Density and Dominance of Mosquitoes' Larvae that Inhabit Phytotelmata in Residential and Plantation Areas in Pesawaran District, Lampung Province, Indonesia

By Emantis Rosa

WORD COUNT 2483 TIME SUBMITTED 18-MAR-2019 11:26AM
PAPER ID 45251195

American Journal of Zoological Research, 2017, Vol. 5, No. 2, 29-32
Available online at http://pubs.sciepub.com/ajzr/5/2/2

DOI:10.12691/ajzr-5-2-2

Density and Dominance of Mosquitoes' Larvae that Inhabit Phytotelmata in Residential and Plantation Areas in Pesawaran District, Lampung Province, Indonesia

Emantis Rosa*

Department of Biology, Lampung University, Bandar Lampung, Indonesia
*Corresponding author: emantisrosa@gmail

Abstract Phytotelmata is one of the natural breeding places of mosquitoes found in nature. The density of mosquito larvae inhabiting phytotelmata is closely related to the volume of puddles present in the phytotelmata. The research was conducted in residential and plantation area at Pesawaran district, Lampung Province, which aims to find out the type of mosquito larvae, density, and dominance of mosquito larvae that inhabit phytotelmata. The results of this study indicate that in the area of Culex quinquefasciatus larvae larvae have the highest density of 62.76%, and the lowest larvae of *Aedes albopictus* and *Toxorynchites sp.* respectively 10,7%. In the highest density plantation area was found in *Aedes albopictus* larvae of 20.64%. The dominant index of mosquito larvae in the settlement area was 0.4 and the dominant index of mosquito larvae in the plantation was 0.611.

Keywords: *phytotelmata, density, larvae, dominant index*

Cite This Article: Emantis Rosa, "Density and Dominance of Mosquitoes' Larvae that Inhabit Phytotelmata in Residential and Plantation Areas in Pesawaran District, Lampung Province, Indonesia." *American Journal of Zoological Research*, vol. 5, no. 2 (2017): 29-32. doi: 10.12691/ajzr-5-2-2.

1. Introduction

The mosquito is one of the insects belonging to the phylum of Arthropoda, where most of the members are vectors of some types of diseases. Mosquito breeding is strongly associated with the type and number of breeding places, because the breeding place is very important for mosquitoes for survival [1].

The mosquito breeding place is very diverse both inside and outside the house, natural and unnatural. Natural breeding place that is on outside the home is water puddle in the plant which is called phytotelmata [2]. These plants can be found anywhere with different types, especially in humid places such as in the tropics [3]. Types of phytotelmata i.e pitcher plant, tree hole, petals, petals, fruit holes, and the root hole [4].

Phytotelmata is one of the natural breeding places of mosquitoes, where mosquitoes can complete their life cycle until they become adults [5]. Research on phytotelmata as a place of insect misery has been done by several researchers in several research topics such as: Water Insects that Inhabit Phytotelmata [3]; Diptera Fluctuation Diptera on Phytotelmata and Its Relation to Climate Variation in West Sumatra Indonesia [6]; Some Chemical Factors and Water Physics Determination of Diptera Density on Phytotelmata in Endemic Areas of Dengue Fever [7]; Diptera density of larvae that inhabit phytotelmata in several locations in West Sumatra, Indonesia [8]. However, information on the density and dominance of mosquito larvae that inhabit phytotelmata especially in residential and plantation areas in Lampung Province, Indonesia, has not been obtained the information, for this study to find out what type of mosquitoes' larvae, density, and dominance of mosquito larvae that inhabit phytotelmata.

2. Materials and Methods

The research was conducted in Taman Sari Village, Gedong Tataan Sub-district, Pesawaran Regency of Lampung Province. Sampling by siphoning water puddle on the part of Phytotelmata plant found at the study site, using a pipette that matches the surface diameter of phytotelmata type to be taken. Water that has been siphoned inserted into the sample bottle, labeled, and then the sample was taken to the laboratory.

The sample water originating from the puddle in phytotelmata is separated from the dirt and garbage that was carried along at the time of siphoning, and then measured the volume of water. Separate the mosquito larvae between the living and the dead. The surviving mosquito larvae were kept to adulthood to ensure identification results, while the dead larvae were inserted into bottles containing 70% alcohol for further identification referring to [9] identification book [10], and [11].

