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DISTRIBUTION AND ABUNDANCE OF YOUNG LEVEL AT THE LOWER (125-150 MASL) AND MIDDLE (150-175 MASL) ALTITUDES AT BUKIT MANDIANGIN FOREST AREA WITH SPECIAL PURPOSES LAMBUNG MANGKURAT UNIVERSITY OF SOUTH KALIMANTAN PROVINCE, INDONESIA

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ABSTRACT
The very high diversity of species at the regeneration level causes the possibility that there are still many types of regeneration that have not been identified, so it is not clear how the distribution, abundance, and structure of the plant community are. The Forest Area with Special Purposes Lambung Mangkurat University has an area of 1,617 ha. The areas included in the Forest Area with Special Purposes Lambung Mangkurat University include Bukit Besar, Bukit Mandiangin, Bukit Pamaton, Bukit Pandamaran, each of which has a different altitude. The aims of this study were (1) to examine the presence of species at several levels of regeneration at several altitudes (2) to analyze the distribution and abundance of regeneration levels (3) to analyze the diversity of species at the regeneration level. The research method used is vegetation analysis by purposive sampling to obtain Important Value Index (IVI), Species Diversity Index (H'), Species Evenness Index (e) and Community Similarity Index (SI). -middle, namely the type of Tengkook ayam (*Nephelium massoia*), while the highest Important Value Index at the sapling level is at the bottom-middle height, namely the Bati-Bati Menjangan (*Eugenia spicata*) and Sasahangan (*Hippocrepis emerus*). the H' value of the seedling-sapling level is moderate and the value of (e) is almost evenly distributed and the value (SI) is low to moderate.

KEY WORDS
Regeneration rate, altitude, species diversity.

Forests are natural ecosystem units that function as sources of germplasm, water storage, components that determine ecosystem stability, oxygen producers, landslide barriers, sources of life, natural resources that provide foreign exchange and a source of meeting community needs. In the forest there is a variety of vegetation, including the vegetation of the youth level such as seedlings and saplings. The presence of a regeneration level, apart from being a source of biodiversity, also plays a role in protecting the soil and soil organisms, helping to create a microclimate on the forest floor, protecting the soil from erosion and maintaining soil fertility. Santoso in Abrori 2016 stated that the diversity of the very high level of youth causes the possibility that there are still many that have not been identified, so it is not clear how the diversity and community structure actually is. Mandiangin Hill is included in the Forest Area with Special Purposes Lambung Mangkurat University an altitude of approximately 275 meters above sea level and has a fairly extensive natural forest vegetation. The problem that arises is how the distribution and abundance of species at the level of regeneration at the lower (125-150 masl) and middle (150-175 masl) elevations, the diversity index value and the influencing factors. Because of the importance of information regarding the composition of the type of regeneration for Forest Area with Special Purposes managers for planning and determining advanced silvicultural techniques in the context of

the natural forest vegetation regeneration process at Forest Area with Special Purposes Lambung Mangkurat University, a study was carried out at Bukit Mandiangin Forest Area with Special Purposes Lambung Mangkurat University.

METHODS OF RESEARCH

This research was conducted for ± 3 months at Bukit Mandiangin Forest Area with Special Purposes Lambung Mangkurat University Mandiangin Village, Karang Intan District, Banjar Regency, South Kalimantan, which includes research activities, data processing and writing research reports. The tools used in this research are a map of the research location, GPS (Global Positioning System), lightmeter, thermohygrometer, raffia rope, meter, phiban, machete, white board, camera, and laptop. The material used in this study was the regeneration of seedlings and saplings at the research site. This study uses 2 types of data, namely primary and secondary. Primary data obtained from direct data collection in the field which is then recorded in the tallysheet of vegetation analysis. While secondary data was obtained through the relevant agencies that manage Forest Area with Special Purposes Lambung Mangkurat University of Mandiangin South Kalimantan Province. Data analysis and data processing in this study included the calculation of the important value index, the species diversity index (H'), the species evenness index (e) and the community similarity index (SI), so that quite complex data were obtained regarding the regeneration found in research sites.

