The hunting efficiency of natural mosquito larvae predators

by

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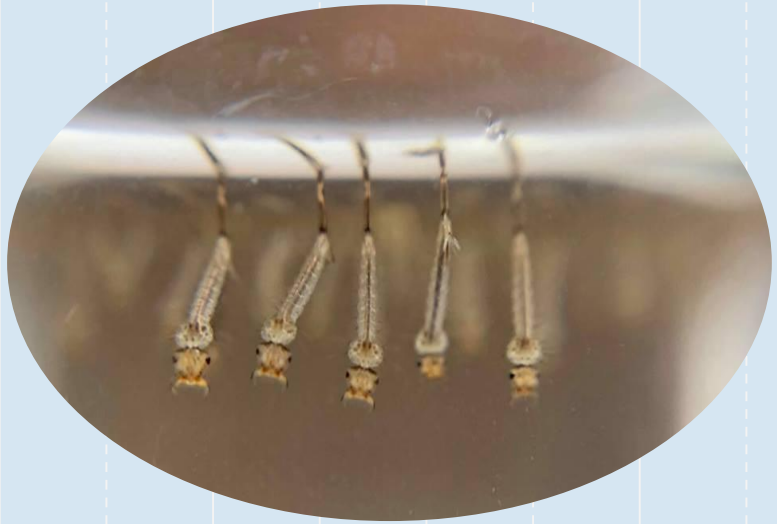

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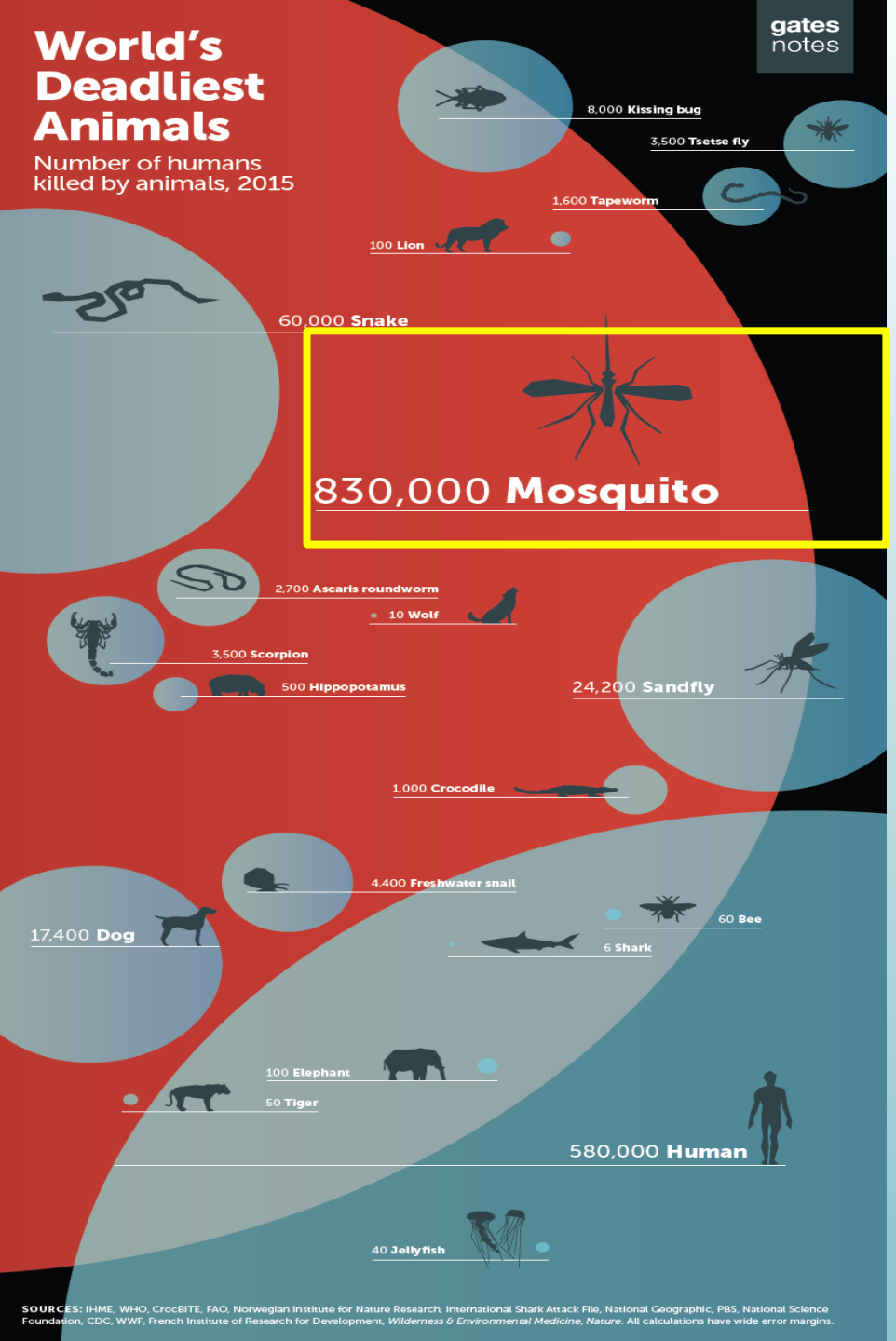


Introduction

More than 3.9 billion people in more than 128 countries are at **risk** of **dengue infection**, with approximately 96 million patients per year.

