Characteristics of hornbill nests in West Kalimantan, Indonesia

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Abstract

Hornbills are secondary cavity nesters that rely on naturally formed tree cavities to nest in. However, the nest availability is limited and can easily decline due to habitat degradation. This study describes the characteristics of trees and nest cavities used by four sympatric hornbill species in Kapuas Hulu, West Kalimantan. We used photographic measurements to estimate the nest entrance dimensions, and we also measured nest characteristics such as nest orientation, tree diameter, nest cavity height, nest position on the tree and cavity shapes. We found 18 nest cavities in use—one each by Bushy-crested and Rhinoceros Hornbills, four Wreathed Hornbill nests and 12 used by Black Hornbills. Trees belonging to the Dipterocarpaceae family were mainly used for nesting (83.3%) with an average diameter at breast height of 91.6 cm, an average tree height of 36 m, and a branch-free height of at least 8 m. Most nest cavities were located on the main trunk and had an elongated slit-shaped entrance, with dimensions ranging from 53.6 – 615.2 cm². The nest cavity height ranged from 2.8 – 29.1 m, and the orientation of the nest entrance varied from 62 – 346°, with Wreathed Hornbill nests being relatively more oriented to the east. Additionally, we found that the area of the nest cavity entrance increases with the weight of the hornbill. These findings provide valuable insights into the selection criteria of hornbills for nesting sites in the region, which can help inform conservation efforts to protect these unique birds and their habitats.

Keywords: Borneo, cavity nesting, *Anorrhinus galeritus*, *Anthracoceros malayanus*, *Buceros rhinoceros*, *Rhyticeros undulatus*

Introduction

There are eight species of hornbills in West Kalimantan out of 13 hornbill species found in Indonesia (Hadiprakarsa *et al.*, 2020a). All hornbills in West Kalimantan are protected by the Regulation of the Ministry of Environment and Forestry of the Republic of Indonesia (Kementerian Lingkungan Hidup Dan Kehutanan Republik Indonesia, 2018). The Helmeted Hornbill is classified as Critically Endangered (CR), while the Black Hornbill, Rhinoceros Hornbill, and Wreathed Hornbill are classified as Vulnerable (VU), and the Oriental Pied Hornbill is classified as Least Concern (LC) (IUCN, 2020). Several of these hornbill species are listed in CITES (Convention on International Trade in Endangered Species; CITES, 2022). The Helmeted Hornbill is listed in Appendix I, whereas the Black Hornbill, Rhinoceros Hornbill, Wreathed Hornbill, and

Oriental Pied Hornbill are listed in Appendix II (CITES, 2022).

Hornbills nest in naturally formed tree cavities. Natural tree cavities are formed through weathering and animal interventions (Poonswad *et al.*, 2013b). Large trees are often required for nesting which may have a very limited number of suitable cavities, and hornbills also cannot make their own nest cavity, therefore the level of competition is quite high (Poonswad *et al.*, 2013b). Inter-specific competition among hornbills for using nest cavities was 40%, with 78 conflicts occurring during the breeding season (Poonswad *et al.*, 2005). Damaged nests are also a factor in reducing the availability of suitable nesting cavities for breeding. Twenty six percent of the 106 nests that were occupied by hornbills had to be repaired in an earlier study (Poonswad *et al.*, 2005).

Several species of hornbills also have specific requirements in selecting nesting cavities (Sibarani *et al.*, 2020). The more hornbill species there are, the more varied the characteristics of nest selection become. Describing nest characteristics in locations with multiple species can help fill the knowledge gap on the specific nesting preferences of each species (Poonswad, 1995; Mudappa and Kannan, 1997; Datta and Rawat, 2004; Naniwadekar *et al.*, 2020). The availability of nesting cavities is a factor that influences hornbill populations (Utoyo *et al.*, 2017). Therefore, it is necessary to document and understand the characteristics of nest trees and the dimensions of the cavities used by different species of hornbills that occur sympatrically. In addition, while there have been several studies of hornbill nest site characteristics from South Asia and other parts of Southeast Asia, this is the first study that quantitatively describes nest site characteristics of several species of hornbills from Indonesia.

