BIODIVERSITAS
Volume 21, Number 4, April 2020
Pages: 1735-1742

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d210457

Short Communication: Plant species richness and diversity in Karangsambung-Karangbolong National Geopark, Indonesia

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Manuscript received: 11 December 2019. Revision accepted: 31 March 2020.

Abstract. *Yudaputra A, Rahardjo P. 2020. Short Communication: Plant species richness and diversity in Karangsambung-Karangbolong National Geopark, Indonesia. Biodiversitas 21: 1735-1742.* The information on plant species richness and diversity in Karangsambung-Karangbolong National Geopark, Central Java is very limited. This study aimed: (i) to investigate plant species richness and abundance as well as floristic composition in Karangsambung-Karangbolong National Geopark; (ii) to reveal the potential uses of plant species recorded in the area. Square sampling plots were applied for nine sampling locations. Square plot of 10 x 10 m was applied to record tree, while nested plots of 5 x 5 m and 2 x 2 m were applied to record sapling and understorey plants including shrubs and herbs, respectively. The highest plant species richness was found in the location with higher elevation and mountainous topography. The species abundance reaches its maximum values at low to moderate elevation. Shannon Diversity Index (H) showed that tree and sapling have moderate diversity, whereas understorey plant has high diversity. *Melastoma malabathricum*, *Clidemia hirta*, *Zingiber zerumbet*, and *Ageratum conyzoides* are the most abundant plants in this Geopark. Most of plants recorded have potential benefit as medicinal uses.

Keywords: Abundance, diversity, Karangsambung-Karangbolong National Geopark, plant richness

INTRODUCTION

The spatial and temporal patterns of species richness, abundance and diversity remain a challenge for ecologists and biogeographers (MacArthur 1972; Lomolino 2001). The patterns of species diversity and richness along elevation gradient is more likely a little understood (Rahbek 1995, 1997; Vetaas and Grytnes 2002). Species richness is the number of different species represented in an ecological community, landscape or region. It is simply a count of species. Species abundance is the number of individuals of a species. Species diversity is defined as the combination of richness and abundance of a species that lives in certain location. Species diversity tends to decrease with increasing elevation, and the maximum species richness occurs at the intermediate or low elevation (Rahbek 1995). Species richness reaches a peak at mid-elevation then decreasing because species have troubles with dispersal and survival (Colwell and Hurtt 1994; Colwell and Lees 2000). Lomolino (2001) suggested that relationship between diversity and elevation depends fundamentally on the interaction of the environmental variables. In terms of understanding the pattern of diversity and richness along environmental gradients, multiple factors need to be considered to gain comprehensive understanding (Pausas and Austin 2001).

In 2018, a new Geopark located in Central Java Province was established by the Indonesian Government and named as Karangsambung-Karangbolong National Geopark. It covers area up to 2,000 ha, including Gunung Waturanda, Bukit Sipako, Gunung Paras, Gunung Brujul, and Bukit Jatibungkus. The parental geology in the Geopark was formed since Pre-tertiary era (the oldest rock over the past 60 million years) with complexity in geological conditions. Pre-tertiary rock structure is rarely found in Java Island. Its formation was composed of several types of rock, including scaly clay rock with lumps of limestone, conglomerates, sandstones, limestones, and basalt (Eocene age) (Asikin 1974). It has a unique natural phenomenon in which many types of rock are formed this formation. The theory of plate collision that took place millions of years ago makes this region as an object that stores diversity of rocks (Raharjo and Chusni 2009). Olistolit limestone was also found in this formation.

Due to the complexity of parental geology, the type of soil in Karangsambung-Karangbolong National Geopark likely varies highly. As a consequence, this variation will affect the diversity and endemicity of plants. While there have been many geological studies in the Geopark, study about the diversity of plants has been lacking. Botanical study in the area is important as the habitat of plants is highly threatened by land-use change by local people, plantation, and mining activities. The area surrounding the Geopark has various land uses, including settlement, small agricultural plantation owned by local people, forest plantation, paddy rice field, public infrastructure, marginal

land, and shrubs (Raharjo et al. 2011). As such, it will be interesting to understand how the diversity of plants differs in those landscapes.

The combination of the complexity of parental rocks, and the diversity of land uses to make a study on the diversity of plants in Karangsambung-Karangbolong National Geopark is important to be carried out. This study trying to understand the plant species richness and abundance as well as floristic composition in Karang-sambung-Karangbolong National Geopark and reveal the potential use of species recorded in the area as well.

MATERIALS AND METHODS

Study period and area

This study was conducted in Karangsambung-Karangbolong National Geopark located between Kebumen and Banjarnegara District, Central Java Province, Indonesia. This study was conducted in April 2019. The sampling locations were shown in map below (Table 1).

Data collection

Several sampling plots were sampled in Karangsambung-Karangbolong National Geopark. Those sampling locations were randomly located in the study site. A square plot with two nested sub-plots was applied to record all plant species and individual numbers in all sampling locations. The plot with size 10 x 10 m was used to sample the trees, while the nested plot of 5 x 5 m was used to sample sapling and the nested plot of 2 x 2 m was used to sample understorey plants (herbs and shrubs). Unidentified plants were brought to Bogor Botanic Garden to be rigorously characterized and identified.

