

# Bionomic Vector Anopheles SPP in Maribu Village, Sentani Barat District Jayapura Regency Papua - Indonesia 2018

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Anopheles mosquito is an important genus in the Anophelinae subfamily. Anopheles is the only type of mosquito that can transmit malaria to humans. There are about 80 species of Anopheles, while there are 24 species declared as malaria vectors. Papua Biomedical Research and Development Center (2006-2014) found species including: Anopheles farauti, Anopheles punctulatus, Anopheles koliensis, Anopheles bancrofti, Anopheles kochi, Anopheles tessellatus. The purpose of this determination is to describe the characteristics of breeding places (habitat), to know the activity of blood sucking and resting habits of Anopheles spp in Maribu Village, Sentani Barat District, Jayapura Regency in 2018. This research is undertaken quantitatively through with survey design and analysis. The results of the research analysis showed that the Anopheles spp larvae habitat in Maribu village consisted of 17 ponds (20.7%), temporary puddles of 37 animals (45.1%) and 28 animals (34.1% of former footing water). The blood-sucking activity of Anopheles spp mosquitoes in Maribu village began at 18:00 CET and reached its peak density at 21.00-22.00 CET, both outside the house and inside the house. Anopheles spp in Maribu village prefer to rest outside the house rather than inside the house after sucking blood or foraging for food. This research suggests that counselling about malaria and its transmission would improve the behaviour (knowledge, attitudes and actions) of the community in an effort to reduce contact between humans and mosquitoes, modification and manipulation of the environment and reduce the habit of being outdoors at night and wearing trousers when outside the house.

**Key words:** *Bionomics, Anopheles spp.*

## Preliminary

Anopheles mosquito is an important genus in the Anophelinae subfamily because Anopheles is the only type of mosquito that can transmit malaria to humans. The cause of Malaria in humans is from Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae and Plasmodium ovale. These are all transmitted by Anopheles mosquitoes, whose species vary from one region to another.

The Anopheles spp mosquito is also a vector or Arthropoda for many new diseases and 're-emerging diseases such as filariasis caused by filarial worms including Wuchereria bancrofti, Brugia malayi and Brugia timori. Anopheles spp mosquito also acts as a vector of all types of Arbovirus group A, the Onyong-onyong virus.

The identification of vector species and knowledge of their ecology and behaviour is essential for epidemiologic studies and the design and implementation of vector control strategies. To understand malaria risk in an area, the species of Anopheles mosquitoes present in that area and which of those species are vectors must be known. Collections of anthropophilic Anopheles spp. must be conducted throughout the year to reflect seasonal changes in population size and attack rates (Burkot et al. 1989). It is essential to collect data in several areas within a region due to the microepidemiological nature of malaria where settlements within close proximity can vary dramatically in transmission dynamics (Greenwood 1989). (Che, Nazimah, & Amin, 2009; Kojo & Paschal 2018).

According to Takken W and Knols B.G.J (1990), Anopheles spp mosquitoes are mosquitoes vector of malaria. In the world there are approximately 400 species that have been recognized, 60 of which have the ability to transmit malaria and 30-40 are hosts of plasmodium parasites which are the cause of malaria in malaria endemic areas. In Indonesia alone, there are 24 species of Anopheles mosquitoes that are capable of transmitting malaria.

World Health Organization (WHO) estimates that there are 270 million cases of malaria, and this causes about 1 million human deaths each year, especially in children. In 2015, there were an estimated 214 million cases of malaria, with 400,000 deaths. About 65% of deaths from malaria are children under 5 years.

In Indonesia, Anopheles spp mosquitoes which become vectors of malaria transmitters are Anopheles sudaicus, Anopheles aconitus, Anopheles barbirostris, Anopheles subpictus, and so on. There are about 80 species of Anopheles, while there are as many as 24 malaria species with different habitats.

In 2012, there were 317, 819 clinical cases of Malaria in Indonesia. This figure has continued to decline until 2016 where there were 218, 450 cases with the Annual Parasite Incident

(API) in the past year (2013-2014) with 24 cases per 1000 people with a mortality rate due to malaria reaching 1.3%.

