

Tree Species Diversity As the Base of Conservation On Panjang Island Jepara, Central Java

by Sri Utami

Submission date: 18-Feb-2019 08:29AM (UTC+0700)

Submission ID: 1079382589

File name: ijaesv10n5_06.pdf (236.13K)

Word count: 2751

Character count: 14753

Tree Species Diversity As the Base of Conservation On Panjang Island Jepara, Central Java

Sri Utami^{a,b*}, Sutrisno Anggoro^c, Tri Retnaningsih Soeprbowati^b

^a Graduate School of Environmental Sciences, Diponegoro University, Indonesia

^b Faculty of Sciences and Mathematics, Diponegoro University, Indonesia

^c Faculty of Fisheries and Marine Sciences, Diponegoro University, Indonesia

¹² Corresponding author Sri Utami

Departement of Biology Faculty of Sciences and Mathematics, Diponegoro
University,

Jl. Prof. Soedarto SH Semarang Indonesia 50275

Telp. (024) 747454; Fax. (024) 76480690

email: utami.biologi@gmail.com

Abstract

Panjang island is a small island in Indonesia which is administered in the territory of the district Jepara, Central Java, Indonesia. Small island properties are susceptible to changes and environmental pressures so it is important to be maintained and protected. Community tree is a component of the ecosystem that plays an important role in protecting the environment. The purpose of this study is to assess the composition and diversity of tree species as a basis for conservation of small islands. The research method is purposive sampling. Research site is was choosed four points located in the southern, eastern, northern and western Panjang island. Each point of the transect line drawn perpendicular to the coastline and put the research site from the beach toward the land. Vegetation data were analyzed by calculating the Importance Value Index, Degree of Constancy, Diversity Index and Evenness Index. There are 33 species of trees belonging to 19 families. Diversity of tree species (H') : 1,58-2,22. In Panjang island there were 2 important tree: *Pemphis acidula* (Setigi) which has the status of Least Concern IUCN and *Excoecaria agallocha* (wood blind) that are endemic in Java, so that these two species need to be protected population. Tree species that plays an important role in conservation on Panjang island are: *Leucaena leucocephala*, *Bombax ceiba*, *Thespesia populnea*, and *Acacia mangium*.

Keyword: Small island, protected population, species diversity index, endemic species, purposive sampling.

1. Introduction

Panjang island is a small island in Indonesia with an area of 19.73 Ha, which is administered in the territory of the district Jepara, Central Java. Natural resources of Panjang island are white sand beaches and its clear waters with its various organisms that would be an attraction to be used as a tourist attraction. Moreover, in the central part of the island there is a protected forest that have been defined by the regional government as a place of birds breeding and conservation [1]. Panjang island as a small island has properties that are vulnerable to changes the environment, therefore it is very necessary to be maintained and protected [2]. Forest management interventions can lead to maintain or increase the diversity [3].

Panjang island region has experienced a very high abrasion, it appears some new buildings are still exposed abrasion collapsed. Climate change and sea-level rise in small island will cause unfavorable shifts in biotic composition and adversely affect among some species [4]. Community trees on Panjang island development and regeneration of the tree less well [5]. Forest regeneration status can be determined by calculating the density of the individual levels of the tree, sapling and seedling. The level of the tree is a plant that has a trunk diameter ≥ 10 cm, saplings is a plant with a trunk diameter <10 cm and height ≥ 1.5 m, at the seedling stage is a plant from seedling to regeneration with a height <1.5 m [6]. Community development and regeneration of trees are said to be good if the density of individual seedlings $>$ saplings $>$ tree level [7, 8]. Regenerating status stands of trees will affect the sustainability and stability of forest ecosystems in the future. Ecosystem stability is the ability of a ecosystem to keep himself remained stable despite the disruption of its components. ⁹

Tree diversity is a fundamental component of ecosystem diversity, contributing to both habitat structure and ecosystem function [9]. Structure, composition and function of the tree are the three essential elements in the forest ecosystem. Changes in these elements is a response of the climate, topography, soil and disturbance [10]. The ecosystem stability can be measured through the diversity species of its component. Species diversity is one of the most important features of biotic communities [11]. High species diversity in the community show the complexity in the ecosystem related to a very high species interactions occur [12]. Community which has a high diversity is composed by many species [8]. ³

