delaware River Basin



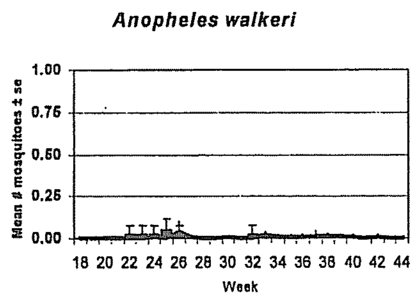
New York Metro



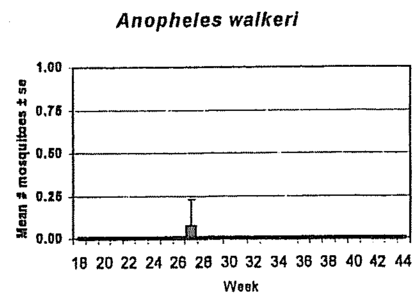
North Central Rural



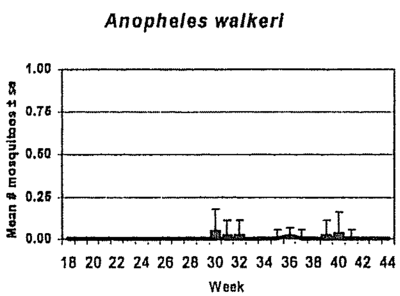
Northwestern Rural



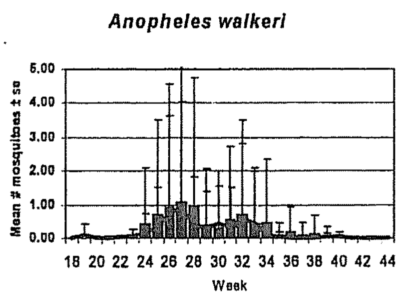
Philadelphia Metro



Pinelands



Suburban Corridor



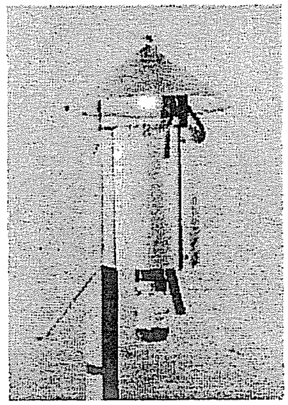
Comments

Anopheles walkeri is an anopheline that overwinters as a winter-hardy egg. As a result, the species appears earlier in the season than other members in this genus. Light trap records from most regions are too low to provide reliable population data. The dataset from the Suburban Corridor shows a typical population curve.

Appendix 1: Key to Common Mosquitoes Found in Light Trap Collections in New Jersey

Key to Common Mosquitoes Found in Light Trap Collections in New Jersey

Wayne J. Crans & Lisa M. Reed
Rutgers the State University of New Jersey



This key was prepared as a training tool for mosquito identification specialists whose primary job is to sort through light trap collections. The key may not be applicable for specimens that were collected as larvae and reared through to the adult stage. Caution should be used for specimens collected during landing rate and bite count collections. A number of species and species complexes that are common in light trap collections have been grouped. *Wyeomyia smithii, and Toxorhynchites rutilus septentrionalis* have not been included because they are not readily attracted to light. For simplification in the identification process, the following rare mosquito species on New Jersey's checklist have been omitted: *An. atropos, An. barberi, An. earlei, Oc. aurifer, Oc. communis, Oc. dorsalis,. Oc. dupreii, Oc. flavescens, Oc. hendersoni, Oc. implicatus, Oc. infirmatus, Oc. intrudens, Oc. mitchellae, Oc. provocans, Oc. spencerii, Oc. thibaulti, Ps. cyanescens, Ps. discolor, Ps. mathesoni, Cx. erraticus, Cx. tarsalis,* and *Cs. minnesotae.* *Aedes albopictus and Oc. japonicus* rarely enter light traps but have been included because of their unique status as introduced exotics and their growing importance as pests

The illustrations were scanned from plates in S.J. Carpenter and W.J. LaCasse 1955. "Mosquitoes of North America (North of Mexico", University of California Press, Berkeley and Los Angeles. Figures pertaining to *Aedes albopictus* and *Ochlerotatus japonicus* were scanned from Tanaka, K, K. Mizusawa and E.S. Saugstad. 1979, "A revision of the adult and larval mosquitoes of Japan (including the Ryukyu Archipelago and the Ogasawara Islands) and Korea", Contributions of the American Entomological Institute, Vol. 16. The enlarged illustrations of wing scales were scanned from John B. Smith's New Jersey State Agricultural Experiment Station report on Mosquitoes, published in 1904.