Environmental change, neglect of vector control strategies, and drug resistance have influenced transmission of malaria through changes in the Republic of Indonesia (Takken and Knols 1991). Pesticide residues from spraying malaria were almost eliminated from Indonesia in Java from 1950 to 1990 (Atmosoedjono 1991). Indonesia surpassed in Sukabumi District, West Java, the rate of *Plasmodium malariae falciparum* and *P. vivax* has increased since 1998. In Sukabumi District in 1998, supported one case of Jakarta 1998 malaria, and in 2003 that number increased to 1,790 cases (Indonesian Ministry of Health, data not approved). In 2003, there were 17 deaths rejected with *P. falciparum* in Simpenan sub-district alone. In Sukabumi District, malaria cases are fatal and many cases in coastal villages. During 2006 and 2007, Lengkong reported 115 cases of malaria and Simpenan reported 63 cases of malaria (Indonesian MoH data not approved). The main malaria vectors on Java are *Anopheles aconitus*, *Anopheles maculatus*, and *Anopheles sundaicus* (Kirwardoyo 1985, Takken and Knol 1991, Baird et al. 1996). *Anopheles aconitus* is associated with highland species associated with terraced rice fields, *An. maculatus* returns with hilly areas with larvae found in stream beds and other small ponds, and *An. sundaicus* is a Coastal species associated with breeding grounds for brackish water (Kirwardoyo 1985, Takken and Knols 1991, Baird 1996). (Che et al., 2009; Kanwal, Khan & Baloch 2017)

Based on an Entomology Survey conducted between 2006 - 2014 by the Papua Biomedical Research and Development Center for the Provinces of Papua and West Papua (Tanah Papua) found the following *Anopheles* species: *An. farauti*, *An. punctulatus*, *An. koliensis*, *An. bancrofti*, *An. kochi*, *An. tessellatus*.

*Anopheles* vector density survey was conducted by Mofu R., et al (2013); Keho, (2017) in the working area of the Hamadi Community Health Center, Jayapura City with an average vector density level of 2.1 birds / person / hour with the captured *Anopheles* species being *Anopheles farauti*, *Anopheles koliensis* and *Anopheles punctulatus*.

The province with the highest Annual Parasite Incidence (API) was in the province of West Papua, namely 167.47 per 1000 population, East Nusa Tenggara 104.10 per 1000 population, Papua Province 84.74 per 1000 population and North Maluku 51.42 per 1000 residents with a prevalence rate of West Papua 10.6%, Papua 10.1% and NTT 4.4%.

Papua Province is a malaria endemic area with malaria morbidity ranked second in the top 10 diseases. Based on the Annual Parasite Incident (API) in the last 5 years, namely in 2009 amounted to 53.81 per 1000 population, in 2010 amounted to 55.70 per 1000 population, in 2011 amounted to 59 per 1000 population, in 2012 amounted to 57.68 per 1000 population and in 2013 increased by 63, 696 per 1000 population

Jayapura Regency with varied regional topography ranging from lowlands, swamps and highlands (hills) and wet tropical climates with an average temperature (temperature) is 26-33, humidity 75-84% with high and uneven raindrops, between rainy season and dry season is not clear.

The characteristics of the Jayapura Regency are swamps, lakes, lowlands, highlands, forests and streams, illustrating that these areas are very potential areas as breeding places and resting places for malaria vectors and are very vulnerable to malaria distribution.

Data from the Jayapura Regency Health Office shows that in 2015 there were 61,725 malaria cases and in 2016 there were 65,666 cases with API 57.29 / 1000 population. Puskesmas Dosay is one of the puskesmas under the District Health Office. The working area of the Dosay Community Health Center consists of 5 villages, namely Maribu, Waibron, Dosay, Sabron Sari and Sabron Yaru. Maribu village / village is a village / village with a high incidence of malaria, namely in 2015 as many as 434 cases and in 2016 as many as 349 cases.

