NEW JERSEY STATE MOSQUITO CONTROL COMMISSION

A STATE MOSQUITO SURVEILLANCE PROGRAM FOR NEW JERSEY

FINAL WEEKLY REPORT FOR 2009 – SPECIES SUMMARIES

Prepared by:
Lisa Reed and Scott Crans
Center for Vector Biology, Rutgers
180 Jones Avenue
New Brunswick, NJ 08901-8536
Tel 732/993-5342
Fax 888/504-2379
E-mail lreed@rci.rutgers.edu

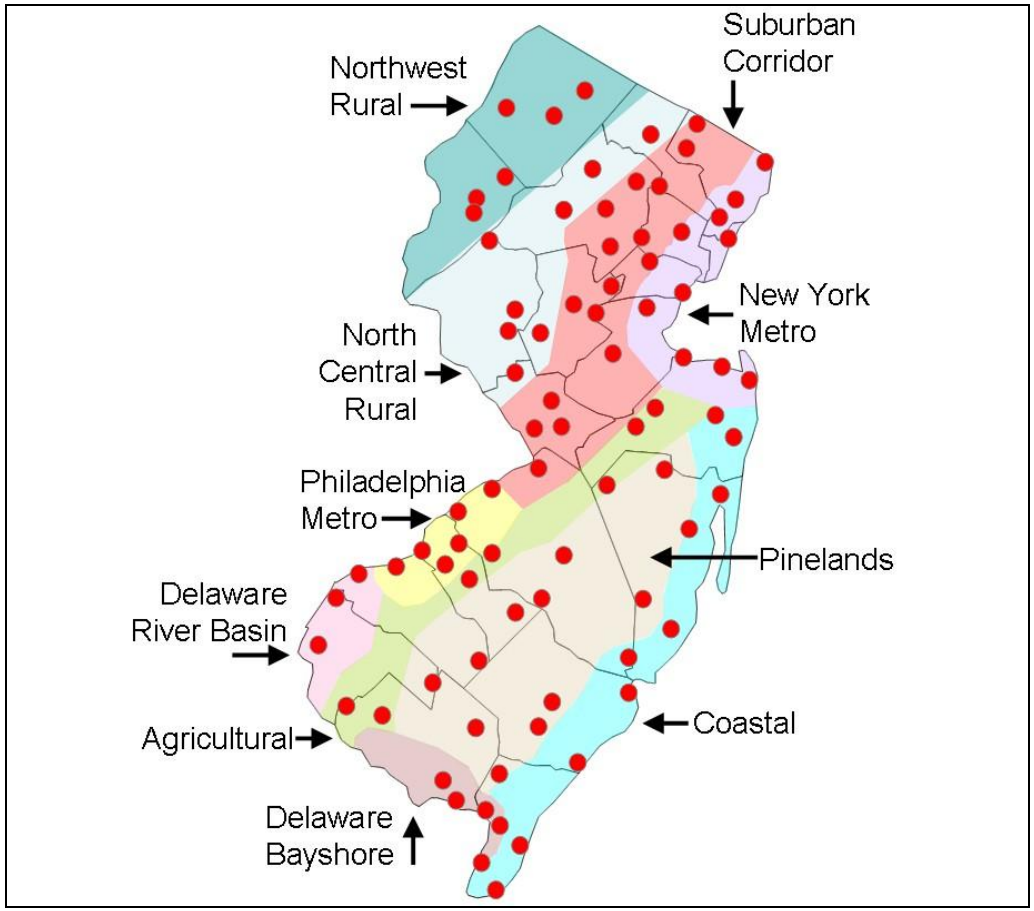
RUTGERS
New Jersey Agricultural Experiment Station

NEW JERSEY STATE SURVEILLANCE

Final Weekly Report for 2009

Purpose: Data from 84 New Jersey light traps contributed by county mosquito control agencies are used to calculate trends in mosquito populations for species of nuisance or health concerns.

Calculations are based on regional distributions, with emphasis on mosquito habitat and land use. Trends will allow a statewide evaluation of changing mosquito populations, in response to control and/or changes in habitat.



The State Surveillance Program Overview
In New Jersey, county-level mosquito control agencies use New Jersey light traps to monitor certain nuisance and health-risk mosquito species. Agencies have many years worth of experience in the placement, use, and interpretation of light traps and their data as monitoring mosquito populations is an essential part of an integrated pest management approach. But county agencies are limited to county data, and a landscape-wide view of changing mosquito trends is not available. The purpose of this program is to cover that gap and provide information of nuisance and health-risk mosquito populations on a regional level.

The 2009 Season: Nineteen of the 21 county mosquito control agencies participated in this program during the season. Most agencies provided data in a timely matter. However, at times, most agencies were occasionally pressed to get the data to Headlee Labs. Therefore, interpretation of the data is more robust for the previous week's report than during the current week. Care must be taken with the interpretation of the most current week's data.

During 2009, 36 mosquito species were identified out of the 237,436 individual mosquitoes caught in the statewide surveillance light trap network throughout New Jersey. This number appears to be within the range from recent years (between 100,000 and 300,000 individuals). No *Anopheles earlei* were trapped, and those species with less than 10 individuals trapped for the entire season includes *Aedes abserratus, Ae. atropalpus, Ae. barberi,* and *Psorophora howardii.*

The Coastal and Pinelands collected a wider variety of mosquitoes than did other regions. This is different than several times in the past where the Suburban Corridor instead of the Pinelands collected more species. Also, the number of traps set in each region was significantly correlated with the number of species found (Table 1. Pearson's $r=0.671$, $n=10$, $p < 0.02$) but the correlation was not "tight" so that the suburban corridor, with the most number of traps actually caught fewer species this year. It was, however, the region with the largest number of individuals trapped (at 43,280) yet the number of traps used did not correlate with the number of mosquitoes caught (Pearson's $r=0.55$, $p>0.05$). The second most abundant numbers caught was in the Northwestern Rural region, with only 7 traps.

Table 1. Number of county traps used in each region with the number of mosquito species identified in the traps.

Region	***Number of Traps***	***Number of Species***	***Number of Mosquitoes***
Agricultural	6	26	7,134
Coastal	9	30	39,902
Delaware Bayshore	6	23	35,626
Delaware River Basin	2	15	6,538
New York Metro	10	25	26,493
North Central Rural	8	20	4,281
Northwestern Rural	7	22	40,294
Philadelphia Metro	6	22	13,743
Pinelands	11	29	20,145
Suburban	17	27	43,280
Statewide Total	82	36	237,436

The most abundant species caught statewide were the *Culex* Mixed (including *Cx. pipiens, Cx. salinarius* and *Cx. restuans*), *Aedes vexans, Ae. sollicitans* and *Ae. cantator* (Figure 1). In half of the 10 regions, the Mixed *Culex* populations were in greatest number. In the other half of the regions, *Ae. vexans* was the predominant species. *Ae. sollicitans* is a significant pest in 5 of the regions. In some previous years, this species has been outnumbered by *Ae. cantator* or *An. bradleyi* in regions that *Ae. sollicitans* has dominated.

A calibration class in the spring prior to the 2009 mosquito season was offered to any county that wished to learn about the proper maintenance and calibration of light traps of which several counties attended. Cleaned and calibrated traps confer compatibility of the datasets.

Figure 1. Cumulative totals for light trap species statewide and Top Ten for each region, 2009.

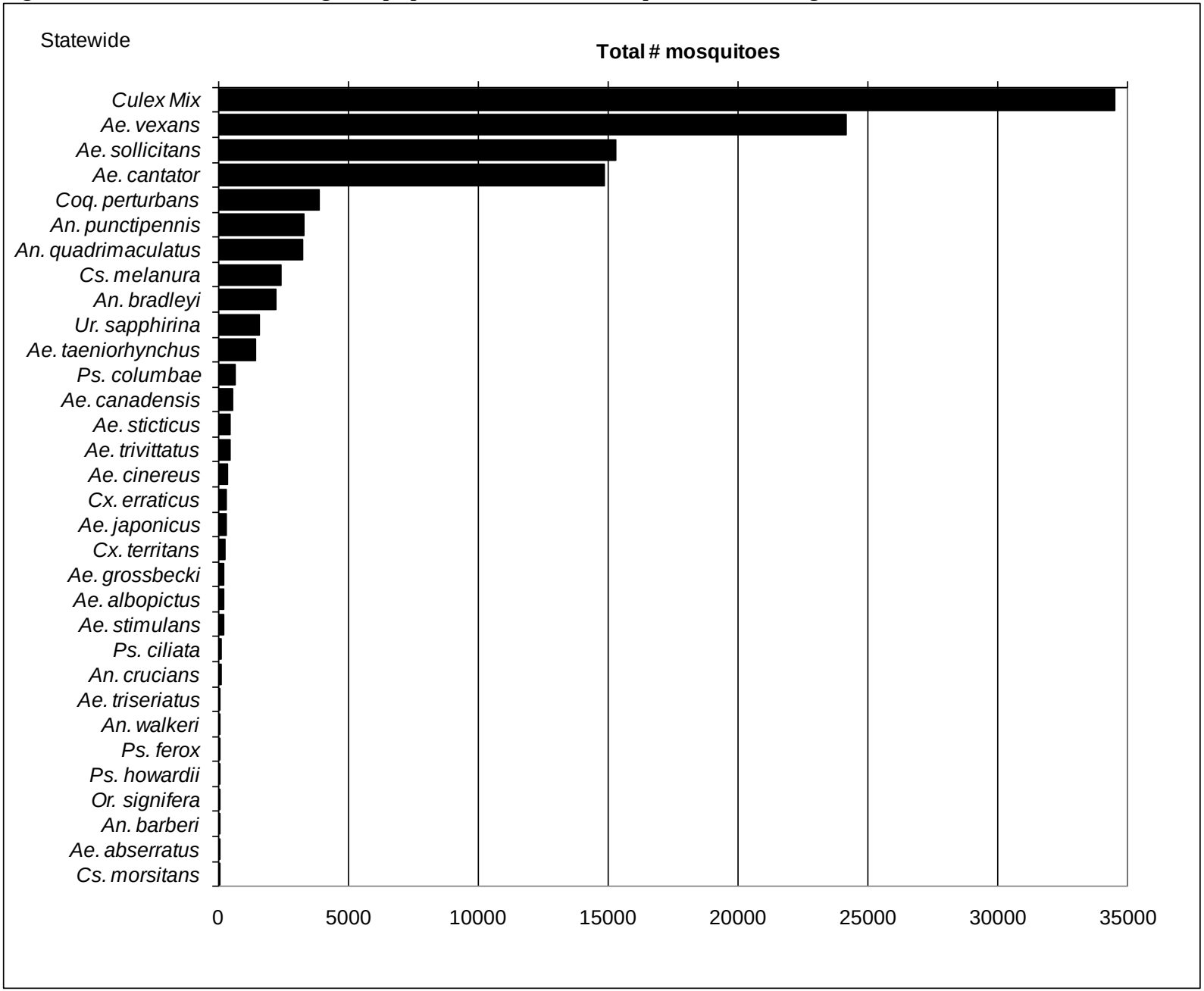


Figure 2. Agricultural Region.

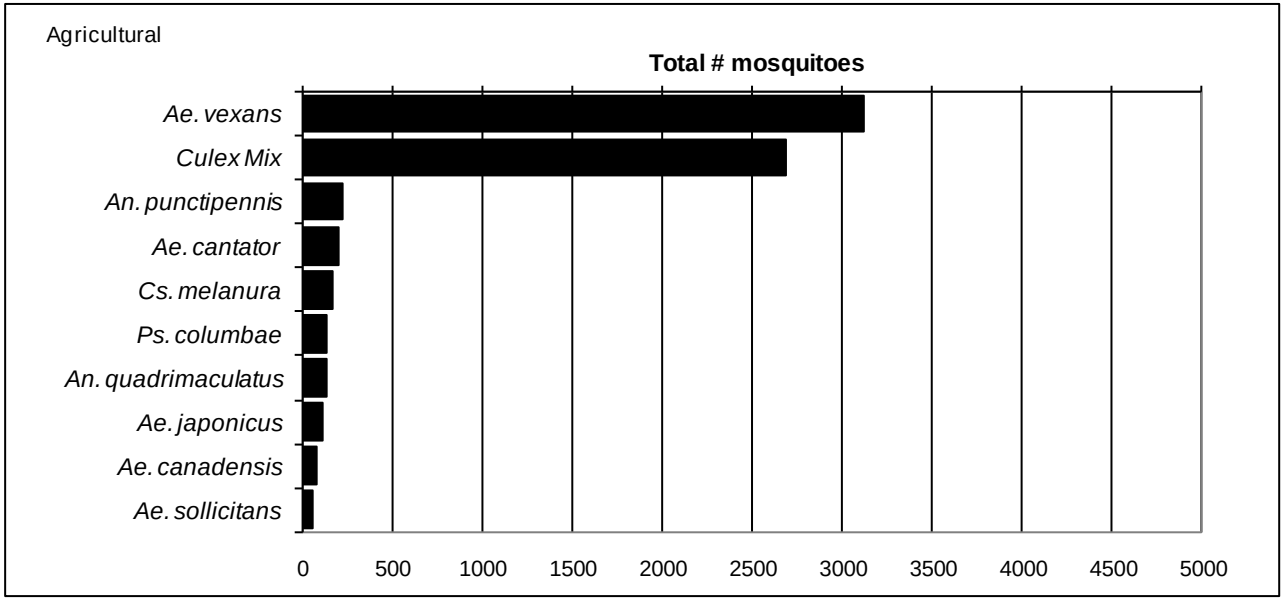


Figure 3. Coastal Region.

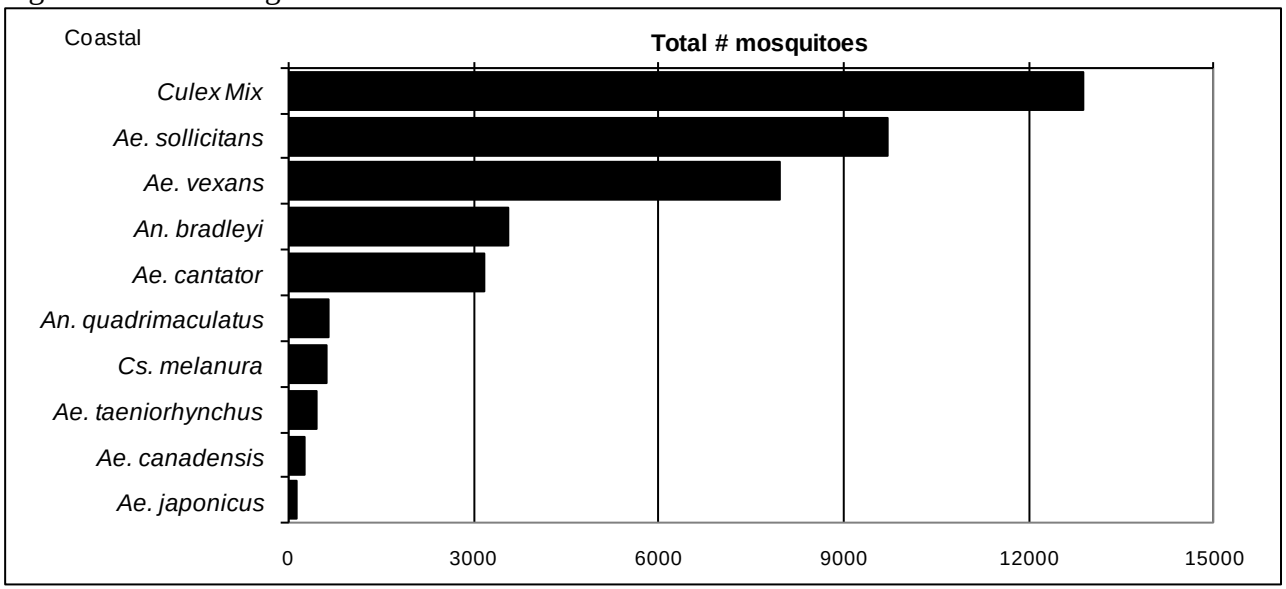


Figure 4. Delaware Bayshore Region.

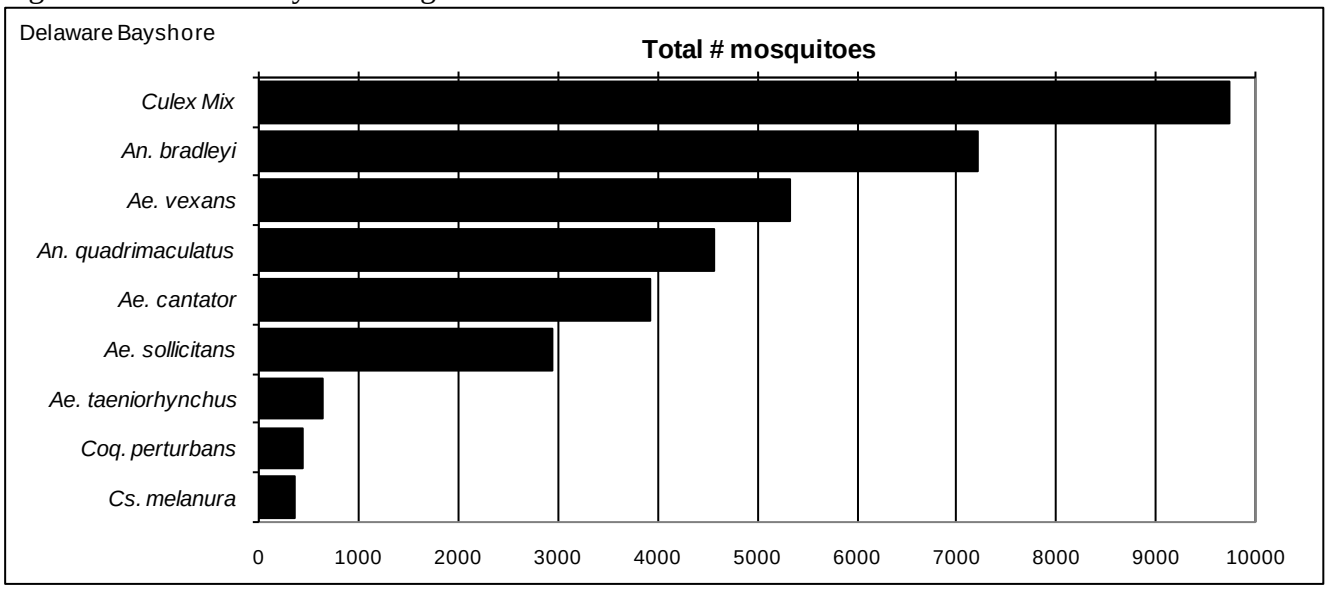


Figure 5. Delaware River Basin Region.

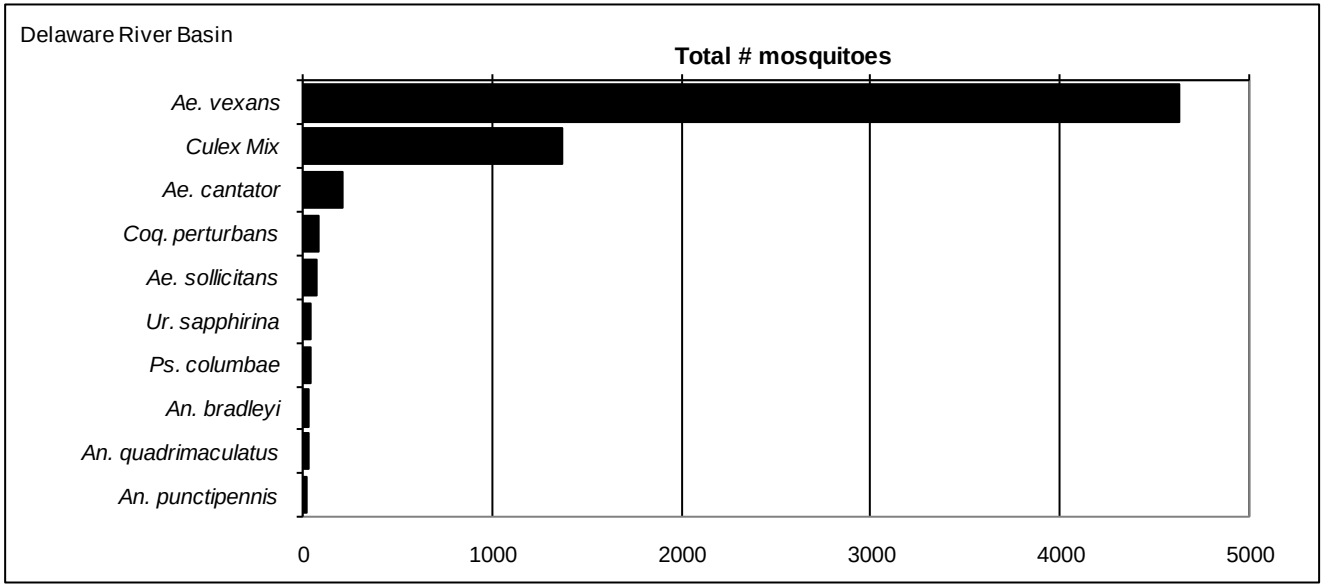


Figure 6. New York Metropolitan Region.

