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KUALA BELALONG, BRUNEI: A HOTSPOT OF OLD WORLD BUTTERFLY DIVERSITY

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ABSTRACT.– Butterflies were sampled extensively over a two year period in an area, approximately 1 km² in extent, of lowland mixed dipterocarp forest in Brunei, N.W. Borneo. A total of 342 species were recorded, and from the species accumulation curve the total number of species present in the area was estimated to be 464, or nearly half the total Bornean fauna. With respect to the Bornean total, Papilionidae and Pieridae were proportionally better represented than Nymphalidae, Hesperiidae or Lycaenidae, a result which is probably partly a function of sampling bias, but may also reflect a more general distribution of species of the first two families. Of 151 commoner species, 80 were restricted in their distribution within the area, in some cases to very small areas of a few hundred m². When species recorded in this study and published records for the surrounding Ulu Temburong region (up to 2000m asl) were combined and compared with species lists for Gunung Mulu National Park, Sarawak (50 km distant), and Mount Kinabalu National Park, Sabah (200 km distant), slightly greater similarities were found between Temburong and Mulu, than Temburong and Kinabalu. Combining the species lists for the three areas leads to a total of 666 recorded species, or two thirds of the Bornean total, suggesting that ultimately almost all Bornean species could be found in these three areas.

KEY WORDS: Borneo, distribution, Hesperiidae, Lycaenidae, Malaysia, New Guinea, Nymphalidae, Oriental, Papilionidae, Pieridae, Riodinidae, Sabah, Sarawak, Southeast Asia, species-richness.

Borneo supports a butterfly fauna of almost 1000 species, largely shared with other parts of the Sundaland plate, including Java, Sumatra and Peninsular Malaysia (Corbet and Pendlebury, 1992; Otsuka, 1988; Otsuka, 1991a, 1991b). The island is characterized by a range of habitats suitable for butterflies, including four distinct lowland forest types (mixed dipterocarp forest, tropical heath, peat swamp forest and mangrove; Whitmore, 1984), and extensive areas of montane vegetation at higher altitudes, (ranging from lower montane oak-laurel forest to alpine heath in the uppermost zone; Corner, 1978). However, present evidence suggests that the broad variation in available habitat types contributes relatively little to butterfly species diversity, most of which is concentrated in lowland mixed dipterocarp forest, and to a lesser extent, in hill dipterocarp forest up to 1500 m. Other lowland forest types have mainly a diluted version of this core fauna (Holloway, 1984; Cassidy, 1985; Orr, unpublished data). The montane fauna is also relatively depauperate (Barlow *et al.*, 1971; Holloway, 1978), especially when compared with the rich high altitude fauna of New Guinea, the nearest comparable area of extensive tropical highlands.

Given that dipterocarp forest is known to exhibit substantial floristic heterogeneity owing to edaphic and topographic factors (Ashton, 1964), it is of interest to know the extent to which species may be concentrated within a single habitat type, and also the scale at which diversity is maintained within a habitat, and how this relates to overall patterns of species richness. It is of particular interest to know if all mixed dipterocarp forests support a roughly uniform diversity of butterflies, or if diversity is concentrated in particular areas of high floristic and or topographic heterogeneity. The forests of North Borneo, generally identifed as a global hotspot for all flora and fauna (Wilson, 1992), are under particular threat, and outside a limited system of national parks, almost all communities are vulnerable in the long term. Information on geographic patterns of species richness is therefore needed to provide benchmark data needed for planning conservation strategies which aim to preserve maximal diversity.

AREA AND METHODS

The Kuala Belalong Field Study Centre (KBFSC) was established in 1990 in the Batu Apoi forest reserve in the Temburong district of the tiny oil-rich sultanate of Brunei. The total area of protected forest within the reserve is around 1000 km² and ranges in elevation from just above sea level to peaks reaching 2000m on the periphery. The research station is located in primary mixed dipterocarp forest on the Belalong river at an elevation of about 60m asl (Fig. 8), and is flanked by ridges rising sharply to 300m asl. Mean annual rainfall for the area is about 4500mm and seasonality is not marked. The lowland forest has one of the highest tree species diversities ever measured (Ashton, 1964; Whitmore, 1984) and the dominant emergents are among the tallest rainforest trees in the world. Within this area we investigated the butterfly fauna over a period of more than two years within an area of approximately one km², centred on the research station (Fig. 1). General features of the area are described in Cranbrook and Edwards (1994).

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