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DIVERSITY OF TREES AND SHRUBS ON SPECIAL-PURPOSE FOREST

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ABSTRACT

The beauty of KHDTK (Special-purpose forest) in Banten province saves a lot of biodiversities that must be protected because it is a source of wealth that supports human life towards prosperity. The research objective was to determine the diversity of trees and shrubs and to identify the types of plants (trees and shrubs) in the Forest Area with Special Purpose in Carita. This research was carried out in Sukarame Village, Carita District, Pandeglang Regency, Banten. The method used in this study is descriptive research. Technique sampling uses the Line transect method. The results showed that the tree Shannon-Weaver (H') Diversity index at KHDTK in Carita was 0.600 in the low category. Bush Shannon-Weaver (H) Diversity Index at Carita KHDTK is 0.692 in the low category. Evenness Index (E) at the KHDTK in Carita is 0.204 in the (low) category. The Evenness Index (E) in the Carita KHDTK was 0.33 in the low category. Further research is needed to be able to find diversity in the KHDTK in Carita and to complement references about KHDTK in Carita.

Keywords: Diversity, Forest Area, Carita.

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Introduction

Indonesia's forests rank third largest in the world with tropical and rain forest types. Forests save a lot of flora and fauna wealth. The government has implemented various policies to conserve forests and their wealth. One of them is to create a forest conservation area called the Special Purpose Forest Zone (KHDTK).

KHDTK is a nature conservation area for collection of flora and fauna (natural or non-natural; endemic or non-endemic) that is useful for research, science, and education, and also as a support facility for cultivation, culture, tourism, and recreation. KHDTK is a forest area whose ecosystem is protected, including plants and animals in it. The legal status of the KHDTK is a protected area that can be used as a place of recreation and commercial tourism that is limited by strict regulations so that its sustainability is maintained. KHDTK criteria cover a wide area that has a specific natural phenomenon and has characteristics in terms of ecosystems, animals, or plants, either endemic or not endemic. KHDTK is a life support area, especially water management, soil fertility, erosion prevention, microclimate balance, and biodiversity conservation (Erwin, Bintoro, & Rusita, 2017).

KHDTK-Banten Province includes tropical forests located in the lowlands and closes to the sea, so it has a unique flora and fauna. Lowland tropical forests are the most abundant vegetation in terms of both the number and types of living things that make up them and also have high land resource values (land, water, sunlight). The characteristics of lowland forests are large trees that have a layered canopy (at least the height of the top canopy is an average of 45 meters, dense and green along) is dominating, has an average annual rainfall of 3,950 mm, and average relative humidity 77% - 85%.

The beauty of KHDTK-Banten province holds a lot of biodiversities that must be protected because it is a source of wealth that supports human life towards prosperity. The diversity of plants and animals in KHDTK-Banten province has an essential role in human life and local communities. The purpose of biodiversity is a food source to maintain the balance of the ecosystem and play a role in the development of science. KHDTK-Banten Province has a lot of vegetation that can be observed, such as shrubs, epiphytes, ferns, palms, vines, and trees. Therefore, research on the abundance of shrub and tree vegetation types was carried out at KHDTK-Banten Province.

Biodiversity refers to two main things, namely the number of species found in an area or species richness in an ecosystem and the number of individuals representing each species. Knowledge of biodiversity is useful in ecology and forestry plants to be able to compare the composition of different species (Naidu & Kumar, 2016). Therefore, in this study, data will be collected to determine the number of plant species contained in an area and the number of individuals representing these plant species.

The purpose of this research is to provide information on the diversity and evenness of plants (trees and shrubs) in the Special Purpose Forest Area in Sukarame Village, Carita District, Pandeglang-Banten, as preliminary data for scientists who will investigate further.

Research Method

Research Design

This study uses descriptive research methods. Sampling using the Line transects method. This research was

conducted in the Special Purpose Forest Zone in Sukarame Village, Carita District, Pandeglang Regency, Banten, on the 2nd to 4th August 2018.

Tools and Materials

This study uses tools such as the crosshairs compass, soil tester, Thermo hygrometer, chest board, stationery, GPS, and pegs. The materials used in this study are raffia or scout cords, label paper, and plastic bags.

Research Procedure

Analysis of vegetation data consisting of density, frequency, dominance, important value index, diversity index, and evenness index. Meanwhile, the determination of stations is divided into two stations. Sampling selection locations use purposive sampling based presence of flora, which is considered to represent the condition of the ecosystem at each station, as well as based on the height of the location. The first location is at S 06 .7 17,773 'and E 105 ^{o} 50,562' 17 m. The second location is at S 06^{o} 17,810 'and E 105^{o} 50,527' 8 m. Each station is divided into sub-stations; the first location is divided into two small stations, and the second location becomes three small stations. Then, the research was conducted using the Line transects method. The mechanism of the line transects method is to determine two points as the center of a transect line with a length of 50m. In this line, segments are made 10m long for trees and 1m for shrubs.