Tabel 1. Sampling locations in Karangsambung-Karangbolong National Geopark, Central Java, Indonesia

Sampling	Elevation (m asl)	Location
Location 1	179	Kebumen
Location 2	407	Kebumen
Location 3	561	Kebumen
Location 4	248	Kebumen
Location 6	800	Banjarnegara
Location 9	404	Kebumen
Location 10	181	Kebumen
Location 11	407	Kebumen
Location 13	262	Kebumen

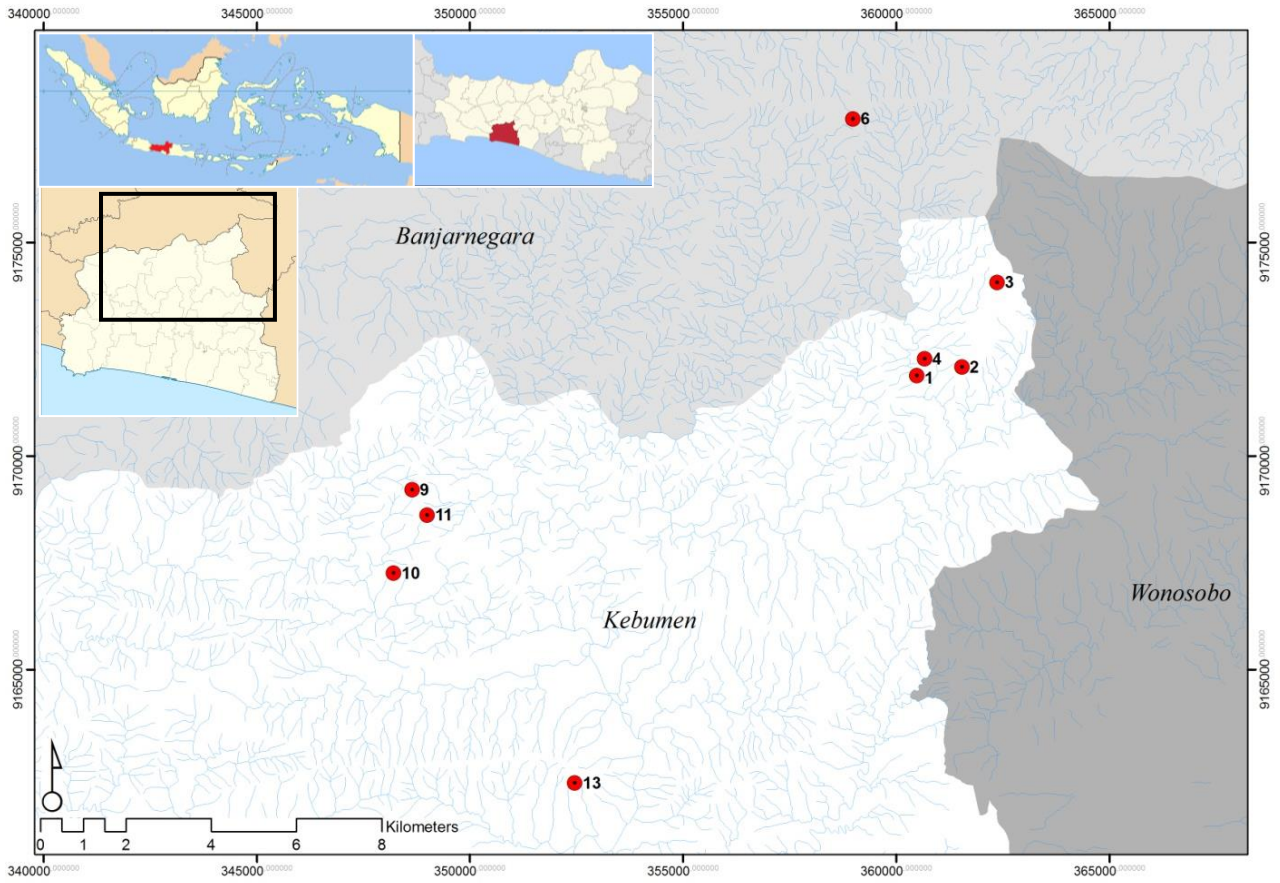

Figure 1. The study area of Karangsambung-Karangbolong National Geopark, Central Java, Indonesia

Data analysis

The diversity of plants was measured using Shannon Diversity Index (H). The visualization of graphic and map were processed using R statistical analysis, Microsoft Excel and Google Earth coordinate points.