In the area of small islands are found unique and endemic plant species. It is estimated that 33% of know threatened plants are island endemic, and 23% of bird species found on islands also are threatened [4]. Sempu small island located in Malang found 54.54% of plant species that categorized of unique qualifications and 32.32% into the category of very unique, which means that most of these plants have a high level of extinction and thus needs to be maintained Indonesia endemitas sustainability [13]. A high flora endemism on small islands have been reported by [14], in Vanua Levu Fiji Islands that discover 34% of endemic species of native plant. Meanwhile [15] reported that in the Lau Group Islands, Fiji 14% of all endemic plant.

Community tree is a component of the ecosystem that plays an important role in protecting the environment. Research has been done in the small island area that

has many rivers as a source of fresh water. Panjang Island is an has no river area with limited sources of fresh water and has a very low rainfall. The objective of this research is to determine the composition and diversity of tree species as a basis for ecosystem management area of Panjang island.

11
2. Material and methods

2.1. Study area

The study was conducted in the forest area of Panjang island Jepara, Central Java in December 2014. Panjang Island is geographically located at position 06 ° 34'33,6 " to 06 ° 34'40,8 ' SL and 110 ° 37'37,2' to 110 ° 37'51,59' EL. The site located on facing slope with an inclination of 0-2% and the altitudinal range is between 0-5 m a.s.l.

2.2. Experiment design

The research used purposive sampling, by making paths around the island and put a research site in the south, west, north and east. At each site transect lines were made perpendicular to the shoreline. Futhermore determined the tree plot 20 x 20 m along the transect line started from littoral region, supralitoral and the central part of the island and point total of 11 samples taken. Eleven soil samples were taken for analysis of soil organic matter, pH, concentration of N, P, K, soil salinity, soil texture, soil moisture and soil temperature.

2.3. Analysis vegetation of tree species diversity

Vegetation analysis is calculated using species importance value index, species diversity index, Evenness Index [16].

1. Important value index (IVI) = rel.density + rel. frequency + rel. dominancy

2. Degree of Conctancy = $\frac{\text{how many times a species found}}{\text{number of site}}$

3. Species diversity index Shannon-Wiener: $H' = - \sum \frac{ni}{N} \log \frac{ni}{N}$

H ' = Shannon-Wiener diversity index

ni = Number of individuals of a species

N = Total number of all individual

4. Evenness Index : $e = H' / \ln S$

e = Evenness Index

H ' = Shannon-Wiener diversity index

S = Number of species

3. Result and Discussion

In Panjang island were found 33 species trees included 19 families. This result is less than that found in the tropical forests of India Ghast are 106 species trees [17], and in Ethiopia Ziway Island there are 141 species of included in 55 familia [18]. This was due to the unfavorable climatic factors for the growth of trees and the only certain tree species that can grow in that environment.

Panjang island region is area that experienced long dry season at relatively high temperatures reached 41.3°C [5]. Panjang island there are 6 months with low rainfall (< 100 mm per month) in June, July, August, September, October and November. Very low rainfall occurred in August, September and October to reach 10 mm (Fig 1). The climatic conditions led to the availability of water in the soil. The availability of water resources critical in small island, water already is short supply because island are drought-prone rely heavily on rainwater from small catchments or limited freshwater lenses [4]. In consequence in Panjang island only a few species of plants that can adapt and establish their lives.

