

First description of the breeding biology and behaviour of the near threatened northern sooty woodpecker *Mulleripicus funebris* (Valenciennes 1826) (Piciformes: Picidae) in Luzon Island, Philippines

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Abstract - Although generally regarded as keystone species within forest communities, woodpeckers (Picidae) remain understudied in the Philippines. We describe for the first time the breeding biology and behaviour of the IUCN Near Threatened northern sooty woodpecker *Mulleripicus funebris* based on observations from a single active nest found in a standing dead *Parkia timoriana* tree at the Subic Watershed Forest Reserve, Zambales, Luzon, Philippines. The nest was observed from late February to May 2022 for a total of 63.7 hours. The cavity was 16.4 m from the ground and had opening dimensions (L x W) of 9.0 x 8.0 cm and a depth of 37.0 cm. Breeding of *M. funebris* lasted ≈ 76 -83 days from nest excavation (≈ 27 days) to fledging. The brood size was two. Both parents were involved in nest building and chick-rearing activities. The male *M. funebris* contributed more hours during nest building and diurnal incubation whereas the female dominated feeding of nestlings and nest sanitation during the time of fledging. We recommend the retention of standing dead trees as nesting sites for woodpeckers and already existing holes for other cavity-nesting fauna.

Keywords: Asian woodpeckers, natural history, nesting ecology, nestling provisioning, parental care, Subic Bay.

Riassunto: Prima descrizione della biologia riproduttiva e del comportamento del picchio fuliginoso *Mulleripicus funebris* (Piciformes: Picidae), quasi minacciato, nell'isola di Luzon, Filippine.

Sebbene siano generalmente considerati specie chiave all'interno delle comunità forestali, i picchi (Picidae) sono ancora poco studiati nelle Filippine. Descriviamo per la prima volta la biologia e il comportamento riproduttivo del picchio fuliginoso *Mulleripicus funebris*, classificato da IUCN come quasi minacciato, basandoci

sulle osservazioni di un singolo nido attivo trovato in un albero morto di *Parkia timoriana* nella Subic Watershed Forest Reserve, a Zambales, Luzon, Filippine. Il nido è stato osservato da fine febbraio a maggio 2022 per un totale di 63,7 ore. La cavità si trovava a 16,4 m dal suolo e aveva un'apertura di di 9 x 8 cm e una profondità di 37 cm. La riproduzione di *M. funebris* è durata ≈ 76 -83 giorni, dallo scavo del nido (≈ 27 giorni) alla nascita. La dimensione della covata era di due uova. Entrambi i genitori hanno partecipato alla costruzione del nido e all'allevamento dei pulcini. Il maschio di *M. funebris* ha contribuito per un maggior numero di ore alla costruzione del nido e all'incubazione diurna, mentre la femmina ha prevalso nell'alimentazione dei nidiacei e la pulizia del nido durante il periodo di allevamento. Si raccomanda di conservare gli alberi morti come siti di nidificazione per i picchi e le cavità già esistenti per altre specie di nidificanti in cavità.

Parole chiave: approvvigionamento dei nidiacei, cure parentali, ecologia della nidificazione, picchi asiatici, storia naturale, Subic Bay.

INTRODUCTION

Woodpeckers (Picidae) are primary excavators that create their own cavities on trees for nesting. For this reason, they are often regarded as keystone species in forest communities (Martin & Eadie, 1999) as they provide nesting holes and roosting sites for obligate secondary cavity-nesting birds and other non-excavating fauna. Their dependence on trees for both foraging and excavation makes them especially sensitive to habitat quality and forest cover change (Ibarra *et al.*, 2017). Thus, they are excellent indicators for forest health (Mikusiński, 2006) and for the diversity of secondary cavity-nesting birds (Drever *et al.*, 2008). However, despite the indisputable importance of woodpeckers in forest ecosystems, basic ecological and life history studies remain scarce for many woodpecker species, especially in Asia where most threatened woodpeckers in the world are found (Mikusiński, 2006; Lammertink, 2014).

In the Philippines, woodpecker endemism is high with nine endemic woodpeckers out of 11 occurring species (Allen, 2020). Unfortunately, five species are already threatened under the Philippine Red List (BMB-DENR, 2020). Alarmingly, ecological and biological studies, and natural history observations on Philippine woodpeckers are not available, even for the threatened island endemics.

