

NOTES ON THE FOOD AND FEEDING HABITS OF RUFOUS-NECKED HORNBILL
ACEROS NIPALENSIS IN ZHEMGANG DISTRICT, BHUTAN¹

KARMA SHERUB² AND ARUN PRATAP SINGH^{3,*}

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²Faculty of Forest Science, College of Natural Resources, P.O. Lobesa, Punakha, Bhutan 14001.

Email: karmasherub3@gmail.com

³Forest Protection Division, Forest Research Institute, P.O. New Forest, Dehradun, Uttarakhand 248 006, India.

Email: ranoteaps@gmail.com

*Corresponding author

A study was carried out to assess the food and foraging behaviour of Rufous-necked Hornbill *Aceros nipalensis* in Zhemgang district, Bhutan, through incidental observations of feeding activity obtained while walking along trails, focal sampling observations, and from analysis of regurgitated seeds around nesting sites. Thirty-three species of fruits and a few invertebrates were observed being eaten by Rufous-necked Hornbill. Feeding occurred mostly from small branches (<75 mm diameter, 58.5%) and within 4–28 m above the ground. Active feeding in the non-breeding season usually occurred between 06:00–12:00 hrs and 15:00–17:00 hrs. Evidences of grazing and felling of fruiting tree calls for reinforcing conservation management in Zhemgang district.

INTRODUCTION

Hornbills are good indicators of the health of forests because they require large tracts of primary forest with large trees for nesting (Poonswad and Kemp 1993). Of the 33 species of hornbills that occur in Asia (Poonswad *et al*, 2013), Bhutan harbours four species: Wreathed

Hornbill *Rhyticeros undulatus*, Oriental Pied Hornbill *Anthracoceros albirostris*, Rufous-necked Hornbill *Aceros nipalensis* (hereafter RNH), and Great Hornbill *Buceros bicornis* (Clements 1992; Webster 2011). Globally, the Oriental Pied Hornbill is classified as Least Concern, the other three are Vulnerable (BirdLife International 2019).