This research was supported by a grant from the New Jersey State Mosquito Control Commission.

Key to Common Mosquitoes Found in Light Trap Collections in New Jersey

1. Palpi as long as proboscis (Genus *Anopheles*) (Fig. 1 A) 2
   Palpi much shorter than proboscis (Fig. 1B) 5

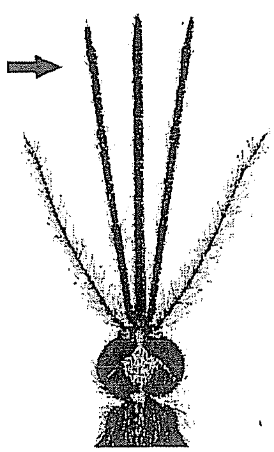


Fig. 1A

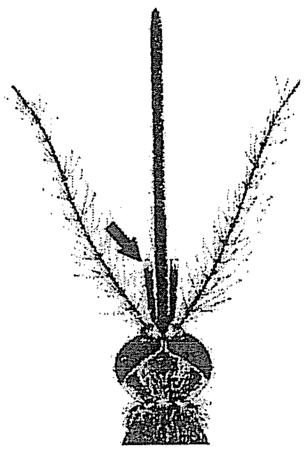


Fig. 1B

2. Wings with one or more small patches of white or coppery colored scales (Fig. 2A) 3
   Wings entirely dark scaled (Fig. 2B) 4

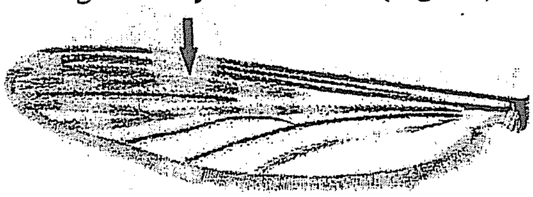


Fig. 2A

Fig. 2B

3. Two patches of light scales on margin of wing (Fig. 3A) ....***Anopheles punctipennis***
   (Note: the palpi are unbanded in this species)
   ....
   One small patch of light scales on margin of wing (Fig, 3B) .....***Anopheles bradleyi/crucians*** (the palpi have white bands in this species)

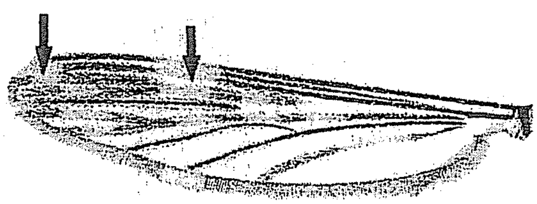


Fig. 3A

Fig. 3B

4. Palpi with narrow white bands (Fig. 4A ....*Anopheles walkeri*
Palpi unbanded (Fig. 4B) ....*Anopheles quadrimaculatus*

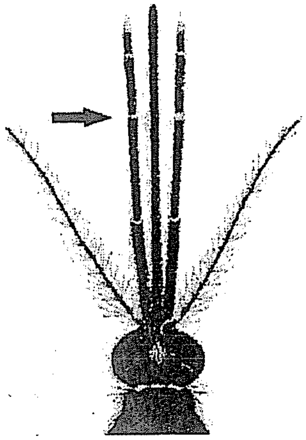


Fig. 4A

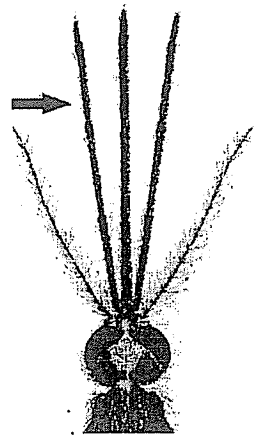


Fig. 4B

5. Abdomen pointed (Fig. 5A)
(Genus *Aedes, Ochlerotatus* and *Psorophora*) 6
Abdomen blunt (Fig. 5B)
(Genus *Culex, Culiseta, Uranotaenia, Orthopodomyia* and *Coquillettidia*) 24

