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Observations on the breeding biology of the Luzon flameback *Chrysocolaptes haematribon* (Wagler 1827) (Piciformes: Picidae) with notes on active nest defence against dollarbird *Eurystomus orientalis* (Linnaeus 1766) (Coraciiformes: Coraciidae)

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Abstract – The breeding biology of the Luzon flameback *Chrysocolaptes haematribon* is little known. Here we provide insights on the breeding of the species from two nests we located. Cavity nests were in dead trees and were 15-19 cm deep; entrances were vertical ovals and had dimensions (L × W) of 11-12 × 8-10 cm. One nest that was observed in April during the days around fledging had one male and one female nestling in it, which left and re-entered the nest on several occasions. The adult female was observed to solely provision food on six occasions, with food items including a moth, a butterfly, beetle larvae, and a small lizard. Attempts by dollarbird *Eurystomus orientalis* to usurp the nest were observed on each of the three observation days. Both the adult male and adult female flamebacks defended the nest either from the inside, outside or a combination of both. This paper serves as the first detailed report on the breeding biology and nest defence of the species and adds valuable information to the scarce knowledge on woodpeckers in the Philippines.

Key words: Asian woodpeckers, breeding behaviour, competition, Luzon, nest usurpation, Subic Bay.

Riassunto – Osservazioni sulla biologia riproduttiva del picchio di Luzon *Chrysocolaptes haematribon* (Wagler 1827) (Piciformes: Picidae) con note sulla difesa attiva del nido contro una ghiandaia marina orientale *Eurystomus orientalis* (Linnaeus 1766) (Coraciiformes: Coraciidae).

La biologia riproduttiva del picchio di Luzon *Chrysocolaptes haematribon* è poco conosciuta. Qui forniamo informazioni sulla riproduzione di questa specie grazie all'individuazione di due nidi. I nidi a cavità si trovavano in alberi morti e avevano una profondità di 15-19 cm; le entrate erano ovali verticali e avevano dimensioni (L×L) di 11-12×8-10 cm. In un nido osservato in aprile, nei giorni prossimi all'involo dei pulcini, c'erano un maschio e una femmina che sono entrati e usciti dal nido in diverse occasioni. La femmina adulta è stata osservata in sei occasioni mentre forniva esclusivamente cibo, tra cui una falena, una farfalla, larve di coleottero e una piccola lucertola. In tre giorni di osservazione sono stati osservati tentativi di usurpazione del nido da parte di una ghiandaia marina orientale *Eurystomus orientalis*. Sia il maschio adulto che la femmina adulta hanno difeso il nido dall'interno, dall'esterno o tramite una combinazione di entrambe le strategie. Questo studio rappresenta il primo rapporto dettagliato sulla biologia riproduttiva e sulla difesa del nido di questa specie e aggiunge informazioni preziose alle scarse conoscenze sui picchi delle Filippine.

Parole chiave: competizione, comportamento riproduttivo, Luzon, Picchi asiatici, Subic Bay, usurpazione del nido.

Primary excavators like the woodpeckers (Picidae) create nest cavities in trees, which are then subsequently used by a myriad of non-excavating cavity users for nesting and roosting (Martin *et al.*, 2004; Cockle *et al.*, 2011). This cavity provisioning capacity of woodpeckers positions them as keystone and facilitator species within many forest communities (Drever & Martin, 2010). Unfortunately, despite their ecological importance, woodpeckers remain understudied in Asia. This knowledge gap is particularly concerning given that Asia harbours the greatest number of threatened woodpecker species in the world (Lammertink, 2014).

The Luzon flameback *Chrysocolaptes haematribon* (Wagler 1827) is a woodpecker species endemic to the lowland forests of Luzon Island, Philippines, where it is speculated to breed from January to May (del Hoyo *et al.*, 2020a). It is characterised by a crimson red back, patterned yellowish belly, black tail, spotted chest and throat, and a crest. The species exhibits sexual dimorphism, with males having red crests and the females with white-spotted black crests. Like most woodpeckers in the Philippines, the Luzon flameback is poorly known. In this paper, we describe for the first time its cavity nest, aspects of its breeding biology, and behaviour around an active nest. We also present the first report of nest defence by the Luzon flameback against a common secondary cavity-nester in the region, the dollarbird *Eurystomus orientalis* (Linnaeus 1766).