In the world, **more than 400,000 deaths** occur per year due to malaria and most of them are children (under 5 years old)

(WHO, 31 October 2017)

By Bill Gates | October 10, 2016

Mosquito Borne Diseases

Mosquito Borne Diseases	Mosquitoes
Dengue and Chikungunya	*Aedes* spp.
Filariasis and Malaria	*Anopheles* spp.
Encephalitis	*Culex* spp.
Zika	*Aedes* and *Culex* spp.

Filariasis

Dengue fever

Chikungunya disease

Disease prevention by controlling mosquito population

Spraying fog for controlling mosquitoes

Negative effects of spraying

- When exposed, causing irritation, rash
- If stays for a long time, may be toxic to the blood
- May damage the respiratory system

Using temephos for controlling mosquitoes

Negative effects of temephos

- Stink
- If enters eyes, it causes irritation.

Biological control of mosquitoes

No negative effect and can control mosquito populations effectively

Natural predators

Toxorhynchites mosquito

Water boatman

Thai fighting fish

True water beetle

Water strider

Guppy fish

Toad tadpoles

Dragonfly naiad

Research questions

1. Are these predators able to hunt mosquito larvae?

2. Is there any effect of predator sex on mosquito larvae hunting?

Hypothesis

1. Different predators would have different mosquito larvae hunting efficiency.

2. Male and female predators would have different mosquito larvae hunting efficiency.

Methodology

1. Collected mosquito larvae predator

2. Collected mosquito larvae

3a. Identified mosquito larvae

3b. Identified predators including males/females

4. Set-up experiments in the lab

Methodology

The types of predators and mosquitoes we found

Types of predators

1. *Toxorhynchites* mosquito

2.Water boatman

3. Thai fighting fish

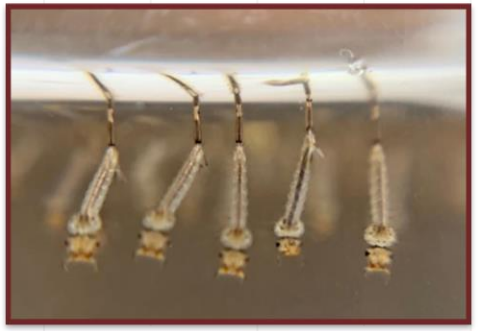
4. Water strider

5. Guppy fish

6. Toad tadpoles

Types of mosquito larvae

1. *Aedes* spp.