The ecological importance of species in community was obtained by calculating the Important Value Index (IVI) (Curtis, 1959). This value is the sum of Relative Density (RD), Relative Frequency (RF), and Dominance Relative (DR) (Curtis, J.T. and McIntosh 1950). The formulas are as follow:

$$\text{Density (D)} = \frac{\text{Total number of individuals}}{\text{Total number of quadrats studied}}$$

$$\text{Relative Density (RD)} = \frac{\text{Total number of individuals of a particular species in all quadrats} \times 100}{\text{Total number of individuals of all the species in all quadrats}}$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrat in which the species occurred}}{\text{Total number of quadrat studied}}$$

$$\text{Relative Frequency (RF)} = \frac{\text{Number of quadrats in which of species occurred} \times 100}{\text{Total number of all species in the quadrat}}$$

$$\text{Dominance (D)} = \frac{\text{Number of individuals}}{\text{Total number of individuals}}$$

$$\text{Relative Dominance (RD)} = \frac{\text{Density of individual} \times 100}{\text{Total number of quadrats studied}}$$

RESULT AND DISCUSSION

The highest plant richness was found in location 10 (Watukelir), followed by location 6 and location 11 (Pager Jawa), while the lowest plant richness was found in location 1 (Figure 2). *Anamirta cocculus* was the most abundant plant species in location 1, *Xantosomas agittifolium*in in location 2, *Cyclosorus opulentus* in location 3, *Clidemia hirta* in location 4, *Urena sinuata* L. in location 6, *Melastoma malabathricum* in location 9 and 13, *Pothos scandens* in location 10, and *Pinanga* sp. in location 11 (Figure 4).

The diversity of plant species in all sampling plots were grouped based on the vegetation stages including tree, sapling, and understorey plants. Tree and sapling stage have a moderate diversity, while the understorey plant has a high diversity (Table 5). The plants recorded in all sampling plots were then categorized based on their potential uses. These included the potential for traditional medicine, food, spice, source of timber, furniture, ornamental plant, essential oil, animal fodder, source of resin, and unknown. The plants are found in Melange mostly have a potential use as traditional medicine (Figure 5).

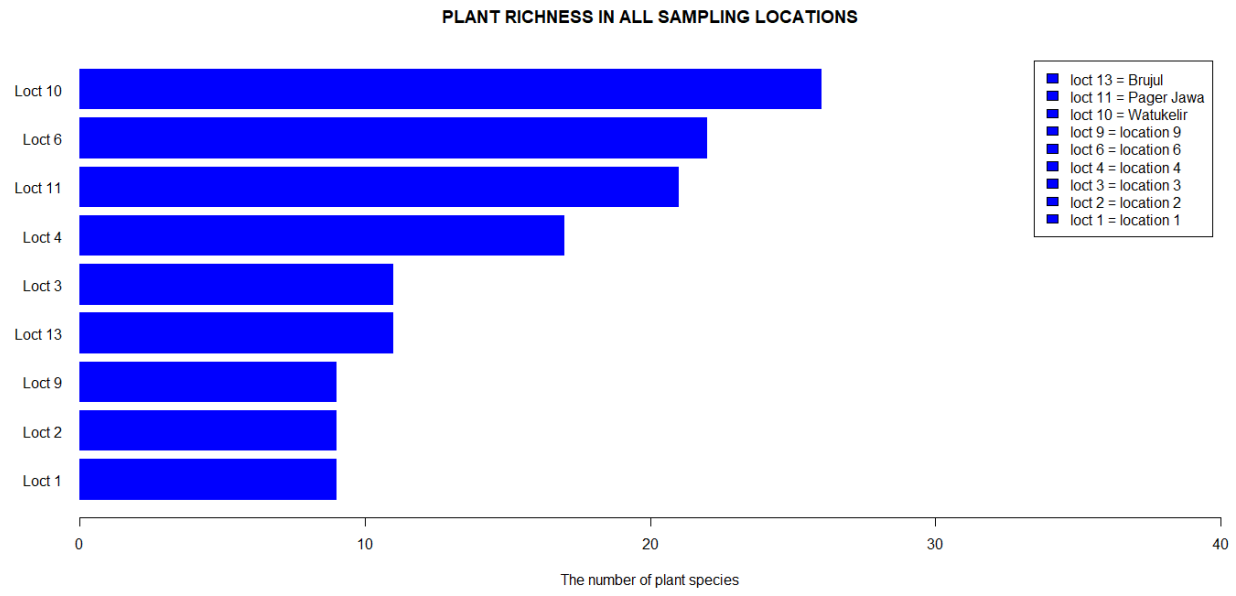

Figure 2. The plant richness in each sampling plot in Karangsambung-Karangbolong National Geopark, Central Java, Indonesia

