Ecological Characteristic Habitat and Distribution Anopheles Larvae Density in Selayar Island Indonesia

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ABSTRACT: The density of *Anopheles* larvae can be influenced by environmental characteristics larval breeding habitats that may have an impact on the incidence of malaria. The aim of the research was to find out the influence of habitat ecological characteristics involving physical environment, chemistry, and biology on the density of Anopheles larvae in Selayar Islands Regency. The research used cross sectional design with study ecological study approach. The samples consisted of 54 habitat points. The data were obtained through observation and analyzed using multivariate with linear regression test. The results of the research indicate that the potential habitats found in Selayar Islands Regency involve eight types of habitat, i.e. river, fishpond, marsh, lagoon, sewers, wells, ground pool, and a container vessel. The highest larvae population is found in fishpond habitat type, i.e 4.8 larvae/25 dipper and lowest one is found in ground pool habitat type, i.e 0.3 larvae/25 dipper. The species found are *An.subpictus, An.vagus, An.indefinitus, An.kochi,* and *An.barbirostris*. The result of bivariate analysis indicate some variables, i.e habitat type, flow type, turbidity, lighting, depth, water temperature, pH, salinity, and the presence of predators with a value of $p > 0.05$. The presence of vegetation variable has a value of $p < 0.05$. The result of linear regression test in which the variables has a value of $p < 0.25$ is tested simultaneously. Salinity and the presence of vegetation variables have a value of $p < 0.05$. It is concluded that salinity as chemical environmental characteristics and the presence of vegetation as biological environment have influence on the density of *Anopheles sp*.

Keywords: Density of larvae, *Anopheles sp*., Environmental characteristics of habitat

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INTRODUCTION

The density of*Anopheleslarvae*may influencemalariatransmission. The larvaethendevelop intofemale *Anopheles* mosquitobeing malaria vectorforhuman(MOH, 2007). Malaria is amajor public health problemworldwide. Estimation ofpopulationat risk ofmalariaas much as3.4billionpeople worldwide (MOH, 2013).

Regency of Selayar Island has 95% of territorial waters which is located in southern part of Sulawesi Islands. Selayar territorial consist of 48% extends to the shore and sea. Generally, breeding habitat of *Anopheles* can be easy to found in low land (Pinault, 2012)and coastal areas. However, *An sundaicus* has contribution of malaria transmission in coastal areas of Indonesia (Elyazar, 2013).

Breeding habitat become potentially for life cycle of *Anopheles* mosquito as malaria vector depend on phisical, chemical and biological environments.Phisical environment such as habitat type, temperature, water pH, turbidity, sun lighting, water flow etc. Biological environment such as vegetation protect mosquito larval from sunlighting and predator, while Chemical environment is as salinity, Fe concentration etc. Knowing the ecological characteristics of breeding habitat of *Anopheles* larva is one step to cut malaria transmission chain through vector habitat intervention (Ariati, 2011). Vector control can be conducted to reduce potential breeding habitat, reduction larval densities through environment modification and decreasing human contat with Malaria vector.

Regency of Selayar Island is Malaria endemicity area, because annual parasitology incidence (API) is still above Millenium Development Goal (MDG) of Malaria target (< 1%o), although API decrease during the last 5 years.. Decresing API need evidence to observe decreasing larval densities of *Anopheles* as malaria vector.

The aim of the research was to find out the influence of habitat ecological characteristics involving physical environment, chemistry, and biology on the density of Anopheles larvae in Selayar Islands Regency.

METHODS

The research used cross sectional design with ecological study approach.The Reseach is conducted on April – Juni 2014 in 6 district in Selayar Islands Regency ie. Bontomatene, Buki, Bontomanai, Benteng, Bontoharu, dan Bontosikuyu Districts. Location was selected based on malaria case found every year, moreever it is coastal areas with low land, where is potential for breeding habitat for *Anopheles* larvae.

Population and Sample

Research population is all breeding habitat of *Anopheles* larvae in research location. Research sample is potentially habitats of *Anopheles* larvae found in radius range 500 m from house of malaria case during the last 3 years.

Research Data Collection

The datas were collected through observation using observation sheet and measuring the characteristics ofphysical, chemistry, and biological environment of breeding habitat.Datas were analyzed through 3 steps ie, univariate analyzes described distribution of ecological characteristics of breeding habitats and *Anopheles* species. Bivariat analyzes use*Mann Whitney* for category data, *Spearman Correlation* for numerical data, and multivariate analyzes use linear regression test.