Result and Discussion

Trees are plants with sizeable wooden stature, height, and a diameter of more than 20 cm. The observations found 19 species of trees in KHDTK-Carita (table 2). Density values can illustrate that species with high-density values have high adjustments as well. Table 1 shows that the highest relative density of trees is *Shorea leprosulla* of 0.5949.

Frequency as a parameter of vegetation can show the distribution of types or patterns of plants in the ecosystem (Fajri, 2008). The tree in the KHDTK-Carita location that has the highest relative frequency in table 1 is *Shorea leprosulla* of 0.4430.

Dominance states that major plant species influences and exert control over the community through a large number of species, size, and dominant growth (Fajri, 2008). Table 1 shows that the highest relative dominance is *Shorea leprosulla* of 0.1738. Therefore, the values of relative density, relative frequency, and relative dominance of *Shorea leprosulla* have the highest value, so that the index of importance is also higher than other species, namely 1.2118.

The calculation of tree diversity in KHDTK-Carita uses the Shannon-Weaver index with a figure of 0.60 in the low diversity category in KHDTK-Carita (table 2) because Dipterocarpaceae family tree species predominate in KHDTK-Carita. The results of the observation showed that 19 species of trees were observed that there were four species, which included the Dipterocarpaceae family were *Hopea adorata*, *Shorea leprosulla*, *Shorea selanica*, and *Dipterocarpus* sp.

In general, the Dipterocarpaceae family lives in the wet tropics with rainfall of more than 1000 mm per year and a dry season of fewer than six months. Therefore, the Dipterocarpaceae family can flourish in tropical rain forests with an altitude of fewer than 1500 mdpl (Purwaningsih, 2004). The results of sorting forest types show that Dipterocarpaceae live mostly in lowland,

hilly, riverside, and coastal forests (Purwaningsih, 2004).

Table 2 also shows the evenness index value of 0.2039 in the low evenness category. The smaller the evenness index value, the evenness value is even lesser. In addition, environmental factors can also affect include the physical-chemical environment, as well as interactions between species around the area under study (Setiadi, 2005). Other factors that influence the existence of plants are animals and humans (Loveless, 1983).

Table 1. Important Value Index of Trees

No	Local Name	Latin Name	KR	FR	DR	INP
1	Meranti	*Shorea leprosulla*	0.59	0.44	0.17	1.21
2	Merawan	*Hopea adorata*	0.21	0.18	0.15	0.54
3	Meranti	*Shorea selanica*	0.06	0.05	0.17	0.28

Dipterocarpaceae family grows on slopes and ridges and grows as trees reaching 50 m (Purwaningsih, 2004). Data of the KHDTK-Carita conservation center shows that biophysical conditions in the region have alluvial soil types with characteristic, such as clay deposition material, stable structure, moist consistency, wet, gray to brown color, low organic, moderate to high base saturation, higher adaptation, varied acidity, and low permeability, sloping to steep topography (10-35%), altitude up to 100 mdpl, average annual rainfall type of 3950 mm, average relative humidity 77-85%, and average temperature of 23-32 ^{o}C. In addition, the Dipterocarpaceae family was planted, because it has economic value that is beneficial to the community and as a supporter of the ecosystem around the KHDTK-Carita. Trees and shrubs that are planted can show relatively high efficiency outside of habitat conditions (Luczak, Kusza, Slonina, & Borecka, 2019).

The observations at KHDTK-Carita found eight species of shrub. Table 3 shows the relative density, highest frequency, and highest relative dominance of *Ardisia elliptica* of 0.33, 0.33, and 0.13 with an important value index obtained of 0.79. Therefore, the species that most influences the stability of an ecosystem in KHDTK-Carita is *Ardisia elliptica*.

Next, the diversity and evenness of the shrubs are calculated. Shrub diversity in KHDTK-Carita was calculated using the Shannon-Weaver (H') index, and evenness index were calculated.

Shrub diversity in the KHDTK-Carita calculated using the Shannon-Weaver index (H') obtained a value of 0.692 (table 4), including the low category. This low diversity index value indicates that the KHDTK-Carita is a climax community. It is consistent with the opinion of Setiadi (2005), which states that the diversity index will be higher if the ecosystem has not reached a climax. Shrub species evenness index in KHDTK-Carita, which has an evenness index (E) of 0.333 (table 4), which is classified as a low category. It shows an abundance that is not uniform and uneven among species because the KHDTK-Carita is a stable ecosystem.

In addition, changes in the dominance structure of plant communities can reduce evenness (E) and allow local species extinction (Walker et al., 2006). Therefore, the development of ecosystems in this case KHDTK-Carita is needed because there are environmental factors that can have an impact on the diversity of trees and shrubs (Sohrabi & Habashi, 2011).