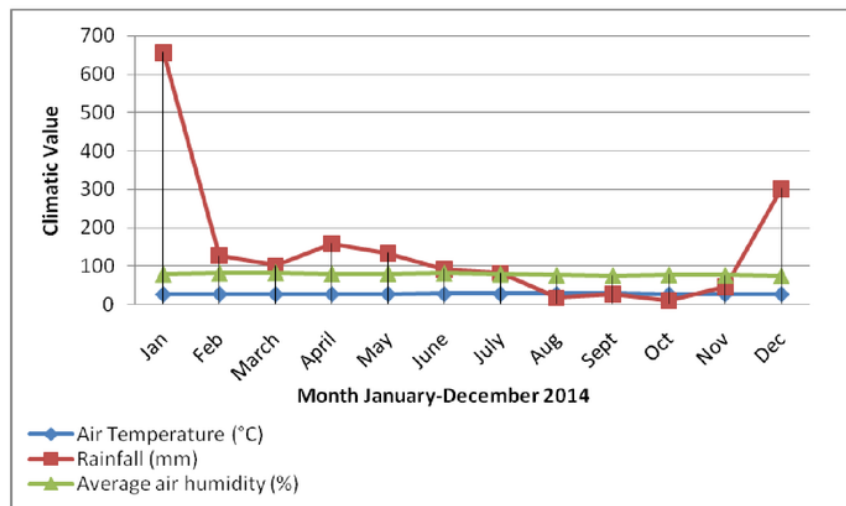


Fig. 1. Climatic factor on the the region Jepara 2014 (Meteorological Agency, Climatology and the Geophysics Central Java 2014).

Tree species have a higher importance value index are *Ceiba petandra*, *Thespesia populnea*, *Leucaena leucocephala*, *Maccranga sp.*, *Tamarindus indica*, *Bombax ceiba*, *Xylocarpus granatum*, *Musa paradisiaca* and *Acacia mangium* (Figure 2). An importance value index was used an indicator species dominant [19], plants species that have a high Importance Value Index is the dominant species in the region [8].

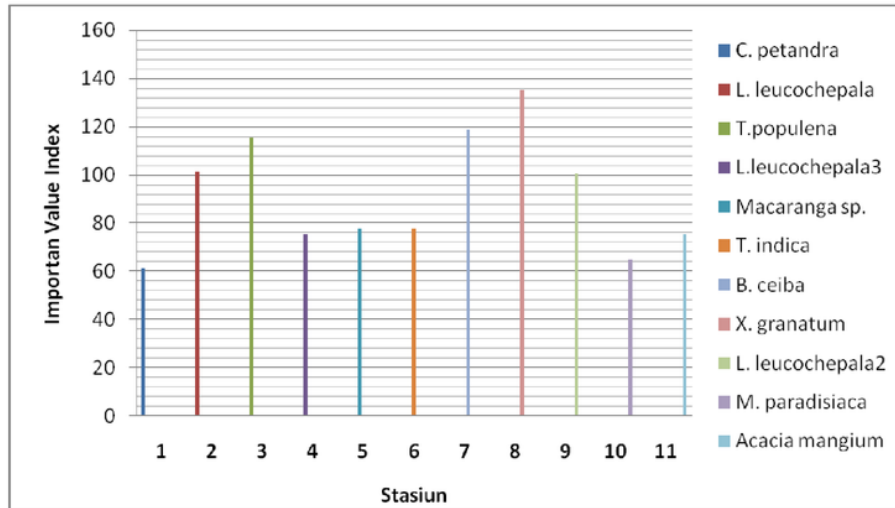


Fig. 2. Species that have highest important value index on Panjang island

The degree of constancy value is the value that describes the distribution area of a species. Figure 3 shows 10 species have a high degree of constancy value (> 45%) are *L.leucocephala*, *Bombax ceiba*, *Acacia mangium*, *Hisbiscus tiliaceus*, *Terminalia catappa* and *Thespesia populnea*. Plant species that have a degree of constancy higher value indicates extent of the distribution area and species has a high adaptability to environmental factors. Vegetation experience cyclical fluctuations from season to season until many years. Vegetation that is formed is a reflection of the overall environmental factors which took place in a very long time [10]. Tree species which play an important role in conservation is species that has important value index high and wide distribution are *L.leucocephala*, *Bombax ceiba*, *Acacia mangium* and *Thespesia populnea*.

