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# Diversity of Fern Species (Pteridophyta) in the Karst Sangkulirang – Mangkalihat

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## ABSTRACT

This study aims to determine the diversity of fern vegetation in the Sangkulirang- Mangkalihat karst area of Berau and East Kutai Regency. The research was carried out for two months in six locations. The plotting method used the purposive sampling method, with a plot size of 10 m x 10 m as many as 15 at each location. The research location of the karst area of Sangkulirang – Mangkalihat was found 4,871 individuals from 55 species, 39 genera, and 23 families. The most abundant species is *Selaginella willdenowii* (Desv. ex Poir.) Baker. Diversity Index ( $H'$ ) was ranging from 1.37 to 2.36. Dominance Index (C) in all research locations closed to 0, so it can be said that there were no dominant species in each location. Evenness Index (e) in Biatan Ulu was more than 0.96, while other locations were more than 0.51. Similarity Index (ISs) in all study locations was less than 50%, so it means that all species in each location are different.

**Keywords:** Karst, Fern, *Selaginella willdenowii*

## 1. INTRODUCTION

Karst forests that grow on rocks are limestone containing calcium carbonate or calcite which is easily dissolved by rainwater, which led to the formation of cracks and tunnels that resembled relief forming morphology. Typical causes of karst forests are that the appearance became more specific than other forests and the exchange of cations that are higher than the soil in the lowland forests [1]. One species of biodiversity of flora in Indonesia is ferns [2], a homosporous plant that can live easily on a wide variety of habitats and anywhere either an epiphyte terrestrial epiphyte, terrestrial as well as in water [3].

## 2. METHODS

The research was carried out for two months in 6 locations. The plotting method is done using the purposive sampling method, with a plot size of 10 x 10 m as many as 15 at each location.

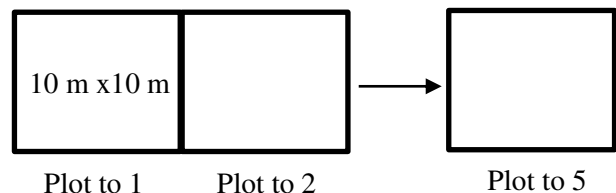


Figure 1. The Scheme of Making Plots.

## 3. RESULTS AND DISCUSSION

### 3.1. Species Diversity and Density

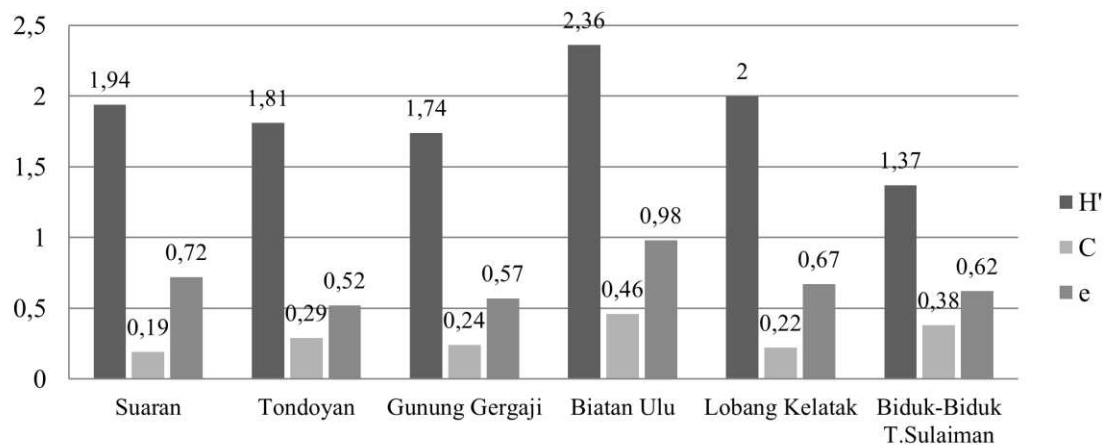
The individual number of ferns found in the whole plot location in the Sangkulirang karst area – Mangkalihat was 4,871 individuals from 55 species, 39 genera, and 23 families. The most abundant species was *Selaginella willdenowii* (Desv. ex Poir.) Baker. Furthermore, the number of individual fern species found is indicated in Table 1.