RESULTS AND DISCUSSION

Based on observations at the research site for the composition of seedling and sapling levels, it can be seen in Table 1. For the seedling level, it was found that several species were able to be present at both altitudes which could occur because of the good adaptation of these species to the environment. According to Ewusie (1980) altitude is a factor that determines the accuracy of the place for habitat for a type of vegetation, where variations in topography and altitude can affect the nature and distribution of plant communities. There are at least two reasons for this clumping pattern to occur, including related to the reproduction of seeds or fruit which tends to fall close to the parent and on soils adjacent to the microclimate conditions (Barbour et al., 1987). According to Silvertown (1982) a safe and conducive habitat will greatly support the existence of seeds of a species. According to Heriyanto & Garsetiasih (2005) several species have a wide tolerance range so that they can be found in several habitats. The ability of natural regeneration of a plant also affects the production and population growth.

If the Important Value Index of a vegetation type is of high value, then that type greatly affects the stability of the ecosystem (Agustina, 2008). According to Soegianto (1994) the important value index is a quantitative parameter that can be used to express the level of dominance (level of control) of species in a plant community. The Important Value Index of the seedling level at the lower elevation can be seen in Figure 1.

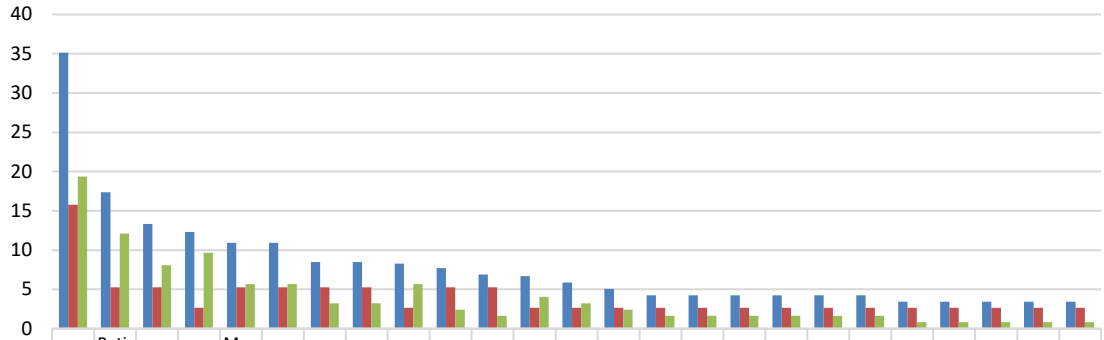
Tengkook ayam (*Nephelium massoia*), Bati-Bati Menjangan (*Eugenia spicata*), Tiwangau (*Glochidion sp*.), Kayu ubar, Mengkudu hutan (*Morinda citrifolia*), Pancar sun, Alaban (*Vitex pinnata*), Bati-bati (*Celtis sp*.) , Bintangur (*Calophyllum inophyllum*), Mahang (*Macaranga sp*.), Bangkal gunung (*Nauclea subdita*), Karamunting (*Melastoma candidum*), Damar kumbang (*Agathis sp*.), Sasahangan (*Hippocrepis emerus*), Jamai (*Instia sp*.), Jambu sekati (*Syzygium sp*.), Jawaling (*Tristaniopsis sp*.), Kayu sapat (*Macaranga triloba*), Mampat (*Cratoxylon formosum*), Patindis (*Uruphyllum aborescens*), Madang pirawas (*Litsea odorifera*), Nanangkaan (*Artocarpus sp*.), sapit udang (*Vernonia sp*), Serai merah (*Dacrycarpus imbricatus*), and Teja (*Ziziphus jujube*). The highest Important Value Index was the type of Tengkook chicken (*Nephelium massoia*) at 35% and the lowest Important Value Index was the type of Teja (*Ziziphus jujube*). 3% although it is not only Teja, but also Madang pirawas (*Litsea odorifera*), Nanangkaan (Artocarpus sp.), Sapit udang (*Vernonia sp*), Serai merah (*Dacrycarpus imbricatus*) each with an Important Value Index of 3%. The difference

between the Important Value Index of Tengkook ayam and Teja is 32%. For Important Value Index, the seedling rate at middle altitude (150-175 masl) can be seen in Figure 2.