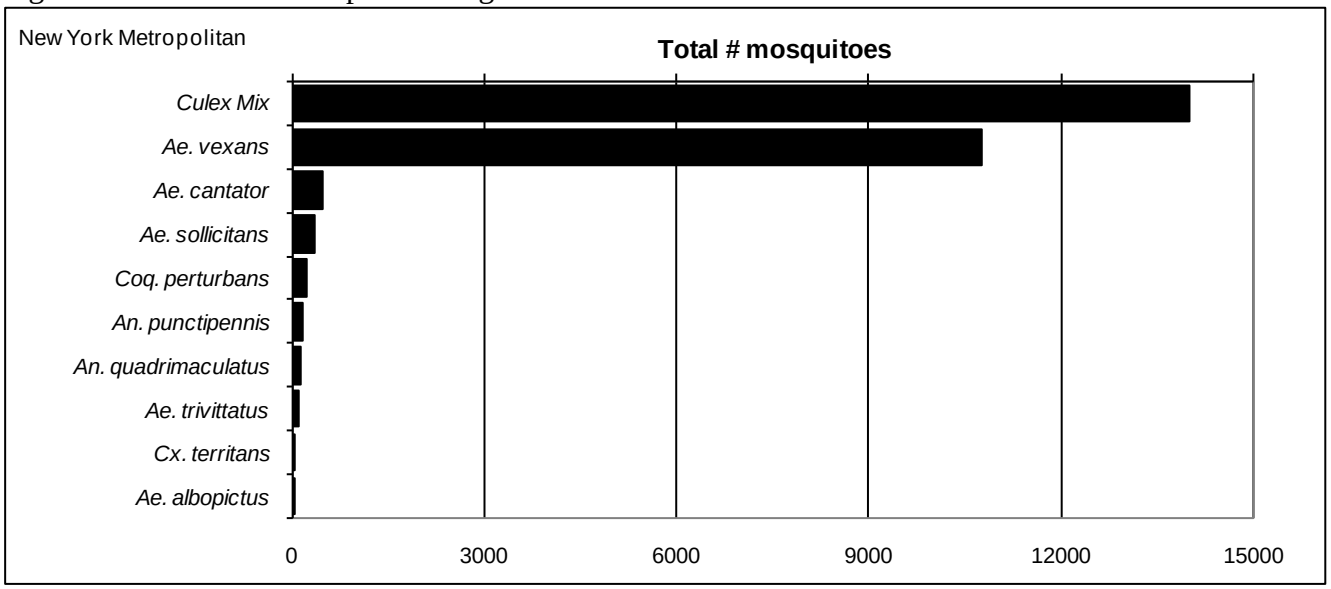


Figure 7. North Central Region.

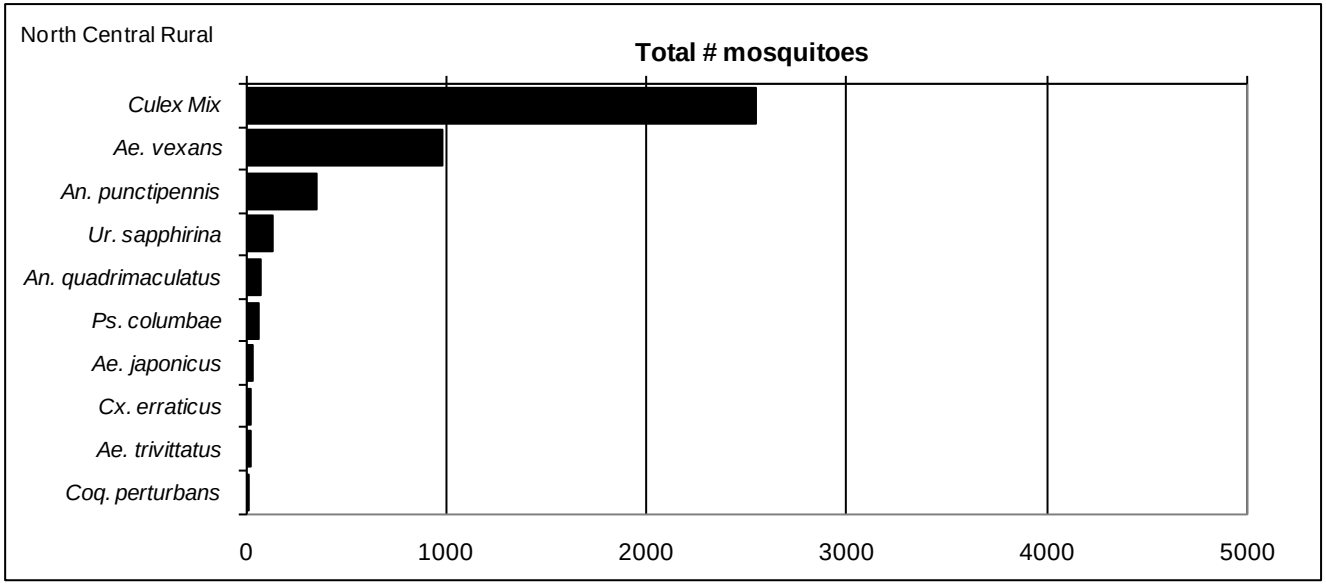


Figure 8. Northwestern Rural Region.

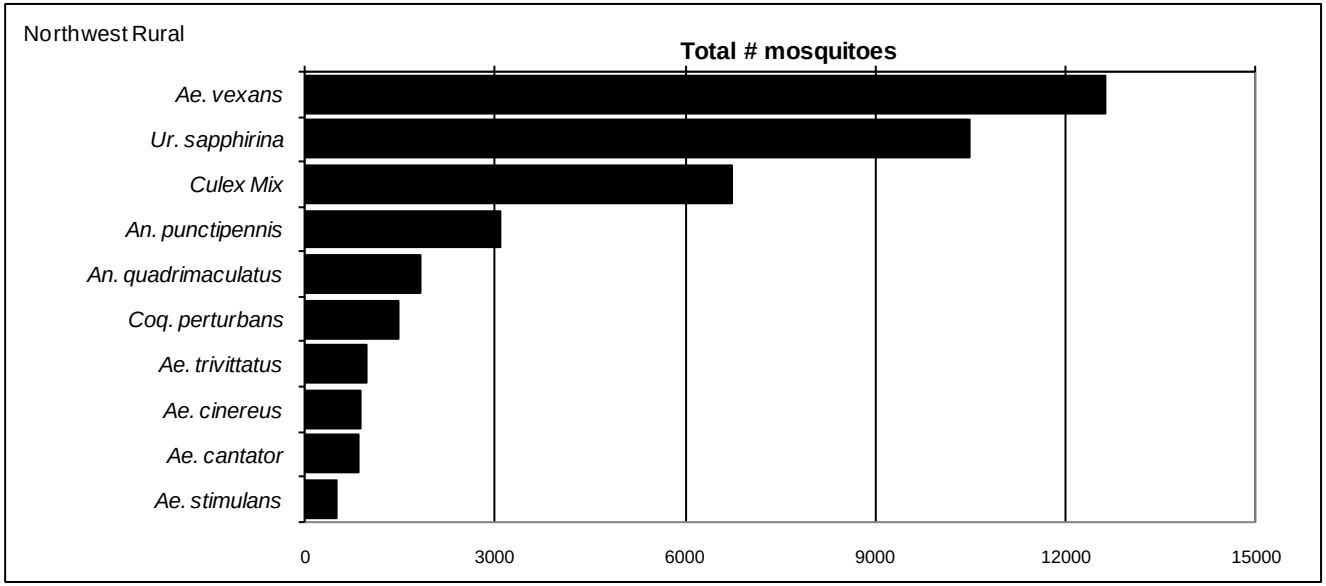


Figure 9. Philadelphia Metropolitan Region.

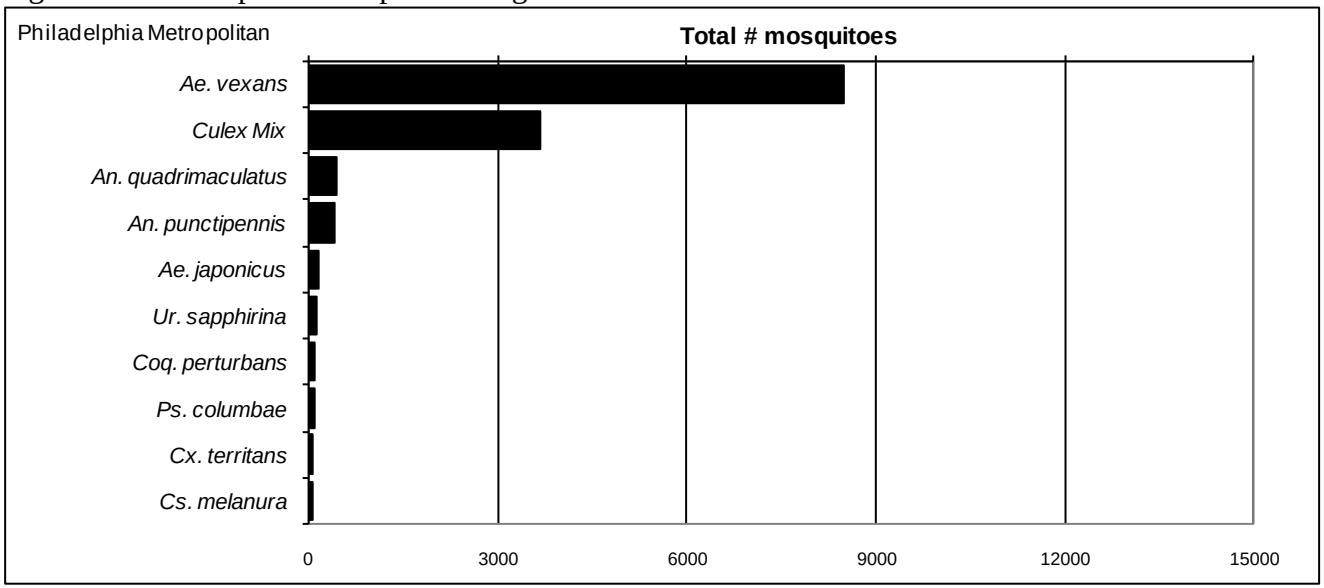


Figure 10. Pinelands Region.

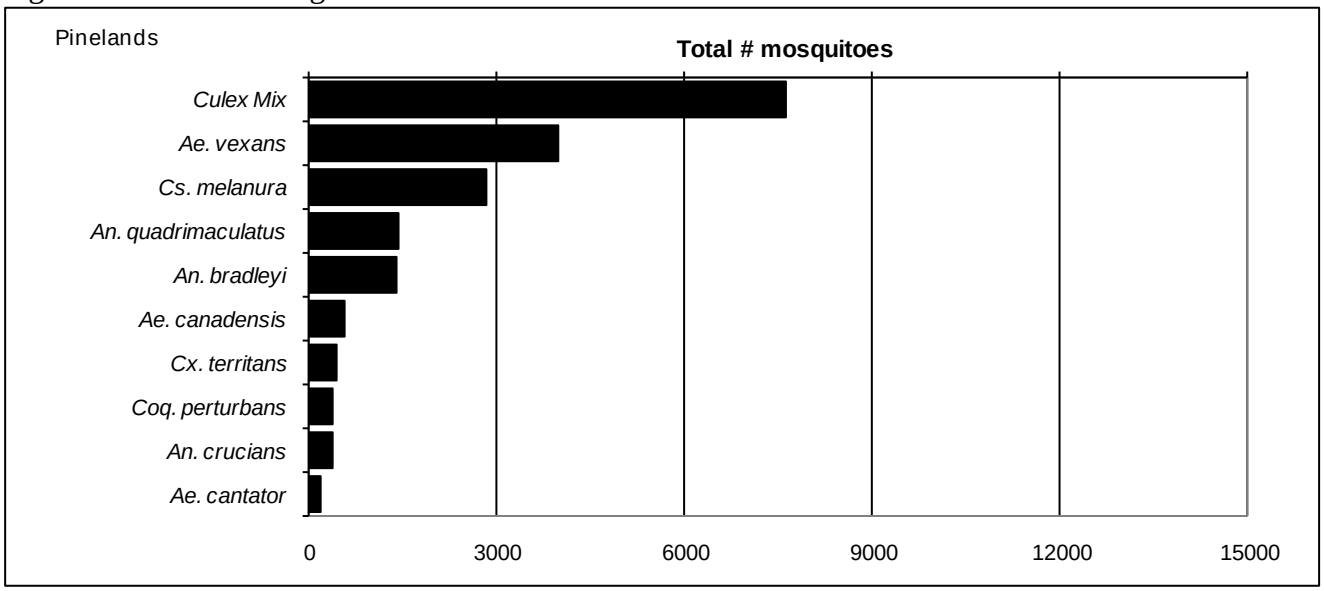
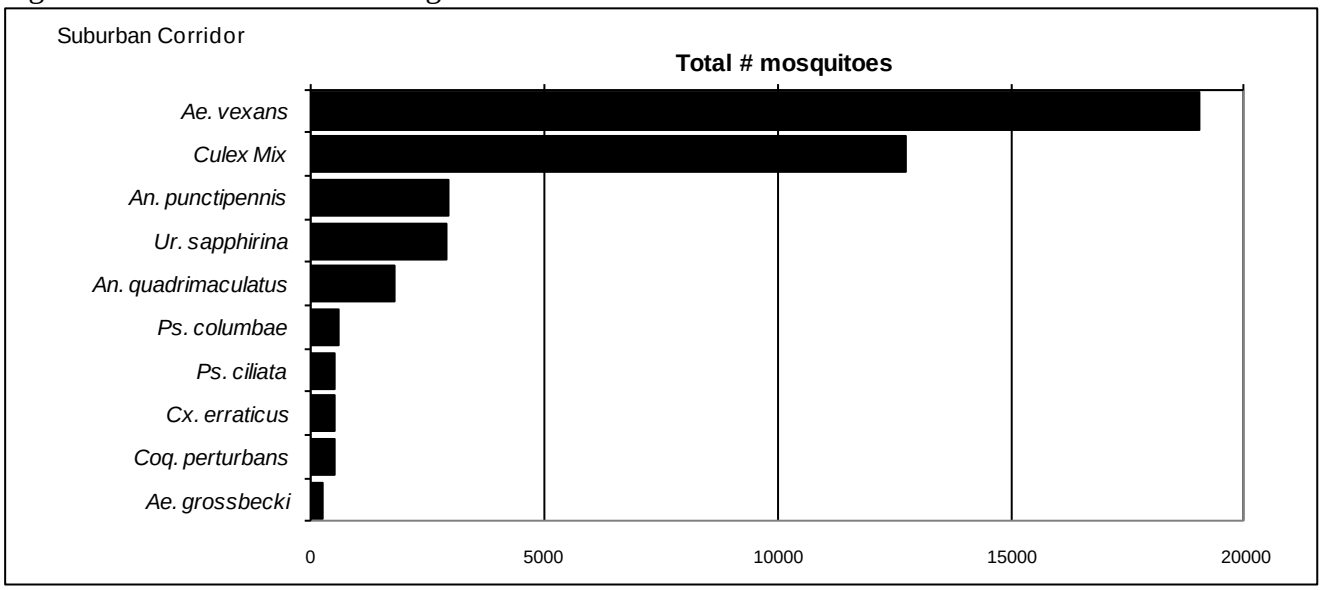


Figure 11. Suburban Corridor Region.



Figures 12-38: Species Summaries. The mosquitoes collected in county operated light traps belong to a series of very different life cycle types as described by Crans (2004). We present the seasonal data for the 27 species from 2009 in the life cycle types below. Historical data was entered for all regions as a running mean encompassing the previous five years. For some regions, historical data is based on fewer than 5 traps. By next year, most of the historical data will be based on the running mean of 5 years as the current dataset becomes incorporated into the historical dataset. Historical data is represented by a solid red line, plotted with error bars, against the black bars of the 2009 dataset.

Univoltine Aedine (*stimulans/canadensis*) Species: 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, the eggs lain 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. Mosquito species collected in light traps that belong to this group include: *Ae. stimulans, Ae. grossbecki, Ae. canadensis, Ae. cinereus* & *Ae. sticticus*. (Figures 12-16).

Multivoltine Aedine (*vexans*) Species: 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, Ae. trivittatus, Ps. columbiae, Ps. ciliata* & *Ps. ferox,* (Figures 17-21).

Multivoltine Aedine (*sollicitans*) Species: 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, biting populations can include mosquitoes of mixed age. Mosquito species collected in light traps that belong to this group include: *Ae. sollicitans, Ae. cantator* & *Ae. teaniorhynchus*. (Figures 22-24).

Multivoltine Aedine (*triseriatus*) Species: These 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 are enter light traps in very low numbers. Mosquito species collected in light traps that belong to this group include: *Ae. triseriatus, Ae. japonicus* & *Ae. albopictus*. (Figures 25-27).

Multivoltine Culex/Anopheline (*quadrimaculatus) Species*: Members that belong to this group have a life cycle strategy that is very similar to the Multivoltine *Culex*. They overwinter as mated females and 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: A*n. quadrimaculatus, Uranotaenia sapphirina, Cx. erraticus* & *Cx. territans*. (Figures 28-31).

Multivoltine Culex/Anopheline (*salinarius*) Species: Members of this group overwinter as mated females that will lay eggs in a variety of brackish water, showing a wide degree of salt tolerance. Larvae generally reach highest numbers in brackish water and with multiple generations, the populations can build throughout the season. *An. bradleyi* is an example of this type. *note* *Culex salinarius* is grouped with the Culex Complex due to the difficulty in distinguishing this species with *Culex pipiens* and *Culex restuans*. (Figure 32).

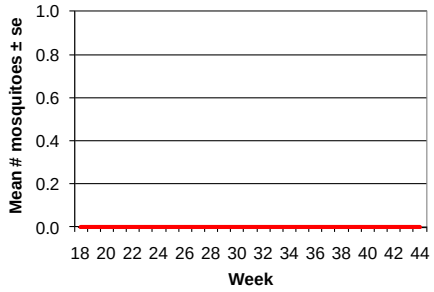
Multivoltine Culex/Anopheline (*pipiens*) Species: Members that belong to this group overwinter as mated females. Populations in early spring are represented by mosquitoes that survived the winter and the numbers are at relatively low levels. These mosquitoes cannot become active until night time temperatures 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 a t 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: The *Culex* Complex, *An. punctipennis* (Figures 33-34).

Miscellaneous Group: The members in this group have little in common because each utilizes a unique life cycle strategy. The mosquito species collected in light traps that we have included in the group include: *Cs. melanura* & *An. crucians* (*Cs. melanura* type*), Cq. perturbans (Cq. perturbans* type*), & An. walkeri (An. walkeri* type*).* (Figures 35-38).

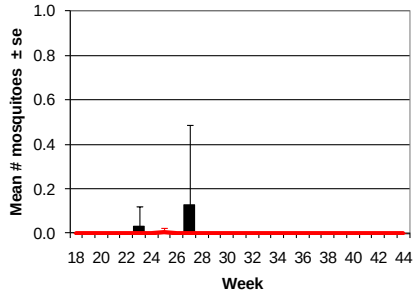
Figure 12.

Aedes stimulans – Univoltine *Aedine* (*Ae. stimulans* Type)

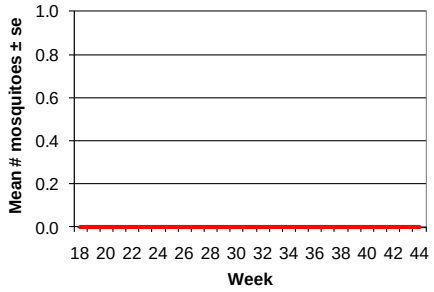
Agricultural



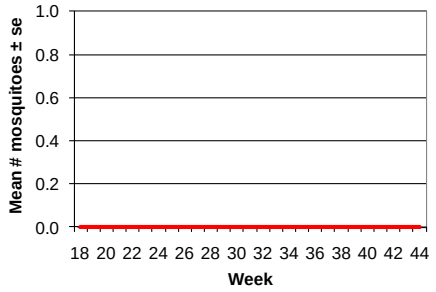
Coastal



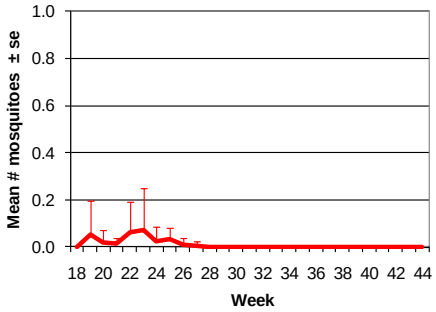
Delaware Bayshore



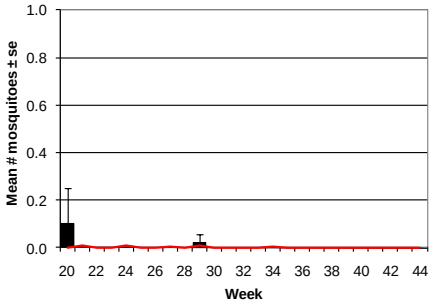
Delaware River Basin



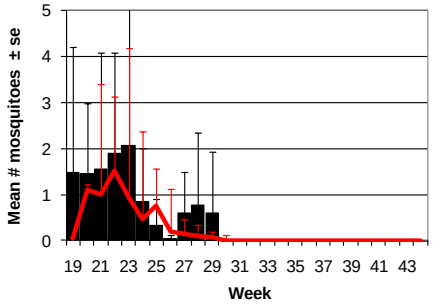
New York Metro



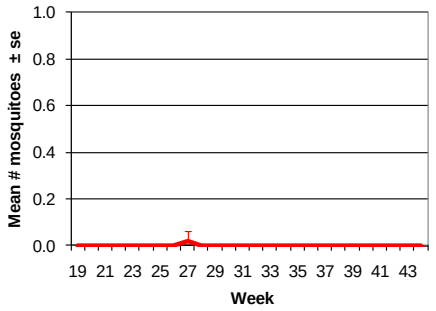
North Central Rural



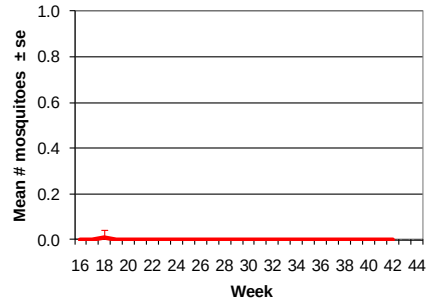
Northwestern Rural



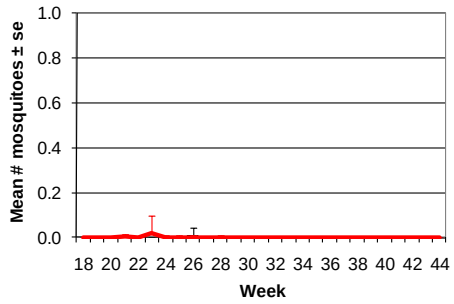
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

The snowpool mosquito, *Aedes stimulans* is appropriately named as it is found in woodland pools of the northeastern US and southwestern Canada. Here in New Jersey, the region with the most predictable populations is the Northwestern Rural. This cold tolerant mosquito develop from overwintering eggs in pools until in early spring when surrounding woodland trees develop leaves and subsequently drain the pools and force *Ae. stimulans* to emerge quickly. Thus, it may be on the wing before this surveillance program begins. The current year pattern in the Northwestern Rural region is typical for this species. Last year, *Ae. stimulans* showed up in number also in the New York Metro region, but this did not happen again this year.

