# Sociocultural factors affecting mosquito breeding sites: A case study of Thai and Burmese residences in Ranong, Thailand

**Students:** Siprang Hongsiriwat, Natcha Kaewthongdee, Peerawit Ouamsiri

**School:** Samsenwittyalai

**Teacher:** Dr.Wanwipa Sutthakiet

**Email:** pusamsen@gmail.com

## Abstract

The research team found Burmese workers in Ranong living with mismanaged water containers that could be mosquito larva breeding sites. Mosquito can spread infectious disease outbreak. The research team then pursued to study 1) the mosquito larvae positive containers and mosquito larvae found in Thai and Burmese household and 2) the difference in the number of mosquito larvae in the containers in Thai and Burmese household in different sociocultural factors. The population was Thai and Burmese household in Ranong, and the sample was 30 Thai households and 30 Burma households. The researchers surveyed positive mosquito containers, mosquito larvae species, and the number of mosquito larvae; moreover, interviews were conducted to gather sociocultural factors: education level, the number and career of the members in the house. Statistics used were frequency, mean, standard deviation, t-test, and ANOVA. The results were 1) the positive containers, the total mosquito larvae, and the mosquito species in Thai and Burmese household, while the number of *Ae. aegypti, Ae. albopictus,* and *Culex* in Thai household was more than in Burmese household at the significant level of .05.

## Research Question

1. How many positive containers and mosquito larvae can be found in Thai and Burmese workers' residence?

2. Are there any difference in the number of mosquito larvae found in the containers in Thai and Burmese household in different social factors?

## Introduction and Review of Literature

Vector-borne infectious diseases, particularly mosquito-borne, pose a substantial threat to populations throughout Southeast Asia. Outbreaks have affected this region several times during the early years of the 21st century, notably through outbreaks of Chikungunya and Dengue. These diseases are believed to be highly prevalent at endemic levels in the region as well. (Servadio, Rosenthal, Carlson, and Bauer, 2018).

It is possible that the devastation Zika has caused outside of African countries. They show that the subspecies of the mosquito vector, Aedes aegypti, that lives in close proximity with people in the tropical urban areas of Asia and the Americas is more likely to both contract and transmit the Zika virus than the subspecies more prevalent in Africa. (Olena, 2020)

Other species can also be the source of disease. For example, malaria is a carrier of the mongoose mosquito. Although nowadays, the overall number of malaria cases has decreased, but it is still more common in border seams forest, mountain and waterfall areas.  Elephant disease is caused by roundworms borne by mosquitoes. There is also encephalitis and mosquito-borne mosquitoes found in rice fields.

One of the most effective ways to control a mosquito population is to reduce its breeding habitats. The control can be carried out in both the larva stage where the mosquito is the larva and in the mosquito larvae stage. (National Institute of Health of Thailand, 2018).

Mosquitoes utilise a wide variety of larval habitat types. Artificial containers are a major source of breeding habitats for mosquitoes worldwide. These artificial containers include plastic bucket, earthen jar, cement, vase and glass etc. There are several examples of how each mosquito species prefers different breeding sites. *Ae. aegypti* breeds in a wide assortment of domestic containers, whereas *Ae. albopictus* tends to be found in natural containers, such as bamboo stumps and coconut shells, or in artificial containers outside the houses such as opened cans and plastic bottles. Culex usually propagates on backwater and in pipes.

Due to the COVID 19 situation, one of the research team returns to their hometown of Ranong Province which has a large number of migrant workers from Myanmar. Knowing that breeding mosquitoes may affect public health, we felt concerned that there were a number of mosquito breeding sites in the workers' residences due to mismanagement. We are interested in conducting a research about mosquitoes.

The objectives of this study are: 1.) to investigate positive container and number of mosquitoes in Thai workers' and Burmese workers' households in Soi Yapa, Sapanpla Road, Paknam Sub-district, Muang District, Ranong Province, Southern Thailand by using GLOBE Observer Mosquito Habitat Mapper Application and 2.) to compare sociocultural factors: the number of members in the house, education level, career and the number of mosquito larvae found in the containers.