Table 1 – Presence and composition of vegetation at the level of seedlings and saplings at the lower and middle heights

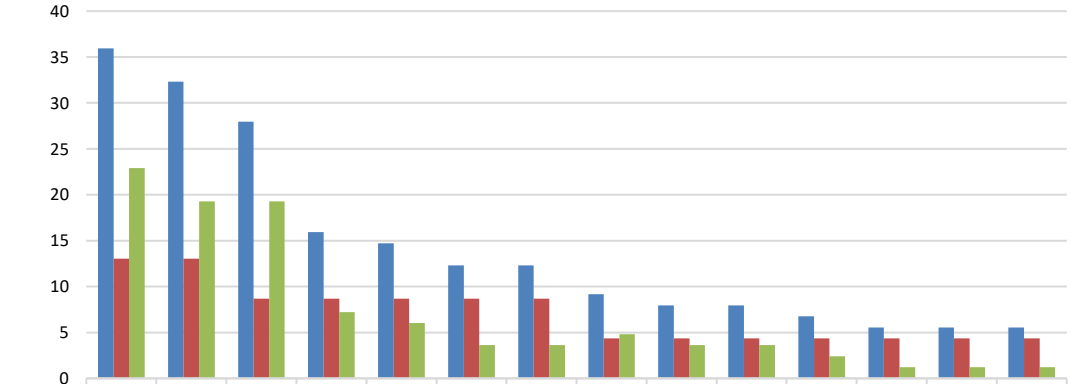
Height	No.	Species name	Scientific name	Family	Level	
					Seedling	Sapling
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lower 125-150 masl	1	Akasia	*Acacia mangium*	Fabaceae	-	+
	2	Alaban	*Vitex pinnata*	Verbenaceae	+	+
	3	Bangkal gunung	*Nauclea subdita*	Rubiaceae	+	-
	4	Bati-bati	*Celtis sp.*	Cannabaceae	+	+
	5	Bati-bati menjangan	*Eugenia spicata*	Myrtaceae	+	+
	6	Bintangur	*Calophyllum inophyllum*	Clusiaceae	+	+
	7	Damar kumbang	*Agathis sp.*	Araucariaceae	+	+
	8	Jamai	*Instia sp.*	Fabaceae	+	+
	9	Jambu sekati	*Syzygium sp.*	Myrtaceae	+	+
	10	Jawaling	*Tristaniopsis sp.*	Myrtaceae	+	-
	11	Karamunting	*Melastoma candidum*	Melastmataceae	+	-
	12	Kayu sapat	*Macaranga triloba*	Euphorbiaceae	+	-
	13	Kayu ubar	-	-	+	-
	14	Madang pirawas	*Litsea odorifera*	Lauraceae	+	-
	15	Madang puspa	*Schima wallichii*	Theaceae	-	+
	16	Mahang	*Macaranga sp.*	Euphorbiaceae	+	+
	17	Mahoni	*Swietenia macrophylla*	Meliaceae	-	+
	18	Mampat	*Cratoxylon formosum*	Hypericaceae	+	+
	19	Marsihung	*Alseodaphne sp.*	Lauraceae	-	+
	20	Mengkudu Hutan	*Morinda citrifolia*	Rubiaceae	+	+
	21	Nanangkaan	*Artocarpus sp.*	Moraceae	+	-
	22	Pancar matahari	-	-	+	-
	23	Petindis	*Uruphyllum aborescens*	Rubiaceae	+	-
	24	Sapit udang	*Vernonia sp.*	Asteraceae	+	+
	25	Sasahangan	*Hippocrepis emerus*	Leguminaceae	+	-
	26	Serai merah	*Dacrycarpus imbricatus*	Podocarpaceae	+	-
	27	Teja	*Ziziphus jujube*	Rhamnaceae	+	-
	28	Tengkook Ayam	*Nephelium massoia*	Sapindaceae	+	+
	29	Tiwangau	*Glochidion sp.*	Phyllanthaceae	+	+
	30	Wangun gunung	*Melicope sp*	Rutaceae	-	+
	Amount				25	18
Middle 150-175 masl	1	Akasia	*Acacia mangium*	Fabaceae	+	+
	2	Alaban	*Vitex pinnata*	Verbenaceae	-	+
	3	Bangkal Gunung	*Nauclea subdita*	Rubiaceae	+	-
	4	Bati-bati	*Celtis sp.*	Cannabaceae	+	-
	5	Bati-bati menjangan	*Eugenia spicata*	Myrtaceae	+	+
	6	Bintangur	*Calophyllum inophyllum*	Clusiaceae	+	-
	7	Damar kumbang	*Agathis sp.*	Araucariaceae	-	+
	8	Jamai	*Instia sp.*	Fabaceae	+	+
	9	Karamunting	*Melastoma candidum*	Melastmataceae	+	+
	10	Kayu habu	*Antiaris toxicaria*	Moraceae	-	+
	11	Kayu sapat laki	-	-	-	+
	12	Lalangsatan	*Lansium sp.*	Meliaceae	-	+
	13	Madang puspa	*Schima wallichii*	Theaceae	-	+
	14	Mahang	*Macaranga sp.*	Euphorbiaceae	-	+
	15	Mampat	*Cratoxylon formosum*	Hypericaceae	+	+
	16	Marsihung	*Alseodaphne sp.*	Lauraceae	-	+
	17	Medang Puspa	*Schima wallichii*	Theaceae	+	-
	18	Nanangkaan	*Artocarpus sp.*	Moraceae	+	-
	19	Sapat laki	-	-	-	+
	20	Sapit udang	*Vernonia sp.*	Asteraceae	+	-
	21	Sasahangan	*Hippocrepis emerus*	Leguminaceae	+	+
	22	Tengkook ayam	*Nephelium massoia*	Sapindaceae	+	-
	23	Tiwangau	*Glochidion sp.*	Phyllanthaceae	+	+
	24	Wangun gunung	*Melicope sp*	Rutaceae	-	+
	Amount				14	17

