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Study of Pteridophyte Diversity and Vegetation Analysis in Jatikerep Legonlele and Nyamplung, Karimunjawa Island Central Jawa

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ABSTRAK

Kajian Diversitas Pteridofit dan Analisis Vegetasi di Jatikerep Legonlele dan Nyamplung, Pulau Karimunjawa, Jawa Tengah. Kajian Pteridofit dan analisis vegetasi dilakukan di tiga lokasi di Kep.Karimunjawa Jawa Tengah. Tujuan dari kajian ini untuk mendata Pterydofit yang dapat tumbuh di kawasan dataran rendah dengan kondisi tanah berpasir dan rendah jumlah curah hujannya. Tiga belas jenis Pteridofit dapat ditemukan di kawasan tersebut dengan jenis yang mendominasi adalah *Lygodium flexuosurydom* diikuti oleh *Pteris vittata, Lygodium microphyllum, Lindsaea ensifolia, Pteris ensiformis, Nephrolepis brownii, Chelianthes tenuifolia, Nephrolepis hirsutula, Cyclosorus extensus, Blechnum finlaysonianum, Taenitis blechnoides, Abacopteris triphylla,* dan *Pteris semipinnata* . Indeks diversitas dikawasan tersebut sanga rendah (Shannon-Wiener (H') = 1.5462). Unsur tanah dan pH tidak banyak mempengaruhi signifikan diversitas Pterydofit.

Kata kunci: Karimunjawa; Pteridofit diversitas; dataran rendah.

INTRODUCTION

Pteridophyte is a seedless vascular plant which can be distributed in high and low topographic positions (Sastrapradja 1979). Several studies of tropical rain forest have documented that the distribution of plant group is correlated with topographic position (Tuomisto & Poulsen 2000). The distribution of pteridophyte which is rooted in the hilly topographic area, the highest number of species and species diversity were found in the valley or lower parts of the slopes and changed with bryophytes in the higher slopes (Djalil 2000). When the topographic position was regularly flat, the distribution and species diversity were found in the highest parts of the slopes (Tuomisto & Poulsen 2000).

Several studies of pteridophyte diversity were conducted at high topographic position in Gunung Gede Pangrango National Park. The result was that pteridophyte diversity is affected by topographic position. *Asplenium caudatum, Polysticum proliticans, Athyrium montanum, Dryopteris hirtipes,* and *Pteris biuarita* were found more abundance in the high slope (Djalil, 2000). In contrast, several studies resulted that some genera of *Lygodium* mostly found in the low topographic position. *Lygodium* can grow in the

ground which is lies 1.500 m asl, less canopy, and soil pH is mostly low (Siregar *et al.* 2004).

Study of pteridophyte diversity needs to be conducted in order to examine the value of the pteridophyte in the ecological system and also ethnobotany (Sastrapradja 1979; Siregar *dkk.* 2004). Study of pteridophyte diversity has never been conducted in lowland rain forest of Karimunjawa National Park. This study needs to be conducted to examine the pteridophyte diversity in lowland rain forest, dry soil, and low amount of rainfall. We also recorded several abiotic factors to examine the correlation between pteridophyte diversity and its environment.

MATERIALS AND METHODS

Field work was conducted at three sites of Karimunjawa Island: Jatikerep (5°52'3"S, 110°25'56" E), Legonlele (5°51'37" S, 110°26'46" E), and Nyamplungan (5°50'8"S, 110°25'46"E). There are no soil differences in Jatikerep, Legonlele and Nyamplungan. Karimunjawa soil texture is lithosol. The topographic character is a range of hills with quartz sand, mica sand, and silt sand as main soil composition. Karimunjawa Island lies in 0 – 506 m above sea level. Annual average precipitation exceeds 3000 mm and average temperature ranges 30 — 31°C.

All pteridophytes which are rooted in the ground were recorded following the plot method. Thirty plots of 10 m x 10 m were separated randomly in Jatikerep, Legonlele and Nyamplungan. The coverage was also measured. In order to know the effect of environment condition to the pteridophyte diversity, some abiotic factors were also recorded in each plot. The soil moisture was recorded using soil meter and soil pH was recorded using pH meter.

Number of relative frequency, number of species density, and number of dominance were calculated in order to measure indices of important value. Species diversity was measured with Shannon-Wiener diversity indices.

In order to know the correlation between abiotic factor and pteridophyte diversity, the diversity in each plot was measured. The diversity in each plot was also correlated with pH and soil moisture using correlation analysis.

RESULTS

The total number of species of terrestrial pteridophyte recorded within 30 plots was 13 species. *Blechnum orientale, Dicranopteris linearis, Lyndsaea ensifolia,* and *Stenochlaena palustris* were also found outside the plots. The total number of pteridophyte individuals found within one plot varied between 3 and 40 individuals per plot; the mean is 18 individuals per plot.

The most abundance pteridophyte was *Lygodium flexuosum* which was represented by 396 individuals in 30 plots with indices of important value 1.331. Then it is followed by *Pteris vittata, Lygodium microphyllum, Lindsaea ensifolia, Pteris ensiformis, Nephrolepis brownii, Chelianthes tenuifolia, Nephrolepis hirsutula, Cyclosorus*

extensus, Blechnum finlaysonianum, Taenitis blechnoides, Abacopteris triphylla, and *Pteris semipinnata* respectively (Table 1). Based on the numerical analysis, the diversity of pteridophyte in Karimunjawa is low with indices of Shannon – Wiener = 1.54.

Pteridophyte diversity was correlated with soil conditions. The diversity was not greater at sites with high pH condition (Figure 1) and was greater at sites with high moisture (Figure. 2). Although soil conditions have correlated with pteridophyte diversity, the

Table 1. Density (Den), Dominance (Dom), Frequency (F), Relative density (RDen), Relative dominance (RDom), Frequency Relative (FR) were calculated to measure Indices of Important Value (IIV). Indices of Important Value of *Lygodium flexuosum* was the highest.