The high number of malaria cases in Maribu village is influenced by the physical condition of the house, environmental sanitation, community behaviour, biological environment, chemistry (pH and water salinity), physical environment (air temperature, air humidity and wind speed), vectors and species density and *Anopheles* bionomics which consists of breeding sites, blood sucking habits, resting places, life cycles, porosity, age and flight distance.

Based on the results of research conducted in Maribu village by Mofu R., et al (2017); Khan & Mohammad (2018), the number of *Anopheles* spp was caught during three (3) days of capture at three (3) locations, totaling 303 tails with the lowest *Anopheles* density of 3.4 tails / person / hourly and highest 4.8 tails / person / hour with *Anopheles* species is *An. koliensi*, *An. farauti* and *An. punctulatus*.

Based on the above problems, we are interested in conducting further research on "Anopheles spp vector bionomic in Maribu village, Sentani Barat District, Jayapura Regency in 2018".

## **Method**

This type of research is descriptive, the researcher intends to draw a bionomic *Anopheles* spp consisting of characteristics of breeding places (habitat), a place to look for food and a place of rest in the Maribu village, West Sentani District, Jayapura Regency. The design of this study is survey research, which is intended to describe the actual (objective) state of the object (respondent). The population in this study was *Anopheles* spp bionomics in Maribu Village, Sentani Barat District, Jayapura Regency. The sample in this study was a breeding ground, a place to find food and a place to rest *Anopheles* spp. Which was found during a survey in Maribu village, Sentani Barat District, Jayapura Regency. Variables in this research are *Anopheles* spp bionomics, which are characteristics of breeding places (habitat), blood sucking activities and resting place.

### **A. Types and Data Sources**

Types and sources of data used in this study, can be divided into two types of data, namely:

#### **1. Primary data**

Primary data is data obtained directly at the time of the study through surveys and observations consisting of bionomic data *Anopheles* sp.

## 2. Secondary data

Secondary data is data used to supplement or support this study from the Puskesmas, the Health Office and the Jayapura Regency Climatology and Geophysics Meteorology Agency (BMKG) and other agencies that are related to objectives and problems.

## **B. Research Instruments and Data Collection Methods**

The instruments used in this study were based on the variables studied, consisting of:

1. Bionomic (habitat) vector of *Anopheles* spp by survey using: Long dipper (dipper), vial bottle, dropper, glass beaker and microscope. The larvae survey was conducted at all types of aquatic habitat locations that were suspected as breeding places for *Anopheles* spp.
2. Blood sucking activities

Performed by measuring the density of *Anopheles* spp. Mosquitoes perched on the catching body at night at 18:00 - 06:00 with the HLC (human landing collection) method carried out at the community home. Each house was carried out by two arrests, inside and outside the house. Every hour, catching mosquitoes for 50 minutes divided into 40 minutes catching with bait people inside and outside the house and 10 minutes on the walls inside and outside the house (cage wall) and rest or collection of catches of 10 minutes.

3. Rest area

The next mosquito catching is carried out in the morning, between 6.00 - 8.00 WIT to find out the break time. Catching mosquitoes is done by using a flashlight, aspirator and paper cup. Identification of *Anopheles* spp by using the Indo-Australian (Eastern Indonesian) *Anopheles* species identification key from Wepster, J. B., Swellengrebel, N. H., (1945), dissecting microscope, chloroform, Petri dish and insect tweezers.

## **C. Data Processing Techniques**

The data processing technique used in this study is Microsoft Excel to analyse and obtain data distribution, which is then presented in the form of frequency distribution tables and graphs to describe the variables studied.

## **D. Data Analysis**

The data obtained were collected for examination and data validation, recapitulation and tabulation coding, and then analysed to describe habitat characteristics, blood sucking

activities and *Anopheles* spp rest area in Maribu Village, Sentani Barat District, Jayapura Regency.