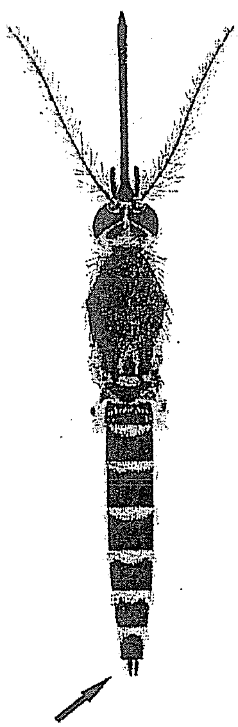


Fig. 5A

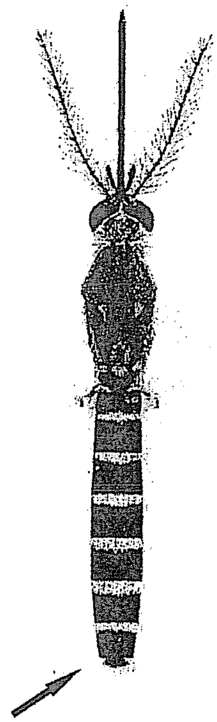


Fig. 5B

6. Large species, head and body 3/8" or larger (Fig. 6A) 7
Small to average size species, head and body less than 3/8" (Fig. 6B)..........8

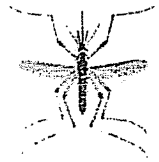


Fig. 6A
Typical size for representative species

Fig. 6B
Maximum size for representative species

7. Abdomen metallic blue in color with narrow pale bands (Fig. 7A) ……***Psorophora howardii***
   Abdomen yellowish in color lacking distinct bands (Fig. 7B)……***Psorophora ciliata***

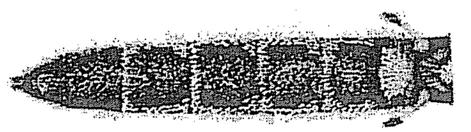


Fig. 7A

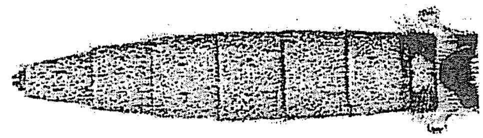


Fig. 7B

8. Hind legs unbanded, tinged with purple and last 2 tarsal segments entirely white (Fig. 8A) ……………………………………………………………***Psorophora ferox***
   Hind legs either banded or dark, but legs not as above ………………………………9

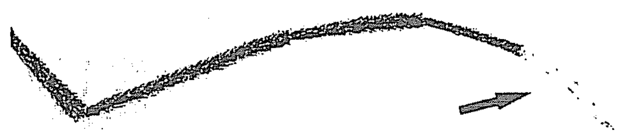


Fig. 8A

9. Tarsi ringed with white bands (Fig. 9A) ……………………………………………10
   Tarsi not ringed with white bands (Fig. 9B ……………………………………20

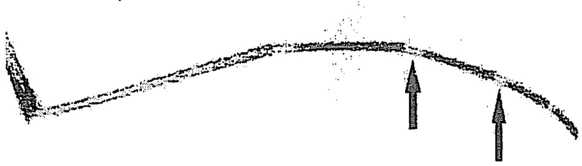


Fig. 9A

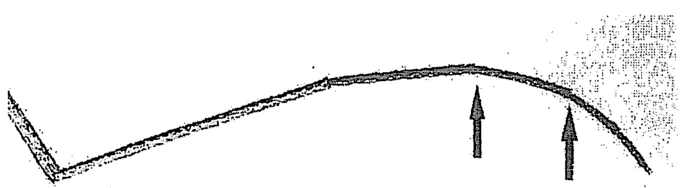


Fig. 9B

10. Tarsal bands overlapping individual segments (Fig. 10A) 11
(Note: this configuration creates bands at both ends of each tarsal segment)
Tarsal bands only on base of individual segments (Fig. 10B) 12