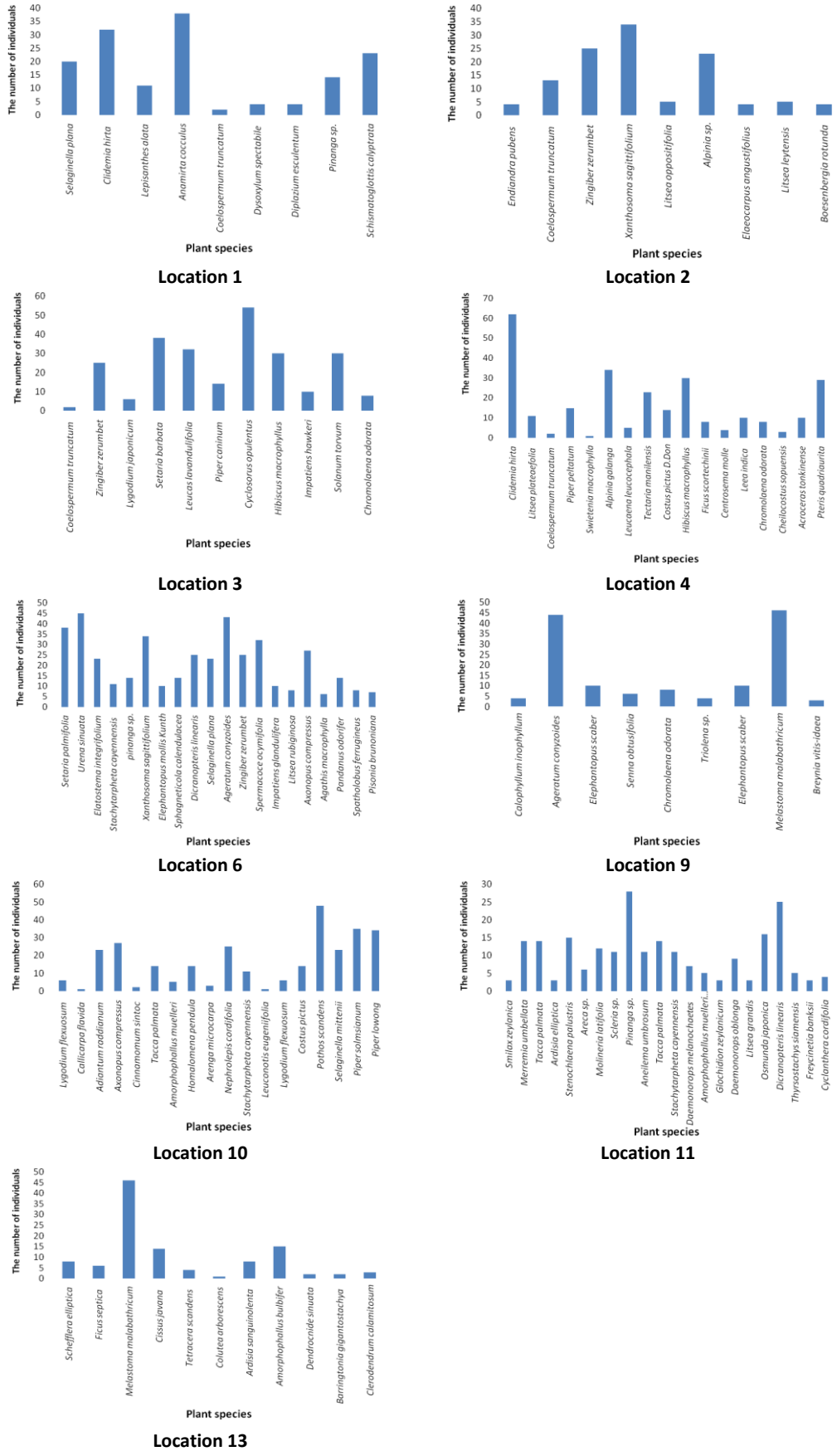

Figure 3. The plant abundance in sampling plots of Karangsambung-Karangbolong National Geopark, Central Java, Indonesia