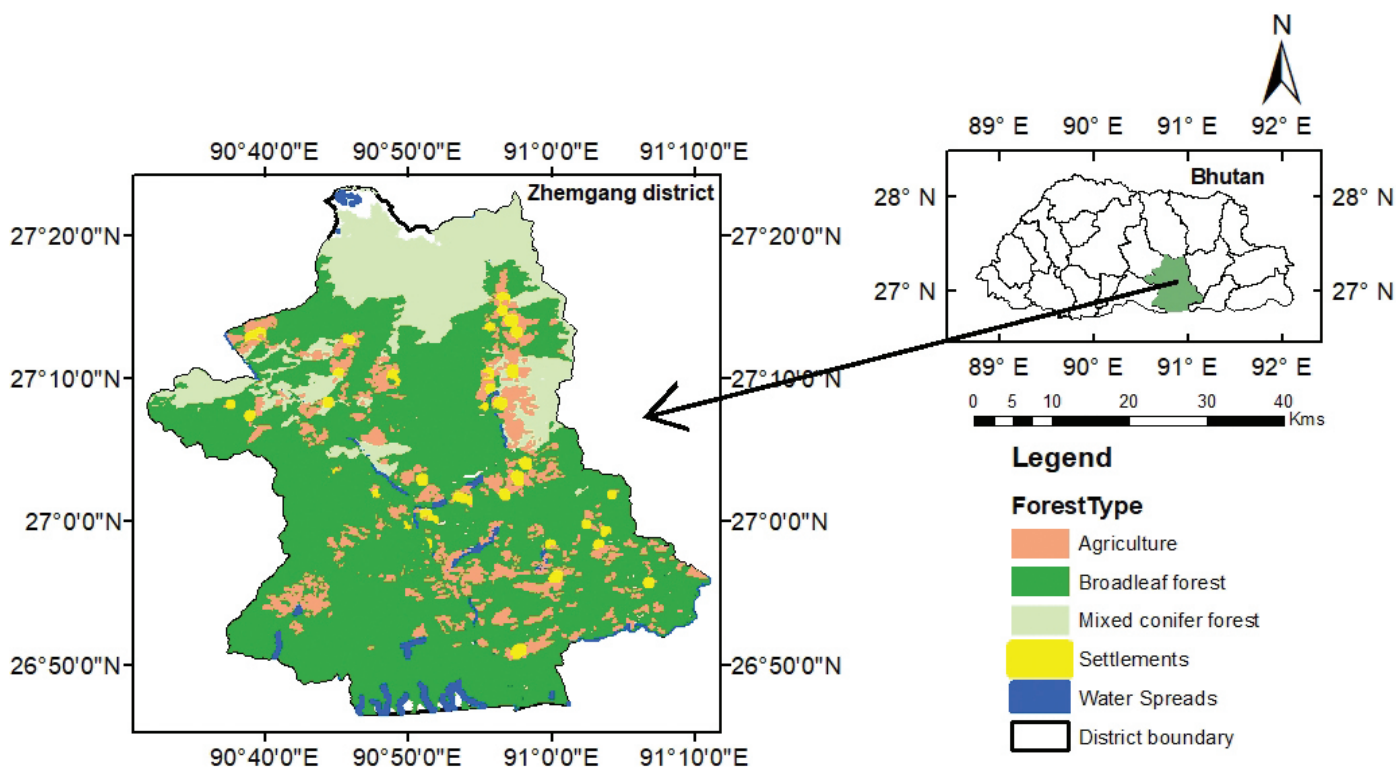


Fig. 1: Map of Bhutan showing the study area (Zhemgang district)

In Bhutan, RNH inhabits mature broadleaf forests, generally at altitudes of 150–2,200 m (Inskipp *et al.* 1999). It is listed as a protected species under Schedule I of the Forest and Nature Conservation Act 1995 of Bhutan, and is commonly found in the districts of Zhemgang, Trongsa, Mongar, Lhuentse, Trashigang, Samdrup Jongkhar, Tsirang, Sarpang (Dorji 2013; Penjore 2010), Dagana, Samtse, and Chhukha (K.S. pers. obs.). Earlier studies on the species in Bhutan dealt with its distribution, habitat characteristics, and nesting behaviour (Clements 1992; Dorji 2013; Sherub and

Tshering 2019). In our study in Zhemgang district of Bhutan, we focused on the food and feeding habits of RNH.

MATERIAL AND METHODS

Study Area

Zhemgang district (27.0770° N and 90.8294° E) is located in south Bhutan (Fig. 1), ranging in altitudes of less than 200 m in the south to over 2,000 m in the north. Most of its area falls under Protected Areas (Jigme Singye Wangchuck

Table 1: List of Species of fruits recorded in the diet of Rufous-necked Hornbill in Zhemgang district

S. No.	Family	Species	Habit	Fruit type and average size (length x width) in cm
1	Alangiaceae	<i>Alangium chinense</i>	Shrub	Drupe, 1 x 0.8
2	Anacardiaceae	<i>Choerospondias axillaris</i>	Tree	Drupe, 3 x 2
		<i>Mangifera sylvatica</i>	Tree	Drupe, 7 x 6
3	Burseraceae	<i>Canarium strictum</i>	Tree	Drupe, 3.5 x 1.5
4	Combretaceae	<i>Terminalia chebula</i>	Tree	Drupe, 4x 2.5
		<i>Terminalia</i> sp.	Tree	Drupe, 3.5 x 1.4
5	Daphniphyllaceae	<i>Daphniphyllum macropodum</i>	Shrub	Drupe, 1 x 1
6	Elaeocarpaceae	<i>Elaeocarpus lanceifolius</i>	Tree	Drupe, 5 x 3.6
7	Lauraceae	<i>Beilschmiedia assamica</i>	Tree	Drupe, 3.4 x 2.3
		<i>Beilschmiedia</i> sp.	Tree	Drupe, 3.8 x 3.3
		<i>Cryptocarya amygdalina</i>	Tree	Drupe, 2.6 x 1
		<i>Litsea</i> sp.	Tree	Drupe, 0.7 x 0.5
		<i>Litsea</i> sp.	Tree	Drupe, 0.5 x 0.3
		<i>Neocinnamomum caudatum</i>	Tree	Drupe, 1.7 x 0.8
		<i>Parasassafras confertiflorum</i>	Tree	Drupe, 0.6 x 0.4
		<i>Persea</i> sp.	Tree	Drupe, 3 x 2.2
		<i>Phoebe</i> sp.	Tree	Drupe, 1.2 x 0.7
8	Magnoliaceae	<i>Magnolia hodgsonii</i>	Tree	Follicle, 14 x 12.5
9	Meliaceae	<i>Aphanamixis polystachya</i>	Tree	Capsule, 3.3 x 3
		<i>Aglaiia lawii</i>	Tree	Capsule, 2 x 1.4
10	Moraceae	<i>Artocarpus lakoocha</i>	Tree	Fig, 15 x 12.5
		<i>Ficus benghalensis</i>	Tree	Fig, 1.5 x 1.4
		<i>F. benjamina</i>	Tree	Fig, 2.3 x 2
		<i>F. elastica</i>	Tree	Fig, 1.5 x 1.3
		<i>F. hederacea</i>	Climbing shrub	Fig, 1.5 x 1.4
		<i>F. hispida</i>	Tree	Fig, 2.8 x 3
		<i>F. hirta</i>	Shrub	Fig, 3 x 2.9
		<i>F. roxburghii</i>	Tree	Fig, 4.7 x 4.5
		<i>F. semicordata</i>	Tree	Fig, 2 x 1.8
		<i>Ficus</i> sp.	Tree	Fig, 1.8 x 2
11	Rhamnaceae	<i>Hovenia acerba</i>	Tree	Capsule/drupe, 0.6 x 0.5
12	Rosaceae	<i>Prunus</i> sp. (wild)	Tree	Drupe, 2.4 x 2
13	Salicaceae	<i>Casearia glomerata</i>	Tree	Capsule, 1.6 x 1.2