Table 2. Diversity and Evenness of Trees in KHDTK-Carita

No.	Local Name	Latin Name	H'	E
1	Merawan	*Hopea adorata*	0.1428	0.0485
2	Meranti	*Shorea leprosulla*	0.1342	0.0455
3	Meranti	*Shorea selanica*	0.0734	0.0249
4	Nyamplung	*Calophyllum inophyllum*	0.0570	0.0193
5	Teureup	*Artocarpus elasticus*	0.0285	0.0096
6	Amis mata	*Ficus montana*	0.0285	0.0096
7	Keruing	*Dipterocarpus sp.*	0.0240	0.0081
8	Kenanga Putih	*Cananga odorata*	0.0192	0.0065
9	Angsana	*Pterocarpus indicus*	0.0139	0.0047
10	Pulam hitam	*Alstonia angustiloba*	0.0079	0.0026
11	Kecapi	*Sandoricum koetjape*	0.0079	0.0026
12	Mahoni	*Swietenia mahagoni*	0.0079	0.0026
13	Jambu air	*Syzygium aqueum*	0.0079	0.0026
14	Bayur	*Pterospermum javanicum*	0.0079	0.0026
15	Perdamaian	*Barringtonia asiatica*	0.0079	0.0026
16	Peuris	*Glochidion fulvirameum*	0.0079	0.0026
17	Rambutan	*Nephelium lappaceum*	0.0079	0.0026
18	Huru minyak	*Schima wallichi*	0.0079	0.0026
19	Melinjo	*Gnetum gnemon*	0.0079	0.0026
TOTAL			**0.6005**	**0.2039**

Table 3. Importance Value Index of Shrubs

No.	Local Name	Latin Name	KR	FR	DR	INP
1	Lampeni	*Ardisia elliptica*	0.3333	0.3333	0.1250	0.7917
2	Asahan	*Tetracera indica* (L)	0.2727	0.2381	0.1250	0.6358
3	Sirih Tanah	*Piper caducibacteum*	0.2424	0.1905	0.1250	0.5579

Table 4. Diversity and Evenness of the Shrubs

No.	Local Name	Latin Name	H'	E
1	Lampeni	*Ardisia elliptica*	0.1592	0.0766
2	Asahan	*Tetracera indica (L)*	0.1539	0.0740
3	Sirih Tanah	*Piper caducibacteum*	0.1492	0.0718
4	Bambu Jepang	*Pseudosasa japanica*	0.0460	0.0221
5	Canar	*Smilax leucophylla*	0.0460	0.0221
6	Pepedesan	*Piper nigrum (L)*	0.0460	0.0221
7	Rotan Jernang	*Daemonorops draco*	0.0460	0.0221
8	Pandan	*Pandanus tectorius*	0.0460	0.0221
TOTAL			**0.6924**	**0.3330**

Conclusion

KHDTK-Carita found 19 species of trees and eight types of shrubs. The diversity and evenness of tree and bush species in the KHDTK-Carita are classified as low. However, the kind of tree that predominates in the KHDTK-Carita is the Dipterocarpaceae family. The type of shrubs that dominates is *Ardisia elliptica*. Further research can be carried out by increasing the number of plots used. In addition, analysis can be carried out at different altitudes.

References

Erwin, Bintoro, A., & Rusita. (2017). Keragaman Vegetasi di Blok Pemanfaatan Hutan Pendidikan Konservasi Terpadu (HPKT) TAHURA Wan Abdul Rachman, Provinsi Lampung. Jurnal Sylva Lestari, 3, 1-11.

Fajri, M. (2008). Pengenalan Umum Dipterocarpaceae, Kelompok Jenis Bernilai Ekonomi Tinggi. Info Teknis Dipterokarps, 2, 9-21.

Loveless, A. R. (1983). Prinsip-prinsip Biologi Tumbuhan Untuk Daerah Tropik 2. Jakarta: Gramedia.

Luczak, K., Kusza, G., Slonina, D., & Borecka, K. (2019). Fruit Trees and Bushes as a Biodiversity Element in The "Gorazdze" Quarry Reclaimed Areas. Journal of Ecological Engineering, 20(3), 24-29.

Naidu, M. T., & Kumar, O. A. (2016). Tree Diversity, Stand Structure, and Community Composition of Tropical Forests in Eastern Ghats of Andhara Pradesh, India. Journal of Asia-Pacific Biodiversity, 9, 328-334.

Purwaningsih. (2004). Review: sebaran Ekologi Jenis – jenis Dipterocarpaceae di Indonesia. Biodiversitas, 5, 89-95.

Setiadi, D. (2005). Keanekaragaman Spesies Tingkat Pohon di Taman Wisata Alam Ruteng, Nusa Tenggara Timur. Biodiversitas, 6, 118-122. DOI:10.13057/biodiv/d060210

Sohrabi, V., & Habashi, H. (2011). Relationship Between Trees and Shrubs Biodiversity with Some Soil Physical Properties in Hyrcanian Forests (North of Iran). International Journal of Biology, 3(4), 22-29.

Walker, M. D., Wahren, C. H., Hollister, R. D., Henry, G. H., Ahluquist, L. E., & Alatalo, J. M. (2006). Plant community responses to experimental warming across the tundra biome. Proc Natl Acad Sci, 103, 1342-1346.

Yusuf, R. (2005). Analisis Vegetasi Hutan Dipterocarpaceae Campuran di Taman Nasional Kayan Mentarang, Kalimantan Timur. Biosfera, 22, 54-66.