**Research**

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**Abstracts:** The Global Learning and Observations to Benefit the Environment (GLOBE) Program has been providing students and the public worldwide with the opportunity to meaningfully contribute to their understanding of the Earth system and global environment. The objective is to use Mosquitoes Habitat Mapper **(**MHM**)** to investigate mosquito information and analyzed it to data collected from the Globe Program in Advanced Data by collecting and analyzing data from the Globe Program over the previous 4 years for the benefit to "prevent" and "warn" more events, leading to a forecast or prediction, which is a picture of what might happen in the future, such as health risk assessment, which is used as a tool for predicting potential risks and as a tool to assist management in developing plans and strategies to avoid further consequences. According to the results of the research, we discovered that the majority of recorders can collect larval data in Mosquito Habitat Mapper (32.3 %) and adult data in Mosquito Habitat Mapper (32.3 %). The physical features and surrounding environment of each water source impact the liquid in that water source, which is a mosquito breeding habitat. Because of the differences in the nature of each water source, the quantity of mosquitoes in each water source varies.

**Research Introduction**

Dengue fever is a major global public health concern around the world. In Asia, an outbreak started in the 1950s, and the disease is now considered a local sickness. The outbreak of this disease has grown in Thailand. The outbreak was discovered to have lasted more than 50 years. The epidemic peaked one year and then declined the following year. The epidemic has evolved from its basic form, namely the epidemic annually, the epidemic peaks for two years, then declines for two years before rising again.

Thailand's epidemic situation thus in 2019 (information as of August 20, 2019). There were 73,324 total cases (The sickness rate is 111.00 per 100,000 people), 77 deaths, and a morbidity rate of 0.11, with a trend

toward more patients (Section of Communicable Diseases Control, Kamphaengphet Provincial Health office, 2562). In addition, from the department of disease control, there were 10,093 cumulative reports of dengue hemorrhagic fever (Dengue fever: DF, Dengue Hemorrhagic Fever : DHF, Dengue Shock Syndrome : DSS) cases (patients increased 818 cases). The rate of illness is 15.22 per 100,000 people. There were reports of 9 deaths. Sickness and death rates were 0.09 percent. The highest rate of dengue fever was 18.06 per 100,000 people in the central region, according to the distribution of dengue fever by area. Southern (15.68), Northeast (15.40), and North (9.45) are the next three regions. The majority of the distribution of dengue hemorrhagic fever is people at the age between the ages of 5 and 14, they have the highest morbidity rate which is 47.41 per 100,000 people. People in the age groups 15-24 years (28.64) and 0-4 years (17.41) came in second and third, respectively.

As citizens, the research team is aware of the issues that occur and recognizes the necessity of avoiding and resolving the dengue hemorrhagic fever problem. As a result of having the Globe Program, which is now broadly supported by students, we can look through a database of surveyors from various places. As a result, we have decided to examine the data from this source in order to discover the relationships between various data until we can eventually solve the problem. The objective of this research is to use data analysis to construct a model for preventing and controlling dengue disease.

**Research Questions**

1. How many data about the larvae have been reported in Thailand?
2. Do type of water resources affected species and genus of larvae?
3. Does the MHM method affected reproduction rate of larvae?

**Research Hypothesises**

1. In Thailand there are many reports about larvae by using GLOBE observer application in Mosquito Habitat Mapper Application.
2. Water resources type will affect the species and genus of larvae because water is the most factor that caused larvae so it will affect directly.
3. Trend of breeding sites elimination by citizens scientist percent may increase year by year.

**Objectives**

1. To study type and popularity of larvae that report through mosquito habitat mapper in Thailand.
2. To study relations between types of larvae and types of breeding sites.

3. To study citizens scientists' behavior that eliminate larvae breeding sites through mosquito habitat mapper.

## Materials and methods

### 1. Materials

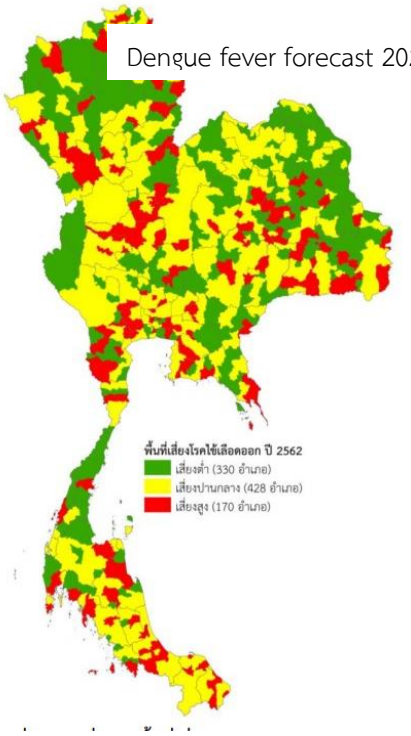
- Source of Data from the GLOBE Program in Advanced Data Access Tool that apply three filters which are Mosquito Habitat Mapper Protocol, have 0-1000 Data range and collected in Thailand for five years that are 2017, 2018, 2019, 2020, and 2021.

