The Invasive Mosquito Project

Master of Public Health Capstone Project and Field Experience Presentation

Ashley Thackrah Trotter Hall 104C Kansas State University November 19, 2015 8:30 a.m.



My Bio

- B.S. Biology, Kansas State University, 2012
- Started MPH Program January 2014
- Emphasis Infectious Diseases/Zoonoses





Presentation Overview

- Introduction
- Invasive Mosquito Project
 - Overall Scope
 - Objectives
 - Materials and Methods
 - Results
 - Discussion
- Field Experience
 - Department of Public Health at Fort Riley Army Installation
 - Riley County Health Department
- Conclusion



Introduction

Epidemiologic Triad



https://onlinecourses.science.psu.edu/stat507/book/export/html/25



Mosquito-Borne Diseases

- Canine heartworm¹
- Chikungunya¹
- Dengue fever¹
- Eastern and western equine encephalitis¹
- Malaria¹
- West Nile virus¹
- Yellow fever¹
- And many more...



Chikungunya

- First locally-transmitted case confirmed in Florida in 2014²
- 11 more local cases since then²
- Symptoms include joint pain, fever, muscle pain, headaches, and rash³
- Currently no medicinal treatment or vaccine³
- Virus transmitted to people by Aedes aegypti and Aedes albopictus mosquitoes⁴



Invasive Mosquito Species

Aedes aegypti⁵

- Yellow fever mosquito
- Found throughout the southeastern U.S.
- Primary vector for yellow fever, dengue, and chikungunya



Aedes albopictus⁶

- Asian tiger mosquito
- Prevalent in the eastern and southeastern U.S.
- Vector for dengue, chikungunya, and Eastern equine encephalitis



Mosquito Surveillance

- Involves monitoring of adult and larval mosquito populations to support mosquito control operations⁷
- Mosquito surveillance includes:
 - Determining what species are present⁷
 - Tracking population fluctuations⁷
 - Detecting mosquito-borne diseases in an area⁷
- All of these aspects help decide what mosquito control activities should be performed⁷



Mosquito Surveillance in Kansas



Image extracted from KDHE at http://www.kdheks.gov/epi/arboviral_disease.htm 8

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Mosquito Surveillance Funding in the U.S.

- West Nile virus outbreak from 1999 to 2002 initiated an influx of government funding for mosquito surveillance⁹
- Over time, this funding has progressively decreased (from \$24 million in 2004 to \$9.3 million in 2012 and 2013)⁹
- Despite this fact, mosquito-borne diseases remain a major threat to public health KANSAS STATE

The Invasive Mosquito Project (IMP)

https://upload.wikimedia.org/wikipedia/commons/b/b6/CDC-Gathany-Aedes-albopictus-1.jpg

Overall Scope

- Nationwide monitoring of invasive container-breeding mosquito species in U.S.
 - Determine distributions of invasive mosquito species
- Citizen science project for high school teachers and students
 - Data collection and educational component



Objectives of IMP

- Define the geographic distribution of mosquito species
- Determine at-risk human and animal populations
- Educate citizen scientists of the risk of mosquito-borne diseases
- Create a network of potential collectors
- Build a central database to store data



My specific objectives

- Design and create a user-friendly collection form and logo
- Build a website with central database



Materials and Methods

Original Collection Form

COLLECTION RECORD FORM

RESET

Tick for larval collection

Collection No. GET NUMBER	Nearest Town	Date	
Country	Specific Locality	Time	
Province	Latitude Longitude	Collector(s)	
2 nd Administrative District	Elevation in meters	Organization	
COMMON FACTORS			

No-Info 🗨	No-Info 🛛 🔽	
SKY	ENVIRONMENTAL MODS	
No-Info 🗨	No-Info 🗨	
DISTANCE FROM HOMES	GROUND USE	
Meters	No-Info 🗨	
I	SKY No-Info DISTANCE FROM HOMES Meters	

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ADULT COLLECTION

LARVAL COLLECTION

Website and Database

- Website needed as a resource for project participants
 - Access classroom materials such as lesson plans,
 PowerPoint presentations, and basic information on mosquitoes and mosquito-borne diseases
- Central database needed to store data collected and submitted by students



Results

https://i.ytimg.com/vi/CjHm2zKiTs0/maxresdefault.jpg



Collection Form



Invasive Mosquito Project

Collection Record Form



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School Name:	Teacher's Name:		
School's Street Address:	Date Cup was Placed (Y)	YY/MM/DD):	
School District Number:	Date Cup was Retrieved	(YYYY/MM/DD):	
City/State/Zip Code:	Number of Days Cup was Outside:		
	Collector Name(s):		
County:			
How mosquito eggs, larvae, or pupae were	Eggs	Larvae/Pupae	
collected (circle one or many)		Open Water	Contained Water

Back of the collection form

Principal Characters for Identifying Mosquitoes of General Importance



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Website

- Resource for current and prospective project participants
- Design of website created by Nolan Blankenau
- Navigate through IMP website between four pages
 Home
 - Collection Form
 - View Data
 - Resources