Methods

This research was conducted in the forests of Batu Lintang village. The data collection area included swamp heath forests, secondary forests, and lowland dipterocarp forests. Batu Lintang village is in Embaloh Hulu District, Kapuas Hulu Regency, West Kalimantan, Indonesia. Batu Lintang village (Fig. 1) has an area of 17,772 ha consisting of Pulan settlement covering 8,292 ha and Sungai Utik settlement which is a Customary Forest with an area of 9,480 ha (Kementrian Lingkungan Hidup Dan Kehutanan Republik Indonesia, 2020).

This research was conducted from February to March 2022 during the non-breeding period. Nest location data was collected through community interviews and Rangkong Indonesia's existing data. Data by the Rangkong Indonesia team was obtained through reports

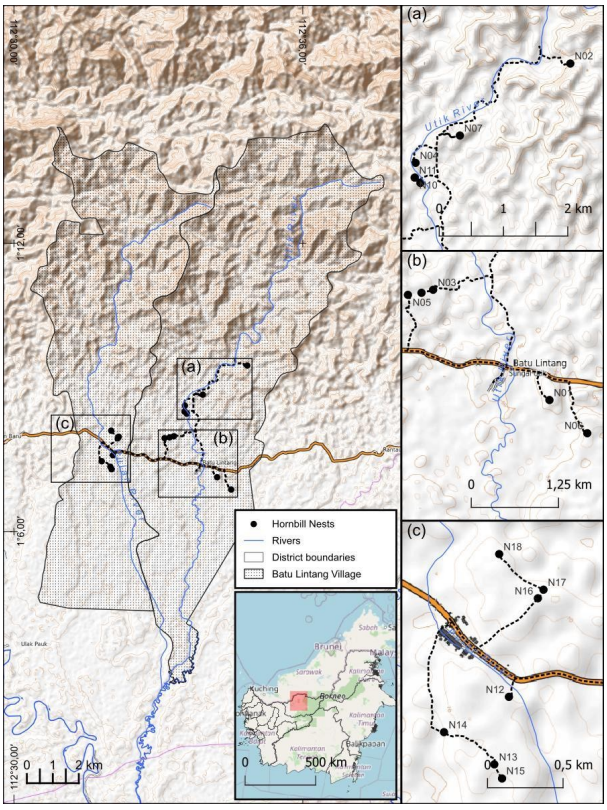

Fig. 1. Map of the study area in West Kalimantan, Indonesia.

from residents regarding the presence of nests, which were then confirmed in the field. This data remains opportunistic due to the unstructured and non-representative nature of the surveys, as nest data is limited to areas frequently visited by the community. Interviews were conducted with community members actively engaged in forest activities to gather information about hornbill activity and potential tree cavities for nests. After collecting information, community members were invited to confirm the tree cavities and profile the nest trees. Potential nest tree cavities were identified by food plant seedlings on the ground, smooth nest entrances, and signs of nest seals at the entrance. Nests were categorised as active when they have the potential to be occupied again by hornbills; inactive nests are those whose conditions do not allow them to be reused.

The tools we used to mark the nest trees included a GPS (Global Positioning System) handset to record location, a Phi-band or tape measure to measure DBH (diameter at breast height), and a compass to determine the orientation of the cavity entrance. Tree height was measured using a rangefinder Bushnell Trophy Xtreme, standing at the base of the tree and measuring to the top of the tree canopy, the height of the first branch was measured by aiming the rangefinder to the junction of the lowest branch attachment to the main trunk, and the nest height from the ground was measured by aiming the rangefinder to the lower edge of the nest entrance. We measured both the active nest trees that have been used by four out of the eight sympatric hornbill species for nesting and/or the inactive nests which have the potential to be reoccupied. The four focal hornbill species were the Bushy-crested Hornbill *Anorrhinus galeritus* (body weight: 933 – 1247 g; body length: 60 – 90 cm), Black Hornbill *Anthracoceros malayanus* (633 – 1050 g; 60 – 80 cm), Wreathed Hornbill *Rhyticeros undulatus* (2685 – 3650 g; 100 – 117 cm) and Rhinoceros Hornbill *Buceros rhinoceros* (2330 – 3000 g; 79 – 90 cm).

