STATUS, DISTRIBUTION AND ECOLOGY OF THE GREY-HEADED BULBUL *PYCNONOTUS PRIOCEPHALUS* IN THE WESTERN GHATS, INDIA

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Summary

The Western Ghats of peninsular India is one of the globally important ecoregions harbouring some of the finest rainforests of the world. This mountain ranges host more than 507 species of birds including several endemics and restricted-range species. Little is known, however, about the ecology and conservation status of many species. Habitat loss and fragmentation due to human activities are the major threats to the restricted-range birds of the Western Ghats. Their narrow habitat requirements, particularly during the breeding season, are yet another possible important factor causing their decline. Hence, evaluation of their basic ecological requirements, particularly their selectivity to microhabitats during breeding is of significant value while formulating conservation programme for these species.

The Grey-headed Bulbul *Pycnonotus priocephalus* is a poorly known endemic to the Western Ghats. This restricted range species has a very limited distribution in the heavy rainfall areas in the hills along the south-western side of India from Belgaum and Goa to Kanyakumari. Observations, including both sightings and collections of Grey-headed Bulbul are very few from 1869 to 2002. It was reported as "fairly common but rather local". However, the recent surveys do not show them 'common' in any of the areas covered. This indicates a decline in population probably due to habitat loss and fragmentation.

Based on the above background a detailed study was carried out to assess the status and distribution of Grey-headed Bulbul in the Western Ghats with respect to altitude and habitat and, to explore the habitat selection, foraging ecology and breeding biology of the species to identify key factors affecting its long- term conservation.

Intensive field surveys were carried out between February 2002 and January 2004 at 24 sites across the Western Ghats to assess the status of the target species. The ecology of the species was studied in the relatively undisturbed tropical wet evergreen forests in the Silent Valley National Park ($11^{°}$ 00' and $11^{°}$ 15' N, $76^{°}$ 15' and $76^{°}$ 35' E) and Muthikkulam Reserved Forest ($10^{°}$ 56' and $10^{°}$ 59' N, $76^{°}$ 41' and $76^{°}$ 45' E) between September 2002 and May 2005.

The results of the status survey suggest that Grey-headed Bulbul is a rare species; with an average encounter rate of 0.19 birds/km. They were recorded from the evergreen, moist deciduous and scrub forests with significant abundance (0.33 birds/km) in the low-

elevation evergreen forests. There were no records of the species from the plantations, *shola* forests and montane grasslands. Maximum number of Grey-headed Bulbul sightings was from the elevations between 700–1,100 m. Even though breeding Grey-headed Bulbul was restricted to the evergreen forests, they were also recorded from the moist deciduous and scrub forests during the nonbreeding season. The results of the univariate analysis show that habitat type, elevation and the vegetation structure have potential influence on the occurrence of Grey-headed Bulbul. The step-wise logistic regression analysis identified canopy cover, shrub cover, ground cover and presence of water as the major predictors of species occurrence during the breeding season; and canopy cover, sub-canopy cover and vegetation types as predictors of the non-breeding season. Grey-headed Bulbuls were not seen in the areas with wood cutting, mining and other anthropogenic pressures. Seasonal variations in the occurrence and abundance were recorded at Silent Valley and surrounding forests. These variations were possibly due to the seasonal migration of the species which in turn associated with the scarcity in fruits and adverse climatic conditions.

The habitat selection process of Grey-headed Bulbul and the competitive interactions with co-existing Yellow-browed Bulbul were examined at Silent Valley National Park and surrounding areas. The univariate and multivariate analyses revealed the non-random habitat selection of Grey-headed Bulbul at all the spatial scales examined. Both meso-scale (0.04 ha) and micro-scale (0.008 ha) vegetation components were important factors influencing habitat selection of Grey-headed Bulbul. During the breeding season, Grey-headed bulbuls foraged in areas dominated by the sub-canopy trees bearing fruits. The high shrub densities in the reed or *Strobilanthes* patches were significant for nesting site selection. Despite the high resource overlap between Grey-headed and Yellow-browed Bulbuls, the ecological separation was clear in terms of the nest sites. Grey-headed Bulbul possibly overrides the competition for the nesting resources with Yellow-browed Bulbul and indirect factors affecting the fitness by selecting two different microhabitats. This asserts the significance of habitat conservation especially the areas with reed patches for breeding, since nesting in the *Strobilanthes* patches are constrained by biotic factors.