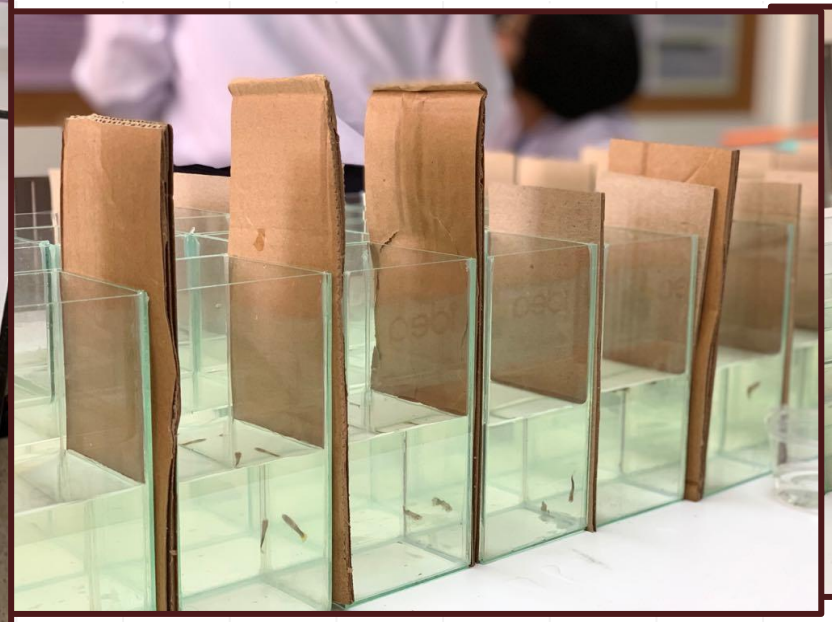


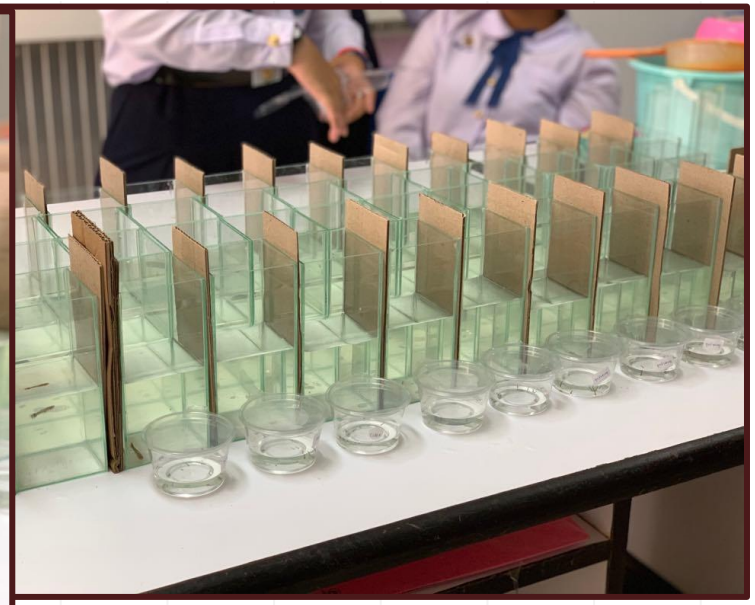
2.*Culex* spp.

Experiment set up: Hunting efficiencies of different predators

1. Kept the predators in containers for 3 days and fed them normally. Then let them starve for 24 hours before starting the experiment