Species	Den	Dom	F	Rden	Rdom	FR	IIV
Abacopteris tryphilla	0.0003	0.00023	0.0333	0.0019	0.0022	0.0175	0.0217
Blechnum finlaysonianum	0.0007	0.00178	0.067	0.0039	0.0169	0.0358	0.0558
Cyclosorus	0.0053	0.0018	0.033	0.0313	0.0167	0.0175	0.0654
Lygodium flexsuosum	0.0973	0.0398	0.733	0.569	0.3762	0.3859	1.3313
Lindsaea microphylum	0.0133	0.0064	0.3	0.0779	0.0613	0.1578	0.2971
Lygodium microphylum	0.0047	0.0247	0.167	0.0273	0.2333	0.0877	0.3483
Nephrolepis brownii	0.011	0.004	0.067	0.0643	0.0379	0.0351	0.1372
Nephrolepis hirsitula	0.0036	0.00135	0.067	0.0215	0.0129	0.0351	0.0693
Pteris ensiformis	0.005	0.0085	0.067	0.0294	0.0801	0.0351	0.1445
Pteris semipinnata	0.0003	0.00004	0.033	0.0019	0.0004	0.0175	0.0199
Pteris vittata	0.0246	0.0138	0.167	0.1443	0.1301	0.0877	0.362
Cheilanthes tenuifolia	0.002	0.0015	0.133	0.0117	0.0137	0.0701	0.0955
Taenitis blechnoides	0.0027	0.00194	0.033	0.0156	0.0183	0.0175	0.0514
	0.1707	0.10584	1.9003	1	1	1.0003	2.9994

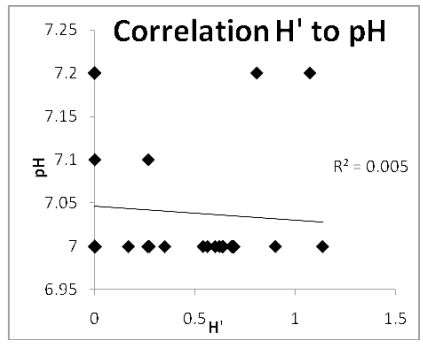

Figure 1. The correlation between pteridophyte diversity (H') and soil pH was negative. Higher soil pH has a tendency to decrease pteridophyte diverstity. But, the correlation is not significant.

correlation was not significant. Numerical analysis using SPSS 16 resulted that there is no significant correlation between pteridophyte diversity with soil pH and pteridophyte diversity with soil moisture (Table 2).

DISCUSSION

On the study, pteridophyte diversity in Karimunjawa is low with H' = 1.546. The range of low indices of diversity is 1 to 1.5 (Rasidi 2003). *Lygodium flexuosum* was measured to be the most abundance species in Karimunjawa. *Lygodium* can grow well in the lowland, less canopy, and dry soil (Darma *et al.* 2003).

Soil moisture and soil pH has a tendency to affect diversity. Pteridophyte diversity is greater while soil moisture is high while pteridophyte diversity is less greater while the soil pH is high. Although it was has a tendency, Pteridophyte diversity in Karimunjawa was not affected significantly with environment condition. Several studies also resulted that there is no significant correlation between pteridophyte diversity and environment condition: soil moisture and soil pH (Djalil 2000, Richard *et al.* 2000).

Next study need to be conducted in order to examine the correlation between pteridophyte diversity and its environment. This study used Shannon – Wiener indices to measure the diversity in each plot. Generally, Shannon – Wiener indices is used to measure the diversity in one area which is represented by severals sample. Thus, next study to measure the correlation between diversity and its environment condition need to be conducted with another method.

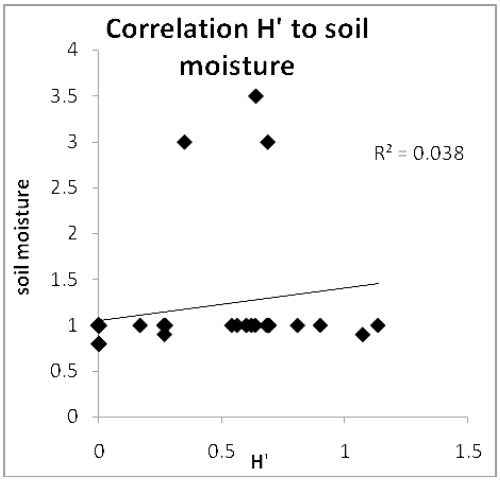

Figure. 2. The correlation between pteridophyte diversity (H') and soil moisture was positive. Higher soil pH has a tendency to increase pteridophyte diverstity. But, the correlation is not significant.

Table 2. The environment condition in each plot. H' is diversity in each plot correlated to soil pH and soil mositure.

PLOT	H’	pH	Moist.
1	0.68709	7	3
2	0	7	1
3	0	7	1
4	1.1358	7	1
5	0.90026	7	1
6	0	7	1
7	0.34883	7	3
8	0.63651	7	1
9	0	7	1
10	0.26714	7.1	0.9
11	0.69315	7	1
12	0.68291	7	1
13	0.16794	7	1
14	0.27119	7	1
15	0	7	1
16	0.56234	7	1
17	0.69176	7	1
18	0.5402	7	1
19	0	7	1
20	0	7	1
21	0.26405	7	1
22	0.80806	7.2	1
23	0.63903	7	3.5
24	0	7.2	0.8
25	0	7.2	0.8
26	0	7.1	0.8
27	1.07338	7.2	0.9
28	0.62109	7	1
29	0.60017	7	1
30	0	7.2	0.8

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