We measured the tree characteristics and the cavity dimensions (Table 1). Estimates of the height and width of the nest entrance were calculated using the formula from Fulton (2020) with several adaptations of the Poonswad (1995) formula by adjusting the type of camera (canon 1200d), sensor size, lens focal length, and distance between the camera and the nest cavity. The modification was considered given the existence of new tools such as rangefinders and DSLR cameras. Measurement of 35 mm film rolls and objects on film in mm units in the Poonswad (1995) formula was replaced by camera sensor sizes and objects in mm and pixels with the Image J 1.53f application (Fig. 2).

$$\textbf{Object height on sensor (mm)} = \frac{B'(\text{mm}) \times L'(\text{pixels})}{B'(\text{pixels})}$$

$$\textbf{Object width on sensor (mm)} = \frac{C'(\text{mm}) \times W'(\text{pixels})}{C'(\text{pixels})}$$

$$\mathbf{L} = \frac{D' \times \text{Object height on sensor (mm)}}{FL}$$

$$\mathbf{W} = \frac{D' \times \text{Object width on sensor (mm)}}{FL}$$

(formula modification Fulton, 2020)

$$\mathbf{EL1} = L - l$$

$$\mathbf{EL2} = (L - l)/L$$

$$\mathbf{EW1} = W - w$$

$$\mathbf{EW2} = (W - w)/W$$

Notation: L = Real Object height (cm), l = Scaled nest entrance height photo (cm), W = Real object width (cm), w = Scaled nest entrance width photo (cm), C' = Sensor width, B' = Sensor height, L' = Object height (pixel), W' = Object width (pixel), D' = Distance to object (cm), FL = Focal Length (mm).

The nest entrance error formula is the difference between the estimated nest entrance measurement using the formula and the measurement using a scale photograph. EL1 = Error calculating the height of the entrance to the nest (cm), EL2 = Error calculating the height of the entrance to the nest (%), EW1 = Error calculating the width of the entrance to the nest (cm), EW2 = Error calculating the width of the entrance to the nest (%). All data were compiled and analysed using Microsoft Excel. The data were analysed descriptively, by comparing results in this study with the others.

Table 1. Data variables measured at the nest tree.

Variable	Description
Nest Tree	
Tree species	The species of nest tree[a]
Diameter at breast height (cm)	Measurement of diameter at breast height of tree nests[a]
Tree height (m)	Measured from ground level[a]
Nest cavity height (m)	Measured from ground level[a]
Height of first branch (m)	Measured from ground level[a]
Nest entrance	
Nest entrance width (cm)	Measurement estimation by photographs[b]
Nest entrance height (cm)	Measurement estimation by photographs[b]
Nest entrance area(cm^2)	width x height[a]
Nesting Cavity Parameters	
Nest entrance orientation (°)	Directly measured[d]
Nest shape	Round is the ratio of the width and height of the nest entrance <1/2, Oval is the ratio of the width and height of the nest entrance = 1/2, Slit is the ratio of the width and height of the nest entrance > 1/2[c]
Nest entrance position	Main Trunk, Primary, Secondary or Tertiary Branch[e]

[a] Rahayuningsih et al. (2017), [b] Poonswad (1995), [c] Poonswad (2012), [d] Sibarani et al. (2020), [e] Datta and Rawat (2004).

