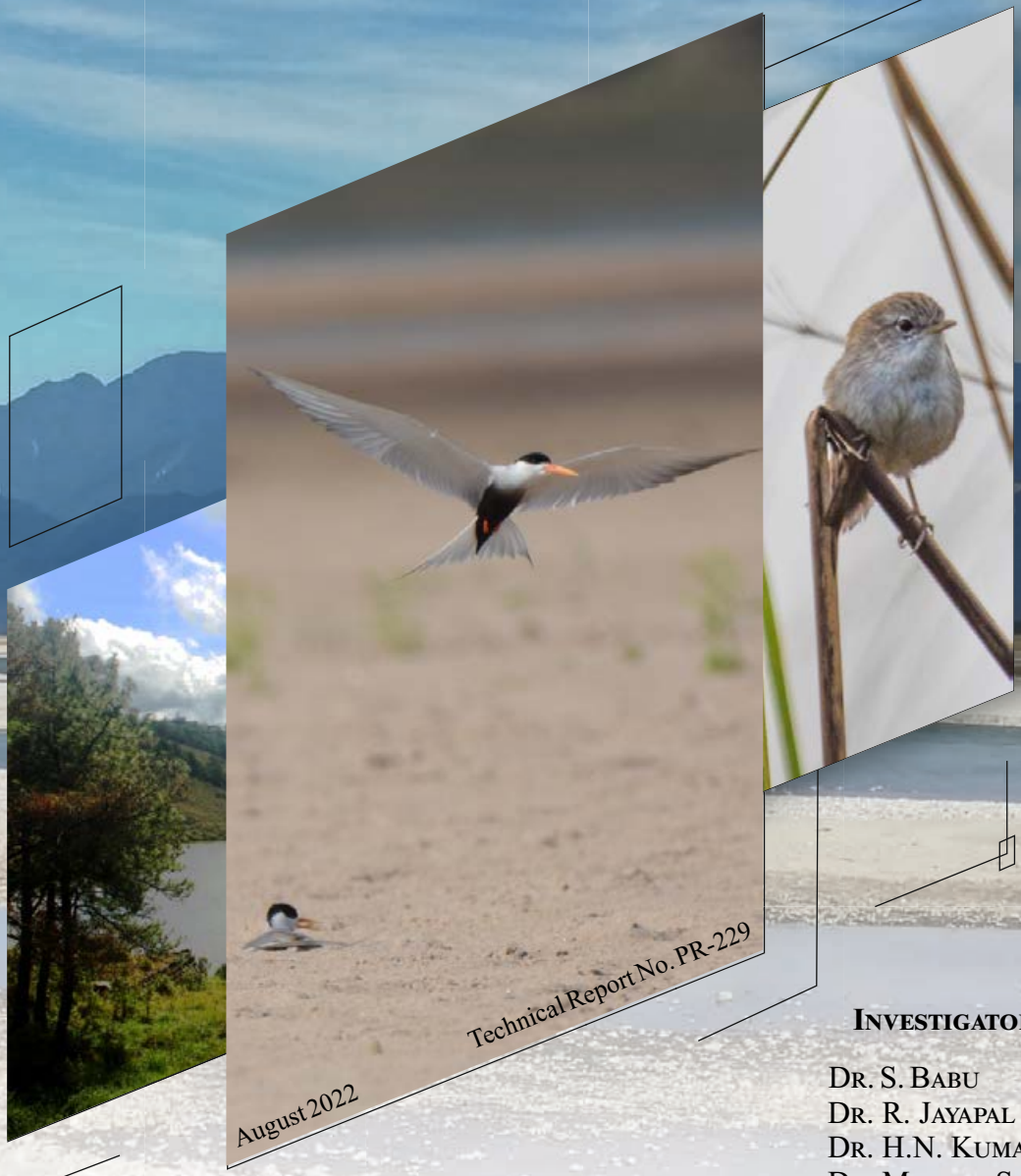
Assessing the distribution, population and habitat use of three endangered species to develop conservation plan for species and their habitats