To determine the value of mosquito larvae density refers to the formula of Michael [12] that is by dividing

the number of species of each individual larvae with the amount of water volume in the occupied Phytotelmata (ml)

$$(K) = \frac{\text{Number of species of each individual larvae}}{\text{water volume in phytotelmata (ml)}}. \quad (1)$$

And to determine the dominance of mosquito larvae, the researchers calculate using Simpson Index formulas [13] with the following formula:

$$Ds = \sum(Pi)^2 \text{, where } Pi = ni / N$$

Note : Ds : Simpsons' Index
ni: The number of individuals of the-i species
N: The totals of individual

An easy way to comply with the journal paper formatting requirements is to use this document as a template and simply type your text into it.

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. Your paper is one part of the entire proceedings, not an independent document. Please do not revise any of the current designations.

3. Result and Discussion

The identification results showed that in the residential area, there were three species of mosquito larvae, *Aedes albopictus, Culex. Quinquefasciatus, Toxorynchites sp.*, And in plantation area also found three species of mosquito larvae namely *Ae.albopictus, Ae. Chrysolineatus, and Cx. Quinquefasciatus*. Total species of mosquitoes found for both areas were five species of mosquito larvae. At least the type of mosquitoes found may be due to environmental factors in the breeding places such as, the volume of water puddle in phytotelmata, the source of food in the breeding place supports the life of mosquito larvae.

The result of mosquito larvae density analysis on phytotelmata in residential area and plantation area can be seen in Table 1 and Table 2.

Table 1 shows that the density of each species of mosquito larvae inhabiting phytothelmata varies. The highest relative density (RD) in the residential area was found in *Culex quinquefasciatus* larvae that inhabited the *Nephelium lappaceum* tree hole at 62.76%. The results of the study of Rosa, et. Al. (2016b) on the density of *Diptera larvae* in phytotelmata in some dengue endemic areas in West Sumatera indicates *that Culex sp* larvae were found to inhabit phytothelmata in several phytotelmata species ie, pandanus, taro, bamboo and pineapple in West Sumatra.

The lowest relative density was found in *Aedes albopictus* and *Toxorynchtes sp*. larvae in the *Nephelium lappaceum* tree with a RD value of 10.7% each.

The relative density of mosquito larvae in the highest plantation area of *Aedes albopictus* larvae that inhabits the fruit hole at *Cocos nucifera* is 20.64%. The lowest relative density of *Cx.Quinquefasciatus* mosquito larvae of 2.24 on Bamboo stumps. (see Table 2)

From both tables above shows that the relative value and density of mosquito larvae is higher in plantation area than in residential area. This is probably due to the fact that the plantation area is further away from the settlements, so the disruption due to human activity against mosquitoes is less than the disruption to mosquitoes in residential areas with higher human activity.

The kinds and types of phytotelmata can also affect the amount of water that is accommodated which will indirectly affect the density of the mosquito larvae that inhabit it. In plantation type phytotelmata found is type of tree hole and fruit hole that morphology and its construction can accommodate the volume of water more, whereas in phytotelmata residential more dominated by type of leaf petals that ability in accommodating fewer puddles. Differences in the ability to accommodate puddles are thought to be due to the morphological and constructional differences of the phytotelmata that include the diameter and depth of the puddle, as well as the environmental factors of phytotelmata.

Plant morphology as a place of puddles greatly affects the volume of puddles. This is in accordance with [14] research, which states that tree-hole phytothelmata can hold more water than other types of phytothelmata. [5] states that in phytothelmata type of leaf petals have a more open morphological form of the leaves so that more easily exposed to the sun, consequently a larger evaporation process, which can lead to reduced volume of water that is accommodated. [7], reported that phytothelmata type leaf petal type will have warmer puddles compared with pipe-like tree type holes, indicating that plant morphology also affects the temperature in puddles.

Table 1. Density and Relative density of mosquito larvae that inhabit phytotelmata in residential areas, Pesawaran district, Lampung province

Kinds of phytothelmata	Kinds of mosquito and Density (ind/ml)							
	Ae. albopictus		*Ae. chrysolineatus*		*Cx. quinquefasciatus*		*Toxorynchites* sp.	
	D	RD(%)	D	RD(%)	D	RD(%)	D	RD(%)
A. macrorhiza	0	0	0	0	0	0	0	0
C. esculenta	0	0	0	0	0	0	0	0
D. fragrans	0	0	0	0	0	0	0	0
G. sanguine	0	0	0	0	0	0	0	0
M. paradisiaca	0	0	0	0	0	0	0	0
N. lappaceum	0,0103	10,7	0	0	0,06	62,76	0,0103	10,7
P. angustifolia	0	0	0	0	0	0	0	0
T. cacao	0,015	15,69	0	0	0	0	0	0

Note : D : Density
RD: Relative Density.