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The Luzon-endemic northern sooty woodpecker *Mullevipicus funebris* is a relatively large woodpecker (30-32 cm) (Allen, 2020; Winkler & Christie, 2020) that thrives in both primary and secondary forests, edges, and pine forests up to 1000 m asl (Allen, 2020). As the name implies, the species is mostly sooty black with a white-dotted black head and horn-yellow beak. It is sexually dimorphic with males having a burgundy-coloured face up to the forehead and forecrown which the females lack (Allen, 2020; Winkler & Christie, 2020). The northern sooty woodpecker co-exists with two other large woodpeckers within its range (Allen, 2020): the white-bellied woodpecker *Dryocopus javensis* and the Luzon flameback *Chrysocolaptes haematribon*.

In this paper, we describe for the first time the breeding biology and nesting behaviour of the near threatened northern sooty woodpecker based on observations from a single active nest. This report also serves as the first documentation of the nest of the said species.

MATERIALS AND METHODS

Study Site

Our study was conducted at the Subic Watershed Forest Reserve (SWFR), Zambales, Luzon, Philippines, from February to May 2022. SWFR is one of the few remaining undisturbed lowland dipterocarp forests in Western Luzon, bordered by the Bataan Natural Park in the southeast and the Philippine Sea in the west. As a key biodiversity area, the reserve harbours a variety of threatened species, some of which are restricted to the Luzon biogeographic region (BirdLife International, 2023). However, industrialization surrounding the reserve continually threatens unguarded areas, particularly those near agricultural sites and human settlements.

Field Procedures

A single active nest was observed for a total of 63.7 hours on 13 separate occasions from the date of discovery until the time of fledging. Observations were made from a distance of around 15 m from the nest tree, using a KOWA spotting scope (TSN-60). We took note of the general breeding behaviour including sex roles and parental care strategies and contributions (i.e., frequency of feeding and faecal sac removal). Nest watches were done either early in the morning (05:30/06:00) or late in the afternoon (16:00) for 1-2 hours. A full daylight observation (06:00-18:00) was also conducted once per nesting stage. All observations were pooled together to describe the breeding behaviour of the species. However, to prevent bias and misrepresentation of parental efforts due to cumulative partial observations, only the full daylight data per breeding stage were analysed to reflect diurnal parental contributions.

Nest Tree and Cavity Measurements

Post fledging, nest tree and cavity characteristics were measured following Gicaraya & Española (2023): girth

at breast height, girth at nest height, cavity opening dimensions (length and width), vertical depth, horizontal depth, depth, and sill width. Because the cavity was in a snag, the tree was accessed through Tyrolean traverse-horizontal progression technique instead of single rope climbing techniques to minimize climbing hazards and ensure the safety of the climber. This was done by installing a rope on trees that stood on the left and right side of the nest tree such that the rope passed horizontally 1-2 meters above the cavity. This rope was then used by our arborist to get to the cavity, very much like how a zipline works.

RESULTS

Nest Tree and Cavity

A pair of northern sooty woodpecker was found taking turns excavating a cavity in the trunk of a Kupang *Parkia timoriana* (DC.) Merr. snag on 23 February 2022. The nest tree was situated at a forest edge surrounded by several large-girthed trees (\approx 2.5-4.0 m) and was approximately 5 m from a road. The nest tree has a girth at breast height of 181 cm. The cavity was excavated 16.4 m from the ground with a girth at nest height of 109 cm. The cavity entrance (Fig. 1a) had opening dimensions (L x W) of 9.0 x 8.0 cm; horizontal depth (measured from the opening rim to the wall of the cavity) of 18 cm; vertical depth (measured from the ceiling to the cavity floor) of 44 cm; and depth (measured from the opening rim to the cavity floor) of 37 cm. Aside from fine wood chips and several down feathers, no other materials were found lining the nest (Fig. 1b).

BEHAVIOURAL OBSERVATIONS

Nest Excavation

At the time of discovery, a male northern sooty woodpecker was excavating a hole estimated to be 5-10 cm deep: implying that excavation may have started just 2-3 days prior to discovery. After 40 minutes of excavation, the male switched roles with the female. The female then excavated for at least 10 minutes before leaving. On 10 March 2022, almost 3/4 of the woodpecker's body could now fit into the cavity with the tail protruding at a sharp angle, indicating the ongoing vertical deepening of the nest. On 18 May 2022, both the male and female fully entered the nest on separate occasions and excavated from the inside. We observed the process of nest excavation for a total of 20.72 hours on six different days from 23 February to 18 March 2022. Excavation sessions lasted between 9 to 72 minutes before one of the pair left and the other took over the duty. We noted that the excavating individual usually called once or twice before switching roles with its partner. Both members of the nesting pair contributed to nest building: the male however, excavated the cavity seven times longer in a day (4.97 hours) compared to the female (0.67 hours) (Fig. 2).