Figure 13.

Aedes grossbecki – Univoltine *Aedine* (*Ae. stimulans* Type)

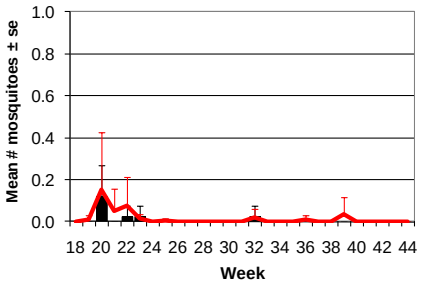
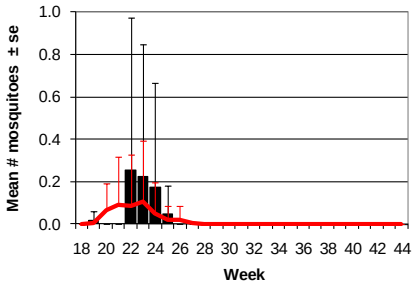
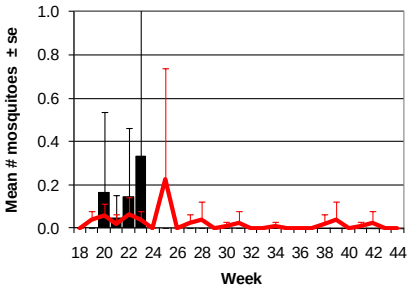
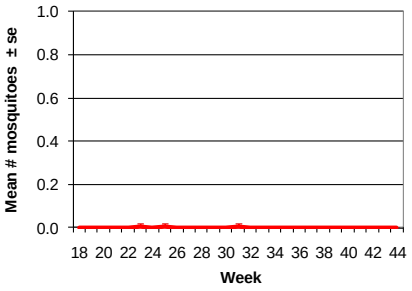
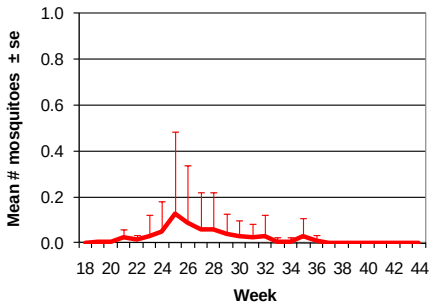
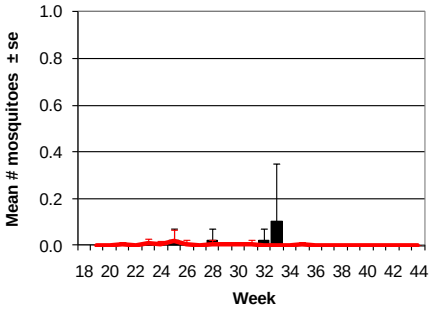
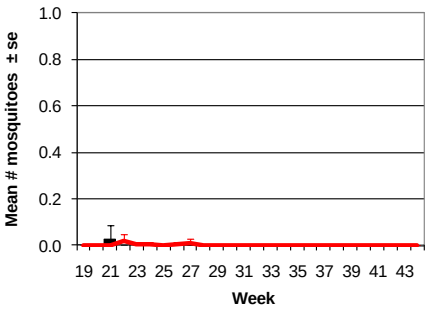
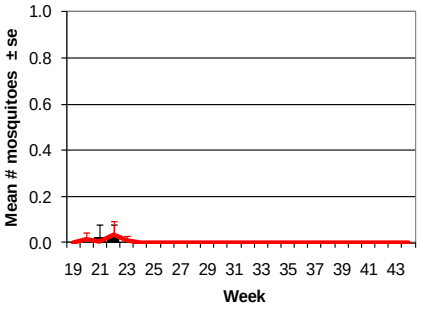
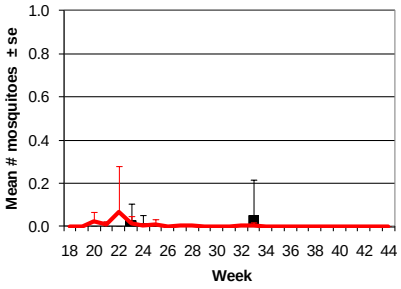
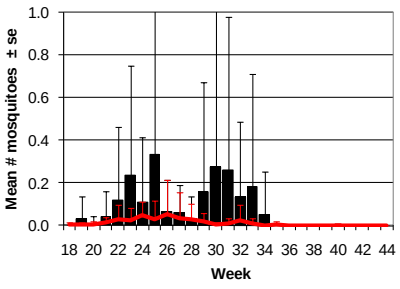
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes grossbecki*, an early to mid-season mosquito, is found in all regions of New Jersey, but with varying abundance, likely due to the majority of its distribution is in the southeast US. Previously, higher abundances were found in the Delaware Bayshore and New York Metropolitan regions. This year, the Suburban Corridor is the region showing the most abundance. This species is considered a "minor" pest because although it may have a noticeable bite, its overall numbers tend to be low with a muted distribution.	

Figure 14.

Aedes canadensis – Univoltine Aedine (*Aedes canadensis* Type)

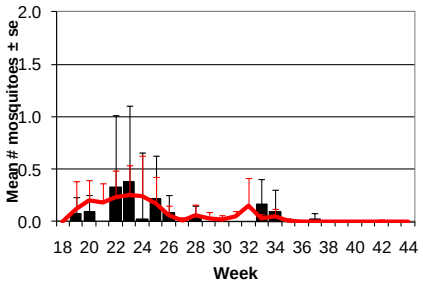
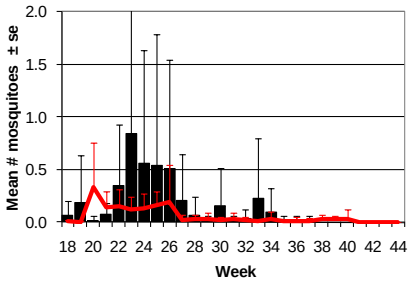
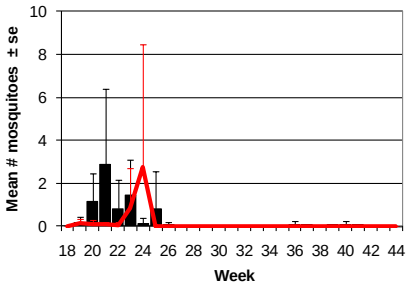
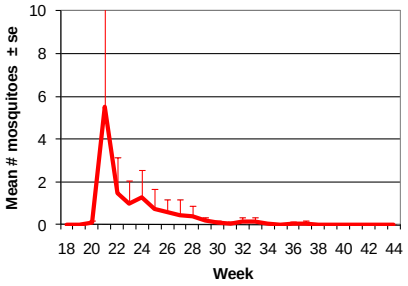
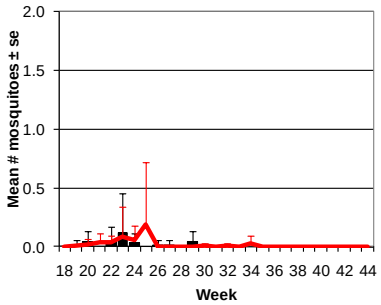
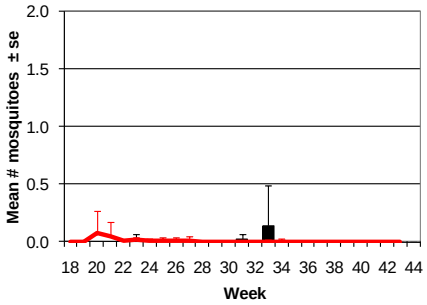
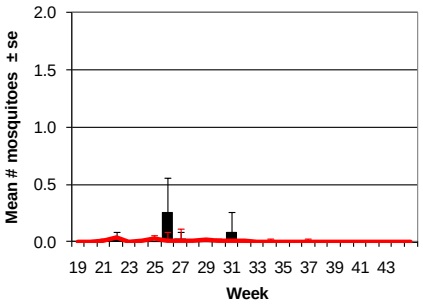
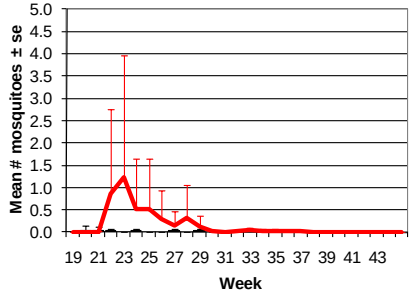
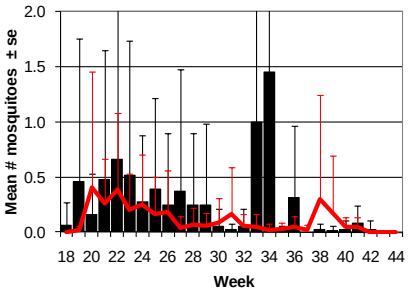
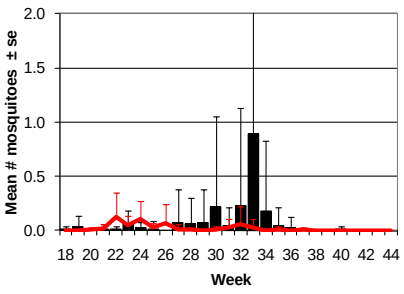
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes canadensis canadensis* experienced higher than historical trends in the Coastal region as well as the Delaware Bayshore region. This species is an early season univoltine mosquito found throughout New Jersey, often with a late season emergence. These later waves of *Ae. canadensis* are not a second generation: this species is not considered to be multivoltine in New Jersey and thus the source of later emergences are eggs that failed to hatch early in the year. If flooding events are greater than events that initiated the spring emergence, then the smaller, late season emergence will occur. This occurred most notably for the Pinelands and the Suburban Corridor regions.	

Figure 15.

Aedes cinereus – Univoltine Aedine (*Aedes canadensis* Type)

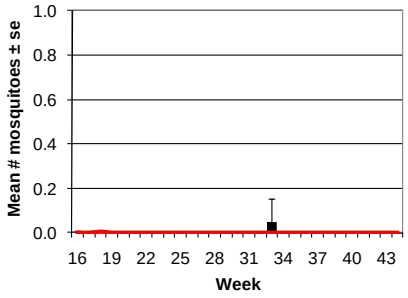
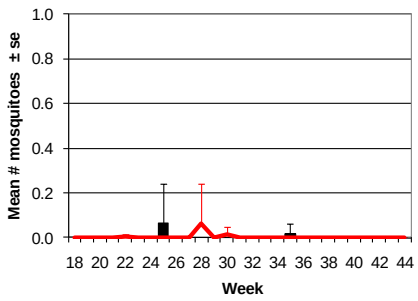
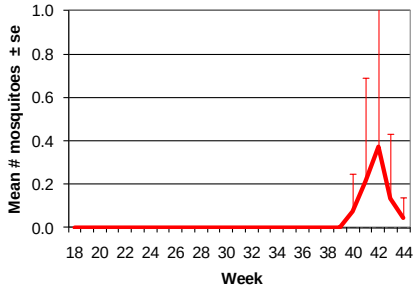
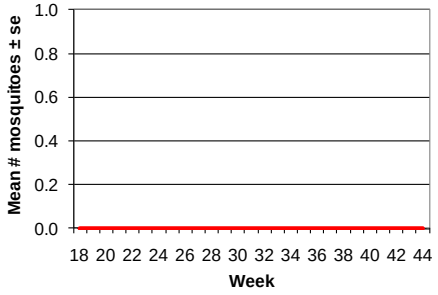
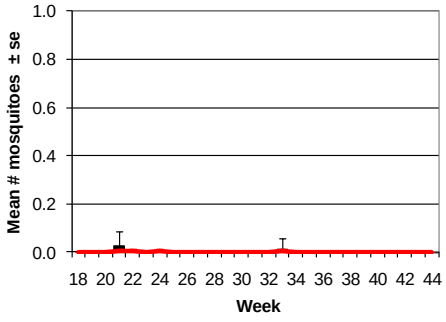
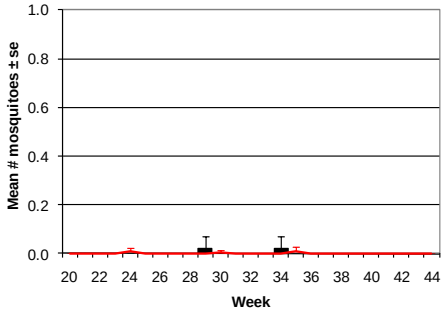
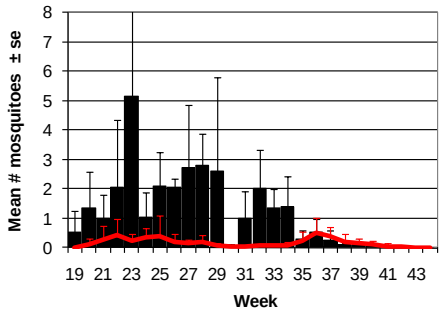
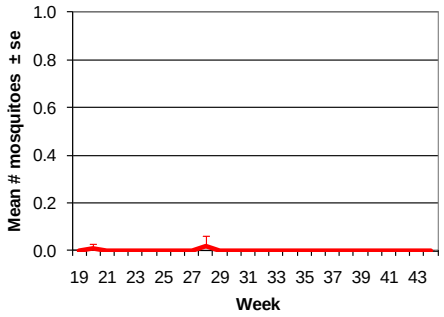
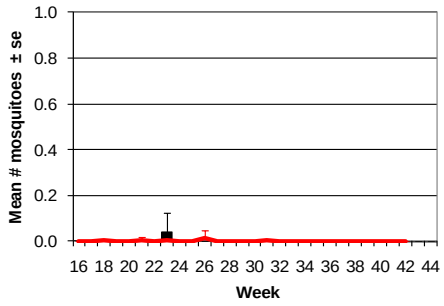
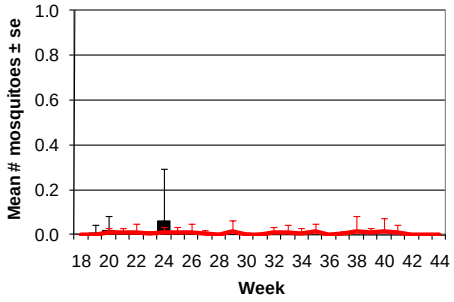
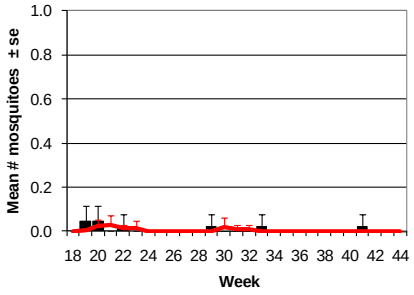
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes cinereus* is a species that appear after early-season species such as *Ae. excrucians* or *Ae. fitchii*. As with *Ae. canadensis*, later emergences can occur from eggs that had not previously hatched. *Ae. cinereus* is very cold-tolerant, with a range that extends into Canada and up through Alaska and can tolerate the early season temperatures. As with the previous year, the Northwestern Rural region experienced abundances well above historical values.	

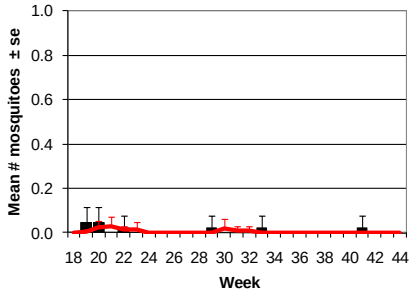
Figure 16.

Aedes sticticus – Univoltine Aedine (*Aedes canadensis* Type)

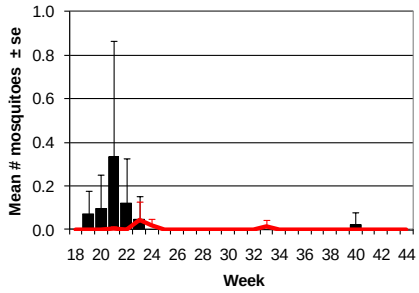
Agricultural



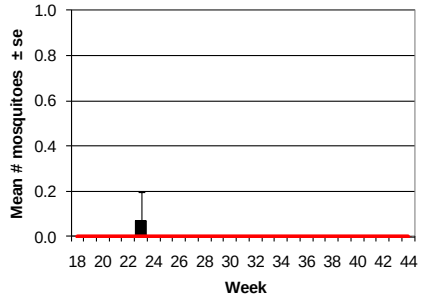
Coastal



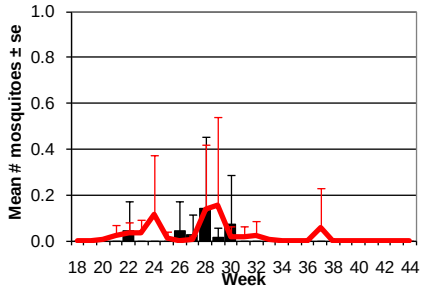
Delaware Bayshore



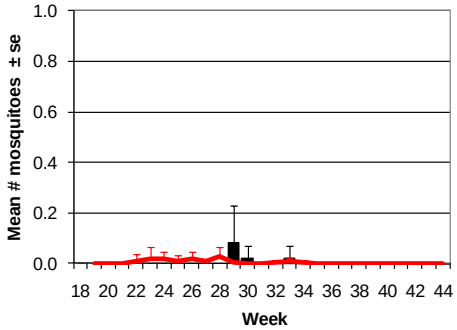
Delaware River Basin



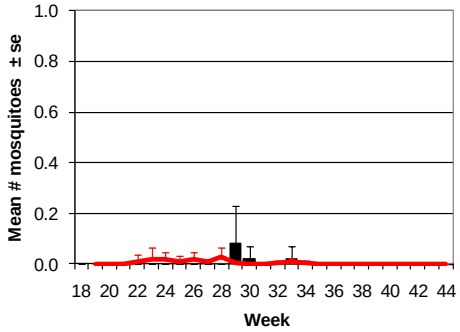
New York Metro



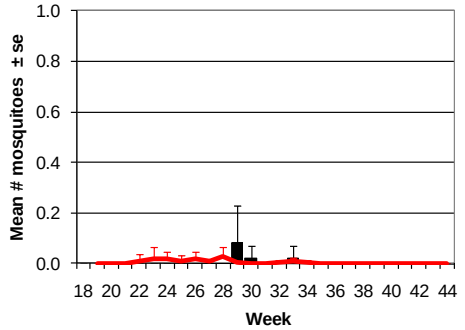
North Central Rural



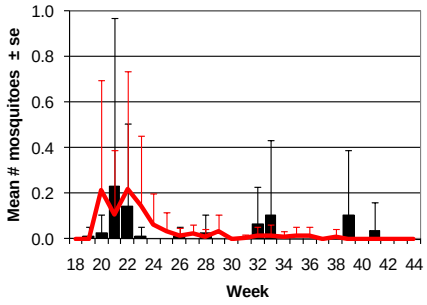
Northwestern Rural



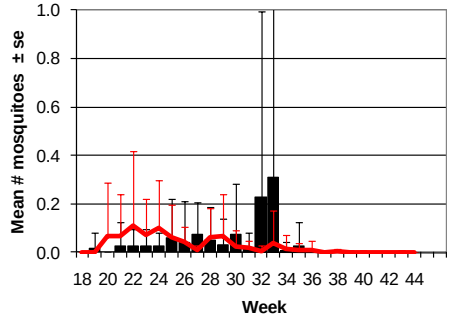
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

Aedes sticticus is a univoltine aedine mosquito with re-occurrence patterns similar to *Aedes canadensis*. After an initial spring emergence from shaded woodland pools located in floodplains, an additional emergence will come from other pools located slightly elevated (i.e., near the edge of the floodplain) when these areas become flooded later during the summer. This double emergence can be seen most easily in the historical data of the Agricultural and the New York Metro regions. This year, activity was high early in the season in the Delaware Bayshore region, with late season activity particularly noticeable in the Suburban Corridor. These likely generated many complaints as this species can be an aggressive biter.

Figure 17.