- Statistical Package for the Social Sciences (SPSS Software) is used for analysing and categorizing data from GLOBE Program in the spreadsheet.

### 2. Methods

2.1 Study sites


Thailand Map




| เขต | เสี่ยงสูง (อำเภอ) |
|---|---|
| 1 | 10 |
| 2 | 9 |
| 3 | 18 |
| 4 | 10 |
| 5 | 15 |
| 6 | 19 |
| 7 | 19 |
| 8 | 1 |
| 9 | 17 |
| 10 | 9 |
| 11 | 19 |
| 12 | 17 |
| 13 | 7 |
| รวม | 170 |

Thailand Map that shows proportion of Dengue Fever in each province in 2019

2.2 Data collections

1. Collected data from the GLOBE Program in Retrieve Data (ADAT) choose Mosquito Habitat Mapper Protocol in 1-year range and count data 0 to 1000 in Thailand and apply it.
2. Upload the data which we had applied filter already in form of excel.
3. Categorize data to make it easy for collect the information.
4. Bring the data from excel into SPSS Software for analyze and make table or graph.

**Results**

| Item found | | Year | | | | Total |
|---|---|---|---|---|---|---|
| | | 2018 | 2019 | 2020 | 2021 | |
| breeding site | | 2341 | 4479 | 2515 | 5176 | 14511 |
| mosquito habitat mapper | larvae | 514 (22.0%) | 1919 (42.8%) | 914 (36.3%) | 1346 (26.0%) | 4693 (32.3%) |
| | eggs | 255 (10.9%) | 893 (19.9%) | 223 (8.9%) | 684 (13.2%) | 2055 (14.2%) |
| | pupae | 488 (20.8%) | 900 (20.1%) | 341 (13.6%) | 97 (1.9%) | 1826 (12.6%) |
| | adults | 402 (17.2%) | 1645 (36.7%) | 353 (14.0%) | 853 (16.5%) | 3253 (22.4%) |

Table 1 Item that have found and collected in MHM

This table showed the number of breeding site over 4 years**.** Citizen scientist filled out the most data of breeding site in recent year for 5**,**176 units. From the table we found that most of recorder can collect the data of larvae in Mosquito Habitat Mapper for 32.3% and data of adults respectively.

**genus * Y * water source type Crosstabulation**

Count

| water source type | | | Y | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | 2018 | 2019 | 2020 | 2021 | |
| contanier : artificial | genus | Aedes | 26 | 96 | 83 | 48 | 253 |
| | | Anopheles | 25 | 116 | 28 | 12 | 181 |
| | | Culex | 5 | 69 | 103 | 3 | 180 |
| | | Unknown | 0 | 3225 | 1950 | 4761 | 9936 |
| | Total | | 56 | 3506 | 2164 | 4824 | 10550 |
| contanier : natural | genus | Aedes | 3 | 4 | 1 | 4 | 12 |
| | | Anopheles | 1 | 9 | 1 | 0 | 11 |
| | | Culex | 0 | 1 | 1 | 0 | 2 |
| | | Unknown | 0 | 269 | 92 | 97 | 458 |
| | Total | | 4 | 283 | 95 | 101 | 483 |
| flowing : still water found next to river or steam | genus | Aedes | 2 | 2 | 0 | 0 | 4 |
| | | Anopheles | 1 | 1 | 0 | 0 | 2 |
| | | Culex | 0 | 1 | 0 | 0 | 1 |
| | | Unknown | 0 | 86 | 39 | 53 | 178 |
| | Total | | 3 | 90 | 39 | 53 | 185 |
| still : lake/pond/swamp | genus | Aedes | 5 | 7 | 0 | 1 | 13 |
| | | Anopheles | 9 | 14 | 3 | 0 | 26 |
| | | Culex | 0 | 4 | 5 | 1 | 10 |
| | | Unknown | 0 | 575 | 209 | 196 | 980 |
| | Total | | 14 | 600 | 217 | 198 | 1029 |
| Total | genus | Aedes | 36 | 109 | 84 | 53 | 282 |
| | | Anopheles | 36 | 140 | 32 | 12 | 220 |
| | | Culex | 5 | 75 | 109 | 4 | 193 |
| | | Unknown | 0 | 4155 | 2290 | 5107 | 11552 |
| | Total | | 77 | 4479 | 2515 | 5176 | 12247 |