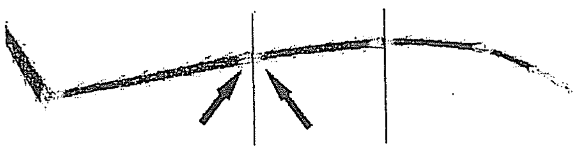


Fig. 10A

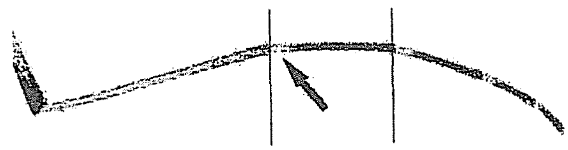


Fig. 10B

11. Wing scales entirely dark (Fig. 11A)..........................***Ochlerotatus canadensis***
Wing scales dark except for a very small patch of white scales on the front of the wing at the base of the costa (Fig. 11B) ....***Ochlerotatus atropalpus***

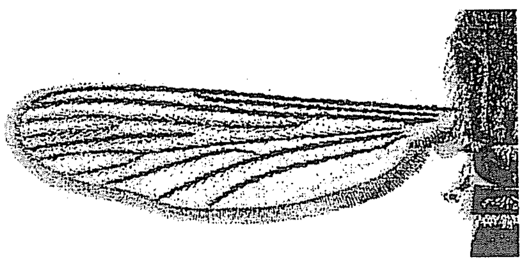


Fig. 11A


Fig. 11B

12. Tarsal bands narrow (Fig. 12A) 13
Tarsal bands broad (Fig. 12B) 14


Fig. 12A

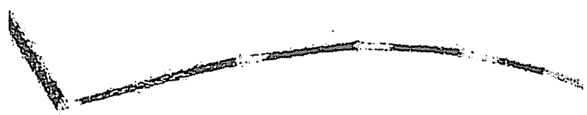


Fig. 12B

13. Abdominal bands with a V-shaped notch, 7th segment largely dark scaled (Fig. 13A) ***Aedes vexans***
Abdominal bands concave rather than notched, 7th segment pale scaled (Fig. 13B)..***Ochlerotatus cantator***

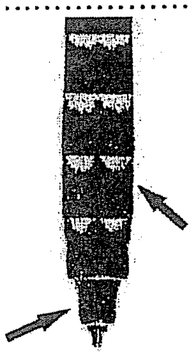


Fig. 13A

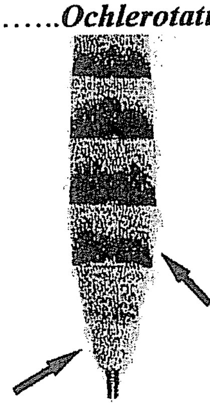


Fig. 13B

14. Proboscis with a pale band near the middle (Fig. 14A) 15
Proboscis unbanded (Fig. 14B) 17

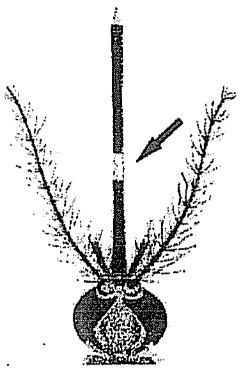


Fig. 14A

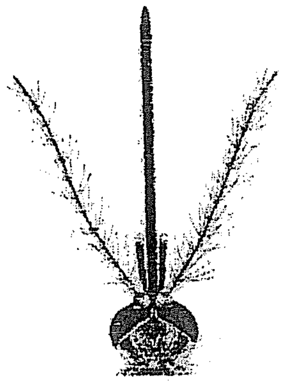


Fig. 14B

15. Bands on the apex of each abdominal segment (end of segment furthest from the head)
(Fig. 15A) ....***Psorophora columbiae***
Bands on the base of each abdominal segment (end of segment closest to the head)
(Fig. 15B) 16

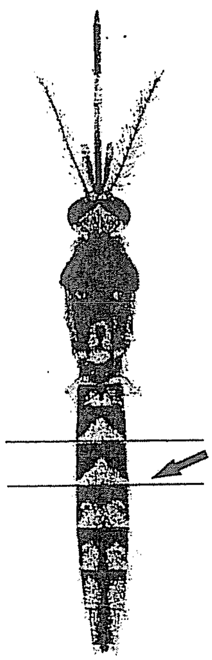


Fig. 15A

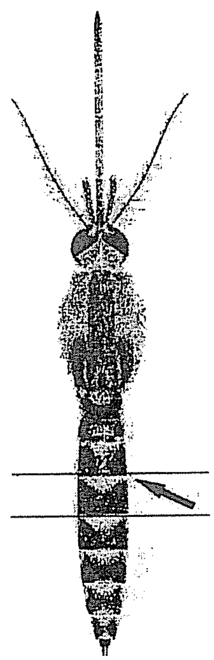


Fig. 15B

16. Abdomen with a longitudinal stripe of pale scales in addition to distinct bands (Fig. 16A) ....***Ochlerotatus sollicitans***
Abdomen with distinct bands but lacks a longitudinal stripe of pale scales (Fig. 16B) ....***Ochlerotatus taeniorhynchus***