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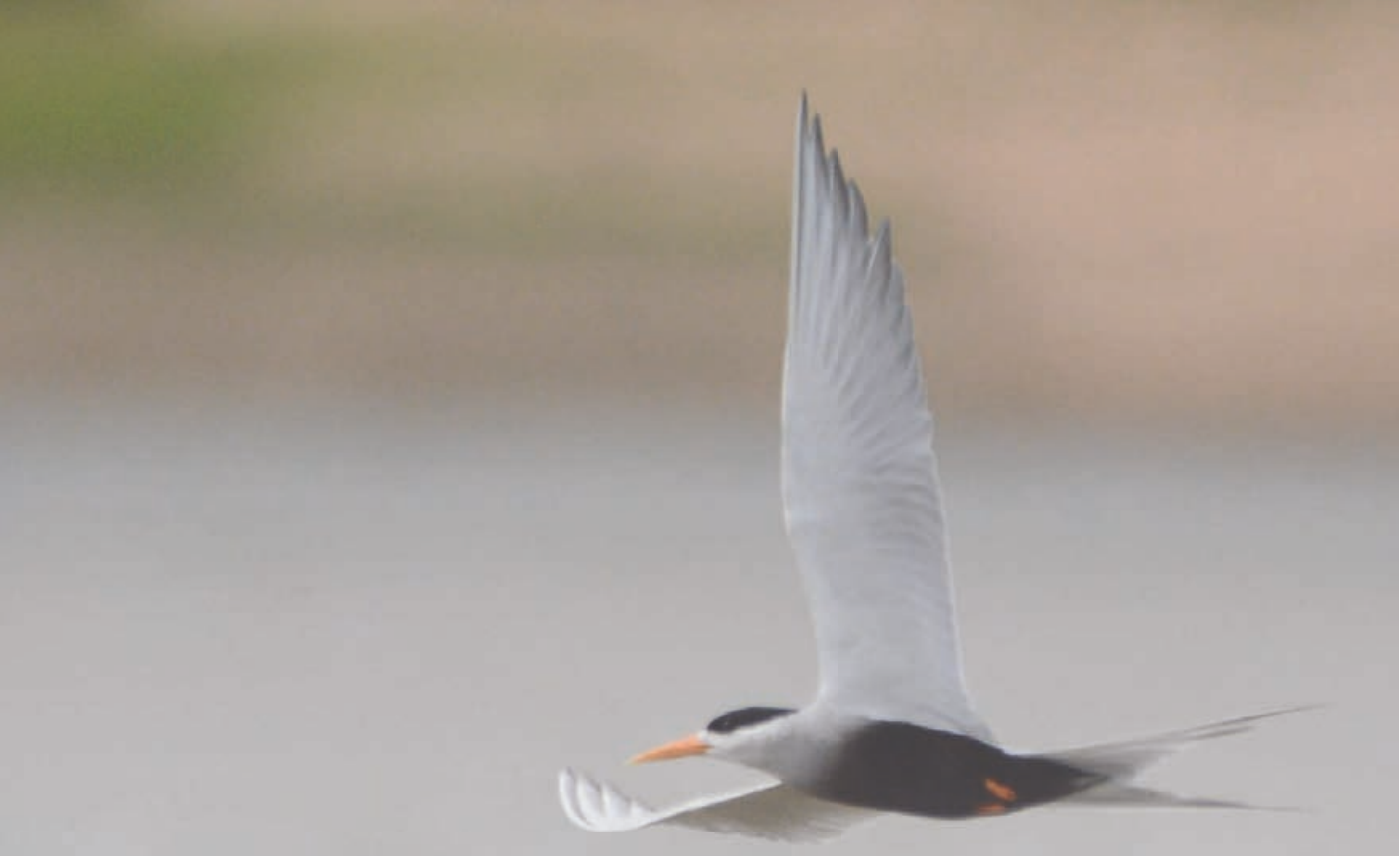

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Executive Summary

The first and foremost step in any conservation activity is to prioritize critical areas where the species is performing well with its population and protect those areas before the species disappears. However, many less charismatic but threatened species have received little attention from conservationists. Prioritization of habitats has not been done hitherto for most of the threatened birds in India. In this context, a study was initiated to assess the population and habitat use of three endangered but less charismatic species' namely Black-bellied Tern, Manipur Bush-quail and Swamp Grass-babbler. The objectives were 1) To elucidate the distribution pattern, abundance, and habitat use of three globally endangered species of India, and 2) To identify anthropogenic pressures that limit the species and to develop a conservation plan for the protection of the species and their habitats.

For the Black-bellied Tern (BBT), an occupancy framework was used to identify determinants of occupancy (both biotic and abiotic factors). Select Indian rivers were divided into several segments of 2 km length and further divided those segments into four 500 m sub-segments to obtain spatial replicates to estimate the detection probability and occupancy of terns. Within each sub-segment, the presence-absence of terns and the site and sampling covariates that may influence occupancy and detection probability of terns were recorded. Thirteen rivers representing different biogeographic zones of India were studied. Nest searches were also conducted in selected rivers. For Swamp Grass-babbler, all grasslands in the Brahmaputra River were mapped using satellite images prior to the survey. Swamp Grass-babblers and other threatened grass land species were recorded at 586 points using audio lure point count method along the river Brahmaputra. Various site covariates (including anthropogenic threats) were measured at all point count stations to elucidate factors influencing species occurrence. For Manipur Bush-quail (MBQ), all grasslands were mapped in Manipur state, camera traps were set, questionnaire survey among hunters was done, and call counts were

made. Due to difficulties in executing the project in the interior parts of Manipur state, the work could not be carried out as expected. However, based on the results and observations, threats to the population of these species were assessed and mitigation measures were suggested to manage them properly.

