

Relationship between Taxonomic Distinctness and Environmental Stress in Terrestrial Organisms at Large Spatial Scale: a Study for Insect family Ceratopogonidae in East Asia

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Abstract: It is generally believed that the series of taxonomic distinctness diversity indices are able to reflect natural ecological gradients and environmental stress on marine and freshwater ecosystems. However, whether the indices are also applicable to terrestrial organisms has not been investigated so far. In the present study, 899 Ceratopogonidae species occurred in 281 counties of China were carefully collected and checked. The program Vegan in R environment is used to calculate average taxonomic distinctness and variation in taxonomic distinctness. Correlation and regression analysis are performed to correlate both indices to environmental factors and find out the dominant variables in explaining the spatial patterns of the two indices. 19 environmental variables including geographic, climatic, topographic and anthropogenic ones are used. The results indicate that, basically, both indices are weakly linked to environmental gradients at large spatial terrestrial scale. They are positively correlated with species richness, which become the most important factor in explaining the variability of the indices at terrestrial context compared to other environmental factors. Average taxonomic distinctness is negatively correlated to latitude, while variation in taxonomic distinctness is negatively related to longitude. Therefore the change of taxonomic distinctness might detect natural ecological gradients in terrestrial ecosystems to some extent. Both indices are not associated with human related factors-human building lands density and human population density, therefore taxonomic distinctness might not reflect environmental disturbance caused by human activities. However, before achieving a final consensus, further studies on other terrestrial taxonomies are necessary.

Key words: biodiversity monitoring, correlation and regression analysis, East Asia, environmental stress, taxonomic distinctness