Note: a) (+) = present in the plot; b) (-) = not present in the plot.



	Tengkook Ayam	Bati-bati menjangan	Tiwangau	Kayu bar	Mengkudu Hutan	Pancar matahari	Alaban	Bati-bati	Bintangur	Mahang	Bangkal gunung	Karamunting	Damar kumbang	Sasahangan	Jamai	Jambu sekati	Jawaling	Kayu sapat	Mampat	Petindis	Madang pirawas	Nanangkaan	sapit udang	serai merah	Teja
IVI (%)	35	17	13	12	11	11	8	8	8	8	7	7	6	5	4	4	4	4	4	4	3	3	3	3	3
RF (%)	16	5	5	3	5	5	5	5	3	5	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
RD (%)	19.4	12.1	8.1	9.7	5.6	5.6	3.2	3.2	5.6	2.4	1.6	4.0	3.2	2.4	1.6	1.6	1.6	1.6	1.6	1.6	0.8	0.8	0.8	0.8	0.8

Figure 1 – Importance Value Index of Lower Altitude Seedling Level



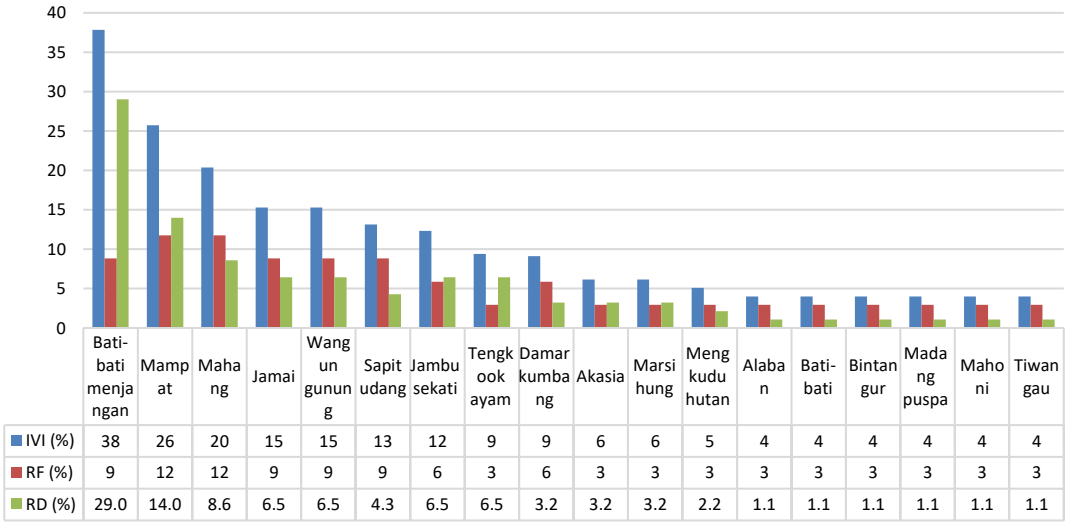
	Tengkook ayam	Bintangur	Bati-bati menjangan	Medang Puspa	Sasahangan	Bati-bati	Karamunting	Bangkal Gunung	Jamai	Mampat	Sapit udang	Akasia	Nanangkaan	Tiwangau
IVI (%)	36	32	28	16	15	12	12	9	8	8	7	6	6	6
RF (%)	13	13	9	9	9	9	9	4	4	4	4	4	4	4
RD (%)	22.9	19.3	19.3	7.2	6.0	3.6	3.6	4.8	3.6	3.6	2.4	1.2	1.2	1.2

