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Imago Population Density of Aedes aegypti and Aedes albopictus on Infected Area of Dengue Hemorrhagic Fever (DHF) in North Sulawesi

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ABSTRACT
The research has been conducted which aims to get the characteristics of population density imago *Aedes aegypty* and *Aedes albopictus* in Kotamobagu, based on the distribution of time and height from the sea level; to get population density of adult *Aedes aegypty* and *Aedes albopictus* captured in indoor and outdoor based on time distribution. The research consists of four phases, i.e. the first phase of determining the location of sampling based on the existence of cases of dengue fever in the city, the second stage of sampling third stage larva, imago capture Aedes aegypti and Aedes albopictus inside and out and a fourth stage of data analysis research. The results showed that the average population density of Aedes aegypti and Aedes albopictus highest, according to time span found on 08.00-10.00 in the morning and 14.00-16.00 in the afternoon. The average population density of Aedes aegyti outdoors highest found in the sample location in South Minahasa. While the average population density outside the lowest found at the location of the sample of Talaud. In contrast to population density, population density outdoors only once showed the highest population density in the s/d at 15.00 16.00 Wita. The peak of population density of Aedes albopictus in the highest room discovered in South Minahasa sample locations while the lowest on a population sample of Talaud. The highest population density peak at 12 noon: whereas the lowest sample location on the Talaud Islands. In contrast to the density of the population of Aedes aegypti in the room which has 2 peaks of the highest population density number of individuals with relatively the same mosquito, Aedes albopictus on only one of the highest population density according to the peak hours. Inversely proportional to the density of population of a. aegypti, a. albopictus more found outside the room. The highest population density is found in the city of Manado and Kotamobagu whereas the lowest was found in Talaud Islands.
Key words: Aedes albopictus, Aedes aegypti, population, density, Northern Sulawesi

INTRODUCTION

In general, the foraging behavior of the mosquito A. aegypti and A. albopictus males are sap sucking female mosquitoes suck blood while being used to ripen the eggs. The nature of the Aedes mosquito is likely to suck the blood of humans rather than animals (anthropophilic). Activities seeking female mosquitoes feed namely from morning until dusk, with two peaks of activity between the hours of 9:00 to 10:00 and 16:00 to 17:00. Aedes mosquitoes have repeatedly blood sucking behavior (multiple bites) in one cycle gonotropik, is also highly effective mosquito to transmit the virus to humans (WHO 2004). Kawada et al. (2007) report that activity to feed A. albopictus is less than 0.1 times compared with A. aegypti in laboratory conditions, these results are consistent with a tendency to bite both these species in the wild. Frequency-attack targets (seek activity feed) on A. aegypti female mosquitoes in unfed conditions is 30 times greater than A. albopictus mosquitoes in some treatment in the laboratory (Kawada, et al., 2007). The movement of A. aegypti mosquitoes from breeding place to place looking for prey and rest area is determined by the ability of A. aegypti mosquitoes fly is an average of 40-100 meters. However passively as the wind can fly as far as 2 km (MOH, 1992).

North Sulawesi region largely plains , consists of mountains and hills punctuated by valleys that make up the land . North Sulawesi regional climate including the tropics, and the temperature was at any rate more elevation to the top and cool as the area Tomohon , Langowan in Minahasa , Modoinding in South Minahasa Regency , Modayag City Kotamobagu and Pasi in Bolaang Mongondow . Rising global temperatures are expected to cause other changes such as increased intensity of extreme weather phenomena . Many diseases are associated with climate change include diarrhea , skin diseases , malaria , dengue fever will increase the number of cases in extreme weather (Haryanto , 2009). Has conducted research with the aim to Getting the Aedes mosquito population density profile Aegypty and Aedes Albopictus in Kotamobagu City , Manado , Bitung , Talaud , Minahasa , South Minahasa and Southeast Minahasa. Getting the data connection between temperature, humidity , precipitation and pH on the development Aegypty aedes mosquitoes and Aedes albopictus .

MATERIALS AND METHODS

The Research Location and Sampling

The research was carried out in the town of Kotamobagu and several Kabupaten/Kota in North Sulawesi that ditentuksan are purposive random sampling (table 1). The location of the sample are set based on the existence of positive cases of dengue fever. The data is the presence of a positive case of dengue fever at the time of Research Data obtained from the Department of health of the province of North Sulawesi and confirmed with data at the service of the district/city that became the object of research.