**Operational Definition**

1. Thai residence: housing of Thai people is divided into house, shop, and rented room.

2. Burmese residence: housing of Burmese people is divided into house, shop, and rented room.

3. Mosquito larva container: a container with waterlogging and mosquitoes can lay eggs.

4. Mosquito larva number: the number of larvae was found in a container.

5. Positive container: a container where larvae were found.

**Research Methods**

**Study Sites**

The study was conducted at Soi Yapa, Sapanpla Road, Paknam Sub-district, Muang District, Ranong Province, Southern Thailand (9° 51' 45" N / 98° 37' 20" E) (Figure 1).


Figure 1: Map of Thailand and study site at Soi Yapa, Sapanpla Road, Paknam Sub-district, Muang District, Ranong Province, Thailand.

(a) Muang District, Ranong Province
(b) Paknam Sub-district, Ranong Province

## Topography

Approximately 86 percent of the area of Ranong is in the Phuket mountain range, and about 14 percent is the plains, divided into 2 areas as follows:

1. Mountains and high places in the east side of the province

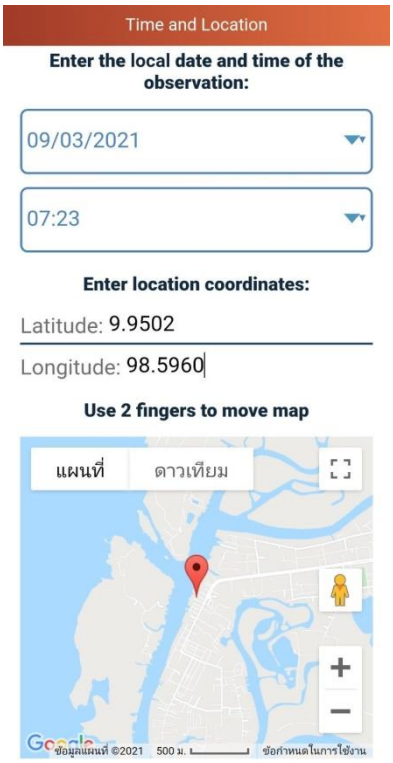
2. Coastal plains in the western area of the province adjacent to the Andaman Sea.

## Climatic Characteristics

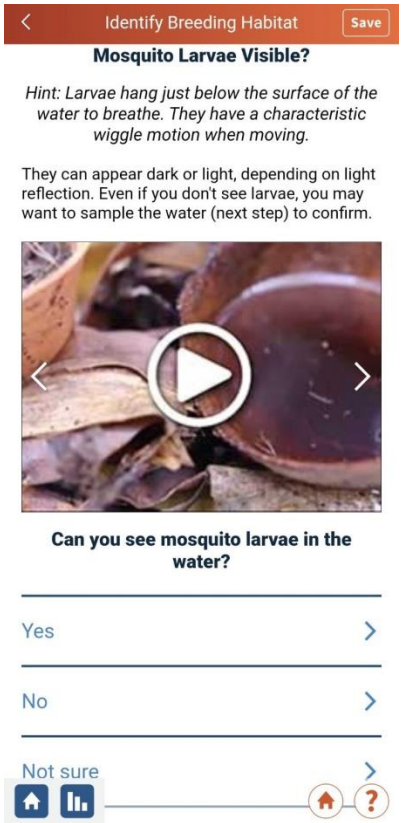
Since Ranong is a province located in the south, the west coast is fully influenced by the southeast monsoon and the southwest monsoon. Therefore, it rains more heavily than other provinces and falls almost all year round. The winter is not very cold because it is far from the influence of cold current. It sometimes rains in the winter. The northeast monsoon wind that blows through the Gulf of Thailand brings rain in a smaller quantity than the provinces in the east of the south.