Fig. 1 - Cavity nest excavated by the northern sooty woodpecker: a) nest entrance; b) nest contents. / Nido scavato dal picchio fuliginoso: a) ingresso del nido; b) contenuto del nido. (Photo: / Foto: Erwin S. Quijano, 29 May 2022).

Diurnal Incubation/Brooding

Observations from 11-12, 15 & 17 April 2022 (16.02 hours), revealed that both parents contribute to diurnal incubation/brooding as evident from the observed prolonged stays of the adults inside the cavity. During a full day observation (06:00-18:00) on 11 April, we recorded that the male stayed inside the cavity for 4.12 hours whereas the female for 3.42 hours. On 14 April, at 18:31, the male was last seen entering the cavity and may have been the one incubating during the night, as is the case with most woodpecker species (Winkler & Christie, 2020).

Nestling Provisioning and Nest Sanitation

On 4-5 May 2022 (16.92 hours), we observed two nestlings peeking from the cavity opening (Fig. 3). The nestlings were black and fully feathered with a slightly whitish breast area. They have short, sturdy, yellowish white bills, and whitish lores, auriculars, and supercilia. During this time, both adult woodpeckers were actively delivering food to the nestlings. Food delivery was done through regurgitation while the adult was perched at the rim of the cavity. On 5 May (06:00-18:00), we recorded 11 feeding instances; five were done by the male and six by the female. Per feeding event, we observed both

adult parents fully entering the cavity and exiting 2-3 minutes later with a faecal sac in the bill. We recorded eight instances of faecal sac removal; five were done by the female and three by the male (Fig. 2). On 14 May at 05:45, the nest was already inactive. We posit that the woodpeckers fledged between 6 and 13 May. During this time, we also noted a pair of green racket-tail parrots *Prioniturus luconensis* inspecting the empty cavity nest for approximately 20 minutes.

DISCUSSION

Woodpeckers typically excavate their nests on dead trees or tree sections soft enough for excavation (Matsuo-ka, 2008). The nest of the northern sooty woodpecker described here, found in the uppermost part of a snag was typical of a picid nest (Winkler & Christie, 2020): cylindrical, deep, and lined with no materials other than wood chips. The species has a brood size of two, within range of the clutch sizes of two congener species ashy woodpecker *M. fulvus* (2-3 eggs; Winkler & Christie, 2020) and great slaty woodpecker *M. pulverulentus* (2-4 eggs; Wells, 1999). Because only a single nest was investigated, further studies are needed to establish the clutch size and the upper limit of the brood size. The nestlings resembled the typical adult form of the species but were generally duller.

