

Bat activity and insect biomass: a study at the aquaculture facility using acoustic detectors

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ABSTRACT

Bats play an important role in mediating insect populations that have the potential to become pests of humans and agriculture. Preserving and managing habitats that host bat populations is fundamental for the control of such insects. This study looks at the preferred feeding areas of bats in regard to different locations at the aquaculture facility located at Delaware State University. Using three locations that are situated close to freshwater sources within the aquaculture facility will determine the most active sites for bat activity. These locations are open field, edge of woods, and within woods. It is hypothesized that the edge will contain the higher insect biomass and acoustic recording of bat activity, and the woods will have the least of the former and latter. To determine insect biomass, one Sante' trap was set up at each of three different locations stated and were used to collect aerial insects. The insects were collected and preserved. Bat acoustic equipment was set up 30 meters away from the Sante' traps and recorded acoustic bat activity that would be collected and organized in SonoBat every other week. The insect biomass and the number of recordings were analyzed for the most active sites. It was found that the edge sites at the aquaculture ponds were the most active, having the higher number of bat recordings and insect biomass than wooded and open habitats. It is important to properly manage edge habitats that support important insectivores to keep agricultural pests and disease vectors from increasing their populations.

INTRODUCTION

The complex interaction between bats and insects is widely misunderstood and underestimated. Bats regulate outbreaks of pest insects that cause harm to humans and agriculture industries. The net worth of bats in the United States is 22.9 billion dollars per year in agricultural pest control (Cleveland, 2006). Unfortunately, the growth of agriculture and large scale destruction of natural aquatic habitats has put many bat populations at risk. Fukui et al. (2006) suggests that 22% of the global bat populations are threatened largely due to loss or manipulation of suitable habitat. A study done by de Jong and Ahlen (1991) describes these suitable habitats as ecotones between deciduous forests and open water areas that provide readily available food sources, such as emergent aquatic insects, and dense trees to avert predation. Unfortunately, Delaware has lost 60% of forested habitats and thousands of miles of riparian habitats since European settlement (FWS, 2010). It is important to properly manage aquatic habitats to preserve the insect and bat relationship.

OBJECTIVE

- Analyze the importance of freshwater habitats for bat and insect relationships
- Determine where the most bat activity takes place: wooded, open or edge habitats
- Compare bat activity with insect biomass at each site

MATERIALS AND METHODS

- Set Sante' traps at three different locations at the aquaculture facility
- Placed SM2BAT detectors 30 m from Sante' traps to detect bat activity
- Collected insects every other day from May 26, 2015 – July 11, 2015
- Collected acoustic data from the detectors every week and sorted calls in SonoBat each day

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Figure 1: Collecting at Sante' traps



Figure 2: SM2BAT setup

RESULTS

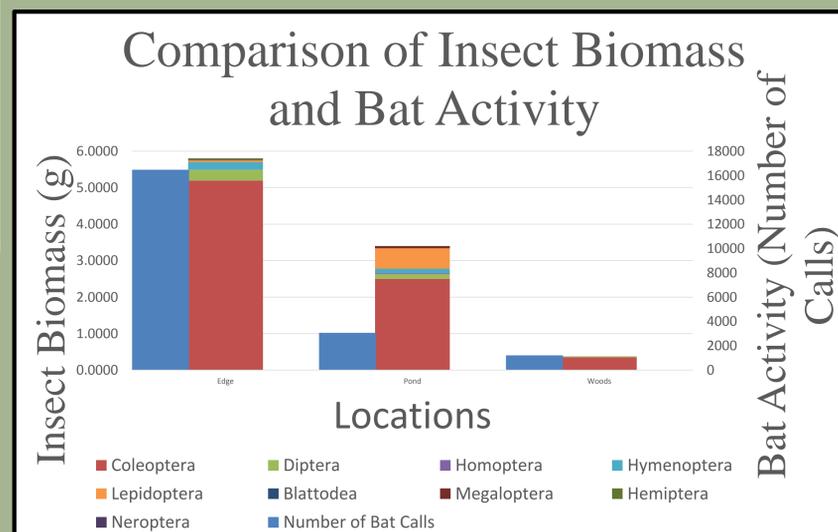


Figure 3: Comparison of Insect biomass and Bat Activity at each location



Figure 4: Common Coleoptera that were collected

RESULTS CONTINUED

- The total insect biomass and bat calls differed greatly for each site. Edge having a total insect biomass of 5.77g and 16,473 bats calls. This is compared to the woods, only having 1,212 bat calls and an insect biomass of 0.38g.
- Coleopteran is the most common insect order found in all locations. The average percent of Coleopteran weight within total insect biomass is 77.15%.

DISCUSSION

- Almeida et al (2014) suggests:
 - woods are used as roosting areas and are important for local bat communities.
 - The result of the woods having the smaller amount of calls, demonstrated in both studies, suggest that dense vegetation interrupts echolocation and flight patterns.
 - The increase in the amount of bat activity at the edge habitat suggests that insects are more abundant and the vegetative structure provides flight corridors.
 - Bat activity increases when water was present
- It cannot be known if Coleopteran is the main food source for local bats, unless if further research is done in the future.
- Moosman Jr et al(2012) described two bat species (*Eptesicus fuscus* and *Myotis lucifugus*), common in the northeast, of having diets mostly comprised of coleopteran. Though this varied with spatial and temporal patterns.

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