### 3.2. Diversity ( $H'$ ), Dominance (C), and Equity (e) Index

The result of the calculation of the diversity index ( $H'$ ), dominance index (C), and equity index (e)

**Table 1.** Ferns in Sangkulirang Mangkalihat - Karst Area

Location	Individual	Species	Family
Suaran	200	15	8
Tondoyan	2405	32	18
Gunung Gergaji	1355	20	14
Biatan Ulu	358	12	7
Lobang Kelatak	448	19	11
Biduk-Biduk – Teluk Sulaiman	113	9	6



**Figure 2** The diversity index ( $H'$ ), dominance index ( $C$ ) and equity index ( $e$ )

Limestone Mountain Forest area in the Sangkulirang - Mangkalihat can be seen in Figure 2.

From Figure 2, the value diversity ( $H'$ ) in Suaran was 1.94, Tondoyan was 1.81, Gunung Gergaji was 1.74, Biatan Ulu was 2.36, Lobang Kelatak was 2.00, and Biduk-Biduk – Teluk Sulaiman was 1.37. Index Dominance ( $C$ ) in Suaran was 0.19, Tondoyan was 0.29, Gunung Gergaji was 0.24, Biatan Ulu was 0.46, Lobang Kelatak was 0.22, and Biduk-Biduk – Teluk Sulaiman was 0.38. Value Equity ( $e$ ) of Suaran was 0.72, Tondoyan was 0.52, Gunung Gergaji was 0.57, Biatan Ulu was 0.98, Lobang Kelatak was 0.67, and Biduk-Biduk – Teluk-Sulaiman was 0.63.

### 3.3 Similarity index (ISs)

The Similarity Index (ISs) of Limestone Mountain Forest Sangkulirang - Mangkalihat can be seen in Table 2. From Table 3, Index Similarity (ISs) between Suaran and Tondoyan was 32.33%, Lobang Kelatak and Biduk-Biduk – Teluk Sulaiman was 9.6%. The similarities on all location research were not equal, between 9.6-32.33%.

## 5. CONCLUSIONS

- The individual number of ferns in the karst area Sangkulirang – Mangkalihat was 4871 individuals from 55 species, 39 genera, and 23 families. The most abundant species was *Selaginella willdenowii* (Desv. ex Poir.) Baker.
- The value of diversity index ( $H'$ ) of ferns in the karst area of Sangkulirang–Mangkalihat can tell that diversity in all locations did not exist.
- The value of dominance index ( $C$ ) ferns karst area in the Sangkulirang – Mangkalihat on all research locations did not reach one, so it can be said that there are no dominant species in each location.
- Index value equity ( $e$ ) of ferns in the karst area of Sangkulirang – Mangkalihat was only distributed pertained evenly in Biatan Ulu, showing the species' stability at that location.
- The value of the index of similarity (ISs) of ferns in the karst area of Sangkulirang - Mangkalihat has an index value of 50%.

**Table 2.** The result of calculation of Similarity Index (ISs)

Location	ISs					
Suaran	-					
Tondoyan	32.33	-				
Gunung Gergaji	21.67	21.77	-			
Biatan Ulu	11.93	11.58	11.48	-		
Lobang Kelatak	20.80	20.65	20.76	21.27	-	
Biduk2 - T. Sulaiaman	9,53	9.32	9.38	10.09	9.6	-
Iss	Suaran	Tondoyan	Gunung Gergaji	Biatan Ulu	Lobang Kelatak	Biduk2 – T. Sulaiman