Aedes vexans – Multivoltine *Aedine* (*Ae. vexans* Type)

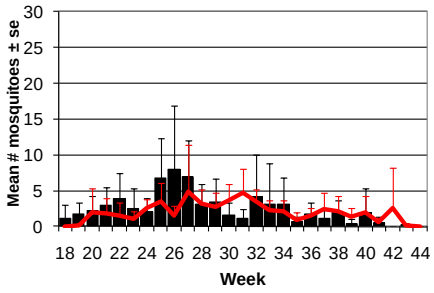
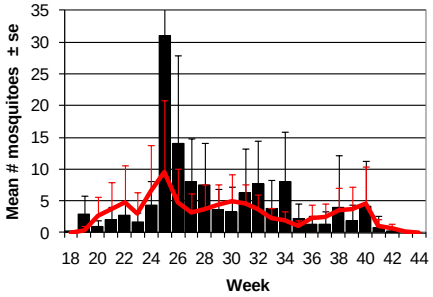
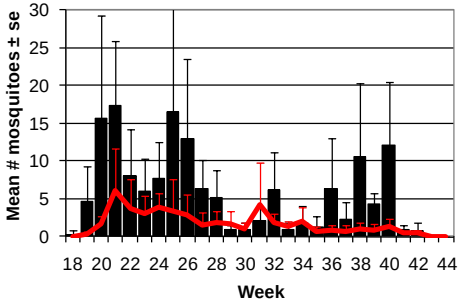
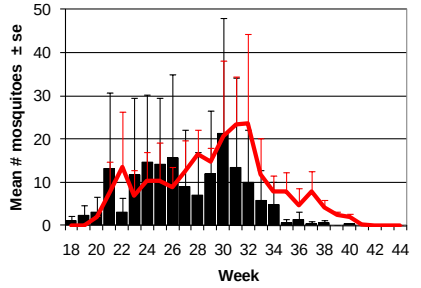
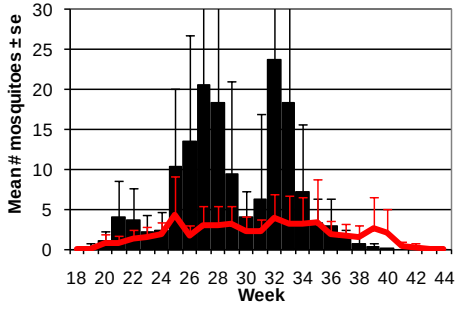
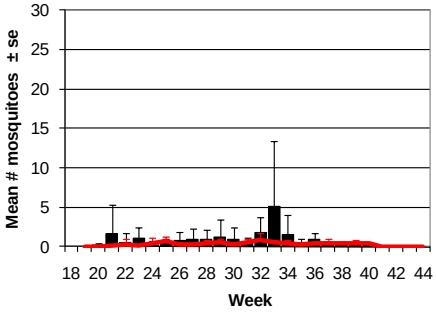
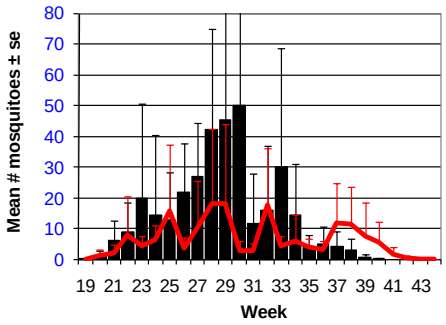
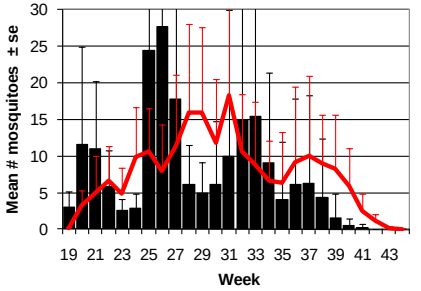
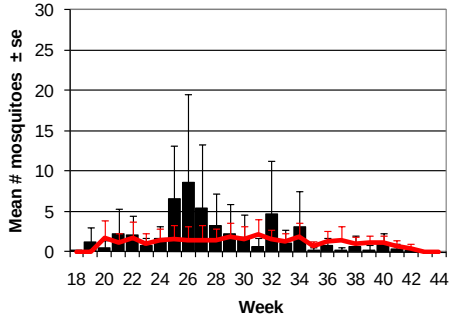
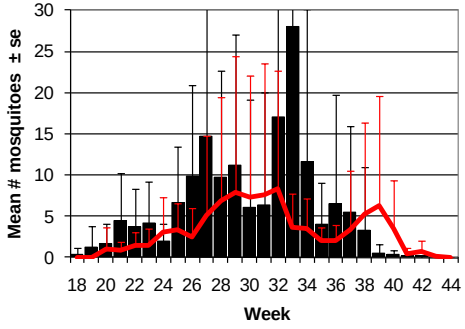
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes vexans* is the model for the fresh floodwater mosquito that produces multiple generations a year. Populations are very dependent on local conditions, although some areas can be influenced by distant conditions, such as floodwater from streams that overflow banks despite no local rains. This condition is found in the Northwestern Rural region, where three rivers meet and flood after rains from upstate New York flow into New Jersey. This year, *Ae. vexans* populations were highly abundant across the state in nearly all regions, reflecting the wetter than average summer New Jersey experienced in 2009.	

Figure 18.

Aedes trivittatus – Multivoltine *Aedine* (*Ae. vexans* Type)

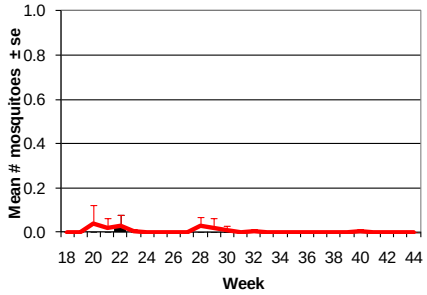
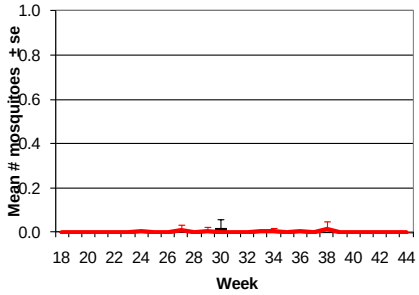
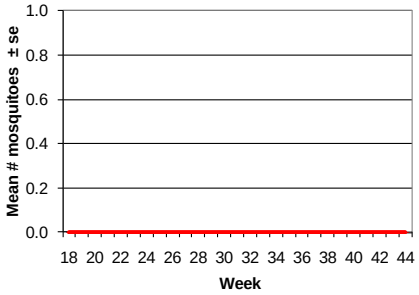
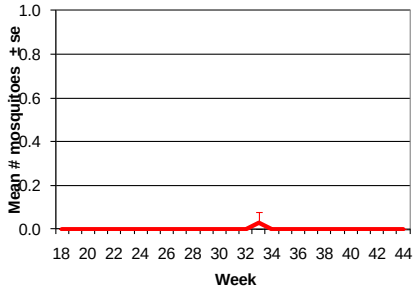
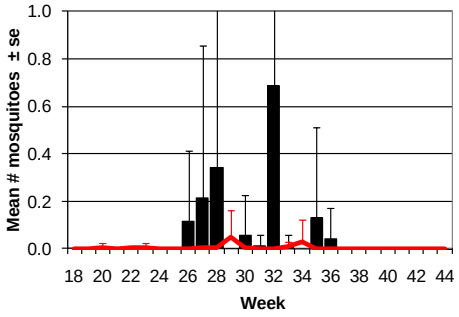
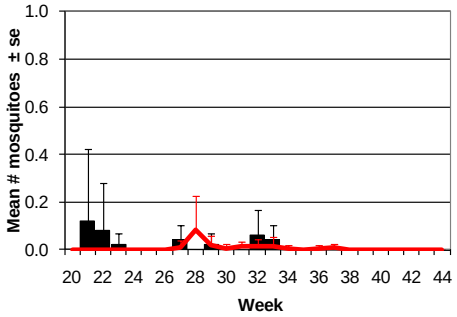
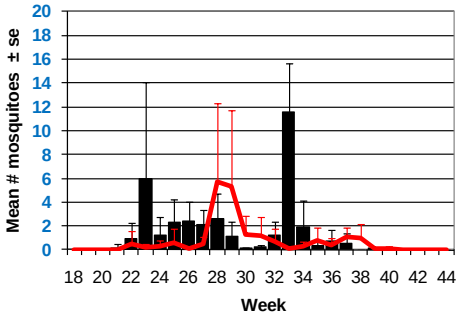
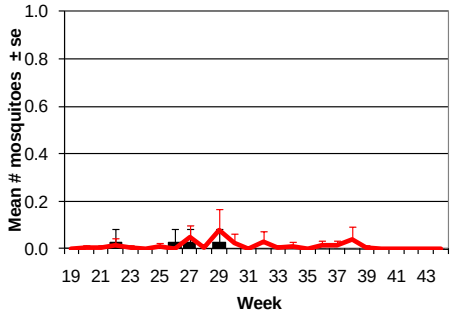
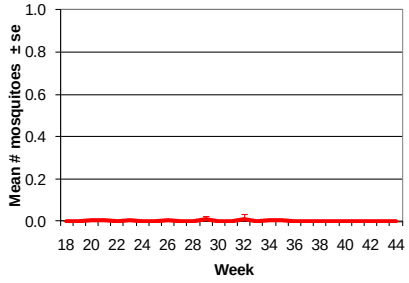
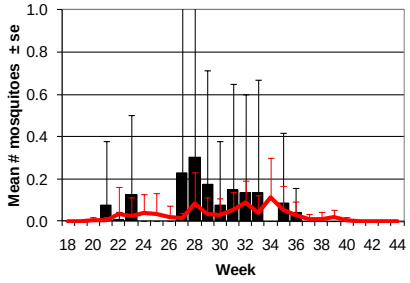
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes trivitattus*, a multivoltine floodwater species, can generate a number of complaints from residents after flooding events. This aggressive, persistent biter is most abundant in the Northwestern Rural region where this year two significant emergences occurred. Other regions such as the New York Metro and the Suburban Corridor also showed increased abundances over historical trends. *Ae. trivittatus* can transmit trivittatus virus to mammalian vertebrates, but this disease is virtually unknown in New Jersey. *Ae. trivittatus* can also transmit WNV when taken from a highly viremic source.	

Figure 19.

Psorophora columbiae – Multivoltine Aedine (*Ae. vexans* Type)

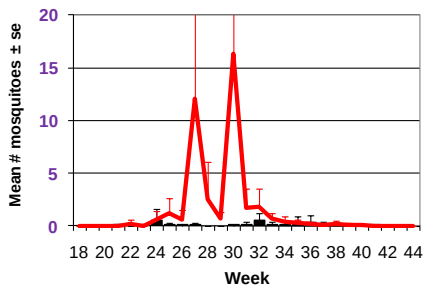
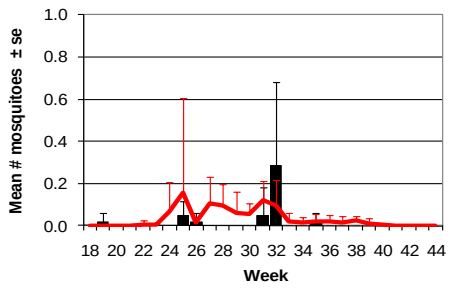
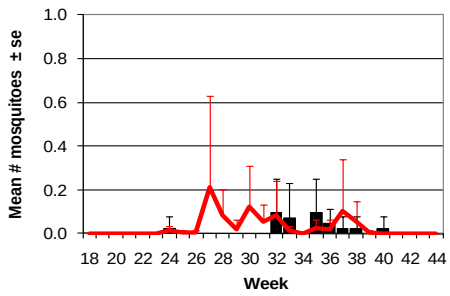
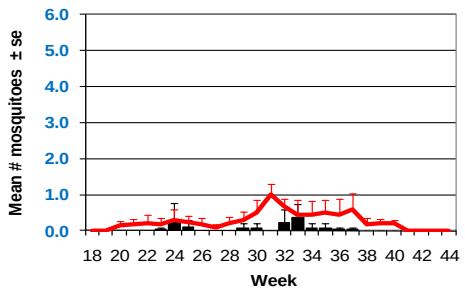
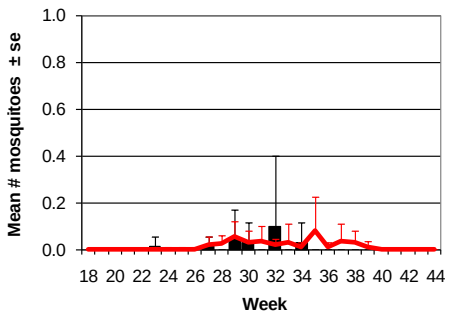
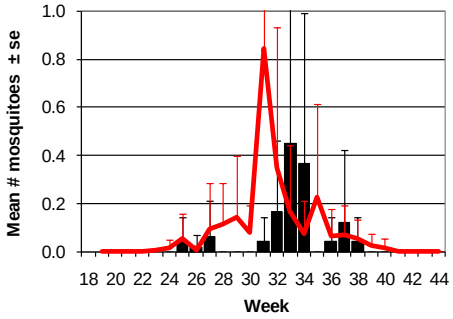
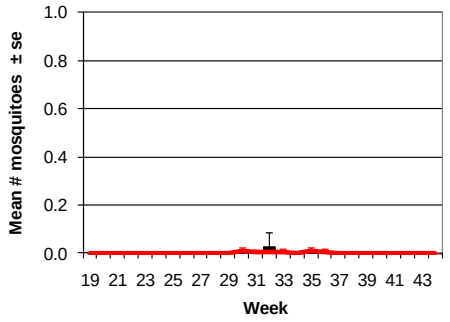
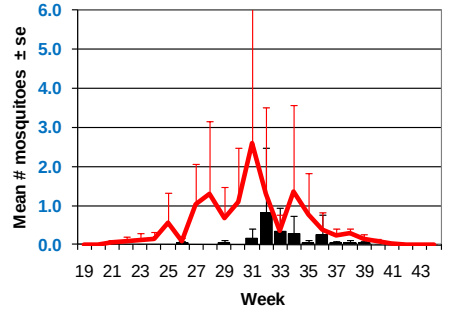
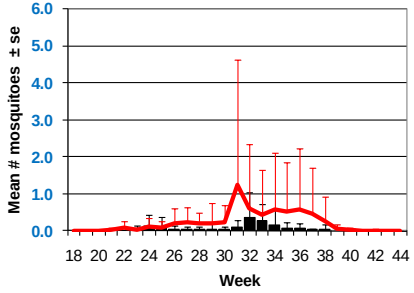
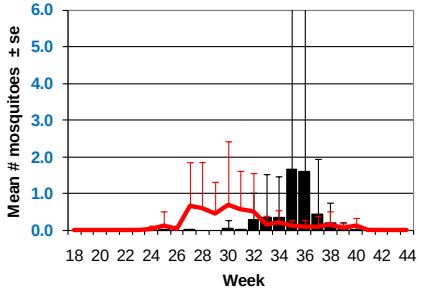
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Psorophora columbiae* is a smaller psorophoran that is preyed upon by its larger brethren. All the psorophorans are floodwater mosquitoes in New Jersey. As such, and as one of the food sources for the larger psorophorans, the population size of this mosquito as well as rain events can regulate the larger psorophorans. This year, population levels were down in just about all regions including the Agricultural, Coastal, Delaware Bayshore, Delaware River Basin, North Central Rural, Philadelphia Metro, Pinelands and the Suburban Corridor. The lower level of this prey item for other mosquitoes likely had an impact on the predator population abundances as well.	

Figure 20.

Psorophora ciliata – Multivoltine Aedine (Ae. vexans Type)

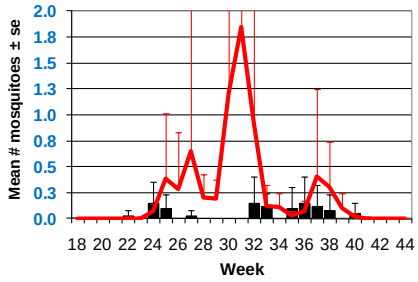
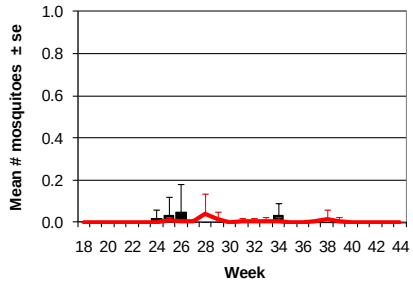
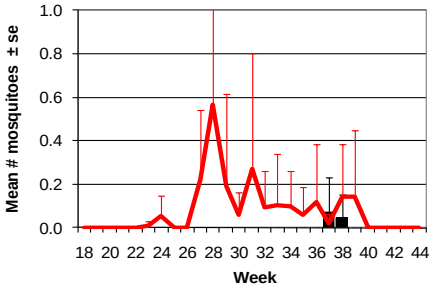
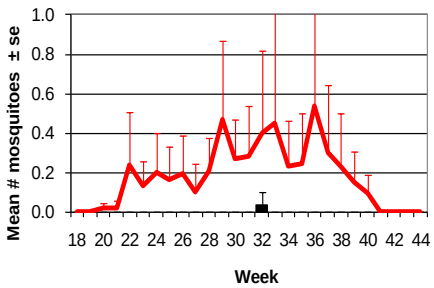
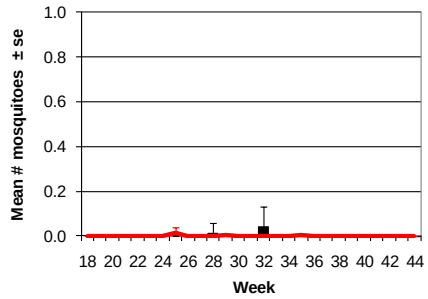
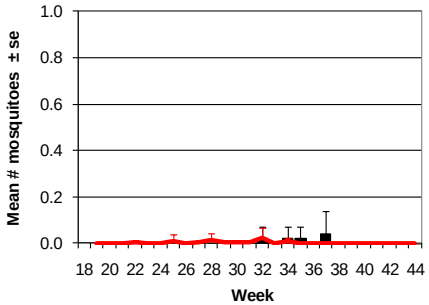
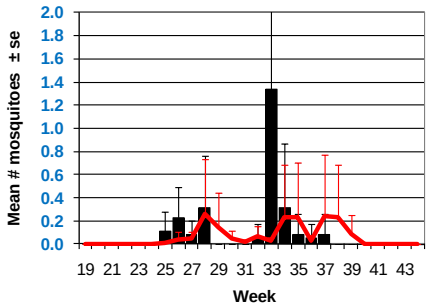
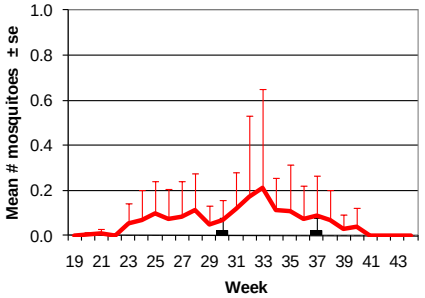
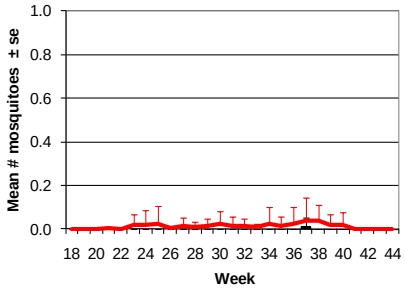
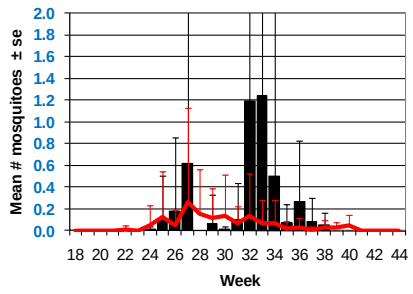
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Psorophora ciliata* is a large mosquito that preys upon smaller mosquitoes such as *Psorophora columbiae* as larvae. As a floodwater mosquito, both habitat and prey are important in the abundance that could result. This year, there were regions that supported fewer than historical records would suggest that they could support (Agricultural, Delaware Bayshore and River Basin regions and the Philadelphia Metro region). Precipitation was substantial this year, but the data for *Psorophora columbiae* suggests that one prey population levels were down in those regions. However, the Northwestern Rural region experienced high population levels of *Ps. ciliata* without the corresponding high levels of *Ps. columbiae* in that regions and the timing of both populations is off for the Suburban Corridor, suggesting other prey items are also important.	

Figure 21.

Psorophora ferox – Multivoltine Aedine (*Ae. vexans* Type)

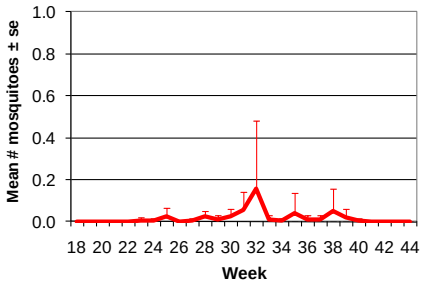
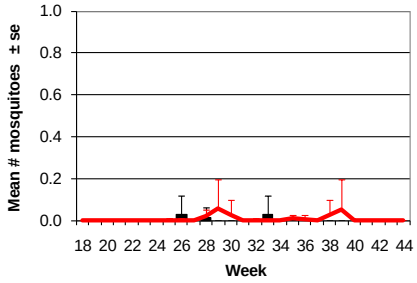
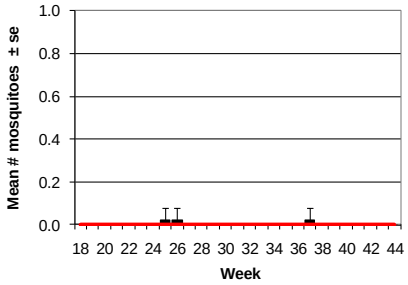
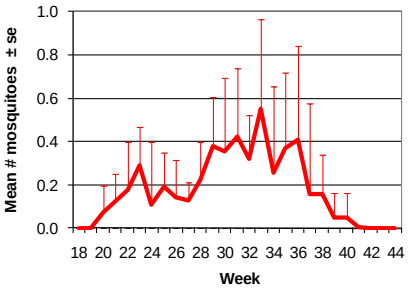
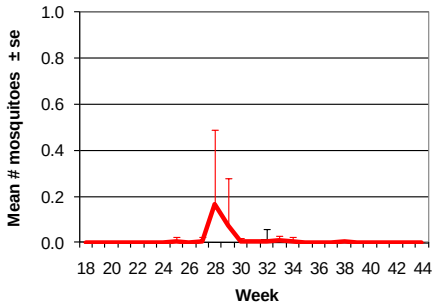
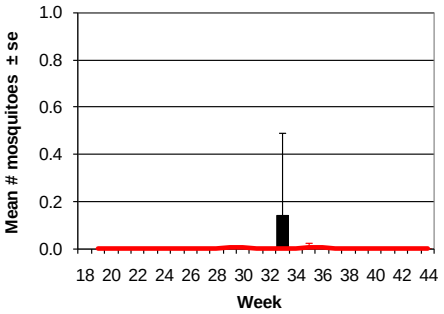
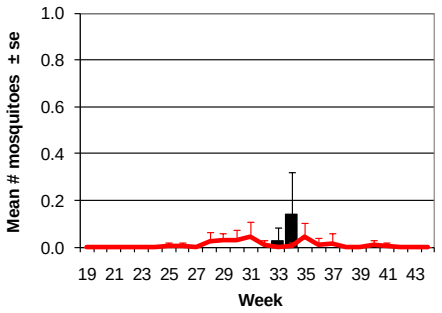
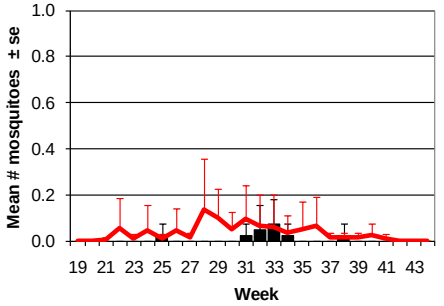
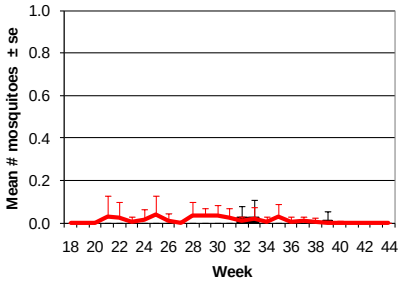
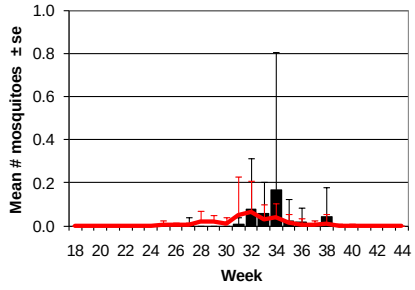
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Psorophora ferox* is a fierce biter found in wooded areas generating numerous complaints when in close proximity to humans. They frequently attack when disturbed at their resting site. As like other multivoltine aedine-type life cycles, *Ps. ferox* can emerge in numbers after flooding events. This year saw a continued decline from the previous year in regions where they are often found: Agricultural, Delaware River Basin, New York and Philadelphia Metro. The Suburban Corridor was the only region that had a sustained population.	

