Mosquito Larvae Density Study at Ballona Freshwater Marsh

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Center For Urban Resilience | Loyola Marymount University | Spring 2019

Abstract

The Ballona Wetlands is a 51-acre freshwater marsh ecosystem located in the Playa Vista Community of Westside Los Angeles, California. The 25 acres north of Loyola Marymount University are part of a riparian corridor that is used for community beautification and enjoyment, while the 26 acres situated to the west of LMU comprise a large freshwater marsh that has been the focus of efforts to restore the ecological function of the area. Along with beautification and community enjoyment, marshes have the potential to serve as sites for mosquito breeding.

Mosquitoes represent a significant health risk, as they are known as vectors of various diseases and nuisances to humans. In order to reproduce, mosquitoes require relatively stagnant water and temperatures consistently above 10°C. In the Ballona Wetlands, a large area of water sits relatively still, and poses a risk as a site of large-scale mosquito reproduction in the center of an urban area. This area has not shown a significant risk of serving as a site of mosquito proliferation, however monitoring needs to be conducted during mosquito breeding seasons to maintain the low-risk site designation. From Aug.-Nov. of 2018, several sites in the Ballona Wetlands were sampled and all mosquito larvae and pupae found were counted and the numbers recorded to better understand mosquito breeding patterns and density.

Introduction

Mosquitoes are known vectors for diseases such as Dengue, Malaria, and more recently Chingunkuya throughout Central America and southern Africa (Zapletal, et. al., 2018). This makes mosquito control very important in California where the temperate coastal climate makes for tolerable mosquito habitat most of the year. Though, there is a drop-off in their numbers during colder months. The breeding conditions that mosquitoes require are found throughout the California coast and much of the southern US. As urban areas have expanded, more city and state agencies are interested in constructed wetlands that may provide ecosystem services enhance the aesthetic appeal of an area.

The Ballona Freshwater Marsh is used by many residents of Playa Vista and is a frequent destination for birders, dog-walking and outdoor education. These community activities increase the likelihood that humans may interact with mosquitos capable of transmitting disease. Therefore, the monitoring of mosquito larvae/pupae densities is an important task in maintaining resident health and safety (Knight et al 2003).

Questions:
What is the population abundance of mosquito larvae in the Ballona Freshwater Marsh?

What specific locations, of those sampled in the freshwater marsh, contain the highest densities of mosquito larvae?

Methods

From August to November 2018, samples were taken from three sites **(Figure 1)** every week. A sampling screen was used to sweep a 1 square meter area at three sites at the marsh using a 500 micron sampling net attached to an extendable pole. Contents of the net were rough sorted on site to remove large pieces of vegetation and other debris present in different quantities at each site **(Figure 2).** For the Outlet and Mid sites the remaining biota were put into sampling jars and labeled on site. For the Inlet site, where aquatic plant concentrations were the most dense, the contents were placed in a basin and that basin was transported back to the lab to be sorted there **(Figure 3).**

After sorting through the dense vegetation sites at the lab in the CURes Research Annex, the contents were splashed with ~ 3oz. of formalin, put in sample jars and sealed.

To fully inspect the samples the formalin is poured into waste containers and the contents of the sample jars are emptied into a basin. The basin is then filled with water in order to allow the dead organisms to sink and the aquatic vegetation to float. This is a good way of separating the material further. The aquatic vegetation is stirred and moved around gently with a glass stir rod to loosen organisms that may be lodged in it and cause them to fall to the bottom of the basin. Once the water has settled the vegetation is skimmed off the top of the water with strainers and placed in a large beaker. The mosquito fern is then placed back into the basin and the process is repeated to ensure all organisms have been removed.

After the second sorting, the vegetation is thrown away and the contents of the beaker are placed under dissection microscopes and analyzed (**Figure 3**). The organisms that are seen are then removed using forceps and placed in vials with ethyl alcohol.

Figure 1. The sites that were regularly sampled from Aug-Oct. 2018. Samples were collected every week

Figure 2. Two of the sites sampled. Left image is the outlet site and the right image is the mid site. All sites were marked out with stakes to ensure sampling at same location. Different densities of aquatic vegetation were present at all sites.