Figure 2 – Index of Importance of Middle Altitude Seedling Level

Tengkook chicken (*Nephelium massoia*), Bintangur (*Calophyllum inophyllum*), Bati-bati menjangan (*Eugenia spicata*), Madang puspa (*Schima wallichii*), Sasahangan *(Hippocrepis emerus),* Bati-bati (*Celtis sp.*), Karamunting (*Melastoma candidum*), Bangkal gunung (*Nauclea subdita*), Jamai (*Instia sp.*), Mampat (*Cratoxylon formosum*), Sapit udang (*Vernonia sp.*), Acacia (*Acacia mangium*), Nanangkaan (*Artocarpus sp.*) and Tiwangau (*Glochidion sp.*). The highest Important Value Index was the type of Tengkook ayam (*Nephelium massoia*) of 36% and the lowest value of Important Value Index was the type of Tiwangau (*Glochidion sp.*) of 6%. The difference between Tengkook ayam (*Nephelium massoia*) and Tiwangau (*Glochidion sp.*) is 30%.

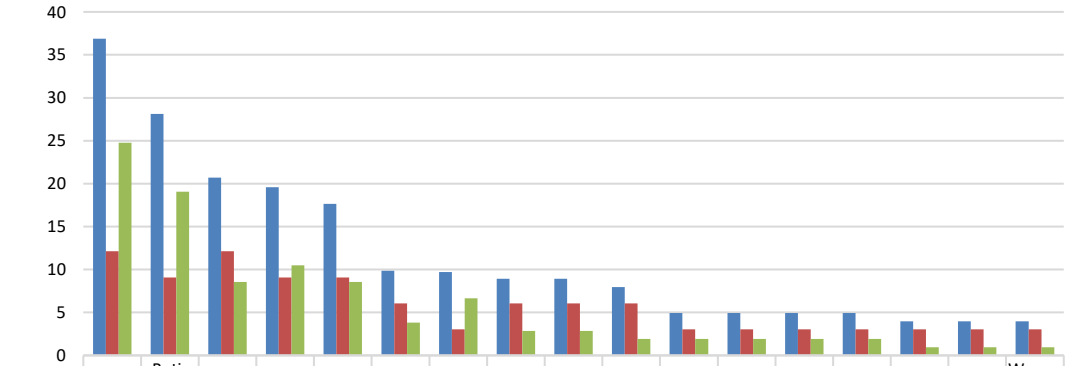
The Importance Value Index of the sapling level at the bottom height can be seen in Figure 3. Bati-bati menjangan (*Eugenia spicata*), Mampat (*Cratoxylon formosum*), Mahang (*Macaranga sp.*), Jamai (*Instia sp*), Wangun gunung (*Melicope sp*), Sapit Udang (*Vernonia sp*), Jambu sekati (*Syzygium sp*), Tengkook ayam (*Nephelium massoia*), Damar kumbang (*Agathis sp*), Acacia (*Acacia mangium*), Marsihung (*Alseodaphne sp.*), Mengkudu Hutan (*Morinda citrifolia*), Alaban (*Vitex pinnata*), Bati-bati (*Celtis sp*), Bintangur (*Calophyllum inophyllum*), Madang puspa (*Schima wallichii*), Mahoni (*Swietenia macrophylla*) and

Tiwangau (*Glochidion sp*.). The highest IVI value is the Bati-bati Menjangan (*Eugenia spicata*) at 38% and the lowest Important Value Index is the Tiwangau species (Glochidion sp.) at 4%. The difference in INP values for bati-bati menjangan (*Eugenia spicata*) and Tiwangau (*Glochidion sp*.) was 34%. The Important Value Index of the sapling level at the middle altitude (150-175 masl) can be seen in Figure 4.