The observations and measurements presented in this paper were part of the Cavity-Nesting Bird Project that aimed to study the ecology of tree cavity-nesting birds at the Subic Watershed Forest Reserve (SWFR), Zambales, Luzon, Philippines from February to June 2022. Tree cavity searches were conducted following Gicaraya & Española (2023a). We present two flameback nests that were measured for tree and cavity characteristics (Table 1), following the methods and parameters described in Gicaraya & Española (2023b). Nest 1 was found on 10 April 2022 in a standing dead Kupang *Parkia timoriana* (DC.) Merr. tree whereas Nest 2 was found on 12 May 2022 in a White Lauan *Shorea contorta* S.Vidal snag. Both nests were situated at the edge of the forest, at least 20 m from roads. Of the two nests, only Nest 1 was occupied upon discovery and all behavioural observations were made there. We observed Nest 1 on 11, 12 and 14 April 2022 for a total of 13.9 daytime hours through a KOWA spotting scope (TSN-60), following the observation procedures of Gicaraya & Española (2024). Nest 2, on the other hand, was already inactive upon discovery. Nonetheless, we accessed the cavity through a ladder to get insights on its previous occupant. Close

inspection of the nest revealed insect remains, spotted throat/chest feathers and contour feathers belonging to the Luzon flameback, thereby confirming cavity use by the species.

Measurements of the cavity revealed deep nests with small and vertical oval entrances similar to the nest holes excavated by the congeneric species Greater flameback *C. guttacristatus* (Tickell 1833) (del Hoyo *et al.*, 2023), Orange-backed woodpecker *C. validus* (Temminck 1825) (Winkler *et al.*, 2023), Crimson-backed flameback *C. stricklandi* (Layard 1854) (del Hoyo *et al.*, 2020b) and White-naped woodpecker *C. festivus* (Boddaert 1783) (Winkler *et al.*, 2020a). Moreover, like the aforementioned congenics, cavity entrances of the Luzon flameback have a pecked tapering part at the bottom of the rim (Figs.1A and 2A). We speculate that this feature functions to prevent rainwater from flooding the cavity. Nests were lined only with wood chips (Fig.1B), much like most other woodpecker nests (Winkler *et al.*, 2020b).

We observed feeding of nestlings on six occasions: four times in 5 hours on 12 April and twice in 5 hours on 14 April. Food items included a moth, butterfly, beetle larvae, and a small lizard. Chicks were fed by the female adult flameback through direct feeding and not by regurgitation, much like in Orange-backed woodpecker (Winkler *et al.*, 2023) and Greater flameback (del Hoyo *et al.*, 2023). Throughout the observation period, we noticed that adult woodpeckers took turns visiting the nest. On several occasions, we observed two flamebacks, smaller in size than the adults, were either alternately peeking out of the cavity entrance or repeatedly leaving and entering the nest. Both smaller flamebacks resembled the adult form of their respective sexes but with shorter crest, beak, and tail. They left and came back to the nest either by themselves or accompanied by an adult. The fact that juveniles were able to fly in and out of the cavity indicates that they were almost ready to fledge. This observation leads us to speculate that the clutch size of this nest was equal to or close to two eggs, in line with the clutch size of the congeners Orange-backed woodpecker (1-2 eggs, Winkler *et al.*, 2023), Greater flameback (2-5 eggs, del Hoyo *et al.*, 2023), Crimson-backed flameback (2 eggs, del Hoyo *et al.*, 2020b) and White-naped woodpecker (1-3 eggs, Winkler *et al.*, 2020a).

On 11 April, 11:00 h, an adult female flameback was seen poking its head from the cavity opening (Fig. 2A) of Nest 1. Five minutes later, a pair of dollarbirds swooped within the vicinity of the nest. The dollarbirds took turns intimidating the nest occupants for a total of five times at the cavity entrance from 11:00 h to 13:00 h. For each attempt, a dollarbird either perched on the rim while flapping its wings and calling aggressively (Fig. 2B-C) or poked its head inside the cavity (Fig. 2D). For most of these attacks, the female flameback would simply retract its head into the cavity. After each failed attempt, the dollarbirds retreated to a nearby tree 10 m away from the nest tree. Nest usurpation attempts continued until 14 April. The highest number of attempts recorded was on 12 April, with 60 attempts in five hours. In several incidents when both adult woodpeckers were present, the male flameback remained inside the cavity either

retracting its head or pecking at the dollarbirds from the inside while the female flameback actively attacked the dollarbirds from the outside.

When we came back on 28 April, the tree with Nest 1 had fallen. We posit that the flamebacks fledged and left the nest several days prior. On this day, we noticed a family of flamebacks consisting of two adults and two sub-adults (one male and one female) foraging on a snag approximately 200 m away from the fallen nest tree. Although we could not ascertain whether these were the same individuals we had previously observed at the nest, this sighting was consistent with the brood size and sex ratio of Nest 1. As the cavity was positioned approximately 18 m from the ground, the impact of the fall had shattered the cavity. We were able to reconstruct the cavity but due to several missing pieces, cavity parameters such as opening dimensions and horizontal depth were only approximated. The dimensions of Nest 1 and Nest 2 are provided in Table 1.