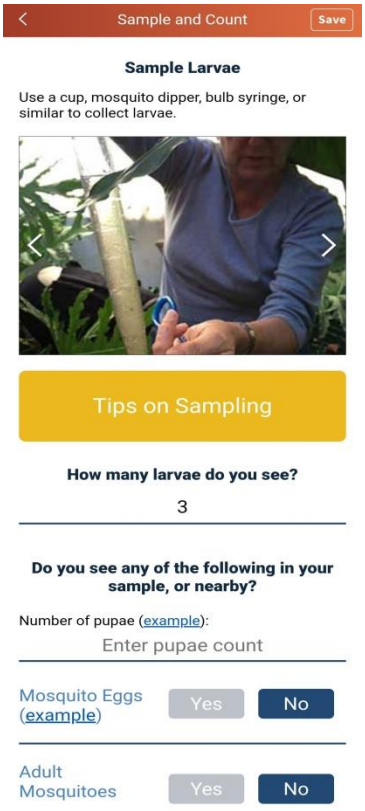
## Data Collection

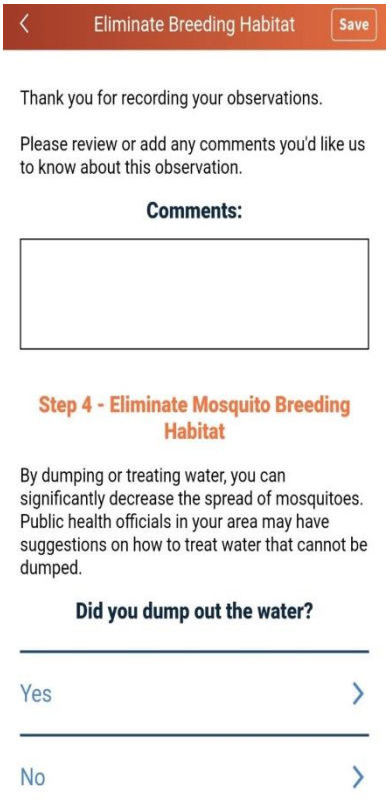
1. Use GLOBE Observer: Mosquito Habitat Mapper App to record the type of container, photograph of the site, and the number of mosquito larvae. Also, tally the number of the mosquito larvae found.





2. Conduct interview to one member of each household to collect the information about sociocultural factors: the number of members in the house, education level, and resident's career.

**Data analysis**

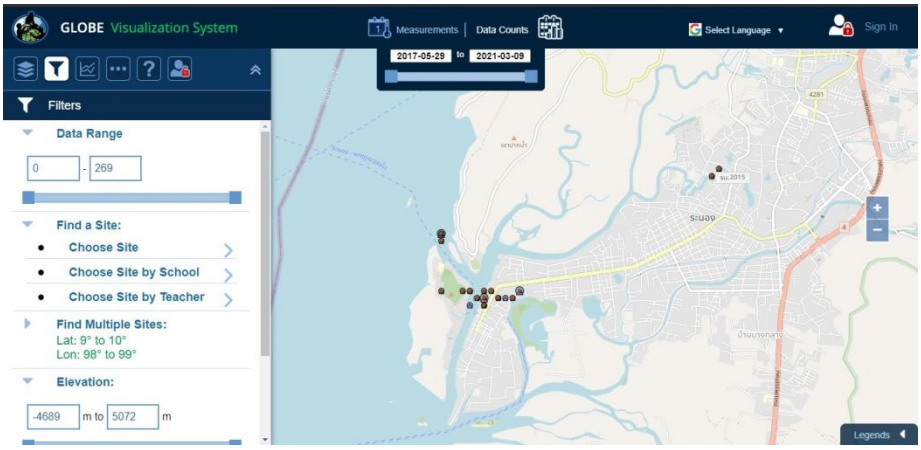
1. Import the dataset into SPSS Version 22 Program . Analyze the summation of positive containers, mosquito larvae species, and mosquito larvae found in Thai and Burmese residences. Also calculate the number of mosquito larvae in each species found in both places. Input the data in the form.

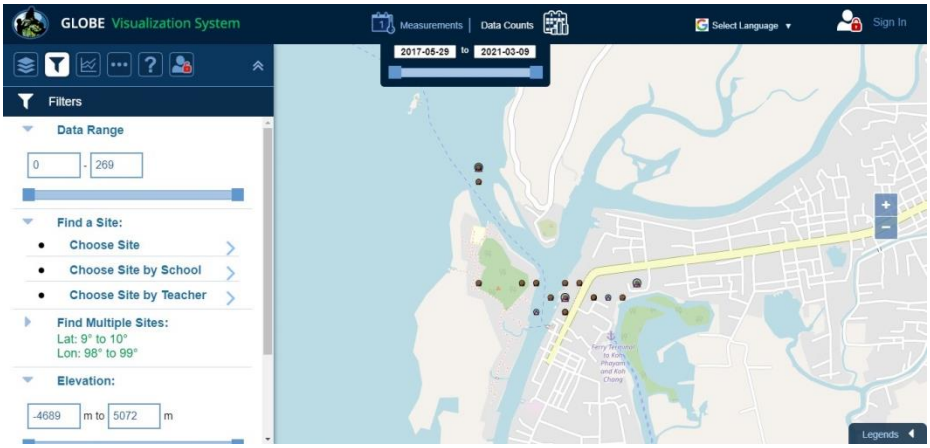
2. Use t-test to compare the differences of 1) the number of positive containers, 2) the number of total mosquito larvae found, 3) the number of mosquito larvae species, and 4) the number of mosquito larvae in each species among Thai and Burmese residence to analyze the differences of mosquitoes in Thai and Burmese residence in Ranong.

