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Keanekaragaman Fungsional dan Kesehatan Hutan Mangrove di Kawasan Taman Nasional Karimunjawa Pulau Karimunjawa-Kemujan
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KEANEKARAGAMAN FUNGSIONAL DAN KESEHATAN HUTAN MANGROVE DI KAWASAN TAMAN NASIONAL KARIMUNJAWA PULAU KARIMUNJAWA-KEMUJAN

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INTISARI

Ekosistem mangrove memiliki peran krusial dalam mitigasi perubahan iklim, perlindungan garis pantai serta *blue carbon*. Penelitian ini bertujuan untuk memetakan sebaran spasial kondisi kesehatan hutan mangrove menggunakan pendekatan *Mangrove Health Index* (MHI), mengetahui variasi struktur komunitas mangrove, serta mengetahui variasi struktur dan karakter fungsional komunitas mangrove pada berbagai kondisi kesehatan yang berbeda di kawasan hutan mangrove Taman Nasional Karimunjawa Pulau Karimunjawa-Kemujan.

Pemetaan kesehatan hutan mangrove dianalisis dengan formula MHI menggunakan citra *Sentinel-2* melalui *Google Earth Engine* (GEE). Variasi struktur komunitas mangrove diperoleh melalui inventarisasi lapangan mencakup pengukuran jumlah individu, diameter batang (DBH), dan tinggi pohon, serta penilaian kelompok fungsional seperti adaptasi salinitas, tipe propagul, tipe perakaran, luas daun, dan tinggi maksimum. *Community-Weighted Mean* (CWM) dignakan untuk menggambarkan dominasi karakter fungsional komunitas. Perbedaan komposisi karakter fungsional komunitas dianalisis menggunakan Uji *Kruskal-Wallis* dan Uji *Dunn Test Benferroni* untuk mengetahui perbedaan antar kelas kesehatan.

Sebanyak 84,04% luas kawasan hutan mangrove di Taman Nasional Karimunjawa Pulau Karimunjawa-Kemujan berkategori sangat baik (*Excellent*), 14,99% luas kawasan berkategori sedang (*Moderate*), dan 0,97% luas kawasan hutan berkategori buruk (*Poor*) dengan *Overal Accuracy* sebesar 87,88%. Variasi karakter fungsional menunjukkan bahwa pada kelas kesehatan buruk mangrove melakukan konvergensi karakter untuk bertahan hidup, sedangkan pada area yang sehat, keanekaragaman karakter menjamin keberlangsungan jasa ekosistem. Terdapat perbedaan signifikan pada nilai fungsional komunitas tingkat adaptasi terhadap salinitas rendah (*p-value* = 0,002), tipe propagul vivipar (*p-value* = 0,017), luas daun (*p-value* = 0,00015), dan tinggi maksimum pohon (*p-value* = 0,00003) antar kelas MHI. Komposisi fungsional komunitas mangrove memengaruhi tingkat kesehatan komunitas melalui karakter fungsionalnya.

Kata Kunci: *Mangrove Health Index* (MHI*), Community-Weighted Mean* (CWM), Karakter Fungsional (*Traits*).

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FUNCTIONAL DIVERSITY AND MANGROVE FOREST HEALTH OF THE KARIMUNJAWA NATIONAL PARK, KARIMUNJAWA-KEMUJAN ISLANDS

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ABSTRACT

Mangrove ecosystems play a crucial role in climate change mitigation, coastal protection, and blue carbon storage. This study aims to map the spatial distribution of mangrove forest health conditions using the Mangrove Health Index (MHI) approach, determine the variation in mangrove community structure, and assess the variation in the structural and functional traits of mangrove communities across different health conditions in the mangrove forest area of Karimunjawa National Park, Karimunjawa-Kemujan Islands.

The mapping of mangrove forest health was analyzed with the MHI formula using Sentinel-2 imagery through Google Earth Engine (GEE). Variations in mangrove community structure were obtained through field inventory, which included measuring the number of individuals, diameter at breast height (DBH), and tree height, as well as assessing functional groups such as salinity adaptation, propagule type, root type, leaf area, and maximum height. Community-Weighted Mean (CWM) was used to describe the dominance of community functional traits. Differences in the composition of community functional traits were analyzed using the Kruskal-Wallis test and Dunn's test with Bonferroni correction to determine differences between health classes.

A total of 84.04% of the mangrove forest area in Karimunjawa National Park, Karimunjawa-Kemujan Islands, was categorized as excellent, 14.99% as moderate, and 0.97% as poor, with an overall accuracy of 87.88%. Variations in functional traits indicated that in the poor health class, mangroves undergo trait convergence to survive, whereas in healthy areas, trait diversity ensures the sustainability of ecosystem services. There were significant differences in the community functional values regarding the adaptation level to low salinity ($p = .002$), viviparous propagule type ($p = .017$), leaf area ($p = .00015$), and maximum tree height ($p = .00003$) across MHI classes. The functional composition of the mangrove community influences its overall health level through these functional traits.

Keywords: Mangrove Health Index (MHI), Community-Weighted Mean (CWM), Functional Traits.

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