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Distribusi Spesies dan Kepadatan Larva Anopheles sp.

Table 1 shows distribution *Anopheles* larval densities based on breeding habitat types. Out of 54 habitats, the highest habitats found larvae is streams ie 8 site point and the lowest positive habitats is Unused well and water tank container. Based on subdistric study area, Anopheles larvae is found highest in subdistrict located in Southern part of Selayar island (B sikuyu) ie 12 site point and the lower one found in 3 subdistricts, where are (B matene, Buki) 2 in Northen part of island and 1 in central city of island (Benteng)

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The highest larval densities found in fishponds habitats ie 4.8 larvae per 25 dips and the lowest one found in ground pools habitat ie 0,04 larvae per 25 dips. There are 5 *Anopheles* species found ie *An.subpictus, An.vagus, An.indefinitus, An.kochi,* and *An.barbirostris. An.subpictus* found almost in all breeding habitat types. *An.vagus* found in fishpond, marsh, lagoon and ground pool. *An.kochi* found in sewer. *An.barbirostris* found in unused well. *An.indefinitus* found in fishpond.

Ecological Characteristics of Breeding Habitat

Table 2 shows bivariate analyzes of phisical characteristics influenceto the larval densities such as habitat type, flow type, turbidity, sun lighting, depth, water temperature. All phisical characteristics variable has $p > 0,05$ that there are no siqnificance influence to the larval densities. Chemical characteristics such as pH and salinity had $p > 0,05$ that there are no siqnificance influence to the larval densities. Biological characteristics such as vegetation has $p = 0,005 < 0,05$ that it has siqnificance influence to the larval densities, whereas predator has notsiqnificance influence to the larval densities ($p = 0,850 > 0,05$). However, all ecological variables has $p > 0,25$ such as turbidity, temperature, salinity and vegetation are analyzed using linear regression test. Finally, multivariate analyze results are found that salinity and vegetation had siqnificance influence to the larval densities ($p < 0,05$) as shown in Table 3.

DISCUSSION

The research show that ecological characteristics generally has not influence *Anopheles* larval densities in Selayar Islands. Based on bivariate analyzes results of 10 ecological variables are found that there are four potential variables had influence to *Anopheles* larval densities such as turbidity, temperature, salinity and vegetation.

*Kruskal Wallis*test found that habitat type has not siqnificance influence to the larval densities, as shown in Table 2. Larval densities are not influenced by habitat type because many otherfactors influence breeding habitats ie. salinity, pH, temperature, rainfall etc. Whereas, based on district analyzes found that habitat type has siqnificance influenced to the larval densities in Bontoharu Districts (middle part of Selayar Island). Habitat type found *Anopheles*larva in Bontoharu Districts such as stream/river, fishpond, sewer and ground pool which are permanent habitats.Similar results found that 60% of high larval densities were found in permanen habitat (Imbahale, 2011).

Habitat type has influence to *Anopheles* species. *An.subpictus* found almost in all breeding habitat types. *An.vagus* found in fishpond, marsh, lagoon and ground pool. *An.kochi* found in sewer. *An.barbirostris* found in unused well. *An.indefinitus* found in fishpond.

*Mann Whitney*test results found that flow type has not siqnificance influence to the *Anopheles*larval densities, as shown in Table 2. Out of 54 habitat site points, there are 32 points of stagnant type and 22 points of slow flow type. There are not influence of flow type because water flow condition changeable in wide habitat type. Although, generally *Anopheles* larvae like habitat with slow flow water and stagnant trends (Bojd *et al*., 2012).

There are not significance influence of turbidity to the *Anopheles*larval densities. Habitat with clear water are found higher than habitat with turbid water. The result this research found that *An.subpictus*and*An.vagus*can be found in clear and turbid water habitats. However, *Anopheles* certain species can be found in turbid water or polluted water habitats (Soleimani, 2013). Generally, *Anopheles* larvae like habitat with clear water be compared to habitat with turbid or polluted water.

There are not significance influence of sun lighting of habitat to the *Anopheles*larval densities. The similar results (Leaua, 2013) that there are no correlation between sunlighting of breeding habitat with *Anopheles* larval densities and *Anopheles* species. These is caused *Anopheles* species can be found in habitats with sunny and shade lighting.