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No	Scientif Name	Family	N
1	<i>Adiantum</i> sp.	Pteridaceae	13
2	<i>Antrophyum</i> sp.	Pteridaceae	3
3	<i>Antrophyum callifolium</i> Blume	Pteridaceae	92
4	<i>Antrophyum parvulum</i> Blume	Pteridaceae	7
5	<i>Antrophyum semicostatum</i> Blume	Pteridaceae	55
6	<i>Asplenium batuense</i> Alderw.	Aspleniaceae	5
7	<i>Asplenium nidus</i> L.	Aspleniaceae	20
8	<i>Asplenium robustum</i> Blume	Aspleniaceae	20
9	<i>Asplenium squamulatum</i> Blume	Aspleniaceae	40
10	<i>Bolbitis</i> sp.	Dryopteridaceae	239
11	<i>Bolbitis heteroclita</i> (C. Presl) Ching	Dryopteridaceae	9
12	<i>Cyclopeltis</i> sp.	Lomariopsidaceae	6
13	<i>Cyclopeltis semicordata</i> (Sw.) J. Sm.	Lomariopsidaceae	209
14	<i>Doryopteris ludens</i> (Wall. ex Hook.) J. Sm.	Pteridaceae	2
15	<i>Drynaria sparsisora</i> (Desv.) T. Moore	Polypodiaceae	160
16	<i>Heterogonium pinnatum</i> (Copel.) Holttum	Tectariaceae	671
17	<i>Lepisorus longifolius</i> (Blume) Holttum	Polypodiaceae	1
18	<i>Lygodium</i> sp.	Lygodiaceae	1
19	<i>Lygodium circinnatum</i> (Burm. f.) Sw.	Lygodiaceae	478
20	<i>Lygodium longifolium</i> (Willd.) Sw.	Lygodiaceae	4
21	<i>Mesophlebion motleyanum</i> (Hook.) Holttum	Thelypteridaceae	3
22	<i>Microlepia</i> sp.	Dennstaedtiaceae	1
23	<i>Nephrolepis cordifolia</i> (L.) C. Presl	Nephrolepidaceae	6
24	<i>Nephrolepis radicans</i> (Burm.) Kuhn	Nephrolepidaceae	182
25	<i>Nephrolepis</i> sp.	Nephrolepidaceae	1
26	<i>Pleocnemia conjugata</i> (Blume) C. Presl	Tectariaceae	2
27	<i>Pronephrium</i> sp.	Thelypteridaceae	33
28	<i>Pronephrium triphyllum</i> (Sw.) Holttum	Thelypteridaceae	46
29	<i>Pteridium</i> sp.	Dennstaedtiaceae	51
30	<i>Pteris</i> sp.	Pteridaceae	11
31	<i>Pteris ensiformis</i> Burm. f.	Pteridaceae	1
32	<i>Pyrrosia angustata</i> (Sw.) Ching	Polypodiaceae	1
33	<i>Selaginella</i> sp.	Selaginellaceae	3
34	<i>Selaginella intermedia</i> Spring	Selaginellaceae	22
35	<i>Selaginella willdenowii</i> (Desv. ex Poir.) Baker	Selaginellaceae	1771
36	<i>Sp 14</i>	-	8
37	<i>Sp1</i>	-	1
38	<i>Sp10</i>	-	5
39	<i>Sp11</i>	-	1
40	<i>Sp12</i>	-	1
41	<i>Sp13</i>	-	1
42	<i>Sp 2</i>	-	2
43	<i>Sp 3</i>	-	1
44	<i>Sp 4</i>	-	292
45	<i>Sp 5</i>	-	2
46	<i>Sp 6</i>	-	26
47	<i>Sp 7</i>	-	1
48	<i>Sp 8</i>	-	1
49	<i>Sp 9</i>	-	2
50	<i>Sphaerostephanos heterocarpus</i> (Blume) Holttum	Thelypteridaceae	6
51	<i>Tectaria</i> sp.	Tectariaceae	262
52	<i>Tectaria crenata</i> Cav.	Tectariaceae	2
53	<i>Thelypteris curta</i> (Christ) C.F. Reed	Thelypteridaceae	7
54	<i>Thelypteris simulata</i> (Davenp.) Nieuwl.	Thelypteridaceae	78
55	<i>Vittaria</i> sp.	Pteridaceae	11