Table 1 Sampling Location of Aedes *spp* in North Sulawesi

No	Regency / City	Sampling Location
1	Manado	Perkamil
2	Bitung	Madidir
3	Minahasa Selatan	Tumpaan
4	Kotamobagu	Keseluruhan wilayah kota
5	Minahasa Tenggara	Ratatotok
6	Minahasa Utara	Laikit
7	Talaud	Melongnguane
8	Bolaang Mongondow Timur	Tutuyan

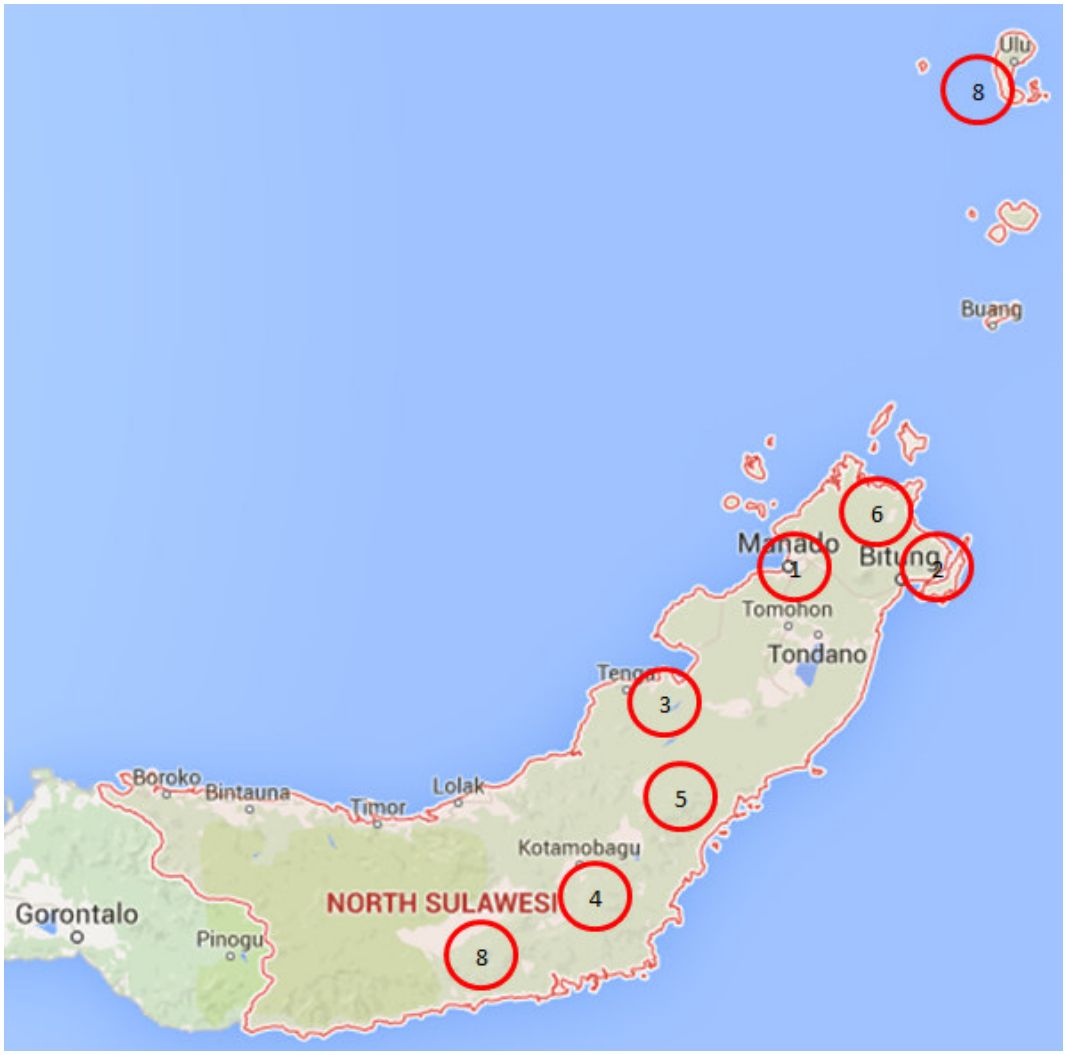

Figure 1. The map showing location of sampling (red circle) of *Aedes spp.*
(map source: google maps)

Materials and Tools

The materials and tools used are:

a. capture: Nets used to catch mosquitoes
b. sample Bottles: used to collect samples of mosquitoes
c. Label: used to provide a description of the location of the sampling.

d. technical: Chloroform used for mosquito samples menterminasi
e. Alcohol 70%: used for mosquito samples mempreservasi
f. Tweezers: used to move the mosquito sample catches on the bottle samples.
g. Puls: morphological characters used to observe the markers of Aedes spp
h. sample Box: used to collect the sample with a constant temperature.