2. Put 1 predator and 10 mosquito larvae inside a glass container (size- H: 6 inch, L: 3 inch, W: 3 inch).



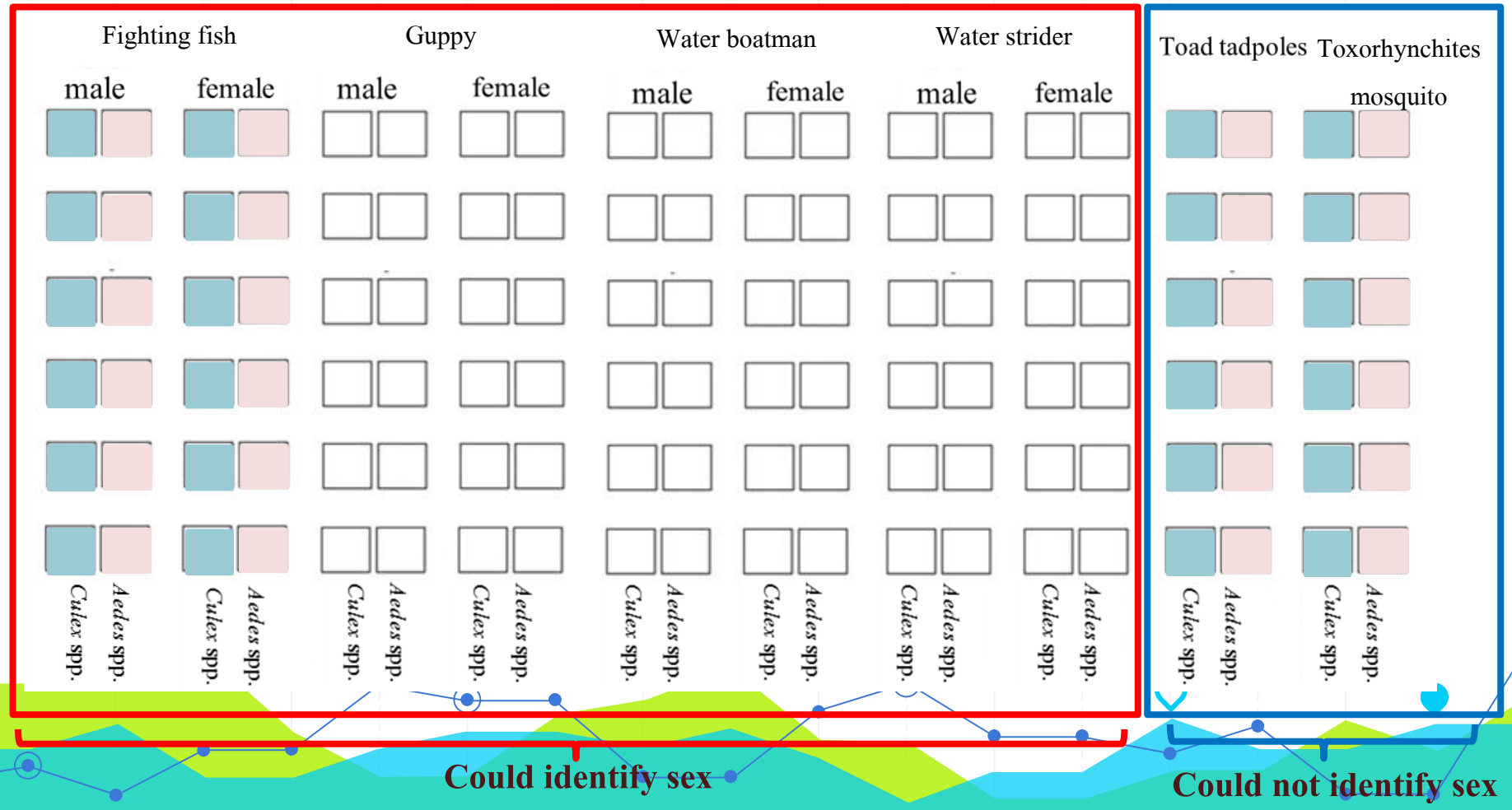


Experiment set up: Hunting efficiencies of different predators

3. The experiment had 6 different set-ups based on predator types

4. In total there were 60 containers

5. After set up of each container, we recorded the time each predator took to hunt the mosquito larvae



Statistical analyses

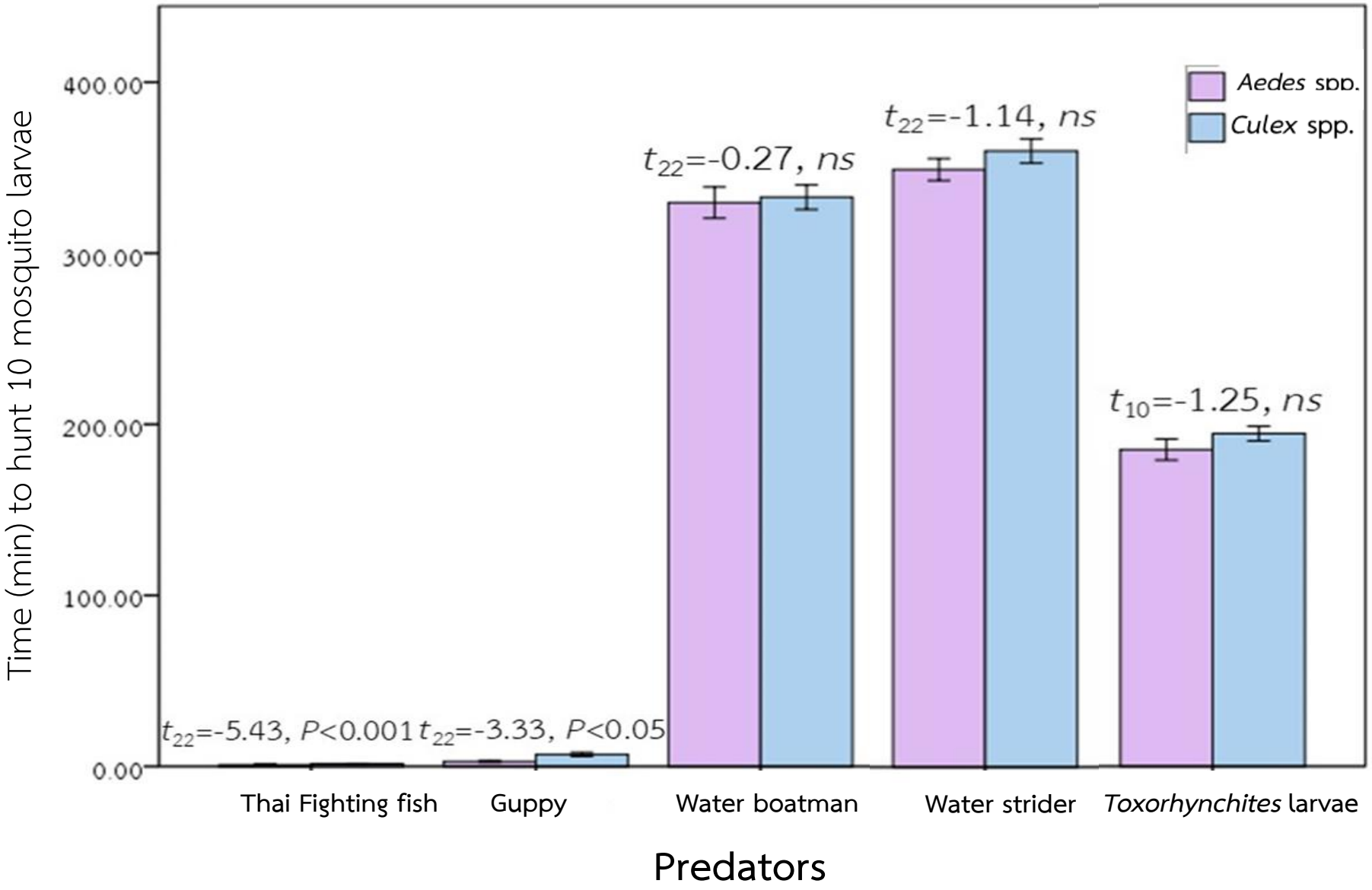
1. We used SPSS to analyse data

2. *T*-tests were used to see the differences between hunting time for *Aedes* and *Culex* spp. for each predator type