Table 2. Density and Relative density of mosquito larvae inhabiting phytotelmata in the Pesawaran Plantation area of Pesawaran, Lampung province

Kinds of phytothelmata	Density (Ind/ml)							
	Ae. albopictus		*Ae. chrysolineatus*		*Cx. quinquefasciatus*		*Toxorynchites* sp.	
	D	RD(%)	D	RD(%)	D	RD(%)	D	RD(%)
A. comosus	0,09	6,63	0	0	0	0	0	0
Bambusa sp.	0,102	7,62	0,16	11,96	0,03	2,24	0	0
C. nucifera	0,276	20,64	0,064	4,78	0,207	15,48	0	0
D.fragrans	0	0	0	0	0	0	0	0
M.paradisiaca	0,11	8,22	0	0	0	0	0	0
P.amaryllifolius	0	0	0	0	0	0	0	0
T.cacao	0,06	4,48	0,068	4,48	0,17	12,71	0	0

Note: D: Density
RD: Relative Density.

Environmental factors that can also affect the volume of water in phytotelmata is rainfall. In the high rainfall range, of course, the volume of puddles contained in phytothelmata will increase, and vice versa.

Other factors that affect the density of mosquito larvae in phytothelmata are the availability of mosquito larvae foods, such as microorganisms and parasitic bacteria available in puddles in phytothelmata. The mosquito larvae act as primary consumers and filter feeders that will feed on particle suspensions from litter as in Aedes and Anopheles [6].

Physical factors such as temperature and humidity also affect the process of mosquito breeding. Optimal temperatures in the mosquito breeding process range from 20-28°C, although at higher temperatures it is known to speed up the mosquito breeding process with a maximum temperature limit of 30°C [16,17]. In this study the temperature in residential areas and plantations ranged from 25°C to 28.5°C which is included in the optimal temperature for mosquito breeding.

Temperatures in puddles are influenced by the vegetation where the plants grow. Plants that grow in the shade will have a lower temperature than plants that are directly exposed to sunlight.

(Table 3) The dominant index value of mosquito larvae inhabiting phytotelmata in the residential is 0.4 which is included in the dominance category, while the index value ranges from 0.31 to 0.60, while the dominance value in the plantation area is 0.611 which is included in the category of high level dominance because Index values ranged from 0.61-1.

Table 3. The dominant index of mosquito larvae in residential and plantations of Pesawaran District, Lampung Province

Types of area	Index of Dominance
Residential	0,4
Plantation	0,611

4. Conclusion

1. The highest mosquito larvae density in residential area is *Culex quinquefasciatus* which inhabit type of phytotelmata *Nephelium lappaceum* type of tree hole of 62,76%, and lowest larva of *Aedes albopictus* and *Toxorynchites sp.* Which inhabit the type of phytotelmata *Nephelium lappaceum* tree-hole type in rambutan of 10.7% each. The highest density in the plantation area is Aedes albopictus larvae that inhabit *Cocos nucifera* type of fruit hole by 20.64%.

2. The dominant index of mosquito larvae inhabiting phytotelmata in residential is 0.4 and the dominant index of mosquito larvae on phytotelmata in plantation is 0.611.

References

[1] Rosa, E. Studi Tempat Perindukan Nyamuk Vektor Demam Berdarah *Dengue* Didalam dan Diluar Rumah di Rajabasa Bandar Lampung. *Jurnal Sains MIPA*. 13 (1): 57- 60. 2007.

[2] Derraik, J.G.B. Mosquito breeding in Phytotelmata in native forest in Wellington Region New Zealand. *New Zealand Journal of Zoology* 29: 185-191. 2005.

[3] Greeney, H. F. The Insect of Plant- Held Waters : A Review and Bibliography, Departement of Entomology. *Journal of Tropical Ecology*. 17(1): 251-260. 2001.

[4] Kitching, K. L. An Ecology Study of Water Filled Tree-holes and Their Position in the Woodland Ecosystem. *Journal Animal Ecology*. 281-302. 1971.

[5] Rosa, E., Salmah, S., Dahelmi, Syamsuardi.. *Jenis dan Tipe Phytothelmata Sebagai* Tempat Perindukan Alami Nyamuk di Beberapa Lokas di Sumatera Barat. Prosiding SNSMAIP. Edisi 3.Universitas lampung. 2012.