Research Procedure

1. The taking of larvae

The taking of the larvae of Aedes aegypty and Aedes albopiktus in doing research in each area. The taking of samples of mosquito larvae, carried out twice a month on media development of mosquitoes that are in nature, namely tires, branches, shelter water destroyed houses and a pool-another puddle in residential or home environment. The larvae are taken as much for 6 months. Most larvae in the keep until adulthood and partially incorporated into alcohol for identification in the laboratory of morphology with the key pests and diseases of the Faculty of agriculture UNSRAT. Each sampling measured temperature, humidity and pH to see the influence of these three factors.

2. Taking the adult mosquito

Imago sampling done 2 times a month for six months. Population counting is done per hour start 06.00-18.00 Wita. It aims to look at the behavior of Aedes aegypty flying and Aedes albopictus and liveliness in search of food. Each sampling measured temperature, humidity and pH to see the influence of these three factors. Retrieval technique of imago is done by sweeping arrest mosquito that is grown with the use of jarring (.....). Arrest mosquito by using nets implemented measures as follows:

a. Prepare bottles and nets catchers.
b. NET such catchers way digerakan swung into the air with the intent to catch mosquitoes that soft sand in the air.
c. Mosquitoes trapped in nets then captured using the bottle.
d. Mosquitoes caught bottled selanjunya inserted into Frezer with temperature-5 0 c.
e. close the holes in the gauze using cotton

RESULTS AND DISCUSSION

The density of Population in the city of Imago Kotamobagu, North Sulawesi

The average to the highest padai Aedes aegypti populations at 08.00-10.00 in the morning and 14.00-16.00 during the afternoon. Of the nine locations were analyzed rataan total highest mosquitoes from 06.00 until 18.00 (10 hours of observation) on location 1 i.e. 7.00 indvidu mosquitoes with the height of the place I (... above sea level) while the average low at eight locations namely 3.00 individual mosquito lies at an altitude of place III (1500 above the sea level). (Table 1).

Table 1. The population density of *Aedes aegypti*

Locations	The Averange Population based on time (hours)						Amounts	The Averange	K
	06.00-08.00	08.00-10.00	10.00-12.00	12.00-14.00	14.00-16.00	16.00-18.00			
1	4	10	3	2	15	8	42	7,000	I
2	2	11	5	3	9	5	35	5,833	
3	3	12	3	1	9	5	33	5,500	
TOTAL	9	33	11	6	33	18	110	18,333	
4	3	11	8	2	13	5	42	7,000	II
5	2	3	4	1	3	3	16	2,667	
6	1	4	3	1	4	5	18	3,000	
TOTAL	6	18	15	4	20	13	76	12,667	
7	2	4	4	2	9	2	23	3,833	III
8	1	4	2	2	4	5	18	3,000	
9	0	6	1	2	3	7	19	3,167	
TOTAL	3	14	7	6	16	14	60	10,000	

The average population of Aedes albopictus to highest padai at 08.00-10.00 in the morning and 14.00-16.00 during the afternoon. Of the nine locations were analyzed rataan total highest mosquitoes from 06.00 until 18.00 (10 hours of observation) on site 3 i.e. indvidu 11.00 mosquitoes with the height of the place I (... above sea level) while the average low at eight locations namely 8.33 individual mosquito lies at an altitude of place III (1500 above the sea level) (Table 2).

Tabel 2. The Population density *Aedes albopictus*

Locations	The Averange Population based on time (hours)						Amounts	The Averange	K
	06.00-08.00	08.00-10.00	10.00-12.00	12.00-14.00	14.00-16.00	16.00-18.00			
1	6	10	13	11	15	9	64	10,667	I
2	8	11	14	9	15	9	66	11,000	
3	7	12	17	12	15	7	70	11,667	
TOTAL	21	33	44	32	45	25	200	33,333	
4	5	11	13	12	12	11	64	10,667	II
5	7	3	15	11	13	9	58	9,667	
6	8	4	19	11	12	8	62	10,333	
TOTAL	20	18	47	34	37	28	184	30,667	
7	4	4	12	11	12	14	57	9,500	III
8	4	4	12	9	9	12	50	8,333	
9	3	6	19	8	7	11	54	9,000	
TOTAL	11	14	43	28	28	37	161	26,833	

2. Population density of the City County Mosquito Imago in North Sulawesi

a. Aedes aegypti

To compare the population density of the location of mosquito research main Kotamobagu then do research rather mosquito population at the kabupaten/kota in North Sulawesi. From the location specified in the sample purposive obtained data an average population density of the highest indoor Aedes aegypti in the city of Manado, whereas to the lowest population was found in the town of Kotamobagu. Popopulasi density peaks of Aedes aegypti in the highest room found on the range of hours 06.00 until 07.00 and 10.00 until 11.00 (Figure 1). Thus in one day was found 2 times the highest population densities of mosquitoes in the room.