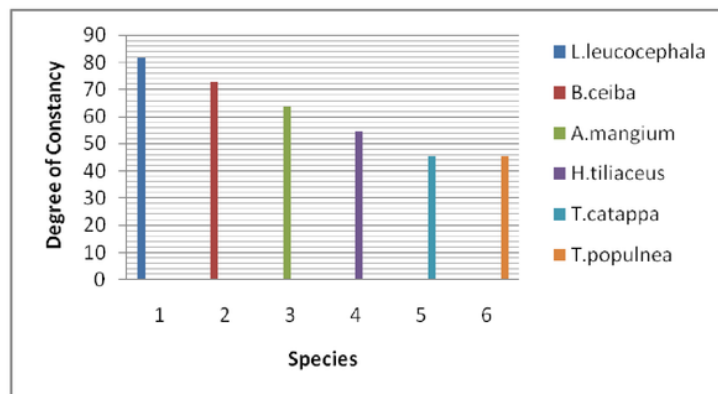


Fig. 3. Degree of constancy plant species (>45%) on Panjang island Jepara

Diversity species index (H') ranged from 1.58 to 2.22 with evenness species index ranged from 0.69 to 0.97 (Fig. 4). Based on the value of the diversity index, it can be said that the community diversity of trees in Panjang island region was moderate. While the evenness index in the category of high value. Species diversity index on the island of Ziway Ethiopia is higher than in Pulau Panjang. Species diversity index on the island of Ziway Ethiopia is 2.60 and evenness index is 0.62 [18]. The index value of diversity is not only determined by the species richness, but also determined by evenness or distribution of individual species [12].

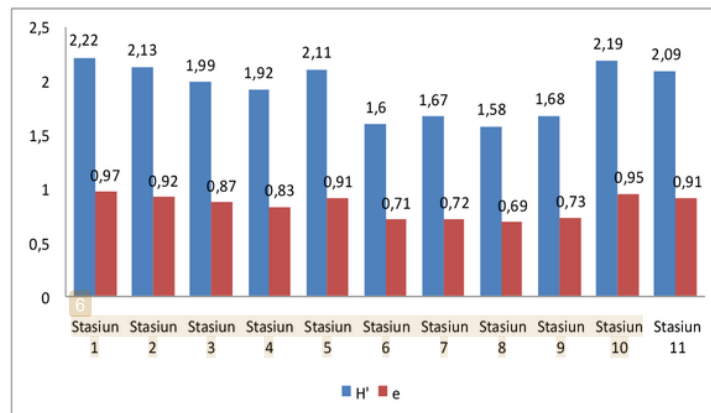


Fig. 4. Diversity and evenness index species of community tree in Panjang island Jepara.

In the area of Panjang island found *Excoecaria agallocha* tree species (timber blind) in small amounts. This species is endemic in Java. This species has much decreased so that needs to be protected [20]. In the area of Panjang island also is found *Pemphis acidula*. This tree is found growing in coastal areas and many were planted around the grave as an ornamental plant that accidentally by the local community. *Pemphis acidula* wood was believed have mystical and as favorite bonsai lovers, makes this tree so much hunted and cause the population continues to decline and likely to become endangered if nothing is did not start to conserve. According to the IUCN Red List of Threatened Species [21], these plant species are included in the category of Least Concern, which means categorized the threatened, with extinction risk status is low and needs to be conserved. The IUCN Red List of Threatened Species is a list of names of animals and plants are endangered and rare that require conservation efforts.

4. Conclusion

There are 33 species of trees which belong to in the 19 families. Diversity of tree species (H') : 1,58-2,22). There is *Phemphis acidula* (Setigi) which has the status of Least Concern IUCN and *Excoecaria agallocha* (wood blind) that are endemic in Java, so that these two species need to be protected population. Plant species that an important role in conservation on Panjang island are : *Leucaena leucocephala*, *Bombax ceiba*, *Thespesia populnea* and *Acacia mangium*.

Acknowledgement

This study is part of a author dissertation titled: *The Strategy of Enviroment Conservation Based Vegetation on Panjang Island, Jepara Jawa Tengah*. Authors gratefully to DIKTI (Directorate General of Ministry of Research Technology and Higher Education) that have provided assistance scholarship studies postgraduate programe. Thank is also adressed to Rully Rahadian, M. Hadi, Jumari, Penny, Imam, Meisya, Nabila, Alam and Laras who have helped in the vegetation sampling.