3. Two-way ANOVA was used to see the effects of sex and mosquito types on the hunting time for each predator type

Results

Mosquito larvae hunting efficiency of predators

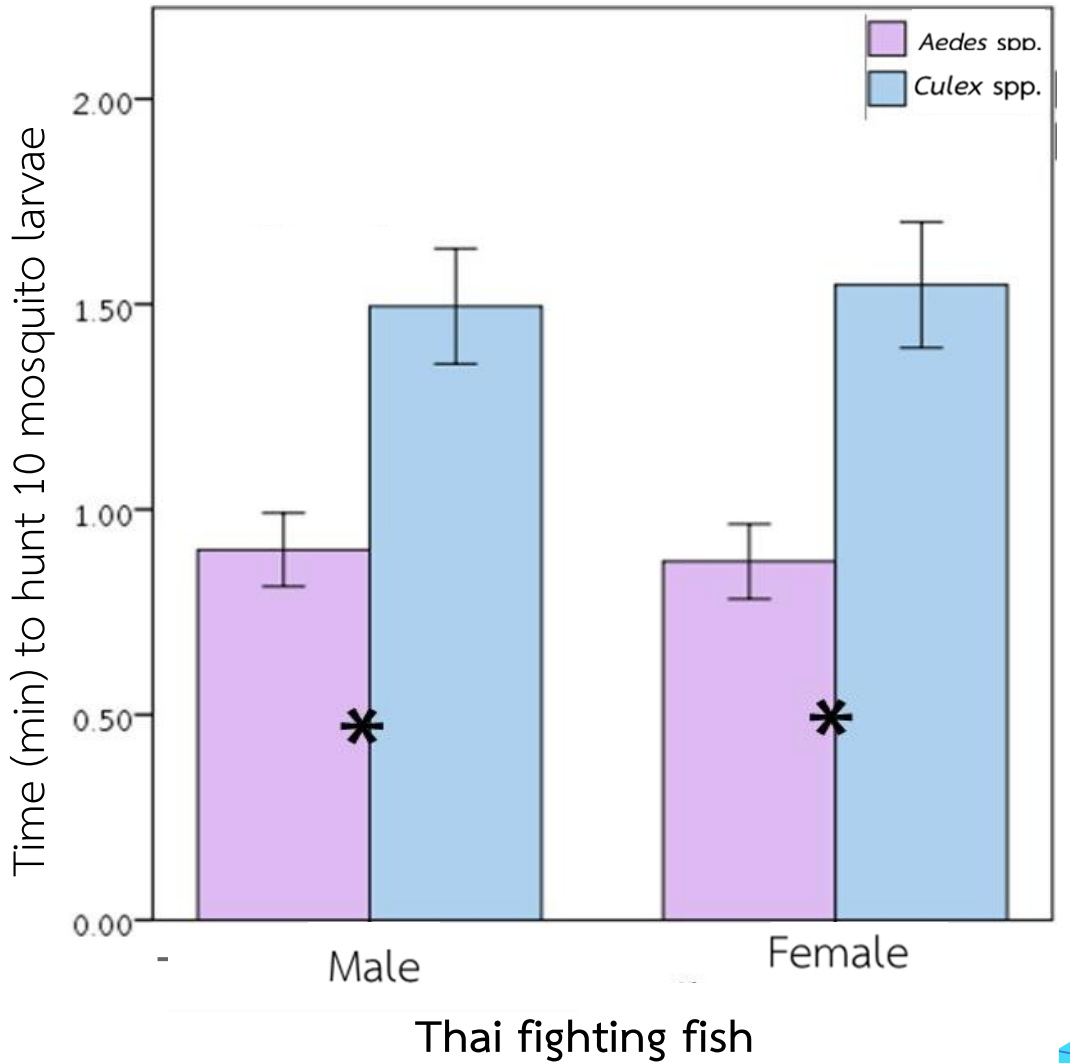


Tadpoles did not hunt mosquito larvae!!