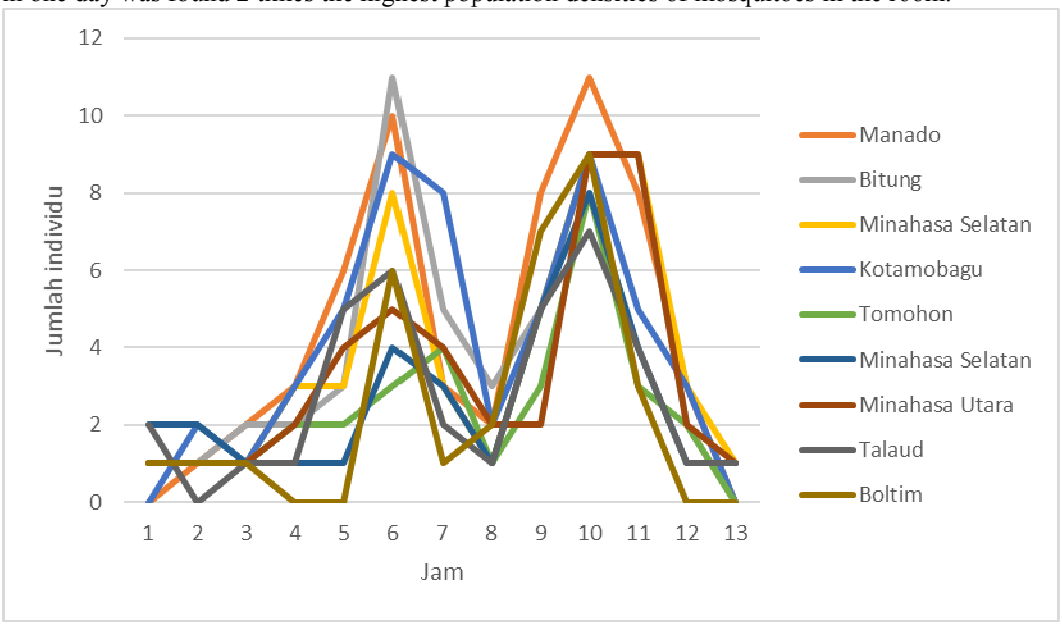

Figure 2. The density of *Aedes aegypti* in the room

The average population density of Aedes aegyti outdoors tettinggi found on the sample location in South Minahasa. While the average population density outside the lowest found at the location of the sample of Talaud. In contrast to population density, population density outdoors only once showed the highest population density in the s/d at 15.00 16.00 Wita (Figure 3).