[6] Rosa, E., Dahelmi, Salmah, S., SyamsuardiFluctuation of Diptera Larvae in Phytothelmata and Relation with Climate Variation in West Sumatra ndonesia. *Pakistan* Journal of Biological Science. 17 (7): 947- 951. 2014.

[7] Rosa, E., Dahelmi, Salmah, S., dan Syamsuardi. Some Factors in Water Chemistery and Physics That Determines the Density of Diptera Larvae on Phytothelmata in Endemic Areas of Dengue Hemorraghic Fever. *ARPNJournal of Agricultural and* Biological Science. 11(2): 76-8. 2016 a.

[8] Rosa, E., Dahelmi, Salmah, S., dan Syamsuardi. Density of Different Dipteran Larvae inhabiting phytotelmata from some location of West Sumatra, Indonesia. *American Journal* of Zoological Reseach. 11(2) 13-16. 2016 b.

[9] Phua Sai Gek., D. Lu., P.A. Bah., F.S. Yoong., N.L Ching. Some common mosquito. larvae in Singapore. Published by Enviromental Health Institut. National Environment Agency. 2008 a.

[10] Phua Sai Gek., D. Lu., P.A. Bah., F.S. Yoong., N.L Ching. Some common mosquito. Larvae in Singapore. Published by Enviromental Health Institut. National Environment Agency. 2010 b.

[11] Michael, P. Ecological Methods for Field and Laboratory Investigations. Tata Mc.Graw -Hill Publishing Company Limited. Delhi. 1984.

[12] Odum, E. P. *Dasar- Dasar Ekologi*. Gajah Mada University Press. Yogyakarta. 1993.

[13] Munirathinam., A., Krishnamoorti, R., Baskaran,G., Govindarajan, R., Venkatesh, A., Tyagi, B. Mosquito Species Biodiversity in Phytothelmata fromWestern Ghats, South India. *Journal of Science*. 56-63. 4.

[14] Kitching, K. L. Food Webs and Container Habitats : The Natural History and Ecology *of Phytothelmata*. Cambridge University Press. New York. 2000.

[15] Hoedojo, R. *Parasitologi Kedokteran Edisi Kedua*. Fakultas Kedokteran Universitas Indonesia. Jakarta. 1993.

[16] Nurmaini. 2003. Mentifikasi Vektor dan Pengendalian Nyamuk *Anopheles aconitus* Secara sederhana. [Internet]. Available on: Digilibusu.ac.id. Acess on 5 Januari 2016.

[17] Department of Health Republik Indonesia. *Kunci Identifikasi Aedes jentik dan Dewasa di Jawa*. Ditjen. P2M dan PLP. Departemen Kesehatan R.I .Jakarta. 1989.

Density and Dominance of Mosquitoes' Larvae that Inhabit Phytotelmata in Residential and Plantation Areas in Pesawaran District, Lampung Province, Indonesia

ORIGINALITY REPORT

24%

SIMILARITY INDEX

PRIMARY SOURCES

1	repository.lppm.unila.ac.id Internet	161 words — 6%
2	repository.unand.ac.id Internet	141 words — 6%
3	aeng.org Internet	76 words — 3%
4	scholar.unand.ac.id Internet	36 words — 1%
5	educationdocbox.com Internet	29 words — 1%
6	Basic and Applied Aspects of Biopesticides, 2014. Crossref	26 words — 1%
7	anzdoc.com Internet	21 words — 1%
8	www.ijmst.co Internet	19 words — 1%
9	www.loxahatcheegrovesfl.gov Internet	16 words — 1%
10	oer-crutech.net Internet	13 words — 1%

11	opac.giga-hamburg.de Internet	11 words — < 1%
12	pt.scribd.com Internet	11 words — < 1%
13	biologi.fst.unair.ac.id Internet	11 words — < 1%
14	www.arpnjournals.org Internet	10 words — < 1%
15	www.fmipa.unsyiah.ac.id Internet	9 words — < 1%
16	cipher.kiev.ua Internet	8 words — < 1%
17	Andrea Paola Albicócco. "Mosquito community structure in phytotelmata from a South American temperate wetland", Journal of Vector Ecology, 12/2011 Crossref	7 words — < 1%

EXCLUDE QUOTES	OFF	EXCLUDE MATCHES	OFF
EXCLUDE BIBLIOGRAPHY	OFF		