The foraging behaviour, phenology of the food plants and morphological characteristics of the fruits devoured by Grey-headed bulbuls were examined by using standard methods. The foraging maneuvers and food handling techniques were adaptive and

based on the type of food resources. They used least energy expensive methods for food procurements and handling. Grey-headed Bulbuls showed significant variations in their foraging behaviour during different stages of breeding; presumably an adaptive behavioural mechanism to cope with their energetic constraints and predation risks. They actively participated in the mixed-hunting flocks during the non-breeding season. General fruiting phenology at Silent Valley shows a bimodal pattern which is typical to the evergreen forests of Southern Western Ghats. On the other hand, the fruiting pattern of 25 major fruit plants of bulbul has shown a uni-model pattern which coincides with the breeding season of the species. The lack of keystone species and strict seasonality of preferred fruit plants create resource scarcity for Grey-headed Bulbul. This lean period of food coupled with adverse climatic conditions leads to the local migration of the species. The number of fruits available for Grey-headed Bulbul is constrained by its specialization in fruit choice in terms of size, colour, seed size and other physical traits. They avoided green and yellow fruits and larger dry fruits. The patchy distribution of Grey-headed Bulbul was associated with the clumped distribution of food resources within the evergreen habitats. The local migratory behaviour of Grey-headed Bulbul has particular conservation concern because most of the existing protected areas in the Southern Western Ghats are in the mid or higher elevations, and the habitats in the lower elevations remain un-protected. Therefore, lower areas adjoining the existing National Parks and Wildlife Sanctuaries need to be protected for the effective conservation of Grey-headed Bulbul and other altitudinal migrant bird species; and other fauna of the low elevations.

Breeding seasonality, nesting site, nest structure and placement; clutch size, brood size, nesting chronology, nest success and parental care of Grey-headed Bulbul were documented by following standard methods during 2003 to 2005. Breeding season of Grey-headed Bulbul which is confined to the drier months was influenced by the fruit abundance and rainfall. The nest sites of Grey-headed Bulbuls were associated with the reed and *Strobilanthes* patches in the mid-elevation evergreen forests. High competition for nesting substrates with Yellow-browed Bulbul and other species belongs to the same nesting guild leads Grey-headed Bulbul to breed in these two different microhabitats. The architecture of the nests varied, apparently, based on the microhabitat. These architectural variations could be an adaptive phenotypic plasticity evolved to improve the fitness and may have arisen from

multiple interacting factors such as differential micro-habitat use to avoid inter-specific competition and predation pressure. The breeding phenology of the species was similar to the patterns recorded in other bulbuls. Nest survival in Grey-headed Bulbul is comparatively lower than that of several threatened species. Meso- and micro scale nest-site characteristics around the nest did not significantly affect nest survival rates. High predation rates could mostly be attributed to the high diversity and abundance of potential nest predators. Grey-headed Bulbul adopted differential parental investment strategies during the incubation and nestling period in response to the varying predation pressure.

The results show that the restricted range, patchiness in occurrence, low population density, local migratory behaviour as a response to the resource scarcity and adverse climatic conditions; nest site limitations due to interspecific competition, low nesting success, high predation pressure; and distinct ecological requirements during breeding and non-breeding seasons of Grey-headed Bulbul make it extremely vulnerable to the habitat loss and fragmentation. The study also highlights the importance of reed patches and the low- and mid-elevation evergreen forests for the long-term survival of Grey-headed Bulbul. And, most such habitats are outside the protected areas. Therefore, formulation of a sustainable reed extraction scheme and filling the gaps in the existing Protected Area network, especially the addition of low elevation forests is necessary for the effective conservation and management of Grey-headed Bulbul. Moreover, Grey-headed Bulbul may be included under the "Vulnerable" category of the IUCN owing to its patchiness in occurrence, low population density and habitat loss.