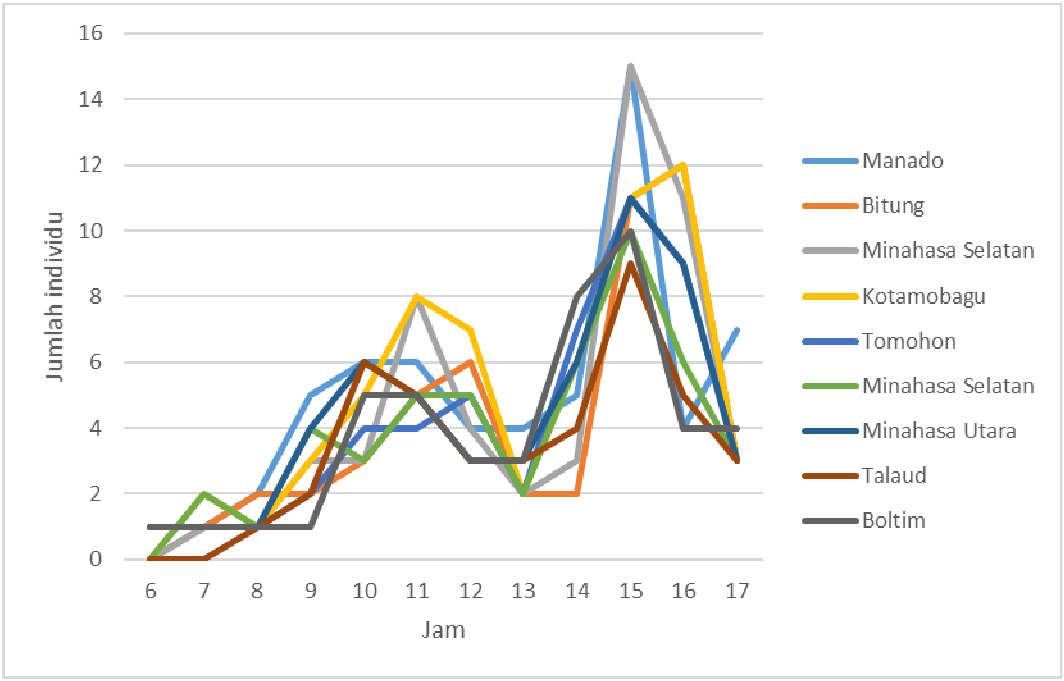

Figure 3. The density of Aedes albopictus in room

a. Aedes albopictus

The peak of population density of Aedes albopictus in the highest room discovered in South Minahasa sample locations while the lowest on a population sample of Talaud. The highest population density peak at 12 noon: whereas the lowest sample location on the Talaud Islands (Figure 4). In contrast to the density of the population of Aedes aegypti in the room which has 2 peaks of highest population density number of individuals with relatively the same mosquito, Aedes albopictus on only one of the highest population density according to the peak hours.

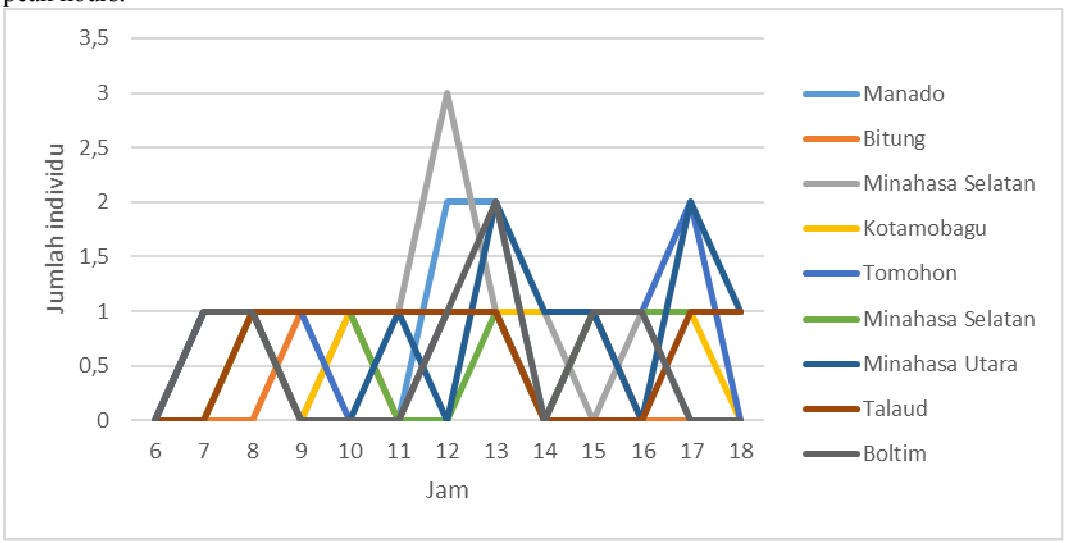

Figure 4. The density of Aedes aegypti in the room

The average population density of Aedes albopictus in the outdoors the highest found in the sample location in South Minahasa. While the average population density outside the lowest found at the location of the sample of Talaud. As is the case with a population density of outdoor Aedes aegypti, Aedes outdoor population density alobopictus only one times showed the highest population density that is at 16.00 and 17.00: Wita (Figure 3).