Totally four species of terns (Black-bellied Tern, River Tern, Whiskered Tern and Little Tern) were recorded during the survey in 13 rivers. Out of the thirteen rivers surveyed, BBT was recorded in only seven rivers and significant population of BBT was recorded in only five rivers. In terms of abundance, the highest abundance (birds/segment) of BBT was recorded from the central Indian rivers namely Chambal, Mahanadi and Brahmani. However, the population of BBT was low in South Indian rivers namely Tungabhadra, Godavari, Cauvery and Bharathapuzha. Despite previous records of BBT from Yamuna and Brahmaputra, it could not recorded during our survey. This may be due to time of sampling and rarity of BBT in these rivers. High abundance of BBT in central Indian rivers may be due to year-round water availability and relatively low anthropogenic pressures on these rivers. Although factors influencing the occupancy of BBT varied among rivers, some variables consistently influenced the occupancy of BBT across rivers with high model weights and model-averaged beta coefficients. Among them, elevation, number of sandbars, extent of sand area, water spread area and water turbidity determine occupancy of BBT in all rivers analyzed. It can be concluded that BBT occupy river stretches that are found in low elevation/plains with large extent of sand, sandbars, water and less turbid water.

Audio lured point count was conducted in 586 locations along the river, but grass-babbler was recorded only in 63-point count station with an encounter rate and mean abundance of 0.11 sightings/ point and 0.15 birds/point respectively. Encounter rate of Jerdon's Babbler was the highest followed by Swamp Grass-babbler and Black-breasted Parrotbill. Mean abundance of Swamp Grass-babbler was relatively lower than the Jerdon's Babbler and Black-breasted parrotbill but higher than Marsh Babbler. Grass-babbler was recorded frequently from D'Ering Wildlife Sanctuary, Kaziranga National Park and Dibru-Saikhowa National Park. Other than these protected areas, grass-babbler was also reported from non-PA grasslands along the Brahmaputra River. On the whole, the occurrence of Swamp Grass-babbler in a point count station was influenced by the percentage of bare land, grass richness, average grass height, grazing intensity, and distance to woodland. Except for the percentage of bare land, all the variables had positive influence on the occurrence of Grass-babbler *i.e.,* Grass-babbler occupied area that had a small proportion of bare land with relatively tall grasses and moderate grazing and away from the woodland. Grass-babbler's predicted suitable distribution was mostly contributed by normalized difference vegetation index (30%), dry bare soil index

(22.9%) and elevation (17.4%).

During the call count, seven species of Galliformes were recorded, including two globally threatened species, namely White-cheeked Hill Partridge and Blyth's Tragopan. Manipur Bush-quail was never heard calling during the survey. Based on questionnaire survey conducted in 43 villages, it is understood that an average of 12.48 ± 9.40 persons involved in hunting wild animals. Five villagers reported seeing Manipur Bush-quails from grassland or bushland while going for hunting and other purposes. The villages of Hengjang, Tsingtai Gullen and Barak reported sightings of Manipur Bush-quail from high grasslands, while villagers in Sarinabang and Tatbung reported riverine and bushland as Manipur Bush-quail's habitat. Similarly, they mentioned that they had not seen these birds for the past few years and had seen only the Manipur Bush-quail a few times in their lives. As expected, the predicted distribution of Manipur Bush-quail was higher in Manipur and Assam, but an unexpectedly high proportion of suitable sites were also found in West Bengal. Most of the potential areas of Manipur Bush-quail were predicted over cropland, cropland/natural vegetation mosaics and savanna types. This species prefers low altitude forests *i.e.,* forests below 1000 m as most of the areas (99.9%) were in lower altitudes of Northeast India. Loktak, Trishna WLS and Buxa TR have suitable areas of Manipur Bush-quail to a large extent.

Major threats to populations of BBT in studied rivers and other freshwater systems in India can be brought under five categories: 1. Water and aggregate extraction (varying sizes of sand and gravel); 2. Flooding of rivers due to dams and natural disasters (for example: cyclones); 3. Land use and land cover change along the river basin; 4. Other anthropogenic driving factors (waste dumping, pilgrimage activities and tourism attract large numbers of human-associated predators – crow, kite and dog; occasional poaching, trampling by livestock); and 5. Pollution from industrial and agricultural fields along rivers. Anthropogenic threats that cause or alter the grassland structure and composition can directly affect the Swamp Grass-babbler and other grassland-associated birds. For example, threats that increase bare cover and wood lands might directly affect the grassland birds. Alteration in flood-plain grasslands, grass extraction, fire and grazing alter grass height or create more bare cover. In addition, the increasing invasive shrubs and trees in the grasslands modify grasslands and increase woodland respectively. We provided suggestions to manage these threats for each of the species are made under respective chapters.