Monitoring Mosquito Larvae Population Density in the Ballona Wetlands Freshwater Marsh

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Abstract

Mosquitoes play an important role in wetland ecosystems. Their larvae feed on algae and plankton, and also provide a valuable food source for migrating bird species. However, adult mosquitoes can be a public health concern due to their possible transmittance of vector-borne diseases. The importance of protecting both the ecosystems used by mosquitoes and public health has prompted the monitoring of mosquito populations in the Ballona Wetlands. This research aims to investigate and understand how the freshwater marsh supports the early life history stages of mosquitoes, and what role the Ballona Wetlands play in mosquito population dynamics in west Los Angeles. The work presented here is the first phase: a pilot study that tests the utility of field-based surface water sampling methods to quantify the abundance and diversity of mosquito larvae in the freshwater marsh. This experimental study will provide temporal data of the appearance of mosquitoes in the wetlands, report population abundances of mosquito larvae, pupae and eggs, and discern the specific locations that contain the highest densities of mosquitoes.

Introduction

Constructed wetlands like the Ballona freshwater marsh function as effective water filtration systems and wildlife habitats while simultaneously harboring breeding mosquito populations, which increases the risks of vector-borne pathogenic and viral infections(*Knight et al 2003*).

In order to better understand mosquito species in relation to public health, a more complete assessment of mosquito community abundance, populations, and temporal changes is necessary(*Crocker et al 2017*). In Southern California, mosquito season typically begins in early March and lasts until late September.

The primary aim of this pilot study is to monitor mosquito larvae abundance at specific locations in the Ballona Wetlands freshwater marsh by forming a reliable research methodology for sampling and evaluating larvae densities.

Questions:
What is the population abundance of mosquito larvae in the Ballona freshwater marsh?

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

When do mosquitoes actually begin to appear and accumulate in the freshwater marsh?

Methods

Figure 1: A Google Earth image of the Ballona Wetlands freshwater marsh. The sampling sites are boxed and circled in the yellow outline. The inlet and outlet of the marsh are labeled in yellow, as well.

Sampling: Peristaltic pumps were used to pump water from sampling sites in the freshwater marsh through a net to capture organisms at the freshwater marsh sampling sites. Peristaltic pumps were calibrated before sampling and ran at a rate of 85 gallons/hour. The water was pumped through a 120um mesh net and the content of the water were collected in a connected container. Peristaltic pumps were powered by a portable generator and ran for 1 hour at each site per week.

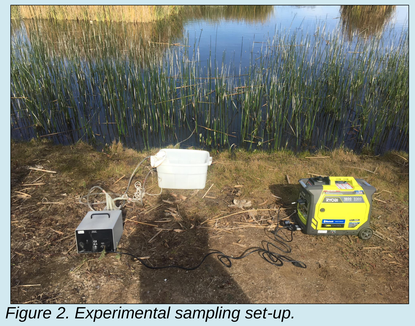

Figure 2. Experimental sampling set-up.

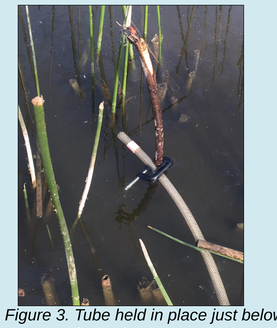

Figure 3. Tube held in place just below water surface where mosquito larvae live.

Larvae counting: The contents of each 85 gallon water sample collected was concentrated down to a single 400 mL volume for counting. Water samples were assessed by examining 25 mL subsamples in petri dishes. Mosquito larvae were identified under a microscope and by their distinctive physical appearance and movement and subsequently counted and recorded. Other organisms within the samples were recorded by their phylum classifications.

Results

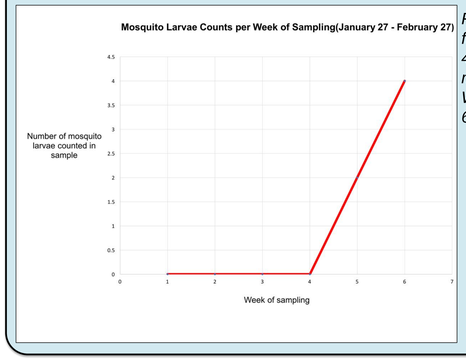

Figure 4. Depiction of current data obtained from the ongoing pilot study. Weeks 1 through 4(January 27-February 13) yielded zero mosquito larvae in the collected samples. Week 5 yielded 2 mosquito larvae and week 6 yielded 4 mosquito larvae.

A total of 6 mosquito larvae were recorded during sampling, found in the last two weeks of February 2018. Only the inlet site reported mosquito larvae.

The larvae that were sampled were of different sizes, indicating different molt/growth stages. No egg rafts or pupae were found in the samples.

Figure 5. An Aedes mosquito larva viewed through a microscope. Larvae can range in size between 0.5 mm and 5 mm depending on their growth stage.

Discussion

Implications:

Preliminary data and results indicate that mosquitoes will breed year round in the freshwater marsh, so long as the temperature is at least 50 F.

Daytime and nighttime temperature fluctuations could be stabilizing breeding mosquito populations in the freshwater marsh during the colder fall and winter seasons.

Future Work:

Continue sampling and counting methodology through the spring and summer seasons, hypothesizing that samples will contain increasing numbers of larvae progressing into mosquito breeding season.

Literature Cited

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L. Knight, R., E. Walton, W., F. O'Meara, K. Reisen, W., Wass, R. December 2003. Strategies for effective mosquito control in constructed treatment wetlands. *Ecological Engineering* 21 211-232.
Pictures:https://bugguide.net/node/view/737110 google earth for map pictures

Acknowledgements

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