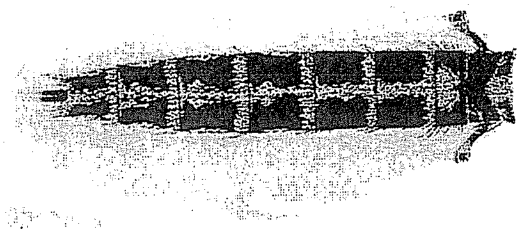


Fig. 16A

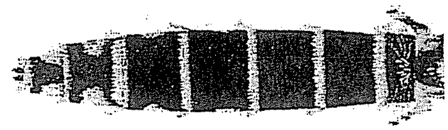


Fig. 16B

17. Thorax with a single white stripe that extends onto the head (Fig. 17A) ....***Aedes albopictus***
Thorax with golden stripes or lacking stripes altogether (Fig. 17B) 18

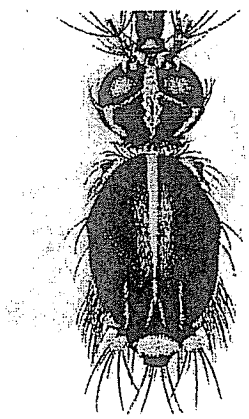


Fig. 17A

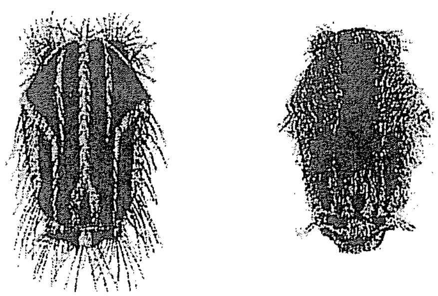


Fig. 17B

18. Multiple golden stripes on the thorax (Fig. 18A) .... ***Ochlerotatus japonicus***
(note: this species also has incomplete abdominal bands that produce bright white patches on the sides of each abdominal segment)
Thorax not ornamented with a striping pattern (Fig. 18B) 19

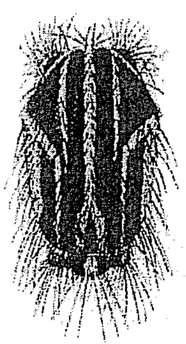


Fig. 18A


Fig. 18B

19. Individual wing scales broad (Fig. 19A) .... ***Ochlerotatus grossbeckii***
(Note: The broad wing scales have a triangular shape in this species)
Individual wing scales narrow (Fig. 19B)........................... ***Ochlerotatus stimulans*** **Group**
(Oc. stimulans, Oc. excrucians, Oc. fitchii)

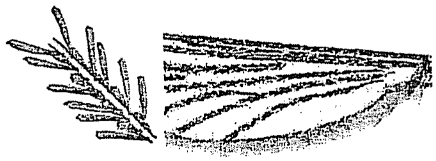


Fig. 19A

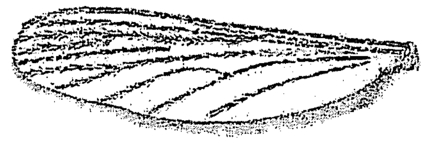


Fig. 19B

20. Thorax with either one or two broad stripes of pale scales down middle (Fig. 20A) 21
Thorax either entirely dark or pale with a dark stripe down the middle (Fig. 20B) 22

Fig. 20A

Fig. 20B

21. Thorax with a single broad stripe of pale scales down middle
(Fig 21A) .... ***Ochlerotatus atlanticus***
Thorax with two broad stripes of pale scales down middle
(Fig. 21B) ....***Ochlerotatus trivittatus***

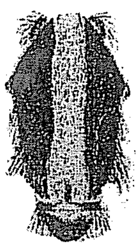


Fig. 21A

Fig. 21B

22. Abdominal bands incomplete (Fig. 22A) .... ***Ochlerotatus triseriatus***
(Note: this species has a distinct black & white color pattern)
Abdominal bands complete (Fig. 22B) 23
(these species are brown rather than black)