There are not significance influence of water temperature and depth water habitat to *Anopheles* larval densities. *Anopheles* larvae can be found at 27–38 °C and depth water

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between 2 – 157,5 cm. Water temperature of habitat be changeable depend to sunlighting habitat. The similar result found that average water temperature habitat of *Anopheles* larvae between 26,7 °C – 38,2 °C (Marhtyni, 2010).

Chemical characteristics ie. Salinity has significance influence to *Anopheles* larval densities, whereas other Chemical characteristics ie. pH has nosignificance influence to *Anopheles* larval densities.

The characteristics of the observed biological environment is the presence of vegetation and the presence of predators . The presence of vegetation significance value of 0.005 < 0.05 means that there is the influence of the vegetation on larval density . The density of larvae with vegetation higher than with no vegetation . The presence of vegetation utilized by the larvae as nutrients and shelter from predators . This study is similar with research that found that *An.subpictus* larvae are found in the flora grass and kale (Leaua , 2013) .

The influence of the presence of predators on larval density obtained significance value 0.850 > 0.05 . This means that there is no influence of the presence of predators on larval density . These results could be due to breeding habitat where the average has dense vegetation to protect larvae from predators. So even though the habitat is found predators , larvae can hide behind the flora or other items contained habitat . This study is similar with research that found that there was no effect of the presence of predators by larval density . Predators are found in habitats such as fish , shrimp, crabs , snails and dragonflies (*Anax junius*)(Soleimani, 2013).

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CONCLUSIONS AND RECOMMEDATIONS

Physical environmental characteristics (habitat type, type of flow, turbidity, light, depth, and water temperature) and chemical characteristics (pH and salinity) found no effect on the density of *Anopheles* larvae in Selayar IslandRegency. The presence of vegetation as a biological environment found no effect on the density of Anopheles larvae . but instead to the presence of predators. However, after multivariate analysis derived variables that most

influence the density of *Anopheles*larvae is salinity and vegetation. It is expected that health workers routinely and periodically conduct entomological surveys to prevent the development of Anopheles larvae which can be vectors of malaria .

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ATTACHMENT

Table 1. Distribution of *Anopheles*Larval densities based on Type of Habitat in Selayar Island Regency

No.	Type of Habitat	No. Habitat in each Subdistrict												Total	n (+)	n (-)
		I		II		III		IV		V		VI				
		+	-	+	-	+	-	+	-	+	-	+	-			
1	Stream	0	1	1	0	1	0	0	1	2	0	4	0	10	**8**	2

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2	Fish ponds	x	x	x	x	1	1	0	1	4	0	0	1	8	5	3
3	Marsh	x	x	x	x	0	1	1	0	x	x	1	2	5	2	3
4	Lagoon	x	x	x	x	2	0	x	x	x	x	1	0	3	3	0
5	Sewers	0	3	x	x	1	1	0	2	2	0	4	2	15	7	8
6	Unused Wells	x	x	x	x	x	x	0	1	x	x	1	1	3	1	2
7	Ground Pool	1	1	x	x	x	x	0	1	2	1	1	0	7	4	3
8	Container Tank	0	1	x	x	1	0	0	1	x	x	x	x	3	1	2
	Total	1	6	1	0	6	3	1	7	10	1	12	6	**54**	**31**	**23**

Source : Primary Data, 2014

Note :

I : Bontomatene Subdistrict
II : BukiSubdistrict
III : BontomanaiSubdistrict
IV : BentengSubdistrict
V : BontoharuSubdistrict
VI : BontosikuyuSubdistrict

Tabel 2. Recapitulation ofEcological Characteristics Influenceto *Anopheles*Larval Densities in Selayar Islands Regency

Ecological Characteristics		n	*p-value*
Phisical Environment	**Type of habitat**		
	Stream	10	
	Fish ponds	8	
	Marsh	5	
	Lagoon	3	0,469
	Sewers	15	
	Unused Wells	3	
	Ground pool	7	
	Container Tanks	3	
	Flow Type		
	Stagnant	32	0,673
	Flow	22	
	Turbidity		
	Clear	37	0,138
	Turbid	17	
	Sun lighting		
	Sunny	33	0,691
	Shade	21	
	Depth	54	0,589
	Water Temperature	54	0,184
Chemical Environment	**pH**	54	0,577
	Salinity	54	0,073
Biological Environment	**Presence of vegetation**		
	Present	38	0,005
	Nothing	16	
	Presence of predator		
	Present	27	0,850
	Nothing	27	