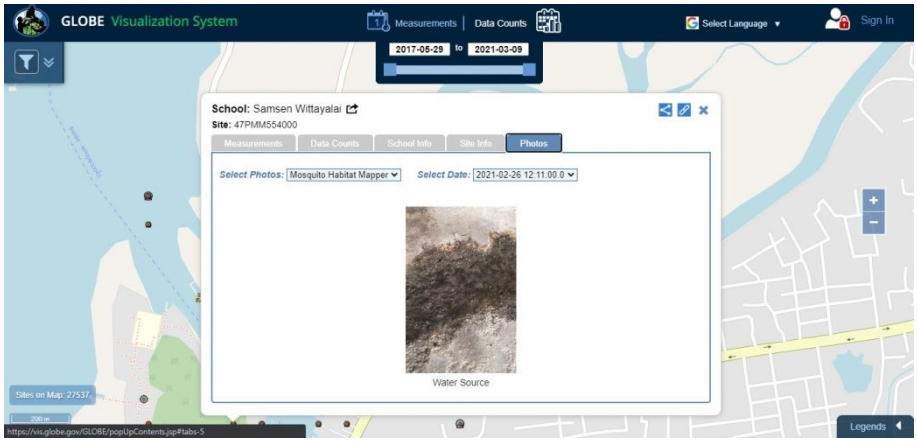
3. Use One-way ANOVA to compare 1) nationality of the residence, 2) type of container, and 3) career of the residence to 1) the number of containers mosquito larvae found, 2) the number of total mosquito larvae found, and 3) the number of mosquito larva species to analyze the differences of social factors and mosquitoes.

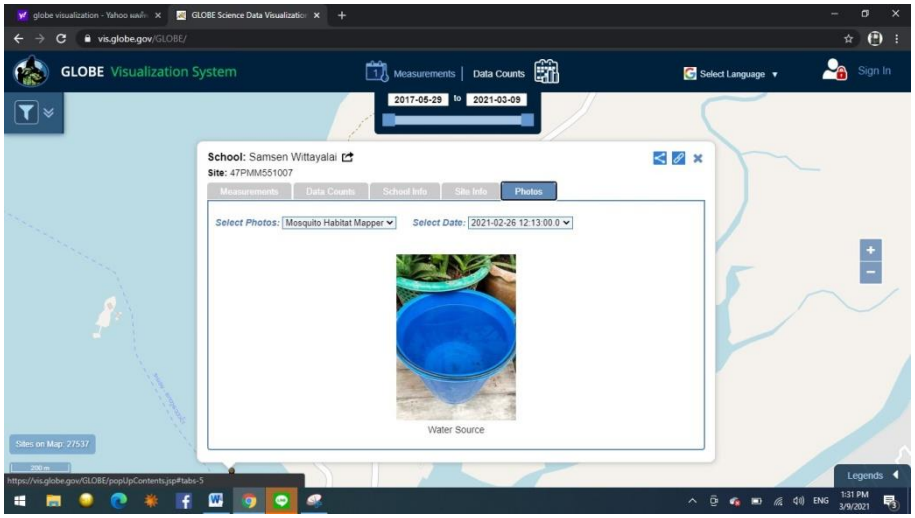
**Results**

1. The observation of the researcher were recorded in Mosquito Habitat Mapper App.




GLOBE Visualization System
Measurements | Data Counts
Select Language
Sign In
2017-05-29 to 2021-03-09
Filters
Data Range
0 - 269
Find a Site:
Choose Site
Choose Site by School
Choose Site by Teacher
Find Multiple Sites:
Lat: 9° to 10°
Lon: 98° to 99°
Elevation:
-4689 m to 5072 m
Legends