Figure 22.

Aedes sollicitans – Multivoltine Aedine (*Aedes sollicitans* Type)

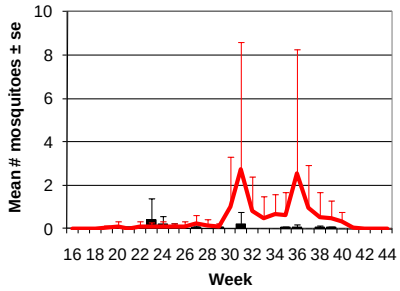
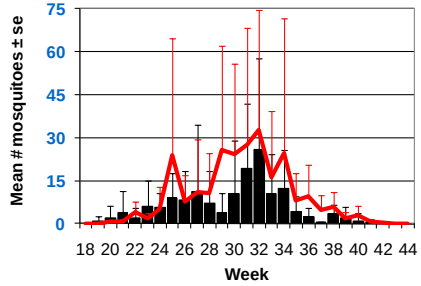
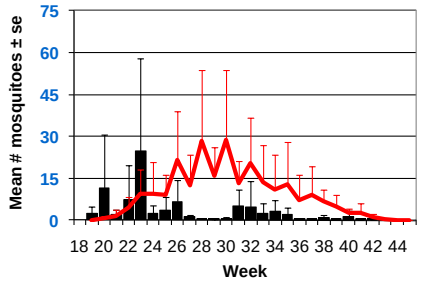
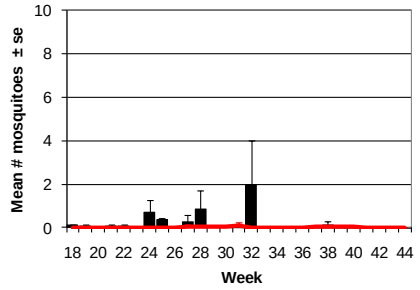
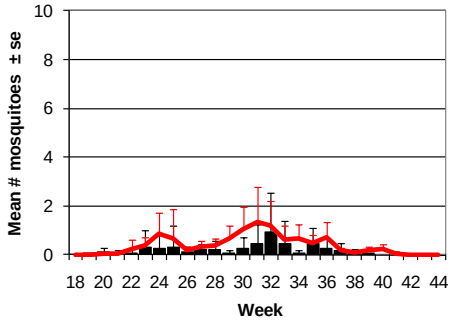
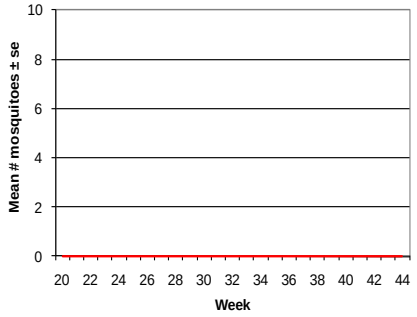
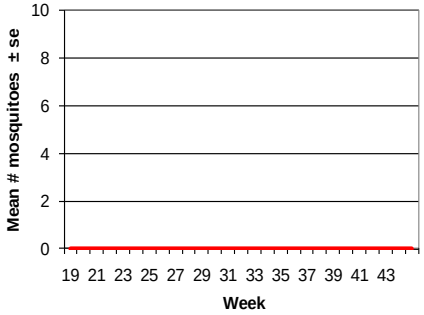
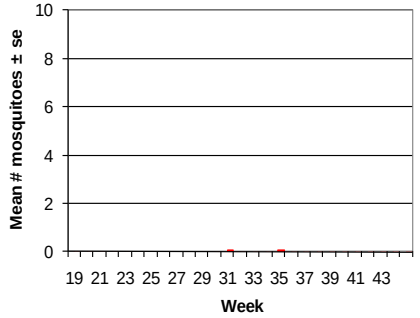
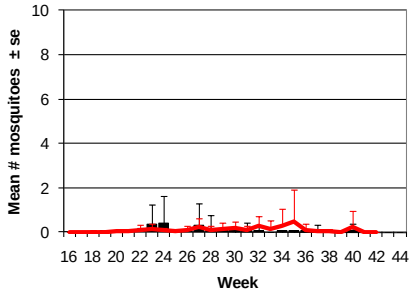
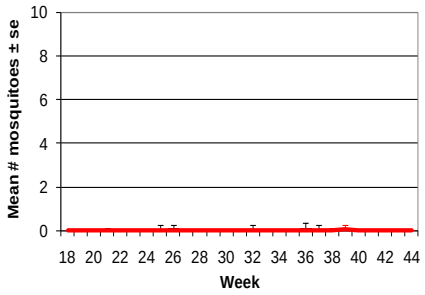
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes sollicitans* is the significant salt marsh mosquito along the eastern half of the US, and one of the motivations for the early attentions paid to mosquito control in New Jersey. This long-flying mosquito can generate nuisance complaints far from its natal habitat. Most abundance comes from the Coastal and Delaware Bayshore regions (the latter of which whose population was reduced in the middle of the season, possibly due to changes in the pesticides used), but more inland sites can also record their presence. This species may contribute to the coastal cases of eastern equine encephalitis.	

Figure 23.

Aedes cantator – Multivoltine Aedine (*Aedes sollicitans* Type)

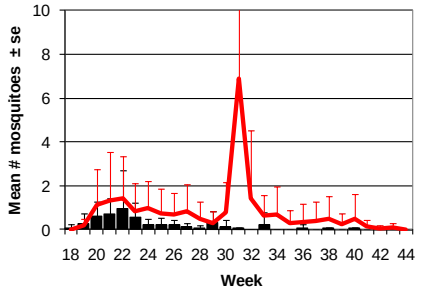
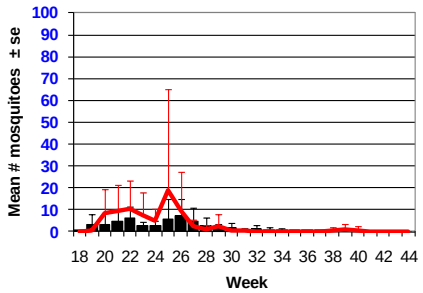
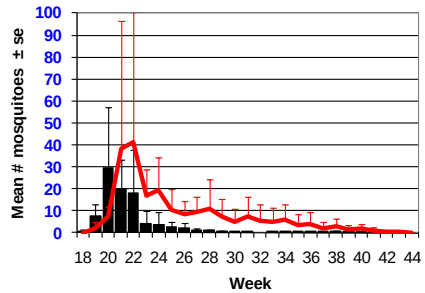
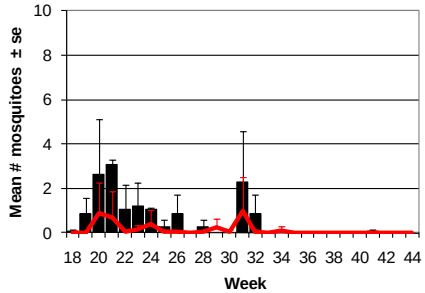
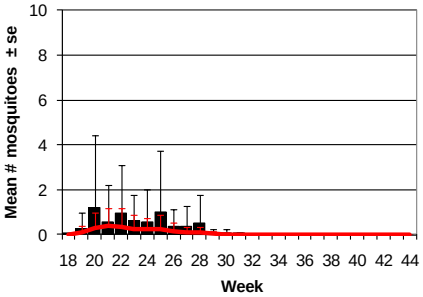
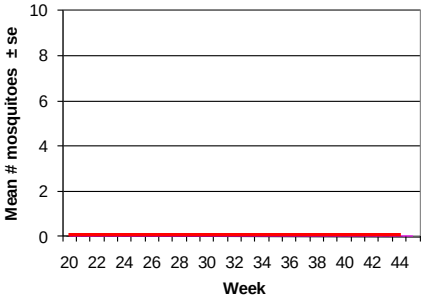
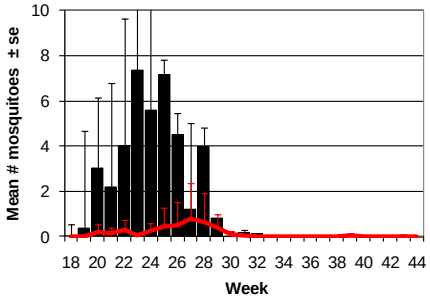
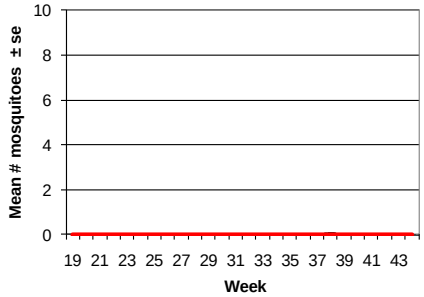
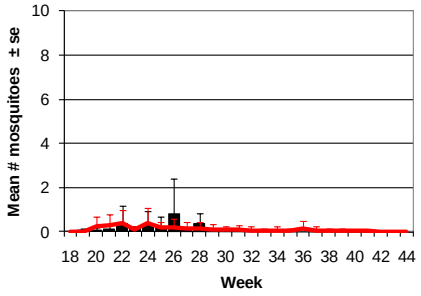
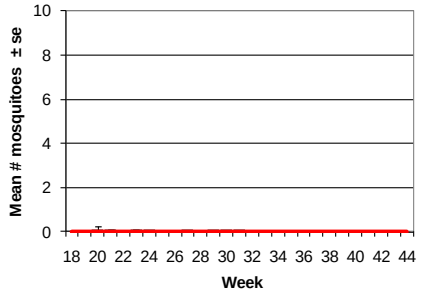
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes cantator* is a facultative salt marsh floodwater species that can exploit both natural and anthropogenic sources of saline habitat. Their significant presence in the Coastal and Delaware Bayshore regions is obvious. The Northwestern region, however, might be a puzzlement until the habitat is understood: a textile factory contributes habitat through the use of saline waters to help set the dye in fabrics. In this region this year, numbers were significantly higher than historical values as they were also in the Delaware River Basin region, but to a lesser extent.	

Figure 24.

Aedes taeniorhynchus – Multivoltine Aedine (*Aedes sollicitans* Type)

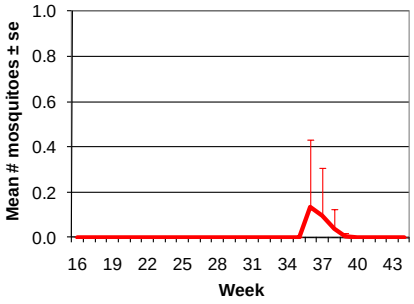
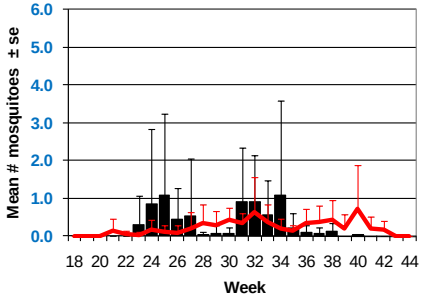
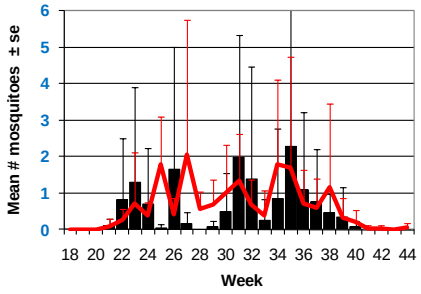
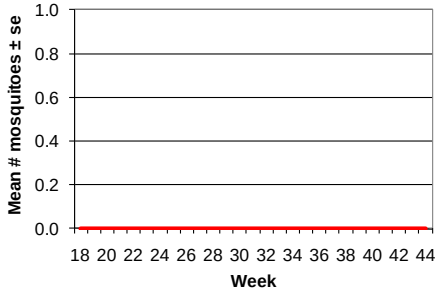
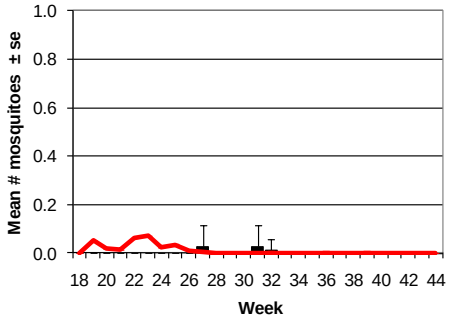
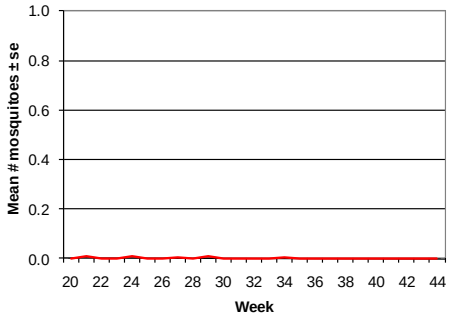
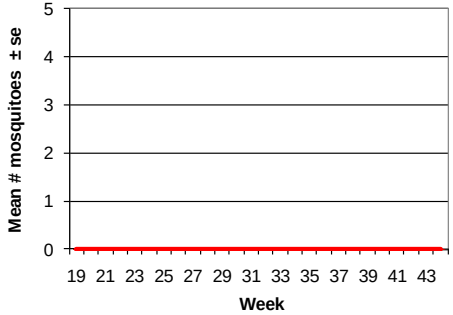
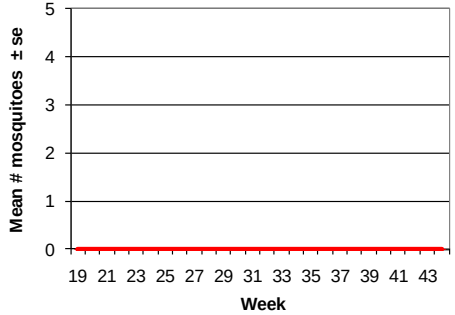
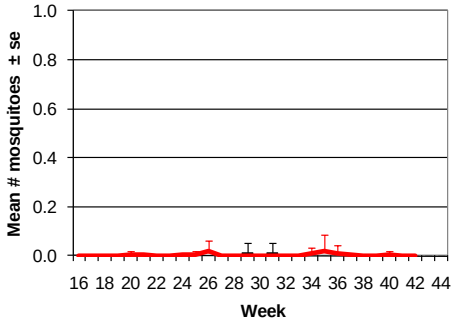
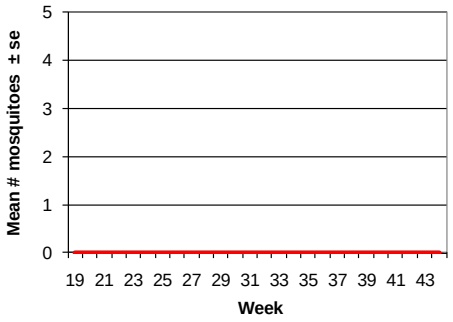
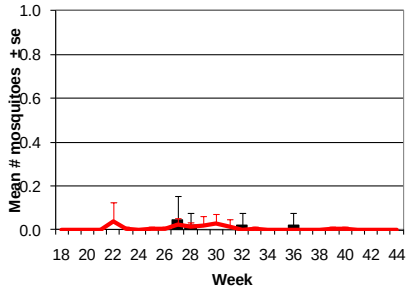
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes taeniorhynchus* is a floodwater species found primarily in coastal salt water habitats. Its most abundant populations are found along the Delaware Bayshore region and can often be found in conjunction with *Ae. sollicitans*, where both can be intolerable pests. Fortunately, *Ae. taeniorhynchus* is not an efficient vector or either EEE or WNV. Migration flights are not as long as *Ae. sollicitans* and this mosquito is usually not seen far from either the Delaware Bayshore or Coastal regions. This year, the population in the Delaware Bayshore region appears impacted, likely by the same circumstances as with *Ae. sollicitans*.	

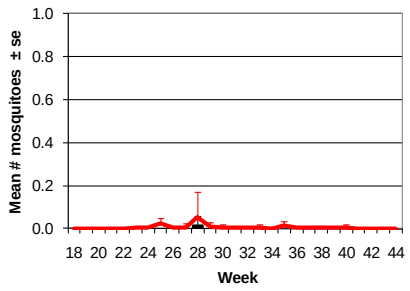
Figure 25.

Aedes triseriatus – Multivoltine Aedine (*Aedes triseriatus* Type)

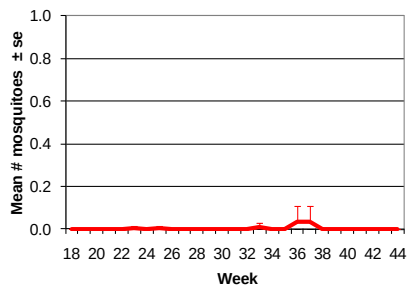
Agricultural



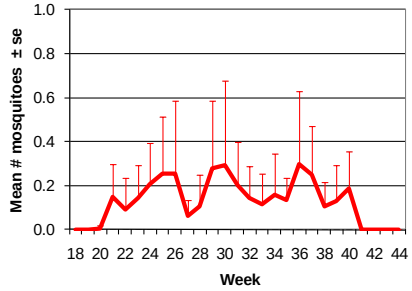
Coastal



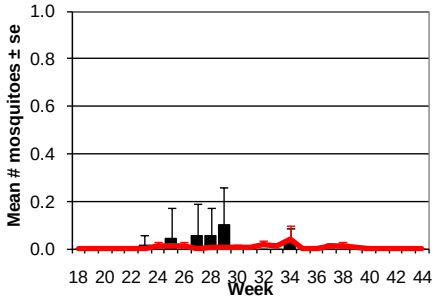
Delaware Bayshore



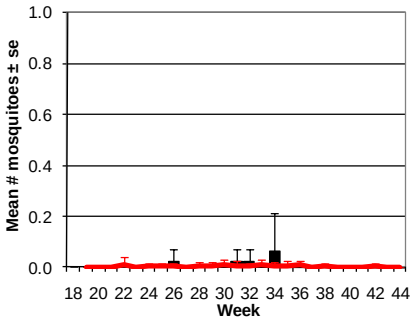
Delaware River Basin



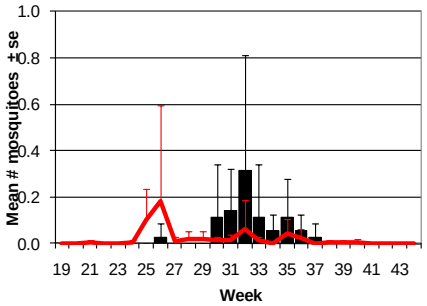
New York Metro



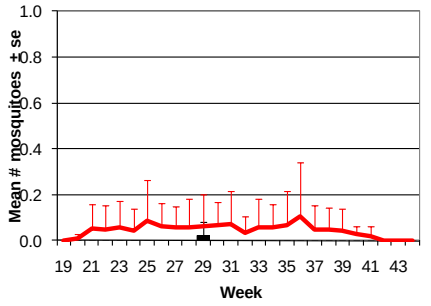
North Central Rural



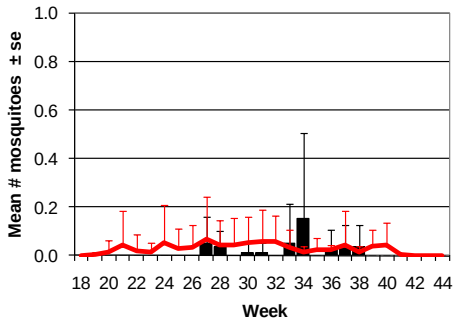
Northwestern Rural



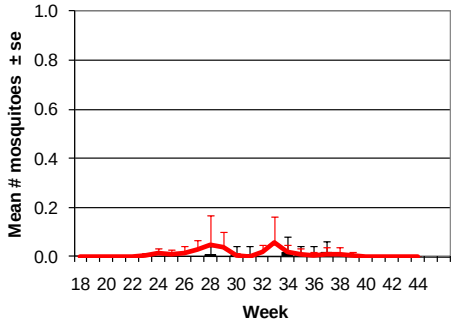
Philadelphia Metro



Pinelands



Suburban Corridor



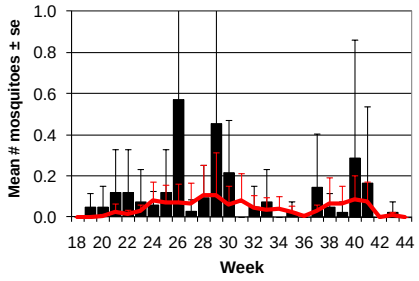
Comments

Aedes triseriatus, the Eastern Treehole mosquito, is a known vector of La Crosse encephalitis virus. Transmission to the following year is through overwintering eggs (vertical transmission) that develop into infected adults. Amplification is through small vertebrates such as chipmunks and tree squirrels. The CDC reports 3 known cases of La Crosse in New Jersey, all occurring during the mid 1970's. This species is not well attracted to light traps. Last year, the largest populations were trapped in the Delaware River Basin. But this year, no individuals were seen in this region. The Philadelphia Metro region did not have the population numbers seen in previous years. In the Northwestern Rural region which can also have significant populations, significant numbers were seen during the middle of the season.