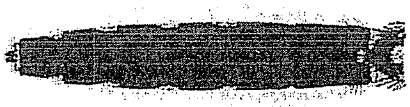


Fig. 22A

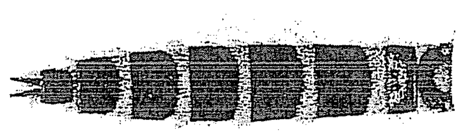


Fig. 22B

23. Relatively small species, 2 dark spots on top of head behind eyes
(Fig. 23A)...***Aedes cinereus***
Medium to large species, lacks dark spots on head behind eyes
(Fig. 23B)............................ .... ***Oclerotatus abserratus/ Ochlerotatus sticticus***

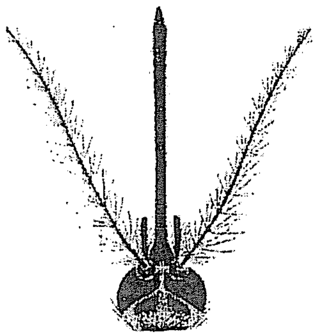


Fig. 23A

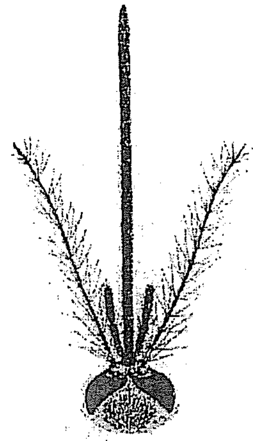


Fig. 23B

24. Very small species with iridescent blue scales on head and thorax
(Fig. 24A) ....***Uranotaenia sapphirina***
Lacks conspicuous iridescent blue scales...25

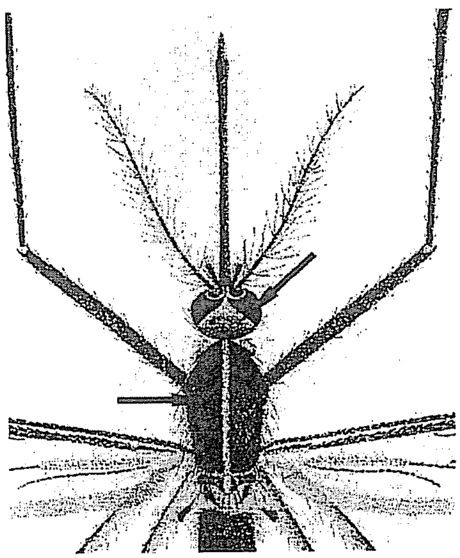


Fig. 24A

25. Tarsi ringed with white bands (Fig. 25A)..26
Tarsi unbanded (Fig. 25B) 28

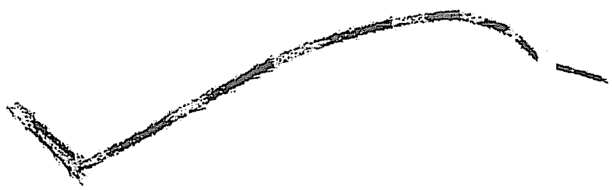
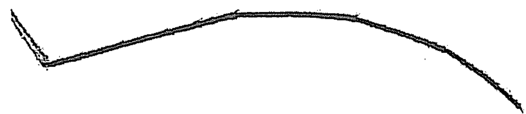



Fig. 25A

Fig. 25B

26. Thorax ornamented with fine lines of white scales
(Fig. 26A).......................................***Orthopodomyia signifera / Orthopodomyia alba***
Thorax without fine lines of white scales 27

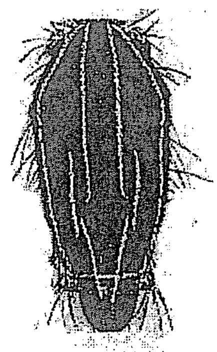


Fig. 26A

27. Tarsal bands broad, white band on proboscis (Fig. 27A).......... ***Coquillettidia perturbans***
Tarsal bands narrow, no band on proboscis (Fig 27B)...................... ***Culiseta morsitans***