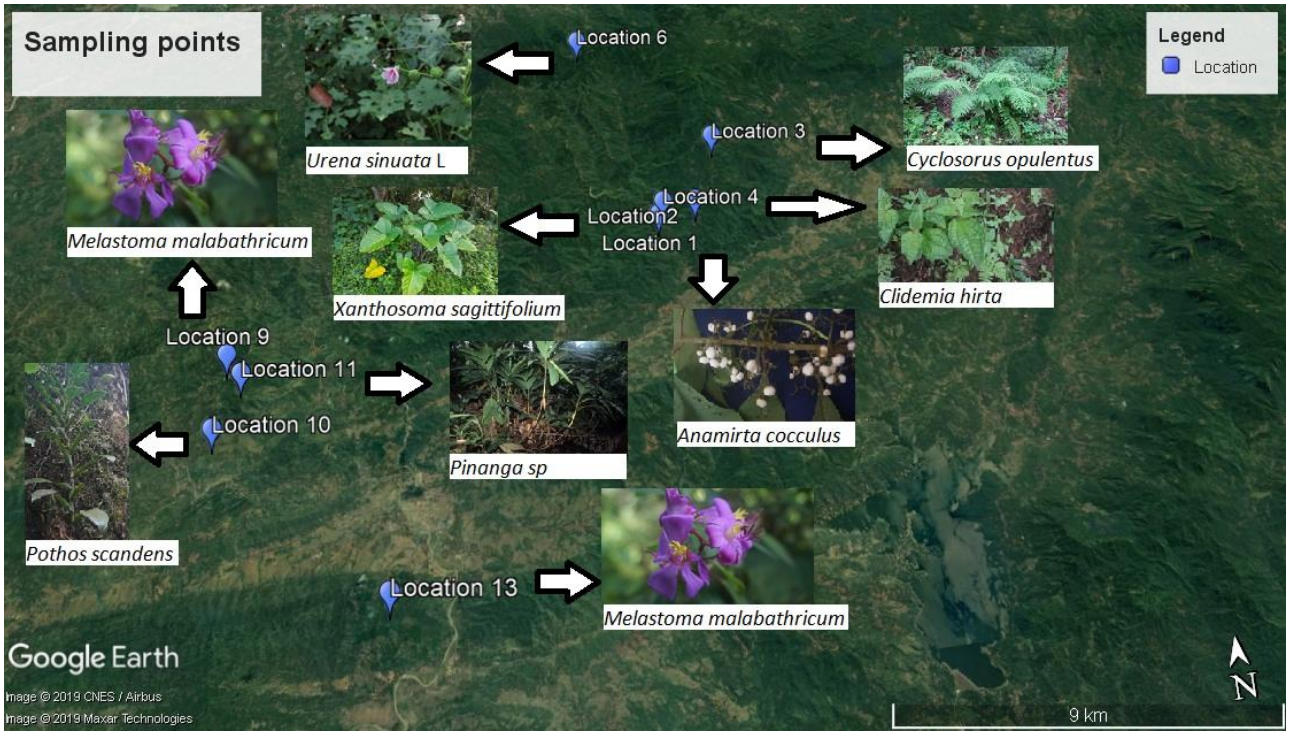

Figure 4. The most abundance of plant species that found in every sampling plot in Kebumen and Banjarnegara, Central Java, Indonesia

Table 2. The vegetation analysis of tree growth stage in all observation plots

Plant species	N	D	RD	F	RF	Do	RDo	IVI
Coelospermum truncatum (Wall.) Baill. exK.Schum.	2	0.20	2.70	0.22	13.33	0.03	0.30	16.34
Dysoxylum spectabile (G.Forst.) Hook.f.	4	0.40	5.41	0.11	6.67	0.05	0.60	12.67
Endiandra pubens Meisn.	4	0.40	5.41	0.11	6.67	0.05	0.60	12.67
Litsea oppositifolia Gibbs	5	0.50	6.76	0.11	6.67	0.07	0.75	14.17
Elaeocarpus angustifolius Blume	4	0.40	5.41	0.11	6.67	0.05	0.60	12.67
Ficus scortechinii King	8	0.80	10.81	0.11	6.67	0.11	1.20	18.68
Agathis pausrophylla (Lindl.) Mast.	6	0.60	8.11	0.11	6.67	0.08	0.90	15.68
Litsea rubiginosa Boerl.	8	0.80	10.81	0.11	6.67	0.11	1.20	18.68
Pisonia brunoniana Endl.	7	0.70	9.46	0.11	6.67	0.09	1.05	17.18
Calophyllum inophyllum L.	4	0.40	5.41	0.11	6.67	0.05	0.60	12.67
SterculiaguttataRoxb. ex G.Don	5	0.50	6.76	0.11	6.67	0.07	0.75	14.17
Ardisia elliptica Thunb.	3	0.30	4.05	0.11	6.67	0.04	0.45	11.17
Ficus septica Burm.f.	6	0.60	8.11	0.11	6.67	0.08	0.90	15.68
Ardisia sanguinolenta Blume	8	0.80	10.81	0.11	6.67	0.11	1.20	18.68

Note: N: Number of species, D: Density, RD: Relative Density, F: Frequency, RF: Relative Frequency, Do: Dominance, Rdo: Relative Dominance, IVI: Important Value Index

Table 3. The vegetation analysis of sapling growth stage in all observation plots

Plant species	N	D	RD	F	RF	Do	RDo	IVI
Barringtonia gigantostachya Koord. & Valeton	2	0.40	4.08	0.11	9.09	0.04	0.45	13.63
Colutea arborescens L.	1	0.20	2.04	0.11	9.09	0.02	0.23	11.36
Litsea grandis (Nees) Hook.f.	3	0.60	6.12	0.11	9.09	0.06	0.68	15.89
Glochidion zeylanicum (Gaertn.) A.Juss.	3	0.60	6.12	0.11	9.09	0.06	0.68	15.89
Leea indica (Burm. f.) Merr.	10	2.00	20.41	0.22	18.18	0.20	2.27	40.86
Ziziphus jujuba Mill.	2	0.40	4.08	0.11	9.09	0.04	0.45	13.63
Leucaenaleuco cephala (Lam.) de Wit	5	1.00	10.20	0.11	9.09	0.10	1.13	20.43
Swietenia macrophylla King	1	0.20	2.04	0.11	9.09	0.02	0.23	11.36
Litsea plateaefolia Elmer	11	2.20	22.45	0.11	9.09	0.22	2.49	34.03
Lepis anthesalata (Blume) Leenh.	11	2.20	22.45	0.11	9.09	0.22	2.49	34.03

Table 4. The vegetation analysis of understorey vegetation (shrubs and herbs) in all observation plots

