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First photographic evidence of the Great slaty woodpecker *Mulleripicus pulverulentus* (Temminck 1826) (Aves: Piciformes: Picidae) from Bhutan, with brief description of its habitat

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Abstract

The Great slaty woodpecker *Mulleripicus pulverulentus* (Temminck) is a globally threatened bird species and has been categorized as Vulnerable in the IUCN Red List of Threatened Species. We report the first photographic evidence of *M. pulverulentus* from Phibsoo Wildlife Sanctuary (PWS), Sarpang district, in the Himalayan Kingdom of Bhutan. A group, comprising five individuals, of *M. pulverulentus* was sighted opportunistically at the study location on 19 April 2022. We recorded the nesting cavities actively used by *M. pulverulentus* in the forest habitat dominated by Sal trees (*Shorea robusta*). This study highlights the significance of protecting lowland forests, and mature Sal stands in particular, for conservation of this globally threatened species of bird.

Key words: Conservation, nesting cavity, Phibsoo Wildlife Sanctuary, Sal forest

Avifauna diversity of Bhutan is currently represented by a total of 749 recognized species distributed among 352 genera, 92 families, and 20 orders (Lepage, 2022). Of which, the family Picidae (woodpeckers) is comprised of 21 species belonging to 14 genera.

Mulleripicus pulverulentus is a threatened woodpecker and is one of the largest woodpeckers in the world (Winkler et al., 2020). This species is listed as "Vulnerable" as it has suffered a rapid population decline over the past 20 years (three generations) due to the loss of primary forest cover throughout much of its range (BirdLife International, 2016), and in Nepal it is listed as "Endangered" (Bird Conservation Nepal, 2011).

Mulleripicus pulverulentus is widely distributed across the Indian sub-continent and South-East Asia, ranging from northern India through the foothills of the Himalayas to southern China, Nepal, Myanmar, Laos, Vietnam, Bhutan, Cambodia and Thailand, and through peninsular Malaysia and Singapore to the western islands of Indonesia and the Philippines (del Hoyo et al., 2002; Inskipp et al., 2011; Winkler et al., 1995; BirdLife International, 2016). However, the species is rare throughout this wide geographic range (Winkler et al., 1995).

In Bhutan, *M. pulverulentus* was included in "Checklist of birds of Bhutan" (Lepage, 2022), and according to Lammertink et al. (2009), its population estimate in 1985 was presumed to be around 2561 individuals based on forest cover trends. Similarly, BirdLife International (2016) also mentioned Bhutan as one of the distribution range countries for this species. However, these previous reports did not provide any information on habitat and type locality of *M. pulverulentus* in Bhutan. Although the aforementioned historical records suggest that *M. pulverulentus* is believed to occur in Bhutan, there has never been a preserved voucher specimen or photographic evidence to confirm the occurrences of *M. pulverulentus* in the

country. Herein, we validate the previous records by providing the first photographic evidence of *M. pulverulentus* from Bhutan.

Phibsoo Wildlife Sanctuary (PWS) is the smallest protected area in Bhutan with an area of only 286.83 sq. km. It encompasses Sarpang district to the east and Dagana district to the west. It is located in the Himalayan foothills of southern Bhutan, between 26°42' to 26°51' N latitude and 89°56' to 90°12' E longitude. The sanctuary's southern boundary follows the Indo-Bhutan international border with Ripu-Chirang Reserved Forest on the Indian side.

It is situated along the foothills and represents the subtropical landscape ecosystem of the country. Falling under the humid subtropical climate of the country, it experiences hot summers and cold winters. Its elevation ranges from 65 m a.s.l. to 1800 m a.s.l. PWS receives incessant summer rainfall and remains wet for the entire season while winter is often welcomed by drier and sunny weather.

PWS straddles the Indo-Malayan biogeographic realm and falls under the Subtropical zone with three broad categories of vegetation, namely: Sub-tropical semi-evergreen forest; Sub-tropical moist deciduous forest; and Sub-tropical moist evergreen forests. A significant proportion of its geographical area is represented by the sub-tropical moist deciduous forest, mostly consisting of Sal trees (*Shorea robusta*) which serve as important habitat for *M. pulverulentus* and other faunal diversity.