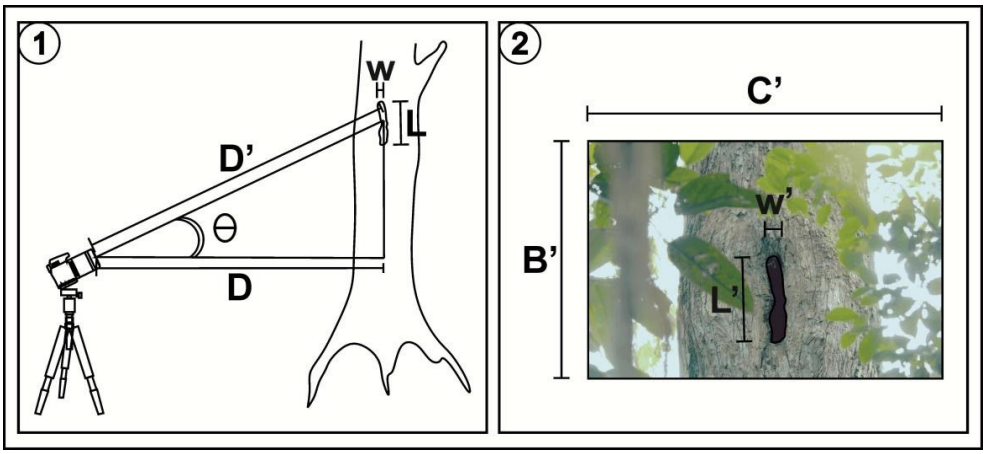

Fig. 2. Method of measuring the nest cavity entrance based on modification of Poonswad, 1995 and Fulton, 2020.

Results

A total of 18 hornbill nests was measured, consisting of nine active and three inactive Black Hornbill nests, one active Bushy-crested Hornbill nest, one active Rhinoceros Hornbill nest, and four active Wreathed Hornbill nests. There were 14 tree species utilised by four species of hornbills for nesting, primarily from the Dipterocarpaceae family (83.33%) (*Rubroshorea macrophylla* (de Vriese) P. S. Ashton & J. Heck, *R. retusa* (Meijer) P. S. Ashton & J. Heck, *Shorea* sp. 1 (red meranti), *R. albida* (Symington) P. S. Ashton & J. Heck, *Shorea* sp. 2 (red meranti), *Shorea* sp. 3 (red meranti), S*horea* sp. 4 (red meranti), *S. pachyphylla* Ridl. Ex Symington, R. *parvifolia* (Dyer) P. S. Ashton & J. Heck, *Dipterocarpus crinitus* Dyer, *Dipterocarpus* sp.) and the remaining were from Burseraceae (*Dacryodes* sp.), Clusiaceae (*Garcinia mangostana* L), Crypteroniaceae (*Dactylocladus stenostachys* Oliv). Meranti (*R. albida)* is a frequently used tree species for nesting, accounting for 16.7% of recorded nest trees. All the nest trees were found in lowland forests at elevations ranging from 18 to 126 m asl (Table 2).

Bushy-crested Hornbill nests were on trees with the largest diameter at breast height (DBH) of 130 cm, while the Black Hornbill utilised trees with the smallest DBH of 78.8 cm. The nest tree height for each hornbill species varied between 32.5 and 44.9 m. The height of the first branch of the nest tree ranged from 19.6 to 31.2 m. The distance between the nest entrance and the first branch ranged from 80 – 100.9 cm. The shortest distance was 80 cm for the Wreathed Hornbill, while the longest is 100.9 cm for the Black Hornbill (Table 3).

The highest nest entrance from the ground was 28.5 m for the Bushy-crested Hornbill, while the lowest was 8.8 m for the Black Hornbill (Table 4). The large hornbill (Rhinoceros Hornbill) had the tallest, widest, and largest nest entrance. Conversely, the small hornbill (Bushy-crested Hornbill) had the lowest nest entrance height, while the Black Hornbill had the smallest nest entrance width (Table 4). The error of the nest entrance height was 0.56 cm (-3.86%), while the width error was -1.11 cm (-25.38%) (Table 4). Large hornbills have the largest nest entrance area, whereas small hornbills have the smallest area (Table 4).

Eighteen nest cavities from seventeen nest trees of four hornbill species were characterised. The Black Hornbill nests consisted of active nests (N01 – N05, N07, N09, N11, N12) and inactive nests (N06, N08, N10). The active nest of the Bushy-crested Hornbill was N13, while the active nests of the Wreathed Hornbill were N14 – N17, and the active nest of the Rhinoceros Hornbill was N18. The inactive

Table 2. Species and proportions of hornbill nest trees.

No.	Hornbill Species	Nest Tree Family			
		Dipterocarpaceae	Burseraceae	Clusiaceae	Crypteroniaceae
1	Black Hornbill	9	1	1	1
2	Bushy-crested Hornbill	1	n/a	n/a	n/a
3	Wreathed Hornbill	4	n/a	n/a	n/a
4	Rhinoceros Hornbill	1	n/a	n/a	n/a
Total nest trees		15	1	1	1

Table 3. Characteristics of hornbill nest trees.