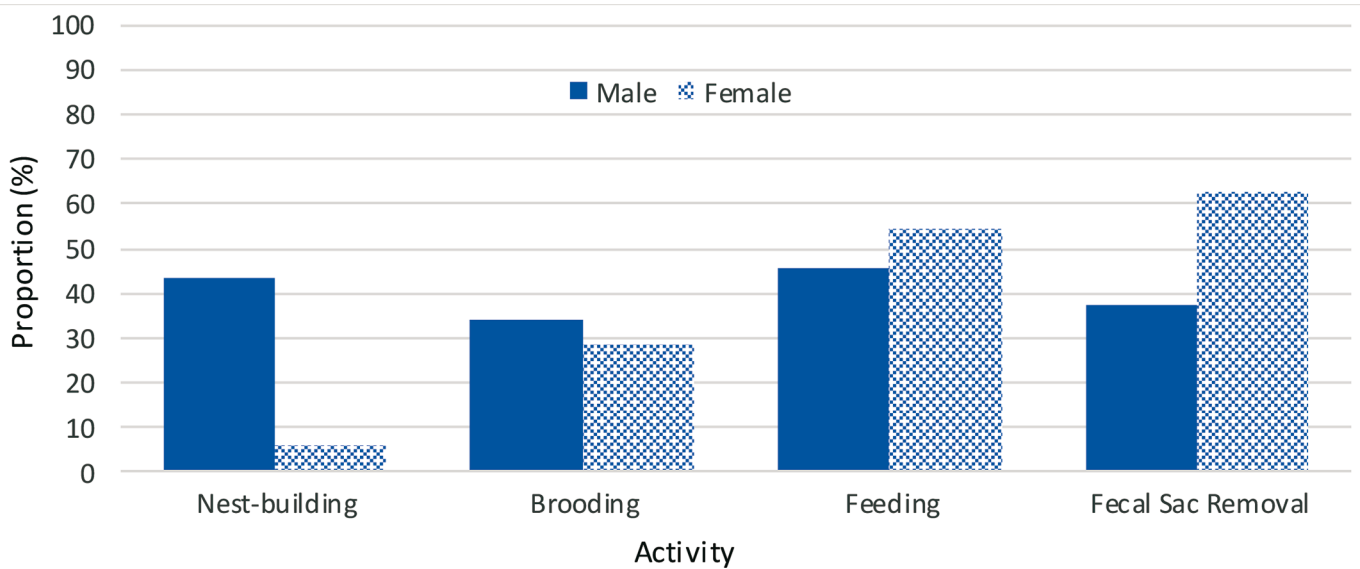


Fig. 2 - Contribution of male and female northern sooty woodpecker to different breeding activities in one full daylight observation period (06:00-18:00). Nest building and brooding efforts were expressed as proportions of time spent (%) from total observation hours whereas feeding and faecal sac removal as proportions of counts (%) from total number of incidences. / Contributo del maschio e della femmina di picchio fuliginoso alle diverse attività riproduttive durante un intero periodo di osservazione diurna (06:00-18:00). Lo sforzo per la costruzione del nido e la cova è stato espresso come proporzione del tempo trascorso (%) rispetto al totale delle ore di osservazione, mentre l'alimentazione e la rimozione delle sacche fecali come proporzione dei conteggi (%) rispetto al numero totale di incidenze.

We noted that both nestlings appeared female, as they did not have the prominent red coloration on the face of an adult male. Sex dimorphism in nestlings may be expected, considering that in the congeneric great slaty woodpecker such dimorphism occurs in nestlings (Lammertink, 2004). The observed breeding season for the species within our site (February to May) coincides with the information reported by Winkler and Christie (2020) for the species in Luzon and Polillo Islands.

Based on our data, nest excavation was ≈ 27 days and egg laying to fledging was ≈ 49 -56 days. Assuming excavation commenced on 20 February and the nestlings fledged around 6-13 May, we estimate the total nesting cycle duration to be ≈ 76 -83 days. In terms of behaviour, both sexes were involved in nest building and chick-rearing. As for parental contributions, the male dominated nest excavation whereas the female contributed more to nest sanitation, much like in Hairy Woodpeckers *Dryobates villosus* (Staebler, 1949). Both sexes contributed relatively equal efforts to diurnal incubation and feeding of nestlings around the time of fledging. Our findings agree with known behavioural patterns for most woodpeckers: males generally contribute more or equally share diurnal parental care to females (Bock, 1970; Short, 1982; Wik-tander *et al.*, 2000; Chazarreta *et al.*, 2011; Koenig & Walters, 2011; Kozma & Kroll, 2013; Winkler & Christie, 2020) on top of their nocturnal incubation and brooding duties (Ligon, 1999). Nonetheless, we recommend future studies on the northern sooty woodpecker to include more nesting pairs and full daylight observations to further corroborate parental contributions reported here.

We also note that the northern sooty woodpecker appears to be a non-cooperative breeder, unlike its con-

gener great slaty woodpecker (Lammertink, 2004). This is evident from the absence of helpers during our nest watches and sightings of northern sooty woodpeckers as either solitary or in pairs and on no occasion in large groups.

To our knowledge, this is the first report on the breeding biology and natural history of the northern sooty woodpecker. Understanding its natural history allows us to appreciate the species better and aid to its conservation. Our finding of an active nest tree near a highly disturbed road suggests a degree of tolerance towards human disturbance or a selection pattern based on mere nest site availability – information that may guide conservation planning and silvicultural practices. Although limited in observation hours and sample size, our findings add information to the scarce knowledge on woodpecker ecology in the Philippines. Our behavioural observations contribute to baseline information in understanding picid evolutionary adaptations in the Philippines, where geographically separated populations and species exist. We recommend the retention of standing dead trees as nesting sites for woodpeckers and existing woodpecker cavities for use of obligate secondary cavity-nesting birds like the Coledo *Sarcops calvus*, Oriental Dollarbird *Eurystomus orientalis*, Philippine Falconet *Microhierax erythrogenys* and Blue-naped Parrot *Tanygnathus lucionensis* and other non-excavating fauna such as bats and rodents. Based on our observations of a pair of green racquet-tail parrots inspecting a northern sooty woodpecker cavity, we hypothesize that cavities excavated by this woodpecker may be used by this understudied Luzon-endemic IUCN Endangered parrot, and this warrants further studies.



Fig. 3 - Northern sooty woodpecker nestlings peeking at the entrance of the cavity nest on 5 May 2022. / Nidiacei di picchio fuliginoso che sbirciano dall'ingresso della cavità del nido il 5 maggio 2022. (Photo: / Foto: Jhaynhell Fidelino).

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