



Macrohabitat Characteristics and Distribution Hotspots of Endemic Bird Species in Taiwan

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ABSTRACT: Understanding species distributions is essential for developing biodiversity conservation strategies. We combined two bird inventories conducted from 1993 to 2004 and identified specific features of 17 endemic bird species in Taiwan. We used eight environmental variables, including elevation, annual total precipitation, annual mean temperature, warmth index, percentage of forest cover, mean Normalized Difference Vegetation Index (NDVI), percentage of building area, and road density, to define macrohabitat characteristics of each species. All the data were in a 1×1 km grid system. The 17 species were classified as common (being present in more than 200 grids), uncommon (100–200 grids) or rare (less than 100 grids). The Mikado Pheasant (*Syrnaticus mikado*), as a rare species, had the lowest occurrence records, while the Taiwan Barbet (*Megalaima nuchalis*), as a common species, had the highest. Each species had a specific distribution range and habitat preference. These 17 species occupied heterogeneous elevation and climatic conditions. In general, they favored habitats with high vegetation cover, at almost full forest cover and median to high NDVI. Canonical correspondence analysis (CCA) indicated that elevation had the highest correlations with species distributions, with axis 1 accounting for 57.5% of the variation and axis 2 for 9.8%. The endemic species in Taiwan could be classified into three groups mainly separated by elevation based on the CCA. Potential biodiversity hotspots, in the elevation range of 300 and 1500 m with 45%–100% forest cover, included 33.2% areas of Taiwan. Only 35% of actual hotspots (grid with the number of endemic species ≥ 7) were located in the potential hotspots. Most of the actual hotspots (65%) occur at higher elevation than the potential hotspots. These data demonstrated the distribution patterns of the endemic bird species in Taiwan, and topography and vegetation are the most important macrohabitat factors associated with these species.

KEY WORDS: biodiversity inventory, macrohabitat, canonical correspondence analysis, endemic bird species, biodiversity hotspot.

INTRODUCTION

Understanding the relationship between a species and its environment provides the foundations for biodiversity conservation. This information provides the basis for early stage conservation programs and can help in the development of possible solutions to specific conservation issues (Goldsmith, 1991; Thomas, 1996; Watson, 2005). Many studies have indicated that qualities of habitats are critical factors affecting the abundance and distribution of species (Harrison and Quinn, 1989; Kindvall, 1996; Franken and Hik, 2004; Armstrong, 2005; Schooley and Branch, 2007). High-quality habitats can not only provide a species with a stable living space in which to maintain its population, but also enable a declining species to recover. In contrast, an unsuitable habitat compromises the survival of a species. By understanding environmental features affecting species distribution, we can determine the preference of a species for a particular habitat, and how it uses that habitat. We could then apply this knowledge to design adequate conservation strategies.

Endemic species are often found in isolated geographical units, such as islands or isolated eco-regions (Gaston, 1994). Because of their limited geographic ranges, endemic species often require specific environments for maintaining healthy populations (Lamoreux et al., 2006; Malcolm et al., 2006). Thus, the identification and conservation of specific habitats are critical issues for conserving endemic species.

Taiwan is located at the junction of the tropical and sub-tropical zones, and thus has diverse ecological environments. Among 560 bird species recorded in Taiwan, 15 are endemic, according to the 6th edition of Clements Checklist of the Birds of the World (Clements et al., 2007). Recent studies by Li et al., (2006) and Feinstein et al. (2008) indicated that two additional species, the Taiwan Barbet (*Megalaima nuchalis*) and Taiwan Hwamei (*Harrulax taewanus*), should be included as endemic. Overall, the number of endemic bird species in Taiwan is one of the highest (*i.e.* a hotspot) in the greater China region (Lei et al., 2003).

This study analyzed distribution patterns of the 17 Taiwanese endemic bird species using data from bird