Table 2.1 Water source type compare with genus

**species * Y * water source type Crosstabulation**

Count

| water source type | | | Y 2018 | 2019 | 2020 | 2021 | Total |
|---|---|---|---|---|---|---|---|
| contanier : artificial | species | aegypti | 4 | 9 | 24 | 6 | 43 |
| | | albopictus | 4 | 16 | 24 | 32 | 76 |
| | | incerta | 16 | 5 | 9 | 3 | 33 |
| | | Unknown | 0 | 3476 | 2107 | 4783 | 10366 |
| | Total | | 24 | 3506 | 2164 | 4824 | 10518 |
| contanier : natural | species | aegypti | 0 | 1 | 0 | 0 | 1 |
| | | albopictus | 1 | 0 | 1 | 2 | 4 |
| | | incerta | 2 | 0 | 0 | 0 | 2 |
| | | Unknown | 0 | 282 | 94 | 99 | 475 |
| | Total | | 3 | 283 | 95 | 101 | 482 |
| flowing : still water found next to river or steam | species | albopictus | 1 | 0 | 0 | 0 | 1 |
| | | incerta | 1 | 0 | 0 | 0 | 1 |
| | | Unknown | 0 | 90 | 39 | 53 | 182 |
| | Total | | 2 | 90 | 39 | 53 | 184 |
| still : lake/pond/swamp | species | albopictus | 5 | 2 | 0 | 0 | 7 |
| | | incerta | 0 | 1 | 0 | 0 | 1 |
| | | Unknown | 0 | 597 | 217 | 198 | 1012 |
| | Total | | 5 | 600 | 217 | 198 | 1020 |
| Total | species | aegypti | 4 | 10 | 24 | 6 | 44 |
| | | albopictus | 11 | 18 | 25 | 34 | 88 |
| | | incerta | 19 | 6 | 9 | 3 | 37 |
| | | Unknown | 0 | 4445 | 2457 | 5133 | 12035 |
| | Total | | 34 | 4479 | 2515 | 5176 | 12204 |

Table 2.2 Water source type compare with species

According to Table 2.1, no unidentified genus was detected in any of the water sources in 2018. However, it was shown that between 2019 and 2021, the most unidentified genus mosquitoes were found in every water sources. Container: artificial is the most prevalent sort of water source for mosquitoes.

According to Table 2.2, no unidentified species was detected in any of the water sources in 2018. However, it was shown that between 2019 and 2021, the most unidentified species mosquitoes were found in every water sources. Container: artificial is the most prevalent sort of water source for mosquitoes.

| Item found & Eliminated | | Year 2018 | 2019 | 2020 | 2021 | Total |
|---|---|---|---|---|---|---|
| larvae | found | 514 | 1919 | 914 | 1346 | 4693 |
| | eliminated | 368 (71.6%) | 1426 (74.3%) | 737 (80.6%) | 903 (67.1%) | 3434 (73.2%) |
| eggs | found | 255 | 893 | 223 | 684 | 2055 |
| | eliminated | 210 (82.4%) | 768 (86.0%) | 164 (73.5%) | 277 (40.5%) | 1419 (69.1%) |
| pupae | found | 488 | 900 | 341 | 97 | 1826 |
| | eliminated | 362 (74.2%) | 688 (76.4%) | 280 (82.1%) | 87 (89.7%) | 1417 (77.6%) |
| adults | found | 402 | 1645 | 353 | 853 | 3253 |
| | eliminated | 311 (77.4%) | 1270 (77.2%) | 250 (70.8%) | 384 (45.0%) | 2215 (68.1%) |

Table 3 Compare between Item found and eliminated

According to the table above that compare between item found and eliminated, it showed that citizen scientists eliminated larvae 73.2%, eggs 69.1%, pupae 77.6% and adults 68.1% according to mentioned data show that citizen scientists eliminated more than half of sites were found since 2018.

## Discussion

1. From the information of this research are relate with the above hypothesis, as shown in Table 1 because in 2021 there have a largest data that collected about larvae by using GLOBE observer application in Mosquito Habitat Mapper Application over 4 years so it can conclude that, nowadays there are many reports in Thailand and it can be estimated that there will be rises over the year.
1. The data survey findings are compatible with the prior hypothesis, as shown in Tables 2.1 and 2.2. Because each water source affects the liquid in that water source, which is a mosquito breeding habitat, by its physical qualities and surrounding environment. This results in a difference in the number of mosquitoes in each water source, which is due to the distinct nature of each water source.
2. The data research findings are improper with the prior hypothesis, as shown in table 3 because each citizen scientists have different behavior and when survey the sites it is not every place that can eliminated, which mean amount of elimination is not relate to amount sites were found. This results in a fluctuate in trend of eliminated sites percent, which due to citizen scientist behavior and sites circumstance.

## Conclusion

The first table showed the number of breeding sites over four years. We discovered that the majority of recorders can collect larval data in Mosquito Habitat Mapper (32.3 %) and adult data in Mosquito Habitat Mapper (32.3 %). According to tables 2.1 and 2.2, the physical features and surrounding environment of each water source impact the liquid in that water source, which is a mosquito breeding habitat. Because of the differences in the nature of each water source, the quantity of mosquitoes in each water source varies. And from the data in the 3rd table, citizen scientists have eradicated 73.1 % of larvae, 69 % of eggs, 77.6 % of pupae, and 68 % discovered since 2018.

## Acknowledgements

We thank Dr. Wanwipa Suitkiet, Paramed limsakun and Dr. Sirilak Chumkiew for helping with experimental design, data analysis and manuscript preparation. This work was supported in part by Samsenwittayalai School and Suranaree University of Technology.

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