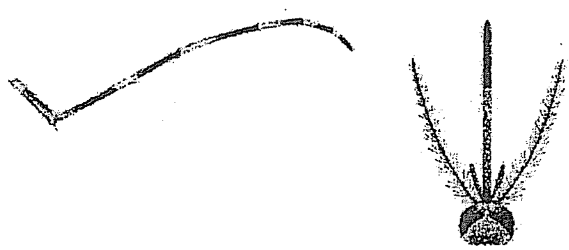
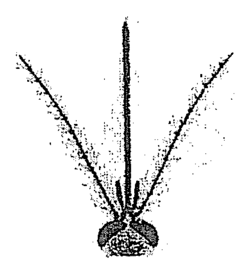



Fig. 27A

Fig. 27B

28. Relatively large species, wing scales mixed dark and light on the forward wing veins (Fig. 28A) .... ***Culiseta inornata***
Average size, wing scales entirely dark (Fig. 28B) 29

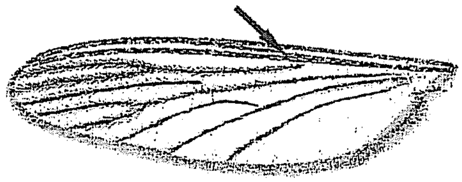


Fig. 28A

Fig. 28B

29. Abdomen dark with a purple coloration, lacks complete pale bands (Fig. 29A) .... ***Culiseta melanura***
Abdomen marked with pale bands that extend completely across the dorsal surface (Fig. 29B)...30

Fig. 29A

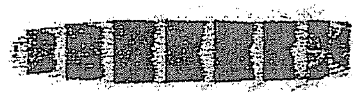


Fig. 29B

30. Bands on the apex of each abdominal segment (end of segment furthest from the head) (Fig.30A)... ***Culex territans***
Bands on the base of each abdominal segment (end of segment closest to the head) (Fig. 30B).....................***Culex* Complex: *Culex pipiens/ Culex restuans/ Culex salinarius***

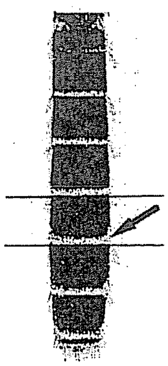


Fig. 30A

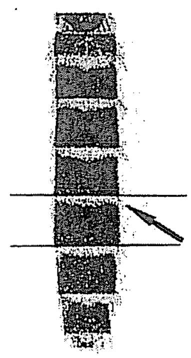


Fig. 30B

(Note : Characters are available to separate species that make up the *Culex* complex but damage to specimens collected in light traps make species identifications unreliable with this group)

Identification Key

"Key to Common Mosquitoes Found in Light Trap Collections in New Jersey."

The identification key for those mosquito species most commonly found in light traps in New Jersey has been developed and sent to mosquito control agencies for comment. The figures used in the key were scanned from original works found in Carpenter and LaCasse (1955) and Tanaka *et al.* (1979). Copyright privileges were granted for all applicable images. Appendix 1.

LITERATURE CITED

Carpenter, S. J. and W. J. LaCasse 1955 Mosquitoes of North American (North of Mexico). University of California Press: Berkeley and Los Angeles.

Crans, W. J. 2004. A classification system for mosquito life cycles: Life cycle types for mosquitoes of the northeastern United States. J. Soc. Vector Ecology June: 1-11.

Mulhern, T. D. 1942 New Jersey mechanical trap for mosquito surveys. New Jersey Experiment Station Circular Number 421

Reed, L. M., Crans, Kent, R., and K. Bartlett. 2003 New Jersey State Surveillance Program, 2002. Proceedings of the NJMCA 90: 45-49.

Tanaka, K. Mizusawa, K. and E. S. Saugstad 1979 A revision of the adult and larval mosquitoes of Japan (including the Ryukyu Archipelago and the Ogasawara Islands) and Korea. Contributions of the American Entomological Institute, Vol 16.