GLOBE Visualization System
Measurements | Data Counts
Select Language
Sign In
2017-05-29 to 2021-03-09
School: Samsen Wittayalai
Site: 47PMM554000
Measurements
Data Counts
School Info
Site Info
Photos
Select Photos: Mosquito Habitat Mapper
Select Date: 2021-02-26 12:11:00.0
Water Source
Sites on Map: 27537
Legends


globe visualization - Yahoo
GLOBE Science Data Visualization
vis.globe.gov/GLOBE/
GLOBE Visualization System
Measurements | Data Counts
Select Language
Sign In
2017-05-29 to 2021-03-09
School: Samsen Wittayalai
Site: 47PMM551007
Measurements
Data Counts
School Info
Site Info
Photos
Select Photos: Mosquito Habitat Mapper
Select Date: 2021-02-26 12:13:00.0
Water Source
Sites on Map: 27537
Legends
ENG
1:31 PM
3/9/2021

2. The number of positive containers and mosquito larva that could be found in Thai and Burmese workers' residence.

| Number of | Thai | | | Burmese | | |
|---|---|---|---|---|---|---|
| | Home | Shop | Rented Room | Home | Shop | Rented Room |
| Positive Container | 25 | 19 | 3 | - | - | 64 |
| Sum of Larvae | 134 | 166 | 23 | - | - | 267 |
| Type of Larvae type | 3 | 2 | 3 | - | - | 3 |

Table 1 positive containers, mosquito larvae, and mosquito larva species found in different residence.

| | No. of positive containers | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Earthern jar | Plant pot | Plant saucer | Cement Container | Drainage | bottle | Bucket | Fish tank | Pond | Puddle | Vase | Glass | Total |
| Thai (30 households) | 7 | 11 | 7 | 0 | 12 | 6 | 11 | 4 | 5 | 3 | 7 | 9 | 82 |
| Burmese (30 households) | 0 | 3 | 0 | 0 | 6 | 16 | 21 | 0 | 10 | 7 | 21 | 20 | 104 |
| Total | 7 | 14 | 7 | 0 | 18 | 22 | 32 | 4 | 15 | 10 | 28 | 29 | 186 |

Table 2 different types of positive containers in Thai and Burmese residence

| | No. of mosquito larva in each species | | | |
|---|---|---|---|---|
| | *Ae. aegypti* | *Ae. albopictus* | *Culex* | Total |
| Thai (30 households) | 170 | 79 | 62 | 311 |
| Burmese (30 households) | 165 | 54 | 48 | 267 |
| Total | 335 | 133 | 110 | 578 |

Table 3 mosquito larva species in Thai and Burmese residence

2. The difference among nationality of the residence to 1) the number of positive containers, 2) the number of total mosquito larvae found, 3) the number of mosquito larvae species, and 4) the number of mosquito larvae in each species

| Number of | Thai | | Burmese | | t | df | p |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | | |
| Positive container | 1.808 | 0.749 | 2.286 | 1.084 | -1.896 | 48.169 | 0.064 |
| Sum of larvae | 12.423 | 9.023 | 9.536 | 5.903 | 1.401 | 52 | 0.167 |
| Type of larvae species | 1.923 | 0.560 | 2.036 | 0.793 | -.606 | 48.656 | 0.547 |

Table 4 comparing the mean of positive containers, total mosquito larvae found, and mosquito larvae species found in Thai and Burmese residence

From table 4, it was found that the mean of positive containers in Thai and Burmese residence, the mean of the total mosquito larvae found, and the number of mosquito larvae species found were not different.

| Mosquito larvae species | Thai | | Burmese | | t | df | p |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | | |
| Ae. aegypti | 6.30 | 4.598 | 4.23 | 3.149 | 2.028 | 42.562 | .049* |
| Ae. albopictus | 5.27 | 4.920 | 2.35 | 2.080 | 2.174 | 17.305 | .044* |
| Culex | 4.43 | 3.031 | 2.67 | 1.749 | 2.068 | 30 | .047* |

Table 5 comparing the number of total mosquito larvae found in Thai and Burmese residence

From table 5, it was found that mean of *Ae. aegypti*, *Ae. albopitus*, and *Culex* in Thai and Burmese residence were significantly different. There were more *Ae. aegypti*, *Ae. albopitus*, and *Culex* in Thai residence than in Burmese residence.