References:

- [1]. Peraturan Daerah Kabupaten Jepara, 2011, "Rencana Tata Ruang dan Wilayah Kabupaten Jepara Tahun 2011-2031". No.2, pasal 30
- [2]. BAPPENAS, 2003, "Strategi dan Rencana Aksi Keanekaragaman Hayati Indonesia 2003-2020". Dokumen Nasional, Jakarta.
- [3]. Barna, M., and Bosela, M., 2015, "Tree Species Diversity Change in Natural Regeneration of a Beech Forest Under Different Management," *Forest Ecology and Management* 342 : 93-102.
- [4]. Hay J.E., Suarez A.G., Wong P.P., Brigulio, L., Ragoonaden S., 2001, "Small Island States," <http://www.ipcc.ch/ipccreports/tar/wg2/pdf/wg2Tarchap17.pdf>. Download: 2 Agustus 2015.
- [5]. Utami, S., Anggoro, S., and Suprobowati, T.R., 2014, "Regenerating Stands of Trees in the Forest Preserve Pulau Panjang Jepara, Central Java," *Proc. of the National Seminar on Biology : Research, Development and Learning, UNES Semarang*, 29 Nov.2014, 306-311.
- [6]. Park, A., Justiniano, M.J., and Fredericksen, T.S., 2005, "Natural Regeneration and Environmental Relationships of Tree Species in Logging Gaps in a Bolivian Tropical Forest," *Forest Ecology and Management*, 217, 147-157
- [7]. Deb, P., and Sundriyal, R.C., 2008, "Tree Regeneration and Seedling Survival Pattern in Old-Growth Lowland Tropical Rainforest in Namdapha National Park, North-East India," *Forest Ecology and Management*, 255, 3995-4006
- [8]. Indriyanto, 2008, "Ekologi Hutan," P.T.Bumi Aksara Jakarta.
- [9]. Srivastava, D.S., and Vellend, M., 2005, "Biodiversity-ecosystem Function Research: it is Relevant to Conservation," *Annual Review of Ecology, Evolution and Systematic*, 36, 267-338

- [10]. Mandal, G., and Joshi, S.P., 2014, "Analysis of Vegetation Dynamics and Phytodiversity from Three dry deciduous Forest of Donn Valley, Western Himalaya, India, *Journal of Asia-Pacific Biodiversity*, 7, 292-304
- [11]. Cerny, T., Dolezal, J., Janecek, S., Srutek, M., Valachovic, M., Petrik, P., Altman, J., Bartos, M., and Song, J., 2013, "Environmental Correlates of Plant Diversity in Korean Temperate Forest," *Acta Oecologica*, 47, 37-45
- [12]. Brower, J.E., Zar, J. A., and Von Ende, C. N., 1997, "Field and Laboratory Methods for General Ecology," Mc. Graw-Hill, New York, Chap.4.
- [13]. Sulistyowati, H., 2008, Analisis Status Flora Cagar Alam Pulau Sempu Kabupaten Malang. *Jurnal Ilmu Dasar*, 9 (1), 78-81.
- [14]. Keppel, G., Rounds, I.S., and Thomas, N.T., 2006, "The Flora, Vegetation and Conservation Value of Mesic Forest at Dogotuki, Vanua Levu, Fiji Islands," *New Zealand Journal of Botany*, 44 (5): 273-292.
- [15]. Franklin, J., Keppel, G., dan Whistler, W.A., 2008, "The Vegetation and Flora of Lakeba, Nayau dan Aiwa Island, Central Lau Group, Fiji," *J. Micronesica*, 40 (1/2), 169-225.
- [16]. Krebs, C.J., 2001, "Ecology The Experimental Analysis of Distribution and Abundance" Fifth edition. Benyamin Cumming, an imprint of Addition Wesley Longman, Inc. San Fransisco California.
- [17]. Anitha, K., Joseph, S., Chandran, R.J., Ramasamy, E.V., and Prasad, S.N., 2010, "Tree species Diversity and Community Composition in human-diminated tropical forest of western Ghats Biodiversity Hotspot, India," *Ecological Complexity*, 7, 217-224
- [18]. Zegeye, H., Teketay, D., and Kelbessa, E., 2006, "Diversity, regeneration status and Socio-economic of the Vegetation in the islands of Lake Ziway, South-central Ethiopia," *Flora*, 201, 483-498.
- [19]. Lohbeck, M., Pooter, L., Paz, H., Pla, L., Van Breugel, M., Martinez-Ramos, M., and Bongers, F., 2012, "Functional Diversity Changes During Tropical Forest Succession," *Perpectives in Plant Ecology, Evolution and Systematics*, 14, 89-96, doi:10.1016/j.flora.2005.10.006
- [20]. Puslit Biologi-LIPI, 2001, Jenis-jenis Hayati yang Dilindungi Perundang-undangan Indonesia. Noerdjito dan Maryanto, The Nature Conservacy dan USAID, Jakarta
- [21]. *The IUCN Red List of Threatened Species* (2013), *International Union for Conservation of Nature (IUCN)*. 2013. *The IUCN Red List of Threatened Species*(*Phemphis acidula*)<http://www.iucnredlist.org/search>. 1 Juni 2014:08.00

