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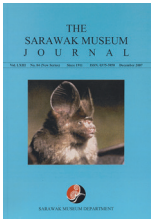

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PATTERNS OF AVIFAUNA DISTRIBUTION EAST AND WEST OF WALLACE'S LINE

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ABSTRACT

The aim of this study was to compare the patterns of avifaunal distribution in the Wallacea, Sunda and Sahul Shelf. The geographical distribution of avifauna species, genera and families were grouped into various regions. The subregions and island included in this study were Thailand, Peninsular Malaysia, Sumatra, Borneo, Java, Bali, Lombok, Sulawesi, the Philippines and New Guinea. Jaccard Similarity Index (Cj= j/a+b+j)was used to analyse the avifauna distribution data. The indices were then subjected to a hierarchical cluster analysis using Unweighted Pair-group Method (UPGMA) in Multivariate Statistical Package (MVSP) Ver 3.13n programme to classify the avifauna distribution into discrete groups. The results of this study broadly support the avifaunal distribution predicted by the glacial biogeographic model. Together, the results show gradual diversification of avifauna when the sea levels were lower and continued until the present sea level. However, the classic transition lines, such as Wallace's Line, proposed that avifaunal divergence tends to occur predominantly at justone stage (Stage Four,or maximum glaciation, in Wallace's case). Our analyses suggest that avifaunal divergence has occurred in an ongoing fashion across all glacial stages. This could be seen from the differences among families correspond to the late glaciation (Stage Three) and differences among genera to early glaciation (Stage One), while differences among species to the middle glaciation (Stage Two). Presumably this is why the exact position of transition lines has been so controversial. Analyses at different levels inevitably identify different positions.

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INTRODUCTION

Biogeographic theory suggests that both historical and contemporary mechanisms may influence the processes of faunal speciation, extinction, immigration and emigration (Platnik, 1981; Graves and Gotelli, 1983; Karr, 1990). In Sundaland (the Malay Peninsula, Sumatra, Java, and Borneo), for example, historical changes in the climatic conditions are thought to have exerted a great influence on vegetation types in this region during Pleistocene glacial periods (Platnick, 1981; Graves and Gotelli, 1983; Karr, 1990). For instance, it has been speculated that during glacial periods sea levels and annual rainfall dropped to a level approximately 30% below present values, and resulting emergent land areas connecting the current landmasses were dominated by 'savanna-like' habitat (Verstappen, 1975). Such massive changes are predicted to have played a dominant role in modifying faunal composition and geographic ranges of species in the Southeast Asian region.

Biogeographic theories have traditionally been examined by way of analyzing the geographic distribution of the extant species (Platnick, 1981; Cracraft, 1982). The unique faunal composition of the Indo-Malayan and Indo-Australian regions, which encompass the Sunda Shelf, the Sahul Shelf and clusters of islands in between these two shelves, usually termed as Wallacea, have traditionally been proven as an important venue for biogeographic studies because these regions are known to show huge transitions in faunal composition (Mayr, 1942). The classic example is that of the difference between Indo-Malayan and Indo-Australian zoogeographic regions, characterized by 'Wallace Line' (Wallace, 1860; Mayr, 1944; Groves, 1984).

The current pattern of avifauna distribution is predicted to be congruent with the proposed landbridges, corridors or dispersal routes in relation to the physical splitting of once continuous area of distribution by the processes of continental drift and changes in sea levels during glaciations. The sequence and timing of connections between the present Sunda and Wallacea islands can be deduced from bathymetric data (Heaney, 1984; Heaney, 1986; Ruedi, 1996). Based