Generally, cavity nests are safer compared to open nests (Nilsson, 1984). The walls of the cavity offer protection while allowing for defence from the inside (Paclík *et al.*, 2022). Likewise, cavity opening dimensions that narrowly fit the user prevent the entry of large predators. This, however, does not protect them from generalists and same-sized usurpers. In regions where cavity-nesting species richness is high, competition for available and high-quality nests may ensue — especially when nesting trees are scarce, and cavity-users have similar preferences and breeding periods. The dollarbird breeds from March to May (Fry & Boesman, 2020), which overlaps with the observed breeding period of the Luzon flameback. We posit that the observed usurpation attempts may have been due to a potential limitation in available suitable cavities for dollarbirds or mere preference for woodpecker-excavated cavities for nesting.

Nest defence is a vital aspect of parental care (Caro, 2005). Eggs and nestlings are most likely to survive as a result of a successful defence of the parents against predators or usurpers. Behavioural responses to nest usurpation include chasing and attacking the invader, and in the case of cavity-nesters, blocking the nest entrance with their beaks pointed towards the cavity opening (Kilham, 1968; Paclík *et al.*, 2009). Luzon flamebacks utilised either inside defence (i.e., blocking the cavity entrance and increased attentiveness), outside defence (chasing and attacking the intruders), or a combination of both. We noted that inside defence was the primary strategy when only one parent was present. When both parents were in attendance, the female woodpecker shifted to offensive mode while the male blocked the cavity entrance. Woodpeckers have been documented to utilise both inside and outside defence (Paclík *et al.*, 2022), however, during high-risk situations when only one parent is guarding the nest, inside defence is preferred. This is especially true during critical periods of incubation and nestling stages (Paclík *et al.*, 2022).

Published observations on woodpecker nest defence are quite scarce in literature, with most behavioural reports being suggestive rather than confirmatory (Paclík *et al.*, 2009). Likewise, studies on woodpeckers in the Philippines are lacking. To our knowledge, our observations are the first report on the biology and

behaviour of the species. Despite the limited observation period, our findings serve as an addition to the growing knowledge on woodpeckers in the Philippines. Based on this study, we recommend maintaining trees in different stages of decomposition to serve as potential nesting sites for the woodpeckers. These recommendations will likely apply to closely related, globally threatened *Chrysocolaptes* woodpeckers elsewhere in the Philippines, namely to the Yellow-faced flameback *C. xanthocephalus* and the Red-headed flameback *C. erythrocephalus*, both species with an urgent need for detailed studies.

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Table 1 – Measurements of two Luzon flameback nest trees and cavities. / Misure di due alberi nido e cavità di nidificazione del picchio di Luzon.

Tree and Cavity Characteristics	Nest	
	1	2
Nest tree species	<i>Parkia timoriana</i>	<i>Shorea contorta</i>
Tree status	Standing dead tree	Snag
Position of the cavity	Main Trunk	Main Trunk
Girth at nest height (m)	0.65	0.84
Girth at breast height (m)	0.89	0.86
Nest height (m)	18.0	7.55
Horizontal depth (cm, opening rim to the wall of the cavity)	14*	13
Vertical depth (cm, ceiling to cavity floor)	35	45
Depth (cm, opening rim to cavity floor)	19	15
Vertical opening length (cm)	11*	12
Horizontal opening length (cm)	8*	10

*estimated from reconstructed nest



Fig.1 – Luzon flameback cavity nest and contents: A) Cavity opening of Nest 2 showing the prominent pecked tapering part at the bottom of the cavity entrance rim; B) Nest contents consisted of wood chips and feathers: flameback throat/chest feather (encircled) and contour feather (inset). / Nido a cavità di picchio di Luzon e contenuto: A) Apertura della cavità del nido 2, dove si può osservare la parte assottigliata con il becco sulla parte inferiore del bordo d'ingresso della cavità; B) Il contenuto del nido è costituito da trucioli di legno e piume: piume della gola e del petto (nel cerchio) e piume di contorno (nell'insetto).



Fig. 2 – Active nest defence of the Luzon flameback against usurping dollarbird: A) The lone parent (female) present in the nest blocked the cavity with increased attentiveness; B-C) The dollarbird perched on the cavity rim accompanied by aggressive flapping of wings and loud vocalizations; D) A dollarbird attempted to enter the cavity by poking its head inside. / Difesa attiva del nido di picchio di Luzon contro l'usurpazione da parte di ghiandaia marina orientale: A) Il genitore solitario (femmina) presente nel nido ha bloccato la cavità con maggiore attenzione; B-C) La ghiandaia marina orientale si è appollaiata sul bordo della cavità accompagnata da un aggressivo sbattere di ali e da forti vocalizzazioni; D) Una ghiandaia marina orientale ha tentato di entrare nella cavità infilando la testa all'interno.