3. The difference in the number of mosquito larvae found in different positive containers.

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| *Ae. aegypti* | Between Groups | 557.226 | 10 | 55.723 | 7.007 | .000 |
| | Within Groups | 437.395 | 55 | 7.953 | | |
| | Total | 994.621 | 65 | | | |
| *Ae .albopictus* | Between Groups | 178.717 | 8 | 22.340 | 1.947 | .091 |
| | Within Groups | 332.783 | 29 | 11.475 | | |
| | Total | 511.500 | 37 | | | |
| *Culex* | Between Groups | 104.425 | 8 | 13.053 | 3.283 | .012 |
| | Within Groups | 91.450 | 23 | 3.976 | | |
| | Total | 195.875 | 31 | | | |

*sig<0.05

Table 6 comparing mosquito larvae species within different types of containers

*Post hoc tests are not able to be performed for every species because at least one container has fewer than two cases.

From Table 6, it was found that the mean of *Ae. aegypti* and *Culex* found in different containers are significantly different. Further analysis cannot be done as there were some containers that fewer than two mosquito larvae.

3. The difference in the number of mosquito larvae found in the residence of people with different careers

**ANOVA**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| *Ae .aegypti* | Between Groups | 148.246 | 6 | 24.708 | 1.722 | .132 |
| | Within Groups | 846.376 | 59 | 14.345 | | |
| | Total | 994.621 | 65 | | | |
| *Ae .albopictus* | Between Groups | 105.036 | 6 | 17.506 | 1.335 | .272 |
| | Within Groups | 406.464 | 31 | 13.112 | | |
| | Total | 511.500 | 37 | | | |
| *Culex* | Between Groups | 43.630 | 5 | 8.726 | 1.490 | .227 |
| | Within Groups | 152.245 | 26 | 5.856 | | |
| | Total | 195.875 | 31 | | | |

*sig<0.05

Table 7 comparing mosquito larvae species found in the residence of people with different careers

After comparing mosquito larvae species found in the residence of people with different careers, no significance in number was found.

| | Thai | | | Burmese | | |
|---|---|---|---|---|---|---|
| | *Ae .aegypti* | *Ae. albopictus* | *Culex* | *Ae. aegypti* | *Ae. albopictus* | *Culex* |
| No of households | 30 | 30 | 30 | 30 | 30 | 30 |
| No of positive households | 22 | 13 | 14 | 23 | 18 | 16 |
| No of containers | 82 | 82 | 82 | 104 | 104 | 104 |
| No of positive containers | 27 | 15 | 14 | 39 | 23 | 18 |
| Larval Index | | | | | | |
| HI | 73.33 | 43.33 | 46.67 | 76.67 | 60.00 | 53.33 |
| CI | 32.93 | 18.29 | 17.07 | 37.50 | 22.12 | 17.31 |
| BI | 90.00 | 50.00 | 46.67 | 130.00 | 76.67 | 60.00 |

HI: The number of positive household for Aedes per 100 houses.
BI : The number of positive container for Aedes per 100 containers.
CI: The number of positive container for Aedes per 100 houses.

Table 8 HI, CI and BI for each species in both Thai and Burmese.

**Discussion**

The result supported our hypothesis that there were no differences in the number of mosquito larvae found in the containers in Thai and Burmese household in different social factors. The most positive container in Thailand was a drainage. It was because the source at the survey was Sapanpla Road which was located on the roadside. Therefore there was a lot of drainage on the road around that area which of these drainages might not have been cleaned by the district office as expected. Even the drainage of each house itself may not be often cleaned, making it a breeding ground for mosquitoes. As for Burmese migrant workers, the most positive container is a bucket and vase without lid to cover. A lot of Burmese people use buckets in the activity in their daily life. Some Burmese people use buckets to take a bath and use vases putting flowers to pay respects to the monks. They are also used for many other activities for example, the occupation about

fishing. Some buckets might not be used very often. Therefore, they were not cleaned for a long time, thus becoming breeding sites for mosquitoes.

Comparing to High and low risk Dengue Haemorrhagic fever areas affecting key breeding place of *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) in Nakhon Si Thammarat, southern Thailand (Promprou and Jarroensutasinee, 2007) the most positive container at Nakhon Si Thammarat was Earthen jar which is the Third positive container of our Thai positive container. Showing that even in different provinces, the earthen jar still be found as a breeding site for mosquitoes in Thailand.

This study shows that there were more *Ae. aegypti*, *Ae. albopitus*, and *Culex* in Thai residence than in Burmese residence. The container type was associated with the number of mosquito larvae in relation to the mosquito larvae of *Ae.aegypti* and *Culex*. *Ae.aegypti* and *Culex* mosquito larvae were found at most in bucket type containers and none were found in cement container. The most important mosquito vectors of dengue fever viruses and other. Regularly cleaned so that the holes do not plug. Regarding dumps, alternative proposals to garbage disposal should be promoted. In all cases, providing useful information and encouraging communitarian participation are essential for a successful mosquito control (Cardo 2015).

