

# Study of mosquito species and their number in a touristic place in Pak Meng beach, Trang

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## Abstract

This research aimed to study the type and number of mosquito larvae in the establishments (shops, hotels/resorts and coffee shops) in Pak Meng beach at Sikao District, Trang province during February - March 2019. We randomly selected 26 establishments. Collected mosquito larvae samples from various types of containers by using a mesh size of 0.55 mm. Classify containers into six groups such as small earthen jars, water storage container, cement tanks, flower plant pots, lotus pond, and drain. We measured water quality (surface temperature, water temperature, conductivity and pH). Then the mosquito larvae were preserved in the laboratory. We identified and count mosquito larvae each container.

Our results showed that, hotel/resort found the highest number of mosquito larvae with a total of 1,724 mosquito larvae, divided into 69 *Aedes aegypti*, 26 *Aedes albopictus*, 1624 *Culex* spp. and 5 *Toxorhynchites*. The study was conducted in 26 establishments. A total of 1,724 mosquito larvae, divided into 69 *Aedes aegypti*, 26 *Aedes albopictus*, 5 *Toxorhynchites*. and 1,624 *Culex* spp. The highest number of mosquito larvae mostly found in hotel/resort. The water quality (pH and water temperature) of water containers in each type of mosquito larvae were different significant.

**Keywords:** container, *Culex* spp. larvae, *Aedes aegypti* larvae, *Aedes albopictus* larvae, *Toxorhynchites* spp. larvae, water quality, tourist attraction

## Introduction

Thailand is located in the tropical region. Most people are at risk of becoming a dangerous disease from mosquito vectors such as *Aedes* spp., *Culex* spp., And other mosquitoes that are endangered by the disease. Disease-causing mosquitoes in Thailand can be found throughout the year, such as dengue fever, elephantiasis, malaria, Chikungunya disease, etc. Statistics of patients and deaths from dangerous diseases caused by mosquitoes are increasing. Every year, nowadays there is a new incidence of diseases called Sika. Which has a mosquito that carry disease recently. *Culex coronator*, *Cx Tarsalis* and *Cx quinquefasciatus* has been reported as a potential carrier for the transmission of Zika virus in Brazil, China, and Mexico (Guo et al., 2016; Guedes et al., 2017; Elizondo-Quiroga *et al.*, 2018). There are currently no drugs or vaccines that can be used directly to prevent and control mosquito vectors. There are many reasons that cause the spread of mosquito-related diseases, including population increase, city carrier control or travel during tourist travel (Ratnam et al., 2012).

Travelers are high risk of getting the disease and also lead to the spread of non-endemic diseases to other regions of the world (Wilder-Smith, 2012) and the increase in dengue infection in the resident population is reflected in the return travelers who have diseases related to mosquitoes. Which is the cause of illness in 2-10% of tourists and is the main reason for visiting hospitals of tourists (Ratnam et al., 2012). Trang Province is considered a province with many interesting attractions, one of which is Pak Meng Beach. Pak Meng Beach, located in Sikao District, Trang Province, Southern of Thailand is a popular tourist destination. Trang Province is a connecting point to various islands Of Trang Province and nearby provinces, a lot of tourists pouring in Park Meng beach. In 2018, The tourist came to travel in Pak Meng beach about 2,931,622 people (2,561,198 Thai tourist, 370,424 Foreigner). The best time to visit Trang during December to May because Trang is located in the coastal zone as well as Phuket and Krabi. Which is under the influence of the seasonal monsoon or southwest monsoon. The average temperature is warm throughout the year at an average of 20 - 36 degrees Celsius. In 2018, Trang province has a dengue incidence rate 66.42 cases per 100,000 people. At the national level, the rate of illness was 83.26 per one hundred thousand people due to the abundance of mosquitoes.