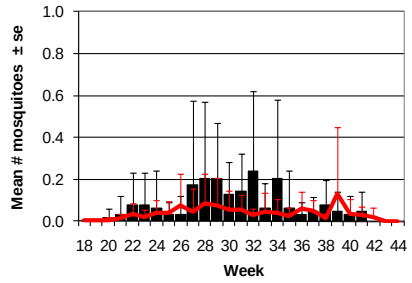
Figure 26.

Aedes japonicus – Multivoltine Aedine (*Aedes triseriatus* Type)

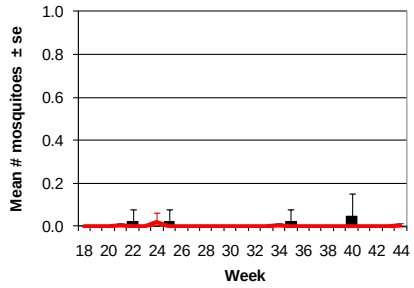
Agricultural



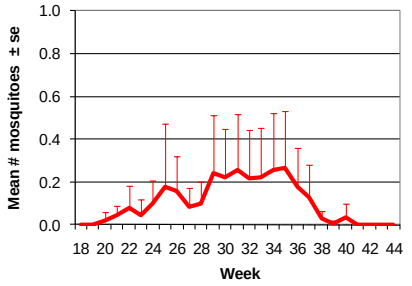
Coastal



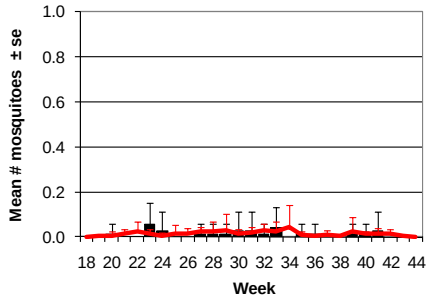
Delaware Bayshore



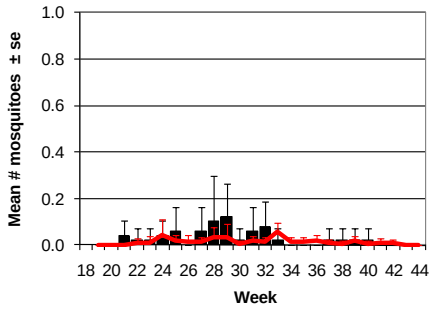
Delaware River Basin



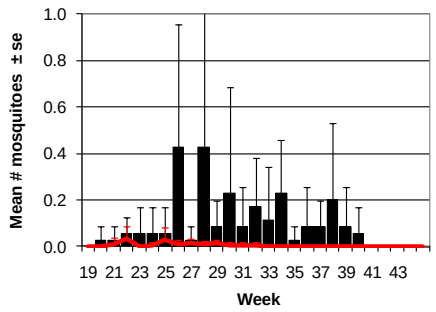
New York Metro



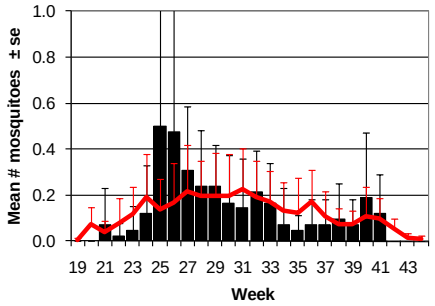
North Central Rural



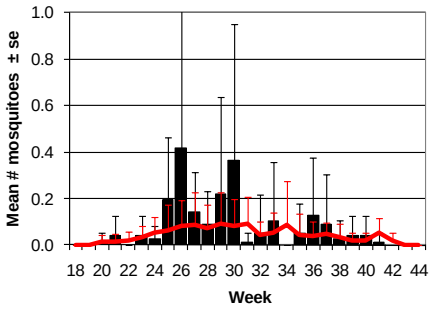
Northwestern Rural



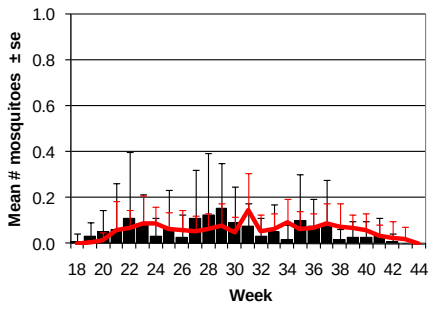
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

Aedes japonicus, a cold-tolerant invasive species, was very abundant in the Delaware River Basin and the Philadelphia Metro regions last year. This year, population levels remained high in the Philadelphia Metropolitan region, as well as most other regions, but were not recorded in the Delaware Bayshore region. Despite the low numbers of the Japanese Rock Pool mosquito that are attracted to light traps, the numbers track natural population trends (Falco 2002). Pools positive for West Nile virus are often found in this vector-competent species.

Falco RC, Daniels TJ, Slamecka MC 2002 Prevalence and Distribution of *Ochlerotatus japonicus* (Diptera: Culicidae) in Two Counties in Southern New York State. Journal of Medical Entomology: 39(6):920–925.

Figure 27.

Aedes albopictus – Multivoltine Aedine (*Aedes triseriatus* Type)

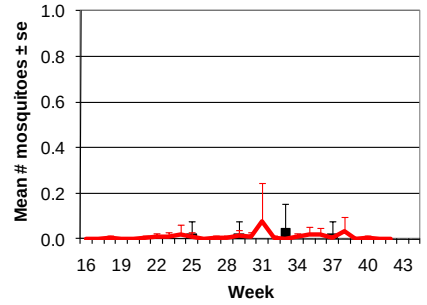
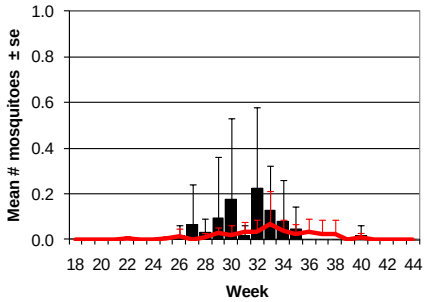
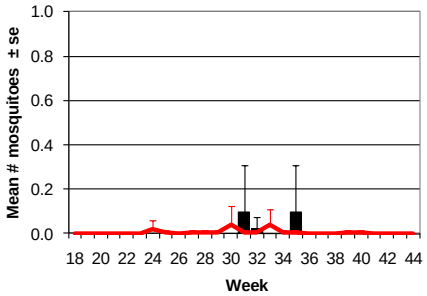
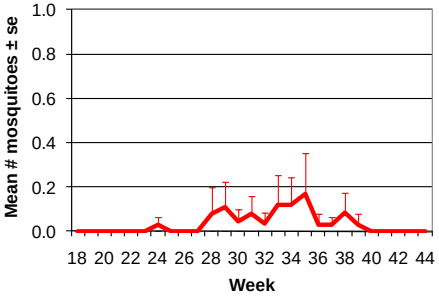
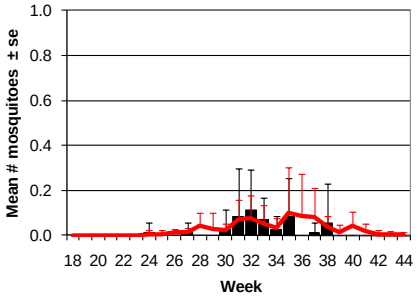
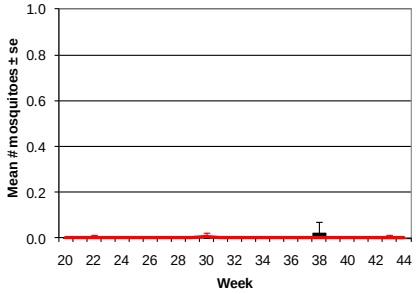
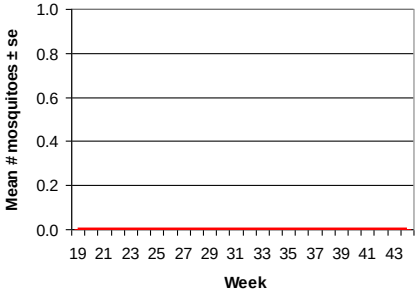
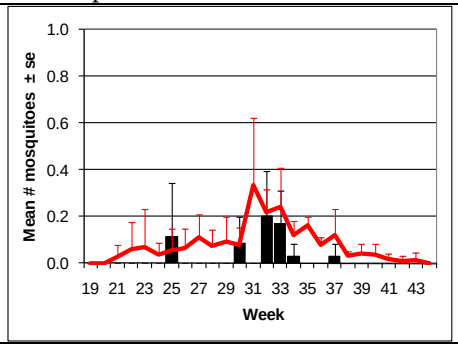
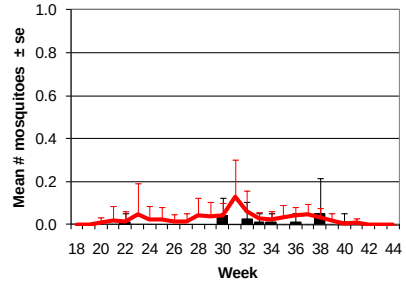
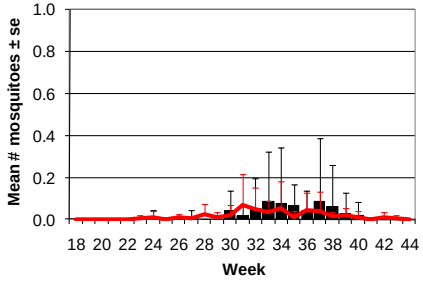
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Aedes albopictus* made its first appearance in New Jersey in 1995, ten years after the initial US invasion in Texas. In New Jersey, all counties but those in the Northwestern Rural region have reported populations, some with significant numbers. In 2009, the Coastal region experienced higher than historical trends while on the other side of the state, the Philadelphia Metropolitan region had a sporadic presence of this species. The Delaware River Basin recorded no *Aedes albopictus* in the traps from that region.	

Figure 28.

Anopheles quadrimaculatus – Culex/Anopheles (*An. quadrimaculatus* Type)

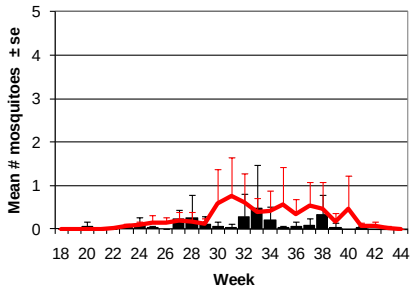
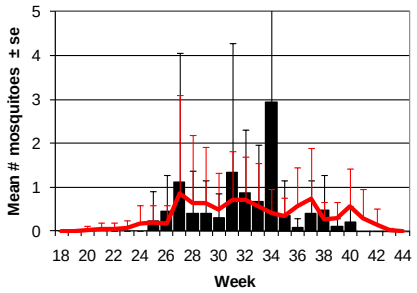
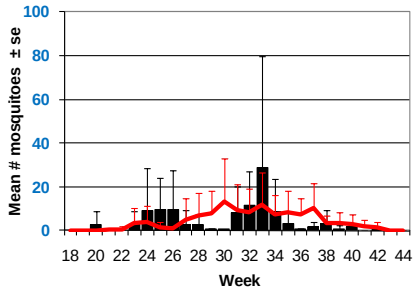
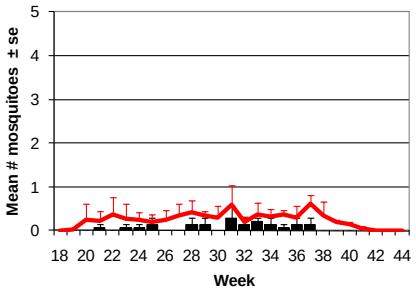
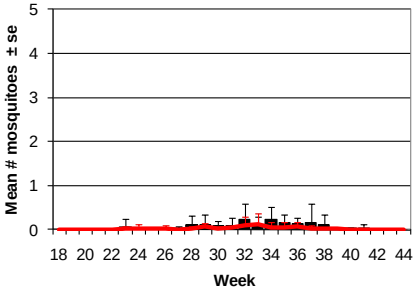
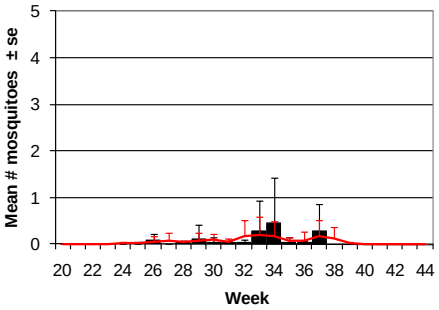
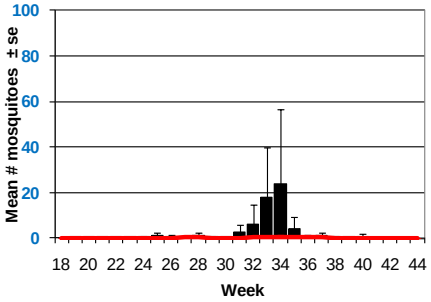
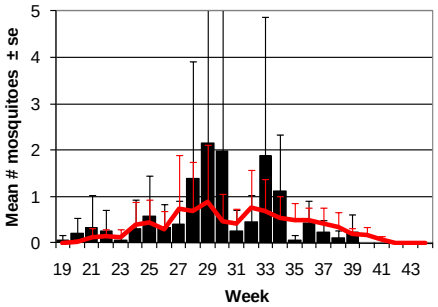
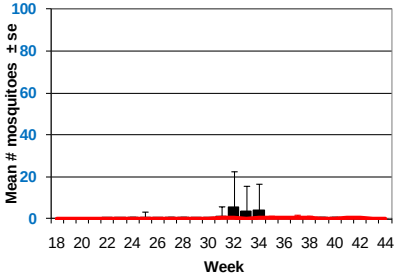
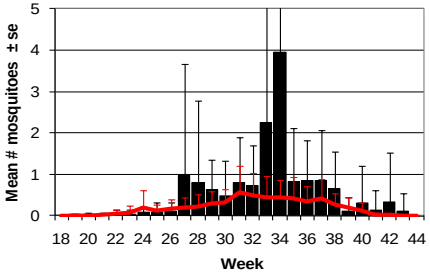
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Anopheles quadrimaculatus* is the type species for multivoltine mosquitoes that lay non-desiccant resistant eggs on clean water and that overwinters as adult females. *An. quadrimaculatus* will utilize brackish water for larval habitat, allowing it to exploit a variety of habitat that gives it greatest range in New Jersey. In the past, *An. quadrimaculatus* has been a significant vector of malaria in New Jersey. This year, population levels were generally along the historical trends, with a few exceptional emergences occurring in the Coastal, Philadelphia Metro and Suburban Corridor. The Agricultural region continued to experience a reduction of this mosquito.	

Figure 29.

Uranotaenia sapphirina – Culex/Anopheles (*An. quadrimaculatus* Type)

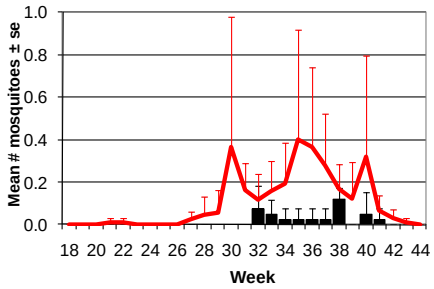
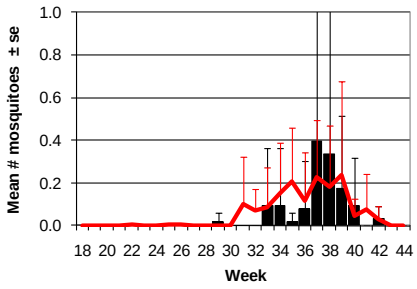
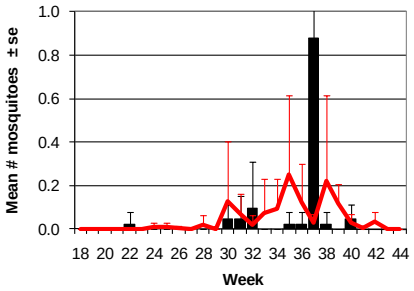
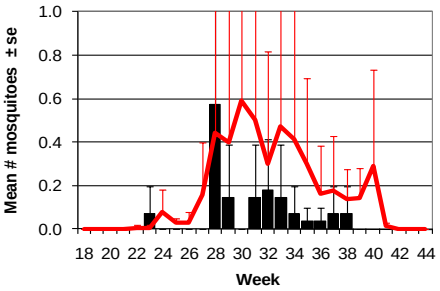
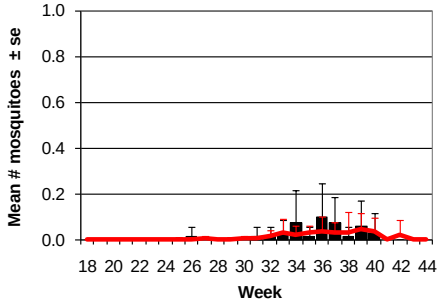
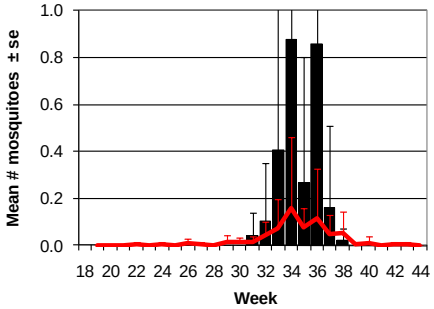
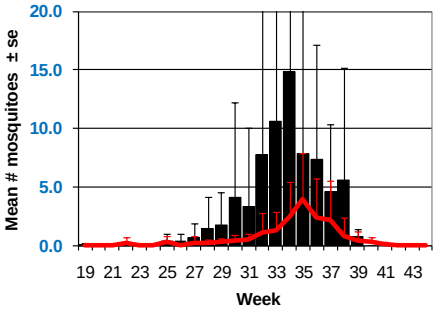
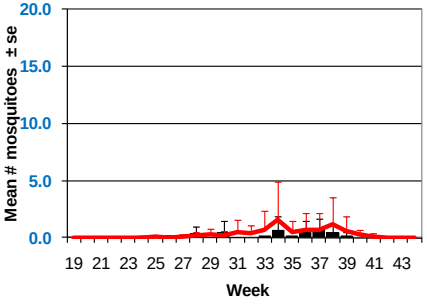
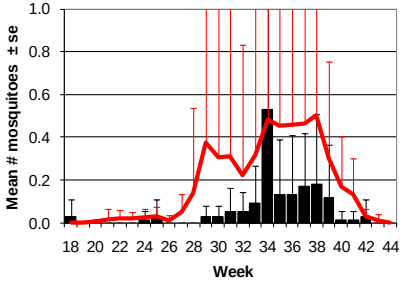
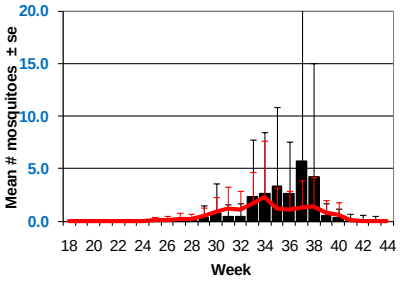
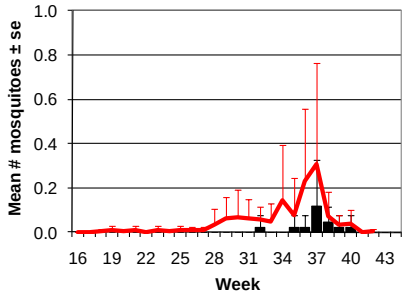
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		This small mosquito is generally considered not to be a health threat, although eastern equine encephalitis and West Nile viruses have been detected in them in the US. Although it is found throughout New Jersey and is often recorded in the light traps of this program and can overwinter near anthropogenic sources, this mosquito apparently bites few humans. Largest populations usually occur in the Northwestern Rural region and the Suburban Corridor. Typically, populations will build up and then slowly decline. This year, populations flourished in the Northwestern Rural region, with abundances also seen in the North Central Rural and the Suburban Corridor. Populations were reduced in the Agricultural, Delaware River Basin and the Pinelands regions.	

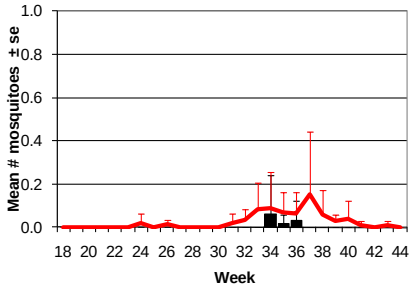
Figure 30.