FINANCIAL STATEMENT
FISCAL YEAR 2005

DEPARTMENT OF ENVIRONMENTAL PROTECTION

FY 2004 Mosquito Control, Research, Administration and Operations Appropriation (Account #100-042-4800-076)	$1,500,000.00
FY 2004 State Mosquito Control Commission Allocation	**$1,244,222.00**

PROGRAMS

Administration/Supplies	$ 2,877.55
Airspray Program	$802,706.97
Equipment Maintenance, Repairs and Purchases	$ 59,632.55
Education and Information	$ 3,000.00

MEMORANDUM OF AGREEMENTS

NJDH/SS Mosquito Specimen Testing	$ 89,943.95
Bio-Control Program-Fish	$ 25,000.00
Bio-Control Program-Copepods	$ 9,275.00
Research-Transmission Cycle WNV	$ 7,563.98

PROFESSIONAL SERVICE CONTRACTS – RUTGERS

Vector Surveillance	$172,585.00
Statewide Surveillance	$ 32,530.00
Monitoring of Insecticides	$ 39,107.00

Balance as of 6/30/05 **$ 0.00**

PUBLICATIONS/PRESENTATIONS SUPPORTED BY SMCC
JULY 1, 2004 – JUNE 30, 2005

Bartlett, K. 2004. Mosquito and amphibian associations. Proc. NJ Mosquito Control Assoc. 91:84-85

Bartlett, K. 2005. Mechanisms of mosquito hearing. Proc. NJ Mosquito Control Association. (In Press)

Csorgo, S. Hardsurfacing – What it is and why you should do it. Proc. NJ Mosquito Control Assoc. (In Press).

Crans, W.J. 2004. Mosquito-borne encephalitis in New Jersey in 2003. Proc. NJ Mosquito Control Assoc. 91:29-33.

Crans, W.J. 2005. Mosquito-borne encephalitis in New Jersey. Proc. Northeastern Mosquito Control Assoc. 50:9-14.

Crans, W.J. 2005. Mosquito-borne encephalitis in New Jersey. Proc. NJ Mosquito Control Association. (In Press)

Farajollahi, A. 2005. Seasonal dynamics of *Culex pipiens* in New Jersey and its role as an overwintering reservoir for West Nile virus. Proc. Northeastern Mosquito Control Assoc. 50:22-23.

Greuner, J.L. 2004. Tips for mosquito surveillance on horse farms. Proc. NJ Mosquito Control Assoc. 91:9-11.

Gruener, J.L., W.J. Crans and L. McCuiston. 2004 Identification and ecology of the mosquito vectors of West Nile virus to horses in New Jersey. Proc. NJ Mosquito Control Assoc. 91:47-52.

Kent, R. 2004. The New Jersey State Mosquito Control Commission and the Office of Mosquito Control Coordination, 2003. Proc. NJ Mosquito Control Assoc. 91:3-5

Kent, R. Report of the State Mosquito Control Commission and the Office Of Mosquito Control Coordination. Proc. NJ Mosquito Control Assoc. (In Press).

Kent, R. Mosquito Commissions on Mosquito Departments – A State Perspective. Proc. NJ Mosquito Control Assoc. (In Press).

Meyer, R. 2004. Ambient Sampling and Analysis of Pesticide Used in Adult Mosquito Control: Residual Pesticide Monitoring in Bergen County. Proc. NJ Mosquito Control Asso. 91:72-76

Meyer, R. and A. Rush – Monitoring Mosquito Control Pesticides: Goals and Progress. Proc. NJ Mosquito Control Assoc. (In Press).

Puelle, R.S. 2004. Risk analysis for field scientists involved with eastern equine encephalitis virus surveillance programs. Proc. NJ Mosquito Control Assoc. 91:53.

Rainey, T. 2004. *Culex* populations and West Nile activity in Hunterdon County. Proc. NJ Mosquito Control Assoc. 91:39-41.

Rainey. 2005. Preliminary comparison and evaluation of RAMP with RT-PCR for use as arbovirus surveillance tools in New Jersey mosquito control programs. Proc. NJ Mosquito Control Assoc. (In Press).

Reed, L.M. and R.S. Puelle. 2004. West Nile virus: ecological survey of New Jersey wildlife using blocking ELISA. Proc. NJ Mosquito Control Assoc. 91:42-46.

Reed, L.M., W.J. Crans and R. Kent. 2004. The New Jersey State Surveillance Program, 2003. Proc. NJ Mosquito Control Assoc. 91:56-68.

Reed, L.M. 2005. The NJ state surveillance program, 2004. Proc. NJ Mosquito Control Assoc. (In Press).

Reed, L.M., W.J. Crans and R. Kent. Update on the NJ Surveillance Program Presentation. 50th Annual Meeting of the Northeastern Mosquito Control Association, Inc.