*Aedes aegypti* like to lay eggs in a water storage container. While *Aedes albopictus* likes to lay eggs in natural containers outside the house or man-made containers outside the house. *Culex* spp. and *Toxorhynchites* spp. prefer to live in dirty water sources (Rueda, 2007). *Anopheles* spp. prefer to live in the forest area. But if found in urban areas, often found in

swamps, ponds and containers used for drinking water storage. From these reasons Therefore, the researcher interested in studying the species and number of mosquito larvae and breeding areas of mosquito larvae in the establishment at Pak Meng Beach Tourist Site, Sikao District, Trang Province in order to know the types of mosquitoes that are used to transport diseases and know the source Varieties of mosquitoes in tourist sites for surveillance and protection for communities and tourists

### **Research question**

1. To study the diversity of mosquito larvae in hotels/resorts, restaurants, and coffee shops in a touristic place
2. To study their habitats and water qualities of their habitats.

### **Hypothesis**

1. Mosquito larvae numbers should be more in hotel/resort than restaurant/coffee shop because of presence of ditch besides the hotels/resorts.
2. *Culex* spp. should be more in numbers in hotel/resort compared to other mosquito larvae as they prefer dirty water like ditch water.

### **Materials and methods**

#### **Study area**

This research was conducted at Pak Meng beach, Sikao district, Trang Provinces southern of Thailand. It located on the latitude 7.495092N longitude 99.327476 E as shown in Figure 1.

#### **Time duration and sampling point setting**

For sampling, the researchers collected mosquito larvae and water samples at Pak Meng beach during February to March 2019. Dividing the study into 2 areas: Beach area from Pak Meng pier to Pak Meng Resort, and Pak Meng intersection area to Rajamangala University of Technology Srivijaya Trang Campus. Each area will collect water containers of every tourist attraction. The distance along the beach is 4.7 kilometers. Distance from Pak Meng intersection to Rajamangala University of Technology Srivijaya Trang Campus is 4 kilometers. Total distance is approximately 8.7 kilometers, as shown in Figure 2.



Figure 1 Study area at Pak Meng beach in Krabi province, Thailand

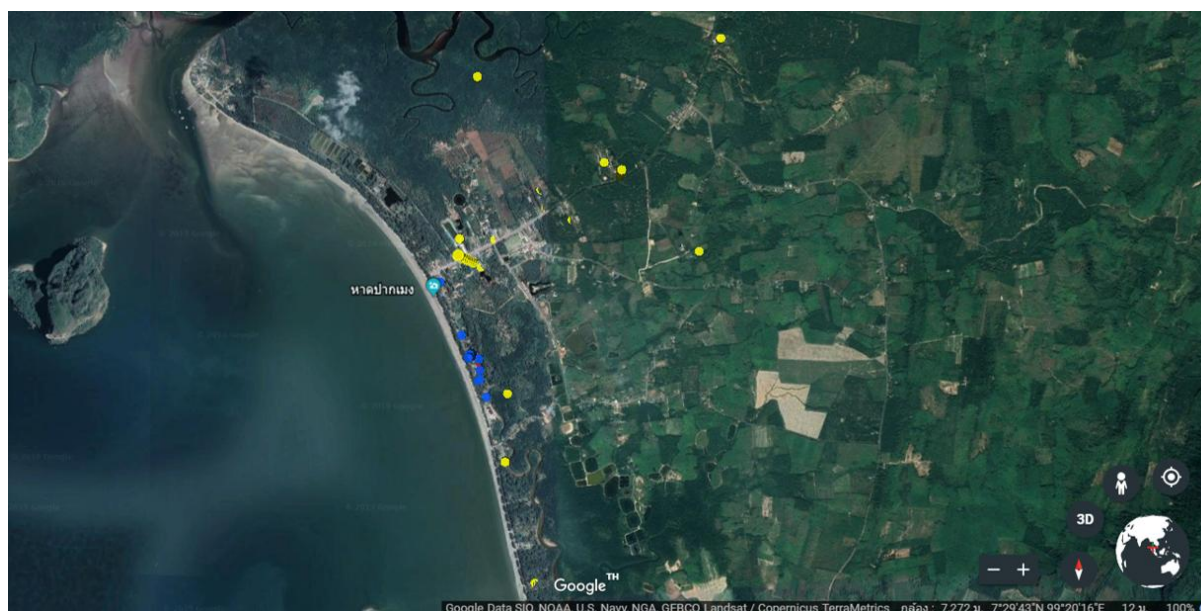


Figure 2 Study area yellow color show as hotel/Resort, purple show as restaurant and red color show as coffee shop collection sites at Pak Meng beach.