HI, CI and BI were used in this story to tell how much mosquito larvae in order to control and monitor mosquito population and larvae index was calculated for each species in both Thai and Burmese. HI, CI and BI were found in wide range (17.00-130.00). HI of all mosquito larvae were high in both nationalities (HI must less than 10%, WHO). CI were 32.93 and 37.50 for *Ae. aegypti*, 18.29 and 22.12 for *Ae. albopictus*, and 17.07 and 17.31 for Culex in both Thai and Burmese.

We can utilize the result for mosquito larva management in the household. As the results showed a significant number of larvae in plastic containers in Burmese household, the government officer can ask for the employers' cooperation to encourage their Burmese workers to frequently clean the water in plastic containers. For Thai household, the results showed a significant number of larvae in drainage. The administrative organization in the area can instruct Thai people in

the area to frequently clear the remaining water or put in chemical in the drainage to remove mosquito larvae.

## Conclusion

1. From this study, Thai found more mosquito larvae than Burmese. Both Thai and Burmese found the *Ae.aegypti* the most. However, Thai found less positive container than Burmese, with Thai found the most positive container in type of drainage and Burmese found the most positive container in type of bucket and vases.

2. It was found that nationality was related to the number of mosquito larvae. There were more *Ae. aegypti*, *Ae. albopitus*, and *Culex* in Thai residence than in Burmese residence.

3. The container type was associated with the number of mosquito larvae in relation to the mosquito larvae of *Ae.aegypti* and *Culex*. *Ae.aegypti* and *Culex* mosquito larvae were found at most in bucket type containers and none were found in cement container.

4. Larvae index was calculated for each species in both Thai and Burmese. HI, CI and BI were found in wide range (17.00-130.00). HI of all mosquito larvae were high in both nationalities (HI must less than 10%, WHO). CI were 32.93 and 37.50 for *Ae. aegypti*, 18.29 and 22.12 for *Ae. albopictus*, and 17.07 and 17.31 for *Culex* in both Thai and Burmese. And BI were 90.00 and 130.00 for *Ae. aegypti*, 50.00 and 76.67 for *Ae. albopictus*, and 46.67 and 60.00 for *Culex* in both Thai and Burmese.

## Acknowledgements

We thank Dr. Wanwipa Sutthakiet , Mr. Sutthiphan Hiranpruk, Assoc. Prof. Dr. Krisanadej Jaroensutasinee, Assoc. and Prof. Dr. Mullica Jaroensutasinee for helping with experimental design, data analysis and manuscript preparation. This work was supported in part by Samsenwittayalai School.

## Bibliography

Joseph L.Servadio, Samantha R. Rosenthal, Lynn Carlsond and Cici Bauera. (2018) Climate patterns and mosquito-borne disease outbreaks in South and Southeast Asia. Journal of Infection and Public Health 11 566-571 from Climate patterns and mosquito-borne disease outbreaks in South and Southeast Asia - ScienceDirect

Abby Olena. (2020) Mosquitos in Asia and the Americas More Susceptible to Zika Virus from Mosquitos in Asia and the Americas More Susceptible to Zika Virus | The Scientist Magazine® (the-scientist.com)

National Institute of Health of Thailand (2018) from 8_61 (moph.go.th)

María V.Cardo, Paula Rosín, Aníbal E.Carbajo and Darío ezzani. (2015) Artificial container mosquitoes and first record of Aedes aegypti in the islands of the Paraná Lower Delta, Argentina. Journal of Asia-Pasific Entomology Pages 727-733 from Artificial container mosquitoes and first record of Aedes aegypti in the islands of the Paraná Lower Delta, Argentina - ScienceDirect and

https://www.sciencedirect.com/science/journal/12268615

Suppawan PROMPROU, Mullica JAROENSUTASINEE and Krisanadej JAROENSUTASINEE. (2007) High and Low Risk Dengue Haemorrhagic Fever Areas Affecting Key Breeding Place of Aedes aegypti (L.) and Ae. albopictus (Skuse) in Nakhon Si Thammarat, Southern Thailand. Walailak J Sci & Tech 2007; 4(1): 9-22.