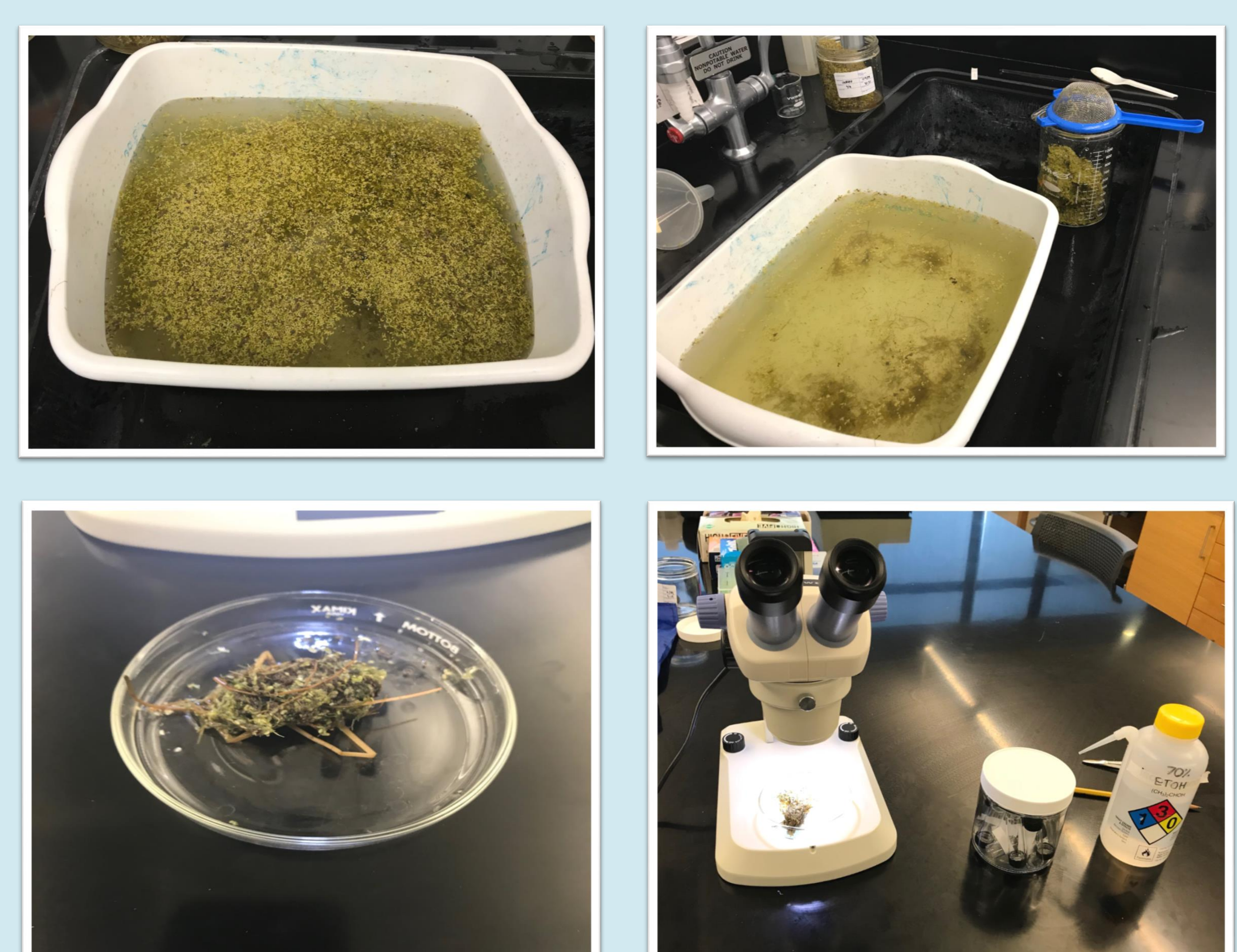

Figure 3. The complete process for quantifying mosquito larvae and pupae were as follows: 1. Combine all the jars from one sample site and date, add water, allow vegetation to rise to the surface (top left). 2. Skim off vegetation and repeat step one. Pour remaining material through 500 micron filter to remove water (top right). 3. Processing of material to identify mosquito pupae and larvae using dissecting microscope and preserve organisms of interest in Ethyl Alcohol (two bottom images).