### Population and sample

We collected mosquito larvae from all water containers in and around tourist place from randomly touristic place in Pak Meng beach with a total of 26 touristic place. During the larvae survey, habitat types and water qualities of water habitats (pH, water temperature, conductivity, surface temperature) were recorded.

## Sampling of water quality

Sampling of water samples in the study area from 09.00 am. -19.00 pm. By measuring water quality such as pH value, conductivity, surface temperature, and water temperature in every container found in every place surveyed

**Table 1** Equipment for measuring water qualities

Parameter	Equipment
Surface water Temperature (°C)	Infrared Thermometer
Water Temperature (°C)	PC Test 35 Multi-Parameter
Acid-base (pH)	pH Meter
Conductivity	Conductivity Meter

## Data analysis

Descriptive statistics were calculated one-way ANOVA test was used to test the mean differences in the number of mosquito larvae species and water quality. Chi square test were used to test the difference of the number of mosquito larvae species in each habitat. The significant tests were one-tailed with significant level at  $P < 0.05$ .

## Results

### Number of mosquito larvae found at the establishment in Pak Meng beach

We found that between restaurant and hotel/resort. *Culex* spp. Mosquito was higher in hotel/resort than restaurant. And *Aedes albopictus* was higher in restaurant than hotel/resort. In both place *Culex* spp. Mosquito was more than other species (Table 2).

**Table 2** Types and number of mosquito larvae found in establishments in Pak Meng beach

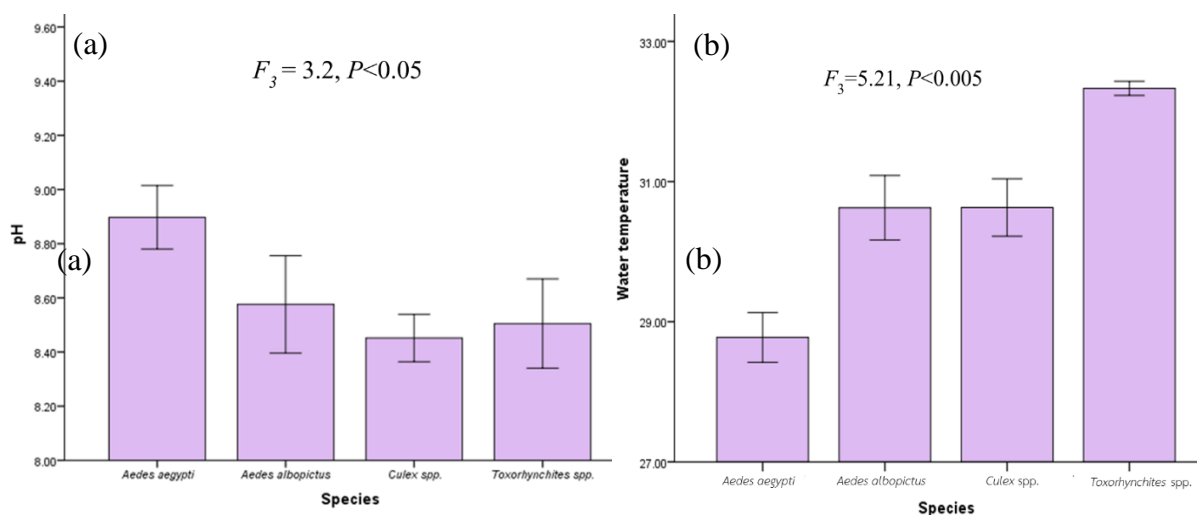
Study sites	Types of Mosquito Larvae				Analysis
	<i>Aedes aegypti</i>	<i>Aedes albopictus</i>	<i>Culex</i> spp.	<i>Toxorhynchites</i> spp.	
Restaurant	69	23	141	0	$\chi^2_2 = 91.09, P < 0.001$
Hotel/Resort	0	3	1483	5	$\chi^2_2 = 2934.20, P < 0.001$
Analysis	-	$\chi^2_2 = 15.39, P < 0.001$	$\chi^2_2 = 1108.97, P < 0.001$	-	