Culex erraticus – *Culex/Anopheles* (*An. quadrimaculatus* Type)

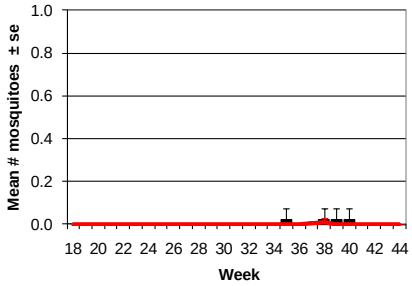
Agricultural



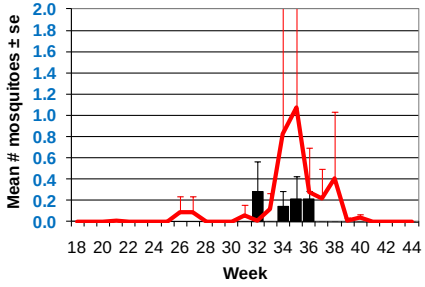
Coastal



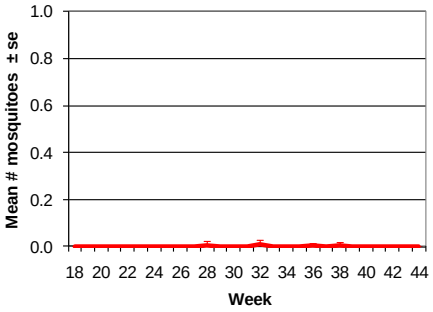
Delaware Bayshore



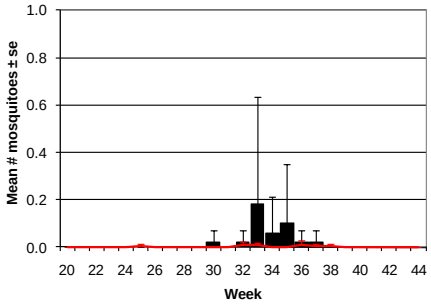
Delaware River Basin



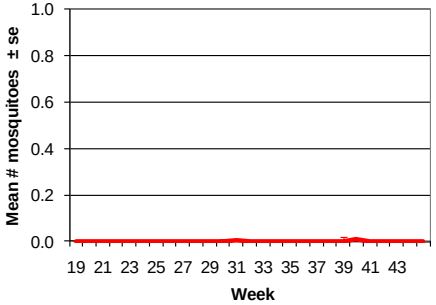
New York Metro



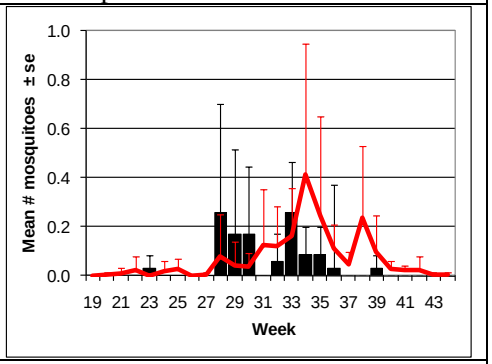
North Central Rural



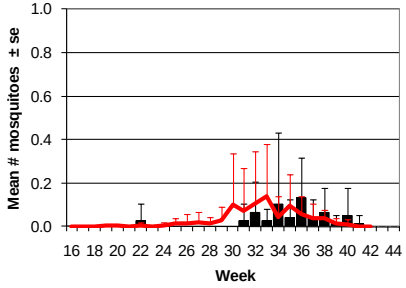
Northwestern Rural



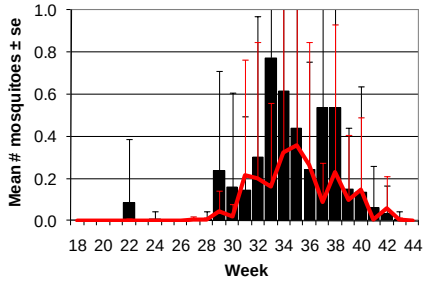
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

Culex erraticus was first detected in New Jersey in the late 1960's. For most of the years since then, this mosquito has been thought of as rare. Recently, populations have begun to show up more frequently in traps seen before as well as being seen for the first time in other areas. Catholic in its diet, *Cx. erraticus* has been implicated in the amplification and transmission cycle of eastern equine encephalitis. For the first time in New Jersey, this species has been found to be positive for EEE. In fact, it was the species with the second most numerous pools to *Cs. melanura* and was found positive in two distinct areas of southern New Jersey. This species should be regularly included in the testing of mosquito pools for EEE.

Figure 31.

Culex territans – *Culex/Anopheles* (*An. quadrimaculatus* Type)

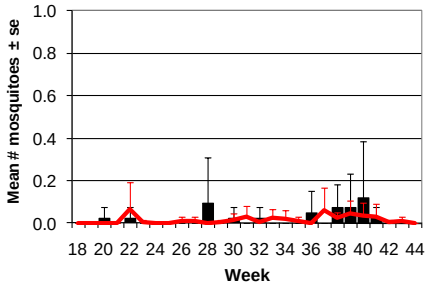
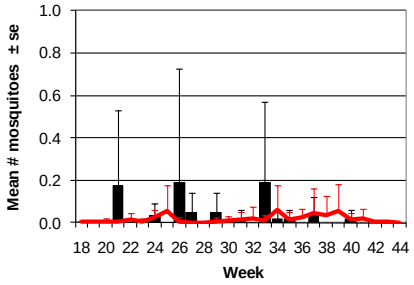
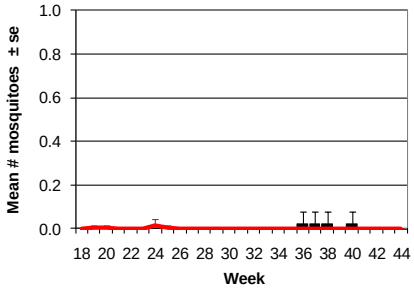
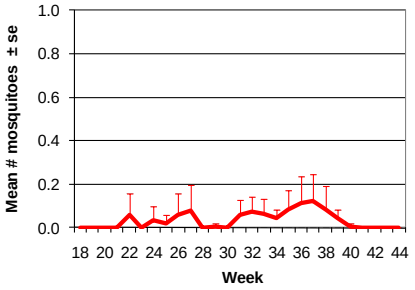
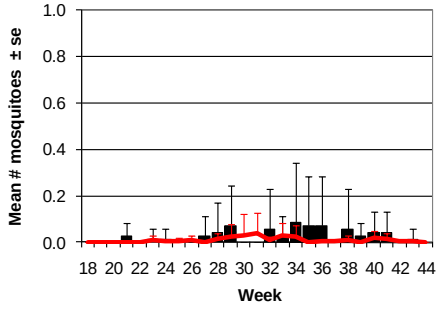
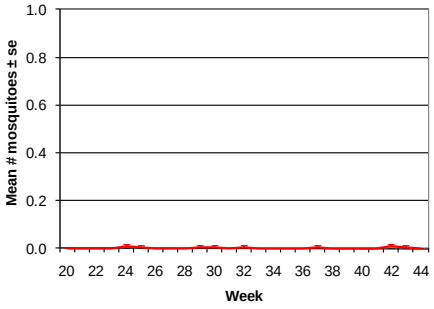
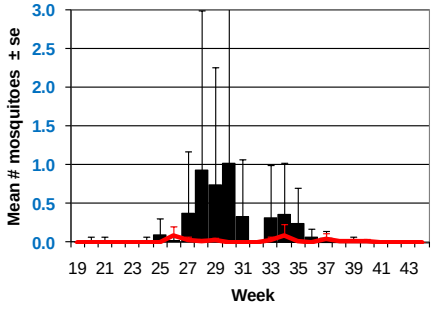
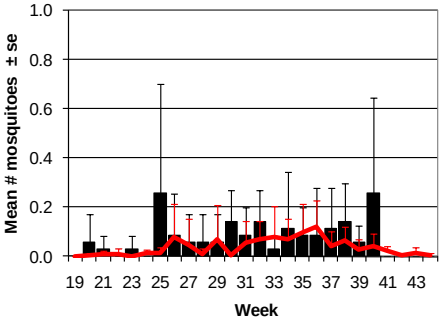
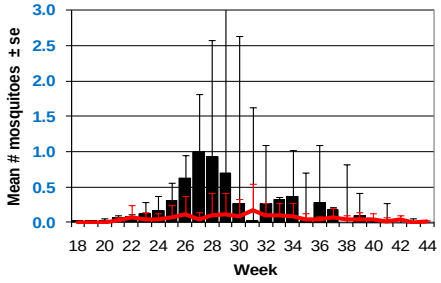
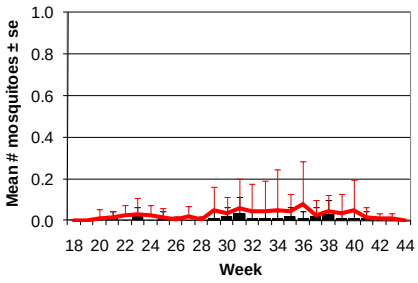
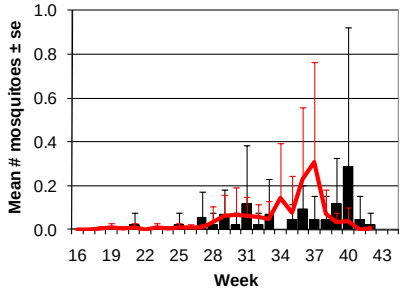
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Culex territans* is a specialized frog-feeder with cold tolerance that allows it to be present when early-season frogs appear. This means that a portion of the population is not likely recorded in the light traps as they have already appeared and disappeared before the traps were turned on. As with other *Culex*, females overwinter in protected hibernaculae. This species is found throughout most of New Jersey. It is most common in the Pinelands regions although there was a large and similarly patterned abundance found in the Northwestern Rural region. *Cx. territans* was noticeably missing from the Delaware River Basin.	

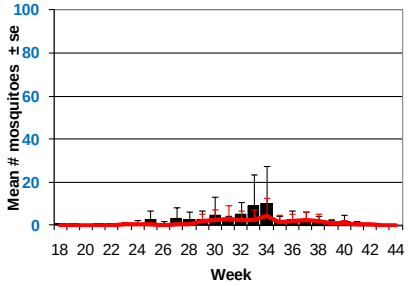
Figure 32.

Anopheles bradleyi – Culex/Anopheles (*Cx. salinarius* Type)

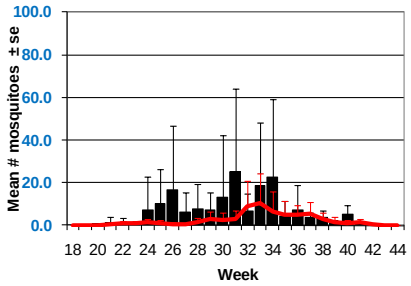
Agricultural



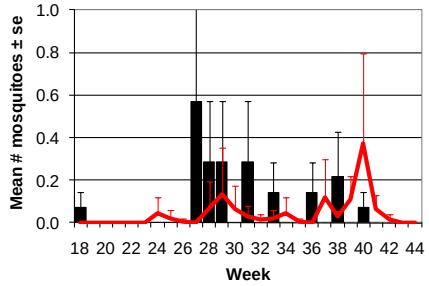
Coastal



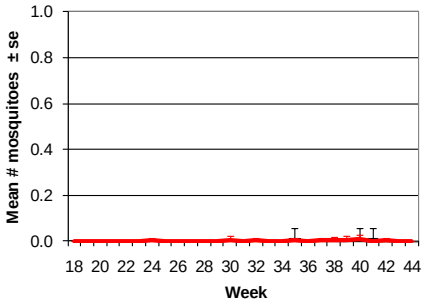
Delaware Bayshore



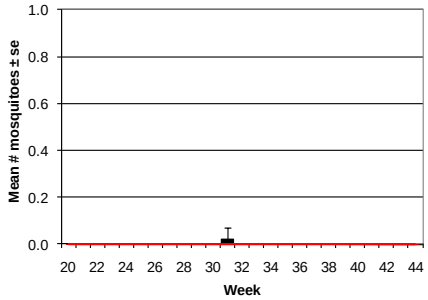
Delaware River Basin



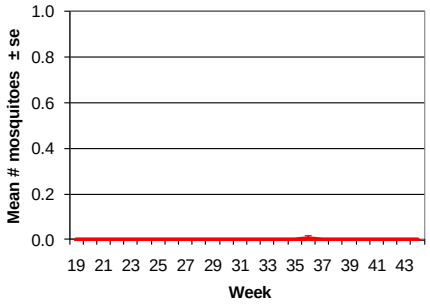
New York Metro



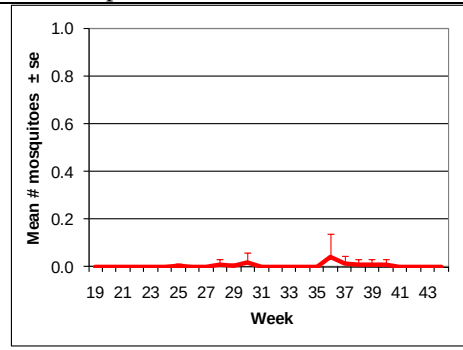
North Central Rural



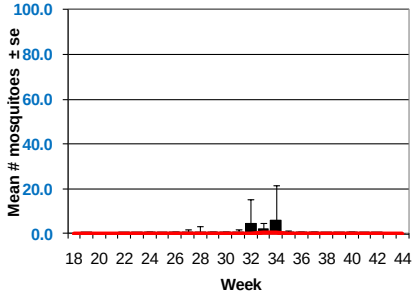
Northwestern Rural



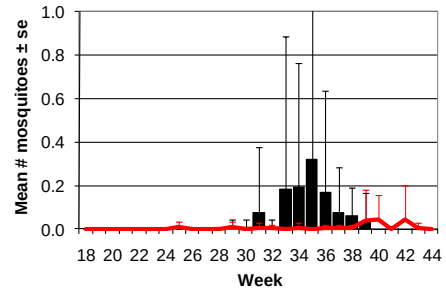
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

Anopheles bradleyi is a salt tolerant floodwater species that exploits more brackish water areas near salt marshes. Its largest populations are found in the Coastal and Delaware Bayshore, but surprisingly not in the Delaware River Basin, where dredge spoil impoundments have produced significant populations in earlier years (Slaff and Crans 1982). This year, abundances in several regions were above historical levels, including the Delaware Bayshore, River Basin and the Suburban Corridor.

Slaff, M., and W.J. Crans. 1982. Impounded water as a major producer of *Culex salinarius* (Diptera: Culicidae) in coastal areas of New Jersey, USA. Journal of Medical Entomology. 19: 185-190.

Figure 33.

Mixed *Culex* spp. – Culex/Anopheles (*Cx pipiens/salinarius* Type)

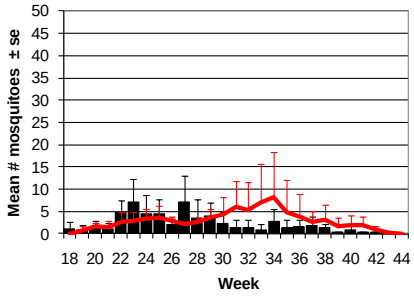
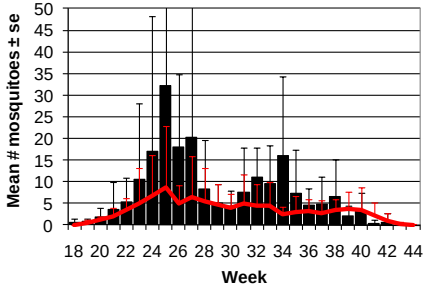
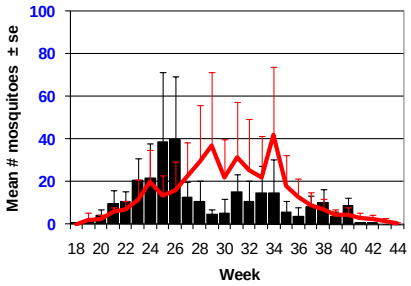
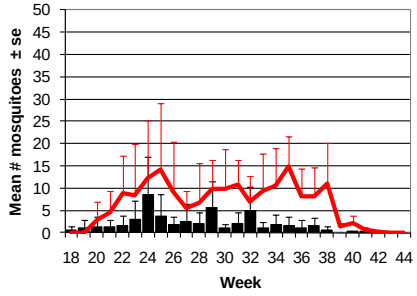
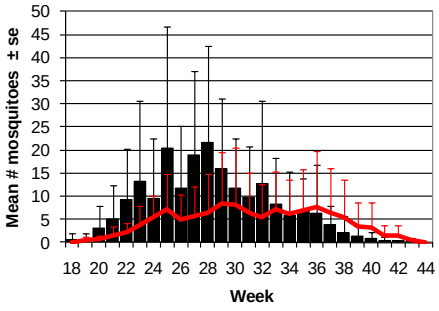
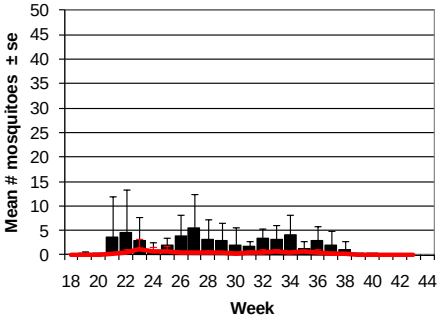
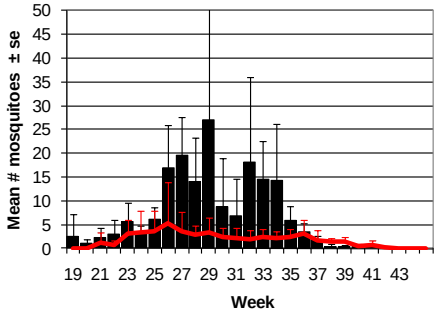
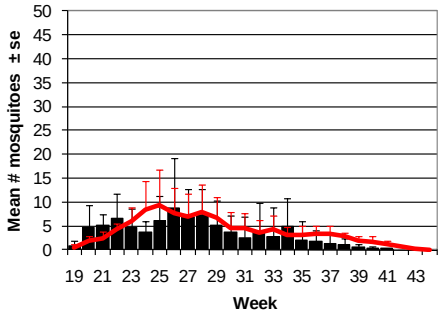
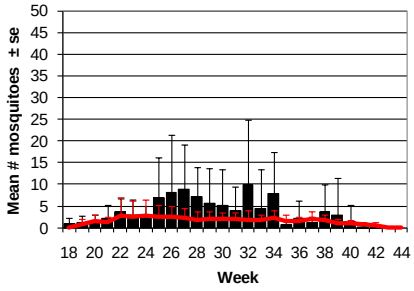
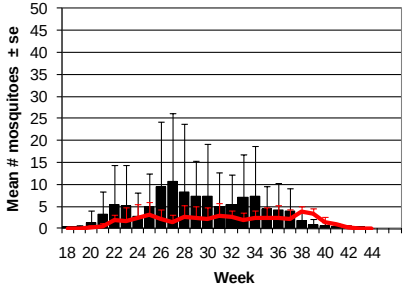
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		Mixed *Culex spp.* (including *Culex pipiens*, *Cx. restuans* and *Cx. salinarius*) are consolidated into one group as individuals from the three species can be difficult to distinguish after going through a light trap. Two of these (*Cx. pipiens* and *Cx. restuans*) are primarily bird feeders, although they may change their diet to include mammals as the summer ends. This is the primary enzootic vector for West Nile virus in the northeast US. Populations in 2009 were around historical values, with notable increases in the Coastal and Northwestern Rural regions and decreases in the Delaware Bayshore and River Basin regions. This year saw a decrease in WNV activity.	

Figure 34.

Anopheles punctipennis – Culex/Anopheles (*Cx pipiens* Type)

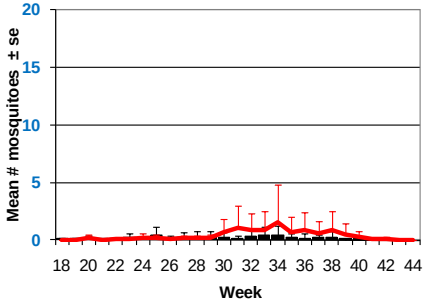
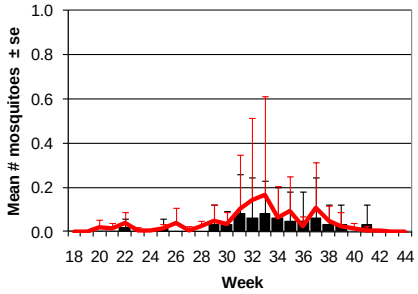
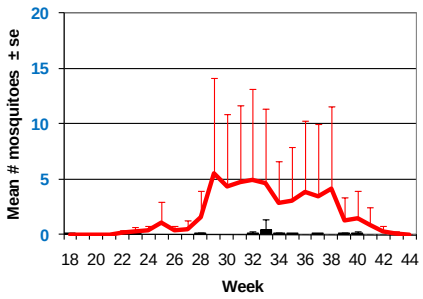
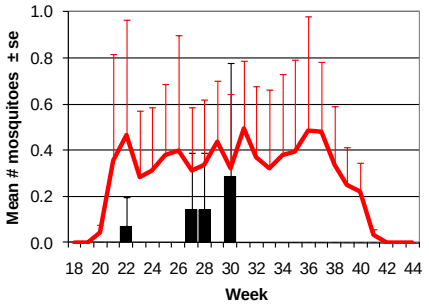
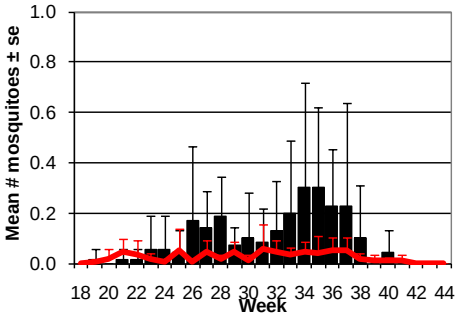
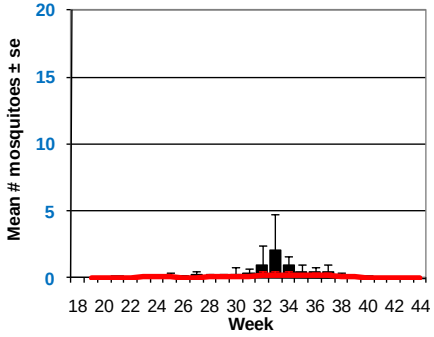
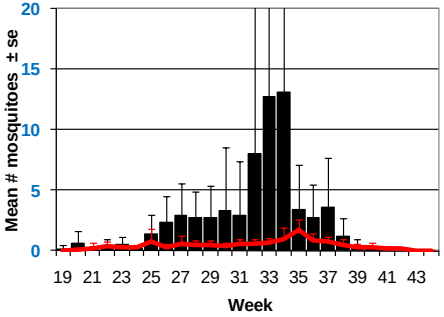
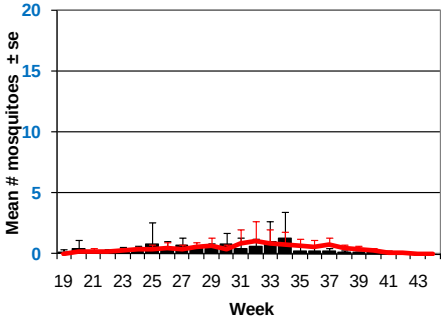
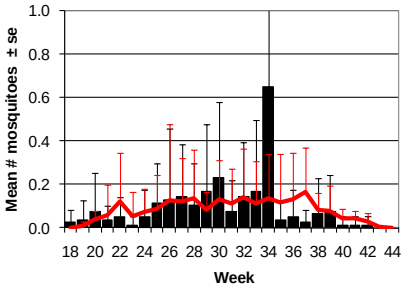
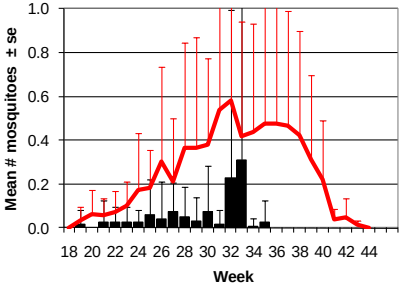
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Anopheles punctipennis* showed a variable response this year, with higher than historical values in the New York Metro and the Northwestern Rural while population suppression occurred in the Delaware Bayshore, Delaware River Basin and the Suburban Corridor. Historically, the Delaware Bayshore has been a region of high production, but this is the second year in a row that fewer *An. punctipennis* mosquitoes have been found. Several viruses have been isolated in this multivoltine species, including West Nile and Eastern Equine encephalitis. Malaria, caused by the *Plasmodium* protozoan, has also been found in this species, but unlike *An. quadrimaculatus*, *An. punctipennis* is not considered a major vector.	