National Park (JSWNP) and Royal Manas National Park (RMNP). The topography is mostly rugged, dominated by warm broadleaf forests that are multi-storey, dense and with a high diversity and density of woody tree species.

Surveys and Sampling

Random trails within the study area, which ranged from 3–24 km, were walked during 2017 and 2018; total sampling effort was 361 km walked in 42 days. A lookout was kept for active nests, and incidental feeding activity observed (if any) was recorded during the surveys. More detailed data on diet and foraging behaviour were obtained by following and observing feeding individuals during the non-breeding season. Additionally, its diet composition was studied by examining regurgitated seeds at nesting sites during the breeding season from April to July in 2017.

Five perch types were categorized which was observed used by RNH while feeding, namely crown foliage, small branch (< 75 mm diameter), large branch (> 75 mm diameter) trunk and ground. Direct and indirect observations were made to investigate the foraging methods used, such as cracking, probing, hawking, plucking and snatching (Poonswad *et al.* 1998) and the heights at which the birds were feeds on fruits or prey items. One nest of RNH was continuously observed during the breeding season from 06:00–18:00 hrs over four days to study the food provisioning behaviour of the male RNH.

RESULTS AND DISCUSSION

RNH was recorded to feed on the fruits of 33 plant species (Table 1), besides a few species of invertebrates including beetles, bee larvae, caterpillars, freshwater crabs, and young of birds. As for foraging habits, RNH often fed on fruits while resting on a branch, or by clinging onto the foliage to reach the fruit. Most of the feeding was carried out on small branches (58.5% of records), followed by large branches (24.6%), and within the crown foliage (14.6); foraging on the trunk (1.8%) and ground (0.5%) were rare. On trees, the

birds fed within the height range of 4–28 m above the ground, but mostly within the range 8–16 m (54.8%).

Observations of the nest of RNH monitored from 06:00–18:00 hrs over four days during the breeding season (April–July) showed that the male fed the female 4–5 times in a day, spending about 30–75 seconds at the nest to do so. The earliest delivery was at 08:15 hrs and the last was at 17:17 hrs, irrespective of weather conditions. Intervals between visits ranged from 19 to 205 minutes. Active feeding in the non-breeding season usually occurred from 06:00–12:00 hrs and 15:00–17:00 hrs.

CONSERVATION ISSUES

RNH requires vast tracts of forests to survive (Datta 2009; Poonswad and Kemp 1993). Over the years, the threats of habitat loss and fragmentation have severely impacted the population of RNH, thus making it more significant for conservation attention (Mudappa and Raman 2009). The RNH habitat in our study area in Bhutan faces the threat of intense grazing, affecting the growth of fruiting tree saplings. Cutting of fruiting trees and large trees was another issue that threatens the survival of hornbill species as they are primarily fruit-eaters and require large trees for nesting.

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