## Type and number of mosquito larvae found in various habitats according to the establishment of tourist attractions in Pak Meng beach

From the study of species and number of mosquito larvae found in various habitats in tourist attractions at Pak Meng beach, it is found that the tourist place in the restaurant have 3 types of habitat which are small jar, large jar and plastic tank, which the most found 5 plastic tanks. The hotel / resort had positive 6 types of habitat include small jar, cement tank, plastic tank, pot tray, lotus pond, and ditch. In the restaurant, found the most *Culex* larvae in plastic tanks about 131 larvae, 10 larvae in small jar. Found the most *Aedes albopictus* larvae in plastic tanks about 19 larvae, 4 larvae in large jars. Found the most *Aedes aegypti* larvae in plastic tanks. In hotels/resorts, mostly found *Toxorhynchites* larvae in small jars. *Culex* spp. larvae mostly found in ditches 1,250 larvae, followed by 140 larvae in plastic tanks. *Aedes albopictus* larvae mostly found in plastic tanks 2 larvae, followed by 1 larva in cement pond. (Table 3)

## The water quality of habitat of mosquito larvae species

From the study of the water quality of the habitat of each species of mosquito larvae. *Aedes aegypti*, *Aedes albopictus* and *Toxorhynchites* spp. preferred higher pH compared to *Culex* spp. *Toxorhynchites* and *Culex* spp. preferred higher water temperature compared to *Aedes aegypti*. Conductivity was not different among habitats of different mosquito larvae. Surface water temperature was not different among habitats of different mosquito larvae (Figure 3).



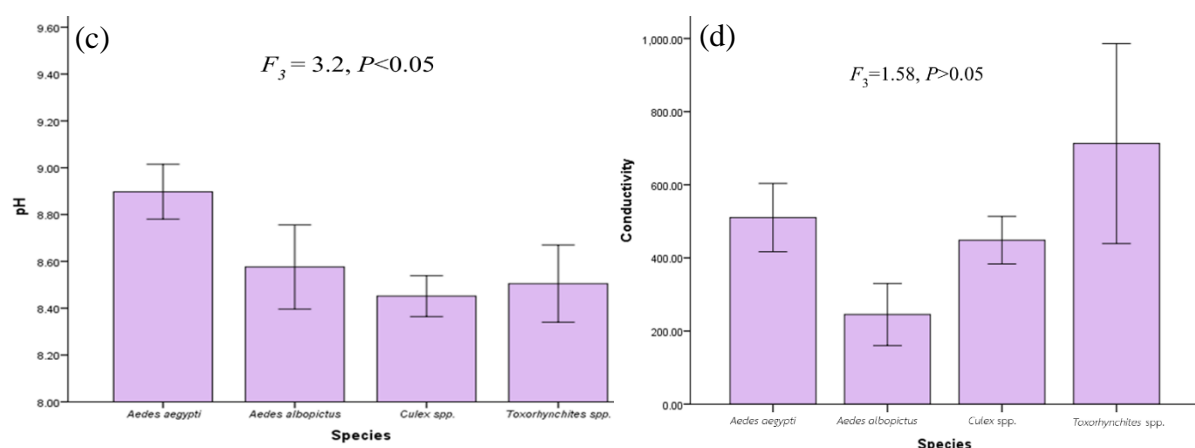


Figure 3 The water quality (a) pH (b) Water temperature (c) of habitat of mosquito larvae species