Figure 35.

Culiseta melanura – Unique (*Cs. melanura* Type)

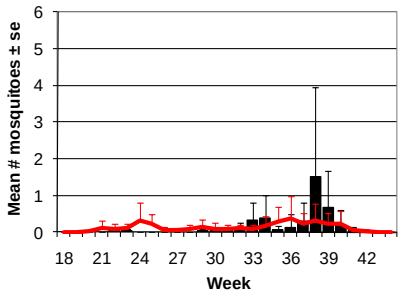
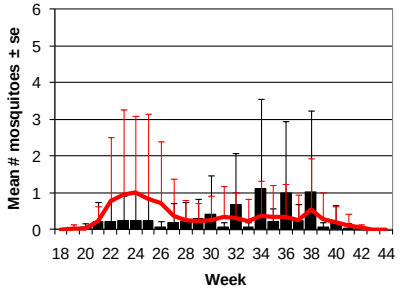
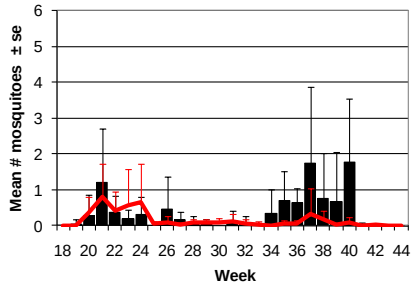
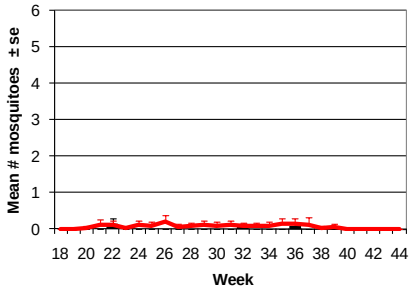
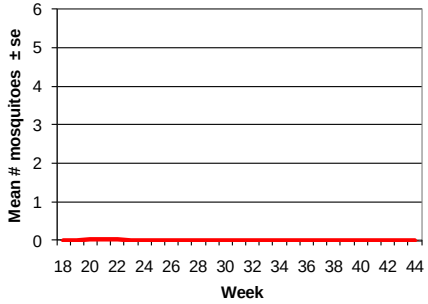
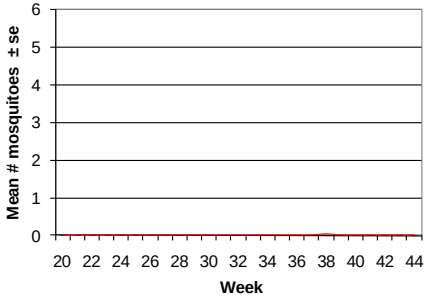
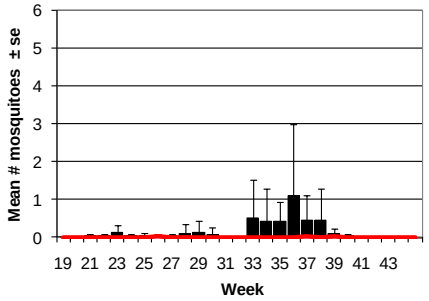
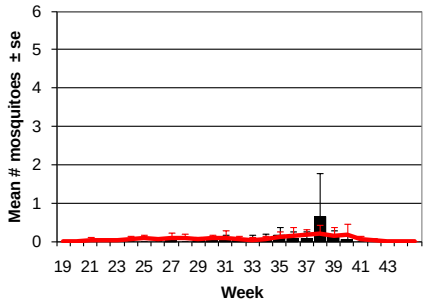
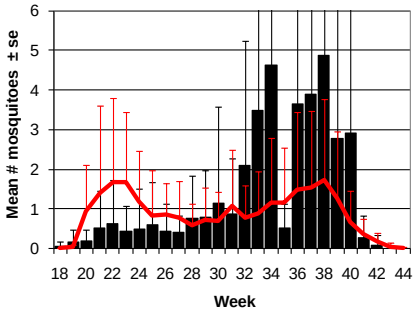
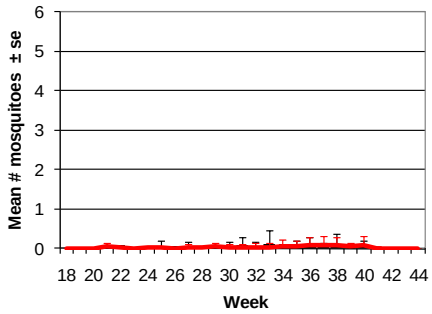
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Culiseta melanura* is the enzootic vector of eastern equine encephalitis virus. This species overwinters as larvae in the acidic waters of peat bogs, usually safely inside crypts formed at the base of trees. This makes larval control of them particularly difficult. Historical values of the Pinelands clearly show the second generation where most EEE amplification occurs that develops during the second half of the season. This season shows this generation's elevated abundances in the Pinelands, Agricultural, Coastal, Delaware Bayshore and the Northwestern Rural regions. This occurred during a year when EEE activity was high.	

Figure 36.

Anopheles crucians – Unique (*Cs. melanura* Type)

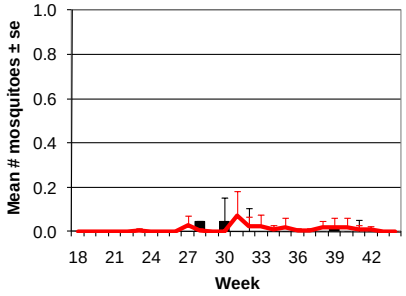
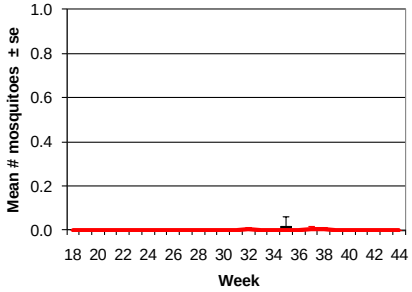
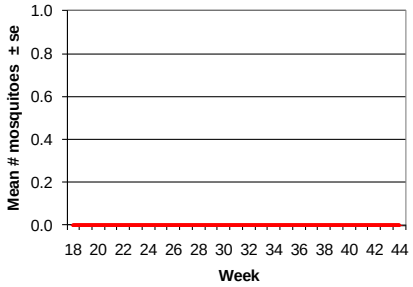
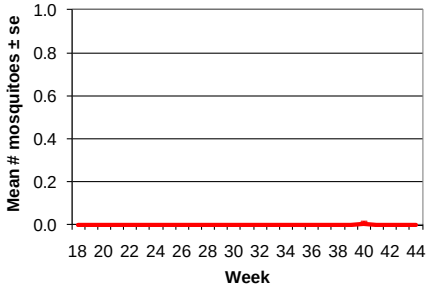
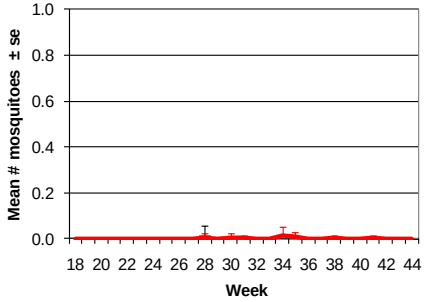
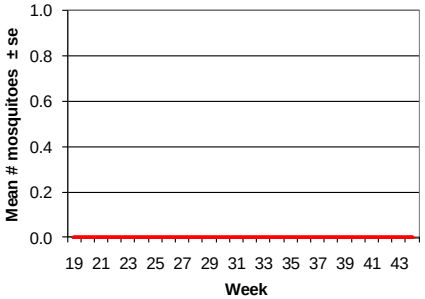
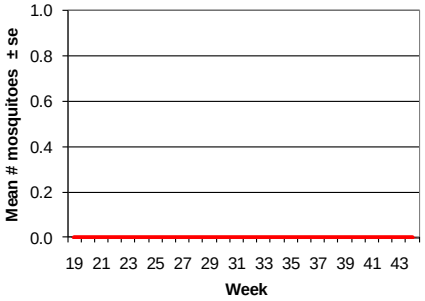
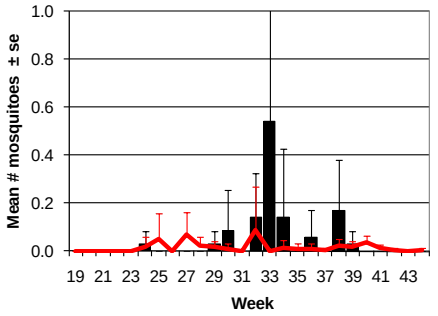
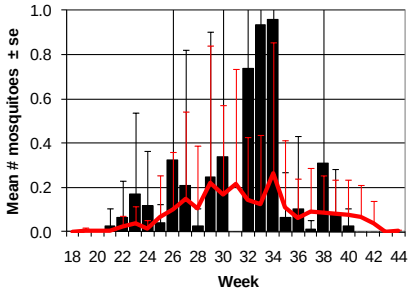
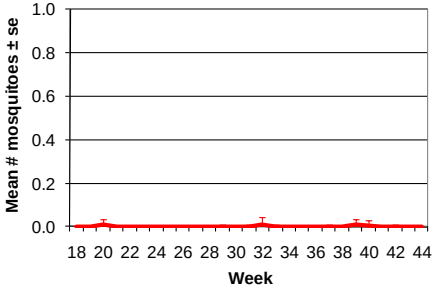
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Anopheles crucians* has not been reported previously in the final reports due to low numbers, but this year, abundances in the Pinelands and Philadelphia Metro regions elevated this species. *An. crucians* is similar to *Cs. melanura* with overwintering larvae that likely spend time burrowed in bottom sediment. It can apparently exploit habitats with varying amounts of mineral salts not tolerated by other species. Although reported in saline habitats in the past, (perhaps misidentified i.e. *An. bradleyi*) few *An. crucians* appeared in either the Coastal or Delaware Bayshore habitats. This species is a potential vector of malaria.	

Figure 37.

Coquillettidia perturbans – Miscellaneous Group

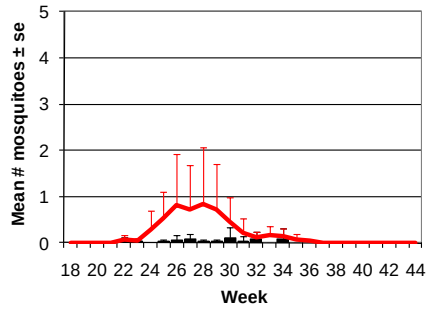
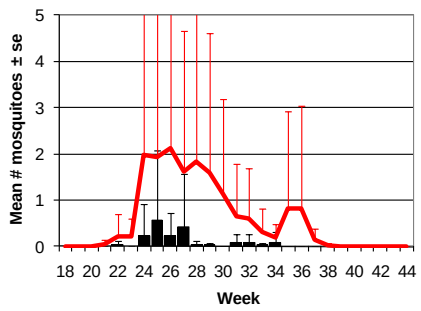
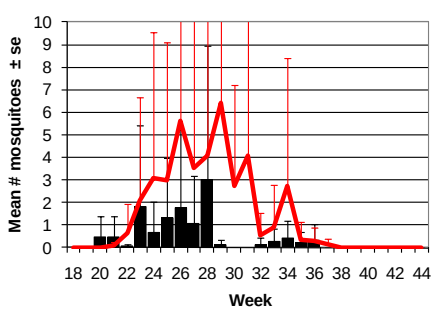
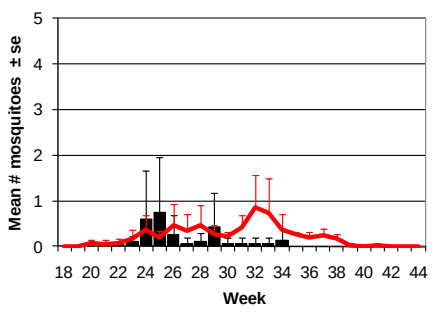
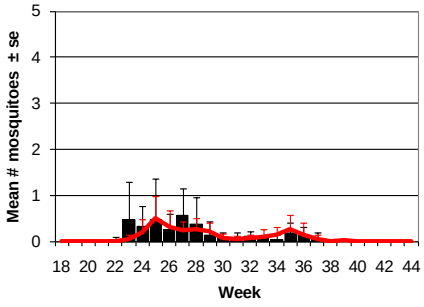
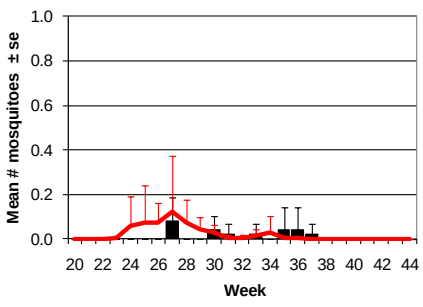
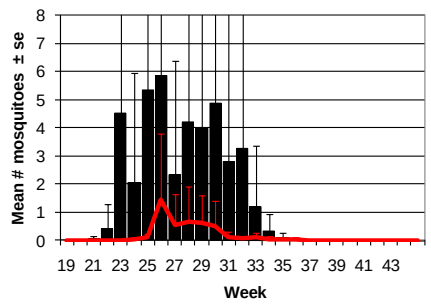
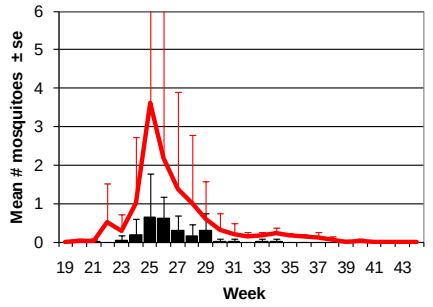
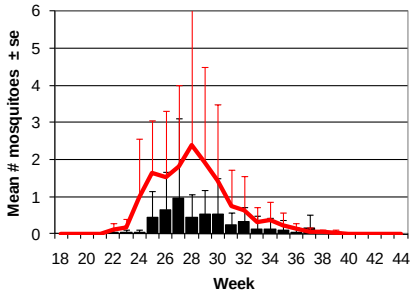
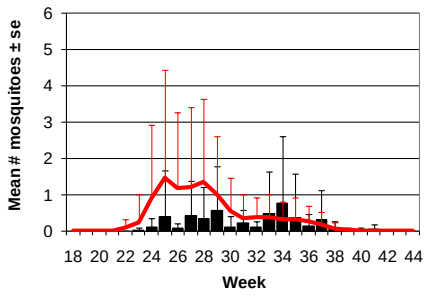
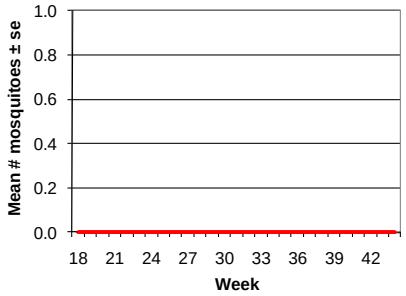
Agricultural	Coastal	Delaware Bayshore	Delaware River Basin
			
New York Metro	**North Central Rural**	**Northwestern Rural**	**Philadelphia Metro**
			
Pinelands	**Suburban Corridor**	**Comments**	
		*Coquillettidia perturbans*, a suspected vector of inland EEE cases, spends its larval time attached to plants and gaining oxygen through the piercing of the plant phloem. This exploitation of plants makes this species more difficult to control. This year, population suppression occurred to some degree in the Agricultural, Coastal, Delaware Bayshore, Philadelphia Metro, Pinelands and Suburban Corridor while the Northwestern Rural region experienced an abundance of this species.	

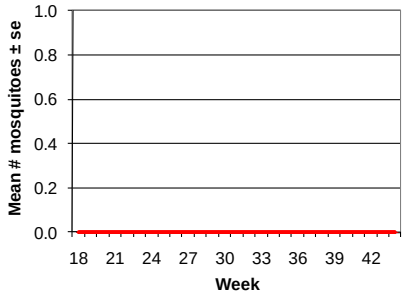
Figure 38.

Anopheles walkeri – Monotypic (*An. walkeri* Type)

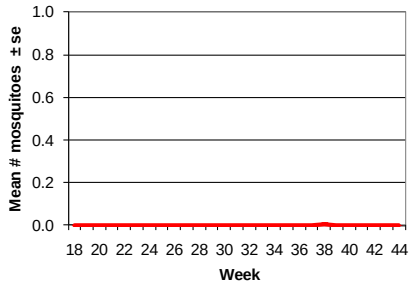
Agricultural



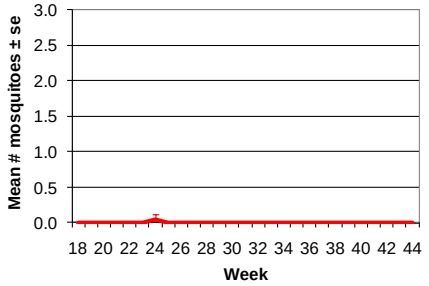
Coastal



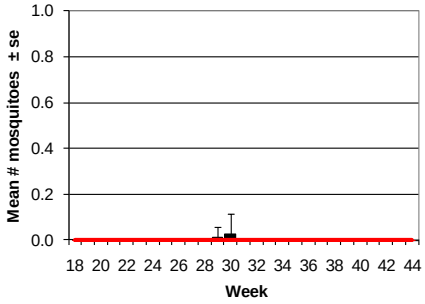
Delaware Bayshore



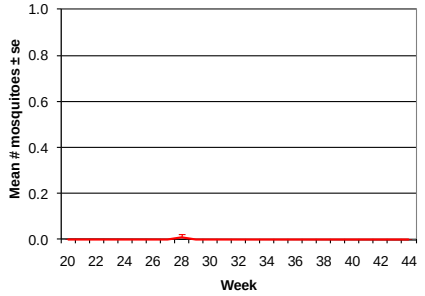
Delaware River Basin



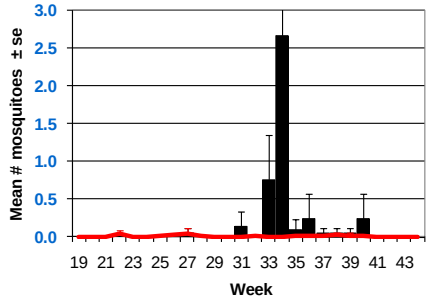
New York Metro



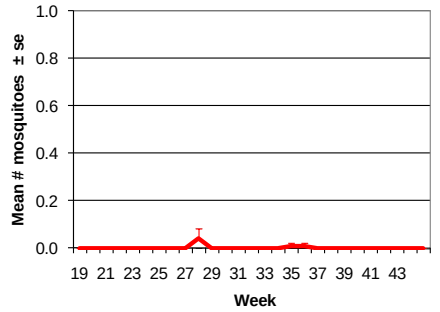
North Central Rural



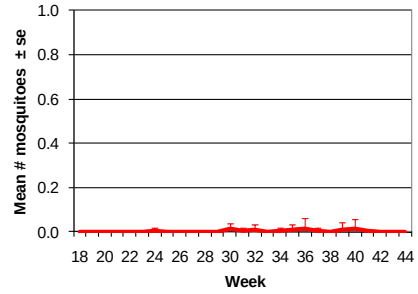
Northwestern Rural



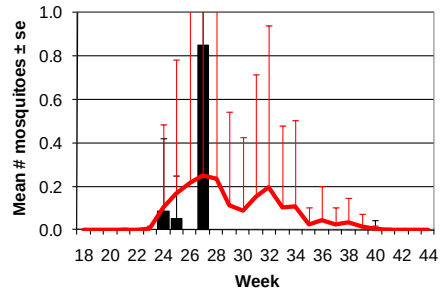
Philadelphia Metro



Pinelands



Suburban Corridor



Comments

Anopheles walkeri is the only anopheline to overwinter as an egg and is thus given its own life cycle classification (Crans 2004). This species has been found in association with beaver dams in the Northwestern Rural region (Duckworth & Musa 2002). Primary habitat is found in certain Suburban areas in Morris County as well as more rural areas in Sussex County. This year, populations in the Suburban Corridor, apart from an exceptional emergence during week 27, were generally absent. However, in the adjacent Northwestern Rural region, this species flourished, with abundances well above the historical trends for the last five years.

Crans, W. 2004 A classification system for mosquito life cycles: life cycle types for mosquitoes of the northeastern United States. Journal of Vector Ecology. 29: 1-10.

Duckworth, T and C. Musa. 2002 Beaver activity – impacts on mosquito control. NJMCA Proceedings pp 29-36.