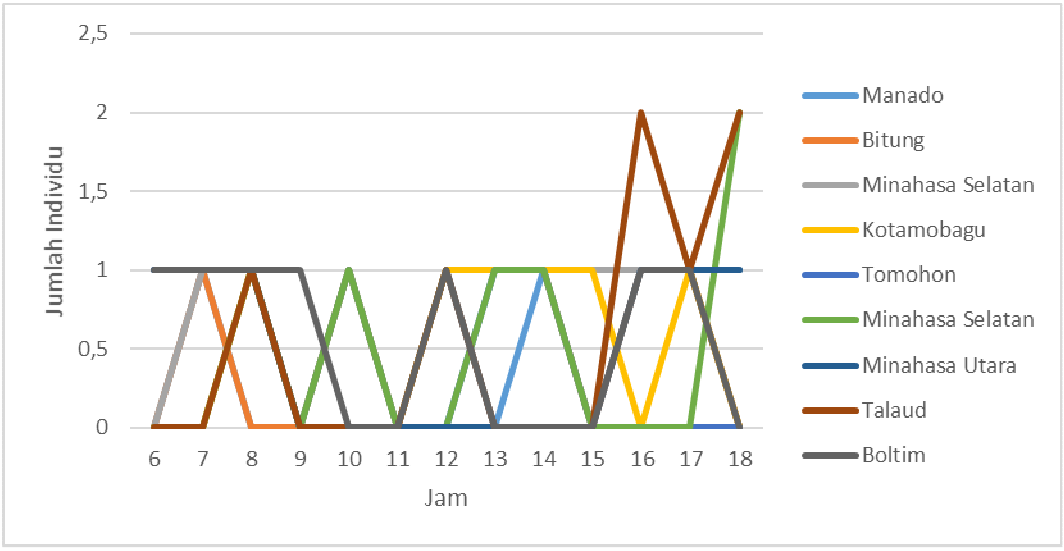

Figure 5. The density *of Aedes albopictus* outdoors

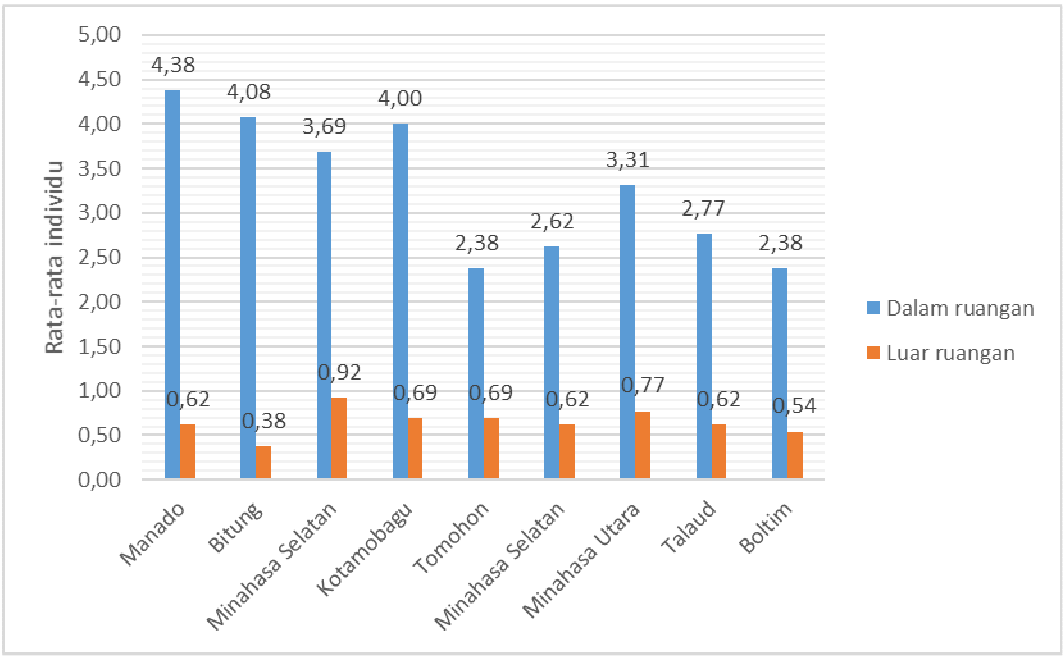

Figure 6 Diagrams average density of Aedes aegypti populations inside and outside of the room