Tree Species Diversity As the Base of Conservation On Panjang Island Jepara, Central Java

ORIGINALITY REPORT

17%

SIMILARITY INDEX

14%

INTERNET SOURCES

9%

PUBLICATIONS

4%

STUDENT PAPERS

PRIMARY SOURCES

1	mbio.undip.ac.id Internet Source	2%
2	www.ripublication.com Internet Source	2%
3	www.klima.ph Internet Source	2%
4	Barna, Milan, and Michal Bosela. "Tree species diversity change in natural regeneration of a beech forest under different management", <i>Forest Ecology and Management</i> , 2015. Publication	1%
5	Submitted to Deakin University Student Paper	1%
6	pt.scribd.com Internet Source	1%
7	Nur Linda Isa, Monica Kusneti, Rudy Agung Nugroho. "Bird diversity of the wetland area in Suwi river, Muara Ancalong, Kutai Timur,	1%

Kalimantan Timur, Indonesia", F1000Research, 2018

Publication

8	www.miga.org Internet Source	1%
9	Duguid, Marlyse C., Brent R. Frey, David S. Ellum, Matthew Kelty, and Mark S. Ashton. "The influence of ground disturbance and gap position on understory plant diversity in upland forests of southern New England", <i>Forest Ecology and Management</i> , 2013. Publication	1%
10	www.riversymposium.com Internet Source	1%
11	www.ccsenet.org Internet Source	1%
12	www.ijesd.org Internet Source	1%
13	repository.unib.ac.id Internet Source	<1%
14	www.mdpi.com Internet Source	<1%
15	ejournal.undip.ac.id Internet Source	<1%
16	Butti, Camilla, R. Ewan fordyce, Mary Ann	

Raghanti, Xiaosi Gu, Christopher J. Bonar, Bridget A. Wicinski, Edmund W. Wong, Jessica Roman, Alanna Brake, Emily Eaves, Muhammad A. Spocter, Cheuk Y. Tang, Bob Jacobs, Chet C. Sherwood, and Patrick R. Hof. "The Cerebral Cortex of the Pygmy Hippopotamus, *Hexaprotodon liberiensis* (Cetartiodactyla, Hippopotamidae): MRI, Cytoarchitecture, and Neuronal Morphology : STRUCTURE OF THE HIPPOPOTAMUS BRAIN", *The Anatomical Record*, 2014.

Publication

<1%

17

Falasifah, Sunarno Sunarno, Muhammad Anwar Djaelani, Rully Rahadian. " Pegagan and cinnamon bark flours as a feed supplement for quail growth rate () ", *Journal of Physics: Conference Series*, 2018

Publication

<1%

18

helda.helsinki.fi

Internet Source

<1%

19

Morita, M.. "Changes in sperm motility in response to osmolality/ Ca^{2+} in three Indonesian fresh water teleosts: Goby (*Oxyeleotris marmorata*), Java carp (*Puntius javanicus*), and catfish (*Clarias batrachus*)", *Comparative Biochemistry and Physiology, Part A*, 200603

Publication

<1%

20

Brian L. Cypher, Erica C. Kelly, Francesca J. Ferrara, Charles A. Drost, Tory L. Westall, Brian R. Hudgens. "Diet patterns of island foxes on San Nicolas Island relative to feral cat removal", Pacific Conservation Biology, 2017

Publication

<1%

21

"Proceedings of the 10th National Technical Seminar on Underwater System Technology 2018", Springer Nature, 2019

Publication

<1%

Exclude quotes Off
Exclude bibliography On

Exclude matches < 7 words

Tree Species Diversity As the Base of Conservation On Panjang Island Jepara, Central Java

GRADEMARK REPORT

FINAL GRADE

/500

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8