Variables (Mean ± SD)	Hornbill Species			
	BH	BCH	WH	RH
Diameter at breast height (cm)	(78.8 ± 27.6)	(130 ± 0)	(125 ± 12.8)	(73.2 ± 0)
Tree height (m)	(32.5 ± 6.9)	(44.9 ± 0)	(42.7 ± 3.6)	(41.6 ± 0)
Height of first branch (m)	(19.6 ± 5.8)	(31.2 ± 0)	(24.8 ± 5.5)	(26.6 ± 0)

BH – Black Hornbill, BCH – Bushy-crested Hornbill, WH – Wreathed Hornbill, RH – Rhinoceros Hornbill.

Black Hornbill nest N06 had been taken over by stingless bees (Figure 3). Nest N08 was overgrown with moss and along with N07, constituted two cavities in the same tree. Nests N10, N11, and N12 were located on the edge of hunting trails, and according to local accounts, the parent hornbill at nest N10 was shot by hunters, rendering it unused. In addition to human disturbances, some nests also suffered damage, such as nest N10, which was flooded (Figure 3).

The nest entrance direction of the Black Hornbill ranged from northwest to northeast (Table 5). The nest entrances of Bushy-crested and Rhinoceros Hornbill were oriented between southeast and east-southeast. The Wreathed Hornbill occupies nest cavities oriented relatively more towards the east (Table 5).

Table 4. Characteristics of hornbill nest cavities.

Variables	Hornbill Species			
	BH [a]	BCH [a]	WH [a]	RH [a]
Nest entrance height (cm)	(28.5± 8.9)	(17.1 ± 0)	(28.8 ± 15.3)	(58.3 ± 0)
Error (cm)[b]	(0.56 ± 8.03)			
Error (%)[b]	(-3.86 ± 0.29)			
Nest entrance width (cm)	(6.4 ± 2.2)	(10.4 ± 0)	(9.2 ± 5.4)	(10.6 ± 0)
Error (cm)[c]	(-1.11 ± 0.97)			
Error (%)[c]	(-25.38 ± 0.20)			
Nest entrance area (cm^2)	(175 ± 49.6)	(178.9 ± 0)	(237.9 ± 140.3)	(615.2 ± 0)
Nest cavity height (m)	(8.8 ± 5.1)	(28.5 ± 0)	(24 ± 7.6)	(15.8 ± 0)
Nest entrance orientation (°)	(188.3 ± 89.1)	(120 ± 0)	(98.8 ± 14.8)	(129 ± 0)

BH – Black Hornbill, BCH – Bushy-crested Hornbill, WH – Wreathed Hornbill, RH – Rhinoceros Hornbill, [a] Mean±SD, [b] Error for all nest entrance heights, [c] Error for all nest entrance widths.

Table 5. Qualitative characteristics of hornbill nest trees.

Parameters	Black Hornbill	Bushy-crested Hornbill	Wreathed Hornbill	Rhinoceros Hornbill
Nest status	Active (9) Inactive (3)	Active (1)	Active (4)	Active (1)
Nest entrance position	Main Trunk (12)	Main Trunk (1)	Primary (1)	Main Trunk (1)
Nest shape	Slit (11)	Round (1)	Slit (3)	Slit (1)
Nest cavity direction	Northwest to Northeast	Southeast	East	East-southeast