Source : Primary Data, 2014

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Tabel 3. Results of Linear Regression Test of Ecological Variables Influence to *Anopheles sp.*Larval Densities

Variables	**Koefisien Korelation**	***p-value***
Salinity	0,552	0,000
The Presence of vegetation	0,324	0,006
Konstanta		0,001

Source : Primary Data, 2014

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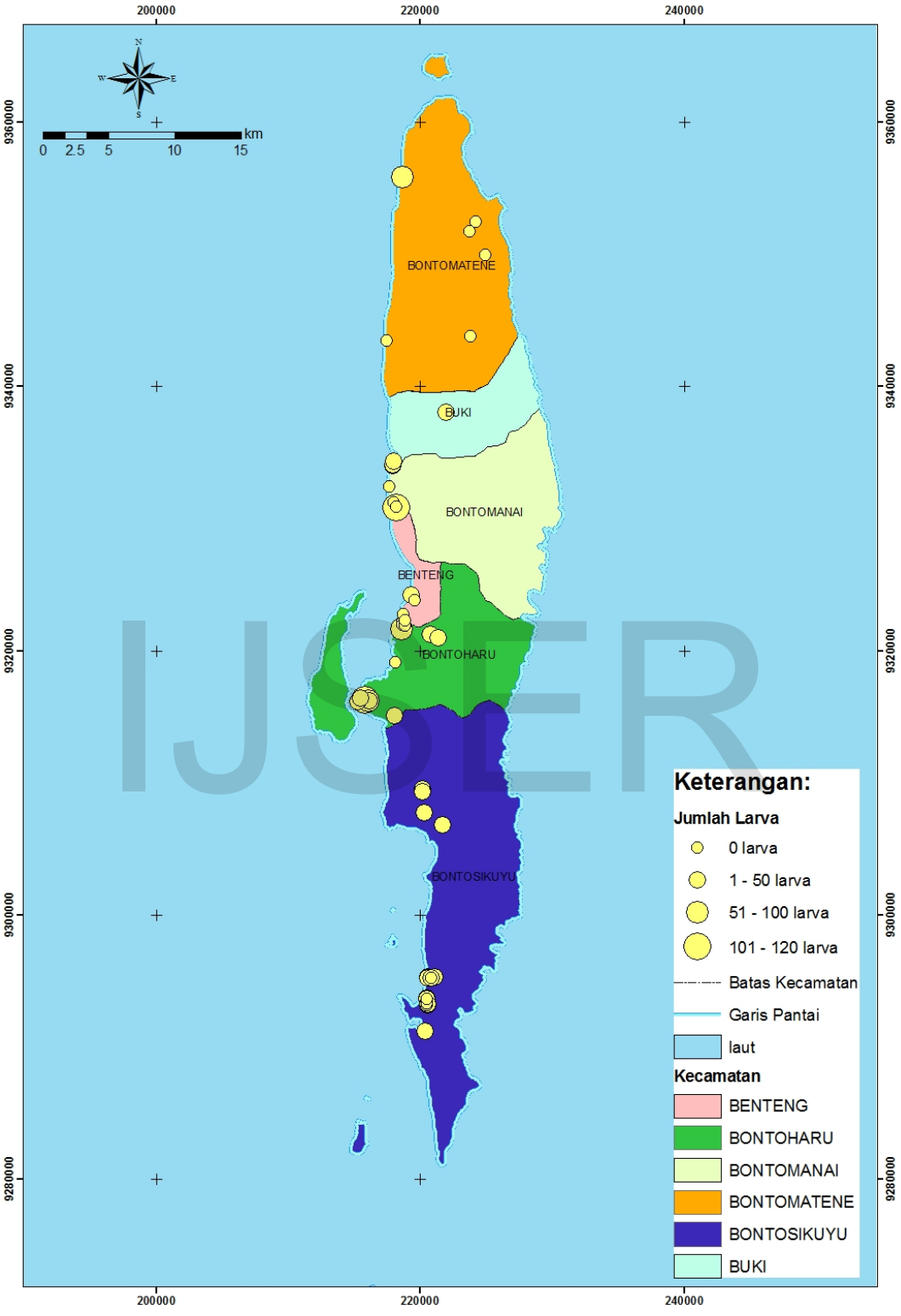

Figure 1. Map of Distribution of*Anopheles sp.*Larval Densities in Selayar Islands Regency 2014