No particular survey method has been used to record this species. The bird was sighted opportunistically during the nationwide hornbill survey, for which, the point count method was adopted. A total of 40 observation points were identified along the 20 km predetermined line transect, starting from Themba to Phibsoo outpost, with a minimum distance between successive points of 500 m. The nationwide hornbill survey was organized by Ugyen Wangchuk Institute for Conservation and Research (UWICER), during the month of April 2022. On 19 April 2022, *M. pulverulentus* individuals were observed at (26°48'01.90" N; 90°10'56.44" E, and 337 m a.s.l) in Phibsoo Wildlife Sanctuary, Sarpang District, Bhutan.

Locality data, along with habitat information, were collected. Geo-location of species was recorded using a GPS (Global Positioning System) Garmin eTrex. The location map (Fig. 1) was produced using a GIS (Global Information System) tool after projecting the location of the bird following projected coordinated system (Drukreff 03 Bhutan). Photographs were taken using Nikon COOLPIX P900 (83x optical zoom) and NIKON D500 digital cameras. Following the observation, the photographs were closely analyzed and the observed species was confirmed as *M. pulverulentus* based on morphological diagnostic characters.

We sighted *M. pulverulentus* at a single location of the 40 predetermined observation points along the Themba-Phibsoo forest trek designated for the nationwide hornbill survey. On the 19th of April 2022, at 8:45 hours, we observed a single *M. pulverulentus* (Fig. 2) sitting on a Sal tree. A few minutes later, we heard a lot of vocal communication and contact calling from nearby trees. This was accompanied by the arrival of two more individuals (one male and one female) with a lot more vocalization. Subsequently, we documented the sightings with digital photographs and the sex of individuals was determined by verifying a few distinctive morphological features. For example, males have a red cheek patch, a dull yellow chin, and a chisel-shaped bill (Fig. 3), while females lack the red patch on the cheek, have a bright yellow chin and have a more slender bill (Fig. 4). Since there was limited time available for observing other natural history of the species, we abandoned the place and continued with the hornbill survey.

We revisited the area on 23 May 2022, and on this occasion we observed a single *M. pulverulentus* resting on a branch of a Sal tree in the same location. About 20 minutes later, four individuals appeared from the adjoining Sal forest. This group included four individuals, comprising two males and two females. We closely scanned the surrounding area and discovered five nest cavities, arranged in a vertical formation on a single False Hemp Tree (*Tetrameles nudiflora*) a few meters away from the location of the bird sighted. The nest holes were located at an approximate height of 25 m above the ground. This observation confirmed the existence of a breeding population in the area.

We stayed at the same location for an hour making close observations. We noticed frequent vocalization and movement of the birds around surrounding Sal stands. This was followed by visiting of the top-most cavity within time intervals of 10 to 15 minutes, alternatively by two individuals (Fig. 5). Subsequently, we found the remaining four lower cavities were not currently being used by the observed group of *M. pulverulentus*. Although the nesting location is dominated by natural Sal forest, we did not find any other nesting cavities in surrounding Sal trees. The observed habitat type of *M. pulverulentus* at this current location is sub-tropical moist deciduous forest, mostly consisting of Sal trees (Fig. 6). The contiguous vegetation consists of sparely distributed large *T. nudiflora* trees and other tree species in this landscape, particularly along the streams, including *Pterospermum acerifolium*, *Delinia indica*, *Bombax ceiba*, *Terminalia* sp., and *Syzygium formosum*.

Until recently, there had been insufficient evidence to ascertain the presence of *M. pulverulentus* in Bhutan. Our record of the bird from PWS at this crucial time not only contributes to the diversity of Bhutanese avifauna but also offers new scientific insight into the current knowledge about this species. With the present record of *M. pulverulentus*, PWS is now home to 418 recognized species of bird (PWS, 2022).

Our observations of the species at the Singye River Valley confirm that the species is breeding in PWS. However, the study suggests that *M. pulverulentus* is very rare in the survey area.