Plant species	N	D	RD	F	RF	Do	RDo	IVI
Spermaco ceocymifolia Willd. exRoem. &Schult.	11	5.50	0.73	0.22	2.17	0.01	0.08	2.98
Senna obtusifolia (L.) H.S.Irwin & Barneby	6	3.00	0.40	0.11	1.09	0.00	0.04	1.53
Smilax zeylanica L.	3	1.50	0.20	0.11	1.09	0.00	0.02	1.31
Leuconotiseugeniifolia (Wall. ex G.Don) A.DC.	1	0.50	0.07	0.11	1.09	0.00	0.01	1.16
Arenga microcarpa Becc.	3	1.50	0.20	0.11	1.09	0.00	0.02	1.31
Cinnamomum sintoc Blume	2	1.00	0.13	0.11	1.09	0.00	0.01	1.23
Callicarpa flavida Elmer	1	0.50	0.07	0.11	1.09	0.00	0.01	1.16
Daemonorops oblonga (Reinw. ex Blume) Blume	9	4.50	0.59	0.22	2.17	0.01	0.07	2.83
Areca sp.	6	3.00	0.40	0.22	2.17	0.00	0.04	2.61
Aneilemaum brosum (Vahl) Kunth	11	5.50	0.73	0.11	1.09	0.01	0.08	1.89
Stachytarpheta cayennensis (Rich.) Vahl	11	5.50	0.73	0.33	3.26	0.01	0.08	4.07
Melastoma malabathricum L	46	23.00	3.04	0.22	2.17	0.03	0.34	5.55
Tetracera scandens (L.) Merr.	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Dendrocnide sinuata (Blume) Chew	2	1.00	0.13	0.11	1.09	0.00	0.01	1.23
Clerodendrum calamitosum L.	3	1.50	0.20	0.11	1.09	0.00	0.02	1.31
Selaginella plana (Desv. ex Poir.) Hieron.	14	7.00	0.92	0.22	2.17	0.01	0.10	3.20
Clidemia hirta (L.) D. Don	42	21.00	2.77	0.22	2.17	0.03	0.31	5.25
Anamirta cocculus (L.) Wight &Arn.	35	17.50	2.31	0.11	1.09	0.02	0.26	3.65
Diplazium esculentum (Retz.) Sw.	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Pinanga sp.	14	7.00	0.92	0.33	3.26	0.01	0.10	4.29
Schismato glottiscalyptrata (Roxb.) Zoll. &Moritzi	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Zingiber zerumbet (L.) Roscoe ex Sm.	25	12.50	1.65	0.33	3.26	0.02	0.18	5.09
Xanthosomas agittifolium (L.) Schott	34	17.00	2.24	0.22	2.17	0.02	0.25	4.67
Alpinia sp.	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Litsealey tensis Merr.	6	3.00	0.40	0.11	1.09	0.00	0.04	1.53
Boesenbergia rotunda (L.) Mansf.	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Lygodium japonicum (Thunb.) Sw.	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Setaria barbata (Lam.) Kunth	38	19.00	2.51	0.11	1.09	0.03	0.28	3.87
Leucas lavandulifolia Sm.	32	16.00	2.11	0.11	1.09	0.02	0.23	3.43
Piper caninum Blume	33	16.50	2.18	0.22	2.17	0.02	0.24	4.59
Cyclosorus opulentus (Kaulf.) Nakaike	44	27.00	3.56	0.11	1.09	0.04	0.40	5.05
Hibiscus macrophyllus Roxb. exHornem.	30	15.00	1.98	0.22	2.17	0.02	0.22	4.37
Impatiens hawkeri W.Bull	10	5.00	0.66	0.11	1.09	0.01	0.07	1.82
Solanum torvum Sw.	30	15.00	1.98	0.11	1.09	0.02	0.22	3.29
Chromolaena odorata (L.) R.M.King & H.Rob.	8	4.00	0.53	0.33	3.26	0.01	0.06	3.85
Piper peltatum L.	15	7.50	0.99	0.11	1.09	0.01	0.11	2.19
Alpinia galanga (L.) Willd.	34	17.00	2.24	0.11	1.09	0.02	0.25	3.58
Tectaria manilensis (C. Presl) Holttum	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Costus pictus D.Don	14	7.00	0.92	0.22	2.17	0.01	0.10	3.20
Centro semamolle Benth.	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Leea indica (Burm. f.) Merr.	24	12.00	1.58	0.22	2.17	0.02	0.18	3.93
Acroceras tonkinense (Balansa) C.E.Hubb. ex Bor	10	5.00	0.66	0.11	1.09	0.01	0.07	1.82
Pteris quadriaurita Retz.	29	14.50	1.91	0.11	1.09	0.02	0.21	3.21
Setaria palmifolia (J.Koenig) Stapf	49	24.50	3.23	0.11	1.09	0.03	0.36	4.68
Spermacoce ocymifolia Willd. exRoem. &Schult. (synonym ; *Hemidiodiaocymifolia)*	32	16.00	2.11	0.22	2.17	0.02	0.23	4.52
Urena sinuata L.	45	22.50	2.97	0.11	1.09	0.03	0.33	4.39
Elatostema integrifolium var. tomentosum (Hook.f.) W.T.Wang	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Xanthosomas agittifolium (L.) Schott	38	19.00	2.51	0.22	2.17	0.03	0.28	4.96
Elephantopus mollis Kunth	30	15.00	1.98	0.11	1.09	0.02	0.22	3.29
Sphagneticola calendulacea (L.) Pruski	14	7.00	0.92	0.11	1.09	0.01	0.10	2.11
Dicranopteris linearis (Burm. f.)	25	12.50	1.65	0.33	3.26	0.02	0.18	5.09
Selaginella Underw.plana (Desv. ex Poir.) Hieron.	20	10.00	1.32	0.22	2.17	0.01	0.15	3.64
Ageratum conyzoides (L.) L.	48	24.00	3.17	0.22	2.17	0.03	0.35	5.69
Axonopus compressus (Sw.) P.Beauv.	27	13.50	1.78	0.22	2.17	0.02	0.20	4.15
Pandanus odorifer (Forssk.) Kuntze	14	7.00	0.92	0.11	1.09	0.01	0.10	2.11
Spatholobus ferrugineus (Zoll. & Moritzi) Benth.	8	4.00	0.53	0.11	1.09	0.01	0.06	1.67
Elephantopus scaber L.	10	5.00	0.66	0.11	1.09	0.01	0.07	1.82
Mikania micrantha Kunth	7	3.50	0.46	0.11	1.09	0.00	0.05	1.60
Triolena sp.	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Breyniavitis-idaea (Burm.f.) C.E.C.Fisch.	3	1.50	0.20	0.11	1.09	0.00	0.02	1.31
Osmunda japonica Thunb.	16	8.00	1.06	0.22	2.17	0.01	0.12	3.35