### Research Result

1. Characteristics of *Anopheles* spp. Habitat in Maribu Village, Sentani Barat District, Jayapura Regency.

**Table 2:** Habitat Type and Number of larvae of *Anopheles* spp in Maribu Village, West Sentani District 2018

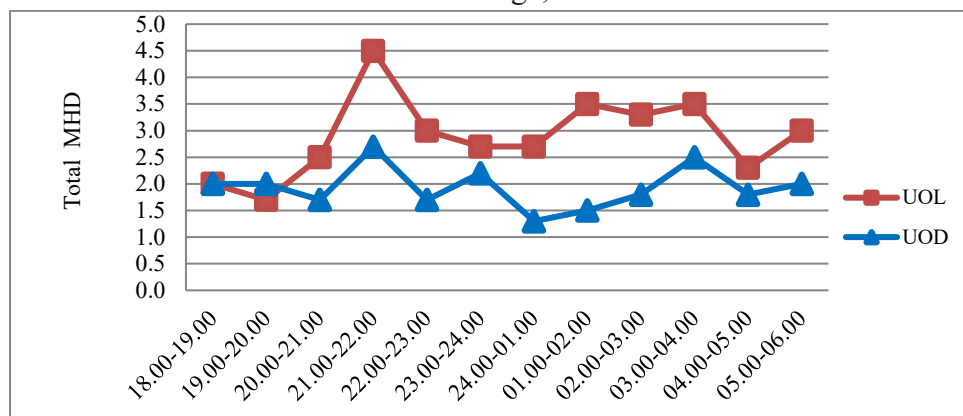
No	Type Habit	Number of larvae (tail)	Percentage (%)
1	Pool	17	20,7
2	Temporary puddles	37	45,1
3	Animal footing	28	34,1
	Total	82	100

Data source: Primary, 2018

From 82 *Anopheles* spp larvae obtained as many as 17 individuals (20.7%) in pond habitat types, 37 individuals (45.1%) in temporary puddles and 28 individuals (34.1%) in standing puddles of animal footprints. The results of observations on the physical and environmental conditions of the type of habitat (habitat) of *Anopheles* spp in Maribu village found that the preferred type of water is waters in the presence of water plants or green moss and calm without water flow and being exposed to sunlight.

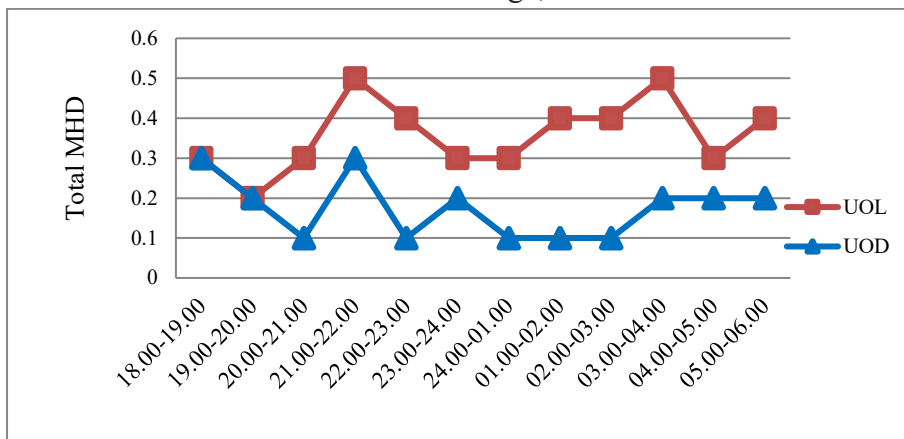
2. *Anopheles* spp's blood-sucking activity in Maribu Village, Sentani Barat District, Jayapura Regency.
  - a. Man Biting Rate (MBR)
  - b. Man Hour Density (MHD)

**Figure 7.** Density (MBR) of *Anopheles* spp When Sucking Blood Outside and Inside the House Based on Hours in Maribu Village, West Sentani District 2018



The above results show that the blood-sucking activity of *Anopheles* spp (group) in Maribu Village began at 18:00 CET and reached a peak density at 21.00-22.00 CET, both outside the house and inside the house. At 01.00-04.00 WIT outside the house the density tended to be stable, which is 3.5 individuals / person and decreases at 04.00 - 05.00 WIT. In the house, the density of *Anopheles* spp has increased based on the MBR at 03.00-04.00 WIT, which is 2.5 heads / person (Koirala & Koirala 2016). The average density of *Anopheles* spp (*An. Punctulatus*, *An. Koliensis* and *An. Farauti*) people per night (MRB) in the house is 1.9 fish / person / night and outside the house is 2.9 fish / person / night with an average Man biting rate (MBR) of 2.4 individuals / person / night.