## Discussion

Our result show that, we found mosquito larvae in 2 types of found in restaurants, hotels/resorts in tourist place at Pak Meng beach and found 4 types of mosquito larvae, such as *Culex* larvae, *Aedes aegypti* larvae, *Aedes albopictus* larvae, *Toxorhynchites* spp. larvae. The most mosquito larvae are found is hotel / resort found a total of 1,491 larvae, divided into the most *Culex* spp. larvae 1,483, followed by 5 *Toxorhynchites* spp. larvae, 3 *Aedes albopictus* larvae, but no *Aedes aegypti* larvae. While the restaurant found 166 mosquito larvae. Divided into 141 *Culex* spp. larvae, followed by 69 *Aedes aegypti* larvae, 23 *Aedes albopictus* larvae, but no *Toxorhynchites* spp. larvae. Several species of *Culex* spp., which serve as vectors of one or more important diseases of birds, humans, and other animals. The diseases they vector include arbovirus infections such as West Nile virus, Japanese encephalitis, or St. Louis encephalitis, but also filariasis and avian malaria.

The habitat of mosquito larvae that we found in 10 restaurants were 5 large earthen jars, 1 small earthen jar and plastic tank and 17 hotels/resorts such as 31 plastic tank, 16 cement ponds, 14 water gardens, 14 water gardens, 9 small earthen jars, 1 plant plate and ditch. The habitat that finds the most mosquito larvae is the ditch in the hotel / resort attraction. Which found 1,250 mosquito larvae, most of which are *Culex* spp. larvae. And the habitat that found the least mosquito larvae is large jar about 4 mosquito larvae. From the study, it can be seen that the establishment of tourist attractions that found the largest number of mosquito larvae is hotels / resorts. And the most mosquito larvae are *Culex* spp. larvae. Due to we were conducted the mosquito larvae in the summer which was after the rain. Causing water to be trapped for a long time the water become dirty which *Culex* spp. larvae prefer to live in dirty water (Rueda, 2008), causing the most *Culex* spp. larvae to be found.

**Table 3** Type and number of mosquito larvae found in various breeding sites According to tourist attractions Pak Meng beach

Sites	mosquito larvae habitat	Number of habitats		Types of mosquito larvae				Total
		Total	Found mosquito larvae	<i>Aedes aegypti</i>	<i>Aedes albopictus</i>	<i>Culex</i> spp.	<i>Toxorhynchites</i> spp.	
Restaurant	Small earthen jars	1	1	0	0	10	0	233
	Large earthen jars	1	1	0	4	0	0	
	Plastic tanks	5	0	69	19	131	0	
Hotel/Resort	Small earthen jars	9	4	0	0	9	5	1,491
	Cement tank	31	4	0	1	34	0	
	Plastic tanks	16	1	0	2	140	0	
	Plant plats	1	1	0	0	8	0	
	Container water garden	14	3	0	0	42	0	
	Ditch	1	1	0	0	<b>1,250</b>	0	
Coffee shop	Cement tank	1	0	0	0	0	0	0
Total		80	23	69	26	1,624	5	1,724



## Conclusion

We see that 1491 mosquito larvae were found in hotel/resort. 99.4% of them was *Culex* spp. 0.33% of them was *Toxorhynchite*. 0.2% of them was *Aedes albopictus*. 233 mosquito larvae were found in restaurant 60.52% of them was *Culex* spp. 29.61% of them was *Aedes aegypti*, 9.87% of them was *Aedes albopictus* and we did not find any mosquito larvae in coffee shop. The benefit of this research is to suggest the administration to control the mosquito, To inform the mosquito situation to the tourists, to make them aware about the mosquito situation and to make the Pak Meng beach a safe place for the tourists.

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