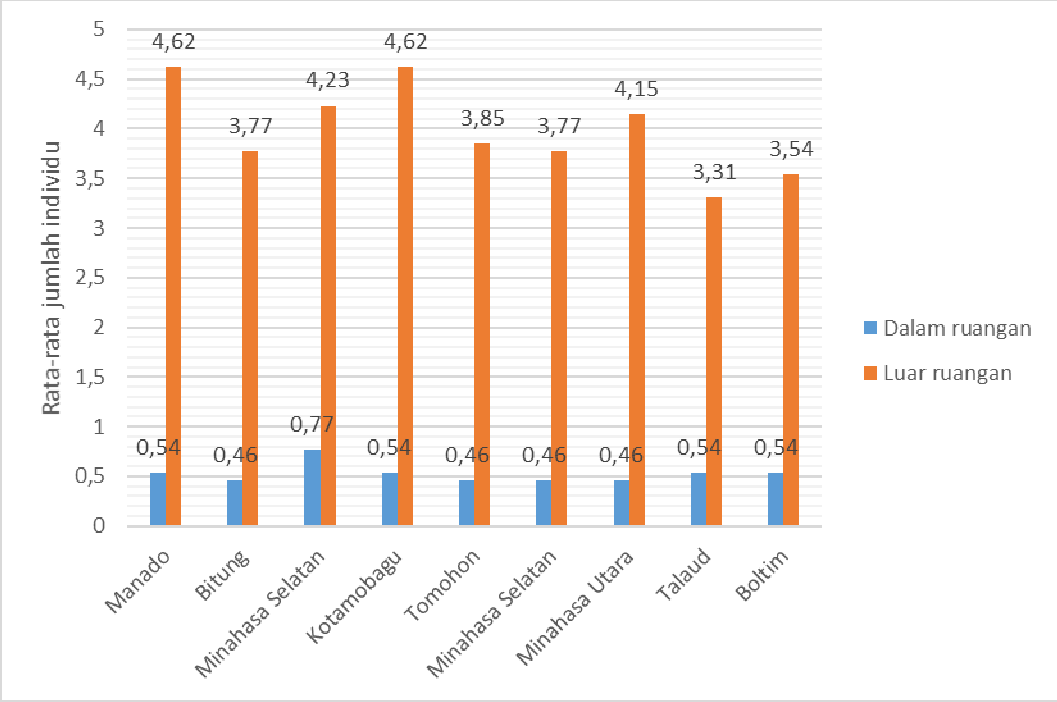

Figure 7. Diagram of the average population density of Aedes albopictus inside and outside of the room

Aedes aegypti mosquito species which live and are found in countries located between North latitude and 350 350 South latitude on the lowest air temperature around 100 c. in summer, the species is occasionally found in areas located up to about 450 South latitude. In addition the resilience of this species also depends on the altitude of the area concerned from the surface of the sea. This species is not usually found in areas with an elevation of more than 1000 meters above sea level. With this highly anthropophilic and habit of living near humans. AE. Aegypti adults liked the dark place hidden in the House as a place of beristirahatnya, a mosquito vector it is efficient for arbovirus. AE. Aegypti also has a habit of foraging (bite humans for smoked his blood) throughout the day especially between 08.00-13.00 and from 15.00-17.00. As domestic mosquitoes in urban areas, it is the principal vector mosquito (95%) for the spread of diseases of DBD. Distance terbangspontan the mosquito females of this type is limited to about 30-50 meters per day. Flight distance away usually happens passively through all types of vehicles including trains, ships and aircraft. Mosquitos Ae. aegypti live and breed in shelters clean water that is not directly related to the land such as a bath, jars, cans, where the drinking bird and so on. The age of the mosquito Ae. aegypti ranges from 2 weeks to 3 months or average 1.5 months depending on temperature, humidity of the surroundings.

Mosquito density will increase at the time of the rainy season where there is a pool of clean water that can be a place for depression. In addition to the mosquito Ae. aegypti, dengue fever disease can also be transmitted by mosquitos Ae. albopictus. But the mosquito's role in spreading the disease dengue fever less if compared to the mosquito Ae. aegypti. AE. aegypti likes to rest in a dark, humid places, and hidden inside the House or building including in the bedroom, bathroom, small room or the kitchen. Indoors, the mosquitoes prefer to rest on commodities that hung like clothing, mosquito nets, in a dark room gordyn and humid. In General Ae. aegypti preferring the place perindukan in the form of clean water but from the results of a study by some researchers corroborate that eggs of mosquitoes with ovitrap in more hay from the marinade on it with clean water. Karen A Polson mentions the existence of a difference number of eggs on the ovitrap use 10% of the water with a straw ovitrap marinade that use plain water. The number of eggs that dihasilakan more at 10% of the water of the straw in the marinade to use plain water. AE. albopictus is included in the same subgenus with Ae. Aegyti (Stegomyia). The species is widespread in Asia and tropical countries to subtropical splendour.

Over the past two decades, this species has expanded its reach to the North and South America, the Caribbean, Africa, Northern Europe and some Pacific Islands. AE. albopictus has the habit of laying outdoors especially in the bamboo forest. This mosquito will bite all day, from the morning until the afternoon. Even able to suck up blood several times. AE. albopictus mosquito is a farm (forest mosquito) to acquire food dengancara bite and suck the blood of different types of animals, breeds in tree holes, indentations, pieces of bamboo plants and coconuts. The larvae of mosquito immature forms or types of habitat has lived in a pool of water in cans, other shelters including a heap of garbage in the open air. Larval Habitat of this kind caused this species encountered in rural areas, suburbs and city parks.