**Figure 8.** *Anopheles* spp (MDH) Density When Sucking Blood Outside and Inside the House Based on Hours in Maribu Village, West Sentani District 2018

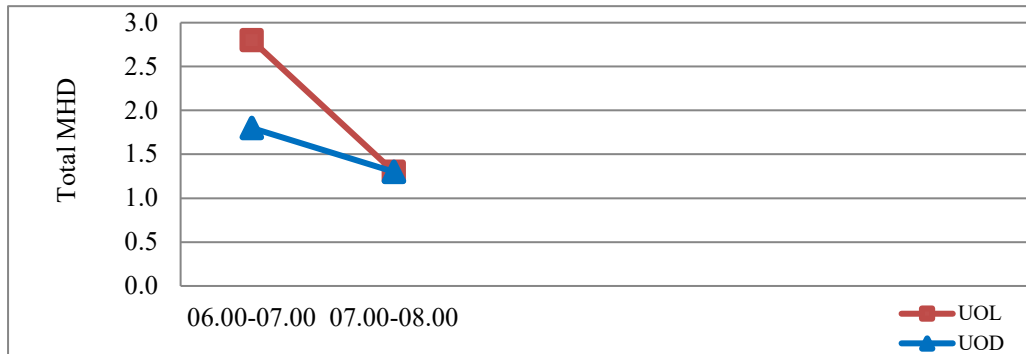


The above results show that the blood-sucking activity of *Anopheles* spp (group) in Maribu village began at 18:00 CET and reached peak densities at 21.00-22.00 CET, both outside the house and inside the house and at 3:00 to 4:00 AM WIT day. The average density of *Anopheles* spp (*An. Punctulatus*, *An. Koliensis* and *An. Farauti*) people per hour (MHD) in the house is 0.2 fish / person / hour and outside the home is 0.4 fish / person / hour with an average Man hour density (MDH) of 0.3 fish / person / hour.

1. *Anopheles* spp resting habits in Maribu Village, Sentani Barat District, Jayapura Regency.



**Figure 9.** Density (MBR) of *Anopheles* spp When Sucking Blood Outside and Inside the House Based on Hours in Maribu Village, West Sentani District 2018



Based on the results of mosquito catching carried out it was demonstrated that at 06.00 - 07.00 WIT it was 2.8 tails / person / hour outside the house and 1.8 tails / person / hour inside the house and at 07.00-08.00 WIT the same results were obtained both outside and inside the house that is 1.3 tail / person / hour.

## Conclusions

*Anopheles* spp larvae habitat in Maribu village consists of ponds, temporary puddles and water from animal footprints. The blood-sucking activity of *Anopheles* spp in Maribu village starts at 18.00 CET and reaches its peak density at 21.00-22.00 CET, both outside the house and inside the house. *Anopheles* spp in Maribu village, prefer to rest outside the house rather than inside the house after sucking blood or foraging for food.

Counseling about malaria and its transmission to parents and school children is important to continuously improve the behavior, knowledge, attitudes and actions of the community in an effort to reduce contact between humans and mosquitoes. Physical environmental control is carried out in the form of environmental modification and manipulation to eliminate the *Anopheles* spp vector habitat such as draining sewage water, piling up puddles and cleaning the bushes. Biological control is implemented by means of spreading predatory fish in standing water and using cattle as barriers. Reducing the habit of being outdoors at night and wearing trousers when outside the home are actions that people can do to reduce possible exposure to mosquito bites.





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