	Bati-bati menjangan	Mampat	Mahang	Jamai	Wangun gunung	Sapit udang	Jambu sekati	Tengkook ayam	Damar kumbang	Akasia	Marsihung	Mengkudu hutan	Alaban	Bati-bati	Bintangur	Madang puspa	Mahoni	Tiwangau
IVI (%)	38	26	20	15	15	13	12	9	9	6	6	5	4	4	4	4	4	4
RF (%)	9	12	12	9	9	9	6	3	6	3	3	3	3	3	3	3	3	3
RD (%)	29.0	14.0	8.6	6.5	6.5	4.3	6.5	6.5	3.2	3.2	3.2	2.2	1.1	1.1	1.1	1.1	1.1	1.1

Figure 3 – Importance Value Index of Lower Sapling Level



	Sasahangan	Bati-bati menjangan	Akasia	Mahang	Mampat	Damar kumbang	Lalangsatan	Jamai	Sapat laki	Madang puspa	Alaban	Karamunting	Kayu sapat laki	Tiwangau	Kayu habu	Marsihung	Wangun gunung
IVI (%)	37	28	21	20	18	10	10	9	9	8	5	5	5	5	4	4	4
RF (%)	12	9	12	9	9	6	3	6	6	6	3	3	3	3	3	3	3
RD (%)	24.8	19.0	8.6	10.5	8.6	3.8	6.7	2.9	2.9	1.9	1.9	1.9	1.9	1.9	1.0	1.0	1.0

Figure 4 – Index of Sapling Levels at Middle Elevation

Sasahangan (*Hippocrepis emerus)*, Bati deer (*Eugenia spicata*), Acacia (*Acacia mangium*), Mahang (*Macaranga sp*.), Mampat (*Cratoxylon formosum*), Damar kumbang (*Agathis sp*.), Lalangsatan (*Lansium sp*.), Jamai (*Instia sp*) , Sapat laki, Madang puspa (*Schima wallichii*), Alaban (*Vitex pinnata*), Karamunting (*Melastoma candidum*), Kayu sapat laki, Tiwangau (*Glochidion sp*.), Kayu ubar, Marsihung (*Alseodaphne sp*.) and Wangun gunung (*Melicope sp*.). The highest Important Value Index is the Sasahangan (*Hippocrepis emerus)* species at 37% and the lowest Important Value Index is the Wangun gunung species (*Melicope sp*.) at 4%. The difference in Important Value Index between Sasahangan (*Hippocrepis emerus*) and wangun gunung (*Melicope sp*.) is 33%.

The values of the Species Diversity Index (H') and the Species Evenness Index (e) seedlings and saplings can be seen in Table 2:

Table 2 – Diversity and Evenness Index of Seedlings and Saplings at Each Height

Height The place	Information/ Index	Level Growth	Amount Type	Score	Criteria
Lower 125-150 masl	Species Diversity (H')	Seedling	25	2.98	medium
		Sapling	18	2.62	medium
	Specific Evenness (e)	Seedling Sapling	25	0.93	Almost evenly
Middle 150-175 masl	Species Diversity (H')	Seedling	25	2.98	medium
		Sapling	18	2.62	medium
	Specific Evenness (e)	Seedling	25	0.93	Almost evenly
		Sapling	18	0.91	Almost evenly

Source: Processed primary data, 2022.

Based on Table 2, the value of the species diversity index (H') of seedlings and saplings at lower altitude (125-150 masl) if adjusted to the Shannon-Weiner category regarding the index value (H') which if the value is 1 < H ' < 3 then includes the criteria medium which can be interpreted as moderate diversity and community stability is moderate or there is no certain species whose life tends to dominate other types, because in that area the types of vegetation found are quite diverse or varied and can be seen in Table 1.

The existence of a value (H') can measure the maturity of a plant community. A plant community is said to be mature if it is more complex and more stable or the H value > 3 is high. Meanwhile, the value of the species evenness index (e) for seedlings and saplings according to Magurran (1988) is almost evenly distributed. This fairly high (e) value can mean that the plants found in the research location have a fairly good and fairly even distribution of species, so that the community balance tends to be quite stable, although it is indeed good if the value (e) falls into the criteria evenly so that the community balance is correct completely stable.