Results

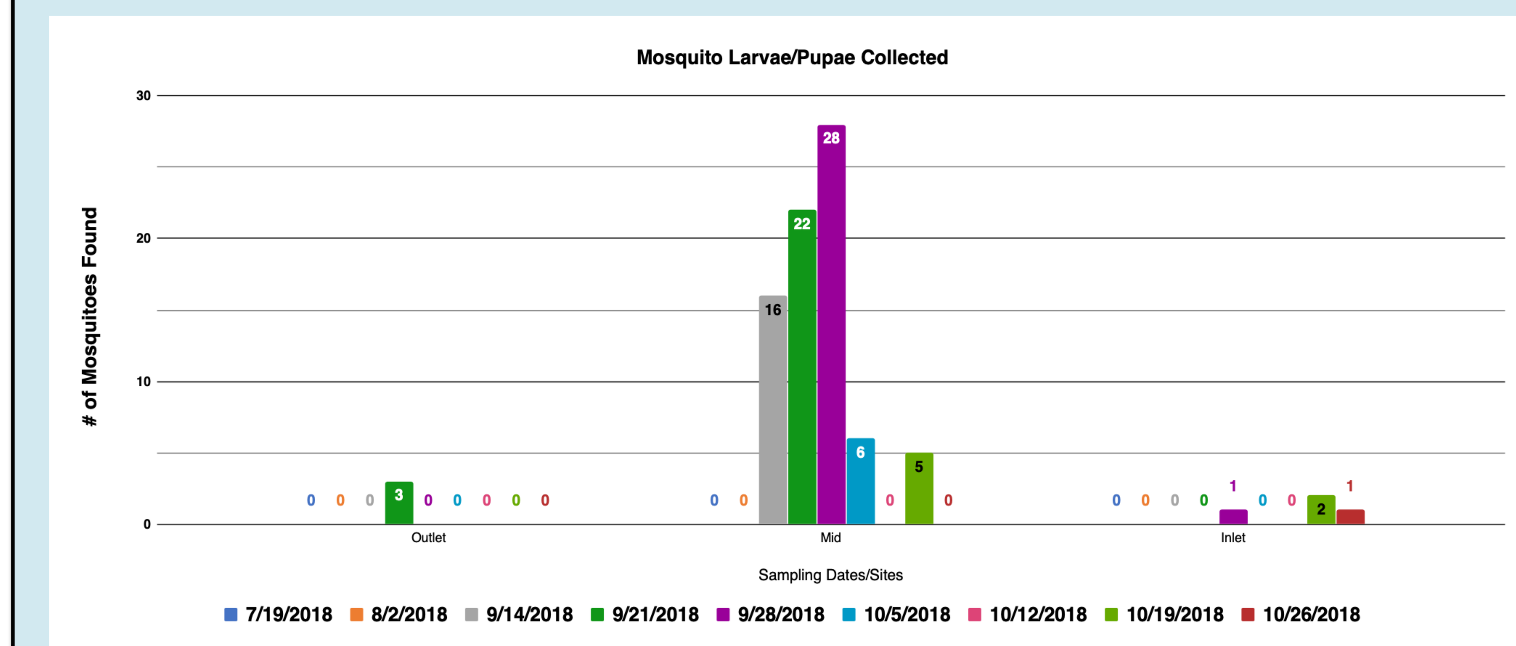

Figure 4. Histogram showing the density of mosquito larvae/pupae during the Aug-Nov. 2018 sampling season. Densities were greatest at the mid site each week sampled and overall.

All samples were sorted and the contents of each site were separated by the week the sample was collected. The Mid site displayed the highest density of mosquito larva/pupa.

Discussion

The higher density of mosquitos present at the mid site could be an indicator that this part of the marsh is particularly susceptible to mosquito breeding. This may be due to a combination of factors including, depth of water, presence/absence of mosquito fish, temperature and amount of pesticides used and the distribution and density of aquatic vegetation. The mid site was the only site where there was an intermediate amount of aquatic vegetation and this may have increased the habitat available for mosquito ovipositioning by creating pockets of stagnant water. At the inlet site, the aquatic vegetation was very dense and it is unlikely that mosquitos would have been able to lay their eggs in the water. The outlet site has the fastest moving water and the least amount of aquatic vegetation. These characteristics could prevent mosquito breeding by limiting potential ovipositioning sites.

The results indicate that there are specific areas within the marsh where mosquito abatement efforts could be concentrated to maximize effectiveness.

Literature Cited

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Acknowledgements

We would like to thank the Center for Urban Resilience and all of its staff for their support during this project.

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