Lomariopsis marginata (Schrad.) Kuhn	6	3.00	0.40	0.11	1.09	0.00	0.04	1.53
Piper caninum Blume	14	7.00	0.92	0.22	2.17	0.01	0.10	3.20
Lygodium flexuosum (L.) Sw.	6	3.00	0.40	0.11	1.09	0.00	0.04	1.53
Adiantum raddianum C. Presl	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Tacca palmata Blume	14	7.00	0.92	0.22	2.17	0.01	0.10	3.20
Amorphophallus muelleri Blume	5	2.50	0.33	0.22	2.17	0.00	0.04	2.54
Homalomena pendula (Blume) Bakh.f.	14	7.00	0.92	0.11	1.09	0.01	0.10	2.11
Nephrolepis cordifolia (L.) C. Presl	25	12.50	1.65	0.11	1.09	0.02	0.18	2.92
Pothos scandens L.	48	24.00	3.17	0.11	1.09	0.03	0.35	4.61
Selaginella mittenii Baker	23	11.50	1.52	0.11	1.09	0.02	0.17	2.77
Piper solmsianum C.DC.	35	17.50	2.31	0.11	1.09	0.02	0.26	3.65
Piper lowong Blume	34	17.00	2.24	0.11	1.09	0.02	0.25	3.58
Merremiaum bellata (L.) Hallier f.	14	7.00	0.92	0.11	1.09	0.01	0.10	2.11
Stenochlaena palustris (Burm. f.) Bedd.	15	7.50	0.99	0.11	1.09	0.01	0.11	2.19
Molineria latifolia (Dryand. ex W.T.Aiton) Herb. ex Kurz	12	6.00	0.79	0.11	1.09	0.01	0.09	1.97
Scleria sp.	11	5.50	0.73	0.11	1.09	0.01	0.08	1.89
Thyrsostachys siamensis Gamble	5	2.50	0.33	0.11	1.09	0.00	0.04	1.45
Freycinetia banksii A.Cunn.	3	1.50	0.20	0.11	1.09	0.00	0.02	1.31
Cyclanthera cordifolia	4	2.00	0.26	0.11	1.09	0.00	0.03	1.38
Schefflera elliptica (Blume) Harms	8	4.00	0.53	0.11	1.09	0.01	0.06	1.67
Cissus javana DC.	14	7.00	0.92	0.11	1.09	0.01	0.10	2.11
Amorphophallus bulbifer (Roxb.) Blume	15	7.50	0.99	0.11	1.09	0.01	0.11	2.19

Table 5. Plant diversity index in all vegetation stages represented using Shannon Diversity Index (H)

Vegetation stage	Diversity Index (H)	Category
Tree	2.59	Moderate
Saplings	2.76	Moderate
Understorey plants (shrubs and herbs)	4.01	High

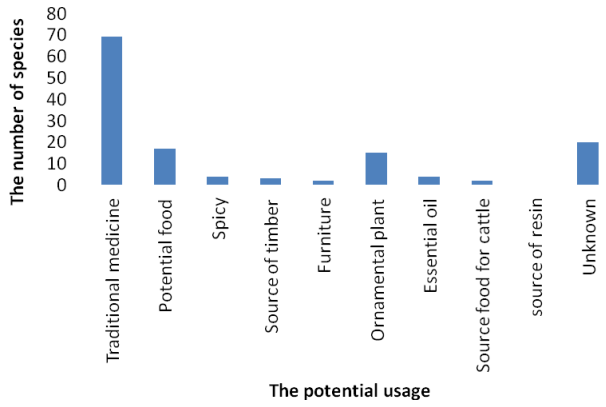

Figure 5. The potential use of plant diversities in Karangsambung-Karangbolong National Geopark. The plants are grouped based on their usages. The information was gathered from the literature review