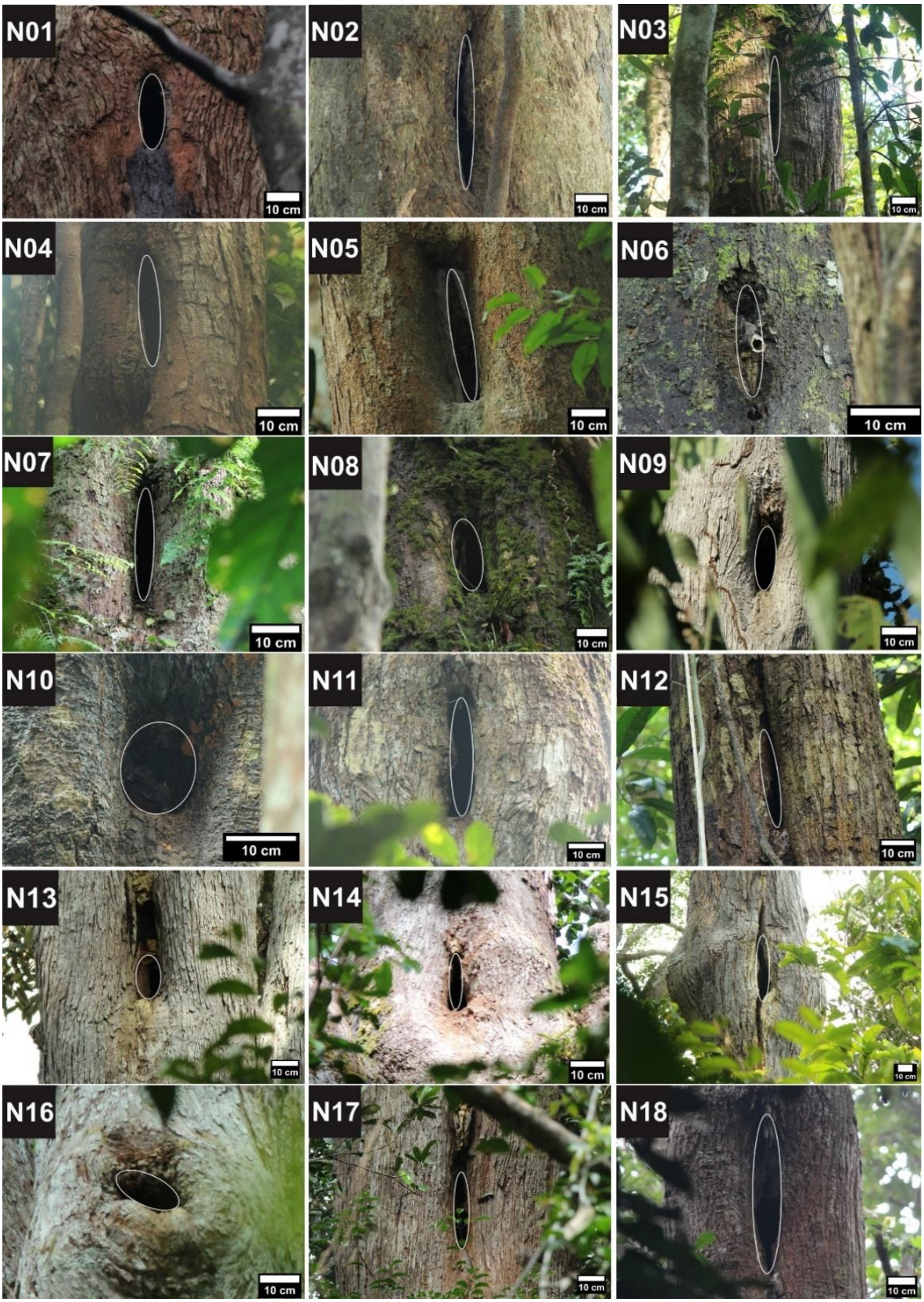

Fig. 3. Hornbill nest cavities recorded in Kapuas Hulu, 2022. Nest cavities of Black Hornbill (N01 – N12), Bushy-crested Hornbill (N13), Wreathed Hornbill (N14 – N17), and Rhinoceros Hornbill (N18). Photo: Mikael Repormanto.

Discussion

Four species of hornbills (Rhinoceros Hornbill, Wreathed Hornbill, Bushy-crested Hornbill, and Black Hornbill) were found nesting out of the eight hornbill species present in West Kalimantan. The species whose nests have not been found are the White-crowned Hornbill, Helmeted Hornbill, Wrinkled Hornbill, and the Oriental Pied-Hornbill. A population survey by Hadiprakarsa *et al*. (2020b) showed that all eight hornbill species were found at the study site. It is possible that the nests of the other four species (White-crowned Hornbill, Helmeted Hornbill, Wrinkled Hornbill, and Oriental Pied Hornbill) have not been found due to opportunistic nest data collection based solely on community reports. Nest exploration was limited to areas frequently visited by the local community. Additionally, the habitats of these four species are relatively far from human settlements, and sightings were rare in the study area (Hadiprakarsa *et al*. 2020a).