The community similarity index (SI) values for the seedling and sapling levels for each height can be seen in Table 3:

Table 3 – Similarity Index (SI) values at each height

	Growth Rate	B	T	C	SI (%)
Location 1	Seedling	19	13	7	43.75
	Sapling	15	21	5	27.78
	Growth Rate	B	T	C	SI (%)
Location 2	Seedling	15	7	5	45.45
	Sapling	13	6	1	10.53

Note: 1. B = Altitude 125-150 masl; 2. T = Altitude 150-175 masl; 3. C = Many of the same type/vegetation.

Based on Table 3, the value of the Similarity Index (IS) is divided into 2 (two) locations. The SI calculation at location 1 of the sapling level between B-T (altitude 125-150 masl with a height of 150-175 masl) obtained a value of 43.75% and 27.78%. Meanwhile, at the location of 2 levels of seedling-sapling between B-T (altitude 125-150 masl with an altitude of 150-175 masl) the scores were 45.45% and 10.53%. According to Odum (1993), the IS value for saplings at location 1 and seedlings at location 2 was in the low-medium category, but for saplings at location 2, the IS value of only 10.53% was in very low category. The smaller the similarity index value for each combination of observation stations, the lower the similarity level. Variations in environmental conditions, both physical and chemical, and interactions between species along the gradient of the study area, eventually resulted in the vegetation being included in the low category. According to Sarmiento (1986) differences in altitude provide significant differences in climate and ecological variations as well as plant growth.

The similarity of the species being suspected apart from the location of the BT being quite close together, the difference in height or slope may affect the dissolution of organic matter from top to bottom so that between adjacent elevation locations there is a buildup of organic matter which ultimately supports plant growth at lower altitudes. Microsite conditions

that are relatively homogeneous will be occupied by individuals of the same type, because these species naturally have developed adaptation and tolerance mechanisms to their habitat (Barbour et al., 1987).

CONCLUSION

There are species for seedlings and saplings at the lower and middle heights, some of which can be present at both heights. This may be due to good adaptability, so that even though there is a difference in height, these species are still able to grow and maintain their existence.

Analysis of the distribution and abundance of species found for seedlings at lower elevations as many as 25 species and at middle altitude as many as 14 species, while at the sapling level at lower elevations as many as 18 species and at middle altitude as many as 17 species. If viewed from the evenness index, the value is fairly even, which means that the distribution or distribution of species indicates that no species grows to dominate the plant community.

Analysis of species diversity at the seedling and sapling levels as a whole was of moderate value, meaning that the species found were quite diverse or varied which indicated the community was quite stable.

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REFERENCES

1. Abrori, M. 2016. Keanekaragaman Tumbuhan Bawah di Cagar Alam Manggis Gadungan Kecamatan Puncu Kabupaten Kediri. Skripsi. Fakultas Sains dan Teknologi. Universitas Islam Negeri (UIN). Maulana Malik Ibrahim Malang. Malang.
2. Agustina, E. 2008. Identifikasi dan Karakterisasi Morfologi Mikrofunfi Akuatik dan Potensi Pemanfaatannya untuk Bioremediasi.[Skripsi]. Institut Pertanian Bogor.
3. Barbour, G.M., Burk.J.K & Pitts.W.D. 1987. Terrestrial Plant Ecology. Los Angeles: The Benyamin/ Cumming Publishing Company. Inc.
4. Ewusie, J.Y. 1980. Pengantar Ekologi Tropika. Terjemahan, ITB-Press. Bandung. hlm. 234-245.
5. Heriyanto, N. M., & Garsetiasih, R. (2005). Kajian Ekologi Pohon Burahol (Stelechocarpus burahol) di Taman Nasional Meru Betiri, Jawa Timur. Buletin Plasma Nutfah, 11(2).
6. Magurran, A.E. 1988. Ecological Diversity and Its Measurement. New Jersey (US): Princeton University Press.
7. Odum, H. 1993. Ekologi Sistem Pengantar. Universitas Gadjah Mada, Yogyakarta.
8. Sarmiento, G. 1986. Ecologically Crucial Features of Climate in High Tropical Mountains. En: Vuilleumier, F., Monasterio, M. (Eds): High Altitude Tropical Biogeography. Oxford University Press. Oxford.
9. Silvertown, J.W. 1982. Introduction to plant population ecology. Longman. London.
10. Soegianto, A. 1994. Ekologi Kuantitatif: Metode Analisis Populasi dan Komunitas. Jakarta: Penerbit Usaha Nasional.