Tour of Website

• <u>www.citizenscience.us</u>



Home page





Collection Form page

Togshor's Name	Plages fill out whichover sections below	Masquita Spasies - Number of Adults
First Name	are applicable.	Collected
Last Name	- Eggs - Container A	Add another species
	Eggs Container A	Add diferrer species
Teacher's Email	Position of Container	Other Species
	USun UShade	them here.
School Name	Tupe of Container	Add other species
School District Number	e.g., oviposition cup	Student Name
	Beginning of Collection	
City	YYYY-MM-DD	Species Identification Confirmed By
	End of Collection	
State	YYYY-MM-DD	Date Confirmed
Alabama V	Number of Egg Ratts	YYYY-MM-DD
	Number of Individual Eggs	
	Eggs - Container B	
	, Eggs Container B	
	Larvae/Pupae	
	Adults	
Comments		
<u></u>		
	Submit	

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View Data page



USDA ARS Address - 1515 College Avenue, Manhattan, KS 66502 USDA ARS Website

Contact us via email: invasive.mosquito.project@gmail.com



Resources page

Lesson 1: Egg Collection

PowerPoint Presentation Presentation Information Introduction to Mosquitoes Worksheet Quiz A

Quiz B

Collection Notes Egg Collection Procedures Collection Record Form Potential Collaborators/Identifiers North American

Collecting

Mosquito Project

Note to Teachers Keys to the worksheets and quizzes are available by emailing us at invasive.mosquito.project@gmail.com.

Mosquitoes

Chikungunya Handout Walter Reed Biosystematics

> American Mosquito Control Association

United States CDC

Mosquito Bite Prevention

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Discussion

Importance of my objectives

- Logo provides visual representation for the IMP project
- New collection form offers improved organization and structure
- Website serves as user-friendly resource for project participants
- Database stores data that contributors have collected



Importance of IMP

- Mosquito species distribution data
- Multiple entities benefit
 - Students learn about:
 - Public health and safety
 - Mosquitoes and mosquito-borne diseases
 - Bite prevention and source reduction
 - Real data collection



Importance of IMP

- Teachers benefit from educational materials
- Public health departments and mosquito control agencies can:
 - Obtain distribution data for mosquitoes in their area
 - Take the opportunity to educate the public
 - Create a partnership with teachers/schools





Fort Riley Department of Public Health



Prevent https://www.facebook.com/FortRileyDepartmentofPublicHealth/?fref=ts Preceptor: Colonel Paul Benne Fort Riley, Kansas August 17 – October 1, 2015



Environmental Health Section

- Worked under the supervision of Mr. Ronald Gerace, Sanitarian
- Focused on mosquito surveillance methods used on Fort Riley Army Installation
 - Mosquito trapping methods
 - Mosquito species identification
 - Mosquito control and prevention measures



Mosquito Trapping Methods

CDC Light Trap



New Jersey Light Trap



http://sjmosquito.org/assets/images/pic-nj-light-trap.jpg

Gravid Trap



http://www.ct.gov/mosquito/cwp/view.asp?a=3#36&Q=414712&mesquitoNay=

Mosquito Species Identification





https://upload.wikimedia.org/wikipedia/commons/thumb/d/dd/Mosquito_gender_en.svg/2000px-Mosquito_gender_en.svg.png



http://media.padil.gov.au/species/136221/900-large.jpg



Mosquito Control and Prevention Methods

- Fogging practiced to control adult mosquito populations
 - Contracted service through Best Pest Control of Manhattan
- B.t.i. Mosquito Briquets used to control the larval stage of mosquitoes







Riley County Health Department



http://www.rileycountyks.gov/1127/About-Us

Preceptor: Brenda Nickel Manhattan, Kansas June 1 – June 29, 2015



Focus Group Interview

- Conducted focus group interview with three public health professionals
 - Patti Grub Disease Investigator for Riley County
 - Jason Orr Public Health Emergency Preparedness Coordinator
 - Steven DeHart Environmental Health Specialist for Riley County
- Purpose to determine if any surveillance, interventions, or guidelines related to mosquitoes are performed in Riley County



Focus Group Questions

Question	Description
1	What is your current position title and your responsibilities?
2	What is the information you need to know on a disease outbreak?
3	What information do you need to know about invasive mosquito species?
4	What would be your role in a situation where there is an invasive mosquito introduction or disease outbreak related to invasive mosquito species?
5	In regards to the provinue question, what erbevirel (arthroped herpe viruses) surveillence would be
5	done, if any?
6	What type of interventions would be used to address this type of situation?
7	Is there a plan in place to monitor for mosquitoes, especially invasive mosquitoes? Are there any
	disease surveillance activities currently being performed in Riley County?
8	At what point would you let the community know about a disease outbreak related to invasive
	mosquitoes, like Chikungunya?
9	What arboviral disease related to mosquitoes are reportable?
10	Are there practices in place to promote protection against mosquitoes?
11	Who controls mosquito populations in Riley County?
12	Is surveillance being performed for Chikungunya in returning travelers?



Conclusion

- Mosquito surveillance is vital to public health
- My field experiences provided real-world knowledge of the inner workings of a public health department



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Questions?

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