Review of: "A Quantitative Analysis of Co-occurrence Matrices in Ecological Systems: Measuring Connectance and Entropy"

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Potential competing interests: No potential competing interests to declare.

The paper, **"A Quantitative Analysis of Co-occurrence Matrices in Ecological Systems: Measuring Connectance and Entropy,"** presents a thorough analysis of co-occurrence matrices and graphs, covering various metrics and methods for studying ecological networks.

The author introduces negentropy formulas specifically designed for co-occurrence matrices, providing a new perspective on analyzing ecological communities. This approach aims to quantify connections between ecological components more effectively than traditional diversity indices or single vector analyses.

The paper demonstrates strong mathematical foundations in its approach to co-occurrence analysis, combining concepts from information theory and ecology to provide a unique analytical framework. Statistical methods, such as Pearson correlation coefficients and ranking procedures, are used to validate the proposed metrics.

The author compares matrix and graph representations of co-occurrence data, highlighting differences in parameter correlations and redundancy.

However, some issues should be resolved.

- Concepts like the evenness of eigenvalues and nested similarity indices are introduced without sufficient explanation for readers unfamiliar with graph theory and matrix analysis. The study appears to be based on a limited dataset, which may limit the generalization of its findings.
- The author addresses the challenges in interpreting entropy measures for co-occurrence matrices compared to single vectors, but they do not fully explore the potential limitations. Also, the paper does not discuss alternative analytical approaches, making it difficult to assess the robustness of the proposed metrics.
- More ecological examples are needed to demonstrate how these measures of entropy and negentropy show the species interactions or ecosystem properties. There is also a lack of discussion on the implications of matrix size and sparsity for different ecological datasets.
- The paper presents strong mathematical foundations and introduces a novel approach to co-occurrence analysis, but it falls short in connecting the theoretical developments to real-world ecological systems.

Therefore, addressing the above-mentioned limitations, such as by providing more ecological interpretation and

demonstrating practical applications, would significantly enhance the impact and relevance of this work for ecologists and conservation biologists.