Results

Mosquito larvae hunting efficiency

Thai fighting fish



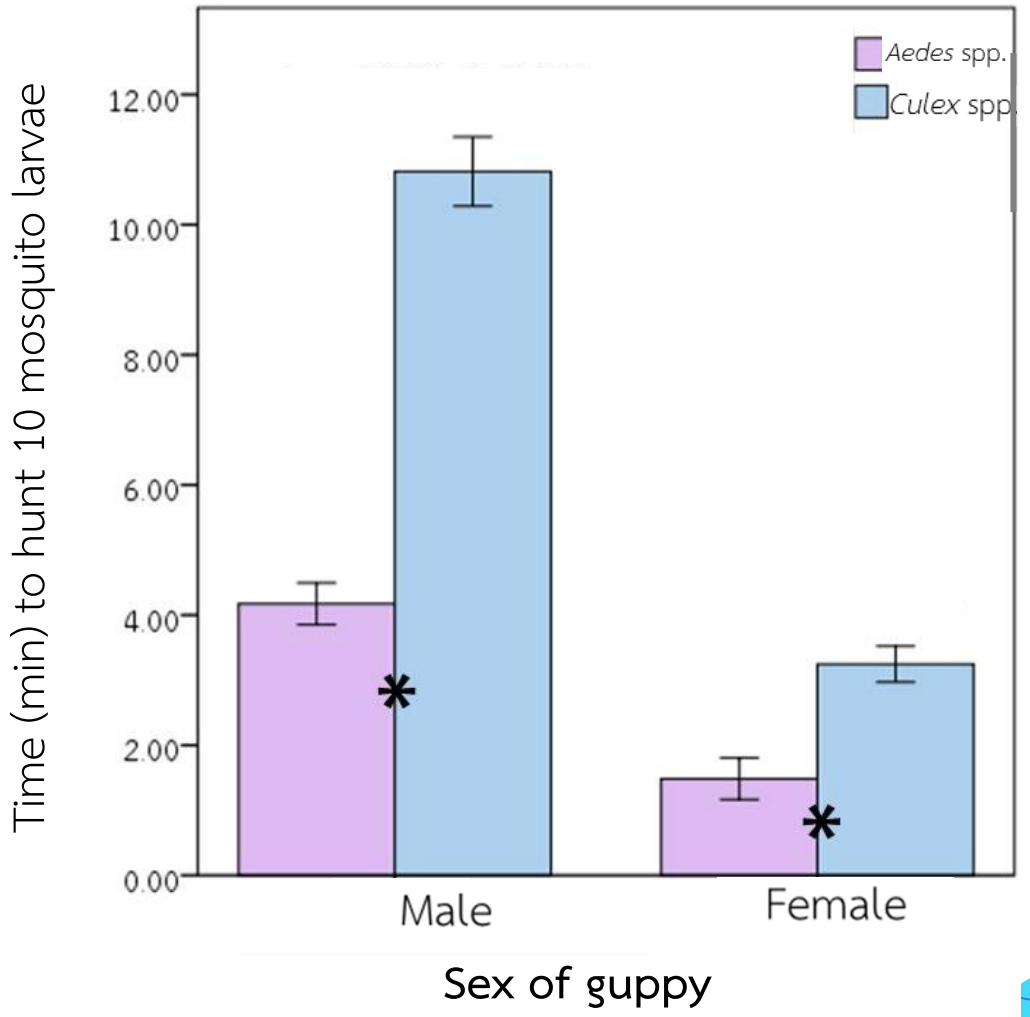
Sex: $F = 0.009$, *ns*

Mosquito types: $F = 27.01$, $P < 0.001$

Results

Mosquito larvae hunting efficiency

Guppy



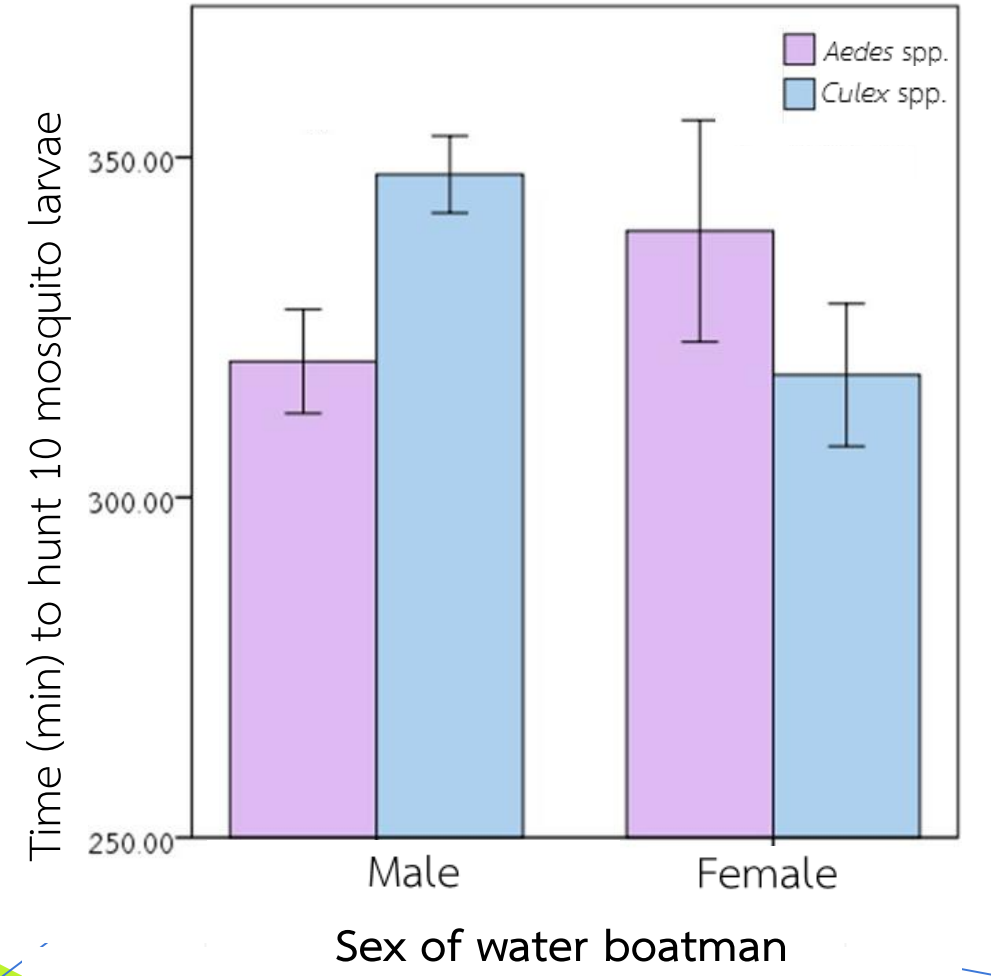
Sex: F = 187.05, P < 0.001

Mosquito types: F =125.49, P < 0.001

Results

Mosquito larvae hunting efficiency

Water boatman



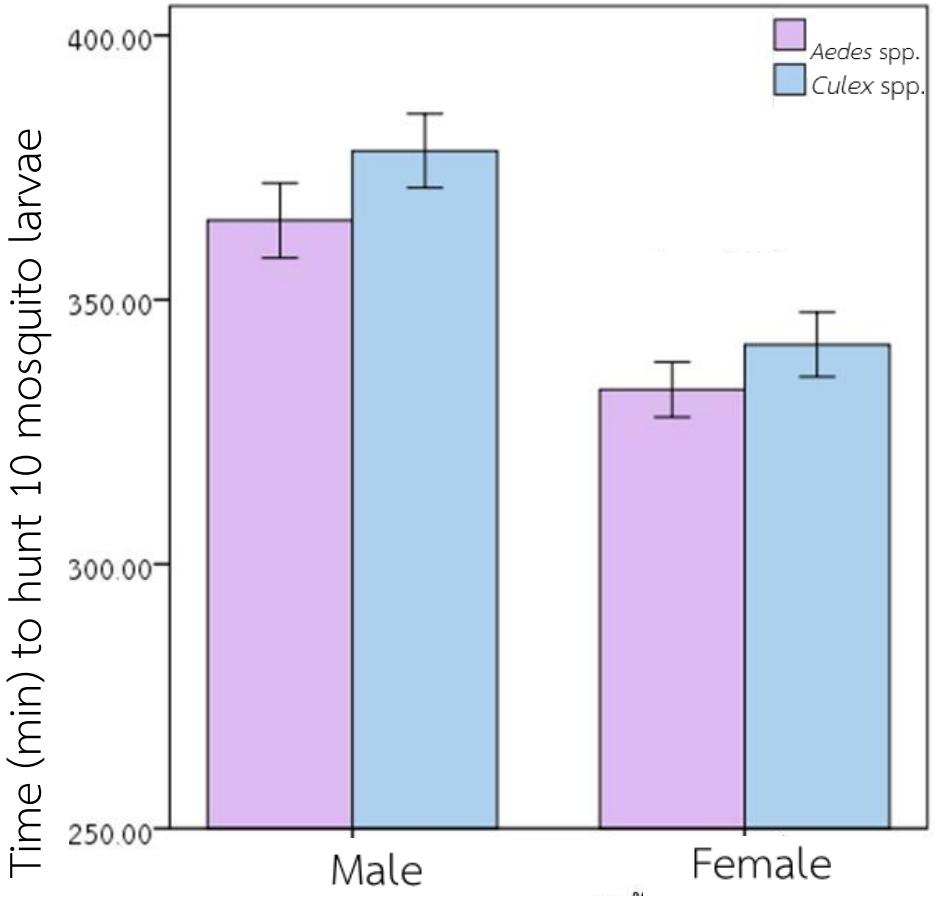
Sex: *F* =0.23, *ns*

Mosquito types: *F* =0.89, *ns*

Results

Mosquito larvae hunting efficiency

Water strider



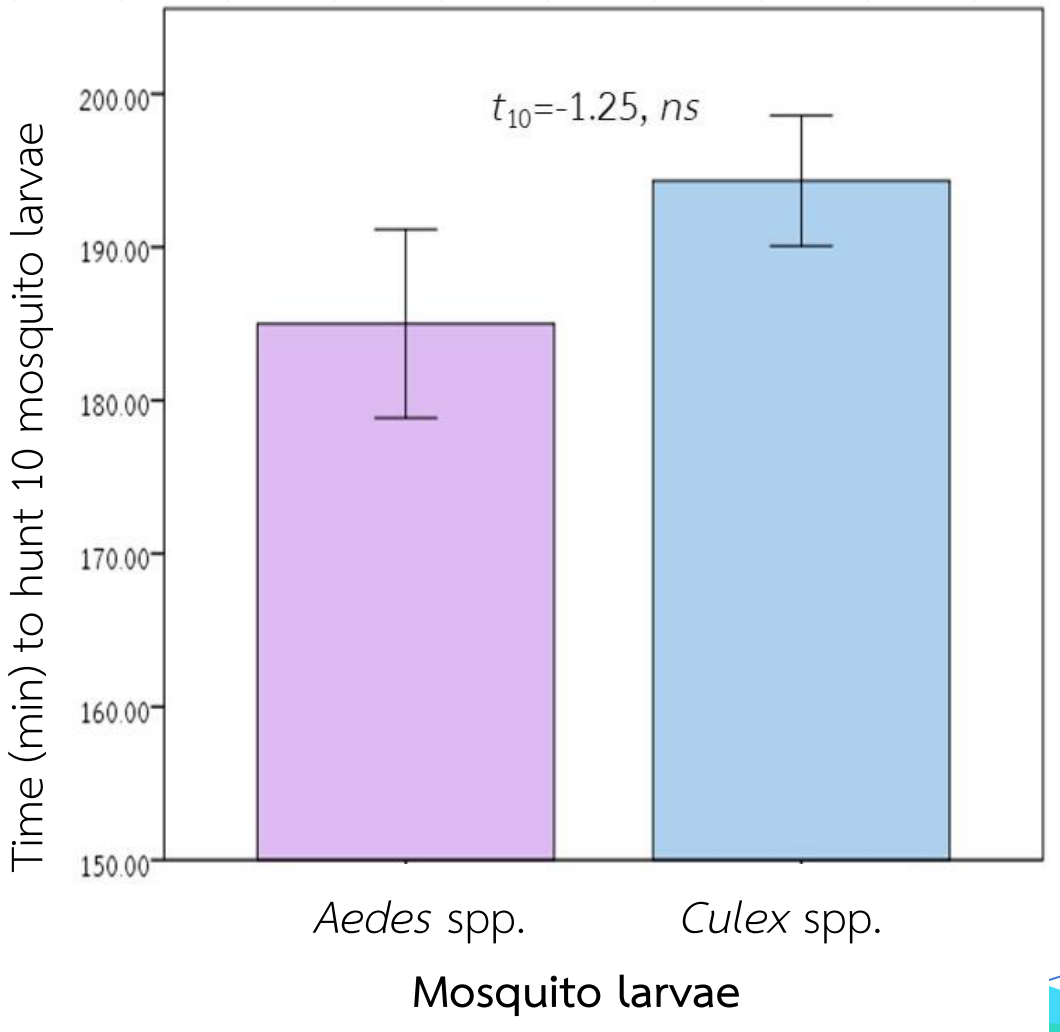
Sex: $F = 28.78$, $P < 0.001$

Mosquito types: $F = 2.86$, *ns*

Results

Mosquito larvae hunting efficiency

Toxorhynchites mosquito larvae



Conclusions

1. We observed that tadpoles did not hunt any mosquito species that means they do not act as mosquito predators.
2. Sexes of guppy and water striders showed different hunting behavior. Females hunted all mosquitoes within shorter time compared to males. It indicates that female guppy and water striders act as more efficient mosquito predators compared to males.
3. Fighting fish and guppy took less time to hunt *Aedes* larvae than to hunt *Culex* larvae. Other predators took similar time for hunting these two mosquito species. It indicates that fighting fish and guppy act as more efficient *Aedes* predators.

Suggestions based on our research

1. People in Trang province can use natural predators to control mosquito populations, as well as to prevent mosquito borne diseases.

2. People can protect mosquito predators in natural environment.

3. People can keep some predators inside the water containers in their house to control mosquitoes.

How predators hunt mosquito larvae?

Water boatman

Toxorhynchites mosquito larvae

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THANK YOU FOR ATTENTION !