The nesting record may indicate which hornbill species are more common in the study area. In this study, we recorded more Black Hornbill nests (66.7%), indicating that this species is the commonest in the study area, followed by Wreathed Hornbill (22.2%). This is an interesting finding because nests of Black Hornbill are quite rare in some areas of the species range, as shown by several past studies (Poonswad, 1995; Sibarani *et al*. 2020). The Black Hornbill and Wreathed Hornbill are commonly found in lowland forests ranging from below 200 m asl (Hadiprakarsa *et al*., 2020a), as shown by this study.

Black Hornbill is believed to have a relatively high tolerance for environmental changes like its close relative, the Oriental Pied Hornbill, which is also found near settlements and secondary forests affected by logging (Hadiprakarsa *et al*., 2020a; BirdLife International, 2022). However, this species is locally common and higher numbers of nest trees were found for this species. Most Black Hornbill nest trees are in swampy heath (Kerapah) forest areas with litter-rich, occasionally flooded, and sandy soil. Black Hornbill nest trees in flat lowland areas (<100 m asl) typical of swampy heath forests are also found in selectively logged secondary forest areas. This aligns with the findings of previous studies (McConkey and Chivers, 2004; Lubis *et al*., 2023; Ridho *et al*., 2023). Black Hornbills in Indonesia are also found in the lowland dipterocarp forests, secondary forests, patches of secondary forest, and heath forests (Kerangas). Protecting this area is recommended, as it is in a non-conservation area, and hunting and habitat degradation are potential threats to the species.
We recorded only a single nest of the Bushy-crested Hornbill and the Rhinoceros Hornbill. The limited number of nests is due to the information being restricted to areas most frequently explored by the community in the swampy heath (*kerapah*) forest, making the data less representative and opportunistic. Exploration of specific habitats, such as lowland dipterocarp forests, is also necessary to ensure appropriate representation.

Almost all tree species used by the four hornbill species were identified as species of the Dipterocarpaceae family. This tree family comprises species with relatively strong and durable wood (Muslich and Sumarni, 2006). For example, Meranti *Shorea* spp. and Keruing *Dipterocarpus* spp. fall into durability classes 1–3 (Muslich and Sumarni, 2006). Almost all these nest trees showed large girth (DBH = 73.2–130 cm). This is in line with previous research that showed that hornbills tend to use trees with DBH more than 40 cm and tree height >35 m (Kinnaird and O'Brien, 2007; Rahayuningsih *et al*., 2017; Poonswad, 1995).

Female Rhinoceros Hornbills use nests with the longest, widest, and largest entrances, although the data may not be fully representative due to

the sample size of only one. This is likely related to their relatively long body and wings, as well as their wide beaks. A relatively high nest entrance is believed to facilitate the movement of the female hornbill when entering or exiting the nest. According to Poonswad *et al*. (2013b), the female hornbill enters or exits the nest by inserting or withdrawing her head first, followed by her wing in a sideways movement. A relatively wide nest entrance makes it easier for the hornbill's beak to enter or exit. The Rhinoceros Hornbill has the largest beak size compared to the other three species (Tobias *et al*., 2022). The nest entrance must be wider than the hornbill's beak. The width of the Rhinoceros hornbill's nest entrance is 10.6 cm (Table 4), which is wider than the average beak width of female Rhinoceros hornbills at 4.96 cm (Tobias *et al*., 2022). The size of the nest cavity greatly corresponds to the size of the hornbill, as hornbills choose nest cavities that are as small as possible to minimise the effort required to seal the entrance (Poonswad, 1995).

The Bushy-crested Hornbill uses nests with the lowest entrance height. This is likely due to the Bushy-crested Hornbill's body and wing size, which are the second smallest after the Black Hornbill (Hadiprakarsa *et al*., 2020a; Tobias *et al*., 2022). However, the sample size for the Bushy-crested Hornbill is only one nest, which is insufficient to fully justify this assumption. The Black Hornbill uses nests with the smallest entrance width. This is consistent with the entrance width of 6.4 cm (Table 4), which is larger than the beak width of 3.15 cm (Tobias *et al*., 2022).

The variation in nest cavity area is related to the hornbill's body size. The relatively large body size of hornbills is a limiting factor in the availability of appropriate cavity sizes . Large hornbills have wider nest entrance openings than smaller hornbills (Table 4). Rhinoceros and Wreathed hornbills are large compared to the Bushy-crested and Black hornbills. Small hornbills are also relatively lighter (Poonswad *et al*. 2013b; Hadiprakarsa *et al*., 2020a).