Aedes albopictus is basically a forest species adapt to the human environment in rural, suburban and

urban areas. Mosquitoes lay eggs in a tree hole and growing, segment of bamboo, and the base of the leaf as a forest habitat, as well as the artificial reservoir in urban areas. This mosquito is a random blood and more zoofilik (chose) rather than Ae. aegypti. The distance flown was able to reach the 500 meters. Unlike Ae. aegypti, some strains of this species successfully adapt to cold weather in the region of North Asia and the Americas, while the eggs spend the winter with the rest.

In the wet season to relative available more places that are suitable for the habitat of Ae. albopictus. That is why the number of populations of Ae. Albopictus is closely associated with the rainy season. In the adult form of this species also has a habit of foraging during the day. Adult female mosquitoes flying distance of this type ranged between 400-600 meters. The opportunity move passively for Ae. albopictus is more limited because the species occur outside the home. But on the other hand, the feeding habits of Ae. Albopictus allowed the species transmit Dengue virus from monkeys to humans and vice versa. In Asia, beberapawilayah Ae. albopictus is sometimes thought to be a vector of epidemic DBD although not as important as Ae. aegypti. In the laboratory, these two mosquito species can transmit Dengue virus in mosquitoes through vertical females to eggs until his descendants although Ae albopictus faster to do it.

DF is an infectious disease caused by the dengue virus is transmitted through mosquito bites and Ae. aegypti. This disease can attack everybody and can result in death especially in children and raises unusual or plague. The disease is transmitted in the blood there is Dengue virus. This person usually shows symptoms of pain but it also does not hurt that is if you have enough immunity against Dengue virus. If a person is bitten by the mosquito Ae. aegypti then viruses would go along with the blood dihisapnya. In the body of mosquito, Dengue virus, it will breed by way of splitting and spread throughout the body of the mosquito. Within one week the amount can reach tens or even hundreds of thousands so it's ready to be transmitted or transferred to others. Next at the time mosquitoes to bite another person, then after puncture tool mosquito (proboscis) discovered capillaries, the blood of these people smoked before first issued saliva gland of mosquito saliva so that blood who smoked did not freeze. Refers to the Sonoto (2009) research that Aedes aegypti And Aedes albopictus SP. sp. more on water ditch, mosquitoes there is interest in the condition of sewer water containing chemical compounds is good and organic compounds (water plant) which can be used as food.

Refer to the Index of prevention of urban-culture figures DBD aedes should not be more than 5%, while on types of Aedes aegypti URsp.dan Aedes albopictus SP. average on a water ditch of 23.66% and 21%, on a water well dig 39.20% and 16.66% and on rain water of 16.66% and% 31.03. so drawn the conclusion that with an average above 5% good in rain water, dig water wells and water sewer will most likely cause disease in a certain area of DBD, then needed prevention and control studies previously higher DBD.

Along with saliva the mosquito Ae. aegypti which carries Dengue virus it will be stricken with the disease dengue fever, people who have enough immunity against Dengue virus, will not be stricken with the disease, though there is a virus in the blood. Instead on people who do not have sufficient immunity against Dengue virus, he'll even low-grade fever pain pain weight i.e. high fever accompanied by bleeding shock, even hanging from the immune level. Up to now have been able to Dengue virus serotypes 4 was isolated in Indonesia namely DEN-1, DEN-2, DEN-3 and DEN-4. It turns out that DEN-2 and DEN-3 was the most numerous serotypes as the cause. Nimmannitya (1975) in Thailand're reporting that serotypes DEN-2 dominant while in Indonesia especially by DEN-3 Although lately there is a tendency of domination by DEN-2 virus.

CONCLUSION

1. The average population density of Aedes aegypti and Aedes albopictus highest according to time span found on 08.00-10.00 in the morning and 14.00-16.00 lunch in the afternoon.
2. The average population density of Aedes aegyti outdoors highest found on the sample location in South Minahasa. While the average population density outside the lowest found at the location of the sample of Talaud. In contrast to population density, population density outdoors only once showed the highest population density in the s/d at 15.00 16.00 Wita
3. The peak of population density of Aedes albopictus in the highest room discovered in South Minahasa sample locations while the lowest on a population sample of Talaud. The highest population density peak at 12 noon: whereas the lowest sample location on the Talaud Islands. In contrast to the density of the population of Aedes aegypti in the room which has 2 peaks of highest population density number of individuals with relatively the same mosquito, Aedes albopictus on only one of the highest population density according to the peak hours.
4. Inversely proportional to the density of population of a. aegypti, a. albopictus more found outside the room. The highest population density is found in the city of Manado and Kotamobagu whereas the lowest was found in Talaud Islands

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