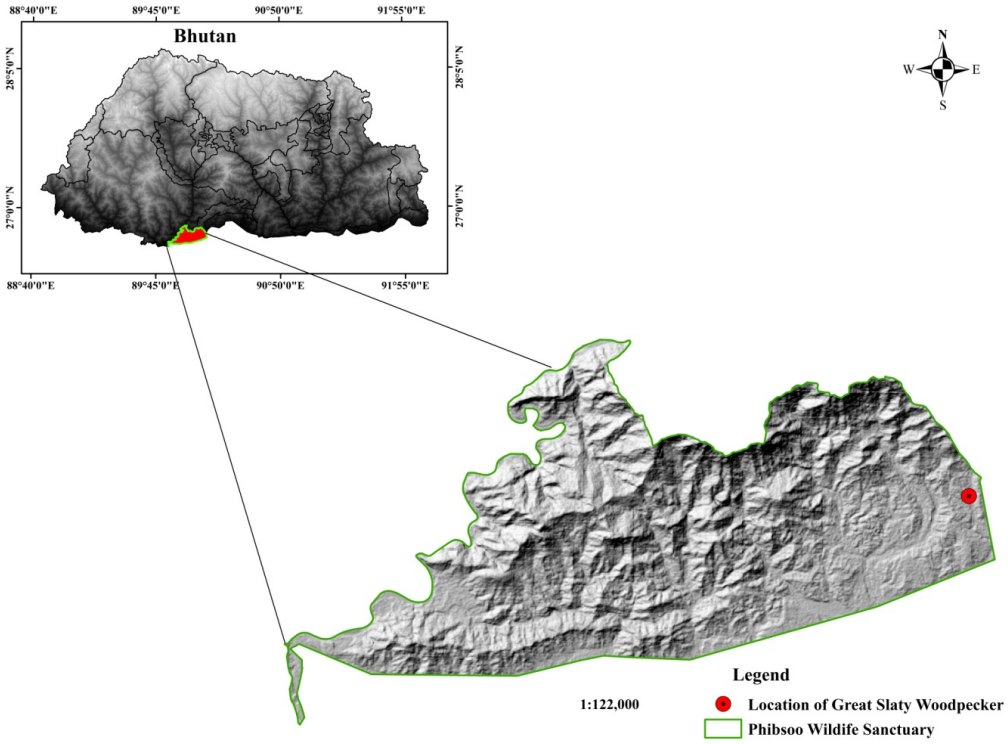

Figure 1: GIS maps of Bhutan and Phibsoo Wildlife Sanctuary, showing location of *Mulleripicus pulverulentus* sighting.

Figure 2: *Mulleripicus pulverulentus* (male) making contact calls. Photo by Namgay Dorji.

Figure 3: *Mulleripicus pulverulentus* (male) resting on a Sal tree. Photo by Bal Krishna Koirala.

Figure 4: *Mulleripicus pulverulentus* (female) inspecting the nest cavity. Photo by Thinley Wangchuk.

Figure 5: Nest cavity of *Mulleripicus pulverulentus* on *Tetrameles nudiflora.* Female leaving the nest cavity after arrival of male. Photo by Sonam Dorji.

Figure 6: Current habitat of *Mulleripicus pulverulentus* in the Phibsoo Wildlife Sanctuary. Sub-tropical moist deciduous forest, mostly consisting of Sal (*S. robusta*) and sparsely distributed *T. nudiflora* trees. Photo by Tashi Phuntsho.

In Bhutan, the present study suggests that *M. pulverulentus* prefers dipterocarp forest, particularly dominated by mature *S. robusta* trees. Our findings also reveal that large scattered trees and contiguous Sal forest seem to be suitable habitat for this species. Our observations of *M. pulverulentus* preferring habitat are similar to those of Ali and Ripley (1983), BirdLife International (2016), Winkler et al. (1995), Kumar and Shahabuddin (2012), and Pandey (2018), where the species is reported to prefer tall mature trees and contiguous Sal forest. According to Kumar and Shahabuddin (2012) and Kumar et al. (2011), the species is known to prefer matured Sal and Sain trees (*Terminalia alata*) for nest cavities. However, its association with mature *T. nudiflora* for excavating nest cavities in the present study highlights the importance of preserving some mature trees of this species within Sal forest habitat for the conservation of *M. pulverulentus*. Our observations of *M. pulverulentus* selecting *T. nudiflora* as cavity trees within Sal forest stands are a significant addition to the current knowledge about this species.

Although there is no adequate evidence to ascertain whether the species is facing survival threats at its present locality, elsewhere, the species is reported to be threatened by the decline of old-growth Sal forests. Protecting Sal forests, along with large, scattered trees appears to be vital for conservation of this species. Additionally, further studies on the population status, distribution, extent of suitable habitat, and natural history of *M. pulverulentus* would be very useful in conserving this species, as well as its critical habitat.

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Conflict of interest

All the authors declare that there are no conflicting issues related to this short communication.

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