The lowest nest cavity positions were at Black Hornbill nests. The breeding duration of Black Hornbill is relatively shorter (± 50 days) than Bushy-crested (± 96 days), Wreathed (126 days), and Rhinoceros Hornbill (± 122 days) (Poonswad *et al*. 2013b). A relatively short breeding duration reduces the likelihood of predator threats. Bushy-crested, Wreathed, and Rhinoceros Hornbill being larger in size, have relatively longer breeding durations. Hornbills with a longer breeding duration may require higher nests to reduce the predator threat (Poonswad, 1995).

The orientation of Wreathed Hornbill nest cavities is relatively towards the east. Wreathed Hornbill are believed to prefer cavities with morning light exposure. However, for the Black Hornbill, nest orientation is still random, while there is only one nest each for the Rhinoceros Hornbill and the Bushy-crested Hornbill. Morning light has long wavelengths that can accelerate bird reproductive performance (Yang *et al*., 2016; Rizal, 2018).

Three Black Hornbill nests were inactive. The nest cavities were inactive due to collapsed, flooded, narrowed, or widened nest floors, making them unsuitable for hornbills to nest (Poonswad *et al*., 2005). In addition to structural damage, nests were also taken over by stingless bees, while poaching of hornbill chicks from their nests also affects nest usage (Poonswad, *et al*., 2013a; Vercoe *et al*., 2021). Stingless bees can seal the nest cavities when their colonies occupy tree cavities. This occurs in 91.5% of large trees with a DBH of 60-120 cm, particularly within the Dipterocarpaceae family (Eltz *et al*., 2002; Macedo *et al*., 2020). Hornbill nests are taken over by different species up to 50% of the time, with some of the species that take over the nests including the sun bear, Great

Slaty Woodpecker, Yellow-throated Marten, and monitor lizards (Datta and Rawat, 2004; Poonswad *et al.*, 2005).

Most of the nest cavities were on the main trunk, similar to observations on hornbill nest trees in India (Datta and Rawat, 2004). The formation of cavities in Dipterocarpaceae trees is done by woodpeckers (Kumar e*t al.*, 2011). The cavities formed undergo enlargement and are then occupied by hornbills, which is consistent with Poonswad e*t al.* (2013b) who reported hornbills using nest cavities formed by woodpeckers. In Kalimantan, there are 18 species of woodpeckers and nine species of barbets (Eaton e*t al.*, 2022). Additionally, cavity formation in the main trunk can occur due to stem injuries and decomposition by wood-decaying microorganisms such as *Trichoderma* sp., *Gliocladium* sp., and *Fusarium* sp. (Supa-Amornkul e*t al.*, 2011). Only a small portion of the cavities were located on the primary branches, similar to Datta and Rawat (2004). Cavity formation on branches is due to branch breakage, including injuries caused by wildlife and decaying wood (Poonswad, 1995; Poonswad e*t al.*, 2013b). This study aligns with the findings of Datta and Rawat (2004) in India, where Great Hornbills *Buceros bicornis t*end to choose slit-shaped cavities. The shape of one nest entrance for the Wreathed hornbill is oval (Table 5), which is also consistent with Datta and Rawat (2004). However, the data in this study are limited in explaining the reasons behind the preference for nest shapes, highlighting a research gap that warrants further exploration.

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Kementrian Lingkungan Hidup Dan Kehutanan Republik Indonesia. 2020. Penetapan Hutan Adat Menua Sungai Utik Kepada Masyarakat

Hukum Adat Dayak Iban Menua Sungai Utik Ketemenggungan Jalai Lintang Seluas 9.480 Hektar. Lokasinya Berada Di Kawasan Hutan Lindung (HL) Seluas 3.862 Hektare, Di Kawasan Hutan Produksi Terbatas (HPT) Seluas 5.518 Hektare, Dan Areal Penggunaan Lain (APL) Seluas 100 Hektare Di Desa Batu Lintang, Kecamatan Embaloh Hulu, Kabupaten Kapuas Hulu, Kalimantan Barat.

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