

**ELEVATIONAL PATTERNS AND DISTRIBUTION OF
FERNS ON MOUNT TRUS MADI**



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ABSTRACT

This study examined the ferns species richness patterns along elevational gradient of Mount Trus Madi (2642 m a.s.l.), the second highest mountain in Malaysia. Sampling of ferns and environmental variables were carried out in 15 research plots (20 m x 20 m) along the northwestern slope of the mountain. A total of 58 species of ferns were recorded within the research plots: 11 species were recorded at 1000 m a.s.l., 18 at 1400 m a.s.l., 29 at 1800 m a.s.l., 23 at 2200 m a.s.l. and 14 at 2600 m a.s.l. Out of these, 35 species were categorized as epiphytes, 24 species as terrestrials and one species as facultative epiphyte. In addition, another 12 species were randomly collected outside the plots, and thus, excluded from any statistical analysis. Dendrogram derived from a cluster analysis of the 15 research plots indicated that there were two major clusters of ferns, defined as low- and high-elevation assemblages. Overall, the species accumulation curve has reached the asymptote. Based on the Locally Weighted Sum of Square (LOESS) and quadratic polynomial regression analysis, both categories (terrestrial and epiphyte) and epiphytic ferns showed pronounced and statistically significant hump-shaped pattern of species richness, maximized at 1800 m a.s.l and declining towards both ends of the mountain. Inversely, terrestrial ferns showed a statistically significant decreasing pattern of species richness. Permutation tests showed that the distributions of terrestrial and epiphytic ferns were significantly related to four environmental variables: elevation, forest canopy cover, temperature and relative humidity. The cumulative percentage of explained variance of species-environmental variables relationship for the first two Canonical Correspondence Analysis (CCA) axes was 78.11% for epiphytes and 75.59% for terrestrials. These figures indicated that the two-dimensional CCA map is sufficient to analyze the multivariate relationship between ferns species and environmental variables. The outcome of this study had shed light on fern species richness pattern along elevational gradients of Mount Trus Madi. Furthermore, it could be incorporated in the conservation management of the Nuluhon Trusmadi Forest Reserve or other tropical mountain ecosystems.

ABSTRAK

CORAK KETINGGIAN DAN TABURAN PAKU PAKIS DI GUNUNG TRUS MADI

Kajian ini meneliti corak kekayaan spesies paku pakis di sepanjang cerun ketinggian Gunung Trus Madi (2642 m d.p.l.), gunung kedua tertinggi di Malaysia. Persampelan paku pakis dan pemboleh ubah alam sekitar dilaksanakan dalam 15 plot kajian (20 m x 20 m) di sepanjang cerun barat laut gunung tersebut. Sejumlah 58 spesies paku pakis telah direkod dalam plot kajian: 11 spesies direkodkan pada ketinggian 1000 m d.p.l., 18 spesies pada 1400 m d.p.l., 29 spesies pada 1800 m d.p.l., 23 spesies pada 2200 m d.p.l. dan 14 spesies pada 2600 m d.p.l. Berdasarkan penemuan ini, 35 spesies dikategorikan sebagai epifit, 24 spesies sebagai daratan dan satu spesies sebagai fakultatif epifit. Sebagai tambahan, sejumlah 12 spesies telah dikutip secara rawak di luar plot kajian dan dikecualikan dari sebarang analisis statistik. Dendrogram yang dihasilkan dari analisis kluster untuk 15 plot kajian menunjukkan bahawa terdapat dua kluster utama paku pakis iaitu, kumpulan tanah rendah dan kumpulan tanah tinggi. Secara keseluruhan, keluk pengumpulan spesies mencapai garis asimptot. Berdasarkan analisis locally weighted sum of square (LOEES) dan regresi polynomial kuadratik, kedua-dua kategori paku pakis (epifit dan daratan) menunjukkan corak kekayaan spesies 'hump-shaped' yang ketara dan signifikan. Kekayaan spesies adalah maksimum pada ketinggian 1800 m d.p.l. dan berkurangan apabila menghampiri kaki gunung dan puncak gunung. Sebaliknya, kekayaan spesies paku pakis daratan berkurangan di sepanjang cerun ketinggian gunung serta corak kekayaan spesies tersebut adalah signifikan. Analisis pilih-aturnya menunjukkan sebaran paku pakis daratan dan paku pakis epifit adalah berkait rapat secara signifikan dengan empat pemboleh ubah alam sekitar iaitu ketinggian, litupan kanopi hutan, suhu dan kelembapan relatif. Peratus kumulatif varians hubungan di antara spesies dan pemboleh ubah alam sekitar untuk dua paksi Canonical Correspondence Analysis (CCA) yang pertama adalah 78.11% untuk paku pakis epifit dan 75.59% untuk paku pakis daratan. Angka tersebut menunjukkan bahawa peta dua dimensi CCA adalah mencukupi untuk menganalisis hubungan multivariat di antara paku pakis dan pemboleh ubah alam sekitar. Dapatan kajian ini telah memberi kefahaman mendalam terhadap corak kekayaan spesies paku pakis di sepanjang cerun ketinggian Gunung Trus Madi. Malahan, ia boleh digunakan dalam pengurusan pemuliharaan Hutan Simpan Nuluhon Trusmadi atau ekosistem gunung tropika yang lain.