In Karangsambung-Karangbolong National Geopark, plant richness at the mountainous location tends to have a higher value. The highest species richness was recorded in location 10 (Watukelir), followed by location 6 and location 11 (Pager Jawa). Those locations have a steep hill topography that is far away from human activities. Several locations at higher elevation tend to have a higher plant richness because of few human activities there. The vegetation at higher elevation is still relatively dense and diverse even though some areas are converted into plantation. This is understandable because the lowland areas in the Geopark are mostly converted into agriculture, plantation, and settlement, making the richness of species is relatively low. Pager Jawa (location 11) is considered as a location with high plant richness which is dominated by palms and woody trees. The results of this study are not in accordance with Rahbek (1995) that stated the diversity tends to decrease with increasing elevation, but this is applied to pristine or primary forest.

Plants having a high value of Important Value Index (IVI) indicates that those plants are dominant in the region, have better adaptability and play the most important role than others. According to Lubis (2009) and Abdiyani (2008), a type of vegetation can affect the stability of an ecosystem because it is dominant in terms of environmental changes and vegetation competition. The result of calculation of Important Value Index (IVI), *Ficus scortechinii* King, *Litsearu biginosa* Boerl., *Ardisias anguinolenta* Blume have the highest IVI for tree vegetation stage with the value >17. For sapling vegetation stage, *Leea indica* (Burm. f.) Merr., *Litsea plateaefolia* Elmer, and *Lepis anthesalata* (Blume) Leenh have the highest IVI with value >30. For groundcover, *Melastoma malabathricum* L, *Clidemia hirta* (L.) D. Don, *Zingiber zerumbet* (L.) Roscoe ex Sm., *Cyclosorus opulentus* (Kaulf.) Nakaike, *Dicranopteris linearis* (Burm. f.) Underw., *Ageratum conyzoides* (L.) L. are plants that having IVI >5.

Melastoma malabathricum is considered a native plant of tropical Asia, subtropics and the Pacific Islands. This plant is generally found in bushes, rice fields, and mountain slopes. The plant itself belongs to Melastomataceae family which is generally in the form of shrubs, shrubs or trees. The population grows wild on open or protected land, on dry or moist soil, lowland to an altitude of 2000 m above sea level. This plant is a weed on perennial plantation, such as rubber, coconut, oil palm and teak (Joffry et al. 2012). *Clidemia hirta* is originated from South America, blooms throughout the year, spreads very quickly and is relatively more abundant outside its native area than its natural habitat. *C. hirta* is a type of understorey plant which has high adaptability because it is able to grow optimally at low altitudes up to 1000 m above sea level with open and humid environmental conditions and soil that has a high humus content (Ismaini 2015). *Ageratum conyzoides* is native to Tropical America, especially Brazil, and considered as an invasive weed in many other regions including in Africa, Australia, Southeast Asia, and the USA. *A. conyzoides* is relatively well adapted in any kind of environmental condition (Weakley 2008). *Zingiber zerumbet* has a high IVI because this plant is planted by local people and dispersed very quickly in most regions in this geopark.

Based on Shannon Diversity Index (H), the diversity of tree and saplings vegetation are relatively moderate in Karangsambung-Karangbolong National Geopark with a score of 2.59 and 2.76, respectively. Miardini et al. (2010) state that H value of $1 \leq H \leq 3$ shows that the diversity of species in an area is moderate, the distribution of the number of individuals per species is moderate and the stability of the community is moderate. Meanwhile, the diversity of understorey plants is relatively high with a score of 4.01. High or low value of the diversity index is influenced by the number of species and the number of individuals found. According to Samingan (1976) the more species found, the higher the Diversity Index value. The higher the Diversity Index value of an area shows the more stable the community in the region. The vegetation in Karangsambung-Karangbolong is dominated by shrub and herbs with only few trees and sapling. The landscape of Karangsambung-Karangbolong is mostly dominated by understorey plants (shrubs and herbs) because most of areas have been converted into forest plantation with homogenous tree species composition. Many shrubs and herbs that found in the area have potential benefits as herbal medicine, some of them have different uses such as potential food, spice, ornamental plant, essential oil, and many others.

In conclusion, the highest species richness of plants in Karangsambung-Karangbolong National Geopark is found at the locations with the mountainous topography (steep hills). Watu Kelir and Pager Jawa are two locations that still have high diversity of plants compared to the other locations. The understorey plants (shrubs and herbs) dominated the landscape of Karangsambung-Karangbolong National Geopark. *Melastoma malabathricum*, *Clidemia hirta*, *Ageratum conyzoides*, and *Zingiber zerumbet* are the most abundant species in all sampling locations. Most of plants in this area have potential uses as herbal medicine.

ACKNOWLEDGEMENTS

We are highly appreciated and thankful to Indonesian Institute of Sciences (LIPI) for giving research funds to our team. We also thank to Bapak Ikar Supriyatna who helping to identify the plant species. A lot of thanks delivered to Bapak Haris who help us to collect data during fieldwork.

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